

# Rational Developer for i Sandbox for IBM i Lab Exercise Workbook

Rational Developer for i

# Lab 02f - Maintain a Free-Form ILE RPG application using Remote System Explorer

This exercise guides you through editing a free-form RPG source member and working with the LPEX editor

Version 7, January 2021

The most up to date version of this document can be found on Rational Developer for i - Hands-On Labs at <u>http://ibm.biz/rdi\_labs</u>.





**IBM Software** 

© Copyright International Business Machines Corporation, 2021. All rights reserved.

US Government Users Restricted Rights - Use, duplication or disclosure restricted by GSA ADP Schedule Contract with IBM Corp.

Lab 02f - Maintain an IBM i application using Remote System Explorer (RSE) to Edit Free- Form RPG source	4
	4
LEARNING OBJECTIVES	
SKILL LEVEL AND PREREQUISITES	
CONVENTIONS USED IN THIS WORKBOOK	5
CLIENT SYSTEM REQUIREMENTS	5
HOST SYSTEM REQUIREMENTS	
1. OPENING SOURCE MEMBERS IN THE REMOTE SYSTEM EXPLORER	6
1.1 Getting started with RDi	
1.2 Opening a source member	
1.3 Opening a second source member and multiple views	
1.4 Using the Outline view of a source member	
2. WORKING WITH THE REMOTE SYSTEMS LPEX EDITOR	
2.1 Changing default editor settings	
2.2 Autosave while editing source	
2.3 Changing the editor appearance	
2.4 Changing key behavior in the editor	. 20
2.5 Using SEU commands in the LPEX editor	
2.6 Requesting undo and redo operations	
2.7 Invoking language sensitive help	
2.8 Finding and replacing text	
2.9 Filtering lines by string	
2.10 Filtering lines by type	
2.11 Searching multiple files	
2.12 Comparing files using the Remote System Explorer	
2.13 Checking syntax	. 45
Congratulations!	. 47

## Lab 02f - Maintain an IBM i application using Remote System Explorer (RSE) to Edit Free-Form RPG source

## Overview

This tutorial teaches you how to maintain an IBM i application written in ILE RPG using the Remote System Explorer.

## Learning objectives

Use tools and views in the Remote System Explorer (RSE) perspective to edit, a source member.

## Skill level and prerequisites

Introductory.

Important!
Nor should see that <b>DD: I shou</b> (Call's should be for several set this bit. I shou
You should complete <b>RDi Lab01</b> 'Getting started' before you work on this lab. Lab01
contains the following information and instructions:
Which IBM i server to connect to
Which User ID to use

- How to start RDi, create a connection and connect
- How to setup the correct library list for this lab

Knowledge of basic Microsoft Windows operations such as working with the desktop, mouse operations such as opening folders and drag-and-drop is assumed. It will also be helpful if you understand DDS and ILE RPG.

## Conventions used in this workbook

Bold font	is used to highlight user interface controls
Mono-spaced font	is used for user input text and code blocks
Italic font	is used for variable names and glossary terms

The following icons are also used to identify categories of information:

lcon	Purpose	Explanation
	Important!	This symbol calls attention to a particular step or command. For example, it might alert you to type a command carefully because it is case sensitive.
i	Information	This symbol indicates information that might not be necessary to complete a step but is helpful or good to know.
<b>B</b>	Trouble- shooting	This symbol indicates that you can fix a specific problem by completing the associated troubleshooting information.

## Client System requirements

The labs require <u>IBM Rational Developer for IBM i (RDi)</u> to be installed on your workstation. If you do not yet have this, you can download it for free from <u>http://ibm.biz/rdi\_trial</u>.

## Host System requirements

The easiest way to ensure you have everything you need, is to use the demonstration IBM i server that is set up and ready to use with these lab exercises. These labs use the RSELABxx library on that system. For those who want to run these labs on to their own system, you can load a SAVF with the RSELABxx library from <u>rselabxx.savf</u>.

## 1. Opening source members in the Remote System Explorer

This module teaches you about the Live Parsing eXtensible (LPEX) editor. How to edit source members and how to navigate through source member.

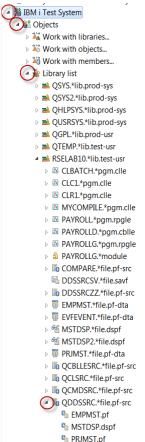
Learning objectives:

- Open a member for edit from the Table view or the Remote Systems view
- Maximize the editor space
- Open another member for edit
- Switch from one edit session to another edit session
- Open multiple views of the same source member
- Display a structural outline of items defined in a source member
- **1.1** Getting started with RDi

The information about starting Rational Developer for i (RDi) is described in Lab01 the first of this series of labs. Please start with the first lab to learn how create a connection to an IBM i system. How to use the Remote System Explorer View to access IBM i objects. After you went through the exercises in the first Lab, you are ready to start with this Lab and use the connection to your IBM i system that is available in the RDi workspace.

Make sure the library list is setup so library RSELABxx, **xx** being your assigned team number, is part of the library list.

- \_\_1. Expand library **RSELABxx** if it is not already expanded
- \_\_\_2. Expand file **QDDSSRC** in library **RSELABxx**



#### **1.2** Opening a source member

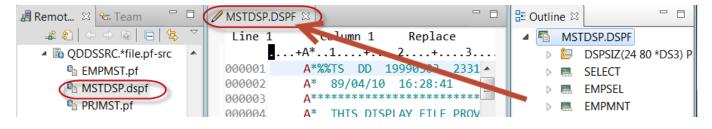
You are going to use the Remote Systems LPEX Editor to edit the member MSTDSP found in QDDSSRC.

\_\_\_\_1. From the Remote Systems view **right-click** member **MSTDSP** in the **QDDSSRC** source file. Select to **Open With**, then **Remote Systems LPEX Editor**.

The Remote Systems LPEX Editor opens. It is built right into the workbench, with rich editing functions and is IBM i aware! It is a superset of SEU! The syntax checker is ported from SEU, and the reference manuals are built-in and F1 cursor sensitive.

- **2.** Double-click the **MSTDSP** tab to maximize the Editor window.
- **3.** Double-click the **MSTDSP** tab again to return the view to its original size.

✓ In QDDSSRC.*file.pt In EMPMST.pf	-src	:				
MSTDSP.dspf		Go To		>		
PRJMST.pf	ſ	Open With		>	Ø	Remote Systems LPEX Editor
🖻 REFMST.pf		Browse With		>	7	Screen Designer
<ul> <li>RSNMST.pf</li> <li>QLONGSRCPF.*1</li> </ul>	8	Refresh		F5	Γ	
<ul> <li>&gt; I QRPGLESRC.*file</li> </ul>	Þ	Rename		F2		
> 🗟 QRPGLESRCP.*fi		Delete		Delete		
		Сору				
> 🗊 REFMST.*file.pf-	<b></b>	Move				



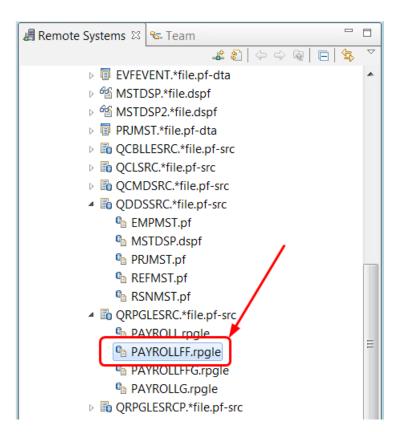


**Tip:** To open IBM i<sup>™</sup> members quickly, you can use the keyboard shortcut Ctrl+Alt+Q.

### **1.3** Opening a second source member and multiple views

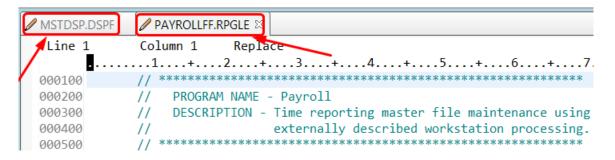
Next let's open a second member in the editor. To open a second source member:

1. In the Remote Systems view, double-click member PAYROLLFF in the QRPGLESRC source file.



You can easily switch between the two edit sessions

2. Click on each tab to switch from one edit session to another edit session.

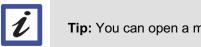




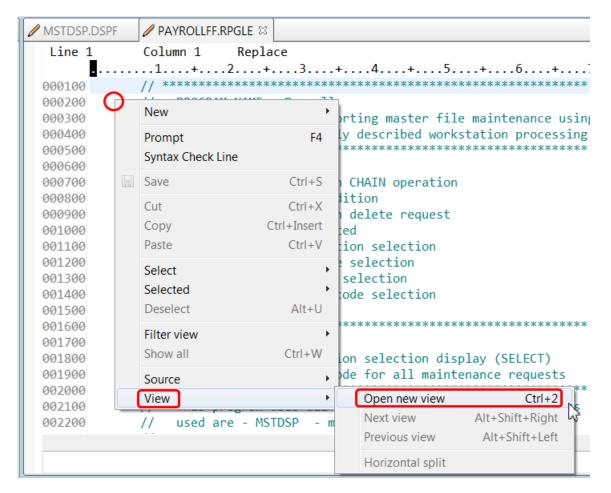
Tip: You can also switch between files that are open in the editor view by pressing CTRL+F6.

You can open multiple views of the **same** source member while editing in the Remote Systems LPEX editor. To open multiple views of your RPG source:

- 3. Double-click the **PAYROLLFF** tab in the editor to maximize the Editor window.
- \_\_\_\_4. Right-click this source in the Editor view and click View > Open new view.



Tip: You can open a maximum of five views of the same source.



\_5. Right-click in one of the source views and select View > Next view or View > Previous view to navigate among the views.

EMBOX1.DE	EMO	S.IBM.COM:RSELX/0	QRPGLESRC(PAY	ROLLFF): 1	EMBOX1.DI	EMOS.IBM.COM:RSQRPGLESRC(PAYRO	LLFF): 2
Line 1		Column 1	Replace		Line 1	Column 1 Replace	
		1+2	+3	+4.			+ 4
000100	>	// *********	***********	******	000100	// ************************************	******
000200		New	+	1 =	000200	// PROGRAM NAME - Payro	oll
000300		Prompt	F4	portir	000300	// DESCRIPTION - Time r	reporti
000400			14	lly de	000400	// extern	nally d
000500		Syntax Check Line		*****	000500	// ************************************	*****
00600		Save	Ctrl+S		000600	<pre>// INDICATORS USED</pre>	
00700		Cut	Ctrl+X	on CHA	000700	// 50 - No record found	
00800				nditic	00800	// 60 - General error o	
00900		Сору	Ctrl+Insert	on del	000900	<pre>// 90 - Protect display</pre>	
01000		Paste	Ctrl+V	sted	001000	// KC - End of job requ	
01100		Select		ation	001100	<pre>// KD - Return to appl:</pre>	
01200				ee sel	001200	// KE - Return to emplo	
01300		Selected		t sele	001300	<pre>// KF - Return to proje</pre>	
01400		Deselect	Alt+U	code	001400	// KG - Return to reaso	on code
01600		Filter view		*****	001500	// LR - Last record	
01700		Show all	Ctrl+W		001600 001700	//	******
01800		Show an	Cult	tion s	001700	<pre>// SUBROUTINES USED // EDITSL - Edit applic</pre>	
01900		Source	+.	citon i	001000	// EDITSL - Edit applic	
02000	ſ	View	+	Open	new view	Ctrl+2	
02100	_	// This pro	gram uses al	Next	view	Alt+Shift+Right program uses a	11 exte
02200			- MSTDSP -	_	www.		- maint
02300		11	- EMPMST -	FIEVIC	0.0000000	Automatic Contention of the state	- emplo
02400			- PRJMST -	Horiz	ontal split		- proje



Note:

Any changes made in one of the views will automatically update all other views of the same source.

