



Installing and Configuring

Interactive COBOL

on Windows[®]

Revision 5.40

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PREFACE

Scope

This manual provides the information needed to install and configure the Interactive COBOL product on Windows®.

The complete documentation for Interactive COBOL includes the following manuals:

Installing and Configuring Interactive COBOL on Linux (011-00402)

Installing and Configuring Interactive COBOL on Windows® (011-00403)

Provides the appropriate sections necessary to properly install and configure Interactive COBOL in the given environment.

Interactive COBOL Utilities Manual (011-00300)

Provides a simple guide to all the user visible utilities.

Interactive COBOL Language Reference & Developer's Guide (011-00100)

Provides the complete COBOL syntax supported by Interactive COBOL. Shows how to use the development tools including the compiler and IDE. It also explains how the COBOL runtime works including its internal system calls, builtins, and how to program across the multiple environments supported by Interactive COBOL.

sp2 panel Editor

Provides how to develop and use the Interactive COBOL sp2 User Interface (GUI) Development System.

COBOL FormPrint

Provides how to use the FormPrinter Editor to setup printers.

Readic.txt and Notesic.txt

Provides up-to-date release notes for the product that describes new features, bug fixes, known problems, and other product information on a version-by-version basis.

Terms

This document will use several terms which it will define as generic names to describe several individual products.

ICOBOL refers to any of the Interactive COBOL products unless otherwise stated.

ICOBOL/Windows refers to **ICOBOL** on a supported version of the Windows operating system.

Windows will be used to collectively refer to various versions of the Windows operating system. As of ICOBOL 5.40 and this manual, the supported versions are Windows Server 2008 R2 through Windows Server 2019 and Windows 7 through Windows 10.

PC refers to any style of personal computer based on the Intel x86 microcomputer architecture that runs Windows or a Linux-compatible operating system.

RDOS refers to the Data General operating system RDOS.

DG refers to Data General Corporation.

I. INTRODUCTION

This manual will discuss:

- 1) how to install the Interactive COBOL product,
- 2) how to configure the execution environment, and
- 3) how to start COBOL programs.

A. Product Overview

The Interactive COBOL product set is composed of several products: The Interactive COBOL Runtime System, the Interactive COBOL Development System, the Interactive COBOL GUI Development System, the FormPrint Editor, the Interactive COBOL ODBC Driver, the Interactive COBOL Client/Server facility, and the cgiCOBOL runtime.

The Interactive COBOL Runtime is the product which runs standard Interactive COBOL programs along with the needed utilities. The Runtime System is all that is needed to distribute Interactive COBOL applications that do not need development capabilities.

The Interactive COBOL Development System adds the Interactive COBOL compiler(ICOBOL), along with an Integrated Development Environment (ICIDE) to the Runtime System. The Development System allows COBOL applications to be built and debugged..

The Interactive COBOL GUI Development Systems provides the sp2 Panel Editor (ICSP2) and other needed files to allow graphical screens to be developed for deployment on Windows. The runtime support for “panels” created with the sp2 Panel Editor is provided in the Windows runtime releases and in Linux runtime releases when communicating with Windows ThinClients..

The Interactive COBOL FormPrint Editor (ICQPRW) allows printer forms to be designed for use on Windows. It allows the complexities of such forms to be somewhat isolated from a COBOL program, yet still enables a COBOL programmer to have close control over the form directly from a program using standard COBOL code. The runtime support for “panels” created with ICQPRW is provided in the Windows runtime releases and in Linux runtime releases when communicating with Windows ThinClients..

The Interactive COBOL Client/Server facility (ICNETD) is a server that provides the server side support for both the thick-client and thin-client client/server offerings across a network between Linux and Windows machines. It provides thick-client support with the ICIOS server, ThinClient support with the ICRUNRS server, remote logging support with the ICLOGS server, and remote SQL access with the ICSQLS server..

The cgiCOBOL runtime (ICRUNCGI) enables the use of **ICOBOL** programs as Common Gateway Interface (CGI) scripts, initiated by a web server in response to a browser request. CgiCOBOL programs can be written using standard ANSI COBOL syntax.

Interactive COBOL on Windows provides both 32-bit and 64-bit native application that requires either Windows Server 2008, Windows Vista, Windows 7, Windows 8+. Most Interactive COBOL on Windows executables are provided as console applications.

Interactive COBOL licenses are available in models ranging from one(1) to 2049 users.

An Interactive COBOL on Windows license is keyed to a particular unique number. In most cases this number is provided by the MAC address of the network card (NIC) on the machine. In other cases, it is provided by a parallel or USB protection device provided with the license. The actual license gives the maximum number of active users to be logged on simultaneously to the runtime along with any options or additional products licensed for use by an installation. Licenses can be shared over a network with other Windows and/or Linux machines.

Installing and Configuring Interactive COBOL on Windows

The Interactive COBOL on Windows runtime supports Microsoft and compatible networks allowing file sharing among various Interactive COBOL on Windows users on multiple nodes (or workstations) on the network using standard Microsoft type locking.

B. How to Read this Manual

The manual is laid out such that it can be read in sequential order. Version-specific product details are not typically included in this manual, but rather in the readme files that accompany each release. They can be downloaded separately from the website and read before proceeding with Chapter II, or they can be read from the installed system after the installation has been completed.

Begin with the Installation Chapter (Chapter II), which describes how to install Interactive COBOL on Windows, any changes needed to the operating environment, and tips and techniques to get the most from your system.

Chapter III describes how to use the **ICOBOL** service manager (ICSVCMGR) on Windows.

Proceed with the Licensing (ICPERMIT) Chapter (Chapter IV), which describes how Interactive COBOL is licensed and how to use the Interactive COBOL License Server (ICPERMIT).

Continue the installation process by reading either the ICEDCFW Chapter (Chapter V) or ICCONFIG Chapter (Chapter VI), which describes how to operate the Interactive COBOL configuration utility to prepare a configuration file, printer translation file, and/or Terminal description file for the Interactive COBOL runtime.

Proceed with the ICEEXEC Chapter (Chapter VII) which describes how to start and stop the Interactive COBOL Executive process (ICEEXEC) which reads the configuration file and provides shared resources used by the product.

Proceed with the Starting ICRUN Chapter (Chapter VIII), which describes how to start and stop the Interactive COBOL runtime.

Chapters IX describes ThinClient support.

Chapter X describes some tuning tips for Interactive COBOL.

Chapter XI describes the default ICTERM definitions.

The APPENDIX section contains various information including an ASCII Chart, an RS-232C discussion, Support suggestions, etc., which can be used as reference material.

C. Operating Environment

C.1. General Concepts

The Interactive COBOL system has been designed to provide an application operating environment that works as consistently as possible among several different operating system environments. This consistency is expressed in a few key concepts that have their roots in the UNIX operating systems. If you have used UNIX, the concepts may already be familiar to you.

The first concept is that programs communicate with their operating environment through three input/output streams or files: standard input (stdin), standard output (stdout), and standard error (stderr). Programs can read data to be processed from stdin, process it in some way, and write the results to stdout. They report errors to stderr. By default most systems connect stdin to the console keyboard and both stdout and stderr to the console display.

Many utilities, especially in the COBOL environment, must process complex data files that do not fit this simple model and so they do not often use stdin for the data to process. However, the stdout and stderr files are still very

useful. They allow the utility to logically separate error reporting from reporting the results of processing. For example, the ICSTAT utility reports statistics about ICISAM files. It reports these statistics to stdout. If an error occurs, for example one of the command arguments does not exist, the error is reported to stderr.

The second concept is the ability to redirect i/o files from the default files to another file or device. The system provides a very simple way to redirect these standard files in the command processor by using the special characters '<' and '>'. When stdout is redirected to a file, it provides a simple mechanism to capture the output of a utility. See your operating system documentation for more on this concept. A variation of this concept is the ability to use the output of one program as the input to another program. This is called piping and uses the special character '|' between the two program names.

The third major concept is the ability to customize the operation of specific programs by setting information in items called Environment Variables. Environment variables have a name and a value like program variables or data items. The difference is that these variables are managed by the command processor and operating system. The utility programs can ask the operating system whether a particular environment variable is set or not, and what its value is. They are most often used to set default operating options, or the locations of important files. For example, all Interactive COBOL Windows executable programs look for the environment variable ICROOT as the base directory for finding the installation files. Customized system files can be found by using the ICCONFIGDIR environment entry. Each ICOBOL utility also looks for command-line options in an environment variable by its own name, e.g., ICREORG looks for an environment variable named ICREORG. Windows provides environment variables through its command processor.

During the Interactive COBOL installation, several pseudo-environment variables are configured into the Windows registry for use by Interactive COBOL programs if they do not find the environment variables maintained by the command processor. These entries include ICCODEPATH, ICROOT, and ICCONFIGDIR and they are set to point to the installation directory of Interactive COBOL.

Environment variables are maintained in the command processor. Environment variables are setup with a command like:

```
SET ICSMTPSERVER=192.168.0.1
  or
SET ICRUN=-ip
```

On Windows, common environment variables can be configured into the Registry. From the **Start** menu, choose **Settings, Control Panel**. From **Control Panel**, select **System**, and then pick the **Environment** tab. In this sheet, either system-wide or user-specific environment variables can be configured.

C.2. Directory Structure

The Interactive COBOL software is installed by default in the "program files" directory with the name "icobol". This directory can be installed wherever is most appropriate or convenient for your system and should be included on your PATH.

The main directory contains all of the Windows executable programs, the *readme* file(s), and supplied COBOL executable programs. One subdirectory is called *help*. The help subdirectory contains help (.hf) files for all the Windows executable programs defined as <command>.hf. There may be additional directories with other miscellaneous files, see the appropriate *readme* files for a list of all the actual files. Descriptions that start with (Dev) are part of the development system.

Installing and Configuring Interactive COBOL on Windows

<u>Main Directory</u>	<u>Sub-Directories</u>	<u>Description</u>
icobol		Main executables, .dlls, and needed files
	docs	All documentation, readme files
	examples	Various examples
	cgi	Cgiruntime, scripts, examples
	config	various configuration files, .pti, messages
	icodbc	sample ICISAM odbc files
	print	various pdf sample backgrounds
	programs	Examples, login, sp2logon, isqltest, ...
	qpr	Formprint examples
	sp2	Sp2 examples
	help	Help files (.hf)
	icnet	Server surrogate files
	install	Install information
	qpr	(Dev) Gui-printer development (Formprint) (ICQPRW)
	card	qpr files in card format
	crt	qpr files in crt format
	sentinel	Rainbow sentinel device files
	sp2	(Dev) Gui-screen development (ICSP2)
	card	sp2 files in card format
	crt	sp2 files in crt format
	uninstall	Uninstall information
	x86	On a 64-bit os this holds all the matching 32-bit executables

Installations previous to 4.70 had a *print* sub-directory for printer translation (.pti) files and background .pdf files and a *term* sub-directory for terminal description (.tdi) files. The default versions of .pti and .tdi files are now built into the runtimes and any customized file(s) should be stored in a directory that is specified by the ICCONFIGDIR environment entry.

Windows executable programs require the corresponding help file to be available in order to display their help text. If it is not available, an error message will be displayed that it could not find the help file. The help file uses the ICCONFIGDIR or ICROOT environment variables to find the needed file. Help files are sought via the following steps:

```
%ICCONFIGDIR%\help\command.hf
<installdir>\help\command.hf
%ICROOT%\help\command.hf
<curdir>\<i>command.hf
```

C.3. ICEXEC Control Program

The Interactive COBOL system uses a control program called ICEXEC to coordinate shared multi-user access to system resources. The following executables **require** the shared area that ICEXEC manages:

icrun, icrunw	icios	(I/O server started by icnetd)
icrunsgi	icrunrs	(ThinClient server started by icnetd)
icsmview	icwhoas	

All other Interactive COBOL executables can operate with or without ICEXEC.

D. Conventions

Another aspect of providing a consistent system across multiple operating platforms, is in the command-line interface. The Windows executable programs use a common command-line syntax across all platforms, and they adhere to the following standard conventions:

- 1) all switches are composed of a single letter or digit preceded by a hyphen (-) (or optionally a forwardslash (/) on Windows);
- 2) the switches are order independent;
- 3) the switches ARE case sensitive;
- 4) lower-case switches imply an action or modification of an action, e.g., '-h' for help;
- 5) UPPER-CASE switches imply an action with a required argument that must follow with an intervening space, e.g., '-A audit.log' for setting up an auditfile called audit.log.
- 6) multiple lower-case switches can be combined with one hyphen, e.g., '-axz' for '-a -x -z'.

The following shows how the various conventions for defining syntax will be represented in the Interactive COBOL documentation:

- [] Brackets enclose optional portions of a format. One of the options contained within the brackets may be explicitly specified or that portion may be omitted.
- { } Braces enclosing a portion of a format means that one of the options contained within the braces must specified.
- | Bar will be used to separate choices when multiple choices are allowed.
- ... Ellipse indicates that the previous item can be repeated one or more times.
- italic-lower-case* Indicates a generic term representing a value that is defined as indicated.

E. Common Switches

E.1. Overview

There are several common switches that appear on all ICOBOL executable programs except for ICINFO. These are described in detail in the following sections so that the descriptions for each program can be abbreviated. The command-line switch processor scans all the command-line switches, checking for errors. Any errors display an abbreviated startup banner (the program name and revision) to stdout before displaying the error message to stderr and then exiting with a non-zero exit code. If there are no errors to terminate processing prematurely, the common switches are processed. First, if the Help switch is given, an abbreviated startup banner and help text are displayed to stdout after which the program exits normally (i.e. no other switches or arguments are processed). Next, if the Audit switch is given, auditing is enabled. Finally, the Quiet switch, if given, is processed. The program then begins

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its specific processing by emitting a startup banner, consisting of the program name, revision level, system, and the copyright notice. When the program finishes processing, it will emit a trailer message indicating that it is done.

E.2. Audit Switch

The Audit switch will be shown in the syntax as:

```
-a[:aflag] | -A file|dir[:aflag]
```

Where *aflag* is a|b|d|p|t|u|da|db|pa|pb|ta|tb|ua|ub and modifies auditing as:

- a Append. If the file exists, do Not truncate the file, just append. The Append flag can be used alone or with the Date, Pid, Time, or Username flags.
- b Backup. If a previous log file (.lg) exists, rename it to *.lgb and then open a new .lg file. The Backup flag can be used alone, or with the Date, Pid, Time, and Username options. On Linux, this will break hard links.
- d Date. Add date in the form of YYYYMMDD before the .lg extension.
- p PID. Add pid in the form of NNNN before the .lg extension.
- t Time. Add time in the form of YYYYMMDDHHmmssh before the .lg extension. (YYYY-year, MM-month, DD-day of the month, HH-hour, mm-minute, ss-second, hh-hundredths of seconds.)
- u Username Add username in the form _name before the .lg extension.

NOTE:

- 1) On Windows, the option "-A c:a" will be treated as open file "c" in append mode in the current directory. Previously this would have been open file "a" in the current directory of drive C:. To get the old behavior, enter

```
"-A c:.\a"
```

The audit flags (a,b,d,p,t,u) instruct the Audit processing to take a different action than the default for the audit file. The default action is the same as usual, truncate the file to zero on startup.

NOTE:

- a Audit to the default file for this command.
- A *file* Audit to the specified file.
- A *dir* Audit to default file in the specified directory.

Audit files contain a copy of any output that was sent to either stdout or stderr, in the same order as it was emitted at execution time (i.e., it may be interspersed). The programs handle this internally, so stdout and stderr can still be redirected. The audit file can be specified to use the default name in the current directory (-a), a user specified name (-A *file*), or the default name in a specified directory (-A *dir*). An audit file is always created if it does not already exist. If it does exist, it is truncated to zero unless the Backup flag is set.

The default audit file name is <command>.lg.

An enhanced auditing facility is available when required. This facility provides verbose messaging and should not be used in a production environment.

The Enhanced Auditing syntax adds the *tflag* options as shown below:

```
-a[:aflag][:tflag][:tflag]...]      Audit to <program>.lg  
-A path[:aflag][:tflag][:tflag]...]  Audit to file path, or path/program.lg if path is a directory
```

aflag is a|b|d|da|db|p|pa|pb|t|ta|tb|u|ua|ub

a=append, b=backup, d=timestamp, p=process-id, t=timestamp, u=username

tflag is ALL|FILE|ICNETD|IND|MPX|NET|PDF|PGM|REL|SEQ|SP2|SQL|SYSERRS|WEB

ALL enables all sub-system enhanced tracing options.

FILE provides statistics and tracing for lower level file operations (this is very verbose and mostly only useful when requested by Support),

ICNETD provides enhanced tracing for ICNETD,

IND provides Indexed i/o statistics and open/close tracing,

MPX provides enhanced tracing when using network multiplex i/o from the runtime, icrunrc, icodbcd (any program that uses the network),

NET provides for enhanced network tracing for any network traffic,

PDF provides enhanced tracing when using the PDF facility from the runtime,

PGM provides CALL/EXIT/CANCEL tracing, (including builtins),

REL provides relative i/o statistics and open/close tracing,

SEQ provides sequential i/o statistics and open/close tracing,

SP2 provides enhanced tracing when using SP2 or QPR from the runtime or icrunrc,

SQL provides enhanced tracing when using ISQL from the runtime,

SYSERRS provides enhanced tracing for System errors,

WEB provides enhanced tracing when using any internet type facility like email from the runtime.

These trace flags for enhanced auditing should be used when requested by support or to track down problems as the logs can be very verbose.

E.3. Quiet Switch

The Quiet switch will be shown in the syntax as:

-q

The Quiet switch works by suppressing all output that is emitted to stdout. The most obvious effect is that it suppresses the usual banner and trailer messages that are emitted to stdout as the program starts and terminates. Because it is suppressing stdout, the Quiet switch may also suppress other parts of the usual output.

E.4. Help Switch

The Help switch will be shown in the syntax as:

-h|-?

The Help switch displays a summary of the command-line syntax, the switches and what they do, and the applicable environment variables.

F. Filename Extensions

Interactive COBOL requires that the extension for certain specific types of files to match those given in the following table except for those marked *defacto*. Those marked *defacto* are only the most common extensions used for these purposes and not required. All Interactive COBOL release files will conform to these *defacto* standards.

Those extensions marked as this sentence is marked are extensions in some older revision of Interactive COBOL or ICHOST but are handled in some special cases by current Interactive COBOL utilities.

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Common extensions used by Interactive COBOL include:

<i>.CD</i>	<i>old ICHOST COBOL program file</i>
<i>.CF</i>	<i>old Configuration file (pre 3.30)</i>
.CFI	Configuration file (.ini format)
.CL	Library file
.CO	COBOL Source programs (card format) (<i>defacto</i>)
.COB	AOS/VS COBOL text-format source
.CX	COBOL Program file
.DT,.NT	Pair of files, ICPACK data and index temporary files
.ER	Error file (<i>defacto</i>)
.FA	File attribute file
.FP	Failsafe protection file
.GSY	Global symbol file for the IDE
.HF	Interactive COBOL help files
.ICP	Project files for the IDE
.LG	Audit / Log file (<i>defacto</i>)
.LGB	Backup Audit / Log file (<i>defacto</i>)
.LK	Link file
.LS	List file (<i>defacto</i>)
.MS	Message file
<i>.PD,.DD</i>	<i>Pair of files, Data General revision COBOL program file (program and data)</i>
.PQ	Printer control file
<i>.PT</i>	<i>old Printer translation file (pre 3.30)</i>
.PTI	Printer translation file (.ini format)
<i>.RP</i>	<i>old Remote protection file (MS-DOS only)</i>
.SD	ICRUN Sort data file (temporary)
.SR	COBOL Source programs (text format) (<i>defacto</i>)
.ST	ICRUN Sort tag file (temporary)
.SY	COBOL Symbol table file
<i>.TD</i>	<i>old Terminal description file (pre 3.30)</i>
.TDI	Terminal description file (.ini format)
.TMP	Temporary file (<i>defacto</i>)
<i>.UDB</i>	<i>U/FOS database (pre 5.30)</i>
.XD,.NX	Pair of files, ICISAM file (data and index portion)
.XCO	COBOL Source programs (extended card format) (<i>defacto</i>) (New in 5.40)
.XDB	ODBC database definition file (.ini format)
.XDT	ODBC table definition file (.ini format)
<i>.XL</i>	<i>Log file (pre 5.40)</i>
<i>.XLG</i>	<i>Generation log file (pre 4.00)</i>

G. Exit Codes

All Windows executable programs return exit codes that provide an indication of the success or failure of the program. These are returned into ERRORLEVEL on Windows. In general, the following codes will be returned:

- 0 The program completed without errors.
- 1 The program ran, but some items it processed had errors. For example, ICCHECK checked a series of files, and some of them were corrupt.
- 2 The program was running, but was terminated by an operator interrupt or external abort.
- 3 The program was running, but was terminated by some fatal internal error. For example, the compiler was running but detected that its virtual memory manager had run out of memory unexpectedly.
- 4 There were command-line errors and so the program did not perform any of the requested functions.
- 5 The user was not authorized to execute the program or perform a requested operation, so the program did not run.

- 6 The program experienced an error during its initialization phrase and could not execute. For example, it could not allocate sufficient memory to perform its function.
- 7 Help was requested.
- 8-9 Reserved for future 'common' errors.
- 10- These codes are specific to each program and will be documented with each program.

All of the programs support exit codes 0 through 9 with the meaning described above.

H. Common Environment Variables

H.1. Overview

There are several common environment entries that most Interactive COBOL executable programs use. These are described in detail in the following sections so as to not be duplicated under all program descriptions. Other environment variables that are more program specific will be described under each program.

On Windows, common environment variables can be configured into the registry. From the **Start** menu, choose **Settings, Control Panel**. From **Control Panel** select **System**, and then pick the **Environment** tab. In this sheet system or user specific environment variables can be configured.

H.2. ICROOT

ICROOT specifies the Interactive COBOL root directory. *ICROOT* is used to find the various directories (help, sp2, qpr, ...).

The syntax is:

```
ICROOT=dir
```

Where

dir

Specifies the directory where to find the various Interactive COBOL directories. Usually this should be set to the directory where the current revision is installed.

If *ICROOT* is not set, then the *ICROOT* that was stored in the registry at startup is used.

H.3. ICCONFIGDIR

(Added in 4.70)

ICCONFIGDIR specifies a directory for customized system files. If *ICCONFIGDIR* is specified, it will be used to find any customized help, messages, print, or term files. If not found, *ICROOT* will be used. *ICCONFIGDIR* provides a mechanism to have customized versions of system files that are not affected by the installation of a newer version of **ICOBOL**.

The syntax is:

```
ICCONFIGDIR=dir
```

Where

dir

Specifies the directory where to find the customized system entries from help, messages, print, and term.

If *ICCONFIGDIR* is not set, then *ICROOT* is used.

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H.4. ICTMPDIR

ICTMPDIR specifies a directory to which programs may write any temporary files.

The syntax is:

```
ICTMPDIR=dir
```

Where

dir

Specifies a valid pathname for the directory in which any needed temporary files are to be written.

If *ICTMPDIR* is not set, the current directory is used.

Some programs that use the *ICTMPDIR* environment variable are *ICRUN*, *ICRUNRS* and *ICSORT*.

In a network environment, *ICTMPDIR* should be used on each workstation to point to a local disk to reduce network traffic.

H.5. ICPERMIT_MACHINE

ICPERMIT_MACHINE specifies the default license server machine and TCP/IP port.

The syntax is:

```
ICPERMIT_MACHINE=machine[:port]
```

or

```
ICPERMIT_MACHINE=:port
```

Where

Machine

Specifies an ip-address or a machine-name on which an *ICPERMIT* license server is running. The default is the current machine (localhost).

Port

Specifies the TCP/IP port which *ICPERMIT* is using. The default is 7334. The license server and the clients **MUST** use the same port.

Some of the programs that look for the *ICPERMIT_MACHINE* environment variable are *ICOBOL*, *ICRUN*, *ICRUNW*, the *ICNETD* servers (*ICIOS*, *ICRUNRS*, *ICSQLS*), *ICPERMIT*, *ICODBCDR*, and any other **ICOBOL** licensed executables.

H.6. Executable Name

All Windows executable utilities support an environment variable of the same name as the utility in upper-case. For example, 'iccheck' will recognize the variable *ICCHECK*. The environment variable can contain command line options for the utility which will be processed prior to any options actually present on the command line. If such an environment variable is present, the utility will display the complete set of options at startup.

I. Reporting Problems

If you have problems, please first review the manual to recheck your installation and operation. Next check APPENDIX C for a list of general problems to see if any discuss your particular incident. Next review the moments just before the problem occurred to see if you changed anything, i.e., changed the configuration file, added a new device driver, changed attributes, etc.

If your problems still persist, email us at support@icobol.com with a description of the problem. Please include the information listed below:

- 1) Describe only one problem at a time
- 2) **Send a copy of the output of ICINFO from the system with the problem.** The latest revision of ICINFO can be downloaded from the web site (www.icobol.com). If the system in question is an older version, make sure to inform us which version of ICOBOL has the problem.
- 3) If the problem is a COBOL problem, a simple test program that reproduces it should be provided. The shorter the better. Include the source and .CX files for the program, along with any data files needed. If this program requires user input (name, password, data-entry, etc.), please provide a script for how to logon and duplicate the problem.
- 4) If data files are being corrupted then please send 'before' and 'after' images of the file.
- 5) If the problem is with a utility, send the exact command line of how the utility was invoked.
- 6) For problems involving devices such as terminals, printers, etc., please send a copy of the current configuration file.
- 7) Media should be in compressed tar (.tgz) format. If it is too large to attach to an email, you can request a link from us to be able to upload the file to us.

Other items that would be helpful to include are:

Is the problem repeatable?

Can you work around the problem?
If so, how?

What is the easiest way to get the problem?

What is the importance of obtaining a solution to the problem?
(Urgent, moderate, low, nuisance)

II. INSTALLATION

A. Introduction

This chapter describes how to install the Interactive COBOL on Windows release along with general guidelines for use on Windows. The Interactive COBOL on Windows download full release (for 5.40, win540.exe) includes all parts (runtime, development, ICSP2, ICQPRW, ICODBC, ICNETD, ICIDE) of the Interactive COBOL release. All or portions can be installed as needed for a particular installation. Separate (smaller) versions are available that **ONLY** includes the Runtime and ThinClient client portions (winXXXr.exe) or just the ThinClient client portion (winXXXtc.exe) respectively.

After installation, either the ICCONFIG or ICEDCFW utility should be run to build custom configuration file(s) (.CFI), any custom terminal description files (.TDI), and any custom printer translation files (.PTI) that are required for execution.

A runtime-only installation uses about 10MB while a full install can take upwards of 80MB. The installation program ensures that enough disk space is available to install the selected components.

Installation must be done on every machine that is to use ICOBOL even if the software is to be used from a remote machine as this allows the registry, appropriate shortcuts, and file associations to be set on each machine.

An install for the same revision can be run several times to ADD additional components or to CHANGE any of the selection values that the install program prompts for. An install SHOULD NOT remove pieces that have already been installed as this could lead to a corrupt install.

Batch/scripted installs can be done and more information is shown on page [37](#) for those installs.

B. Software Installation

B.1. Introduction

This section provides the necessary steps to get the Interactive COBOL on Windows software installed.

Interactive COBOL on Windows is available as a self-extracting executable. The installation packages for Interactive COBOL on Windows are available for download via a browser from our website at <http://www.icobol.com/download/current.php>.

If a revision of Interactive COBOL on Windows **before 2.50** is installed, it must be removed before installing newer revisions of Interactive COBOL. This can be done using the **Add/Remove programs** from the **Control Panel** and selecting Interactive COBOL.

On Windows, installation can only be done by Administrators.

NOTE: The installation will use the directory pointed to by the environment variable TEMP. If this temporary directory cannot be accessed, an appropriate message will be issued. Log files for both the install and uninstall will also be written to this directory. Their default names are: “**ICOBOL 5 Setup Log.txt**” and “**ICOBOL 5 Uninstall Log.txt**”.

When updating a revision on Windows, all running **ICOBOL** services will be stopped and re-started.

The installer checks for a previous revision. If a previous revision is detected that does not have its install information available, the installation prompts you to CANCEL the install and remove the old revision. If the install information is available, (by reading a previous install.txt file for revisions before 5 or by reading the registry) then that information is used to pre-load all the needed prompts in the installation.

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Current installers include:

winXXX.exe	Master (Full) installer, allows all features
winXXXr.exe	Runtime-only installer
winXXXtc.exe	ThinClient client installer

Where *XXX* represents the revision of the product.

To do a quick upgrade of an already existing **ICOBOL 5** install using the same settings as currently installed all that needs to be done is:

```
winXXX /u
```

(Note this option cannot be used to upgrade from **ICOBOL 3** or **4** to **ICOBOL 5**.)

B.2. Execution

The syntax for the installation program when using the self-extracting .exe is shown below:

```
winXXX.exe [/r] | [/S:<pathname>] | [/u]
```

Where

/r	Record mode. Writes a script file (.ini to be used later for an install with no prompting (silent). The filename will be prompted for at the end. Default is MasterSettings.ini in the current user's Documents folder.
/S:<pathname>	Silent(scripted) mode. Reads a script file previously produced by a Record mode. Allows for unattended or batch type installs. During a silent install, no user requested prompts are made.
/u	Update mode. If a valid ICOBOL 5 revision is already installed, Update will perform a silent/batch update using the exact same information that is currently installed. When updating a revision, all services will be stopped, the update performed, and then the services will be re-started.

Switches must be separated by spaces.

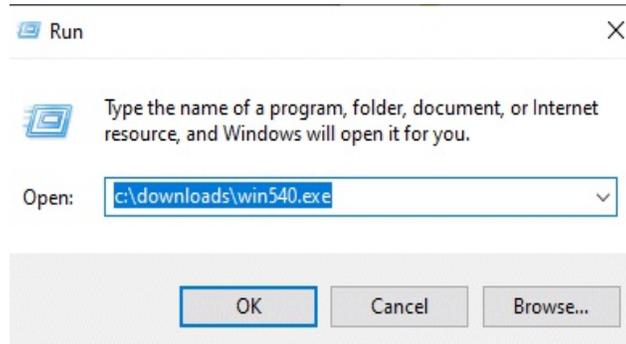
A runtime installer is provided as winXXXr.exe. It only supports a runtime and license server. It cannot be used to update an install that has more than a runtime and/or license server.

A thinclient client-only installer is provided as winXXXtc.exe. This cannot be used to update an install that has more than a thinclient client installed.

The title bar will show the type and revision of the install.

For a downloaded release:

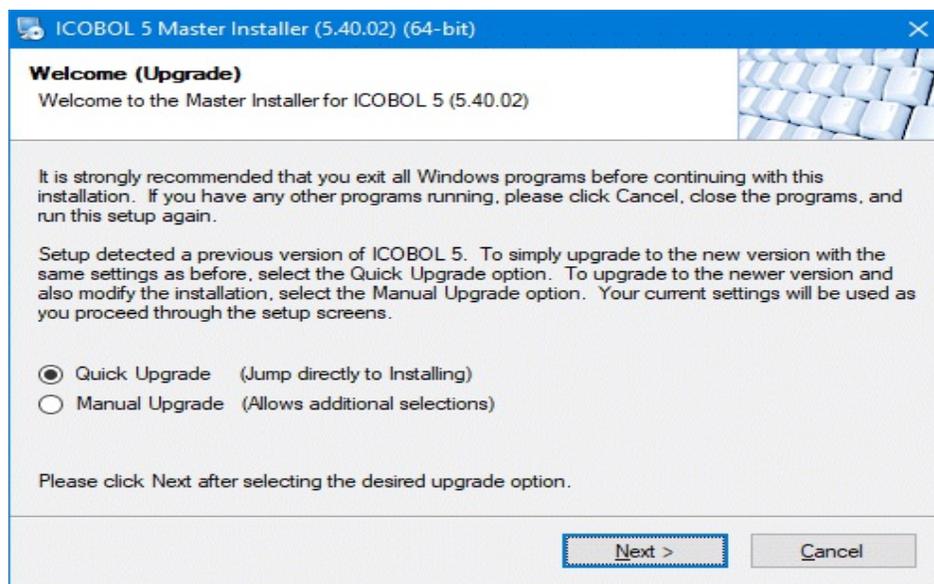
1. The downloaded release is contained in a single executable file.
2. From the **Start** menu choose **Run**. In the Open field of the Run dialog, type the complete path to the downloaded executable. For example, C:\download\win540.exe. (or whatever drive letter and directory the downloaded file is in other than C:\download and any different revision number other than 540).



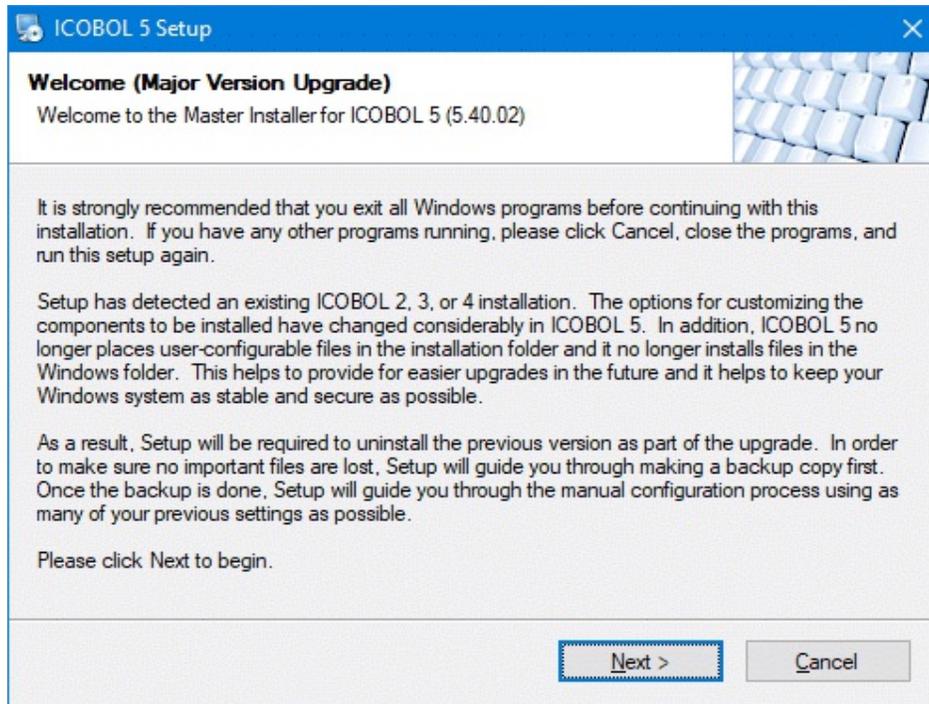
If you are not currently an Administrator you will be prompted for that access via a User Account Control screen.

3. The setup program will begin operation in a Welcome Screen. The content of the screen will vary, depending on whether or not **ICOBOL** has already been installed. Beside the **Welcome** will be (New), (Major Version Upgrade), (Upgrade), or (Change) depending on if the installer has detected a previous **ICOBOL** revision. Along the very top you will see the type of installer Master, Runtime, or ThinClient along with the installer revision and whether you are installing on a 32-bit or 64-bit operating system. Only 32-bit executables will be installed on a 32-bit operating system but both 32-bit and 64-bit executables will be installed on a 64-bit operating system. (The 32-bit executables will be in the x86 subdirectory for a 64-bit install.)
4. From this point on, the installation will step through a series of menus to allow for a custom installation of Interactive COBOL on Windows on this particular machine. Questions will include what components to install, installation folder, working folder, and any service related questions. At any time the installation can be canceled and no software will be installed or you can back up and redo a particular step.

Following are some samples of the Welcome screens.

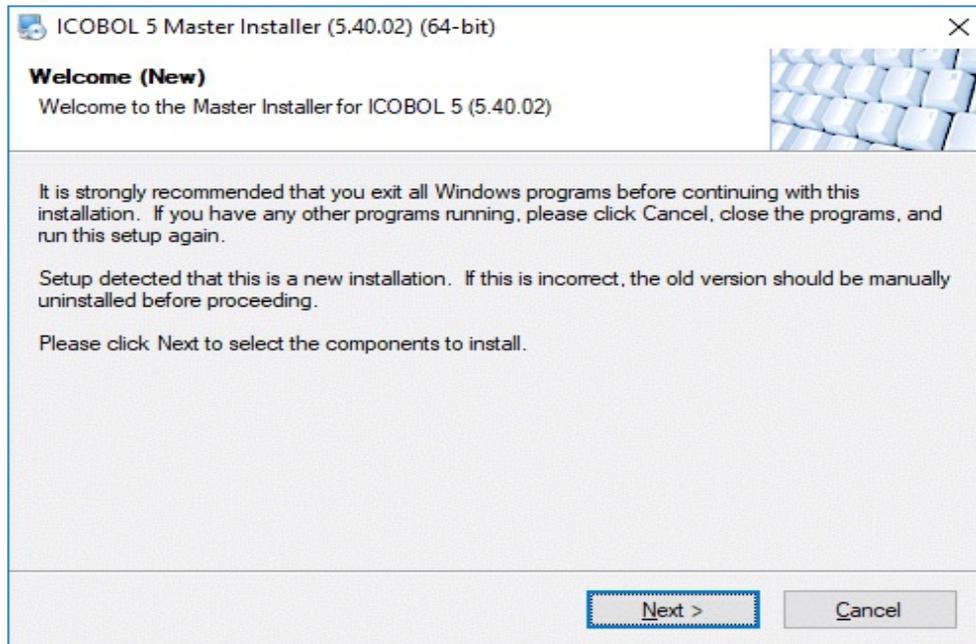


This is the screen you will get if an older revision of version 5 is already installed. Typically the Quick Upgrade is all that is needed to get your system up to date.

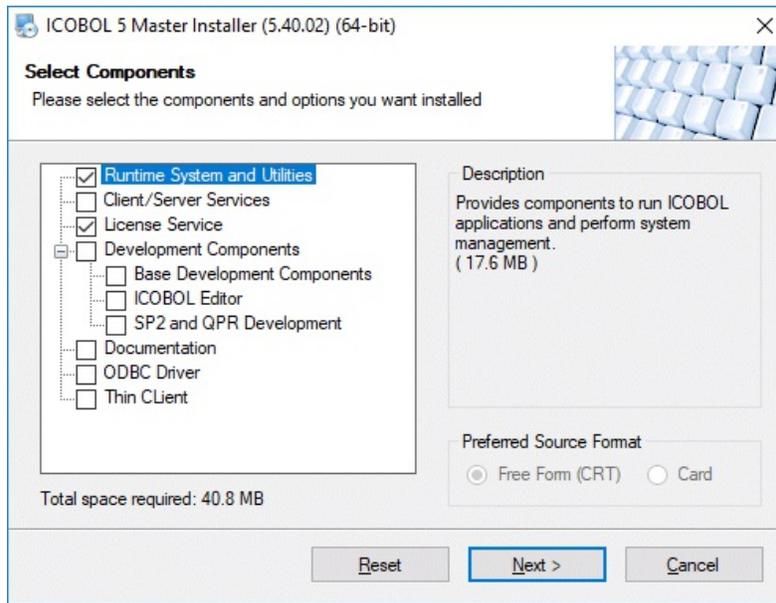


You get the Major Version Upgrade screen if the installer detects that the installed version is major revision 4 or before. The system will prompt you that it will be making a backup of the previous version before proceeding with the Install.

For a New install you will see a Welcome screen as seen below. The next several screens walk through a new installation.

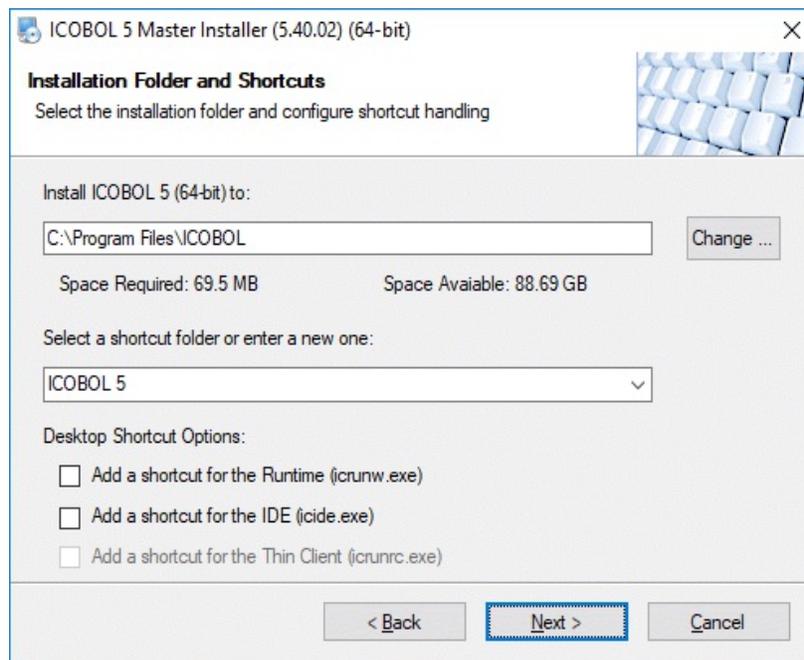


Clicking Next will bring up the license agreement screen and then the Select Components screen shown below:



Selections here will determine what other screens will be shown. Client/Server Services will install all the needed files for any server surrogate(s). If this machine is only to act as a license server, then only the License Service box needs to be selected. If this machine is to act as a license server and file server then only those two service boxes need to be checked.

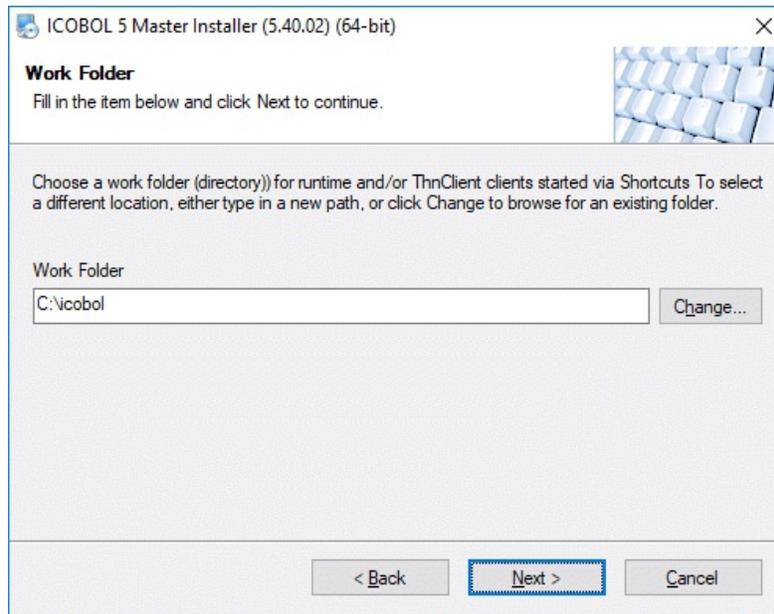
Next will prompt for the Installation Folder and Shortcuts. The Installation location is where any needed files are loaded. This location is set as the default ICROOT entry and stored in the registry. It will also be added to the default PATH. On a 64-bit system the x86 folder will also be added to the PATH so the 32-bit executables can be found.



Next will prompt for a working folder for runtimes and thinclients. If the folder does not exist you will be prompted

Installing and Configuring Interactive COBOL on Windows

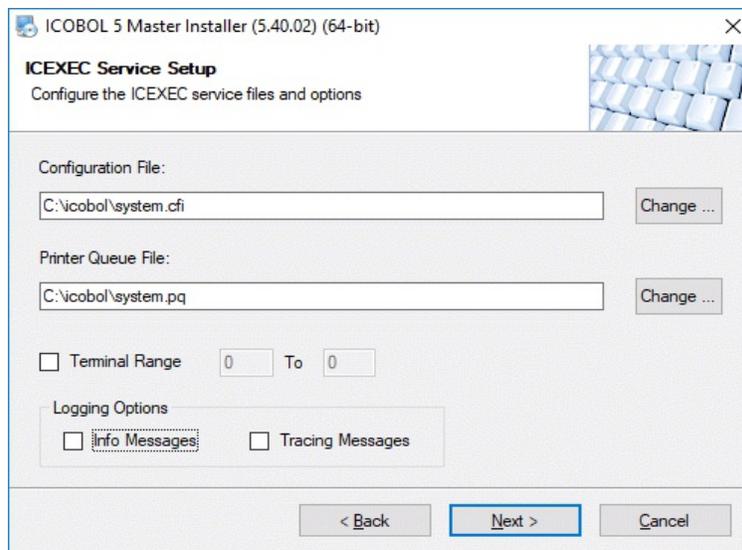
to create it.



This working folder is where all instances of **ICOBOL** executables will start whenever a working folder is not known (as icons, from startup, or services, etc.). In particular, runtimes (icrunrs) started by ICNETD for ThinClient connections will start in this folder. This information is stored in the registry. If the folder does not exist, you will be prompted as to whether to create the directory.

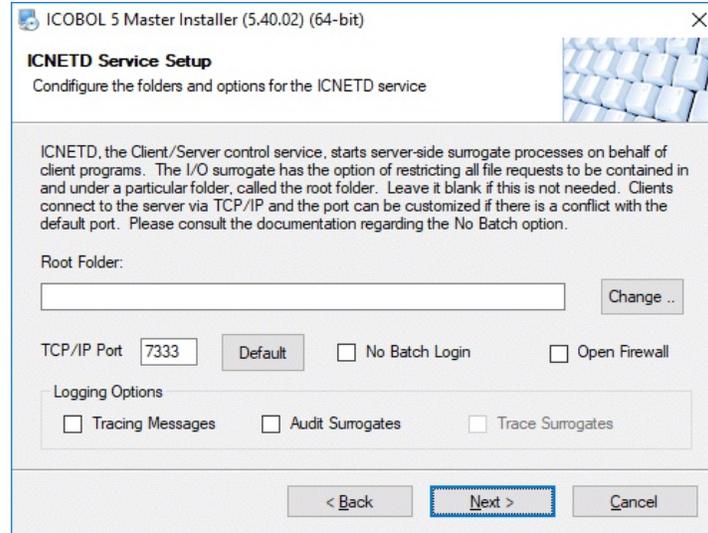
The working directory should not be the root of a filesystem or under the "Program Files" directory as those are Windows protected subsystems.

Next will prompt for ICEXEC setup if any selection requires ICEXEC. A default configuration file is supplied. After the install you can use ICCONFIG or ICEDCFW to tailor the configuration.

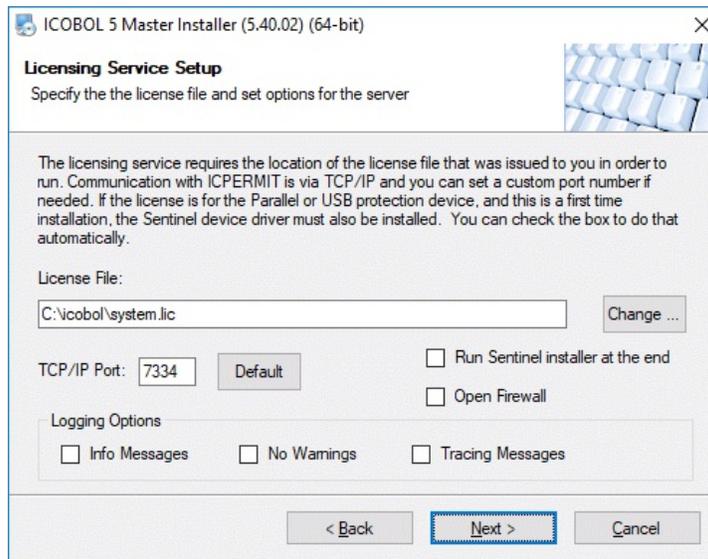


The printer control queue (.pq) file should be in a location that is normally writable and not the root or under the "Program Files" directory.

Next if any Client/Server services had been selected the following will be shown to tailor ICNETD.



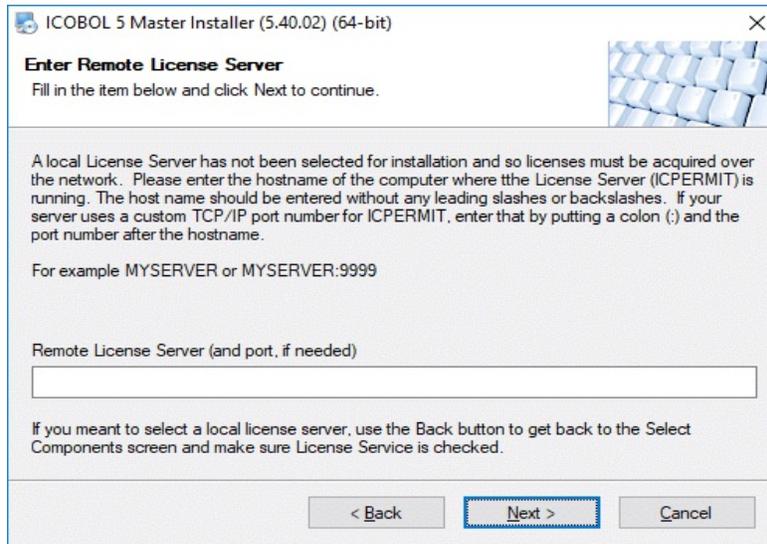
If the License service had been selected then the following will be shown:



One item to note here is if you have a parallel or USB protection device you should select that the Sentinel installer should be run at the end of this install.

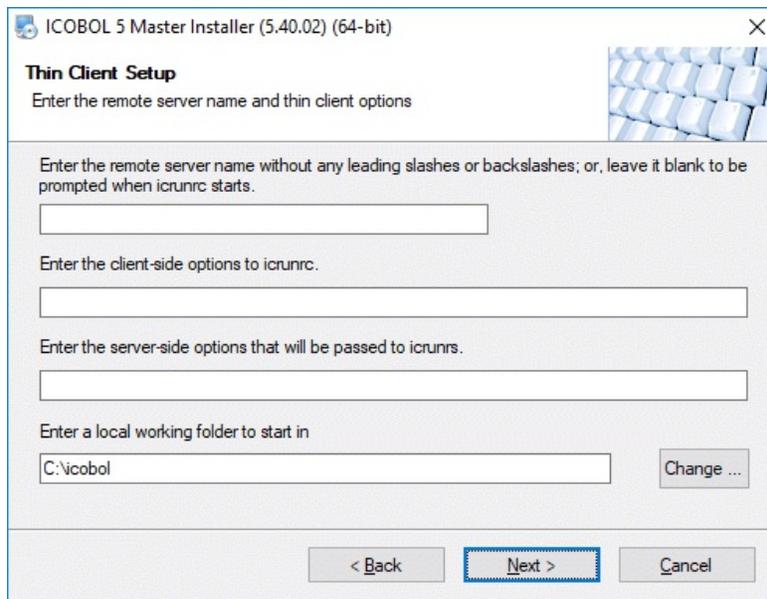
Installing and Configuring Interactive COBOL on Windows

If the License service had not been selected you will get the following to provide where to find the remote license server.



The screenshot shows a dialog box titled "ICOBOL 5 Master Installer (5.40.02) (64-bit)". The main heading is "Enter Remote License Server" with the instruction "Fill in the item below and click Next to continue." Below this, a paragraph explains that a local license server was not selected and provides instructions on how to enter a remote server hostname and port. An example "MYSERVER or MYSERVER:9999" is given. A text input field is provided for the "Remote License Server (and port, if needed)". A note at the bottom states that if a local server was intended, the user should go back to the "Select Components" screen. At the bottom of the dialog are three buttons: "< Back", "Next >" (highlighted with a blue dashed border), and "Cancel".

