

Informix® Guide to GLS Functionality

Informix Dynamic Server, Version 7.3
Informix Dynamic Server with Advanced Decision Support and Extended Parallel Options, Version 8.2
Informix Dynamic Server with Universal Data Option, Version 9.1x
Informix Dynamic Server, Developer Edition, Version 7.3
Informix Dynamic Server, Workgroup Edition, Version 7.3
INFORMIX-SE, Version 7.2x

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Read this introduction for an overview of the information provided in this manual and for an understanding of the documentation conventions used.

About This Manual

This manual describes the Global Language Support (GLS) feature available in Informix products. The GLS feature allows Informix application-programming interfaces (APIs) and Informix database servers to handle different languages, cultural conventions, and code sets. This manual describes only the language-related topics that are unique to GLS.

The GLS feature provides support for the following language-related topics:

- Collation order of characters
- Definition of uppercase and lowercase conventions
- Non-ASCII characters as character data
- Culture-specific formatting for numeric, monetary, date, and time values

This manual is platform independent. It provides GLS information for both Microsoft Windows NT and UNIX platforms for the following Informix database servers:

- Informix Dynamic Server
- Informix Dynamic Server, Developer Edition
- Informix Dynamic Server, Workgroup Edition
- Informix Dynamic Server with Advanced Decision Support and Extended Parallel Options

- Informix Dynamic Server with Universal Data Option
- INFORMIX-SE

Types of Users

This manual is written for application developers and system administrators who want to use the GLS environment with Informix products.

Informix products use the U.S. 8859-1 English locale as the default locale. The default is **en_us.8859-1** on UNIX platforms or **en_us.1252** (Microsoft **1252**) for Windows NT environments. This default locale supports U.S. English format conventions for dates, times, and currency, and includes the ASCII code set plus many 8-bit characters such as é, è, and ñ.

This manual is primarily intended for those users who need to use Informix products with a nondefault locale. It assumes that you are familiar with Informix database servers and associated products. If that is not the case, refer to your [Getting Started](#) manual. If you need more information about your operating system, see your system-specific documentation.

Software Dependencies

This manual assumes that you are using one of the following Informix products:

- Informix Dynamic Server, Version 7.3
- Informix Dynamic Server, Developer Edition, Version 7.3
- Informix Dynamic Server, Workgroup Edition, Version 7.3
- Informix Dynamic Server with Advanced Decision Support and Extended Parallel Options, Version 8.2
- Informix Dynamic Server with Universal Data Option, Version 9.1x
- INFORMIX-SE, Version 7.2x

New Features

For a comprehensive list of new features, see the release notes for your database server.

Documentation Conventions

This section describes the conventions that this manual uses. These conventions make it easier to gather information from this and other Informix manuals.

The following conventions are covered:

- Typographical conventions
- Icon conventions
- Command-line conventions
- Sample-code conventions
- Character-representation conventions

Typographical Conventions

This manual uses the following standard set of conventions to introduce new terms, illustrate screen displays, describe command syntax, and so forth.

Convention	Meaning
KEYWORD	All keywords appear in uppercase letters in a serif font.
<i>italics</i>	Within text, new terms and emphasized words appear in italics. Within syntax diagrams, values that you are to specify appear in italics.
boldface	Identifiers (names of classes, objects, constants, events, functions, program variables, forms, labels, and reports), environment variables, database names, filenames, table names, column names, icons, menu items, command names, and other similar terms appear in boldface.
<code>monospace</code>	Information that the product displays and information that you enter appear in a monospace typeface.
KEYSTROKE	Keys that you are to press appear in uppercase letters in a sans serif font.
◆	This symbol indicates the end of feature-, product-, platform-, or compliance-specific information within a table or section.



Tip: When you are instructed to “enter” characters or to “execute” a command, immediately press RETURN after the entry. When you are instructed to “type” the text or to “press” other keys, no RETURN is required.

Icon Conventions

Throughout the documentation, you will find text that is identified by several different types of icons. This section describes these icons.

Comment Icons

Comment icons identify warnings, important notes, or tips. This information is always displayed in italics.

Icon	Description
	The <i>warning</i> icon identifies vital instructions, cautions, or critical information.
	The <i>important</i> icon identifies significant information about the feature or operation that is being described.
	The <i>tip</i> icon identifies additional details or shortcuts for the functionality that is being described.

Feature, Product, and Platform Icons

Feature, product, and platform icons identify paragraphs that contain feature-specific, product-specific, or platform-specific information.

Icon	Description
	Identifies information that is specific to Dynamic Server with AD and XP Options.
	Identifies information that is specific to an Asian Language Support (ALS) database or application.
	Identifies information that is specific to the INFORMIX-ESQL /C product.
	Identifies information that relates to the Informix Global Language Support (GLS) feature.
	Identifies information that is specific to Dynamic Server and its editions. However, in some cases, the identified section applies only to Informix Dynamic Server and not to Informix Dynamic Server, Workgroup and Developer Editions. Such information is clearly identified.
	Identifies information that is specific to a Native Language Support (NLS) database or application.
	Identifies information that is specific to the INFORMIX-SE database server.
	Identifies information that is specific to Informix Dynamic Server with Universal Data Option.
	Identifies information that is specific to UNIX platforms.
	Identifies information that is specific to Informix Dynamic Server, Workgroup and Developer Editions.
	Identifies information that is specific to the Windows NT environment.

These icons can apply to a row in a table, one or more paragraphs, or an entire section. If an icon appears next to a section heading, the information that applies to the indicated feature, product, or platform ends at the next heading at the same or higher level. A ♦ symbol indicates the end of the feature-, product-, or platform-specific information that appears within a table or a set of paragraphs within a section.

Compliance Icons

Compliance icons indicate paragraphs that provide guidelines for complying with a standard.

Icon	Description
	Identifies information that is specific to an ANSI-compliant database.
	Identifies information that is an Informix extension to ANSI SQL-92 entry-level standard SQL.
	Identifies functionality that conforms to X/Open.

These icons can apply to a row in a table, one or more paragraphs, or an entire section. If an icon appears next to a section heading, the compliance information ends at the next heading at the same or higher level. A ♦ symbol indicates the end of compliance information that appears in a table row or a set of paragraphs within a section.

Command-Line Conventions

This section defines and illustrates the format of commands that are available in Informix products. These commands have their own conventions, which might include alternative forms of a command, required and optional parts of the command, and so forth.

Each diagram displays the sequences of required and optional elements that are valid in a command. A diagram begins at the upper-left corner with a command. It ends at the upper-right corner with a vertical line. Between these points, you can trace any path that does not stop or back up. Each path describes a valid form of the command. You must supply a value for words that are in *italics*.

You might encounter one or more of the following elements on a command-line path.

Element	Description
command	This required element is usually the product name or other short word that invokes the product or calls the compiler or preprocessor script for a compiled Informix product. It might appear alone or precede one or more options. You must spell a command exactly as shown and use lowercase letters.
<i>variable</i>	A word in <i>italics</i> represents a value that you must supply, such as a database, file, or program name. A table following the diagram explains the value.
-flag	A flag is usually an abbreviation for a function, menu, or option name or for a compiler or preprocessor argument. You must enter a flag exactly as shown, including the preceding hyphen.
.ext	A filename extension, such as .sql or .cob , might follow a variable that represents a filename. Type this extension exactly as shown, immediately after the name of the file. The extension might be optional in certain products.
(. , ; + * - /)	Punctuation and mathematical notations are literal symbols that you must enter exactly as shown.

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Element	Description
' '	Single quotes are literal symbols that you must enter as shown.
Privileges p. 5-17 Privileges	A reference in a box represents a subdiagram. Imagine that the subdiagram is spliced into the main diagram at this point. When a page number is not specified, the subdiagram appears on the same page.
Standard DBDATE Formats see SQLR	A reference to SQLR in this manual refers to the <i>Informix Guide to SQL: Reference</i> . Imagine that the subdiagram is spliced into the main diagram at this point.
— ALL —	A shaded option is the default action.
→ →	Syntax within a pair of arrows indicates a subdiagram.
—	The vertical line terminates the command.
-f — OFF — ON —	A branch below the main path indicates an optional path. (Any term on the main path is required, unless a branch can circumvent it.)
— , — — variable —	A loop indicates a path that you can repeat. Punctuation along the top of the loop indicates the separator symbol for list items.
— , — — 3 size —	A gate ($\sqrt{3}$) on a path indicates that you can only use that path the indicated number of times, even if it is part of a larger loop. Here you can specify <i>size</i> no more than three times within this statement segment.

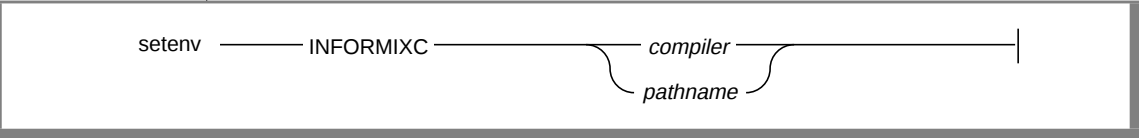
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How to Read a Command-Line Diagram

Figure 1 shows a command-line diagram that uses some of the elements that are listed in the previous table.

Figure 1
Example of a Command-Line Diagram



WIN NT

To construct a command correctly, start at the top left with the command **setenv**. Then follow the diagram to the right, including the elements that you want. The elements in the diagram are case sensitive. ♦

Windows NT uses a different syntax to set environment variables. It does not use the **setenv** command. Many Informix products on Windows NT use the SETNET32 graphical tool to set environment variables. However, the following steps are still useful to show how to follow command-line syntax. ♦

Figure 1 on page -12 diagrams the following steps:

1. Type the word `setenv`.
2. Type the word `INFORMIXC`.
3. Supply either a compiler name or `pathname`.
After you choose *compiler* or *pathname*, you come to the terminator.
Your command is complete.
4. Press RETURN to execute the command.

Sample-Code Conventions

Examples of SQL code occur throughout this manual. Except where noted, the code is not specific to any single Informix application development tool. If only SQL statements are listed in the example, they are not delimited by semicolons. For instance, you might see the code in the following example:

```
CONNECT TO stores7
:
:
DELETE FROM customer
      WHERE customer_num = 121
:
:
COMMIT WORK
DISCONNECT CURRENT
```

To use this SQL code for a specific product, you must apply the syntax rules for that product. For example, if you are using the Query-language option of DB-Access, you must delimit multiple statements with semicolons. If you are using an SQL API, you must use EXEC SQL at the start of each statement and a semicolon (or other appropriate delimiter) at the end of the statement.



Tip: Ellipsis points in a code example indicate that more code would be added in a full application, but it is not necessary to show it to describe the concept being discussed.

For detailed directions on using SQL statements for a particular application development tool or SQL API, see the manual for your product.

Character-Representation Conventions

Throughout this manual, examples show how single-byte and multibyte characters appear. Because multibyte characters are usually ideographic (such as Japanese or Chinese characters), this manual does not use the actual multibyte characters. Instead, it uses ASCII characters to represent both single-byte and multibyte characters. This section provides general information about how this manual represents multibyte and single-byte characters abstractly. For a definition of multibyte and single-byte characters, see the [“Glossary.”](#)

Single-Byte Characters

This manual represents single-byte characters as a series of lowercase letters. The format for representing one single-byte character abstractly is:

a

In this format, a stands for any single-byte character, not for the letter “a” itself.

The format for representing a string of single-byte characters is as follows:

a . . . z

In this format, a stands for the first character in the string, and z stands for the last character in the string. For example, if the string `Ludwig` consists of single-byte characters, the following format represents this 6-character string abstractly:

abcdef



Tip: The letter “s” does not appear in alphabetical sequences that represent strings of single-byte characters. The manual reserves the letter “s” as a symbol that represents a single-byte white-space character. For further information, see [“White Space in Strings” on page 15](#).

Multibyte Characters

This manual does not attempt to show the actual appearance of multibyte characters in text, examples, or diagrams. Instead, the following convention shows abstractly how multibyte characters are stored:

A¹ . . . Aⁿ

One to four identical uppercase letters, each followed by a different superscript number, represent one multibyte character. The superscripts show the first to the *n*th byte of the multibyte character, where *n* has values between two and four. For example, the following symbols represent a multibyte character that consists of two bytes:

A¹A²

The following notation represents a multibyte character that consists of four bytes (the maximum length of a multibyte character):

A¹A²A³A⁴

The following example shows a string of multibyte characters in an SQL statement:

```
CREATE DATABASE A1A2B1B2C1C2D1D2E1E2;
```

This statement creates a database whose name consists of five multibyte characters, each of which is two bytes long. For more information on how to use multibyte characters in SQL identifiers, see [“Naming Database Objects” on page 3-4](#).

Single-Byte and Multibyte Characters in the Same String

If you are using a multibyte code set, a given string might be composed of both single-byte and multibyte characters. To represent these mixed strings, this manual simply combines the formats for multibyte and single-byte characters.

For example, suppose that you have a string with four characters. The first and fourth characters are single-byte characters, and the second and third characters are multibyte characters that consist of two bytes each. The following format represents this string:

```
aA1A2B1B2b
```

White Space in Strings

White space is a series of one or more space characters. A GLS locale defines what characters are considered to be space characters. For example, both the TAB and blank might be defined as space characters in one locale, but certain combinations of the CTRL key and another character might be defined as space characters in a different locale.

The convention for representing single-byte white spaces in this manual is the letter “s.” The following notation represents one single-byte white space:

```
s
```

In the ASCII code set, an example of a single-byte white space is the blank character (ASCII code number 32). To represent a string that consists of two ASCII blank characters, the manual uses the following notation:

```
s s
```

The following notation represents a multibyte white-space character:

$$s^1 \dots s^n$$

In this format, s^1 represents the first byte of the white-space character, and s^n represents the last byte of the white-space character, where n has values between two and four. For example, the following notation represents one 4-byte white-space character:

$$s^1 s^2 s^3 s^4$$

Trailing White Spaces

Combinations of characters and white spaces can occur in quoted strings, in CHAR columns that contain fewer characters than the defined length of the column, and in other situations. For example, if a CHAR(5) column in a single-byte code set contains a string of three characters, the string is extended with two white spaces so that its length is equal to the defined length of the column, as follows:

abc ss

The following example shows the representation for a string of five characters (three characters of data and two trailing white spaces) in a multibyte code set where each of the characters and white-space characters consists of two bytes:

$$A^1 A^2 B^1 B^2 C^1 C^2 s^1 s^2 s^1 s^2$$

Sometimes a string can contain both single-byte and multibyte white-space characters. In the following example, the string is composed of these elements: three single-byte characters (abc), a single-byte white-space character (s), a multibyte white-space character ($s^1 s^2$), two single-byte white-space characters (ss), and one multibyte white-space character ($s^1 s^2$):

$$abc s^1 s^2 s s s^1 s^2$$

Additional Documentation

For additional information, you might want to refer to the following types of documentation:

- On-line manuals
- Printed manuals
- Error message files
- Documentation notes, release notes, and machine notes
- Related reading

On-Line Manuals

An Answers OnLine CD that contains Informix manuals in electronic format is provided with your Informix products. You can install the documentation or access it directly from the CD. For information about how to install, read, and print on-line manuals, see the installation insert that accompanies Answers OnLine.

Printed Manuals

To order printed manuals, call 1-800-331-1763 or send email to moreinfo@informix.com. Please provide the following information when you place your order:

- The documentation that you need
- The quantity that you need
- Your name, address, and telephone number

UNIX

Error Message Files

Informix software products provide ASCII files that contain all of the Informix error messages and their corrective actions. For a detailed description of these error messages, refer to *Informix Error Messages* in Answers OnLine.

To read the error messages under UNIX, you can use the following commands.

Command	Description
finderr	Displays error messages on line
rofferr	Formats error messages for printing



WIN NT

To read error messages and corrective actions under Windows NT, use the **Informix Find Error** utility. To display this utility, choose **Start→Programs→Informix** from the Task Bar. ◆

Documentation Notes, Release Notes, Machine Notes

In addition to printed documentation, the following sections describe the on-line files that supplement the information in this manual. Please examine these files before you begin using your database server. They contain vital information about application and performance issues.

UNIX

On UNIX platforms, the following on-line files appear in the directory **\$INFORMIXDIR/release/en_us/0333**.

On-Line File	Purpose
GLSDOC_x.y	The documentation-notes file for your version of this manual describes features that are not covered in the manual or that have been modified since publication. Replace x.y in the filename with the version number of your database server to derive the name of the documentation-notes file for this manual.
SERVERS_x.y	The release-notes file describes feature differences from earlier versions of Informix products and how these differences might affect current products. This file also contains information about any known problems and their workarounds. Replace x.y in the filename with the version number of your database server to derive the name of the release-notes file.
IDS_x.y or SE_x.y or IUNIVERSAL_x.y	The machine-notes file describes any special actions that are required to configure and use Informix products on your computer. Machine notes are named for the product described. Replace x.y in the filename with the version number of your database server to derive the name of the machine-notes file.



WIN NT

The following items appear in the Informix folder. To display this folder, choose **Start→Programs→Informix** from the Task Bar.

Item	Description
Documentation Notes	This item includes additions or corrections to manuals, along with information about features that may not be covered in the manuals or that have been modified since publication.
Release Notes	This item describes feature differences from earlier versions of Informix products and how these differences might affect current products. This file also contains information about any known problems and their workarounds.

Machine notes do not apply to Windows NT platforms. ◆

Related Reading

For additional information about cultural and linguistic requirements around the world and how computer systems handle those requirements, consult the following books on internationalization:

- *Developing and Localizing International Software* by Tom Madell, Clark Parsons, and John Abegg (Prentice-Hall, Inc., 1994)
- *Programming for the World: A Guide to Internationalization* by Sandra Martin O'Donnell (Prentice-Hall, Inc., 1994)

For a list of publications that provide an introduction to database servers and operating-system platforms, refer to your [Getting Started](#) manual.

Compliance with Industry Standards

The GLS feature for Informix products is based on the X/Open XPG4 specifications. The American National Standards Institute (ANSI) has established a set of industry standards for SQL. Informix SQL-based products are fully compliant with SQL-92 Entry Level (published as ANSI X3.135-1992), which is identical to ISO 9075:1992, on Informix database servers. In addition, many features of Informix database server products comply with the SQL-92 Intermediate and Full Level and X/Open SQL CAE (common applications environment) standards.

Informix SQL-based products are compliant with ANSI SQL-92 Entry Level (published as ANSI X3.135-1992) on INFORMIX-SE, with the following exceptions:

- Effective checking of constraints
- Serializable transactions ♦

SE

Informix Welcomes Your Comments

Please tell us what you like or dislike about our manuals. To help us with future versions of our manuals, we want to know about corrections or clarifications that you would find useful. Include the following information:

- The name and version of the manual that you are using
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- Your name, address, and phone number

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Or send a facsimile to the Informix Technical Publications Department at:

650-926-6571

We appreciate your feedback.

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he Global Language Support (GLS) feature lets Informix products easily handle different languages, cultural conventions, and code sets for Asian, European, Latin American, and Middle Eastern countries.

The GLS feature allows you to create databases using the diacritics, collating sequence, and monetary and time conventions of the language that you select. No ONCONFIG configuration parameters exist for GLS, but you must set the appropriate environment variables.

This chapter introduces basic concepts and describes the GLS feature. It covers the following topics:

- What a GLS locale is and what information it provides
- How to establish a locale for Informix products
- How to customize end-user formats that a locale defines
- How a client application establishes a connection with a database
- How to use code-set conversion to convert character data between a client and a database, or a database and a file
- How to use localized message files with Informix products

What Is the GLS Feature?

In a database application, most of the tasks that the database server and the client application perform do not depend on the type of data that they handle. However, some portion of the tasks that the database server and client application perform are dependent on the data. For example, the database server must sort U.S. English data differently than Korean character data. The client application must display French currency differently than English currency.

If the Informix database server or the SQL API product included the code to perform these data-dependent tasks, each would need to be written specially to handle a different set of culture-specific data. In fact, past Informix products have done that with the Asian Language Support (ALS) products for support of Asian (multibyte) data and the Native Language Support (NLS) feature for support of single-byte, non-English data.

With support for GLS, Informix products no longer need to specify how to process this culture-specific information directly. Culture-specific information resides in a GLS locale. When an Informix product needs culture-specific information, it makes a call to the GLS library. The GLS library, in turn, accesses the GLS locale and returns the information to the Informix product. A GLS locale is a set of Informix files that bring together the information about data that is specific to a particular culture, language, or territory. In particular, a GLS locale provides the following information:

- The name of the code set that the application data uses
- The collation order to use for character data
- The format for different types of data to appear to end users

For more information on a GLS locale, see [page 1-8](#).

In addition, the GLS feature is a more portable way to support culture-specific information. Many operating systems provide support for non-English data. However, this support is usually in a form that is specific to the operating system. Not many standards yet exist for the format of culture-specific information. This lack of conformity means that if you move an application from one operating-system environment to another, you might need to change the way in which the application requests language support from the operating system. You might even find that the new operating-system environment does not provide the same aspect of language support that the initial environment provided.

Informix products support the GLS feature. Therefore, they can access culture-specific information regardless of the operating system under which they run. They can locate the locale information on any platform to which they are ported.

GLS Support by Informix Products

Informix provides GLS support in the following types of products and utilities:

- Informix database servers
- Informix client applications and database server utilities
- The INFORMIX-GLS application-programming interface

The following sections outline the features that GLS support provides for the first two types of Informix products. For information about INFORMIX-GLS, see [Chapter 7, “INFORMIX-GLS Features.”](#)

Informix Database Servers

With the GLS feature, Informix database servers provide support for the following culture-specific features:

- Processing non-ASCII characters and strings
You can use non-ASCII characters to name user-specifiable database objects, such as tables, columns, views, statements, cursors, and stored procedures, and you can use a collation order that suits the local customs.
You can also use non-ASCII characters in many other contexts. For example, you can use them to evaluate the WHERE and ORDER BY clauses of your SELECT statements or to sort data in NCHAR and NVARCHAR columns. You can use GLS collation features without the modification of existing code.
- Evaluation of regular expressions
You can use non-ASCII characters in regular expression comparisons that involve NCHAR and NVARCHAR data.



- Translation of locale-specific values for dates, times, numeric data, and monetary data

You can use end-user formats that are particular to a country or culture outside the U.S. to specify date, time, numeric, and monetary values when they appear in literal strings. The database server can translate these formats to the appropriate internal database format.

- Accessibility of formerly incompatible character code sets

The client application can perform code-set conversion between convertible code sets to allow you to access and share data between databases and clients that have different code sets. For more information on code-set conversion, see [page 1-40](#).

Tip: For more information on how the database server provides support for the GLS feature, refer to [Chapter 4, “Database Server Features.”](#)

Informix Client Applications and Utilities

To the GLS feature, a *client application* can be either an Informix SQL API product, such as INFORMIX-ESQL/C or INFORMIX-ESQL/COBOL, or an Informix database server utility, such as DB-Access, **dbexport**, or **onmode**. The following Informix client applications provide support for the GLS feature:

- The DB-Access utility, which is bundled with Informix database servers, allows user-specifiable database objects such as tables, columns, views, statements, cursors, and stored procedures to include non-ASCII characters and to be sorted according to localized collation rules.

For more information on identifiers, see [“Identifiers That Support Non-ASCII Characters” on page 3-5](#). For additional SQL identifiers, see [“SQL Identifiers That Support Non-ASCII Characters” on page 4-8](#). For more general information about the DB-Access utility, refer to the [DB-Access User Manual](#).

- The SQL APIs allow host and indicator variable names as well as names of user-specifiable database objects such as tables, columns, views, statements, cursors, and stored procedures to include non-ASCII characters. For more information, see [Chapter 5, “General SQL API Features.”](#)
- The INFORMIX-GLS application-programming interface helps you internationalize your programs. For more information, see [Chapter 7, “INFORMIX-GLS Features.”](#) ♦
- Database server utilities such as **dbexport** or **onmode** allow many command-line arguments to include non-ASCII characters. For more information, see [Chapter 4, “Database Server Features.”](#)

Additional GLS Support

Informix products include the GLS locale files to support the default locale, U.S. English, and most non-Asian locales. (For more information on the default locale, see [page 1-18](#).) If you do not find a locale to support your language and territory, you must install a Language Supplement for a particular language in addition to your Informix product.

A Language Supplement provides the locale files and error messages to support a particular language or set of languages. The International Language Supplement provides support for all non-Asian languages that Informix products support. You can obtain support for an Asian language (such as Korean, Japanese, or Chinese) with special add-on supplements.

For more information about the Language Supplements, contact your Informix sales representative. For more information about how to create customized message files, see [“Locating Message Files” on page 1-49](#).

A GLS Locale

For data to be useful, it must be available in the format that the end user of the database application understands. This format depends on factors such as the language that the user speaks and the culture or territory in which the user resides.

The GLS locale is set of Informix files that bring together the information about data that is specific to a particular culture, language, or territory. In particular, a GLS locale provides the following information:

- The name of the code set that the application data uses
- The collation order to use for character data
- The format for different types of data to appear to end users

This section describes each of these topics in more detail.

Tip: For information about the format of these GLS files, see [Appendix A](#).



A Code Set

A *character set* is one or more natural-language alphabets together with additional symbols for digits, punctuation, and diacritical marks. Each character set has at least one *code set*, which maps its characters to unique bit patterns. These bit patterns are called *code points*. ASCII, ISO8859-1, Microsoft 1252, and EBCDIC are examples of code sets that support the English language.

The number of unique characters in the language determines the amount of storage that each character requires in a code set. Because a single byte can store values in the range 0 to 255, it can uniquely identify 256 characters. Most Western languages have fewer than 256 characters and therefore have code sets made up of *single-byte characters*. When an application handles data in such code sets, it can assume that 1 byte stores 1 character.

The ASCII code set contains 128 characters. Therefore, the code point for each character requires 7 bits of a byte. These single-byte characters with code points in the range 0 to 128 are sometimes called ASCII or *7-bit characters*. The ASCII code set is a single-byte code set and is a subset of all code sets that Informix products support.

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If a code set contains more than 128 characters, some of its characters have code points that must set the eighth bit of the byte. These non-ASCII characters might be either of the following types of characters:

- 8-bit characters

The 8-bit characters are single-byte characters whose code points are between 128 and 255. Examples from the ISO8859-1 or Microsoft 1252 code set include the non-English é, ñ, and ö characters. Only if the software is *8-bit clean* can it interpret these characters correctly. For more information on 8-bit characters and 8-bit clean software, see the description of the **GLS8BITFSYS** environment variable on [page 2-25](#). ♦

- Multibyte characters

If a character set contains more than 256 characters, the code set must contain multibyte characters. A multibyte character might require from 2 to 4 bytes of storage. Many Asian languages contain 3,000 to 8,000 ideographic characters. Such languages have code sets made up of both single-byte and multibyte characters. These code sets are called multibyte code sets. Some characters in the Japanese SJIS code set are multibyte characters of 2 or 3 bytes. Applications that handle data in multibyte code sets cannot assume that 1 character takes only 1 byte of storage.



Tip: In this manual, the term *non-ASCII characters* applies to all characters with a code point greater than 127. Non-ASCII characters include both 8-bit and multibyte characters.

Informix products can support single-byte or multibyte code sets. For some examples of GLS locales that support non-ASCII characters, see [“Supporting Non-ASCII Characters” on page 1-30](#).



Tip: Throughout this manual, examples show how single-byte and multibyte characters appear. Because multibyte characters are usually ideographic (such as Japanese or Chinese characters), this manual does not use the actual multibyte characters. Instead, it uses ASCII characters to represent both single-byte and multibyte characters. For more information about how this manual represents multibyte and single-byte characters abstractly, see [“Character-Representation Conventions” on page 13](#) of the Introduction.

The Collation Order

Collation involves the sorting of character data that is either stored in a database or manipulated in a client application. The collation order affects the following tasks when you select from the database with the SQL SELECT statement:

- Logical predicates in the WHERE clause

```
SELECT * FROM tab1 WHERE col1 > 'bob'
SELECT * FROM tab1 WHERE site BETWEEN 'abc' AND 'xyz'
```

- Sorted data that the ORDER BY clause creates

```
SELECT * FROM tab1 ORDER BY col1
```

- Comparisons in MATCHES and LIKE clauses

```
SELECT * FROM tab1 WHERE col1 MATCHES 'a1*'
SELECT * FROM tab1 WHERE col1 LIKE 'dog'
SELECT * FROM tab1 WHERE col1 MATCHES 'abc[a-z]'
```

For more information on how choice of a locale affects the SELECT statement, see [“Collation Order in SELECT Statements” on page 3-22](#).

Informix database servers support the following two methods of collation of character data:

- Code-set order
- Localized order

Code-Set Order

Code-set order refers to the bit-pattern order of characters within a code set. The order of the code points in the code set determines the sort order. For example, in the ASCII code set, A=65 and B=66. The character A always sorts before B because a code point of 65 is less than one of 66. However, because a=97 and M=77, the string *abc* sorts after *Me*, which is not always the preferred result.

The database server sorts data in CHAR, VARCHAR, and TEXT columns in code-set order. All code sets that Informix products support include the ASCII characters as the first 127 characters. Therefore, other characters in the code set have the code points 128 and greater. When the database server sorts data in a CHAR, VARCHAR, or TEXT column, it puts character strings that begin with ASCII characters before characters strings that begin with non-ASCII characters in the sorted results.

For an example of a data set in code-set order, see [Figure 3-2 on page 3-23](#).

Localized Order

Localized order refers to an order of the characters that relates to a real language. The locale defines the order of the characters in the localized order. For example, even though the character À might have a code point of 133, the localized order could list this character after A and before B (A=65, À=133, B=66). In this case, the string ÀB sorts after AC but before BD.

Tip: The *COLLATION* category of the locale file determines the localized order. For more information on the *COLLATION* category, see [page A-6](#).

The localized order can include *equivalent characters*, those characters that the database server is to consider as equivalent when it collates them. For example, if the locale defines uppercase and lowercase versions of a character as equivalent characters in the localized order, the database server considers the strings Arizona, ARIZONA, and arizona as equivalent and collates them together.

A localized order can also specify a certain type of collation order. It can define a telephone-book sorting order or a dictionary sort order. For example, a telephone book might require the following sort order:

```
Mabin
McDonald
MacDonald
Madden
```

A dictionary, however, might require the following sort order for these same names:

```
Mabin
Madden
MacDonald
McDonald
```

If the GLS locale defines a localized order, the database server sorts data in NCHAR and NVARCHAR columns in this localized order. For an example of a data set in localized order, see [Figure 3-3 on page 3-24](#).



Collation Support

The collation order that Informix database servers use depends on the data type of the database column. The following table summarizes these collation orders.

Data Types	Collation Order
CHAR, VARCHAR, TEXT	Code-set order
NCHAR, NVARCHAR	Localized order

The difference in collation order is the only distinction between the CHAR and NCHAR data types and the VARCHAR and NVARCHAR data types. For more information, see [“Using Character Data Types” on page 3-12](#).

Informix Native Language Support (NLS) database servers (before Version 7.2) use the same collation orders as Version 7.2 and later database servers: code-set order for CHAR and VARCHAR data and localized order for NCHAR and NVARCHAR data. ♦

Informix Asian Language Support (ALS) database servers use code-set order for CHAR and VARCHAR data. They do not support NCHAR and NVARCHAR data. ♦

If a locale does not define a localized order, the database server collates NCHAR and NVARCHAR data in code-set order.

End-User Formats

The *end-user format* is the format in which data appears within a client application when it is in literal strings or character variables. End-user formats are useful for data types whose format in the database is different from the format to which users are accustomed. In a database, the database server stores data for DATE, DATETIME, MONEY, and numeric data types in compact internal formats. For example, the database server stores a DATE value as an integer number of days since the date of December 31, 1899, so the date 03/19/96 is 35142. This internal format is not very intuitive.

NLS

ALS

Informix products support end-user formats so that a client application can use this more intuitive form instead of the internal format. Literal strings or character variables can appear in SQL statements as column values or as arguments of SQL API library functions.

An Informix product uses an end-user format when it encounters a string (a literal string or the value in a character variable) in the following contexts:

- When an Informix product *scans* a string, it uses an end-user format to determine how to interpret the string so that it can convert it to a numeric value.

For example, suppose that DB-Access has the default locale (U.S. English) as its client locale. The literal date in the following INSERT statement uses the end-user format for dates that the default locale defines:

```
INSERT INTO mytab ( date1 ) VALUES ( '03/19/96' )
```

When the database server receives the data from the client application, the database server uses the end-user format to interpret this literal date so that it can convert it to the appropriate internal format (35142).

- When an Informix product *prints* a string, it uses an end-user format to determine how to format the numeric value as a string.

For example, suppose that an ESQL/C client application has a French locale as its client locale, and this locale defines a date end-user format that formats dates as *dd/mm/yy*. The following **rdatestr()** function uses the end-user format for dates to obtain the value in the **datestr** character variable:

```
err = rdatestr(jdate, datestr);
```

The **rdatestr()** function uses the end-user format to determine how to format the internal format (35142) as a date string before it puts the value in the **datestr** variable. For more information about the effect of the GLS feature on SQL API library functions, see [“Enhanced ESQL Library Functions” on page 5-7](#).

A GLS locale defines end-user formats for the following types of data:

- Representation of currency notation and numeric format
You can use an end-user format that is particular to a country or culture outside the U.S. to specify monetary values.
- Representation of dates and times
You can specify date and time values in an end-user format that is particular to a country or culture outside the U.S.

The following sections describe each of these types of data in more detail.

Numeric and Monetary Formats

Numeric data is data from columns with the following data types: DECIMAL, INTEGER, SMALLINT, FLOAT, and SMALLFLOAT. Monetary data is data from a MONEY column. When an Informix product scans a string that contains monetary data, it uses the monetary end-user format to determine how to convert this string to the internal integer value for a MONEY column. When an Informix product prints a string that contains monetary data, it uses the monetary end-user format to determine how to format the internal integer value for a MONEY column as a string. In the same way, Informix products use the numeric end-user format to scan and print strings for the internal values of the numeric data types.



Important: *The end-user formats of the numeric and monetary data do not affect the internal format of the numeric or MONEY data types in the database. They affect only how the client application views the data.*

The end-user formats for numeric and monetary data specify the following characters and symbols:

- The *decimal-separator symbol*, often called the radix character, that separates the integral part of the numeric value from the fractional part
In the default locale, the period is the decimal separator (3.01). In a French or other European locale, the comma is the decimal separator (3,01).

- The *thousands-separator symbol* that appears between groups of digits in the integral part of the numeric value

In the default locale, the comma is the thousands separator (3,255); in a French locale, the space is the thousands separator (3 255).

- The number of digits to group between each appearance of a non-monetary thousands separator

For example, this information might specify that numbers always omit the separator at the millions position, which produces the following output: 1234,345.

- The characters that indicate positive and negative numbers

In addition to this numeric notation, monetary data also uses a *currency symbol* to identify the currency unit. A locale can define this symbol to appear at the front (\$100) or back (100FF) of the monetary value. In this manual, the combination of currency symbol, decimal separator, and thousands separator is called *currency notation*.



Tip: To customize the end-user format that the locale defines for monetary values, you can use the **DBMONEY** environment variable. For more information, see “Customizing Monetary Values” on page 1-53.

The NUMERIC category of the locale file defines the end-user formats for numeric data. The MONETARY category of the locale file defines the end-user formats for monetary data. For more information on the NUMERIC and MONETARY categories, see [page A-7](#).

Date and Time Formats

Date data is for DATE or DATETIME columns. Time data is for a DATETIME column. When an Informix product scans a string that contains time data, it uses the time end-user format to determine how to convert this string to the internal integer value for a DATETIME column. When an Informix product prints a string that contains time data, it uses the time end-user format to determine how to format the internal integer value for a DATETIME column as a string. In the same way, Informix products use the date end-user format to scan and print strings for the internal values of the date data types.



Important: The end-user formats of the date and time data do not affect the internal format of the DATE or DATETIME data types in the database. They affect only how the client application views the data.

The end-user formats for date and time involve characters and symbols that format date and time values. This information includes the names and abbreviations for days of the week and months of the year. It also includes the commonly used representations for dates, time (12-hour and 24-hour), and DATETIME values.

The end-user formats can include the names of eras (as in the Japanese Imperial date system) and non-Gregorian calendars (such as the Arabic lunar calendar). For example, the Taiwan culture uses the Ming Guo year format in addition to the Julian calendar year. Ming Guo 0001 is equivalent to January 1, 1912 on the Julian calendar. For dates before 1912, Ming Guo years are negative. The Ming Guo year 0000 is undefined; any attempt to use it generates an error.

The following table shows some era-based dates.

Julian Year	Ming Guo Year	Remarks
1993	82	1993 – 1911 = 82
1912	01	1912 – 1911 = 01
1911	–01	1911 – 1912 = –01
1910	–02	1910 – 1912 = –02
1900	–12	1900 – 1912 = –12



Important: If you use a Ming Guo date string in a *SELECT*, *INSERT*, *UPDATE*, or *DELETE* statement in a Version 7.2 or later product, you might encounter a problem due to different implementations of ALS and GLS. For details, see the Release Notes.

Japanese Imperial-era dates are tied to the reign of the Japanese emperors. The following table shows Julian and Japanese era dates. It shows the Japanese era format in full, with abstract multibyte characters for the Japanese characters, and in an abbreviated form that uses romanized characters (gengo). The abbreviated form of the era uses the first letter of the English name for the Japanese era. For example, H represents the Heisei era.

Julian Date	Abstract Japanese Era (in full)	Japanese Era (gengo)
1868/09/08	A ¹ A ² B ¹ B ² 01/09/08	M01/09/08
1912/07/30	A ¹ A ² B ¹ B ² 45/07/30	M45/07/30
1912/07/31	A ¹ A ² B ¹ B ² 01/07/31	T01/07/31
1926/12/25	A ¹ A ² B ¹ B ² 15/12/25	T15/12/25
1926/12/26	A ¹ A ² B ¹ B ² 01/12/26	S01/12/26
1989/01/07	A ¹ A ² B ¹ B ² 64/01/07	S64/01/07
1989/01/08	A ¹ A ² B ¹ B ² 01/01/08	H01/01/08
⋮		
1995/01/01	A ¹ A ² B ¹ B ² 07/01/01	H07/01/01

In the preceding table, A¹A² and B¹B² represent multibyte Japanese characters.

The TIME category of the locale file defines the end-user formats for date and time data. For more information on the TIME category, see [page A-8](#).

Tip: To customize the end-user formats that the locale defines for date and time values, you can use the **GL_DATE** and **GL_DATETIME** environment variables. For more information, see “[Customizing Date and Time End-User Formats](#)” on [page 1-50](#).



How Do You Set a GLS Locale?

In a client / server environment, both the database server and the client application must know which language the data is in to be able to process the application data correctly. The language affects database-server tasks such as sorting (collation) and comparison. It also affects client tasks such as end-user formats and alphabetic case conversion.

A GLS locale identifies the code set, the collation sequence, character classification (for comparisons), and end-user formats of monetary, numeric, date, and time data. For the database server and the client application to communicate successfully, you must establish the appropriate GLS locales for your environment.

This section describes the following topics:

- A default locale
- The format of a GLS locale name
- The locales that you must establish for Informix products
- How to establish a nondefault locale

The Default Locale

Informix products use U.S. English as the *default locale*. This locale specifies the following information:

- The U.S. English language and an English-language code set
- Standard U.S. formats for monetary, numeric, date, and time data

To use the default locale for your Informix database applications, you do not need to perform any special steps. However, if you want to use a customized version of U.S. English, or British English, or even another language, you must set environment variables to identify the appropriate locale. For information on how to specify a GLS locale, see [“A Nondefault Locale” on page 1-28](#).

UNIX

WIN NT

The Default Code Set

The *default code set* is the code set that the default locale supports. When you use the default locale, the default code set supports both the ASCII code set and some set of 8-bit characters. (For a chart of ASCII values, see the Relational Operator segment in the [Informix Guide to SQL: Syntax](#).) The name of the default code set is platform dependent.

The default code set on UNIX platforms is ISO8859-1. ♦

The default code set for Windows NT environments is Microsoft 1252. ♦

Default Date and Time End-User Formats

When you use the default locale, Informix products use the following end-user formats for date and time values:

- For DATE values: %m/%d/%iy
For more information on these formatting directives, see the description of **GL_DATE** on [page 2-27](#).
- For DATETIME values: %iY-%m-%d %H:%M:%S
For more information on these formatting directives, see the description of **GL_DATE** and **GL_DATETIME** on [pages 2-27](#) and [2-37](#), respectively.

For an introduction to date and time end-user formats, see “[Date and Time Formats](#)” on [page 1-15](#). For information about how to customize these end-user formats, see [page 1-50](#).

Default Numeric and Monetary End-User Formats

When you use the default locale, Informix products use the following end-user formats for numeric and monetary values:

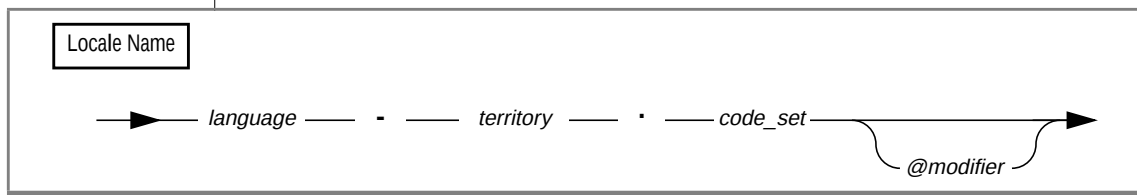
- The thousands separator is the comma (,).
- The decimal separator is the period (.).
- Three digits appear between each thousands separator.
- The positive and negative signs are plus (+) and minus (-), respectively.

For monetary values, Informix products also use the currency symbol, which is the dollar sign (\$) and which appears in front of a monetary value.

For an introduction to numeric and monetary end-user formats, see [“Numeric and Monetary Formats” on page 1-14](#). For information about how to customize these end-user formats, see [page 1-53](#).

GLS Locale Names

A GLS locale name identifies the language, territory, and code set that you want your Informix product to use. This name has the following syntax.



code_set is the name of the code set that the locale supports.

language is the two-character name that represents the language for a specific locale.

modifier is an optional locale modifier that has a maximum of four alphanumeric characters. This specification modifies the cultural-convention settings that the *language* and *territory* settings imply. The modifier usually indicates a special type of localized order that the locale supports. For example, you can set *@modifier* to specify dictionary or telephone-book collation order.

territory is a two-character name that represents the cultural conventions. For example, *territory* might specify the Swiss version of the French, German, or Italian language.

The default locale, U.S. English, has the following locale name, where *en* indicates the English language, *us* indicates the United States territory, and *code_set* indicates the platform-specific name of the default code set:

```
en_us.code_set
```

UNIX

The name of the default locale on UNIX platforms is **en_us.8859-1**. The number 8859-1 indicates the name of the default code set, the ISO8859-1 code set. ♦

WIN NT

The name of the default locale for Windows NT environments is **en_us.1252**. The number 1252 indicates the name of the default code set, commonly known as the Microsoft ANSI code set. It represents American English and most European languages ♦

In a locale name, you can specify the code set as either the code-set name or the condensed form of the code-set name. For example, the following locale names both identify the U.S. English locale with the ISO8859-1 code set:

- The locale name **en_us.8859-1** uses the code-set name to identify the ISO8859-1 code set.
- The locale name **en_us.0333** uses the condensed form of the code-set name to identify the ISO8859-1 code set.

For more information on the condensed form of a code-set name, see [page A-16](#).

