

Natural Engineer

Advanced Services for Windows

Version 9.1

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Specifications contained herein are subject to change, and these changes will be reported in subsequent revisions or editions.

Readers' comments are welcomed. Comments may be addressed to the Documentation Department at the address on the back cover. Internet users may send comments to the following e-mail address:

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TABLE OF CONTENTS

ABOUT THIS MANUAL.....	1
Purpose of this manual	1
Target Audience	1
Typographical Conventions used in this manual	2
How this manual is organized	3
Terminology	4
Related Literature	7
NATURAL FOR AJAX CONVERSION.....	9
Chapter Overview.....	9
Natural for Ajax Conversion Overview.....	10
Natural for Ajax Conversion Workflow Window	11
Separate Processing Rules from Maps	14
Natural Map Extraction	15
Inline Map Extraction.....	19
Cross-Reference to Adapters	23
Code Conversion	30
REFACTORING.....	35
Chapter Overview.....	35
Preparation Tasks	36
Preparation Tasks Processes.....	40
Reporting to Structured Mode Conversion.....	41
Separate Processing Rules from Maps	42
Convert Back References to Labels.....	54
Check for Redundant Code	57
Check for Conversational Database Loops.....	60
Check for Unused Variables.....	63
Expand Copycodes	66
Componentization	75
Component Builder	77
Similar Code Identifier	84
Database Split.....	92
Data Definition Module Selection	94
User View Analysis.....	99
Refactor Database Access	100

Natural Engineer Advanced Services

BUSINESS RULES.....105

- Chapter Overview105
- Business Rules Overview.....106
- Business Rules Workflow107
- Rule Type Maintenance109
- Candidate Creation.....112
- Candidate Maintenance115
- Rule Definition.....118
- Component Generation127

DATA MASKING133

- Chapter Overview133
- Data Model Maintenance134
- Data Masking Rules Maintenance.....154
- Data Masking Calendar Maintenance162
- Data Masking Execution168

INDEX171

ABOUT THIS MANUAL

Purpose of this manual

This manual contains the full documentation for the Advanced Services functions within Natural Engineer.

Advanced Services provides the facility to apply and impose standards onto Natural objects and reorganize the internal structure of Natural applications.

The topics covered are:

- Natural for Ajax Conversion.
- The individual Refactoring processes required to successfully reorganize the internal structure of Natural applications.
- Business Rules.
- Creation of Test Data via Data Masking on ADABAS.

Target Audience

The target audience for this manual is intended to be any User of Natural Engineer at any level of experience.

Typographical Conventions used in this manual

The following conventions are used throughout this manual:

UPPERCASE TIMES	Commands, statements, names of programs and utilities referred to in text paragraphs appear in normal (Times) uppercase.
UPPERCASE BOLD COURIER	In illustrations or examples of commands, items in uppercase bold courier must be typed in as they appear.
< >	Items in angled brackets are placeholders for user-supplied information. For example, if asked to enter <file number>, you must type the number of the required file.
<u>Underlined</u>	Underlined parts of text are hyperlinks to other parts within the online source manual. This manual was written in MS-Word 97 using the "hyperlink" feature.

The following symbols are used for instructions:

⇒	Marks the beginning of an instruction set.
□	Indicates that the instruction set consists of a single step.
1.	Indicates the first of a number of steps.

How this manual is organized

This manual is organized to reflect all the Advanced Services functions of Natural Engineer in the following chapters:

Chapter	Contents
1	Describes the Natural for Ajax Refactoring processes.
2	Describes the individual Refactoring processes used to reorganize the internal structure of Natural applications.
3	Describes the Business Rules processes to identify Natural code that are applicable to user defined Business Rules.
4	Describes the creation of Test Data via Data Masking on ADABAS.

Natural Engineer Advanced Services

Terminology

This section offers some of the terms that are specific to the Natural Engineer product.

Note: Familiarity is assumed with the general terminology of Natural, Adabas, Microsoft and Mainframe operating systems.

Analysis

The Analysis process of Natural Engineer searches application data within the Natural Engineer Repository, according to specified Search Criteria and generates reports on the search results.

Application

An Application is a library or group of related libraries, which define a complete Application. In Natural Engineer, the Application can have a one-to-one relationship with a single library of the same name, or a library of a different name, as well as related steplibs. The Application refers to all the source code from these libraries, which Natural Engineer loads into the Repository.

Browser

An Internet Browser such as Microsoft Internet Explorer or Netscape.

Category

Categories in Natural Engineer specify whether and how a Modification is applied to the Natural code. Valid categories are: Automatic change, Manual change, Reject the default Modification, No change to the data item, and the data item is in Generated Code.

A category is further broken down according to type of change (for example: Keyword, Literal, Data Item, Database Access, Definition).

Cobol

Abbreviation of Common Business Orientated Language. A programming language.

Cobol Link

A Cobol Link is the link between the individual Cobol modules and the executable Cobol program referenced in the JCL object.

Consistency

An option in the Analysis process that causes Natural Engineer to trace an Impact through the code, using left and right argument resolution to identify further code impacted by the code found.

Database Access Definition

A collective term used to identify DDMs, SQL Tables or Predict User Views.

About this Manual

Data Item

A collective term used for any data fields within a programming object. These can be user-defined variables, DDM fields or System Variables. It is inter-changeable with the term 'variable'.

Environment

The Environment process is the means by which Natural Engineer generates a structured view of the application code in the Natural Engineer Repository. This provides application analysis reports and inventory information on the application and is used as the basis for Impact Analysis.

Exception

An Exception is an Item identified as impacted that does not require a Modification. Where there are a few similar Exception Items, they can be treated as Exceptions, and rejected in the Modification review process. Where there are many similar (therefore not Exceptions), consideration should be given to changing the Search Criteria so they are not identified as impacted in the first place.

Generated Code

This is code which has been generated by a Natural code generator, such as Construct, and which is not normally modified directly in the Natural editor.

Impact

An Impact is an instance of a Natural code Item; e.g., data item or statement (a "hit" scored by the Analysis process) that matches the defined Search Criteria used in the Analysis process.

Iteration

An Iteration is one examination cycle of a field identified according to the specified Search Criteria. For example, one Iteration is reading the field right to left. Multiple Iterations are performed when the option of 'Consistency' or Multi Search is requested for Analysis, and Natural Engineer performs as many Iterations as necessary to exhaust all possibilities of expressing and tracing the field, and can be limited by a setting in the NATENG.INI file.

JCL

Job Control Language.

JCL object

A JCL object is a collection of Job Control statements in the order which they are to be executed in a mainframe batch environment. Commonly referred to as JCL.

Library

A single library of source code, which exists in the Natural system file.

Modification

A Modification is a change suggested or made to an object or data item resulting in the required compliance of that object or data item. Modifications in Natural Engineer are classified according to Category and Type.

Natural Engineer Advanced Services

Refactoring

Improving a computer program by reorganizing its internal structure without altering its external behavior.

Soft Link

A Soft Link is where a link between two objects has been defined using an alphanumeric variable rather than a literal constant.

TLM

Text Logic Members are used to contain the code required to support inclusion of common code into the application. An example of this is the code to include into an application before updating a database.

Type

The Type of Modification available, for example: Data Item, Keyword and Literal.

Variable

A collective term used for any data fields within a programming object. These can be user-defined variables, DDM fields or System Variables. It is inter-changeable with the term 'data item'.

Related Literature

The complete set of Natural Engineer manuals consists of:

1 Natural Engineer Concepts and Facilities (NEE91-006ALL)

The Concepts and Facilities manual describes the many application systems problems and solutions offered by Natural Engineer, providing some guidelines and usage that can be applied to Natural applications.

2 Natural Engineer Release Notes (NEE91-008ALL)

The Release Notes describe all the information relating to the new features, upgrades to existing functions and documentation updates that have been applied to Natural Engineer.

**3 Natural Engineer Installation Guide for Windows (NEE91-010WIN)
Natural Engineer Installation Guide for Mainframes(NEE91-010MFR)
Natural Engineer Installation Guide for Unix (NEE91-010UNIX)**

The Installation Guide provides information on how to install Natural Engineer on PC, Unix and mainframe platforms.

**4 Natural Engineer Administration Guide (NEE91-040WIN)
Natural Engineer Administration Guide (NEE91-040MFR)
Natural Engineer Administration Guide (NEE91-040UNIX)**

The Administration Guide provides information on all the various control settings available to control the usage of the different functions within Natural Engineer.

**5 Natural Engineer Application Management (NEE91-020WIN)
Natural Engineer Application Management (NEE91-020MFR)
Natural Engineer Application Management (NEE91-020UNIX)**

The Application Management manual describes all the functions required to add Natural applications into the Repository.

**6 Natural Engineer Application Documentation (NEE91-022WIN)
Natural Engineer Application Documentation (NEE91-022MFR)
Natural Engineer Application Documentation (NEE91-022UNIX)**

The Application Documentation manual describes all the available functions to document a Natural application within the Repository. These functions will help enhance / supplement any existing systems documentation such as BSD / CSD / Specifications etc.

Natural Engineer Advanced Services

- 7 Natural Engineer Application Analysis and Modification (NEE91-023WIN)
Natural Engineer Application Analysis and Modification (NEE91-023MFR)
Natural Engineer Application Analysis and Modification (NEE91-023UNX)**

The Application Analysis and Modification manual describes all the available functions to carry out analysis of Natural applications; including basic keyword searches. The modification process is described and detailed to show how it can be applied to modify single selected objects within a Natural application, or the entire Natural application in one single execution.

- 8 Natural Engineer Application Restructuring (NEE91-024WIN)
Natural Engineer Application Restructuring (NEE91-024MFR)
Natural Engineer Application Restructuring (NEE91-024UNX)**

The Application Restructuring manual describes the analysis and modification functionality required to carryout some of the more sophisticated functions such as Object Builder.

- 9 Natural Engineer Utilities (NEE91-080WIN)
Natural Engineer Utilities (NEE91-080MFR)
Natural Engineer Utilities (NEE91-080UNX)**

The Utilities manual describes all the available utilities found within Natural Engineer and, when and how they should be used.

- 10 Natural Engineer Reporting (NEE91-025ALL)**

The Reporting manual describes each of the reports available in detail, providing report layouts, how to trigger the report and when the report data becomes available. The various report-producing mediums within Natural Engineer are also described.

- 11 Natural Engineer Batch Processing [Mainframes] (NEE91-026MFR)
Natural Engineer Batch Processing [Mainframes] (NEE91-026UNX)**

The Batch Processing manual describes the various batch jobs (JCL/Scripts) and their functionality.

- 12 Natural Engineer Messages and Codes (NEE91-060ALL)**

The Messages and Codes manual describes the various messages and codes produced by Natural Engineer.

- 13 Natural Engineer Web Interface Installation and Configuration Guide(NEA84-010ALL)**

The Web Interface Installation and Configuration Guide provides information on how to install and configure the Natural Engineer Web Interface.

- 14 Natural Engineer Advanced Services (NEE91-017WIN)
Natural Engineer Advanced Services (NEE91-017MFR)
Natural Engineer Advanced Services (NEE91-017UNX)**

The Advanced Services manual describes various advanced options such as the Refactoring of Natural application source code with Natural Engineer, conversion of applications for Natural for Ajax, Business Rule processing and Data Masking.

NATURAL FOR AJAX CONVERSION

Chapter Overview

This chapter describes the Natural for Ajax Conversion option available from the Refactoring option on the Advanced Services menu.

The following topics are covered:

1. [Natural for Ajax Conversion Overview](#)
2. [Natural for Ajax Conversion Workflow](#)
3. [Separate Processing Rules from Maps](#)
4. [Natural Map Extraction](#)
5. [Inline Map Extraction](#)
6. [Cross-Reference to Adapters](#)
7. [Code Conversion](#)

Natural for Ajax Conversion Overview

Natural for Ajax provides an environment that enables the creation of rich internet applications, providing Natural users on UNIX and mainframe platforms to develop Natural applications that utilize a browser based user interface.

The Natural for Ajax Conversion option provides the facility to generate a web page from either inline INPUT or MAP statements, using Ajax compliant files. The Ajax compliant file generated by the Natural for Ajax Conversion process within Natural Engineer is in XML format. This file can be used by the relevant Ajax Painter within Natural to generate the web page.

The Ajax compliant file will be used to generate a Natural adapter (a map object within Natural for Ajax). The Natural adapter will act as the interface between the application and web page.

It is also possible to convert map objects into Ajax compliant files.

Cross-reference data can be created to provide a link between the inline INPUT or MAP statements and their respective adapters.

The application objects that contain any INPUT, INPUT USING MAP, REINPUT or MAP statements can be modified to use the correct Natural for Ajax compliant code required by the new adapters.

The Natural for Ajax Conversion process is invoked using the following menu navigation:

Advanced Services → Natural for Ajax Conversion

Natural for Ajax Conversion Workflow Window

The Natural for Ajax Conversion Workflow screen provides all the options that are available to apply the Natural for Ajax Conversion process.

The following Figure 1-1 illustrates the Natural for Ajax Conversion Workflow screen.

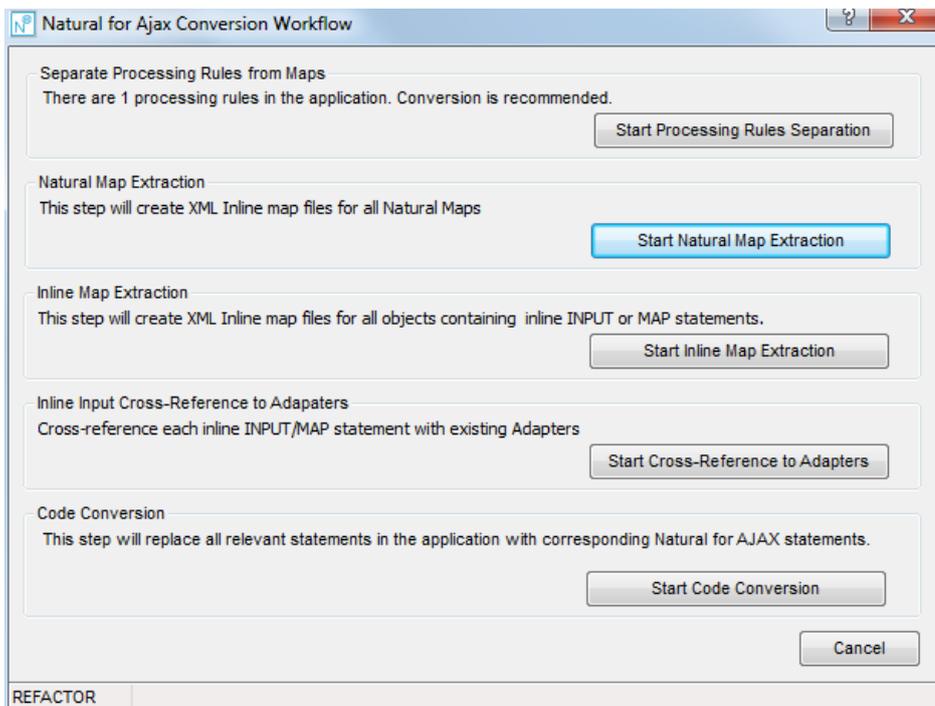


Figure 1-1 Natural for Ajax Conversion Workflow screen

SCREEN ITEMS	DESCRIPTION
Separate Processing Rules from Maps	This option provides the facility to remove any in-line processing rules within map objects, encompassing them within new generated subprogram objects. <i>Note: This option is only available if any processing rules have been found within the currently selected application.</i>
Natural Map Extraction	This option provides the facility to generate Ajax compliant files for any Natural map objects.
Inline Map Extraction	This option provides the facility to generate Ajax compliant files for any in-line INPUT or MAP statements.
Inline Input Cross-Reference to Adapters	This option provides the facility to generate cross-reference data for any in-line INPUT or MAP statements with existing adapters.
Code Conversion	This option provides the facility to convert relevant Natural statements to Natural for Ajax statements.

BUTTON NAME	DESCRIPTION
Start Processing Rules Separation	Invoke the Processing Rules Separation process. <i>For more information refer to the section Separate Processing Rules from Maps.</i>
Start Natural Map Extraction	Invoke the Natural Map Extraction process. <i>For more information refer to the section Natural Map Extraction.</i>
Start Inline Map Extraction	Invoke the Inline Map Extraction process. <i>For more information refer to the section Inline Map Extraction.</i>
Start Cross-Reference to Adapters	Invoke the Cross-Reference to Adapters process. <i>For more information refer to the section Cross-Reference to Adapters.</i>
Start Code Conversion	Invoke the Code Conversion process. <i>For more information refer to the section Code Conversion.</i>
Cancel	Cancel the Natural for Ajax Conversion Workflow process and return back to the main Natural Engineer screen.

STATUS BAR ITEM	DESCRIPTION
------------------------	--------------------

The Natural for Ajax Conversion status bar is divided into 2 individual panes.

Pane 1	Name of the selected application.
---------------	-----------------------------------

Pane 2	Any Natural for Ajax Conversion processing messages.
---------------	--

Separate Processing Rules from Maps

Any processing rules that are present within map objects, for the selected application, will need to be removed first.

This is done by using the Separate Processing Rules from Maps process, which will identify any in-line processing rules, separate them from their respective maps and generate new subprograms containing the processing rules. Existing calling objects for each map are then modified to reference the new processing rules subprograms.

This process is part of the Application Refactoring processes available within Natural Engineer.

Note: For more information on the Separate Processing Rules from Maps process, refer to the [Separate Processing Rules from Maps](#) section in Chapter 2 of this manual.

The Separate Processing Rules from Maps option is invoked by using the ‘Start Processing Rules Separation’ button on the Natural for Ajax Conversion Workflow screen.

Natural Map Extraction

The Natural Map Extraction option provides the facility to select existing map objects within an application, and convert them into Ajax compliant files.

The Ajax compliant files can then be used as Natural adapters to form the interface between the application code and the web page.

Natural Map Extraction Window

The Natural Map Extraction option is invoked by using the ‘Start Natural Map Extraction’ button on the Natural for Ajax Conversion Workflow screen.

The following Figure 1-2 illustrates the Natural Map Extraction screen.

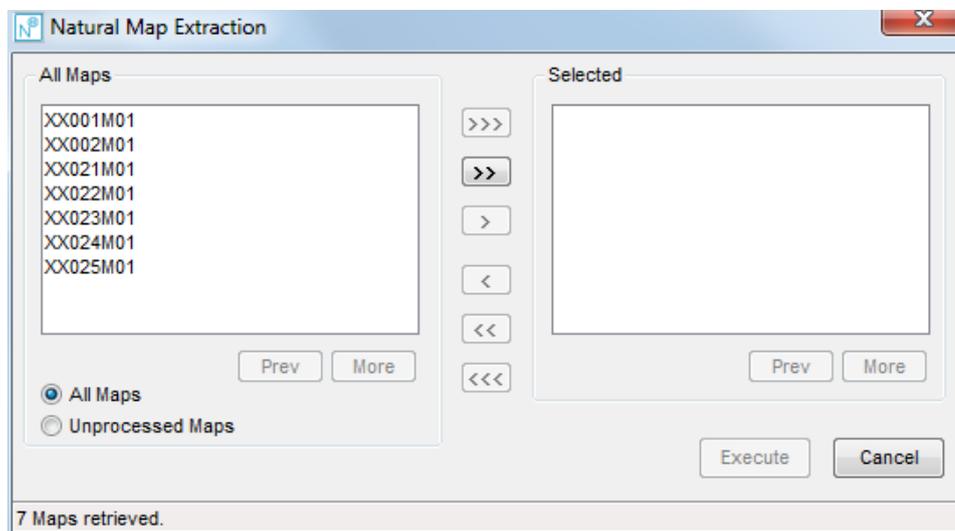


Figure 1-2 Natural Map Extraction screen

SCREEN ITEMS	DESCRIPTION
Map List	<p>List all the map objects within the currently selected application.</p> <p>The list of map objects can be tailored to your requirements using the options 'Change Start Position of Map List...' from the Map List context menu and the All Maps/Unprocessed Maps radio buttons.</p> <p>The Map List title reflects the map objects being listed and will append any reposition values that may have been specified.</p> <p>Map objects can be selected by using a double click with the left hand mouse button.</p> <p><i>Note: Any map objects listed that have already been processed will have an '*' (asterisk) appended to the right hand side of the map object name.</i></p>
Selected	<p>List all the map objects that have been selected for Natural Map Extraction processing.</p> <p><i>Note: At least one map object must be selected to run the Natural Map Extraction process.</i></p> <p>Map objects can be de-selected by using a double click with the left hand mouse button.</p>

BUTTON NAME	DESCRIPTION
Map List group:	
Prev	<p>Scrolls the map object list to previous page.</p> <p>This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.</p>
More	<p>Scrolls the map object list forward one page.</p> <p>This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.</p>
All Maps	If selected, then all processed and unprocessed map objects are listed.
Unprocessed Maps	If selected, then only the map objects that have not yet been processed are listed.

BUTTON NAME	DESCRIPTION
-------------	-------------

Selection / De-selection buttons:

>>>	Select all map objects in the map list (when more than one page is available, as set by the LISTBOXMAX parameter in the NATENG.INI file).
>>	Select all map objects on the current page in the map list.
>	Select all selected map objects in the map list.
<	De-select all selected map objects in the selected list.
<<	De-select all map objects on the current page in the selected list.
<<<	De-select all map objects in the selected list (when more than one page is available, as set by the LISTBOXMAX parameter in the NATENG.INI file).

Selected group:

Prev	Scrolls the selected list to previous page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.
More	Scrolls the selected list forward one page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.

Natural Map Extraction screen:

Execute	Invoke the Natural Map Extraction process for the selected map objects.
Cancel	Cancel any map object selection and return back to the Natural for Ajax conversion screen.

Note: For more information on the NATENG.INI file parameter LISTBOXMAX refer to Chapter 1 in the Natural Engineer Administration Guide for Windows manual.

STATUS BAR ITEM	DESCRIPTION
-----------------	-------------

Pane	Any Natural Map Extraction processing messages.
-------------	---

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Natural Engineer Advanced Services

Natural Map Extraction Context Menu

The Natural Map Extraction context menu is invoked by placing the cursor on any of the map objects listed in the Map list and using the right hand mouse button with a single click.

CONTEXT MENU ITEM	DESCRIPTION										
Change Start Position of Map List...	<p>Reposition the list of map objects to start from a particular map object name.</p> <p>The reposition value can be input using either a complete name or part name using an '*' (asterisk) wildcard.</p> <p>The reposition value is appended to the map list title to highlight the type of repositioning being applied.</p> <p>Possible reposition values are:</p> <table><thead><tr><th>Value</th><th>Result</th></tr></thead><tbody><tr><td>' ' (blank)</td><td>Reposition to the top of the map list.</td></tr><tr><td>*</td><td>Reposition to the top of the map list.</td></tr><tr><td>ABC*</td><td>Only show map objects that are prefixed by 'ABC'.</td></tr><tr><td>XYZ</td><td>Reposition to the first map object that either matches or is greater than 'XYZ' and then continue the map list from that point.</td></tr></tbody></table>	Value	Result	' ' (blank)	Reposition to the top of the map list.	*	Reposition to the top of the map list.	ABC*	Only show map objects that are prefixed by 'ABC'.	XYZ	Reposition to the first map object that either matches or is greater than 'XYZ' and then continue the map list from that point.
Value	Result										
' ' (blank)	Reposition to the top of the map list.										
*	Reposition to the top of the map list.										
ABC*	Only show map objects that are prefixed by 'ABC'.										
XYZ	Reposition to the first map object that either matches or is greater than 'XYZ' and then continue the map list from that point.										