\_6. Scroll down and place the cursor at line 33 in the left view of the Payroll source.

7. Press End key, then Press Enter.

EMBOX1.DEMOS	5.IBM.COM:RSELABXX	//QRPGLESRC(PAYROLLFF): 1		EMBOX1.DEMO	S.IBM.COM:RSELA	BXX/QRPGLESRC(PAYROLLFF): 2	2
Line 34	Column 8 R	eplace 1 change		Line 33	Column 11	Replace 1 change	
+	.1+2.	+3+4	+5	+	1 <mark>.</mark> +	.2+3+4	+
003200	// Compile t	ime array containing	error 🔺	003000	Dcl-F RSNMST		
003300	Dcl-S ERR	Char(50)	DIM	003100	11	0	
003301				003200	// Compile	e time array containing	error –
003400	Dcl-S EMESS	Char(50);	=	003300	Dcl-S ERR	Char(50)	DI
003500	11			003301			
003600	// **********	*****	*****	003400	Dcl-S EMESS	Char(50);	

A new line is inserted in both views.

Define a new integer variable, i with length 10:

**\_\_\_8.** First type in **Dc** and press Ctrl-Space to see what op-codes are available.

300	Dcl-S ERR	Char(50)	DIM(10) CTDA
301	Dc		
400	🔓 Dcl-c	DCL-S	
500	🔓 Dcl-ds		
600	🔓 Dcl-f	Define	a standalone field
700 800	Dcl-parm	*****	*****
900	🔓 Dcl-pi	ntrols	the display fi
000	🔓 Dcl-pr		keys described (
100	Dcl-s		one maintenance
200	Concl-subf		select on the se
300 400	Dcl-proc		add a new recou he file.
400	a b cr proc		ne TIIe.

\_9. Select Dcl-S, press Space key and then press Ctrl-Space to find out what comes next

Dcl-s	
⑦ Name:	Name:
RNF3308	
RNF3308 RNF3308	Enter a valid name. The normal rules for RPG IV symbolic names apply; reserved words cannot be used (see Symbolic Names). The name can begin in any position in the space provided. Thus, indenting can be used to indicate the shape of data in data structures.
	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
	ls the display file processing and
	n keys described on each display
	m one maintenance application to

\_10. Enter the name i and a space then press Ctrl-Space to get content assistance on what comes next.

Dcl-S ERR	Char(50)	••••	DIM(10) CTDATA PERRCD(1);
Dcl-s i			
De 😿 bindec(digits)			INT(digits)
NF3308E windec(digits:decin	nal-positions)	Ξ	
NF3308E			The INT keyword indicates that the item is a numeric data type
/ ate			with signed integer format.
/ 🔐 date(format{separa	ator})		
/ 😿 float(bytes)			************
/ 🐨 graph(length)			the display file processing and
net ind			keys described on each display one maintenance application to
int(digits)			select on the selection formats
	Þ		· · · · · · · · · · · · · · · · · · ·

\_\_\_11. Select int(digits) and you are prompted to type in the number of digits in between the parentheses.

Dcl-F	INT	
11	(	
// (	digits	t
Dcl-S	)	
Dcl-s	i int(	)

**12.** Specify 10 digits and end the free-form statement with a semicolon

MSTDSP.DSPF	🖉 *PAYROLLFF.RPGLE 🖾				
EMBOX1.DEMOS.	IBM.COM:RSELABXX/QRPG	LESRC(PAYROLLFF): 1	EMBOX1.DEMO	S.IBM.COM:RSELABXX/QRPGLESRC(PAYROLLFF): 2	×
Line 55	Column 33 Insert		Line 49	Column 20 Replace 6 changes	
+	1+2+.	3 <b>.</b> .+4+	.5+	1+2+3+4+	5
003200	<pre>// Compile time a</pre>	rray containing error	▲ 004600	<pre>// Housekeeping, clear display field</pre>	5 i 🔺
003300	Dcl-S ERR	Char(50) DI	004700	//	
003301	Dcl-S i	int(10);	004701	i = 0;	
003400	Dcl-S EMESS	Char(50);	004800	Exsr MAIN;	=
003500	11		004900	<pre>// If MAIN is done program ends</pre>	=

Now, in the view on the right, you can start using the new variable while being able to maintain your view on the left on the definition of the variable.

Another nice feature is the ability to change the way the views split, if you don't like the vertical split you can specify to split horizontal instead. Let's try that:

\_\_\_13. Right-click a source view and select View > Horizontal split to change from a vertical split of the views to a horizontal split of the views.

	.+1+2	_			1+ <mark>2</mark> +
)		arrav conta	ining error 🔺		<pre>// Housekeeping, cle</pre>
	New	•	DIM	004700	11
	Prompt	F4	. =	004701	i = 0;
	Syntax Check Line		; –	004800	Exsr MAIN;
			*****	004900	<pre>// If MAIN is done pr</pre>
	Save	Ctrl+S		005000	*INLR = *on;
	Cut	Ctrl+X	*****	005100 005200	// MAIN SUBROUTINE BegSr MAIN;
	Сору	Ctrl+Insert	trols the d	005300	DoU *INKC;
			tion keys d	005400	*IN60 = *OFF;
	Paste	Ctrl+V	from one ma	005500	EMESS = *BLANK;
	Select	+	vou select	005600	EMPAPL = *BLANK;
	Selected	+	will add a	005700	PRJAPL = *BLANK;
	Deselect	Alt+U	1 in the fil	005800	RSNAPL = *BLANK;
		7410.0	*****	005900	//
	Filter view	+	lay fields a	006000	<pre>// Write the SELECT</pre>
	Show all	Ctrl+W		006100	//
	Source			006200	//
	View			006200	DoU not *IN60;
	view		Open new vie		EXTINC SELECT,
	Add/Remove Breakpoint		Next view	Alt+Shift+	
蓉	Set Service Entry Point		Previous view	Alt+Shift	:+Left LeaveSr; Else;
-	DoU *INKC;		Horizontal sp	lit	Exsr EDITSL;

Here is how your edit view should look now:

🖉 MSTDSP.DSPF	✓ *PAYROLLFF.RPGLE ≅
EMBOX1.DEM	OS.IBM.COM:RSELABXX/QRPGLESRC(PAYROLLFF): 1
Line 41	Column 46 Insert 6 changes
	1+2+3+4+ <b>.</b> 5+6+7.
003200	<pre>// Compile time array containing error descriptions.</pre>
003300	Dcl-S ERR Char(50) DIM(10) CTDATA PERRCD(1);
003301	Dcl-S i int(10);
003400	Dcl-S EMESS Char(50);
003500	
003600	// ************************************
	OS.IBM.COM:RSELABXX/QRPGLESRC(PAYROLLFF): 2
Line 50	Column 18 Replace 6 changes
	+1+ <b>2</b> .2+3+4+5+6+7.
004600	<pre>// Housekeeping, clear display fields and reset indicators.</pre>
004700	
004701	i = 0;
004800	Exsr MAIN;
004900	// If MAIN is done program ends
005000 005100	*INLR = *on; // MATN_SUBROUTINE

If you want to close the extra views:

- \_\_\_14. Right-click the source view that you want to close (RSELABXX/QRPGLESRC(PAYROLL): 2)
- \_\_\_15. Select View > Close view

Tip:



This option is not available on the first view

You have opened another member for edit and seen multiple views of a member.

#### **1.4** Using the Outline view of a source member

The Outline view acts as an excellent resource when you want to navigate through RPG, COBOL and DDS source in the Remote Systems LPEX editor. The Outline view displays a structural outline of items defined in the file that you currently have open in the Remote Systems LPEX editor window. With the editor active, you can expand the file structure in the Outline view and click various elements in the view to jump to that location in the source itself. To see an Outline view of your RPG source:

\_1. Click the **PAYROLLFF** tab in the editor and take a look at the outline view on its right.

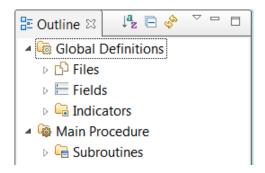
MSTDSP.DSPF	✓*PAYROLLFF.RPGLE ⋈		🏗 Outline 🛛 🛛 📲 🖻 🚸 🍸 🗖 🗖
Line 54 + 002600 002700 002800 002900 003000 003100	Column 46 Insert 6 changes 1+2+3+4+5+6+7 // ***********************************	.+	type filter text  Global Definitions  Main Procedure



Tip:

If you have closed the Outline view previously, you can reset the perspective by selecting **Window > Reset perspective** from the workbench menu or **Window > Show view > Other**, then expand **General** and click **Outline** in the Show view dialog.

The Outline view contains your source program in a tree view without the lines containing logic.



Now you want to see more details of your source member.

- \_2. Expand Files.
- \_\_\_3. Expand the MSTDSP workstation file.
- \_\_\_4. Expand the EMPSEL record format.
- \_\_\_5. Expand EMPNO.
- 6. Click on any line number in the Outline view.

This will position the source editor accordingly.



Tip:

Clicking a field or a variable in the Outline view will position the editor to its definition.

MSTDSP.DSPF			🗄 Outline 🛛 🦊 🖓 🖓 🖓
Line 190	Column 12 Insert 6 changes	•	type filter text
+	1+2+3+4+5+6+.	7	
017400	//		🔺 🗟 Global Definitions
017500	EndDo;		▲ <sup>1</sup> D <sup>2</sup> Files
017600	EndSr;		🔺 🗐 MSTDSP : WORKSTN (Externally Desc
017700	// ************************************	*	▷ I SELECT
017800	<pre>// Employee master maintenance routine.</pre>		▲ 🖫 EMPSEL
017900	// ************************************	*	Indicator (1)
018000	//		
018100	<pre>// Housekeeping, clear display fields and reset indicator</pre>	s.	▶ ■ *IN04 : Indicator (1)
018200	//		▷ • *IN60 : Indicator (1)
018300	BegSr EMPTAG;		🔺 🛄 EMPNO : Zoned Decimal (6,0)
018400	DoU *INKC;	=	● 27 (D)
018500	*IN60 = '0';	_	● 28 (D)
018600	EMESS = *Blanks;		● 190 (M)
018700	EMPNO = 0;		• 213
018800	ACODE = *Blanks;		
018900	// error loop start		ACODE : Character (1)
019000	DoU not *IN60;		EMESS : Character (50)
019100	ENAME = *Blanks; 🔐		● 203
019200	EMCAT = *Blanks; <sup>1</sup>		EMPMNT

The lines followed by a (D) mean definitions. Those followed by an M mean a modification reference and if there is no suffix, then it is a read only reference.

