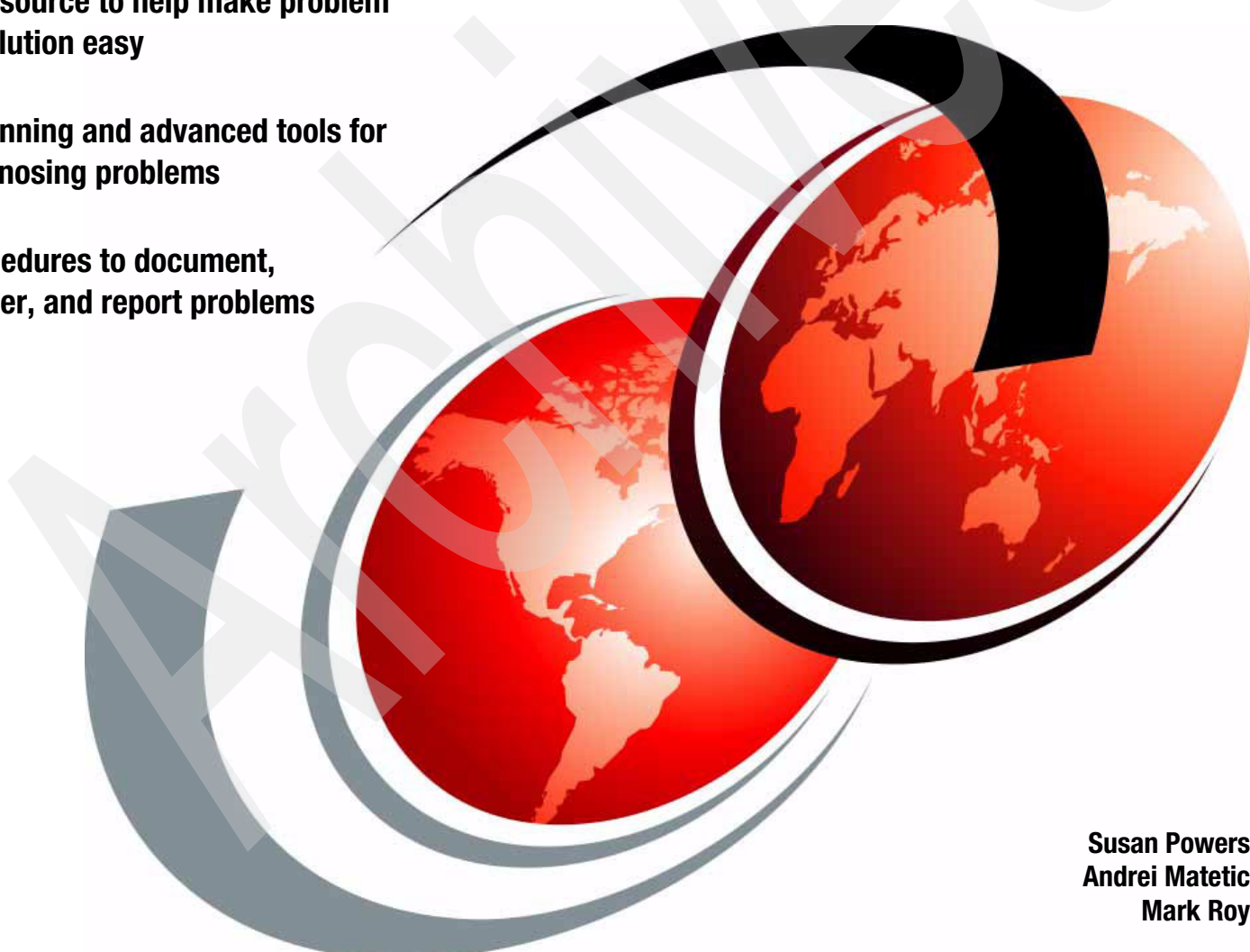**IBM**

i5/OS Diagnostic Tools for System Administrators:
An A to Z Reference for Problem Determination

One source to help make problem resolution easy

Beginning and advanced tools for diagnosing problems

Procedures to document, gather, and report problems

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International Technical Support Organization

i5/OS Diagnostic Tools for System Administrators

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Note: Before using this information and the product it supports, read the information in "Notices" on page xiii.

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Contents

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Preface

Although the System i servers rate over a 99.9% availability factor, there are times when problems occur. Some problems limit the use of a device, program, or application. More severe and pervasive problems limit the use of more components. In either circumstance, the amount of time a component is unavailable relates directly to the actions taken to manage the situation. The ability to resolve problems depends on the tools that are available, the knowledge (and attitude) of the worker, the symptoms and nature of the problem, and other factors.

This book is designed to introduce you to the problem determination aids used in an i5/OS® environment. You can become familiar with the tools that are available and the instructions for how each one works. As proficiency builds with the use of each tool and familiarity with the procedures, efficiency of the system operator and service personnel increases.

> **Note:** The information in this book is written from an operating system perspective versus a hardware perspective. The tools discussed are based on i5/OS V5R4. The information applies to IBM® System i5™, eServer™ i5, eServer iSeries®, and AS/400e™ models. Throughout this book, we use the term "System i" to refer to this family of processors.

Consider this book a "Don't Panic, Read Me First" guide to help you support System i models. It discusses problem analysis, problem determination, and problem source identification. And it offers you step-by step instructions that show you how to use the i5/OS problem determination aids to produce detailed problem information.

Part 1 is useful for the system administrator and operations staff to handle routine problems. This part covers basic problem determination, fundamental steps, and the most common processes.

Part 2 is useful for the system administrator and operations staff to gather necessary documentation for the support provider or more detailed information for analysis for in-house situations.

This book is based on tools and processes available for System i processors of RISC technology. CISC-based AS/400® systems are covered in the publication *AS/400 Data Collection Guide*, SC21-8253. Systems running OS/400® V4R5 and earlier are covered in *AS/400e Diagnostic Tools for System Administrators, An A to Z Reference for Problem Determination,* SG24-8253-00.

The team that wrote this book

This book was produced by a team of specialists from around the world working at the International Technical Support Organization, Rochester Center.

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Part 1

Service tools for operators

The System i system operator plays a key part in system management. The system operator can be the first user to detect a problem. Their actions impact the effectiveness of the problem resolution effort.

Part 1 of this book describes the tools intended primarily for use by the System i system operator. The topics covered in this part include:

► An overview of problem determination

► A perspective of the documents available for system information

► The routine aids used to diagnose job problems (including job logs and spooled files)

► History files

► The system problem log

► Power problems

► Saving collected information to report as an Authorized Program Analysis Report (APAR)

1

Note to users running diagnostic tools on systems with limited interactive capacity:

The i5/OS diagnostic tools are generally commands run from an interactive (5250) session. On systems that have limited or no interactive capacity, consideration needs to be made to ensure that when performing diagnostic tasks that the work is done within the constraints of the interactive capacity of that system. Of most concern are those commands that print or dump diagnostic data - the process of generating the diagnostic data can be significant and should not be done from within an interactive job on systems with limited interactive capacity; rather, these functions should be submitted to batch and run there. For example, a print trace (PRTTRC) command can be long-running for a large trace and should be submitted to batch.

There is also a single job/console exception for interactive (5250 OLTP) work, which means a single interactive job can perform service diagnostics with the full capacity of the system, regardless of the system limitations associated with interactive application capacity. This single job exception can be used to submit interactive work in concert with background (for example, batch) jobs performing service diagnostics, facilitating an expedient problem resolution whether you require one or more diagnostic analysts working on a common problem.

1

Problem determination overview

Locating and resolving problems in an i5/OS environment can be similar to solving a crossword puzzle. Puzzles look different from each other, but after working on a few of them, you begin to see a pattern. Each person has a slightly different method of approaching the puzzle, depending on the clues that are presented. As long as you work systematically through all of the clues, the solution eventually presents itself.

Unlike crossword puzzles, when solving i5/OS problems, a range of problem determination aids are at your disposal, including technical specialists to help you with problem analysis. When system availability is a priority, using all the appropriate tools to resolve the problem as quickly as possible is paramount.

In this book, the problem determination aids that can be used to produce detailed problem information are shown with step-by-step instructions. The use of the various i5/OS displays and menus are explained to assist in gathering information for your service provider.

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1.1 The problem determination process

Problem determination has components of both art and science. Following a formula as in science might not always produce the desired end result. However, a "scientific", disciplined approach is always a good start, as well as a sense of purpose and control.

The terms *problem determination* and *problem source identification* are often joined together into yet another acronym, PD/PSI. While this might seem to be an unnecessary duplication of terms, it conveys that there is an important distinction between the following components of problem analysis:

► **Problem determination (PD)**: The process of finding out exactly what the problem is and what its effects are

► **Problem source identification (PSI)**: The process of finding out what has caused the problem

In some cases, it is not possible to give a complete explanation of the cause of a problem. Your service provider, with the assistance of appropriate diagnostic information, can recommend a course of action to recover from a problem.

1.2 Your service provider

The term "service provider" is used in this book to refer to the group of people that you use for technical support for i5/OS problems.

In some cases, this is your local IBM office or the IBM Business Partner who supplied your System i solution. In countries where IBM does not have local representation, service might be available though an affiliated company.

In the majority of cases, either an IBM Hardware Maintenance Agreement or an IBM Software Maintenance Agreement is required for entitlement to problem support from IBM or its affiliates. In some cases, both of these contracts (or their equivalent in your country) are required.

Refer to the iSeries Information Center for a discussion on obtaining problem support. See **Troubleshooting** → **Report Problems** → **Overview** → **Contact IBM Support** at:

http://www.ibm.com/eserver/iseries/infocenter

1.3 Defining problems

A motor mechanic expects the owner of the vehicle to provide sufficient information to direct them to the problem area of the problem vehicle. If you tell a mechanic that your car is running badly, but neglect to provide any detailed symptoms, they can spend unnecessary time looking for unrelated causes. Isolating a problem involves understanding the problem and defining it in terms meaningful to those who support the system.

There are two classifications of symptoms that assist in defining any i5/OS system-related problem:

► External symptoms
► Internal symptoms

The following sections provide a summary of these two different symptom categories.

1.3.1 External symptoms

The first objective of problem isolation is to define the external symptoms accurately. The external symptoms are the attributes of the incident that first drew attention to the existence of a problem. One or more of the following symptoms can be present:

► **Incorrect output:** The displayed or printed output from a job is not as expected.

► **Messages:** There are error messages in the job log, system operator message queue, or the system history log.

► **Wait:** A job, many jobs, or the entire system can stop processing with little CPU activity.

► **Loop:** A job, or many jobs, can consume large amounts of CPU, precluding normal processing.

> **Tip:** The job or system is either in a loop or a wait state. There is no such thing as a "hang".

1.3.2 Internal symptoms

The second objective of problem isolation is to find one or more internal symptoms. Any number of internal symptoms can contribute to an external symptom. Each internal symptom has a special diagnostic plan that requires the collection of specific information.

Where messages are concerned, it is necessary to record any return codes, sense codes, dump identifiers, and qualifiers. Refer to Chapter 4, "Collecting messages" on page 35, for more information on messages and Table 4-3 on page 58 for a road map to gather useful codes.

When a loop is encountered, it is necessary to determine if there is a single job involved in the loop or if the entire system is affected.

When a wait condition is encountered, it is necessary to determine whether the wait is at a job or a system level.

Messages are the key indicators in determining if a lock condition is held within a job environment or between jobs.

1.4 Using the Problem Summary Form

Problem Report Forms are supplied in the iSeries Information Center. These forms are designed to assist in the collection of details relating to a problem. The Problem Summary forms serve as a reminder to record details that might seem obvious, but vary significantly from system to system.

Some examples of the information recorded on the Problem Report Forms are:

► Error message identifiers
► Date and time of the problem
► System reference codes

We recommend that you use the Problem Summary Forms to gather details about the problem, before you contact your service provider. Using these forms serves as a checklist for recording the majority of symptoms and problem indications. Refer to the iSeries Information Center for the Problem Summary Form specific to the model processor experiencing the

problem, because the layout of the operator panel varies with processor model. There are also different forms for partitioned and non-partitioned systems.

Problem Summary Forms can be found in the iSeries Information Center at:

http://www.ibm.com/eserver/iseries/infocenter

When you reach this site, click **Troubleshooting** → **Report problems: Overview** → **Gather information with the problem summary form.**

1.5 A word on iSeries Navigator

iSeries Navigator is a powerful graphical interface for Windows® clients. With iSeries Navigator, managing and administering your System i configuration and operating system environment is made possible from a Windows desktop.

iSeries Navigator enables the management of communications, printing, database, security, and other system operator functions. This interface is designed as a productivity enhancement and is the only interface to some of the newer features introduced with i5/OS. For information on installing iSeries Navigator, refer to the iSeries Information Center at:

http://www.ibm.com/eserver/iseries/infocenter

When you reach this site, click **Connecting to iSeries** → **iSeries Navigator.**

For a release-by-release comparison of the functions available in iSeries Navigator, see:
http://publib.boulder.ibm.com/infocenter/iseries/v5r3/ic2924/info/razj2/rzaj2functiontable.htm

Further information about iSeries Navigator is available in the following IBM Redbooks publications:

► *Managing OS/400 with Operations Navigator V5R1 Volume 1: Overview and More*, SG24-6226

► *Managing OS/400 with Operations Navigator V5R1 Volume 2: Security*, SG24-6227

► *Managing OS/400 with Operations Navigator V5R1 Volume 3: Configuration and Service*, SG24-5951

► *Managing OS/400 with Operations Navigator V5R1 Volume 4: Packages and Products*, SG24-6564

► *Managing OS/400 with Operations Navigator V5R1 Volume 5: Performance Management*, SG24-6565

Also refer to the iSeries Information Center for information on IBM System i Access for Web.

1.6 Information required for problems

The information listed here is required *every time* you report a problem to your service provider:

► **The version, release, and modification level of i5/OS and any affected Licensed Program Product (LPP)**

Installed Licensed Program Products (LPPs) can be at a different release level than that of the operating system. Be specific when specifying the release levels of individual products.

Use the GO LICPGM display as shown in Figure 1-1 to determine the installed release of each licensed program. Enter option 10 to display the Licensed Products, and use the F11 key to display the Release information.

```
Display Installed Licensed Programs
                                                        System:    ITSOSYS1
 Licensed   Installed
 Program    Release      Description
 5722SS1    V5R4M0 L00   Library QGPL
 5722SS1    V5R4M0 L00   Library QUSRSYS
 5722SS1    V5R4M0 L00   i5/OS
 5722SS1    V5R4M0       Extended Base Support
 5722SS1    V5R4M0       Online Information
 5722SS1    V5R4M0       Extended Base Directory Support
 5722SS1    V5R4M0       Example Tools Library
 5722SS1    V5R4M0       Host Servers
 5722SS1    V5R4M0       System Openness Includes
 5722SS1    V5R4M0       HA Switchable Resources
 5722DG1    V5R4M0       IBM HTTP Server for i5/OS
 5722DG1    V5R4M0       Triggered Cache Manager
 5722JC1    V5R4M0       IBM Toolbox for Java
 5722JV1    V5R4M0       IBM Developer Kit for Java
                                                                  More...
 Press Enter to continue.


 F3=Exit    F11=Display option   F12=Cancel    F19=Display trademarks
```

Figure 1-1   GO LICPGM: Option 10

To produce a listing that can be forwarded to your service provider, use the Display Software Resources command:

DSPSFWRSC OUTPUT(*PRINT)

► **The level of the cumulative package applied to your system**

Use the DSPPTF command to display the program temporary fix (PTF) list for the installed licensed programs, as shown in Figure 1-2 on page 8.

The TC entry at the top of the list identifies the Cumulative Package installed. The format is TCyyddd, where:

– *yy* is the year of the Cumulative Package release.
– *ddd* is the Julian day of the Cumulative Package release.

> **Note:** Use one of the following commands to determine the Cumulative PTF Package level installed on your system:
>
> ```
> DSPPTF LICPGM(5722SS1)
> DSPPTF LICPGM(5722999)
> ```
>
> When selecting 5722SS1, look for the **TCyyddd** entry.
>
> When selecting 5722999, look for the **TLyyddd** entry.

```
 Display PTF Status
                                                     System:   ITSOSYS1
 Product ID  . . . . . . . . . . . . . :     5722999
 IPL source  . . . . . . . . . . . . . :     ##MACH#B
 Release of base option  . . . . . . . :     V5R4M0 L00


 Type options, press Enter.
   5=Display PTF details   6=Print cover letter   8=Display cover letter


      PTF                                           IPL
 Opt  ID      Status                                Action
      TL06192  Temporarily applied                  None
      TL06115  Superseded                           None
      TL06066  Superseded                           None
      TL06024  Superseded                           None
      TL05354  Superseded                           None
      TL05326  Superseded                           None
      RE06180  Permanently applied                  None
      RE06144  Permanently applied                  None
      RE06115  Permanently applied                  None
                                                              More...
 F3=Exit    F11=Display alternate view   F17=Position to    F12=Cancel
```

Figure 1-2   DSPPTF command: Displaying the cumulative PTF level

► **The level of the Program Temporary Fix groups applied to your system**

A PTF group consists of a list of Program Temporary Fixes (PTFs) defined for the purpose of managing those PTFs as one group. A PTF group can identify other PTF groups called related PTF groups. The PTFs in the PTF group as well as the PTFs in all related PTF groups are used to determine the overall status of the PTF group.

Select **F6=Print** to produce the listing.

```
Work with PTF Groups
                                                           System:    ITSOSYS1
Type options, press Enter.
  4=Delete   5=Display   6=Print   8=Display special handling PTFs
  9=Display related PTF groups


Opt   PTF Group            Level  Status
      SF99540               6192  Installed
      SF99539                 27  Installed
      SF99504                  4  Installed
      SF99315                  3  Installed
      SF99291                  4  Installed
      SF99114                  5  Installed




                                                                        Bottom
 F3=Exit    F6=Print    F11=Display descriptions    F12=Cancel
 F22=Display entire field
```

Figure 1-3   WRKPTFGRP command: Displaying the PTF group level

For more information about collecting PTF information, refer to Chapter 32, "Collecting program temporary fix (PTF) levels" on page 495.

1.7 Finding your printed output

While performing the problem determination procedures outlined in this publication, you can run commands or procedures that produce spooled output. There is more than one way to locate spooled files that are produced. The following procedure shows a simple method to locate spooled files generated within the current interactive job.

To locate spooled files for the current interactive job, perform the following steps:

1. Type WRKJOB on a command line, and press the Enter key. A display appears like the example in Figure 1-4 on page 10.

```
Work with Job
                                                        System:    ITSOSYS1
Job:    QPADEV0003    User:   ITSOUSER            Number:    004516

Select one of the following:

     1. Display job status attributes
     2. Display job definition attributes
     3. Display job run attributes, if active
     4. Work with spooled files

    10. Display job log, if active, on job queue, or pending
    11. Display call stack, if active
    12. Work with locks, if active
    13. Display library list, if active
    14. Display open files, if active
    15. Display file overrides, if active
    16. Display commitment control status, if active
                                                             More...
Selection or command
===>

F3=Exit    F4=Prompt    F9=Retrieve    F12=Cancel
```

Figure 1-4   WRKJOB display

2. Type 4 in the Selection or command prompt. A display appears like the example in
   Figure 1-5.

```
Work with Job Spooled Files

 Job:   QPADEV0003    User:   ITSOUSER           Number:    004516

 Type options, press Enter.
   1=Send   2=Change   3=Hold   4=Delete   5=Display   6=Release   7=Messages
   8=Attributes          9=Work with printing status

                   Device or                    Total    Current
 Opt  File         Queue        User Data   Status  Pages    Page    Copies
      QSYSPRT      QPRINT                    RDY      47               1
      QSYSPRT      QPRINT                    RDY       1               1
      QSYSPRT      IBMOUTQ                   HLD      47               1
      QSYSPRT      IBMOUTQ                   HLD      47               1
      QSYSPRT      IBMOUTQ                   HLD      47               1
      QSYSPRT      IBMOUTQ                   HLD      47               1
      QSYSPRT      IBMOUTQ                   HLD      47               1
      QPDSPFD                                FIN
      QPSRODSP     IBMOUTQ      DSPSAVF      RDY       1               1
                                                             More...
 Parameters for options 1, 2, 3 or command
 ===>
 F3=Exit    F10=View 3    F11=View 2    F12=Cancel    F22=Printers    F24=More keys
```

Figure 1-5   WRKJOB: Spooled files display

Table 1-1 explains the fields highlighted in Figure 1-5 on page 10.

Table 1-1   Column descriptions for the Work with Job Spooled Files display

Item	Description
File	The value listed in the File column is the printer file name. Various spooled files can be identified by the name in this column. For example, a job log always displays QPJOBLOG in this field.
Device or queue	The value listed in the Device or Queue column is the name of the output queue where the spooled file has been generated. The spooled file can be moved to another output queue.
User data	The value in the User Data column is useful in identifying the command that has produced the output. For example, QPSRODSP is produced with the DSPSAVf command. The QPDSPNET file is produced with the DSPNETA CL command.

Note: For many of today's problems you also need to find spooled files of the jobs you are troubleshooting.

1.8 Recreating a problem

In some cases, the most appropriate approach to resolve a problem is to supply sufficient material to your service provider who can re-create the problem on another System i system.

When a problem is perceived to be a software defect in i5/OS, a Licensed Program Product, or an application, supplying a test environment to your service provider ensures that all the required diagnostic information can be gathered.

Follow these steps to collect the re-creation materials:

1. Create a library to hold the test environment.

2. Copy all the required objects into the test environment library, for example: applications, data files, source files, data areas, and configuration definitions.

3. Run the failing program or procedure in the test environment to ensure that the problem can be demonstrated.

4. Save the test environment to offline media or a save file.

5. Forward the offline media or save file to your service provider, with the step-by-step instructions to re-create the problem.

1.9 System i server problem management

The server's problem management functions are integrated into the System i Licensed Internal Code (LIC) and i5/OS. These management functions automate problem analysis, problem logging and tracking, problem notification, and problem reporting.

System failures fall into two groups:

► System-detected failures
► User-detected errors

Problem management functions are provided for both categories of failures.

Refer to 7.1, "Analyzing problems detected by i5/OS" on page 107, and 7.2, "Creating a new entry in the problem log" on page 108, for information on the interfaces to this function through the WRKPRB and ANZPRB commands.

1.9.1 First Failure Data Capture (FFDC)

One of the components of the system problem management functions is a facility known as First Failure Data Capture (FFDC). Software problems are not automatically analyzed by the system. However, the system can record problem log entries and capture diagnostic information through the FFDC function. This facility is enabled by setting the QSFWERRLOG system value to *LOG. The system has a default value for QSFWERRLOG of *LOG to enable the FFDC feature.

When the system detects a software problem, the error might be logged in the error log. A message is sent to the system operator message queue (QSYSOPR). Then, the problem can be analyzed and reported to your service provider by working with the problem log entry.

The information captured by FFDC can include a dump and other job related information. Each problem log entry created by FFDC has a library associated with it. This library is the repository for the diagnostic information automatically collected by the FFDC process. This library is referred to as the *APAR library* and has a standard naming convention. The library is named QSCnnnnnnn, where *nnnnnnn* is the last seven digits of the problem log identifier.

> **Note:** The Service Monitor is available with i5/OS V5R4. See the iSeries Information Center for associated information.

1.9.2 Flight recorders

In addition to the information that is collected automatically by FFDC and manually by the commands and procedures in this publication, System i server architecture incorporates another set of tools called *flight recorders*. Some flight recorders are extracted from a Main Storage Dump or LIC logs or through APIs.

Flight recorders are integrated into LIC and i5/OS. They are designed by the architects of the system to collect specific data, usually at a lower level than the user interfaces described in this publication.

Flight recorders vary in their implementation from release to release. They usually require direction from your service provider or the IBM development team to gather the information about a specific problem.

A flight recorder is typically used only under the direction of your service provider. For a closer look at flight recorders and their use, refer to Appendix D, "Using system flight recorders" on page 513.

1.10 A word on PTFs

IBM periodically creates Program Temporary Fixes (PTFs) to correct problems or prevent problems found within a particular IBM licensed program. In addition, PTFs supply fixes for problems that seem to be hardware failures, or they can provide new functions.

PTFs are designed to replace one or more objects in a licensed program. Generally, PTFs are incorporated in a future release of the operating system or licensed program.

A program maintenance strategy is recommended for all System i customers. Establishing a maintenance strategy can reduce the impact to System i operations that result from unplanned outages or program failures. Due to the broad range of customer environments, a single recommendation does not apply to all situations. It is the customer's responsibility to evaluate their operations, identify an appropriate strategy, and apply scheduled maintenance to achieve optimal system performance and availability.

The following guidelines can help you to develop an effective Program Maintenance Strategy. A Program Maintenance Strategy for your System i solution should include:

► **Preventive Service**: Cumulative PTF packages, service packs, and group PTF packages

► **Corrective Service**: Single PTFs, including high-impact and pervasive (HIPER) PTFs

► **Preventive Service Planning Information**: PSPs and Alerts

It is appropriate to consider installing PTFs as part of the problem determination process. In particular, this becomes increasingly important when a software defect is suspected in IBM-supplied software. Your service provider might advise you when it is necessary to bring your system up to the latest PTF level as a problem determination step.

2

System information documents

When the System i server is not accessible using a session, your service provider relies on previously gathered information about your system to help them in providing a resolution to a problem. This chapter advises you on what system information to collect and keep safe for future reference, if and when it is required.

2.1 Print System Information (PRTSYSINF)

The information in Table 2-1, which was produced from running the Print System Information (PRTSYSINF) command, is of great value when recovering your system in the event of a system disaster. PRTSYSINF is a good documentation tool that can be incorporated into daily or routine management tasks:

Table 2-1   PRTSYSINF output.

Spooled file name	User data	Description of contents
QPEZBCKUP	DSPBCKUPL	List of all user libraries
QPEZBCKUP	DSPBCKUPL	List of all folders
QSYSPRT	DSPSYSVAL	Current settings for all system values
QDSPNET	DSPNETA	Current settings for all network attributes
QSYSPRT	DSCFGL	Configuration lists
QSYSPRT	DSPEDTD	User-defined edit descriptions (a separate spooled file for each)
QSYSPRT	DSPPTF	Details of all PTFs that are installed on the system
QPRTRPYL	WRKRPYLE	All the reply list entries
QSYSPRT	DSPRCYAP	Settings for access path recovery times
QSYSPRT	DSPSRVA	Settings for service attributes
QSYSPRT	DSPNWSSTG	Network server storage spaces information
QSYSPRT	DSPPWRSCD	Power on/off schedule
QSYSPRT	DSPHDWRSC	Hardware configuration (a separate spooled file for each resource type, such as *STG or *LWS)
QSYSPRT	WRKOPTCFG	Optical device descriptions
QSYSPRT	DSPRJECFG	Remote job entry configurations
QPDSTSRV	DSPDSTSRV	SNADS configuration
QPRTSBSD	DSPSBSD	Subsystem descriptions (a separate spooled file for each subsystem description on your system)
QSYSPRT	DSPSFWRSC	Installed licensed programs (software resource list)
QPRTOBJD	DSPOBJD	A list of all journals on your system
QPDSPJRNA	WRKJRNA	The journal attributes for each journal that is not in the QUSRSYS library (a separate file for each journal). Typically, journals in the QUSRSYS library are IBM-supplied journals. If you have your own journals in the QUSRSYS library, you need to manually print information about these journals.

Spooled file name	User data	Description of contents
QSYSPRT	CHGCLNUP	Settings for automatic cleanup
QPUSRPRF	DSPUSRPRF	Current values for the QSECOFR user profile
QPRTJOB	DSPJOBD	Current values for the QDFTJOBD job description
QPJOBLOG	PRTSYSINF	The job log for this job

In the above table, note that user data automatically contains the CL command run by PRTSYSINF.

2.2 Hardware device listing

The hardware device listing is important to assist you and the service provider in determining problems with controllers and cable labelling.

2.2.1 Work with Hardware Products (WRKHDWPRD)

Type the Work with Hardware Products (WRKHDWPRD) command on a command line. Then, a menu appears like the example shown in Figure 2-1.

```
Work with Hardware Products
                                                    System:    ITSOSYS1
 Select one of the following:

     4. Display description label locations
     5. Change description label locations

















  Selection


  F3=Exit    F12=Cancel
```

Figure 2-1   Work with Hardware Products menu

Select option 4, and press Enter. A display appears as shown in Figure 2-2 on page 18. Press F17. This produces a spooled file named QSYSPRT.

This information is particularly important when it comes to labelling the communication cables from the rear of the system unit and expansion units to communication cabinets containing hubs, routers, or multistation access units. Correctly identifying the labelled cable saves time in problem determination.

```
Display Description Label Locations
                                                   System:    ITSOSYS1
 System type-model/serial . . . . . . . . :   9406-520 / 65-99999

 ----------------Location-----------------
 Frame    EIA     Device    Card
  ID    Location Position  Position  Port  Label
 3                          C03        1   ETHLINO1, QESLINE,
                                             QTILINE
 3                          C04            CTL01
 3                          C12        1   ETHLINO2
 3                          D41            OPT01
                                       1   VLAN01HTBT
                                       2   VLAN02LAN
                                       3   VLAN03GE01
                                       4   VLAN04GE02
                                       5   VLAN05GE03
                                       6   VLAN06GE04
                                       7   *NONE
                                       8   *NONE
                                       9   *NONE
                                                             More...
```

Figure 2-2   Display Description Label Locations display

2.3 Printing local device addresses

This information is particularly beneficial in detecting workstation device and cabling problems on your system. On some larger system configurations, this can reduce the amount of time spent trying to track down a "rogue" workstation.

Note: This section applies only to clients with devices attached through twinax.

2.3.1 Print Device Addresses (PRTDEVADR)

To determine which workstation controllers are configured on your system, first type **WRKCTLD**
*LWS on a command line. Press Enter. A display appears like the example in Figure 2-3. The
controller names are shown.

```
Work with Controller Descriptions
                                                        System:    ITSOSYS1
 Position to  . . . . .                    Starting characters

 Type options, press Enter.
   2=Change   3=Copy     4=Delete    5=Display    6=Print    7=Rename
   8=Work with status   9=Retrieve source      12=Print device addresses


 Opt   Controller   Type        Text
       CTL01        2746        CREATED BY AUTO-CONFIGURATION
       QCTL         2746        Controller description created during IPL.




                                                                    Bottom
 Parameters or command
 ===>
 F3=Exit    F4=Prompt    F5=Refresh    F6=Create    F9=Retrieve    F12=Cancel
 F14=Work with status
```

Figure 2-3   Work with Controller Descriptions display

Now, type **PRTDEVADR <controller name>** on the command line, and press Enter. This creates
a spooled file named QPDCDEVA for each controller you request, as shown in Figure 2-4 on
page 20.

```
Display Spooled File
 File . . . . . :  QPDCDEVA                                      Page/Line   1/1
 Control . . . . .                                              Columns    1 - 130
 Find . . . . . .
 *...+....1....+....2....+....3....+....4....+....5....+....6....+....7....+....8....+....9....+....0....+....1....+....2....+....3
 5722SS1 V5R4M0 060210            Device Addresses for        ITSOSYS1  10/31/07 12:51:42   Page   1
                              Local Work Station Controller CTL01
                                      Type 2746
      Switch Setting --> 0        1        2        3        4        5        6

 _____
 _____
                 :        :        :        :        :        :        :        :
                 : DSP01   : DSP02   : DSP03    : DSP04    :        :        :        :
      Port 0 : *DSP     : *DSP     : *DSP      : *DSP     :        :        :        :
                 : 3487  HC : 3487  HC : 3487  HC : 3487  HC :        :        :        :
                 :        :        :        :        :        :        :        :
                 :        :        :        :        :        :        :        :
                 :        :        :        :        :        :        :        :
                 :        :        :        :        :        :        :        :
                 :        :        :        :        :        :        :        :
                 :        :        :        :        :        :        :        :
 :_____:_____:_____:_____:_____:_____:_____:___
 _____:
                 :        :        :        :        :        :        :        :
                 :        :        :        :        :        :        :        :
      Port 1 :        :        :        :        :        :        :        :
                                                                      More...
  F3=Exit  F12=Cancel  F19=Left  F20=Right  F24=More keys
```

Figure 2-4   Display Spooled File display of file QPDCDEVA

2.4 System configuration list

The system configuration list contains information on the system, packaging hardware, logical
hardware resource, and a legend. This particular list is very helpful in determining the point of
failure from system reference codes displayed on the front panel.

Note: When any system changes have taken place, either hardware or software, we
advise that you record these changes by performing the tasks in this section.

2.4.1 Printing the system configuration list

Contact the security officer or system administrator to obtain service authority to use System
Service Tools (SST). This authority is necessary to use SST. Refer to Chapter 26, "Using
System Service Tools (SST)" on page 415, to access SST. Follow these steps to print the
system configuration list:

1. On the Start a Service Tool display, select option 7 (Hardware Service Manager).

2. Select the Print (F6) function key on the Hardware Service Manager display, as shown in
   Figure 2-5 on page 21.

```
Hardware Service Manager

 Attention:  This utility is provided for service representative use only.

    System unit . . . . . . . . :    9406-520 65-99999
    Release . . . . . . . . . :    V5R4M0

 Select one of the following:
     1.  Packaging hardware resources (systems, frames, cards,...)
     2.  Logical hardware resources (buses, IOPs, controllers,...)
     3.  Locate resource by resource name
     4.  Failed and non-reporting hardware resources
     5.  System power control network (SPCN)
     6.  Work with service action log
     7.  Display label location work sheet
     8.  Device Concurrent Maintenance
     9.  Work with resources containing cache battery packs
                                                                    Bottom
 Selection



 F3=Exit      F6=Print configuration      F9=Display card gap information
 F10=Display resources requiring attention      F12=Cancel
```

Figure 2-5   Hardware Service Manager display

3. On the next display, accept the defaults, and press Enter. A spooled file name of
   QPCSMPRT is created, as shown in Figure 2-6 on page 22.

```
Display Spooled File
 File . . . . . :  QPCSMPRT                                           Page/Line   1/1
 Control . . . . .                                                    Columns     1 - 130
 Find  . . . . . .
 *...+....1....+....2....+....3....+....4....+....5....+....6....+....7....+....8....+....9....+....0....+....1....+....2....+....3
    HARDWARE SERVICE MANAGER              SYSTEM CONFIGURATION LIST    ITSOSYS1   11/02/07
12:54:17   PAGE
 SYSTEM TYPE / MODEL / FEATURE CODE / SERIAL NUMBER / RELEASE : 9406 / 520 / 8972 / 65-99999  /
 V5R4M0
                                  - - LOCATION - -
                        SERIAL     FRAME DEVICE CARD  RESOURCE  PART
 DESCRIPTION            TYPE-MODEL   NUMBER    ID  POS.  POS.  NAME    NUMBER      LOGICAL
ADDRESS
 SYSTEM            9406-820     65-99999              CEC01
  SYSTEM UNIT      9406-820     65-99999   1          CEC01
  SYSTEM BUS       282D         18-1047049  1         LB01   21P5046   2/  1/ /  - / /  / / / /
  SYSTEM BUS       282D         18-1047049  1         LB02   21P5046   2/  2/ /  - / /  / / / /
   BACKPLANE       283F         38-12091    1    DB1        04N2472
   BACKPLANE       283F         38-01761    1    DB2®       04N2472
    ACTIVE BACKPLANE    282D      18-1047049  1    MB1  BP01   0000021P5046
   HSL I/O BRIDGE      282D      18-1047049  1    MB1  BC03   21P5046
   MULTI-ADAPTER BRIDGE   282D   18-1047049  1    MB1  PCI01D  21P5046   2/  1/0/ 31- / /  / / / /
   BUS EXPANSION ADAPTER   282D   18-1047049  1   MB1  BCC02  21P5046
   MULTI-ADAPTER BRIDGE   282D   18-1047049  1    MB1  PCI02D  21P5046   2/  2/0/ 31- / /  / / / /
   BUS EXPANSION ADAPTER   282D   18-1047049  1   MB1  BCC03  21P5046
   MAIN STORAGE RISER    2884     28-0164077  1    M02  MR01   0000004N4801
   MAIN STORAGE      3007-000   28-1329092  1   M02A MS16   0000023L7697 LOCATION =>       0
                                                                    More...
  F3=Exit  F12=Cancel  F19=Left  F20=Right  F24=More keys
```

Figure 2-6   Display spooled file for QPCSMPRT

2.5 Retrieve Configuration Source (RTVCFGSRC)

The Retrieve Configuration Source (RTVCFGSRC) command is another useful documentation tool that can be used to re-create configurations if they are deleted, damaged, or change. This is discussed in 13.2.3, "Retrieving the configuration source" on page 211.

2.6 Cluster configuration

Gathering the cluster configuration can be useful if you are using clustering and need to re-create a cluster environment.

2.6.1 Printing cluster information

To print the cluster information, type **DSPCLUINF DETAIL(*FULL) OUTPUT(*PRINT)** on a command line. Press Enter. A spooled file named QCSTDSPCLU is created, as shown in Figure 2-7.

```
Display Spooled File
 File . . . . . :  QCSTDSPCLU                                            Page/Line   1/1
 Control . . . . .                                                       Columns    1 - 130
 Find . . . . . .
 *...+....1....+....2....+....3....+....4....+....5....+....6....+....7....+....8....+....9....+....0....+....1....+....2....+....3
             DSPCLUINF                    Page    1
 5722SS1 V5R4M0  060210              ITSOSYS1  11/09/07  14:53:51 UTC
             Display Cluster Information
 Cluster . . . . . . . . . . . . . :  CLUSTER001
 Consistent information in cluster  :  *NO
 Current cluster version  . . . . . :  4
 Current cluster modification level :  0
 Configuration tuning level . . . . :  *NORMAL
 Number of cluster nodes  . . . . . :  3
 Number of device domains . . . . . :  1
 Detail . . . . . . . . . . . . . . :  *FULL
                   Cluster Membership List
             Potential
             Node  Mod  Device
 Node     Status    Vers Level  Domain    ------Interface Addresses-------
 ITSOSYS3 Inactive    5   0   DEVDMN1     nnn.nn.nn.n
 ITSOSYS2 Active      5   0   DEVDMN1     nnn.nn.nn.n
 ITSOSYS1 Failed      5   0   DEVDMN1     nnn.nn.nn.n

                                                                        More...
 F3=Exit  F12=Cancel  F19=Left  F20=Right  F24=More keys
```

Figure 2-7   Display spooled file for QCSTDSPCLU

> **Note:** The information displayed or printed might not be current if the command is called on a node that has a status of Inactive or Failed. In this case, the information displayed or printed reflects the state of the cluster when the node was last active.

2.6.2 Printing cluster resource group information

To print the cluster resource group information, type DSPCRGINF on a command line and press F4. An example is shown in Figure 2-8.

```
Display CRG Information (DSPCRGINF)

Type choices, press Enter.

Cluster  . . . . . . . . . . . .                    Name
Cluster resource group . . . . .   *LIST            Character value, *LIST
Output . . . . . . . . . . . . .   *PRINT           *, *PRINT




                                                                    Bottom
 F3=Exit    F4=Prompt    F5=Refresh    F12=Cancel    F13=How to use this display
 F24=More keys
```

Figure 2-8   Display CRG Information prompt

Enter the cluster name in the Cluster prompt, the cluster resource group name in the Cluster resource group prompt and change the Output prompt from * to *PRINT. Press Enter.

> **Note:** The information displayed or printed might not be current if the command is called on a node that has a status of Inactive or Failed. In this case, the information displayed or printed reflects the state of the cluster when the node was last active.

A spooled file named QCSTDSPCRG is created, as shown in Figure 2-9 on page 25.

```
 Display Spooled File
 File . . . . . :  QCSTDSPCRG                                          Page/Line   1/1
 Control . . . . .                                                     Columns    1 - 130
 Find . . . . . .
 *...+....1....+....2....+....3....+....4....+....5....+....6....+....7....+....8....+....9....+....0....+....1....+....2....+....3
                  DSPCRGINF                    Page    1
 5722SS1 V5R4M0 060210                ITSOSYS1 11/09/07 15:14:47 UTC
                  Display CRG Information
 Cluster . . . . . . . . . . . . :  CLUSTER001
 Cluster resource group . . . . . :  GRG001
 Reporting node identifier . . . :  ITSOSYS1
 Consistent information in cluster:  *NO
 Cluster resource group type  . . . :   Device
 Cluster resource group status  . . :   Inactive
 Previous CRG status . . . . . . . :   Switchover Pending
 Exit program . . . . . . . . . . . :  *NONE
   Library . . . . . . . . . . . . :    *NONE
 Exit program format . . . . . . . :  *NONE
 Exit program data . . . . . . . . :  *NONE
 User profile . . . . . . . . . . . :  *NONE
 Text . . . . . . . . . . . . . . . :  CRG
 Distribute information queue . . . :  *NONE
   Library . . . . . . . . . . . . :    *NONE
 Failover message queue . . . . . . :  *NONE
                                                              More...

 F3=Exit  F12=Cancel  F19=Left  F20=Right  F24=More keys
```

Figure 2-9   Display spooled file for QCSTDSPCRG

Refer to Chapter 18, "Cluster Resource Services" on page 297 for gathering information unique for clustered systems.

2.7 Additional information

For more information on collecting system information, refer to the Printing system information topic in the iSeries Information Center at:

http://www.ibm.com/eserver/iseries/infocenter

When you reach this site, click **Systems management** → **Backup and recovery** → **Backing up your system** → **Overview of the GO SAVE command** → **GO SAVE command menu options** → **Performing a complete save using the GO SAVE checklist** → **Printing system information.**

3

Easy data collection

When you encounter a problem on your system and need assistance from a service provider, you can begin collecting data about the problem using a standard tool known as Operational Assistant (OA).

OA does not require any initial procedures before collecting data related to your problem. If you just encountered a problem with your job and want to collect data about the problem without making choices, use OA to gather the data. Otherwise, use the *save APAR data* functions as described in Chapter 7, "Problem log and Save APAR Data" on page 105.

If you plan to save APAR data, it is helpful to know whether there is a problem log entry associated with your problem. If you used the Analyze a Problem (ANZPRB) command, a problem log entry exists. The system also creates problem log entries for certain hardware and software errors. Both types of errors have associated problem log entries.

> **Note:** Software errors detected by the system are logged only if the system value QSWERRLOG is set to *LOG.

Refer to Table 3-1 for more information to help you choose either OA or save APAR data.

Table 3-1   Operational Assistant and SAVAPARDTA functions

Function	Authorized users	Data collected	Output queue	Selection list?	Reference
OA	Any	Your job log, your job information, PTFs, QHST, active jobs, your message queues, QSYSOPR, PTFs	QEZDEBUG in library QUSRYSYS	No	See 3.1, "Using Operational Assistant to collect data" on page 28.
Save APAR data	System operator, service representative	All of the above plus LIC logs, error logs, etc.	QSCAPAROQ in library QSCxxxxxxx	Yes	See 7.4, "Using Save APAR Data (SAVAPARDTA) to collect data" on page 119.

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3.1 Using Operational Assistant to collect data

OA is an easy to use interface to i5/OS operations. It is a useful tool when your environment is not more complicated than a 5250-session. One of the features is collecting data for a problem you are having in your current sign-on session or job. Data collection is automatic and requires no input from the user.

The following data is collected in the QEZDEBUG output queue in the QUSRSYS library:

- ► The messages on QSYSOPR message queue
- ► The messages on your workstation message queue
- ► The messages from your user message queue
- ► Currently active jobs
- ► The history log (QHST)
- ► PTFs
- ► The job information for this sign-on session
- ► The job log for this sign-on session

To use OA to collect data associated with your immediate problem, perform the following steps:

1. Enter the following command:

    GO USERHELP

    The display shown in Figure 3-1 appears.

```
 USERHELP              Information and Problem Handling
                                                        System:   ITSOSYS1
  To select one of the following, type its number below and press Enter:

       1. How to use help
       2. Information Assistant options
       3. Display work station user

      10. Save information to help resolve a problem
      11. Technical support tasks

      80. Temporary sign-off




  Type a menu option below


  F1=Help   F3=Exit   F9=Command line   F12=Cancel
```

Figure 3-1   Information and Problem Handling display

2. Select option 10 (Save information to help resolve a problem). The display shown in Figure 3-2 on page 29 appears.

```
Save Information to Help Resolve a Problem
                                                    System:    ITSOSYS1
 To save information about a problem with your session, enter a brief
   description and press Enter.

 Brief description of problem . . . . . . . . .


 Enter notes about problem  . . . . . . . . . .   Y            Y=Yes, N=No
















 F1=Help   F3=Exit   F5=Refresh   F12=Cancel
```
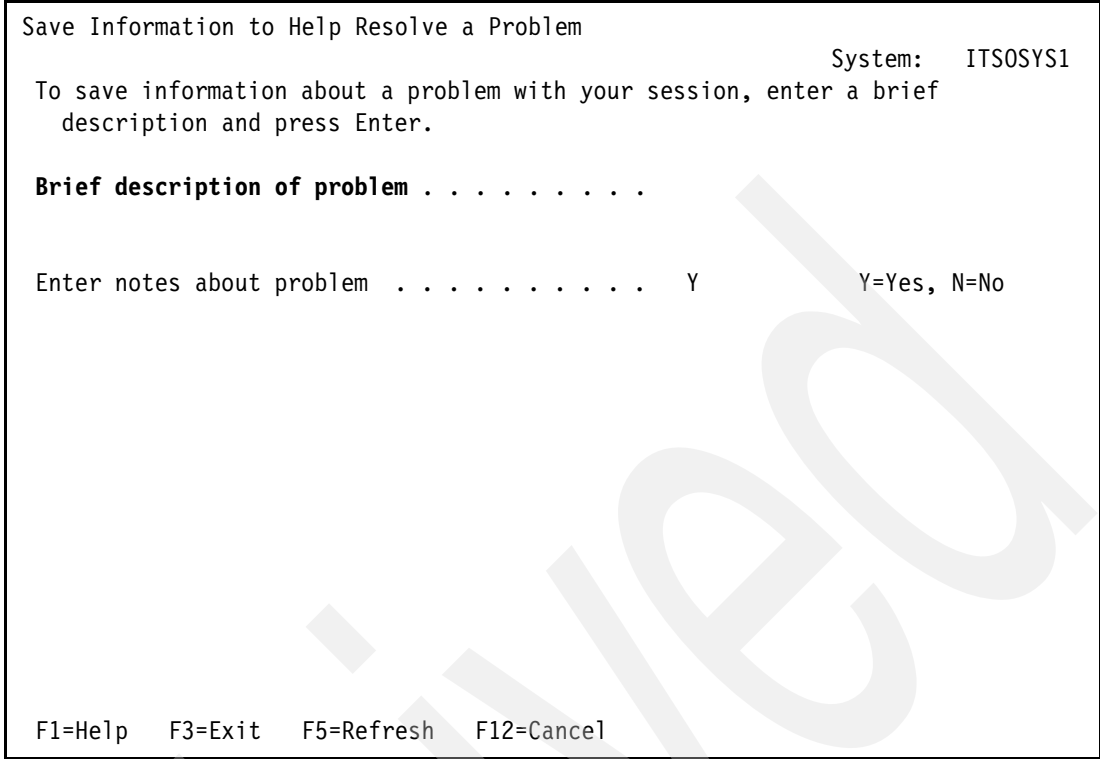
Figure 3-2   Save Information to Help Resolve a Problem display

3. Enter a short description of the problem.

4. Press the Enter key to display the Select Text Type screen as shown in Figure 3-3 on page 30.

```
Select Text Type
                                                      System:   ITSOSYS1
 Select one of the following:.

   Problem Definition
      1. Problem description text
      2. Problem diagnostic text

   Query Data
     10. Query status text

     99. Private system text




                                                                  Bottom
 Selection


 F3=Exit    F12=Cancel
```

Figure 3-3   Select Text Type display

Note: Option 1 (Problem description text) is used to update/add the long problem description text associated with the problem. This text is sent to IBM Service each time the problem is reported.

Option 2 (Problem diagnostic text) is used to update/add the problem diagnostic text associated with the problem. This text is for information related to analyzing/diagnosing the problem and is NOT sent to IBM Service.

5. Select option 1 (Problem description text) to display an area to enter notes. The notes can describe the problem in more detail, list the procedure to re-create the problem, and provide information about the system itself. The display shown in Figure 3-4 on page 31 appears.

```
Update Description Text
                                                        System:    ITSOSYS1
 Problem ID . . . . . . . . :    0631354176
 Current status . . . . . :    OPENED
 Problem  . . . . . . . . :    Problem created from USERHELP menu.


 Type text, press Enter.
 The problem occurred when I ran the TIMEDELAY program. I received
 message ....




                                                                    Bottom
 F3=Exit      F6=Insert line    F12=Cancel    F14=Delete line    F17=Top
 F18=Bottom    F20=Right
```

Figure 3-4   Update Description Text display

6. Type some notes about the problem, as shown in the example in Figure 3-4.

7. After you enter any notes, press F3. The display shown in Table 3-2 appears.

```
Update Description Text
 ............................................................ m:    ITSOSYS1
 :                           Exit Text                          :
 :                                                              :
 :  Type choice, press enter:                                   :
 :                                                              :
 :  Option  . . . .   1   1=Save text and exit                  :
 :                        2=Exit without saving text            :
 :                        3=Resume entering text                :
 :                                                              :
 :  F12=Cancel                                                  :
 :                                                              :
 :..............................................................:




                                                                Bottom
    F3=Exit       F6=Insert line   F12=Cancel   F14=Delete line   F17=Top
    F18=Bottom    F20=Right
```

Figure 3-5   Exit Text display

8. Select option 1 (Save text and exit).

While the data is collected, messages appear at the bottom of the display.

When all the data has been collected, a message appears at the bottom of the display, for example:

`Problem information created for 0631355700.`

This is the number of the problem log entry created. All the spooled files created have this number as the user data.

9. Record the number of the problem to give to your service provider. This is the number of the problem entry in the problem log. If you want to save this data as APAR data or collect more information about the problem, go to 7.4.2, "Saving APAR data from an existing problem log entry" on page 120. Otherwise, if you do not need to collect any more information in this guide, go to 30.5, "Sending the problem report and documentation by e-mail" on page 466, to submit the information with the problem report.

APAR data can be saved from a Save APAR Data display or by using the Save APAR Data (SAVAPARDTA) command. The Save APAR Data display appears when using the problem log, the Analyze a Problem (ANZPRB) command, or F14 from the QSYSOPR message queue. See Table 3-2 to find a path to the Save APAR Data display. Then go to 7.5, "Selecting APAR data to collect" on page 121.

Table 3-2   Display or command selection

Starting from	Command	Option or F key	On this display	Reference
Problem log	WRKPRB	8		
		30	Work with Problem	See 7.4.2, "Saving APAR data from an existing problem log entry" on page 120.
Analyze a problem	ANZPRB (hardware)	F15	Display Problem Analysis Results	See 7.4.1, "Saving APAR data from the ANZPRB command display" on page 120.
	ANZPRB (software)	Y	Save Problem Data	See 7.4.1, "Saving APAR data from the ANZPRB command display" on page 120.
F14	DSPMSG QSYSOPR	F15	Display Problem Analysis Results	See 7.4.1, "Saving APAR data from the ANZPRB command display" on page 120.
Command line	SAVAPARDTA	Enter key	Save APAR Data	See 7.4.3, "Saving APAR data using the SAVAPARDTA command" on page 121.

4

Collecting messages

This chapter covers information on working with messages in message queues, finding additional information about your messages, and displaying messages for the system operator.

Messages provide answers to many problems and assist you with most of the problem isolation. When the system detects an error, it usually provides a message that describes the problem and the actions needed to solve the problem.

A message can contain the following information:

- ► Names of the failing programs or jobs
- ► Return codes and error codes
- ► From and To programs and instruction numbers of each program
- ► References to Licensed Internal Code (LIC) logs and error logs (Product Activity Log or PAL)
- ► Information that explains the problem
- ► Information about how to solve the problem

Tip: When you move the cursor to anywhere on the text of a message and press the F1 (Help) key, the additional message information panel appears. This additional information is also called *message help text* or *second-level text*. To save this information to a spooled file, press F6 (Print).

Messages are found in the following places:

- ► At the bottom of displays or on the Command Entry display after a command is entered
- ► In a job message queue (or job log) for an active user, subsystem, and system job
- ► In QHST (history log)
- ► In QSYSOPR (system operator message queue)
- ► In QSYSMSG (an optional message queue that certain messages are directed to instead of, or in addition to, the QSYSOPR message queue)
- ► In QCFGMSGQ for communications messages
- ► In message queues associated with printers, line descriptions and controller descriptions

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Messages are sent by your job, a program, the system you are using, or a system in the network. All messages sent to QSYSOPR are also sent to QHST. The reverse is not true. Further information regarding messages can be found in the iSeries Information Center at:

http://www.ibm.com/eserver/iseries/infocenter

When you reach this site, click **Troubleshooting** → **Detect problems** → **Message queues.**

Tip: To identify which message queue is associated with a printer, line description or controller description, use the DSPDEVD, DSPLIND and DSPCTLD commands to display their descriptions. Look for the Current message queue setting.

4.1 Getting started

Use Table 4-1 for further information on locating messages in your system.

Table 4-1   Finding messages

Look for a message	Go to
On a display	Section 4.2, "Viewing and saving messages that appear on a display" on page 38
In a message queue (or job log) for your own (or another user's) job	Section 4.3, "Finding messages in a job log" on page 40
In a system or subsystem job	Section 4.4, "Messages for subsystem and system jobs" on page 53
In the system operator message queue (QSYSOPR)	Section 4.5, "Messages in the system operator message queue (QSYSOPR)" on page 56
In the history log (QHST)	Chapter 6, "Collecting the history log (QHST)" on page 91
Look for the message text when the message number is known	Section 4.8, "Finding details on a specific message number" on page 66
Look for messages using iSeries Navigator	Section 4.9, "Viewing messages with iSeries Navigator" on page 49

Note: Review the method for locating the printed output in 1.7, "Finding your printed output" on page 9.

4.2 Viewing and saving messages that appear on a display

Figure 4-1 shows an example of a message that appears at the bottom of the display.

```
MAIN                          i5/OS Main Menu
                                                    System:     ITSOSYS1
 Select one of the following:

      1. User tasks
      2. Office tasks
      3. General system tasks
      4. Files, libraries, and folders
      5. Programming
      6. Communications
      7. Define or change the system
      8. Problem handling
      9. Display a menu
     10. Information Assistant options
     11. iSeries Access tasks

     90. Sign off

 Selection or command
 ===> sndsrvrqs *test


 F3=Exit   F4=Prompt   F9=Retrieve   F12=Cancel   F13=Information Assistant
 F23=Set initial menu
 Last request at level 4 ended.
```

Figure 4-1   A message on a display

Follow the steps that are listed to collect all the information that relates to the message.

> **Important:** The Print Screen key can be used to capture messages that appear on a display. However, a screen print does *not* give sufficient information for use in problem determination, because detailed message information is not captured. Follow the instructions in this section to capture the information in a format that gives your service provider sufficient information to analyze your problem.

To view and save additional message information for a message that appears on a display (when the user's assistance level is set to intermediate), follow the steps listed here:

1. Move the cursor to the line with the message that you want to save.

2. Press the F1 (Help) key to view the additional message information. A display appears for the message, as shown in Figure 4-2.

```
Additional Message Information

 Message ID . . . . . . :   CPF1907       Severity . . . . . . . . :   00
 Message type . . . . . :   Escape
 Date sent  . . . . . . :   11/02/07      Time sent  . . . . . . :   13:19:21

 Message . . . . :    Last request at level 4 ended.




                                                                      Bottom
 Press Enter to continue.


 F3=Exit    F6=Print    F9=Display message details
 F10=Display messages in job log   F12=Cancel   F21=Select assistance level
```

Figure 4-2   Additional Message Information

3. If this message relates to the problem, continue with the next step. Otherwise, go to step 5.

4. To keep a record of this message for problem determination purposes, press F6 (Print) to store to a spooled file (file name QPMHAMI). This ensures that you have captured all the relevant information pertaining to this message.

5. Press F12 (Cancel) to cancel and return to the display that showed the message.

6. If "More..." appears in the lower right corner of the display, continue with the next step. Otherwise, go to step 8.

7. Page forward to see more messages.

8. To continue looking for more messages, repeat steps 1 through 5. Collect the additional message information for each message that relates to the problem until all the message information has been saved.

9. If F10 (Display messages in job log) is shown on the Additional Message Information display, go to 4.3, "Finding messages in a job log" on page 40, to save any messages that relate to the problem in the job log. Otherwise, continue with the next step.

10. If you have found all the messages that relate to the problem, go to 4.6, "Checking the contents of the additional message information" on page 58, to determine whether more information needs to be collected using this guide.

11. If you need to find other messages that relate to the problem, go to step 1 and repeat this process.

> **Note:** In the context of problem determination and problem source identification, it is common to print the entire job log. A complete job log gives your service provider information on the sequence, timing, and context of the messages that are issued to the job. Refer to 4.3, "Finding messages in a job log" on page 40, for further information.

4.3 Finding messages in a job log

There are two types of jobs in i5/OS:

► Inactive jobs
► Active jobs

On i5/OS V5R4 systems, job logs have a job log pending status. Use WRKJOBLOG to find a job loop. On systems prior to i5/OS V5R4, inactive jobs no longer have their job structures in the system, so the job message queue is no longer available. The messages associated with the job are written to the job log when the job terminates. If the logging level in the job description is set for maximum logging (4, 0, *SECLVL), then all the information is captured in the spooled file. To find the messages in the job log of an inactive job, go to 4.3.3, "Finding a job log for an inactive job" on page 51.

Active jobs have their job structures in the system and the associated job message queue is available. Perform the following steps to display the messages for an active job:

1. Return to a command line.

2. If you are looking for messages for:

   – Your own job, go to step 9 on page 43
   – Another user's job, continue with the next step

3. Enter WRKACTJOB to display a list of active jobs. A display of active jobs appears, as shown in Figure 4-3 on page 41.

```
 Work with Active Jobs                          ITSOSYS1
                                                   11/02/07  13:22:29
 CPU %:       .5     Elapsed time:   26:33:06    Active jobs:    160

 Type options, press Enter.
   2=Change   3=Hold   4=End    5=Work with   6=Release   7=Display message
   8=Work with spooled files    13=Disconnect ...
                   Current
 Opt  Subsystem/Job  User       Type   CPU %  Function       Status
      QBATCH         QSYS       SBS     .0                   DEQW
      QCMN           QSYS       SBS     .0                   DEQW
      QCTL           QSYS       SBS     .0                   DEQW
        QSYSSCD      QPGMR      BCH     .0   PGM-QEZSCNEP    EVTW
      QINTER         QSYS       SBS     .0                   DEQW
       QPADEV0002    MARK       INT     .0   CMD-STRSST      DEQW
       QPADEV0003    ACA1       INT     .1   CMD-WRKACTJOB   RUN
       QPADEV0005    ANDREI     INT     .0   CMD-STRSST      DSPW
      QSERVER        QSYS       SBS     .0                   DEQW
                                                                More...
 Parameters or command
 ===>
 F3=Exit   F5=Refresh       F7=Find      F10=Restart statistics
 F11=Display elapsed data   F12=Cancel   F23=More options   F24=More keys
```

Figure 4-3   WRKACTJOB display

Tips:

► Press F14 to include all jobs such as group, prestart, and system request jobs.

► If "More..." appears on the display, page forward or backward to continue searching for a job.

---

4. Locate the appropriate job on the Work with Active Jobs screen, and enter 5 in the Opt (option) column.

5. If this is the job you want to work with, continue with the next step. Otherwise, go to 5.6, "Finding a job name" on page 83.

6. Type 5 in the Opt (option) column next to the active job you want to select.

7. Press the Enter key. A display appears as shown in Figure 4-4 on page 42.

```
Work with Job
                                                      System:    ITSOSYS1
Job:   QPADEV0003    User:   ACA1          Number:   004016

Select one of the following:

     1. Display job status attributes
     2. Display job definition attributes
     3. Display job run attributes, if active
     4. Work with spooled files

    10. Display job log, if active, on job queue, or pending
    11. Display call stack, if active
    12. Work with locks, if active
    13. Display library list, if active
    14. Display open files, if active
    15. Display file overrides, if active
    16. Display commitment control status, if active
                                                             More...
Selection or command
===>
```

Figure 4-4   Work with Job display

8. Select option 10 (Display job log, if active, on job queue or pending), and press the Enter key.

9. Enter DSPJOBLOG to display your own job log (or job logs of other jobs). A display
    appears as shown in Figure 4-5.

```
Display Job Log
                                                    System:   ITSOSYS1
Job . . :   QPADEV0003    User . . :   ACA1       Number . . . :   004016

 3>> dspjoblog












                                                                 Bottom
 Press Enter to continue.

 F3=Exit    F5=Refresh    F10=Display detailed messages    F12=Cancel
 F17=Top    F18=Bottom
```

Figure 4-5   Display Job Log

10. Press F10 (Display detailed messages) to see all the messages. A display appears as
    shown in Figure 4-6 on page 44.

```
Display All Messages
                                                     System:    ITSOSYS1
 Job . . :   QPADEV0003    User . . :  ACA1        Number . . . :  004016

    No record found.
 5 >  *SYSTEM/ENDRQS
 4 > sndsrvrqs *test
    No record found.
    Universal Connection has not been configured for Electronic Customer
      Support.
    Line QESLINE vary on failed.
    Vary command not processed.
    Cannot connect to IBM service system.
    Error occurred while processing request.
 4 >  *SYSTEM/ENDRQS
    Last request at level 1 ended.
   > wrkactjob
   > wrkjob
                                                                  More...
 Press Enter to continue.

 F3=Exit    F5=Refresh    F12=Cancel    F17=Top    F18=Bottom
```

Figure 4-6   Display All Messages

11. If "Bottom" appears on the display, page backward. Otherwise, if "More..." appears on the display, page forward or backward to look for the message that relates to the problem.

12. Move the cursor to the line with a message that you want to save.

13. Press the F1 (Help key) to view the additional message information.

14. If this message relates to the problem, continue with the next step. Otherwise, press F12 (Cancel).

15. Press F6 (Print) to save this message as shown in Figure 4-7 on page 45.

```
Additional Message Information

Message ID . . . . . . :   CPI8C6B        Severity . . . . . . . :    10
Message type . . . . . :   Diagnostic
Date sent  . . . . . . :   11/02/07       Time sent  . . . . . . :    13:22:24


Message . . . . :   Universal Connection has not been configured for
  Electronic Customer Support.
Cause . . . . . :   Universal Connection must be configured before starting
  any Electronic Customer Support transaction.
Recovery  . . . :   Run the iSeries Navigator IBM Universal Connection Wizard
  or CL Command CRTSRVCFG to create the configuration, and try the request
  again.




                                                                       Bottom
Press Enter to continue.


 F3=Exit   F6=Print   F9=Display message details    F12=Cancel
 F21=Select assistance level
```

Figure 4-7   Pressing F6 to create a spooled file

16. Press F12 (Cancel) to cancel, and return to the Display All Messages display.

17. To continue looking for more messages, repeat steps 11 through 17. Continue saving the additional message information for each message that relates to the problem until all the message information has been saved.

4.3.1 Printing the job log

Note: Job logs on i5/OS V5R4 systems can have a job log pending status.

Job logs provide information about what occurred in any given job. They are useful when tracking a sequence of events, messages, operator responses, and time stamps, among others.

To print a job log, follow these steps:

1. To select the job from the WRKACTJOB screen, enter 5 in the Opt column.

2. Enter the following parameters on the command line to create a spooled file copy of the job log:

   `OPTION(*JOBLOG) OUTPUT(*PRINT)`

   A spooled file, with a file name of QPJOBLOG, is created and stored on an output queue.

   Refer to Chapter 5, "Job information, job logs, and spooled files" on page 69.

Note: Review the method for locating the printed output in 1.7, "Finding your printed output" on page 9.

4.3.2 Producing a job log for an inactive job with a pending job log

If i5/OS has been configured to take advantage of the V5R4 Log Output feature, a job log for a job that has ended can be in a pending state and not appear on the displays shown in this section unless you direct i5/OS to produce the job log.

> **Tip:** In V5R4 the Log Output option was introduced to reduce the overhead of creating job logs by allowing the system administrator to specify if and when i5/OS should create a job log. Deferring or suppressing job log creation can be particularly useful when an event occurs that causes many jobs to end at the same time, avoiding the processing overhead associated with producing many job logs in a short period of time.
>
> The Log Output option is controlled by the system value QLOGOUTPUT. It can be overridden by the Job log output (LOGOUTPUT) parameter on the Create or Change Job Description (CRTJOBD or CHGJOBD) and Change Job (CHGJOB) commands.

If a job has ended but the job log has not yet been produced, you might need to direct i5/OS to produce the job log immediately. Use the Work with Job Logs (WRKJOBLOG) command to find any pending job logs as shown in Figure 4-8.

```
  Work with Job Logs                            ITSOSYS1
                                                          11/17/07   17:12:11
  Type options, press Enter.
    4=Delete    5=Display   8=Work with spooled files    12=Work with job


                                                        File   User
  Opt  Date      Time       State  Job         User      Number Number Data
  12   11/17/07 17:50:24   *PND   QPADEV0003 ACA1      005312






                                                                     Bottom
  Parameters or command
  ===>
  F3=Exit     F4=Prompt    F5=Refresh    F9=Retrieve    F11=Display output queue
  F12=Cancel  F14=Find     F15=Repeat find   F17=Top   F18=Bottom
```

Figure 4-8   WRKJOBLOG: Finding pending job logs

Select option 12 to work with the job you need to generate a job log for. The Work with Job display is presented. Press Page Down to get to part 2 of the display as illustrated in Figure 4-9 and Figure 4-10 on page 48.

```
Work with Job
                                                   System:    ITSOSYS1
 Job:   QPADEV0003     User:   ACA1          Number:   005312

 Select one of the following:

     1. Display job status attributes
     2. Display job definition attributes
     3. Display job run attributes, if active
     4. Work with spooled files

    10. Display job log, if active, on job queue, or pending
    11. Display call stack, if active
    12. Work with locks, if active
    13. Display library list, if active
    14. Display open files, if active
    15. Display file overrides, if active
    16. Display commitment control status, if active
                                                          More...
 Selection or command
 ===>


 F3=Exit   F4=Prompt   F9=Retrieve   F12=Cancel
```

Figure 4-9   Work with Job: Part 1

```
Work with Job
                                                          System:    ITSOSYS1
Job:    QPADEV0003    User:    ACA1          Number:    005312

Select one of the following:

    17. Display communications status, if active
    18. Display activation groups, if active
    19. Work with mutexes, if active
    20. Work with threads, if active
    21. Work with media library attributes, if active

    30. All of the above

    40. Change job
    41. End job
    42. Hold job
    43. Release job
                                                                      Bottom
Selection or command
===> 40

F3=Exit    F4=Prompt    F9=Retrieve    F12=Cancel
```

Figure 4-10   Work with Job: Part 2

Another method is to note the job name and use DSPJOBLOG to display the job log.

Select option 40 (Change job) to display the Change Job display. Press F10 (Additional parameters) and then Page Down to get to part 2 of the display as illustrated in Figure 4-11 and Figure 4-12 on page 50.

```
  Change Job (CHGJOB)

  Type choices, press Enter.

  Job name . . . . . . . . . . . . > QPADEV0003    Name, *
    User . . . . . . . . . . . . . >   ACA1         Name
    Number . . . . . . . . . . . . >   005312       000000-999999
  Job priority (on JOBQ) . . . . .   *SAME          0-9, *SAME
  Output priority (on OUTQ) . . .   5              1-9, *SAME
  Print device . . . . . . . . . .   *SAME          Name, *SAME, *USRPRF...
  Output queue . . . . . . . . . .   *SAME          Name, *SAME, *USRPRF, *DEV...
    Library  . . . . . . . . . . .                  Name, *LIBL, *CURLIB
  Run priority . . . . . . . . . .   *SAME          1-99, *SAME




                                                                      Bottom
  F3=Exit   F4=Prompt   F5=Refresh    F10=Additional parameters   F12=Cancel
  F13=How to use this display        F24=More keys
```

Figure 4-11   Change Job: Part 1

```
Change Job (CHGJOB)

Type choices, press Enter.

Message logging:
  Level  . . . . . . . . . . . .    *SAME          0-4, *SAME
  Severity . . . . . . . . . . .    *SAME          0-99, *SAME
  Text . . . . . . . . . . . . .    *SAME          *SAME, *MSG, *SECLVL, *NOLIST
Log CL program commands  . . . .    *SAME          *SAME, *NO, *YES
Job log output . . . . . . . . .    *PND           *SAME, *SYSVAL, *JOBLOGSVR...
Job message queue full action  .    *SAME          *SAME, *SYSVAL, *NOWRAP...
Inquiry message reply  . . . . .    *SAME          *SAME, *RQD, *DFT, *SYSRPYL
Break message handling . . . . .    *SAME          *SAME, *NORMAL, *NOTIFY...
Status message . . . . . . . . .    *SAME          *SAME, *USRPRF, *SYSVAL...
DDM conversation . . . . . . . .    *SAME          *SAME, *KEEP, *DROP
Schedule date  . . . . . . . . .    *SAME          Date, *SAME, *CURRENT...
Schedule time  . . . . . . . . .    *SAME          Time, *SAME, *CURRENT
Job date . . . . . . . . . . . .    *SAME          Date, *SAME
Date format  . . . . . . . . . .    *SAME          *SAME, *SYSVAL, *YMD, *MDY...
Date separator . . . . . . . . .    *SAME          *SAME, *SYSVAL, *BLANK, /...
                                                                     More...
F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
F24=More keys
```

Figure 4-12   Change Job: Part 2

Type *JOBEND in the Job log output prompt as shown in Figure 4-13 and press Enter.
This causes i5/OS to start producing the job log immediately.

```
Change Job (CHGJOB)

Type choices, press Enter.

Message logging:
  Level  . . . . . . . . . . . .    *SAME          0-4, *SAME
  Severity . . . . . . . . . . .    *SAME          0-99, *SAME
  Text . . . . . . . . . . . . .    *SAME          *SAME, *MSG, *SECLVL, *NOLIST
Log CL program commands  . . . .    *SAME          *SAME, *NO, *YES
Job log output . . . . . . . . . >  *JOBEND        *SAME, *SYSVAL, *JOBLOGSVR...
Job message queue full action  .    *SAME          *SAME, *SYSVAL, *NOWRAP...
Inquiry message reply  . . . . .    *SAME          *SAME, *RQD, *DFT, *SYSRPYL
Break message handling . . . . .    *SAME          *SAME, *NORMAL, *NOTIFY...
Status message . . . . . . . . .    *SAME          *SAME, *USRPRF, *SYSVAL...
DDM conversation . . . . . . . .    *SAME          *SAME, *KEEP, *DROP
Schedule date  . . . . . . . . .    *SAME          Date, *SAME, *CURRENT...
Schedule time  . . . . . . . . .    *SAME          Time, *SAME, *CURRENT
Job date . . . . . . . . . . . .    *SAME          Date, *SAME
Date format  . . . . . . . . . .    *SAME          *SAME, *SYSVAL, *YMD, *MDY...
Date separator . . . . . . . . .    *SAME          *SAME, *SYSVAL, *BLANK, /...
                                                                     More...
F3=Exit    F4=Prompt    F5=Refresh    F12=Cancel    F13=How to use this display
F24=More keys
```

Figure 4-13   Changing the Job log output prompt in CHGJOB

4.3.3 Finding a job log for an inactive job

Job logs are created with a print file identifier of QPJOBLOG. These spooled files are placed on the QEZJOBLOG output queue in the QUSRSYS library by default, unless the system has been modified to place them elsewhere. WRKSPLF is also useful.

Job log pending status is supported with i5/OS V5R4.

> **Tip:** Consult your system administrator if the default for job log spooling output queue has been changed.
>
> System cleanup deletes job logs after a pre-determined number of days. If you cannot find the required job log, use option 1 from the CLEANUP menu to determine how long job logs remain on your system before they are deleted. System cleanup also deletes pending job logs.
>
> If you are using Business Recovery Media Services (BRMS) or other software to save spooled files, you might need to restore the job log back to the system before continuing. With i5/OS V5R4, you can save and restore spooled files.

Browse QEZJOBLOG output queue to locate the required job log or if the default output queue has been changed, browse the output queue your system is using.

If you know the user profile name and the job name associated with the required job log, use the Work with Job (WRKJOB) command to locate the jobs within the system. An example is illustrated in Figure 4-14 on page 52 and Figure 4-15 on page 53.

Figure 4-14 on page 52 shows the Select Job screen resulting from the WRKJOB command. Enter option 1 to select the Work with Job screen for that job. The job log is found in the Work

With Spooled Files option (option 4) of the Work with Job screen. If the job log is pending, it is still under Option 10 to display the job log.

```
 Command Entry                              ITSOSYS1
                                                      Request level:    1
 All previous commands and messages:
  4 >  *SYSTEM/ENDRQS
      Last request at level 1 ended.
    > wrkactjob
    > wrkjob
  3 > dspjoblog
    > WRKJOB JOB(QSYS/SCPF)
      A duplicate job named 000000/QSYS/SCPF was found.
      A duplicate job named 000108/QSYS/SCPF was found.
      A duplicate job named 000264/QSYS/SCPF was found.
      A duplicate job named 003800/QSYS/SCPF was found.
      Duplicate jobs found.
      End of duplicate names.
                                                                  Bottom
 Type command, press Enter.
 ===> WRKJOB JOB(QSYS/SCPF)



 F3=Exit   F4=Prompt   F9=Retrieve   F10=Exclude detailed messages
 F11=Display full      F12=Cancel    F13=Information Assistant    F24=More keys
```

Figure 4-14   WRKJOB: Finding duplicate job names

Figure 4-15 on page 53 shows the duplicate jobs found for the SCPF jobs run under the QSYS user profile. The display lists the fully qualified job names of all the jobs found on the system.

```
 Select Job                              ITSOSYS1
                                                  11/02/07  13:28:10
 Type option, press Enter.
   1=Select


                                                              Entered
 Option   Job          User        Number  Type     -----Status-----  System
          SCPF         QSYS        000000   SYS      ACTIVE            10/30/07
          SCPF         QSYS        003800   SYS      OUTQ              10/20/07
          SCPF         QSYS        000264   SYS      OUTQ              10/09/07
          SCPF         QSYS        000108   SYS      OUTQ              10/09/07













                                                              Bottom
 F3=Exit    F12=Cancel
 Duplicate jobs found.
```

Figure 4-15   WRKJOB: Inactive jobs shown as OUTQ status

The current instance of the SCPF job always has the system assigned job number of 000000.
This is due to the fact that SCPF is always the first i5/OS job in the system after an IPL. On
power down, the job number is reassigned to the next available system number, to avoid a
conflict of duplicate job numbers during the subsequent IPL.

4.4 Messages for subsystem and system jobs

Subsystems QBASE, QCTL, QINTER, QBATCH, QSPL, and QSYSWRK, QUSRWRK are
examples of the IBM-supplied subsystem descriptions. System jobs (such as QSYSARB,
QDBxSRVxnn, and SCPF) contain useful information in their job message queues while
active. When the jobs are inactive, the information is found in their job logs.

To find and save job logs for *inactive* subsystem or system jobs, see 5.5, "Saving the job log
and spooled files for a job that has ended" on page 80. Perform the following steps for an
active subsystem or system job:

1. Enter the WRKACTJOB command to list all active jobs. A display appears as shown in
   Figure 4-16 on page 54.

```
Work with Active Jobs                            ITSOSYS1
                                                   11/02/07  13:28:52
 CPU %:       .5     Elapsed time:   26:39:29    Active jobs:   160

 Type options, press Enter.
   2=Change   3=Hold   4=End    5=Work with   6=Release   7=Display message
   8=Work with spooled files    13=Disconnect ...
                    Current
 Opt  Subsystem/Job  User      Type  CPU %  Function        Status
      QPWFSERVSD     QUSER      BCH    .0                    SELW
      QPWFSERVSO     MARK       PJ     .0                    DEQW
      QSERVER        QPGMR      ASJ    .0                    EVTW
      QZDASRVSD      QUSER      BCH    .0                    SELW
      QZLSFILET      QUSER      PJ     .0                    TIMW
      QZLSSERVER     QPGMR      BCH    .0                    EVTW
    QSPL             QSYS       SBS    .0                    DEQW
    QSYSWRK          QSYS       SBS    .0                    DEQW
      CRTPFRDTA      QSYS       BCH    .0   CMD-CRTPFRDTA    DEQW
                                                                More...
 Parameters or command
 ===>
 F3=Exit   F5=Refresh      F7=Find     F10=Restart statistics
 F11=Display elapsed data  F12=Cancel  F23=More options   F24=More keys
```

Figure 4-16   WRKACTJOB: System and subsystem jobs

Note: A subsystem job has a type of SBS. A system job has a type of SYS.

2. A *system job* is a job initiated by the i5/OS operating system. Such work as controlling system resources and scheduling jobs is performed by system jobs.

   System jobs can be divided into the following categories:

   – System startup

     • Start-control-program-function (SCPF)

     • Job table cleanup (QWCBTCLNUP)

     • Software agreements acceptance (QLPSVR)

   – System arbiters

     • High priority functions (QSYSARB)

     • Tape resources (QTAPARB)

     • Command analyzer spaces and others (QSYSARB2)

     • Job structures (QSYSARB3)

     • Subsystem control and power down system (QSYSARB4)

     • Machine events (QSYSARB5)

   – System communication

     • Logical unit services (QLUS)

     • Communications arbiters (QCMNARB01..nn)

     • System communications (QSYSCOMM1)

- Remote file system communications (Q400FILSVR)
  - Database
    - Database file statistics collection (QDBFSTCCOL)
    - Database cross-reference system job (QDBSRVXR, QDBXxxxR and QDBSRVXR2)
    - Database server (QDBSRV01 and QDBSxxxV01)
    - Database server, high priority (QDBSRV02..nn and QDBSxxxV..nn)
    - Database server, low priority (QDBSRV02..nn and QDBSxxxV..nn)
    - Database parallelism (QQQTEMP1 and QQQTEMP2)
  - Other
    - Alert manager (QALERT)
    - Decompress system object (QDCPOBJ1..n)
    - Files system (QFILESYS1)
    - Job schedule (QJOBSCD)
    - Library cleanup for independent disk pool group (QLIxxxCL)
    - Object cleanup for independent disk pool group (QLIxxxRP)
    - LU 6.2 resynchronization (QLUR)
    - Performance adjustment (QPFRADJ)
    - System spool maintenance (QSPLMAINT and QSPMNxxxxx)
    - System spool print queue updater (QSPPFxxxxx)
    - Tape device (QTAPARB)
    - Network server host adapter events (QNWHARBxx)
    - Cleanup permanent job structures (QWCPJOBS)
    - Cleanup temporary job structures (QWCTJOBS)

The functions of the IBM-supplied subsystems are listed in Table 4-2.

Table 4-2   IBM-supplied subsystems

IBM-supplied subsystem	Function
QBASE	Default controlling subsystem
QBATCH	Batch job subsystem
QCMN	Communications subsystem
QCTL	Controlling subsystem
QDSNX	Distributed systems node executive subsystem
QFNC	Finance subsystem
QHTTPSVR	HTTP server subsystem
QINTER	Interactive subsystem
QLPINSTALL	Licensed program installation subsystem
QPGMR	Programmers subsystem

IBM-supplied subsystem	Function
QSERVER	Server (file, database, and system) subsystem
QSNADS	SNA distribution services subsystem
QSPL	Spooling subsystem
QSYSSBSD	Backup controlling subsystem
QSYSWRK	System job subsystem
QUSRWRK	User subsystem

3. Type 5 in the Opt column next to the subsystem or system job listed on the Work with Active Job display with which you want to work. Refer to 4.3, "Finding messages in a job log" on page 40, for details on displaying the messages, printing message details, and producing a spooled job log.

For information regarding the functions of the various system and subsystem jobs, refer to the iSeries Information Center at:

http://www.ibm.com/eserver/iseries/infocenter

When you reach this site, click **Systems management** → **Work management** → **Concepts** → **Jobs** → **Job types** → **System jobs**.

4.5 Messages in the system operator message queue (QSYSOPR)

Tips: Messages relating to a problem can also be sent to other message queues. The procedures in this section can also be used for any other message queue.

There are two methods to access the system operator message queue from a 5250 display:

1. Enter the following command to display the QSYSOPR message queue:

   DSPMSG QSYSOPR

2. Use the system request function, and select option 6 (SYSREQ). Messages are responded to automatically if the queue is set to *DFT.

Tip: For information on the modes of delivery for a message queue, refer to the iSeries Information Center at:

http://www.ibm.com/eserver/iseries/infocenter

When you reach this site, click **Programming** → **CL** → **Alphabetic list of CL commands** → **C** → **CHGMSGQ**.

The QSYSOPR message queue on a 5250 display appears when the user's assistance level is set to intermediate, as shown in Figure 4-17.

```
Display Messages
                                                   System:   ITSOSYS1
Queue . . . . . :   QSYSOPR              Program . . . . :   *DSPMSG
  Library . . . :     QSYS                 Library . . . :
Severity  . . . :   00                   Delivery  . . . :   *HOLD

Type reply (if required), press Enter.
  Subsystem QSERVER in library QSYS starting.
  Subsystem QUSRWRK in library QSYS starting.
  Subsystem QINTER in library QSYS starting.
  Subsystem QBATCH in library QSYS starting.
  Subsystem QCMN in library QSYS starting.
  1229.40M of 1230.10M for shared pool *INTERACT allocated.
  Subsystem QBATCH started.
  Subsystem QSPL in library QSYS starting.
  Subsystem QSYSWRK started.
  Subsystem QUSRWRK started.
  Subsystem QSERVER started.
  Subsystem QINTER started.
  Activity related to documents and folders is now allowed.
                                                              More...
F3=Exit              F11=Remove a message              F12=Cancel
F13=Remove all       F16=Remove all except unanswered  F24=More keys
```

Figure 4-17   QSYSOPR: System operator message queue

3. Locate the message that relates to the problem.

4. Move the cursor to the line with a message that you want to view or save.

5. Press F1 (Help) to view the additional message information.

6. Press F6 (Print) to save this message.

7. Press F12 (Cancel) to return to the Display Messages display.

8. Continue to review the system operator messages and gather further messages if required.

9. Press F12 (Cancel) to return to the display from where you entered the DSPMSG QSYSOPR command.

4.5.1 Printing messages from the QSYSOPR message queue

The QSYSOPR message queue is a communication vehicle between system functions and the system operator. Its function is much the same as a job log is for a job. To print messages from the QSYSOPR message queue, follow these steps:

1. Type the DSPMSG command on the command line, and use the F4 key to prompt the options.

Enter QSYSOPR as the message queue name and *PRINT for the output. A display appears as shown in Figure 4-18.

```
Display Messages (DSPMSG)

Type choices, press Enter.

Message queue  . . . . . . . . . > QSYSOPR      Name, *WRKUSR, *SYSOPR...
  Library  . . . . . . . . . . .     *LIBL      Name, *LIBL, *CURLIB
Output . . . . . . . . . . . . . > *PRINT       *, *PRINT, *PRTWRAP

                         Additional Parameters

Message type . . . . . . . . . .   *ALL         *ALL, *INFO, *INQ, *COPY
Messages to display first  . . .   *LAST        *LAST, *FIRST
Severity code filter . . . . . .   0            0-99, *MSGQ
Assistance level . . . . . . . .   *PRV         *PRV, *USRPRF, *BASIC...




                                                                    Bottom
F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
F24=More keys
```

Figure 4-18   Printing the QSYSOPR message queue

2. Select any other parameters as requested by your service provider.

3. Press Enter to create a spooled file. The print file identifier is QPDSPMSG.

Note: Review the method for locating the printed output in 1.7, "Finding your printed output" on page 9.

4.6 Checking the contents of the additional message information

This section outlines the information in the message displays and spooled files discussed in this chapter.

Table 4-3 lists the components of the message display. All of the components listed can be determined from a display of a message or from the spooled file.

Table 4-3   Message information details

Message information	Refer to:
Message identifier	Figure 4-19 on page 59
From program	Figure 4-19 on page 59
From program instruction	Figure 4-19 on page 59

Message information	Refer to:
To program	Figure 4-19 on page 59
To program instruction	Figure 4-19 on page 59
Message text	Figure 4-19 on page 59
From module	Figure 4-20 on page 60
From procedure	Figure 4-20 on page 60
From statement	Figure 4-20 on page 60
LIC log identifier	Figure 4-21 on page 61
Error log (PAL) identifier	Figure 4-22 on page 61
Sense code identifier	Figure 4-23 on page 62
Reference to a failing controller line, controller or device	Figure 4-24 on page 63
Reference to a manual	Figure 4-25 on page 64
Reference to another log or message queue	Figure 4-26 on page 65

Pressing F6 (Print) creates a spooled file named QPMHAMI. The user data shows the message identifier for the message saved. The spooled file contains the message that was saved. If you select the option to create a spooled job log, the print file name is QPJOBLOG.

```
Display Spooled File
 File . . . . . :   QPMHAMI                            Page/Line   1/1
 Control . . . . .                                     Columns    1 - 78
 Find . . . . . .
 *...+....1....+....2....+....3....+....4....+....5....+....6....+....7....+...
                  Additional Message Information                      Page    1
 5722SS1 V5R4M0  060210                         ITSOSYS1  11/02/07  13:44:32 UTC
  Message ID . . . . . . :   CPF2640    Severity . . . . . . . :    40
  Date sent  . . . . . . :   11/02/07   Time sent  . . . . . . :    13:42:23
  Message type . . . . . :   Escape
  From . . . . . . . . . :   MARK       CCSID  . . . . . . . . :    65535
  From program . . . . . . . . . :   QDCVRX
   From library . . . . . . . . :     QSYS
   Instruction  . . . . . . . . :     0551
  To program . . . . . . . . . :   QESCARP
   To library . . . . . . . . :       QSYS
   Instruction  . . . . . . . . :     095F
  Time sent  . . . . . . . . . . :   13:42:23
  Message . . . . :   Vary command not processed.
  Cause . . . . . :    Previous errors have ended command processing.  Some
    functions of the command may have completed.
                                                                       More...
  F3=Exit   F12=Cancel   F19=Left   F20=Right   F24=More keys
```

Figure 4-19   Additional message information (1)

```
Display Spooled File
File . . . . . :   QPMHAMI                            Page/Line   1/1
Control . . . . .                                     Columns     1 - 78
Find . . . . . .
*...+....1....+....2....+....3....+....4....+....5....+....6....+....7....+...
                  Additional Message Information                  Page     1
5722SS1 V5R4M0  060210                        ITSOSYS1  11/02/07  13:42:46 UTC
 Message ID . . . . . . :   CPI8C6B       Severity . . . . . . . :   10
 Date sent  . . . . . . :   11/02/07      Time sent  . . . . . . :   13:42:23
 Message type . . . . . :   Diagnostic
 From . . . . . . . . . :   MARK          CCSID  . . . . . . . . :   65535
 From program . . . . . . . . . :    QESUC
   From library . . . . . . . . :      QSYS
   From module  . . . . . . . . :      QESUC
   From procedure . . . . . . . :      sendMsg__11EsErrorCodeFv
   From statement . . . . . . . :      10
 To program . . . . . . . . . . :    QESCARP
   To library . . . . . . . . . :      QSYS
   Instruction  . . . . . . . . :      05E4
 Time sent  . . . . . . . . . . :    13:42:23.455600
 Message . . . . :   Universal Connection has not been configured for
                                                                   More...
 F3=Exit   F12=Cancel   F19=Left   F20=Right   F24=More keys
```

Figure 4-20   Additional message information (2)

Figure 4-21 on page 61 through Figure 4-27 on page 65 illustrate that diagnostic codes, such as VLOG identifiers, error log identifiers, and sense codes, as well as references to manuals and commands that are useful for problem determination are found.

```
Display Formatted Message Text
                                                         System:    ITSOSYS1
Message ID . . . . . . . . . . :   CPF8102
Message file . . . . . . . . . :   QCPFMSG
  Library  . . . . . . . . . . :     QSYS


Message . . . . :   Class &4 in library &9 damaged.
Cause . . . . . :   Class &4 in library &9 has &8 damage and may not be
  usable. The owner of the damaged class is &6. The VLOG dump identifier is
  &7.
Recovery  . . . :   Do one of the following:
    -- Delete the damaged class (DLTCLS command) and then create the class
  (CRTCLS command) again, or restore it from the saved media (RSTOBJ command).
    -- If the class is IBM-supplied and is in library QSYS, restore the
  operating system and select the option to restore programs and language
  objects on the Specify Install Options display.  See the Backup and Recovery
  book, SC41-5304, for the procedure for restoring the operating system.



                                                                       Bottom
  Press Enter to continue.

  F3=Exit    F11=Display unformatted message text    F12=Cancel
```

Figure 4-21   Reference to an LIC log

```
Additional Message Information

 Message ID . . . . . . :   CPF6792       Severity . . . . . . . :    70
 Message type . . . . . :   Information
 Date sent  . . . . . . :   11/02/07      Time sent  . . . . . . :    07:41:13

 Message . . . . :   Device TAP01 needs to be cleaned.
 Cause . . . . . :   The tape drive read/write heads have become dirty and need
   to be cleaned.
 Recovery  . . . :   Clean drive TAP01 by following recommended cleaning
   procedure and retry the operation.  If the problem continues, use a new tape
   for this operation because the tape media itself maybe bad.
 Technical description . . . . . . . . :   Error Log ID X'00000000'.




                                                                       Bottom
  Press Enter to continue.

  F3=Exit    F6=Print    F9=Display message details    F12=Cancel
  F21=Select assistance level
```

Figure 4-22   Reference to an error log (PAL)

```
Additional Message Information

Message ID . . . . . . :   CPI5906      Severity . . . . . . . :   70
Message type . . . . . :   Information
Date sent  . . . . . . :   11/02/07     Time sent  . . . . . . :   12:01:46


Message . . . . :   Local system sent SNA negative response data to controller
  TESTCTL on device *N.
Cause . . . . . :   The remote system may have sent Systems Network
 Architecture (SNA) data that does not conform to SNA protocols or the
 configuration is not correct.
Recovery  . . . :   If the controller is a host system, this may not be an
  error.
   If the controller is a host-type controller, the remote system may have
 more logical units varied on than there are device descriptions configured
 or varied on and attached to the controller at the local system.
   If the controller is an advanced program-to-program communications (APPC)
 controller or host-type controller, verify the following device description
 and mode parameters on both the local system and the remote system:
   -- LCLLOCNAME (local location name)
   -- RMTLOCNAME (remote location name)
   -- MODE      (mode)
   -- LCLCTLSSN  (locally controlled session)
   -- MAXSSN     (maximum session)
Technical description . . . . . . . :   The error log identifier is *N.  The
  local system sent either **SNA sense code 08170001 or SNA UNBIND** type *N.
  Sense data and UNBIND types are described in **SNA Formats, GA27-3136.**
```

Figure 4-23   Reference to an SNA sense code and a manual

```
Additional Message Information

Message ID . . . . . . :   CPC2607      Severity . . . . . . . :   00
Message type . . . . . :   Completion
Date sent  . . . . . . :   10/10/07      Time sent  . . . . . . :   13:31:41

Message . . . . :   Vary on completed for line VLANO2LAN.
Cause . . . . . :   The vary configuration (VRYCFG) command was issued
  requesting that line VLANO2LAN be varied on.
Technical description . . . . . . . . :   The status of line VLANO2LAN will be
  VARY ON PENDING until line initialization is completed or line failure
  occurs.




                                                                      Bottom
Press Enter to continue.

 F3=Exit   F6=Print   F9=Display message details   F12=Cancel
 F21=Select assistance level
```

Figure 4-24   Reference to a line description

```
Display Spooled File
File . . . . . :  QPMHAMI
Control . . . . .
Find . . . . . .
*...+....1....+....2....+....3....+....4....+....5....+....6....+....7....+....8
               Additional Message Information            Page    1
5722S1 V5R4M0  060210                      ITSOSYS1  10/10/07  05:42:08
 Message ID . . . . . . :  CPI591A     Severity . . . . . . . :   70
 Date sent . . . . . . :  10/10/07     Time sent . . . . . . :   18:16:12
 Message type . . . . . :  Information
 From job . . . . . . . . . . . :  QSYSARB
  User . . . . . . . . . . . . :    QSYS
  Number . . . . . . . . . . . :    001825
 Coded character set ID . . . . :  65535
 Message . . . . :   Controller on line TRLINE varied off or not recognized by
   local system.
 Cause . . . . . :   A remote station attempted to establish a local area
   network connection with this system. There is no controller on the local
   system that is varied on with remote adapter address (ADPTADR parameter)
   0004ACECBC0C, source service access point (SSAP parameter) 04, and
   destination service access point (DSAP parameter) 04.
 Recovery . . . :   Verify the proper controllers are varied on.  The line
   does not have to be varied off to be used again.  Have the remote system
   operator try the request again.
     If the line is configured to allow automatic creation of APPC controller
   descriptions on LAN, repeat the request again.  Also refer to the APPN Support topic in the
Information Center book, http://www.ibm.com/eserver/iseries/infocenter, under the chapter
Automatic Configuration and Connection Network Support.
     If the problem continues, report the problem (ANZPRB command).
```

Figure 4-25   Reference to a manual

```
Additional Message Information

Message ID . . . . . . :   TCP1A77        Severity . . . . . . . . :    30
Message type . . . . . :   Information
Date sent  . . . . . . :   10/10/07       Time sent  . . . . . . :    13:34:38

Message . . . . :   STRTCP completed successfully; however errors occurred.
Recovery  . . . :   Use the Display Job Log (DSPJOBLOG) CL command to see the
  previously listed messages in the job log.




                                                                      Bottom
Press Enter to continue.

F3=Exit   F6=Print   F9=Display message details    F12=Cancel
F21=Select assistance level
```

Figure 4-26   Reference to other messages in the same job

```
Additional Message Information

Message ID . . . . . . :   CPPEA13        Severity . . . . . . . . :    70
Message type . . . . . :   Information
Date sent  . . . . . . :   10/30/07       Time sent  . . . . . . :    18:27:42

Message . . . . :   *Attention*  Contact your hardware service provider.
Cause . . . . . :   Internal analysis of exception data indicates that
  hardware service is recommended to maintain system performance.
Recovery  . . . :   It is recommended that you contact your hardware service
  provider to have the cache battery pack of an I/O card replaced. Failure to
  do so could result in reduced system performance.
    Press F14 and report the problem.
Technical description . . . . . . . . :   LIC Predictive Analysis



                                                                      Bottom
Press Enter to continue.

F3=Exit   F6=Print      F9=Display message details    F12=Cancel
F14=Work with problem   F21=Select assistance level
```

Figure 4-27   Reference to other messages in the same job, continued

4.7 Printing messages

There are several methods that allow a user to locate and print spooled output. In this section, we assume that all the required spooled files have been created in the current interactive job. Follow these steps:

1. Return to a display with a command line.

2. Enter the WRKJOB command. On the screen that appears, select option 4 to display a list of the spooled files created during the current interactive job.

3. If there is spooled output that you do not want to print, type 3 in the Opt (options) column. Choosing option 3 places the spooled file on hold.

4. Ensure that all the spooled files named QPMHAMI that you need to print are in RDY (ready) status.

5. Move the spooled files in RDY status to an output queue with a spool writer started. Your spooled files should now be printed.

   For further information on controlling the spooled files, refer to the iSeries Information Center at:

   http://www.ibm.com/eserver/iseries/infocenter

   When you reach this site, click **Systems management** → **Basic system operations** → **iSeries basic operations** → **Work with printer output**.

4.8 Finding details on a specific message number

When a message number has been recorded in relation to a problem, and the F6 (Print) function has not been used to gather the message details, use the DSPMSGD command to display the message text on the display. Follow these steps:

1. Type DSPMSGD on the command line, and press F4 to prompt the parameters. A display appears like the example shown in Figure 4-28 on page 67.

```
Display Message Description (DSPMSGD)

Type choices, press Enter.

Range of message identifiers:
  Lower value  . . . . . . . . .   *FIRST        Name, *ALL, *FIRST
  Upper value  . . . . . . . . .   *ONLY         Name, *ONLY, *LAST
Message file . . . . . . . . . .   QCPFMSG       Name
  Library  . . . . . . . . . . .    *LIBL        Name, *LIBL, *CURLIB...
Detail . . . . . . . . . . . . .   *FULL         *BASIC, *FULL
Format message text  . . . . . .   *YES          *YES, *NO
Output . . . . . . . . . . . . .   *             *, *PRINT




                                                                    Bottom
 F3=Exit    F4=Prompt    F5=Refresh    F12=Cancel    F13=How to use this display
 F24=More keys
```

Figure 4-28   Display Message Description display

2. Enter the following parameters:

   – The message number or range of messages required
   – The message file

   Refer to the help text for the DSPMSGD command for further details on displaying a range
   of messages. The default message file is QCPFMSG in QSYS, which is used for the
   following types of messages:

   – CAExxxx
   – CPAxxxx
   – CPCxxxx
   – CPExxxx
   – CPDxxxx
   – CPFxxxx
   – CPGxxxx
   – CPIxxxx
   – CPPxxxx
   – CPXxxxx

3. Specify the correct message file for the message you are attempting to display. Some of
   the message files are listed in Table 4-4 as an example. The message files available
   depend on the Licensed Program Products (LPPs) that are installed.

Table 4-4   Message files

Messages	Message file
Cobol (CBL)	QCBL/QCBLMSG
ILE Cobol (LNC)	QCBLLE/QLNCMSG

Messages	Message file
iSeries Access (IWS)	QIWS/QIWSMSG
Lotus® Notes® (LNT)	QNOTES/QLTNSVMSG
RPG (RPG)	QRPG/QRPGMSG
ILE RPG	QRPGLE/QRPGLEMSG
SQL (SQL)	QSQL/QSQL4MSG
TCP/IP (TCP)	QTCP/QTCPMSGF
HTTP	QHTTP/Q...

5

Job information, job logs, and spooled files

A job log is one of the most important sources of information about a problem. It provides the complete picture of the steps performed in the job and the messages received by the job. The job log is the starting point for most problem determination.

This chapter explains how to collect job information, job logs, and spooled files for active and inactive user jobs. The instructions include how to find a job name, how to make sure a job log is produced for a job, and how to find spooled files for a job.

To determine whether the job log is complete, you need to understand the following terms:

► **Job information** (as used in this book): A spooled file that contains the information shown on the Work with Job screens.

► **Job log**: Unless in pending status, it is a spooled file that contains some or all of the messages that have been issued to the job message queue. System i users filter out unwanted messages from the job log by changing the logging level for the job.

► **Message logging level**: Determines the level of detail shown for messages in a job log. The logging level is specified in the job description associated with the job during job initiation but can also be changed for a job that has already started. It cannot be changed for a job that has ended.

For further information on the relationship of the spooled output, job logging level, and the job description, refer to the iSeries Information Center at:

http://www.ibm.com/eserver/iseries/infocenter

5.1 Getting started

Before you begin this chapter, be sure to review the information in Chapter 4, "Collecting messages" on page 35.

It is useful to collect job information, job logs, and spooled files for active, inactive, subsystem, and system jobs. When faced with a problem, it is often appropriate to collect the job log for more than one job. Table 5-1 can assist you in selecting the right job logs to collect for different problem areas.

Table 5-1   Job logs to check for different problem areas

Problem area	Job log to be checked
Communications	Communications subsystem Communication server jobs QLUS System arbiter jobs
Device, job queue, or communications allocation	The subsystem
IPL	SCPF System arbiter jobs
Locks on devices	The subsystem System arbiter jobs Communication arbiters QLUS
Printing	QSPL QBATCH
Subsystem startup	The subsystem
Vary on lines, controllers, or devices	System arbiter jobs Communication arbiters QLUS
TCP/IP applications	The server job(s) for the TCP/IP application. Refer to 5.6.3, "Finding the job and user name for a TCP/IP application server job" on page 87

Note: Review the method for locating the printed output in 1.7, "Finding your printed output" on page 9.

5.2 Message logging parameters

The messages that are logged to a job log are controlled by three parameters: level, security, and text. Each is described in this section.

5.2.1 Level

The level parameter consists of the following values:

0   No data is logged.

1	All messages sent to the job's external message queue with a severity level greater than or equal to the specified message severity are logged. This includes the indications of job start, job end, and job completion status.
2	Logging level 1 information
	Requests that are entered on a command line or commands that are logged from a CL program, which result in a high-level message with a severity code greater than or equal to the severity specified, cause the request or command and all associated messages to be logged.
3	Logging level 1 information
	All requests entered on a command line or commands being logged from a CL program. Requests entered on a command line or commands being logged from a CL program, which result in a high-level message with a severity code greater than or equal to the severity specified, cause all associated messages to be logged.
4	This value represents all requests that entered on a command line or commands that are logged from a CL program, as well as all messages with a severity code greater than or equal to the severity specified, including trace messages.

5.2.2 Severity

The second of the three message logging values specifies the minimum severity level that causes error messages to be logged in the job logs of jobs that use this job description. Specify a value, ranging from 00 through 99, that indicates the lowest severity level that causes an error message to be logged in the job's log. Only messages that have a severity code greater than or equal to this value are logged in the job's log. The highest (most severe) message severity is 99.

5.2.3 Text

The text parameter consists of the following values:

*MSG	Only message text is written to the job's log.
*SECLVL	Both the message text and message help of the error message is written to the job's log.
*NOLIST	No job log is produced if the job completes normally. If the job ends abnormally (if the end of job code is 20 or higher), depending on the setting of LOGOUTPUT, a job log is produced. The messages appearing in the job's log contain both message text and online help information.

5.3 Setting the message logging level

The message logging level can be set so that all messages sent to the job message queues are saved in the job log. For batch jobs, a spooled file containing the job log is produced (if required) when the job ends. A job log is created for an interactive job when you sign off using the SIGNOFF LOG(*LIST) command.

5.3.1 Interactive job

To change the logging level for the current interactive job, the basic method is to use the Change Job (CHGJOB) command from the command line. Page forward to the Message Logging parameter. A display appears like the example shown in Figure 5-1.

```
Change Job (CHGJOB)

Type choices, press Enter.

Message logging:
  Level  . . . . . . . . . . . .   4              0-4, *SAME
  Severity . . . . . . . . . . .   00             0-99, *SAME
  Text . . . . . . . . . . . . .   *NOLIST        *SAME, *MSG, *SECLVL, *NOLIST
Log CL program commands  . . . .   *NO            *SAME, *NO, *YES
Job log output . . . . . . . . .   *JOBEND        *SAME, *SYSVAL, *JOBLOGSVR...
Job message queue full action  .   *NOWRAP        *SAME, *SYSVAL, *NOWRAP...
Inquiry message reply  . . . . .   *RQD           *SAME, *RQD, *DFT, *SYSRPYL
Break message handling . . . . .   *NORMAL        *SAME, *NORMAL, *NOTIFY...
Status message . . . . . . . . .   *NORMAL        *SAME, *USRPRF, *SYSVAL...
DDM conversation . . . . . . . .   *KEEP          *SAME, *KEEP, *DROP
Schedule date  . . . . . . . . .   *SAME          Date, *SAME, *CURRENT...
Schedule time  . . . . . . . . .   *SAME          Time, *SAME, *CURRENT
Job date . . . . . . . . . . . .   110106         Date, *SAME
Date format  . . . . . . . . . .   *MDY           *SAME, *SYSVAL, *YMD, *MDY...
Date separator . . . . . . . . .   '/'            *SAME, *SYSVAL, *BLANK, /...
                                                                      More...
F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
F24=More keys
```

Figure 5-1   CHGJOB: Message logging parameter

This method changes the logging level for the current job only.

To change the logging level on a permanent basis, or to change the logging level before a job starts, follow these steps:

1. Enter the following command to display the user profile of the current user or the user having the problem:

   DSPUSRPRF USRPRF(user-profile)

   Replace *user-profile* with the name of the user profile that is concerned.

2. Page forward to find the job description name and job description library. A display appears like the example shown in Figure 5-2 on page 73.

```
Display User Profile - Basic

 User profile . . . . . . . . . . . . . . . :   OPER01

 Initial program  . . . . . . . . . . . . . :   QCMD
   Library . . . . . . . . . . . . . . . . :     *LIBL
 Initial menu . . . . . . . . . . . . . . . :   MAIN
   Library . . . . . . . . . . . . . . . . :     *LIBL
 Limit capabilities . . . . . . . . . . . . :   *NO
 Text . . . . . . . . . . . . . . . . . . . :   ITSO user profile 01

 Display sign-on information  . . . . . . . :   *SYSVAL
 Limit device sessions  . . . . . . . . . . :   *SYSVAL
 Keyboard buffering . . . . . . . . . . . . :   *SYSVAL
 Maximum storage allowed  . . . . . . . . . :   *NOMAX
   Storage used . . . . . . . . . . . . . . :    12
 Highest scheduling priority  . . . . . . . :   3
 Job description  . . . . . . . . . . . . . :   QDFTJOBD
   Library  . . . . . . . . . . . . . . . . :     QGPL
                                                            More...
 Press Enter to continue.

 F3=Exit   F12=Cancel
```

Figure 5-2   Display User Profile display

In this example, QDFTJOBD is the job description, and QGPL is the library for the job description.

3. Press F12 (Cancel) to cancel this display.

4. Enter the following command to work with the job description:

   `WRKJOBD JOBD(library/job-description-name)`

   Replace *library* with the name of the library and *job-description-name* with the name of the job description found in step 1.

5. Enter 5 in the Opt column next to the name of the job description to display the job description.

6. Page forward to find the Message logging parameter. A display appears like the example in Figure 5-3 on page 74.

```
Display Job Description
                                                    System:    ITSOSYS1
Job description:   QDFTJOBD       Library:    QGPL

Message logging:
  Level  . . . . . . . . . . . . . . . . . . . . :   4
  Severity . . . . . . . . . . . . . . . . . . . :   0
  Text . . . . . . . . . . . . . . . . . . . . . :   *NOLIST
Log CL program commands  . . . . . . . . . . . . :   *NO
Job log output . . . . . . . . . . . . . . . . . :   *SYSVAL
Accounting code  . . . . . . . . . . . . . . . . :   *USRPRF
Print text . . . . . . . . . . . . . . . . . . . :   *SYSVAL


Routing data . . . . . . . . . . . . . . . . . . :   QCMDI


Request data . . . . . . . . . . . . . . . . . . :   *NONE




                                                              More...
Press Enter to continue.

F3=Exit   F12=Cancel
```

Figure 5-3   DSPJOBD: Message logging level

Note: Use caution when changing QDFTJOBD, as any settings affect all jobs that use the default job description.

7. Record all the values for Level, Severity, and Text. Save these values and restore them to their original values after all the information for the problem report is collected.

8. Press Enter to return to the Work with Job Description display.

9. Type 2 in the Opt column next to the name of the job description you used in the previous steps. This requests a change to the job description.

10. Press Enter. The Change Job Description (CHGJOBD) display appears.

11.Press F10 (Additional parameters) to display more parameters. A display appears like the example shown in Figure 5-4.

```
  Change Job Description (CHGJOBD)

  Type choices, press Enter.

  Job description  . . . . . . . . > QDFTJOBD      Name
    Library  . . . . . . . . . . .     *LIBL       Name, *LIBL, *CURLIB
  Job queue  . . . . . . . . . .     QBATCH       Name, *SAME
    Library  . . . . . . . . . . .     QGPL        Name, *LIBL, *CURLIB
  Job priority (on JOBQ) . . . . .   5            1-9, *SAME
  Output priority (on OUTQ)  . . .   5            1-9, *SAME
  Print device . . . . . . . . . .   *USRPRF      Name, *SAME, *USRPRF...
  Output queue . . . . . . . . . .   *USRPRF      Name, *SAME, *USRPRF, *DEV...
    Library  . . . . . . . . . . .                Name, *LIBL, *CURLIB
  Text 'description' . . . . . . .   'Default job description'


                        Additional Parameters

  User . . . . . . . . . . . . . .   *RQD         Name, *SAME, *RQD
  Accounting code  . . . . . . . .   *USRPRF
                                                             More...
```

Figure 5-4   CHGJOBD display

12.Page forward to find the Message logging parameter. A display appears like the example shown in Figure 5-5 on page 76.

```
Change Job Description (CHGJOBD)

Type choices, press Enter.

Print text . . . . . . . . . . .      *SYSVAL
Routing data . . . . . . . . . .      'QCMDI'

Request data or command  . . . .      *NONE




Initial library list . . . . . .      *SYSVAL        Name, *SAME, *SYSVAL, *NONE
              + for more values
Initial ASP group  . . . . . . .      *NONE          Name, *SAME, *NONE
Message logging:
  Level  . . . . . . . . . . . .      4              0-4, *SAME
  Severity . . . . . . . . . . .      00             0-99, *SAME
  Text . . . . . . . . . . . . .      *NOLIST        *SAME, *MSG, *SECLVL, *NOLIST
Log CL program commands  . . . .      *NO            *SAME, *NO, *YES
Job log output . . . . . . . . .      *SYSVAL        *SAME, *SYSVAL, *JOBLOGSVR...
                                                                          More...
F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
F24=More keys
```

Figure 5-5   CHGJOBD: Message logging

13. In the Level prompt, type 4 if it does not already appear there.

14. In the Severity prompt, type 00 if it is not already there.

15. In the Text prompt, type *SECLVL if it is not already there.

16. Press the Enter key. A message shows that the job description was changed. All messages are logged for any new job using this job description.