Inline Map Extraction

The Inline Map Extraction option provides the facility to select programming objects that contain any inline INPUT or MAP statements, and convert them into Ajax compliant files.

The Ajax compliant files can then be used as Natural adapters to form the interface between the application code and the web page.

Inline Map Extraction Window

The Inline Map Extraction option is invoked by using the ‘Start Inline Map Extraction’ button on the Natural for Ajax Conversion Workflow screen.

The following Figure 1-3 illustrates the Inline Map Extraction screen.

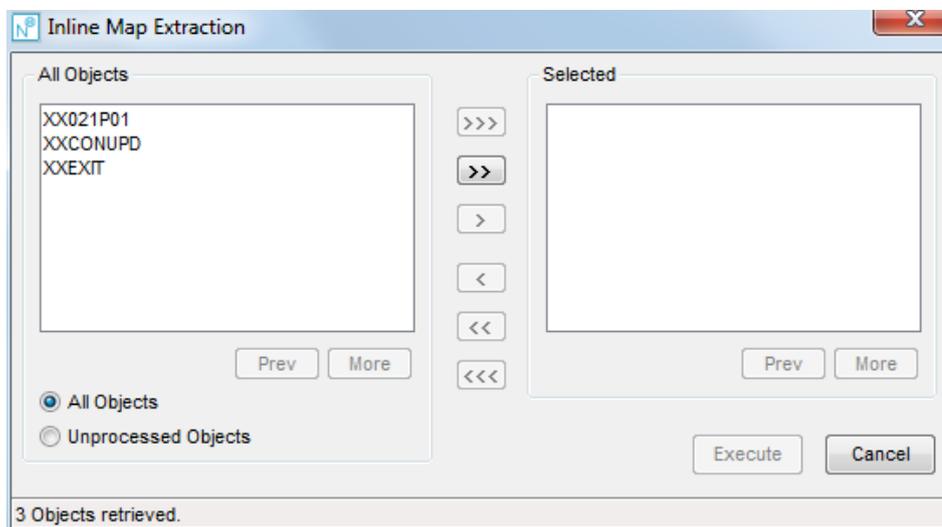


Figure 1-3 Inline Map Extraction screen

SCREEN ITEMS	DESCRIPTION
Object List	<p>List all the objects containing INPUT and/or MAP statements, within the currently selected application.</p> <p>The list of objects can be tailored to your requirements using the options 'Change Start Position of Object List...' from the Object List context menu and the All Objects/Unprocessed Objects radio buttons.</p> <p>The Object List title reflects the objects being listed and will append any reposition values that may have been specified.</p> <p>Objects can be selected by using a double click with the left hand mouse button.</p> <p><i>Note: Any objects listed that have already been processed will have an '*' (asterisk) appended to the right hand side of the object name.</i></p>
Selected	<p>List all the objects that have been selected for Inline Map Extraction processing.</p> <p><i>Note: At least one object must be selected to run the process.</i></p> <p>Objects can be de-selected by using a double click with the left hand mouse button.</p>

BUTTON NAME	DESCRIPTION
Object List group:	
Prev	<p>Scrolls the object list to previous page.</p> <p>This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.</p>
More	<p>Scrolls the object list forward one page.</p> <p>This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.</p>
All Objects	If selected, then all processed and unprocessed objects are listed.
Unprocessed Objects	If selected, then only the objects that have not yet been processed are listed.

BUTTON NAME	DESCRIPTION
-------------	-------------

Selection / De-selection buttons:

>>>	Select all objects in the object list (when more than one page is available, as set by the LISTBOXMAX parameter in the NATENG.INI file).
>>	Select all objects on the current page in the object list.
>	Select all selected objects in the object list.
<	De-select all selected objects in the selected list.
<<	De-select all objects on the current page in the selected list.
<<<	De-select all objects in the selected list (when more than one page is available, as set by the LISTBOXMAX parameter in the NATENG.INI file).

Selected group:

Prev	Scrolls the selected list to previous page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.
More	Scrolls the selected list forward one page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.

Inline Map Extraction screen:

Execute	Invoke the Inline Map Extraction process for the selected objects.
Cancel	Cancel any object selection and return back to the Natural for Ajax conversion screen.

Note: For more information on the NATENG.INI file parameter LISTBOXMAX refer to Chapter 1 in the Natural Engineer Administration Guide for Windows manual.

STATUS BAR ITEM	DESCRIPTION
-----------------	-------------

Pane	Any Inline Map Extraction processing messages.
-------------	--

Inline Map Extraction Context Menu

The Inline Map Extraction context menu is invoked by placing the cursor on any of the objects listed in the Object list and using the right hand mouse button with a single click.

CONTEXT MENU ITEM	DESCRIPTION										
Change Start Position of Object List...	<p>Reposition the list of objects to start from a particular object name.</p> <p>The reposition value can be input using either a complete name or part name using an '*' (asterisk) wildcard.</p> <p>The reposition value is appended to the object list title to highlight the type of repositioning being applied.</p> <p>Possible reposition values are:</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>' ' (blank)</td> <td>Reposition to the top of the object list.</td> </tr> <tr> <td>*</td> <td>Reposition to the top of the object list.</td> </tr> <tr> <td>ABC*</td> <td>Only show objects that are prefixed by 'ABC'.</td> </tr> <tr> <td>XYZ</td> <td>Reposition to the first object that either matches or is greater than 'XYZ' and then continue the object list from that point.</td> </tr> </tbody> </table>	Value	Result	' ' (blank)	Reposition to the top of the object list.	*	Reposition to the top of the object list.	ABC*	Only show objects that are prefixed by 'ABC'.	XYZ	Reposition to the first object that either matches or is greater than 'XYZ' and then continue the object list from that point.
Value	Result										
' ' (blank)	Reposition to the top of the object list.										
*	Reposition to the top of the object list.										
ABC*	Only show objects that are prefixed by 'ABC'.										
XYZ	Reposition to the first object that either matches or is greater than 'XYZ' and then continue the object list from that point.										

Cross-Reference to Adapters

The Cross-Reference to Adapters option provides the facility to create cross-reference data between the inline INPUT, MAP and INPUT USING MAP statements and their respective Adapters (map objects).

The Adapters can be selected either from the currently selected application or from any other applications by using the general selection option.

For INPUT USING MAP statements the user may use the supplied User Exit 4 (NEEUEX4) to generate the Adapter name. Typically the use exit would contain similar rules to that used to generate the Adapter name in Application Designer.

Note: The user exit module supplied is named 'NEEUEX4X' on the Natural Engineer SYSNEE library. This is to avoid overwriting any existing (modified) versions on the production SYSNEE library during Natural Engineer installation. If this user exit has not been loaded before, then it will need to be renamed to 'NEEUEX4' before making use of the User Exit functionality.

Cross-Reference to Adapters Window

The Cross Reference to Adapters option is invoked by using the ‘Start Cross Reference to Adapters’ button on the Natural for Ajax Conversion Workflow screen.

The following Figure 1-4 illustrates the Cross-Reference to Adapters screen.

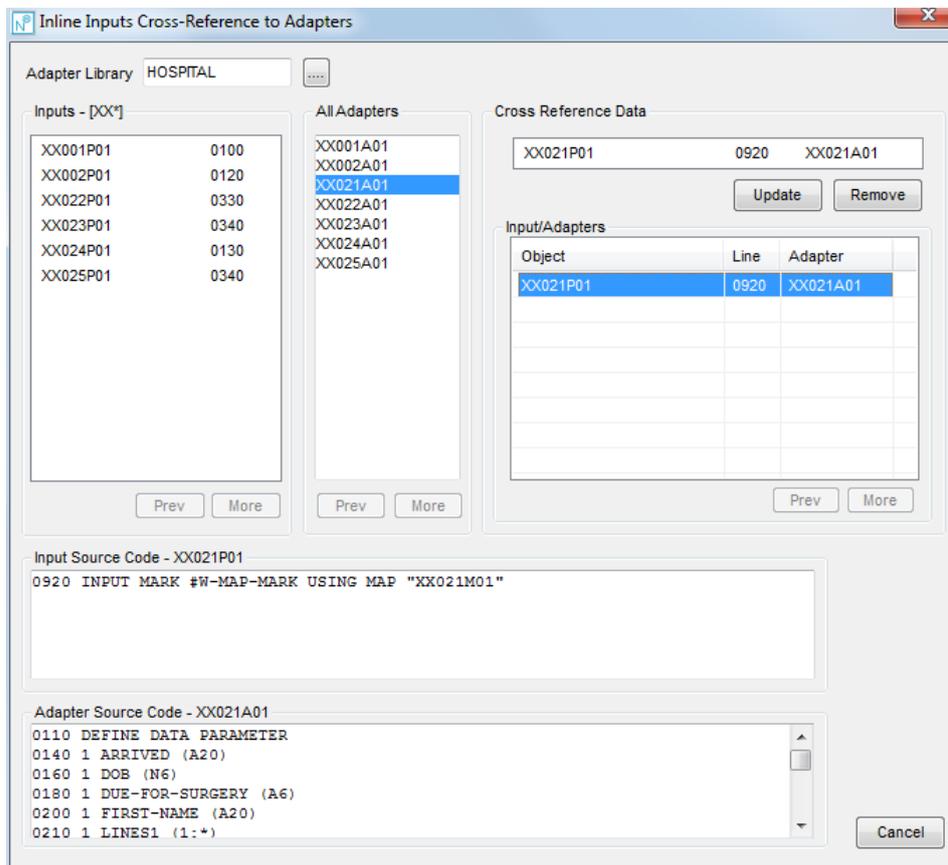


Figure 1-4 Cross-Reference to Adapters screen

SCREEN ITEMS	DESCRIPTION
Adapter Library	The name of the library from which the Adapter List is populated. <i>Note: The Adapter Library is synonymous with Natural libraries.</i>
All Inputs List	The list of objects containing inline INPUT, MAP or INPUT USING MAP statements found within the currently selected application. Statement Line numbers are also shown for each inline input. The list of Inputs can be tailored to your requirements using the options 'Change Start Position of Object List...' from the All Input List context menu.
Adapter List	List all the Adapter objects within the currently selected Adapter library. The list of Adapter objects can be tailored to your requirements using the options 'Change Start Position of Adapter List...' from the Adapter List context menu.
Cross Reference Data group:	
Object & Line Number	The name of the object and the line number for selected the INPUT or MAP statement.
Adapter Name	The name of the Adapter to be associated with the selected object and line number.
Input/Adapters	List of available object, line number and Adapter relationships.
Input Source Code	Displays all the relevant source code for the selected Inline Input. The name of the object containing the inline input will be appended to the Inline Input Source Code frame title.
Adapter Source Code	Displays all the relevant source code for the selected Adapter. The name of the selected adapter will be appended to the Adapter Source Code frame title.

BUTTON NAME	DESCRIPTION
Adapter Library Selection [....]	Invokes the General Selection screen, listing all the Natural Libraries. <i>Note: The Adapter Library is synonymous with Natural libraries.</i>

1

Natural Engineer Advanced Services

BUTTON NAME	DESCRIPTION
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Inline Inputs List group:

Prev	Scrolls the All Inputs object list to previous page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.
More	Scrolls the All Inputs object list forward one page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.

Adapters List group:

Prev	Scrolls the Adapters object list to previous page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.
More	Scrolls the Adapters object list forward one page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.

Cross Reference Data group:

Add/Update	Add or update cross reference data relationship.
Remove	Remove cross reference data relationship.
Prev	Scrolls the Input/Adapters list to previous page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.
More	Scrolls the Input/Adapters list forward one page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.

Cross-Reference to Adapters screen:

Cancel	Cancel the Cross-Reference to Adapters process and return back to the Natural for Ajax conversion screen.
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Note: For more information on the NATENG.INI file parameter LISTBOXMAX refer to Chapter 1 in the Natural Engineer Administration Guide for Windows manual.

Cross-Reference to Adapters Context Menus

The Cross-Reference to Adapters context menus are invoked by placing the cursor on any of the items listed in the All Inputs, Adapter or the Input/Adapters lists and using the right hand mouse button with a single click.

All Inputs List Context Menu

CONTEXT MENU ITEM	DESCRIPTION										
Change Start Position of Object List...	<p>Reposition the list of objects to start from a particular object name.</p> <p>The reposition value can be input using either a complete name or part name using an '*' (asterisk) wildcard.</p> <p>The reposition value is appended to the object list title to highlight the type of repositioning being applied.</p> <p>Possible reposition values are:</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>' ' (blank)</td> <td>Reposition to the top of the object list.</td> </tr> <tr> <td>*</td> <td>Reposition to the top of the object list.</td> </tr> <tr> <td>ABC*</td> <td>Only show objects that are prefixed by 'ABC'.</td> </tr> <tr> <td>XYZ</td> <td>Reposition to the first object that either matches or is greater than 'XYZ' and then continue the object list from that point.</td> </tr> </tbody> </table>	Value	Result	' ' (blank)	Reposition to the top of the object list.	*	Reposition to the top of the object list.	ABC*	Only show objects that are prefixed by 'ABC'.	XYZ	Reposition to the first object that either matches or is greater than 'XYZ' and then continue the object list from that point.
Value	Result										
' ' (blank)	Reposition to the top of the object list.										
*	Reposition to the top of the object list.										
ABC*	Only show objects that are prefixed by 'ABC'.										
XYZ	Reposition to the first object that either matches or is greater than 'XYZ' and then continue the object list from that point.										
View Source Code	Display the selected object source code in a browser.										

Adapter List Context Menu

CONTEXT MENU ITEM	DESCRIPTION										
Change Start Position of Adapter List...	<p>Reposition the list of Adapter objects to start from a particular Adapter object name.</p> <p>The reposition value can be input using either a complete name or part name using an '*' (asterisk) wildcard.</p> <p>The reposition value is appended to the Adapter list title to highlight the type of repositioning being applied.</p> <p>Possible reposition values are:</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>' ' (blank)</td> <td>Reposition to the top of the Adapter object list.</td> </tr> <tr> <td>*</td> <td>Reposition to the top of the Adapter object list.</td> </tr> <tr> <td>ABC*</td> <td>Only show Adapter objects that are prefixed by 'ABC'.</td> </tr> <tr> <td>XYZ</td> <td>Reposition to the first Adapter object that either matches or is greater than 'XYZ' and then continue the Adapter object list from that point.</td> </tr> </tbody> </table>	Value	Result	' ' (blank)	Reposition to the top of the Adapter object list.	*	Reposition to the top of the Adapter object list.	ABC*	Only show Adapter objects that are prefixed by 'ABC'.	XYZ	Reposition to the first Adapter object that either matches or is greater than 'XYZ' and then continue the Adapter object list from that point.
Value	Result										
' ' (blank)	Reposition to the top of the Adapter object list.										
*	Reposition to the top of the Adapter object list.										
ABC*	Only show Adapter objects that are prefixed by 'ABC'.										
XYZ	Reposition to the first Adapter object that either matches or is greater than 'XYZ' and then continue the Adapter object list from that point.										

Input/Adapters List Context Menu

CONTEXT MENU ITEM	DESCRIPTION										
Change Start Position of Input/Adapter List...	<p>Reposition the list of Input/Adapter objects to start from a particular Input/Adapter object name.</p> <p>The reposition value can be input using either a complete name or part name using an '*' (asterisk) wildcard.</p> <p>The reposition value is appended to the Input/Adapter list title to highlight the type of repositioning being applied.</p> <p>Possible reposition values are:</p> <table><thead><tr><th>Value</th><th>Result</th></tr></thead><tbody><tr><td>' ' (blank)</td><td>Reposition to the top of the Input/Adapter object list.</td></tr><tr><td>*</td><td>Reposition to the top of the Input/Adapter object list.</td></tr><tr><td>ABC*</td><td>Only show Input/Adapter objects that are prefixed by 'ABC'.</td></tr><tr><td>XYZ</td><td>Reposition to the first Input/Adapter object that either matches or is greater than 'XYZ' and then continue the Input/Adapter object list from that point.</td></tr></tbody></table>	Value	Result	' ' (blank)	Reposition to the top of the Input/Adapter object list.	*	Reposition to the top of the Input/Adapter object list.	ABC*	Only show Input/Adapter objects that are prefixed by 'ABC'.	XYZ	Reposition to the first Input/Adapter object that either matches or is greater than 'XYZ' and then continue the Input/Adapter object list from that point.
Value	Result										
' ' (blank)	Reposition to the top of the Input/Adapter object list.										
*	Reposition to the top of the Input/Adapter object list.										
ABC*	Only show Input/Adapter objects that are prefixed by 'ABC'.										
XYZ	Reposition to the first Input/Adapter object that either matches or is greater than 'XYZ' and then continue the Input/Adapter object list from that point.										

Code Conversion

The Code Conversion option provides the facility to select objects that contain any INPUT, INPUT USING MAP, REINPUT or MAP statements, and modify them to use the correct Natural for Ajax compliant code required by the new Adapters.

Certain types of statements are not modified as they are not compatible with Natural for Ajax. For example:

- INPUT with no literal or Map – assumes INPUT from STACK
- REINPUT USING HELP
- INPUT NO ERASE

When the Code Conversion is complete a window is shown which shows warning messages, manual intervention required and user information e.g., if an Adapter is not cross referenced to a statement or User Exit 4 is not used to generate the Adapter Names for a Natural Map then the statement is converted but with a default Adapter name. The user then needs to manually apply the correct Adapter to the code.

The modified objects are located in the Modification library.

Code Conversion Window

The Code Conversion option is invoked by using the 'Start Code Conversion' button on the Natural for Ajax Conversion Workflow screen.

The following Figure 1-5 illustrates the Code Conversion screen.

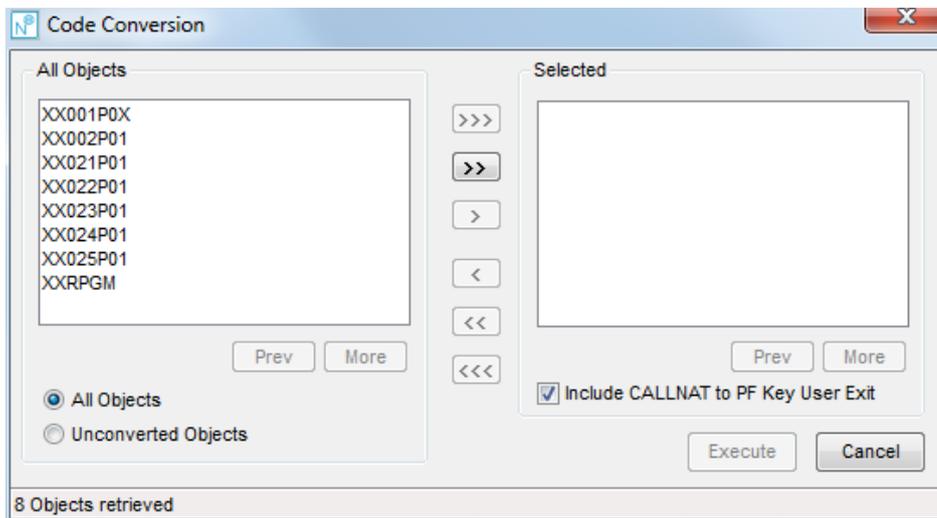


Figure 1-5 Code Conversion screen

SCREEN ITEMS	DESCRIPTION
Object List	<p>List all the objects containing INPUT and/or MAP statements, within the currently selected application.</p> <p>The list of objects can be tailored to your requirements using the options 'Change Start Position of Object List...' from the Object List context menu and the All Objects/Unconverted Objects radio buttons.</p> <p>The Object List title reflects the objects being listed and will append any reposition values that may have been specified.</p> <p>Objects can be selected by using a double click with the left hand mouse button.</p> <p><i>Note: Any objects listed that have already been processed will have an '*' (asterisk) appended to the right hand side of the object name.</i></p>
Selected	<p>List all the objects that have been selected for Code Conversion processing.</p> <p><i>Note: At least one object must be selected to run the process.</i></p> <p>Objects can be de-selected by using a double click with the left hand mouse button.</p>
BUTTON NAME	DESCRIPTION
Object List group:	
Prev	<p>Scrolls the object list to previous page.</p> <p>This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.</p>
More	<p>Scrolls the object list forward one page.</p> <p>This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.</p>
All Objects	If selected, then all processed and unconverted objects are listed.
Unconverted Objects	If selected, then only the objects that have not yet been processed are listed.

BUTTON NAME	DESCRIPTION
Selection / De-selection buttons:	
>>>	Select all objects in the object list (when more than one page is available, as set by the LISTBOXMAX parameter in the NATENG.INI file).
>>	Select all objects on the current page in the object list.
>	Select all selected objects in the object list.
<	De-select all selected objects in the selected list.
<<	De-select all objects on the current page in the selected list.
<<<	De-select all objects in the selected list (when more than one page is available, as set by the LISTBOXMAX parameter in the NATENG.INI file).
Selected group:	
Prev	Scrolls the selected list to previous page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.
More	Scrolls the selected list forward one page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.
Include CALLNAT to PF Key User Exit	When selected, the PF Key user exit will be included in the converted code.
Code Conversion screen:	
Execute	Invoke the Code Conversion process for the selected objects.
Cancel	Cancel any object selection and return back to the Natural for Ajax conversion screen.

Note: For more information on the NATENG.INI file parameter LISTBOXMAX refer to Chapter 1 in the Natural Engineer Administration Guide for Windows manual.

STATUS BAR ITEM	DESCRIPTION
Pane	Any Code Conversion processing messages.

Code Conversion Context Menu

The Code Conversion context menu is invoked by placing the cursor on any of the objects listed in the Object list and using the right hand mouse button with a single click.

CONTEXT MENU ITEM	DESCRIPTION										
Change Start Position of Object List...	<p>Reposition the list of objects to start from a particular object name.</p> <p>The reposition value can be input using either a complete name or part name using an '*' (asterisk) wildcard.</p> <p>The reposition value is appended to the object list title to highlight the type of repositioning being applied.</p> <p>Possible reposition values are:</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>' ' (blank)</td> <td>Reposition to the top of the object list.</td> </tr> <tr> <td>*</td> <td>Reposition to the top of the object list.</td> </tr> <tr> <td>ABC*</td> <td>Only show objects that are prefixed by 'ABC'.</td> </tr> <tr> <td>XYZ</td> <td>Reposition to the first object that either matches or is greater than 'XYZ' and then continue the object list from that point.</td> </tr> </tbody> </table>	Value	Result	' ' (blank)	Reposition to the top of the object list.	*	Reposition to the top of the object list.	ABC*	Only show objects that are prefixed by 'ABC'.	XYZ	Reposition to the first object that either matches or is greater than 'XYZ' and then continue the object list from that point.
Value	Result										
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XYZ	Reposition to the first object that either matches or is greater than 'XYZ' and then continue the object list from that point.										

REFACTORING

Chapter Overview

This chapter describes the Refactoring option available from the Advanced Services menu. Refactoring is used to reorganize the internal structure of a Natural application.

The topics covered are:

1. [Preparation](#)
2. [Componentization](#)
3. [Database Split](#)

Preparation Tasks

The Refactoring Preparation screen is used to control and initiate all the tasks required to prepare the Natural application for the subsequent Refactoring processes.

Tasks are grouped into two categories:

1. **Mandatory**

These tasks must be performed before progressing to the next Refactoring phase.

2. **Optional**

These tasks are optional and provide the facility to review and apply further refinements to the application. For example, identify redundant source code and remove it from the application to improve the maintainability of the refactored application.

Preparation Tasks Screen

The Preparation Tasks screen shows all the mandatory and optional tasks available to prepare a Natural application for future Refactoring processes. The tasks are organized into three pages and can be navigated using the 'Previous' and 'Next' buttons.

