Ingres® 2006 Release 3

Interactive Performance Monitor User Guide

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Chapter 1: Introducing Ingres Performance Monitoring

The *Interactive Performance Monitor User Guide* provides a comprehensive look at the performance monitoring capabilities of Ingres®. This chapter provides a brief introduction to the Interactive Performance Monitor (IPM) and the ways it can be used. This chapter also introduces you to various conventions and notations used throughout the guide.

Interactive Performance Monitor

The Interactive Performance Monitor (IPM) monitors a running Ingres installation. It displays information about servers, sessions, and locking and logging activity.

IPM is an interactive, forms-based interface with the functionality of the following tools:

- iimonitor
- lockstat
- logstat
- iinamu

IPM can be used for multiple purposes, as follows:

- Monitoring

  IPM monitors the state of the different processes, the logging and locking systems, the database servers, the log file, and the user sessions.

- Performance analysis

  IPM can be used to analyze performance problems. It displays in real time which tables and pages are locked, whether the locks are shared or exclusive, and which transactions are blocking or possibly deadlocked with other transactions. It displays user sessions and whether each is active or waiting for user input, and displays log file and logging system statistics.

- System management

  IPM provides information useful for maintaining and tuning the Ingres configuration. For example, it displays in real time how much of the log file is in use and by whom. IPM can also be used to spot user behaviors that interfere with other users, such as transactions that are neither committed nor rolled back over a long time.

Terms Used in This Guide

You should be familiar with the following terms and definitions. Some of these terms will assist you in interpreting the monitoring data displayed by IPM.

A *blocking lock* is a lock granted on a resource in such a way as to prevent another lock from being granted on that same resource. For example, an exclusive lock on a table prevents another shared or exclusive lock from being granted on that table. A blocking lock serializes access to a resource, table, page, or database. For example, an exclusive lock on a table blocks all other access to that table. Until the transaction holding the lock completes (commits or rolls back), all other transactions must wait.

Note: A blocking lock is not a deadlock.

A *deadlock* is a condition that occurs when one transaction is waiting for a lock held by another transaction *at the same time* that the other transaction is waiting for a lock held by the first. Both transactions block each other from completing.

A *lock list* is a list of one or more locks on resources in a given database or servers. Each session has at least one lock list. When a session is in a transaction, that session has an additional lock list containing all the locks acquired during the transaction.

A *logical lock* is a lock that is usually acquired during a transaction and released during a transaction or at commit time. A page lock is a logical lock.

A *physical lock* is a lock that can span multiple transactions in any given session. In most cases, table and database locks are held from the point that they are acquired until the end of the session.

A *resource* is any object in a database on which a lock can be held. A table, a page in a table, or even a database is a resource.

A *command* is an operation that you execute at the operating system level. An extended operation invoked by a command is often referred to as a *utility*.

A *statement* is an operation that you embed within a program or execute interactively from a terminal monitor. A statement can be written in Ingres 4GL, a host programming language (such as C), or a database query language (SQL or QUEL).

System-specific Text in This Guide

This guide provides information that is specific to your operating system, as in these examples:

Windows: This information is specific to the Windows operation system.

UNIX: This information is specific to the UNIX operation system.

VMS: This information is specific to VMS operating system.

When necessary for clarity, the symbol  is used to indicate the end of the system-specific text.

For sections that pertain to one system only, the system is indicated in the section title.

Syntax Conventions Used in This Guide

This guide uses the following conventions to describe syntax:

Convention	Usage
`Monospace`	Indicates key words, symbols, or punctuation that you must enter as shown
Italics	Represent a variable name for which you must supply an actual value
[ ] (brackets)	Indicate an optional item
{ } (braces)	Indicate an optional item that you can repeat as many times as appropriate
| (vertical bar)	Separates items in a list and indicates that you must choose one item

Chapter 2: Installation Considerations for IPM

This chapter discusses various installation and configuration settings required to monitor Ingres. This includes granting privileges for lesser-privileged users to monitor Ingres.

Privileges and IPM

IPM provides powerful abilities to view information about any user session and the Ingres installation as a whole. It requires restricted system privileges to run.

You can install IPM so that less privileged users can use it. However, this type of installation permits any user to display large quantities of system and other user information. Users can display, for example, what other user sessions are running, what tables other users are accessing, whether a given user session is currently active, how much log file space any transaction is taking up, which user sessions are holding locks blocking which other sessions, and so on.

Note: Do not select this type of IPM installation unless you intend ordinary users to have the capability to display system and other user information.

Privileges are required to view queries or remove sessions or servers.

UNIX: By default, IPM can be run only by the Ingres system administrator. This is the account used for performing installations.

If needed, you can permit IPM to be run by less privileged users with the following command entered at the operating system prompt:

```
chmod 4711 ipm
```

VMS: By default, IPM can be run only with operating system privileges that requires SYSPRV CMKRNL and WORLD privileges.

If needed, you can permit IPM to be run by less privileged users by installing it with enhanced privileges. To do this, type the following at the operating system prompt:

```
INSTALL :== $INSTALL/COMMAND

INSTALL REPLACE full_dir_spec:IPM.EXE -

       $_ /OPEN/PRIV=(SYSPRV,CMKRNL,WORLD)
```

Requirements for Running IPM

IPM must be run on the same machine as the Ingres installation that is to be monitored and must be pointed at the desired installation just as any application or embedded user program.

Because IPM opens the master database (iidbdb) to get a list of databases and opens other databases to get table names, the installation must be in a state to allow database connections.

An exception is the stand-alone mode (the **-s** option). In stand-alone mode, IPM does not require DBMS servers to accept connections, but can show logging and locking information only, not server and session information.

ipm Command—Start IPM

The ipm command invokes IPM. If the ipm command is invoked with no options, IPM displays databases, open databases, relation and page resources, active transactions, and user lock lists for all databases in the current installation.

Some ipm command options are incompatible with other options. If you select options that are incompatible at start-up, a message is displayed that indicates the incompatibility.

Most options can be changed while running IPM from the Option Selection Screen (see page 24).

The ipm command has the following format:

```
ipm [options]
```

where *options* are:

-d*dbname*

Reports on resources for database *dbname* only.

-e

Displays system (NONPROTECT) lock lists as well as user lock lists. The -e option is the only option that affects the Lock List Display.

-i

Displays inactive in addition to active transactions. The -i option affects the Log Transaction Display.

-l[*resourcetype*]

Reports on a specific resource type (page, table, database, and so on). If a resource type is not specified, all resource types are reported. For a list of valid resource types, see Resource Type (see page 14).

-n

Prints resources granted in null mode.

-r*seconds*

Sets refresh time for various screens. Specify a given number of seconds.

-s

Runs IPM in stand-alone mode, in which it operates even if the DBMS server is down or not accepting connections.

-t

Reports on a particular table. The -d option must also be used with this option.

Resource Type—Display Specific Resource

The following resource types can be specified on the **-l** flag on the ipm command. These options affect only the Resource List Display:

buffermgr

Displays buffer manager locks. Each multiserver data buffer holds a buffer manager lock.

bufmgrdb

Displays a buffer manager database lock. This lock is used to determine the validity of cache contents. When a server opens a database, the value in this lock is used to determine if the cached information for the database is valid; therefore, it does not actually lock any resources.

bufmgrtable

Displays a buffer manager table lock. This lock type is the same as the buffer manager database lock, but operates on tables rather than databases.

checkpoint

Displays checkpoint resource locks. Each database that has online backup running holds a checkpoint resource lock on it.

ckpcluster

Displays checkpoint resource locks for an Ingres cluster installation.

config

Displays configuration locks. This lock type is used when accessing a database config file. The config file holds database configuration information.

control

Displays a table control lock. It is requested to perform modify, modify to relocate, create index, create table, and drop SQL commands. This lock is also held by sessions reading a table with readlock=nolock set.

createtable

Displays createtable locks. Any user creating a table holds a createtable lock on that table.

database

Displays database locks. Any user connected to database holds a database lock on that database.

dbtblid

Displays locks of the type used to manage temporary table IDs. The lock value is used to store the next table id to use for temporary tables and does not actually lock any resource.

event

Displays event locks. This lock type is used by processes that use the locking system as a means to signal events. It does not actually lock any resource.

extend

Displays extend locks. This lock type is used while extending (adding a new page to) a file. It prevents two processes from trying to add pages to the same file at the same time.

journal

Displays journal locks. This lock type is used when accessing database journal files. It is held only by RCP (recovery process) and ACP (archiver process).

opendb

Displays open database resource locks. Each open database in a server holds this type of lock.

page

Displays page locks. Any user accessing a page in a table holds a page lock on that page.

svdatabase

Displays server database locks. Each database opened by a server holds a server database lock on it.

svpage

Displays server page locks. Each page touched by a server on behalf of a session in that server holds a server page lock.

svtable

Displays server table resource locks. Each table touched by a session in a server holds this type of lock.

syscontrol

Displays locks of the type used in conjunction with user defined abstract data types.

table

Displays table locks. Any user in a table holds a table lock on that table.

IPM Release Compatibility

The release of IPM supplied with your current release package works only with that release. You *cannot* use the current release with any previous releases.

Chapter 3: Understanding Forms and Menus

This chapter introduces IPM screens, describes the main menu screen and option screen, and provides summaries of the menus and selections.

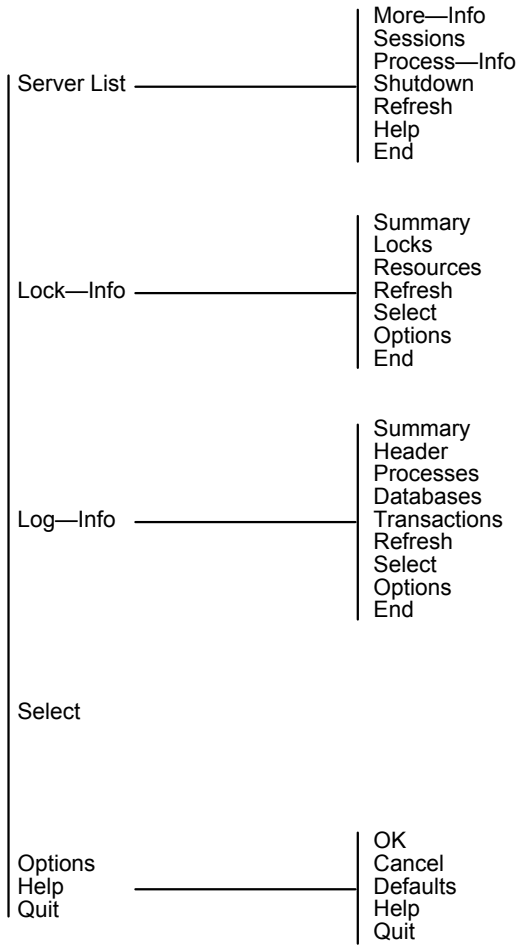
Notes on IPM Display Format

Note the following about IPM displays:

- IPM uses pop-up screens where possible to allow the context on the previous screens to be preserved without obscuring the currently displayed data.
- IPM displays all lock, transaction, and process IDs in hexadecimal format.
- On the menu map summaries, items selected from the boxed screen areas are shown in bold. Menu items selected from the menu list at the bottom of the screen are shown in regular typeface. The boxed 1s and 2s represent replicated sets of menu items.

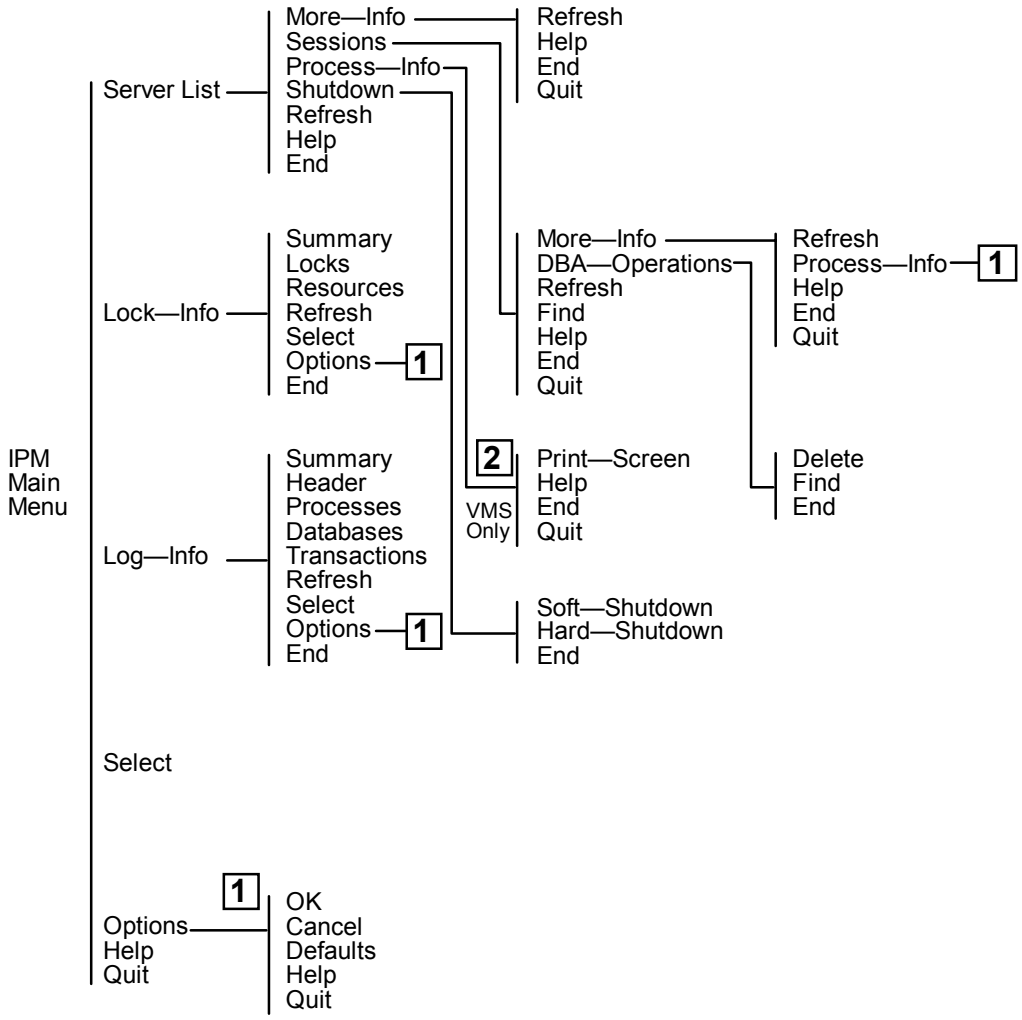
Main Menu Map

The following figure illustrates each selection that is accessible from the IPM Main Menu:



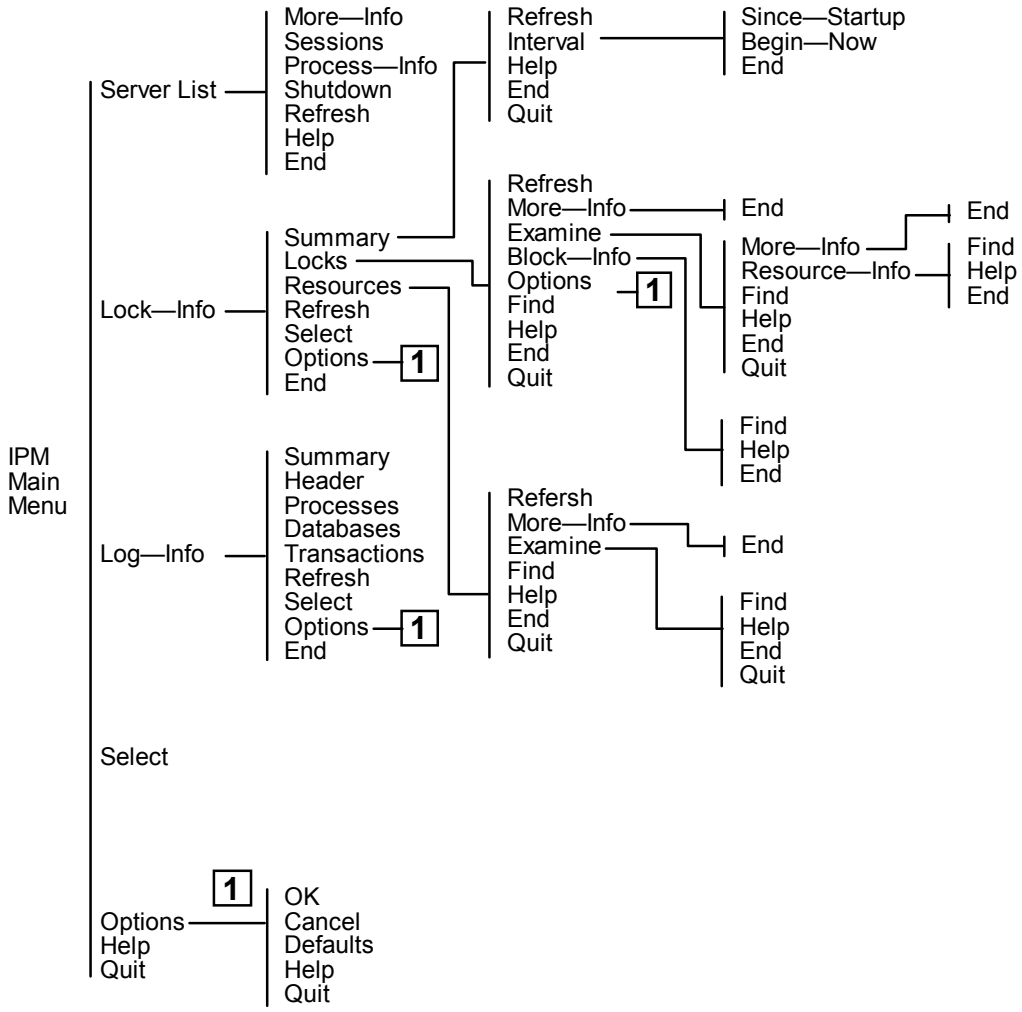
Server List Menu Map

The following figure illustrates each selection that is accessible from the Server_List menus:



