

Rational Developer for i Sandbox for IBM i Lab Exercise Workbook

Rational Developer for i

Lab 03 – Compiling RPG

Verify and compile an RPG source member and work with the error list.

Version 6, January 2021

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

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Lab 03 – Compiling RPG

Overview

This module teaches you how to verify and compile RPG programs and use the error list in the Remote System Explorer. When errors are found by either the verify or the compile step, the Error List appears. The Error List is a powerful tool that manages errors found by the verify and compile utilities. You will become familiar with these tools, the various capabilities of the Error List and the RPG program that you have created.

Learning objectives

After completing these exercises, you should be able to accomplish the following tasks independently:

- Check for semantic errors in a source member on your workstation
- Start the Program Verifier tool
- Use the Error List to locate each error in the source
- Use content-assist to fix an error
- Save your source
- Re-verify source
- Change compile preferences
- Invoke the compile command
- Change the current library using the Command field in the Object Table view
- Start an interactive connection
- Invoke the Payroll program

Skill level and prerequisites

Introductory.

Important!



You should complete **RD*i* Lab01** '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 RD*i*, 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
<i>Italic font</i>	is used for variable names and glossary terms

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

Icon	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.
	Information	This symbol indicates information that might not be necessary to complete a step but is helpful or good to know.
	Trouble-shooting	This symbol indicates that you can fix a specific problem by completing the associated troubleshooting information.

Client System requirements

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

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 [rselabxx.savf](#).

1 Verify and compile using Remote System Explorer (RSE)

1.1 Verifying the source

Now you get to play with one of the most powerful and unique features of the Remote System Explorer, – the Program Verifier. Before you compile your code on an IBM i system, you can make certain that there are no errors by invoking the Program Verifier.

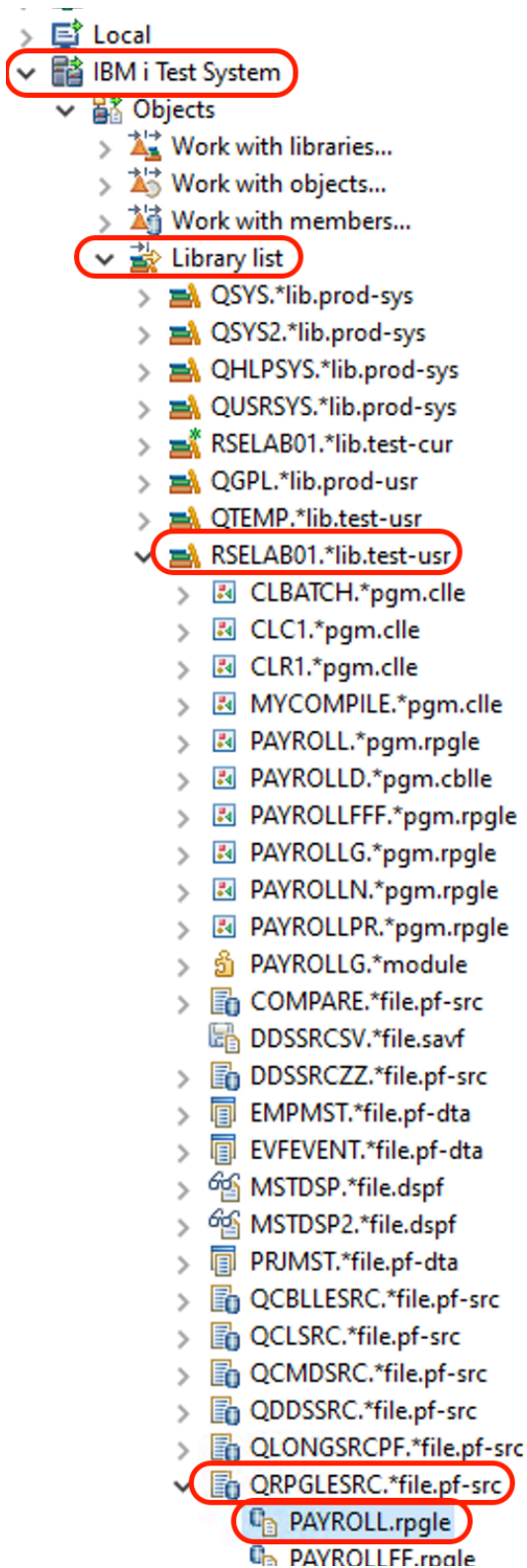
The verifier checks for semantic (compile) errors on your workstation so that you can guarantee a clean compile on your IBM i system. Think of the host cycles you'll save. It is especially handy when you are writing code, but you are disconnected from a server. You can do this because Remote System Explorer ported the parsing and checking code from the IBM i compilers to the workstation.

The Error List view lists the errors that are found and their severity, displays the error messages directly within the source and helps you to navigate between the errors.

To invoke the verifier:

1. Expand the connection to your IBM i server and drill down to the member list in the QRPGLSRC source file in library RSELABxx, (do not use xx, 99 or 10, use the User ID number you were given) if your list in the RSE view doesn't show the member list already.

