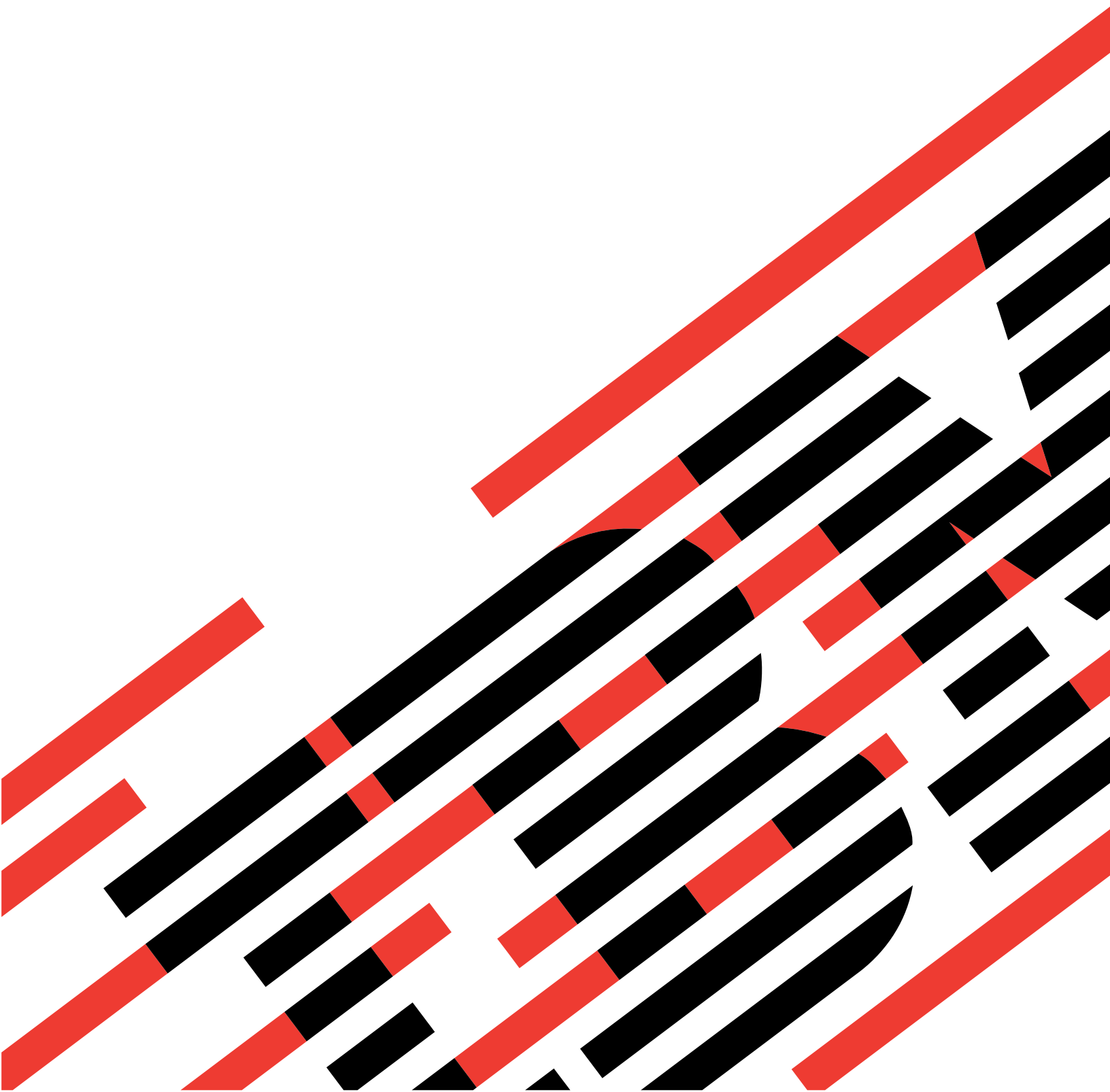# IBM

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iSeries

Globalization: Set up OS/400 with an NLV

Version 5 Release 3

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Globalization: Set up OS/400 with an NLV

Version 5 Release 3

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> **Note**
>
> Before using this information and the product it supports, be sure to read the information in
> "Notices," on page 29.

Contents

OS/400 globalization

The iSeries^(TM) server is designed to support the culture and languages of many countries around the world. As companies integrate e-commerce on a global scale into their fundamental business processes, their prospective customers, established customers, and active partners can take advantage of increased revenue and decreased expenses through software globalization.

Globalizing your e-business is no longer a luxury, it is a necessity. As the Internet transcends national and geographical boundaries, the concept of doing business within a single country is quickly giving way to the need to compete in an international marketplace.

Globalized software gives you the following advantages:
- Increased customer satisfaction that can increase sales
- Enhanced customer support communications
- Enhanced global information dissemination
- A better return on Information Technology (IT) investments

This information shows you how to:
- Create an application efficiently and at minimal expense.
- Retrofit existing applications for globalization and create new applications designed for globalization. Designing an application for globalization, however, is usually less expensive than retrofitting an existing application.
- Ensure that the application design does not interfere with the current or planned design of other internationalized applications.

These pages provide a single source for the information you need to build applications for national and international audiences. You can find out more information at the IBM^(R) Globalizing your e-business Web site (http://www.ibm.com/software/globalization/index.jsp) and the iSeries Globalization Web site (http://www.ibm.com/servers/eserver/iseries/software/globalization/).

In addition to the following topics, you can find information about what's new in this release and how you can print this topic.

Globalization overview
This topic describes the way that globalization has been implemented on OS/400^(R), including topics that describe globalization-specific values on the system and topics that describe how services and functions in OS/400 support globalization.

Set up OS/400 with a national language version
This topic describes the steps you need to take to properly install and configure a national language version on OS/400, with topics ranging from selecting and installing hardware, installing software, and configuring your environment to run in a globalized setting. You can use this information as you install your own servers, and you can apply the principles when you develop applications for customers who are installing their own national language version on OS/400.

Develop global applications
This topic provides guidelines for designing, developing, and delivering globalized applications:
- Designing functions that are sensitive to national languages
- Supporting various types of hardware
- Translating the textual data in your application
- Making your application available worldwide

Handle data in globalized applications

This topic describes the ways in which OS/400 enables you to handle data in a globalized environment. Included in these pages are topics that describe Unicode and Unicode data, the Chinese standard GB18030, how to use CCSIDs to integrate multiple language environments consistently, and how to use bidirectional data, DBCS data, and locales.

Globalization reference information

This topic provides detailed supporting information for the concepts and tasks discussed in the Globalization category.

Globalization checklists

This topic gathers together all of the checklists that are contained with these pages. These checklists are useful reminders of the issues you need to consider as you create and work with globalized applications.

What's new for V5R3

Technical updates include the following:

- Ideographic language (DBCS) support. In previous releases, OS/400$^{(R)}$ required an Ideographic language as the primary language to support an Ideographic language secondary language or an Ideographic language device. This restriction is removed. This means that any NLV of OS/400 can support an Ideographic language device or program. IBM$^{(R)}$ still produces and ships the same number of ideographic (DBCS) NLVs listed below:
  - English Uppercase DBCS (Feature 2938)
  - English Uppercase and Lowercase DBCS (Feature 2984)
  - Japanese DBCS (Feature 2962)
  - Korean DBCS (Feature 2986)
  - Simplified Chinese DBCS (Feature 2989)
  - Traditional Chinese DBCS (Feature 2987)

  The current CCSID and field types of the shipped database files are not changed by this update.
- Unicode support. OS/400 support for Unicode data encoding has been enhanced. DB2$^{(R)}$ UDB for iSeries$^{(TM)}$ has been enhanced to allow for storing UTF-8 or UTF-16 data in a field, and to provide advanced cultural sorting on UTF8 or UTF-16 fields. For more information, see the SQL Reference topic. OS/400 Unicode print capabilities have been enhanced to support bidirectional printing and character layout capabilities that are needed to support complex scripts. For more information, see the DDS for physical and logical files topic.
- The version of International Components for Unicode (ICU) libraries shipped as option 39 of OS/400 has been enhanced to contain the 2.6.1 version of ICU as the new default version. For more information on ICU see http://oss.software.ibm.com/icu/
- OS/400 support of time has been enhanced. Time management allows you to manage time on your iSeries server. Within the time management component of iSeries Navigator, you can work with the time zone and time adjustment functions. With these two functions, time management allows you to choose a time zone for your system to use. In addition, you can identify the software to use as the time maintenance application that synchronizes your system time with an external time source.
- Locale source selection has been enhanced to support several new locales.
- CCSID support has been enhanced to support several new CCSIDs and mappings between CCSIDs. CCSIDS 1200, 1232, 5348, 901, 902, 4909, and 62248 were added. For more information see http://www.ibm.com/servers/eserver/iseries/software/globalization/ccsid.html

How to see what's new or changed

To help you see where technical changes have been made, this information uses:

- The ≫ image to mark where new or changed information begins.
- The ≪ image to mark where new or changed information ends.