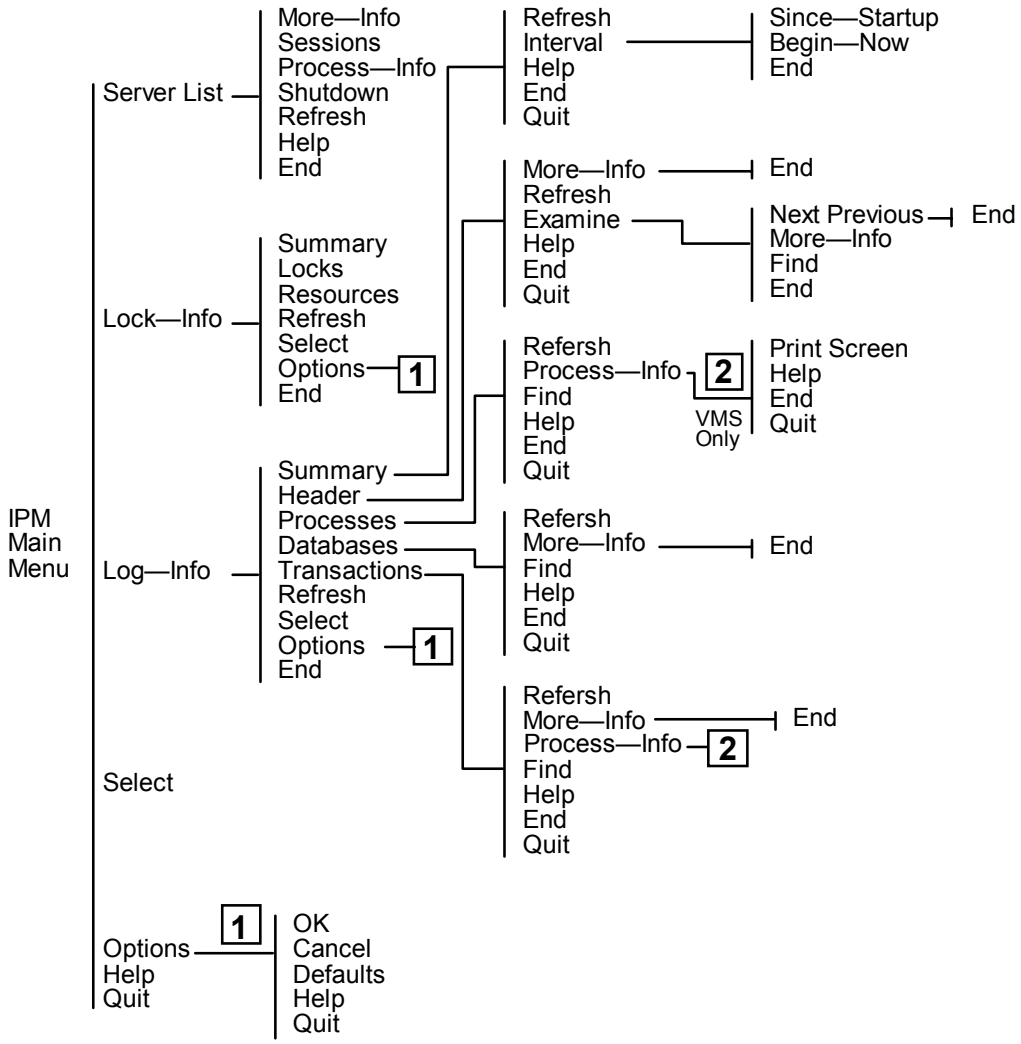
Lock Info Menu Map

The following figure illustrates each selection that is available from the Lock_Info portion:



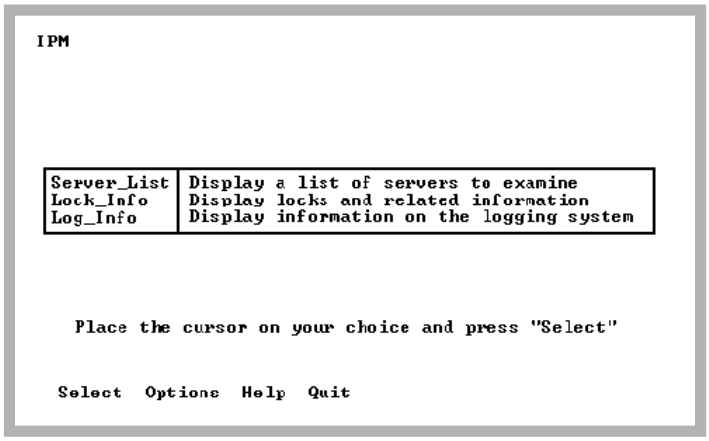
Log Info Menu Map

The following figure illustrates each selection that is available from the Log_Info portion:



Main Menu Screen

When IPM is started, the Main Menu screen is displayed, as shown here:



You select a given category in the Main Menu by using the up and down arrow keys.

The command line options specified at startup can be changed by selecting the Options menu item.

The Main Menu has the following options:

Server List

Displays the Server Information screens. This area displays a list of servers (that are registered with the Name Server). You can view session information, remove sessions, and shut down servers (provided you are a privileged user). Note that this area contains iinamu and iimonitor functionality. The server list is not available in IPM stand-alone mode (-s start-up option).

For more information on server monitoring information, see the chapter "Monitoring Server Information."

Lock_Info

Displays a new set of menu items and choices to display information pertaining to the locking system. Locking system summaries, lock lists, and resources can be viewed. This area is where concurrency analysis and locking activity viewing is done.

For details on locking information, see the chapter "Monitoring Lock Information."

Log_Info

Displays a new set of menu items and choices to display information pertaining to the logging system. Logging system summaries, transaction lists, process, and database lists can be viewed. This area can be used to monitor transaction rates, log file activity, processes, and databases in the logging system.

For details on logging information, see the chapter "Monitoring Log Information."

Main-Menu Menu Items

The Main Menu has the following menu items:

Options

Lets you view or set options that determine what resources are displayed on the Resource Display screen. Options include displaying resources:

- For a specific database
- Of specified types
- Of all types
- For a specific table

IPM provides pop-up help for each option listing available choices.

For more information on the Option menu item, see Option Selection Screen (see page 24).

Help

Displays help screens

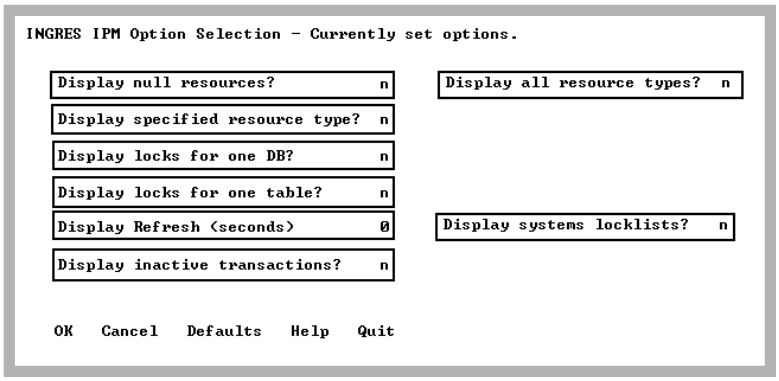
Quit

Exits IPM

Option Selection Screen

The Option Selection screen allows the runtime options to be viewed and changed while IPM is running. This screen can be selected from the Main Menu, Lock List Display, or Resource Display screens.

These options can also be specified on the command line when IPM is invoked with the ipm command.



Some options determine which resources are displayed when the Resource Display screen is refreshed. By specifying appropriate options, you can display detailed resource locking information down to the page level or a summary display of what databases are currently open.

The Option Selection screen has the following options:

Display null resources?

By default, IPM suppresses display of granted null resources. (Granted null relation locks show what tables were referenced during the database session, that is, a granted null lock on a table indicates that a query was run against that table. Granted null locks do not block any access to the resource they are granted on.)

N is the default unless a resource type is specified.

If this option is set to Y, IPM displays any resources that are granted null and that qualify, based on other specified options.

Display all resource types?

By default, IPM displays only database, table, and page resources. If this option is set to Y, all resource types are displayed.

Display specified resource type?

By default, IPM displays database, open database, table, and page resources. If this option is set to Y, enter the resource you are searching in the Type to display field. Resource types of interest include:

- Database
- Table
- Age
- Createtable

Other resource types exist. For a full list of resource types, see Resource Type (see page 14). To display a pop-up list, enter a (?) in the Type to Display field and press Return.

Display locks for one DB?

By default, IPM displays locks for all databases in the current installation. If this option is set to Y, enter the database in the Specify database field. To display a pop-up list, enter a (?) in the Specify database field and press Return.

Display locks for one table?

By default, IPM displays locks for all tables. If this option is set to Y, enter the table name in the Specify a table name field. You must also set the Display resources for one DB field to Y.

Display Refresh (seconds)

By default, IPM displays snapshots of your installation. If this option is set to a number greater than zero, IPM automatically refreshes the display. Select a number n between 1 and 999 to specify autorefresh (auto update) every n seconds on the Locking System Summary, Logging System Summary, and Logging System Header Display screens.

On autorefreshable screens, the state is displayed in the upper right-hand corner as one of the two following states:

- Autorefresh: Disabled
- Autorefresh: Enabled, n seconds

Display system locklists?

By default, IPM displays user lock lists only. A lock list with a status of NONPROTECT is usually a system lock list. If this option is set to Y, IPM also displays system lock lists.

Display inactive transactions?

By default, IPM displays active transactions only. A transaction with a status of INACTIVE is usually a system transaction and not displayed. User transactions that have issued only selects are INACTIVE. User transactions that have been committed but not journaled also have a status of INACTIVE. If this option is set to Y, IPM also displays inactive transactions.

Change Options on the Options Selection Screen

To make changes to the Option Selection screen:

1. Use the cursor to move from field to field, and type your changes as desired.
2. Select the OK menu item.

   Your changes are saved.

   Note: Some options are incompatible with other options. For example, do not specify the display of all resource types and also the display of table resource locks for a table, because a table resource lock type is a subset of all resource types. If any saved options are incompatible, IPM displays an error message.
3. Select the Refresh menu item on the Lock List Display or Resource Display screens, if you were using these screens previously.

   The search is rerun with the new search criteria.

Option Selection Menu Items

The Option Selection screen has the following menu items:

OK

Saves the options that are shown and returns to the previous screen.

Cancel

Ignores any changes made to the options and returns to the previous screen.

Defaults

Resets all options to the state when the IPM Option Selection screen was entered and do not return to the previous screen. At this point, any changes to the options can be made.

Help

Displays the help screens.

Quit

Exits IPM.

Chapter 4: Monitoring Server Information

This chapter discusses the IPM screens that display server information.

Server Information

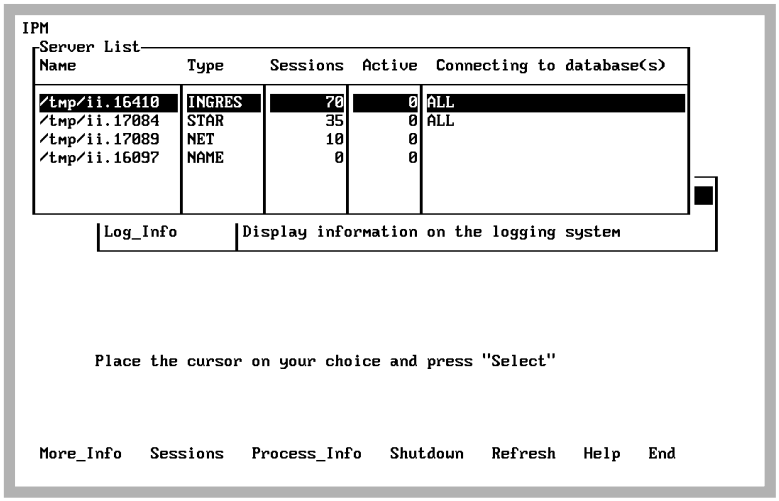
Server information displayed by IPM includes server lists, session lists, and related information.

A privileged user can terminate servers or sessions.

To review server information, select Server_List from the Main Menu.

Server List Screen

The Server List screen displays the servers registered with the Name Server.



The Server List screen contains the following fields:

Name

This field contains the name of the server.

Type

This field contains the type of server: Ingres DBMS Server, Ingres Star Server, Ingres Communications Server, or NAME (Name server, or GCN).

Sessions

This field displays the number of sessions in the server.

Active

This field contains the number of active sessions.

Connecting to databases(s)

This field indicates the databases that are accessible from this server. If your installation is running a server that was configured to connect to only certain databases (the _dblist server parameter), IPM lists each database (with the same server name) on a separate line. Otherwise, it displays ALL to indicate that this server can connect to any database in the current Ingres installation. If there are many databases or long database names, they can be displayed using the More_Info menu item.

Server List Menu Items

The Server List screen contains the following menu items:

More_Info

Displays the Server Detail screen. The Server Detail screen contains more information for the server on which the cursor is positioned. This screen is available only for the Ingres DBMS Server and Ingres Star Servers.

For more information on this, see Server Detail Screen (More_Info) (see page 31).

Sessions

Displays the Session List screen. The Session List screen shows all of the sessions for the server on which the cursor is positioned. The information displayed includes the session name and session id. This screen is available only for the Ingres DBMS Server and Ingres Star Server.

For more information on this, see Session List Screen (see page 33).

VMS:

Process_Info

Displays the Detailed Process Information screen. The Detailed Process Information screen shows various job and process information (JPI) for the server on which the cursor is positioned. Such information includes CPU time, Direct I/O, Buffered I/O, Enqueue limit, and so on. This display automatically refreshes and can be selected for any server except the Name Server.

For more information on this screen, see Detailed Process Information Screen (VMS Only) (see page 40).

Shutdown

Displays a submenu that allows a privileged user to shut down a server normally or in an emergency. Only the Ingres DBMS Server or Ingres Star Server can be specified. Available choices are:

Soft_Shutdown

Same as set server shutdown in iimonitor, Soft_Shutdown is preferred, provided it is OK to wait until the current sessions end before the server stops. After this menu item is executed, the connection to the server is maintained and the submenu reappears. This allows the Hard_Shutdown menu item to be selected, if desired. If IPM is connected to the server you are trying to shut down, you must exit from IPM for the shutdown to complete.

Hard_Shutdown

Same as stop server in iimonitor. Use this instead of operating system commands like VMS stop or UNIX kill -9. Executing this menu item immediately stops the server and breaks out of the submenu.

End

Drops the server connection after Soft_Shutdown and returns to the Server List screen. After using this option, you cannot reconnect to the server.

Refresh

Queries the Name Server for a list of servers. If there are none, IPM displays a message to that effect and returns to the Main Menu screen.

Help

Displays help screens.

End

Returns to the Main Menu screen.

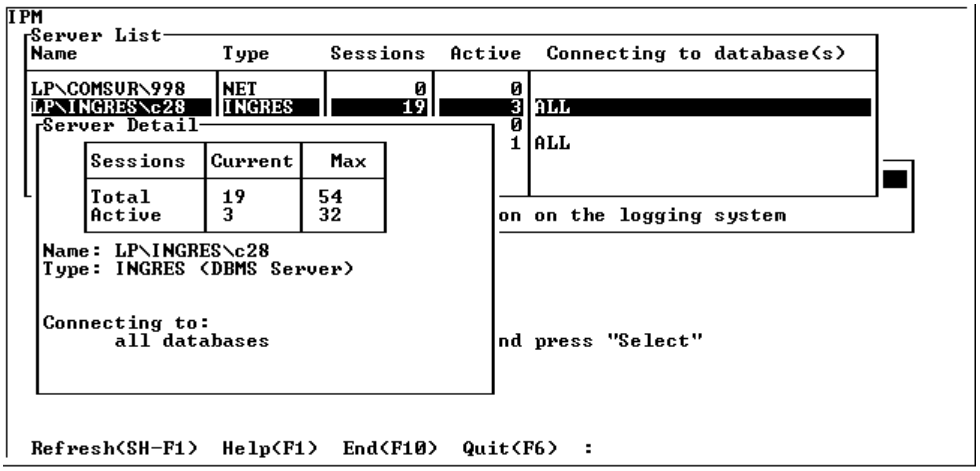
Quit

Exits IPM.

Server Detail Screen (More_Info)

The Server Detail screen displays information about a selected server.