The Preparation Tasks screen is accessed by using the following menu navigation: Advanced Services → Refactoring → Preparation from the main Natural Engineer screen.

The following Figure 2-1 illustrates the Refactoring - Preparation Tasks screen showing the mandatory tasks.

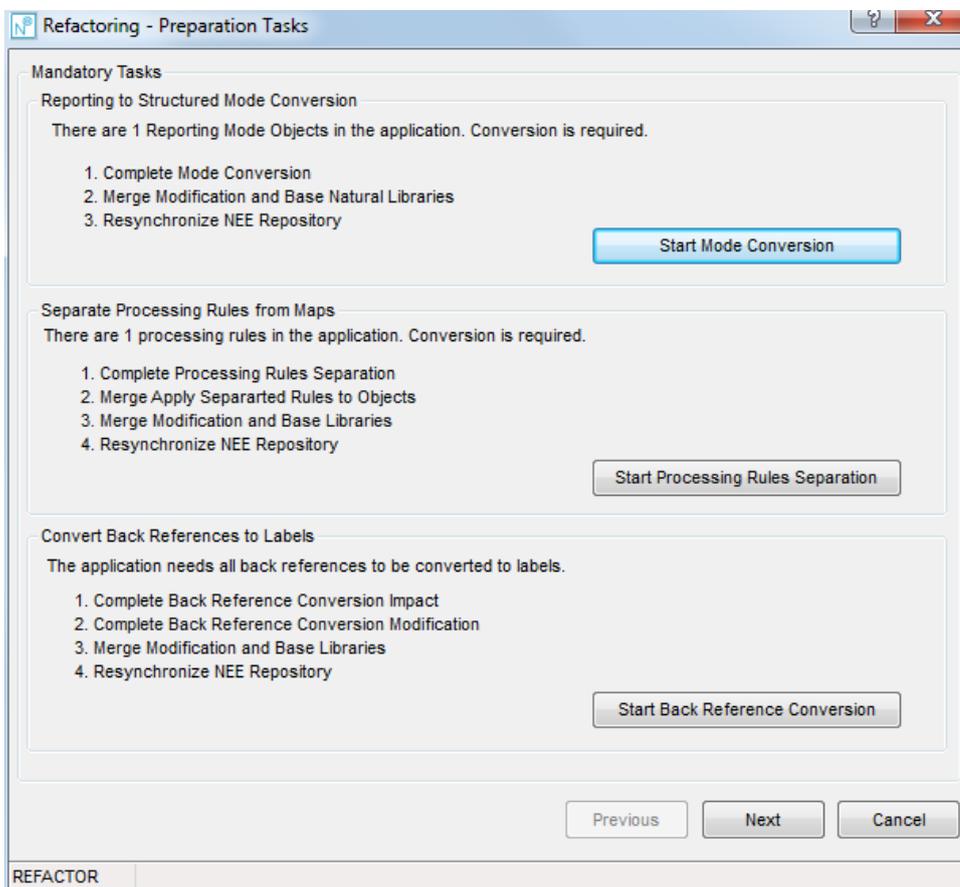


Figure 2-1 Refactoring - Preparation Tasks screen showing the mandatory tasks

2

Natural Engineer Advanced Services

The following Figure 2-2 illustrates the Refactoring - Preparation Tasks screen showing optional tasks.

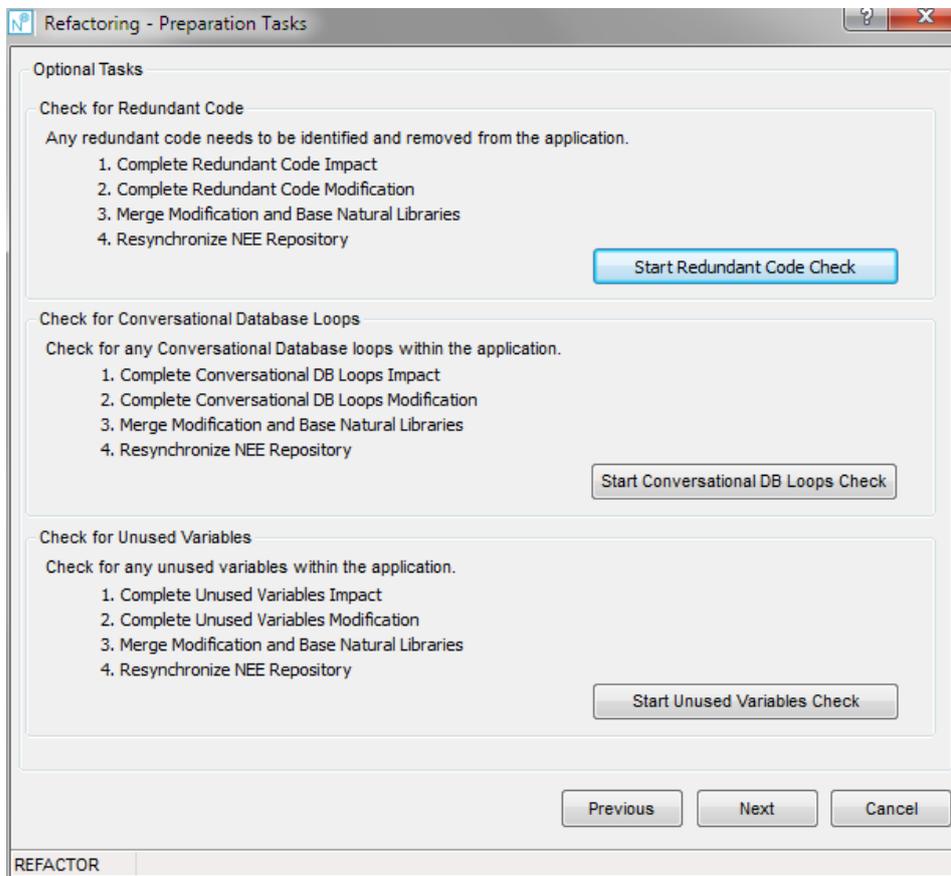


Figure 2-2 Refactoring - Preparation Tasks screen showing optional tasks

The following Figure 2-3 illustrates the Refactoring – Preparation Tasks screen showing further optional tasks.

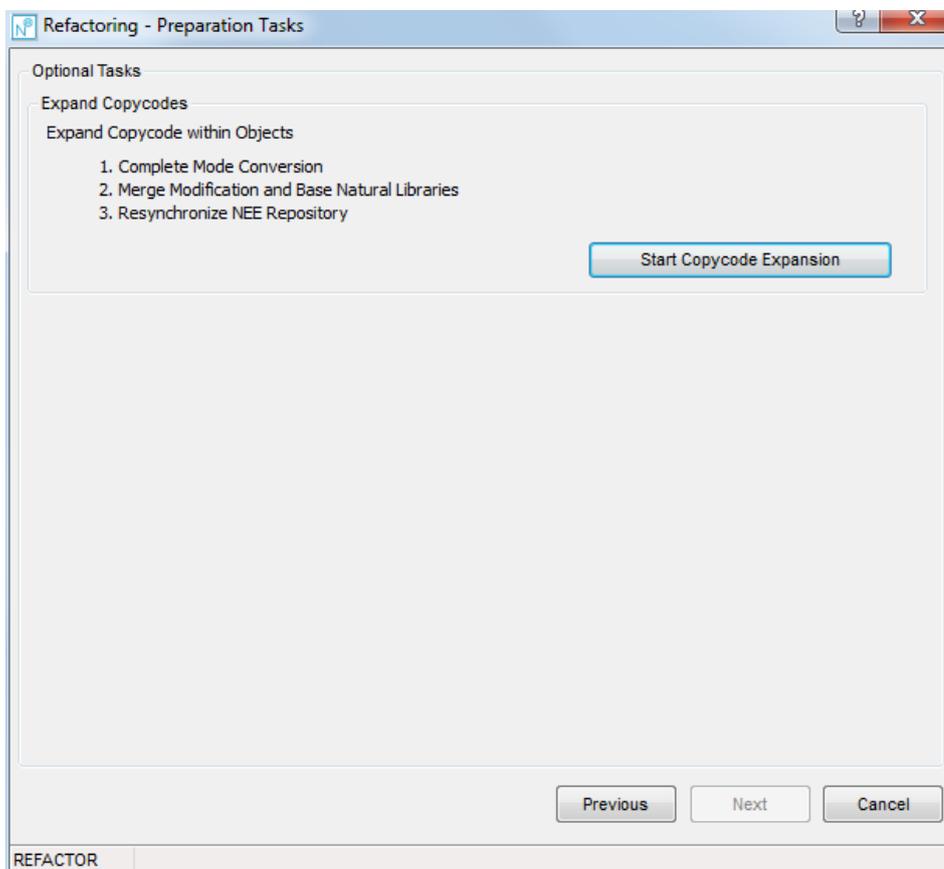


Figure 2-3 Refactoring – Preparation Tasks screen showing further optional tasks

Preparation Tasks Processes

This chapter describes the individual Refactoring processes available to prepare a Natural application for subsequent Refactoring processes. The topics covered are:

- [Reporting to Structured Mode Conversion](#)
- [Separate Processing Rules from Maps](#)
- [Convert Back References to Labels](#)
- [Check for Redundant Code](#)
- [Check for Conversational Database Loops](#)
- [Check for Unused Variables](#)
- [Expand Copycodes](#)

Reporting to Structured Mode Conversion

The Reporting to Structured Mode Conversion task is mandatory and should be the first task performed under the Refactoring Preparation Tasks.

The Reporting to Structured Mode Conversion task is invoked by using the 'Start Mode Conversion' button on the Refactoring Preparation Tasks screen.

This will invoke the Mode Conversion process, which will convert all Natural Reporting mode objects into Natural Structured mode objects.

Note: For more information on the Mode Conversion process, refer to Chapter 3 in the Natural Engineer Utilities for Windows manual.

Separate Processing Rules from Maps

The Separate Processing Rules from Maps task is mandatory and should be the second task performed under the Refactoring Preparation Tasks.

The Separate Processing Rules from Maps task is invoked by using the ‘Start Processing Rules Separation’ button on the Refactoring Preparation Tasks screen.

This will invoke the Separate Processing Rules from Maps process, which will identify any in-line processing rules, separate them from their respective maps and generate new subprograms containing the processing rules. Existing calling objects for each map are then modified to reference the new processing rules subprograms.

Processing Rule Separation Screen

The Processing Rule Separation screen provides all the options required to separate the in-line processing rules from maps into new subprograms, apply modification to the map calling objects to reference the new processing rules subprograms and restart the Processing Rule Separation process.

The Processing Rule Separation screen is accessed by using the 'Start Processing Rules Separation' button from the Refactoring Preparation Tasks screen.

The following Figure 2-4 illustrates the Processing Rule Separation screen.

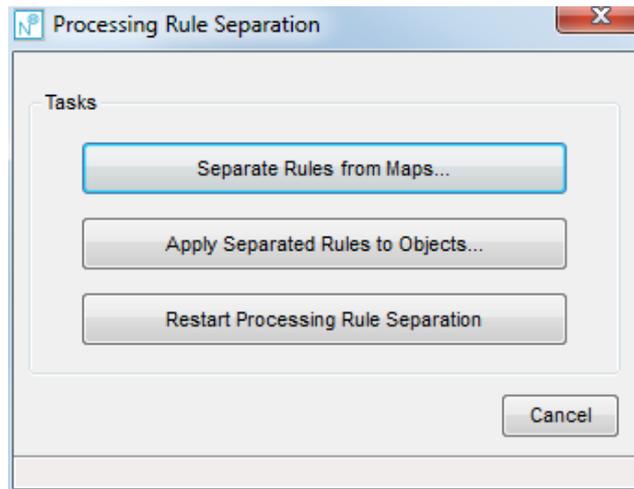


Figure 2-4 Processing Rule Separation screen

2

Natural Engineer Advanced Services

BUTTON NAME	DESCRIPTION
Separate Rules from Maps...	Invoke the Separate Rules from Maps process. <i>Note: For more information refer to the section Separate Rules from Maps Screen.</i>
Apply Separated Rules to Objects...	Invoke the Apply Separated Rules to Objects process. <i>Note: For more information refer to the section Apply Separated Rules to Objects Screen.</i>
Restart Processing Rule Separation	Restart the Processing Rule Separation process. <i>Note: For more information refer to the section Restart Processing Rule Separation.</i>
Cancel	Cancel the Processing Rule Separation process and return back to the main Natural Engineer screen.

STATUS BAR ITEM	DESCRIPTION
Pane	Any Processing Rule Separation processing messages.

Separate Rules from Maps Screen

The Separate Rules from Maps screen allows you to select the map objects from which the processing rules will be separated.

The Separate Rules from Maps screen is accessed by using the ‘Separate Rules from Maps...’ button from the Processing Rule Separation screen.

The following Figure 2-5 illustrates the Separate Rules from Maps screen.

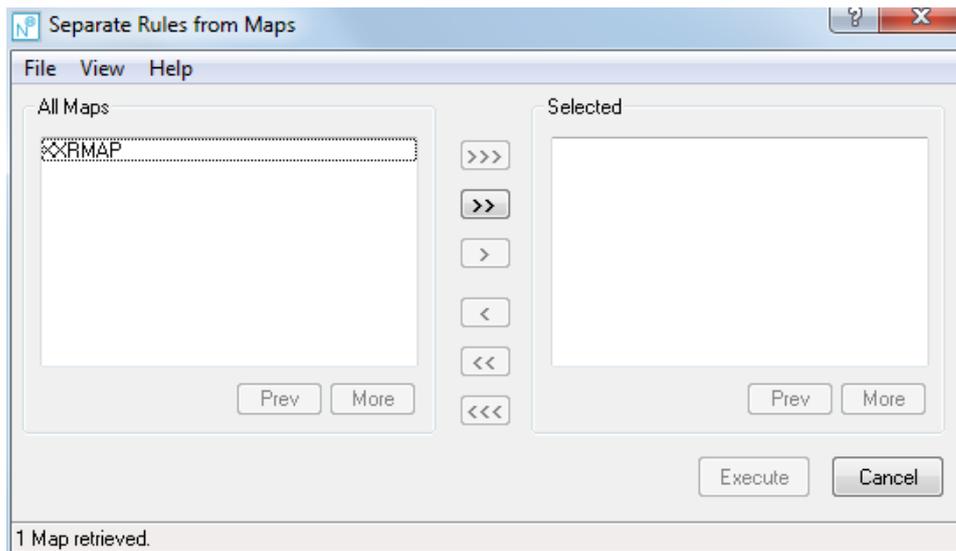


Figure 2-5 Separate Rules from Maps screen

MENU ITEMS	OPTIONS	DESCRIPTION										
File	Exit	Exit the Separate Rules from Maps screen and return back to the Processing Rule Separation screen.										
View	Change Start Position of Map List...	<p>Reposition the list of map objects to start from a particular map object name.</p> <p>The reposition value can be input using either a complete name or part name using an '*' (asterisk) wildcard.</p> <p>The reposition value is appended to the map list title to highlight the type of repositioning being applied.</p> <p>Possible reposition values are:</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>' ' (blank)</td> <td>Reposition to the top of the map list.</td> </tr> <tr> <td>*</td> <td>Reposition to the top of the map list.</td> </tr> <tr> <td>ABC*</td> <td>Only show map objects that are prefixed by 'ABC'.</td> </tr> <tr> <td>XYZ</td> <td>Reposition to the first map object that either matches or is greater than 'XYZ' and then continue the map list from that point.</td> </tr> </tbody> </table>	Value	Result	' ' (blank)	Reposition to the top of the map list.	*	Reposition to the top of the map list.	ABC*	Only show map objects that are prefixed by 'ABC'.	XYZ	Reposition to the first map object that either matches or is greater than 'XYZ' and then continue the map list from that point.
Value	Result											
' ' (blank)	Reposition to the top of the map list.											
*	Reposition to the top of the map list.											
ABC*	Only show map objects that are prefixed by 'ABC'.											
XYZ	Reposition to the first map object that either matches or is greater than 'XYZ' and then continue the map list from that point.											
	View Unprocessed Maps Only	<p>Change the list of map objects displayed in the Map List.</p> <p>If checked (indicated by a tick to the left) then only the map objects that have not yet been processed are listed.</p> <p>If unchecked (no tick) then all processed and unprocessed map objects are listed.</p>										
Help		Invoke the Separate Rules from Maps help.										

SCREEN ITEMS	DESCRIPTION
Map List	<p>List all the map objects with processing rules used by the currently selected application.</p> <p>The list of map objects can be tailored to your requirements using the options 'Change Start Position of Map List...' and 'View Unprocessed Maps Only' from the View menu.</p> <p>The Map List title reflects the map objects being listed and will append any reposition values that may have been specified.</p> <p>Map objects can be selected by using a double click with the left hand mouse button.</p> <p><i>Note: Any map objects listed that have already been processed will have an '*' (asterisk) appended to the right hand side of the map object name.</i></p>
Selected	<p>List all the map objects that have been selected for Separate Rules from Maps processing.</p> <p><i>Note: At least one map object must be selected to run the separation.</i></p> <p>Map objects can be de-selected by using a double click with the left hand mouse button.</p>

BUTTON NAME	DESCRIPTION
Map List group:	
Prev	<p>Scrolls the map object list to previous page.</p> <p>This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.</p>
More	<p>Scrolls the map object list forward one page.</p> <p>This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.</p>

BUTTON NAME	DESCRIPTION
-------------	-------------

Selection / De-selection buttons:

>>>	Select all map objects in the map list (when more than one page is available, as set by the LISTBOXMAX parameter in the NATENG.INI file).
>>	Select all map objects on the current page in the map list.
>	Select all selected map objects in the map list.
<	De-select all selected map objects in the selected list.
<<	De-select all map objects on the current page in the selected list.
<<<	De-select all map objects in the selected list (when more than one page is available, as set by the LISTBOXMAX parameter in the NATENG.INI file).

Selected group:

Prev	Scrolls the selected list to previous page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.
More	Scrolls the selected list forward one page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.

Separate Rules from Maps screen:

Execute	Invoke the Separate Rules from Maps process for the selected map objects.
Cancel	Cancel any map object selection and return back to the Processing Rule Separation screen.

Note: For more information on the NATENG.INI file parameter LISTBOXMAX refer to Chapter 1 in the Natural Engineer Administration Guide for Windows manual.

STATUS BAR ITEM	DESCRIPTION
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Pane	Any Separate Rules from Maps processing messages.
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Apply Separated Rules to Objects Screen

The Apply Separated Rules to Objects screen allows you to select the objects referencing the map objects from which the processing rules have been separated.

These will then be modified to call the new processing rules subprograms.

Note: After applying the separated rules to objects, copy the PDA object NEEMSG-A from the Natural library SYSNEE to the Modification library. This is a mandatory PDA containing the required parameters used by the modified map calling objects.

The Apply Separated Rules to Objects screen is accessed by using the 'Apply Separated Rules to Objects ...' button from the Processing Rule Separation screen.

The following Figure 2-6 illustrates the Apply Separated Rules to Objects screen.



Figure 2-6 Apply Separated Rules to Objects screen

MENU ITEMS	OPTIONS	DESCRIPTION										
File	Exit	Exit the Apply Separated Rules to Objects screen and return back to the Processing Rule Separation screen.										
View	Change Start Position of Object List...	<p>Reposition the list of objects to start from a particular object name.</p> <p>The reposition value can be input using either a complete name or part name using an '*' (asterisk) wildcard.</p> <p>The reposition value is appended to the object list title to highlight the type of repositioning being applied.</p> <p>Possible reposition values are:</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>' ' (blank)</td> <td>Reposition to the top of the object list.</td> </tr> <tr> <td>*</td> <td>Reposition to the top of the object list.</td> </tr> <tr> <td>ABC*</td> <td>Only show objects that are prefixed by 'ABC'.</td> </tr> <tr> <td>XYZ</td> <td>Reposition to the first object that either matches or is greater than 'XYZ' and then continue the object list from that point.</td> </tr> </tbody> </table>	Value	Result	' ' (blank)	Reposition to the top of the object list.	*	Reposition to the top of the object list.	ABC*	Only show objects that are prefixed by 'ABC'.	XYZ	Reposition to the first object that either matches or is greater than 'XYZ' and then continue the object list from that point.
Value	Result											
' ' (blank)	Reposition to the top of the object list.											
*	Reposition to the top of the object list.											
ABC*	Only show objects that are prefixed by 'ABC'.											
XYZ	Reposition to the first object that either matches or is greater than 'XYZ' and then continue the object list from that point.											
	View Unprocessed Objects Only	<p>Change the list of objects displayed in the Object List.</p> <p>If checked (indicated by a tick to the left) then only the objects that have not yet been processed are listed.</p> <p>If unchecked (no tick) then all processed and unprocessed objects are listed.</p>										
Object Types		<p>Allows you to select the types of object to be listed.</p> <p>Available selections are:</p> <ul style="list-style-type: none"> ▪ All Objects ▪ Helproutines ▪ Programs ▪ Subprograms ▪ Subroutines 										
Help		Invoke the Apply Separated Rules to Objects help.										

SCREEN ITEMS	DESCRIPTION
Object List	<p>List all the objects referencing maps with processing rules used by the currently selected application.</p> <p>The list of objects can be tailored to your requirements using the options available in the Object Types menu. Further refinement can be made using the options 'Change Start Position of Object List...' and 'View Unprocessed Objects Only' from the View menu.</p> <p>The Object List title reflects the objects being listed and will append any reposition values that may have been specified.</p> <p>Objects can be selected by using a double click with the left hand mouse button.</p> <p><i>Note: Any objects listed that have already been processed will have an '*' (asterisk) appended to the right hand side of the object name.</i></p>
Selected	<p>List all the objects that have been selected for Apply Separated Rules to Objects processing.</p> <p><i>Note: At least one object must be selected to run the process.</i></p> <p>Objects can be de-selected by using a double click with the left hand mouse button.</p>

BUTTON NAME	DESCRIPTION
Object List group:	
Prev	<p>Scrolls the object list to previous page.</p> <p>This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.</p>
More	<p>Scrolls the object list forward one page.</p> <p>This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.</p>

BUTTON NAME	DESCRIPTION
-------------	-------------

Selection / De-selection buttons:

>>>	Select all objects in the object list (when more than one page is available, as set by the LISTBOXMAX parameter in the NATENG.INI file).
>>	Select all objects on the current page in the object list.
>	Select all selected objects in the object list.
<	De-select all selected objects in the selected list.
<<	De-select all objects on the current page in the selected list.
<<<	De-select all objects in the selected list (when more than one page is available, as set by the LISTBOXMAX parameter in the NATENG.INI file).

Selected group:

Prev	Scrolls the selected list to previous page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.
More	Scrolls the selected list forward one page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.

Apply Separated Rules to Objects screen:

Execute	Invoke the Apply Separated Rules to Objects process for the selected map objects.
Cancel	Cancel any object selection and return back to the Processing Rule Separation screen.

Note: For more information on the NATENG.INI file parameter LISTBOXMAX refer to Chapter 1 in the Natural Engineer Administration Guide for Windows manual.

STATUS BAR ITEM	DESCRIPTION
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Pane	Any Apply Separated Rules to Objects processing messages.
-------------	---

Restart Processing Rule Separation

The Restart Processing Rule Separation option will delete any internal cross-reference records created by the Separate Rules from Maps process.

Any modified objects generated by the Apply Separated Rules to Objects will not be deleted from the Modification library. This needs to be done manually.

When this option is selected, a warning screen is displayed providing the facility to either proceed with the restart or cancel it.

