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Retooling Enterprise Systems

# RM/InfoExpress®

*User's Guide*

*Version 2.1 for TCP/IP*

This manual is a complete user's guide to Liant Software Corporation's RM/InfoExpress file management system for Microsoft Windows and UNIX clients communicating with UNIX and Windows NT servers using TCP/IP (Transmission Control Protocol/Internet Protocol) on a network. It is assumed that the reader is familiar with RM/COBOL and various local area networks (LANs) and wide area networks (WANs).

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The software described in this document is furnished to the user under a license for a specific number of uses and may be copied (with inclusion of the copyright notice) only in accordance with the terms of such license. The software is delivered in two parts: the server programs, licensed for a single machine, and the client program, licensed for multiple client machines.



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# Table of Contents

## List of Figures



## List of Tables

# Preface

## Welcome to RM/InfoExpress Version 2.1

**Note** The RM/InfoExpress version number refers to the server; client(s) do not have version numbers.

RM/InfoExpress is the file management system designed to optimize RM/COBOL data file access on various local area networks (LANs) and wide area networks (WANs).

The *RM/InfoExpress User's Guide* is intended for commercial application developers who have a basic understanding of RM/COBOL, Microsoft Windows, UNIX, and TCP/IP (Transmission Control Protocol/Internet Protocol). The information in this preface outlines the contents of this manual, defines typographic and programming conventions used in the documentation, and provides information about registering your product and obtaining technical support. The new features and significant changes in this release are also discussed.

## Organization of Information

This user's guide is divided into the following parts:

**Chapter 1—Installation and Verification** lists hardware and software requirements, and provides procedures for installing RM/InfoExpress for TCP/IP on both clients and servers for a specific LAN or WAN type. Also included are procedures for verifying that both client and server software are properly installed and communicating with one another.

**Chapter 2—Configuring and Starting the RM/InfoExpress Server** describes the procedures required to configure and run RM/InfoExpress servers for UNIX and Windows NT.

**Chapter 3—Using RM/InfoExpress with RM/COBOL for Windows Programs** describes how to access the RM/InfoExpress Windows client program, how RM/COBOL for Windows programs point to network data files, and explains how to execute RM/COBOL for Windows programs for use with RM/InfoExpress.

**Chapter 4—Using RM/InfoExpress with RM/COBOL for UNIX Programs** describes how to access the RM/InfoExpress UNIX client program, how RM/COBOL for UNIX programs point to network data files, and how to execute RM/COBOL for UNIX programs for use with RM/InfoExpress.

**Chapter 5—RM/InfoExpress Server Operations** describes the RM/InfoExpress server commands. This chapter also describes the information displayed by the server during RM/InfoExpress execution.

**Chapter 6—File Security on the RM/InfoExpress UNIX Server** describes the implementation of file security on the RM/InfoExpress UNIX server.

**Appendix A—Messages** lists and defines the information and error messages that may be generated during an RM/InfoExpress session.

**Appendix B—Limits and Ranges** lists the logical and physical limits and ranges of RM/InfoExpress.

**Appendix C—Troubleshooting RM/InfoExpress** describes problems that you may encounter during an RM/InfoExpress session and provides solutions.

**Appendix D—Configuring RM/InfoExpress** describes various configuration parameters for RM/InfoExpress client and server components.

**Appendix E—RM/InfoExpress Security Parameter File Update Utility** describes how to use the utility program (**ixsecure.cob**) to update the parameter file (**ixpwfile**) with security-related information that is used by the server to authenticate the clients.

**Appendix F—Using RM/InfoExpress with Relativity** describes how to access Relativity files using RM/InfoExpress.

**Appendix G—Using RM/InfoExpress with RM/plusDB** describes how to access RM/plusDB tables using RM/InfoExpress.

The *RM/InfoExpress User's Guide* also includes an index.

# Related Publications

The following documents contain information necessary for a complete understanding of RM/InfoExpress for TCP/IP as used in conjunction with a specific operating system and a local area network (LAN) or wide area network (WAN):

- *Microsoft Windows 3.1 User's Guide*
- *Microsoft Windows NT Online Help*
- *Microsoft Windows 95 Online Help*
- *Microsoft Windows 95 Resource Kit*
- *Microsoft Windows 98 Online Help*
- *Microsoft Windows 98 Resource Kit*
- *RM/COBOL User's Guide*

# Conventions and Symbols

The following symbols and conventions are used or followed throughout this user's guide.

1. Text that you enter or that is displayed on your screen is indented and appears in a monospaced font. This type style is also used for sample command lines, program code and file listing examples, and sample sessions.

2. Variable information, for which you substitute a specific value, is printed in italics. For example:

   ```
   runcobol name [options]
   ```

   Italic type also identifies the titles of other manuals and the chapter names in this guide, and occasionally it is used for emphasis.

3. Program names, directory names, filenames, and commands appear in bold type and lowercase text. You can type program names, directory names, filenames, and commands in uppercase or lowercase letters, except where otherwise stated.

   Bold type is also used for emphasis on some types of lists, and for anything you must type exactly as it appears.

4. Key combinations are connected by a plus sign (+), for example, Ctrl + X. This notation indicates that you press and hold down the first key while you press the second key. For example, “press Ctrl + X” indicates to press and hold down the Ctrl key while pressing the X key. Then release both keys.

5. RM/COBOL compile and runtime command line options may be preceded by a hyphen. If any option is preceded by a hyphen, then a leading hyphen must precede all options. When assigning a value to an option, the equal sign is optional if leading hyphens are used.

6. The term “window” refers to a delineated area of the screen, normally smaller than the full screen. The term "Windows" refers to the Microsoft Windows 3.1, Windows 95, Windows 98, or Windows NT operating systems.

# Registration

Please take a moment to fill out and mail (or fax) the registration card you received with RM/InfoExpress. Registering your product entitles you to the following benefits:

- **Customer support**. Free 30-day telephone support, including direct access to support personnel and 24-hour message service.
- **Special upgrades.** Free media updates and upgrades within 60 days of purchase.
- **Product information.** Notification of upgrades or revisions to RM/InfoExpress when they are released. You can also receive up-to-date information about other Liant products via the World Wide Web. (See “Online Information” on page xiv.)

# Technical Support

Liant Software Corporation is dedicated to helping you achieve the highest possible performance from our products. The technical support staff is committed to providing you prompt and professional service when you have problems or questions about your Liant products.

These technical support services are subject to Liant's prices, terms, and conditions in place at the time the service is requested.

While it is not possible to maintain and support specific releases of all software indefinitely, we offer priority support for the most current release of each product. For customers who elect not to upgrade to the most current release of the products, support is provided on a “best effort” basis.

## Support Guidelines

When you need assistance, you can expedite your call by having the following information available for the technical support representative:

1. Company name, support contract, partner, ADR, or distributor number.
2. Liant product serial number (found on the media label, registration card, or product banner message).
3. Liant product version number.
4. Operating system and version number.
5. Hardware, related equipment, and terminal type.
6. Exact message appearing on screen.
7. Concise explanation of the problem and process involved when the problem occurred.

## Test Cases

You may be asked for an example (test case) that demonstrates the problem.

- The smaller the test case is, the faster we will be able to isolate the cause of the problem.
- Do not send full applications.
- Reduce the test case to one or two programs and as few data files as possible.
- If you have very large data files, write a small program to read in your current data files and to create new data files with as few records as necessary to reproduce the problem.
- Test the test case before sending it to us to ensure that you have included all the necessary components to recompile and run the test case. You may need to include an RM/COBOL configuration file.

# Online Information

Additional information related to Liant's products can be obtained 24 hours a day, seven days a week, including holidays, through Liant's Internet World Wide Web site. The address is http://www.liant.com.

# Version 2.1 Enhancements

This section highlights some of the new and enhanced features of RM/InfoExpress version 2.1.

## RM/InfoExpress Server Now Supported on Windows NT Version 4.0

A version of the RM/InfoExpress server software now runs on the Windows NT Server (version 4.0).

## File Security on the RM/InfoExpress UNIX Server

The RM/InfoExpress UNIX server now provides enhanced file security. The level of security is specified at the time the server is invoked. The server performs various validations on the authenticity of the client(s) before granting access to a file. See Chapter 6, *File Security on the RM/InfoExpress UNIX Server*, for more information.

## New Utility to Update RM/InfoExpress Parameter File

To make the RM/InfoExpress server screens display similar information about all types of clients, all new clients now provide client-specific information (such as *client-machine-name* and *user-name* of the client on the server, as described in Chapter 6) to the server from a security parameter file. This parameter file, default name **ixpwfile**, is created using a utility program, **ixsecure.cob**. Refer to Appendix E, *RM/InfoExpress Security Parameter File Update Utility*, for more information about how to use this utility.

## Improved Server Screens

Additional information has been added to the server screens to identify the clients. For example, the Error Log screen now displays the name of the file on which the error occurred.

## Optional Message Compression

This version of RM/InfoExpress optionally compresses messages before transmitting them on the network. Depending on the compressibility of the messages, which include the records from RM/COBOL data files, compression may improve the performance of RM/InfoExpress over WANs and heavily loaded LANs.

## Optional Message Encryption

This version of RM/InfoExpress optionally encrypts messages before transmitting them on the network to provide more security for the COBOL data.

## Initialization File Support

All implementations of RM/InfoExpress now allow configuration information to be stored in a file that is in an .INI format. See Appendix D, *Configuring RM/InfoExpress*, for more information.

## -m Server Option Obsolete

The RM/InfoExpress server now automatically expands the message buffer size (set using the -m option on the server command line) as required by each session. The user should no longer receive the error RMIX_ERR_OUT_OF_MEMORY when transmitting large records (usually larger than 5000 bytes).

## Use Count Check by the Server

The RM/InfoExpress server now limits the number of client connections to the value specified by the UseCount configuration option or the licensed use count, whichever is less. For more information, see the UseCount option as described in Appendix D.

### New File Count Option

The RM/InfoExpress server can now be configured for any number of simultaneously open files, independent of the licensed use count. For more information, see the FileCount configuration option as described in Appendix D.

### New Option to Handle the Display of Long Filenames

The RM/InfoExpress screen handler can now be configured to display more reasonably a filename that is too long to fit in the screen handler's display field. For more information, see the DotsBias configuration option as described in Appendix D.

## Version 2.0.2 Enhancements

This section highlights some of the new and enhanced features of RM/InfoExpress version 2.0.2

### New Server Option Enables the RM/plusDB Interface

The -b option has been added in order to enable RM/InfoExpress to communicate with RM/plusDB. Use the -b option when invoking the RM/InfoExpress server with the RM/plusDB product if every filename is to be checked for an RM/plusDB table name by the server before opening the RM/COBOL data file. See Appendix G, *Using RM/InfoExpress with RM/plusDB*, for more information.

## Version 2.0 Enhancements

This section highlights some of the new and enhanced features of RM/InfoExpress version 2.0.

### RM/InfoExpress UNIX Server Filename Case Sensitivity

For the RM/InfoExpress UNIX server, the -c option allows you to specify whether to map the filename on an Open request to uppercase, lowercase, or leave it unaltered (the default). See Chapter 2, *Configuring and Starting the RM/InfoExpress Server*, for more information.

## RM/InfoExpress UNIX Server Configuration Option

For the RM/InfoExpress UNIX server, the -c 1 configuration option must be specified if the pathnames are to be converted to lowercase (as in the previous version). The default is no conversion. For more information, see Chapter 2.

## RM/InfoExpress UNIX Server Runs as a Daemon

This version of the RM/InfoExpress UNIX server runs unattended in the background and no longer requires an additional terminal. The server uses data structures built in shared memory. The server modifies the data structures using a well-defined administrative API (Application Programming Interface) to preserve the integrity of the server data structures.

## RM/InfoExpress Screen Handler Program

The screen handler portion of RM/InfoExpress has been removed from the server program and is now a separate application. The screen handler application shares the data structures present in shared memory along with the server daemon. The screen handler accesses the data structures using a well-defined administrative API.

The screen handler program is improved to read an entire screen of information in a single operation, thus providing more consistency to the data it displays.

Under UNIX, the screen handler can be invoked more than once on the system, making it possible for multiple users to view the server statistics simultaneously. The screen handler application can be run from any terminal on the UNIX system.

The command sequence, Terminate Display, now terminates the screen handler program without affecting the server or any clients.

The following sections describe two additional modifications to the screen handler program.

### Changes in the Default Behavior

The default behavior of the screen handler program allows only the termination of the screen handler program itself. This prevents you from accidentally stopping the server or a specific client. To terminate the server or a particular client, you must specify the -t option (as described in Chapter 2) when you start the screen handler program.

### New Screens

The Error Information screen has been replaced by two new screens.

The Open Log screen displays information about the most recent 24 open operations performed by the server. The Error Log screen displays information about the most recent 24 errors, including the complete error code and location of the error. See Chapter 5, *RM/InfoExpress Server Operations,* for more information.

## More COBOL Information Added to Existing Screens

More COBOL-related information has been added to existing screens. The Client Files Information screen now displays the organization, open mode, and the access mode of each file currently opened by the client. A new field, System name, has been added to the Client Information screen. This field displays the type of operating system on which the client is running. See Chapter 5 for further details.

## Improved Error Handling

Error handling has been improved in this version of RM/InfoExpress. Additional information, such as the location of the occurrence, is also now maintained.

## KEEPSESSION Configuration Option

The default value for the KEEPSESSION configuration option has changed from NO to YES. For more information, see Appendix D, *Configuring RM/InfoExpress.*

# Chapter 1: Installation and Verification

This chapter lists the hardware and software needed to use RM/InfoExpress for TCP/IP (Transmission Control Protocol/Internet Protocol), detailing the differences between the client and server program requirements. Chapter 1 also provides instructions for installing RM/InfoExpress and outlines procedures for verifying that RM/InfoExpress is properly installed.

**Note** Before continuing, please take a moment to fill out and mail in or fax the Product Registration Card. If you choose to mail your registration, we have provided postage-paid envelopes. Registration enables you to receive automatic notification of RM/InfoExpress updates and new products, and access to free 30-day introductory telephone support.

## System Requirements

The version of RM/InfoExpress that you have purchased is for a particular combination of hardware and operating systems. Several items listed below vary depending on the actual version of the product that you have purchased. The version-specific information for those items is located in the system requirements list that is shipped with your product.

Before you can use RM/InfoExpress for TCP/IP, your personal computer configuration must meet or exceed the requirements set forth in this section.

### Required Hardware

#### RM/InfoExpress Windows Client Hardware

- IBM PC or compatible 386-based system, capable of running Windows 3.1 (for 16-bit clients)

  - or -

  IBM PC or compatible 486-based system, capable of running Windows 95, Windows 98, or Windows NT, version 3.51 or later (for 32-bit clients)

- Network card, such as Ethernet

### RM/InfoExpress Windows NT Server Hardware

- IBM PC or compatible 486-based system, capable of running Windows NT, version 4.0 or later
- Network card, such as Ethernet

### RM/InfoExpress UNIX Client and Server Hardware

1. **Memory.** The amount of memory depends on the specific version of the product that you have purchased.
2. **Hard Disk.** A hard disk drive is required for installing this product. The amount of space required is version-specific.
3. **Removable Media.** Some form of removable media (magnetic tape or floppy disk) is required for installing this product. The type of media is version-specific.
4. **Terminal.** A terminal with a minimum capacity of 80 columns and 24 rows.
5. **Network card.** Ethernet is one example of a suitable network card.

## Required Software

RM/InfoExpress for TCP/IP, delivered on appropriate media, contains a number of individual files and programs. Each volume of delivered media contains one or more README files, which list the actual files and programs delivered. Please check these README files after you have installed the product to make sure that you have received all of the appropriate files and programs.

For a list of known problems and recovery tips, refer to the section “Known Problems” in the README file.

**Note** The RM/InfoExpress server software should be installed only on the machine on which it is to run. If appropriately licensed, the RM/COBOL runtime system with the RM/InfoExpress client software may be stored on a UNIX machine or a Windows NT Server.

### RM/InfoExpress Client Software

RM/InfoExpress for TCP/IP supports two types of client programs. One client runs on your computer under the control of a Windows operating system; the other client runs on a UNIX or UNIX-based operating system.

#### *Windows Client*

The client software requirements for Windows include the following:

- Windows 3.1 (for 16-bit clients)

  - or -

  Windows 95, Windows 98, or Windows NT, version 3.51 or later (for 32-bit clients)

- RM/COBOL for Windows runtime system (**runcobol**) version 6.*x*

- RM/InfoExpress Windows client dynamic link library (DLL) program delivered with your RM/COBOL for Windows runtime system (**rmclntcp.dll** for 16-bit clients or **rmtcp32.dll** for 32-bit clients)

- RM/InfoExpress file security parameter update utility program (**ixsecure.cob**)

  **Note** Older (16-bit) clients cannot use the UNIX server security features described in Chapter 6, *File Security on the RM/InfoExpress UNIX Server*.

- Windows Sockets version 1.1 implementation available from a variety of network software vendors. Windows 95 and Windows 98 both include Windows Sockets version 1.1.

#### *UNIX Client*

The client software requirements for UNIX include the following:

- UNIX-based operating system supporting the BSD Sockets interface to TCP/IP

- RM/COBOL for UNIX runtime system (**runcobol**) version 6.*x* with the RM/InfoExpress UNIX client program (**runinfoxtcp**)

- RM/InfoExpress file security parameter update utility program (**ixsecure.cob**)

### RM/InfoExpress Server Software

RM/InfoExpress for TCP/IP supports two types of server programs: one for Windows NT Server, version 4.0 systems, and one for UNIX-based systems.

#### *Windows NT Server*

The RM/InfoExpress Windows NT server program runs under the control of the following:

- Windows NT Server version 4.0, which supports the Windows Sockets interface to TCP/IP. The complete Microsoft TCP/IP package must be installed.
- RM/InfoExpress Windows NT server main program (**rmsrvtcp.exe**)
- RM/InfoExpress Windows NT server screen handler program (**rmdistcp.exe**)

#### *UNIX Server*

The RM/InfoExpress UNIX server program runs under the control of the following:

- UNIX-based operating system supporting the BSD Sockets interface to TCP/IP
- RM/InfoExpress UNIX server main program (**rmservertcp**)
- RM/InfoExpress UNIX server screen handler program (**rmdisptcp**)
- RM/InfoExpress file security parameter update utility program (**ixsecure.cob**)

# Installation

The instructions for installing RM/InfoExpress are provided in this section.

## Installing the RM/InfoExpress Windows Client Program

Windows 95, Windows 98, and Windows NT come with Windows Sockets as part of the operating system. Before installing this implementation of RM/InfoExpress on Windows 3.1, however, you must obtain and install a Windows Sockets version 1.1 implementation (also known as a TCP/IP stack). In addition to installing a **winsock.dll** file (and any other files that it requires) on Windows 3.1, you must install a **hosts** file and a **services** file.

- The **hosts** file lists the IP (Internet Protocol) addresses and host name(s) of all machines (clients and servers) that are connected to your network. As an alternative to using a **hosts** file on every machine, you can use DNS (Domain Name Servers). One machine or a few machines run DNS; all of the other machines on the network access DNS to resolve names to IP addresses.

- The **services** file lists the service name and port number/protocol of all available services. You must locate and edit the **services** file for your Windows Sockets implementation in order to add the following line:

  ```
  RMCFileServer  21069/tcp
  ```

  Verify that no other line contains RMCFileServer (in any mixture of uppercase or lowercase letters) and that no other line contains the port number 21069. If port number 21069 is already in use, select another unused port number. We recommend that you choose a port number between 5000 and 32000.

  **Note** The user must ensure that the RMCFileServer line in the **services** file is identical on every machine (clients and servers) on the network.

The RM/InfoExpress Windows client program (**rmclntcp.dll** for 16-bit clients or **rmtcp32.dll** for 32-bit clients) is installed by the setup procedure for RM/COBOL for Windows if you chose the option to do so. If you did not initially install it, run the RM/COBOL setup procedure again and choose to install only the RM/InfoExpress Client option. If you wish to run the client verification program, choose the Verification Suite option also.

## Installing the RM/InfoExpress UNIX Client Program

If supported on your UNIX system, the RM/InfoExpress UNIX client program, **runinfoxtcp**, is installed automatically along with RM/COBOL for UNIX. This RM/InfoExpress client executable will, for all practical purposes, be the same as your **runcobol** system except that the RM/InfoExpress client code is statically linked into it.

For setting up the **/etc/hosts** and **/etc/services** files such that the RM/InfoExpress UNIX client can access the RM/InfoExpress UNIX server, refer to the section, "Installing the RM/InfoExpress UNIX Server Program" on page 1-7.

## Installing the RM/InfoExpress Windows NT Server Program

Before you install the RM/InfoExpress Windows NT server program, you must first ensure that the complete Microsoft TCP/IP package has been installed and set up on your Windows NT Server machine.

Make certain that the **hosts** and **services** files are included in the Windows directory (\WINNT\system32\drivers\etc).

- The **hosts** file lists the IP (Internet Protocol) addresses and host name(s) of all machines (clients and servers) that are connected to your network. As an alternative to using a **hosts** file on every machine, you can use DSN (Domain Name Servers). One machine or a few machines run DNS; all of the other machines on the network access DNS to resolve names to IP addresses.

- The **services** file lists the service name and port number/protocol of all available services. The **rmaddsvc** program will update the **services** file during setup in order to add the following line:

  ```
  RMCFileServer  21069/tcp
  ```

  No other line may contain RMCFileServer (in any mixture of uppercase or lowercase letters), and no other line may contain the port number 21069. If port number 21069 is already in use, select another unused port number. We recommend that you choose a port number between 5000 and 32000.

  **Note** The user must ensure that the RMCFileServer line in the **services** file is identical on every machine (clients and servers) on the network.

To install the RM/InfoExpress Windows NT server program on your Windows NT Server machine, take the following steps:

1. Log in as Administrator.
2. Insert the delivered media into drive a:.
3. Click **Start** on the task bar, select **Run**, type **a:setup**, and click **OK**.

   The RM/InfoExpress Setup window is displayed.
4. Follow the setup instructions to install the product.

   RM/InfoExpress is installed and run as a Windows NT Service.

## Installing the RM/InfoExpress UNIX Server Program

Before you install the RM/InfoExpress UNIX server program, you must first ensure that TCP/IP has been installed and set up on your UNIX server machine. Make certain that a **hosts** file and **services** file, usually named **/etc/hosts** and **/etc/services**, are included.