The default locale has no locale modifier. However, Informix does provide the following locale that supports dictionary sort order for U.S. English, where *code_set* indicates the platform-specific name of the default code set:

```
en_us.code_set@dict
```

A sample nondefault locale for a French-Canadian locale follows:

```
fr_ca.8859-1
```

UNIX

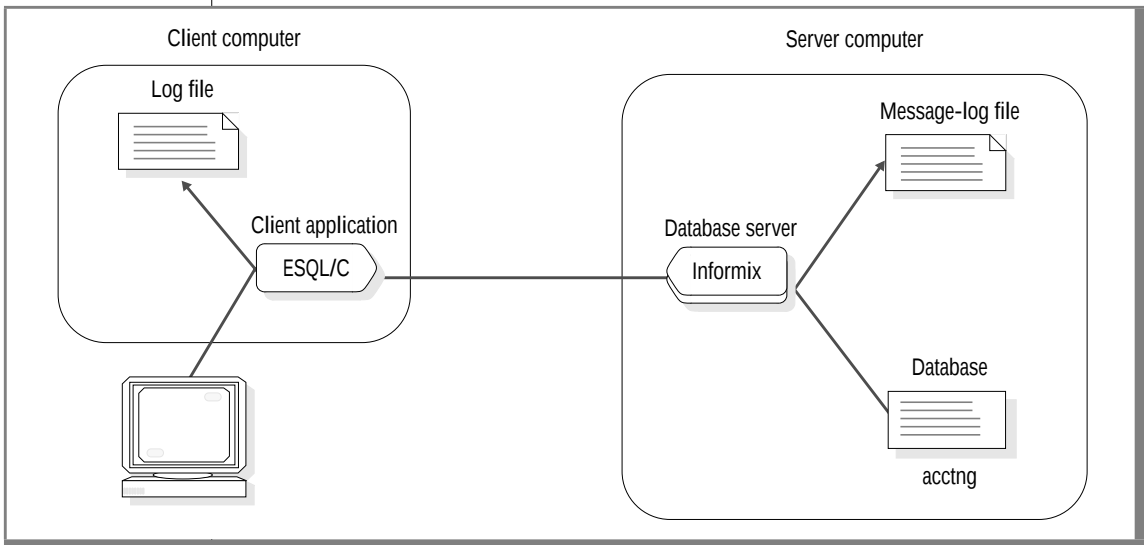
You can use the **glfiles** utility to generate a list of the GLS locales that are available on your UNIX system. For more information, see “[The glfiles Utility](#)” on [page A-21](#). ♦

An Informix product uses the locale name to find the corresponding *GLS locale file*. A locale file is a runtime version of the locale information. The locale name must correspond to a GLS locale file in a subdirectory of the Informix installation directory (which the **INFORMIXDIR** environment variable indicates) called **gls**. For more information on GLS locale files, see [Appendix A, “Managing GLS Files.”](#)

Locales in the Client/Server Environment

When a database application runs in a client/server environment, the client application, database server, and one or more databases might reside on different computers. Figure 1-1 shows a sample database server connection between an ESQL/C client application and the **acctng** database through an Informix database server.

Figure 1-1
Example of a Client/Server Environment



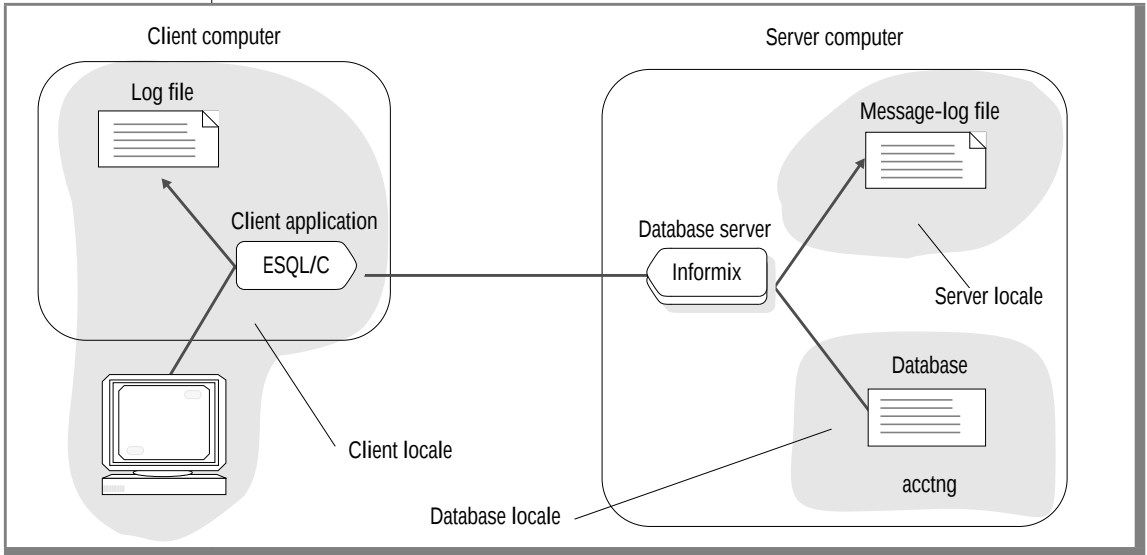
These computers might have different operating systems or different language support. To ensure that these three parts of the database application communicate locale information successfully, Informix products support the following locales:

- The *client locale* identifies the locale that the client application uses.
- The *database locale* identifies the locale of the data in a database.
- The *server locale* identifies the locale that the database server uses for its server-specific files.

Figure 1-2 shows the client locale, database locale, and server locale that the sample ESQL/C application (from [Figure 1-1 on page 1-22](#)) establishes.

Figure 1-2

The Client Locale, Database Locale, and Server Locale



When you set the same or compatible GLS locales for each of these locales, your client application is not dependent on how the operating system of each computer implements language-specific features.

The following sections describe each of these locales in more detail.

The Client Locale

The *client locale* specifies the language, territory, and code set that the client application uses to perform read and write (I/O) operations on the client computer. In a client application, I/O operations include reading a keyboard entry or a file for data to be sent to the database and writing data that the database server retrieves from the database to the screen, a file, or a printer. In addition, an SQL API client uses the client locale for literal strings (end-user formats), embedded SQL statements, host variables, and data sent to or received from the database server with ESQL library functions in an ESQL source file (.ec).

In the sample connection that [Figure 1-2 on page 1-23](#) shows, if the client locale is German with the Microsoft 1252 code set (**de_de.1252**), the German locale-specific information that the ESQL/C client application uses includes the following:

- Valid date end-user formats support the following format for the U.S. English date of Tuesday, 02 / 11 / 1997:

Tu., 11. Feb 1997

- Valid monetary end-user formats support the following format for the U.S. English amount of \$354,446.02:

DM354.446,02



Tip: To provide this information for the client locale, the locale file contains the following locale categories: *COLLATION*, *CTYPE*, *TIME*, *MONETARY*, and *NUMERIC*. For more information, see [“Locale Categories” on page A-4](#).

The database server uses the client locale as one part of the information to determine the server-processing locale for the current session. For more information, see [“Establishing a Database Connection” on page 1-31](#).

To determine the client locale, Informix client applications use environment variables set on the client computer. To obtain the localized order and end-user formats of the client locale, a client application uses the following precedence:

1. **DBDATE** and **DBTIME** environment variables for the end-user formats of date and time data and **DBMONEY** for the end-user format of monetary data (if one of these is set)
2. **GL_DATE** and **GL_DATETIME** environment variables for the end-user formats of date and time data (if one of these is set)
3. The information that the client locale defines (**CLIENT_LOCALE**, if it is set)

NLS

4. **LC_*** environment variables for the associated category of the client locale (if **DBNLS** is set on the client):
 - ❑ **LC_CTYPE** for the character-classification information
For more information about character classification, see the CTYPE category in [page A-6](#).
 - ❑ **LC_COLLATE** for the localized order
For more information about the COLLATE category, see [page A-6](#).
 - ❑ **LC_NUMERIC** for numeric end-user formats
For more information about the NUMERIC category, see [page A-7](#).
 - ❑ **LC_MONETARY** for monetary end-user formats
For more information about the MONETARY category, see [page A-7](#).
 - ❑ **LC_TIME** for date and time end-user formats
For more information about the TIME category, see [page A-8](#).
5. **LANG** environment variable (if, on the client, **DBNLS** is set, but the associated **LC_*** is not set) ♦
6. The default locale (U.S. English)

UD

Client applications that are based on Informix Version 9.1 or later products use the precedence of steps 2, 3, and 6 in the preceding list. You do not need to set the other environment variables for Version 9.1 or later client applications. ♦

Support for **DBDATE** and **DBTIME** provides backward compatibility for client applications that are based on earlier versions of Informix products. Informix recommends that you use **GL_DATE** and **GL_DATETIME** for new applications.

NLS

Support for **LANG** and the **LC_*** environment variables provides backward compatibility for client applications that are based on Informix NLS products. These applications use the precedence of steps 1, 4, 5, and 6 in the preceding list. You are not required to set **CLIENT_LOCALE** for NLS-based applications. However, **CLIENT_LOCALE** does provide certain advantages to your application. For more information, see the [Informix Migration Guide](#). ♦

ALS

Client applications that are based on Informix ALS products use the precedence of steps 1, 3, and 6 in the preceding list. For more information about how to run ALS-based applications, see the [Informix Migration Guide](#). ♦

For information on the **CLIENT_LOCALE**, **DBDATE**, **DBTIME**, **DBMONEY**, **GL_DATE**, and **GL_DATETIME** environment variables, see their entries in [Chapter 2, “GLS Environment Variables.”](#)

The Database Locale

The *database locale* specifies the language, territory, and code set that the database server needs to interpret correctly locale-sensitive data types (NCHAR and NVARCHAR) in a particular database. The database locale determines the following information for the database:

- The code set whose characters are valid in any character column
 - The code set whose characters are valid in the names of database objects such as databases, tables, columns, and views
- For more information, see [“Naming Database Objects” on page 3-4](#).
- The localized order to collate data from any NCHAR and NVARCHAR columns

The database server uses the database locale as one part of the information to determine the server-processing locale for the current session. For more information, see [“Establishing a Database Connection” on page 1-31](#).

The database server also uses the database locale when it creates a new database. It stores a condensed version of the database locale in the **sytables** catalog of the database.

NLS

Informix NLS databases (before Version 7.2) also store the locale-specific information in **sytables**. However, the locale names are different from those in GLS databases. For information on how GLS database servers convert NLS databases, see the [Informix Migration Guide](#). ♦

ALS

Informix ALS databases store the locale-specification information somewhat differently. For information on how GLS database servers convert ALS databases, see the [Informix Migration Guide](#). ♦

AD/XP

When the database server stores the database locale information directly in the system catalog, it permanently attaches the locale to the database. In this way, the database server can always determine the locale that it needs to interpret the locale-sensitive data correctly. This information includes operations such as how to handle regular expressions, compare character strings, and ensure proper use of code sets.

The collation order determines the data type of system catalog tables.

- If a database locale is collated in code-set order, all its system catalog tables are created with the CHAR data type.
- If a database locale is collated in localized order, all its system catalog tables are created with the NCHAR data type. ♦

In the sample connection shown in [Figure 1-2 on page 1-23](#), the database server references the database locale when the client application requests sorted information for an NCHAR column in the **acctng** database. If the database locale is German with the Microsoft 1252 code set (**de_de.1252**), the database server uses a localized order that sorts accented characters, such as ö, after their unaccented counterparts. This order means that the string **öff** sorts after **ord** but before **pre**.

The client application uses the database locale (as set on the client computer) to determine whether to perform code-set conversion. For more information, see [“Performing Code-Set Conversion” on page 1-40](#).

The Server Locale

The *server locale* specifies the language, territory, and code set that the database server uses to perform read and write (I/O) operations on the server computer (the computer on which the database server runs). These I/O operations include reading or writing the following files:

- Diagnostic files that the database server generates to provide additional diagnostic information
- Log files that the database server generates to record events
- Explain file, **sqexplain.out**, that the SQL statement SET EXPLAIN generates



However, the database server does not use the server locale to write files that are in an Informix-proprietary format (database and table files). For a more detailed description of the files that the database server writes in the server locale, see [Chapter 4, “Database Server Features.”](#)

In the sample connection that [Figure 1-2 on page 1-23](#) shows, the Informix database server uses the server locale to determine the code set to use when it writes a message-log file.

Tip: *The database server is the only Informix product that needs to know the server locale. Any database server utilities that you run on the server computer use the client locale to read from and write to files and the database locale (on the server computer) to access databases that are set on the server computer.*

A Nondefault Locale

By default, Informix products use the U.S. English locale. However, Informix products support many other locales. To use a nondefault locale, you must set the following locale environment variables:

- Set the **CLIENT_LOCALE** environment variable to specify a nondefault client locale.

If you do not set **CLIENT_LOCALE**, the client locale is the default locale, U.S. English.

- Set **DB_LOCALE** on each client computer to specify a nondefault database locale for a client application to use when it connects to a database.

If you do not set **DB_LOCALE**, on the client computer, the client application sets the database locale to the client locale. This default value keeps the client application from having to perform code-set conversion.

You might also want to set **DB_LOCALE** on the server computer so that the database server can perform operations such as the creation of databases (when the client does not specify its own **DB_LOCALE**).

- Set the **SERVER_LOCALE** environment variable to specify a nondefault server locale.

If you do not set **SERVER_LOCALE**, the server locale is the default locale, U.S. English.

UNIX

To set these locale environment variables, assign them the name of a GLS locale (see [page 1-20](#)).

You set environment variables with the appropriate shell command (such as **setenv** for the C shell).

For example, to set the client locale to Japanese with the SJIS character set on a UNIX system, you might enter the following command on the client computer at the shell prompt:

```
setenv CLIENT_LOCALE ja_jp.sjis
```

You can use the **glfiles** utility to obtain a list of GLS locales that your Informix product supports. For more information, see “[The glfiles Utility](#)” on [page A-21](#). ♦

WIN NT

You set environment variables in the **registry** (with the SETNET32 utility) or in the **InetLogin** structure of an SQL API program. For more information on SETNET32, see your [Installation Guide](#) for Windows NT products. For more information on **InetLogin**, see the manual for your SQL API product.

You can examine the **%INFORMIXDIR%\gls\lcX** directory to determine the GLS locales that your Informix product supports. For more information on this directory, see [Appendix A](#). ♦

When you want to access a database locale with a nondefault locale, the client and database locales on your client computer must support this nondefault locale. Make sure that these two locales are the same or that their code sets are convertible. For more information on convertible code sets, see “[Performing Code-Set Conversion](#)” on [page 1-40](#).

For example, to access a database with a Japanese SJIS locale, set both the **DB_LOCALE** and **CLIENT_LOCALE** environment variables to the **ja_jp.sjis** locale name. If you set **DB_LOCALE** but do not set **CLIENT_LOCALE**, the client application returns an error because it cannot set up code-set conversion between SJIS (the database code set) and the default code set (the code set of the default locale).

When a client application requests a connection, the database server uses information in the client, database, and server locales to create the server-processing locale. For more information, see “[Establishing a Database Connection](#)” on [page 1-31](#). For information on the syntax of the **CLIENT_LOCALE**, **DB_LOCALE**, and **SERVER_LOCALE** environment variables, refer to those entries in [Chapter 2](#), “[GLS Environment Variables](#).”

How Do Informix Products Use GLS Locales?

Informix products use GLS locales for the following tasks:

- When a client application requests a connection, the database server uses the client and database locales to determine if these locales are compatible.
- When a client application first begins execution, it compares the client and database locales to determine if it needs to perform code-set conversion.
- All Informix products that display product-specific messages look in a directory specific to the client locale to locate these messages.

Supporting Non-ASCII Characters

An Informix product determines which code set it uses from the name of a GLS locale. Informix provides locales that support both single-byte and multibyte code sets. All code sets that Informix supports define the ASCII characters. Most also support additional non-ASCII characters (8-bit or multibyte characters). For more information on code sets and non-ASCII characters, see [page 1-8](#).

The following types of GLS locales are examples of locales that contain non-ASCII characters in their code sets:

- The default locale supports the default code set, which contains 8-bit characters for non-English characters such as é, ñ, and ö.
The name of the default code set depends on the platform on which your Informix product is installed. For more information on the default code set, [page 1-19](#).

UNIX

- Many nondefault locales support the default code set.
Nondefault locales that support the UNIX default code set, ISO8859-1, include British English (**en_gb.8859-1**), French (**fr_fr.8859-1**), Spanish (**es_es.8859-1**), and German (**de_de.8859-1**). ♦
- Other nondefault locales, such as Japanese SJIS (**ja_jp.sjis**), Korean (**ko_kr.ksc**), and Chinese (**zh_cn.gb**), contain multibyte code sets.

For the contexts in which you can use non-ASCII characters, including multibyte characters, see [Chapter 3, “SQL Features,”](#) [Chapter 4, “Database Server Features,”](#) and [Chapter 5, “General SQL API Features.”](#)

However, for an Informix product to support non-ASCII characters, it must use a locale that supports a code set with these same non-ASCII characters.

Establishing a Database Connection

When a client application requests a connection to a database, the database server uses GLS locales to perform the following steps:

1. Examine the client locale information that the client passes.
2. Verify that it can establish a connection between the client application and the database that it requested.
3. Determine the server-processing locale, which the database server uses to handle locale-specific information for the connection.

Sending the Client Locale

When the client application requests a connection, it sends the following environment variables from the client locale to the database server:

- **Locale information**

- **CLIENT_LOCALE** and **DB_LOCALE**

If **CLIENT_LOCALE** is not set (and **DBNLS** is *not* set), the client sets it to the default locale. If **DB_LOCALE** is not set (and **DBNLS** is *not* set), the client does not send a **DB_LOCALE** value to the database server.

- **DBNLS** and **LC_***

The client application sends the **LC_*** environment variables *only* if **DBNLS** is set. If **DBNLS** is set, but the **LC_*** variables are not, the client sets the appropriate **LC_*** values, based on the **LANG** environment variable, and sends these **LC_*** values to the database server. The client application does *not* send the value of the **LANG** environment variable to the database server. ♦

- **DBCODESET**

A Version 5.x ALS client application can send **DBCODESET** to a Version 7.2 or later database server; the database server converts the **DBCODESET** value to a valid locale name and uses it as **DB_LOCALE**. A Version 6.x ALS client application sends the **CLIENT_LOCALE** and **DB_LOCALE** environment variables. ♦

- **User-customized end-user formats**

- **Date and time end-user formats: GL_DATE and GL_DATETIME or DBDATE and DBTIME**

- **Monetary end-user formats: DBMONEY**

If you do not set any of these environment variables, the client application does not send them to the database server, and the database server uses the end-user formats that the client locale defines.

The database server uses this information to verify the database locale and to establish the server-processing locale.

NLS

ALS

Verifying the Database Locale

To open an existing database, the client application must correctly identify the database locale for the databases that it needs to access. The database server verifies the database locale from the information that the client sends when it requests a database server connection. To perform this verification, the database server compares the following two database locales:

- The database locale from the **DB_LOCALE** environment variable that the client application sends
For more information, see [“Sending the Client Locale” on page 1-32](#).
- The database locale that is stored in the system catalog of the database that the client application requests
For more information, see [“The Database Locale” on page 1-26](#).

Two database locales match if their language, territory, code set, and any optional locale modifiers are the same. If these database locales do not match, the database server performs the following actions:

- It sets the SQLWARN7 warning flag in the SQL Communications Area (SQLCA structure).
For more information on how to check the SQLWARN7 warning flag, see [“Checking for Connection Warnings” on page 5-25](#).
- It uses the database locale that is stored in the system catalog of the requested database as the database locale.



Warning: Check for the SQLWARN7 warning flag after your ESQL client application requests a connection. If the two database locales do not match, the client application might incorrectly interpret data that it retrieves from the database, or the database server might incorrectly interpret data that it receives from the client. If you proceed with such a connection, it is your responsibility to understand the format of the data that is being exchanged.

For example, suppose that your client application uses **CLIENT_LOCALE** set to **en_us.1252** and **DB_LOCALE** set to **en_us.8859-1** and then opens a database with the French **fr_fr.8859-1** locale. The database server sets SQLWARN7 because the languages and territories of the two locales are different. The database server then uses the locale of the database (**fr_fr.8859-1**) for the localized order of the data.

NLS

However, your application might choose to use this connection. It might be acceptable for the application to receive the NCHAR and NVARCHAR data that is sorted in a French localized order. Any code-set conversion that the client application performs would still be valid because both database locales support the ISO8859-1 code set. (For more information on code-set conversion, see [page 1-40](#).)

Instead, if the application opens a database with the Japanese SJIS (**ja_jp.sjis**) locale, the database server sets the SQLWARN7 flag because the language, territory, *and* code sets differ. The database server then uses the **ja_jp.sjis** locale for the localized order of the data. Your application would probably *not* continue with this connection. Because the code sets are different, the client application would not perform code-set conversion correctly.

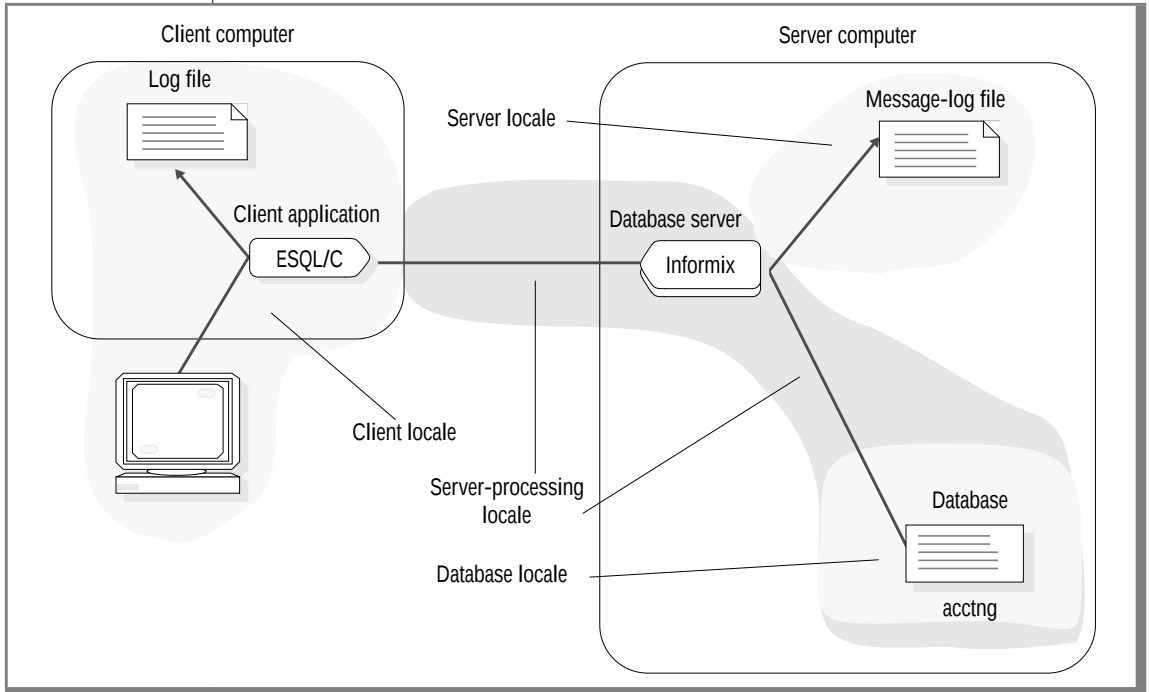
If **DBNLS** is set to one (1), the database server does not allow the client to connect to a database if the database locale that the client sends does not match the database locale of the NLS database that the client requested. ♦

Determining the Server-Processing Locale

The database server uses the *server-processing locale* to obtain locale information for its own internal sessions and for any connections. When the database server begins execution, it initializes the server-processing locale to the default locale. When a client application requests a connection, the database server must redetermine the server-processing locale to include the client and database locales. The database server uses the server-processing locale to obtain locale information that it needs when it transfers data between the client and database.

Once the Informix database server verifies the database locale (see [page 1-33](#)), it uses a precedence of environment variables from the client and database locales to set the server-processing locale. Figure 1-3 shows the relationship between the client locale, database locale, server locale, and server-processing locale.

Figure 1-3
The Server-Processing Locale



The database server obtains the following information from the server-processing locale:

- Locale information for the database

This database information includes the localized order and code set for data in columns with the locale-specific data types (NCHAR and NVARCHAR). The database server obtains this information from the name of the database locale that it has just verified (see [page 1-33](#)).

- Locale information for client-application data

This client-application information is the end-user formats for date, time, and monetary data. The database server obtains this information from the client application when the client requests a connection (see [page 1-32](#)).



Tip: The database server uses the server locale for read and write operations on its own operating-system files. For information about operating-system files, see [“Using the Server Locale” on page 4-3](#).

Locale Information for the Database

The database server must know how to interpret the data in any columns with the locale-specific data types, NCHAR and NVARCHAR. To handle this locale-specific data correctly, the database server must know the localized order for the collation of the data and the code set of the data. In addition, the database server uses the code set of the database locale as the code set of the server-processing locale. The database server might have to perform code-set conversion between the code sets of the server-processing locale and the server locale. For more information, see [“Performing Code-Set Conversion” on page 1-40](#).

The database server uses the following precedence to determine this database information:

1. The locale that the database server uses to determine the database information for the server-processing locale depends on the state of the database to which the client application requests a connection, as follows:
 - a. For a connection to an *existing* database, the database server uses the database information from the database locale that it obtains when it verifies the database locale (see [page 1-33](#)). If the client application does not send **DB_LOCALE**, the database server uses the **DB_LOCALE** that is set on the server computer.
 - b. For a *new* database, the database server uses the **DB_LOCALE**, which the client application has sent (see [page 1-32](#)).
2. **LC_COLLATE** and **LC_CTYPE** environment variables that the client application passes (if **DBNLS** is set on the client computer) ♦
3. The locale that the **DB_LOCALE** environment variable on the server computer indicates
4. **LC_COLLATE** and **LC_CTYPE** environment variables on the server computer (if **DBNLS** is set on the client computer)
5. **LANG** environment variable on the server computer (if **DBNLS** is set on the client) ♦
6. **DBCODESET** environment variable that the client application passes
7. **DBCODESET** environment variable on the server computer (if **DBCODESET** is *not* set on the client computer) ♦
8. The default locale (U.S. English)

Informix Version 9.1 or later database servers use the precedence of steps 1, 3, and 8 in the preceding list to obtain the database information for the server-processing locale. You are not required to set the other environment variables.

Support for **LANG** and the **LC_*** environment variables provides backward compatibility for client applications that are based on Informix NLS products. These applications use the precedence of steps 2, 4, 5, and 8 in the preceding list. You are not required to set **CLIENT_LOCALE** for NLS-based applications. However, **CLIENT_LOCALE** does provide certain advantages to your application. For more information, see the [Informix Migration Guide](#). ♦

NLS

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ALS



Support for the **DBCODASET** environment variable provides backward compatibility for client applications that are based on Informix Version 5.x ALS products. These applications use the precedence of steps 1, 3, 6, 7, and 8 in the preceding list. For more information about how to run ALS-based applications, see the *Informix Migration Guide*. ♦

Tip: The precedence rules apply to how the database server determines both the *COLLATION* category and the *CTYPE* category of the server-processing locale. For more information on these locale categories, see [page A-4](#).

For more information on how the database server obtains these environment variables, see “[Sending the Client Locale](#)” on [page 1-32](#).

If the client application makes another request to open a database, the database server must reestablish the database information for the server-processing locale, as follows:

1. Reverify the database locale by comparing the database locale in the database to be opened with the value of the **DB_LOCALE** environment variable from the client application (see [page 1-33](#)).
2. Reestablish the server-processing locale with the newly verified database locale (from the preceding step).

For example, suppose that your client application has **DB_LOCALE** set to **en_us.8859-1** (U.S. English with the ISO8859-1 code set). The client application then opens a database with the U.S. English locale (**en_us.8859-1**), and the database server establishes a server-processing locale with **en_us.8859-1** as the locale that defines the database information.

If the client application now closes the U.S. English database and opens another database, one with the French locale (**fr_fr.8859-1**), the database server must reestablish the server-processing locale. The database server sets the **SQLWARN7** flag to indicate that the two locales are different. However, your client application might choose to use this connection because both these locales support the ISO8859-1 code set. If the client application opens a database with the Japanese SJIS locale (**ja_jp.sjis**) instead of one with a French locale, your client application would probably not continue with this connection because the locales are too different.

Locale Information For the Client Application

The database server must know how to interpret the end-user formats when they appear in monetary, date, or time data that the client application sends. It must also convert data from the database to any appropriate end-user format before it sends this data to the client application. (For more information about end-user formats, see [page 1-12](#).)

The database server uses the following precedence to determine this client-application information:

1. **DBDATE** and **DBTIME** environment variables for the date and time end-user formats and **DBMONEY** for the monetary end-user formats (if one of these is set on the client)
2. **GL_DATE** and **GL_DATETIME** environment variables (if one of these is set on the client) for the date and time end-user formats
3. The locale that the **CLIENT_LOCALE** environment variable from the client application indicates (see [page 1-32](#))
4. If **DBNLS** is set on the client computer (for an NLS-based application):
 - a. **LC_MONETARY**, **LC_NUMERIC**, and **LC_TIME** environment variables that the client application passes to define end-user formats of monetary, numeric, and date / time data, respectively
 - b. **LC_MONETARY**, **LC_NUMERIC**, and **LC_TIME** environment variables on the server computer for the end-user formats of monetary, numeric, and date / time data, respectively
 - c. **LANG** environment variable on the server computer ♦
5. **DBCODESET** environment variable that the client passes ♦
6. The default locale (U.S. English)

Version 9.1 or later database servers use the precedence of steps 2, 3, and 6 in the preceding list to set the end-user formats for the server-processing locale. You are not required to set the other environment variables. Support for **DBDATE** and **DBTIME** provides backward compatibility for client applications that are based on earlier versions of Informix products. Informix recommends that you use **GL_DATE** and **GL_DATETIME** for new applications.

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NLS

Support for **LANG** and the **LC_*** environment variables provides backward compatibility for client applications that are based on Informix NLS products. If **DBNLS** is set on the client, these applications use the precedence of steps 1, 4, and 6 in the preceding list to set the end-user formats for the server-processing locale. You are not required to set **CLIENT_LOCALE** for NLS-based applications. However, **CLIENT_LOCALE** does provide certain advantages to your application. For more information, see the [Informix Migration Guide](#). ♦

ALS

Support for the **DBCODESET** environment variable provides backward compatibility for client applications that are based on Informix Version 5.x ALS products. These applications use the precedence of steps 1, 3, 5, and 6 in the preceding list. For more information about how to run ALS-based applications, see the [Informix Migration Guide](#). ♦



Tip: The precedence rules apply to how the database server determines the **NUMERIC MONETARY**, **TIME**, and the **MESSAGES** categories of the server-processing locale. For more information on these locale categories, see [page A-4](#).

The client application passes the **DBCODESET**, **DBDATE**, **DBMONEY**, **DBTIME**, **GL_DATE**, **GL_DATETIME**, and **LC_*** environment variables (if they are set) to the database server. It also passes the **CLIENT_LOCALE** and **DB_LOCALE** environment variables. For more information, see [“Sending the Client Locale” on page 1-32](#).

Performing Code-Set Conversion

Informix products use GLS locales to perform code-set conversion. Both an Informix client application and a database server might perform code-set conversion. This section provides the following information about how Informix products support code-set conversion:

- What code-set conversion is
- When code-set conversion is performed
- Which data is converted

What Is Code-Set Conversion?

You specify a code set as part of the GLS locale (see [page 1-20](#)). At runtime, Informix products adhere to the following rules to determine which code sets to use:

- The client application uses the *client code set*, which the **CLIENT_LOCALE** environment variable specifies, to write all files on the client computer and to interact with all client I/O devices.
- The database server uses the *server code set*, which the **SERVER_LOCALE** environment variable specifies, to write files (such as debug and warning files).
- The database server uses the *database code set*, which the **DB_LOCALE** environment variable specifies, to transfer data to and from the database.

In a client/server environment, character data might need to be converted from one code set to another if the client or server computer uses different code sets to represent the same characters. The conversion of character data from one code set (the source code set) to another (the target code set) is called *code-set conversion*. Without code-set conversion, one computer cannot correctly process or display character data that originates on the other (when the two computers use different code sets).

Code-set conversion does not provide either of the following capabilities:

- Code-set conversion is not a semantic translation.
It does not convert between words in different languages. For example, it does not convert from the English word *yes* to the French word *oui*. It only ensures that each character retains its meaning when it is processed or printed, regardless of how it is encoded.
- Code-set conversion does not create a character in the target code set if it exists only in the source code set.
For example, if the character *â* is passed to a target computer whose code set does not contain that character, the target computer can never process or print the character exactly.

For each character in the source code set, a corresponding character in the target code set should exist. However, if the source code set contains characters that are not in the target code set, the conversion must then define how to map these mismatched characters to the target code set. (Absence of a mapping between a character in the source and target code sets is often called a *lossy error*.) If all characters in the source code set exist in the target code set, mismatch handling does not apply.

A code-set conversion uses one of the following four methods to handle mismatched characters:

- Round-trip conversion

This method maps each mismatched character to a unique character in the target code set so that the return mapping maps the original character back to itself. This method guarantees that a two-way conversion results in no loss of information; however, data that is converted just one way might prevent correct processing or printing on the target computer.

- Substitution conversion

This method maps all mismatched characters to one character in the target code set that highlights mismatched characters. This method guarantees that a one-way conversion clearly shows the mismatched characters; however, a two-way conversion results in loss of information if mismatched characters are present.

- Graphical-replacement conversion

This method maps each mismatched character to a character in the target code set that looks similar to the source character. (This method includes the mapping of one-character ligatures to their two-character equivalents and vice versa.) This method tries to make printing of mismatched data more accurate on the target computer, but it most likely confuses the processing of this data on the target computer.

- A hybrid of two or three of the preceding conversion methods

Tip: Each code-set-conversion source file (**.cv**) indicates how the associated conversion handles mismatched characters. For information on code-set-conversion files, see [Appendix A, “Managing GLS Files.”](#)



When Is Code-Set Conversion Performed?

An application needs to use code-set conversion only when the two code sets (client and server-processing locale, or server-processing locale and server) are different. The following situations are possible causes of code sets that differ:

- Different operating systems might encode the same characters in different ways.

For example, the code for the character â (a-circumflex) in Windows Code Page 1252 (a common Microsoft code set) is hexadecimal 0xE2. In IBM Coded Character Set Identifier (CCSID) 437 (a common IBM UNIX code set), the code is hexadecimal 0x83. If the code for â on the client is sent unchanged to the IBM UNIX computer, it prints as the Greek character γ (gamma). This action occurs because the code for γ is hexadecimal 0xE2 on the IBM UNIX computer.

- One language can have several code sets. Each might represent a subset of the language.

For example, the code sets **ccdc** and **big5** are both internal representations of a subset of the Chinese language. However, these subsets consist of different numbers of Chinese characters.



Tip: The IBM CCSID code-set numbers are a system of 16-bit numbers that uniquely identify the coded graphic character representations. Informix products support the CCSID numbering system. For more information, see [Appendix A, “Managing GLS Files.”](#)

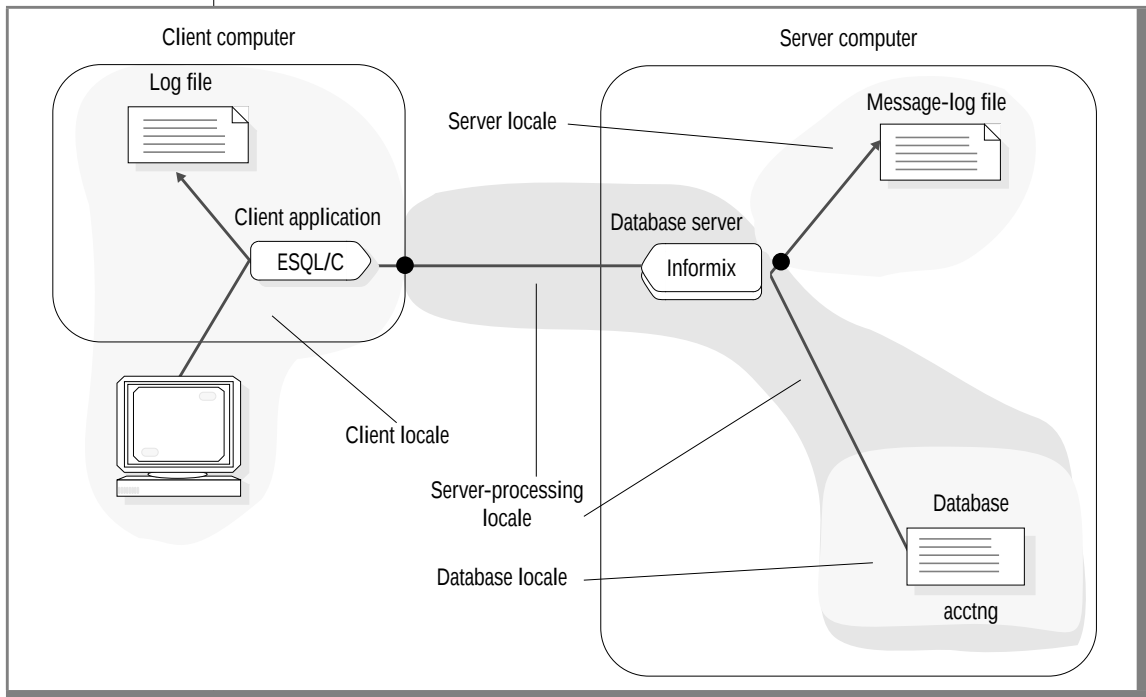
If a code-set conversion is required when data goes from computer A to computer B, it is also required when the data goes from computer B to computer A.

In the client / server environment, the following situations might require code-set conversion:

- If the client locale and database locale specify different code sets, the client application performs code-set conversion so that the server computer is not loaded with this type of processing.
- If the server locale and server-processing locale specify different code sets, the database server performs code-set conversion when it writes to and reads from operating-system files such as log files.

In Figure 1-4, the black dots indicate the two points in a client / server environment at which code-set conversion might occur.

Figure 1-4
Points of GLS Code-Set Conversion



In the sample connection that Figure 1-4 shows, the ESQL/C client application performs code-set conversion on the data that it sends to and receives from the database server if the client and database code sets are convertible. The Informix database server also performs code-set conversion when it writes to a message-log file if the code sets of the server locale and server-processing locale are convertible.

NLS

Informix products provide operating-system locales for backward compatibility with NLS databases. (For information on how to list operating-system locales, see [Appendix A, “Managing GLS Files.”](#))

UNIX

If your NLS-based client application (**DBNLS** is set) uses an operating-system locale for either the client or the database locale, your NLS-based application does not automatically perform code-set conversion. For code-set conversion to occur, you must set the **DBAPICODE** environment variable. The **COLLCHAR** environment variable allows client applications to use NLS collation. For more information on these two environment variables, see the [Informix Migration Guide](#). ♦

Informix Gateway products on UNIX use the **GL_PATH** environment variable to override the default locations for GLS code-set conversion tables. For details, see the Version 7.2 or later INFORMIX-Enterprise Gateway documentation. ♦

Client Application Code-Set Conversion

An Informix client application automatically performs code-set conversion between the client and database code sets when the following conditions are true:

- The code sets that the client and database locales support do not match.
- A valid object code-set conversion exists for the conversion between the client and database code sets.

When the client application begins execution, it compares the names of the client and database locales to determine whether to perform code-set conversion. If the **CLIENT_LOCALE** and **DB_LOCALE** environment variables are set, the client application uses these locale names to determine the client and database code sets, respectively. If **CLIENT_LOCALE** is not set (and **DBNLS** is *not* set), the client application assumes that the client locale is the default locale. If **DB_LOCALE** is not set (and **DBNLS** is *not* set), the client application assumes that the database locale is the same as the client locale (the value of **CLIENT_LOCALE**).

NLS

If **DBNLS** is set on the client application, the client application is to connect to an NLS database server. This client application still performs code-set conversion between the code sets that the **CLIENT_LOCALE** and **DB_LOCALE** environment variables indicate. However, if you set **DB_LOCALE** and *not* **CLIENT_LOCALE**, the client application performs code-set conversion between the client code set, which the **LC_CTYPE** environment variable indicates (or **LANG**, if **LC_CTYPE** is not set), and the database code set, which **DB_LOCALE** indicates. ♦

ALS

If the Version 9.1 or later client application is to connect to a Version 6.0 ALS database server, it sets **CLIENT_LOCALE** and **DB_LOCALE** to indicate the client and database locales. This client application still performs code-set conversion between the code sets that the **CLIENT_LOCALE** and **DB_LOCALE** environment variables indicate. If the Version 9.1 or later client application is to connect to a Version 5.x ALS database server, you must set **CLIENT_LOCALE** and **DB_LOCALE** to indicate the client and database code sets. In this case, the Version 9.1 or later client application performs code-set conversion between these two code sets. ♦

If the client and database code sets are the same, no code-set conversion is needed. However, if the code sets do not match, the client application must determine whether the two code sets are *convertible*. Two code sets are convertible if the client can locate the associated code-set-conversion files. These code-set-conversion files must exist on the client computer.

UNIX

You can use the **glfiles** utility to obtain a list of code-set conversions that your Informix product supports. For more information, see [“The glfiles Utility” on page A-21](#). ♦

WIN NT

You can examine the **%INFORMIXDIR%\gls\cvY** directory to determine the GLS code-set conversions that your Informix product supports. For more information on this directory, see [Appendix A](#). ♦

If no code-set-conversion files exist, the client application generates a run-time error when it starts up to indicate that the code sets are incompatible. If these code-set-conversion files exist, the client application automatically performs code-set conversion when it sends data to or receives data from the database server.

When a client application performs code-set conversion, it makes the following assumptions:

- All database data within the client application is handled in the client code set.
- All databases that the client application accesses on a single database server use the *same* database locale, territory, and code set. When the client application opens a different database, it does *not* recheck the database locale to determine if the code set has changed.



Warning: Check for the `SQLWARN7` warning flag after each request for a connection. If the two database locales do not match, the client application might be performing code-set conversion incorrectly. The client application continues to perform any code-set conversion based on the code set that **DB_LOCALE** supports. If you proceed with such a connection, it is your responsibility to understand the format of the data that is being exchanged.

For example, suppose your client application has **CLIENT_LOCALE** set to **en_us.1252** and **DB_LOCALE** set to **en_us.8859-1**. The client application determines that it must perform code-set conversion between the Microsoft 1252 code set (in the client locale) and the ISO8859-1 code set (in the database locale). The client application then opens a database with the French **fr_fr.8859-1** locale. The database server sets `SQLWARN7` and uses the locale of the database (**fr_fr.8859-1**) for the localized order of the data. However, your application might choose to use this connection. The code-set conversion that the client application performs is still valid because both database locales support the ISO8859-1 code set.

Instead, if the application opens a database with the Japanese SJIS (**ja_jp.sjis**) locale, the database server sets the `SQLWARN7` flag and uses the **ja_jp.sjis** locale for the localized order of the data. Your application would probably *not* continue with this connection. When the client application started, it determined that code-set conversion was required between the Microsoft 1252 and ISO8859-1 code sets. The client application performs this code-set conversion until it terminates. When you open a database with **ja_jp.sjis**, the client application would perform code-set conversion incorrectly. It would continue to convert between Microsoft 1252 and ISO8859-1 instead of between Microsoft 1252 and Japanese SJIS. This situation could lead to serious corruption of data.

Database Server Code-Set Conversion

An Informix database server automatically performs code-set conversion between the code sets of the server-processing locale and the server when the following conditions are true:

- The **CLIENT_LOCALE**, **DB_LOCALE**, and **SERVER_LOCALE** environment variables are set such that the code sets of the server-processing locale and the server locale are different.
- A valid code-set conversion exists between the code sets of the server locale and server-processing locale.