The following Figure 2-7 illustrates the Restart Processing Rule Separation warning screen.

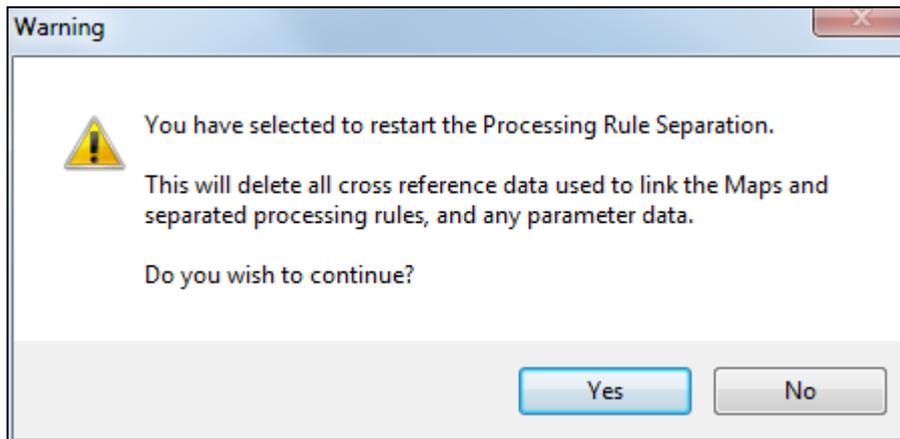


Figure 2-7 Restart Processing Rule Separation warning screen

Convert Back References to Labels

The Convert Back References to Labels task is mandatory and should be the third task performed under the Refactoring Preparation tasks.

The Convert Back References to Labels task is invoked by using the 'Start Back Reference Conversion' button on the Refactoring Preparation Tasks screen.

This will invoke the Convert Back References to Labels process, which uses the Impact Analysis function within Natural Engineer, using the combination search keyword REFACTORING with sub criteria 'Convert Back References to Labels'.

Impact Analysis will look for any numeric back references which can be converted to labels.

After the Impact results have been reviewed, the Modification function within Natural Engineer can be used to convert any numeric back references to use the new labels.

Convert Back References to Labels Impact Analysis

The Convert Back References to Labels Impact Analysis is invoked by using the ‘Start Back Reference Conversion’ button from the Refactoring Preparation Tasks screen.

This will invoke the Impact Analysis function, where an Impact Version and Impact Criteria need to be specified.

The Impact Criteria are specified by selecting the combination search keyword REFACTORING, this will invoke the Refactoring Preferences screen where the ‘Convert Back References to Labels’ option can be selected.

The following Figure 2-8 illustrates the Refactoring Preferences screen with Convert Back References to Labels option specified.

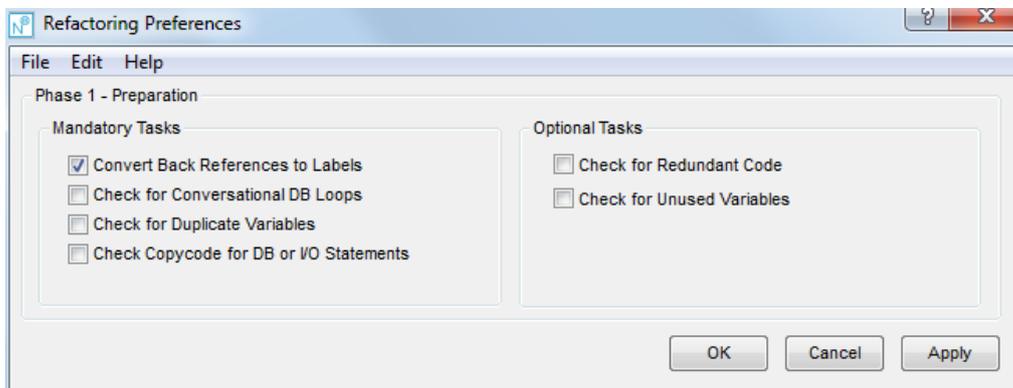


Figure 2-8 Refactoring Preferences screen for Convert Back References to Labels

Note: For more information about the combination search keyword REFACTORING refer to Chapter 3 in the Natural Engineer Application Analysis & Modification for Windows manual.

After specifying the Impact criteria, run the Impact Analysis using the menu option Analysis → Impact Execution accessed from the main Natural Engineer screen.

2

Natural Engineer Advanced Services

Convert Back References to Labels Modification

After reviewing the Impact results, the impacted objects can be modified using the Modification function accessed using the menu option Modification → Execute Modification for All Objects.

The modified objects can be found in the Modification library.

Note: For more information about the Modification function refer to Chapter 2 in the Natural Engineer Application Analysis & Modification for Windows manual.

Check for Redundant Code

The Check for Redundant Code task is optional.

The Check for Redundant Code task is invoked by using the 'Start Redundant Code Check' button on the Refactoring Preparation Tasks screen.

This will invoke the Check for Redundant Code process, which uses the Impact Analysis function within Natural Engineer, using the combination search keyword REFACTORING with sub criteria 'Check for Redundant Code'.

Impact Analysis will look for any unused source code lines within programming objects within the Natural application. Impacts are only made for Structured mode objects.

After the Impact results have been reviewed, manual modification will need to be applied to the impacted objects. No automated Modification is available for this option.

Check for Redundant Code Impact Analysis

The Check for Redundant Code Impact Analysis is invoked by using the ‘Start Redundant Code Check’ button from the Refactoring Preparation Tasks screen.

This will invoke the Impact Analysis function, where an Impact Version and Impact Criteria need to be specified.

The Impact Criteria are specified by selecting the combination search keyword REFACTORING, this will invoke the Refactoring Preferences screen where the ‘Check for Redundant Code’ option can be selected.

The following Figure 2-9 illustrates the Refactoring Preferences screen with Check for Redundant Code option specified.

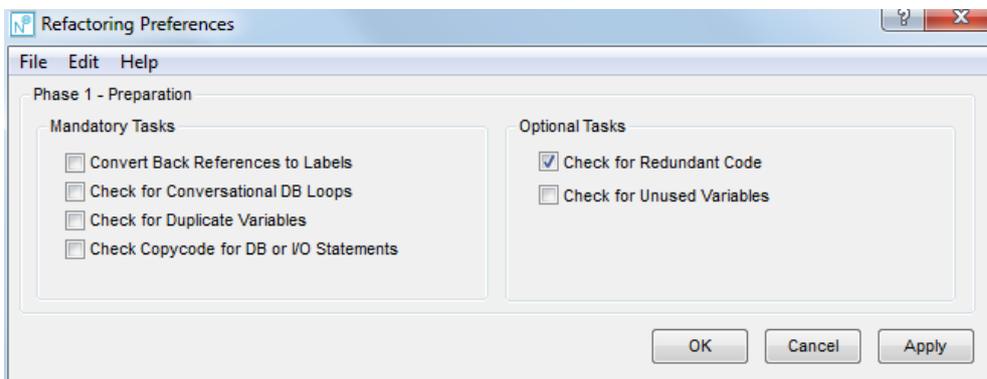


Figure 2-9 Refactoring Preferences screen for Check for Redundant Code

Note: For more information about the combination search keyword REFACTORING refer to Chapter 3 in the Natural Engineer Application Analysis & Modification for Windows manual.

After specifying the Impact criteria, run the Impact Analysis using the menu option Analysis → Impact Execution accessed from the main Natural Engineer screen.

Check for Redundant Code Modification

After reviewing the Impact results, the impacted objects need to be modified manually as Natural Engineer does not apply automatic modification for this option.

The modified objects can be found in the Modification library.

Note: For more information about the Modification function refer to Chapter 2 in the Natural Engineer Application Analysis & Modification for Windows manual.

Check for Conversational Database Loops

The Check for Conversational Database Loops task is optional.

The Check for Conversational Database Loops task is invoked by using the 'Start Conversational DB Loops Check' button on the Refactoring Preparation Tasks screen.

This will invoke the Check for Conversational Database Loops process, which uses the Impact Analysis function within Natural Engineer, using the combination search keyword REFACTORING with sub criteria 'Check for Conversational DB Loops'.

Impact Analysis will look for any screen I/O statements within database processing loops.

After the Impact results have been reviewed, manual modification will need to be applied to the impacted objects. No automated Modification is available for this option.

Check for Conversational Database Loops Impact Analysis

The Check for Conversational Database Loops Impact Analysis is invoked by using the 'Start Conversational DB Loops Check' button from the Refactoring Preparation Tasks screen.

This will invoke the Impact Analysis function, where an Impact Version and Impact Criteria need to be specified.

The Impact Criteria are specified by selecting the combination search keyword REFACTORING, this will invoke the Refactoring Preferences screen where the 'Check for Conversational DB Loops' option can be selected.

The following Figure 2-10 illustrates the Refactoring Preferences screen with Check for Conversational DB Loops option specified.

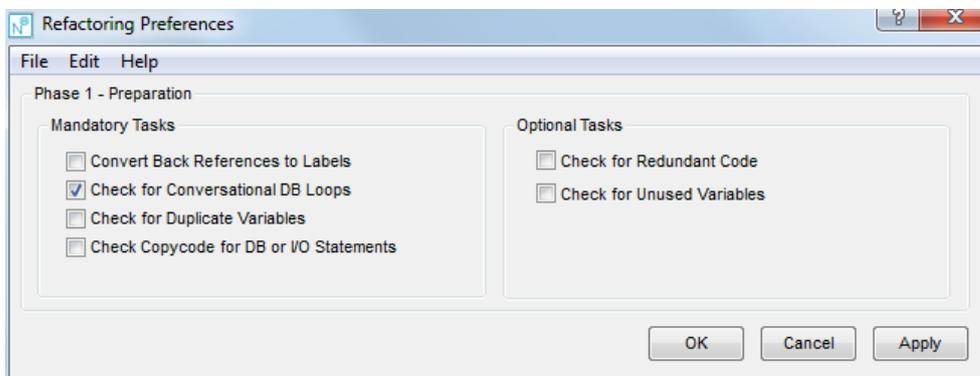


Figure 2-10 Refactoring Preferences screen for Check for Conversational DB Loops

Note: For more information about the combination search keyword REFACTORING refer to Chapter 3 in the Natural Engineer Application Analysis & Modification for Windows manual.

After specifying the Impact criteria, run the Impact Analysis using the menu option Analysis → Impact Execution accessed from the main Natural Engineer screen.

2

Natural Engineer Advanced Services

Check for Conversational Database Loops Modification

After reviewing the Impact results, the impacted objects need to be modified manually as Natural Engineer does not apply automatic modification for this option.

The modified objects can be found in the Modification library.

Note: For more information about the Modification function refer to Chapter 2 in the Natural Engineer Application Analysis & Modification for Windows manual.

Check for Unused Variables

The Check for Unused Variables task is optional.

The Check for Unused Variables task is invoked by using the ‘Start Unused Variables Check’ button on the Refactoring Preparation Tasks screen.

This will invoke the Check for Unused Variables process, which uses the Impact Analysis function within Natural Engineer, using the combination search keyword REFACTORING with sub criteria ‘Check for Unused Variables’.

Impact Analysis will look for any unused user-defined or logical view variables.

After the Impact results have been reviewed, the Modification function within Natural Engineer can be used to comment out any unused variables.

Check for Unused Variables Impact Analysis

The Check for Unused Variables Impact Analysis is invoked by using the ‘Start Unused Variables Check’ button from the Refactoring Preparation Tasks screen.

This will invoke the Impact Analysis function, where an Impact Version and Impact Criteria need to be specified.

The Impact Criteria are specified by selecting the combination search keyword REFACTORING, this will invoke the Refactoring Preferences screen where the ‘Check for Conversational DB Loops’ option can be selected.

The following Figure 2-11 illustrates the Refactoring Preferences screen with Check for Unused Variables option specified.

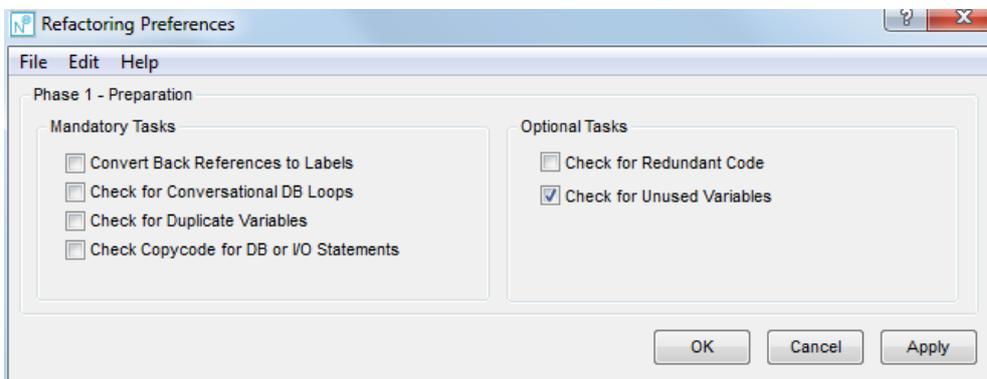


Figure 2-11 Refactoring Preferences screen for Check for Unused Variables

Note: For more information about the combination search keyword REFACTORING refer to Chapter 3 in the Natural Engineer Application Analysis & Modification for Windows manual.

After specifying the Impact criteria, run the Impact Analysis using the menu option Analysis→Impact Execution accessed from the main Natural Engineer screen or by selecting Execute on the Advanced Options Impact screen.

Check for Unused Variables Modification

After reviewing the Impact results, the impacted objects can be modified using the Modification function accessed using the menu option Modification → Execute Modification for All Objects.

The modified objects can be found in the Modification library.

Note: For more information about the Modification function refer to Chapter 2 in the Natural Engineer Application Analysis & Modification for Windows manual.

Expand Copycodes

The Expand Copycodes task is optional.

The Expand Copycodes task is invoked by using the 'Start Copycode Expansion' button on the Refactoring Preparation Tasks screen.

This will invoke the Expand Copycodes process, which provides the facility to select the objects within an application that use copycodes, to have the copycodes expanded within the objects.

Exclusions can be specified to prevent unwanted expansion of copycodes.

Copycode Expansion Screen

The Copycode Expansion screen allows you to select the objects within an application containing copycodes, to apply the necessary modification to expand the copycode within them.

The Copycode Expansion screen is accessed by using the ‘Start Copycode Expansion’ button from the Refactoring Preparation Tasks screen.

The following Figure 2-12 illustrates the Copycode Expansion screen.

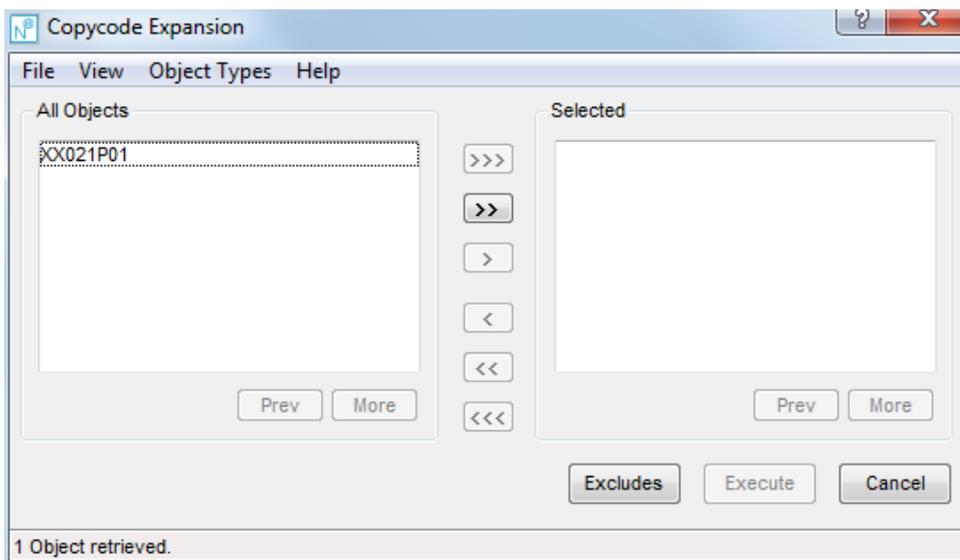


Figure 2-12 Copycode Expansion screen

MENU ITEMS	OPTIONS	DESCRIPTION										
File	Exit	Exit the Copycode Expansion screen and return back to the Refactoring Preparation Tasks screen.										
View	Change Start Position of Object List...	<p>Reposition the list of objects to start from a particular object name.</p> <p>The reposition value can be input using either a complete name or part name using an '*' (asterisk) wildcard.</p> <p>The reposition value is appended to the object list title to highlight the type of repositioning being applied.</p> <p>Possible reposition values are:</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>' ' (blank)</td> <td>Reposition to the top of the object list.</td> </tr> <tr> <td>*</td> <td>Reposition to the top of the object list.</td> </tr> <tr> <td>ABC*</td> <td>Only show objects that are prefixed by 'ABC'.</td> </tr> <tr> <td>XYZ</td> <td>Reposition to the first object that either matches or is greater than 'XYZ' and then continue the object list from that point.</td> </tr> </tbody> </table>	Value	Result	' ' (blank)	Reposition to the top of the object list.	*	Reposition to the top of the object list.	ABC*	Only show objects that are prefixed by 'ABC'.	XYZ	Reposition to the first object that either matches or is greater than 'XYZ' and then continue the object list from that point.
Value	Result											
' ' (blank)	Reposition to the top of the object list.											
*	Reposition to the top of the object list.											
ABC*	Only show objects that are prefixed by 'ABC'.											
XYZ	Reposition to the first object that either matches or is greater than 'XYZ' and then continue the object list from that point.											
	View Unprocessed Objects Only	<p>Change the list of objects displayed in the Object List.</p> <p>If checked (indicated by a tick to the left) then only the objects that have not yet been processed are listed.</p> <p>If unchecked (no tick) then all processed and unprocessed objects are listed.</p>										
Object Types		<p>Allows you to select the types of object to be listed.</p> <p>Available selections are:</p> <ul style="list-style-type: none"> ▪ All Objects ▪ Helproutines ▪ Programs ▪ Subprograms ▪ Subroutines 										
Help		Invoke the Copycode Expansion help.										

SCREEN ITEMS	DESCRIPTION
Object List	<p>List all the objects containing copycodes within the currently selected application.</p> <p>The list of objects can be tailored to your requirements using the options available in the Object Types menu. Further refinement can be made using the options 'Change Start Position of Object List...' and 'View Unprocessed Objects Only' from the View menu.</p> <p>The Object List title reflects the objects being listed and will append any reposition values that may have been specified.</p> <p>Objects can be selected by using a double click with the left hand mouse button.</p> <p><i>Note: Any objects listed that have already been processed will have an '*' (asterisk) appended to the right hand side of the object name.</i></p>
Selected	<p>List all the objects that have been selected for Copycode Expansion processing.</p> <p><i>Note: At least one object must be selected to run the process.</i></p> <p>Objects can be de-selected by using a double click with the left hand mouse button.</p>

BUTTON NAME	DESCRIPTION
Object List group:	
Prev	<p>Scrolls the object list to previous page.</p> <p>This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.</p>
More	<p>Scrolls the object list forward one page.</p> <p>This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.</p>

BUTTON NAME	DESCRIPTION
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Selection / De-selection buttons:

>>>	Select all objects in the object list (when more than one page is available, as set by the LISTBOXMAX parameter in the NATENG.INI file).
>>	Select all objects on the current page in the object list.
>	Select all selected objects in the object list.
<	De-select all selected objects in the selected list.
<<	De-select all objects on the current page in the selected list.
<<<	De-select all objects in the selected list (when more than one page is available, as set by the LISTBOXMAX parameter in the NATENG.INI file).

Selected group:

Prev	Scrolls the selected list to previous page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.
More	Scrolls the selected list forward one page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.

Copycode Expansion screen:

Excludes	Invoke the Copycode Exclusion process.
Execute	Invoke the Copycode Expansion process. This will modify the selected objects by expanding any copycode objects that have not been excluded. The modified objects can be located in the Modification library. <i>Note: This button is only enabled if any selections have been made.</i>
Cancel	Cancel any object selection and return back to the Refactoring Preparation Tasks screen.

Note: For more information on the NATENG.INI file parameter LISTBOXMAX refer to Chapter 1 in the Natural Engineer Administration Guide for Windows manual.

STATUS BAR ITEM	DESCRIPTION
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Pane	Any Copycode Expansion processing messages.
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Copycode Exclusion Screen

The Copycode Exclusion screen allows you to select the copycode objects, within an application that you do not want to have expanded within the objects using them.

The Copycode Exclusion screen is accessed by using the 'Excludes' button from the Copycode Expansion screen.

The following Figure 2-13 illustrates the Copycode Exclusion screen.

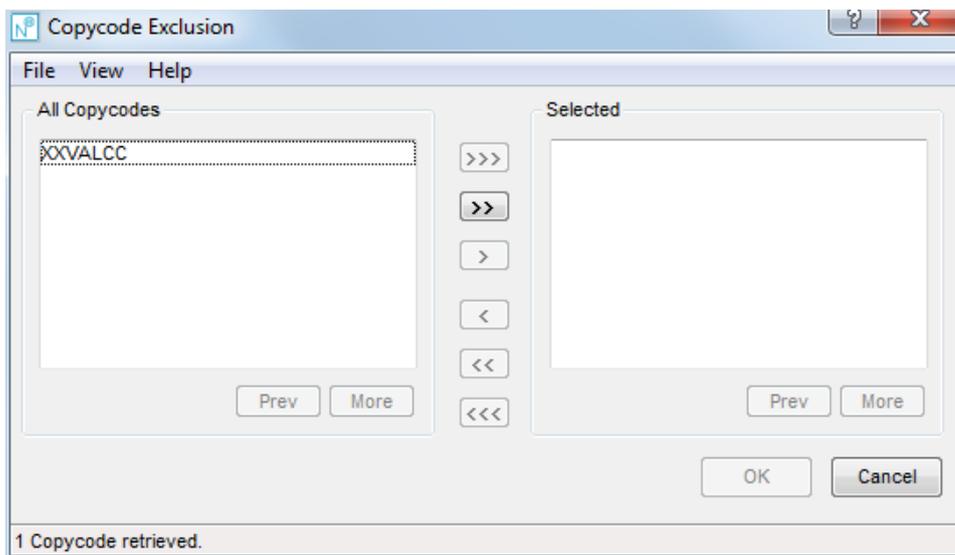


Figure 2-13 Copycode Exclusion screen

MENU ITEMS	OPTIONS	DESCRIPTION										
File	Exit	Exit the Copycode Exclusion screen and return back to the Copycode Expansion screen.										
View	Change Start Position of Copycode List...	<p>Reposition the list of copycode objects to start from a particular copycode object name.</p> <p>The reposition value can be input using either a complete name or part name using an '*' (asterisk) wildcard.</p> <p>The reposition value is appended to the copycode list title to highlight the type of repositioning being applied.</p> <p>Possible reposition values are:</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>' ' (blank)</td> <td>Reposition to the top of the copycode object list.</td> </tr> <tr> <td>*</td> <td>Reposition to the top of the copycode object list.</td> </tr> <tr> <td>ABC*</td> <td>Only show copycode objects that are prefixed by 'ABC'.</td> </tr> <tr> <td>XYZ</td> <td>Reposition to the first copycode object that either matches or is greater than 'XYZ' and then continue the copycode object list from that point.</td> </tr> </tbody> </table>	Value	Result	' ' (blank)	Reposition to the top of the copycode object list.	*	Reposition to the top of the copycode object list.	ABC*	Only show copycode objects that are prefixed by 'ABC'.	XYZ	Reposition to the first copycode object that either matches or is greater than 'XYZ' and then continue the copycode object list from that point.
Value	Result											
' ' (blank)	Reposition to the top of the copycode object list.											
*	Reposition to the top of the copycode object list.											
ABC*	Only show copycode objects that are prefixed by 'ABC'.											
XYZ	Reposition to the first copycode object that either matches or is greater than 'XYZ' and then continue the copycode object list from that point.											
Help		Invoke the Copycode Exclusion help.										