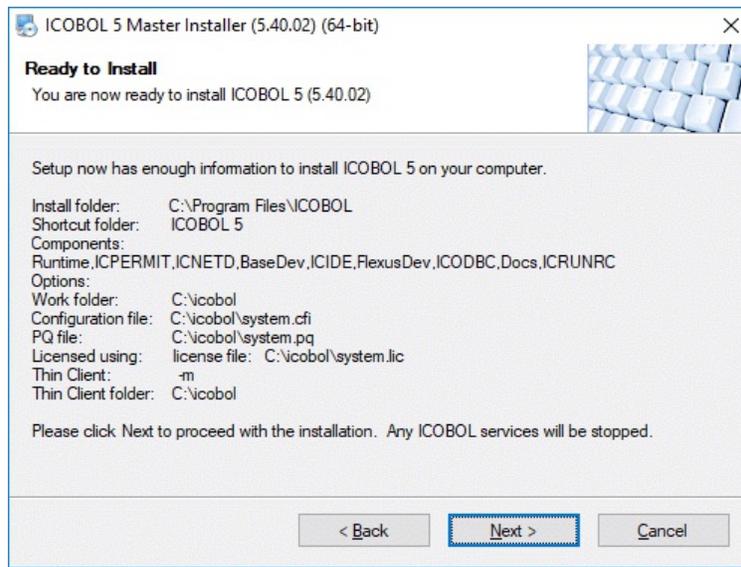
If ThinClient had been selected the following will be shown:



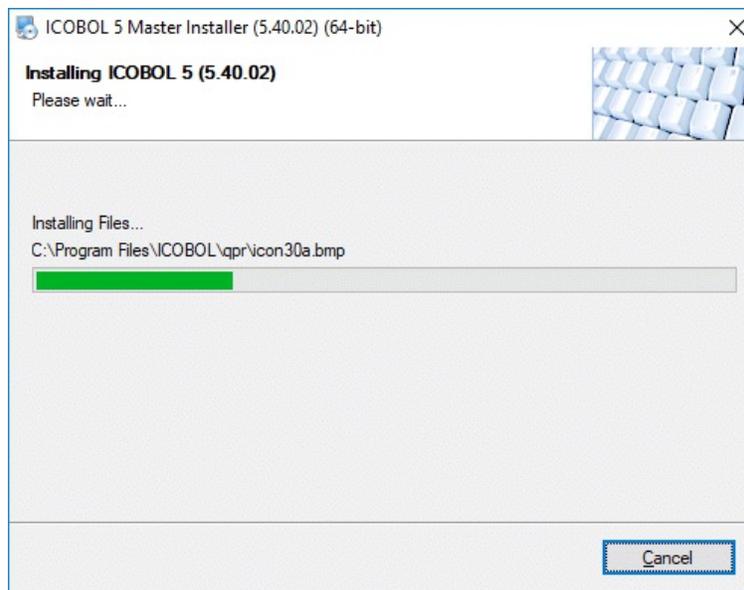
The screenshot shows a dialog box titled "ICOBOL 5 Master Installer (5.40.02) (64-bit)". The main heading is "Thin Client Setup" with the instruction "Enter the remote server name and thin client options". Below this, there are four text input fields: 1) "Enter the remote server name without any leading slashes or backslashes; or, leave it blank to be prompted when icrunrc starts." 2) "Enter the client-side options to icrunrc." 3) "Enter the server-side options that will be passed to icrunrcs." 4) "Enter a local working folder to start in" with the text "C:\icobol" and a "Change ..." button. At the bottom of the dialog are three buttons: "< Back", "Next >" (highlighted with a blue dashed border), and "Cancel".

This screen allows the Remote machine for the ThinClient client to connect with along with any needed arguments to be specified. The question mark "?" can be used for the Remote server to have the ThinClient prompt for the remote machine.

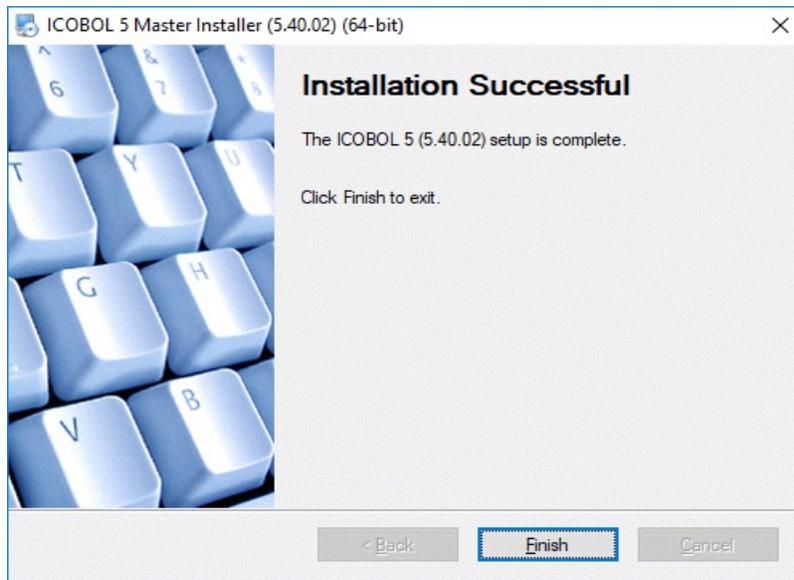
Finally a Ready to Install screen to confirm selections. If you need to change something press the Back to return to the needed screen.



Selecting Next will start the install and the following status screen will be shown.



Finally the finish screen.



Any desktop shortcut(s) selected and an **ICOBOL 5** folder will have been created under Start which will include various shortcuts to programs, documentation, console apps, etc.

Once the installation is finished, you may be asked to restart. If the restart option is given then that says that at some point in the install a file that was in use needed to be updated or a device driver was loaded and a restart will ensure that the correct file is in place.

At this point, the Interactive COBOL on Windows software has been installed and an Interactive COBOL folder will be shown with several selections. Restarting at this time will insure that all drivers will be installed and activated. Any of the new **ICOBOL** services that were installed are started without requiring a restart.

Save your installer for future reference.

The *Console Apps* folder includes console versions of icconfig, icrun and icrun in debug mode.

The *Docs* folder include the **ICOBOL** Readme (readic.txt) that should be read for any new information that has not been put into this manual. In addition there are other readme files that may be useful. These include readme files for cgiCOBOL, sp2 and FormPrint, Installation, and Documentation to name a few along with any documentation .pdf files..

A sample program, *logon*, has been included on the release along with its source file that shows some examples of Interactive COBOL specific features or other useful features. Some of the features included are: use of terminal Print Pass Through, ability to execute an operating system program, disk space, directory listings, the Get Error Message ability, and some SCREEN HANDLER features to name a few.

The shortcuts setup by the installation program are setup in the "All User's" profile and you must be Administrator to change these settings.

C. Software Uninstall

To uninstall a previously installed version of Interactive COBOL on Windows use the standard Windows uninstall procedures as described below.

From the **Start** menu, choose **Settings, Control Panel**. In the **Control Panel** folder select the **Add/Remove**

Programs. In the **Add/Remove Programs** property sheet, scroll through the software that can be removed and select Interactive COBOL. Click on the Add/Remove. An initial screen may be shown do you wish to Uninstall the Sentinel driver and any installed services. Press any key to continue. Next a dialog box will be shown to confirm file deletion. Click Yes to continue. Interactive COBOL will now be removed and a message will be given. Click OK to confirm. Interactive COBOL has now been removed from this machine.

Uninstall removes all the files that the previous installation had installed for a particular version of Interactive COBOL. It will not remove any new files that have been added to the installation directory (or sub-directories). Since new files are not removed, any directory containing a new file is also not removed. It is not recommended to add new files to the installation directory without fully understanding its implications. If a file had been modified from its original it is still removed.

D. Startup Recommendations

When building applications using Interactive COBOL, it is highly recommended to always start the runtime with the Audit switch (-a or -A) such that any errors or warnings can be viewed at a later time if needed.

Another option is to start the runtime with the Quiet switch (-q) such that no runtime generated messages will be displayed on the console screen. Only messages that are in the COBOL application will be displayed. This is especially useful when running a program from the command line, i.e., <icrun -q program>. When running with the Quiet switch (-q), it is even more imperative to have the Audit switch (-a or -A) enabled such that if any errors occur all the associated messages will be displayed somewhere.

Using the Audit switch (-a or -A) and the Information switch (-i) together will provide the maximum amount of information in case a problem does develop.

E. Batch/Silent(Scripted) Install

The install process can be scripted such that batch installs can be performed.

To build a sample script you must execute the install with the record option (/r) and take the appropriate selections. In record mode the installer is started as if it was a New install. All the screens are provided to allow for a scripted session to be recorded. At the end it prompts for a location to save the recorded steps. The defaults are the current users Documents folder. The default names are: MasterSettings.ini, RuntimeSettings.ini, or ThinClientSettings.ini.

When running in Record mode no actual install will be performed.

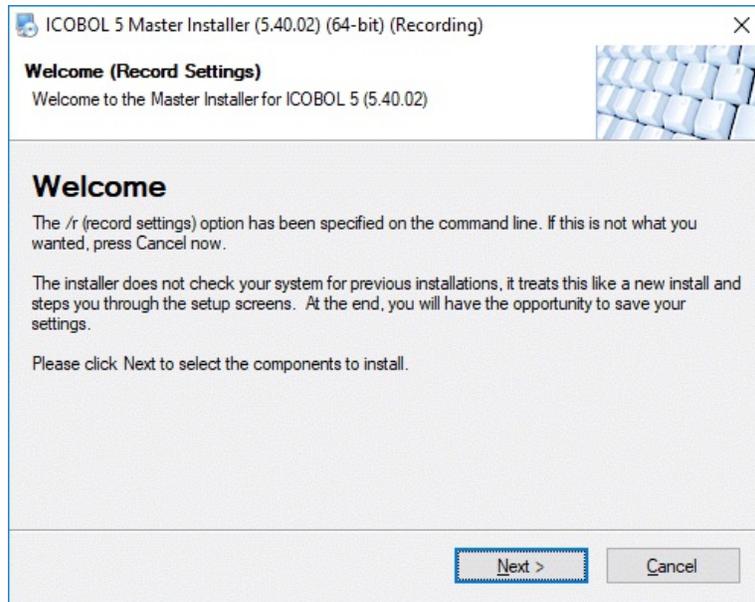
Using the command line /S:<path> will execute the installer silently with the provided recorded steps.

Use of the Start /wait will cause a command prompt to wait for the batch installer to finish.

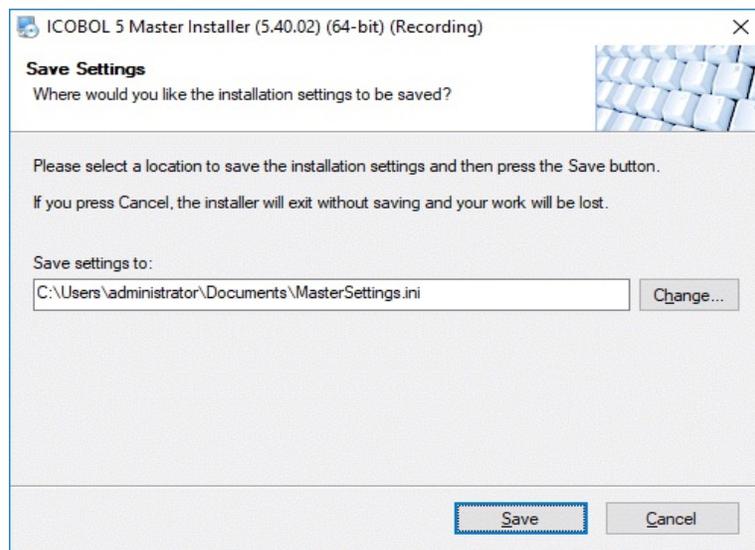
Thus, you would enter:

```
winXXX.exe /r
```

The following screen will be shown that you are in Record mode:



At the end you will have the option to Save your selection with the following screen.



To do an install with the exact same responses, a silent install can be done by entering `"/S:<path-name>"` after the `winXXX.exe` on the command line. The pathname should be the path to the script file.

When doing a silent install, a log file (`ICOBOL 5 Setup Log.txt`) is written to the temp folder that tells whether the install succeeded. Note that the temp folder is that of the administrator.

During a silent(scripted) install, no user requested prompts are made.

The Update switch is available that allows subsequent revisions of **ICOBOL** to update the installed revision using all the same information that was used before. The `/u` switch can be used at install time to perform this update. The Update switch (`/u`) and the Silent Switch (`/S`) are mutually exclusive.

By using the recording mode and then silent(scripted) install a Batch install can be done with no interactive response

required. The log file can be used to determine the success or failure of the batch install by looking at the last line in the file.

To record the script for a Runtime or Thinclient client install follow the same steps using that installer..

LOG File

Log files for both the install and uninstall are written to the Administrator's Temp directory (usually C:\users\administrator\AppData\Local\Temp). (Note that AppData is usually a hidden directory.) Their default names are: "**ICOBOL 5 Setup Log.txt**" and "**ICOBOL 5 Uninstall Log.txt**".

The LOG file provides line item details. Each line starts with a date/time stamp, then a status (Success, Error, Notice, Debug, Error, Skipped, Info,...) and then the operation.

The last line should provide the exit code.

III. ICSVCMGR

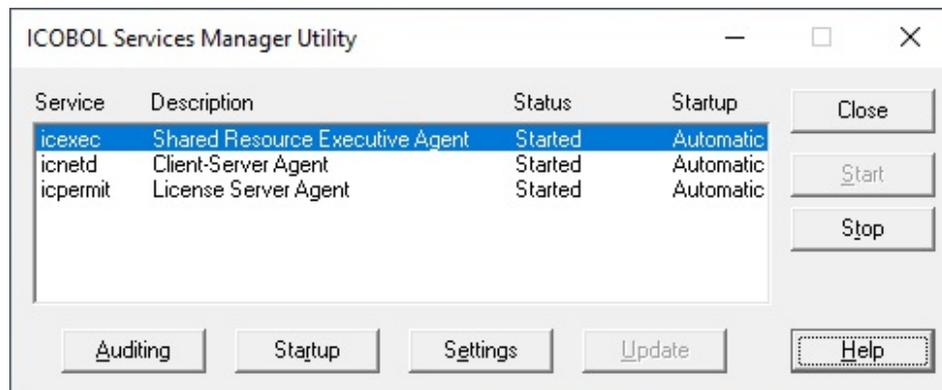
A. Introduction

ICSVCMGR is the Interactive COBOL Services Manager for Windows. It appears in the Control Panel as **ICOBOL Services** and as a shortcut in the “Interactive COBOL” program group.

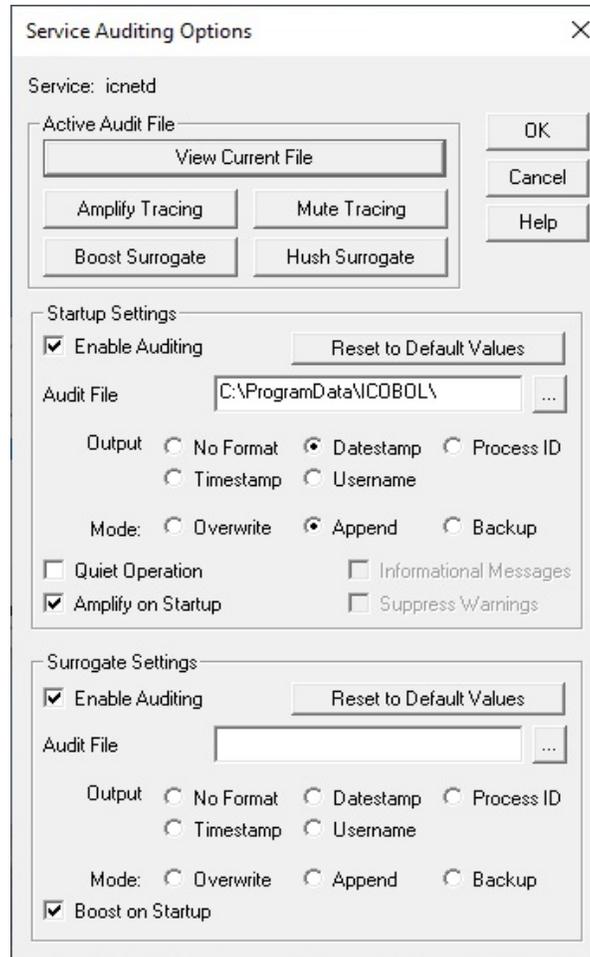
B. GUI Service Manager

The GUI version of ICSVCMGR is available from the Interactive COBOL programs selection or from the Windows Control Panel. The GUI ICSVCMGR can be used to change any selection and to start and stop the **ICOBOL** services. It CANNOT be used to install or uninstall a service.

The main screen is shown below. From it you can select the appropriate service (only those installed will show) and you can do any of the actions shown on the right or along the bottom. If an action is grayed out, then it is not available.



Selecting **icnetd** and then **Auditing** will show the following:



The name of the service is shown at the top. Actions dealing with the currently active audit file are listed immediately below that in the “Active Audit File” group box. Options dealing with audit file settings for the service itself are shown in the “Startup Settings” group box in the middle third of the dialog. The “Startup Settings” will display the settings as found in the Windows service database. These are the settings that will be in force the NEXT time the service is started. Normally, unless changed by someone, these will be the same as the active running service. The icnetd service has an additional set of audit file settings in the Surrogate Settings group box in the bottom third of the dialog. They are analogous to the Startup Settings but apply to the surrogate processes started by icnetd to service client requests. This section will be grayed out for icexec and icpermit.

View Current File

Select the “View Current File” button to view the current audit log file. If the service is still active, this will be the file that is currently being written. If the service is inactive, this will be the last audit file written. If the audit file is being logged with the datestamp, timestamp, Process ID, or username options and the file can not be uniquely identified, an “Audit File” box will be displayed to allow the user to select the specific audit file to open. The snapshot of the file will be opened using the Windows “notepad” editor. From there, the user may view or print the contents of the file. The user will need to close and reopen the file to refresh the contents shown on the screen.

Amplify Tracing

Select the “Amplify Tracing” button to send a message to an active running service to “amplify” its auditing functions. This action will tell the service to log more information in the audit file. This function is only available to running services and is not supported by the icexec service. If successful, a message saying the “Tracing success-

fully amplified.” is displayed. This option is the equivalent of using the “-O a” from the command line versions of the service programs: `icpermit|icnetd -O a`

Mute Tracing

Select the “Mute Tracing” button to send a message to an active running service to “mute” it’s auditing functions. This action will tell the service to log less information in the audit file. This function is only available to running services and is not supported by the icexec service. If successful, a message saying the “Tracing successfully muted.” is displayed. This option is the equivalent of using the “-O m” from the command line versions of the service programs: `icpermit|icnetd -O m`

Startup Settings and Surrogate Settings

Most of these selections work the same way in both sections. Differences are noted in the descriptions.

Enable Auditing

The “Enable Auditing” checkbox will turn on auditing for the service or surrogate. When NOT enabled, the “Audit File Pathname” and “Output Flags” options are grayed. In conjunction with the “Audit File Pathname” and “Output Flags” options, this option will determine where the audit file is located. This option is the equivalent of using either the “-A” or “-a” from the command line versions of the service programs, depending on how Audit File Pathname is set.:

Reset to Default Values

The “Reset to Default Values” button will set the audit file settings to the defined default settings. These are the same settings that would be in effect if you had taken all the default selections during the installation of the software. This button only affects the audit file settings, other settings on the command line are not modified. The changes are reflected immediately in the settings.

Audit File Pathname

The “Audit File Pathname” edit window will allow the user to set the location of the audit log file. If left blank the audit file will default to the directory where the service is started, normally the “C:\WINDOWS\system32” directory. The user may enter either a pathname or a fully qualified filename. If just a pathname is used, the filename portion will default to the service name. Audit log files will use the “.lg” extension unless specified differently here.

This field in the Surrogate Settings group works the same as for the service when it is set. However, when it is blank, it uses the value that is set in Startup Settings group.

The recommended location is the %ProgramData%\ICOBOL directory.

This option is the equivalent of using either the “-A” or “-a” from the command line versions of the service programs.

```
icexec|icpermit|icnetd -A path[:aflag]
```

if an “Audit File Pathname” is specified or

```
icexec|icpermit|icnetd -a[:aflag]
```

if “Audit File Pathname” is left blank

Where

aflag is determined by the “Output Flags” option

For example, using the ICEXEC service:

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Audit File Pathname	Command Line Equivalent	Audit Log Filename
<blank>	“-a”	“C:\WINDOWS\system32\icexec.lg” (not recommended)
C:\ProgramData\ICOBOL	“-A C:\ProgramData\ICOBOL”	“C:\ProgramData\ICOBOL\icexec.lg”
C:\Logdir\logname.txt	“-A C:\Logdir\logname.txt”	“C:\Logdir\logname.txt”

Output Flags

The “Output Flags” option allows the user to specify the action taken by the service upon startup.

This option is the equivalent of using the “:flag” on either “-A” or “-a” settings from the command line versions of the service programs (see the preceding examples).

Where

aflag is determined by the “Output Flags” option as follows:

Overwrite	No flag is specified. If a previous log file (.lg) exists, it will be overwritten.
Append	Do not truncate the file, just append to the current file.
Backup	If a previous log file (.lg) exists, rename it to *.lgb and then open a new .lg file.
Datestamp	Add date in the form of _YYYYMMDD before the .lg extension. (YYYY-year, MM-month, DD-day of the month)
Timestamp	Add time in the form of _YYYYMMDDHHmmsshh before the .lg extension. (HH-hour, mm-minute, ss-second, hh-hundredths of seconds.)
Process ID	Add process id (pid) in the form of _NNNN before the .lg extension
Username	Add username in the form _name before the .lg extension.

Quiet Operation

The “Quiet Operation” option allows the user to specify that the service is to run in QUIET mode. This normally means NO output will be sent to either STDOUT or STDERR. Tracing information is still sent to the audit log file if it is enabled.

This option is the equivalent of using the “-q” from the command line versions of the service programs.

```
icexec|icpermit|icnetd -q
```

Amplify on Startup

The “Amplify on Startup” option allows the user to specify that the service is to start operating with the amplified tracing switch set ON. This option is the equivalent of using the “-t” from the command line versions of the service programs.

Informational Messages

The “Informational Messages” option allows the user to specify that the service is to start operating with the informational message switch set ON. When set, information type messages as well as warnings and errors are issued by the service. It is equivalent to using the “-i” from the command line versions of the service programs.

This option is not supported by the icnetd service.

Suppress Warnings

The “Suppress Warnings” option allows the user to specify that the service is to start operating with the suppress warning switch set ON. When set, warning messages are NOT issued by the service. This option is the equivalent of using the “-N w” from the command line versions of the service programs.

This option is only supported by the icpermit service.

Boost on Startup

This setting is equivalent to **Amplify on Startup** but for surrogates.

OK Button

The “OK” button will save any changes made by the user to the audit settings and write them to the Windows service manager database. If successful, the user will be returned to the initial status display window.

Cancel Button

The “Cancel” button will allow the user to return to the initial status display window without saving any changes. When unsure of your actions on a particular window, you should use the “Cancel” button (or the escape key) to exit the window.

Help Button

The “Help” button will open the help system for ICSVCMGR.

From the main window, selecting a service and then clicking the **Startup** button will show the following:

The screenshot shows a dialog box titled "Service Startup Options" with a close button (X) in the top right corner. The "Service:" field is set to "icexec".

The "Startup Type" section has three radio buttons: "Automatic" (selected), "Manual", and "Disabled". To the right of this section are three buttons: "OK", "Cancel", and "Help".

The "Log On As:" section has two radio buttons: "System Account" (selected) and "This Account:". Below "System Account" is a checkbox labeled "Allow Service to Interact with Desktop". Below "This Account:" are three text input fields labeled "Password:", "Confirm Password:", and "Password:". The "Confirm Password:" field is currently empty.

The "Dependencies" section has a large empty text area and two buttons: "Add..." and "Remove".

The name of the service is shown at the top. The “Service Startup Options” dialog allows the user to specify

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Windows service options. These options are common to all Windows services and the user should refer to the Windows documentation for a more complete description of these options.

Startup Type

The Startup Type defines when a service is started by the Windows service manager. Three startup types are defined:

Automatic.	Service is started at boot time.
Manual	Service is not started at boot time but can be manually started later.
Disabled	Service is not started at boot time and is disabled by the service manager.

Interactive COBOL services are usually started automatically at boot time.

This option is the equivalent of using the “-S” from the command line version of ICSVCMGR.

```
icsvcmgr -S a|d|m icexec|icpermit|icnetd
```

Log On As

The log on information is used to define the Windows user account used when a service is started. Normally the default system account “LocalSystem” account is used to start the service. If necessary, a different account may be used.

This option is the equivalent of using the “-U” and “-P” from the command line versions of ICSVCMGR.

```
icsvcmgr -U username -P password icexec|icpermit|icnetd
```

Dependencies

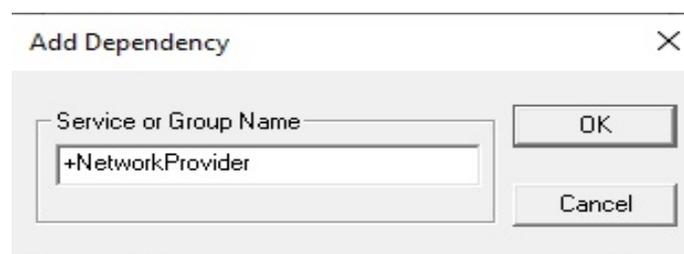
In certain instances, the order a service is started at boot time is important. The Dependencies setup allows a user to maintain a list of services (or service groups) that must be started before the specified service is started by the Windows service manager.

This option is the equivalent of using the “-D” from the command line versions of ICSVCMGR.

```
icsvcmgr -D dependency icexec|icpermit|icnetd
```

Adding Dependencies

To add a dependency, select the “Add” button to bring up the “Add Dependency” window. Enter the service name and hit the “OK” button to add the dependency. The service added should now be shown on the “Service Startup Options” dialog. Service groups are signified by prefixing the name with a “+” sign.



Removing Dependencies

To remove a dependency, highlight the dependency to remove and hit the “Remove” button.

OK Button

The “OK” button will save any changes made by the user to the settings and write them to the Windows service manager database. If successful, the user will be returned to the initial status display window.

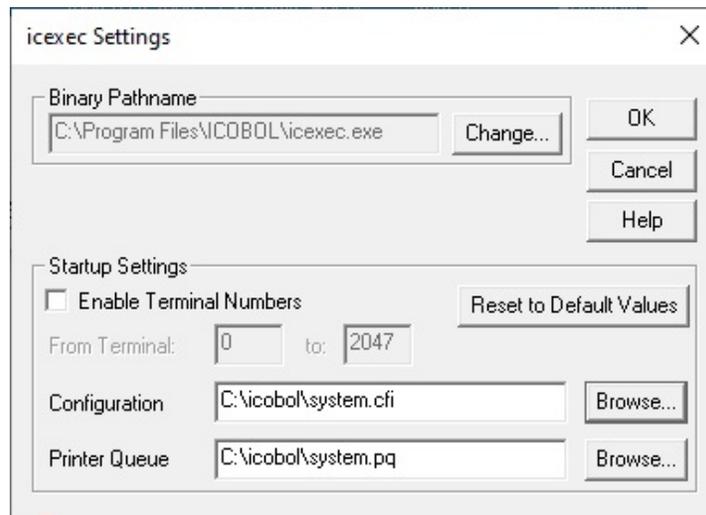
Cancel Button

The “Cancel” button will allow the user to return to the initial status display window without saving any changes. When unsure of your actions on a particular window, you should use the “Cancel” button (or the escape key) to exit the window.

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Selecting a service in the main window and clicking on the **Settings** button will show the following for each of the indicated services:

Settings For ICEXEC:



Binary Pathname

The “Binary Pathname” option displays the pathname to the executable file that is the specified service. This pathname is normally set during the installation and is not changed. It can be changed by selecting the “Change...” button and using the Open dialog window that comes up to select a new pathname.

This option is the equivalent of using the “-B” from the command line versions of ICSVCMGR.

```
icsvcmgr -B pathname icexec
```

Reset to Default Values

The “Reset to Default Values” button will set the icexec service settings to the defined default settings. These are the same settings that would be in effect if you had taken all the default selections during the installation of the software.

This option is the equivalent of using the following:

```
icexec -C %workingdir%\system.cfi -P %workingdir%\system.pq
```

Where

workingdir was defined at installation time

Terminal Numbers

The user may specify a range of terminal numbers to be used by the icexec service. To specify a range, the user must first select the “Enable Terminal Numbers” check box, then enter the proper range. The numbers entered here correspond to the console numbers @CONn to @CONm.

This option is the equivalent of using the “-T n:m” from the command line version of the service program.

```
icexec -T 0:1024
```

Configuration File

The user may specify either a directory name or a fully qualified filename for the configuration file. If just the directory name is entered, the service will attach the name “system.cfi” to the directory when opening the configuration file. The user may select the “Browse” button to bring up a browse window that can be used to select the proper directory path or file on the disk. If this field is left blank then the service will use it’s default value for the configuration file.

This option is the equivalent of using the “-C dir|file” from the command line version of the service program.

```
icexec -C configfile
```

Printer Queue File

The user may specify either a directory name or a fully qualified filename for the printer queue file. If just the directory name is entered, the service will attach the name “system.pq” to the directory when opening the printer queue file. The user may select the “Browse” button to bring up a browse window that can be used to select the proper directory path or file on the disk. If this field is left blank then the service will use it’s default value for the printer queue file.

This option is the equivalent of using the “-P dir|file” from the command line version of the service program.

```
icexec -P printerqueuefile
```

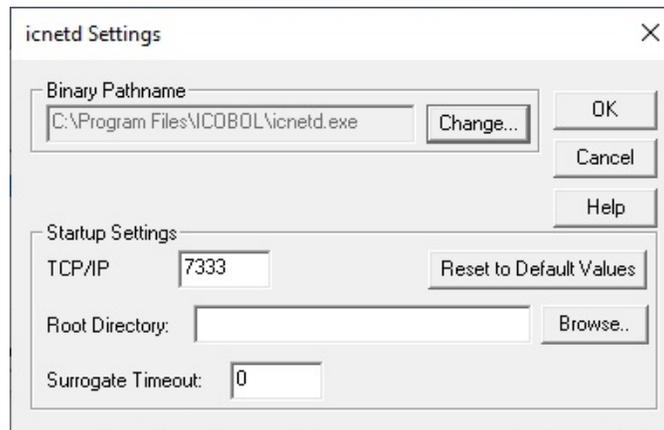
OK Button

The “OK” button will save any changes made by the user to the icexec settings and write them to the Windows service manager database. If successful, the user will be returned to the initial status display window.

Cancel Button

The “Cancel” button will allow the user to return to the initial status display window without saving any changes. When unsure of your actions on a particular window, you should use the “Cancel” button (or the escape key) to exit the window.

Settings For ICNETD



Binary Pathname

The “Binary Pathname” option displays the pathname to the executable file that is the specified service. This pathname is normally set during the installation and is not changed. It can be changed by selecting the “Change...” button and using the Open dialog window that comes up to select a new pathname.

This option is the equivalent of using the “-B” from the command line versions of ICSVCMGR.

```
icsvcmgr -B pathname icnetd
```

Reset to Default Values

The “Reset to Default Values” button will set the icnetd service settings to the defined default settings. These are the same settings that would be in effect if you had taken all the default selections during the installation of the software.

This option is the equivalent of using the following:

```
icnetd
```

TCP/IP Port

The user may specify the “listening” TCP/IP port for the icnetd service. This would be used in case there is a conflict with the default port normally used by the service (7333).

This option is the equivalent of using the following:

```
icnetd -M :port
```

Root Directory (for icios (thickclients))

The user may specify the pathname for the effective root directory of the service. When clients access files through icnetd’s i/o server, icios, the file pathnames are relative to this root directory. The user may select the “Browse” button to bring up a browse window that can be used to select the proper path on the disk. If this field is left blank, then the service will use it’s default value for the root directory. This option is NOT used by the ThinClient or ICSQLS servers.

This option is the equivalent of using the following:

```
icnetd -R rootdir
```

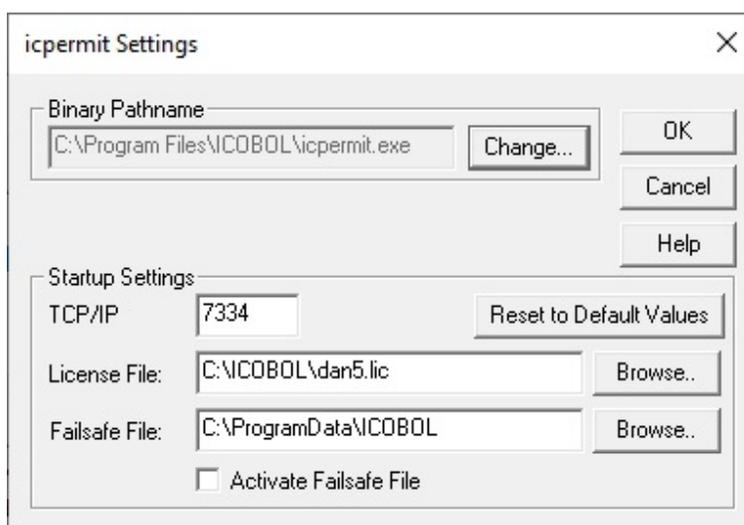
OK Button

The “OK” button will save any changes made by the user to the icnetd settings and write them to the Windows service manager database. If successful, the user will be returned to the initial status display window.

Cancel Button

The “Cancel” button will allow the user to return to the initial status display window without saving any changes. When unsure of your actions on a particular window, you should use the “Cancel” button (or the escape key) to exit the window.

Settings For ICPermit



Binary Pathname

The “Binary Pathname” option displays the pathname to the executable file that is the specified service. This pathname is normally set during the installation and is not changed. It can be changed by selecting the “Change...” button and using the Open dialog window that comes up to select a new pathname.

This option is the equivalent of using the “-B” from the command line versions of ICSVCmgr.

```
icsvcmgr -B pathname icpermit
```

Reset to Default Values

The “Reset to Default Values” button will set the icpermit service settings to the defined default settings. These are the same settings that would be in effect if you had taken all the default selections during the installation of the software.

This option is the equivalent of using the following:

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```
icpermit -L %windisk%\system.lic -F %windir%
```

Where

windisk is the root directory of the disk containing Windows (usually C:\)

windir is the main Windows directory (usually C:\WINDOWS)

TCP/IP Port

The user may specify the “listening” TCP/IP port for the icpermit service. This would be used in case there is a conflict with the default port normally used by the service (7334).

This option is the equivalent of using the following:

```
icpermit -M :port
```

License File

The user may specify the license description file that the icpermit service will use when servicing license authorization requests. The user must specify a fully qualified filename for the license description file. The user may select the “Browse” button to bring up a browse window that can be used to select the proper file on the disk. If this field is left blank then the service will use its default value for the license description file.

This option is the equivalent of using the following:

```
icpermit -L licensefile
```

Failsafe File

The user may specify the directory name for the location of the failsafe file, system.fp. The user may select the “Browse” button to bring up a browse window that can be used to select the proper path on the disk. If this field is left blank, then the service will use its default value for the failsafe file.

This option is the equivalent of using the following:

```
icpermit -F failsafedir
```

Activate Failsafe File

The user may select this box to use the existing failsafe security file instead of the protection device.

This option is the equivalent of using the following:

```
icpermit -f
```

OK Button

The “OK” button will save any changes made by the user to the icpermit settings and write them to the Windows service manager database. If successful, the user will be returned to the initial status display window.

Cancel Button

The “Cancel” button will allow the user to return to the initial status display window without saving any changes.

When unsure of your actions on a particular window, you should use the “Cancel” button (or the escape key) to exit the window.

Help can always be used to provide additional information for an item.

Update Button

On the main menu, the Update button is only available for the ICPERMIT service. When clicked, it causes the service to re-read the license file and re-authorize its licenses. This allows an upgraded license (e.g., that adds users or new components) to be installed while running.

IV. LICENSING (ICPERMIT)

A. Introduction

This chapter discusses the license description file and how to use ICPERMIT, the license server, to provide authorization information to any Interactive COBOL processes that requires licensing.

Interactive COBOL on Windows requires a valid license to be present for various programs to be executed. ICPERMIT is the authorizing program that reads a license description file (default system.lic) and authorizes the specified product(s) for the given user count. On Windows several different protection methods are used to authorize a license. These include a parallel protection device or a USB protection device with a matching serial number to the license or via a MAC address which uses the Media Access Control address of a network (usually ethernet) interface.

ICPERMIT allows licenses to be shared over a TCP/IP-based network. Licenses can be shared among machines of different types (Windows, Linux).

If remote licensing is being used, ICPERMIT should not be running on the local machine but must be available over a network from a central server.

B. License Description File

The license description file provides the unique information needed to license an individual site for the various combinations of product(s) and users. This license file must be used in combination with a unique protection method, either a parallel protection device or a USB protection device (under Windows), a serial protection device (under Linux), or MAC address.

If the license is provided on a PRODUCT ACTIVATION KEY card, a license description file can be created by using a standard text editor and entering the license (LIC) and authorization key (KEY) information provided on the card.

If the license has been provided as an e-mail attachment then copy/move the license file to the needed directory. If the license is provided on media then copy the license file to the appropriate disk.

PRODUCT ACTIVATION KEY

The PRODUCT ACTIVATION KEY contains the license and key information to authorize licensed products. Each KEY shows one or more licensed products in the following fashion:

```
* For PARALLEL DEVICE SN: 00000766
* ICOBOL Runtime License
LIC 01-PARALLEL-00000766-ICRUN-50-A-ANYWHERE-00033
KEY 2fgy87klms-8uloplmn98-jhtrewsa-j8h6frd5s4-cxwzbnmk87-98up0kmngf
```

Where

Line one is a comment showing the protection method for the license (MAC, PARALLEL, SERIAL, USB, etc.) with its Envyr serial number (SN:).

Line two is a comment showing the licensed product for this license.

Line three (starting with LIC) is the text description of the license showing the license information revision (01), license type (PARALLEL), serial number (00000766), licensed product (ICRUN), product revision (50), options (A), operating system (ANYWHERE), and user count (00033).

Line four (final line) (starting with KEY) is an encrypted version of the license that can spill across multiple lines as needed.

Lines two through four can be repeated for each particular licensed product.

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NOTE: The letters "i", "l", "q", and "v" are not used to prevent confusion with the number 1 or the letters "g" and "u".

Lines in the license description file that start with a `*` are comment entries only. Comment entries and blank lines are ignored.

If the license type is PARALLEL, SERIAL, or USB then this license must be paired up with the parallel, serial, or USB protection device with the same serial number to allow authorization. If the license type is MAC, then this license will only run on a particular hardware configuration with its unique MAC network address as provided by the NIC interface.

After building a license description file, run ICPERMIT with the Check switch (-c) to insure that the file was entered correctly.

Licensed products for each type of license currently include:

- All runtimes (ICRUN/ICRUNW, ICRUNCGI, ICRUNRS, etc.) use **ICOBOL** Runtime Licenses,
- Runtimes that use SP2 and/or FormPrint use **ICOBOL** SP2 Runtime Licenses,
- All requests to ICNETD (client/server) use **ICOBOL** Network Server Licenses,
this includes the ICIOS, ICRUNRS, and ICSQLS surrogates,
- ICOBOL and ICIDE use **ICOBOL** Development Licenses,
- ICSP2 uses **ICOBOL** SP2 Development Licenses,
- ICQPRW uses **ICOBOL** FormPrint Development Licenses,
- ODBC-enabled programs using the **ICOBOL** ODBC Driver use **ICOBOL** ODBC Driver Licenses.

C. Parallel or USB Protection

Parallel and USB protection devices are supported for Windows platforms. Note that the appropriate hardware connection must also be available to connect the protection device.

If your license description file specifies "For PARALLEL DEVICE SN: xxxxxxxx" then a parallel protection device must be installed. Parallel protection devices must be placed on an IBM compatible parallel printer port that ICPERMIT can access through the standard parallel printer locations of 3BCh, 378h, or 278h. A parallel port on a USB port will NOT work. The parallel protection device causes no interference to an attached printer or any character transmitted to the printer. The parallel protection device provides a unique identification value to which an individual license description file is keyed.

If your license description file specifies "For USB DEVICE SN: xxxxxxxx" then a USB protection device must be installed. USB protection devices must be installed in a powered USB port. USB devices should be installed only **AFTER ICOBOL** has been installed with local licensing selected as the USB Sentinel driver files will be provided to the operating system at that time. Upon initial installation of the USB protection device, the operating system will detect the device and load the needed driver.

D. MAC Protection

If your license description file specifies "For MAC xx-xx-xx-xx-xx-xx" then a network interface in the machine must have a MAC address with the given value.

The ICINFO utility can be used to show MAC addresses.

E. ICPERMIT

E.1. Syntax

The syntax for ICPERMIT is:

```
icpermit [-a[:aflag]|-A file|dir[:aflag] [-c] [-f] [-F faildir] [-h|-?]
          [-i] [-L licedesc] [-M machine[:port]] [-N w]
          [-O a|c|d|e|i|l|m|p|r|s|t|u] [-q] [-s] [-t]
```

Where

- a[:aflag] or -A file|dir[:aflag] (Audit)
Enables auditing (default icpermit.lg). Where *aflag* is a|b|d|p|t|u|d|a|d|b|p|a|p|b|t|a|t|b|u|a|u|b, defined as a-append, b-backup, d-date, p-pid, t-time, and u-username.
- c (Check-only)
Check a license description file for validity and query any specified device, do not install. (Check can be used even when another ICPERMIT is running.)
- f (Failsafe)
Use an existing failsafe security file instead of the protection device.
- F faildir (Failsafe location)
Specifies where to locate the failsafe security file. The failsafe file, system.fp, is located in this directory if given, otherwise the current directory is used.
- h|-? (Help)
Display help text.
- L licedesc (License description file)
Specifies the license description filename. The default is system.lic.
- M machine[:port] (Machine)
Specifies the license server machine and optional TCP port. The default is the current machine (localhost) and port 7334. *Machine* can be an ip-address or a machine-name. No leading “\” should be specified.
- N w (No)
Specifies a No option: Valid options are: w=No Warnings.
- O a|c|d|e|i|l|m|p|r|s|t (Operation)
Specifies an operation to perform:

a (Amplify)	Amplify (turn on) tracing on the running icpermit
c (Check)	Check if an icpermit is running,
d (Disable)	Disable any new license connections,
e (Enable)	re-Enable new license connections,
i (Info)	display license Information,
l (Local)	enable Local operation,
m (Mute)	Mute (turn off) tracing,
p (Post)	the current connection/license information to be written (Posted) to the log file,
r (Remote)	enable Remote operation (requires -M),
s (Start)	Start icpermit
t (Terminate)	Terminate icpermit
u (Update)	cause icpermit to reread the license file and Update its licenses
- q (Quiet)
Enables quiet operation.
- s (Service)
Enables start as a service.
- t (Tracing enabled)
Start with tracing enabled.

ICPERMIT can also be stopped and started manually by going to the Services selection under Control panel. New arguments can also be provided by specifying startup parameters. If given, the new startup parameters replace the stored parameters for this single invocation. On installation, ICPERMIT is installed as a service.

Note: The Check Operation (-O c), the Check mode (-c), and the Post Operation (-O p) do not require

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administrator privilege.

E.2. Description

ICPERMIT can run in one of several modes:

Check mode	(-c)	validates a license description file and device
Operation mode	(-O)	performs an ICPERMIT operation
License mode	(neither -c or -O)	provides license authorization

Check mode (-c)

Check mode instructs ICPERMIT to validate the given license description file and then query the protection device to confirm the license. ICPERMIT in check mode does not interfere with an already running ICPERMIT or whether local or remote licensing is in effect. Check mode does not require administrator privilege.

Below is the output from a successful check.

```
> icpermit -c
icpermit Revision 5.00 (Windows)
Copyright (C) 1987-2014, Envyr Corporation. All rights reserved.
License check was successful
icpermit is finished
>
```

If successful, an ERRORLEVEL of 0 is returned, otherwise a 1 is returned.

Operation mode (-O a|c|d|e|i|l|m|p|r|s|t|u)

Operation mode instructs ICPERMIT to perform some operation. All operation modes, except Check (-O c) require administrator privilege. In most cases, it communicates to a currently running ICPERMIT through the ICPERMIT TCP/IP port. Valid options include: (a) amplify (turn on) tracing, (c) check if already running; (d) disable licenses; (e) enable licenses; give (i) info; (l) enable local licensing, (m) mute (turn off) tracing; (p) post ; (r) enable remote licensing, (s) start the icpermit service, and (t) terminate icpermit. If no ICPERMIT is running (for amplify, check, disable, enable, mute, post, terminate, or update) an "Unable to connect to the license server socket" will be given.

Operation amplify (-O a) sends an amplify command to an already running ICPERMIT to cause it to turn on tracing. If successful the following will be given:

```
Tracing of requests has been amplified.
```

Operation check (-O c) queries either the local or remote ICPERMIT to see if it is running. If successful, the pid and machine on which ICPERMIT is running is given. If successful, one of the following will be given:

```
ICPERMIT is running on pid 4294757653 of computer localhost, using port 7334.
```

Or

```
ICPERMIT is running on pid 150 of computer ntserver, using port 7334.
```

Operation disable (-O d) sends a disable command to ICPERMIT to disable providing any new license authorizations. Licenses that are currently authorized will continue to operate but no new licenses will be granted. This pauses the ICPERMIT service. If successful the following will be given:

```
The software licenses have been disabled.
```

Operation enable (-O e) sends an enable command to ICPERMIT to re-enable any licenses that had previously been disabled. This continues the ICPERMIT service. If successful the following will be given:

```
The software licenses have been re-enabled.
```

Operation info (-O i) queries ICPERMIT to provide current licensing information including licenses available, in use, and the most used. If successful the following type of message will be given:

```
License 1: (enabled) ICOBOL Runtime Revision 4.xx and before
  Serial# 21000063 OS: Windows
  Authorized: 0 (max 0) of 129   References: 0
License 2: (enabled) ICOBOL Development Revision 4.xx and before
  Serial# 21000063 OS: Windows
  Authorized: 0 (max 0) of 129   References: 0
```

Operation local (-O l) sets a registry entry that ICPERMIT will be running locally.

Operation mute (-O m) sends a mute command to ICPERMIT to cause it to turn off tracing. If successful the following will be given:

```
Tracing of requests has been muted.
```

Operation post (-O p) sends the post command to ICPERMIT to instruct it to output to its audit log the current license connection information.

Operation remote (-O r) sets a registry entry that ICPERMIT will be running on a remote machine. No local ICPERMIT will be permitted to run. Requires -M *machine* switch to specify the remote machine (option port).

Operation start (-O s) specifies that the ICPERMIT service should be started.

Operation terminate (-O t) specifies that the ICPERMIT service should be terminated.

Operation update (-O u) specifies that the ICPERMIT service should reread the license and file and reauthorize (Update) any additional licenses. This operation allows for licenses to be added or updated while the system is running.

With the use of TCP/IP, ICPERMIT can be used over the Internet by allowing the ICPERMIT port to be accepted (through a firewall) by the Internet server site. Then remote users can use licenses from a single "master" license server at any time the Internet is available from their machine.

Licenses can be shared over a network by machines of the same type or different types.

On a system shutdown, the system shutdown will send the appropriate message to ICPERMIT to cause it to start shutting down.

On shutdown, ICPERMIT will log its connection/license information to the log file.

When started with a valid protection method, ICPERMIT creates a failsafe security file, system.fp. The failsafe security file can be used to start ICPERMIT for up to 3 weeks after the failsafe security file was last written. (While ICPERMIT is running, the filesafe file is updated every 24 hours.) This insures that if the protection method fails, Interactive COBOL can still be used until you have time to get a replacement. From initial activation, the failsafe security file is good for 10 days. Within that timeframe, you should insure that your protection method has been replaced.

To use a failsafe file either use the Services Panel and start the ICPERMIT service manually and add the -f switch or use ICSVCMGR to change the ICPERMIT service to add the -f switch.

License mode

License mode instructs ICPERMIT to authorize processes that require Interactive COBOL licenses. ICPERMIT

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uses the information in the license description file to provide any required authorizations. ICPERMIT in license mode can only be started as a service and it must run under an account with administrator privileges.

The installation program sets up the ICPERMIT service to start in the working directory and with the license file information provided to the install script. The audit log defaults to icpermit.lg in the application log directory (usually C:\ProgramData\ICOBOL). The ICPERMIT service may be managed from the ICOBOL control panel applet called ICSVCMGR or directly from the control panel Services applet. To use the latter, from the **Start** menu, choose **Settings, Control Panel**. In the **Control Panel** folder, select **Services**. While in **Services**, ICPERMIT can be stopped and restarted.

When ICPERMIT is started in license mode it takes the following steps:

- 1) Processes and validates any command line switches.
- 2) The audit file is opened. If it does not exist, it is created.
- 3) Opens a TCP/IP socket on the specified port to communicate with licensed products.
- 4) Reads the license description file and provides authorization based on that information.
 - a) If the Failsafe switch (-f) was given the failsafe file is used to authorize users until a new protection device can be installed. This authorization is only temporary and will expire after the indicated period.
 - b) For a protection device, ICPERMIT interrogates the device as specified by the license to validate the license provided and authorize users.
 - c) If authorized by step b above, a new failsafe file (system.fp) is written to the appropriate location for subsequent use with the Failsafe switch (-f) if the protection device fails for some reason.
- 5) Waits to authorize users.

If at any point in the above steps ICPERMIT detects an error, it displays the appropriate message and terminates.

When given a termination request, if no licenses are in use, ICPERMIT will terminate immediately; otherwise, it will pause for about 2 minutes before terminating. ICPERMIT does NOT terminate processes that are running.

For local connections, ICPERMIT continuously checks to insure that the process that requested a license is still running. If it no longer detects the process, a message will be generated, and the license will be removed from use to be re-used. This check is not done for remote licenses. If a remote user terminates abnormally, that license will remain in use until ICPERMIT receives a terminate request via the TCP/IP keepalive mechanism.

E.3. Errors

If at any point in starting an error is detected, the appropriate message is displayed and ICPERMIT terminates. All errors return a non-zero ERRORLEVEL.

Some example errors and how to fix them appear below.

If the license description file is bad in some way, the following will be generated:

```
Error: Invalid or mis-matched license information: Line 4
Error: No licenses are authorized.
```

Check that the license description file has been entered correctly on the given LIC and KEY lines associated with the Line number shown.

If no protection device can be found, the following will be generated:

```
Error: Device is not available or does not exist: Software protection device
Error: No licenses are authorized
```

Attach the correct protection device or change the license file.

If an incorrect parallel device is found, the following will be generated:

```
Error: License description does not match protection device information: Software
      protection device
Error: No licenses are authorized
```

Attach the correct protection device or change the license file.

If an ICPERMIT operation (-O) is done trying to communicate with an ICPERMIT that is NOT running the following will be generated:

```
Error: Unable to connect to the license server socket.
```

Various errors above this error may indicate particular reasons why no connection could be made, including errors like: connection refused, remote computer is not available, etc.

On Windows, if you get an error like:

```
Oct-28-2011 11:31:28.40 icpermit (4294847509): Error: Unexpected operating
system error (oserr=10022): Creating primary listening socket
      Error: Could not create socket: Unexpected operating system error
(oserr=10022)
```

Then TCP/IP is not installed and must be installed.

E.4. Notes

Licensed products do directly interact with the protection device. They use the TCP/IP port created by an ICPERMIT to request authorizations.

Below are *errnum* values for errors that can be returned when communicating with the Sentinel driver for either parallel or USB protection devices.

1 Invalid function code	8 Write not ready	15 Packet too small
2 Invalid Packet	9 No port found	16 Invalid parameter
3 Unit not found	10 Already zero	17 Memory access error
4 Access denied	11 Driver open error	18 Version not supported
5 Invalid Memory address	12 Driver not installed	19 Os not supported
6 Invalid access code	13 IO Communications error	20 Query too long
7 Port is busy		30 Driver is busy

F. ICPERMIT Termination

To terminate ICPERMIT, either use the Terminate Operation (-O t) of ICPERMIT, use ICSVCMGR, or standard system services and select STOP .

When ICPERMIT terminates it will first prevent any new Interactive COBOL processes from starting.

Please be patient while ICPERMIT is terminating.

On a system shutdown, the system shutdown script/executable will send the appropriate signals to ICPERMIT to cause it to start shutting down.

As ICPERMIT terminates, it will log its connection/license information to the log file.

V. ICEDCFW

A. Introduction

ICEDCFW is the Windows GUI version of the configuration utility. ICEDCFW and/or ICCONFIG can be used to create and edit configuration files (.cfi), terminal description files (.tdi), and printer translation files (.pti). Each of these files is a .ini based text file with the appropriate sections and definitions. Whereas ICCONFIG can be run from a connected terminal or telnet session, ICEDCFW requires a standard Windows graphical session to run.

NOTE: Versions of ICOBOL before 3.30 used configuration files, terminal description files, and printer translation files with the extensions of .cf, .td, and .pt files that were binary files. This format has been discontinued. The ICREVUP utility (documented in the fromicobol3.txt file) has been provided to up-rev these files to their .ini-based counterparts. If you need to be able to configure these older files then you must keep an older copy of the configuration utility around to provide that ability. The current configuration utilities will ONLY support the .ini-based format.

Check boxes are used for Yes/No type responses. Checking the box is a Yes. An un-checked box is a No.

While editing a file, the OK selection at the bottom of the screen can also be used to save and close a file.

While editing a file, the CANCEL selection at the bottom of the screen can be used to close a file ignoring any changes.

While editing a file, the APPLY selection at the bottom of the screen can be used to save the file. It will be gray (inactive) until a change has been made.

If no Save is done, then any changes made are NOT saved. If you try to exit and no Save has been done since the configuration was last modified, you are prompted whether a Save should be done.

Multiple files of the same or different types can be opened and edited at the same time .

B. Startup

To start ICEDCFW the syntax is:

```
icedcfw [-a[:aflag]|-A file|dir[:aflag]] [-h|-?] [-q] [file]
```

Where

-a[:aflag] or *-A file|dir[:aflag]* (Audit)

Enables auditing (default icedcfw.lg). Where *aflag* is a|b|d|p|t|u|d|a|d|b|p|a|p|b|t|a|t|b|u|a|u|b, defined as a-append, b-backup, d-date, p-pid, t-time, and u-username.

-h|-? (Help)

Displays help text.

-q (Quiet)

Enables quiet operation.

file

Specifies the actual filename to edit. If no extension is given, the '.cfi' extension is added. To edit a terminal description file or a printer translation file, the filename with the correct extension must be given.

If no argument is provided, ICEDCFW starts with the last file that was being edited.

If the given configuration file exists and cannot be read at startup, an error is displayed and ICEDCFW terminates. The error should be fixed before re-running ICEDCFW. If the given configuration file does not exist at startup, a warning is displayed that the file was not found but ICEDCFW continues with no file.

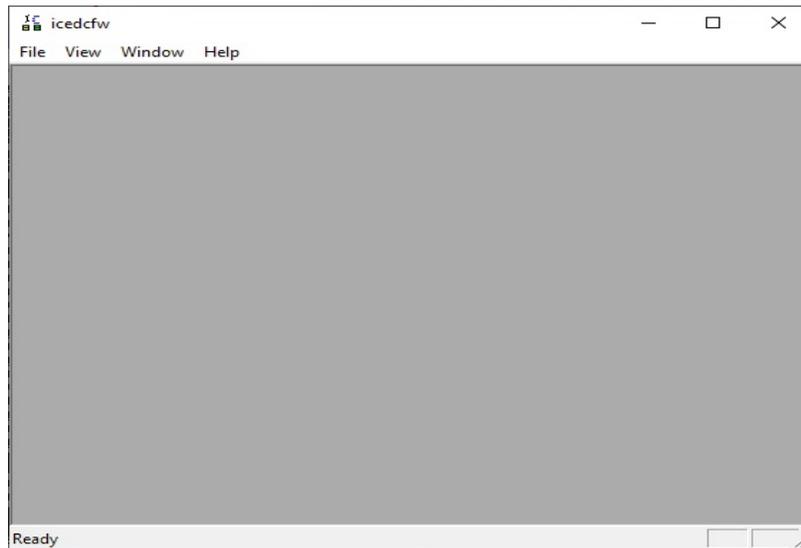
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For example the line:

```
icedcfw samplecf.cfi
```

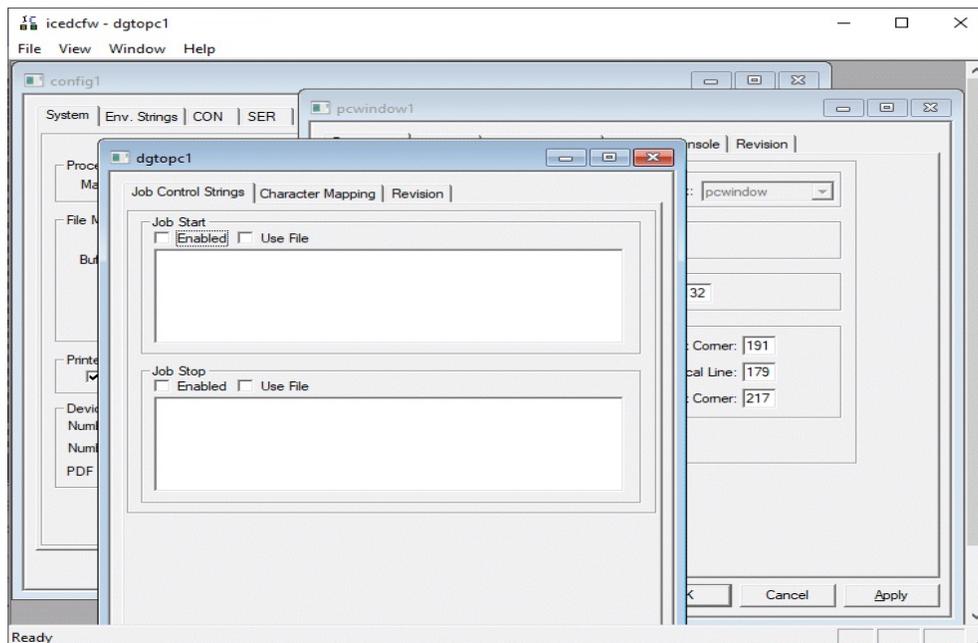
would retrieve the configuration file samplecf.cfi.

SCREEN 1 shows the MDI Window displayed when ICEDCFW starts with no file open. The View Tab allows Status Bar and Set Font for printing.



SCREEN 1. ICEDCFW no file

Multiple files of the same or different types can be opened and edited at the same time as shown in the following screen:



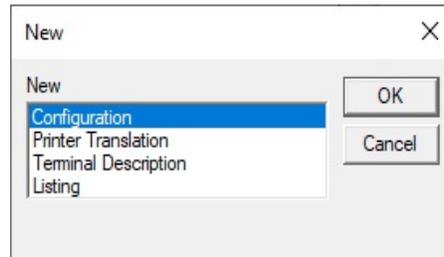
SCREEN 2. ICEDCFW multiple files

C. ICEDCFW Menus

C.1. File Menu

The **File** menu provides the ability to create a New file of any type, to open an existing file, and to Exit the application.

Selecting **New** will show a selection box like below:



that selects the type of file to be created.

Selecting **Open** will bring up a Open dialog box.

Once a file is open, there are selections for Save, Save As, Close, Create Listing, Print, and Print Preview. There is also a list of some of the most recently edited files that can be opened directly.

Selecting **Exit** will exit the application.

C.2. View Menu

The **View** menu provides the ability to enable/disable the Status bar at the bottom and most importantly it provides a Font selection for the font to use with any listing. Only fixed fonts should be used and the default is a Courier font.

C.3. Window Menu

The **Window** menu provides the ability select how you want multiple files to be viewed. (Cascade, Tile, Arranged) along with selecting the current file.

C.4. Help Menu

The **Help** menu has an About selection that displays the revision of **ICOBOL** currently in use.

D. System Configuration (.cfi)

D.1. Overview

Initially opening a configuration file or selecting the **System** tab will show SCREEN 3. Each portion of the configuration file has a separate tab to allow that section to be configured.

D.2. System tab

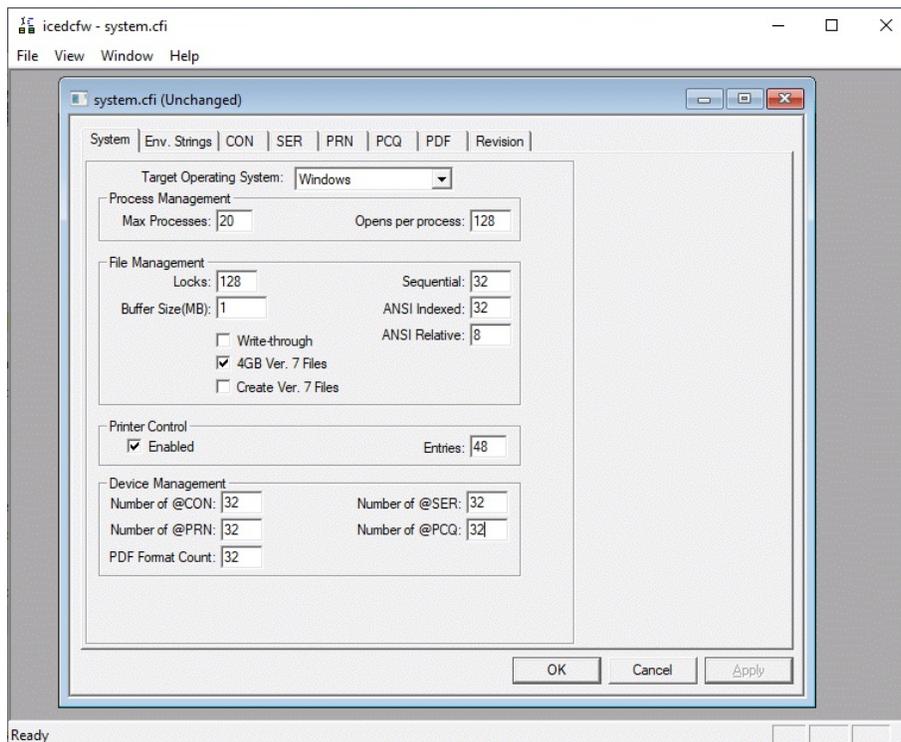
These System Parameters define how the Interactive COBOL runtime allocates various resources. Choose the

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appropriate values by typing a valid value for each parameter. If there is an error, the menu is re-displayed with the cursor on the offending entry.

Terminal Status in Interactive COBOL will display the actual values that are current for some of these parameters along with the actual in use count for the files, record locks, and several other values.

System Information in Interactive COBOL will display the in use, maximum used, and configured values for many of these parameters during a particular invocation of the runtime.



SCREEN 3. ICEDCFW SYSTEM PARAMETERS

Target Operating System will show the target operating system for which this configuration is being setup for. For a new configuration file it defaults to "Windows".

Under Process Management.

Processes, is the maximum number of Interactive COBOL processes including ICEXEC, runtimes, and ICNETD servers that can execute simultaneously when ICEXEC is running. Valid entries are from 1 to 9999; 8 is the default.

OPENS is the maximum number of simultaneous file opens that any Interactive COBOL runtime invocation will allow to be opened (i.e., OPEN FD's in a COBOL program). The number of available handles is decreased every time a file is logically opened by any program in the run unit. Valid entries are from 100 to 2048; 128 is the default.

Under File Management.

These apply to ICEXEC as a whole .

Locks is the number of simultaneous record locks allowed . Valid entries are from 0 to 32767; 128 is the default.

SEQUENTIAL is the number of unique sequential files that can be simultaneously opened . Valid entries are from 0 to 4096; 32 is the default.

Buffer Size (MB) is the amount of memory, in MegaBytes, that will be allocated for buffers. A certain minimum buffer size must be provided that is calculated as "maximum number of processes * 2 * 4KB". Valid entries are from 1 to 3072; 1 is the default. With no ICEXEC, more than 1MB is generally not needed since most files are opened in network mode such that all writes must flush the data to the network immediately. If large files are opened exclusively for modification then increasing this parameter may be useful. With ICEXEC, this number should be such that each runtime has at least 30-40KB.

ANSI INDEXED is the number of unique indexed files that can be simultaneously opened. Valid entries are from 0 to 8192; 32 is the default.

Write-through set to Yes instructs the Interactive COBOL runtime to write all modified pages to the operating system on any operation that modifies data that resides on the disk. Valid entries are Yes or No; No is the default.

ANSI RELATIVE is the number of unique relative files that can be simultaneously opened. Valid entries are from 0 to 4096; 8 is the default.

Enable 4GB ICISAM version 7 files specifies whether to create version 7 ICISAM files with the ability to have 4GB files. If not enabled (No), only 2GB files are allowed. Valid entries are yes and no; Yes is the default. Note that version 8 ICISAM files are created by default and they always allow greater than 4GB file sizes.

Create ICISAM Version 7 files specifies whether to create version 7 ICISAM files as the default when creating new ICISAM files. Valid entries are yes and no; No is the default such that version 8 ICISAM files are created by default.

(This was added in 5.20)

Under Printer Control.

Enabled allows for the Printer Control Utility to be enabled (Yes) or disabled (No). If set to No, files normally placed in the printer control file (system.pq) are not placed there and the IC_PRINT_STAT builtin will return an error. Valid entries are Yes or No; Yes is the default.

Entries is the maximum number of entries allowed in the printer control file at once. Once this number is reached, all new files will get a File Status 99 when a new file is being OPEN'ed which would create a new entry in the printer control file. Valid entries are from 48 to 1024 entries; 48 is the default.

Under Device Management

Number of @CON is the number of consoles to allowed to be configured in this configuration. Valid entries are from 1 to 2048. 32 is the default

Number of @SER is the number of serials to allowed to be configured in this configuration. Valid entries are from 0 to 2048. 32 is the default

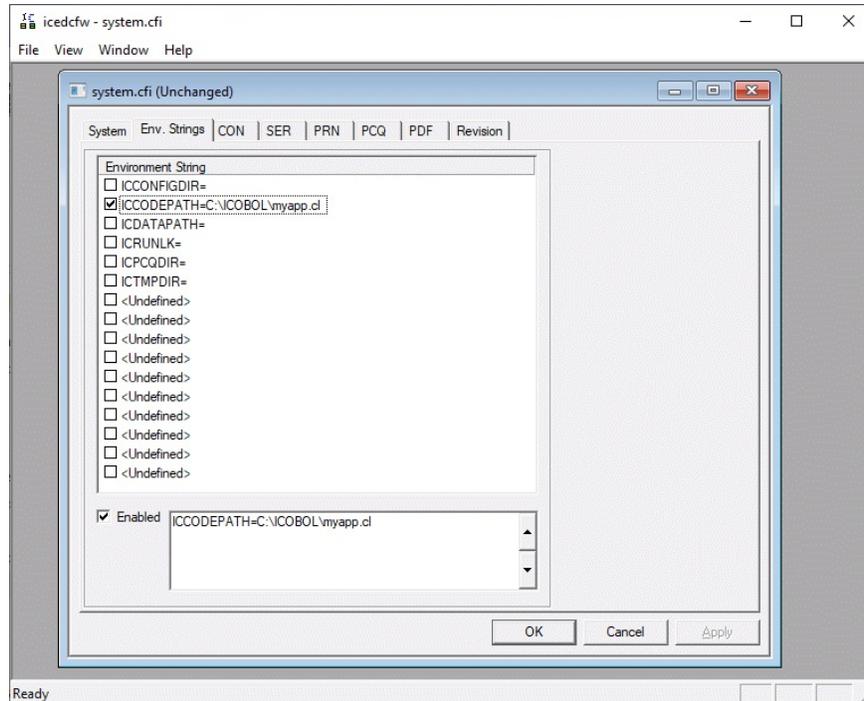
Number of @PRN is the number of printers to allowed to be configured in this configuration. Valid entries are from 0 to 2048. 32 is the default

Number of @PCQ is the number of printer queues to allowed to be configured in this configuration. Valid entries are from 0 to 2048. 32 is the default

PDF Format Count is the number of PDF Forms to be allowed to be configured in this configuration. Valid entries are from 0 to 256. 32 is the default.

D.3. Environment Strings tab

The **Env. Strings** tab shows SCREEN 4 which allows common environment entries to be specified. Entries defined in this section will be available to the runtime for all consoles. These common environment entries can be overridden by setting the same entry in the actual environment provided by the operating system.



SCREEN 4. ICEDCFW ENVIRONMENT STRINGS

More on environment entries can be found on page [125](#), [155](#).

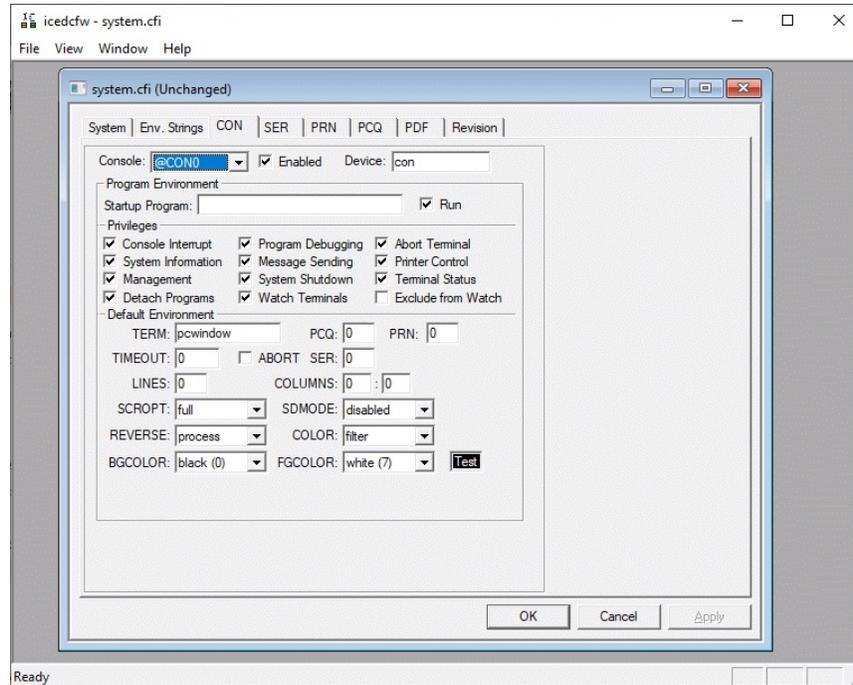
Up to 15 default environment strings can be stored in the configuration file.

An environment string entry allows up to 255 characters.

D.4. Consoles and Programs tab

Selecting the **CON** tab allows the configuration information for all the logical console lines (@CON0 and up) in the Interactive COBOL system to be defined as shown in SCREEN 5.

This menu allows a console to be enabled or disabled and an actual hardware device to be assigned to it.



SCREEN 5. ICEDCFW CONSOLE DEVICE

Where:

The first entry *Console* is the console to be configured. Valid numbers are 0 to the highest supported console.

Enabled set to Yes allows this console to execute Interactive COBOL.

Device, can be any of the following:

- 1) “con” allows the console to be available from the Master Console session. (ICTERM=pcwindow). In most cases, many consoles should be configured this way to allow multiple invocations.
- 2) a valid “*machine-name*” or “*ip-address*” allows the console to be available for a ThinClient connection from that particular remote machine.
- 3) “icrunrs” allows the console to be available for ThinClient programs only.
- 4) “nul” allows the console to be available for detached programs .
- 5) “cgi”, allows the console to be available for cgi programs using icruncgi. You should have enough “cgi” consoles to support the maximum simultaneous number of cgi connections you expect to have.
- 6) (blank) allows the console to be available for telnet/rlogin/ThinClient sessions.

The *machine-name* and/or *ip-address* allows for a specific machine to have a specific console number or numbers when using thinclients. The ip-address would be given as an *n.n.n.n* value.

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Multiple consoles can be set to the same device to allow multiple runtime sessions to be started on that device. Within the same device name, consoles are used on a first-come first-served basis. A particular console can be selected by using the Terminal number switch (-T *n*).

Run specifies whether this console allows a COBOL program to be run on it. Valid selections are Yes or No. The default is Yes for all consoles. Console lines with the Run program option enabled are called program lines. If the Run Program option is set to No this console device is treated like an @SER serial device and all the remaining settings in this menu are ignored.

Startup program is the initial COBOL program to run when ICRUN initializes this console. Valid selections are no entry or any valid COBOL program with up to 30 characters. The default is no entry causing the COBOL program LOGON to be run.

Privileges

These options provide for individual control over many system management functions about whether a COBOL program on this console has access to the particular feature. Valid selections are Yes or No. Console 0 defaults to all these settings enabled. All other consoles default to have Abort, Printer control management, and Shutdown disabled.

Console interrupt determines whether to allow the user to abort the currently running COBOL program with the Ctrl-C sequence and to halt the program with the Ctrl-Break sequence. If set to No, the Ctrl-C character is passed on up to the program as data and the Ctrl-Break sequence is ignored. When set to Yes, Ctrl-C is trapped by the runtime system and generates an abort to the currently running program, Ctrl-Break is trapped by the runtime system and generates a halt to the currently running program.

Program Debugging determines whether to allow Interactive COBOL debugging to be run on this line.

Abort Terminal determines whether this feature is allowed for COBOL programs running on this console.

System Information determines whether this feature is allowed for COBOL programs running on this console.

Message Sending determines whether this feature is allowed for COBOL programs running on this console.

Printer Control determines whether this feature is allowed for COBOL programs running on this console.

Printer Control Management determines whether this console is allowed to perform all operations on the printer control file while in the Printer Control utility. If this privilege is granted, this console may perform any operation on any file while in the printer control utility provided the user has access to the file from the operating system.

System Shutdown is ignored.

Terminal Status determines whether this feature is allowed for COBOL programs running on this console.

Detach Programs determines whether to allow this program to detach programs and run Host programs.

Watch other terminals determines whether the Watch facility should be allowed for COBOL programs running on this console.

Exclude from Watch determines whether this program can be Watched or Controller by another.

Default Environment

This section specifies terminal specific information for a particular console line. There are corresponding environment entries available that override these entries in present.

ICTERM specifies the terminal description entry to be used for this console. The default is pwindow for all

consoles. Valid ICTERM selections are valid terminal description entries with corresponding .TDI files. For an enabled console, this menu cannot be exited without some selection specified for ICTERM.

PCQ sets the generic printer control queue (@PCQ) to @PCQn based on the entered number. Valid selections are 0 through 2047, the default is 0. If set to an invalid queue, an error will occur on the OPEN.

PRN sets the generic printer device (@PRN) to @PRNn based on the entered number. Valid selections are 0 through 2047, the default is 0. If set to an invalid printer, an error will occur on the OPEN.

ICTIMEOUT sets a default global timeout value in seconds for all ACCEPTs and STOP literals on this console. If no key has been pressed in the specified time interval, the ACCEPT returns with the ESCAPE code set to 99. Valid selections are 0 through 6300, the default is 0 meaning no timeout, i.e., wait forever.

ICABORT specifies whether to abort the console (i.e., log it off) if an ACCEPT times out due to the global timeout setting (ICTIMEOUT). Valid selections are off or on, the default is off.

SER sets the generic serial device (@SER) to @SERn based on the entered number. Valid selections are 0 through 2047, the default is 0. If set to an invalid serial device, an error will occur on the OPEN.

ICLINES and *ICCOLUMNS* set the number of lines and columns (including min and max) that will be allowed on this console. Valid selections are 0 through 255. The default of 0 says use the values specified in the terminal description entry. These values indicate to Interactive COBOL where the screen wraps (ICCOLUMNS) and scrolls (ICLINES). If set incorrectly, screens may not display properly.

ICSCROPT specifies how the SCREEN OPTIMIZER is to perform. Valid selections are off, partial, full, and mute. The default is full. All enabled consoles have at least one screen area reserved. For a 24x80 column screen, a single screen image consumes about 8KB.

Off says to transmit character codes as they are written by the program.

Partial enables the SCREEN OPTIMIZER to use a simple method of reducing the amount of characters sent to the terminal.

Full enables the SCREEN OPTIMIZER to keep two images of the current screen in memory and provides a complex method of comparing the data in the two images to reduce the amount of characters sent to the terminal to only those characters that would change the screen display at the end of an operation. In this mode two additional memory areas are allocated to hold this image.

Mute forces Interactive COBOL to not send any implied codes to the terminal either at startup or termination.

Only when executing a program instruction are codes sent to the terminal.

Ctrl-U from the keyboard while in an input from the console, can be used to refresh the screen.

Usually partial and/or full will provide improved screen performance. Full is preferred with the debugger.

ICSDDMODE specifies whether to enable the SCREEN HANDLER and if so in what mode. Valid selections are disabled, underline (0), reverse (1), and linedraw (2). The default is disabled. Linedraw uses the characters for line drawing specified in the terminal description file for the particular terminal.

ICREVERSE specifies how to interpret reverse codes from a COBOL program. Valid selections are filter, ignore, and process. The default is process. Reverse codes are Ctrl-B and Ctrl-V along with the two-byte sequences <036>D and <036>E.

Filter says to watch for reverse codes from the program and to NOT send them to the terminal, since it does not support reverse.

Ignore says that the user wants total control of the screen and may be sending binary reverse data to the screen and that Interactive COBOL should ignore all reverse codes (i.e., do not look for reverse codes). If running in this mode, the SCREEN OPTIMIZER cannot correctly repaint a user's screen that includes reverse codes.

Process says to interpret reverse codes from the program and send the appropriate sequences to the terminal.

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ICCOLOR specifies how to interpret color codes from a COBOL program. Valid selections are filter, ignore, and process. The default is filter.

Filter says to watch for color codes from the program and to NOT send them to the terminal, since it does not support color.

Ignore says that the user wants total control of the screen and may be sending binary color data to the screen and that Interactive COBOL should ignore all color codes (i.e., do not look for color codes). If running in this mode, the SCREEN OPTIMIZER cannot correctly repaint a user's screen that includes colors.

Process says to interpret color codes from the program and send the appropriate sequences to the terminal.

When set to Process the initial background and foreground colors are set by Interactive COBOL at startup.

ICBGCOLOR sets the initial background color to the indicated value when running with *ICCOLOR* set to Process. Valid selections are black (0), blue (1), green (2), cyan (3), red (4), magenta (5), brown (6), and white (7). The default is black (0).

ICFGCOLOR sets the initial foreground color to the indicated value when running with Color support (*ICCOLOR*) set to Process. Valid selections are black (0), blue (1), green (2), cyan (3), red (4), magenta (5), brown (6), and white (7). The default is white (7).

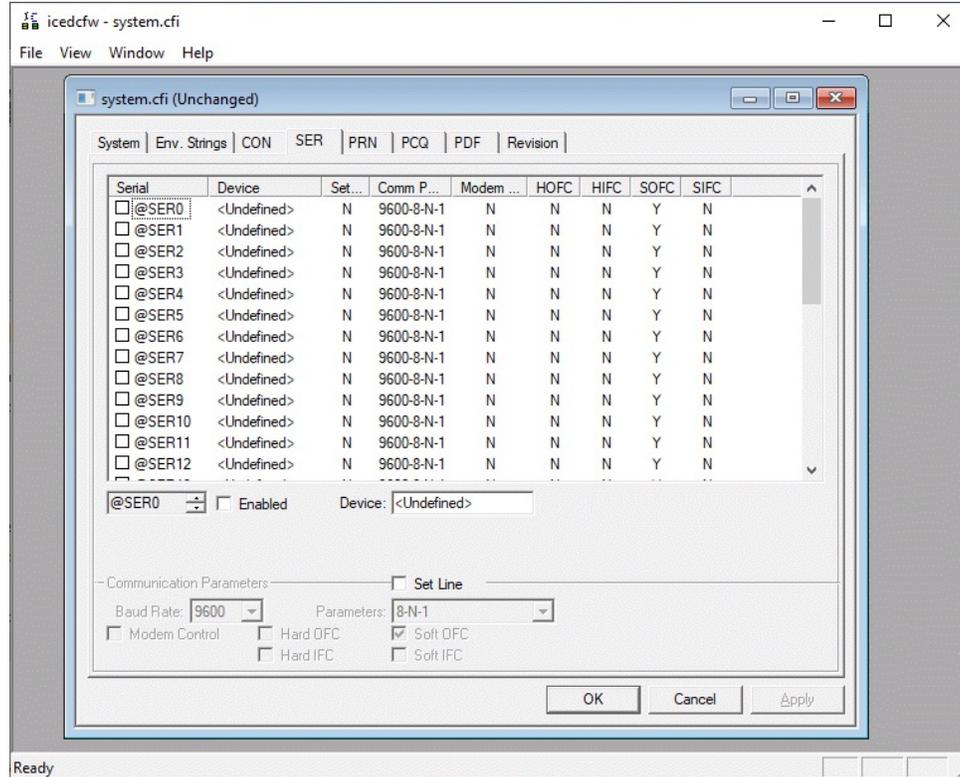
The Test box is used to show the current *ICBGCOLOR* and *ICFGCOLOR* settings output.

Console lines that are not enabled are ignored.

D.5. Serial Lines tab

Selecting the **SER** tab allows the configuration information for all the logical serial lines (@SER0-@SER2047) to be defined as shown in SCREEN 6. A serial device differs from a console device in that it can only be used for I/O.

This menu defines logical serial devices to point to a particular hardware device.



SCREEN 6. ICEDCFW SERIAL DEVICE

Where:

Enabled set to Yes allows this serial device to be used.

Device can be any of the hardware character devices except for parallel printers that support both input and output operations. Two or more serial devices (@SERn) can point to the same hardware device.

If a COM port above 9 is specified it must be specified as "\\.\COM10", etc..

Set Line instructs the runtime whether to use the following port device settings. If set to No, the default the following settings are not used and an open of the device will use whatever system defaults there are. If set to Yes, the runtime will attempt to set the device settings to the given values.

Baud Rate and *Parameters* set the appropriate selection to the given value. These values must match those of the attached device or else undefined results will occur. Generally the baud rate should be set to the fastest possible setting that the runtime, port, wiring, and attached device can support.

Modem Control (modem control) tells Interactive COBOL how to handle modem control signal Data Carrier Detect (DCD) for a particular device. If Modem Control is set to No, DCD is ignored.

Modem Control set to Yes for serial lines will cause an OPEN to wait until DCD is asserted before returning. If DCD is lowered after the OPEN, the next I/O operation to that line will receive an error and the appropriate action

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will be taken.

Hard OFC (HOFC) tells Interactive COBOL how to handle the Clear To Send (CTS) signal. HOFC set to No says to ignore CTS. HOFC set to Yes says to monitor CTS to decide if the attached device is ready to receive output. If not, it waits until CTS is asserted. Data Set Ready (DSR) must also be asserted for characters to be sent.

Hard IFC (HIFC) tells Interactive COBOL how to handle the Request to send (RTS) signal. HIFC set to No says to leave RTS high after an open. HIFC set to Yes says to raise and lower RTS to instruct the attached device if it can send data.

HOFC and HIFC should both be enabled when dealing with high-speed modems as SOFC and SIFC are not reliable in these cases.

Soft OFC (SOFC) tells Interactive COBOL whether to watch for a Ctrl-S (XOFF) coming from the output device to tell Interactive COBOL to stop sending characters and then wait for a Ctrl-Q (XON) to continue transmitting. SOFC set to No says to ignore XON and XOFF codes while Yes says to watch for an XOFF and stop transmitting until an XON is seen.

Soft IFC (SIFC) tells Interactive COBOL whether to send Ctrl-S (XOFF) and Ctrl-Q (XON) to the input device to tell it to stop transmitting characters and start transmitting characters respectively. This should NEVER be used for a DG terminal or emulator because the Ctrl-S and Ctrl-Q codes are valid attribute control codes and are NOT recognized as XOFF and XON.

A hardware device configured as a console device enabled to run programs cannot also be used as a serial device.

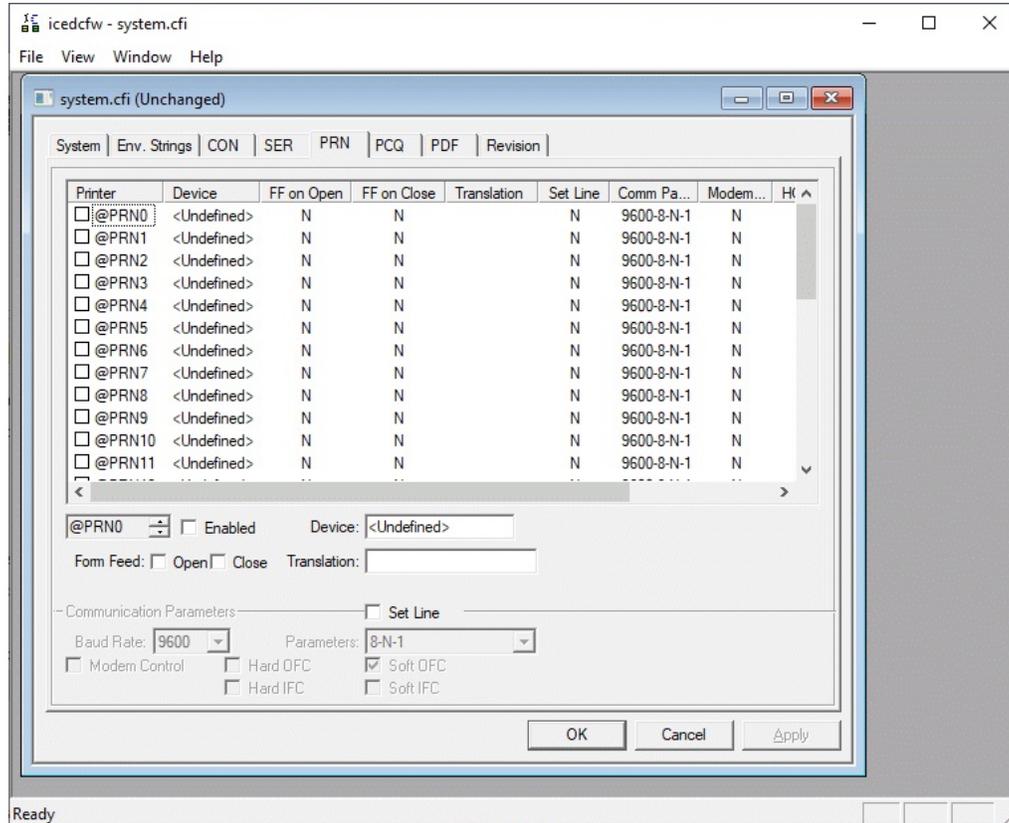
Serial devices that are not enabled or for which the hardware device is not available are ignored and give an error on OPEN.

When opening serial devices and Set Line is No, the runtime uses the last setting for that serial device to set up the default parameters (baud, parity, number of data bits, etc.). The MODE command can be used to perform these settings if needed. This MODE will be remembered until another setting is stored. In addition, extended open options can be used to set the needed values.

D.6. **Printers** tab

Selecting the **PRN** tab allows the configuration information for all the logical printers (@PRN0-@PRN2047) to be defined as shown in SCREEN 7.

This menu defines certain characteristics for each logical printer to be specified.



SCREEN 7. ICEDCFW PRINTER DEVICE

Where:

Enabled set to Yes allows this printer device to be used.

Device directs the Interactive COBOL runtime where to send the print data for a particular logical printer. Possible selections are any of the hardware character devices (COMx, MDMx, LPTx, etc) that are not in use as terminal lines or blank for None. Two or more printers (@PRNn) can point to the same hardware device. This would be useful if different printer options are needed.

FF on OPEN and *FF on CLOSE* instructs the runtime whether to send a Form-Feed to the printer when the appropriate statement is executed on a particular printer.

Translation specifies a printer translation file to be used when printing. If nothing is specified, each character is printed as given. Printer translation files are opened and read when the runtime system is started.

Set Line instructs the runtime whether to use the following port device settings. If set to No, the following settings are not used and an open of the device will use whatever system defaults there are. If set to Yes, the runtime will attempt to set the device settings to the given values. These device settings are ignored for parallel ports.

Baud Rate and *Parameters* set the appropriate selection to the given value. These values must match those of the attached device or else undefined results will occur. Generally the baud rate should be set to the fastest possible

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setting that the runtime, port, wiring, and output device can support.

Modem Control tells Interactive COBOL how to handle modem control signal Data Carrier Detect (DCD) for a particular device. If Modem Control is set to No, DCD is ignored.

Modem Control set to Yes for serial lines will cause an OPEN to wait until DCD is asserted before returning. If DCD is lowered after the OPEN, the next I/O operation to that line will receive an error and the appropriate action will be taken.

Hard OFC (HOFC) tells Interactive COBOL how to handle the Clear To Send (CTS) signal. HOFC set to No says to ignore CTS. HOFC set to Yes says to monitor CTS to decide if the attached device is ready to receive output. If not, it waits until CTS is asserted. Data Set Ready (DSR) must also be asserted for characters to be sent.

Hard IFC (HIFC) tells Interactive COBOL how to handle the Request to send (RTS) signal. HIFC set to No says to leave RTS high after an open. HIFC set to Yes says to raise and lower RTS to instruct the attached device if it can send data.

HOFC and HIFC should both be enabled when dealing with high-speed modems as SOFC and SIFC are not reliable in these cases.

Soft OFC (SOFC) tells Interactive COBOL whether to watch for a Ctrl-S (XOFF) coming from the output device to tell Interactive COBOL to stop sending characters and then wait for a Ctrl-Q (XON) to continue transmitting. SOFC set to No says to ignore XON and XOFF codes while Yes says to watch for an XOFF and stop transmitting until an XON is seen.

Soft IFC (SIFC) tells Interactive COBOL whether to send Ctrl-S (XOFF) and Ctrl-Q (XON) to the input device to tell it to stop transmitting characters and start transmitting characters respectively. This should NEVER be used for a DG terminal or emulator because the Ctrl-S and Ctrl-Q codes are valid attribute control codes and are NOT recognized as XOFF and XON.

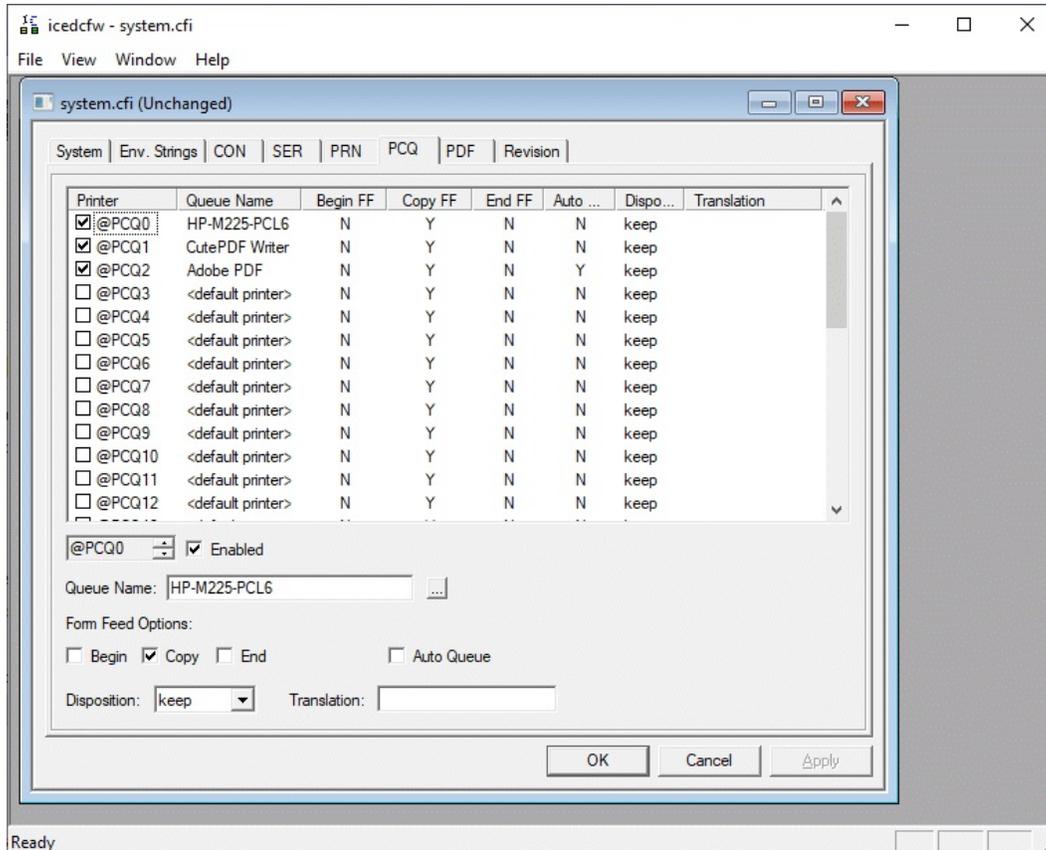
Printers that are not enabled or for which the hardware device is not available, are ignored and give an error on OPEN.

PRN devices are direct linkages from the Interactive COBOL runtime to the device. When used with the COBOL EXCLUSIVE option, the Interactive COBOL runtime prevents other Interactive COBOL processes from opening that device while it is in use.

D.7. **Printer Queues** tab

Selecting the **PCQ** tab allows the configuration information for all the logical printer control queues (@PCQ0-@PCQ2047) to be defined as shown in SCREEN 8.

This menu defines certain characteristics for each logical printer control queue to be specified.



SCREEN 8. ICEDCFW PRINTER QUEUE DEVICE

Where:

Enabled set to Yes allows this printer control queue device to be used. When the Interactive COBOL runtime starts, it checks with the Windows printer subsystem for each enabled printer control queue.

Queue Name directs Interactive COBOL where to send the data for a particular logical printer control queue. Any printer defined to the Windows Printer subsystem can be specified or blank. On Windows, use the printer name as given in the **Printer Control Panel** (from the **Start** menu, choose **Settings, Printers**) for local printers and use the network port name for redirected printers. Blank can be used to select the default printer. The ... box can be used to pull-down all the current Windows printers on this machine. ICINFO can also be used to see the available Windows printers on a particular machine.

The *Form Feed* options instructs the Printer Control Utility whether to add additional Form Feeds at certain points when printing to the print device.

Auto Queue instructs the Printer Control utility whether to automatically queue a file to its default print queue when the file has been closed.

Translation specifies a printer translation file to be used when printing. If nothing is specified, each character is printed as given. Printer translation files are opened and read when the runtime is started.

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Disposition provides the Printer Control utility with the default option for a particular print file of whether to Keep, Remove, or Delete the particular file or entry after it has been printed.

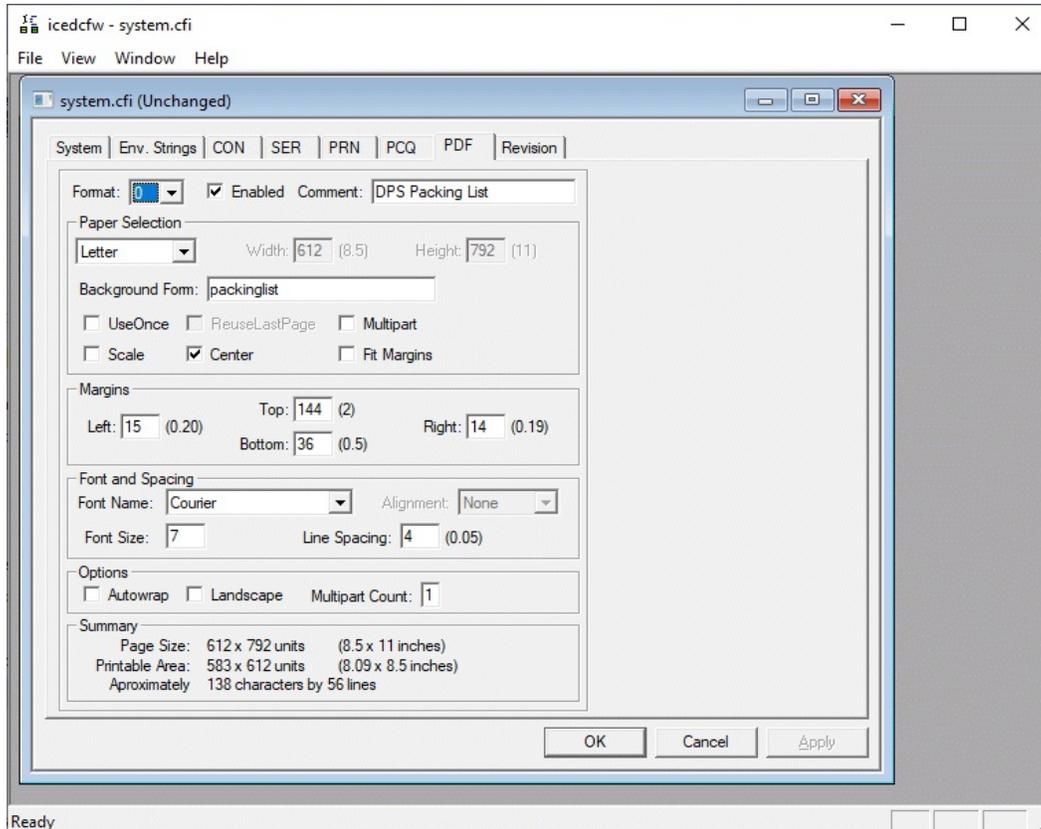
Printer control queues that are not enabled are ignored and give an error on OPEN.

Printer control queues (@PCQs) are indirect linkages from Interactive COBOL to a particular device through Interactive COBOL print spooler. The data is spooled to a disk file and when the file is closed under COBOL the disk file is submitted to the appropriate print spooler to be printed on the indicated print device. If a printer control queue is opened directly, e.g., "@PCQ25", the runtime will write the data directly to the Windows print spooler without creating a temporary file in most cases. In cases where it does need to create a temporary file, the file will NOT be placed in the .pq file or in the ICPCQDIR directory and will be sent to the printer spooler on CLOSE.

D.8. PDF Formats tab

Selecting the **PDF** tab allows the configuration information for all the PDF Forms to be defined as shown in SCREEN 9.

This menu defines certain characteristics for each PDF Format.



SCREEN 9. ICEDCFW PDF FORMATS

Where:

Format is the particular format description to be configured. The range of values is as specified in the System Parameters configuration.

Enabled set to Yes allows this PDF Format to be used.

Comment provides a brief description of this format. This description is stored in the shared area and is viewable by ICSMVIEW or in the Printer Control Utility.

Paper Selection allows for a particular paper size to be entered by scrolling through the various predefined sizes or by entering a custom size which allows for the specific size to be set. Valid selections include A5, A4, Executive, Lineprinter, Tabloid, Ledger, Legal, Letter, and Custom.

Background Form is optional; and allows a background image file (pdf format) to be specified that will be imposed on the pdf image to be created. At runtime this form must be present in the directory specified by ICCONFIGDIR or in the current directory.

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The following selections only apply if a background image is specified:

UseOnce: Y/N (Default is N)

Y=use the background form one time (*ReuseLastPage* appears)

N=old behavior (*MultiPart* appears)

ReuseLastPage: Y/N (Appears only when *UseOnce*=Y)

Y=once the form has been used, reuse the last page of the form for all the remaining pages.

When used with a 1-page form, the effect is the same as *UseOnce*=N.

N=once the form is used, print remaining pages with no form.

ReuseLastPage is useful to have a unique first page.

Multipart specifies whether this background image is a multi-page document. When set, the runtime will generate a logical page multiple times for each page in the image.

Scale specifies whether to scale the background image. When set to Yes, the image will be scaled to either the paper size or margin size. The aspect ratio is kept intact. The default is No.

Center specifies whether the background image should be centered. When set to Yes, the image will be centered to either the paper size or margin setting. The default is Yes.

Fit Margins specifies whether to use the margin settings or the paper size should be used when scaling or centering the image. The default is the paper size.

Margins allows the specific inside margins to be specified for this format. Units are in points, which are 1/72 inch units.

Font Name allows for a specific supported font to be entered. Currently supported fonts include: Courier, Courier-Oblique, Courier-Bold, Courier-BoldOblique, Helvetica, Helvetica-Oblique, Helvetica-Bold, Helvetica-BoldOblique, Times-Roman, Times-Italic, Times-Bold, and Times-BoldItalic. These are 12 of the 14 standard Adobe fonts.

Font Size is the specified size in points. Sizes from 2 - 72 can be specified. For example, a 12-point Courier font provides 10 characters per inch. The 10 is usually referred to as the pitch for fixed fonts. A 10-point Courier provides 12 characters per inch, i.e., 12 pitch.

Line Spacing specifies the default spacing between lines in points. The line height is the sum of *font size* and *line spacing*.

Autowrap specifies whether to wrap lines that are too long or truncate the lines.

Landscape specifies whether this page should be treated as landscape or portrait. (Swaps width and height.)

Multipart Count specifies whether to generate multiple pages for each page. If this value is greater than 1, then a multi-part form will be generated. If a multi-page image is specified and *Multipart* is set to Y then this value MUST match the number of pages in the image. If a multi-page image file was specified, but *Multipart* is set to N, then this file will be used in a modulo fashion as logical pages are presented.

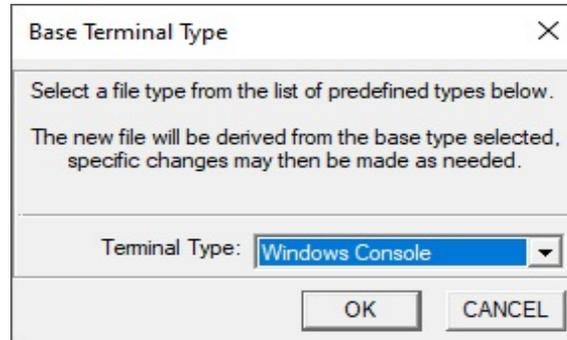
The Summary section at the bottom of the screen shows a summary of what the pdf page specifics. This is kept constantly updated as selections are made in the screen.

All page dimensions and margins are in points which are 1/72 inch units. The values in parenthesis (x) show inches.

E. Terminal Descriptions (.tdi)

E.1. Overview

To create a new terminal description file, select the **File** tab, New, Terminal Description will present a Base Terminal Description as shown below.



SCREEN 10. ICEDCFW BASE TERMINAL TYPE

The Base Terminal Type screen allows a base terminal type to be selected from a list of available terminals. These can be selected via a pull-down menu. This base set includes the following:

ANSI class:	AIX Console, ANSI, AT&T 605, AT386 Console, SCO Console, SUN Console, XENIX Console, XTERM Console, 386IX Console	
DG class:	DG D200+	
Disk class:	File	
IBM class:	IBM 3151	
Freedom class:	FREEDOM-One	
VTxxx class:	VT100, VT220, VT220PC, Linux	
Wyse 50 class:	WYSE 50	
Wyse class:	WYSE 60	
PC Window class:	PCWINDOW, PCWINDOWCOLOR, PCWINDOWMONO	(On Windows only)
Terminfo class:	TERMINFO	(On Linux only)

The sets of classes shown above are the default output codes used for each of the particular base terminal descriptions. I.E., all the terminal descriptions in the ANSI class use ANSI codes, those in the DG class use DG control codes, etc. . When in the Configure Display screens these classes are shown at the top as Format.

More information about these base terminal descriptions can be found in the ICTERM Chapter starting on page [173](#).

Once a base terminal type is selected the file will be named, opened, and positioned to the Keyboard selection as shown in the following Keyboard section.

A comment can be placed into a terminal description file from any selection. The Comment field allows up to thirty (30) characters to be entered for this terminal description. This option is especially useful if you change a base terminal description to provide some documentation of the change. For example, if you add a HotKey to a DG description you may change the comment to "DG F1 Hot".

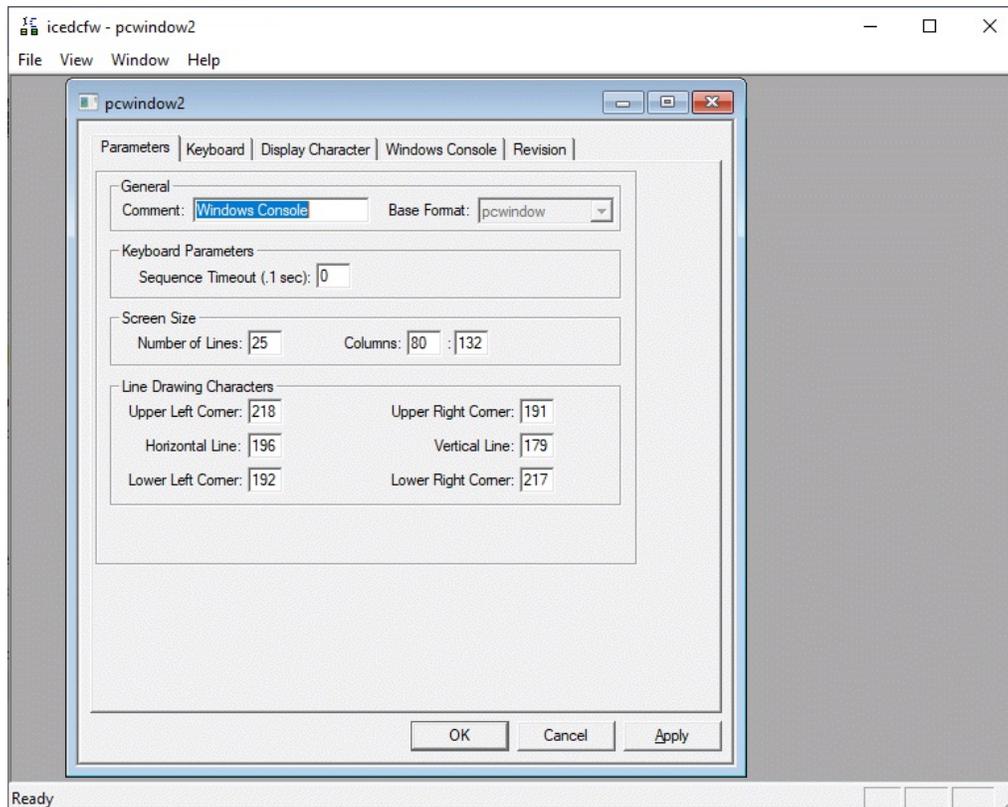
E.2. Parameters tab

Selecting the Parameters tab gives the PARAMETER CONFIGURATION as seen in SCREEN 11.

The current name of the terminal being configured is displayed at the top of the screen along with its format. The format can be any of the valid display classes mentioned previously.

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The PARAMETER CONFIGURATION provides the basic defaults for this terminal description for the number of lines and columns and what characters to use for the line drawing character set. The lines and columns values can be overridden by the ICLINES and/or ICCOLUMNS environment entries either in the actual environment or in the PROGRAM ENVIRONMENT screen specified previously in the configuration file.



SCREEN 11. ICEDCFW TERMINAL PARAMETER

The sequence timeout is the number of tenths of seconds to wait for the intercharacter gap between function keys sequences. The default is 5 for most terminals. Some remote connections, using telnet or rlogin, may need to have this number adjusted upward to correctly handle function key sequences.

The line drawing codes are the decimal codes for the ASCII character to be used for each appropriate part of a box. The default values shown are what this terminal supports. If the terminal does not support a real line drawing character set, the default values of 43, 45, and 124 (decimal) which are '+', '-', and '|', are used.

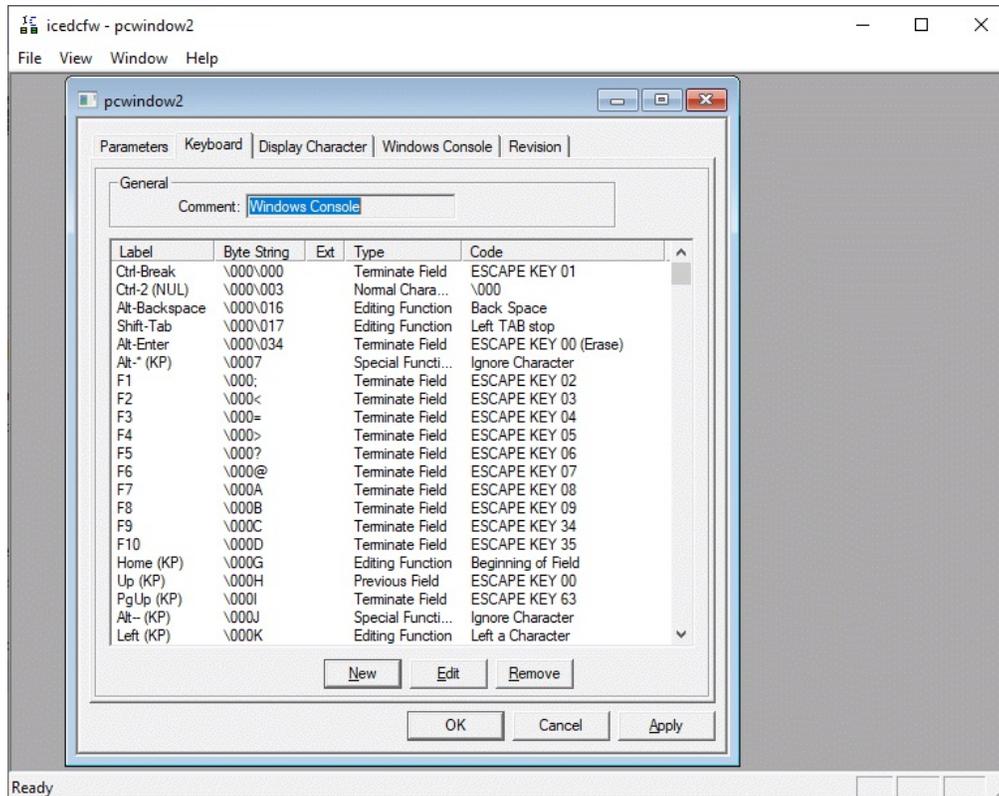
These line drawing codes are used by the SCREEN HANDLER when ICSDMODE has been set to drawlines.

E.3. Keyboard tab

The **Keyboard** tab presents the screen as shown in SCREEN 12. The KEYBOARD CONFIGURATION instructs Interactive COBOL what to do for each possible input sequence from this keyboard.

The current name of the terminal being configured is displayed at the top along with its format. The format can be either ASCII or terminfo. In ASCII mode, this table instructs Interactive COBOL how to handle each of the entered ASCII sequences on input from the keyboard. In terminfo mode, this table instructs Interactive COBOL how to handle each of the entered terminfo capname sequences on input from the keyboard.

This table can have up to 512 unique input sequences for a particular terminal description.



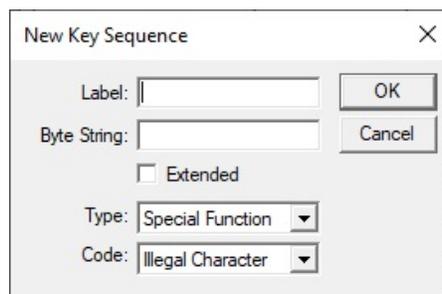
SCREEN 12. ICEDCFW TERMINAL DESCRIPTION (ICTERM) – KEYBOARD

To allow a new terminal description to be available for Interactive COBOL a terminal description file (.TDI) must be created for that particular ICTERM entry. Each of the base terminal descriptions can be used to create a default description file that can be customized. This can be done by using option 1 (Select Base Terminal) followed by option 7 (Save terminal description file) using the base terminal selections.

All the base terminal descriptions are available by default within the runtimes without needing the actual file. Only customized files need to be provided.

Each row of the table describes an input value. This table is always stored in sorted order based on the input sequence defined in column 2. The up-arrow and down-arrow keys will position to the needed row.

The Edit and Remove selections work on the current row. While the New selection will bring up a popup window that allows a new input key to be entered. The New popup window can be seen below. The Edit popup is the same with a different title.



SCREEN 13. ICEDCFW TERMINAL DESCRIPTION (ICTERM) – KEYBOARD (Entry)

Both the Edit and New selections shows a popup window that allows all the columns of each row to be entered. These entries are described below.

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Label gives the legend or label of the key and any shift or ctrl key that must be pressed to get this key. Interactive COBOL does not use this column in any way, it is useful only as a label.

Byte String gives the actual codes (series of 8-bit bytes) that this key generates when pressed on the keyboard. Interactive COBOL normally watches for these code(s) in a timing-sensitive fashion and, if seen, will handle as specified by the next field.

When entering data for Byte String the following can be used:

<code>\a</code> enters a bell (Ctrl-G)	<code>\t</code> enters a tab (Ctrl-I)
<code>\b</code> enters a backspace (Ctrl-H)	<code>\v</code> enters a vertical tab (Ctrl-K)
<code>\dnnn</code> enters nnn in decimal	<code>\xnn</code> enters nn in hex
<code>\e</code> enters an ESC	<code>\z</code> allows for timing-insensitive keystrokes to be entered
<code>\f</code> enters a form-feed (Ctrl-L)	<code>\|, \^, \", \', and \?</code> enters a single <code>\|, \^, \", \', and \?</code> respectively
<code>\k</code> allows a terminfo Capname to be entered when using terminfo	<code>\@</code> through <code>_</code> enters the control code (<code>\000 - \037</code>)
<code>\n</code> enters a linefeed (Ctrl-J)	<code>\nnn</code> enters nnn in octal
<code>\r</code> enters a carriage-return (Ctrl-M)	any printable character (<code>'!' - '~</code>) is entered as itself

When displayed on the screen or in the listing, all printable characters (`'!' - '~`) will be displayed as is, while all others will be shown in octal.

Type shows the type to be entered and *Code* shows within that type, how to interpret the key (code), and for next, previous, and terminating types whether to erase to the right of the cursor position.

Valid Types with their Codes are defined in the following paragraphs. The numbers in parentheses after the Types and Editing codes are the values returned in the `IC_GET_KEY` builtin function for the appropriate keystroke.

Normal Character (1) - The runtime system will treat keycodes of this type as normal 8-bit ASCII characters. The Code column contains the actual character code to be used by the runtime system. The value can be 0 to 255 (decimal).

Editing Function (2) - This type of keycode instructs the runtime system to take the action as described in the Code column. The possible actions in the Code column are:

clear to end-of-field (7)	beginning of field (8)	end of field (9)	right word (10)
left word (11)	destructive TAB (12)	left TAB stop (13)	right TAB stop (14)
left a character (1)	right a character (2)	backspace (3)	delete a character (4)
insert mode ON/Off (5)	clear field (6)	sound bell (15)	back delete (16)

The Back delete (16) action code does a collapsing backspace (i.e., it deletes the previous character and closes up the line).

TAB settings are set at every fourth character position from the beginning of the field, i.e., 1, 5, 9, . . .

Terminate Field (3) - This type of keycode causes the runtime system to accept the current field and set the ESCAPE KEY value to the value given in the Code column. The ESCAPE KEY value can be 00 to 99, but remember that value 99 is used for timeouts.

Previous Field (4) - This type of keycode instructs the runtime system to move to the previous field in a screen. If the current field is not the first field in a screen, the field is accepted and the screen is positioned to the preceding field. If the current field is the first (or only) field in a screen, the result depends on the ESCAPE KEY value associated with the key given in the Code column. If the ESCAPE KEY value is 00 (default), the system will beep, and the screen will remain positioned at the first field. If the ESCAPE KEY value is not 00, the field will be accepted, and the screen will exit with the specified ESCAPE KEY value. The ESCAPE KEY value can be 00 to 99, but remember that the system returns 99 for timeouts.

Next Field (5) - This type of keycode instructs the runtime system to move to the next field in a screen. If the current field is not the last field in a screen, the field is accepted and the screen is positioned to the next field. If the current field is the last (or only) field in a screen the field will be accepted and the screen will exit with the specified ESCAPE KEY value given in the Code column. When using the default value it will act just like a newline had been hit. The ESCAPE KEY value can be 00 to 99, but remember that the system returns 99 for timeouts.

Use of the *Previous Field* and *Next Field* functions on the up-arrow and down-arrow keys with unique ESCAPE KEY values will allow applications to tie several screens together and control the flow from one screen to the other. The default setting of up-arrow is Previous field-ESCAPE KEY 00. The default setting of down-arrow is Next field-ESCAPE KEY 00.

Hot Key Function (6) - Allows for a particular hotkey program to be called whenever this key is entered. The code column allows a value from 00 to 99 to be set such that a COBOL CALL "hotkey<nn>" will be called with the given value replacing the <nn>. There must be a COBOL program available and executable with this name or else a beep will be given.

Previous Row (7) - This type of key code instructs the runtime system to move to the "best fitting" field on a previous row in a screen. If the current field is not in the topmost row of the screen it is accepted and the cursor is positioned to the "best fitting" field. If the current field is in the topmost row of the screen, the result depends on the ESCAPE KEY value associated with the key in Code Column. If the ESCAPE KEY value is 00, the screen will remain positioned in the current field and the bell will sound. If the ESCAPE KEY value is not 00, the field will be accepted and the screen will exit with the specified ESCAPE KEY value. The "best fitting" field is defined to be a field in a preceding row which has the same column position (1st choice), a higher column position (2nd choice) or a lower column position (last choice) than the current field. In any case, the field selected will be the first screen row preceding the current one which contains ANY fields.

Next Row (8) - This type of key code instructs the runtime system to move to the "best fitting" field on a subsequent row in a screen. If the current field is not in the bottommost row of the screen it is accepted and the cursor is positioned to the "best fitting" field. If the current field is in the bottommost row of the screen, the result depends on the ESCAPE KEY value associated with the key in Code Column. If the ESCAPE KEY value is 00, the screen will remain positioned in the current field and the bell will sound. If the ESCAPE KEY value is not 00, the field will be accepted and the screen will exit with the specified ESCAPE KEY value. The "best fitting" field is defined to be a field in a subsequent row which has the same column position (1st choice), a lower column position (2nd choice) or a higher column position (last choice) than the current field. In any case, the field selected will be the first screen row following the current one which contains ANY fields.

Special Function (0) - Is a set of special internal actions to be taken by the runtime upon receipt of this keystroke. *Special Function* keys do not return in IC_GET_KEY. The actions are defined by the following Codes:

Illegal Character - The runtime system will beep when it receives a keystroke of this type.

Ignored Character - The runtime system ignores keycodes of this type.

Refresh Screen - The runtime system will clear the current screen and totally refresh the screen from its internal image.

Enter minus - This runtime system enters a minus character key followed by a *Terminate Field* with an ESCAPE KEY 0, as two separate keystrokes.

An *Erase* selection will be displayed for *Terminate Field*, *Next Field*, *Previous Field*, *Next Row*, and *Previous Row* types. If Erase is not checked (the default), the runtime accepts the current field as currently displayed. If checked, all characters to the right of the cursor in the current field are discarded. It is equivalent to first entering the clear to end-of-field key followed by the same Terminate, Next, or Previous key without the Erase option.

When configuring for Linux and using the terminfo base setting, Terminfo Capname codes should be entered by preceding the Capname with a backslash (\). For example, `\kcuD1` would be entered for cursor down.

Installing and Configuring Interactive COBOL on Windows

When configuring for Windows and using the PCWINDOW base setting, an extended keyboard code can be entered by preceding a null with a backslash (\) followed by the appropriate code. For example, Shift-TAB would be entered as `\000\017`.

Extended

The timing-insensitive selection (*Extended*) can be used to configure multi-character keystroke sequences for those terminals that do not support the needed number of function keys. The lead-in character for a timing-insensitive sequence must not have been previously defined as a timing-sensitive character, otherwise an error is given. An example of how timing-insensitive keys can be entered is given below:

Let's say you want the Ctrl-R character to be the lead-in character for your timing-insensitive codes and you wish to use Ctrl-R followed by the `1' key for function key F1, followed by a `2' for F2, and so on up to `9', Ctrl-R followed by an `a' for F10, `b' for F11, . . . , `f' for F15 and the shifted states of the second character to get the shifted function keys. I.E., Ctrl-R followed by `!' for Shift-F1, and Ctrl-R followed by `A' for Shift-F10 etc. .

Now, to allow the Ctrl-R character to be the lead-in for the functions keys F1-F15 in the normal and shift states and allow the Ctrl-R Ctrl-R keystrokes to be interpreted as a single Ctrl-R, change the default Ctrl-R Byte String entry from `"\022"` to `"\z\022\022"`.

Now for each needed function key add the appropriate line. For the first case it would be:

For column 1 (Label), give an appropriate label:

MyF1

For column 2 (Byte String), give the string:

\0221

For column 3 (Ext), enable timing-insensitive:

Y

For column 4 (Type), give the type code as:

Terminate Field

For column 5 (Code), give the appropriate function key code to be returned:

ESCAPE 2

For column 6 (Erase), give the appropriate value on whether to erase to the right of the cursor:

N

Now continue these responses row by row to add the needed keys as given below:

```
\0222 to generate F2
.
\0229 to generate F9
\022a to generate F10
.
\022f to generate F15
\022! to generate Shift-F1
.
\022( to generate Shift-F9
\022A to generate Shift-F10
.
\022F to generate Shift-F15
```

Additional timing-insensitive keys can be added by following the above example.

E.4. **Display Characters** tab

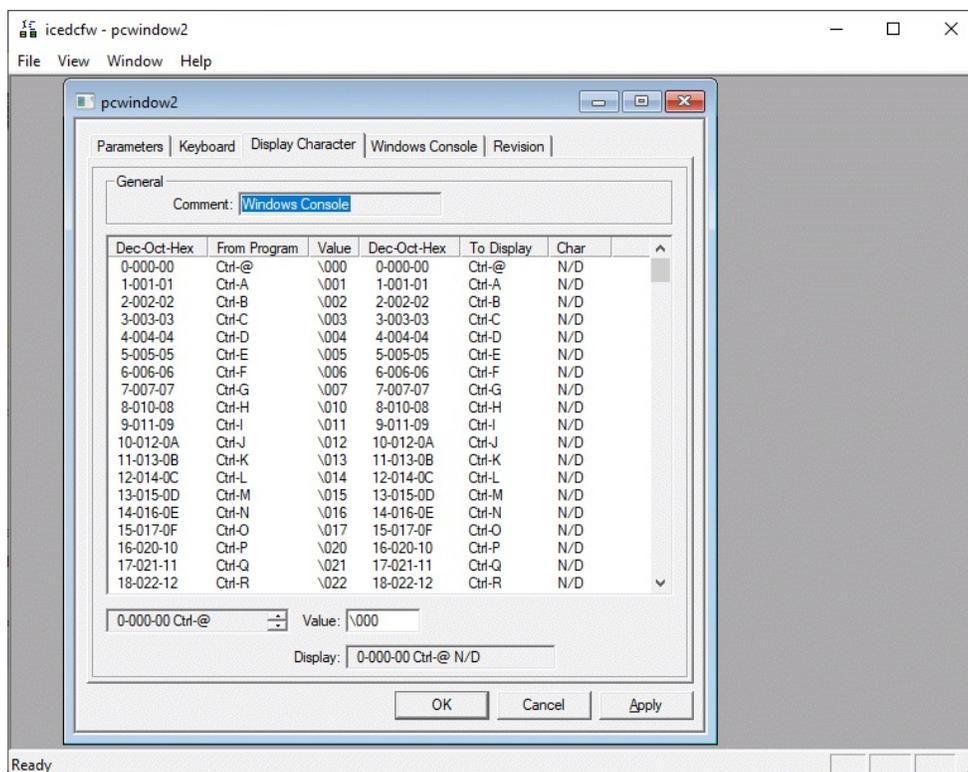
Selecting the **Display Characters** tab presents SCREEN 14. The DISPLAY CHARACTER CONFIGURATION instructs Interactive COBOL what to do for each possible output character from the COBOL program to the terminal. This option is not available for terminfo.

The current name of the terminal being configured is displayed at the top along with its format.

This table provides entries for all 256 possible sequences with each line representing an entry as two major columns: Character from program and Character to Display.

The first major column, Character from Program, gives the character from the program to be output to the terminal in Decimal, Octal, Hex, and as a Description.

The second major column, Character to Display, give a Value column that allows entry of the value to be displayed along with 5 additional sub-columns showing the Decimal, Octal, Hex, Description, and what this output character looks like on this terminal.



SCREEN 14. ICEDCFW TERMINAL DISPLAY CHARACTER

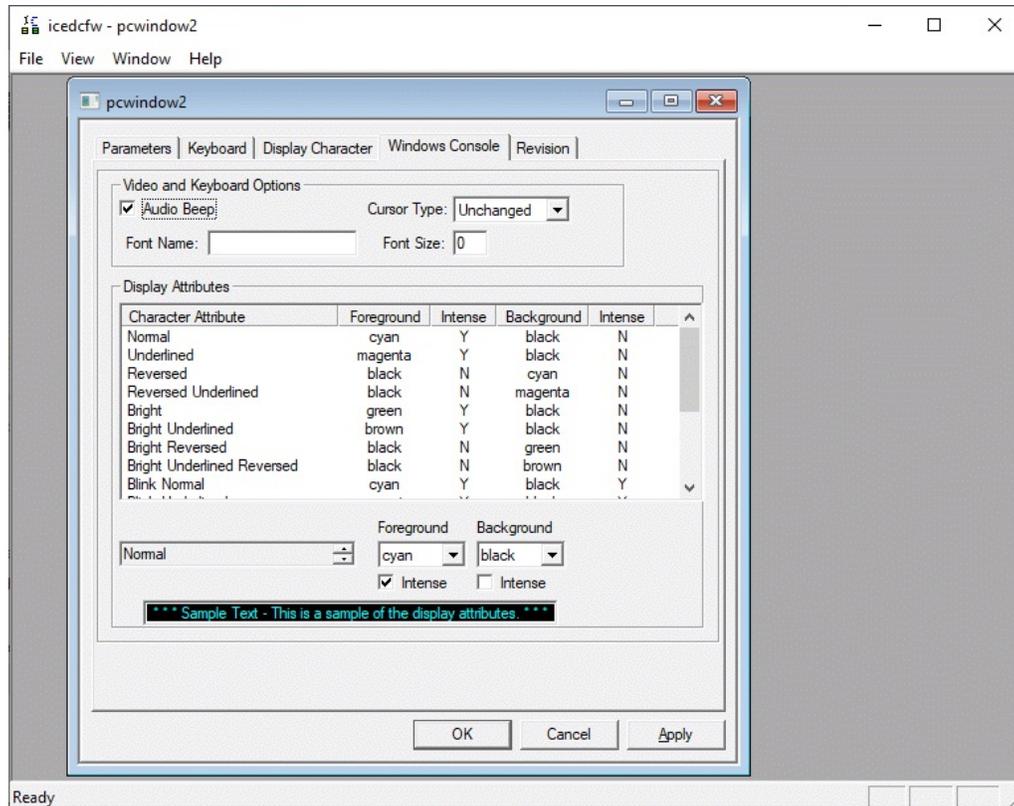
When entering data in the Values column the following can be used:

- \a* enters a bell (Ctrl-G)
- \b* enters a backspace (Ctrl-H)
- \dnnn* enters nnn in decimal
- \e* enters an ESC
- \f* enters a form-feed (Ctrl-L)
- \n* enters a linefeed (Ctrl-J)
- \r* enters a carriage-return (Ctrl-M)
- \t* enters a tab (Ctrl-I)
- \v* enters a vertical tab (Ctrl-K)
- \xnn* enters nn in hex
- \|*, *\^*, *\|'*, *\|'*, and *\|?* enters a single '\', '^', '|', and '?' respectively
- \@* through *_* enters the control code (\000 - \037)
- \nnn* enters nnn in octal
- any printable character ('!' - '~') is entered as itself

When displayed in the Chr column, all non-control code characters (both 7- and 8-bit) will be displayed as defined within parenthesis (), while the control code characters will show a N/D (Not Displayable) in that column.

E.5. Windows Console tab (for pwindow types)

Selecting the **Windows Console** tab presents SCREEN 15. Here options particular to the Windows Master console can be set. This tab is only available with the pwindow terminal types.



SCREEN 15. ICEDCFW WINDOWS CONSOLE

This screen configures all the needed Master Console settings.

Audio beep specifies whether to enable the audio beep. The default is for beep to be enabled. In certain cases when the beep is done too often on the Master Console, it can slow the machine for other users, in those cases, it may be wise to disable the beep.

Cursor type specifies what type of cursor to use when the runtime starts. Valid selections are unchanged, line, or block. Unchanged is the default.

For each of the character attribute combinations, the foreground color and intensity and the background color and intensity can be changed. Up to eight colors can be selected. If the color environment (ICCOLOR) has been set to process, these attribute-to-color defaults are NOT used. The actual character attribute is sent to the monitor unchanged.

When using a PCWINDOW or PCWINDOWCOLOR base, all 16 different attribute combinations can be specified. When using the PCWINDOWMONO base, only the 8 non-blinking attribute combinations are set, the blinking versions are set to match their non-blinking counterparts.

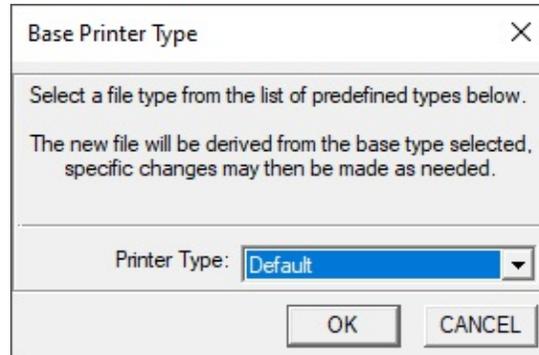
The icrunw and the icrunrc programs support the bold and underline attributes via different fonts and blink is also supported.

At the bottom of the screen is an approximate rendition of the colors with out the bold, underline, and/or blink attribute(s) applied..

F. Printer Translations (.pti)

F.1. Overview

To create a new printer translation file, select the **File** tab, New, Printer Translation and the following Base Printer Type screen will be given.



SCREEN 16. ICEDCFW BASE PRINTER TYPE

From this screen the base printer translation type can be selected from the pull-down menu. Valid selections include the following:

Default:	basic one to one mapping
DG to PC:	maps the DGI character set to the standard IBM PC character set
PC to DG	maps the standard IBM PC character set to the DGI character set

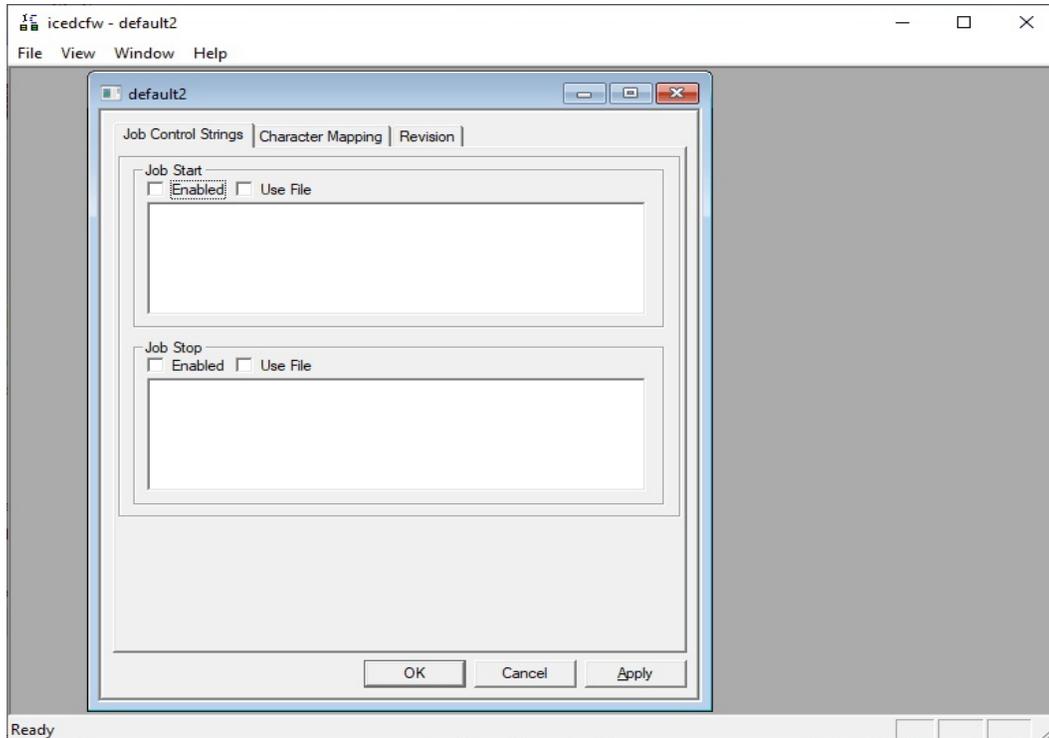
Once a base printer type is selected the file will be named, opened, and positioned to the Character Mapping selection.

To open an existing printer translation file, use the File tab, selecting OPEN and then position to the appropriate directory and file.

The Comment box can be used to insert a comment into a printer translation file. Upto thirty (30) characters can be entered for this printer translation. This option is especially useful if you change a base printer translation to provide some documentation of the change.

F.2. Job Control Strings tab

The Job Control Strings tab can be used to insert job control strings at the beginning and/or end of a print file. Each can be separately set and can either be a series of values or a filename that contains the codes to be inserted.



SCREEN 17. ICEDCFW PRINTER JOB CONTROL STRING

F.3. Character Mapping tab

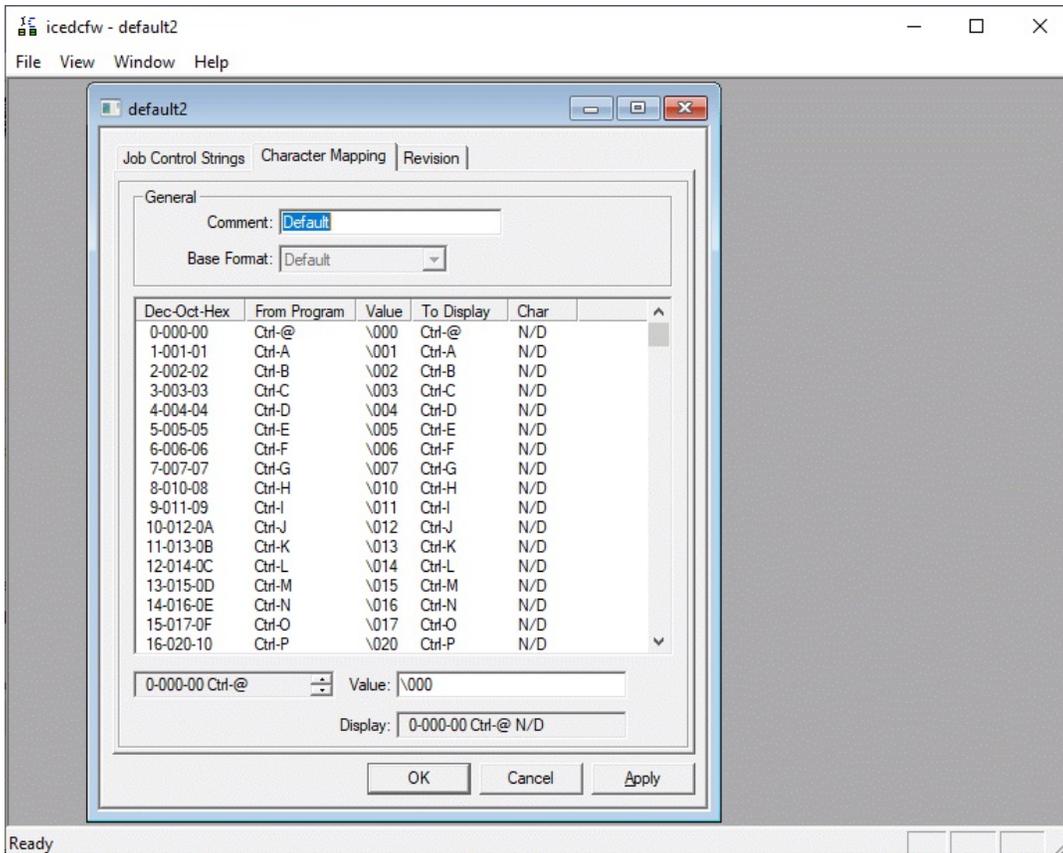
The **Character Mapping** tab presents SCREEN 18. The CHARACTER MAPPING CONFIGURATION instructs Interactive COBOL what to do for each possible output character from the COBOL program to the printer.

The current name of the printer being configured is displayed at the top of the screen.

This table provides entries for all 256 possible sequences with each line representing an entry as two major columns: Character from program and Character to Print.

The first major column, Character from Program, gives the character from the program to be output to the printer in Decimal, Octal, Hex, and as a Description.

The second major column, Character(s) to Print, give a Value(s) column that allows entry of the value(s) to be displayed along with 5 additional sub-columns showing the Decimal, Octal, Hex, Description, and what this output character looks like on this terminal. If more than one character is entered in the Values column, the Dec/Oct/Hex columns will only show "Extended Character Map". Up to 11 characters are allowed.



SCREEN 18. ICEDCFW CHARACTER MAPPING

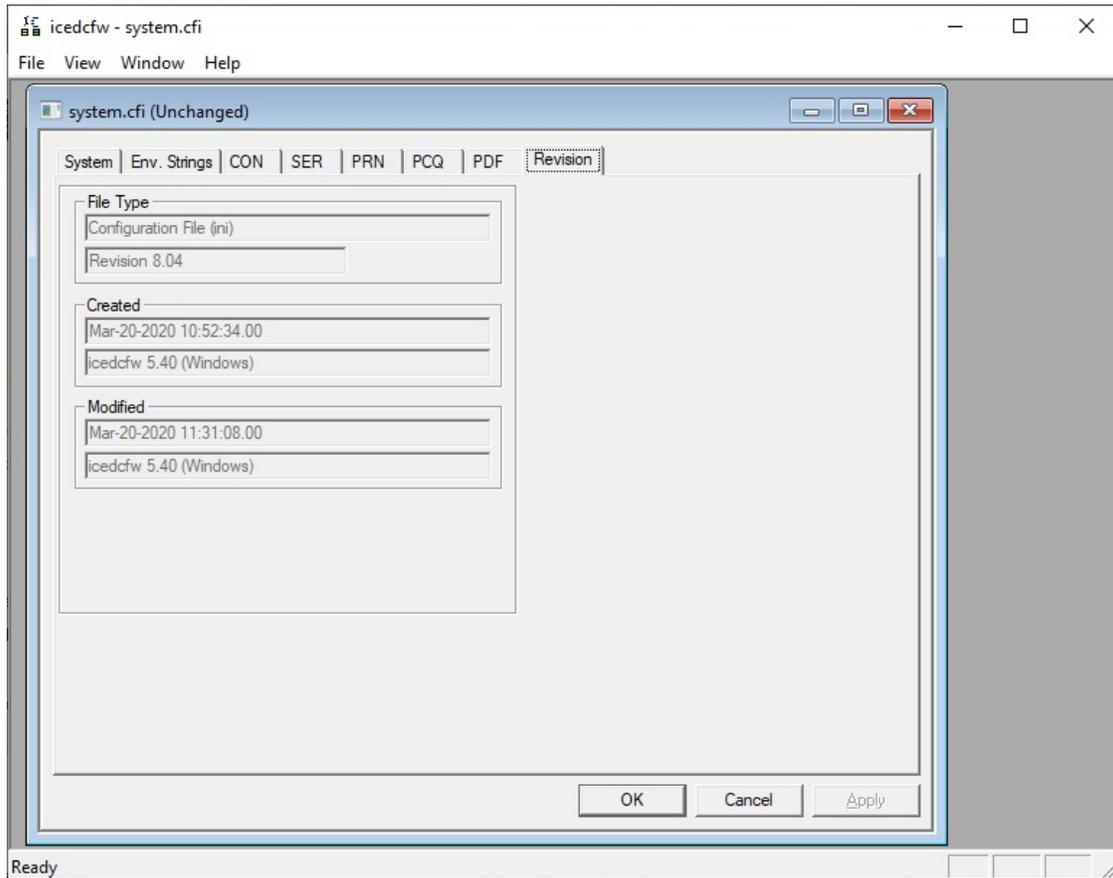
When entering data in the Values column the following can be used:

- | | |
|--|--|
| <i>a</i> enters a bell (Ctrl-G) | <i>t</i> enters a tab (Ctrl-I) |
| <i>b</i> enters a backspace (Ctrl-H) | <i>v</i> enters a vertical tab (Ctrl-K) |
| <i>dnnn</i> enters nnn in decimal | <i>xnn</i> enters nn in hex |
| <i>e</i> enters an ESC | <i>\, \^, \", \', and \?</i> enters a single '\, '^, '\"', '\'', and \'?' respectively |
| <i>f</i> enters a form-feed (Ctrl-L) | <i>^@ through ^_</i> enters the control code (\000 - \037) |
| <i>n</i> enters a linefeed (Ctrl-J) | <i>nnn</i> enters nnn in octal |
| <i>r</i> enters a carriage-return (Ctrl-M) | any printable character ('! - '~) is entered as itself |

When displayed in the Chr column, all non-control code characters (both 7- and 8-bit) will be displayed as defined within parenthesis (), while the control code characters will show a N/D (Not Displayable) in that column.

G. Revision tab

The **Revision** tab is available in most screens to show the current revision information for the selected file.



SCREEN 19. ICEDCFW REVISION

H. Exit ICEDCFW

Selecting the Close button [X] from the title bar or selecting Exit from the **File** tab will terminate ICEDCFW. If any modification was done to a file you will be prompted to Save the changes.

VI. ICCONFIG

A. Introduction

ICCONFIG is the Windows character version of the configuration utility. ICEDCFW and/or ICCONFIG can be used to create and edit configuration files (.cfi), terminal description files (.tdi), and printer translation files (.pti). Each of these files is a .ini based text file with the appropriate sections and definitions.

For a new file, ICCONFIG provides a set of default values as a starting point for your configuration. However, every system will require tailoring to account for the requirements of the application, number of users, and system resources available.

FIGURE 1 is a summary of the ICCONFIG menu structure where the #n refers to the SCREEN number in this chapter:

MAIN MENU	#20
- SYSTEM CONFIGURATYION (.CFI)	#21
* SYSTEM PARAMETERS	#22
* ENVIRONMENT STRINGS	#23
* CONSOLES AND PROGRAMS (@CONn)	#24
* SERIALS (@SERn)	#25
* PRINTERS (@PRNn)	#26
* PRINTER CONTROL QUEUES (@PCQn)	#27
* PDF FORMATS	#28
- TERMINAL DESCRIPTIONS (.TDI)	#29
* PARAMETERS	#30
* KEYBOARD	#31
* DISPLAY	#32
* COLOR/ATTRIBUTE MAPPING	#33
- PRINTER TRANSLATIONS	#34
* JOB CONTROL STRINGS	#35
* CHARACTER MAPPING	#36

FIGURE 1. ICCONFIG MENU DIAGRAM

Generally we recommend going through each menu sequentially setting the appropriate values. You should understand your particular hardware configuration before getting to the devices.

B. Startup and Main Menu

To start ICCONFIG the syntax is:

```
icconfig [-a[:aflag]|-A file|dir[:aflag]] [-b] [-h|-?] [-l|-L file|dir]
         [-O targetos] [-P ptname] [-q] [-T tname] [file]
```

Where

- a[:aflag] or -A file|dir[:aflag] (Audit)
Enables auditing (default icconfig.lg). Where *aflag* is a|b|d|p|t|u|da|db|pa|pb|ta|tb|ua|ub, defined as are a-append, b-backup, d-date, p-pid, t-time, and u-username.
- b (Batch)
Enables batch mode operation.
- h|-? (Help)
Displays help text.
- l|-L file|dir (Load .ini)
Load the appropriate *file.ini* or *dir/file.ini*.
- O targetos (Set Operating system environment)
Specifies the default target operating system environment. If not specified, it defaults based on the current

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operating environment as UNIX or WINDOWS. Valid selections are UNIX and Windows.

-P *ptname* (Set Printer translation)

Specifies the default printer translation entry. If not specified, it defaults to a one to one map. Valid selections can be seen with the Help switch.

-q (Quiet)

Enables quiet operation.

-T *tdname* (Set Terminal description)

Specifies the default terminal description entry. If not specified, it defaults based on the current operating environment as `pcwindow` ([On Windows](#)) and `terminfo` ([On Linux](#)). Valid selections can be seen with the Help switch.

file

Specifies the actual file to be configured. Files with the `.cfi` extension will go directly to the System Configuration menu, files with the `.pti` extensions will go directly to the printer translation menu, and files with the `.tdi` extensions will go directly to the Terminal Description menu. If no extension is given, the `.cfi` extension is added. For a simple file the file is sought only in the current directory.

If no argument is provided, ICCONFIG starts in the main menu.

If batch mode operation is specified, ICCONFIG starts and if the configuration file exists it is read and if it was updated it is rewritten and ICCONFIG terminates. If no configuration file exists a default configuration file is created and ICCONFIG terminates.

If both batch mode and Set Terminal description (or Set Printer) are given, ICCONFIG does not use a configuration file but only acts on the given terminal description (or printer translation) just as batch mode alone acts on the configuration file. (Updates it if it exists and needs updating, otherwise creates one).

The `-l|-L` (Load `.ini`) switches (Batch update facility) are documented at the end of this section on page [122](#).

If the given configuration file exists and cannot be read at startup, an error is displayed and ICCONFIG terminates. The error should be fixed before re-running ICCONFIG. If the given configuration file does not exist at startup, a warning is displayed that the file was not found but ICCONFIG continues with the retrieved filename set to blank. If a save is done the file will be saved under the startup name.

For example the line:

```
icconfig samplecf.cfi
```

would set the configuration file to be `samplecf.cfi` while in ICCONFIG. In the main screen of ICCONFIG the file retrieved (if any) will be displayed and the filename that will be used on a Save or exit with update.

ICCONFIG always assumes the master console type `pcwindow`.

While in ICCONFIG the general use of keys is:

- 1) the ESC key will exit from the current menu and return to the previous choice, in the MAIN MENU it will exit ICCONFIG.
- 2) up-arrow (↑) and down-arrow (↓) will move to the entry before or following the current entry. For menus that fit on one screen, at the top it will wrap to the bottom and at the bottom it will wrap to the top. For menus that scroll, at the top it will move to the bottom of the table and at the bottom it will move to the top of the table for up-arrow and down-arrow, respectively. The prompts will show these as `<up>` and `<down>` respectively since the arrow-characters are unprintable on most terminals.
- 3) function keys F1 and F2 will move to the previous field (left) and the next field (right) within the same row of a row-column table menu.
- 4) function keys F3 and F4 will move to the previous page (up) and the next page (down) keeping the cursor in the same location.
- 5) function key F5 will copy the fields for the current row or screen to the next row or screen. It is very useful in the initial setup to duplicate a standard entry down through a particular table. In the terminal keyboard

configuration table setup it will insert a new entry.

- 6) the Newline, Carriage-return, or ENTER key will select that choice and, for multi-field menus, move to the next entry.
- 7) the left-arrow (←) and right-arrow (→) keys act based on the type of field being entered.

Individual fields, within a menu, can be one of several types:

Yes/No fields accept Y, y, N, n, left-arrow, right-arrow, or space to select a value.

Ferris-wheel fields accept left-arrow, right-arrow, or space to select a value.

Data-entry fields, which can be either numeric or character, accept typed in values for the particular selection.

Left-arrow and right-arrow in these fields just position within the field.

Menu fields accept either a number, up-arrow, or down-arrow to select a value.

SCREEN 20 shows the MAIN MENU displayed when ICCONFIG starts. Type the number for the selection to choose or use the up-arrow and down-arrow keys to change the value. Pressing ENTER for the currently displayed value executes that option.

```

icconfig Revision 5.20 (Windows)

1.  Configure System Configurations (.cfi)
2.  Configure Terminal Descriptions (.tdi)
3.  Configure Printer Translations (.pti)

Selection:  _

Press <up> or <down> to select, ESC to exit
    
```

SCREEN 20. ICCONFIG MAIN MENU

C. System Configuration (.cfi)

C.1. Overview

Option 1 from the MAIN MENU will display SCREEN 21, the SYSTEM CONFIGURATION menu. This menu provides the ability to configure all the sections of system configuration files (.cfi).

```

icconfig Revision 5.40 (Windows)

1.  Configure System Parameters
2.  Configure Environment Strings
3.  Configure Consoles and Programs (@CONn)
4.  Configure Serial Lines (@SERn)
5.  Configure Printers (@PRNn)
6.  Configure Printer Control Queues (@PCQn)
7.  Configure PDF Formats

8.  Change Directory
9.  Save Configuration File
10. Retrieve Configuration File
11. Reset Configuration to Defaults
12. Change Target OS Type

Selection:
Directory:  C:\icobol
Retrieved file:  .\system.cfi
Save(d) file:  .\system.cfi
Target OS type:  Windows

Press <up> or <down> to select, ESC to exit.
    
```

SCREEN 21. ICCONFIG SYSTEM CONFIGURATION (.cfi)

The Directory line display the current directory.

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The Retrieved file line displays the filename that was last retrieved, which may have been from the command line or selections. If no file was retrieved, this field will be blank and default values will be used for this configuration session.

The Save(d) file line displays the filename to which this session of ICCONFIG has been written; using selection 7, otherwise, it will be blank.

The *[target OS]* will show the target operating system for which this configuration is being setup for. If no configuration file is retrieved, it defaults to either "Windows" or "UNIX" based on the current operating system unless ICCONFIG had been started with the Set Operating System switch (-O).

To start from the default case, type 11 to Reset the parameters to the defaults.

Note: All the defaults listed in this manual and in ICCONFIG are what will be used on a Reset or if no configuration file can be found when ICCONFIG starts.

Pressing ESC will exit the screen and if ICCONFIG detects any modification since a Save or a Retrieve, it will prompt with a message asking if you wish to save your changes. If you type Y, a save is done before exiting; otherwise, your changes are discarded.

C.2. Configure System Parameters

Option 1 from the SYSTEM CONFIGURATION menu will show SCREEN 22. These parameters define how the Interactive COBOL runtime allocates various resources. Choose the appropriate values by typing a valid value for each parameter. Press ENTER to choose the displayed value and go on to the next parameter. Up-arrow and down-arrow can also be used to position to the previous or next menu selection. ENTER at the last field will position back to the top. Pressing ESC any time will return to the previous menu after checking to ensure that all parameters are consistent. If there is an error, the menu is re-displayed with the cursor on the offending entry. This entry must be corrected to exit the menu.

Terminal Status in Interactive COBOL will display the actual values that are current for some of these parameters along with the actual in use count for the files, record locks, and several other values.

System Information in Interactive COBOL will display the in use, maximum used, and configured values for many of these parameters during a particular invocation of the runtime.

System Parameter Configuration			
Number of processes allowed	8	Number of OPENS per process	128
Buffer area size (MB)	1	Buffer Write-thru enabled	N
Number of SEQUENTIAL files	32	Number of record locks	128
Number of ANSI INDEXED files	32	Number of ANSI Relative files	8
Enable 4GB ICISAM ver 7 files	Y	Create ICISAM Version 7 files	N
Printer Control enabled	Y	Printer control entries	48
Number of @CON devices	32	Number of @PCQ devices	32
Number of @PRN devices	32	Number of @SER devices	32
Number of PDF Formats	32		

Press <up>, <down> to position, ESC to exit.

SCREEN 22. ICCONFIG SYSTEM PARAMETERS

Number of processes, is the maximum number of Interactive COBOL processes including ICEXEC, runtimes, utilities, and compilers that can execute simultaneously when ICEXEC is running. Valid entries are from 1 to 9999; 8 is the default.

Number of OPENS per process is the maximum number of simultaneous file opens that any Interactive COBOL

runtime invocation will allow to be opened (i.e., OPEN FD's in a COBOL program). The number of available handles is decreased every time a file is logically opened by any program in the run unit. Valid entries are from 100 to 2048; 128 is the default.

The following 6 items (*Buffer area size*, *Buffer write-thru*, *Number of sequential files*, *Number of Record locks*, *Number of Indexed files*, and *Number of Relative files*) apply to ICEXEC as a whole.

Buffer area size (MB) is the amount of memory, in MegaBytes, that the runtime system will allocate for buffers. A certain minimum buffer size must be provided that is calculated as "maximum number of processes * 2 * 4KB". Valid entries are from 1 to 3076; 1 is the default. For ICRUN, more than 1MB is generally not needed since most files are opened in network mode such that all writes must flush the data to the network immediately. If large files are opened exclusively for modification then increasing this parameter may be useful. For ICEXEC, this number should be set such that each runtime has a minimum 30/40KB apiece.

Buffer Write-through set to Yes instructs the Interactive COBOL runtime to write all modified pages to the operating system on any operation that modifies data that resides on the disk. Valid entries are Yes or No; No is the default.

Number of SEQUENTIAL files is the number of unique sequential files that can be simultaneously opened by the entire system. Valid entries are from 0 to 4096; 32 is the default.

Number of record locks is the number of simultaneous record locks allowed by the entire system. Valid entries are from 0 to 32767; 128 is the default.

Number of ANSI INDEXED files is the number of unique indexed files that can be simultaneously opened by the entire system. Valid entries are from 0 to 8192; 32 is the default.

Number of ANSI RELATIVE files is the number of unique relative files that can be simultaneously opened by the entire system. Valid entries are from 0 to 4096; 8 is the default.

Enable 4GB ICISAM version 7 files specifies whether to create version 7 ICISAM files with the ability to have 4GB files. If not enabled (No) only 2GB files are allowed. Valid entries are yes and no; Yes is the default. Note that version 8 ICISAM files are the default and they always allow greater than 4GB files.

Create ICISAM Version 7 files specifies whether to create version 7 ICISAM files as the default when creating new ICISAM files. Valid entries are yes and no; No is the default such that version 8 ICISAM files are created by default.

Printer Control enabled allows for the Printer Control Utility to be enabled (Yes) or disabled (No). If set to No, files normally placed in the printer control file (system.pq) are not placed there and the IC_PRINT_STAT builtin will return an error. Valid entries are Yes or No; Yes is the default.

Printer Control entries is the maximum number of entries allowed in the printer control file at once. Once this number is reached, all new files will get a File Status 99 when a new file is being OPEN'ed which would create a new entry in the printer control file. Valid entries are from 48 to 1024 entries; 48 is the default.

Number of @CON, @PRN, @SER, @PCQ devices is the maximum number of each of those devices that you wish to configure. Valid entries are from 0 (1 for @CONs) to 2048 entries; 32 is the default. These numbers will be used in the later configuration menus to set the maximum allowed set of devices. You do not need to configure more than you actually need.

Number of PDF Formats specifies the maximum number of format entries that can be specified. These entries are used to specify how pdf files should be generated.

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C.3. Configure Environment Strings

Option 2 from the SYSTEM CONFIGURATION menu allows common environment entries to be specified.

Environment String Configuration		
Num	Enable?	String Value
0	N	ICCODEPATH=
1	N	ICDATAPATH=
2	N	ICRUNLK=
3	N	ICPCQDIR=
4	N	ICTMPDIR=
5	N	ICCONFIGDIR=
.	.	.
15	N	

Press <up>, <down>, F1, F2, F3, F4 to position
F5 to copy, ESC to exit.

SCREEN 23. ICCONFIG ENVIRONMENT STRING

These environment values are only processed by the runtime system (ICRUN, ICRUNW, ICRUNRS). More on environment entries can be found on page [125](#), [155](#).

Up to 16 default environment strings can be stored in the configuration file.

An environment string entry allows up to 255 characters.

C.4. Configure Consoles and Programs (@CONn)

Option 3 from the SYSTEM CONFIGURATION menu allows the configuration information for all the logical console lines (@CON0 and up) in the Interactive COBOL system to be defined. Upon selecting option 3, the CONSOLE CONFIGURATION menu is displayed along with the current settings as shown in SCREEN 24. The actual number of entries is controlled by the Number setting in the System Parameters Configuration.

This menu allows a console to be enabled or disabled, an actual hardware device to be assigned to it, and any program setting can be defaulted.