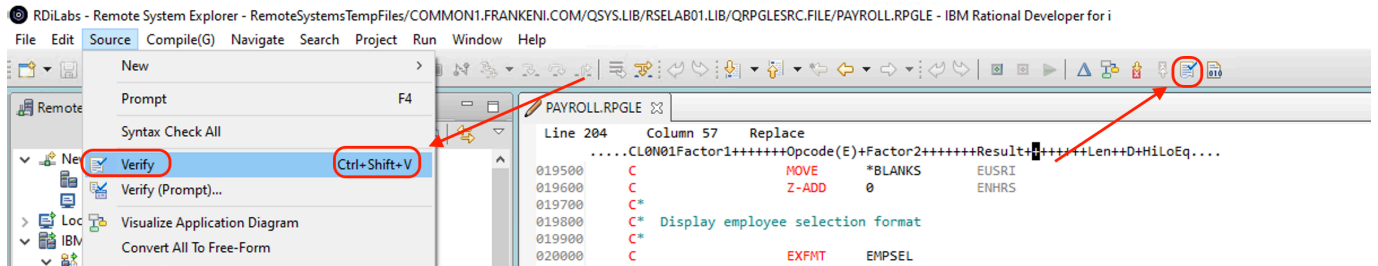
- __2. Open member **PAYROLL** in **QRPGLESRC** in the editor if it is not already open.



- 3. With the focus on the editor, click **Source > Verify** from the workbench menu. If the editor doesn't have focus click on the editor tab.



Tip: Similarly, you can also use the context menu, right click the source member in the Remote Systems View, use the Verify tool button, or Ctrl+Shift+V - you need the source in the editor for the tool bar button to be visible.



After a moment the **verifier** will display an Error List below the Editor window.

The error list shows you:

- a. The error messages
- b. The severities of the errors
- c. The line numbers
- d. The source locations
- e. The connection names

ID	Message	Severity	Line	Location	Connection
RNF5178	ENDSR operation is missing for subroutine EDITSL; ENDSR statement is ass...	30	397	RSELAB01/QRPGLESRC(PAYROLL)	IBM i Test System
RNF5184	Factor 2 must be '0' or '1' when the Result is an indicator or an INDDS data ...	30	364	RSELAB01/QRPGLESRC(PAYROLL)	IBM i Test System
RNF7018	The operand RSNTAX of EXSR is not a subroutine name.	30	95	RSELAB01/QRPGLESRC(PAYROLL)	IBM i Test System
RNF7030	The name or indicator EMES is not defined.	30	365	RSELAB01/QRPGLESRC(PAYROLL)	IBM i Test System
RNF7030	The name or indicator RSNTAX is not defined.	30	95	RSELAB01/QRPGLESRC(PAYROLL)	IBM i Test System
RNF7031	The name or indicator RSNTAG is not referenced.	0	110	RSELAB01/QRPGLESRC(PAYROLL)	IBM i Test System

Next you will fix the errors in your source.

4. Double-click the error RNF7030, for EMES not defined at line 365.

ID	Message	Severity	Line	Location	Connection
RNF5178	ENDSR operation is missing for subroutine EDITSL; ENDSR statement is ass...	30	397	RSELAB01/QRPGLESRC(PAYROLL)	IBM i Test System
RNF5184	Factor 2 must be '0' or '1' when the Result is an indicator or an INDDS data ...	30	364	RSELAB01/QRPGLESRC(PAYROLL)	IBM i Test System
RNF7018	The operand RSNTAX of EXSR is not a subroutine name.	30	95	RSELAB01/QRPGLESRC(PAYROLL)	IBM i Test System
RNF7030	The name or indicator EMES is not defined.	30	365	RSELAB01/QRPGLESRC(PAYROLL)	IBM i Test System
RNF7030	The name or indicator RSNTAX is not defined.	30	95	RSELAB01/QRPGLESRC(PAYROLL)	IBM i Test System
RNF7031	The name or indicator RSNTAG is not referenced.	0	110	RSELAB01/QRPGLESRC(PAYROLL)	IBM i Test System

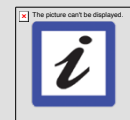
You are automatically brought back into the Editor window to the line where the error occurred. The error on line 365 is a typo.

```

Line 365      Column 54      Replace
.....CL0N01Factor1+++++Opcode(E)+Factor2+++++Result+++++Len++D+HiLoEq....
036100      C      RSNAPL      ANDEQ      'X'
036200      C*     THE BUG IS HERE
036300      C*     *****
036400      C      MOVE      '2'      *IN60
036500      C      MOVE      ERR(2)    EMES
036600      C      ELSE
036700      C      MOVE      '0'
036800      C      END
036900      C*

```

The variable EMES should be EMESS. One good way of finding the correct name is the content-assist tool.



Tip:

The Outline view must be populated to use content-assist.

5. Select the misspelled variable (double click on it) EMES if it is not selected already and press **CRTL+spacebar** to start the content assist tool.

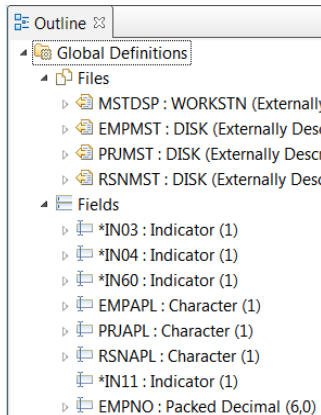
```

Line 365      Column 54      Insert
.....CL0N01Factor1+++++Opcode(E)+Factor2+++++Result+++++Len++D+HiLoEq....
036500      C      MOVE      ERR(2)    EMES
036600      C      ELSE
036700      C      MOVE      '0'
036800      C      END
036900      C*
037000      C*     The following IF AND combination ensure
037100      C*     application has been selected.

```

The selection presented contains the correct name.

6. Double-click the variable EMESS in the list to correct the variable name. Another way to find the variable name is to use the Outline view and see what variables are declared.



That was easy, let's fix the next error; it is a RNF7030 as well. Go to the error list.



Tip:

In the error list, the source lines in error that you have changed already are displayed with a check mark in the prefix area. This makes it easy to concentrate on errors you have not taken care of.