For a list of files for which Informix database servers perform code-set conversion, see [“Using the Server Locale” on page 4-3](#). For information on GLS code-set conversion files, see [page A-14](#).

Which Data Is Converted?

When the code sets of two locales differ, an Informix product must use code-set conversion to prevent data corruption of character data. Code-set conversion converts the following types of character data:

- SQL data types
 - CHAR and VARCHAR
 - NCHAR and NVARCHAR
 - TEXT (the BYTE data type is *not* converted)
- Any of the ESQL/C character data types (**char**, **fixchar**, **string**, and **varchar**)
- SQL statements, both static and dynamic
- Database objects such as:
 - Column names
 - Table names
 - Statement-identifier names
 - Cursor names
- Stored procedure text
- Command text
- Error message text in the **sqlca.sqlerrm** field



Tip: If your ESQL/C client application uses code-set conversion, you might need to take special programming steps. For more information, see [“Handling Code-Set Conversion” on page 6-12](#).

UNIX

WIN NT

Locating Message Files

Informix products use GLS locales to locate product-specific message files. By default, Informix products automatically search a subdirectory that is associated with the client locale for the product-specific message files.

Informix products search the **\$INFORMIXDIR/msg/lg_tr/code_set** directory. ♦

Informix products search the **%INFORMIXDIR%\msg\lg_tr\code_set** directory. ♦

In this path, *lg* and *tr* are the language and territory, respectively, from the name of the client locale, and *code_set* is the condensed form of the code-set name. For more information about condensed code-set names, see [“Locale-File Subdirectories” on page A-10](#).

Informix products use a precedence of environment variables to locate product-specific message files. The **DBLANG** environment variable lets you override the client locale, as the location of message files that Informix products use. You might use **DBLANG** to specify a directory where the message files reside for each locale that your environment supports. For more information, see the entry for **DBLANG** in [Chapter 2, “GLS Environment Variables.”](#)

How Do You Customize Client End-User Formats?

You can set environment variables to override the following end-user formats in the client locale:

- End-user format of date and time (DATE, DATETIME) values
- End-user format of monetary (MONEY) values

This section explains how to customize these end-user formats. For a description of an end-user format, see [page 1-12](#).

Customizing Date and Time End-User Formats

The GLS locales define end-user formats for dates and times, which you do not usually need to change. However, you can customize end-user formats for DATE and DATETIME values (for example, 10-27-97 for the date 10/27/97) with the following environment variables.

Environment Variable	Description
GL_DATE	Supports extended format strings for international formats in date end-user formats.
GL_DATETIME	Supports extended format strings for international formats in time end-user formats.
DBDATE	Specifies a date end-user format. <i>(Supported for backward compatibility.)</i>
DBTIME	Specifies a time end-user format for certain embedded-language (ESQL) library functions. <i>(Supported for backward compatibility.)</i>

A date or time end-user format string specifies a format for the manipulation of internal DATE or DATETIME values as a literal string. For more information, see [“End-User Formats” on page 1-12](#).

Tip: When you set these environment variables, you do not affect the internal format of the DATE and DATETIME values within a database.

The **GL_DATE** and **GL_DATETIME** environment variables support formatting directives that allow you to specify an end-user format. A formatting directive has the form %x (where x is one or more conversion characters). For the complete syntax of the **GL_DATE** and **GL_DATETIME** environment variables, see the entries for these environment variables in [“GLS-Related Environment Variables” on page 2-4](#).



Era-Based Date and Time Formats

The **GL_DATE** and **GL_DATETIME** environment variables provide support for alternative dates and times such as era-based (Asian) formats. These alternative formats support dates such as the Taiwanese Ming Guo year and the Japanese Imperial-era dates. For more information about these era-based date formats, see [“Date and Time Formats” on page 1-15](#).



Tip: The **DBDATE** and **DBTIME** environment variables also provide some support for era-based dates. See the entries for these environment variables in [Chapter 2, “GLS Environment Variables.”](#)

To specify era-based formats for DATE and DATETIME values, use the **E** conversion modifier, as follows:

- For either **GL_DATE** or **GL_DATETIME**, **E** can appear in several formatting directives.
For a list of valid formatting conversions for eras, see [“Alternative Time Formats” on page 2-39](#).
- For **DBDATE**, **E** can appear in the format specification.
For more information about date specifications, see the description of **DBDATE** in [Chapter 2, “GLS Environment Variables.”](#)

Date and Time Precedence

Informix products use the following precedence to determine the end-user format for an internal DATE value:

1. **DBDATE**
2. **GL_DATE**
3. Information that the client locale defines (**CLIENT_LOCALE**, if it is set)
4. **LC_TIME** (if **DBNLS** is set)

5. **LANG** (if **DBNLS** is set, and **LC_TIME** is not set)
If **LANG** is set, but **LC_TIME** is not, the client application sets **LC_TIME** from the **LANG** value; it does not send **LANG** to the database server. ♦
6. Default date format = %m/%d/%iy (if **DBDATE**, **GL_DATE** and **DBNLS** are not set, and no locale is specified)
For more information on these formatting directives, see the description of **GL_DATE** on [page 2-27](#).

Informix products use the following precedence to determine the end-user format for an internal DATETIME value:

1. **DBDATE** and **DBTIME**
2. **GL_DATETIME**
3. Information that the client locale defines (**CLIENT_LOCALE**, if it is set)
4. **LC_TIME** (if **DBNLS** is set)
If **LANG** is set, but **LC_TIME** is not, the client application sets **LC_TIME** from the **LANG** value; it does not send **LANG** to the database server.
5. **LANG** (if **DBNLS** is set, but **LC_TIME** is not set) ♦
6. Default DATETIME format = %iY-%m-%d %H:%M:%S (if **CLIENT_LOCALE**, **DBTIME**, **GL_DATETIME**, and **DBNLS** are not set)
For more information on these formatting directives, see the description of **GL_DATE** and **GL_DATETIME** on [pages 2-27](#) and [2-37](#), respectively.

Customizing Monetary Values

The GLS locales contain end-user formats, which you do not usually need to change. However, you can set the **DBMONEY** environment variable to customize the appearance of the currency notation. For information on the **DBMONEY** environment variable, see the [Informix Guide to SQL: Reference](#).

A monetary end-user format string specifies a format for the manipulation of internal DECIMAL, FLOAT, and MONEY values as monetary literal strings. For more information, see “[End-User Formats](#)” on page 1-12. Informix products use the following precedence to determine the end-user format for a MONEY value:

1. **DBMONEY**
2. Information that the client locale defines (**CLIENT_LOCALE**, identifies the client locale; if it and **DBNLS** are not set, the client locale is the default locale)
3. **LC_MONETARY** (if **DBNLS** is set)
4. **LANG** (if **DBNLS** is set, but **LC_MONETARY** is not set)
If **LANG** is set, but **LC_MONETARY** is not, the client application sets **LC_MONETARY** from the **LANG** value; it does not send **LANG** to the database server. ♦
5. Default currency notation = \$,.

If **DBMONEY** and **DBNLS** are not set, and no locale is specified, the currency symbol is the dollar sign, the thousands separator is the comma, and the decimal separator is the period.

GLS Environment Variables

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DB_LOCALE	2-18
DBMONEY	2-19
DBTIME	2-21
ESQLMF	2-23
GLS8BITFSYS	2-24
GL_DATE	2-26
GL_DATETIME	2-36
SERVER_LOCALE	2-42

Informix products establish the client, database, and server locales with information from GLS-related environment variables and from data that is stored in the database. This chapter provides descriptions of the GLS-related environment variables.

Setting and Retrieving Environment Variables

The GLS feature lets you use the diacritics, collating sequence, and monetary, date, and number conventions of the language that you select when you create databases. No ONCONFIG configuration parameters exist for GLS, but you must set the appropriate environment variables.

On UNIX platforms, set environment variables with the appropriate shell command (such as **setenv** for the C shell). For more information, refer to your UNIX shell documentation.

With INFORMIX-ESQL/C, you can use the C **putenv()** function to modify, create, and delete environment variables, and the C **getenv()** function to retrieve the values of environment variables from the operating-system environment. For details, see the [INFORMIX-ESQL/C Programmer's Manual](#). ♦

In Windows NT environments, set environment variables in the **registry** (with the SETNET32 utility) or in the **InetLogin** structure. For more information on SETNET32, see the Windows NT [Installation Guide](#) for your product. For more information on **InetLogin**, see the Microsoft Windows documentation for your SQL API.

With INFORMIX-ESQL/C, you can use the **ifx_putenv()** function to modify, create, and delete environment variables for the current local process and the **ifx_getenv()** function to retrieve the values of environment variables.



Important: If you use `ifx_putenv()`, the application must set all environment variables before it calls any other Informix library routine to avoid initializing the GLS routines and freezing the values of certain locale and formatting environment variables.

For details, see the [INFORMIX-ESQL/C Programmer's Manual](#). ♦

For detailed information about setting and manipulating GLS and Informix environment variables, see the [Informix Guide to SQL: Reference](#).

GLS-Related Environment Variables

The following table shows an alphabetical list of the GLS-related environment variables that you can set for Informix database servers and SQL API products. These environment variables are described in this chapter on the pages that are listed in the last column.

Environment Variable	Restrictions	Page
CC8BITLEVEL	ESQL / C only	2-5
CLIENT_LOCALE		2-7
DBDATE		2-9
DBLANG		2-16
DB_LOCALE		2-19
DBMONEY		2-20
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ESQLMF	ESQL / C only	2-24
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GL_DATETIME		2-37
SERVER_LOCALE		2-43

UNIX

Informix Gateway products on UNIX use the **GL_PATH** environment variable to override the default locations for GLS code-set conversion tables. For details, see the Version 7.2 or later INFORMIX-Enterprise Gateway documentation. ♦

Informix products support many other non-GLS environment variables. For a complete description of these environment variables, refer to the [Informix Guide to SQL: Reference](#).

CC8BITLEVEL

The **CC8BITLEVEL** environment variable indicates the ability of your C-language compiler to process non-ASCII (8-bit and multibyte) characters.



The value of the **CC8BITLEVEL** environment variable determines the type of processing that the ESQL/C filter, **esqlmf**, performs on non-ASCII characters. The following values are possible:

- 0 tells the **esqlmf** filter to convert all non-ASCII characters, in literal strings and comments to octal constants (for C compilers that do not support these uses of non-ASCII characters).
- 1 tells the **esqlmf** filter to convert non-ASCII characters in literal strings to octal constants but allow them in comments (some C compilers do support non-ASCII characters in comments).
- 2 tells the **esqlmf** filter to allow non-ASCII characters in literal strings and ensure that all the bytes in the non-ASCII characters have the eighth bit set (for C compilers with this requirement).
- 3 indicates that the **esqlmf** filter does not need to filter non-ASCII characters (for C compilers that support multibyte characters in literal strings and comments).



To invoke **esqlmf** each time that you process an ESQL/C file with the **esql** command, set the **ESQLMF** environment variable to 1 (see [page 2-24](#)). If you do not set **CC8BITLEVEL**, the **esql** command assumes a value for **CC8BITLEVEL** of 0.

Important: For **ESQLMF** to take effect, do not set **CC8BITLEVEL** to 3.

For more information on the actions that **esqlmf** takes, see “[The esqlmf Filter](#)” on [page 6-7](#).

CLIENT_LOCALE

The **CLIENT_LOCALE** environment variable specifies the *client locale*, which the client application uses to perform read and write operations on the client computer. (For information about the client locale, see [page 1-23](#).)

CLIENT_LOCALE

Locale Name
p. 1-20

WIN NT

Changes to **CLIENT_LOCALE** also should be reflected in the Windows NT **registry** database under HKEY_LOCAL_MACHINE. ♦

Informix products use the **CLIENT_LOCALE** environment variable for the following purposes:

- When the preprocessor for ESQL/C or ESQL/COBOL processes a source file, it accepts C or COBOL source code that is written in the code set of the **CLIENT_LOCALE**.

The C compiler and the operating system that you use might impose limitations on the ESQL/C program. For more information, see [“The esqlmf Filter” on page 6-7](#).

- When an ESQL/C or ESQL/COBOL client application executes, it checks **CLIENT_LOCALE** for the name of the client locale, which affects operating-system filenames, contents of text files, and formats of date, time, and numeric data.

For more information, see [“Non-ASCII Characters in ESQL Source Files” on page 5-4](#).

- When a client application and a database server exchange character data, the client application performs code-set conversion when the code set of the **CLIENT_LOCALE** environment variable is different from the code set of **DB_LOCALE** (on the client computer).

Code-set conversion prevents data corruption when these two code sets are different. For more information, see [“Performing Code-Set Conversion” on page 1-40](#).

- When the client application requests a connection, it sends information, including the **CLIENT_LOCALE**, to the database server. The database server uses **CLIENT_LOCALE** when it determines how to set the client-application information of the server-processing locale. For more information, see [“Establishing a Database Connection” on page 1-31](#).
- When database utilities create files, the filenames and file contents are in the code set that **CLIENT_LOCALE** specifies.
- When a client application looks for product-specific message files, it checks the message directory that is associated with the name of the client locale (**CLIENT_LOCALE**).

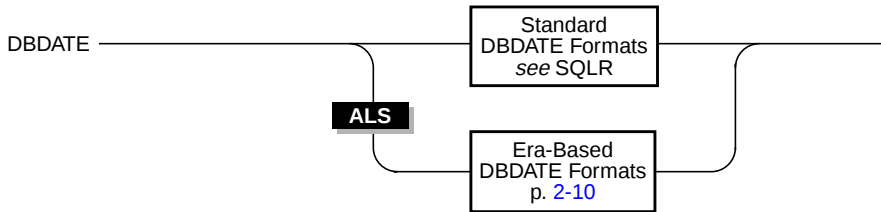
For more information, see [“Locating Message Files” on page 1-49](#).

If you do not set **CLIENT_LOCALE** (and **DBNLS** is also *not* set), the client application uses the default locale, U.S. English, as the client locale.

DBDATE

The **DBDATE** environment variable specifies the end-user formats of values in DATE columns. For more information on end-user formats, see [page 1-12](#).

Important: *DBDATE* is evaluated at system initialization time. If it is invalid, the system initialization fails.



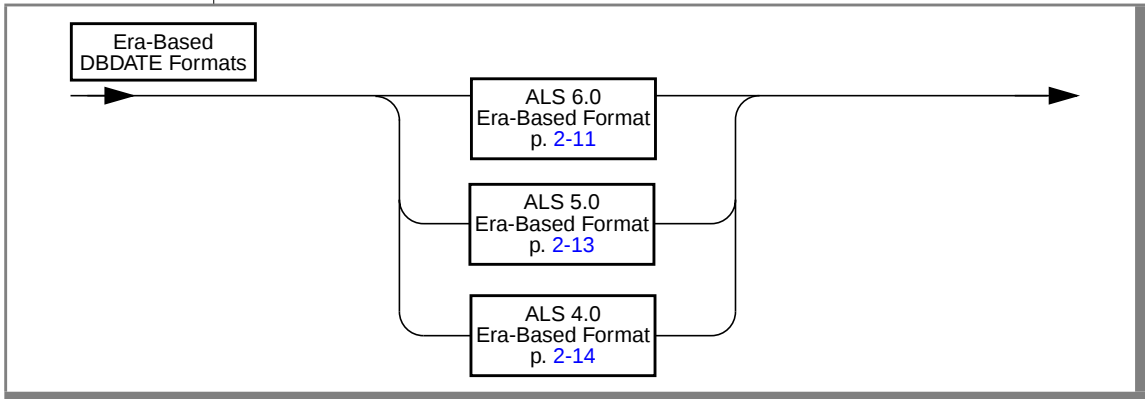
ALS

Informix products support the era-based extensions in **DBDATE** for backward compatibility with Informix ALS products. Informix recommends that you use the **GL_DATE** environment variable (see [page 2-27](#)) for date end-user formats in new client applications. ♦

For a description of the standard **DBDATE** formats and general information about this environment variable, refer to the [Informix Guide to SQL: Reference](#). This section describes the era-based (Asian) formats that **DBDATE** supports. For more information on era-based dates, see “[Era-Based Date and Time Formats](#)” on [page 1-51](#).

Era-Based DDBDATE Formats

The **DDBDATE** environment variable supports special extensions that format values in DATE columns as era-based date strings. The following diagram shows the syntax of the era-based date **DDBDATE** formats.



For **DDBDATE** to format era-based dates, you must have a client locale that supports eras. The **CLIENT_LOCALE** environment variable must specify the name of a locale that defines era information. If the client locale does not support eras, Informix products ignore these era-based formats.



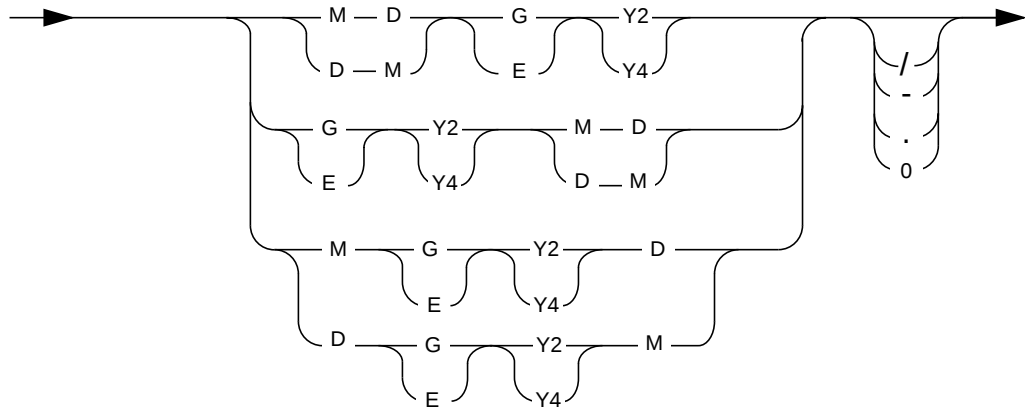
Tip: Era-based date formats can also appear in the date-format strings of certain ESQL library functions. For more information, see [“Extended DATE-Format Strings” on page 5-10](#).

ALS

ALS 6.0 Era-Based Format

The ALS 6.0 Era-Based Format syntax for **DBDATE** provides backward compatibility with Informix ALS Version 6.0 products.

ALS 6.0 Era-Based Format



The **G** and **E** era-year modifiers appear as a prefix to the year specifier to indicate how to format an era, as follows:

- The **G** era-year modifier formats the era as an abbreviated era name.
- The **E** era-year modifier formats the era as the full era name (usually a multibyte character).

The following table shows some sample era-based **DBDATE** formats that are compatible with Informix ALS Version 6.0 products. In this table, the sample outputs for these formats assume that the client locale is Japanese SJIS (**ja_jp.sjis**).

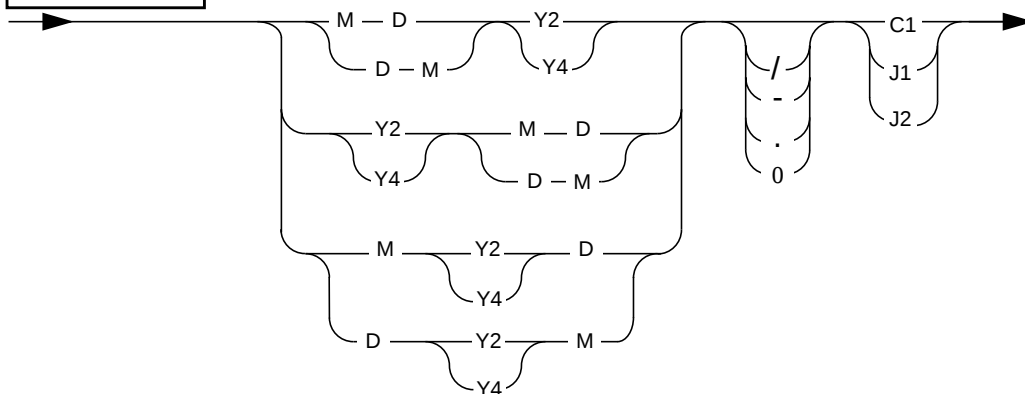
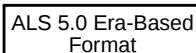
Description	DBDATE Setting	October 5, 1990 appears as:
Format with abbreviated era name	GY2MD/	H02/10/05
	MDGY2.	10.05.H02
	GY2MD0	H021005
	GY4DM/	H0002/05/10
Format with full era name	EY2MD/	A ¹ A ² 02/10/05
	MDEY20	1002A ¹ A ² 02
	EY2DM.	A ¹ A ² 02.05.10
	EY4MD/	A ¹ A ² 0002/10/05
	EY4DM-	A ¹ A ² 0002-05-10

In the preceding table, A¹A² is a multibyte character in the Japanese SJIS code set that represents the full era name. H is an ASCII character that represents the abbreviated era name. The Japanese SJIS locale (**ja_jp.sjis**) defines these era names.

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ALS 5.0 Era-Based Format

The ALS 5.0 Era-Based Format syntax for **DBDATE** provides backward compatibility with Informix ALS Version 5.0 products.



The C1, J1, and J2 era-year modifiers appear as an extension, at the end of the **DBDATE** format. They indicate how to format an era, as follows:

- The C1 era-year modifier formats the era as the abbreviated era name for a Taiwanese Ming Guo date.
- The J1 era-year modifier formats the era as the abbreviated era name for the Japanese Imperial era dates.
- The J2 era-year modifier formats the era as the full era name for the Japanese Imperial era dates.

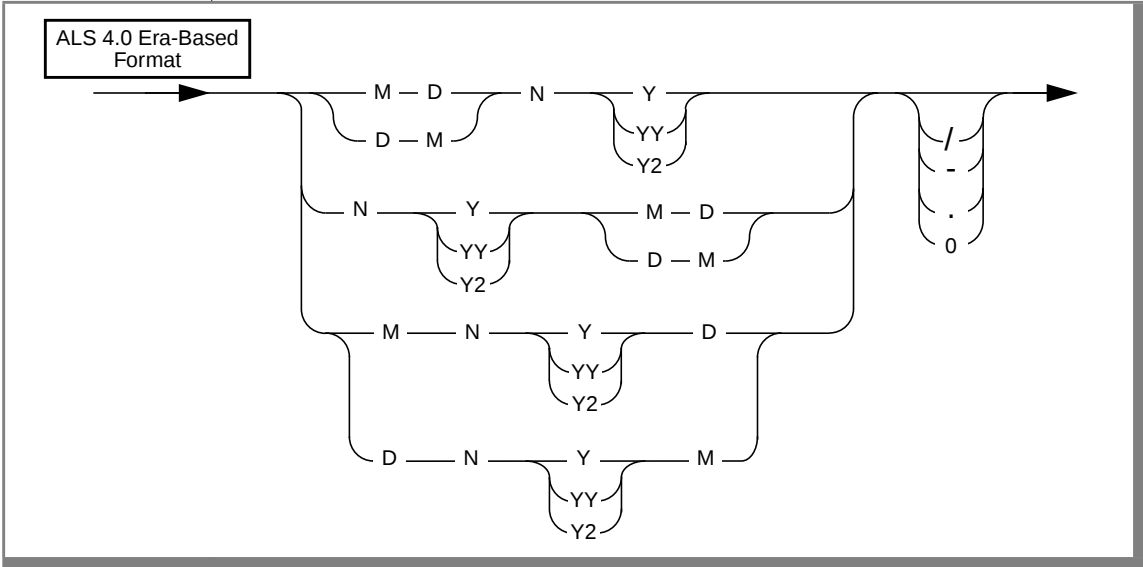
The following table shows some sample era-based **DBDATE** formats that are compatible with Informix ALS Version 5.0 products. In this table, the sample outputs for the Japanese Imperial era assume that the locale is **ja_jp.sjis** (Japanese SJIS). The Taiwanese Ming Guo dates assume a **zh_tw.big5** locale.

Description	DBDATE Setting	October 5, 1990 appears as:
Japanese Imperial era	Y2MD-J1	H02-10-05
	Y4MD/J1	H0002/10/05
	Y2MD/J2	A ¹ A ² 02/10/05
	Y4MD/J2	A ¹ A ² 0002/10/05
	DMY4J2	05/10/A ¹ A ² 0002
Taiwanese Ming Guo date	Y2MD/C1	79/10/05
	Y4MD/C1	0079/10/05
	DMY4.C1	05.10.0079

ALS

ALS 4.0 Era-Based Format

The ALS 4.0 Era-Based Format syntax for **DBDATE** provides backward compatibility with Ascii Corporation Version 4.0 Asian products.



The following table shows some sample era-based **DBDATE** formats that are compatible with Ascii Corporation 4.0 products. In this table, the sample outputs for these formats assume that the locale is Japanese (**ja_jp.sjis**).

Description	DBDATE Setting	October 5, 1990 appears as:
Japanese Imperial era	NYMD /	H02 / 10 / 05
	NYYMD /	H02 / 10 / 05
	MDNYY /	10 / 05 / H02
	NY2MD /	H02 / 10 / 05
	NY2DM-	H02-05-10

Scanning and Printing Era-Based Formats

For an Informix product to *scan* a date string that contains an era-based date, it expects the **DBDATE** environment variable to specify the era-based format of the value to scan. Suppose that you set **DBDATE** to the following end-user format:

```
EY2DM/
```

An Informix product uses this era-based **DBDATE** format to interpret a date string that it must convert to an internal DATE value as follows:

- **E** tells the Informix product to expect a multibyte character that represents the era name. For the Taiwanese locale (**zh_tw.big5**), you can omit the era name from the date string (the multibyte character is null).
- **Y2** tells the Informix product to expect a year offset for the era. This offset can be a 2-digit or a 4-digit numeric value.
- **D** tells the Informix product to expect a numeric value that represents the day of the month.
- **M** tells the Informix product to expect either a numeric value that represents the month or the month name, which the locale defines.
- The slash (/) identifies the date separator. However, the Informix product ignores the date separator when it scans a date string. Therefore, you can use any character as a date separator during the scan operation.

For an Informix product to *print* a date string that contains an era-based date, it expects **DBDATE** to indicate the era-based format of the value to print. With **DBDATE** set as in the previous example, an Informix product uses this end-user format to convert an internal DATE value to an era-based date string as follows:

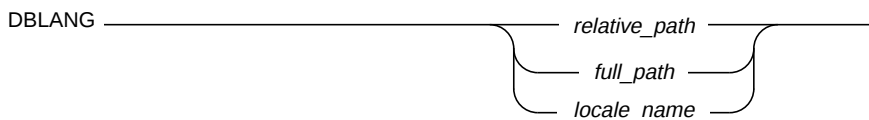
- E tells the Informix product to print the multibyte character that represents the era name.
- Y2 tells the Informix product to print a 2-digit year offset for the era.
- D tells the Informix product to print the numeric value that represents the day.
- M tells the Informix product to print the numeric value that represents the month.
- The slash (/) identifies the date separator that the Informix product prints between each portion of the date. This character must be one of the valid date separators during the print operation.

Tip: The **DBDATE** environment variable supports only the slash (/), period (.), and minus sign (-) as date separators. To specify some other character, including non-ASCII characters, as a date separator, use the **GL_DATE** environment variable.

For more information on the scan and print operations, see [“End-User Formats” on page 1-12](#).

DBLANG

The **DBLANG** environment variable specifies the subdirectory of **INFORMIXDIR** that contains the customized, language-specific message files that an Informix product uses.



- relative_path* is the subdirectory of the Informix installation directory (that **INFORMIXDIR** specifies).
- full_path* is the full pathname of the directory that contains the compiled message files.
- locale_name* is the name of a GLS locale that has the format *lg_tr.code_set*, where *lg* is a two-character name that represents the language for a specific locale, *tr* is a two-character name that represents the cultural conventions, and *code_set* is the name of the code set that the locale supports.



Tip: For a detailed description of the syntax of **DBLANG**, see the “[Informix Guide to SQL: Reference](#).”

Informix products locate product-specific message files in the following order:

1. If **DBLANG** is set to a *full_path*: the directory that *full_name* indicates
2. If **DBLANG** is set to a *relative_path*:
 - a. In **\$INFORMIXDIR/msg/\$DBLANG** on UNIX or **%INFORMIXDIR%\msg\%DBLANG%** on Windows NT
 - b. In **\$INFORMIXDIR/\$DBLANG** on UNIX or **%INFORMIXDIR%\%DBLANG%** on Windows NT
3. If **DBLANG** is set to a *locale_name*: the **msg** subdirectory for the locale in **\$INFORMIXDIR/msg/lg_tr/code_set** on UNIX systems or **%INFORMIXDIR%\msg\lg_tr\code_set** in Windows NT environments, where *lg*, *tr*, and *code_set* are the language, territory, and code set, respectively, in *locale_name*.

The value of **DBLANG** does not affect the messages that the database server writes to its message log. The database server obtains the locale for these messages from the **SERVER_LOCALE** environment variable.

NLS

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4. If **DBLANG** is *not* set: the **msg** subdirectory for the locale in **\$INFORMIXDIR/msg/lg_tr/code_set** on UNIX systems or **%INFORMIXDIR%\msg\lg_tr\code_set** in Windows NT environments, where *lg* and *tr* are the language and territory, respectively, from the locale that is associated with the Informix product, and *code_set* is the condensed name of the code set that the locale supports:
 - ❑ For Informix client products: *lg* and *tr* are from the client locale (from **CLIENT_LOCALE**, if it is set)
 - ❑ For Informix database server products: *lg* and *tr* are from the server locale (from **SERVER_LOCALE**, if it is set)
5. If **LANG** and **DBNLS** are set (the client uses NLS), but **DBLANG** is not set:
 - a. In **\$INFORMIXDIR/msg/\$LANG** on UNIX or **%INFORMIXDIR%\msg\%LANG%** on Windows NT
 - b. In **\$INFORMIXDIR/\$LANG** on UNIX or **%INFORMIXDIR%\%LANG%** on Windows NT ♦
6. If **DBLANG**, **CLIENT_LOCALE**, and **LANG** are not set:
 - a. In **\$INFORMIXDIR/msg/en_us/0333** on UNIX systems or **%INFORMIXDIR%\msg\en_us\0333** in Windows NT environments, an internal message directory for the default locale
 - b. In **\$INFORMIXDIR/msg/en_us.8859-1** on UNIX systems or **%INFORMIXDIR%\msg\en_us\8859-1** in Windows NT environments, the message directory of the default locale (for backward compatibility with Version 6.0 ALS products) ♦
 - c. In **\$INFORMIXDIR/msg** on UNIX systems or **%INFORMIXDIR%\msg** in Windows NT environments, the default Informix message directories
 - d. In **\$INFORMIXDIR/msg/english** on UNIX systems or **%INFORMIXDIR%\msg\english** in Windows NT environments, the message directory for the default locale of the operating system ♦

The compiled message files have the **.iem** file extension. For more information on **DBLANG**, see the [Informix Guide to SQL: Reference](#).

DB_LOCALE

The **DB_LOCALE** environment variable specifies the *database locale*, which the database server uses to handle locale-sensitive data types (NCHAR, NVARCHAR) of the database. (For information about the database locale, see [“The Database Locale” on page 1-26.](#))

DB_LOCALE

Locale Name p. 1-20

WIN NT

Changes to **DB_LOCALE** also should be reflected in the Windows NT **registry** database under HKEY_LOCAL_MACHINE. ♦

Informix products use the **DB_LOCALE** environment variable for the following purposes:

- When a client application and a database server exchange character data, the client application performs code-set conversion when the value of the **DB_LOCALE** environment variable (on the client computer) is different from the value of **CLIENT_LOCALE**.

Code-set conversion prevents data corruption when these two code sets are different. For more information, see [“Performing Code-Set Conversion” on page 1-40.](#)

- When the client application requests a connection, it sends information, including the **DB_LOCALE** (if it is set), to the database server.

The database server uses **DB_LOCALE** when it determines how to set the database information of the server-processing locale. For more information, see [“Sending the Client Locale” on page 1-32.](#)

- When a client application tries to open a database, the database server compares the value of the **DB_LOCALE** environment variable that the client application passes with the database locale that is stored in the database.

When a database server accesses data in columns with locale-specific data types (NCHAR, NVARCHAR), it uses the locale that is saved in the database. For more information, see [“Verifying the Database Locale” on page 1-33.](#)

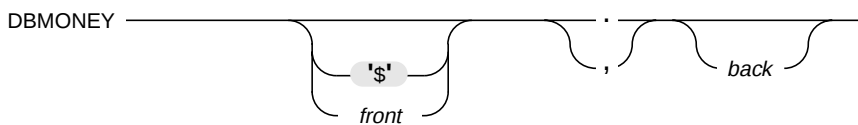
- When the database server creates a database, it examines the database locale (**DB_LOCALE**) to determine how to store character information in the system catalog of the database. If the database locale defines only a code-set order for collation (like the default locale, U.S. English), the database server creates CHAR and VARCHAR columns to store the character information. However, if the database locale defines a localized order for collation, the database server creates NCHAR and NVARCHAR columns to store this character information.

The database server uses the value of the **DB_LOCALE** environment variable that the client application sends. However, if you do not set **DB_LOCALE** on the client computer, the database server uses the value of **DB_LOCALE** on the server computer as the database locale.

For client applications, if you do not set **DB_LOCALE** on the client computer, the client applications assume that the database locale is the value of the **CLIENT_LOCALE** environment variable. However, the client application does not send this assumed value to the database server when it requests a connection.

DBMONEY

The **DBMONEY** environment variable specifies the end-user formats for values in MONEY columns. For more information about end-user formats, see [page 1-12](#).



Tip: For a detailed description of the syntax for **DBMONEY**, see the “[Informix Guide to SQL: Reference](#).”

With this environment variable, you can set the following currency notation:

- The currency symbol that appears before or after the monetary value
The *front* value specifies a currency symbol before the monetary value, and the *back* value specifies a currency symbol after the value. The currency symbol can be non-ASCII characters if your client locale supports a code set that defines the non-ASCII characters that you use.
- The monetary decimal separator, which separates the integral part of the monetary value from the fractional part
You can specify a comma (,) or a period (.) as the monetary decimal separator. When you use one of these symbols in the **DBMONEY** value, you implicitly assign the other symbol to the thousands separator.

For example, suppose you set **DBMONEY** as follows:

```
DM,
```

This value sets the following currency notation:

- The currency symbol, DM, appears before a monetary value.
- The decimal separator is a comma.
- The thousands separator is a period.

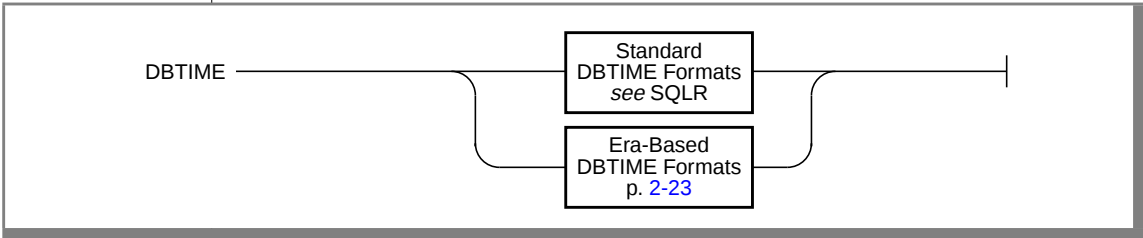
In the default locale, the currency symbol is the dollar sign (\$), and it appears at the front of the monetary values. The period (.) is the decimal separator, and the comma (,) is the thousands separator. The currency notation that you specify with **DBMONEY** takes precedence over the currency notation that the locale defines. For more information, see [“Customizing Monetary Values” on page 1-53](#).

DBTIME

The **DBTIME** environment variable specifies the end-user formats of values in DATETIME columns for SQL API routines. For more information on end-user formats, see [page 1-12](#).



Tip: The **DBTIME** environment variable affects only certain DATETIME and INTERVAL formatting routines in the INFORMIX-ESQL/COBOL and INFORMIX-ESQL/C function libraries. For information about how these library functions are affected, refer to “[DATETIME-Format Functions](#)” on [page 5-15](#).



ALS

Informix products support the era-based extension in **DBTIME** for backward compatibility with Informix ALS products. Informix recommends that you use the **GL_DATETIME** environment variable (see [page 2-37](#)) for date and time end-user formats in client applications for Version 9.1 or later databases. ♦

For a description of the standard **DBTIME** formats and general information about this environment variable, refer to the [Informix Guide to SQL: Reference](#). This section describes the era-based (Asian) formats that **DBTIME** supports. For more information on era-based dates and times, see “[Era-Based Date and Time Formats](#)” on [page 1-51](#).

Era-Based DBTIME Formats

The **DBTIME** environment variable supports special extensions to format values in DATETIME columns as era-based dates and times. The following diagram shows the syntax for the era-based formatting directives that **DBTIME** supports.

Era-Based
DBTIME Formats

'string'

string is the formatting directives that specify the end-user format for the DATETIME values. You can use any formatting directive that formats nonera-based dates and times. For a list of these formatting directives, see the entry for **DBTIME** in the [Informix Guide to SQL: Reference](#).

You can also use the era-based formatting directives that the following list describes:

- %EC** accepts either the full or the abbreviated era name during a scan; during a print, **%EC** is replaced by the full name of the base year of the era that the locale defines (same as **%C** if the locale does not define an era).
- %Eg** accepts either the full or the abbreviated era name during a scan; during a print, **%Eg** is replaced by the abbreviated name of the base year of the era that the locale defines (same as **%C** if the locale does not define an era).
- %Ey** is replaced by the offset from the start of the era that **%EC** or **%Eg** specifies. This date is the era year only (same as **%y** if the locale does not define an era).

Because DATETIME values must be compliant with ANSI-SQL standards, you cannot specify a literal DATETIME string that does not comply with these standards in an SQL statement.

The following examples show valid DATETIME input values for the given **DBTIME** formats.

DBTIME Format	December 27, 1991 appears as:
%b %d, %Y	Dec 27, 1991
%y %m %dc1	80 12 27
%Y %m %dc1	0080 12 27
%Eg%Ey %m %d %H:%M:%S	H03 12 27 22:12:10

You can include non-ASCII characters in an era-based **DBTIME** format if the client locale supports a code set that contains these characters. For example, suppose you set **CLIENT_LOCALE** to the Japanese SJIS locale (**ja_jp.sjis**). To specify the multibyte SJIS character A¹A² as the separator between hours, minutes, and seconds, you might set **DBTIME** to the following string:

```
%EC%Ey %m %d %HA1A2%MA1A2%SA1A2
```

With this **DBTIME** value and a Japanese client locale of **ja_JP.sjis**, a DATETIME value of “December 27, 1991 22:12:10” would be formatted as follows:

```
B1B203 12 27 22A1A212A1A222A1A2
```

In the preceding example, the multibyte character B¹B² is the full era name, which the client locale must define.

ESQLMF

The **ESQLMF** environment variable indicates whether the **esql** command automatically invokes the ESQL/C multibyte filter, **esqlmf**.





When you set **ESQLMF** to 1, the **esql** command invokes **esqlmf** to filter multibyte characters as part of the preprocessing for an ESQL/C source file. The value of the **CC8BITLEVEL** environment variable (see [page 2-5](#)) determines the type of filtering that **esqlmf** performs. For more information on the actions that **esqlmf** takes, see [“The esqlmf Filter” on page 6-7](#).

Important: For **ESQLMF** to take effect, **CC8BITLEVEL** must not be set to 3.

If you want to compile existing source code whose non-ASCII characters have already been converted, either set **ESQLMF** to 0 or do not set it. In either case, **esql** does not invoke **esqlmf**.

GLS8BITFSYS

The **GLS8BITFSYS** environment variable tells an Informix product whether the operating system can support non-ASCII characters in filenames.



When you set **GLS8BITFSYS** to 1 (or do not set it), Informix products can use non-ASCII characters (8-bit or multibyte characters) in the filename of an operating-system file that it generates. When you set **GLS8BITFSYS** to 0, Informix products generate filenames with 7-bit ASCII characters only.

You can set **GLS8BITFSYS** with other Informix database servers, but only the INFORMIX-SE database server and certain utilities and compilers check the value. ♦

SE

Restrictions on Non-ASCII Filenames

If your locale supports a code set with non-ASCII characters, restrictions apply to filenames for operating-system files that Informix products generate. Before you or an Informix product creates a file and assigns a filename, consider the following questions:

- Does your operating system support non-ASCII filenames?
- Does the Informix product accept non-ASCII filenames?

Making Sure That Your Operating System Is 8-Bit Clean

To support non-ASCII characters in filenames, your operating system must be *8-bit clean*. An operating system is 8-bit clean if it reads the eighth bit as part of the code value. In other words, the operating system must not ignore or make its own interpretation on the value of the eighth bit.

Informix recommends that you consult your operating-system manual or system administrator to determine whether your operating system is 8-bit clean before you decide to use a nondefault locale that contains non-ASCII characters in filenames that Informix products use and generate.

Setting the GLS8BITFSYS Environment Variable

Use the **GLS8BITFSYS** environment variable to tell Informix products whether the operating system is 8-bit clean. This environment variable determines whether an Informix product can use non-ASCII characters in the filename of an operating-system file that it generates:

- When you set **GLS8BITFSYS** to 1, Informix products assume that the operating system is 8-bit clean.

An Informix product can use non-ASCII characters in a filename. If you include non-ASCII characters in a filename that you specify from within a client application, you must ensure that the code set of the server-processing locale supports these non-ASCII characters. If you do not set **GLS8BITFSYS**, Informix database servers behave as if **GLS8BITFSYS** is set to 1.

- When you set **GLS8BITFSYS** to 0, Informix products assume that the operating system is *not* 8-bit clean.

An Informix product does *not* allow non-ASCII characters in filenames. If you include non-ASCII characters in a filename from within a client application, the Informix product uses an internal algorithm to convert these non-ASCII characters to ASCII characters. The filenames that result are 7-bit clean.

Filenames with invalid byte sequences generate errors when they are used with GLS-based products.

SE

Operating-System Files That Informix Products Generate

The value of the **GLS8BITFSYS** environment variable affects the filenames of the following types of files that Informix products generate:

- The INFORMIX-SE database server uses **GLS8BITFSYS** on the server computer to create files for database and table names.
For a list of these SE files, see [“Using the Server Locale” on page 4-3](#).
◆
- Some database utilities, such as **dbexport**, use **GLS8BITFSYS** on the client computer to create files.
- The compilers for INFORMIX-ESQL/C and INFORMIX-ESQL/COBOL products use **GLS8BITFSYS** on the client computer to create and use ESQL source files.

For a list of these files, see [“Non-ASCII Characters in ESQL Source Files” on page 5-4](#).

Once an Informix product has generated an operating-system file, it has written that filename and the file contents in a particular code set. Whenever an Informix product or client application needs to access that file, you must ensure that the product uses a server-processing locale that supports that same code set. For more information, refer to the section for your Informix product that the preceding list names.

GL_DATE

The **GL_DATE** environment variable specifies end-user formats of values for DATE columns. For more information on end-user formats, see [page 1-12](#).

Important: *GL_DATE* is evaluated when it is used. If it is invalid, the operations that called it fail.

The extended functionality of the **GL_DATE** environment variable replaces the functionality of the **DBDATE** environment variable (see [page 2-9](#)). Informix recommends that applications use **GL_DATE** instead of **DBDATE**.



An end-user format in **GL_DATE** can contain the following characters:

- One or more white-space characters, which the CTYPE category of the locale specifies
For more information on the CTYPE locale category, see [page A-6](#).
- An ordinary character (other than the % symbol or a white-space character)
- A formatting directive, which is composed of the % symbol followed by a conversion character that specifies the required replacement

GL_DATE _____ 'string' _____|

string is the formatting directives that specify the end-user format for **GL_DATE** values. You can use any formatting directive that formats dates. For a list of the era-based formatting directives, see [“Alternative Date Formats” on page 2-31](#).