To find other information about what's new or changed this release, see the Memo to Users.

Print this topic

The Globalization topic is divided into smaller PDF documents that correspond to the major categories as they are presented in the iSeries^(TM) Information Center. The smaller size of each of the parts makes downloading and printing the Globalization information faster and easier. You can view or print the following topics:

- Globalization overview
- Set up OS/400^(R) with an NLV
- Develop globalized applications
- Handle data in globalized applications
- Globalization reference information

If it is more convenient for you, you can also print the Globalization information as a single PDF.

You need Adobe Acrobat Reader to view or print these PDFs. You can download a copy from the Adobe

Web site (www.adobe.com/prodindex/acrobat/readstep.html).

Note: Some of the illustrations in the PDF format of the Globalization topic do not display in the same manner as they do in the HTML format. The HTML format shows the illustrations as they are best viewed.

Set up OS/400 with a national language version

The feature code identified when you order an OS/400^(R) program is the language of your textual data and is called the primary language of the system. Any other language versions that you have ordered are called secondary languages. For secondary languages, the national language version consists of only the textual data for all licensed programs ordered. The program code is not contained in the secondary language version.

The primary language is the language in which the system is serviced and from which all language-dependent or culture-dependent system values are initialized. In addition, other system objects and functions assume attributes based on the primary language. For example, messages appearing in the history log always appear in the primary language.

The following topics provide details about setting up OS/400 with a national language version:
- How a language is displayed for OS/400 functions
- Installation preparation
- Checklist: Globalization planning
- Ordering equipment and software
- Hardware installation
- Software installation
- Configuring a national language version
- Scenarios: Setting up OS/400 with a national language version

For more information

See the Software Installation PDF for complete details on installing your primary language and licensed programs.

How a language is displayed for OS/400 functions

If you want information presented in a language other than the primary language of the server, you must first have a secondary language loaded. When a secondary language is loaded, you can display information in that language in any of three ways.

Method 1: Place the desired language at the top of your library list

One way to display information in a secondary language is to change the system part of your library list so that your desired national language library is positioned before all other libraries in the system library list that contain national language information.

For example, to present the French version of textual data, you could enter the following command to place French information at the top of the library list:

```
CHGSYSLIBL  LIB(QSYS2928)  OPTION(*ADD)
```

To remove a library from the library list enter:

```
CHGSYSLIBL  LIB(QSYS2928)  OPTION(*REMOVE)
```

Note: The authority shipped with the CHGSYSLIBL command does not allow all users to run the command. As shipped, you must have *ALLOBJ and *SECADM special authority to use the Change System Library List (CHGSYSLIBL) command.

Method 2: Create a subsystem for the desired language

A second way to present information in a different language is to follow these steps:

1. Create a subsystem for the secondary language.
2. Define the subsystem system part of the library list entry with the national language version library for the secondary language.

All jobs running in the subsystem use textual data from the secondary language. All jobs that you submit as batch jobs have the national language version library as the first library on the system part of the library list.

Method 3: Change the library list for your job so that the national language version library for the secondary language is the first library on the system part of the library list

A third way to present information in a different language is to change the library list for your job so that the national language version library for the secondary language is the first library on the system part of the library list. All jobs running in the subsystem use textual data from the secondary language. All jobs that you submit as batch jobs have the national language version library as the first library on the system part of the library list.

How a language of your choice is displayed for licensed programs

Libraries for other licensed programs are added either automatically, or must be added by the user, when needed. If you want to add libraries for other licensed programs to your library list, use the CHGLIBL command.

Installation preparation and national languages

IBM$^{(R)}$ periodically creates program temporary fixes (PTF) to correct existing problems or potential problems within a particular IBM licensed program. PTFs are designed to fully replace one or more objects in the licensed program. Primary and secondary languages may have language-sensitive online information PTFs.

If the primary language of your system is changed at any time for reasons other than a new release update, the cumulative PTF package of the new primary language should be at the same level as the previous primary national language. PTFs that were associated with the primary language and any secondary language must be applied again. In addition, primary language and secondary language PTFs for the online information need to be ordered by the customer.

Checklist: Globalization planning

When planning to install a multilingual system, start by completing the Globalization planning checklist for globalization and multilingual support. The checklist consists of two parts, which should be completed sequentially.

Globalization checklist: Part 1

Before you work with a national language, answer the questions in the following table. After you have answered the questions in this table, you can then use Planning checklist for globalization support, part 2 (page 5) for planning for multilingual support.

Check off	Question	Response
	What national language version for the primary language are you going to install? (Refer to Set up an iSeries(TM) server with an NLV.)	
	What program library can it be ordered from? (Refer to National language version feature codes.)	
	Are you going to use a DBCS national language version as a secondary language? (Refer to Secondary language requirements.)	
	Are you aware that the latest 5250 PC emulation is necessary to support graphics data format (GDF) type?	
	What national language version for the secondary language are you going to install, if any? (Refer to Secondary language requirements.)	
	Do you want to change your subsystem to change the language of your initial sign-on display? (Refer to Secondary language requirements.)	
	What release level of the national language version for the primary language are you ordering? (Refer to Selection and change of a primary language.)	
	Are the release levels of the national language version for the secondary language the same as the primary language you ordering? (Refer to Secondary language requirements.)	

Globalization checklist: Part 2

When you have completed part 1 (page 5) of the checklist, answer the additional questions in part 2, below:

Check off	Question	Response
	What local workstation controllers support your language? (Refer to Order equipment and software.)	
	What display stations and keyboards are required to support your language? (To determine the display stations and keyboards, refer to Order equipment and software and Multilingual support for the iSeries workstation controller.)	
	What printers support your language? (Refer to Order equipment and software.)	
	What keyboard ID are you using for your local devices? (Refer to National language version default system values.)	
	What remote workstation controllers support your language? (Refer to Order equipment and software.)	
	What display stations and keyboards support your language from a remote location? (Refer to Order equipment and software and Multilingual support for the iSeries workstation controller.)	
	What printers support your language from a remote location? (Refer to Order equipment and software.)	
	What keyboard ID are you using for your remote devices? (Refer to National Language Version default system values.)	
	Are you considering the workstation customization function for workstations? (See the Workstation Customization PDF.)	
	What applications support your languages on the local system? (Contact your marketing support representative in your country.)	
	What applications support your languages on the remote system? (Contact your marketing support representative in your country.)	
	Do you want all your database files with the CCSID of the primary language? (Refer to Database management support for CCSIDs.)	
	Do you want to work with sort sequence tables in your applications? (Refer to Sort sequence for programs	

Check off	Question	Response
	When creating user profiles (user IDs) only certain characters are allowed. You can use any of the following characters in the user profile name: • Any letter (A through Z) • Any number (0 through 9) • These special characters: pound (#), dollar ($), underscore (_), at (@). However, these characters should be avoided for globalized application systems. See User profile name considerations for more information. See the Security Reference ![icon] PDF for more detailed information on user profile considerations.	

Order equipment and software

To properly support a language or multiple languages on a single system, the appropriate hardware and software must be ordered and configured. This section describes some considerations you should take into account when ordering your hardware and software.

• Workstation controller requirements
• Keyboards

Workstation controllers

Workstation controllers that attach to the iSeries$^{(TM)}$ server can support a number of different languages simultaneously. The characteristics of multilingual support depend on the type of workstation controller. The types of workstation controllers that can be attached to the iSeries server are:

• Twinaxial
• ASCII
• Remote

Multilingual support for the iSeries workstation controller

There are limitations to the amount of support provided by a workstation controller in a multilingual support.

• The workstation must be able to transmit and receive data in the required language.
• Each workstation controller supports a maximum number of languages at the same time, regardless of the keyboard types. This maximum number is in addition to the U.S. English support.
  – Twinaxial workstation controllers support a maximum of 3 languages.
  – ASCII workstation controllers support a maximum of 14 national language versions, in addition to U.S. English.
• The number of keyboard types allowed on a workstation controller is dependent on the different keyboard types required.