To display detailed information on a server, position the cursor at a server in the Server List and select More_Info from the Server List menu. The Server Detail pop-up is displayed. The boxed area shows the session count information.



The Server Detail Screen (More_Info) screen displays the following information:

Total current sessions

Number of sessions connected to the specified server.

Total maximum sessions

Maximum number of sessions that the specified server can handle at any one time. This is equivalent to the server configuration parameter, connected_sessions.

Active current sessions

Number of sessions in a computable state. The server does not yet provide a count of the number of active transactions to IPM; therefore, this number is always 0.

Active maximum sessions

Maximum number of sessions that can be in a computable state. It is equivalent to the active_sessions server configuration parameter. This qualifier to the server startup command currently has no effect on the number of computable sessions allowed at any one time.

The maximum and active maximum sessions are determined at server startup.

UNIX: The Idle Quantums field is not displayed.

VMS: The amount of CPU used is displayed in terms of Quantums in the Idle Quantums field. As an example, a display of 324485/327697 indicates that there were 324,485 quantums idle out of 327,697 total quantums while this server was active.

Server Detail Menu Items

The Server Detail screen has the following menu items:

Refresh

Queries the specified server for server detail information. If the specified server no longer exists, a message is displayed.

Help

Displays help screens.

End

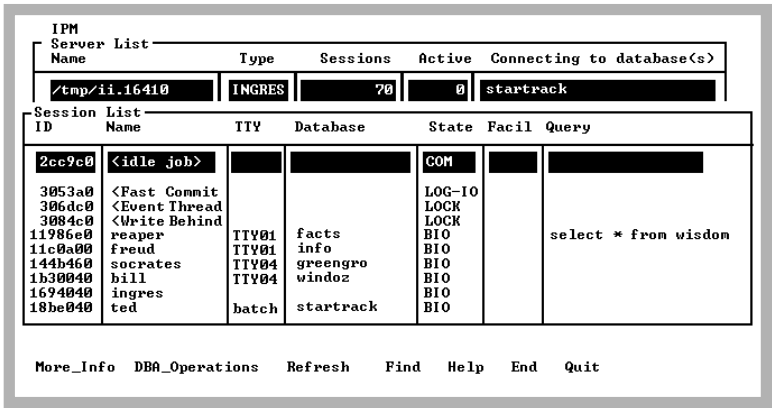
Returns to the Server List screen.

Quit

Exits IPM.

Session List Screen

The Session List screen appears when you select Sessions from the Server List screen. This pop-up screen displays the sessions for the selected server. The selected server is the one on which the cursor rests in the Server List.



The Session List screen has the following columns:

ID

Uniquely identifies the session.

Name

Name of the session. This is a scrollable field; move the cursor to the field and use the arrow keys to see the entire contents.

Internal sessions are displayed with angle brackets <>. The bracketed internal sessions are available only if the option (Display Internal Sessions?) in the options panel is set to y. The default setting is n. Session names for user sessions are usually the same as the user name. (Both the user name and session name are shown under More_Info).

TTY

Terminal name, if known. Network and internal sessions do not show a terminal.

Database

The database to which the session is currently connected.

State

State of the session. Use the Find menu item to search this column. The following states are shown. Note that these states are not identical in meaning for internal sessions, such as the Fast Commit Thread:

BIO

The session is waiting for client communications.

COM

The session is computable; it is not waiting for the user or for I/O.

DIO

The session is waiting for disk I/O.

FREE

The session is about to terminate.

LOCK

The session is waiting for another session to release locks. The wait continues until the other session completes its transaction.

LOG-IO

The session is waiting for output to the log file.

MUTEX

The session is waiting for another session to complete accessing an internal data structure. The wait continues only until the other session is done accessing.

Facil

The server facility currently handling the session. The More_Info screen spells out the meaning of the facility acronym. Examples are:

DMF

Data Manipulation Facility

OPF

Optimizer Facility

QEF

Query Execution Facility

Query

The first 24 characters of the query currently running is shown. This field is displayed only if the user running IPM is a privileged user.

The More_Info screen shows more of the query. The query is shown only if it is current. A current query is one being processed by the Ingres DBMS Server, not a query that has returned results and finished executing, even though the user has not committed.

Session List Menu Items

The Session List screen has the following menu items:

More_Info

Displays the Session Detail screen. This screen displays information about the selected session, indicated by the cursor position when this menu item is selected.

For more information on this, see Server Detail Screen (More_Info) (see page 31).

DBA_Operations

Displays a submenu that allows a privileged user to delete the session on which the cursor is positioned.

The submenu choices are:

Delete

Removes session from the server. Any open transactions it has are rolled back.

Find

Same as Find menu item below.

End

Returns to the Session List screen.

Caution! *Do not remove internal sessions (marked with angle brackets <>). Removing an internal session must be used only as a last resort and only with assistance from Customer Support.*

Removing an internal session can cause the loss of all uncommitted transactions and can prevent you from properly shutting down your Ingres installation.

Refresh

Queries the specified server for a list of sessions and refresh the display. If the server no longer exists, a message is printed.

Find

Searches for matching values in any column in the scrolling area. Tab to the desired column and select Find.

For example, use Find to search for LOCK in the State column.

Help

Displays help screens.

End

Returns to the Server List screen.

Quit

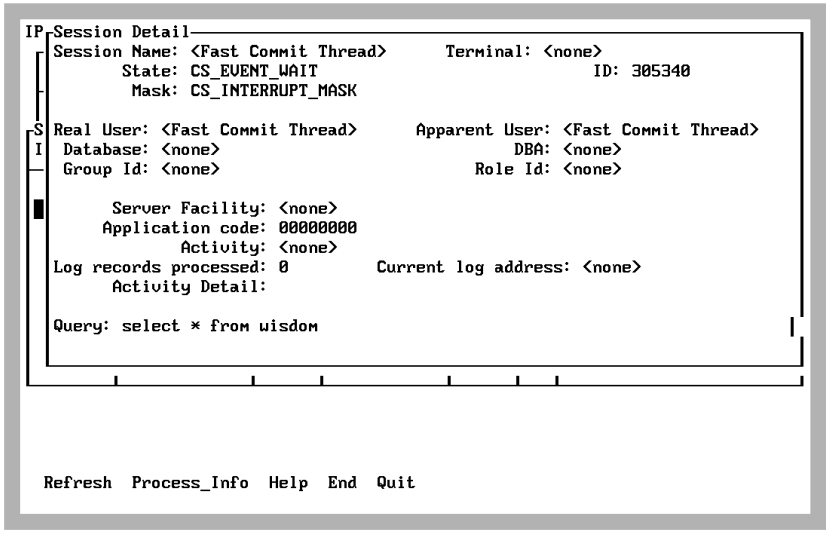
Exits IPM.

Session Detail Screen (More_Info)

The Session Detail screen displays detailed information for the selected session.

To display detailed information on a session, position the cursor at a session in the Session List and select More_Info from the Session List menu. The Session Detail pop-up is displayed.

Session Name, Terminal, ID, Database, and Server Facility are the same as on the Session List screen. State is replaced by the expanded state and mask. The expanded state and mask expose details of the internal session state; those details are subject to change between Ingres releases and must be interpreted by qualified support personnel.



The Session Detail screen displays the following information:

Real User, Apparent User

Usually identical. If the session was started with the -u flag to impersonate another user, the apparent user is the user who is being impersonated. For example, if privileged user, ted, started a session with the command sql -ubill dbname, the apparent user is bill and the real user is ted.

DBA

The owner of the database (database administrator) to which the session is connected

Group ID, Role ID

The group and role IDs, if any, for the current session. These features are part of the Knowledge Management Extension.

Client PID

Shows the client process ID (PID), which is displayed if the session is being run from a client that is local and interactive (as opposed to batch).

You can observe the client process's Job and Process (JPI) parameters using the Process_Info menu item from the Detailed Process Information screen.

Appears on VMS.

TID

The internal thread ID (TID). TID is displayed in the Session Details screen when Ingres is using OS threads.

Appears on UNIX.

Activity

Current state of the session. Possible states are as follows:

Aborting

A normal abort is being performed (that is, the user issued a rollback, deadlock, and so on).

Performing force abort processing

An abort of an old transaction is in process.

Aborting on behalf of an interrupt

An abort is taking place due to an interrupt (Control C).

Aborting on behalf of a terminating session

An abort is taking place for a session that is terminating ungracefully.

Terminating session

A session is terminating normally.

Fetching IIDBDB information

A session that is starting up is retrieving iidbdb information. This can show up for extended periods due to locks on the iidbdb, or the logging system is full.

Optimizing query

The optimizer is at work.

Waiting on event lock signal (LKevent)

The Event Thread is usually in this state.

Log records processed, Current log address

Number of log records processed and current log address being processed when the session is backing out the transaction due to any cause. This allows visual confirmation that the server is indeed doing work on the rollout. Periodic refreshes give a measure of the progress in performing the rollout.

Causes of backing out include:

- The rollback statement in SQL
- The session being removed
- Running out of log file space
- Deadlock

Caution! *The session that is being rolled out must never be removed, nor can the server containing that session be terminated in any way.*

Query

The first 128 characters of the query currently running is shown. A current query is one being processed by the Ingres DBMS Server, not a query that has returned results and finished executing, even though the user has not committed. This field is active only if the user running IPM is a privileged user.

Session Detail Menu Items

The Session Detail screen has the following menu items:

Refresh

Queries the specified server for new session detail for the specified session and refresh the display. If the server or session no longer exists, a message is printed.

Process_Info

Valid on VMS.

Displays a screen that shows job-process information for the client that is being examined. The client process must be local and interactive (not in batch) for this option to work: a PID cannot be obtained for a session's client unless the client is tied to a terminal. Information displayed includes CPU time, Direct I/O, Buffered I/O, Enqueue limit, etc. This display automatically refreshes. For more information on process_info menu item, see Detailed Process Information Screen (VMS Only) (see page 40).

Help

Displays help screens.

End

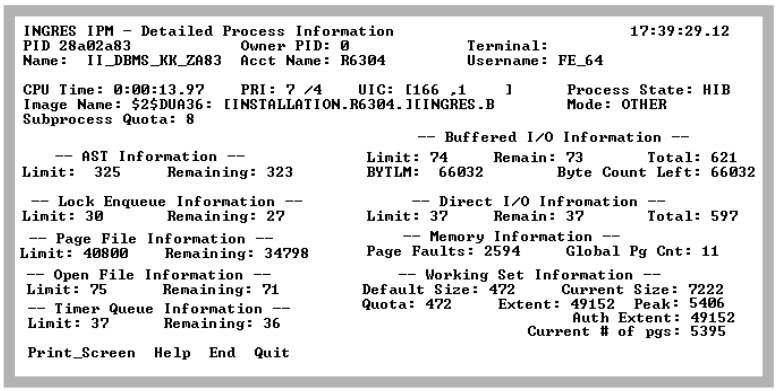
Returns to the Session List screen.

Quit

Exits IPM.

Detailed Process Information Screen (VMS Only)

The Detailed Process Information screen displays detailed job/process information on the selected process (usually a server). This screen is available on VMS only.



This screen helps you to determine if the quotas for the account that started this process are adequate.

The display is automatically refreshed. The Display Refresh field on the Options Display screen does not affect the refresh time of this screen.

When the process that is being monitored is deleted, an appropriate message is displayed in the upper left corner of the form. At any time, the current screen can be written to a file for later analysis. This display is useful for observing servers that are running large queries, MQTs (Multi Query Transactions), or users to ensure that there are sufficient operating system resources. For more information on JPI parameters, see the *VMS System Services Manual*.

Display Detailed Process Information Screen

To display the Detailed Process Information screen, select Process_Info from any of the following screens:

- Server Information:
  - Server List
  - Session's More_Info (Session Detail)
    When this screen is invoked from the Session Detail screen, the client process information is displayed. This works only when the client process is local and interactive.
- Logging Information:
  - Log Info's Processes (Log Process Display)
  - Log Info's Transactions (Log Transaction Display)

  When invoked from the Logging area of IPM, information is displayed for a server, recovery process (RCP), or archiver (ACP).

Place the cursor on the process you want displayed from the appropriate screen before selecting this menu item.

Detailed Process Information Screen Fields

The detail process information screen contains the following information:

CPU Time

The cumulative CPU time.

Process State

The VMS process state.

Lock Enqueue Information

The important value is the Remaining field. When this value reaches zero the server cannot acquire any more locks. This leads to errors or lock escalation, which implies table level locking. Lock escalation causes serious concurrency problems. This is relevant only for Ingres installations on VMS clusters that use the VMS Distributed Lock Manager (DLM).

Direct I/O Information

The Total field shows how many cumulative direct I/O requests were made. This indicates how much disk I/O is being performed.

Page Faults

Indicates if the working set sizes (also displayed) are sufficient.

Open File Information

The Remaining field shows how many more files the process can open. On queries that touch many tables, on databases with journals and queries that contain aggregates, the File Limit Quota (FILLM) can be exceeded if not set at sufficient levels. For more information, see the *System Administrator Guide*.

Detailed Process Information Menu Items

The Detailed Process Information screen has the following menu items:

Print_Screen

Captures the current screen's contents to a file. You are prompted for the file name. This stops the screen refresh while writing the screen out. When the screen is written to the file, the screen refresh resumes.

Help

Displays help screens.

End

Returns to the previous screen.

Quit

Exits IPM.

Chapter 5: Monitoring Lock Information

This chapter discusses the IPM screens that display lock information.

Lock Information

Lock information displayed by IPM includes lock lists, locks by resource, and other related information. This information is useful for concurrency analysis and the tuning of a running system. Displays include the following:

Lock List Display

Lets you locate concurrency bottlenecks.

Resource List Display

Lets you gauge the amount of activity in a database, table or page.

Locking System Summary

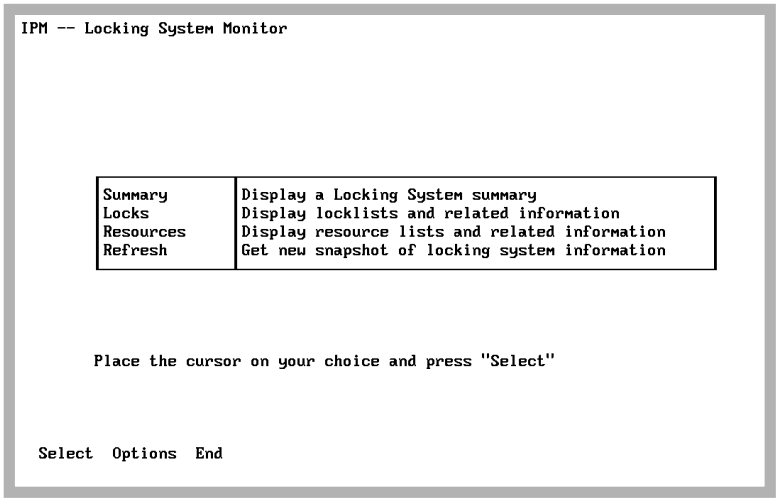
Lets you determine if the locking parameters specified at installation or configuration time are adequate.

To review lock information, select the Lock_Info screen from the Main Menu.

Lock Info Menu Screen

The Lock Info Menu screen appears when you select Lock_Info from the Main Menu.

This screen is the top-level screen for IPM monitoring of the Ingres locking system.



From this screen, you can select various locking system parameters for monitoring, including a snapshot of the locking system. You may experience a delay as the system displays locking system parameters.

The options specified at IPM startup can be viewed on the Options selection screen. To specify the information that is obtained from the locking system, see Option Selection Screen (see page 24).

Lock Info Selections

The Lock_Info screen has the following selections:

Summary

Displays the Locking System Summary screen. Information on the locking system is displayed (lock list activity, deadlock counts, and other data).

For more information on this screen, see Locking System Summary Screen (see page 48).

Locks

Displays the Lock List Display screen. All lock lists in the locking system that meet the appropriate option selections are displayed.

For more information on this screen, see Lock List Display Screen (see page 55).

Resources

Displays the Resource List Display screen. All resources of interest that have locks on them are displayed. The resources displayed depend on the setting of IPM options.

For more information on this screen, see Resource Lock Display Screen (see page 63).

Refresh

Queries the locking system for locking information. Lock List and Resource information are obtained together to ensure a consistent snapshot of the locking system. After setting IPM options, select this menu item so the locking information reflects the set options.

For more information, see Option Selection Screen (see page 24).

Lock Info Menu Items

The Lock Info Menu has the following menu items:

Select

Selects the item on which the cursor is resting.

Options

Displays the Option Selection screen. The current option settings are displayed. They can be modified and saved. If any options for lock lists or resources were changed, select the Refresh menu item.

For more information on this, see Option Selection Screen (see page 24).