7. Double-click RNF7030, showing RSNTAX not defined at line 95.

ID	Message	Severity	Line	Location	Connection
RNF5178	ENDSR operation is missing for subroutine EDITS1; ENDSR statement is ass...	30	397	RSELAB01/QRPGLESRC(PAYROLL)	IBM i Test System
RNF5184	Factor 2 must be '0' or '1' when the Result is an indicator or an INDDS data ...	30	364	RSELAB01/QRPGLESRC(PAYROLL)	IBM i Test System
RNF7018	The operand RSNTAX of EXSR is not a subroutine name.	30	95	RSELAB01/QRPGLESRC(PAYROLL)	IBM i Test System
RNF7030	The name or indicator EMES is not defined.	30	365	RSELAB01/QRPGLESRC(PAYROLL)	IBM i Test System
RNF7030	The name or indicator RSNTAX is not defined.	30	95	RSELAB01/QRPGLESRC(PAYROLL)	IBM i Test System
RNF7031	The name or indicator RSNTAG is not referenced.	0	110	RSELAB01/QRPGLESRC(PAYROLL)	IBM i Test System

Fix it in the editor.

8. RSNTAX should really be RSNTAG. Make the appropriate change.

```

*PAYROLL.RPGLE
Line 95      Column 42      Insert
.....CL0N01Factor1+++++Opcode(E)+Factor2+++++Result+++++Len++D+HiLoEq....
009100      C                when      PRJAPL = 'X'
009200      C                EXSR      PRJTAG
009300      C*
009400      C                when      RSNAPL = 'X'
009500      C                EXSR      RSNTAX
009600      C                ENDSL
009700      C* if KC end program
009800      C                if
009900      C                leave
010000      C                endif
    
```

✘ RNF7018 (30) The operand RSNTAX of EXSR is not a subroutine name.
✘ RNF7030 (30) The name or indicator RSNTAX is not defined.

__9. Go to the next error RNF5184.

The next error is actually RNF7018 but it is related to the one you just fixed and already has a check mark and can be ignored. It shows the same line number, which is an indication that both errors are related.

__10. Double-click RNF5184.

ID	Message	Severity	Line	Location	Connection
RNF5184	Factor 2 must be '0' or '1' when the Result is an indicator or an INDDS data ...	30	364	RSELAB01/QRPGLESRC(PAYROLL)	IBM i Test System
RNF7018	The operand RSNTAX of EXSR is not a subroutine name.	30	95	RSELAB01/QRPGLESRC(PAYROLL)	IBM i Test System
RNF7030	The name or indicator EMES is not defined.	30	365	RSELAB01/QRPGLESRC(PAYROLL)	IBM i Test System
RNF7030	The name or indicator RSNTAX is not defined.	30	95	RSELAB01/QRPGLESRC(PAYROLL)	IBM i Test System
RNF7031	The name or indicator RSNTAG is not referenced.	0	110	RSELAB01/QRPGLESRC(PAYROLL)	IBM i Test System

__11. Fix this by replacing the 2 with a 1.

```

Line 377      Column 40      Insert      1 change
.....CL0N01Factor1+++++Opcode(E)+Factor2+++++Result+++++Len++D+HiLoEq...
036200      C*      THE BUG IS HERE
036300      C*      *****
036400      C      MOVE      '2'      *IN60
036500      C      MOVE
036600      C      ELSE
036700      C      MOVE
036800      C      END
036900      C*

```

Error RNF7515 is related to the first error you fixed. It has the same line number it already has a check mark. You can ignore it. The only serious remaining error is RNF5178. This error is caused by a missing ENDSR.

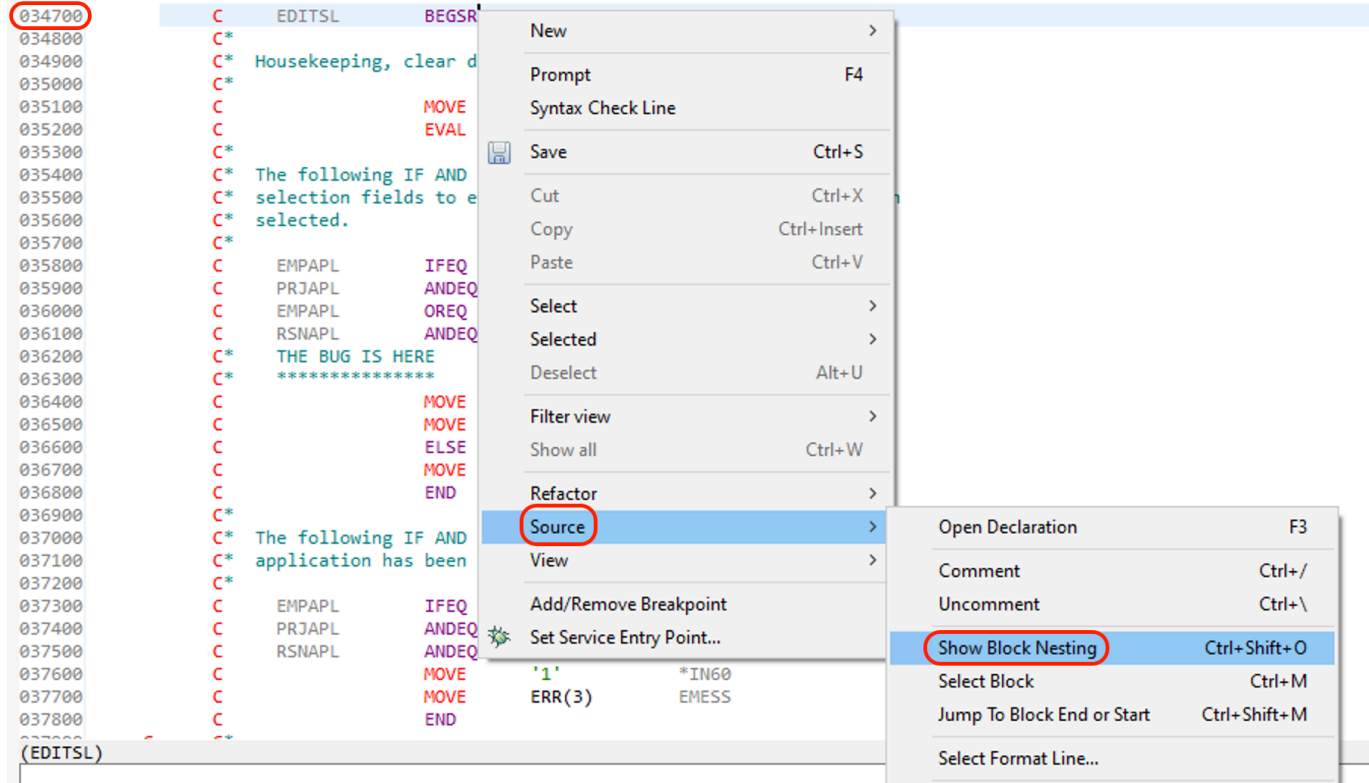
ID	Message	Severity	Line	Location	Connection
RNF5178	ENDSR operation is missing for subroutine EDITSL; ENDSR statement is ass...	30	397	RSELAB01/QRPGLESRC(PAYROLL)	IBM i Test System
RNF5184	Factor 2 must be '0' or '1' when the Result is an indicator or an INDDS data ...	30	364	RSELAB01/QRPGLESRC(PAYROLL)	IBM i Test System
RNF7018	The operand RSNTAX of EXSR is not a subroutine name.	30	95	RSELAB01/QRPGLESRC(PAYROLL)	IBM i Test System
RNF7030	The name or indicator EMES is not defined.	30	365	RSELAB01/QRPGLESRC(PAYROLL)	IBM i Test System
RNF7030	The name or indicator RSNTAX is not defined.	30	95	RSELAB01/QRPGLESRC(PAYROLL)	IBM i Test System