\_\_\_\_7. Press Ctrl-D to duplicate the line EMPNO = 0; Notice how the outline view is immediately updated with the new reference. Press Ctrl-Z to remove the duplicated line. We will discuss **Undo** more in the next section.

MSTDSP.DSPF	✓ *PAYROLLFF.RPGLE ≅		- 8	E Outline ∞	↓ªz 🖻 🤣 🎽 🗖
Line 190	Column 13 Insert 7 changes			type filter text	
	+1	+5+	.6+7		
017500	EndDo;		<u> </u>	A 🕼 Global Definitions	
017600	EndSr;			▲ D Files	
017700	// ************************************	**************	*****	🔺 🗟 MSTDSP : WOR	STN (Externally Desc
017800	<pre>// Employee master maintenance ro</pre>	utine.		▷ 🖺 SELECT	
017900	// ************************************	*****	*****	🔺 🖆 EMPSEL	
018000				▷ 💽 *IN03 : Ind	licator (1)
018100	<pre>// Housekeeping, clear display fi //</pre>	elds and reset i	ndicators.	▷ 💽 *IN04 : Ind	licator (1)
018200 018300	// BegSr EMPTAG;			▷ • <b>*</b> IN60 : Ind	licator (1)
018400	DoU *INKC;				Zoned Decimal (6,0)
018500	*IN60 = '0';			● 27 (D)	coned Decimar (0,0)
018600	EMESS = *Blanks;		=		
018700				● 28 (D)	
018701	EMPNO = 0;			● 190 (M)	
018800	ACODE = *Blanks;			● 191 (M)	)
018900	// error loon start			● 214	
0 II	the second second to EMDNO	018500	*	IN60 = '0';	
8. Hov	ver the mouse over the EMPNO				
vari	iable for a little while and notice	018600	El	MESS = *Blanks;	
the	hover that appears and shows	018700	El	MPND = 0;	
	definition of the variable. This	018800	-		-
			A	COD EMPNO : Packed	Decimal (6,0)
W1l	l work for all other references as	018900	// e	rror loop start	

\_\_9. Hold down the Ctrl key and hover over any variable, for example the EMESS variable and it will appear underlined like a hyperlink. If you click on it at this point, it will take you to the definition of that variable. This will also work for calls to subroutines and procedures.

018400	DoU *INKC;			
010400	DOU INKC,	21,000	DUL D LINN	
018500	*IN60 = '0';	301	Dcl-S i	int(10);
018600	EMESS = *Blanks	s; <sup>11</sup> 100	Dcl-S EMESS	Char(50);
		-1:00		

\_\_\_\_10. The other buttons on the outline view allow you to sort entries alphabetically, instead of in the order they appear in the source, as well as collapse all sections. The yellow arrows allow you to refresh the outline view in case external files have changed and you want to pick up the new set of records and fields. The final divot brings up a menu that will take you to preferences to customize your ILE RPG editor behavior.

🗄 Outline 🛛	
-------------	--

\_\_\_\_\_11. Click the **PAYROLL** tab to get the PAYROLL editor window in focus for the next lesson.

You have displayed an outline of a source member while editing RPG or DDS sources.

well.

## 2. Working with the Remote Systems LPEX editor

This module teaches you how to edit an RPG source member and learn about some of the Remote Systems LPEX Editor's language support features.

Learning Objectives

- Change the default settings of the LPEX Editor Parsers
- Change the color settings and font used by the Editor
- Change the default behavior of the Enter key
- Use SEU commands to edit source
- Undo and redo source changes
- View language sensitive help for the MOVE operation code
- View a list of all help contents
- Limit the search of help to specific documents
- Search the help
- Request a prompt for a specification line
- Display context sensitive help for any field in the IBM i Source Prompter
- View the beginning and ending of constructs in your source
- Use the Find and Replace window to search for an item in your source
- Filter or subset your source
- Filter lines based on line type
- Search through members in a source physical file
- Compare different versions of a program and identify the differences
- Syntax check source by line
- View help on syntax errors
- Introducing the LPEX editor

Your program editing tasks are simplified with the Remote Systems LPEX Editor. The editor can access source files on your workstation or your IBM i system directly. When a compilation results in errors, you can jump from the compiler messages to an editor containing the source. The editor opens with the cursor positioned at the offending source statements so that you can correct them.

Here is a list of some of the basic editor features that you would expect in a workstation editor:

- Cut, copy, and paste
- Block marking of lines, characters, or rectangles with copy, move, and delete operations
- Powerful find and replace function
- Unlimited undo and redo

In addition, there are a few more functions that you may not have seen in a workstation editor:

- Token highlighting where different language constructs are highlighted using different colors to help identify them in a program
- SEU-like format-line rulers to show the purpose of each column for column-sensitive languages like RPG and DDS. These rulers can automatically update themselves to reflect the current specification.
- SEU-like specification prompting for CL, RPG, and DDS
- Sequence numbers, which allow SEU-style commands in the prefix area
- Intelligent tabbing between columns for column-sensitive languages
- Automatic uppercasing for languages that expect uppercase
- Settings for column-sensitive languages that simplify text insertions and deletions
- On-line language reference

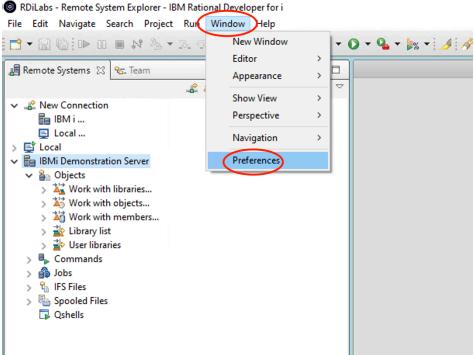
### 2.1 Changing default editor settings

The LPEX Editor has predefined settings, but also has an associated preferences page containing settings that you can modify. The name of the preference category is LPEX Editor and it appears in the left pane of the **Preferences** window.

You will change the default settings of LPEX Editor Parsers, Appearance and User Key Actions. LPEX provides special support for insertion and deletion in column-sensitive languages. When column-sensitive editing is selected, each column is considered as a separate entry space. For example, in an RPG source member, if you are inserting into or deleting characters from a string that is in the Factor 2 entry, the Result field entry does not move. The default editor preference is that column-sensitive editing is off. You can switch this support on by going to the workbench preferences window.

2.2 Autosave while editing source

1. In the workbench menu, click **Window > Preferences** from the workbench menu.



The Preferences window opens

In the left pane of the Preferences window, expand Remote Systems.

- \_2. Select **Remote Systems LPEX Editor**.
- 3. The right pane allows you to set preferences for this feature.
- 4. When selected, each column is considered as a separate entry space. To enable or disable **autosave** while editing source in the Remote Systems LPEX Editor, select or de-select the **Autosave** check box in the preference dialog. By default, autosave is enabled and the value

for the minutes is set to 5. You can specify a value between 1 and 60 minutes

\_5. Click the **Apply** button.

O Preferences	and international distances in the	
	Remote Systems LPEX Editor	$\Leftrightarrow \bullet \Leftrightarrow \bullet \bullet \bullet$
<ul> <li>&gt; Profiling</li> <li>&gt; QVT Operational Editor</li> <li>@Remote Systems</li> <li>Communications</li> <li>DataStore</li> </ul>	See <u>'File Associations'</u> for associating See <u>'LPEX Editor'</u> for changing basic	
> Debug File Cache Files > IBM i Logging	<ul> <li>Autosave</li> <li>Minutes between saves (1 - 60)</li> <li>Show date area</li> <li>Column sensitive editing</li> </ul>	5
Passwords    Remote Reconciler   Remote Systems LPE	Resequence start at (1-9999): Resequence increment by (1-9999):	100
SSL/TLS > Report Design > Run/Debug > Server	Resequence lines at save	
SIP > Team		Restore Defaults Apply
?		OK Cancel



**Note:** The **Autosave** action will perform a local backup onto the workstation disk. It will not remotely save the member onto the IBM i server. Use the **Save** or **Save as** actions to save the member back onto the IBM i server.

#### **2.3** Changing the editor appearance

Other interesting preference settings are located under LPEX Editor. You can use the link at the top of the page to quickly jump to the LPEX Editor preferences. **Appearance** allows you to modify color settings and font used by the Editor.

To change the editor **appearance**:

- \_\_\_\_1. In the left pane of the **Preferences** window, expand **LPEX Editor**.
- 2. Select **Appearance** under LPEX Editor
- 3. In the right pane under the **Styles** list, select **formatLine**.
- \_\_\_4. Change the **Foreground** color to dark green.

- \_\_5. Change Font to 12.
- 6. Change **Background** color to light green.

Notice, how your changes are reflected in the sample edit view.

O Preferences	
type filter text	Appearance $\Leftrightarrow \bullet \bullet \bullet \bullet \bullet$
<ul> <li>&gt; JET Transformations</li> <li>Jython</li> <li>PEX Editor</li> <li>Appearance</li> <li>Block</li> <li>Compare</li> <li>Controls</li> <li>Find Text</li> <li>Parsers</li> <li>Print</li> <li>Save</li> </ul>	Palette Font eclipse Consolas-regular-12 Styles emphasis expandHide formatLine parserDefault parserMessage prefixArea prefixText
> System z LPEX Editor Tabs	Preview
User Actions	Line 1 Column 1 Replace
User Commands	<b>-</b> +1+2+3+4+
User Key Actions	Emphasis, current line, default text

To change the current line appearance to make it more visible when editing:

#### 7. Select **currentLine** under the **Styles** list.

This option highlights the line that the cursor is on. The option applies to all source files opened in the editor area.

- \_\_8. Change the **Background** color to light yellow.
- 9. If you don't like the changes you made, you can click **Restore Defaults** to return to the original settings.

O Preferences		
type filter text		Appearance 🗢 👻 🔿 💌
<ul> <li>&gt; JET Transformations         Jython         LPEX Editor         Appearance         Block         Compare         Controls         Find Text         &gt; Parsers         Print         Save         Save</li></ul>		Palette Font   eclipse Consolas-regular-12   Styles   addedLines   background   Effects   CurrentLine   Effects   CurrentLine   Effects   CurrentLine   Styles
<ul> <li>System z LPEX Editor</li> <li>Tabs</li> </ul>		Preview
User Actions		Line 1 Column 1 Replace
User Commands		
User Key Actions		Emphase, current line, default text
Heer Mouse Actions	-	** ERR001 Embedded parser message.