- The **hosts** file lists the IP (Internet Protocol) addresses and host name(s) of all machines (clients and servers) that are connected to your network. As an alternative to using a **hosts** file on every machine, you can use DNS (Domain Name Servers). One machine or a few machines run DNS; all of the other machines on the network access DNS to resolve names to IP addresses.
- The **services** file lists the service name and port number/protocol of all available services. The **rmaddsvc** program will update the **services** file during setup in order to add the following line:

  ```
  RMCFileServer  21069/tcp
  ```

  No other line may contain RMCFileServer (in any mixture of uppercase or lowercase letters), and no other line may contain the port number 21069. If port number 21069 is already in use, select another unused port number. We recommend that you choose a port number between 5000 and 32000.

  **Note** The user must ensure that the RMCFileServer line in the **services** file is identical on every machine (clients and servers) on the network.

To install the RM/InfoExpress UNIX server on your UNIX server machine, take the following steps. (Note that installation information specific to your UNIX system can be found on the media label.)

1. Log in as root.

2. The amount of disk space required to install this product is noted on the media envelope label. The average minimum disk space required to install this product is one megabyte (1 MB). You can check the availability of space on your system by executing the following command:

   ```
   df
   ```

3. Create an empty directory in which you want to install RM/InfoExpress. For example:

   ```
   mkdir /usr/rminfox
   cd /usr/rminfox
   ```

4. Copy the contents of the distribution media (all volumes) onto your hard disk. On most versions of this product, you will use the following command to copy the files:

   ```
   cpio -ivcmdB </dev/rmt0
   ```

   **Note** The delivered media contains compressed files. This allows Liant to use fewer floppy disks in a distribution set and also speeds up the install time. The files are compressed or decompressed using the GNU **gzip** and **gunzip** programs. A copy of these programs or the source is available from the Free Software Foundation (FSF), which can be accessed from CompuServe (using GO UNIXFORUM) or from Internet (using "anonymous ftp" from **prep.ai.mit.edu**). The **COPYING.gnu** file is a copy of the GNU General Public License. Use the **cat** or **pg** commands to review the file contents. If you do not have access to these online services, FSF provides a copy of the source for a minimum media handling charge. A copy of the source also may be obtained from Liant Software Corporation.

5. Issue the following command to install RM/InfoExpress server. This command performs the necessary steps to decompress the files and make them executable.

   ```
   ./install
   ```

# Verification

## System Verification

For both the RM/InfoExpress client and server software components, the first step is to verify that the TCP/IP network software is running correctly on the client machine as well as the server machine.

For RM/InfoExpress Windows client verification, follow all the vendor's recommendations for verifying that the Windows Sockets TCP/IP network software is running correctly. If applications such as **ping**, **telnet**, **ftp**, and so forth, are included by the vendor with the Windows Sockets or TCP/IP for Windows implementation, you are encouraged to ensure that these run properly.

For RM/InfoExpress server and client verification on UNIX, follow all of the recommendations provided with the UNIX operating system for verifying that TCP/IP is running properly. If applications such as **ping**, **telnet**, **ftp**, **rlogin**, and so forth, are available, you are encouraged to ensure that these run properly.

## Verifying the RM/InfoExpress Windows Client

If you choose both the RM/InfoExpress Client and Verification Suite options when installing RM/COBOL for Windows, a program-item icon labeled ixverify is created in the RM/COBOL program list. Choose this icon to invoke the RM/InfoExpress Windows client verification program. The RM/InfoExpress Client WinSock Info message box appears in the center of the screen, as illustrated in Figure 1-1.


**Figure 1-1 RM/InfoExpress Client WinSock Info Message Box**

The "Ver" (version) number must be 1.1, which indicates that the Windows Sockets implementation complies with the 1.1 standard. If the version number is other than 1.1, RM/InfoExpress Windows client software may malfunction. The "HighVer" number should be 1.1 or higher. The "MaxSockets" number should be at least as large as the number of RM/COBOL applications that will access remote files. Generally, each

connection to a different server within each separate application requires one socket. Configure the Windows Sockets implementation for the appropriate maximum number of sockets, according to the vendor's instructions.

If no message box appears, the RM/InfoExpress Windows client software is not properly installed or started. Check that the RM/InfoExpress Windows client DLL file (**rmclntcp.dll** for 16-bit clients or **rmtcp32.dll** for 32-bit clients) exists in your Windows directory (\WINDOWS). Check that **winsock.dll** (for 16-bit clients) or **wsock32.dll** (for 32-bit clients) exists in the proper vendor-specific location, along with any other DLLs that it requires. For 16-bit clients, check that any terminate-and-stay-resident (TSR) programs required by the Windows Sockets implementation are also loaded.

**Note** This client verification does not attempt to connect to any server. It simply verifies that the Windows Sockets implementation is sufficient to allow the RM/InfoExpress Windows client DLL to be loaded and run.

## Verifying the RM/InfoExpress UNIX Client

Use the procedure described in the "Verifying RM/InfoExpress UNIX Client and Server Communication" section on page 1-15 to verify the UNIX client.

## Verifying the RM/InfoExpress Server

The following procedures verify that the RM/InfoExpress server programs have been installed correctly.

**Note** Only one RM/InfoExpress server program may be active on any given server machine.

### *Windows NT Server*

Start the Windows NT Service Control Manager (SCM) in the Windows Control Panel as follows:

1. Click **Start** on the task bar.
2. Select **Settings**.
3. Select **Control Panel**.
4. Double-click on the **Services** icon.
5. Find **RM/InfoExpress Server** in the list of services.

6. To start the service, click **Start**.

   This action will launch the RM/InfoExpress Windows NT server program, which runs under the System account and has access to any resources that this account is permitted to use.

7. Double-click on the **rmdistcp** icon in the RM/InfoExpress folder to start the RM/InfoExpress screen handler program, **rmdistcp.exe**.

The RM/InfoExpress server main screen appears, as illustrated in Figure 5-2 on page 5-3. The server is ready to process requests from client machines. If the server main screen does not appear, check that no other RM/InfoExpress server program is already running on the machine. If other messages appear, contact Liant technical support services.

**Note** The RM/InfoExpress Windows NT server program also can be launched in user mode using the icon created by default in the RM/InfoExpress program group. To start the server, simply double-click on the RM/InfoExpress Windows NT server icon. The server will run using the current account and will be terminated when you log out. When launched in this mode, there is also a small, 10- to 20-second delay before the server becomes active.

### *UNIX Server*

Start the RM/InfoExpress UNIX server and screen handler programs, **rmservertcp** and **rmdisptcp**, on the UNIX server machine by entering the following commands:

```
/usr/rminfox/rmservertcp
/usr/rminfox/rmdisptcp -t
```

The RM/InfoExpress server main screen appears, as illustrated in Figure 5-2 on page 5-3. The server is ready to process requests from client machines. If the server main screen does not appear, check that no other RM/InfoExpress server program is already running on the machine. If other messages appear, contact Liant technical support services.

## Verifying RM/InfoExpress Windows Client and Server Communication

The following procedures verify that the RM/InfoExpress Windows client program can correctly communicate with the RM/InfoExpress server program using the TCP/IP communication protocol. We recommend that you first read Chapter 3, *Installation and System Considerations for Microsoft Windows*, in the *RM/COBOL User's Guide*, for more information.

1. Start the RM/InfoExpress server program running on the server machine, as described in the "Verifying the RM/InfoExpress Server" section on page 1-10.

2. Select the RM/COBOL program group from the Windows desktop.

3. Copy the RUNCOBOL program-item icon to a new icon:

   a) Choose the RUNCOBOL icon by clicking the mouse pointer on the icon.

   b) Right-click the RUNCOBOL icon and choose the Copy option from the menu.

   c) Move the mouse pointer to a new location, right-click, and choose the Paste option from the menu.

   **Note** An alternative procedure to Steps 3 (b) and (c) is to hold down the Ctrl key and the mouse button simultaneously while dragging the icon to a new location. Then select the copied icon by clicking on it.

4. Modify the properties of the copied icon:

   a) Right-click on the copy of the RUNCOBOL icon and choose the Rename option from the menu.

   b) Type a new name for the icon (for example, IXDEMO) and press Enter.

   c) Right-click on the renamed copy of the RUNCOBOL icon and choose the Properties option from the menu. The Properties dialog box is displayed.

   d) Select the Shortcut tab.

   e) Press End to enter input at the end of the existing command and then press Backspace to erase the question mark.

   f) For a UNIX server, enter the following:

      ```
      \\server\usr\rminfox\infoxdmo x=rmtcp32v.cfg
      ```

For a Windows NT Server, enter the following:

```
\\server\infoxdmo x=rmtcp32v.cfg
```

**Note** You may type either backslashes (\) or forward slashes (/) to separate the edgenames of the path, but do not mix them. Notice the double backslashes or double forward slashes at the beginning. Substitute the actual machine name of your server machine (where the RM/InfoExpress server program is running as described in Step 1) for *server*. This name is usually displayed as Machine ID at the bottom of the server main screen, but it is whatever name is specified in your **hosts** file or known to your DNS that maps to the IP address of the UNIX server machine.

- Under UNIX, the rest of the pathname assumes that RM/InfoExpress was installed into **/usr/rminfox** during the server installation procedure. If it was installed elsewhere, substitute the correct pathname.
- Under Windows NT, RM/InfoExpress is normally installed in the \Program Files\RMInfoExpress directory, which is the server's current directory.

Step 4 (f) also adds a configuration record file to the **runcobol** command. This configuration record file (**rmtcp32v.cfg**) is used by ixverify. It must reside in the directory named in the Working Directory text box shown in the Program Item Properties dialog box. You can use any text editor to create this file, which should contain the following information:

```
EXTERNAL-ACCESS-METHOD CREATE-FILES=YES NAME=RMTCP32 OPTIONS='I'
```

Specify NAME=RMCLNTCP rather than RMTCP32 if you are running the older 16-bit version of the RM/InfoExpress Windows client software.

If you make a mistake, click Cancel and return to the beginning of Step 4.

g) Click OK or press Enter to complete the modification. The dialog box closes and the new icon appears.

5. Run the new icon by double-clicking on it or pressing Enter with the icon selected.

6. The RM/InfoExpress Client WinSock Info message box appears on the screen, as described in the "Verifying the RM/InfoExpress Windows Client" section on page 1-9.

**Note** This message box is displayed because the OPTIONS='I' keyword is specified on the EXTERNAL-ACCESS-METHOD configuration record in the **rmtcp32v.cfg** file. In a production environment, omit OPTIONS='I' so that the message box will not appear.

7. Click OK or press Enter to acknowledge the message box.

   The **infoxdmo** verification program window displays the following information:

```
RM/InfoExpress Verification Program
   1. RM/COBOL                        File Test
   2. RM/InfoExpress                  File Test
   3. Local RM/plusDB                 File Test
   4. RM/InfoExpress (RM/plusDB)      File Test
   5. All tests above
   6. Exit Program
                                      Enter test number
```

   **Note** File test options 3 and 4 require both RM/plusDB, Liant's RM/COBOL relational database interface, and the RM/InfoExpress UNIX server with an RM/plusDB connection. (For more information, see Appendix G, *Using RM/InfoExpress with RM/plusDB*.) These two options are not present in the **infoxdmo** program shipped with the RM/InfoExpress Windows NT server.

   a) If a return code 252 error (STOP sign) box is displayed, the **infoxdmo** verification program could not be loaded from the server.

   b) If a "COBOL I/O error 30, Runtime Library error 11004" is displayed, the server name has probably been entered incorrectly. Click OK or press Enter. Return to Step 5 and then specify the correct server name in Step 6. If the server name was correct, check that the **hosts** file (or DNS) contains the server name and that the **services** file contains the proper RMCFileServer line (see page 1-5).

   c) If "COBOL procedure error 204" is displayed, the server name is correct but the remaining path is incorrect. Click OK or press Enter. Return to Step 5 and then specify the correct pathname in Step 6.

   d) Other return code values and other error codes are described in the *RM/COBOL User's Guide*, and in Appendix A, *Messages*, of this manual. If an error message occurs, check the following:

      1) The status of the RM/InfoExpress server. (Is it still running?)

      2) The pathname on the server machine of the **infoxdmo** verification program.

      3) The server name in your **hosts** file.

      4) The RMCFileServer line in your **services** file.

      If you cannot determine the cause of the problem and correct it, contact Liant technical support services.

8. At the “Enter test number” prompt, type 2 and press Enter. The following prompt appears:

   ```
   Enter remote directory where files are to be created.
   ```

9. Enter the name of the directory on the RM/InfoExpress server where the files are to be created. For example:

   ```
   \\server\usr\rminfox
   ```

   The directory must already exist on the server machine, and the RM/InfoExpress server user must have read and write permissions to it.

   The **infoxdmo** verification program creates one indexed file (**inxfl**) and performs five tests: write sequential, read sequential, read random, rewrite random, and delete random. Timing information for each test is shown.

10. When the five tests are complete, the “Type any key to continue . . .” prompt appears. At this point, RM/InfoExpress Windows client and server communication verification is successfully complete.

You may run other tests in the verification program, run test number 2 specifying a different server, or exit the program.

## Verifying RM/InfoExpress UNIX Client and Server Communication

The following procedures verify that the RM/InfoExpress UNIX client program can correctly communicate with the RM/InfoExpress server program using the TCP/IP communication protocol. We recommend that you first read Chapter 2, *Installation and System Considerations for UNIX*, in the *RM/COBOL User’s Guide*, for more information.

1. Start the RM/InfoExpress server program running on the server machine, as described earlier in the “Verifying the RM/InfoExpress Server” section on page 1-10.

2. Run the verification program, **infoxdmo**, using the RM/InfoExpress UNIX client program, **runinfoxtcp**, by entering the following command:

   ```
   runinfoxtcp infoxdmo
   ```

3. Check that your PATH environment variable is set to point to the directory where **runinfoxtcp** is installed and the RUNPATH environment variable is pointing to the directory where **infoxdmo.cob** is present.

   **Note** The **infoxdmo.cob** utility program may reside on your UNIX or Windows NT Server machine. You can load the program across the network by specifying the

server path in the RUNPATH environment variable. For example: RUNPATH=//*server/path*.

The **infoxdmo** verification program window displays the following information:

```
RM/InfoExpress Verification Program
   1. RM/COBOL                        File Test
   2. RM/InfoExpress                  File Test
   3. Local RM/plusDB                 File Test
   4. RM/InfoExpress (RM/plusDB)      File Test
   5. All tests above
   6. Exit Program
                                      Enter test number
```

**Note** File test options 3 and 4 require both RM/plusDB, Liant's RM/COBOL relational database interface, and the RM/InfoExpress UNIX server with an RM/plusDB connection. (For more information, see Appendix G, *Using RM/InfoExpress with RM/plusDB*.)

a) If a "COBOL I/O error 30" is displayed, look at the explanation in Appendix A, *Messages*, or in the *RM/COBOL User's Guide* for the corresponding error.

b) For any RM/InfoExpress error, check the following:

   1) The status of the RM/InfoExpress server. (Is it still running?)

   2) The server name in your **hosts** file.

   3) The RMCFileServer entry in your **services** file.

   If you cannot determine the cause of the problem and correct it, contact Liant technical support for assistance.

4. At the "Enter test number" prompt, type 2 and press Enter. The following prompt appears:

   ```
   Enter remote directory where files are to be created.
   ```

5. Enter the name of the directory on the RM/InfoExpress server where the files are to be created. For example:

   ```
   //server/usr/rminfox
   ```

   **Note** You may type either backslashes (\) or forward slashes (/) to separate the edgenames of the path, but do not mix them. Notice the double backslashes or double forward slashes at the beginning. Substitute the actual machine name (in uppercase) of your server machine (where the RM/InfoExpress server program is

running as described in Step 1) for *server*. This name is usually displayed as Machine ID at the bottom of the server main screen, but it is whatever name is specified in your **hosts** file or known to your DNS that maps to the Internet Protocol address of the server machine.

The directory must already exist on the server machine and the RM/InfoExpress server must have read and write permissions to it.

The **infoxdmo** verification program creates one indexed file (**inxfl**) and performs five tests: write sequential, read sequential, read random, rewrite random, and delete random. Timing information for each test is shown.

6. When the five tests are complete, the "Type any key to continue..." prompt appears. At this point, RM/InfoExpress client and server communication verification is complete.

You may run other tests in the verification program, run test number 2 specifying a different server, or exit the program.

# Chapter 2: Configuring and Starting the RM/InfoExpress Server

This chapter describes the procedures required to configure and run RM/InfoExpress servers for UNIX and Windows NT.

## Server Configuration Options

RM/InfoExpress allows you to specify server configuration options either in the server configuration file (**rmixsrvr.ini**) or on the command line. The command line specification overrides the configuration file setting. While we recommend that you specify the configuration options in the server configuration file, the ability to specify configuration options on the command line ensures backward compatibility with previous releases, and enables special, temporary invocations of the server without affecting the settings in the configuration file. For example, there may be times when it would be helpful to specify the -d option in order to create a debug file to send to Liant technical support services.

All command line options have a configuration file equivalent. However, from version 2.1 forward, all new program options must be specified in the configuration file. There is no command line equivalent.

For more information, see Appendix D, *Configuring RM/InfoExpress*.

# Starting the RM/InfoExpress UNIX Server Program

On the UNIX server machine, start the RM/InfoExpress UNIX server programs, **rmservertcp** and **rmdisptcp**, by entering:

```
/usr/rminfox/rmservertcp [-option]
/usr/rminfox/rmdisptcp [-option]
```

The RM/InfoExpress UNIX server screen handler program, **rmdisptcp**, monitors the server activity and does not affect the communication between the client and server.

The RM/InfoExpress server main screen appears, as illustrated in Figure 5-2 on page 5-3. If the server main screen does not appear, follow the instructions for RM/InfoExpress server verification beginning on page 1-10. The following sections describe the server program and screen handler program command line options.

## Server (rmservertcp) Command Line Options

Options for the RM/InfoExpress UNIX server program (**rmservertcp**) can be any of the following:

- **-b.** Enables RM/plusDB interface code.

  **Note** The -b command line option is equivalent to the EnablePlusDB configuration option. (see page D-10). The command line option overrides the configuration option.

- **-c n|u|l.** Indicates how the cases of pathnames from the clients are converted. The -c option has three values:

  - **-c n.** Indicates that no filename mapping is performed. This is the default value.
  - **-c u.** Indicates that the entire filename is mapped to uppercase before the Open request is attempted. The option may be specified as -c upper, if desired.
  - **-c l.** Indicates that the entire filename is mapped to lowercase before the Open request is attempted. The option may be specified as -c lower, if desired.

  **Note** The -c command line option is equivalent to the ConvertFileName configuration option (see page D-9). The command line option overrides the configuration option.

- **-d *pathname*.** This option causes the file ***pathname*** to be created and trace information to be written into it. After the RM/InfoExpress server program is terminated, send this file to Liant technical support services for further investigation. Use this option only when you are investigating a problem with the help of Liant technical support services. Under normal conditions, using this option affects server operations negatively.

  **Note** The -d command line option is equivalent to the InfoxDebug configuration option (see page D-3). The command line option overrides the configuration option.

- **-k *dddd*.** Indicates the maximum number of clients to be served. If more clients are to be served, the server should be brought down and started again. The default value is 50. This value cannot be greater than the number of clients for which the server is licensed.

  **Note** The -k command line option is equivalent to the UseCount configuration option (see page D-9). The command line option overrides the configuration option.

- **-p *nnnnn*.** Indicates the common buffer pool size. Do not change the default value for this parameter unless instructed by Liant technical support services.

  **Note** The -p command line option is equivalent to the FileBufferPool configuration option (see page D-8). The command line option overrides the configuration option.

- **-z *nnnnn*.** Indicates the maximum amount of data that can be handled by the TCP send function. The default value is system-dependent and has been set by Liant. Do not specify this parameter unless instructed to do so by Liant technical support services.

  **Note** The -z command line option is equivalent to the MaxSendSize configuration option (see page D-5). The command line option overrides the configuration option.

### Screen Handler (rmdisptcp) Command Line Option

The following is an option for the RM/InfoExpress UNIX screen handler program (**rmdisptcp**):

- **-t.** Indicates that the user is requesting to terminate the server or a particular client. If this option is not specified, the user can terminate only the display of the screen handler program. The screen handler program does not support any configuration file. Therefore, if desired, this option must be specified on the command line.

  For example, the following command will allow the user to terminate the server:

  ```
  rmdisptcp -t
  ```

# Starting the RM/InfoExpress Windows NT Server Program

On the Windows NT Server machine, start the Windows NT Service Control Manager (SCM) in the Windows Control Panel as follows:

1. Click **Start** on the task bar.
2. Select **Settings**.
3. Select **Control Panel**.
4. Double-click on the **Services** icon.
5. Find **RM/InfoExpress Server** in the list of services.
6. To start the service, click **Start**.

   This action will launch the RM/InfoExpress Windows NT server program, which runs under the System account and has access to any resources that this account is permitted to use.
7. Double-click on the **rmdistcp** icon in the RM/InfoExpress folder to start the RM/InfoExpress screen handler program, **rmdistcp.exe**.

   The RM/InfoExpress Windows NT server screen handler program, **rmdistcp.exe**, monitors the server activity and does not affect the communication between the client and server.

The RM/InfoExpress server main screen appears, as illustrated in Figure 5-2 on page 5-3. If the server main screen does not appear, follow the instructions for RM/InfoExpress server verification beginning on page 1-10. See the description of the server program and screen handler program command line options on pages 2-6 and 2-7, respectively.

**Note** The RM/InfoExpress Windows NT server program also can be launched in user mode using the icon created by default in the RM/InfoExpress program group. To start the server, simply double-click on the RM/InfoExpress Windows NT server program icon. You may wish to add command line options to the Target command line in the Shortcut tab of the Properties dialog box for the icon, or you may use the command line options from a DOS command line. (For more information about Windows shortcuts, see "Creating a Windows Shortcut" in Chapter 3, *Installation and System Considerations for Microsoft Windows*, in the *RM/COBOL User's Guide*.) The server will run using the current account and will be terminated when you log out. When launched in this mode, there is also a small, 10- to 20-second delay before the server becomes active.