You can also use the nonera-based formatting directives that the following list describes:

- %a is replaced by the abbreviated weekday name as defined in the locale.
- %A is replaced by the full weekday name as defined in the locale.
- %b is replaced by the abbreviated month name as defined in the locale.
- %B is replaced by the full month name as defined in the locale.
- %C is replaced by the century number (the year divided by 100 and truncated to an integer) as a decimal number (00 through 99).
- %d is replaced by the day of the month as a decimal number (01 through 31). A single digit is preceded by a zero (0).
- %D is the same as the %m / %d / %y format.

- %e** is replaced by the day of the month as a decimal number (1 through 31). A single digit is preceded by a space.
- %h** is the same as the **%b** formatting directive.
- %iy** is replaced by the year as a 2-digit decade (00 through 99) for both scanning and printing. It is the Informix-specific formatting directive for **%y**. For more information, see [“The Year Formatting Directives” on page 2-30](#).
- %iY** is replaced by the year as a 4-digit decimal number (0000 through 9999) for both scanning and printing. It is the Informix-specific formatting directive for **%Y**. For more information, see [“The Year Formatting Directives” on page 2-30](#).
- %m** is replaced by the month as a decimal number (01 through 12).
- %n** is replaced by a newline character.
- %t** is replaced by the TAB character.
- %w** is replaced by the weekday as a decimal number (0 through 6); 0 represents the locale equivalent of Sunday.
- %x** is replaced by a special date representation that the locale defines.
- %y** requires that the year be a 2-digit decimal number (00 through 99) for both scanning and printing. For more information, see [“The Year Formatting Directives” on page 2-30](#).
- %Y** requires that the year be a 4-digit decimal number (0000 through 9999) for both scanning and printing. For more information, see [“The Year Formatting Directives” on page 2-30](#).
- %%** is replaced by % (to allow % in the format string).

White-space or other nonalphanumeric characters must appear between any two formatting directives. For example, if you use a U.S. English locale, you might want to format an internal DATE value for 03/05/1997 in the ASCII string format that the following example shows:

```
Mar 05, 1997 (Wednesday)
```

To do so, set the **GL_DATE** environment variable as follows:

```
%b %d, %Y (%A)
```

If a **GL_DATE** format does not correspond to any of the valid formatting directives, the behavior of the Informix product when it tries to format is undefined.

Tip: The **GL_DATETIME** environment variable accepts these date-formatting directive in addition to those that the section on [page 2-37](#) lists.



The Year Formatting Directives

You can use the following formatting directives in the end-user format of the **GL_DATE** environment variable to format the year of a date string: **%y**, **%iy**, **%Y**, and **%iY**. The **%iy** and **%iY** formatting directives provide compatibility with the Y2 and Y4 year specifiers of the **DBDATE** environment variable.

When an Informix product uses an end-user format to *print* an internal date value as a string, the **%iy** and **%iY** formatting directives perform the same task as **%y** and **%Y**, respectively. To print a year with one of these formatting directives, an Informix product performs the following actions:

- The **%iy** and **%y** formatting directives both print the year of an internal date value as a 2-digit decade.
For example, when you set **GL_DATE** to '%y %m %d' or '%iy %m %d', an internal date for March 5, 1997 formats to '97 03 05'.
- The **%iY** and **%Y** formatting directives both print the year of an internal date value as a 4-digit year.
For example, when you set **GL_DATE** to '%Y %m %d' or '%iY %m %d', the internal date for March 5, 1997 formats to '1997 03 05'.

When an Informix product uses an end-user format to *scan* a date, the **%iy** and **%iY** formatting directives perform differently from **%y** and **%Y**, respectively. The following table summarizes how the year formatting directives behave when an Informix product uses them to scan date strings.

GL_DATE Format	Date String to Scan	
	'1994 03 06'	'94 03 06'
%y %m %d	<i>Error</i>	Internal date for 1994 03 06
%iy %m %d	Internal date for 1994 03 06	Internal date for 1994 03 06
%Y %m %d	Internal date for 1994 03 06	Internal date for 0094 03 06
%iY %m %d	Internal date for 1994 03 06	Internal date for 1994 03 06

In a scan of a date string, the **%iy** and **%y** formatting directives both assume the current century for a 2-digit year. However, you can set the **DBCENTURY** environment variable to change this assumption. For details, see the [Informix Guide to SQL: Reference](#).

For more information on how Informix products use end-user formats to scan and print strings, see [“End-User Formats” on page 1-12](#).

Alternative Date Formats

To support alternative date formats in an end-user format, **GL_DATE** accepts the following *conversion modifiers*:

- **E** indicates use of an alternative era format, which the locale defines.
- **O** (the letter O) indicates use of alternative digits, which the locale also defines.

The following table shows date-formatting directives that support conversion modifiers.

Alternative Date Format	Description
%EC	Accepts either the full or the abbreviated era name for scanning; for printing, %EC is replaced by the full name of the base year (period) of the era that the locale defines (same as %C if locale does not define an era).
%Eg	Accepts either the full or the abbreviated era name for scanning; for printing, %Eg is replaced by the abbreviated name of the base year (period) of the era that the locale defines (same as %C if locale does not define an era).
%Ex	Is replaced by a special date representation for an era that the locale defines (same as %x if locale does not define an era).
%Ey	Is replaced by the offset from %EC of the era that the locale defines. This date is the era year only (same as %y if locale does not define an era).
%EY	Is replaced by the full era year, which the locale defines (same as %Y if locale does not define an era).
%Od	Is replaced by the day of the month in the alternative digits that the locale defines (same as %d if locale does not define alternative digits).
%Oe	Is the same as %Od (same as %e if locale does not define alternative digits).
%Om	Is replaced by the month in the alternative digits that the locale defines (same as %m if locale does not define alternative digits).
%Ow	Is replaced by the weekday as a single-digit number (0 through 6) in the alternative digits that the locale defines (same as %w if locale does not define alternative digits). The equivalent of zero (0) represents the locale equivalent of Sunday.
%Oy	Is replaced by the year as a 2-digit number (00 through 99) in the alternative digits that the locale defines (same as %y if locale does not define alternative digits). For information about how to format a year value, see the description of %y .
%OY	Is the same as %EY (same as %Y if locale does not define alternative digits).

The TIME category of the locale defines the following era information:

- The full and abbreviated names for an era
- A special date representation for the era (which the %Ex formatting directive uses)

The NUMERIC category of the locale defines the alternative digits for a locale (which the %Ox formatting directives use). For more information on the TIME and NUMERIC categories of a locale, see [page A-4](#).

For a description of the era-based formats for DATETIME values, see “[Alternative Time Formats](#)” on [page 2-39](#).

Optional Date Format Qualifiers

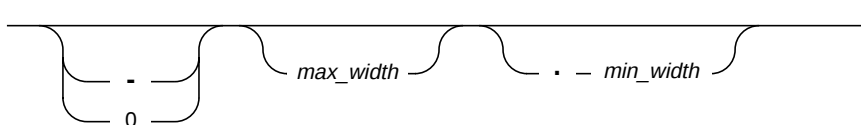
You can specify the following optional *format qualifiers* immediately after the % symbol of the formatting directive. A date format qualifier defines a field specification for the date that the Informix product scans or prints. The following sections describe what a field specification means for the scan and print operations. (For more information on the scan and print operations, see “[End-User Formats](#)” on [page 1-12](#).)



Tip: The `GL_DATETIME` environment variable accepts these date format qualifiers in addition to those that “[Optional Time Format Qualifiers](#)” on [page 2-40](#) lists.

Field Specification for a Scan

When an Informix product uses an end-user format to scan a date string, the field specification defines the number of characters to expect as input. This field specification has the following syntax.



max_width is a decimal number that indicates the maximum number of characters to scan

min_width is a decimal number that indicates the minimum number of characters to scan

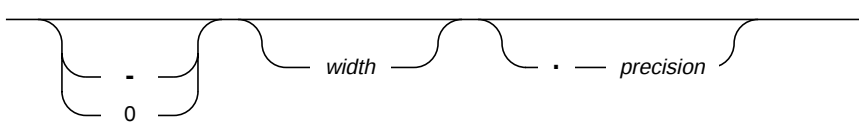
The first character of the field specification indicates whether to assume that the field value is justified or padded, as follows:

- If the first character is a minus sign (-), an Informix product assumes that the field value is *left justified* and begins with a digit; this value can include trailing spaces.
- If the first character is a zero (0), an Informix product assumes that the field value is *right justified* and any zeros on the left are pad characters (they are not significant).
- If the first character is neither a minus sign nor a zero (0), the Informix product assumes that the field value is *right justified* and any spaces on the left are pad characters. However, if the field value begins with a zero, it cannot include pad characters.

An Informix product ignores the field specification if the field value is not a numeric value.

Field Specification for a Print

When an Informix product uses an end-user format to print a date string, the field specification defines the number of characters to print as output. This field specification has the following syntax.



width is a decimal number that indicates a minimum field width for the printed value

precision is a decimal number that indicates the precision to use for the field value. The meaning of the precision value depends on the particular formatting directive with which it is used, as the following table shows.

Formatting Directives	Description
%C, %d, %e, %Ey, %iy, %iY, %m, %w, %y, %Y	Value of <i>precision</i> specifies the minimum number of digits to print. If a value supplies fewer digits than <i>precision</i> specifies, an Informix product pads the value with leading zeros. The %d , %Ey , %iy , %m , %w , and %y formatting directives have a default precision of 2. The %Y directive has no precision default; year 0001 would be formatted as 1 rather than as 0001.
%a, %A, %b, %B, %EC, %Eg, %h	Value of <i>precision</i> specifies the maximum number of characters to print. If a value supplies more characters than <i>precision</i> specifies, an Informix product truncates the value.

(1 of 2)

Formatting Directives	Description
%D	Values of <i>width</i> and <i>precision</i> affect each element of these formatting directives. For example, %6.4D prints as follows: %6.4m / %6.4d / %6.4y
%Ox	For formatting directives that include the O modifier (alternative digits), the value of <i>precision</i> is still the minimum number of digits to print. The <i>width</i> value defines the format width rather than the actual number of digits.
%Ex, %EY, %n, %t, %x, %%	The values of <i>width</i> and <i>precision</i> have no effect on these formatting directives.

(2 of 2)

For example, the following formatting directive displays the month as a decimal number with a maximum field width of 4:

%4m

The following formatting directive displays the day of the month as a decimal number with a minimum field width of 3 and a maximum field width of 4:

%4.3d

The first character of the field specification indicates whether to justify or pad the field value, as follows:

- If the first character is a minus sign (-), an Informix product prints the field value as *left justified* and pads this value with spaces on the right.
- If the first character is a zero (0), an Informix product prints the field value as *right justified* and pads this value with zeros on the left.
- If the first character is neither a minus sign nor a zero (0), an Informix product prints the field value as *right justified* and pads this value with spaces on the left.

GL DATETIME

The **GL_DATETIME** environment variable specifies the end-user formats of values in DATETIME columns. For more information on end-user formats, see [page 1-12](#).



Important: The **GL_DATETIME** environment variable supports a superset of the formatting directives of the **DBTIME** environment variable (see [page 2-22](#)). Informix recommends that applications use **GL_DATETIME** instead of **DBTIME**.

A **GL DATETIME** format can contain the following characters:

- One or more white-space characters, which the CTYPE category of the locale specifies
- For more information on the CTYPE locale category, see [page A-6](#).
- An ordinary character (other than the % symbol or a white-space character)
 - A formatting directive, which is composed of the % symbol followed by a conversion character that specifies the required replacement

For more information on the CTYPE locale category, see [page A-6](#).

GL DATETIME _____ 'string' _____

string contains the formatting directives that specify the end-user format for **GL_DATETIME** values. You can use any formatting directive that formats dates or times. For a list of formatting directives for dates, see the description of **GL_DATE** on [page 2-27](#). For a list of the era-based formatting directives for time values, see “[Alternative Time Formats](#)” on [page 2-39](#).

You can also use the nonera-based time formatting directives that the following list describes:

%c is replaced by a special date/time representation that the locale defines.

`%Fn` is replaced by the value of the fraction of a second with precision that is specified by the integer *n*. The default value of *n* is 2; the range of *n* is $0 \leq n \leq 5$. This value overrides any width or precision between the `%` and `F` character (see [page 2-40](#)).

- %H is replaced by the hour as a decimal number (00 through 23) (24-hour clock).
- %I is replaced by the hour as a decimal number (00 through 12) (12-hour clock).
- %M is replaced by the minute as a decimal number (00 through 59).
- %p is replaced by the A.M. or P.M. equivalent as defined in the locale.
- %r is replaced by the commonly used time representation for a 12-hour clock format (including the A.M. or P.M. equivalent) as defined in the locale.
- %R is replaced by the time in 24-hour notation (%H:%M).
- %S is replaced by the second as a decimal number (00 through 61). The second can be up to 61 instead of 59 to allow for the occasional leap second and double leap second.
- %T is replaced by the time in the %H:%M:%S format.
- %X is replaced by the commonly used time representation as defined in the locale.

White-space or other nonalphanumeric characters must appear between any two formatting directives. If a **GL_DATETIME** format does not correspond to any of the valid formatting directives, the behavior of the Informix product when it tries to format is undefined.

In addition to the formatting directives that the preceding table lists, you can include the following date-formatting directives in the end-user format of **GL_DATE**:

%a, %A, %b, %B, %C, %d, %D, %e, %h, %iy, %iY, %m, %n, %t, %w,
%x, %y, %Y, %%

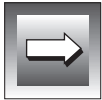
For more information on these date-formatting directives, see the **GL_DATE** environment variable on [page 2-27](#).

For example, if you use an U.S. English locale, you might want to format an internal DATETIME YEAR TO SECOND value to the ASCII string format that the following example shows:

```
Mar 21, 1997 at 16 h 30 m 28 s
```

To do so, set the **GL_DATETIME** environment variable as the following line shows:

```
%b %d, %Y at %H h %M m %S s
```



Important: The value of **GL_DATETIME** affects the behavior of certain ESQL library functions if the **DBTIME** environment variable ([page 2-22](#)) is not set. (For information about how these library functions are affected, refer to “[DATETIME-Format Functions](#)” on [page 5-15](#).) The value of **DBTIME** takes precedence over that of **GL_DATETIME**.

Alternative Time Formats

To support alternative time formats in an end-user format, **GL_DATETIME** accepts the following *conversion modifiers*:

- E indicates use of an alternative era format, which the locale defines.
- O (the letter O) indicates use of alternative digits, which the locale also defines.

The following table shows time-formatting directives that support conversion modifiers.

Alternative Time Format	Description
%Ec	is replaced by a special date/time representation for the era that the locale defines (same as %c if locale does not define an era).
%EX	is replaced by a special time representation for the era that the locale defines (same as %X if locale does not define an era).
%OH	is replaced by the hour in the alternative digits that the locale defines (24-hour clock) (same as %H if locale does not define alternative digits).

(1 of 2)

Alternative Time Format	Description
%OI	is replaced by the hour in the alternative digits that the locale defines (12-hour clock) (same as %I if locale does not define alternative digits).
%OM	is replaced by the minute with the alternative digits that the locale defines (same as %M if locale does not define alternative digits).
%OS	is replaced by the second with the alternative digits that the locale defines (same as %S if locale does not define alternative digits).

(2 of 2)

The TIME category of the locale defines the following era information:

- The full and abbreviated names for an era
- A special date representation for the era (which the %Ex formatting directive uses)
- A special time representation for the era (which the %EX formatting directive uses)
- A special date/time representation for the era (which the %Ec formatting directive uses)

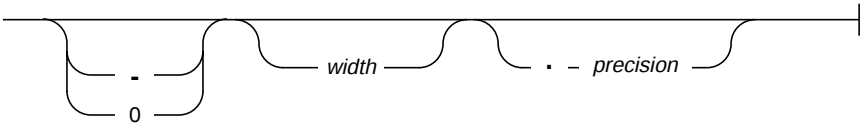
The NUMERIC category of the locale defines the alternative digits for a locale (which the %Ox formatting directives use). For more information on the TIME and NUMERIC categories of a locale, see [page A-4](#).

GL_DATETIME also supports the era-based date-formatting directives in an end-user format. For more information, see “[Alternative Date Formats](#)” on [page 2-31](#).

Optional Time Format Qualifiers

You can specify the following optional *format qualifiers* immediately after the % symbol of the formatting directive. A time format qualifier defines a field specification for the time (or date and time) that the Informix product scans or prints. This section describes what a field specification means for the print operation. For a description of what a field specification means for the scan operation, see [page 2-34](#). For general information on the scan and print operations, see “[End-User Formats](#)” on [page 1-12](#).

When an Informix product uses an end-user format to print a string from an internal format, the field specification defines the number of characters to print as output. This field specification has the following syntax.



- width* is a decimal number that indicates a minimum field width for the printed value
- precision* is a decimal number that indicates the precision to use for the field value. The meaning of the precision value depends on the particular formatting directive with which it is used, as the following table shows.

Formatting Directives	Description
%E, %H, %I, %M, %S	Value of <i>precision</i> specifies the minimum number of digits to print. If a value supplies fewer digits than the <i>precision</i> specifies, an Informix product pads the value with leading zeros. The %H, %M, and %S formatting directives have a default precision of 2.
%p	Value of <i>precision</i> specifies the maximum number of characters to print. If a value supplies more characters than the <i>precision</i> specifies, an Informix product truncates the value.
%R, %T	Values of <i>width</i> and <i>precision</i> affect each element of these formatting directives. For example, %6.4R prints as follows: %6.4H:%6.4M
%F	Value of <i>precision</i> can follow this directive as an optional precision specification. This value must be between 1 and 5. Otherwise, an Informix product generates an error. This precision value overrides any <i>precision</i> value that you specify between the % symbol and the formatting directive.

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Formatting Directives	Description
%Ox	For formatting directives that include the O modifier, value of <i>precision</i> is still the minimum number of digits to print. The <i>width</i> value defines the format width rather than the actual number of digits.
%c, %Ec, %EX, %X	The values of <i>width</i> and <i>precision</i> have no effect on these formatting directives.

(2 of 2)

For example, the following formatting directive displays the minute as a decimal number with a maximum field width of 4:

%4M

The following formatting directive displays the hour as a decimal number with a minimum field width of 3 and a maximum field width of 6:

%6.3H

The first character of the field specification indicates whether to justify or pad the field value, as follows:

- If the first character is a minus sign (-), an Informix product prints the field value as *left justified* and pads this value with spaces on the right.
- If the first character is a zero (0), an Informix product prints the field value as *right justified* and pads this value with zeros on the left.
- If the first character is neither a minus sign nor a zero (0), an Informix product prints the field value as *right justified* and pads this value with spaces on the left.

SERVER_LOCALE

The **SERVER_LOCALE** environment variable specifies the *server locale*, which the database server uses to perform read and write operations that involve operating-system files on the server computer. (For information about the server locale, see [“The Server Locale” on page 1-27.](#))

SERVER_LOCALE

Locale Name p. 1-20

WIN NT

Changes to **SERVER_LOCALE** also should be reflected in the Windows NT **registry** database under HKEY_LOCAL_MACHINE. ♦

The database server uses the **SERVER_LOCALE** environment variable for the following purposes:

- When the Informix database server writes its operating-system files, it uses the server code set (which **SERVER_LOCALE** specifies).

For a list of operating-system files for your database server, see [“Using the Server Locale” on page 4-3.](#)

- When a database server looks for product-specific message files, it looks in the message directory that is associated with the name of the server locale (**SERVER_LOCALE**).

For more information, see [“Locating Message Files” on page 1-49.](#)

- On operating systems that are 8-bit clean, the INFORMIX-SE database server stores the names of database objects (such as the database name and table names) in the code set that **SERVER_LOCALE** specifies.

On operating systems that are *not* 8-bit clean, SE can convert any non-ASCII characters in these names to ASCII characters. Set the **GLS8BITFSYS** environment variable to indicate whether the operating system is 8-bit clean. For more information, see [“Using the Server Locale” on page 4-3.](#) ♦

Tip: If you do not set **SERVER_LOCALE**, Informix database servers use the default locale, U.S. English, as the server locale.



SE

SQL Features

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T

his chapter explains how the GLS feature affects the Informix implementation of SQL. It describes how the choice of a locale affects the following topics:

- The names that you use for database objects in data definition statements such as CREATE TABLE and CREATE INDEX
- The behavior of character data types such as CHAR, VARCHAR, NCHAR, and VARCHAR
- Collation order in the CREATE INDEX and SELECT statements
- The use of non-ASCII characters in quoted strings, comments, column substrings, and the TRIM function in SELECT and other statements
- The SQL length functions
- The behavior of the MONEY data type
- The behavior of data manipulation statements such as INSERT, DELETE, and UPDATE and load statements

For descriptions of SQL features that are not unique to the GLS feature, see the *Informix Guide to SQL: Syntax*. For additional information on the Informix implementation of SQL, consult the *Informix Guide to SQL: Reference*, the *Informix Guide to SQL: Tutorial*, and the *Informix Guide to Database Design and Implementation*.

UD

Dynamic Server with UD Option extends the functionality of relational databases to an object-oriented relational database with the creation of new data types. For information about how these new data types might affect global language support, see [Chapter 4, “Database Server Features.”](#) ♦



Naming Database Objects

You need to assign names to database objects when you use data definition statements such as CREATE TABLE and CREATE INDEX. This section describes considerations for naming database objects when you use a nondefault locale. In particular, this section explains which SQL identifiers and delimited identifiers accept non-ASCII characters.

Important: To use a nondefault locale, you must set the appropriate locale environment variables for Informix products. For more information, see [“A Nondefault Locale” on page 1-28](#).

Rules for Identifier Names

An SQL identifier is a sequence of letters, digits, and underscores that represents the name of a database object such as a table, column, index, or view. The following table summarizes the rules for SQL identifiers.

SQL Identifier Rules	For More Information
An SQL identifier must begin with a letter or with an underscore. The remaining characters in the identifier can be any combination of letters, numbers, and underscores.	“Valid Characters in Identifier Names” on page 3-9
You cannot include white-space characters in identifiers unless you use them in a delimited identifier. You cannot use SQL reserved words as identifiers unless you use them in a delimited identifier.	“Non-ASCII Characters in Delimited Identifiers” on page 3-10
An SQL identifier can contain up to 18 bytes. The only exception is that database names are limited to 10 bytes in INFORMIX-SE.	“Multibyte Characters and Identifier Length” on page 3-11

UD

Identifiers That Support Non-ASCII Characters

If you use a nondefault locale that supports a code set with non-ASCII characters, you can use these non-ASCII characters to form most SQL identifiers. Figure 3-1 shows the SQL identifiers that support non-ASCII characters (except for Dynamic Server with UD Option).

For additional supported SQL identifiers for Dynamic Server with UD Option, see [Figure 4-1 on page 4-8](#). ♦

In this table, the SQL Identifier column lists the name of each database object. The SQL Segment column shows the segment that gives the complete syntax of the identifier in the *Informix Guide to SQL: Syntax*. (For more information, see [“References to SQL Segments” on page 3-7](#).) The Notes column describes any special considerations for the identifier and also provides an example of an SQL statement that creates or uses the identifier.

All SQL identifiers in Figure 3-1 can be used with all Informix databases unless the Notes column indicates otherwise.

Figure 3-1
SQL Identifiers That Support Non-ASCII Characters

SQL Identifier	SQL Segment	Notes
Column name	Expression	An example of an SQL statement that creates a column name is CREATE TABLE.
Connection name	Quoted string	An example of an SQL statement that creates a connection name is CONNECT. For more information, see “Specifying Quoted Strings” on page 3-34 .
Constraint name	Constraint name	An example of an SQL statement that creates a constraint name is CREATE TABLE.
Cursor name	Identifier	An example of an SQL statement that creates a cursor name is DECLARE. For more information, see “Using Non-ASCII Characters in Source Code” on page 5-6 .

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AD/XP

SQL Identifier	SQL Segment	Notes
Database name	Database name	An example of an SQL statement that creates a database name is CREATE DATABASE. Restrictions apply when you use multibyte characters for database names in SE. For more information, see “Generating Non-ASCII Filenames” on page 4-9.
Filename	None	An example of an SQL statement that specifies a pathname and filename is LOAD. The syntax for pathnames and filenames (including log files) depends on the operating system. If you use multibyte characters in pathnames, you limit portability of the files to those operating systems that can support multibyte filenames. For more information, see “Generating Non-ASCII Filenames” on page 4-9. Dynamic Server with AD and XP Options does not support non-ASCII characters in filenames and pathnames. ♦
Host variable name	None	An example of an SQL statement that specifies a host variable is FETCH. For more information, see “Using Non-ASCII Characters in Source Code” on page 5-6.
Index name	Index name	An example of an SQL statement that creates an index name is CREATE INDEX.
Role name	Identifier	An example of an SQL statement that creates a role name is CREATE ROLE. You cannot execute statements that are related to roles in SE.
Statement identifier	Identifier	An example of an SQL statement that creates a statement identifier is PREPARE. For more information, see “Using Non-ASCII Characters in Source Code” on page 5-6.

(2 of 3)

SQL Identifier	SQL Segment	Notes
Stored procedure name	Procedure name	An example of an SQL statement that creates a stored procedure name is CREATE PROCEDURE.
Stored procedure variable name	Expression	An example of an SQL statement that creates a stored procedure variable name is CREATE PROCEDURE.
Synonym name	Synonym name	An example of an SQL statement that creates a synonym name is CREATE SYNONYM.
Table name	Table name	An example of an SQL statement that creates a table name is CREATE TABLE. Restrictions apply when you use multibyte characters for table names in SE. For more information, see “Generating Non-ASCII Filenames” on page 4-9.
Trigger correlation name	Identifier	An example of an SQL statement that creates a trigger correlation name is CREATE TRIGGER.
Trigger name	Identifier	An example of an SQL statement that creates a trigger name is CREATE TRIGGER.
View name	View name	An example of an SQL statement that creates a view name is CREATE VIEW.

(3 of 3)

References to SQL Segments

The SQL Segment column in [Figure 3-1 on page 3-5](#) refers to the segment in the *Informix Guide to SQL: Syntax* that gives the complete syntax of the identifier. In many cases, the complete syntax of an SQL segment can include other identifiers. For example, the Index Name segment in the *Informix Guide to SQL: Syntax* shows that the syntax of an index name can include a database name, a database server name, and an owner name as well as the simple name of the index.

When you look up a particular object in [Figure 3-1 on page 3-5](#), keep in mind that the simple name of the object accepts multibyte characters, but the other identifiers in the syntax for that object accept multibyte characters only if they also appear in the table. For example, the database name identifier within the Index Name segment accepts multibyte characters, but the database-server-name identifier within the Index Name segment does not accept multibyte characters.

Owner Name in SQL Identifiers

The owner name provides further identification of a database object within a database.

ANSI

The ANSI term for an owner name is a schema name. ♦

The ability to put non-ASCII characters in the owner-name portion of an identifier depends on whether your operating system supports multibyte characters in user names.

UNIX

If your database server is on a computer with the UNIX operating system, the owner-name qualifier defaults to the UNIX login ID. However, most versions of UNIX do not support multibyte characters in the UNIX login IDs. ♦

You can use multibyte characters in owner names if you explicitly specify an owner name (in single quotes) when you create database objects. For example, you can assign an owner name that contains multibyte characters when you put the owner-name portion of the index name in quotes in a CREATE INDEX statement.



Warning: *If you specify multibyte characters in an owner name on a UNIX system, you do so at your own risk. If a UNIX login ID is used to match the owner name, the match might fail.*

The following example shows a CREATE INDEX statement that specifies a multibyte owner name. In this example, the owner name consists of three 2-byte characters:

```
CREATE INDEX 'A1A2B1B2C1C2'.myidx ON mytable (mycol)
```

The preceding example assumes that the client locale supports a multibyte code set and that A¹A², B¹B², and C¹C² are valid characters in this code set.

Valid Characters in Identifier Names

In the syntax of an SQL identifier, a *letter* can be any character that the alpha class of the locale defines. The alpha class lists all characters that are classified as alphabetic. (For further information on character classification, see [“The CTYPE Category” on page A-6](#).) In the default locale, the alpha class of the code set includes the ASCII characters in the ranges a to z and A to Z. When Informix products use the default locale, SQL identifiers can use these ASCII characters wherever *letter* appears in the syntax of an SQL identifier.

In a nondefault locale, the alpha class of the locale also lists the ASCII characters in the ranges a to z and A to Z. It might also include non-ASCII characters such as non-ASCII digits or ideographic characters. For example, the alpha class of the Japanese UJIS code set (in the Japanese UJIS locale) contains Kanji characters. When Informix products use a nondefault locale, SQL identifiers can use non-ASCII characters wherever *letter* is valid in the syntax of an SQL identifier. A non-ASCII character is also valid for *letter* as long as this character is listed in the alpha class of the locale.

The SQL statements in the following example use non-ASCII characters as letters in SQL identifiers:

```
CREATE DATABASE marché;

CREATE TABLE équipement
(
  code NCHAR(6),
  description NVARCHAR(128,10),
  prix_courant MONEY(6,2)
);

CREATE VIEW ça_va AS
  SELECT numéro,nom FROM abonnés;
```

In this example, the user creates the following database, table, and view with French-language character names in a French locale (such as **fr_fr.8859-1**):

- THE CREATE DATABASE statement uses the identifier **marché**, which includes the 8-bit character **é**, to name the database.
- The CREATE TABLE statement uses the identifier **équipement**, which includes the 8-bit character **é**, to name the table, and the identifiers **code**, **description**, and **prix_courant** to name the columns.

- The CREATE VIEW statement uses the identifier **çà_va**, which includes the 8-bit characters **ç** and **à**, to name the view.
- The SELECT clause within the CREATE VIEW statement uses the identifiers **numéro** and **nom** for the columns in the select list and the identifier **abonnés** for the table in the FROM clause. Both **numéro** and **abonnés** include the 8-bit character **é**.

All of the identifiers in this example conform to the rules for specifying identifiers. For these names to be valid, the client locale must support a code set with these French characters.

For the complete syntax and usage of identifiers in SQL statements, see the Identifier segment in the [Informix Guide to SQL: Syntax](#).

Non-ASCII Characters in Delimited Identifiers

A delimited identifier is an identifier that is enclosed in double quotes. When the **DELIMIDENT** environment variable is set, the database server interprets sequences of characters in double quotes as delimited identifiers and sequences of characters in single quotes as strings. This interpretation of quotes is compliant with the ANSI standard.

When you use a nondefault locale, you can specify non-ASCII characters in most delimited identifiers. You can put non-ASCII characters in a delimited identifier if you can put non-ASCII characters in the undelimited form of the same identifier. For example, [Figure 3-1 on page 3-5](#) shows that you can put non-ASCII characters in an undelimited index name. Thus you can put non-ASCII characters in an index name that you have enclosed in double quotes to make it a delimited identifier, as follows:

```
CREATE INDEX "A1A2#B1B2" ON mytable (mycol)
```

For the complete description of delimited identifiers, see the Identifier segment in the [Informix Guide to SQL: Syntax](#).

SE

Multibyte Characters and Identifier Length

An SQL database server limits the name of an SQL identifier to 18 bytes. When you use multibyte characters in identifier names, you must ensure that the identifier does not exceed this size requirement.

The name of an INFORMIX-SE database is limited to 10 bytes. For more information, see [“Data Types for Dynamic Server with UD Option” on page 4-20.](#) ♦

For example, the following CREATE SYNONYM statement creates a synonym name of 8 multibyte characters:

```
CREATE SYNONYM A1A2A3B1B2C1C2C3D1D2E1E2F1F2G1G2H1H2 FOR A1A2B1B2
```

The synonym name shown in the preceding example is 18 bytes long (six 2-byte multibyte characters and two 3-byte multibyte characters), so it does not exceed the maximum length for identifier names. However, the following CREATE SYNONYM statement generates an error because the total number of bytes in this synonym name is 20:

```
CREATE SYNONYM A1A2A3B1B2B3C1C2C3D1D2D3E1E2F1F2G1G2H1H2 FOR A1A2B1B2
```

This statement specifies four 3-byte characters and four 2-byte characters for the synonym name. Even though the synonym name has only eight characters, the total number of bytes in the synonym name would be 20 bytes, which exceeds the maximum length for an identifier name.

Using Character Data Types

The choice of a locale can affect the way that the database server handles character data. The section explains how this choice affects data in the following SQL character data types:

- Locale-sensitive character data types: NCHAR and NVARCHAR
- Other character data types: CHAR, VARCHAR, and TEXT

You specify data types in data definition statements such as CREATE TABLE and ALTER TABLE.

The NCHAR Data Type

The NCHAR data type stores character data in a fixed-length field. This data can be a sequence of single-byte or multibyte letters, numbers, and symbols. However, the code set of your database locale must support this character data. NCHAR columns typically store names, addresses, phone numbers, and so on.

The syntax of the NCHAR data type is as follows:

```
NCHAR(size)
```

In this format, the *size* parameter specifies the number of bytes in the column. The total length of an NCHAR column cannot exceed 32,767 bytes for all editions and options of Informix Dynamic Server or 32,511 bytes for SE. If you do not specify *size*, the database server assumes NCHAR(1). For the complete syntax of the NCHAR data type, see the Data Type section in the [Informix Guide to SQL: Syntax](#).

Because the length of this column is fixed, when the database server retrieves or sends an NCHAR value, it transfers exactly *size* bytes of data. If the length of a character string is shorter than *size*, the database server extends the string with spaces to make up the *size* bytes. If the string is longer than *size* bytes, the database server truncates the string.

Collating NCHAR Data

The NCHAR data type is a locale-sensitive data type. The only difference between NCHAR and CHAR data types is the collation order. The database server collates data in NCHAR columns in localized order. The database server collates data in CHAR columns in code-set order. For more information on collation order, see [“The Collation Order” on page 1-10](#).



Tip: The default locale (U.S. English) does not specify a localized order. Therefore, the database server sorts NCHAR data in code-set order. When you use the default locale, there is no difference between CHAR and NCHAR data.

Handling NCHAR Data

Within a client application, always manipulate NCHAR data in the **CLIENT_LOCALE** of the client application. The client application performs code-set conversion of NCHAR data automatically if **CLIENT_LOCALE** differs from **DB_LOCALE**. For information on code-set conversion, see [page 1-40](#).

Multibyte Characters with NCHAR

To store multibyte character data in an NCHAR column, your database locale must support a code set with these same multibyte characters. When you store multibyte characters, make sure to calculate the number of bytes that are needed. The *size* parameter of the NCHAR data type refers to the number of bytes of storage that is reserved for the data.

Because one multibyte character might use several bytes for storage, the value of *size* bytes does not indicate the number of characters that the column can hold. The total number of multibyte characters that you can store in the column is less than the total number of bytes that you can store in the column. Make sure to declare the *size* value of the NCHAR column in such a way that it can hold enough characters for your purposes.

Treating NCHAR Values as Numeric Values

If you plan to perform calculations on numbers that are stored in a column, assign a numeric data type (such as INTEGER or FLOAT) to that column. The description of the CHAR data type in the [Informix Guide to SQL: Reference](#) provides detailed reasons why you should not treat certain numbers as CHAR values. The same reasons apply for certain numeric values as NCHAR values. Treat only numbers that have leading zeros (such as postal codes) as NCHAR data types. Use NCHAR only if you need to sort the numeric values in localized order.

Nonprintable Characters with NCHAR

An NCHAR value can include tabs, spaces, and nonprintable characters. Nonprintable NCHAR and CHAR values are entered, displayed, and treated similarly. For more information on nonprintable characters, see the description of the CHAR data type in the [Informix Guide to SQL: Reference](#).

The NVARCHAR Data Type

The NVARCHAR data type stores character data in a variable-length field. This data can be a sequence of single-byte or multibyte letters, numbers, and symbols. However, the code set of your database locale must support this character data.

The syntax of the NVARCHAR data type is as follows:

```
NVARCHAR(max, reserve)
```

In this format, the *max* parameter specifies the maximum number of bytes that can be stored in the column, and the *reserve* parameter specifies the minimum number of bytes that are reserved for the column. You must specify the maximum size (*max*) of the NVARCHAR column. The size of this parameter cannot exceed 255 bytes. When you place an index on an NVARCHAR column, the maximum size is 254 bytes. You can store shorter, but not longer, character strings than the value that you specify.

You can optionally specify the minimum reserved space (*reserve*) parameter. This value can range from 0 to 255 bytes but must be less than the maximum size (*max*) of the NVARCHAR column. If you do not specify a minimum space value, the default value of *reserve* is 0. Specify the *reserve* parameter when you initially intend to insert rows with short or null data in this column but later expect the data to be updated with longer values.

Although use of NVARCHAR economizes on space that is used in a table, it has no effect on the size of an index. In an index that is based on an NVARCHAR column, each index key has a length equal to *max* bytes, the maximum size of the column.

The database server does not strip an NVARCHAR object of any user-entered trailing spaces, nor does it pad the NVARCHAR object to the full length of the column. However, if you specify a minimum reserved space (*reserve*), and some of the data values are shorter than that amount, some of the space that is reserved for rows goes unused.

For the complete syntax of the NVARCHAR data type, see the Data Type segment in the [Informix Guide to SQL: Syntax](#).

SE

The INFORMIX-SE database server does not support the NVARCHAR data type. ♦

Collating NVARCHAR Data

The NVARCHAR data type is a locale-sensitive data type. The only difference between NVARCHAR and VARCHAR data types is the collation order. The database server collates data in NVARCHAR columns in localized order. The database server collates data in VARCHAR columns in code-set order. For more information on collation order, see [“The Collation Order” on page 1-10](#).



Tip: The default locale (U.S. English) does not specify a localized order. Therefore, the database server sorts NVARCHAR data in code-set order. When you use the default locale, there is no difference between VARCHAR and NVARCHAR data.

Handling NVARCHAR Data

Within a client application, always manipulate NVARCHAR data in the **CLIENT_LOCALE** of the client application. The client application performs code-set conversion of NVARCHAR data automatically if **CLIENT_LOCALE** differs from **DB_LOCALE**. For information on code-set conversion, see [page 1-40](#).

Multibyte Characters with NVARCHAR

To store multibyte character data in an NVARCHAR column, your database locale must support a code set with these same multibyte characters. When you store multibyte characters, make sure to calculate the number of bytes that are needed. The *max* parameter of the NVARCHAR data type refers to the maximum number of bytes that the column can store.

Because one multibyte character might use several bytes for storage, the value of *max* bytes does not indicate the number of characters that the column can hold. The total number of multibyte characters that you can store in the column is less than the total number of bytes that you can store in the column. Make sure to declare the *max* value of the NVARCHAR column so that it can hold enough characters for your purposes.

Nonprintable Characters with NVARCHAR

An NVARCHAR value can include tabs, spaces, and nonprintable characters. Nonprintable NVARCHAR characters are entered, displayed, and treated in the same way as nonprintable VARCHAR characters. For detailed information on how to enter and display nonprintable characters, see the description of the VARCHAR data type in the [Informix Guide to SQL: Reference](#).

Tip: *The database server interprets the null character (ASCII 0) as a C null terminator. Therefore, in NVARCHAR data, the null terminator acts as a string-terminator character.*



Storing Numeric Values in an NVARCHAR Column

When you insert a numeric value into a NVARCHAR column, the database server does not pad the value with trailing blanks up to the maximum length of the column. The number of digits in a numeric NVARCHAR value is the number of characters that you need to store that value. For example, the database server stores a value of 1 in the **mytab** table when it executes the following SQL statements:

```
CREATE TABLE mytab (col1 VARCHAR(10));  
INSERT INTO mytab VALUES (1);
```

Performance Considerations for NCHAR and NVARCHAR

The NCHAR data type is very similar to the CHAR data type, and NVARCHAR is very similar to the VARCHAR data type. The difference between these data types is as follows:

- The database server collates NCHAR and NVARCHAR column values in localized order.
- The database server collates CHAR and VARCHAR column values in code-set order.

Localized collation is dependent on the sorting rules that the locale defines, not simply on the computer representation of the character (the code points). This difference means that the database server might perform complex processing to compare and collate NCHAR and NVARCHAR data. Therefore, access to NCHAR data might be slower with respect to comparison and collation than to CHAR data. Similarly, access to data in an NVARCHAR column might be slower with respect to comparison and collation than access to the same data in a VARCHAR column.

Assess whether your character data needs to take advantage of localized order for collation and comparison. If code-set order is adequate, use the CHAR and the VARCHAR data types.

Other Character Data Types

The choice of locale can affect the character data types CHAR, VARCHAR, and TEXT. This section describes how this choice affects each of these character data types.

The CHAR Data Type

The CHAR data type stores character data in a fixed-length field. This data can consist of letters, numbers, and symbols. The following list summarizes how choice of a locale affects the CHAR data type:

- The size of a CHAR column is byte based, not character based.
For example, if you define a CHAR column as CHAR(10), the column has a fixed length of 10 bytes, not 10 characters. If you want to store multibyte characters in a CHAR column, keep in mind that the total number of characters you can store in the column might be less than the total number of bytes you can store in the column. Make sure to define the byte size of the CHAR column so that it can hold enough characters for your purposes.
- You can enter single-byte or multibyte characters in a CHAR column.
The database locale must support the characters that you want to store in CHAR columns.
- The database server sorts CHAR columns in code-set order, not in localized order.
For more information on collation order, see [“The Collation Order” on page 1-10](#).
- Within a client application, always manipulate CHAR data in the **CLIENT_LOCALE** of the client application.
The client application performs code-set conversion of CHAR data automatically if **CLIENT_LOCALE** differs from **DB_LOCALE**. For information on code-set conversion, see [page 1-40](#).

For the syntax of the CHAR data type, see the [Informix Guide to SQL: Syntax](#). For a detailed explanation of the CHAR data type, see the [Informix Guide to SQL: Reference](#).

The VARCHAR Data Type

The VARCHAR data type stores character data in a variable-length field. This data can consist of letters, numbers, and symbols. The following list summarizes how the choice of a locale affects the VARCHAR data type:

- The maximum size and minimum reserved space for a VARCHAR column are byte based, not character based.
For example, if you define a VARCHAR column as VARCHAR(10,6), the column has a maximum length of 10 bytes and a minimum reserved space of 6 bytes. If you want to store multibyte characters in a VARCHAR column, keep in mind that the total number of characters you can store in the column might be less than the total number of bytes you can store in the column. Make sure to define the maximum byte size of the VARCHAR column so that it can hold enough characters for your purposes.
- You can enter single-byte or multibyte characters in a VARCHAR column.
The database locale must support the characters that you want to store in VARCHAR columns.
- The database server sorts VARCHAR columns in code-set order, not in localized order.
For more information on collation order, see [“The Collation Order” on page 1-10](#).
- Within a client application, always manipulate VARCHAR data in the **CLIENT_LOCALE** of the client application.
The client application performs code-set conversion of VARCHAR data automatically if **CLIENT_LOCALE** differs from **DB_LOCALE**. For information on code-set conversion, see [page 1-40](#).

For the syntax of the VARCHAR data type, see the [Informix Guide to SQL: Syntax](#). For a detailed explanation of the VARCHAR data type, see the [Informix Guide to SQL: Reference](#).

The TEXT Data Type

The TEXT data type stores any kind of text data. TEXT columns typically store memos, manual chapters, business documents, program source files, and other types of textual information. The following list summarizes how the choice of a locale affects the TEXT data type:

- The database server stores character data in a TEXT column in the code set of the database locale.
- You can enter single-byte or multibyte characters in a TEXT column. The database locale should support the characters that you want to store in TEXT columns. However, you can put any type of character in a TEXT column.
- Text columns do not have an associated collation order. The database server does not build indexes on TEXT columns. Therefore, it does not perform collation tasks on these columns. For more information on collation order, see [“The Collation Order” on page 1-10](#).
- Within a client application, always manipulate TEXT data in the **CLIENT_LOCALE** of the client application. The client application performs code-set conversion of TEXT data automatically if **CLIENT_LOCALE** differs from **DB_LOCALE**. For information on code-set conversion, see [page 1-40](#).