Twinaxial workstation controller requirements: The local twinaxial workstation controller maps keyboard data received from a workstation into EBCDIC values corresponding to the keyboard ID configured for that workstation on the system. Multiple languages are supported by using a separate keyboard mapping table to handle each unique combination of national language version and keyboard for each workstation attached to the system.

The amount of storage available within the twinaxial workstation controller for mapping tables is limited and restricts the total number of national language versions that the workstation controller can simultaneously support. Depending on the mix of languages and types of keyboards, the twinaxial workstation controller can support several different national language versions simultaneously (in addition to U.S. English, which is always available).

Keyboard types on the twinaxial workstation controller

The twinaxial workstation controller supports the following types of IBM[(R)] keyboards:
- 5250 typewriter keyboard
- 5250 data entry keyboard
- 122-key typewriter keyboard
- 122-key data entry keyboard
- Enhanced keyboard

The sum of the computational factors for a language and keyboard type must not exceed 22 for the twinaxial workstation controller. The following table shows the computational factor for each language, KBDTYPE parameter, and keyboard type.

Each workstation controller supports a maximum number of languages at the same time, regardless of the keyboard types. This maximum number is in addition to the US English support.

Note: The actual number of keyboards of each type does not have any impact on the sum. For example, the computational factor is 3 whether there are 1 or 30 enhanced keyboards running Austrian/German.

Language and keyboard computational factor table

To use the language and keyboard computational factor table, do the following:
1. Identify the language down the first column of the table.
2. Identify the keyboard type across the row for the selected language.
3. Record the computational factor listed for each keyboard type.
4. Repeat the first three steps for all the required keyboard types.
5. Add the computational factor for all required keyboard types.
   a. If the sum of all computational factors does not exceed 22, then the twinaxial workstation controller can support all the required keyboard types for the languages.
   b. If the sum of the computational factors exceeds 22, then the twinaxial workstation controller may not support all the required keyboard types for the languages.

Language	KBDTYPE	5250 Typewriter Keyboard	5250 Data Entry Keyboard	122-key Typewriter Keyboard	122-key Data Entry Keyboard	Enhanced Keyboard
Albanian	ALI	N/A	N/A	1	N/A	3
Arabic	CLB	2	N/A	2	N/A	2.5
Austrian / German	AGB	1	1	1	N/A	3
Austrian / German MNCS	AGI	1	1	1	N/A	3
Belgian Dutch MNCS	BLI	1	1	1	N/A	3
Brazilian Portuguese	BRB	1	1	1	N/A	3
Bulgarian	BGB	N/A	N/A	N/A	N/A	3
Canadian French	CAB	1	1	1	1	3
Canadian French MNCS	CAI	1	1	1	1	3

Language	KBDTYPE	5250 Typewriter Keyboard	5250 Data Entry Keyboard	122-key Typewriter Keyboard	122-key Data Entry Keyboard	Enhanced Keyboard
Croatian	YGI	1	1	1	N/A	3
Cyrillic	CYB	2	N/A	2	N/A	2.5
Czech	CSB	N/A	N/A	N/A	N/A	3
Danish	DMB	1	1	1	N/A	3
Danish MNCS	DMI	1	1	1	N/A	3
Estonia	ESB	N/A	N/A	N/A	N/A	1.5
Finnish / Swedish	FNB	1	1	1	N/A	3
Finnish / Swedish MNCS	FNI	1	1	1	N/A	3
French (Azerty)	FAB	1	1	1	N/A	3
French (Azerty) MNCS	FAI	1	1	1	N/A	3
French (Qwerty)	FQB	1	1	N/A	N/A	N/A
French (Qwerty) MNCS	FQI	1	1	N/A	N/A	N/A
Greek	GNB	2	N/A	2	N/A	2.5
Hebrew	NCB	2	N/A	2	N/A	2.5
Hungarian	HNB	N/A	N/A	1	N/A	3
Icelandic	ICB	1	N/A	1	N/A	3
Icelandic MNCS	ICI	1	N/A	1	N/A	3
International	INB	1	1	N/A	N/A	N/A
International MNCS	INI	1	1	N/A	N/A	N/A
Iran (Farsi)	IRB	N/A	N/A	2	N/A	2.5
Italian	ITB	1	1	1	N/A	3
Italian MNCS	ITI	1	1	1	N/A	3
Japanese - English	JEB	1	1	N/A	N/A	N/A
Japanese - English MNCS	JKB	1	1	N/A	N/A	N/A
Japanese - Kanji and Katakana	JKB	N/A	N/A	N/A	N/A	2.5
Japanese - Kanji and US English	JUB	N/A	N/A	1	N/A	N/A
Japanese Katakana	KAB	2	2	2	2	2.5
Japanese Latin Extended	JPB	1	1	N/A	N/A	N/A
Korean	KOB	1	1	1	1	1
Latin 2	ROB	1	N/A	1	N/A	1.5
Latvia	LVB	N/A	N/A	N/A	N/A	2.5
Lithuania	LTB	N/A	N/A	N/A	N/A	2.5
Macedonian	MKB	N/A	N/A	N/A	N/A	2.5
Netherlands Dutch	NEB	1	1	1	1	3
Netherlands Dutch MNCS	NEI	1	1	1	1	3
Norwegian	NWB	1	1	1	1	3
Norwegian MNCS	NWI	1	1	1	1	3
Polish	PLB	N/A	N/A	1	N/A	3

Language	KBDTYPE	5250 Typewriter Keyboard	5250 Data Entry Keyboard	122-key Typewriter Keyboard	122-key Data Entry Keyboard	Enhanced Keyboard
Portuguese	PRB	1	1	1	N/A	3
Portuguese MNCS	PRI	1	1	1	N/A	3
Romanian	RMB	1	1	1	N/A	3
Russian	RUB	N/A	N/A	N/A	N/A	3
Serbian (Latin)	YGI	1	1	1	N/A	3
Serbian (Cyrillic)	SQB	1	1	1	N/A	3
Simplified Chinese	RCB	1	1	1	1	N/A
Slovakian	SKB	N/A	N/A	1	N/A	3
Slovenian	YGI	1	1	1	N/A	3
Spanish	SPB	1	1	1	N/A	3
Spanish MNCS	SPI	1	1	1	N/A	3
Spanish Speaking	SSB	1	1	1	1	3
Spanish Speaking MNCS	SSI	1	1	1	1	3
Swedish	SWB	1	1	1	N/A	3
Swedish MNCS	SWI	1	1	1	N/A	3
Swiss / French MNCS	SFI	1	N/A	1	N/A	3
Swiss / German MNCS	SGI	1	N/A	1	N/A	3
Thai	THB	N/A	N/A	N/A	N/A	2.5
Traditional Chinese	TAB	1	1	1	1	1
Turkish (QWERTY)	TKB	1	N/A	1	N/A	1.5
Turkish (F)	TRB	1	N/A	1	N/A	1.5
United Kingdom English	UKB	1	1	1	1	3
United Kingdom English MNCS	UKI	1	1	1	1	3
United States / Canada English	USB	See note.				
United States / Canada MNCS	USI	1	1	1	1	3

Note: Information about USB is not included, because it is always available and does not take up any additional space in the workstation controller.

ASCII workstation controller requirements: Like twinaxial devices, ASCII devices for different national language versions support different code pages. The ASCII workstation controller handles conversion of data back and forth between a particular EBCDIC code page for a language and an ASCII code page for that same language by using a set of mapping tables.

The ASCII workstation controller can simultaneously support 14 national language versions (in addition to U.S. English, which is always available).

The set of languages that may be selected for the ASCII workstation controller is a subset of the language types that may be selected for the twinaxial workstation controller. For the list of languages supported by the ASCII workstation controller, see Multilingual support for the iSeries(TM) workstation controller (page 7).

Keyboard types on an ASCII workstation controller

The maximum number of country and keyboard types on the ASCII workstation controller is 14. Depending on the display or printer device type, the controller may be able to fully support all graphic characters in a language. If the display or printer does not support all graphic characters in your language, you can use the workstation customization function to display and print unsupported graphic characters.