## Configuring the RM/InfoExpress Server Under Windows NT

It is possible to configure the RM/InfoExpress Windows NT server program either to load automatically when Windows NT is started or to run under a specific account. Instructions follow for both configurations.

### Automatic Loading

To configure the RM/InfoExpress server to automatically load when Windows NT is started, take the following steps:

1. Start the Windows NT Service Control Manager and find the server in the list of services, as described previously in the section "Starting the RM/InfoExpress Windows NT Server Program" on page 2-4.
2. Click **Startup**.
3. Under **Startup Type**, select **Automatic**.

The server will now be loaded automatically the next time Windows NT is started.

### Running Under a Specific Account

To configure the server to run under a specific account, take the following steps:

1. Start the Windows NT Service Control Manager and find the server in the list of services, as described previously in the section "Starting the RM/InfoExpress Windows NT Server Program" on page 2-4.

2. Click **Startup**.

3. Under **Log On As**, select one of the following options:

   - Select **System Account** to run the server under the default account.

   - or -

   - Type the name and password of the selected account.

## Server (rmsrvtcp.exe) Command Line Options

Options for the RM/InfoExpress Windows NT server program (**rmsrvtcp.exe**), when launched from the icon or from a DOS command line, can be any of the following:

- **-d *pathname*.** This option causes the file ***pathname*** to be created and trace information to be written into it. After the RM/InfoExpress server program is terminated, send this file to Liant technical support services for further investigation. Use this option only when you are investigating a problem with the help of Liant technical support services. Under normal conditions, using this option affects server operations negatively.

  **Note** The -d command line option is equivalent to the InfoxDebug configuration option (see page D-3). The command line option overrides the configuration option.

- **-k *dddd*.** Indicates the maximum number of clients to be served. If more clients are to be served, the server should be brought down and started again. The default value is 50. This value cannot be greater than the number of clients for which the server is licensed.

  **Note** The -k command line option is equivalent to the UseCount configuration option (see page D-9). The command line option overrides the configuration option.

- **-p *nnnnn*.** Indicates the common buffer pool size. Do not change the default value for this parameter unless instructed by Liant technical support services.

  **Note** The -p command line option is equivalent to the FileBufferPool configuration option (see page D-8). The command line option overrides the configuration option.

- **-z *nnnnn*.** Indicates the maximum amount of data that can be handled by the TCP send function. The default value is system-dependent and has been set by Liant. Do not specify this parameter unless instructed to do so by Liant technical support services.

  **Note** The -z command line option is equivalent to the MaxSendSize configuration option (see page D-5). The command line option overrides the configuration option.

## Screen Handler (rmdistcp.exe) Command Line Option

The following is an option for the RM/InfoExpress Windows NT screen handler program (**rmdistcp.exe**):

- **-t.** Indicates that the user is requesting to terminate the server or a particular client. If this option is not specified, the user can terminate only the display of the screen handler program. The screen handler program does not support any configuration file. Therefore, if desired, this option must be specified on the command line.

  For example, the following command will allow the user to terminate the server:

  ```
  rmdistcp.exe -t
  ```

# Chapter 3: Using RM/InfoExpress with RM/COBOL for Windows Programs

This chapter describes the procedures required to use RM/InfoExpress with RM/COBOL for Windows programs, including how to access the RM/InfoExpress Windows client program, how RM/COBOL for Windows programs point to network data files, and how to execute RM/COBOL for Windows programs for use with RM/InfoExpress.

**Note** For information on how to start the RM/InfoExpress server programs on either UNIX or Windows NT, refer to the appropriate sections in Chapter 2, *Configuring and Starting the RM/InfoExpress Server*.

## Accessing the RM/InfoExpress Windows Client Program

The RM/InfoExpress for TCP/IP Windows client program is **rmclntcp.dll** (for 16-bit clients) or **rmtcp32.dll** (for 32-bit clients). The program is invoked automatically by the RM/COBOL runtime system program for Windows (**runcobol**) when an EXTERNAL-ACCESS-METHOD record, specifying either NAME=RMCLNTCP or NAME=RMTCP32, is included in the RM/COBOL configuration file. See the EXTERNAL-ACCESS-METHOD configuration record section in Chapter 10, *Configuration*, of the *RM/COBOL User's Guide*, for more information.

**Note** The OPTIONS='I' keyword, which causes an informative message box to appear, normally should not be specified on the EXTERNAL-ACCESS-METHOD configuration record. Other client-specific configuration options are described in Appendix D, *Configuring RM/InfoExpress*.

# Pointing to Network Files

The following methods can be used to specify the pathnames of remote network data files in an RM/COBOL for Windows program to be accessed by RM/InfoExpress.

## Specifying Synonyms

Generally, RM/COBOL programs contain synonyms in the file-access-name field of the SELECT clause. For example:

```
SELECT INX-FILE ASSIGN TO RANDOM, "inxfl"
```

The synonyms are mapped to the actual pathname before executing the RM/COBOL program.

Synonym specification depends on the operating system on which the runtime system application and the RM/InfoExpress client software are running. If you are using RM/COBOL for Windows 95, 98, or NT, synonyms are specified by setting properties. If you are using RM/COBOL for Windows 3.1, synonyms are specified by setting filename synonyms in the **runcobol.ini** file.

For example, to access a file on a UNIX server from a Windows 95, 98 or NT client, set the following synonym:

```
inxfl=\\Unix_server\usr\infox\inxfl
```

In this example, the synonym **inxfl** points to a file **inxfl** in directory **infox** of directory **usr** on a UNIX server, **Unix_server**. It is also possible to use DOS environment variables (created with the DOS SET command) as synonyms if the Windows runtime system is started with a command line from a DOS box running under Windows. For more information, refer to the "Directory Search Sequences" section in Chapter 3, *Installation and System Considerations for Microsoft Windows*, of the *RM/COBOL User's Guide*.

Here are three examples using synonyms:

*Example 1*

```
inxfl=\\Unix_server\usr\infox\inxfl
```

*Example 2*

```
relfl=Q:\usr\infox\relfl
```

*Example 3*

```
inxfl=\\WinNT_server\SharedFiles\inxfl
```

where:

**inxfl** and **relfl** (specified on the left side of the SET expression) are both synonyms.

**Unix_server** is the name of the UNIX server accessed by RM/InfoExpress, as shown in the **hosts** file or as known by DNS.

***Q*** is a drive letter mapped to a UNIX server.

**\usr\infox\inxfl** and **\usr\infox\relfl** are the pathnames on the server.

**WinNT_server** is the name of the Windows NT Server, as shown in the **hosts** file or as known by DNS.

**SharedFiles** is the share name known to the Windows NT Server running on *WinNT_server*.

In Examples 1 and 3, RM/InfoExpress is able to process the **inxfl** file because the pathname begins with double backslashes (\\). It could also begin with double forward slashes (//).

In Example 2, RM/InfoExpress is unable to process the **relfl** file because it is not using the appropriate naming convention. Processing, however, is handled through conventional network access. Thus, for RM/COBOL files specified by filename only, you may access server files by using either a synonym that points to a server directory or the runtime system directory search sequence.

## Specifying RUNPATH Environment Variables

Specifying an RM/InfoExpress server in one of the RUNPATH components causes RM/COBOL to access the file using RM/InfoExpress. For example:

```
RUNPATH=C:\prog;N:\data;\\Unix_server\usr\data;\\WinNT_Server\Shares\data
```

causes RM/COBOL to search for a file first in the directory **prog** on the local disk C; then in the directory **data** on the network drive **N:** (assuming that drive N is mapped to a network volume) using conventional network access; next in the subdirectory **data** of directory **usr** on the server **Unix_server** using RM/InfoExpress; and lastly, in the directory **data** in whatever directory is associated with the **Shares** share name on **WinNT_Server** using RM/InfoExpress.

For more information on the RUNPATH environment variable specification, refer to the “Locating RM/COBOL Files” section in Chapter 3 of *RM/COBOL User’s Guide*.

## Specifying Explicit Pathnames in the RM/COBOL Program

You must change the pathname in the SELECT clause of the RM/COBOL program for filenames that include drive specifiers, computer names, or directory paths, and that do not already point to a server directory. For example:

```
SELECT DATA-FILE ASSIGN TO RANDOM, "\\Unix_server\usr\infox\data.fil"
```

This type of pathname specification makes the program less portable, however, because whenever the location of the file **data.fil** changes (from one server to another), you must recompile the source program.

## Specifying Complete Pathnames Using RM/COBOL Data-Names

Some RM/COBOL programs use data-names to dynamically change pathnames. For example, the SELECT statement:

```
SELECT INX-FILE ASSIGN TO RANDOM, DATA-FIL
```

In this example, DATA-FIL is the data-name defined in the DATA DIVISION, and it contains the complete pathname of the file at the time the file was opened. These data-names must include the name of a UNIX machine or Windows NT Server on which an RM/InfoExpress server is running. For example, DATA-FIL could contain the following:

```
\\Unix_server\usr\infox\data.fil
```

# Executing RM/COBOL Programs

Execute your RM/COBOL program by entering the following command line as described in the "System Configuration" section of Chapter 3, *Installation and System Considerations for Microsoft Windows*, in the current RM/COBOL user's guide.

**Note** If you are running RM/COBOL for Windows version 3.1, you must refer to this section in the version 6.0 *RM/COBOL User's Guide*.

```
runcobol name [option]
```

where:

*name* points to RM/COBOL object files.

*option* is any valid RM/COBOL runtime command option.

Before executing the **runcobol** command, set up the environment to create and access files on the server machine, and create a configuration file to define the external access method.

Execute the RM/COBOL verification suite for Windows, as described in Chapter 5, *System Verification*, of the *RM/COBOL User's Guide*.

# Chapter 4: Using RM/InfoExpress with RM/COBOL for UNIX Programs

This chapter describes the procedures required to use RM/InfoExpress with RM/COBOL for UNIX programs, including how to access the RM/InfoExpress UNIX client program, how RM/COBOL for UNIX programs point to network data files, and how to execute RM/COBOL for UNIX programs for use with RM/InfoExpress.

**Note** For information on how to start the RM/InfoExpress server programs on either UNIX or Windows NT, refer to the appropriate sections in Chapter 2, *Configuring and Starting the RM/InfoExpress Server*.

## Accessing the RM/InfoExpress UNIX Client Program

The RM/InfoExpress for TCP/IP UNIX client program is **runinfoxtcp**. This program is the same as the RM/COBOL runtime system for UNIX (**runcobol**), except that the RM/InfoExpress UNIX client code is statically linked into it.

By specifying the keyword NAME=NONE on the EXTERNAL-ACCESS-METHOD record in the configuration file, you can bypass the RM/InfoExpress UNIX client code in **runinfoxtcp** and use this executable just like **runcobol** with almost no additional overhead. See the EXTERNAL-ACCESS-METHOD configuration record section in Chapter 10, *Configuration*, of the *RM/COBOL User's Guide*, for more information.

# Pointing to Network Files

The following methods can be used to specify the pathnames of remote network data files in an RM/COBOL for UNIX program to be accessed by RM/InfoExpress.

## Specifying Synonyms

Generally, RM/COBOL programs contain synonyms in the file-access-name field of the SELECT clause. For example:

```
SELECT INX-FILE ASSIGN TO RANDOM, "inxfl"
```

The synonyms are mapped to the actual pathname before executing the RM/COBOL program.

Synonym specification depends on the operating system on which the runtime system application and the RM/InfoExpress client software are running. For example, to access a file on a UNIX server from a UNIX client, execute the following command (assuming Bourne shell) prior to invoking the client:

```
inxfl=//UNIX_SERVER/usr/infox/inxfl; export inxfl
```

In this example, the synonym **inxfl** points to a file **inxfl** in directory **infox** of directory **usr** on a UNIX server, **UNIX_SERVER**. See also the description of synonyms in the "Directory Search Sequences" section in Chapter 2, *Installation and System Considerations for UNIX*, of the *RM/COBOL User's Guide*.

## Specifying RUNPATH Environment Variables

Specifying an RM/InfoExpress server in one of the RUNPATH components causes RM/COBOL to access the file using RM/InfoExpress. For example:

```
RUNPATH=/usr/local/infox://UNIX_SERVER/usr/data://WinNT_Server/Shares/data
```

causes RM/COBOL to search for a file first in the directory **/usr/local/infox** on the local disk using conventional network access; then in the directory **data** in directory **usr** on **UNIX_SERVER** using RM/InfoExpress; and lastly, in the directory **data** in whatever directory is associated with the **Shares** share name on **WinNT_Server** using RM/InfoExpress.

For more information on the RUNPATH environmental variable specification, refer to the "Locating RM/COBOL Files" section in Chapter 2 of the *RM/COBOL User's Guide*.

## Specifying Explicit Pathnames in the RM/COBOL Program

For filenames that include directory paths and that do not already point to a server directory, you must change the pathname in the SELECT clause of the RM/COBOL program. For example:

```
SELECT DATA-FILE ASSIGN TO RANDOM, "//UNIX_SERVER/usr/infox/data.fil"
```

This type of pathname specification makes the program less portable, however, because whenever the location of the file **data.fil** changes (from one server to another), you must recompile the source program.

## Specifying Complete Pathnames Using RM/COBOL Data-Names

Some RM/COBOL programs use data-names to dynamically change pathnames. For example, the SELECT statement:

```
SELECT INX-FILE ASSIGN TO <RANDOM> DATA-FIL
```

In this example, DATA-FIL is the data-name defined in the DATA DIVISION, and it contains the complete pathname of the file at the time the file was opened. These data-names must include the name of a UNIX machine or Windows NT Server on which an RM/InfoExpress server is running. For example, DATA-FIL could contain the following:

```
//UNIX_SERVER/usr/infox/data.fil
```

# Executing RM/COBOL Programs

Execute your RM/COBOL program by entering the following command line on the terminal of your UNIX client machine:

```
runinfoxtcp name [option]
```

where:

*name* points to RM/COBOL object files.

*option* is any valid RM/COBOL runtime command option.

Before executing the **runinfoxtcp** command, set up the environment to create and access files on the server machine.

Execute the RM/COBOL verification suite for UNIX, as described in Chapter 5, *System Verification*, of the *RM/COBOL User's Guide*.

# Chapter 5: RM/InfoExpress Server Operations

The RM/InfoExpress user interface is implemented for UNIX character-based terminals and the Window NT console interface.

## Key Functions

Table 5-1 describes the keys used in the RM/InfoExpress server program.

**Table 5-1 RM/InfoExpress Server Keys**

| Key | Action |
|---|---|
| *n* *X* | Any command or response may be selected by pressing the first character of the command. Case is not important. For example: S for Select file, t for Terminate, or a number, if appropriate. |
| Escape (Esc) | Selects No in response to a query from the command line. Also backtracks through a menu path. |
| Home | Returns to the RM/InfoExpress server main screen. |
| Up Arrow | Moves the cursor up during client or file selection. |
| Down Arrow | Moves the cursor down during client or file selection. |
| Left Arrow | Moves the cursor left during the selection of menu commands and responses. |
| Right Arrow | Moves the cursor right during the selection of menu commands and responses. |
| Page Up (PgUp) or Ctrl+B | Scrolls the screen up to examine and review client and file information. |
| Page Down (PgDn) or Ctrl+F | Scrolls the screen down to examine and review client and file information. |
| Enter | Chooses the currently highlighted item for command and response selection, and for individual client or file selection. |

# Screen Format

Except for the main screen, eWith the exception of the main screenach RM/InfoExpress server program screen has the same basic format, as illustrated and described in Figure 5-1.

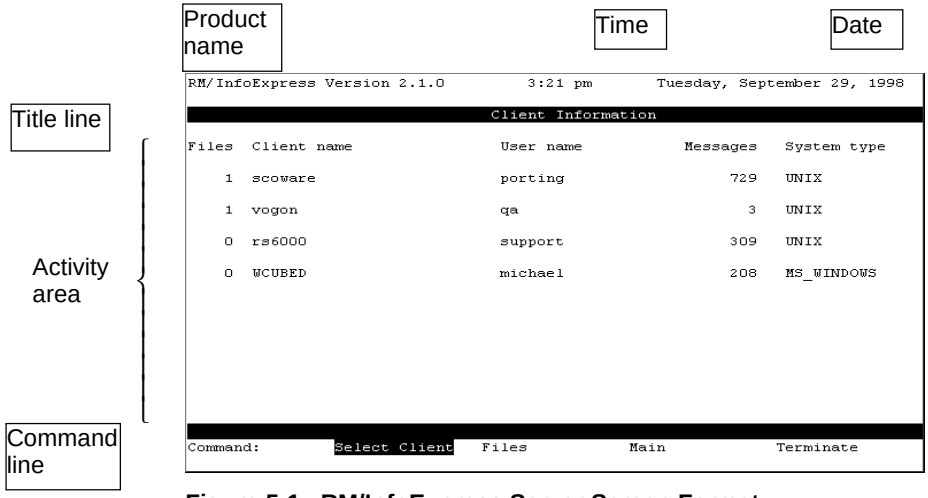


**Figure 5-1 RM/InfoExpress Server Screen Format**

The elements of the RM/InfoExpress screen are described as follows:

- **Activity area.** The activity area contains information related to the current activity or screen.
- **Command line.** The command line, located at the bottom of the screen, shows command names, user prompts, or user queries.
- **Date.** The date area displays the current system date.
- **Product name.** The product name displays the product name and version information.
- **Time.** The time area displays the current system time.
- **Title line.** The title line displays the name of the screen.

# RM/InfoExpress Server Command Structure

The first screen you see when you start the RM/InfoExpress server program is the RM/InfoExpress server main screen, as illustrated in Figure 5-2.

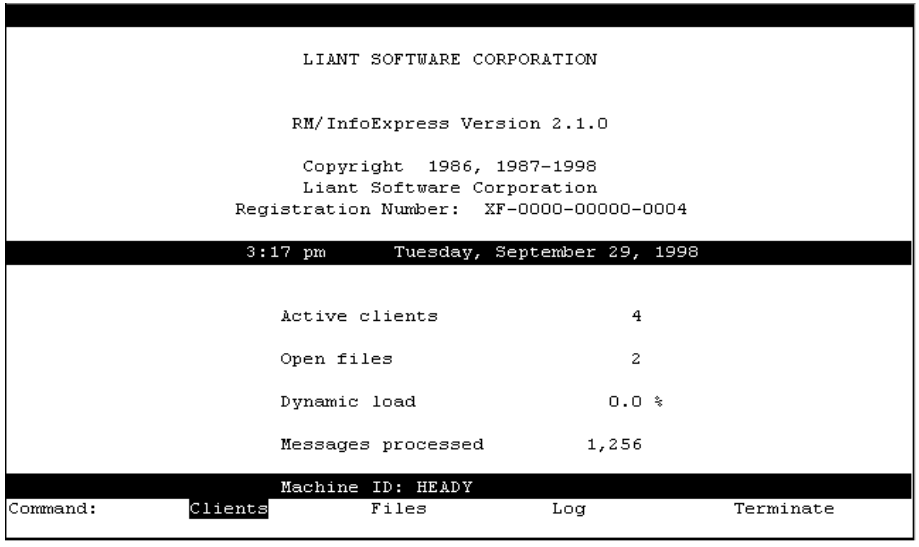


**Figure 5-2 RM/InfoExpress Server Main Screen**

The RM/InfoExpress server main screen lists the current time and date, and identifies the RM/InfoExpress server machine. It also provides an overview of current network activity, including the following:

- The Active clients field indicates the total number of clients currently connected to this RM/InfoExpress server. Other programs using RM/COBOL are not shown.
- The Open files field records a count of the number of files currently open.
- The Dynamic load field shows the percentage of CPU utilization by the server.
- The Messages processed field indicates the number of client requests honored by the server.

The command line at the bottom of the server main screen contains the following command options:

- **Clients.** This command lists all clients and reports on specific clients. Clients may be selected any time the Clients field appears in the command line. See page 5-4.
- **Files.** This command lists all currently open files and reports on specific files. Files may be selected any time the Files field appears in the command line. See page 5-6.
- **Log.** This command provides access to two sub-screens: Open Log and Error Log. Select log information from a command line or by pressing the letter **L** at any time. See pages 5-7 and 5-10.
- **Terminate.** This command provides a number of termination modes. Terminate may be selected any time the Terminate field appears in the command line. See page 5-11.

Each command and its associated screens, prompts, and queries are described in the following sections. To return to the server main screen from any of the following screens, press the letter **M** or choose main from the command line.

## Client Information

The Client Information screen, illustrated in Figure 5-3, appears when you choose the **Clients** command from the RM/InfoExpress server main screen.

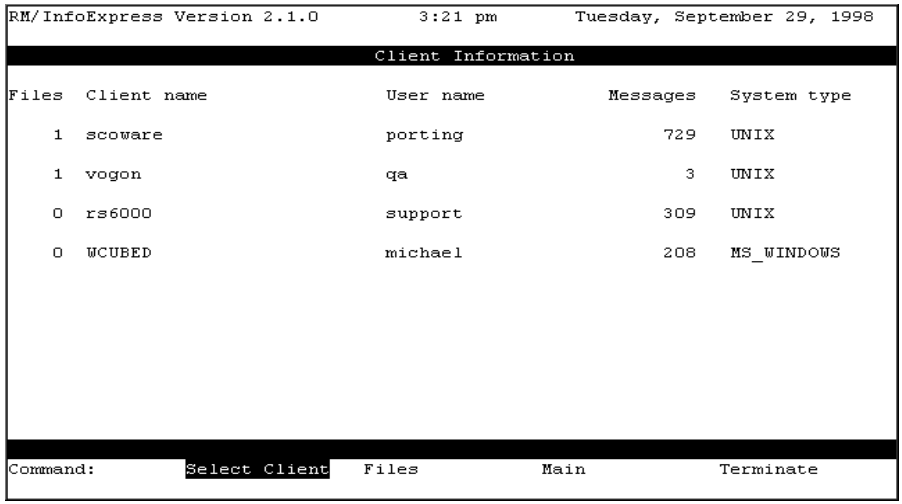


**Figure 5-3 Client Information Screen**

The Client Information screen lists all active clients by name, the number of files each client has open, the total number of messages processed for each client, and the type of operating system on which the client is running. Whenever there are more clients or files than can be displayed on a single screen, a message appears on the screen advising that Page Up or Page Down may be used to request the previous or next screen.