#### 2.4 Changing key behavior in the editor

To modify the default behavior of the Enter key:

- Expand LPEX Editor if not already expanded \_1.
- 2. Select User Key Actions.

The LPEX Editor has a predefined behavior for the Enter key to always add a new line and not split the line when the Enter key is pressed. To change the default behavior for the Enter key to split the line, use the following instructions.

Type **c-i** in the Key field, this means Ctrl-I as shown. 3.



## Tip:

The Key and Action fields are case sensitive. Make sure that the values typed in the Key and Action fields are exactly as shown above.

Type **findSelection** in the **Action** field. 4.



Tip: Use the drop-down list to select the value

#### Click the Set button. \_5.

O Preferences	And shares and provide and		
type filter text	User Key Actions	¢	• 🔶 • •
> Java EE 🔺			
> Java Persistence	Key	Action	
> JavaScript	c-i	findSelection	
Jython			
LPEX Editor			
> Appearance			
Block			
Compare			
Controls			
Find Text			
> Parsers =			-
Print			
Save			
Tabs			-
User Actions			
User Commands			Set
User Key Actions			Delete
User Mouse Actions			Delete
User Profile	Key C-i	Ctrl+I	
> C:\wrkspc\demo\lat			
> C:\wrkspc\demo\lat	Action findSelection	•	
> Model Validation			
<ul> <li>Modeling</li> <li>▲ Ⅲ</li> </ul>	Reset	Restore Defaults	Apply
?		С ок с	
ſ			ancel

We go through one other preferences entry that users like to change. When you enter a control opcode LPEX can automatically indent the subsequent lines a configurable number of blanks and insert the endxx statement with the capitalization that meets your conventions. In our case, we are using camel case for our opcodes. Here is how to configure this behavior:

- 6. Expand Remote Systems
- \_\_\_\_7. Expand Remote Systems LPEX Editor, and then IBM i Parsers
- **\_\_8.** Expand **ILE RPG**
- \_\_9. Click Key Behavior
- \_\_10. Change the Automatic closure of control bock style combo box to the camel case option
- \_\_\_11. Click **OK** on the Preferences window
- **12.** Return to the Editor window.

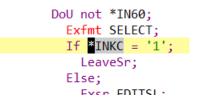
Preferences		
type filter text	Key Behavior	↓ ↓ ↓ ↓
type filter text	Key Behavior         Alt-5 action splits the line and shifts the text on the new line         Enter key behavior         Inter key splits line for free form source         Repeat previous specification type         Repeat previous specification cursor position         Position         Position         Position         Position         Position         Position         FROM         Automatic indent by the number of spaces specified in <u>"formatter"</u> preferences         Automatic closure of control block         Style:         Tab key behavior         Tab key indents free-form source by the number of spaces specified in <u>"formatter"</u> preferences         User defined tab stops for fixed form code         H: Control         H: Control         Stab key undents free-form code	
Free-form SQL Form Key Behavion Templates RPC/400 SSL/TLS Report Design Run/Debug Selection Feedback Server Team	And every: 0 Restore Default	is Apply
?	ОК	Cancel

Next let's see the results of the customization.

**12.** Position your cursor around line 53, and double click on the \*INKC reference.

Exsr MAIN; // If MAIN is done program ends \*INLR = \*on; // MAIN SUBROUTINE BegSr MAIN; DoU \*INKC; \*IN60 = \*OFF; EMESS = \*BLANK; FMPAPI = \*RIANK · Procesi

**\_\_\_13.** Hold down the Ctrl key and press **i**.



This finds the next occurrence of the selected text.

- 14. Hit Enter to insert a line, notice that the cursor is indented properly.
- \_\_\_\_15. Type if \*INLR=\*off; and press enter

```
DoU not *IN60;
Exfmt SELECT;
If *INKC = '1';
If *INLR = *off;
EndIf;
LeaveSr;
Else;
Exsr EDITSL;
EndIf;
```

Notice how the **EndIf** is inserted in camel case and the cursor is indented 2 spaces all as specified in the preferences.

You have changed some of the default editor settings and seen the results of the changes. Feel free to change the preferences to your preferred settings.

#### 2.5 Using SEU commands in the LPEX editor

You can configure the LPEX Editor to adopt the keyboard and command personalities of many popular editors. Most editor profiles differ only in the keys and commands used to perform various editor tasks. Some base editor profiles, listed below, also add prefix information and a command area at the start of each line:

- ispf
- seu
- xedit

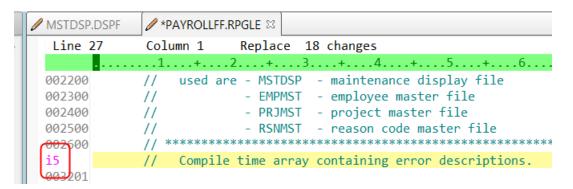
The editor recognizes prefix commands used by these editor profiles. Depending on which profile you are using, you can enter SEU, XEDIT, or ISPF commands when the prefix area is active. If you are an SEU expert, you will appreciate the ability to use SEU commands. To enter SEU commands:

- \_\_1. Move the cursor into the gray sequence number area to the left of the edit area
- \_\_\_2. On any sequence number type dd.
- 3. Go down a few lines and type dd again and press **Enter**.

MSTDSP.DSPF	✓ *PAYROLLFF.RPGLE ≅
Line 31	Column 1 Replace 17 changes
	$\dots 1 \dots + \dots 2 \dots + \dots 3 \dots + \dots 4 \dots + \dots 5 \dots + \dots 6 \dots 4^{3} + \dots$
_002600	// ************************************
dd	Dcl-F MSTDSP WORKSTN;
002800	<pre>Dcl-F EMPMST Usage(*Update:*Delete:*Output) Keyed;</pre>
002900	<pre>Dcl-F PRJMST Usage(*Update:*Delete:*Output) Keyed;</pre>
003000	Dcl-F RSNMST Usage(*Update:*Delete:*Output) Keyed;
dd	//
003200	<pre>// Compile time array containing error descriptions.</pre>

Notice that the lines have been deleted.

- \_4. Now type i5 in the sequence number area.
- 5. Make sure the cursor is within the sequence number area.
- 6. Press Enter.



Five new lines are inserted.

You have learned how to use SEU commands in the editor.

#### 2.6 Requesting undo and redo operations

The editor records each set of changes you make to a file in the Editor window. The number of changes made since the last file save is displayed on the status line. If you want to undo a set of changes made to a file you use the Undo operation. You can also cancel the effects of an Undo operation by using the Redo operation.

Now you are going to undo some of the changes you just made to the file. Then you will cancel the Undo operation by using the Redo operation. Finally, you will reload the source so that it is back to its original content.

\_\_\_1. Click Edit > Undo from the workbench menu. Notice that the 5 new lines disappear.

10 R	DiLab	s - Remote System Expl	orer - Remot	eSystemsTempFiles	s/COM	NON1.F	RAI
File	Eclit	Source Compile(G)	Navigate	Search Project	Run	Windo	w
	$\checkmark$	Undo		Ctrl+Z	20	*	•
R R	\$	Redo		Ctrl+Y		-	8
-6:3	of	Cut		Ctrl+X		- 	~
		Сору		Ctrl+C			~
	Ē	Paste		Ctrl+V			
	×	Delete		Delete			
		Select All		Ctrl+A			
		Find/Replace		Ctrl+F			
		Find Next		Shift+F4			
		Find Previous					
		Find Other		>			
		Show All		Ctrl+W			

.

Press Ctrl+Z to undo the last change. \_\_\_2.

Notice that the deleted lines reappear.

MSTDSP.DSPF	✓ *PAYROLLFF.RPG	LE X	
Line 31	Column 1 R	eplace 17 changes	
	1+2	+4.	+5+6+7
002400	// -	PRJMST - project	master file
002500	// -	RSNMST - reason o	code master file
002600	// **********	******	***********
002700	Dcl-F MSTDSP	WORKSTN;	
002800	Dcl-F EMPMST	Usage(*Update:*De	elete:*Output) Keyed;
002900	Dcl-F PRJMST	Usage(*Update:*De	elete:*Output) Keyed;
003000	Dcl-F RSNMST	Usage(*Update:*De	elete:*Output) Keyed;
003100	//		
003200	<pre>// Compile ti</pre>	me array containing	g error descriptions.
003206			
003300	Dcl-S ERR	Char(50)	<pre>DIM(10) CTDATA PERRCD(1);</pre>
002201	nol c i	int(10).	

Click **Edit > Redo** from the workbench menu. \_\_3.

Notice that the lines are deleted again.

At this point you will reload the source from the IBM i server to make sure that it is back in its original form.

Click **File > Close** on the workbench menu. \_\_4.



Tip: You can also click the X on the PAYROLLFF tab. The asterisk before a file name in the tab, means there are unsaved changes.

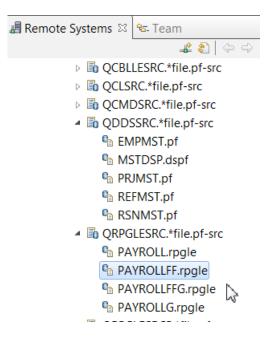
D R	DiLabs	- Remote	System Explo	rer - Remot	eSystems	TempFiles	/COMI	MON1.FRA	NK	KENI.COM/QSYS.LIB/RSELAB05.LIB/QRPGLESRC.FILE/
File	Edit	Source	Compile(G)	Navigate	Search	Project	Run	Window	Н	Help
$\smile$	New					Alt+S	hift+N	> 🎋 🗸	0	) + 💁 + 🎉 + 🥖 🛷 + 👰 + 🖓 + 🌾
	Open l	File							h	
	Open l	Projects f	rom File Syste	m					4	/ *PAYROLLFF.RPGLE
								_		Line 33 Column 87 Replace
	Close	)					Ctrl+F4	A 1	1	+1+2+3.
	Close	All				Ctrl+S	hift+W			000100 // ******************************

A Save Resource dialog opens asking if you want to save the latest changes.

5.	Click No

Save	e Resource
?	'PAYROLLFF.RPGLE' has been modified. Save changes?
	Yes No Cancel

\_\_\_\_6. In the workbench, in the **Remote Systems** view and open the **PAYROLLFF** member in the QRPGLESRC file by double clicking on it.



You have learned how to undo and redo changes that you made to a file.

2.7 Invoking language sensitive help

Inside the editor, there is cursor-sensitive language-reference help available.