```

      Console and Program Environment Configuration

      Console number:    1

Enable:  N      Device: _____
Run programs? Y  Startup program: _____

Console interrupt?      Y      Program debugging?      N
Abort terminal?         N      System information?     Y
Message sending?       Y      Printer control?       Y
Printer control management? N    System shutdown?       Y
Terminal status?       Y      Detach/Host pgms?     Y
Watch other terminals? N      Exclude from being watched N

      Default Environment String Values
ICTIMEOUT=  0      ICABORT= off      PCQ= 0  PRN= 0  SER= 0
ICTERM= _____ ICLINES= 0      ICCOLUMNS= 0: 0
ICSCROPT= full    ICSDMODE= disabled  ICREVERSE= process
ICCOLOR= filter   ICBGCOLOR= black (0)  ICFGCOLOR= white (7)

Press <up>, <down>, F3 previous, F4 next, F5 copy, ESC to exit.
Device:(blank), con, nul, ip, machname, icrunrs, cgi
    
```

SCREEN 24. ICCONFIG CONSOLE and PROGRAM ENVIRONMENT

The first entry is the console to be configured. Valid numbers are 0 to the highest supported console. Valid selections for each parameter and the defaults are:

Enable set to Yes allows this console to be used by Interactive COBOL.

Device, can be any of the following:

- 1) "con" allows the console to be available from the Master Console session. (ICTERM=pcwindow). In most cases, many consoles should be configured this way to allow multiple invocations.
- 2) a valid "machine-name" or "ip-address" allows the console to be available for a ThinClient connection from that particular remote machine.
- 3) "icrunrs" allows the console to be available for ThinClient programs only.
- 4) "nul" allows the console to be available for detached programs.
- 5) "cgi", allows the console to be available for cgi programs using icruncgi. You should have enough "cgi" consoles to support the maximum simultaneous number of cgi connections you expect to have.
- 6) (blank) allows the console to be available for telnet/rlogin/ThinClient sessions.

The *machine-name* and/or *ip-address* allows for a specific machine to have a specific console number or numbers for thinclient connections.

Multiple consoles can be set to the same device to allow multiple runtime sessions to be started on that device. Within the same device name, consoles are used on a first-come first-served basis. A particular console can be selected by using the Terminal number switch (-T *n*).

Run Program specifies whether this console allows a COBOL program to be run on it. Valid selections are Yes or No. The default is Yes for @CON0 but No for all others.

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Console lines with the Run program option enabled are called program lines. If the Run Program option is set to No this console device is treated like a serial device and all the remaining settings in this menu are ignored.

The number of program lines (or number of programs) works together with the Maximum number of processes and the licensed number of users to set an upper limit on the maximum number of programs that may be run simultaneously. This maximum number of programs is the lower of these three counts. The lower of the two configured values is shown in the Terminal Status and the System Information screens.

Startup program is the initial COBOL program to run when the runtime initializes this console. Valid selections are no entry or any valid COBOL program with up to 30 characters. The default is no entry causing the COBOL program LOGON to be run.

Privileges Setup

These options provide for individual control over many system management functions about whether a COBOL program on this console has access to the particular feature. Valid selections are Yes or No.

Console interrupt privilege instructs Interactive COBOL whether to allow the user to abort the currently running COBOL program with the Linux Intr and Quit key sequences. If set to No, the character is passed on up to the program as data. When set to Yes, the Intr key set for this terminal is trapped by the runtime system and generates an abort to the currently running program and the Quit key for this terminal is trapped by the runtime system and generates a Hangup. The *stty isig* option is NOT used by Interactive COBOL - its initial setting is ignored. The runtime will set and clear the *isig* option as required.

Program debugging privilege: Allows the runtime to be started in debug mode. The default is No.

Abort terminal privilege determines whether COBOL programs running on this console may abort other terminals. The default is No except for CON0.

System Information privilege determines whether COBOL programs running on this console may view the system information screen.

Message sending privilege determines whether COBOL programs running on this console may send messages to other terminals.

Printer Control privilege determines whether COBOL programs running on this console may use the Printer Control Utility.

Printer Control Management determines whether this console is allowed to perform all operations on the printer control file while in the Printer Control utility. If this privilege is granted, this console may perform any operation on any file while in the printer control utility provided the user has access to the file from the operating system.

The *System Shutdown* privilege is ignored.

Terminal status privilege determines whether COBOL programs running on this console may access the terminal status screen or terminal control utility.

Detach/Host programs privilege determines whether to allow this program to detach COBOL jobs with the IC_DETACH builtin and, whether to allow the "|os-program" call for COBOL programs running on this console.

Watch other terminals privilege determines whether to allow this program to use the Watch Facility (if licensed) to Watch and/or Control another user. If enabled, the Watch and Control commands will be available to this user when in the Terminal Control Utility. If not enabled, the Watch and Control commands will NOT be available.

Exclude from being watched privilege determines whether to allow the program on this terminal to be Watched or Controlled by another terminal. If enabled, then this task will never be allowed to be watched or controlled.

Default Environment String Values

This section specifies terminal specific information for a particular console line. The ICTIMEOUT, ICABORT, PCQ, PRN, SER, ICTERM, ICCOLUMNS, ICLINES, ICSCROPT, ICSDMODE, ICREVERSE, ICCOLOR, ICBGCOLOR, and ICFGCOLOR entries can be set in the user's environment to override any of these selections.

ICTIMEOUT sets a default global timeout value in seconds for all ACCEPTs and STOP literals on this console. If no key has been pressed in the specified time interval, the ACCEPT returns with the ESCAPE code set to 99. Valid selections are 0 through 6300; the default is 0 meaning no timeout, i.e., wait forever.

ICABORT instructs Interactive COBOL whether to abort the console (i.e., log it off) if an ACCEPT times out due to the global timeout setting (ICTIMEOUT). Valid selections are off or on; the default is off.

PCQ sets the generic printer control queue (@PCQ) to @PCQn based on the entered number. Valid selections are 0 through 2047; the default is 0. If set to an invalid queue, an error will occur on the OPEN.

PRN sets the generic printer device (@PRN) to @PRNn based on the entered number. Valid selections are 0 through 2047; the default is 0. If set to an invalid printer, an error will occur on the OPEN.

SER sets the generic serial device (@SER) to @SERn based on the entered number. Valid selections are 0 through 2047; the default is 0. If set to an invalid serial device, an error will occur on the OPEN.

ICTERM specifies the terminal description entry to be used for this console. The default for all consoles is terminfo. Valid ICTERM selections are valid terminal description entries with corresponding .TDI files. For an enabled console, this menu cannot be exited without some selection specified for ICTERM.

ICCOLUMNS and *ICLINES* set the number of columns and lines that will be allowed on this console. Valid selections are 0 through 255. The default of 0 says use the values specified in the terminal description entry. For terminfo and pwindow descriptions, the defaults are those defined in the terminfo database and by the video bios hardware, respectively. These values indicate to Interactive COBOL where the screen wraps (ICCOLUMNS) and scrolls (ICLINES). If set incorrectly, screens may not display properly. The second selection for ICCOLUMNS is for compressed mode if supported by the terminal.

ICSCROPT specifies how the Interactive COBOL SCREEN OPTIMIZER is to perform. Valid selections are off, partial, full, and mute. The default is off. All enabled consoles have at least one screen area reserved. For a 24x80 column screen, a single screen image consumes about 8KB.

OFF says to transmit character codes as they are written by the program.

Partial enables the SCREEN OPTIMIZER to use a simple method of reducing the amount of characters sent to the terminal by comparing data to the single screen image.

Full enables the SCREEN OPTIMIZER to allocate an additional image of the current screen in memory and provides a complex method of comparing the data in the two images to reduce the amount of characters sent to the terminal to only those characters that would change the screen display at the end of an operation.

Mute forces Interactive COBOL to not send any implied codes to the terminal either at startup or termination.

Only when executing a program instruction are codes sent to the terminal.

Ctrl-U from the keyboard while in an ACCEPT can be used to refresh the screen.

Usually partial and/or full will provide improved screen performance. Full is preferred with the debugger.

ICSDMODE specifies whether to enable the SCREEN HANDLER and if so in what mode. Valid selections are disabled, underline (0), reverse (1), and linedraw (2). The default is disabled. Linedraw uses the characters for line drawing specified in the terminal description file for the particular terminal.

ICREVERSE instructs Interactive COBOL how to interpret reverse codes from a COBOL program. Valid selections are filter, ignore, and process. The default is process. Reverse codes are Ctrl-B and Ctrl-V along with the two-byte sequences <036>D and <036>E.

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Filter tells Interactive COBOL to watch for reverse codes from the program and to NOT send them to the terminal, since it does not support reverse.

Ignore tells Interactive COBOL that the user wants total control of the screen and may be sending binary reverse data to the screen and that Interactive COBOL should ignore all reverse codes (i.e., do not look for reverse codes). If running in this mode, the SCREEN OPTIMIZER cannot correctly repaint a user's screen that includes reverse codes.

Process tells Interactive COBOL to interpret reverse codes from the program and send the appropriate sequences to the terminal.

ICCOLOR instructs Interactive COBOL how to interpret color codes from a COBOL program. Valid selections are filter, ignore, and process. The default is filter.

Filter tells Interactive COBOL to watch for color codes from the program and to NOT send them to the terminal, since it does not support color.

Ignore tells Interactive COBOL that the user wants total control of the screen and may be sending binary color data to the screen and that Interactive COBOL should ignore all color codes (i.e., do not look for color codes). If running in this mode, the SCREEN OPTIMIZER cannot correctly repaint a user's screen that includes colors.

Process tells Interactive COBOL to interpret color codes from the program and send the appropriate sequences to the terminal. When set to Process, the initial background and foreground colors are set by Interactive COBOL at startup.

ICBGCOLOR sets the initial background color to the indicated value when running with *ICCOLOR* set to Process. Valid selections are black (0), blue (1), green (2), cyan (3), red (4), magenta (5), brown (6), and white (7). The default is black (0).

ICFGCOLOR sets the initial foreground color to the indicated value when running with Color support (*ICCOLOR*) set to Process. Valid selections are black (0), blue (1), green (2), cyan (3), red (4), magenta (5), brown (6), and white (7). The default is white (7).

Console lines that are not enabled are ignored.

The table is searched from lowest to highest to decide the console-number for programs so the first occurrence of the device will select the console.

C.5. Configure Serial Lines (@SERn)

Option 4 from the SYSTEM CONFIGURATION menu defines the configuration information for the logical serial devices (@SER0 - @SER2047) in the Interactive COBOL system to be defined. Upon selecting option 4, the SERIAL CONFIGURATION menu is displayed along with the current settings as shown in SCREEN 25. The actual number of entries is controlled by the Number setting in the System Parameters Configuration. A serial device differs from a console device in that it can only be used for I/O. Console devices can be used to run programs or for I/O.

This menu defines logical serial devices to point to a particular hardware device.

Serial Device (@SERn) Configuration										
@SER	Device	Enable?	Set	Baud Rate	Data Bits	Parity	Stop Bits	Mdm Ctl	HFC O	SFC I
0	_____	N	N	9600	8	N	1	N	N	Y
1	_____	N	N	9600	8	N	1	N	N	Y
2	_____	N	N	9600	8	N	1	N	N	Y
3	_____	N	N	9600	8	N	1	N	N	Y
.										
.										
2046		N	N	9600	8	N	1	N	N	Y
2047		N	N	9600	8	N	1	N	N	Y

Press <up>, <down>, F1, F2, F3, F4 to position, F5 to copy, ESC to exit.

SCREEN 25. ICCONFIG SERIAL CONFIGURATION

Valid selections for each parameter and the defaults are:

Parameter	Valid Selections	Default
Device	Any serial (COM, MDN) device	(blank)
Enable	Yes or No	No
Set	Yes or NO	No
Baud rate	Any valid baud rate	9600
Data Bits	7 or 8	8
Parity	Yes or No	No
Stop Bits	1 or 2	1
Mdm Ctl	Yes or No	No
HFC O	Yes or No	No
HFC I	Yes or No	No
SFC O	Yes or No	Yes
SECI	Yes or No	No

Explanations:

Device can be any of the hardware character devices except for parallel printers that support both input and output operations. Two or more serial devices (@SERn) can point to the same hardware device.

If a COM port above 9 is specified it must be specified as "\\.\COM10", etc..

Enable set to Yes allows this serial device to be used.

Set instructs the runtime whether to use the following port device settings. If set to No, the default the following settings are not used and an open of the device will use whatever system defaults there are. If set to Yes, the runtime will attempt to set the device settings to the given values.

Baud Rate, *Data Bits*, *Parity*, and *Stop bits* set the appropriate selection to the given value. These values must match those of the attached device or else undefined results will occur. Generally the baud rate should be set to the fastest possible setting that the runtime, port, wiring, and attached device can support.

Mdm Ctl (modem control) tells Interactive COBOL how to handle modem control signal Data Carrier Detect (DCD) for a particular device. If Mdm Ctl is set to No, DCD is ignored.

Mdm Ctl set to Yes for serial lines will cause an OPEN to wait until DCD is asserted before returning. If DCD is lowered after the OPEN, the next I/O operation to that line will receive an error and the appropriate action will be

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taken.

HFC O (HOFC) tells Interactive COBOL how to handle the Clear To Send (CTS) signal. HOFC set to No says to ignore CTS. HOFC set to Yes says to monitor CTS to decide if the attached device is ready to receive output. If not, it waits until CTS is asserted. Data Set Ready (DSR) must also be asserted for characters to be sent.

HFC I (HIFC) tells Interactive COBOL how to handle the Request to send (RTS) signal. HIFC set to No says to leave RTS high after an open. HIFC set to Yes says to raise and lower RTS to instruct the attached device if it can send data.

HOFC and HIFC should both be enabled when dealing with high-speed modems as SOFC and SIFC are not reliable in these cases.

SFC O (SOFC) tells Interactive COBOL whether to watch for a Ctrl-S (XOFF) coming from the output device to tell Interactive COBOL to stop sending characters and then wait for a Ctrl-Q (XON) to continue transmitting. SOFC set to No says to ignore XON and XOFF codes while Yes says to watch for an XOFF and stop transmitting until an XON is seen.

SFC I (SIFC) tells Interactive COBOL whether to send Ctrl-S (XOFF) and Ctrl-Q (XON) to the input device to tell it to stop transmitting characters and start transmitting characters respectively. This should NEVER be used for a DG terminal or emulator because the Ctrl-S and Ctrl-Q codes are valid attribute control codes and are NOT recognized as XOFF and XON.

A hardware device configured as a console device enabled to run programs cannot also be used as a serial device.

Serial devices that are not enabled or for which the hardware device is not available are ignored and give an error on OPEN.

When opening serial devices and Set is No, the runtime uses the last setting for that serial device to set up the default parameters (baud, parity, number of data bits, etc.). The MODE command can be used to perform these settings if needed. This MODE will be remembered until another setting is stored. In addition, extended open options can be used to set the needed values.

C.6. Configure Printers (@PRNn)

Option 5 from the SYSTEM CONFIGURATION menu defines the configuration information for logical printers (@PRN0 - @PRN2047) in the Interactive COBOL system to be defined. Upon selecting option 5, the PRINTER CONFIGURATION menu is displayed along with the current settings as shown in SCREEN 26. The actual number of entries is controlled by the Number setting in the System Parameters Configuration.

This menu defines certain characteristics for each logical printer to be specified.

```

Printer Device (@PRNn) Configuration
@PRN Device      FFd Printer      Baud Data      Stop Mdm HFC SFC
                  Ena O C Translation  Set Rate Bits Pty Bits Ctl O I O I
-----
0  _____  N N N                    N 9600 8 N 1 N N N Y N
1  _____  N N N                    N 9600 8 N 1 N N N Y N
2  _____  N N N                    N 9600 8 N 1 N N N Y N
3  _____  N N N                    N 9600 8 N 1 N N N Y N
.
.
.
2046             N N N                    N 9600 8 N 1 N N N Y N
2047             N N N                    N 9600 8 N 1 N N N Y N

Press <up>, <down>, F1, F2, F3, F4 to position, F5 to copy, ESC to exit.

```

SCREEN 26. ICCONFIG PRINTER CONFIGURATION

Valid selections for each parameter and the defaults are:

Parameter	Valid Selections	Default
Device	Any serial (COM, MDM) or parallel (LPT) device	(blank)
Enable	Yes or No	No
FF on OPEN	Yes or No	No
FF on CLOSE	Yes or No	No
Printer Translation	filename	(blank)
Set	Yes or No	No
Baud Rate	Any valid baud rate	9600
Data Bits	7 or 8	8
Parity	Yes or NO	No
Stop Bits	1 or 2	1
Mdm Ctl	Yes or No	No
HFC O	Yes or No	No
HFC I	Yes or No	No
SFC O	Yes or No	Yes
SFC I	Yes or No	No

Explanations:

Device directs the Interactive COBOL runtime where to send the print data for a particular logical printer. Possible selections are any of the hardware character devices that are not in use as terminal lines or blank for None. Two or more printers (@PRNn) can point to the same hardware device. This would be useful if different printer options are needed.

Enable set to Yes allows this printer device to be used.

FF on OPEN and *FF on CLOSE* instructs the runtime whether to send a Form-Feed to the printer when the appropriate statement is executed on a particular printer.

Printer Translation specifies a printer translation file to be used when printing. If nothing is specified, each character is printed as given. Printer translation files are opened and read when the runtime system is started.

Set instructs the runtime whether to use the following port device settings. If set to No, the default the following settings are not used and an open of the device will use whatever system defaults there are. If set to Yes, the runtime will attempt to set the device settings to the given values. These device settings are ignored for parallel ports.

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Baud Rate, Data Bits, Parity, and Stop bits set the appropriate selection to the given value. These values must match those of the attached device or else undefined results will occur. Generally the baud rate should be set to the fastest possible setting that the runtime, port, wiring, and output device can support.

Mdm Ctl (modem control) tells Interactive COBOL how to handle modem control signal Data Carrier Detect (DCD) for a particular device. If *Mdm Ctl* is set to No, DCD is ignored.

Mdm Ctl set to Yes for serial lines will cause an OPEN to wait until DCD is asserted before returning. If DCD is lowered after the OPEN, the next I/O operation to that line will receive an error and the appropriate action will be taken.

HFC O (HOFC) tells Interactive COBOL how to handle the Clear To Send (CTS) signal. HOFC set to No says to ignore CTS. HOFC set to Yes says to monitor CTS to decide if the attached device is ready to receive output. If not, it waits until CTS is asserted. Data Set Ready (DSR) must also be asserted for characters to be sent.

HFC I (HIFC) tells Interactive COBOL how to handle the Request to send (RTS) signal. HIFC set to No says to leave RTS high after an open. HIFC set to Yes says to raise and lower RTS to instruct the attached device if it can send data.

HOFC and HIFC should both be enabled when dealing with high-speed modems as SOFC and SIFC are not reliable in these cases.

SFC O (SOFC) tells Interactive COBOL whether to watch for a Ctrl-S (XOFF) coming from the output device to tell Interactive COBOL to stop sending characters and then wait for a Ctrl-Q (XON) to continue transmitting. SOFC set to No says to ignore XON and XOFF codes while Yes says to watch for an XOFF and stop transmitting until an XON is seen.

SFC I (SIFC) tells Interactive COBOL whether to send Ctrl-S (XOFF) and Ctrl-Q (XON) to the input device to tell it to stop transmitting characters and start transmitting characters respectively. This should NEVER be used for a DG terminal or emulator because the Ctrl-S and Ctrl-Q codes are valid attribute control codes and are NOT recognized as XOFF and XON.

A hardware device configured as a console device enabled to run programs cannot also be used as a printer device.

Printers that are not enabled or for which the hardware device is not available, are ignored and give an error on OPEN.

PRN devices are direct linkages from the Interactive COBOL runtime to the device. When used with the COBOL EXCLUSIVE option, the Interactive COBOL runtime prevents other Interactive COBOL processes from opening that device while it is in use.

C.7. Configure Printer Control Queues (@PCQn)

Option 6 from the SYSTEM CONFIGURATION menu defines the configuration information for up to 2048 printer control queues (@PCQ0 - @PCQ2047) in the Interactive COBOL system to be defined. Upon selecting option 6, the PRINTER QUEUE CONFIGURATION menu is displayed along with the current settings as shown in SCREEN 26. The actual number of entries is controlled by the Number setting in the System Parameters Configuration.

This menu defines certain characteristics for each logical printer control queue to be specified.

```

Printer Control Queue (@PCQn) Configuration
@PCQ  Windows Printer Name          Printer      Aut End  FFeed
-----  -----  -----  -----  -----  -----
0      _____  Y          N  keep  N Y N
1      _____  N          N  keep  N Y N
2      _____  N          N  keep  N Y N
3      _____  N          N  keep  N Y N
.
.
.
2046   _____  N          N  keep  N Y N
2047   _____  N          N  keep  N Y N

Press <up>, <down>, F1, F2, F3, F4 to position, F5 to copy, ESC to exit.
    
```

SCREEN 27. ICCONFIG WINDOWS PRINTER QUEUE CONFIGURATION

Valid selections for each parameter and the defaults are:

Parameter	Valid Selections	Default
<i>Windows Printer</i>	Any Printer defined as a Windows Printer or (blank)	(blank)
<i>Enable</i>	Yes or No	No (@PCQ0 Yes)
<i>Printer Translation</i>	filename	(blank)
<i>Auto Queue</i>	Yes or No	No
<i>Disposition</i>	Keep, Remove, or Delete	Keep

Explanations:

Windows Printer directs Interactive COBOL where to send the data for a particular logical printer control queue. Any printer defined to the Windows Printer subsystem can be specified. Use the printer name as given in the **Printer Control Panel** (from the **Start** menu, choose **Settings, Printers**) for local printers and use the network port name for redirected printers. Blank can be used to select the default printer. ICINFO can also be used to see the available Windows printers on a particular machine. Note that the length of the name is limited to 35 characters and the printer name as defined in Windows must fit within this limit in order to be used as a PCQ printer.

Enable set to Yes allows this printer control queue device to be used. When the Interactive COBOL runtime starts, it checks with the Windows printer subsystem for each enabled printer control queue.

Printer Translation specifies a printer translation file to be used when printing. If nothing is specified, each character is printed as given. Printer translation files are opened and read when the runtime is started.

Auto Queue instructs the Printer Control utility whether to automatically queue a file to its default print queue when the file has been closed.

Ending Disposition provides the Printer Control utility with the default option for a particular print file of whether to Keep, Remove, or Delete the particular file or entry after it has been printed.

Form Feed options allows for a form-feed to be inserted at the beginning (B), end of a copy (C), or the end of the printout (F).

Printer control queues that are not enabled are ignored and give an error on OPEN.

Printer control queues (@PCQs) are linkages from Interactive COBOL to a particular device through Interactive COBOL print spooler. If a printer control queue is opened directly, e.g., "@PCQ25", the that data is written directly to the Windows printer.

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C.8. Configure PDF Formats

Option 7 from the SYSTEM CONFIGURATION menu defines the configuration information for up to 256 PDF Formats. Upon selecting option 7, the PDF FORMAT menu is displayed along with the current settings as shown in SCREEN 27. The actual number of entries is controlled by the Number setting in the System Parameters Configuration.

This menu defines certain characteristics for each PDF Format to be specified.

```
PDF Format Configuration
Format Number: 0___

Enable? Y          Comment: _____

Paper: Letter      Width: 612 (8.5)      Height: 792 (11)
Background Form: _____
UseOnce: N ReuseLastPage: N Multipart: N Scale: N Center: Y Fit Margins: N

Margins:
Left: 18 (0.25)   Top: 36 (0.5)      Right: 18 (0.25)
Bottom: 36 (0.5)

Font Name: Courier      Alignment: None
Font Size: 12          Line Spacing: 0 (0)

Autowrap: N          Landscape: N          Multipart Count: 1

Summary: Page Size: 612 x 792 units (8.5 x 11 inches)
Printable Area: 576 x 720 units (8 x 10 inches)
Approximately 80 characters by 60 lines

Page Dimensions and Margins are in 1/72 inch units. Parentheses show inches.
Press <up>, <down> or Enter, F3 previous, F4 next, F5 to copy, ESC to exit.
```

SCREEN 28. ICCONFIG PDF FORMATS CONFIGURATION

Where:

Format Number is the particular format description to be configured. The range of values is as specified in the System Parameters configuration. Currently at most 256 formats can be specified.

Enable set to Yes allows this PDF Format to be used.

Comment provides an optional brief description of this format. This description is stored in the shared area and is viewable by ICSMVIEW or in the Printer Control Utility.

Paper allows for a particular paper size to be entered by scrolling through the various predefined sizes or by entering a custom size which allows for a specific size to be set. Valid selections include A5, A4, Executive, Lineprinter, Tabloid, Ledger, Legal, Letter, and Custom. Letter is the default. If Custom is selected prompts for Width and Height are provided.

Background Form is optional and allows a background image file (in .pdf format) to be specified that will be imposed on the pdf image to be created. At runtime this form must be present in the the directory specified by ICCONFIGDIR or the current directory.

The following selections only apply if a background image is specified:

UseOnce: Y/N (Default is N)

Y=use the background form one time (*ReuseLastPage* appears)

N=old behavior (*MultiPart* appears as before)

ReuseLastPage: Y/N (Appears only when *UseOnce*=Y)

Y=once the form has been used, reuse the last page of the form for all the remaining pages.

When used with a 1-page form, the effect is the same as *UseOnce*=N.

N=once the form is used, print remaining pages with no form.

ReuseLastPage is useful to have a unique first page.

Multipart specifies whether this background image is a multi-page document. When set, the runtime will generate a logical page multiple times for each page in the image. The default is No.

Scale specifies whether to scale the background image. When set to Yes, the image will be scaled to either the paper size or margin size. The aspect ratio is kept intact. The default is No.

Center specifies whether the background image should be centered. When set to Yes, the image will be centered to either the paper size or margin setting. The default is Yes.

Fit Margins specifies whether to use the margin settings or the paper size should be used when scaling or centering the image. The default is the No (use paper size).

Margins allows the specific inside margins (Top, Left, Right, Bottom) to be specified for this format. Units are in points, which are 1/72 inch units. The defaults are 36 (.5 in) for Top and Bottom and 18 (.25 in) for Left and Right.

Font Name allows for a specific supported font to be entered. Currently supported fonts include: Courier, Courier-Oblique, Courier-Bold, Courier-BoldOblique, Helvetica, Helvetica-Oblique, Helvetica-Bold, Helvetica-BoldOblique, Times-Roman, Times-Italic, Times-Bold, and Times-BoldItalic. These are 12 of the 14 standard Adobe fonts. The default is Courier.

Alignment is shown when a proportional font is specified and instructs how characters are to be placed on a page. Valid selections are: None, Character, Word. None is the default. Character will treat the font like a fixed font and place each character in a fixed position on the line. Word will set each word into a calculated fixed position.

Font Size is the specified size in points. Size can range from 2 to 72. For example, a 12-point Courier font provides 10 characters per inch. The 10 is usually referred to as the pitch for fixed fonts.. A 10-point Courier provides 12 characters per inch, i.e., 12 pitch. The default is 12.

Line Spacing specifies the default spacing between lines in points. The line height is the sum of *font size* and *line spacing*. The default is 0.

Autowrap specifies whether to wrap lines that are too long or truncate the lines. The default is No (truncate).

Landscape specifies whether this page should be treated as landscape or portrait. (Swaps width and height.) The default is No (portrait).

Multipart Count specifies whether to generate multiple pages for each page. If this value is greater than 1, then a multi-part form will be generated. If a multi-page image is specified and *Multipart* is set to Y then this value MUST match the number of pages in the image. If a multi-page image file was specified, but *Multipart* is set to N, then this file will be used in a modulo fashion as logical pages are presented. The default is 1.

The Summary section at the bottom of the screen shows a summary of the pdf page specifics. This is kept constantly updated as selections are made in the screen.

All page dimensions and margins are in points which are 1/72 inch units. The values in parenthesis (x) show inches.

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C.9. Change Directory

The Change Directory selection from the SYSTEM CONFIGURATION menu allows the current directory to be changed.

C.10. Save

The Save selection allows any changes of the current values in the configuration file to be saved. You are prompted on the Save(d) file line for the filename (without the '.cfi' extension) to which this session should be saved. The default will be the retrieved name or system.cfi. If no Save is done, then any changes made are NOT saved. If you try to exit and no Save has been done since the configuration was last modified, you are prompted whether a Save should be done.

Note:

Once a Save is done with new values, ICEXEC will not see the changes until the next time ICEXEC is executed. I.E., you cannot change the configuration in effect while ICEXEC is running, although the configuration file can be modified.

C.11. Retrieve

The Retrieve selection allows a configuration file to be read such that it can be viewed or updated. The filename to be retrieved is prompted for on the Retrieved file line.

C.12. Reset to Defaults

The Reset to Defaults selection allows you to start from scratch and set all new values or just to see the default configuration values. Remember you do not have to Save the results of a work session in ICCONFIG.

D. Terminal Descriptions (.tdi)

D.1. Overview

Option 2 from the MAIN MENU will display SCREEN 29. This menu provides the ability to configure different terminal types for ICTERM. The terminal descriptions are saved to a file called the terminal description file with a '.tdi' extension. To build a base set of terminal description files, use the menu to select the appropriate base terminal (selection 1) and then use Save (selection 8) to create that default description.

The name of the current base terminal selection is displayed in this screen and the Configure Keyboard and Configure Display screens.

```

Terminal Description (ICTERM) Configuration
Name: pcwindow
Base: pcwindow           Comment: Windows Console

1. Select Base Terminal
2. Change Comment
3. Configure Parameters
4. Configure Keyboard
5. Configure Display Characters
6. Configure Color/Attribute Map (pcwindow)
7. Change Directory
8. Save Terminal Description File
9. Retrieve Terminal Description File

Selection: 1

Directory: [directory]
Retrieved file:
Save(d) file:

Press <up>, <down> to select, ESC to exit.

```

SCREEN 29. ICCONFIG TERMINAL DESCRIPTION (ICTERM) (.tdi)

To allow a particular terminal description to be available for Interactive COBOL, a terminal description file (.TDI) must be created for that particular ICTERM entry. Each of the base terminal descriptions can be used to create a default description file. This can be done by using option 1 (Select Base Terminal) followed by option 8 (Save terminal description file) for each of the possible base terminal selections.

All the base terminal descriptions are available by default within the runtimes without needing the actual file. Only customized files need to be provided.

To change a terminal description file, use option 1 (Select Base Terminal) or option 9 (Retrieve Terminal description file) to choose the description to be changed. Now use options 4 (Configure Keyboard), 3 (Configure Parameters), and/or 5 (Configure Display Characters) to change the needed values and then use option 8 (Save Terminal Description file) to store that terminal description. Option 2 (Change comment) can be used to store a comment about this new description.

To build a new terminal description file use option 1 (Select Base Terminal) or option 9 (Retrieve Terminal description file) to choose a description whose output characteristics match the new terminal. Now use options 4 (Configure Keyboard), 3 (Configure Parameters), and/or 6 (Configure Display Characters) to change the needed values for the particular terminal and then use option 8 (Save Terminal Description file) with a new filename. These tailored versions should generally be saved with a different name and comment to distinguish them from the defaults. Option 2 (Change comment) can be used to store a comment about this new description.

Option 6 (Configure Color/Attribute Map) is only for use with the pcwindow base terminal and allows the Windows master console screen to be setup.

D.2. Select Base Terminal

Option 1 from the TERMINAL DESCRIPTION menu positions to the Base Terminal Description field and allows a base terminal to be selected from a list of available terminals. These can be selected via a ferris wheel using the left-arrow and right-arrow keys. This base set includes the following:

```

Ansi class:  ANSI, AIX Console, AT&T 605, AT386 Console, SCO Console, SUN Console, XENIX
              Console, XTERM Console, 386IX Console
DG class:    DG D200+
DGUNIX class: DG D217+ in dgunix mode
Disk class:  File
IBM class:   IBM 3151

```

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Freedom class: FREEDOM-One
VTxxx class: VT100, VT220, VT220PC, Linux
Wyse 50 class: WYSE 50
Wyse class: WYSE 60
PC Windows class: PCWINDOW, PCWINDOWCOLOR, PCWINDOWMONO (On Windows only)
Terminfo class: TERMINFO (On Linux only)

The sets of classes shown above are the default output codes used for each of the particular base terminal descriptions. All the terminal descriptions in the Ansi class use ansi codes, those in the DG class use DG control codes, etc. . When in the Configure Display screens, these classes are shown at the top as Format.

More information about these base terminal descriptions can be found in the ICTERM Chapter on page [173](#).

D.3. Change Comment

Option 2 from the TERMINAL DESCRIPTION menu can be used to insert a comment into a terminal description file. Selecting option 2 positions to the Comment field allowing up to thirty (30) characters to be entered for this terminal description. This option is especially useful if you change a base terminal description to provide some documentation of the change. For example if you add a HotKey to a DG description you may change to comment to "DG F1 Hot".

D.4. Configure Parameters

Option 3 from the TERMINAL DESCRIPTION menu gives the PARAMETER CONFIGURATION as shown in SCREEN 29.

The current name of the terminal being configured is displayed at the top of the menu along with its format. The format can be any of the valid display classes mentioned previously.

The PARAMETER CONFIGURATION provides the basic defaults for this terminal description for the number of lines and columns and what characters to use for the line drawing character set. The lines and columns values can be overridden by the ICLINES and/or ICCOLUMNS environment entries either in the actual environment or in the PROGRAM ENVIRONMENT screen specified previously in ICCONFIG.

```
Parameter Configuration
Name: pcwindow
Base: pcwindow          Comment: Windows Console

Keyboard
Sequence Timeout (.1 sec): 0

Screen Size
Lines: 25 Normal Columns: 80 Compress Columns: 80

Line Drawing Character Codes
Upper Left Corner: 218 Upper Right Corner: 191
Lower Right Corner: 217 Lower Left Corner: 192
Horizontal Line: 196 Vertical Line: 179

Windows Console Parameters
Enable audio beep? Y Cursor type: Unchanged
Font: _____ Font Size: 0

Press <up> or <down> to position, ESC to exit.
```

SCREEN 30. ICCONFIG PARAMETER CONFIGURATION

The sequence timeout is the number of tenths of seconds to wait for the intercharacter gap between function keys sequences. The default is 0 for pcwindows and 5 for more other cases. Some remote connections, using telnet or rlogin, may need to have this number adjusted upward to correctly handle function key sequences.

The screen size and line drawing codes are NOT available for terminfo type terminals.

The screen size specifies the default rows and columns for this terminal type. If the Compress columns is set to a value other than that set for normal columns then Compressed mode is supported on this terminal.

The line drawing codes are the decimal codes for the ASCII character to be used for each appropriate part of a box. The default values shown are what this terminal supports. If the terminal does not support a real line drawing character set, the default values of 43, 45, and 124 (decimal) which are '+', '-', and '|', are used.

Windows Console Parameters: (Only for pcwindows)

Enable audio beep specifies whether to enable the audio beep. The default is for beep to be enabled. In certain cases when the beep is done too often on the Master Console, it can slow the machine for other users, in those cases, it may be wise to disable the beep.

Cursor type specifies what type of cursor to use when the runtime starts. Valid selections are unchanged, line, or block. Unchanged is the default.

Font specifies the fixed font to use at runtime startup. If not specified, the default is Courier New.

Font size specifies the font size to use at runtime startup. If not specified 11 is used. Valid values are 2 to 99.

D.5. Configure Keyboard

Option 4 from the TERMINAL DESCRIPTION menu presents the screen as shown in SCREEN 31. The KEYBOARD CONFIGURATION menu instructs Interactive COBOL what to do for each possible input sequence from this keyboard.

The current name of the terminal being configured is displayed at the top of the menu along with its format. The format can be either ASCII or terminfo. In ASCII mode, this table instructs Interactive COBOL how to handle each of the entered ASCII sequences on input from the keyboard. In terminfo mode, this table instructs Interactive COBOL how to handle each of the entered terminfo capname sequences on input from the keyboard.

This table can have up to 512 unique input sequences for a particular terminal description.

The first column of the table gives the legend or label of the key and any shift or ctrl key that must be pressed to get this key. Interactive COBOL does not use this column in any way, it is useful only as a label.

Column 2 gives the actual codes (series of 8-bit bytes) that this key generates when pressed on the keyboard. Interactive COBOL normally watches for these code(s) in a timing-sensitive fashion and, if seen, will handle as specified by the next field.

When entering data in column 2 the following can be used:

<code>\a</code> enters a bell (Ctrl-G)	<code>\r</code> enters a carriage-return (Ctrl-M)
<code>\b</code> enters a backspace (Ctrl-H)	<code>\t</code> enters a tab (Ctrl-I)
<code>\dnnn</code> enters nnn in decimal	<code>\v</code> enters a vertical tab (Ctrl-K)
<code>\e</code> enters an ESC	<code>\xnn</code> enters nn in hex
<code>\f</code> enters a form-feed (Ctrl-L)	<code>\|, \^, \", \', and \?</code> enters a single '\', '^', '"', "'", and '?' respectively
<code>\k</code> allows a terminfo Capname to be entered when using terminfo	<code>^@ through ^_</code> enters the control code (\000 - \037)
<code>\n</code> enters a linefeed (Ctrl-J)	<code>\nnn</code> enters nnn in octal
	any printable character (^! - `~) is entered as itself

When displayed on the screen or in the listing, all printable characters (^! - `~) will be displayed as is, while all others will be shown in octal.

The next columns allow the type to be entered; within that type, how to interpret the key (code), and for next,

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previous, and terminating types whether to erase to the right of the cursor position. Right-arrow or left-arrow is then used to cycle forward or backward through the valid choices through these ferris-wheel fields.

The up-arrow, down-arrow, F1 (left), F2 (right), F3 (page-up), and F4 (page-down) keys will position to the field to change.

Keyboard Configuration						
Name: pcwindow						
Base: pcwindow		Comment: Windows Console				
Label	Byte String	Ext	Type	Code	Erase	
Ctrl-Break	\000\000	N	Terminate Field	ESCAPE KEY	1	N
Ctrl-2 (NUL)	\000\003	N	Normal Character	\000		N
Alt-Backspace	\000\016	N	Editing Function	Back Space		N
Shift-Tab	\000\017	N	Editing Function	Left TAB stop		N
Alt-Enter	\000\034	N	Terminate Field	ESCAPE KEY	0	Y
Alt-* (KP)	\0007	N	Special Function	Ignore Charact		N
F1	\000;	N	Terminate Field	ESCAPE KEY	2	N
F2	\000<	N	Terminate Field	ESCAPE KEY	3	N
F3	\000=	N	Terminate Field	ESCAPE KEY	4	N
F4	\000>	N	Terminate Field	ESCAPE KEY	5	N
F5	\000?	N	Terminate Field	ESCAPE KEY	6	N
.						
.						
.						

Press <up>, <down>, F1-F4 to position, F5 to copy, F6 to delete, ESC to exit.

SCREEN 31. ICCONFIG KEYBOARD CONFIGURATION

This table is always stored in sorted order based on the input sequence defined in column 2.

Valid Types with their Codes are defined in the following paragraphs. The numbers in parentheses after the Types and Editing codes are the values returned in the IC_GET_KEY builtin function for the appropriate keystroke.

Normal Character (1) - The runtime system will treat keycodes of this type as normal 8-bit ASCII characters. The Code column contains the actual character code to be used by the runtime system. The value can be 0 to 255 (decimal).

Editing Function (2) - This type of keycode instructs the runtime system to take the action as described in the Code column. The possible actions in the Code column are:

clear to end-of-field (7)	beginning of field (8)	end of field (9)	right word (10)
left word (11)	destructive TAB (12)	left TAB stop (13)	right TAB stop(14)
left a character (1)	right a character (2)	backspace (3)	delete character (4)
insert mode ON/OFF (5)	clear field (6)	sound bell (15)	back delete (16)

TAB settings are set at every fourth character position from the beginning of the field, i.e., 1, 5, 9, . . .

Terminate Field (3) - This type of keycode causes the runtime system to accept the current field and set the ESCAPE KEY value to the value given in the Code column. The ESCAPE KEY value can be 00 to 99, but remember that value 99 is used for timeouts.

Previous Field (4) - This type of keycode instructs the runtime system to move to the previous field in a screen. If the current field is not the first field in a screen, the field is accepted and the screen is positioned to the preceding field. If the current field is the first (or only) field in a screen, the result depends on the ESCAPE KEY value associated with the key given in the Code column. If the ESCAPE KEY value is 00 (default), the system will beep, and the screen will remain positioned at the first field. If the ESCAPE KEY value is not 00, the field will be accepted, and the screen will exit with the specified ESCAPE KEY value. The ESCAPE KEY value can be 00 to 99, but remember that the system returns 99 for timeouts.

Next Field (5) - This type of keycode instructs the runtime system to move to the next field in a screen. If the current field is not the last field in a screen, the field is accepted and the screen is positioned to the next field. If the current field is the last (or only) field in a screen the field will be accepted and the screen will exit with the specified ESCAPE KEY value given in the Code column. When using the default value, it will act just like a newline had been hit. The ESCAPE KEY value can be 00 to 99, but remember that the system returns 99 for timeouts.

Use of the *Previous Field* and *Next Field* functions on the up-arrow and down-arrow keys with unique ESCAPE KEY values will allow applications to tie several screens together and control the flow from one screen to the other. The default setting of up-arrow is Previous field-ESCAPE KEY 00. The default setting of down-arrow is Next field-ESCAPE KEY 00.

Hot Key Function (6) - Allows for a particular hotkey program to be called whenever this key is entered. The code column allows a value from 00 to 99 to be set such that a COBOL CALL "hotkey<nn>" will be called with the given value replacing the <nn>. There must be a COBOL program available and executable with this name or else a beep will be given.

Previous Row (7) - This type of key code instructs the runtime system to move to the "best fitting" field on a previous row in a screen. If the current field is not in the topmost row of the screen, it is accepted and the cursor is positioned to the "best fitting" field. If the current field is in the topmost row of the screen, the result depends on the ESCAPE KEY value associated with the key in Code Column in ICCONFIG. If the ESCAPE KEY value is 00, the screen will remain positioned in the current field and the bell will sound. If the ESCAPE KEY value is not 00, the field will be accepted and the screen will exit with the specified ESCAPE KEY value. The "best fitting" field is defined to be a field in a preceding row which has the same column position (1st choice), a higher column position (2nd choice) or a lower column position (last choice) than the current field. In any case, the field selected will be the first screen row preceding the current one which contains ANY fields.

Next Row (8) - This type of key code instructs the runtime system to move to the "best fitting" field on a subsequent row in a screen. If the current field is not in the bottommost row of the screen, it is accepted and the cursor is positioned to the "best fitting" field. If the current field is in the bottommost row of the screen, the result depends on the ESCAPE KEY value associated with the key in Code Column in ICCONFIG. If the ESCAPE KEY value is 00, the screen will remain positioned in the current field and the bell will sound. If the ESCAPE KEY value is not 00, the field will be accepted and the screen will exit with the specified ESCAPE KEY value. The "best fitting" field is defined to be a field in a subsequent row which has the same column position (1st choice), a lower column position (2nd choice) or a higher column position (last choice) than the current field. In any case, the field selected will be the first screen row following the current one which contains ANY fields.

Special Function (0) - Is a set of special internal actions to be taken by the runtime upon receipt of this keystroke. *Special Function* keys do not return in IC_GET_KEY. The actions are defined by the following Codes:

Illegal Character - The runtime system will beep when it receives a keystroke of this type.

Ignored Character - The runtime system ignores keycodes of this type.

Refresh Screen - The runtime system will clear the current screen and totally refresh the screen from its internal image.

Enter minus - This runtime system enters a minus character key followed by a *Terminate Field* with an ESCAPE KEY 0, as two separate keystrokes.

The Erase column is only valid for *Terminate Field*, *Next Field*, *Previous Field*, *Previous Row*, and *Next Row* types. If Erase is set to No (the default), the runtime accepts the current field as currently displayed. If set to Yes, all characters to the right of the cursor in the current field are discarded. It is equivalent to first entering the clear to end-of-field key followed by the same Terminate, Next, or Previous key without the Erase option.

When configuring for Linux and using the terminfo base setting, Terminfo Capname codes should be entered by preceding the Capname with a backslash (\). For example, `\kcuD1` would be entered for cursor down.

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The Ext column is the timing-insensitive option and can be used to configure multi-character keystroke sequences for those terminals that do not support the needed number of function keys. The lead-in character for a timing-insensitive sequence must not have been previously defined as a timing-sensitive character, otherwise an error is given by ICCONFIG. An example of how timing-insensitive keys can be entered is given below:

Let's say you want the Ctrl-R character to be the lead-in character for your timing-insensitive codes and you wish to use Ctrl-R followed by the `1' key for function key F1, followed by a `2' for F2, and so on up to `9', Ctrl-R followed by an `a' for F10, `b' for F11, . . . , `f' for F15 and the shifted states of the second character to get the shifted function keys. I.E., Ctrl-R followed by `!' for Shift-F1, and Ctrl-R followed by `A' for Shift-F10 etc. .

Now, to allow the Ctrl-R character to be the lead-in for the functions keys F1-F15 in the normal and shift states and allow the Ctrl-R Ctrl-R keystrokes to be interpreted as a single Ctrl-R, change the default Ctrl-R Byte String entry from "\022" to "\022\022" with the Ext column set to Y.

Now for each needed function key add the appropriate line. For the first case it would be:

In column 1 (Label), give an appropriate label:

```
MyF1
```

In column 2 (Byte String), give the string:

```
\0221
```

In column 3 (Ext), enable the key:

```
Y
```

In column 4 (Type), give the type code as:

```
Terminate Field
```

In column 5 (Code), give the appropriate function key code to be returned:

```
ESCAPE 2
```

In column 6 (Erase), give the appropriate value on whether to erase to the right of the cursor:

```
N
```

Now continue these responses row by row to add the needed keys as given below:

```
\0222  to generate F2
.
\0229  to generate F9
\022a  to generate F10
.
\022f  to generate F15
\022!  to generate Shift-F1
.
\022(  to generate Shift-F9
\022A  to generate Shift-F10
.
\022F  to generate Shift-F15
```

Additional timing-insensitive keys can be added by following the above example.

D.6. Configure Display Characters

Option 5 from the TERMINAL DESCRIPTION menu presents the screen as shown in SCREEN 32. The DISPLAY CHARACTER CONFIGURATION instructs Interactive COBOL what to do for each possible output character from the COBOL program to the terminal. This option is not available for terminfo.

The current name of the terminal being configured is displayed at the top of the menu along with its format.

This table provides entries for all 256 possible sequences with each line representing an entry as two major columns: Character from program and Character to Display.

The first major column, Character from Program, gives the character from the program to be output to the terminal in Decimal, Octal, Hex, and as a Description.

The second major column, Character to Display, give a Value column that allows entry of the value to be displayed along with 5 additional sub-columns showing the Decimal, Octal, Hex, Description, and what this output character looks like on this terminal.

```

Display Character Configuration
Name: pcwindow
Base: pcwindow           Comment: Windows Console

Character from Program      Character to Display
Dec Oct Hex Description    Value  Dec Oct Hex Description Chr
-----
  0  000 00  Ctrl-@      \000   0  000 00  Ctrl-@      N/D
  1  001 01  Ctrl-A      \001   1  001 01  Ctrl-A      N/D
  2  002 02  Ctrl-B      \002   2  002 02  Ctrl-B      N/D
  3  003 03  Ctrl-C      \003   3  003 03  Ctrl-C      N/D
  .
  .
254 376 FE  \376      \376  254 376 FE  \376      ( )
255 377 FF  \377      \377  255 377 FF  \377      ( )

Press <up>, <down>, F1, F2, F3, F4 to position, F5 to copy, ESC to
exit.
```

SCREEN 32. ICCONFIG DISPLAY CHARACTER CONFIGURATION

When entering data in the Values column the following can be used:

- `\a` enters a bell (Ctrl-G)
- `\b` enters a backspace (Ctrl-H)
- `\dnnn` enters nnn in decimal
- `\e` enters an ESC
- `\f` enters a form-feed (Ctrl-L)
- `\n` enters a linefeed (Ctrl-J)
- `\r` enters a carriage-return (Ctrl-M)
- `\t` enters a tab (Ctrl-I)
- `\v` enters a vertical tab (Ctrl-K)
- `\xnn` enters nn in hex
- `\|, \^, \|", \|', and \|?` enters a single `\|, \^, \|", \|', and \|?` respectively
- `\@ through _` enters the control code (`\000 - \037`)
- `\nnn` enters nnn in octal
- any printable character (`^! - `~`) is entered as itself

When displayed in the Chr column, all non-control code characters (both 7- and 8-bit) will be displayed as defined within parenthesis (), while the control code characters will show a N/D (Not Displayable) in that column.

D.7. Configure Color / Attribute Map (pcwindow types)

Option 6 from the TERMINAL DESCRIPTION menu can be used to set the color and attribute mapping for the pcwindow type terminals. This screen allows changing the mappings of the displayable attributes. For each of the character attribute combinations, the foreground color and intensity, and the background color and intensity be changed. Up to eight colors can be selected. If the color environment (ICCOLOR) has been set to process, these attribute-to-color defaults are NOT used. The actual character attribute is sent to the monitor unchanged.

When using a PCWINDOW or PCWINDOWCOLOR base, all 16 different attribute combinations can be specified.

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When using the PCWINDOWMONO base, only the 8 non-blinking attribute combinations are set, the blinking versions are set to match their non-blinking counterparts. Also when using PCWINDOWMONO setting the Normal set of attributes will copy them to the following selections where they can still be changed.

Note that the icrunw and the icrunrc programs support the bold and underline attributes via different fonts and blink is also supported.

Color Attribute Configuration				
Character Attribute Combination	Foreground		Background	
	Color	Intense	Color	Intense
Normal	Cyan	Y	Black	N
Underlined	Magenta	Y	Black	N
Reversed	Black	N	Cyan	N
Reversed Underlined	Black	N	Magenta	N
Bright	Green	Y	Black	N
Bright Underlined	Brown	Y	Black	N
Bright Reversed	Black	N	Green	N
Bright Underlined Reversed	Black	N	Brown	N
Blink Normal	Cyan	Y	Black	Y
Blink Underlined	Magenta	Y	Black	Y
Blink Reversed	Black	N	Cyan	Y
Blink Reversed Underlined	Black	N	Magenta	Y
Blink Bright	Green	Y	Black	Y
Blink Bright Underlined	Brown	Y	Black	Y
Blink Bright Reversed	Black	N	Green	Y
Blink Bright Und Reversed	Black	N	Brown	Y

Press <up> or <down> to position,
<left> or <right> to change, ESC to exit.

SCREEN 33. ICCONFIG COLOR ATTRIBUTE MAP

D.8. Change Directory

Option 7 from the TERMINAL DESCRIPTION menu can be used to change the default directory from which terminal description file are saved to or retrieved from.

D.9. Save and Retrieve Terminal Description File

Options 8 and 9 from the TERMINAL DESCRIPTION menu, allow for terminal description file(s) to be saved or retrieved with the '.tdi' extension. The Save(d) file and Retrieved file fields are used to prompt for the filename to be saved or retrieved respectively.

E. Printer Translations (.pti)

E.1. Overview

Option 3 from the MAIN MENU will display SCREEN 34. This menu provides the ability to configure different printer translations files for use when printing through the @PRN's or @PCQ's. Printer translations are saved to files called printer translation files with a '.pti' extension. To build a base set of printer translation files, use the menu to select the appropriate base translation (selection 1) and then use save (selection 7) to create that default translation. The default translation should never be saved and used as that is just a one to one mapping of characters which will be done automatically if no printer translation is specified. On Linux, when using the Linux spooler, the Linux spooler should be configured to use the appropriate filter to perform the printer translation instead of using Interactive COBOL printer translation facility.

The name of the current base printer selection is displayed in this screen and the Configure Character Mapping screen.

```

Printer Translation Configuration

Name: default
Base: default                                Comment: Default

1. Select Base Translation
2. Change Comment
3. Job Control String
4. Configure Character Mapping

5. Change Directory
6. Save Printer Translation File
7. Retrieve Printer Translation File

Selection: 1

Directory:          [directory]
Retrieved file:
Save(d) file:

Press <up>, <down>, to select, ESC to exit.

```

SCREEN 34. ICCONFIG PRINTER TRANSLATION (.pti)

To allow a particular printer translation to be available for Interactive COBOL, a printer translation file (.PTI) must be created for that particular entry. Each of the base printer translations can be used to create a default file. This can be done by using option 1 (Select Base Translation) followed by option 6 (Save) for each of the possible base selections although the default one to one map should never be saved. It should only be used as a starting point to make changes for a new printer translation file.

All the base printer translations are available by default within the runtimes without needing the actual file. Only customized files need to be provided.

To change a printer translation file, use option 1 (Select Base Translation) or option 7 (Retrieve) to choose the translation to be changed. Now use option 4 (Configure Character Mapping) to change the needed values and then use option 6 (Save) to store that printer translation. Option 2 (Change comment) can be used to store a comment about this new translation.

To build a new printer translation file, use option 1 (Select Base Translation) or option 6 (Retrieve) to choose a translation whose output characteristics most closely match the new translation. Now use option 4 (Configure Character Mapping) to change the needed values for the particular translation and then use option 6 (Save) with a new filename. These tailored versions should generally be saved with a different name and comment to distinguish them from the defaults. Option 2 (Change comment) can be used to store a comment about this new translation.

E.2. Select Base Translation

Option 1 from the PRINTER TRANSLATION menu positions to the Base Printer Translation field and allows a base translation to be selected from a list of available translations. These can be selected via a ferris wheel using the left-arrow and right-arrow keys. This base set includes the following:

Default:	basic one to one mapping
DG to PC:	maps the DGI character set to the standard IBM PC character set
PC to DG	maps the standard IBM PC character set to the DGI character set

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E.3. Change Comment

Option 2 from the PRINTER TRANSLATION menu can be used to insert a comment into a printer translation file. Selecting option 2 positions to the Comment field allowing up to thirty (30) characters to be entered for this printer translation. This option is especially useful if you change a base printer translation to provide some documentation of the change.

E.4. Job Control String

Option 3 from the PRINTER TRANSLATION menu can be used to insert job control strings at the beginning and/or end of a print file. Each can be separately set and can either be a series of values or a filename that contains the codes to be inserted.