Use the command **Select Client** to select a particular client in order to see more detailed information. Press Enter or the letter **S** to choose the **Select Client** command. The following prompt appears on the command line:

```
Select Client to display (using PgUp, PgDn, or Arrow keys)
```

Use Page Up, Page Down, or the arrow keys to select a client and press Enter. The Client Files screen appears, as illustrated in Figure 5-4.

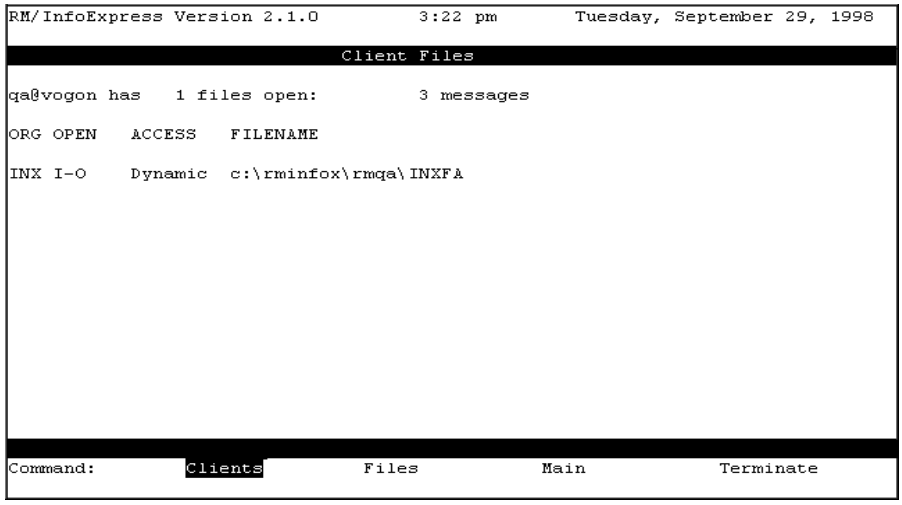


**Figure 5-4 Client Files Screen**

The Client Files screen shows the total number of files currently opened by the client, and the total number of messages passed between the client and the server. For each open file, the Client Files screen also shows the following information.

- The ORG column indicates the file organization:
  - INX (Indexed)
  - SEQ (Sequential)
  - REL (Relative)
  -

- The OPEN column indicates the type of open mode:
  - I-O (Input/Output)
  - Input
  - Output
  - Extend
- The ACCESS column indicates the type of access:
  - Dynamic
  - Sequent(ial)
  - Random
- The FILENAME column indicates the absolute pathname.

## File Information

The File Information screen, illustrated in Figure 5-5, appears when you choose the **Files** command from the RM/InfoExpress server main screen.

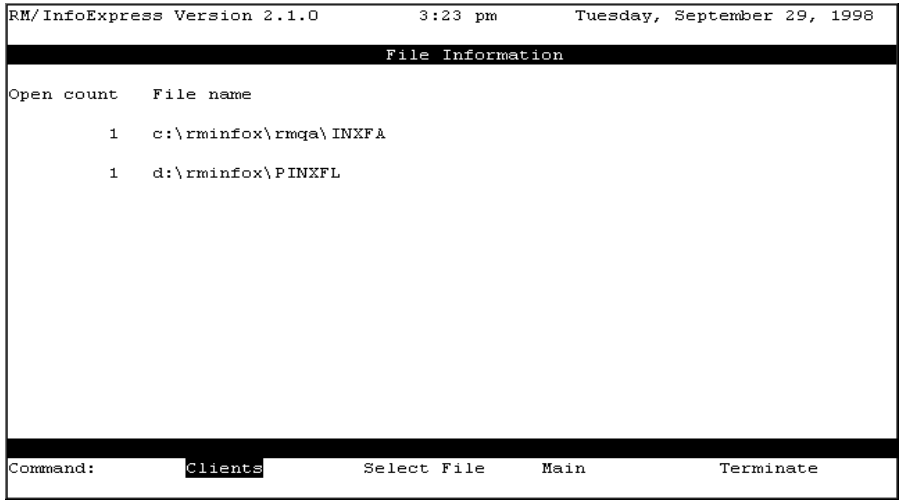


**Figure 5-5 File Information Screen**

The File Information screen lists the absolute pathname for each file and the number of times each file has been opened. Whenever there are more clients or files than can be displayed on a single screen, a message appears on the screen advising that Page Up or Page Down may be used to request the previous or next screen.

Use the command **Select File** to select a particular file in order to see more detailed information. Press Enter or type the letter **S** to choose the **Select File** command. The following prompt appears on the command line:

```
Select file to display (using PgUp, PgDn or Arrow keys)
```

Use Page Up, Page Down, or the arrow keys to select a file and press Enter. The File Clients screen appears, as illustrated in Figure 5-6.

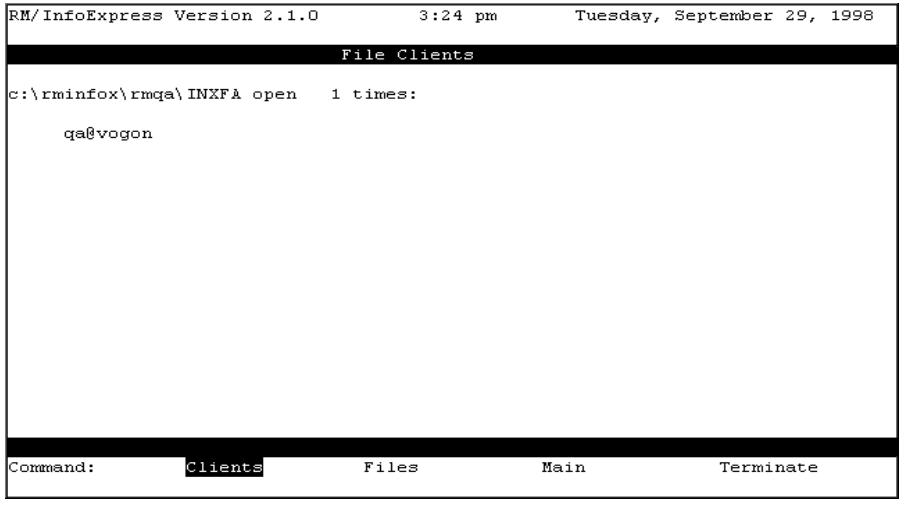


**Figure 5-6 File Clients Screen**

The File Clients screen shows the number of clients that have opened this file since the server was initiated and lists the clients that currently have the file open.

## Open Log Information

The Open Log screen, illustrated in Figure 5-7, appears when you choose the **Log** command from the RM/InfoExpress server main screen, and then choose the **Open Log** command or press the letter **O**. The Open Log screen displays information about a maximum of 24 previous opens by the server, beginning with the latest open.

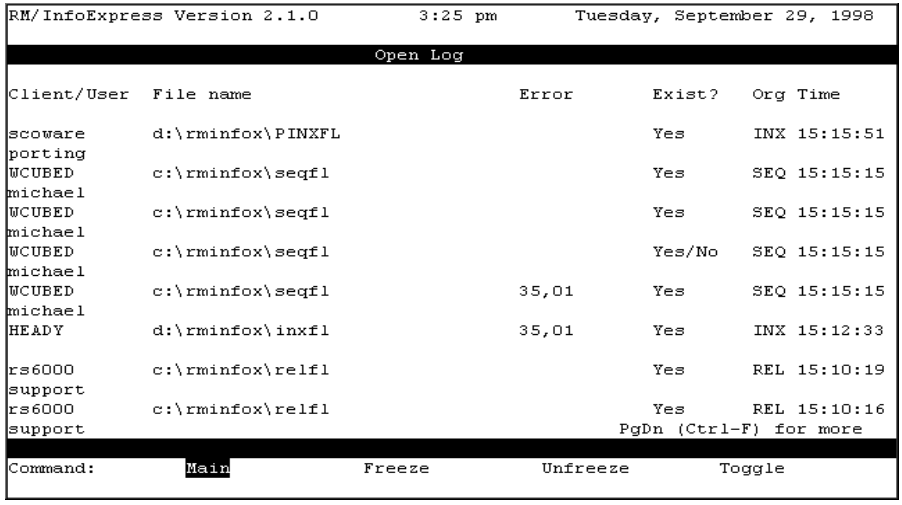


**Figure 5-7 Open Log Screen**

The command line provides three commands: **Freeze**, **Unfreeze**, and **Toggle**. To choose a command, use the arrow keys or press the first letter of the desired command.

The **Freeze** command temporarily suspends the updating of the Open Log screen for that particular screen handler application. However, it does not affect the logging of the new opens into the data structures by the server.

The **Unfreeze** command causes the screen handler to update the Open Log screen with the information from the server data structures.

The **Toggle** command causes the information on the Open Log screen to be displayed in a different form, illustrated in Figure 5-8, which is useful for Liant technical support.

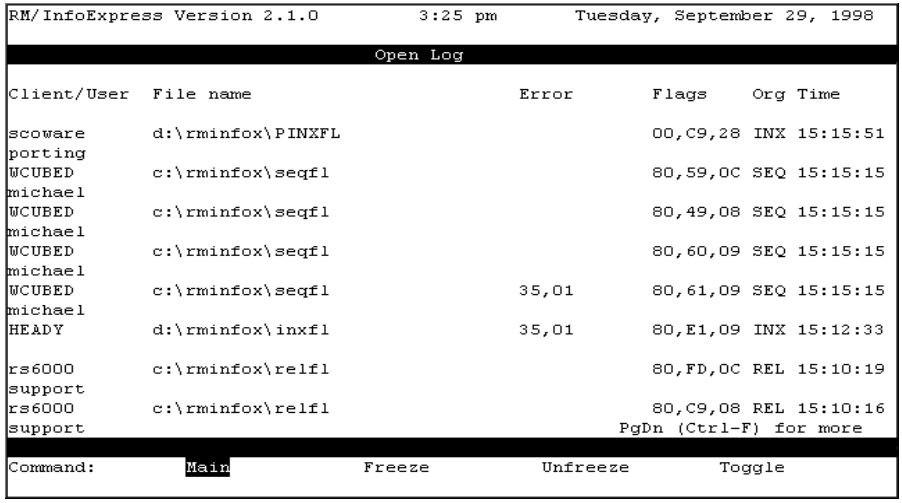


**Figure 5-8 Open Log Screen (Toggled)**

## Error Log Information

The Error Log screen, illustrated in Figure 5-9, appears when you choose the **Log** command from the RM/InfoExpress server main screen, and then choose the **Error Log** command or press the letter **E**. The Error Log screen displays a maximum of 24 errors, beginning with the most recent error. It also lists the name of the client for which the error was issued, the error code detected by the server, the time the error occurred, the location within the RM/InfoExpress server code at which the error occurred, and an explanation (or status) of the error.

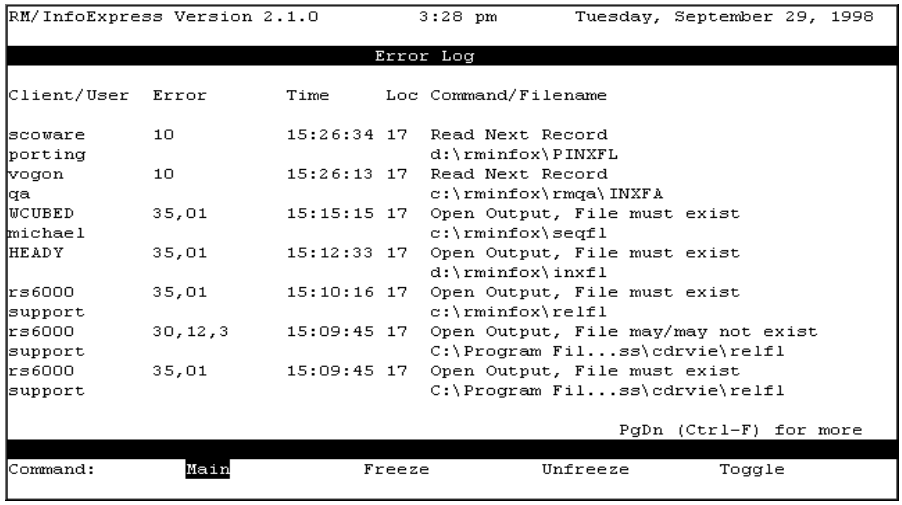


**Figure 5-9 Error Log Screen**

The command line provides three commands: **Freeze**, **Unfreeze**, and **Toggle**. To choose a command, use the arrow keys or press the first letter of the desired command.

The **Freeze** command temporarily suspends the updating of the Error Log screen for that particular screen handler application. However, it does not affect the logging of the new errors into the data structures by the server.

The **Unfreeze** command causes the screen handler to update the Error Log screen with the information from the server data structures.

The **Toggle** command causes the information on the Error Log screen to be displayed in a different form, illustrated in Figure 5-10, which is useful for Liant technical support.

```
RM/InfoExpress Version 2.1.0          3:28 pm        Tuesday, September 29, 1998

                                  Error Log

Client/User   Error        Time      Loc FAP Message

scoware       10           15:26:34 17   01 FF 12 00 00 01 0A 03 01 06 19 01 82 1E
porting                                  01 19 05 04 BC 0F 6B 00 07 10 53 68 61 72
vogon         10           15:26:13 17   01 FF 12 00 00 01 0A 03 01 06 19 01 82 1E
qa                                       01 28 05 04 CC 0F 6B 00 0F 6B 00 24 06 00
WCUBED        35,01        15:15:15 17   01 FF 24 00 00 01 01 03 01 02 0A 01 1E 0D
michael                                  01 08 0E 01 08 16 04 80 61 09 00 06 0D 5C
HEADY         35,01        15:12:33 17   01 FF 34 00 00 01 01 03 01 06 0A 01 1E 0D
                                         01 08 0E 01 08 12 08 03 00 00 00 03 00 09
rs6000        35,01        15:10:16 17   01 FF 24 00 00 01 01 03 01 04 0A 01 1E 0D
support                                  01 08 0E 01 08 16 04 80 E1 09 00 06 0D 2F
rs6000        30,12,3      15:09:45 17   01 FF 24 00 00 01 01 03 01 04 16 04 80 E0
support                                  09 00 0A 01 1E 0D 01 08 0E 01 08 06 0D 2F
rs6000        35,01        15:09:45 17   01 FF 24 00 00 01 01 03 01 04 0A 01 1E 0D
support                                  01 08 0E 01 08 16 04 80 E1 09 00 06 0D 2F

                                                        PgDn (Ctrl-F) for more

Command:          Main            Freeze          Unfreeze        Toggle
```

**Figure 5-10 Error Log Screen (Toggled)**

## Termination of Communication Activity

The **Terminate** command provides access to a variety of termination nodes.

When you select the **Terminate** command from anywhere within the RM/InfoExpress server program, the Terminate command line appears, as illustrated in Figure 5-11.


**Figure 5-11 Terminate Command Line**

**Note** To avoid terminating the server accidentally, the default behavior of the RM/InfoExpress screen handler program has been changed. When you start the screen handler program, you can only terminate the display of the screen handler, not the server or a particular client. The Terminate command line on the server main screen will show only the Display command. If the -t option is specified (see page 2-4for UNIX and page 2-7 for Windows NT), you may also terminate the server or a particular client. The illustration in Figure 5-11 and the following discussion assume that -t option is specified for the screen handler program.

The **Terminate** commands are described in the next sections.

### Termination of Screen Interface

It is possible to temporarily terminate the screen interface program in order to increase the processing power of the server. Press the letter **D** to choose the **Display** command from the Terminate command line. The screen handler program will be terminated without affecting the server or any clients.

### Termination of Client Communications

Termination of communications between the client and server should be requested only if the particular client is interfering with other clients on the network (for instance, a runaway program has left a record locked). Keep in mind that any access to open files will result in I/O errors on shared files on the terminated client. This action does not remove the client program.

Press the letter **C** to choose the **Client** command from the Terminate command line. The Client Information screen (see Figure 5-3 on page 5-4) appears with the following prompt at the command line:

```
Select Client to terminate (using PgUp, PgDn or Arrow Keys)
```

Use Page Up, Page Down, or the arrow keys to select a client and press Enter. The Client Files screen appears (see Figure 5-4 on page 5-5) with the following prompt at the command line:

```
Terminate selected Client?  No  Yes
```

Press the letter **Y** to terminate communication. Press Enter or Escape or the letter **N** to cancel the command.

### Termination of the Server

To terminate the server, press the letter **S** from the Terminate command line. The following command line appears, as illustrated in Figure 5-12.

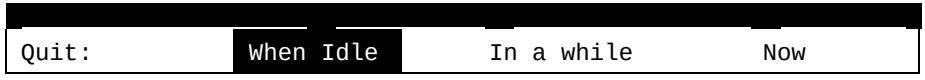


**Figure 5-12 Quit Command Line**

The **Quit** commands are described in the following sections.

### *Quit When Idle*

Press the letter **W** to choose the **When Idle** command. The following prompt appears:

```
Quit when idle?
```

Press the letter **N** or press Escape to cancel the command. Otherwise, when all clients are idle, the following prompt appears:

```
Terminate Server Now?  No  Yes
```

Press the letter **Y** to terminate the server immediately. Press the letter **N**, Escape, or Home to cancel the command.

### *Quit in a While*

Press the letter **I** to choose the **In A While** command. The following command line appears, as illustrated in Figure 5-13.

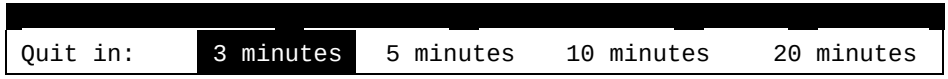


**Figure 5-13 Quit in a While Command Line**

When you choose one of the time options, the number of minutes will decrement as the specified time elapses. You can cancel the termination at any time by pressing the letter **N** or Escape. Otherwise, when all clients are idle, the following prompt appears:

```
Terminate Server Now?  No  Yes
```

Press the letter **Y** to terminate the server immediately. Press the letter **N**, Escape, or Home to cancel the command.

### *Quit Now*

Press the letter **N** to choose the **Now** command. The following prompt appears:

```
Terminate Server Now?  No  Yes
```

Press the letter **Y** to terminate the server immediately. Press the letter **N**, Escape, or Home to cancel the command.

# Chapter 6: File Security on the RM/InfoExpress UNIX Server

An important consideration in RM/InfoExpress is protecting the system and its data from unauthorized access. This chapter describes the implementation of file security on the RM/InfoExpress UNIX server and the authentication procedures performed by the server on various clients to grant access to the files on the server.

## UNIX System Security

The basic security features of UNIX operating systems allow a user of a UNIX server to belong to one of three categories of file access: Owner, Group, and Others. Each category of users can have different access permissions to files. The possible file access permissions are read, write, and execute. For example, if only the Owner of the file has write permission, the UNIX operating system will prevent any other user from writing to the file.

On a standalone UNIX server, the operating system validates the authenticity of the user at login time using information stored in the system password file and other security files. In a networked, client/server environment, however, users may log in to the UNIX server from remote, non-UNIX clients. To validate users on these clients, UNIX uses other security database files such as **.rhosts** (see page 6-4) or **hosts.equiv**.

**Note** The RM/InfoExpress UNIX server software does not look at **hosts.equiv**, nor does it use the **ruserok** function.

When a user on a remote client logs in to the UNIX server, the networking software on the client passes information to the server about that user, including the server user name, password, and client machine name. After the user has been authenticated, the user on the remote client is allowed to access the files on the server as one of the local users of that server. For more information on file security provided by the UNIX operating system, refer to your UNIX system documentation.

## RM/InfoExpress File Security

The implementation of file security in RM/InfoExpress uses the UNIX system security philosophy to protect the files on the RM/InfoExpress UNIX server from unauthorized

access by users on client machines. To be able to use the file security features of RM/InfoExpress, a security parameter file, **ixpwfile**, must be created on each client machine and each UNIX server using the utility program, **ixsecure.cob**. For more information on this utility, see Appendix E, *RM/InfoExpress Security Parameter File Update Utility*.

On a client machine, **ixpwfile** contains information needed to connect the RM/InfoExpress client to different RM/InfoExpress UNIX servers. Similarly, on the server, **ixpwfile** is created by the server administrator and contains information that permits different clients to be connected to this server. Only the server administrator should have read and write permissions to the server security parameter file.

The client passes information obtained from **ixpwfile** to the server when a session is established. The server validates this information against the server's version of **ixpwfile**.

## RM/InfoExpress UNIX Server Security Levels

The RM/InfoExpress UNIX server can be invoked at one of six security levels using the configuration option ServerSecurityLevel=*number*, where *number* has a value in the range of 0 through 5. These six security levels are described in Table 6-1 on page 6-3. (Refer also to Appendix D, *Configuring RM/InfoExpress*, for more information about server configuration.)

If the ServerSecurityLevel option is absent in the configuration file, the server runs in "compatibility mode" (see page 6-6), that is, the server behaves like a version 2.0 server.

**Note** Older RM/InfoExpress clients can only connect to RM/InfoExpress servers running at security levels "compatible", 0, or 1.

At other security levels, the server performs various tests on the client to validate its authenticity to access files on the server. These tests become more stringent as the security level increases, which means that starting the server at level 5 provides the highest level of security to files on the server.

When the RM/InfoExpress UNIX server is run with security enabled, the server-user-name passed from the client is used, if possible, as the User ID while accessing files. If the server-user-name is not present (as is the case for older versions of the RM/InfoExpress client) or invalid, the server will either run the process with the default server user or disallow the client connection to the server. Only servers running at security level 0 or 1 will use the default server user. A server running at security level 0 or 1 will terminate with an error if the default server user is invalid. Servers running at security level 2 or higher will disallow the client connection unless the server-user-name is present and valid. See "Setting Up the Network to Run RM/InfoExpress with Security Enabled" on page 6-6 for more information.

The RM/InfoExpress UNIX server security levels are summarized in Table 6-1. Terminology used in the table is defined following the table.