Languages supported without workstation customization
- Arabic
- Austrian/German
- Austrian/German MNCS
- Belgian Dutch MNCS
- Canadian French
- Canadian French MNCS
- Danish
- Danish MNCS
- Finnish/Swedish
- Finnish/Swedish MNCS
- French (Azerty)
- French (Azerty) MNCS
- Hebrew
- Italian
- Italian MNCS
- Norwegian
- Norwegian MNCS
- Portuguese
- Portuguese MNCS
- Spanish
- Spanish MNCS
- Spanish Speaking
- Spanish Speaking MNCS
- Swedish
- Swedish MNCS
- Swiss/French
- Swiss/French MNCS
- Swiss/German
- Swiss/German MNCS
- United Kingdom English
- United Kingdom English MNCS
- United States and Canada English
- United States and Canada English MNCS

Languages supported using workstation customization

Using the workstation customization functions, the following countries or languages can also be supported by the ASCII workstation controller.
- Brazilian Portuguese

- Croatian
- Cyrillic
- Czech
- Estonian
- Greek
- Hungarian
- Icelandic
- Icelandic MNCS
- Latin 2
- Latvian
- Lithuanian
- Polish
- Russian
- Slovakian
- Slovenian
- Turkish
- Thai
- Ukranian

5394 remote workstation controller requirements: The 5394 remote workstation controller is a twinaxial workstation controller and uses conversion tables to map the data between the devices.

The 5394 remote workstation controller can support up to 4 MNCS languages at a time and only one language that is not a MNCS language. When changing languages, you must change the keyboard language code. Changing the keyboard language code is explained further in the *5394 Remote Control Unit Setup Guide* and the *5394 Remote Control Unit Introduction and Installation Planning* book.

5494 remote workstation controller requirements: The 5494 remote workstation controller has 4 ports for twinaxial workstations, a port for communication networks, and on the Model 002, a port for attaching to a token-ring network.

The 5494 remote workstation controller can support up to 4 MNCS languages at a time and only one language that is not a MNCS language. When changing languages, you must change the keyboard language code. Changing the keyboard language codes is explained further in the *5494 Remote Control Unit Planning Guide* and the *5494 Remote Control Unit User's Guide*

Keyboards
You can choose the keyboard that matches the national language version you are using; see the Keyboard layouts topic in the Reference information for illustrations of these keyboards.

Determine the number of supported keyboard types

To determine the number of keyboard types that the twinaxial or ASCII controllers can support, you must understand the following:
- A twinaxial or ASCII workstation controller can support several types of keyboards and languages.
- Each of the supported languages may be available on more than one of the supported keyboards.
- For each workstation controller, the size of the conversion table for each keyboard is different.
- The matrix for languages used on each supported keyboard type is called a keyboard and language computational factor.
- The sum of the computational factors for each required keyboard type determines whether all required keyboard types can be supported on one workstation controller.

- If the sum of the computational factors for the required keyboard types exceeds the maximum limit, the language for the first workstation that caused the overflow and any additional workstations default to U.S. English.
- To recover from a keyboard-type overflow, you can do one of the following:
  - Attach the workstation causing the overflow to a second workstation controller.
  - On the same workstation controller, configure the workstations causing the overflow to some other keyboard type that reduces the sum of the computational factor to within the maximum limits.

Hardware installation and national languages

When installing or changing a device on your system, you must make sure that the device is configured correctly to reflect the keyboard ID that matches the character set and code page of the job CCSID. Changing the keyboard configuration of a device results in different behavior, similar to adding a new display or printer to the system.

Panels, menus, and messages used by the installation process do not support right-to-left presentation of data. Therefore, online information for the installation appears left to right, in English, for bidirectional languages (such as Arabic and Hebrew).

The following topics provide additional information about hardware installation:
- Console device
- Workstation consideration
- Considerations for changing printers

Console device

Make sure that your console device is configured to support the default code page of the primary language you are going to install. If the console device supports the code page of the new primary language, panels, messages, and online help will display properly after you change the primary language. For example, you cannot have a 5555 configured as the console device unless the primary language is a DBCS language.

You must change the console device to one that supports the code page of the new primary language before doing the IPL that activates the new primary language. Make sure that autoconfig is on before doing this IPL.

Scenario: Console configured as a single-byte device: Your system has a primary language of English Uppercase DBCS (feature 2938). You decide to change the primary language to Japanese DBCS (feature 2962).

The existing console device on your system is configured as a single-byte-only English device using a code page of 00037. While a single-byte English device supports the installation of all other single-byte national language versions, it does not support the installation of double-byte national language versions. You must change the console device to one that supports the Japanese DBCS code page before doing the activation IPL.

If you do not change the console device to one that supports the Japanese DBCS code page, the IPL cannot complete.

Scenario: Console configured with an F-type keyboard: Assume that your system has a primary language of English (feature 2924) and you decide to change your primary language to Czech, Farsi, Hungarian, Russian, Polish, Slovakian, or Thai. Also assume that your system console has an F Type keyboard (a relatively old keyboard type).

While F type keyboards are supported for many national language versions, they are not supported for Czech, Farsi, Hungarian, Russian, Polish, Slovakian, or Thai. You must change the system console to a device that does not have an F type keyboard.

If you do not change the console device and keyboard, an error results because there is no keyboard mapping table supported for the F type keyboard in your new primary language (Czech, Farsi, Hungarian, Russian, Polish, Slovakian, or Thai). The IPL that occurs when changing the primary language cannot complete.

Workstation considerations

In a multilingual environment, different workstations support different languages on the same iSeries$^{(TM)}$ server. Any data that is not tagged with CCSIDs should be stored in separate objects, unless the CCSID for each language is the same. Data that is tagged with CCSIDs (such as message files and database files) do not have to be stored in separate objects.

To correctly retrieve, process, and display data that is not tagged with CCSIDs, the application being used needs to be aware of the language differences, and how they relate to the following:

- Programmable workstations through iSeries Access programs
- Nonprogrammable workstations

  Note: The 3486, 3487, 3488 model V, and 3489 displays support all languages (except Thai) listed in 3486, 3487, 3488 Model V, and 3489 Keyboard and Display Part Numbers by Language.

- Keyboards

  Keyboard layouts contains examples of the IBM$^{(R)}$-enhanced keyboard for the languages supported by OS/400$^{(R)}$.

- Telnet or pass-through implications

  The characters shown on your workstation depend on the keyboard type defined on your source system. If you pass through to the target system and use a virtual device with a different keyboard type, you may not see the same characters as if you were directly attached to the target system, because the target system uses another language.

Considerations for changing printers

When changing printers, consider the areas of data interchange, data stream, fonts, and host printer emulation.

- Interchange (a System/370$^{(TM)}$ system or a System/390$^{(R)}$ system sending Advanced Function Printing (AFP$^{(TM)}$) data for DBCS to OS/400$^{(R)}$.)

  AFP data containing DBCS data can be generated on OS/400. In addition, the server can receive AFP-generated data from the System/370 system containing DBCS data and print it on IPDS$^{(TM)}$ printers attached to the iSeries$^{(TM)}$ server. The IPDS printers must be configured with *YES specified for the AFP parameter.

- Data Stream

  Printers consist of SNA character string (SCS) and intelligent printer data stream (IPDS) printers.

  SNA character string (SCS) is a data stream composed of EBCDIC controls, optionally intermixed with end-user data, which is carried within a request/response unit. Host-attached SCS printers can be configured by the systems engineer or by the customer, using a diskette or selection of keys on the printer. The appropriate printer operator's guide should be used to determine how to configure the SCS printer for the language you are using.

  One of the strengths of IPDS is that independent applications can create source data. The source data from independent applications is merged at the printer to create an integrated mixed data page. For example, text data could be produced on an editor like the OfficeVision$^{(R)}$ editor, image data could be the output of a scanner stored in a folder, and graphics data could be produced by the Business Graphics Utility program. IPDS makes it possible to integrate application output rather than requiring the use of integrated applications.

- Fonts

Font types for IPDS printers can be configured through the use of the Create Device Description (Printer) or Change Device Description (Printer) (CRTDEVPRT or CHGDEVPRT) commands. Fonts may be downloaded from the host or may be saved in printer storage.

For a list of the character identifier (CHRID values) supported by the various printers and languages, see the Printer Device Programming PDF.

- iSeries Access printer to emulate host printer

  The iSeries Access programs support multiple languages on a single server. An iSeries Access user (except for host emulation) can use any single language of choice that is installed on the attached iSeries server. If an iSeries Access user has a host emulation session with five different iSeries servers, the user can potentially view a different language on each session. However, the same personal computer ASCII code page must be on all the systems.