For the complete syntax of the TEXT data type, see the [Informix Guide to SQL: Syntax](#). For a detailed explanation of the TEXT data type, see the [Informix Guide to SQL: Reference](#).

Collating Character Data

Collation involves the sorting of the data values in columns that have character data types. For an explanation of collation order and a discussion of the two methods of sorting character data (code-set order and localized order), see [“The Collation Order” on page 1-10](#).

The type of collation order that the database server uses affects the following SQL statements:

- CREATE INDEX
- SELECT

Collation Order in CREATE INDEX

The CREATE INDEX statement creates an index on one or more columns of a table. The ASC and DESC keywords in the CREATE INDEX statement control whether the index keys are stored in ascending or descending order.

When you use a nondefault locale, the following locale-specific considerations apply to the CREATE INDEX statement:

- When you create an index on a CHAR or VARCHAR column, the index keys are stored in code-set order.
For example, if the database stores its database locale as the Japanese SJIS locale (**ja_jp.sjis**), index keys for a CHAR column in any table of the database are stored in Japanese SJIS code-set order.
- When you create an index on an NCHAR or NVARCHAR column, the index keys are stored in localized order.
For example, if the database is branded with the Japanese SJIS locale, index keys for an NCHAR column in any table of the database are stored in the localized order that the **ja_jp.sjis** locale defines.

If you use the default locale (U.S. English), the index keys are stored in the code-set order (in ascending or descending sequence) of the default code set regardless of the data type of the character column. Because the default locale does not define a localized order, the database server sorts NCHAR and NVARCHAR columns, as well as CHAR and VARCHAR columns, in code-set order.

For a complete description of the CREATE INDEX statement, see the [Informix Guide to SQL: Syntax](#).

Collation Order in SELECT Statements

The SELECT statement performs a query on the specified table and retrieves data from the specified columns and rows. Collation order affects the following parts of the SELECT statement:

- THE ORDER BY clause
- The relational operator, BETWEEN, and IN conditions of the WHERE clause
- The MATCHES and LIKE conditions of the WHERE clause

For a complete description of the SELECT statement, see the [Informix Guide to SQL: Syntax](#).

The ORDER BY Clause

The ORDER BY clause sorts the retrieved rows by the values that are contained in a column or set of columns. When this clause sorts character columns, the results of the sort depend on the data type of the column, as follows:

- CHAR and VARCHAR columns are sorted in code-set order.
- NCHAR and NVARCHAR columns are sorted in localized order.

Assume that you use a nondefault locale for the client and database locale, and you make a query against the table called **abonnés**. This SELECT statement specifies three columns of CHAR data type in the select list: **numéro** (employee number), **nom** (last name), and **prénom** (first name).

```
SELECT numéro,nom,prénom
FROM abonnés
ORDER BY nom;
```

The statement sorts the query results by the values that are contained in the **nom** column. Because the **nom** column that is specified in the ORDER BY clause is a CHAR column, the database server sorts the query results in the code-set order. As Figure 3-2 shows, names that begin with uppercase letters come before names that begin with lowercase letters, and names that start with an accented letter (Ålesund, Étaix, Ötker, and Øverst) come at the end of the list.

Figure 3-2
Data Set for Code-Set Order of the abonné Table

numéro	nom	prénom
13612	Azevedo	Edouardo Freire
13606	Dupré	Michèle Françoise
13607	Hammer	Gerhard
13602	Hämmerle	Greta
13604	LaForêt	Jean-Noël
13610	LeMaître	Héloïse
13613	Llanero	Gloria Dolores
13603	Montaña	José Antonio
13611	Oatfield	Emily
13609	Tiramisù	Paolo Alfredo
13600	da Sousa	João Lourenço Antunes
13615	di Girolamo	Giuseppe
13601	Ålesund	Sverre
13608	Étaix	Émile
13605	Ötker	Hans-Jürgen
13614	Øverst	Per-Anders

However, the result of the query is different if the **numéro**, **nom**, and **prénom** columns of the **abonnés** table are defined as NCHAR rather than CHAR.

Suppose the nondefault locale defines a localized order that collates the data as Figure 3-3 shows. This localized order defines equivalence classes for uppercase and lowercase letters and for unaccented and accented versions of the same letter.

Figure 3-3
Data Set for Localized Order of the abonné Table

numéro	nom	prénom
13612	Azevedo	Edouardo Freire
13601	Ålesund	Sverre
13600	da Sousa	João Lourenço Antunes
13615	di Girolamo	Giuseppe
13606	Dupré	Michèle Françoise
13608	Étaix	Émile
13607	Hammer	Gerhard
13602	Hämmerle	Greta
13604	LaForêt	Jean-Noël
13610	LeMaître	Héloïse
13613	Llanero	Gloria Dolores
13603	Montaña	José Antonio
13611	Oatfield	Emily
13605	Ötker	Hans-Jürgen
13614	Øverst	Per-Anders
13609	Tiramisù	Paolo Alfredo

The same SELECT statement now returns the query results in localized order because the **nom** column that the ORDER BY clause specifies is an NCHAR column.

The SELECT statement supports use of a column substring in an ORDER BY clause. However, you need to ensure that this use for column substrings works with the code set that your locale supports. For more information, see [“Partial Characters in Column Substrings” on page 3-37](#).

Logical Predicates in a WHERE Clause

The WHERE clause specifies search criteria and join conditions on the data that you want to select. Collation rules affect the WHERE clause when the expressions in the condition are column expressions with character data types and the search condition is one of the following logical predicates:

- Relational-operator condition
- BETWEEN condition
- IN condition
- EXISTS and ANY conditions

Relational-Operator Conditions

The following SELECT statement assumes a nondefault locale. It uses the less than (<) relational operator to specify that only those rows are to be retrieved from the **abonnés** table in which the value of the **nom** column is less than Hammer.

```
SELECT numéro,nom,prénom
FROM abonnés
WHERE nom < 'Hammer';
```

If **nom** is a CHAR column, the database server uses code-set order of the default code set to retrieve the rows that the WHERE clause specifies. The following sample of output shows that this SELECT statement retrieves only two rows.

numéro	nom	prénom
13612	Azevedo	Edouardo Freire
13606	Dupré	Michèle Françoise

These two rows are those less than Hammer in the code-set-ordered data set shown in [Figure 3-2 on page 3-23](#).

However, if **nom** is an NCHAR column, the database server uses localized order to sort the rows that the WHERE clause specifies. The following sample of output shows that this SELECT statement retrieves six rows.

numéro	nom	prénom
13612	Azevedo	Edouardo Freire
13601	Ålesund	Sverre
13600	da Sousa	João Lourenço Antunes
13615	di Girolamo	Giuseppe
13606	Dupré	Michèle Françoise
13608	Étaix	Émile

These six rows are those less than Hammer in the localized-order data set shown in [Figure 3-3 on page 3-24](#).

BETWEEN Conditions

The following SELECT statement assumes a nondefault locale and uses a BETWEEN condition to retrieve only those rows in which the values of the **nom** column are in the inclusive range of the values of the two expressions that follow the BETWEEN keyword:

```
SELECT numéro,nom,prénom
FROM abonnés
WHERE nom BETWEEN 'A' AND 'Z';
```

The query result depends on whether **nom** is a CHAR or NCHAR column. If **nom** is a CHAR column, the database server uses the code-set order of the default code set to retrieve the rows that the WHERE clause specifies. The following sample output shows the query results.

numéro	nom	prénom
13612	Azevedo	Edouardo Freire
13606	Dupré	Michèle Françoise
13607	Hammer	Gerhard

(1 of 2)

numéro	nom	prénom
13602	Hämmerle	Greta
13604	LaForêt	Jean-Noël
13610	LeMaître	Héloïse
13613	Llanero	Gloria Dolores
13603	Montaña	José Antonio
13611	Oatfield	Emily
13609	Tiramisù	Paolo Alfredo

(2 of 2)

Because the database server uses the code-set order for the **nom** values (see [Figure 3-2 on page 3-23](#)), these query results do not include the following rows:

- Rows in which the value of **nom** begins with a lowercase letter: da Sousa and di Girolamo
- Rows with an accented letter: Ålesund, Étaix, Ötker, and Øverst

However, if **nom** is an NCHAR column, the database server uses localized order to sort the rows. The following sample output shows the query results.

numéro	nom	prénom
13612	Azevedo	Edouardo Freire
13601	Ålesund	Sverre
13600	da Sousa	João Lourenço Antunes
13615	di Girolamo	Giuseppe
13606	Dupré	Michèle Françoise
13608	Étaix	Émile
13607	Hammer	Gerhard
13602	Hämmerle	Greta

(1 of 2)

numéro	nom	prénom
13604	LaForêt	Jean-Noël
13610	LeMaître	Héloïse
13613	Llanero	Gloria Dolores
13603	Montaña	José Antonio
13611	Oatfield	Emily
13605	Ötker	Hans-Jürgen
13614	Øverst	Per-Anders
13609	Tiramisù	Paolo Alfredo

(2 of 2)

Because the database server uses localized order for the **nom** values, these query results include rows in which the value of **nom** begins with a lowercase letter or accented letter.

IN Conditions

An IN condition is satisfied when the expression to the left of the IN keyword is included in the parenthetical list of values to the right of the keyword. This SELECT statement assumes a nondefault locale and uses an IN condition to retrieve only those rows in which the value of the **nom** column is any of the following: Azevedo, Llanero, or Oatfield.

```
SELECT numéro,nom,prénom
FROM abonnés
WHERE nom IN ('Azevedo', 'Llanero', 'Oatfield');
```

The query result depends on whether **nom** is a CHAR or NCHAR column. If **nom** is a CHAR column, the database server uses code-set order (see [Figure 3-2 on page 3-23](#)). The database server retrieves rows in which the value of **nom** is Azevedo, but not rows in which the value of **nom** is azevedo or Åzevedo because the characters A, a, and Å are not equivalent in the code-set order (see [Figure 3-2 on page 3-23](#)). The query also returns rows with the **nom** values of Llanero and Oatfield.

However, if **nom** is an NCHAR column, the database server uses localized order (see [Figure 3-3 on page 3-24](#)) to sort the rows. If the locale defines A, a, and Å as equivalent characters in the localized order, the query returns rows in which the value of **nom** is Azevedo, azevedo, or Åzevedo. The same selection rule applies to the other names in the parenthetical list that follows the IN keyword.

Comparisons with MATCHES and LIKE Conditions

Collation rules also affect the WHERE clause when the expressions in the condition are column expressions with character data types and the search condition is one of the following conditions:

- MATCHES condition
- LIKE condition

MATCHES Condition

A MATCHES condition tests for matching character strings. The condition is true, or satisfied, when the value of the column to the left of the MATCHES keyword matches the pattern that a quoted string specifies to the right of the MATCHES keyword. You can use wildcard characters in the string. For example, you can use brackets to specify a range of characters. (For more information on MATCHES, see the Condition Segment in the [Informix Guide to SQL: Syntax](#).)

When the MATCHES condition does not list a range of characters in the string, it specifies a *literal match*. For literal matches, the data type of the column determines whether collation considerations come into play, as follows:

- For CHAR and VARCHAR columns, no collation considerations come into play.
- For NCHAR and NVARCHAR columns, collation considerations might come into play because these data types use localized order and the locale might define equivalence classes of collation.

For example, the localized order might specify that a and A are an equivalent class. That is, they have equal weight in the collation sequence. For further information on localized order, see [page 1-11](#).

The examples in the following table illustrate the different results that CHAR and NCHAR columns produce when a user specifies the MATCHES keyword without a range in a SELECT statement. These examples assume use of a nondefault locale that defines A and a in an equivalence class. It also assumes that **col1** is a CHAR column and **col2** is an NCHAR column in table **mytable**.

Query	Data Type	Query Results
SELECT * FROM mytable WHERE col1 MATCHES 'art'	CHAR	All rows in which column col1 contains the value 'art' with a lowercase a
SELECT * FROM mytable WHERE col2 MATCHES 'art'	NCHAR	All rows in which column col2 contains the value 'art' or 'Art'

When you use the MATCHES keyword to specify a range, collation considerations come into play for all columns with character data types. When the column to the left of the MATCHES keyword is an NCHAR, NVARCHAR, CHAR, or VARCHAR column, and the quoted string to the right of the MATCHES keyword includes brackets to specify a range, the database server uses localized order.



Important: When the database server determines the characters that fall within a range, it always uses the localized order that is specified for the database, even for CHAR and VARCHAR columns. This behavior is an exception to the rule that the database server uses code-set order for all operations on CHAR and VARCHAR columns and uses localized order for all operations on NCHAR and NVARCHAR columns.

Some simple examples show how the database server treats NCHAR, NVARCHAR, CHAR, and VARCHAR columns when you use the MATCHES keyword with a range in a SELECT statement. Suppose that you want to retrieve from the **abonnés** table the employee number, first name, and last name for all employees whose last name **nom** begins in the range of characters E through P. Also assume that the **nom** column is an NCHAR column. The following SELECT statement uses a MATCHES condition in the WHERE clause to pose this query:

```
SELECT numéro,nom,prénom
FROM abonnés
WHERE nom MATCHES '[E-P]*'
ORDER BY nom;
```

The rows for Étaix, Ötker, and Øverst appear in the query result because, in the localized order ([Figure 3-3 on page 3-24](#)), the accented first letter of each name falls within the E through P *MATCHES* range for the **nom** column.

numéro	nom	prénom
13608	Étaix	Émile
13607	Hammer	Gerhard
13602	Hämmerle	Greta
13604	LaForêt	Jean-Noël
13610	LeMaître	Héloïse
13613	Llanero	Gloria Dolores
13603	Montaña	José Antonio
13611	Oatfield	Emily
13605	Ötker	Hans-Jürgen
13614	Øverst	Per-Anders

If **nom** is a CHAR column, the query result is exactly the same as when **nom** was an NCHAR column. The database server always uses localized order to determine what characters fall within a range, regardless of whether the column is CHAR or NCHAR.

LIKE Condition

A LIKE condition also tests for matching character strings. As with the *MATCHES* condition, the LIKE condition is true, or satisfied, when the value of the column to the left of the LIKE keyword matches the pattern that the quoted string specifies to the right of the LIKE keyword. You can use only certain symbols as wildcards in the quoted string. (For more information on LIKE, see the Condition Segment in the *Informix Guide to SQL: Syntax*.)

The LIKE condition can specify only a *literal match*. For literal matches, the data type of the column determines whether collation considerations come into play, as follows:

- For CHAR and VARCHAR columns, no collation considerations come into play.
- For NCHAR and NVARCHAR columns, collation considerations might come into play because these data types use localized order, and the locale might define equivalence classes of collation.

For example, the localized order might specify that a and A are an equivalent class. For more information, see the description of literal matches with the MATCHES condition on [page 3-29](#).

The LIKE keyword does not support matches with a range. That is, you cannot use bracketed wildcard characters in LIKE conditions.

Wildcard Characters in LIKE and MATCHES Conditions

Informix products support the following ASCII characters as wildcard characters in the MATCHES and LIKE conditions.

Clause	Wildcard Characters
LIKE	_ %
MATCHES	* ? [] ^ -

For CHAR and VARCHAR data, the database server performs byte-by-byte comparison for pattern matching in the LIKE and MATCHES conditions. For NCHAR and NVARCHAR data, the database server performs pattern matching in the LIKE and MATCHES conditions based on characters, not bytes. Therefore, the _ (underscore) wildcard of the LIKE clause and the ? wildcard of the MATCHES clause match any one single-byte or multibyte character, as the following table shows.

Condition	Quoted String	Column Value	Result
LIKE	'ab_d'	'abcd'	True
LIKE	'ab_d'	'abA ¹ A ² d'	True
MATCHES	'ab?d'	'abcd'	True
MATCHES	'ab?d'	'abA ¹ A ² d'	True

The database server treats any multibyte character as a literal character. To tell the database server to interpret a wildcard character as its literal meaning, you must precede the character with an escape character. You must use single-byte characters as escape characters; the database server does not recognize use of multibyte characters for this purpose. The default escape character is the backslash (\).

The following use of the MATCHES clause gives a true result for the column value that is shown.

Clause	Quoted String	Column Value	Result
MATCHES	'ab\?d'	'ab?d'	True

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Handling Character Data

The GLS feature allows you to put non-ASCII characters (including multibyte characters) in the following parts of an SQL statement:

- Quoted strings
- Comments
- Column substrings
- TRIM function arguments
- UPPER, LOWER, and INITCAP function strings ♦

Specifying Quoted Strings

You use quoted strings in a variety of SQL statements, particularly data manipulation statements such as SELECT and INSERT. A quoted string is a sequence of characters that are delimited by quotation marks. The quotation marks can be single quotes or double quotes. However, if the **DELIMIDENT** environment variable is set, the database server interprets a sequence of characters in double quotes as a delimited identifier rather than as a string. (For more information about delimited identifiers, see [page 3-10](#).)

When you use a nondefault locale, you can use any characters in the code set of your locale within a quoted string. If the locale supports a code set with non-ASCII characters, you can use these characters in a quoted string. In the following example, the user inserts column values that include multibyte characters into the table **mytable**:

```
INSERT INTO mytable
VALUES ('A1A2B1B2abcd', '123X1X2Y1Y2', 'efgh')
```

In this example, the first quoted string includes the multibyte characters A¹A² and B¹B². The second quoted string includes the multibyte characters X¹X² and Y¹Y². The third quoted string contains only single-byte characters. This example assumes that the locale supports a multibyte code set with the A¹A², B¹B², X¹X², and Y¹Y² characters.

For complete information on quoted strings, see the Quoted String segment in the [Informix Guide to SQL: Syntax](#).

Specifying Comments

To use comments after SQL statements, introduce the comment text with one of the following comment symbols:

- The double dash (--) complies with the ANSI SQL standard.
- Curly brackets ({}) are an Informix extension to the standard.

When you use a nondefault locale, you can use any characters in the code set of your locale within a comment. If the locale supports a code set with non-ASCII characters, you can use these characters in an SQL comment. In the following example, the user inserts a column value that includes multibyte characters into the table **mytable**:

```
EXEC SQL insert into mytable
values ('A1A2B1B2abcd', '123') -- A1A2 and B1B2 are multibyte characters.
```

In this example, the SQL comment includes the multibyte characters A¹A² and B¹B². This example assumes that the locale supports a multibyte code set with the A¹A² and B¹B² characters.

For complete information on SQL comments and comment symbols, see the Introduction to the [Informix Guide to SQL: Syntax](#).

Specifying Column Substrings

When you specify a column expression with a character data type in a SELECT statement (or in any other SQL statement that includes an embedded SELECT statement), you can specify that a subset of the data in the column is to be retrieved. A column expression that includes brackets to signify a subset of the data in the column is known as a *column substring*. The syntax of a column substring is as follows:

```
column_name[ first, last]
```

In this format, *first* is the position of the first byte in the substring, and *last* is the position of the last byte in the substring. For the complete syntax of column expressions, see the Expression segment in the [Informix Guide to SQL: Syntax](#).

Column Substrings in Single-Byte Code Sets

Suppose that you want to retrieve the **customer_num** column and the seventh through ninth bytes of the **lname** column from the **customer** table. To perform this query, use a column substring for the **lname** column in your SELECT statement, as follows:

```
SELECT customer_num, lname[7,9] as lname_subset
FROM customer
WHERE lname = 'Albertson'
```

If the value of the **lname** column is **Albertson**, the following sample output shows the result of the query.

customer_num	lname_subset
114	son

Because the locale supports a single-byte code set, the preceding query seems to return the seventh through ninth characters of the name **Albertson**. However, column substrings are byte based, and the query returns the seventh through ninth bytes of the name. Because one byte is equal to one character in single-byte code sets, the distinction between characters and bytes in column substrings is not apparent in these code sets.

Column Substrings in Multibyte Code Sets

For multibyte code sets, column substrings return the specified number of bytes, not number of characters. If a character column **multi_col** contains a string that consists of three 2-byte characters, this 6-byte string can be represented as follows:

A¹A²B¹B²C¹C²

Suppose that you specified the following column substring for the **multi_col** column in a query:

multi_col[1,2]

The query returns the following result:

A¹A²

The substring that the query returns consists of 2 bytes (1 character), not 2 characters.

To retrieve the first two characters from the **multi_col** column, specify a column substring in which *first* is the byte position of the first byte in the first character and *last* is the byte position of the last byte in the second character. For the 6-byte string A¹A²B¹B²C¹C², you specify this column substring as follows in your query:

```
multi_col[1,4]
```

The following result is returned:

```
A1A2B1B2
```

The substring that the query returns consists of the first 4 bytes of the column value as you specified. These 4 bytes represent the first two characters in the column.

Partial Characters in Column Substrings

A multibyte character might consist of 2, 3, or 4 bytes. A multibyte character that has lost one or more of its bytes so that the original intended meaning of the character is lost is called a *partial character*.

Unless prevented, a column substring might truncate a multibyte character or split it up in such a manner that it no longer retains the original sequence of bytes. A partial character might be generated when you use column subscript operators on columns that contain multibyte characters. Suppose that a user specifies the following column substring for the **multi_col** column where the value of the string in **multi_col** is A¹A²B¹B²C¹C²:

```
multi_col[2,5]
```

The user requests the following bytes in the query: A²B¹B²C¹. However, if the database server returned this column substring to the user, the first and third characters in the column would be truncated.

Avoidance in a Multibyte Code Set

Informix database servers do not allow partial characters to occur. The GLS feature prevents the database server from returning the specified range of bytes literally when this range contains partial characters. If your database locale supports a multibyte code set and you specify a particular column substring in a query, the database server replaces any truncated multibyte characters with single-byte white spaces.

For example, suppose the **multi_col** column contains the string $A^1A^2A^3A^4B^1B^2B^3B^4$, and you execute the following SELECT statement:

```
SELECT multi_col FROM tablename WHERE multi_col[2,4] = 'A1A2B1B2'
```

The query indicates that no matching rows were found because the database server converts the substring **multi_col**[2,4], the string $A^2A^3A^4$, to three single-byte spaces (sss). The WHERE clause of the query specifies the following condition for the search:

```
WHERE 'sss' = 'A1A2A3'
```

Because this condition is never true, the query retrieves no matching rows.

Informix database servers replace partial characters in each individual substring operation, even when they are concatenated. For example, suppose the **multi_col** column contains $A^1A^2B^1B^2C^1C^2D^1D^2$, and the WHERE clause contains the following condition:

```
multi_col[2,4] | multi_col[6,8]
```

The query does not return any rows because the result of the concatenation ($A^2B^1B^2C^2D^1D^2$) contains two partial characters, A^2 and C^2 . The Informix database server converts these partial characters to single-byte spaces, and creates the following WHERE clause condition:

```
WHERE 'sB1B2sD1D2' = 'A1A2B1B2'
```

This condition is also never true, so the query retrieves no matching rows.

Misinterpreting Partial Characters

Partial characters present a problem if the substrings strings can be processed or presented to users in any way that makes their concatenation not reconstruct the original logical string. Possible problem areas include when a substring of one multibyte character is actually a valid character by itself. For example, suppose a multibyte code set contains a 4-byte character, $A^1A^2A^3A^4$, that represents the digit 1 and a 3-byte character, $A^2A^3A^4$, that represents the digit 6. Suppose also that you use the locale that contains this multibyte code set when you execute the following query:

```
SELECT multi_col FROM tablename WHERE multi_col[2,4] = 'A2A3A4'
```

The database server interprets **multi_col[2,4]** as the valid 3-byte character (a multibyte 6) instead of a substring of the valid 4-byte character ('sss'). Therefore, the WHERE clause contains the following condition:

```
WHERE '6' = '6'
```

The problem of partial characters does not occur in single-byte code sets because each character is stored in a single byte. When your database locale supports a single-byte code set, and you specify a particular column substring in a query, the database server returns exactly the subset of data that you requested and does not replace any characters with white spaces.

Partial Characters in an ORDER BY Clause

Partial characters might also create a problem when you specify column substrings in an ORDER BY clause of a SELECT statement. The general format for specifying column substrings in the ORDER BY clause is as follows:

```
ORDER BY column-name [first, last]
```

In this format, *first* represents the first byte of the first character in the column substring, and *last* represents the last byte of the last character in the column substring.

If the locale supports a multibyte code set whose characters are all of the same length, you can use column substrings in an ORDER BY clause. However, the more likely scenario is that your multibyte code set contains characters with varying lengths. In this case, you might not find it useful to specify column substrings in the ORDER BY clause.

For example, suppose that you want to retrieve all rows from the **multi_data** table, and you want to use the **multi_chars** column with a column subscript to collate the query results. The following SELECT statement attempts to collate the query results according to the portion of the **multi_chars** column that is contained in the fourth to sixth characters of the column:

```
SELECT * FROM multi_data
ORDER BY multi_chars[7,12]
```

If the locale supports a multibyte code set whose characters are all 2 bytes in length, you know that the fourth character in the column begins in byte position 7, and the sixth character in the column ends in byte position 12. The preceding SELECT statement does not generate partial characters.

However, if your multibyte code set contains a mixture of single-byte characters, 2-byte characters, and 3-byte characters, the column substring **multi_chars[7,12]** might create partial characters from the **multi_chars** data. In this case, you might get unexpected results when you specify a column substring in the ORDER BY clause.

For information on the collation order of different types of character data in the ORDER BY clause, see [“The ORDER BY Clause” on page 3-22](#). For the complete syntax and usage of the ORDER BY clause, see the SELECT statement in the [Informix Guide to SQL: Syntax](#).



Tip: A partial character might also be generated when an ESQL program copies multibyte data from one buffer to another. For more information, see [“Avoiding Partial Characters” on page 5-26](#).

Avoidance in BYTE and TEXT Columns

Partial characters are not a problem when you specify a column substring for a column with the BYTE or TEXT data type. The database server avoids partial characters in BYTE and TEXT columns in the following way:

- Because the database server interprets a BYTE column as a series of bytes, not characters, the splitting of multibyte characters as a result of the byte range that a column substring specifies is not an issue.

A column substring for a BYTE column returns the exact range of bytes that is specified and does not replace any bytes with white spaces.

- The database server interprets a TEXT column as a series of characters.

A column substring for a TEXT column returns the exact range of bytes that is specified. Attempts to resolve partial characters in TEXT data are resource intensive. Therefore, the database server does not replace any bytes with white spaces. For more information on the TEXT data type, see [page 3-19](#).



Warning: Because your application handles the interpretation of BYTE and TEXT data, it must handle possible occurrences of partial characters in multibyte simple-large object (blob) data.

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Specifying Arguments to the TRIM Function

The TRIM function is an SQL function that removes leading or trailing pad characters from a character string. By default, this pad character is an ASCII space. If your locale supports a code set that defines a different character as a space, TRIM does not remove this locale-specific space from the front or back of a string. If you specify the LEADING, TRAILING, or BOTH keywords for TRIM, you can define a different pad character. However, you cannot specify a non-ASCII character as a pad character, even if your locale supports a code set that defines the non-ASCII character.

Using Case-Insensitive Search Functions

In Version 7.3, the SQL functions UPPER, LOWER, and INITCAP support GLS. They accept multibyte characters in character-type source strings and operate on them. The return type is the same as the type of the source string:

- UPPER converts every letter in a string to uppercase.
- LOWER converts every letter in a string to lowercase.
- INITCAP changes the first letter of a word or series of words into uppercase.

For complete information about these search functions, see the [Informix Guide to SQL: Syntax](#).

Using SQL Length Functions

You can use SQL length functions in the SELECT statement and other data manipulation statements. Length functions return the length of a column, string, or variable in bytes or characters.

The choice of locale affects the following three SQL length functions:

- The LENGTH function
- The OCTET_LENGTH function
- The CHAR_LENGTH (or CHARACTER_LENGTH) function

For the complete syntax of these functions, see the Expression segment in the [Informix Guide to SQL: Syntax](#).

The LENGTH Function

The LENGTH function returns the number of bytes of data in character data. However, the behavior of the LENGTH function varies with the type of argument that the user specifies. The argument can be a quoted string, a character-type column other than the TEXT data type, a TEXT column, a host variable, or a stored-procedure variable.

The following table shows how the LENGTH function operates on each of these argument types. The Example column in this table uses the symbol *s* to represent a single-byte trailing white space. This table also assumes that the sample strings consist of single-byte characters.

LENGTH Argument	Behavior	Example
Quoted string	Returns number of bytes in string, minus any trailing white spaces as defined in the locale.	If the string is 'Ludwig', the result is 6. If the string is 'Ludwigssss', the result is still 6.
CHAR, VARCHAR, NCHAR, or NVARCHAR column	Returns number of bytes in a column, minus any trailing white spaces, regardless of defined length of the column.	If the fname column of the customer table is a CHAR(15) column, and this column contains the string 'Ludwig', the result is 6. If the fname column contains the string 'Ludwigssss', the result is still 6.
TEXT column	Returns number of bytes in a column, including trailing white spaces.	If the cat_descr column in the catalog table is a TEXT column, and this column contains the string 'Ludwig', the result is 6. If the cat_descr column contains the string 'Ludwigssss', the result is 10.
Host or procedure variable	Returns number of bytes that the variable contains, minus any trailing white spaces, regardless of defined length of the variable.	If the procedure variable f_name is defined as CHAR(15), and this variable contains the string 'Ludwig', the result is 6. If the f_name variable contains the string 'Ludwigssss', the result is still 6.

With Single-Byte Code Sets

When you use the default locale or any locale with a single-byte code set, the LENGTH function seems to return the number of characters in the column. In the following example, the **stores7** database, which contains the **customer** table, uses the default code set for the U.S. English locale. Suppose a user enters a SELECT statement with the LENGTH function to display the last name, length of the last name, and customer number for rows where the customer number is less than 106.

```
SELECT lname AS cust_name, length (fname) AS length, customer_num AS cust_num
FROM customer
WHERE customer_num < 106
```

The following sample of output shows the result of the query. For each row that is retrieved, the **length** column seems to show the number of characters in the **lname (cust_name)** column. However, the **length** column actually displays the number of bytes in the **lname** column. In the default code set, 1 byte stores 1 character. (For more information about the default code set, see [“The Default Locale” on page 1-18.](#))

cust_name	length	cust_num
Ludwig	6	101
Carole	6	102
Philip	6	103
Anthony	7	104
Raymond	7	105

With Multibyte Code Sets

When you use the LENGTH function in a locale that supports a multibyte code set, such as the Japanese SJIS code set, the distinction between characters and bytes is meaningful. The LENGTH function returns the number of bytes in the column or quoted string, and this result might be quite different from the number of characters in the string.

The following example assumes that the database that contains the **customer_multi** table has a database locale that supports a multibyte code set. Suppose that the user enters a SELECT statement with the LENGTH function to display the last name, the length of the last name, and the customer number for the customer whose customer number is 199.

```
SELECT lname AS cust_name, length (fname) AS length, customer_num AS cust_num
FROM customer_multi
WHERE customer_num = 199
```

Assume that the last name (**lname**) for customer 199 consists of four characters, represented as follows:

aA¹A²bB¹B²

In this representation, the first character (the symbol a) is a single-byte character. The second character (the symbol A¹A²) is a 2-byte character. The third character (the symbol b) is a single-byte character. The fourth character (the symbol B¹B²) is a 2-byte character.

The following sample of output shows the result of the query. Although the customer first name consists of 4 characters, the length column shows that the total number of bytes in this name is 6.

cust_name	length	cust_num
aA ¹ A ² bB ¹ B ²	6	199

The OCTET_LENGTH Function

The OCTET_LENGTH function returns the number of bytes and generally includes trailing white spaces in the byte count. This SQL length function uses the definition of white space that the locale defines. OCTET_LENGTH returns the number of bytes in a character column, quoted string, host variable, or procedure variable. However, the actual behavior of the OCTET_LENGTH function varies with the type of argument that the user specifies.

The following table shows how the OCTET_LENGTH function operates on each of the argument types. The Example column in this table uses the symbol `s` to represent a single-byte trailing white space. For simplicity, the Example column also assumes that the sample strings consist of single-byte characters.

OCTET_LENGTH Argument	Behavior	Example
Quoted string	Returns number of bytes in string, including any trailing white spaces.	If the string is 'Ludwig', the result is 6. If the string is 'Ludwigsss', the result is 10.
CHAR or NCHAR column	Returns number of bytes in string, including trailing white spaces. This value is the defined length, in bytes, of the column.	If the fname column of the customer table is a CHAR(15) column, and this column contains the string 'Ludwig', the result is 15. If the fname column contains the string 'Ludwigsss', the result is still 15.
VARCHAR or NVARCHAR column	Returns number of bytes in string, including trailing white spaces. This value is the actual length, in bytes, of the character string. It is not the defined maximum column size.	If the cat_advert column of the catalog table is a VARCHAR(255, 65) column, and this column contains the string "Ludwig", the result is 6. If the column contains the string 'Ludwigsss', the result is 10.
TEXT column	Returns number of bytes in column, including trailing white spaces.	If the cat_descr column in the catalog table is a TEXT column, and this column contains the string 'Ludwig', the result is 6. If the cat_descr column contains the string 'Ludwigsss', the result is 10.
Host or procedure variable	Returns number of bytes that the variable contains, including any trailing white spaces, regardless of defined length of variable.	If the procedure variable f_name is defined as CHAR(15), and this variable contains the string 'Ludwig', the result is 6. If the f_name variable contains the string 'Ludwigsss', the result is 10.

The difference between the LENGTH and OCTET_LENGTH functions is that OCTET_LENGTH generally includes trailing white spaces in the byte count, whereas LENGTH generally excludes trailing white spaces from the byte count.

The advantage of the OCTET_LENGTH function over the LENGTH function is that the OCTET_LENGTH function provides the actual column size whereas the LENGTH function trims the column values and returns the length of the trimmed string. This advantage of the OCTET_LENGTH function applies both to single-byte code sets such as ISO8859-1 and multibyte code sets such as the Japanese SJIS code set.

The following table shows some results that the OCTET_LENGTH function might generate.

OCTET_LENGTH Input String	Description	Result
'abc '	A quoted string with 4 single-byte characters (the characters abc and 1 trailing space)	4
'A ¹ A ² B ¹ B ² '	A quoted string with 2 multibyte characters	4
'aA ¹ A ² bB ¹ B ² '	A quoted string with 2 single-byte and 2 multibyte characters	6

The CHAR_LENGTH Function

The CHAR_LENGTH function (also known as the CHARACTER_LENGTH function) returns the number of characters in a quoted string, column with a character data type, host variable, or procedure variable. However, the actual behavior of this function varies with the type of argument that the user specifies.

The following table shows how the CHAR_LENGTH function operates on each of the argument types. The Example column in this table uses the symbol s to represent a single-byte trailing white space. For simplicity, the Example column also assumes that the sample strings consist of single-byte characters.

CHAR_LENGTH Argument	Behavior	Example
Quoted string	Returns number of characters in string, including any trailing white spaces as defined in the locale.	If the string is 'Ludwig', the result is 6. If the string is 'Ludwigssss', the result is 10.
CHAR or NCHAR column	Returns number of characters in string, including trailing white spaces. This value is the defined length, in bytes, of the column.	If the fname column of the customer table is a CHAR(15) column, and this column contains the string 'Ludwig', the result is 15. If the fname column contains the string 'Ludwigssss', the result is 15.
VARCHAR or NVARCHAR column	Returns number of characters in string, including white spaces. This value is the actual length, in bytes, of the character string. It is not the defined maximum column size.	If the cat_advert column of the catalog table is a VARCHAR(255, 65) and this column contains the string "Ludwig", the result is 6. If the column contains the string 'Ludwigssss', the result is 10.
TEXT column	Returns number of characters in column, including trailing white spaces.	If the cat_descr column in the catalog table is a TEXT column, and this column contains the string 'Ludwig', the result is 6. If the cat_descr column contains the string 'Ludwigssss', the result is 10.
Host or procedure variable	Returns number of characters that the variable contains, including any trailing white spaces, regardless of defined length of variable.	If the procedure variable f_name is defined as CHAR(15), and this variable contains the string 'Ludwig', the result is 6. If the f_name variable contains the string 'Ludwigssss', the result is 10.

The CHAR_LENGTH function is especially useful with multibyte code sets. If a quoted string of characters contains any multibyte characters, the number of characters in the string differs from the number of bytes in the string. You can use the CHAR_LENGTH function to determine the number of characters in the quoted string.

However, the CHAR_LENGTH function can also be useful in single-byte code sets. In these code sets, the number of bytes in a column is equal to the number of characters in the column. If you use the LENGTH function to determine the number of bytes in a column (which is equal to the number of characters in this case), LENGTH trims the column values and returns the length of the trimmed string. In contrast, CHAR_LENGTH does not trim the column values but returns the actual size of the column.

The following table shows some results that the CHAR_LENGTH function might generate for quoted strings.

CHAR_LENGTH Input String	Description	Result
'abc '	A quoted string with 4 single-byte characters (the characters abc and 1 trailing space)	4
'A ¹ A ² B ¹ B ² '	A quoted string with 2 multibyte characters	2
'aA ¹ A ² bB ¹ B ² '	A quoted string with 2 single-byte and 2 multibyte characters	4

Handling MONEY Columns

The MONEY data type stores currency amounts. This data type stores fixed-point decimal numbers up to a maximum of 32 significant digits. You can specify MONEY columns in data definition statements such as CREATE TABLE and ALTER TABLE.

The choice of locale affects monetary data in the following ways:

- The value of the default scale parameter in the definition of MONEY columns
- The currency notation that the client application uses

The locale defines the default scale and currency notation in the MONETARY category of the locale file. For information on the MONETARY category of the locale file, see [“The MONETARY Category” on page A-7](#).

Default Values for the Scale Parameter

Define a MONEY column with the following syntax:

```
MONEY(precision, scale)
```

Internally, the database server stores MONEY values as DECIMAL values. The *precision* parameter defines the total number of significant digits, and the *scale* parameter defines the total number of digits to the right of the decimal separator. For example, if you define a column as MONEY(8,3), the column can contain a maximum of eight digits, and three of these digits are to the right of the decimal separator. A sample data value in the column might be 12345.678.

If you omit the *scale* parameter from the declaration of a MONEY column, the database server provides a scale that the locale defines. For the default locale (U.S. English), the database server uses a default scale of 2. It stores the data type MONEY(*precision*) in the same internal format as the data type DECIMAL(*precision*,2). For example, if you define a column as MONEY(10), the database server creates a column with the same format as the data type DECIMAL(10,2). A sample data value in the column might be 12345678.90.

For nondefault locales, if you omit the scale when you declare a MONEY column, the database server declares a column with the same internal format as DECIMAL data types with a locale-specific default scale. For example, if you define a column as MONEY(10), and the locale defines the default scale as 4, the database server stores the data type of the column in the same format as DECIMAL(10,4). A sample data value in the column might be 123456.7890.

For the complete syntax of the MONEY data type, see the [Informix Guide to SQL: Syntax](#). For a complete description of the MONEY data type, see the [Informix Guide to SQL: Reference](#).

Format of Currency Notation

Client applications format values in MONEY columns with the currency notation that the locale defines. This notation specifies the currency symbol, thousands separator, and decimal separator. (For more information on currency notation, see [“Numeric and Monetary Formats” on page 1-14.](#))

For the default locale, the currency symbol is a dollar sign (\$), the thousands separator is a comma (,), and the decimal separator is a period (.). For nondefault locales, the locale defines the appropriate culture-specific currency notation for monetary values. You can also use the **DBMONEY** environment variable to customize the currency symbol and decimal separator for monetary values. For more information, see [“Customizing Monetary Values” on page 1-53.](#)

Using Data Manipulation Statements

The choice of a locale can affect the following SQL data manipulation statements:

- DELETE
- INSERT
- ★ LOAD
- ★ UNLOAD
- ★ UPDATE

The following sections describe the GLS aspects of these SQL statements. For a complete description of the use and syntax of these statements, see the [Informix Guide to SQL: Syntax](#).

Specifying Conditions in the WHERE Clause

The following SQL statements might include a WHERE clause to tell the database server on which rows to operate:

- For the DELETE statement, the WHERE clause specifies which rows to delete.
- For the INSERT statement, if the statement includes an embedded SELECT, the WHERE clause specifies which rows to insert from another table.
- For the UPDATE statement, the WHERE clause specifies which rows to update. In addition, the SET clause can include an embedded SELECT statement whose WHERE clause identifies a row whose values are to be assigned to another row.
- For the UNLOAD statement, the WHERE clause of the embedded SELECT specifies which rows to unload.

The choice of a locale affects these uses of a WHERE clause in the same way that it affects the WHERE clause of a SELECT. For more information, see [“Logical Predicates in a WHERE Clause” on page 3-25](#) and [“Comparisons with MATCHES and LIKE Conditions” on page 3-29](#).

Specifying Era-Based Dates

The following SQL statements might specify DATE and DATETIME column values:

- The WHERE clause of the DELETE statement
- The VALUES clause of the INSERT statement
- The SET clause of the UPDATE statement

When you specify a DATE column value in one of the preceding SQL statements, the database server uses the **GL_DATE** (or **DBDATE**) environment variable to interpret the date expression, as follows:

- If you have set **GL_DATE** (or **DBDATE**) to an era-based (Asian) date format, you can use era-based date formats for date expressions.
- If you have not set the **GL_DATE** (or **DBDATE**) environment variable to an era-based date format, you can use era-based date formats for date expressions *only* if the server-processing locale supports era-based dates. For more information on the server-processing locale, see [“Determining the Server-Processing Locale” on page 1-34](#).
- If your locale does not support era-dated dates, you cannot use era-based date formats for date expressions. If you attempt to specify an era-based date format in this case, the SQL statement fails.

When you specify a DATETIME column value, the database server uses the **GL_DATETIME** (or **DBTIME**) environment variable instead of the **GL_DATE** (or **DBDATE**) environment variable to interpret the expression.

For more information, see [“Era-Based Date and Time Formats” on page 1-51](#). For information on how to set the **GL_DATE**, **GL_DATETIME**, **DBDATE**, and **DBTIME** environment variables to an era-based format, see their entries in [Chapter 2, “GLS Environment Variables.”](#)

Loading and Unloading Data

The LOAD and UNLOAD statements allow you transfer data to and from your database with operating-system text files. The following sections describe the GLS aspects of the LOAD and UNLOAD statements. For a complete description of the use and syntax of these statements, see the [Informix Guide to SQL: Syntax](#).

Loading Data into a Database

The LOAD statement inserts data from an operating-system text file into a table or view. This operating-system text file is called a LOAD FROM file. The data in this file can contain any character that the client code set defines. If the client locale supports a multibyte code set, this data can contain multibyte characters. If the database locale supports a code set that is different from but convertible to the client code set, the client performs code-set conversion on the data before it sends this data to the database server. For more information, see [“Performing Code-Set Conversion” on page 1-40](#).

The locale also defines the formats for date, time, numeric, and monetary data. You can use any format that the client locale supports as a column value in the LOAD FROM file. For example, a French locale might define monetary values that have a space as the thousands separator and a comma as the decimal separator. When you use this locale, the following MONEY column value is valid in a LOAD FROM file:

```
3 411,99
```

You can set environment variables to specify alternative end-user formats for date and monetary data. If you set these environment variables, the LOAD FROM files can use the alternative end-user formats for DATE, DATETIME, and MONEY column values. For more information, see [“Customizing Date and Time End-User Formats” on page 1-50](#) and [“Customizing Monetary Values” on page 1-53](#).