```
Job Control String Configuration
Name      Enable? Use File? Value
-----
Job Start  N      N
Job End    N      N

Press <up>, <down>, F1, F2 to position, ESC to exit.
```

SCREEN 35. ICCONFIG PRINTER JOB CONTROL STRING CONFIGURATION

E.5. Configure Character Mapping

Option 4 from the PRINTER TRANSLATION menu presents SCREEN 36. The CHARACTER MAPPING CONFIGURATION instructs Interactive COBOL what to do for each possible output character from the COBOL program to the printer.

The current name of the printer being configured is displayed at the top of the menu.

This table provides entries for all 256 possible sequences with each line representing an entry as two major columns: Character from program and Character(s) to Print.

The first major column, Character from Program, gives the character from the program to be output to the printer in Decimal, Octal, Hex, and as a Description.

The second major column, Character(s) to Print, gives a Value column that allows entry of the value to be displayed along with an additional sub-column showing what this output character looks like on this terminal. Up to 11 bytes are allowed.

```

Character Mapping Configuration
Name:      default
Base:      Default
Character from Program  Character(s) to Print
Dec Oct Hex Description Byte String (Maximum 11 bytes)  Chr
-----
0 000 00 Ctrl-@          \000              N/D
1 001 01 Ctrl-A          \001              N/D
2 002 02 Ctrl-B          \002              N/D
3 003 03 Ctrl-C          \003              N/D
.
.
.
254 376 FE \376          \376              ( )
255 377 FF \377          \377              ( )

Press <up>, <down>, F1, F2, F3, F4 to position,
F5 to copy, ESC to exit.
    
```

SCREEN 36. ICCONFIG CHARACTER MAPPING CONFIGURATION

When entering data in the Values column the following can be used:

- `\a` enters a bell (Ctrl-G)
 - `\b` enters a backspace (Ctrl-H)
 - `\dnnn` enters nnn in decimal
 - `\e` enters an ESC
 - `\f` enters a form-feed (Ctrl-L)
 - `\n` enters a linefeed (Ctrl-J)
 - `\r` enters a carriage-return (Ctrl-M)
- `\t` enters a tab (Ctrl-I)
 - `\v` enters a vertical tab (Ctrl-K)
 - `\xnn` enters nn in hex
 - `\|, \^, \|", \|', and \|?` enters a single '\', '^', '"', "'", and '?' respectively
 - `^@ through ^_` enters the control code (\000 - \037)
 - `\nnn` enters nnn in octal
 - any printable character ('! - `~') is entered as itself

When displayed in the Chr column, all non-control code characters (both 7- and 8-bit) will be displayed as defined within parenthesis (), while the control code characters will show a N/D (Not Displayable) in that column.

E.6. Change Directory

Option 5 from the PRINTER TRANSLATION menu can be used to change the default directory from which printer translation files are saved to or retrieved from.

E.7. Save and Retrieve Printer Translation File

Options 6 and 7 from the PRINTER TRANSLATION menu, allow for printer translation file(s) to be saved or retrieved with the '.pti' extension. The Save(d) file and Retrieved file fields are used to prompt for the filename to be saved or retrieved respectively.

F. Exit ICCONFIG

Pressing ESC while in the MAIN MENU terminates ICCONFIG and returns you to the program from which you called ICCONFIG. If ICCONFIG detects any modification since a Save or a Retrieve, it will prompt with a message asking if you wish to save your changes. If you type Y, a save is done before exiting; otherwise, your changes are discarded.

G. Batch Update Facility (.cfi)

ICCONFIG supports a batch update facility. The -l|-L (Load .ini) switches are available to load a .ini file into the current (or new configuration). This facility uses standard .ini file processing to allow for non-interactive changing of the configuration file.

The -l|-L file|dir (Load .ini), instructs ICCONFIG to use the .ini file specified to change the current configuration. Only those sections and line(s) that are being changed need to be present in the .ini file to be loaded. If a change is made, ICCONFIG will display that the file was updated. If no changes were made, no message will be displayed and the configuration file will not be updated. Only valid lines are read from the .ini file. The Load switch requires the Batch switch (-b).

The ICCONFIG .ini file processing provides the ability to specify an entire configuration file (.cfi). No support is provided for terminal description files or printer description files.

Rules for processing the .ini file:

1. Section names (names inside of []) and keywords (names on the left of the =) are case sensitive.
2. Entries are not read from the .ini file in the order they appear in the .ini file. ICCONFIG reads sections and keywords within a section in a predetermined order (the order does match a generated .ini file).
3. Invalid entries (either sections or keywords) are never read.
4. If more than one matching keyword in a section, only the first one is read.
5. Values for keywords are checked for correctness. An error is given with the keyword and section names. A special value <empty> is used/provided to denote no value for a keyword.
6. Except for trailing spaces on a line, spaces are significant.
7. Comment lines can be entered in the .ini file with the ";" character.
8. Valid section names are shown in a default .cfi file. By looking at a main section and looking at its default entries values you can see all the valid entries for that section.

So to perform a batch update, one would start with a valid .cfi file and pick the section(s) needed and copy them to the appropriate .ini file to be used for the batch update.

VII. ICEEXEC

A. Introduction

ICEEXEC is a service that coordinates execution of Interactive COBOL processes and configures global structures on a single machine. ICEEXEC is required to allow for unique terminal numbering (on this machine) and to coordinate all of the resources that are controlled by the system configuration file (.CFI). The ICEEXEC utility must be running before any Interactive COBOL runtime (ICRUN, ICRUNW, ICRUNCGI), ICNETD servers (ICIOS, ICRUNRS, ICLOGS, ICSQLS), or ICSMVIEW is allowed to execute. All other Interactive COBOL executables (ICOBOL, ICCHECK, ICPACK, etc.) can be run with or without ICEEXEC.

B. Syntax

The syntax is:

```
icexec [-a[:aflag] | -A file|dir[:aflag]] [-C file|dir] [-h|-?] [-O c|s|t]
      [-P file|dir] [-q] [-s] [-t] [-T min:max]
```

Where

- a[:aflag] or -A file|dir[:aflag] (Audit)
Enables auditing (default icexec.lg). Where *aflag* is a|b|d|p|t|u|d|db|pa|pb|ta|tb|ua|ub, defined as a-append, b-backup, d-date, p-pid, t-time, and u-username.
- C file|dir (Configuration file)
Specifies the configuration file. If only a directory is specified, the filename system.cfi is appended, otherwise the given filename is used. If no configuration file is given, then system.cfi in the current directory is used.
- h | -? (Help)
Display help text.
- O c|s|t (Operation)
Specifies an operation to perform. Valid operations are:
 c - check if running,
 s - start, and
 t - terminate.
- P file|dir (Printer Queue location)
Specifies the printer queue file. If only a directory is specified, the filename system.pq is appended, otherwise the given filename is used. If no file is given, then system.pq in the current directory is used.
- q (Quiet)
Enables quiet operation.
- s (Service)
Tells ICEEXEC that it is running as a service. Required when “localsystem” is not the starting account.
- t (Trace)
Enables tracing. Useful for debugging. If tracing is selected, then ICEEXEC is started with an increased level of logging.
- T min:max (Terminal range)
Specifies a range of consoles to use from the configuration file. If not specified, all enabled consoles are enabled.

ICEEXEC can also be stopped and started manually by going to the Services selection under Control panel. New arguments can also be provided by specifying startup parameters. If given, the new startup parameters replace the stored parameters for this single invocation.

On installation, ICEEXEC is installed as a service. ICSVCMGR can be used to change the default command line if needed. More on ICSVCMGR can be found on page [41](#).

D. Processing

ICEXEC maintains the global shared area to which all **ICOBOL** processes that deal with files attach. It continuously monitors active processes. If ICEXEC detects that a process terminates unexpectedly for any reason it checks to see if that process had any files opened and if they had been modified. If so, ICEXEC will open the affected file(s) and flush any modified buffers to the disk. If they had not been modified, ICEXEC just clears the shared area information for that file. ICEXEC will log any unexpected error conditions that it detects along with what it has to do to keep the files and shared area in a consistent state. Unexpected terminations should be investigated to determine their cause; and, if it is the result of process traps or core dumps, the problems should be reported.

VIII. STARTING ICRUN

A. Introduction

Interactive COBOL on Windows is a product that provides the ability to run Interactive COBOL programs.

This chapter discusses how to start the Interactive COBOL on Windows runtime (ICRUN & ICRUNW).

ICRUN.EXE is a console mode executable while ICRUNW.EXE is a GUI mode executable. ICRUNW requires a master console while ICRUN can run on the master console, serial lines, or telnet sessions.

Differences of the GUI version with the console version.

- A. The icon displayed with the GUI will not be the command icon (usually set to MSDOS). The icon is set to an IC bitmap.
- B. GUI version only runs in a GUI session, **Not** in a telnet session. The console version is required for telnet sessions.
- C. When started from a command window, 1) the GUI does not inherit the lines and columns from that window; and 2) the GUI returns to the command window immediately since it is running in a new window (exit codes will not normally be seen).
- D. GUI version, Alt-Enter key behaves as an Enter, does not go Full Screen.
- E. GUI version, Command-line errors generate a Message box.
- F. When calling the command processor, the command will be executed in a new window.

The ICRUNW and ICRUNRC executables try to select appropriate Bold and Underline fonts to match the selected font and allow the Bold and Underline screen attributes to be more fully implemented.

The console version should be used when running in a batch stream.

From this point on ICRUN and ICRUNW will be treated the same unless specifically specified.

ICRUN requires that ICEXEC is running.

B. Environment Entries

B.1. Overview

ICRUN searches for specific Interactive COBOL entries in the user's current environment. These entries allow the user to tailor a particular session of Interactive COBOL for a particular application, company, etc. Environment entries can be set in Windows by using the *SET* command or they can be specified in the configuration file using ICCONFIG or ICEDCFW.

If an entry is found in the environment, it overrides any similar entry in the configuration file.

Interactive COBOL on Windows environment entries in addition to the common ones of ICROOT, ICCONFIGDIR, ICTMPDIR, ICPERMIT_MACHINE, and TZ are:

DATAFILE	Generic data file (@DATA)
ICABORT	Enable aborting on global timeout
ICBGCOLOR	Specify the initial background color
ICCODEPATH	PATH for .CX files
ICCOLOR	Specify how to support color
ICCOLUMNS	Columns for terminal
ICDATAPATH	PATH for data files
ICFGCOLOR	Specify the initial foreground color

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ICFONT	Specify the font name for the GUI runtime (icrunw)
ICFONTSIZE	Specify the point size for the font for the GUI runtime (icrunw)
ICICON	Specify the icon to use for the process (icrunw)
ICLINES	Lines for terminal
ICNETUSESHEARTBEAT	Specifies whether to use a heartbeat connection with ICNET surrogates
ICPCQDIR	Directory for spooled print files
ICPCQFILTER	Specify a default Printer Control Utility Filter
ICPROMPTCHAR	Specify the prompt character
ICREVERSE	Specify how to support reverse
ICRUN	Default switches for the runtime
ICRUNDIR	Specifies a default directory
ICRUNLK	Link file
ICSCROPT	SCREEN OPTIMIZER selection
ICSDMODE	SCREEN HANDLER selection
ICTERM	Terminal type
ICTIMEOUT	Specify global timeout for ACCEPT
ICVKDECIMAL	Specify how to handle the Del (.) key on the numeric keypad
LISTFILE	Generic list file (@LIST)
PCQ	Generic printer control queue
PRN	Generic printer device
SER	Generic serial device
PTS	Print Pass Thru device
PTSMODE	How to support @PTS
PTSFONT	PTS font
PTSFONTSIZE	PTS fontsize

B.2. DATAFILE

DATAFILE specifies a filename for the @DATA file.

The syntax is:

```
DATAFILE=filename
```

Where

filename

Specifies a filename to be used to replace @DATA in a COBOL OPEN.

B.3. ICABORT

ICABORT specifies whether to abort the Interactive COBOL process if a global timeout (ICTIMEOUT) occurs.

The syntax is:

```
ICABORT=on|off
```

If not specified in the environment, then the ICABORT from the configuration file is used.

If ICTIMEOUT is not set or has been overridden by an ACCEPT with TIME-OUT statement or the IC_SET_TIMEOUT builtin, the abort is ignored.

B.4. ICBGCOLOR, ICCOLOR, ICFGCOLOR

ICCOLOR instructs Interactive COBOL how to interpret color codes from a COBOL program. Valid selections are filter, ignore, and process, the default is filter.

The syntax is:

```
ICCOLOR=filter|ignore|process
```

Where

filter

Causes the runtime to watch for color codes from the program and to NOT send them to the terminal, since it does not support color. Filter is the default.

ignore

Tells the runtime that the user wants total control of the screen and may be sending binary color data to the screen and that the runtime should ignore all color codes (i.e., do not look for color codes). If running in this mode the SCREEN OPTIMIZER should not be enabled as the runtime cannot repaint a user's screen.

process

The runtime interprets color codes from the program and sends the appropriate sequences to the terminal. When set to Process the initial background and foreground colors are set by the runtime at startup.

ICBGCOLOR sets the default background color to the indicated value when running with *ICCOLOR* set to Process. Valid selections are black (0), blue (1), green (2), cyan (3), red (4), magenta (5), brown (6), and white (7) either as the name or the number. The default is black (0).

The syntax is:

```
ICBGCOLOR=black|blue|green|cyan|red|magenta|brown|white|
          0|1|2|3|4|5|6|7
```

ICFGCOLOR sets the default foreground color to the indicated value when running with *ICCOLOR* set to Process. Valid selections are black (0), blue (1), green (2), cyan (3), red (4), magenta (5), brown (6), and white (7) either as the name or the number. The default is white (7).

The syntax is:

```
ICFGCOLOR=black|blue|green|cyan|red|magenta|brown|white|
          0|1|2|3|4|5|6|7
```

If not specified in the environment then the appropriate entry from the configuration file is used.

Currently only DG and ANSI based terminals support color.

B.5. ICCODEPATH

ICCODEPATH specifies directories or COBOL library files (up to 16) that ICRUN will search to find a COBOL program (.CX) file when a simple program name is encountered in a CALL, CALL PROGRAM, or from the command line..

The syntax is:

```
ICCODEPATH=dir|file[;dir|file]...
```

Where

dir

Specifies a directory in which ICRUN should look for the .CX files of programs with simple names.

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file

Specifies a COBOL library file in which ICRUN should look for the .CX files of programs with simple names. COBOL Library files are built by the ICLIB utility.

If not specified in the environment, then the ICCODEPATH entry from the configuration file is used. If neither is specified, the default ICCODEPATH as stored in the registry upon Interactive COBOL installation is used.

If ICCODEPATH is specified, the current directory is searched last by default and must be specified by an empty entry or a period in ICCODEPATH if you wish it to be searched sooner. The list is searched for programs (.CX files) in the order given in ICCODEPATH.

ICCODEPATH must only include directory names or COBOL library names.

The ICCODEPATH only applies to a program with a simple name. The syntax is the same as for a system PATH.

A sample entry is:

```
ICCODEPATH=.;D:\PGMS;C:\icobol.cl;C:\MAIN\PGMS;E:;c:\program files\icobol
```

which searches the current directory (current drive), D:\PGMS, the library file C:\icobol.cl, C:\MAIN\PGMS, E: (current directory), and finally the installation directory for a particular .CX file.

ICCODEPATH is processed at startup.

B.6. ICTERM, ICCOLUMNS, ICLINES

ICTERM tells Interactive COBOL what type of terminal is attached to a particular line. *ICLINES* and *ICOLUMNS* specify the number of lines and columns for the terminal.

The syntax is:

```
ICTERM=terminal-type  
ICLINES=lines  
ICOLUMNS=columns[:ccolumns]
```

Where

terminal-type

Specifies a valid *ICTERM* entries described below or in the *ICTERM* Chapter starting on page [173](#), with a corresponding terminal description file

lines

Specifies the number of lines for this terminal. It can range from 24 to 255.

columns[:*ccolumns*]

Specifies the number of columns for this terminal. It can range from 80 to 255. If the second value is given, then both normal and compressed mode are supported. The larger value is the compressed number of columns. The first value given will be the mode that the screen starts in. For example, either *ICOLUMNS*=80:132 or *ICOLUMNS*=132:80 are allowed. In the first case the screen starts with 80 columns and in the 2nd case the screen starts with 132 columns.

If not specified in the environment, then the *ICTERM* from the configuration file is used.

If *ICLINES* and/or *ICOLUMNS* are not specified, or are 0, then that specified in the configuration file is used if non-zero. If *ICLINES* and/or *ICOLUMNS* are zero in the configuration file, then the numbers in the appropriate terminal description file are used except for the *terminfo* and *pcwindow* terminal descriptions. If no *ICLINES* or *ICOLUMNS* information can be found, the defaults of 24 lines by 80:132 columns are used.

The only valid terminal type for the master console is a *pcwindow-type*. For serial lines and telnet sessions in “simple

mode” any of the other ICTERM settings can be used but it should match the emulation being used.

When using CGI, ICTERM=file should be set.

More on these terminal types can be found in the ICTERM Chapter, starting on page [173](#).

ICLINES should be set to the line at which the terminal will scroll the screen when a line-feed (<lf>) is sent. (Line-feed and newline are the same.)

ICCOLUMNS should be set to the column position after which the terminal will wrap to the next line. If both normal and compressed spacing is available then two values should be specified.

With the pwindow-type selection almost all combinations of lines and columns can be selected as the necessary scroll-bars will be presented depending on the selected font and size.

B.7. ICDATAPATH

ICDATAPATH specifies directories that ICRUN will search to open a COBOL data file with a simple name.

The syntax is:

```
ICDATAPATH=dir [; dir] . . .
```

Where

dir

Specifies a directory in which ICRUN should look for data files with simple names.

If not specified in the environment, then the ICDATAPATH entry from the configuration file is used. If neither is specified, a default ICDATAPATH of the current directory is used.

If ICDATAPATH is specified, the current directory is searched last by default and must be specified by an empty entry or a period in ICDATAPATH if you want it to be searched sooner. The list is searched for data files in the order given in ICDATAPATH.

ICDATAPATH must only include directory names.

The ICDATAPATH only applies to a data file with a simple name. The syntax is the same as for a system PATH.

A sample entry is:

```
ICDATAPATH=. ; D:\DATA ; C:\MAIN\DATA ; E :
```

which searches the current directory (current drive), D:\DATA, C:\MAIN\DATA, and finally E: (current directory) for a particular data file.

ICDATAPATH is processed at startup.

B.8. ICFONT, ICFONTSIZE (icrunw only)

ICFONT can be used to specify a default fixed font for the GUI runtime (icrunw) to use when painting the console screen. The default selection is “Courier New”. ICFONTSIZE can be used to specify the default point size for the GUI runtime (icrunw) to use when painting the console screen. The default selection is 11.

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The syntax is:

```
ICFONT=font
ICFONTSIZE=fontsize
```

Where

font

Specifies a font to be used.

fontsize

Specifies the point size for the font. *Fontsize* must be a integer value between 2 and 99 inclusive and must be available for the given font.

The default font is "Courier New" and the default point size is 11.

Some fixed fonts that are available on most machines are:

Courier, Courier New, Fixedsys, and Terminal.

Courier New is a TrueType font such that all point sizes are available. Courier is usually a bit map with a limited selection of sizes.

If the indicated font or size is not available, Windows will pick a font or size that matches as close as possible to the given settings. If a proportional font is selected the screen handler will do the best it can to kept the columns aligned.

The ICRUNW and ICRUNRC executables try to select appropriate Bold and Underline fonts to match the selected font and allow the Bold and Underline screen attributes to be more fully implemented.

The term "Bold" can be appended to a font to provide a slighter darker appearance if needed.

B.9. ICICON (icrunw only)

ICICON can be set to point to an icon file that will be used by the GUI runtime (icrunw) at startup to replace the default IC icon that appears in the upper left of the screen.

If the icon cannot be loaded for any reason a warning is given and the default icon is used.

The syntax is:

```
ICICON=icon-file
```

Where

Icon-file

Specifies a valid pathname to an icon file.

Example:

```
set ICICON=c:\program files\icobol\mytest.ico
```

B.10. ICNETUSESHEARTBEAT

ICNETUSESHEARTBEAT specifies whether a client/server connection using the ICNET i/o surrogate *icios* would be opened with a heartbeat connection. When opened with a heartbeat connection the two processes periodically send “heartbeat” packets to ensure that a connection is active. Upon the loss of the connection the *icios* surrogate will cleanly terminate. This will happen after two heartbeats are lost, usually within 120 seconds

The syntax is:

```
ICNETUSESHEARTBEAT=1
```

ICNETUSESHEARTBEAT is processed on the first client/server connection. I.E. an open using the following type of pathname, "@[icnet:]\machine-name[:port]\path".

ICNETUSESHEARTBEAT requires 4.40 or above on both the client and server.

B.11. ICPCQDIR

ICPCQDIR specifies a particular directory in which simple printer filenames should be created (printer control directory) when Printer Control is enabled. *ICPCQDIR* is not used otherwise.

The syntax is:

```
ICPCQDIR=dir
```

Where

dir

Specifies a valid pathname for the directory in which COBOL printer files with simple names are to be located.

If not specified in the environment then the *ICPCQDIR* from the configuration file is used. If neither is specified, printer files are located in the current directory.

The Printer files affected are those with an ASSIGN TO PRINTER filename and ASSIGN TO PRINTER-1 filename where the filename specified is a simple filename, i.e., no directory qualifiers. Each user can have his own printer control directory or there can be a common one for a group of people or the entire network.

B.12. ICPCQFILTER

ICPCQFILTER specifies a particular printer control utility filter. The display may be modified for the life of the runtime by setting the *ICPCQFILTER* environment variable to establish the default filter. The specified filter will be active every time the Printer Control Utility is entered. This method applies to all methods of starting the Printer Control Utility (*IC_PRINT_STAT*).

ICPCQFILTER, takes values in a format similar to the command lines of the Interactive COBOL utilities.

The syntax is:

```
ICPCQFILTER=command-line
```

Where *command-line* includes:

-B *min:max*

Printed by console numbers ranging from *min* to *max*

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- D *directory*
Pathname of directory directly or indirectly containing the print job
- F *filename*
Simple filename of the print job
- I *min:max*
Owned by console numbers ranging from *min* to *max*
- M *mode*
The job's current status. Valid modes are:
1=Not yet printed 2=Already printed 3=Error occurred 4=Update in progress
5=Queued to print 6=Holding in queue 7=Printing 8=Retrying
9=Terminating
- O *owner*
Username of the owner
- P *printedby*
Username of the last user to print the file
- Q *min:max*
Printer control queues ranging from *min* to *max*
- r
Read access to a file
- S *min:max*
Filesize (in bytes) ranging from *min* to *max*

None of the command line options may be specified more than once.

For example, if ICPCQFILTER is set to "-O mary -Q 2:3", the Printer Control Utility would only display files owned by the user "mary" and destined for either @PCQ2 or @PCQ3.

B.13. ICPROMPTCHAR

ICPROMPTCHAR specifies an alternate prompt character for screen input fields. The default character is the underscore (_).

The syntax is:

ICPROMPTCHAR=x where x is a single display-able character

B.14. ICREVERSE

ICREVERSE informs Interactive COBOL how to interpret reverse codes from a COBOL program.

The syntax is:

ICREVERSE=filter|ignore|process

Where

filter

Causes the runtime to watch for reverse codes from the program and to NOT send them to the terminal, since it does not support reverse.

ignore

Tells the runtime that the user wants total control of the screen and may be sending binary reverse data to the screen and that the runtime should ignore all reverse codes (i.e., do not look for reverse codes). If running in this mode, the SCREEN OPTIMIZER cannot correctly repaint a user's screen that includes reverse.

process

The runtime interprets reverse codes from the program and sends the appropriate sequences to the terminal. Process is the default.

If not specified in the environment then the ICREVERSE setting from the configuration file is used.

B.15. ICRUN

The contents of the *ICRUN* environment variable are treated like switches entered from the command line and processed before any other switches or arguments when starting ICRUN or ICRUNW.

The syntax is:

```
ICRUN=icrun-switches
```

Where

icrun-switches

Specifies any valid command line switches for the runtime but not a command-line argument.

Remember the switch indicator (either '-' or '/') must be consistent through the entire command line.

B.16. ICRUNDIR

ICRUNDIR specifies a particular directory that the runtime will position to after it has successfully processed the command line and optionally opened its audit log. All subsequent current directory usage will use this value

The syntax is:

```
ICRUNDIR=dir
```

Where

dir

Specifies a valid pathname for the directory into which the runtime will position to just before it starts to run the initial program.

If the specified value is NOT a valid directory, an error will be given at startup and the runtime will exit.

If the Info switch (-i) is given, a message will be given about processing the ICRUNDIR environment variable.

ICRUNDIR is processed before ICDATAPATH and ICCODEPATH.

B.17. ICRUNLK

ICRUNLK specifies where the link file can be found.

The syntax is:

```
ICRUNLK=file
```

Where

file

Specifies a valid filename for the link file.

If not specified in the environment then the ICRUNLK from the configuration file is used. If neither is specified, ICRUN does not look for a link file.

If specified in one form or other, then the link file must exist, be readable, and be a valid link file.

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The entry can be a directory (in which case `icrun.lk` is appended for the file) or a complete filename. This feature can be used to link filenames of one type or length to another without changing the COBOL programs. This file is created with the `ICLINK` utility explained in the Utilities Manual. The link file is opened, read, and closed at startup.

B.18. ICSCROPT

ICSCROPT informs Interactive COBOL and *ICCONFIG* whether to enable the Interactive COBOL SCREEN OPTIMIZER.

The syntax is:

```
ICSCROPT=off|on|full|partial|mute
```

Where

`off`

Disables screen optimization

`partial`

Enables simple single screen optimization

`on` and `full`

Enables full screen optimization

`mute`

Disables any screen optimization and prevents Interactive COBOL from sending any implied codes of its own at startup or termination.

If not specified in the environment then the *ICSCROPT* entry from the configuration file is used.

The SCREEN OPTIMIZER keeps track of all data sent to the console and prevents rewriting the same data multiple times. It uses an image of the current screen always in memory.

Usually screen optimization will provide improved screen performance.

The full option usually provides better screen update performance than the partial option, but it requires more memory and cpu time.

B.19. ICSDMODE

ICSDMODE instructs Interactive COBOL how to enable the Interactive COBOL SCREEN HANDLER that provides many SCREEN DEMON™ like features.

The syntax is:

```
ICSDMODE=disabled|underline|0|reverse|1|linedraw|2
```

Where

`disabled`

Disables the SCREEN HANDLER

`0` or `underline`

Run in standard SCREEN DEMON format, which is to underline the row above the box and underline the last row in the box for the top and bottom lines, and use reverse video for the sides.

`1` or `reverse`

Use reverse video for the entire box. This means that two (2) more lines than in standard mode are hidden under the box.

`2` or `linedraw`

Use the line drawing character set of a terminal for the entire box. As in 1 above, two (2) more lines than in

standard mode are hidden under the box. If a particular terminal does not have a line drawing character set +, -, and | are used for the corners, horizontal, and vertical portions of the box, respectively. Currently, only the terminal types ibm, xenix, 386ix, and pwindow support the line drawing characters by default.

If not specified in the environment then the ICSDMODE from the configuration file is used.

For more information on the Interactive COBOL SCREEN HANDLER, see the Screen Handler section in the ICRUN Chapter of the Interactive COBOL Language Reference & Developer's Guide.

B.20. ICTIMEOUT

ICTIMEOUT specifies a global timeout in seconds for all screen ACCEPTs (and STOP literal). If no key has been hit in that time the ACCEPT will timeout with the ESCAPE KEY set to 99.

The syntax is:

```
ICTIMEOUT=n
```

Where

n

Valid timeout values are:

<=0 or >=65535	Wait Forever
>6300 and <65535	Set to 6300
1-6300	Set to <i>n</i> seconds

6300 seconds is 1 hr. & 45 min.

If not specified in the environment, then the ICTIMEOUT from the configuration file is used.

The ACCEPT with TIME-OUT statement and the IC_SET_TIMEOUT builtin will override this selection.

B.21. ICVKDECIMAL

ICVKDECIMAL specifies how the keyboard handler in ICRUN(W) and ICRUNRS interprets the Del key on the numeric keypad when Num Lock is on. (The key labeled with a period above the word 'Del' on a US keyboard). **(Added in 5.12)**

The syntax is:

```
ICVKDECIMAL=character
```

Where

character

Specifies a character to be returned rather than the period.

Command prompt example:

```
> SET ICVKDECIMAL=,  
> icrun
```

will now return a comma instead of a period in ICObOL screens.

B.22. LISTFILE

LISTFILE specifies a filename for the @LIST file.

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The syntax is:

```
LISTFILE=filename
```

Where

filename

Specifies a filename to be used to replace @LIST in a COBOL OPEN.

B.23. PCQ, PRN, SER

PCQ, *PRN*, and *SER* allow the generic printer control queue (@PCQ), the generic printer (@PRN), and the generic serial (@SER) devices to be specified for each process.

The syntax for each is:

```
PCQ=n  
PRN=n  
SER=n
```

Where

n

Specifies a number from 0 to 2047 for PCQ, PRN, and SER that is the appropriate device (@PCQn, @PRNn, or @SERn) enabled and defined in the configuration file.

B.24. PTS, PTSMODE, PTSFONT, PTSFONTSIZE (icrunw only)

These environment variables control how the process handles the local printer device, i.e. printer-pass thru for the GUI runtime (icrunw) .

The syntax is:

```
PTS=default | prompt | prn | printer-name  
PTSMODE= char | paint  
PTSFONT=prompt | font-name  
PTSFONTSIZE=ptsize
```

For PTS

<i>prn</i>	use the setting for PRN0. (This is how ICRUNW worked in pre-3.47.)
default	use the default Windows printer.
Prompt	display the Print Dialog to select a particular printer. If the dialog is Canceled or Closed no printer is selected.
<i>printer-name</i>	use the specified Windows printer.

For PTSMODE

char	specifies that print data is sent directly to the print driver. (This is how it worked in pre-3.47).
paint	specifies that data should actually be "painted" onto the printer. In this mode, fonts, and font sizes can be specified. In addition, this mode will work with GDI-printers.

For PTSFONT (only used when in paint mode)

prompt	says to provide the ChooseFont dialog to select fonts and sizes.
<i>font-name</i>	selects the specified font.

For PTSFONTSIZE (only used when in paint mode)

pointsize specifies a valid size from 2 to 99.

A setting of PTS=prompt, PTSFONT=prompt, and PTSMODE=paint provides for showing the Windows print dialog, allowing font, color, and size to be specified, and the "painting" of data to the printer.

Note that the Local print option from the Printer Control Utility uses Printer Pass Thru (@PTS)

C. Syntax

The syntax for the runtime system is:

```
icrun [-a[:aflag]|-A file|dir[:aflag]] [-b] [-C
l|n|u] [-D yyyyymmdd[:hhmmss]] [-E var=value]... [-G {drsu}...] [-h|-?]
[-i] [-I 2] [-M mode] [-N {bdeiowx}...] [-p] [-q] [-s] [-S os] [-t]
[-T n] [-U l|n|u] [-W title] [-z|-Z ddir] [program [argument]...]
```

or icrunw for the GUI version.

Where

- a[:aflag] or -A file|dir[:aflag] (Audit)
Enables auditing (default icrun.lg). Where *aflag* is a|b|d|p|t|u|da|db|pa|pb|ta|tb|ua|ub, defined as a-append, b-backup, d-date, p-pid, t-time, and u-username.
- b (Batch) (icrun only)
Specifies that the runtime is being used in batch mode and does not need the screen manager.
- C l|n|u (Case Conversion)
Specifies the type of conversion to be applied to filenames before using them in operating system calls. The selections are l=lower case, n=no change, u=uppercase. The default is l (lowercase). Generally this is not important in Windows, which has a case-insensitive filesystem, but it is in Linux where filenames are case sensitive.
- D yyyyymmdd[:hhmmss] (Date bias)
Specifies a date with an optional time from which to bias all COBOL date and time functions (ACCEPT FROM DAY, DATE, TIME, DAY-OF-WEEK, the IC_FULL_DATE builtin, message sending, etc.). The current date/time is subtracted from this date/time and the resultant value is added to all date and time functions. No date/time changes are made to the operating system. This can be used to set a date/time forward or backward for testing purposes.
- E var=value (set Environment value)
Specifies that the environment variable *var* should be setup with the given *value*. This is especially useful for ThinClients to pass environment information over to the server runtime..
- G {drsu}... (General)
Specifies general option(s):
 - d (Duplicate) Generate FILE STATUS 02 with ANSI COBOL 74 programs when using ICISAM version 7 files and a duplicate key is processed as defined by ANSI.
 - r (RDOS) Uses the first underscore in an ACCEPT field as a terminator that erases all characters to the right of it from the string of characters entered into the field. This behavior is how Interactive COBOL on RDOS operated.
 - s (Switch) Enable strict switch processing. The first "/" indicates the start of program switches.
 - u (Upper-case) Upper-case program names returned by ACCEPT FROM ENVIRONMENT.
- h|-? (Help)
Display help text.
- i (Information)
Displays all Information (Info) messages while starting. The default is to not display information messages.
- I 2 (ICOBOL 2)
Run **ICOBOL 2** .cx files. This is no longer required as the runtime will auto-detect an **ICOBOL 2** .cx file.
- M mode (window Mode)
Specify the initial window mode for the runtime. Valid values for *mode* are the values for the IC_WINDOWS_SHOW_CONSOLE builtin plus 0. *Modes* are: 0 does nothing, 1 is Hide, 2 is

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- Maximize, 3 is Minimize, etc.
- N {beio}... (No options)
Specifies NO option(s). Valid no-option values are:
 - b (No-re-assignment) do not reassign terminal number.
 - e (No-embedded spaces) do not allow Embedded spaces in filenames.
 - i (No-interrupts) do not allow console Interrupts
 - o (No-OCCURS) do not do OCCURS DEPENDING ON bounds checking
 - w (No-warnings) do not display any Warning messages
 - x (No-close) do not offer the Close option on the Window for icrunw
 - p (Prompt for username)
Always Prompt for username to pass to the server on a remote connection (ICNETD).
 - q (Quiet)
Enables quiet operation.
 - s (Startup program)
Forces the runtime to use the program from the command line as the initial startup program for the first console, although it will operate in Logon mode after that.
 - S *os* (System Code)
Overrides the default system code returned by an ACCEPT FROM ENVIRONMENT. *os* must be a value from 00 to 99.
 - t (Trace)
Generates trace level diagnostics to the audit log.
 - T *n* (Terminal number)
Specifies the console number in the configuration file.
 - U *l|n|u* (Username)
Specifies the case in which user name will be returned in the ACCEPT FROM USER NAME statement. Valid cases are upper-case (u), lower-case (l), or no conversion (n). The default is lower-case (l).
 - W *title* (Title)
Sets the window title for the runtime to be "*title* - program" instead of "icrun - program"
 - z | -Z *ddir* (Debug)
Instructs the runtime to start in debug mode using the current directory (-z) or the directory *ddir* as the default directory for symbol files (.sy).
- program* (Program mode)
Specifies a COBOL program name including optional program-switches. This forces the runtime into Program mode and starts the program on the next available console. When the program terminates, the runtime terminates. When used together with the Quiet switch (-q) no runtime termination message is displayed when it terminates.
- argument*
Provide optional arguments that will be passed to the specified program's Linkage section. Each argument gets placed in the next Linkage item. If more arguments are specified than there are Linkage items they are ignored.

The runtime starts in one of two modes. If no COBOL program is specified, it starts in Logon mode using a default program called logon.cx. If a COBOL program is specified and no -s switch is specified, the runtime starts in Program mode. Logon mode and Program mode respond to program termination in different ways.

When using the Prompt for username switch, the Save option is ignored in the username/password screen. For thick clients, the prompt is done when a connect to a network resource via ICNETD is made.

More on program switch processing can be found in the CALL PROGRAM statement in the Language Reference Manual.

Any argument or selection that has embedded spaces in it must be quoted or else it will be taken as multiple arguments.

When using an audit log with the runtime:

- A) If any Error is encountered (like Indexed out of Range, etc.) the message will be written to the audit log along

with the pc where the error occurred, the next pc, the exception status register, and the name of the program.

- B) If an asynchronous event (like a Ctrl-C, Ctrl-Break, a Windows-Close, an Abort or Kill from another console) are encountered, then that message will be written to the audit log along with the pc where the error occurred, the next pc, the exception status register, and the name of the program.

The format for the above cases:

```
Error: message
      OP=nnn1 PC=nnn2 E=nn3 in program-name
```

Where

nnn1 is the current pc
nnn2 is the next pc that would have been executed
nn3 is the current exception status
program-name is the current COBOL program.

When running in logon mode, there could be multiple of these type of messages in the audit log as the user would only need to hit newline to continue from these errors back to the main startup program..

Running with an audit log is always recommended, as it will allow you to look back over events if needed. In general, these runtime audit logs should be small. The Audit option with pid is probably the best type of auditing to use.

```
icrun -a:p (for example)
```

Then you can use the pid number to look up the process in the icpermit and/or icexec logs if needed.

Several examples for Program mode are:

1) `icrun -q mainjob`

Runs the program MAINJOB in Program mode with no runtime specific information displayed.

2) `icrun -q mainjob/a/b/c`

Runs the program MAINJOB in Program mode with no runtime specific information displayed and the COBOL switches A, B, and C set to ON.

3) `icrun mainjob available-data`

Runs the program MAINJOB in Program mode with information displayed at startup passing the data given by available-data into the first argument in MAINJOB's linkage section.

4) `icrun mainjob "data one" "data two"`

Runs the program MAINJOB in Program mode with information displayed at startup passing the data given by "data one" and "data two" as two separate arguments into the first and second arguments in MAINJOB's linkage section.

The runtime searches the user's environment for its environment entries (as explained in the previous section).

To run the runtime, the executable file (ICRUN.EXE or ICRUNW.EXE) and the appropriate .dll files (icrun32.dll or icrun64.dll, icsys32.dll or icsys64.dll, sp2.dll, icbltn.dll) must be available and the following conditions must be met:

- 1) An ICPERMIT (described on page [57](#), [58](#), [60](#), [61](#), [65](#)) is running with a free runtime license,
- or
- 2) Remote authorization has been specified and an ICPERMIT is running on a remote machine with a free runtime license.

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- 3) An ICEXEC must be running to supply configuration information.
- 4) A terminal description file to provide terminal information if it overrides a built-in terminal type or it is a custom terminal type.

Two optional files can also be supplied. These are:

A link file (icrun.lk) can be supplied to link old filenames to new filenames. This feature can be used to link DG style filenames to Windows or Linux style filenames without changing the COBOL programs. This file is created with the ICLINK utility explained in the Utilities Manual. The link file (icobol.lk) is sought using the ICRUNLK entry.

A COBOL library file (icobol.cl) can be supplied, which holds COBOL programs to be executed. This optimizes CALL and CALL PROGRAM statements. The ICLIB utility is used to create and maintain the COBOL library file. ICLIB is explained in the Utilities Manual. The library file can be specified in the ICCODEPATH entry.

ICRUN.EXE can be located in the current directory or anywhere along the current PATH.

After being loaded, the runtime allocates memory as needed.

Additional program-areas are allocated for each call. Program-areas are placed in a re-use list whenever a program is CANCEL'ed or when the console executes a STOP RUN.

To start the runtime system from the command line type "ICRUN" or "ICRUNW" and press the ENTER key. The runtime performs the following steps with the resultant messages specified as either Information or Warning messages. As the runtime starts it can be interrupted at any point by pressing Ctrl-Break. By default, information messages are not displayed.

- 1) The runtime revision information and copyright notice.
- 2) Authorization is checked.
- 3) The terminal descriptions file is processed and its full pathname displayed.
- 4) Confirmation of processing ICRUNLK with its full pathname.
- 5) Confirmation of processing ICCODEPATH and/or ICDATAPATH with their contents displayed.
- 6) Confirmation of processing ICPCQFILTER.
- 7) Finally, if no errors were encountered, a message saying that the system is ready is displayed.
- 8) Memory is requested as needed to fulfill requirements for program loading and screen saving.

The runtime's messages are placed in the base console or sent to the audit log.

SCREEN 36 is a sample display of the base console of a runtime session with the Info switch.

Info messages are just that, information messages showing that something was done. These messages are displayed only if the Information switch (-i) was given.

```
>icrun -i
icrun Revision 5.40 (Windows (64-bit))
Copyright (C) 1987-2020, Envyr Corporation. All rights reserved.
Info: Processing link file: d:\test200\icrun.lk
Info: Processing ICCODEPATH environment: \;d:\icobol.cl
Info: Processing terminal description file: d:\icobol\term\pcwindow.
icrun is ready
      (switches to CON enabled for programs)
icrun is finished
>
```

SCREEN 37. SAMPLE ICRUN STARTUP SCREEN

Warning messages are items that should be examined and possibly corrected if there really is a problem.

If any time during startup the runtime detects a fatal error, the startup will terminate. Fatal errors require you to perform some corrective action. The error message will suggest the particular area that needs to be corrected.

Several more common fatal errors and the corrective steps to take are:

- 1) *Error: Connection refused (oserr=10061) Connecting to localhost*
Error: The required software license is not authorized.

Local licensing is being used and no ICPERMIT is running on this machine. Start an ICPERMIT to provide license services. See more on ICPERMIT on page(s) [57](#), [58](#), [60](#), [61](#), [65](#).

- 2) *Error: Connection refused (oserr=10061) Connecting to mainmachine*
Error: The required software license is not authorized.

Remote licensing is being used and either there is no machine on the network with the remote name or no ICPERMIT is running on that machine. See more on ICPERMIT on page(s) [57](#), [58](#), [60](#), [61](#), [65](#).

- 3) *Insufficient memory: Allocating *****

The runtime ran out of memory allocating the specified data structure, usually it shows how much more memory is required for this structure. More memory can be added or use ICONFIG or ICEDCFW to reduce the amount of buffers allocated, reduce the number of active devices in the run unit, reduce other numbers in the system parameter screen, etc. until the error disappears.

```

ICOBOL LOGON Revision 5.40.02 (62) ICOBOL/WINDOWS 64
Console: 0 PID: 488 User Name: danp Node: WIN10X64VM
Dir: C:\Users\danp ICTERM: no icterm
DATE: 3/21/2020 TIME: 9:37:39.21 DAY-OF-YEAR: 81 DAY-OF-WEEK: Sat
Standard LOGON

Option: (P)

(C)all an OS program
(D)etach a COBOL program
(L)og off
(R)un a COBOL program
(S)ystem Management Menu
(T)est Menu
(U)tilities & Functions Menu
  
```

By default, the Title Bar top left shows the process name (icrun) and the name of the current COBOL program (logon). If the IC icon (or an icon selected with ICICON) is shown to the left of icrun then the GUI icrunw is being used. If the Windows command icon (drive letter on a black background) is shown to the left of icrun the the console mode icrun is being used.

Right-clicking in the Title bar will give the System menu including:

(Gui) Restore, Move, Size, Minimize, Maximize, Close, Edit, Font, Compress, Select printer, Printer font, and About selections.

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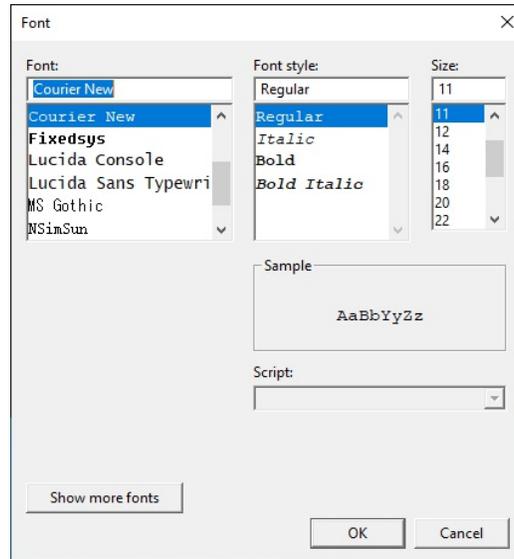
(Console) Restore, Move, Size, Minimize, Maximize, Close, Edit, Default, Properties selections.

Additionally for the GUI:

Maximize will enlarge a font to the maximum size that all the current screen (ICLINES and ICCOLUMNS) can fit on the display. A Font size will never shrink on a Maximize.

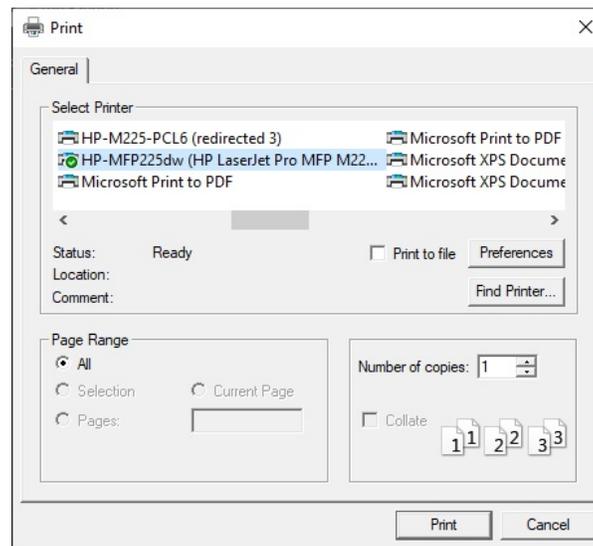
Edit brings up the Copy, Print, Paste, Select all, and PrtScr dialog

Font brings up the ChooseFont dialog box as shown below to allow the screen font, style, and size to be changed.



Compress toggles between compressed and non-compressed mode if available, otherwise it will be grayed out. In compress mode, a check-mark will be displayed.

Select printer, brings up the Printer selection dialog as shown below to select the Windows printer used for printer pass thru (@PTS).



Printer font selects the font, style, and size for the printer selected above. It implies paint mode.

About shows the current revision of ICRUN along with currently selected printer, font, and size as shown below:



Right-clicking in the screen area will give the Edit menu that includes:

Copy, Print, Paste, Select all, and PrtScrn dialog

Holding down the left-mouse button will allow data within the screen to be selected by moving the cursor..

D. Termination

To terminate the runtime, the IC_SHUTDOWN builtin can be called.

If enabled, Ctrl-C can be used to terminate the runtime.

If enabled, the close button [x] from the Title bar can also be clicked to terminate the runtime.

Do not use the Ctrl-Alt-Del combination to terminate the runtime.

E. Failure

On Shutdown, if any device cannot be properly terminated, ICRUN will have tried to clean up the file system by flushing all open files.

IX. ICNETD

A. Introduction

ICNETD provides the TCP/IP network communication and security handling for the server side of the client/server operations. These include the file i/o server (iclios), the ThinClient server (icrunrs), and the Remote ISQL server (icsqls) for **ICOBOL**. Clients that use the i/o handler (iclios) will generally be referred to as "ThickClients".

A TCP/IP network must be running between the client and server machines with the necessary daemons and drivers. The ping utility can be used from both the client and the server to check that each can access the other with the given machine name or IP address.

ICNETD I/O client/server (iclios) is required in order to share files between Linux machines and Windows machines and between two or more Linux machines. Sharing files via NFS mounted file systems is NOT supported or recommended! The ICNETD I/O client/server (iclios) often enhances performance when sharing files between two or more Windows machines vs. sharing files via a shared network drive..

The ICNETD I/O client access can be used over the Internet to access remote files. If a firewall is being used on the server machine, the port used by ICNETD (default 7333) must be opened.

I/O Client (thickclient)

I/O Client support is offered by the Linux and Windows runtime systems, the ODBC driver (ICODBCDR), and the user library. This is generally referred to as thickclient mode. The I/O client/server model differs from the traditional **ICOBOL** support for remote file access in that it acts at the COBOL operation level rather than the operating system operation level. In other words, it remotely reads and writes records rather than disk blocks. For complex files, like indexed files, this generally provides enhanced I/O performance in the network environment while reducing network traffic.

The I/O client (iclios) requires a separate **ICOBOL** Network Server License in the license description file that ICPERMIT manages in order for the server to service clients in i/o client mode (no runtime licenses are used in this mode). Each simultaneous connection (iclios process) requires a user count in the license.

ThinClient

ThinClient client (icrunrc) support is offered on all machines and gui support (sp2/qpr) is available under Windows. In the thinclient cases, only a small part of the code is on the client machine. Just enough to display the provided information and provide keyboard input support.

When providing ThinClient (icrunrc) support, both an **ICOBOL** Runtime license and an **ICOBOL** Network Services license must be available to start the ThinClient server (icrunrs). In addition, if any gui is to be used (sp2 or qpr) then an **ICOBOL** SP2RUN license will be required. ThinClient is similar to telnet support but is done all in **ICOBOL** space via an encrypted interface with the additional support for the gui components of sp2 and qpr and an automatic reconnection ability.

When using ThinClient client (icrunrc) and connecting to a Linux machine (thru ICNETD), the basic environment variables normally set by Linux logon are set by ICNETD. These are: HOME, LOGNAME, MAIL, and SHELL. The MAIL entry is set only if ICNETD is given the default MAIL path by using the ICNETD_MAIL environment variable to provide the path to the standard mail directory, to which ICNETD will add the username. For example, if ICNETD_MAIL is given as /usr/spool/mail/ then when the user "joe" logs on via a ThinClient, then the MAIL environment variable will be set to "/usr/spool/mail/joe".

The SHELL entry will only be set if the shell value is provided by the passwd file.

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ISQL Client

An ISQL client is similar to the I/O Client, but it works at the SQL request level instead of the file level. It is used to support runtime system applications that use the **ICOBOL** imbedded SQL (ISQL) feature.

When providing ISQL support, an **ICOBOL** Network Server license must be available to start the ISQL server (icsqls). The ISQL server communicates with the ODBC Administrator and the ODBC Driver manager only on the remote machine. If the ODBC driver being used is the ICOBOL ODBC driver, then an ISQL connection will also require an ICODBCDR license for each copy of icsqls that is running.

B. Syntax

The standard syntax is:

```
icnetd [-a[:aflag]|-A file|dir[:aflag]] [-d] [-h|-?] [-L file|dir[:aflag]]
      [-M machine[:port]|:port] [-N bp] [-O a|b|c|h|m|p|s|t] [-q] [-R rootdir]
      [-s] [-S {a|t}:{on:off}] [-t]
```

Where

- a[:aflag]|-A file|dir[:aflag] (Audit)
Enables auditing (default icnetd.lg). Where *aflag* is a|b|d|p|t|u|da|db|pa|pb|ta|tb|ua|ub, defined as a-append, b-backup, d-date, p-pid, t-time, and u-username.
- h|-? (Help)
Displays help text.
- d (Debug)
Run in debug mode, no daemonization. (On Linux only.)
- L file|dir[:aflag] (Log Surrogates - new in 5.40)
Enables specifying an alternate location and/or format for logging surrogates. This option overrides the option -S a: {on|off}
- M machine[:port]|[:port] (Machine)
Specifies the remote machine and/or TCP service port address for ICNETD. *Machine* defaults to localhost if not specified. *Port* defaults to 7333 if not specified.
- N bp (No options)
Specifies NO options. Valid NO options are:
 - b (No-logon-as-batch) Allow logons to the icios server without the logon-as-batch privilege (On Windows only)
 - p (No-password) Allow logons without passing a password (On Linux only)
- O a|b|c|h|m|p|s|t (Operation)
Specifies an operation to perform. Valid operations are:
 - a (Amplify) Amplify daemon tracing
 - b (Boost) Boost (amplify) server tracing
 - c (Check) Check to see ICNETD is already running
 - h (Hush) Hush (mute) server tracing
 - m (Mute) Mute daemon tracing
 - p (Post) Cause connection information to be written to the log file
 - s (Start) Start ICNETD (On Windows only)
 - t (Terminate) Terminate ICNETD.
- q (Quiet)
Enables quiet operation.
- R rootdir (ROOT)
Specifies the effective root directory on the machine to which thickclient remote users have access. Default is “/” on Linux and “current-drive:\“ on Windows. Only used by the icios server.
- s (Service)
Service indicator. On Windows it is required when running as a service. On Linux it is required when running under systemd (RHEL 7 and up) vs. /etc/init.d (RHEL 6 and before, or emulated in RHEL 7 and up)
- S {a|t}:{on:off} (Server)

Server options:

a-audit (per processing)

t-tracing can be enabled and disabled.

-t (Trace)

Enables tracing to allow debugging.

-T *seconds* (new in 5.40)

Set a time limit for retaining icrunrs surrogates that are awaiting a reconnect from a client. The maximum is 65534 (a bit over 18 hours). The default is to retain them indefinitely.

Environment variables:

ICNETD

Command line options

ICPERMIT_MACHINE Remote machine for server licensing

ICNETD can be managed by using the ICSVCMGR application under Control Panel or by the standard Windows Services applet. More on ICSVCMGR can be found in the Installing and Configuring on Windows manual. ICSVCMGR can be used to change the default command line if needed.

You must have administrator privilege to start/stop the ICNETD service and to use the “amst” Operate options from the command line.

ICNETD -O c (check) can be done by any client to see if an ICNETD daemon is running. The Machine switch can be used to check a remote machine.

C. Description

From the operating system standpoint, a TCP/IP network must be running between the client and server machines with the necessary daemons. The *ping* utility can usually be used from both the client and the server to check that each can access the other with the given host-name, although it is often blocked by default in many firewalls.

Each service request requires Network Server licenses for the various services that it offers as described in the preceding section.

On the server system, ICNETD must be running to provide the initial server connection to the client. When ICNETD starts, it registers itself with TCP/IP as a server listening for connections on a particular TCP/IP port. The default port is 7333, but this can be changed from the command line. When a client opens a TCP/IP connection on this port, ICNETD is notified of the connection and the type of request (either ThickClient, ThinClient, or remote ICSQL client) being made. ThickClients are from remote runtimes, ICODBC drivers, or user library applications that need client/server file support while ThinClients are specialized front-ends on the clients that provide only a very small interface handler. ICNETD then tries to log in the given username/password. On Windows, the provided username must have the “logon as batch” privilege for icios and the “logon locally” for icrunrs. Up to three attempts will be made before an error is returned to the application. If no such user is found, an exception 309 "Network path was not found" is usually given. While making these attempts, username, password, and domain will be prompted for on the client machine. Once logged in, the appropriate server (icios for ThickClient support, icrunrs for ThinClient support, or icsqls for remote ICSQL support) is started and the appropriate license(s) are requested. From this point on, the server process will handle all client requests. If ICNETD is not running when a connection is attempted, the client will usually receive an exception 315.

Each server process acts just like that user with all the same access controls and privileges. Icios servers will remain until the process that requested the service terminates. (I.E., even if all opened “remote” files are closed such that there are no open across the connection the server will remain.) This provides a performance boost for closing and then re-opening files in an application at the expense of keeping the process and license in use.

On Linux, the No-password option (-N p) can be used to not require a password. For security reasons, this is not recommended. On Windows, if the username has a password it must be provided.

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The username/password prompt has an option to save the information for future logins. The username/password/domain will be saved for each ip address in the user's registry on Windows clients and in a file with the name `.icnet.<ip-address>` written to the user's home directory (as given by the HOME environment entry) for Linux clients. On Windows, the user profile must have the "logon as Batch" privilege enabled to use icios servers and the "logon locally" privilege must be enabled to use icrunrs servers.

The ICNETD servers icios and icrunrs require ICEXEC to be running. The ICNETD server icsqls does NOT require ICEXEC to be running.

NOTE: ICNETD servers use processes as well as file resources from ICEXEC, thus the process count and other system parameters in the system configuration must take this into account.

When ThickClient clients access files through ICNETD, the file pathnames are relative to ICNETD's effective root directory. By default, this is the actual root of the server file system. It may be desirable for security reasons to limit remote users to a subset of the server file system. This can be done by using the `-R` parameter when starting ICNETD to change its effective root. It will prefix the filenames from the client with the subdirectory from the `-R` parameter before opening them. Thus, if `-R` is set to `"/remote/files"` and the client opens `"/ar/customer"`, the server will open `"/remote/files/ar/customer"`.

The `Rootdir` switch (`-R rootdir`) instructs ICNETD to always prepend the *rootdir* to any name passed to the ICNETD server for ThickClients. (Icios)

If no `Rootdir` is given, all filenames start at the actual root directory of the current-drive.

In order to access multiple drives no `Rootdir` may be specified and the appropriate drive must be given by the COBOL program (i.e., `"@//machine10/D:/test/file"`).

When server tracing is enabled, each server generates its own log file (`icios_<time>.lg`, `icrunrs_<time>.lg`, ...) in the **ICOBOL** working directory in addition to the log file generated by the server (ICNETD). *Time* is the timestamp of when the process started. The location and naming convention for log files can be modified using the `-L` option.

Another item to note, when opening files ASSIGN'ed to PRINTER, if the filename is an ICNETD remote file it is NOT placed in the local printer control file (.pq). If the ICNETD server has an ICEXEC running with PCQ's enabled, it will be placed in that printer control queue (.pq) file. The console number for the entry will be set to -1.

ICNETD servers cannot accessed mapped drives since the servers were started from a service which never loaded that mapping. Instead a full network path must be specified (`\\server\sharename\path\filename`).

On termination, ICNETD outputs a table of connection information to the log file.

D. Use as ThickClient (icios)

The ThickClient client accesses files on the server by using a special network filename. The syntax of this filename uses the special leadin character that is also used by logical device names followed by a standard Internet Uniform Resource Locator (URL). The syntax is as follows:

```
@[icnet: ]//machine[:port-address]/path
```

Where

machine

Is the remote machine name or IP address of the machine on which you wish to access files.

port-address

Is the TCP service port on which ICNETD is listening on the remote machine instead of the default (7333).

path

Is the filename, including any directory specifiers, to the file on the specific machine.

The *machine* is often a simple name on a local area network, e.g., "accounting". It can be a full internet name on a wide area network, such as "accounting.envyr.icobol.com", or an IP address, such as "166.82.100.101". The naming used will depend on how your network is configured.

As mentioned above, the *path* supplied will depend on whether ICNETD has been configured with an effective root or not. In order to access the file "/remote/files/ar/customer" on the "accounting" server, the client would specify the following:

```
# ICNETD<enter>                                (ICNETD started with the default root)
```

```
@icnet://accounting/remote/files/ar/customer
```

```
# ICNETD -R /remote/files<enter>              (ICNETD started with a new effective root)
```

```
@icnet://accounting/ar/customer
```

In order to print a queued file on the server using @PCQ0, the client would specify:

```
@icnet://accounting/@PCQ0
```

Nothing except TCP/IP is required on the client system from Interactive COBOL to connect to the server. Client exceptions that can be received trying to connect are:

252 "Program is not authorized to run"	A Network Server license is not available on the specified machine.
306 "Network Request not supported"	A revision mismatch between the client and the ICNETD daemon.
307 "Remote Computer is not available"	There is no computer by the given machine name available on the network.
309 "Network path was not found"	The current username is not available (from /etc/passwd) on the remote machine. Access denied.
315 "Unexpected Network Error"	There is no ICNETD running on the remote machine.
323 "Network name not found"	Couldn't set group-id or user-id from /etc/passwd.

On the server system, the ICNETD daemon must be running to provide the initial server connection to the client. It then forks a server ICNETD process that "logs into the given user's account" on that machine. For this reason, all users who access files on a server must have accounts available on that server with matching user names. Each server process acts just like that user with all the same access controls and privileges. If no such user is found, an exception 309 is given. ICNETD starts icios servers with the `logon_batch` option so all usernames on the ICNETD server machine must have the "Logon as a batch job" privilege when using thickclients. To add this user right do the following on the machine on which ICNET is running: Select the User manager. Select Policies and then User Rights. Check the Show Advanced User rights box. Now select the "Log on as a batch job" right and then add the needed groups and/or users.

If the username/password is invalid on the first open to the ICNETD server, the user will be prompted for a valid username/password with a pop-up box. Three(3) attempts will be allowed before an error is returned. ESC will cause the open to fail. Once a valid password is given, it will be remembered for all subsequent connections. If a new username was given, the new username/password pair is not remembered for a new connection, the original username/password pair will be used.

When communicating with a Windows based ICNETD, the following os-errors can be reported in the Logon Failure username/password pop-up dialog box. Use these error descriptions to help solve the problem.

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1314 Privilege not held
1315 Invalid account name
1317 No such user
1326 Logon failure (unknown username or bad password)
1327 Account restriction
1328 Invalid logon hours
1329 Invalid workstation
1330 Password expired
1331 Account disabled
1385 Logon type not granted (Need a privilege)

From a client, to check that the ICNETD server is running on a remote machine the following should be done:

```
icnetd -O c -M machine
```

Icios can be set to detect loss of client connection by using the ICNETDUSESHEARTBEAT environment variable from the client side.

Setting ICNETDUSESHEARTBEAT=1 causes a heartbeat thread to be enabled on the client and server to continuously provide a heartbeat across the network. In this mode if icios detects a loss of the heartbeat it will shutdown the icios server process cleanly closing all files. Usually this will happen withing 60-120 seconds.

Some Examples:

On Linux, if you start ICNETD with no root directory (-R):

@//server1/usr/joe/data	would access /usr/joe/data on machine server1
@icnet://server1/usr/joe/data	would access /usr/joe/data on machine server1
@//server2/data	would access /data on machine server2
@//server2/@pcq6	would access @PCQ6 on server2

On Windows, if you start ICNETD with no root directory (-R):

@\\server1\user\joe\data	would access \\server1\user\joe\data on machine server1 drive C:
@icnet:\\server1\user\joe\data	would access \\server1\user\joe\data on machine server1 drive C:
@\\server2\D:\data	would access D:\data on machine server2
@\\server2\@PCQ6	would access @PCQ6 on server2

The ICLINK utility can be used to provide a mapping from filenames in the COBOL program to client/server type filenames. See the ICLINK Chapter for more information.

E. Use as ThinClient (icrunrs)

When icnetd starts a ThinClient server (icrunrs), it will pass the client's ip address in as an environment variable called ICREMOTEADDRESS and the client's host name as ICREMOTEHOST. (Basically a "-E ICREMOTEADDRESS=n.n.n.n -E ICREMOTEHOST=xxxx" on the command line.) These two entries can then be queried from COBOL by using the IC_GET_ENV builtin after determining that a ThinClient is running by doing an IC_TERM_STAT builtin and looking at the two ThinClient flags.

The sample logon program has been updated to show this information in the upper left corner of the main screen, if available.

The ThinClient server (icrunrs) is started by ICNETD and runs the logon program by default. On Windows, the ThinClient server is installed when ICNETD is selected. When the ThinClient server is invoked by ICNETD, it requests both a runtime license and a Network Server license from the license manager and then starts the COBOL program. If sp2 or qpr calls are made by the COBOL program then a sp2runtime license will be acquired at that point. The ThinClient server uses consoles with device set to “machine-name” or ip-address first, then “icrunrs”, and finally to (blank). The ICTERM setting is provided by the ThinClient client. Note that all users that attach to ICNETD via a thinclient must have the "Log on locally" privilege when the server is a Windows machine. Also note that the password cannot be empty.

On the server ensure that the following are accessible in the current directory or via PATH, ICCODEPATH, ICDATAPATH, etc:

- cobol object code (.cx files)
- data files

Once the application is running, it will make user interface calls which are intercepted by the ThinClient server library. Some of these calls are processed on the server and some are sent to the client machine for processing. Normally character calls sent to the client will result in a response from the end user. Each ThinClient server (icrunrs) requires a runtime license, Network Server license, and possibly an SP2Runtime license.

To debug ThinClient consider the following:

Make sure the program(s) run without ThinClient before moving to ThinClient.

On the server

1. Configure ICNETD surrogate tracing (icnetd -O b). This will cause icrunrs_(pid).lg files to be created for each icrunrs started. Any **ICOBOL** errors will be logged to this log file. Note that the location and format of these log files can be set with the -L option.
2. Configure ICNETD server tracing (icnetd -O a). Provides more logging information in the icnetd.lg file.
3. Alternatively, e.g., when the server is in production and you don't want all the logging turned on all of the time, the enhanced logging for the server and for surrogates can be turned on and off dynamically with the -S options. Note that the -L option must be set before the service is started.

If gui support (sp2 and/or qpr) is also to be used then an additional SP2RUNTIME license is required on the server. To run totally in gui mode the logon program sp2logon can be invoked. Gui support is only provided when the ThinClient client is running on Windows.

On the server ensure that the following are accessible in the current directory or via PATH, ICCODEPATH, ICDATAPATH, ICCONFIGDIR, SP2DIR, SP2.CFG, etc:

- cobol object code (.cx files)
- data files
- panel files
- sp2 configuration file
- sp2tc.ini

Once the application is running, it will make SP2 (and FormPrint) user interface calls which are intercepted by the ThinClient (gui) server library. Some of these calls are processed on the server and some are sent to the client machine for processing. Normally sp2 calls sent to the client will result in a response from the end user. Each ThinClient server that uses SP2 or QPR requires an SP2 runtime license in addition to the standard runtime license and Network Server license when using gui calls.

To debug ThinClient with gui consider the following in addition to the steps outlined above:

1. On the client, set SP2DBG=2 to get an sp2dbg.xxx log file. (QPRLOG=1 for FormPrint)

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2. On the server, set SP2DBG=2 to get an sp2dbg.xxx log file. (QPRLOG=1 for FormPrint.)

More on using ThinClient with gui support can be found in the readsp2.txt file.

F. Use as ISQL Client (icsqls)

The ISQL client accesses databases on the server by using a special network filename in the DSN specification in the CONNECT statement.. The syntax of this DSN uses the special leadin character that is also used by logical device names followed by a standard Internet Uniform Resource Locator (URL). The syntax is as follows:

```
@[icnet:]/machine[:port-address]/connection-string
```

Where

machine

Is the remote machine name or IP address of the machine on which you wish to the database.

port-address

Is the TCP service port on which ICNETD is listening on the remote machine instead of the default (7333).

connection-string

Is the same connection string that would have been supplied if the database were located locally instead of remotely.

The *machine* is often a simple name on a local area network, e.g., "accounting". It can be a full internet name on a wide area network, such as "accounting.envyr.icobol.com", or an IP address, such as "166.82.100.101". The naming used will depend on how your network is configured.

Normal ICNETD login conventions apply to making the connection to *machine*. Also, the ICNETUSESHEARTBEAT environment variable is support for icsqls.

The connection and database processing are handled via ODBC calls, so an ODBC framework must be available on the server machine.

Using ISQL in client/server mode can greatly reduce network traffic and increase performance in comparison to the client using a local ODBC driver that does its processing via a network share.

G. ICNETD Auditing

ICNETD provides various logging modes to facilitate debugging.

Initially, a default ICNETD log file will look like:

```
Audit log for icnetd 4.20 (Windows) created Dec-21-2009 09:34:13.00
icnetd Revision 4.20 (Windows)
Copyright (C) 1987-2009, Envyr Corporation. All rights reserved.
Started without Startup Parameters specified
Options: -A C:\WINDOWS\b -s -M :7333
Dec-21-2009 09:34:13.80 icnetd (868):          icnetd is ready, listening on: port=7333 on machine RALPHJ
```

When running with ThinClients that happen to disconnect for some reason the following will be added:

```
Dec-21-2009 09:51:49.26 icnetd (868):          Reconnect request from surrogate on pid 2064 for client on
machine ENVYRMOBILE pid 2320
Dec-21-2009 09:51:58.81 icnetd (868):          Reconnect request from surrogate on pid 1676 for client on
machine ENVYRMOBILE pid 2884
```

These could reconnect or not as:

```
Dec-21-2009 09:53:49.60 icnetd (868): Warning: Reconnecting surrogate terminated (Exit Code = 0): pid=2064 for
client on machine ENVYRMOBILE pid 2320
```

```
Dec-21-2009 10:58:41.11 icnetd (868):      Reconnecting client on machine ENVYRMOBILE pid 2884 to surrogate
on pid 1676
Dec-21-2009 10:58:41.29 icnetd (868): Error: Reconnecting from 75.251.64.189:57346
Dec-21-2009 10:58:41.29 icnetd (868): Error: The reconnection key does not match any connection: Processing
reconnect
```

In one case (surrogate 2064) you will see that the surrogate terminated, in this case ICREMOTETIMEOUT had been set and it timed out.

In the second case (surrogate 1676) no timeout was given and the remote client reconnected.

The two error lines are when the thinclient client tried to reconnect with the previously terminated surrogate (2064).

Additional lines in the log can be shown by making an ICNETD -O p (post) call. This will cause ICNETD to dump its current connection table as such:

```
Dec-21-2009 11:05:34.11 icnetd (868):      Connected to server (command request) 127.0.0.1:2933
Dec-21-2009 11:05:34.11 icnetd (868):      Post current connection data:
Client..... Surrogate Date and Time
Computer Name IP Address Port PID User Name Program Rev PID Connection Established Recon
-----
ENVYRMOBILE 75.251.64.189 57347 2828 Ralph Jordan icrunrc 4.20 3652 Dec-21-2009 11:03:09.00 No
ENVYRMOBILE 75.251.64.189 57345 2884 Ralph Jordan icrunrc 4.20 1676 Dec-21-2009 09:50:23.00 No
RALPHJ 192.168.2.105 2930 696 ralph icrun 4.20 1800 Dec-21-2009 11:05:23.00 No
-----
```

Note the final column of Recon. This column will be set to “Yes S” if the surrogate has requested a reconnection or an “Yes C” if the client has requested to reconnect.

By adding additional auditing options this log can be used to show all the actual requests and even the command lines used to start the various surrogates. ICNETD -O a, ICNETD -O b, etc. All of these operations/options can be set with either the command line directly when starting ICNETD or as operations from a command ICNETD. These should only be used for trace and debugging purposes as they will create a much larger log file.

X. THINCLIENT

A. Introduction

ThinClient support is provided to allow a standard application to be run on a server (either Linux or Windows) and deploy the application's user interface to any client machine connected to the server via a TCP/IP network. The clients can be any Linux or Windows based machines for which an icrunrc executable is provided. If running under Windows then both gui and character applications are supported.

The main advantage to the thin-client architecture (versus the standard thick-client architecture which is done via a runtime accessing data files over the network) is that the business logic and database files are maintained and executed in a central location yet end-users still have access to the user interface and all its associated conveniences. Only the standard **ICOBOL** screen interfaces will be shipped to the client. The COBOL program itself runs on the server machine accessing files directly on that machine. When using a Linux icrunrc, NO gui Sp2 and/or FormPrint interface calls are allowed when running ThinClient.

You can think of the ICRUNRC/ICRUNRS combination as a type of telnet session with ICRUNRC being the telnet client/terminal emulator and ICRUNRS being the telnetd server connection.

The TCP/IP connection between the ThinClient client (icrunrc) and the ThinClient server (icrunrs) is encrypted.

No telnetd server must be purchased for the Windows server machine to run client connections.

On Windows, no terminal emulator needs to be purchased for the client to connect to Windows servers or Linux servers when using ThinClient.

On Windows, the ICRUNRC executable tries to select appropriate Bold and Underline fonts to match the selected font and allow the Bold and Underline screen attributes to be more fully implemented.

When using the ThinClient, you are assured that only COBOL access can be made to the remote machine. No interactive command session can be invoked.

B. Environment Entries

B.1. Overview

ICRUNRC searches for specific Interactive COBOL entries in the user's current environment. These entries allow the user to tailor a particular session of Interactive COBOL for a particular application, company, etc. Environment entries can be set in Windows by using the *SET* command.

Interactive COBOL on Windows environment entries in addition to the common ones of ICROOT , ICCONFIGDIR, and TZ are:

ICBGCOLOR	Specify the initial background color
ICCOLOR	Specify how to support color
ICCOLUMNS	Columns for terminal
ICFGCOLOR	Specify the initial foreground color
ICFONT	Specify the font name for the GUI runtime (icrunw)
ICFONTSIZE	Specify the point size for the font for the GUI runtime (icrunw)
ICICON	Specify an icon file to be used
ICLINES	Lines for terminal
ICREVERSE	Specify how to support reverse
ICRUNRC	Default switches for the icrunrc
ICSCROPT	SCREEN OPTIMIZER selection
ICTERM	Terminal type

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PTS	Print Pass Thru device
PTSMODE	How to support @PTS
PTSFONT	PTS font
PTSFONTSIZE	PTS fontsize
ICRECONNECTTIMEOUT	seconds to stop trying to reconnect to the server

B.2. ICBGCOLOR, ICCOLOR, ICFGCOLOR

ICCOLOR specifies how to interpret color codes from a COBOL program. Valid selections are filter, ignore, and process, the default is filter.

The syntax is:

```
ICCOLOR=filter|ignore|process
```

Where

filter

Causes the client to watch for color codes from the program and to NOT send them to the terminal, since it does not support color. Filter is the default.

ignore

Tells the client that the user wants total control of the screen and may be sending binary color data to the screen and that the client should ignore all color codes (i.e., do not look for color codes). If running in this mode the SCREEN OPTIMIZER should not be enabled as the client cannot repaint a user's screen.

process

The client interprets color codes from the program and sends the appropriate sequences to the terminal. When set to Process the initial background and foreground colors are set by the client at startup.

ICBGCOLOR sets the default background color to the indicated value when running with *ICCOLOR* set to Process. Valid selections are black (0), blue (1), green (2), cyan (3), red (4), magenta (5), brown (6), and white (7) either as the name or the number. The default is black (0).

The syntax is:

```
ICBGCOLOR=black|blue|green|cyan|red|magenta|brown|white|  
0|1|2|3|4|5|6|7
```

ICFGCOLOR sets the default foreground color to the indicated value when running with *ICCOLOR* set to Process. Valid selections are black (0), blue (1), green (2), cyan (3), red (4), magenta (5), brown (6), and white (7) either as the name or the number. The default is white (7).

The syntax is:

```
ICFGCOLOR=black|blue|green|cyan|red|magenta|brown|white|  
0|1|2|3|4|5|6|7
```

Currently only pwindows, DG, and ANSI based terminals support color.

B.3. ICTERM, ICCOLUMNS, ICLINES

ICTERM specifies what type of terminal is attached. *ICLINES* and *ICCOLUMNS* specify the number of lines and columns for the terminal.

The syntax is:

```
ICTERM=terminal-type
ICLINES=lines
ICCOLUMNS=columns[:ccolumns]
```

Where

terminal-type

Specifies a valid *ICTERM* entries described below or in the *ICTERM* Chapter starting on page [173](#), with a corresponding terminal description file

lines

Specifies the number of lines for this terminal. It can range from 24 to 255.

columns[:*ccolumns*]

Specifies the default number of columns for this terminal. It can range from 80 to 255. If the second value is given, then a secondary set of columns are supported. The lowest value is considered the normal mode and the higher value is considered the compressed mode.

If *ICTERM* is not specified in the environment, then *pcwindow* is used.

If *ICLINES* and/or *ICCOLUMNS* are not specified, or are 0, then the numbers in the appropriate terminal description file are used except for the terminfo and *pcwindow* terminal descriptions. If no *ICLINES* or *ICCOLUMNS* information can be found, the defaults of 24 lines by 80 columns are used.

The only valid terminal type for the master console is *pcwindow*-type selections..

More on these terminal types can be found in the *ICTERM* Chapter, starting on page [173](#).

ICLINES should be set to the line at which the terminal will scroll the screen when a line-feed (<lf>) is sent. (Line-feed and newline are the same.)

ICCOLUMNS should be set to the column position after which the terminal will wrap to the next line. If both normal and compressed spacing is available then two values should be specified.

B.4. ICFONT, ICFONTSIZE

ICFONT can be used to specify a default fixed font for the client to use when painting the console screen. The default selection is "Courier New". *ICFONTSIZE* can be used to specify the default point size for the GUI client to use when painting the console screen. The default selection is 11.

The syntax is:

```
ICFONT=font
ICFONTSIZE=fontsize
```

Where

font

Specifies a font to be used.

fontsize

Specifies the point size for the font. *Fontsize* must be a integer value between 2 and 99 inclusive and must be available for the given font.

The default font is "Courier New" and the default point size is 11.

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Some fixed fonts that are available on most machines are:

Courier, Courier New, Fixedsys, and Terminal.

Courier New is a TrueType font such that all point sizes are available. Courier is usually a bit map with a limited selection of sizes. If a proportional font is selected the screen handler will do the best it can to keep the columns aligned.

Appropriate Bold and Underline fonts will be selected to match the selected font and allow the Bold and Underline screen attributes to be more fully implemented.

If the indicated font or size is not available, Windows will pick a font or size that matches as close as possible to the given settings.

The term "Bold" can be appended to a font to provide for a slighter darker appearance if needed.

B.5. ICICON

ICICON can be set to point to an icon file that will be used by the runtime at startup to replace the default IC icon that appears in the upper left of the screen.

If the icon cannot be loaded for any reason a warning is given and the default icon is used.

The syntax is:

```
ICICON=icon-file
```

Where

Icon-file

Specifies a valid pathname to an icon file.

Example:

```
set ICICON=c:\program files\icobol\mytest.ico
```

B.6. ICREVERSE

ICREVERSE specifies how to interpret reverse codes from a COBOL program.

The syntax is:

```
ICREVERSE=filter|ignore|process
```

Where

filter

Causes the client to watch for reverse codes from the program and to NOT send them to the terminal, since it does not support reverse.

ignore

Tells the client that the user wants total control of the screen and may be sending binary reverse data to the screen and that the client should ignore all reverse codes (i.e., do not look for reverse codes). If running in this mode, the SCREEN OPTIMIZER cannot correctly repaint a user's screen that includes reverse.

process

The client interprets reverse codes from the program and sends the appropriate sequences to the terminal. Process is the default.

B.7. ICRUNRC

The contents of the *ICRUNRC* environment variable are treated like switches entered from the command line and processed before any other switches or arguments when starting ICRUNRC.

The syntax is:

```
ICRUNRC=icrunrc-switches
```

Where

icrunrc-switches

Specifies any valid command line switches for icrunrc.

Remember the switch indicator (either '-' or '/') must be consistent through the entire command line.

B.8. ICSCROPT

ICSCROPT specifies whether to enable the Interactive COBOL SCREEN OPTIMIZER.

The syntax is:

```
ICSCROPT=off|on|full|partial|mute
```

Where

off

Disables screen optimization

partial

Enables simple single screen optimization

on and full

Enables full screen optimization

mute

Disables any screen optimization and prevents the client from sending any implied codes of its own at startup or termination.

The SCREEN OPTIMIZER keeps track of all data sent to the console and prevents rewriting the same data multiple times. It uses an image of the current screen always in memory.

Usually screen optimization will provide improved screen performance.

The full option usually provides better screen update performance than the partial option, but it requires more memory and cpu time. Full is the default.

B.9. PTS, PTSMODE, PTSFONT, PTSFONTSIZE

These environment variables control how the process handles the local printer device, i.e. printer-pass thru.

The syntax is:

```
PTS=default | prompt | prn | printer-name
PTSMODE= char | paint
PTSFONT=prompt | font-name
PTSFONTSIZE=ptsize
```

For PTS

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default	use the default Windows printer.
Prompt	display the Print Dialog to select a particular printer. If the dialog is Canceled or Closed no printer is selected.
<i>printer-name</i>	use the specified Windows printer.

For PTSMODE

char	specifies that print data is sent directly to the print driver.
paint	specifies that data should actually be "painted" onto the printer. In this mode, fonts, and font sizes can be specified. In addition, this mode will work with GDI-printers.

For PTSFONT (only used when in paint mode)

prompt	says to provide the ChooseFont dialog to select fonts and sizes.
<i>font-name</i>	selects the specified font.

For PTSFONTSIZE (only used when in paint mode)

<i>pointsize</i>	specifies a valid size from 2 to 99.
------------------	--------------------------------------

A setting of PTS=prompt, PTSFONT=prompt, and PTSMODE=paint provides for showing the Windows print dialog, allowing font, color, and size to be specified, and the "painting" of data to the printer.

Also note that the Local print option from the Printer Control Utility uses Printer Pass Thru (@PTS)

B.10. ICRECONNECTTIMEOUT

ICRECONNECTTIMEOUT allows a specific time in seconds to be specified for ICRUNRC to continue to try to reconnect to its ICRUNRS server when a connection has been lost.

The syntax is:

ICRECONNECTTIMEOUT=seconds

Where

seconds
is from 0 - 65535.
0 is wait for ever, the default
1-6300 is to wait for that long in seconds (6300 is 1 hr and 45 minutes)
>6300 is set to 6300.

If the connection between the ThinClient client and server is dropped for some reason the ThinClient client will display a Reconnecting message similar to below:

```
Reconnecting
-----
Connection reset by peer (oserr=10054)
Press ESC to cancel and exit icrunrc
```

or

```
Reconnecting
-----
The network heartbeat has failed to respond
Press ESC to cancel and exit icrunrc
```

The ThinClient client will continue to try to reconnect. When it is successful the message will be removed from the screen and the session can be continued.

C. Syntax

The syntax is:

```
icrunrc [-a[:aflag] | -A file|dir[:aflag]] -c [-E var=val]... [-h|-?] [-i]
        [-m | -M machine[:port]] [-N swx] [-p] [-q] [-t] [ -- icrunrs-switches ] [
        program [arg]... ]
```

Where icrunrc switches are:

- a[:aflag] or -A file|dir[:aflag] (Audit)
Enables auditing (default icrunrc.lg). Where *aflag* is a|b|d|p|t|u|d|b|p|a|p|b|t|a|t|b|u|a|u|b, defined as a-append, b-backup, d-date, p-pid, t-time, and u-username.
- c (Crash recovery)
Enable crash recovery mode. Requires -N s.
- E var=val (Environment)
Set the environment variable *var* to *val* in the current environment.
- h | -? (Help)
Display help text.
- i (Info)
Display additional informational messages
- m (Machine prompt)
Prompts for the machine
- M machine[:port] (Machine)
Specifies the remote machine as either an ip-address or a machine-name and optional port to connect to. If *port* is not given, 7334 is the default. If *machine* is not given, then localhost is used.
- N {swx}... (No option)
Specifies a NO option:
s - No Sp2 (gui) support, like icrunrc in 3.xx
w - No Warnings messages are generated.
x - No Close (X) option on the window.
- p (Prompt for username)
Always Prompt for username to pass to the server.
- q (Quiet)
Enables quiet operation.
- t (Trace)
Enables trace information to be written to the audit log. Useful for debugging. When combined with the Info switch even more trace information is given.
- (double-dash) (Start Icrunrs switches)
Two dashes (--) instruct the ThinClient client to pass all remaining switches and arguments to the ThinClient server.

Program

The COBOL program to start. If not specified then the program specified in the server's configuration file is used. If that is not set then logon is used.

Arg

Any arguments needed by *program*.

When using the Prompt for username switch, the Save option is ignored in the username/password screen. For thin clients the prompt is done immediately.

Where *icrunrs-switches* are:

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- C *l|n|u* (Case)
Specifies the default Case conversion (Linux):
l=lower, n=none, u=upper (default is l)
- D *date[:time]* (Date/time override)
Specifies an override for the default date/time. Date/time formats are YYYYMMDD & HHMMSS
- E *var=val* (Environment)
Sets the environment variable *var* to value for icrunrs
- G {*drs*}... (General)
Specifies a General switch:
d=duplicate key I-O Status, r=RDOS-like ACCEPT, s=strict switch processing,
u=uppercase program name in ACCEPT FROM ENVIRONMENT
- i (Info)
Put out Info messages
- I 2 (IC2)
Run **ICOBOL 2.xx .cx** files. This is no longer required as the runtime will auto detect an **ICOBOL 2 .cx**.
- M *mode* (window Mode)
Specify the initial window mode for the runtime. Valid values for *mode* are the values for the
IC_WINDOWS_SHOW_CONSOLE builtin plus 0. 0 does nothing, 1 is Hide, 2 is Maximize, 3 is
Minimize, etc.
- N {*beinow*} (No)
Specifies NO options:
b=No auto reassign, e=No embedded spaces, i=No console interrupts,
n=No Nagle Algorithm suppressed, o=No OCCURS DEPENDING bounds check,
w=No warnings
- p (Prompt for username)
Always Prompt for username to pass to the server via ICNETD.
- q (Quiet)
Specifies Quiet operation
- s (Startup mode)
Run *program* in startup mode
- S *n* (System code)
Specifies the System code value to be returned in ACCEPT FROM ENVIRONMENT
- T *n* (Terminal)
Specifies the Terminal number is *n*
- U *l|n|u* (Username)
Convert username case:
l=lower, n=none, u=upper (default is n)
- W *title* (Windows Title)
set the Window title as specified for a Windows client.
- z | -Z *dir* (Debugger)
Run debugger, use current or specified *dir* to find .sy files

ICRUNRC Environment variables:

ICCONFIGDIR	Help, print, term descriptions		
ICROOT	Help and print descriptions	ICRUNRC	Command line options
ICCOLOR	Color handling mode	ICBGCOLOR, ICFGCOLOR	Color values
ICLINES	Screen height	ICCOLUMNS	Screen width
ICREVERSE	Reverse-video Control	ICSCROPT	Screen Optimizer mode
ICTERM	Terminal description	ICICON	Icon file
ICRECONNECTTIMEOUT	seconds to stop trying to reconnect		
ICFONT (win)	GUI font	ICFONTSIZE (win)	GUI font pointsize
PTS	print pass thru device	PTSMODE (win)	char | paint
PTSFONT (win)	font for PTS	PTSFONTSIZE (win)	PTS font-size
SP2DIR	directories for SP2	QPRDIR	Directories for FormPrint

ICRUNRS Environment variables:

ICCONFIGDIR Help, print, term descriptions

ICROOT	Help and print descriptions	ICRUNRS	Command line options
ICRUNDIR	Directory for runtime surrogate		
ICPCQDIR	Print job file directory		
ICRUNLK	File name link file	PRN,SER,PCQ	Default device units
ICCODEPATH	.CX file path list	ICDATAPATH	Data file path list
ICTIMEOUT	Timeout Delay	ICABORT	Abort on Timeout
ICPCQFILTER	PCQ filter command	ICPERMIT_MACHINE	Servermachine[:port]
DATAFILE	@DATA resolution	LISTFILE	@LIST resolution
ICSDBMODE	Screen Handler Mode	ICTMPDIR	Temporary file directory
ICRECONNECTTIMEOUT	seconds to stop trying to reconnect		
SP2DIR	directories for SP2	QPRDIR	Directories for FormPrint

The ICRUNRS environment variables are from the ICNETD - ICRUNRS process tree.

When ICNETD starts a ThinClient server, it will pass the client's ip-address and host-name in the environment variables ICREMOTEADDRESS and ICREMOTEHOST respectively. (Basically "-E ICREMOTEADDRESS=n.n.n.n -E ICREMOTEHOST=machine" on the client command line.) These can then be queried from a COBOL program by using the IC_GET_ENV builtin after determining that a ThinClient is running by doing an IC_TERM_STAT builtin and looking at the two thinclient flags (SP2-SRV-FLAG and CHAR-SRV-FLAG). More information on IC_TERM_STAT can be found in the ICOBOL Reference Manual.

The sample logon program does look for these variables when it detects a Thinclient.

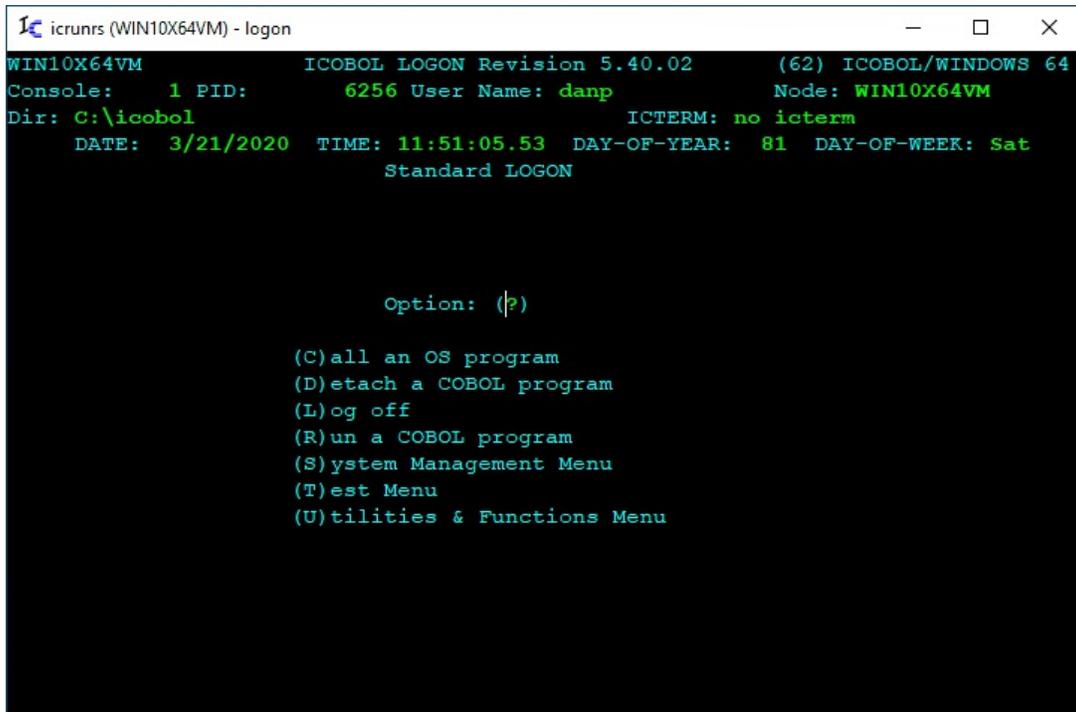
There are additional builtins IC_CLIENT_CALL_PROCESS, IC_CLIENT_DELETE_FILE, IC_CLIENT_GET_ENV, IC_CLIENT_GET_FILE, IC_CLIENT_PUT_FILE, IC_CLIENT_RESOLVE_FILE, IC_CLIENTSET_ENV, IC_CLIENT_SHELLEXECUTE that can be used to communicate with the client machine. More information on these can be found in the ICOBOL Reference Manual.

The trace switch, -t, requires the audit option.

When used with the Tracing switch (-t), the Info switch (-i) causes more trace info to be dumped to the audit log.

Below is a sample shot of the screen using the standard logon program provided showing the client machine-name as the Node name on line 2 at the far right.

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```
icrunrs (WIN10X64VM) - logon
WIN10X64VM ICOBOL LOGON Revision 5.40.02 (62) ICOBOL/WINDOWS 64
Console: 1 PID: 6256 User Name: danp Node: WIN10X64VM
Dir: C:\icobol ICTERM: no icterm
DATE: 3/21/2020 TIME: 11:51:05.53 DAY-OF-YEAR: 81 DAY-OF-WEEK: Sat
Standard LOGON

Option: (?

(C)all an OS program
(D)etach a COBOL program
(L)og off
(R)un a COBOL program
(S)ystem Management Menu
(T)est Menu
(U)tilities & Functions Menu
```

By default, the top shows the process name (icrunrs), remote machine (RALPHJ8), and the name of the current COBOL program (logon).

Right-clicking in the system area will give the System menu including:

Restore, Move, Size, Minimize, Maximize, Close, Edit, Font, Compress, Select printer, Printer font, and About selections. This system menu acts just as the gui runtime system menu in page [141](#).

Right-clicking in the screen area will give menu that includes:

Copy, Print, Paste, and Select all

Holding down the left-mouse button will allow data within the screen to be selected.

D. ThinClient Features

The ThinClient has an automatic reconnection ability when attached to an ICNETD/ThinClient server of 4.00 or above.

If the connection between the ThinClient client and the server is dropped for some reason the ThinClient client will display a Reconnecting message similar to below:

```

                    Reconnecting
-----
Connection reset by peer (oserr=10054)
Press ESC to cancel and exit icrunrc

```

or

```

                    Reconnecting
-----
The network heartbeat has failed to respond
Press ESC to cancel and exit icrunrc

```

The ThinClient will continue to try to reconnect. When it is successful the message will be removed from the screen and the session can be continued.

If at any time you wish to terminate the reconnection process just hit ESC.

The ThinClient connection provides for compression on the downstream leg. This should help performance on slower network connections.

The ThinClient server, icrunrs, has an additional No switch. The "-N n" switch will cause the socket connection from the server (icrunrs) to the client (icrunrc) to have the TCP Nagle Algorithm NOT be suppressed. In some cases, this may help screen performance over a slower WAN connection.

In the default case, the Nagle Algorithm is always disabled.

This option can be passed to icrunrs from icrunrc as:

```
icrunrc -M server-machine -- -N n
```

This option should be used with care as it has the tendency to slow down performance on an LAN. If auditing is enabled for the servers, an Info message is written to the audit log if info has also be enabled.

ICSCROPT=full should be enabled for both the icrunrc client and the icrunrs server to provide the best screen buffering options, especially over a slow WAN connection.

On the client machine, the ICRUNRC command will invoke the runtime thinclient. All screen input and output will be performed by this thin client.

On the server machine, an ICRUNRS will be started by ICNETD to run COBOL programs for that particular ThinClient session.

The ICRUNRC uses all the normal screen environment setting to set up its screen capabilities for the client. These include ICTERM, ICSCROPT, ICLINES, ICCOLUMNS, etc. .

The ICRUNRS server does require a license, called the Network Server license (ICNET) in addition to an standard Runtime license. The ICRUNRS server will run under control of ICNETD under both Linux and Windows.

When using ThinClients, the environment for ICNETD is very important as it is what is passed to the ICRUNRS startup. Especially important is ICCODEPATH, etc.

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When ICRUNRS starts, it requires a console that has been enabled and has the device name of <blank>, icrunrs, matching *ip-address*, or a matching *machine-name*, set to run programs.

To use ICRUNRC you must communicate with an ICNETD from 3.30 or higher.

The ThinClient client (icrunrc) DOES NOT use ICEXEC or require a license on the client itself.

When connecting to a Windows server, the user to be logged on must have the "Log on locally" privilege.

On Linux

There is a separate ThinClient installer that performs a very small installation of just the icrunrc program file.

The ThinClient client provides seamless pass - thru support for whatever terminal type is used under the thinclient client as given by the ICTERM entry.

On Windows

The ICRUNRC install is a separate install question with both the runtime and full installers and it also has its own installer.

The ThinClient client supports the Windows GUI environment via the ICTERM=pcwindow screen interface much as the standard GUI runtime.

The ThinClient client supports Print-Pass Thru by using the default Windows printer at the time of the Print-Pass Thru On. If no default printer or an error is received, then the data will go to the screen.

The Print Screen command is supported in the same fashion.

In addition all GUI calls to Sp2 and Formprint are supported. See the next chapter for more specific information on using ThinClient with sp2 and Formprint.

When using ICRUNRC the IC_WINDOWS_SETFONT builtin can be used even when connected to a Linux server to change the client font and font size.

E. Using ThinClient

ThinClient client

In the Windows install, a ThinClient client option is presented to allow the ThinClient client portion of the runtime to be installed for those clients that need ThinClient access to a server computer. You are prompted for a server machine. Only Local installs are allowed.

When the ThinClient client (icrunrc) starts, it connects to the ThinClient server on a server machine running ICNETD. (icrunrc takes a -M machine argument to specify the server machine.). The client then performs a logon to the server with a username/password just as if you were accessing a file using the ICNETD client/server support. After a good logon, the ICNETD server will start a ThinClient server (icrunrs) to provide screen communication with the ThinClient client.

On the client ensure that the following are accessible in the current directory or via PATH, ICROOT, etc:

- terminal description file (.tdi)

No licensing is required on the client side.

ThinClient server

The ThinClient server (icrunrc) is started by icnetd and runs the logon program by default. On Windows, the ThinClient server is currently installed when ICNETD is selected. On Linux, the ThinClient server is installed by default. When the ThinClient server is invoked by ICNETD, it requests a Network Services license and an **ICOBOL** runtime license from the license manager and then starts the COBOL program logon.cx by default. The ThinClient server uses consoles with device set to “machine-name” or “ip-address” then “icrunrc” and then (blank). The ICTERM setting is passed from the client. Note that all users that attach to ICNETD via a thinclient connection must have the "Log on Locally" privilege when the server is an Windows machine.

On the server ensure that the following are accessible in the current directory or via PATH, ICCODEPATH, ICDATAPATH, etc:

- cobol object code (.cx files)
- data files

Once the application is running, it will make console user interface calls which are intercepted by the ThinClient server library. Some of these calls are processed on the server and some are sent to the client machine for processing. Normally console calls sent to the client will result in a response from the end user. Each ThinClient server (icrunrc) requires a Network Services license, an **ICOBOL** runtime license, and possibly an SP2Runtime license. .

The ThinClient requires at least **ICOBOL** Rev 3.30.

To debug ThinClient consider the following:

- A. Make sure the program(s) run without ThinClient before moving to ThinClient.
- B. With ThinClient
 - B.1 On the server, turn on ICNETD server tracing (icnetd -O b). This will cause icrunrc_(pid).lg files to be created for each icrunrc started. Any **ICOBOL** errors will be logged to this log file. Without this log file, all **ICOBOL** messages are lost.
 - B.2 On the server, turn on ICNETD server tracing (icnetd -O a). Provides more logging information in the icnetd.lg file.

To use the - switch to pass information to the ThinClient server, consider you are going to a Linux machine called aix2 and you want to support mixed cases filenames then you can do the following:

```
icrunrc -M aix2 -- -C n
```

In this case, the -M aix is processed by the ThinClient client (icrunrc) while the -C n is passed to the server and to the ThinClient server (icrunrc) to be processed.

For gui:

On the client ensure that the following are accessible in the current directory or via PATH, ICROOT, SP2DIR, SP2.CF, QPRDIR, QPR.CFG, etc:

- panel files
- fonts.sp2 and/or fonts.qpr
- image files
- help files
- repeat group files
- other needed .dll (jpeg)

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- sp2tc.ini

No licensing is required on the client side.

ThinClient (gui) server

The ThinClient server (icrunrs) is started by icnetd and can run the sp2logon program. On Windows, the ThinClient server is currently installed when ICNETD is selected. On Linux, the ThinClient server is installed by default. When the ThinClient server is invoked by ICNETD, it requests a Network Services license and an **ICOBOL** runtime license from the license manager and then starts the COBOL program logon.cx by default. It may request an SP2 runtime license from the license manager if an SP2-enabled program is executed. The ThinClient server uses consoles with device set to a matching *ip-address*, a matching *machine-name*, icrunrs, blank. Note that all users that attach to ICNETD must have the "Log on as Batch" privilege when the server is an Windows machine.

On the server ensure that the following are accessible in the current directory or via PATH, SP2DIR, SP2.CFG, etc:

- cobol object code (.cx files)
- data files
- panel files
- sp2 configuration file

- sp2tc.ini

Once the application is running, it will make SP2 (and FormPrint) user interface calls which are intercepted by the ThinClient server library. Some of these calls are processed on the server and some are sent to the client machine for processing. Normally sp2 calls sent to the client will result in a response from the end user. Each ThinClient server requires an SP2 runtime license AND an **ICOBOL** runtime license, and a **ICOBOL** Network Services license.

To debug ThinClient in gui mode consider the following:

- A. Make sure the program(s) run without ThinClient before moving to ThinClient.
- B. With ThinClient
 - B.1 On the client, set SP2DBG=2 to get an sp2dbg.xxx log file. (QPRLOG=1 for FormPrint)
 - B.2 On the server, set SP2DBG=2 to get an sp2dbg.xxx log file. (QPRLOG=1 for FormPrint.)
 - B.3 On the server, turn on ICNETD server tracing (icnetd -O b). This will cause icrunrs_(pid).lg files to be created for each icrunrs started. Any **ICOBOL** errors will be logged to this log file. Without this log file, all **ICOBOL** messages are lost.
 - B.4 On the server, turn on ICNETD server tracing (icnetd -O a). Provides more logging information in the icnetd.lg file.

More on ThinClient in gui mode can be found in the readsp2.txt file.

XI. TIPS

A. Overview

Interactive COBOL has been designed to be configurable such that small systems are not burdened with large system requirements and large system are not limited by the small systems constraints. Generally the default configuration options provided by Interactive COBOL allow a basic system to be started. The tips below should be taken as a starting point to configuring a well performing system that does not include wasted memory but does allow some flexibility for growth. It should be noted that for any particular application these guidelines may not apply; although, they can be used as a guide to help in understanding your individual performance requirements.

B. Interactive COBOL

To get the very best possible performance try the following tips:

- 1) Use the fewest possible selections in ICCODEPATH with a library as the first or second selection. (helps CALL & CALL PROGRAM)
- 2) Use a printer control directory (ICPCQDIR) that is different from your default directory for your printer files if these are created and deleted very often to avoid creating sparse directory entries.
- 3) Use a COBOL library file for all your programs, at least the most often used ones. (helps CALL & CALL PROGRAM)

The System Information utility under the runtime should be viewed to help select parameters in the System Parameter menu of ICCONFIG or ICEDCFW that can be configured up or down to provide a more optimal configuration.

C. Windows

To get the very best possible performance try the following tips:

- 1) Keep your hard disk organized. (helps all I/O)
- 2) On a frequent basis check for disk fragmentation and run a compress program if needed. (helps all I/O)

D. Disk Fragmentation

Disk Fragmentation is when individual files are scattered all over the disk instead of being allocated contiguously. During normal everyday use, especially the multiuser Interactive COBOL runtime environment, many files will be written and/or created during the day resulting in disk fragmentation. There are many available disk optimizers (reorganizers) that are available to remedy this situation.

It would be a very useful habit to run a weekly disk optimizer to keep your disk from being too fragmented. This could possibly be done after your weekly backup operations.

The CHKDSK utility (or SCANDISK) using a template, i.e., CHKDSK *.* can also be used to inform you of files that have non-contiguous storage. For more on this feature of CHKDSK (or SCANDISK) please refer to your operating system manual.

E. Character Set(s)

Each individual device on the system may support different character sets. On terminal devices the terminal description files provide support for any specific key sequence to be entered as data. On output, the Interactive COBOL runtime generally treats all characters as 8-bit bytes with the range from 0 to 31 (decimal) and 128 to 159 as being unprintable control codes. The remaining characters are treated as some type of printable character. The ASCII Codes chart on page [195](#) shows the DG/DG International and US/PC character sets.

F. Crashes, Power Failures, or Aborts

You should also check the status of all of your ICISAM files to be sure that they were not corrupted. This can be done with the ICCHECK utility using the Reliable switch (-r).

G. Redirection and Pipes

Windows provides internal functions that programs can use to receive input and display output. These are called *standard input* and *standard output*. With the Windows redirection feature these can be redirected to get or send data to a device other than the console. For more information on redirection and pipes please see your Windows manual.

Examples of how redirection can be useful are given below with the command line and an explanation of how the command works.

```
icinfo > icinfo.ls
```

Runs ICINFO with its output being redirected to the file icinfo.ls

```
iccheck >NUL
```

Runs ICCHECK with its output being redirected to the NUL device. Since ICCHECK will return an ERRORLEVEL of 1 if an error is encountered, a .BAT file can check the ERRORLEVEL to see if there were any errors with the ICCHECK.

Redirection will NOT work with ICCONFIG, ICEDCFW, or ICREVWbut will work with all other utilities. Only standard output redirection is useful as none of the utilities require input.

Redirection will work with ICRUN to capture messages that normally go to the console screen. This same thing can be accomplished with the Audit switch (-a or -A) to ICRUN.

Piping can be used to display only one screen of output at a time by sending output through a filter program like MORE. For example:

```
icinfo | more
```

Runs ICINFO and displays one screen of output and then prompts to display more by using the MORE filter.

H. Backup

Backup is a very necessary function to insure that data is not lost and/or to allow for a quicker recovery from machine and disk problems that may have corrupted your data.

One item to note is that for your most frequent backups you do not need to backup those files that do not change. Obviously the most important files are those that change on a daily basis because of additions or deletions. However,

all files should be backed up periodically to insure that you have good copies in the event of a hardware or disk problem.

I. Network Tips

A good feature to use from your network, if it supports it, is to update your node's clock from the network clock whenever a node attaches to the network. This insures one set of date and time stamps on the files.

When running ICRUN, if multiple workstations share the printer control file, users at any terminal on the network will be able to see others' reports. If the reports are stored in a sharable and accessible directory others will be able to print the reports given the appropriate access. Files that need to be shared should always be addressed by their UNC name. To create simple files with a UNC name, make sure that ICPCQDIR is set to the appropriate UNC name. For files created with a directory specifier, make sure that the program specifies a UNC name. **DO NOT USE A MAPPED DRIVE** as part of the name. If you do not wish to share the printer control file, each workstation (node) should have its own unique printer control file.

The Terminal number switch (-T *n*) can be used to provide a unique set of console line numbers over the entire network.