  Refer to the iSeries Access topic for your environment for information on installing and configuring attached PC printers.

  For information about a specific device, see the appropriate device manuals.

Software installation and national languages

If your system will be communicating with systems using different languages, use care when specifying configuration names that will be exchanged with the remote system. Do not use characters that may not be available on the keyboard used by the remote system; for example, characters such as a dollar sign ($), pound sign (#), and an at sign (@). For an illustration of characters you can use in configuration names, see Invariant character set.

You should limit support of configuration names that use characters outside of the invariant character set to those already in use on existing systems.

Configuration names that may be exchanged with remote systems include:
- Network identifiers
- Location names
- Control point names
- Mode description names
- Class-of-service description names
- User IDs (from the directory entry)

For more information on configuration names, see the Communications Configuration PDF (located in the V5R1 Information Center Supplemental Manuals topic). For more information on software installation, see the Software Installation PDF and the appropriate software product books.

Configure a national language version

The following topics provide information about configuring OS/400$^{(R)}$ with a national language version:
- User profile name considerations
- Service tools
- System and user interfaces
- Configuring the primary language
- Configuring secondary languages
- Installing and enabling locales

User profile name considerations

The user profile name identifies the user to the server. This user profile name is also known as the user ID. It is the name the user types in the *User* prompt on the Sign On display.

The user profile name can be a maximum of 10 characters. The characters can be:

- Any letter (A through Z)
- Any number (0 through 9)
- In addition to these characters, three special codepoints are allowed (x'5B', x'7B', x'7C'). For many CCSIDs, including 37, these code points are interpreted as '$', '#', and '@', respectively. For other CCSIDs, however, these code points represent other characters. Although these code points are allowed, you should avoid using them because of the potential misinterpretation when multiple CCSIDs are used on a single system. For example, a Spanish person using CCSID 284 may create a user profile with the name ″ESPA Ñ OL″, but an English person using CCSID 37 would see this name as ″ESPA#OL″.

The user profile name cannot begin with a number.

Note: You can create a user profile such that when a user signs on, the user ID is only numerals. To create a profile like this, specify a Q as the first character, such as Q12345. A user can then sign on by entering 12345 or Q12345 for the *User* prompt on the Sign On display. See the iSeries(TM) Security Reference ⬛ PDF for more detailed information on user profile considerations.

Service tools

Panels, messages, and online help information for service tools are usually shown in the primary language of the system. Therefore, the workstation from which the system is being serviced must be configured to support the primary language, and the keyboard for the primary language must be attached to that workstation.

Panels, menus, and messages used by the service tools do not support right-to-left presentation of data. Therefore, online information for the service tools appears left to right, in English, for bidirectional languages (such as Arabic and Hebrew).

System and user interfaces

The server interfaces and user interfaces are presented through a workstation or printer. The workstation controller interprets keystrokes on keyboards according to the mapping determined by the KBDTYPE parameter in the device description. The display presents the data to the user, depending on the code page mapping located in the workstation controller. This code page mapping in the workstation controller is determined by the CHRID parameter in the device description. Each supported keyboard type has a character identifier assigned to it, and the default setting of CHRID in the device description (*KBDTYPE) refers to that character identifier. For information about setting code page and national language support on a personal computer, refer to the iSeries(TM) Access topic.

See the following topics for more information about system and user inferfaces:

- NLV automatic device configuration
- NLV automatic character set and code page conversion
- NLV printer file conversion

Automatic device configuration: Automatic configuration defines the local devices and some remote devices to the server for you. This means that the devices attached to your server are available for use when the server is running and has a powered-on display. You do not have to use manual configuration to create configuration descriptions for the devices before you can use them. For devices that are able to send configuration information to the workstation controller, the KBDTYPE parameter is set according to the keyboard attached. If the device cannot send KBDTYPE information to the server, the QKBDTYPE (keyboard system value) is used. For more information about automatic configuration, see the Local Device Configuration ⬛ PDF.

Note: If you use manual configuration to set up a device with a different keyboard type than the hardware reports, automatic configuration changes the device description to match the keyboard attached. To avoid this, each time the device is powered on, you can switch automatic configuration off by setting QAUTOCFG system value to 0 (Off).

Automatic character set and code page conversion: The system provides automatic conversion between character set and code pages for all applications that are enabled for national language support. This automatic conversion can be controlled in the display, menu, or panel source, or through the CHRID parameter on the control language (CL) commands that create these displays. The character set and code page of the device used by the end user is determined by the CHRID parameter in the device description. The CHRID value is normally set to *KBDTYPE.

When the data to be presented is in a character set and code page different from the language of the end user, automatic data conversion may occur. For detailed information on data conversions, refer to the Implement CDRA with CCSIDs topic. For a list of supported CCSIDs, see the CCSIDs topic in the Globalization reference topic.

Printer file conversion: The printer provides printed output to the user. OS/400$^{(R)}$ printer support does not do any conversion between the different character sets. For the data to be printed, the user must make sure that the proper character set and code page are specified in the printer and the fonts are in the printer.

If the CHRID value of the printer file is set to *JOBCCSID, the printer joins the CHRID value of the job CCSID to the data to be printed. For externally described printer files, constants within your DDS (data description specification) are converted from the DDS source file CCSID to the character identifier of the job CCSID value.

Configure the primary language

A primary language consists of program code, textual data for each licensed program ordered, and default national language cultural values. The primary language is the language in which the system is serviced and from which all language-dependent or culture-dependent system values are initialized. In addition, other system objects and functions assume attributes based on the primary language. For example, messages appearing in the history log always appear in the primary language.

For each licensed program installed on the server, the national language version for the primary language is in the product library. For example, the OS/400$^{(R)}$ program ordered in Spanish is installed in library QSYS as the primary language.

The server provides default system values for each of the primary languages. If some of the defaults do not meet the needs of your users, you can change some language-dependent system values.

For a list of default system values for each of the primary languages, see Default system values topic. See the System values topic for information on how to change system value settings.

Select and change the primary language

Choosing your primary language is important. OS/400 lets you change your primary language to accommodate your business needs based on the country in which you are operating. Keep in mind, however, that changing the primary language can take several hours or longer to accomplish.

To change a primary language on your system, you can order a different primary language from IBM$^{(R)}$. If you have a secondary language tape for the language you want as your new primary language, you can change the primary language from that tape. For example, if you have a primary language of U.S. English, and a secondary language of Canadian French, you can use the Canadian French secondary language

tape to change your primary language to Canadian French. The instructions to change the primary language on your system are in the chapter called ″Changing Your Primary Language″ in the Software

Installation [image] PDF.

When you change a primary or secondary language, and want to continue receiving software and documentation updates for future releases of licensed programs that you are currently using, contact your IBM representative.

Selecting and changing a primary language affects the following operational characteristics of your system:

* Cultural values of the user.
* Language used to communicate with the system through user interfaces presented through a workstation or printer (see the figure in the topic Example: How locales work).
* Implied character identifier (CHRID) of the character data stored in objects other than database files, message files, and message queues on the system.

≫ All user-created database files have an implicit CCSID and are tagged with the job default CCSID (DFTCCSID) unless you provide a CCSID at creation time. ≪

* If you change the primary language and the CCSID for the data remains the same, there is no effect on your system. An example would be to change the primary language from the German MNCS to the Italian MNCS, which both use CCSID 00500. The multinational character set refers to character set 00697 and code page 00500.
* If changing the primary language includes changing the CCSID value, the character data in objects other than database files may not be presented properly through the system and user interfaces. The database manager automatically converts character data unless conversion is suppressed by the application that processes the file. Data in objects other than database files are displayed correctly if the CHRID value of the display file, panel group, or menu is *JOBCCSID.

≫ Because some of the system values are set based on the installed primary language, you should record your current system value settings before you change the primary language of your system. Then, after you change the primary language, you can compare the current system values with the previous system value settings. ≪

≫ When you change the primary language of your system, the CCSID of the text fields in the system-supplied output files might also change. This is because the CCSID is dependent on the installed primary language. ≪

Configure secondary languages

A secondary language consists of textual data for all licensed programs supported for a national language version. When you install a secondary language, the textual data for licensed programs installed on your system is copied into the secondary language library. See the chapter called ″Installing a Secondary

Language″ in the Software Installation [image] PDF for instructions on installing secondary languages.