Unloading Data from a Database

The UNLOAD statement writes the rows that a SELECT statement retrieves to an operating-system text file. This operating-system text file is called an UNLOAD TO file. The data in this file contains characters that the client code set defines. If the client locale supports a multibyte code set, this data can contain the multibyte characters. If the database locale supports a code set that is different from but convertible to the client code set, the client performs code-set conversion on the data before it writes this data to the UNLOAD TO file. (For more information, see [“Performing Code-Set Conversion” on page 1-40](#).)



The client locale and certain environment variables determine the output format of certain data types in the UNLOAD TO file. These data types include DATE values, MONEY values, values of numeric data types, and DATETIME values. For further information, see [“End-User Formats” on page 1-12](#) and [“How Do You Customize Client End-User Formats?” on page 1-49](#).

Important: You can use an UNLOAD TO file, which the UNLOAD statement generates, as the input file (the LOAD FROM file) to a LOAD statement that loads another table or database. When you use an UNLOAD TO file in this manner, make sure that all environment variables and the client locale have the same values when you perform the LOAD as they did when you performed the UNLOAD.

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AD/XP

SE

UD

AD/XP

IDS

UD

This chapter describes how the Global Language Support (GLS) feature affects the database server. It covers the following main topics

- When the database server uses the server locale
- Which database server and SQL utilities provide support for the GLS feature
- How the high-performance loader supports non-ASCII characters ♦
- How multibyte characters affect the name of a database ♦
- How the GLS feature might affect Dynamic Server with UD Option data types ♦

For descriptions of database server features that are not unique to the GLS feature, see your [Administrator's Guide](#). For an introduction to the GLS feature, see [Chapter 1, "GLS Fundamentals."](#)

Using the Server Locale

The database server might perform read and write operations to the following operating-system files:

- Diagnostic files
The database server generates diagnostic files when you set one or more of the following configuration parameters: DUMPCNT, DUMPCORE, DUMPPDIR, DUMPGCORE, and DUMPSHMEM. Diagnostic files include the **af.xxx**, **shmem.xxx**, **gcore.xxx**, and **core** files.
- Message-log file
The database server generates a user-specified message-log file when you set the MSGPATH configuration parameter. ♦

W/D

When you set the MSGPATH configuration parameter, Dynamic Server, Workgroup and Developer Editions writes status messages and diagnostic messages to the file **%INFORMIXDIR%\online.log** and performs reads of the file. ♦

SE

The INFORMIX-SE database server creates operating-system files for the following objects:

- Database

When SE creates a database, it creates a subdirectory that is called **dbname.dbs** in your current directory.

- Table and index (**.dat** and **.idx** files)

When you create a table in a database, SE creates two files, a data file (**.dat**) and an index file (**.idx**). SE stores the data and index files that are associated with a database in the **dbname.dbs** subdirectory.

- Log file

SE creates this file when you specify the WITH LOG IN clause of the CREATE DATABASE statement. ♦



Tip: For information about diagnostic, database, table, index, and message-log files as well as configuration parameters, see your “[Administrator’s Guide](#).” For information about the **dbexport** utility, see the “[Informix Migration Guide](#).”

These operating-system files reside on the server computer, the same computer on which the database server resides. When the database server reads from or writes to these files, it must use a code set that the server computer supports. The database server obtains this code set from the server locale.

Set the server locale with the **SERVER_LOCALE** environment variable. If you do not set **SERVER_LOCALE**, the database server uses the default locale, U.S. English, as the server locale. For the definition of server locale, see [page 1-27](#). For information on how to set **SERVER_LOCALE**, see [page 2-43](#).

AD/XP

All coservers should have identical GLS operating-system environments. ♦

AD/XP

UD

The database server needs to determine the code set that the server locale supports (the server code set) to perform the following tasks that are associated with the read and write operations to its operating-system files:

- Perform code-set conversion between the code sets of the server-processing locale and the server locale
- Use non-ASCII characters in identifiers ♦
- Use non-ASCII characters in SQL identifiers ♦
- Generate filenames that contain non-ASCII characters (except for Dynamic Server with AD and XP Options)

Performing Code-Set Conversion

This section summarizes the code-set conversion that the database server and a client product perform. For more general information, see [page 1-40](#).

What Data Does the Database Server Convert?

Once the database server creates the operating-system file, it has generated a filename and written file contents in the code set of the server locale (the server code set). Any Informix product or client application that needs to access this file must have a server-processing locale that supports this same server code set. You must ensure that the appropriate locale environment variables are set so that the server-processing locale supports a code set with these non-ASCII characters. (For more information on the server-processing locale, see [page 1-34](#).)

The database server checks the validity of a filename with respect to the server-processing locale before it references a filename.

Dynamic Server with AD and XP Options rejects any filename that is not ASCII alphanumeric 7-bit. ♦

AD/XP

When the database server transfers data to and from its operating-system files, it handles any differences in the code sets of the server-processing locale and the server locale as follows:

- If these two code sets are the same, the database server can read from or write to its operating-system files in the code set of the server locale.
- If these two code sets are different, and an Informix code-set conversion exists between them, the database server automatically performs code-set conversion when it reads from or writes to its operating-system files.

For code-set conversion to resolve the difference in code sets, the server locale must support the actual code set that the database server used to create the file. For more information, see [“The Server Code Set” on page 4-10](#).

- If these two code sets are different, but no Informix code-set conversion exists, the database server cannot perform code-set conversion.

If the database server reads from or writes to an operating-system file for which no code-set conversion exists, it uses the code set of the server-processing locale to perform the read or write operation.

Which Data Does a Client Product Convert?

When the code sets of two locales differ, an Informix client product must use code-set conversion to prevent data corruption of character data. Code-set conversion converts the following types of character data:

- SQL data types
 - CHAR and VARCHAR
 - NCHAR and NVARCHAR
 - LVARCHAR ♦
 - TEXT (the BYTE data type is *not* converted)
- Any of the ESQL / C character data types (**char**, **fixchar**, **string**, and **varchar**)
- SQL statements, both static and dynamic



AD/XP

- Database objects such as:
 - Column names
 - Table names
 - Statement-identifier names
 - Cursor names

For a complete list of SQL identifiers, see [“SQL Identifiers That Support Non-ASCII Characters” on page 4-8](#).

- Stored procedure text
- Command text
- Error message text in the **sqlca.sqlerrm** field

Tip: If your ESQL/C client application uses code-set conversion, you might need to take special programming steps. For more information, see [“Handling Code-Set Conversion” on page 6-12](#).

Non-ASCII Characters in Identifiers

Dynamic Server with AD and XP Options permits non-ASCII (8-bit and multibyte) characters in many common identifiers such as column name, connection name, constraint name, database name, index name, role name, stored procedure name, synonym, table name, trigger name, and view name.

The database server does not allow multibyte characters in the following identifiers specific to Dynamic Server with AD and XP Options:

- Dbslice
- Coserver
- Cogroup

Dynamic Server with AD and XP Options allows only ASCII alphanumeric 7-bit names for the following identifiers:

- Chunk name
- Filename
- Message-log filename
- Pathname

SQL Identifiers That Support Non-ASCII Characters

If you use a nondefault locale that supports a code set with non-ASCII characters, you can use these non-ASCII characters to form most SQL identifiers. Dynamic Server with UD Option can support non-ASCII characters in the following SQL identifiers:

- The SQL identifiers that *all* Informix database servers support
[Figure 3-1 on page 3-5](#) lists the SQL identifiers in which *all* Informix database servers can support non-ASCII characters.
- Some of the SQL identifiers that are unique to Dynamic Server with UD Option

Figure 4-1 shows the additional SQL identifiers in which Dynamic Server with UD Option can support non-ASCII characters. The SQL Identifier column lists the name of the database object. The SQL Segment column shows the segment that gives the complete syntax of the identifier in the [Informix Guide to SQL: Syntax](#). The Notes column describes any special considerations for the identifier and also provides an example of an SQL statement that creates or uses the identifier.

Figure 4-1

SQL Identifiers Unique to Dynamic Server with UD Option That Support Non-ASCII Characters

SQL Identifier	SQL Segment	Notes
Cast	Expression	An example of an SQL statement that uses a cast name is CREATE CAST.
Distinct data type	Data Type	An example of an SQL statement that uses a distinct-data-type name is CREATE DISTINCT.
Function	Function Name	An example of an SQL statement that uses a function name is CREATE FUNCTION.
Opaque data type	Data Type	An example of an SQL statement that uses an opaque data type name is CREATE OPAQUE TYPE.

(1 of 2)

SQL Identifier	SQL Segment	Notes
Operator class	Expression	An example of an SQL statement that uses an operator-class name is CREATE OPCLASS.
Procedure	Procedure Name	An example of an SQL statement that uses a procedure name is CREATE PROCEDURE.
Row data type	Data Type	An example of an SQL statement that uses a row data type name is CREATE ROW TYPE.

(2 of 2)

Generating Non-ASCII Filenames

AD/XP

The material in this section does not apply to Dynamic Server with AD and XP Options. ♦

You can use non-ASCII characters (8-bit and multibyte characters) when you create or refer to any of the following database server names:

- Chunk name
- Message-log filename
- Pathname

The following restrictions affect the ability of the database server to generate filenames that contain non-ASCII characters:

- The database server must know whether the operating system is 8-bit clean.
- The server code set must support these non-ASCII characters.

SE

When you specify the name of a database, table, or index, SE creates a file that includes the identifier name. When you create a database log file, SE creates a file with the specified name. See [“Naming a Database on INFORMIX-SE” on page 4-13](#). ♦

UNIX

The Message-Log File

The MSGPATH configuration parameter specifies a filename for a message log. Suppose you specify a message log that is called $/A^1A^2B^1B^2/C^1C^2D^1D^2$, where A^1A^2 , B^1B^2 , C^1C^2 , and D^1D^2 are multibyte characters, with the configuration parameter in your ONCONFIG configuration file.

```
MSGPATH /A1A2B1B2/C1C2D1D2 # multibyte message-log filename
```

The database server assumes that the operating system is 8-bit clean, and it generates a file that is called $C^1C^2D^1D^2$ in the $/A^1A^2B^1B^2$ directory. ♦

WIN NT

The MSGPATH configuration parameter specifies a filename for a message log. Suppose you specify a message log that is called $\backslash A^1A^2B^1B^2\backslash C^1C^2D^1D^2$, where A^1A^2 , B^1B^2 , C^1C^2 , and D^1D^2 are multibyte characters, with the configuration parameter in your ONCONFIG configuration file.

```
MSGPATH \A1A2B1B2\C1C2D1D2 # multibyte message-log filename
```

The database server assumes that the operating system is 8-bit clean, and it generates a file that is called $C^1C^2D^1D^2$ in the $\backslash A^1A^2B^1B^2$ directory. ♦

The Server Code Set

When the database server actually creates a file whose filename has non-ASCII characters, the server locale must support these non-ASCII characters. Before you start a database server, you must set the **SERVER_LOCALE** environment variable to the name of a locale whose code set contains these non-ASCII characters.

For example, suppose you want a message log with the UNIX path $/A^1A^2B^1B^2/C^1C^2D^1D^2$, where A^1A^2 , B^1B^2 , C^1C^2 , and D^1D^2 are multibyte characters in the Japanese SJIS code set. You must perform the following steps to enable the database server to create this message-log file on the server computer:

1. Modify the MSGPATH configuration parameter in the ONCONFIG file, as shown on [page 4-10](#).
2. Set the **SERVER_LOCALE** environment variable on the server computer to the Japanese SJIS locale, **ja_jp.sjis**.
3. Start the database server with the **oninit** utility.

IDS

UD

W/D

When the database server initializes, it creates the `/A1A2B1B2/C1C2D1D2` message log. For more information on **oninit**, see your [Administrator's Guide](#). ♦

For example, suppose that you want a message log for Dynamic Server, Workgroup and Developer Editions with the path `C1C2D1D2D3`, where `C1C2` and `D1D2D3` are multibyte characters in the Japanese SJIS code set. You must perform the following steps to enable Dynamic Server, Workgroup and Developer Editions to create this message-log file on the server computer:

1. Modify the MSGPATH configuration parameter in the ONCONFIG file.
2. Set the **SERVER_LOCALE** environment variable on the server computer to the Japanese SJIS locale, **ja_jp.sjis**.
3. Start the database server.

When the database server initializes, it creates the `\C1C2D1D2D3` message log. For more information on message-log files and initialization, see your [Administrator's Guide](#). ♦

SE

For example, suppose you want an INFORMIX-SE message log with the path `C1C2D1D2D3`, where `C1C2` and `D1D2D3` are multibyte characters in the Japanese SJIS code set. You must perform the following steps to enable SE to create this message-log file from within a client application:

1. Set the **SERVER_LOCALE** environment variable on the server computer to the Japanese SJIS locale, **ja_jp.sjis**.
2. Set the **CLIENT_LOCALE** environment variable on the client computer to the Japanese SJIS locale, **ja_jp.sjis**, or to a locale that supports a convertible code set. For more information, see [“Performing Code-Set Conversion” on page 4-5](#).
3. Start the client application from which you execute the following SQL statement:

```
CREATE DATABASE A1A2B1B2 WITH LOG IN 'C1C2D1D2D3'
```

When SE executes this CREATE DATABASE statement, it can support the Japanese SJIS characters in the database name and the message-log file. For more information on CREATE DATABASE, see the [Informix Guide to SQL: Syntax](#). ♦

SE

The GLS8BITFSYS Environment Variable

The **GLS8BITFSYS** environment variable on the server computer tells the SE database server whether the operating system is 8-bit clean. SE uses the value of **GLS8BITFSYS** to determine whether it can use non-ASCII characters in the filename of an operating-system file that it generates, as follows:

- When **GLS8BITFSYS** is 1, SE can use non-ASCII characters in its filenames.
- When **GLS8BITFSYS** is 0, SE does *not* allow non-ASCII characters in its filenames.

For example, create an SE database that is called $A^1A^2B^1B^2$, where A^1A^2 and B^1B^2 are multibyte characters, with the following SQL statement:

```
CREATE DATABASE A1A2B1B2
```

Tip: For more information about how to use multibyte characters in the name of an SE database, see [“Data Types for Dynamic Server with UD Option” on page 4-20](#).

If **GLS8BITFSYS** is 1 (or is not set) on the server computer, SE assumes that the operating system is 8-bit clean, and it generates a database directory, $A^1A^2B^1B^2$.**.dbs**. For more information on an 8-bit clean operating system and the **GLS8BITFSYS** environment variable, see [page 2-25](#).



SE

Data Portability

Use of non-ASCII characters for SE database names and table names might present compatibility problems. To achieve maximum portability for SE, Informix recommends that you not use non-ASCII database names, so that you retain the option to shift the database to an operating system that is not 8-bit clean. To disable the capability of SE to generate 8-bit filenames (even if the operating system is 8-bit clean), set the **GLS8BITFSYS** environment variable to 0.

SE

Naming a Database on INFORMIX-SE

The INFORMIX-SE database server limits the name of a database to 10 bytes. When you use multibyte characters in database names, you must ensure that the database name meets this size requirement. The following CREATE DATABASE statement creates a database name of five multibyte characters:

```
CREATE DATABASE A1A2B1B2C1C2D1D2E1E2
```

The database name that is shown in the preceding representation is 10 bytes long (five 2-byte multibyte characters), so it does not exceed the maximum length for SE database names. However, the following CREATE DATABASE statement generates an error because the total number of bytes in this database name is 12:

```
CREATE DATABASE A1A2A3A4B1B2B3B4C1C2C3C4
```

This statement specifies three 4-byte characters for the name of an SE database. In this case, the total number of bytes in the database name would be 12 bytes, and this length exceeds the maximum length for a database name in SE. The database server rejects the statement with the following error message:

```
-354: Incorrect database or cursor name format
```

To recover from this error, you must reenter the CREATE DATABASE statement and specify a name whose total length in the buffer is not more than 10 bytes.



Tip: You specify the database name in the code set of the client locale (the client code set). When your client application performs code-set conversion on a database name, it might expand this name beyond the 10-character limit. Make sure that the database name is 10 or fewer characters that the database code set defines, not just that the client code set defines.

Locale Support by Database Server Utilities

The GLS feature enables database server utilities to provide the following locale-specific support:

- Locale environment variables to establish nondefault locales
- Non-ASCII characters in command-line arguments

This section provides information that is specific to the use of the GLS feature by database server utilities. For a complete description of utilities, see your [Administrator's Guide](#). For information about how to use Informix utilities to migrate to or from a database server, see the [Informix Migration Guide](#). For information about database server utilities for auditing, see your [Trusted Facility Manual](#).

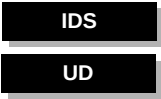
Locale Environment Variables

Database server utilities and SQL utilities are client applications that request information from an instance of the database server. Therefore, these utilities use the **CLIENT_LOCALE**, **DB_LOCALE**, and **SERVER_LOCALE** environment variables to obtain the name of a nondefault locale, as follows:

- If a database utility is to use a nondefault code set to accept input (including command-line arguments) and to generate output, you must set the **CLIENT_LOCALE** environment variable.
- If a database utility accesses a database with a nondefault locale, you must set the **DB_LOCALE** environment variable.
- If a database utility causes the database server to write data on the server computer that has a nondefault code set, you must set the **SERVER_LOCALE** environment variable.

These utilities also perform code-set conversion if the database and the client locales support convertible code sets. For more information on code-set conversion, see [page 1-40](#). For more information on these environment variables, see [Chapter 2, "GLS Environment Variables."](#)

Changes to locale environment variables also should be reflected in the Windows NT **registry** database under HKEY_LOCAL_MACHINE. ♦



Non-ASCII Characters in Command-Line Arguments

Most database server utilities support non-ASCII characters in command-line arguments. These utilities interpret all command-line arguments in the client code set (which **CLIENT_LOCALE** defines). For more information about these utilities, see your [Administrator's Guide](#).

Figure 4-2 shows utilities for Informix Dynamic Server and Informix Dynamic Server with Universal Data Option that accept non-ASCII characters in command-line arguments or produce non-ASCII output.

Figure 4-2
Database Server Utilities That Support Non-ASCII Characters

Utility Name	Non-ASCII Characters in Command-Line Arguments	Non-ASCII Output
onaudit	<i>-f input_file</i>	Yes
oncheck	<i>-cc -pc database</i> <i>-ci -cI -pk -pK -pl -pL database:table#index_name</i> <i>-ci -cI -pk -pK -pl -pL -cd -cD -pB -pt -pT -pd -pD -pp database:table</i>	Yes
onload	<i>database:table</i> <i>-i old_index new_index</i> <i>-t tape_device</i>	Yes
onlog	<i>-d tape_device</i>	None
onpload (Dynamic Server with UD Option only)	<i>-d source</i> <i>-j jobname</i> <i>-p projectname</i>	Yes
onshowaudit	<i>-f input_file</i> <i>-s server_name</i>	Yes

(1 of 2)

Utility Name	Non-ASCII Characters in Command-Line Arguments	Non-ASCII Output
onspaces	-p <i>pathname</i> -f <i>filename</i>	None
onstat	-o <i>filename -dest filename_source</i>	Yes
onunload	<i>database:table</i> -t <i>tape_device</i>	Yes

(2 of 2)



Figure 4-3 shows utilities for Dynamic Server, Workgroup and Developer Editions that accept non-ASCII characters in command-line arguments or produce non-ASCII output.

Figure 4-3
Database Server Utilities That Support Non-ASCII Characters

Utility Name	Non-ASCII Characters in Command-Line Arguments	Non-ASCII Output
onaudit	-f <i>input_file</i>	Yes
oncheck	-cc -pc <i>database</i> -ci -cI -pk -pK -pl -pL <i>database:table#index_name</i> -ci -cI -pk -pK -pl -pL -cd -cD -pB -pt -pT -pd -pD -pp <i>database:table</i>	Yes
onload	<i>database:table</i> -i <i>old_index new_index</i> -t <i>source</i>	Yes
onlog	-d <i>device</i>	None
onshowaudit	-s <i>server_name</i>	Yes

(1 of 2)

W/D

Utility Name	Non-ASCII Characters in Command-Line Arguments	Non-ASCII Output
onspaces	-p <i>pathname</i> -f <i>filename</i>	None
onstat	-o <i>filename -dest</i> <i>filename_source</i>	Yes
onunload	<i>database:table</i> -t <i>source</i>	Yes

(2 of 2)



AD/XP

Figure 4-4 shows utilities for Dynamic Server with AD and XP Options that accept non-ASCII characters in command-line arguments or produce non-ASCII output.

Figure 4-4
Database Server Utilities That Support Non-ASCII Characters

Utility Name	Non-ASCII Characters in Command-Line Arguments	Non-ASCII Output
onstat		Yes
onutil	CHECK TABLE DATA <i>database:owner:table</i> CHECK TABLE INFO <i>database:owner:table</i>	Yes

You can use the **xctl** utility to wrap utilities such as **onstat**. ♦

SE

Figure 4-5 shows INFORMIX-SE utilities that accept non-ASCII characters in command-line arguments.

Figure 4-5
SE Utilities That Support Non-ASCII Characters

Utility Name	Non-ASCII Characters in Command-Line Arguments	Non-ASCII Output
secheck	<i>filename</i>	None
selog	<i>log filename</i> -f <i>tablename</i>	None

The SE utilities accept non-ASCII characters in the parameters for *filename*, *log filename*, and *tablename*. ♦

Support by SQL Utilities

The DB-Access utility generates labels and messages in the code set of the client locale.

AD/XP

DB-Access accepts multibyte command-line arguments for *database* and *script_file*. ♦

The following SQL utilities also accept non-ASCII characters in command-line arguments and generate any output in the client code set:

- **chkenv**
- **dbexport**
- **dbimport**
- **dbload**
- **dbschema**

For a description of the **chkenv** utility, refer to the [Informix Guide to SQL: Reference](#). For a description of the **dbload** and **dbschema** utilities, refer to the [Informix Guide to SQL: Tutorial](#). For information about how to use **dbexport** and **dbimport** and other SQL utilities to migrate to or from a database, see the [Informix Migration Guide](#). For information about DB-Access, see the [DB-Access User Manual](#).

IDS

W/D



AD/XP

Enhancements to the onmode Utility

You can use the **-b** option with the **onmode** utility to revert from a GLS database to an Informix ALS, NLS, or pre-NLS database.

Important: *You cannot revert to an ALS Version 5.0 database from a GLS database.*

For information on how to use the **onmode** utility to migrate to an older version of a database server, see the [Informix Migration Guide](#). For a complete description of the **onmode** utility, refer to your [Administrator's Guide](#).

Using the High-Performance Loader

High-performance parallel loading and unloading for Dynamic Server with AD and XP Options performs table loads and unloads with *external tables*. It uses a series of enhanced SQL statements that you can issue with DB-Access or embed in ESQL/C.

High-performance loading provides extensive support for loading tables from many different sources and performs a variety of data format conversions. It also supports non-ASCII characters in field and record delimiters. High-performance loading performs the following types of operations that might involve support for non-ASCII characters:

- Transfers data files across platforms with the Informix data format
- Transfers operational data from a mainframe to a data warehouse
- Uses the server to convert data between delimited ASCII, fixed ASCII, EBCDIC, and Informix internal (raw) representation
- Uses SQL INSERT and SELECT statements to specify the mapping of data to new columns in a database table

Enhanced SQL statements for the loader such as CREATE EXTERNAL TABLE ...USING, INSERT INTO ... SELECT, and SELECT ... INTO EXTERNAL *table-name* USING, use identifiers that support GLS. For information about these standard SQL identifiers and identifiers for Dynamic Server with AD and XP Options, see [“Identifiers That Support Non-ASCII Characters” on page 3-5](#).

For detailed information about high-performance loading and unloading with external tables, see your [Administrator's Guide](#).

Data Types for Dynamic Server with UD Option

Dynamic Server with UD Option provides support for the following data types:

- Traditional SQL-92 data types
- LVARCHAR data type
- Smart large objects
- Complex data types: collections and row types
- Opaque data types
- Distinct data types

In addition, Dynamic Server with UD Option provides the following built-in data types:

- Simple large objects: TEXT and BYTE
- ★ BOOLEAN

For information about GLS considerations for the TEXT and BYTE data types, see [Chapter 3, “SQL Features.”](#) The BOOLEAN data type has no GLS considerations.

The following sections summarize the GLS considerations for the SQL-92, LVARCHAR, smart-large-object, complex, opaque, and distinct data types.

SQL-92 Data Types

Dynamic Server with UD Option supports the traditional SQL-92 data types, as the following table shows.

Traditional SQL-92 Data Type	Dynamic Server with UD Option Implementation
Integer	SMALLINT, INTEGER, INT8, SERIAL, SERIAL8
Floating-point number	SMALLFLOAT, FLOAT
Character string:	
Fixed	CHAR, NCHAR
Varying	VARCHAR, NVARCHAR
Date and time (including interval)	DATE, DATETIME, INTERVAL
Numeric and decimal	DECIMAL, MONEY

For these data types, Dynamic Server with UD Option automatically provides the following locale-related tasks:

- It automatically performs code-set conversion when it transfers data to and from its operating-system files.

For more information, see the discussion of code-set conversion in [“Performing Code-Set Conversion” on page 4-5](#).

- It automatically uses localized collation order for data in NCHAR and NVARCHAR columns.

For more information on NCHAR and NVARCHAR, see [“Using Character Data Types” on page 3-12](#).

- It automatically interprets locale-specific formatting for date and time data and for monetary data.

For more information, see [“End-User Formats” on page 1-12](#).

LVARCHAR Data Type

The LVARCHAR data type is also used to represent the format of a base type value. LVARCHAR is similar to the Informix-specific data type VARCHAR. (VARCHAR stores character data of varying length.)

- The LVARCHAR data type supports values greater than 256 bytes.
- The LVARCHAR data type is collated in code-set collation order.
- Client applications perform code-set conversion on LVARCHAR data.

For more information on code-set collation and conversion, see [Chapter 1, “GLS Fundamentals.”](#)

The LVARCHAR data type supports SQL length functions similar to the VARCHAR data type. For more information, see [“Using SQL Length Functions” on page 3-41.](#)

For more information on the LVARCHAR data type, see the [Informix Guide to SQL: Reference](#).

Smart Large Objects

A smart large object can store text or images. Smart large objects are stored and retrieved in pieces and have database properties such as crash recovery and transaction rollback. Dynamic Server with UD Option supports the following two smart- large-object data types:

- The BLOB data type stores any type of binary data, including images and video clips.
- The CLOB data type stores text such as PostScript or HTML files.

You can seek smart large objects in bytes, but not in characters. Therefore, you need to manage the byte offset of multibyte characters when you seek information in smart large objects. You can use the functions of INFORMIX-GLS to assist you in this task. For more information, see [Chapter 7, “INFORMIX-GLS Features.”](#)

Dynamic Server with UD Option does *not* automatically perform code-set conversion for either of these smart-large-object data types.

Complex Data Types

Dynamic Server with UD Option also provides support for the complex data types:

- Collection types: SET, MULTiset, and LIST
- Row types: named row types and unnamed row types

Any of these data types can have members with character, date or time, or numeric data types. The database server can still handle the GLS concerns for these data types when they are part of a complex data type.

Opaque Data Types

Dynamic Server with UD Option provides the capabilities for programmers to define *opaque* data types. An opaque data type is fully encapsulated; its internal structure is not known to the database server. Therefore, the database server cannot automatically perform locale-specific tasks such as code-set conversion for opaque types.

When you create an opaque data type, you must write the support functions and SQL functions of the opaque type so that they handle locale-sensitive data.

Many user-defined functions handle non-ASCII data correctly, even if they were originally written for ASCII data. However, some functions might perform abnormally. Follow these suggested actions to manage these functions:

- If the server locale is not supported by the function, the function can return an error message.
Dynamic Server with UD Option provides a new application-programming interface (API) routine to locate the current server locale from within a user function.
- Ensure that the function works correctly with any locale-sensitive issues such as string manipulation or the formatting of date, time, or money values.

You can use the functions of INFORMIX-GLS to assist you in these tasks. For more information, see [Chapter 7, “INFORMIX-GLS Features.”](#)

When you create an opaque data type, you must write the support functions of the opaque type so that they handle any locale-sensitive data. In particular, consider how to handle any locale-sensitive data when you write the following support functions:

- The input and output support functions
- The receive and send support functions

The following sections summarize GLS considerations for these support functions. For more information on the support functions of an opaque data type, see *Extending INFORMIX-Universal Server: Data Types*.

Input and Output Support Functions

The internal representation of an opaque data type is the C structure in which it is stored. Each opaque type also has a character-based format, known as its external representation. This external representation is stored in an internal data type called `LVARCHAR`. The `LVARCHAR` data type can store single-byte (ASCII and non-ASCII) and multibyte character data. Data of an opaque data type can be transferred to and from the database server in this external representation. Therefore, an opaque data type can hold single-byte or multibyte data.

However, the ability to transfer the data between a client application and database server is not sufficient to support locale-sensitive data. It does not ensure that the data is correctly manipulated at its destination.

The input and output support functions convert the opaque data type from its internal to an external representation, and vice versa. The input function converts the external representation of the data type to the internal representation. The output function converts the internal representation of the data type to the external representation.

These functions should correctly handle any locale-sensitive data. In addition, they should perform any code-set conversion that is required.

Send and Receive Support Functions

The send and receive functions support binary transfer of opaque data types. That is, they convert the opaque data type from its internal representation on the client computer to its internal representation on the server computer (where it is stored), as follows:

- When a client application sends an opaque type in its internal representation to the database server, the database server invokes the *receive* support function to convert the data from the client internal representation to the server internal representation.
- When a client application receives an opaque type in its internal format from the database server, the database server invokes the *send* support function to convert the data from the server internal representation to the client representation.

If the internal representation of an opaque type contains a string, money, date, or time type, the client application cannot perform any locale translation because the opaque data type is encapsulated. Therefore, the send and receive functions must perform the translation. You can use the following DataBlade API functions to help with these translations:

- **mi_get_string(), mi_put_string()**
- **mi_get_money(), mi_put_money()**
- **mi_get_date(), mi_put_date()**
- **mi_get_datetime(), mi_put_datetime()**

For more information on these DataBlade API functions, see the *DataBlade API Programmer's Manual*.

Distinct Data Types

A distinct data type has the same internal storage representation as its source type but has a different name. Its source type can be an existing opaque data type, built-in data type, named row type, or another distinct data type. Dynamic Server with UD Option handles GLS considerations for a distinct type as it would the source type.

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T

his chapter explains how the Global Language Support (GLS) feature affects the Informix Structured Query Language application-programming interfaces (SQL APIs), INFORMIX-ESQL/C and INFORMIX-ESQL/COBOL. It contains the following topics:

- Where multibyte characters are valid in an embedded-language (ESQL) source file
- How ESQL library functions have been enhanced to support multibyte characters and localized date and time end-user formats
- How to check for warnings within an ESQL application if a connection encounters locale-related inconsistencies

Important: *INFORMIX-ESQL/COBOL might not be supported by every version of the Informix database servers discussed in this manual. For details, see your Release Notes.*

This chapter covers GLS information for both ESQL/C and ESQL/COBOL. For information specific to ESQL/C, refer to [Chapter 6, “INFORMIX-ESQL/C Features.”](#)

Tip: *For descriptions of Informix SQL API features that are not unique to the GLS feature, see the “[INFORMIX-ESQL/C Programmer’s Manual](#).” For a discussion of INFORMIX-GLS, a set of C language functions, procedures, and macros that allow you to develop internationalized applications, see the “[INFORMIX-GLS Programmer’s Manual](#).” For information about the DataBlade API, a C language API that is provided with Dynamic Server with UD Option, see the “[DataBlade API Programmer’s Manual](#).”*



UNIX

WIN NT

Non-ASCII Characters in ESQL Source Files

Each Informix SQL API product contains a processor to process an ESQL source file that has embedded SQL and preprocessor statements:

- The ESQL/C processor, **esql**, processes C source files.
- The ESQL/COBOL processor processes COBOL source files.

The name of the ESQL/COBOL processor is **esqlcobol**. ♦

The name of the ESQL/COBOL processor is **esqlcob**. ♦

The processors for ESQL/C and ESQL/COBOL products use operating-system files in the following situations:

- They write language-specific source files (**.c** and **.cob** files) when they process an ESQL source file.

The ESQL processors use the client code set (that the client locale specifies) to generate the filenames for these language-specific files.

- They read ESQL source files (**.ec** and **.eco**) that the user creates.

The ESQL processors use the client code set to interpret the contents of these ESQL source files.

You specify the client locale with the **CLIENT_LOCALE** environment variable. For more information on this environment variable, see [page 2-7](#).

Generating Non-ASCII Filenames

When an ESQL processor processes an ESQL source file, it must generate a corresponding intermediate file for the source file. If you use non-ASCII characters (8-bit and multibyte character) in these source-file names, the following restrictions affect the ability of the ESQL/C or ESQL/COBOL processor to generate filenames that contain non-ASCII characters:

- The ESQL processor must know whether the operating system is 8-bit clean.
- The code set of the client locale (the client code set) must support the non-ASCII characters that are used in the ESQL source filename.

- Your C or COBOL compiler supports the non-ASCII characters that the filename of the ESQL/C or ESQL/COBOL source file uses.

If your C compiler does not support non-ASCII characters, you can use the **CC8BITLEVEL** environment variable as a workaround when your source file contains multibyte characters. For more information, see [“The esqlmf Filter” on page 6-7](#).

The GLS8BITFSYS Environment Variable

The **GLS8BITFSYS** environment variable on the client computer tells an ESQL processor whether the operating system is 8-bit clean. An ESQL processor uses the value of **GLS8BITFSYS** to determine whether it can use non-ASCII characters in the filename of an ESQL intermediate file that it generates, as follows:

- When **GLS8BITFSYS** is 1, an ESQL processor can use non-ASCII characters in filenames that it generates.
- When **GLS8BITFSYS** is 0, an ESQL processor does *not* allow non-ASCII characters in filenames that it generates.

For example, suppose you compile an ESQL/C source file that is called **A¹A²B¹B².ec**, where **A¹A²** and **B¹B²** are multibyte characters. If **GLS8BITFSYS** is set to 1 (or is not set) on the client computer, an ESQL processor assumes that the operating system on the client computer is 8-bit clean, and it generates an intermediate C file that is called **A¹A²B¹B².c**.

For more information on an 8-bit-clean operating system and on the **GLS8BITFSYS** environment variable, see [page 2-25](#).

The Client Code Set

When an ESQL processor actually creates a file whose filename has non-ASCII characters, the client locale must support these non-ASCII characters. Before you start an Informix database server, you must ensure that the code set of the client locale (the client code set) contains these characters. When you use a nondefault locale, you must set the **CLIENT_LOCALE** environment variable to the name of a locale whose code set contains these non-ASCII characters.

For example, suppose you want to process an ESQL/C source file with the path /A¹A²B¹B²/C¹C²D¹D², where A¹A², B¹B², C¹C², and D¹D² are multibyte characters in the Japanese SJIS code set. You must perform the following steps to enable the **esql** command to create the intermediate C source file on the client computer:

1. Set the **CLIENT_LOCALE** environment variable on the client computer to the Japanese SJIS locale, **ja_jp.sjis**.
2. Process the ESQL/C source file with the **esql** command.

Once an ESQL processor creates an intermediate file, it has generated a filename and written file contents in the client code set. Any Informix product or client application that needs to access this file must have a client locale that supports this same code set.

If the code sets that are associated with the filename and with the client locale do not match, a valid filename might contain illegal characters with respect to the client locale. The ESQL processor rejects any filename that contains illegal characters and displays the following error message:

```
Illegal characters in filename.
```

Using Non-ASCII Characters in Source Code

The ESQL processors obtain the code set for use in ESQL source files from the client locale. Within an ESQL source file, you can use non-ASCII characters for the following objects (these examples use A¹A² and B¹B² to represent multibyte characters):

- ESQL host variable and indicator variable names

For example, in an ESQL/C program, the following use of multibyte characters is valid:

```
char A1A2[20], B1B2[20];  
:  
:  
EXEC SQL select col1, col2 into :A1A2 :B1B2;
```

For more information on ESQL/C host variables, see [“Non-ASCII Characters in Host Variables” on page 6-4](#).

- ESQL comments

For example, in an ESQL/COBOL program, the following use of multibyte characters is valid:

```
EXEC SQL CONNECT TO A1A2 END-EXEC. -- A1A2 DATABASE OPENED
```

- Names of SQL identifiers such as databases, tables, columns, views, constraints, prepared statements and cursors

For more information, see [“Naming Database Objects” on page 3-4](#).

- Literal strings

For example, in an ESQL/C program, the following use of multibyte characters is valid:

```
EXEC SQL insert into tbl1 (nchr1) values 'A1A2B1B2';
```

- Filenames and pathnames, as long as your operating system supports multibyte characters in filenames and pathnames

For example, in an ESQL/COBOL program, the following use of multibyte characters is valid:

```
EXEC SQL INCLUDE 'A1A2/B1B2' END-EXEC.
```



Tip: Some C-language compilers support multibyte characters in literals or comments only. For such compilers, you might need to set the **ESQLMF** and **CC8BITLEVEL** environment variables so that the ESQL/C processor calls a multibyte filter. For more information, see [“The esqlmf Filter” on page 6-7](#).

To use non-ASCII characters in your ESQL source file, the client locale must support them.

Enhanced ESQL Library Functions

Informix SQL API products support locale-specific enhancements to the ESQL/C library functions and ESQL/COBOL routines. These ESQL library functions fall into the following categories:

- DATE-format functions
- DATETIME-format functions
- Numeric-format functions
- String functions

In addition, this section describes the GLS-related error messages that these ESQL functions might produce.

DATE-Format Functions

The ESQL DATE-format functions in Figure 5-1 support the following extensions to format era-based DATE values:

- Support for the **GL_DATE** environment variable
- Support for era-based date formats of the **DBDATE** environment variable
- Extensions to the date-format strings for ESQL DATE-format functions
- Support for a precedence of date end-user formats

ESQL/C Date Function	ESQL/COBOL Date Routine
rdatestr()	ECO-DAT
rstrdate()	ECO-STR
rdefmtdate()	ECO-DEF
rfmtdate()	ECO-FMT

Figure 5-1
*ESQL DATE-Format Functions That
Support Era-Based Extensions*

This section describes locale-specific behavior of the ESQL DATE-format functions. For general information on the syntax and use of the ESQL / C DATE-format functions, see the [INFORMIX-ESQL/C Programmer's Manual](#). For general information on the syntax and use of ESQL / COBOL DATE-format routines, see the *INFORMIX-ESQL/COBOL Programmer's Manual*.

GL_DATE Support

The value of the **GL_DATE** environment variables can affect the results that these ESQL DATE-format functions generate. The end-user format that **GL_DATE** specifies overrides date end-user formats that the client locale defines. For more information, see [“Precedence for Date End-User Formats” on page 5-14](#).

DBDATE Extensions

Figure 5-2 shows the ESQL DATE-format functions that support the extended era-based date syntax for the **DBDATE** environment variable. (For more information of the era-based date extensions, see the description of **DBDATE** on [page 2-9](#).)

ESQL/C Date Function	ESQL/COBOL Date Routine
rdatestr()	ECO-DAT
rstrdate()	ECO-STR

Figure 5-2
*ESQL DATE-Format Functions That
Support DBDATE Extensions*

When you set **DBDATE** to one of the era-based formats, these functions use era-based dates to convert between date strings and internal DATE values. The following ESQL/C example shows a call to the **rdatestr()** library function:

```
char str[100];
long jdate;
:
:
rdatestr(jdate, str);
printf("%s\n", str);
```

If you set **DBDATE** to GY2MD/ and **CLIENT_LOCALE** to the Japanese SJIS locale (**ja_jp.sjis**), the preceding code fragment prints the following value for the date 08/18/1990:

```
H02/08/18
```



Important: Informix products treat any undefined characters in the alphabetic era specification as an error.

If you set **DBDATE** to a era-based date format (that is specific to a Chinese or Japanese locale), make sure to set the **CLIENT_LOCALE** environment variable to a locale that supports era-based dates.

Extended DATE-Format Strings

Figure 5-3 shows the ESQL DATE-format functions that support the extended-DATE format strings.

ESQL/C Date Function	ESQL/COBOL Date Routine
rdefmtdate()	ECO-DEF
rfmtdate()	ECO-FMT

Figure 5-3
ESQL DATE-Format Functions That Support Extended-Format Strings

Figure 5-4 shows the extended-format strings that these ESQL functions support for use with GLS locales.

Figure 5-4 <i>Extended-Format Strings for GLS Locales</i>		
Era Year	Format	Era Used
Full era year: full name of the base year (period) followed by a 2-digit year offset Same as GL_DATE end-user format of "%EC%02.2Ey"	eyy	The era that the client locale (that CLIENT_LOCALE indicates) defines
Abbreviated era year: abbreviated name of the base year (period) followed by a 2-digit year offset Same as GL_DATE end-user format of "%Eg%02.2Ey"	gyy	The era that the client locale (that CLIENT_LOCALE indicates) defines

The extended-format strings in Figure 5-4 format eras with 2-digit year offsets. To obtain a 4-digit year offset, use the **c1**, **j1**, or **j2** extended-format strings (see [Figure 5-6 on page 5-12](#)).

Figure 5-5 shows some sample extended-format strings for era-based dates.

Figure 5-5
Sample Extended-Format Strings for GLS Locales

Description	Sample Format	October 5, 1990 prints as:
Abbreviated era year	gyymmdd	H021005
	gyy.mm.dd	H02.10.05
Full era year	eyymmdd	A ¹ A ² 021005
	eyy-mm-dd	A ¹ A ² 02-10-05
	eyyB ¹ B ² mmB ¹ B ² ddB ¹ B ²	A ¹ A ² 02B ¹ B ² 10B ¹ B ² 05B ¹ B ²

The examples in Figure 5-5 assume that the client locale is Japanese SJIS (**ja_jp.sjis**).

The following ESQL/C code fragment contains a call to the **rdefmtdate()** library function:

```
char fmt_str[100];
char in_str[100];
long jdate;
:
rdatestr("10/05/95", &jdate);
strcpy("gyy/mm/dd", fmt_str);
rdefmtdate(&jdate, fmt_str, in_str);
printf("Abbreviated Era Year: %s\n", in_str);

strcpy("eyymmdd", fmt_str);
rdefmtdate(&jdate, fmt_str, in_str);
printf("Full Era Year: %s\n", in_str);
```

When the **CLIENT_LOCALE** specifies the Japanese SJIS (**ja_jp.sjis**) locale, the code fragment displays the following output:

```
Abbreviated Era Year: H07/10/05
Full Era Year: H021005
```

ALS

Informix Version 9.1 or later products support additional extended-format strings for backward compatibility with Informix ALS products. Informix recommends that you use the extended-format strings that work with GLS locales (see [Figure 5-4 on page 5-10](#)) in Version 9.1 or later client applications.

Figure 5-6 shows the extended-format strings that these ESQL functions support for backward compatibility with ALS Version 5.0 products.

Figure 5-6
Extended-Format Strings for ALS Version 5.x Compatibility

Era Year	Format	Era Used
Full era year: full name of the base year (period) followed by a 2-digit year offset Same as GL_DATE end-user format of "%EC%02.2Ey"	yyj2	Japanese Imperial
Full era year: full name of the base year (period) followed by a 4-digit year offset Same as GL_DATE end-user format of "%EC%04.4Ey"	yyyyj2	Japanese Imperial
Abbreviated era year: abbreviated name of the base year (period) followed by a 2-digit year offset Same as GL_DATE end-user format of "%Eg%02.2Ey"	yyc1 yyj1	Taiwanese Ming Guo Japanese Imperial
Abbreviated era year: abbreviated name of the base year (period) followed by a 4-digit year offset Same as GL_DATE end-user format of "%Eg%04.4Ey"	yyyc1 yyyyj1	Taiwanese Ming Guo Japanese Imperial

The following table shows some sample ALS Version 5.0 extended-format strings for era-based dates.