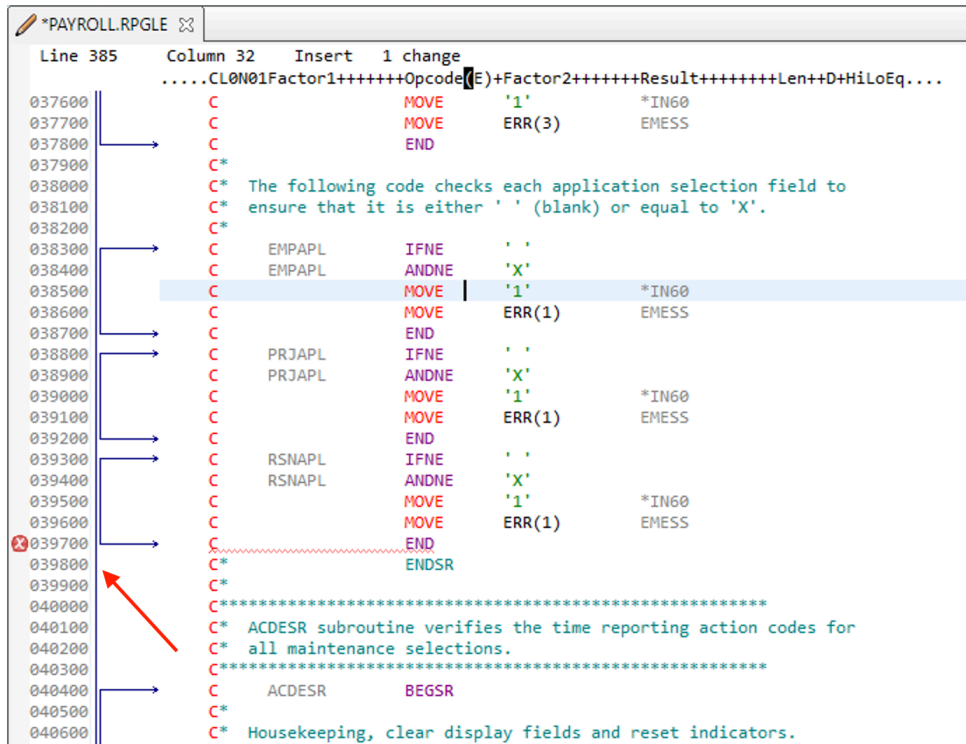
Tip:

You can use the **Show Block Nesting** feature to find where the ENDSR is missing.

Move your cursor to line 347, where the BEGSR statement is. Right-click and select **Source > Show Block Nesting**.