This help is invaluable if you cannot remember the order of fields in an RPG specification or the allowed values for a variable field. This help is available from the LPEX Editor window. To receive language sensitive help, press F1 in an Editor window. If the cursor is on an operation code, you receive help for that operation code; otherwise, you receive help for the current specification. To access language sensitive help

\_\_\_1. Position the cursor over the Dcl-F operation code in line 27 of the ILE RPG source



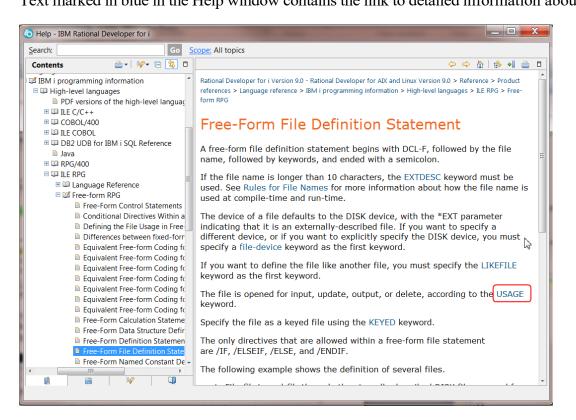
To jump to a specific line, type the number into the editor's command entry line (the Esc key will take you there) and press Enter.

#### **2.** Press **F1**.

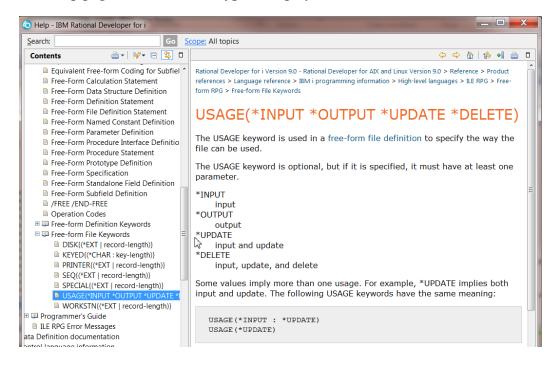
Tip:

Line 27	Column 8	Replace
	. Free-Form+++	*********
002400	1/	- PRJMST - project master
002500	//	- RSNMST - reason code ma
002600	// ********	******
002700	Dcl-F MSTDSP	WORKSTN;
002800	Dcl-F EMPMST	<pre>Usage(*Update:*Delete:*</pre>
002900	Dcl-F PRJMST	<pre>Usage(*Update:*Delete:*</pre>
•	- 111	
Undo succes	sful. Document	is now at original state.

Language-sensitive help for the DCL-F operation code appears in a Help window. Text marked in blue in the Help window contains the link to detailed information about the topic in blue.



#### Click the link **USAGE**. The Help page for **Date Data Type** is displayed



- **\_\_3.** Explore the Help window to see what else is available.
- 4. Close the Help window.
- 5. Select Help > Help Contents on the workbench menu

RDiLabs - Remote System Explorer - RemoteSystemsTempFiles/COMMON1.FRANKENCOM/QSYS.LIB/RSELAB05.LIB/QRPGLESRC.FILE/PAYROL

File E	Edit Source Compile(G) Navigate Sea	arch Project Run	Window Help					
- 1		N = 7:00	🗄 🎄 🗸 🚳 Welcome					
		well of each at a						
🖉 Rer	mote Systems 🔀 😤 Team		Help Contents					
You	can see the help that is availa	ble in the prod	luct.					
	cate the language reference inf	-						
	e left pane of the Help windo							
6.	Expand Rational Develope							
0. 7.	Expand <b>Reference</b> .							
	1							
8.	Expand Language refere							
9.	Expand IBM i programn	0	10 <b>n</b> .					
10.	1 8 8	ages.						
11.	Expand ILE RPG.							
<u> </u>	Expand Language Refer	ence.						
	lelp - IBM Rational Developer for i							
	Search:	Go <u>Scope:</u> All topic	cs					
-	Contents	۵ 🔄 🚽 🚀 ا						
	🗉 🗐 Rational Developer for i 9.6.0		- Rational Developer for i 9.6.0 > Reference > Language reference > IBM i programming information > High-level lan					
	Rational Developer for i	^						
	🗉 🚅 Overview		ILE RPG Reference					
	🗉 🚅 Tutorials		This reference provides information about the RPG IV language as it is implement system.					
	🗉 🚅 Installing		This reference covers:					
	🖲 🚅 Configuring		Basics of RPG IV:					
	Upgrading and migrating		RPG IV character set     RPG IV reserved words					
	Developing      Travilate to a time and averaget		<u>Compiler directives</u>					
	It is a standard support in the second se		RPG IV program cycle     Files					
	🗉 🕼 Accessibility features		<ul> <li>Indicators</li> <li>Error Handling</li> </ul>					
	Accessibility for Eclipse products	s	Subprocedures					
	B 🕼 API reference		Definitions: <u>Defining Data and Prototypes</u>					
	🖃 🗷 Language reference		<ul> <li><u>Data types and Data formats</u></li> <li>RPG IV specifications:</li> </ul>					
	IBM i programming information	ion	<u>Control</u>					
	🗐 🕮 High-level languages		<ul> <li><u>File description</u></li> <li><u>Definition</u></li> </ul>					
			<ul> <li>Input</li> <li>Calculation</li> </ul>					
			Output					
	🖲 🚅 ILE COBOL 🗄 🕼 DB2 for IBM i SQL Ret		<ul> <li><u>Procedure</u></li> <li>Ways to manipulate data or devices:</li> </ul>					
		erence	Built-in Functions     Expressions					
	□ ILE RPG		Operation Codes					
	🗉 🗹 Language Referen	ce	PDF file for ILE RPG Reference					
	🗆 🖬 ILE RPG Refere		You can view and print a PDF file of this information.					
	PDF file for	ILE RPG Reference	About ILE RPG Reference					
	🗉 🚅 About ILE R	PG Reference 🗸 🗸	, Read this section for information about the reference.					
	< <	>	What's New - New and changed features in each release of the ILE RPG compiler since V3R1					

Having the latest version of the manuals at your fingertips will make it easier to find programming information. There is also the option to search the help by specifying a search string.

You have accessed language sensitive help

#### 2.8 Finding and replacing text

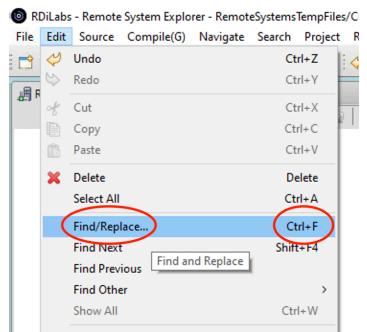
The LPEX Editor also has a powerful find and replace text feature. You use the Find and Replace window to search for an item. You can search for a word, a partial word, or a sequence of such. You can also enter a pattern you want to match, provided that the pattern follows the rules of regular expression. You can replace the found search item. If the entered text or pattern is found, the cursor moves to either the next or previous occurrence of the search item, according to your chosen search direction, and replaces the found text according to your selections. To find and replace text:

\_\_\_\_\_. Click anywhere in the editor to give it focus then press **Ctrl+Home** to go to the top of the file.



Tip: When you press **Ctrl+Home** to go to the top of a file or **Ctrl+End** to go to the bottom of a file, a quick mark is set at your cursor position. This allows you to return to that line by pressing **Alt+Q**. **Ctrl+Q** will set a quick mark.

\_2. Click Edit > Find/Replace from the workbench menu or press Ctrl+F.



The Find/Replace window opens at the bottom of the Editor window

At the bottom of this window, you will notice that you have some options to select from, for example, search only in certain columns. You want to find the first occurrence of BEGSR.

- \_3. In the Find field, enter **BEGSR** to find the start of a subroutine.
- 4. Make sure the **Replace** field is blank.

You would use this field for text replacement.

MSTDSP.DSPF	PAYROLLFF.RPGLE 🛛 🗖 🗖
Line 52	Column 8 Replace
	Free-Form++++++++++++++++++++++++++++++++++++
005200	BegSr MAIN;
005300	DoU *INKC;
005400	*IN60 = *OFF;
005500	EMESS = *BLANK;
005600	EMPAPL = *BLANK;
005700	PRJAPL = *BLANK;
005800	RSNAPL = *BLANK;
005900	//
аабааа	// Write the SELECT format to display If end
•	111 F
Find BEGSR	✓ Next Previous All
Replace	Replace Replace all
Case sensitiv	e 🔲 Whole word 🔲 Regular expression 🗹 Wrap 🔲 Select found te
Restrict sear	ch to selection 🔲 Restrict search to columns Start column 📋 End

The Editor moves the active line to line 52, which contains the first **BEGSR** phrase in the file.

\_5. Click Next to go to the next location of BEGSR in the file

MSTDSP.DSPF	✓ PAYROLLFF.RPGLE ≅	
Line 110	Column 8 Replac	ce 🗧
	Free-Form+++++++++	*****
010600	// *************	**********
010700	//	
010800	<pre>// Housekeeping,</pre>	clear display fields and rese
010900	//	
011000	BegSr RSNTAG;	
011100	DoU *INKC;	
011200	EMESS = *Blanks	;
011300	RSCDE = *Blanks	-
011/00	ΔCODE - *Rlanks	· · · · · · · · · · · · · · · · · · ·
•		P
Find BEGSR Replace		▼ Next Previous All Replace Replace all
	_	ular expression 🗹 Wrap 🔲 Select found te search to columns Start column 1 End

MSTDSP.DSPF	PAYROLLFF.RPGLE 🛛 🗖 🗖
Line 112	Column 39 Replace
	Free-Form++++++++++++++++++++++++++++++++++++
010600	// ************************************
010700	//
010800	<pre>// Housekeeping, clear display fields and rese</pre>
010900	//
011000	BegSr RSNTAG;
011100	DoU *INKC;
011200	EMESS = *Blanks; Y
011300	RSCDE = *Blanks;
011400	ACODE = *Blanks;
011500	// start of error loop
011600	DoU not *IN60;
011700	RSDSC = *Blanks;
011800	//
011900	// Display reason code selection format
•	4
	▼

\_6. Click anywhere in the Editor window to close the Find/Replace window.

You have searched for a string in your source using the Find/Replace window. Next let's do some filtering

**2.9** Filtering lines by string

The editor allows you to filter or subset your source so that you see only lines containing a given string. Filtering lines makes it quick and easy to find lines without having to scroll through your source. To filter source by string:

- \_\_1. Double-click the variable EMPAPL, on line 56 in the Editor window, to select it.
- 2. Select **Edit > Selected > Filter Selection** from the workbench menu.