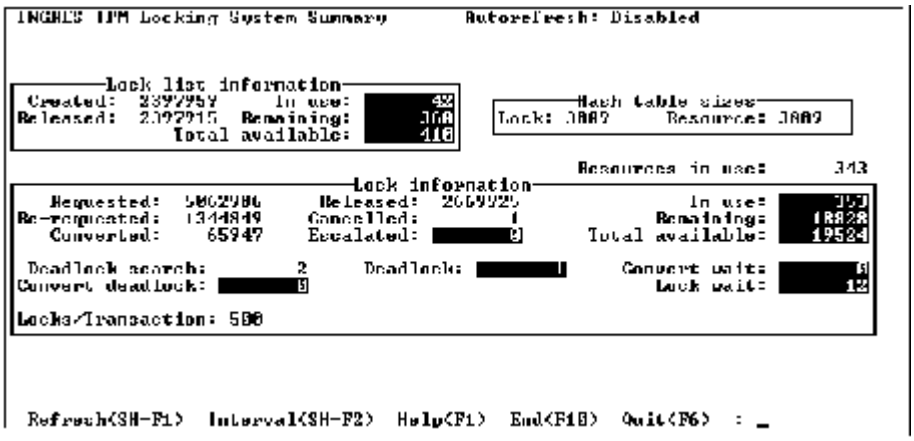
End

Returns to the Main Menu screen.

Locking System Summary Screen

The Locking System Summary screen appears when you select Locking System Summary from the Lock Info Menu screen.

The data on this screen helps you to determine which locking parameters need to be adjusted.



Because there is currently no way to view all of the locking parameters used to configure the locking system, keep a record of the parameters in a prominent place when viewing this screen.

Use autorefresh when monitoring this information. The screen autorefreshs if the -r flag was specified at startup or the Display Refresh field on the Option Selection screen was changed to a number between 1 and 999 seconds. For more information, see Option Selection Screen (see page 24).

When tests or benchmarks are run, monitor the locking system activity during the test by selecting the Interval menu item and selecting the Start_Now menu item. IPM displays the statistics accumulated since the start time.

If the Interval option was previously enabled, the start time and current time fields appear in the upper right-hand corner of the Locking System Summary screen. To reset the start time (which is the time when the Start_Now menu item is selected), select the Interval menu item and the Start_Now menu item.

The start time and statistics obtained at the start time remains unchanged until the Begin_Now or Since_Startup menu items are selected or the user exits IPM. This allows other functions (for example, logging, other locking, or server information) to be used while accumulating statistics. When the Locking System Summary screen is displayed at a later time, the running totals since the start time are not lost.

When displaying statistics over an interval, you must set the Autorefresh option. This causes the display to be automatically updated.

When this screen is displayed on VMS cluster installations, additional fields are displayed. For more information, see VMS Cluster Only Fields (VMS Only) (see page 51).

Locking System Summary Fields

By observing the fields on the Locking System Summary, you can spot conditions when more locking system resources need to be made available. You reconfigure the locking system using rcpconfig. For more information, see the *System Administrator Guide*.

The Locking System Summary has the following fields:

Lock List Created

The number of times a lock list was created on behalf of a server, session, or transaction.

Lock List Released

The number of times a release of a lock list occurred on behalf of a server, session, or transaction.

Lock Lists in Use

The number of lock lists in use by a server, session, or transaction.

Lock Lists Remaining

The number of lock lists remaining to be used by a server, session, or transaction.

Lock Requested

The number of new lock requests that the locking system processed.

Lock Rerequested

The number of times an implicit lock conversion request was issued on a resource that the lock list already had locked. Implicit lock conversions can occur when a request is made on a page for update that was previously requested for read.

Lock Converted

The number of times an explicit lock conversion request is made to change a lock mode on a physical lock from one mode to another. These types of requests occur as a result of a physical lock being converted during an existing transaction to lower or higher modes.

Lock Released

The number of times a specific logical lock is released, as opposed to a full, partial, or physical lock release.

Lock Cancelled

The number of times a lock request was cancelled due to a timeout or interrupt.

Lock Escalated

The number of times a partial release occurred to allow escalation of lock granularity from page to table level.

Locks in Use

The number of locks in use by a server, session, or transaction.

Locks Remaining

The number of locks remaining to be used by a server, session, or transaction.

Total available

The total sum of resources in use, locks in use, and locks remaining

Deadlock search

The number of times a deadlock search was initiated.

Deadlock

The number of times that deadlock existed.

Convert wait

The number of times an existing lock waited for conversion to a different lock mode.

Convert deadlock

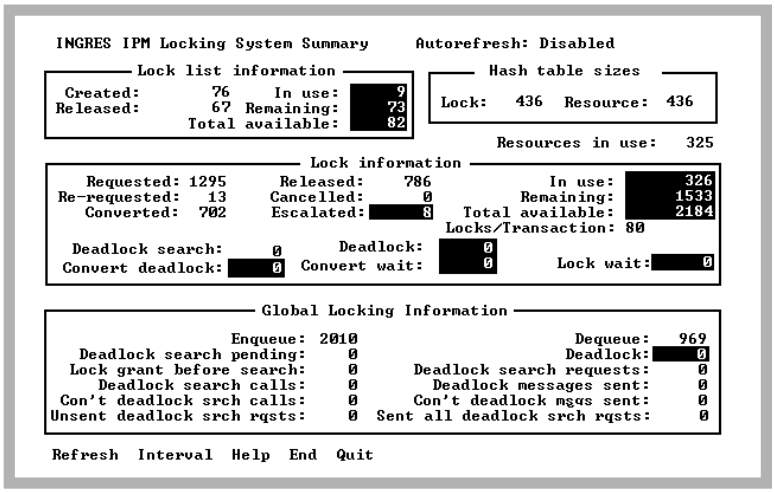
The number of times a request for conversion turned into a deadlock.

Lock Wait

The number of times a new lock request had to wait to be granted.

VMS Cluster Only Fields (VMS Only)

The following shows the Locking System Summary as it appears when IPM is running on a VMS cluster installation.



The Global Locking Information box appears only in VMS cluster installations. The fields in this area are as follows:

Enqueue

The number of times the VMS lock manager was called to map Ingres locks onto their VMS counterparts through the use of VMS system calls.

Dequeue

The number of times the VMS lock manager was called to dequeue VMS locks using VMS system calls that occurred as a result of a change in status of the corresponding Ingres lock.

Deadlock search pending

The number of pending global deadlock search requests.

Deadlock

The number of global deadlocks that occurred.

Lock grant before search

The number of global locks that were granted without contention as a result of the lock request.

Deadlock search requests

The number of times a global deadlock search was initiated.

Deadlock search calls

The number of times the Cluster Server Process (CSP) requested deadlock search information.

Deadlock messages sent

The number of times a global deadlock message was built up and sent.

Con't deadlock srch calls

The number of times a continue global deadlock search request was issued in response to an unresolved global contention problem.

Con't deadlock msgs sent

The number of continue global deadlock search messages that were sent due to an unresolved global contention problem.

Unsent deadlock srch rqsts

The number of unsent global deadlock search messages found.

Sent all deadlock srch rqsts

The number of times that global deadlock search requests were more than 50% of the total number of transactions.

Locking System Summary Menu Items

The Locking System Summary has the following menu items:

Refresh

Queries the locking system for locking summary information. Even if the autorefresh option is set, this menu item can still be selected at any time.

Interval

Sets a start time to begin measuring locking summary information. Otherwise, the information displayed is activity since the locking system was started.

For more information on this menu item, see Interval Option (Locking Systerm Summary) (see page 53).

Help

Displays help screens.

End

Return to the Lock Info Menu.

Quit

Exits IPM.

Interval Option (Locking System Summary)

The Interval menu item displays a submenu that allows a start time to be set. This allows display of summary information that occurred since the selected start time. Choices available from the submenu are:

Since_Startup

Fields displaying cumulative statistical data reflect activity from initial Ingres startup. This is the default mode when starting IPM. Current and Start time fields are not displayed.

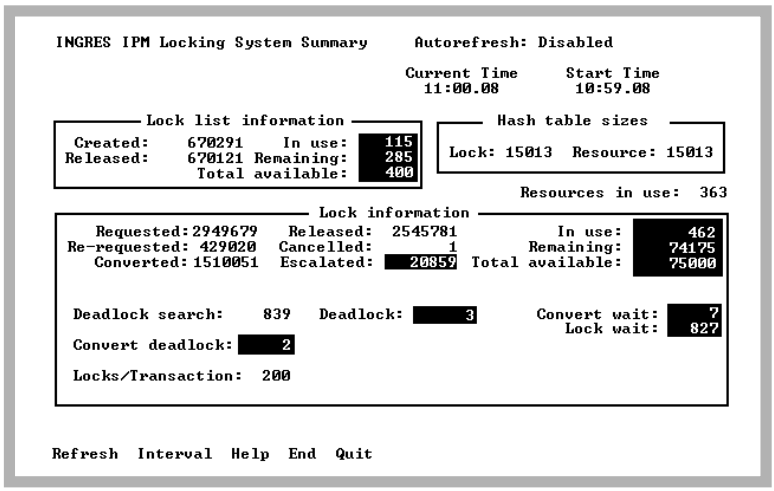
Begin_Now

Enables the Interval option and sets a new baseline for cumulative statistical data. Screens displaying cumulative statistical information display Current Time and Starting Time in the upper right hand corner, giving the current bounds of the interval.

End

Returns to the previous menu.

When the Interval option is enabled, the following screen is displayed:



Display Locking System Summary

To display a summary of locking information

Select the Locking System Summary screen from the Lock Info Menu screen.

The Locking System Summary screen is displayed.

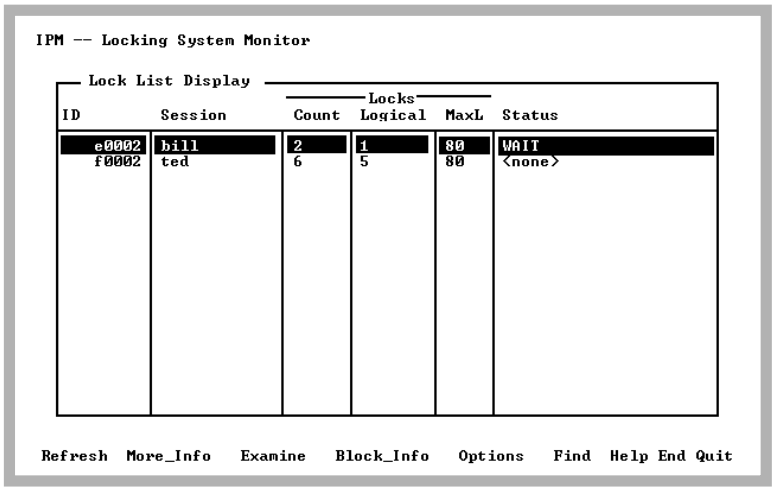
Lock List Display Screen

The Lock List Display screen appears when you select Locks from the Lock Info Menu screen.

This screen displays all lock lists for current user transactions in the Ingres locking system on the current machine for the current installation. Lock lists that belong to user transactions also have an associated session name displayed.

It is useful to view locks by lock list to see what transactions are currently active. Use this screen to locate transactions that cannot proceed because they are blocked by another transaction.

This screen contains an entry for each lock, as shown in this example:



System lock lists (NONPROTECT) are not displayed unless the "Display system locklists" option is set or the -e flag is specified on the command line.

VMS: If the status is ENQWAIT, the lock list in question is waiting for a resource locked by another Ingres user on another node in the VMS cluster. In this case, invoke IPM on the other nodes and search for a lock list holding locks on the resource in contention.

To view the locks for a given lock list, select the Examine menu item. The submenu that appears displays all locks for a particular lock list.

By selecting the Options menu item, you can change the IPM options. The only option that affects this screen is the Display empty locklists option. If any options were changed for lock lists or resources, select the Refresh menu item. For more information, see Option Selection Screen (see page 24).

Find Waiting Locks

Each transaction is represented in the Lock List Display screen by a lock list. The session name (if any) is also displayed.

To find waiting lock lists

1. Tab to the Status column and select the Find menu item.

   The Find prompt appears.

2. Type **WAIT** and press the Return key.

   If there are any lock lists with blocked locks, place the cursor on that lock list.

Lock List Display Fields

The Lock List Display has the following columns:

ID

Internal lock list identifier.

Session

The name of the session or <none>. Only lock lists belonging to user transactions have session names.

Count

The total number of locks on the list currently.

Logical

The number of logical locks on the list currently.

MaxL

The total number of logical locks allowed on this list. For user transactions, this is the maximum number of locks per lock list. Some internal lock lists that contain physical locks exceed this number.

Status

State of the lock list when the locking information was obtained. Values include:

WAIT

Waiting for a lock. This indicates a blocked lock. Use the Block_Info menu item to find the blocking lock.

NONPROT

Can be released without going through recovery (system lock lists only).

ORPHAN

Lock list remaining without transaction.

EWAIT

Waiting on a system event.

RECOVER

Lock list taken over by the recovery process.

MASTER

Lock list owned by the recovery process.

ESET

Lock list set on wait queue for event.

EDONE

Event that the lock list is waiting on is done.

NOINT

Lock requests on this list are non-interruptible.

The following statuses apply only on VMS cluster installations:

ENQWAIT

Waiting for VMS lock request.

G_DEADLOCK_SEARCH

Global deadlock search in progress.

STALL_ENQ

Lock requests are stalled for node failure recovery.

Lock List Display Menu Items

The Lock List Display has the following menu items:

Refresh

Queries the Ingres locking system for locking information. Lock List and Resource information are obtained together to ensure a consistent snapshot of the locking system. After setting IPM Options, select this menu item so the locking information reflects the current options. For more information, see Option Selection Screen (see page 24).

More_Info

Displays a pop-up screen with additional information on the selected lock list.

For more information on this pop-up screen, see Lock List Display More_Info Screen (see page 59).

Examine

Displays the Lock Detail Display screen, which displays all locks in the selected lock list. If table names must be retrieved, a delay may occur because a database must be opened.

For more information on this screen, see Lock Detail Display Screen (see page 60).

Block_Info

Displays the Blocking Lock Display screen if the selected lock list contains a lock that cannot be granted. The lock that is blocking a lock in the current lock list is displayed, as well as all other locks on that given resource.

For more information, see Blocking Lock Display Screen (see page 65).

If this menu item is selected and the current lock list does not have any locks waiting (to be granted), a pop-up message to that effect is displayed.

Options

Displays the Option Selection screen. The current option settings are displayed. Various options can be modified and saved.

Find

Searches a column in a scrolling region (tablefield). If searching a text column, Find locates all occurrences in the column. To locate the next occurrence of your previous search, enter (.).

Help

Displays help screens.

End

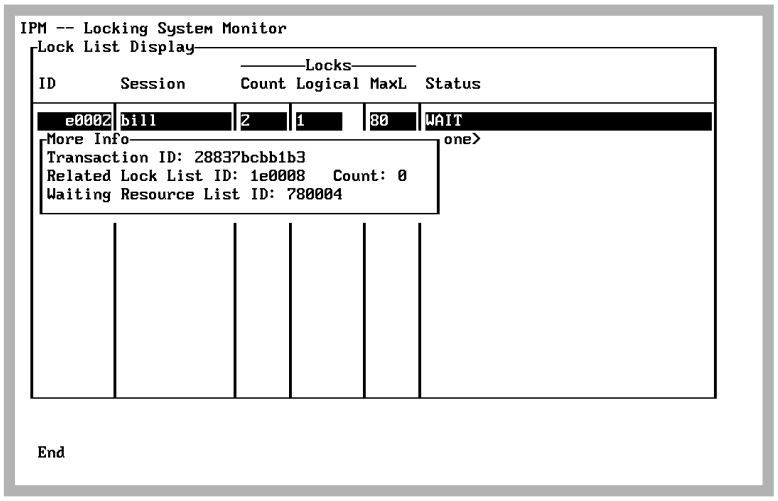
Returns to the Lock Info Menu screen.

Quit

Exits IPM.

Lock List Display More_Info Screen

When the More_Info menu item is selected from the Lock List Display, a pop-up containing additional fields for the specified lock list is displayed.



The additional fields are:

Transaction ID

Transaction identifier associated with this lock list. This value corresponds to the External TX ID column on the Log Transaction Display screen. For more information, see Log Transaction Display Screen (see page 100).

Related Lock List ID

Related lock list identifier, if not a transaction lock list

Count

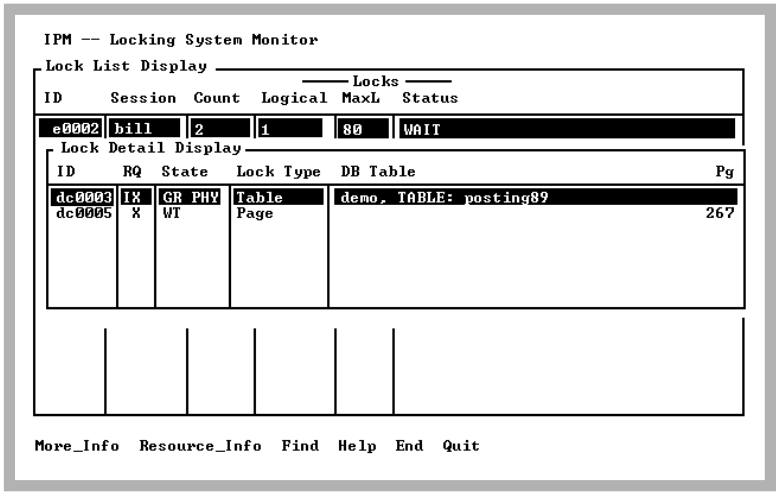
Number of related lock list identifiers that this lock list must assure are released before this lock list can be released

Waiting Resource List ID

Internal resource block identifier of the lock that is currently blocked

Lock Detail Display Screen

The Lock Detail Display screen pops up when you select the Examine menu item from the Lock List Display screen. This screen contains the individual locks for the selected lock list or all locks for all lock lists.