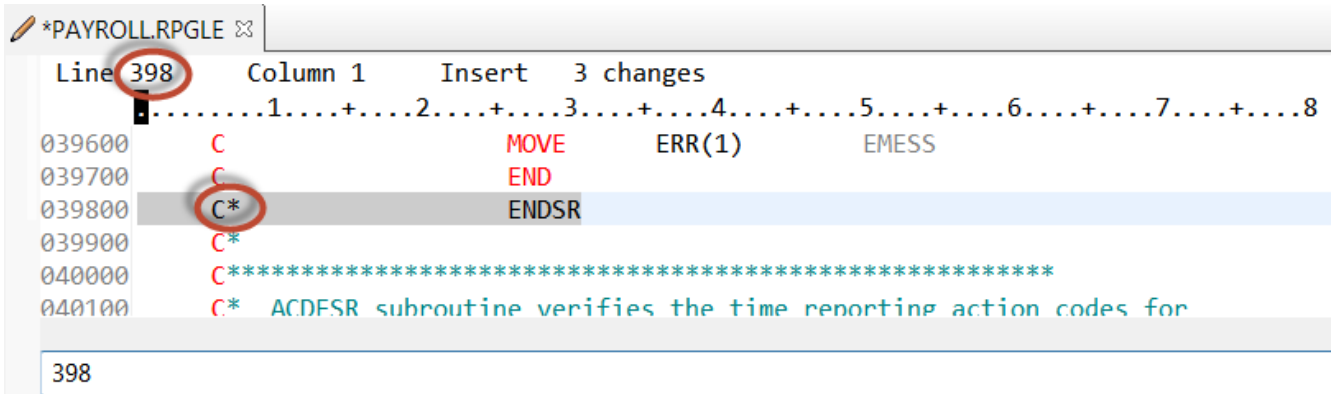


You should see the block nesting of the current subroutine and that the ENDSR is missing before the next subroutine at line 404.



__12. Move to line 398 in the editor.

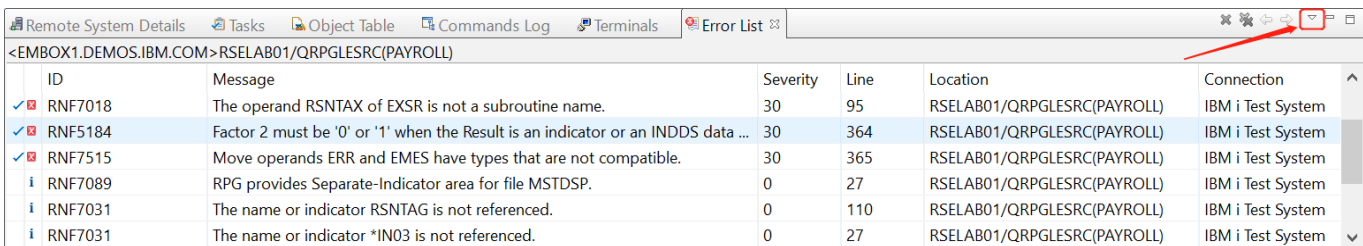
__13. Remove the asterisk (*) from the C-spec.



You can use the **Tab** key to quickly move to the appropriate column.

All the non-informational errors are now fixed.

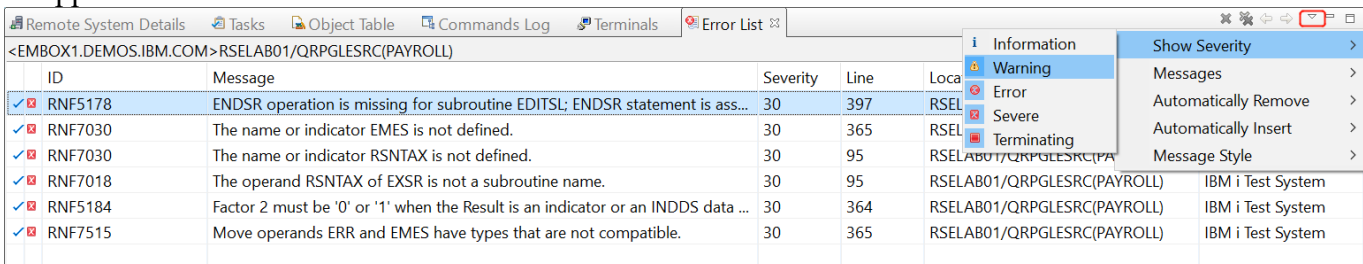
You can filter out messages according to these severities by using the filter menu.



__14. Click the **View Menu** button in the Error List title bar.

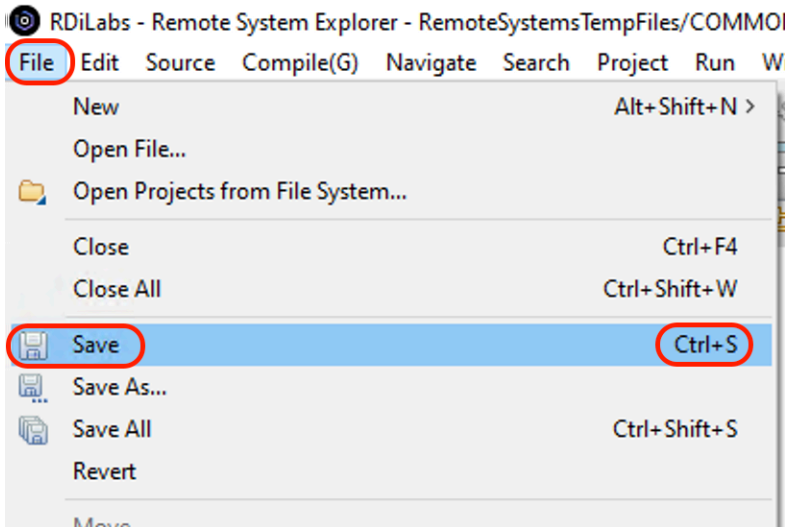
__15. Click **Show Severity** on the pop-up menu.

__16. Uncheck severity type **Information** in the list. After this, all the information item in the error list disappears.