**Table 6-1 RM/InfoExpress UNIX Server Security Levels**

| Server Security Level | Requires | To |
|---|---|---|
| 0 | A valid server-user-name. | Verify that server-user-name is valid. If validation fails, server runs the process as the default server user. |
| 1 | A valid server-user-name.<br>An appropriate entry in the **.rhosts** file | Verify that server-user-name and **.rhosts** entry are valid. If validation fails, server runs the process as the default server user. |
| 2 | A valid server-user-name.<br>An appropriate entry in the **.rhosts** file. | Verify that server-user-name and **.rhosts** entry are valid. If validation fails, client connection is disallowed. |
| 3 | A valid server-user-name.<br>An appropriate entry in the **ixpwfile** file.<br>The correct user password. The password is normally obtained from **ixpwfile** on the client. | Verify that server-user-name and password are valid. If validation fails, client connection is disallowed. |
| 4 | A valid server-user-name.<br>An appropriate entry in the **.rhosts** file.<br>An appropriate entry in the **ixpwfile** file.<br>The correct user password. The password is normally obtained from **ixpwfile** on the client. | Verify that server-user-name, **.rhosts** entry, **ixpwfile** entry, and password are valid. If validation fails, client connection is disallowed. |
| 5 | A valid server-user-name.<br>An appropriate entry in the **.rhosts** file.<br>An appropriate entry in the **ixpwfile** file.<br>The correct user password. The password must be entered by the user on the client. | Verifies that server-user-name, **.rhosts** entry, **ixpwfile** entry, and password entered by the user are valid. If validation fails, client connection is disallowed. |

### Server-User-Name

In Table 6-1, a "valid server-user-name" means that the **ixpwfile** on the client contains an entry specifying the name of the server machine, the name of the client machine, and a valid user-name to be used on the server. (For more information, see "ixpwfile File Entry" on page 6-5.)

### Default Server User

At security level 0 or 1, the server allows the client to run as a default user on the server when the client fails to meet the security requirements of the server. Normally, the default server user will be allowed to access files that do not require high levels of security. The default server user, which must be a valid user on the server, is specified using the configuration parameter, DefaultServerUser. (For more information, refer to "UNIX Server-Specific Configuration Options" section in Appendix D. See also page 6-6 for the discussion of compatibility of older clients with the new server.)

### .rhosts File Entry

The **.rhosts** file, present in each user's home directory on the server, is used by the UNIX operating system to validate the permissions of clients who try to access the files on the server owned by the local user. This ASCII file contains information about the client machine and one of its users. The following is a template for an entry line in the **.rhosts** file:

```
machine-name    [user-name]
```

where *machine-name* is the node name of a client machine, and *user-name* is the name of the user on that machine who, when connected to the server, will obtain the owner's permissions on files owned by the local user. If *user-name* is not found on the entry, all the users on the client machine have permission to access files.

**Note** *user-name* refers to the name used on the client machine, not on the server machine. The *user-name* may match the name used on the server machine, or it may be different.

An "appropriate entry in the **.rhosts** file" in Table 6-1 means that the **.rhosts** file exists in server-user-name's home directory, the **.rhosts** file owner is server-user-name, only the owner has write permissions (that is, the file permissions must be "rw-r--r--"), and a line exists in the **.rhosts** file specifying client machine-name and, optionally, the client user-name.

### ixpwfile File Entry

To successfully establish a session with the server running at one of the six security levels, clients must pass certain information to the server at the time the session is established. This information is created and stored in an **ixpwfile** security parameter file for each client and each server system.

Each record in the **ixpwfile** security parameter file consists of four fields:

```
{server-machine-name, client-machine-name,
   server-user-name, password}
```

where *server-machine-name* is the name of the machine running the RM/InfoExpress UNIX server with which the client (*client-machine-name*) will establish the session. *server-user-name* is the name of the user on the server by which the client is known. *password* is the password string of the user (*server-user-name*) on the server.

For information about how to run the utility program to create and update **ixpwfile**, refer to Appendix D-8.

An "appropriate entry in the **ixpwfile** file" in Table 6-1 means that the **ixpwfile** on the server (pointed to in the **rmixsrvr.ini** configuration file) contains an entry specifying the *server-machine-name*, *client-machine-name*, and *server-user-name*. Note that the *password* should not be present in the entry on the RM/InfoExpress server. The *password* is ignored.

### User Password

In Table 6-1, "correct user password" means that the password sent by the client matches the UNIX system password for *server-user-name* on the server.

## Additional Parameters Needed for Non-UNIX Clients

Every UNIX and 32-bit Windows machine on the network is recognized by its node name. There is, however, no concept of a node name on a machine running the Windows 3.1 operating system. For proper recognition, workstations running Windows 3.1 must define the *client-machine-name* using the ClientName configuration parameter. Refer to the "Client-Specific Configuration Options" section in Appendix D for more information on RM/InfoExpress configuration.

## Client Validation by the Server at Different Security Levels

At the time the connection between the client and the server is established, each client passes information obtained from the **ixpwfile** security parameter file and the configuration file to the RM/InfoExpress UNIX server. The server then validates this information using the UNIX security database files such as **etc/passwd**, **$HOME/.rhosts**, and so forth, and the **ixpwfile** security parameter file on the server.

## Server Compatibility With Older and Newer Clients

### Older Clients with the New Server

Previous versions of RM/InfoExpress clients can communicate with the new server running in "compatibility mode" (that is, no security level specified or at security levels 0 or 1). These clients run as the default server user. When the server security level is 2 or greater, however, the server rejects the client connections. One of the following error messages is displayed:

```
RMIX_ERR_SERVER_USERNAME_PARAM_NOT_FOUND
```

- or -

```
RMIX_ERR_USER_PASSWORD_NOT_FOUND
```

### New Clients with an Older Server

New versions of RM/InfoExpress clients can communicate with older (pre-2.1) versions of the RM/InfoExpress UNIX server without any problem. The information passed by the new client at the time the session is established will be ignored by the older server.

## Setting Up the Network to Run RM/InfoExpress with Security Enabled

The following sections provide instructions for setting up each of the six levels of file security on the RM/InfoExpress UNIX server. (The setup differences between server security levels are summarized in Table 6-2 on page 6-15.) In these procedures, two UNIX machines are connected to a network and are known on that network as *serverU* and *clientU*. A third machine running Windows, known on the network as *clientW*, is also connected on the same network.

A UNIX user running RM/COBOL with the RM/InfoExpress client on machine *clientU* wants to access data files on the RM/InfoExpress server running on machine *serverU*. On the client machine, the user logs in as *clientUser1*, but on the server machine the user logs

in as *serverUser1* with password *pass1*. (Note that *serverUser1* may be the same as or different from *clientUser1*.)

Similarly, a Windows user running RM/COBOL with the RM/InfoExpress client on machine *clientW* wants to access data files on the RM/InfoExpress server running on machine *serverU*. On the client machine, the user is known as *clientUser2*, but on the server machine the user is known as *serverUser2* with password *pass2*. (Note that *serverUser2* may be the same as or different from *clientUser2*.)

It is assumed that the following software is installed and available:

- RM/COBOL with the RM/InfoExpress client on the UNIX client machine (in directory **/usr/rmcobol**) and on the Windows client machine (in directory **c:\rmcobol**)
- RM/COBOL on the UNIX server machine (in directory **/usr/rmcobol**)
- RM/InfoExpress server on the UNIX server machine (in directory **/usr/rminfox**)

The following notes apply to the procedures for setting up RM/InfoExpress to run at each of the six security levels:

**Note 1** "create an **ixpwfile**" means to run **runcobol ixsecure.cob** with your current directory set to where you want **ixpwfile** to reside or with the IXPWFILE environment variable pointing to the path.

Normally, **ixpwfile** on the UNIX server is maintained by the RM/InfoExpress server administrator, and only such file is present on the UNIX server machine, generally in the **/usr/rminfox** directory. The **ixpwfile** on a Windows client machine is normally maintained by the owner of the Windows machine and resides in the RM/COBOL install directory, **c:\rmcobol**. On a UNIX client machine, each RM/InfoExpress client has his own copy of **ixpwfile**. The client or server configuration file (either **rmixclnt.ini** or **rmixsrvr.ini**) can be used to configure other locations for **ixpwfile**. The environment variable IXCONFIG may be used to specify the location and pathname of the configuration file on UNIX.

RM/COBOL with the RM/InfoExpress client will look for **ixpwfile** in the location specified by the IxPwFile option in the Security section of the client configuration file. If the IxPwFile option is not present in the configuration file, then RM/COBOL with the RM/InfoExpress client will attempt to open file **ixpwfile** in the current working directory.

If the server security level is 3 or 4, passwords may be stored in the client **ixpwfile**; therefore, it should reside in a secure place (with appropriate owner and restrictive permissions on UNIX).

**Note 2** "create a *filename*.ini file" means to use a text editor of your choice to create the appropriate configuration file:

- **/usr/rminfox/rmixsrvr.ini** for a UNIX server.
- **c:\windows\rmixclnt.ini** for a Windows client.
- **/usr/rmcobol/rmixclnt.ini** for a UNIX client, if only a single client configuration file is to be used when no user passwords are required in the security parameter file. If multiple configuration files are required so that each UNIX user can be responsible for the UNIX system password stored in a tradition **ixpwfile**, then the configuration file should be placed in the current working directory or located using the IXCONFIG environment variable.

**Note 3** "create a **.rhosts** file" means to use a text editor of your choice to create a file named **.rhosts** in the home directory of *serverUser*. The owner of the file must be *serverUser* and only the owner can have write permission. The **.rhosts** file entry is the following:

```
clientU clientUser
```

*clientUser* is optional; if not present, any client user-name on machine *clientU* is allowed. *clientUser* is a client user-name, not a server-user-name such as *serverUser*. Although *clientUser* and *serverUser* are often the same user-name, this is not required.

**Note 4** Notation of the form:

```
serverU/clientU/serverUser1/pass1
```

will be used to indicate an **ixpwfile** entry with *serverU* as the server-machine-name, *clientU* as the client-machine-name, *serverUser1* as the server-user-name, and *pass1* as the UNIX system password for the UNIX user ID *serverUser1*. The password will only be present for security levels 3 and 4.

### Setup For Running RM/InfoExpress at Server Security Level 0

1. Create an **ixpwfile** (see Appendix E) on each of the two client machines, *clientU* and *clientW*.

   a) On machine *clientU*, create an **ixpwfile** and enter:

   ```
   serverU / clientU / serverUser1
   ```

   b) On machine *clientW*, create an **ixpwfile** and enter:

   ```
   serverU / clientW / serverUser2
   ```

2. Create a configuration (.INI) file (see Appendix D) on each of the three machines, *clientU*, *clientW*, and *serverU*.

   a) On machine *clientU*, create **rmixclnt.ini** and enter:

   ```
   [Security]
   ixpwfile=<path>
   ```

   b) On machine *clientW*, create **rmixclnt.ini** and enter:

   ```
   [Security]
   ixpwfile=<path>
   ```

   If you are running 16-bit Windows, you must also enter:

   ```
   ClientName=clientW
   ```

   c) On machine *serverU*, create **rmixsrvr.ini** and enter:

   ```
   [Security]
   ServerSecurityLevel=0
   DefaultServerUser=<server-user-name>
   ```

3. Start the RM/InfoExpress server on machine *serverU* (see page 2-2).

4. Run the application on machines *clientU* and *clientW*.

### Setup For Running RM/InfoExpress at Server Security Level 1

1. Create an **ixpwfile** (see Appendix E) on each of the two client machines, *clientU* and *clientW*.

   a) On machine *clientU*, create an **ixpwfile** and enter:

   ```
   serverU / clientU / serverUser1
   ```

   b) On machine *clientW*, create an **ixpwfile** and enter:

   ```
   serverU / clientW / serverUser2
   ```

2. Create a configuration (.INI) file (see Appendix D) on each of the three machines, *clientU*, *clientW*, and *serverU*.

   a) On machine *clientU*, create **rmixclnt.ini** and enter:

   ```
   [Security]
   ixpwfile=<path>
   ```

   b) On machine *clientW*, create **rmixclnt.ini** and enter:

   ```
   [Security]
   ixpwfile=<path>
   ```

   If you are running 16-bit Windows, you must also enter:

   ```
   ClientName=clientW
   ```

   c) On machine *serverU*, create **rmixsrvr.ini** and enter:

   ```
   [Security]
   ServerSecurityLevel=1
   DefaultServerUser=<server-user-name>
   ```

3. Create two **.rhosts** files (see page 6-4) on machine *serverU*.

   a) Log in as *serverUser1*, create **$HOME/.rhosts** and enter:

   ```
   clientU clientUser1
   ```

   b) Log in as *serverUser2*, create **$HOME/.rhosts** and enter:

   ```
   clientW clientUser2
   ```

4. Start the RM/InfoExpress server on machine *serverU* (see page 2-2).

5. Run the application on machines *clientU* and *clientW*.

### Setup For Running RM/InfoExpress at Server Security Level 2

1. Create an **ixpwfile** (see Appendix E) on each of the two client machines, *clientU* and *clientW*.

   a) On machine *clientU*, create an **ixpwfile** and enter:

   ```
   serverU / clientU / serverUser1
   ```

   b) On machine *clientW*, create an **ixpwfile** and enter:

   ```
   serverU / clientW / serverUser2
   ```

2. Create a configuration (.INI) file (see Appendix D) on each of the three machines, *clientU*, *clientW*, and *serverU*.

   a) On machine *clientU*, create **rmixclnt.ini** and enter:

   ```
   [Security]
   ixpwfile=<path>
   ```

   b) On machine *clientW*, create **rmixclnt.ini** and enter:

   ```
   [Security]
   ixpwfile=<path>
   ```

   c) On machine *serverU*, create **rmixsrvr.ini** and enter:

   ```
   [Security]
   ServerSecurityLevel=2
   ```

3. Create two **.rhosts** files (see page 6-4) on machine *serverU*.

   a) Log in as *serverUser1*, create **$HOME/.rhosts** and enter:

   ```
   clientU clientUser1
   ```

   b) Log in as *serverUser2*, create **$HOME/.rhosts** and enter:

   ```
   clientW clientUser2
   ```

4. Start the RM/InfoExpress server on machine *serverU* (see page 2-2).

5. Run the application on machines *clientU* and *clientW*.

### Setup For Running RM/InfoExpress at Server Security Level 3

1. Create an **ixpwfile** (see Appendix E) on each of three machines, *clientU, clientW,* and *serverU*.

   a) On machine *clientU*, create an **ixpwfile** and enter:

   ```
   serverU / clientU / serverUser1 / pass1
   ```

   b) On machine *clientW*, create an **ixpwfile** and enter:

   ```
   serverU / clientW / serverUser2 / pass2
   ```

   c) On machine *serverU*, create an **ixpwfile** and enter:

   ```
   serverU / clientU / serverUser1
   serverU / clientW / serverUser2
   ```

2. Create a configuration (.INI) file (see Appendix D) on each of the three machines, *clientU*, *clientW* and *serverU*.

   a) On machine *clientU*, create **rmixclnt.ini** and enter:

   ```
   [Security]
   ixpwfile=<path>
   ```

   b) On machine *clientW*, create **rmixclnt.ini** and enter:

   ```
   [Security]
   ixpwfile=<path>
   ```

   c) On machine *serverU*, create **rmixsrvr.ini** and enter:

   ```
   [Security]
   ixpwfile=<path>
   ServerSecurityLevel=3
   ```

3. Start the RM/InfoExpress server on machine *serverU* (see page 2-2).

4. Run the application on machines *clientU* and *clientW*.

### Setup For Running RM/InfoExpress at Server Security Level 4

1. Create an **ixpwfile** (see Appendix E) on each of three machines, *clientU, clientW,* and *serverU*.

   a) On machine *clientU*, create an **ixpwfile** and enter:

   ```
   serverU / clientU / serverUser1 / pass1
   ```

   b) On machine *clientW*, create an **ixpwfile** and enter:

   ```
   serverU / clientW / serverUser2 / pass2
   ```

   c) On machine *clientW*, create an **ixpwfile** and enter:

   ```
   serverU / clientU / serverUser1
   serverU / clientW / serverUser2
   ```

2. Create a configuration (.INI) file (see Appendix D) on each of the three machines, *clientU*, *clientW*, and *serverU*.

   a) On machine *clientU*, create **rmixclnt.ini** and enter:

   ```
   [Security]
   ixpwfile=<path>
   ```

   b) On machine *clientW*, create **rmixclnt.ini** and enter:

   ```
   [Security]
   ixpwfile=<path>
   ```

   c) On machine *serverU*, create **rmixsrvr.ini** and enter:

   ```
   [Security]
   ixpwfile=<path>
   ServerSecurityLevel=4
   ```

3. Create two **.rhosts** files (see page 6-4) on machine *serverU*.

   a) Log in as *serverUser1*, create **$HOME/.rhosts** and enter:

   ```
   clientU clientUser1
   ```

   b) Log in as *serverUser2*, create **$HOME/.rhosts** and enter:

   ```
   clientW clientUser2
   ```

4. Start the RM/InfoExpress server on machine *serverU* (see page 2-2)

5. Run the application on machines *clientU* and *clientW*.

### Setup For Running RM/InfoExpress at Server Security Level 5

1. Create an **ixpwfile** (see Appendix E) on each of three machines, *clientU*, *clientW*, and *serverU*.

   a) On machine *clientU*, create an **ixpwfile** and enter:

   ```
   serverU / clientU / serverUser1
   ```

   b) On machine *clientW*, create an **ixpwfile** and enter:

   ```
   serverU / clientW / serverUser2
   ```

   c) On machine *clientW*, create an **ixpwfile** and enter:

   ```
   serverU / clientU / serverUser1
   serverU / clientW / serverUser2
   ```

2. Create a configuration (.INI) file (see Appendix D) on each of the three machines, *clientU*, *clientW*, and *serverU*.

   a) On machine *clientU*, create **rmixclnt.ini** and enter:

   ```
   [Security]
   ixpwfile=<path>
   ```

   b) On machine *clientW*, create **rmixclnt.ini** and enter:

   ```
   [Security]
   ixpwfile=<path>
   ```

   c) On machine *serverU*, create **rmixsrvr.ini** and enter:

   ```
   [Security]
   ixpwfile=<path>
   ServerSecurityLevel=5
   ```

3. Create two **.rhosts** files on machine *serverU* (see page 6-4).

   a) Log in as *serverUser1*, create **$HOME/.rhosts** and enter:

   ```
   clientU clientUser1
   ```

   b) Log in as *serverUser2*, create **$HOME/.rhosts** and enter:

   ```
   clientW clientUser2
   ```

4. Start the RM/InfoExpress server on machine *serverU* (see page 2-2).

5. Run the application on machines *clientU* and *clientW*. The appropriate password entry dialog box is displayed.

### Setup Differences Between Server Security Levels

Table 6-2 summarizes the differences between the setup procedures for each server security level and the setup for the next higher level.

**Note** The entry in ServerSecurityLevel=*number* in step 2c of each setup procedure is incremented by one, beginning with level 1.

**Table 6-2 Summary of Setup Differences Between Server Security Levels**

| Server Security Levels | Setup Differences |
|---|---|
| 0 and 1 | Setup for level 1 adds step 3, which is the requirement for **.rhosts** files on the server machine. |
| 1 and 2 | Setup for level 2 does not support older clients (such as 16-bit Windows clients). Thus, the ClientName=clientW entry described in level 1 step 2b is not necessary. The DefaultServerUser=<*server-user-name*> entry in level 1 step 2c is not needed because the server at level 2 refuses the connection rather than running as <*server-user-name*>. |
| 2 and 3 | Setup for level 3 uses passwords rather than **.rhosts** files. Steps 1a and 1b requires the entry of passwords in the client ixpwfile entries, and level 3 step 1c is added because the server requires ixpwfile entries (passwords are not needed here) for the clients that will connect to it. Level 3 step 2c adds the ixpwfile=<*path*> entry so that the server can access the **ixpwfile** created by level 3 step 1c. Level 2 step 3, which is the **.rhosts** file requirement, is not needed at level 3. |
| 3 and 4 | Setup for level 4 adds step 3, which is the requirement for **.rhosts** files on the server machine. |
| 4 and 5 | Setup for level 5 does not require passwords in steps 1a and 1b for the client ixpwfile entries because the server forces clients to make the user enter the password via a dialog box on the client machine. |

# Appendix A: Messages

This appendix lists the error messages that can occur while RM/InfoExpress is being used.

## Error Message Types

Errors that can occur when using RM/InfoExpress fall into two categories:

- **COBOL errors**, which do not start with the value 30. These errors are described in the appropriate RM/COBOL user's guide.
- **Non-COBOL permanent errors**, which have the following format:

  `30, error type, error code`

  where:

  *error type* is used to identify the software that generates the error.

  *error code* is the number returned by that software.

  Table A-1 lists each error type, the error codes that can occur with each type, and the possible source of the error code for errors generated by RM/InfoExpress. Other error codes associated with error types such as UNIX and Windows can be found in the appropriate vendor documentation.

  A complete description of each error type can be found in “Permanent Error Types” beginning on page A-2. A complete description of possible error codes begins on page A-3.

**Note 1** For more information on error messages, refer to “Error Message Types” and “Error Message Formats” in Appendix A, *Runtime Message*s, in the *RM/COBOL User's Guide*.

**Note 2** Previous versions of RM/InfoExpress usually returned two errors: 255 for network-specific errors and 254 for errors detected by RM/InfoExpress. In this version of RM/InfoExpress, errors are returned as they occur, along with the appropriate error code.

**Table A-1 Error Types and Associated Error Codes**

| Permanent Error Type (Number and Description) | Possible Error Code (Number/Description) | Possible Error Code (Source) |
|---|---|---|
| 15 - RM/InfoExpress Server Error | 1 - 13 | RM/InfoExpress API |
| | 21 - 59 | RM/InfoExpress |
| | 12*xxx* | RM/InfoExpress Windows Sockets Interface |
| | 4*xx* - 5*xx* | RM/InfoExpress BSD Sockets Interface |
| 16 - RM/InfoExpress Client Error | 21 - 59 | RM/InfoExpress |
| | 12*xxx* | RM/InfoExpress Windows Sockets Interface |
| | 4*xx* - 5*xx* | RM/InfoExpress BSD Sockets Interface |
| 21 - RM/InfoExpress WinSock Error | 10*xxx* - 11*xxx* | Windows Sockets |

# Permanent Error Types

## Error type 15: RM/InfoExpress Server Error

This type of error is generated by the RM/InfoExpress server when it encounters an error within its code. Errors such as incorrect File Access Protocol (FAP) message received from the client, out-of-memory, and so forth, fall into this category.