The program code is not included in the secondary language version.

Secondary language environments

Some multilingual environments have more than one national language version installed. To have a single iSeries(TM) server support multiple languages, you must have the associated hardware installed. You must also have sufficient disk storage space available to contain all of the system and application textual data for the secondary languages. The amount of disk storage space that is required varies by language and applications, but it is usually somewhere in the range of 50 to 300 MB.

The languages currently supported on OS/400^(R) as either primary or secondary languages can be found in NLV feature codes. Listed are the national language versions, their feature codes, and the program libraries from which they are available.

Each of the national language versions available from the program library (primary or secondary) include culture- and language-dependent system values for that particular language. Date format, date and time separators, code page and character set, and keyboard types are examples. The system values are initially set to the cultural values of the primary language. By setting up a subsystem, however, you can ensure that the cultural values for the secondary languages are set properly for users of the secondary languages.

Applications can use language values that are available in message CPX8416, in file QCPFMSG, accessed using the library list. Message CPX8416 gives the correct values for the primary or secondary language, depending on the library list.

Except for logical partitioning (LPAR), when you use a multilingual environment, the primary language version and any secondary languages must be at the same release level. You must also order and install the correct devices (workstation controllers, display stations, and printers) to support your languages.

The following links provide additional information about using primary and secondary languages:
- Secondary language requirements
- Ensuring that the secondary language can be used
- Multilingual support

Notes on secondary languages when you require English as the primary language: »

The following considerations are important when you require English as the primary language and you want to install DBCS secondary languages.

If you install Japanese DBCS (feature number 5762) as a secondary language and you require English as a primary language

If you install Japanese DBCS (feature number 5762) as a secondary language and you require English as a primary language, you should install English uppercase DBCS (2938) as the primary language. English uppercase DBCS (2938) should be installed because all of its user interface text is in uppercase English letters. Some Japanese workstation displays do not support lowercase English letters. English Uppercase DBCS allows users to view English text from these Japanese displays, without loss of data. If you do install English uppercase DBCS as the primary language, you must respond to all messages in uppercase rather than lowercase. If you respond in lowercase, you will receive an error message.

Set the QKBDTYPE system value to JUB (Japanese English) when using Japanese DBCS (5762) as a secondary language with English Uppercase and Lowercase Support for DBCS (2984). Use JUB as QKBDTYPE because this allows the primary language users to enter English characters, but not Katakana characters.

If Simplified Chinese, Traditional Chinese, or Korean is used as a secondary language and English is required as the primary language

If Simplified Chinese, Traditional Chinese, or Korean is used as a secondary language and English is required as the primary language, use English Uppercase and Lowercase (2984) as a primary language. You should use English Uppercase and Lowercase because English uppercase and lowercase characters can be displayed on devices supporting these DBCS languages.

In other cases:

In cases other than those described in the previous topics, use English (2924) as a primary language.

«

Enable the secondary language: To ensure that secondary languages can be used after they have been installed on OS/400(R), you must do the following:

- Change the user's system part of the library list to add the secondary language library to the beginning of the list. You can accomplish this in one of the following ways:
  - Use the Change System Library List (CHGSYSLIBL) command to add the desired national language library to the top of the library list. The command can be in an initial program specified in the user profile so the user does not have to enter the command at every sign-on.

    The authority shipped with the CHGSYSLIBL command does not allow all users to run the command. To enable a user to run the CHGSYSLIBL command without granting the user rights to the command, you can write a CL program containing the command. The program is owned by the security officer and adopts the security officer's authority when created. Any user with authority to run the program may use it to change the system part of the library list in the user's job.
  - Use a separate subsystem for a secondary language. To do this:
    1. Create a subsystem description to be used for secondary language users (QGPL/DANISH, for example).
    2. Specify the secondary language library for SYSLIBLE (QSYS2926, for example).
    3. Specify the sign-on display file from the secondary language library for SGNDSPF (QSYS2926/QDSIGNON, for example).
    4. Remove the appropriate display devices (Remove Work Station Entry (RMVWSE) command) from the interactive subsystem and add them (Add Work Station Entry (ADDWSE) command) to the secondary language subsystem. When you use these commands, no one can be signed on to the devices that you are removing.
    5. If you want to use separate job queues (JOBQ) and output queues (OUTQ) for a secondary language, you can create these in the secondary language library (for example, QSYS2926). Attach the job queue to the secondary language subsystem (for example, QGPL/DANISH).
  - You may have licensed programs that have secondary language libraries and that are not on the OS/400 secondary language tape. You should add those secondary language libraries to the library list before the primary language product libraries. Use the Change System Library List (CHGSYSLIBL) command to add the secondary language libraries to the library list if the product libraries are in the system part of the library list.
- Specify the keyboard ID for the secondary language in the device description for the display station. This can be accomplished through the use of the Change Device Description (Display) (CHGDEVDSP) command. You need to vary off your device, use the CHGDEVDSP command, and then use the Vary Configuration (VRYCFG) command to vary the device back on.
- Change the date format to reflect the date format of your language. The date format, date separator, and time separator only can be changed using the CHGJOB command for secondary language users. If you use the CHGSYSVAL command to change these values, all primary language users and all secondary language users have this information changed. The following table illustrates this and shows the ways the date and other NLS-related job attributes should be specified for secondary language users:

	CHGJOB	CRTJOBD	CHGJOBD	CRTUSRPRF	CHGUSRPRF
Date	X	X	X		
Date Format	X				
Date Separator	X				
Time Separator	X				

	CHGJOB	CRTJOBD	CHGJOBD	CRTUSRPRF	CHGUSRPRF
Character Set Identifier	X			X	X
Language Identifier	X			X	X
Sort Sequence	X			X	X
Country or Region Identifier	X			X	X

- Change the CCSID value to reflect the CCSID of the secondary language that you want to use. You can set the CCSID value for all jobs to run under your user profile by using the Change User Profile (CHGUSRPRF) command. This change takes effect for any jobs that enter the system using your profile after you have made the change.

  You can set the CCSID value for a batch job to be run using the CCSID parameter on the Submit Job (SBMJOB) command. You can change the CCSID of a job that is running by using the Change Job (CHGJOB) command. For more information on CCSID values, see Work with CCSIDs.

- Ensure that your data, in objects other than database files and message files, prints correctly. To do this, you may want to direct all of your printed output to a print queue that contains printer output for only the character identifier of your language.

  1. Use the Create Output Queue (CRTOUTQ) command to create a printer queue.
  2. Use the OUTQ parameter of the Change Job (CHGJOB) command to change your job output queue.

     CHGJOB OUTQ(output_queue)

     Note: You can use the Change User Profile (CHGUSRPR)F command instead to make a more permanent change to the OUTQ. Then, each time you sign on to the system, the correct OUTQ is used.

  If the printer supports changing the code page, you can use the *JOBCCSID value in the printer file.

- Change other culture- and language-dependent values to the secondary language you want to use if you do not want to use the system values. Use the Change Job (CHGJOB) command to change the culture- and language-dependent values.

See Linguistic and cultural values for information on changing linguistic and cultural system values, as well as the subsystem description.

Multilingual support: Multilingual support on OS/400$^{(R)}$ is support that includes more than one language on one system. A server that works in multiple languages must be able to handle a variety of cultural and linguistic characteristics, such as:

- Graphic characters, such as an e accent grave (è)
- Currency symbols, such as the Pound Sterling symbol
- Date formats, such as 24.06.93
- Time formats, such as 23:59
- Sort sequences, such as a, b, c....

The server must also handle differences such as the direction in which text prints and displays. For example, all text of Latin-based languages, such as French and Spanish, displays from left to right across a display. On the other hand, the general direction of Arabic and Hebrew text is from right to left across a display. The server displays text, prints text, and allows data entry left to right for some languages and right to left for other languages.

Printing and displaying text left to right for some languages and right to left for others is not enough, though. Numbers and Latin character phrases that are included in Arabic and Hebrew text display and

print from left to right. For example, Hebrew text generally flows from right to left across a display. When Hebrew text includes a street address, the street name flows right to left, but the address number flows left to right. Similarly, if Hebrew text includes a Latin name, such as John Smith, the Latin name flows from left to right. Because this text flows both right to left and left to right (bidirectionally), the system displays and prints text bidirectionally.