$\checkmark$	Undo	Ctrl+Z	4 5 4 - 0	) - 9 -	<b>₽%</b> ▼ 3	🚀 🔹 🚱 💌 🏹 💌 😓 🔶 👻 🤤		
\$	Redo	Ctrl+Y		# *DAVDC	LLFF.RPGLE	M		
of	Cut	Ctrl+X		Line S	lumn 18 Replace 1 change			
	Сору	Ctrl+C		Line :		1+		
Ē	Paste	Ctrl+V	^	004300 004400	11	determines if the program		
×	Delete	Delete		004500	11	update an existing record ************************************		
	Select All	Ctrl+A		004600 004700		Housekeeping, clear displa		
	Find/Replace	Ctrl+F		004800	Ex	sr MAIN;		
	Find Next	Shift+F4		004900 005000	// *II	If MAIN is done program end NLR = *on;		
	Find Previous			005100	11	-		
	Find Other	>		005200		gSr MAIN; DoU *INKC;		
	Show All	Ctrl+W		005400		*IN60 = *OFF;		
		Curr	_	005500		EMESS = *BLANK;		
	Add Bookmark			005600 005700		EMPAPL = *BLANK; PRJAPL = *BLANK;		
	Add Task			005800		RSNAPL = *BLANK;		
	Select	>		005900 006000				
(	Selected	>	Copy selection		Alt+C			
	Deselect	Alt+U	Overlay with sel	ection	Alt+Z	DoU not *IN60;		
	Increase indent	Tab	Move selection		Alt+M	<pre>Exfmt SELECT; If *INKC = '1';</pre>		
	Decrease indent	Shift+Tab	Delete selection		Alt+D	LeaveSr;		
	Mark	>	Uppercase selec	tion	Alt+K	Else; Exsr EDITSL;		
Λ	Compare to file	ŕ	Lowercase selec	tion	Alt+I	EndIf;		
	Keystroke Recorder	>	Shift selection le	eft	Alt+F7	TE the second second india		
	Reystroke Recorder		Shift selection r	ight	Alt+F8	IF the general error indic program continues to loop		
	Content Assist	Ctrl+Space	Filter selection			E- ID		
	Show Tooltip Description	Ctrl+Shift+Space	Exclude selection	on		EndDo;		
_	> GWFSRC.*file.pf-	src	Fill selection			The application selection		

RDILabs - Remote System Explorer - RemoteSystemsTempFiles/COMMON1.FRANKENI.COM/QSYS.LIB/RSELAB05.LIB/QRPGLESRC.FILE/PAYROLLI
 File Edit Source Compile(G) Navigate Search Project Run Window Help

A compressed source view is shown, it only displays the lines that contain the string EMPAPL. Plus signs in front of the line numbers allow to expand the source lines following the line containing the string

MSTDSP.DSPF	✓ PAYROLLFF.RPGLE ≅
Line 56	Column 18 Replace
	Free-Form++++++++++++++++++++++++++++++++++++
œ	
005600	EMPAPL = *BLANK;
007900	<pre>// If EMPAPL (employee maintenance) equals X, '</pre>
008800	When EMPAPL = 'X';
Ø35800	If EMPAPL = 'X'
Ø36000	or EMPAPL = 'X'
Ø37300	If EMPAPL = ' '
038300	If EMPAPL <> ' '
●038400	and EMPAPL <> 'X';
4	4
8 occurrence	
o occurrence	

The number of occurrences is shown at the bottom of the editor view. To expand the section of source after line 79 up to the next occurrence of the string:

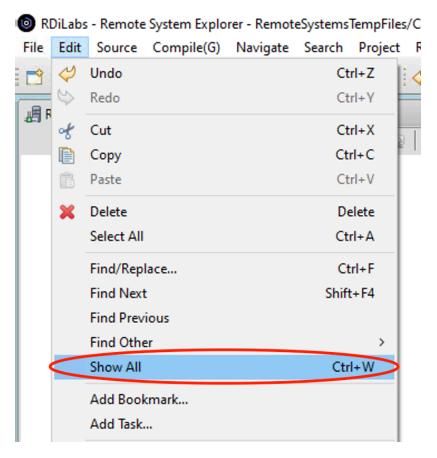
\_\_3. Expand line 79.

MSTDSP.DSPF	PAYROLLFF.RPGLE 🛛	
Line 81	Column 1 Replace	
	1+2+3+4+5	+
•		
⊕ 005600	EMPAPL = *BLANK;	
	<pre>// If EMPAPL (employee maintenance) equals X,</pre>	, ·
008000	<pre>// branches to label EMPTAG.</pre>	
008100	<pre>// If PRJAPL (project maintenance) equals X,</pre>	t
008200	<pre>// branches to label PRJTAG.</pre>	
008300	<pre>// If the prior two tests were not successful</pre>	L,
008400	<pre>// reason code maintenance. The program will</pre>	L (
008500	<pre>// next executable operation.</pre>	
008600	//	
008700	Select;	
• 008800	When EMPAPL = 'X';	
Ø35800	If EMPAPL = 'X'	
Ø36000	or EMPAPL = 'X'	
Ø37300	If EMPAPL = ' '	
038300	If EMPAPL <> ' '	
Ø38400	and EMPAPL <> 'X';	

This expands the section up to the next instance of EMPAPL.

Now you want to show the entire source again:

\_\_\_4. Click **Edit** > **Show all** from the workbench menu, or right click in the editor and select **Show all** from the context menu, or press **Ctrl+W**.



The entire source member is displayed again.

You have filtered your source so that you see only lines containing a given string.

#### **2.10** Filtering lines by type

To help you navigate quickly through your ILE RPG source the editor allows you to filter lines based on the line type. Imagine you want to see where all the subroutines are defined in your source. To filter lines by type:

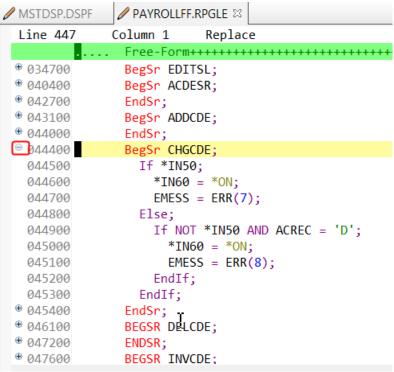
- \_\_\_1. Right-click in the Editor view for the PAYROLL member.
- **2.** Click **Filter view > Subroutines** in the context menu.

/ MSTDSP.E	DSPF	PAYROLLFF	.RPGLE ⊠		
Line 83		Column 9	Replace		•
		<mark>.</mark> 1+	2+	.3+4	+5+
007700		<pre>// tested</pre>	and the p	rogram will bra	anch to the s 🔺 🔤
007800 L	J	New		►	
007900		Prompt		F4	) equals X,
008000				14	
008100 008200		Syntax Check Line	yntax Check Line		equals X, t
008200		Save		Ctrl+S	successful,
008400		Cut		Ctrl+X	rogram will
008500		Сору		Ctrl+Insert	
008600		Paste		Ctrl+V	
008700				Carry	
008800		Select		•	
008900 009000		Selected		•	
009100		Deselect		Alt+U	
009200	ſ	Filter view		•	Date
009300 009400	Ľ	Show all		Ctrl+W	Code
					Comments
•		Source		•	Control
		View		•	Procedures
📲 Remote S	vster	n Details 👘 🧟 Ta	isks 🔒 Ol	oject Table 🛛 🗔 C	Subroutin
L, Remote 5	yoter				Errors

All source lines containing the BEGSR or ENDSR operation codes are displayed allowing you to move quickly and easily to the desired subroutine in your file.

Line 52	Column 15 Replace
	Free-Fo <mark>r</mark> m++++++++++++++++++++++++++++++++++++
 ⊕	
€ 005200	BegSr MAIN;
⊕ 010200	EndSr;
⊕ 011000	BegSr RSNTAG;
<ul> <li>€ 011000</li> <li>€ 017600</li> </ul>	EndSr;
• 01/000 • 018300	BegSr EMPTAG;
<ul> <li>● 018300</li> <li>● 025700</li> </ul>	EndSr;
<ul> <li>● 026400</li> </ul>	BegSr PRJTAG;
<ul> <li>● 020400</li> <li>● 033500</li> </ul>	EndSr;
<ul> <li>033300</li> <li>034700</li> </ul>	BegSr EDITSL;
<ul><li>● 040400</li></ul>	BegSr ACDESR;
<ul> <li>● 040400</li> <li>● 042700</li> </ul>	EndSr;
<ul> <li>● 042700</li> <li>● 043100</li> </ul>	BegSr ADDCDE;
<ul> <li>● 043100</li> <li>● 044000</li> </ul>	EndSr;
<ul> <li>044000</li> <li>044400</li> </ul>	BegSr CHGCDE;
<ul> <li>● 045400</li> </ul>	
<ul><li>● 045400</li><li>● 046100</li></ul>	EndSr;
	BEGSR DELCDE;
⊕ 047200     ⊕ 047600	ENDSR;
• 047600	BEGSR INVCDE;

\_3. Expand the subroutine declaration for CHGCDE (line 444). to show all lines in this subroutine.



Now you could work with the source inside this subroutine.

\_4. Right-click in the Editor window and click **Show all** on the context menu (or hit **Ctrl-W**) to show all lines.

• 034700		De-C- EDITCL -	
⊕ 040400		Syntax Check Selection	1
• 042700		Convert Selection To Free-Form	
• 043100		Save	Ctrl+S
044000			
⊜ 044400		Cut	Ctrl+X
044500		Сору	Ctrl+Insert
044600		Paste	Ctrl+V
044700		Taste	Curry
044800		Select	•
044900		Selected	•
045000		Deselect	Alt+U
045100		Deselect	AILTO
045200		Filter view	►
045300	ſ	Show all	Ctrl+W
045400		L/L	
• 046100		Source	×
• 047200		View	•
047600			
		Add/Remove Breakpoint	

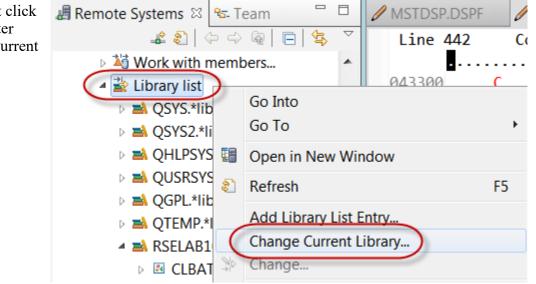
You have filtered lines in your source by line type.

### 2.11 Searching multiple files

If you would like to search through the members in a source physical file or through the files in a local directory, you can use the Search tool. The Multi-File Search utility allows you to search for a particular string of text in many members on the host. This function can also be used on local files. You need to change the current library for your RSE job to your development library, so the results of the SEARCH are placed in this library and not into the default current library QGPL.