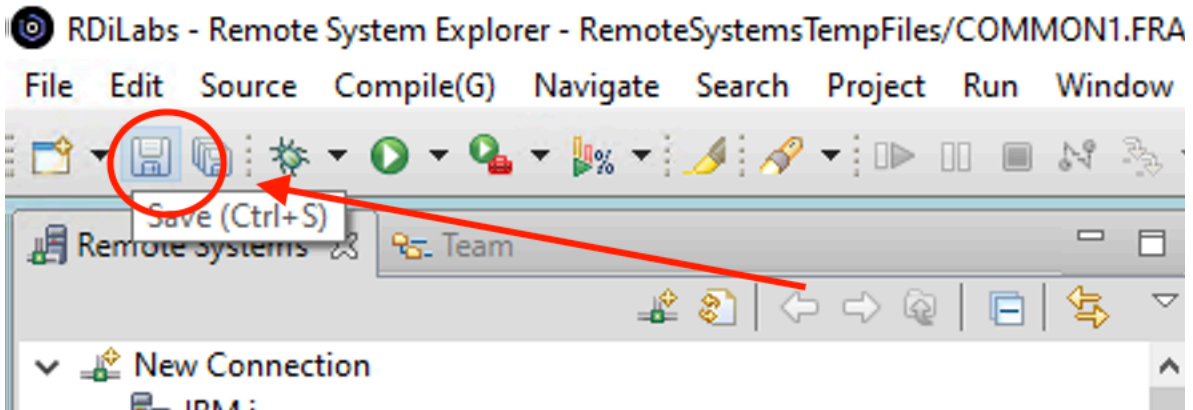


__17. You can save the member using one of these ways:

- a. Click **File > Save** from the workbench menu



- b. Click the Save icon in the workbench toolbar:



- c. Press **Ctrl+ S**.

Changes are uploaded to the IBM i system.

__18. Verify your source again.

Everything should be ok. Since the **Information** severity has been unchecked, you should not see any error message. You are ready to compile the program.

```

PAYROLL.RPGLE
Line 397      Column 7      Insert
.....C0N01Factor1+++++Opcode(E)+Factor2+++++Result+++++Len++D+HiLoEq....
038600      C              MOVE          ERR(1)      EMESS
038700      C              END
038800      C      PRJAPL    IFNE          ' '
038900      C      PRJAPL    ANDNE         'X'
039000      C              MOVE          '1'          *IN60
039100      C              MOVE          ERR(1)      EMESS
039200      C              END
039300      C      RSNAPL    IFNE          ' '
039400      C      RSNAPL    ANDNE         'X'
039500      C              MOVE          '1'          *IN60
039600      C              MOVE          ERR(1)      EMESS
039700      C              END
039800      C              ENDSR
039900      C*
040000      C*****
040100      C* ACDESR subroutine verifies the time reporting action codes for
040200      C* all maintenance selections.
040300      C*****
040400      C      ACDESR    BEGSR
Verify program action completed with informational and/or warning messages.

```

ID	Message	Severity	Line	Location
EVFF5133	All messages have been filtered out or removed.			

You have verified your source and fixed any errors.

1.2 Compiling source remotely

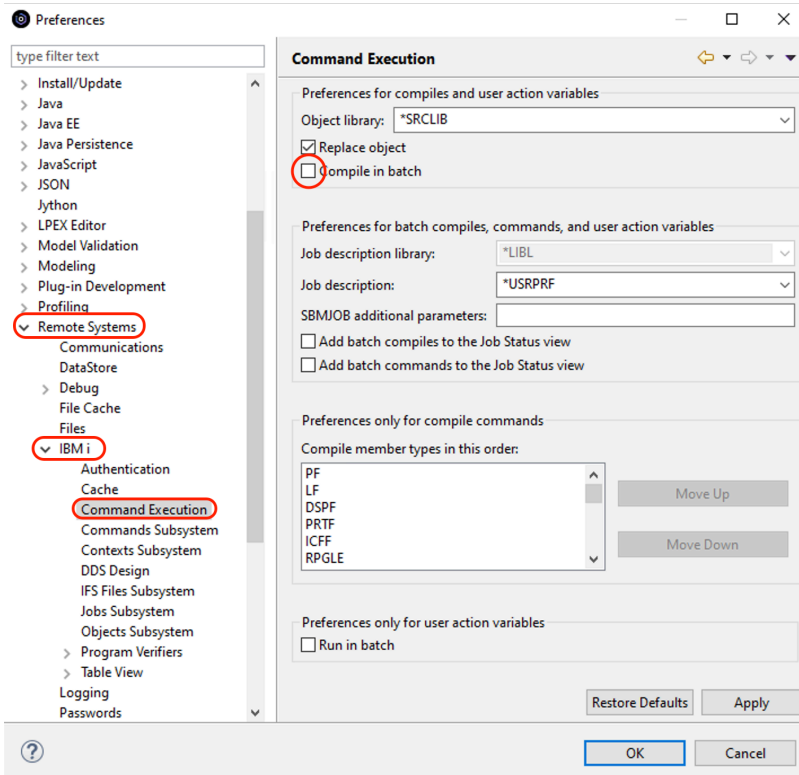
The remote compile capability is part of the Remote System Explorer. It gives you a workstation interface to submit requests to compile, bind, or build objects on the IBM i host. It allows for easy access to all the compile options available for all the supported CRTxxx commands.

If you used the local program verifier, then your host compiles should be successful -- no wasted IBM i cycles. However, if there are errors, the host compiler will send the error information back to the workstation and they will be loaded into the Error List view, which behaves just as it did when you did a local verify.

The default for compiling programs is to submit the compile to the batch job queue. Here in this exercise, you can run the compile interactively.