Multilingual network. Two or more servers, each using a different primary language, can interchange data. Because data is flowing between systems with different primary languages, the data must have a CCSID assigned. When data has a CCSID assigned, data integrity is maintained. Thus, character data is correctly displayed for the receiving user.

Install and enable locales

If you are installing a new release, you can request that library QSYSLOCALE be installed on the system at that time. See System-supplied locale source definition files for a list of the system-supplied locale source members.

If you decide to install library QSYSLOCALE at a later time, type GO LICPGM and press the Enter key. Scroll until you find *Extended NLS Support*. Select option 1 to install *Extended NLS Support*.

Locales can be enabled on OS/400$^{(R)}$ by using system values or user profiles.

Enable locales with system values:

Two system values are related to locales:

QLOCALE
> The system value specifying the locale object. The default is *NONE. Other possible values are:
> - *C
>
>   The C locale is assigned for this user (same result as using *POSIX)
> - *POSIX
>
>   The POSIX (Portable Operating System Interface for Computer Environments) locale path name is assigned for this user.
> - locale path name
>
>   The path name of the locale to be assigned for this user.

QSETJOBATR
> A system value that sets job attributes at job start up time. The default is *NONE. The following values indicate the job attributes that are to be set from the locale object specified by QLOCALE:
> - *CCSID (Coded character set identifier)
>
>   The CCSID associated with a locale when the locale object is created.
> - *DATFMT (Date format)
>
>   The date format is determined from the locale object.
> - *DATSEP (Date separator)
>
>   The date separator is determined from the locale object.
> - *SRTSEQ (Sort sequence)
>
>   The sort sequence is determined from the locale object
> - *TIMSEP (Time separator)
>
>   The time separator is determined from the locale object.
> - *DECFMT (Decimal format)
>
>   The decimal format is determined from the locale object.

Enable locales with user profiles:

Two parameters on the user profile are related to locales:

LOCALE

The parameter value specifying the locale object to use for the LANG environment variable. The default is *NONE. Other possible values are:

- *SYSVAL

  The system value QLOCALE is used to determine the locale path name to be assigned for this user.

- *C

  The C locale is assigned for this user (same result as using *POSIX)

- *POSIX

  The POSIX locale path name is assigned for this user.

- locale path name

  The path name of the locale to be assigned for this user.

SETJOBATR

The parameter value that sets job attributes at job start up time. The default is *NONE. If *SYSVAL is specified, then the attributes are set from the QSETJOBATR value. The same attributes (*CCSID, *TIMSEP, *DATFMT, *DATSEP, *DECFMT, *SRTSEQ) that can be specified on the system value QSETJOBATR can be specified on the SETJOBATR parameter of the user profile.

If you want all users on the system to use locales, setting system values accomplishes this. On the other hand, the user profile is an ideal mechanism if you want to provide locale function to a limited or specific group of users.

For more information

See the following topics for more information about using locales:

- Locales
- Work with locales. This topic provides numerous examples showing how you can use locales.

Scenarios: Set up OS/400 with a national language version

The following topics provide scenarios for multilingual support:

- Scenario: a single server supporting Spanish
- Scenario: a single server supporting Spanish and an existing EBCDIC database
- Scenario: a single server supporting English, Japanese, and German

For more information about the details described in the scenarios, see the following topics:

- For Unicode, see the Work with Unicode topic.
- For Unicode database information relating to DDS, see the DDS for physical and logical files information.
- For Unicode display information with DDS, see the DDS for display files information.
- For Unicode printing information with DDS, see the DDS for printer files information.
- For information about using the subsystem description, see the Enable the secondary language topic.

Scenario: a single server supporting Spanish

≫

In this scenario there is a single server supporting Spanish users and applications.

The primary language of the system is Spanish (NLV 2931). Because 2931 is the primary language, the default system settings and OS/400[(R)] localization preference are set to Spanish.

The user has also created a database file where the fields of interest are defined to contain Unicode, since they plan to use this sane database file for both 5250 applications and Java[(TM)] applications.

The following example shows the SQL statement used to create a database containing a Unicode field named PART_NAME and a non-Unicode field named STOCK_NUMBER:
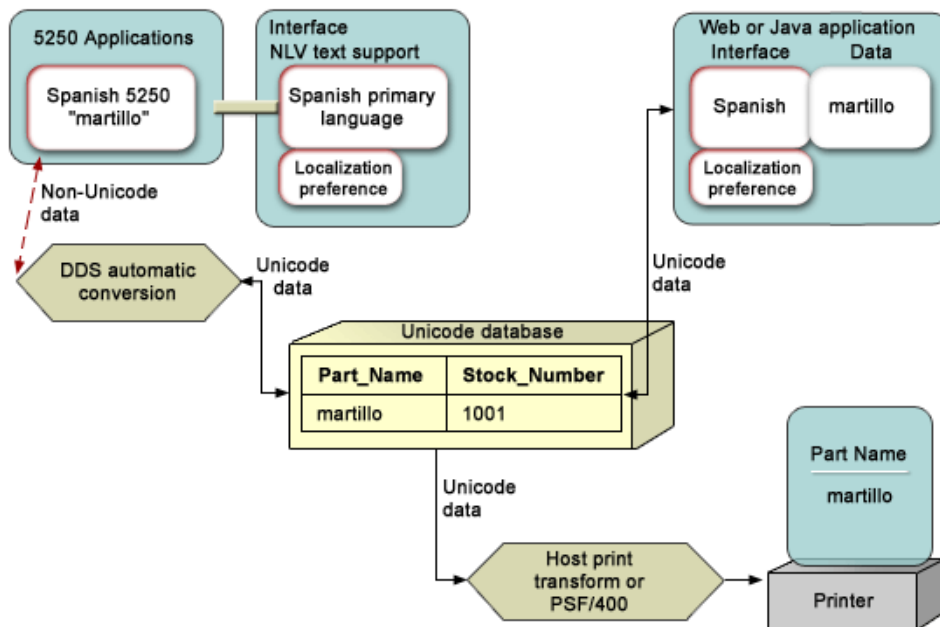
```
CREATE TABLE SAMPLE (PART_NAME GRAPHIC (10) CCSID 1200
   NOT NULL WITH DEFAULT, STOCK_NUMBER INT NOT NULL WITH DEFAULT 0)
```

If the user wants to display this data with a web service or Unicode enabled application, then Unicode is the natural encoding for web use, and no conversion is needed. To get the correct localization preference for the Java application, the user sets the Java locale to sp_SP for Spanish in Spain.

If the user wants to display this data with a 5250 session, then the Unicode field must be converted to the CCSID of the display device. The user only has to set the user profiles's CCSID value to 284 to tell the system that this user is on a Spanish display. This service is provided automatically by the system if requested with the CCSID keyword and the *CONVERT parameter in DDS.

To print the Unicode data, the user specifies the *NOCONVERT parameter of the CCSID keyword, and a TrueType font using the FONTNAME keyword. The unconverted Unicode data can be printed with PSF/400 or with Host Print Transform.

The following graphic illustrates this scenario.

《

Scenario: a single server supporting Spanish and an existing EBCDIC database
》

In this scenario there is a single server supporting Spanish users and applications and an existing EBCDIC database.

The primary language of the system is Spanish (NLV 2931). Because 2931 is the primary, the default system settings and OS/400$^{(R)}$ localization preference is set to Spanish.

The user has also created a database file where the fields of interest are defined to contain Unicode, because they plan to use this same database file for both 5250 applications and Java$^{(TM)}$ applications. They also have an existing database in which the fields are defined in EBCDIC.

The following example shows the SQL statement used to create the EBCDIC database:

```
CREATE TABLE SAMPLE (PART_NAME CHAR (10) CCSID 284 NOT NULL WITH DEFAULT,
    STOCK_NUMBER INT NOT NULL WITH DEFAULT 0)
```

The following example shows the SQL statement used to create a database containing a Unicode field named PART_NAME and a non-Unicode field named STOCK_NUMBER:

```
CREATE TABLE SAMPLE (PART_NAME GRAPHIC (10) CCSID 1200 NOT NULL WITH DEFAULT,
    STOCK_NUMBER INT NOT NULL WITH DEFAULT 0)
```

When using the Unicode file

If the user wants to display this data with a web service or Unicode enabled application, then Unicode is the natural encoding for web use, and no conversion is needed. To get the correct localization preference for the Java application, the user sets the Java locale to `sp_SP` for Spanish in Spain.