Database and table names are shown for table and page type locks. If a database cannot be opened or if IPM is running in stand-alone mode (-s flag), the table ID is displayed instead of the table name. The table is identified by the reltid and reltidx values in the iirelation catalog.

If this screen is displaying the locks for a particular lock list, IPM displays locks in the order in which they were acquired by the session to which the lock list belongs.

The Lock Detail Display has the following fields:

ID

Internal lock ID

RQ

Mode in which the lock was requested. For possible values, see Mode Values (see page 64).

State

Current state of the lock:

- GR = granted
- WT = waiting
- PHY = this lock is a physical lock).

This column scrolls, so additional information can be displayed to the right of the visible part. Use the arrow keys to scroll the column.

Lock Type

Type of resource. For a list of resource types, see Resource Type (see page 14).

DB Table-Pg

The resource key on which this lock is held. Typically a database name, table name, and page on which this lock is held, but format can vary depending on the Lock Type. The values are justified and formatted for ease of reading.

Lock Detail Display Menu Items

The menu items on the Lock Detail Display screen are:

More_Info

Place the cursor on the desired lock and select this menu item. Additional information for that lock is displayed on a pop-up screen.

For more information on this screen, see Lock Detail Display More_Info Screen (see page 62).

Resource_Info

All locks for the resource on which the cursor rests are displayed on the Resource Lock Display screen, providing useful information about the number of other sessions that have a lock on that resource. For example, you can see what other locks are held for page 0 in table foo. Other information displayed includes the session name (if any).

For more information on this screen, see Resource Lock Display Screen (see page 63).

Find

Searches a column in a scrolling region (tablefield). If searching a text column, Find locates all occurrences wherever they are in the column. To locate the next occurrence of your previous search, enter (.).

Help

Displays help screens

End

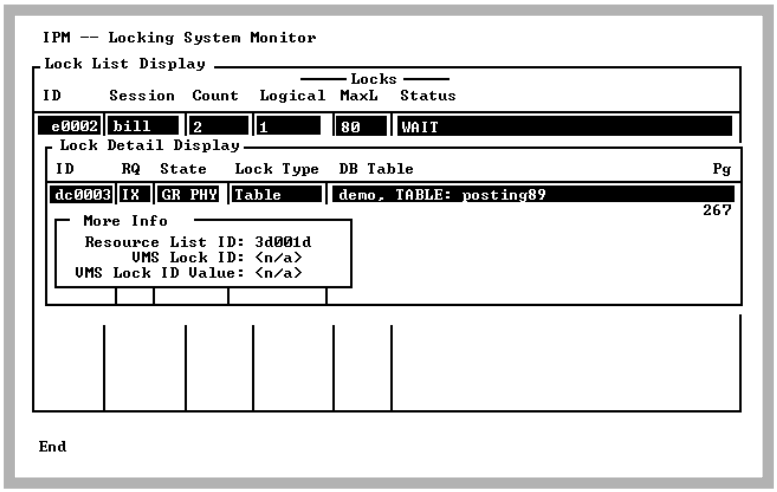
Returns to the Lock List Display screen

Quit

Exits IPM

Lock Detail Display More_Info Screen

When the More_Info menu item is selected from the Examine submenu, a pop-up containing additional fields for the specified lock is displayed.



The additional fields are described in the following table.

Resource List ID

The Internal Resource block identifier to which this lock belongs

Distributed Lock ID

The distributed lock ID assigned to this Ingres lock.

Appears on VMS and UNIX cluster installations only.

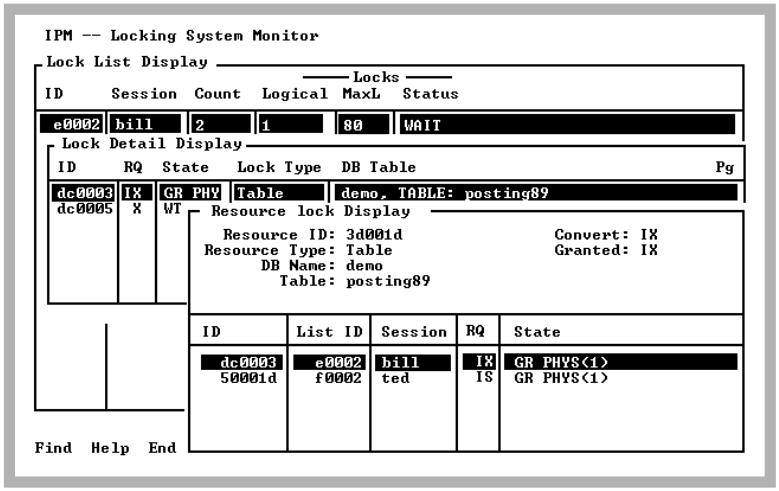
Distributed Lock ID value

The value contained in the VMS lock assigned to this Ingres lock.

Appears on VMS and UNIX cluster installations only.

Resource Lock Display Screen

The Resource Lock Display screen is displayed when you select Resource_Info from the Lock Detail Display screen. All the locks held on the resource related to the lock specified on the Lock Detail Display screen are displayed.



If the specified lock belonged to page 0 of the foo table, the Resource Lock Display screen displays all locks held on that same resource (page 0, foo table).

For example, if the specified lock is a table lock, it is useful to see what other locks are held on that table because it is an indication of how much activity is occurring there.

The Resource Lock Display has the following items:

Resource ID

Resource block identifier of the resource on which the blocking lock is held

Resource Type

Type of resource. For a list of resource types, see Resource Type (see page 14).

Convert

Mode to which this resource is converting. For a list of possible modes, see Mode Values (see page 64).

Granted

Mode in which this resource is granted. For a list of possible modes, see Mode Values (see page 64).

DB Name

Name of the database

Table

Table name to which this resource belongs. If the resource is not a table or page resource type, this field does not appear.

Page

Page number of this resource. If the resource is not a page resource type, this field does not appear.

Mode Values

Possible mode values that can appear in locking displays (for example, in the Convert and Granted fields of the Resource Lock Display) are as following:

S (Shared)

This mode is used when reading.

IS (Intended shared)

For table resource types, this means that there are shared page locks in this table.

Note: This lock strength can be seen on pages if row level locking is used.

X (Exclusive)

This mode is used when writing.

IX (Intended exclusive)

This is same as intended shared, except pages are exclusively locked.

Note: This lock strength can be seen on pages if row level locking is used.

N (Null)

Used to keep a lock without causing locking contention. It is less expensive to convert a lock than to drop and request a new one.

SIX (Shared with intent to update)

This mode is used with Embedded SQL cursors.

Resource Lock Display Menu Items

The Resource Lock Display has the following menu items:

Find

Searches any column in the scrolling area. To initiate the search, tab to the desired column and select Find. If you are searching a text column, Find locates all occurrences in the column.

Help

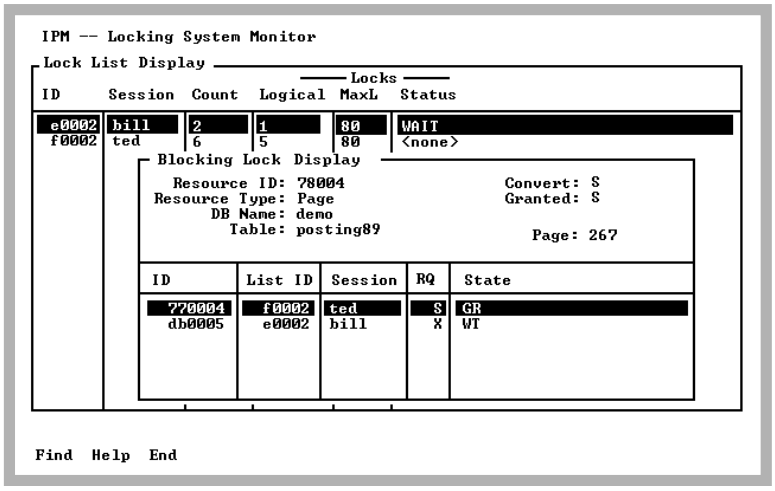
Displays help screens.

End

Returns to the Lock Detail Display screen.

Blocking Lock Display Screen

The Blocking Lock Display screen appears when you select Block_Info from the Lock List Display screen. This screen helps locate bottlenecks in the database.



If there are tables where concurrent access is not occurring (that is, much waiting is occurring because a database session is performing table level locking or has page locks that escalate to table level locks), Block_Info finds the lock that is granted on a resource for which another lock is waiting.

For example, if there is a lock list that is blocked (waiting or converting). The granted lock is known as a blocking lock because it is blocking access to a resource. Block_Info finds the blocking lock. It is either be a granted page lock on the same page or a granted table lock on the table that contains the page. All locks that are found are displayed in the scrolling area in the bottom area of the pop-up. The upper portion of the pop-up contains information on the selected resource. The first lock in the scrolling area is the blocking lock. All other (waiting) locks are displayed below it.

Look for Concurrency Bottlenecks

The Blocking Lock Display helps locate bottlenecks in the database.

To look for concurrency bottlenecks

1. Run IPM on the desired database, and display the Lock List Display.
2. Tab to the Status column and select the Find menu item.

   The String to search for prompt appears.
3. Enter **WAIT**.
4. Select the Block_Info menu item if a waiting lock list is found.

   The blocking lock is found if it is in the locking system in the current installation on the machine where IPM is running.

Note: If you are searching for a lock on another node in the cluster, the lock may not be visible on the current node. To find the lock, run IPM on the other nodes.

Blocking Lock Display Fields

The Blocking Lock Display includes the following information:

Resource ID

Resource block identifier of the resource that the blocking lock is held on

Resource Type

Type of resource. For a list of resource types, see Resource Type (see page 14).

Convert

Mode to which this resource is converting. For a list of possible modes, see Mode Values (see page 64).

Granted

Mode in which this resource is requested. For a list of possible modes, see Mode Values (see page 64).

DB Name

Name of the database.

Table

The table name to which this resource belongs. If the resource is not a table or page resource type, this field does not appear.

Page

Page number of this resource. If the resource is not a page resource type, this field does not appear.

Scrolling Area (Blocking Lock Display)

The scrolling area in the Blocking Lock Display contains the following columns:

ID

Internal lock identifier for this lock

List ID

Internal lock list identifier to which this lock belongs

Session

Name of the session to which this lock belongs

RQ

Mode in which the lock was requested. For a list of possible modes, seeMode Values (see page 64).

State

Current state of the lock:

- GR = granted
- WT = waiting

Blocking Lock Display Menu Items

The Blocking Lock Display has the following menu items:

Find

Searches any column in the scrolling area. To initiate the search, tab to the desired column select Find. If you are searching a text column, Find locates all occurrences in the column.

Help

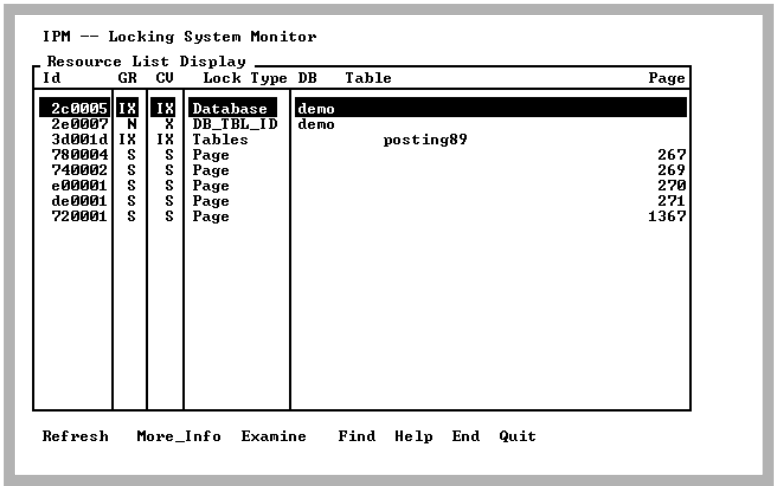
Displays help screens.

End

Returns to the previous menu.

Resource List Display Screen

The Resource List Display screen appears when you select Resources from the Lock Info Menu screen. This screen contains an entry for each resource that has one or more locks granted or requested on it.



The information displayed is sorted by database. Page and row resources are listed under the table resource to which they belong (for example, all pages for table x in database test are listed under the entry for table x). The Database name is left-justified in the DB-Table-Page column. The database name is printed only when it changes. The same applies for table names. Table names are indented 5 spaces.

This screen allows high traffic areas to be found. If there is much page locking in a given table and there are many page type entries under the table entry of interest, select the Examine menu item by placing the cursor on the table entry of interest.

For example, to see what and how many locks are on table test, place the cursor on that table resource entry and select the Examine menu item. When the Lock Detail Display screen appears, there is one lock for each session touching the test table. If many locks are displayed, it is an indication that this table is a potential contention source (for example, any session attempts to lock the table shared or exclusive).

If a database cannot be opened to display table names, IPM displays <can't find [x, y]> instead. The x is the reltid of the table and y is the reltidx of that table ("reltid" and reltidx are columns in the iirelation catalog).

When a database cannot be opened, the possible reasons are given below:

- The database is locked exclusively by another session.
- Another user is accessing that database using a server started up with the -sole or **/**sole option.
- IPM is being run in stand-alone mode (**-s** option).

By selecting the Options menu item, you can view or modify various IPM options that affect which resources are displayed. To use this menu item, see Option Selection Screen (see page 24).

Selecting the Refresh menu item after changing the options collects resource information based on the new option settings.

It is not necessary to select the Refresh menu item when the options you have changed result in a subset of the resource information currently displayed.

For example, all resources for database test are selected based on the previous options. If the new option settings select only a specific resource type for that database, return to the Lock Info Menu and select the Resources menu item.

Resource List Display Fields

Columns in the Resource List Display screen are:

Id

The internal resource block identifier

GR

The mode in which this resource is granted. For a list of possible modes, see Mode Values (see page 64).

CV

The mode to which this resource is converting. For a list of possible modes, see Mode Values (see page 64).

Lock Type

The type of resource. For a list of resource types, see Resource Type (see page 14).

DB Table-Pg

The database name, table name or page that identifies this resource. The values are justified and formatted for ease in reading.

Resource List Display Menu Items

The menu items available on this screen are:

Refresh

Queries the Ingres locking system for locking information. Lock List and Resource information are obtained together to ensure a consistent snapshot of the locking system. After setting IPM Options, select this menu item so the locking information reflects the options you set. For more information, see Option Selection Screen (see page 24).

More_Info

Place the cursor on the desired resource and select this menu item. Additional information for that resource is displayed on a pop-up screen (including the number of physical locks).

For more information on this screen, see Resource List Display More_Info Screen (see page 72).

Examine

Place the cursor on the desired resource and select this menu item. The Resource Detail Display screen is displayed. It contains information for all locks on that resource. Other information, such as the session name, is also shown.

For additional information on this screen, see Resource Detail Display Screen (see page 73).

Find

Searches any column in the scrolling area. To initiate the search, tab to the desired column and select Find. If you are searching a text column, Find locates all occurrences in the column.

Help

Displays help screens

End

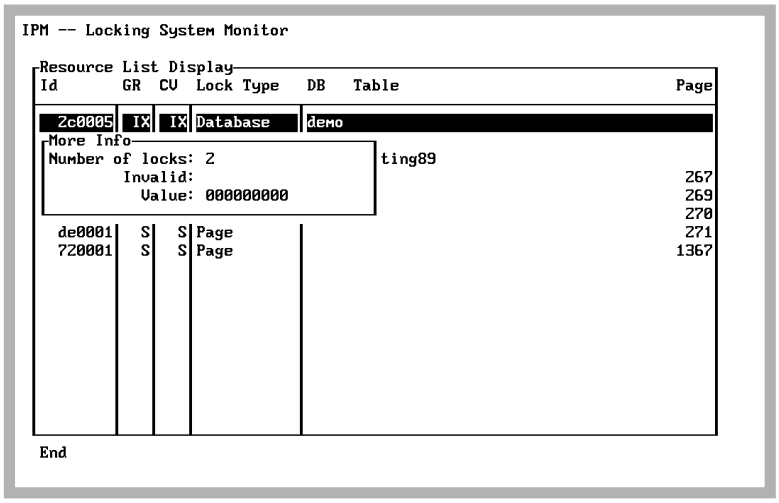
Returns to the Lock Info Menu screen

Quit

Exits IPM

Resource List Display More_Info Screen

When the More_Info menu item is selected from the Resource List Display, a pop-up containing additional fields for the specified resource is displayed.