Possible error codes for error type 15 are described in “RM/InfoExpress API-Generated Error Codes” on page A-3, “RM/InfoExpress-Generated Error Codes” on page A-6, “RM/InfoExpress Windows Sockets Interface Error Codes” on page A-15, and “RM/InfoExpress BSD Sockets Interface Error Codes” on page A-16.

### Error type 16: RM/InfoExpress Client Error

This type of error is generated by the RM/InfoExpress client when it encounters an error within its code. Errors such as incorrect File Access Protocol (FAP) message received from the RM/COBOL program (**runcobol**), incorrect FAP response from the server, out-of-memory, and so forth, fall into this category.

Possible error codes for error type 16 are described in “RM/InfoExpress-Generated Error Codes” on page A-6, “RM/InfoExpress Windows Sockets Interface Error Codes” on page A-15, and “RM/InfoExpress BSD Sockets Interface Error Codes” on page A-16.

### Error type 21: RM/InfoExpress WinSock Error

Error type 21 is generated by RM/InfoExpress when either the Windows client program or the Windows server program receives an error from the underlying Windows Sockets software. Possible error codes are described in "RM/InfoExpress WinSock Error Codes" on page A-13.

## RM/InfoExpress API-Generated Error Codes

Error codes 1 through 13 are common to the server program, the screen handler program, and the API application.

### Error code 1: RMIX_API_ERR_SERVER_ALREADY_EXISTS

**Failure Definition:** Indicates that the server being started encounters a server already running in the system, or at least one of its components is present in the system.

**Action:** For RM/InfoExpress running on UNIX, this error occurs if the server invoked previously is not terminated, or it is terminated improperly. If the server has been terminated improperly, remove the related IPC (Inter Process Communications) objects (shared memory, key starting with 0x49584D and semaphore, key starting with 0x495853 (displayed using **ipcs** command)) using the UNIX command **ipcrm**.

## Error code 2: RMIX_API_ERR_OUT_OF_MEMORY

**Failure Definition:** Indicates that there is not enough memory available in the system for RM/InfoExpress (server or screen handler programs) to continue.

**Action:** Bring down all the connected clients, bring down the server, and make more memory available before starting the server again.

## Error code 3: RMIX_API_ERR_TOO_MANY_USERS

**Failure Definition:** Indicates that too many screen handler programs are being invoked. The limit is nine for UNIX and Windows NT.

**Action:** Close any unnecessary screen handler applications.

## Error code 4: RMIX_API_ERR_NOT_AUTHORIZED

**Failure Definition:** Indicates that the application using the server API attempted either to open the server database with a mode other than O_RDONLY, or it used an unauthorized API. This message may also indicate that the screen handler executable is corrupted.

**Action:** In case of a corrupted screen handler executable, install RM/InfoExpress again.

## Error code 5: RMIX_API_ERR_SERVER_NOT_PRESENT

**Failure Definition:** Indicates that either the application using the server API or the screen handler application is being started without the server having been started.

**Action:** Start the server and then start the application.

## Error code 6: RMIX_API_ERR_CLIENT_ID_NOT_FOUND

**Failure Definition:** Indicates a malfunction of either the server or the screen handler.

**Action:** Bring down all the connected clients, terminate the server, and restart.

## Error code 7: RMIX_API_ERR_TOO_MANY_CLIENTS

**Failure Definition:** Indicates that the server has run out of free slots for remote clients.

**Action:** Bring down unused client connections to release some slots on the server. Alternatively, you can also perform one of the following:

- Edit the server configuration file, **rmixsrvr.ini**, to include the UseCount option (for more information, see "Common Server-Specific Configuration Options" in Appendix D, *Configuring RM/InfoExpress*).
- Bring down all the connected clients, terminate the server, and restart with the -k option (for more information, see Chapter 2, *Configuring and Starting the RM/InfoExpress Server*).

## Error code 8: RMIX_API_ERR_TOO_MANY_FILES

**Failure Definition:** Indicates that the server has run out of the free slots for open files.

**Action:** Close inactive open files from the client applications. Alternatively, edit the server configuration file, **rmixsvr.ini**, to include the FileCount option (for more information, see "Common Server-Specific Configuration Options" in Appendix D).

## Error code 9: RMIX_API_ERR_CLIENT_NOT_FOUND

**Failure Definition:** Indicates a server malfunction.

**Action:** Bring down all the connected clients, terminate the server, and restart.

## Error code 11: RMIX_API_ERR_FILE_NOT_FOUND

**Failure Definition:** Indicates a malfunction of either the server or the screen handler.

**Action:** Bring down all the connected clients, terminate the server, and restart.

## Error code 12: RMIX_API_ERR_SERVER_ APPLICATION_MISMATCH

**Failure Definition:** Indicates that either the screen handler or the server API application that is being started does not match the server running in the system.

**Action:** Use a matching screen handler. Also, make sure that the screen handler and the server belong to same release, even though they support the same protocol.

### Error code 13: RMIX_API_ERR_SERVER_DATABASE_ NOT_OPEN

**Failure Definition:** Indicates a malfunction of either the server or the screen handler.

**Action:** Bring down all the connected clients, terminate the server, and restart.

# RM/InfoExpress-Generated Error Codes

Error codes 21 through 59 are common to the client, the server, and the screen handler.

### Error code 21: RMIX_ERR_INVALID_FAP_MESSAGE

**Failure Definition:** Indicates an RM/InfoExpress system error.

**Action:** Contact Liant technical support for assistance.

### Error code 22: RMIX_ERR_FILE_HANDLE_NOT_FOUND

**Failure Definition:** Indicates an RM/InfoExpress system error.

**Action:** Contact Liant technical support for assistance.

### Error code 23: RMIX_ERR_OUT_OF_MEMORY

**Failure Definition:** Indicates that there is not enough memory available in the system for RM/InfoExpress (client or server) to continue.

**Action:** If the associated error type is 15 (RM/InfoExpress Server Error), bring down all the connected clients, bring the server down, and make more memory available before starting the server again. If the associated error type is 16 (RM/InfoExpress Client Error), terminate the client application and restart it after making more memory available on the client system.

## Error code 24 RMIX_ERR_SESSION_REJECTED

**Failure Definition:** This error is reported by either the Windows client or the server. When returned by the server, it indicates a problem with the network interface. When returned by the Windows client, it indicates that the RM/COBOL runtime does not match the client.

**Action:** If returned by the server, contact Liant technical support for assistance. If returned by the client, use the version of the runtime that matches the Windows client.

## Error code 26 RMIX_ERR_SIGNAL_CAUGHT

**Failure Definition:** Indicates an RM/InfoExpress system error.

**Action:** Contact Liant technical support for assistance.

## Error code 27 RMIX_ERR_FAP_MANIPULATION

**Failure Definition:** Indicates an RM/InfoExpress system error.

**Action:** Contact Liant technical support for assistance.

## Error code 28 RMIX_ERR_IPC_OBJECTS_REMOVED

**Failure Definition:** Indicates that the server or the screen handler discovered Inter Process Communications (IPC) objects missing in the system. This error is specific to the server and the screen handler for UNIX.

**Action:** It may be that the IPC objects have been removed accidentally. Remove the other IPC objects and start the server and/or the screen handler again.

## Error code 30 RMIX_ERR_INVALID_COMMAND

**Failure Definition:** Indicates an RM/InfoExpress system error.

**Action:** Contact Liant technical support for assistance.

## Error code 32 RMIX_ERR_TOO_MANY_CLIENTS

**Failure Definition:** The server reports this error when the number of clients exceeds the value specified on the -k option (or the UseCount configuration file option) or the number of licensed use counts, whichever is less.

**Action:** Restart the server with a larger value on the UseCount configuration file option (see "Common Server-Specific Configuration Options" in Appendix D) or use a server licensed for more users.

## Error code 33 RMIX_ERR_DEF_USER_NAME_NOT_FOUND

**Failure Definition:** The server, running at a security level of 0 to 2, reports this error when it detects that the name specified on the DefaultServerUser configuration file option or the user name **rmserver** is not a valid user on the server machine. This error may also occur if root is specified as the default user name.

**Action:** Using system administration tools, add a new user with the name specified. If that user already exists, check the **etc/passwd** file.

## Error code 34 RMIX_ERR_SECURITY_INFO_NOT_FOUND

**Failure Definition:** The RM/InfoExpress server reports this error when it cannot find a match for the *server-user-name*, *client-machine-name*, and *server-machine-name* triple passed by the client in the server's security parameter file, **ixpwfile**.

**Action:** Update **ixpwfile** by using the utility program **ixsecure.cob** on both the client and the server machines to add an entry for the *client-machine-name* and the *server-user-name* pair. (For more information, see Chapter 6, *File Security on the RM/InfoExpress UNIX Server*, and Appendix E, *RM/InfoExpress Security Parameter File Update Utility*.) For a non-UNIX client, the client name is the value of the ClientName configuration file option. For a UNIX client, this is the node name and is given by the **uname** command.

## Error code 35 RMIX_ERR_USER_PASSWORD_PARAM_ NOT_FOUND

**Failure Definition:** This error is normally reported by the RM/InfoExpress server running at a security level of 3 or higher.

**Action:** Contact Liant technical support for assistance.

## Error code 36 RMIX_ERR_SYSTEM_PASSWORD_MISMATCH

**Failure Definition:** The server, running at a security level of 3 or higher, reports this error when it detects that the *password* string stored in the **ixpwfile** security parameter file on the client machine and on the server machine, and the password stored in the UNIX system, do not match.

**Action:** See that the *password* string entered interactively at the client terminal or stored in **ixpwfile** on the client machine matches the *password* string stored in **ixpwfile** on the server machine and the one stored in the UNIX system. To update the password entry in **ixpwfile**, use the utility program **ixsecure.cob** (see Appendix E).

## Error code 37 RMIX_ERR_SYSTEM_PASSWORD_NOT_FOUND

**Failure Definition:** The server, running at a security level of 3 or higher, reports this error when it cannot locate the user password in the UNIX system security database.

**Action:** This error normally occurs on UNIX systems that maintain the security database in a file different from the **/etc/passwd** file. This indicates that one or both of these files have been corrupted. Contact your system administrator.

## Error code 38 RMIX_ERR_RHOSTS_FILE_OPEN_ERROR

**Failure Definition:** The server reports this error when it cannot open the **.rhosts** file in the user's home directory.

**Action:** Seek your system administrator's help in creating the **.rhosts** file with appropriate entries in the user's home directory on the server machine .

## Error code 39 RMIX_ERR_RHOSTS_FILE_PERMISSIONS_INVALID

**Failure Definition:** The server reports this error when it finds the permissions of the **.rhosts** file in the user's home directory to be invalid.

**Action:** Set the permissions of the **.rhosts** file in the user's home directory on the server machine to be "-rw-r--r--" and make certain that the user is the owner of this file.

## Error code 40 RMIX_ERR_ENTRY_NOT_FOUND_IN_ RHOSTS_FILE

**Failure Definition:** The server reports this error when it fails to find a matching client name entry (with the *client-machine-name* parameter passed by the client machine) in the **.rhosts** file on the server machine.

**Action:** With the help of your system administrator, edit the **.rhosts** file in the user's home directory on the server machine and add a new entry containing the *client-machine-name* and an optional *server-user-name*.

## Error code 41 RMIX_ERR_NO_SESSION

**Failure Definition:** Both the server and the client may report this error. Although not fatal, this error is still considered an RM/InfoExpress system error.

**Action:** Contact Liant technical support for assistance.

## Error code 42 RMIX_ERR_SERVER_USER_NAME_ PARAM_NOT_FOUND

**Failure Definition:** The server, running at a security level of 0 to 5, reports this error when it detects that the *server-user-name* parameter is absent in the information passed by the client when connections are established.

**Action:** This error may occur when an old client tries to establish a connection with the new server running at security level 2 or higher. This error may also occur when the new client cannot provide the required information to the server due to some problem in processing the security parameter file, **ixpwfile** (for example, the file is not present on the client machine). Upgrade to a new version of the RM/InfoExpress client in order to use security features on the server.

## Error code 43 RMIX_ERR_CLIENT_MACH_NAME_ PARAM_NOT_FOUND

**Failure Definition:** The server, running at a security level of 0 to 5, reports this error when it detects that the *client-machine-name* parameter is absent in the information passed by the client when connections are established.

**Action:** This error may occur when an old client tries to establish a connection with the new server running at security level 2 or higher. This error may also occur when the new client cannot provide the required information to the server due to some problem in processing the security parameter file, **ixpwfile** (for example, the file is not present on the client machine). Upgrade to a new version of the RM/InfoExpress client in order to use security features on the server.

## Error code 44 RMIX_ERR_SERVER_SECURITY_INFO_ FILE_ERROR

**Failure Definition:** This error occurs when the server fails to open the security parameter file, **ixpwfile**, on the server machine.

**Action:** Make sure that a valid security parameter file, **ixpwfile**, is present on the server machine. If this file does not exist, create it using the **ixsecure.cob** utility program (see Appendix E).

## Error code 45 RMIX_ERR_MALFORMED_MESSAGE

**Failure Definition:** Indicates an RM/InfoExpress system error. This error occurs when either the client or the server fails to decompress the message received from the session partner.

**Action:** Contact Liant technical support for assistance.

## Error code 46 RMIX_ERR_NO_MEMORY_FOR_ COMPRESSION

**Failure Definition:** There was insufficient memory to compress or decompress the data.

**Action:** Set the IxCompress configuration file option to No to disable message compression (see “Common Configuration Options” in Appendix D, *Configuring RM/InfoExpress*). Message compression should not be used for records of more than 64000 bytes.

## Error code 47 RMIX_ERR_TOO_MANY_FILES

**Failure Definition:** The client(s) have exceeded the total number of open files supported by the server.

**Action:** Increase the value of the FileCount configuration file option and restart the server (see “Common Server-Specific Configuration Options” in Appendix D).

## Error code 48 RMIX_ERR_SYSTEM_PASSWORD_FILE_ OPEN_ERROR

**Failure Definition:** This error occurs when an invalid **/etc/passwd** file (which may be missing) or the *server-user-name* with which the client is trying to run is not present on the server machine.

**Action:** Contact your system administrator.

## Error code 49 RMIX_ERR_CLIENT_SECURITY_INFO_ FILE_ERROR

**Failure Definition:** This error occurs when the client fails to open the security parameter file, **ixpwfile**, on the client machine.

**Action:** Make sure that a valid security parameter file, **ixpwfile**, is present on the client machine. If this file does not exist, create it using the **ixsecure.cob** utility program (see Appendix E, *RM/InfoExpress Security Parameter File Update Utility*).

## Error codes 50 — 59

**Failure Definition:** Error codes 50 through 59 represent internal errors in the RM/InfoExpress server program. Error code 54 may indicate an attempt to use an old client with a new server in a mode other than compatibility mode.

**Action:** Contact Liant technical support for assistance.

# RM/InfoExpress WinSock Error Codes

Table A-2 lists the possible error codes for permanent error type 21 (see page A-2). Codes in the 10000 range represent network or system errors. Codes in the 11000 range represent database errors.

**Table A-2 Error Codes Generated by Windows Sockets**

| Error Code | Description | Windows Sockets Error Equivalent | UNIX Error Equivalent |
|---|---|---|---|
| 10004 | Interrupted system call | WSAEINTR | EINTR |
| 10009 | Bad file number | WSAEBADF | EBADF |
| 10013 | Permission denied | WSAEACCES | EACCES |
| 10014 | Bad address | WSAEFAULT | EFAULT |
| 10022 | Invalid argument | WSAEINVAL | ENOTSOCK |
| 10024 | Too many open files | WSAEMFILE | EMFILE |
| 10035 | Operation would block | WSAEWOULDBLOCK | EWOULDBLOCK |
| 10036 | Blocking operation in progress | WSAEINPROGRESS | EINPROGRESS |
| 10037 | Operation already in progress | WSAEALREADY | EALREADY |
| 10038 | Operation on non-socket | WSAENOTSOCK | ENOTSOCK |
| 10039 | Destination address required | WSAEDESTADDRREQ | EDESTADDRREQ |
| 10040 | Message too long | WSAEMSGSIZE | EMSGSIZE |
| 10041 | Wrong protocol type | WSAEPROTOTYPE | EPROTOTYPE |
| 10044 | Socket type not supported | WSAESOCKTNOSUPPORT | ESOCKTNOSUPPORT |
| 10045 | Operation not supported | WSAEOPNOTSUPP | EOPNOTSUPP |
| 10046 | Protocol family not supported | WSAEPFNOSUPPORT | EPFNOSUPPORT |
| 10047 | Address family not supported | WSAEAFNOSUPPORT | EAFNOSUPPORT |
| 10048 | Address already in use | WSAEADDRINUSE | EADDRINUSE |
| 10049 | Cannot assign address | WSAEADDRNOTAVAIL | EADDRNOTAVAIL |

**Table A-2 Error Codes Generated by Windows Sockets *(Cont.)***

| Error Code | Description | Windows Sockets Error Equivalent | UNIX Error Equivalent |
|---|---|---|---|
| 10050 | Network is down | WSAENETDOWN | ENETDOWN |
| 10051 | Network is unreachable | WSAENETUNREACH | ENETUNREACH |
| 10052 | Network reset connection | WSAENETRESET | ENETRESET |
| 10053 | Connection was aborted | WSAECONNABORTED | ECONNABORTED |
| 10054 | Peer reset connection | WSAECONNRESET | ECONNRESET |
| 10055 | No available buffer space | WSAENOBUFS | ENOBUFS |
| 10056 | Socket already connected | WSAEISCONN | EISCONN |
| 10057 | Socket not connected | WSAENOTCONN | ENOTCONN |
| 10058 | Socket was shut down | WSAESHUTDOWN | ESHUTDOWN |
| 10059 | Too many references | WSAETOOMANYREFS | ETOOMANYREFS |
| 10060 | Connection timed out | WSAETIMEDOUT | ETIMEDOUT |
| 10061 | Connection refused | WSAECONNREFUSED | ECONNREFUSED |
| 10062 | Symbolic link loop | WSAELOOP | ELOOP |
| 10063 | Path name too long | WSAENAMETOOLONG | ENAMETOOLONG |
| 10064 | Host is down | WSAEHOSTDOWN | EHOSTDOWN |
| 10065 | Host is unreachable | WSAEHOSTUNREACH | EHOSTUNREACH |
| 10066 | Directory not empty | WSAENOTEMPTY | |
| 10067 | Process limit | WSAEPROCLIM | |
| 10091 | Network is unusable | WSASYSNOTREADY | |
| 10092 | Version not supported | WSAVERNOTSUPPORTED | |
| 10093 | Startup not done | WSANOTINITIALISED | |
| 11001 | Host not found | WSAHOST_NOT_FOUND | HOST_NOT_FOUND |
| 11002 | Try again | WSATRY_AGAIN | TRY_AGAIN |
| 11003 | No recovery | WSANO_RECOVERY | NO_RECOVERY |
| 11004 | No data | WSANO_DATA | NO_DATA |

# RM/InfoExpress Windows Sockets Interface Error Codes

Codes in the 12000 range are generated by the Windows Sockets interface portion of the RM/InfoExpress Windows client program or the Windows server program and represent memory allocation failures or unexpected conditions.

These errors are considered RM/InfoExpress system errors. When these errors are detected, contact Liant technical support for assistance.

**Table A-3 Error Codes Generated by the RM/InfoExpress Sockets Interface**

| Error Code | Description |
|---|---|
| 12001 | Insufficient memory for connect. |
| 12002 | Internal socket number already in use. |
| 12003 | Unexpected event occurred during connect. |
| 12004 | Unexpected error condition from connect. |
| 12005 | Unexpected event occurred during initial receive. |
| 12006 | Received data length error (client/server not synchronized). |
| 12007 | Received data length error (client/server not synchronized). |
| 12008 | Received data length error (client/server not synchronized). |
| 12009 | Received data length inconsistent with FAP message length. |
| 12010 | Unexpected event occurred during secondary receive. |
| 12011 | Unexpected event occurred during send. |
| 12012 | Internal buffer length too small for status. |
| 12013 | Insufficient memory for status. |
| 12014 | Unknown error during asynchronous wait. |
| 12015 | Unknown error during event wait. |
| 12016 | Received data length error. |
| 12017 | Unknown error during asynchronous-wait. |
| 12018 | Unknown error during event wait. |
| 12019 | Unknown error during event wait. |

# RM/InfoExpress BSD Sockets Interface Error Codes

Error codes 401 through 413 are generated by the BSD Sockets interface portion of the RM/InfoExpress client and the server. These error codes are defined in Table A-4.

These errors are considered RM/InfoExpress system errors. When these errors are detected, contact Liant technical support for assistance.

**Table A-4 Error Codes Generated by the RM/InfoExpress BSD Sockets Interface**

| Error Code | Description |
|---|---|
| 401 | Insufficient for connect. |
| 402 | Socket already in use. |
| 403 | Out of memory. |
| 406 | Received data length error (client/server not synchronized). |
| 407 | Received data length error (client/server not synchronized). |
| 408 | Received data length error (client/server not synchronized). |
| 409 | Received data length inconsistent with FAP message length. |
| 412 | Internal buffer length too small for status. |
| 501 | BSD Sockets error HOST_NOT_FOUND. |
| 502 | BSD Sockets error TRY_AGAIN. |
| 503 | BSD Sockets error NO_RECOVERY. |
| 504 | BSD Sockets error NO_DATA. |

# Appendix B: Limits and Ranges

This appendix describes RM/InfoExpress limits and ranges.

## Limits and Ranges

The following limitations apply to RM/InfoExpress for TCP/IP:

1. Only one RM/InfoExpress server program may be active on one server machine at any given time.

2. The RM/InfoExpress UNIX and Windows NT screen handler programs can invoke nine screen handler or user API applications.

3. The RM/InfoExpress screen handler program updates the screen every second.

4. The RM/InfoExpress 16-bit Windows client cannot handle files with record sizes larger than 32000 bytes. Do not attempt to open a file with a record size larger than 32000 bytes using **rmclntcp.dll** (for 16-bit clients).

5. The RM/InfoExpress server supports up to 50 clients by default or the number of clients for which the server is licensed, whichever is less.

   To invoke the server to support a specific number of clients, use the UseCount configuration option. The specific number must be less than the number of clients for which the server is licensed. Refer to Appendix D, *Configuring RM/InfoExpress*, for more information.