To change the preferences to run the compile interactively:

- __1. Click **Window > Preferences** from the workbench menu.
- __2. In the left pane of the Preferences window, expand **Remote Systems**
- __3. Expand **IBM i** under Remote Systems
- __4. Click **Command Execution** under IBM i.
- __5. In the right pane of the Preferences window, clear the **Compile in batch** check box
- __6. Click **OK** to return to the Remote System Explorer perspective

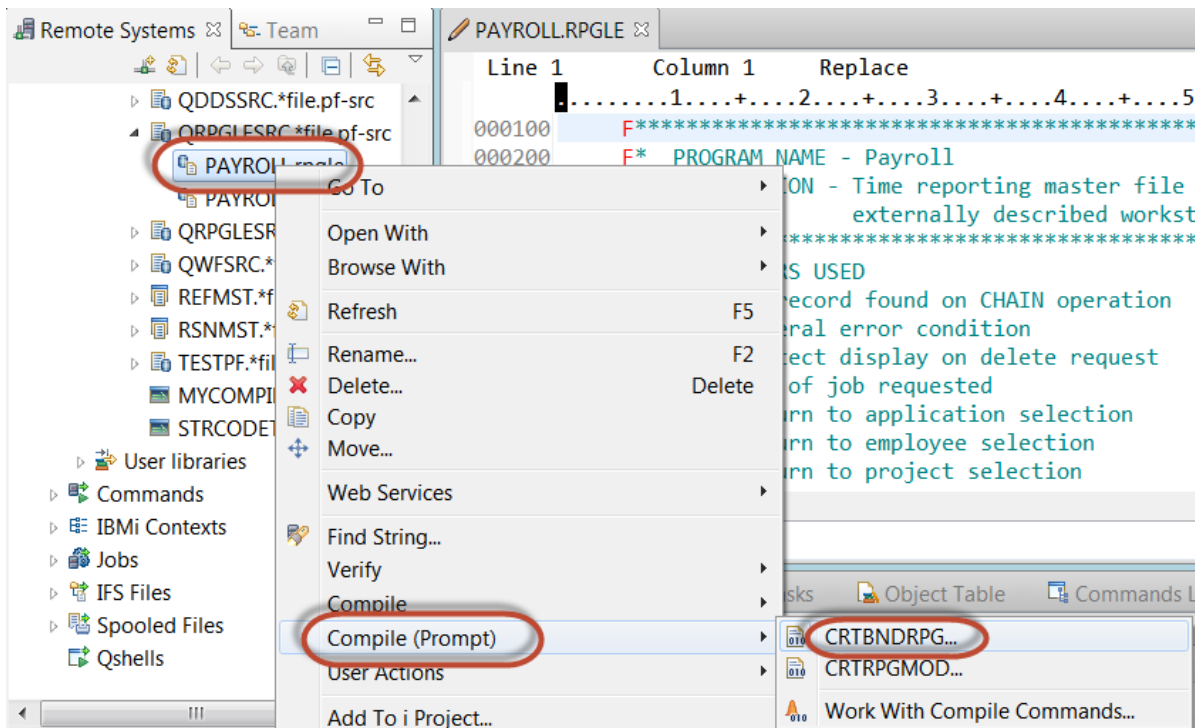


You will now use the prompt for the CRTBNDRPG command to specify your compile parameters. All entry fields pertaining to names are already filled in with the correct information.

To compile source:

- __7. Right-click the PAYROLL member in QRPGLESRC.

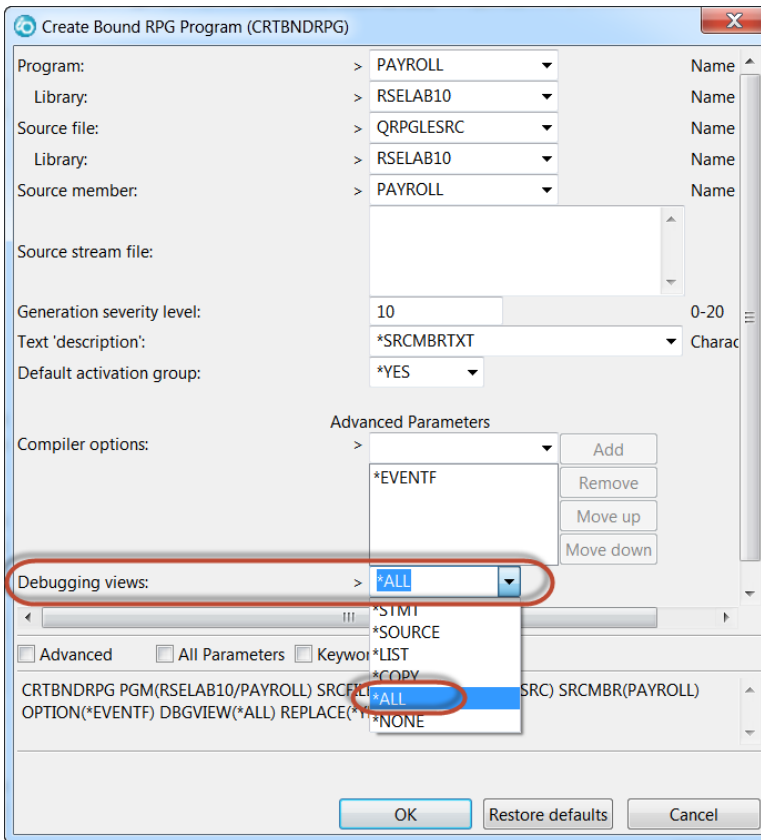
- __8. Click **Compile (Prompt) > CRTBNDRPG** on the pop-up menu.



The Create Bound RPG Program (CRTBNDRPG) dialog opens.

- __9. In the **Debugging views** drop down list, select the ***ALL** parameter. If you want to see the other parameters available, click **Advanced**.