The additional fields are:

Number of locks

The number of physical locks held on this resource

Invalid

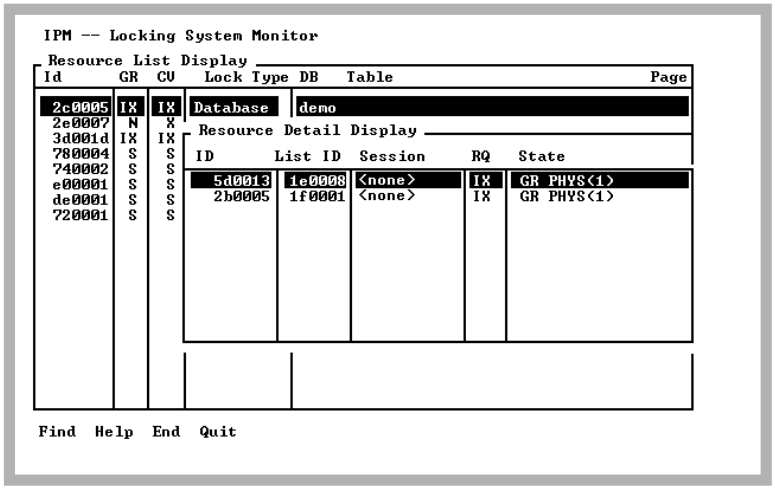
Indicates if the value is valid or not

Value

The lock value associated with this resource

Resource Detail Display Screen

The Resource Detail Display screen pops up when you select the Examine menu item from the Resource List Display screen. This screen displays all the locks held on the specified resource.



The number of locks held on a resource indicates the amount of concurrent activity and points to potential concurrency bottlenecks.

Resource Detail Display Fields

The Resource Detail Display has the following information:

ID

The internal lock identifier for this lock

List ID

The internal lock list identifier to which this lock belongs

Session

The name of the session to which this lock belongs

RQ

The mode in which this lock was requested. For a list of possible modes, see Mode Values (see page 64).

State

The current state of the lock:

- GR = granted
- WT = waiting

Resource Detail Display Menu Items

The Resource Detail Display has the following menu items:

Find

Searches any column in the scrolling area. To initiate the search, tab to the desired column and select Find. If you are searching a text column, Find locates all occurrences in the column.

Help

Displays help screens.

End

Returns to the Resource List Display screen.

Quit

Exits IPM.

Chapter 6: Monitoring Log Information

This chapter discusses the IPM screens that display log information.

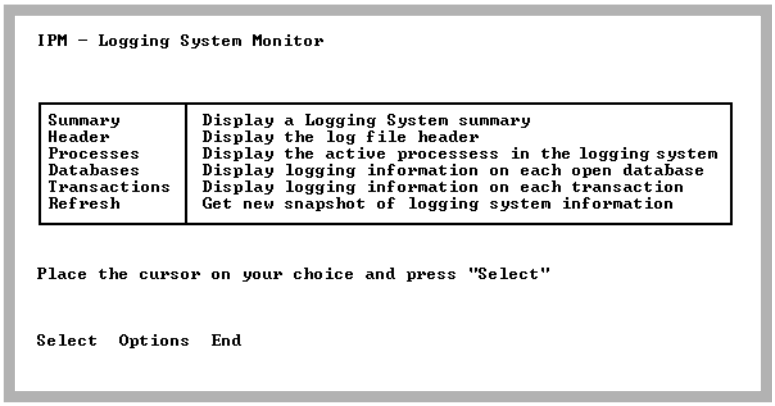
Log Information

Log information displayed by IPM includes log summary information, header information, log processes, transactions, and databases. You can use the information for logging system analysis and tuning, and for determining if the log file size is adequate. Other logging system parameters set at installation or configuration time can be compared against the Logging System Summary screen to see if they are sufficient.

To review log information, select the Log_Info screen from the Main Menu.

Log Info Menu Screen

The Log Info Menu screen appears when you select Log_Info from the Main Menu. This screen is the top-level screen for IPM monitoring of the Ingres logging system.



The Log Info menu has the following selections:

Summary

Displays the Logging System Summary screen. Information on the logging system is displayed (transactions started and finished, Log I/Os, and other data).

For more information on this screen, see Logging System Summary Screen (see page 77).

Header

Displays the Logging System Header screen. Information shown includes force abort and log full points and a diagram showing log file usage and percent full.

For more information on this screen, see Logging System Header Screen (see page 84).

Processes

Displays the Log Process Display screen. This screen contains a list of all processes in the Ingres installation (Ingres DBMS Server(s) and archiver and recovery processes).

For more information on this screen, see Log Process Display Screen (see page 94).

Databases

Displays the Log Database Display screen. This screen contains a list of all databases currently in the logging system.

For more information on this screen, see Log Database Display Screen (see page 97).

Transactions

Displays the Log Transaction Display screen. This screen contains a list of all transactions currently in the logging system.

For more information on this screen, see Log Transaction Display Screen (see page 100).

Refresh

Queries the logging system for logging information. Process, database, and transaction information are obtained together to ensure a consistent snapshot of the logging system.

Log Info Menu Items

The Log Info menu screen contains the following menu items:

Select

Selects the item on which the cursor is resting.

Options

Displays the Option Selection screen. The current option settings are displayed. They can be modified and saved.

For more information on this screen, see Option Selection Screen (see page 24).

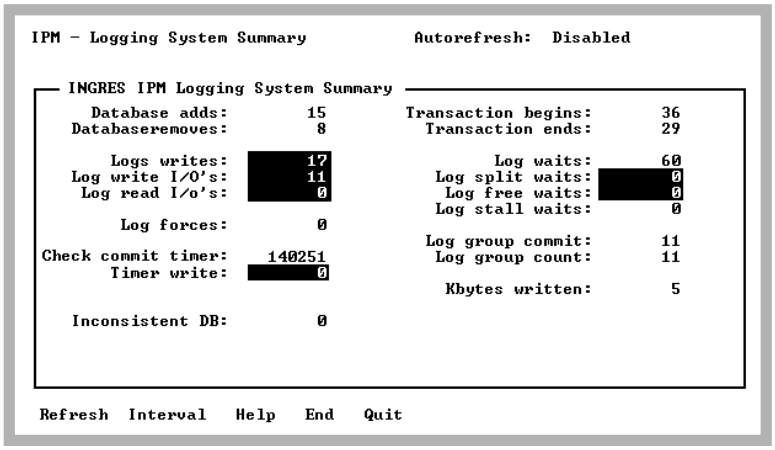
End

Returns to the Main Menu.

Logging System Summary Screen

The Logging System Summary screen appears when you select Summary from the Log Info Menu screen.

The data on this screen helps you to determine which logging parameters need to be adjusted.



Because there is currently no way to view all of the logging parameters used to configure the logging system, keep the parameters in a prominent place when viewing this screen.

This screen automatically refreshes the information if the -r flag was specified at startup or the Display Refresh field on the Option Selection screen was changed to a number between 1 and 999 seconds. For more information, see Option Selection Screen (see page 24).

When tests or benchmarks are run, monitor the locking system activity during the test by selecting the Interval menu item and selecting the Start_Now menu item. IPM displays the statistics accumulated since the start time.

In addition, if the Interval option was previously enabled, the start time and current time fields appear in the upper right-hand corner of the Logging System Summary screen. To reset the start time (which is the time when the Start_Now menu item is selected), select the Interval menu item followed by the Start_Now menu item.

The start time and statistics obtained at the start time remains unchanged until the Begin_Now or Since_Startup menu items are selected or the user exits IPM. This allows other functions (for example, locking, other logging, or server information) to be used while accumulating statistics. When the Logging System Summary screen is displayed at a later time, the running totals since the start time are not lost.

When displaying statistics over an interval, you must set the Autorefresh option, which causes the display to be automatically updated.

Logging System Summary Fields

The Logging System Summary screen has the following fields:

Database adds

The number of databases added to the logging system.

Database removes

The number of databases removed from the logging system. This means the last user of a database has disconnected from Ingres. The number of databases currently open is the difference between Database adds and Database removes.

Log writes

The number of log writes. This is a memory-to-memory write.

UNIX: Shows the number of log writes into shared memory.

VMS: Shows the number of log writes into the non-paged pool.

Log write I/O's

The number of write I/Os actually done to the log file. This is a physical write.

Log read I/O's

The number of read I/Os actually done to the log file. This is a physical read.

Log forces

The number of log force requests. These occur under the following circumstances:

- The buffer manager forces a specific log page to disk. This occurs during the consistency point (for fast commit) or before a transaction commit.
- The buffer manager forces the last log buffer in the logging system to disk. This occurs normally during the close of a table.
- The RCP or DBMS Server forces the last log record of a transaction to disk before recovering the transaction.

Check commit timer

The number of times that the timer, associated with the group commit, is completed. This does not necessarily mean that a write to the log file occurs. A write does not occur if the log buffer, that initiated the timer, is full. This timer is activated only when there are multiple transactions active in the logging system that can cause delays for users because of group commit.

The timer wakes up every 10 milliseconds and checks if there is a buffer waiting to be forced to the log file. If a buffer is found, the timer waits for 20 additional milliseconds before calling the routine to write out the buffer.

Timer write

The number of times a group commit timer check resulted in a group commit.

Inconsistent DB

The number of inconsistent database occurrences. This number must be zero. If it is not, check the errlog.log file.

UNIX: The errlog.log file is in $II_SYSTEM/INGRES/files

VMS: The errlog.log file is in II_SYSTEM:[INGRES.FILES]

Transaction begins

The number of transactions started.

Transaction ends

The number of commits or transactions ended. This value represents user-initiated transaction ends such as commits, rollbacks, and interrupts. It does not include system-generated transaction ends such as LOG-FULL. The difference between Transaction begins and Transaction ends is the number of current transactions.

Log waits

The number of times any event wait condition requires a log buffer write to stall. These events encompass things like LOG-FULL, CP writing, RECOVERY, archiving required, FREE WAIT for log buffer, OPENDB wait, log buffer SPLIT WAIT, and wait for log I/O to complete (the log buffer being written to the log file).

Log split waits

The number of times a log split operation is delayed due to the lack of free log buffers. This must be watched because the logging system cannot proceed with the log record split until a free buffer is available. You can reduce this by increasing the number of log buffers or increasing their size.

Log free waits

The number of times all the log buffers are either in force mode or unavailable for writing. Only one log buffer is currently written to at a time. If this state is frequent (more than five per minute during busy times), an increase in the number of log buffers is the solution. Remember that an increase in the number of buffers requires more memory (number_of_buffers x buffer_size). This condition affects throughput to the log file. For more information, see the *System Administrator Guide* for more information.

Log stall waits

The number of times stalled while making requests to the logging system. This occurs while consistency points are being taken or during LOG-FULL conditions. This is acceptable (not in the LOG-FULL case) and these types of stalls only last for a fraction of a second. If 100 sessions are stalled for one event, this count is incremented by 100. Only stalls due to LOG-FULL events are reflected in this value.

For more information on log stall waits see, Logging System Header Screen (see page 84). Depending upon the causes of a Log stall wait, the following statuses are shown in the Logging System Header screen:

LOGFULL, FORCE_ ABORT

The log file is full.

LOGFULL, CPFLUSH

The log file is overly full while executing a consistency point (CP). The CP must complete before log space can be released. The status LOGFULL, ARCHIVE is also be displayed.

LOGFULL, ARCHIVE

The log file becomes full and journaled transactions must be archived to free up log space. When the archiver is done, log file space is released.

Log group commit

The number of times that multiple transactions are participating in a log buffer flush to the log file. The value is incremented every time a write to disk completes a group commit (piggyback write).

Log group count

The number of transactions that are participating in the flush to the log file. If one group commit event writes on behalf of ten sessions (threads), this number is incremented by ten. The ratio between this number and the Log group commit indicates how effective group commit is (for example, group count/group commit indicates the number of log write requests by threads that are satisfied per group commit write).

Kbytes written

The number of kilobytes written to the log file.

Logging System Summary Menu Items

The menu items available on this screen are:

Refresh

Queries the logging system for logging summary information. Even if the autorefresh option is set, this menu item can still be selected at any time.

Interval

Sets a start time to begin measuring logging summary information. Otherwise, the information displayed is activity since the logging system was started.

For more information on this menu item, see Interval Option (Logging System Summary) (see page 83).

Help

Displays help screens.

End

Returns to the Log Info Menu screen.

Quit

Exits IPM.

Interval Option (Logging System Summary)

The Interval menu item on the Logging System Summary displays a submenu that allows a start time to be set. This lets you display information that occurred since the selected start time. Options available from the submenu are:

Since_Startup

Fields displaying cumulative statistical data reflect activity from initial Ingres startup. This is the default mode when starting IPM. Current and Start time fields are not displayed.

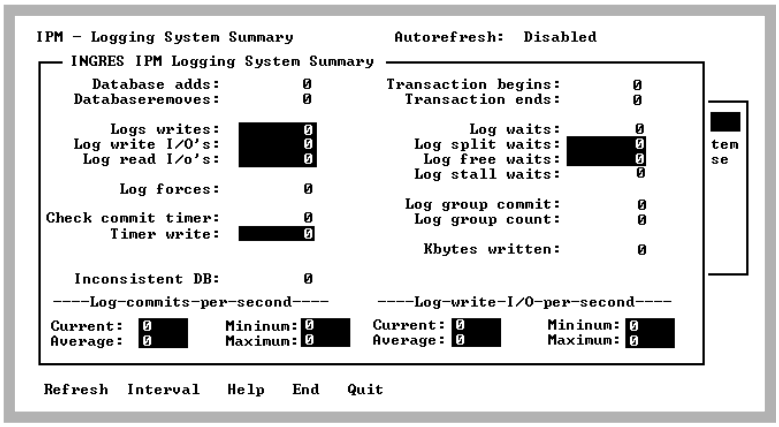
Begin_Now

Enables the Interval option and sets a new baseline for cumulative statistical data. Screens displaying cumulative statistical information display Log commits per second and Log write I/O per second at the bottom of the main screen.

End

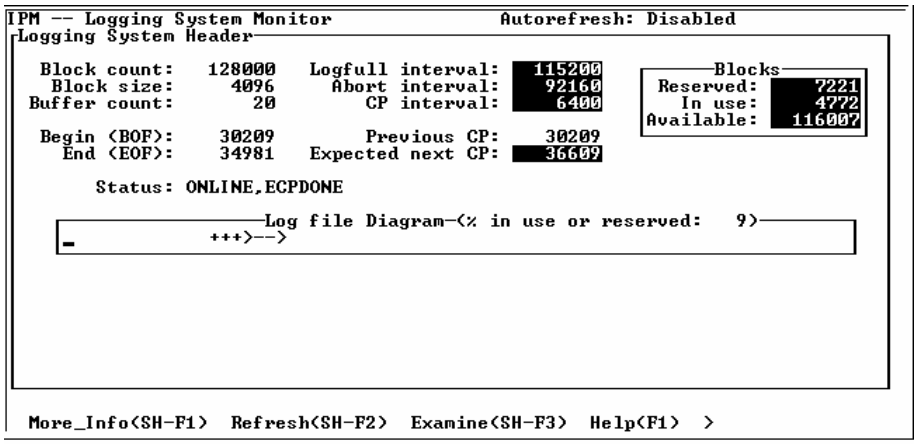
Returns to the previous menu.

When the Interval option is enabled, the Logging System Summary appears as follows. Two additional items appear at the bottom of the main screen: Log commits per second and Log write I/O per second.



Logging System Header Screen

The Logging System Header screen appears when you select Header from the Log Info Menu screen. This screen displays the current state of the logging system and critical points in the log file.



The Log file Diagram displays a logical view of the log file in use. The Log file Diagram starts at page 1 of the log file through the page specified by the Block count field. In the sample screen, the upper end of the diagram represents page 1024. The area of the diagram covered by the arrow (>----->) is the area of the log file in use (in this case from page 12 to 22). As the BOF (beginning of file) and EOF (end of file) move, so does the arrow.

This screen can be displayed during benchmarks, tests, or daily use to help the system administrator determine if the log file is near FORCE_ABORT. The Blocks in use field shows the actual number of blocks in use. If it is greater than the value in the Abort interval field, IPM displays a warning indicator. The same occurs when the Blocks in use exceeds the value in the Logfull interval field. The system administrator can decide to increase the size of the log file if the percentage of the log file in use approaches the Abort interval.

This screen autorefreshes the information if the -r flag was specified at startup or the Display Refresh field on the Option Selection screen was changed to a number between 1 and 999 seconds. For more information, see Option Selection Screen (see page 24).

Logging System Header Fields

The Logging System Header screen has the following fields:

Block count

The number of blocks in the log file. This value is also specified when running IIBUILD or rcpconfig. Multiply by the block size to get the log file size in bytes.

Block size

The log file block size in bytes. This value is specified when running the install or configure program.

Buffer count

The number of log buffers. These are the same size as the log file block size.

Logfull interval

The logging system parameter LOG_FULL_LIMIT occurs. When the Blocks in use field is equal to this value, all transaction activity is halted. A warning field is displayed in the lower right-hand corner. This value is also determined when running the install or configure program. For more information see, the *System Administrator Guide*.

Abort interval

The logging system parameter FORCE_ABORT. When the Blocks in use field exceeds this value, the oldest transaction is aborted. To find out which transaction is being aborted, use the Log Transaction Display screen. Also, see Logging System Header Screen with Transaction Display (see page 91). Tab to the Status column and select the Find menu item to look for the word FORCE. A warning indicator is also displayed. For more information, see the *System Administrator Guide*.