17. New jobs that use the changed QDFTJOBD job description produce a job log with maximum information in the job log, until the original settings recorded in step 7 are restored.

> **Note:** When signing off from an interactive job, you can use the F4 (Prompt) key, and enter *LIST for the Job Log parameter to cause a spooled file labelled QPJOBLOG to be written with the messages from the job. This entry takes precedence over the log value specified for the job itself.
>
> If the command line is unavailable, use the system request key to display the system request command line, then type **90 *LIST**.

5.3.2 Batch jobs

Batch jobs use the same parameters as discussed in the previous section for controlling the level of messages recorded in the job log. Change the Message logging parameter in the job description that is invoked when the batch job starts. New batch jobs then create a job log containing the maximum message information.

Two additional factors to consider when dealing with batch jobs are:

► Batch jobs usually do not create a job log unless the job is considered to have terminated abnormally. This is due to the Text parameter being set to *NOLIST, causing a job log to be produced only when there is a message with a severity higher than 20 encountered in the job. Also, the setting of LOGOUTPUT parameter on i5/OS V5R4 can affect the jobs' behavior.

> **Note:** The LOGOUTPUT parameter available with i5/OS V5R4 can change the behavior of batch jobs.

► Batch jobs can optionally override the logging level or the job description at the time the job is submitted with the SBMJOB command. Press F10 for Additional parameters and page forward. Figure 5-6 displays and highlights where the Message Logging might be altered.

```
  Submit Job (SBMJOB)

  Type choices, press Enter.

  System library list  . . . . . .    *CURRENT      *CURRENT, *SYSVAL
  Current library  . . . . . . . .    *CURRENT      Name, *CURRENT, *USRPRF...
  Initial library list . . . . . .    *CURRENT      Name, *CURRENT, *JOBD...
               + for more values
  Initial ASP group  . . . . . . .    *CURRENT      Name, *CURRENT, *JOBD, *NONE
  Message logging:
    Level  . . . . . . . . . . . .    *JOBD         0-4, *JOBD
    Severity . . . . . . . . . . .    *JOBD         0-99, *JOBD
    Text . . . . . . . . . . . . .    *JOBD         *JOBD, *MSG, *SECLVL, *NOLIST
  Log CL program commands  . . . .    *JOBD         *JOBD, *NO, *YES
  Job log output . . . . . . . . .    *JOBD         *JOBD, *SYSVAL, *JOBLOGSVR...
  Job message queue maximum size      *JOBD         2-64, *JOBD, *SYSVAL
  Job message queue full action  .    *JOBD         *JOBD, *SYSVAL, *NOWRAP...
  Inquiry message reply  . . . . .    *JOBD         *JOBD, *RQD, *DFT, *SYSRPYL
  Hold on job queue  . . . . . . .    *JOBD         *JOBD, *NO, *YES
  Schedule date  . . . . . . . . .    *CURRENT      Date, *CURRENT, *MONTHSTR...
                                                                        More...
  F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
  F24=More keys
```

Figure 5-6   SBMJOB: Message logging

> **Tip:** Submit a batch job to a job queue that is held. The job can then be changed using the CHGJOB command before it starts running.

5.3.3 Other jobs

Other jobs (for example, autostart, prestart, evoked, etc.) use the same parameters as discussed in the previous sections for controlling the level of messages recorded in the job log. Change the Message logging parameter in the job description that is referenced when the job starts. New jobs then create a job log containing the maximum message information. Use the CHGJOB command to change the logging level of an active job.

5.4 Saving the job information and spooled files for an active job

The jobs listed on the Work with Active Jobs display can be treated in the same manner when attempting to create any of the output listed below, or when locating any other spooled files that might be associated with that active job. The following sections describe the steps used to produce the spooled output for:

▸ A job log
▸ A spooled file with the job information

5.4.1 Saving the job log for any active job

To save the job log for an active job, follow these steps:

1. On a command line, enter the WRKACTJOB command.

2. Type 5 in the Opt column on the Work with Active Jobs screen to select the job.

3. Enter the parameters on the command line as shown in Figure 5-7 to create a job log spooled file.

```
 Work with Active Jobs                           ITSOSYS1
                                                          11/01/07  16:32:10
  CPU %:       .3      Elapsed time:   00:03:31     Active jobs:    160

 Type options, press Enter.
   2=Change   3=Hold   4=End   5=Work with   6=Release   7=Display message
   8=Work with spooled files   13=Disconnect ...
                      Current
 Opt  Subsystem/Job  User        Type  CPU %  Function       Status
      QBATCH         QSYS        SBS    .0                    DEQW
      QCMN           QSYS        SBS    .0                    DEQW
      QCTL           QSYS        SBS    .0                    DEQW
        QSYSSCD      QPGMR       BCH    .0    PGM-QEZSCNEP    EVTW
      QINTER         QSYS        SBS    .0                    DEQW
        QPADEV0002   MARK        INT    .0    CMD-WRKACTJOB   RUN
        QPADEV0003   ACA1        INT    .0    CMD-STRSST      DEQW
 5      QPADEV0005   ANDREI      INT    .0    CMD-STRSST      DSPW
      QSERVER        QSYS        SBS    .0                    DEQW
                                                                     More...
 Parameters or command
 ===> option(*joblog) output(*print)
 F3=Exit   F5=Refresh       F7=Find       F10=Restart statistics
 F11=Display elapsed data   F12=Cancel    F23=More options   F24=More keys
```

Figure 5-7   Generating a job log from the Work with Active Jobs display

A spooled file with a file name of QPJOBLOG is created.

5.4.2 Saving the job information for an active job

To save the job information for an active job, follow these steps:

1. To locate the active job, type WRKACTJOB on a command line.

2. Type 5 in the Opt column on the Work with Active Jobs screen to select the job.

3. Enter the parameters on the command line, as shown in Figure 5-8, to create a spooled file of job information.

```
 Work with Active Jobs                            ITSOSYS1
                                                       11/01/07  16:32:10
 CPU %:       .3     Elapsed time:   00:03:31     Active jobs:   160

 Type options, press Enter.
   2=Change   3=Hold   4=End   5=Work with   6=Release   7=Display message
   8=Work with spooled files   13=Disconnect ...
                      Current
 Opt  Subsystem/Job  User       Type  CPU %  Function         Status
      QBATCH         QSYS       SBS    .0                      DEQW
      QCMN           QSYS       SBS    .0                      DEQW
      QCTL           QSYS       SBS    .0                      DEQW
        QSYSSCD      QPGMR      BCH    .0   PGM-QEZSCNEP       EVTW
      QINTER         QSYS       SBS    .0                      DEQW
        QPADEV0002   MARK       INT    .0   CMD-WRKACTJOB      RUN
        QPADEV0003   ACA1       INT    .0   CMD-STRSST         DEQW
 5      QPADEV0005   ANDREI     INT    .0   CMD-STRSST         DSPW
      QSERVER        QSYS       SBS    .0                      DEQW
                                                                     More...
 Parameters or command
 ===> output(*print)
 F3=Exit   F5=Refresh       F7=Find      F10=Restart statistics
 F11=Display elapsed data   F12=Cancel   F23=More options   F24=More keys
```

Figure 5-8 Creating a job information spooled file from Work with Active Jobs display

A spooled file with a file name of QPDSPJOB is created.

5.4.3 When a display is input inhibited

When commands cannot be entered due to an input inhibited condition, try one of the following alternatives to access a command line:

► Press the Reset key.

► Press the System Request key. If the System Request menu is displayed, select option 1 (Display sign-on for an alternative job). Sign on and use the WRKACTJOB command as previously discussed.

► Press the System Request key. If the System Request menu is displayed, select option 3 (Display current job). If the message text for CPX2313 has been altered to substitute WRKJOB for DSPJOB, a command line is presented at the bottom of the Work with Job screen. Use the WRKACTJOB command as previously discussed.

► Use an alternate session or another terminal.

> **Tip:** Refer to the Registered Software Knowledge Base for details on modifying the message description for CPX2313, to use the WRKJOB command from the System Request menu, and for accessing a command line.
>
> Access to the Registered Software Knowledge Base is available to clients with Software Maintenance for iSeries or monthly iSeries or System i Support Line contracts in the United States and other countries where entitlement has been deployed. The Knowledge Base can be accessed at:
>
> http://www-912.ibm.com/supporthome.nsf/document/20300257.

5.5 Saving the job log and spooled files for a job that has ended

A job that has ended is also called an *inactive job*. A job log is produced for all jobs that end abnormally. An inactive job cannot be found if it does not have any spooled files. Once a job is inactive, the job message queue no longer exists. The messages are written to the spooled job log at the end of the job. The message logging level determines the amount of detail that is preserved in the job log.

> **Note:** On i5/OS V5R4 systems, jobs can be in a job log pending status.

Some details about the job name must be known to locate the spooled output associated with an inactive job.

> **Note:** A complete job name (qualified job name) contains a name, a user, and a number. The system assigns all the job numbers.

5.5.1 The qualified job name is known

When the qualified job name for a job is known, use the following command to locate the spooled files associated with a job that has ended:

```
WRKJOB JOB(number/user/job-name) OPTION(*SPLF)
```

Replace *number/user/job-name* with the number, user, and name of the inactive job. The list of spooled output associated with the job is displayed.

5.5.2 Part of the qualified job name is known

When only part of the job name is known for the job, use the following sections to determine where the spooled files are for a job that has ended.

When the job name is known
On a command line, enter:

```
WRKJOB JOB(job-name) OPTION(*SPLF)
```

Replace *job-name* with the name of the job. A display appears like the example shown in Figure 5-9.

```
 Select Job                            ITSOSYS1
                                                      11/01/07   16:55:52
 Type option, press Enter.
   1=Select


                                                                 Entered
 Option   Job          User        Number  Type      -----Status-----  System
          QPRTJOB      MARK        004102  BATCH     OUTQ           11/01/07
          QPRTJOB      ACA1        004101  BATCH     OUTQ           11/01/07
          QPRTJOB      AKA1        004100  BATCH     OUTQ           11/01/07
          QPRTJOB      ASA1        004099  BATCH     OUTQ           11/01/07
          QPRTJOB      QDIRSRV     003793  PRINT     OUTQ           10/30/07
          QPRTJOB      QSECOFR     001252  PRINT     OUTQ           10/16/07




                                                                  Bottom
 F3=Exit    F12=Cancel
 Duplicate jobs found.
```

Figure 5-9   WRKJOB: Duplicate jobs found

Note that all the jobs listed in Figure 5-9 have the same value in the Job column in each case. The User and Number columns differentiate the various jobs.

Select the appropriate job by entering option 1, and view the Work with Job panel.

When the user name is known

On the command line, type:

WRKUSRJOB USER(user)

Replace *user* with the user name of the job. A display appears like the example shown in Figure 5-10.

```
  Work with User Jobs                         ITSOSYS1
                                                       11/01/07  16:56:26
  Type options, press Enter.
    2=Change   3=Hold   4=End   5=Work with   6=Release   7=Display message
    8=Work with spooled files   13=Disconnect


  Opt  Job          User       Type      -----Status-----  Function
       QPADEV0002   MARK       INTER     OUTQ
       QPADEV0002   MARK       INTER     ACTIVE            CMD-WRKUSRJOB
       QPADEV0003   ACA1       INTER     OUTQ
       QPADEV0003   ACA1       INTER     ACTIVE            CMD-STRSST
       QPRTJOB      MARK       BATCH     OUTQ
       QPRTJOB      ACA1       BATCH     OUTQ
       QPRTJOB      AKA1       BATCH     OUTQ
       QPRTJOB      ASA1       BATCH     OUTQ



                                                                    Bottom
  Parameters or command
  ===>
  F3=Exit      F4=Prompt    F5=Refresh    F9=Retrieve   F11=Display schedule data
  F12=Cancel   F17=Top      F18=Bottom    F21=Select assistance level
```

Figure 5-10   WRKUSRJOB display

Notice that the Job name differs for each entry in Figure 5-10.

Select the appropriate job by entering option 5, and view the Work with Job panel.

5.6 Finding a job name

To assist with finding a job name on the Work with Active jobs display, follow this process:

1. If the job is active, enter the WRKACTJOB command to list all active jobs on the system. A display appears like the one in Figure 5-11.

```
 Work with Active Jobs                          ITSOSYS1
                                                     11/01/07  16:57:11
 CPU %:      .3      Elapsed time:   00:05:28     Active jobs:    160

 Type options, press Enter.
   2=Change   3=Hold   4=End    5=Work with    6=Release   7=Display message
   8=Work with spooled files    13=Disconnect ...
                       Current
 Opt   Subsystem/Job  User       Type  CPU %  Function        Status
       QBATCH         QSYS        SBS    .0                    DEQW
       QCMN           QSYS        SBS    .0                    DEQW
       QCTL           QSYS        SBS    .0                    DEQW
         QSYSSCD      QPGMR       BCH    .0   PGM-QEZSCNEP     EVTW
       QINTER         QSYS        SBS    .0                    DEQW
         QPADEV0002   MARK        INT    .0   CMD-WRKACTJOB    RUN
         QPADEV0003   ACA1        INT    .0   CMD-STRSST       DEQW
         QPADEV0005   ANDREI      INT    .0   CMD-STRSST       DSPW
       QSERVER        QSYS        SBS    .0                    DEQW
                                                                  More...
 Parameters or command
 ===>
 F3=Exit   F5=Refresh       F7=Find       F10=Restart statistics
 F11=Display elapsed data   F12=Cancel    F23=More options   F24=More keys
```

Figure 5-11   WRKACTJOB display

The indentation shows the jobs that are running in a subsystem monitor. Subsystem monitor and system jobs are not indented. For example, QPADEV0002 is running in subsystem QINTER.

2. Press F14 to include all jobs such as group jobs, prestart jobs, and system request jobs.

3. If "More..." appears on the display, page forward to continue searching for a job.

4. Match the job type in Table 5-2 with the job type listed on the Work with Active Jobs display, which is shown in Figure 5-11, to determine how job names are assigned.

Table 5-2   WRKACTJOB: Job type details

Job type	Description	Job name	User name
ASJ	Autostart	Specified in the subsystem Autostart job entry	Specified in the job description
BCH	Batch	Specified in the SBMJOB command	Specified in user job description
BCI	Batch Immediate	Specified in the spawn() API or host servers	Inherited from the job spawning the BCI job

Job type	Description	Job name	User name
EVK	Evoke	Communications device name	Specified on procedure start request
INT	Interactive	Workstation name	User name entered on sign-on
MRT	Multiple requester terminal	Procedure name	User who starts the job
PJ	Prestart	Name of the program started for the job	User profile associated with the job
PDJ	Print driver job	Name of the writer	QSPLJOB
RDR	Reader	Name of the reader	QSPLJOB
SBS	Subsystem monitor	Name of the subsystem	QSYS
SYS	System	Name of the system job	QSYS
WTR	Writer	Name of the writer	QSPLJOB

Job subtypes further qualify job types. Job types are described in the iSeries Information Center at:

http://pulib.boulder.ibm.com/infocenter/iseries/v5r3/ic2924/info/apis/WMAttrDesc.html#HDRWRKJOB

5.6.1 Finding the job and user name for an autostart job

Use the following steps to find the job and user name for an autostart job:

1. On a command line, enter:

   DSPSBSD SBSD(library/subsystem)

   Replace *library/subsystem* with the names of the library and subsystem that ran the failing autostart job.

2. Select the Autostart job entries. A display appears as shown in Figure 5-12.

```
Display Autostart Job Entries
                                                          System:    ITSOSYS1
Subsystem description:   QSERVER        Status:   ACTIVE

Job              Job Description    Library
QSERVER            QPWFSERVER        QSYS




                                                                    Bottom
Press Enter to continue.

F3=Exit    F12=Cancel
```

Figure 5-12   Display Autostart Job Entries: Locating the job description

3. Record the name shown in the Job column. This is the job name.
4. Record the names shown in the Job Description and Library columns.
5. Press the Enter key.
6. Enter the following command on the command line:

   DSPJOBD JOBD(library/job-description)

Replace *library/job-description* with the information recorded in the previous step. A display appears as shown in Figure 5-13.

```
Display Job Description
                                                        System:    ITSOSYS1
Job description:   QPWFSERVER     Library:   QSYS

User profile . . . . . . . . . . . . . . . . . . :   QPGMR
CL syntax check  . . . . . . . . . . . . . . . . :   *NOCHK
Hold on job queue  . . . . . . . . . . . . . . . :   *NO
End severity . . . . . . . . . . . . . . . . . . :   30
Job date . . . . . . . . . . . . . . . . . . . . :   *SYSVAL
Job switches . . . . . . . . . . . . . . . . . . :   00000000
Inquiry message reply  . . . . . . . . . . . . . :   *DFT
Job priority (on job queue)  . . . . . . . . . . :   5
Job queue  . . . . . . . . . . . . . . . . . . . :   QBATCH
  Library  . . . . . . . . . . . . . . . . . . . :     QGPL
Output priority (on output queue)  . . . . . . . :   5
Printer device . . . . . . . . . . . . . . . . . :   *USRPRF
Output queue . . . . . . . . . . . . . . . . . . :   *USRPRF
  Library  . . . . . . . . . . . . . . . . . . . :

                                                                  More...

Press Enter to continue.

F3=Exit   F12=Cancel
```

Figure 5-13   Display Job Description: Finding the user profile

The user name is the User profile in the job description.

7. Press F3 (Exit) to exit.

The job name and the user name are now known.

5.6.2 Finding the job and user name for a prestart job

Use the following steps to find the job and user name for a prestart job:

1. Enter the following command on the command line:

   DSPSBSD SBSD(library/subsystem)

   Replace *library/subsystem* with the names of the library and subsystem that ran the failing prestart job.

2. Select Prestart job entries. A display appears like the example shown in Figure 5-14.

```
 Display Prestart Job Entries
                                                         System:    ITSOSYS1
 Subsystem description:    QSERVER        Status:    ACTIVE

 Type options, press Enter.
   5=Display details

 Opt      Program         Library        User Profile
          QPWFSERVSO      QSYS            QUSER
          QPWFSERVSS      QSYS            QUSER
          QPWFSERVS2      QSYS            QUSER
          QPWFSTPO        QSYS            QUSER
          QPWFSTP1        QSYS            QUSER
          QPWFSTP2        QSYS            QUSER
          QTFPJTCP        QIWS            QUSER
          QZDAINIT        QSYS            QUSER
          QZLSFILE        QSYS            QUSER
          QZLSFILET       QSYS            QUSER



                                                                      Bottom
 F3=Exit    F9=Display all detailed descriptions    F12=Cancel
```

Figure 5-14   Display Prestart Job Entries

3. Record the name shown in the Program column. This is the job name.

4. Record the user profile name. The user name is the user profile.

5. Press F3 (Exit) to exit.

The job name and user name are now known.

5.6.3 Finding the job and user name for a TCP/IP application server job

Use the following steps to find the job and user name for a server job for a TCP/IP application:

1. Enter the following command on the command line:

   WRKACTJOB SBS(QSYSWRK QUSRWRK)

By default, the server jobs run in the QSYSWRK and QUSRWRK subsystems. For a list of TCP/IP application server job names, refer to the Server table in the iSeries Information Center at:

http://www.ibm.com/eserver/iseries/infocenter

When you reach this site, click **System Management** → **Work Management** → **Reference** → **Server job table.**

Tip: Most server jobs for TCP/IP applications have their message logging level set to LOG(4 00 *NOLIST) by default. To produce a job log for these jobs, refer to 5.3, "Setting the message logging level" on page 71.

5.7 Verifying the contents of the job log

Use the following steps to verify that the job log contains the information pertaining to the problem that you are reporting to your service provider:

1. View the spooled file of the job log (file name QPJOBLOG) on a display. We recommend that you use a display session with 132-column capability.

2. Verify that the job log contains a record of commands, information, and error messages that occurred while the job was running.

   Figure 5-15 shows an example of a job log. Table 5-3 identifies the areas of interest in the display for the first message in Figure 5-15.

```
Display Spooled File
File . . . . . :  QPJOBLOG                                        Page/Line   1/1
Control . . . . .                                        Columns    1 - 130
Find . . . . . .
*...+....1....+....2....+....3....+....4....+....5....+....6....+....7....+....8....+....9....+....0....+....1....+....2....+....3
 5722SS1 V5R4M0 060210              Job Log                 ITSOSYS1 10/30/07 18:29:26     Page   1
  Job name . . . . . . . . . . :  QTLPD00567    User . . . . . . :  QTCP        Number . . . . . . . . . . . :  003094
  Job description  . . . . . . :  QTMPLPD      Library . . . . . :  QTCP
 MSGID   TYPE         SEV DATE   TIME      FROM PGM   LIBRARY  INST   TO PGM   LIBRARY   INST
 CPF1124  Information       00  10/20/07 12:12:27.189832 QWTPIIPP   QSYS      066E   *EXT           *N
                 Message . . . . :  Job 003094/QTCP/QTLPD00567 started on 10/20/07 at 12:12:26
                 in subsystem QSYSWRK in QSYS. Job entered system on 10/20/07 at 12:12:26.
 CPI1125   Information       00  10/20/07 12:12:27.191376 QWTPCRJA   QSYS      010F   *EXT           *N
                 Message . . . . :  Job 003094/QTCP/QTLPD00567 submitted.
                 Cause . . . . . :  Job 003094/QTCP/QTLPD00567 submitted to job queue
                 QSYSNOMAX in QSYS from job 003073/QTCP/QTCPSTSVRS. Job
                 003094/QTCP/QTLPD00567 was started using the Submit Job (SBMJOB) command
                     with the following job attributes: JOBPTY(5) OUTPTY(5) PRTTXT()
                 RTGDTA(LPDSERVE) SYSLIBL(QSYS    QSYS2   QHLPSYS  QUSRSYS)
                 CURLIB(QTCP) INLLIBL() INLASPGRP(*NONE) LOG(4 00 *NOLIST) LOGCLPGM(*NO)
                 LOGOUTPUT(*JOBEND) OUTQ(/*DEV) PRTDEV(PRT01) INQMSGRPY(*RQD) HOLD(*NO)
                     DATE(*SYSVAL) SWS(00000000)  MSGQ(QUSRSYS/QTCP) CCSID(65535)
 SRTSEQ(*N/*HEX)
              LANGID(ENU) CNTRYID(US) JOBMSGQMX(16) JOBMSGQFL(*WRAP) ALWMLTTHD(*NO)
                 SPLFACN(*KEEP).
                                                                  More...
  F3=Exit  F12=Cancel  F19=Left  F20=Right  F24=More keys
```

Figure 5-15   Display Spooled File: A spooled job log

Table 5-3   Verifying job log messages

Item	Value
Job name	003094/QTCP/QTLPD00567
Job description	QTMPLPD
Date and time the message was sent	10/20/07 12:12:27.189832
Message identifier	CPF1124
Severity	00
Type of message	Information
Message text	Job .../.../... started on ../../.. at ..:..:..

Item	Value
Program sending the message	QWTPIIPP
Instruction in the sending program	066E
Program receiving the message	*EXT
Instruction in the receiving program	*N

6

Collecting the history log (QHST)

The history log (QHST) provides a high-level audit trail of the activities performed on the server. It is a collection of i5/OS messages. This log contains messages about the events within the system, including:

- ► Authorization violations
- ► Changes in device status
- ► Communication errors
- ► Copies of system operator messages
- ► Database information
- ► Hardware error notification
- ► IPL and install information
- ► Job-level information
- ► PTF information
- ► Subsystem information
- ► System-level information

This chapter describes how to save all or part of the history log.

6.1 Getting started

To understand the benefit and use of the history log, i5/OS users must first have knowledge of the i5/OS messages as discussed in Chapter 4, "Collecting messages" on page 35, or in the following:

Troubleshooting → Reference Information → Details: Messages, Details: Message Queues, and Details: Logs in the iSeries Information Center at:

http://www.ibm.com/eserver/iseries/infocenter

6.2 Checking the contents of messages in the history log (QHST)

The main user interface to working with the messages in the history log is the Display Log (DSPLOG) command. This command has a number of parameters that allow the user to filter a subset of messages to the display or to a spooled file. To check the contents of the messages in the history log, follow these steps:

1. Type DSPLOG on a command line. Use the F4 (Prompt) key if you want to view a subset of the history log. The command defaults position you at the first message occurring in the log for the current date. Subsequent sections in this chapter provide details on how to extract a subset of messages from the history log.

2. Press the Enter key. A display appears like the example shown in Figure 6-1.

```
 Display History Log Contents

 Job 004054/QPGMR/QCLNCALITM started on 10/31/07 at 22:00:00 in subsystem QCTL
 Cleanup of operator and work station messages started.
 Job 004055/QPGMR/QCLNUSRPGM started on 10/31/07 at 22:00:00 in subsystem QCTL
 Cleanup of operator and work station messages successfully completed.
 Cleanup of user messages started.
 Job 004051/QPGMR/QCLNSYSMSG ended on 10/31/07 at 22:00:01; 1 seconds used; en
 User cleanup program started.
 Cleanup of job logs and other system output started.
 User cleanup program successfully completed.
 Job 004055/QPGMR/QCLNUSRPGM ended on 10/31/07 at 22:00:01; 1 seconds used; en
 000007 of 000051 messages deleted from QPGMR.
 Cleanup of user messages successfully completed.
 Job 004050/QPGMR/QCLNUSRMSG ended on 10/31/07 at 22:00:01; 1 seconds used; en
 Job 004054/QPGMR/QCLNCALITM ended on 10/31/07 at 22:00:01; 1 seconds used; en
 Job 004056/QPGMR/QCLNCRITMS started on 10/31/07 at 22:00:01 in subsystem QCTL
 Job 004056/QPGMR/QCLNCRITMS ended on 10/31/07 at 22:00:01; 1 seconds used; en
 Cleanup of job logs and other system output successfully completed.
                                                                    More...
 Press Enter to continue.

 F3=Exit    F10=Display all    F12=Cancel
```

Figure 6-1   Display History Log Contents

3. If "More..." appears on the display, page forward or backward to continue searching for a message.

4. Move the cursor to a message that relates to the problem.

5. Press the F1 (Help) key to view the additional message information.

6. If this message indicates the problem, continue with the next step. Otherwise, go to step 9.

7. Check the additional message information in a message for references to an error log, a LIC log ID, or other useful information. Record details of information that are used later to locate further problem information. To check the additional message information, go to the following section.

8. Press F6 (Print) to save additional message information.

9. Press F12 (Cancel) to return to the history log.

10. If you need to find more messages in the history log that relate to the problem, repeat steps 3 through 9. Otherwise, continue with the next step.

11. Press F12 (Cancel) to cancel the Display History Log Contents display.

See 6.4, "Saving the history log (QHST)" on page 99, for details on how to print the history log.

6.2.1 Finding additional information in a message

Refer to 4.6, "Checking the contents of the additional message information" on page 58, for details on examining the messages for additional information.

6.3 Viewing part of the history log

When looking for particular messages in the history log, use the additional parameters of the DSPLOG command to perform the following functions:

► Find messages in QHST for a specific time period
► Find messages in QHST for specific jobs
► Find specific messages in QHST
► Find messages in QHST for the latest installation of software

Each of these options is described further in the following sections.

6.3.1 Finding messages in QHST for a specific period of time

Use the following steps to select messages in QHST for a specific period of time:

1. Type DSPLOG on a command line, and press F4 (Prompt).

2. Enter the beginning and ending time and date near the time that the problem occurred.

Note: If the date or time has been changed forward on a system, the messages in QHST can appear out of sequence when displayed with DSPLOG. If the date or time has been changed backwards, they do not appear in the DSPLOG unless you specify the earlier date or time.

A display appears like the example shown in Figure 6-2 on page 94.

3. Set the Output parameter to *PRINT to create a spooled file with a file label of QPDSPLOG.

```
  Display Log (DSPLOG)

  Type choices, press Enter.

  Log  . . . . . . . . . . . . .    QHST          QHST
  Time period for log output:
    Start time and date:
    Beginning time . . . . . . . .  08:00:00      Time, *AVAIL
    Beginning date . . . . . . . .  07/07/07      Date, *CURRENT, *BEGIN
    End time and date:
    Ending time  . . . . . . . . .  09:00:00      Time, *AVAIL
    Ending date  . . . . . . . . .  07/07/07      Date, *CURRENT, *END
  Output . . . . . . . . . . . . .  *             *, *PRINT, *PRTWRAP...




                                                                      Bottom
  F3=Exit   F4=Prompt   F5=Refresh   F10=Additional parameters   F12=Cancel
  F13=How to use this display        F24=More keys
```

Figure 6-2 DSPLOG: Selecting messages by time period

Note: The first message that appears when displaying the history log is the first message that is found after the specified start time. Page forward or backward to see messages in the history log that might be outside the specified start and end time.

When displaying the history log to the screen, it is only necessary to specify a start time in the DSPLOG command. The end time is not required.

Specify an end time when creating a spooled file from the history log to limit the size of the file that is written.

6.3.2 Finding messages in QHST for specific jobs

Use the following steps to find messages in the history log for specific jobs:

1. Type DSPLOG on a command line, and press F4 (Prompt).

2. Press F10 (Additional parameters), and page forward to display additional parameters.

3. Move the cursor to the **Jobs to display** prompt. See Figure 6-3 on page 95.

4. Enter one or more job names. If you are entering more than one job name, use the + for the more values parameter. Then, type the job names, and press the Enter key. The fully qualified job name must be used.

The output can be directed to the display or to a spooled file.

```
 Display Log (DSPLOG)

 Type choices, press Enter.


                         Additional Parameters

 Jobs to display  . . . . . . . .   *NONE         Name, *NONE
   User . . . . . . . . . . . . .                 Name
   Number . . . . . . . . . . . .                 000000-999999
              + for more values



 Message identifier . . . . . . .   *ALL          Name, *ALL
              + for more values




                                                              Bottom
 F3=Exit    F4=Prompt    F5=Refresh    F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 6-3   Display Log: Jobs to display

Note: If you enter a job name without a number or user, the i5/OS searches for all jobs with the specified name.

6.3.3 Finding specific messages in QHST

Locating a specific message in the history log is used when searching for evidence of a problem that occurred some time ago. It is also used when you attempt to determine if the same symptom is being encountered in multiple jobs on the system.

Use the following steps to find specific messages in the history log:

1. Type DSPLOG on a command line, and press F4 (Prompt).
2. Press F10 (Additional parameters), and page forward to display additional parameters.

3. Move the cursor to the Message identifier prompt. See Figure 6-4.

```
  Display Log (DSPLOG)

  Type choices, press Enter.


                           Additional Parameters

  Jobs to display  . . . . . . . .    *NONE          Name, *NONE
    User . . . . . . . . . . . . .                   Name
    Number . . . . . . . . . . . .                   000000-999999
               + for more values


  Message identifier . . . . . . .    *ALL           Name, *ALL
               + for more values




                                                                 Bottom
  F3=Exit    F4=Prompt    F5=Refresh    F12=Cancel   F13=How to use this display
  F24=More keys
```

Figure 6-4   Display Log: Message identifier

The output can be directed to the display or to a spooled file.

6.3.4 Finding specific messages in QHST for a job in a specific time period

Locating specific messages that occur within a known time period can be used when you attempt to determine if more than one job is encountering the same problem.

Use the additional parameters in the DSPLOG command to define the search criteria. The following selections can be combined to find specific messages in QHST for a specific job in a specific time period.

Refer to the following sections for details on the parameters. Combine the parameters to produce the required selection:

► Section 6.3.1, "Finding messages in QHST for a specific period of time" on page 93
► Section 6.3.2, "Finding messages in QHST for specific jobs" on page 94
► Section 6.3.3, "Finding specific messages in QHST" on page 95

6.3.5 Finding messages in QHST for the latest installation

Following the installation of IBM-supplied software, or a cumulative PTF package, the history log can be scanned to determine the success of the operation.

Use the following steps to locate the messages that relate to the most recent installation of software or a cumulative PTFs package:

1. Enter `GO LICPGM` on the command line to display the Work with Licensed Programs display, and page forward. A display appears like the example shown in Figure 6-5. The help text for option 50 is shown prompted on this screen.

```
LICPGM                    Work with Licensed Programs
                                                   System:   ITSOSYS1
 Select one of the following:

   Completion Status
     50. Display log for messages
         ............................................................
 Relat :                         Option 50 - Help                   :
   70. :                                                            :
   71. :  Select this option to display the status of the install process.  :
   72. :                                                    Bottom  :
       : F2=Extended help   F3=Exit help   F10=Move to top   F12=Cancel     :
       : F13=Information Assistant          F14=Print help               :
       :                                                            :
       :............................................................:


                                                            Bottom
 Selection or command
 ===>


 F3=Exit   F4=Prompt   F9=Retrieve   F12=Cancel   F13=Information Assistant
 F16=System Main menu
```

Figure 6-5   Work with Licensed Programs: Display log for messages

2. Type 50 on the command line to display the log for messages. A display appears as shown in Figure 6-6 on page 98.

```
Display Install History

Type choices, press Enter.

  Start date . . . . . .   10/17/07   MM/DD/YY

  Start time . . . . . .   14:50:50   HH:MM:SS

  Output . . . . . . . .   *          *, *PRINT













F3=Exit    F12=Cancel
```

Figure 6-6   Display Install History

3. The date and time shown on the display indicate when the first message for the latest installation was sent to QHST.

4. The results can be displayed in one of the following ways:

   – To print the install messages in QHST, type ***PRINT** in the Output prompt, and press the Enter key. A spooled file with a file label of QPDSPLOG is produced.

   – To view the installation messages in QHST, press the Enter key. A display appears as shown in Figure 6-7 on page 99.

```
Display History Log Contents

 *PGM objects for product 5733AZ1 option *BASE release *FIRST restored.
 *LNG objects for NLV 2924 for product 5733AZ1 option *BASE release *FIRST res
 *PGM objects for product 5733W61 option *BASE release *FIRST restored.
 *PGM objects for product 5733W61 option 2 release *FIRST restored.
 *PGM objects for product 5733W61 option 7 release *FIRST restored.
 PTF installation process started.
 Loading of PTFs started.
 Loading of PTFs completed successfully.
 Marking of PTFs for delayed application started.
 Marking of PTFs for delayed application completed successfully.
 PTFs installed successfully.
 Apply PTF started.
 Applying of PTFs for product 5722999 completed successfully.
 Applying of PTFs completed.
 PTFs applied or removed during IPL.


                                                                    Bottom

 Press Enter to continue.

 F3=Exit    F10=Display all    F12=Cancel
```

Figure 6-7   Display History Log Contents: Installation history

5. Press the Help key to view the additional message information.

6.4 Saving the history log (QHST)

In some environments, the history log can be saved to satisfy audit requirements, or it can be copied to backup media and deleted from the system simply to reduce disk utilization. The history log can be saved in two forms:

► As a spooled file
► As a file on tape

To save all or part of the history log (QHST) to a spooled file, set the Output parameter to *PRINT on the DSPLOG command, in conjunction with other additional parameters to produce a spooled file with a print label of QPDSPLOG.

> **Note:** *Specifying *PRINT includes the message text but not the additional information. To include the additional information in the spooled file, specify *PRTSECLVL instead of *PRINT. If you are sending this log to your service provider, consider using *PRTSECLVL to provide more detailed information.

i5/OS stores the history messages in files in library QSYS. Example files are shown in Figure 6-8.

```
 Work with Files

 Type options, press Enter.
   1=Create   3=Copy   4=Delete   5=Display physical file member
   8=Display file description     9=Save   10=Restore   13=Change description


 Opt  File         Library    Attribute   Text

      QHST06282A   QSYS       PF          10610091120311061010130108
      QHST06283A   QSYS       PF          10610101301081061010133141
      QHST06283B   QSYS       PF          10610101331411061010153912
      QHST06283C   QSYS       PF          10610101539121061010172220
      QHST06283D   QSYS       PF          10610101722201061012060025
      QHST06285A   QSYS       PF          10610120600251061016220045
      QHST06289A   QSYS       PF          10610162200451061017134016
      QHST06290A   QSYS       PF          10610171340161061017150923
      QHST06290B   QSYS       PF          10610171509231061018150551
      QHST06291A   QSYS       PF          10610181505511061019154128
                                                                    More...
 Parameters for options 1, 3, 4, 5, 8, 9, 10 and 13 or command
 ===>
 F3=Exit     F4=Prompt   F5=Refresh   F9=Retrieve   F11=Display names only
 F12=Cancel   F16=Repeat position to   F17=Position to
```

Figure 6-8   Work with Files: QHST*

The size of the files is determined by system value QHSTLOGSIZ. Once the existing file is full, a new file is opened. The old file can be saved or deleted.

Note: The system value QHSTLOGSIZ can be set to a special value of *DAILY. The special value *DAILY specifies that a new version of the history log is created each time the date in the history log messages changes, or when the current log version reaches the maximum size of 10,000,000 records.

The naming convention used for the files is QHSTyyddda, where:

► *yy*: The last two digits of the year
► *ddd*: The Julian day on which the file is created
► *a*: An alphabetic suffix to distinguish files created with the same date

When the Cleanup Tasks are run on the system, the history log files that are older than the date specified (as shown in Figure 6-9) are deleted to conserve disk space.

```
Change Cleanup Options                    ITSOSYS1
                                                   11/02/07  12:15:24
 Type choices below, then press Enter.

 Allow automatic cleanup . . . . . . . . . . . .   Y             Y=Yes, N=No

 Time cleanup starts each day  . . . . . . . . .   22:00:00      00:00:00-
                                                                 23:59:59,
                                                                 *SCDPWROFF,
                                                                 *NONE


 Number of days to keep:
   User messages . . . . . . . . . . . . . . . .   7             1-366, *KEEP
   System and workstation messages . . . . . . .   4             1-366, *KEEP
   Critical system messages  . . . . . . . . . .   *KEEP         1-366, *KEEP
   Job logs and other system output  . . . . . .   7             1-366, *KEEP
   System journals and system logs . . . . . . .   30            1-366, *KEEP




 F1=Help   F3=Exit   F5=Refresh   F12=Cancel
```

Figure 6-9   Change Cleanup Options: System logs

When the i5/OS cleanup task has deleted history log files, the messages for that period no longer exist in the history log. If history log messages are required to be kept as part of audit requirements, or for other reasons, consider including these files as part of your backup strategy.

6.5 Verifying times and dates in the history log

After you produce a spooled file of the history log, verify its contents, as shown in the following series of steps, to ensure that the required information has been captured. Use the

following steps to verify that the beginning and ending messages in the Output (*PRINT) or
Output (*PRTSECLVL) option have been used:

1. Enter the WRKJOB command on the command entry line, and enter option 4. A display
   appears like the example shown in Figure 6-10.

```
Work with Job Spooled Files

 Job:    QPADEV0003     User:    MARK           Number:    004016

 Type options, press Enter.
   1=Send    2=Change    3=Hold    4=Delete    5=Display    6=Release    7=Messages
   8=Attributes          9=Work with printing status

                    Device or                          Total    Current
 Opt   File         Queue         User Data    Status   Pages      Page    Copies
       QPDSPJNA     QPRINT        WRKJRNA       RDY        3                 1
       QSYSPRT      QPRINT        CHGCLNUP      RDY        1                 1
       QPUSRPRF     QPRINT        DSPUSRPRF     RDY        2                 1
       QPRTJOBD     QPRINT        DSPJOBD       RDY        1                 1
       QPDCDEVA     QPRINT                      RDY        2                 1
       QPMSGD                                   *DLT
       QPDSPLOG     QPRINT                      RDY        9                 1


                                                                     Bottom
 Parameters for options 1, 2, 3 or command
 ===>
 F3=Exit    F10=View 3    F11=View 2    F12=Cancel    F22=Printers    F24=More keys
```

Figure 6-10   QPDSPLOG

2. Type 5 in the Opt column next to the file QPDSPLOG to display the contents. Figure 6-11
   shows an example of the contents of a history log spooled file.

```
 Display Spooled File
 File . . . . . :  QPDSPLOG                                                    Page/Line  1/1
 Control . . . . .                                                   Columns   1 - 130
 Find . . . . . .
 *...+....1....+....2....+....3....+....4....+....5....+....6....+....7....+....8....+....9....+....0....+....1....+....2....+....3
  5722SS1 V5R4M0 060210                        History Log                             Page  0001
 MSGID   SEV MSG TYPE
 CPF1164  00 COMPLETION   Message . . . . :   Job 004063/QTMHHTTP/QHTTP ended on 11/02/07 at 00:00:02;
 1 seconds used; end code 0
                                     X.
                  Cause . . . . . :   Job 004063/QTMHHTTP/QHTTP completed on 11/02/07 at 00:00:02 after it used
 1 seconds
                  processing unit time.  The job had ending code 0. The job ended after 1 routing steps with a secondary
                     ding code of 0.  The job ending codes and their meanings are as follows:  0 - The job completed
                  normally. 10 - The job completed normally during controlled ending or controlled subsystem ending. 20
                   - The job exceeded end severity (ENDSEV job attribute). 30 - The job ended abnormally. 40 - The job
                  ended before becoming active. 50 - The job ended while the job was active. 60 - The subsystem ended
                   abnormally while the job was active. 70 - The system ended abnormally while the job was active. 80 -
                  The job ended (ENDJOBABN command). 90 - The job was forced to end after the time limit ended
                     (ENDJOBABN command). Recovery  . . . :   For more information, see the Work Management topic
 in the
                  Information Center, http://www.ibm.com/eserver/iseries/infocenter.
                  QHTTP     QTMHHTTP  004063            11/02/07 00:00:03.033296 QTMHHTTP
 CPF1124  00 INFO        Message . . . . :   Job 004122/QSYS/QYMEPFRCVT started on 11/02/07 at 00:00:04 in
 subsystem QSYSWRK in
                  QSYS. Job entered system on 11/02/07 at 00:00:04.
                                                 X
                  QYMEPFRCVT QSYS     004122            11/02/07 00:00:04.456224 QSYS
                                                                        More...
  F3=Exit  F12=Cancel  F19=Left  F20=Right  F24=More keys
```

Figure 6-11   Contents of QPDSPLOG

3. Look for the date and time in the first message that appears in the file.

4. Page forward to the last message in the file.

5. Look at the date and time in the last message that appears in the file.

6. Once you have determined that the spooled file includes the messages that relate to the problem being reported, forward this information to your service provider, along with any other relevant information. Refer to 7.3, "Reporting the problem to your service provider electronically" on page 116, for further details.

7

Problem log and Save APAR Data

The problem log is one of the problem management tools provided by i5/OS. In the problem log, detailed information about a specific problem is recorded. For example, you can see:

► The product type and serial number of the device that had the problem
► The date and time of the problem
► The part that failed and the problem status

Problems that are detected by i5/OS are logged into the problem log with a status of *OPENED.

User-detected problems are entered into the problem log with the Analyze Problem (ANZPRB) command. In the process of creating a new entry, i5/OS guides you in providing more relevant information on the problem. This interface allows you to analyze the problem and report it to your service provider electronically when necessary.

The service provider who receives the problem determines whether the request is related to hardware or software and takes the appropriate action, as described here:

► **Software service**: A search is performed against the database of program temporary fixes (PTFs) by using the symptom string created during problem analysis. If a match is found and a PTF is available, the service provider transmits the PTF to you electronically.

The PTF you receive electronically is placed in the QGPL library as a save file. The file name is the PTF number, preceded by a Q. If the problem is not resolved, use the Save APAR Data (SAVAPARDTA) command to collect related information to an APAR library. Forward this APAR library to your service provider, as described in 7.4, "Using Save APAR Data (SAVAPARDTA) to collect data" on page 119.

► **Hardware service**: The same process is followed for hardware service as is described for software service above. If a resolution PTF match is not found, your service provider might call you to assist in further problem definition.

The Save APAR data command (SAVAPARDTA) is often necessary for problem isolation. It is usually performed after analyzing the problem, when the recommended remedy actions do not resolve the problem.

Use the Save APAR Data display or command, which allows you to collect data of different types and from several sources without entering multiple commands to capture information.

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This information is stored in an APAR library, which you then save onto removable media. The media is then sent to your service provider for further analysis.

When you save APAR data, the following functions are performed:

- ► Creates an entry in the problem log if one does not exist
- ► Creates an APAR library with a unique name derived from the problem number
- ► Creates an output queue named QSCAPAROQ in the APAR library
- ► Saves the problem log entry and the associated spooled files, product activity log, and LIC log entries
- ► Displays a list of sources for additional information
- ► Collects the data as an object or spooled file
- ► Saves the data in your APAR library

The WRKPRB, ANZPRB, and SAVAPARDTA commands are shipped with public *EXCLUDE authority. The QPGMR, QSYSOPR, QSRV, and QSRVBAS user profiles have private authorities to use the commands. If necessary, see your security officer to obtain the necessary authority to use these commands.

To save APAR data, it is helpful to know whether there is a problem log entry associated with your problem. If you used the ANZPRB command, a problem log entry does exist. i5/OS also creates problem log entries for certain hardware and software errors. Both types of errors have associated problem log entries.

> **Note:** Software errors detected by i5/OS are logged only if the system value QSFWERRLOG is set to *LOG.

7.1 Analyzing problems detected by i5/OS

This section outlines the steps to analyze a problem where an entry exists in the problem log:

1. Type WRKPRB on any command line, and press Enter. A display appears as shown in Figure 7-1.

```
 Work with Problems
                                                         System:    ITSOSYS1
 Position to . . . . . . .                    Problem ID

 Type options, press Enter.
   2=Change    4=Delete    5=Display details    6=Print details
   8=Work with problem    9=Work with alerts    12=Enter text


 Opt   Problem ID  Status          Problem Description
       0630664855  PREPARED        Preventive service planning information reques
       0630363383  READY           *Attention*  Contact your hardware service pro
       0629341727  READY           *Attention*  Contact your hardware service pro
       0629255940  CLOSED          *Attention*  Contact your hardware service pro
       0629141447  READY           *Attention*  Contact your hardware service pro
       0629052034  VERIFIED        *Attention*  Contact your hardware service pro
       0629049658  READY           *Attention*  Contact your hardware service pro
       0629043592  READY           Software problem data for QRWDISCO has been lo
       0629043590  READY           *Attention*  Contact your hardware service pro
       0628959620  READY           *Attention*  Contact your hardware service pro
                                                                         Bottom
 F3=Exit      F5=Refresh    F6=Print list      F11=Display dates and times
 F12=Cancel   F16=Report prepared problems   F24=More keys
```

Figure 7-1   Work with Problems display

2. Enter option 8 next to the problem with which you want to work. Press Enter, and a display appears as shown in Figure 7-2 on page 108.

```
 Work with Problem
                                                         System:    ITSOSYS1
 Problem ID . . . . . . . :    0629043592
 Current status . . . . . :    READY
 Problem . . . . . . . . :    Software problem data for QRWDISCO has been
logged
. Refer to help text for addit


 Select one of the following:.

      1. Analyze problem
      2. Report problem

      4. Verify problem corrected

     20. Close problem

     30. Save APAR data to APAR library
                                                                    More...
 Selection
```

Figure 7-2   Work with Problem display

3. Select option 1 to analyze the problem.

4. Depending on the nature of the problem, you are prompted to run various tests to determine the cause of the problem.

5. After the analysis, the possible causes are displayed with recommended recovery action. Follow the recommendations before you report the problem to your service provider.

6. If the analysis does not resolve the problem, you are directed to report the problem to your service provider.

This ends the procedure in analyzing the problem detected by i5/OS.

7.2 Creating a new entry in the problem log

This section outlines the steps to create a new entry in the problem log. Follow these steps to create a problem entry for a user-detected problem:

1. Type ANZPRB on any command line, and press Enter. A display appears like the example shown in Figure 7-3 on page 109.

```
Select Type of System
                                                   System:    ITSOSYS1
Select one of the following:

  System with the problem is
     1. This AS/400 or attached devices
     2. Another AS/400
     3. Another type of system, not an AS/400











Selection or command
===>

F3=Exit   F4=Prompt   F9=Retrieve   F12=Cancel
```

Figure 7-3   Select Type of System menu

2. Select the option that most closely corresponds to the problem you encountered. In this example, we select option 1. The display shown in Figure 7-4 appears.

```
Analyze a Problem
                                                   System:    ITSOSYS1
Select one of the following:

  Analyze a Problem
     1. Job or program problem (application or system)
     2. System performance problem
     3. Hardware problem
     4. Communications/LAN hardware problem

  Describe a Problem
     5. Problem occurred during IPL of this AS/400
     6. Job or program problem (application or system)






Selection or command
===>

F3=Exit   F4=Prompt   F9=Retrieve   F12=Cancel
```

Figure 7-4   Analyze a Problem menu

3. Select option 6 to describe the problem encountered. A display appears like the example shown in Figure 7-5.

```
Select Product
                                                    System:   ITSOSYS1
 Position to . . . . . . .              Product

 Type option, press Enter.
   1=Select


             Product
 Opt  Product  Option   Description
      5722999  *BASE    Licensed Internal Code
      5722SS1  *BASE    i5/OS
      5722DG1  *BASE    IBM HTTP Server for i5/OS
      5722JC1  *BASE    IBM Toolbox for Java
      5722JV1  *BASE    IBM Developer Kit for Java
      5722PT1  *BASE    Performance Tools for iSeries - Base
      5722QU1  *BASE    Query for iSeries
      5722ST1  *BASE    DB2 Query Manager and SQL Development Kit for
      5722TC1  *BASE    TCP/IP Connectivity Utilities for i5/OS
      5722WDS  *BASE    WDS for iSeries
      5722XE1  *BASE    iSeries Access for Windows
                                                              More...
 F3=Exit    F5=Refresh   F11=Display releases    F12=Cancel
 F19=Display trademarks
```

Figure 7-5   Select Product display

4. Scroll up or page down to see more products. In this example, we selected 5722TC1 TCP/IP Connectivity Utilities for i5/OS. A display appears like the example shown in Figure 7-6.

```
Select Product Function

                                             System:   ITSOSYS1
Product . . . . . . . . . . . . :   TCP/IP Connectivity Utilities for i5/OS
Option  . . . . . . . . . . . . :   TCP/IP Connectivity Utilities for i5/OS


Type option, press Enter.
  1=Select


        Product
Opt     function
        Telnet (Remote terminal logon)
        File Transfer Protocol (FTP)
        Simple Mail Transfer Protocol (SMTP)
        Line Printer Requester (LPR)
        Line Printer Daemon (LPD)
        Customer written application
        Configuration
        Activation or deactivation
        Workstation Gateway (WSG)
        Post Office Protocol (POP)
                                                          More...
F3=Exit    F12=Cancel
```

Figure 7-6   Select Product Function display

5. Enter 1 next to the Activation or deactivation option. A display appears as shown in Figure 7-7 on page 112.

```
 Select Message Information
                                                           System:    ITSOSYS1
 Do the following, then return here.
    Press F14 to view the messages associated with your job
    Press the function key to display detailed messages.
    Find the first escape message in the list of messages after the failing
    command by doing the following for each message:
    - Put the cursor on the message.
    - Press the Help key.
    - Check the Message type field for "ESCAPE."

More...

Type choices, press Enter. If there are no messages related to the problem,
   just press Enter.

    Message . . . . . . . . . . . . . . ID
    Code . . . . . . . . . . . . . . . .Code
    From program . . . . . . . . . . . Name
    To program . . . . . . . . . . . . Name

F3=Exit    F12=Cancel F14=Display job log  F15=Work with active jobs
```

Figure 7-7   Specify Message Information display

6. Type the appropriate message **ID**, **code** (if present), the **From program**, and the **To program** information from the screen. Press Enter. A display appears as shown in Figure 7-8 on page 113.

Note: Code information is an identifier used by service personnel to help resolve problems. Some examples of code information are a reason code, error code, or completion code. The code does not appear on every message display.

```
Enter Problem Description
                                                        System:    ITSOSYS1
Type description, press Enter.

  Problem description . . .   User detected a software problem on this AS/400.
















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

Figure 7-8   Enter Problem Description display

7. Type a meaningful description for the problem occurrence, and press Enter. A display
   appears as shown in Figure 7-9.

```
Save Problem Data
                                                        System:    ITSOSYS1
If you have APAR data to be saved, you may want to save this data now.
This data may be requested if you report the problem and a PTF cannot be
found.




Type choice, press Enter.

Save APAR data . . . . . . . .        Y=Yes, N=No








  F3=Exit    F12=Cancel
```

Figure 7-9   Save Problem Data display

8. If you have APAR data to be saved, you might want to save this data now. Refer to 7.4, "Using Save APAR Data (SAVAPARDTA) to collect data" on page 119, for more details. In this example, we specify N and press Enter. A display appears as shown in Figure 7-10.

```
Report Problem
                                                  System:    ITSOSYS1
The problem has been logged.


Select one of the following:

     1. Prepare service request












Selection


F3=Exit    F13=Add notes    F12=Cancel
```

Figure 7-10   Report Problem display

9. On this display, press F13 to add notes to describe the problem further. After you press F13, a display appears as shown in Figure 7-11 on page 115.

```
Select Text Type
                                                                    System:    ITSOSYS1
Select one of the following:.

  Problem Definition
     1. Problem description text
     2. Problem diagnostic text

  Query Data
    10. Query status text

    99. Private system text




                                                                               Bottom
Selection


F3=Exit    F12=Cancel
```

Figure 7-11   Select Text Type menu

10.Select option 1 to describe your problem. Press Enter, and a display appears as shown in Figure 7-12.

```
Update Description Text
                                                                    System:    ITSOSYS1
Problem ID . . . . . . . :     0630665185
Current status . . . . . :     READY
Problem  . . . . . . . . :     User detected a software problem on this AS/400.



Type text, press Enter.












                                                                               Bottom
F3=Exit        F6=Insert line   F12=Cancel    F14=Delete line   F17=Top
F18=Bottom     F20=Right
```

Figure 7-12   Update Description Text display

11. Describe your problem on the lines provided.

This ends the procedure for creating a new entry in the problem log.

7.3 Reporting the problem to your service provider electronically

This section outlines the steps to electronically report problems logged in the problem log to your service provider. To use this procedure to report your problem, your electronic customer support modem needs to be available and powered on.

Follow the steps shown here:

1. Type WRKPRB on any command line, and press Enter. A display appears as shown in Figure 7-1 on page 107.
2. Enter option 8 next to the problem with which you want to work. Press Enter, and a display appears as shown in Figure 7-2 on page 108.
3. Select option 2 to report the problem to your service provider.

> **Note:** Only problems with a status of *Prepared* can be sent to your service provider. If the problem has a status such as *Opened* or *Ready*, enter option 1 to analyze and prepare the problem.

4. Press Enter. A display appears as shown in Figure 7-13.

```
  Verify Contact Information
                                                           System:    ITSOSYS1
   Type changes, press Enter.

      Company . . . . . . . . . .
      Contact . . . . . . . . . .
      Mailing address:
        Street address line 1 . .
        Street address line 2 . .
        Street address line 3 . .
        City or locality  . . . .
        State or province . . . .
        Country or region . . . .
        Postal code . . . . . . .
      Contact telephone numbers:
        Primary . . . . . . . . .
        Help desk or pager number
      Fax telephone numbers:
        Primary . . . . . . . . .
        Alternative . . . . . . .
                                                                      More...
   F3=Exit    F4=Prompt    F5=Refresh    F12=Cancel
```

Figure 7-13   Verify Contact Information display

5. Verify the information stated in the display. Modify any incorrect fields by typing over the current information, and press Enter. A display appears as shown in Figure 7-14 on page 117.

```
  Select Problem Severity
                                                        System:    ITSOSYS1
 Problem ID . . . . . . . . . :    0629141447
 Current status . . . . . . . :    READY
 Problem  . . . . . . . . . . :    *Attention*  Contact your hardware service
pro
vider.



 Select one of the following:

      1. High   - Requires immediate solution
      2. Medium - Restricts function
      3. Low    - Limits function
      4. None   - Operates with full function




 Selection


 F3=Exit   F12=Cancel
```

Figure 7-14   Select Problem Severity display

6. Select the severity level that closely describes the impact of this problem to your business environment.

7. Press Enter. A display appears as shown in Figure 7-15.

```
 Select Service Provider
                                                      System:   ITSOSYS1
 Position to . . . . . . .            Control point
   Network ID . . . . . .


 Type option, press Enter.
   1=Select


        Control
 Opt    Point        Network ID     Description
        *IBMSRV                     IBM Service Support







                                                              Bottom
 F5=Refresh    F12=Cancel
```

Figure 7-15   Select Service Provider display

8. Type 1 in the Opt column to select your service provider.

   It shows IBM as the service provider. Multiple service providers can be established
   depending on your environment or support structure.

9. Press Enter, and a display appears as shown in Figure 7-16.

```
 Select Reporting Option
                                                      System:   ITSOSYS1
 Problem ID . . . . . . . . . :   0629141447
 Current status . . . . . . . :   READY
 Problem  . . . . . . . . . . :   *Attention*  Contact your hardware service
 pro
 vider.




 Select one of the following:


     1. Send service request now
     2. Do not send service request
     3. Report service request by voice
  Selection




 F3=Exit    F12=Cancel
```

Figure 7-16   Select Reporting Option display

10. Select option 1 to send your send request.

11. For a successful transmission, you should see the message:

    ```
    Problem reporting complete. Service number is XXXXX.
    ```

    The status of the problem also changes from PREPARED to SENT.

This ends the procedure to report your problem electronically.

7.4 Using Save APAR Data (SAVAPARDTA) to collect data

Using the Save APAR Data displays or command allows you to collect data from several sources without having to enter multiple commands.

The Save APAR Data function performs these tasks:

► Creates an entry for the problem in the problem log if one does not exist
► Creates an APAR library with a unique name derived from the problem number
► Creates an output queue QSCAPAROQ in your APAR library
► Saves the problem log entry and the associated spooled files, error log, and LIC log
► Displays a selection list of data sources
► Collects the data as an object or spooled file
► Saves the data in your APAR library

Note: LIC logs were formerly called Vertical Licensed Internal Code (VLIC) logs.

APAR data can be saved from a Save APAR Data display or by using the Save APAR Data (SAVAPARDTA) command. The Save APAR Data display appears when you use the problem log, the Analyze a Problem (ANZPRB) command, or F14 from the QSYSOPR message queue.

Use Table 7-1 to find a path to the Save APAR Data display.

Table 7-1   Display or command selection

Starting from	Command	Option or F key	On this display	Reference
Problem log	**WRKPRB**	8	Work with problems	
		30	Work with problem	Section 7.4.2, "Saving APAR data from an existing problem log entry" on page 120
Analyze problem	**ANZPRB**	Y	Save Problem Data	Section 7.4.1, "Saving APAR data from the ANZPRB command display" on page 120
F14	**DSPMSG QSYSOPR**	8	Work with problems	
		30	Work with problem	Section 7.4.2, "Saving APAR data from an existing problem log entry" on page 120
Command line	**SAVAPARDTA**	Enter	Save APAR Data	Section 7.4.3, "Saving APAR data using the SAVAPARDTA command" on page 121

7.4.1 Saving APAR data from the ANZPRB command display

If you use the ANZPRB command for problem isolation, the display shown in Figure 7-17 on page 120 appears at the end of the analysis to allow you to save additional APAR data unless a PTF has been found for your problem.

```
Save Problem Data
                                                     System:   ITSOSYS1
If you have APAR data to be saved, you may want to save this data now.
This data may be requested if you report the problem and a PTF cannot be
found.




Type choice, press Enter.

Save APAR data . . . . . . . .          Y=Yes, N=No








F3=Exit   F12=Cancel
No PTFs found that match symptom for problem 0632743380.
```

Figure 7-17   Save Problem Data display

To save APAR data, follow these steps:

1. Type Y. Press Enter to display the selection list.
2. Proceed to 7.5, "Selecting APAR data to collect" on page 121.

7.4.2 Saving APAR data from an existing problem log entry

To collect APAR data, follow these steps:

1. Enter WRKPRB on a command line. A display appears as shown in Figure 7-1 on page 107.

2. Search for the problem description that matches your problem.

3. Type option 8 next to the problem ID, and press Enter. A display appears as shown in Figure 7-2 on page 108.

4. Select option 30 to (Save APAR data to APAR library). The problem log entry is always saved in the APAR library.

5. The following data is saved if it is available:

   – Any spooled files associated with the entry
   – Any Product Activity Log record associated with the entry
   – Any LIC log associated with the Product Activity Log ID

   > **Note:** All machine detected problems have an associated error log entry. Machine detected software problems also have a LIC log associated with the problem.

6. The `Problem data automatically saved` message appears at the bottom of the display.

7. Bring your cursor down to the message text, and press F1 to see what is saved.

7.4.3 Saving APAR data using the SAVAPARDTA command

To collect APAR data using the SAVAPARDTA command, follow these steps:

1. Type SAVAPARDTA on any command line, and press F4. A display appears like the example shown in Figure 7-18.

```
 Save APAR Data (SAVAPARDTA)

 Type choices, press Enter.

 Problem identifier . . . . . . .                    Character value, *NEW




                                                                    Bottom
 F3=Exit    F4=Prompt    F5=Refresh    F12=Cancel   F13=How to use this display
 F24=More keys
```
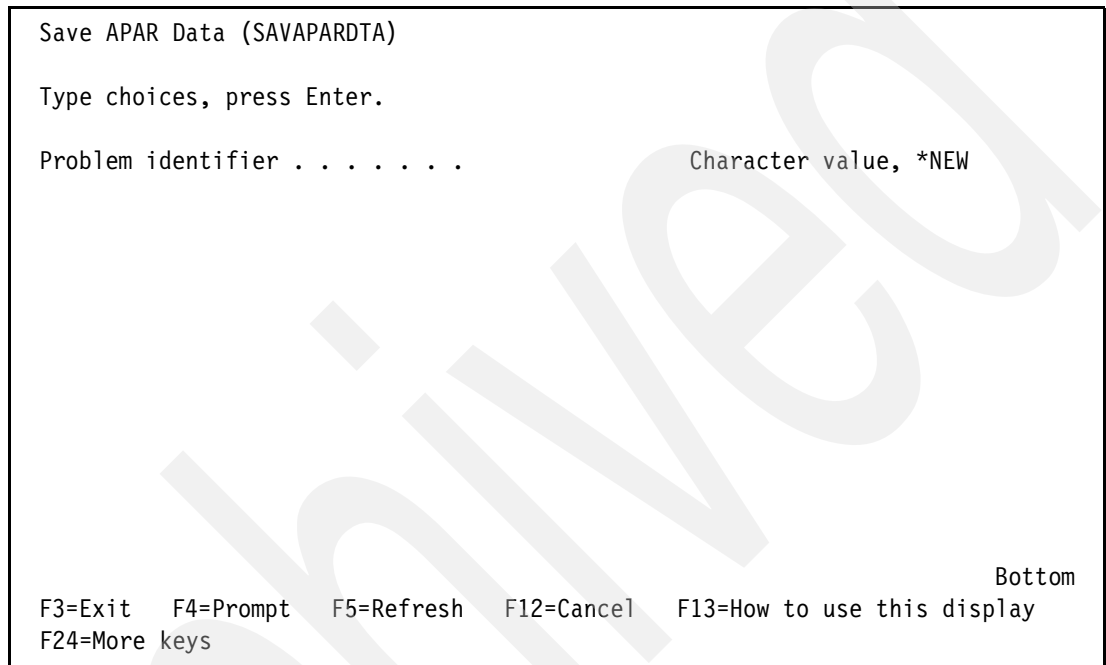
Figure 7-18   Save APAR Data display

2. If there is no entry for the problem in the problem log, type ***NEW** in the Problem identifier prompt, and press Enter. Otherwise, type the number of the problem identifier.

7.5 Selecting APAR data to collect

The Save APAR Data selection list allows you to select one or more data sources to save APAR data. Some of the selections run an i5/OS command. See Appendix A, "Quick reference to data collection commands" on page 505, to find the command that is run. Your service provider helps you determine which data to select. In general, follow these steps:

1. From the Save APAR Data menu (refer to Figure 7-19 on page 122), page down or scroll forward to see the rest of the list.

2. Type 1 (Select) in the Opt column next to the data source you need.

   More than one selection is allowed. Some of the selections display a prompt screen. Other selections collect data without a prompt. Once data for a selection is collected, the prompt appears again, or collection for the next selection starts.

3. Press F12 to exit from the prompt screen once a message appears at the bottom of the display indicating the data collection is complete. Repeat steps 2 and 3 until you have saved all the data you need.

4. If you do not need to collect any other information, press Enter, and proceed with sending
   the service request.

```
Save APAR Data
                                              System:   ITSOSYS1
Problem ID:   0630363383      APAR Library:   QSC0363383

Type options, press Enter.
  1=Select

Opt      APAR Data
         History log
         Program temporary fixes
         System values
         Job information
         System job information
         Active jobs
         Object (library/object)
         Object (path name)
         System object
         Hardware resources
         Software resources
         Spooled file
         Document or folder
                                                         More...
F3=Exit   F9=Command line    F12=Cancel
```

Figure 7-19   Save APAR Data display (Part 1 of 2)

5. Page forward to see the rest of the list.

```
     Save APAR Data
                                                          System:    ITSOSYS1
     Problem ID:   0630363383     APAR Library:    QSC0363383


     Type options, press Enter.
       1=Select

     Opt     APAR Data
             Error log entry by ID
             Error log entries by time range
             VLIC log entry by ID
             VLIC log entries by time range
             Problem log entry by ID
             Problem log entries by time range
             Internal configuration




                                                                     Bottom
     F3=Exit    F9=Command line    F12=Cancel
```

Figure 7-20   Save APAR Data display (Part 2 of 2)

6. Type 1 (Select) in the Opt column next to the data source you need.

    More than one selection is allowed. Some of the selections display a prompt screen, while others collect data without a prompt. Once data for a selection has been collected, the prompt appears again, or collection for the next selection starts.

7. Press F12 to exit from the prompt screen once a message appears at the bottom of the display that indicates the data collection is complete.

7.5.1 More information on the Save APAR Data selections

Use Table 7-1 on page 119 to determine the commands that are run automatically for a selection from the Save APAR Data display. Use the selection list, instead of the command, to save the output in the APAR library.

> **Note:** Some selections show a prompt display to enter specific data. Sometimes the defaults on the prompt screen collect the data you need. Some selections do not display a prompt screen and do not use the command defaults. The table provides this information.

Table 7-2   Automatic selection commands

Selection	Command used	Prompt for	Default	Information collected	Reference
History log	DSPLOG	Time range	The current day	History log for the time range specified	See 6.4, "Saving the history log (QHST)" on page 99.

Selection	Command used	Prompt for	Default	Information collected	Reference
Program temporary fixes	DSPPTF	None	*ALL	All the program temporary fixes installed on the system.	See 23.2.2, "Collecting a list of program temporary fixes (PTFs)" on 286.
System values	WRKSYSVAL	None	*ALL	All the system values	See 2.1, "Print System Information (PRTSYSINF)" on page 16.
Job information	DSPJOB	Job Name	Current job	All job information, job log	See Chapter 5, "Job information, job logs, and spooled files" on page 69.
System job information	DSPJOB	List of system jobs to select	None	All job information, job log	See "Saving system job information" on page 129.
Active jobs	WRKACTJOB	None	*ALL	List of the active jobs in the system, performance and status information	
Object (configuration)	DSPNWID or DSPLIND or DSPCTLD or DSPDEVD and DMPOBJ	Object name, type	None	Display and dump of object	See "Saving a system object" on page 132.
Object (library)	SAVLIB	Object name, type	None	Save of library	See "Saving objects" on page 130.
Object (other types)	SAVOBJ or CRTDUPOBJ or DMPOBJ	Object name, type	None	object	See "Saving objects" on page 130.
System object	DMPSYSOBJ	Object name, type	Current process (JOB)	Object dump information	See "Saving a system object" on page 132.
Hardware resources	DSPHWRSC	None	*CMN, *LWS, *PRC, *STG	Hardware configuration and resource information of the system	
Software resources	DSPSFWRSC	None	None	Software resource information of the system.	
Spooled file	Internal	Spooled file attributes	None	Spooled file	See "Saving a spooled file" on page 133.

Selection	Command used	Prompt for	Default	Information collected	Reference
Document or folder	SAVDLO	Name of document or folder	None	Document or folder	See "Saving documents or folders" on page 135.
Error log entry by ID	PRTERRLOG	Error log ID	None	Error log ID with hex data	See "Saving an error log entry by ID" on page 137.
Error log entries by time range	PRTERRLOG	Time and date range	Current day	Error log entries with hex data	See "Saving error log entries by time range" on page 138.
LIC log entry by ID	PRTINTDTA	VLIC log ID	None	LIC log with dump data	See "Saving a LIC log entry by ID" on page 139.
LIC log entries by time range	PRTINTDTA	Date and time range	Current day	LIC log entries with dump data	See "Saving LIC log entries by time range" on page 141.
Problem log entry by ID	DSPPRB	Problem log ID	None	Problem log entry	See "Saving a problem log entry by ID" on page 142.
Problem log entries by time range	DSPPRB	Date and time range	Current day	Problem log entries	See "Saving problem log entries by time range" on page 144.
Internal configuration	PRTINDTA	None	*INTCFG	VMC link map, VMC alter log resource configuration record (RCR)	See 25.1, "Using PRTINTDTA to collect a specific entry in the LIC log" on page 402, and 25.2, "Using PRTINTDTA to collect LIC log entries for a specific time" on page 402.

Saving the history log (QHST)

This selection saves all messages in the history log within a specific time range. The display shown in Figure 7-21 on page 126 appears.

```
Save History Log
                                                   System:    ITSOSYS1
 Type choices, press Enter.

 Time period for log output:

   Beginning time . . . . . . . .   *AVAIL        Time, *AVAIL
   Beginning date . . . . . . . .   *CURRENT      Date, *CURRENT

   Ending time  . . . . . . . . .   *AVAIL        Time, *AVAIL
   Ending date  . . . . . . . . .   *CURRENT      Date, *CURRENT










 F3=Exit    F9=Command line    F12=Cancel
```

Figure 7-21   Save History Log display (Part 1 of 2)

To save the history log for the current day, press the Enter key. Otherwise, enter the beginning and ending time and date near the time the problem occurred. The time the problem occurred should be within the beginning and ending time range. For example, if the problem occurred

at about 3:00 p.m. on 01 July 2007, the display would appear like the example shown in Figure 7-22.

```
  Save History Log
                                                      System:    ITSOSYS1
  Type choices, press Enter.

  Time period for log output:

    Beginning time . . . . . . . .   14:00:00      Time, *AVAIL
    Beginning date . . . . . . . .   07/01/07      Date, *CURRENT

    Ending time  . . . . . . . . .   16:00:00      Time, *AVAIL
    Ending date  . . . . . . . . .   07/01/07      Date, *CURRENT
```

Figure 7-22   Save History Log display (Part 2 of 2)

The first message that is saved is the first one found after the specified beginning time.

After pressing Enter, the `Problem data automatically` saved message appears at the bottom of the display. Press F12 to continue.

Saving job information

This selection collects job information and the job log for a job. The job can be your current sign-on session, another user's job, or a subsystem or system job. The display shown in Figure 7-23 appears.

```
  Save Job Information
                                                        System:    ITSOSYS1
  Type choices, press Enter.

  Job name . . . . . . . . . . . .   *               Name, *
    User . . . . . . . . . . . . .                   Name
    Number . . . . . . . . . . . .                   000000-999999















  F3=Exit    F9=Command line    F12=Cancel
```

Figure 7-23   Save Job Information display

To collect job information and a job log, perform one of the following tasks:

► To collect job information and the job log for your current job (sign-on session), press the Enter key.

► To collect job information and the job log for another job, enter the job name. If you do not know the name of the job, go to 5.6, "Finding a job name" on page 83, for help in finding the job name.

After pressing Enter, the `Job 999999/aaaaaaaaaa/bbbbbbbbbb log saved` message appears at the bottom of the display. Press F12 to continue.

Saving system job information

This selection collects job information and the job log for a system job. The display shown in Figure 7-24 appears.

```
Save System Job Information
                                                    System:    ITSOSYS1
 Type options, press Enter.
   1=Select

 Opt      System Job     Description
          SCPF           Start Control Program Function
          QALERT         Alert Manager
          QDBSRV         Database Services
          QDCPOBJ        Decompress Object Processor
          QJOBSCD        Job Schedule Manager
          QLUS           Logical Unit Services
          QPFRADJ        Performance Adjust Manager
          QSPLMAINT      Spool Object Maintenance
          QSYSARB        System Arbiter
          QWCBTCLNUP     Work Control Block Table Cleanup




                                                               Bottom
  F3=Exit   F9=Command line   F12=Cancel
```

Figure 7-24   Save System Job Information display

To collect job information and a job log, complete one of the following tasks:

► To collect job information and the job log for one of the system jobs listed, type 1 next to each of the system jobs needed.

► To collect the SCPF job log for the *last* IPL, complete the following tasks:

  a. Press F12 to return to the Save APAR Data display.

  b. Type 1 in the Opt column next to Job information to select it.

  c. Type the following job information:

Job name	**SCPF**	Name, *
User	**QSYS**	Name
Number	**000000**	000000-99999

  The job log is saved with the other data collected.

Saving objects

This selection saves the object specified. The displays shown in Figure 7-25 and Figure 7-26 on page 131 appear.

```
Save Object (Library/Object)
                                                    System:    ITSOSYS1
  Type choices, press Enter.

Object . . . . . . . . . . . . . .          Name
  Library  . . . . . . . . . . .            Name
Object type  . . . . . . . . . .            *type













  F3=Exit    F9=Command line    F12=Cancel
```

Figure 7-25   Save Object (Library/Object) display

```
 Save Object (Path Name)
                                                         System:    ITSOSYS1
 Type choices, press Enter.

 Object . . . . . . . . . . . . .

 F3=Exit    F9=Command line    F12=Cancel
```
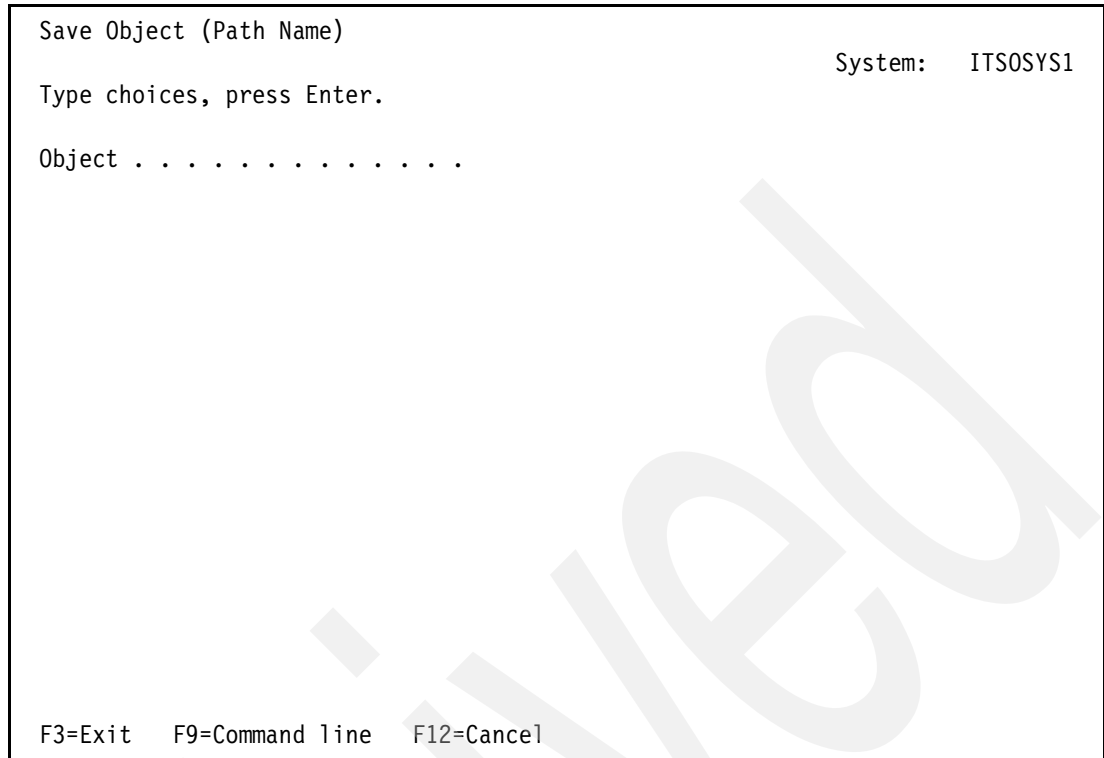
Figure 7-26   Save Object (Path name) display

Follow these steps:

1. Type the name of the object in the Object prompt.

2. Type the library containing the object in the Library prompt.

3. Type the object type in the Object type prompt.

To determine the object type for the object, refer to the iSeries Information Center at:

http://www.ibm.com/eserver/iseries/infocenter

When you reach this site, click **Programming** → **CL** → **CL Concepts** → **Objects** → **External object types.**

The information collected about an object depends on the type of object, for example:

► **Configuration object**

Configuration objects are dumped by the Dump Object (DMPOBJ) command and displayed by the Display Line Description (DSPLIND), Display Network Interface Description (DSPNWID), Display Controller Description (DSPCTLD), or Display Device Description (DSPDEVD) command. The spooled files created by the commands are saved in the APAR library.

► **Library object**

Library objects are saved by the Save Library (SAVLIB) command into a save file in the APAR library.

► **Other object types**

Other object types are saved by the Save Object (SAVOBJ) command into a save file in the APAR library. If the save operation fails, the object is copied by the Create Duplicate

Object (CRTDUPOBJ) command into the APAR library. If this copy operation fails, the object is dumped by the Dump Object (DMPOBJ) command, and the spooled file is created by the command saved in the APAR library.

Saving a system object

The selection to save a System Object allows you to specify the internal system object you want saved by the Dump System Object (DMPSYSOBJ) command. The spooled file created by the DMPSYSOBJ command is saved in the APAR library (Figure 7-27).

```
 Save System Object
                                                      System:    ITSOSYS1
  Type choices, press Enter.

 Object . . . . . . . . . . . . .    *PCS
                                                 Name, *PCS, *MCHCTX, *ALL
 Context or Library . . . . . . .    *NONE
                                                 Name, *NONE, *MCHCTX
 Internal object type . . . . . .    *ALL        *ALL, 01, 02, 03, 04, 07,
                                                   08, 09, 0A, 0B, 0C, 0D,
                                                   0E, 0F, 10, 11, 12, 13,
                                                   14, 15, 18, 19, 1A, 1B, 1C
 Internal object subtype  . . . .    *ALL        *ALL, Hexadecimal value




 F3=Exit    F9=Command line    F12=Cancel
```

Figure 7-27   Save System Object display

Choose one of the following tasks to dump an object:

► To dump the process control space of your job, press the Enter key.

► To dump the machine context, type *MCHCTX in the Object prompt, and press the Enter key.

► To dump the QTEMP library for your job, type QTEMP for the Object prompt, 04 for the Internal object type, and 01 for the Internal object subtype. Then press the Enter key.

► To dump any other object, perform these tasks:

   a. Enter the object in the Object prompt.

      Type the object name, the generic name of a group of objects, or *ALL to dump all the objects in a context or library.

   b. Type the context, library, or *MCHCTX in the Context or Library prompt.

   c. Type the internal object type in the Internal object type prompt.

      Type *ALL to save all internal object types in the context, and do not enter an internal object subtype.

To determine the internal object type for an object, refer to the iSeries Information Center at:

http://www.ibm.com/eserver/iseries/infocenter

When you reach this site, click **Programming** → **APIs** → **API Concepts** → **API parameters** → **Internal object types.**

> **Tip:** In the Internal object types topic in the iSeries Information Center, the Hexadecimal Format column in the table represents the type and subtype. The first two characters are the type and the last two characters are the subtype.

d. Type the internal object subtype in the Internal object subtype prompt.

Type *ALL to save all internal object subtypes in the context.

To determine the object subtype for the object, refer to the iSeries Information Center at:

http://www.ibm.com/eserver/iseries/infocenter

When you reach this site, click **Programming** → **APIs** → **API Concepts** → **API parameters** → **Internal object types.**

Saving a spooled file

This selection finds a spooled file and saves it in the APAR library associated with your problem ID. The display shown in Figure 7-28 appears.

```
  Save Spooled File
                                                    System:    ITSOSYS1
  Type choices, press Enter.

  Spooled file . . . . . . . . . .                  Name
  Job name . . . . . . . . . . .     *              Name, *
    User . . . . . . . . . . . .                    Name
    Number . . . . . . . . . . .                    000000-999999
  Spooled file number  . . . . . .   *ONLY          1-999999, *ONLY, *LAST, *ANY
  Job system name  . . . . . . . .   *ONLY          Name, *ONLY, *CURRENT, *ANY
  Spooled file created:
    Creation date  . . . . . . . .   *ONLY          Date, *ONLY, *LAST
    Creation time  . . . . . . . .                  Time, *ONLY, *LAST
  Text . . . . . . . . . . . . . .






  F3=Exit    F9=Command line    F12=Cancel
```

Figure 7-28   Save Spooled File display

To find these spooled file attributes, complete the following steps:

1. Refer to 5.3, "Setting the message logging level" on page 71, and 5.2, "Message logging parameters" on page 70, to find the spooled files for a job.

> **Note:** Press the F9 key for a command line so you can enter commands from this display.

For example, if you entered the WRKSPLF command, the display shown in Figure 7-29 would appear.

```
Work with All Spooled Files

 Type options, press Enter.
   1=Send    2=Change    3=Hold    4=Delete    5=Display    6=Release    7=Messages
   8=Attributes          9=Work with printing status


                              Device or                      Total    Cur
 Opt   File       User       Queue       User Data    Sts    Pages    Page  Copy
       QPJOBLOG   ACA1       QEZJOBLOG   QPADEV0003   RDY      2             1
       QPEZBCKUP  ASA1       QPRINT      DSPBCKUPL    RDY      1             1
       QPEZBCKUP  ASA1       QPRINT      DSPBCKUPL    RDY      1             1
       QSYSPRT    AKA1       QPRINT      DSPSYSVAL    RDY      3             1
       QPDSPNET   MARK       QPRINT      DSPNETA      RDY      1             1
       QPDCCFGL   MARK       QPRINT      DSPCFGL      RDY      1             1
       QSYSPRT    MARK       QPRINT      DSPEDTD      RDY      1             1
       QSYSPRT    MARK       QPRINT      DSPEDTD      RDY      1             1
       QSYSPRT    MARK       QPRINT      DSPEDTD      RDY      1             1
                                                                       More...
 Parameters for options 1, 2, 3 or command
 ===>
 F3=Exit    F10=View 4    F11=View 2    F12=Cancel    F22=Printers    F24=More keys
```

Figure 7-29   Work with All Spooled Files display

2. From the Work with Output Queue or Work with All Spooled Files display, type option 8 next to the spooled file to display the spooled file attributes.

3. Press the Enter key. For example, the display shown in Figure 7-30 on page 135 appears.

```
Work with Spooled File Attributes

Job  . . . . . . . . . :    QPADEV0003       File . . . . . . . . :    QPJOBLOG
  User . . . . . . . :       ACA1             Number . . . . . . :      000001
  Number . . . . . . :      004013           Creation date  . . . :    10/31/07
Job system name  . . :    A105GG8M          Creation time  . . . :    14:00:56


Status . . . . . . . . . . . . . . . . . :    READY
Output queue . . . . . . . . . . . . . . :    QEZJOBLOG
  Library  . . . . . . . . . . . . . . . :      QUSRSYS
ASP file resides on  . . . . . . . . . :    1
Form type  . . . . . . . . . . . . . . :    *STD
Output priority  . . . . . . . . . . . :    5
Copies left to produce . . . . . . . . :    1
Total copies . . . . . . . . . . . . . :    1
Maximum records  . . . . . . . . . . . :    *NOMAX
Number of separators . . . . . . . . . :    0
File becomes available . . . . . . . . :    *FILEEND
Hold file before written . . . . . . . :    *NO
                                                                          More...

Press Enter to continue.


F3=Exit   F5=Refresh   F12=Cancel   F13=Change
```

Figure 7-30   Work with Spooled File Attributes display

4. Record the job, user, number, file, and file number from the header of the Work with Spooled File Attributes display.

5. Type these values on the Save Spooled File display.

6. Enter text to describe what is in the spooled file.

Saving documents or folders

This selection saves documents and folders in a save file created for you. The display shown in Figure 7-31 on page 136 appears.

```
 Save Document or Folder
                                                         System:    ITSOSYS1
  Type choices, press Enter.

  Document or Folder . . . . . . .              Name, *ALL
  Folder . . . . . . . . . . . .
                                                Name

















  F3=Exit    F9=Command line    F12=Cancel
```
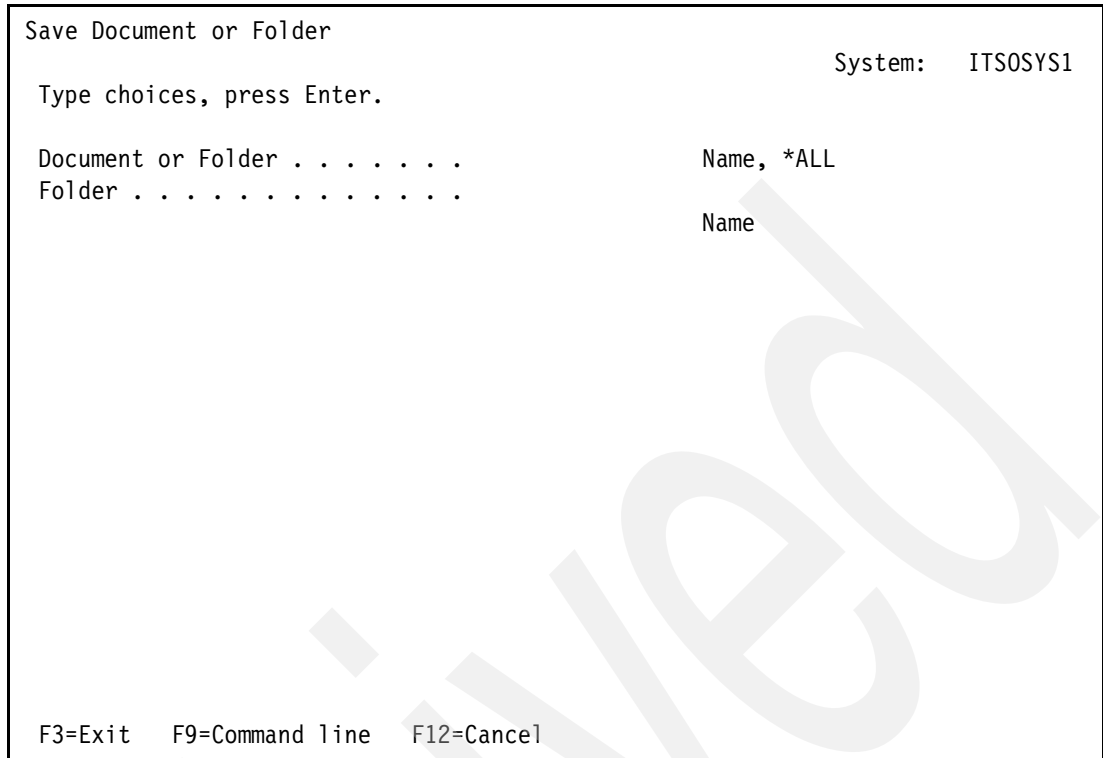
Figure 7-31   Save Document or Folder display

To save a document, follow these steps:

1. Enter the name of the document library object in the Document or Folder prompt.

2. Enter the name of the folder that contains the document in the Folder prompt.

3. Press the Enter key.

To save a folder, complete these steps:

1. Enter *ALL in the Document or Folder prompt.

2. Enter the user-assigned name of the folder in which the documents to be saved are located in the Folder prompt.

   The folder object and all successively nested documents and subfolders are saved.

3. Press the Enter key.

> **Note:** Individual objects in use when this selection is made cannot be saved. If an object lock occurs, determine which job is locking the object by using the WRKOBJLCK command. If appropriate, end the locking job to free the lock.

Saving an error log entry by ID

This selection saves a specific error log with the hex data. The display shown in Figure 7-32 appears.

```
Save Error Log Entry by ID
                                                          System:    ITSOSYS1
 Type choices, press Enter.

 Error log identifier . . . . . .             Hexadecimal value











  F3=Exit    F9=Command line    F12=Cancel
```

Figure 7-32   Save Error Log Entry by ID display

Type the error log identifier in the Error log identifier prompt.

Note: The error log ID is usually found in a message related to the problem. See Figure 4-22 on page 61 for an example of how to find an error log ID in a message.

Saving error log entries by time range

This selection saves error logs with hex data within the specific time range. The display shown in Figure 7-33 appears.

```
Save Error Log Entries by Time Range
                                                    System:    ITSOSYS1
 Type choices, press Enter.

 Time period for log output:

   Beginning time . . . . . . . .    *AVAIL        Time, *AVAIL
   Beginning date . . . . . . . .    *CURRENT      Date, *CURRENT

   Ending time  . . . . . . . . .    *AVAIL        Time, *AVAIL
   Ending date  . . . . . . . . .    *CURRENT      Date, *CURRENT










 F3=Exit    F9=Command line    F12=Cancel
```

Figure 7-33   Save Error Log Entries by Time Range display

To save all the error logs for the current day, press the Enter key. Otherwise, enter the beginning and ending time and date near the time at which the problem occurred. The time at which the problem occurred should be within the beginning and ending time range. For example, if the problem occurred at about 3:00 p.m. on 01 July 2007, the display appears as shown in Figure 7-34 on page 139.

```
 Save Error Log Entries by Time Range
                                                      System:    ITSOSYS1
 Type choices, press Enter.

 Time period for log output:

   Beginning time . . . . . . . .   14:00:00      Time, *AVAIL
   Beginning date . . . . . . . .   07/01/07      Date, *CURRENT

   Ending time  . . . . . . . . .   16:00:00      Time, *AVAIL
   Ending date  . . . . . . . . .   07/01/07      Date, *CURRENT












 F3=Exit    F9=Command line    F12=Cancel
```

Figure 7-34   Save Error Log Entries by Time Range display

The first error log entry that is saved is the first one found after the specified beginning time.

Saving a LIC log entry by ID

This selection saves a specific LIC log with the associated dump data. The display shown in
Figure 7-35 on page 140 appears.

```
Save VLIC Log Entry by ID
                                                        System:    ITSOSYS1
 Type choices, press Enter.

 VLIC log identifier  . . . . . .              Hexadecimal value

















 F3=Exit    F9=Command line    F12=Cancel
```

Figure 7-35   Save LIC Log Entry by ID display

Type the LIC log identifier in the VLIC log identifier field.

Note: The LIC log ID is usually found in a message related to the problem. See Figure 4-21 on page 61, or 4.5, "Messages in the system operator message queue (QSYSOPR)" on page 56, or 4.6, "Checking the contents of the additional message information" on page 58, for an example of how to find a dump identifier in a message.

Saving LIC log entries by time range

This selection saves LIC logs with the associated dump data within the specific time range. The display shown in Figure 7-36 appears.

```
  Save VLIC Log Entries by Time Range
                                                        System:    ITSOSYS1
   Type choices, press Enter.

   Time period for log output:

     Beginning time . . . . . . . .   *AVAIL        Time, *AVAIL
     Beginning date . . . . . . . .   *CURRENT      Date, *CURRENT

     Ending time  . . . . . . . . .   *AVAIL        Time, *AVAIL
     Ending date  . . . . . . . . .   *CURRENT      Date, *CURRENT








   F3=Exit    F9=Command line    F12=Cancel
```

Figure 7-36   Save LIC Log Entries by Time Range display

To save all the LIC logs for the current day, press Enter. Otherwise, enter the beginning and ending time and date near the time the problem occurred. The time the problem occurred should be within the beginning and ending time range. For example, if the problem occurred at about 3:00 p.m. on 01 July 2007, the display appears as shown in Figure 7-37 on page 142.

```
Save VLIC Log Entries by Time Range
                                                     System:    ITSOSYS1
 Type choices, press Enter.

 Time period for log output:

   Beginning time . . . . . . . .   14:00:00       Time, *AVAIL
   Beginning date . . . . . . . .   07/01/07       Date, *CURRENT

   Ending time  . . . . . . . . .   16:00:00       Time, *AVAIL
   Ending date  . . . . . . . . .   07/01/07       Date, *CURRENT














 F3=Exit    F9=Command line    F12=Cancel
```

Figure 7-37   Save LIC Log Entries by Time Range display

The first LIC log entry saved is the first one found after the specified beginning time.

Saving a problem log entry by ID

This selection saves a specific problem log entry.

Note: The problem log entry specified on the Save APAR Data selection display is automatically saved. The display shown in Figure 7-38 appears.

```
Save Problem Log Entry by ID
                                                         System:    ITSOSYS1
 Type choices, press Enter.

 Problem identifier . . . . . . .                  Character value
 Origin:
   Network identifier . . . . . .   *NETATR        *NETATR
   Control point name . . . . . .   *NETATR        *NETATR

















 F3=Exit    F9=Command line    F12=Cancel
```
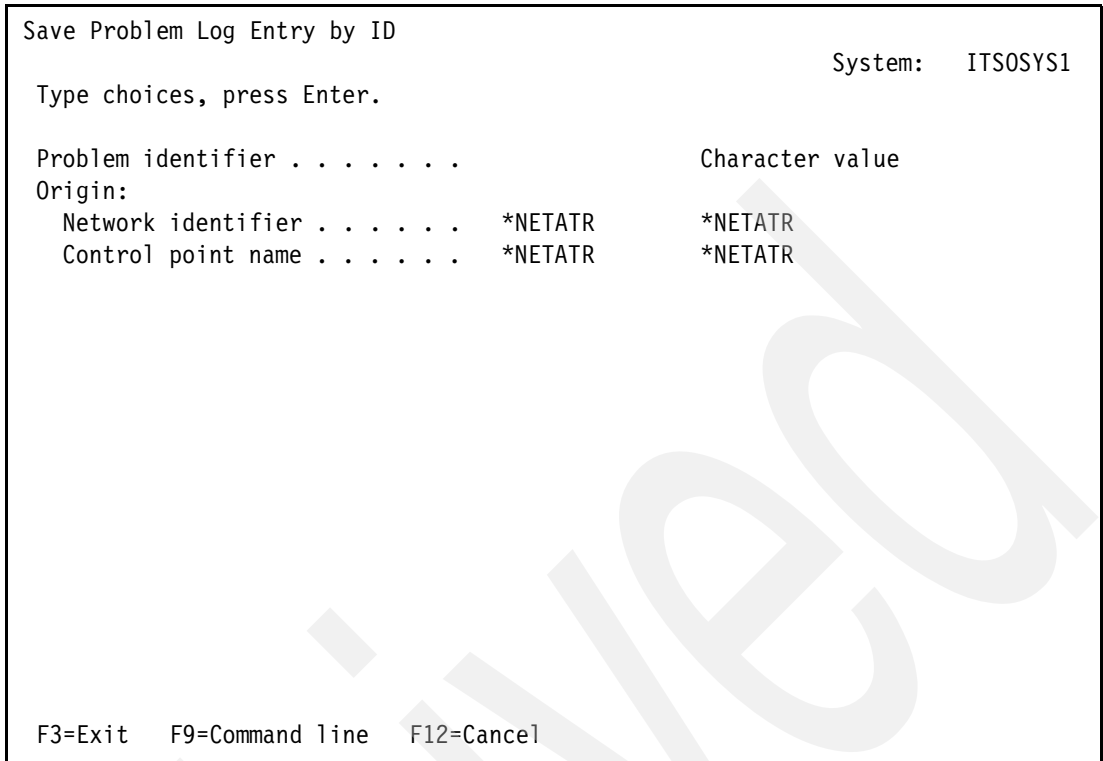
Figure 7-38   Save Problem Log Entry by ID display

To save a problem log entry by ID, follow these steps:

1. Type the problem identifier of the problem log entry to be saved in the Problem identifier prompt.

2. Type the name of the system on which the problem originated in the Origin prompt.

   – If the problem originated on this system, press Enter.

   or

   – Enter the network ID of the system or *NETATR if the system has the same network ID as the one defined for this system.

   – Enter the control point name of the system or *NETATR if the system has the same control point name as the one defined for this system.

Saving problem log entries by time range

This selection saves problem log entries within the specific time range. The display shown in Figure 7-39 appears.

```
  Save Problem Log Entries by Time Range
                                                          System:    ITSOSYS1
  Type choices, press Enter.

  Time period for problem output:

    Beginning time . . . . . . . .    *AVAIL        Time, *AVAIL
    Beginning date . . . . . . . .    *CURRENT      Date, *CURRENT

    Ending time  . . . . . . . . .    *AVAIL        Time, *AVAIL
    Ending date  . . . . . . . . .    *CURRENT      Date, *CURRENT









  F3=Exit    F9=Command line    F12=Cancel
```

Figure 7-39   Save Problem Log Entries by Time Range display

To save all the problem log entries for the current day, press Enter. Otherwise, enter the beginning and ending time and date for the problem log entries needed. For example, to collect problem log entries that were created between 2:00 p.m. and 4:00 p.m. on 01 July 2007, the display would appear as shown in Figure 7-40 on page 145.

```
Save Problem Log Entries by Time Range
                                                       System:    ITSOSYS1
 Type choices, press Enter.

 Time period for problem output:

   Beginning time . . . . . . . .   14:00:00      Time, *AVAIL
   Beginning date . . . . . . . .   07/01/07      Date, *CURRENT

   Ending time  . . . . . . . . .   16:00:00      Time, *AVAIL
   Ending date  . . . . . . . . .   07/01/07      Date, *CURRENT












 F3=Exit    F9=Command line    F12=Cancel
```

Figure 7-40 Save Problem Log Entries by Time Range display

The first problem log entry saved is the first one found after the specified beginning time.

7.5.2 Viewing the APAR data that is collected

Spooled files are automatically copied to user spaces in the APAR library. These user spaces are saved when you save the APAR library.

To view the collected spooled files and verify you have collected the correct data, enter the following command from any command line:

WRKOUTQ OUTQ(QSCxxxxxxx/QSCAPAROQ)

QSCxxxxxxx is the name of the APAR library.

7.5.3 Finding the APAR library

The APAR data is saved in a uniquely named APAR library. The library is named by replacing the first three numbers of the problem ID with "QSC". For example, if the problem ID is 9926202722, the APAR library is QSC6202722.

To find the problem entry created and the APAR library, complete these steps:

1. Enter the WRKPRB command. A display appears as shown in Figure 7-1 on page 107.

2. Search for the problem description that matches your problem. You can also locate the problem by date and time of the occurrence.

3. Type 5 next to the problem ID to display the problem. The display shown in Figure 7-41 on page 146 appears.

```
Display Problem Details
                                                        System:   ITSOSYS1
 Problem ID . . . . . . . . :    0630363383
 Current status . . . . . :    READY
 Problem  . . . . . . . . . :    *Attention*  Contact your hardware service
provider.


 Problem message ID  . . . . . . . :    CPPEA13
 Problem type  . . . . . . . . . . :    Machine detected
 Problem category  . . . . . . . . :    *CRITICAL
 Date and time detected  . . . . . :    10/30/07  18:27:41
 System reference code . . . . . . :    SRC27788009
 Reporting device type . . . . . . :    2778
   Model . . . . . . . . . . . . . :      001
   Feature . . . . . . . . . . . . :
   Serial number . . . . . . . . . :      10-1297005
   EC level  . . . . . . . . . . . :
                                                                 More...
 Press Enter to continue.


 F3=Exit    F5=Display possible causes    F6=Display problem history
 F11=Display APAR library    F12=Cancel
```

Figure 7-41   Display Problem Details display

4. Press F11 to display the APAR library. A display appears like the example shown in Figure 7-42.

```
Display Library

Library  . . . . . . :    QSC0363383      Number of objects  . :    47
Type . . . . . . . . :    PROD            Library ASP number . :    1
Create authority . . :    *SYSVAL         Library ASP device . :    *SYSBAS
                                          Library ASP group  . :    *SYSBAS


Type options, press Enter.
  5=Display full attributes    8=Display service attributes


Opt   Object      Type      Attribute            Size   Text
      QSCAPAROQ   *OUTQ                           28672
      QSCAPARMST  *USRSPC                          8192
      QSCCMN015A  *USRSPC                          8192  DSPHDWRSC TYPE(*CMN)
      QSCCMN015D  *USRSPC                         12288  DSPHDWRSC TYPE(*CMN)
      QSCERI000A  *USRSPC                          8192  PRTERRLOG TYPE(*ERRLO
      QSCERI000D  *USRSPC                         12288  PRTERRLOG TYPE(*ERRLO
      QSCHSL001A  *USRSPC                          8192  DSPLOG LOG(QHST) PERI
      QSCHSL001D  *USRSPC                          8192  DSPLOG LOG(QHST) PERI
      QSCHSL002A  *USRSPC                          8192  DSPLOG LOG(QHST) PERI
      QSCHSL002D  *USRSPC                          8192  DSPLOG LOG(QHST) PERI
                                                                 More...
 F3=Exit    F12=Cancel    F17=Top    F18=Bottom
```

Figure 7-42   Display Library display

5. These are the objects contained in the library associated with this problem log entry. Spooled files are saved in objects that are type *USRSPC. Other objects are saved as a copy or duplicate of the object that was collected.

   The contents of the user space cannot be displayed until the data is restored by a service provider. See 7.8, "Restoring APAR data using the RSTAPARDTA command" on page 151.

7.5.4 Viewing the list of data after it is saved

Once the save APAR data function is complete, all the data is saved in an APAR library. The library contains objects and user spaces for spooled files. To view the list of saved data, follow these steps:

1. If you are at the Display Problem Details display, press F11 to display the APAR library. Otherwise, go to 7.5.3, "Finding the APAR library" on page 145. The display shown in Figure 7-43 appears.

```
  Display Library


  Library  . . . . . . :     QSC0363383      Number of objects  . :    47
  Type . . . . . . . . :     PROD            Library ASP number . :    1
  Create authority . . :     *SYSVAL         Library ASP device . :    *SYSBAS
                                             Library ASP group  . :    *SYSBAS


  Type options, press Enter.
    5=Display full attributes   8=Display service attributes


  Opt   Object      Type       Attribute            Size   Text
        QSCAPAROQ   *OUTQ                           28672
        QSCAPARMST  *USRSPC                          8192
        QSCCMN015A  *USRSPC                          8192   DSPHDWRSC TYPE(*CMN)
        QSCCMN015D  *USRSPC                         12288   DSPHDWRSC TYPE(*CMN)
        QSCERIO00A  *USRSPC                          8192   PRTERRLOG TYPE(*ERRLO
        QSCERIO00D  *USRSPC                         12288   PRTERRLOG TYPE(*ERRLO
        QSCHSL001A  *USRSPC                          8192   DSPLOG LOG(QHST) PERI
        QSCHSL001D  *USRSPC                          8192   DSPLOG LOG(QHST) PERI
        QSCHSL002A  *USRSPC                          8192   DSPLOG LOG(QHST) PERI
        QSCHSL002D  *USRSPC                          8192   DSPLOG LOG(QHST) PERI
                                                                        More...
  F3=Exit   F12=Cancel   F17=Top    F18=Bottom
```

Figure 7-43   Display Library display

These are the objects contained in the library associated with this problem log entry. Spooled files are saved in objects that are type *USRSPC. Other objects are saved as a copy or duplicate of the object that was collected. The contents of the user space cannot be displayed until the data is restored by a service provider. See 7.8, "Restoring APAR data using the RSTAPARDTA command" on page 151.

2. To display the spooled files, go to 7.5.2, "Viewing the APAR data that is collected" on page 145.

7.6 Using other APAR data options in the problem log

To work with other APAR data options from a problem log entry, go to 7.4.2, "Saving APAR data from an existing problem log entry" on page 120, if you are not at the Work with Problem display. Then continue here. For example, the display shown in Figure 7-44 appears. Use the Page Down key to view the display shown in Figure 7-45 on page 149.

```
 Work with Problem
                                                          System:    ITSOSYS1
 Problem ID . . . . . . . :    0629043592
 Current status . . . . . :    READY
 Problem  . . . . . . . . :    Software problem data for QRWDISCO has been
logged
. Refer to help text for addit


 Select one of the following:.

      1. Analyze problem
      2. Report problem

      4. Verify problem corrected

     20. Close problem

     30. Save APAR data to APAR library
                                                                  More...
 Selection


 F3=Exit   F12=Cancel
```

Figure 7-44   Work with Problem menu (Part 1 of 2)

```
Work with Problem
                                                        System:   ITSOSYS1
 Problem ID . . . . . . . . :   0629043592
 Current status . . . . . :   READY
 Problem  . . . . . . . . . :   Software problem data for QRWDISCO has been
logged
. Refer to help text for addit


 Select one of the following:.

    31. Display APAR library
    32. Save APAR library
    33. Delete APAR data




                                                               Bottom
 Selection


 F3=Exit   F12=Cancel
```

Figure 7-45   Work with Problem menu (Part 2 of 2)

When you work with a problem log entry on the Work with Problem display, you can choose one of the following options to work with the APAR data:

► **Save APAR data to APAR library**

This option invokes the Save APAR Data (SAVAPARDTA) command. See 7.5, "Selecting APAR data to collect" on page 121.

This option appears if:

– The user is authorized to the SAVAPARDTA command.
– This is not a PTF order.
– The problem originated on this system.
– The problem was not created by the RSTAPARDTA command.

No other options for APAR data are displayed if no APAR data has been collected for the problem.

► **Display APAR library**

This option invokes the Display Library (DSPLIB) command to display a list of all objects saved in the APAR library.

This option appears if:

– APAR data has been collected.
– There is an APAR library associated with the problem.

► **Save APAR library**

This option invokes the Save Library (SAVLIB) command to save APAR data to offline media, or a save file.

This option appears if:

- The user is authorized to the SAVLIB command.
- APAR data has been collected.
- There is an APAR library associated with the problem.

► **Delete APAR library**

This option invokes the Delete APAR Data (DLTAPARDTA) command to clear the APAR output queue, delete objects in the library, and then delete the APAR library associated with this problem.

This option appears if:

- The user is authorized to the DLTAPARDTA command.
- APAR data has been collected.
- There is an APAR library associated with the problem.

Refer to 7.5, "Selecting APAR data to collect" on page 121, 7.5.4, "Viewing the list of data after it is saved" on page 147, and the following section for more information.