SCREEN ITEMS	DESCRIPTION
Copycode List	<p>List all the copycode objects within the currently selected application.</p> <p>The list of copycode objects can be tailored to your requirements using the option 'Change Start Position of Copycode List...' from the View menu.</p> <p>The Copycode List title reflects the copycode objects being listed and will append any reposition values that may have been specified.</p> <p>Copycode objects can be selected by using a double click with the left hand mouse button.</p>
Selected	<p>List all the copycode objects that have been selected for Copycode Exclusion processing.</p> <p><i>Note: At least one object must be selected to run the process.</i></p> <p>Copycode objects can be de-selected by using a double click with the left hand mouse button.</p>

BUTTON NAME	DESCRIPTION
Copycode List group:	
Prev	<p>Scrolls the copycode object list to previous page.</p> <p>This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.</p>
More	<p>Scrolls the copycode object list forward one page.</p> <p>This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.</p>

BUTTON NAME	DESCRIPTION
-------------	-------------

Selection / De-selection buttons:

>>>	Select all copycode objects in the copycode list (when more than one page is available, as set by the LISTBOXMAX parameter in the NATENG.INI file).
>>	Select all copycode objects on the current page in the copycode list.
>	Select all selected copycode objects in the copycode list.
<	De-select all selected copycode objects in the selected list.
<<	De-select all copycode objects on the current page in the selected list.
<<<	De-select all copycode objects in the selected list (when more than one page is available, as set by the LISTBOXMAX parameter in the NATENG.INI file).

Selected group:

Prev	Scrolls the selected list to previous page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.
More	Scrolls the selected list forward one page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.

Copycode Exclusion screen:

OK	Saves the Copycode Exclusion settings and close the current screen. <i>Note: This button is only enabled if any selections have been made.</i>
Cancel	Cancel any copycode object selection and return back to the Copycode Expansion screen.

Note: For more information on the NATENG.INI file parameter LISTBOXMAX refer to Chapter 1 in the Natural Engineer Administration Guide for Windows manual.

STATUS BAR ITEM	DESCRIPTION
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Pane	Any Copycode Exclusion processing messages.
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Componentization

The Refactoring Componentization screen is used to control and initiate all the tasks required to restructure Natural applications.

The topics covered are:

1. [Component Builder](#)
2. [Similar Code](#)

Componentization Screen

The Componentization screen shows all tasks available to restructure a Natural application. The Componentization screen is accessed by using the following menu navigation: Advanced Services → Refactoring → Componentization from the main Natural Engineer screen.

The following Figure 2-14 illustrates the Refactoring - Componentization screen.

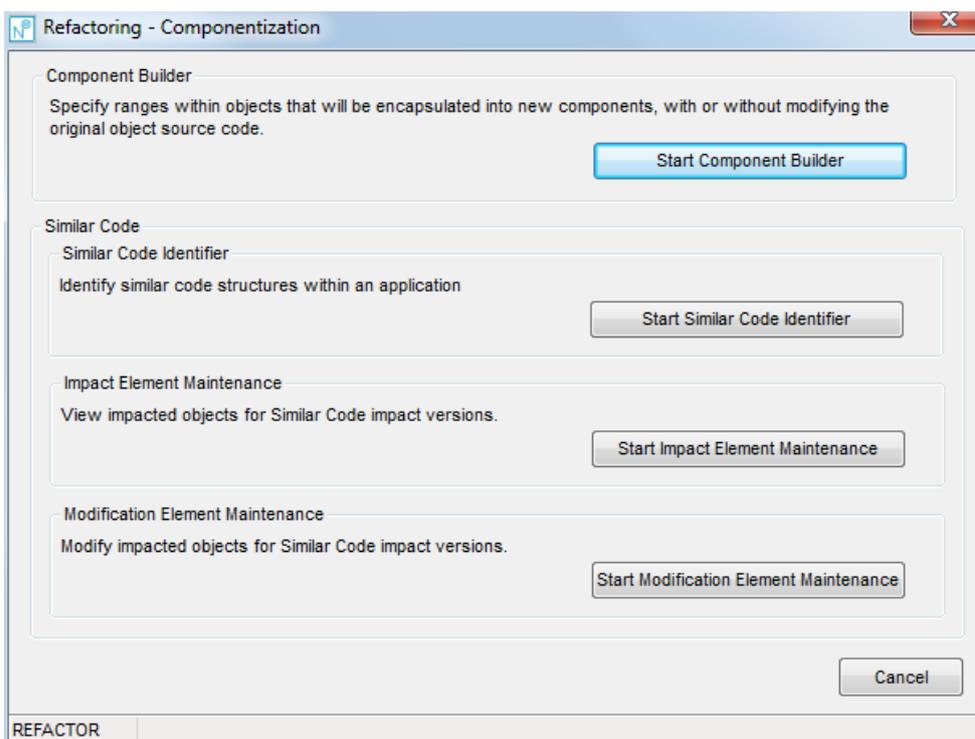


Figure 2-14 Refactoring - Componentization screen

Component Builder

The Component Builder option provides the facility to specify line ranges which will be encapsulated into new Natural components. These components may then be used as independent Natural objects.

The following tasks may be actioned depending on the selections made.

1. Generate new subprogram objects.

New subprogram objects are created in the Modification library with the source code for the selected line ranges from the original object copied into it. If a subprogram name has been specified for the line range, this will be used to create the new object.

2. Generate Parameter Data Area (PDA) objects.

PDA objects are generated for any data that needs to be passed between the calling object and the new subprogram. If a PDA name has been specified for the line range, this will be used to create the new object.

3. Generate Local Data Area (LDA) objects.

LDA objects are generated for all the data items that are found within the selected line range. If an LDA name has been specified for the line range, this will be used to create the new object.

4. Modify the original object to reference the new subprogram object.

The original object will be modified to remove the source code for the line range specified. This is replaced with a CALLNAT statement to call the new subprogram and pass any required parameters. Only valid where only one line range has been selected.

Component Builder Window

The Component Builder screen can be accessed by using the 'Component Builder' button from the Refactoring - Componentization screen.

The following Figure 2-15 illustrates the Component Builder screen.

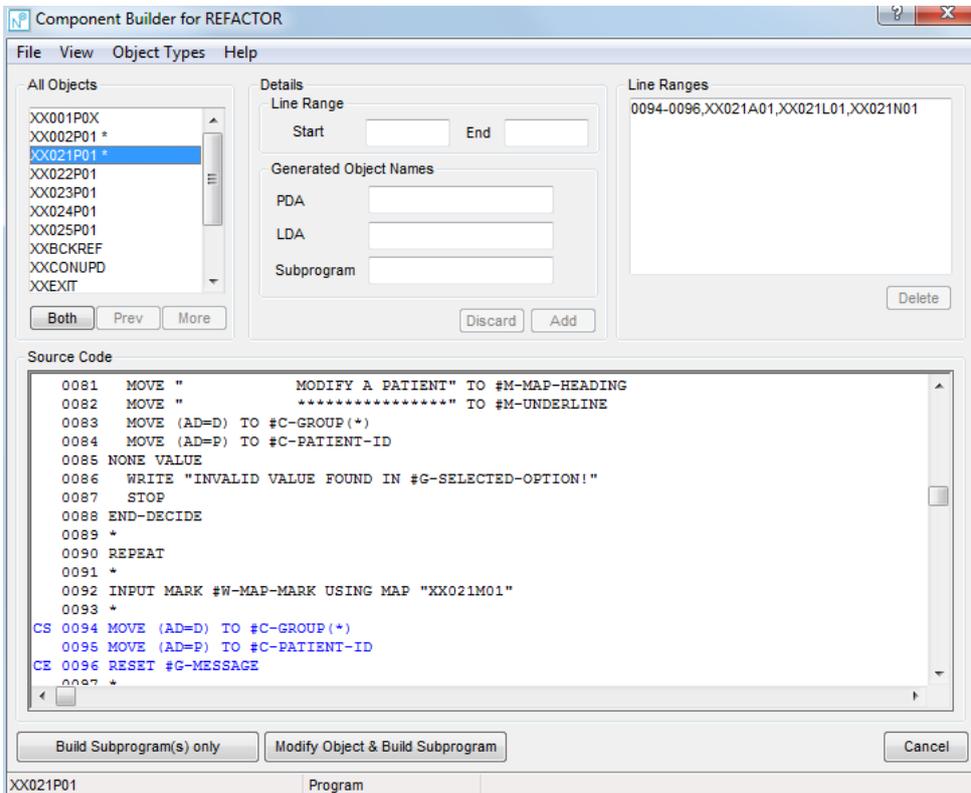


Figure 2-15 Component Builder screen

MENU ITEMS	OPTIONS	DESCRIPTION										
File	Exit	Exit the Component Builder screen and return back to the Refactoring Componentization screen.										
View	Change Start Position of Object List...	<p>Reposition the list of objects to start from a particular object name.</p> <p>The reposition value can be input using either a complete name or part name using an '*' (asterisk) wildcard.</p> <p>The reposition value is appended to the object list title to highlight the type of repositioning being applied.</p> <p>Possible reposition values are:</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>' ' (blank)</td> <td>Reposition to the top of the object list.</td> </tr> <tr> <td>*</td> <td>Reposition to the top of the object list.</td> </tr> <tr> <td>ABC*</td> <td>Only show objects that are prefixed by 'ABC'.</td> </tr> <tr> <td>XYZ</td> <td>Reposition to the first object that either matches or is greater than 'XYZ' and then continue the object list from that point.</td> </tr> </tbody> </table>	Value	Result	' ' (blank)	Reposition to the top of the object list.	*	Reposition to the top of the object list.	ABC*	Only show objects that are prefixed by 'ABC'.	XYZ	Reposition to the first object that either matches or is greater than 'XYZ' and then continue the object list from that point.
Value	Result											
' ' (blank)	Reposition to the top of the object list.											
*	Reposition to the top of the object list.											
ABC*	Only show objects that are prefixed by 'ABC'.											
XYZ	Reposition to the first object that either matches or is greater than 'XYZ' and then continue the object list from that point.											
Object Types	<p>Allows you to select the types of object to be listed.</p> <p>Available selections are:</p> <ul style="list-style-type: none"> ▪ All Objects ▪ Helproutines ▪ Programs ▪ Subprograms ▪ Subroutines 											
Help	Invoke the Component Builder help.											

SCREEN ITEMS	DESCRIPTION
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Object List	<p>List of all the objects used by the currently selected application.</p> <p>The list of objects can be tailored to your requirements using the options available in the Object Types menu. Further refinement can be made using the option 'Change Start Position of Object List...' from the View menu.</p> <p>The Object List title reflects the Object Types being listed and will append any reposition values that may have been specified.</p> <p>Objects can be selected using the left mouse button with a single click.</p> <p>Any objects that have had line ranges saved will show with an asterisk (*) to the right of the object name. For example: XX021P01 *.</p>
--------------------	--

Line Range group:

Start	The start of range statement line number.
--------------	---

End	The end of range statement line number.
------------	---

Generated Object Names:

PDA	<p>Name for the generated PDA object.</p> <p>If left blank the object will be derived from the mask setting of COMPONENT_OBJECT_NAME in the NATENG.INI file.</p>
------------	--

LDA	<p>Name for the generated LDA object.</p> <p>If left blank the object will be derived from the mask setting of COMPONENT_OBJECT_NAME in the NATENG.INI file.</p>
------------	--

Subprogram	<p>Name for the generated subprogram object.</p> <p>If left blank the object will be derived from the mask setting of COMPONENT_OBJECT_NAME in the NATENG.INI file.</p>
-------------------	---

Line Ranges group:

Line Ranges List	List of all the line ranges that have been saved for an object.
-------------------------	---

Source Code	<p>Display the selected source code for the currently selected object. Any source code lines that are part of a saved line range will be colored blue and will have the following in the first 2 bytes of the line:</p>
--------------------	---

CS	Indicates that the line is the start of a range.
-----------	--

CE	Indicates that the line is the end of a range.
-----------	--

BUTTON NAME	DESCRIPTION
Object List group:	
Both	This button provides additional refinement of the objects listed in the Objects List box. This button has three different states, with the button text changing accordingly: <ul style="list-style-type: none"> Both The default for the screen is to list all objects whether they have line ranges saved or not. OEM O Only list objects that have line ranges saved, i.e., OEM data available. N OEM Only list objects that have no line ranges saved, i.e., no OEM data available.
Prev	Scrolls the object list to previous page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.
More	Scrolls the object list to forward one page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.
Details group:	
Discard	Reset the current Line Range details.
Add / Replace	Add / Replace the current Line Range details. Button text will read 'Add' for new details and 'Replace' for any existing details (when selecting existing saved Line Ranges).
Line Ranges group:	
Delete	Delete the selected line range.
Component Builder screen:	
Build Subprogram(s) only	Enabled when at least one line range has been added. Subprogram objects will be generated for each line range along with any necessary PDA and LDA objects. Objects are written to the Modification library for this application.
Modify Object & Build Subprogram	Enabled when no or only one line range has been added. A Subprogram object will be generated for the line range along with a PDA and LDA object as necessary. The original object will be modified to remove the code within the line range and replace with a 'callnat' to the new subprogram. Objects are written to the Modification library for this application.

2

Natural Engineer Advanced Services

BUTTON NAME	DESCRIPTION
--------------------	--------------------

Object List group:

Cancel	Cancel the Component Builder process and return back to the Refactoring Componentization screen.
---------------	--

Note: For more information on the NATENG.INI file parameter LISTBOXMAX refer to Chapter 1 in the Natural Engineer Administration Guide for Windows manual.

STATUS BAR ITEM	DESCRIPTION
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The Component Builder status bar is divided into 3 individual panes.

Pane 1	Name of the selected object. If the selected object is from a steplib, then the steplib library name will also be shown here.
Pane 2	Object type of the selected object.
Pane 3	Any Component Builder processing messages.

Similar Code Identifier

The Similar Code option provides the facility to search for similar source code structures within an application. For example, to find instances of a particular read of a database file within an application, to find date or currency conversions.

The process to locate similar code structures is invoked by simply reviewing the existing objects within an application and selecting the start and end line number range of the source code required. This will pinpoint the keywords and their respective order, which Impact will use to identify the similar source code.

Once all the selections have been completed, Impact Analysis needs to be executed and the Impact results reviewed.

For example; the following source code start and end line range is selected:

```
::::  
0150 READ VEHICLES  
0160   DISPLAY MAKE MODEL *ISN  
0170 END-READ  
::::
```

This will pinpoint the keywords and their respective order to be

```
READ  
DISPLAY  
END-READ
```

And result in identifying the following source code structures:

```
::::  
0150 READ VEHICLES  
0160   DISPLAY MAKE MODEL *ISN  
0170 END-READ  
::::  
0620 READ EMPLOYEES  
0630   DISPLAY PERSONNEL-ID NAME  
0640 END-READ  
::::
```

But not the following source code structure:

```
::::  
1050 READ VEHICLES  
1060  ADD 1 TO #RECORDS-COUNTER  
1070  DISPLAY MAKE MODEL *ISN  
1080 END-READ  
::::
```

This is because the code structure block contains an extra keyword ‘**ADD**’, which was not part of the original selection.

Similar Code Identifier Window

The Similar Code screen can be accessed by using the 'Similar Code Identifier' button from the Refactoring Componentization screen.

The following Figure 2-16 illustrates the Similar Code Identifier screen.

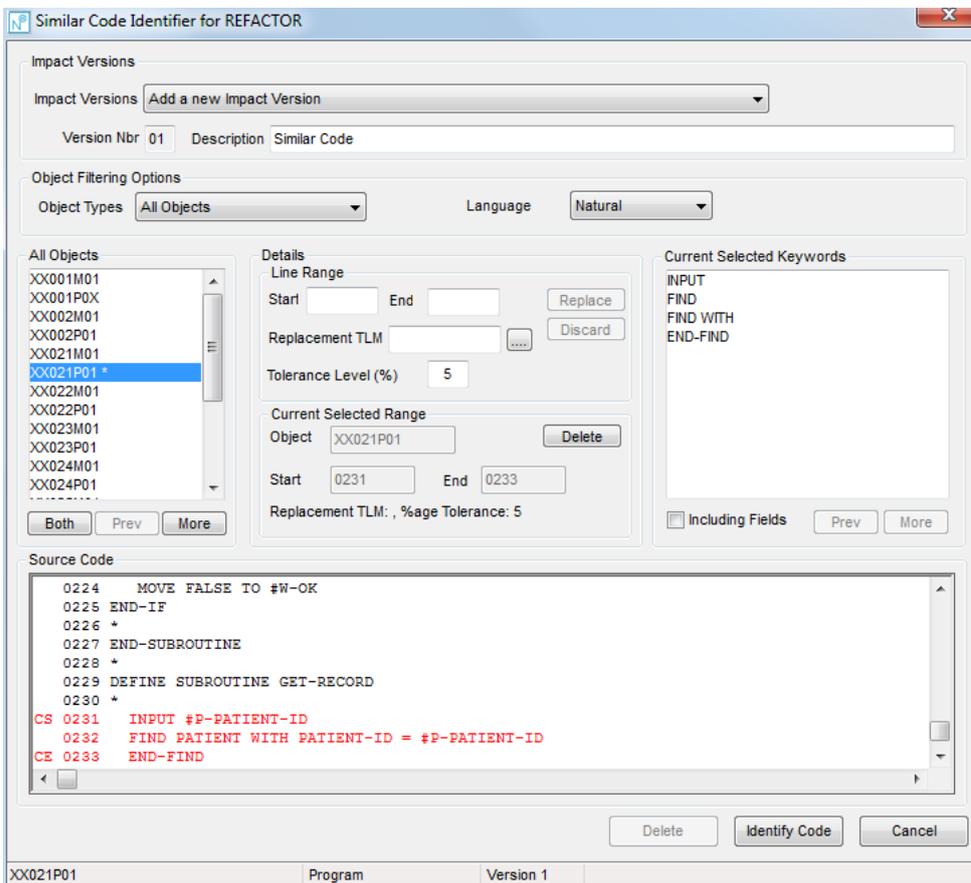


Figure 2-16 Similar Code Identifier screen

SCREEN ITEMS	DESCRIPTION
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Impact Versions group:

Impact Versions	Change the Impact version to review alternate Similar Code Impact Criteria for the application. Select 'Add a new Impact Version' to define new Similar Code Identifier criteria.
------------------------	--

Impact Nbr	The number of the Impact version
-------------------	----------------------------------

Description	The Description of the Impact version
--------------------	---------------------------------------

Object Filtering Options group:

Object Types	Allows you to select the types of object to be listed.
---------------------	--

Available selections are:

- **All Objects**
- **Programs**
- **Subprograms**
- **Maps**
- **Subroutines**
- **Copycodes**

Language	Allows you to select the programming language of the objects to be listed.
-----------------	--

Available selections are dependent on the type of objects loaded into the repository but may include:

- **All**
- **Cobol**
- **JCL**
- **Natural**

Object List group:

- Object List** List of all the objects used by the currently selected application.
- The list of objects can be tailored to your requirements using the options available in the Object Types menu. Further refinement can be made using the option 'Change Start Position of Object List...' from the View menu.
- The Object List title reflects the Object Types being listed and will append any reposition values that may have been specified.
- Objects can be selected using the left mouse button with a single click.
- Any objects that have had line ranges saved will show with an asterisk (*) to the right of the object name. For example: XX021P01 *.

Details - Line Range group:

- Start** The start of range statement line number.
- End** The end of range statement line number.
- Replacement TLM** The name of the Text Logic Member (TLM) to replace the impacted range in the object source code.
- Tolerance Level (%)** Allows for a level of mis-match between the selected code and the Similar Code Criteria.

Details - Current Selected Range group:

- Object** The name of the object containing the selected line range.
- Start** The start of range statement line number.
- End** The end of range statement line number.

Current Selected Keywords group:

- Keyword List** List of all the keywords that have been found in the specified line ranges. These will be used by the Impact process to identify similar code structures throughout the application.
- Including Fields** If selected, then the Similar Code Identifier process will also check the fields that are part of the marked syntax. For example:
- MOVE #A TO #B**
- With the Including Fields selected, the process would look for MOVE statements with the fields #A and #B. If not selected, then the fields would be ignored, and only MOVE statements identified.

Source Code group:

Source Code Display the selected source code for the currently selected object. Any source code lines that are part of a saved line range will be colored blue and will have the following in the first 2 bytes of the line:

CS Indicates that the line is the start of a range.

CE Indicates that the line is the end of a range.

Note: If a single line has been selected for start and end ranges, e.g., 0100-0100, then the indicator will show only CS.

BUTTON NAME	DESCRIPTION
-------------	-------------

Object List group:

Prev	Scrolls the object list to previous page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.
-------------	---

More	Scrolls the object list to forward one page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.
-------------	--

Line Range group:

Discard	Reset the current Line Range start and end details.
----------------	---

Add / Replace	Add / Replace the Current Selected Range and Current Selected Keywords details. Button text will read 'Add' for new details and 'Replace' if there are any previously saved details.
----------------------	---

Current Selected Range group:

Delete	Delete the selected line range.
---------------	---------------------------------

BUTTON NAME	DESCRIPTION
-------------	-------------

Current Selected Keywords group:

Prev	Scrolls the keyword list to previous page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.
More	Scrolls the keyword list forward one page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.

Similar Code Identifier screen:

Delete	Deletes the specified Impact Version for the Criteria.
Identify Code	Invoke the Similar Code Identifier process. <i>Note: This button is only enabled if any selections have been made.</i>
Cancel	Cancel the Similar Code Identifier process and return back to the Refactoring Phase 1 screen.

Note: For more information on the NATENG.INI file parameter LISTBOXMAX refer to Chapter 1 in the Natural Engineer Administration Guide for Windows manual.

STATUS BAR ITEM	DESCRIPTION
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The Similar Code Identifier status bar is divided into 4 individual panes.

Pane 1	Name of the selected object. If the selected object is from a steplib, then the steplib library name will also be shown here.
Pane 2	Object type of the selected object.
Pane 3	The currently selected Impact Version number.
Pane 4	Any Similar Code Identifier processing messages.

Similar Code Identifier - Impact Element Maintenance

The Impact Element Maintenance option provides the facility to review the results of the executed Impact Analysis for the Similar Code Identifier Option. All impacted objects within the chosen applications are available for selection. Once selected the impacted items within the object are listed.

The impacted items can be selected to reveal the source code context within the object and the impact match reason showing why the item has been impacted. The context of the data item within the data definitions of the selected object are also shown.

Note: For more information on the Impact Element Maintenance Screen refer to Chapter 1 in the Natural Engineer Application Analysis & Modification for Windows manual.

Similar Code Identifier - Modification Element Maintenance

The Modification Element Maintenance option provides the facility to review and modify interactively, the default modifications to be applied to objects from the Similar Code Identifier Impact execution. All impacted objects within an application are available for selection; once selected a list of the impacted items within the object are listed.

The Modification Element Maintenance option allows each modification to be updated to change the modification types, categories and replacement values as desired. The Modification changes to be applied can be reviewed before they are implemented, using the Browser.

The Modification Element Maintenance option also provides the facility to review the Impact results in the Browser.