CP interval

A consistency point occurs when the log file size (Blocks in use field) reaches a multiple of this number.

Blocks in use

The number of blocks in use in the log file. This is determined by the Begin (BOF) and End (EOF) values. This value is used for the Log file in use diagram.

Blocks available

The number of remaining blocks in the log file

Blocks Reserved

The number of blocks set aside to write compensation records in the event that transactions need to rollback.

Begin (BOF)

The logical beginning of file. This is the position in the log file that holds the oldest transaction.

End (EOF)

The logical end of file. This is the position in the log file that holds the newest uncommitted transaction.

Previous CP

The log file address of the last consistency point. This is the position in the log file where the last consistency point was taken.

Expected next CP

The log file address of the next expected consistency point

Status

The status of the logging and recovery systems. For a list of valid status fields, see Logging System Header Screen Status Field Values (see page 87).

Log file Diagram

Depicts a logical view of the log file with the left side of the field representing page 1 and the right side representing Block count pages (for example, 1024 pages). Within this field an arrow diagram (">------>") represents the portion of the log file in use. If the portion of the log file in use spans only one position in the field, an "*" is displayed. As the EOF and BOF change, the arrow moves from left to right and wrap around the diagram.

% in use

The percentage of the log file in use. This is determined by the Begin (BOF) and End (EOF) values.

Logging System Header Screen Status Field Values

The Status field on the Logging System Header screen can have the following values:

ACP_ SHUTDOWN

The archiver is preparing to shut down. (This indicates that an rcpconfig command with the shutdown option has been issued.)

ARCHIVE

The archiver process is archiving journaled transactions to the journal files.

BCPSTALL

The logging system is requesting the recovery process to start writing a begin consistency point.

CKP_SBACKUP

The logging system marks the start of on-line backup. It marks this block as the on-line backup start block (SB). Ckpdb starts backing up the database.

CLOSEDB

The logging system is in the process of closing a database.

CPFLUSH

DBMS servers are flushing their modified pages to disk.

CPNEEDED

The logging system is about to take a consistency point.

CPWAKEUP

The logging system is synchronizing the fast-commit threads.

DISABLE_DUAL_LOGGING

The logging system is in the process of disabling dual logging.

DUAL_LOGGING

Dual logging is enabled.

Note: DUAL_LOGGING does not mean that both primary and dual logs are active. To determine this, check for Active Log(s).)

ECP

The logging system is requesting that the recovery process start writing an end consistency point.

ECPDONE

The logging system has taken an end consistency point. This status flag is present most of the time while the logging system is functioning normally.

FORCE_ ABORT

The force-abort-limit has been reached; the logging system is aborting the oldest transaction. The Log Transaction Display screen can be used to find out which transaction is being aborted.

IMM_SHUTDOWN

The logging system has been told to shut down immediately. (This is displayed when the user invokes rcpconfig with the imm_shutdown option.) Note that the logging system does not perform any housekeeping as part of the shutdown process. The recovery process becomes responsible for backing out any uncommitted transactions left in the log file once the logging system has been restarted.

LOGFULL

The log file is full. The system administrator must determine the cause of this and increase the log file size. A warning indicator is also displayed.

MAN_ABORT

The logging system has been requested to manually abort a distributed transaction.

MAN_COMMIT

The logging system has been requested to manually commit a distributed transaction.

ONLINE

The logging system is on line. The logging and recovery systems are operating OK.

OPENDB

The logging system is in the process of opening a database.

PURGEDB

A database has been closed by the last user who had it open; the archiver is archiving transactions that belong to this database.

RCP_RECOVER

The recovery process is recovering transactions from a runaway DBMS.

RECOVER

The logging system has requested the recovery process to perform recovery.

START_ARCHIVER

This is an important status that indicates that the archiver has stopped and must be restarted by the database administrator (DBA). This is not done automatically. If the archiver is not restarted, the log file eventually fills up, reaching the LOG_FILE_FULL limit, and causing Ingres to stall.

START_SHUTDOWN

The logging system is shutting down. As part of the shutdown process, the logging system commits to disk all the committed transactions and backs out any uncommitted ones. The archiver also journals all the committed transactions for tables with journaling enabled.

Logging System Header Menu Items

The Logging System Header screen has the following menu items:

More_Info

Displays additional information on the log file addresses.

For more information on this screen, see Logging System Header More_Info Screen (see page 90).

Refresh

Queries the logging system for logging system header information. Even if the autorefresh option is set, this menu item can be selected at any time.

Examine

Displays a submenu and additional screen display fields that allow examination of the transactions in the log file. For more information, see Logging System Header Screen with Transaction Display (see page 91).

Help

Displays help screens.

End

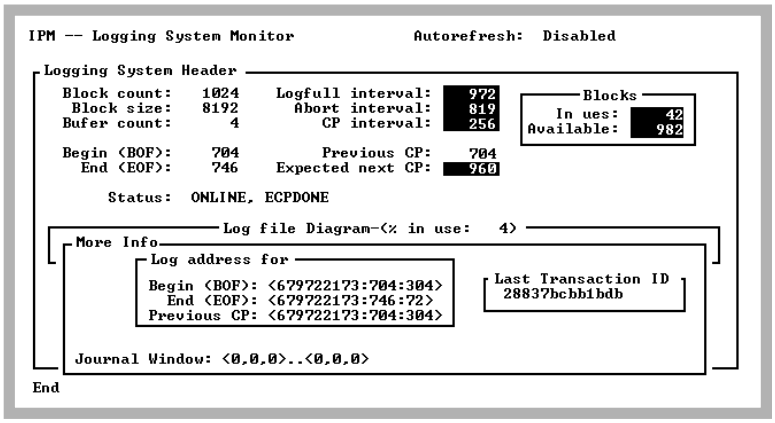
Returns to the Log Info Menu screen.

Quit

Exits IPM.

Logging System Header More_Info Screen

Selecting the More_Info menu item from the Logging System Header screen displays a pop-up screen, providing additional log address information.



The pop-up has the following fields:

Begin (BOF)

The log file address of the beginning of file

End (EOF)

The log file address of the end of file

Previous CP

The log file address of the last consistency point

Last transaction ID

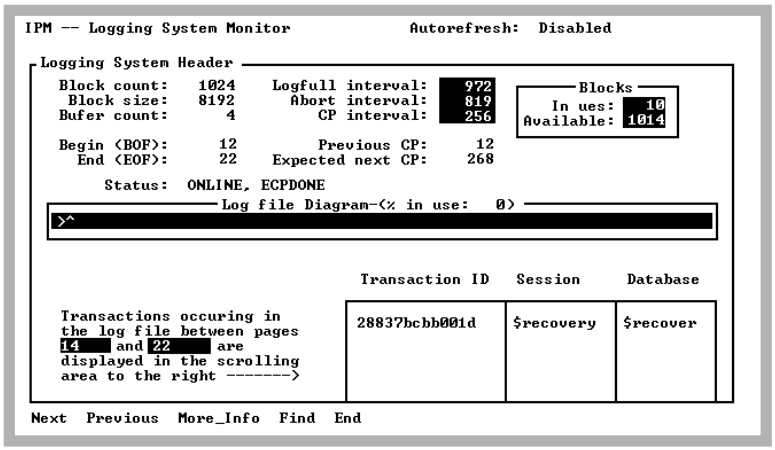
The last transaction ID used. This number corresponds to the External TX ID column on the Log Transaction Display screen and the Transaction ID column on the Lock List Display screen.

Journal window

The log file address range where the archiver looks for records to journal

Logging System Header Screen with Transaction Display

When you select the Examine menu item, the Logging System Header screen displays additional transaction information.



The Log file Diagram field is highlighted and a caret symbol ^ appears in that field marking the position of the log file currently being examined. Any transactions occurring in the range of pages covered by the caret (^) symbol are displayed in the scrolling area. The range of log file pages currently being examined is also displayed.

By using the Next and Previous menu items, you can move the caret symbol to any area of the Log file diagram covered by the arrow (“>----->”). By default, when the Examine menu item is selected, the caret symbol appears at the BOF. The Next menu item can be selected until a user transaction appears in the scrolling area. This transaction is the oldest transaction in the log file and prevents log file space from being reclaimed.

Examine a Particular Position in the Log File

From the Logging System Transaction Display, a position in the log file can be examined.

To examine a particular position in the log file

1. Open the Logging System Transaction Display and move the cursor to the Log file Diagram.
2. Place the cursor (using the arrow keys) anywhere on the arrow representation of the log file, and then select the Examine menu item.

   A snapshot is taken of the transactions, as well as the BOF and EOF. A pop-up screen displays the range of log file pages with transactions. The snapshot is used until the Examine submenu is exited.

To obtain the latest state of the logging system

1. Exit the Examine submenu and select Examine again.

   Autorefresh, if enabled, is suspended during the Examine phase. Autorefresh is re-enabled when you exit the submenu.

Transaction Display Menu Items

After the Examine menu item is selected, a submenu appears. The menu items allow the caret symbol to be moved around on the diagram.

Note: Until you exit this submenu, the information being displayed is a snapshot.

The Transaction Display has the following menu items:

Next

Moves the caret symbol to the right by one position. Moving beyond the EOF wraps around to the BOF. Any transactions occurring in the range covered by the next position are displayed in the scrolling area.

Previous

Moves the caret symbol to the left by one position. Moving below the BOF wraps around to the EOF. Any transactions occurring in the range covered by the previous position are displayed in the scrolling area.

More_Info

Place the cursor on the transaction of interest (in the Transaction scrolling area) and select this menu item. Additional information for that transaction is displayed.

For more information on this screen, see More_Info Screen (Transaction Display) (see page 94).

Find

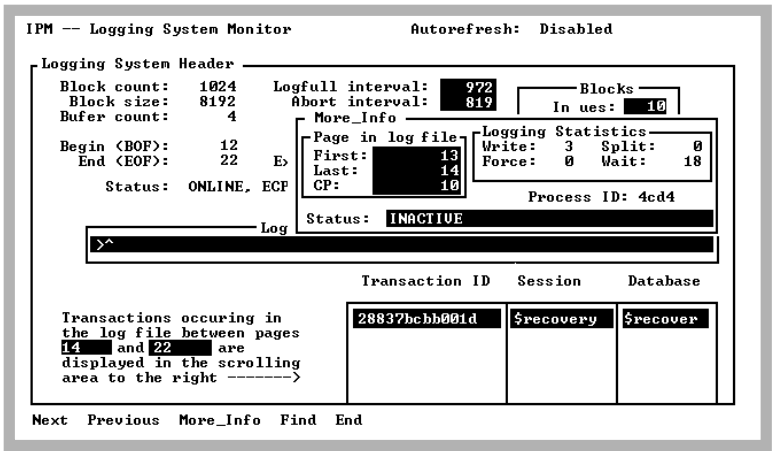
Searches any column in the scrolling area. To initiate the search, tab to the desired column and select Find. If you are searching a text column, Find locates all occurrences in the column.

End

Returns to the Logging System Header screen main menu.

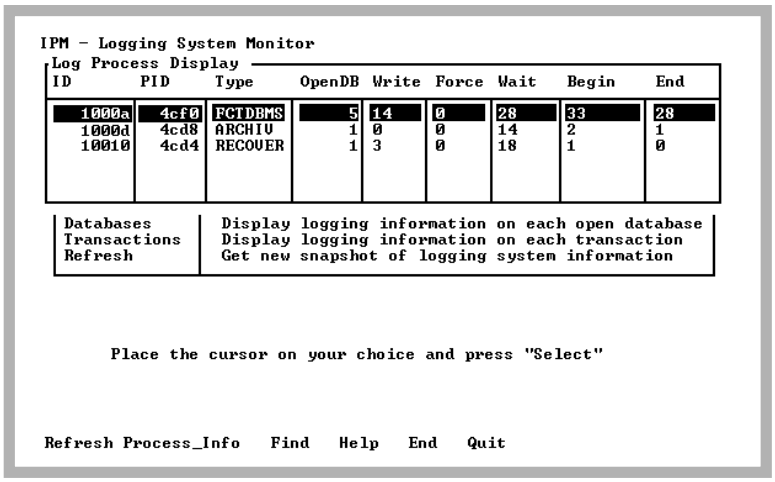
More_Info Screen (Transaction Display)

When you select the More_Info menu item from the Examine submenu, the Logging System Header screen displays a pop-up screen displaying additional transaction information.



Log Process Display Screen

The Log Process Display screen appears when you select Processes from the Log Info Menu screen. As shown below, this screen displays the current processes in the logging system and their states and statistics.



The processes include DBMS servers, the archiver and recovery processes. Information available includes number of open databases and log write requests. By viewing this data you can, for example, determine how much logging activity (by process) is occurring for a DBMS server.

The Log Process Display screen has the following information:

ID

The internal process ID (PID) of processes in the logging system. This is not the operating system PID.

PID

The operating system process ID (PID) for this process

Type

The type of process. Valid types are as follows:

ARCHIV

Archiver processor for the current installation (ACP)

CKPDB

Online backup

DBMS

DBMS server process

FCTDBMS

DBMS server process running with fast commit

RECOVER

Recovery process (RCP)

SBM

Server is attached to a shared data buffer.

OpenDB

The number of different databases currently opened

Write

The number of log file write requests made by this process

Force

The number of log forces

Wait

Indicates how many times the current process waited to use the logging system

Begin

The number of transactions started by this process

End

The number of transactions ended. The difference between the value in this column and the value in the Begin column is the number of current transactions for this process.

Log Process Display Menu Items

The Log Process Display has the following menu items:

Refresh

Queries the logging system for logging information. Process, database, and transaction information are obtained together to ensure a consistent snapshot of the logging system.

Process_Info

Appears on VMS.

Displays the Detailed Process Information screen. This screen shows various job-process information for the process on which the cursor is positioned. Such information includes CPU time, Direct I/O, Buffered I/O, Enqueue limit, etc. This display automatically refreshes.

For details on this screen, see Detailed Process Information Screen (VMS Only) (see page 40).

Find

Searches any column in the scrolling area. To initiate the search, tab to the desired column and select Find. If you are searching a text column, Find locates all occurrences in the column.

Help

Displays help screens.

End

Returns to the Log Info Menu screen.

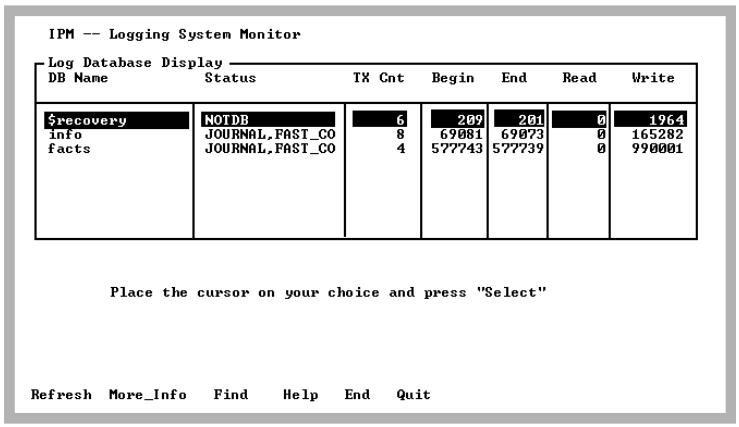
Quit

Exits IPM.

Log Database Display Screen

The Log Database Display screen appears when you select Databases from the Log Info Menu screen.

This screen can be used to monitor logging activity by database.



The screen contains an entry for each active database. Information includes the number of transaction begins and ends, and the number of log file write requests. The status of a database can also be determined. For a list of valid status values, see Logging System Header Screen Status Field Values (see page 87).

The Log Database Display shows the following information:

DB Name

The database name.

Status

The database status. Valid values are as follows:

CKPDB_PEND

Online backup for this database is about to start.

CLOSEDB_PEND

This database is about to be closed; the last user in the database is exiting.

EBACKUP

Online backup

FAST_COMMIT

This database is running with Fast Commit.

FBACKUP

Online backup

JOURNAL

This database has journaling enabled.

NOTDB

The entry is not a database.

OPENDB_PEND

This database is about to be opened for the first user of the database.

PURGE

This database is closed and the archiver is archiving transactions.

TX Cnt

The number of currently open transactions. This is the difference between the Begin and End columns.

Begin

The number of transaction begins that have occurred so far.

End

The number of transaction ends that have occurred so far.

Read

The number of log file read requests that have been made so far. It is unusual for this value to be greater than 0 for any entry except the $recovery entry. Log file reads are usually done during transaction rollout and during journaling by the archiver.

Write

The number of log file write requests made.

Log Database Display Menu Items

The Log Database Display has the following menu items:

Refresh

Queries the logging system for logging information. Process, database and transaction information are obtained together to ensure a consistent snapshot of the logging system.

More_Info

Displays additional information for the selected database, including the database location and journal window. For more information on this screen, see Log Database Display More_Info Screen.

Find

Searches any column in the scrolling area. To initiate the search, tab to the desired column and select Find. If you are searching a text column, Find locates all occurrences in the column.

Help

Displays help screens.