7.7 Deleting APAR data using the DLTAPARDTA command

To delete APAR data from the problem log, go to 7.6, "Using other APAR data options in the problem log" on page 148. Otherwise, enter the DLTAPARDTA command on a command line, and press F4. The display shown in Figure 7-46 appears.

```
   Delete APAR Data (DLTAPARDTA)

  Type choices, press Enter.

  Problem identifier . . . . . . .                    Character value

















   Bottom
   F3=Exit   F4=Prompt   F5=Refresh   F10=Additional parameters   F12=Cancel
   F13=How to use this display        F24=More keys
```
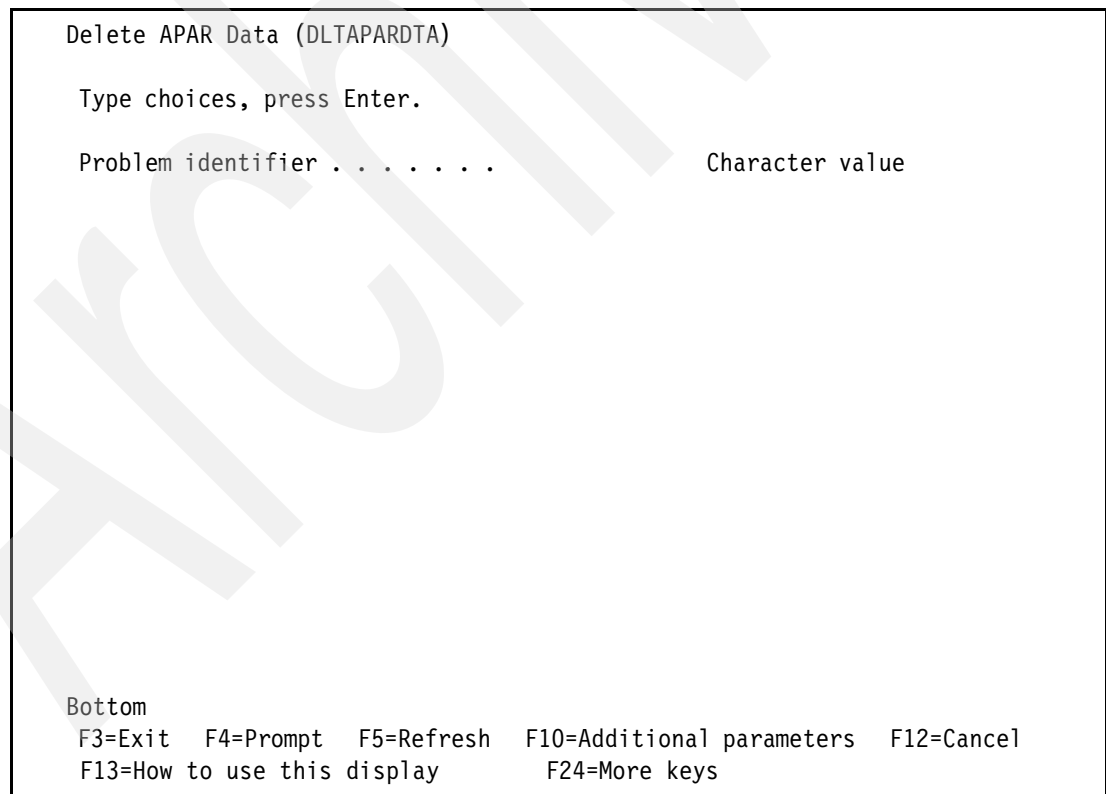
Figure 7-46   Delete APAR Data display (Part 1 of 2)

If the problem originated on this system, enter the problem ID in the Problem identifier prompt, and press the Enter key. Otherwise, press F10 for Additional Parameters, and enter

the network identifier and control point name for the system where the problem originated.
The display shown in Figure 7-47 appears.

```
 Delete APAR Data (DLTAPARDTA)

 Type choices, press Enter.

 Problem identifier . . . . . . .                    Character value

                          Additional Parameters

 Origin:
   Network identifier . . . . . .   *NETATR      Name, *NETATR
   Control point name . . . . . .   *NETATR      Name, *NETATR




                                                                   Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```
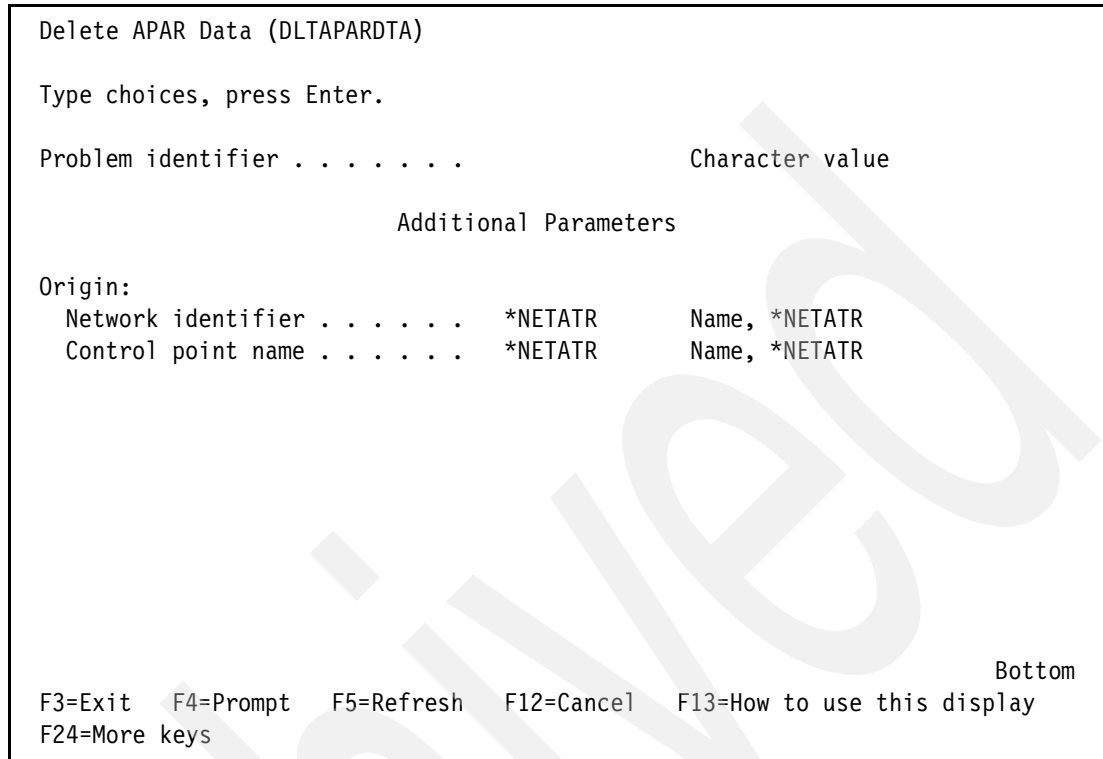
Figure 7-47   Delete APAR Data display (Part 2 of 2)

To find the origin for the problem, follow these steps:

1. Enter the WRKPRB command.

2. Find the problem ID.

3. Type 5 next to the problem ID to display details.

    The origin is at the top of the Display Problem Details display that appears.

> **Note:** If the origin of the problem is, for example, IBM.ITSOSYS1, the network identifier
> is *IBM* and the control point name is *ITSOSYS1*.

When you delete APAR data, you clear the spooled files from the QSCAPAROQ in the APAR
library, delete the QSCAPAROQ output queue, and then delete the APAR library. The problem
log entry history shows that the APAR data was deleted and the reference to the APAR library
is removed.

7.8 Restoring APAR data using the RSTAPARDTA command

> **Note:** The RSTAPARDTA command is available with the System Manager for iSeries
> product only (program number 5722-SM1).

The RSTAPARDTA command provides a way to access APAR data once the APAR data is restored onto the system with the Restore Library (RSTLIB) command.

To restore APAR data, perform these steps:

1. Use the RSTLIB command to restore the APAR library onto the service provider's system.

2. Wait for the message indicating the restore is complete.

3. Type RSTAPARDTA on a command line, and press F4.

4. Type the library that you entered on the RSTLIB command in the Restore to library prompt.

5. Wait for the message indicating the restore is complete.

This ends the procedure to restore the APAR data using the RSTAPARDTA command.

The RSTAPARDTA command creates a problem log entry with the same ID as the problem log entry saved.

All spooled files saved using the SAVAPARDTA command are spooled onto the QSCAPAROQ output queue in the restored library. All objects saved as APAR data are in the restored library.

8

Power problems

This chapter discusses the detection and handling of power problems. Power problems can be divided into two areas: critical and redundant. Total power loss of the entire system or a frame (tower) is a *critical loss*. An internal power supply failure is regarded as a *redundant loss*. Most System i models today have more redundancy built into the hardware using redundant power supplies, with uninterruptible power supplies provided externally.

8.1 Detecting power problems

System i servers have an internal and external System Power Control Network (SPCN). The System i server monitors the power connections and reports back any detected failures to the system operator's message queue or posts a system reference code (SRC) on the front control panel of the system unit or the system expansion unit.

When an uninterruptible power supply (UPS) is installed, a signal cable from the UPS to the System i server allows the server to monitor the power signal interface and provide messages in the history log (QHST).

8.1.1 Messages

The system operators message queue (QSYSOPR) receives messages, some of which allow problem analysis procedures to run against them. Messages with an asterisk (*) at the start of the message allow problem analysis. The operator executes problem analysis by selecting F14 with the cursor aligned within the text of the message on the screen.

When you press the F1 key, a screen appears like the example shown in Figure 8-1.

```
                    Display Formatted Message Text
                                                      System:    ITSOSYS1
Message ID . . . . . . . . . :    CPPA139
Message file . . . . . . . . :    QCPFMSG
  Library  . . . . . . . . . :      QSYS


Message . . . . :   Regulator fault
Cause . . . . . :    A regulator has detected a fault. Fault tolerance may
  allow continued system operation. The failing unit is located in frame 2
  and is connected to SPCN port 3  . The Unit Reference Code for this problem
  is 10006718 and the Error Log ID is 9920147250.
Recovery  . . . :    Press F14 to run Problem Analysis.




                                                                    Bottom
Press Enter to continue.
F3=Exit    F11=Display unformatted message text    F12=Cancel
```

Figure 8-1   Display Formatted Message Text

8.1.2 SRC

System reference codes (SRC) are posted on the front panel of the system unit or system expansion unit. They are also captured in the Product Activity Log. The digits of the SRC indicate the source of the error, that is:

► SRC codes of 0000 XXXX include SPCN and non-SPCN control panel reference codes.
► SRC codes of 1XXX XXXX are System Power Control Network (SPCN) reference codes.

8.2 Problem determination

To perform problem determination on power failures, refer to the chapter on handling and reporting system problems in *AS/400 Basic Operations, Administration and Problem Handling*, SC41-5206.

You can also refer to the power loss recovery chapter in *Backup and Recovery*, SC41-5304.

> **Note:** Know where the power source is for the system unit and system expansion units. For example, know where the power distribution supply box or the main power outlet in the wall is for the system and expansion units.

8.3 Uninterruptible power supplies

Use an Uninterruptible Power Supply (UPS) to provide an alternative power source in the event of utility power loss to a system. The UPS has to be sized correctly for the system configuration to allow a controlled power down.

If the UPS is not sized correctly, for example, it is too small to keep the system powered for a sufficient length of time, the system and jobs end abnormally. Abnormal terminations increase the chances for object damage. The subsequent IPL is an abnormal IPL, which is longer than a normal IPL.

> **Note:** The ability to control the power down of the system prevents probable loss of access paths or files open for updates and transactions in process.

8.3.1 Planning and setup

Planning information for UPS is contained in *AS/400 Physical Planning Reference*, SA41-5109, and also in the UPS manufacturer's documentation. Some of the UPS manufacturer Web sites are:

- ► http://www.oem.exide.com/ibm-ups/
- ► http://www.bestpower.com
- ► http://www.apcc.com/

8.3.2 Messages

When utility power is lost and the UPS is providing AC power, the System i server logs messages in the QHST message queue. Likewise, when utility power is restored, it logs messages again.

Table 8-1 lists the messages logged to QHST when utility power alerts.

Table 8-1   UPS-related messages in the history log

Message ID	Message text
CPF1816	System utility power failed at &1
CPF1817	System power restored at &1
CPF1819	System ending. Power failure message not monitored

Message ID	Message text
CPI0961	Uninterruptible power supply (UPS) no longer attached
CPI0962	Uninterruptible power supply (UPS) is now attached
CPI0963	System on auxiliary power
CPI0964	Weak battery condition exists
CPI0965	Failure of battery backup feature in system unit
CPI0966	Failure of battery backup feature in expansion unit
CPI0973	Weak battery condition no longer exists
CPI0974	UPS has been bypassed
CPI0975	UPS no longer bypassed
CPI0976	Notification of message &1; failed
CPI0981	Automatic IPL disabled
CPI0994	System power is restored

Send UPS messages to a separate message queue by changing the system value UPS message queue (QUPSMSGQ) to a message queue of your choice. By default, all UPS messages are sent to message queue QSYSOPR in library QSYS.

Additional information about the messages in Table 8-1 on page 155 is available in *Backup and Recovery*, SC41-5304.

8.3.3 Problem determination

Each UPS has its unique set of problem determinations, as well as maintenance requirements. Contact your service provider or refer to UPS manufacturer documentation for problem determination information and assistance.

8.3.4 Availability functions

Other functions to consider for system availability when standby power is accessible include:

► System Managed Access Path Protection (SMAPP)
► Journaling files and access paths
► Commitment control
► System i models with Continuous Power Main Storage (CPM)

Refer to *Backup and Recovery*, SC41-5304, and *The System Administrator's Companion to AS/400 Backup and Recovery*, SG24-2161, for further information.

8.4 Additional information

For more information about power and uninterruptible power supplies, refer to the following manuals:

► *Backup and Recovery*, SC41-5304
► *AS/400 Physical Planning Reference*, SA41-5109
► *AS/400 Basic System Operation, Administration, and Problem Handling*, SC41-5206

► UPS manufacturer documentation, which is available on the Web at these sites:

  – `http://www.oem.exide.com/ibm-ups/`
  – `http://www.bestpower.com/as400/`
  – `http://www.apcc.com/`

Part 2

Service provider and advanced service aids

Behind the scenes of the support role of the System i system management team is the service provider. When the i5/OS system operator completes the initial problem resolution phases, he or she works with the account service provider. More advanced tools for more skilled technicians are described in this part.

Part 2 of this document describes the tools intended primarily for use in advanced problem determination. These include tools used by the system operator for more advanced problems and tools used by the specialist representing the account.

The topics covered in this part include:

► Initial Program Load
► Main Storage Dump
► Job traces
► Database problem determination tools
► Communications problem determination
► Watches
► Java™
► HTTP
► Dumping a job
► Dumping an object
► Collecting an IOP dump

- ► Tracing and collecting information on the Licensed Internal Code (LIC)
- ► Using SST and DST
- ► Collecting the Problem Activity Log (PAL)
- ► Information on the service director
- ► Knowledge database and technical documents
- ► Program Temporary Fixes

Note to users running diagnostic tools on systems with limited interactive capacity:

The i5/OS diagnostic tools are generally commands run from an interactive (5250) session. On systems that have limited or no interactive capacity, consideration needs to be made to ensure that when performing diagnostic tasks that the work is done within the constraints of the interactive capacity of that system. Of most concern are those commands that print or dump diagnostic data - the process of generating the diagnostic data can be significant and should not be done from within an interactive job on systems with limited interactive capacity; rather, these functions should be submitted to batch and run there. For example, a print trace (PRTTRC) command can be long-running for a large trace and should be submitted to batch.

There is also a single job/console exception for interactive (5250 OLTP) work, which means a single interactive job can perform service diagnostics with the full capacity of the system, regardless of the system limitations associated with interactive application capacity. This single job exception can be used to submit interactive work in concert with background (for example, batch) jobs performing service diagnostics, facilitating an expedient problem resolution if you require one or more diagnostic analysts working on a common problem.

9

Initial program load (IPL)

An initial program load (IPL) is the process by which a system or partition becomes operational from a powered off state. When a system is restarted while in operational state, an IPL is also performed. There are three distinct phases in an IPL. Each phase is subdivided into stages that perform specific functions. These phases, which are discussed further in this chapter, are:

► Hardware
► Licensed Internal Code (LIC)
► Operating system (i5/OS)

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9.1 Hardware

The hardware portion of an IPL includes the service processor and the virtual service processor (VSP) for partitions. The service processor is responsible for initiating the IPL by communicating with the control panel. The service processor hardware is then tested, the code is loaded into the service processor random access memory (RAM), and the processor code is loaded.

The functions performed by the service processor during the IPL are:

► Hardware diagnostics or basic assurance tests (BATs) are run.

► The load source input/output processor (IOP or MFIOP) is IPLed.

► Licensed Internal Code (LIC) required to IPL the service processor is acquired from the load source unit. The load source can be disk, tape, or optical.

► The service processor runs diagnostics to the processor.

► The service processor loads the LIC, and then starts the CPU.
On POWER5™ systems, the service processor loads and starts the converged hypervisor. The hypervisor starts the VSP for the partition which then loads LIC for the partition.

9.2 Licensed Internal Code

Licensed Internal Code (LIC) is responsible for the following IPL steps:

1. Main storage initialization
2. Tasking
    a. Task dispatcher created
    b. IPL continues as a task
3. Transport manager (Bus) initialization
    a. Buses are started
    b. I/O device checking
4. Confirmation of I/O device attachment
5. Resource management initialization
6. Events
7. Dedicated Service Tools (DST)

DST then creates the IPL service function, and the IPL continues through several LIC initialization and recovery steps (such as storage management and start LIC log).

9.3 Operating system

i5/OS is the third phase of the IPL. i5/OS commences system functionality. This phase produces the sign-on screen. After sign on, the user has access to the applications and the Licensed Program Products.

The IPL status system reference codes that are displayed are discussed in the following section.

9.4 System reference codes on the front panel

Symptoms of a system problem are usually noticed by users. For example, the display screen has an input inhibit cross symbol after pressing the Enter key. To determine the problem, observe whether the system reference codes are on the physical or virtual control panel or the hardware management console (HMC). SRCs display the status of the IPL or indicate a machine problem.

9.4.1 IPL status

The codes shown in Table 9-1 are the IPL System Reference Codes, sometimes referred to as progress codes, for each phase of the IPL.

Table 9-1   Functional area IPL reference codes

Phase	Functional Area	IPL status code
Hardware	Service processor	C1xx xxxx
	Virtual service processor (LPAR)	C2xx xxxx
	Converged hypervisor	C7xx xxxx
LIC	Licensed Internal Code (LIC)	C6xx xxxx
Operating System	i5/OS	C9xx xxxx
N/A	Operational System	01 A or 01 B

The articles in the Reference codes topic of the Service provider information section of the IBM Systems Hardware Information Center include a list of the functions performed in each phase.

SRC codes are documented in the iSeries Information Center. Look for the IPL codes in the "SRC finder" topic as a reference section of the Work Management section of the System Management topic:

System Management → **Work Management** → **Reference** → **IPL SRC finder**

For logical partitions, see **System Management** → **Logical partitions** → **Partitioning** → **Troubleshooting** → **Logical Partition SRC Finder**

9.4.2 Machine problems

When a machine problem occurs that is associated with a system reference code, the attention light is lit on the control panel. If a partition is having a problem, it transitions to a failed state and displays a SRC on either the virtual control panel or the HMC. Table 9-2 lists the system reference codes that relate to the area of the problem.

Table 9-2   Failing area reference codes

Failing Area	Failing SRC
Machine Hardware Error	0xxx xxx --> 9xxx xxxx
Power	1xxx xxxx
IOP	B0xx xxx
Service Processor	B1xx xxxx

Failing Area	Failing SRC
Virtual Service Processor (LPAR)	B2xx xxxx
Processor and some LIC	B3xx xxxx and B4xx xxxx
LIC	B6xx xxxx
Converged Hypervisor™	B7xx xxxx
i5/OS machine check	B9xx xxxx

Important: When any of these SRCs appear on the control panel, the system has stopped operating. Collect the remaining SRC data before you contact your service provider. Instructions on how to collect SRC data can be found in the *Collect system reference codes* topic in the iSeries Information Center. For POWER5 systems, refer to *Logical Partitions on System i5: A Guide to Planning and Configuring LPAR with HMC on System i*, SG24-8000.

9.4.3 Operator intervention

The system reference codes shown in Table 9-3 indicate that an action is required. For example, the correct CD has to be inserted, or the system requires a service action to be performed before the IPL can be completed.

Table 9-3   Attention reference codes

Area requesting intervention	SRC
Service processor	A1xx xxxx
Virtual service processor (LPAR)	A2xx xxxx
LIC	A6xx xxxx
Converged Hypervisor	A7xx xxxx
i5/OS	A9xx xxxx

In other words, any reference code starting with an A indicates that action is required from the system administrator or operator.

9.4.4 General system status

The DXXX XXXX system reference codes reflect general system status. Refer to the List of progress codes found in **Hardware Information Center Service Provider Information** → **Reference Codes**. Some of these codes are shown in Table 9-4.

Table 9-4   General status reference codes

Area	SRC
Service Processor	D1xx xxxx
Virtual Service Processor	D2xx xxxx
LIC	D6xx xxxx
i5/OS	D9xx xxxx

These system reference codes are located in the Reference codes topic of the Service provider information section of the IBM Systems Hardware Information Center.

9.5 IPL options

There are several options when you select an IPL:

- ▶ IPL type (A, B, C, or D) depending on the copy of LIC you intend to use or the functions that are required to be performed.
  - A - Base LIC plus perm applied PTFs
  - B - Base LIC plus temp applied PTFs
  - C - Reserved
  - D - IPL from tape or optical (restore or install LIC)
- ▶ IPL mode
  - manual - DST and the operating system present menus and prompts that allow you to make changes to the system environment
  - normal - requires no operator intervention during the IPL
  - secure - not a form of IPL. It is a means to prevent an unauthorized or inadvertent IPL from the control panel.
  - auto - mode for an automatic remote IPL, automatic IPL by date and time, and an automatic IPL after a power failure
- ▶ IPL speed
  - fast - some hardware diagnostics are skipped
  - slow - full hardware diagnostics are performed
- ▶ Firmware boot side (POWER5 systems)
  - Permanent
  - Temporary

There are three ways to change IPL settings:

- ▶ Control Panel
- ▶ Prompt (F4 key) the PWRDWNSYS command
- ▶ CHGIPLA

The IBM Systems Hardware Information Center has information on how to use the control panel to change IPL settings. The screen shown in Figure 9-1 on page 166 displays the parameters that you can change with the CHGIPLA command.

```
Change IPL Attributes (CHGIPLA)

 Type choices, press Enter.

 Restart type . . . . . . . . . .   *SYS          *SAME, *SYS, *FULL
 Keylock position . . . . . . . .   *NORMAL       *SAME, *NORMAL, *AUTO...
 Hardware diagnostics . . . . . .   *MIN          *SAME, *MIN, *ALL
 Compress job tables  . . . . . .   *NONE         *SAME, *NONE, *NEXT...
 Check job tables . . . . . . . .   *ABNORMAL     *SAME, *ABNORMAL, *ALL, *SYNC
 Rebuild product directory  . . .   *NONE         *SAME, *NONE, *NORMAL...
 Mail Server Framework recovery     *NONE         *SAME, *NONE, *ABNORMAL
 Display status . . . . . . . . .   *ALL          *SAME, *SYS, *NONE...
 Start TCP/IP . . . . . . . . . .   *YES          *SAME, *YES, *NO
 Spooled file recovery  . . . . .   *DETACH       *SAME, *DETACH, *REMOVE
 Clear job queues . . . . . . . .   *NO           *SAME, *YES, *NO
 Clear output queues  . . . . . .   *NO           *SAME, *YES, *NO
 Clear incomplete joblogs . . . .   *NO           *SAME, *YES, *NO
 Start print writers  . . . . . .   *YES          *SAME, *YES, *NO
 Start to restricted state  . . .   *NO           *SAME, *YES, *NO


                                                                    Bottom
 F3=Exit    F4=Prompt    F5=Refresh    F12=Cancel    F13=How to use this display
 F24=More keys
```

Figure 9-1   Change IPL Attributes (CHGIPLA)

More information about IPL attributes can be found in the iSeries Information Center article about the CHGIPLA command.

9.6 IPL timing

There is an operating system function that tracks IPL times. To evaluate IPL timings on your system, on a command line, enter:

CALL QWCCRTEC

QWCCRTEC produces a QPSRVDMP spooled file. A sample of the report is shown in Figure 9-2 on page 167 and Figure 7-47 on page 151.

```
5722SS1 V5R4M0  060210                    AS/400 DUMP            005299/ITSO/QPADEV0002      11/17/07 11:48:38      PAGE   1
                                                                                                                   PAGE   2
OBJECT TYPE-           SPACE                                         *QTSP
NAME-       QWCSRCDATAOUTPUT                TYPE-      19  SUBTYPE-        EF
CREATION-   11/17/07  11:48:38              SIZE-      0000009000
ATTRIBUTES-         0000                    ADDRESS-   FB50096CB2 000000
SPACE ATTRIBUTES-
  000000   00FFF000 00000074 19EFD8E6 C3E2D9C3   C4C1E3C1 D6E4E3D7 E4E34040 40404040   * 0      È ŌQWCSRCDATAOUTPUT       *
  000020   40404040 40404040 40020000 00000000   00008000 00100000 00000000 00000000   *                                *
  000040   00000000 00000000 00000000 00000000   00000000 00000000 00000000 00000000   *                                *
  000060   00000000 00000000 00000000 00000000   00FFF000                              *                      0          *
SPACE-
  000000   E7D7C640 D7E6D9C4 E6D54040 404040F1   F061F3F0 61F0F640 F1F87AF1 F07AF2F0   *XPF PWRDWN          10/30/07 18:10:20*
  000020   0000C4F9 F0F000F2 F7F4F000 000000F1   F061F3F0 61F0F640 F1F87AF1 F07AF2F1   *  D900 2740         10/30/07 18:10:21*
  000040   0000C4F9 F0F000F2 F7F5F000 000000F1   F061F3F0 61F0F640 F1F87AF1 F17AF2F9   *  D900 2750         10/30/07 18:11:29*
  000060   0000C4F9 F0F000F2 F7F7F000 000000F1   F061F3F0 61F0F640 F1F87AF1 F17AF2F9   *  D900 2770         10/30/07 18:11:29*
  000080   0000C4F9 F0F000F2 F7F8F000 000000F1   F061F3F0 61F0F640 F1F87AF1 F17AF2F9   *  D900 2780         10/30/07 18:11:29*
  0000A0   0000C4F9 F0F000F2 F7F9F000 000000F1   F061F3F0 61F0F640 F1F87AF1 F17AF2F9   *  D900 2790         10/30/07 18:11:29*
  0000C0   0000C4F9 F0F000F2 F7C3F000 000000F1   F061F3F0 61F0F640 F1F87AF1 F17AF3F0   *  D900 27C0         10/30/07 18:11:30*
  0000E0   C5958440 D7E6D9C4 E6D54040 404040F1   F061F3F0 61F0F640 F1F87AF1 F17AF3F5   *End PWRDWN          10/30/07 18:11:35*
  000100   E7D7C640 C9D7D340 40404040 404040F1   F061F3F0 61F0F640 F1F87AF2 F47AF5F4   *XPF IPL             10/30/07 18:24:54*
  000120   0000C3F9 F0F000F2 F8F1F000 000000F1   F061F3F0 61F0F640 F1F87AF2 F47AF5F4   *  C900 2810         10/30/07 18:24:54*
  000140   0000C3F9 F0F000F2 F8F2F000 000000F1   F061F3F0 61F0F640 F1F87AF2 F47AF5F4   *  C900 2820         10/30/07 18:24:54*
  000160   00000000 F1F000F2 F000F0F0 F1F000F1   F061F3F0 61F0F640 F1F87AF2 F47AF5F4   *  10 20 0010        10/30/07 18:24:54*
  000180   00000000 F1F000F2 F000F0F0 F2F000F1   F061F3F0 61F0F640 F1F87AF2 F47AF5F4   *  10 20 0020        10/30/07 18:24:54*
  0001A0   00000000 F1F000F3 F000F0F0 F1F000F1   F061F3F0 61F0F640 F1F87AF2 F47AF5F4   *  10 30 0010        10/30/07 18:24:54*
  0001C0   00000000 F1F000F3 F000F0F0 F2F000F1   F061F3F0 61F0F640 F1F87AF2 F47AF5F4   *  10 30 0020        10/30/07 18:24:54*
  0001E0   00000000 F1F000F3 F000F0F0 F3F000F1   F061F3F0 61F0F640 F1F87AF2 F47AF5F4   *  10 30 0030        10/30/07 18:24:54*
  000200   00000000 F1F000F3 F000F0F0 F4F000F1   F061F3F0 61F0F640 F1F87AF2 F47AF5F4   *  10 30 0040        10/30/07 18:24:54*
  000220   00000000 F1F000F3 F000F0F0 F5F000F1   F061F3F0 61F0F640 F1F87AF2 F47AF5F4   *  10 30 0050        10/30/07 18:24:54*
  000240   00000000 F1F000F3 C100F0F0 F1F000F1   F061F3F0 61F0F640 F1F87AF2 F47AF5F4   *  10 3A 0010        10/30/07 18:24:54*
  000260   0000C3F9 F0F000F2 F8F3F000 000000F1   F061F3F0 61F0F640 F1F87AF2 F47AF5F4   *  C900 2830         10/30/07 18:24:54*
  000280   00000000 F1F000F3 C100F0F0 F1F800F1   F061F3F0 61F0F640 F1F87AF2 F47AF5F4   *  10 3A 0018        10/30/07 18:24:54*

  0002A0   00000000 F1F000F3 C100F0F0 F2F000F1   F061F3F0 61F0F640 F1F87AF2 F47AF5F4   *  10 3A 0020        10/30/07 18:24:54*
  0002C0   00000000 F1F000F3 C100F0F0 F2C300F1   F061F3F0 61F0F640 F1F87AF2 F47AF5F4   *  10 3A 002C        10/30/07 18:24:54*
  0002E0   00000000 F1F000F3 C100F0F0 F3F000F1   F061F3F0 61F0F640 F1F87AF2 F47AF5F5   *  10 3A 0030        10/30/07 18:24:55*
  000300   00000000 F1F000F3 C100F0F0 F3F500F1   F061F3F0 61F0F640 F1F87AF2 F47AF5F5   *  10 3A 0035        10/30/07 18:24:55*
  000320   00000000 F1F000F3 C100F0F0 F5F000F1   F061F3F0 61F0F640 F1F87AF2 F47AF5F5   *  10 3A 0050        10/30/07 18:24:55*
  000340   00000000 F1F000F3 C100F0F0 F5F500F1   F061F3F0 61F0F640 F1F87AF2 F47AF5F5   *  10 3A 0055        10/30/07 18:24:55*
  000360   00000000 F1F000F3 C100F0F0 F7F1F1   F061F3F0 61F0F640 F1F87AF2 F47AF5F5   *  10 3A 0071        10/30/07 18:24:55*
  000380   00000000 F1F000F3 C100F0F0 F7F2F000F1   F061F3F0 61F0F640 F1F87AF2 F47AF5F5   *  10 3A 0072        10/30/07 18:24:55*
  0003A0   00000000 F1F000F3 C100F0F0 F8F000F1   F061F3F0 61F0F640 F1F87AF2 F47AF5F5   *  10 3A 0080        10/30/07 18:24:55*
  0003C0   00000000 F1F000F3 C100F0F0 F8F200F1   F061F3F0 61F0F640 F1F87AF2 F47AF5F5   *  10 3A 0082        10/30/07 18:24:55*
  0003E0   00000000 F1F000F3 C100F0F0 C1F000F1   F061F3F0 61F0F640 F1F87AF2 F47AF5F5   *  10 3A 00A0        10/30/07 18:24:55*
  000400   00000000 F1F000F3 C100F0F0 C1F400F1   F061F3F0 61F0F640 F1F87AF2 F47AF5F5   *  10 3A 00A4        10/30/07 18:24:55*
  000420   00000000 F1F000F3 C100F0F0 C1F800F1   F061F3F0 61F0F640 F1F87AF2 F47AF5F5   *  10 3A 00A8        10/30/07 18:24:55*
  000440   00000000 F1F000F3 C100F0F0 C1C100F1   F061F3F0 61F0F640 F1F87AF2 F47AF5F5   *  10 3A 00AA        10/30/07 18:24:55*
  000460   00000000 F1F000F3 C100F0F0 C1C300F1   F061F3F0 61F0F640 F1F87AF2 F47AF5F5   *  10 3A 00AC        10/30/07 18:24:55*
  000480   00000000 F1F000F3 C100F0F0 C2F000F1   F061F3F0 61F0F640 F1F87AF2 F47AF5F5   *  10 3A 00B0        10/30/07 18:24:55*
  0004A0   00000000 F1F000F3 C100F0F0 C2F800F1   F061F3F0 61F0F640 F1F87AF2 F47AF5F5   *  10 3A 00B8        10/30/07 18:24:55*
  0004C0   00000000 F1F000F3 C100F0F0 C2C100F1   F061F3F0 61F0F640 F1F87AF2 F47AF5F5   *  10 3A 00BA        10/30/07 18:24:55*
```

Figure 9-2   IPL Timing report

The amount of time it takes to IPL can be reduced by managing the work management configuration of this system, such as the number of spooled files and number of jobs. See the iSeries Information Center for tips on what can be done to minimize the amount of time required to IPL.

9.7 IPL on logically partitioned systems

The IPL sequence of secondary partitions is the same as the primary partition, except for the first phase, the Service Processor phase. When the primary partition begins the IPL, the service processor checks all the hardware and verifies that the components are operational. Therefore, the IPL time for secondary partitions systems is significantly reduced in comparison to other stand-alone systems of the same configuration and performance.

10

Main storage dumps

A *main storage dump* (MSD) records the status of the system at the time the dump is taken. A MSD contains the contents of main storage (memory) at the time the dump occurs.

► System and user data
► System processor data
► Service processor data

Together, this information helps the service provider to determine the cause of the system failure.

There are two types of main storage dumps:

► **System initiated**: This is done by the service processor as the result of a system failure.

► **User initiated**: This is done by selecting control panel function 22 when the system waits, loops, or appears to have an operating system failure. On some models, you can also perform a manual dump on a secondary partition by selecting option 22 from the Work with Partition Status display. For partitions on an HMC managed system, a MSD is a partition restart type.

Attention: Failure to collect the main storage dump when necessary can prolong problem resolution. Taking a main storage dump causes the system to stop. Use this procedure as directed by your service provider.

If you want to:

► Perform a MSD manually, go to 10.2, "Performing a system main storage dump manually" on page 170, or 10.3, "Performing a user initiated MSD on a secondary partition" on page 171.

► Copy a current MSD, go to 10.4, "Copying a current main storage dump" on page 175.

► Copy a MSD from disk to media, go to 10.5, "Copying a main storage dump from ASP (disk) to media" on page 180.

If you do not have service authority, contact the security officer or system administrator. See Chapter 26, "Using System Service Tools (SST)" on page 415, and Chapter 27, "Using Dedicated Service Tools (DST)" on page 427, for more information.

10.1 System initiated main storage dump

After a failure that causes the system to perform a main storage dump, the Main Storage Dump Occurred display appears as shown in Figure 10-1.

```
Main Storage Dump Occurred
                                                        S/N 10ABCDEF

The system has failed.  Report the following information to
your IBM service representative.

             SRC word 1 . . . . . . . :   B6005121
             SRC word 2 . . . . . . . :   0D200000
             SRC word 3 . . . . . . . :   0002000A
             SRC word 4 . . . . . . . :   00100011
             SRC word 5 . . . . . . . :   00000000
             SRC word 6 . . . . . . . :   00000000
             SRC word 7 . . . . . . . :   00000000
             SRC word 8 . . . . . . . :   00000000
             SRC word 9 . . . . . . . :   00000000
             Type/Model/Feature . . :    9406 0520 7451

Warning: The Main Storage Dump (MSD) must be copied for service.
         Failure to copy the Main Storage Dump will limit
         the ability to diagnose the failure.

Press Enter to copy the MSD for service or view the MSD.
```

Figure 10-1   Main Storage Dump Occurred

Figure 10-1 shows the failing reference codes (from SRC word 1 through SRC word 9). These codes are needed for problem determination.

> **Important:** When you press F3 to exit or F12 to cancel at this stage, a significant portion of the MSD that resides in main storage is lost. This limits the ability to diagnose the failure.

For more information, refer to 10.4, "Copying a current main storage dump" on page 175.

10.2 Performing a system main storage dump manually

Use this procedure on the primary partition, on a system without logical partitions, or a non-HMC managed POWER5 system. For systems with logical partitions, refer to 10.3, "Performing a user initiated MSD on a secondary partition" on page 171.

Perform the following procedure to perform a manual MSD:

1. Select the Manual mode on the control panel.

   For more information on how to set the system to manual mode, refer to the "Control Panel" topic in the IBM Systems Hardware Information Center.

2. Use the up arrow or down arrow buttons to display Function 22 on the panel and press Enter.

3. An attention Service Reference Code (SRC) A1003022 is displayed, which indicates that Function 22 has been selected and confirmation is required. Reselect Function 22, with the arrow keys, and press Enter.

    During MSD processing, SRCs that begin with 'D' are displayed and changed to 'C' SRCs during the IPL to the MSD Manager screen.

    Note: If a SRC other than A1003022 is displayed after selecting function 22 the first time, contact your service provider.

4. When the first portion of the dump is complete, a display similar to the example in Figure 10-1 on page 170 is displayed on the console.

Refer to 10.4, "Copying a current main storage dump" on page 175.

Attention: If you perform an MSD on the system, all activities end abnormally. You do not have access to the machine for a relatively long period of time. Perform an MSD only at the direction of your service provider.

For a system with logical partitions, performing MSD on the primary partition causes all active secondary partitions to abnormally terminate its activities. During the copying of the MSD at the primary partition console, shut down the secondary partition because exiting the MSD manager causes the secondary partition to abnormally end again if it is active.

10.3 Performing a user initiated MSD on a secondary partition

Depending on your hardware platform, use one of the following sections to perform a user initiated MSD for a secondary partition:

► 10.3.1, "Performing a user initiated partition MSD on a non-POWER5 system" on page 172 (such as System models 7xx and 8xx)

► 10.3.2, "Performing a user initiated partition MSD on a POWER5 system" on page 174 (such as System models 520, 550, 570, 595, and i5/OS partitions on model 590s)

10.3.1 Performing a user initiated partition MSD on a non-POWER5 system

Follow this procedure on a secondary logical partition machine to perform a manual MSD:

1. From a workstation of the *primary partition,* enter the Start System Service Tools (STRSST) command from the command line. Sign on with a valid service tools user ID and password. A display appears as shown in Figure 10-2.

```
System Service Tools (SST)

 Select one of the following:

      1. Start a service tool
      2. Work with active service tools
      3. Work with disk units
      4. Work with diskette data recovery
      5. Work with system partitions
      6. Work with system capacity
      7. Work with system security
      8. Work with service tools user IDs and Devices



 Selection

     _

 F3=Exit          F10=Command entry          F12=Cancel
```
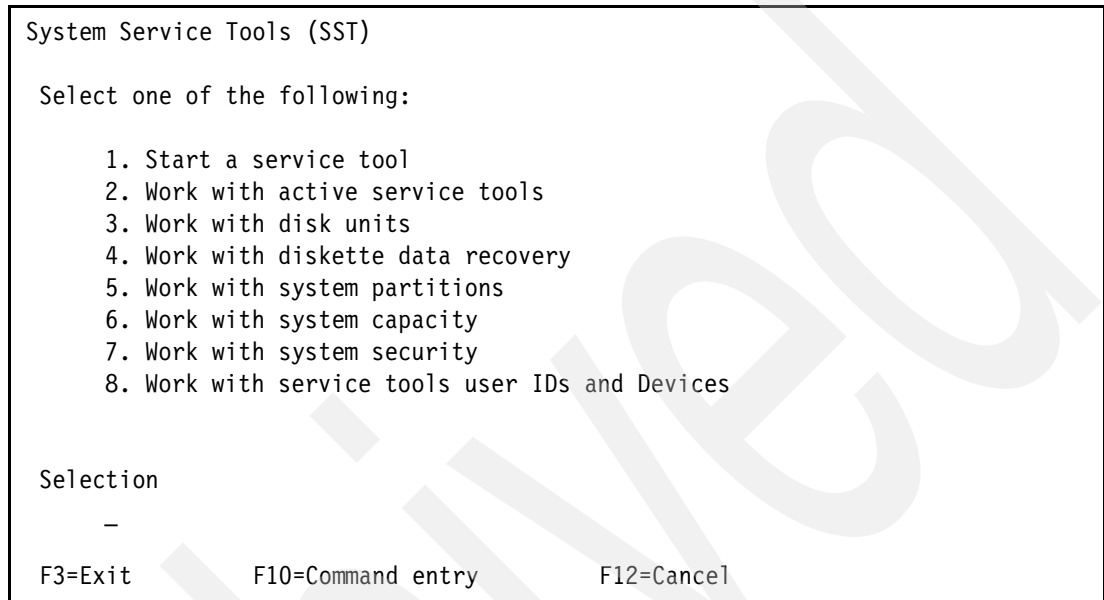
Figure 10-2   System Service Tools menu

> **Note:** If you do not see this display, it might be due to an authority problem. Service authority is required on the user profile. See your security officer if necessary.

2. Select option 5 to work with system partitions. Press Enter. A display appears like the example shown in Figure 10-3 on page 173.

```
Work with Partition Status
                                              System:    ITSOSYS1
Type options, press Enter.
  1=Power on      3=IPL restart    7=Delayed power off   8=Immediate power off
  9=Mode normal  10=Mode manual  11=Mode auto            12=Mode secure
  A=Source A      B=Source B       C=Source C            D=Source D

    Partition              IPL     IPL                  Sys IPL  Reference
Opt Identifier  Name       Source  Mode      State      Action   Codes
     0          PRIMARY    B       Normal    On         IPL      11
 10  1          LPAR2      B       Normal    On         IPL      11




F3=Exit   F5=Refresh                       F10=Monitor partition status
F11=Work with partition configuration   F12=Cancel   F23=More options
```

Figure 10-3   Work with Partition Status menu

3. If the desired partition is not in *manual* mode, select option 10 to place it in manual mode.

4. Press F23 for more options. The display changes as shown in Figure 10-4.

```
Work with Partition Status
                                              System:    ITSOSYS1
Type options, press Enter.
 13=IPL partition on system IPL   14=Hold partition on system IPL
 20=Display system type/model     21=Force Dedicated Service Tools
 22=Force Main Storage Dump       34=Force CPM or MSD IPL retry

    Partition              IPL     IPL                  Sys IPL  Reference
Opt Identifier  Name       Source  Mode      State      Action   Codes
     0          PRIMARY    B       Normal    On         IPL      11
 22  1          LPAR2      B       Manual    On         IPL      11








F3=Exit   F5=Refresh                       F10=Monitor partition status
F11=Work with partition configuration   F12=Cancel   F23=More options
```

Figure 10-4   Work with Partition Status menu with more options

5. Select option 22 to force an MSD for the secondary partition. A Confirm Force Main
   Storage Dump display appears as shown in Figure 10-5 on page 174.

```
Confirm Force Main Storage Dump
                                                          System:   ITSOSYS1
 Force Main Storage Dump (MSD) of partition LPAR2
 was requested.

 Press F10 to confirm your choice to force a MSD.
   Partition processing will be ended and the partition
   will be IPLed.
 Press F12 to return to change your choice.












 F10=Force MSD    F12=Cancel
```

Figure 10-5   Confirm Force Main Storage Dump display

6. Press F10 to confirm the choice to force a main storage dump.

7. The Force MSD successfully message appears at the bottom of the display.

8. The secondary partition performs an IPL. Then a Main Storage Dump Occurred display (refer to Figure 10-1 on page 170) appears on the console of the secondary partition.

> **Important:** Do not exit or cancel out of this procedure. If you press F3 to exit or F12 to cancel at this stage, a large portion of the MSD that resides in the main storage is lost. This limits the ability to diagnose the failure.

Refer to 10.4, "Copying a current main storage dump" on page 175.

10.3.2 Performing a user initiated partition MSD on a POWER5 system

For a partition on an HMC managed system, use the following procedure to perform a user initiated MSD.

1. Go to the Hardware Management Console (HMC).

2. In the management environment, select the HMC and expand.

3. Select and expand **Server and Partition**.

4. Select **Server Management**.

5. In the navigation area, expand the managed system.

6. Under the managed system, select and expand **Partitions**.

7. Right-click on the desired partition and select **Restart Partition** from the context menu.

8. Select **Dump** and click **OK**.

9. The partition performs an IPL. Then a Main Storage Dump Occurred display (refer to Figure 10-1 on page 170) appears on the console of the partition.

> **Note:** Additional information about performing a MSD on HMC managed systems can be found in *Logical Partitions on System i5: A Guide to Planning and Configuring LPAR with HMC on System i*, SG24-8000).

Refer to 10.4, "Copying a current main storage dump" on page 175.

10.4 Copying a current main storage dump

This procedure copies a main storage dump (MSD) to a reserved area on the system. This prevents the MSD from being lost prior to the next IPL.

Follow these steps to copy the current MSD to a predefined storage area:

1. From the Main Storage Dump Occurred display as shown in Figure 10-1 on page 170, press Enter to copy the MSD for further analysis. The Main Storage Dump Manager menu appears as shown in Figure 10-6.

```
Main Storage Dump Manager

 Select one of the following:

      1. Work with current main storage dump (MSD)
      2. Work with copies of main storage dumps
      3. Work with copy options
      4. Activate remote service support communication line







 Selection    1



 F3=Exit     F12=Cancel
```

Figure 10-6   Main Storage Dump Manager menu

2. Select option 1 (Work with current main storage dump (MSD). Press Enter. The Work with Current Main Storage Dump menu appears as shown in Figure 10-7 on page 176.

```
Work with Current Main Storage Dump

Select one of the following:

     1. Display/Print
     2. Copy to media
     3. Copy to ASP




Selection

    _

F3=Exit      F10=IPL Status      F11=Copy status      F12=Cancel
```
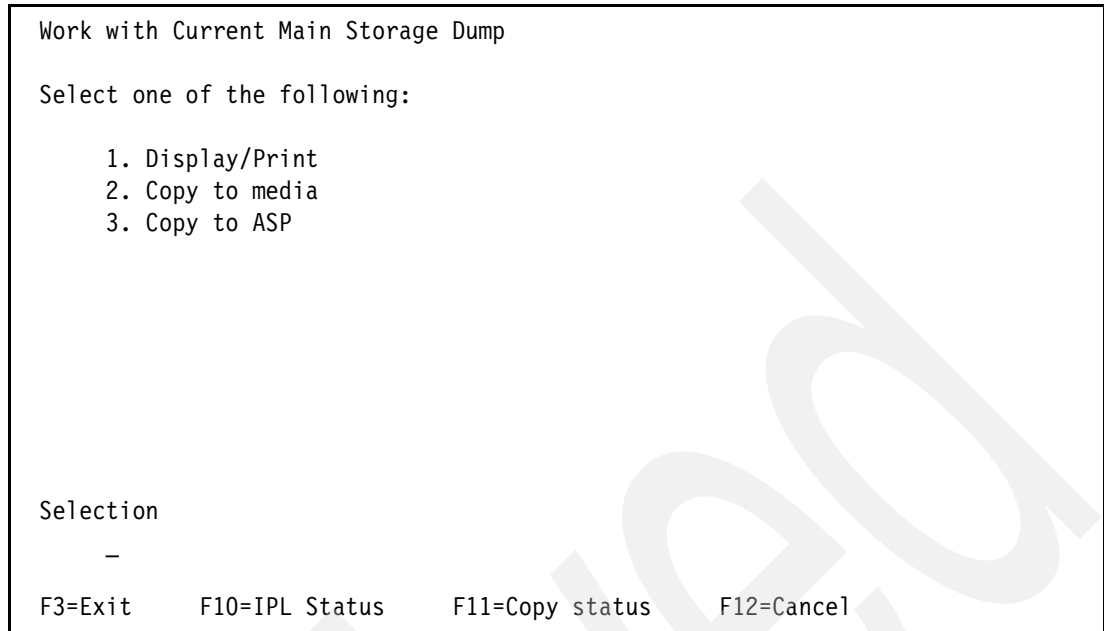
Figure 10-7   Work with Current Main Storage Dump menu

3. Select option 2 to copy to tape media or option 3 to copy to ASP (disk).

   For option 2, proceed to 10.4.1, "Copying the current MSD to media" on page 176.

   For option 3, proceed to 10.4.2, "Copying the current MSD to ASP" on page 179.

   Note: We recommend that you copy the MSD to the hard disk if you have sufficient disk storage. This process is much faster, and the system can be available sooner. You can then copy it to removable media from storage using the Main Storage Manager in SST. Refer to 10.4.2, "Copying the current MSD to ASP" on page 179.

10.4.1 Copying the current MSD to media

To copy the current main storage dump to removable media, follow these steps:

1. From the Work with Current Main Storage Dump screen in Figure 10-7, select option 2, Copy to media, and press Enter. The Copy Main Storage Dump to Media screen is displayed as shown in Figure 10-8 on page 177.

```
Copy Main Storage Dump to Media

Type choices, press Enter.

  Volume ID . . . . . . . . . . .    MSDTAP

  Sequence number . . . . . . . . .  0001           0000-9999

  Check for active files  . . . . .  1              1=Yes, 2=No




  F3=Exit    F12=Cancel
```

Figure 10-8   Copy Main Storage Dump to Media display

Note: If the Select Media Type screen is displayed, select the option for Tape.

2. Leave the default for Volume ID as MSDTAP, and change the Sequence number to 0001. Press Enter to continue. The Work with Tape Devices screen appears as shown in Figure 10-9.

```
Work with Tape Devices
                                                   System:   ITSOSYS1
 Type option, press Enter.
   1=Select   2=Deselect   5=Display details

             Resource                      Serial
Option       Name          Type   Model    Number          Selected
             TAP01         6390   001      00-0812447
             TAP02         63A0   001      00-48274








 F3=Exit    F5=Refresh    F12=Cancel
 Make the device ready before making a selection
```

Figure 10-9   Work with Tape devices display

3. Insert a removable media into the tape drive, and set the drive to *Ready* status.

4. Select the correct tape drive and press Enter. The Copy Main Storage Dump to Media Status screen appears as shown in Figure 10-10.

```
Copy Main Storage Dump to Media Status

 Type choices, press Enter.

 From:
   Dump description . . . . :   Current Main Storage Dump

 To:
   Output device . . . . . .:   TAP01
   Volume ID . . . . . . . .:   MSDTAP
   File sequence number . . :   0001


                             % completed



 Press F15 to cancel copy
 Press F11 to return & continue copy
```

Figure 10-10   Copy Main Storage Dump to Media Status display

5. The message `Copy starts after storage management recovery completed` can appear at the bottom of the display. This depends on whether the storage management recovery completed before you arrive at this display.

6. The status of the copy process is shown by the percent completed message. The percentage increments as the copy proceeds.

7.   When the copy procedure is successfully completed, process the tape as directed by your service provider.

Tip: We recommend either copying the MSD again to a second tape or to ASP. That way a copy is available should the first be unreadable or end up lost in transit to your service provider.

8. Exit the Main Storage Dump Manager by pressing F3 three times. The system automatically performs an IPL.

This ends the procedure for copying an MSD to media.

10.4.2 Copying the current MSD to ASP

To copy the current main storage dump to an auxiliary storage pool, follow these steps:

1. Select option 3 to copy MSD to ASP. Then, the Copy Main Storage Dump to ASP screen appears as shown in Figure 10-11.

```
Copy Main Storage Dump to ASP

Type choices, press Enter.

From:
  Dump description . . . . :   Current Main Storage Dump

To:
  Dump description . . . . .   System dump when performing entire system save









F3=Exit      F12=Cancel
```

Figure 10-11   Copy Main Storage Dump to ASP display

2. Type a meaningful dump description to describe the symptoms of the problem, for example:

   `System dump when performing entire system save.`

3. Press Enter to start copying the dump. The Copy Main Storage Dump to ASP status screen appears as shown in Figure 10-12 on page 180.

```
Copy Main Storage Dump to ASP Status




 From:
   Dump description . . . . : Current Main Storage Dump

 To:
   Dump description . . . . : System dump when performing entire system save.


                                 % Complete



 Press F10 to display IPL status.
 Press F15 to cancel copy.
 Press F11 to return and continue copy.
```

Figure 10-12   Copy Main Storage Dump to ASP status display

The message `Copy starts after storage management recovery completed` can appear at the bottom of the display. This depends on whether the storage management recovery completes before you arrive at this display.

Note: The `Copy starts after storage management recovery completed` message might appear on a secondary partition system when you perform an MSD on a partition. Wait until the `Storage management recovery completed` message appears, and then the copying proceeds.

4. The copying proceeds. The percent completed counter shows the status of the amount that has been copied.

5. After the dump is copied, a message appears that indicates success or failure of the copy.

6. If the copy procedure is successfully completed, press F3 three times to exit the Main Storage Dump Manager. The system automatically performs an IPL. Otherwise, copy MSD to media or contact your service provider.

This ends the procedure for copying MSD to ASP (disk).

10.5 Copying a main storage dump from ASP (disk) to media

This procedure copies a main storage dump from ASP (disk) to a tape media. This can be done from the Dedicated Service Tools (DST) or the System Service Tools (SST). For this example, we perform the procedure from SST:

1. Run Start System Service Tools (STRSST) on the command line. Sign on with a valid service tools user ID and password. A menu appears like the example shown in Figure 10-13 on page 181.

```
System Service Tools (SST)

 Select one of the following:

      1. Start a service tool
      2. Work with active service tools
      3. Work with disk units
      4. Work with diskette data recovery
      5. Work with system partitions
      6. Work with system capacity
      7. Work with system security
      8. Work with service tools user IDs and Devices



 Selection



 F3=Exit          F10=Command entry          F12=Cancel
```
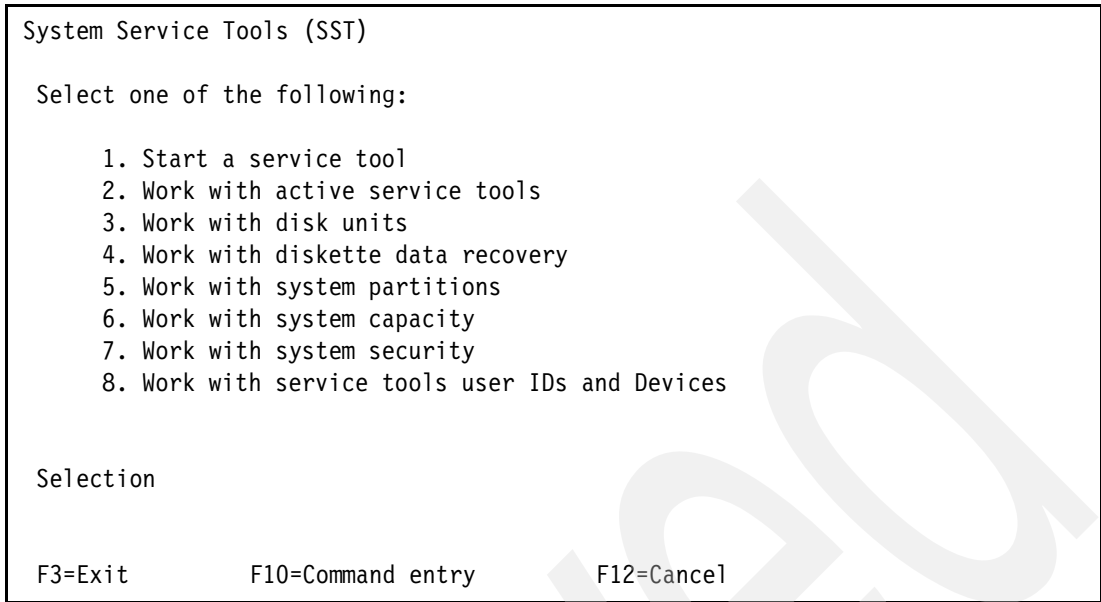
Figure 10-13   System Service Tools menu

Note: If you do not see this display, it can be due to an authority problem. Service authority is required on the user profile. See your security officer.

2. Enter option 1 to start a service tool. Press Enter. A menu appears like the one shown in Figure 10-14.

```
 Start a Service Tool

 Warning: Incorrect use of this service tool can cause damage
 to data in this system. Contact your service representative
 for assistance.

 Select one of the following:

      1. Product activity log
      2. Trace Licensed Internal Code
      3. Work with communications trace
      4. Display/Alter/Dump
      5. Licensed Internal Code log
      6. Main storage dump manager
      7. Hardware service manager


 Selection  6

 F3=Exit          F12=Cancel          F16=SST menu
```

Figure 10-14   Start a Service Tool menu

3. Type option 6 (Main storage dump manager). Press Enter. A menu appears like the one shown in Figure 10-15 on page 182.

```
Main Storage Dump Manager

Select one of the following:

     1. Work with current main storage dump (MSD) residue
     2. Work with copies of main storage dumps
     3. Work with copy options




Selection    2


F3=Exit      F12=Cancel
```

Figure 10-15   Main Storage Dump Manager menu

4. Type option 2 to work with copies of main storage dumps. Press Enter. A display appears like the example shown in Figure 10-16.

```
Work with Copies of Main Storage Dumps

 Type option, press Enter.
   4=Delete     5=Display/Print     7=Rename     8=Copy to media

 Opt    ID  Date      Level   SRC         Description
         4  08/24/07  V5R4M0  A2D03000    system crash
         5  11/06/07  V5R4M0  B6005121    crash dump
         6  11/08/07  V5R4M0  A2D03000    PMR#12345,678,000








 F3=Exit     F9=Copy from media     F11=Display copy status     F12=Cancel
```

Figure 10-16   Work with Copies of Main Storage Dumps display

5. Type option 8 to copy the desired MSD to tape media. The display shown in Figure 10-16 appears.

   You can differentiate the dumps by their date of occurrence and the description that you entered earlier during the copying to ASP process.

```
Copy Main Storage Dump to Media

 Type choices, press Enter.

   Volume ID . . . . . . . . . . .    MSDTAP

   Sequence number . . . . . . . . .  0001          0000-9999

   Check for active files  . . . . .  1             1=Yes, 2=No








 F3=Exit    F12=Cancel
```

Figure 10-17   Copy Main Storage Dump to Media display

6. Change the sequence number to 0001 and press Enter to proceed. The Select Tape Unit display appears as shown in Figure 10-18.

```
 Select Tape Unit

 Type choice, press Enter.

   Tape unit . . . . . . .    TAP01       Name, F4 for list













 F3=Exit         F4=Prompt         F12=Cancel
```

Figure 10-18   Select Tape Unit display

7. Insert a removable media onto the tape drive. Set the tape drive to *Ready* status.

8. Type the tape drive identifier for the Tape unit prompt, and press Enter (for example, TAP01). The Copy Main Storage Dump to Media Status display appears as shown in Figure 10-19 on page 184.

```
Copy Main Storage Dump to Media Status

 Type choices, press Enter.

 From:
   Dump description . . . . :   System Wait

 To:
   Output device . . . . . .:   TAP01
   Volume ID . . . . . . . .:   MSDTAP
   File sequence number . . :   0001

                               0% completed


 Press F15 to cancel copy
 Press F11 to return & continue copy
```

Figure 10-19   Copy Main Storage Dump to Media Status display

9. The status of the copy process is shown by the **0% completed** counter.

10. When the copy procedure is successfully completed, process the tape as directed by your service provider.

This ends the procedure for copying the main storage dump from the ASP (disk).

10.6 MSD copy options

Certain aspects of the MSD copy process are customized from the Main Storage Dump Copy Options screen:

```
 Main Storage Dump Copy Options

 Type options, press Enter.

   Auto copy and reIPL . . . .   1    1=Yes
                                      2=No


   Subset if possible  . . . .   1    1=Yes
                                      2=No, if enough room for full copy
                                      3=No

   ASP number  . . . . . . . .   1   (1-32)






 F3=Exit      F12=Cancel
```

Figure 10-20   Main Storage Dump Copy Options

10.6.1 Auto copy

The Auto copy and reIPL option allows for a MSD to be automatically copied to ASP (disk) and have the system reIPLed. Autocopy is extremely useful for situations when an operator is not available to copy the MSD. A MSD that is automatically copied has a text description of *Auto Copy*. A dump with this description should be renamed at the earliest convenience. The messages listed in Table 10-1 are associated with MSD auto copy.

Table 10-1   Message IDs associated with MSD auto copy

Message ID	Description
CPI099A	Main storage dump automatically copied.
CPP01A7	Auto copy failed or not attempted.
CPP01A8	System ASP threshold exceeded after auto copy done.

Important: MSD auto copy fails in the following cases and the MSD needs to be manually copied to either media or disk for service:

- An Auto Copy dump already exists.

- There is insufficient space in the specified ASP.

We recommend that MSD auto copy be enabled.

10.6.2 Subset MSD

In previous releases, the size of a main storage dump was the same as the amount of main storage in the system. Subsetting a MSD was introduced to help reduce the size of a MSD as the amount of supported main storage increased.

When subsetting is enabled, the MSD is analyzed by the system. Based on the problem state (such as system loop), the system decides if partitions of main storage need to be saved as part of the dump.

We recommend that, when possible, Subset MSD should be enabled.

10.6.3 ASP Number

Traditionally, MSD copies reside in the system ASP (ASP number 1). The ASP number can be changed so that subsequent MSD copies are stored in another ASP. Dumps in the current ASP are lost during the next full storage management (SM) directory recovery. Save the dumps to media if they are needed.

In the screen below, you are warned that changing the ASP results in old dump copies being lost during full SM directory recovery. Press Enter to confirm the change.

```
Main Storage Dump Copy Options

Type options, press Enter.

  Auto copy and reIPL . . . .   1    1=Yes
                                     2=No

  Subset if possible  . . . .   1    1=Yes
                                     2=No, if enough room for full copy
                                     3=No

  ASP number  . . . . . . . .   2   (1-32)

  Caution:  You are requesting an ASP change.
  Old dump copies will be lost during full SM directory recovery.
  Press Enter again to confirm.



F3=Exit     F12=Cancel
```

Figure 10-21   Copy options

On the Work with Copies of Main Storage Dumps screen, MSDs that are lost are flagged with an asterisk.

```
Work with Copies of Main Storage Dumps

Type option, press Enter.
  4=Delete     5=Display/Print     7=Rename     8=Copy to media

Opt   ID  Date      Level   SRC         Description
      4   08/24/07  V5R4M0  B6005121    system crash                          *
      5   11/06/07  V5R4M0  A2D03000    Auto Copy                             *
      6   11/08/07  V5R4M0  A2D03000    PMR#12345,678,999                     *










F3=Exit     F9=Copy from media     F11=Display copy status     F12=Cancel
*  Copy will be lost during full SM directory recovery.
```

Figure 10-22   Work with Copies of Main Storage Dumps

Unless directed by service, we do not recommend changing the ASP number.

10.7 Advanced analysis macro service documents

While a MSD is preferable, there are situations when a MSD cannot be collected. The advanced analysis macro *servicedocs* allows for problem determination data to be collected before it can be lost (such as IPL).

10.7.1 Load the PTF

Based on the release level of Licensed Internal Code, load and apply the listed PTF for the servicedocs function. These PTFs can be loaded and applied immediately.

Table 10-2   PTFs for the servicedocs advanced analysis macro

LIC Release	PTF Number
V5R3M0	MF39118
V5R3M5	MF39543
V5R4M0	MF39599

Tip: To determine the release level of Licensed Internal Code, run the following command:

`DSPPTF LICPGM(5722999)`

Look for the *Release of base option* line toward the top of the screen.

10.7.2 Running servicedocs

Prior to collecting servicedocs data, perform the following:

1. Create an output queue for the spooled file data:

   `CRTOUTQ OUTQ(<library>/PMR<XXXXX>)`

   Replace <library> with your user library and <xxxx> with the first five characters of your problem number.

2. Issue the following command from the command line:

   `OVRPRTF FILE(QPCSMPRT) OUTQ(<library>/PMR<XXXXX>) MAXRCDS(*NOMAX)`

3. Issue the following command from the command line:

   `CHGJOB OUTQ(<library>/PMR<XXXXX>)`

Use the following steps to perform the servicedocs collection:

1. From a command line, issue the following command

   STRSST

2. Sign on to service tools with a valid service tools user ID and password.

3. Select Start a service tool (Option 1)

4. Select Display/Alter/Dump (Option 4)

5. Select Dump to printer (Option 2)

6. Select Licensed Internal Code (LIC) data (Option 2)

7. Select Advanced Analysis (Option 14)

You should see a screen similar to the one below.

```
Select Advanced Analysis Command

Output device  . . . . . . :   Printer

Type options, press Enter.
  1=Select

Option    Command

   _      _____
          FLIGHTLOG
   _      ADDRESSINFO
   _      ALTSTACK
   _      BATTERYINFO
   _      CLUSTERINFO
   _      CONDITIONINFO
   _      COUNTERINFO
   _

                                                      More...

F3=Exit    F12=Cancel
```
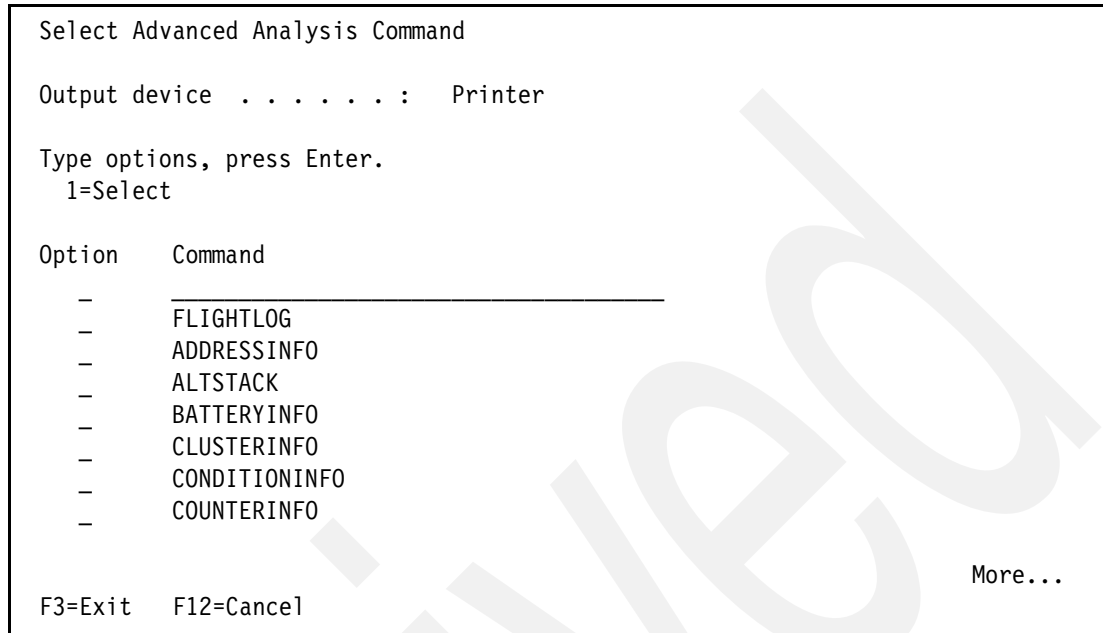
Figure 10-23   Select Advanced Analysis

8. In the option field next to the blank line, type a 1, and on the blank line in the command column, type `servicedocs`. Press Enter.

9. The Specify Advanced Analysis Options screen is displayed. Add options to the command as directed by your service provider. Press Enter.

```
Specify Advanced Analysis Options

Output device  . . . . . . :   Printer

Type options, press Enter.

  Command . . . . :   SERVICEDOCS

  Options . . . . .   _____
                      _____




F3=Exit    F4=Prompt    F12=Cancel
```
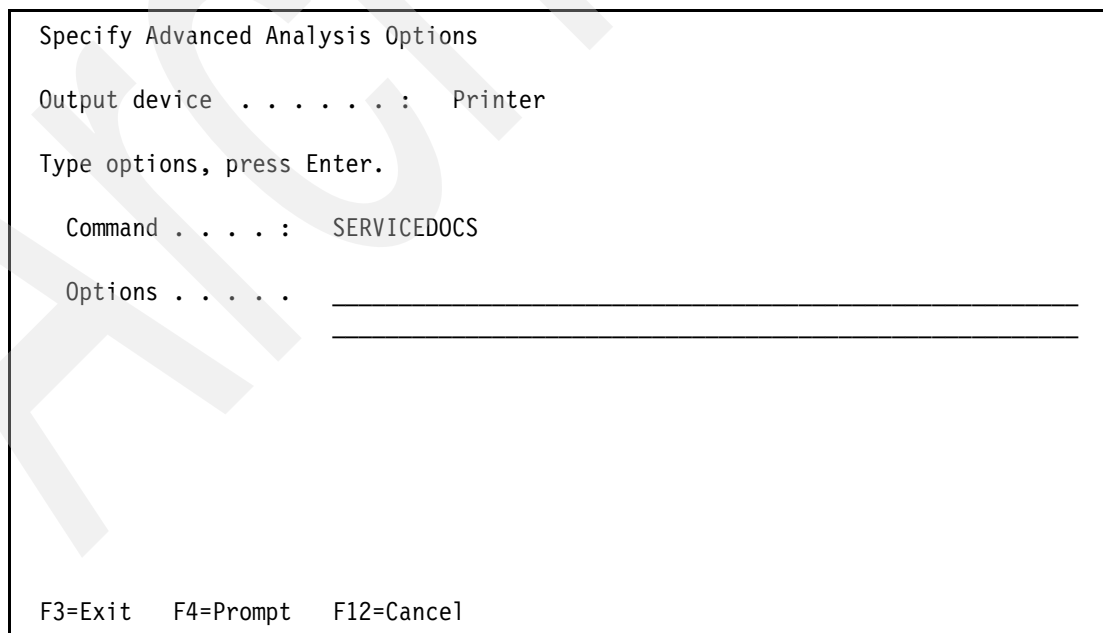
Figure 10-24   Specify Advanced Analysis Options

10.Press Enter

11. Specify a title for the dump and 2147483647 for the Through page. Press Enter.

```
Specify Dump Title

 Output device  . . . . . . :    Printer

 Type choices, press Enter.

   Dump title . . . . . . . . . . .   a descriptive title

   Perform seizes  . . . . . . . . .   1              1=Yes, 2=No

   Partial print page numbers:
     From page . . . . . . . . . . .           1   1-2147483647
     Through page  . . . . . . . . .   2147483647   1-2147483647




 F3=Exit    F12=Cancel
```

Figure 10-25   Specify title

12. The message `Dump to printer successfully submitted.` is displayed.

13. Press F12 four times and then select Display dump status (Option 7) from the Display/Alter/Dump Output Device screen.

14. Press F5 to refresh the display. When the number of Dump requests changes to zero, and the Dump completed normally message is displayed, the servicedocs collection is complete.

> **Important:** Until the `Dump requests not complete` is zero, **do not** use the Attention or SYSREQ keys.

```
Display Status of Dump

Dump requests
  not complete . . . . . . . . . :        1

Title of
  active dump . . . . . . . . . :    A DESCRIPTIVE TITLE




Press Enter to continue.

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

Figure 10-26   Display status

15. Press F3 three times and Enter to exit service tools.

Prior to sending the spooled file to your service provider:

► Verify the output

   If the spooled file contains the string, "MACRO NOT LOADED ON SYSTEM OR MACRO
   FUNCTION SIGNATURE IS INCORRECT." then the servicedocs PTF is not on the
   system. Refer to 10.7, "Advanced analysis macro service documents" on page 187.

► Provide an indication of which job or jobs need to be investigated

Tracing jobs

A job trace collects and formats the following data:

► Calls and returns from the licensed programs and application programs
► Messages that occur during a job
► Data generated by trace points in the licensed program

Always start a trace before an error occurs, and then end it after the error occurs.

A job trace can affect that job's performance.

Each entry in the trace has an associated time stamp.

Tracing a job is sometimes necessary to provide a detailed view of the flow of a job. The information that is collected in a job trace is typically used by programmers and the IBM service and development teams. However, a job trace can also be useful for problem determination of your own applications.

Job traces and job logs are used as complementary tools to analyze a problem. Obtain these two spooled files concurrently.

The job trace function is documented in the iSeries Information Center at:

http://www.ibm.com/eserver/iseries/infocenter

Refer to it for details about:

► When to run a job trace
► How to run a job trace

11.1 Job tracing with STRTRC

The STRTRC, ENDTRC, DLTTRC, and PRTTRC *CL* commands supersede the function provided by the TRCJOB command. ADDTRCFTR and RMVTRCFTR are new trace commands available with i5/OS V5R4.

The Start Trace (STRTRC) command starts traces of original program model (OPM) programs and Integrated Language Environment® (ILE) procedures and Java programs (both compiled and JIT).

The benefits of using STRTRC include:

► Can trace other jobs (STRSRVJOB not required)

► Generic job trace support (Limit of one system wide generic trace)

► Trace up to eight jobs with one STRTRC command (i5/OS V5R3 or earlier)

► Trace compiled Java and Java JIT programs in addition to OPM (Original Program Model) and ILE (Integrated Language Environment) programs.

► You can specify a watch to automatically end the trace when the specified error occurs.

> **Note:** The TRCJOB command initiates job trace functions on systems prior to OS/400 V5R1. TRCJOB has a significant amount of run-time expense that affects the job being traced. The STRTRC command is available in OS/400 V5R1. STRTRC is superior in performance and functionality compared with TRCJOB. And beginning with i5/OS V5R4, TRCJOB uses STRTRC.
>
> Although TRCJOB exists on V5R1 through V5R3 systems, We recommend using STRTRC.

11.1.1 STRTRC

The STRTRC command is used to create and start traces.

> **Note:** To use the STRTRC command you must have *SERVICE special authority, or be authorized to the Service Trace function through iSeries Navigator's Application Administration support. CL commands are also available.
>
> A trace cannot be defined to trace all job names and all users.

To start a trace, enter the STRTRC command and press Enter. Refer to Figure 11-1 on page 193.

```
                          Start Trace (STRTRC)

 Type choices, press Enter.

 Session ID . . . . . . . . . . .                 Name, *GEN
 Jobs:
   Job name . . . . . . . . . . .    *            Name, generic*, *, *ALL
     User . . . . . . . . . . . .                 Name, generic*, *ALL
     Number . . . . . . . . . . .                 000001-999999, *ALL
   Thread ID to include . . . . .                 Thread ID, *ALL, *SELECT
               + for more values
               + for more values
 Job types  . . . . . . . . . . .    *ALL         *ALL, *ACTIVE, *NEW
 Maximum storage to use . . . . .    10000        1024-4000000 K
 Trace full . . . . . . . . . . .    *WRAP        *STOPTRC, *WRAP
 Trace type . . . . . . . . . . .    *ALL         *ALL, *FLOW, *DATA, *TRCTYPE




                                                                     Bottom
 F3=Exit    F4=Prompt    F5=Refresh    F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 11-1   Start Trace (STRTRC) screen 1 of 3

The session ID is used to identify the trace and is a parameter for the ENDTRC, PRTTRC, and DLTTRC *CL* commands. The session ID can either be user specified or system generated. The value for the session ID needs to be unique.

The Job name, User, Number, and Thread ID fields allow you to specify which job, jobs, or threads are traced. Generic names are supported for the Job name and User. By default, the current job is traced.

The Job types parameter allows you to specify which jobs that meet the selection criteria are traced, as follows:

► *ALL (default) - All jobs that meet the job name selection criteria are included in this trace collection. This includes jobs that are currently active and jobs that start after the trace begins.

► *ACTIVE - Only jobs that are currently active at the time this trace session is being activated and meet the job name selection criteria are included in this trace collection.

► *NEW - Only new jobs that begin after this trace session is activated and meet the generic job name selection criteria are included in this trace collection.

The maximum storage to use and Trace full parameters govern how space is used for the trace and if the trace is to be ended when the specified space limit is reached. The default is *WRAP to allow the trace to run until the problem occurs. Unless otherwise directed by service, specify *STOPTRC for the Trace full parameter to stop the trace.

The Trace type parameter specifies the types of job trace data to be stored in the trace file, as follows:

► *ALL - All the trace data collected is stored in trace records.

- ► *FLOW - The flow of control is traced when OPM programs and ILE procedures are called and when they return.

> **Note:** Requires an optimization level less than 40.

- ► *DATA - The data that is provided at predefined trace points within the operating system is stored in trace records. This includes trace records for the CL commands that have run.
- ► *TRCTYPE - Trace the specific components specified for the Trace type (TRCTYPE) parameter.

The STRTRC parameters are shown in Figure 11-2. See CHGPGM to call trace at high optimization.

```
                         Start Trace (STRTRC)

  Type choices, press Enter.


  Trace type:
    Component  . . . . . . . . . .   *NONE          Character value, *NONE...
    Trace level  . . . . . . . . .                  *ERROR, *INFO, *VERBOSE
                + for more values
  Trace filter . . . . . . . . . .   *NONE          Name, *NONE
  Restart after next IPL . . . . .   *NO            *NO, *YES
  Watch for message:
    Message identifier . . . . . .   *NONE          Name, *NONE
    Comparison data  . . . . . . .

    Compare against  . . . . . . .                  *MSGDTA, *FROMPGM, *TOPGM
                + for more values
  Watched message queue:
    Message queue  . . . . . . . .   *SYSOPR        Name, *SYSOPR, *JOBLOG...
      Library  . . . . . . . . . .    *LIBL         Name, *LIBL
                + for more values
                                                                       More...
  F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
  F24=More keys
```

Figure 11-2   Start Trace (STRTRC) screen 2 of 3

If *TRCTYPE is specified for Trace type, you can select the component and level under the Trace Type field. The component trace type values are listed in Table 11-1.

Table 11-1   Component trace descriptions and values

Trace Description	Value
ASP Management	*ASPMGT
Cluster Resource Services	*CLUSTER
Commitment Control	*CMTCTL
Database Host Server	*DBHSVR
Database SQL	*DBSQL
Device Configuration	*DEVCFG

Trace Description	Value
Directory Services	*DIRSRV
Extended Dynamic Remote SQL (EDRS)	*EDRSQL
Environment Variable APIs	*ENVVAR
File Server	*FILESVSR
Flight Recorder	*FLIGHTRCD
Host Print Transform	*HPT
HTTP Server powered by Apache	*HTTP
Integrated File System	*IFS
Interprocess Communication APIs	*IPC
Internet Print Protocol Driver	*IPPDRV
Lock Space Management	*LOCKSPACE
iSeries NetServer™	*NETSVR
Network Print Server	*NPS
Operational Assistant	*OPASSIST
OpenSSL APIs	*OPENSSL
POSIX Miscellaneous APIs	*POSIXMISC
POSIX Process Related APIs	*POSIXPROC
POSIX Thread APIs	*PTHREAD
QNTC File System	*QNTC
QShell	*QSHELL
Remote Access Services	*RAS
Registration Facility	*REGFAC
Software Security	*SECURITY
Socket APIs	*SOCKETS
TCP/IP Configuration	*TCPIPCFG
Thread Management	*THREADMGT
Work Management	*WRKMGT

The Trace level specifies how much data should be recorded by the specified component, as follows:

- ► *ERROR - Components typically trace error return codes, exception conditions, and invalid input. The amount of data is usually small.

- ► *INFO - Components typically trace entry and exit from interfaces, parameters and return codes, and major changes of flow or semantics caused by input or other decisions. The amount of data is moderate.

- ► *VERBOSE - This level includes INFO and ERROR trace level data. The amount of data can be large.

If you want the trace to continue after an IPL of the system, specify *YES for Restart after next IPL. Only one trace can be specified to restart on next IPL and only if at least one generic job name is specified in the Job name (JOB) parameter. (i5/OS V5R4 only).

Figure 11-3 shows the parameters available for watching jobs on i5/OS V5R3 systems or later.

```
                          Start Trace (STRTRC)

 Type choices, press Enter.


 Watched job:
   Job name . . . . . . . . . . .     *              Name, generic*, *
     User . . . . . . . . . . . .                    Name, generic*
     Number . . . . . . . . . . .                    000001-999999, *ALL
               + for more values
 Watch for LIC log entry:
   Major code . . . . . . . . . .    *NONE           0000-FFFF, *ALL, *NONE
   Minor code . . . . . . . . . .                    0000-FFFF, *ALL
   Comparison data  . . . . . . .


               + for more values
 Length of time to watch  . . . .    *NOMAX          1-43200, *NOMAX
 Trace program  . . . . . . . . .    *NONE           Name, *NONE
   Library  . . . . . . . . . . .                    Name, *LIBL
 Time interval  . . . . . . . . .    *NONE           1-9999, *NONE

                                                                      Bottom
 F3=Exit    F4=Prompt    F5=Refresh    F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 11-3   Start Trace (STRTRC) screen 3 of 3

Tracing jobs through the STRTRC command supports watches. When the watch condition is met, a user defined trace program, if one is specified in the trace program parameter, is called, and the trace is ended.

With i5/OS V5R4, watches can be independent of a trace. Watches are explained in Chapter 15, "Advanced function: Watch support" on page 265.

> **Note:** To determine what traces are active on a system at any point in time, you can use the WRKTRC command on an i5/OS V5R4 system. Messages are logged to QHST for each trace that is started and stopped. Monitor for CPC3921 for STRTRC and CPC3923 for ENDTRC.

11.1.2 ENDTRC

After the error has occurred, the trace needs to be ended. To end a trace type the ENDTRC command and press Enter. To see the additional parameters, press F9. See Figure 11-4 on page 197 for the parameters of the ENDTRC command.

```
                            End Trace (ENDTRC)

 Type choices, press Enter.

 Session ID . . . . . . . . . . .                  Name, *PRV
 Data option  . . . . . . . . . .   *LIB           *LIB, *DLT
 Data library . . . . . . . . . .   *CURLIB        Name, *CURLIB
 Replace data . . . . . . . . . .   *YES           *YES, *NO
 Print trace data . . . . . . . .   *NO            *NO, *YES




                                                                      Bottom
 F3=Exit F4=Prompt F5=Refresh F12=Cancel F13=How to use this display
  Parameter SSNID required.
```
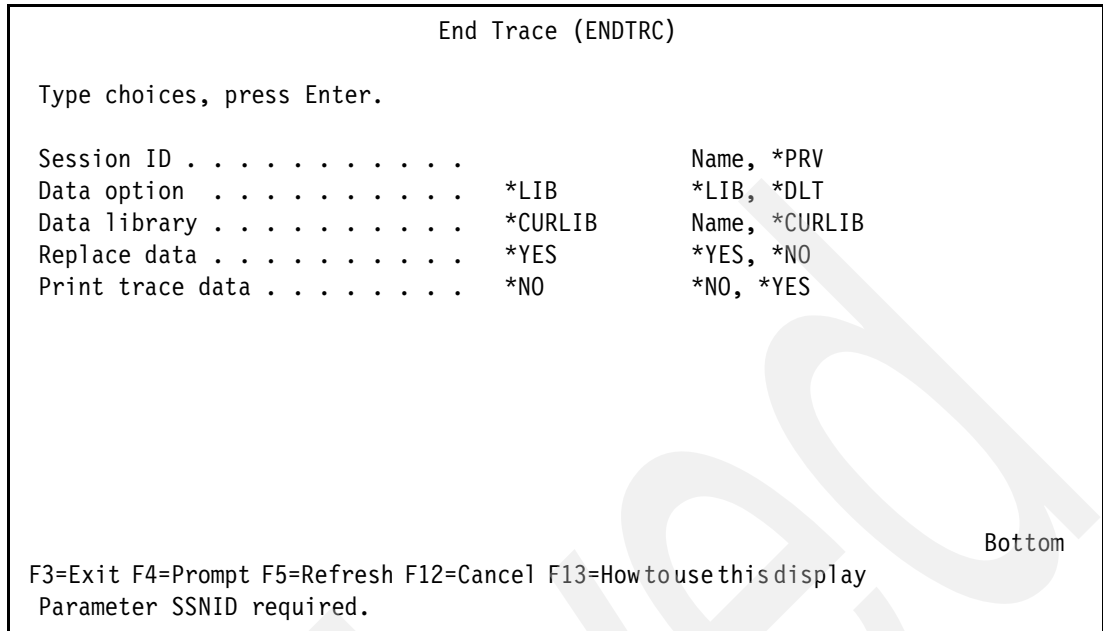
Figure 11-4   End Trace (ENDTRC)

Specify the session ID of the trace to be collected. The Data option parameter specifies if the trace data should be saved. Normally this is the case, but if not, specify *DLT to end the trace and delete the associated trace data. If you want the data to go into a library that is different from your current library, you can change the Data library to a library of your choice.

Optionally, the trace data can also be printed when saved by specifying *YES for Print trace data.

11.1.3 PRTTRC

The PRTTRC command allows you to print a trace. To print a trace, type the PRTTRC command and press F4. See Figure 11-5 on page 198 for an illustration.

```
                          Print Trace Data (PRTTRC)

 Type choices, press Enter.

 Data member  . . . . . . . . . .                  Name
 Data library . . . . . . . . . .   *CURLIB        Name, *CURLIB
 Select jobs  . . . . . . . . . .   *ALL           Name, generic*, *ALL
   User . . . . . . . . . . . . .                  Name, generic*, *ALL
   Number . . . . . . . . . . . .                  000001-999999, *ALL
               + for more values



 Delete trace . . . . . . . . . .   *NO            *YES, *NO
 Sort by  . . . . . . . . . . . .   *THREAD        *TIME, *THREAD
 Output . . . . . . . . . . . . .   *PRINT         *PRINT, *OUTFILE




                                                                         Bottom
 F3=Exit    F4=Prompt    F5=Refresh    F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 11-5 Print Trace Data (PRTTRC)

Specify the session ID for the Data member, and change the Data library if required. Unless directed by your service provider, leave the remaining parameters at their defaults.

The printed output shows up in a spooled file called QPSRVTRCJ with the user data section containing the session ID.

11.1.4 DLTTRC

Delete the trace data when you no longer need it since traces can consume a large amount of storage. To delete a trace, type in the DLTTRC command and press F4. Specify the session ID for the Data member, and change the Data library if required. See Figure 11-6 on page 199 for an illustration.

```
                          Delete Trace (DLTTRC)

 Type choices, press Enter.

 Data member  . . . . . . . . . .               Name
 Data library . . . . . . . . . .   *CURLIB     Name, *CURLIB












                                                                    Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```
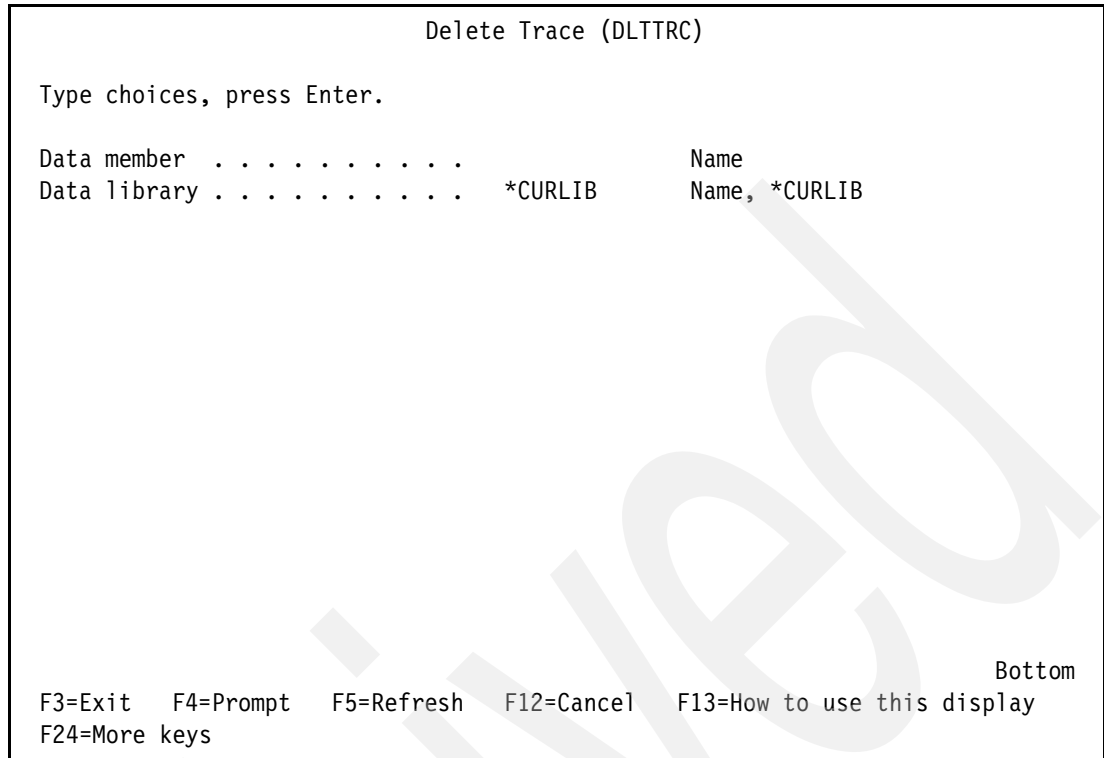
Figure 11-6   Delete Trace (DLTTRC)

11.2 Tracing your own job (STRTRC)

To run a trace on an interactive job at your session, perform the following steps:

1. Enter STRTRC on the command line, and press F4 to prompt the command.

   We recommend that you set the Maximum storage (MAXSTG) parameter to 16000 unless your service provider directs you to do differently.

2. Enter the commands, or run the program that creates the error.

3. End the trace after the error occurs.

11.3 Verifying the trace contains the error

Ensure that you have captured the job log and the job trace for the job (or jobs) that are related to the current problem. Follow these steps:

1. Look for the spooled file QPSRVTRC.
2. Type 5 in the Opt column next to the file QPSRVTRC that contains the trace.
3. Press the Enter key.

11.4 Other traces

Traces of other specific functions that are run at a job level on the System i are also documented in the iSeries Information Center. Refer to it for information on collecting these less common traces.

Table 11-2 lists the traces in this category.

Table 11-2   Additional traces

Trace	Command
Intersystem Communications Function (ICF)	TRCICF
CPI Communications	TRCCPIC
Cryptographic Services	TRCCS
Trace TCP Application	TRCTCPAPP

12

Database - Data Collection and Analysis

This chapter briefly describes several tools that can be used to collect and analyze data from your system to assist with database problem determination. A brief description of the function of each tool is provided along with a link to the Web site where detailed information on the use of the tool is provided, including instructions for downloading the tool, if necessary. Several of the tools must be obtained from IBM Database Support.

This chapter also provides information on problem analysis in a distributed database environment.

12.1 Data Collection Tools

In addition to the tools described in this chapter, there are many database tools and programming examples, too numerous to describe here, available on the iSeries Information Center site:

http://publib.boulder.ibm.com/infocenter/iseries/v5r3/ic2924/index.htm

under the **Database → Performance and Optimization** link.

12.1.1 Intelligent Communications Trace Analyzer for iSeries

The Communications Trace Analyzer tool is designed to help you analyze an iSeries Communications Trace (taken by either the STRCMNTRC command or the TRCCNN command) for various Performance, Connection and/or Security problems you might be experiencing.

The Analyzer asks you questions about the communications problem you suspect you are having and ask you where the trace is located. The Analyzer then reads in and analyzes the trace and shows you where problems might exist as well as its confidence that those are in fact real problems. It provides a detailed explanation of each problem it finds and offer advice as to how the situation might be resolved:

http://www-912.ibm.com/supporthome.nsf/document/33072549

12.1.2 STRDBG UPDPROD(*YES)

The Start Debug CL command (STRDBG) activates SQL and query engine messages for the job. These messages are sent to the job log and provide detailed information on the open data path (ODP) used and created and suggestions to improve performance. It gives a general idea of the query method being used and provides suggestions on indexes to build to improve performance.

12.2 DB Support Tools

The following tools are available through iSeries DB Support and can be used in conjunction with DB support personnel to analyze specific customer application environments.

12.2.1 DBMon

Database Monitor collects information about the SQL statements run by a job or system. The information collected includes: environment settings and job settings, each SQL statement that finished during the time of the DBMon run, the amount of time each SQL statement ran, how each statement was implemented and any indexes that could be created to improve the run time of the query. All of the information is put into a database file for further analysis. The complete layout of the file and field information is found in the Database Performance and Query Optimization book.

The Database Monitor is used when a job or system running SQL is experiencing performance problems or functional errors and more information is needed about the SQL statements that are being executed. Database monitor is most often used to analyze long running query statements and to obtain more information about message SQL7917.

12.2.2 QRYPRF

This Query Performance Facility tool is a set of menus that can be used to collect and analyze a detailed database monitor collection (STRDBMON). Options are provided for analyzing a database monitor collection, creating suggested indexes, and retrieving the current SQL statement from an active job.

Use this tool whenever you need to collect or analyze a database monitor collection. The tool is also useful for analyzing the files in the database to determine what indexes are already available. You can also retrieve the currently running SQL statement from an active job.

12.2.3 ANZDBFSTC

The Analyze Database File Statics (ANZDBFSTC) tool takes a job log of the statistics collection job (QDBFSTCCOL) and generates tables from the data that can be queried and analyzed easier.

Use this tool to find out what statistics are being collected, how often statistics are being collected, and in general how much work the statistics collection job is causing on the system. For example, you can determine if the same statistic is being refreshed multiple times throughout the day. You can also determine if the statistics collector is responsible for causing peaks of high disk input/output (IO), high page faulting, or is possibly the cause of an intermittent performance problem.

12.2.4 QRYODP

The Query Open Data Path (QRYODP) tool collects information for active jobs. The information includes the number of open data paths, the number of open SQL cursors, and the amount of temporary storage being used at the time the command was run.

This tool can be useful when looking at temporary storage problems. It can help you identify what jobs are taking up temporary storage. Or, if the DIRDUMP tool shows that most of the space is being consumed by QQSPC objects, then this tool can be helpful in finding the jobs that are using the QQSPC objects. You can also use this tool to determine how many data paths and SQL cursors are currently open for a specific job or system wide.

12.2.5 PRTSQLINF

The Print SQL Information tool produces a spool file containing information about the SQL statements that are related to a SQL package or a program with embedded SQL statements. The information gathered includes compile settings, the SQL statements, and the access plan.

Use PRTSQLINF to find SQL statements, check before and after compile options, and determine the implementation method used for each statement. PRTSQLINF can also be used to compare the current program object or SQL Package to one restored from a save prior to the problem occurring to identify any access plan differences.

12.2.6 CHKPF

The Check Damage on Physical Files (CHKPF) command allows you to check each physical file or table of a library for rows or records that cannot be read by the operating system. The command runs over a specific library or all libraries on the system. The command checks only the physical files and report errors. It does not perform any recovery.

12.2.7 DIRDUMP

DIRDUMP is a tool that can be used to investigate storage consumption problems. DIRDUMP examines the storage in use on a system at the time that it is run and summarizes that storage by object type/sub-type, segment type/sub-type, and object name. This gives an overall picture of the size and type of objects taking up space on the system.

DIRDUMP uses a dump of either the temporary or permanent directory as its input, depending on whether you are interested in examining temporary or permanent storage consumption. The addresses in the directory are resolved and records containing information about what is at each address are written to an output file. A query can then be run over the output file to produce reports summarizing this information.

DIRDUMP can function as an alternative or counterpoint to a Pex trace for investigating a storage consumption problem. A Pex trace is the ideal tool to use if it can be run while the storage consumption is occurring. If the storage growth has already stopped or is occurring so slowly that it would be difficult to run a Pex trace long enough to get a good sample, a DIRDUMP might provide some answers.

12.2.8 DMPPLS

The DMPPLS tool takes a snapshot of memory by taking a sample of pages in main storage and reporting the contents.

Use this tool when you need to find out what resides in memory. Understanding the contents of memory can prove useful when pursuing a temporary storage problem, when trying to explain the cause of page faults, when trying to understand the activity behind high paging, or when determining the memory usage profile of an application.

12.2.9 ANZDMPPLS

The Analyze Dump Pool Statics (ANZDMPPLS) tool provides two commands, ANZDMPPLS and STRDMPPLS. The STRDMPPLS command allows you to collect multiple pool dumps over a period of time. The ANZDMPPLS command takes the collected pool dump data and summarizes it so that it can easily be graphed and analyzed.

Use these commands when you need to monitor the contents of memory over a period of time. For example, this can be useful when trying to understand why faulting occurs on objects that should typically be in memory. This would answer the question "What pushed the objects out of memory?"

12.3 Distributed Database Problem Determination

Operating in a distributed database environment presents unique challenges in gathering data for problem determination because the information about an application's processing is contained in more than one job on multiple systems. The tools and techniques described earlier in this book for gathering Job Information and Job Logs, Job Traces, History Logs, and Communication Traces are all useful in analyzing problems in a distributed environment. The key to gathering data for distributed applications is knowing where to find the information for the application's remote jobs.

There are two messages that can be used to identify a remote job running as part of a distributed application, one of which appears in the source system's job log for each of the application's remote jobs. The specific message issued depends on the communication

protocol being used. In an SNA communication environment, CPI9150 is issued to identify each remote database job. In a TCP/IP communication environment, CPI9160 is used to identify each remote database job. Each message identifies one remote job on a remote system that was started as part of the distributed application, as well as specifics regarding the communication protocol being used.

A message is also placed in the source system's job log to indicate when an application's remote job ends. Again these messages are specific to the communication protocol being used. CPI9151 is issued when a remote job ends in an SNA environment. CPI-9161 is used to indicate when a remote job ends in a TCP/IP environment.

There are also messages in the application's remote job logs that can be used to identify which application source job caused the remote job to be started. Once again these messages are communication protocol specific. Message CPI-9152 is used to identify the remote source job and system when running over SNA. CPI-9162 identifies the remote source job and system in a TCP/IP environment.

Using the remote job and system information in these messages provides the complete picture of what a distributed database application is doing and where each part of the application's work is being executed. It is important to examine what is occurring in all jobs that are part of a distributed database application to effectively perform problem determination.

12.3.1 Trace TCP/IP Application Formatted Trace

Trace TCP/IP Application (TRCTCPAPP) is a useful tool for analyzing the communication flows between systems in a DDM or DRDA® distributed database environment. The tool can be used to trace DDM and DRDA application flows by specifying *DDM in the TCP/IP application (APP) parameter when starting the trace. The output from the trace can be formatted to easily identify the DDM and DRDA code points, chaining values, and other trace data by specifying "lvl=2" in the Argument list (ARGLIST) parameter when ending the trace. Note: "lvl=2" must be specified in lower case.

13

Communications problem determination

The purpose of this chapter is to provide:

► An overview of problem determination on i5/OS where network communications is involved

► An approach to i5/OS problem determination for communications-related problems

There are many possible approaches to problem determination when communications between systems are involved.

The methods suggested here are some of the possible approaches. The most appropriate steps in any situation depend on the protocol and the topology of the network concerned.

13.1 Introduction to communications problem determination

Once you understand the concept of a layered communications model and how it relates to i5/OS, you are able to select the most appropriate problem determination tool.

13.1.1 The communications model

The communications model shown in Figure 13-1 is a generic, or hybrid, model. It shows the relationship of the layers as data is sent from the application to the communications link, and similarly, the inbound flow from the link to the application.
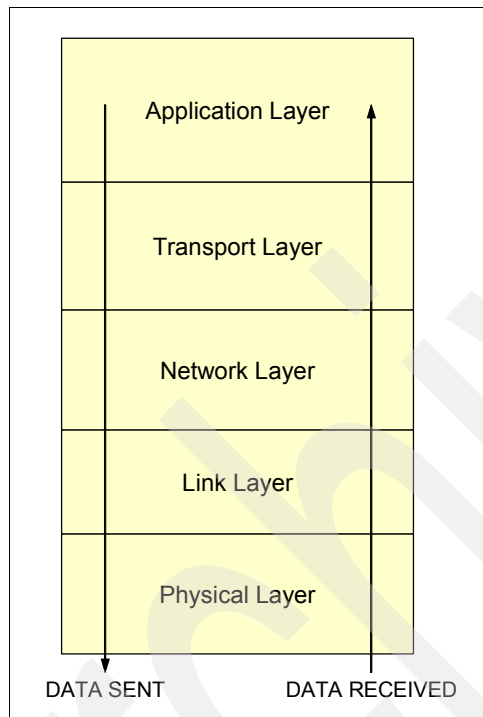
Figure 13-1   Layered communications model

As the data is passed down the layered model (or stack), the system adds the appropriate packaging around the data as it passes through each layer. This packaging is sometimes referred to as *encapsulation*. When the encapsulated data is presented to the partner in the conversation (system or application), the data is passed up through the layers. The packaging is removed at each layer before being presented to the layer above it in the model.

The model (shown in Figure 13-1) is representative of all communications architectures and protocols. The functions of the five layers in the model are summarized in Table 13-1.

Table 13-1   Communications model: Layer functions

Layer	Function
Application layer	This depends on the application. An example is a communications application Telnet or display station pass through (DSPT).
Transport layer	The primary function of this layer is to add reliability.
Network layer	This layer provides logical switching or routing.

Layer	Function
Link layer	This layer is where the protocol is implemented, for example: SDLC, X.25, and IP.
Physical layer	This refers to the hardware adapters, interfaces, and cables.

13.2 Communications problem determination

This section presents a collection of ideas and procedures that relate to problem determination in communications networks, where System i servers can participate as a communications partner.

Use the following tools to enable your service provider to gather sufficient information about your communications environment and to perform problem determination.

13.2.1 A network diagram

One of the most important tools that you can use in the problem determination process, where communications is concerned, is a network diagram. There is no IBM system tool to produce a network diagram as part of the configuration process. Therefore, this very important piece of documentation is often overlooked.

Keep the network diagram simple, but be sure to include all of the information that relates to the following areas:

- ► System names
- ► System addresses
- ► Methods of connection
- ► Link types
- ► Link speeds
- ► Protocols
- ► Routes

An example of a simple SNA network diagram is shown in Figure 13-2 on page 210. The diagram shows the legacy Electronic Customer Support (ECS) network. Current ECS connectivity is TCP/IP based and supports a wide range of connectivity options.
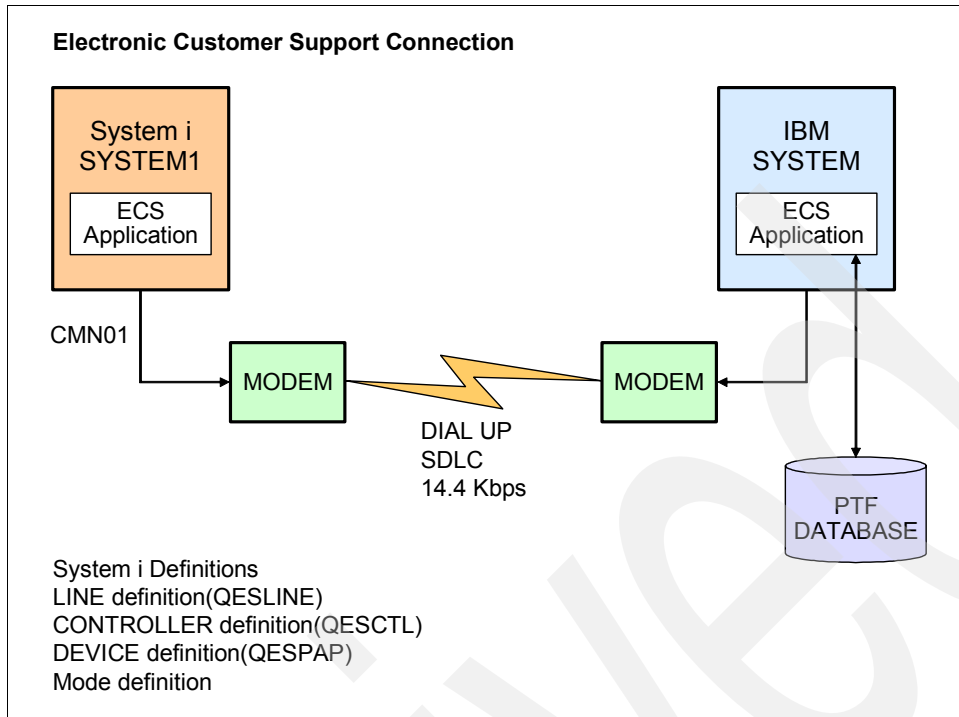
Figure 13-2   Example of a simple network diagram

13.2.2 Configuration definitions

i5/OS configuration services provide a set of facilities for controlling and maintaining configuration information. An understanding of the communications objects defined in the following sections provides valuable knowledge to those performing problem determination in a network.

The i5/OS architecture hierarchy of communications objects is shown in Figure 13-3.
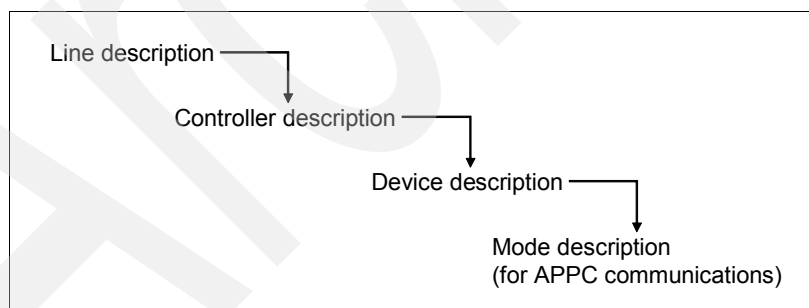
Figure 13-3   i5/OS architecture hierarchy of communications objects

The Work with Configuration Status display represents this hierarchy by showing the dependent object indented below its parent object.

Line description

The line description is a definition of the way in which a communications port is to be used. The line description selects the particular data link protocol and the physical and logical parameters that condition the protocol's behavior.

Several line descriptions can be defined for any one hardware resource, but only one definition can be active at any one time.

Controller description
The controller description describes the characteristics of the remote system or remote workstation controller. A controller description is required for each adjacent system or remote controller that communicates with the system.

Device description
The device description defines the characteristics of the physical or logical devices with which the system communicates. A device description is required for each device connected to a controller.

Mode description
The mode description defines the number of sessions (or conversations) that can be conducted simultaneously over a connection between two systems. The mode description is used in Systems Network Architecture (SNA) connections.

Interface definition
An interface must be defined in TCP/IP communications to allocate the network address to the physical resource that uses the protocol. It must also define the addressing structure used for the network in which the system participates.

Network interface definition or NWS
A network interface definition is similar to a line description. It defines the connection to a network where proprietary communications protocols are used. An example of this would be setting up a Windows server on an Integrated xSeries® Server.

13.2.3 Retrieving the configuration source

The Retrieve Configuration Source (RTVCFGSRC) command captures the parameters required to create the communications object, into a source physical file. When compiled into a CL program and run as an application, the configuration objects in question can be re-created as required.

The information gathered by using the RTVCFGSRC command is very useful in problem determination. It provides another mechanism to document system configuration objects and the parameters used to generate them. There is no easy method to guarantee that the information stored on the system is used in the system. That is to say, the existence of a definition does not guarantee that it is needed on the system. System administrators need to control the existence or accuracy of this information manually.

The display in Figure 13-4 on page 212 shows the RTVCFGSRC command parameters.

```
                  Retrieve Configuration Source (RTVCFGSRC)

 Type choices, press Enter.

 Configuration description  . . . > QESLINE        Name, generic*, *ALL
                 + for more values
 Type . . . . . . . . . . . . . . > *LIND          *ALL, *NWSD, *NWID, *LIND...
 Source file  . . . . . . . . . .   QCLSRC         Name, QCLSRC
   Library  . . . . . . . . . . .     *LIBL        Name, *LIBL, *CURLIB
 Source member  . . . . . . . . .   *CFGD          Name, *CFGD
 Retrieve option  . . . . . . . .   *NET           *NET, *OBJ

                            Additional Parameters

 Member option  . . . . . . . . .   *REPLACE       *ADD, *REPLACE
 Text 'description' . . . . . . .   *CFGDTXT




                                                                    Bottom
 F3=Exit    F4=Prompt    F5=Refresh    F12=Cancel    F13=How to use this display
 F24=More keys
```

Figure 13-4   RTVCFGSRC example

The default for the Retrieve option parameter is *NET. For nonswitched lines, all the attached controllers and devices are retrieved at the same time. For switched lines, run separate RTVCFGSRC commands for the individual configuration objects of the switched network.

An example of the output from the retrieve operation is shown in Figure 13-5.

```
 Columns . . . :    1  71             Edit                          QGPL/QCLSRC
  SEU==>                                                              QESLINE
  FMT **   ...+... 1 ...+... 2 ...+... 3 ...+... 4 ...+... 5 ...+... 6 ...+... 7
       *************** Beginning of data *************************************
 0000.01 /*                              QESLINE    11/03/07 13:00:46 */
 0000.02 CRTLINSDLC LIND(QESLINE) RSRCNAME(CMN01) ONLINE(*NO) ROLE(*SEC) +
 0000.03          INTERFACE(*RS232V24) CNN(*SWTPP) VRYWAIT(*NOWAIT) +
 0000.04          AUTOCALL(*NO) EXCHID(05687BF0) NRZI(*YES) MAXCTL(1) +
 0000.05          CLOCK(*MODEM) LINESPEED(2400) MODEM(*V54) MODEMRATE(*FULL) +
 0000.06          SWTCNN(*DIAL) AUTOANS(*NO) AUTODIAL(*YES) DIALCMD(*V25BIS) +
 0000.07          CALLNBR(*NONE) STNADR(1C) MAXFRAME(521) THRESHOLD(*OFF) +
 0000.08          DUPLEX(*HALF) MODULUS(8) MAXOUT(7) INACTTMR(300) +
 0000.09          POLLRSPDLY(0) LINKSPEED(9600) COSTCNN(128) COSTBYTE(128) +
 0000.10          SECURITY(*NONSECURE) PRPDLY(*TELEPHONE) USRDFN1(128) +
 0000.11          USRDFN2(128) USRDFN3(128) DSRDRPTMR(6) AUTOANSTYP(*DTR) +
 0000.12          CTSTMR(25) RMTANSTMR(60) CMNRCYLMT(2 5) TEXT(*BLANK)
```

Figure 13-5   RTVCFGSRC output example

13.2.4 Configuration status

The Work with Configuration Status (WRKCFGSTS) command is frequently the entry point for communications problem determination, since the status of the configuration object (line, controller, or device) represents the primary symptom of the problem.