Note: For more information on the Modification Element Maintenance Screen refer to Chapter 2 in the Natural Engineer Application Analysis & Modification for Windows manual.

Database Split

The Database Split screen provides a series of tasks to control and initiate all the tasks required to separate any Database Access from a Natural Application.

The topics covered are:

1. [DDM Selection](#)
2. [User View Analysis](#)
3. [Refactor Database Access](#)

Database Split Screen

The Database Split screen shows all tasks available to separate any Database Access from a Natural Application.

The Database Split screen is accessed by using the following menu navigation: Advanced Services → Refactoring → Database Split from the main Natural Engineer screen.

The following Figure 2-17 illustrates the Refactoring – Database Split screen.

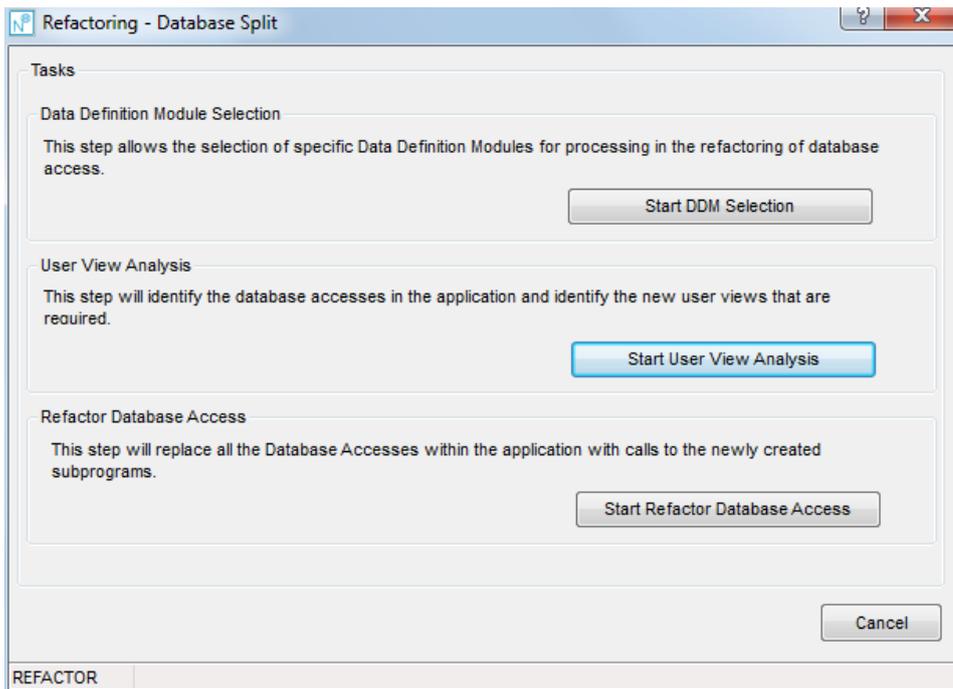


Figure 2-17 Refactoring – Database Split screen

Data Definition Module Selection

The Data Definition Module Selection task is invoked by using the ‘Start DDM Selection’ button on the Refactoring – Database Split screen.

This will invoke the Data Definition Module Selection process, which provides the facility to select the DDMs within an application that are to be processed during the User View Analysis and Refactor Database Access processes. If no DDMs are selected, then the User View Analysis and Refactor Database Access processes will process all the DDMs within the application.

DDM Selection Screen

The DDM Selection screen allows you to select the DDMs within an application, to which to apply the necessary modification to encapsulate each database access in a new generated subprogram, and change the original database access to call the new subprogram.

For each selected DDM, the User View Analysis and Refactor Database Access processing will only process the database accesses for these selected DDMs. All non-selected DDMs will be ignored.

If no DDMs are selected, then all the DDMs will be processed during the User View Analysis and Refactor Database Access processing.

The DDM Selection screen is accessed by using the ‘Start DDM Selection’ button from the Refactoring – Database Split screen.

The following Figure 2-18 illustrates the DDM Selection screen.

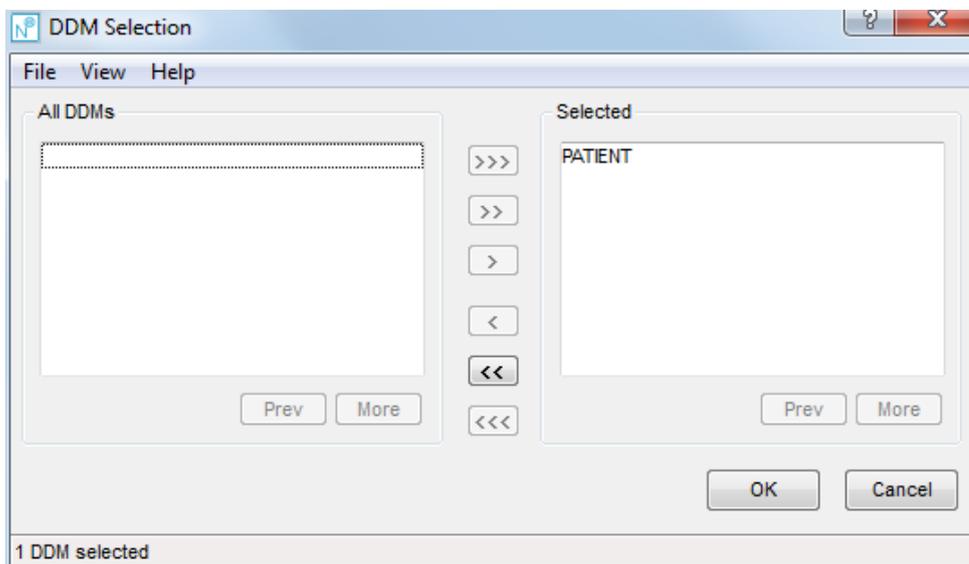


Figure 2-18 DDM Selection screen

MENU ITEMS	OPTIONS	DESCRIPTION										
File	Exit	Exit the DDM Selection screen and return back to the Refactoring – Database Split screen.										
View	Change Start Position of DDM List...	<p>Reposition the list of DDM objects to start from a particular DDM object name.</p> <p>The reposition value can be input using either a complete name or part name using an '*' (asterisk) wildcard.</p> <p>The reposition value is appended to the DDM list title to highlight the type of repositioning being applied.</p> <p>Possible reposition values are:</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>' ' (blank)</td> <td>Reposition to the top of the DDM list.</td> </tr> <tr> <td>*</td> <td>Reposition to the top of the DDM list.</td> </tr> <tr> <td>ABC*</td> <td>Only show DDMs that are prefixed by 'ABC'.</td> </tr> <tr> <td>XYZ</td> <td>Reposition to the first DDM object that either matches or is greater than 'XYZ' and then continue the DDM list from that point.</td> </tr> </tbody> </table>	Value	Result	' ' (blank)	Reposition to the top of the DDM list.	*	Reposition to the top of the DDM list.	ABC*	Only show DDMs that are prefixed by 'ABC'.	XYZ	Reposition to the first DDM object that either matches or is greater than 'XYZ' and then continue the DDM list from that point.
Value	Result											
' ' (blank)	Reposition to the top of the DDM list.											
*	Reposition to the top of the DDM list.											
ABC*	Only show DDMs that are prefixed by 'ABC'.											
XYZ	Reposition to the first DDM object that either matches or is greater than 'XYZ' and then continue the DDM list from that point.											
Help		Invoke the DDM Selection help.										

SCREEN ITEMS	DESCRIPTION
DDM List	<p>List all the DDM objects used by the currently selected application.</p> <p>The list of DDM objects can be tailored to your requirements using the option 'Change Start Position of DDM List...' from the View menu.</p> <p>The DDM List title reflects the DDM objects being listed and will append any reposition values that may have been specified.</p> <p>DDM objects can be selected by using a double click with the left hand mouse button.</p>
Selected	<p>List all the DDM objects that have been selected for User View Analysis and Refactor Database Access processing.</p> <p>DDM objects can be de-selected by using a double click with the left hand mouse button.</p>

BUTTON NAME	DESCRIPTION
DDM List group:	
Prev	<p>Scrolls the DDM object list to previous page.</p> <p>This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.</p>
More	<p>Scrolls the DDM object list forward one page.</p> <p>This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.</p>

BUTTON NAME	DESCRIPTION
-------------	-------------

Selection / De-selection buttons:

>>>	Select all DDM objects in the DDM list (when more than one page is available, as set by the LISTBOXMAX parameter in the NATENG.INI file).
>>	Select all DDM objects on the current page in the DDM list.
>	Select all selected DDM objects in the DDM list.
<	De-select all selected DDM objects in the selected list.
<<	De-select all DDM objects on the current page in the selected list.
<<<	De-select all DDM objects in the selected list (when more than one page is available, as set by the LISTBOXMAX parameter in the NATENG.INI file).

Selected group:

Prev	Scrolls the selected list to previous page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.
More	Scrolls the selected list forward one page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.

DDM Selection screen:

OK	Saves the DDM Selection settings.
Cancel	Cancel any DDM object selection and return back to the Refactoring – Database Split screen.

Note: For more information on the NATENG.INI file parameter LISTBOXMAX refer to Chapter 1 in the Natural Engineer Administration Guide for Windows manual.

STATUS BAR ITEM	DESCRIPTION
-----------------	-------------

Pane	Any DDM Selection processing messages.
-------------	--

User View Analysis

The User View Analysis task is invoked by using the 'Start User View Analysis' button on the Refactoring – Database Split screen.

This will invoke the User View Analysis process, which will identify all the database accesses within a Natural application's objects, new consolidated Views are identified adding all the fields for the DDM being referenced for each new View.

Note: The database accesses are controlled by the DDMs that have been selected using the Data Definition Module Selection task. If no DDMs have been selected then all DDMs and database accesses will be processed. For more information refer to the section [Data Definition Module Selection](#).

The User View Analysis task identifies two types of view:

1. **Access Views**
These are views that are used by read only database access statements.
2. **Update Views**
These are views that are used by update database access statements.

The new Access and Update Views are generated internally for use by Natural Engineer during the Refactor Database Access process.

Refactor Database Access

The Refactor Database Access task is invoked by using the ‘Start Refactor Database Access’ button on the Refactoring – Database Split screen.

This will invoke the Refactor Database Access process, which provides the facility to select the objects within an application containing database accesses and modify them to remove the database access statements into new generated subprograms. The original objects containing the database accesses are changed to call the new subprograms.

Note: The database accesses are controlled by the DDMs that have been selected using the Data Definition Module Selection task. If no DDMs have been selected then all DDMs and database accesses will be processed. For more information refer to the section [Data Definition Module Selection](#).

The modified objects and new generated subprograms are found in the Modification library.

Note: If any of the objects need to be refactored again, then it is recommended that the modification library is empty and that the User View Analysis process is re-run first.

Refactor Database Access Screen

The Refactor Database Access screen allows you to select the objects within an application containing database access statements, to apply the necessary modification to encapsulate each database access in a new generated subprogram, and change the original database access to call the new subprogram.

All modified and new generated objects are located in the Modification library.

The Refactor Database Access screen is accessed by using the ‘Start Refactor Database Access’ button from the Refactoring – Database Split screen.

The following Figure 2-19 illustrates the Refactor Database Access screen.

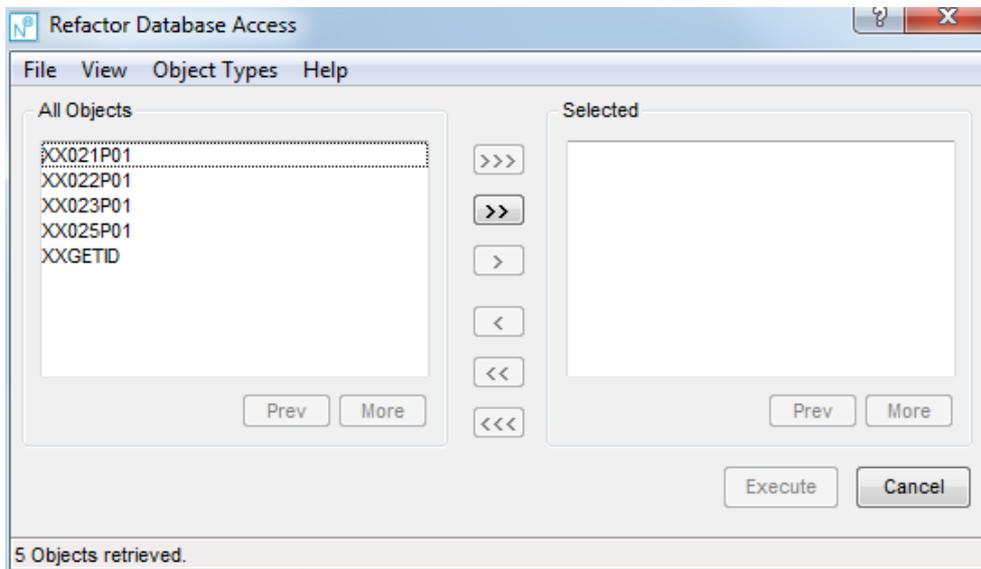


Figure 2-19 Refactor Database Access screen

MENU ITEMS	OPTIONS	DESCRIPTION										
File	Exit	Exit the Refactor Database Access screen and return back to the Refactoring – Database Split screen.										
View	Change Start Position of Object List...	<p>Reposition the list of objects to start from a particular object name.</p> <p>The reposition value can be input using either a complete name or part name using an '*' (asterisk) wildcard.</p> <p>The reposition value is appended to the object list title to highlight the type of repositioning being applied.</p> <p>Possible reposition values are:</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>' ' (blank)</td> <td>Reposition to the top of the object list.</td> </tr> <tr> <td>*</td> <td>Reposition to the top of the object list.</td> </tr> <tr> <td>ABC*</td> <td>Only show objects that are prefixed by 'ABC'.</td> </tr> <tr> <td>XYZ</td> <td>Reposition to the first object that either matches or is greater than 'XYZ' and then continue the object list from that point.</td> </tr> </tbody> </table>	Value	Result	' ' (blank)	Reposition to the top of the object list.	*	Reposition to the top of the object list.	ABC*	Only show objects that are prefixed by 'ABC'.	XYZ	Reposition to the first object that either matches or is greater than 'XYZ' and then continue the object list from that point.
Value	Result											
' ' (blank)	Reposition to the top of the object list.											
*	Reposition to the top of the object list.											
ABC*	Only show objects that are prefixed by 'ABC'.											
XYZ	Reposition to the first object that either matches or is greater than 'XYZ' and then continue the object list from that point.											
	View Unprocessed Objects Only	<p>Change the list of objects displayed in the Object List.</p> <p>If checked (indicated by a tick to the left) then only the objects that have not yet been processed are listed.</p> <p>If unchecked (no tick) then all processed and unprocessed objects are listed.</p>										
Object Types		<p>Allows you to select the types of object to be listed.</p> <p>Available selections are:</p> <ul style="list-style-type: none"> ▪ All Objects ▪ Helproutines ▪ Programs ▪ Subprograms ▪ Subroutines 										
Help		Invoke the Refactor Database Access help.										

SCREEN ITEMS	DESCRIPTION
Object List	<p>List all the objects within the currently selected application that contain database access statements.</p> <p>The list of objects can be tailored to your requirements using the options available in the Object Types menu. Further refinement can be made using the options 'Change Start Position of Object List...' and 'View Unprocessed Objects Only' from the View menu.</p> <p>The Object List title reflects the objects being listed and will append any reposition values that may have been specified.</p> <p>Objects can be selected by using a double click with the left hand mouse button.</p> <p><i>Note: Any objects listed that have already been processed will have an '*' (asterisk) appended to the right hand side of the object name.</i></p>
Selected	<p>List all the objects that have been selected for Refactor Database Access processing.</p> <p><i>Note: At least one object must be selected to run the process.</i></p> <p>Objects can be de-selected by using a double click with the left hand mouse button.</p>

BUTTON NAME	DESCRIPTION
Object List group:	
Prev	<p>Scrolls the object list to previous page.</p> <p>This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.</p>
More	<p>Scrolls the object list forward one page.</p> <p>This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.</p>

BUTTON NAME	DESCRIPTION
-------------	-------------

Selection / De-selection buttons:

>>>	Select all objects in the object list (when more than one page is available, as set by the LISTBOXMAX parameter in the NATENG.INI file).
>>	Select all objects on the current page in the object list.
>	Select all selected objects in the object list.
<	De-select all selected objects in the selected list.
<<	De-select all objects on the current page in the selected list.
<<<	De-select all objects in the selected list (when more than one page is available, as set by the LISTBOXMAX parameter in the NATENG.INI file).

Selected group:

Prev	Scrolls the selected list to previous page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.
More	Scrolls the selected list forward one page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.

Refactor Database Access screen:

Execute	Invoke the Refactor Database Access process for the selected objects.
Cancel	Cancel any object selection and return back to the Refactoring – Database Split screen.

Note: For more information on the NATENG.INI file parameter LISTBOXMAX refer to Chapter 1 in the Natural Engineer Administration Guide for Windows manual.

STATUS BAR ITEM	DESCRIPTION
-----------------	-------------

Pane	Any Refactor Database Access processing messages.
-------------	---

BUSINESS RULES

Chapter Overview

This chapter describes the Business Rules option available from the Advanced Services option on the main Natural Engineer menu.

The following topics are covered:

1. [Business Rules Overview](#)
2. [Business Rules Workflow](#)
3. [Rule Type Maintenance](#)
4. [Candidate Creation](#)
5. [Candidate Maintenance](#)
6. [Rule Definition](#)
7. [Component Generation](#)

Business Rules Overview

The Business Rules screen provides a series of tasks to identify and specify business logic and their associated code snippets. The topics are invoked via the [Business Rules Workflow](#) screen.

As a precursor to Business Rules processing it is recommended that copycodes should be expanded for all Applications/Objects to be used within the Business Rules process. This may be performed by using the following menu navigation: Advanced Services → Refactoring → Preparation → [Expand Copycodes](#) from the main Natural Engineer screen.

The individual topics covered are:

1. [Rule Type Maintenance](#)
2. [Candidate Creation](#)
3. [Candidate Maintenance](#)
4. [Rule Definition](#)
5. [Component Generation](#)

Business Rules Workflow

The Business Rules Workflow screen is accessed by using the following menu navigation: Advanced Services → Business Rules from the main Natural Engineer screen.

The following Figure 3-1 illustrates the Business Rules Workflow screen.

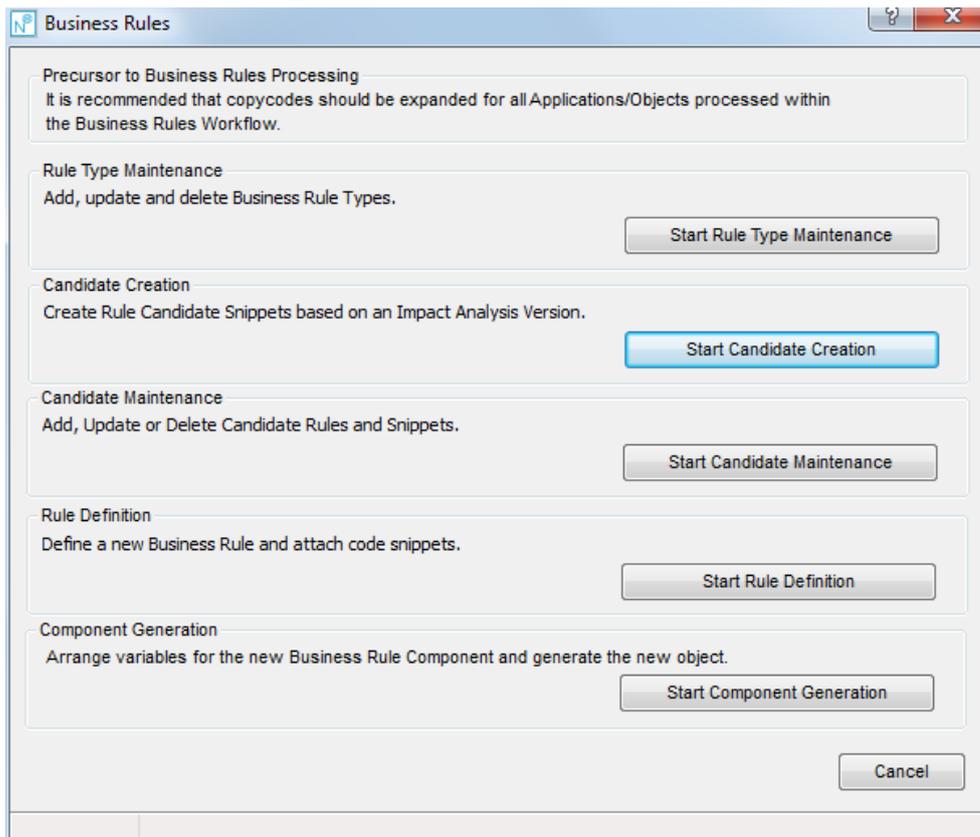


Figure 3-1 Refactoring – Business Rules screen

SCREEN ITEMS	DESCRIPTION
Rule Type Maintenance	This option provides the facility to add, update or delete Business Rule Types. Rule types contain the criteria by which Candidate Rules can be found within the existing system when applied against an impact version.
Candidate Creation	This option provide the facility to find candidates that meet that criteria for the selected impact analysis based on the criteria within the Rule Type chosen,. These Candidates can form the building blocks of Business Rules and their associated components.
Candidate Maintenance	This option provides the facility to add, update or delete Candidate Rules and snippets.
Rule Definition	This option provides the facility to define a Business Rule and assign code snippets to it.
Component Generation	This option provides the facility to generate the new object based on the rules specified.

BUTTON NAME	DESCRIPTION
Start Rule Type Maintenance	Invoke the Rule Type Maintenance process. <i>For more information refer to the section Rule Type Maintenance.</i>
Start Candidate Creation	Invoke the Candidate Creation process. <i>For more information refer to the section Candidate Creation.</i>
Start Candidate Maintenance	Invoke the Candidate Maintenance process. <i>For more information refer to the section Candidate Maintenance.</i>
Start Rule Definition	Invoke the Rule Definition process. <i>For more information refer to the section Rule Definition.</i>
Start Component Generation	Invoke the Component Generation process. <i>For more information refer to the section Component Generation.</i>
Cancel	Cancel the Business Rules Workflow process and return back to the main Natural Engineer screen.

STATUS BAR ITEM	DESCRIPTION
The Business Rules Workflow status bar is divided into 2 individual panes.	
Pane 1	Name of the selected application.
Pane 2	Any Business Rules Workflow processing messages.

Rule Type Maintenance

The Rule Type Maintenance option provides the facility to add, delete or update specific Rule Types. Rule types contain the criteria by which Candidate Rules can be found within the existing system when applied against an impact version. For instance, if a user wants to search for a validation business rule they may set up a Rule Type of 'V', a description of 'Validation' and specify the Natural Statements that apply to this type of action e.g., REINPUT within a conditional statement.

Rule Type Maintenance Window

The Rule Type Maintenance option is invoked by using the 'Start Rule Type Maintenance' button on the [Business Rules Workflow](#) screen.

The following Figure 3-2 illustrates the Rule Type Maintenance screen.

The screenshot shows a window titled "Rule Type Maintenance". It is divided into several sections:

- Rule Types:** A dropdown menu is set to "V - VALIDATION". Below it, the "Rule Type" field contains "V" and the "Description" field contains "VALIDATION".
- Selection Lists:** Two dropdown menus are present: "Keywords" (set to "Select a Keyword") and "System Functions" (set to "Select a System Function"). Each has an "Add" button to its right.
- Rule Type Attributes:** Two list boxes are shown: "Selected Keywords" (containing "REINPUT,") and "Selected Functions" (empty). Each list box has a "Reset" button to its right.
- Conditional Statement:** A checkbox labeled "Conditional Statement" is checked. Next to it is a dropdown menu set to "And". A "Reset" button is located to the right of this section.