To change the current library:

- \_\_1. In the RSE view, right click on the Library List filter
- 2. Click on the Change current library action

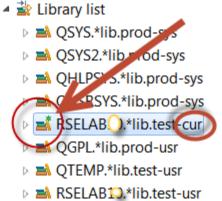


\_\_3. In the **Change Current Library** dialog

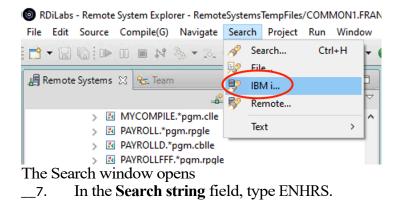
- \_4. Key in the library name RSELABxx (do not use xx or 99, use your team number)
- \_5. Click the **OK** button

Change Current Library
Current library RSELAB99
CHGCURLIB CURLIB(RSELAB99)
OK Cancel

You are done setting the current library, RSELABxx now shows a decorator (a little star) that indicates this is the current library.



To search multiple files: \_\_6. Click **Search --> IBM i** on the workbench menu.



- \_\_8. Use the drop-down list for **Connection** and ensure you use your **IBM i Test System**.
- \_\_9. Under Target in the Library field, type RSELABxx. (do not use xx or 99, use your team number)
- \_\_\_\_10. Under Target in the File field, type QDDSSRC to search all members in this source physical file.
- \_\_\_\_\_11. Under Target in the Member field, select \*ALL.
- \_12. Click Search.

Search	
🖻 IBM i Search 🖻 Remote Search 📴 File Search 🗢 AST Search 📴 Java Search 🖓 JavaScript Search 🦻 Model Search 🕅 Plug-in	n Search 🦻 Test Log Search
Search string: ENHRS	✓ ▲ Case sensitive
Connection: IBM i Test System	▼ New
C Target	
Library: RSELABXX	► A Browse
File: QDDSSRC	▼ ▲ Browse
Member filter:	<ul> <li>✓ ▲ Browse</li> </ul>
	Browse
Source members Data members	
Columns	
All columns     All co	
Between 1 and 80	
Between 1 and end of line	
Customize	Search Cancel
	🦻 Remote Search 😥
NHRS" - 3 Occurrences in 3 Members	
• General RSELAB01/QDDSSRC(EMPMST) (1 match) (Line 18) ENHRS A ENHRS R	
CLINE IS) ENHRS A ENHRS R     Imatch)     Imatch)	
(Line 99) ENHRS A ENHRS R B 11 37REFFLD(RCEMP/ENHRS *LIBL/EMPMS	

(Line 27) ENHRS A ENHRS 3 1 TEXT('EMPLOYEE NORMAL WEEK HOU

The Multi-File Search window lists all the lines in all the files that reference ENHRS.

\_\_13. Double-click the last line in the list at

A ENHRS 3 1 TEXT ('EMPLOYEE NORMAL WEEK HOURS')

The member REFMST is automatically loaded into the editor (it may take a few seconds to load, see messages at bottom of workbench) and the cursor is placed on the correct line.

🖗 🔹 Not connected <No Current Work> 🖉 🔹 0 Hits (Downloading member RSE...RC(REFMST) 🤤 🖗 💌

MSTDS	SP.DSPF	PAYROLLF	F.RPGLE	REFMST.	PF 🕺 🗌	
Line	27	Column 1	Replac	e	Close	
	A.		Name++++	++RLen++T	pb	.Functions+++++
000019	A		EMCAT	1		TEXT('EMPLO 🔺
000020	A					COLHDG('EMP
000021	. Α		EDEPT	5		TEXT('EMPLO
000022	A					COLHDG('EMP
000023	A		ELOCN	30		TEXT('EMPLO
000024	Α					COLHDG('EMP =
000025	A		EUSRI	8		TEXT('EMPLO
000026	A					COLHDG('EMP
000027	A		ENHRS	3	1	TEXT('EMPLO
000028	- A					COLHDG('NOR

\_\_\_14. Click the X in the **REFMST** tab to close the REFMST file.

You have searched through members in a source physical file.

### 2.12 Comparing files using the Remote System Explorer

If your code undergoes many changes, you will find the Compare utility useful. It allows you to compare different versions of a program and find the differences.

Using the compare utility in the workbench you can view the differences between two files by comparing them. You can compare different files, and you can compare versions in the workbench with versions in the repository or with the local edit history.

After a comparison is carried out, the Compare Editor opens in the editor area. In the compare Editor, you can browse through all the differences and copy highlighted differences between the compared resources. You can save changes to resources that are made in the comparison editor.



### Tip:

Make sure all lines show in the source before starting the Compare tool.

We are going to compare the fixed-format version of the PAYROLL member with the free-format version which is member PAYROLLFF.

\_\_1. Click on the PAYROLL member in source file QRPGLESRC in library RSELABxx (use your team number, not xx)

To select a second member to compare with:

- \_2. Press the CTRL key then select member PAYROLL and PAYROLLFF in the same source file.
- \_\_3. Once both members are highlighted, right click on them for the context menu
- \_\_4. Click the **Compare with --> Each other** actions on the content menu

<ul> <li>QKPGLESKC.*file.pf-</li> <li>PAYROLL.rpgle</li> <li>PAYROLLFF.rpgle</li> <li>PAYROLLFF.rpgle</li> </ul>		000029 A 000030 A 000031 A Go To	EPHRC	5	1 1	TEXT COLF TEXT COLF
<ul> <li>PAYROLLG.rpgle</li> <li>QRPGLESRCP.*file.p</li> <li>QWFSRC.*file.pf-src</li> </ul>		Open With Browse With	¢ ¢	7 5	1 1	TEX COLF TEX
▷	8	Refresh	F5			COLF
RSNMST.*file.pf-dta	Þ	Rename	F2			
TESTPF.*file.pf-src	×	Delete	Delete			
MYCOMPILE.*cmd		Сору		Cont Tab		
STRCODETCP.*cmd	÷	Move		bject Tab	le	Commar
User libraries		Web Services				
mmands Ai Contexts		Find String Verify Compile	↓ Ctrl+Shift+C			
Remote 🛛 📘		User Actions	*	37REFFLC	(RCE	MP/ENHRS '
	Aread	Add To i Project Make Available Offline Debug(Service Entry) ARCAD-Transformer RF	⊳ G ►	TEXT('EM	PLOY	EE NORMAL
		Compare With	•	Each	Othe	er 🔰
	Ъ	Visualize Application D	liagram			

The compare editor displays, it is best to maximize this view:

\_5. Double-click on the Compare editor tab.

Fext Compare 🛛 🖓	🛆 强 🖉
F************************************	<pre>// This program uses all externally described fi // used are - MSTDSP - maintenance display file // - EMPMST - employee master file // - PRJMST - project master file // - RSNMST - reason code master file // ***********************************</pre>
D* Compile time array containing error descrip D ERR S 50 DIM(10) D EMESS S 50 E*	Dcl-S ERR Char(50) DIM(10) CTD# Dcl-S EMESS Char(50); //
C*************************************	<pre>// MAINLINE CALCULATIONS // ***********************************</pre>

You see both members side by side, the differences are marked by markers in the right-side bar. The tool buttons allow you to position to next or previous line with a difference. Scroll up and down to see the difference between equivalent fixed and free format RPG.

The editor is positioned at the first difference

\_\_6. To position the editor on the next difference on the next difference button.

MSTDSP.DSPF / PAYROLLFF.RPGLE Growpare ('PAYROLL.RPGLE' -	- 'PAYROLLFF.RPGLE') 🛛 🗖 🗖
/ Text Compare 💌	A 28 A 28 A A
F************************************	<pre>// This program uses all externally described fi // used are - MSTDSP - maintenance display file // - EMPMST - employee master file // - PRJMST - project master file // - RSNMST - reason code master file // ***********************************</pre>

It now shows the next line with differences

MSTDSP.DSPF / PAYROLLFF.RPGLE	L.RPGL	LE' - 'PAYROLLFF.RPGLE') ⊠
🖉 Text Compare 💌		🛆 🖄 🖓
<pre>//* Invalid action code</pre>		ENDSR;
//*		//*
BEGSR INVCDE;		<pre>//* Invalid action code</pre>
*IN60 = *ON;		//*
EMESS = ERR(4);		BEGSR INVCDE;
ENDSR;		*IN60 = *ON;
/END-FREE		EMESS = ERR(4);
0*		ENDSR;
O* The compile time array ERR is entered bel	.01	//
0* precceded by "** " to denote the beginnin	g	// The compile time array ERR is entered below.
0*		<pre>// precceded by "** " to denote the beginning of</pre>
* Array ERR - Error descriptions		//
MAINTENANCE SELECTION CODE NOT EQUAL TO "X"		** Array ERR - Error descriptions
NORE THAN ONE APPLICATION SELECTED FOR MAINTENANCE		MAINTENANCE SELECTION CODE NOT EQUAL TO "X"
NO APPLICATION SELECTED FOR MAINTENANCE		MORE THAN ONE APPLICATION SELECTED FOR MAINTENANCE
ACTION CODE NOT EQUAL TO "A", "C" OR "D"		NO APPLICATION SELECTED FOR MAINTENANCE
ADD REQUESTED BUT RECORD ALREADY EXISTS IN FILE		ACTION CODE NOT EQUAL TO "A", "C" OR "D"
WARNING - RECORD WAS PREVIOUSLY DELETED		ADD REQUESTED BUT RECORD ALREADY EXISTS IN FILE
CHANGE REQUESTED BUT RECORD DOES NOT EXIST		WARNING - RECORD WAS PREVIOUSLY DELETED
CHANGE REQUESTED BUT RECORD IS DELETED		CHANGE REQUESTED BUT RECORD DOES NOT EXIST
DELETE REQUESTED BUT RECORD DOES NOT EXIST		CHANGE REQUESTED BUT RECORD IS DELETED
DELETE REQUESTED BUT RECORD ALREADY DELETED		DELETE REQUESTED BUT RECORD DOES NOT EXIST
		DELETE REQUESTED BUT RECORD ALREADY DELETED

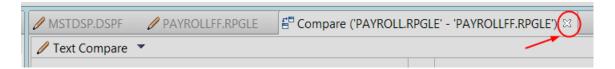
To change preferences on the compare, used the context menu by right clicking.