Figure 13-6 shows an example of the WRKCFGSTS display for an operation using an Electronic Customer Support (ECS) connection. Note the various values for the status. These are explained in Table 13-2 on page 214. It also shows the configuration objects that define the Electronic Customer Support (ECS) connection during the connection process.

```
                      Work with Configuration Status            ITSOSYS1
                                                           09/07/07  00:53:19
 Position to  . . . . .                   Starting characters


 Type options, press Enter.
   1=Vary on   2=Vary off   5=Work with job   8=Work with description
   9=Display mode status    13=Work with APPN status...


 Opt   Description       Status           ------------Job--------------
       QESLINE           CONNECT PENDING
         QESCTL          VARY ON PENDING
           QESPAP        VARY ON PENDING
             *UNKNOWN    VRYONP/ALLOCATE     QPADEV000M  OPER01      082243






                                                                    Bottom
 Parameters or command
 ===>
 F3=Exit   F4=Prompt   F12=Cancel   F23=More options   F24=More keys
```

Figure 13-6   ECS connection in progress

Figure 13-7 shows the status for a successful connection. Refer to Table 13-2 for an explanation of the status of each configuration object.

```
                    Work with Configuration Status            ITSOSYS1
                                                        09/07/07  00:53:39
 Position to  . . . . .                Starting characters

 Type options, press Enter.
   1=Vary on   2=Vary off   5=Work with job   8=Work with description
   9=Display mode status    13=Work with APPN status...

 Opt  Description      Status                 ------------Job-------------
      QESLINE          ACTIVE
        QESCTL         ACTIVE
          QESPAP       ACTIVE
            *UNKNOWN   ACTIVE/ALLOCATE        QPADEV000M  OPER01      082243




                                                                     Bottom
 Parameters or command
 ===>
 F3=Exit   F4=Prompt   F12=Cancel   F23=More options   F24=More keys
```

Figure 13-7   Successful ECS connection

Table 13-2 provides an explanation of the common configuration status. For an explanation of other statuses, place the cursor on the Status column of the Work with Configuration Status and press F1.

Table 13-2   Communication object status

Status	Description
Varied off	The system is not using the communications object.
Vary on pending	The system is varying the object on. Responses are pending from the remote system.
Varied on	The system has established capability to communicate through the communications object. A message is sent to QSYSOPR.
Connect pending	Switched connections remain in this state until communication is established.
Active	A connection has been made with the remote system with the device represented by the communications object at the next lower level in the hierarchy.
Recovery pending	An error has occurred and a message has been sent to QSYSOPR. The reply to the message determines the next action to be taken.
Recovery cancelled	Error recovery has been cancelled as a result of the reply to the message posted to QSYSOPR. A message is sent to QHST.

Status	Description
Failed	An error occurred that can only be recovered with a vary off and vary on of the communications object. Some situations require an IOP reset. A message is sent to QHST. A Product Activity Log (PAL) or error log, and a LIC log entry are made.
*Damaged	A low level instruction failed to complete and the communications object must be re-created to resume operation. A LIC log entry is made.
Locked	The status of the communications object cannot be determined due to an object lock. Use the WRKOBJLCK command to determine where the lock is held.
Unknown	The status indicator cannot be determined. This is an error condition. Use the DMPOBJ command and report the condition to your service provider.
Sign On display	The subsystem is performing sign-on processing. The sign-on display is not necessarily shown on the display.
System request	The System Request function has been invoked on a display. The interactive session on the device is stopped, until the session resumes.
Held	A lock is held on the device that is preventing communication.

13.2.5 Messages

Messages related to communications failures are sent to the QSYSOPR message queue by default, or to message queues associated with line descriptions and controller descriptions. See the QCFGMSQ system value.

Many of the messages that relate to communications errors require a reply. The action that the system takes in response to the error is conditioned by the reply to the message issued to the system operator message queue.

To further understand message options, refer to the following chapters:

► Chapter 4, "Collecting messages" on page 35
► Section 4.5, "Messages in the system operator message queue (QSYSOPR)" on page 56
► Chapter 6, "Collecting the history log (QHST)" on page 91

In many instances, the help text of the message provides enough detail to identify the cause of the problem, or additional information required by your service provider to analyze the problem. The possible causes are listed along with return codes and cause codes that relate directly to the condition that has produced the communications symptom being experienced.

13.2.6 Problem analysis: F14 on messages

i5/OS uses a problem analysis mechanism on many messages issued to the system operator message queue. This mechanism allows the operator to quickly gain access to problem determination and problem reporting. Messages where this feature is available are identified on the display with an asterisk.

The display in Figure 13-8 shows a message, at which you can press the F14 key to perform problem analysis.

```
                          Display Messages
                                                  System:    ITSOSYS1
 Queue . . . . . :   QSYSOPR              Program . . . . :    *DSPMSG
   Library . . . :    QSYS                  Library . . . :
 Severity . . . :   00                    Delivery . . . :    *HOLD


 Type reply (if required), press Enter.
   Directory not registered. (C G)
     Reply . . :   C
   Cleanup of operator and work station messages started.
   Cleanup of user messages started.
   Cleanup of job logs and other system output started.
   User cleanup program started.
   User cleanup program successfully completed.
   Cleanup of operator and work station messages successfully completed.
   000007 of 000053 messages deleted from QPGMR.
   000010 of 000020 messages deleted from QTCP.
   Cleanup of user messages successfully completed.
 * System cannot call controller QESCTL. No lines available. (C R)
     Reply . . :   C
                                                                More...
 F3=Exit              F11=Remove a message            F12=Cancel
 F13=Remove all       F16=Remove all except unanswered     F24=More keys
```

Figure 13-8   QSYSOPR: F14 Work with problem allowed for message

The system problem log (WRKPRB)

Once a problem is detected by the system or perceived by the user, problem determination procedures can be run. The results of these actions can be submitted to your service provider by using either the WRKPRB or ANZPRB command.

Refer to Chapter 7, "Problem log and Save APAR Data" on page 105, for more information on using the system problem log.

13.2.7 Verify Communications (VFYCMN)

The Verify Communications (VFYCMN) command is used to help ensure that the communications equipment operates correctly. The procedure is used to test communications components at the following levels:

► Link tests

  – Remote modem test
  – Local modem test
  – Cable wrap test
  – Communications input/output adapter wrap test
  – Link test
  – Communications interface trace
  – Concurrent LPDA-2 tests

► Wireless Network Management Utility tests

Local and remote modem tests depend on the modems involved to support the Link Problem Determination Aid procedures (LPDA-1 and LPDA-2).

The type of line being verified determines which of the tests are executed.

A subset of these tests is available in the System Service Tools:

► Adapter internal test
► Adapter wrap test

Verification tests run on the I/O adapter and cable require a wrap connector to complete the tests. If necessary, consult your hardware service provider before proceeding with these tests. The display in Figure 13-9 is shown to notify the operator to use the SST options.

```
 AJCUJ047              Problem Analysis


 Hardware tests for this resource are supported under system service
 tools. Perform the following after exiting:

   Vary off the resource.

   From the command line enter the following command:

     STRSST
       Select Start a service tool.
       Select Hardware service manager.
       Display Logical hardware resources.
       Display System bus resources.
       Display Resources associated with IOP.
       Select verify on CMN01



   Press enter to continue



 F3=Exit
```

Figure 13-9   Communication verification tests

13.2.8 Communications trace

The communications trace facility is a service function to allow the capture of data on a communications line. The user must have special authority of *SERVICE in the user profile to run a communications trace. Alternatively the user can have QIBM_Service_Trace with the CHGFCNUSG command.

The trace facility has the following CL command interfaces in addition to the System Service Tools menu:

► STRCMNTRC
► ENDCMNTRC
► CHKCMNTRC
► DMPCMNTRC
► PRTCMNTRC

► DLTCMNTRC

Once the data is traced, it can be formatted and placed in a spooled file for printing or browsing. The trace data can also be written to an output file in an unformatted manner.

For further information, refer to Chapter 14, "Collecting a communications trace" on page 237.

13.2.9 Licensed Internal Code Trace (TRCINT)

The Licensed Internal Code (LIC) trace (TRCINT) is a service function to allow the capture of the data and internal control blocks at the LIC level. This tool requires some preliminary problem determination activity. In most cases, specific direction from your service provider is required.

The TRCINT function is the CL command interface to the service tool. It is most commonly used in the collection of what is known as a *TCP/IP component trace*, in relation to communications errors. The LIC trace has a large number of other trace options.

Seek assistance from your service provider to ensure that the trace captures the required information.

The display in Figure 13-10 shows the options for the TCP/IP component trace. For further information, refer to Chapter 24, "Tracing the Licensed Internal Code" on page 361. That chapter also includes information about using a source/sink trace in SNA networks.

```
                     Display Command String

 TRCINT SET(*ON)
        TRCTBL('ITSO trace of TCP/IP')
        SIZE(512 *MB)
        TRCFULL(*WRAP)
        TRCTYPE(*TCPIP)
```

Figure 13-10   TRCINT: TCP/IP component trace

13.3 SNA communications

In addition to the problem determination aids listed in the previous section, the items in the following sections apply to communications within Systems Network Architecture (SNA).

13.3.1 SNA sense codes

Some messages issue SNA sense codes, as shown in Figure 13-11 on page 219. This screen displays sense code 08040000. The meaning of this sense code is:

8004 Unrecognized Destination:

A node in the path has no routing information for the destination specified either by the SLU name in a BIND request or by the transmission header (TH). Refer to the latest

version of *Systems Network Architecture Formats,* GA27-3136, for information about this sense code.

```
                     Additional Message Information

 Message ID . . . . . . :   CPI5906      Severity . . . . . . . :    70
 Message type . . . . . :   Information
 Date sent  . . . . . . :   09/07/07 Time sent  . . . . . . :    00:53:35


 Message . . . . :   Local system sent SNA negative response data to controller
   QESCTL on device *N.
 Cause . . . . . :   The remote system may have sent Systems Network
   Architecture (SNA) data that does not conform to SNA protocols or the
   configuration is not correct.
 Recovery  . . . :   If the controller is a host system, this may not be an
   error.
     If the controller is a host-type controller, the remote system may have
   more logical units varied on than there are device descriptions configured
   or varied on and attached to the controller at the local system.
     If the controller is an advanced program-to-program communications (APPC)
   controller or host-type controller, verify the following device description
   and mode parameters on both the local system and the remote system:
     -- LCLLOCNAME (local location name)
     -- RMTLOCNAME (remote location name)
     -- MODE       (mode)
     -- LCLCTLSSN  (locally controlled session)
     -- MAXSSN     (maximum session)
 Technical description . . . . . . . . :   The error log identifier is *N.  The
   local system sent either SNA sense code 80040000 or SNA UNBIND type *N.
   Sense data and UNBIND types are described in SNA Formats, GA27-3136.
```

Figure 13-11   SNA sense code

Refer to *Systems Network Architecture Formats,* GA27-3136 at:
http://www-1.ibm.com/support/docview.wss?uid=pub1ga27313619
or a tool such as GetSense for the meaning of the individual codes. GetSense is supplied with Personal Communications, which is part of the client component of the iSeries Access product.

13.3.2 Communications error recovery

Communications errors can be classified by several different classes:

► **Class 1 errors:** Are data transmission and integrity errors
► **Class 2 errors:** Leave the affected resource in a PENDING state
► **Class 3 errors:** Require the affected resource to be varied off and on
► **Class 4 errors:** Are application or program errors

The problem determination and recovery performed to handle the errors at these levels involve the analysis of communications parameters such as:

► Communication object configuration parameters (retry and time-out)
► System values (such as QCMNRCYLMT)

The problem determination and recovery also includes such activities as:

► Resetting the status of the communications object
► Handling the errors issued to the QSYSOPR message queue

Refer to the following reference for information about using the retry and time-out settings:

http://www.ibm.com/eserver/iseries/infocenter

When you reach this site, click **Systems management** → **System values** → **System value categories** → **System values: Performance overview** → **Performance system values: Communications configuration recovery.**

13.3.3 Verifying an APPC connection

The Verify APPC Connection (VFYAPPCCNN) command, also known as APING, exchanges data packets between the local location and the specified remote location using Advanced Program-to-Program Communications, and measures the round-trip time of each data packet exchange iteration. This command can be useful to:

► Confirm an APPC link between two systems is active and available
► Confirm a particular mode is started and can be used to start a conversation
► Determine the time taken to allocate a conversation
► Determine the performance characteristic of a link (round trip response times)

> **Note:** For this function to work, the remote location specified must be running the target portion of this function, APINGD (APING daemon).

For an example of the output generated by VFYAPPCCNN, refer to Figure 13-12.

```
                          Command Entry                        ITSOSYS1
                                                     Request level:   1
 Previous commands and messages:
   > VFYAPPCCNN RMTLOCNAME(ITSOSYS2) MODE(#INTER)
     Verifying APPC connection to remote location ITSOSYS2 on mode #INTER.
     Allocate took .041 seconds.
     Remote system type is i5/OS.
     Initial exchange took .027 seconds.
     Iteration 1 took .001 seconds.
     Iteration 2 took .001 seconds.
     Round-trip (in milliseconds) min/avg/max = 1/1/1



                                                                  Bottom
 Type command, press Enter.
 ===>



 F3=Exit    F4=Prompt    F9=Retrieve    F10=Include detailed messages
 F11=Display full      F12=Cancel    F13=Information Assistant    F24=More keys
```

Figure 13-12   Results of a VFYAPPCCNN command

13.3.4 Troubleshooting APPN and HPR

If you have a communication problem specifically related to APPN and HPR running over your system, reviewing the following iSeries Information Center topics might also help in troubleshooting:

- ► Solve remote communication problems using STRPASTHR
- ► Solve communication problems using DSPAPPNINF
- ► Solve communication problems using WRKAPPNSTS

They can be found at:

http://www.ibm.com/eserver/iseries/infocenter

When you reach this site, click **Networking** → **Network communications** → **APPC, APPN, and HPR** → **Troubleshooting APPN and HPR.**

13.4 TCP/IP communications

The following items relate specifically to problem determination in a TCP/IP network involving System i configurations.

13.4.1 Using PING to verify a TCP/IP connection

The iSeries Information Center has a complete TCP/IP troubleshooting article. Information in this book highlights the key points.

The PING (or VFYTCPCNN) command is the most commonly used diagnostic tool in a TCP/IP environment. PING runs a procedure to verify that a connection to another machine is possible.

The PING command can use LOOPBACK as a parameter, in place of a system name or TCP/IP address, to verify the capability of the TCP/IP stack (software) within the system, for example, PING LOOPBACK compared to PING system-name or ip-address.

Refer to the following reference for information about using the PING command:

http://www.ibm.com/eserver/iseries/infocenter

When you reach this site, click **Networking** → **TCP/IP Troubleshooting** → **Troubleshooting tools and techniques** → **Tools to verify your network structure** → **Ping.**

13.4.2 Using TRACEROUTE to trace the route of an IP packet

The TRACEROUTE (or TRCTCPRTE) command can be used to trace the route of IP packets (known as probes) sent to another system. The display in Figure 13-13 shows the TRACEROUTE command parameters.

```
                        Trace TCP/IP Route (TRACEROUTE)

 Type choices, press Enter.

 Remote system . . . . . . . . . >



 Range of hops to probe:
   Starting probe TTL (hop limit)   1                1-255
   Maximum probe TTL (hop limit)    30               1-255
 Probes sent per hop  . . . . . .   3                1-64
 Response wait time . . . . . . .   3                1-120
 Packet length (in bytes) . . . .   40               40-65535
 Output . . . . . . . . . . . . .   *MSG             *MSG, *VERBOSE, *DTAQ




                                                                       Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F10=Additional parameters   F12=Cancel
 F13=How to use this display       F24=More keys
```

Figure 13-13 TRACEROUTE parameters

In the Remote system prompt, type the IP address or name of the system to be traced and press Enter. Results similar to those in Figure 13-14 on page 223 show how the probes reached the destination system.

```
                               Command Entry                            ITSOSYS1
                                                                Request level:   1
       Previous commands and messages:
          > TRACEROUTE RMTSYS('199.169.9.151')
            Probing possible routes to 199.169.9.151 using *ANY interface.
            1 192.168.9.117   0.518 0.532 0.456
            2 192.168.9.107   0.460 0.472 0.383




                                                                            Bottom
       Type command, press Enter.
       ===>



       F3=Exit   F4=Prompt    F9=Retrieve   F10=Include detailed messages
       F11=Display full        F12=Cancel    F13=Information Assistant   F24=More keys
```

Figure 13-14   TRACEROUTE results

Each line of the results show the IP address of each hop the packet traversed and also the response times in milliseconds. In this example, there are two hops and the response times for each of the three probes sent. If no response was received for a hop within the specified time, an * is displayed instead.

Refer to the following reference for information about using the TRACEROUTE command:

http://www.ibm.com/eserver/iseries/infocenter

When you reach this site, click **Networking** → **TCP/IP Troubleshooting** → **Troubleshooting tools and techniques** → **Tools to verify your network structure** → **Trace route.**

13.4.3 Using NETSTAT to work with the status of TCP/IP network

The Network Status (NETSTAT or WRKTCPSTS) allows you to display information about the status of the TCP/IP interfaces, routes and connections. The NETSTAT command displays a menu, which is shown in Figure 13-15 on page 224.

```
                     Work with TCP/IP Network Status
                                                        System:    ITSOSYS1
   Select one of the following:

       1. Work with TCP/IP interface status
       2. Display TCP/IP route information
       3. Work with TCP/IP connection status
       4. Work with IPv6 interface status
       5. Display IPv6 route information
       6. Work with IPv6 connection status







   Selection or command
   ===>

   F3=Exit    F4=Prompt    F9=Retrieve    F12=Cancel
```

Figure 13-15   NETSTAT menu

Options 1 to 3 display information about the Internet Protocol Version 4 (IPv4) network.
Options 4 to 6 display information about the Internet Protocol Version 6 (IPv6) network.

> **Tip:** To bypass this screen for options 1 to 3, you can use the Option parameter, specifying
> *IFC (interfaces), *RTE (routes) or *CNN (connections). In V5R4 there are no parameters
> to bypass this screen for IPv6 networks. You can press F20 on the subsequent screens to
> work with the corresponding IPv6 network displays.

Basic information about the options is contained in this chapter.

Refer to the following reference for information about using the NETSTAT command:

http://www.ibm.com/eserver/iseries/infocenter

When you reach this site, click **Networking** → **TCP/IP Troubleshooting** → **Troubleshooting
tools and techniques** → **Tools to verify your network structure** → **Netstat.**

13.4.4 Using NETSTAT to work with the status of TCP/IP interfaces

Selecting option 1 (Work with TCP/IP interface status) or option 4 (Work with IPv6 interface
status) on the Work with TCP/IP Network Status menu shows the status of each link as
shown in Figure 13-16 on page 225. This example uses an IPv4 network.

```
                   Work with TCP/IP Interface Status
                                                    System:    ITSOSYS1
 Type options, press Enter.
   5=Display details   8=Display associated routes   9=Start   10=End
   12=Work with configuration status   14=Display multicast groups

     Internet           Network            Line      Interface
 Opt Address            Address            Description  Status
     9.15.129.42         9.15.129.0        ETHLIN01    Active
     129.0.0.3           129.0.0.3         *LOOPBACK   Active
     175.29.29.13       175.29.29.13       VLAN02LAN   Active
     175.29.29.14       175.29.29.18       VLAN01HTBT  Active
     175.29.29.16       175.29.29.17       VLAN03GE01  Inactive
     175.29.29.19       175.29.29.20       VLAN04GE02  Inactive
     175.29.29.20       175.29.29.22       VLAN05GE03  Inactive
     175.29.29.27       175.29.29.28       VLAN06GE04  Inactive
     195.169.9.129      195.169.9.99       ETHLIN02    Active




                                                              Bottom
 F3=Exit   F9=Command line   F11=Display line information   F12=Cancel
 F13=Sort by column          F20=Work with IPv6 interfaces  F24=More keys
```

Figure 13-16   Work with TCP/IP Interface Status

This example shows a number of interfaces are active while others are inactive. For more
information on other statuses move the cursor to the Interface Status column and press F1.
From this display you can start, stop, or display more detailed information about an interface.

13.4.5 Using NETSTAT to display TCP/IP routes

Selecting option 2 (Display TCP/IP route information) or option 5 (Display IPv6 route information) on the Work with TCP/IP Network Status menu shows the ultimate destination of each route as shown in Figure 13-17. This example uses an IPv4 network.

```
                     Display TCP/IP Route Information
                                                    System:    ITSOSYS1
 Type options, press Enter.
   5=Display details


     Route               Subnet             Next                Route
 Opt Destination         Mask               Hop                 Available
     9.15.90.0           255.255.255.129 *DIRECT                *YES
     129.0.0.0           255.0.0.0          *DIRECT             *YES
     175.25.26.24        255.255.255.252    *DIRECT             *NO
     175.25.26.20        255.255.255.252    *DIRECT             *NO
     175.25.26.16        255.255.255.252    *DIRECT             *NO
     175.25.26.12        255.255.255.252    *DIRECT             *NO
     175.25.26.8         255.255.255.252    *DIRECT             *YES
     175.25.26.0         255.255.255.248    *DIRECT             *YES
     195.168.8.0         255.255.255.0      *DIRECT             *YES
     225.0.0.1           241.0.0.1 *         DIRECT             *YES
     225.0.0.1           241.0.0.1          *DIRECT             *NO
     225.0.0.1           241.0.0.1          *DIRECT             *NO
     225.0.0.1           241.0.0.1          *DIRECT             *NO
                                                                    More...
 F3=Exit   F5=Refresh    F9=Command line   F11=Display route type   F12=Cancel
 F13=Sort by column      F20=Display IPv6 routes   F24=More keys
```

Figure 13-17   Display TCP/IP Route Information

Select option 5 for more detailed information about a route.

13.4.6 Using NETSTAT to work with the status of TCP/IP connections

Selecting option 3 (Work with TCP/IP connection status) or option 6 (Work with IPv6 connection status) on the Work with TCP/IP Network Status menu shows information about each connected remote host, as shown in Figure 13-18. This example uses an IPv4 network.

```
                    Work with TCP/IP Connection Status
                                                    System:    ITSOSYS1
 Type options, press Enter.
   3=Enable debug   4=End   5=Display details   6=Disable debug
   8=Display jobs


     Remote            Remote        Local
 Opt Address           Port          Port      Idle Time  State
     *                 *             daytime   167:24:25  Listen
     *                 *             daytime   167:24:25  *UDP
     *                 *             ftp-con > 009:45:54  Listen
     *                 *             telnet    001:10:32  Listen
     *                 *             time      167:24:25  Listen
     *                 *             time      167:24:25  *UDP
     *                 *             netbios > 167:20:26  Listen
     *                 *             netbios > 000:00:03  *UDP
     *                 *             netbios > 000:01:24  *UDP
     9.15.120.65       3823          netbios > 000:18:17  Established
     195.199.9.105     1047          as-rmtcmd 000:27:23  Established
     195.169.9.105     1056          as-file   001:35:59  Established
                                                             More...
 F3=Exit   F5=Refresh   F9=Command line   F11=Display byte counts   F12=Cancel
 F20=Work with IPv6 connections   F22=Display entire field   F24=More keys
```

Figure 13-18   Work with TCP/IP Connection Status

From this display you can end, debug, display detailed information or display the jobs or tasks using a connection.

Note: The debug option is used in conjunction with the Trace Internal (TRCINT) command with parameters of TRCTYPE(*SCK) and SCKDTA(*N *N () *SODEBUG). For more information on running internal traces, refer to Chapter 24, "Tracing the Licensed Internal Code" on page 361.

13.4.7 Status of TCP/IP server jobs

iSeries Navigator provides a function to display the status of all TCP/IP servers in one window, which is shown in Figure 13-19. To navigate to this window, use **iSeries Navigator → My Connections → click a server → Network → Servers → TCP/IP.**
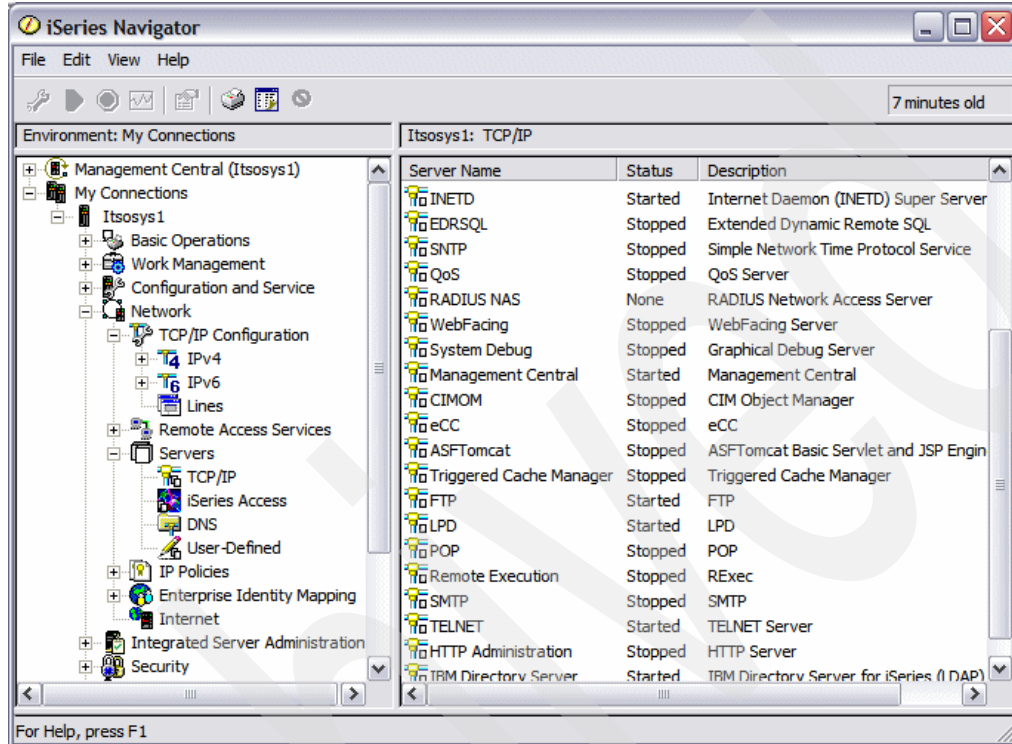
Figure 13-19   Status of TCP/IP server jobs

From this display right-click on a server to display a list of options such as Start, Stop, Server Jobs, and Configuration. Select Server Jobs as shown in Figure 13-20.
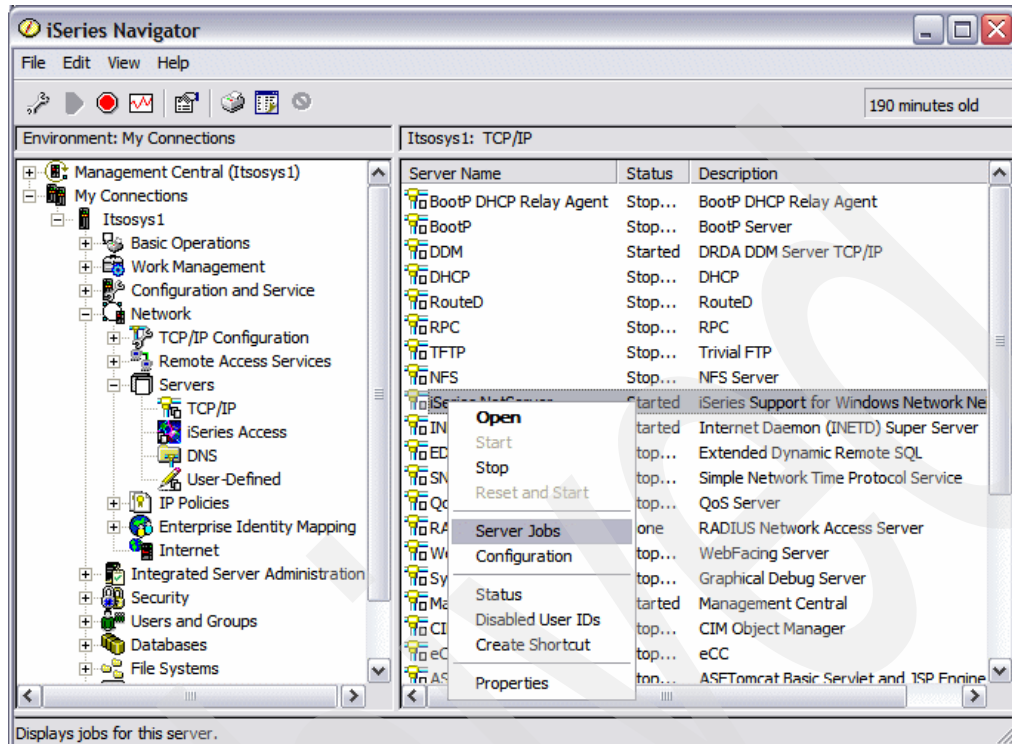
Figure 13-20   Selecting options for a TCP/IP server

All the related server jobs for the selected server are listed as displayed in Figure 13-21.
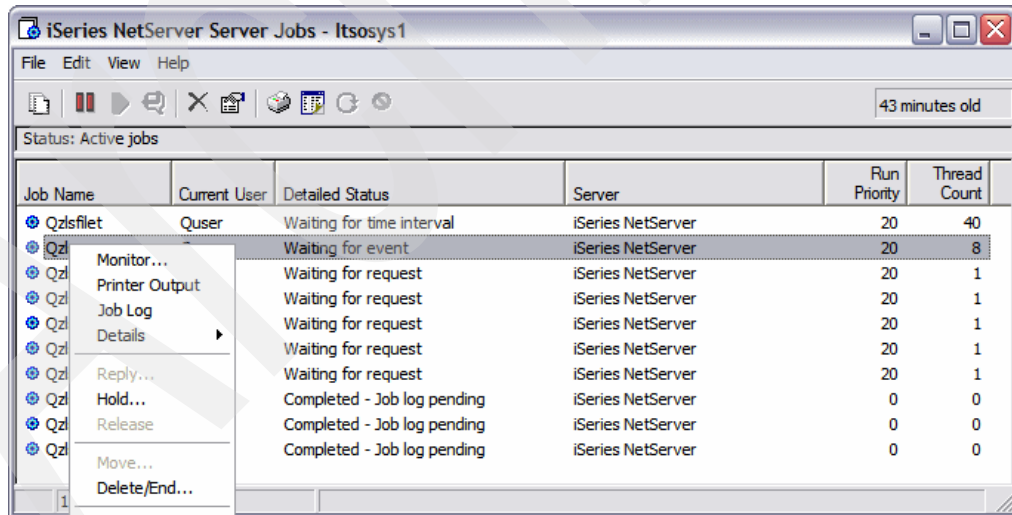
Figure 13-21   Display server job status

From this display right-click on a job to display a list of options such as Monitor, Printer Output, Job Log, Details, End.

Similar information can be obtained using the **iSeries Navigator** → **My Connections** → **right-click a server** → **Work Management** → **Server Jobs** function. This view includes all server jobs, not just TCP/IP servers. It also displays the current user of the server job.

13.4.8 iSeries Navigator Connections

iSeries Navigator includes tools to diagnose problems. Two of the more commonly used are Verify iSeries Connection and Verify Central System Connection.

Verify iSeries Connection can be used to confirm a PC can communicate successfully with a system. It also checks the status of the server jobs used by iSeries Navigator. The tool can be accessed from **iSeries Navigator** → **My Connections** → **right-click a server** → **Connection to Server** → **Verify Connection**. An example of the checks performed are in Figure 13-22.
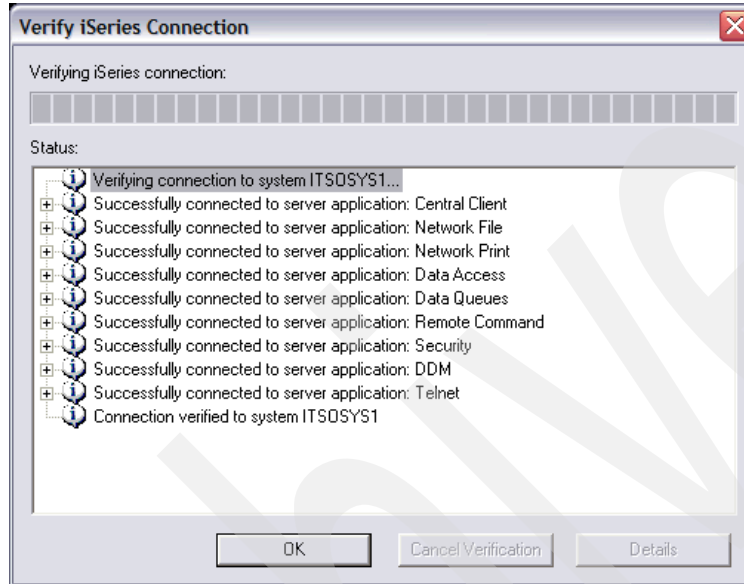
Figure 13-22   Verifying an iSeries connection

Verify Central System Connection can be used to confirm Management Central on a PC can communicate successfully with a central system. It also checks the status and various attributes of the server configuration. The tool can be accessed from **My Connections** →

right-click Management Central → Verify Connection. An example of the checks performed are in Figure 13-23.
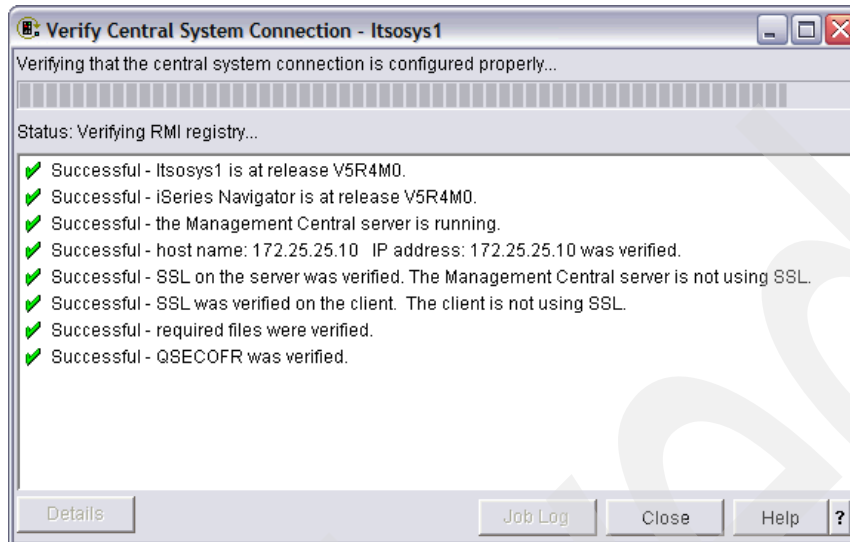
Figure 13-23   Verifying a Central System Connection

13.4.9 Trace TCP/IP Application (TRCTCPAPP)

The Trace TCP Application (TRCTCPAPP) command traces data that pertains to specific TCP/IP applications servers such as:

- ► Certificate Services server
- ► Directory Services server
- ► Distributed data management (DDM with DRDA) running over TCP/IP
- ► File Transfer Protocol (FTP)
- ► Host servers
    - – Central server
    - – Database server
    - – Data queue server
    - – Network print server
    - – Remote command server
    - – Server mapper
    - – Sign on server
- ► HTTP server (Apache)
- ► Layer Two Tunneling Protocol (L2TP)
- ► Packet rules
- ► Point-to-Point Protocol (PPP)
- ► Quality of Service (QoS)
- ► Simple Mail Transfer Protocol (SMTP) client and server (*MSF)
- ► Simple Network Time Protocol (SNTP) client and server (*POP)
- ► Telnet
- ► Virtual private network (VPN) server
- ► Virtual terminal APIs

Note: Tracing Telnet or Virtual terminal APIs start a Virtual terminal manager component LIC trace. This LIC trace can have potential performance impacts on the system.

Some examples using this command are:

► To trace all Telnet activity, enter:

```
TRCTCPAPP APP(*TELNET) SET(*ON)
```

► To trace the activity on a specific device, when you know the device name, enter:

```
TRCTCPAPP APP(*TELNET) SET(*ON) DEVD(devicename)
```

► To trace the activity on a specific device, when you know the IP address of the client, enter:

```
TRCTCPAPP APP(*TELNET) SET(*ON) RMTNETADR(*INET 'www.xxx.yyy.zzz')
```

► To turn the trace off and spool output, enter:

```
TRCTCPAPP APP(*TELNET) SET(*OFF)
```

> **Note:** The Additional traces (ADLTRC) parameter can be used to start other types of traces such as LIC component, communication and job traces, depending on the options specified. This simplifies data collection because more than one type of trace can be initiated at the same time using a single TRCTCPAPP command.

Refer to the following reference for more information about using the TRCTCPAPP command:

http://www.ibm.com/eserver/iseries/infocenter

When you reach this site, click **Networking** → **TCP/IP Troubleshooting** → **Troubleshooting tools and techniques** → **Tools for tracing data and jobs** → **Trace TCP application.**

> **Tip:** When you use this function, you can create large amounts of spooled output, if a general trace is specified. You can change the job description of the job performing the trace to cause the TRCTCPAPP output to be written to an output file. Consult your service provider if the amount of output anticipated can be large, to determine whether using an output file is more appropriate to capture the output.

13.4.10 Trace Connections (TRCCNN)

The Trace Connections (TRCCNN) command is provided to produce a trace formatted similar to a communications trace, but it uses the LIC trace data as its input. In this manner, the original form of the TCP/IP packets can be traced. Trace connection is useful for situations in which the general communications trace is not available or not effective. For example:

► You have TCP applications that use Secure Sockets Layer (SSL) or you use IP security. In either case, the data that flows over the communications line is encrypted. Therefore, the general communications trace might not be helpful if you need to see the data. Trace connection traces the data before encryption and after decryption and therefore, can be used when the general communications trace is not effective.

► You are using TCP/IP over a connection that does not support the general communications trace function, such as Loopback, OptiConnect, or Twinaxial. In this situation, you can use the trace connection as an alternative method for generating a trace.

To run the TRCCNN command, the user must have *SERVICE or QIBM_Service_Trace special authority and enough authority to use the objects as shown in Table 13-3 on page 233.

Table 13-3   TRCCNN: Required object authority

Object	Library	Type	Authority
TRCCNN	QSYS	*CMD	*USE
QSCCNN	QSYS	*PGM	*USE
QSCCNN1	QSYS	*PGM	*USE
QSCFMTTRC	QSYS	*PGM	*USE

Tip: TRCCNN automatically uses the TRCINT to capture the trace data, then formats the TRCINT data contained in the QPCSMPRT spooled file. TRCCNN can also be used to format any QPCSMPRT file that was generated by a previous usage of the TRCINT command.

Some examples using this command are:

► To trace all SSL activity, enter:

```
TRCCNN SET(*ON) TRCTYPE(*SSL) SIZE(*MAX)
```

► To turn the trace off and spool output, enter:

```
TRCCNN SET(*OFF)
```

► To format the output from a previous TRCINT TRCTYPE(*SCK) command, enter:

```
TRCCNN SET(*FORMAT) TRCTYPE(*SSL) JOB(JobNumber/UserName/JobNumber)
```

Refer to the following reference for information about using the TRCCNN command:

http://www.ibm.com/eserver/iseries/infocenter

When you reach this site, click **Networking** → **TCP/IP Troubleshooting** → **Troubleshooting tools and techniques** → **Tools for tracing data and jobs** → **Trace connection.**

13.5 Other communications

Data can be traced and formatted for lines, network interfaces (NWI) or Network server description (NWS) for any of the communications types in the following list:

► Asynchronous communications
► Asynchronous Transfer Mode (ATM)
► Binary Synchronous Communications (BSC)
► Distributed Data Interfaces (DDI)
► Ethernet Version 2 or IEEE 802.3
► Frame Relay
► Integrated Services Digital Network Data Link Control (IDLC)
► Integrated Services Digital Network (ISDN)
► Network basis input/output system (NETBIOS)
► Point to Point Protocol (PPP)
► Synchronous Data Link Control (SDLC)
► Token-ring Network
► Wireless communications
► X.25

Note: Although IDLC and ISDN can still be traced, the protocols are no longer supported by IBM.

SNA and TCP/IP connections are covered in detail in this publication. Seek advice from your service provider if you need assistance to trace and format a trace involving any of these protocols.

13.6 System jobs overview

The tools and techniques summarized in this chapter up to this point deal with the hardware resources and the associated interfaces, the configurations and the status of the communications devices, and the messages issued.

The i5/OS components associated with communications presents a range of system jobs that need to be understood. The following sections summarize those system jobs.

13.6.1 System jobs

System jobs are created by i5/OS to perform operations such as controlling system resources. The system jobs related to communications functions are shown in Figure 13-4.

Table 13-4   Communications-related system jobs

Job	Function
SCPF	The SCPF system job provides the environment and directs the functions necessary to start the i5/OS licensed program during an initial program load (IPL).
QSYSARB QSYSARBn	The system arbiters (QSYSARB and QSYSARB2 through QSYSARB5), started by an SCPF system job, provide the environment for the running of high-priority functions.
QLUS	Provides event handling for logical unit devices (communications devices) and also acts as the manager of communications devices.
QALERT	The alert manager system job performs the tasks necessary to process alerts.
QSYSCOMM1	The system communications job handles some communications activity and some I/O system activity.
QCMNARB01 QCMNARBn	The communications arbiter system jobs process work for communications. This work includes communications connect, disconnect, lock and error recovery processing. The system starts these jobs during every IPL. The QCMNARB system value setting determines the number of communication arbiters jobs that are started.
Q400FILSVR	Performs the common programming interface communications (APPN or APPC) for these remote file systems.

13.6.2 Subsystem jobs

The subsystems described in Table 13-5 on page 235 have the ability to contain communications-related jobs within the system. Function was added in i5/OS V5R4 to more easily trace all jobs, including QINTER/SBS for device traces.

Table 13-5   Communications-related subsystems

Subsystem	Description
QBASE	The default subsystem for all user-related jobs, including communications. If the system is configured for a controlling subsystem and other specific subsystems, QBASE is not used.
QCMN	APPC jobs.
QSERVER	Contains the database and file server jobs. These jobs are started by the STRHOSTSVR command.
QSYSWRK	Contains the TCP/IP driver jobs and pass-through server jobs. These jobs are created by the STRTCP or STRTCPSVR commands.
QSNADS	Contains the jobs related to SNA distributions.
QINTER	Telnet, DSPT, LWS, RWS, RTL, FNC device allocation

13.6.3 Server jobs

Server jobs depend on the system configurations and the applications being run. They are too numerous to detail in this publication, and the names occasionally change from release to release.

For a list of TCP/IP application server job names, refer to the Server table in the iSeries Information Center at:

http://publib.boulder.ibm.com/infocenter/iseries/v5r3/ic2924/info/rzaks/rzaksserverjobs.htm

When you reach this site, click **Networking** → **TCP/IP troubleshooting** → **Troubleshooting tools and techniques** → **Troubleshooting tips** → **Server table.**

This table contains information about each server, such as:

► Server name
► Method that is used to start the server
► Method that is used to end the server
► The name of the licensed product under which this server is shipped
► Server type
► The name of the subsystem where a particular server runs
► Job name
► Shipped default value for Autostart servers parameter
► Default port

14

Collecting a communications trace

A communications trace is one of the tools to isolate communication problems related to your system's network connection. A communications trace is also very useful for debugging a distributed application since it shows whether the application data sent is received. You should understand the concepts introduced in Chapter 13, "Communications problem determination" on page 207, before you attempt to collect communications trace data.

You can use the communications line or network interface description while the communications trace is running. You must know the name of the line or network interface description before you start the procedure.

Run traces using Command Language (CL) commands. They can also be run from SST.

14.1 Getting started

> **Note:** Review the method for locating the printed output in 1.7, "Finding your printed output" on page 9.

To collect a communications trace, you need to follow these steps:

1. Vary off the line or network interface, if instructed.
2. Start the communications trace.
3. Vary on the line or network interface, if instructed.
4. Cause the error to occur.
5. End the communications trace.
6. Format or print the communications trace.
7. Verify that the communications trace captured the error.
8. Delete the communications trace when it is no longer needed.

If you are instructed by the service provider to vary off the line, enter the following command:

```
VRYCFG CFGOBJ(line-name) CFGTYPE(*LIN)
       STATUS(*OFF)
```

If you are working with a switched line, you must also enter the following command to vary off the controller and devices:

```
VRYCFG CFGOBJ(ctl-name) CFGTYPE(*CTL)
       STATUS(*OFF)
```

You must have service or QIBM_Service_Trace special authority to use the communications trace commands or SST. Contact the security officer or system administrator if you do not have this authority.

14.2 Using commands for a communications trace

i5/OS provides commands that start, stop, check status, dump, print, and delete a communications trace. These commands perform the same function as the communications trace service tool in SST.

Use Table 14-1 to select a communications trace command.

Table 14-1   Selecting CL commands for performing communications trace functions

If you want to:	Use this command:	Refer to:
Start a communications trace	**STRCMNTRC**	14.2.1, "Starting a communications trace using STRCMNTRC" on page 239
End a communications trace	**ENDCMNTRC**	14.2.3, "Using ENDCMNTRC to stop a communications trace" on page 242
Check communication trace status. There is also an API to check the status of a communications trace.	**CHKCMNTRC**	14.2.2, "Using CHKCMNTRC to check the communications trace status" on page 240
Copy unformatted communication trace data to a stream file	**DMPCMNTRC**	14.2.4, "Using DMPCMNTRC to copy communication trace data to a stream file" on page 242

If you want to:	Use this command:	Refer to:
Format or save a communications trace	**PRTCMNTRC**	14.2.5, "Using PRTCMNTRC to save the communications trace from the trace buffer" on page 244
Delete a communications trace	**DLTCMNTRC**	14.2.7, "Using DLTCMNTRC to delete a communications trace" on page 249

Note: Information collected in a communications trace buffer is lost during the IPL process.

14.2.1 Starting a communications trace using STRCMNTRC

To start a communications trace, complete the following steps:

1. Type STRCMNTRC on any command line, and press F4 (Prompt). A display appears as shown in Figure 14-1.

```
Start Communications Trace (STRCMNTRC)

Type choices, press Enter.

Configuration object . . . . . . >              Name
Type . . . . . . . . . . . . . >              *LIN, *NWI, *NWS
Buffer size  . . . . . . . . . .    128K       Number, *MIN, *MAX, 128K...
Data direction . . . . . . . . .    *BOTH      *SND, *RCV, *BOTH
Trace full . . . . . . . . . . .    *WRAP      *WRAP, *STOPTRC
Number of user bytes to trace:
  Beginning bytes  . . . . . . .    *CALC      Number, *CALC, *MAX
  Ending bytes . . . . . . . . .               Number, *CALC
Watch for message:
  Message identifier . . . . . .    *NONE      Name, *NONE
  Comparison data  . . . . . . .

  Compare against  . . . . . . .               *MSGDTA, *FROMPGM, *TOPGM
            + for more values


                                                                  Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 14-1   Start Communications Trace display

Note: Enter the configuration object name and type to display the remaining parameters.

2. Type the configuration object name (line or network interface description) in the Configuration object prompt.

3. Type the configuration object type in the Type prompt.

4. Type *MAX in the Buffer size prompt.

5. Type a description of the trace in the Trace description prompt.

6. Press the Enter key.

> **Note:** On i5/OS V5R4 systems, you can use the WRKTRC command to determine what traces are active on a system at any point in time.

For information on automatically monitoring and ending traces when certain predetermined criteria are met, refer to Chapter 15, "Advanced function: Watch support" on page 265.

Tips when starting a communications trace

Consider these tips when starting a communications trace:

► You might see other parameters in the STRCMNTRC command, depending on the configuration being traced. If you need more information on these parameters, use the F1 (Help) key to display the help text.

► The default for the Number of user bytes to trace parameter has changed with different operating system levels.

► On LAN connections, the communications trace facility defaults to only capturing the first 100 bytes of each frame transmitted. If you need to see all the data in each frame, select *MAX for this parameter.

► All the data for other protocols is captured.

14.2.2 Using CHKCMNTRC to check the communications trace status

The CHKCMNTRC command checks the status of communications traces started from the STRCMNTRC command or the communications trace service tool in SST.

To check the status of a communications trace or of all communications traces for one configuration type, complete the following steps:

1. Type CHKCMNTRC on any command line, and press F4 (Prompt). A display appears as shown in Figure 14-2 on page 241.

```
Check Communications Trace (CHKCMNTRC)

Type choices, press Enter.

Configuration object . . . . . .              Name, *ALL
Type . . . . . . . . . . . . . .              *LIN, *NWI, *NWS















                                                                    Bottom
F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
F24=More keys
```

Figure 14-2 Check Communications Trace display

2. Perform one of the following tasks:

   – Type the name of the configuration object in the Configuration object prompt and the type of the configuration object in the Type prompt.

   – Type *ALL in the Configuration object prompt and the type of the configuration object in the Type prompt to check the status of traces for all lines or network interface descriptions.

3. A message appears for each trace. For example, if you entered:

   `CHKCMNTRC CFGOBJ(*ALL) CFGTYPE(*LIN)`

   The following messages are displayed:

   ```
   Communications trace TRNLIN type *LIN has status ACTIVE
   Communications trace QTILINE type *LIN has status WAITING
   CHKCMNTRC completed successfully
   ```

   Message `CPF39B0 No traces exist` is issued when no traces are active.

   Use the "Check" API to determine the storage available for a communication trace.

4. If the trace status of the configuration object is waiting, continue with the next step. Otherwise, go to step 7.

5. If you are working with a switched line, enter the following command to vary on the controller. Otherwise, continue with the next step for all other types of lines.

   ```
   VRYCFG CFGOBJ(ctl-name) CFGTYPE(*CTL)
          STATUS(*ON)
   ```

6. Enter the following command to vary on the line:

   ```
   VRYCFG CFGOBJ(line-name) CFGTYPE(*LIN)
          STATUS(*ON)
   ```

7. Enter the commands and programs to re-create the problem. Trace the data on the line for a period of time specified by your service provider.

8. After the error occurs, complete the steps in the following section.

> **Note:** Do not delay ending the trace after the error recurs. Otherwise, trace information can overflow or too much data can be collected unnecessarily.

14.2.3 Using ENDCMNTRC to stop a communications trace

Use the ENDCMNTRC command to stop or end a communications trace running on the system.

To stop a communications trace using this command, complete this process:

1. Type DMPCMNTRC on any command line, and press F4 (prompt). A display appears as shown in Figure 14-3.
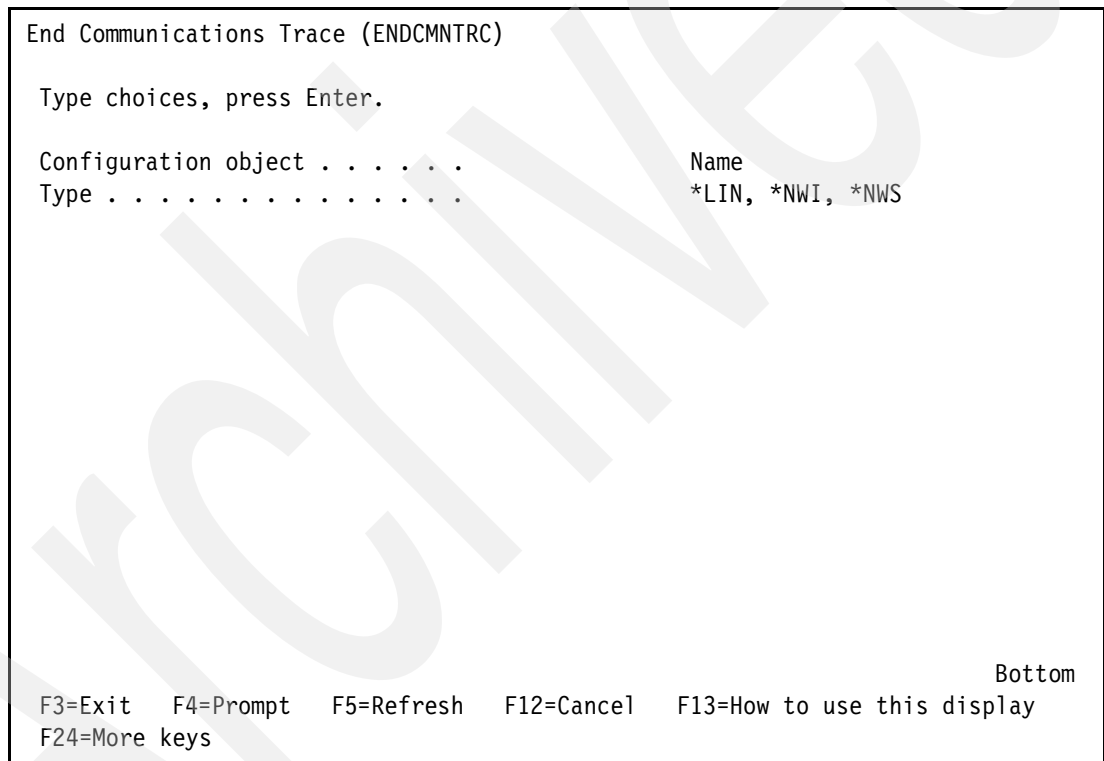
```
End Communications Trace (ENDCMNTRC)

 Type choices, press Enter.

 Configuration object . . . . . .              Name
 Type . . . . . . . . . . . . . .              *LIN, *NWI, *NWS

                                                                       Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 14-3   End Communications Trace display

2. In the Configuration object prompt, type the configuration object name.

3. In the Type prompt, type the configuration object type.

4. Press the Enter key.

14.2.4 Using DMPCMNTRC to copy communication trace data to a stream file

Dumping the data to a stream file offers several advantages over printing the trace data immediately. Consider these advantages when deciding whether to use this function:

► You can run new traces without losing data from the existing trace

- You can run an initial program load (IPL) on the server and still keep the raw trace data in the stream file
- You can format trace data multiple times, even after you run an IPL or delete the prior trace buffer
- You can use a custom formatter to analyze the trace data stream file.
- If you intend to send your trace data to your service provider or you intend to analyze it on a different system, saving it as a stream file produces a much smaller object than saving it in an Output file. This can reduce the time taken to send the trace data electronically.

The data in the stream file can be formatted at a later time, either on the current system or a different system, by using the Print Communications Trace (PRTCMNTRC) command and specifying the FROMSTMF parameter.

> **Note:** If you are using Internet Protocol version 6 (IPv6), you must dump the trace data into a stream file by following these steps. However, if you are using IPv4, this is an optional part of the communications trace process.

Before you copy the trace data, complete the following steps:

1. Go to 14.2.2, "Using CHKCMNTRC to check the communications trace status" on page 240, and follow the steps to check the status of the trace.
2. If the trace is not stopped, go to 14.2.3, "Using ENDCMNTRC to stop a communications trace" on page 242, to end the trace.

To copy the trace data, complete these steps:

1. Create a directory, such as mydir. See the CRTDIR (Create Directory) command description in the iSeries Information Center, to create a directory.

   The CRTDIR (Create Directory) command description can be found at:

   http://www.ibm.com/eserver/iseries/infocenter

   When you reach this site, click **Programming** → **CL** → **CL command finder.**

To copy the trace, enter DMPCMNTRC on a command line, and press F4 (Prompt). The display shown in Figure 14-4 on page 244 appears.

```
Dump Communications Trace (DMPCMNTRC)

Type choices, press Enter.

Configuration object . . . . . .              Name
Type . . . . . . . . . . . . . .              *LIN, *NWI, *NWS
To stream file . . . . . . . . .

Replace file . . . . . . . . . .   *NO        *NO, *YES








                                                                  Bottom
F3=Exit    F4=Prompt    F5=Refresh    F12=Cancel    F13=How to use this display
F24=More keys
```

Figure 14-4   Dump communications trace display

2. For the Configuration object prompt, specify the same line you specified when you started the trace.

3. For the Type prompt, specify the type of resource used for your trace.

4. For the To stream file prompt, specify the path name, such as /mydir/mytraces/trace1 and press the Enter key.

14.2.5 Using **PRTCMNTRC** to save the communications trace from the trace buffer

Use the Print Communications Trace (PRTCMNTRC) command to transfer the trace data, that is still in the trace buffer, to a spooled file or outfile. If you want to print from a stream file that was created using the Dump Communications Trace (DMPCMNTRC) command, ignore this section and go to 14.2.6, "Using PRTCMNTRC to save the communications trace from a stream file" on page 247.

Before you save the trace, complete the following steps:

1. Go to 14.2.2, "Using CHKCMNTRC to check the communications trace status" on page 240, and follow the steps to check the status of the trace.

2. If the trace is not stopped, go to 14.2.3, "Using ENDCMNTRC to stop a communications trace" on page 242, to end the trace.

To save the trace, complete these steps:

1. To print (format) the trace, enter PRTCMNTRC on a command line, and press F4 (Prompt) then press the Enter key. The display shown in Figure 14-5 on page 245 appears.

```
Print Communications Trace (PRTCMNTRC)

 Type choices, press Enter.

 Configuration object . . . . . .                 Name
 From stream file . . . . . . . .

 Output . . . . . . . . . . . . .   *PRINT        *PRINT, *OUTFILE














                                                                      Bottom
 F3=Exit    F4=Prompt    F5=Refresh    F12=Cancel    F13=How to use this display
 F24=More keys
```

Figure 14-5   Print Communications Trace display

2. Type the configuration object name in the Configuration object prompt.

3. Type the configuration object type in the Configuration object type prompt and press the
   Enter key

   Perform one of the following tasks:

   – To save the trace in an outfile, go to step 6 on page 246.
   – To format and save the trace in a spooled file, Press continue with the next step.

4. Type *PRINT in the Output prompt. Press the Enter key. A display appears like the example in Figure 14-6.

```
 Print Communications Trace (PRTCMNTRC)

  Type choices, press Enter.

  Configuration object . . . . . . > ETHLINO2      Name
  From stream file . . . . . . . .

  Type . . . . . . . . . . . . . . > *LIN          *LIN, *NWI, *NWS
  Output . . . . . . . . . . . . .   *PRINT        *PRINT, *OUTFILE







                                                                Bottom
  F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
  F24=More keys
```

Figure 14-6   Print Communications Trace: Additional options

5. Press the Enter key.

   If you are instructed by the service provider to choose a specific format, go to step 1 on page 243. Otherwise, press the Enter key twice and go to step 8 on page 247.

6. If you want to save the trace in an outfile, type *OUTFILE in the Output prompt, and press the Enter key. A display appears like the one in Figure 14-7 on page 247.

```
Print Communications Trace (PRTCMNTRC)

 Type choices, press Enter.

 Configuration object . . . . . . > ETHLINO2      Name
 From stream file . . . . . . . .

 Type . . . . . . . . . . . . . . > *LIN          *LIN, *NWI, *NWS
 Output . . . . . . . . . . . . . > *OUTFILE      *PRINT, *OUTFILE
 File to receive output . . . . .                Name
   Library . . . . . . . . . .       *LIBL       Name, *LIBL, *CURLIB
 Output member options:
   Member to receive output . . .   *FIRST       Name, *FIRST
   Replace or add records . . . .   *REPLACE     *REPLACE, *ADD
 Character code . . . . . . . . .   *CALC        *EBCDIC, *ASCII, *CALC
 Controller description . . . . .   *ALL         Name, *ALL




                                                                 Bottom
 F3=Exit    F4=Prompt    F5=Refresh    F12=Cancel    F13=How to use this display
 F24=More keys
```

Figure 14-7   Print Communications Trace to an outfile

Note: The trace is not formatted in the database file (outfile). It is formatted when it is
printed.

7. Type the name and library of the database file to receive the output in the File prompt, and
   press the Enter key.

8. Go to 14.4, "Verifying the contents of the communications trace" on page 260, and follow
   the steps to display the trace.

14.2.6 Using PRTCMNTRC to save the communications trace from a stream file

If you previously used the Dump Communications Trace (DMPCMNTRC) command to create
a stream file, you can use the Print Communications Trace (PRTCMNTRC) command to
format the trace data and place it in a spooled file.

Before you save the trace, complete the following steps:

1. Go to 14.2.2, "Using CHKCMNTRC to check the communications trace status" on
   page 240, and follow the steps to check the status of the trace.

2. If the trace is not stopped, go to 14.2.3, "Using ENDCMNTRC to stop a communications
   trace" on page 242, to end the trace.

To save the trace, complete these steps:

1. To print (format) the trace, enter PRTCMNTRC on a command line, and press F4
   (Prompt). The display shown in Figure 14-8 on page 248 appears.

```
Print Communications Trace (PRTCMNTRC)

Type choices, press Enter.

Configuration object . . . . . .              Name
From stream file . . . . . . . .





                                                                  Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 14-8   Print Communications Trace display

2. Type the name of the stream file you created previously with the Dump Communications Trace (DMPCMNTRC) command, into the From stream file prompt and press the Enter key. The display shown in Figure 14-9 appears.

```
 Print Communications Trace (PRTCMNTRC)

 Type choices, press Enter.

 Configuration object . . . . . .                   Name
 From stream file . . . . . . . . > '/mydir/mytraces/trace1'

 Character code . . . . . . . . .   *CALC          *EBCDIC, *ASCII, *CALC
 Format TCP/IP data by address:
   Source/destination IP address    *ALL

   Source/destination IP address    *ALL

 IP port number . . . . . . . . .   *ALL           Number, *ALL




                                                                    Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 14-9   Print Communications Trace display - additional prompts

3. If you are instructed by the service provider to change any other prompts, type those changes and press the Enter key.

4. Go to 14.4, "Verifying the contents of the communications trace" on page 260, and follow the steps to display the trace.

14.2.7 Using DLTCMNTRC to delete a communications trace

Tip: Before deleting a communications trace, go to 14.4, "Verifying the contents of the communications trace" on page 260, to confirm the trace was successful.

The DLTCMNTRC command is used to delete a communications trace data that exists on the system. To delete trace data, complete these steps:

1. Type DLTCMNTRC on any command line, and press F4 (Prompt). A display appears like the example in Figure 14-10.
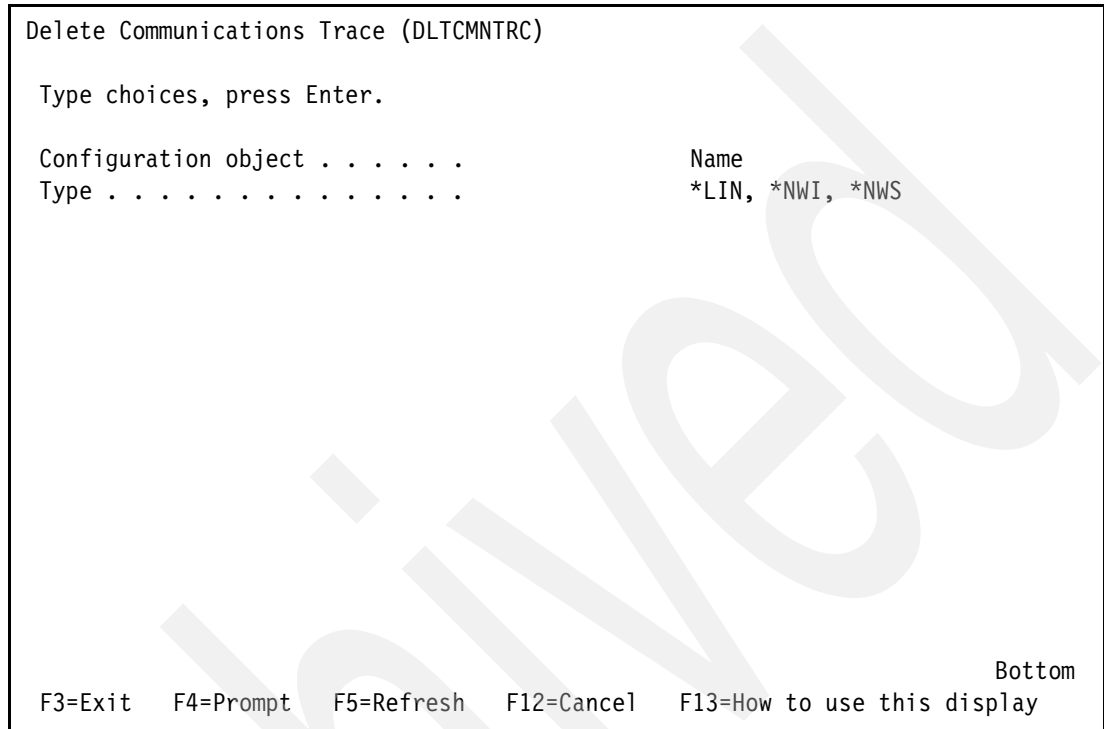
```
Delete Communications Trace (DLTCMNTRC)

 Type choices, press Enter.

 Configuration object . . . . . .               Name
 Type . . . . . . . . . . . . . .               *LIN, *NWI, *NWS


















                                                                    Bottom
  F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
```

Figure 14-10   Delete Communications Trace display

2. In the Configuration object prompt, type the configuration object name.

3. In the Type prompt, type the configuration object type.

4. Press the Enter key.

5. Select one of the following options:

► To collect more information about your problem, go to the appropriate chapter regarding that problem in this guide.

► If you do not need to collect any more information in this guide, go to 30.5, "Sending the problem report and documentation by e-mail" on page 466, and follow the steps to submit the communications trace with the problem report.

14.3 Using SST for a communications trace

You can control a communications trace from the System Service Tools (SST). This tool or the commands can be used in the same trace session. For example, you can start a trace in SST and stop it by using the ENDCMNTRC command.

The following displays illustrate the method of controlling a communications trace from the SST Work with Communications Traces menu.

Note: CL commands are the recommended interface for running traces, as CL commands are typically enhanced prior to SST functions. SST does allow a change to the size of the trace buffer.

14.3.1 Starting a communications trace using SST

To start a communications trace, complete the following steps:

1. If you are at the Work with Communications Traces display, continue with the next step. Otherwise, enter the STRSST command, and type option 1 to Start a Service Tool.

2. Select option 3 (Work with communications trace) from the Start a Service Tool menu. A display appears as shown in Figure 14-11.

```
  Work with Communications Traces


  Type options, press Enter.
    2=Stop trace       4=Delete trace      6=Format and print trace
    7=Display message   8=Restart trace


       Configuration
  Opt   Object         Type   Trace Description       Protocol    Trace Status

    (No active traces)













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

Figure 14-11   SST: Work with Communications Trace display

3. Press F6 to start a trace. A display appears as shown in Figure 14-12 on page 252.

```
Start Trace

Type choices, press Enter.

  Configuration object . . . . . . .

  Type   . . . . . . . . . . . . . .   1          1=Line, 2=Network interface
                                                  3=Network server

  Trace description  . . . . . . . .

  Buffer size  . . . . . . . . . . .         128  128-1048576 K bytes

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

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

  Number of bytes to trace:
    Beginning bytes  . . . . . . . .   *CALC      Value, *CALC, *MAX
    Ending bytes   . . . . . . . . .   *CALC      Value, *CALC


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

Figure 14-12   SST: Start Trace options

4. Type the name of the line or network interface description you want to trace in the Configuration object prompt. This example uses the line **ETHLIN01**.

5. Type the type of configuration object in the Type prompt.

6. Type 6 in the Buffer size prompt.

7. Type a description of the trace in the Trace description prompt. The display shown in Figure 14-13 on page 253 appears.

```
Start Trace

Type choices, press Enter.

  Configuration object . . . . . . .    ethlin01

  Type   . . . . . . . . . . . . . .    1              1=Line, 2=Network interface
                                                       3=Network server

  Trace description  . . . . . . . .    ITSO 11/6/2007

  Buffer size  . . . . . . . . . . .          128   128-1048576 K bytes

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

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

  Number of bytes to trace:
    Beginning bytes  . . . . . . . .    *CALC          Value, *CALC, *MAX
    Ending bytes   . . . . . . . . .    *CALC          Value, *CALC


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

Figure 14-13   SST: Start Trace example

8. Press the Enter key. A display appears as shown in Figure 14-14.

```
Select Trace Options

Configuration object . . . . . :    ETHLIN01
Type   . . . . . . . . . . . . :    LINE

Select one of the following:

      1.  All data (no filtering)
      2.  Remote controller data
      3.  Remote MAC address data
      4.  Remote SAP data
      5.  Local SAP data
      6.  IP protocol number
      7.  IP address data




Selection
      1
F3=Exit      F5=Refresh      F12=Cancel
```

Figure 14-14   SST: Select Trace Options example

9. Select option 1(All data).

10. Press the Enter key. A display appears as shown in Figure 14-15.

```
  Work with Communications Traces

 Type options, press Enter.
   2=Stop trace          4=Delete trace     6=Format and print trace
   7=Display message    8=Restart trace


      Configuration
 Opt   Object          Type    Trace Description        Protocol   Trace Status
       ETHLINO1        LINE    ITSO 11/6/2007           ETHERNET   ACTIVE











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

Figure 14-15   SST: Communication trace started

11. Perform one of the options shown in Table 14-2.

Table 14-2   SST: Communication trace status

If the trace status is	Then:
Active	Trace data is being gathered
Error	An error occurred while the trace was gathering data. Some data might have been gathered or while the trace was being formatted.
Formatting	The trace is being formatted
Starting	Trace is being started by another user. You cannot stop or delete this trace. Use F5 to update the trace status.
Stopped	The trace has stopped. It is not gathering data.
Stopping	The trace is stopping
Waiting	Step 12. Continue with the next step. Otherwise, go to step 14. The trace is waiting for the line, network interface, or network server to be varied on and is not gathering data.

If the trace status is	Then:
Error	Delete the trace and repeat the steps to re-create the trace data
Other than waiting or error	Step 12

12. Press F3 (Exit) until you exit from the service tool.

> **Note:** The trace does not stop if you exit SST while the trace is running.

13. Press the Enter key to exit SST.

14. If you are working with a switched line, enter the following command to vary on the controller. Otherwise, continue with the next step.

```
VRYCFG CFGOBJ(ctl-name) CFGTYPE(*CTL)
        STATUS(*ON)
```

15. Enter the following command to vary on the line:

```
VRYCFG CFGOBJ(line-name) CFGTYPE(*LIN)
        STATUS(*ON)
```

16. Enter the commands and programs that caused the problem. Trace the data for the period of time specified by your service provider.

17. Go to 14.3.2, "Stopping a communications trace using SST" on page 255, after the error occurs.

> **Note:** It is important to stop the trace promptly to avoid collecting too much data or to prevent wrapping the data.

14.3.2 Stopping a communications trace using SST

To stop the trace, follow these steps:

1. If you are at the Work with Communications Traces display, continue with the next step. Otherwise, enter the STRSST command, type option 1 (Start a service tool), and then select option 3 (Work with communications trace) on the Start a Service Tool menu.

> **Note:** If the status is waiting, press F5 (Refresh) to refresh the status on the Work with Communications Traces display.

2. Type 2 in the Opt column next to the name of the line or network interface description you want to stop tracing.

3. Press the Enter key. A display appears as shown in Figure 14-16.

```
Work with Communications Traces

 Type options, press Enter.
   2=Stop trace        4=Delete trace      6=Format and print trace
   7=Display message   8=Restart trace


       Configuration
 Opt   Object          Type   Trace Description        Protocol    Trace Status
       ETHLINO1        LINE   ITSO 11/6/2007           ETHERNET    STOPPING













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

Figure 14-16   SST: Stopping a communications trace

In this example, the trace status changed to *stopping*.

```
Work with Communications Traces

 Type options, press Enter.
   2=Stop trace        4=Delete trace     6=Format and print trace
   7=Display message   8=Restart trace


       Configuration
 Opt   Object          Type   Trace Description        Protocol   Trace Status
       ETHLIN01        LINE   ITSO 11/6/2007           ETHERNET   STOPPED












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

Figure 14-17   SST: Communication trace stopped

In this example, the trace status changed to *stopped*.

Tip: In the example above, the trace buffer has filled and begun to overwrite the data collected earlier in the trace. In this case, the SST issues the `Trace buffer wrapped` message at the bottom of the screen to alert you to the fact that you might need to re-run the trace with a larger buffer size selected.

The spooled output also contains the `Trace buffer wrapped` warning message.

Note: The `Trace buffer wrapped` message at the bottom of the screen is only issued the first time you stop a trace that has wrapped. Subsequent use of the Work with Communications Traces display do not show the message.

4. Continue with the following section to format and save the trace.

14.3.3 Formatting and saving the communications trace using SST

Note: SST does not have the facility to copy the trace data to a stream file. If you need to do this for the reasons specified in 14.2.4, "Using DMPCMNTRC to copy communication trace data to a stream file" on page 242, refer to that section for guidance on how to copy the data.

To format and save the communications trace using SST, follow these steps:

1. If you are at the Work with Communications Traces display, continue with the next step. Otherwise, go to 26.5.1, "Starting a Service Tool" on page 418, and select option 3 (Work with communications trace) on the Start a Service Tool menu.

2. If you are at the Work with Communications Traces display, and the trace you want to format is not stopped, go to step 2 on page 255 to stop the trace. A display appears like the example in Figure 14-18.

```
  Work with Communications Traces

 Type options, press Enter.
   2=Stop trace        4=Delete trace      6=Format and print trace
   7=Display message   8=Restart trace


       Configuration
 Opt   Object          Type   Trace Description       Protocol    Trace Status
        ETHLIN01        LINE   ITSO 11/6/2007          ETHERNET    STOPPED
















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

Figure 14-18 SST: Communication trace example

In this example, ETHERNET is the protocol for the line being traced.

3. Type 6 in the Opt column next to the name of the stopped configuration object that you want to format and print.

4. Press the Enter key. A display appears for an ETHERNET protocol as shown in Figure 14-19 on page 259.

```
Format Trace Data

Configuration object  . . . . :    ETHLINO1
Type  . . . . . . . . . . . . :    LINE

Type choices, press Enter.

  Controller . . . . . . . . . .   *ALL         *ALL, name

  Data representation  . . . . .   3            1=ASCII, 2=EBCDIC, 3=*CALC

  Format RR, RNR commands  . . .   N            Y=Yes, N=No
  Format Broadcast data  . . . .   Y            Y=Yes, N=No
  Format UI data only  . . . . .   N            Y=Yes, N=No
  Format SNA data only . . . . .   N            Y=Yes, N=No
  Format TCP/IP data only  . . .   N            Y=Yes, N=No

  Select Ethernet data . . . . .   3            1=802.3, 2=ETHV2, 3=Both




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

Figure 14-19   SST: Formatting communications trace data

> **Note:** The format choices shown in this display are not available for every protocol.

5. Press the Enter key to format the trace data for the format choices shown. Wait for the following message to appear:

   `Format of trace data complete.`

   The QPCSMPRT spooled file containing the trace is created.

6. If you are instructed by the service provider to choose a specific format, continue formatting the data as required, creating another spooled file each time you select the Format and print trace option.

> **Tip:** It is appropriate in most cases to format the data in the communications trace buffer in more than one manner. You can format the data as many times as required until the trace buffer is deleted.

7. Type 6 in the Opt column next to the name of the configuration object you were tracing in the previous steps.

   Wait for the `Format of trace data complete` message or the `No trace records found` message. The QPCSMPRT spooled file is created that contains the trace data.

8. Press F3 (Exit) until you exit the communications trace and the System Service Tools (SST).

9. Press the Enter key to exit SST.

Go to 14.4, "Verifying the contents of the communications trace" on page 260, to display the trace.

14.3.4 Deleting a communications trace using SST

> **Tip:** Before deleting a communications trace, go to 14.4, "Verifying the contents of the communications trace" on page 260, to confirm the trace was successful.

To delete a trace, perform the following steps:

1. If you are at the Work with Communications Traces display, continue with the next step. Otherwise, go to 26.5.1, "Starting a Service Tool" on page 418, and select option 3 (Work with communications trace).

2. Type 4 in the Opt column next to the name of the line you traced.

3. Press the Enter key.

4. Wait for the Confirm Delete of Traces display.

5. Press the Enter key to delete the trace.

6. Press F3 (Exit) to exit.

   Select one of the following options:

   – To continue working with a service tool, go to 26.5, "Working with SST" on page 418.

   – To collect more information about your problem, go to the appropriate chapter for that problem in this book.

   – If you do not need to collect any more information in this guide, go to 30.5, "Sending the problem report and documentation by e-mail" on page 466, to submit the communications trace with the problem report.

14.4 Verifying the contents of the communications trace

> **Note:** Refer to the procedure for locating the appropriate spooled files created while collecting problem determination information.

To verify the contents of the communications trace, complete the following steps:

1. Press F11 (View 2) to view the date and time of the spooled file or files with which you want to work.

2. Type 5 in the Opt column next to the spooled file QPCSMPRT that you want to display. QPCSMPRT contains the communications trace.

3. Press the Enter key. A display appears as shown in Figure 14-20 on page 261.

```
 Display Spooled File
 File . . . . . :   QPCSMPRT
Page/Line   1/1
 Control . . . . .
Columns    1 - 130
 Find . . . . . .

*...+....1....+....2....+....3....+....4....+....5....+....6....+....7....+....8....+....9....
+....0....+....1....+....2....+....3
  COMMUNICATIONS TRACE     Title: ITSO 11/6/2007                11/06/07 13:04:12
Page:       1
   Trace Description . . . . . :  ITSO 11/6/2007
   Configuration object . . . . :  ETHLIN01
   Type . . . . . . . . . . . . :  1         1=Line, 2=Network Interface
                                     3=Network server
   Object protocol . . . . . . :  ETHERNET
   Start date/Time . . . . . . :  11/06/07 12:56:20.181
   End date/Time . . . . . . . :  11/06/07 13:03:47.535
   Bytes collected . . . . . . :  96766
   Buffer size . . . . . . . . :  128       kilobytes
   Data direction . . . . . . . :  3         1=Sent, 2=Received, 3=Both
   Stop on buffer full . . . . :  N         Y=Yes, N=No
   Number of bytes to trace
    Beginning bytes . . . . . :  *CALC     Value, *CALC, *MAX
    Ending bytes  . . . . . . :  *CALC     Value, *CALC
   Select Trace Options:
   ---------------------
   Remote Controller . . . . . :            Name, *ALL
   Remote MAC Address . . . . . :            Value, *ALL

More...
 F3=Exit   F12=Cancel   F19=Left   F20=Right   F24=More keys
```

Figure 14-20   Display the communications trace spooled file

4. Verify that this is the communications trace for the line or network interface description traced and that the time the trace started and ended is correct.

5. Verify that you have selected the correct data collection and format options. You find these listed on the subsequent pages of the printed output.

6. Verify that the trace has wrapped. Type **wrapped** in the Find field on the Display Spooled File display and press F16. If the trace has wrapped, a display appears as shown in Figure 14-21 on page 262. If the trace has not wrapped, a display appears as shown in Figure 14-22 on page 263.

```
 Display Spooled File
 File . . . . . :  QPCSMPRT                                            Page/Line  3/4
 Control . . . . .                                           Columns   1 - 130
 Find . . . . . .  wrapped
 *...+....1....+....2....+....3....+....4....+....5....+....6....+....7....+....8....+....9....+....0....+....1....+....2....+....3
 *** COMMUNICATIONS TRACE INFORMATION MESSAGES ***
   Trace buffer wrapped
 *** END TRACE INFORMATION MESSAGES ***
  COMMUNICATIONS TRACE    Title: ITSO 11/6/2007         11/06/07 12:37:26          Page:   3
  Record     Data  Record          Controller Destination Source    Frame        Number Number  Poll/
  Number S/R Length Timer        Name     MAC Address MAC Address  Format Command Sent  Received
 Final  DSAP  SSA
  ------ --- ------ --------------- ---------- ----------- ----------- ------ ------- ------ ------- ----- ---- ---
   562  R     33 12:26:44.03520         FFFFFFFFFFFF 0004AC5EE892  802.3  UI                OFF   AA   AA
       Data . . . . . :  0000000806000608 00060400010004AC 5EE8920905A92400 00000000000905A9
 *...............;YK..Z.........
               01                                            *.
   563  R     50 12:26:44.54335         FFFFFFFFFFFF 0004AC5EE892  ETHV2  Type: 0806
       Data . . . . . :  0001080006040001 0004AC5EE8920905 A924000000000000 0905A90100000000
 *...........;YK..Z.........Z....
               0000000000000000 0000000000003AC2 6BC0                 *...............B,{
   564  R     33 12:26:44.54342         FFFFFFFFFFFF 0004AC5EE892  802.3  UI                OFF   AA   AA
       Data . . . . . :  0000000806000608 00060400010004AC 5EE8920905A92400 00000000000905A9
 *...............;YK..Z.........
               01                                            *.


                                                         More...
  F3=Exit  F12=Cancel  F19=Left  F20=Right  F24=More keys
  String found in position 17.
```

Figure 14-21   Communications trace has wrapped

If the buffer has wrapped you might need to re-run the trace with a larger buffer size selected.

```
Display Spooled File
File . . . . . :  QPCSMPRT                                         Page/Line   1/1
Control . . . . .                                      Columns     1 - 130
Find . . . . . .  wrapped
*...+....1....+....2....+....3....+....4....+....5....+....6....+....7....+....8....+....9....+....0....+....1....+....2....+....3
 COMMUNICATIONS TRACE      Title:                     11/06/07 11:29:39               Page:    1
  Trace Description . . . . . :
  Configuration object . . . . :  ETHLIN02
  Type . . . . . . . . . . . . :  1          1=Line, 2=Network Interface
                                 3=Network server
  Object protocol . . . . . . :  ETHERNET
  Start date/Time . . . . . . :  11/06/07  11:29:22.329
  End date/Time . . . . . . . :  11/06/07  11:29:31.436
  Bytes collected . . . . . . :  4164
  Buffer size . . . . . . . . :  1048576     kilobytes
  Data direction . . . . . . . :  3          1=Sent, 2=Received, 3=Both
  Stop on buffer full . . . . :  N          Y=Yes, N=No
  Number of bytes to trace
   Beginning bytes . . . . . :  *CALC      Value, *CALC, *MAX
   Ending bytes  . . . . . . :  *CALC      Value, *CALC
  Select Trace Options:
  --------------------
                                                       More...

 F3=Exit  F12=Cancel  F19=Left  F20=Right  F24=More keys
 Character string not found in file.
```

Figure 14-22   Communications trace has wrapped

7. If there is more than one communications trace because you selected a specific format, perform one of the following options. Otherwise, continue with the next step:

   – To use SST, go to step 2 on page 260.

   – To use commands, go to 14.2.5, "Using PRTCMNTRC to save the communications trace from the trace buffer" on page 244.

Go to 14.2.7, "Using DLTCMNTRC to delete a communications trace" on page 249, or 14.3.4, "Deleting a communications trace using SST" on page 260, to delete the trace when it is no longer needed or it is not the one you want to submit with the problem report. The trace that is collected is automatically deleted if you perform an IPL. However, the spooled file is still saved.

14.5 Tools for analyzing a communication trace

The Communications Trace Analyzer is designed to analyze a communications trace created by either the STRCMNTRC command or the TRCCNN command, for various performance, connection or security problems you might be experiencing.

The Communications Trace Analyzer helps determine the type of communication problem that you encounter. It asks questions about the problem, the location of the trace, and analyzes the trace to show you where potential problems might exist and validate that they are, in fact, problems. For each problem it discovers, it provides a detailed explanation and offers resolution suggestions.

It also shows you the frames within the trace that provide the evidence for each problem. You can also use the analyzer to browse the trace by individual port pair conversations or other levels, either viewing summaries of each frame or the actual frames as they appear in the trace. For further information about the Communications Trace Analyzer, refer to the iSeries Information Center at:

http://www.ibm.com/eserver/iseries/infocenter

When you reach this site, click **Networking** → **TCP/IP Troubleshooting** → **Troubleshooting tools and techniques** → **Tools for tracing data and jobs** → **Communications trace** → **Tools for analyzing a communication trace.**

> **Note:** In i5/OS V5R4, the tool is included in the base operating system. For previous releases it can be downloaded from the following site:
>
> http://www-03.ibm.com/servers/eserver/support/iseries/tools/ictrace.html

14.6 Further information

To further explore the facilities and functions of the Communications Trace tool, refer to the following resources:

► The Communications trace topic in the iSeries Information Center at:

http://www.ibm.com/eserver/iseries/infocenter

When you reach this site, click **Networking** → **TCP/IP Troubleshooting** → **Troubleshooting tools and techniques** → **Tools for tracing data and jobs** → **Communications trace.**

► The Registered Software Knowledge Base at:

http://www-912.ibm.com/supporthome.nsf/document/20300257.

15

Advanced function: Watch support

Watch support enhances the trace functions in i5/OS by automatically monitoring and ending traces when certain predetermined criteria are met. This prevents the loss of valuable trace data and reduces the amount of time you need to spend monitoring traces.

For example, when you start a trace on a busy server, it is possible for large amounts of trace data to be collected very quickly so that the trace buffer wraps, overlaying previous trace data. By the time you can manually determine the problem has occurred and stop the trace, the previous trace data that is needed to solve the problem can be overlaid. The result can be lost trace data.

The watch function solves this problem by allowing you to set certain watch criteria using the watch parameters. When a failure occurs, there is often a message or a Licensed Internal Code (LIC) log that is generated at the time of the failure. You can specify which messages or LIC logs should be monitored during the trace collection. When the messages occur the server automatically ends the trace.

Watch support is available for the following commands:

► Trace Connection (TRCCNN)
► Start Communications Trace (STRCMNTRC)
► Start Trace (STRTRC)
► Trace TCP/IP Application (TRCTCPAPP)
► Trace Internal (TRCINT)

Note: Watch support is not available through the SST interface to the trace functions.

In i5/OS V5R4, watch support has been expanded to allow i5/OS users access to the functionality through the following commands and APIs:

► Start Watch (STRWCH)
► End Watch (ENDWCH)
► Work with Watches (WRKWCH)
► Start Watch API (QSCSWCH)

► End Watch API (QSCEWCH)

The watch function enhances your ability to detect and react to problems represented by specific messages or LIC log entries. The watch for event function notifies you when the specified event (message or LIC log entry) occurs, and then calls the specified exit program to take the desired action. Using these commands, you can invoke your own exit programs without having to run a trace. Consider using this function when analyzing problems that do not need a trace to be run or simply as a tool to trigger events within your operating environment.

For more information about using trace programs for your own operating environment, refer to the iSeries Information Center at:

http://www.ibm.com/eserver/iseries/infocenter

When you reach this site, click **Troubleshooting** → **Detect problems** → **Watch for event function.**

Note: Much of the text of this chapter on watch support was taken from the help text of the trace commands.

15.1 Watch parameters

The trace commands have the following parameters to specify the watch criteria:

► Watch for message (WCHMSG)
► Watched message queue (WCHMSGQ)
► Watched job (WCHJOB)
► Watch for LIC log entry (WCHLICLOG)
► Length of time to watch (WCHTIMO)
► Trace program (TRCPGM)
► Time interval (TRCPGMITV)

When using the watch parameters, consider the following:

► When the WCHJOB parameter is specified, the issuer of the command must be running under a user profile which is the same as the job user identity of the job being watched. Or the issuer of the command must be running under a user profile which has job control (*JOBCTL) special authority.

► Job control (*JOBCTL) special authority is also required if a generic user name is specified for the WCHJOB parameter.

► If you specify a generic user name in the WCHJOB parameter, you must have one of the following:

   – All object (*ALLOBJ) special authority

   – Authority to the Watch Any Job function of the operating system through iSeries Navigator's Application Administration support.

   – Used the Change Function Usage (CHGFCNUSG) command with a function ID of QIBM_WATCH_ANY_JOB to change the list of users that are allowed to start and end watch operations.

► Operational (*OBJOPR) and execute (*EXECUTE) authorities to the user exit program if specified in the Trace program (TRCPGM) parameter, and execute (*EXECUTE) authority to the library where the program is located.

► Use (*USE) authority to the message queues specified in the Watched message queue (WCHMSGQ) parameter, and use (*USE) authority to the library where the message queue is located.

The parameters for the watch function are discussed in this chapter. For examples on how to use the watch support parameters, refer to the help text of the trace command you are using.

15.1.1 Watch for message

The Watch for message parameter (WCHMSG) allows you to specify up to five message identifiers to be watched for. If a value other than *NONE is specified, you must specify where to watch for the message on the WCHMSGQ parameter. When the watched for message is added to the specified message queue or log, the trace exit program is called. If no trace exit program is defined, the trace stops.

If you receive multiple messages with the same message identifier, you can also specify comparison data to help distinguish a particular instance of a message. If the message data, the From program, or the To program includes the specified text, the watched for condition is true. If the message data, the From program or the To program does not contain the specified text, the trace function continues.

15.1.2 Watched message queue

The Watched message queue (WCHMSGQ) parameter specifies where to watch for the message identifiers specified on the WCHMSG parameter. You can specify to watch the message being added to the system operator message queue (*SYSOPR) or to other message queues, the history log (*HSTLOG) or job logs (*JOBLOG). Up to three message queues or special values can be specified.

15.1.3 Watched job

The Watched job parameter (WCHJOB) specifies the job whose job log is watched for the messages specified on the WCHMSG parameter. The specified job is watched only if *JOBLOG is specified on the WCHMSGQ parameter. Up to five job names can be specified.

You can watch the job log of the job that issued this trace command or you can specify other jobs. You can also specify a generic name of the job to be watched, for example, QDBSRV0*. The asterisk substitutes for any valid characters. A generic job name specifies all jobs with job names that begin with the generic prefix.

15.1.4 Watch for Licensed Internal Code log entry

The Watch for Licensed Internal Code Log (WCHLICLOG) parameter specifies up to five LIC log entry identifiers which are to be watched for. Each LIC log entry contains a major and a minor code. The watched for condition is met if a LIC log entry is added that matches the specified major and minor codes and any comparison data. When the watched for log entry is added to the LIC log, the trace exit program is called, even when the comparison data specified does not match. If no trace exit program is defined, the trace stops.

If you specify *ALL for Major code, any LIC log entry major code is considered a match. If *ALL is specified for the major code, you cannot specify *ALL for the LIC log entry minor code.

Alternatively, specify the LIC log major code to be watched for. You can specify either a hexadecimal digit or a question mark for each character in the four-digit code. A question mark is a wildcard character that is considered a match for any digit in that position. Up to three wildcard characters can be specified.

If you specify *ALL for Minor code, any LIC log entry minor code is considered a match. If *ALL is specified for the minor code, you cannot specify *ALL for the LIC log entry major code.

Alternatively, specify the LIC log minor code to be watched for. You can specify either a hexadecimal digit or a question mark for each character in the four-digit code. A question mark is a wildcard character that matches any digit in that position. Up to three wildcard characters can be specified.

If you receive multiple LIC log entries with the same major and minor codes, you can also use comparison data to act only on a particular instance of a LIC log entry. If this text is found in the LIC log entry data fields of the watched for log entry, the watched for condition is true. If this text is not found in the LIC log entry data fields of the watched for log entry and no exit program is specified on the TRCPGM parameter, the trace function continues. If the log entry matches the specified major and minor codes and an exit program is specified on the TRCPGM parameter, but the entry data does not contain the specified text, the exit program is called to determine if the trace should continue or stop.

If you use comparison data and this text is found in the LIC log entry data fields compared of a watched for log entry, the watch condition is considered to be true. The text is case sensitive. The LIC log fields which can be compared are Task Dispatching Element (TDE)

number, task name, server type, job name, user ID, job number, thread ID, exception ID, LIC module compile timestamp, LIC module offset, LIC module RU name, LIC module name, LIC module entry point name. The comparison data cannot be used to match across two fields, and can match an entire field or a substring of any field.

When watching for an exception ID, all four hexadecimal digits of the exception ID must be specified. Also, the prefix MCH can be specified if you want to compare only against the exception ID field and avoid possible substring matches with the other fields.

15.1.5 Length of time to watch

The Watch Time O parameter (WCHTIMO) specifies the time limit, in minutes, for watching for a message or a LIC log entry. When the specified amount of time has elapsed, the trace exit program is called (if one was specified on the TRCPGM parameter). The trace is ended and message CPI3999 is sent to the system operator message queue.

There is no time limit for watching for a particular message or LIC log entry if *NOMAX is specified. Alternatively, specify the number of minutes (from 1 to 43200) that the trace is to remain active while none of the watched for conditions have been met.

15.1.6 Trace program

The Trace program (TRCPGM) specifies the program to be called for user-defined trace commands and procedures. The trace program can be called:

► Before the application trace starts.
► After a match of a message identifier specified for the WCHMSG parameter, or a match of a LIC log entry specified for the WCHLICLOG parameter occurs.
► When the time interval specified on the TRCPGMITV parameter is reached.
► When the length of time to watch specified on WCHTIMO parameter is reached.

For documentation and an example trace program, refer to the iSeries Information Center at:

http://www.ibm.com/eserver/iseries/infocenter

When you reach this site, click **Programming** → **APIs** → **APIs by category** → **Problem Management** → **Monitoring** → **Watch for Trace Event exit program.**

Also refer to: **Networking** → **TCP/IP Troubleshooting** → **Troubleshooting tools and techniques** → **Tools for tracing data and jobs** → **Advanced trace function: Watch support** → **Example: Watch exit program.**

15.1.7 Time interval

The Trace Time Internal parameter (TRCPGMITV) specifies how often the trace exit program is called. You can specify the interval of time, in seconds (between 1 and 9999), of how often the trace exit program is called. The value must be less than the amount of time specified for the WCHTIMO parameter.

Java Virtual Machine problem determination

This chapter discusses a few of the common configuration problems that occur with Java with i5/OS. This discussion covers how to avoid problems, and how to identify and fix them if they do occur.

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16.1 Avoiding Java problems

Many problems encountered running the Java Virtual Machine (JVM™) are a result of poor management of fixes on the system. The Java Group PTF is designed to make this management easier and less error prone.

Individual PTFs should not be applied or removed from the system unless you are directed to do so by your service representative.   If individual PTFs are applied to the system, be very careful to follow the PTF Special Instructions because there are usually distribution requisite PTFs that need to be applied at the same time in order for the JVM to operate correctly. Always apply the entire Java Group PTF and IPL to get the delayed PTFs applied. In V5R3, use the DSPJVMJOB command to show jobs running JVMs. If there are no active JVMs, PTFs are applied immediately.

Always apply the Java Group PTF after installing a new 5722-JV1 Product Option which contains a Java Developer Kit.

Standard operating procedure for the System i and i5/OS recommends that Cumulative PTF Packages are applied on a regular basis to avoid general system problems. The same procedure should also be followed for systems that actively use Java. The Java Group PTF is similar to a Cumulative PTF Package in that it ships a collection of PTFs for many different products. The difference is that the Java Group PTF only contains the PTFs required for optimal Java efficiency and accuracy. A good maintenance strategy would be to apply the latest Cumulative PTF Package, followed by the latest Java Group PTF, whenever updates are done to the system.

Most of the PTFs in the Java Group PTF are also packaged within the Cumulative PTF Package. With this overlap of PTFs, the application of the Java Group PTF after already applying the Cumulative PTF Package goes swiftly. This overlap exists because each can be applied individually.

The Java Group PTF for each supported i5/OS release is refreshed approximately every three months. This schedule is subject to change without notice under various circumstances. For an example on how to check the system for an applied Java Group PTF, see section 25.1.1.

Java Group PTFs are:

► V5R2M0 - SF99169

► V5R3M0 - SF99269

For more information concerning Cumulative PTF Packages or Java Group PTFs, contact your primary IBM System i service provider.

16.1.1 Checking for Java Group PTFs on the System i

To determine what level of Java Group PTF is on the System i system, perform the following steps:

1. Enter WRKPTFGRP on the command line, and then press Enter. A display appears like the example shown in Figure 16-1 on page 273.

```
                          Work with PTF Groups
Type options, press Enter.
  4=Delete     5=Display     6=Print     9=Display related PTF groups

Opt   PTF Group                   Level     Status
  _     SF99169                      14     Installed



F3=Exit     F6=Print     F11=Display descriptions     F12=Cancel
F22=Display entire field
```

Figure 16-1   WRKPTFGRP command on OS/400 V5R2

2. The PTF Group in this example is SF99169 and it is at Level 14. The Status field displays `Installed` if all of the PTFs are successfully applied, whether or not they are temporarily or permanently applied.

3. If no Java Group PTF is found in the list when using WRKPTFGRP, you should order it from your service provider.

4. If Status reflects `Not Installed`, select option 5 (Display) to list the PTFs included with the Group PTF. All of the PTFs must be applied, so find which PTFs are not applied and correct them. In most cases, there are delayed PTFs awaiting the next Initial Program Load (IPL).

5. Your service provider can inform you of the latest level that is available for the Java Group PTF. Compare the level obtained from service with the Level displayed here. You should try to maintain the latest Java Group PTF.

The status of the PTF Group display can indicate Installed when in fact you need to install the group again. If individual PTFs were removed, or if a JV1 option was installed after the group was applied, the group PTF should be installed again. PTFs which are missing are applied.

16.2 Finding the cause of Java problems

If at any time you suspect there might be a problem with Java on your i5/OS system, the following checks should be performed before contacting your service provider. The checks listed here catch many configuration problems.

16.2.1 Which 5722-JV1 options are installed?

Perform the following steps:

1. Enter **go licpgm** on the command line, and then press Enter. A Work with Licensed Programs menu appears like the example shown in Figure 16-2 on page 274.

```
LICPGM                    Work with Licensed Programs
                                                              System:
Select one of the following:

  Manual Install
      1. Install all

  Preparation
      5. Prepare for install

  Licensed Programs
     10. Display installed licensed programs
     11. Install licensed programs
     12. Delete licensed programs
     13. Save licensed programs

                                                                 More...
Selection or command
===> _____
 _____
F3=Exit    F4=Prompt   F9=Retrieve   F12=Cancel   F13=Information Assistant
F16=AS/400 Main menu
```

Figure 16-2   Work with Licensed Programs

2. Select Option 10 to Display installed licensed programs.

3. Page down on the Display Installed Licensed Programs screen until you find the 5722-JV1 product and its options. Figures 402-404 show an example list of only the installed 5722-JV1 LPP options. Note: There are many other installed LPPs besides 5722-JV1, but they are not displayed in Figures 402-404.

4. Use F11 (Display option) to switch between the different displays found in Figure 16-3 - Figure 16-5 on page 275.

```
                 Display Installed Licensed Programs

Licensed    Installed
Program     Status         Description
5722JV1     *COMPATIBLE    Developer Kit for Java
5722JV1     *COMPATIBLE    Java Developer Kit 1.2
5722JV1     *COMPATIBLE    Java Developer Kit 1.1.8
5722JV1     *COMPATIBLE    Java Developer Kit 1.3
5722JV1     *COMPATIBLE    Java Developer Kit 1.4
                                                              More...
Press Enter to continue.

F3=Exit    F11=Display option   F12=Cancel   F19=Display trademarks
```

Figure 16-3   Display Installed Status of 5722-JV1

5. Make sure that Installed Status is *COMPATIBLE or *INSTALLED (Figure 16-3). If there are errors displayed, you should re-install 5722-JV1 from the original media. It is recommended to perform DLTLICPGM LICPGM(5722JV1) OPTION(*ALL) before re-installing. This is not necessary but recommended because it might clean out any bad files located in /QIBM/ProdData/Java400/ or in the QJAVA library.

```
                Display Installed Licensed Programs

Licensed    Installed
Program     Release      Description
5722JV1     V5R2M0       Developer Kit for Java
5722JV1     V5R2M0       Java Developer Kit 1.2
5722JV1     V5R2M0       Java Developer Kit 1.1.8
5722JV1     V5R2M0       Java Developer Kit 1.3
5722JV1     V5R2M0       Java Developer Kit 1.4

                                                              More...
Press Enter to continue.


F3=Exit    F11=Display option    F12=Cancel    F19=Display trademarks
```

Figure 16-4   Display Installed Release of 5722-JV1

6. Make sure that Installed Release is the same as the i5/OS release. Figure 16-4 is an example on an OS/400 V5R2 system. The Installed Release in Figure 403 matches OS/400 V5R2, so 5722-JV1 is correctly installed. If any of the 5722-JV1 options, or *BASE, do not match the i5/OS operating system then you must re-install 5722-JV1.

7. Permanently remove the current install of Java.

   `DLTLICPGM LICPGM(5722JV1) OPTION(*ALL)`

8. Re-install 5722-JV1 from your distribution media. If you cannot find your installation media, contact your service provider.

```
                Display Installed Licensed Programs

Licensed    Installed
Program     Release      Description
5722JV1     *BASE        Developer Kit for Java
5722JV1     3            Java Developer Kit 1.2
5722JV1     4            Java Developer Kit 1.1.8
5722JV1     5            Java Developer Kit 1.3
5722JV1     6            Java Developer Kit 1.4

                                                              More...
Press Enter to continue.

F3=Exit    F11=Display option    F12=Cancel    F19=Display trademarks
```

Figure 16-5   Display Installed Option of 5722-JV1

9. Check which options are installed using Figure 16-5. It is possible that the version of the Java Developer Kit you wish to use is not installed, which naturally would result in error if you tried to use it. Install any options that are missing. At least one 5722-JV1 option must be installed.

Note: If you do decide to install or re-install one or more Java options, you must re-apply the latest Java Group PTF to ensure that any PTFs for the option are applied. Only the PTFs not already applied are processed. See 16.1.1, "Checking for Java Group PTFs on the System i" on page 272 for more information on Java Group PTFs.

16.2.2 Check if 5722-JV1 has any errors

Java is packaged for i5/OS within the Licensed Program Product called Developer Kit for Java (5722-JV1). The CHKPRDOPT (Check Product Option) command can be used to evaluate whether an LPP has errors not displayed in `go licpgm`. Every option of 5722-JV1 should be checked separately with this command. Possible options include *BASE, 3, 4, 5, 6, or 7. After calling CHKPRDOPT, press F10 to Include detailed messages.

Example: V5R2M0 2924 (English) iSeries:

```
                              Command Entry
                                                   Request level:   1
All previous commands and messages:
  > CHKPRDOPT PRDID (5722JV1) OPTION(*BASE)
    Product 5722JV1 release V5R2M0 option *BASE load 2924 correctly
    installed.
    Product 5722JV1 release V5R2M0 option *BASE load 5050 correctly
    installed.
    No errors detected by CHKPRDOPT.
  > CHKPRDOPT PRDID (5722JV1) OPTION(6)
    Product 5722JV1 release V5R2M0 option 0006 load 5106 correctly installed.
    No errors detected by CHKPRDOPT.
  > CHKPRDOPT PRDID (5722JV1) OPTION(7)
    All product loads checked are only defined.
    No errors detected by CHKPRDOPT.
                                                                   Bottom
Type command, press Enter.
===> _____
  _____
  _____
  _____

 F3=Exit    F4=Prompt    F9=Retrieve    F10=Exclude detailed messages
 F11=Display full       F12=Cancel    F13=Information Assistant    F24=More keys
```

Figure 16-6   Results of running three CHKPRDOPT commands on an OS/400 V5R2 system

1. CHKPRDOPT PRDID(5722JV1) OPTION(*BASE)

   This displays the main product load as well as the language load. The example here was a V5R2M0 English (2924) OS/400, so in Figure 16-6 you see load 2924. A successful check displays `No errors detected by CHKPRDOPT`.

2. CHKPRDOPT PRDID(5722JV1) OPTION(6)

   Option 6 was installed (See Figure 16-5 on page 275) and a successful CHKPRDOPT call displays `No errors detected by CHKPRDOPT` as in Figure 16-6.

3. CHKPRDOPT PRDID(5722JV1) OPTION(7)

   Option 7 was not installed (See Figure 16-5 on page 275). If an option is defined, but not installed, it displays as in Figure 16-6.

16.2.3 Java Group PTF

There are many times where the cover letter of PTF is not followed. The most common problem with Java is an incorrect PTF level, even though the correct level is dictated in the cover letter and in Java Group PTFs. The best solution is to apply the latest Java Group PTF.

Contact your service provider to figure out the level of the latest Java Group PTF. Refer to 16.2.3, "Java Group PTF" on page 276 to verify that the latest Java Group PTF is applied successfully on the System i.

16.2.4 Hello World

The simplest of all Java programs, "Hello World", is a good initial test to see if Java is minimally functional. If any of the following checks fail, then there is a configuration problem somewhere on your System i. Proceed to 16.2.2, "Check if 5722-JV1 has any errors" on page 276 to begin examination of your current System i configuration.

This is a general overview of the checks below. Every check has a verbose listing of all the classes loaded while running the Java program. Every check below must be run for each 5722-JV1 option that is installed. The examples shown below are using J2SE™ v1.3, which is available in 5722-JV1 Option 5. Every check should display `Hello World` at the end.

1. Run the following on the command line:

   ```
   JAVA CLASS(Hello) PROP((java.version '1.3')) OPTION(*VERBOSE)
   ```

2. Run the following on the command line:

   ```
   JAVA CLASS(Hello) PROP((java.version '1.3') (java.compiler NONE))
   OPTION(*VERBOSE)
   ```

3. Run the following in QSHELL:

   ```
   java –verbose –Djava.version=1.3 Hello
   ```

4. Run the following in QSHELL:

   ```
   java –verbose –Djava.version=1.3 –Djava.compiler=NONE Hello
   ```

16.2.5 Runtime files

The primary runtime file for every Java version has native methods inside of it. For this reason, the attached Java program of the primary runtime file for each Java version should never be altered in any way. If you are unable to run "Hello World" (16.2.2, "Check if 5722-JV1 has any errors" on page 276), then it is possible there is something wrong with the file. These files are subject to change at any time, so an exact screenshot is not available for comparison here. There are general rules that every version of the runtime file adheres to, so those are listed instead.

Enter the following command on the command line. After pressing Enter, the display in Figure 16-6 on page 276 and Figure 16-7 on page 278 appears. It is necessary to substitute the version jdkxx in the command below. Possible values for xx are 12, 13, 14, and 15.

```
DSPJVAPGM CLSF('/QIBM/ProdData/Java400/jdkXX/lib/rt.jar')
```

```
                  Display Java Program Information
File name . . . . . . . . . . . . . . . . . . :  < odData/Java400/jdk14/lib/rt.jar
Owner . . . . . . . . . . . . . . . . . . . :  QSYS



Java program creation information:
  File change date/time . . . . . . . . . . . . . . :  12/16/03  10:15:34
  Java program creation date/time . . . . . . . . . :  12/16/03 12:35:38
  Java programs . . . . . . . . . . . . . . . . . :  25
  Total classes in source . . . . . . . . . . . . :  9207
  Classes with current Java programs  . . . . . . . :  9207
  Classes without current Java programs . . . . . . :  0
  Classes containing errors . . . . . . . . . . . :  0
  Optimization  . . . . . . . . . . . . . . . . . :  40
  Enable performance collection . . . . . . . . . . :  *NONE
  Use adopted authority . . . . . . . . . . . . . . :  *NO
  User profile  . . . . . . . . . . . . . . . . . :  *USER
                                                              More...
Press Enter to continue.

F3=Exit   F12=Cancel   F22=Display entire field
```

Figure 16-7   Display Java Program – Screen 1

```
                  Display Java Program Information
File name . . . . . . . . . . . . . . . . . . :  < odData/Java400/jdk14/lib/rt.jar
Owner . . . . . . . . . . . . . . . . . . . :  QSYS




  Profiling data  . . . . . . . . . . . . . . . . . :  *NOCOL
  Licensed Internal Code options  . . . . . . . . . :  NoPreresolveExtRef.PreLo
adExtRef.AllowMultiThreadedCreate




Java program statistics:
  Java Program size (K bytes) . . . . . . . . . . . :  267428
  Release program created for . . . . . . . . . . . :  V5R3M0

                                                              Bottom
Press Enter to continue.

F3=Exit   F12=Cancel   F22=Display entire field
```

Figure 16-8   Display Java Program – Screen 2

General rules for the IBM supplied Java runtime file (rt.jar) on the System i (see Figure 16-7):

► The owner must be QSYS.

► The Java program creation date/time should never be more than 24 hours ahead of the File change date/time.

If it is more than 24 hours ahead, then it is possible that the attached Java program was incorrectly re-created. Any user recreation of the primary Java runtime files, shipped by IBM, breaks the links that allow the primary Java native methods to function.

► The File change date/time should never be a more recent date than the Java program creation date/time.

► It is possible that a user altered the jar or zip file by either replacing it or making changes to the classes within the file. Any time the physical *STMF file is altered, the File change date/time is updated to reflect the change. These types of changes should never be done to IBM supplied files.

► The number of Java programs for the rt.jar should never be a number less than ten (10).

► If an attached Java program was somehow accidentally re-created or damaged, the value for Java programs usually falls back to one (1). If this happens, Java does not run.

► The number of Total classes in source must match the value for Classes with current Java programs. The value should also be larger than 4,000.

    If these two values differ, then there are class files missing information in the attached Java program and runtime errors are mostly likely to occur.

► If Classes without current Java programs or Classes containing errors has any value other than zero (0), then there is an error with the attached Java program.

► Optimization must be 40.

► Enable performance collection must be *NONE.

► Use adopted authority must be *NO.

► User profile must be *USER.

► Profiling data must be *NOCOL.

► The Licensed Internal Code options can be ignored.

► The Java program size should never be less than 100 MBs.

► The Release program created for must match the release of i5/OS. The example in Figure 16-7 on page 278 is on a i5/OS V5R3 system, so it is correct.