Description	Sample Format	October 5, 1990 prints as:
Japanese era:		
Abbreviated era year, 2-digit year	yymddj1	H021005
Abbreviated era year, 4-digit year	yyymddj1	H00021005
Full era year, 2-digit year	yymddj2	A ¹ A ² 021005
Full era year, 4-digit year	yyymddj2	A ¹ A ² 00021005
Taiwanese Ming Guo date:		
With 2-digit year	yymddc1	791005
	yy.mm.ddc1	79.10.05
	yyA ¹ A ² mmA ¹ A ² ddA ¹ A ²	79A ¹ A ² 10A ¹ A ² 05A ¹ A ²
With 4-digit year	yyymddc1	00791005

Figure 5-7 shows the extended-format strings that these ESQL functions support for backward compatibility with ALS Version 4.x products.

Figure 5-7
Extended-Format Strings for ALS 4.x Compatibility

Era Format	Format	Locale
Full era year: full name of the base year (period) followed by a 2-digit year offset Same as GL_DATE end-user format of "%EC%02.2Ey"	nnnnyy	Japanese
Abbreviated era year: abbreviated name of the base year (period) followed by a 2-digit year offset Same as GL_DATE end-user format of "%Eg%02.2Ey"	nyy	Japanese
Day of the week, with symbols that the locale defines (Sunday through Saturday in Asian characters). Multibyte characters are printed if DB_LOCALE is set to another language.	ww	any Asian

The following table shows some sample ALS Version 4.x extended-format strings for era-based dates.

Description	Sample Format	October 5, 1990 prints as:
Japanese era:		
Abbreviated era year	nyymmdd	H021005
Full era year	nnnnyy mm dd nnnnyymmdd (ww)	A ¹ A ² 02 10 05 A ¹ A ² 021005 (B ¹ B ²)

In addition to the era-based combinations in [Figures 5-4 through Figure 5-7](#), the format string also supports the combinations that the [INFORMIX-ESQL/C Programmer's Manual](#) and the [INFORMIX-ESQL/COBOL Programmer's Manual](#) describe for these functions. ♦

Precedence for Date End-User Formats

The ESQL DATE-format functions use the following precedence to determine the end-user format for values in DATE columns:

- 1. The end-user format that **DBDATE** specifies (if **DBDATE** is set)
- 2. The end-user format that **GL_DATE** specifies (if **GL_DATE** is set)
- 3. The date end-user format that the client locale specifies (if **CLIENT_LOCALE** is set)
- 4. The date end-user format from the default locale: **%m %d %iY**

For more information on the precedence of **DBDATE**, **GL_DATE** and **CLIENT_LOCALE**, refer to [“Customizing Date and Time End-User Formats” on page 1-50](#).

Tip: Informix products support **DBDATE** for backward compatibility with earlier products. Informix recommends the use of the **GL_DATE** environment variable for new client applications.



DATEIME-Format Functions

The ESQL DATEIME-format functions in Figure 5-8 support the following extensions to format era-based DATEIME values:

- Support for the **GL_DATEIME** environment variable
- Support for era-based date and times of the **DBTIME** environment variable
- Extensions to the date and time format strings for ESQL DATEIME-format functions
- Support for a precedence of DATEIME end-user formats

ESQL/C DATEIME Function	ESQL/COBOL DATEIME Routine
dtevfmtasc()	ECO-DTCVASC
dteofmtasc()	ECO-DTTOASC

Figure 5-8
*ESQL DATEIME-Format Functions
That Support Era-Based Extensions*

This section describes locale-specific behavior of the ESQL DATEIME-format functions. For general information on the syntax and use of the ESQL / C DATEIME-format functions, see the [INFORMIX-ESQL/C Programmer's Manual](#). For general information on the syntax and use of ESQL / COBOL DATEIME-format routines, see the [INFORMIX-ESQL/COBOL Programmer's Manual](#).

GL_DATEIME Support

The value of the **GL_DATEIME** environment variables can affect the results that these ESQL DATEIME-format functions generate. The end-user format that **GL_DATEIME** specifies overrides date and time formats that the client locale defines. For more information, see [“Precedence for DATEIME End-User Formats” on page 5-17](#).

DBTIME Support

The ESQL DATETIME-format functions in [Figure 5-8 on page 5-15](#) support the extended era-based date and time format strings for the **DBTIME** environment variable. (For more information on the era-based date and time extensions, see the description of **DBTIME** on [page 2-22](#).)

When you set **DBTIME** to one of the era-based formats, these functions can use era-based dates and times to convert between literal DATETIME strings and internal DATETIME values.

***Tip:** Informix products support **DBTIME** for backward compatibility with earlier products. Informix recommends the use of the **GL_DATETIME** environment variable for new applications.*

If you set **DBTIME** to a era-based DATETIME format (that is specific to a Chinese or Japanese locale), make sure to set the **CLIENT_LOCALE** environment variable to a locale that supports era-based dates and times.

Extended DATETIME-Format Strings

The following table shows the extended-format strings that the ESQL functions in [Figure 5-8 on page 5-15](#) support.

Format	Description	December 27, 1991 prints as:
%y %m %dc1	Taiwanese Ming Guo date	80 12 27
%Y %m %dc1	Taiwanese Ming Guo date	0080 12 27
%y %m %dj1	Japanese era with abbreviated era symbols	H03 12 27
%Y %m %dj1	Japanese era with abbreviated era symbols	H0003 12 27
%y %m %dj2	Japanese era with full era symbols	A ¹ A ² B ¹ B ² 03 12 27
%Y %m %dj2	Japanese era with full era symbols	A ¹ A ² B ¹ B ² 0003 12 27

In addition to the formats in the preceding table, these ESQL DATETIME-format functions support the GLS date and time specifiers. For a list of these specifiers, see the description of the **GL_DATE** and **GL_DATETIME** environment variables in [Chapter 2, “GLS Environment Variables.”](#)

Precedence for DATETIME End-User Formats

The ESQL DATETIME-format functions use the following precedence to determine the end-user format of values in DATETIME columns:

- 1. The end-user format that **DBTIME** specifies (if **DBTIME** is set)
- 2. The end-user format that **GL_DATETIME** specifies (if **GL_DATETIME** is set)
- 3. The date and time end-user formats that the client locale specifies (if **CLIENT_LOCALE** is set)
- 4. The date and time end-user format from the default locale:
 %iY-%m-%d %H:%M:%S

For more information on the precedence of **DBDATE**, **GL_DATE** and **CLIENT_LOCALE**, refer to [“Customizing Date and Time End-User Formats” on page 1-50](#).

Numeric-Format Functions

The ESQL numeric-format functions in Figure 5-9 support the following extensions to format numeric values:

- Support for multibyte characters in format strings
- Locale-specific formats for numeric values
- Formatting characters for currency symbols
- Support for the **DBMONEY** environment variable

ESQL/C Numeric Function	ESQL/COBOL Numeric Routine
rfmtdec()	None
rfmtdouble()	ECO-FEL
rfmtlong()	ECO-FIN

Figure 5-9
ESQL Numeric-Format Functions That Support Extended Numeric Formats



This section describes locale-specific behavior of the ESQL numeric-format functions. For general information on the syntax and use of the ESQL/C numeric-format functions, see the [INFORMIX-ESQL/C Programmer's Manual](#). For general information on the syntax and use of ESQL/COBOL numeric-format routines, see the [INFORMIX-ESQL/COBOL Programmer's Manual](#).

Tip: For a list of errors that these ESQL numeric-format functions might return, see [“GLS-Specific Error Messages” on page 5-24](#).

Support for Multibyte Characters

The ESQL numeric-format functions in [Figure 5-9 on page 5-17](#) support multibyte characters in their format strings as long as your client locale supports a multibyte code set that defines these characters. However, these ESQL functions and routines interpret multibyte characters as literal characters. You cannot use multibyte equivalents of the ASCII formatting characters.

For example, the following ESQL/C code fragment shows a call to the **rfmtlong()** function with the multibyte character A^1A^2 in the format string:

```
stcopy("A1A2***,***", fmtbuf);
rfmtlong(78941, fmtbuf, outbuf);
printf("Formatted value: %s\n", outbuf);
```

This code fragment generates the following output (as long as the client code set contains the A^1A^2 character):

```
Formatting value: A1A2*78,941
```

Locale-Specific Numeric Formatting

The ESQL numeric-format functions in [Figure 5-9 on page 5-17](#) require a format string as an argument. This format string determines how the numeric-format function formats the numeric value. A format string consists of a series of formatting characters and the following currency notation.

Formatting Character	Function
Dollar sign (\$)	Currency symbol
Comma (,)	Thousands separator
Period (.)	Decimal separator

Regardless of the client locale that you use, you must use the preceding ASCII symbols in the format string to identify where to place the currency symbol, decimal separator, and thousands separator. The numeric-format function uses the following precedence to translate these symbols to their locale-specific equivalents:

1. The symbols that **DBMONEY** indicates (if **DBMONEY** is set)
For locale-specific behavior of **DBMONEY**, see [“DBMONEY Extensions” on page 5-23](#).
2. The symbols that the appropriate locale category of the client locale (if **CLIENT_LOCALE** is set) specifies
If the format string contains either a \$ or @ formatting character, a numeric-format function assumes that the value is a monetary value and refers to the MONETARY category of the client locale. If these two symbols are not in the format string, a numeric-format function refers to the NUMERIC category of the client locale.
For more information on the use of the \$ and @ formatting characters, see [“Currency-Symbol Formatting” on page 5-21](#). For more information on the MONETARY and NUMERIC locale categories, see [“Locale Categories” on page A-4](#).
3. The actual symbol that appears in the format string (\$, comma, or period)

In other words, these numeric-format functions replace the dollar sign in the format string with the currency symbol that **DBMONEY** specifies (if it is set) or with the currency symbol that the client locale specifies (if **DBMONEY** is not set). The same is true for the decimal separator and thousands separator.

For example, the following ESQL/C code fragment shows a call to the **rfmtlong()** function:

```
stcopy("$***,***.&&", fmtbuf);
rfmtlong(78941, fmtbuf, outbuf);
printf("Formatted value: %s\n", outbuf);
```

In the default, German, and Spanish locales, this code fragment produces the following results for the internal MONEY value of 78941.00 (if **DBMONEY** is not set).

Format String	Client Locale	Formatted Value
\$***,***.&&	Default locale (en_us.8859-1)	\$*78,941.00
	German locale (de_de.8859-1)	DM*78.941,00
	Spanish locale (es_es.8859-1)	Pts*78.941,00

Currency-Symbol Formatting

The ESQL numeric-format functions in [Figure 5-9 on page 5-17](#) support all formatting characters that the *INFORMIX-ESQL/C Programmer's Manual* and the *INFORMIX-ESQL/COBOL Programmer's Manual* describe. In addition, you can use the following formatting characters to indicate the placement of a currency symbol in the formatted output.

Formatting Character	Function
\$	This character is replaced by the <i>precede-currency symbol</i> if the locale defines one. The MONETARY category of the locale defines the precede-currency symbol, which is the symbol that appears <i>before</i> a monetary value. When you group several dollar signs in a row, a single currency symbol floats to the rightmost position that it can occupy without interfering with the number.
@	This character is replaced by the <i>succeed-currency symbol</i> if the locale defines one. The MONETARY category of the locale defines the succeed-currency symbol, which is the symbol that appears <i>after</i> a monetary value.

For more information, see [“The MONETARY Category” on page A-7](#).

You can include both formatting characters in a format string. The locale defines whether the currency symbol appears before or after the monetary value, as follows:

- If the locale formats monetary values with a currency symbol *before* the value, the locale sets the currency symbol to the precede-currency symbol and sets the succeed-currency symbol to a blank character.
- If the locale formats monetary values with a currency symbol *after* the value, the locale sets the currency symbol to the succeed-currency symbol and sets the precede-currency symbol to a blank character.

The default locale defines the currency symbol as the precede-currency symbol, which appears as a dollar sign (\$). In the default locale, the succeed-currency symbol appears as a blank. In the default, German, and French locales, the numeric-format functions produce the following results for the internal MONEY value of 1.00.

Format String	Client Locale	Formatted Result
\$**,***	Default locale (en_us.8859-1)	\$*****1
	German locale (de_de.8859-1)	DM*****1
	French locale (fr_fr.8859-1)	s*****1
\$**,***@	Default locale (en_us.8859-1)	\$*****1s
	German locale (de_de.8859-1)	DM*****1s
	French locale (fr_fr.8859-1)	s*****1FF
\$\$,\$\$\$,\$\$	Default locale (en_us.8859-1)	ssss\$1.00
	German locale (de_de.8859-1)	ssssDM1,00
	French locale (fr_fr.8859-1)	ssss1FF
,@	Default locale (en_us.8859-1)	*****1s
	German locale (de_de.8859-1)	*****1s
	French locale (fr_fr.8859-1)	*****1FF
@***,***	Default locale (en_us.8859-1)	s*****1
	German locale (de_de.8859-1)	s*****1
	French locale (fr_fr.8859-1)	FF*****1

In the preceding table, the character *s* represents a blank or space, the FF is the French currency symbol for French francs, and the DM is the German currency symbol for deutsche marks. For more information on locale-specific currency notation, see [page 5-19](#).

The **DBMONEY** environment variable can also set the precede-currency symbol and the succeed-currency symbol. The syntax diagram for **DBMONEY** (see [page 2-20](#)) refers to these symbols as *front* and *back*, respectively. If set, **DBMONEY** takes precedence over the symbols that the locale defines.

DBMONEY Extensions

You can specify the currency symbol and decimal-separator symbol with the **DBMONEY** environment variable. These settings override any currency notation that the client locale specifies.

You can use multibyte characters for these symbols if your client code set supports them. For example, the following table shows how multibyte characters appear in sample output.

Format String	Number to Format	DBMONEY	Output
"\$\$\$\$.\$\$"	1234	'\$'.	\$1,234.00
"\$\$\$\$.\$\$"	1234	DM,	DM1.234,00
"\$\$\$\$.\$\$"	1234	A ¹ A ² .	A ¹ A ² 1,234.00
"\$\$\$\$.\$\$"	1234	.A ¹ A ²	s1,234.00
"&&&&&&&@"	1234	.A ¹ A ²	s1,234.00A ¹ A ²
"\$&&&&&&&@"	1234	A ¹ A ² .	A ¹ A ² s1,234.00
"\$&&&&&&&@"	1234	.A ¹ A ²	s1,234.00A ¹ A ²
"@&&&&&&&@"	1234	.A ¹ A ²	A ¹ A ² s1,234.00

In the preceding table, the character s represents a blank or space. For more information on **DBMONEY**, see [page 2-20](#).

String Functions

Figure 5-10 shows the ESQL string functions that support locale-specific shifted characters.

ESQL/C String Function	ESQL/COBOL String Routine
rdownshift()	ECO-DSH
rupshift()	ECO-USH

Figure 5-10
*ESQL String Functions That Support
Locale-Specific Shifted Characters*



These string functions use the information in the CTYPE category of the client locale to determine the shifted code points. (For more information on the CTYPE locale category, see [page A-6](#).) If the client locale specifies a multibyte code set, these functions can operate on multibyte strings.

Important: With multibyte character strings, a shifted string might occupy more memory after a shift operation than it did before. You must ensure that the buffer you pass to these ESQL shift functions is large enough to accommodate this expansion.

GLS-Specific Error Messages

The following ESQL functions might generate GLS-specific error messages:

- DATE-format functions (see [Figure 5-1 on page 5-8](#))
- DATETIME-format functions (see [Figure 5-8 on page 5-15](#))
- Numeric-format functions (see [Figure 5-9 on page 5-17](#))

For more information on GLS-specific error messages, refer to the *Informix Error Messages* manual.

Establishing a Database Connection

To connect to a database, an ESQL client application requests a connection from the database server. The database server must verify that it can access the database and establish the connection between the client and the database. Your client application performs the following tasks:

- Sends its client and database locale information to the database server

The ESQL program performs this step automatically when it requests a connection.

- Checks for connection warnings that the database server generates
You must provide code in your ESQL program to perform this step.

Sending Client-Locale Information

When an ESQL client program requests a connection to a database, it sends its client-locale information to the database server. The database server uses this information to determine the following information:

- How are numeric and monetary values formatted?
- How are dates and times formatted?
- What database locale does the client expect?

For information on the subset of client-locale information that the client program sends, see [“Sending the Client Locale” on page 1-32](#).

Checking for Connection Warnings

The ESQL client application sends the value of its database locale (**DB_LOCALE**) to the database server. The database server must verify that this database is compatible with the database locale in the system catalog of the database that the client application wants to open.

If this comparison fails, the database server sets the **SQLWARN7** warning flag in the **SQLCA** structure and uses the database locale in the database system catalog. An ESQL client application can check for this warning as follows:

- An ESQL/C client application checks the **sqlca.sqlwarn.sqlwarn7** field.
- An ESQL/COBOL client application checks the **SQLWARN7 OF SQLWARN OF SQLCA** field.

If the **sqlwarn7** field has a value of **W**, the database server has ignored the database locale that the client specified and has instead used the locale in the database as the database locale.

Warning: *If the database server generates a warning when it establishes the connection, your application should check the **SQLCA** structure for warnings after a connection. If you proceed with such a connection, it is your responsibility to understand the format of the data that is being exchanged.*



For more information on the comparisons, see [“Verifying the Database Locale” on page 1-33](#). For more information on how to handle exceptions within an ESQL program, see the [INFORMIX-ESQL/C Programmer's Manual](#) or the [INFORMIX-ESQL/COBOL Programmer's Manual](#).

Avoiding Partial Characters

When you use a locale that supports a multibyte code set, make sure that you define buffers large enough to avoid the generation of partial characters. Possible areas for consideration include:

- When you copy data from one buffer to another
- When you have character data that might undergo code-set conversion

For more detailed examples of partial characters, see [“Partial Characters in Column Substrings” on page 3-37](#).

Copying Character Data

When you copy data, you must ensure that the buffers are an adequate size to hold the data. If the destination buffer is not large enough for the multibyte data in the source buffer, the data might be truncated during the copy. For example, the following ESQL/C code fragment copies the multibyte data $A^1A^2A^3B^1B^2B^3$ from **buf1** to **buf2**:

```
char buf1[20], buf2[5];
:
:
strcpy("A1A2A3B1B2B3", buf1);
:
:
strcpy(buf1, buf2);
```

Because **buf2** is not large enough to hold the multibyte string, the copy truncates the string to $A^1A^2A^3B^1B^2$. To prevent this situation, ensure that the multibyte string fits into a buffer before the ESQL/C program performs the copy.

Using Code-Set Conversion

If you have a character buffer to hold character data from a database, you must ensure that this buffer is large enough to accommodate any expansion that might occur if the application uses code-set conversion. (For more information on code-set conversion, see [“Performing Code-Set Conversion” on page 1-40.](#))

If the client and database locales are different (and convertible), the application might need to expand this value. For example, if the **fname** column is defined as CHAR(8), the following ESQL/C code fragment selects an 8-byte character value into the 10-byte **buf1** host variable:

```
char buf1[10];  
:  
:  
EXEC SQL select fname into :buf1 from tab1 where cust_num = 29;
```

You might expect that a 10-byte buffer would be adequate to hold an 8-byte character value from the database. However, if the client application expands this value to 12 bytes, the value no longer fits in the **buf1** buffer. The **fname** value would be truncated to fit into **buf1**, possibly creating partial characters if **fname** contains multibyte characters. (For more information on partial characters, see [“Partial Characters in Column Substrings” on page 3-37.](#))

To avoid this situation, make sure that you define buffers to handle the maximum character-expansion possible, 4 bytes, in the conversion between your client and database code sets.

INFORMIX-ESQL/C Features

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T

his chapter explains how the Global Language Support (GLS) feature affects the Informix SQL application-programming interface (API) INFORMIX-ESQL/C. It contains the following topics:

- How ESQL/C handles non-ASCII characters in host variables
- How to handle the locale-sensitive data types, NCHAR and NVARCHAR, in ESQL/C applications
- Which ESQL/C library functions support locale-specific features
- How to use the ESQL/C filter, **esqlmf**
- How to handle code-set conversion from within an ESQL/C application
- How to interpret the results that the DESCRIBE statement returns for a dynamic SELECT that includes the TRIM function

This chapter covers GLS information that is specific to ESQL/C. For GLS information for INFORMIX-ESQL/C and INFORMIX-ESQL/COBOL, refer to [Chapter 5, “General SQL API Features.”](#)



Tip: For descriptions of Informix SQL API features that are not unique to the GLS feature, see the “[INFORMIX-ESQL/C Programmer’s Manual](#).” For a discussion of the INFORMIX-GLS application-programming interface, a set of C language functions, procedures, and macros that allow you to develop internationalized applications, see the “[INFORMIX-GLS Programmer’s Manual](#).” For information about the DataBlade API, a C language application-programming interface that is provided with Dynamic Server with UD Option, see the “DataBlade API Programmer’s Manual.”

Non-ASCII Characters in Host Variables

ESQL/C allows the use of non-ASCII characters in host variables when the following conditions are true:

- The client locale supports a code set with the non-ASCII characters that the host variable name contains.
You must set the client locale correctly before you preprocess and compile an ESQL/C program. For more information, see [“How Do You Set a GLS Locale?” on page 1-18](#).
- Your C compiler supports compilation of the same non-ASCII characters as the source code.
You must ensure that the C compiler supports use of non-ASCII characters in C source code. For information about how to indicate the support that your C compiler provides for non-ASCII characters, see [“Invoking the ESQL/C Filter” on page 6-9](#).

ESQL/C applications can also support non-ASCII characters in comments and SQL identifiers. For more information, see [“Non-ASCII Characters in ESQL Source Files” on page 5-4](#).

The following code fragment declares an integer host variable that contains a non-ASCII character in the host variable name and then selects a serial value into this variable:

```
/*
   This code fragment declares an integer host variable
   "hôte_ent", which contains a non-ASCII character in the
   name, and selects a serial value (code number in the
   "numéro" column of the "abonnés" table) into it.
*/

EXEC SQL BEGIN DECLARE SECTION;
    int hôte_ent;
    :
    :
EXEC SQL END DECLARE SECTION;
:
EXEC SQL select numéro into :hôte_ent from abonnés
    where nom = 'Ötker';
```

As long as the client locale supports the non-ASCII characters, you can use these characters to define indicator variables, as the following example shows:

```
EXEC SQL BEGIN DECLARE SECTION;
      char   hôtevar[30];
      short  ind_de_hôtevar;
EXEC SQL END DECLARE SECTION;
```

You can then access indicator variables with these non-ASCII names, as the following example shows:

```
:hôtesvar INDICATOR :hôtesvarind

:hômesvar:hômesvarind

$hômesvar$hômesvarind
```

Locale-Sensitive Character Data Types

The SQL data types NCHAR and NVARCHAR support locale-specific data. (For more information about these data types, see [“Using Character Data Types” on page 3-12.](#))

ESQL/C supports the predefined data types **string**, **fixchar**, and **varchar** for host variables that contain character data. In addition, you can use the C **char** data type for host variables. The following table shows which of these host-variable data types you can use for NCHAR and NVARCHAR data.

Locale-Sensitive Data Type	char	fixchar	string	varchar
NCHAR	✓	✓	✓	✓
NVARCHAR	✓		✓	✓

Tip: For general information on how to use these host-variable data types with character data, see the [“INFORMIX-ESQL/C Programmer’s Manual.”](#)



Your ESQL/C program can access columns of data types NCHAR and NVARCHAR when it selects into or reads from character host variables. The following code fragment declares a **char** host variable, **hôte**, and then selects NCHAR data into the **hôte** variable:

```
/*
   This code fragment declares a char host variable "hôte",
   which contains a non-ASCII character in the name, and
   selects NCHAR data (non-ASCII names in the "nom" column
   of the "abonnés" table) into it.
*/

EXEC SQL BEGIN DECLARE SECTION;
    char hôte[10];
    :
    :
EXEC SQL END DECLARE SECTION;
:
EXEC SQL select nom into :hôte from abonnés
    where numéro > 13601;
```

When you declare ESQL/C host variables for the NCHAR and NVARCHAR data types, keep in mind the relationship between the declared size of the variable and the amount of character data that it can hold, as follows:

- If your locale supports a single-byte code set, the size of the NCHAR and NVARCHAR variable determines the number of characters that it can hold.
- If your locale supports a multibyte code set, you can no longer assume a one-byte-per-character relationship.

In this case, you must ensure that you declare an ESQL/C host variable large enough to accommodate the number of characters that you expect to receive from the database.

For more information, see [“The NCHAR Data Type” on page 3-12](#) and [“The NVARCHAR Data Type” on page 3-14](#).

You can insert a value that a character host variable (**char**, **fixchar**, **string**, or **varchar**) holds in columns of the NCHAR or NVARCHAR data types. For more information about how to insert host variables into the NCHAR and NVARCHAR data types, see the [INFORMIX-ESQL/C Programmer's Manual](#).

Extended ESQL/C Library Functions

ESQL/C includes the following ESQL/C library functions that provide GLS support.

DATE-Format Functions	DATETIME-Format Functions	Numeric-Format Functions	String Functions
rdatestr()	dttofmtasc()	rfmtdec()	rupshift()
rstrdate()	dtevfmtasc()	rfmtdouble()	rdownshift()
rdeffmtdate()		rfmtlong()	
rfmtdate()			

These functions accommodate features of nondefault locales such as locale-specific dates and times, non-ASCII characters, and locale-specific classification of lowercase and uppercase characters. For more information about these enhancements, see [“Enhanced ESQL Library Functions” on page 5-7](#).

The esqlmf Filter

The ESQL/C processor, **esql**, accepts C source programs that are written in the client code set (the code set of the client locale). The ESQL/C preprocessor, **esqlc**, can accept non-ASCII characters (8-bit and multibyte) in the ESQL/C source code as long as the client code set defines them.

However, the capabilities of your C compiler might limit your ability to use non-ASCII characters within an ESQL/C source file. If the C compiler does not fully support non-ASCII characters, it might not successfully compile an ESQL/C program that contains these characters. To provide support for common non-ASCII limitations of C compilers, ESQL/C provides an ESQL/C filter that is called **esqlmf**.

This section provides the following information about the ESQL/C filter:

- How the ESQL/C filter processes non-ASCII characters
- How you invoke the ESQL/C filter

Filtering Non-ASCII Characters

As part of the compilation process of an ESQL/C source program, the ESQL/C processor calls the C compiler. When you develop ESQL/C source code that contains non-ASCII characters, the way the C compiler handles such characters can affect the success of the compilation process. In particular, the following situations might affect compilation of your ESQL/C program:

- Multibyte characters might contain C-language tokens.
A component of a multibyte character might be indistinguishable from certain single-byte characters such as percent (%), comma, backslash (\), and double quote ("). If such characters exist in a quoted string, the C compiler might interpret them as C-language tokens, which can cause compilation errors or even lost characters.
- The C compiler might not be 8-bit clean.
If a code set contains non-ASCII characters (with code values that are greater than 127), the C compiler must be 8-bit clean to interpret the characters. To be 8-bit clean, a compiler must read the eighth bit as part of the code value; it must not ignore or put its own interpretation on the meaning of this eighth bit.

To filter a non-ASCII character, the ESQL/C filter converts each byte of the character to its octal equivalent. For example, suppose the multibyte character A¹A²A³ has an octal representation of \160\042\244 and appears in the **stcopy()** call.

```
stcopy("A1A2A3", dest);
```

After **esqlmf** filters the ESQL/C source file, the C compiler sees this line as follows:

```
stcopy("\160\042\244", dest); /* correct interpretation */
```

To handle the C-language-token situation, the filter prevents the C compiler from interpreting the A^2 byte (octal \042) as an ASCII double quote and incorrectly parsing the line as follows:

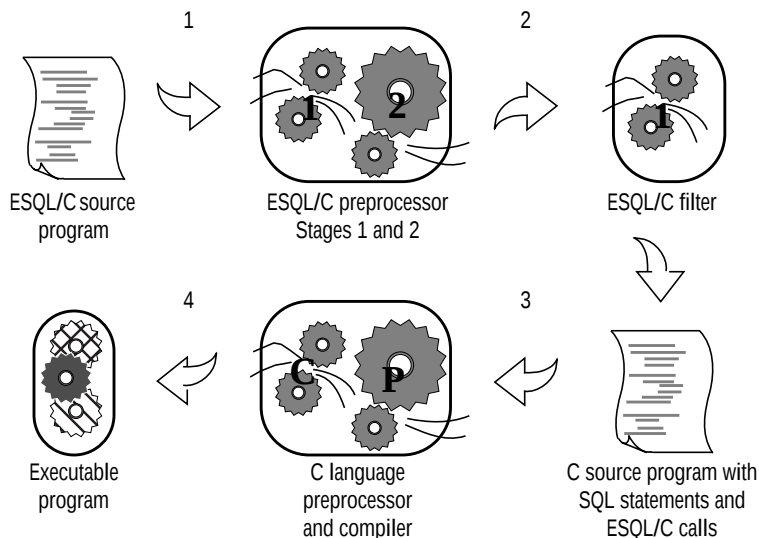
```
strcpy("A1A3, dest); /* incorrect interpretation of A2 */
```

The C compiler would generate an error for the preceding line because the line has terminated the string argument incorrectly. The **esqlmf** utility also handles the 8-bit-clean situation because it prevents the C compiler from ignoring the eighth bit of the A^3 byte. If the compiler ignores the eighth bit, it incorrectly interprets A^3 (octal \244) as octal \044.

Invoking the ESQL/C Filter

Figure 6-1 shows how an ESQL/C program that contains non-ASCII characters becomes an executable program.

Figure 6-1
Creating an ESQL/C Executable Program from a Non-ASCII Source Program



The **esql** command can automatically call the ESQL/C filter, **esqlmf**, to process non-ASCII characters. When you set the following environment variables, you tell **esql** how to invoke **esqlmf**:

- The **ESQLMF** environment variable indicates whether **esql** automatically calls the ESQL/C filter.

When you set **ESQLMF** to 1, **esql** automatically calls **esqlmf** after the ESQL/C preprocessor and before the C compiler (see [Figure 6-1 on page 6-9](#)).

- The **CC8BITLEVEL** environment variable indicates the non-ASCII characters in the ESQL/C source file that **esqlmf** filters.

Set **CC8BITLEVEL** to indicate the ability of your C compiler to process non-ASCII characters.

How **esqlmf** filters an ESQL/C source file depends on the value of the **CC8BITLEVEL** environment variable. For each value of **CC8BITLEVEL**, the following table shows the **esqlmf** command that the ESQL/C processor invokes on a ESQL/C source file.

CC8BITLEVEL Value	esqlmf Action
0	Converts all non-ASCII characters, in literal strings <i>and</i> comments, to octal constants.
1	Converts non-ASCII characters in literal strings, but not in comments, to octal constants.
2	Converts non-ASCII characters in literal strings to octal constants to ensure that all the bytes in the non-ASCII characters have the eighth bit set.
3	Does not invoke esqlmf .



Important: To invoke the **esqlmf** commands that **CC8BITLEVEL** can specify, you must set the **ESQLMF** environment variable to 1.

When you set **CC8BITLEVEL** to 0, 1, or 2, the ESQL/C processor performs the following steps:

1. Converts the embedded-language statements (**source.ec**) to C-language source code (**source.c**) with the ESQL/C preprocessor
2. Filters non-ASCII characters in the preprocessed file (**source.c**) with the ESQL/C filter, **esqlmf** (if the **ESQLMF** environment variable is 1)
Before **esqlmf** begins filtering, it creates a copy of the C source file (**source.c**) that has the **.c_** file extension (**source.c_**).
3. Compiles the filtered C source file (**source.c**) with the C compiler to create an object file (**source.o**)
4. Links the object file with the ESQL/C libraries and your own libraries to create an executable program

When you set **CC8BITLEVEL** to 3, the ESQL/C processor omits step 2 in the preceding list.

If you do not set **CC8BITLEVEL**, **esql** converts non-ASCII characters in literal strings and comments. You can modify the value of **CC8BITLEVEL** to reflect the capabilities of your C compiler. For more information on **CC8BITLEVEL**, see [page 2-5](#).

AD/XP

IDS

W/D

UD

Handling Code-Set Conversion

When the client and database code sets differ, the ESQL/C client application performs code-set conversion on character data. (For more information, see [“Performing Code-Set Conversion” on page 1-40](#).) If your ESQL/C application executes in an environment in which code-set conversion might occur, make sure that the application correctly handles the following situations:

- When the application writes blobs (BYTE and TEXT values) to the database, it must set the **loc_type** field in the locator structure **loc_t** to indicate the type of blob that it needs to write.

For general information on **loc_type** and **loc_t**, see the [INFORMIX-ESQL/C Programmer's Manual](#). ♦

- When the application writes CLOB and BLOB data to the database in Dynamic Server with UD Option, it uses various large-object (LO) file descriptors.

For detailed information, see the [INFORMIX-ESQL/C Programmer's Manual](#). ♦

- When the application uses the **sqllda** structure to describe dynamic SQL statements, it must account for possible size differences in character data.

For general information on the **sqllda** structure, see the [INFORMIX-ESQL/C Programmer's Manual](#).

- When the application has character data that might undergo code-set conversion, you must declare character buffers that can hold the data.

For more information, see [“Avoiding Partial Characters” on page 5-26](#).

SE

UD

Writing TEXT Values

The information in this section does not apply to INFORMIX-SE or Dynamic Server with UD Option.

For information on how to write TEXT values in Dynamic Server with UD Option, refer to the [INFORMIX-ESQL/C Programmer's Manual](#). INFORMIX-SE does not support TEXT and BYTE data types. ♦

ESQL/C uses the **loc_t** locator structure to read blobs from and write blobs to the database server. The **loc_type** field of this structure indicates the data type of the blob value that the structure describes. When the client and database code sets are the same (no code-set conversion), the client application does not need to set the **loc_type** field explicitly because the database server can determine the blob data type implicitly. The database server assumes that character data has the TEXT data type and noncharacter data has the BYTE data type.

However, if the client and database code sets are different and convertible, the client application must know the data type of this blob in order to determine whether to perform code-set conversion on the blob data. Before your ESQL/C client application inserts a blob into the database, it must explicitly set the **loc_type** field of the blob as follows:

- For a TEXT blob, the ESQL/C client application must set the **loc_type** field to **SQLTEXT** before the INSERT statement.

The client performs code-set conversion on TEXT blob data before it sends this data to the database for insertion.

- For a BYTE blob, the ESQL/C client application must set the **loc_type** field to **SQLBYTES** before the INSERT statement.

The client does *not* perform code-set conversion on BYTE blob data before it sends this data to the database for insertion.

Important: The **sqltypes.h** header file defines the data-type constants **SQLTEXT** and **SQLBYTES**. You must include this header file in your ESQL/C source file to use these constants. For more information on the **sqltypes.h** header file, see the [“INFORMIX-ESQL/C Programmer's Manual.”](#)

Your ESQL/C source code does not need to set **loc_type** before it reads blob data from a database. The database server obtains the data type of the blob from the database and sends this data type to the client with the data.



If you set **loc_bufsize** to -1, ESQL/C allocates memory to hold a single blob value. It stores the address of this memory buffer in the **loc_buffer** field of the **loc_t** structure. If the client application performs code-set conversion on TEXT blobs that the database server retrieves, ESQL/C handles any possible data expansion as follows:

1. Frees the existing memory that the **loc_buffer** field references
2. Reallocates a memory buffer that is large enough to store the expanded TEXT data
3. Assigns the address of this new memory buffer to the **loc_buffer** field
4. Assigns the size of the new memory buffer to the **loc_bufsize** field

If this reallocation occurs, ESQL/C changes the memory address at which it stores the TEXT blob. If your ESQL/C program references this address, the program must account for the address change.

ESQL/C does not need to reallocate memory for the TEXT data if code-set conversion does not expand the TEXT data or if it condenses the data. In either of these cases, the **loc_buffer** field remains unchanged, and the **loc_bufsize** field contains the size of the buffer that the **loc_buffer** field references.

Using the DESCRIBE Statement

The **sqllda** structure is a dynamic-management structure that contains information about columns in dynamic SQL statements. The DESCRIBE...INTO statement uses the **sqllda** structure to return information about the select-list columns of a SELECT statement. It sets the **sqlvar** field of an **sqllda** structure to point to a sequence of partially filled **sqlvar_struct** structures. Each structure describes a single select-list column. (For more information about how to determine select-list columns, see “Using an sqllda Structure” in the [INFORMIX-ESQL/C Programmer's Manual](#).)

Each **sqlvar_struct** structure contains character data for the column name and the column data. When the ESQL/C client application fills this structure, the column name and the column data are in the client code set. When the database server fills this structure (when it executes a DESCRIBE...INTO statement), this character data is in the database code set.

When the client application performs code-set conversion between the client and database code sets, the number of bytes that is required to store the column name and column data in the client code set might not equal the number that is required to store this same information in the database code set. Therefore, the size of the character data in **sqlvar_struct** might increase or decrease during code-set conversion. To handle this possible difference in size, the client application must ensure that it correctly handles the character data in the **sqlvar_struct** structure.

The sqldata Field

To hold the column data, the client application must allocate a buffer and set **sqldata** to point to this buffer. If your client application might perform code-set conversion, it must allocate sufficient storage to handle the increase in the size of the column data that might occur.

When the DESCRIBE...INTO statement sets the **sqllen** field, the **sqllen** value indicates the length of the column data in the database code set. Therefore, if you use the value of **sqllen** that the DESCRIBE...INTO statement retrieves, you might not allocate a buffer that is sufficiently large for the data when it is in the client code set. For example, the following code fragment allocates an **sqldata** buffer with the **malloc()** system call:

```
EXEC SQL include sqlda;
:
:
struct sqlda *q_desc;
:
EXEC SQL describe sqlstmt_id into q_desc;
:
:
q_desc->sqlvar[0].sqldata =
    (char *)malloc(q_desc->sqlvar[0].sqllen);
```

In the preceding code fragment, the client application might truncate characters that it converts because the client application uses the **sqlen** value to determine the buffer size. Instead, increase the buffer to four times its original size when you allocate a buffer, as the following code fragment shows:

```
EXEC SQL include sqlda;
EXEC SQL define BUFSIZE_FACTOR 4;
:
:
struct sqlda *q_desc;
:
:
q_desc->sqlvar[0].sqlen =
    q_desc->sqlvar[0].sqlen * BUFSIZE_FACTOR + 1;
q_desc->sqlvar[0].sqldata =
    (char *)malloc(q_desc->sqlvar[0].sqlen);
```

Informix suggests a buffer-size factor (BUFSIZE_FACTOR) of 4 because a multibyte character has a maximum size of 4 bytes.

The sqlname Field

The **sqlname** field contains the name of the column. When the client application performs code-set conversion, this column name might also undergo expansion when the application converts it from the database code set to the client code set. Because the ESQL/C application stores the buffer for **sqlname** data in its internal work area, your ESQL/C source code does not have to handle possible buffer-size increases. Your code processes the contents of **sqlname** in the client code set.

Using the TRIM Function

When you dynamically execute a SELECT statement, the DESCRIBE statement can return information about the select-list columns at runtime. DESCRIBE returns the data type of a select-list column into the appropriate field of the dynamic-management structure that you use. (For more information, see “Determining the Data Type of a Column” in the [INFORMIX-ESQL/C Programmer’s Manual](#).)

When you use the DESCRIBE statement on a prepared SELECT statement with the TRIM function in its select list, the data type of the trimmed column that DESCRIBE returns depends on the database server that you use and the data type of the column to be trimmed (the *source character-value expression*). For more information on the source character-value expression, see the description of the TRIM function in the [Informix Guide to SQL: Syntax](#).

SE

The TRIM function works differently with INFORMIX-SE. ♦

Except for INFORMIX-SE, the data type that the DESCRIBE statement returns depends on the data type of the source character-value expression, as follows:

- If the source character-value expression is data type CHAR or VARCHAR, DESCRIBE returns the data type of the trimmed column as SQLVCHAR.
- If the source character-value expression is data type NCHAR or NVARCHAR, DESCRIBE returns the data type of the trimmed column as SQLNVCHAR.



Important: *TRIM does not support the LVARCHAR data type in Dynamic Server with UD Option.*

The following SELECT statement contains the **manu_code** column, which is defined as a CHAR data type, and the **cat_advert** column, which is defined as a VARCHAR column. When you describe the following SELECT statement and use the TRIM function with an Informix database server other than INFORMIX-SE, DESCRIBE returns a data type of SQLVCHAR for both trimmed columns:

```
SELECT TRIM(manu_code), TRIM(cat_advert) FROM catalog;
```

SE



If the **manu_code** column is defined as NCHAR instead, DESCRIBE returns a data type of SQLNVCHAR for this trimmed column.

For INFORMIX-SE, the DESCRIBE statement returns the same data type as the source character-value expression. When you dynamically execute the following SELECT statement with an SE database server, the DESCRIBE statement returns a data type of SQLCHAR, the same data type as the select-list column, **manu_code** (the source character-value expression).

```
SELECT TRIM(manu_code) FROM manufact; ♦
```

Important: The **sqltypes.h** header file defines the data-type constants SQLCHAR, SQLVCHAR, and SQLNVCHAR. You must include this header file in your ESQL/C source file in order to use these constants. For more information on the **sqltypes.h** header file, see the “[INFORMIX-ESQL/C Programmer’s Manual](#).”

INFORMIX-GLS Features

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This chapter introduces the INFORMIX-GLS application-programming interface and briefly describes how it works with the Global Language Support (GLS) feature. For complete information about how to use INFORMIX-GLS, see the [*INFORMIX-GLS Programmer's Manual*](#).

The INFORMIX-GLS functions are also documented on-line as HTML pages with Dynamic Server with UD Option. ♦

What Is INFORMIX-GLS?

INFORMIX-GLS is an application-programming interface (API) that lets DataBlade module developers and ESQL/C programmers develop internationalized applications with a C-language interface. The macros and functions of INFORMIX-GLS provide access within an application to GLS locales, which contain culture-specific information. You can use INFORMIX-GLS to write programs (or change existing programs) to handle different languages, cultural conventions, and code sets.

Location of Locale Information

All INFORMIX-GLS functions access the *current processing locale*. The current processing locale (sometimes called the *current locale*) is the locale that is currently in effect for an application. It is based on one of the following environments:

- The client environment
ESQL/C creates client applications. Therefore, the current processing locale for ESQL/C applications is the client locale.
The current processing locale for client LIBMI applications is also the client locale.
- The database that the database server is currently accessing
The current processing locale for DataBlade server routines is the server-processing locale, which the database server determines from the client, database, and server locales. ♦

INFORMIX-GLS Features

You can use INFORMIX-GLS functions to create internationalized applications. The goal of internationalization is to create (or modify) an application so that you need only point the application to the correct GLS locale to support a different language, territory, and code set.

INFORMIX-GLS provides macros and functions to help you perform the following internationalization tasks:

- Process single-byte, multibyte, and wide characters
INFORMIX-GLS functions perform character classification, case conversion, and code-set conversion. These functions access the current processing locale to determine character classes and character case.
- Process single-byte, multibyte, and wide-character strings
INFORMIX-GLS functions perform string traversal, string concatenation, copying, length determination, and character searching. These functions access the current processing locale and its code set to determine the size of individual characters.