At the bottom of the window, there are four buttons: "Delete", "OK", "Cancel", and "Apply".

Figure 3-2 Rule Type Maintenance screen

SCREEN ITEMS	DESCRIPTION
--------------	-------------

Rule Types group:

Rule Types Selection	Existing Rule Types may be selected or a new one added. If 'Add a new Rule Type' is selected the Rule Type and Rule Type Description fields will become available for input.
-----------------------------	--

Rule Type	The unique identifier of the Rule Type.
------------------	---

Rule Type Description	The description of the Rule Type.
------------------------------	-----------------------------------

Selection Lists group:

Keywords	Selects any Natural Keywords that apply to the Rule Type.
-----------------	---

System Functions	Selects any Natural System Functions that apply to the Rule Type.
-------------------------	---

Rule Types Attributes group:

Selected Keywords	Lists all the selected keywords for the Rule Type.
--------------------------	--

Selected Functions	Lists all the selected functions for the Rule Type.
---------------------------	---

Conditional Statement	This option determines if the Rule Type attributes are located within a conditional block within the Natural Code e.g., within an IF or DECIDE statement.
------------------------------	---

If selected the following options apply:

AND	All the selected attributes must be located within a conditional block.
------------	---

OR	At least one selected attribute must be located within a conditional block.
-----------	---

BUTTON NAME	DESCRIPTION
-------------	-------------

Selection Lists group:

Add Keywords	Adds the Keyword to the Rule Types Attributes selected keyword list.
---------------------	--

Add System Functions	Adds the System Function to the Rule Types Attributes selected functions list.
-----------------------------	--

Rule Types Attributes group:

Reset Selected Keywords	Removes all selected keywords for the selected Rule Type.
--------------------------------	---

BUTTON NAME	DESCRIPTION
Reset Selected Functions	Removes all selected functions for the selected Rule Type.
Rule Type Maintenance screen:	
Delete	Deletes the selected Rule Type.
OK	Save changes and close the current screen.
Cancel	Cancel the Rule Type Maintenance process and return back to the Business Rules screen.
Apply	Save changes and retain the current screen. <i>Note: This button is only enabled if any changes have been made.</i>

Candidate Creation

The Candidate Creation option provides the facility to find candidates (pieces of Natural Code) that meet that criteria for the selected impact analysis based on the criteria within the Rule Type chosen. These Candidates can form the building blocks of Business Rules and their associated components and are stored as Candidate Snippets with Natural Engineer. The impact analysis would have been pre-run against an application.

Candidate Creation Window

The Candidate Creation option is invoked by using the 'Start Candidate Creation' button on the [Business Rules Workflow](#) screen.

The following Figure 3-3 illustrates the Candidate Creation screen.

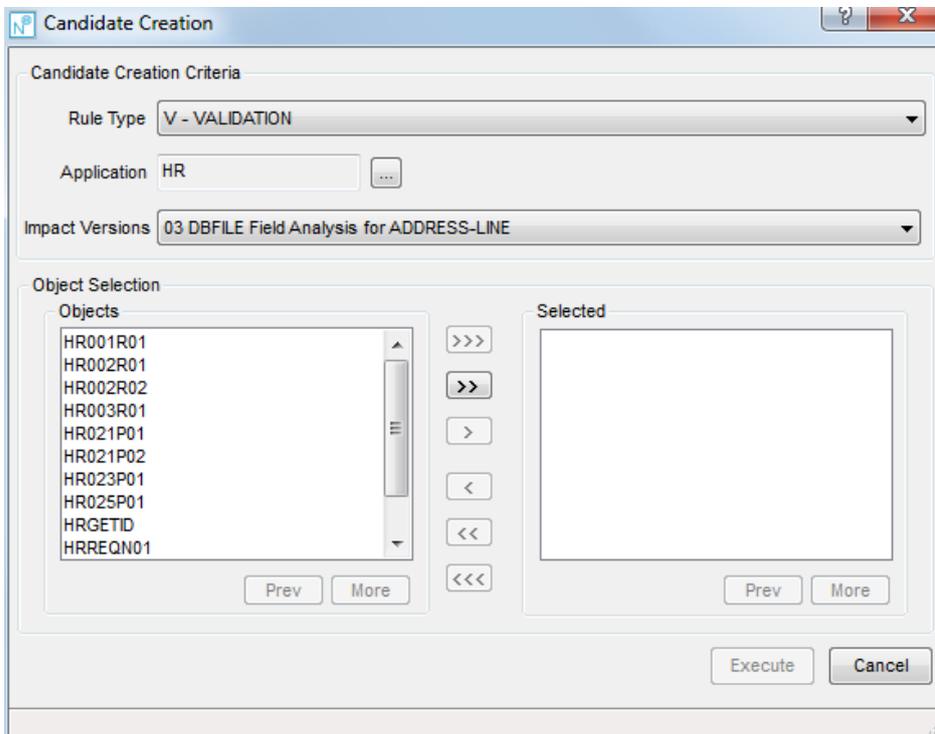


Figure 3-3 Candidate Creation screen

SCREEN ITEMS	DESCRIPTION
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Candidate Creation Criteria group:

Rule Type Select the Rule Type to apply to the impact results.

Application The Application name.

Impact Versions The Impact Version.

Object Selection group:

Object List List all the objects within the currently selected application that have been impacted.

The list of objects can be tailored to your requirements using the options 'Change Start Position of Object List...' from the Object List context menu.

Objects can be selected by using a double click with the **left hand mouse button**.

Note: Any objects listed that have already been processed will have an '' (asterisk) appended to the right hand side of the object name.*

Selected List all the objects that have been selected for Candidate Creation processing.

Note: At least one object must be selected to run the process.

Objects can be de-selected by using a double click with the **left hand mouse button**.

BUTTON NAME	DESCRIPTION
-------------	-------------

Candidate Creation Criteria group:

Application Selection [...] Invokes the General Selection screen, listing all the available Applications.

Objects group:

Prev Scrolls the object list to previous page.

This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.

3

Natural Engineer Advanced Services

BUTTON NAME	DESCRIPTION
More	Scrolls the object list forward one page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.
Selection / De-selection buttons:	
>>>	Select all objects in the list (when more than one page is available. The amount of entries on a page is controlled by the LISTBOXMAX parameter in the NATENG.INI file).
>>	Select all objects on the current page in the list.
>	Select all selected objects in the list.
<	De-select all selected objects in the selected list.
<<	De-select all objects on the current page in the selected list.
<<<	De-select all objects in the selected list (when more than one page is available. The amount of entries on a page is controlled by the LISTBOXMAX parameter in the NATENG.INI file).
Selected group:	
Prev	Scrolls the selected list to previous page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.
More	Scrolls the selected list forward one page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.
Candidate Creation screen:	
Execute	Invoke the Candidate Creation process for the selected objects.
Cancel	Cancel the Candidate Creation process and return back to the Business Rules screen.

Candidate Maintenance

The Candidate Maintenance option provides the facility to add, update or delete Candidate Rules and snippets. These may be rules and snippets created by the Candidate Creation process or new ones based on code samples.

Candidate Maintenance Window

The Candidate Maintenance option is invoked by using the ‘Start Candidate Maintenance’ button on the [Business Rules Workflow](#) screen.

The following Figure 3-4 illustrates the Candidate Maintenance screen.

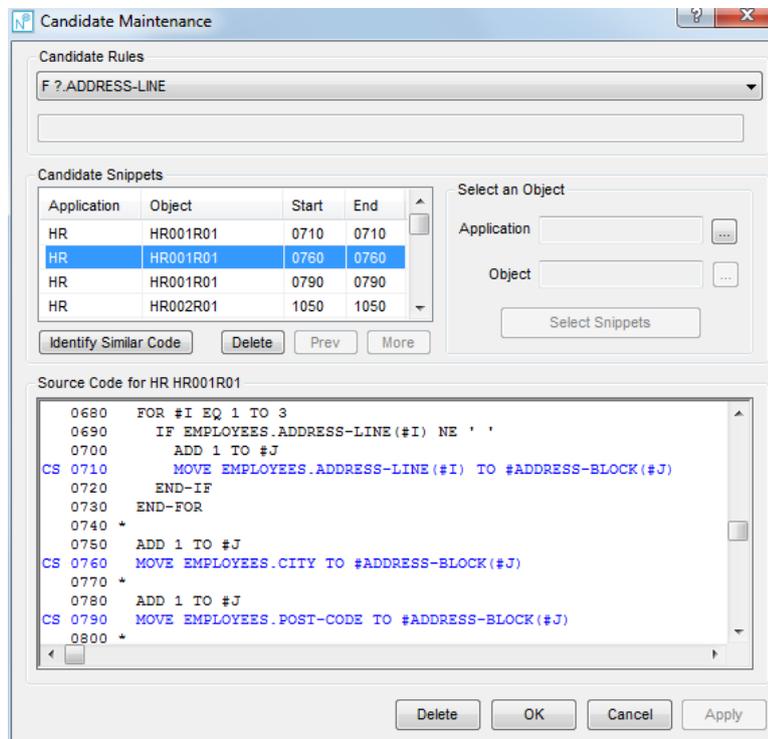


Figure 3-4 Candidate Maintenance screen

SCREEN ITEMS	DESCRIPTION
--------------	-------------

Candidate Rules group:

Candidate Rule Selection	Existing Candidate Rules may be selected or a new one added. If 'Add a new Candidate Rule' is selected the Candidate Rule field will become available for input. Snippets for a particular Application and Object may then be selected using the Select an Object process.
---------------------------------	--

Candidate Rule	The unique identifier of the Candidate Rule.
-----------------------	--

Candidate Snippets group:

Application	The name of the Application where the snippet derived from.
--------------------	---

Object	The name of the Object where the snippet derived from.
---------------	--

Start	The starting statement number of the snippet.
--------------	---

End	The ending statement number of the snippet.
------------	---

Select an Object group:

This allows additional snippets to be added to the selected Candidate Rule from any Application/Object within the repository. So a Candidate Rule could contain snippets from more than one application.

Application	The name of the Application to select the snippet from.
--------------------	---

Object	The name of the Object to select the snippet from.
---------------	--

Candidate Maintenance screen:

Source Code	Display the selected source code for the currently selected object. Any source code lines that are part of a saved line range will be colored blue and will have the following in the first 2 bytes of the line:
--------------------	--

CS Indicates that the line is the start of a range.

CE Indicates that the line is the end of a range.

Note: If a single line has been selected for start and end ranges, e.g., 0100-0100, then the indicator will show only CS.

BUTTON NAME	DESCRIPTION
-------------	-------------

Candidate Snippets group:

Identify Similar Code	Invokes the Similar Code Identifier screen to identify other pieces of code within the Application that contain similar code structures to the selected snippet. The results may then be used to identify potential locations for the use of the new Business Rule Component.
Delete	Deletes the selected snippet.
Prev	Scrolls the snippet list to previous page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.
More	Scrolls the snippet list forward one page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.

Select an Object group:

Application Selection [....]	Invokes the General Selection screen, listing all the available Applications.
Object Selection [....]	Invokes the General Selection screen, listing all the available Objects for the selected Application.
Select Snippets	Import the source code of the selected Application/Object into the Source Code box to allow additional snippets to be added to the Candidate Rule.

Candidate Maintenance screen:

Delete	Deletes the selected Candidate Rule.
OK	Save changes and close the current screen.
Cancel	Cancel the Candidate Maintenance process and return back to the Business Rules screen.
Apply	Save changes and retain the current screen.

Note: This button is only enabled if any changes have been made.

Rule Definition

The Rule Definition option provides the facility to define a Business Rule or select an existing Business Rule. Code snippets from existing Candidate Rules may be assigned to the Business Rule or new code snippets from other objects may be imported into the rule.

The list of selected snippets determines the code that is generated in the new object. This is done on a hierarchical basis with the snippet at the top of the list getting incorporated into the generated object first.

Rule Definition Window

The Rule Definition option is invoked by using the 'Start Rule Definition' button on the Business Rules Workflow screen.

The following Figure 3-5 illustrates the Rule Definition screen.

The screenshot shows the 'Rule Definition' window with the following sections:

- Business Rules:** A dropdown menu showing 'ADDRESS VALIDATION'.
- Rule Name:** An empty text field with a 'Maintain Description and Keywords*' button to its right.
- Candidate Rules:** A dropdown menu.
- Objects Containing Candidate Snippets:** A table with columns 'Application' and 'Object'.
- Selected Snippets:** A table with columns 'Application', 'Object', 'Start', and 'End'. It contains the following data:

Application	Object	Start	End
HR	HR003R01	0640	0640
HR	HR003R01	0640	0640
HR	HR001R01	0790	0790
HR	HR002R02	1110	1110
HR	HR002R02	1160	1160
HOSPITAL	XX021P01	0650	0660
- Selected Source Code:** A list of code snippets with columns for Application, Object, and Code. The code snippets are:
 - HR003R01 0640 MOVE EMPLOYEES.POST-CODE TO #LABEL-ADDRESS(#J)
 - HR003R01 0640 MOVE EMPLOYEES.POST-CODE TO #LABEL-ADDRESS(#J)
 - HR001R01 0790 MOVE EMPLOYEES.POST-CODE TO #ADDRESS-BLOCK(#J)
 - HR002R02 1110 MOVE EMPLOYEES.ADDRESS-LINE(#I) TO #ADDRESS(#J)
 - HR002R02 1160 MOVE EMPLOYEES.CITY TO #ADDRESS(#J)
 - XX021P01 0650 MOVE *DATN TO #L-TEMP-DATE
 - XX021P01 0660 DECIDE ON FIRST VALUE OF #G-SELECTED-OPTION
 - HR021P02 2220 MOVE BY NAME EMPLOYEES TO EMPLOYEES-UPDATE
 - HR021P02 1970 IF EMPLOYEES.ADDRESS-LINE(1) EQ ''
 - HR021P02 1980 REINPUT FULL 'Please enter Employees Address'
 - HR021P02 1990 MARK *EMPLOYEES.ADDRESS-LINE(1) ALARM

Buttons at the bottom include 'Export Source', 'Delete', 'OK', 'Cancel', and 'Apply'.

Figure 3-5 Rule Definition screen

SCREEN ITEMS	DESCRIPTION
Business Rules group:	
Business Rule Selection	Existing Business Rules may be selected or a new one added. If 'Add a new Business Rule' is selected the Business Rule field will become available for input.
Rule Name	The unique identifier of the Business Rule.
Candidate Rules	This allows the selection of an existing Candidate Rule where snippets may be imported into the Business Rule. Snippets may be imported directly from an object by using the Application/Object buttons in the Objects Containing Candidate Snippets Group and selecting specific code structures.
Objects Containing Candidate Snippets group:	
Application	The name of the Application where the object containing the candidate snippets reside.
Object	The name of the object containing the candidate snippet. Objects can be selected by using a double click with the left hand mouse button . This will invoke the Select Snippets screen allowing the selection of the snippets to be imported from the particular object.
Selected Snippets group:	
Application	The name of the application where the particular snippet comes from.
Object	The name of the object where the particular snippet comes from.
Start	The starting line number of the snippet.
End	The ending line number of the snippet.
<i>NB: Snippets may be promoted or demoted in the list by using the Selected Snippets Context Menu.</i>	
Rule Definition screen:	
Selected Source Code	Display the selected source code for the currently selected object. Any source code lines that are part of a saved line range will be colored blue and will have the following in the first 2 bytes of the line: CS Indicates that the line is the start of a range. CE Indicates that the line is the end of a range. <i>Note: If a single line has been selected for start and end ranges, e.g., 0100-0100, then the indicator will show only CS.</i>

BUTTON NAME	DESCRIPTION
-------------	-------------

Business Rules group:

Maintain Description and Keywords	<p>Invokes the Maintain Description and Keywords screen to add and maintain the description and keywords for the Business Rule.</p> <p>If a description and/or keywords have been added then an asterix '*' will be shown on the button.</p>
--	--

Objects Containing Candidate Snippets group:

Prev	<p>Scrolls the object list to previous page.</p> <p>This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.</p>
More	<p>Scrolls the object list forward one page.</p> <p>This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.</p>

Selected Snippets group:

Identify Similar Code	<p>Invokes the Similar Code Identifier screen to identify other pieces of code within the Application that contain similar code structures to the selected snippet. The results may then be used to identify potential locations for the use of the new Business Rule Component.</p>
Select Addl.	<p>Invokes the Select Snippets screen to choose additional snippets to be added to the Business Rule.</p>
Remove	<p>Remove the selected snippet from the Business Rule.</p>
Prev	<p>Scrolls the snippet list to previous page.</p> <p>This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.</p>
More	<p>Scrolls the snippet list forward one page.</p> <p>This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.</p>

BUTTON NAME	DESCRIPTION
Rule Definition screen:	
Export Source	Save the selected source code shown to a file. The file is saved with a file extension of '.TXT'. By default, this file will be saved to the data folder where Natural Engineer is installed.
Delete	Deletes the selected Business Rule.
OK	Save changes and close the current screen.
Cancel	Cancel the Rule Definition process and return back to the Business Rules screen.
Apply	Save changes and retain the current screen.
	<i>Note: This button is only enabled if any changes have been made.</i>

Selected Snippets Context Menu

The Selected Snippets context menu is invoked by placing the cursor on any of the snippets listed in the Selected Snippets list and using the right hand mouse button with a single click.

CONTEXT MENU ITEM	DESCRIPTION
Move Snippet up one place	Promote the snippet in the hierarchical list of code to be added to the new generated object.
Move Snippet down one place	Demote the snippet in the hierarchical list of code to be added to the new generated object.

Maintain Description and Keywords

The Maintain Description and Keywords screen is invoked from the [Rule Definition](#) screen. It provides the ability to add a description for the selected Business Rule and to add Keywords to help identify the Business Rules. These keywords are used by the Keyword Catalogue which is accessed from the Utilities menu.

The following Figure 3-6 illustrates the Maintain Description and Keywords screen.

The screenshot shows a window titled "Maintain Description and Keywords". It features a "Rule Description" text area containing "Validation for Address". Below this is a "Search Keywords" section with two columns: "VALIDATION" and "ADDRESS". The first row of the "Search Keywords" section has "VALIDATION" in the first column and "ADDRESS" in the second column. There are eight additional empty rows in the "Search Keywords" section. At the bottom of the window are three buttons: "OK", "Cancel", and "Apply".

Figure 3-6 Maintain Description and Keywords screen

SCREEN ITEMS	DESCRIPTION
Rule Description	The description of the Business Rule.
Search Keywords	The Keywords associated with the Business Rule.

BUTTON NAME	DESCRIPTION
OK	Save changes and close the current screen.
Cancel	Cancel the Maintain Description and Keywords process and return back to the Rule Definition screen.
Apply	Save changes and retain the current screen. <i>Note: This button is only enabled if any changes have been made.</i>

Select Snippets

The Select Snippets screen is invoked from the [Rule Definition](#) screen. It gets invoked when an object from a candidate rule is selected or when the “Select Addl.” button is selected. It provides the ability to choose additional snippets to be added to the list of snippets within the business rule or remove existing snippets.

The following Figure 3-7 illustrates the Select Snippets screen.

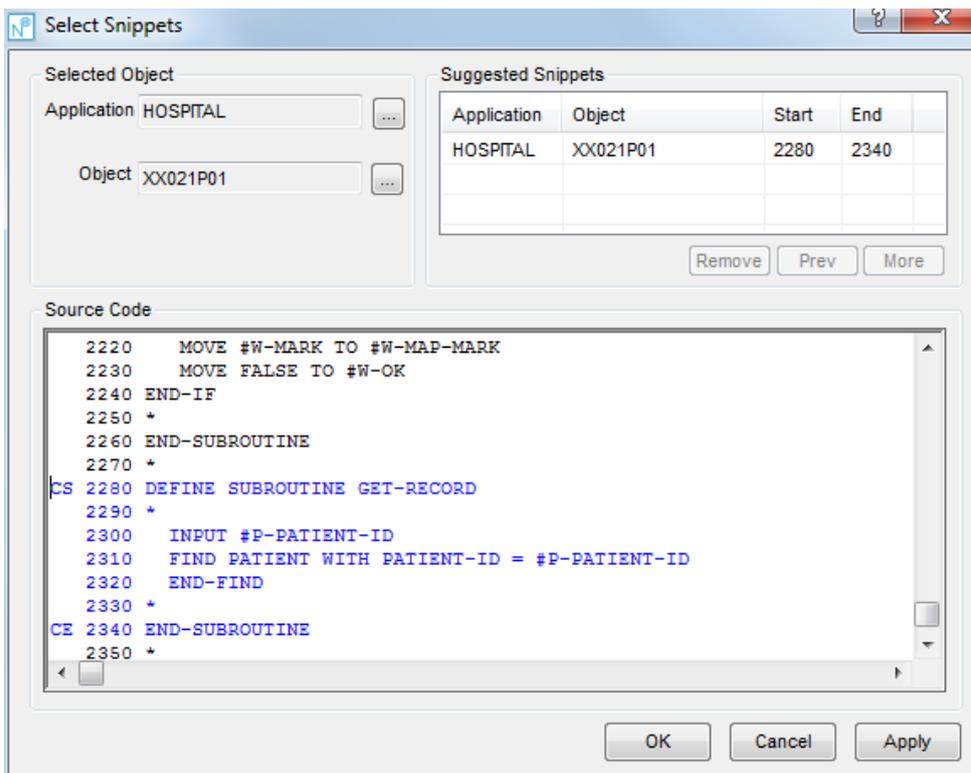


Figure 3-7 Select Snippets screen

SCREEN ITEMS DESCRIPTION

Selected Object group:

Application The name of the application to select the snippet from.

Object The name of the object to select the snippet from.

Suggested Snippets group:

Application The application name related to the chosen snippet.

Object The object name related to the chosen snippet.

Start The starting line number of the chosen snippet.

End The ending line number of the chosen snippet.

Select Object screen:

Source Code Display the selected source code for the currently selected object. To select a line click within the Source Code box on the line required.

Any source code lines that are part of a saved line range will be colored blue and will have the following in the first 2 bytes of the line:

CS Indicates that the line is the start of a range.

CE Indicates that the line is the end of a range.

Note: If a single line has been selected for start and end ranges, e.g., 0100-0100, then the indicator will show only CS.

BUTTON NAME	DESCRIPTION
-------------	-------------

Selected Object group:

Application Selection [...]	Invokes the General Selection screen, listing all the available Applications.
------------------------------------	---

This button will not be available if invoked from the Objects containing candidate snippets list on the Rule Definition screen.

Object Selection [...]	Invokes the General Selection screen, listing all the available objects for the selected Application.
-------------------------------	---

This button will not be available if invoked from the Objects containing candidate snippets list on the Rule Definition screen.

Selected Snippets group:

Remove	Removes the snippet from the chosen snippet list.
---------------	---

Prev	Scrolls the snippet list to previous page.
-------------	--

This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.

More	Scrolls the snippet list forward one page.
-------------	--

This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.

Select Object screen:

OK	Save changes and close the current screen.
-----------	--

Cancel	Cancel the Select Snippet process and return back to the Rule Definition screen.
---------------	--

Apply	Save changes and retain the current screen.
--------------	---

Note: This button is only enabled if any changes have been made.

Component Generation

The Component Generation option provides the facility to generate a new object based on the snippets selected for a specified Business Rule.