# Appendix C: Troubleshooting RM/InfoExpress

This appendix is designed to help if you run into any problems when using RM/InfoExpress. Each section suggests steps you can take to solve the problem.

## runcobol Failure

If the **runcobol** client application fails with error library error 9, the DOS **share** program is not loaded. You must quit Windows, load the DOS **share** program, and restore Windows.

## Failure to Locate File or Path

Error messages that occur while accessing the file on the server machine, for example, "File not found" or "Path not found", generally indicate one of the following conditions:

1. The RM/InfoExpress UNIX server program is not running on a UNIX server machine. In this case, load **rmservertcp**.

2. The complete filename (defined using the synonym or other means) does not correctly point to the location on the server. Check your environment variables and synonyms.

3. In the case of a Windows client, the **rmclntcp**, **rmtcp32**, and **winsock** DLLs are not in the execution path.

4. For a Windows client, the **runcobol** configuration file contains an incorrect DLL name or the DLL specified on the NAME option of the EXTERNAL-ACCESS-METHOD record cannot be located.

5. Invoke the RM/InfoExpress server with the -c l option so that pathnames from Windows clients will be converted to lowercase by the server.

6. While accessing files from a UNIX client, make certain that the machine name specified in the pathname is the same as the one in the **/etc/hosts** file on the client machine. For example, the machine name "HAL9000" in the pathname defined by **INXFL=//RS6000/rminfox/inxfl** matches the name "HAL9000" in the **/etc/hosts** file entry 138.52.123.45 hal9000 HAL9000.

# RM/InfoExpress Client Entries Not Terminating

Certain situations on some versions of UNIX, when running RM/InfoExpress using the TCP/IP protocol, can cause the server not to notice that a client has been terminated. This occurs only if the client is terminated in a non-standard method, such as turning off the client workstation or experiencing a system failure on the client workstation. In such instances, the RM/InfoExpress client is unable to inform the server that the client is terminating. Although the operating system eventually notifies the RM/InfoExpress server that the connection has been broken, it could take several hours on some implementations of UNIX before the notification occurs.

One version of UNIX that exhibits this behavior is AIX running on the RS/6000. To reduce the amount of time before the inactivity on a TCP/IP connection is interpreted as a lost connection under AIX, use the **no** command:

```
no -o tcp_keepidle=200 -o tcp_keepintvl=60
```

where:

-*o* is a network option.

tcp_keepidle determines the number of half-seconds to wait after the last successful I/O operation before attempting to determine whether a connection has been lost.

tcp_keepintvl determines the number of half-seconds to wait between requests for a response from the possibly lost connection.

After ten requests with no response, the operating system reports a lost connection to the server. The settings shown in this example will report a broken connection after 400 seconds (100+30*10).

**Note** You must run the **no** command each time the network is started since it does not permanently change the default configuration values.

# Appendix D: Configuring RM/InfoExpress

RM/InfoExpress can be uniformly configured across all implementations of clients and servers. To maintain compatibility with previous versions, environment variables supported by previous versions can be used to override the settings of the configuration file. On the server, all the command line options can be specified in the configuration file.

This appendix describes the configuration files and their options.

## Configuration Files and Options

Even though the names of the configuration files used by different implementations of RM/InfoExpress are different, the format of all these files is identical. The configuration files are as follows:

| Use | To set configuration parameters for |
|---|---|
| **rmixclnt.ini** | RM/InfoExpress Windows and UNIX client programs |
| **rmixsrvr.ini** | Either the RM/InfoExpress UNIX or Windows NT server program |

For Windows clients and Windows NT servers, the configuration file must be present in the Windows directory (\WINDOWS or \WINNT, respectively). For UNIX clients and UNIX servers, the configuration file must be present in the current directory or the directory pointed to by the environment variable IXCONFIG.

In a configuration file, any line beginning with a semi-colon (;) is treated as a comment and is not processed.

The client and server configuration files are divided into sections, each of which consists of a group of related options that you can use to customize your implementation of RM/InfoExpress. Some configuration options are used only by the client, while others are used only by the server. Some options are specific to the type of server. Still others are common to both client and server. All configuration options are shown in the sample configuration file that follows. A more detailed description of the configuration options begins on page D-3.

**Note** Option names are not case-sensitive.

## Sample Configuration File

```
[Debug]
;###Common###
InfoxDebug=debug filename

[Options]
;###Common###
IxCompress=Yes|No

;###Client-Specific###
KeepSession=Yes|No

;###Server-Specific, All Servers###
DotsBias=number
FileBufferPool=number
FileCount=number
UseCount=number

;###Server-Specific, UNIX Server Only###
ConvertFileName=NoConvert|UpperCase|LowerCase
EnablePlusDB=Yes|No
LargeFileLockLimit=number
RelUseLargeLimit=Yes|No
SeqUseLargeLimit=Yes|No

;###Server-Specific, Windows NT Server Only###
UseCurrentDirectory=Yes|No
UseSystemShares=Yes|No

[Security]
;###Common###
IxEncrypt=Yes|No
IxPwFile=pathname    (UNIX only)

;###Client-Specific###
AcceptPassword=Yes|No
ClientName=client-machine-name

;###Server-Specific, UNIX Server Only###
DefaultServerUser=server-user-name
ServerSecurityLevel=number
```

```
[Sharing]
;###Server-Specific, Windows NT Server Only###
share-name=share-path

[Tcp]
;###Common###
MaxSendSize=number

[Winsock]
;###Common###
IgnoreHangupError=Yes|No    (Windows only)
UseShutDown=Yes|No          (Windows only)

;###Client-Specific###
UseBlockingIO=Yes|No
```

# Common Configuration Options

The following configuration options are *common* to both the client and server components of RM/InfoExpress:

- **IgnoreHangupError.** The IgnoreHangupError option in the [Winsock] section is used only by RM/InfoExpress on Windows. If the value is IgnoreHangupError=Yes, any error returned by Windows Sockets functions, called while the Windows client is trying to disconnect the session with the server, are ignored. Do not specify this option unless instructed to do so by Liant technical support services.

  IgnoreHangupError=No is the default value. If the value is set to No, a possibly serious error, should one occur while disconnecting the session with the server, is returned to the Close operation. This is normal behavior for any I/O operation.

- **InfoxDebug.** The InfoxDebug option in the [Debug] section causes the file whose pathname is given by *debug filename* to be created and trace information written into it. After the client RM/COBOL application is terminated, send this file to Liant technical support services for further investigation. Use this option only when you are investigating a problem with the assistance of Liant technical support services. Using this option under normal conditions affects client operations negatively.

  On the server, the InfoxDebug configuration option is equivalent to the -d command line option (see the appropriate sections on starting the RM/InfoExpress UNIX and Windows NT server programs in Chapter 2, *Configuring and Starting the RM/InfoExpress Server*). The command line option overrides the configuration option.

- **IxCompress.** The IxCompress option in the [Options] section is used to compress messages transmitted on the network. Depending on the compressibility of the messages, which may contain COBOL data records, this option may improve the performance on the network. IxCompress=Yes is the default. When the value is set to Yes, the RM/InfoExpress component (either the client or the server) negotiates the compressibility of the messages exchanged with its session counterpart. If both the session partners have the value set to Yes, the messages are compressed before they are sent and decompressed immediately after they are received. However, if any of the session partners have the value set to No, the message compression does not take place. Message compression will not take place if either of the session partners are using a release of RM/InfoExpress earlier than version 2.1.

- **IxEncrypt.** The IxEncrypt option in the [Security] section is used to encrypt messages to provide more security to the data transmitted on the network. IxEncrypt=No is the default. When the value is set to Yes, the RM/InfoExpress component (either the client or the server) negotiates the encryption of the messages exchanged with its session counterpart. If both the session partners have the value set to Yes, the messages are encrypted before they are sent and decrypted immediately after they are received. However, if any of the session partners have the value set to No, the message encryption does not take place. Message encryption will not take place if either of the session partners are using a release of RM/InfoExpress earlier than version 2.1.

- **IxPwFile.** The value of *pathname* specified on the IxPwFile option in the [Security] section is used only by RM/InfoExpress on UNIX to locate the file containing the security parameters. If this option is absent, RM/InfoExpress looks for the security parameter file, **ixpwfile** in the current directory. See Chapter 6, *File Security on the RM/InfoExpress UNIX Server.*

- **MaxSendSize.** The MaxSendSize option in the [Tcp] section may be specified for those TCP/IP implementations that have a limitation. We recommend that you leave this value unspecified unless you know that the TCP/IP in use has a limitation. Some UNIX systems have a limit of 4096 bytes. Note that this value is *not* the same value as the size of the maximum packet allowed on the network.

  The value specified by the MaxSendSize option is used to determine whether the RM/InfoExpress client or server code must perform multiple send operations on a given message. The underlying TCP stack implementation determines the maximum allowable value for a single send operation. Multiple send operations may be required for some large messages. The TCP stack will transmit the data in as many network packets as required by the underlying network. Again, for large messages, multiple network packets may be required.

  If I/O errors occur on a file with a record size larger than about 4000 bytes while files with smaller record sizes perform normally, try specifying MaxSendSize=4096. The default value is system-dependent, but is currently 4096 or larger. The value cannot be less than 512.

  On the server, the MaxSendSize configuration option is equivalent to the -z command line option (see the sections on starting the RM/InfoExpress UNIX and Windows NT server programs in Chapter 2). The command line option overrides the configuration option.

- **UseShutdown.** The UseShutdown option in the [Winsock] section is used only by RM/InfoExpress on Windows. If the value is UseShutdown=Yes, the Windows Sockets ShutDown function is called before calling the CloseSocket function. Do not specify this option unless instructed to do so by Liant technical support services.

  UseShutdown=No is the default value. If the value is set to No, the Windows Sockets shutdown function is never used.

# Client-Specific Configuration Options

The following configuration options are *specific* to RM/InfoExpress clients:

- **AcceptPassword**. The AcceptPassword option in the [Security] section specifies whether or not the client should always accept passwords interactively. The default value is No. The server requires a password from the client when the server is running at security level 3, 4, or 5. At level 5 the server forces the client to always accept the password interactively, ignoring any password stored in the **ixpwfile** on the client machine.

  When AcceptPassword=No is set and the server is running at level 3 or 4, the client obtains the password from the **ixpwfile** on the client machine and sends it to the server.

  When AcceptPassword=Yes is set and the server is running at level 3 or 4, the client accepts the password interactively (as it does for level 5).

  The server administrator may wish to set AcceptPassword=Yes on unsecured client machines where it is undesirable to store any passwords (even though they are encrypted) in the **ixpwfile** on that client machine.

- **ClientName.** The ClientName option in the [Security] section is used to specify the name of the client machine. This name is used by the UNIX server as part of the client validation at the time connections are established. This name is also displayed on the server screens. If this option is absent, the client uses the name MSWINDOWS on 16-bit Windows.

- **KeepSession.** Located in the [Options] section. KeepSession=Yes is the default. If the value is set to Yes, the client keeps the session with the server until the run unit terminates, even if all files on that server are closed before that time. This option is sometimes necessary when the client application opens and closes files rapidly, causing sessions to be established and released in rapid succession. Some network implementations cannot handle such frequent session creation, which can lead to errors and program hangs. This option may also improve performance slightly by eliminating the overhead of releasing and re-establishing a session between the Close of one remote file and the Open of another remote file on the same server. The drawback of specifying this option is that sessions may be kept with several servers for long periods of time when they will never be used again, thereby consuming network resources. Errors may occur if some network resources are exhausted.

  If the value is KeepSession=No, the client releases the session with the server when the last open file is closed. In addition, the UNIX client supports this option as an

environment variable (also called KEEPSESSION), which when set, overrides the current setting.

- **UseBlockingIO.** The UseBlockingIO option in the [Winsock] section is provided to improve the performance of the RM/InfoExpress Windows client. If the value is UseBlockingIO=Yes, Windows Sockets functions are called in blocking mode; that is, every function call will block until the request is complete. Using this value also ensures that Windows Sockets Asynchronous functions and the PeekMessage function are never called. Substantial performance improvements may occur, depending upon the type of Windows Sockets implementation used. However, the operator will not be able to cancel a Read operation waiting on a locked record. We suggest users experiment using their own benchmark programs to determine whether specifying the value Yes results in better performance for the specific TCP/IP implementation in use.

  If the value is UseBlockingIO=No (the default value), Windows Sockets Asynchronous functions and the PeekMessage function are used; that is, functions are called in non-blocking mode. If any COBOL program using the Windows client executes a Read operation that waits on a locked record and the operator requires the ability to cancel that operation, the UseBlockingIO option must be set to No.

## Sample RM/InfoExpress Windows Client Configuration File

The following is a sample Windows client configuration file (**rmixclnt.ini**).

```
[Debug]
;;;InfoxDebug=DBGFILE

[Security]
ClientName=Foo
IxPwFile=d:\tmp\IXPWFILE

[Winsock]
UseBlockingIO=Yes
```

# Common Server-Specific Configuration Options

The following configuration options are *common* to both the RM/InfoExpress UNIX server and the Windows NT server programs:

- **DotsBias.** The DotsBias option in the [Options] section is used to specify where an ellipsis (…) appears in filenames that are too long to fit in the screen handler's display field. The leftmost part of the filename appears to the left of the dots and the rightmost part of the filename appears to the right of the dots (the middle of the filename is replaced by the ellipsis.) The default value is zero, which causes the ellipsis to appear in the middle of the field. Negative values move the ellipsis to the left and positive values move the ellipsis to the right. Special value +9999 moves the ellipsis completely out of the right side of the field, thus displaying the leftmost part of the filename (truncated). This is equivalent to RM/InfoExpress version 2.0 behavior. Special value -9999 moves the ellipsis completely out of the left side so that the rightmost part of the filename is displayed (with no ellipsis). This option is cosmetic and has no effect on server operation other than the display.

- **FileBufferPool.** The FileBufferPool option in the [Options] section is used to specify the common buffer pool size on the server machine. The default value is zero, which causes the default size for the common buffer pool. Normally, you should not need to specify a value. For additional information, see the description of the BUFFER-POOL-SIZE keyword in the RUN-FILES-ATTR configuration record in Chapter 10, *Configuration*, of the *RM/COBOL User's Guide*.

  The FileBufferPool configuration option is equivalent to the -p command line option (see the sections on starting the RM/InfoExpress UNIX and Windows NT server programs in Chapter 2). The command line option overrides the configuration option.

- **FileCount.** The FileCount option in the [Options] section may be used to specify the number of files the server can have open simultaneously. The default value is ten times the UseCount. FileCount may need to be increased when every client application has more than ten files on the server open simultaneously. Reducing FileCount will reduce the server's shared and local memory requirements.

- **UseCount.** The UseCount option in the [Options] section may be used to specify the number of clients that the server can serve simultaneously. This number must not be greater than the server's licensed client count. A reduced value on the UseCount option will reduce the server's shared and local memory requirements. The number of clients will default to the server's licensed client count unless the client count is "unlimited." In that case, it will default to 50.

  The UseCount configuration option is equivalent to the -k command line option (see the sections on starting the RM/InfoExpress UNIX and Windows NT server programs in Chapter 2). The command line option overrides the configuration option.

# UNIX Server-Specific Configuration Options

The following configuration options are *specific* to the RM/InfoExpress UNIX server:

- **ConvertFileName.** The ConvertFileName option, which is located in the [Options] section and can have three values, is used to process the filename before the file is opened on the server's native operating system. When ConvertFileName=NoConvert (the default value), no filename mapping is performed. ConvertFileName=UpperCase indicates that the entire filename is mapped to uppercase before the Open request is attempted. ConvertFileName=LowerCase indicates that the entire filename is mapped to lowercase before the Open request is attempted.

The ConvertFileName configuration option is equivalent to the -c command line option (see the appropriate sections on starting the RM/InfoExpress UNIX and Windows NT server programs in Chapter 2). The command line option overrides the configuration option.

- **DefaultServerUser.** The DefaultServerUser option in the [Security] section specifies the user name (at security levels 0 or 1) to run on the server when the security validation fails. Normally, the default server user will be allowed to access files that do not require high levels of security. The default server user must be a valid user on the server. The default is DefaultServerUser=rmserver.

- **EnablePlusDB.** The EnablePlusDB option in the [Options] section is used to enable the RM/plusDB interface code in the server. If the value is EnablePlusDB=Yes, the server passes the Open request to the statically linked RM/plusDB access method in order to determine whether the file being opened is an RM/plusDB table before opening the file as an RM/COBOL data file. If the value is EnablePlusDB=No, the server tries to open the file as a local RM/COBOL data file. Refer to Appendix G, *Using RM/InfoExpress with RM/plusDB*, for more information.

  The EnablePlusDB configuration option is equivalent to the -b command line option (see the appropriate sections on starting the RM/InfoExpress UNIX and Windows NT server programs in Chapter 2). The command line option overrides the configuration option.

- **LargeFileLockLimit.** The LargeFileLockLimit option in the [Options] section determines the limit for the location to apply locks to a file that will be accessed as a large file. For record and file locks to perform correctly, all run units (that is, all RM/InfoExpress servers and RM/COBOL runtime systems) opening a particular file must use the same lock limit for that file. The lock limit also limits the actual amount of data that can be stored in a file. This limit will be used when a new indexed file is created provided the file version of the file is 3 or greater. Otherwise, this limit has no effect on indexed files. The value assigned to this keyword is specified in gigabytes (GB). The maximum value is 1048576, which equates to 1 petabyte ($2^{50}$). The minimum value is 1. The default value is 64. The lock limit for a normal file is 2 GB.

- **RelUseLargeLimit.** The RelUseLargeLimit option in the [Options] section determines which value to use for the limit when applying locks to a relative file. If the value is set to No (the default), the lock limit for relative files is 2 GB. If the value is set to Yes, the value of the LargeFileLockLimit option is used. For record and file locks to perform correctly, all run units (that is, all RM/InfoExpress servers and RM/COBOL runtime systems) opening a file must use the same lock limit for that file.

- **SeqUseLargeLimit.** The SeqUseLargeLimit option in the [Options] section determines which value to use for the limit when applying locks to a sequential file. If the value is set to No (the default), the lock limit for sequential files is 2 GB. If the value is set to Yes, the value of the LargeFileLockLimit option is used. For record and file locks to perform correctly, all run units (that is, all RM/InfoExpress servers and RM/COBOL runtime systems) opening a file must use the same lock limit for that file.

- **ServerSecurityLevel.** The ServerSecurityLevel option in the [Security] section specifies the security level number at which the UNIX server is to run (for more information, see Chapter 6). Valid values range from 0 through 5. If this option is

not specified, the server runs in compatibility mode, that is, the behavior is equivalent to an RM/InfoExpress version 2.0 server.

### Sample RM/InfoExpress UNIX Server Configuration File

The following is a sample UNIX server configuration file (**rmixsrvr.ini**).

```
[Debug]
;;;InfoxDebug=DBGFILE

[Security]
IxPwFile=/usr/foo/ixpwfile
ServerSecurityLevel=5
DefaultServerUser=foo
```

# Windows NT Server-Specific Configuration Options

The following configuration options are *specific* to the RM/InfoExpress Windows NT server:

- ***share-name***. The *share-name* option in the [Sharing] section defines a share name and equates it with a pathname (*share-path*). On Windows, the edgename following the server machine name is a share name; for example, *\\server-name\share-name\rest-of-path-to-file*. All share names and paths are case-insensitive.

The server generates pathnames as follows:

- Search for the specified share name.
  - If found, substitute the share-path for the name;
    if not found, search for a null share name.
    - If found, prepend the share-path to the filename;
      if not found, check the UseCurrentDirectory configuration flag.
      - If “Yes”, prepend the current working directory path to the filename;
        if “No”, return a “35” error;

The generated pathname is then given to the RM/COBOL File Manager.

For example, if the [Sharing] section on host *serverW* contains:

```
[Sharing]
cdrive=c:\tmp
AcctPayable=d:\acctpayable\data
=e:\guest\data
```

then the client path \\serverW\cdrive\file.dat causes the server to access

```
c:\tmp\file.dat
```

Similarly,

| | |
|---|---|
| `\\serverW\cdrive\red\white\blue` | `c:\tmp\red\white\blue` |
| `\\serverW\acctpayable\master.inx` | `d:\acctpayable\data\master.inx` |
| `\\serverW\file1` | `e:\guest\data\file1` |
| `\\serverW\xyzzy\tmp\junk.x` | `e:\guest\data\xyzzy\tmp\junk.x` |
| `\\serverW\cdrive` | `e:\guest\data\cdrive` |

If the null share name line (=e:\guest\data) did not exist and the server was started in c:\bin, then:

| | |
|---|---|
| `\\serverW\file1` | `c:\bin\file1` |
| `\\serverW\xyzzy\tmp\junk.x` | `c:\bin\xyzzy\tmp\junk.x` |
| `\\serverW\cdrive` | `c:\bin\cdrive` |

The server's current working directory is the default path for the null share name provided the UseCurrentDirectory option is set to Yes.

If there is no [Sharing] section and if UseCurrentDirectory=No and UseSystemShares=No are both set, then every open returns a 35 error.

The path associated with a share name is intended to start with a drive letter and to specify a valid directory so that the resulting final pathname is an absolute pathname on the server machine.

- **UseCurrentDirectory.** The UseCurrentDirectory option in the [Options] section determines whether or not the server's current directory pathname is prepended to the filename when the edgename following the server name does not match any valid share name. UseCurrentDirectory=Yes is the default.

- **UseSystemShares.** The UseSystemShares option in the [Options] section determines whether or not the Windows NT system share names are used. UseSystemShares=Yes is the default. A Windows NT system share name is defined in the Shared As portion of the Sharing tab of the disk or directory folder Properties. Note that the Access Type and Passwords portions of the Sharing tab are ignored by the RM/InfoExpress server. If UseSystemShares=No is specified, only the share names defined in the **rmixsrvr.ini** file [Sharing] section are used.

## Sample RM/InfoExpress Windows NT Server Configuration File

The following is a sample Windows NT server configuration file (**rmixsrvr.ini**).

```
[Debug]
;;;InfoxDebug=DBGFILE

[Sharing]
cdrive=c:\
ShareTemp=d:\tmp\shared\files

[Options]
UseCurrentDirectory=Yes
UseSystemShares=Yes
```

# Appendix E: RM/InfoExpress Security Parameter File Update Utility

This appendix describes how to use the **ixsecure.cob** program to update the **ixpwfile** parameter file with security-related information that is used by the server to authenticate the clients. (The implementation of file security in RM/InfoExpress is detailed in Chapter 6, *File Security on the RM/InfoExpress UNIX Server*.)