XII. ICTERM DESCRIPTIONS

A. Overview

Following is a definition of how the default terminal description entries are setup. These default definitions are stored in ICCONFIG and ICEDCFW and the runtimes. Only non-default terminal description files need to be saved. Interactive COBOL uses the ICTERM entry to instruct it as to how to handle input and output to terminal lines. ICCONFIG or ICEDCFW can be used to change and add to these entries. If an entry is modified in any fashion, it is recommended that a new entry be built with a suitable name and comment noting that it differs from the defaults provided.

Included in each section is a basic input (from the keyboard) and output (to the display) section. More detail can be found by using ICCONFIG or ICEDCFW to view each terminal description or by printing a copy of the terminal description. Certain descriptions that are available in the Terminal Description menu are not included here as they pertain mainly to Linux systems.

OUTPUT

On output the following DG codes are intercepted and cause the appropriate action on the terminal chosen.

<u>Code(s)</u>	<u>Action</u>	<u>Code(s)</u>	<u>Action</u>
\002	Reverse off	\030	Cursor right
\007	Bell	\031	Cursor left
\010	Cursor home	\032	Cursor down
\011	(tab) Space	\034	Dim ON
\012	Newline	\035	Dim off
\013	Erase to eol	\036A<n>	Set FG color
\014	Erase screen and home cursor	\036B<n>	Set BG color
\015	Carriage return	\036D	Reverse ON
\016	Blink ON	\036E	Reverse off
\017	Blink off	\036F'	Print Pass Through ON
\020	Position cursor col,line	\036F?2	Print Pass Through off
\021	Print Screen	\036F?	Print Pass Through ON
\022	Scroll ON	\036Fa	Print Pass Through off
\023	Scroll off	\036FE	Erase screen and home cursor
\024	Underscore ON	\036FF	Erase to end of screen
\025	Underscore off	\036FJ	Select normal spacing
\026	Reverse ON	\036FK	Select compressed spacing
\027	Cursor up		

Where

color *n* is Ascii:

0 - black, 1 - blue, 2 - green, 3 - cyan, 4 - red, 5 - magenta, 6 - yellow, 7 - white.

Installing and Configuring Interactive COBOL on Windows

Notes:

1. Print Pass Through off when going to a non-DG terminal will not generate a Ctrl-F when the printing is finished. This is strictly a DG terminal function.
2. A newline in DG causes the cursor to move to the first column of the next line.
3. Color codes are only interpreted if Color Support (ICCOLOR) has been set to process. (Not the default).
4. Reverse codes are interpreted unless ICREVERSE has been set to Ignore or Filter.
5. If a particular terminal cannot handle an attribute (either a color or character attribute, or both) then that attribute will appear to be ignored.
6. DG terminals default to Bright mode with an attribute for DIM. Most other terminals default to Dim mode with an attribute for BRIGHT.

INPUT

The following input keyboard codes are common to all terminals unless specifically overridden.

<u>Ctrl code</u>	<u>Action</u>
Ctrl-A	Position to end (END)
Ctrl-B	Position left word
Ctrl-E	Insert Mode ON/Off
Ctrl-F	Position right word
Ctrl-I	Destructive tab (TAB)
Ctrl-J	(Newline) Accepts the entire field (ESCAPE 00)
Ctrl-M	(Carriage Return) Acts like a Newline except on DG terminals where it is a truncating terminator (ESCAPE 00)
Ctrl-N	Position back tab
Ctrl-O	Position forward tab
Ctrl-P	Position to beginning (HOME)
Ctrl-R	Delete a character
Ctrl-T	Backspace
Ctrl-U	Refresh screen
Ctrl-V	Erase to end of field
ESC (Ctrl-[)	Sends an ESC (ESCAPE 01)

Decimal code 32 (space) - 126 (~) along with their 8-bit counterparts 160 - 254 are passed through as valid characters to the COBOL programs.

Function keys (other than ESC) are treated just as DG function keys in that they accept the entire field and terminate the ACCEPT with ESCAPE KEY set to the appropriate value. These will be defined as ESCAPE nn where nn will refer to the ESCAPE KEY returned to the COBOL program.

The following is a generalization for the keycap legends, if they exist; not all keyboards will generate a Shift state for each key.

<u>code</u>	<u>action</u>
TAB	Destructive tab
Shift-TAB	Position back tab
Ins,Insert	Insert Mode ON/Off
HOME	Position to beginning
END	Position to end
Shift-END	Position to beginning
DEL	Backspace
↑	Move to previous field (Beep at top)
↓	Move to next field (Fall out at bottom)
→	Move right a character (Beep at end of field)
←	Move left a character (Beep at beginning of field)
Shift-↑	ESCAPE 70
Shift-↓	ESCAPE 77
Shift-→	ESCAPE 71
Shift-←	ESCAPE 72

The following keys are generally ignored by Interactive COBOL unless otherwise configured.

PageUp PageDown Page Send ..

For the best support with all the DG function keys, a terminal that supports the DG emulation is preferred; otherwise not all function keys with their appropriate shift states may be available.

To be able to run on various terminal types, the use of function keys should be restricted to the lowest common denominator (i.e., the one with the fewest function keys). There are not many terminals that support the Ctrl-Shift state of function keys. There are also not many terminals that have more than 10 or 12 function keys. A good start is to use only function keys f1 - f10 in base and shifted states before moving on to additional keys.

In the following tables when the generation of a key is described, the backslash character (\) implies that the next three digits comprise an octal code returned by the key.

B. DG

DG type (ICTERM=dg)

Assumes a DG D200 or upward compatible terminal.

Color is supported on D220, D230, and D470 type-terminals.

Compressed mode is supported for terminals that support compressed mode.

Additional Input Keys:

<u>legend</u>	<u>action</u>
ERASE EOL (Ctrl-K)	Erase to end
ERASE PAGE (Ctrl-L)	Erase entire field
Shift-CMD-PRINT (\036\001)	ESCAPE 74
Shift-HOME (\036\010)	ESCAPE 75
CMD-PRINT (\036\021)	ESCAPE 73

Function Keys

ESCAPE KEY nn values					Generated by \036 (plus the following)			
	Normal	Shift	Ctrl	Ctrl-Shift	Normal	Shift	Ctrl	Ctrl-Shift
F1	2	10	18	26	q	a	1	!
F2	3	11	19	27	r	b	2	"
F3	4	12	20	28	s	c	3	#
F4	5	13	21	29	t	d	4	\$
F5	6	14	22	30	u	e	5	%
F6	7	15	23	31	v	f	6	&
F7	8	16	24	32	w	g	7	'
F8	9	17	25	33	x	h	8	(
F9	34	41	48	55	y	i	9)
F10	35	42	49	56	z	j	:	*
F11	36	43	50	57	{	k	;	+
F12	37	44	51	58	|	l	<	,
F13	38	45	52	59	}	m	=	-
F14	39	46	53	60	~	n	>	.
F15	40	47	54	61	p	`	0	/
C1	62	66			\	X		
C2	63	67			]	Y		
C3	64	68			^	Z		
C4	65	69			_	[
(no \036 for the following)								
↑		70					\027	
↓		77					\032	
→		71					\030	
←		72					\031	

Notes:

1. When using a non-DG terminal in a DG emulation mode, make sure the terminal does NOT have transmit XON/XOFF enabled since ^S and ^Q are used as real control codes when going from the host system to the terminal.
2. When positioning past column 126 on a DG terminal (or emulation), ICRUN will use the D400 window positioning code (\036FP<col><col><line><line>) since the Ctrl-P sequence is not valid for these locations. (col and line are ASCII 0-? to represent hex values).

C. DGUNIX

DGUNIX type (ICTERM=dgunix)

Assumes a DG D217+ or upward compatible terminal.

DGUNIX is very similar to DG but no binary key sequences or command sequences are used. All sequences are in ASCII.

Compressed mode is supported for terminals that support compressed mode.

Additional Input Keys:

<u>legend</u>	<u>action</u>
DEL (\010)	Backspace
ERASE EOL (\036PE)	Erase to end
ERASE PAGE (\036PH)	Erase entire field
HOME (036PF)	Position to beginning
Shift-CMD-PRINT (\036P1)	ESCAPE 74
Shift-HOME (\036PF)	ESCAPE 75
CMD-PRINT (\036P0)	ESCAPE 73

Function Keys

ESCAPE KEY nn values					Generated by \036 (plus the following)			
Normal	Shift	Ctrl	Ctrl-Shift		Normal	Shift	Ctrl	Ctrl-Shift
F1	2	10	18	26	q	a	1	!
F2	3	11	19	27	r	b	2	"
F3	4	12	20	28	s	c	3	#
F4	5	13	21	29	t	d	4	\$
F5	6	14	22	30	u	e	5	%
F6	7	15	23	31	v	f	6	&
F7	8	16	24	32	w	g	7	'
F8	9	17	25	33	x	h	8	(
F9	34	41	48	55	y	i	9)
F10	35	42	49	56	z	j	:	*
F11	36	43	50	57	{	k	;	+
F12	37	44	51	58	|	l	<	/
F13	38	45	52	59	}	m	=	-
F14	39	46	53	60	~	n	>	.
F15	40	47	54	61	p	`	0	/
C1	62	66			\	X		
C2	63	67			]	Y		
C3	64	68			^	Z		
C4	65	69			_	[
↑		70			PA	Pa		
↓		77			PB	Pb		
→		71			PC	Pc		
←		72			PD	Pd		

D. ANSI

ANSI type (ICTERM=ANSI)

Assumes a standard ANSI or upward compatible terminal.

Color is supported if the corresponding terminal supports the ANSI color sequences of:

ESC [3*f*;*4b*m

where

f is the foreground color (0 - 7)

b is the background color (0 - 7).

colors are Ascii:

0 - black, 1 - red, 2 - green, 3 - yellow, 4 - blue, 5 - magenta, 6 - cyan, 7 - white.

Compressed mode is supported for terminals that support compressed mode.

Additional Input Keys:

<u>legend</u>	<u>action</u>	<u>Generated by</u>
PageUp	ESCAPE 63	\033[5~
PageDown	ESCAPE 65	\033[6~

Function Keys

	ESCAPE KEY nn values	Generated by
	<u>Normal</u>	<u>Normal</u>
F1	2	\033OP
F2	3	\033OQ
F3	4	\033OR
F4	5	\033OS
F5	6	\033[15~
F6	7	\033[17~
F7	8	\033[18~
F8	9	\033[19~
F9	34	\033[20~
F10	35	\033[21~
F11	36	\033[23~
F12	37	\033[24~

The above values are what the Windows XP telnet client provides. (added in 3.44)

E. ATT

AT&T type (ICTERM=att)

Assumes an AT&T 605 or upward compatible terminal.

Color is supported if the corresponding terminal supports the ANSI color sequences.

Compressed mode is supported for terminals that support compressed mode.

Additional Input Keys:

<u>legend</u>	<u>action</u>
END	Erase to end
Shift <-	ESCAPE 72
Shift ->	ESCAPE 71
Shift-Insert	Insert ON/Off
Insert	Insert ON/Off
Shift-Up-arrow	ESCAPE 70
Shift-Down-arrow	Down-arrow

Function Keys

ESCAPE KEY nn values Generated by
 \033 (plus the following)

	Normal	Shift		Normal	Shift
F1	2	10		Oc	OC
F2	3	11		Od	OD
F3	4	12		Oe	OE
F4	5	13		Of	OF
F5	6	14		Of	OF
F6	7	15		Oh	OH
F7	8	16		Oi	OI
F8	9	17		Oj	OJ
F9	34	41		No	NO
F10	35	42		Np	NP
F11	36	43		Nq	NQ
F12	37	44		Nr	NR
F13	38	45		Ns	NS
F14	39	46		Nt	NT

F. FILE

File type (ICTERM=file)

Assumes a standard 8-bit ASCII format with no control codes generated for positioning except for carriage-return, line-feed, form-feed, and spaces. No function keys are supported in this entry.

This is most useful as a detached program.

This is required for cgiCOBOL programs.

No compressed mode support.

Additional Input Keys:

None.

G. FREEDOM

Freedom type (ICTERM=freedom)

Assumes a Freedom ONE type terminal.

No compressed mode support.

Additional Input Keys:

Function Keys

ESCAPE KEY nn values		Generated by Ctrl-A (followed by below) then <cr>	
Normal	Shift	Normal	Shift
F1	2	10	\040
F2	3	11	\141
F3	4	12	A
F4	5	13	B
F5	6	14	C
F6	7	15	D
F7	8	16	E
F8	9	17	F
F9	34	41	G
F10	35	42	H
F11	36	43	I
F12	37	44	J
F13	38	45	K
F14	39	46	L
F15	40	47	M
			N

H. IBM

IBM type (ICTERM=ibm)

Assumes an IBM 3101 or upward compatible terminal with the turnaround character set to carriage-return (\015).

Compressed mode is supported for terminals that support compressed mode.

Additional Input Keys:

<u>legend</u>	<u>action</u>
ER INP	Erase field
CLEAR	Erase Field
ERASE EOF	Erase to end
PRINT	ESCAPE 73

Function Keys

<u>ESCAPE KEY nn values</u>				<u>Generated by</u>		
				\033 (plus the following)		
	<u>Normal</u>	<u>Shift</u>	<u>Ctrl-Shift</u>	<u>Normal</u>	<u>Shift</u>	<u>Ctrl-Shift</u>
F1	2	10	26	a\015	!a\015	"a\015
F2	3	11	27	b\015	!b\015	"b\015
F3	4	12	28	c\015	!c\015	"c\015
F4	5	13	29	d\015	!d\015	"d\015
F5	6	14	30	e\015	!e\015	"e\015
F6	7	15	31	f\015	!f\015	"f\015
F7	8	16	32	g\015	!g\015	"g\015
F8	9	17	33	h\015	!h\015	"h\015
F9	34	41	55	i\015	!i\015	"i\015
F10	35	42	56	j\015	!j\015	"j\015
F11	36	43	57	k\015	!k\015	"k\015
F12	37	44	58	l\015	!l\015	"l\015

PA1, PA2, PA3, Del LN, Ins LN, Jump, Print Line, Pr Msg, Send.. are all Ignored.

To support character attributes, more than a 3101 terminal must be available.

I. LINUX

LINUX type (ICTERM=linux)

Assumes the master console under Linux.

Color is supported if the corresponding monitor/emulator/terminal supports the ANSI color sequences.

A file is included in the examples directory, called linuxadd.map, that increases the function key support on the Linux master console to Shift-F9 - Shift-F12, Ctrl-F1 - Ctrl-F12, and Ctrl-Shift F1 - Ctrl-Shift F12. This file is used as "loadkeys linuxadd.map".

Please see the Linux documentation on loadkeys/dumpkeys for more information.

Additional Input Keys:

Function Keys

ESCAPE KEY nn values					Generated by \033[(plus the following)			
	Normal	Shift	Ctrl	Ctrl-Shift	Normal	Shift	Ctrl	Ctrl-Shift
F1	2	10	18	26	[A	25~	39~	51~
F2	3	11	19	27	[B	26~	40~	52~
F3	4	12	20	28	[C	28~	41~	53~
F4	5	13	21	29	[D	29~	42~	54~
F5	6	14	22	30	[E	31~	43~	55~
F6	7	15	23	31	17~	32~	44~	56~
F7	8	16	24	32	18~	33~	45~	57~
F8	9	17	25	33	19~	34~	46~	58~
F9	34	41	48	55	20~	35~	47~	59~
F10	35	42	49	56	21~	36~	48~	60~
F11	36	43	50	57	23~	37~	49~	61~
F12	37	44	51	58	24~	38~	50~	62~

J. PCWINDOW

PCWINDOW type: (ICTERM=pwindow, pwindowcolor)

This entry is only available when running **ICOBOL** on Windows.

This entry only makes sense when running on the Master Console.

This entry uses different colors for attributes. In general, the pwindowmono selection should be used to more properly represent selected screen attributes.

Color is supported if the corresponding monitor supports color and/or shades.

At startup, the ICLINES and/or ICCOLUMNS settings will be used to set the display to have the given number of rows and columns. If running in full-screen mode make sure that the values work with the native graphics card. At termination, the screen is returned to its original setting.

Compressed mode is supported by setting ICCOLUMNS to min:max. The default is 80:132.

Additional Input Keys:

<u>legend</u>	<u>action</u>
PageUp	ESCAPE 63
PageDown	ESCAPE 65
Ctrl-PageUp	ESCAPE 67
Ctrl-PageDown	ESCAPE 69

Function Keys

ESCAPE KEY nn values

	Normal	Shift	Ctrl	Alt or Ctrl-Shift
F1	2	10	18	26
F2	3	11	19	27
F3	4	12	20	28
F4	5	13	21	29
F5	6	14	22	30
F6	7	15	23	31
F7	8	16	24	32
F8	9	17	25	33
F9	34	41	48	55
F10	35	42	49	56
F11	36	43	50	57
F12	37	44	51	58
↑ (Uparrow)			70	
↓ (Downarrow)			77	
→ (Rightarrow)			71	
← (Leftarrow)			72	

Use ICCONFIG's or ICEDCFW's Terminal Description menu to print a listing of all the supported keys.

K. PCWINDOWMONO

PCWINDOW type: (ICTERM=pcwindowmono)

This entry is only available when running **ICOBOL** on Windows and is only useful when running on the Master Console.

This entry is just like pcwindow but it is monochrome only. No attributes are mapped to colors. Colors are supported only with actual Color combinations. The default is White on black.

Two(2) ways to have a different color other than White-on-Black

A different color combination can easily be chosen by simply replacing the particular color that you wish to change in the tdi file. For example, if you want green on black just go into the Configure Color/Attribute Map and change the "White" selections to "Green" leaving everything else the same. Save to the same or a separate name like "pcwindowgreen".

or

Use the environment variables ICCOLOR=process, ICFGCOLOR=green. This will set green on black. Or also set ICBGCOLOR=white and you will have Green-on-White.

At startup, the ICLINES and/or ICCOLUMNS settings will be used to set the display to have the given number of rows and columns. If running in full-screen mode make sure that the values work with the native graphics card. At termination, the screen is returned to its original setting.

Compressed mode is supported by setting ICCOLUMNS to min:max. The default is 80:132.

Additional Input Keys:

<u>legend</u>	<u>action</u>
PageUp	ESCAPE 63
PageDown	ESCAPE 65
Ctrl-PageUp	ESCAPE 67
Ctrl-PageDown	ESCAPE 69

Function Keys

ESCAPE KEY nn values

	Normal	Shift	Ctrl	Alt or Ctrl-Shift
F1	2	10	18	26
F2	3	11	19	27
F3	4	12	20	28
F4	5	13	21	29
F5	6	14	22	30
F6	7	15	23	31
F7	8	16	24	32
F8	9	17	25	33
F9	34	41	48	55
F10	35	42	49	56
F11	36	43	50	57
F12	37	44	51	58
↑ (Uparrow)			70	
↓ (Downarrow)			77	
→ (Rightarrow)			71	
← (Leftarrow)			72	

Use ICCONFIG's or ICEDCFW's Terminal Description menu to print a listing of all the supported keys.

L. VT100

VT100 type (ICTERM=vt100)

Assumes a standard DEC VT100 or upward compatible terminal. Only four function keys are supported in this entry.

Color is supported if the corresponding terminal supports the ANSI color sequences.

Compressed mode is supported for terminals that support compressed mode.

Additional Input Keys:

Function Keys

ESCAPE KEY	nn values	Generated by
	Normal	Normal
PF1	2	\033OP
PF2	3	\033OQ
PF3	4	\033OR
PF4	5	\033OS

M. VT220VT220 type (ICTERM=vt220)

Assumes a standard DEC VT220 or upward compatible terminal.

Color is supported if the corresponding terminal supports the ANSI color sequences.

Compressed mode is supported for terminals that support compressed mode.

Additional Input Keys:

<u>Function Keys</u>		
ESCAPE KEY	nn values	Generated by
	Normal	Normal
PF1	2	\033OP
PF2	3	\033OQ
PF3	4	\033OR
PF4	5	\033OS

Function keys F6 - F20 are treated like F1 - F15

ESCAPE KEY	nn values	Generated by
		\033 (plus the following)
	Normal	Normal
F6	2	[17~
F7	3	[18~
F8	4	[19~
F9	5	[20~
F10	6	[21~
F11	7	[23~
F12	8	[24~
F13	9	[25~
F14	34	[26~
F15	35	[28~
F16	36	[29~
F17	37	[31~
F18	38	[32~
F19	39	[33~
F20	40	[34~

N. VT220PC

VT220 type (ICTERM=vt220pc)

Assumes a standard Windows PC using an VT220 or Ansi emulator. Later Xterm emulation under Linux more closely match this emulation.

Color is supported if the corresponding terminal supports the ANSI color sequences.

Compressed mode is supported for terminals that support compressed mode.

Additional Input Keys:

Function Keys

ESCAPE KEY nn values		Generated by \033 (plus the following)							
		Ctrl						Ctrl	Ctrl-Shift
	Normal	Shift	Ctrl	Shift	Normal	Shift			
F1	2	10	18	26	[11~	[11;2~	[11:5~	[11:6~	
F2	3	11	19	27	[12~	[12;2~	[12:5~	[12:6~	
F3	4	12	20	28	[13~	[13;2~	[13:5~	[13:6~	
F4	5	13	21	29	[14~	[13;2~	[14:5~	[14:6~	
F5	6	14	22	30	[15~	[15;2~	[15:5~	[15:6~	
F6	7	15	23	31	[17~	[17;2~	[17:5~	[17:6~	
F7	8	16	24	32	[18~	[18;2~	[18:5~	[18:6~	
F8	9	17	25	33	[19~	[19;2~	[19:5~	[19:6~	
F9	34	41	48	55	[20~	[20;2~	[20:5~	[20:6~	
F10	35	42	49	56	[21~	[21;2~	[21:5~	[21:6~	
F11	36	43	50	57	[23~	[23;2~	[23:5~	[23:6~	
F12	37	44	51	58	[24~	[24;2~	[24:5~	[24:6~	

ESCAPE KEY nn values		Generated by
	Normal	Normal
PF1	2	\033OP
PF2	3	\033OQ
PF3	4	\033OR
PF4	5	\033OS

O. WYSE, WY50

WYSE type (ICTERM=wyse)

Assumes a WYSE 60 or upward compatible terminal with hidden attributes.

Compressed mode is supported for terminals that support compressed mode.

WYSE50 type (ICTERM=wy50)

Assumes a WYSE 50 terminal with non-hidden attributes. In this case, only a single attribute is supported. Any Blink, Bright, Reverse, or Underline attribute will use write-protect mode which can be configured on a Wyse-50 to either dim, normal, or reverse. Thus, you will be able to see two attributes (normal and protected) as long as the protect mode display attribute is NOT set to normal. We recommend that reverse be used, especially if the Screen Handler is also being used.

Write protect mode on and off are ESC ")" and ESC "(" respectively. This mode does not actual write protect the screen unless protect mode has been enabled with an ESC "&". Protect mode disable is ESC "" (single-close-quote) and is the default.

Additional Input Keys:

<u>legend</u>	<u>action</u>
CLR LINE, ERASE EOF	Erase to end
CLR SCRN, ERASE EOP	Erase field
PRINT, Prt SC	ESCAPE 73

Function Keys

ESCAPE KEY nn values				Generated by				
				\001 (plus the following)				
			Ctrl				Ctrl	
	Normal	Shift	Ctrl	Shift	Normal	Shift	Ctrl	Shift
F1	2	10	18	26	@\015	^\015	\200\015	\220\015
F2	3	11	19	27	A\015	a\015	\201\015	\221\015
F3	4	12	20	28	B\015	b\015	\202\015	\222\015
F4	5	13	21	29	C\015	c\015	\203\015	\223\015
F5	6	14	22	30	D\015	d\015	\204\015	\224\015
F6	7	15	23	31	E\015	e\015	\205\015	\225\015
F7	8	16	24	32	F\015	f\015	\206\015	\226\015
F8	9	17	25	33	G\015	g\015	\207\015	\227\015
F9	34	41	48	55	H\015	h\015	\210\015	\230\015
F10	35	42	49	56	I\015	i\015	\211\015	\231\015
F11	36	43	50	57	J\015	j\015	\212\015	\232\015
F12	37	44	51	58	K\015	k\015	\213\015	\233\015
F13	38	45	52	59	L\015	l\015	\214\015	\234\015
F14	39	46	53	60	M\015	m\015	\215\015	\235\015
F15	40	47	54	61	N\015	n\015	\216\015	\236\015

F16 ignored ..

Next, Prev, Send, Send Line, SN Msg, Del Line, Ins Line are all Ignored.

For both WYSE and WY50

The down-arrow key sends a Ctrl-J which is normally a new-line, instead with ICTERM=wyse, Interactive COBOL treats a Ctrl-J like a normal down-arrow.

Given the behavior of the down-arrow, the Enter key (which sends a Ctrl-M (carriage-return) is treated like a normal new-line and acts as an Terminator with no Erase. (Thus, there is no key on a Wyse like the DG carriage-return, i.e., that functions as a Terminator with Erase.)

Installing and Configuring Interactive COBOL on Windows

The backspace key and the left-arrow key send a Ctrl-H. By default, Interactive COBOL treats a Ctrl-H like a left-arrow

For the Ctrl and Ctrl-Shift function keys, the line that the terminal is on must be running in 8-bit mode since the high order bit is determining the function key.

P. XENIX, SCO

XENIX or SCO type (ICTERM=xenix or ICTERM=sco)

Assumes the master console under SCO XENIX or SCO UNIX.

Many terminal emulators for PC's support an SCO master console mode.

Some terminals have an SCO or XENIX or UNIX mode that matches this description.

Color is supported if the corresponding monitor/emulator/terminal supports the ANSI color sequences.

Additional Input Keys:

Function Keys

ESCAPE KEY nn values				Generated by \033[(plus the following)				
	Normal	Shift	Ctrl	Ctrl-Shift	Normal	Shift	Ctrl	Ctrl-Shift
F1	2	10	18	26	M	Y	k	w
F2	3	11	19	27	N	Z	l	x
F3	4	12	20	28	O	a	m	y
F4	5	13	21	29	P	b	n	z
F5	6	14	22	30	Q	c	o	@
F6	7	15	23	31	R	d	p	[
F7	8	16	24	32	S	e	q	\
F8	9	17	25	33	T	f	r]
F9	34	41	48	55	U	g	s	^
F10	35	42	49	56	V	h	t	~ (open)
F11	36	43	50	57	W	i	u	{
F12	37	44	51	58	X	j	v	}

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APPENDIX A. ASCII CODES

Dec	Oct	Hex	DG Function	Ctrl-code	PC Function/Character
0	000	00	Null	Ctrl @	NUL
1	001	01	Print Screen Form	Ctrl A	SOH
2	002	02	Reverse off	Ctrl B	STX
3	003	03		Ctrl C	ETX
4	004	04		Ctrl D	EOT
5	005	05	Read cursor address	Ctrl E	ENQ
6	006	06		Ctrl F	Ack
7	007	07	Bell	Ctrl G	Bell
8	010	08	Cursor Home	Ctrl H	Backspace
9	011	09		Ctrl I	HTab
10	012	0A	Newline	Ctrl J	Linefeed
11	013	0B	Erase EOL	Ctrl K	VTab
12	014	0C	Erase Screen	Ctrl L	Form-feed
13	015	0D	Carriage Return	Ctrl M	Carriage Return
14	016	0E	Blink ON	Ctrl N	SO
15	017	0F	Blink off	Ctrl O	SI
16	020	10	Write cursor addr(c,r)	Ctrl P	DLE
17	021	11	Print Screen	Ctrl Q	DC1 (XON)
18	022	12	Roll Enable	Ctrl R	DC2
19	023	13	Roll Disable	Ctrl S	DC3 (XOFF)
20	024	14	Underscore ON	Ctrl T	DC4
21	025	15	Underscore OFF	Ctrl U	NAK
22	026	16	Reverse On	Ctrl V	SYN
23	027	17	Cursor Up	Ctrl W	ETB
24	030	18	Cursor Right	Ctrl X	CAN
25	031	19	Cursor Left	Ctrl Y	EM
26	032	1A	Cursor Down	Ctrl Z	SUB
27	033	1B	Escape	Ctrl [	ESC
28	034	1C	Dim ON	Ctrl \	FS
29	035	1D	Dim OFF	Ctrl]	GS
30	036	1E	Command Header	Ctrl ^	RS
31	037	1F		Ctrl _	US

Dec	Oct	Hex	DG	PC	Dec	Oct	Hex	DG	PC	Dec	Oct	Hex	DG	PC
32	040	20	space	space	64	100	40	@	@	96	140	60	'	'
33	041	21	!	!	65	101	41	A	A	97	141	61	a	a
34	042	22	"	"	66	102	42	B	B	98	142	62	b	b
35	043	23	#	#	67	103	43	C	C	99	143	63	c	c
36	044	24	\$	\$	68	104	44	D	D	100	144	64	d	d
37	045	25	%	%	69	105	45	E	E	101	145	65	e	e
38	046	26	&	&	70	106	46	F	F	102	146	66	f	f
39	047	27	'	'	71	107	47	G	G	103	147	67	g	g
40	050	28	(	(	72	110	48	H	H	104	150	68	h	h
41	051	29	)	)	73	111	49	I	I	105	151	69	i	i
42	052	2A	*	*	74	112	4A	J	J	106	152	6A	j	j
43	053	2B	+	+	75	113	4B	K	K	107	153	6B	k	k
44	054	2C	,	,	76	114	4C	L	L	108	154	6C	l	l
45	055	2D	-	-	77	115	4D	M	M	109	155	6D	m	m
46	056	2E	.	.	78	116	4E	N	N	110	156	6E	n	n
47	057	2F	/	/	79	117	4F	O	O	111	157	6F	o	o
48	060	30	0	0	80	120	50	P	P	112	160	70	p	p
49	061	31	1	1	81	121	51	Q	Q	113	161	71	q	q
50	062	32	2	2	82	122	52	R	R	114	162	72	r	r
51	063	33	3	3	83	123	53	S	S	115	163	73	s	s
52	064	34	4	4	84	124	54	T	T	116	164	74	t	t
53	065	35	5	5	85	125	55	U	U	117	165	75	u	u
54	066	36	6	6	86	126	56	V	V	118	166	76	v	v
55	067	37	7	7	87	127	57	W	W	119	167	77	w	w
56	070	38	8	8	88	130	58	X	X	120	170	78	x	x
57	071	39	9	9	89	131	59	Y	Y	121	171	79	y	y
58	072	3A	:	:	90	132	5A	Z	Z	122	172	7A	z	z
59	073	3B	;	;	91	133	5B	[	[	123	173	7B	{	{
60	074	3C	<	<	92	134	5C	\	\	124	174	7C	|	|
61	075	3D	=	=	93	135	5D	]	]	125	175	7D	}	}
62	076	3E	>	>	94	136	5E	^	^	126	176	7E	~	~
63	077	3F	?	?	95	137	5F	_	_	127	177	7F	DEL	␣

Installing and Configuring Interactive COBOL on Windows

Dec	Oct	Hex	DGI	Dec	Oct	Hex	DGI	
<u>PC</u>				<u>PC</u>				
128	200	80	Ç	192	300	C0	Á	Ł
129	201	81	ü	193	301	C1	À	ł
130	202	82	é	194	302	C2	Â	ŧ
131	203	83	â	195	303	C3	Ã	ł
132	204	84	ä	196	304	C4	Ä	—
133	205	85	à	197	305	C5	Å	ł
134	206	86	å	198	306	C6	Æ	ł
135	207	87	ç	199	307	C7	Ç	ł
136	210	88	ê	200	310	C8	É	ł
137	211	89	è	201	311	C9	È	ŕ
138	212	8A	è	202	312	CA	Ê	ł
139	213	8B	ï	203	313	CB	Ë	ŕ
140	214	8C	î	204	314	CC	Í	ł
141	215	8D	ì	205	315	CD	Ì	=
142	216	8E	À	206	316	CE	Î	ł
143	217	8F	Å	207	317	CF	Ï	ł
144	220	90	É	208	320	D0	Ñ	ł
145	221	91	æ	209	321	D1	Ó	ŕ
146	222	92	Æ	210	322	D2	Ò	ŕ
147	223	93	ó	211	323	D3	Ô	ŕ
148	224	94	ö	212	324	D4	Ö	Ł
149	225	95	ò	213	325	D5	Õ	ŕ
150	226	96	û	214	326	D6	Ø	ŕ
151	227	97	ù	215	327	D7	Œ	ł
152	230	98	ÿ	216	330	D8	Ú	ł
153	231	99	Ï	217	331	D9	Û	J
154	232	9A	Ü	218	332	DA	Û	ŕ
155	233	9B	ç	219	333	DB	Ü	■
156	234	9C	£	220	334	DC	space	■
157	235	9D	¥	221	335	DD	ÿ	■
158	236	9E	ƒ	222	336	DE	space	■
159	237	9F	f	223	337	DF	space	■

160	240	A0	space	á	224	340	E0	á	α
161	241	A1	—	í	225	341	E1	à	β
162	242	A2	½	ó	226	342	E2	â	Γ
163	243	A3	μ	ú	227	343	E3	ä	π
164	244	A4	²	ñ	228	344	E4	ã	Σ
165	245	A5	³	Ñ	229	345	E5	å	σ
166	246	A6	¤	ª	230	346	E6	æ	μ
167	247	A7	¢	º	231	347	E7	ç	τ
168	250	A8	£	¿	232	350	E8	é	Φ
169	251	A9	ª	ŕ	233	351	E9	è	θ
170	252	AA	º	ŕ	234	352	EA	ê	Ω
171	253	AB	¡	½	235	353	EB	ë	δ
172	254	AC	¿	¼	236	354	EC	í	∞
173	255	AD	©	¡	237	355	ED	ì	φ
174	256	AE	®	«	238	356	EE	î	e
175	257	AF	‡	»	239	357	EF	ï	∩
176	260	B0	»	⋮	240	360	F0	ñ	≡
177	261	B1	«	⋮	241	361	F1	ó	±
178	262	B2	¶	⋮	242	362	F2	ò	≥
179	263	B3	™	|	243	363	F3	ô	≤
180	264	B4	ƒ	ł	244	364	F4	õ	∫
181	265	B5	¥	ł	245	365	F5	ö	∫
182	266	B6	±	ł	246	366	F6	ø	÷
183	267	B7	≤	ŕ	247	367	F7	œ	≈
184	270	B8	≥	ŕ	248	370	F8	ú	°
185	271	B9	·	ł	249	371	F9	ù	·
186	272	BA	` (grave)	ł	250	372	FA	û	·
187	273	BB	§	ŕ	251	373	FB	ü	√
188	274	BC	° (degree)	ł	252	374	FC	ÿ	°
189	275	BD	¨ (umlaut)	ł	253	375	FD	ÿ	²
190	276	BE	´ (acute)	ł	254	376	FE	space	■
191	277	BF	†	ŕ	255	377	FF	space	space

► **Notes:**

1. Decimal codes 128 - 159 for DGI are the same as their 7-bit counterparts by default.

2. DGI is as defined by a D216E+/D217/D413/D463 terminal.

APPENDIX B. RS-232C

Two basic types of serial interfaces have been defined by the Electronic Industries Association (EIA). These are DTE (Data Terminal Equipment) and DCE (Data Communications Equipment). These conventions specify the direction of information flow for data and control signals. The names of the signals are always based on their DTE function. Each position on a DTE connector performs a function which is complementary to the corresponding position on the DCE connector. This means that connections between DTE and DCE connectors can be made pin-for-pin. When making connections of the same type, the functions of the pins rather than the number of the pins, must be matched.

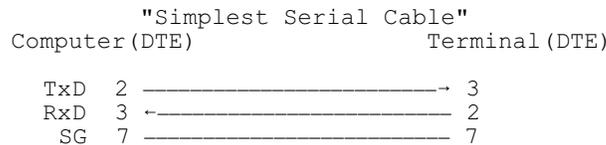
The connectors on terminals are almost all DTE, while the connectors on modems are almost all DCE. The connectors from computers can be either. The serial port(s) on the back of PC and AT class machines are almost always DTE. In the PC/AT world, almost all add-on serial boards (both dumb and smart) provide a DTE connection. On many Linux machines the connection is usually DCE. You should always check your equipment's documentation to determine if it is DTE or DCE.

To connect a DTE connection to a DCE connection using the same connector, only a straight-thru cable is needed. For example, to connect a terminal or a PC to a modem, a 25-pin straight-thru cable can be used.

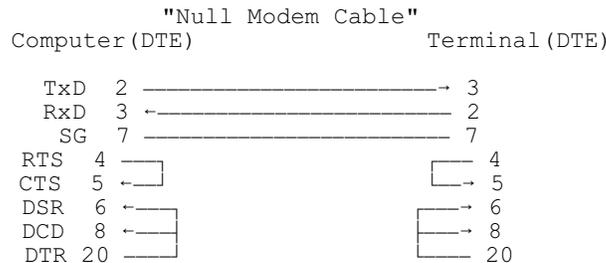
The following table lists the signals which are generally available on an RS-232C DTE DB25-pin or an AT DB9-pin connector. All the examples assume a DB25-pin connector.

Function	Signal	I/O	DB25	AT-DB9
Frame Ground	GND	-	Pin 1	plug
Transmit Data	TxD	O	Pin 2	Pin 3
Receive Data	RxD	I	Pin 3	Pin 2
Request To Send	RTS	O	Pin 4	Pin 7
Clear To Send	CTS	I	Pin 5	Pin 8
Data Set Ready	DSR	I	Pin 6	Pin 6
Signal Ground	GND	-	Pin 7	Pin 5
Data Carrier Detect	DCD	I	Pin 8	Pin 1
Data Terminal Ready	DTR	O	Pin 20	Pin 4
Ring Indicator	RI	I	Pin 22	Pin 9

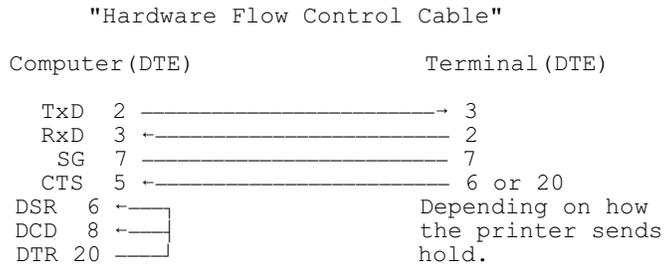
A typical RS-232C wiring diagram for standard hardwired terminals or serial printers not needing hardware flow control to a DTE connection can be made with the following 3-wire connection:



Some devices, especially older Data General terminals, require the 4-5 and 6-8-20 loop-back on the terminal side to go ON LINE, but most newer terminals have an option to disable this requirement. Read the documentation for the device to be connected to see if any of these loop-back schemes are required.

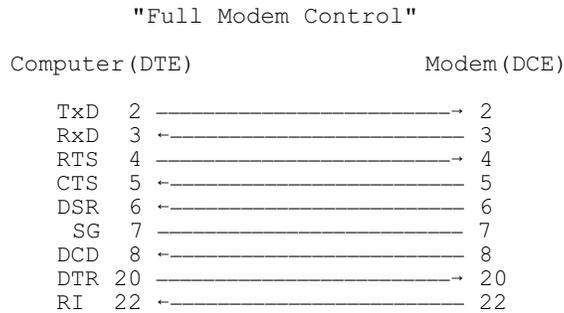


A typical wiring diagram for devices needing hardware flow control can be made with the following 4-wire connection:



Hardware flow control is used when a device (usually a printer) cannot send software flow control codes. The correct pin on the printer, usually 6 (DSR) or 20 (DTR), must be wired to pin 5 (CTS) such that the computer will know to stop sending data until pin 5 (CTS) is re-asserted.

A typical wiring diagram for devices needing modem control can be made with the following 9-wire connector:



In many cases ring indicator (RI) is not needed or supported by the host device and in some cases the Data Set Ready (DSR) signal is not needed thus allowing an 8 or even 7-wire cable.

Hardware flow control is generally required for modems with data compression (MNP 5 or V.42bis) to keep the computer from overrunning its input buffer since hardware flow control is generally much faster than software flow control.

When using high speed modems with data compression support, the baud rate must be set to at least 56000 (for V.32bis modems) or 38400 (for V.32 modems) to realize the maximum throughput.

APPENDIX C. HELPFUL HINTS

1. On Windows, to open a network printer you can use redirected LPT ports. i.e., a "NET USE LPT9 \\machine\printer" can be done and then LPT9 can be entered as the device name for an @PRN or @SER logical device.

When using shared printers in this fashion remember that they are no longer "DIRECTLY CONNECTED". There will be some buffering and/or queueing that is done by the sharing entity that will cause WRITES to the device to act differently than a real direct connect (like a serial or parallel port that physically resides in the current machine.) In most cases a CLOSE must be done to the device to ensure that all data has been written. Also in some cases an implicit CLOSE will be done automatically (not by **ICOBOL**) but by the sharing entity if there is no activity for some time period (like a minute) on that file. This is done to ensure that remote processes will not tie up a network resource.

2. After installation, to change the username/password value for any configured services you must use the ICSVCMGR utility. You CANNOT do an upgrade as it will NOT prompt for a new username/password.

APPENDIX D. NOTES AND WARNINGS

1. Serial device default baud rate settings:

The runtime uses the last setting for serial devices to set up the default parameters (baud, parity, data, etc.) on an open. The MODE command can be used to perform these settings if needed. This MODE will be remembered until another setting is stored. In addition, extended open options can be used to set the needed values.

2. Interactive COBOL on Windows uses .DLLs to load portions of its needed code. All the .DLL's shipped with Interactive COBOL are dynamically loaded at load time. The following rules apply as to how .DLL are found.

- A. First the system searches the set of pre-installed DLLs.
- B. Next, the directory where the executable module for the current process is located is searched.
- C. The current directory is searched.
- D. The windows system directory is searched.
- E. The windows directory is searched.
- F. The directories in the PATH environment variable are searched.

If a specific .DLL cannot be located, the system terminates the process and displays a dialog box that reports the error.

The **ICOBOL** runtime requires the following .DLL's. (ICRUNxx.DLL). The ICBLTN.DLL is loaded if found. The SP2.DLL is loaded when required for sp2. The QPR.DLL is loaded when required for FormPrint.

ICPERMIT.EXE requires the appropriate Rainbow Sentinel .dll's if a parallel or USB protection device is being used.

ICSP2.EXE and ICQPRW.EXE require the UIB.DLL.

3. After installing Interactive COBOL, it's folder (directory) should not be renamed. To place the installation in a new directory, you should uninstall and re-install while saving any modified files.

If the installation directory is renamed, Uninstalling from the Control Panel will not work, certain shortcuts set up by the installation script will not work, and any service entries may not work.

4. When trying to get printing to work on Windows use Notepad to see what printers are available on this machine and if you can print a sample file to that printer.

This can be done by starting Notepad and then select File > Page Setup. In Page Setup select printer and then pull-down the name box to see all the valid printer names. These are the names that can be entered into the PCQ device selection in ICCONFIG. Now select the printer to send some test output to and go back to the Notepad screen. Enter some data and then select File > Print. If the data does not print, work with Windows to get it to print before preceding to ICRUN.

ICINFO can also be used to see the default and current printer selections.

If after setup, the runtime prints to a printer with no error but no paper comes out of the printer, do the following:

- A) pause the Windows print spooler,
- B) re-print the file from the runtime,
- C) check the Windows print spooler and make sure the file is there,
- D) if so, that says that **ICOBOL** did get the data to the Windows printer, now un-pause the printer,
- E) if the file "prints" and disappears from the screen but no paper comes out of the printer, then this probably means that the printer in its current state does not handle ASCII data. Its running in "GDI" mode. You can confirm this if the printer is connected to a parallel port by going to the local machine with the printer and from the command prompt do a "dir >|pt1". If nothing comes out on the printer then its a GDI printer (or Windows printer).

When buying printers, look for some UNIX support. These indicate that the printer will accept standard ASCII data and not need a special print driver that only works in a Windows environment.

5. When using Printer Control Queues from the runtime, the user must have write access to the Windows spool directory. On Windows it usually defaults to "\WINDOWS\system32\spool\printers" or otherwise an access denied (exception 5) is returned when you try to print from the runtime system.

6. After installation, the Interactive COBOL screen will be shown with all the installed shortcuts. This is the best time to change any needed startup parameter by selecting the shortcut and right-clicking to properties.

7. When sharing a .pq file across the network, use UNC names to name printer files that are stored in the .pq file. Using a local file name like "drive:\directory...\filename" will only allow that file to be used by processes that have that local drive.

If a UNC name is used, all processes across the network will be able to use that file.

A workaround for simple filenames is to set the ICPCQDIR environment variable to the UNC name of the spool directory where these print files will be stored. In this way, the full UNC name will be stored in the .pq file. I.E., set ICPCQDIR=\\mainmachine\c\prints.

8. Currently, Interactive COBOL handles at most fifteen (15) character usernames. Longer usernames will generate a warning and be truncated.

9. If you are using **ICOBOL** for Windows machine networked to a Windows machine (or any LAN Manager server) then you could be experiencing some database corruption.

This can be solved by using the Registry Editor to add/change a certain parameter. Follow the steps below to make the change.

WARNING: USING REGISTRY EDITOR INCORRECTLY CAN CAUSE SERIOUS, SYSTEM-WIDE PROBLEMS THAT MAY REQUIRE YOU TO REINSTALL WINDOWS TO CORRECT THEM. USE THIS TOOL AT YOUR OWN RISK.

A. Start the Registry Editor and go to the following subkey:

HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\LanmanWorkstation\Parameters

B. Add or change the following:

Value name: UseLockReadUnlock
Data Type: REG_DWORD
Data: 0 (Default: 1)

C. Exit the Registry Editor

**** NOTE: The 2.34 and up Installation will automatically perform this function.

10. If you are using **ICOBOL** on Windows machines with network interfaces (NICs) that used a shared memory address to communicate with the computer (SMC cards for example) some customers have reported network problems when running these cards in Full Duplex mode.

These problems seem to have been cleared up by forcing the interfaces to Half Duplex mode. This can be done either in the Hub or Switch or by selecting the network interface and disabling Auto-Neg. and setting Half Duplex.

11. If specifying COM ports on Windows, COM ports above 9 must be given as \\.\COMx. You can also specify COM1-9 with this format also. Also note that most command line programs cannot handle COM10 or greater. (See Microsoft article Q115831 - HOWTO: Specify Serial Ports Larger than COM9)

Installing and Configuring Interactive COBOL on Windows

12. On Windows, if you get one of the following errors:

- A. "Initialization of the dynamic library ...\system32\user32.dll failed",
- B. In the ICEXEC log, you get an exit code 128 when starting a runtime,
- C. In the ICNETD log, you get an exit code 128 when starting an icnetd server, or

13. On Windows, automatic services must be careful in their use of network files at startup. The following rules must be followed:

- A. Mapped drive names cannot be used, use a UNC name. (No drive mapping is available to the service manager.)
- B. A specific username/password must be specified for the service that allows running as a service and has network access to the remote machine(s). (The default username for a service does not allow remote access of network files.)
- C. The service must have a dependency set that prevents it from starting until after the network is available. (In the default case, services are started in basically alphabetical order.)

ICSVCMGR can be used to set or change the username/password and the dependency settings if needed.

This applies to the .lic file for ICPERMIT and the .cfi and .pq files for ICEXEC and to any needed executables.

14. On Windows, when using standard Microsoft networking (i.e., you open files using drive letters that have been mapped to shared drives/directories on another machine) if you experience file corruption then make the following change to the Windows registry.

Follow the steps below to make the change.

WARNING: USING REGISTRY EDITOR INCORRECTLY CAN CAUSE SERIOUS, SYSTEM-WIDE PROBLEMS THAT MAY REQUIRE YOU TO REINSTALL WINDOWS TO CORRECT THEM. USE THIS TOOL AT YOUR OWN RISK.

- A. Start the Registry Editor and go to the following subkey:

HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\LanmanServer\Parameters

- B. Add or change the following:

Value name: EnableOpLocks
Data Type: REG_DWORD
Data: 0 (Default: 1)

(This entry defaults to 1 (True) if no value is specified.)

- C. Exit the Registry Editor

EnableOpLocks specifies whether the server allows clients to use oplocks (opportunistic locking) on files. Oplocks are a performance enhancement, but have the potential to cause lost cached data on some networks, particularly wide-area networks.

**** The above registry entry is set automatically when ****
**** installing **ICOBOL** 2.44 or above on a Windows machine. ****

On a Windows machine only being used as a client, opportunistic locking can be disabled just on that machine as follows. (If you have made the above change to the server machine this change is unnecessary.)

Follow the steps below to make the change.

WARNING: USING REGISTRY EDITOR INCORRECTLY CAN CAUSE SERIOUS, SYSTEM-WIDE PROBLEMS THAT MAY REQUIRE YOU TO REINSTALL WINDOWS TO CORRECT THEM. USE THIS TOOL AT YOUR OWN RISK.

A. Start the Registry Editor and go to the following subkey:

HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\LanmanWorkstation\Parameters

B. Add or change the following:

Value name: UseOpportunisticLocking
 Data Type: REG_DWORD
 Data: 0 (Default: 1)

(This entry defaults to 1 (True) if no value is specified.)

C. Exit the Registry Editor

UseOpportunisticLocking specifies whether the workstation redirector should use opportunistic-locking (oplock) performance enhancement.

ICINFO has been updated to show these values on Windows.

More information on this can be found by reading Microsoft Articles Q129202 or Q102967.

15. On Windows, if an environment entry (like ICROOT) is placed in the system environment then if you change its value you must remember to re-boot to allow all the processes (especially the service manager) to see the change. This is especially true if ICROOT was placed in the system environment and then a new revision is loaded into a different directory.

NOTE: Setting ICROOT in the system environment is generally not recommended as it is always available from the registry entry set by the **ICOBOL** Installation for all **ICOBOL** executables.

16. On Terminal Server edition, we recommend doing a full install (either server or local) and to place the configuration and printer control queue files locally.

If you do not follow the above then the following may be required:

A. You may need to run the REGISTER command with the /SYSTEM option on the icexec.exe executable if you get an error when starting the runtime about no shared area when logged in using Terminal Server Clients but the runtime works when run from the master console. For example:

REGISTER ICEXEC.EXE /SYSTEM

B. Services may not start and give a error code 4 in the Event Log. If this is true and the username/password option was prompted for in the **ICOBOL** install then the Audit directory for the services is set to a Read-Only directory for this username. Either use ICSVCMGR or REGEDIT to change the command line to the particular service to may the Audit directory a different directory. Generally we recommend setting it to "C:\WINDOWS".

Windows Terminal Server is a good platform for **ICOBOL** since the applications actually run on the server and only the screen/keyboard is run on the client.

17. Performance Hints on a network.

A. Set ICTMPDIR to a local directory.

Installing and Configuring Interactive COBOL on Windows

- B. If using a link file, make the link file local. (VERY IMPORTANT)
- C. If using a COBOL library file, make the library file local.
- D. Use ICNET to access remote files.
- E. If possible, open a file EXCLUSIVELY, it will process much, much faster.

18. On Windows, when doing a client install, if the error "Unable to start runtime executive service is given" then ICEXEC was installed as a service but it could not start. See the Event log for more specifics but in most cases it will be that the username/password given on the client machine does not match that on the server.

19. To have hot keys work in sp2, you need to make the hot key be a control key for each panel by selecting Panel-> Control Keys and adding the appropriate values. For example, if F8 is the hot key and you want it to call hotkey09, you would define 322 to be a control key (value is from the sp2 manual, appendix A)

Then in the cobol program something like this:

```
call "sp2" using sp2-converse-data mainmenu-converse-data
if mainmenu-key = 322
    call "hotkey09"
end-if.
```

APPENDIX F. COMMON PROBLEMS

Review the moments just before the problem occurred to see if you changed anything.

Following is a list of general problems that some users have encountered along with our initial suggestion on what to look at in your system.

1. If you try to start an Interactive COBOL command and you get the message “Cannot run in DOS mode:” then for some reason the environment is set up to Not Detect windows. Go into Properties, Program, Advanced, and uncheck that option.

If your problems still persist fill out a Support Information Request (SIR) form using the one from the end of this manual as a guide.

!!Send a copy of the ICINFO report for all reported problems!! The latest version of ICINFO can always be downloaded from the web site (www.icobol.com).

For the fastest response to an Interactive COBOL problem please follow these guidelines and if possible either e-mail or fax the needed information. The E-mail is support@icobol.com and the FAX number is (919) 851-4609.

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