Fixing a damaged rt.jar file

If any of the previous checks fail, then the rt.jar might be damaged or missing. It is possible if this file is damaged or missing that there are other files that have also been damaged. The most reliable way to fix this is to reinstall the 5722-JV1 option which correlates to the JDK™ which is damaged and then reapply the latest Java Group. You do not need to reinstall the BASE or other options of 5722-JV1; reinstalling only the option with a damaged rt.jar is necessary.

In each release, one JDK is imbedded into the i5/OS operating system and the JV1 option only contains links to the files. In this case, reinstalling JV1 does not fix the problem and you must reinstall 5722-SS1 Option (3). In order to determine what needs to be installed, use WRKLNK OBJ('/QIBM/ProdData/Java400/jdkXX/lib/rt.jar') DETAIL(*EXTENDED) where XX is the version of the JDK. On the Work with Object Links panel, use option 12 (Work with links). If this is a symbolic link to a file in /QIBM/ProdData/OS400/Java400/jdk/lib, the damaged file is only fixed by reinstalling 5722-SS1 Option 3. Reapply the Java Group PTF once the install is complete.

Authorities for runtime files

Occasionally, public authorities to the critical runtime files or the directories are altered in a way that prevents a JVM from running. Starting with the base directory '/', use WRKLNK

option 9 (Work with authority) to verify that user *PUBLIC has data authority of *RX for each directory in the path:

WRKLNK OBJ('/QIBM/ProdData/Java400/jdk13/lib/rt.jar')

16.2.6 SystemDefault.properties

i5/OS provides a convenience mechanism for adding additional properties to your Java Virtual Machine, without having to alter your code. This is done in the form of a *STMF file called SystemDefault.properties. Inside this regular text file you can specify any number of Java Virtual Machine properties that you wish to use. Conflicting properties can adversely affect Java usage. It is important to note that this file is not shipped with i5/OS, but is created only by a user of the System i. There are three places where this file can reside that the Java Virtual Machine recognizes, as discussed below.

Default location

The default location is /QIBM/UserData/Java400/SystemDefault.properties.   This default file location is considered a "system-wide" properties file, because it affects every JVM on the System i system. Naturally, this default file location should be used with care and sensitivity to other users and applications on that system. The following example is a very common problem with this convenience mechanism. This example is just one of many different scenarios that are possible with improper use of SystemDefault.properties.

Example: User A does not want to load any extension jar files in their Java Virtual Machine, so they decide to create /QIBM/UserData/Java400/SystemDefault.properties and enter java.ext.dirs="" inside. At the same time this occurred, User B was working on a project which was using classes located in the extension directories. After User A created the SystemDefault.properties file, User B began to experience errors and did not know why. In this situation, User B was "broken" because of User A and neither was aware of the situation that had occurred.

User profile home directory

To avoid using a "system-wide" properties file, users can place a SystemDefault.properties file in the home directory of their user profile. If you do not know the home directory of your user profile, use the following steps. These steps are for a user profile called EXAMPLE. For your own use, replace EXAMPLE with the user profile you wish to check:

1. Enter the following command on the command line, and press Enter.

   DSPUSRPRF USRPRF(EXAMPLE)

```
                        Display User Profile - Basic

User profile . . . . . . . . . . . . . . . . :     EXAMPLE

Home directory . . . . . . . . . . . . . . . :     /home/mydir

                                                                   Bottom
 Press Enter to continue.

 F3=Exit    F12=Cancel
```

Figure 16-9   Display User Profile

2. Page down in the Display User Profile – Basic display until you reach the bottom. The very last entry is for Home directory. As you can see in Figure 16-9 on page 280, this example has the Home directory listed as /home/mydir.

3. With these settings, any Java Virtual Machine that user EXAMPLE starts looks for /home/mydir/SystemDefault.properties.

User specified directory

The environment variable QIBM_JAVA_PROPERTIES_FILE can be used to specify where the SystemDefault.properties file is located. Use the DSPENVVAR command to see if the environment variable exists and if so, what the value is.

Is SystemDefault.properties the problem?

Check for a SystemDefault.properties in the locations discussed in previous sections. If the file does exist, rename the file to something else and then try to run java Hello (See 16.2.4, "Hello World" on page 277). If removing SystemDefault.properties from the Java Virtual Machine startup path fixes your Java problem then the file should be reviewed for any incompatibilities it contains.

16.2.7 Property names and values

This section is valid for i5/OS releases of i5/OS V5R3 or later. If you are using an earlier release, skip to the next section.

There are so many ways to pass in different properties for a Java Virtual Machine that sometimes it is very confusing to understand exactly which properties are in a Java Virtual Machine and what their values are. There are a couple of different ways to see which properties are being used in your Java Virtual Machine when it begins. This can be done using the PropDump Java program or using a JVM property called os400.display.properties.

The PropDump Java program is not much more complex than the Hello Java program, so it is a viable alternative to the standard Hello World example. With this standalone Java program, you can see what properties exist and what their values are in normal JVM startup. This is an excellent test to see if the normal Java environment is functional. The term "normal" refers to the existing environment that affects Java, such as system environment variables, SystemDefault.properties files, and Java extension files.

Another way to see properties during JVM startup is to add the JVM property called os400.display.properties. This can be done through interactive Java commands, programs written using JNI™, or using the SystemDefault.properties file. If you are using third party applications where it is not possible to employ changes directly to the application, use the SystemDefault.properties file to temporarily display the properties in your JVMs. This change should be done only temporarily because it dumps all JVM properties to standard out for every single JVM that is started. As you can deduce, this can result in many unnecessary spool files being created if this property is left in a SystemDefault.properties file indefinitely. If you do not know how to use the SystemDefault.properties file, refer to 16.2.6, "SystemDefault.properties" on page 280.

16.3 Additional data collection

Depending on the problem you are experiencing, you might need to collect additional diagnostic data. In this section, a situation where a JVM is using too much CPU is used as an example.

16.3.1 JVM has excessive CPU

To help diagnose the problem of a JVM using excessive CPU, gather the following information:

1. Collect a Display Job (DSPJOB) of the JVM. Perform this step as close as possible to the dump of the JVM in step 2. To do this, start two Telnet sessions to the system. In one session, type the following command. Do not press the Enter key yet:

   `DSPJOB JOB(NUMBER/USER/NAME) OUTPUT(*PRINT) OPTION(*ALL)`

   On the second Telnet session, set up the DMPJVM command as described in 17.4, "Collecting JVM dumps" on page 292.

2. Press the Enter key on both Telnet sessions at the same time.

3. Collect a snapshot of the System Status statistics using the following command:

   `WRKSYSSTS OUTPUT(*PRINT)`

4. Collect a snapshot of the Shared Storage Pools statistics using the following command:

   `WRKSHRPOOL OUTPUT(*PRINT)`

5. Repeat steps 2 to 4 a few times.

6. Collect the processor feature code of the system using the following command:

   `DSPSYSVAL SYSVAL(QPRCFEAT) OUTPUT(*PRINT)`

7. Collect the Performance adjustment setting using the following command:

   `DSPSYSVAL SYSVAL(QPFRADJ) OUTPUT(*PRINT)`

> **Note:** To determine which thread in the application is consuming excessive CPU, look at the threads section for the DSPJOB. Look for the thread IDs that are using the highest CPU. Note the thread ID using excessive CPU and search for it in the DMPJVM output. Some of the threads are not in the DMPJVM since they are the Garbage Collector threads.
>
> Once you find the thread ID in the DMPJVM, look at the stack for the thread to see if any of your application classes are displayed in the stack. If so, then you have the class that is a potential issue.

16.3.2 JVM memory leaks

If the performance of your JVM degrades as it runs for a longer period of time, you might have erroneously coded a memory leak. In memory leak situations, memory usage can reach the maximum allowed for the JVM and cause excessive faulting in the memory pool for the JVM, severely degrading performance. If you suspect that a memory leak is occurring, the Analyze Java Virtual Machine (ANZJVM) command can be used to help diagnosis.

ANZJVM finds object leaks by taking two copies of the garbage collection heap that are separated by a specified time interval. To find object leaks, look at the number of instances of each class in the heap. Classes that have an unusually high number of instances should be noted as possibly leaking.

You should also note the change in number of instances of each class between the two copies of the garbage collection heap. If the number of instances of a class continually increases, that class should be noted as possibly leaking.

To use the ANZJVM command, follow these steps:

1. Find the job name, user and number of the JVM jobs. Type DSPJVMJOB and press the Enter key. An example of the output from a DSPJVMJOB command is shown in Figure 16-10.

```
                    Display Java Virtual Machine Jobs              ITSOSYS1
                                                        12/05/07  12:30:07
     Java Virtual Machine Jobs:   13          Allow New JVM:    Yes


                                             Current
     Job          User       Number  Type   User        Status  Subsystem
     SERVER1      QEJBSVR     514152  BCH    QEJBSVR     JVAW    QEJBAS5
     WEBSPHERE_   QEJBSVR     514105  BCH    QEJBSVR     JVAW    QEJBAS5
     WEBSPHERE_   QEJBSVR     514117  BCH    QEJBSVR     JVAW    QEJBAS5
     SERVER1      QEJBSVR     514175  BCH    QEJBSVR     JVAW    QEJBAS5
     ADMIN        QEJBSVR     511875  BCH    QEJBSVR     JVAW    QWAS6
     ITSOWAS1     QEJBSVR     536463  BCH    QEJBSVR     JVAW    QWAS6
     SERVER1      QEJBSVR     511920  ASJ    QEJBSVR     JVAW    QEJBAS5
     ADMIN        QTMHHTTP    511878  BCI    QTMHHTTP    SIGW    QHTTPSVR
     QJVAEXEC     QEJBSVR     514169  BCI    QEJBSVR     JVAW    QEJBAS5
     QJVAEXEC     QEJBSVR     514142  BCI    QEJBSVR     JVAW    QEJBAS5
     QSRVMON      QSYS        511824  BCI    QSECOFR     DEQW    QSYSWRK
     QJVACMDSRV   QIBMHELP    511856  BCI    QIBMHELP    JVAW    QSYSWRK
     QYPSJSVR     QYPSJSVR    511865  BCH    QYPSJSVR    SIGW    QSYSWRK


                                                                   Bottom
     F3=Exit   F5=Refresh   F11=Display server type    F12=Cancel

     (C) COPYRIGHT IBM CORP. 1980, 2007.
```

Figure 16-10   Display Java Virtual Machine Jobs display

2. Note the Job, User and Number of the job to be dumped. In this example we are using the Websphere Application Server job ITSOWAS1. Then use the F3 (Exit) key to return to a command line.

3. Type ANZJVM on any command line and press F4 (Prompt). A display appears as shown in Figure 16-11 on page 284.

```
                      Analyze Java Virtual Machine (ANZJVM)

 Type choices, press Enter.

 Job name . . . . . . . . . . . .                    Name
   User . . . . . . . . . . . . .                    Name
   Number . . . . . . . . . . . .                    000000-999999
 Time interval  . . . . . . . . .   60               0-3600
 Force garbage collection . . . .   *YES             *YES, *NO
 Sort by  . . . . . . . . . . . .   *NUMOBJCHG       *NUMOBJCHG, *NUMOBJ...




                                                                         Bottom
 F3=Exit   F4=Prompt   F5=Refresh    F10=Additional parameters   F12=Cancel
 F13=How to use this display        F24=More keys
```
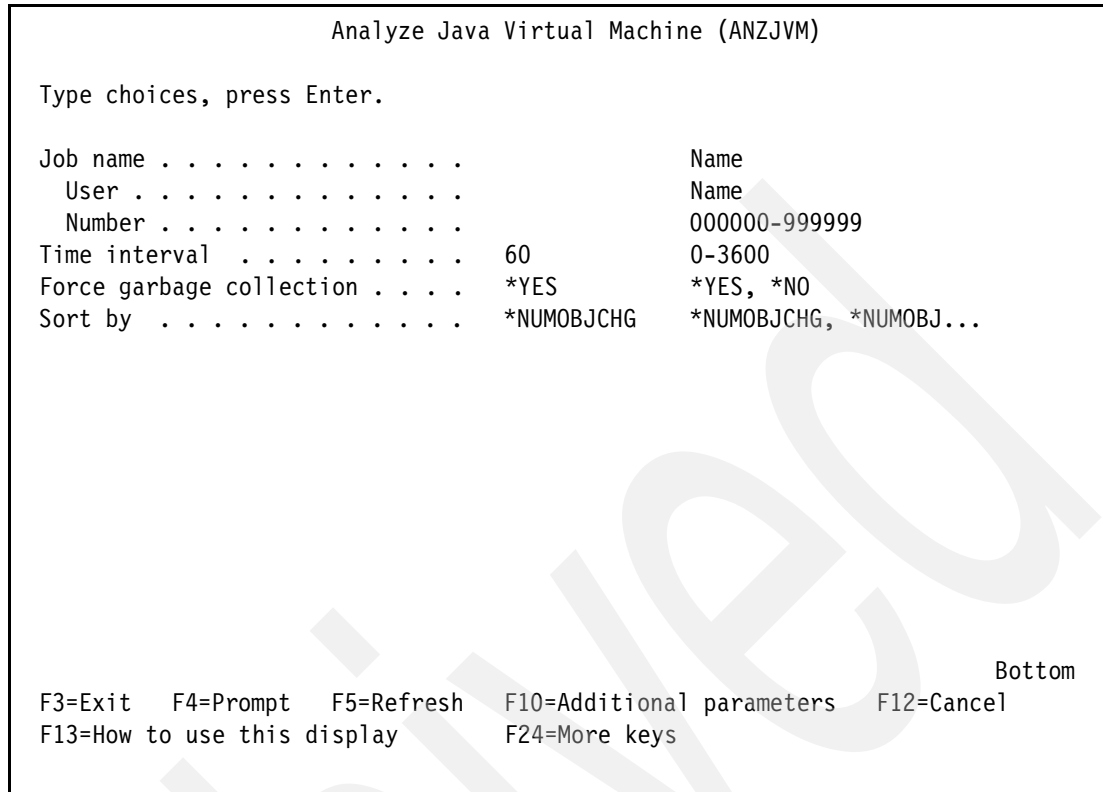
Figure 16-11   Analyze Java Virtual Machine display

Consider what time interval you wish to use. The longer the time interval between the two
copies, the more certainty you have that objects are actually leaking. By running ANZJVM
a series of times with a larger time interval, you should be able to diagnose with a high
degree of certainty what is leaking.

4. Type the job name in the Job name prompt, the user name in the User prompt and the job
   number in the Number prompt. Type the interval you require in the Time interval prompt
   and press the Enter key. The display is then inhibited for the length of time you specified in
   the Time interval prompt.

   Note: Consider submitting the ANZJVM command to batch if you want to continue
   using your telnet session while the ANZJVM command is running.

5. A spooled file called QANZJVM is created by the job executing the ANZJVM. Locate the spooled file and display it. A display appears as shown in Figure 16-12.

```
Display Spooled File
File  . . . . . :   QANZJVM                                                      Page/Line   1/6
Control . . . . .                                                               Columns     1 - 130
Find  . . . . . .
*...+....1....+....2....+....3....+....4....+....5....+....6....+....7....+....8....+....9....+....0....+....1....+....2....+....3
Tue Dec  5 14:32:21 Central Standard Time 2006
Job: 536463/QEJBSVR/ITSOWAS1
Interval: 500 (SEC)
Total garbage collection cycles prior to runing: 37
Total garbage collection cycles after runing: 39
GC forced: YES
TIME OF FORCED GC: Tue Dec  5 14:23:27 Central Standard Time 2006
TIME OF FORCED GC: Tue Dec  5 14:32:20 Central Standard Time 2006
..................................................................
. Class loader information                                        .
..................................................................
0 Default class loader
1 com/ibm/ws/classloader/CompoundClassLoader
2 sun/reflect/DelegatingClassLoader
3 com/ibm/ws/bootstrap/ExtClassLoader
4 sun/misc/Launcher$AppClassLoader
5 com/ibm/ws/management/connector/interop/JMXClassLoader
6 sun/misc/Launcher$ExtClassLoader
..................................................................
                                                                                            More...

 F3=Exit   F12=Cancel   F19=Left   F20=Right   F24=More keys
```

Figure 16-12   Analyze Java Virtual Machine output display

6. To capture another analysis for comparison over time, or to sort the report differently using the Sort by prompt on the command, repeat steps 3 on page 283 to 5.

16.4 Additional problem determination guides and tools

The *IBM Technology for Java VM in i5/OS* book, SG24-7353 has a detailed problem determination chapter, entitled JVM Analysis overview. This book provides procedures for gathering data and analyzing the following types of problems:

► JVM does not start

► A JVM crash

► The application becomes unresponsive

► Application performance issues

► Memory leaks

Your service provider might request you run one or more of the following Java macros in Service Tools:

► JAVAFLIGHTREC

► JAVAJARTOOLS

► JAVAJITINFO

► JAVAGCINFO

► JAVALOCKINFO

The process for running these macros is the same as for running the FLIGHTLOG macro. Instructions can be found in , "Flight recorders available from FLIGHTLOG macro" on

page 516. In step 7 on page 516 of those instructions, substitute FLIGHTLOG with the macro you have been asked to run.

See Chapter 17, "Java Virtual Machine logs and dumps" on page 287 for information on logs and dumps relative to JVM.

16.5 Contacting your service provider

If you do end up with a problem that you cannot fix, contact your service provider. Before doing so, it greatly helps speed up the debug process if you complete the following checklist. All of these are potential questions that the service provider might ask when trying to help debug your problem.

► What level of Java Group PTF is installed?

► What level of CUM is installed?

► Does "Hello World" run?

► Which Java Developer Kit are you trying to use?

► Are there any 4300 (major code) vlogs? If yes, save them in a text file for sending in to service.

► If the problem appears to be a System i specific JVM problem, you might be asked for a simplified version or scenario that can be used to easily reproduce the problem.

17

Java Virtual Machine logs and dumps

This chapter discusses collecting Java Virtual Machine logs and dumps.

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17.1 Collecting Java Virtual Machine logs

A Java Virtual Machine (JVM) server creates two types of logs: JVM server job logs and JVM error logs. The former are the same type of job logs that any i5/OS job generates. The latter are logs specific to JVMs and are stored as stream files in the Integrated File System.

Problems detected after server initialization are most likely not recorded in the server job logs unless a critical condition occurs. They are recorded in the error log.

17.1.1 JVM server job logs

To find the active JVM on a system, use the Display JVM Jobs (DSPJVMJOB) command. An example of the output from a DSPJVMJOB command is shown in Figure 17-1. The WebSphere® Administration Server (WAS) instance named ITSOWAS1 is used in the examples in this chapter.

```
            Display Java Virtual Machine Jobs              ITSOSYS1
                                                    12/05/07  12:30:07
 Java Virtual Machine Jobs:   13        Allow New JVM:    Yes


                                       Current
 Job          User       Number  Type  User       Status   Subsystem
 SERVER1      QEJBSVR    514152  BCH   QEJBSVR    JVAW     QEJBAS5
 WEBSPHERE_   QEJBSVR    514105  BCH   QEJBSVR    JVAW     QEJBAS5
 WEBSPHERE_   QEJBSVR    514117  BCH   QEJBSVR    JVAW     QEJBAS5
 SERVER1      QEJBSVR    514175  BCH   QEJBSVR    JVAW     QEJBAS5
 ADMIN        QEJBSVR    511875  BCH   QEJBSVR    JVAW     QWAS6
 ITSOWAS1     QEJBSVR    536463  BCH   QEJBSVR    JVAW     QWAS6
 SERVER1      QEJBSVR    511920  ASJ   QEJBSVR    JVAW     QEJBAS5
 ADMIN        QTMHHTTP   511878  BCI   QTMHHTTP   SIGW     QHTTPSVR
 QJVAEXEC     QEJBSVR    514169  BCI   QEJBSVR    JVAW     QEJBAS5
 QJVAEXEC     QEJBSVR    514142  BCI   QEJBSVR    JVAW     QEJBAS5
 QSRVMON      QSYS       511824  BCI   QSECOFR    DEQW     QSYSWRK
 QJVACMDSRV   QIBMHELP   511856  BCI   QIBMHELP   JVAW     QSYSWRK
 QYPSJSVR     QYPSJSVR   511865  BCH   QYPSJSVR   SIGW     QSYSWRK


                                                              Bottom
 F3=Exit   F5=Refresh   F11=Display server type   F12=Cancel

 (C) COPYRIGHT IBM CORP. 1980, 2007.
```

Figure 17-1   Display Java Virtual Machine Jobs display

The WAS 6.0 job named ADMIN is for the IBM Web Administration for i5/OS administration server. The job named ITSOWAS1 is the user defined application server. The name of the server is defined when the server instance is created.

Note the job name, user and number of the JVM job you are interested in. To view the job logs for these jobs, refer to Chapter 4, "Collecting messages" on page 35.

17.1.2 JVM error logs

When a WAS server is created, error logging is enabled unless it is explicitly disabled. Error logging can be subsequently enabled or disabled through the administration server.

For information about enabling WAS logs, refer to:

http://www.ibm.com/eserver/iseries/infocenter

Navigate to:

e-business and Web serving → Application servers → IBM WebSphere Application Server - Express V5.1 → Troubleshooting → WebSphere Application Server log files → Java virtual machine log files.

The error logs are created as stream files in a /logs directory. If the default path is used during the server configuration, refer to Table 17-1 to find the path for your installation.

Table 17-1   Error log path names

Version	Path
6.0	/QIBM/UserData/WebSphere/AppServer/V6/Base/profiles/your_WAS_server/logs/your_WAS_server/
5.1	/QIBM/UserData/WebAS51/Base/your_WAS_server/logs
5.0	/QIBM/UserData/WebAS5/Base/your_WAS_server/logs

If a different path was specified during configuration, look up the path through the IBM Web Administration for i5/OS administration console. For further information on the administration console, refer to the iSeries Information Center at:

http://www.ibm.com/eserver/iseries/infocenter

When you reach this site, click **e-business and Web serving → Application servers → IBM WebSphere Application Server - Express V5.1 → Troubleshooting → WebSphere Application Server log files → Java virtual machine log files → Configure the Java virtual machine log files.**

The error logs are accessible using the WRKLNK command. An example, using version 6.0 of WAS is:

```
WRKLNK OBJ('/QIBM/UserData/WebSphere/AppServer/V6/Base/profiles/ITSOWAS1/
logs/ITSOWAS1/*')
```

An example of the WRKLNK command output is shown in Figure 17-2 on page 290.

```
                        Work with Object Links

Directory  . . . . :    /QIBM/UserData/WebSphere/AppServer/V6/Base/profiles/ >

Type options, press Enter.
  2=Edit   3=Copy   4=Remove   5=Display   7=Rename   8=Display attributes
  11=Change current directory ...

Opt   Object link          Type      Attribute    Text
      native_stderr.log    STMF
      native_stdout.log    STMF
      trace.log            STMF
      ITSOWAS1.pid         STMF
      SystemErr.log        STMF
      SystemOut.log        STMF



                                                                       Bottom
Parameters or command
===>
F3=Exit   F4=Prompt   F5=Refresh   F9=Retrieve   F12=Cancel   F17=Position to
F22=Display entire field          F23=More options
```

Figure 17-2   Work with Object Links display

The error log is the file prefixed with SystemErr.

Note: The SystemOut.log file can be another good source of information when conducting problem determination. This log file can be found, displayed and saved in the same manner as SystemErr.log.

Select option 5 to view the contents of the log. An example of the contents of an error log is shown in Figure 17-3 on page 291.

```
 Browse : ITSOWAS1/SystemErr.log
 Record :      1  of   5978 by  18                    Column :    1    99 by 131
 Control :

 ....+....1....+....2....+....3....+....4....+....5....+....6....+....7....+....8....+....9....+....0....+....1....+....2....+....3.
 ************Beginning of data***************
 com.ibm.db2.jdbc.app.DB2DBException: Relational database NULL not in relational database directory.
  at java.lang.Throwable.<init>(Throwable.java:195)
  at java.lang.Exception.<init>(Exception.java:41)
  at java.sql.SQLException.<init>(SQLException.java:40)
  at com.ibm.db2.jdbc.app.DB2DBException.<init>(DB2DBException.java:47)
  at com.ibm.db2.jdbc.app.DB2ConnectionRuntimeImpl.SQLConnect(Native Method)
  at com.ibm.db2.jdbc.app.DB2ConnectionRuntimeImpl.connect(DB2ConnectionRuntimeImpl.java:145)
  at com.ibm.db2.jdbc.app.DB2Connection.<init>(DB2Connection.java:408)
  at com.ibm.db2.jdbc.app.DB2Driver.handleURLProcessing(DB2Driver.java:1274)
  at com.ibm.db2.jdbc.app.DB2Driver.connect(DB2Driver.java:808)
  at java.sql.DriverManager.getConnection(DriverManager.java:512)
  at java.sql.DriverManager.getConnection(DriverManager.java:171)
  at Database.doGet(Database.java:94)
  at javax.servlet.http.HttpServlet.service(HttpServlet.java:743)
  at javax.servlet.http.HttpServlet.service(HttpServlet.java:856)
  at com.ibm.ws.webcontainer.servlet.ServletWrapper.service(ServletWrapper.java:1212)
  at com.ibm.ws.webcontainer.servlet.ServletWrapper.handleRequest(ServletWrapper.java:629)
  at com.ibm.ws.webcontainer.servlet.CacheServletWrapper.handleRequest(CacheServletWrapper.java:80)

 F3=Exit   F10=Display Hex   F12=Cancel   F15=Services   F16=Repeat find   F19=Left   F20=Right
```

Figure 17-3   Sample error log

For more information about interpreting the contents of the log files, refer to the iSeries Information Center at:

http://www.ibm.com/eserver/iseries/infocenter

When you reach this site, click **e-business and Web serving** → **Application servers** → **IBM WebSphere Application Server - Express V5.1** → **Troubleshooting** → **WebSphere Application Server log files** → **Java virtual machine log files** → **Interpret the contents for the Java virtual machine log files.**

Error logs can be copied to a spooled file or saved to a save file or offline media such as a tape device. To spool the error log, type `print` in the Control prompt.

> **Note:** The Print command spools the file starting with the current line and spools the rest of the file. To see other functions available within this display, press F1 in the Control prompt.

For more information about saving the error log to a save file or offline media, refer to Using the Save (SAV) command and specifying the device name in:

Systems management → **Backup and recovery** → **Backup your server** → **Manually save parts of your server** → **Save user data in your server** → **Save file systems.**

17.2 Vertical Licensed Internal logs

Check for Vertical Licensed Internal Logs (VLOGs) with major code 4300. These all pertain to the JVM:

1. Enter STRDST, Start a service tool,

2. Select Option 5, Licensed Internal Code log.

3. Select Option 1, Select entries from the Licensed Internal Code (LIC) log.

4. Entry type: Major code 4300

These entries are useful to your service provider in determining the problem. Of particular interest are the ones with minor code 09FF and any others generated during the same time period.

17.3 Job logs

Sometimes the job log can come in handy for figuring out what is wrong with your Java environment. When Java is started from the interactive display, the JVM is actually run in another process. Many messages of interest are in the JVM process's job log, not the interactive job log. By default, this joblog is named QPJOBLOG for user data QJVACMDSRV. If running java ends with JVA0122 'Java program complete with exit code 1. Review the JVMs job log to determine which messages led to the problem.

17.4 Collecting JVM dumps

In many situations your service provider needs a dump of the Java Virtual Machine (JVM) associated with a job to help with problem determination. The Dump Java Virtual Machine (DMPJVM) command is used to obtain this information.

17.4.1 Using DMPJVM

To dump the JVM of an active job using the Dump Java Virtual Machine (DMPJVM) command, complete the following steps:

Note: DMPJVM holds the job briefly while it takes a snapshot of the JVM. On rare occasions, with large JVMs, this can cause a performance problem that could require a JVM restart to recover.

1. Find the job name, user and number of the JVM jobs. Type DSPJVMJOB and press the Enter key. An example of the output from a DSPJVMJOB command is shown in Figure 17-4.

```
                    Display Java Virtual Machine Jobs                  ITSOSYS1
                                                            12/05/07  12:30:07
    Java Virtual Machine Jobs:   13          Allow New JVM:    Yes


                                             Current
    Job          User      Number  Type     User        Status   Subsystem
    SERVER1      QEJBSVR    514152  BCH      QEJBSVR     JVAW     QEJBAS5
    WEBSPHERE_   QEJBSVR    514105  BCH      QEJBSVR     JVAW     QEJBAS5
    WEBSPHERE_   QEJBSVR    514117  BCH      QEJBSVR     JVAW     QEJBAS5
    SERVER1      QEJBSVR    514175  BCH      QEJBSVR     JVAW     QEJBAS5
    ADMIN        QEJBSVR    511875  BCH      QEJBSVR     JVAW     QWAS6
    ITSOWAS1     QEJBSVR    536463  BCH      QEJBSVR     JVAW     QWAS6
    SERVER1      QEJBSVR    511920  ASJ      QEJBSVR     JVAW     QEJBAS5
    ADMIN        QTMHHTTP   511878  BCI      QTMHHTTP    SIGW     QHTTPSVR
    QJVAEXEC     QEJBSVR    514169  BCI      QEJBSVR     JVAW     QEJBAS5
    QJVAEXEC     QEJBSVR    514142  BCI      QEJBSVR     JVAW     QEJBAS5
    QSRVMON      QSYS       511824  BCI      QSECOFR     DEQW     QSYSWRK
    QJVACMDSRV   QIBMHELP   511856  BCI      QIBMHELP    JVAW     QSYSWRK
    QYPSJSVR     QYPSJSVR   511865  BCH      QYPSJSVR    SIGW     QSYSWRK


                                                                       Bottom
    F3=Exit   F5=Refresh   F11=Display server type   F12=Cancel

    (C) COPYRIGHT IBM CORP. 1980, 2007.
```

Figure 17-4   Display Java Virtual Machine Jobs display

2. Note the Job, User and Number of the job to be dumped. In this example we are using the Websphere Application Server job ITSOWAS1. Then use the F3 (Exit) key to return to a command line.

3. Type the following command to change the wait time of your job and press the Enter key:

   CHGJOB DFTWAIT(900)

   > **Note:** The DMPJVM command can take a few minutes to complete on a busy system, or when the JVM job is consuming a lot of CPU or is faulting. Changing the default wait time parameter of the job allows the subsequent DMPJVM command additional time to complete.

4. Type DMPJVM on any command line and press F4 (Prompt). A display appears as shown in Figure 17-5 on page 294.

```
                    Dump Java Virtual Machine (DMPJVM)

 Type choices, press Enter.

 Job name . . . . . . . . . . . .                    Name
   User . . . . . . . . . . . . .                    Name
   Number . . . . . . . . . . . .                    000000-999999
 Stack frames . . . . . . . . . .    10              0000-9999, *ALL




                                                                    Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F10=Additional parameters   F12=Cancel
 F13=How to use this display        F24=More keys
```

Figure 17-5   Dump Java Virtual Machine display

5. A spooled file called QDMPJVM is created by the job executing the DMPJVM. Locate the spooled file and display it. A display appears as shown in Figure 17-6.

```
Display Spooled File
File  . . . . . :   QDMPJVM                        Page/Line   1/6
Control . . . . .                                  Columns     1 - 130
Find  . . . . . .
*...+....1....+....2....+....3....+....4....+....5....+....6....+....7....+
Mon Dec  4 14:46:34 Central Standard Time 2006
Java Virtual Machine Information  536463/QEJBSVR/ITSOWAS1
.................................................................
. Classpath                                                      .
.................................................................
java.version=1.4
sun.boot.class.path=/QIBM/ProdData/WebSphere/AppServer/V6/Base/java/endorse
d/ibmorb.jar:/QIBM/ProdData/WebSphere/AppServer/V6/Base/java/endorsed/ibmex
t.jar:/QIBM/ProdData/WebSphere/AppServer/V6/Base/java/endorsed/ibmext.jar:/
QIBM/ProdData/WebSphere/AppServer/V6/Base/java/endorsed/ibmjgssfw.jar:/QIBM
/ProdData/WebSphere/AppServer/V6/Base/java/endorsed/ibmjgssprovider.jar:/QI
BM/ProdData/WebSphere/AppServer/V6/Base/java/endorsed/ibmjsseprovider2.jar:
/QIBM/ProdData/WebSphere/AppServer/V6/Base/java/endorsed/ibmorb.jar:/QIBM/P
rodData/WebSphere/AppServer/V6/Base/java/endorsed/ibmorbapi.jar:/QIBM/ProdD
ata/WebSphere/AppServer/V6/Base/java/endorsed/ibmpkcs.jar:/QIBM/ProdData/We
bSphere/AppServer/V6/Base/java/endorsed/ibmpkcs11.jar:/QIBM/ProdData/WebSph
ere/AppServer/V6/Base/java/endorsed/ibmpkcs11impl.jar:/QIBM/ProdData/WebSph
ere/AppServer/V6/Base/java/endorsed/xml.jar:/QIBM/ProdData/OS400/Java400/jd
k/lib/jdkptf14.zip:/QIBM/ProdData/OS400/Java400/jdk/lib/ibmjssefw.jar:/QIBM
                                                                  More...

F3=Exit   F12=Cancel   F19=Left   F20=Right   F24=More keys
```

Figure 17-6   Dump Java Virtual Machine output display

18

Cluster Resource Services

In a clustered System i configuration, be prepared with the following documentation before calling IBM Service:

► What is the name of your cluster?

► How many nodes make up your cluster and what are their names?

► What release are the nodes in your cluster at?

► What is your cluster version?

► What cumulative PTF package are the nodes at?

► What is a description of the problem?

► Do you have any cluster resource group (CRG) objects?

  – What are the CRG names and what type is each CRG (data, application, device)?

The DMPCLUINF CL command produces a file which has one or more members that contain information about the cluster. Each member contains the following:

► Printout of ACK Index messages

► ACK Index object

► Message trace queue

  – Types of messages in the trace queue

  – Reading each entry in the trace queue

► Cluster internal object (CIO)

► QCSTCRGMIX object

► QCSTCRGMI2 object

► Cluster Resource Group (CRG) object

Collecting HTTP server traces

An HTTP server trace provides additional information about server operations, from process management to Universal Resource Indicator (URI) interpretation.

The Trace TCP/IP Application (TRCTCPAPP) command is used to start and stop a trace on an active HTTP server. TRCTCPAPP traces only the manager and primary jobs of the nominated server. The Start TCP/IP Server (STRTCPSVR) command is used to start a trace on an inactive HTTP server. STRTCPSVR traces all server jobs of the nominated server.

Tracing can be set at three levels of granularity as shown in Table 19-1.

Table 19-1   HTTP server tracing levels

Trace level using TRCTCPAPP	Trace level using STRTCPSVR	Description
*ERROR	-ve	The service trace contains trace records for all error return codes or exception conditions.
*INFO	-vi	The service trace contains *ERROR level trace records as well as trace records for entry and exit points from application level APIs and API parameters.
*VERBOSE	-vv	The service trace contains *INFO level trace records as well as trace records for debugging control flow or data corruption.

When a trace is turned off, i5/OS automatically generates a trace report. In some circumstances, you might want to view the results of a trace while the trace is still running. The Dump User Trace (DMPUSRTRC) command can be used one or more times during a trace to take a snapshot of the trace data at any point in time.

A trace can be ended explicitly using the Trace TCP/IP Application (TRCTCPAPP) command or implicitly using the End TCP/IP Server (ENDTCPSVR) command. Both methods produce the same trace output but i5/OS places the output in different places. For TRCTCPAPP, the output is generated within the job executing the command. For ENDTCPSVR, the output is generated by the HTTP server jobs.

19.1 Starting a trace using TRCTCPAPP on an active HTTP server

To start a trace on an active HTTP server using the Trace TCP/IP Application (TRCTCPAPP) command, complete the following steps:

1. Type TRCTCPAPP on any command line and press F4 (Prompt). A display appears as shown in Figure 19-1.

```
                      Trace TCP/IP Application (TRCTCPAPP)

 Type choices, press Enter.

 TCP/IP application . . . . . . .                *FTP, *SMTPSVR, *SMTPCLT...
 Trace option setting . . . . . .    *ON         *ON, *OFF, *END, *CHK



















                                                                        Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 19-1   Trace TCP/IP Application display

2. Type *HTTP in the TCP/IP application prompt and press the Enter key. A display appears as shown in Figure 19-2.

```
                      Trace TCP/IP Application (TRCTCPAPP)

 Type choices, press Enter.

 TCP/IP application . . . . . . . > *HTTP           *FTP, *SMTPSVR, *SMTPCLT...
 Trace option setting . . . . . .   *ON             *ON, *OFF, *END, *CHK
 Maximum storage for trace  . . .   *APP            1-16000, *APP
 Trace full action  . . . . . . .   *WRAP           *WRAP, *STOPTRC
 Additional traces  . . . . . . .   *NONE           *NONE, *CMNARB, *CMNTRC...
                + for more values
 Trace program  . . . . . . . . .   *NONE           Name, *NONE
   Library  . . . . . . . . . . .                   Name, *LIBL, *CURLIB
 HTTP server instance . . . . . .                   Character value
 Trace level  . . . . . . . . . .   *ERROR          *ERROR, *INFO, *VERBOSE
 Configuration object . . . . . .                   Name
 Type . . . . . . . . . . . . . .                   *LIN, *NWI, *NWS




                                                                      More...
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 19-2   Trace TCP/IP Application display with additional options

3. Type the name of the HTTP server to be traced in the HTTP server instance prompt and type the level of granularity of tracing you require in the Trace level prompt as shown in Figure 19-3. Press the Enter key.

```
                    Trace TCP/IP Application (TRCTCPAPP)

 Type choices, press Enter.

 TCP/IP application . . . . . . . > *HTTP          *FTP, *SMTPSVR, *SMTPCLT...
 Trace option setting . . . . . .   *ON            *ON, *OFF, *END, *CHK
 Maximum storage for trace  . . .   *APP           1-16000, *APP
 Trace full action  . . . . . . .   *WRAP          *WRAP, *STOPTRC
 Additional traces  . . . . . . .   *NONE          *NONE, *CMNARB, *CMNTRC...
               + for more values
 Trace program  . . . . . . . . .   *NONE          Name, *NONE
   Library  . . . . . . . . . . .                  Name, *LIBL, *CURLIB
 HTTP server instance . . . . . . > apachedft      Character value
 Trace level  . . . . . . . . . . > *verbose       *ERROR, *INFO, *VERBOSE
 Configuration object . . . . . .                  Name
 Type . . . . . . . . . . . . . .                  *LIN, *NWI, *NWS




                                                                        More...
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 19-3 Trace TCP/IP Application display with additional options

Press the Enter key. The trace is now active.

4. Type the Display Job Log (DSPJOBLOG) command on the command line, press the Enter key, then press F10 (Display detailed messages). A display appears as shown in Figure 19-4. Record the job name, user and number of the manager and primary jobs. These details are needed when verifying your trace output or optionally, for the prompts on the DMPUSRTRC command.

```
                              Command Entry                           ITSOSYS1
                                                         Request level:   1
 All previous commands and messages:
      Job 005889/AKA1/QPADEV0005 started on 11/27/07 at 12:06:01 in subsystem
        QINTER in QSYS. Job entered system on 11/27/07 at 12:06:01.
      Message queue AKA1 is allocated to another job.
    > TRCTCPAPP APP(*HTTP) HTTPSVR(APACHEDFT) TRCLVL(*VERBOSE)
      User Trace option changed for job 005869/QTMHHTTP/APACHEDFT.
      User Trace option changed for job 005874/QTMHHTTP/APACHEDFT.
      Object QZSRHTTPTR in QUSRSYS type *USRQ deleted.




                                                                      Bottom
 Type command, press Enter.
 ===>



 F3=Exit   F4=Prompt   F9=Retrieve   F10=Exclude detailed messages
 F11=Display full      F12=Cancel    F13=Information Assistant   F24=More keys
```

Figure 19-4   Finding the names of jobs being traced

19.2 Starting a trace using STRTCPSVR on an inactive HTTP server

To start a trace on an inactive HTTP server using the Start TCP/IP Server (STRTCPSVR) command, complete the following steps:

1. Type STRTCPSVR on any command line and press F4 (Prompt). A display appears as shown in Figure 19-5.
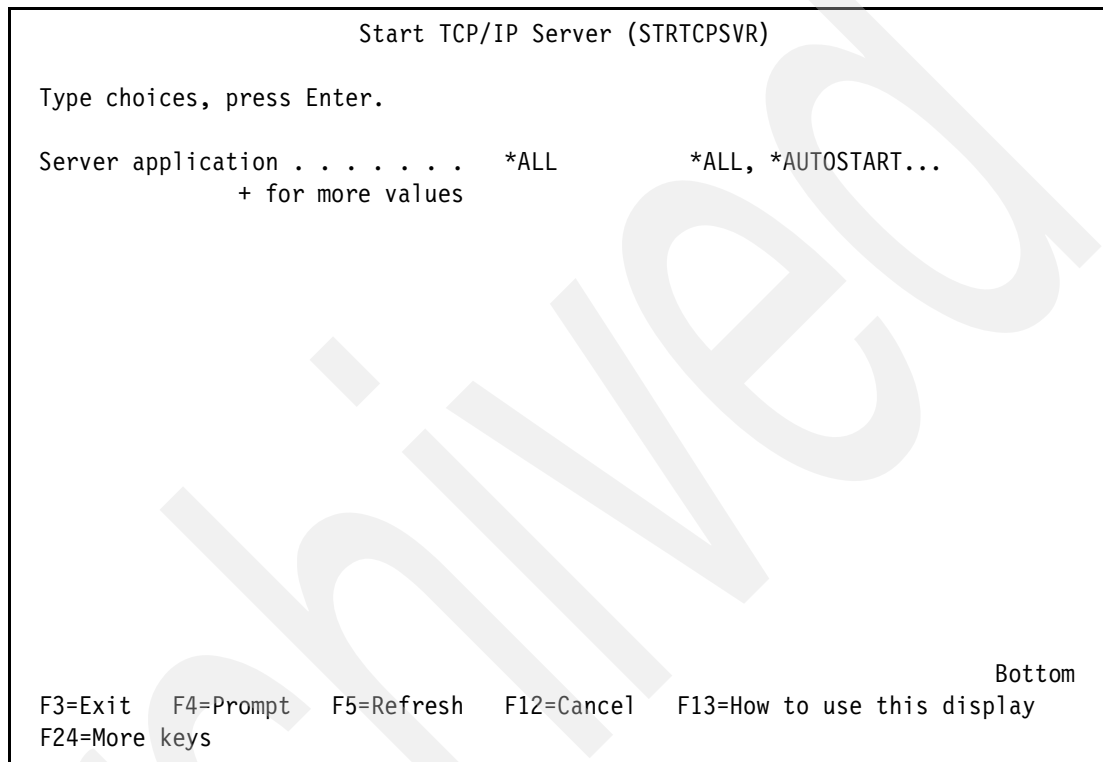
```
                     Start TCP/IP Server (STRTCPSVR)

 Type choices, press Enter.

 Server application . . . . . . .   *ALL          *ALL, *AUTOSTART...
               + for more values




                                                                   Bottom
   F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
   F24=More keys
```

Figure 19-5   Start TCP/IP Server display

2. Type *HTTP in the Server application prompt and press the Enter key. A display appears
   as shown in Figure 19-6.

```
                       Start TCP/IP Server (STRTCPSVR)

 Type choices, press Enter.

 Server application . . . . . . . > *HTTP          *ALL, *AUTOSTART...
                + for more values
 Restart server . . . . . . . . .   *NONE          *NONE, *HTTP, *DNS, *DHCP...
 HTTP server:
   Server instance  . . . . . . .   *ALL           Name, *ALL, *ADMIN
   Instance startup values  . . .




                                                                       Bottom
 F3=Exit    F4=Prompt    F5=Refresh    F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 19-6   Start TCP/IP Server display with additional options

3. Type the name of the HTTP server to be traced in the HTTP server instance prompt and type the level of granularity of tracing you require in the Trace level prompt as shown in Figure 19-7. Press the Enter key.

```
                          Start TCP/IP Server (STRTCPSVR)

 Type choices, press Enter.

 Server application . . . . . . . > *HTTP          *ALL, *AUTOSTART...
                 + for more values
 Restart server . . . . . . . . .   *NONE          *NONE, *HTTP, *DNS, *DHCP...
 HTTP server:
   Server instance  . . . . . . .   apachedft      Name, *ALL, *ADMIN
   Instance startup values  . . .   -vv




                                                                        Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 19-7   Start TCP/IP Server display with additional options

Press the Enter key. The server starts and the trace is now active.

4. Type the Work with Active Jobs (WRKACTJOB) command on the command line as follows:

WRKACTJOB SBS(QHTTPSVR)

5. Press F11 (Display elapsed data) then press F11 (Display thread data). A display appears as shown in Figure 19-8. Record the job name, user and number of the jobs being traced. These details are needed when verifying your trace output or optionally, for the prompts on the DMPUSRTRC command.

```
                         Work with Active Jobs                        ITSOSYS1
                                                          11/27/07   12:03:34
 CPU %:        .0      Elapsed time:   00:00:00      Active jobs:    254

 Type options, press Enter.
   2=Change   3=Hold   4=End   5=Work with   6=Release   7=Display message
   8=Work with spooled files    13=Disconnect ...

 Opt   Subsystem/Job   User       Number   Type   CPU %   Threads
       QHTTPSVR        QSYS       005855   SBS     .0        2
         ADMIN         QTMHHTTP   005882   BCH     .0        1
         ADMIN         QTMHHTTP   005883   BCI     .0        1
         ADMIN         QTMHHTTP   005884   BCI     .0        30
         ADMIN         QTMHHTTP   005885   BCI     .0        1
         APACHEDFT     QTMHHTTP   005869   BCH     .0        1
         APACHEDFT     QTMHHTTP   005871   BCI     .0        1
         APACHEDFT     QTMHHTTP   005874   BCI     .0        47
         ITSOHTTP1     QTMHHTTP   005870   BCH     .0        1
                                                                      More...
 Parameters or command
 ===>
 F3=Exit   F5=Refresh    F7=Find   F10=Restart statistics    F11=Display status
 F12=Cancel   F17=Top   F18=Bottom   F23=More options      F24=More keys
```

Figure 19-8   Finding the names of jobs being traced using WRKACTJOB

19.3 Dumping a trace using DMPUSRTRC

To dump an HTTP server trace while it is still active, use the Dump User Trace (DMPUSRTRC) command. This can be useful if you need to view the trace data at a point in time, then continue on with collecting more trace data. To dump a snapshot of the trace data, complete the following steps:

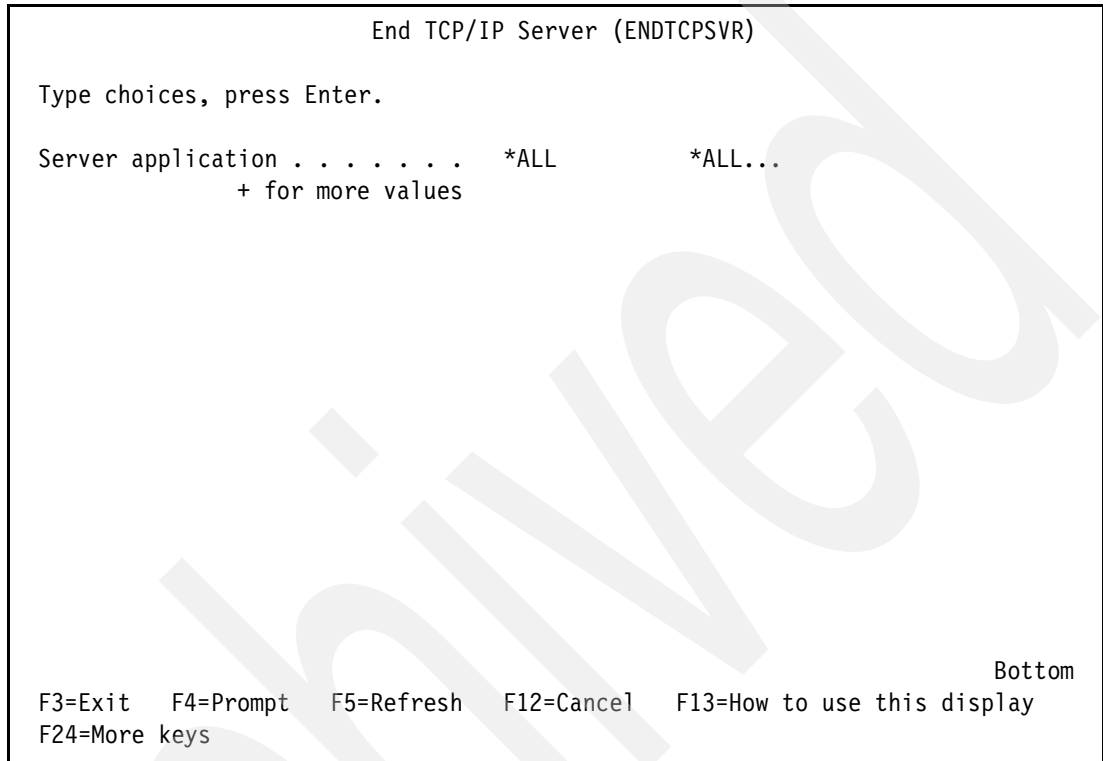1. Type DMPUSRTRC on any command line and press F4 (Prompt). A display appears as shown in Figure 19-9.

```
                         Dump User Trace (DMPUSRTRC)

 Type choices, press Enter.

 Job name . . . . . . . . . . . .    *               Name, *
   User . . . . . . . . . . . . .                    Name
   Number . . . . . . . . . . . .                    000000-999999
 Trace record identifiers . . . .    *THD            *THD, *JOB

 Output . . . . . . . . . . . . .    *FILE           *FILE, *STDOUT
 Thread IDs to include  . . . . .    *ALL            Hexadecimal value, *ALL
               + for more values
 Thread IDs to exclude  . . . . .    *NONE           Hexadecimal value, *NONE
               + for more values




                                                                      Bottom
 F3=Exit    F4=Prompt    F5=Refresh    F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 19-9   Dump User Trace display

2. Type the job name, user and number of the job to be dumped in the Job name, User and Number prompts and press the Enter key. A display appears as shown in Figure 19-10.

```
                          Command Entry                          ITSOSYS1
                                                       Request level:   1
 Previous commands and messages:
   > DMPUSRTRC JOB(005869/QTMHHTTP/APACHEDFT)
     User Trace data for job 005869/QTMHHTTP/APACHEDFT dumped to member
       QP0Z005869 in file QAP0ZDMP in library QTEMP.
   > DMPUSRTRC JOB(005874/QTMHHTTP/APACHEDFT)
     User Trace data for job 005874/QTMHHTTP/APACHEDFT dumped to member
       QP0Z005874 in file QAP0ZDMP in library QTEMP.




                                                                   Bottom
 Type command, press Enter.
 ===>



 F3=Exit   F4=Prompt   F9=Retrieve   F10=Include detailed messages
 F11=Display full      F12=Cancel    F13=Information Assistant   F24=More keys
```

Figure 19-10   Finding the member name in the output file

In this example both the manager and a primary job have been dumped. i5/OS creates a file named QAP0ZDMP in the QTEMP library of the job executing the DMPUSRTRC command. The trace data is placed in a different member for each job being traced. The member names follow the naming format of QP0Z999999, where 999999 is the job number of the job being traced.

> **Note:** The QTEMP library of a job is cleared when the job ends. If you need to retain the trace file, move it to a permanent library using the Move Object (MOVOBJ) command.

Press the Enter key. The trace is now active.

3. To view the trace data, use the Display Physical File Member (DSPPFM) command, for example:

DSPPFM FILE(QAP0ZDMP) MBR(QP0Z005869)

A display appears as shown in Figure 19-11.

```
Display Physical File Member
File . . . . . . :    QAP0ZDMP             Library  . . . . :    QTEMP
Member . . . . . :    QP0Z005913           Record . . . . . :    1
Control  . . . . .                         Column . . . . . :    1
Find . . . . . . .
*...+....1....+....2....+....3....+....4....+....5....+....6....+....7....+..
User Trace Dump for job 005913/QTMHHTTP/ADMIN. Size: 16000K, Wrapped 0 times.


--- 11/29/2007 10:27:37 ---
 00000068:955104
Application............: HTTP
Instance...............: ADMIN
System.................: ITSOSYS1.ITSO.IBM.COM
Start date/time........: Wed Nov 29 10:27:37 2007



 00000068:982032 isAsciiCcsid() - ccsid 37 is not an ascii ccsid
 00000068:982056
THREAD ID:TIMESTAMP    DATA
-----------------------------------------------------
 00000068:995512 PARENT: Trace level set to 'VERBOSE' for this process.
 00000068:995544 Apache/2.0.58
 00000068:995576 Module - mpmt_pthread.c.
 00000068:995600 Module Magic Number: 20020903

 F3=Exit   F12=Cancel   F19=Left   F20=Right   F24=More keys
```

Figure 19-11   Displaying dumped user trace data

In this example, the trace has not wrapped, as indicated in the first line of the trace data. If the trace has wrapped, it can overwrite data you might need for your investigation. Consider ending the trace and restarting it specifying a larger buffer size in the Maximum storage for trace prompt on the Trace TCP/IP Application (TRCTCPAPP) command.

Note: Subsequent usage of the DMPUSRTRC command, within the same job, appends the trace records to the existing member(s) in the QAP0ZDMP file in the QTEMP library.

19.4 Ending a trace using TRCTCPAPP

If the trace is to be ended but not the HTTP server, complete the following steps:

1. Type TRCTCPAPP on any command line and press F4 (Prompt). A display appears as shown in Figure 19-12.
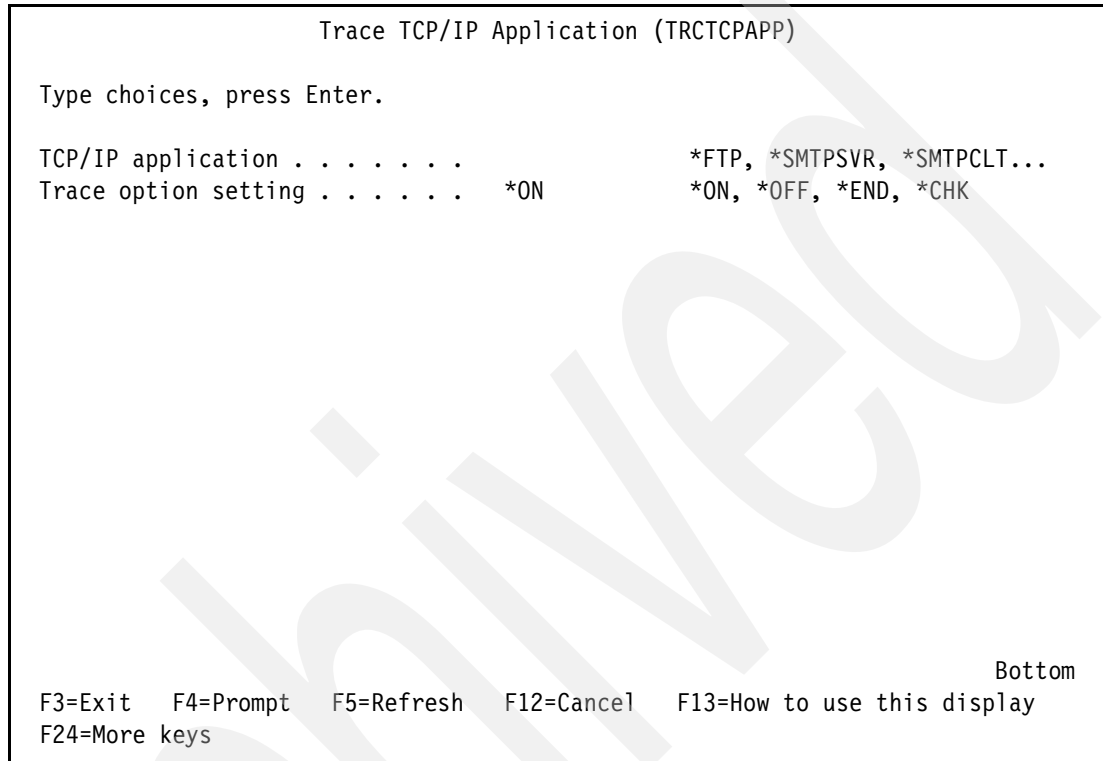
```
                       Trace TCP/IP Application (TRCTCPAPP)

 Type choices, press Enter.

 TCP/IP application . . . . . . .                    *FTP, *SMTPSVR, *SMTPCLT...
 Trace option setting . . . . . .    *ON             *ON, *OFF, *END, *CHK














                                                                        Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 19-12   Trace TCP/IP Application display

2. Type *HTTP in the Server application prompt and *OFF in the Trace option setting prompt, then press the Enter key. A display appears as shown in Figure 19-13.

```
                    Trace TCP/IP Application (TRCTCPAPP)

 Type choices, press Enter.

 TCP/IP application . . . . . . . > *HTTP          *FTP, *SMTPSVR, *SMTPCLT...
 Trace option setting . . . . . . > *OFF           *ON, *OFF, *END, *CHK
 Trace title  . . . . . . . . . .   *DFT




                                                                      Bottom
 F3=Exit    F4=Prompt    F5=Refresh    F12=Cancel    F13=How to use this display
 F24=More keys
```

Figure 19-13   Trace TCP/IP Application display with additional prompts

If you do not want to give your trace a descriptive title, press the Enter key. Alternatively, type your text in the Trace title prompt and then press the Enter key. The trace is now stopped.

To locate the trace spooled file, use the WRKJOB OPTION(*SPLF) command. The spooled files have a file name of QZSRHTTPTR.

19.5 Ending a trace using ENDTCPSVR

If the trace is to be ended along with the HTTP server, complete the following steps:

1. Type ENDTCPSVR on any command line and press F4 (Prompt). A display appears as shown in Figure 19-14.

```
                         End TCP/IP Server (ENDTCPSVR)

 Type choices, press Enter.

 Server application . . . . . . .   *ALL          *ALL...
               + for more values




















                                                                        Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 19-14   End TCP/IP Server display

2. Type *HTTP in the Server application prompt and press the Enter key. A display appears as shown in Figure 19-15.

```
                        End TCP/IP Server (ENDTCPSVR)

 Type choices, press Enter.

 Server application . . . . . . . > *HTTP          *ALL...
                 + for more values
 HTTP server:
   Server instance  . . . . . . .   *ALL          Name, *ALL, *ADMIN




















                                                                      Bottom
 F3=Exit    F4=Prompt    F5=Refresh    F12=Cancel    F13=How to use this display
 F24=More keys
```

Figure 19-15   End TCP/IP Server display with additional prompts

3. Type the name of the HTTP server to be stopped in the Server instance prompt and press the Enter key.

   To locate the trace spooled files, use the WRKSPLF SELECT(QTMHHTTP) command. The spooled files have a file name of QZSRHTTPTR.

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2. Type *HTTP in the Server application prompt and press the Enter key. A display appears as shown in Figure 19-15.

```
                        End TCP/IP Server (ENDTCPSVR)

 Type choices, press Enter.

 Server application . . . . . . . > *HTTP          *ALL...
                 + for more values
 HTTP server:
   Server instance  . . . . . . .   *ALL          Name, *ALL, *ADMIN




















                                                                      Bottom
 F3=Exit    F4=Prompt    F5=Refresh    F12=Cancel    F13=How to use this display
 F24=More keys
```

Figure 19-15   End TCP/IP Server display with additional prompts

3. Type the name of the HTTP server to be stopped in the Server instance prompt and press the Enter key.

   To locate the trace spooled files, use the WRKSPLF SELECT(QTMHHTTP) command. The spooled files have a file name of QZSRHTTPTR.

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19.6 Verifying the contents of trace data created with TRCTCPAPP

After you have located the QZSRHTTPTR spooled files, look at the User data column. i5/OS generates the User data with a format of QSRV999999, where 999999 is the number of the job that was traced. Using the job numbers you recorded when starting the trace, locate the spooled files for those jobs. Enter a 5 beside the spooled files to be verified, as shown in Figure 19-16 and press the Enter key.

```
                          Work with All Spooled Files

  Type options, press Enter.
    1=Send   2=Change   3=Hold   4=Delete   5=Display   6=Release   7=Messages
    8=Attributes        9=Work with printing status


                             Device or                   Total    Cur
  Opt   File       User      Queue       User Data   Sts  Pages  Page  Copy
        QPJOBLOG   QTMHHTTP  QEZJOBLOG   ITSOHTTP1   RDY    2            1
        QPJOBLOG   QTMHHTTP  QEZJOBLOG   APACHEDFT   RDY    2            1
        QZSRHTTPTR QTMHHTTP  PRT01       QSRV005869  HLD    1            1
        QZSRHTTPTR QTMHHTTP  PRT01       QSRV005874  HLD    1            1
        QZSRHTTPTR QTMHHTTP  PRT01       QSRV005892  HLD    1            1
        QZSRHTTPTR QTMHHTTP  PRT01       QSRV005895  HLD    17           1
        QZSRHTTPTR QTMHHTTP  PRT01       QSRV005896  HLD    1            1
    5   QZSRHTTPTR QTMHHTTP  PRT01       QSRV005897  HLD    314          1
        QZSRHTTPTR QTMHHTTP  PRT01       QSRV005898  HLD    1            1
                                                                    Bottom
  Parameters for options 1, 2, 3 or command
  ===>
  F3=Exit   F10=View 4   F11=View 2   F12=Cancel   F22=Printers   F24=More keys
```

Figure 19-16   Work with All Spooled Files display

A display appears similar to the sample shown in Figure 19-17.

```
Display Spooled File
File . . . . . :   QZSRHTTPTR
Control . . . . .
Find . . . . . .
*...+....1....+....2....+....3....+....4....+....5....+....6....+....7....+....8....+....9....+....0..
User Trace Dump for job 005897/QTMHHTTP/APACHEDFT. Size: 16382K, Wrapped 0 times.
--- 11/27/2007 12:21:47 ---
 00000010:783896
 Application............: HTTP
 Instance...............: APACHEDFT
 System.................: ITSOSYS1.ITSO.IBM.COM
 Start date/time........: Mon Nov 27 12:21:47 2007
 00000010:784024 isAsciiCcsid() - ccsid 37 is not an ascii ccsid
 00000010:784048
 THREAD ID:TIMESTAMP   DATA
 ---------------------------------------------------
 00000010:784096 CHILD: Trace level set to 'VERBOSE' for this process.
 00000010:784128 Apache/2.0.58
 00000010:784152 Module - main.c.
 00000010:784176 Module Magic Number: 20020903
 00000010:791120 create_process()
 00000010:792368 openPrimaryLanguageCatalog()
 00000010:793520 openPrimaryLanguageCatalog(): attempt primary language catalog open. Load ID = 2924
 00000010:793584 openMessageCatalog(): catalog name = /QIBM/PRODDATA/HTTPA/MRI2924/SERVER/QZSRHTTP.CAT

 F3=Exit   F12=Cancel   F19=Left   F20=Right   F24=More keys
```

Figure 19-17   Displaying trace data

In this example, the trace has not wrapped, as indicated in the first line of the trace data. If the trace has wrapped, it can overwrite data you might need for your investigation. Consider restarting the trace specifying a larger buffer size in the Maximum storage for trace prompt on the Trace TCP/IP Application (TRCTCPAPP) command.

19.7 Further information

Further information on HTTP traces can be found in the book *IBM HTTP Server (powered by Apache): An Integrated Solution for IBM eServer iSeries Servers*, SG24-6716 in the iSeries Information Center at:

http://www.ibm.com/eserver/iseries/infocenter

When you reach this site, click **About information center** → **Overview and what's new** → **Printable PDFs and manuals** and then search on HTTP.

20

Collecting HTTP server logs

The HTTP server creates two types of logs, HTTP server job logs and HTTP error logs. The former are the same type of job log that any i5/OS job can generate. The latter are logs specific to HTTP and are stored as stream files in the Integrated File System.

Problems detected after server initialization are most likely not recorded in the server job logs unless a critical condition occurs. They are recorded in the error log.

20.1 HTTP server job logs

The server jobs run in the QHTTPSVR subsystem. For each server, there is more than one job. The number of jobs for a server depends on how it is configured. Some of the more common jobs are listed in Table 20-1.

Table 20-1   HTTP server job types

Job type	Function	WRKACTJOB - Function column
Manager	Creates and manages other server jobs	QZHBMAIN
Logging	Logs information to the server logs with one job for each type of logging (error, access, etc.)	QZSRLOG
Primary	Accepts and serves client requests	QZSRHTTP
CGI	Runs Common Gateway Interface (CGI) programs	QZSRCGI or QYUNLANG

To find the active jobs on a system, use the WRKACTJOB SBS(QHTTPSVR) command. An example is shown in Figure 20-1.

```
                      Work with Active Jobs                        ITSOSYS1
                                                   11/27/07        11:47:41
   CPU %:     1.4      Elapsed time:   00:00:02    Active jobs:   255


   Type options, press Enter.
     2=Change   3=Hold   4=End    5=Work with   6=Release   7=Display message
     8=Work with spooled files    13=Disconnect ...
                       Current
   Opt  Subsystem/Job  User        Type  CPU %  Function       Status
        QHTTPSVR       QSYS        SBS    .0                   DEQW
          ADMIN        QTMHHTTP    BCH    .0    PGM-QZHBMAIN    SIGW
          ADMIN        QTMHHTTP    BCI    .0    PGM-QZSRLOG     SIGW
          ADMIN        QTMHHTTP    BCI    .0    PGM-QZSRHTTP    SIGW
          ADMIN        AKA1        BCI    .0    PGM-QZSRCGI     TIMW
          APACHEDFT    QTMHHTTP    BCH    .0    PGM-QZHBMAIN    SIGW
          APACHEDFT    QTMHHTTP    BCI    .0    PGM-QZSRLOG     SIGW
          APACHEDFT    QTMHHTTP    BCI    .0    PGM-QZSRHTTP    SIGW
          ITSOHTTP1    QTMHHTTP    BCH    .0    PGM-QZHBMAIN    SIGW
                                                                        More...
   Parameters or command
   ===>
   F3=Exit   F5=Refresh       F7=Find       F10=Restart statistics
   F11=Display elapsed data   F12=Cancel    F23=More options   F24=More keys
```

Figure 20-1   Work with Active Jobs display of HTTP server jobs

In this example, the jobs called ADMIN are for the Administration server. The jobs called APACHEDFT service the default Apache server. Use Table 20-1 to match the Function column to a server job type.

Referring to the example in Figure 20-1, the server jobs are:

► The first job is the manager job
► The second job is a logging job

► The third job is the primary job
► The fourth job is a CGI job

To view the job logs for these jobs, refer to Chapter 4, "Collecting messages" on page 35.

20.1.1 HTTP error logs

When an HTTP server is created, error logging is enabled unless it is explicitly disabled. Error logging can be subsequently enabled or disabled through the Administration server. For information about enabling logs, refer to:

e-business and Web serving → **IBM HTTP Server for i5/OS** → **Tasks** → **Log and log file tasks** → **Set up logs**

The error logs are created as stream files in the /logs directory beneath the server root directory. If the default server root was accepted when the server was created, the error logs are created in the /www/your_HTTP_server/logs directory.

To find where your server is writing the error log, look at the job log for the logging server jobs. Locate the `This is a logging job for HTTP Server your server name` message. Press F1 to see the additional text, as shown in Figure 20-2.

```
                     Additional Message Information

 Message ID . . . . . . :   HTP8432       Severity . . . . . . . :   00
 Message type . . . . . :   Diagnostic
 Date sent  . . . . . . :   11/27/07      Time sent  . . . . . . :   11:38:31


 Message . . . . :   This is a logging job for HTTP Server APACHEDFT.
 Cause . . . . . :   This is a logging job for HTTP Server APACHEDFT.
 Technical description . . . . . . . . :   There are one or more jobs
   associated with HTTP server APACHEDFT. This is the job that will log
   information to file /www/apachedft/logs/error_log for this server.




                                                                    Bottom
 Press Enter to continue.


 F3=Exit    F6=Print    F9=Display message details    F12=Cancel
 F21=Select assistance level
```

Figure 20-2   Additional Message Information display

The error logs are accessible using the following command:

```
WRKLNK OBJ('/www/your HTTP server name/logs/*')
```

If necessary, use the Page Down key to view the list of the error logs. An error log has a name prefixed with error_log and suffixed with the date in YYMMDDHH format where:

► YY is the year indicator

- ► MM is the month indicator
- ► DD is the day indicator
- ► HH is the hour indicator

An example of the WRKLNK command output is shown in Figure 20-3.

```
                          Work with Object Links

 Directory  . . . . :    /www/apachedft/logs

 Type options, press Enter.
   2=Edit    3=Copy    4=Remove    5=Display    7=Rename    8=Display attributes
   11=Change current directory ...

 Opt    Object link           Type                  Attribute    Text
        error_log.Q1061117 >  STMF
        error_log.Q1061118 >  STMF
        error_log.Q1061119 >  STMF
        error_log.Q1061120 >  STMF
        error_log.Q1061121 >  STMF
        error_log.Q1061122 >  STMF
        error_log.Q1061123 >  STMF
 5      error_log.Q1061124 >  STMF
        maint.log             STMF
                                                                        Bottom
 Parameters or command
 ===>
 F3=Exit   F4=Prompt   F5=Refresh   F9=Retrieve   F12=Cancel   F17=Position to
 F22=Display entire field          F23=More options
```

Figure 20-3 Work with Object Links display

Select option 5 to view the contents of the log. An example of the contents of an error log is shown in Figure 20-4.

```
Browse : /www/apachedft/logs/error_log.Q106112200
 Record :     108   of       126 by  18                   Column :    1    165 by 131
 Control :

....+....1....+....2....+....3....+....4....+....5....+....6....+....7....+....8....+....9....+....0....+....1....+....2....+....3.
[Wed Nov 22 16:48:40 2007] [error] [client 123.456.789.01] ZSRV_MSG0667: authenticate_basic_user400: 401 was returned when attemptin
[Wed Nov 22 16:48:58 2007] [error] [client 123.456.789.01] ZSRV_MSG0669: ap_get_kerberos_auth: Return code from unwrap_kerb_token =
[Wed Nov 22 16:48:58 2007] [error] [client 123.456.789.01] ZSRV_MSG0667: authenticate_basic_user400: 401 was returned when attemptin
[Wed Nov 22 16:49:27 2007] [error] [client 123.456.789.01] ZSRV_MSG0669: ap_get_kerberos_auth: Return code from unwrap_kerb_token =
[Wed Nov 22 16:49:27 2007] [error] [client 123.456.789.01] ZSRV_MSG0667: authenticate_basic_user400: 401 was returned when attemptin
[Wed Nov 22 17:03:08 2007] [error] ZSRV_MSG0216: Error occurred during SSL processing, error = 406.
[Wed Nov 22 17:03:08 2007] [error] ZSRV_MSG0252: SSL initialization operation failed, return code error = 3455.
[Wed Nov 22 17:04:07 2007] [error] ZSRV_MSG0214: Improperly formated certificate or certificate not valid, error = 415.
[Wed Nov 22 17:05:16 2007] [error] [client 123.456.789.01] ZSRV_MSG0669: ap_get_kerberos_auth: Return code from unwrap_kerb_token =
[Wed Nov 22 17:05:16 2007] [error] [client 123.456.789.01] ZSRV_MSG0667: authenticate_basic_user400: 401 was returned when attemptin
[Wed Nov 22 17:21:35 2007] [error] ZSRV_MSG0214: Improperly formated certificate or certificate not valid, error = 415.
[Wed Nov 22 17:21:54 2007] [error] [client 123.456.789.02] ZSRV_MSG0018: File /www/apachedft/htdocs/favicon.ico does not exist
[Wed Nov 22 17:21:54 2007] [error] [client 123.456.789.02] ZSRV_MSG0016: URI in request GET /favicon.ico HTTP/1.1 is not valid
[Wed Nov 22 17:46:05 2007] [error] ZSRV_MSG0214: Improperly formated certificate or certificate not valid, error = 415.
[Wed Nov 22 17:48:25 2007] [error] [client 123.456.789.03] ZSRV_MSG0018: File /www/apachedft/htdocs/favicon.ico does not exist
[Wed Nov 22 17:48:25 2007] [error] [client 123.456.789.03] ZSRV_MSG0016: URI in request GET /favicon.ico HTTP/1.1 is not valid
[Wed Nov 22 18:30:00 2007] [error] ZSRV_MSG0214: Improperly formated certificate or certificate not valid, error = 415.
[Wed Nov 22 21:02:59 2007] [error] ZSRV_MSG0214: Improperly formated certificate or certificate not valid, error = 415.
[Wed Nov 22 22:00:55 2007] [error] ZSRV_MSG0214: Improperly formated certificate or certificate not valid, error = 415.
F3=Exit   F10=Display Hex   F12=Cancel   F15=Services   F16=Repeat find   F19=Left   F20=Right
```

Figure 20-4 Sample error log

Error logs can be copied to a spooled file or saved to a save file or offline media such as a tape device. To spool the error log, type `print` in the Control prompt.

> **Note:** The Print command spools the file starting with the current line and spools the rest of the file. To see other functions available within this display, press F1 in the Control prompt.

For more information about saving the error log to a save file or offline media, refer to Using the Save (SAV) command and Specifying the device name in:

Systems management → Backup and recovery → Backup your server → Manually save parts of your server → Save user data in your server → Save file systems

20.1.2 HTTP status codes

Your HTTP server responds to a client request with standard three-digit codes, such as 404 or 500. These are known as HTTP status codes. They often provide additional information about the cause of a failure. Table 20-2 offers a quick guide on HTTP status codes.

Table 20-2   HTTP status codes

Status code group	Meaning	Example
1xx	Informational. Contains a provisional response that influences the client's behavior.	101 Switching Protocols Sent when an updated version of protocol has been negotiated.
2xx	Successful. Returns information about the status of negotiations and transactions.	200 OK The client request is fulfilled. Can contain additional information in the reply to GET, POST, HEAD, TRACE methods.
3xx	Redirection. Requests an action from the user agent.	304 Not Modified Often used in an answer to conditional requests, usually when caching is involved.
4xx	Client error. Sent to your browser window when the page you requested cannot be served.	404 Not Found The server is unable to find anything matching the client request. Also used for security reasons when the requesting user should not have access to a particular resource.
5xx	Server error. Sent to your browser window when the server is unable to fulfill your request because of an internal problem.	503 Service Unavailable The server has encountered a temporary condition that is preventing the fulfillment of a client request.

For a full list of HTTP status codes, refer to the Internet Engineering Task Force Web site at:

http://tools.ietf.org/html/rfc2616#section-10

21

Dumping a job

Dumping the internal structures of a job is useful when a problem with a job behaves in a predictable manner. For example, a function goes into a wait state or fails with a particular message.

Dumping a job is equivalent to taking a photograph of a moving target. If the movement is predictable enough, a photograph can be planned, resulting in a snapshot at the required point.

The system automatically produces dumps for some unmonitored escape messages. Dumps can also be produced manually.

There are two types of dumps that relate to jobs (or processes) in the system:

► **Process dump**: A process dump captures the i5/OS view of the job structures.

   This dump is taken when the problem is suspected to be at the i5/OS level (or above the machine interface).

► **Process internal dump**: A process internal dump captures the machine or Licensed Internal Code (LIC) view of the job structures.

   This dump is taken when the problem is suspected to be at the LIC level (or below the machine interface).

21.1 Process dump

A process dump is taken by using the Dump Job (DMPJOB) command.

The current interactive job is dumped when the DMPJOB command is used from a command line. Jobs other than the current job must be serviced to direct the operating system to dump the required job structures, when the DMPJOB command is used. Servicing a job is performed by using the STRSRVJOB command.

Perform the following steps to create a process dump:

1. Use the STRSRVJOB command to service the job for which a process dump is to be taken, unless the current interactive job is to be dumped.

2. Type DMPJOB on the command line, prompt with the F4 key, then press Enter. A display appears like the example shown in Figure 21-1.

> **Note:** To dump just the call stack for all threads in the process, specify *NONE for Program, *NONE for Job structure area, *NO for Objects referenced by address, and *THDSTK for Job threads.

```
  Dump Job (DMPJOB)

  Type choices, press Enter.

  Program to dump:
    Program  . . . . . . . . . . .   *ALL            Name, *ALL, *NONE
      Library  . . . . . . . . . .                   Name, *ALL
    Call level . . . . . . . . . .                   Number, *LAST, *FIRST, *ALL
              + for more values
  Job structure areas  . . . . . .   *ALL            *ALL, *NONE
  Objects referenced by address  .   *YES            *YES, *NO
  Job threads  . . . . . . . . . .   *YES            *YES, *NO, *THDSTK
  Thread ID to include . . . . . .   *ALL            Thread ID, *ALL, *SELECT
              + for more values




                                                                    Bottom
  F3=Exit    F4=Prompt    F5=Refresh    F12=Cancel   F13=How to use this display
  F24=More keys
```

Figure 21-1   Dump Job: Command prompt

3. Unless instructed by your service provider to change any of the parameters, press Enter.

The DMPJOB command produces a spooled file with the label QPSRVDMP.

> **Note:** Refer to the procedure for locating spooled output in 1.7, "Finding your printed output" on page 9.

21.2 Process internal dump

A process internal dump is created by using the DMPJOBINT command or through the System Service Tools.

The current interactive job is dumped when the DMPJOBINT command is used from a command line. Jobs other than the current job must be serviced to direct the operating system to dump the required job structures, when the DMPJOBINT command is used. Servicing a job is performed by using the STRSRVJOB command.

Perform the following steps to create a process dump:

1. Use the STRSRVJOB command to service the job for which a process internal dump is to be taken, unless the current interactive job is to be dumped.

2. Type DMPJOBINT on the command line, and press the Enter key. A display appears, as shown in Figure 21-2, if the command is prompted. There are no parameters to prompt for this display.

```
Dump Job Internal (DMPJOBINT)




 F3=Exit   F5=Refresh   F12=Cancel   F13=How to use this display   F24=More
keys

 No parameters to show; press Enter to run, F3 to exit.
```

Figure 21-2   DMPJOBINT command: Has no parameters to prompt

3. The DMPJOBINT command produces a LIC log. A message is issued to the user's job indicating the identifier that is associated with the dump. A display appears when the additional information is viewed by pressing the Help key (Figure 21-3 on page 326). The LIC log created has a major and minor code of 0800 0000 and is identified as an MI Requested Dump.

```
Additional Message Information

Message ID . . . . . . :   CPC3637      Severity . . . . . . . :    00
Message type . . . . . :   Completion
Date sent  . . . . . . :   05/26/07 Time sent  . . . . . . :    16:22:54


Message . . . . :   Dump identifier is 01003CBE.
Cause . . . . . :   The completion message contains the dump identifier (ID).
Recovery  . . . :   To get a printout, use the Print Internal Data command
  with these values: PRTINTDTA TYPE(*DMP) DMPID(01003CBE).






                                                                      Bottom
Press Enter to continue.

F3=Exit   F6=Print   F9=Display message details
F10=Display messages in job log   F12=Cancel   F21=Select assistance level
```

Figure 21-3   DMPJOBINT: Message CPC3637 is issued

4. To create a spooled file of the LIC log, use the PRTINTDTA command as specified in the
   displayed message (CPC3637) in Figure 21-3.

A spooled file with a label QPCSMPRT is created when the PRTINTDTA command is used.

21.3 Using System Service Tools for a process internal dump

A process internal dump can be created from the System Service Tools (SST) menu by
following these steps:

1. Enter STRSST from the command line. Sign on with a valid service tools user ID and
   password. Select option 1 from the display shown in Figure 21-4. Note that i5/OS V5R4
   has 8 options.

```
System Service Tools (SST)

Select one of the following:

    1. Start a service tool
    2. Work with active service tools
    3. Work with disk units
    4. Work with diskette data recovery
    5. Work with system partitions
```

Figure 21-4   SST menu

2. Select option 4 from the menu shown in Figure 21-5 to start the Display, Alter, Dump function.

```
Start a Service Tool

Warning: Incorrect use of this service tool can cause damage
to data in this system.  Contact your service representative
for assistance.

Select one of the following:

     1. Product activity log
     2. Trace Licensed Internal Code
     3. Work with communications trace
     4. Display/Alter/Dump
     5. Licensed Internal Code log
     6. Main storage dump manager
     7. Hardware service manager
```

Figure 21-5   Start Service Tool menu

3. Select option 2 (Dump to Printer) on the Dump Output Device display as shown in Figure 21-6.

```
Display/Alter/Dump Output Device

Select one of the following:

     1. Display/Alter storage
     2. Dump to printer

     4. Dump to tape

     6. Print tape dump file
     7. Display dump status
```

Figure 21-6   SST: Dump Output Device selection

4. Select option 4 (Tasks and Processes) from the Select Data screen, as shown in Figure 21-7.

```
Select Data

Output device  . . . . . . :   Printer

Select one of the following:

     1. Machine Interface (MI) object
     2. Licensed Internal Code (LIC) data
     3. LIC module
     4. Tasks/Processes
     5. Starting address
```

Figure 21-7   SST: Select Data menu

5. Select option 2 (Process) as shown in Figure 21-8.

```
Select Task/Process

Output device  . . . . . . :   Printer

Select one of the following:

     1. Task
     2. Process
```

Figure 21-8   SST: Select Task/Process menu

6. Select option 5 (Display a list of processes) as shown in Figure 21-9.

```
Find Process

Output device  . . . . . . :   Printer

Select one of the following:

     1. Find by process (PCS - Process Control Space) name
     2. Find by Task Dispatching Element (TDE) address
     3. Find by TDE number
     4. Find by TDE ID
     5. Display list of processes
```

Figure 21-9   SST: Find Process menu

7. Select the process to be dumped by typing 1 in the left-hand column as shown in Figure 21-10.

```
 Work with Processes

 Type option, press Enter.
   1=Select process to work with    2=Display threads

                                TDE        TDE       TDE              Thread
   Process Name                 Number     ID        Address         Count
   QTFTP00071QTCP     048220    000000000C31 000001B2 B000100007807000    1
   QZSCSRVS  QUSER    048212    000000000C0D 00000207 B0001000077B7000    1
   QZRCSRVS  QUSER    048210    000000000C0B 00000204 B000100007783000    1
   QZRCSRVS  QUSER    048209    000000000C0A 00000202 B000100007785000    1
   QZSOSIGN  QUSER    048208    000000000C09 000001D9 B0001000077AD000    1
 1 QPADEV00140PER01   048203    000000000BF3 000001D0 B000100007787000    1
   REPORT    QNOTES   048192    000000000BD1 00000200 B00010000773B000    1
   EVENT     QNOTES   048191     000000000BC9 000001F8 B00010000772B000    8
```

Figure 21-10   SST: Work with Processes display

8. Press Enter to confirm your choice of process.

9. Press Enter, and the Display Process Found Information screen appears.

10. Select the option from the Select Format screen as directed by your service provider. The options are shown in Figure 21-11.

```
 Select Format

 Output device  . . . . . . :    Printer

 Select one of the following:

      1. Hexadecimal
      2. Base structure
      3. Disassembled code for cursors
```

Figure 21-11   SST: Select Format menu

11. Specify a dump title as illustrated in the example in Figure 21-12.

```
 Specify Dump Title

 Output device  . . . . . . :    Printer

 Type choices, press Enter.

   Dump title . . . . . . . . . . .    ITSO Example - 05/26/07

   Perform seizes  . . . . . . . .  1            1=Yes, 2=No

   Partial print page numbers:
     From page . . . . . . . . . . .            1   1-2147483647
     Through page  . . . . . . . . .         9999   1-2147483647
```

Figure 21-12   SST: Specify Dump Title display

The following message is displayed at the bottom of the screen when Enter is pressed to submit the dump:

```
Dump to printer successfully submitted.
```

12. Press F16 to return to the SST menu.

13. Press F10 to obtain a command entry screen.

14. Enter the WRKJOB command, and select option 4 to locate the spooled file with the QPCSMPRT label created by this procedure.

Note: In addition to using the System Service Tools (SST) to create a process internal dump, the functions are also available under Dedicated Service Tools (DST).

21.4 Changing a message description

If the problem causes a specific set of messages each time you run a particular function, and one of the error messages is an unmonitored escape message, the message description for that message can be altered to produce job dumps automatically when that message is issued. This is achieved by changing the DMPLST parameter in the message description.

We recommend that you use the Add Message Description (ADDMSGD) command to create the message again, and then place the new message in an override file. This avoids any confusion or unwanted dumps, if the system supplied message description is not changed back to its original setting.

For example, if a program performed a step where an object in a library was renamed, and this function was not able to complete due to the fact that the required name was already in existence, an escape message CPF-2132 would be issued.

Looking at the message description for CPF-2132, we find that the DMPLST parameter is set to *NONE, as shown in Figure 21-13.

```
 Display Message Attributes
                                                      System:    ITSOSYS1
 Message ID . . . . . . . . . . :    CPF2132
 Message file . . . . . . . . . :    QCPFMSG
   Library  . . . . . . . . . . :      QSYS

 Severity . . . . . . . . . . . :    40

 Log problem  . . . . . . . . . :    *NO

 Default program  . . . . . . . :    *NONE
   Default library  . . . . . . :

 Message level  . . . . . . . . :    08/04/07

 Alert option . . . . . . . . . :    *NO

 Data to be dumped  . . . . . . :    *NONE

                                                            More...
 Press Enter to continue.

 F3=Exit    F12=Cancel
```

Figure 21-13   DSPMSGD: Display Message Attributes display

Use the CHGMSGD command to alter the Data to be dumped attributes for the message CPF-2132. Perform the following steps to change this parameter:

1. Type DSPMSGD on the command line, and press F4 to prompt the command.

2. Enter the message ID and message file parameters as shown in Figure 21-14 on page 331.

```
Change Message Description (CHGMSGD)

Type choices, press Enter.

Message identifier . . . . . . . > CPF2132      Name
Message file . . . . . . . . . . > QCPFMSG      Name
  Library  . . . . . . . . . . .    yourlib     Name, *LIBL, *CURLIB
First-level message text . . . .   *SAME




Second-level message text  . . .   *SAME






                                                                 ...
Severity code  . . . . . . . . .   *SAME           0-99, *SAME



                                                               More...
F3=Exit   F4=Prompt   F5=Refresh   F10=Additional parameters   F12=Cancel
F13=How to use this display       F24=More keys
```

Figure 21-14   CHGMSGD: Command prompt

3. Press F10 for additional parameters, and scroll down to find the Data to be Dumped
   parameter, as shown in Figure 21-15.

```
 Change Message Description (CHGMSGD)

Type choices, press Enter.

Range of reply values:
  Lower value  . . . . . . . .     *SAME
  Upper value  . . . . . . . .
Relationship for valid replies:
  Relational operator  . . . . .   *SAME           *SAME, *NONE, *EQ, *LE...
  Value  . . . . . . . . . . . .
Default reply value  . . . . . .   *SAME




                         Additional Parameters

Default program to call  . . . .   *SAME           Name, *SAME, *NONE
  Library  . . . . . . . . . . .                   Name, *LIBL, *CURLIB
Data to be dumped  . . . . . . .   *SAME           1-99, *SAME, *NONE, *JOB...
              + for more values
                                                                More...
F3=Exit    F4=Prompt    F5=Refresh   F12=Cancel   F13=How to use this display
F24=More keys
```

Figure 21-15   CHGMSGD: Additional Parameters

The values for the DMPLST parameter are shown in Figure 21-16.

```
Specify Value for Parameter DMPLST


Type choice, press Enter.


Type . . . . . . . . . . . . . :    INTEGER
Data to be dumped  . . . . . . .    *SAME


Single Values
  *SAME
  *NONE
Other Values
  *JOB
  *JOBINT
  *JOBDMP
```

Figure 21-16   DMPLST parameters

The DMPLST parameter specifies the data dumped when this message is sent as an escape message to a program that is not monitoring for it. This parameter can specify that data related to the job be dumped, that data from message data fields be dumped, or that a combination of these be dumped. The standard job dump can also be requested.

You can enter multiple values for this parameter. If you are on an entry display and you need additional entry fields to enter these multiple values, type a plus sign (+) in the entry field opposite the phrase "+".

The values for this parameter are defined here:

*JOB   This value is the same as specifying * on the Job name prompt (JOB parameter) and *PRINT on the Output prompt (OUTPUT parameter) of the DSPJOB (Display Job) command.

*JOBDMP   The data areas of the job are dumped as specified by the Dump Job (DMPJOB) command. *JOBDMP can be specified by itself, with *JOB, with *JOBINT, or with a list of message data field numbers.

*JOBINT   The internal machine data structures related to the job processing are dumped to the machine error log as specified by the Dump Job Internal (DMPJOBINT) command. *JOBINT can be specified by itself, with *JOBDMP, *JOB, or with a list of message data field numbers.

22

Dumping an object

Dumping objects is a problem analysis procedure used when problems with object structure and integrity are encountered.

Reading the contents of an object dump is not an easy task and is generally left to IBM development. For example, developers can use an object dump to examine the extent of damage to the object while working to determine the cause of the problem. For more information on object damage, refer to Appendix F, "Damaged objects" on page 523.

The following are the Control Language (CL) commands that dump an object on the System i server:

► **Dump Object (DMPOBJ)**: The Dump Object (DMPOBJ) command dumps the contents or attributes of the specified operating system object to a spooled printer file named QPSRVDMP. The dump captures the i5/OS view of the object structures.

► **Dump Object (DMP)**: The Dump Object (DMP) command dumps the contents and/or attributes of the specified integrated file system object to a spooled printer file named QPSRVDMP.

► **Dump System Object (DMPSYSOBJ)**: The Dump System Object (DMPSYSOBJ) command is used primarily for problem analysis tasks. It dumps the content or attributes of machine interface (MI) system objects to a spooled printer file named QPSRVDMP. The system dump captures the machine or Licensed Internal Code (LIC) view of the object structures.

The DMPOBJ and DMPSYSOBJ commands are shipped with public *EXCLUDE authority. To use these commands, sign on as QSRV or QSRVBAS, or have *ALLOBJ authority.

The DMP command requires that you have read and execute (*RX) authorities to the directory containing the object and read (*R) to the object.

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22.1 Dump Object (DMPOBJ)

This section outlines the steps to perform an object dump using the DMPOBJ command. In our example, we dump the startup-job object named QSTRUP with object type *PGM located in QGPL library. Follow these steps:

1. Type DMPOBJ from any command line. Press F4. A display appears like the example shown in Figure 22-1.

```
  Dump Object (DMPOBJ)

  Type choices, press Enter.

  Object...... . . ......... . . .        QSTRUP       Name
    Library  . . . . . . . . . . .         QGPL         Name, *LIBL, *CURLIB, QTEMP
  Object type  . . . . . . . . . .         *PGM         *ALRTBL, *AUTL, *BNDDIR...




                                                                          Bottom
  F3=Exit    F4=Prompt    F5=Refresh    F12=Cancel    F13=How to use this display
  F24=More keys
```

Figure 22-1   Dump Object (DMPOBJ) display

2. Type the object name, library name, and object type. Press Enter.
3. The DMPOBJ command produces a spooled file with a label QPSRVDMP.

Tip: If you do not know the object type or the library name, use the WRKOBJ command to find the required information.

22.2 Dump Object (DMP)

This section outlines the steps to perform a dump of an Integrated File System object using the DMP command.

The DMP command has the following restrictions:

► You must have read and execute (*RX) authorities to the directory containing the object and read (*R) to the object. If the object is in QSYS.LIB file system, you must have use (*USE) authority to the object and execute (*EXECUTE) authority to the library. To dump internal document library objects all object (*ALLOBJ) special authority is required.

► The Dump (DMP) command does not allow a pattern to be specified for a directory in the path name, only for the object name.

► Not all file systems support the DMP command. The following list of local file systems are supported:
  – Root file system
  – QOpenSys file system
  – QSYS.LIB file system
  – QDLS file system
  – User-defined file systems

The default for the DMP command is to display the Select Object screen. The objects listed are based on the current directory. Use the DSPCURDIR command to display the current directory and either the CD or CHGCURDIR command to change the current directory if required.

To dump an Integrated File System object with the DMP command, follow these steps:

1. At a command line type in the following command and prompt with F4.

   DMP

   The Dump Object screen is displayed as shown in Figure 22-2.

```
                          Dump Object (DMP)

 Type choices, press Enter.

 Object . . . . . . . . . . . . .    '*'




















                                                                    Bottom
 F3=Exit    F4=Prompt    F5=Refresh    F12=Cancel    F13=How to use this display
 F24=More keys
```
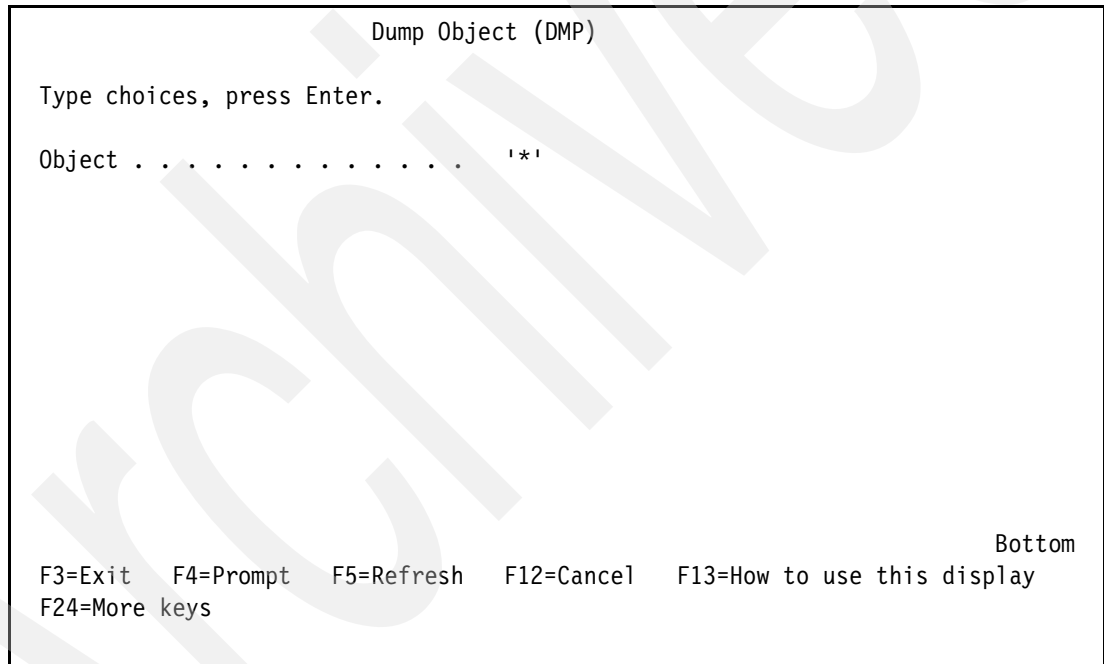
Figure 22-2   Dump Object (DMP) display

2. Key in the object name to be dumped and press Enter.

   Note:

   – Specifying a directory name
     (such as /QIBM/ProdData/CA400/Express/Install/Image) dumps the object associated with the directory Image in this example.

   – Specifying a directory name with an asterisk
     (such as /QIBM/ProdData/CA400/Express/Install/Image/*) brings up the Select Object screen.

   – Specifying a directory name with an object name
     (such as /QIBM/ProdData/CA400/Express/Install/Image/SETUP.EXE) dumps the specified object, SETUP.EXE in this example.

22.3 Dump System Object (DMPSYSOBJ)

This section outlines the steps to perform an object dump using the DMPSYSOBJ command. In our example, we perform a dump system object on a display device description object named DSP01 located in QSYS library. Follow these steps:

1. Type DMPSYSOBJ from any command line. Press F4. A display appears as shown in Figure 22-3.

```
  Dump System Object (DMPSYSOBJ)

  Type choices, press Enter.

  Object . . . . . . . . . . . . .   DSP01
  Context or library . . . . . . .   QSYS
  Internal object type . . . . . .   *ALL            *ALL, 01, 02, 03, 04, 07...
  Internal object subtype  . . . .   *ALL            Character value, *ALL
  Object type  . . . . . . . . . .   *DEVD           *ALL, *ALRTBL, *AUTL...
  Hexadecimal offsets  . . . . . .   *NONE           00000000-00FFFFFF, *NONE
                    + for more values
  Area of space to dump:
    Hexadecimal offset . . . . . .   *               00000000-00FFFFFF, *
    Hexadecimal length or *  . . .                   00000001-00FFFFFF, *




                                                                      Bottom
  F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
  F24=More keys
```

Figure 22-3   Dump System Object (DMPSYSOBJ) display

2. Type the object name, library name, and object type. Leave the remaining parameters at their default (which are the initial values displayed) unless you are instructed by your service provider to change any of the parameters. Press Enter. In this example, the device description for DSP01 is dumped.

    To determine the object type for an object, refer to the iSeries Information Center at:
    `http://www.ibm.com/eserver/iseries/infocenter`

    When you reach this site, click **Programming** → **APIs** → **API Concepts** → **API parameters** → **Internal object types.**

    The DMPSYSOBJ command produces a spooled file with a label QSRVDMP.

22.4 Using System Service Tools for a dump system object

A dump system object dump can also be performed from the System Service Tools (SST) menu by following these steps:

1. Enter STRSST from the command line. Sign on with a valid service tools user and password. The menu shown in Figure 22-4 on page 337 appears. Select option 1 (Start a service tool).

```
System Service Tools (SST)

 Select one of the following:

       1. Start a service tool
       2. Work with active service tools
       3. Work with disk units
       4. Work with diskette data recovery
       5. Work with system partitions
```

Figure 22-4   SST menu

2. The menu shown in Figure 22-5 appears. Select option 4 from the menu to start the
    Display, Alter, Dump function.

```
Start a Service Tool

Warning: Incorrect use of this service tool can cause damage
to data in this system.  Contact your service representative
for assistance.

Select one of the following:

       1. Product activity log
       2. Trace Licensed Internal Code
       3. Work with communications trace
       4. Display/Alter/Dump
       5. Licensed Internal Code log
       6. Main storage dump manager
       7. Hardware service manager
```

Figure 22-5   Start Service Tool menu

3. On the Display/Alter/Dump Output Device display, select option 2 (Dump to Printer) as
    shown in Figure 22-6.

```
Display/Alter/Dump Output Device

Select one of the following:

       1. Display/Alter storage
       2. Dump to printer
       3. Dump to diskette
       4. Dump to tape
       5. Print diskette dump file
       6. Print tape dump file
       7. Display dump status
```

Figure 22-6   SST: Display/Alter/Dump Output Device selection

4. Select option 1 (Machine Interface (MI) object) from the Select Data menu, as shown in
    Figure 22-7 on page 338.

```
Select Data

Output device  . . . . . . :    Printer

Select one of the following:

     1. Machine Interface (MI) object
     2. Licensed Internal Code (LIC) data
     3. LIC module
     4. Tasks/Processes
     5. Starting address
```

Figure 22-7   SST: Select Data menu

5. Scroll up or page down to see more options. In this example, we select option 16 (Device description (10)), as shown in Figure 22-8.

```
Select MI Object

Output device  . . . . . . :    Printer

Select one of the following:

    11. Data space (0B)
    12. Data space index (0C)
    13. Cursor (0D)
    14. Index (0E)
    15. Commit block (0F)
    16. Device description (10)
    17. Line description (11)
    18. Controller description (12)
    19. Dump space (13)
    20. Class of service (14)


                                                           More...
Selection


F3=Exit    F12=Cancel
```

Figure 22-8   SST: Select MI Object menu

6. Select option 1 (Find by object name), as shown in Figure 22-9 on page 339.

```
Find MI Object

Output device  . . . . . . :    Printer

Select one of the following:

      1. Find by object name
      2. Find by object address
```

Figure 22-9   SST: Find MI Object menu

7. Enter the name of the device and the subtype as shown in Figure 22-10. In our example, we enter DSP01 for the Name prompt and leave the default for the Subtype prompt.

```
Find By Object Name

Output device  . . . . . . :    Printer

Type choices, press Enter.

   Object:
      Type . . . . . . . . . :    (10) - Device Description
      Name . . . . . . . . . .    DSP01
      Subtype  . . . . . . .     01    00-FF
```

Figure 22-10   SST: Find By Object Name display

For more information on object type and subtype, refer to the External object types article in the iSeries Information Center, Version 5 Release 4.

The Display Object Found Information screen appears as shown in Figure 22-11 on page 340.

```
Display Object Found Information

Output device  . . . . . . :   Printer


Object:
  Type . . . . . . . . . . :   (10) - Device Description
  Name . . . . . . . . . . :   DSP01
  Subtype  . . . . . . . . :   01

Context:
  Name . . . . . . . . . . :   Machine Context
  Subtype  . . . . . . . . :   00

User profile:
  Name . . . . . . . . . . :   QPGMR
  Subtype  . . . . . . . . :   01



Press Enter to continue.

F3=Exit    F12=Cancel
```

Figure 22-11   SST: Display Object Found Information display

8. Press Enter to proceed. The Select Format display appears as shown in Figure 22-12.

```
Select Format

Output device  . . . . . . :   Printer

Select one of the following:

    1. Hexadecimal
    2. Base structure
```

Figure 22-12   SST: Select Format display

9. Select the option from the Select Format display as directed by your service provider. In the majority of cases, option 2 (Base structure) is required.

10. Specify a dump title as illustrated in the example in Figure 22-13 on page 341.

```
Specify Dump Title

Output device  . . . . . . :    Printer

Type choices, press Enter.

  Dump title  . . . . . . . . . . .    ITSO Example - 11/14/07

  Perform seizes  . . . . . . . . .  1          1=Yes, 2=No

  Partial print page numbers:
    From page . . . . . . . . . . .          1    1-2147483647
    Through page  . . . . . . . . .       9999    1-2147483647
```

Figure 22-13   SST: Specify Dump Title display

11. Press Enter to submit the dump. The following message is displayed at the bottom of the screen:

    Dump to printer successfully submitted.

12. Press F16 to return to the SST menu.

13. Press F10 to obtain a command entry screen.

14. Enter the WRKJOB command, and select option 4 to locate the spooled file with the QPCSMPRT label created by this procedure.

The same procedure can also be performed with DST to perform a dump system object. See 27.1, "Getting started" on page 428 for the DST printing requirements.

23

Collecting an input/output processor (IOP) dump

This chapter explains how to use the I/O debug utility to collect a dump for an input/output processor (IOP). You can access the I/O debug utility in Hardware Service Manager from either the System Service Tools (SST) or Dedicated Service Tools (DST) menus.

The IOP dump contains information such as data from the memory, hardware registers, and error log of an IOP. This operation takes place at the hardware bus level and can be used to gather data from an inoperable IOP. The data can be displayed, printed, or saved to tape. In some error situations, the IOP automatically stores dump information in a Product Activity Log (PAL) entry. You can locate it by searching for the class of the entries that are labeled *Dump.*

If you do not have authority to use SST or DST, contact the security officer or system administrator.

> **Attention:** Improper use of an IOP dump can cause a system failure, that can require a system IPL to recover. Use this tool under the direction of your service provider.

23.1 Performing an IOP dump on most IOPs

This section outlines the steps to perform an IOP dump using SST or DST. The steps are as follows:

1. If you are not at the Start a Service Tool menu and you are using:

   – SST, go to 26.5.1, "Starting a Service Tool" on page 418.
   – DST, go to 27.4.1, "Starting a DST service tool" on page 435.

   Then, return here to continue.

2. Select the option for Hardware Service Manager from the Start a Service Tool menu:

   – For DST, select option 4.
   – For SST, select option 7.

   Press Enter. A menu appears like the example shown in Figure 23-1.

```
Hardware Service Manager

 Attention:  This utility is provided for service representative use only.


    System unit . . . . . . . . :   9406-820 10-5GG8M
    Release . . . . . . . . . :   V5R4M0


Select one of the following:
    1.  Packaging hardware resources (systems, frames, cards,...)
    2.  Logical hardware resources (buses, IOPs, controllers,...)
    3.  Locate resource by resource name
    4.  Failed and non-reporting hardware resources
    5.  System power control network (SPCN)
    6.  Work with service action log
    7.  Display label location work sheet
    8.  Device Concurrent Maintenance
    9.  Work with resources containing cache battery packs
                                                                Bottom
Selection
      2


 F3=Exit       F6=Print configuration      F9=Display card gap information
 F10=Display resources requiring attention      F12=Cancel
```

Figure 23-1   Hardware Service Manager menu

3. Select option 2 (Logical hardware resources (buses, IOPs, controllers,...). Press Enter. The Logical Hardware Resources menu appears as shown in Figure 23-2.

```
Logical Hardware Resources


Select one of the following:

     1. System bus resources
     2. Processor resources
     3. Main storage resources
     4. High-speed link resources




Selection


F3=Exit        F6=Print configuration        F12=Cancel
```

Figure 23-2   Logical Hardware Resource menu

4. Select option 1 (System bus resources). Press Enter. The Logical Hardware Resource on System Bus display appears as shown in Figure 23-3.

```
Logical Hardware Resources on System Bus

System bus(es) to work with . . . . . .    *ALL  *ALL, *SPD, *PCI, 1-511
Subset by . . . . . . . . . . . . . .      *ALL  *ALL, *STG, *WS, *CMN, *CRP

Type options, press Enter.
  2=Change detail    4=Remove    5=Display detail    6=I/O debug
  7=Display system information
  8=Associated packaging resource(s)     9=Resources associated with IOP

                                                        Resource
Opt Description                    Type-Model  Status      Name
      System Bus                   28AB-       Operational LB07
       Multi-adapter Bridge        28AB-       Operational PCI07D
       Multi-adapter Bridge        28AB-       Operational PCI08D
  9     Combined Function IOP      2843-001    Operational CMB03
     Virtual System Bus            -           Operational LB03
     Virtual IOP                   268C-001    Operational CMB02

                                                             Bottom
F3=Exit    F5=Refresh    F6=Print    F8=Include non-reporting resources
F9=Failed resources      F10=Non-reporting resources
F11=Display serial/part numbers      F12=Cancel
```

Figure 23-3   Logical Hardware Resources on System Bus display

5. Enter option 9 (Resources associated with IOP) in the Opt column next to the IOP for which you want to perform an IOP dump. A display appears as shown in Figure 23-4.

```
Logical Hardware Resources Associated with IOP

Type options, press Enter.
  2=Change detail    4=Remove    5=Display detail    6=I/O debug
  7=Verify           8=Associated packaging resource(s)


                                                            Resource
Opt Description                     Type-Model  Status      Name
 6  Combined Function IOP           2843-001    Operational  CMB03
      Communications IOA            2838-001    Operational  LIN03
       Communications Port          2838-001    Operational  CMN11
        Communications Channel      605A-001    Operational  CHN02





F3=Exit    F5=Refresh    F6=Print    F8=Include non-reporting resources
F9=Failed resources       F10=Non-reporting resources
F11=Display serial/part numbers     F12=Cancel
```

Figure 23-4   Logical Hardware Resources Associated with IOP display

6. Verify that this is the correct IOP with the correct IOA or device attached.

7. Enter option 6 (I/O Debug) on the Opt column next to the IOP. The Select IOP Debug Function menu appears as shown in Figure 23-5.

```
Select IOP Debug Function

Resource name . . . . . . . . :  CMB02
Dump type . . . . . . . . . . :  Normal

Select one of the following:

     1. Read/Write I/O processor data
     2. Dump I/O processor data
     3. Reset I/O processor
     4. IPL I/O processor
     5. Enable I/O processor trace
     6. Disable I/O processor trace



Selection
     2

F3=Exit      F12=Cancel
F8=Disable I/O processor reset      F9=Disable I/O processor IPL
```

Figure 23-5   Select IOP Debug Function menu

8. Enter option 2 (Dump I/O processor data). Press Enter. A display appears as shown in Figure 23-6.

> **Attention:** Performing a dump on an IOP that controls the disk drive can cause a system failure, which requires a system IPL to recover. Schedule this IOP dump for an off-peak time, and perform these IOP dumps using DST.

```
Dump I/O Processor Data

Note: Improper data offset when requesting storage or extended
dump may fail an operational IOP.

Type choices, press Enter.

  Data type  . . . . . . . . 1                    1=Dump
                                                  2=Error log
                                                  3=Storage
                                                  4=Registers
                                                  5=Extended storage
  Data offset  . . . . . . 0000000000000000
  Data length  . . . . . . . *ALL                 *ALL, hexadecimal number
  Issue unit reset . . . . . 2                    1=Yes, 2=No




 F3=Exit     F12=Cancel
```

Figure 23-6   Dump I/O Processor Data display

> **Important:** Certain processors need a unit reset to perform a dump. Issuing an IOP reset to a processor that is running can cause the processor to become inoperable. This can result in a system failure, which in turn, requires a system IPL to recover. Consult your service provider if you need to reset the IOP.

9. Use the default setting unless advised by your service provider. Note that the default setting for issuing a unit reset is 2 (No). Therefore, it does not disrupt the system

operation. Press Enter to proceed. The Work with Processor Data display appears as shown in Figure 23-7.

```
Work with Processor Data

Select one of the following:

     1. Display/Alter data
     2. Print data
     3. Save data to tape




Selection


F3=Exit      F12=Cancel
00936800 (hex) bytes of data were dumped.
```

Figure 23-7   Work with Processor Data menu

The `nnnnnnnn (hex) bytes of data were dumped` message appears at the bottom of the display.