End

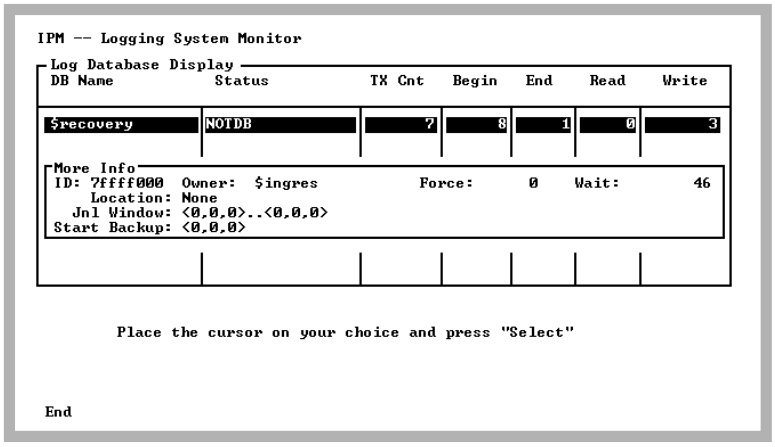
Returns to the Log Info Menu screen.

Quit

Exits IPM.

Log Database Display More_Info Screen

When the More_Info menu item is selected from the Log Database Display screen, a pop-up screen containing additional fields for the specified database is displayed.



The pop-up screen has the following fields:

ID

The internal database ID for this database

Owner

The DBA for this database

Force

The number of times log file forces occurred for this database

Wait

The number of times transactions in this database had to wait to use the logging system

Location

The database location

Jnl Window

The range of log file addresses where there are transactions for this database that must be journaled. This field implies that journaling is enabled for this database.

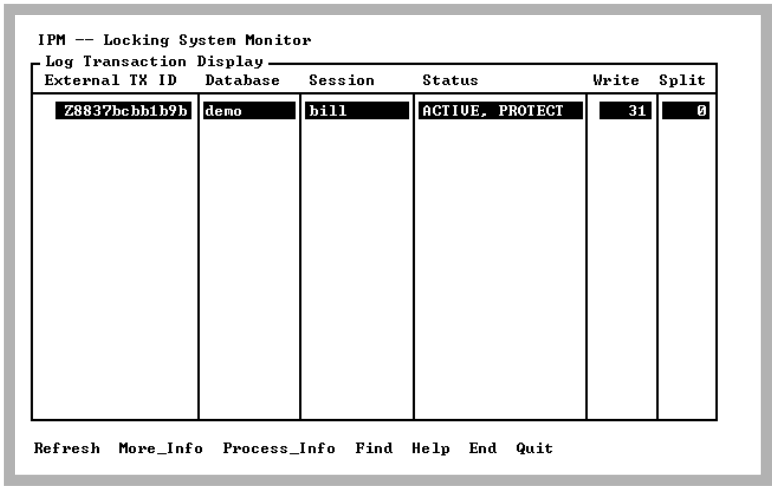
Start Backup

The log file address where on-line backup for this database begins

Log Transaction Display Screen

The Log Transaction Display screen appears when you select Transactions from the Log Info Menu screen.

This screen contains an entry for each transaction in the logging system.



This screen lets you observe the activity of each transaction and pinpoint those transactions that are generating extensive logging system activity. The status of each transaction is also displayed. You can use the Find menu item to search for FORCE_ABORT transactions by tabbing to the Status column and selecting Find.

The Process_Info menu item allows monitoring of the process to which the selected transaction belongs. For example, in multi-server installations, it is not necessary to determine to which server a transaction belongs. Place the cursor on the desired transaction and select the Process_Info menu item. The Detailed Process Information Screen (VMS Only) (see page 40) is displayed.

Once a transaction is committed, it is no longer in the logging system. When this screen is refreshed, the transaction disappears from the display if it was committed between the last screen refresh and the current time. Transactions that have been committed and not yet journaled (and when fast commit is on) appear with a status of INACTIVE. By default, INACTIVE transactions are not displayed. The -i option or the Display inactive transactions field on the Options Display screen can be set to "y" to force display of inactive transactions.

Log Transaction Display Fields

The columns of information on the Log Transaction Display screen are:

External TX ID

The Transaction ID. This column corresponds to the Transaction ID field on the More_Info pop-up screen for the Lock List display. For more information, see Lock List Display Screen (see page 55).

Database

The name of the database in which this transaction is running

Session

The session name running this transaction. Session names beginning with $ are internal transactions.

Status

The status of the transaction. Valid statuses are as follows:

ACTIVE

Active. User transactions are usually in this state. No commit has been issued.

DISTRIBUTED

The transaction is a slave transaction of a larger distributed transaction.

FORCE_ABORT

The transaction is being rolled out because the log file reached the FORCE_ABORT limit.

INACTIVE

Not Active. Internal transactions are usually in this state.

MAN_ABORT

The distributed transaction was manually rolled out.

MAN_COMMIT

The distributed transaction was manually committed.

NOABORT

The transaction cannot be aborted due to FORCE_ABORT or LOG_FILE_FULL. Distributed transactions have this status.

PROTECT

The transaction must be recoverable. User transactions always have this status.

RE-ASSOC

The transaction's connection to the master coordinating application has been lost and the transaction is awaiting reconnection in order to close the transaction.

RECOVER

The transaction has been taken over by the recovery process.

SERVER_ABORT

The server to which this transaction belongs is aborting that transaction.

SESSION_ABORT

The transaction is being rolled out because the session owning this transaction has requested the abort.

WILLING_COMMIT

The transaction is ready to commit. This applies to distributed transactions only.

Write

The number of log file write requests made by this transaction

Split

The number of times a write to the log file was split across more than one log file page and there was not a free buffer. If this occurs frequently, the number or size of the log buffers must be increased to prevent throughput problems to the log file.

Log Transaction Display Menu Items

The menu items available on this screen are:

Refresh

Queries the logging system for logging information. Process, database, and transaction information are obtained together to ensure a consistent snapshot of the logging system.

More_Info

Place the cursor on the desired transaction and select this menu item. Additional information for that transaction is displayed, including the first and last page address in the log file for this transaction.

For more information on this screen, see Log Transaction Display More_Info Screen (see page 104).

VMS:

Process_Info

Displays the Detailed Process Information screen. This screen shows various job-process information for the process on which the cursor is positioned. Such information includes CPU time, Direct I/O, Buffered I/O, Enqueue limit, etc. This display automatically refreshes.

For more information on this screen, see Detailed Process Information Screen (VMS Only) (see page 40).

Find

Searches any column in the scrolling area. To initiate the search, tab to the desired column and select Find. If you are searching a text column, Find locates all occurrences in the column.

Help

Displays help screens

End

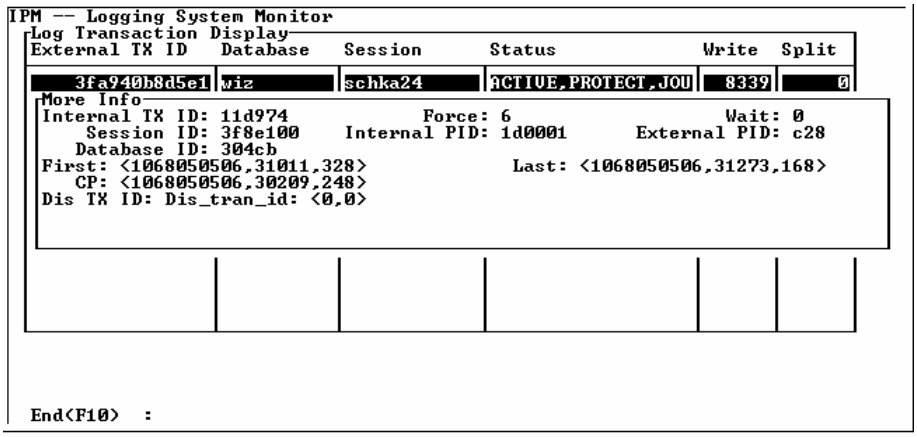
Returns to the Log Info Menu screen

Quit

Exits IPM

Log Transaction Display More_Info Screen

When the More_Info menu item is selected from the Log Transaction Display screen, a pop-up screen containing additional fields for the specified transaction is displayed.



The pop-up has the following fields:

Internal TX ID

The internal transaction ID used by the logging system

Force

Indicates how many times this transaction has caused a log buffer to be forced to the log file

Wait

The number of times this transaction had to wait to use the logging system

Session ID

The session ID of the session that owns this transaction. This ID corresponds to the ID column on the Session List screen. For more information, see Session List Screen (see page 33).

Internal PID

The internal process ID (PID) used by the logging system for the process to which this transaction belongs. This field corresponds to the ID column on the Log Process display. For more information, see Log Process Display Screen (see page 94).

External PID

The operating system PID for the process to which this transaction belongs. This field corresponds to the PID column on the Log Process display. For more information, see Log Process Display Screen (see page 94).

Database ID

The internal database ID used by the logging system. This field corresponds to the ID field on the More_Info pop-up screen for the Log Database display. For more information, see Log Database Display Screen (see page 97).

Dis TX ID

The distributed transaction ID to which this transaction belongs

First

The log file address (position in the log file) for the begin transaction marker for this transaction. It is possible to determine the oldest transaction by viewing the middle number of this field.

Last

The log file address (position in the log file) for the last record written to the log file

CP

The log file address (position in the log file) where a consistency point is taken

Chapter 7: Using IPM to Monitor and Troubleshoot

This chapter provides procedures for using IPM in specific situations. These procedures show how to use IPM as a general purpose and problem-solving tool.

This chapter describes procedures for:

- Monitoring
  - Determining which servers are running
  - Viewing a list of sessions in a DBMS server
  - Viewing the amount of logging and locking resources being consumed
  - Using IPM when you have an unresponsive server
- Analyzing performance
  - Checking on slow system response time during heavy transaction activity
  - Finding concurrency problems by monitoring the locking system
  - Determining the efficiency of group commit in your installation
- Managing the system
  - Determining how close to capacity the log file is
  - Locating a transaction that is preventing reclamation of log file space
- Troubleshooting
  - Using IPM utilities for troubleshooting an Ingres installation

View Running Servers

To determine which servers are running in an installation, use IPM to display either the Server List or the Log Process Display.

To display the Server List screen

Select Server_List from the Main Menu.

Only servers registered with the Name server are shown.

To display the Log Process Display screen

1. Select Log_Info from the Main Menu.

   The Log_Info Menu is displayed.

2. Select Processes.

   The Log Process screen is displayed. All servers, and the archiver and recovery processes in the current installation are shown.

View Sessions

To view a list of sessions in a DBMS server

1. Select Server_List from the Main Menu.

   The Server List screen is displayed.

2. Select a server and then select the Sessions menu item.

   The Session List screen is displayed. If desired, you can view session detail. Privileged users can remove unwanted sessions.

Monitor Resource Usage

If you are monitoring a busy system and want to view the amount of locking and logging resources being consumed for a certain period, use the Interval option with autorefresh on.

Both the Locking System Summary and Logging System Summary screens allow statistics to be collected over an interval whose starting point is determined by selecting the Interval menu item.

To start the interval

1. Invoke IPM with autorefresh on. To do this, either use the -r flag on the ipm command, or set the autorefresh option on the Option Selection screen (select the Options menu item from the Main Menu).
2. Select either Lock_Info or Log_Info from the Main Menu.

   Either the Lock Info Menu or Log Info Menu is displayed.
3. Select Summary from either the Lock Info Menu screen or the Log Info Menu screen.

   The System Summary screen is displayed.
4. Select the Interval menu item.

   The Interval submenu is displayed.
5. Select the Begin_Now menu item to enable the Interval option.

   A starting and current time is displayed. The starting times and statistics are saved until reset. This allows you to use other parts of IPM and view these screens to see the latest cumulative locking and logging statistics.

Operate With an Unresponsive Server

If a server becomes unresponsive, you can still monitor the state of the system with IPM. There are two methods:

- Restart IPM with the **-s** (stand-alone) option.

  In this case, IPM cannot print database or table names because it cannot connect to any server in stand-alone mode. However, this is the simplest method.

- Start up a second server.

  Delete the first (problem) server from the Name Server's list using the iinamu utility. You must be a privileged user to invoke this utility. For more information on starting a server and using the iinamu utility, see the *System Administrator Guide.*

  After IPM connects to the new server, you can use IPM to determine the state of the system. Use the Log and Lock Information areas (Log Info and Lock Info from the Main Menu) to view the state of the system.

Check for Logging Delays

Certain logging conditions may result in user complaints of slow response time. The Logging System Header screen in IPM can help you determine if a sluggish system is due to logging activities.

To check for logging delay

1. Select Log_Info from the Main Menu.

   The Log Info Menu is displayed.

2. Select Header.

   The Logging System Header screen is displayed.

3. Check the Status field.

   Any of the following states indicates that the delay is due to the logging system:

   LOGFULL,CPFLUSH

   The log file is overly full while executing a consistency point (CP). The CP must complete before log space can be released. The status LOGFULL, ARCHIVE may also be displayed.

   LOGFULL,ARCHIVE

   The log file becomes full and journaled transactions must be archived to free up log space. When the archiver is done, log space is released.

   LOG_FULL

   The log file has reached a limit where all database updates/deletes/inserts are stalled until enough space is reclaimed. The Warning field is also visible.

   FORCE_ABORT

   The logging system is backing out the oldest transaction. Doing this does not block any other transactions, but it does take CPU cycles. The amount of CPU cycles used depends upon what the transaction was doing when it was singled out for rollback.

Locate Concurrency Problems

If a session is stalled, it may be waiting for a lock.

To check for concurrency problems

1. Select Lock_Info from the Main Menu.

   The Lock Info Menu is displayed.

2. Select Locks.

   The Lock List Display screen is displayed.

3. Tab to the Status column and select the Find menu item.

   The String to search for prompt appears.

4. Type **WAIT** and press the Return key.

   If there are lock lists with blocked locks, the cursor is placed on that lock list. Any lock lists with a status of WAIT are blocked from proceeding.

5. Select the Block_Info menu item to determine what lock is preventing the transaction from proceeding. (The cursor must be on the blocked lock list.)

   The Blocking Lock Display screen is displayed.

6. Look in the scrolling area. The blocking lock is at the top, and all other waiting locks are below. Note the session name so that you can track down the user.

7. Select End.

   You are returned to the Lock List Display screen.

8. Select a lock list and than select the Examine menu item to view the individual locks for that lock list.

Determine Group Commit Efficiency

You can use IPM to determine how efficient group commit is in your installation. The ratio of Log group count to Log group commit indicates how many waiting transactions are satisfied for each group commit operation.

To determine the efficiency of group commit in your installation

1. Select Log_Info from the Main Menu.

   The Log Info Menu is displayed.

2. Select Summary.

   The Logging System Summary screen is displayed.

3. Look at the ratio of Log group count to Log group commit.

   A ratio of 10:1 indicates that 10 commits were satisfied with one group commit write. You can use the Interval menu item to observe this over a short period of time.

   If the ratio approaches 1:1, potentially empty (or near empty) log buffers are being written out, possibly wasting space in the log file. To avoid this, decrease the size and number of the log buffers.

Check Log File Capacity

The Logging System Header screen in IPM lets you determine how full and how close to FORCE_ABORT the log file is.

Note: This procedure is most useful when the autorefresh option is set.

To check the capacity of the log file

1. Select Log_Info from the Main Menu.

   The Log Info Menu is displayed.

2. Select Header.

   The Logging System Header screen is displayed.

3. Check the following values:

   - The Log file diagram, which shows how full the log file is.
   - The Blocks in use field.

4. Compare the Block in use value to Abort interval and Logfull interval to determine how close to FORCE_ABORT and LOG_FILE_FULL the logging system is.

Locate a Problem Transaction

To see which transaction is preventing reclamation of log file space

1. Select Log_Info from the Main Menu.

   The Log Info Menu is displayed.

2. Select Header.

   The Logging System Header screen is displayed.

3. Examine the Log File diagram.

   The diagram depicts the log file as it logically appears. The field boundaries represent the physical begin and end of file. The logical begin and end are marked by > symbols.

4. Select the Examine menu item.

   A submenu and additional transaction information on the Logging System Header screen is displayed.

   On this transaction display, you can view the transactions that span the portion of the log file represented by the ^ symbol on the Log file diagram field. All transactions found for the current portion of the log file appear in the scrolling area on the bottom right of the screen. The Next and Previous menu items move the caret symbol to any area of the Log file Diagram covered by the arrow (">----->").

5. Select Next to logically step through the log file (starting at the BOF--where the caret rests) until a user transaction appears in the scrolling area.

   This transaction is the oldest transaction in the log file that is preventing log file space from being reclaimed.

6. Take steps to remove or commit the offending transaction.

IPM as a Troubleshooting Tool

You can use IPM as an efficient troubleshooting tool to locate the source of various operating or functional problems by using IPM utilities. IPM includes the following utilities, often used in troubleshooting an Ingres installation:

iimonitor

This utility is used to monitor and administer DBMS servers. With iimonitor or IPM, you can examine the status of a DBMS server or shut down a server or particular server session.

lockstat

The lockstat utility allows you to display locking status information.

logstat

The logstat utility allows you to display logging status information.

iinamu

This utility is used to monitor and administer the Name Server. You can display DBMS server information, register servers, and delete servers from the registered list.

For detailed troubleshooting procedures, see the *System Administrator Guide*.

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