If the user wants to display this data with a 5250 session, then the Unicode field must be converted to the CCSID of the display device. The user only has to set the user profiles's CCSID value to 284 to tell the system that this user is on a Spanish display. This service is provided automatically by the system if requested with the CCSID keyword and the *CONVERT parameter in DDS.

To print the Unicode data, the user specifies the *NOCONVERT parameter of the CCSID keyword, and a TrueType font using the FONTNAME keyword. The unconverted Unicode data can be printed with PSF/400 or with Host Print Transform.

When using the EBCDIC file

If the user wants to display this data with a web service, then the file first must be converted to Unicode. This can be done with the JDBC connector. To get the correct localization preference for the Java application, the user sets the Java locale to `sp_SP` for Spanish in Spain.

If the user wants to display this data with a 5250 session, EBCDIC is the natural encoding for the 5250 device and no conversion is needed. To print the EBCDIC data, the user sends the data to the printer; because EBCDIC is the default encoding for the printer, no conversion is needed.

Logical file support

One of the unique features of OS/400 is the ability to use the system's logical file support to have either the EBCDIC file appear to the application as a Unicode file, or to have a Unicode file appear to the application as an EBCDIC file. This might be of use if you want to move your database to Unicode, but do not want to update your existing applications.

If the majority of your application's use of the database would involve Unicode, you could have the data stored as Unicode, and create a logical view of the file in EBCDIC. You could then have your EBCDIC programs access this logical file and they would not need to be updated to handle Unicode.

If the majority of your application's use of database would involve EBCDIC, you could have the data stored as EBCDIC, and create a logical view of the file in Unicode. You could then have your Unicode programs access this logical file and they would not need to be updated to handle EBCDIC. However, since EBCDIC encodes a smaller set of characters than Unicode does, some character loss might occur.

The following graphic illustrates this scenario.

《
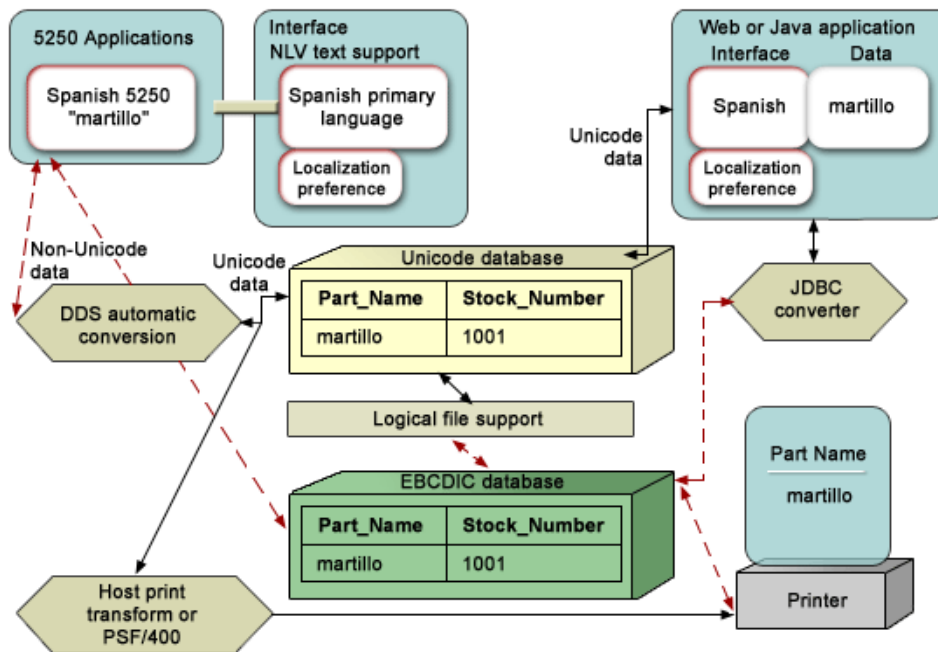
Scenario: a single server supporting English, Japanese, and German
》

In this scenario there is a single server supporting English, Japanese, and German users and applications.

The primary language of the system is English (NLV 2924). The system has also been loaded with secondary languages of Japanese (NLV 2962) and German (2929). Because 2924 is the primary language, the default system settings and OS/400$^{(R)}$ localization preference is set to English. Because these three NLVs are installed, each user can work with the system in English, German, or Japanese.

Each set of users sees their language of choice and OS/400 localization preference from the initial sign-on screen by the use of a subsystem description for each secondary language.

The user has also created a database file in which the fields of interest are defined to contain Unicode. Since Unicode provides a unique number for every character on any platform, in any program,and in any language, one field can contain English, German, and Japanese.

The following example shows the SQL statement used to create a database containing a Unicode field named ″PART_NAME″ and a non-Unicode field named ″STOCK_NUMBER″:

```
CREATE TABLE SAMPLE (PART_NAME GRAPHIC (10) CCSID 1200
   NOT NULL WITH DEFAULT, STOCK_NUMBER INT NOT NULL WITH DEFAULT 0)
```

If the user wants to display this data with a web service or Unicode enabled application, then Unicode is the natural encoding for web use and no conversion is needed. To get the correct localization and interface preference for the Java application, the user needs to set the Java locale to the correct value: en_US for English, Jp_JA for Japanese, and de_DE for German.

If the user wants to display this data with a 5250 session, then the Unicode field must be converted to the CCSID of the display device. The user only has to set the user profile's CCSID value to the correct value

(37 for English, 1399 for Japanese, and 278 for German) to tell the system what the user's preference is for the display. This service is provided automatically by the system if requested with the CCSID keyword and the *CONVERT parameter in DDS.

To print the Unicode data, the user specifies the *NOCONVERT parameter of the CCSID keyword, and a TrueType font using the FONTNAME keyword. The unconverted Unicode data can be printed with PSF/400 or with Host Print Transform.

The following graphic illustrates this scenario.

≪
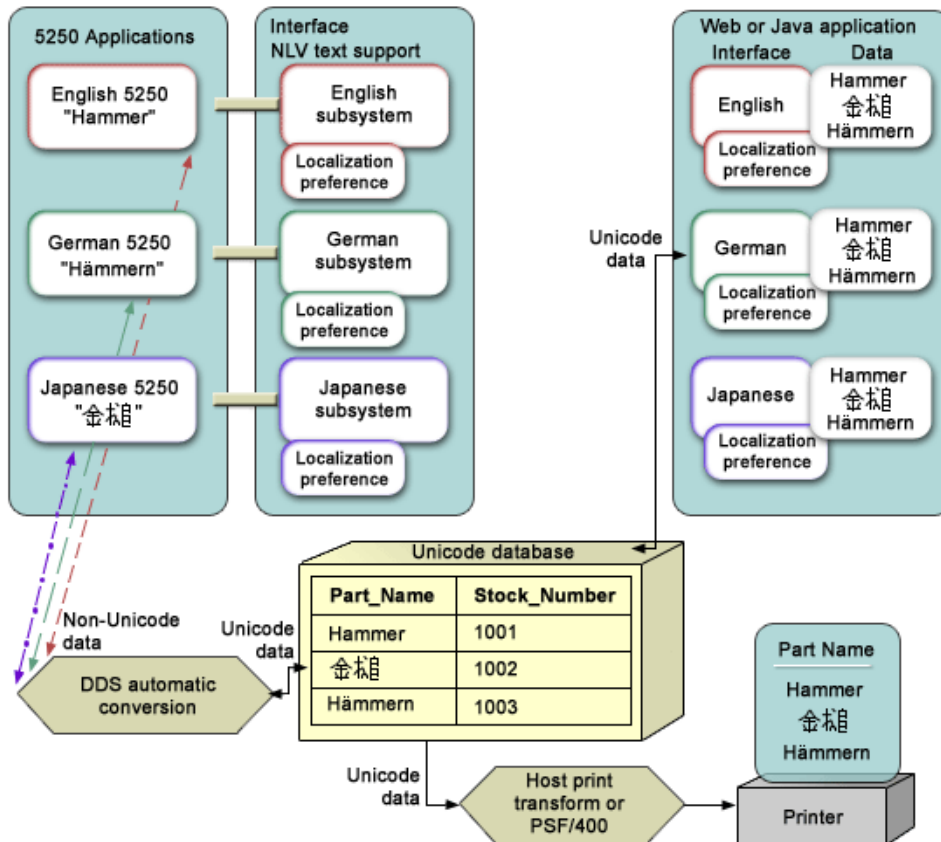
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