This ends the procedure to perform an IOP dump on most IOPs. Proceed to the following section or to

Note: Do not press F3 (Exit) or F12 (Cancel) at the Work with Processor Data menu (refer to Figure 23-7). If so, all dump data *is lost*.

23.1.1 Saving the IOP dump data to tape

This procedure is a continuation from the previous section. The steps to save the IOP dump data are described here:

1. From the Work with Processor Data menu (see Figure 23-7 on page 348), enter option 3 (Save data to tape). The Specify Tape File display appears as shown in Figure 23-8.

```
 Specify Tape File

 Type choices, press Enter.

   Volume ID  . . . . . . . . . . .    ITS0001

   File name  . . . . . . . . . . .    IOPDUMP

   Sequence number  . . . . . . . .    0000          0000-9999

   Check for active files . . . . .    2             1=Yes, 2=No




 F3=Exit      F12=Cancel
```

Figure 23-8   Specify Tape File display

2. Type the volume identifier, file name, sequence number, and 1 or 2 for the Check for active files field at its respective prompt.

   Entering 1 at the Check for active file prompt causes the system to check whether there are any active files residing on the removable media that is to be inserted onto the tape drive. If an active file is found, a message is issued. If you enter 2 at the Check for active file prompt, the system does not check for active files. Any active file residing on the tape is over written.

3. Press Enter to continue. The Select Tape Unit display appears as shown in Figure 23-9 on page 350.

```
Select Tape Unit

Type choice, press Enter.

  Tape unit . . . . . . .  TAP01         Name, F4 for list
```
```
  F3=Exit           F4=Prompt          F12=Cancel
```
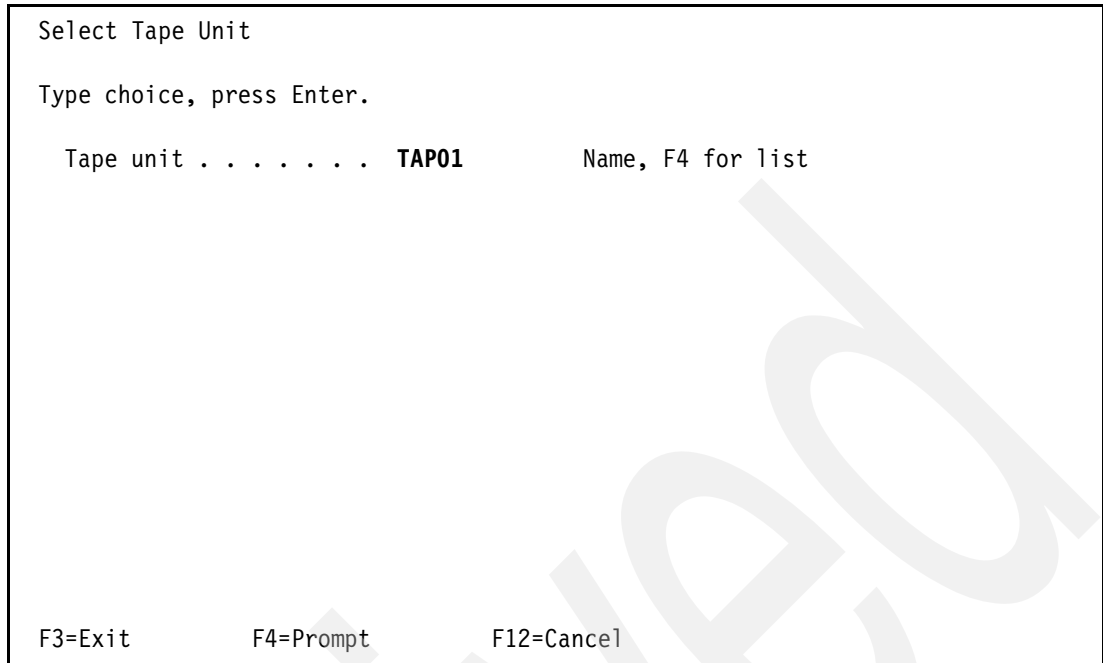
Figure 23-9   Select Tape Unit display

4. Insert a removable media onto a tape unit, and set it to *ready* status.

5. Type the tape unit identifier at the Tape unit prompt (for example, TAP01). Press Enter to proceed.

6. After the save is completed, the `Tape save was successful` message appears.

This ends the procedure to save the IOP dump data to tape.

23.1.2 Printing the IOP dump data

This procedure is a continuation from 23.1, "Performing an IOP dump on most IOPs" on page 344. The steps to print the IOP dump data are described here:

1. From the Work with Processor Data menu (refer to Figure 23-7 on page 348), type option 2 (Print data), and press Enter.

2. The `Print request successfully submitted to service printer` message appears at the bottom of the display.

3. Enter the WRKSPLF or the WRKJOB OPTION(*SPLF) command to locate your printout with the file name QPCSMPRT.

This ends the procedure to print the IOP dump data.

23.2 Performing an IOP dump for communication controllers

This section outlines the steps to perform an IOP dump or exception dump for a #2617 Ethernet communication controller and #2619 token-ring communication controller. Follow these steps:

1. Follow step 1 through step 4 from 23.1, "Performing an IOP dump on most IOPs" on page 344. Return here after you have completed step 4 of the procedure. The display shown in Figure 23-10 appears.

```
Logical Hardware Resources on System Bus

System bus(es) to work with . . . . . .    *ALL  *ALL, 1-  1
Subset by . . . . . . . . . . . . . .      *ALL  *ALL, *STG, *WS, *CMN

Type options, press Enter.
  2=Change detail    4=Remove    5=Display detail    6=I/O Debug
  8=Associated packaging resource(s)      9=Resources associated with IOP

                                                            Resource
Opt  Description                    Type-Model  Status      Name
     System Bus                        -        Operational  SPD01
     Multiple Function IOP    *    918B-001     Operational  CMB01
     Workstation IOP          <    2661-001     Operational  WS01
  9  Communications IOP            2619-001     Operational  CC04
     Storage IOP                   6502-001     Operational  SI01
     Communications IOP            6616-001     Operational  CC03



F3=Exit    F5=Refresh    F6=Print    F8=Include non-reporting resources
F9=Failed resources       F10=Non-reporting resources
F11=Display serial/part numbers       F12=Cancel
```

Figure 23-10   Logical Hardware Resource on System Bus display

2. Type option 9 (Resources associated with IOP) in the Opt column next to the IOP for which you want to perform an IOP dump. A display appears as shown in Figure 23-11 on page 352.

```
Logical Hardware Resources Associated with IOP

Type options, press Enter.
  2=Change detail     4=Remove     5=Display detail     6=I/O Debug
  7=Verify            8=Associated packaging resource(s)


                                                         Resource
Opt   Description                    Type-Model  Status    Name
 6    Communications IOP             2619-001    Operational  CC04
       Communications IOA            2619-001    Operational  LIN09
        Communications Port          2619-001    Operational  CMN10
       Communications IOA            605A-001    Operational  LIN10
       Workstation IOA               6055-001    Operational  CTL02




F3=Exit     F5=Refresh     F6=Print    F8=Include non-reporting resources
F9=Failed resources        F10=Non-reporting resources
F11=Display serial/part numbers       F12=Cancel
```

Figure 23-11   Logical Hardware Resources Associated with IOP display

3. Verify that this is the correct IOP with the correct IOA or device attached.

4. Type option 6 (I/O Debug) in the Opt column next to the IOP. A menu appears like the example shown in Figure 23-12.

```
Select IOP Debug Function

Resource name . . . . . . . . :  CC04
Dump type . . . . . . . . . . :  Normal

Select one of the following:

     1. Read/Write I/O processor data
     2. Dump I/O processor data
     3. Reset I/O processor
     4. IPL I/O processor
     5. Enable I/O processor trace
     6. Disable I/O processor trace



Selection


F3=Exit        F6=Set dump type        F12=Cancel
F8=Disable I/O processor reset       F9=Disable I/O processor IPL
```

Figure 23-12   Select IOP Debug Function menu

5. Press F6 to Set dump type. A menu appears as shown in Figure 23-13.

```
  Set Dump Type

  Select one of the following:

       1. Set IOP for normal dump
       2. Set IOP for exception dump









  Selection


  F3=Exit        F5=Clear exception dump storage          F12=Cancel
```
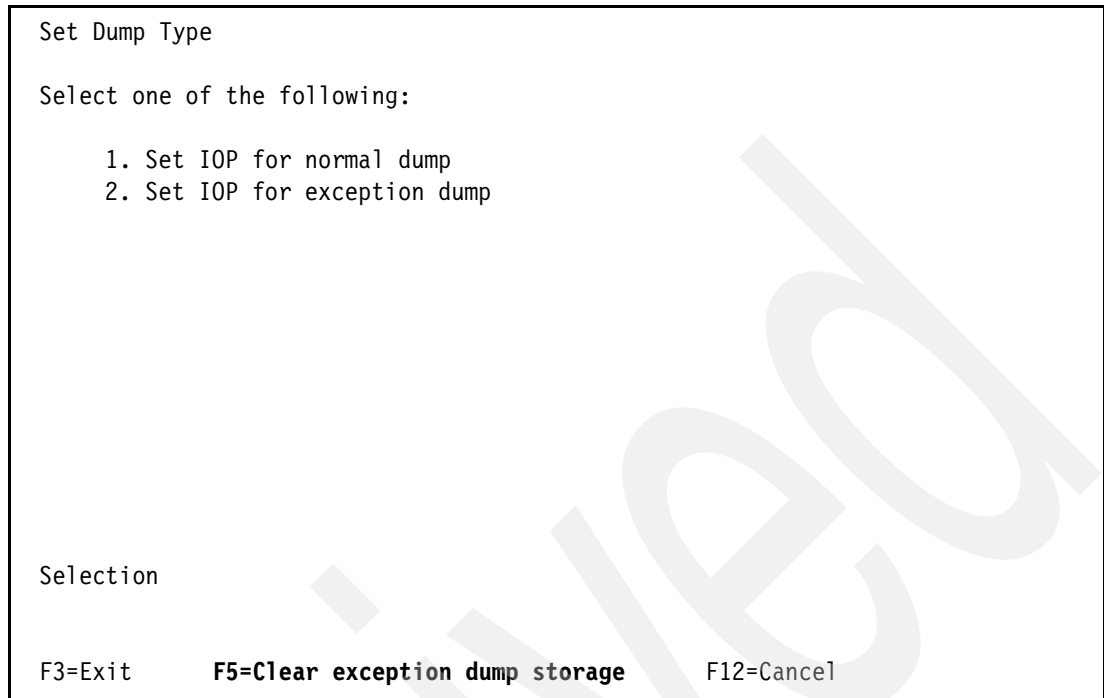
Figure 23-13   Set Dump Type menu

6. Press F5 to clear the exception dump storage. The `Successfully cleared exception dump storage` message appears at the bottom of the screen.

7. Type option 2 to set the IOP for exception dump. Press Enter. The `IOP card set to exception dump must not be moved` message appears at the bottom of the screen.

8. Press F12 to return to the Select IOP Debug Function menu (refer to Figure 23-12 on page 352).

9. Type option 2 to dump the I/O processor data. Press Enter. A display appears like the one in Figure 23-14 on page 354.

```
Dump I/O Processor Data

Note: Improper data offset when requesting storage dump may fail
an operational IOP.

Type choices, press Enter.

  Data type  . . . . . . . . . . .  1          1=Dump
                                                2=Error log
                                                3=Storage
                                                4=Registers
  Data offset  . . . . . . . . . .  00000000
  Data length  . . . . . . . . . .  *ALL       *ALL, hexadecimal number
  Issue unit reset . . . . . . . .  2          1=Yes, 2=No




  F3=Exit       F12=Cancel
```

Figure 23-14   Dump I/O Processor Data display

10. Use the default settings unless your service provider advises you to use another option. Press Enter to proceed. The system inhibits activity for a few seconds. The Work with Processor Data menu appears as shown in Figure 23-15 on page 355.

Important: The IOP exception dump for the #2617/#2619 communication controllers can be performed while a customer is using the controller as long as you use 2 (No) for the Issue unit reset prompt.

```
  Work with Processor Data

  Select one of the following:

       1. Display/Alter data
       2. Print data
       3. Save data to diskette
       4. Save data to tape




  Selection


  F3=Exit      F12=Cancel
  Exception dump successfully taken
```
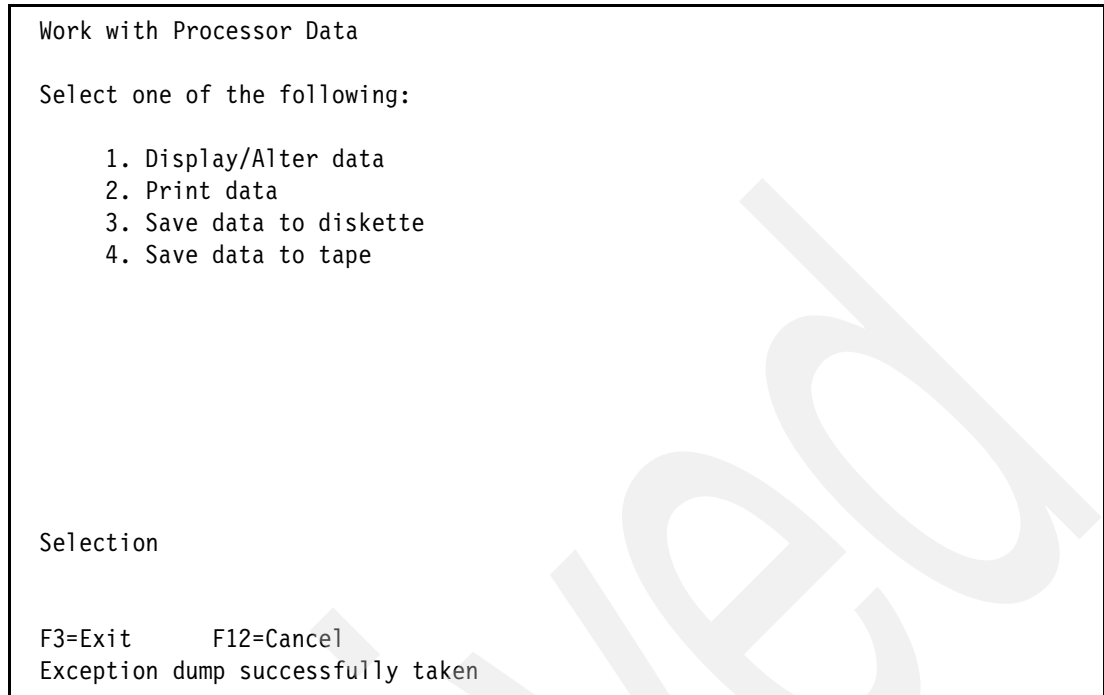
Figure 23-15   Work with Processor Data menu

11. The `Exception dump successfully taken` message appears at the bottom of the display.

Proceed to 23.1.1, "Saving the IOP dump data to tape" on page 349, or 23.1.2, "Printing the IOP dump data" on page 350.

23.3 Performing a communications IOP dump from the command line

The following procedure can be used to capture an IOP dump for a communications IOP. The dump is stored in the PAL and can be retrieved at a later date. The IOP dump entry has a system reference code of B600512D.

This procedure is only valid for communication IOPs.

The format of the command is as follows:

```
CALL QSOMAINT PARM('21' 'LINENAME')
```

Replace LINENAME with the name of the communications line that you would like to dump. For example:

```
CALL QSOMAINT PARM('21' 'ETHLINO1')
```

Tip: Use the WRKCFGSTS *LIN command to help determine the communications line name if it is not know.

23.4 Restoring the IOP dump tape to another system

This section outlines the steps to restore the IOP dump saved in 23.1.1, "Saving the IOP dump data to tape" on page 349. Complete this process:

1. If you are at the Start a Service Tool menu, continue with the next step. Otherwise, go to 26.5.1, "Starting a Service Tool" on page 418. Return here after you review how to start a Service Tool.

2. Type option 4 (Display/Alter/Dump) from the Start a Service Tool menu. A display appears as shown in Figure 23-16.

```
Display/Alter/Dump Output Device

Select one of the following:

     1. Display/Alter storage
     2. Dump to printer
     3. Dump to diskette
     4. Dump to tape
     5. Print diskette dump file
     6. Print tape dump file
     7. Display dump status




Selection
     6

F3=Exit    F12=Cancel
```
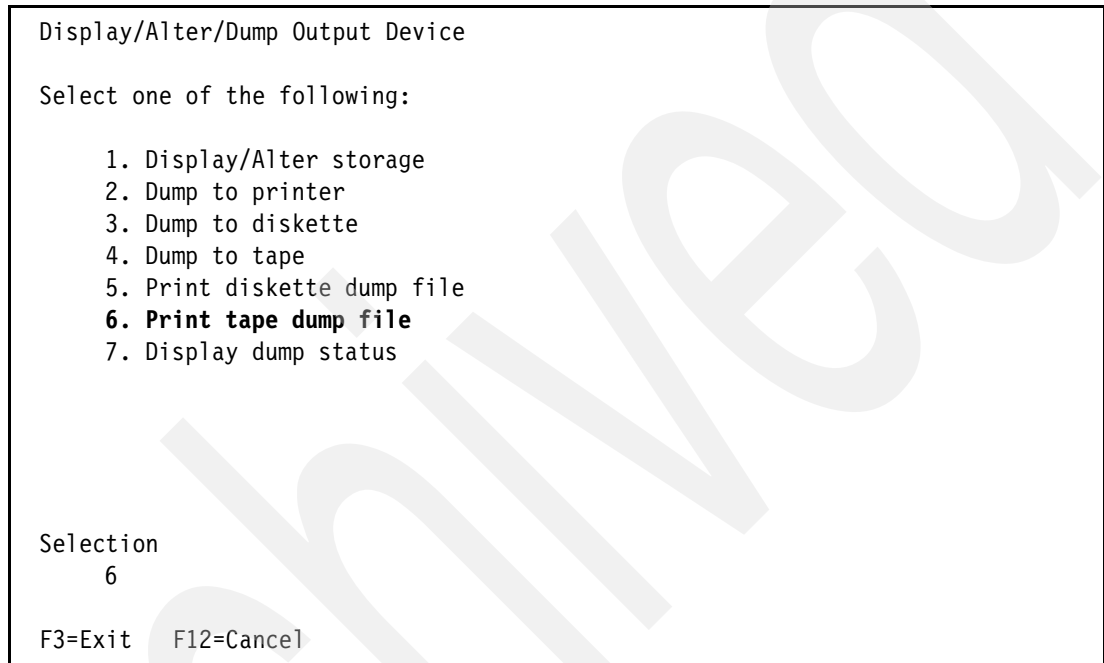
Figure 23-16   Display/Alter/Dump Output Device menu

3. Type option 6 (Print tape dump file). A display appears like the example shown in Figure 23-17.

```
 Print Tape File

 Type choices, press Enter.

   Partial print page numbers:
     From page . . . . . . . . . . .           1   1-2147483647
     Through page  . . . . . . . . .  2147483647   1-2147483647

   Volume ID . . . . . . . . . . . .  ITS0001

   File  . . . . . . . . . . . . . .  IOPDUMP

   Sequence number . . . . . . . . .  0000           0000-9999




 F3=Exit    F12=Cancel
```

Figure 23-17   Print Tape File display

4. Type 2147483547 for the Through page option since you do not know how many pages this IOP dump tape produces. Type the volume identifier and the file name of the tape in its respective field.

> **Tip:** If you do not know the volume identifier and the file name of the tape, use the **DSPTAP DEV(TAP01) DATA(*LABELS)** CL command to find out. You can check the information from another session without having to exit from this menu.

5. Press Enter. The Select Tape Unit display appears as shown in Figure 23-18 on page 358.

```
 Select Tape Unit

 Type choice, press Enter.

   Tape unit . . . . . . .   TAP01        Name, F4 for list












   F3=Exit          F4=Prompt          F12=Cancel
```
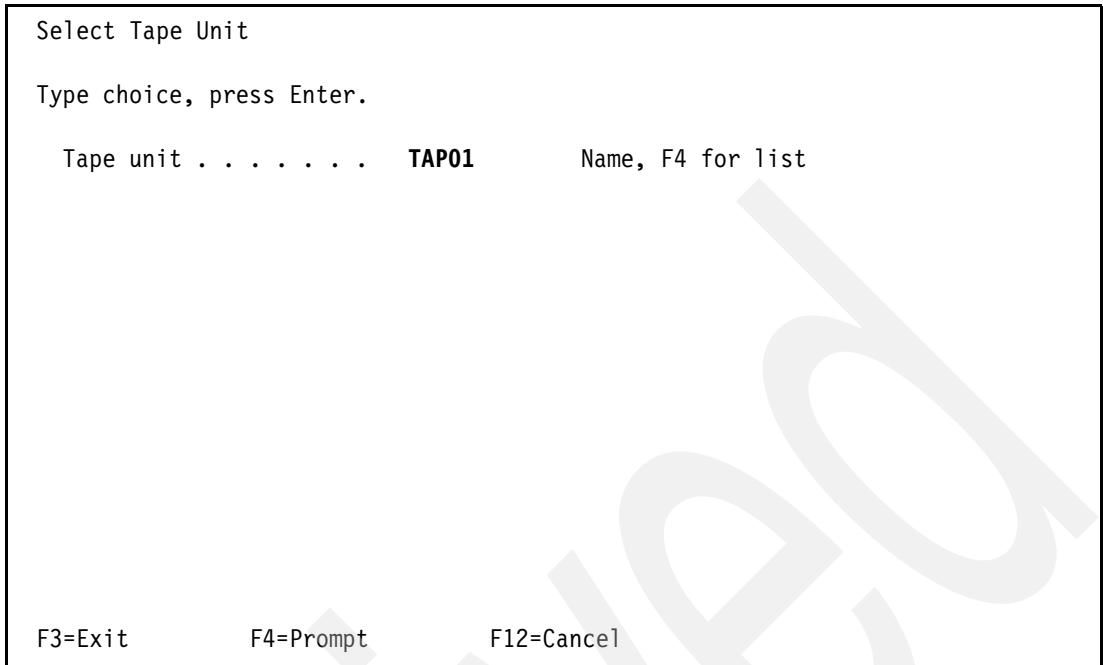
Figure 23-18   Select Tape Unit display

6. Insert the LIC log tape on to the tape unit, and set it to *ready* status.

7. Type the tape unit identifier in the Tape unit prompt, for example, TAP01. Press Enter to proceed.

8. The restore process starts. You are brought back to the Print Tape File menu (refer to Figure 23-17 on page 357). The `Print of tape file successfully submitted` message appears at the bottom of the display.

9. Press F3 (Exit) to return to the Display/Alter/Dump Output Device menu (refer to Figure 23-16 on page 356).

   Note: Do not exit the Display/Alter/Dump Output Device menu at this time. This causes the dump request to terminate.

10. Enter option 7 (Display dump status) to check the status of your dump request. A display appears as shown in Figure 23-19 on page 359.

```
Display Status of Dump

Dump requests
  not complete  . . . . . . . . :       1

Title of
  active dump . . . . . . . . . :  File IOPDUMP          Vol IBMIRD




Press Enter to continue.

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

Figure 23-19   Display Status of Dump

11. Press F5 to refresh the display occasionally, and wait for the Dump completed normally - File IOPDUMP Vol ITS00001 message to appear.

12. Press F3 three times to exit from the service tool.

13. Press Enter when prompted to exit SST.

14. Use the WRKSPLF *CL* command to locate your printout with the file name QPCSMPRT.

This ends the procedure to restore the IOP dump tape to another system using SST.

24

Tracing the Licensed Internal Code

A trace of the Licensed Internal Code (LIC) is often referred to as a *LIC trace* or an *internal trace*. A LIC trace is used to collect data about the internal operations of the Licensed Internal Code. A LIC trace monitors various internal events. Therefore, it can be used to debug a problem that can be re-created but is not visible at the application level. This tool is usually used under the direction of your service provider.

The process to collect the LIC trace data follows this order:

1. Start the trace.

2. Run the job until a failure occurs. A trace without a failure cannot be used to solve a problem, but it can be used to compare the difference between a failing event and a non-failing event.

3. Stop the trace.

4. Dump the trace data to a tape, database file, or printer.

Traces can be run by using the Trace Internal (TRCINT) command from any command line or by selecting the Trace Licensed Internal Code option from System Service Tools (SST) or Dedicated Service Tools (DST).

There are two ways to start the LIC trace:

► **SST:** Refer to 24.2.1, "Using SST to collect a Source/Sink LIC trace" on page 385, or DST.

► **TRCINT CL command:** Refer to 24.2.2, "Using the TRCINT command to collect a Source Sink LIC trace" on page 393.

Service or QIBM_Service_Trace special authority is necessary to use SST and DST. Contact your security officer or system administrator to obtain appropriate authorization.

Note: The DST method of tracing LIC is similar to the SST method, except that the options differ. You should always start the trace using a CL command or SST unless a workstation is not available. Review the method for locating the printed output in 1.7, "Finding your printed output" on page 9, prior to using the process outlined in this chapter.

24.1 TCP/IP Licensed Internal Code trace

A commonly traced LIC function is TCP/IP. A TCP/IP trace can trace all TCP/IP activity or it can be restricted to subsets. Subsets, known as filters, can be applied based on job information, TCP/IP protocol, ports, IP addresses, lines and more. Events are traced relative to activities within a specific component as well as the execution of instructions within a LIC module. The latter is to be used under the direction from higher levels of support such as IBM development. The examples given in 24.2.1, "Using SST to collect a Source/Sink LIC trace" on page 385 and 24.2.2, "Using the TRCINT command to collect a Source Sink LIC trace" on page 393 are based on a TCP/IP trace filtering on job and user name.

24.1.1 Using SST to collect a TCP/IP LIC trace

This section outlines the steps required to take a TCP/IP trace from SST and collect data for further problem determination. In this example, we perform a TCP/IP trace on TELNET Device Manager jobs. Follow these steps:

1. If you are not at the Start a Service Tool menu, follow the steps in 26.5.1, "Starting a Service Tool" on page 418. Return here after you review how to start a Service Tool.

2. Select option 2 (Trace Licensed Internal Code) from the Start a Service Tool menu. Press Enter. The Work with Internal Traces display appears as shown in Figure 24-1.

```
  Work with Internal Traces


  Type options, press Enter.
    2=Allocate     3=Work with enable details     4=Delete
    5=Display      6=Dump     7=Activate     8=Deactivate     9=Clear

  Opt   Trace Name                     Updated     -------- Status --------
        SYSTEM DEFAULT TRACE BUFFER    11/28/07  Complete        Disabled














    F3=Exit     F6=Create     F12=Cancel
```

Figure 24-1   Work with Internal Traces display

3. If you are using the system default trace buffer, we recommend that you use option 9 to clear the trace table. Otherwise, create a new table by pressing F6 (Create table). The display shown in Figure 24-2 on page 363 appears.

```
 Create Internal Trace

 Type choices, press Enter.

   Trace name . . . . . . .    TELNET DEVICE MANAGER LCKW

   Buffer size  . . . . . .    64         megabytes    1- 11395

   Wrap allowed . . . . . .    Y          Y=Yes, N=No













 F3=Exit     F12=Cancel
```

Figure 24-2   Create Internal Trace display

4. Type a meaningful name for the table name describing the symptoms of the problem, for example, "TELNET DEVICE MANAGER LCKW". A table size of 64 MB is generally recommended. Press Enter to create the table. The display shown in Figure 24-3 on page 364 appears.

Note: The storage indicated on this parameter is immediately allocated from the system auxiliary storage pool (ASP 1). This storage is not dynamically allocated as it is needed. This storage space is not available for use by the system except to record trace-related information.

Before specifying a large value on this parameter, the amount of free space in the system ASP should be checked. Use the Work with System Status (WRKSYSSTS) command to determine the amount of available free space in the system ASP. System performance degradation can result if the size of the free space in the system ASP is significantly reduced as a result of the value specified.

Note: The trace table size should be greater than 128000 kilobytes or 128 megabytes if tracing data over a gigabit Ethernet line.

```
Work with Internal Traces

Type options, press Enter.
  2=Allocate    3=Work with enable details    4=Delete
  5=Display     6=Dump    7=Activate    8=Deactivate    9=Clear

Opt  Trace Name                      Updated    -------- Status --------
     SYSTEM DEFAULT TRACE BUFFER     11/28/07   Complete      Disabled
 3   TELNET DEVICE MANAGER LCKW      11/28/07   Cleared       Disabled














 F3=Exit    F6=Create    F12=Cancel
```

Figure 24-3   Work with Internal Traces display with a new table created

5. A new table is created with a status of *Cleared* and *Disabled*. Enter option 3 (Work with enable details). The Enable Internal Trace display appears as shown in Figure 24-4.

```
Enable Internal Trace

Trace:    TELNET DEVICE MANAGER LCKW

Type options, press Enter.
  1=Enable    2=Disable    3=Work with enable details

Opt   Description                                          Status
 3    Component traces                                     Disabled
      MI instruction supervisory linkage (SVL) trace      Disabled
      Multi-programming level (MPL) trace                 Disabled
      Task/thread performance trace                       Disabled
      Transaction trace                                   Disabled

      Qualifier restrictions                              Disabled
      Task/thread restrictions                            Disabled
      Automatic deactivation                              Disabled






 F3=Exit    F12=Cancel
```

Figure 24-4   Enable Internal Trace display

6. Enter option 3 (Work with enable details) next to Component traces to select the type of trace to be collected. A display appears like the one in Figure 24-5.

```
  Enable Component Trace

  Trace:     TELNET DEVICE MANAGER LCKW

  Type options, press Enter.
    1=Enable     2=Disable     3=Work with enable details

  Opt    Description                                                Status
   3     Transmission control protocol (TCP/IP)                    Disabled
         Transport layer interface                                 Disabled
         Virtual I/O                                               Disabled
         Virtual terminal manager                                  Disabled




                                                                     Bottom
    F3=Exit     F12=Cancel
```

Figure 24-5   Enable Component Trace display

7. Scroll down or page down until you see **Transmission control protocol (TCP/IP)**. Enter option 3 next to this description to work with enable details. A display appears like the example in Figure 24-6 on page 366.

```
Enable Transmission Control Protocol Trace

 Trace:     TELNET DEVICE MANAGER LCKW

 Type options, press Enter.
   1=Enable    2=Disable    3=Work with enable details

 Opt    Description                                               Status
  1     Transmission control protocol (TCP/IP)                    Disabled

        Transmission control protocol (TCP/IP) restrictions       Disabled




















 F3=Exit     F12=Cancel
```

Figure 24-6   Enable Transmission Control Protocol Trace display

8. Enter option 1 next to Transmission control protocol (TCP/IP) and press the Enter key. The Status column is then updated to show Enabled.

9. Press Enter twice to return to the Enable Internal Trace display as shown in Figure 24-7 on page 367.

```
Enable Internal Trace


Trace:    TELNET DEVICE MANAGER LCKW


Type options, press Enter.
  1=Enable    2=Disable    3=Work with enable details


Opt   Description                                           Status
    > Component traces                                      Enabled
      MI instruction supervisory linkage (SVL) trace        Disabled
      Multi-programming level (MPL) trace                   Disabled
      Task/thread performance trace                         Disabled
      Transaction trace                                     Disabled

      Qualifier restrictions                                Disabled
  3   Task/thread restrictions                              Disabled
      Automatic deactivation                                Disabled






  F3=Exit    F12=Cancel
```

Figure 24-7   Enable Internal Trace display

10.Enter option 3 next to Task/thread restrictions. Refer to Figure 24-8.

```
Enable Task/Thread Trace Restrictions


Trace:    TELNET DEVICE MANAGER LCKW


Type options, press Enter.
  1=Enable    2=Disable    3=Work with enable details


Opt   Description                                           Status
      Task restrictions                                     Disabled
  3   Process/thread restrictions                           Disabled
      Server restrictions                                   Disabled
      TDE restrictions                                      Disabled












  F3=Exit    F12=Cancel
```

Figure 24-8   Enable Task/Thread Trace Restrictions display

11. Enter option 3 next to Process/thread restrictions. Refer to Figure 24-9.

```
 Restrict Processes to Trace

 Trace:     TELNET DEVICE MANAGER LCKW

 Type choices, press Enter.

   Job          User          Number
   QTV*         QTCP                           Thread restrictions:  0

 Job or user is generic if asterisk (*) specified.

 F3=Exit    F4=Prompt    F10=Restrict threads    F12=Cancel
```

Figure 24-9   Restrict Processes to Trace Display

12. Type QTV* in the Job prompt and QTCP in the User prompt. This filters the tracing to include only jobs with a job name starting with QTV and also with a user name of QTCP. Press the Enter key.

> **Note:** In this example, both the TELNET Device Manager jobs (QTVDEVICE) and the TELNET Server job (QTVTELNET) are traced because we used the generic job name QTV*.

13. Press F3 (Exit) to return to the Work with Internal Traces screen, as shown in Figure 24-10.

```
 Work with Internal Traces

 Type options, press Enter.
   2=Allocate    3=Work with enable details    4=Delete
   5=Display     6=Dump    7=Activate    8=Deactivate    9=Clear

 Opt  Trace Name                     Updated    -------- Status --------
       SYSTEM DEFAULT TRACE BUFFER    11/28/07   Complete        Disabled
       TELNET DEVICE MANAGER LCKW     11/28/07   Cleared         Enabled




















 F3=Exit    F6=Create    F12=Cancel
 Trace is ready to activate.
```

Figure 24-10   Work with Internal Traces with the new trace ready to activate

14. Enter option 7 to activate the trace components that have been enabled from the previous steps. The status changes from *Cleared* to *Active* as shown in Figure 24-11 on page 370.

```
Work with Internal Traces

Type options, press Enter.
  2=Allocate    3=Work with enable details    4=Delete
  5=Display     6=Dump    7=Activate    8=Deactivate    9=Clear

Opt  Trace Name                     Updated    -------- Status --------
     SYSTEM DEFAULT TRACE BUFFER    11/28/07   Complete        Disabled
     TELNET DEVICE MANAGER LCKW     11/28/07   Active          Enabled

 F3=Exit    F6=Create    F12=Cancel
```

Figure 24-11   Work with Internal Traces with the new trace active

15. Re-create the problem.

16. After the problem is re-created, enter option 8 to deactivate it. The status changes from *Active* to *Complete*.

17. Enter option 6 to dump the trace table. The display shown in Figure 24-2 on page 363 appears.

```
Dump Trace


Trace:      TELNET DEVICE MANAGER LCKW


Type options, press Enter.
  6=Dump


Opt    Description
       Component traces
       MI instruction supervisory linkage (SVL) trace
       Multi-programming level (MPL) trace
       Task/thread performance trace
       Transaction trace













 F3=Exit     F9=Dump all     F12=Cancel
```

Figure 24-12   Dump Trace display

18. Press F9 to dump the entire selection, unless you are instructed otherwise by your service provider. The Specify Time Qualification display appears as shown in Figure 24-13.

```
Specify Time Qualification

Type choice, press Enter.

  Specify time . . . . . . .   N    Y=Yes, N=No
















 F3=Exit     F12=Cancel
```

Figure 24-13   Specify Time Qualification display

19. Select the default setting of N (No) for Specify time, and press Enter. This collects the entire trace data gathered. The Select Dump Device display appears as shown in Figure 24-14.

```
  Select Dump Device

  Type choices, press Enter.

    Dump device  . . . . . . .    1    1=Printer
                                        2=Media

    Title  . . . . . . . . . .    PMR 12345

    TDE cross reference  . . .    1    1=Only for records dumped
                                        2=All TDEs during trace












  F3=Exit     F12=Cancel
```
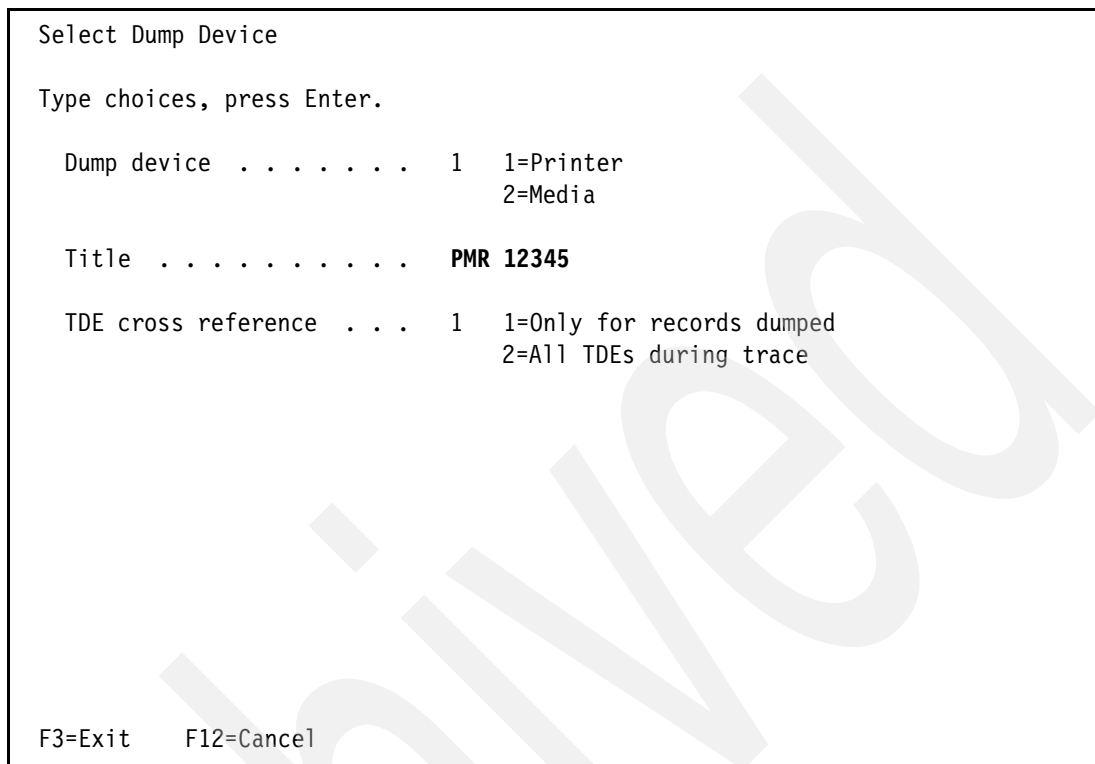
Figure 24-14   Select Dump Device display

20. You have the option to print or write the trace directly to tape. We recommend that you name the title with the PMR number. This helps your service provider to cross-reference the documentation received with their problem management system. Press Enter to proceed.

21. Wait until the `Dump completed successfully` message appears at the bottom of the display.

22. Exit the System Service Tools (SST).

23. Once your service provider has received the trace and acknowledged the contents are correct, use option 4 (Delete) on the display shown in Figure 24-3 on page 364. This removes the trace data and frees up any disk storage utilized for the trace buffer.

If you selected the option to print the trace, you should be able to locate your printout with the file name QPCSMPRT by using the WRKSPLF command. Use option 5 (Display) to view the file. It should look similar to the display in Figure 24-15.

```
 Display Spooled File
 File . . . . . :   QPCSMPRT
Page/Line   1/1
 Control . . . . .
Columns    1 - 130
 Find . . . . . .

*...+....1....+....2....+....3....+....4....+....5....+....6....+....7....+....8....+....9....+....0....
+....1....+....2....+....3
       *** LIC TRACE DUMP OUTPUT ***                      PMR 12345
11/28/07  16:33:28   PAGE
 TCP/IP              IDENTIFIER : TO#31000                      TIME 11/28/07  16:26:46.214528
TDE# 000000000377
  #1   (   13)    +0000    E3D6E3C3D7E6D9C9  E3C5D7E4E3
*TOTCPWRITEPUT
  #2   (    8)    +0000    C9936D548B002D00
*Il_è»...
  #3   ( 3872)    +0000    FFFFFFFFC5FF79D0  E3C3D7C5D5C4D7E3   D5596E64EE008D00  E2D2D4E2C7D80000
*....E.`}TCPENDPTNß>ÃÔ.ý.SKMSGQ.
                  +0020    0000000000000000  0000000000000000   0000000000000000  D3D6E3D9D5C9D5E3
*.......................LOTRNIN
                  +0040    0000000000000000  0000000000000000   FFFFFFFFC698B100  E2D5C4C3C1C3C8F4
*....................Fq£.SNDCACH
                  +0060    0000000000000000  00000000C0A80982   0000000000000000  0000000000000000
*............{y.b...............
                  +0080    00000000C0A80982  0000000000000000   0000000000000000  00000000C0A80982
*....{y.b...................{y.
                  +00A0    0000000000000000  0000000000000000   00000000C0A8096B  0000000000000000
*...................{y.,.......
                  +00C0    8C5BFDD517399006  0000000000000014   00000000000005C0  0000000000000014
*ð$ÙN..°................{.......
                  +00E0    4200000000000026  0600020000000000   0000000000000000  0000000000000000
*â.............................
                  +0100    0000000000000000  0000000000000000   0000000000000000  0000000000000000
*.............................
                  +0120    0000004000000000  0000000000000000   0000000000010100  0000000000000000 *...
...........................
                  +0140    0000000000000000  4500000000004000   40065945C0A80982  C0A8096B00000000
*........á..... . .ßá{y.b{y.,...
                  +0160    0000000000000000  0000000000000000   0000000000000000  0000000000000000
*.............................
                  +0180    0000000000000000  0000000000000000   0000000000000000  0000000000000000
*.............................
                  +01A0    FFFFFFFF41705480  0000000000000000   0000000000000000  DE5B32D1FA001488
*.... øèØ................ú$.J ..
                  +01C0    8C4D3202C83E4008  EC31D7E545000F00   8C4D32030EEF0000  000005D4D5000000
*ð(..H. .Ö.PVá...ð(...Õ.....MN..

More...
 F3=Exit   F12=Cancel   F19=Left   F20=Right   F24=More keys
```

Figure 24-15   Display spooled file of LIC trace output

This ends the procedure to collect a TCP/IP LIC trace.

24.1.2 Using the TRCINT command to collect a TCP/IP LIC trace

Additional filtering can be done based on Job, Thread, Task, and Sever type. Refer to the command help on parameters JOB, SLTTHD, SVRTYPE, TASK, TASKNBR, of the TRACE INTERNAL command.

This section outlines the steps to start a TCP/IP trace using the TRCINT command and collect data for further problem determination.

Tracing a TCP/IP problem

You can use **TRCINT** to debug Licensed Internal Code in the TCP/IP protocol stack and sockets.

1. Type TRCINIT on the command line, and press F4. A display appears like the one shown in Figure 24-16.

```
Trace Internal (TRCINT)

 Type choices, press Enter.

 Trace option setting . . . . . .    *ON              *ON, *OFF, *END, *HOLD...
 Trace table name . . . . . . . .   TCP/IP Problem




                                                                       Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 24-16   Trace internal (TRCINT)

2. Type *ON in the Trace option setting prompt. You can use the default setting for Trace table name or create a new table by typing a meaningful name that describes the symptom of the problem, for example, "TCP/IP problem".

3. Press Enter to continue. The Trace Internal display shows more options (see Figure 24-17 on page 375).

```
Trace Internal (TRCINT)

Type choices, press Enter.

Trace option setting . . . . . . > *ON            *ON, *OFF, *END, *HOLD...
Trace table name . . . . . . . . > 'TCP/IP Problem'
Trace table size:
  Number of units  . . . . . . .  64              1-998000, *NOCHG, *MAX, *MIN
  Unit of measure  . . . . . . .  *MB             *KB, *MB
Trace full . . . . . . . . . . .  *NOCHG          *NOCHG, *WRAP, *STOPTRC
Trace type . . . . . . . . . . .  *TCPIP          000000-999999, *SVL, *MPL...
               + for more values
Job name . . . . . . . . . . . .  *NOCHG          Name, generic*, *NOCHG, *ALL
  User . . . . . . . . . . . . .                  Name, generic*, *ALL
  Number . . . . . . . . . . . .                  000000-999999, *ALL
               + for more values



Thread ID to include . . . . . .  *NOCHG          Thread ID, *ALL, *SELECT
               + for more values
                                                                    More...
```

Figure 24-17   Trace internal (TRCINT)

4. Change the Size option to 64 MB (recommended) and Trace full option to *WRAP.

5. At the Trace type, type *TRCTCP and press Enter. Scroll down or page down to see the option for TCP/IP data as, Protocol, Local port, Remote Port and so on. Refer to Figure 24-18.

```
Trace Internal (TRCINT)

Type choices, press Enter.

TCP/IP data:
  Protocol . . . . . . . . . . .                  *TCP, *UDP, *ICMP, *IGMP...
  Local port . . . . . . . . . .                  1-65535

  Remote port  . . . . . . . . .                  1-65535

  Local IP address . . . . . . .

  Remote IP address  . . . . . .

  Line description . . . . . . .                  Name
  Line type  . . . . . . . . . .                  *PPP, *OPC

                                                                    More...
F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
F24=More keys
```

Figure 24-18   Trace internal (TRCINT)

6. Type the items to be filtered. The items to be traced varies with the situation; consult your service provider on what should be included. Press Enter.

7. Re-create the problem.

8. After the problem is re-created, use the same TRCINT command and press F4. A display appears similar to the example in Figure 24-19.

```
Trace Internal (TRCINT)


Type choices, press Enter.


Trace option setting . . . . . . > *OFF          *ON, *OFF, *END, *HOLD...
Trace table name . . . . . . . . > 'TCP/IP Problem'
Task information . . . . . . . .   *TRCREF       *ALL, *TRCREF
Output . . . . . . . . . . . . .   *PRINT        *PRINT, *OUTFILE




                                                                    Bottom
F3=Exit    F4=Prompt    F5=Refresh    F12=Cancel    F13=How to use this display
F24=More keys
```

Figure 24-19   Trace Internal display

9. Type *OFF for the Trace option setting prompt and meaningful text to describe the problem in the Trace table name prompt. Then, press Enter. The display refreshes with one more prompt.

10. Leave the default setting for Task information, and press Enter again.

11. Once you set the trace off, the records are written to the spool printer file QPCSMPRT. Use the WRKSPLF command to locate your printout.

Tracing a TELNET device manager job

In this example, we perform a TCP/IP trace on TELNET Device Manager jobs. *SERVICE or QIBM_Service_Trace special authority is required to use TRCINT.

1. Type TRCINIT on the command line, and press F4. A display appears like the one shown in Figure 24-20.

```
Trace Internal (TRCINT)


Type choices, press Enter.


Trace option setting . . . . . . > *ON           *ON, *OFF, *END, *HOLD...
Trace table name . . . . . . . . > 'TELNET DEVICE MANAGER LCKW'




F3=Exit    F4=Prompt    F5=Refresh    F12=Cancel    F13=How to use this display
F24=More keys
```

Figure 24-20   Trace Internal display

2. Type *ON in the Trace option setting prompt. You can use the default setting for Trace table name or create a new table by typing a meaningful name that describes the symptom of the problem, for example, "TELNET DEVICE MANAGER LCKW".

3. Press Enter to continue. The Trace Internal display shows more options (see Figure 24-21).

```
Trace Internal (TRCINT)

Type choices, press Enter.

Trace option setting . . . . . . > *ON          *ON, *OFF, *END, *HOLD...
Trace table name . . . . . . . . > 'TELNET DEVICE MANAGER LCKW'
Trace table size:
  Number of units  . . . . . . .   128          1-998000, *NOCHG, *MAX, *MIN
  Unit of measure  . . . . . . .   *MB           *KB, *MB
Trace full . . . . . . . . . . .   *WRAP         *NOCHG, *WRAP, *STOPTRC
Trace type . . . . . . . . . . .   *TCPIP        000000-999999, *SVL, *MPL...
              + for more values
Job name . . . . . . . . . . . .   QTV*          Name, generic*, *NOCHG, *ALL
  User . . . . . . . . . . . . .     QTCP        Name, generic*, *ALL
  Number . . . . . . . . . . . .                 000000-999999, *ALL
              + for more values



Thread ID to include . . . . . .   *NOCHG        Thread ID, *ALL, *SELECT
              + for more values
                                                                  More...
F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
F24=More keys
```

Figure 24-21   Trace Internal display with more options

4. Change the following prompts:

   – The Number of units to 128
   – The Unit of measure to *MB
   – The Trace full to *WRAP
   – The Trace type to *TCPIP
   – The Job name to QTV*
   – The User to QTCP

   Press Enter twice. The trace is now active.

   Note: To determine what traces are active on a system at any point in time, you can use the WRKTRC command on i5/OS V5R4 systems.

5. Re-create the problem.

6. After the problem is re-created, use the same TRCINT command and press F4. A display appears similar to the example in Figure 24-22.

```
Trace Internal (TRCINT)

 Type choices, press Enter.

 Trace option setting . . . . . .   *OFF              *ON, *OFF, *END, *HOLD...
 Trace table name . . . . . . . .   TELNET DEVICE MANAGER LCKW









                                                                         Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 24-22   Turning a trace off using the Trace Internal display

7. Type *OFF for the Trace option setting prompt and the trace table name you used when starting the trace in the Trace table name prompt. Then, press Enter. The display refreshes with one more prompt (Figure 24-23 on page 379).

```
Trace Internal (TRCINT)

Type choices, press Enter.

Trace option setting . . . . . . > *OFF          *ON, *OFF, *END, *HOLD...
Trace table name . . . . . . . . > 'TELNET DEVICE MANAGER LCKW'
Task information . . . . . . . .   *TRCREF        *ALL, *TRCREF
Output . . . . . . . . . . . . .   *PRINT         *PRINT, *OUTFILE




                                                                    Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 24-23   Trace Internal display

8. Leave the default setting for Task information, and press Enter again.

9. Once you set the trace off, the records are written to the spool printer file QPCSMPRT.
   Use the WRKSPLF command to locate your printout. Use option 5 (Display) to view the
   file. It should look similar to the display in Figure 24-24 on page 380.

```
 Display Spooled File
 File . . . . . :   QPCSMPRT
Page/Line   1/1
 Control . . . . .
Columns    1 - 130
 Find . . . . . .

*...+....1....+....2....+....3....+....4....+....5....+....6....+....7....+....8....+....9....
+....0....+....1....+....2....+....3
      *** LIC TRACE DUMP OUTPUT ***                   PMR 12345
11/28/07  16:33:28   PAGE
 TCP/IP               IDENTIFIER : TO#31000                      TIME 11/28/07
16:26:46.214528   TDE# 000000000377
  #1  (   13)    +0000   E3D6E3C3D7E6D9C9  E3C5D7E4E3
*TOTCPWRITEPUT
  #2  (    8)    +0000   C9936D548B002D00
*Il_è»...
  #3  ( 3872)    +0000   FFFFFFFFC5FF79D0  E3C3D7C5D5C4D7E3  D5596E64EE008D00
E2D2D4E2C7D80000 *....E.`}TCPENDPTNß>ÃÕ.ÿ.SKMSGQ.
               +0020   0000000000000000  0000000000000000  0000000000000000
D3D6E3D9D5C9D5E3 *.......................LOTRNIN
               +0040   0000000000000000  0000000000000000  FFFFFFFFC698B100
E2D5C4C3C1C3C8F4 *...................Fq£.SNDCACH
               +0060   0000000000000000  00000000C0A80982  0000000000000000
0000000000000000 *............{y.b..............
               +0080   00000000C0A80982  0000000000000000  0000000000000000
00000000C0A80982 *....{y.b...................{y.
               +00A0   0000000000000000  0000000000000000  00000000C0A8096B
0000000000000000 *...................{y.,........
               +00C0   8C5BFDD517399006  0000000000000014  00000000000005C0
0000000000000014 *ð$ÙN..°................{.......
               +00E0   4200000000000026  0600020000000000  0000000000000000
0000000000000000 *â............................
               +0100   0000000000000000  0000000000000000  0000000000000000
0000000000000000 *.............................
               +0120   0000004000000000  0000000000000000  0000000000010100
0000000000000000 *... .........................
               +0140   0000000000000000  4500000000004000  40065945C0A80982
C0A8096B00000000 *........á..... . .ßá{y.b{y.,...
               +0160   0000000000000000  0000000000000000  0000000000000000
0000000000000000 *.............................
               +0180   0000000000000000  0000000000000000  0000000000000000
0000000000000000 *.............................
               +01A0   FFFFFFFF41705480  0000000000000000  0000000000000000
DE5B32D1FA001488 *.... øèØ...............ú$.J ..
               +01C0   8C4D3202C83E4008  EC31D7E545000F00  8C4D32030EEF0000
000005D4D5000000 *ð(..H. .Ö.PVá...ð(...Õ.....MN..

More...
 F3=Exit   F12=Cancel   F19=Left   F20=Right   F24=More keys
```

Figure 24-24   Display spooled file of LIC trace output

10. To dump the records to a database file, use the same TRCINT command but change the Output parameter to *OUTFILE when you get to step 8 on page 379. A display similar to the example in Figure 24-25 appears.

```
  Trace Internal (TRCINT)

  Type choices, press Enter.

  Trace option setting . . . . . . > *OFF          *ON, *OFF, *END, *HOLD...
  Trace table name . . . . . . . . > 'TELNET DEVICE MANAGER LCKW'
  Task information . . . . . . . .   *TRCREF       *ALL, *TRCREF
  Output . . . . . . . . . . . . . > *OUTFILE      *PRINT, *OUTFILE
  File to receive output . . . . . > PMR12345TR    Name
    Library  . . . . . . . . . . . >   MARK        Name, *LIBL, *CURLIB
  Output member options:
    Member to receive output . . .   *FIRST        Name, *FIRST
    Replace or add records . . . .   *REPLACE      *REPLACE, *ADD




                                                                        Bottom
  F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
  F24=More keys
```

Figure 24-25   Trace Internal display

11. Type the name of the file in the File to receive output prompt and the library for that file in the Library prompt and press the Enter key. We recommend that you name the file with the PMR number as shown in the example in Figure 24-25. In this example the file is called PMR12345TR and it resides in the library named MARK.

12. Once you set the trace off, the records are written to the database file. To display the file, use the DSPPFM. It should look similar to the display in Figure 24-26 on page 382.

```
 Display Physical File Member
 File . . . . . . :  PMR12345TR     Library . . . . :  MARK
 Member . . . . . :  PMR12345TR      Record . . . . . :  1
 Control . . . . .                Column . . . . . :  1
 Find . . . . . . .


*...+....1....+....2....+....3....+....4....+....5....+....6....+....7....+....8....+....9....
+....0....+....1....+....2....+....3
 TCP/IP          TO#3100020071128162646214528000000000377 #00001 (00013)
E3D6E3C3D7E6D9C9E3C5D7E4E3 #00002 (00008) C9936D548B00
 TCP/IP          TO#3102920071128162646214560000000000377 #00001 (00009)
E2C5D5C440D3D6D6D7 #00002 (00008) 0000000000000000 #00
 TCP/IP          TO#0853120071128162646214576000000000377 #00001 (00026)
E3D6C9D7F4E2C5D5C4C3C1C3C8C57A7AC1C4C4D6E4E3D3C9D5C5 #
 TCP/IP          TO#0854120071128162646214592000000000377 #00001 (00023)
E3D6C9D7F4C3C1C3C8C57A7AC1C4C4C4C1E3C1C7D9C1D4 #00002
 TCP/IP          TO#2140020071128162646214608000000000377 #00001 (00096)
E3D6C4C4C9C6C1E2E3C9D67A7A0000000000000000000000000000
 TCP/IP          TO#2123020071128162646275856000000000284 #00001 (00096)
E3D6C4C4C9C6C1E2E3C9D6C2C1E2C57A7A0000000000000000000000
 TCP/IP          TO#2123020071128162646275872000000000284 #00001 (00096)
E3D6C4C4C9C6C1E2E3C9D6C2C1E2C57A7A00000000000000000000000
 TCP/IP          TO#2123220071128162646367984000000000284 #00001 (00096)
E3D6C4C4C9C6C1E2E3C9D67A7A0000000000000000000000000000000
 TCP/IP          TO#0860120071128162646368000000000000284 #00001 (00023)
E3D6C9D7D7C9C6E7C2C1E2C57A7AD9C5C3C5C9E5C5C9D7 #00002
 TCP/IP          TO#0860020071128162646368016000000000284 #00001 (00023)
E3D6C9D7D7C9C6E7C2C1E2C57A7AD9C5C3C5C9E5C5C9D7 #00002
 TCP/IP          TO#3271020071128162646368032000000000284 #00001 (00013)
D9C5C3E5C9D5C2D6E4D5C44D5D #00002 (00008) 000000000000
 TCP/IP          TO#3201020071128162646368064000000000284 #00001 (00017)
E3D6E3C3D7C9D54D5D406040C5D5E3D9E8 #00002 (00020) 4500
 TCP/IP          TO#3201820071128162646368080000000000284 #00001 (00010)
D5D6D9D4C1D3D7C1E3C8
 TCP/IP          TO#3299020071128162646368080000000000284 #00001 (00008) E2C5C7E3D6E3D3D5
#00002 (00004) 00000000
 TCP/IP          TO#3202020071128162646368080000000000284 #00001 (00015)
E3C3D7D7D9D6C3C5E2E2E2C5D84D5D #00002 (00004) 711E95D1
 TCP/IP          TO#3298820071128162646368096000000000284 #00001 (00022)
E3C3D7D7D9D6C3C5E2E2E2C5D84D5D60D9C5E3E4D9D5 #00002 (0
 TCP/IP          TO#3204020071128162646368096000000000284 #00001 (00015)
E3C3D7D7D9D6C3C5E2E2C1C3D24D5D #00002 (00004) EA0701A0
 TCP/IP          TO#3298620071128162646368112000000000284 #00001 (00022)
E3C3D7D7D9D6C3C5E2E2C1C3D24D5D60D9C5E3E4D9D5 #00002 (0


More...
 F3=Exit   F12=Cancel   F19=Left   F20=Right   F24=More keys
```

Figure 24-26   Display Physical File Member display of LIC trace output

13. To dump the records to a tape drive, use the same TRCINT command, and press F4. A display similar to the example in Figure 24-27 on page 383 appears.

```
Trace Internal (TRCINT)

Type choices, press Enter.

Trace option setting . . . . . .   *SAVE           *ON, *OFF, *END, *HOLD...
Trace table name . . . . . . . .   TELNET DEVICE MANAGER LCKW




















                                                                    Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 24-27   Trace Internal display

14. Type *SAVE for the Trace option setting prompt and type the trace table name you used when starting the trace in the Trace table name prompt. Then, press Enter. The display refreshes with one more option (Figure 24-28).

```
  Trace Internal (TRCINT)

  Type choices, press Enter.

  Trace option setting . . . . . . > *SAVE          *ON, *OFF, *END, *HOLD...
  Trace table name . . . . . . . .  TELNET DEVICE MANAGER LCKW
  Output device  . . . . . . . . .  TAP01           Name
  Task information . . . . . . . .  *TRCREF         *ALL, *TRCREF




                                                                        Bottom
  F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
  F24=More keys
```

Figure 24-28   Trace Internal display

15. Insert a removable media into the tape drive, and set the device to a *Ready* status.

16. Type the tape device name in the Output device prompt (for example, TAP01). Press Enter to continue with the save process.

17. Once your service provider has received the trace and acknowledged the contents are correct, use the following command to delete the trace records:

    TRCINT SET(*END) TRCTBL('TELNET DEVICE MANAGER LCKW')

    This removes the trace data and frees up any disk storage utilized for the trace buffer.

This ends the procedure to collect a LIC trace using the TRCINT command.

24.2 Source/Sink LIC trace

In SNA environments, commonly traced LIC functions are those related to input and output activities, also known as *source/sink*. A source/sink trace tracks events of a selected line, controller, device, network interface, and network server. Other events are traced relative to activities within a specific component and even instruction execution within a LIC module. The latter is used under the direction from higher levels of support such as the IBM developer. Therefore, the examples given in 24.2.1, "Using SST to collect a Source/Sink LIC trace" on page 385 and 24.2.2, "Using the TRCINT command to collect a Source Sink LIC trace" on page 393 are based on a source/sink trace.

24.2.1 Using SST to collect a Source/Sink LIC trace

This section outlines the steps required to take a source/sink trace from SST and collect data for further problem determination. In this example, we perform a source/sink trace from a workstation where there is no response from the system when the F1 help key is used. Follow these steps:

1. If you are not at the Start a Service Tool menu, follow the steps in 26.5.1, "Starting a Service Tool" on page 418. Return here after you review how to start a Service Tool.

2. Type option 2 (Trace Licensed Internal Code) from the Start a Service Tool menu. Press Enter. The Work with Internal Traces display appears as shown in Figure 24-29.

```
 Work with Internal Traces


 Type options, press Enter.
   2=Allocate     3=Work with enable details     4=Delete
   5=Display     6=Dump     7=Activate     8=Deactivate     9=Clear


 Opt   Trace Name                        Updated   -------- Status --------
       SYSTEM DEFAULT TRACE BUFFER       11/28/07  Complete         Disabled

















 F3=Exit     F6=Create     F12=Cancel
```

Figure 24-29   Work with Internal Traces display

3. If you are using the system default trace buffer, we recommend that you use option 9 to clear the trace table. Otherwise, create a new table by pressing F6 (Create table). The display shown in Figure 24-30 appears.

```
 Create Internal Trace

 Type choices, press Enter.

   Trace name . . . . . . .  F1 help key no response

   Buffer size  . . . . . .  64          megabytes   1- 11519

   Wrap allowed . . . . . .  Y           Y=Yes, N=No

   F3=Exit     F12=Cancel
```

Figure 24-30   Create Internal Trace display

4. Type a meaningful name for the table name describing the symptoms of the problem, for example, "F1 help key no response". A table size of 64 MB is generally recommended. Press Enter to create the table. The display shown in Figure 24-31 on page 387 appears.

Note: The storage indicated on this parameter is immediately allocated from the system auxiliary storage pool (ASP 1). This storage is not dynamically allocated as it is needed. The storage space is not available for use by the system except to record trace-related information.

Before specifying a large value on this parameter, the amount of free space in the system ASP should be checked. Use the Work with System Status (WRKSYSSTS) command to determine the amount of available free space in the system ASP. System performance degradation can result if the size of the free space in the system ASP is significantly reduced as a result of the value specified.

Note: The trace table size should be greater than 128000 kilobytes or 128 megabytes when tracing data over a gigabit Ethernet line.

```
Work with Internal Traces

Type options, press Enter.
  2=Allocate    3=Work with enable details    4=Delete
  5=Display     6=Dump    7=Activate    8=Deactivate    9=Clear

Opt  Trace Name                    Updated    -------- Status --------
     SYSTEM DEFAULT TRACE BUFFER   11/28/07   Complete       Disabled
 3   F1 HELP KEY NO RESPONSE       11/28/07   Cleared        Disabled

















 F3=Exit    F6=Create    F12=Cancel
```

Figure 24-31   Work with Internal Traces display with a new table created

5. A new table is created with a status of *Cleared* and *Disabled*. Enter option 3 (Work with enable details). The Enable Internal Trace display appears as shown in Figure 24-32.

```
Enable Internal Trace

Trace:    F1 HELP KEY NO RESPONSE

Type options, press Enter.
  1=Enable    2=Disable    3=Work with enable details

Opt   Description                                        Status
 3    Component traces                                   Disabled
      MI instruction supervisory linkage (SVL) trace    Disabled
      Multi-programming level (MPL) trace               Disabled
      Task/thread performance trace                     Disabled
      Transaction trace                                 Disabled

      Qualifier restrictions                            Disabled
      Task/thread restrictions                          Disabled
      Automatic deactivation                            Disabled






 F3=Exit    F12=Cancel
```

Figure 24-32   Enable Internal Trace display

6. Enter option 3 (Work with enable details) next to Component traces to select the type of trace to be collected. A display appears like the one in Figure 24-33.

```
Enable Component Trace

Trace:     F1 HELP KEY NO RESPONSE

Type options, press Enter.
  1=Enable    2=Disable    3=Work with enable details

Opt    Description                                          Status
       Recovery management                                  Disabled
       Remote support                                       Disabled
       Resource management                                  Disabled
       Server message block (SMB)                           Disabled
       Signals                                              Disabled
       Sockets                                              Disabled
  3    Source/sink object trace                             Disabled
       Space object management                              Disabled
       Storage management                                   Disabled
       Stream I/O                                           Disabled
       Synchronization management                           Disabled
       System journal management                            Disabled
       Transaction management                               Disabled
                                                                More...
F3=Exit    F12=Cancel
```

Figure 24-33   Enable Component Trace display

7. Scroll down or page down until you see **Source/Sink object trace**. Enter option 3 next to this description to work with enable details.

Note: Sometimes an IBM developer asks you to trace additional data such as the Common class input/output manager (CCIOM) and Machine Services Control Point (MSCP). You can select them at the same time as the Source/Sink object trace.

A display appears like the example in Figure 24-34 on page 389.

```
Enable Source/Sink Object Trace

 Trace:    F1 HELP KEY NO RESPONSE

 Type options, press Enter.
   1=Enable    2=Disable

 Opt   Description                                             Status
       Control blocks/error path (detailed internal data)     Disabled
       Licensed internal code (LIC) messages (SRMs/ORBs)      Disabled
       Protocol (SNA/SDLC or RD fields)                       Disabled
       User data (data stream/SCS)                            Disabled

       Machine services control point (MSCP)                  Disabled




       0 objects are enabled.

 F3=Exit    F6=Add object     F10=Work with objects     F12=Cancel
```

Figure 24-34   Enable Source/Sink Object Trace display

8. Press F6 to enter the line, controller, and device (one at a time). The display shown in
   Figure 24-35 appears.

```
 Specify Source/Sink Object

 Trace:     F1 HELP KEY NO RESPONSE

 Type choices, press Enter.

   Type . . . . . . . . . . .   2     1=Controller description (CTLD)
                                      2=Device description (DEVD)
                                      3=Line description (LIND)
                                      4=Network interface description (NWID)
                                      5=Network server description (NWSD)

   Object . . . . . . . . . .   DSP01

   Sub-objects  . . . . . . .   N     N=No
                                      Y=Yes




 F3=Exit    F6=Add DST object    F12=Cancel
```

Figure 24-35   Specify Source/Sink Object display

9. After you enter the line, controller, and device, press Enter. The Enable Source/Sink Object Trace display appears. Enter option 1 next to User data (data stream/SCS) to enable the user data. Refer to Figure 24-36.

```
Enable Source/Sink Object Trace

Trace:    F1 HELP KEY NO RESPONSE

Type options, press Enter.
  1=Enable    2=Disable

Opt    Description                                              Status
       Control blocks/error path (detailed internal data)      Disabled
       Licensed internal code (LIC) messages (SRMs/ORBs)       Disabled
       Protocol (SNA/SDLC or RD fields)                        Disabled
  1    User data (data stream/SCS)                             Disabled

       Machine services control point (MSCP)                   Disabled




    1 objects are enabled.

 F3=Exit    F6=Add object    F10=Work with objects    F12=Cancel
```

Figure 24-36   Enable Source/Sink Object Trace display

10. Press Enter four times to return to the Work with Internal Traces display, which is shown in Figure 24-37.

```
 Work with Internal Traces

 Type options, press Enter.
   2=Allocate    3=Work with enable details    4=Delete
   5=Display    6=Dump    7=Activate    8=Deactivate    9=Clear

 Opt  Trace Name                    Updated    -------- Status --------
      SYSTEM DEFAULT TRACE BUFFER   11/28/07   Complete         Disabled
  7   F1 HELP KEY NO RESPONSE       11/28/07   Active           Enabled













 F3=Exit    F6=Create    F12=Cancel
```

Figure 24-37 Work with Internal Traces with the new table enabled

11. Enter option 7 to activate the trace components that have been enabled from the previous steps. The status changes from *Cleared* to *Active*.

12. Re-create the problem at the device that you specified earlier.

13. After the problem is re-created, enter option 8 to deactivate it. The status changes from *Active* to *Complete*.

14. Enter option 6 to dump the trace table. The display shown in Figure 24-38 on page 392 appears.

```
Dump Trace

 Trace:      F1 HELP KEY NO RESPONSE

 Type options, press Enter.
   6=Dump

 Opt    Description
        Component traces
        MI instruction supervisory linkage (SVL) trace
        Multi-programming level (MPL) trace
        Task/thread performance trace
        Transaction trace




 F3=Exit     F9=Dump all     F12=Cancel
```

Figure 24-38   Dump Trace display

15. Press F9 to dump the entire selection, unless you are instructed otherwise by your service provider. The Specify Time Qualification display appears as shown in Figure 24-39.

```
 Specify Time Qualification

 Type choice, press Enter.

   Specify time . . . . . . .   N   Y=Yes, N=No













 F3=Exit     F12=Cancel
```

Figure 24-39   Specify Time Qualification display

16. Select the default setting of N (No) for Specify time, and press Enter. This collects the entire trace data gathered. The Select Dump Device display appears as shown in Figure 24-40.

```
  Select Dump Device

  Type choices, press Enter.

    Dump device  . . . . . . .   1    1=Printer
                                      2=Media

    Title  . . . . . . . . . .   PMR 12345

    TDE cross reference  . . .   1    1=Only for records dumped
                                      2=All TDEs during trace
















  F3=Exit     F12=Cancel
```

Figure 24-40   Select Dump Device display

17. You have the option to print or write the trace directly to tape. We recommend that you name the title with the PMR number. This helps your service provider to cross-reference the documentation received with their problem management system. Press Enter to proceed.

18. Wait until the `Dump completed successfully` message appears at the bottom of the display.

19. Exit the System Service Tools (SST).

20. Once your service provider has received the trace and acknowledged the contents are correct, use option 4 (Delete) on the display shown in Figure 24-31 on page 387. This removes the trace data and frees up any disk storage utilized for the trace buffer.

If you selected the option to print the trace, you should be able to locate your printout with the file name QPCSMPRT by using the WRKSPLF command. This ends the procedure to collect a source/sink trace.

24.2.2 Using the TRCINT command to collect a Source Sink LIC trace

This section outlines the steps to start a source/sink trace using the TRCINT command and collect data for further problem determination. In this example, we perform a source/sink trace from a workstation where there is no response from the system when the F1 help key is used.

Type TRCINIT on the command line, and press F4. A display appears like the one shown in Figure 24-41 on page 394.

```
Trace Internal (TRCINT)

Type choices, press Enter.

Trace option setting . . . . . .   *ON              *ON, *OFF, *END, *HOLD...
Trace table name . . . . . . . .   F1 help key no response
```

(middle of screen intentionally blank)

```
                                                                    Bottom
F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
F24=More keys
```

Figure 24-41   Trace Internal display

1. Type *ON in the Trace option setting prompt. You can use the default setting for Trace table name or create a new table by typing a meaningful name that describes the symptom of the problem, for example, "F1 help key no response".

2. Press Enter to continue. The Trace Internal display shows more options (see Figure 24-42 on page 395).

```
Trace Internal (TRCINT)

Type choices, press Enter.

Trace option setting . . . . . . > *ON              *ON, *OFF, *END, *HOLD...
Trace table name . . . . . . . . > 'F1 help key no response'
Trace table size:
  Number of units  . . . . . . .   64              1-998000, *NOCHG, *MAX, *MIN
  Unit of measure  . . . . . . .   *MB             *KB, *MB
Trace full . . . . . . . . . . .   *WRAP           *NOCHG, *WRAP, *STOPTRC
Trace type . . . . . . . . . . .   *SRCSINK        000000-999999, *SVL, *MPL...
            + for more values
Job name . . . . . . . . . . . .   *NOCHG          Name, generic*, *NOCHG, *ALL
  User . . . . . . . . . . . . .                   Name, generic*, *ALL
  Number . . . . . . . . . . . .                   000000-999999, *ALL
            + for more values


Thread ID to include . . . . . .   *NOCHG          Thread ID, *ALL, *SELECT
            + for more values
                                                                        More...
F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
F24=More keys
```

Figure 24-42   Trace Internal display with more options

3. Change the following prompts:

   – The Number of units to 64
   – The Unit of measure to *MB
   – The Trace full to *WRAP
   – The Trace type to *SRCSINK

   and press Enter. The display refreshes with more options. Refer to Figure 24-43 on page 396.

```
Trace Internal (TRCINT)

Type choices, press Enter.

Stop on trace point:
  Trace point type . . . . . . .    *NOCHG        Character value, *NOCHG
  Trace point qualifier  . . . .                  0-65535
  Trace point entry  . . . . . .                  1-65535
  Trace point entry offset . . .                  Hexadecimal value
  Trace point match value  . . .
            + for more values
Device . . . . . . . . . . . . .    DSP01         Name, *NONE
            + for more values
Controller:
  Controller . . . . . . . . . .    CTL01         Name, *NONE
  Attached devices . . . . . . .                  *NODEV, *ALLDEV
            + for more values



                                                                    More...
 F3=Exit    F4=Prompt    F5=Refresh    F12=Cancel    F13=How to use this display
 F24=More keys
```

Figure 24-43   Trace Internal display with more options

4. Scroll down or page down to see the option for Controller, Line, and so on.

5. Type the device name, controller name, line name, and so on. For example, in this problem, we need to specify the workstation name (DSP01) and the controller name (CTL01). The items to be traced vary with the situation. Consult your service provider on what should be included. Press Enter.

6. Re-create the problem at the device that you specified when starting the trace.

7. After the problem is re-created, use the same TRCINT command and press F4. A display appears similar to the example in Figure 24-44 on page 397.

```
Trace Internal (TRCINT)

Type choices, press Enter.

Trace option setting . . . . . .   *ON          *ON, *OFF, *END, *HOLD...
Trace table name . . . . . . . .   F1 help key no response












                                                                   Bottom
 F3=Exit    F4=Prompt    F5=Refresh    F12=Cancel    F13=How to use this display
 F24=More keys
```

Figure 24-44   Turning a trace off using the Trace Internal display

8. Type *OFF for the Trace option setting prompt and the trace table name you used when starting the trace in the Trace table name prompt. Then, press Enter. The display refreshes with one more prompts (Figure 24-45 on page 398).

```
 Trace Internal (TRCINT)

 Type choices, press Enter.

 Trace option setting . . . . . . > *OFF          *ON, *OFF, *END, *HOLD...
 Trace table name . . . . . . . . > 'F1 help key no response'
 Task information . . . . . . . .   *TRCREF        *ALL, *TRCREF
 Output . . . . . . . . . . . . .   *PRINT         *PRINT, *OUTFILE




                                                                    Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 24-45   Trace Internal display

9. Leave the default setting for Task information, and press Enter again.

10. Once you set the trace off, the records are written to the spool printer file QPCSMPRT. Use the WRKSPLF command to locate your printout.

11. To dump the records to a tape drive, use the same TRCINT command, and press F4. A display similar to the example in Figure 24-45 appears.

```
Trace Internal (TRCINT)

Type choices, press Enter.

Trace option setting . . . . . .   *SAVE          *ON, *OFF, *END, *HOLD...
Trace table name . . . . . . . .   F1 help key no response




                                                                    Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 24-46   Trace Internal Display

12. Type *SAVE for the Trace option setting prompt and the trace table name you used when
    starting the trace in the Trace table name prompt. Then, press Enter. The display
    refreshes with one more option (Figure 24-47 on page 400).

```
Trace Internal (TRCINT)

Type choices, press Enter.

Trace option setting . . . . . . > *SAVE          *ON, *OFF, *END, *HOLD...
Trace table name . . . . . . . .  F1 help key no response
Output device  . . . . . . . . .  TAP01           Name
Task information . . . . . . . .  *TRCREF         *ALL, *TRCREF









                                                                    Bottom
 F3=Exit    F4=Prompt    F5=Refresh    F12=Cancel    F13=How to use this display
 F24=More keys
```

Figure 24-47   Trace Internal display

13. Insert a removable media onto the tape drive, and set it to *Ready* status.

14. Type the tape device name in the Output device prompt (for example, TAP01). Press Enter to continue with the save process.

15. Once your service provider has received the trace and acknowledged the contents are correct, use the following command to delete the trace records:

    TRCINT SET(*END) TRCTBL('F1 help key no response')

    This removes the trace data and frees up any disk storage utilized for the trace buffer.

This ends the procedure to collect a LIC trace using the TRCINT command.

25

Collecting Licensed Internal Code (LIC) logs

Licensed Internal Code (LIC) writes informational or error messages to the LIC log during normal system operations. Each message written to the LIC log shows an internal dump identifier. See 4.6, "Checking the contents of the additional message information" on page 58, for more information about finding an internal log ID in a message.

Note: The LIC log was previously known as the VLIC log or VLOG. Not all i5/OS screens have been updated since the name change so periodically you can find references to an earlier name in screens and messages.

The Licensed Internal Code (LIC) log contains a range of information that is useful in investigating LIC errors. The information is stored in entries which indicate:

▶ The status of the system (for example, type of IPL)
▶ The execution of an internal cleanup routine
▶ A problem with task or system object

If you do not have the authority to use SST or DST, contact the security officer or system administrator.

Note: We recommend that you review the method for locating the printed output in 1.7, "Finding your printed output" on page 9, prior to reading this chapter.

25.1 Using PRTINTDTA to collect a specific entry in the LIC log

This section outlines the steps to collect one entry in the LIC log using the PRTINTDTA command. The steps are as follows:

1. Type PRTINTDTA on the command line, and press F4 (Prompt). A display appears like the example shown in Figure 25-1. *Service or QIBM_Service_Dump special authority is required to use PRTINTDTA.

> **Note:** See 4.6, "Checking the contents of the additional message information" on page 58, for a reference of a dump identifier in a message. See Figure 4-21 on page 61.

```
Print Internal Data (PRTINTDTA)

 Type choices, press Enter.

 Type of data . . . . . . . . . .   *DMP          *DMP, *INTCFG, *NOTES
 Dump identifier  . . . . . . . .   01020576      Character value, *NONE, *ALL
 Time period for internal data::

   Beginning time . . . . . . . .   *AVAIL        Time, *AVAIL
   Beginning date . . . . . . . .   *CURRENT      Date, *CURRENT

   Ending time  . . . . . . . . .   *AVAIL        Time, *AVAIL
   Ending date  . . . . . . . . .   *CURRENT      Date, *CURRENT




                                                                      Bottom
 F3=Exit    F4=Prompt    F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 25-1   Print Internal Data (PRTINTDTA) display

2. Type *DMP in the Type of data field.
3. Type the dump identifier in the Dump identifier field. This example uses 01020576 as the dump identifier.
4. Press Enter, and use the WRKSPLF or WRKJOB OPTION(*SPLF) command to locate your printout with the file name QPCSMPRT.

This ends the procedure for collecting a single entry of the LIC log.

25.2 Using PRTINTDTA to collect LIC log entries for a specific time

This section outlines the steps to collect LIC log entries for a specific time using the PRTINTDTA command. The steps are outlined here:

1. Type PRTINTDTA on the command line, and press F4 (Prompt).

2. Type *DMP in the Type of data field.

3. Type *ALL in the Dump identifier field.

4. To save the LIC logs for the current day, press the Enter key.

    Otherwise, enter the beginning and ending time and date near the time the problem occurred. The time the problem occurred should be within the beginning and ending time range.

    Your display should appear like the example in Figure 25-2.

```
  Print Internal Data (PRTINTDTA)


  Type choices, press Enter.


  Type of data . . . . . . . . . . > *DMP          *DMP, *INTCFG, *NOTES, *JOB
  Dump identifier  . . . . . . . .   *ALL          Character value, *NONE, *ALL
  Time period for internal data:
    Start time and date:
    Beginning time . . . . . . . .   13:50:00      Time, *AVAIL
    Beginning date . . . . . . . .   11/06/07      Date, *CURRENT
    End time and date:
    Ending time  . . . . . . . . .   14:50:00      Time, *AVAIL
    Ending date  . . . . . . . . .   11/06/07      Date, *CURRENT




                                                                       Bottom
  F3=Exit    F4=Prompt    F5=Refresh    F12=Cancel   F13=How to use this display
  F24=More keys
```

Figure 25-2 Print Internal Data (PRTINTDTA) display

5. Press Enter. Use the WRKSPLF or WRKJOB OPTION(*SPLF) *CL* command to locate your printout with the file name QPCSMPRT.

This ends the procedure for collecting LIC entries for a specific time using the PRTINTDTA CL command.

25.3 Using SST or DST to collect specific entries in the LIC log

This section outlines the steps to collect one or more specific entries in the LIC log using SST or DST. The steps are outlined here:

1. If you are not at the Start a Service Tool menu and you are using:

    – SST, go to 26.5.1, "Starting a Service Tool" on page 418.
    – DST, go to 27.4.1, "Starting a DST service tool" on page 435.

    Then, return here to continue.

2. Select the option for Licensed Internal Code log from the Start a Service Tool menu.

    – For DST, select option 2.
    – For SST, select option 5.

    A menu appears like the example shown in Figure 25-3 on page 404.

```
Licensed Internal Code Log


Select one of the following:


    1. Select entries from the Licensed Internal Code (LIC) log
    2. Dump entries to printer from the Licensed Internal Code log
    3. Dump entries to tape from the Licensed Internal Code log
    5. Change the Licensed Internal Code log sizes
    6. Clear the Licensed Internal Code log
    7. Display the status of the Licensed Internal Code log





Selection
    1

F3=Exit    F12=Cancel
```

Figure 25-3   Licensed Internal Code Log menu

3. Type option 1 (Select entries from the Licensed Internal Code (LIC) log). Press Enter. The display shown in Figure 25-4 appears.

```
Specify Licensed Internal Code Log Selection Values


Type choices, press Enter.

  Entry ID:
    Starting  . . . . . . . . . .   FFFFFFFF   00000000-FFFFFFFF

  Entry type:
    Major code  . . . . . . . . .   0000       0000-FFFF
    Minor code  . . . . . . . . .   0000       0000-FFFF

  Starting:
    Date  . . . . . . . . . . . .   00/00/00   MM/DD/YY
    Time  . . . . . . . . . . . .   00:00:00   HH:MM:SS
  Ending:
    Date  . . . . . . . . . . . .   00/00/00   MM/DD/YY
    Time  . . . . . . . . . . . .   00:00:00   HH:MM:SS


 F3=Exit    F12=Cancel
```
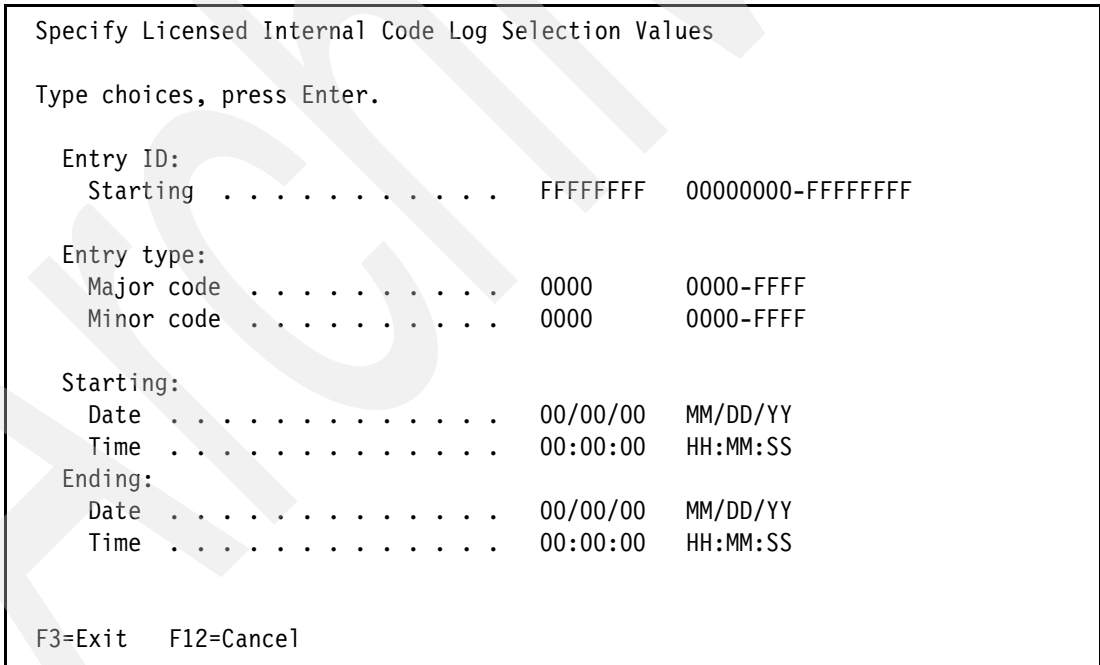
Figure 25-4   Specify Licensed Internal Code Log Selection Values display

4. By default, all LIC Logs are displayed starting with the most current. To narrow the number of log entries displayed, complete one of the following options:

   – Enter a specific Entry ID (for a particular dump), and press the Enter key. For more information on the dump ID, refer to 4.6, "Checking the contents of the additional message information" on page 58.

- – Enter a specific Entry type (major and minor code) and press the Enter key.
- – Enter a range for the starting and ending dates and times.
5. Press the Enter key to display all the LIC log entries.
6. The display shown in Figure 25-5 appears when you choose to display all LIC log entries.

```
Select Entries from Licensed Internal Code Log

Type options, press Enter to dump entry to selected device.
  1=Printer   2=Media   5=Display entry   8=Display note

       Entry     Major                        Major Minor                       Dump
Opt    ID        Description                  Code  Code  Date      Time        K bytes
       010006B9  Authority                    0B00  000B  11/06/07  10:34:05       0
       010006BA  Authority                    0B00  000B  11/06/07  10:34:05       0
       010006BB  Authority                    0B00  000B  11/06/07  10:34:05       0
       010006BC  Authority                    0B00  000B  11/06/07  10:34:05       0
       010006BD  Authority                    0B00  000B  11/06/07  10:34:05       0
       010006BE  Authority                    0B00  000B  11/06/07  10:34:05       0
       010006BF  Authority                    0B00  0002  11/06/07  10:34:05       0
       010006C0  Authority                    0B00  0002  11/06/07  10:34:05       0
       010006C1  Authority                    0B00  000B  11/06/07  10:34:05       0
       010006C2  Authority                    0B00  0002  11/06/07  10:34:05       0
       010006C3  Authority                    0B00  0002  11/06/07  10:34:05       0
       010006C4  Recovery                     0E00  FFFF  11/06/07  10:34:05       1
       010006C5  Service function             0C00  E3D7  11/06/07  10:48:33      84
       010006C6  Synchronization              2100  0140  11/06/07  12:32:44       0
                                                                              Bottom

 F3=Exit    F12=Cancel
```

Figure 25-5   Select Entries from Licensed Internal Code Log display

The most current or latest entries are shown at the bottom of the log. To see an earlier entry, page up or scroll down the display.

Dump data exists for the LIC log entries that have one or more K bytes of a dump shown in the Dump K Bytes column of the display (Figure 25-5). In our example, a 84 K dump exists for the 010006C5 entry ID.

7. Type 1 in the Opt column next to each LIC log entry that you want to save in a spooled file. You can select more than one entry.
8. Press Enter, and the nnn is the print dump request identifier message appears.

> **Note:** The *nnn* starts at one and increments by one for each print request.

9. Press F3 to exit the Select Entries from Licensed Internal Code Log menu, and the nnn Print request has completed successfully message appears.
10. If you are using:
    - – SST, from a command line enter the WRKSPPLF or WRKJOB OPTION(*SPLF) *CL* command to locate your printout with file name QPCSMPRT
    - – DST, the printout goes to the service printer
11. Press F3 twice to exit from the service tool.

12. If you are using:

- SST, press the Enter key to exit SST
- DST, select option 1 (Exit Dedicated Service Tools (DST) option from the Exit Dedicated Service Tools menu, and press the Enter key to exit DST

This ends the procedure to collect specific entries in the LIC log using SST or DST.

25.4 Dumping all LIC log entries to a removable media using SST or DST

This section outlines the steps to dump entries in the LIC log to a tape. The steps are as follows:

1. If you are at the Start a Service Tool menu, continue with the next step. Otherwise, if you are using:

   - SST, go to 26.5.1, "Starting a Service Tool" on page 418
   - DST, go to 27.4.1, "Starting a DST service tool" on page 435

   Then, return here to continue.

2. Select option 5 (Licensed Internal Code log) from the Start a Service Tool menu:

   - For DST, select option 2.
   - For SST, select option 5.

   Press Enter. The display shown in Figure 25-6 appears.

```
Licensed Internal Code Log

Select one of the following:

     1. Select entries from the Licensed Internal Code (LIC) log
     2. Dump entries to printer from the Licensed Internal Code log
     3. Dump entries to tape from the Licensed Internal Code log
     5. Change the Licensed Internal Code log sizes
     6. Clear the Licensed Internal Code log
     7. Display the status of the Licensed Internal Code log




Selection
     3

F3=Exit    F12=Cancel
```

Figure 25-6   Licensed Internal Code Log menu

3. Type option 3 (Dump entries to tape from the Licensed Internal Code log). Press Enter. A display appears like the one in Figure 25-7.

```
 Dump Entries to Tape from Licensed Internal Code Log

 Type choices, press Enter.

   Dump option . . . . . . . . . . .   3            1=Header
                                                    2=Header and note entry
                                                    3=Header and entire entry
   Entry ID:
     Starting  . . . . . . . . . . .   00000000    00000000-FFFFFFFF
     Ending  . . . . . . . . . . . .   FFFFFFFF    00000000-FFFFFFFF

   Entry type:
     Major code  . . . . . . . . . .   0000        0000-FFFF
     Minor code  . . . . . . . . . .   0000        0000-FFFF

   Starting:
     Date  . . . . . . . . . . . . .   00/00/00    MM/DD/YY
     Time  . . . . . . . . . . . . .   00:00:00    HH:MM:SS
   Ending:
     Date  . . . . . . . . . . . . .   00/00/00    MM/DD/YY
     Time  . . . . . . . . . . . . .   00:00:00    HH:MM:SS

 F3=Exit    F12=Cancel
```

Figure 25-7   Dump Entries to Tape from Licensed Internal Code Log display

4. Leave the default setting as 3 for the Dump option. The header and entire entry are required for problem determination.

5. Press Enter to dump all the entries in the LIC log. The Select Tape File display appears as shown in Figure 25-8 on page 408.

```
Select Tape File

Type choices, press Enter.

  Volume ID . . . . . . . . . . . .   ITS0001

  File  . . . . . . . . . . . . . .   LICLOG01

  Sequence number . . . . . . . . .   0000        0000-9999

  Check for active files  . . . . .   1           1=Yes, 2=No




F3=Exit    F12=Cancel
```

Figure 25-8   Select Tape File display

6. Type the Volume ID (identifier), and press Enter. The Dump Entries from Licensed Internal Code Log Warning display appears as shown in Figure 25-9.

```
Dump Entries from Licensed Internal Code Log Warning

Warning:  Do not remove the media from the device until the Service
Function is ended or until you are prompted to remove it.

















Press Enter to continue.

F3=Exit    F12=Cancel
```

Figure 25-9   Dump Entries from Licensed Internal Code Log Warning display

7. Press Enter to proceed. The Select Tape Unit display appears as shown in Figure 25-10 on page 409.

```
Select Tape Unit

Type choice, press Enter.

  Tape unit . . . . . . .   TAP01        Name, F4 for list

  F3=Exit          F4=Prompt         F12=Cancel
```
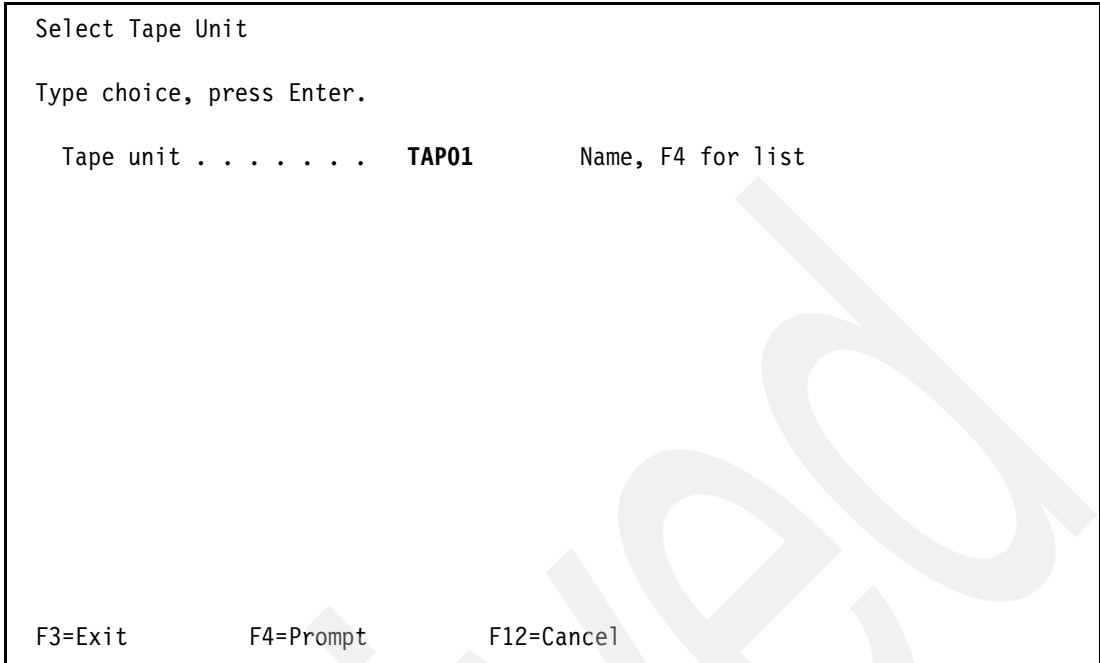
Figure 25-10   Select Tape Unit display

8. Insert a removable media onto a tape unit, and set it to *Ready* status.

9. Type the tape unit identifier (example, TAP01), and press Enter.

10. The dumping proceeds. Then, you are brought back to the Dump Entries to Tape from Licensed Internal Code Log display (refer to Figure 25-7 on page 407). The `nnn is the tape dump request identifier` message appears at the bottom of the display.

11. Press F3 to return to the Licensed Internal Code Log menu (refer to Figure 25-6 on page 406).

> **Note:** Do not exit the Licensed Internal Code Log menu at this time. This causes the dump request to be terminated.

12. Type option 7 (Display the status of the Licensed Internal Code log) to check the status of your dump request. Press Enter. The display shown in Figure 25-11 on page 410 appears.

```
Display Licensed Internal Code Log Status

Dump requests not complete . . . . . . . :      1

















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

Figure 25-11   Display Licensed Internal Code Log Status display

13. Press F5 (Refresh) to refresh occasionally, and wait until the message `1 Tape request has completed normally` appears. The `Dump requests not complete` changes to zero.

14. Press F3 twice to exit from the service tool.

15. If you are using:
   – SST, press the Enter key to exit SST
   – DST, select the **Exit Dedicated Service Tools (DST)** option from the Exit Dedicated Service Tools menu, and press the Enter key to exit DST

This ends the procedure to dump all LIC log entries to a removable media using SST or DST.

25.5 Restoring the LIC log tape to another system using SST

This section outlines the steps to restore the LIC log entries saved in the previous section.

Note: The final output of this procedure is a spooled file with a large number of pages. Ensure that you are restoring to a system that has sufficient storage.

Complete these steps:

1. If you are at the Start a Service Tool menu, continue with the next step. Otherwise, go to 26.5.1, "Starting a Service Tool" on page 418. Then, return here to continue.

2. Type option 4 (Display/Alter/Dump) from the Start a Service Tool menu. Press Enter. A menu appears like the example shown in Figure 25-12 on page 411.

```
Display/Alter/Dump Output Device

Select one of the following:

     1. Display/Alter storage
     2. Dump to printer
     3. Dump to diskette
     4. Dump to tape
     5. Print diskette dump file
     6. Print tape dump file
     7. Display dump status




Selection
      6

F3=Exit    F12=Cancel
```

Figure 25-12   Display/Alter/Dump Output Device menu

3. Type option 6 (Print tape dump file). Press Enter. The Print Tape File display appears as shown in Figure 25-13.

```
Print Tape File

Type choices, press Enter.

  Partial print page numbers:
    From page . . . . . . . . . . .          1    1-2147483647
    Through page  . . . . . . . . .  2147483647  1-2147483647

  Volume ID . . . . . . . . . . .    ITS00001

  File  . . . . . . . . . . . . .    LICLOG01

  Sequence number . . . . . . . . .  0000         0000-9999






F3=Exit    F12=Cancel
```

Figure 25-13   Print Tape File display

4. Type **2147483547** for the Through page option since you do not know how many pages this LIC log tape produces. Type the Volume ID (identifier) and the File name of the tape in the respective fields.

> **Tip:** If you do not know the volume identifier and the file name of the tape, use the following command to find out:
>
> ```
> DSPTAP DEV(TAP01) DATA(*LABELS)
> ```
>
> Here, TAP01 is the name of the tape device.

5. Press Enter to proceed. The Select Tape Unit display appears as shown in Figure 25-14.

```
  Select Tape Unit

  Type choice, press Enter.

    Tape unit . . . . . . .    TAP01        Name, F4 for list

    F3=Exit          F4=Prompt          F12=Cancel
```
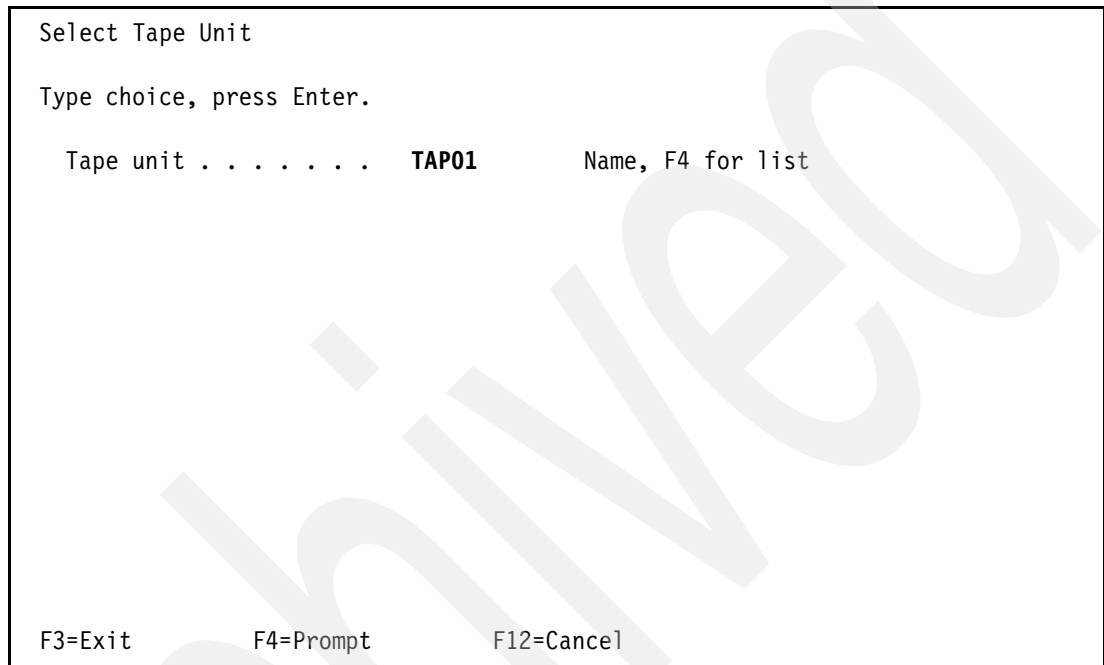
Figure 25-14   Select Tape Unit display

6. Insert the LIC log tape on to the tape unit, and set it to *Ready* status.

7. Type the tape unit identifier for the Tape unit prompt (for example, TAP01). Press Enter to continue.

8. The restoring process starts. Then, you are brought back to the Print Tape File menu (refer to Figure 25-13 on page 411). The `Print of tape file successfully submitted` message appears at the bottom of the display.

9. Press F3 (Exit) to return to the Display/Alter/Dump Output Device menu (refer to Figure 25-12 on page 411).

> **Note:** Do not exit the Display/Alter/Dump Output Device menu at this time. This causes the dump request to terminate.

10. Enter option 7 (Display dump status) to check the status of your dump request. Press Enter. A display appears like the one in Figure 25-15 on page 413.

```
Display Status of Dump

Dump requests
  not complete  . . . . . . . . . :        1

Title of
  active dump . . . . . . . . . :    File LICLOG01 error








Press Enter to continue.

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

Figure 25-15   Display Status of Dump

11. Press F5 to refresh the display occasionally and wait for the `Dump completed normally - File LICLOG01 Vol IBMIRD` message to appear.

12. Press F3 three times to exit from the service tool.

13. Press Enter when prompted to exit SST.

14. Enter the WRKSPLF or WRKJOB OPTION(*SPLF) command to locate your printout with the file name QPCSMPRT.

This ends the procedure to restore the LIC log tape to another system using SST.

26

Using System Service Tools (SST)

This chapter describes how to use System Service Tools (SST). You can use SST while the operating system and user programs are running. However, only one person can use certain functions in SST at a time. System Service Tools (SST) is a subset of functions that are available under Dedicated Service Tools (DST). See Chapter 27, "Using Dedicated Service Tools (DST)" on page 427, for information about DST.

> **Note:** DST user profiles are now referred to as Service Tool user IDs. The "full, basic, and security" service authorities are now called privileges.

26.1 Getting started

The use of SST is managed through i5/OS security. Specify `*SERVICE` authority in the special authority (SPCAUT) parameter of the user profile to use SST. Contact the security officer or system administrator to obtain proper authority to use SST.

To access service tools using SST, complete the following steps:

1) Type STRSST (Start SST) on an i5/OS command line. The Start SST Sign-on display appears.

2) Enter the following information:

– Service Tools User ID

Sign-on using your service tools user ID.

For more information about how to create a service tools user ID, see Configure Service Tools user IDs in the IBM iSeries Information Center.

– Password

Enter the password associated with this user ID.

3. Press Enter.

Contact the security officer or system administrator to obtain proper authority to use SST.

26.2 Service tools user IDs

In addition to having the proper authority to issue the `STRSST` command, you need to sign in to service tools with a valid service tools user ID and password. Service tools user IDs were introduced in OS/400 V5R1 as a means to allow for granularized access to individual service tools in both SST and DST.

> **Note:** Service tools user IDs have no relation to operating system user profiles. It is possible to have a service tools user ID and operating system user profile with the same name.

Up to one hundred service tools user IDs are supported including the four defaults that are shipped with the system as show in Table 26-1.

Table 26-1   Default service tools user IDs and passwords

Service tools user ID	Default Password	Capability
QSECOFR	QSECOFR	Full service tools and security
22222222	22222222	Full service tools
QSRV	QSRV	Full service tools **except** Display/Alter/Dump
11111111	11111111	Limited service tools

> **Note:** The passwords associated with Service Tools IDs are case sensitive. For security purposes, change the passwords from their default.

For additional information about Service Tools user IDs and their maintenance, refer to the iSeries Information Center at:

http://www.ibm.com/eserver/iseries/infocenter

When you reach this site, click **Security** → **Service tools user IDs and passwords.**

> **Note:** The same set of service tools user IDs can be used to access either SST or DST. There is no special set of service tools user IDs strictly for DST. Any user created services tool id need to have the *Start Service Tools* privilege granted.

26.3 Resetting QSECOFR

The Change DST Password command (CHGDSTPWD) can be used to reset the Service ID for QSECOFR. Refer to the iSeries Information Center for further information.

26.4 Accessing SST

To access SST, enter STRSST on a command line. A service tools sign on screen is displayed as shown in Figure 26-1.

```
Start Service Tools (STRSST) Sign On


                                          SYSTEM: ITSOSYS


 Type choice, press Enter.

   Service tools user ID. . . .  _____
   Service tools password . . .















 Note: The password is case-sensitive.


 F3=Exit      F9=Change Password         F12=Cancel
```

Figure 26-1   Start System Service Tools - screen 1

After supplying a valid service tools user ID and password, a menu appears like the one shown in Figure 26-2 on page 418.

```
System Service Tools (SST)


Select one of the following:


     1. Start a service tool
     2. Work with active service tools
     3. Work with disk units
     5. Work with system partitions
     6. Work with system capacity
     7. Work with system security
     8. Work with service tools user IDs and Devices








Selection


 F3=Exit           F10=Command entry        F12=Cancel
```
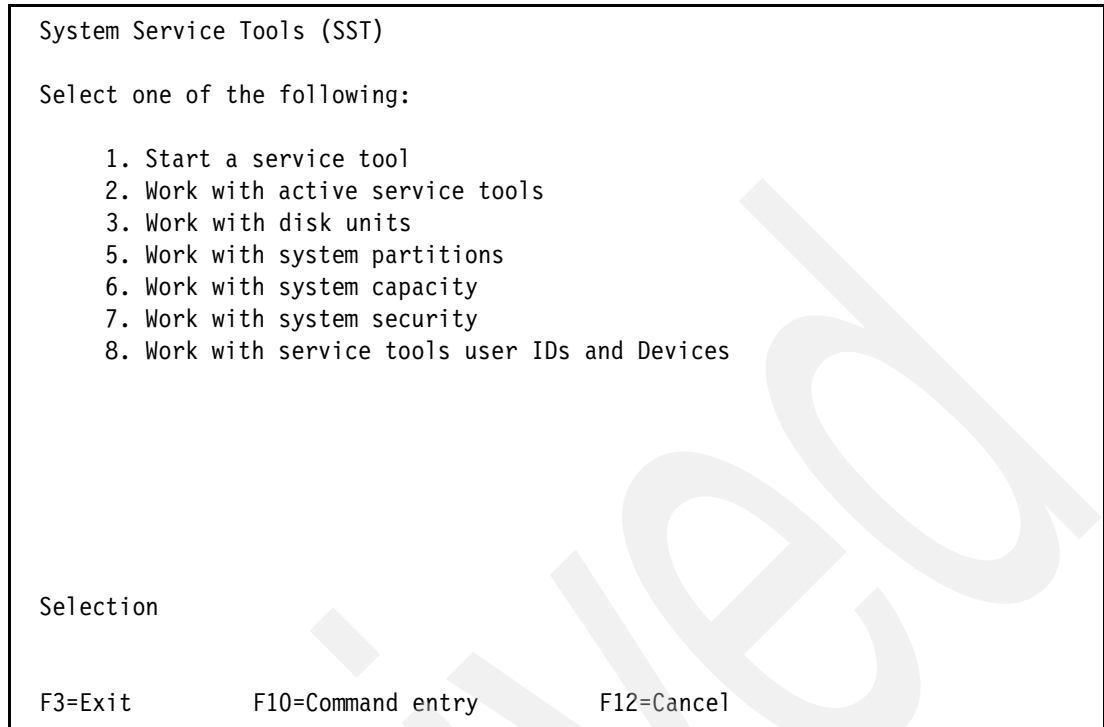
Figure 26-2   System Service Tools (SST) menu

For more information about how to create a service tools ID, see "Configure Service Tools User IDS" in the iSeries Information Center.

Continue to the following section to work with a service tool.

26.5 Working with SST

This section describes the various tasks you can perform when working with SST.

26.5.1 Starting a Service Tool

To start a System Service Tool, follow these steps:

1. If you are not at the Start a Service Tool menu for SST, follow the steps in 26.4, "Accessing SST" on page 417. Otherwise, continue with the next step.
2. Select option 1 (Start a service tool) from the SST main menu to display a list of the tools you can use. A menu appears like the example in Figure 26-3 on page 419.

```
Start a Service Tool

Warning: Incorrect use of this service tool can cause damage
to data in this system.  Contact your service representative
for assistance.

Select one of the following:

     1. Product activity log
     2. Trace Licensed Internal Code
     3. Work with communications trace
     4. Display/Alter/Dump
     5. Licensed Internal Code log
     6. Main storage dump manager
     7. Hardware service manager




Selection


F3=Exit          F12=Cancel          F16=SST menu
```

Figure 26-3   Start a Service Tool menu

3. Select a service tool from the list of tools displayed in Figure 26-3.

    Note: Options 4 and 7 in Figure 26-3 are not discussed in the following list. Contact your IBM Service Provider for instructions and usage of these tools.

    If you selected to work with:

    – **Product activity logs**: Go to Chapter 28, "Collecting the Product Activity Log" on page 445.

    – **Trace Licensed Internal Code**: Go to Chapter 24, "Tracing the Licensed Internal Code" on page 361.

    – **Work with Communications trace**: Go to Chapter 14, "Collecting a communications trace" on page 237.

    – **Licensed Internal Code (LIC) log**: Go to Chapter 25, "Collecting Licensed Internal Code (LIC) logs" on page 401.

    – **Main storage dump manager**: Go to Chapter 10, "Main storage dumps" on page 169.