- Handle memory management for multibyte and wide-character strings

INFORMIX-GLS functions assist in memory allocation of multibyte-character strings and wide-character strings. These functions access the current processing locale and its code set to determine the size of individual characters.

- Convert date, time, money, and number strings to and from binary values

INFORMIX-GLS functions assist in the conversion of locale-specific formats for date, time, monetary, and numeric values to and from their internal formats in the database (their binary values). These functions access information in the current processing locale to interpret the locale-specific formats.

- Process input and output multibyte-character streams

INFORMIX-GLS functions call user-defined functions to obtain the bytes of a multibyte character from, and put these bytes in, a character stream.

Informix client applications as well as database servers can access INFORMIX-GLS. For applications, you link the INFORMIX-GLS library to your application to perform locale-related tasks. Informix database servers automatically include the INFORMIX-GLS library.

INFORMIX-GLS Compatibility

This section provides information about INFORMIX-GLS compatibility.

Informix Products

The INFORMIX-GLS library is compatible with most Informix products. The database server and the application must both support INFORMIX-GLS in order for you to use INFORMIX-GLS for internationalization.

UD

The following Informix application products can use INFORMIX-GLS to handle internationalization:

- Version 9.13 of INFORMIX-ESQL/C

For more information on how to write ESQL/C applications, see the [INFORMIX-ESQL/C Programmer's Manual](#).

- The Informix DataBlade API for development of both client LIBMI applications and user-defined routines (UDRs)

Both kinds of DataBlade programs use DataBlade API functions to obtain locale information from a database server. For more information on how to use the DataBlade API, see the *DataBlade API Programmer's Manual*. ♦

An ESQL/C client application or a client LIBMI application that uses INFORMIX-GLS can obtain locale information from an Informix database server that supports GLS functionality:

- Informix Dynamic Server, Version 7.3
- Informix Dynamic Server with Advanced Decision Support and Extended Parallel Options, Version 8.2 and later
- Informix Dynamic Server with Universal Data Option, Version 9.1x
- INFORMIX-OnLine Dynamic Server, Version 7.2x
- INFORMIX-OnLine Workgroup Server, Version 7.2x
- INFORMIX-SE, Version 7.2x

UD

A DataBlade server routine can use INFORMIX-GLS to obtain locale information from Dynamic Server with UD Option. ♦

X/O

Industry Conformance

INFORMIX-GLS was derived from the X/Open XPG4 specifications. Therefore, it conforms to the X/Open XPG4 internationalization standards.

Managing GLS Files

UNIX

This appendix provides the following information about how to manage GLS files:

- How GLS files provide locale-related information
- What information a GLS locale file provides
- What other GLS files Informix products use
- How to determine which GLS files you can remove if you do not need them
- How to list the available GLS locales and code-set conversions with the **glfiles** utility ♦

Accessing GLS Files

Informix products access the following GLS files to obtain locale-related information.

GLS Files	Reference
GLS locale files	page A-3
Code-set-conversion files	page A-14
Code-set files	page A-17
The registry file	page A-18

In general, you do not need to examine the GLS files. However, you might want to look at these files to determine the following locale-specific information.

Locale-Specific Information	GLS File to Examine	Reference
Collation order		
Exact localized order	Source locale file (*.lc): LC_COLLATION category	Figure A-1 on page A-12
Exact code-set collation order	Source code-set file (*.cm)	page A-17
Character mappings		
Locale-specific mapping between uppercase and lowercase characters	Source locale file (*.lc): LC_CTYPE category	Figure A-1 on page A-12
Locale-specific classification of characters	Source locale file (*.lc): LC_CTYPE category	Figure A-1 on page A-12
Code-set-specific character mappings	Source code-set file (*.cm)	page A-17
Mappings between characters of the source and target code sets	Source code-set-conversion file (*.cv)	page A-14
Method for character mismatches during code-set conversion	Source code-set-conversion file (*.cv)	page A-14
Code points for characters	Source code-set file (*.cm)	page A-17

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Locale-Specific Information	GLS File to Examine	Reference
End-user formats		
Numeric (non-monetary) data	Source locale file (*.lc): LC_NUMERIC category	Figure A-1 on page A-12
Monetary data	Source locale file (*.lc): LC_MONETARY category	Figure A-1 on page A-12
Date data	Source locale file (*.lc): LC_TIME category	Figure A-1 on page A-12
Time data	Source locale file (*.lc): LC_TIME category	Figure A-1 on page A-12

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GLS Locale Files

The *locale file* defines a GLS locale. It describes the basic language and cultural conventions that are relevant to the processing of data for a given language and territory. This section provides the following information about GLS locale files:

- How the locale file groups locale-specific information into locale categories
- Where locale files reside and how these locale files are named

Locale Categories

A GLS locale file groups locale-specific information into the six locale categories that the following table shows.

Locale Category	Description
CTYPE	Controls the behavior of character classification and case conversion.
COLLATION	Controls the behavior of string comparisons.
NUMERIC	Controls the behavior of non-monetary numeric end-user formats.
MONETARY	Controls the behavior of currency end-user formats.
TIME	Controls the behavior of date and time end-user formats.
MESSAGES	Controls the definitions of affirmative and negative responses to messages.

The CTYPE and COLLATION categories primarily affect how the database server stores and retrieves character data in a database. The NUMERIC, MONETARY, and TIME categories affect how a client application formats the internal values of the associated SQL data types.

The default locale, U.S. English, provides the following behavior for each of the locale categories.

Locale Category	In Default Locale (U.S. English)
CTYPE	The default code set classifies characters.
	The default code set is ISO8859-1. ♦
	The default code set is Microsoft 1252. ♦
COLLATE	The default locale does not define a localized order. Therefore, the database server collates NCHAR and NVARCHAR data in code-set order.

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WIN NT

Locale Category	In Default Locale (U.S. English)
NUMERIC	The following numeric notation for use in numeric end-user formats: ■ Thousands separator: comma (,) ■ Decimal separator: period (.) ■ Number of digits between thousands separators: 3 ■ Symbol for positive number: plus (+) ■ Symbol for negative number: minus (-) ■ No alternative digits for era-based dates
MONETARY	The following currency notation for use in monetary end-user formats: ■ Currency symbol: dollar sign (\$) appears before the currency value ■ Thousands separator: comma (,) ■ Decimal separator: period (.) ■ Number of digits between thousands separators: 3 ■ Symbol for positive number: plus (+) ■ Symbol for negative number: minus (-) Default scale for MONEY columns: 2
TIME	The following date and time end-user formats: ■ DATE values: %m/%d/%iy ■ DATETIME values: %iY-%m-%d %H:%M:%S No definitions for era-based dates.
MESSAGES	None

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The following sections describe each of these locale categories in more detail.

NLS

The CTYPE Category

The CTYPE category defines how to classify the characters of the code set that the locale supports. This category includes specifications for which characters the locale classifies as spaces, blanks, control characters, digits, uppercase letters, lowercase letters, and punctuation. This category might also include mappings between uppercase and lowercase letters. Informix products access this category when they need to determine the validity of an identifier name, shift the case of a character, or compare characters.

For Version 7.2 and later products, the CTYPE locale category replaces the functionality of the NLS environment variable, **LC_CTYPE**. ♦

The COLLATION Category

The COLLATION category defines the localized order. When an Informix product needs to compare two strings, it first breaks up the strings into a series of collation elements. The database server compares each pair of collation elements according to the collation weights of each element. The COLLATION category provides support for the following capabilities:

- Multicharacter collation elements define characters that the database server should collate as a single unit.

For example, the localized order might treat the Spanish double-*l* (*ll*) as a single collation element instead of a pair of *l*'s.

- Equivalence classes assign the same collation weight to different collation elements.

For example, the localized order might specify that *a* and *A* are an equivalence class (*a* and *A* are equivalent characters).

The difference in collation order is the only distinction between the CHAR and NCHAR data types and the VARCHAR and NVARCHAR data types. For more information, see [“Using Character Data Types” on page 3-12](#).

If a locale does not contain a COLLATION category, Informix products use code-set order for collation of all character data types (CHAR, NCHAR, NVARCHAR, TEXT, and VARCHAR).

NLS

For Version 7.2 and later products, the COLLATION locale category replaces the functionality of the NLS environment variable, **LC_COLLATE**. ♦

The NUMERIC Category

The NUMERIC category defines the following numeric notation for end-user formats of numeric, nonmonetary values:

- The numeric decimal separator
- The numeric thousands separator
- The number of digits to group between each appearance of a nonmonetary thousands separator
- The characters that indicate positive and negative numbers

This numeric notation applies to the end-user formats of data for numeric (DECIMAL, INTEGER, SMALLINT, FLOAT, SMALLFLOAT) columns within a client application. For more information on end-user formats, see [page 1-12](#).

Important: *Information in the NUMERIC category does not affect the internal format of the numeric data types in the database.*

The NUMERIC category also defines alternative digits for use in era-based dates and times. For more information on alternative digits, see “[Alternative Date Formats](#)” on [page 2-31](#) and “[Alternative Time Formats](#)” on [page 2-39](#).

For Version 7.2 and later products, the NUMERIC locale category replaces the functionality of the NLS environment variable, `LC_NUMERIC`. ♦

The MONETARY Category

The MONETARY category defines the following currency notation for end-user formats of monetary values:

- The currency symbol and whether it appears before or after a monetary value
- The monetary decimal separator
- The monetary thousands separator
- The number of digits to group between each appearance of a monetary thousands separator
- The characters that indicate positive and negative monetary values and the position of these characters (before or after)
- The number of fractional digits (those to the right of the decimal point) to display



NLS



NLS

This currency notation applies to the end-user formats of data from MONEY columns within a client application. For more information on end-user formats, see [page 1-12](#).

Important: *Information in the MONETARY category does not affect the internal format of the MONEY data type in the database.*

The MONETARY category also defines the default scale for a MONEY column. For the default locale (U.S. English), the database server stores the data type MONEY(*precision*) in the same internal format as the data type DECIMAL(*precision*,2). A nondefault locale can define a different default scale. For more information on default scales, see “[Default Values for the Scale Parameter](#)” on [page 3-49](#).

To customize the end-user format of monetary values, use the **DBMONEY** environment variable. For more information, see “[Customizing Monetary Values](#)” on [page 1-53](#).

For Version 7.2 and later products, the MONETARY locale category replaces the functionality of the NLS environment variable, **LC_MONETARY**. ♦

The TIME Category

The TIME category lists characters and symbols that format date and time values. This information includes the names and abbreviations for days of the week and months of the year. It also includes special representations for dates, time (12-hour and 24-hour), and DATETIME values.

These representations can include the names of eras (as in the Japanese Imperial era system) and non-Gregorian calendars (such as the Arabic lunar calendar). The locale determines what calendar to use (Gregorian, Hebrew, Arabic, Japanese Imperial, and so on) when it scans or prints a month, day, or year. For more information on the scan and print operations, see “[End-User Formats](#)” on [page 1-12](#).

If the locale supports era-based dates and times, the TIME category defines the full and abbreviated era names and special date and time representations. For more information, see “[Alternative Date Formats](#)” on [page 2-31](#) and “[Alternative Time Formats](#)” on [page 2-39](#).



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This date and time information applies to the end-user formats of data in DATE and DATETIME columns within a client application. For example, the ESQL/COBOL library routine ECO-DAT uses the date end-user format in the TIME category of the client locale to determine how to print a date string from an internal DATE value.

Important: Information in the TIME category does not affect the internal format of the DATE and DATETIME data types in the database.

To customize the format of date and time values, use the **GL_DATE** and **GL_DATETIME** environment variables. For more information, see [“Customizing Date and Time End-User Formats” on page 1-50](#).

For Version 7.2 and later products, the TIME locale category replaces the functionality of the NLS environment variable, **LC_TIME**. ♦

The MESSAGES Category

The MESSAGES category defines the format for affirmative and negative responses. This category is optional. Informix products do not use the strings that the MESSAGES category defines.

To obtain the locale name for the MESSAGES category of the client locale, a client application uses the locale that **CLIENT_LOCALE** indicates. If **CLIENT_LOCALE** is not set, the client sets the category to the default locale.

Location of Locale Files

When an Informix product needs to obtain locale-specific information, it accesses one of the following GLS locale files, depending on the platform:

- GLS locale files reside in the following file:

`$INFORMIXDIR/gls/lcX/lg_tr/codemodf.lco` ♦

- GLS locale files reside in the following file:

`%INFORMIXDIR%\gls\lcX\lg_tr\codemodf.lco` ♦

In these paths, **INFORMIXDIR** is the environment variable that specifies the directory in which you install the Informix product, and **gls** is the subdirectory that contains the GLS files.

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This section describes the remaining elements in the pathname of GLS locale files, as follows:

- For information on the **lcX** subdirectory and its **lg_tr** locale-file subdirectories, see [page A-10](#).
- For information on the locale object (*.lco) and source (*.lc) files, see [page A-11](#).
- For information on the name of the **codemodf.lco** file, see [page A-12](#).

Locale-File Subdirectories

The subdirectories of the **lcX** subdirectory, where **X** represents the version number for the locale object-file format, contain the GLS locale files. These subdirectories have names of the form **lg_tr**, where **lg** is the 2-character language name and **tr** is the 2-character territory name that the locale supports.

The GLS locale-file subdirectories are in the **\$INFORMIXDIR/gls/lcX** directory for UNIX and in the **%INFORMIXDIR%\glslcX** directory for Windows NT. ♦

The following table shows some languages and territories that Informix products can support, along with their associated locale-file subdirectory names.

Language	Territory	Locale-File Subdirectory
English	United States	en_us
	Great Britain	en_gb
	Australia	en_au
German	Germany	de_de
	Austria	de_at
	Switzerland	de_ch
French	Belgium	fr_be
	Canada	fr_ca
	Switzerland	fr_ch
	France	fr_fr

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Version 7.2 and later products also provide GLS locales that are compatible with many operating-system locales. These locale files reside in the **os** subdirectory of the **lcX** subdirectory in your Informix installation. The **os** subdirectory contains a subdirectory for each operating-system locale that the platform of your Informix product supports.

The GLS operating-system locales are in subdirectories of the **\$INFORMIXDIR/gls/lcX/os** directory for UNIX and in subdirectories of the **%INFORMIXDIR%\gls\lcX\os** directory for Windows NT.

Informix provides these operating-system GLS locale files for backward compatibility with Informix NLS products. For more information, see the [Informix Migration Guide](#). ♦

Locale Source and Object Files

Each locale file has the following two forms:

- A locale *source* file is an ASCII file that defines the locale categories for the locale.
This file has the **.lc** file extension and serves as documentation for the corresponding object file.
- A locale *object* file is a compiled form of the locale information.
Informix products use the object file to obtain locale information quickly. Locale object files have the **.lco** file extension.

The header of the locale source file (**.lc**) lists the language, territory, code set, and any optional locale modifier of the associated locale. A section of the locale source file supports each of the locale categories, as Figure A-1 shows.

Figure A-1
Locale Categories in a Locale Source File

Locale Category	Locale-File Category	Reference
CTYPE	LC_CTYPE	page A-6
COLLATE	LC_COLLATE	page A-6
NUMERIC	LC_NUMERIC	page A-7
MONETARY	LC_MONETARY	page A-7
TIME	LC_TIME	page A-8
MESSAGES	LC_MESSAGES	page A-9

Locale Filenames

To conform to DOS 8.3 naming conventions, a GLS locale file uses a condensed form of the code-set name, *codemodf*, in its filenames. The 4-character *code* name of each locale file is the hexadecimal representation of the code-set number for the code set that the locale supports. The 4-character *modf* name is the optional locale modifier.

For example, the ISO8859-1 code set has an IBM CCSID number of 819 in decimal and 0333 in hexadecimal. Therefore, the 4-character name of a locale source file that supports the ISO8859-1 code set is **0333.lc**. The following table shows some code sets and locale modifiers that Informix products can support, along with their associated locale source filenames.

Code Set	Locale Modifier	Locale Source File
ISO8859-1 (IBM CCSID 819)	<i>none</i>	0333.lc
	Dictionary	0333dict.lc
Microsoft 1252 (West Europe)	<i>none</i>	04e4.lc
	Dictionary	04e4dict.lc
IBM CCSID 850	<i>none</i>	0352.lc
	Dictionary	0352dict.lc

A French locale that supports the ISO8859-1 code set has a GLS locale that is called **0333.lc** file in the **fr_fr** locale-file subdirectory. The default locale, U.S. English, also uses the ISO8859-1 code set (on UNIX platforms); a locale file that is called **0333.lc** is also in the **en_us** locale-file subdirectory. Because both the French and U.S. English locales support the Microsoft 1252 code set, both the **fr_fr** and **en_us** locale-file subdirectories contain a **04e4.lc** locale file as well.

Figure A-2 on page A-23 shows the output that the **glfiles** utility generates for locale files. ♦

Tip: To save disk space, you might want to keep only those locale files that you intend to use. For information on which locale files you can remove, refer to “[Removing Locale and Code-Set-Conversion Files](#)” on page A-20.

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Other GLS Files

In addition to GLS locale files, Informix products might also use the following GLS files:

- Code-set-conversion files map one code set to another.
- Code-set files define code-point values for code sets.
- The Informix **registry** file converts locale aliases to valid locale filenames. ♦

This section describes each of these types of GLS files. For information on GLS locale files, see [page A-3](#).

Code-Set-Conversion Files

The *code-set-conversion file* describes how to map each character in a particular source code set to the characters of a particular target code set. Informix products can perform a given code-set conversion if code-set-conversion files exist to describe the mapping between the two code sets.

Important: *A client application checks the code sets that the client and database locales support when it begins execution. If code sets are different, and no code-set-conversion files exist, the client application generates an error. For information, see “Establishing a Database Connection” on page 1-31.*

When an Informix product needs to obtain code-set-conversion information, it accesses one of the following GLS code-set-conversion files, depending on the platform:

- GLS code-set-conversion files reside in the following file:
`$INFORMIXDIR/gls/cvY/code1code2.cvo` ♦
- GLS code-set-conversion files reside in the following file:
`%INFORMIXDIR%\gls\cvY\code1code2.cvo` ♦

In these paths, **INFORMIXDIR** is the environment variable that specifies the directory in which you install the Informix product, **gls** is the subdirectory that contains the GLS files, and **Y** represents the version number for the code-set-conversion object-file format.

This section describes the remaining elements in the pathname of GLS code-set-conversion files, as follows:

- For information on the code-set-conversion object (*.cvo) and source (*.cv) files, see [page A-15](#).
- For information on the name of the **code1code2.cvo** file, see [page A-16](#).
- For information about which code-set-conversion files an Informix product must locate, see [page A-16](#).

Code-Set-Conversion Source and Object Files

Each code-set-conversion file has the following two forms:

- The code-set-conversion *source* file is an ASCII file that describes the mapping to use for one direction of the code-set conversion.
This file has a **.cv** extension and serves as documentation for the corresponding object file.
- The code-set-conversion *object* file is a compiled form of the code-set-conversion information.
Informix products use the object file to obtain code-set-conversion information quickly. Object code-set-conversion files have a **.cvo** file extension.

The header of the code-set-conversion source file (**.cv**) lists the two code sets that it converts and the direction of the conversion.

Code-Set-Conversion Filenames

To conform to DOS 8.3 naming conventions, GLS code-set-conversion files use a condensed form of the code-set names, **code1code2**, in their filenames. The 8-character name of each code-set-conversion file is derived from the hexadecimal representation of the code-set numbers of the source code set (*code1*) and the target code set (*code2*).

For example, the ISO8859-1 code set has an IBM CCSID number of 819 in decimal and 0333 in hexadecimal. The IBM CCSID 437 code set, a common IBM UNIX code set, has a hexadecimal value of 01b5. Therefore, the **033301b5.cv** code-set-conversion file describes the conversion from the CCSID 819 code set to the CCSID 437 code set.

Required for Code-Set Conversion

Informix products use the Informix Code-Set Name-Mapping file to translate between code-set names and the more compact code-set numbers. You can use the **registry** file to find the hexadecimal values that correspond to code-set names or code-set numbers. For more information, see [“The Informix registry File” on page A-18](#).

Most code-set conversion requires *two* code-set-conversion files. One file supports conversion of characters in code set A to their counterparts in code set B. Another supports the conversion in the return direction (from B to A). Such conversions are called *two-way* code-set conversions. For example, the code-set conversion between the CCSID 437 code set (hexadecimal 01b5 code number) and the CCSID 819 code set (or ISO8859-1 with a hexadecimal 0333 code number) requires the following two code-set-conversion files:

- The **01b50333.cv** file describes the mappings to use when Informix products convert characters in the CCSID 437 code set to those in the ISO8859-1 code set.
- The **033301b5.cv** file describes the mappings to use when Informix products convert characters in the ISO8859-1 code set to those in the CCSID 437 code set.

To be able to convert between these two code sets, an Informix product must be able to locate *both* these code-set-conversion object files. Performing the conversion on only one direction would result in mismatched characters. For more information on mismatched characters, see [page 1-42](#).

The following table shows some of the code-set conversions that Informix products can support, along with their associated code-set-conversion source filenames.

Source Code Set	Target Code Set	Code-Set-Conversion Source File
ISO8859-1	Microsoft 1252	033304e4.cvo
Microsoft 1252	ISO8859-1	04e40333.cvo
ISO8859-1	IBM CCSID 850	03330352.cvo
IBM CCSID 850	ISO8859-1	03520333.cvo
Microsoft 1252	IBM CCSID 850	04e40352.cvo
IBM CCSID 850	Microsoft 1252	035204e4.cvo

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[Figure A-4 on page A-25](#) shows the output that the **glfiles** utility generates for these code-set-conversion files. ♦

Tip: To save disk space, you might want to keep only those code-set-conversion files that you intend to use. For information about which code-set-conversion files you can remove, refer to [“Removing Locale and Code-Set-Conversion Files” on page A-20](#)

Code-Set Files

An Informix *code-set file* (also called a character-mapping or *charmap* file) defines a code set for subsequent use by locale and code-set-conversion files. A GLS locale includes the appropriate code-set file for the code set that it supports. In addition, Informix products can perform code-set conversion between the code sets that have code-set files.

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When an Informix product needs to obtain code-set information, it accesses one of the following GLS code-set files, depending on the platform:

- GLS code-set files reside in the following file:

`$INFORMIXDIR/gls/cmZ/code.cmo` ♦

- GLS code-set files reside in the following file:

`%INFORMIXDIR%\gls\cmZ\code.cmo` ♦

In these paths, **INFORMIXDIR** is the environment variable that specifies the directory in which you install the Informix product, **gls** is the subdirectory that contains the GLS files, and **Z** represents the version number for the code-set object-file format.

Each code-set file has the following two forms:

- The code-set *source* file is an ASCII file that describes the characters of a character set.

This file has a **.cm** extension and serves as documentation for the corresponding object file.

- The code-set *object* file is a compiled form of the code-set information.

The object file is used to create locale object files. Object code-set files have a **.cmo** file extension.

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[Figure A-5 on page A-26](#) shows the output that the **glfiles** utility generates for charmap files. ♦

The Informix registry File

The Informix Code-Set Name-Mapping file, which is called **registry**, is an ASCII file that associates code-set names and aliases with their code-set numbers. A code-set number is based on the IBM CCSID numbering scheme. Informix products use code-set numbers to determine the filenames of locale and code-set-conversion files. For more information on locale files and code-set-conversion files, see [page A-12](#) and [page A-16](#), respectively.

For example, you can specify the French locale that supports the ISO8859-1 code set with any of the following locale names as locale aliases:

- The full code-set name

`fr_fr.8859-1`

- The decimal value of the IBM CCSID number

`fr_fr.819`

- The hexadecimal value of the IBM CCSID number

`fr_fr.0333`

When you specify a locale name with either of the first two forms, Informix products use the Informix Code-Set Name-Mapping file to translate between code-set names (8859-1) or code-set number (819) to the condensed code-set name (0333). For information about the file format and search algorithm that Informix products use to convert code-set names to code-set numbers, refer to the comments at the top of the **registry** file.

When an Informix product needs to obtain information about locale aliases, it accesses the GLS code-set files in the following path:

```
%INFORMIXDIR%\gls\cmZ\registry
```

In these paths, **INFORMIXDIR** is the environment variable that specifies the directory in which you install the Informix product, **gls** is the subdirectory that contains the GLS files, and **Z** represents the version number for the code-set object-file format.



Warning: Do not remove the Informix Code-Set Name-Mapping file, **registry**, from the Informix directory. Do not modify this file. Informix products use this file for the language processing of all locales.

Removing Unused Files

An Informix product contains the following GLS files:

- Locale files: source (*.lc) and object (*.lco)
- Code-set-conversion files: source (*.cv) and object (*.cvo)
- Code-set files: source only (*.cm)

To save disk space, you might want to keep only those files that you intend to use. This section describes which of these files you can safely remove from your Informix installation.

Removing Locale and Code-Set-Conversion Files

You can safely remove the following GLS files from your Informix installation:

- *For those locales that you do not intend to use, you can remove locale source and object files (.lc and .lco) from the subdirectories of the lcX subdirectory in your Informix installation.*

For more information on the **lcX** pathname, see [“Locale-File Subdirectories” on page A-10](#).

- *For those code-set conversions that you do not intend to use, you can remove code-set-conversion source and object files (.cv and .cvo) from the subdirectories of the cvY subdirectory in your Informix installation.*

For more information on the **cvY** pathname, see [“Code-Set-Conversion Filenames” on page A-16](#).



Warning: Do not remove the locale object file for the U.S. 8859-1 English locale, **0333.lco** in the **en_us** locale-file subdirectory. In addition, do not remove the Informix Code-Set Name-Mapping file, **registry**. Informix products use these files for the language processing of all locales.

Because Informix products do not access source versions of locale and code-set conversion files, you can safely remove them. However, these files do provide useful on-line documentation for the supported locales and code-set conversions. If you have enough disk space, Informix recommends that you keep these source files for the GLS locales (*.lc) and code-set conversions (*.cv) that your Informix installation supports.

Removing Code-Set Files

Informix provides the source version of code-set files (.cm) as on-line documentation for the locales and code-set conversions that use them. Because Informix products do not access source code-set files, you can safely remove them. However, if you have enough disk space, Informix recommends that you keep these source files for the GLS locales and code-set conversions that your Informix installation supports.

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The glfiles Utility

To comply with DOS 8.3 naming conventions, Informix products use condensed filenames to store GLS locales and code-set-conversion files. These filenames do not match the names of the locales and code sets that the end user uses. You can use the **glfiles** utility to generate a more readable list of the following GLS-related files:

- The GLS locales that are available on your system
- The Informix code-set-conversion files that are available on your system
- The Informix code-set files that are available on your system

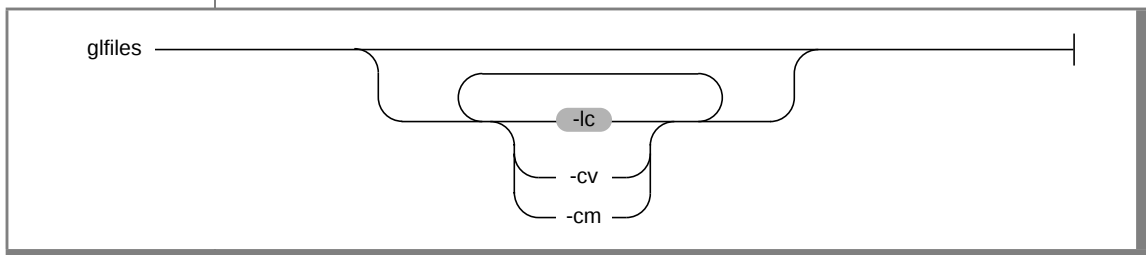
Listing GLS Locale Files

Before you run **glfiles**, take the following steps:

- Set the **INFORMIXDIR** environment variable to the directory in which you install your Informix product.
If you do not set **INFORMIXDIR**, **glfiles** checks the **/usr/informix** directory for the GLS files.
- Change directories to the directory where you want the files that **glfiles** generates to reside.

The utility creates the GLS file listings in the current directory.

The following diagram shows the syntax of the **glfiles** utility.



Listing GLS Locale Files

The **glfiles** utility can create a file that lists the available GLS locales in the following ways:

- When you specify the **-lc** command-line option
- When you omit all command-line options

For each **lcX** subdirectory in the **gls** directory specified in **INFORMIXDIR**, **glfiles** creates a file in the current directory that is called **lcX.txt**, where **X** is the version number of the locale object-file format. The **lcX.txt** file lists the locales in alphabetical order, sorted on the name of the GLS locale object file.

Figure A-2 shows a sample file, **lc11.txt**, that contains the available GLS locales.

```

Filename: lc11/ar_ae/0441.lco
Language: Arabic
Territory: United Arabic Emirates
Modifier: greg
Code Set: 8859-6
Locale Name: ar_ae.8859-6

Filename: lc11/ar_ae/0441greg.lco
Language: Arabic
Territory: United Arabic Emirates
Modifier: greg
Code Set: 8859-6
Locale Name: ar_ae.8859-6
:
:
Filename: lc11/en_us/0333.lco
Language: English
Territory: United States
Code Set: 8859-1
Locale Name: en_us.8859-1

Filename: lc11/en_us/0333dict.lco
Language: English
Territory: United States
Modifier: dict
Code Set: 8859-1
Locale Name: en_us.8859-1

Filename: lc11/en_us/0352.lco
Language: English
Territory: United States
Code Set: PC-Latin-1
Locale Name: en_us.PC-Latin-1

Filename: lc11/en_us/04e4.lco
Language: English
Territory: United States
Code Set: CP1252
Locale Name: en_us.CP1252
:
:

```

Figure A-2
Sample glfiles File
for GLS Locales

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The **lcX.txt** file also contains GLS locales that are compatible with many operating-system locales. Figure A-3 shows the format in **lc11.txt** for these GLS operating-system locales. For more information, see [“Locale-File Subdirectories” on page A-10](#).

```
*****
*
* The following locales are provided to ensure that
* Informix servers, starting with version 7.20, can
* open databases created by version 6.xx and 7.1x
* Informix servers. Because these locales are based
* on operating-system locales and operating-system
* locales do not provide the required information,
* no Language, territory, Modifier, or Code Set
* names are provided below.
*
*****

Filename: lc11/os/de
Locale Name: de

Filename: lc11/os/en_US
Locale Name: en_US

Filename: lc11/os/es
Locale Name: es

Filename: lc11/os/fr
Locale Name: fr

Filename: lc11/os/iso_8859_1
Locale Name: iso_8859_1
:
:
```

Figure A-3
*Format for
Operating-System
Locales*



Examine the **lcX.txt** files to determine the GLS locales that the **\$INFORMIXDIR/gls/lcX** directory on your system supports.

Listing Code-Set-Conversion Files

When you specify the **-cv** command-line option, the **glfiles** utility creates a file that lists the available code-set-conversion files. For each **cvY** subdirectory in **\$INFORMIXDIR/gls**, **glfiles** creates a file in your current directory that is called **cvY.txt**, where **Y** is the version number of the code-set-conversion object-file format. The **cvY.txt** file lists the code-set conversions in alphabetical order, sorted on the name of the object code-set-conversion file.

For two-way code-set conversions, the **\$INFORMIXDIR/gls/cvY** directory contains two code-set-conversion files. One file supports conversion from the characters in code set A to their mappings in code set B, and another supports the conversion in the return direction (from code set B to code set A). For more information on two-way code-set conversion, see [page A-14](#).

Figure A-4 shows a sample file, **cv9.txt**, that contains the available code-set conversions.

```

Filenames: cv9/002501b5.cvo and cv9/01b50025.cvo
Between Code Set: Greek
and Code Set: IBM CCSID 437

Filenames: cv9/00250333.cvo and cv9/03330025.cvo
Between Code Set: Greek
and Code Set: ISO8859-1
:
:
Filenames: cv9/033304e4.cvo and cv9/004e40333.cvo
Between Code Set: 8859-1
and Code Set: 1252
:
:
```

Figure A-4
Sample glfiles File
for Informix
Code-Set-
Conversion Files

Examine the **cvY.txt** file to determine the code-set conversions that the **\$INFORMIXDIR/gls/cvY** directory on your system supports.

Listing Character-Mapping Files

When you specify the **-cm** command-line option, the **glfiles** utility creates a file that lists the available charmap files. For each **cmZ** subdirectory in **\$INFORMIXDIR/gls**, **glfiles** creates a file in the current directory that is called **cmZ.txt**, where **Z** is the version number of the charmap object-file format. The **cmZ.txt** file lists the character mappings in alphabetical order, sorted on the name of the GLS object charmap file.

Figure A-5 shows a sample file, **cm3.txt**, that contains the available character mappings.

```
Filename: cm3/032d.cm
Code Set: 8859-7

Filename: cm3/0333.cm
Code Set: 8859-1

Filename: cm3/0352.cm
Code Set: PC-Latin-1
:
:
Filename: cm3/04e4.cm
Code Set: CP1252
:
:
```

Figure A-5
*Sample glfiles File
for Informix
Character-Mapping
Files*

Examine the **cmZ.txt** file to determine the character mappings that the **\$INFORMIXDIR/gls/cmZ** directory on your system supports.

Glossary

This Glossary contains terms used in this manual. For additional terms in Informix manuals, see the Glossary in the [Informix Guide to SQL: Reference](#).

7-bit character	A character that is composed of seven bits, such as all the characters of the ASCII code set.
8-bit character	Single-byte characters with code values between 128 and 255. Examples from the ISO8859-1 code set include the non-English é, ñ, and ö characters. They can be interpreted correctly only if the software that interprets them is 8-bit clean.
8-bit clean	A piece of software or a file system that can process character data that contains 8-bit characters. Otherwise, only the characters of the ASCII code set can be represented and processed correctly in such a system.
16-bit code set	A code set (such as JIS X0208) in which approximately 65,000 distinct characters can be encoded.
alpha class	All characters that are classified as alphabetic in a code set. For example, the alpha class of the ASCII code set is the letters <i>a</i> through <i>z</i> and <i>A</i> through <i>Z</i> .
ALS	An acronym for Asian Language System (or Asian Language Support). ALS refers to a class of products that have been developed to operate with multibyte code sets. ALS products support various multibyte code sets whose characters are composed of 8, 16, 24, and 32 bits. ALS servers and tools are available for the Version 6.x and earlier family of products. These products might have been developed with the GLS Library or other software written specifically to handle Asian language processing.

ASCII	An acronym for the American Standards Committee for Information Interchange. This acronym is often used to describe an ordered set of printable and nonprintable characters used in computers and telecommunication. This code set is traditionally used in computer systems found in the United States. It contains 128 characters (each of which can be represented with 7 bits of information) and is the proper subset of every GLS character map and logical unit.
byte	The smallest computer memory unit (often called an octet).
character	A logical unit of storage for the value code in a code set. It can be represented by one or more bytes and can be a numeric, alphabetic, or nonprintable character (control character).
client	An application program that requests services from a server program, typically a file server or a database server.
client locale	The environment that defines the behavior of the client application by specifying a language, a code set, and the conventions used for a particular language. These conventions can include date, time, and monetary formats. For example, to read and write files, the client refers to the client locale, which is typically specified by the CLIENT_LOCALE environment variable.
code point	An entry in a code set. For example, in the ASCII code set, the 65th code point is A.
coded character set	See <i>code set</i> .
code set	A character set for a locale. A given language has a character set of one or more natural-language alphabets plus additional symbols for digits, punctuation, and diacritical marks. Each character has at least one code set, which maps its characters to unique bit patterns. ASCII, ISO8859-1, Microsoft 1252, and EBCDIC are examples of code sets for the English language.
code-set conversion	A translation of code points from one code set to another, such as ASCII to EBCDIC.
code-set order	The sequence of characters when sorted in terms of their numerical representation and code-point value in a code set. For example, in the ASCII code set, uppercase characters (A through Z) are ordered before lowercase characters (a through z).

collation	The process of ordering or comparing characters. The order or compare process is based on the code-set value of the character (code-set order) or on the localized order (collated order). Full internationalization of sorting and collating functions and support libraries is required in order to correctly and efficiently perform case conversions, comparisons, and regular expressions such as <code>column1 = column2</code> .
collation order	The sequence of values that specifies some logical ordering in which the character fields in a database are sorted and indexed. Collation order is also known as collating sequence.
DB_LOCALE	The database locale. On the client, the value of DB_LOCALE specifies how databases are created on the database server (that is, which code set and collation order). In addition, DB_LOCALE specifies the code-set conversion (if any) between the client application and database server. On the database server, DB_LOCALE specifies how databases are created if this information is not specified by the client application.
encoding	The process of mapping a national character to its numeric representation in a coded-character set.
fixed-width character	Character implementations such as UNICODE which assign a fixed number of bytes for each character encoded. Fixed-width character implementations are also referred to as wide-character encoding, which typically implies the use of specially defined data types.
flexible-width character	Character implementations which support encoding schemes that allow for single-byte characters and multibyte characters to be used simultaneously. The simultaneous use of single-byte and multibyte characters is achieved by establishing a protocol for recognizing the respective code sets supported in the encoded scheme. An example of flexible-width character implementation is Extended UNIX Code (EUC). EUC allows for support of up to four code sets simultaneously. In EUC, the 7-bit ASCII code set is supported with up to three other code sets for interoperability and compatibility. The other three code sets can be encoded as two-, three-, or four-byte code sets.
Global Language Support	GLS, an application environment that allows Informix application-programming interfaces (APIs) and database servers to handle different languages, cultural conventions, and code sets. Products labeled GLS use the GLS Library and GLS locales to facilitate locale-based processing. The GLS library supports text processing and multibyte characters.
GLS	See <i>Global Language Support</i> .

International-ization (I18n)	The process of making Informix products easily adaptable to any culture and language (abbreviated I18n). Among other features, internationalized software provides support for culturally specific sorting and for adaptable date, time, and money formats. An internationalized product does not required re-compilation of source code for each cultural environment. The user simply exchanges resource files and sets up the proper operating environment.
ISO8859-1	A code set that contains 256 single-byte characters. Characters 0 through 127 are the ASCII characters. Characters 128 through 255 are mostly characters from European languages, for example, é, ñ and ö.
language supplement	The result of the product localization process. A language supplement for a specific Western European language can be installed with an Informix product to allow the user to see error and warning messages in a language other than English. If installed with DB-Access, the menu names, options and on-line help for that product also appear in the specific language.
local character	A character in the native-language character set.
locale	The environment that defines the behavior of the program at runtime. The rules are usually based on the linguistic customs of the region or the territory. GLS library-based products use GLS locales that Informix defines and pre-processes for customers. Customers are not able to modify Informix locales. The locale can be set through an environment variable that dictates output formats for numbers, currency symbols, dates, and time as well as collation order for character strings and regular expressions.
localization (L10n)	The process of adapting an internationalized product to a specific cultural environment (abbreviated L10n). This process usually involves the creation of culturally specific resource files; the selection of message catalogs; the setting of date, time, and money formats; and the translation of the product user interface. It might also include the translation and production of end-user documentation, packaging, and collateral materials.
localization kit	The files and documentation that Informix supplies a localization center to enable translation to localize for the following products: ESQL/C, ESQL/COBOL, INFORMIX-SE, Dynamic Server, Dynamic Server with AD and XP Options, Dynamic Server with UD Option, and Dynamic Server, Workgroup and Developer Editions.

multibyte character	A character that might require from two to four bytes of storage. If a language contains more than 256 characters, the code set must contain multibyte characters. Many Asian languages contain 3,000 to 8,000 ideographic characters. Such languages have code sets made up of both single byte and multibyte characters (a multibyte code set). Some characters in the Japanese SJIS code set are multibyte characters of two or three bytes. Applications that handle data in a multibyte code set cannot assume that one character requires only one byte of storage.
native language	The computer user's spoken or written language (for example, English, Chinese, German, and so on).
NLS	An acronym for Native Language Support (or Native Language System). Informix limits its use of this term to the support of English and European languages for Informix servers Version 6.x and later.
NLS Open, Implicit, Explicit	Features introduced by Informix Version 6.0 server and connectivity products. The NLS feature was introduced in such a way that all types of client applications could access NLS data from the database server regardless of whether the client itself was able to process the NLS data according to the rules of a locale or whether the client supported the new NCHAR and NVARCHAR data types introduced by the database server. To process these new data types, the Informix 6.0 server and connectivity products created three modes by which a client could connect to a database: Open NLS, Implicit NLS, and Explicit NLS. These modes are determined by the values of two environment variables (DBNLS and COLLCHAR) sent to the server.
OPEN NLS	A mode for tools that have <i>not</i> been modified to process NLS data according to the rules of a locale and have <i>not</i> been modified to support the NCHAR and NVARCHAR data types. In this mode, the database server allows the client to connect to any database, regardless of the locale of the database. When NCHAR and NVARCHAR data is sent from the database server to the client application, the database server converts it to CHAR and VARCHAR data, respectively. When CHAR and VARCHAR data is sent from the client to the database server, the database server converts it to NCHAR and NVARCHAR data, respectively. This mode is enabled when the client sets DBNLS=2 and COLLCHAR=1.

IMPLICIT NLS	A mode for tools that have been modified to process NLS data according to the rules of a locale but have <i>not</i> been modified to support the NCHAR and NVARCHAR data types. In this mode, the locale that the client uses must equal the locale used by the database to which the client is trying to connect. When NCHAR and NVARCHAR data is sent from the database server to the client application, the server converts it to CHAR and VARCHAR data, respectively. When CHAR and VARCHAR data is sent from the client to the database server, the database server converts it to NCHAR and NVARCHAR data, respectively. This mode is enabled when the client sets DBNLS=1 and COLLCHAR=1.
EXPLICIT NLS	A mode for tools that have been modified to process NLS data according to the rules of a locale and have been modified to support the NCHAR and NVARCHAR data types. In this mode, the locale that the client uses must equal the locale used by the database to which the client is trying to connect. This mode is enabled when the client sets DBNLS=1 and COLLCHAR=0. The following environment variable settings are correct, but they do not allow access to any NLS features: DBNLS=0 and COLLCHAR=0. If you do not set these variables, the default is 0. The following environment variable settings are not valid: DBNLS=0 and COLLCHAR=1, and DBNLS=2 and COLLCHAR=0.
partial character	A multibyte character that has lost one or more bytes so that the intended meaning of the character is lost. GLS software provides context-specific solutions that prevent partial characters from being generated during string-processing operations.
server locale	The locale with which the server performs input and output. For example, files that are written and read with respect to the locale that the SERVER_LOCALE environment variable specifies.
server processing locale	The environment that the database server dynamically determines based on the client locales and information that is stored in the database being accessed.

**single-byte
character**

A character that has one byte of storage. The number of unique characters in the language determines the amount of storage that each code-set character requires. Because a single byte can store values in the range of 0 to 255, it can uniquely identify 256 characters. Most Western languages have fewer than 256 characters, so their code sets consist of single-byte characters. When an application handles data in these code sets, it can assume that one character is always stored in one byte.

UNICODE

A consortium of computer vendors tasked to create a unified worldwide code set. UNICODE was integrated as part of the ISO international standard 10646-1 and is emerging as the code-set choice for Microsoft operating systems. Informix supports UNICODE and continues to support the diverse prevailing code sets for both compatibility reasons and the advanced processing requirements of three-byte and four-byte encoding schemes.

white space

A series of one or more space characters. The GLS locale defines the characters that are considered to be space characters. For example, both the `TAB` and blank might be defined as space characters in one locale, but certain combinations of the `CTRL` key and another character might be defined as space characters in a different locale file.

wide character

A form of a code set that involves normalizing the size of each multibyte character so that each character is the same size. This size must be equal to or greater than the largest character that an operating system can support, and it must match the size of an integer data type that the C compiler can scale. Some examples of an integer data type that the C compiler can scale are short integer (**short int**), integer (**int**), or long integer (**long int**).

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