\_\_\_\_7. Right click to see how the compare can be customized

🖉 MSTDSP.DSPF 🛛 🥒 PAYROLLFF.RPGLE 🛛 🕄 Compare ('PAYRO	OLL.RPGL	E' - 'PAYROLLFF.RPGLE') 🛛 🗖 🗖
🖉 Text Compare 🔻		A 🖄 🖓 🕻
<pre>//* Invalid action code //* BEGSR INVCDE; *IN60 = *ON; EMESS = ERR(4); ENDSR; /END-FREE 0* 0* The compile time array ERR is entered be 0* precceded by "** " to denote the beginning </pre>		ENDSR; //* //* Invalid action code //* BEGSR INVCDE; *IN60 = *ON; EMESS = ERR(4); ENDSR; // // The compile time array ERR is entered below.
O* ** Array ERR - Error descriptions MAINTENANCE SELECTION CODE NOT EQUAL TO "X MORE THAN ONE APPLICATION SELECTED FOR MAINTE NO APPLICATION SELECTED FOR MAINTENANCE ACTION CODE NOT EQUAL TO "A", "C" OR "D" ADD REQUESTED BUT RECORD ALREADY EXISTS IN F WARNING - RECORD WAS PREVIOUSLY DELETED	Copy Select A Set Enco Find/Re	oding     EDE NOT EQUAL TO X       selected for MAINTENANCE       place       Ctrl+F       od I BEADY EXISTS IN ETLE
CHANGE REQUESTED BUT RECORD DOES NOT EXIST CHANGE REQUESTED BUT RECORD IS DELETED DELETE REQUESTED BUT RECORD DOES NOT EXIST DELETE REQUESTED BUT RECORD ALREADY DELETED	Show W	White Space REVIOUSLY DELETED REVIOUSLY DELETED CORD DOES NOT EXIST RECORD IS DELETED DELETE REQUESTED BUT RECORD DOES NOT EXIST DELETE REQUESTED BUT RECORD ALREADY DELETED

To close the Compare Editor.

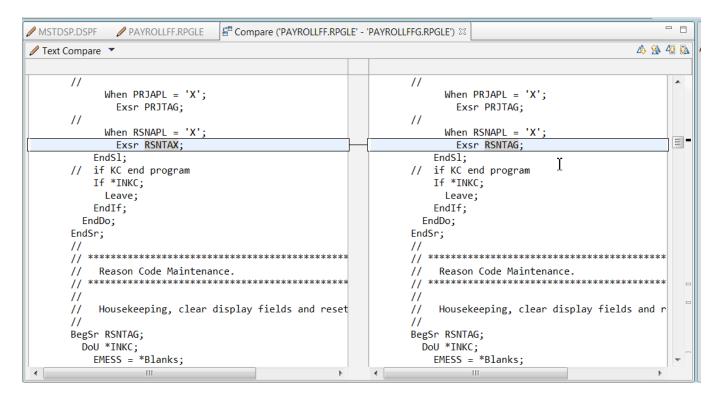
\_8. Click the X on the Editor tab



### For a more typical compare

<ul> <li>QRPGLESRC.*file.pf-sr</li> <li>PAYROLL.rpgle</li> <li>PAYROLLFF.rpgle</li> <li>PAYROLLFF.rpgle</li> <li>PAYROLLG.rpgle</li> <li>PAYROLLFR.rpgle</li> <li>QRPGLESRCP.*file.pf-src</li> <li>REFMST.*file.pf-dta</li> <li>RSNMST.*file.pf-src</li> <li>TESTPF.*file.pf-src</li> <li>MYCOMPILE.*cmd</li> <li>QGPL.*lib.prod-usr</li> </ul>		Go To Open With Browse With Refresh Rename Delete	> > F5 F2 Delete			
> 📥 QTEMP.*lib.tes	st-usr	Copy Move		🖉 Tasks 🛛 📓 Object		
> 🖆 User libraries		WOVE		3 Members		
Second	82	Find String		:(EMPMST) (1 match)		
> 🞒 Jobs				A ENHRS R		
> 😭 IFS Files		Verify		(MSTDSP) (1 match)		
B Spooled Files Solution Spooled Files		Compile	Ctrl+Shift+C	A ENHRS R B1		
Lp Osnelis		User Actions	>	(REFMST) (1 match)		
Properties 🔀 🖳 Remote S	cratchpad	Add To i Project		A ENHRS 3 1		
operty	Value	Make Available Offline				
Attribute	SRC	Debug or Code Coverage (Service Entry)	>			
Name	PAYROLLI					
Number of children	0	Compare With	>	Each Other		
Source	RSELAB01 🔁	Visualize Application Diagram				
Taut	-					

\_\_9. Compare the PAYROLLFF and PAYROLLFFG members



\_\_\_\_11. Click the **X** on the Editor tab

Let's have a look at the syntax checker

### **2.13** Checking syntax

One of the powerful features that the LPEX Editor shares with SEU is its ability to syntax check your source. Syntax checking can be done either when the cursor leaves each line of source or all at once on either the currently selected source or on the entire source member.

Now you will create a syntax error and watch for the prompt to correct it. To syntax check the file:

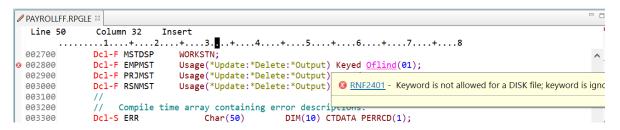
- \_\_\_1. In the PAYROLL Editor window move the cursor to line 28 by typing the line number in the sequence number column or scrolling down.
- \_\_\_\_2. Add the Oflind(01) keyword to the end before the semicolon ';'.

🖥 IBM i RSE Getting	) Started 🖉 *PAYR	OLLFF.RPGLE 🛛
Line 28 W	Column 73 Re	place 1 change
+	1+2	+3+4+5+6+7 <b>.</b> .+
002700	Dcl-F MSTDSP	WORKSTN;
002800	Dcl-F EMPMST	<pre>Usage(*Update:*Delete:*Output) Keyed Oflind(01);</pre>
002900	Dcl-F PRJMST	<pre>Usage(*Update:*Delete:*Output) Keyed;</pre>
003000	Dcl-F RSNMST	<pre>Usage(*Update:*Delete:*Output) Keyed;</pre>

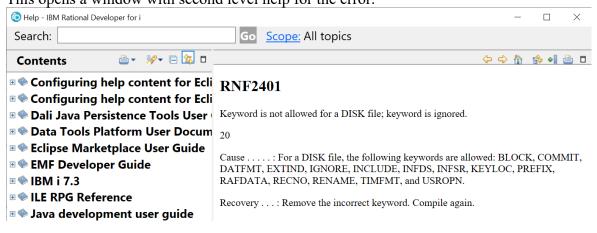
**\_\_\_3.** Move the cursor off the line.

A red annotation appears in front of line 28 and the token in error is underlined.

\_4. If you hover the cursor over **Oflind(01)**, a hover containing the error message appears.



#### \_5. Click the link **RNF2401** in the error message in the hover. This opens a window with second level help for the error.



- **\_\_6.** Close the Help window.
- \_\_\_\_7. Remove the **Oflind(01)** keyword to correct the error. (Alternatively, you can use **Edit > Undo** to correct this).
- **\_\_8.** Move the cursor off the line you just fixed.

The error message is automatically removed from the editor.



Tip:

You can toggle automatic syntax checking. Click **Window > Preferences** from the workbench menu and then expand **Remote Systems > Remote Systems LPEX Editor > IBM i Parsers**. Now, select the language you want to change the settings for in the left pane of the Preferences window, select or deselect the **Automatic syntax checking** check box and then click **OK** 



Tip: You can syntax check the whole source member currently in the editor by clicking Source > Syntax Check All.

## **Congratulations!**

You have successfully completed the introduction to editing IBM i source members using the LPEX editor.

We recommend that you move on to the next lab in the sequence; or browse the list of labs on Rational Developer for i - Hands-On Labs at <u>http://ibm.biz/rdi\_labs</u> to choose a lab of interest.

More information, material and opportunities to discuss the product can be found at our RDi Hub:

http://ibm.biz/rdi hub

# **Enjoy working with Rational Developer for i!**

### Notices

© Copyright IBM Corporation 1992, 2021 All rights reserved.

U.S. Government Users Restricted Rights - Use, duplication or disclosure restricted by GSA ADP Schedule Contract with IBM Corp.

This information was developed for products and services offered in the U.S.A. IBM may not offer the products, services, or features discussed in this documentation in other countries. Consult your local IBM representative for information on the products and services currently available in your area. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any IBM intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any non-IBM product, program, or service.

IBM may have patents or pending patent applications covering subject matter described in this documentation. The furnishing of this documentation does not give you any license to these patents. You can send license inquiries, in writing, to:

IBM Director of Licensing IBM Corporation North Castle Drive Armonk, NY 10504-1785 U.S.A.

For license inquiries regarding double-byte (DBCS) information, contact the IBM Intellectual Property Department in your country or send inquiries, in writing, to:

IBM World Trade Asia Corporation Licensing 2-31 Roppongi 3-chome, Minatoku Tokyo 106, Japan

The following paragraph does not apply to the United Kingdom or any other country where such provisions are inconsistent with local law: INTERNATIONAL BUSINESS MACHINES CORPORATION PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OR CONDITIONS OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some states do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you.

This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. IBM may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

Any references in this information to non-IBM Web sites are provided for convenience only and do

not in any manner serve as an endorsement of those Web sites. The materials at those Web sites are not part of the materials for this IBM product and use of those Web sites is at your own risk.

Licensees of this program who wish to have information about it for the purpose of enabling: (i) the exchange of information between independently created programs and other programs (including this one) and (ii) the mutual use of the information which has been exchanged, should contact:

Intellectual Property Dept. for WebSphere Software IBM Corporation 3600 Steeles Ave. East Markham, Ontario Canada L3R 9Z7

Such information may be available, subject to appropriate terms and conditions, including in some cases, payment of a fee.

The licensed program described in this documentation and all licensed material available for it are provided by IBM under terms of the IBM Customer Agreement, IBM International Program License Agreement or any equivalent agreement between us.

Any performance data contained herein was determined in a controlled environment. Therefore, the results obtained in other operating environments may vary significantly. Some measurements may have been made on development-level systems and there is no guarantee that these measurements will be the same on generally available systems. Furthermore, some measurements may have been estimated through extrapolation. Actual results may vary. Users of this document should verify the applicable data for their specific environment.

Information concerning non-IBM products was obtained from the suppliers of those products, their published announcements or other publicly available sources. IBM has not tested those products and cannot confirm the accuracy of performance, compatibility or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products.

All statements regarding IBM's future direction or intent are subject to change or withdrawal without notice, and represent goals and objectives only.

### Copyright license

This information contains sample application programs in source language, which illustrates programming techniques on various operating platforms. You may copy, modify, and distribute these sample programs in any form without payment to IBM, for the purposes of developing, using, marketing or distributing application programs conforming to the application programming interface for the operating platform for which the sample programs are written. These examples have not been thoroughly tested under all conditions. IBM, therefore, cannot guarantee or imply reliability, serviceability, or function of these programs.

Each copy or any portion of these sample programs or any derivative work, must include a copyright notice as follows:

© (your company name) (year). Portions of this code are derived from IBM Corp. Sample Programs. © Copyright IBM Corp. 1992, 2021. All rights reserved

### Trademarks and service marks

The following terms are trademarks or registered trademarks of International Business Machines Corporation in the United States, other countries, or both.

- i5/OS
- IBM
- OS/400
- Rational
- WebSphere

Microsoft, Windows, and the Windows logo are trademarks of Microsoft Corporation in the UnitedStates, other countries, or both. Other company, product or service names may be trademarks or service marks of others.