Work with System Security

The following screens are available with i5/OS V5R4. They can be selected from SST menu option 7 or DST main menu option 13.

```
 Work with System Security

                                                     SYSTEM: ITSOSYS


Type choices, press Enter.

   Allow system value security changes . . . . . . . . 1      1 = Yes, 2 = No
   Allow new digital certificates . . . . . . . . . . 1       1 = Yes, 2 = No
   Allow a service tools user ID with a default and expired password to change
        its own password . . . . . . . . . . . . . . . 1        1 = Yes, 2 = No



 F3=Exit        F12=Cancel
```

Figure 26-4   System Security menu

```
 Work with Service Tools User IDs

                                                     SYSTEM: ITSOSYS


Type choices, press Enter.
1 = Create              2 = Change password          3 = Delete
4 = Display             5 = Enable                   6 = Disable
7 = Change privileges   8 = Change description

Opt     User ID      Description                      Status

        QSECOFR      QSECOFR                          Disabled
        QSRV         QSRV  R                          Enabled
        ITSOUSER     ITSO User                        Enabled
        11111111     11111111                         Enabled
        22222222     22222222                         Enabled



 F3=Exit          F5 Refresh          F12=Cancel
```

Figure 26-5   Service Tools IDs

```
Change Service Tools User Privileges
                                                        SYSTEM: ITSOSYS
Service tools user ID name . . . . . . . . . . . . . . . QSECOFR


Type choices, press Enter.
1 = Revoke   2 = Grant

Option  Functions                                         Status
        Disk units - operations                           Granted
        Disk units - administration                       Granted
        Disk units - read only                            Granted
        System partitions- operations                     Granted
        System partitions- administration                 Granted
        Partition remote panel key PRIMARY      0         Granted
        Partition remote panel key PST2         1         Granted
        Operator panel functions                          Granted
        Operating system initial program load (IPL)       Granted
        Install                                           Granted
        Performance data collector                        Granted
        Hardware service manager                          Granted
        Display/Alter/Dump                                Granted



More . . .
F3=Exit          F5=Reset        F9 = Defaults      F12=Cancel
```

Figure 26-6   Change SST user privileges screen

Device IDs are new for i5/OS V5R1 and are used for authenticating the LAN console.

There is a predefined device ID of QCONSOLE. The following are associated screens.

```
Work with Service Tools Device IDs
                                                        SYSTEM: ITSOSYS
Type option, press Enter.
1 = Create                2 = Reset password      3 = Delete
4 = Display               5 = Enable              6 = Disable
7 = change attributes     8 = Change description


Opt     Device ID      Description                       Status
        TEST           DEVICE FOR TESTING                Enabled
        QCONSOLE       QCONSOLE                          Enabled



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

Figure 26-7   Work with Service Tools Device IDs

The following are the screens for selecting the console type. A new option for better recovery and takeover is implemented in i5/OS V5R3.

```
Change Service Tools Device Attributes
                                                          SYSTEM: ITSOSYS
Service tools device ID name . . . . . . . . . . . . . QCONSOLE


Type option, press Enter.


1=Revoke     2=Grant


Option      Attributes                                           Status
            Operations Console (LAN)                             Revoked
            Partition remote panel PRIMARY                       Revoked
            Partition remote panel PST2        1                 Revoked
            Partition remote console PRIMARY        0            Revoked
            Partition remote console PST2           1            Revoked


F3=Exit       F5=Reset      F12=Cancel
```

Figure 26-8   Change Service Tools Device Attributes

The Select Console menu allows console recovery. The console can be taken over by another console. It is used for Operations Console and HMC. See Figure 26-9.

```
Select Console
                                                          SYSTEM: ITSOSYS
Allow console recovery and console can be
taken over by another console . . . . . . . . . . . . . . . 1    1=Yes, 2=No


Select one of the following:
Console type . . . . . . . . . . . . . . . . . . . . . . 4
1. Twinaxial
2. Operations console (Direct)
3. Operations console (LAN)
4. Hardware management console (HMC)
Current state of console tag . . . . . . . . . . . . . . 4


Allow console to be taken over by another console . . . . . .2    1=Yes, 2=No


Press enter to continue.
F3=Exit       F12=Cancel
```

Figure 26-9   Select Console menu

When the System i is not partitioned, two additional parameters are available from the Select Console menu:

- ▶ Allow supported internal LAN adapter to be the console (Yes or No)
- ▶ Allow supported Gigabit LAN adapter to be the console (Yes or No)

The Work with Service Tools Security Data menu follows. Option 4 allows you to restore all or a single DST user profile from a tape or optical device. Option 5 allows you to save all DST user profiles to a tape or optical device. Option 6 allows you to change the password and encryption level. Option 7 allows you to work with Service Tools locks on device IDs from SST.

```
 Work with Service Tools Security Data
                                                          System: ITSOSYS

  Select one of the following:

 1. Reset operating system default password
 2. Change operating system install security
 3. Work with service tools security log
 4. Restore service tools security data
 5. Save service tools security data
 6. Change password level
 7. Work with lock for device IDs from SST
 8. Password expiration interval in days
 9. Maximum sign-on attempts allowed
 10. Duplicate password control
 11. Autocreate service tools devices


 F3=Exit      F5=Reset      F12=Cancel
```

Figure 26-10   Work with Service Tools Security Data

Suspending an active SST service tool

Suspending a service tool allows you to work with multiple service tools without having to completely exit a service tool before starting a new one.

To suspend an active service tool and start another tool, press F16 (SST menu). Pressing F16 (SST menu) allows you to reach the SST main menu quickly.

Note: F16 (SST menu) does not show up on many of the menus for internal service tools. However, it can be entered from all displays. F16 (SST menu) has no other purpose when using service tools.

Go to step 2 in 26.5.1, "Starting a Service Tool" on page 418, to continue working with SST.

Returning to a suspended SST service tool

To return to a suspended service tool, select option 2 (Work with active service tools) from the SST main menu.

A display appears, as shown in Figure 26-11 on page 424, which contains a list of all the active service tools.

```
  Work with Active Service Tools

  Type options, press Enter.
    1=Select service tool        4=End service tool

  Option      Service Tool                                 Status
              Licensed Internal Code log                   Active
              Product activity log                         Active
              Hardware service manager                     Active













    F3=Exit          F5=Refresh          F12=Cancel          F16=SST menu
```

Figure 26-11   Work with Active Service Tools

Type 1 in the Opt column next to the service tool to which you want to return, and press the Enter key. If you were working with:

► **Product activity logs**: Go to Chapter 28, "Collecting the Product Activity Log" on page 445.

► **Trace Licensed Internal Code**: Go to Chapter 24, "Tracing the Licensed Internal Code" on page 361.

► **Communications trace**: Go to Chapter 14, "Collecting a communications trace" on page 237.

► **Licensed Internal Code (LIC) logs**: Go to Chapter 25, "Collecting Licensed Internal Code (LIC) logs" on page 401.

► **Main storage dump manager**: Go to Chapter 10, "Main storage dumps" on page 169.

If no service tools are active, a screen similar to Figure 26-12 on page 425 is displayed.

```
  Work with Active Service Tools

  Type options, press Enter.
    1=Select service tool        4=End service tool

  Option     Service Tool                                    Status

    (There are no active service tools in your system)













  F3=Exit          F12=Cancel         F16=SST menu
```

Figure 26-12   Work with Active Service Tools display

26.5.2 Leaving SST to access a command line

In addition to suspending an individual service tool, all of SST can be suspended giving you access to a command line. To keep any service tool active and, at the same time, run programs or enter commands from the operating system command line:

1. Press F16 (SST menu) to access the SST main menu.
2. Press F10 (Command entry). The Command Entry display appears. Use this display to enter commands.

Enter commands and programs on the command line. To return to SST, continue to the following section.

> **Note:** Certain commands and functions (such as PTF activity) are sensitive to SST already being active in the current process. They fail and the following message is posted in the joblog:
>
> CPF7215 System Service Tools already active in this process.

26.5.3 Returning to SST

To return to SST after leaving SST, press F3 (Exit) until you return to the SST main menu.

Go to step 2 in 26.5.1, "Starting a Service Tool" on page 418, to continue working with SST. If you need to return to a suspended service tool, go to "Returning to a suspended SST service tool" on page 423.

26.5.4 Ending SST

To end SST, press F3 (Exit) or F12 (Cancel) from any menu until the Exit System Service Tools display appears, as shown in Figure 26-13.

```
Exit System Service Tools

 Note: All active service tools will end.

 Press Enter to continue ending SST.
 Press F12=Cancel to return to the SST menu and not end SST.

















 F12=Cancel
```
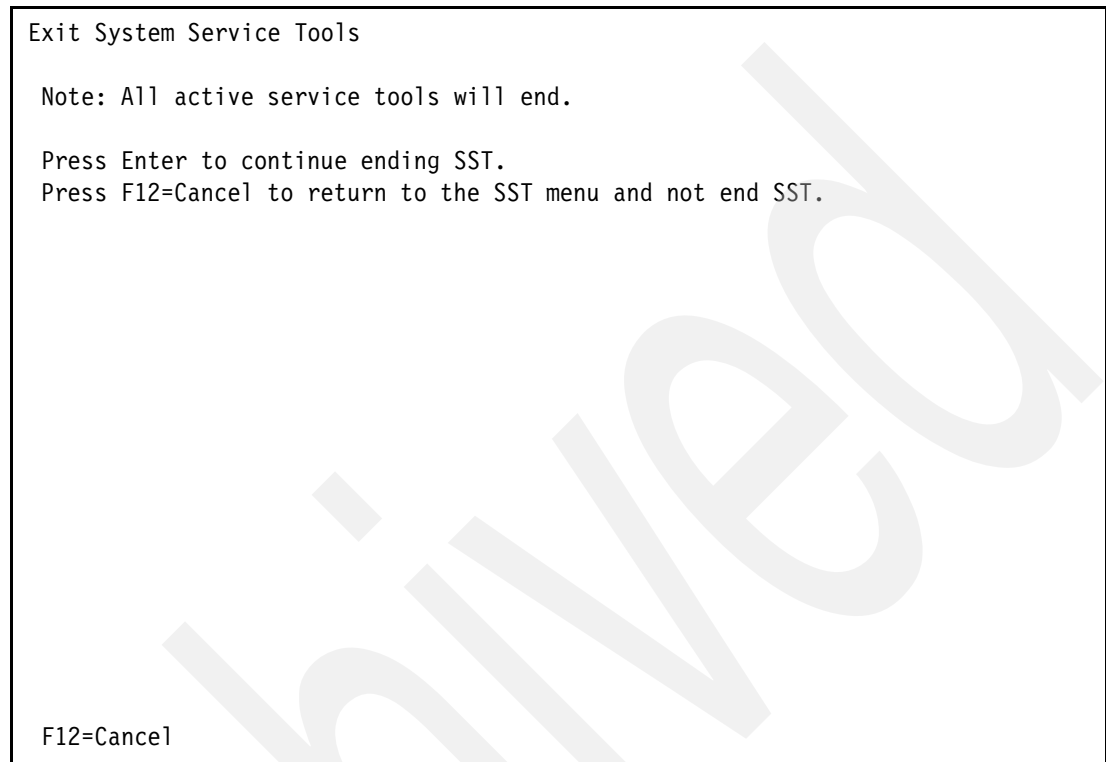
Figure 26-13   Exit System Service Tools display

Press the Enter key to end all service tools and SST, or press F12 (Cancel) to return to the SST main menu. Go to step 2 in 26.5.1, "Starting a Service Tool" on page 418, to continue working with SST.

27

Using Dedicated Service Tools (DST)

This chapter describes how to use the Dedicated Service Tools (DST). You use DST to run one or more Licensed Internal Code (LIC) service tools. Unlike System Service Tools (SST), DST can be used before the operating system is loaded. See Chapter 26, "Using System Service Tools (SST)" on page 415, for information about SST.

27.1 Getting started

Before you use DST, verify that you have the following tools:

- ► For printing, the printer must be a Systems Network Architecture (SNA) character string (SCS) data stream printer. Intelligent printer data stream (IPDS) and ASCII printers are not supported by DST.
- ► A tape device or writable optical unit attached to the system is needed by some service tools.
- ► A tape that is free of defects, a new tape volume, or any previously initialized tape.
- ► A valid service tools user ID and password to sign on to DST. You must have the service tools privilege for the function you wish to use (such as LIC log). If you do not already have this authority, contact your security officer or system administrator.

Note: DST and SST user IDs and passwords are not related to operating system user profiles and passwords.

To access DST, use one of the following:

- ► During an attended IPL, complete the steps in 27.1.1, "Bringing up DST during an attended IPL" on page 428.
- ► To access DST during an IPL and after the operating system is loaded go to 27.1.2, "Bringing up DST using Function 21 on the control panel" on page 429.

27.1.1 Bringing up DST during an attended IPL

Complete the following steps when the system is operating to perform an attended IPL and bring up DST:

1. Use one of the following methods to prepare the system for an attended IPL with DST:
   - Enter the following command to change the system value QIPLTYPE to "1" to perform an attended IPL using DST:

     `CHGSYSVAL SYSVAL(QIPLTYPE) VALUE('1')`

   - Place the system in manual mode

2. Enter the following command to power down the system:

   `PWRDWNSYS OPTION(*IMMED) RESTART(*YES)`

   The system powers down and starts the IPL. The menu shown in Figure 27-1 on page 429 appears.

```
 IPL or Install the System
                                                        System:    ITSOSYS1
 Select one of the following:

        1. Perform an IPL
        2. Install the operating system
        3. Use Dedicated Service Tools (DST)
        4. Perform automatic installation of the operating system
        5. Save Licensed Internal Code




 Selection

        _


 Licensed Internal Code - Property of IBM 5722-999 Licensed
 Internal Code (c) Copyright IBM Corp.  1980, 2007.  All
 rights reserved.  US Government Users Restricted Rights -
 Use duplication or disclosure restricted by GSA ADP schedule
 Contract with IBM Corp.
```

Figure 27-1   IPL or Install the System menu

3. Select option 3 (Use Dedicated Service Tools (DST)) from the IPL or Install the System menu to use DST.

4.

At this point, the system is IPLed to a state called *limited paging*. Certain functions and service tools have limited functionality:

► Until the storage management recovery step is complete, main storage dump copies, and data on the other disk units, is not available.

► LIC logs cannot be displayed until the Start LIC Log IPL step is complete.

► Until the Product Activity Log and APPN step, only the shadow log is available. The shadow log contains PAL entries for the current IPL. After the Product Activity Log and APPN step completes, all PAL entries are accessible.

27.1.2 Bringing up DST using Function 21 on the control panel

If you did not perform an IPL of the system in DST debug mode, the job that is running at the console workstation ends, when DST is posted to the console. Signoff the console before posting DST to the console.

If the system is in restricted state, exiting DST causes the system to end with a SRC indicating that the console was lost while in restricted state.

To check whether the system is in the restricted state, follow these steps:

1. Enter the WRKSBS command.

2. Verify the status of the controlling subsystem (press F11). The system is in the restricted state if the status of the controlling subsystem is RSTD.

Details on performing functions on the control panel are detailed in the IBM Systems Hardware Information Center.

Use one of the following procedures to post DST to the console.

Stand-alone

On a stand-alone system or a nonHMC managed POWER5 system, use the following procedure to post DST to the system console.

1. Place the system in manual mode.

2. Use the up and down arrow keys on the control panel to select function 21, and press Enter.

3. Continue to 27.3, "DST Sign on" on page 434.

Partition on nonPOWER5 systems

For a secondary partition on a nonPOWER5 system, use the following procedure to post DST to the partition console.

> **Note:** There can be only one session of Work with system partitions per partition.
>
> Forcing DST disconnects whatever job is running on the console for the partition. If the console job on the partition is Work with system partitions, DST is then blocked using Work with system partitions because there is an active job in work with system partitions.
>
> The following system value settings allow for the disconnected console job to end in a timely manner:
>
> ```
> QDEVRCYACN -  *ENDJOB or *ENDJOBNOLIST
> QDSCJOBITV   -  5
> ```
>
> Be aware that these system values affect all interactive jobs. Make these changes for console users only.

1. Sign on to the primary partition.

2. From the command line, issue the following command and press Enter.

   ```
   STRSST
   ```

3. Sign on to service tools with a valid service tools user ID and password.

4. Select Work with system partitions (Option 5).

5. Select Work with partition status (Option 2)

   A screen similar to the following is shown.

```
 Work with Partition Status
                                                             System:    ITSOSYS1
 Type options, press Enter.
   1=Power on      3=IPL restart    7=Delayed power off   8=Immediate power off
   9=Mode normal  10=Mode manual   11=Mode auto          12=Mode secure
   A=Source A      B=Source B       C=Source C            D=Source D

      Partition              IPL    IPL                    Sys IPL  Reference
 Opt  Identifier  Name       Source Mode       State      Action   Codes
       0          PRIMARY    B      Normal     On         IPL
       1          XSM2       B      Normal     On         IPL
       2          XSM1       B      Normal     On         IPL




 F3=Exit   F5=Refresh                         F10=Monitor partition status
 F11=Work with partition configuration   F12=Cancel   F23=More options
```

Figure 27-2   Status

6. If the partition is not in manual mode, use option 10 (Mode manual) to place the partition into manual mode.

7. Select option 21 (Force Dedicated Service Tools), and press Enter.
   Option 21 can be displayed by selecting F23 (More options).

8. The message `Force DST was successful` should be displayed on the bottom of the Work with Partition Status screen, and the DST sign on should be displayed on the secondary partition console.

9. Continue to 27.3, "DST Sign on" on page 434.

Using a Hardware Management Console to partition a POWER5 system

Use the following procedure to post DST to the partition console for a partition on a POWER5 system:

1. Go to the Hardware Management Console (HMC).

2. In the management environment, select the HMC and expand.

3. Select and expand Service Applications.

4. Select and expand Service Utilities.

5. Select the managed system from the list displayed, and from the menu select **Selected** → **Operator Panel Service Functions**.

6. Select the desired partition from the dialog, and from the menu select **Partition Functions** → **Activate Dedicated Service Tools (21) - i5/OS**.

7. A dialog with the message `Operator panel function 21 initiated` should be displayed and the DST sign on screen should appear on the partition console.

8. Continue to 27.3, "DST Sign on" on page 434.

27.2 Keeping DST active during an IPL or performing an IPL in debug mode

Complete the following tasks to continue using DST service tools during an IPL or to perform an IPL in debug mode:

1. If you are not at the Use Dedicated Service Tools (DST) menu, follow the steps in 27.1.1, "Bringing up DST during an attended IPL" on page 428.

2. Select option 6 (Select DST console mode) from the Use DST menu. A menu appears like the example shown in Figure 27-3.

```
 Select DST Console Mode

Warning: Incorrect use of DST debug mode can cause damage to
data in this system.  Contact your service representative
for assistance.

Select one of the following:

  1. Exit Dedicated Service Tools (DST) on IPL
  2. Start DST debug mode on IPL







Selection

    __

F3=Exit      F12=Cancel
```
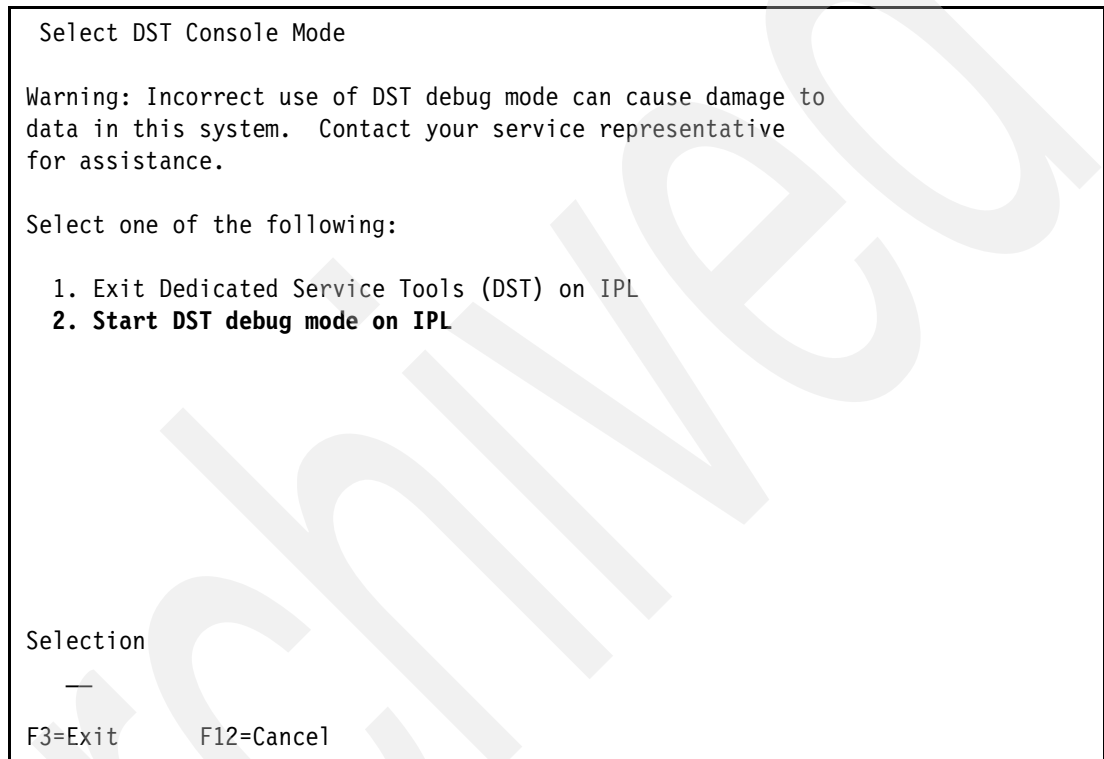
Figure 27-3 Select DST Console Mode menu

3. Enter option 2 (Start DST debug mode on IPL) from the Select DST Console Mode menu. A menu appears like the example shown in Figure 27-4 on page 433.

```
Use Dedicated Service Tools (DST)
                                                    System:    ITSOSYS1
Select one of the following:

     1. Perform an IPL
     2. Install the operating system
     3. Work with Licensed Internal Code
     4. Work with disk units
     5. Work with DST environment
     6. Select DST console mode
     7. Start a service tool
     8. Perform automatic installation of the operating system
     9. Work with save storage and restore storage
    10. Work with remote service support
    11. Work with system partitions

    13. Work with system security
    14. End batch restricted state

 Selection
     _1_

 F3=Exit              F12=Cancel
```

Figure 27-4   Use Dedicated Service Tools (DST) menu

4. Enter option 1 (Perform an IPL) from the Use Dedicated Service Tools (DST) menu. A
   menu appears like the example in Figure 27-5.

```
Select Type of IPL

Select one of the following:

        1.Normal IPL
        2.Step mode IPL

















Selection

     _
```

Figure 27-5   Select Type of IPL

5. Select option 2 (Step-mode IPL) from the Select Type of IPL menu to stop at each of the IPL steps. Otherwise, if you do not want to use a DST service tool during the IPL, select option 1 (Normal IPL).

> **Note:**
> You can press F16 to access the Use Dedicated Service Tools (DST) menu after you select either option. However, if you want to use a DST service tool during an IPL, select option 2 (Step-mode IPL).
>
> If you press F16 (DST menu) while performing an IPL, the Use Dedicated Service Tools (DST) menu appears after the "Start the operating system" step of the IPL. Select option 6 (Select DST console mode) to access the Sign On display. If you do not press F16 (DST menu) during the IPL, the Sign On display for the operating system appears.

Continue with the steps in 27.4.1, "Starting a DST service tool" on page 435, to Use Dedicated Service Tools.

27.3 DST Sign on

When DST is started, the Dedicated Service Tools (DST) Sign On is displayed as shown below.

```
 Dedicated Service Tools (DST) Sign On
                                                     System:    ITSOSYS1
 Type choices, press Enter.

   Service tools user . . . . . . . . . . .   _____
   Service tools password . . . . . . . . .




















 F3=Exit    F5=Change password    F12=Cancel
```

Figure 27-6   Dedicated Service Tools (DST) Sign On

Enter a valid service tools user ID and password, and then press Enter. The Use Dedicated Service Tools (DST) menu appears as shown in Figure 27-7 on page 435.

```
Use Dedicated Service Tools (DST)
                                                    System:    ITSOSYS1
Select one of the following:

      1. Perform an IPL
      2. Install the operating system
      3. Work with Licensed Internal Code
      4. Work with disk units
      5. Work with DST environment
      6. Select DST console mode
      7. Start a service tool
      8. Perform automatic installation of the operating system
      9. Work with save storage and restore storage
     10. Work with remote service support
     11. Work with system partitions

     13. Work with system security
     14. End batch restricted state

Selection

       —

F3=Exit              F12=Cancel
```

Figure 27-7   Use Dedicated Service Tools (DST) menu

Continue the process by following the steps in 27.4.1, "Starting a DST service tool" on page 435.

> **Note:** The Work with system partitions option does not display in DST if one of the following is true:
>
> ► The system does not support partitioning.
> ► The system supports partitioning through the Hardware Management Console (HMC).

27.4 Working with DST

This section describes the various tasks you can perform when working with DST.

27.4.1 Starting a DST service tool

To start a DST, follow these steps:

1. If DST is not active or you are not at the Use Dedicated Service Tools (DST) menu, follow the steps in 27.1, "Getting started" on page 428. Otherwise, continue with the next step.

2. Select option 7 (Start a service tool) from the Use Dedicated Service Tools (DST) menu. A menu appears like the one shown in Figure 27-8 on page 436.

```
 Start a Service Tool

     Warning: Incorrect use of this service tool can cause damage
     to data in this system.  Contact your service representative
     for assistance.

     Select one of the following:

          1. Display/Alter/Dump
          2. Licensed Internal Code log
          3. Trace Licensed Internal Code
          4. Hardware Service Manager
          5. Main Storage Dump Manger
          6. Product Activity Log
          7. Operator Panel Functions
          8. Performance Data Collection




     Selection

          —

     F3=Exit              F12=Cancel
```

Figure 27-8   Start a Service Tool menu

Note: If any service tool is active, and you select the same tool or option, you return to the display from where F16 (DST menu) was pressed. This is true for DST only.

3. Select a service tool from the list of tools displayed in Figure 27-8.

Note: Options 1, 4, 7, and 8 shown in Figure 27-8 are not described in this book because they are more advanced tools. Contact your IBM Service Provider for instructions on usage of these tools.

If you selected to work with:

– **Licensed Internal Code (LIC) logs**: Go to Chapter 25, "Collecting Licensed Internal Code (LIC) logs" on page 401.

– **Trace Licensed Internal Code:** Go to Chapter 24, "Tracing the Licensed Internal Code" on page 361.

– **Input/output debug utility**: Go to Chapter 23, "Collecting an input/output processor (IOP) dump" on page 343.

Note: This option appears on some DST panels depending on the i5/OS release level of the system.

– **Main Storage Dump Manager**: Go to Chapter 10, "Main storage dumps" on page 169.

– **Product Activity Log (PAL)**: Go to Chapter 28, "Collecting the Product Activity Log" on page 445.

– **None of these options**: Go to 27.4, "Working with DST" on page 435.

Temporarily leaving an active DST service tool

To temporarily leave an active DST service tool, press F16 (DST menu) to use another service tool or to temporarily leave DST. When you press F16 (DST menu), you go to the Use DST menu quickly while using a DST service tool.

> **Note:**
>
> ► The service tool you left is still active.
>
> ► You can press F16 from any DST service tool menu even though F16 (DST menu) might not appear on the menu. F16 (DST menu) has no other purpose when using DST service tools.

Go to 27.4.1, "Starting a DST service tool" on page 435, to continue working with DST.

Returning to an active DST service tool

To return to an active DST service tool, follow these steps:

1. Select option 5 (Work with DST environment) from the Use Dedicated Service Tools (DST) menu. A menu appears like the one shown in Figure 27-9.

```
Work with DST Environment
                                                    System:   ITSOSYS1
Select one of the following:

     1. Active service tools
     2. System devices
     3. Service tools user IDs

     5. Service tools device IDs
     6. Service tools security data
     7. Change service tools language



Selection

F3=Exit   F12=Cancel
```
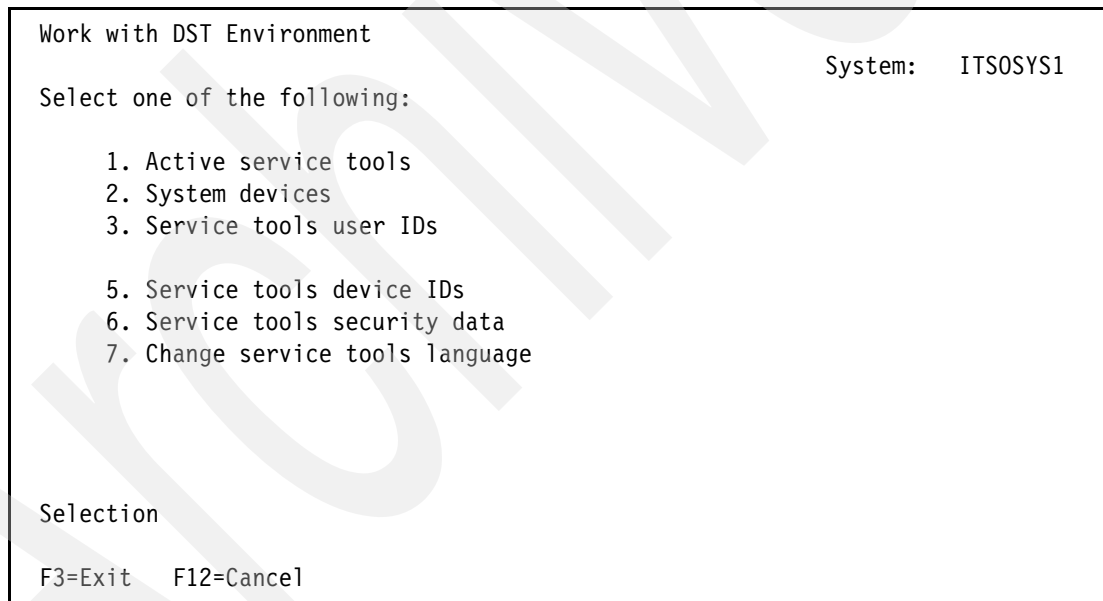
Figure 27-9   Work with DST Environment

2. Select option 1 (Work with active service tools) from the Work with DST Environment display. A display appears like the one shown in Figure 27-10 on page 438.

```
 Work with Active Service Tools

Type option, press Enter.
  4=End service tool    5=Display

Option  Service Tool                      Status
  _       IPL service function             Active
  _       Licensed Internal Code Log       Active
  _       Display/Alter/Dump               Active
  _       Performance Data Collection      Active




                                                                    Bottom

F3=Exit    F12=Cancel
```

Figure 27-10   Work with Active Service Tools

3. Type option 5 in the Option column next to the service tool with which you want to continue working. For example, if you want to continue performing the IPL, type 5 next to IPL service function. The display where F16 (DST menu) was pressed appears. If you were working with:

   – **Trace Licensed Internal Code**: Go to Chapter 24, "Tracing the Licensed Internal Code" on page 361.

   – **Licensed Internal Code (LIC) logs**: Go to Chapter 25, "Collecting Licensed Internal Code (LIC) logs" on page 401.

   – **Product Activity Logs (PAL)**: Go to Chapter 28, "Collecting the Product Activity Log" on page 445.

   – **Input/output debug utility**: Go to Chapter 23, "Collecting an input/output processor (IOP) dump" on page 343.

   – **Main Storage Dump Manager**: Go to Chapter 10, "Main storage dumps" on page 169.

27.4.2 Temporarily leaving DST to access the operating system

To temporarily leave DST to go to the operating system while in DST, press F16 (DST menu). The Use Dedicated Service Tools (DST) menu appears.

Select option 6 (Select DST console mode) from the Use Dedicated Service Tools (DST) menu only if the system is operating and you have performed an IPL in debug mode.

Continue to the following section when you are ready to return to DST.

27.4.3 Returning to DST after temporarily leaving DST

A return to DST is successful only if DST is available. If an option was chosen to exit DST, then DST is not available. To return to the Use Dedicated Service Tools (DST) menu during an IPL or install if DST was not ended, perform one of the following actions:

► Before the `Start the Operating System` message appears during an IPL, perform one of the following tasks:

  – Press F16 (DST menu) from a service tool to return to the Use DST menu.

  – Use Function 21 on the control panel to switch from the active IPL to the Use Dedicated Service Tools (DST) menu.

► After the `Start the Operating System` message appears during an IPL, choose one of the following tasks:

  – Press F16 (DST menu) from a service tools menu in DST to return to the Use DST menu.

  – Use Function 21 on the control panel to switch from the active IPL to the Use Dedicated Service Tools (DST) menu.

  – Press the System Request key, and type `DST` in *uppercase* letters on the system request line.

► After the operating system is loaded, use Function 21 on the control panel to bring up DST.

Press the System Request key, and type `DST` in *uppercase* letters on the system request line.

Go to 27.4.1, "Starting a DST service tool" on page 435, to continue working with DST.

27.4.4 Ending DST

To end DST, press F3 (Exit) or F12 (Cancel) from any menu until a menu appears like the example shown in Figure 27-11 on page 440.

```
 Exit Dedicated Service Tools

Select one of the following:

   1. Exit Dedicated Service Tools (DST)
   2. Resume Dedicated Service Tools




















Selection

  —

F12=Cancel
```
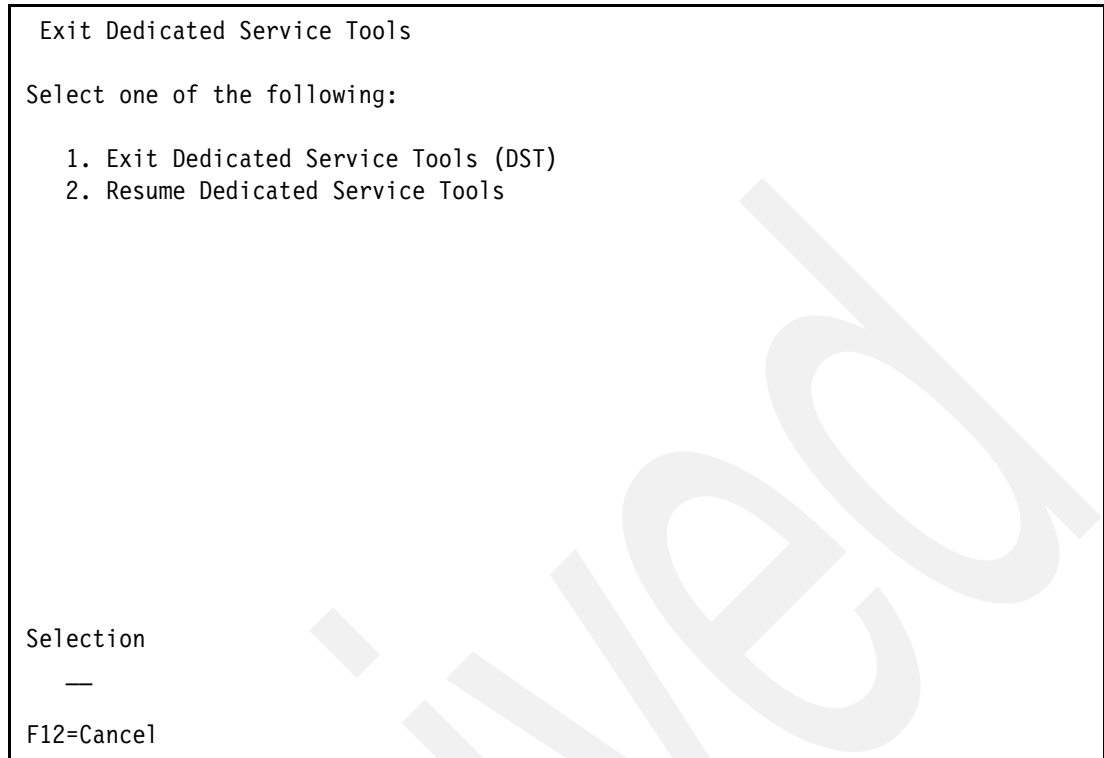
Figure 27-11   Exit Dedicated Service Tools

Select option 1 (Exit Dedicated Service Tools (DST)) to exit DST, or select option 2 (Resume Dedicated Service Tools) to resume using DST. If you select option 1, all service tools or functions that started in DST end. If you are resuming DST, go to 27.4.1, "Starting a DST service tool" on page 435.

If you returned to the operating system from DST, enter the following command to vary on the tape unit that was used with DST tools:

```
VRYCFG CFGOBJ(device-name) CFGTYPE(*DEV)
       STATUS(*ON)
```

Replace *device-name* with the name of the tape unit.

27.5 Handling device intervention or tape error problems in DST

A device intervention or tape error can occur while you try to dump data to tape. When this occurs, a message appears at the bottom of the display. Most of the errors can be fixed, such as loading or formatting a tape. Others can be ignored, such as the notification that other active files are on the tape. If you need help correcting the tape or tape unit error, contact your service provider.

To handle device intervention or tape error problems in DST, read and interpret the message at the bottom of the display. For example, the Device Intervention display (Figure 27-12 on page 441) appears with the Wrong volume loaded message.

```
 Device Intervention Required


  Volume found . . . . . . . . . . . . . . . . . . . . :    IBMIRD
  File found . . . . . . . . . . . . . . . . . . . . . :
  Sequence number found. . . . . . . . . . . . . . . . :    0000

  Volume requested . . . . . . . . . . . . . . . . . . :    MSDTAP
  File requested . . . . . . . . . . . . . . . . . . . :    MSD004
  Sequence number requested. . . . . . . . . . . . . . :    0001

  Type choices, press Enter.

  New volume name. . . . . . . . . . . . . . . . . . . .     MSDTAP_____
  New file name. . . . . . . . . . . . . . . . . . . . .     MSD004_____
  New sequence number. . . . . . . . . . . . . . . . . .     0001

     Action. . . . . . . . . . . . . . . . . . . . . . .     _   1=Cancel
                                                                 2=Ignore
                                                                 3=Retry
                                                                 4=Format


 F3=Exit    F10=Display details         F12=Cancel
 Wrong volume loaded.
```

Figure 27-12   Device Intervention Required

The old Volume found IBMIRD and the New volume or file MSD004 do not match.

Select one of the actions to satisfy the condition. For this example, the wrong volume was loaded, so you need to select the Format (4) action, and press the Enter key. The tape is formatted, and the data is copied to tape.

> **Note:** Actions appear on the Device Intervention display depending on the tape error. If you select ignore, retry, or format action, the data is copied to tape after the error is fixed or ignored.
>
> If you select the *cancel* action, copying the data ends and must be started again from the beginning. If the *cancel* action is the only action available to select, a critical error occurred. In any case, copying the data to tape stops. If a critical error occurs, complete the following steps:
>
> 1. If you are on any intervention display, press F12 (Cancel) to return to the service tool with which you are working.
>
> 2. Correct the tape problem, for example, by replacing the tape. Or, go to 27.5.1, "Handling tape unit problems" on page 442, to select a new tape device.
>
> 3. After the error is corrected, start copying the data again beginning with the first tape. Select the option for copying the data to tape from the service tool you are working with, not from the device intervention display.

If another device intervention or tape error occurs, follow the same process that is explained at the beginning of this section. Otherwise, return to the next step in the procedure that sent you to this procedure.

Once the device intervention request is processed, your are returned back to the service tool you originally selected (such as copying a Main storage dump to a tape device).

27.5.1 Handling tape unit problems

After you select a tape unit in DST, DST uses that tape unit every time you attempt to copy data to tape. If the tape device selected is not usable, complete these steps:

1. Press F3 (Exit) to end the service tool and return to the Use Dedicated Service Tools menu.

2. Select option 5 (Work with DST environment) from the Dedicated Service Tools (DST) menu. A menu appears like the example shown in Figure 27-13.

```
Work with DST Environment
                                                       System:   ITSOSYS1
Select one of the following:

     1. Active service tools
     2. System devices
     3. Service tools user IDs

     5. Service tools device IDs
     6. Service tools security data
     7. Change service tools language




Selection

F3=Exit   F12=Cancel
```
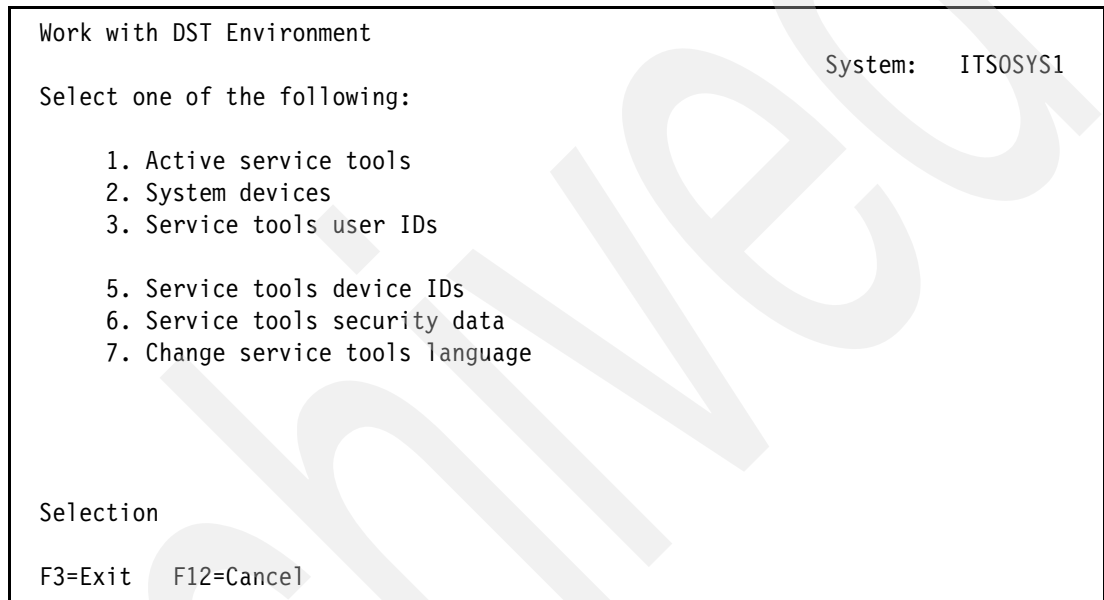
Figure 27-13   Work with DST Environment menu

3. Select option 2 (System devices). The menu shown in Figure 27-14 on page 443 appears.

```
 Work with System Devices
                                                         System:    RCHASI5A
 Select one of the following:

      1. Printers
      2. Tape devices

      4. Optical devices
      5. Alternate installation device
      6. Select console
      7. Configure service tools LAN adapter




 Selection


 F3=Exit    F5=Display LAN adapter configure on DASD
 F6=Clear LAN adapter configure on DASD    F12=Cancel
```

Figure 27-14   Work with System Devices menu

4. Select option 2 (Tape drives), and press Enter. The display shown in Figure 27-15 appears.

```
  Work with tape devices

 Type option, press Enter.
   1=Select       2=Deselect       5=Display details

              Resource                   Serial
   Option     Name     Type   Model     Number           Selected
     __       TAP01    63A0   001       00-1234567













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

Figure 27-15   Selecting a tape or diskette unit

5. Type 1 in the Option column next to the tape unit you want to use. Make sure the tape device is ready.

The screen shown in Figure 27-16 appears.

```
Intervention response being processed




















Wait for next screen
```
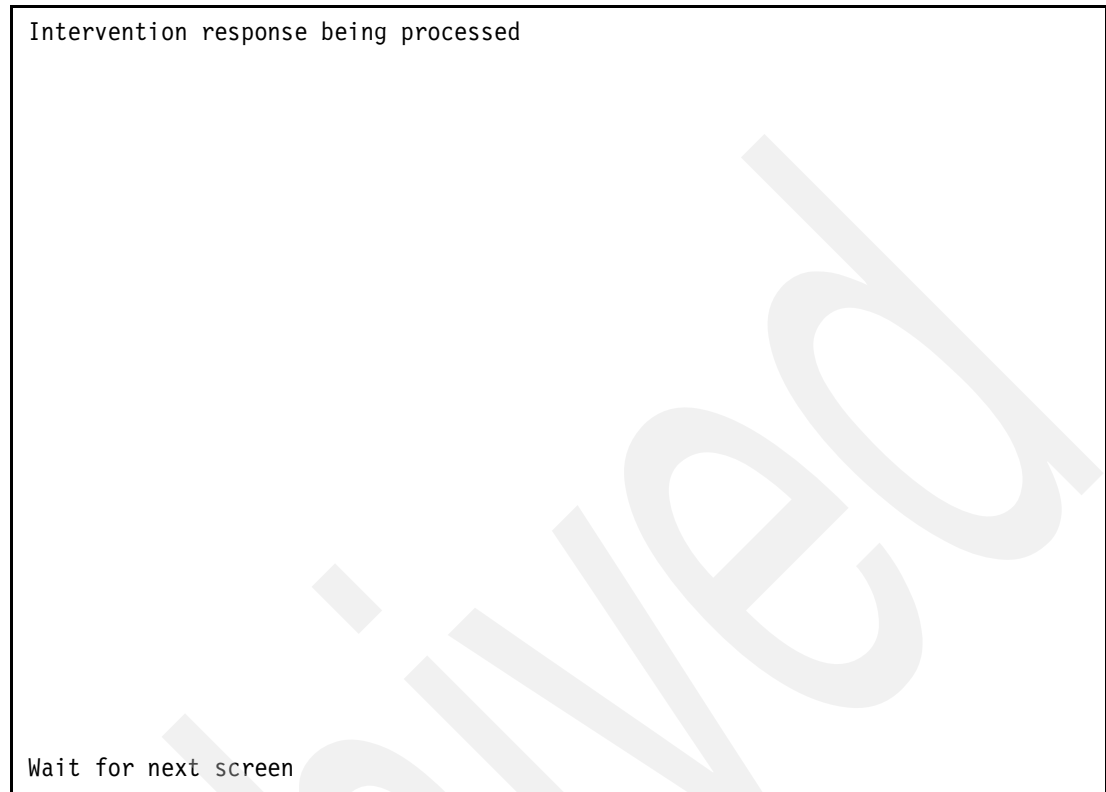
Figure 27-16   Intervention response being processed

28

Collecting the Product Activity Log

The Product Activity Log (PAL), previously known as the Error Log, is used by Licensed Internal Code (LIC) to record errors with system hardware and attached devices. Some software errors and First Failure Data Capture (FFDC) entries are also logged in the PAL. The Product Activity Log can be useful in determining the cause of intermittent errors.

Continue with the following section, to collect an error log using SST or DST, or 28.2, "Using PRTERRLOG to print the Product Activity Log" on page 449.

If you do not have service authority to use SST or DST, contact the security officer or system administrator to obtain the correct authority.

28.1 Using SST or DST to print the Product Activity Log

This section outlines the steps to print a copy of the Product Activity Log using SST or DST. The steps are as follows:

1. If you are at the Start a Service Tool menu, continue with the next step. Otherwise, if you are using:

   – SST, go to 26.5.1, "Starting a Service Tool" on page 418
   – DST, go to 27.4.1, "Starting a DST service tool" on page 435

   Then, return here to continue.

2. Select the option for Product Activity Log from the Start a Service Tool menu:

   – For DST, select option 6.
   – For SST, select option 1.

   Press Enter. A display appears like the example shown in Figure 28-1.

```
Product Activity Log

Select one of the following:

     1. Analyze log
     2. Display or print by log ID
     3. Change log sizes
     4. Work with removable media lifetime statistics
     5. Display or print removable media session statistics
     6. Reference code description




Selection
     1

F3=Exit      F12=Cancel
```
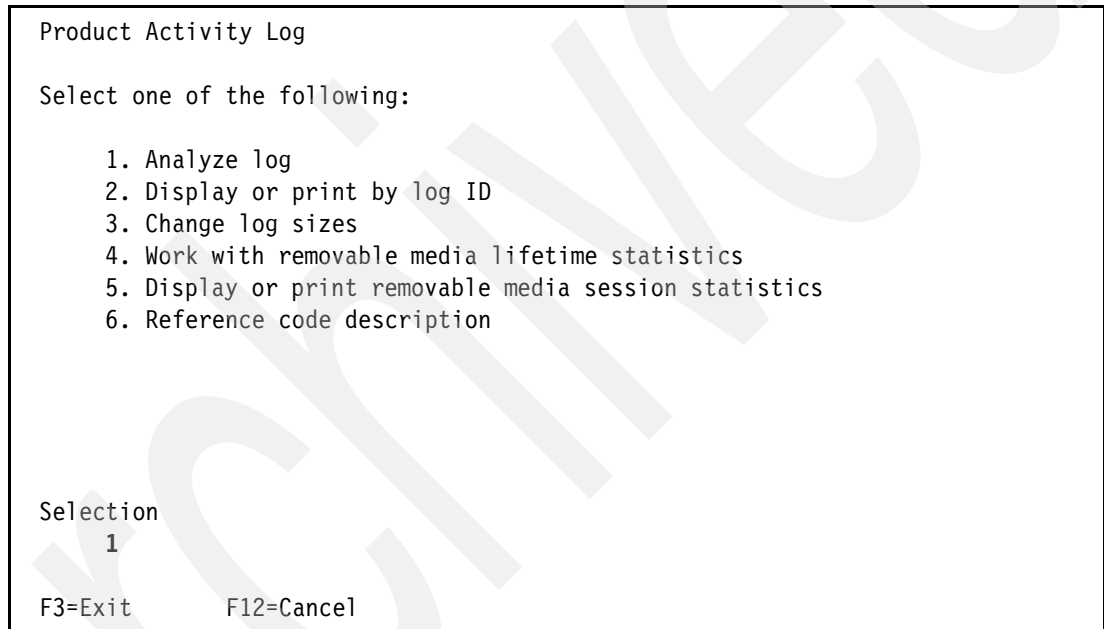
Figure 28-1   Product Activity Log menu

3. Select option 1 (Analyze log). Press Enter.

   The Select Subsystem Data display appears as shown in Figure 28-2.

```
Select Subsystem Data

Type choices, press Enter.

  Log . . . . . . . . . .               1=All logs
                                        2=Processor
                                        3=Magnetic media
                                        4=Local work station
                                        5=Communications
                                        6=Power
                                        7=Cryptography
                                        8=Licensed program
                                        9=Licensed Internal Code


  From:
    Date . . . . . . . .    11/05/07    MM/DD/YY
    Time . . . . . . . .    17:31:08    HH:MM:SS

  To:
    Date . . . . . . . .    11/06/07    MM/DD/YY
    Time . . . . . . . .    17:31:08    HH:MM:SS

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

Figure 28-2   Select Subsystem Data display

4. Unless you only need to gather information for a specific subsystem (such as Magnetic Media), enter 1 in the Log field. Type the From and To date and time that includes the time at which the error occurred. Otherwise, the default time rage is the last twenty-four hours.

5. Press Enter. The Select Analysis Report Options display appears as shown in Figure 28-3 on page 448.

```
Select Analysis Report Options

Type choices, press Enter.

  Report type . . . . . . . . .   3   1=Display analysis, 2=Display summary,
                                      3=Print options
  Optional entries to include:
    Informational . . . . . . .   Y   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=Resource names
    Device types or Resource names
    *ALL                                               *ALL...

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

Figure 28-3   Select Analysis Report Option display

6. Type 3 in the Report type prompt, and leave the other parameters as the default to print
   the Product Activity Log report.

7. Press Enter. The Select Options for Printed Report display appears as shown in
   Figure 28-4.

```
Select Options for Printed Report

Type choices, press Enter.

  Report type  . . . . . .   4       1=Print analysis report
                                     2=Print summary report
                                     3=Print partial report
                                     4=Print full report


    For report type 4:
      Include hexadecimal
        data . . . . . . . .   Y     Y=Yes
                                     N=No







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

Figure 28-4   Select Options for Printed Report display

8. Type `4` in the Report type prompt, and type `Y` (Yes) in the Include hexadecimal data prompt to have the complete report. The hexadecimal data should be included because it provides useful information for problem determination.

9. Press Enter, and the `Printing or spooling operation is complete` message appears at the bottom of the display.

10.Press F3 three times to exit from the service tool.

11.If you are using:

– SST, press the Enter key to exit SST. Use the WRKSPLF command to locate your printout with the file name QPCSMPRT.

– DST, select the Exit Dedicated Service Tools (DST) option, and press the Enter key to exit DST. Your printout is sent to the service printer.

This ends the procedure to print a copy of the Product Activity Log using SST or DST.

28.2 Using PRTERRLOG to print the Product Activity Log

This section outlines the steps to print the Product Activity Log using the PRTERRLOG command. The steps are outlined here:

1. Type PRTERRLOG on the command line, and press F4. The display shown in Figure 28-5 appears.

```
  Print Error Log (PRTERRLOG)

  Type choices, press Enter.

  Type of log data to list . . . .   *ALL          *ALL, *ALLSUM, *ANZLOG...


















                                                                      Bottom
  F3=Exit    F4=Prompt    F5=Refresh    F12=Cancel    F13=How to use this display
  F24=More keys
```

Figure 28-5   Print Error Log display

2. Press Enter twice for the other parameters to be shown. A display appears like the example shown in Figure 28-6 on page 450.

```
   Print Error Log (PRTERRLOG)

   Type choices, press Enter.

   Type of log data to list . . . .    *ALL           *ALL, *ALLSUM, *ANZLOG...
   Output . . . . . . . . . . . . .    *PRINT         *PRINT, *OUTFILE
   Time period for log output:

     Beginning time . . . . . . . .    00:00:00       Time, *AVAIL
     Beginning date . . . . . . . .    11/06/07       Date, *CURRENT

     Ending time  . . . . . . . . .    23:59:59       Time, *AVAIL
     Ending date  . . . . . . . . .    11/07/06       Date, *CURRENT
   Print format . . . . . . . . . .    *HEX           *CHAR, *HEX




                                                                      Bottom
   F3=Exit    F4=Prompt    F5=Refresh    F12=Cancel   F13=How to use this display
   F24=More keys
```

Figure 28-6   Print Error Log display with more parameters

3. Type the From and To date and time that includes the time at which the error occurred.
   Otherwise, the date and time default to the current date.

4. Change the Print format option from *CHAR to *HEX to include hexadecimal data in the
   report.

5. Press Enter. Use the WRKSPLF or WRKJOB OPTION(*SPLF) command to locate the
   QPCSMPRT spooled file.

This ends the procedure to print a copy of the Product Activity Log using the PRTERRLOG
command.

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Electronic Service Agent

Electronic Service Agent™ provides an automatic hardware problem-reporting function that helps predict and prevent hardware errors by early detection of potential problems, downloads fixes, and automatically submits problems to IBM when appropriate.

Electronic Service Agent also provides an automatic software problem-reporting function. Supplemental system service information is sent to IBM and made available to IBM support centers to aid in problem resolution. The same service information is available to be viewed with prior registration of an IBM ID.

Using iSeries Navigator, you can collect the inventory for users and groups, fixes, system values, hardware resources, software resources, service attributes, contact information, or network attributes.

You can share this information with IBM through Electronic Service Agent. This enables IBM to help you identify problems and troubleshoot them more quickly. In some cases, sharing your inventory can help you avoid a problem altogether. For example, you share your software inventory with IBM and a fix becomes available for a software product that you have installed. Depending on the connectivity options you have selected, you can receive the fix automatically, which can help you to avoid a problem before you even experience it.

Electronic Service Agent is integrated into the operating system.

The Electronic Service Agent is an IBM Service Value-Add application program offered to customers free of charge. It is available for systems on IBM Warranty or with an IBM Maintenance Service Agreement. The purpose of Electronic Service Agent is to predict and prevent hardware errors by early detection of potential problems, downloading fixes, and automatically calling IBM Service when needed.

This chapter describes the purpose and importance of using Electronic Service Agent to maintain system availability.

29.1 What Electronic Service Agent can do for you

The Electronic Service Agent application automatically reports hardware-related problems to IBM for service using the Electronic Customer Support (ECS) link on the System i server. Electronic Service Agent also performs problem analysis on those hardware problems before you need to call for service.

Electronic Service Agent assists IBM Service personnel in problem source identification. System and I/O errors are dynamically monitored and analyzed. No further intervention is required. Electronic Service Agent further simplifies error analysis for some errors once the CE is on site. It provides a list of the most probable parts to be replaced or recommends another plan of action for the problem.

29.2 Automatic problem analysis

Electronic Service Agent can perform some automatic problem analysis before it places a hardware service call to IBM. When a system logs a hardware error in the Problem Log, it attempts to process Problem Determination Procedures (PDPs) that exist for that particular system reference code (SRC).

Although Electronic Service Agent does not complete the PDPs for every System Reference Code (SRC) on the System i server, it completes as much as possible in problem diagnosis so that you or the IBM Service Representative has a better understanding of the problem. This means that when a service call is placed to IBM, the system problem report contains a reduced list of possible replacement parts.

If Electronic Service Agent is installed, refer to customer level documentation, form number SA38-0489. For further information on installing or configuring Electronic Service Agent, visit the Web site at:

`http://publib.boulder.ibm.com:80/cgi-bin/bookmgr/LIBRARY`

Submitting a problem report

This chapter provides information about how to submit documentation for an authorized program analysis report (APAR) or problem report and how to include with the report the information collected from the chapters in this book.

30.1 Methods of sending data to your service provider

Data can be sent to your service provider either electronically or on hard copy (for example, printed output or magnetic media). The method you choose depends largely on two factors:

1. Size
2. Service provider's preference

For sending smaller amounts of data, e-mail is often the preferred method. For medium amounts of data, you can use FTP to transmit the documentation to a server in your service provider's network. For larger amounts of data, send the information on magnetic optical media, for example tape cartridge or DVDs.

30.2 Sending the problem report and documentation

To send a problem report and associated documentation, perform these steps:

1. Collect all information recommended by following the chapters in this book and as instructed by the service provider. See 30.3, "What to include with the problem report" on page 454 for more information about what to include with your report.

2. Label any physical material you submit with the problem management report (PMR), Electronic Technical Response (ETR), APAR or your service provider's call reference number. If you are sending documentation electronically, include the problem record number in e-mails and in the PC file names, where possible.

3. Translate into English any information you submit. For example, translate displays, messages, or references to user-created objects.

4. After the report is completed, go to 30.9, "Cleaning up the system after collecting the data" on page 485.

30.3 What to include with the problem report

Include the following items with the problem report:

► All the data saved in the APAR library associated with your problem log entry.

► A program temporary fix (PTF) listing of all the PTFs on the system. See 23.7.2, "Collecting a list of program temporary fixes (PTFs)" on page 300, for more information about collecting a PTF listing.

► A listing of all the PTF Groups on the system. See 23.7.3, "Collecting a list of program temporary fix (PTF) groups" on page 302, for more information about collecting a PTF listing.

► Spooled files collected.

► A detailed description of the sequence of events that lead up to the problem.

► Clear step-by-step instructions necessary to create the problem again.

► All materials necessary to support the instructions so that each step of the instructions can be followed without any error.

► Libraries of saved data.

  If you are sending documentation electronically, see 30.4.4, "Saving libraries to a save file" on page 462.

If you are sending physical media, see 30.7.3, "Saving libraries to tape or DVD" on page 476

► A list of the files contained on the tape, DVD or in a save file and what each file contains.

If you are sending documentation electronically, see 30.4.5, "Collecting a display of the contents of the save file" on page 463.

If you are sending physical media, see 30.7.4, "Collecting a display of the contents of the tape" on page 477 or 30.7.5, "Collecting a display of the contents of a DVD" on page 479. Also refer to "Labeling the tape or DVD" on page 481, for more information about labeling tapes and DVDs.

► System reference code (SRC) data, reported in 1.4, "Using the Problem Summary Form" on page 5, or Chapter 10, "Main storage dumps" on page 169.

► A list of each item you are submitting with the report and an explanation as to why each item is being submitted.

Work with the service provider to determine whether the information collected for the problem is complete and that the problem report is ready to send.

30.4 Packaging document collections for sending electronically

On most occasions, the quality of a document sent electronically is far better than the faxed output from a line printer or laser printer. It is also much quicker than sending documents through a postal or courier service.

In many System i installations, corporate network firewalls prevent the transmission of files directly from the server through the Internet. This section provides steps to transfer small to medium files to a PC, in preparation for sending through e-mail or a service provider's FTP server. The same steps can be used to send the documentation on a CD or DVD attached to a PC.

30.4.1 Transferring a spooled file to a PC using iSeries Navigator

Using iSeries Navigator is the simplest method to transfer a spooled file from the System i server to a PC. This section explains how to use iSeries Navigator to do this.

For the purpose of this exercise and in the example described, communications entries from the Product Activity Log (PAL) are collected and created in a spooled file named QPCSMPRT. Follow these steps:

1. Start iSeries Navigator, and sign on to the system.
2. Select **Basic Operations** → **Printer Output**.
3. Click **QPCSMPRT** under the Output name column, and drag and drop it into a folder on the PC's C: drive or desktop. Repeat this step for any other spooled files to be sent.

An example of the iSeries Navigator display is shown in Figure 30-1 on page 456.
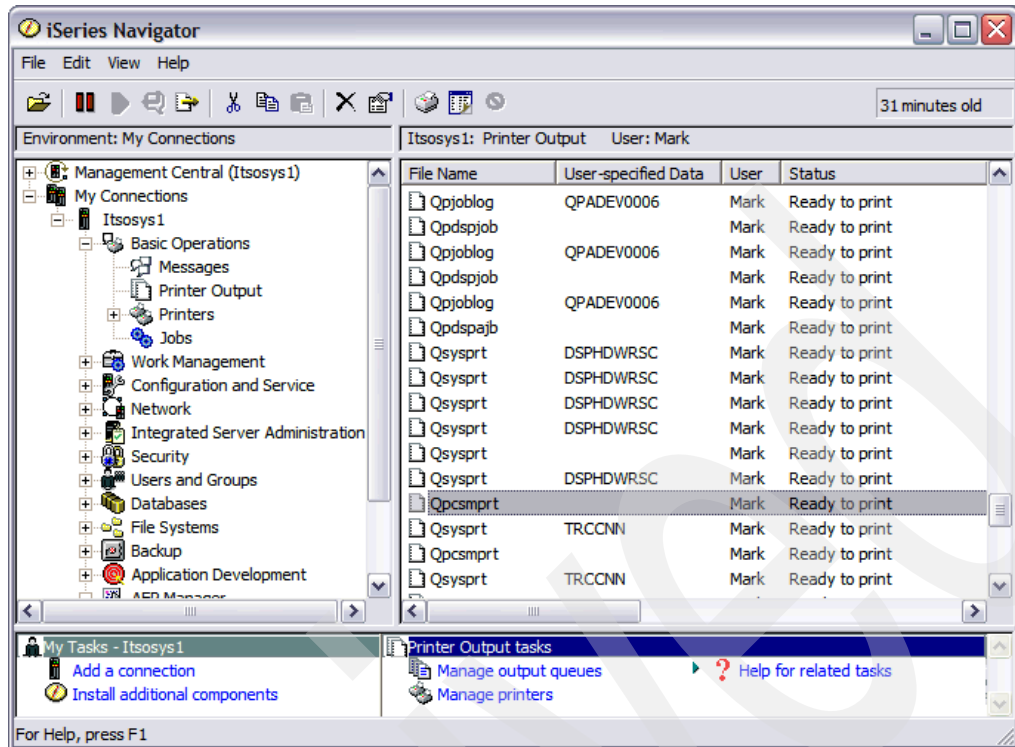
Figure 30-1   Copying a spooled file to a PC using iSeries Navigator

30.4.2 Preparing a spooled file using a physical file

If iSeries Navigator is unavailable, an alternative method of transferring the contents of a spooled file to a PC, is to copy it to a i5/OS physical file then FTP the physical file to a PC.

This section explains how to create the file and populate it with data.

Follow these steps:

1. Create a physical file. The contents of this file is transferred to the PC in a subsequent step:

   `CRTPF FILE(MYLIB/QPCSMPRT) RCDLEN(132)`

2. Type WRKSPLF on the command line, and press Enter. A display appears like the example shown in Figure 30-2 on page 457.

```
Work with All Spooled Files

Type options, press Enter.
  1=Send   2=Change   3=Hold   4=Delete   5=Display   6=Release   7=Messages
  8=Attributes        9=Work with printing status


                              Device or                      Total  Cur
Opt  File        User       Queue           User Data   Sts  Pages  Page Copy
     QPCSMPRT AKA1 QPRINT                    QPADEV003J  RDY  2            1
     QPCSMPRT AKA1 QPRINT                                RDY  1            1
     QPJOBLOG ACA1 QEZJOBLOG                 QPADEV003F  RDY  1            1
     QPJOBLOG ACA1 QEZJOBLOG                             RDY  5            1
     QPJOBLOG MARK QEZJOBLOG                             RDY  26           1
     QPJOBLOG AKA1 QEZJOBLOG                 QPADEV000%  RDY  3            1
     QPJOBLOG ACA1 QEZJOBLOG                             RDY  10           1
     QPCSMPRT ACA1 QPRINT                    DSP01       RDY  1            1
     QPCSMPRT ASA1 QPRINT                    QPADEV003V  RDY  3            1
                                                                    Bottom
Parameters for options 1, 2, 3 or command
===>
F3=Exit   F10=View 2   F11=View 4   F12=Cancel   F22=Printers   F24=More keys
```

Figure 30-2   Work with All Spooled Files display

3. Press F11 twice. The Work with All Spooled Files display appears as shown in Figure 30-3.

```
Work with All Spooled Files

Type options, press Enter.
  1=Send   2=Change   3=Hold   4=Delete   5=Display   6=Release   7=Messages
  8=Attributes        9=Work with printing status


              File
Opt  File        Nbr   Job        User        Number
     QPCSMPRT     12   QPADEV0007 AKA1        004399
     QPCSMPRT     13   QPADEV0007 AKA1        004399
     QPJOBLOG      1   QPADEV0003 ACA1        004413
     QPJOBLOG      1   QPADEV0003 ACA1        004414
     QPJOBLOG      2   QPADEV0008 MARK        004400
     QPJOBLOG      1   QPADEV0007 AKA1        004416
     QPJOBLOG      1   QPADEV0003 ACA1        004415
     QPCSMPRT      1   QPADEV0003 ACA1        004467
     QPCSMPRT     22   QPADEV0006 ASA1        004191
                                                                    Bottom
Parameters for options 1, 2, 3 or command
===>
F3=Exit   F10=View 2   F11=View 4   F12=Cancel   F22=Printers   F24=More keys
```

Figure 30-3   Work with All Spooled Files display

Take note of the file name, job name, user, file number, and job number. This information is required in the next step.

4. On the command line, type CPYSPLF and press the F4 key. The Copy Spooled File (CPYSPLF) display appears as shown in Figure 30-4.

```
Copy Spooled File (CPYSPLF)

 Type choices, press Enter.

Spooled file . . . . . . . . . . > QPCSMPRT      Name
To data base file  . . . . . . . > QPCSMPRT      Name
  Library  . . . . . . . . . . >    MYLIB        Name, *LIBL, *CURLIB
Job name . . . . . . . . . . . > QPADEV0006      Name, *
  User . . . . . . . . . . . . >    ASA1         Name
  Number . . . . . . . . . . . >   004191        000000-999999
Spooled file number  . . . . . > 22              1-999999, *ONLY, *LAST, *ANY
Job system name  . . . . . . . .   *ONLY         Name, *ONLY, *CURRENT, *ANY
Spooled file created:
  Creation date  . . . . . . . .   *ONLY         Date, *ONLY, *LAST
  Creation time  . . . . . . . .                 Time, *ONLY, *LAST
To member  . . . . . . . . . . .   *FIRST        Name, *FIRST
Replace or add records . . . . .   *REPLACE      *REPLACE, *ADD




                                                                   Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F10=Additional parameters   F12=Cancel
 F13=How to use this display       F24=More keys
```

Figure 30-4   Copy Spooled File display

5. Enter the spooled file name, job name, user, and number noted in step 4. Also enter the database file name and library created in step 1. Once the fields are complete, press Enter.

6. You receive a message at the bottom of the screen similar to this one:

   86 records copied to file QPCSMPRT in MYLIB.

> **Tip:** On occasions you might want to preserve some of the spooled file formatting information, such as page breaks and line spacing. This is useful if you are sending a sample report from an application that is not printing as expected. To do this, use the previous steps but specify RCDLEN(133) on the CRTPF command and CTLCHAR(*FCFC) on the CPYSPLF command.

7. Go to 30.4.6, "Transferring a file to a PC using a physical file or save file" on page 464.

30.4.3 Preparing a spooled file using a save file

On some occasions, you might need to preserve all the attributes of a spooled file to be sent. This can be done by saving the spooled files to an i5/OS save file, then FTP it to a PC.

This section explains how to create the save file and populate it with data.

Follow these steps:

1. Create a save file. The contents of this file is transferred to the PC in a subsequent step:

   ```
   CRTSAVF FILE(mylib/save_file)
   ```

2. Create an output queue. The contents of this queue is transferred to the save file in a subsequent step:

   ```
   CRTOUTQ OUTQ(mylib/output_que)
   ```

3. Type WRKSPLF on the command line, and press Enter. A display appears like the example shown in Figure 30-5.

```
 Work with All Spooled Files

 Type options, press Enter.
   1=Send   2=Change   3=Hold   4=Delete   5=Display   6=Release   7=Messages
   8=Attributes        9=Work with printing status


                 File
 Opt  File       Nbr    Job        User        Number
      QPCSMPRT     12   QPADEV0007  ASA1        004399
      QPCSMPRT     13   QPADEV0007  ASA1        004399
      QPJOBLOG      1   QPADEV0003  ACA1        004413
      QPJOBLOG      1   QPADEV0003  ACA1        004414
      QPJOBLOG      2   QPADEV0008  MARK        004400
      QPJOBLOG      1   QPADEV0007  ASA1        004416
      QPJOBLOG      1   QPADEV0003  ACA1        004415
      QPCSMPRT      1   QPADEV0003  ACA1        004467
      QPCSMPRT     22   QPADEV0006  AKA1        004191
                                                                       Bottom
 Parameters for options 1, 2, 3 or command
 ===>
 F3=Exit   F10=View 2   F11=View 4   F12=Cancel   F22=Printers   F24=More keys
```

Figure 30-5   Work with All Spooled Files display

4. Type option 2 (Change) beside each spooled file you want to save and type the name of the output queue on the command line, then press enter. An example is shown in Figure 30-6 on page 460.

```
Work with All Spooled Files

 Type options, press Enter.
   1=Send    2=Change    3=Hold    4=Delete    5=Display    6=Release    7=Messages
   8=Attributes        9=Work with printing status


                                               Last       Spooled
                                               Used       File
 Opt  File        Queue       Library     ASP  Date       Size (K)
  2   QPCSMPRT    QPRINT      QGPL          1  11/06/07        296
      QPCSMPRT    QPRINT      QGPL          1  11/06/07        840
      QPJOBLOG    QEZJOBLOG   QUSRSYS       1  11/06/07         40
  2   QPJOBLOG    QEZJOBLOG   QUSRSYS       1  11/06/07         40
      QPJOBLOG    QEZJOBLOG   QUSRSYS       1  11/06/07        120
      QPJOBLOG    QEZJOBLOG   QUSRSYS       1  11/06/07         72
      QPJOBLOG    QEZJOBLOG   QUSRSYS       1  11/06/07         64
  2   QPCSMPRT    QPRINT      QGPL          1  11/07/06      10312
      QPCSMPRT    QPRINT      QGPL          1  11/07/07         32
                                                                      Bottom
 Parameters for options 1, 2, 3 or command
 ===> OUTQ(mylib/output_que)
 F3=Exit    F10=View 3    F11=View 1    F12=Cancel    F22=Printers    F24=More keys
```

Figure 30-6   Moving spooled files to an output queue

5. On the command line, type SAVOBJ and press the F4 key. The Save Object (SAVOBJ)
   display appears as shown in Figure 30-7.

```
Save Object (SAVOBJ)

 Type choices, press Enter.

 Objects . . . . . . . . . . . .                    Name, generic*, *ALL
               + for more values
 Library . . . . . . . . . . .                      Name, generic*, *USRSPC
               + for more values
 Device . . . . . . . . . . . . .                   Name, *SAVF, *MEDDFN
               + for more values
 Object types . . . . . . . . . .    *ALL           *ALL, *ALRTBL, *BNDDIR...
               + for more values







                                                                      Bottom
 F3=Exit    F4=Prompt    F5=Refresh    F10=Additional parameters    F12=Cancel
 F13=How to use this display        F24=More keys
```

Figure 30-7   SAVOBJ command prompt - 1 of 3

6. Enter the output queue name in the Objects prompt, the library in the Library prompt, *SAVF in the Device prompt and *OUTQ in the Object types prompt. Once the fields are complete, press Enter. An example of the updated display is shown in Figure 30-8.

```
  Save Object (SAVOBJ)

   Type choices, press Enter.

   Objects  . . . . . . . . . . . . > OUTPUT_QUE    Name, generic*, *ALL
                 + for more values
   Library  . . . . . . . . . . . . > MYLIB         Name, generic*, *USRSPC
                 + for more values
   Device . . . . . . . . . . . . . > *SAVF         Name, *SAVF, *MEDDFN
                 + for more values
   Object types . . . . . . . . . . > *OUTQ         *ALL, *ALRTBL, *BNDDIR...
                 + for more values
   Save file  . . . . . . . . . . .               Name
     Library  . . . . . . . . . . .      *LIBL     Name, *LIBL, *CURLIB




                                                                     Bottom
   F3=Exit    F4=Prompt    F5=Refresh    F10=Additional parameters    F12=Cancel
```

Figure 30-8   SAVOBJ command prompt - 2 of 3

7. Enter the save file name in the Save file prompt and the library in the Library prompt, *SAVF in the Device prompt and *OUTQ in the Object types prompt.Once the fields are complete, press F10 (Additional parameters) and scroll down until the Spooled file data prompt is displayed. Type *ALL in the Spooled file data prompt as shown in the example in Figure 30-9 on page 462.

```
Save Object (SAVOBJ)

 Type choices, press Enter.

 Object pre-check . . . . . . . .    *NO            *NO, *YES
 Save active  . . . . . . . . . .    *NO            *NO, *LIB, *SYNCLIB, *SYSDFN
 Save active wait time:
   Object locks . . . . . . . . .    120            0-99999, *NOMAX
   Pending record changes . . . .    *LOCKWAIT      0-99999, *LOCKWAIT...
   Other pending changes  . . . .    *LOCKWAIT      0-99999, *LOCKWAIT, *NOMAX
 Save active message queue  . . .    *NONE          Name, *NONE, *WRKSTN
   Library  . . . . . . . . . . .     *LIBL         Name, *LIBL, *CURLIB
 File member:
   File . . . . . . . . . . . . .    *ALL           Name, *ALL
   Member . . . . . . . . . . . .    *ALL           Name, generic*, *ALL, *NONE
               + for more values
               + for more values
 Save access paths  . . . . . . .    *SYSVAL        *SYSVAL, *NO, *YES
 Save file data . . . . . . . . .    *YES           *YES, *NO
 Spooled file data  . . . . . . .    *all           *NONE, *ALL
                                                                        More...
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 30-9   SAVOBJ command prompt - 3 of 3

8. Press Enter to save the output queue and the spooled files. You receive a message similar to:

   ```
   1 objects saved from library MYLIB.
   ```

9. Go to 30.4.6, "Transferring a file to a PC using a physical file or save file" on page 464.

30.4.4 Saving libraries to a save file

To save libraries to a save file, follow these steps:

1. Create a save file:

   ```
   CRTLIB LIB(ETRxxxxx)
   CRTSAVF FILE(ETRxxxxx/ETRxxxxx)
   ```

   replacing xxxxx with your call record, PMR, ETR or APAR number and press Enter.

   > **Tip:** When saving to a save file, only one library is permitted in a save file. If you have more than one library to save, create additional save files with a suffix, for example ETRxxxxxA, B, and so on.

2. On a command line, type SAVLIB

3. Press F4 (Prompt).

4. Press F9 (All parameters).

5. Type the library name in the Library prompt, *SAVF in the Device prompt, the name of the save file in the Save file prompt and the name of the library the save file resides in, in the Library prompt. In this example, the library name is IBMLIB, and the save file is ETRxxxxx. The display should look like the example in Figure 30-10 on page 463.

```
Save Library (SAVLIB)

 Type choices, press Enter.

 Library  . . . . . . . . . . . .   IBMLIB        Name, generic*, *NONSYS...
              + for more values
 Device . . . . . . . . . . . . .   *SAVF         Name, *SAVF, *MEDDFN
              + for more values
 Volume identifier  . . . . . . .   *MOUNTED
              + for more values
 Sequence number  . . . . . . . .   *END          1-16777215, *END
 Label  . . . . . . . . . . . . .   *LIB
 File expiration date . . . . . .   *PERM         Date, *PERM
 End of media option  . . . . . .   *REWIND       *REWIND, *LEAVE, *UNLOAD
 Starting library . . . . . . . .   *FIRST        Name, *FIRST
 Save file  . . . . . . . . . . .   ETRxxxxx      Name
   Library  . . . . . . . . . . .     ETRxxxxx    Name, *LIBL, *CURLIB
 Media definition . . . . . . . .                 Name
   Library  . . . . . . . . . . .       *LIBL     Name, *LIBL, *CURLIB


                                                                    More...
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 30-10   Save Library display

6. Press the Enter key.

7. The following message should appear indicating that the save is complete:

   ```
   2 objects saved from library IBMLIB.
   ```

   The two objects in this example are the library and the physical file in the library. There can be more objects saved.

   If you have more libraries to save, repeat the steps in this section for each library, otherwise continue with the following section.

30.4.5 Collecting a display of the contents of the save file

To collect a display of the contents of the save file containing the collected data, follow these steps:

1. Enter the following commands to send the spooled file containing the display of the tape to the IBMOUTQ output queue:

   ```
   OVRPRTF FILE(QPSRODSP) OUTQ(IBMLIB/IBMOUTQ)
   ```

2. Type DSPSAVF on a command line.

3. Press F4 (Prompt). The display shown in Figure 30-11 on page 464 appears for tape.

```
Display Save File (DSPSAVF)

Type choices, press Enter.

Save file  . . . . . . . . . . . > ETRxxxxx      Name
  Library  . . . . . . . . . . . >   ETRxxxxx    Name, *LIBL, *CURLIB
Output . . . . . . . . . . . . . > *PRINT        *, *PRINT




                                                                    Bottom
  F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
  F24=More keys
```

Figure 30-11   Display save file

4. In the Save file prompt, type the name of the save file.

5. In the Library prompt, type the name of the library the save file resides in.

6. Change the asterisk (*) in the Output prompt to *PRINT.

7. Press the Enter key. The QPTAPDSP spooled file is created and includes a display of the Saved Object Information.

30.4.6 Transferring a file to a PC using a physical file or save file

With the methods described in the previous sections, the information resides on System i disk storage. To transfer the file to a PC, use either iSeries Access file transfer or File Transfer Protocol (FTP).

To use the FTP method, perform the following steps:

> **Note:** The steps in this section depict how to transfer a file in ASCII format. ASCII format files can be easily read on the destination PC. If the ultimate destination of your file is another System i model, the file should be transferred in BINARY format. This is achieved by substituting the word ASCII for BINARY in step 8., "At the ftp> prompt, type: ascii and press Enter."
>
> You would typically use BINARY for transferring i5/OS save files.

1. Open a DOS prompt from Windows. Type:

   ftp

   Press Enter.

The prompt should now look like this:

```
ftp>
```

2. Type open and press Enter.

   The next line displays to.

3. Type the IP address or name of the system, and press Enter.

4. Three lines appear similar to the following examples:

```
Connected to ITSOSYS1.
220-QTCP at ip-address.
220 Connection will close if idle more than 5 minutes.
User (ITSOSYS1:(none)):
```

5. On the next line, type your user name, and press Enter.

6. You are then prompted for your password. Type your password, and press Enter.

7. The next line informs you that the logon was successful.

8. At the ftp> prompt, type: ascii and press Enter.

9. At the next ftp> prompt, type get MYLIB/QPCSMPRT and press Enter.

10. The next four lines inform you that the transfer is taking place:

```
200 PORT subcommand request successful.
150 Retrieving member QPCSMPRT in file QPCSMPRT in library MYLIB.
226 File transfer completed successfully.
ftp: 9539296 bytes received in 1.05Seconds 9076.40Kbytes/sec.
```

11. At the last ftp> prompt, type: bye. Press Enter.

    Figure 30-12 shows the sequence of events in the FTP process as it would appear on the DOS session.

```
C:\>ftp
ftp> open
To itsosys1
Connected to ITSOSYS1.
220-QTCP at 199.169.9.099.
220 Connection will close if idle more than 5 minutes.
User (ITSOSYS1:(none)): aca1
331 Enter password.
Password:
230 ACA1 logged on.
ftp> ascii
200 Representation type is ASCII nonprint.
ftp> get mylib/qpcsmprt
200 PORT subcommand request successful.
150 Retrieving member QPCSMPRT in file QPCSMPRT in library MYLIB.
226 File transfer completed successfully.
ftp: 9539296 bytes received in 1.05Seconds 9076.40Kbytes/sec.
ftp> bye
221 QUIT subcommand received.

C:\>
```

Figure 30-12   DOS screen session

At the `c:\>` prompt, type: `dir` filename. This lists the file that is to be attached to the e-mail to be sent to your service provider.

30.5 Sending the problem report and documentation by e-mail

E-mail is often the simplest method to send documentation electronically. However many corporate e-mail services limit the maximum size of an e-mail and prevents larger e-mails being sent. If that occurs, consider using a FTP server instead.

> **Note:** We recommend that you discuss any issues or problems with your service provider before sending any files through e-mail. You might be experiencing a known issue that can easily be resolved by a support representative without sending any information electronically.

To e-mail the documentation, follow these steps:

1. Use a data compression or 'zip' utility to create a single binary file containing all of the data that needs to be sent. Use the Problem Management Reference (PMR), Electronic Technical Response (ETR), APAR or your service provider's call record number associated with this problem report as the name of the compressed file.

2. Send the compressed file using e-mail. Contact your service provider and obtain their e-mail address. Then attach the file to a note and then send it to their e-mail address. Include the PMR, ETR, APAR all call record number in the subject line of your e-mail.

3. After the e-mail has been sent, go to 30.9, "Cleaning up the system after collecting the data" on page 485.

30.6 Sending the problem report and documentation through FTP server

When the size of the file to be sent exceeds the limit set by the corporate e-mail service, other methods of transferring the file are required.

IBM provides a server called testcase for customers to send large files to IBM. Other service providers might also provide access to a FTP server. This section describes how to FTP documentation to IBM's server. For other service provider's FTP servers, contact the service provider for instructions.

> **Note:** It is highly recommended to discuss any issues or problems with a representative of the IBM Rochester Support Center before sending any files through the Testcase FTP site. You might be experiencing a known issue that can easily be resolved by a support representative without sending any information electronically. In addition, the Testcase FTP site is not monitored by anyone. Therefore, sending files directly to this FTP does not constitute opening a call record.

To FTP the documentation, follow these steps:

1. Use a data compression or 'zip' utility to create a single binary file containing all of the data that needs to be sent. Use the Problem Management Reference (PMR), Electronic Technical Response (ETR), APAR or your service provider's call record number associated with this problem report as the name of the compressed file.

2. If you have a FTP program, use it to upload the file in binary format to testcase.boulder.ibm.com in folder as400/toibm and login using the "anonymous" user ID and your e-mail address as the password.

3. If you do not have a FTP program, open a DOS prompt from Windows. Type:

   `ftp testcase.boulder.ibm.com`

   Press Enter.

4. The prompt for the user name appears. On the next line, type the user name **anonymous** and press Enter.

5. You are then prompted for your password. Type your e-mail address as your password, and press Enter.

6. At the ftp> prompt, type the following command to change directories:

   `cd as400/toibm`

   and press Enter.

7. At the next `ftp>` prompt, type the following command to create a directory for your upload:

   `mkdir PMRxxxxx`

   replacing xxxxx with your call record, PMR, ETR or APAR number and press Enter.

8. At the next `ftp>` prompt, type the following command to change directories to your upload directory:

   `cd PMRxxxxx`

   and press Enter.

9. At the next `ftp>` prompt, type the following command to change the upload type to binary:

   `bin`

   and press Enter.

10. At the next `ftp>` prompt, type the following command to upload the file to the FTP server:

    `put 12345987.ZIP`

    and press Enter.

11. At the next `ftp>` prompt, type the following command to exit FTP:

    `quit`

    and press Enter.

    Figure 30-13 on page 468 shows the sequence of events in the FTP process as it would appear on the DOS session.

```
C:\>ftp testcase.boulder.ibm.com
Connected to testcase.boulder.ibm.com.
220-IBM's internal systems must only be used for conducting IBM's
220-business or for purposes authorized by IBM management.
220-
220-Use is subject to audit at any time by IBM management.
220-
220-Please read /README.privacy for information concerning the
220-privacy of your data.
220-
220 testcase-yellow secure FTP server ready.
User (testcase.boulder.ibm.com:(none)): anonymous
331 Guest login ok, send your e-mail address as password.
Password:
230 Virtual user vftp logged in.
ftp> cd as400/toibm
250 CWD command successful.
ftp> mkdir PMRxxxxx
257 MKD command successful.
ftp> cd PMRxxxxx
250 CWD command successful.
ftp> bin
200 Type set to I.
ftp> put 1234567.zip
200 PORT command successful.
150 Opening BINARY mode data connection for 1234567.zip.
226 Transfer complete.
ftp: 11 bytes sent in 0.00Seconds 11000.00Kbytes/sec.
ftp> quit
221 Goodbye.
```

Figure 30-13   DOS screen session - FTP to testcase

12. Once the file has been successfully sent or uploaded, notify your service provider so they know to expect it.

13. After the upload has completed, go to 30.9, "Cleaning up the system after collecting the data" on page 485.

The testcase.boulder.ibm.com FTP site can also be accessed through a browser at: ftp://testcase.boulder.ibm.com/ or https://testcase.boulder.ibm.com/.

Service providers can set up an account with Software Delivery and Fulfilment (SDF) to enable them to receive and exchange files, traces, dumps, and so on with their customers, through the same server.

For further information, service providers need to obtain access to the SDF server Web site at:

http://w3sms.boulder.ibm.com/w3sms.nsf/c00134a213f178748725642e007fcce3/cbbe0d0393 34ebf5872564cd0071d123?OpenDocument

Note: IBM provides an alternative FTP site named the IBM Enhanced Customer Data Repository Service (ECuRep). For more information on this server, go to the ECuRep site at: http://www-5.ibm.com/de/support/ecurep.

Instructions for the use of this server are located at the site.

30.7 Sending the problem report and documentation by post or courier

This section discusses sending the problem report and documentation by post or courier

30.7.1 Saving your APAR library

If you saved APAR data from the Save APAR Data display or SAVAPARDTA command described in Chapter 1, "Problem determination overview" on page 3, an APAR library exists. To save the APAR library, see the *Save APAR library* menu option, which is discussed in 7.6, "Using other APAR data options in the problem log" on page 148. If you ran service tools or collected other data to accompany your APAR and did not save the spooled files in the APAR library, return to 30.3, "What to include with the problem report" on page 454.

30.7.2 Printing spooled files

The data collection procedures in this book instruct you to move spooled files to the IBMOUTQ output queue. Or you can override the print files using the Override Print File (OVRPRTF) command, which forces the spooled files created for your job to go to the IBMOUTQ output queue in the IBMLIB library.

Printing spooled files that are ten pages or less

Follow these steps to save and print spooled files that are about 10 pages or less:

1. If you are at the Work with Output Queue display, continue with the next step. Otherwise, enter the following command:

   ```
   WRKOUTQ OUTQ(IBMLIB/IBMOUTQ)
   ```

2. Type 6 in the Opt column next to each spooled file that you want to print.

3. Press F5 (Refresh) to refresh the Sts column. The Sts column should be RDY.

4. Enter the following command to start the print writer:

   ```
   STRPRTWTR WTR(printer) OUTQ(IBMLIB/IBMOUTQ)
             AUTOEND(*NO)
   ```

   Replace *printer* with the printer name, for example, PRT01.

   The printer should start printing. All spooled files that have the status of RDY can print.

5. If there is a problem printing the output, go to 30.8, "Why the spooled file is not printing" on page 482. Otherwise, collect the printed output, and label it with the problem or APAR number.

6. Perform one of the following tasks:

   – If you have been directed by the service provider to print selected pages of a spooled file, go to "Printing selected pages of a large spooled file" on page 470, to print the pages.

   – If no other spooled file needs to be saved or printed, go to 30.7.3, "Saving libraries to tape or DVD" on page 476, to save the IBMLIB library to tape or DVD.

See 30.5, "Sending the problem report and documentation by e-mail" on page 466, for more information about what to send.

Printing selected pages of a large spooled file

The following procedure shows how to print some of the pages of a very large spooled file. Use this procedure only as instructed by the service provider.

To print some of the pages in a large spooled file, complete these steps:

1. If you are at the Work with Output Queue display, continue with the next step. Otherwise, enter the following command to display all the spooled files that were sent to the IBMOUTQ output queue:

   WRKOUTQ OUTQ(IBMLIB/IBMOUTQ)

   For example, the display shown in Figure 30-14 appears.

```
Work with Output Queue

 Queue:   IBMOUTQ        Library:   IBMLIB         Status:   RLS

 Type options, press Enter.
   1=Send   2=Change   3=Hold   4=Delete   5=Display   6=Release   7=Messages
   8=Attributes        9=Work with printing status

 Opt  File         User        User Data   Sts   Pages   Copies  Form Type   Pty
      QCSTDSPCLU   MARK                     RDY       3       1   *STD          5
      QPDSPLOG     MARK        0630551569   RDY       1       1   *STD          5
      QPDSPJOB     ACA1                     RDY      12       1   *STD          5
      QSYSPRT      MARK                     HLD      47       1   *STD          5
      QPDCDEVA     AKA1                     HLD       2       1   *STD          5
      QPDSPAJB     AKA1                     HLD       4       1   *STD          5
      QPCSMPRT     MARK                     HLD    1272       1   *STD          5
      QSYSPRT      ACA1                     HLD      47       1   *STD          5
      QSYSPRT      ACA1                     HLD      47       1   *STD          5
                                                                       More...
 Parameters for options 1, 2, 3 or command
 ===>
 F3=Exit   F11=View 2   F12=Cancel   F20=Writers   F22=Printers
 F24=More keys
```

Figure 30-14   Work with Output Queue display

2. If "More..." appears on the display, page forward or backward to find the spooled file you want to print.

3. If the spooled file does not show RDY in the Sts column, type 6 in the Opt column next to the spooled file you want to print.

4. Press F5 (Refresh) to refresh the Sts column and confirm a status of RDY (ready).

5. Type 8 in the Opt column next to the file you want to print. See the example in Figure 30-15 on page 471.

```
Work with Output Queue

 Queue:  IBMOUTQ        Library:  IBMLIB          Status:  RLS

 Type options, press Enter.
   1=Send   2=Change   3=Hold   4=Delete   5=Display   6=Release   7=Messages
   8=Attributes        9=Work with printing status

 Opt  File        User        User Data   Sts   Pages   Copies  Form Type   Pty
      QPJOBLOG    ACA1        QPADEV0003  HLD       2       1    *STD         5
      QSYSPRT     ACA1                    HLD      47       1    *STD         5
      QSYSPRT     ACA1                    HLD      47       1    *STD         5
      QSYSPRT     ACA1                    HLD      47       1    *STD         5
   8  QPCSMPRT    ACA1                    HLD    1272       1    *STD         5




                                                                        Bottom
 Parameters for options 1, 2, 3 or command
 ===>
 F3=Exit   F11=View 2   F12=Cancel   F20=Writers   F22=Printers
 F24=More keys
```

Figure 30-15   Work with Output Queue display

1. Press the Enter key. For example, the display shown in Figure 30-16 appears.

```
 Work with Spooled File Attributes

 Job  . . . . . . . . :  QPADEV0002      File . . . . . . . . :  QPCSMPRT
   User . . . . . . . :    ACA1            Number . . . . . . :    000054
   Number . . . . . . :    004094        Creation date  . . . :  11/03/07
 Job system name  . . :  A105GG8M        Creation time  . . . :  10:43:24

 Status . . . . . . . . . . . . . . . :  HELD
 Output queue . . . . . . . . . . . . :  IBMOUTQ
   Library  . . . . . . . . . . . . . :    IBMLIB
 ASP file resides on  . . . . . . . . :  1
 Form type  . . . . . . . . . . . . . :  *STD
 Output priority  . . . . . . . . . . :  5
 Copies left to produce . . . . . . . :  1
 Total copies . . . . . . . . . . . . :  1
 Maximum records  . . . . . . . . . . :  *NOMAX
 Number of separators . . . . . . . . :  0
 File becomes available . . . . . . . :  *FILEEND
 Hold file before written . . . . . . :  *YES
                                                                        More...
 Press Enter to continue.

 F3=Exit   F5=Refresh   F12=Cancel   F13=Change
```

Figure 30-16   Work with Spooled File Attributes display

2. Record the job, user, number, file, and file number from the header of the Work with Spooled File Attributes display.

3. Press F12 (Cancel) to return to the Work with Output Queue display.

4. Type 2 in the Opt column next to the spooled file. For example, the display shown in Figure 30-17 appears.

```
 Change Spooled File Attributes (CHGSPLFA)

  Type choices, press Enter.

  Spooled file . . . . . . . . . . > QPCSMPRT      Name, *SELECT
  Job name . . . . . . . . . . . . > QPADEV0002    Name, *
    User . . . . . . . . . . . . . >   AKA1        Name
    Number . . . . . . . . . . . . >   004094      000000-999999
  Spooled file number  . . . . . . > 54            1-999999, *ONLY, *LAST, *ANY
  Job system name  . . . . . . . . > A105GG8M      Name, *ONLY, *CURRENT, *ANY
  Spooled file created:
    Creation date  . . . . . . . . > 11032007      Date, *ONLY, *LAST
    Creation time  . . . . . . . . > 104324        Time, *ONLY, *LAST
  Printer  . . . . . . . . . . . .   *OUTQ         Name, *SAME, *OUTQ
  Print sequence . . . . . . . . .   *SAME         *SAME, *NEXT
  Form type  . . . . . . . . . . .   *STD          Form type, *SAME, *STD
  Copies . . . . . . . . . . . . .   1             1-255, *SAME
  Restart printing . . . . . . . .   *STRPAGE      Number, *SAME, *STRPAGE...



                                                                       More...
  F3=Exit   F4=Prompt   F5=Refresh   F10=Additional parameters   F12=Cancel
  F13=How to use this display        F24=More keys
```

Figure 30-17   Change Spooled File Attributes display (Part 1 of 2)

5. Press F10 (Additional parameters) to display more parameters.

6. Page forward to see the Page range to print prompts. The display shown in Figure 30-18 on page 473 appears.

```
Change Spooled File Attributes (CHGSPLFA)

 Type choices, press Enter.



                         Additional Parameters

Output queue . . . . . . . . . .   IBMOUTQ       Name, *SAME, *DEV
  Library  . . . . . . . . . . .    IBMLIB       Name, *LIBL, *CURLIB
File separators  . . . . . . . .   0             0-9, *SAME
Page range to print:
  Starting page  . . . . . . . .   1             Number, *SAME, *ENDPAGE
  Ending page  . . . . . . . . .   *END          Number, *SAME, *END
File becomes available . . . . .   *FILEEND      *SAME, *JOBEND, *FILEEND...
Save file  . . . . . . . . . . .   *NO           *SAME, *NO, *YES, *IMMED
Expiration date for file . . . .   *NONE         Date, *SAME, *NONE, *DAYS
Days until file expires  . . . .                 1-366
Output priority  . . . . . . . .   5             1-9, *SAME, *JOB
User data  . . . . . . . . . . .   '          '  User data, *SAME
Align page . . . . . . . . . . .   *NO           *SAME, *NO, *YES
                                                                More...
F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
F24=More keys
```

Figure 30-18   Change Spooled File Attributes display (Part 2 of 2)

7. Type the starting page number for the Starting page prompt. Type the ending page number in the Ending page prompt. The defaults cause all of the pages from page one onward to print.

8. Press F12 (Cancel) to return to the Work with Output Queue display.

9. Enter the following command to start the writer:

   STRPRTWTR

10. Press F4 (Prompt). The display shown in Figure 30-19 on page 474 appears.

```
Start Printer Writer (STRPRTWTR)

 Type choices, press Enter.

 Printer  . . . . . . . . . . . .              Name, *ALL, *SYSVAL
 Output queue . . . . . . . . . .    *DEV      Name, *DEV
   Library  . . . . . . . . . . .              Name, *LIBL, *CURLIB
 Queue for writer messages  . . .    *DEVD     Name, *DEVD, *REQUESTER
   Library  . . . . . . . . . . .              Name, *LIBL, *CURLIB
 Form type options:
   Form type  . . . . . . . . . .    *ALL      Form type, *ALL, *STD, *FORMS
   Message option . . . . . . . .    *INQMSG   *INQMSG, *MSG, *NOMSG...
 File separators  . . . . . . . .    *FILE     0-9, *FILE
 Drawer for separators  . . . . .    *DEVD     1-255, *DEVD, *FILE




                                                                    Bottom
 F3=Exit    F4=Prompt   F5=Refresh   F10=Additional parameters   F12=Cancel
 F13=How to use this display        F24=More keys
```

Figure 30-19 Start Printer Writer display (Part 1 of 3)

11. Type the name of the printer. PRT01 is the name of the printer used in this example. Do not press the Enter key.

12. Press the F10 key. The display shown in Figure 30-20 on page 475 appears.

```
Start Printer Writer (STRPRTWTR)

 Type choices, press Enter.

 Printer  . . . . . . . . . . . .   PRT01           Name, *ALL, *SYSVAL
 Output queue . . . . . . . . . .   *DEV            Name, *DEV
   Library  . . . . . . . . . . .                   Name, *LIBL, *CURLIB
 Queue for writer messages  . . .   *DEVD           Name, *DEVD, *REQUESTER
   Library  . . . . . . . . . .                     Name, *LIBL, *CURLIB
 Form type options:
   Form type  . . . . . . . . . .   *ALL            Form type, *ALL, *STD, *FORMS
   Message option . . . . . . . .   *INQMSG         *INQMSG, *MSG, *NOMSG...
 File separators  . . . . . . . .   *FILE           0-9, *FILE
 Drawer for separators  . . . . .   *DEVD           1-255, *DEVD, *FILE




                                                                    Bottom
 F3=Exit    F4=Prompt    F5=Refresh    F10=Additional parameters    F12=Cancel
 F13=How to use this display        F24=More keys
```

Figure 30-20   Start Printer Writer display (Part 2 of 3)

13. Press F10 and then Page forward. The display shown in Figure 30-21 appears.

```
 Start Printer Writer (STRPRTWTR)

 Type choices, press Enter.

 Auto-end options:
   Automatically end writer . . .   *NO             *NO, *YES
   If yes, when to end  . . . . .   *NORDYF         *NORDYF, *FILEEND
 Allow direct print . . . . . . .   *NO             *NO, *YES
 Align page . . . . . . . . . . .   *WTR            *FILE, *WTR, *FIRST
 Initialize printer . . . . . . .   *WTR            *WTR, *FIRST, *ALL
 Spooled file . . . . . . . . . .   QPCSMPRT        Name, *NONE, *LAST
 Job name . . . . . . . . . . . .   QPADEV0002      Name, *
   User . . . . . . . . . . . . .     AKA1          Name
   Number . . . . . . . . . . . .     004094        000000-999999
 Spooled file number  . . . . . .   54              1-999999, *ONLY, *LAST, *ANY
 Job system name  . . . . . . . .   *ONLY           Name, *ONLY, *CURRENT, *ANY
 Spooled file created:
   Creation date  . . . . . . . .   *ONLY           Date, *ONLY, *LAST
   Creation time  . . . . . . . .                   Time, *ONLY, *LAST
 Starting page  . . . . . . . . .   *BEGIN          Number, *BEGIN
                                                                    Bottom
 F3=Exit    F4=Prompt    F5=Refresh    F12=Cancel    F13=How to use this display
 F24=More keys
```

Figure 30-21   Start Printer Writer display (Part 3 of 3)

14. Type the file in the Spooled file prompt, the job in the Job name prompt, the user in the User prompt, the number in the Number prompt, and the file number in the Spooled file number prompt from the information recorded from the Work with Spooled File Attribute display (Figure 30-18 on page 473).

15. Press the Enter key. Printing starts on the page you specified.

16. Enter the following command to end the writer after the file is printed:

    ENDWTR WTR(printer-name) OPTION(*IMMED)

    Replace *printer-name* with the printer name, for example, PRT01.

17. Perform one of the following actions:

    – Collect the printed output, and label it with the problem or APAR number.

    – If no other spooled file needs to be saved or printed, go to the following section to save the library IBMLIB to tape or DVD.

30.7.3 Saving libraries to tape or DVD

To save libraries to a tape or DVD, follow these steps:

1. Load a new tape or DVD.

2. On a command line, type SAVLIB

3. Press F4 (Prompt).

4. Press F9 (All parameters).

5. Type the library name and the device used for the save. In this example, the library name is IBMLIB, and the tape device is TAP01. The display should look like the example in Figure 30-22.

```
Save Library (SAVLIB)

 Type choices, press Enter.

 Library  . . . . . . . . . . .      IBMLIB         Name, generic*, *NONSYS...
              + for more values
 Device . . . . . . . . . . . .      TAP01          Name, *SAVF, *MEDDFN
              + for more values
 Volume identifier  . . . . . .      *MOUNTED
              + for more values
 Sequence number  . . . . . . .      *END           1-16777215, *END
 Label  . . . . . . . . . . . .      *LIB
 File expiration date . . . . .      *PERM          Date, *PERM
 End of media option  . . . . .      *REWIND        *REWIND, *LEAVE, *UNLOAD
 Starting library . . . . . . .      *FIRST         Name, *FIRST
 Save file  . . . . . . . . . .                     Name
   Library  . . . . . . . . . .       *LIBL         Name, *LIBL, *CURLIB
 Media definition . . . . . . .                     Name
   Library  . . . . . . . . . .       *LIBL         Name, *LIBL, *CURLIB


                                                                      More...
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 30-22 Save Library display

6. Press the Enter key.

7. Press the System Request key if the following message appears at the bottom of the display. Otherwise, go to step 10.

   ```
   Waiting for reply to message on message queue QSYSOPR.
   ```

8. Select option 6 (Display the System Operator Messages) on the System Request Menu to display the system operator messages. For example, the display in Figure 30-23 can appear if the user's assistance level is set to intermediate.

```
 Display Messages
                                                    System: ITSOSYS1
Queue . . . . . :   QSYSOPR              Program . . . . :    *DSPMSG
  Library . . . :     QSYS                 Library . . . :
Severity  . . . :   00                   Delivery  . . . :    *HOLD


Type reply (if required), press Enter.
   Cleanup has started.
   Cleanup of operator and work station messages started.
   Cleanup of user messages started.
   Cleanup of job logs and other system output started.
   User cleanup program started.
   User cleanup program successfully completed.
   Cleanup of operator and work station messages successfully completed.
   000007 of 000053 messages deleted from QPGMR.
   000004 of 000045 messages deleted from QTCP.
   Cleanup of user messages successfully completed.
   Cleanup of job logs and other system output successfully completed.
  Active file found on this volume (C I R).
    Reply . . .

Bottom
F3=Exit              F11=Remove a message              F12=Cancel
 F13=Remove all        F16=Remove all except unanswered    F24=More keys
```

Figure 30-23   Display Messages display

9. Reply to the message, and press the Enter key.

10. The following message should appear indicating that the save is complete:

    ```
    2 objects saved from library IBMLIB.
    ```

    The two objects in this example are the library and the physical file in the library. There can be more objects saved.

11. Continue with the following section or with 30.7.5, "Collecting a display of the contents of a DVD" on page 479.

30.7.4 Collecting a display of the contents of the tape

To collect a display of the contents of the tape containing the collected data, follow these steps:

1. Load a tape with the collected data.

2. Enter the following commands to send the spooled file containing the display of the tape to the IBMOUTQ output queue:

```
OVRPRTF FILE(QPTAPDSP) OUTQ(IBMLIB/IBMOUTQ)
OVRPRTF FILE(QPSRODSP) OUTQ(IBMLIB/IBMOUTQ)
```

3. Type DSPTAP on a command line.

4. Press F4 (Prompt). The display shown in Figure 30-24 appears for tape.

```
Display Tape (DSPTAP)

 Type choices, press Enter.

 Device . . . . . . . . . . . . .                Name
 Volume identifier  . . . . . . .   *MOUNTED     Character value, *MOUNTED
 File label . . . . . . . . . . .   *ALL
 Sequence number:
   Starting file sequence number    *FIRST       1-16777215, *ALL, *FIRST
   Ending file sequence number  .   *LAST        1-16777215, *ONLY, *LAST
 Data type  . . . . . . . . . . .   *LABELS       *LABELS, *SAVRST
 Output . . . . . . . . . . . . .   *             *, *PRINT, *OUTFILE
 End of tape option . . . . . . .   *REWIND       *REWIND, *UNLOAD




                                                                    Bottom
 F3=Exit    F4=Prompt    F5=Refresh    F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 30-24   Display Tape (Part 1 of 2)

5. In the Tape device prompt, type the name of the tape device.

6. Change the asterisk (*) in the Output prompt to *PRINT.

7. Press the Enter key. The QPTAPDSP spooled file is created and includes a display of the tape labels.

8. Type DSPTAP on a command line again.

9. Press F4 (Prompt). The display shown in Figure 30-25 on page 479 appears for tape.

```
Display Tape (DSPTAP)

 Type choices, press Enter.

 Device . . . . . . . . . . . . .                  Name
 Volume identifier  . . . . . . .   *MOUNTED       Character value, *MOUNTED
 File label . . . . . . . . . . .   *ALL
 Sequence number:
   Starting file sequence number   *FIRST          1-16777215, *ALL, *FIRST
   Ending file sequence number  .   *LAST          1-16777215, *ONLY, *LAST
 Data type  . . . . . . . . . . .   *LABELS        *LABELS, *SAVRST
 Output . . . . . . . . . . . . .   *              *, *PRINT, *OUTFILE
 End of tape option . . . . . . .   *REWIND        *REWIND, *UNLOAD




                                                                    Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 30-25 Display Tape (Part 2 of 2)

10. In the Tape device prompt, type the name of the tape device.

11. Change *LABELS to *SAVRST in the Data type prompt.

12. Change the asterisk (*) in the Output prompt to *PRINT.

13. Press the Enter key. The QPSRODSP spooled file is created and includes a display of the tape.

14. Remove the tape from the tape unit.

15. Go to "Labeling the tape or DVD" on page 481, to print the files.

30.7.5 Collecting a display of the contents of a DVD

To collect a display of the contents of the DVD containing the collected data, complete these steps:

1. Load a DVD with the saved data.

2. Enter the following commands to send the spooled files containing the display of the DVD to the IBMOUTQ output queue:

   ```
   OVRPRTF FILE(QSYSPRT) OUTQ(IBMLIB/IBMOUTQ)
   OVRPRTF FILE(QPSRODSP) OUTQ(IBMLIB/IBMOUTQ)
   ```

3. On a command line, type: DSPOPT

4. Press F4 (Prompt) then F9 (All parameters). The display shown in Figure 30-26 on page 480 appears for a DVD.

```
Display Optical (DSPOPT)

 Type choices, press Enter.

 Volume identifier  . . . . . . .
 Optical device . . . . . . . . .    *ALL           Name, *ALL
 Data type  . . . . . . . . . . .    *VOLATR        *VOLATR, *SAVRST, *FILATR...
 Output . . . . . . . . . . . . .    *              *, *PRINT, *OUTFILE, *USRSPC
 Path . . . . . . . . . . . . . .


 User space . . . . . . . . . . .                   Name
   Library  . . . . . . . . . . .    *LIBL          Name, *LIBL, *CURLIB
 Replace user space . . . . . . .    *YES           *YES, *NO
 File to receive output . . . . .                   Name
   Library  . . . . . . . . . . .    *LIBL          Name, *LIBL, *CURLIB
 Output member options:
   Member to receive output . . .    *FIRST         Name, *FIRST
   Replace or add records . . . .    *REPLACE       *REPLACE, *ADD
                                                                        Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 30-26   Display DVD (Part 1 of 2)

5. In the Volume identifier prompt, type *MOUNTED.

6. In the Optical device prompt, type the name of the DVD unit.

7. Change *VOLATR to *FILEATR in the Data type prompt.

8. Change the asterisk (*) in the Output prompt to *PRINT.

9. In the Path prompt, type *ALL.

10. Press the Enter key. The spooled file QSYSPRT is created containing a display of the DVD.

11. Type DSPDKT on a command line again.

12. Press F4 (Prompt) then F9 (All parameters). The display shown in Figure 30-27 on page 481 appears for a DVD.

```
Display Optical (DSPOPT)

 Type choices, press Enter.

 Volume identifier  . . . . . . .
 Optical device . . . . . . . . .    *ALL          Name, *ALL
 Data type  . . . . . . . . . . .    *VOLATR       *VOLATR, *SAVRST, *FILATR...
 Output . . . . . . . . . . . . .    *             *, *PRINT, *OUTFILE, *USRSPC
 Path . . . . . . . . . . . . . .