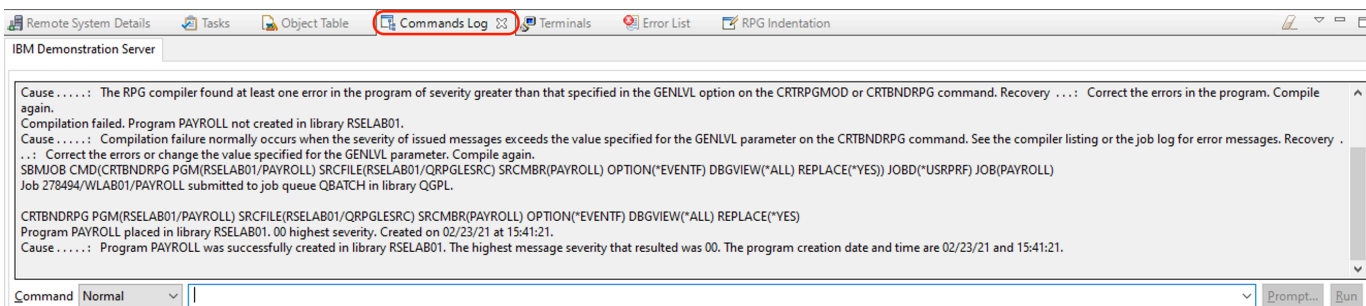
__10. Click **OK** when you are finished.



The progress bar on the workbench (bottom right corner) will indicate that the compile runs. Then the error list will be shown, with no errors, just information messages. You can also check the Commands Log view to verify that your program was created.

__11. Click the **Commands Log** tab at the bottom of the workbench.

This log shows a list of all commands run on the remote system and the messages returned for each command.



You have set compile preferences, invoked the compile command, and checked for a successful compile.

1.3 Submitting IBM i commands in the Object Table view

You can use the Object Table view inside the Remote System Explorer to submit commands to the IBM i system. You can run commands from the **Commands** field beneath the Object Table view, and view messages in the **Messages** field. After you populate the table, you can enter a command and click either **Prompt** to specify parameters and then **Run** or just click **Run**.

When you run a command, the **Messages** field is populated with the messages from the command. When you select a message, the **Details** button is enabled. When you click this button, the message and its help is displayed.

Also note that besides the Object Table view, you can also use the Remote Systems view to run commands and programs. Which one you choose depends on your personal preference. In the Object Table view, you can see the properties of all items at the same time; they are displayed as rows across the table.

In the Remote Systems view, you have greater ease of navigation; you can work from your Library list in the Objects subsystem, and you can see the contents of many items before selecting the one you want to run.

In the **Commands** field, you select where you want to run the command. The choices are Normal, which means that the command will run in the RSE communication server job, Batch or Interactive.

To change the library list:

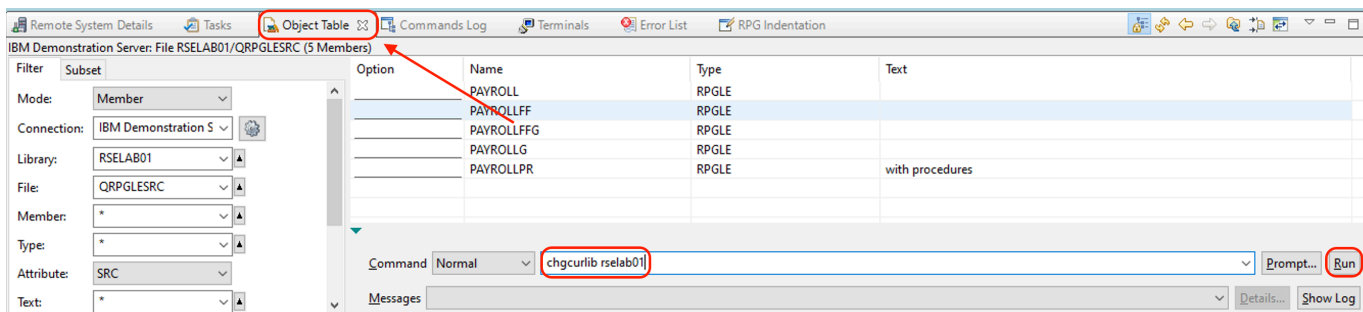
1. Click the **Object Table** view tab from the views at the bottom of the workbench.
2. In the **Command** field type, CHGCURLIB RSELABxx (where xx is your User ID number).



Tip:

If you are **not** using an IBM supplied IBM i server, use a library that is on your own IBM i system.

3. Click **Run**.



Troubleshooting



If the entry fields are disabled in the Object Table view, or you see an error message, activate a connection using one of the following steps. This happens because the Object Table view is not linked to an active connection and can't determine where to run the command.

If you encounter the problems described above, follow these steps to create a link to a connection:

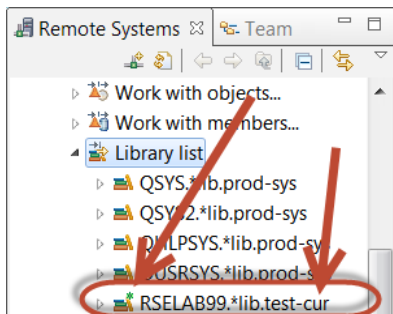
- Click **OK**.
- In the Remote Systems view, right-click QRPGLSRC.
- Click **Show in Table** on the context menu.

This will show the members in the Object Table view and link the view to the connection. The command will run on the IBM i system and after it finishes you will see the completion message on the bottom of the Object Table view.

Back in the workbench in the Remote Systems view:

4. Right-click **Library list**.
5. Click **Refresh**.

You will see a small green asterisk beside the RSELABxx library to indicate it as your current library.



You can also connect to other than IBM i systems with the Remote System Explorer and launch commands for these systems as well, for example, your local system, or Linux[®]

You have submitted a command to change the current library in the command line of the Object Table view.

Congratulations!

You have successfully completed the RDi Lab 03 – Compiling RPG lab exercises.

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 http://ibm.biz/rdi_labs to choose a lab of interest.

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

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