The RM/COBOL object program, **ixsecure.cob**, is included with the RM/InfoExpress media to enable users to build the security parameter file, **ixpwfile**. The RM/COBOL runtime system (**runcobol**) is needed to run this object program.

A separate parameter file (**ixpwfile**) is required for each of the client machines and one for the server machine. The parameter file for the client machine generally has many entries, each giving information about this client and one of the many servers with which this client communicates. Similarly, the parameter file for the server machine may have many entries, each giving information about this server and one of the many clients to which this server may be connected.

# Using the Utility

To run the security parameter file update utility, use the following command:

```
runcobol ixsecure
```

If the security parameter file **ixpwfile** is not in the current directory or has a different name, set the IXPWFILE environment variable to the current pathname of the file.

The RM/InfoExpress Security Parameter Update Utility main screen, illustrated in Figure E-1, is displayed.

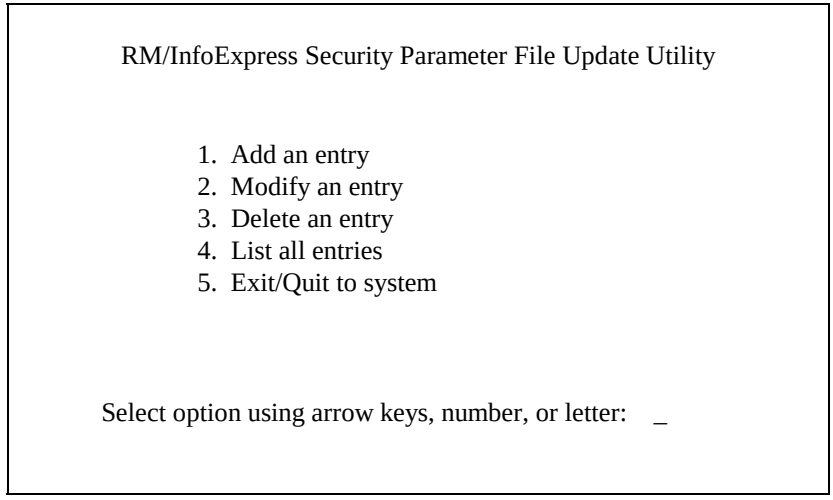


**Figure E-1 RM/InfoExpress Security Parameter File Update Utility Main Screen**

To choose an option on this screen, move the cursor with the arrow keys to a particular option and press Enter. Alternatively, you can type the option number or the first letter of the option description (it is not necessary to press Enter afterwards). To exit the utility program, choose option 5 from the main menu.

**Note** If RM/COBOL finds any errors during any of the operations displayed on the main screen (discussed in more detail in the following sections), a message with the appropriate RM/COBOL runtime error is displayed on the last line of the screen, and the utility waits for acknowledgment.

When the **ixpwfile** is empty (such as the first time this utility is run on a machine), a warning message is displayed and the file is created.

# Adding a New Entry

To add a new entry, choose option 1 on the main screen. The ADD ENTRY screen, illustrated in Figure E-2, is displayed.

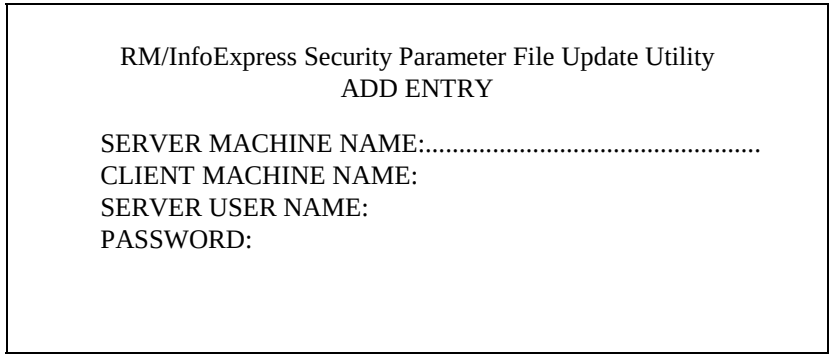


**Figure E-2 RM/InfoExpress Security Parameter File Update Utility ADD ENTRY Screen**

Type the requested information and press Enter on the last line to complete the entry. If you want to cancel the input at any time, press Esc. The utility displays the RM/InfoExpress Security Parameter File Update Utility main screen, illustrated in Figure E-1. Otherwise, the entry will be added to the file.

**Note** If you are creating a security parameter file for an RM/InfoExpress server, the password field on the ADD ENTRY screen should be left blank (simply press Enter in this field). The password in an entry for the server security parameter file is always ignored.

# Modifying an Existing Entry

To modify an existing entry, choose option 2 on the main screen. The MODIFY ENTRY screen, illustrated in Figure E-3, is displayed.

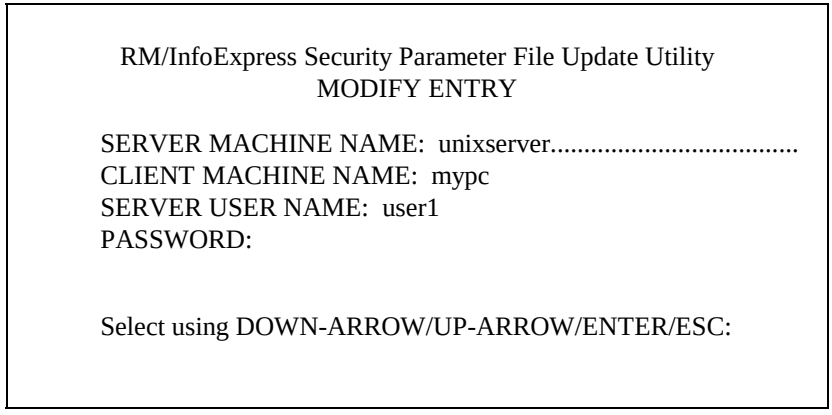


**Figure E-3 RM/InfoExpress Security Parameter File Update Utility MODIFY ENTRY Screen**

Using the arrow keys, choose the entry you wish to modify. Update the information on the screen and press Enter on the last line to complete the entry. If you want to cancel the input at any time, press Esc. The utility displays the RM/InfoExpress Security Parameter File Update Utility main screen, illustrated in Figure E-1. Otherwise, the current entry in the file will be replaced by this information.

# Deleting an Existing Entry

To delete an existing entry, choose option 3 on the main screen. The DELETE ENTRY screen, illustrated in Figure E-4, is displayed.

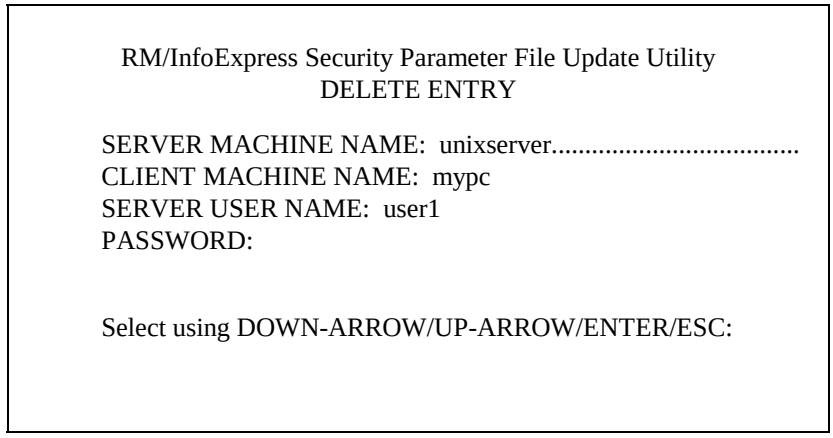


**Figure E-4 RM/InfoExpress Security Parameter File Update Utility DELETE ENTRY Screen**

Using the arrow keys, choose the entry you wish to delete and press Enter. If you want to cancel the input at any time, press Esc. The utility displays the RM/InfoExpress Security Parameter File Update Utility main screen, illustrated in Figure E-1. Otherwise, the current entry in the file will be deleted.

After successful deletion, the following message is displayed for confirmation:

```
Confirm deletion (Y/N)
```

Type Y to confirm deletion. (To abandon the deletion, type N.) The following message is displayed to confirm the successful deletion of the entry from the file:

```
Record deleted successfully.  Press any key...
```

# Listing All Entries

To list all entries in the file, choose option 4 on the main screen. The LIST ENTRIES screen, illustrated in Figure E-5, is displayed showing the following information.

```
                RM/InfoExpress Security Parameter File Update Utility
                                LIST ENTRIES

Server Machine Name    Client Machine Name  Server User Name
unixserver1              mypc                 user1
unixserver2              mypc                 user2




Press any key. . .
```

**Figure E-5 RM/InfoExpress Security Parameter File Update Utility LIST ENTRIES Screen**

Press any key to return to the RM/InfoExpress Security Parameter File Update Utility main screen, illustrated in Figure E-1. If the file contains more entries than can be displayed on one screen, additional screens will be displayed when a key is pressed. When all entries have been displayed, pressing a key will return to the main screen.

**Note** The password information is not displayed.

# Appendix F: Using RM/InfoExpress with Relativity

RM/InfoExpress can be used with Relativity for RM/COBOL to access the catalog and/or files stored on a server running the RM/InfoExpress server program.

This appendix provides separate instructions for 32-bit and 16-bit RM/InfoExpress Windows clients.

**Note** Some earlier versions of Relativity are called Relational DataBridge.

## Changes to Relativity Configuration for 32-bit Windows Clients

The 32-bit RM/InfoExpress Windows client software (**rmtcp32.dll**) is supplied with Relativity version 2.5 and later. It should reside in the Windows System directory. Note that the RM/InfoExpress Windows client software is not supplied with the RM/InfoExpress server software or versions of Relativity prior to 2.5. It is distributed with the RM/COBOL for Windows runtime or development system or, alternatively, it can be downloaded from the Liant web site (www.liant.com) or the Liant bulletin board. Contact Liant technical support for more information.

The configuration procedures that begin on page F-2 assume the following:

- You have the RM/InfoExpress server main program and server screen handler program installed and running on your server machine. (For more information, see Chapter 1, *Installation and Verification.*)
- You have the complete Microsoft TCP/IP software package installed and configured in the Networking option on the Control Panel. (See Chapter 1 for more information.)
- You are running Windows 95, Windows 98, or Windows NT clients.

## Modify the hosts and services Files on the Windows Client

The **hosts** file in the main Windows directory on the client workstation must have an entry for both the client and the server. (If no **hosts** file exists, copy a **HOSTS.SAM** file and amend it as necessary.)

Sample entries are as follows:

```
138.52.123.45   unixware21

138.52.123.67   gertrude
```

The **/etc/hosts** file on the RM/InfoExpress server also must have the same entries for both the server and client. (For more information, see Chapter 1.)

## Create a Configuration File

Create a file, called **rmixclnt.ini**, in the main Windows directory to set configuration parameters for RM/InfoExpress client programs. Include the following entry:

```
[winsock]
UseBlockingIO=Yes
```

This entry prevents a 10055 system error: "No available buffer space".

## Set Up a Relativity Data Source

There are two aspects to configuring the Relativity ODBC data source setup:

1. Configuring Relativity to use RM/InfoExpress.

2. Specifying the location of the Relativity catalog on the server.

All setup options can be configured from the Windows client workstation using the ODBC Data Source Administrator that is distributed with Relativity.

### Configuring Relativity to Use RM/InfoExpress

1. On the Windows client workstation, click the **Start** button, point to **Settings**, and then click **Control Panel**.

2. From the Control Panel, double-click **32bit ODBC** to access the ODBC Data Source Administrator.

3. In the Data Sources dialog box, click **Add**.

4. In the Add Data Source dialog box, select **Relativity for RM (*.rct)** as the driver type.

   The ODBC Relativity for RM Setup dialog box is displayed. It has entries for the data source name and description, as well as buttons to select or create a Relativity catalog.

5. Enter the desired name for the data source (what users will see from their ODBC-enabled application, such as Microsoft Access or Excel).

6. Click **Options** to expand the ODBC Relativity for RM Setup dialog box.

7. In the External Access frame, click the **RM/InfoExpress** check box, which enables its command button.

8. Click **RM/InfoExpress** to display the Setup RM/InfoExpress dialog box.

   The options for “Create - Yes” and “Protocol - TCP” are selected by default.

9. Click **Advanced**.

10. Set the Display Initial Message Box option to **Yes**.

    This is useful when first configuring Relativity to use RM/InfoExpress. A message box will be displayed when RM/InfoExpress is first called. If the message box is not displayed, it indicates that any problems are not network related, but are caused by the software installation. Similarly, if there is a problem but the message box is displayed, the problem is related to the network.

    **Note** After installation is verified, you may return to the Setup RM/InfoExpress dialog box using the 32-bit ODBC Administrator as described in Step 2 and change the Display Initial Message Box option to **No**.

11. Click **OK** to close the Setup RM/InfoExpress dialog box.

## Specifying the Location of the Relativity Catalog on the Server

The way in which you specify the location of the Relativity catalog on the server depends on the version of Relativity that you are using.

### *Relativity Version 2.44 or Later*

Beginning with version 2.44, Relativity provides a facility for specifying a server-based Relativity catalog.

To specify the location of the Relativity catalog on the server:

1. Complete the steps described previously under "Configuring Relativity to Use RM/InfoExpress" on page F-3.

2. In the ODBC Relativity for RM Setup dialog box, click **Options** (if necessary to expand the dialog box) and select the **Access catalog using RM/InfoExpress only** check box.

   The Setup RM/InfoExpress Catalog dialog box is displayed to enable you to specify the complete pathname to the Relativity catalog.

3. Enter the complete pathname.

   You must specify the name in the format *RMInfoExpressServer**PathToFile*, where *RMInfoExpressServer* must match the TCP/IP host name for the server machine on this client (for example, \\HOSTNAME\test.rct). The following example specifies a Relativity catalog called **shirt3.rct** in the directory /**usr/relsamples** on the server **unixware21**:

   ```
   \\unixware21\usr\relsamples\shirt3.rct
   ```

   After you enter a valid RM/InfoExpress server and filename, the Relativity catalog name will be validated and returned to the ODBC Relativity for RM Setup dialog box as the name of the Relativity catalog for the data source.

### *Versions of Relativity Prior to 2.44*

In versions of Relativity prior to version 2.44, the facility for specifying a server-based Relativity catalog did not exist. You must add a "dummy" data source, which is on the client workstation's local drive or network, and then edit the registry settings to point to the correct location, as follows:

1. Complete the steps described previously under "Configuring Relativity to Use RM/InfoExpress" on page F-3.

2. In the ODBC Relativity for RM Setup dialog box, click **Select Catalog** to display the Select Catalog for Data Source dialog box.

3. Select a temporary catalog that is accessible on the client workstation or its network.

   If there is a Windows NT or Novell NetWare network, a single catalog file can be placed in a common drive that is accessible from all the Windows client workstations. Because the Select Catalog for Data Source dialog box does not allow you to enter a server-based catalog location, you must initially define the source as a Relativity catalog on the client workstation's local drive or network. The sample files installed with the Relativity Designer contain a sample catalog that may be used.

4. Click **OK** to close the Select Catalog for Data Source dialog box.

5. Click **OK** to close the ODBC Relativity for RM Setup dialog box.

6. Click **Start** on the task bar and select **Run**.

7. Type the program name, **regedit**, to run the Windows System Registry Editor, which allows you to view, modify, import, and export configuration information particular to this client workstation.

   **CAUTION** We *strongly* recommend that you make a backup copy of your Windows System Registry prior to making any modifications.

   The key for **system data sources** is as follows

   ```
   HKEY_LOCAL_MACHINE\SOFTWARE\ODBC\ODBC.INI
   ```

   The key for **user data sources** is as follows:

   ```
   HKEY_CURRENT_USER\Software\ODBC\ODBC.INI
   ```

   **Note** Early versions of Microsoft ODBC do not separate data sources into user or system types. If you have an early version, use the key for system data sources, that is, HKEY_LOCAL_MACHINE.

8. After opening the desired ODBC.INI key in Step 7, click the name of the data source you want to configure and double-click **Catalog** when it is displayed on the right side of the screen.

   The Edit String dialog box is displayed.

9. In the **Value** box, type the complete path to the Relativity catalog.

   You must specify the name in the format *RMInfoExpressServer**PathToFile*, where *RMInfoExpressServer* must match the TCP/IP host name for the server machine on this client (for example, \\HOSTNAME\test.rct). The following example specifies a Relativity catalog called **shirt3.rct** in the directory **usr\relsamples** on the server **unixware21**:

   ```
   \\unixware21\usr\relsamples\shirt3.rct
   ```

This completes the 32-bit Windows client configuration.

### Verify TCP/IP Network Communication

Make sure the client and server can communicate across the network. If functions such as **telnet**, **ping**, and **ftp** work as expected, the system should be able to support using RM/InfoExpress with Relativity.

# Changes to Relativity Configuration for 16-bit Windows Clients

The 16-bit RM/InfoExpress Windows client software (**rmclntcp.dll**) is supplied with Relativity version 2.5 and later. It should reside in the Windows System directory. Note that the RM/InfoExpress Windows client software is not supplied with the RM/InfoExpress server software or versions of Relativity prior to 2.5. It is distributed with the RM/COBOL for Windows runtime or development system or, alternatively, it can be downloaded from the Liant web site (www.liant.com) or the Liant bulletin board. Contact Liant technical support for more information.

The configuration procedure assumes the following:

- You have the RM/InfoExpress server main program and server screen handler program installed and running on your server machine. (For more information, see Chapter 1, *Installation and Verification.*)
- You have the complete Microsoft TCP/IP software package installed and configured in the Network option on the Control Panel. (See Chapter 1 for more information.)
- You have already defined a sample Relativity data source.

## Access the Relativity Catalog on the Server

For Relativity to access the catalog on the server machine using RM/InfoExpress, follow these steps:

1. Add the following section to the file **reldbms.ini** in the Windows directory on your client workstation:

   ```
   [RMFileManager]
   ExternalAccessRMCLNTCP=Create,I
   ```

   The string, "RMCLNTCP", appended to the string, ExternalAccess, indicates that the RM/InfoExpress Windows client software (**rmclntcp.dll**) is to be used.

   The value, "Create", controls the creation of new files using RM/InfoExpress.

   The value, "I", indicates that the client should display the diagnostic message box when it is loaded the first time.

2. Edit your **c:\windows\odbc.ini** file and add an entry to point to the Relativity catalog on the server machine. For example, add the following entry to the section named [SAMPLE] in the file **odbc.ini** in your Windows directory as follows:

   ```
   [Sample]
   ....
   Catalog=\\srv\usr\relsamples\sample.rct
   ....
   ```

   where *sample.rct* is the name of the Relativity catalog and *srv* is the name of the server machine running the RM/InfoExpress server software. **usr\relsamples\sample.rct* is the pathname of the Relativity catalog on the server machine.

# Appendix G: Using RM/InfoExpress with RM/plusDB

Beginning with RM/COBOL version 6.09, a UNIX shell script, **customiz**, replaces **makefile**. **customiz** allows the user to customize RM/COBOL with different software components. One major advantage of using **customiz** is that it allows the RM/InfoExpress UNIX server to be built with RM/plusDB, the RM/COBOL relational database interface.

For a description of **customiz** and the procedure to build the RM/InfoExpress UNIX server with RM/plusDB, refer to Appendix D, *Customizing RM/COBOL for UNIX*, in the *RM/COBOL User's Guide*.

## Advantages

Until now, the scope of RM/plusDB applications was limited to the UNIX server machine running the database software. However, if you use RM/InfoExpress with RM/plusDB, RM/COBOL applications can be run on different client machines (such as UNIX and Windows) and access records in the database on the UNIX server machine with no changes to the application.

### Tips

- The relational database management system (RDBMS) software must be running on the UNIX server machine when the RM/InfoExpress UNIX server software is started.
- The RM/plusDB environment variables should be set on the UNIX server machine before starting the RM/InfoExpress UNIX server software. Normally, the environment variables required include PLUSDBLIST, PLUSPATH, PLUSDICO, PLUSCOUNTRY, PLUSSQL and PLUSMAPFILE. PLUSMAPFILE should be set to point to a file (for example, setenv PLUSMAPFILE db.map, in case of csh) which helps map uppercase table names to lowercase.

**Note** The RM/InfoExpress UNIX server translates pathnames depending on the -c option (see the "Starting the RM/InfoExpress Server Program" section in Chapter 4, *Using RM/InfoExpress with RM/COBOL for UNIX Programs*) specified at the time of invocation. The following is an example of the map file:

```
TESTDB TESTIO testio
TESTDB TESTNUM testnum
TESTDB TESTDEPT testdept
```

where *TESTDB* is the name of the database, *TESTIO, TESTNUM*, and *TESTDEPT* are the table names defined in the database, and *testio, testnum* and *testdept* are the alternative uses. Refer to the *RM/plusDB User's Guide*, version 2, for more information on setting up the environment.

- Start the RM/InfoExpress UNIX server with RM/plusDB software using the -b option (see Chapter 4):

  ```
  rmservertcp -b
  ```

  where the -b option allows the RM/InfoExpress UNIX server to check each filename for an RDBMS table name before opening the RM/COBOL data file. Additional server options may be specified, if necessary, at the time of the invocation of the server. rmservertcp is the name chosen when linking the RM/InfoExpress UNIX server with the RM/plusDB executable using the **customiz** shell script.

- Start the RM/InfoExpress UNIX server screen handler software using the following command:

  ```
  rmdisptcp
  ```

- Before starting the RM/plusDB application on the client machine, set the environment on the client machine to point to the database table on the server machine. For example, to access the TABLE named TESTIO on the UNIX server machine named rmsrvr, add an entry in the **runcobol.ini** file (if the client machine is running on Windows) as follows:

  ```
  TABLE=//rmsrvr/TESTIO
  ```

  The definition must have the following form:

  ```
  synonym=//server_name/table_name
  ```

  **Note** No RM/plusDB-specific configuration or environment setup is required on the client machine.

# Index

## D



## E



## F



## H



## I

## K



## L



## M



## N



## O



## R

## S

## T



## U



## V



## W