 User space . . . . . . . . . . .                  Name
   Library  . . . . . . . . . . .    *LIBL         Name, *LIBL, *CURLIB
 Replace user space . . . . . . .    *YES          *YES, *NO
 File to receive output . . . . .                  Name
   Library  . . . . . . . . . . .    *LIBL         Name, *LIBL, *CURLIB
 Output member options:
   Member to receive output . . .    *FIRST        Name, *FIRST
   Replace or add records . . . .    *REPLACE      *REPLACE, *ADD
                                                                       Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 30-27   Display DVD (Part 2 of 2)

13. In the Volume identifier prompt, type *MOUNTED.

14. In the Optical device prompt, type the name of the DVD unit.

15. Change *VOLATR to *SAVRST in the Data type prompt.

16. Change the asterisk (*) in the Output prompt to *PRINT.

17. In the Path prompt, type *ALL.

18. Press the Enter key. The QPSRODSP spooled file is created containing a display of the DVD.

19. Remove the DVD from the DVD drive.

20. Go to the following section.

Labeling the tape or DVD

To label the tapes or DVDs, complete the following steps:

1. Enter the following command to print the display of the contents of the tape or DVD:

   STRPRTWTR WTR(printer-device) OUTQ(IBMLIB/IBMOUTQ)

   Replace *printer-device* with the printer name, for example, PRT01.

2. The printer starts, and all spooled files print.

3. If there is a problem printing the output, go to 30.8, "Why the spooled file is not printing" on page 482. Otherwise, continue with the next step.

4. Write on the label of each tape or DVD the number and order of the tapes and DVDs. Use, for example, 1 of 5, 2 of 5, ... 5 of 5, etc. if there is more than one tape or DVD.

5. Write on the printed output the tape or DVD number.

6. Write the APAR or problem number on the printed output.

7. Package the printout with the tape or DVD.

8. Go to 30.7.4, "Collecting a display of the contents of the tape" on page 477, to repeat the procedure for each tape you are submitting with the problem report.

9. If you have everything you need for the problem report, go to 30.9, "Cleaning up the system after collecting the data" on page 485. Otherwise, go to 30.5, "Sending the problem report and documentation by e-mail" on page 466, for more information about what to send.

30.7.6 Packaging and sending your documentation

To send your documentation, follow these steps:

1. Add the PMR, ETR, APAR or call reference number to the outside of the package or envelope.

2. Mail the report and all related information and materials to your service provider.

30.8 Why the spooled file is not printing

To determine why the spooled file report is not printing, follow these steps:

1. Enter the following command to check the printer writer:

   WRKWTR *ALL

   The display shown in Figure 30-28 appears.

```
 Work with All Writers


  Type options, press Enter.
    2=Change    3=Hold    4=End    5=Work with    6=Release    7=Display messages
    8=Work with output queue


 Opt   Writer      Type  Device      Queue        Library    Status  Form Type
       PRT01       PRT   PRT01       IBMOUTQ      IBMLIB     STR     *ALL
```


```












                                                                        Bottom
  Parameters for options 2, 3, 4, 6 or command
  ===>
  F3=Exit    F4=Prompt    F12=Cancel    F22=Start printer writer    F24=More keys
```

Figure 30-28   Work with All Writers display

2. If "More..." appears on the display, page forward to continue searching for the writer in question.

3. Follow the instructions in Table 30-1 if the status is not STR (start). Otherwise, continue with the next step.

Table 30-1   Instructions when status is not STR

If status is:	Do the following:
END	Wait for the writer to end completely, and then enter the command: STRPRTWTR WTR(writer) OUTQ(IBMLIB/IBMOUTQ) AUTOEND(*NO)
JOBQ	Enter the command: RLSJOBQ JOBQ(QSPL)
HLD	Type 6 in the Opt column, next to the writer, to release the writer. Press the Enter key.
MSGW	Type 7 in the Opt column next to the writer, and reply to the messages. After you reply to the messages, press F5 (Refresh) to refresh the Sts column. The status should change to STR. If the status does not change, see your service provider for more help.

4. Type 5 in the Opt column next to the writer if the writer is in the list, the status is STR, and the writer is still not printing.

5. Press the Enter key. The display shown in Figure 30-29 appears.

```
Work with Printer Writer

 Writer . . . . . . . :    PRT01            User . . . . . . . . :    QSPLJOB
 Number . . . . . . . :    004522


 Started by user . . . . . . . . . . . :    QTCP
 Status:
   Writing  . . . . . . . . . . . . . . :    N
   Waiting on message . . . . . . . . . :    N
   Held . . . . . . . . . . . . . . . . :    N
   End pending  . . . . . . . . . . . . :    N
   Hold pending . . . . . . . . . . . . :    N
   Between files  . . . . . . . . . . . :    Y
   Between copies . . . . . . . . . . . :    N
   Waiting for data . . . . . . . . . . :    N
   Waiting for device . . . . . . . . . :    N
   On job queue . . . . . . . . . . . . :    N

                                                                      More...
 Press Enter to continue.


 F3=Exit     F5=Refresh    F6=Messages    F10=Release    F11=Hold    F12=Cancel
 F14=Queue   F24=More keys
```

Figure 30-29   Work with Printer Writer display

6. Check the Between files prompt.

7. Continue with the next step if this prompt is Y. Otherwise, verify all the other prompts on the Work with Printer Writer display.

8. Press F14 to display the writer output queue. The display shown in Figure 30-30 appears.

```
Work with Output Queue

 Queue:   IBMOUTQ        Library:   IBMLIB          Status:   RLS/WTR

 Type options, press Enter.
   1=Send   2=Change   3=Hold   4=Delete   5=Display   6=Release   7=Messages
   8=Attributes         9=Work with printing status

 Opt  File        User        User Data   Sts   Pages   Copies   Form Type   Pty
      QSYSPRT     MARK                     HLD     47       1     *STD         5
      QPDCDEVA    AKA1                     HLD      2       1     *STD         5
      QPDSPAJB    AKA1                     HLD      4       1     *STD         5
      QSYSPRT     MARK                     HLD     47       1     *STD         5
      QSYSPRT     MARK                     HLD     47       1     *STD         5
      QPCSMPRT    ASA1                     HLD     13       1     *STD         5
      QPJOBLOG    ASA1       QPADEV0003    HLD      2       1     *STD         5
      QSYSPRT     MARK                     HLD     47       1     *STD         5
      QSYSPRT     ASA1                     HLD     47       1     *STD         5
                                                                        More...
 Parameters for options 1, 2, 3 or command
 ===>
 F3=Exit   F11=View 2   F12=Cancel   F20=Writers   F22=Printers
 F24=More keys
```

Figure 30-30   Work with Output Queue display

9. Look for a file that has a status of RDY or WTR.

10. If "More..." appears on the display, page forward to continue checking for a file status of RDY or WTR.

11. Refer to Table 30-2 to determine how to change the status of a spooled file to RDY and start printing.

Table 30-2   Changing the status of a spooled file

If the status is:	Perform the following step:
CLO	Wait for the job to end, or type 2 in the Opt column next to the file that you want to print that is closed, and change the `File becomes available` to `*FILEEND` **Note:** For spooled files created by using SCHEDULE(*JOBEND), printing starts after the job ends.
HLD or SAV	Type 6 in the Opt column next to the spooled file to release the file. Press F5 (Refresh) to refresh the status. The status should change to `RDY`.
OPN	Wait for the file to close, or type 2 in the Opt column next to the opened file you want to print, and change `File becomes available` to *IMMED. Printing occurs when the file is closed if you used SCHEDULE(*FILEEND). Printing occurs when the job ends if you used SCHEDULE(*JOBEND).

If the status is:	Perform the following step:
MSGW	Type 7 in the Opt column next to the writer, and reply to the messages. After you reply to the messages, press F5 (Refresh) to refresh the Sts column. The status should change to RDY.

Return to the procedure that sent you here.

30.8.1 Printing tips

To avoid printing problems, you can follow these printing tips:

1. Use the "G" reply instead of the "I" reply when you receive the Load Form Type xyz message. The G reply tells the system to recall the new form type. This message does not appear again until a new form type is used. The I reply tells the system not to recall the new form type. In this case, this message continues to appear for every spooled file.

2. Enter a page number as a reply to a message when a printer error recovery message, such as "End of Forms", is received on the operator's message queue. The print writer automatically begins printing on that page. It is not necessary to cancel the printer writer and start it again. Follow the directions in the message help text of the error recovery message.

3. Enter the following command if you do not want to reply to the printer error recovery messages. In this example, the printer is PRT01.

   CHGDEVPRT DEVD(PRT01) PRTERRMSG(*INFO)

   This command changes the printer's device description to specify that you would like informational error recovery messages instead of inquiry error recovery messages.

30.9 Cleaning up the system after collecting the data

Use Table 30-3 to restore the system and delete objects that are no longer needed after you collect all the requested information.

Table 30-3   Cleaning up the system scenarios

If you	Perform the following step:
Used the Save APAR Data display or SAVAPARDTA command to save data in an APAR library	Enter the following command: DLTAPARDTA PRBID(problem_ID) ORIGIN(network_id control_point_name) or See 11.3, "Verifying the trace contains the error" on page 199.
Created the output queue IBMOUTQ in the library IBMLIB	Enter the following command to delete the output queue: CLROUTQ OUTQ(IBMLIB/IBMOUTQ) DLTOUTQ OUTQ(IBMLIB/IBMOUTQ)
Created the IBMAPAR physical file in the library IBMLIB	Enter the following command to clear and delete the file: DLTF FILE(IBMLIB/IBMAPAR)
Override printer files	The overrides end when the job ends. Otherwise, enter the following command to delete all printer files overrides: DLTOVR FILE(*PRTF)
Created the library IBMLIB	Enter the following command to delete the library: DLTLIB LIB(IBMLIB)

If you	Perform the following step:
Created the data area QGPL/IBMDTAARA	Enter the following command to delete the data area: `DLTDTAARA DTAARA(QGPL/IBMDTAARA)`
Created the data area QSYS/QPATRACE for tracing pass-through communications jobs	Enter the following command to delete the data area: `DLTDTAARA DTAARA(QSYS/QPATRACE)`
Created the data area to trace an RJE session	Enter the following command to delete the data area: `DLTDTAARA DTAARA(RJE-session-description)`

Changed the message logging level for a job	Locate the level, severity, and text information recorded on the Problem Summary Form in 5.3, "Setting the message logging level" on page 71.
	
	Enter the following command to restore the recorded values for your job:
	`CHGJOB JOB(job-name)`
	`LOG(level severity text)`
	
	Replace *level*, *severity*, and *text* with the information that was recorded on the Problem Summary Form. Enter the following command to restore the recorded values for a job description:
	`CHGJOBD JOBD(library/job-description)`
	`LOD(level severity text)`
	
	Replace *level, severity, and text* with the information that was recorded on the Problem Summary Form.

Save any and all information that remains from these procedures to refer to them again.

31

Technical databases and logging problems

The purpose of this chapter is to provide:

► An overview of the tools available to search technical databases when you encounter a problem

► Information for using symptom strings to search

► An overview of the different methods that can be used to log a problem with IBM

This chapter assumes that you have used the problem determination procedures described in this book to identify the key messages, log entries, etc. that appear to be related to a problem. Using these indicators as search criteria in technical databases can lead to finding references to similar occurrences in other environments. These references can suggest temporary fixes, circumventions or permanent solutions. Even if you do not find a direct match, reviewing documents about other problems in the same area can help you see your problem in other views.

If the results of your searches do not reveal any solutions, you might want to raise a problem record with IBM. The data that you have collected assists IBM with their problem analysis.

31.1 Searching technical databases

IBM provides a number of public and restricted access technical databases, along with applications to assist searching them. This section describes the databases most commonly used in problem determination.

In some cases your searches might not reveal what you are looking for. In these cases you can often find a reference to something that can assist you with your problem determination.

31.1.1 Authorized problem analysis reports

The Authorized Problem Analysis Reports (APAR) database contains documents about:

► Known defects in i5/OS and related products
► Suspected defects which have been discovered to be a permanent restriction or a usage error
► Information only

The application allows various search options such as all APARs, information only APARs, by release and more.

Search this database if you want to see if your problem has been reported by someone else and if so, what actions are available to assist you.

The APAR database is available at:

http://www-912.ibm.com/ImprovedSearch/searchoptions.jsp

At this site, select APARs and any other databases to include in your search.

31.1.2 PTF cover letters

The Program Temporary Fix cover letters database contains documents about changes to i5/OS and related products, since the general availability of a release. PTFs are typically created to:

► Resolve a defect
► Provide additional functions

The application allows search options such as all PTFs, by PTF Groups, by release level, and more.

You are directed to this database if you find an APAR for which a PTF has been created. Otherwise, this is a useful database to search using your symptom strings.

The PTF cover letter database is available at:

http://www-912.ibm.com/ImprovedSearch/searchoptions.jsp

At this site, select PTF Cover Letters and any other databases to include in your search.

31.1.3 Software knowledge base

The software knowledge base is a collection of documents from a variety of technical sources. Documents are grouped together in topics, as shown in Table 31-1 on page 489.

Table 31-1   Software knowledge base topics

All documents	Electronic Service Agent	POWER5
AS/400 Mail	Enterprise Resource Planning (ERP)	Print
Basic System Environment Functions (BSEF)	General Information	Remote Support
Client Access	Hardware Management Console (HMC)	System Console
Cluster	Host Servers	System i integration with BladeCenter® and System x™
Communications-SNA	Integrated File System	Systems Management
Communications-TCP	iSeries Support Web Tools	VMC (Vertical Microcode)
Connect for iSeries	Network Station®	WebSphere Application Server
Data Collection	Operating System	WebSphere Commerce Suite
DB2 UDB for OS/400	PM for System i5	

Within each topic, there are subtopics and the functional areas. For example, following the path of **Communications-TCP** → **Traces** → **General** reveals the documents listed in Table 31-2.

Table 31-2   Sample of software knowledge base documents

Title	Doc Number
Collecting a TCP/IP Communications Trace from SST	11071558
IPX™ Communications Trace Data Collection	11571113
TRCJOB for TCP/IP-Based Jobs	19215930
Steps in SST: Error Log ID to SRC to Failing Item	11781347
Collecting a Communications Trace	12800856
Collecting a Source/Sink Trace (R360 and R370)	8983838
LIC Trace for V3R6 and Above	12053852
Collecting a Source/Sink Trace	14665251 8975716
LIC Sockets Trace (Sockets API Level Trace) Using TRCINT	28355818
LIC Sockets Trace Using TRCINT (Collecting All Sockets Data)	28350332
STRTRC/ PEX Data Collection Implications in Large LPAR Environments	29913829
LIC Sockets SSL Trace Using TRCINT	318306348
Communications Trace Formatted for ASCII Using STRCMNTRC	325916571
Collecting LIC Sockets trace for All	346456985
Collecting LIC Sockets Trace by Job	346411261
Running a Communications Trace	12112948

LIC Sockets Trace Using TRCINT (Collecting Socket API Level)	28351817
LIC Sockets Trace Using TRCINT (Collecting Socket API Level)	28351817
Collecting a TRCCNN for All TCP/IP Traffic	358642237
'Trace Options Not Supported', Message in Communications Traces	23113107
TRCCNN Limitation with NFS and Inbound PING	388516648
Collecting a TRCCNN for All TCP/IP Traffic	359301564

The software knowledge database is useful for finding answers to "how do I?" type questions for problem determination and other practices. It is also useful for searching for error messages and for when things are not behaving the way you expect them to.

Some of the information can appear to be out-of-date. However, the documents can provide the basis for helping you proceed with your problem determination.

This database is publicly available at:

http://www-912.ibm.com/ImprovedSearch/searchoptions.jsp

At this site, select Software Knowledge Base and any other databases to include in your search.

31.1.4 Registered software knowledge base

The Registered software knowledge base has the same look and feel as the Software knowledge base, with some different documents. It serves a similar purpose as the Software knowledge base.

Access to the Registered Software Knowledge Base is available in the United States and other countries to clients with Software Maintenance contracts, where entitlement has been deployed.

This database is available to registered users on the IBM System i Support search site at:

http://www-912.ibm.com/ImprovedSearch/searchoptions.jsp

At this site, select Software Knowledge Base and any other databases to include in your search.

> **Note:** When selecting Software knowledge base from the list of available document types on the IBM System i Support search site, the search engine searches both the Software knowledge base and the Registered software knowledge base. Items found in the Registered knowledge base are denoted with a key symbol.
>
> Be aware that searching the Registered knowledge base directly from other links can result in not including some items from the Software knowledge base.

31.1.5 ServiceLink

ServiceLink is a suite of applications which allow searches over different databases. It has a secondary function of managing PMRs, which is covered in 31.3, "Reporting a problem to IBM" on page 492. The applications within ServiceLink are:

► Automatic Software Alert Process (ASAP)

- ► Automatic Status Tracking (AST)
- ► Electronic Technical Response (ETR)
- ► Preventive Service Planning (PSP)
- ► Product Cross Reference (PCR)
- ► Service Information Search (SIS)
- ► Service Request and Delivery (SRD)

Service Information Search (SIS) permits you to access databases about known problems with IBM products, usage information for IBM products, technical flashes and bulletins, and diagnostic information about non-IBM problems. The databases are grouped into two groups:

- ► Technical Information - information not related to defects
- ► APARs and PTFs - information related to defects

When searching Technical Information, the results can be categorized as:

- ► Q&A usage library - use this to search specific non-defect libraries for how-to information by defining search arguments.

- ► Problem diagnosis data (PDDB) - contains documents on user errors, non-IBM errors that appear as IBM symptoms, and product support information.

- ► Flashes and technical bulletins - flashes are technical hints and tips from use experience. Bulletins are additional product documentation.

- ► eSupport Knowledge Base - a collection of miscellaneous databases, not to be confused with the knowledge bases mentioned earlier in this chapter.

When searching APARs and PTFs, the results can be subset into libraries. Libraries are simply groupings of software and hardware products.

These databases are available to registered users at:

https://www-304.ibm.com/usrsrvc/account/userservices/jsp/login.jsp?persistPage=true

31.2 Tips for searching in ServiceLink

When searching APARs and PTFs, you should follow these tips to improve your chances of finding the information you want.

A nonspecific search, such as for component ID (COMPID) and/or software release only, can return many hits. This type of search is called "generic" or "open" search. Using proper search arguments reduces the number of hits and narrows your search. If you do not have a comfortable grasp of the problem or do not have specific key words to search, start with an "open" search and then narrow down the hits by adding keywords, one at a time.

Initially, use two search keywords when searching for APAR numbers:

- ► First Keyword - Product Name or Program Name or Module Name (i.e., 5722BR1 or QRZGETRH)
- ► Second Keyword - a problem type (i.e., Netview MSG)

Table 31-3 below includes some common abbreviations:

Table 31-3   Problem type abbreviations

Problem type	Abbreviation	Search format example
Waits	WAIT	WAIT, generic

Loops	LOOP	LOOP, generic
Performance	PERFM	PERFM, generic
Incorrect Output	INCORROUT	INCORROUT, generic
Unpredictable	UNPRED	UNPRED, generic
Messages	MSG	MSGCPI93B9, MSG5008
Error log	SRC	SRCB9003F10
SRC	SRC	SRC 611 3109, SRC6113109
LIC major/minor codes	VLO	VLO44001002
Statement numbers	/PROC	/PROC
Hexadecimal values	X/	X/34CB
Version and release level	R	r540
Response codes	RC	RC0028
From program	F/	F/QT3REQIO
To program	T/	T/QZSRHTTP
Service program	SP/	SP/QJOEVENTS
Field	FLDS/	FLDS/
Procedure	/PROC	/PROC
Command	OPCS/	OPCS/DMPCMNTRC
Label	PCSS/	PCSS/
Reason code	PRCS/	PRCS/08
Register	REGS/	REGS/
Subroutine	RIDS/	RIDS/
Value of a field or register	VALU/	VALU/
Product	none	5722
Device type	D/T	D/T3812

31.3 Reporting a problem to IBM

This section outlines the various methods that can be used to report a problem to IBM. It covers both telephone reporting and reporting over the Internet.

31.3.1 Software Service Request

The Software Service request application allows you to submit, track and update your problem management reports online. It is similar in function to the ETR application in ServiceLink but has some additional features such as accessing archived PMRs and

e-mailing PMR contents to e-mail addresses. It also includes a basic report generator for summarizing all of your PMRs.

`http://www-912.ibm.com/supporthome.nsf/document/32244842`

PMRs raised though ServiceLink can also be accessed through Software Service Request.

31.3.2 ServiceLink

Within ServiceLink there is an application called Electronic Technical Response (ETR). This application is similar to Software Service Request. It enables you to electronically report problems, indicate the severity, and track your problems through to completion. It lists your problems by user ID, account, or criteria of your choice. Your account-wide list includes records that were opened by calling the IBM Support Center, without first being converted to electronic format.

These databases are available to registered users at:

`https://www-304.ibm.com/usrsrvc/account/userservices/jsp/login.jsp?persistPage=true.`

PMRs raised through Software Service Request can also be accessed through ServiceLink.

31.3.3 Telephone

Problems can be reported verbally by a telephone. The contact numbers for each country can be found in IBM's Directory of worldwide contacts at:

`http://www.ibm.com/planetwide`

When contacting IBM by telephone, have your system serial number and customer account number readily available.

32

Collecting program temporary fix (PTF) levels

Program temporary fixes (PTFs) are updates to i5/OS and Licensed Program Products (LPPs) that have been released since the general availability of the operating system version, release or modification level. When submitting a problem report it is highly recommended that information about PTF levels is included in the accompanying documentation.

This chapter describes how to produce a listing of all PTFs on a system and also a listing of the PTF group levels.

32.1 Collecting a list of all program temporary fixes

A current program temporary fix (PTF) listing shows any additional PTFs that have been applied to your system that might not have been applied with a cumulative package.

Use the Display Program Temporary Fix command:

```
DSPPTF OUTPUT(*PRINT)
```

To collect information for program temporary fixes for all licensed programs on the system, follow these steps:

1. If you have not created the library IBMLIB or output queue IBMOUTQ, enter the following commands:

   ```
   CRTLIB LIB(IBMLIB)
   CRTOUTQ OUTQ(IBMLIB/IBMOUTQ)
   ```

2. Enter the following commands to add the library IBMLIB to your library list and to change the output queue for your job to the output queue IBMOUTQ:

   ```
   ADDLIBLE IBMLIB
   CHGJOB OUTQ(IBMLIB/IBMOUTQ)
   ```

3. Enter the following command to create the QSYSPRT spooled file containing the PTF listing:

   ```
   DSPPTF LICPGM(*ALL) SELECT(*ALL) OUTPUT(*PRINT)
   ```

4. Enter the following command to verify that the spooled file QSYSPRT was created successfully:

   ```
   WRKOUTQ OUTQ(IBMLIB/IBMOUTQ)
   ```

For example, the display shown in Figure 32-1 on page 497 appears.

```
Work with Output Queue

 Queue:   IBMOUTQ        Library:   IBMLIB         Status:   RLS

 Type options, press Enter.
   1=Send   2=Change   3=Hold   4=Delete   5=Display   6=Release   7=Messages
   8=Attributes        9=Work with printing status

 Opt  File        User        User Data    Sts    Pages    Copies  Form Type    Pty
      QSYSPRT     ASA1                      RDY      47         1   *STD           5




                                                                           Bottom
 Parameters for options 1, 2, 3 or command
 ===>
 F3=Exit   F11=View 2   F12=Cancel   F20=Writers   F22=Printers
 F24=More keys
```

Figure 32-1   Work with Output Queue display (Part 1 of 2)

5. If "More..." appears on the display, page forward to continue searching for the QSYSPRT file.

6. Press F11 (View 2) to view the date and time of the QSYSPRT file with which you want to work. The display shown in Figure 32-2 on page 498 appears.

```
Work with Output Queue

 Queue:   IBMOUTQ        Library:   IBMLIB        Status:   RLS

 Type options, press Enter.
   1=Send   2=Change   3=Hold   4=Delete   5=Display   6=Release   7=Messages
   8=Attributes        9=Work with printing status

 Opt  File          File Nbr  Job         User        Number  Date      Time
      QSYSPRT          1     QPADEV0003  ASA1        004515  11/08/07  10:43:06




                                                                       Bottom
 Parameters for options 1, 2, 3 or command
 ===>
 F3=Exit   F11=View 1   F12=Cancel   F20=Writers   F22=Printers
 F24=More keys
```

Figure 32-2   Work with Output Queue display (Part 2 of 2)

Make sure that the spooled file exists for the time you created it.

```
Display Spooled File
 File . . . . . :   QSYSPRT
Page/Line   1/1
 Control . . . . .
Columns    1 - 130
 Find . . . . . .

*...+....1....+....2....+....3....+....4....+....5....+....6....+....7....+....8....+....9....
+....0....+....1....+....2....+....3
                                DISPLAY PTF DETAILS
Page    1
 5722SS1 V5R4M0  060210
 ITSOSYS1  11/08/07  11:07:37 UTC
                                         Display PTF Status
  Product ID . . . . . . . . . . . . . :  5722999
  IPL source . . . . . . . . . . . . . :  ##MACH#B
  Release of base option . . . . . . . :  V5R4M0 L00
  PTF                                                          PTF
IPL            On          Cover
  ID          Status                                           Save File
Action         Order        Letter
  TL06192     Temporarily applied                              No
None          No          No
  TL06115     Superseded                                       No
None          No          No
  TL06066     Superseded                                       No
None          No          No
  TL06024     Superseded                                       No
None          No          No
  TL05354     Superseded                                       No
None          No          No
  TL05326     Superseded                                       No
None          No          No
  RE06180     Permanently applied                              No
None          No          No
  RE06144     Permanently applied                              No
None          No          No
  RE06115     Permanently applied                              No
None          No          No
  RE06025     Permanently applied                              No
None          No          No
  RE06024     Permanently applied                              No
None          No          No

More...
 F3=Exit   F12=Cancel   F19=Left   F20=Right   F24=More keys
```

Figure 32-3   Display PTF Details spooled file

7. Press F3 (Exit) to return to the Work with Output Queue display.

32.2 Collecting a list of program temporary fix groups

To collect information for program temporary fix groups for all licensed programs on the system, follow these steps:

1. If you have not created the library IBMLIB or output queue IBMOUTQ, enter the following commands:

```
CRTLIB LIB(IBMLIB)
CRTOUTQ OUTQ(IBMLIB/IBMOUTQ)
```

2. Enter the following commands to add the library IBMLIB to your library list and to change the output queue for your job to the output queue IBMOUTQ:

```
ADDLIBLE IBMLIB
CHGJOB OUTQ(IBMLIB/IBMOUTQ)
```

   a. Enter the following command to Work with PTF Groups:

```
WRKPTFGRP PTFGRP(*ALL)
```

   For example, the display shown in Figure 32-4 appears.

```
Work with PTF Groups
                                                        System:    ITSOSYS1
 Type options, press Enter.
   4=Delete   5=Display   6=Print   8=Display special handling PTFs
   9=Display related PTF groups

 Opt  PTF Group          Level  Status
      SF99540             6192  Installed
      SF99539               27  Installed
      SF99504                4  Installed
      SF99315                3  Installed
      SF99291                4  Installed
      SF99114                5  Installed




                                                                    Bottom
  F3=Exit   F6=Print   F11=Display descriptions   F12=Cancel
  F22=Display entire field
```

Figure 32-4   Work with PTF Groups display

3. Press F6 to create the QSYSPRT spooled file containing the PTF group listing.

4. Enter the following command to verify that the spooled file QSYSPRT was created successfully:

```
WRKOUTQ OUTQ(IBMLIB/IBMOUTQ)
```

For example, the display shown in Figure 32-5 on page 501 appears.

```
Work with Output Queue

 Queue:   IBMOUTQ         Library:   IBMLIB          Status:   RLS

 Type options, press Enter.
   1=Send    2=Change   3=Hold   4=Delete   5=Display   6=Release   7=Messages
   8=Attributes        9=Work with printing status

 Opt  File         User        User Data   Sts   Pages    Copies  Form Type    Pty
      QSYSPRT      MARK                     RDY     47        1    *STD          5
      QSYSPRT      ASA1                     RDY      1        1    *STD          5




                                                                        Bottom
 Parameters for options 1, 2, 3 or command
 ===>
 F3=Exit    F11=View 2    F12=Cancel    F20=Writers    F22=Printers
 F24=More keys
```

Figure 32-5   Work with Output Queue display (Part 1 of 2)

5. If "More..." appears on the display, page forward to continue searching for the QSYSPRT file.

6. Press F11 (View 2) to view the date and time of the QSYSPRT file with which you want to work. The display shown in Figure 32-6 on page 502 appears.

```
Work with Output Queue

 Queue:   IBMOUTQ        Library:   IBMLIB        Status:   RLS

 Type options, press Enter.
   1=Send   2=Change   3=Hold   4=Delete   5=Display   6=Release   7=Messages
   8=Attributes        9=Work with printing status

 Opt  File        File Nbr  Job        User        Number  Date      Time
      QSYSPRT          1    QPADEV0003  ACA1        004515  11/08/07  10:43:06
      QSYSPRT          2    QPADEV0003  ACA1        004515  11/08/07  10:51:51




                                                                     Bottom
 Parameters for options 1, 2, 3 or command
 ===>
 F3=Exit   F11=View 1   F12=Cancel   F20=Writers   F22=Printers
 F24=More keys
```

Figure 32-6   Work with Output Queue display (Part 2 of 2)

Make sure that the spooled file exists for the time you created it.

7. Type option 5 beside the file to display the contents. A display similar to Figure 32-7 on page 503 appears.

```
Display Spooled File
 File . . . . . :   QSYSPRT
Page/Line   1/1
 Control . . . . .
Columns    1 - 130
 Find . . . . . .

*...+....1....+....2....+....3....+....4....+....5....+....6....+....7....+....8....+....9....
+....0....+....1....+....2....+....3
                                WORK WITH PTF GROUPS
Page    1
 5722SS1 V5R4M0  060210
ITSOSYS1  11/08/07  15:52:56 UTC
                                    Work with PTF Groups
 PTF Group              Level  Status                        Text
  SF99540                      6192   Installed                          CUMULATIVE
PTF PACKAGE C6192540
 SF99539               27  Installed                    GROUP HIPER
  SF99504                       4   Installed                          DB2 UDB FOR
ISERIES
  SF99315                       3   Installed                          TCP/IP GROUP
PTF
 SF99291               4  Installed                    JAVA
  SF99114                       5   Installed                          IBM HTTP
SERVER FOR I5/OS
                     * * * * *  E N D   O F   L I S T I N G  * * * * *
```
```
Bottom
 F3=Exit    F12=Cancel   F19=Left    F20=Right    F24=More keys
```

Figure 32-7   Display With PTF Groups spooled file

8. Press F3 (Exit) to return to the Work with Output Queue display.

Quick reference to data collection commands

Refer to Table A-1 to determine which commands to use to collect the respective data.

Table A-1   Data collection commands reference table

Area	Command used	Information collected
Cluster	DSPCLUINF	Information describing the configuration information about the cluster
Cluster	DSPCRGINF	Information about a cluster resource group
Communications	DMPCMNTRC	Communications trace in a stream file
Communications	PRTCMNTRC	Communications trace
Communications	PRTDEVADR	Device description addresses
Communications	RTVCFGSRC	Communications object source
Communications	TRCCNN	Communications trace
Dump object	DMPOBJ	Operating system object dump information
Dump object	DMPSYSOBJ	Machine interface object dump information
Error log	PRTERRLOG	Error log ID with hex data
Hardware resources	DSPHDWRSC	Hardware configuration and resource information of the system
Hardware resources	WRKHDWPRD	Cable locations
Job information	DSPJOB	All job information, job log

Job information	WRKACTJOB	List of the active jobs in the system, performance and status information
LIC log entry	PRTINTDTA	LIC log with dump data
Messages	DSPLOG	History log for the time range specified
Messages	DSPMSG	Messages in a message queue
Miscellaneous	PRTINTDTA	SLIC link map and LIC alter log
Miscellaneous	PRTSYSINF	Various system information
Problem log	DSPPRB	Problem log entry
Program temporary fixes	DSPPTF	All PTFs in the system
Program temporary fixes	WRKPTFGRP	All PTF groups in the system
Save	SAV	Integrated file system object
Save	SAVAPARDTA	APAR library
Save	SAVDLO	Document or folder
Save	SAVLIB or SAVOBJ	Save of library or object
Software resources	DSPSFWRSC	Software resource information
System values	WRKSYSVAL	All the system values
TCP/IP application	TRCTCPAPP	TCP/IP application trace

Start Remote Support

Remote support allows a support organization to access your system remotely. This gives the service provider faster access to diagnostic tools and information and, in some cases, eliminates the delay of sending documentation in on media or the travel time for on-site assistance.

A remote support connection allows your service provider to have access to a variety of tools and functions:

- ► Operating system command line (can include service tools)
- ► iSeries Navigator
- ► LIC debug
- ► Remote MSD analysis
- ► Debug of failed secondary partitions
- ► HMC command line
- ► Web Based System Manager (WebSM)

Note: Certain functions listed above have specific connection requirements. Your service provider can work with you in setting up the remote connection.

The Start Remote Support (STRRMTSPT) command creates and varies on all configuration objects needed for remote support. If any existing remote support configuration objects are found, they are deleted and then re-created.

An example of a start remote support network is shown in Figure B-1 on page 508.
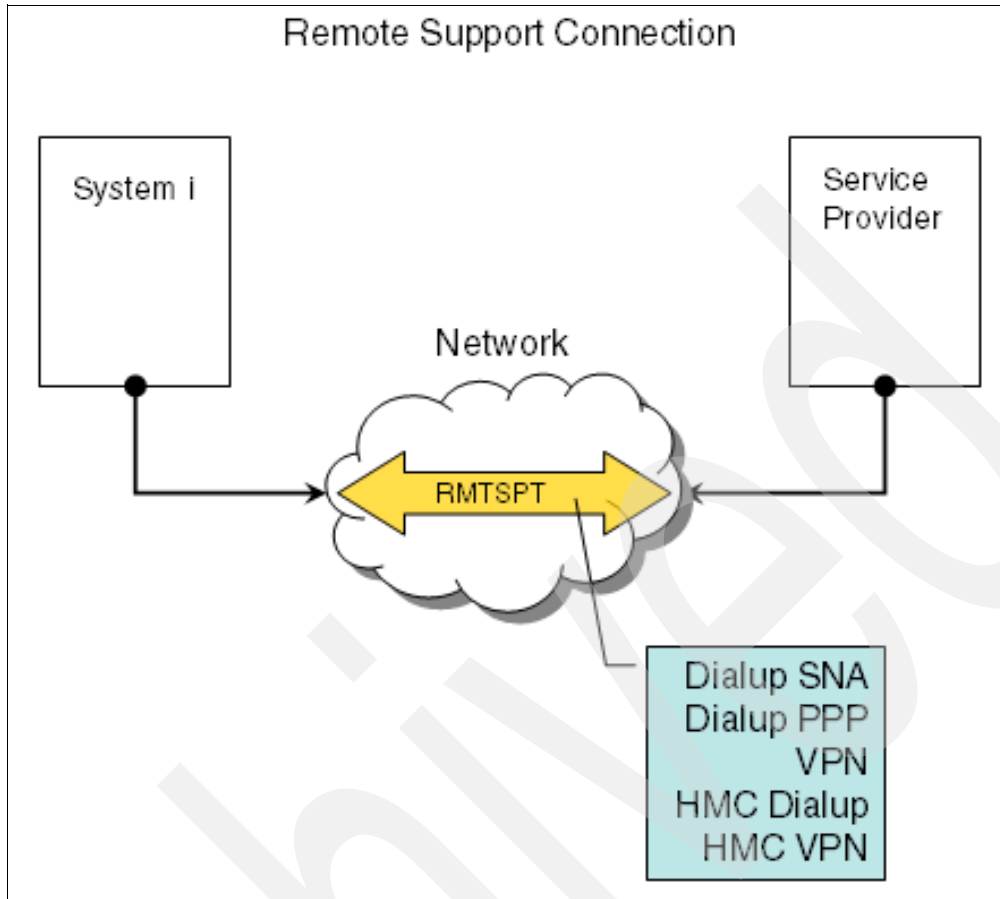
Figure B-1   Start Remote Support network

Why use remote support

The Rochester Certified Remote Support Application runs on internal IBM systems.
Corresponding STRRMTSPT code runs on a user's System i model to provide the necessary
support to connect IBM Support personnel to a remote user's system for the purpose of
providing remote problem analysis.

There are many redundant layers of security on these systems. The remote support
applications provide significant security measures to ensure there is no unauthorized access
to the IBM system or to the remote customer's system.

To establish a connection, the following occurs:

1. IBM must be on the phone with the customer when the remote support connection is
   established.

2. IBM accesses the Certified Remote Support Application and is assigned a set of
   configuration objects to connect to the remote system.

3. IBM provides the remote customer with the appropriate parameters required to run the
   STRRMTSPT command. This creates a matching configuration on the customer's system.
   Considerations for PPP, SNA or VPN connections include:

   – For a PPP or SNA connection, the remote customer must provide to IBM the telephone
     number to the modem that is enabled using the STRRMTSPT command. IBM then

supplies the modem telephone number to the Certified Remote Support Application, and the application attempts to make the connection to the customer's system.

– For a VPN connection, the remote customer must provide IBM with the system serial number and a hashed session key that is provided to them upon successful completion of the STRRMTSPT command. The serial number and session key are then supplied to the Certified Remote Support Application. If the hashed key matches, the application attempts to make the connection to the customer's system.

4. When the connection is successfully established, IBM is presented with a sign on screen to the customer's system.

5. The customer must provide a user profile and password for IBM to use to access the system. This profile must have sufficient authority to allow IBM to perform whatever work is necessary on the customer's system. The security is limited by the authority provided by the customer. Universal access to a customer's system is not allowed by default.

6. IBM completes its work and terminates the connection to the customer's system.

7. IBM has the customer run the ENDRMTSPT command. This disables the access of the customer's system. All configuration objects created by the STRRMTSPT command are deleted.

Access to the customer's system is no longer possible after ENDRMTSPT completes.

Note: While IBM is on a customer's system, IBM is subject to the same level of auditing as any user on the customer's system.

Note: Remote support does not allow anyone other than the person that initiated the remote connection to access the customer's system. Anyone else that needs access to the remote support connection must be authorized by the initiator of the connection.

Getting ready for remote support

With varying customer configurations, your service provider works with you to set up a remote support connection to your system.

Your service provider needs one or more of the following pieces of information in order to setup a remote support connection.

► Resource name for the QESLINE

To determine the resource name of the line to be used as QESLINE, type the following on any command line:

```
DSPLIND QESLINE
```

Look for the Resource names field. The resource name is off to the right.

► ECS telephone number
► System name, and serial number
► HMC machine type, model, and serial number
► HMC sign on information
► Operating system sign on information
► Service tools user ID and password

C

Using the control panel

The control panel is a service and operator interface to the system.

Information on control panel functionality can be found in the software knowledge base. Document number 9463026, Front panel functionality, contains pictures of system control panels for CISC systems and RISC system through the 8xx models.

For POWER5 systems, refer to the Physical control panel article in the IBM Systems Hardware Information Center.

Note: The 590, 595, and 575 server models do not have physical control panels. Instead, they use the Hardware Management Console (HMC) to perform control panel functions.

D

Using system flight recorders

A *flight recorder* is an object that stores trace information to record a history of what has happened in system programs. The flight recorder contains information that can help identify the flow of system programs and certain status information.

> **Note:** A flight recorder should be used only under the direction of your service provider.

How to interpret flight recorder data is outside the scope of this book.

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Getting started

Before you start to work with flight recorders, follow these steps:

1. If you have not created the IBMLIB library or IBMOUTQ output queue, enter the following commands:

```
CRTLIB LIB(IBMLIB)
CRTOUTQ OUTQ(IBMLIB/IBMOUTQ)
```

2. Enter the following commands to add the IBMLIB library to your library list and to change the output queue for your own job to the IBMOUTQ output queue:

```
ADDLIBLE IBMLIB
CHGJOB * OUTQ(IBMLIB/IBMOUTQ)
```

3. Enter the following commands to send the spooled files created to the output queue IBMOUTQ in the library IBMLIB:

```
OVRPRTF FILE(QPSRVDMP) OUTQ(IBMLIB/IBMOUTQ)
OVRPRTF FILE(QPJOBLOG) OUTQ(IBMLIB/IBMOUTQ)
OVRPRTF FILE(QPDSPOLK) OUTQ(IBMLIB/IBMOUTQ)
OVRPRTF FILE(QPDCCTL) OUTQ(IBMLIB/IBMOUTQ)
OVRPRTF FILE(QPDCDEV) OUTQ(IBMLIB/IBMOUTQ)
OVRPRTF FILE(QSYSPRT) OUTQ(IBMLIB/IBMOUTQ)
OVRPRTF FILE(QPDSPLOG) OUTQ(IBMLIB/IBMOUTQ)
OVRPRTF FILE(QPCSMPRT) OUTQ(IBMLIB/IBMOUTQ)(created by dumping Advanced
Analysis macro output)
OVRPRTF FILE(QPRTSBSD) OUTQ(IBMLIB/IBMOUTQ) QWTDMPLF prints the subsystem
descript



OVRPRTF FILE(QWTDMPLF) (prints the subsystem description of the active
subsystem that touched a device, as recorded in the locking flight recorder)
```

The printer file overrides direct the spooled file output to IBMLIB/IBMOUTQ for ease of collection and are in effect until your job ends or the overrides are deleted.

Dump Flight Recorder API (QWTDMPFR)

The Dump Flight Recorder API (QWTDMPFR) dumps the contents of the flight recorders for jobs that have them. In i5/OS V5R4 this API is changed to dump the XPF Common Flight Recorder. It dumps flight recorder entries generated by system code into the space. It can be used in a user job by system code to get a XPF common flight recorder out of a user job. QWTDMPFR can be involved with a fully qualified job name in i5/OS V5R3 as: CALL PGM(QSYS/QWTDMPFR) PARM('QTAPARB QSYS   001234')), which is how to get an XPF Common Flight recorder from a user job.

The following types of jobs have flight recorders:

► Subsystem monitors
► System jobs

When the QWTDMPFR API is called, it causes the contents of the jobs' flight recorders to be dumped.

To dump the flight recorders, type the following command:

```
CALL QWTDMPFR
```

The QPSRVDMP spooled file is created for each job dumped.

You can also specify the job name to get just a single system job, rather than all the system jobs and subsystems you get with the CALL QWTDMPFR invocation. If there are multiple jobs on the system with that name, a selection screen is presented.

For example: `CALL QWTDMPFR QINTER`

```
Select Job ITSOSYS1
                                                    12/01/07  16:30:08
 Type option, press Enter.
   1=Select


                                                                 Entered
 Option  Job         User       Number  Type    -----Status-----  System
         QINTER      QSYS       656173  SBS     ACTIVE            12/01/07
         QINTER      QSYS       655400  SBS     JOBLOG PENDING    12/01/07
         QINTER      QSYS       654685  SBS     JOBLOG PENDING    12/01/07
         QINTER      QSYS       608996  SBS     JOBLOG PENDING    11/16/07







                                                                  Bottom
 F3=Exit    F12=Cancel
 Duplicate jobs found.
```

Figure D-1   Select Job menu

Dump Lock Flight Recorder API (QWTDMPLF)

The Dump Lock Flight Recorder API (QWTDMPLF) performs the following tasks:

► Dumps the Lock Flight Recorders for the device that is specified in the parameter passed to the program

► Collects job logs for QSYSARB and QLUS

► Collects job logs for all active jobs that have touched the device

► Collects the history log (QHST)

► Collects the line, controller, and device descriptions

► Collects a WRKOBJLCK of the device

► Collects a WRKCFGSTS of the controller

► Collects subsystem descriptions of active subsystems that have touched the device

► Dumps associated internal system objects

To use the Lock Flight Recorder, follow these steps:

1. Turn on the flight recorder, and type the following command:

   ```
   CALL QWTSETLF (*ON)
   ```

2. Re-create the steps that caused the error.

3. Type the following command:

   ```
   CALL QWTDMPLF (device)
   ```

   > **Note:** *(device)* is the name of the device with the lock problem.

4. To turn off the flight recorder, on a command line, type:

   ```
   CALL QWTSETLF (*OFF)
   ```

Flight recorders available from FLIGHTLOG macro

Additional flight recorders can be collected through an advanced analysis macro call named `flightlog`. The full list of flight recorders that can be collected is available through the help text of the macro or from your service provider. The more common ones are:

► Cluster
► Dedicated Service Tools (DST)
► Install
► IPL
► Link Loader
► System processor activity sampler
► Transport management

To collect one of these flight recorders, follow the steps below.

1. Access System Service Tools (SST) and sign on with a valid service tools user ID and password. See 26.4, "Accessing SST" on page 417 for information on how to access System Service Tools.

2. Select Option 1, Start a service tool.

3. Select Option 4, Display/Alter/Dump.

4. Select Option 2, Dump to printer.

5. Select Option 2, Licensed Internal Code (LIC) data.

6. Select Option 14, Advanced analysis.

7. From the list of available macros, select FLIGHTLOG by typing a 1 in the option field and pressing Enter.

8. On the Specify Advanced Analysis Options screen, use the value provided to you by your service provider or one from Table D-1 below.

Table D-1   Flightlog options and description

Option	Description
CLUSTER	Cluster
DST	Dedicated Service Tools
INSTALL	Install history

Option	Description
IPL	Initial Program Load (IPL)
LL	Link Loader (PTF information)
SYSTEM	System Processor Activity Sampler
XM	Transport Management

9. Collect the QPCSMPRT spooled file and send to your service provider.

E

Copying displays to another display

i5/OS allows you to copy display images from one user display (the source) to another user display (the target). This allows the second user to view the problem as it occurs.

The following requirements must be met to copy display images to another display station:

► Both display stations are defined to the system.
► Both displays are color, or both are monochrome, but one cannot be color when the other is monochrome.
► Both displays have the same number of character positions horizontally and vertically.

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Starting copy screen

To copy screen images from one user to another, follow these steps:

1. Type STRCPYSCN, and then press the F4 key. A display appears like the one shown in Figure E-1.

```
Start Copy Screen (STRCPYSCN)

 Type choices, press Enter.

 Source device  . . . . . . . . .                    Name, *REQUESTER
 Output device  . . . . . . . . .                    Name, *REQUESTER, *NONE
 Job queue  . . . . . . . . . .   QCTL               Name
   Library  . . . . . . . . . .     *LIBL            Name, *LIBL, *CURLIB
 File to receive output . . . . .  *NONE             Name, *NONE
   Library  . . . . . . . . . .                      Name, *LIBL, *CURLIB
 Output member options:
   Member to receive output . . .  *FIRST            Name, *FIRST
   Replace or add records . . . .  *REPLACE          *REPLACE, *ADD
```

Figure E-1   Start Copy Screen (STRCPYSCN) display

2. Type the device name of the display station that is sending the copied displays in the source device parameter field. The device name can be found in the top right-hand corner of the sign-on menu screen.

3. Type the device name of the display station that is to receive the copied displays, and press Enter. If you are working on the same device that you wish to receive the copied display, type *REQUESTER.

   The source device receives a message as shown in Figure E-2.

```
Display Messages
                                                  System:   ITSOSYS1
 Queue . . . . . :   QPADEV0002         Program . . . . :   *DSPMSG
   Library . . . :     QSYS              Library . . . :
 Severity  . . . :   00                 Delivery  . . . :   *NOTIFY

 Type reply (if required), press Enter.
   From  . . . :   MARK         11/08/07   16:32:37
   Cause . . . . . :    Start copy screen has been requested with output to
     QPADEV0003. Reply C to prevent copy screen or G to allow it. (C G)

     Reply . . .
```

Figure E-2   Display Messages

4. Type G in reply to the message, and press Enter. The message Copy Screen Image from QPADEV0002 to QPADEV0003 has started is issued to indicate success. The sending display station's screens are copied to the other display station.

> **Tip:** If you receive the message Device xxxxxxxxxx not available instead, you might have the Source device and Target device mixed up. Check the parameters entered and swap the device names if that is the case.

The image shown on the receiving display trails the sending display station by one display. The next example shows the sending display on the Start a Service Tool screen (Figure E-3) and the receiving display station on System Service Tools (Figure E-4).

```
System Service Tools (SST)

 Select one of the following:

      1. Start a service tool
      2. Work with active service tools
      3. Work with disk units
      4. Work with diskette data recovery
      5. Work with system partitions
      6. Work with system capacity
      7. Work with system security
      8. Work with service tools user IDs and Devices
```

Figure E-3   Start a Service Tool menu

```
Start Service Tools (STRSST) Sign On

                                        SYSTEM: ITSOSYS1


Type choice, press Enter.

   Service tools user ID. . . . QSECOFR
   Service tools password . . .
```

Figure E-4   System Service Tools menu

Ending copy screen

While you are copying screens, the operator of the receiving display station cannot do any other work at that display station until the copying of screens is ended.

To end the copy screen function from the sending display station, complete these steps:

1. Type ENDCPYSCN and then press Enter. The message shown in Figure E-5 appears a few moments later.

```
Display Messages
                                             System:   ITSOSYS1
Queue . . . . . :   QPADEV0002        Program . . . . :   *DSPMSG
  Library . . . :    QSYS               Library . . . :
Severity . . . :   00                 Delivery  . . . :   *NOTIFY


Type reply (if required), press Enter.
   From  . . . :   MARK          11/08/07   16:50:39
   Copy Screen Image from QPADEV0002 has ended.
```

Figure E-5   Display Messages display

2. To end copy screen function from the receiving display station, perform the following steps:

   a. Press and hold the Alt or Shift key and press the System Request (SysRq) key, or right-click and click **SysRq**.

   b. Type `ENDCPYSCN`, and press Enter.

F

Damaged objects

One of the most frequently misunderstood topics within the System i environment is damaged objects. The objective of this appendix is to provide an understanding of what is meant by the term *damaged object,* how to recognize a damaged object, and what actions are available to recover them.

Object damage

A damaged object is an object whose internal structure is not as expected by the software that uses the object. System i software (specifically, the Licensed Internal Code (LIC)) and the operating system (i5/OS) determine how extensive the damage is. The software indicates to the system operator that a damage condition has been encountered. The cause of the damage, in many cases, can be difficult to determine.

Degrees of damage

There are two main levels or degrees of damage, partial and full, as described in the following section.

Partial damage

An object that is said to have partial damage is in a state that some, but not all, operations with the object can still be performed. For example, it can be possible to read the data from a damaged file, but not possible to perform operations on the object, such as a save.

Partial damage can also be referred to as *soft damage*.

Full damage

An object that is said to be fully damaged is unusable. It is not possible to access the object using any of the standard system interfaces such as commands or system APIs. It can still be possible to access the object or part of the object by using the System Service Tools (SST).

Full damage to an object is marked in the header of the object as such.

Suspended object

An object can be in what is referred to as a *suspended state*. This means that the object is not usable, but the object is not damaged.

When an object is saved, an option can be chosen to free most of the storage associated with that object (such as the `STG(*FREE)` parameter to free storage). The object is still addressable in this state and retains its virtual address within the system. Before the content of the object is used, the object needs to be restored. Because the object maintains the same virtual address when it is restored, existing pointers to the object remain valid.

For example, when trying to display the member of a physical file that has been saved with the storage *FREE option, the following message is displayed:

```
PDM0367 - File TESTFILE in library TESTLIB saved with STG(*FREE) specified.
Restore the file and try the request again.
```

Causes of damage

An object can become damaged when there is a malfunction to prevent an operation from completing. Examples include:

► An unscheduled system power outage
► Abnormal system ends (using panel functions 3 and 8 inappropriately)
► Equipment failure
  – A disk fails to read an object from auxiliary storage (read error)

– A hardware problem causes data to become corrupt
– A requested operation is not completed within the required time limit

As well, it is possible for a user action or an application to cause an object to become unusable. In this situation, while the objects affected are in an invalid state from an application perspective, the objects are rarely damaged from an i5/OS view.

Note: Mirroring and RAID (5 or 6) are high availability options. A single drive failure, or dual drive failure for RAID-6, does not cause the system to fail. Depending on the nature of the hardware failure, it is possible to have damaged objects with mirroring or RAID.

Indications of damage

At the time that a damage condition is initially encountered by software, the system issues a message that the object is damaged. This is frequently accompanied by a Licensed Internal Code log (LIC log) entry. Subsequent requests to use the object also cause a message to be issued. Users encounter a message that the object concerned has been previously marked as damaged, and as such, the operation cannot continue.

The usual indications of hard damage seen by the user, include one or more of the following symptoms:

► Unable to save the object
► Unable to use the object
► Unable to examine the object

In each case, the fact that an operation on an object is not possible due to object damage is reported in a message. The message is issued to the history log, QHST, and to the system operator message queue, QSYSOPR.

When an IPL is performed, the system attempts to locate damaged objects and add them to the object recovery list. The system issues messages to the history log, and logs message CPF8197 to the system operator message queue to indicate that damaged objects were found during the IPL. Some damage is not detected until the object is used.

The text of message CPF8197 is shown in Figure F-1.

```
Message ID . . . . . . . . . :    CPF8197
Message file . . . . . . . . :    QCPFMSG
  Library  . . . . . . . . . :      QSYS


Message . . . . :    Damaged objects found during IPL, &1 message(s) sent.
Recovery  . . . :    Use the DSPLOG command to see the history log for damage
  message(s).
```

Figure F-1   CPF8197 message

Note: Damage to the contents of a database file is not indicated during IPL.

The recovery component of i5/OS monitors for messages from LIC (such as MCH1604) and reflects these in the history log as CPF81xx messages. LIC issues MCHxxxx messages to indicate a machine check condition. MCHxxxx messages signify the writing of a LIC log entry. In some cases, you might need your service provider's assistance to determine which object the system identifies as damaged.

Locating messages about object damage

When you are not certain if there are any instances of damage, use the steps suggested in *Backup and Recovery*, SC41-5304. For easy reference, the steps are listed here:

1. Use the DSPLOG command to produce a spooled file of the messages from the history log.

2. If appropriate, use the date and time range parameters to limit the search.

3. Locate and display the spooled file.

4. Use the F16 (Find) function to locate messages in the log that contain character strings of "damage" or "sync". An example is shown in Figure F-3 on page 527.

5. For the object found in the history log spooled file, note the names and the associated object's type of the object.

6. Based on the object type, as noted in Table F-2 on page 529, select the correct recovery.

Figure F-2 shows an example of a message relating to a damaged object.

```
Additional Message Information

Message ID . . . . . . :   CPF3763      Severity . . . . . . . :    20
Message type . . . . . :   Diagnostic
Date sent  . . . . . . :   07/17/07      Time sent  . . . . . . :   15:44:17


Message . . . . :   FILE TESTFILE in library QGPL  previously damaged.
Cause . . . . . :    FILE TESTFILE in library QGPL  was damaged on the system
  before the save or restore operation. One of the following occurred:
    -- If this is a save operation, the object was not saved.
    -- If this is a restore operation and the object can be deleted by the
  system, it will be restored automatically.
    -- If this is a restore operation and the object cannot be deleted by the
  system, message CPF3819 will appear, and the object will not be restored.
Recovery  . . . :   Do one of the following:
    -- If you are saving the object and the object has recently been saved,
  delete the object and restore it from the previous save operation (RSTOBJ
  command).
    -- If you are restoring the object and it can be deleted by the system, no
  action is necessary.
    -- If you are restoring the object and message CPF3819 appears, you must
  delete FILE TESTFILE in library QGPL  and restore it (RSTOBJ command).
    For more information about handling damaged objects, see the Backup and
  Recovery book, SC41-5304.

Press Enter to continue.

F3=Exit   F6=Print   F9=Display message details   F12=Cancel
F21=Select assistance level
```

Figure F-2   Previous damage encountered

```
Display Spooled File
File  . . . . . :   QPDSPLOG
Control . . . . .
Find  . . . . . .    damage
*...+....1....+....2....+....3....+....4....+....5....+....6....+....7....+....8....+..
                      QPADEV0004 OPER01     004552                   07/17/07 15:41:12
CPF3763  20  DIAGNOSTIC    FILE TESTFILE in library QGPL previously damaged.
                      QPADEV0004 OPER01     004552                   07/17/07 15:44:17
CPF3770  30  ESCAPE        No objects saved or restored for library QGPL.
                      QPADEV0004 OPWE01     004552                   07/17/07 15:44:17
```

Figure F-3   Using F16 to find a string

Refer to Chapter 4, "Collecting messages" on page 35, 4.5, "Messages in the system operator message queue (QSYSOPR)" on page 56, and Chapter 6, "Collecting the history log (QHST)" on page 91, for information on:

► Messages
► The system operator message queue
► The history log

These chapters and sections can help you determine where the messages are and provide guidance to capture the information for your service provider.

LIC logs

A common source for information on damage are LIC logs. Table F-1 shows the type of LIC logs associated with damage. Information in the LIC logs is analyzed to understand the object or objects in question, and at times, the operation involved. Refer to 31.3, "Reporting a problem to IBM" on page 492, for information on an efficient method to forward LIC logs to your service provider so they can be analyzed.

Table F-1   LIC log entries associated with damage

Damage	LIC log major/minor	Description
Full	0300 01tt	Damage is set in the system object. The dump data portion of the LIC log specifies the related system object. In the exception header include, *tt* indicates the object type of the damaged object.
Partial	0300 02tt	Damage is set in the system object. The dump data portion of the LIC log specifies the related system object. In the exception header include, *tt* indicates the object type of the damaged object.
Full or Partial	0301 xxtt	Request made to set damage. However, damage is already set, or the damaged object is not accessible. An *xx* of 01 indicates all, full, hard, or complete damage. If *xx* is 02, partial damage is indicated. If *xx* is 00, the object is unreadable or no information is known. In the exception header include, *tt* indicates the object type of the damaged object.
Partial	0600 1AFA	Data segment identifier (SID) of the data space has an unreadable header. The header is repaired. The data space incurs soft damage.

Damage	LIC log major/minor	Description
Partial	0600 46B5	A data space entry with an invalid data space entry (DENT) status byte (FERENCE error) has been found during an inappropriate spanner recovery delete operation. The data space is soft damaged.

Detecting damage

There are a number of ways that damage is detected on the System i, by the operator and by the system.

As discussed in "Indications of damage" on page 525, the most common way for a user to become aware of a damaged object on the system is to receive a message. This occurs either at the time that the system first detects damage or on a subsequent attempt to use an object flagged as damaged.

There is a phase of the IPL that detects some forms of damage. When damaged objects are detected during an IPL, a CPF8197 message indicating object damage is detected is sent to the QSYSOPR message queue. See Figure F-1 on page 525 to view the example message text.

When you use the following operations or commands, information is relayed to the operator that an object has previously sustained damage:

► Performing a save that includes the damaged object
► Using the Display Object Description (DSPOBJD) command
► Using the Display File Description (DSPFD) command
► Using the Display File Field Description (DSPFFD) command
► Using the Display Physical File Member (DSPPFM) command
► Using Create Duplicate Object (CRTDUPOBJ) command
► Using the Check Object (CHKOBJ) command

A common misconception is that the Reclaim Storage (RCLSTG) command is designed to detect object damage. The reclaim storage procedure, by touching every object on the system, is likely to detect certain types of damage. However, RCLSTG is not designed exclusively for this purpose. While the RCLSTG command alerts the operator to some forms of damage, not all damaged objects are detected.

Refer to the information on RCLSTG in the iSeries Information Center, and in *Backup and Recovery*, SC41-5304. Additional information is also found in the Overview of the RCLSTG Command document in the Software Knowledge Base.

Tip: URLs to the software knowledge base and other IBM sites can be found in Appendix H, "Web sites related to System i problem determination" on page 549.

Recovering damaged objects

Table F-2 on page 529 has been reproduced from the *Backup and Recovery*, SC41-5304, to complete the overview of handling damaged objects.

Table F-2   Recovery by object type

Type of object	Recovery procedure
Operating system (i5/OS) object in QSYS	Contact your service provider. You might need to reinstall the operating system.
IBM-supplied user profile	Perform an abbreviated install of the operating system.
Job description that is specified on the workstation entry for the console in the controlling subsystem	If no other workstation entries exist for the controlling subsystem, the system is not usable. Contact your service provider.
Job queue	Perform an IPL. Restore or re-create the damaged job queue. All job queue entries are lost.
Output queue	Perform an IPL. If the output queue is the default queue for a printer, it is re-created and its entries rebuilt. Other output queues must be restored or re-created. Entries on these queues are lost.
Damaged file whose name starts with QAOSS	Delete the file. Restore it from backup. Run: `RCLDLO DLO(*DCODTL)`
Database files	Refer to the procedure in *Backup and Recovery*, SC41-5304, on "Recovering Damaged Database Files."
Journal	Refer to the procedure in *Backup and Recovery*, SC41-5304, for "Recovering Damaged Journals."
Journal receiver	Refer to the procedure in *Backup and Recovery*, SC41-5304, for "Recovering Damaged Journal Receivers."
Journaled file	Refer to the procedure in *Backup and Recovery*, SC41-5304, for "Recovering Journaled Files."
PTF	If a PTF save file or PTF is damaged, the PTF must be reloaded and re-applied.
All others	Refer to the procedure in *Backup and Recovery*, SC41-5304, for "Recovering Other Types of Damaged Objects."

Refer to *Backup and Recovery*, SC41-5304, for specifics on performing the recovery procedures.

Reclaim storage function

The Reclaim Storage (RCLSTG) command corrects, where possible, objects that were incompletely updated (such as database files, libraries, device descriptions, directories and stream files) and user profiles containing incorrectly recorded object ownership information. Any unusable objects or fragments are deleted.

Functions of reclaim storage

During the reclaim storage process, the system checks every object on the system, including objects in the integrated file system. The major functions of the reclaim storage process are described in the following sections.

Object functions

The system is checked to identify objects that are not addressable through a context (or library). Any object that is not addressable through a context is moved to a library created by the reclaim storage process (library QRCL). Objects without names, or having duplicate names, are given a default name as they are moved to the QRCL library. Default names take the form QRCLnnnnn, where *nnnnn* is a unique number.

Any object that resides in the root file system of the integrated file system, and is not linked to a directory, is moved to the /QReclaim directory. Any object that resides in the QOpenSys file system of the integrated file system, and is not linked to a directory, is moved to the /QOpenSys/QReclaim directory. Any space that is occupied by an unrecoverable object is returned to free space. The structure of complex objects (multi-part objects) is validated to ensure that all the parts are connected correctly.

All objects are checked for proper ownership, and a default owner (user profile QDFTOWN) is assigned where necessary. Similarly, a default authorization list (QRCLAUTL) is assigned if required.

Library functions

Reclaim storage examines the physical structure of a library and corrects it if required. Entries for objects that no longer exist are removed. Partially created libraries are destroyed, and duplicate library names are deleted.

Office functions

Additional checks are performed by reclaim storage, beyond those run during the Reclaim Document Library Object (RCLDLO) command. All DLOs are checked to ensure that they reside in the QDOC library. Object ownership is validated and invalid DLOs are deleted.

Reclaim storage also checks mail objects, verifies mail logs, and ensures all mail resides in a mail log. All mail documents are verified as being attached to a mail item.

Database functions

A number of functions specific to database objects are performed during the reclaim storage process. The same code path used in the IPL is followed to ensure that database and commit recovery criteria are satisfied.

Many types of i5/OS objects are composed of multiple pieces. These are referred to as composite objects. Composite objects are examined, and unattached sub-components (remaining portions of a database object or "danglers") are deleted if they are not needed.

The database cross-reference files are rebuilt when the *DBXREF option is selected on the RCLSTG command.

Running reclaim storage

Consider the following points when you decide to run the RCLSTG command:

► The System i server must be in a restricted state to run RCLSTG.

- ► Add the QRCL library to the QALWUSRDMN system value before you run the RCLSTG command. Alternatively, set the QALWUSRDMN system value to *ALL. Return this system value to its original value when the reclaim storage process has completed.

- ► Reclaim storage requires some free auxiliary storage to run. In situations where disk space is critically short, it can be necessary to back up some objects and delete them from disk before you run the RCLSTG command. This helps ensure the process has sufficient disk space to complete the task. If this is not done, the system can terminate with a system reference code (SRC) on the front panel, indicating an auxiliary storage full condition exists.

- ► Although we do not recommend it, the reclaim storage process can be interrupted by using the system request function (SYSREQ) on the console device where the RCLSTG command is initiated. To help ensure the system is usable, re-run the rebuild of the cross-reference file when the process is cancelled with a SYSREQ.

- ► There is no way to predict the length of time that the reclaim storage takes. Past performance of running the RCLSTG command gives an indication as to how long the process can take.

  At V5R4, `RCLSTG ESTIMATE(*YES) OMIT(*DBXREF)` calculates a runtime estimate based on the information collected on the previous run of RCLSTG. An estimate cannot be provided for the *DBXREF portion.

- ► Because this process is a long running process, schedule a reclaim storage based on necessity. There is no justification for running reclaim storage as a regular cleanup tool. Refer to the possible alternatives listed in this chapter for other processes to assess the need to run reclaim storage.

- ► RCLSTG can be run against an ASP group. No one can be using the ASP group. All objects in the ASP group are checked.

- ► Commitment control must be inactive for the ASP group (*SYSBAS or an independent ASP). Use the Work with Commitment Definitions (WRKCMTDFN) command to see if any commitment control definitions are active.

- ► The reclaim storage process cannot be check pointed (re-started from the step it is stopped at). If the process is terminated, it starts again from the beginning. It cannot be broken down and run in small segments, other than selecting either the core function, the database cross-reference function, or the directory recovery options on the RCLSTG command.

Factors affecting the amount of time that the reclaim storage takes include:

- ► The number of objects on the system
- ► The type of objects (simple or complex)
- ► The amount of damage that the reclaim storage has to process
- ► The amount of auxiliary storage configured on the system
- ► The percentage of storage in use
- ► The amount of main storage on the system

While the reclaim storage process is running, the console displays the percentage of objects scanned. However, 50% of objects processed does not indicate that if the process has run two hours to that point; it takes another two hours to complete.

Reclaim storage parameters

Reclaim storage has three sections: the core function, the database cross-reference function, and the directory recovery function. Each is selected using the RCLSTG command, as shown in Figure F-4 on page 532.

Note: The directory recovery function of RCLSTG pertains to Integrated File System directories and should not be confused with storage management directory recovery.

```
 Reclaim Storage (RCLSTG)

 Type choices, press Enter.

 Estimate time required . . . . .   *NO          *NO, *YES
 Select . . . . . . . . . . . . .   *ALL         *ALL, *DBXREF, *DIR
 Omit . . . . . . . . . . . . . .   *NONE        *NONE, *DBXREF, *DIR
 ASP device or group  . . . . . .   *SYSBAS      Name, *SYSBAS




                                                                Bottom
 F3=Exit    F4=Prompt    F5=Refresh    F12=Cancel    F13=How to use this display
 F24=More keys
```

Figure F-4   RCLSTG command prompt

Table F-3 shows the parameters to run the various functions.

Table F-3   RCLSTG command parameters

Function	RCLSTG command parameters
Full function	RCLSTG SELECT(*ALL)
Database cross reference function	RCLSTG SELECT(*DBXREF)
Directory Recovery	RCLSTG SELECT(*DIR)
Core function	RCLSTG SELECT(*ALL) OMIT(*DBXREF)
Full function on system ASP and user ASPs	RCLSTG ASPDEV(*SYSBAS)
Omit directory recovery portion (core function and database cross reference are performed)	RCLSTG OMIT(*DIR)

When to run the Reclaim Storage command

Run the Reclaim Storage command in the following situations:

► A message is posted indicating that a RCLSTG should be run.

► Database cross-reference files are in error:

  Run RCLSTG with an option for the database cross-reference function, as shown in Table F-3.

► Objects are secured by a damaged or destroyed authorization list:

The RCLSTG command assigns the objects to the default authorization list (QRCLAUTL).

► ASP recovery:

If the data in an ASP is lost due to a disk failure, RCLSTG scans all the auxiliary storage on the system and places the lost objects into the QRCL library.

► Objects are found that are not associated with a library:

This is the prime function of the RCLSTG process. RCLSTG re-establishes addressability of the objects through the default library (QRCL) if possible. The object is deleted if it cannot be recovered.

When not to run reclaim storage

The Reclaim Storage command can be recommended inappropriately. The command can be taken out of context to assume that the Reclaim Storage command can be used as either a general database cleanup tool or a universal cure for many non-specific problems.

Due to the length of time in which the reclaim storage procedure runs, be sure there is a strong indication that the reclaim storage is appropriate for the situation before recommending a recovery procedure.

Examples of circumstances that (in isolation) do not constitute a sound reason for running reclaim storage include:

► System power outage

► Damaged or corrupted objects

► User profile is deleted, but objects remain showing the user profile as the object owner (use CHGOBJOWN first)

► Multiple system (abnormal) terminations since the last RCLSTG

► RCLSTG has not been run for six months (or any time period)

In all of the above situations, perform more problem determination before running RCLSTG. If further investigation shows that there are problems (as indicated in "When to run the Reclaim Storage command" on page 532), then it is appropriate to run the Reclaim Storage command.

After reclaim storage

After the reclaim storage procedure has completed, examine these places to determine what happened during the process:

► The system operator message queue (QSYSOPR)

Look for messages about damaged objects or rebuilt files.

► The history log (QHST)

► The QRCL library

For objects in QRCL, perform the following actions as needed:

– Delete unusable or unnecessary objects
– Move (and rename) objects to other libraries
– Grant authority for objects
– Transfer ownership of objects
– Copy data from rebuilt files

► The /QReclaim directory in the integrated file system

- ► The /QOpenSys/QReclaim directory in the integrated file system
- ► Objects owned by the QDFTOWN user profile
- ► Objects secured by the QRCLAUTL authorization list

Refer to *Backup and Recovery*, SC41-5304, for further information on recovering individual object types found during the reclaim storage process.

Reclaim storage data area

Reclaim storage creates a data area in the QUSRSYS library at the end of its processing. The data area, whose format is shown in Figure F-5, records the start and end date and time, system name and release, as well as the system serial number of the system on which RCLSTG was run. Use the Display Data Area (DSPDTAARA) command to display the data area.

```
Display Data Area
                                                      System:    ITSOSYS1
Data area . . . . . . . :    QRCLSTG
  Library . . . . . . . :      QUSRSYS
Type  . . . . . . . . . :    *CHAR
Length  . . . . . . . . :    1000
Text  . . . . . . . . . :    Information from RCLSTG

          Value
Offset        *...+....1....+....2....+....3....+....4....+....5
     0     '1061130   143307                                    '
    50     '1061130   143707                                    '
   100     'V5R4M0    RCHASI5A  10EAD4C                          '
   150     'R0000325633000149                                   '
   200     'F0000057960000014                                   '
   250     'D0000021470000014                                   '
   300     '00000304163000005                                   '
   350     '                                                    '
   400     '                                                    '
                                                              More...
Press Enter to continue.
```

Figure F-5   QRCLSTG data area

The QRCLSTG data area contains the following information:

- ► Start date: Positions 1-7 (CYYMMDD)
- ► Start time: Positions 11-16 (HHMMSS)
- ► End date: Positions 51-57
- ► End time: Positions 61-66
- ► System release level: Positions 101-106
- ► System name: Positions 111-118
- ► System serial number: Positions 121-127
- ► Internal system data (position 150 forward)

Check the reclaim storage data area to ensure that the dates and times shown match what you expect to see. If the system has been restored from backup media, the reclaim storage data area has been restored as it was when the backup was done. A reclaim storage that is run in the period between the backup and the restore is not reflected. Similarly, if the data area has been restored from a backup made on another system, the information contained in

the data area is not correct. In the latter case, the serial number in the data area does not agree with the system value QSRLNBR.

Reclaim storage status messages

The status messages shown in Figure F-6 relate to the reclaim storage process. They are listed in numeric order.

```
*STATUS Messages
     CPI8201    Reclaim of system cross reference files required
     CPI8202    Database cross reference files processed successfully
     CPI8206    &1% of objects processed.
     CPI8210    Processing data base relationships.
     CPI8212    Data base/library/directory recovery in progress.
     CPI8213    Processing objects on the system.
     CPI8214    All permanent objects have valid owners.
     CPI8215    Object description verification in progress.
     CPI8216    Final clean up in progress.
     CPI8217    Mail Server Framework cleanup in progress.
     CPI8218    Directory recovery in progress.
     CPI8219    Directory cleanup in progress.
     CPI8220    Message queue QSYSOPR in *HOLD delivery mode.
```

Figure F-6   RCLSTG status messages

The escape messages shown in Figure F-7 relate to the reclaim storage process and are listed in numeric order.

```
*ESCAPE Messages
     CPF2119    Library &1 locked.
     CPF2120    Cannot delete library &1.
     CPF2126    Attempt to recover library &1 failed.
     CPF2127    User profile &2 damaged.
     CPF8201    User profile &1 does not exist or is damaged.
     CPF8204    Commitment control cannot be active during reclaim  storage.
     CPF8205    Library &1 does not exist or is damaged.
     CPF8209    System not in proper state to reclaim storage.
     CPF8211    Library &1 damaged.  RCLSTG command ended.
     CPF8224    Duplicate object found while moving or renaming member.
     CPF8251    RCLSTG command ended. Library &1 damaged.
     CPF8252    Error occurred during rebuild of damaged library &1.
```

Figure F-7   RCLSTG escape messages

During the reclaim storage processing, the following messages appear in the order shown:

CPI8220	QSYSOPR message queue set to *HOLD
CPI8212	Data base/library recovery in progress
CPI8213	Processing objects on the system (start of processing)
CPI8206	% of objects processed (percentage of objects processed)
CPI8210	Processing data base relationships
CPI8218	Directory recovery in progress
CPI8219	Directory cleanup in progress
CPI8215	Object description verification in progress
CPI8217	Mail server framework in progress

CPI8216   Final cleanup in progress
CPC8208   RCLSTG processing complete. % objects processed

Prior to V5R4, these messages were displayed on the bottom of the screen during RCLSTG processing. At V5R4, a new status screen is displayed as shown in Figure F-8.

```
 Reclaim Storage in Progress                     ITSOSYS1
                                                     11/30/07  14:33:36
 RCLSTG:
   Select/Omit/ASP device or group :   *ALL  *NONE    *SYSBAS
   Start date and time . . . . . . :   11/30/07  14:33:09
   Current step / total  . . . . . :       2       8



 Reclaim Storage Step                    Percent  Time Elapsed  Time Remaining
  Data base/library/directory recovery      100    00:00:14        00:00:00
 >Reading objects from disk                    6    00:00:09        00:02:21
  Processing data base relationships          0
  File ID table recovery                      0                    00:02:39
  Directory recovery                          0                    00:00:21
  Object description verification             0                    00:00:11
  Mail server framework cleanup               0
  Final cleanup                               0

 Total  . . . . . . . . . . . . . . . . . . . :    00:00:23        00:05:32
```

Figure F-8   V5R4 RCLSTG status screen

Alternatives to reclaim storage

There are no direct substitutes for the reclaim storage process. In the majority of cases, there are other methods of problem determination to consider that are less intrusive.

The facilities listed in this section allow the system owner to maintain maximum system availability, while gathering information to help determine if the reclaim storage process is appropriate.

Messages

Refer to the chapters in this publication for further information regarding the system operator message queue, locating messages in job logs, and the history log to assist in locating damaged objects. See 4.5, "Messages in the system operator message queue (QSYSOPR)" on page 56, Chapter 5, "Job information, job logs, and spooled files" on page 69, and Chapter 6, "Collecting the history log (QHST)" on page 91, respectively.

IPL

The IPL process does a lot of processing designed to ensure the integrity of the system. The specific objects and structures checked during the IPL are those that are necessary for the system to remain operational or cannot be manipulated while the system is running.

IPL times are much shorter than running reclaim storage and can usually be scheduled by a system operator in such a way that the effect on the users is minimized. Depending on the nature of the circumstances surrounding the need for the IPL, it can be necessary to change the IPL settings with the Change IPL Attributes (CHGIPLA) command.

Saving objects

Trying to save an object or library, is an option to verify the state of the saved objects. Using option 21 from the GO SAVE menu to perform a save of the entire system is also an option, but the save ends each time a newly damaged object is discovered. Review the messages in the history log and the job log at the end of the save for evidence of object damage.

Reclaim DB cross-reference

The Reclaim DB Cross-Reference (RCLDBXREF) command is available at V5R4 to check the status of the database cross reference files. Optionally, the RCLDBXREF command can be used to attempt to correct errors that are found. Restricted state is not required to use the RCLDBXREF command. If RCLDBXREF does not correct the problem, a RCLSTG SELECT(*DBXREF) is required to correct the problem.

Checking a database file

The ability to save an object to backup media does not guarantee that a database file is free from corruption. The save process assures that the composite structures of the object are intact and able to be manipulated. An application might be required to verify that the contents of each of the records in a database file are valid.

The save function uses blocking techniques that can result in saving partial or logical damage to tape. To verify that a particular file is not damaged, copy the data to a new file, record by record, in arrival sequence. Use the following commands to perform this operation:

```
OVRDBF FILE(x) SEQONLY(*YES 1)
CPYF FROMFILE(LIBa/x) TOFILE(QTEMP/x) CRTFILE(*YES)
```

Check that the CPYF completes without error.

Checking for damage in physical files

A tool is available by creating a command and procedure to check for damage on physical files. It is the Check Damage on Physical Files (CHKPF) command.

The Check Damage on Physical Files (CHKPF) command checks each physical file or table of a library for data integrity errors or damage. The command runs over a specific library or all libraries on the system. CHKPF checks only the objects and reports errors. It does not perform recovery.

The CHKPF command uses the system cross-reference file (QADBXREF in the QSYS library) to determine the physical files to check for each library. If the system cross-reference file is damaged, this command does not run. You must run either the RCLDBXREF command or the Reclaim Storage command to correct the system cross-reference files prior to running CHKPF.

The CHKPF command runs in batch or interactively. Physical files found to have data integrity errors or damage are identified by a message sent to the message queue of the user profile who runs or submits the CHKPF command. Prior to performing any damage recovery, review individual physical files identified with data integrity errors or damage. Complete this review using CPYF on the physical file and review the job log.

To locate further information on the CHKPF tool and the source needed to create the tool on a System i server, refer to the knowledge base document Check Damage on Physical Files (CHKPF).

PRTDSKINF disk space report

Use the Retrieve Disk Information (RTVDSKINF) command to collect disk space information. This task is submitted as a batch job to collect data about the objects on disk. Information is written to the QAEZDISK file in the QUSRSYS library.

Once this data is collected, use the PRTDSKINF command to produce a spooled file output based on the QAEZDISK data file. Producing a report by using the *SYS option gives the system's estimate of the amount of disk storage that can be reclaimed by running the reclaim storage procedure. The percentage listed as *Storage affected by RCLSTG* is the approximate size of all the objects that are expected to be reclaimed when RCLSTG is run.

G

Problem Information

All methodologies of problem solving involve gathering information. This section contains checklists of questions to help gather information for some problem areas of the system. When a problem occurs, answer as many of the questions as possible. In addition, use the procedures in this document to help gather the information to collect.

The following types of problems are included in this section:

► Printer
► RPG
► Digital Certificate Manager

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Printer Problem Information

The information in this section applies to twinax attached printers only. The following types of problems are included in this section:

► Hung printer or print writer
► Incorrect printer output

Before collecting information about the printer error:

If they do not exist, create the IBMLIB library and IBMOUTQ output queue. To do this, enter the following commands:

```
CRTLIB LIB(IBMLIB)
CRTOUTQ OUTQ(IBMLIB/IBMOUTQ)
```

Enter the following commands to add the IBMLIB library to your library list and to change your job's output queue to the IBMOUTQ output queue:

```
ADDLIBLE IBMLIB
CHGJOB * OUTQ(IBMLIB/IBMOUTQ)
```

Enter the following commands to send all spooled files created for this session to the IBMOUTQ output queue:

```
OVRPRTF FILE(QPCSMPRT) OUTQ(IBMLIB/IBMOUTQ)
OVRPRTF FILE(QSYSPRT) OUTQ(IBMLIB/IBMOUTQ)
OVRPRTF FILE(QPJOBLOG) OUTQ(IBMLIB/IBMOUTQ)
OVRPRTF FILE(QPDSPJOB) OUTQ(IBMLIB/IBMOUTQ)
OVRPRTF FILE(QPDSPJOB) OUTQ(IBMLIB/IBMOUTQ)
```

Note: The printer file overrides are not in effect after your job ends.

Hung Printer

If the printer or print writer is hung, do the following:

Enter WRKWTR *aaaaaaaa* where *aaaaaaaa* is the writer name.

The following display appears:

```
Work with Printer Writer

Writer . . . . . . . . :    PRT01           User . . . . . . . . . :    QSPLJOB
Number . . . . . . . . :    012802

Started by user . . . . . . . . . . . :    WNELSON
Status:
  Writing . . . . . . . . . . . . . . :    N
  Waiting on message . . . . . . . . . :    Y
  Held . . . . . . . . . . . . . . . . :    N
  End pending . . . . . . . . . . . . :    N
  Hold pending . . . . . . . . . . . . :    N
  Between files . . . . . . . . . . . :    Y
  Between copies . . . . . . . . . . . :    N
  Waiting for data . . . . . . . . . . :    N
  On job queue . . . . . . . . . . . . :    N
File being written . . . . . . . . . . :
  File number . . . . . . . . . . . . :

                                                                     More...

Press Enter to continue.


 F3=Exit     F5=Refresh   F6=Messages   F10=Release   F11=Hold   F12=Cancel
 F14=Queue   F24=More keys
```

Figure G-1   Work with printer writer

Press F17 (shown when F24 is pressed to display more keys) to work with the writer job.

The following display appears:

```
Work with Job
                                                       System:    RCHAS730
 Job:   PRT01           User:   QSPLJOB           Number:   012802

 Select one of the following:

      1. Display job status attributes
      2. Display job definition attributes
      3. Display job run attributes, if active
      4. Work with spooled files

     10. Display job log, if active or on job queue
     11. Display program stack, if active
     12. Work with locks, if active
     13. Display library list, if active
     14. Display open files, if active
     15. Display file overrides, if active
     16. Display commitment control status, if active
                                                              More...
 Selection or command
 ===> 10


 F3=Exit   F4=Prompt   F9=Retrieve   F12=Cancel
```

Figure G-2   Work with job

Enter the following command to collect the job log for the writer. Use the job name at the top of the Work with Job display. For example:

```
DSPJOBLOG JOB(012802/QSPLJOB/PRT01)
```

Press the Enter key to create the QPJOBLOG spooled file. The job log is written to this spooled file.

Select option 11 to display the program stack. For example, the following display appears:

```
Display Program Stack
                                               System:    RCHAS730
Job:    PRT01            User:    QSPLJOB      Number:   012802

Job status:   ACTIVE

Request
 Level        Program         Library      Statement       Instruction
    1         QCMD            QSYS                          00A9
              QSPWTRM1        QSYS                          0291
              QMHRCMSS        QSYS                          09B0




                                                               Bottom
Press Enter to continue.

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

Figure G-3   Display stack

Press the Print key to collect the program stack information.

Press the Error Reset key to unlock the keyboard.

Press Enter two times to return to the Work with Printer Writer display.

Press F14 to display the output queue associated with the printer writer. For example, the following display appears:

```
   Work with Output Queue

   Queue:   IBMOUTQ         Library:   IBMLIB          Status:   RLS

   Type options, press Enter.
     1=Send   2=Change    3=Hold   4=Delete   5=Display   6=Release  7=Messages
     8=Attributes          9=Work with printing status


   Opt  File         User        User Data    Sts    Pages   Copies  Form Type    Pty
    3   QPDSPPC      WNELSON                   WTR      6       1     *STD          5
    _   QPJOBLOG     WNELSON     QPADEV0004    RDY      3       1     *STD          5
    _   QSYSPRT      WNELSON                   RDY      1       1     *STD          5
    _   QPDSPJOB     WNELSON                   RDY      5       1     *STD          3
    _   QPJOBLOG     WNELSON     QPADEV0006    RDY      1       1     *STD          5




                                                                           Bottom
   Parameters for options 1, 2, 3 or command
   ===> _____
   F3=Exit   F11=View 2   F12=Cancel   F22=Printers   F24=More keys
```

Figure G-4   Work with output queue

If there is a spooled file with the status WTR, select option 3 to hold the file. The status changes to *HLD.

Type DSPPTF LICPGM(5738SS1) OUTPUT(*PRINT) on the command line to collect a printed list of PTFs.

If you can re-create the problem, continue with the next step.

Press the Enter key to return to the Work with Printer Writer display.

Record the *writer name, number and user*.

Press the Enter key until a command line is displayed.

Enter the following commands to start a trace of the writer, using the information you recorded:

STRSRVJOB JOB(number/user/name)

TRCJOB *ON

Re-create the error.

Enter TRCJOB *OFF to stop the trace. The trace data is saved in spooled file QPSRVTRC.

Enter the command ENDSRVJOB to stop servicing the writer job.

Go to 30.5, "Sending the problem report and documentation by e-mail" on page 466 to submit the collected materials.

Incorrect Printer Output

If your print job or printer is creating incorrect output, do the following:

Type the WRKSPLF or WRKOUTQ command to display the spooled file with the problem.

Type 3 next to the spooled file to hold it. Press the Enter key.

Type 2 next to the spooled file to change the spooled file attributes. Press the Enter key. For example, the following display appears:

```
Change Spooled File Attributes (CHGSPLFA)

Type choices, press Enter.

Spooled file . . . . . . . . . . > QPDSPJOB      Name, *SELECT
Job name . . . . . . . . . . . . > QPADEV0020    Name, *
  User . . . . . . . . . . . . . >  WNELSON      Name
  Number . . . . . . . . . . . . >  012841       000000-999999
Spooled file number  . . . . . . > 1             1-9999, *ONLY, *LAST
Printer  . . . . . . . . . . . .   *OUTQ         Name, *SAME, *OUTQ
Print sequence . . . . . . . . .   *SAME         *SAME, *NEXT
Form type  . . . . . . . . . . .   *STD          Form type, *SAME, *STD
Copies . . . . . . . . . . . . .   1             1-255, *SAME
Restart printing . . . . . . . .   *STRPAGE      Number, *SAME, *STRPAGE...

                        Additional Parameters

Output queue . . . . . . . . . .   WNELSON       Name, *SAME, *DEV
  Library  . . . . . . . . . . .    WNELSON      Name, *LIBL, *CURLIB

                                                                  Bottom
F3=Exit   F4=Prompt   F5=Refresh   F10=Additional parameters   F12=Cancel
F13=How to use this display       F24=More keys
```

Figure G-5   Change attributes

Press F10 to display additional parameters and page down to the *Save file* prompt. For example, the following display appears:

```
Change Spooled File Attributes (CHGSPLFA)

 Type choices, press Enter.

 Page range to print:
   Starting page  . . . . . . . .   1              Number, *SAME, *ENDPAGE
   Ending page  . . . . . . . . .   *END           Number, *SAME, *END
 File becomes available . . . . .   *FILEEND       *SAME, *JOBEND, *FILEEND...
 Save file  . . . . . . . . . . .   *YES    *SAME, *NO, *YES
 Output priority  . . . . . . . .   5              1-9, *SAME, *JOB
 User data  . . . . . . . . . . .   '          '   User data, *SAME
 Align page . . . . . . . . . . .   *NO            *SAME, *NO, *YES
 Print quality  . . . . . . . . .   *STD           *SAME, *STD, *DEVD, *DRAFT...
 Form feed  . . . . . . . . . . .   *DEVD          *SAME, *DEVD, *CONT, *CUT...
 Print fidelity . . . . . . . . .   *CONTENT       *SAME, *ABSOLUTE, *CONTENT
 Print on both sides  . . . . . .   *NO            *SAME, *NO, *YES, *TUMBLE...
 Pages per side . . . . . . . . .   1              *SAME, 1, 2, 4




                                                                      More...
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure G-6   Change attributes

Type *YES in the *Save file* prompt and press the Enter key.

Collect user data from a source/sink trace run under SST as described in Chapter 24, "Tracing the Licensed Internal Code" on page 361. Use the following table to determine the fields to set that are different from the description in the chapter.

Table G-1

Display name	Prompt and value to enter
Allocate general trace table	General table size: New . . . . : 4000
Specify source/sink object	Type 2
Start source/sink object traces	Opt description 1 user data (data stream/SCS)

Note: The trace is now running. Exit from SST. For more information using SST, see Chapter 26, "Using System Service Tools (SST)" on page 415.

Type the command WRKSPLF or WRKOUTQ to display the spooled file.

Type a 6 next to the file to release it.

Once the error has occurred, return to the System Service Tools display.

Select service tool Trace Vertical Licensed Internal Code and press the Enter key.

Go to Chapter 24, "Tracing the Licensed Internal Code" on page 361 and follow the instructions to the end. Then save the trace data.

RPG Problem Information

For problems with RPG programs, collect the materials listed in this section and send a note describing your problem. See the sections below for more detail.

RPG Data to Collect

For any RPG problem, always collect the following user source material and programs.

> **Note:** Many of the procedures to collect these materials are in this book.

- ► All user programs to run the application (RPG, CLP, etc.)
- ► All user file data, data areas, etc
- ► All user source files - RPG source, CL source, DDS source, OCL source (for S36E), etc. associated with the application
- ► Job log for the job, RPG dump if obtainable when error occurs
- ► A list of RPG PTFs applied on the system

Answer the following questions:

- ► What target release was the user program compiled on?
- ► Did recompiling on a different target release solve the problem?

> **Note:** If the program fails at one release but works fine on a previous release, include programs from both releases.

Use the table to determine additional information that needs to be collected for specific problems.

Table G-2   Problems

Type of problem	Data to collect
Compile time problem - (CPF6301 or incorrect RPG compile time message)	Compile listing with GENOPT(*LIST)
Program looping	A trace of the job
Complex communication problem	Application flow chart for programs
Compile option values used on the Create RPG Program command	Compile listing with GENOPT(*LIST)
ICF problem	TRCICF
Communication problem	Steps for communication Configuration set-up for line, controller, and device descriptions.

RPG Data to Send in a File

Send the instructions to reproduce the user problem. If possible, send as an on-line READ ME file instead of paper material.

Include the following information in the instructions:

► Any override of files taking place before running the application.

► Which program to call to start up the application.

► What values to input for any input field on a user display, or special instructions (password on user application) to lead to the point that the program fails.

► For a problem caused by two or more jobs running the same application, detailed steps on a time sequence of what each job does.

Digital Certificate Manager

Problems with digital certificates (programs, procedures and processes) can appear in a variety of ways, such as:

► Password and general problems
► Certificate store and key database
► Browser errors
► HTTP Server
► User certificate task assignment

Many of the problems encountered by clients involve setting up their system properly to use digital certificates: getting the appropriate certificate stores created, SSL configuration as it relates to using digital certificates, and just getting the system setup correction for certifications in general. The i5/OS V5R3 Information Center has a troubleshooting section with scenarios and discussions relating to setting up the System i properly, based on whether the client uses certificates from a public CA or whether they use a local CA that they create on their System i.

Refer to the iSeries Information Center: **Security** → **Digital Certificate Manager** → **Troubleshoot DC** → **DCM Scenarios and Plan for DCM**.

Web sites related to System i problem determination

This appendix offers a list of suggested IBM Web sites related to System i problem determination:

► For iSeries Access Service Pack download:

  `http://www-03.ibm.com/servers/eserver/iseries/access/casp.html`

► Support for System i - Providing support for IBM System i products and related software:

  `http://www-304.ibm.com/jct01004c/systems/support/supportsite.wss/brandmain?brandind=5000027`

► Technical databases:

  – Software knowledge base
  – Registered software knowledge base
  – Preventive service planning (PSP) documents
  – Authorized Problem Analysis Reports (APARs)

  `http://www-912.ibm.com/supporthome.nsf/document/20300257`

► IBM Systems Information Centers:

  `http://publib.boulder.ibm.com/eserver/`

  Contains links to IBM Systems Hardware Information Center and iSeries Information Center

► IBM i5/OS release support:

  `http://www-03.ibm.com/servers/eserver/support/iseries/planning/software/i5osschedule.html`

Note: The Web addresses listed here were accurate at the time this book was written.
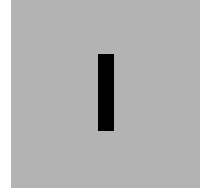
EBCDIC, HEX, and ASCII conversion charts

Code (data and programs) is stored internally in formats other than alphabetic. When working with diagnostic tools, this information might need to be interpreted for you to understand and read the content. Conversion charts from and to hexadecimal and decimal are provided in the following figures.

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Conversion Charts

Hexadecimal/Decimal Conversion

Use the following procedures to convert hexadecimal values to decimal values and decimal to hexadecimal. Use these procedures with the "Decimal/Hexadecimal Conversion Chart" and the "Negative Decimal/Hexadecimal Conversion Chart" on page 2.

Positive/Negative Hexadecimal to Decimal Conversion Procedure
1. Locate each hex digit in its corresponding column position and note the equivalent decimal value. Use the "Negative Decimal/Hexadecimal Conversion Chart on page 2 if either number is negartive.
2. Add the individual decimal equivalents to obtain the total decimal value for the hexadecimal number. Use the minus sign (-) to indicate negative numbers.

Positive/Negative Decimal to Hexadecimal Conversion Procedure
1. Locate the largest decimal value in the table that is less than or equal to the decimal number you are converting. Use the negative number conversion chart if converting a negative number.
2. Note its hexadecimal equivalent and the hexadecimal column position.
3. Subtract the value in the table from the number you are converting.
   - If the remainder is greater than 14, continue with step 1.
   - If the remainder is less than or equal to 14, note the hexadecimal equivalent for column position one.
4. Place the hexadecimal equivalents in the order of their column positions.

Decimal/Hexadecimal Conversion Chart

Hex. digit 4 Hex. = Dec.		Hex. digit 3 Hex. = Dec.		Hex. digit 2 Hex. = Dec.		Hex. digit 1 Hex. = Dec.	
0	0	0	0	0	0	0	0
1	4,096	1	256	1	16	1	1
2	8,192	2	512	2	32	2	2
3	12,288	3	768	3	48	3	3
4	16,384	4	1,024	4	64	4	4
5	20,480	5	1,280	5	80	5	5
6	24,576	6	1,536	6	96	6	6
7	28,672	7	1,792	7	112	7	7
8	32,768	8	2,048	8	128	8	8
9	36,864	9	2,304	9	144	9	9
A	40,960	A	2,560	A	160	A	10
B	45,056	B	2,816	B	176	B	11
C	49,152	C	3,072	C	192	C	12
D	53,248	D	3,328	D	208	D	13
E	57,344	E	3,584	E	224	E	14
F	61,440	F	3,840	F	240	F	15

Figure I-1   Hexadecimal/Decimal Conversion Chart

Conversion Charts

Hexadecimal/Decimal Conversion *(continued)*

Negative Decimal/Hexadecimal Conversion Chart

Hex. digit 4 Hex. = Dec.		Hex. digit 3 Hex. = Dec.		Hex. digit 2 Hex. = Dec.		Hex. digit 1 Hex. = Dec.	
F	0	F	0	F	0	F	0
E	4,096	E	256	E	16	E	1
D	8,192	D	512	D	32	D	2
C	12,288	C	768	C	48	C	3
B	16,384	B	1,024	B	64	B	4
A	20,480	A	1,280	A	80	A	5
9	24,576	9	1,536	9	96	9	6
8	28,672	8	1,792	8	112	8	7
-	-	7	2,048	7	128	7	8
-	-	6	2,304	6	144	6	9
-	-	5	2,560	5	160	5	10
-	-	4	2,816	4	176	4	11
-	-	3	3,072	3	192	3	12
-	-	2	3,328	2	208	2	13
-	-	1	3,584	1	224	1	14
-	-	0	3,840	0	240	0	15

Two to the Nth Power Chart

2	N
1	0
2	1
4	2
8	3
16	4
32	5
64	6
128	7
256	8
512	9
1,024	10
2,048	11
4,096	12
8,193	13
16,384	14
32,768	15
65,536	16

Figure I-2   Negative Decimal/Hexadecimal Conversion Chart

Related publications

The publications listed in this section are considered particularly suitable for a more detailed discussion of the topics covered in this book.

IBM Redbooks Publications

For information about ordering the following publications, see "How to get IBM Redbooks Publications" on page 556. Note that some of the documents referenced here might be available in softcopy only.

► *IBM AS/400 TCP/IP Configuration and Operation*, GG24-3442

► *The System Administrator's Companion to AS/400 Availability and Recovery*, SG24-2161

► *Management Central: A Smart Way to Manage AS/400 Systems*, SG24-5407

► *Managing AS/400 V4R4 with Operations Navigator*, SG24-5646

Other publications

These publications are also relevant as further information sources:

► *AS/400 Client Access Console*, G325-6337

► *AS/400 Licensed Internal Code Diagnostic Aids - Volume 1*, LY44-5900

► *AS/400 Licensed Internal Code Diagnostic Aids - Volume 2*, LY44-5901

► *OS/400 Diagnostic Aids*, LY44-5907

► *AS/400 Physical Planning Reference*, SA41-5109

► *AS/400 Data Collection Guide*, SC21-8253

► *AS/400 Basic System Operation, Administration and Problem Handling*, SC41-5206

► *Backup and Recovery*, SC41-5304

► *Work Management*, SC41-5306

► *Communications Management*, SC41-5406

► *AS/400 TCP/IP Configuration and Reference*, SC41-5420

The following publications are available in softcopy only at:

http://publib.boulder.ibm.com/pubs/html/as400/online/v4r4eng.htm

► *Systems Network Architecture Formats*, GA27-3136

► *System Operation*, SC41-4203

► *OS/400 Security - Reference*, SC41-5302

► *Client Access Express for Windows - Setup*, SC41-5507

► *AS/400 Operations Console Setup V4R4*, SC41-5508

► *CL Reference*, SC41-5722

► *OS/400 CL Reference*, SC41-5726

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Online resources

These Web sites are also relevant as further information sources:

► Locate IBM Redbooks at:

http://www.redbooks.ibm.com

► The iSeries Information Center is located at:

http://publib.boulder.ibm.com/pubs/html/as400/infocenter.htm

► Software Knowledge Base is located at:

http://www.as400service.ibm.com/supporthome.nsf/home/Software+Knowledge+Base

► You can search for publications about Service Director on the Web at:

http://publib.boulder.ibm.com:80/cgi-bin/bookmgr/LIBRARY

► The SDF server Web site is located at:

http://w3sms.boulder.ibm.com/w3sms.nsf/c00134a213f178748725642e007fcce3
cbbe0d039334ebf5872564cd0071d123?OpenDocument

► The AS/400 Technical Support site is on the Web at:

– http://as400service.ibm.com
– http://as400service.rochester.ibm.com

► For information about Client Access, visit the home page at:

http://www.as400.ibm.com/clientaccess/

► For Client Access Service Pack download, go to:

http://www.as400.ibm.com/clientaccess/casp.htm

► For Preventive Service Planning, see:

http://www.as400service.ibm.com/supporthome.nsf/home/
Prev+Serv+Planning+-+PSP

► For Software Problem - APARS, go to:

http://www.as400service.ibm.com/supporthome.nsf/home/

► UPS manufacturer documentation is available on the Web at these sites:

– http://www.bestpower.com/
– http://www.apcc.com/

► A solution for configuring the implementation of a TCP/IP sockets server is available from Hummingbird at:

http://www.hummingbird.com

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► http://www.redbooks.ibm.com

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Abbreviations and acronyms

ADDMSGD	Add Message Description		**DDI**	Distributed Data Interfaces
ADLTRC	Additional traces		**DENT**	data space entry
ANZDBFSTC	Analyze Database File Statics		**DEVD**	description
ANZDMPPLS	Analyze Dump Pool Statics		**DLTAPARDTA**	Delete APAR Data
ANZJVM	Analyze Java Virtual Machine		**DLTCMNTRC**	Delete Communications Trace
ANZPRB	Analyze Problem		**DLTTRC**	Delete Trace
APAR	Authorized Problem Analysis Report		**DMP**	Dump
APP	application		**DMPCMNTRC**	Dump Communications Trace
APPC	advanced program-to-program communications		**DMPJOB**	Dump Job
			DMPJOBINT	Dump Job Internal
ARGLIST	Argument list		**DMPJVM**	Dump Java Virtual Machine
ASAP	Automatic Software Alert Process		**DMPOBJ**	Dump Object
AST	Automatic Status Tracking		**DMPSYSOBJ**	Dump System Object
ATM	Asynchronous Transfer Mode		**DMPUSRTRC**	Dump User Trace
BAT	basic assurance test		**DSPCRGINF**	Display CRG Information
BRMS	Business Recovery Media Services		**DSPCTLD**	Display Controller Description
BSC	Binary Synchronous Communications		**DSPDEVD**	Display Device Description
			DSPDTAARA	Display Data Area
BSEF	Basic System Environment Functions		**DSPFD**	Display File Description
			DSPFFD	Display File Field Description
CBL	Cobol		**DSPJOB**	Display Job
CCIOM	Common class input/output manager		**DSPJOBLOG**	Display Job Log
			DSPJVMJOB	Display JVM Jobs
CGI	Common Gateway Interface		**DSPLIB**	Display Library
CHGDSTPWD	Change DST Password command		**DSPLIND**	Display Line Description
CHGFCNUSG	Change Function Usage		**DSPLOG**	Display Log
CHGIPLA	Change IPL Attributes		**DSPMSG**	Display Messages
CHGJOB	Change Job		**DSPMSGD**	Display Message Description
CHGJOBD	Change Job Description		**DSPNWID**	Display Network Interface Description
CHGMSGD	Change Message Description			
CHGSPLFA	Change Spooled File Attributes		**DSPOBJD**	Display Object Description
CHKCMNTRC	Check Communications Trace		**DSPOPT**	Display Optical
CHKOBJ	Check Object		**DSPPFM**	Display Physical File Member
CHKPF	Check Damage on Physical Files		**DSPSAVF**	Display Save File
CIO	Cluster internal object		**DSPT**	display station pass through
CL	Control Language		**DSPTAP**	Display Tape
COMPID	component ID		**DST**	Dedicated Service Tools
CPM	Continuous Power Main Storage		**ECS**	Electronic Customer Support
CPYSPLF	Copy Spooled File		**ECuRep**	Enhanced Customer Data Repository Service
CRG	Cluster Resource Group			
CRTDUPOBJ	Create Duplicate Object		**EDRS**	Extended Dynamic Remote SQL

ENDCMNTRC	End Communications Trace	**PDPs**	process Problem Determination Procedures
ENDTCPSVR	End TCP/IP Server	**PEX**	performance explorer
ENDTRC	End Trace	**PMR**	Problem Report Record
ENDWCH	End Watch	**POP**	Post Office Protocol
ERP	Enterprise Resource Planning	**PPP**	Point to Point Protocol
ETR	Electronic Technical Response	**PPP**	Point-to-Point Protocol
FFDC	First Failure Data Capture	**PRTCMNTRC**	Print Communications Trace
FTP	File Transfer Protocol	**PRTDEVADR**	Print Device Addresses
HIPER	high-impact and pervasive	**PRTERRLOG**	Print Error Log
HMC	Hardware Management Console	**PRTINTDTA**	Print Internal Data
ICF	Intersystem Communications Function	**PRTSYSINF**	Print System Information
ILE	Integrated Language Environment	**PRTTRC**	Print Trace Data
IO	input/output	**PSI**	Problem source identification
IOP	input/output processor	**PSP**	Preventive Service Planning
IPL	Initial Program Load	**PTF**	Program Temporary Fix
IPv4	Internet Protocol Version 4	**QoS**	Quality of Service
IPv6	Internet Protocol Version 6	**QRYODP**	Query Open Data Path
ISDN	Integrated Services Digital Network	**RAM**	random access memory
JVM	Java Virtual Machine	**RCLDBXREF**	Reclaim DB Cross-reference
L2TP	Layer Two Tunneling Protocol	**RCLDLO**	Reclaim Document Library Object
LIC	Licensed Internal Code	**RCLSTG**	Reclaim Storage
LNT	Lotus Notes	**RCR**	resource configuration record
LOGOUTPUT	log output	**RPG**	Report Program Generator
LPD	Line Printer Daemon	**RSTLIB**	Restore Library
LPP	Licensed Program Product	**RTVCFGSRC**	Retrieve Configuration Source
LPR	Line Printer Requester	**RTVDSKINF**	Retrieve Disk Information
MI	machine interface	**SAV**	Save
MOVOBJ	Move Object	**SAVAPARDTA**	Save APAR Data
MPL	Multi-programming level	**SAVLIB**	Save Library
MSCP	Machine Services Control Point	**SAVOBJ**	Save Object
MSD	main storage dump	**SBMJOB**	Submit Job
NETBIOS	Network basis input/output system	**SCPF**	Start-control-program-function
NWI	network interfaces	**SCS**	SNA character string
NWS	Network server description	**SDF**	Software Delivery and Fulfillment
OA	Operational Assistant	**SDLC**	Synchronous Data Link Control
ODP	open data path	**SID**	segment identifier
OPM	of original program model	**SIS**	Service Information Search
OVRPRTF	Override Print File	**SM**	storage management
PAL	Problem Activity Log	**SMAPP**	System Managed Access Path Protection
PCR	Product Cross Reference	**SMB**	Server message block
PD	Problem determination	**SMTP**	Simple Mail Transfer Protocol
PDDB	Problem diagnosis data	**SNA**	Systems Network Architecture

SNTP	Simple Network Time Protocol		**WCHLICLOG**	Watch for Licensed Internal Code Log
SPCN	System Power Control Network		**WCHMSG**	Watch for message
SRC	System Reference Code		**WCHMSGQ**	Watched message queue
SRD	Service Request and Delivery		**WCHTIMO**	watch
SSL	Secure Sockets Layer		**WebSM**	Web Based System Manager
SST	System Service Tools		**WRKACTJOB**	Work with Active Jobs
STRCMNTRC	Start Communications Trace		**WRKCFGSTS**	Work with Configuration Status
STRCPYSCN	Start Copy Screen		**WRKCMTDFN**	Work with Commitment Definitions
STRDBG	Start Debug CL command		**WRKHDWPRD**	Work with Hardware Products
STRPRTWTR	Start Printer Writer		**WRKJOB**	Work with Job
STRRMTSPT	Start Remote Support		**WRKJOBLOG**	Work with Job Logs
STRSST	Start System Service Tools		**WRKSYSSTS**	Work with System Status
STRTCPSVR	Start TCP/IP Server		**WRKWCH**	Work with Watches
STRTRC	Start Trace		**WSG**	Workstation Gateway
STRWCH	Start Watch			
SVL	supervisory linkage			
SYSREQ	system request function			
SysRq	System Request			
TCP	TCP/IP			
TDE	Task Dispatching Element			
TH	transmission header			
TRACEROUTE	TCP/IP Route			
TRCCNN	Trace Connections			
TRCINT	Licensed Internal Code (LIC) trace			
TRCINT	Trace			
TRCINT	Trace internal			
TRCINT	Trace TCP/IP Application (TRCTCPAPP) Trace Internal			
TRCPGM	Trace program			
TRCPGMITV	Trace Time Internal parameter			
TRCTCPAPP	Trace TCP/IP Application			
TRCTYPE	Trace type			
UPS	Uninterruptible Power Supply			
URI	Universal Resource Indicator			
VFYAPPCCNN	Verify APPC Connection			
VFYCMN	Verify Communications			
VLIC	Vertical Licensed Internal Code			
VLOGs	Vertical Licensed Internal Logs			
VPN	Virtual private network			
VRYCFG	vary configuration			
VSP	virtual service processor			
WAS	WebSphere Administration Server			
WCHJOB	Watched job			

Index

IBM

Redbooks

i5/OS Diagnostic Tools for System Administrators

i5/OS Diagnostic Tools for System Administrators:
An A to Z Reference for Problem Determination

Redbooks

One source to help make problem resolution easy

Beginning and advanced tools for diagnosing problems

Procedures to document, gather, and report problems

Although System i servers rate over a 99.9% availability factor, there are times when problems occur. Some problems limit the use of a device, program, or application. More severe and pervasive problems limit the use of more components. In either circumstance, the amount of time a component is unavailable relates directly to the actions taken to manage the situation. The ability to resolve problems depends on the tools that are available, the knowledge (and attitude) of the worker, the symptoms and nature of the problem at hand, and other factors.

This book is designed to introduce you to the problem determination aids used in an i5/OS environment. You will become familiar with the tools that are available and the instructions for how each one works. As proficiency is built with the use of each tool and familiarity with the procedures, efficiency of the system operator and service personnel increases.

Consider this book a "Do Not Panic, Read Me First" guide to help you support System i models. It discusses problem analysis, problem determination, and problem source identification. And it offers you step-by-step instructions that show you how to use the i5/OS problem determination aids to produce detailed problem information.