For a particular Business Rule names need to be specified for the generated objects and a modification library defined. Field/Variable Analysis would then be performed which extracts the field and variable information from the snippets that will be required for the new object. Further classification of variables may then be undertaken to determine which fields are to be used as parameter or local data.

Component Generation Window

The Component Generation option is invoked by using the ‘Start Component Generation’ button on the [Business Rules Workflow](#) screen.

The following Figure 3-8 illustrates the Component Generation screen.

The screenshot shows the 'Component Generation' window. It has a title bar with a question mark and a close button. The main area is divided into several sections:

- Business Rules:** A list box containing 'ADDRESS VALIDATION'. To the right, there are text boxes for 'PDA Name' (HRADDA01), 'Subprogram Name' (HRADDN01), and 'Modification Library' (HRX). There is also a checkbox for 'System Variables as Parameters?' which is unchecked. Below this section are 'Prev' and 'More' buttons, and a 'Field/Variable Analysis' button.
- Field/Variables:** This section contains two tables.

Parameters			
Name	IO	Format	Array
EMPLOYEES-ADDRESS-LINE	Input	A20	(1,3)
#ADDRESS	Output	A30	(1,5)
#LABEL-REC-#LABEL-ADDRESS	Output	A20	(1,5)
EMPLOYEES.CURR-CODE	Input	A3	(1,4)
EMPLOYEES.SALARY	Input	P9	(1,4)
FMP1 OYFFS RONNIS	Input	P9	(1,4,1,1)

Below the Parameters table is an 'Assign as Local' button and 'Prev' and 'More' buttons.

Local		
Name	Format	Array
#G-SELECTED-OPTION	A1	
#L-TEMP-DATE	N8	
*DATN	N8	
EMPLOYEES.CITY	A20	
EMPLOYEES.POST-CODE	A10	
FMP1 OYFFS PERSONNEL ID	A6	

Below the Local table is an 'Assign as Parameter' button and 'Prev' and 'More' buttons.
- Bottom:** A row of buttons: 'Create Component', 'OK', 'Cancel', and 'Apply'.

Figure 3-8 Component Generation screen

SCREEN ITEMS	DESCRIPTION
--------------	-------------

Business Rules group:

Business Rules	This shows a list of the Business Rules.
PDA Name	The name of the Parameter Data Area that will be generated.
Subprogram Name	The name of the Subprogram that will be generated.
Modification Library	The name of the Natural Library where the generated objects will be stored.
System Variables as Parameters	This ensures that any System Variables that are used within the snippets will get passed as parameters to the generated objects. This would be required if the generated objects are to be called by non-natural objects.

Field Variables group:

Parameters sub-group:

Name	The name of the field to be used as Parameter Data.
I/O	Documentation feature that specifies if the parameter is used as an Input parameter, Output parameter or both.
Format	The format of the field.
Array	Any array definitions of the field.

Local sub-group:

Name	The name of the field to be used as Local Data.
Format	The format of the field.
Array	Any array definitions of the field.

BUTTON NAME	DESCRIPTION
-------------	-------------

Business Rules group:

Prev	Scrolls the Business Rule list to previous page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.
More	Scrolls the Business Rule list forward one page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.

BUTTON NAME	DESCRIPTION
Field/Variable Analysis	<p>Invokes the Field/Variable Analysis process to identify suggested parameter and local fields to be used with the generated object.</p> <p>If an Analysis has already been performed a confirmation box will be presented where the analysis may be re-run or the previous results presented.</p> <p>Field/Variables group: Parameters sub-group:</p>
Prev	<p>Scrolls the parameter variable list to previous page.</p> <p>This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.</p>
More	<p>Scrolls the parameter variable list forward one page.</p> <p>This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.</p>
Assign as Local	<p>Moves the selected field to be local data.</p> <p>Locals sub-group:</p>
Prev	<p>Scrolls the local variable list to previous page.</p> <p>This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.</p>
More	<p>Scrolls the local variable list forward one page.</p> <p>This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.</p>
Assign as Parameter	<p>Moves the selected field to be parameter data.</p> <p>Component Generation screen:</p>
Create Component	<p>This will create the generated object based on the hierarchical order of the snippets selected.</p>
OK	<p>Save changes and close the current screen.</p>
Cancel	<p>Cancel the Component Generation process and return back to the Business Rules Workflow screen.</p>
Apply	<p>Save changes and retain the current screen.</p> <p><i>Note: This button is only enabled if any changes have been made.</i></p>

Generated Object Structure

The generated object may utilize certain data structures and coding techniques depending on the structure of the code selected to be part of the new component.

NAVPDA-A and **NEEMSG-A** are data areas that are provided in source form in the **SYSNEE** library that contain the standard fields used to control the sequence of calls between the calling object and the newly generated component. This ensures that the new business logic is executed in the same sequence as per the original source code.

For example the navigation field **#NAV-FLAG** is set in the generated component to certain values depending on the type of navigation structures that are used.

The following table illustrates the possible values that can be assigned to **#NAV-FLAG** and the resulting outcome:

Value	Translation	Outcome
M	REINPUT	Re-display the screen and retain control in current object.
B	ESCAPE BOTTOM	Exit the screen and retain control in current object.
R	ESCAPE ROUTINE	Exit the screen and transfer control to the calling object.
T	ESCAPE TOP	Re-display the screen and retain control in current object.
F	FETCH / STACK COMMAND	Exit the screen and transfer control to a new object.

Any object that calls the generated object could check the navigation feedback parameters to ensure the appropriate screen navigation is applied.

For example:

```
::::
0600 * -----
0610 *      Navigation Feedback
0620 * -----
0630 DEFINE SUBROUTINE ##NAV-FEEDBACK
0640 DECIDE ON FIRST VALUE OF #NAV-FLAG
0650   VALUE 'B'
0660     ESCAPE BOTTOM
0670   VALUE 'T'
0680     ESCAPE TOP
0690   VALUE 'M'
0700     INCLUDE NEEREC01
0710   NONE VALUES
0720     IGNORE
0730 END-DECIDE
0740 END-SUBROUTINE
0750 END
::::
```


DATA MASKING

Chapter Overview

This chapter describes the Natural Engineer Data Masking option available from the Advanced Services menu.

Data Masking or Data Obfuscation replaces sensitive data with fictitious, but realistic data that can be used for purposes such as software testing and user training.

True Data Masking Techniques via substitution transform confidential information whilst maintaining the integrity of the data. Other techniques such as character scrambling, data redaction (“X-ing” out characters) may render transformed data useless to end users.

The topics covered are:

1. [Data Model Maintenance](#)
2. [Data Masking Rules Maintenance](#)
3. [Data Masking Calendar Maintenance](#)
4. [Data Masking Execution](#)

Data Model Maintenance

The Data Model Maintenance option allows for the definition of relationships between Database files.

Data Model Maintenance Selection Screen

The Data Model Maintenance Selection screen is accessed using the following menu navigation: Advanced Services → Data Masking → Data Model Maintenance.

This screen presents a list of previously defined Data Models or allows the addition of a new one.

The following Figure 4-1 illustrates the Data Model Maintenance Selection screen.

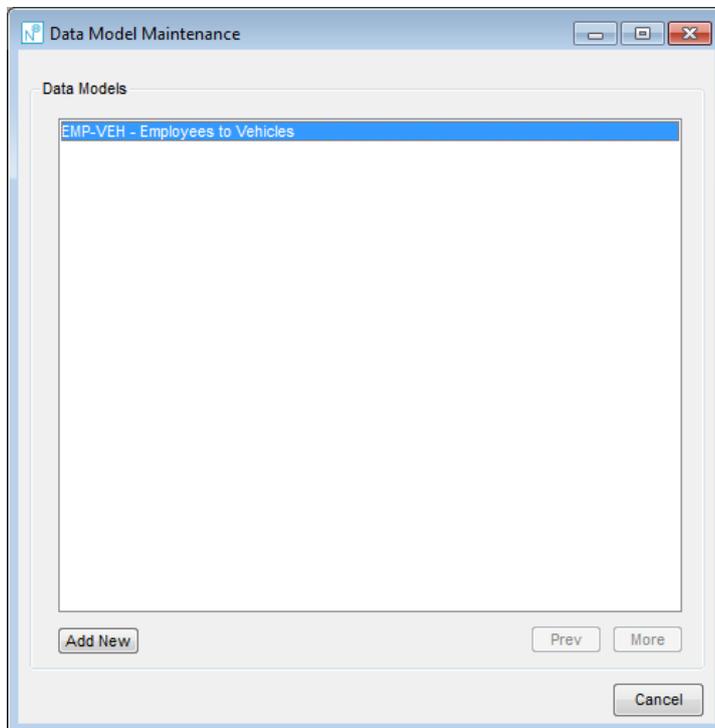


Figure 4-1 Data Model Maintenance Selection screen

SCREEN ITEMS	DESCRIPTION
Data Models	Provides a list of previously defined Data Models. Selecting a Data Model will display the Data Model Maintenance screen where the Data Model may be modified and relationships added or deleted.

BUTTON NAME	DESCRIPTION
Add New	Invoke the Add New Data Model screen.
Prev	Scrolls the Data Model list to previous page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.
More	Scrolls the Data Model list forward one page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.
Data Model Maintenance Selection screen:	
Cancel	Cancel the Data Model Maintenance Selection process and return back to the main Natural Engineer screen.

Note: For more information on the NATENG.INI file parameter LISTBOXMAX refer to Chapter 1 in the Natural Engineer Administration Guide for Windows manual.

Data Model Maintenance Selection Screen Context Menu

The Data Model Maintenance Selection Screen context menu is invoked by placing the cursor on any of the Data Models listed and using the right hand mouse button with a single click.

CONTEXT MENU ITEM	DESCRIPTION										
Data Model Treeview	Will display a Treeview showing the Data Model.										
Change Start Position of Data Model List...	<p>Reposition the list of Data Models to start from a particular Data Model name.</p> <p>The reposition value can be input using either a complete name or part name using an '*' (asterisk) wildcard.</p> <p>The reposition value is appended to the entity list title to highlight the type of repositioning being applied.</p> <p>Possible reposition values are:</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>' ' (blank)</td> <td>Reposition to the top of the Data Model list.</td> </tr> <tr> <td>*</td> <td>Reposition to the top of the Data Model list.</td> </tr> <tr> <td>ABC*</td> <td>Only show Data Models that are prefixed by 'ABC'.</td> </tr> <tr> <td>XYZ</td> <td>Reposition to the first Data Model that either matches or is greater than 'XYZ' and then continue the Data Model list from that point.</td> </tr> </tbody> </table>	Value	Result	' ' (blank)	Reposition to the top of the Data Model list.	*	Reposition to the top of the Data Model list.	ABC*	Only show Data Models that are prefixed by 'ABC'.	XYZ	Reposition to the first Data Model that either matches or is greater than 'XYZ' and then continue the Data Model list from that point.
Value	Result										
' ' (blank)	Reposition to the top of the Data Model list.										
*	Reposition to the top of the Data Model list.										
ABC*	Only show Data Models that are prefixed by 'ABC'.										
XYZ	Reposition to the first Data Model that either matches or is greater than 'XYZ' and then continue the Data Model list from that point.										

Add New Data Model Screen

The Add New Data Model screen is accessed from the Add New button on the [Data Model Maintenance Selection](#) screen.

This screen allows the definition of a Data Model name and Description. When completed the Data Model Maintenance Selection screen will be re-presented allowing the newly added Data Model to be edited and to have relationships added.

The following Figure 4-2 illustrates the Add New Data Model screen.

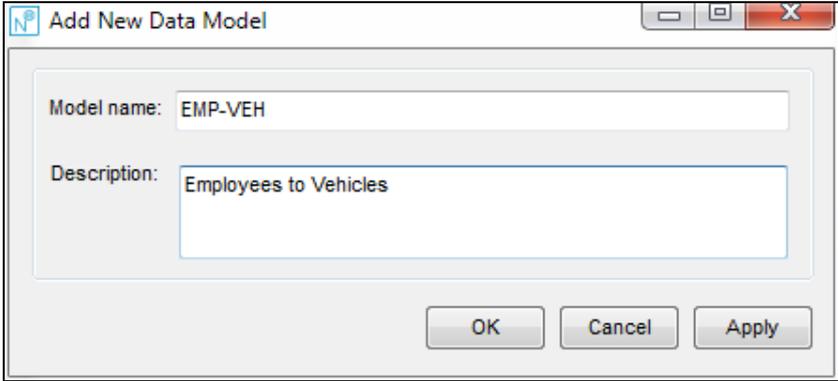


Figure 4-2 Add New Data Model screen

SCREEN ITEMS	DESCRIPTION
Model Name	The name of the Data Model.
Description	The description of the Data Model.

4

Natural Engineer Advanced Services

BUTTON NAME	DESCRIPTION
[OK A	Will add the Data Model name and description and return to the Data Model Maintenance Selection screen.
R Cancel I	Cancel the Add New Data Model process and return to the Data Model Maintenance Selection screen.
S Apply]	Will add the Data Model name and description leaving the Add New Data Model screen open so that multiple Data Models may be added if required.

SCREEN ITEMS	DESCRIPTION
Description	The description of the Data Model.
Relationships group	
Description	The description of the relationship.
Parent	The Parent Relationship (Dependancy).
From	The DDM and Field comprising the From Relationship.
To	The DDM and Field comprising the To Relationship.

BUTTON NAME	DESCRIPTION
[Add Relationship	Invoke the Data Model Relationship Maintenance screen to add a new relationship.
A	
R Prev	Scrolls the Relationship list to previous page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.
I	
S	
] More	Scrolls the Relationship list forward one page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.
Data Model Maintenance Screen	
Entry Point	Invoke the Data Model Entry Point screen.
Source and Targets	Invoke the Maintain Database Sources and Targets screen.
Delete	Will delete the Data Model and return to the Data Model Maintenance Selection screen.
OK	Will add the details and return to the Data Model Maintenance Selection screen.
Cancel	Cancel the Data Model Maintenance process and return to the Data Model Maintenance Selection screen.
Apply	Will add the details leaving the Data Model Maintenance screen open so that multiple entries may be added if required.

Data Model Relationship Maintenance Screen

The Data Model Relationship Maintenance screen is accessed by selecting a Data Model Relationship on the [Data Model Maintenance Screen](#) or by hitting the Add New Relationship button on the same screen.

This screen allows the definition of relationships between fields in files for the Data model.

The following Figure 4-4 illustrates the Data Model Relationship Maintenance screen.

Maintain Relationship for Data Model EMP-VEH

Description
Get Vehicles

From
EMPLOYEES (11)

	Name	F	Length	Start	End
1	PERSONNEL-ID	AA	A 8	1	8

To
VEHICLES (12)

	Name	F	Length	Start	End
1	PERSONNEL-ID	AC	A 8	1	8

Select Fields Conditions

Parent Relationship

Relationship Type

1 : 1
 1 : many
 many : many

Delete OK Cancel Apply

Figure 4-4 Data Model Relationship Maintenance screen

4

Natural Engineer Advanced Services

SCREEN ITEMS	DESCRIPTION
Description	The description of the Relationship.
Parent Relationship	The Parent Relationship (if any).
Relationship Type	The type of the relationship. Options are: 1-1 1-Many Many-Many
From group	
From DDM	The name of the From DDM.
Field Level	The level number of the From field.
Name	The name of the From field.
2-Byte ADABAS Mnemonic	The ADABAS short name for the From field.
F	The data format of the From field.
Length	The length of the From field.
Start	The start byte position of the From field.
End	The end byte position of the From field.
To group	
To DDM	The name of the To DDM.
Field Level	The level number of the To field.
Name	The name of the To field.
2-Byte ADABAS Mnemonic	The ADABAS short name for the To field.
F	The data format of the To field.
Length	The length of the To field.
Start	The start byte position of the To field.
End	The end byte position of the To field.
Fixed Replacement	Contains information regarding any Fixed Value Prefix/Suffix details that have been added.

BUTTON NAME	DESCRIPTION
[From group	
A R I S] Select Fields	Invoke the From Field selection screen.
Conditions	Invoke the Conditions screen for the From Field.
S To group	
] Select Fields	Invoke the To Field selection screen.
Conditions	Invoke the Conditions screen for the To Field.
Data Model Relationship Maintenance Screen	
Delete	Will delete the Data Model Relationship and return to the Data Model Maintenance screen.
OK	Will add the Data Model Relationship and return to the Data Model Maintenance screen.
Cancel	Cancel the Data Model Relationship process and return to the Data Model Maintenance screen.
Apply	Will save the Data Model Relationship.

Data Model Relationship Maintenance Screen Context Menu

The Data Model Relationship Maintenance Screen context menu is invoked by placing the cursor on any of the fields in the From or To lists and using the right hand mouse button with a single click.

CONTEXT MENU ITEM	DESCRIPTION
Edit Start/End Position	Allows the Start/End byte position of the field to be modified.
Remove Selected Field	Will remove the selected field from the list.
Fixed Value Prefix/Suffix	Invokes the Fixed Value Prefix/Suffix screen to allow fixed replacements to be added.
	<i>Note: This is only available on the fields in the To list.</i>

4

Natural Engineer Advanced Services

From Field Selection Screen

The From Field Selection Screen allows one or more From Fields to be selected. Multiple fields may be selected by using CTRL-Click on the required fields.

The following Figure 4-5 illustrates the From Field selection screen.

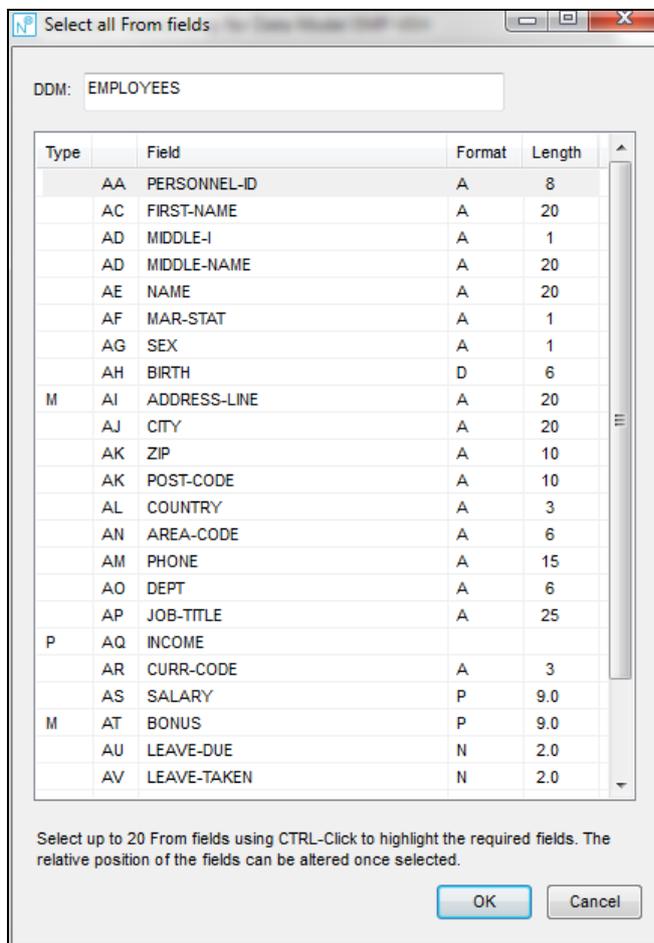


Figure 4-5 From Field selection screen

To Field Selection Screen

The To Field Selection Screen allows one To Fields to be selected.

The following Figure 4-6 illustrates the To Field selection screen.

DDM: VEHICLES

Type	Field	Format	Length
AA	REG-NUM	A	15
AC	PERSONNEL-ID	A	8
AD	MAKE	A	20
AF	COLOR	A	10
AF	COLOUR	A	10
AH	CLASS	A	1
AN	DAT-ACQ-DESC	B	4
AO	MODEL-YEAR-MAKE	A	22

Select one To field.

OK Cancel

Figure 4-6 To Field selection screen

Fixed Value Prefix/Suffix Screen

The Fixed Value Prefix/Suffix screen allows a fixed replacement value to be specified for the front and/or the end of the To field.

The following Figure 4-7 illustrates the Fixed Value Prefix/Suffix selection screen.

Figure 4-7 Fixed Value Prefix/Suffix screen

SCREEN ITEMS	DESCRIPTION
Prefix group	
Offset	The position from the front of the field to start applying the fixed value replacement. This is a non-modifiable field set to offset 1.
Length	The length of the fixed value replacement for the prefix.
Value	The value to be replaced for the prefix.
Suffix group	
Offset	The position from the start of the field to start applying the fixed value replacement for the suffix.
Length	The length of the fixed value replacement for the suffix.
Value Start	The start value to be replaced for the suffix.
Value End	The end value to be replaced for the suffix.

BUTTON NAME	DESCRIPTION
OK	Will add the Fixed Value Prefix/Suffix information and return to the Data Model Relationship Maintenance screen.
Cancel	Cancel the Fixed Value Prefix/Suffix process and return to the Data Model Relationship Maintenance screen.

Relationship Conditions Screen

The Relationship Conditions screen is a multi-tabbed screen allowing specific conditions to be applied to the To and/or From fields or bespoke code for more complex conditions.

The following Figure 4-8 illustrates the Relationship Conditions screen – Simple Tab.

Field	Operator	Value
NAME	EQ	SMITH

Figure 4-8 Relationship Conditions screen – Simple Tab

The following Figure 4-9 illustrates the Relationship Conditions screen – Bespoke Tab.

```
~SEX~ EQ 'F' AND ~SALARY~ GT 30000
```

Field names from the DDM should be enclosed by ~ e.g. ~FELDA~ EQ 'A'

Figure 4-9 Relationship Conditions screen – Bespoke Tab

Data Model Entry Point Maintenance Screen

The Data Model Entry Point Maintenance screen is accessed by selecting the Entry Point button on the [Data Model Maintenance Screen](#).

This screen allows the definition of an Entry Point for a Data Model. The Entry Point is the starting point of records to be read that builds the required set of data. It is possible to specify a defined Descriptor/Super with single or a range of values.

Conditions can be specified to determine whether to accept the record read (For instance, only accept if SEX is F (Female)).

The following Figure 4-10 illustrates the Data Model Entry Point Maintenance screen.

The screenshot shows a window titled "Data Model Entry Point Maintenance for EMP-VEH". At the top, there is a text box labeled "DDM:" containing the value "EMPLOYEES". Below this is the "Entry Point" section, which contains a table with three columns: "Field", "Operator", and "Value". The first row shows "PERSONNEL-ID" in the Field column, "THRU" in the Operator column, and a range of values "11100102" to "11100105" in the Value column. Below the "Entry Point" section is the "Conditions" section, which has two tabs: "Simple" and "Bespoke". The "Simple" tab is selected, and it contains a table with three columns: "Field", "Operator", and "Value". The first row shows "SEX" in the Field column, "EQ" in the Operator column, and "F" in the Value column. At the bottom of the window, there are four buttons: "Delete", "OK", "Cancel", and "Apply".

Figure 4-10 Data Model Entry Point Maintenance screen

4

Natural Engineer Advanced Services

SCREEN ITEMS	DESCRIPTION
DDM	The name of the DDM.
Entry Point group	
Field	The name of the field to be used as the Entry Point. The field maybe specified as *ISN. If the logic determining the top record is complex, a user defined program may be written to execute beforehand to create a list of ISNs in a work file to be used by the process to extract records.
Operator	The Operator to determine the records to be read.
Value From	The value of the record or the From value of the record if an Operator such as THRU has been selected.
Value To	The To value of the record if an Operator such as THRU has been selected.
Conditions group – Simple Tab	
Field	The name of the field to be used as a condition in determining which records are to be read.
Operator	The Operator of the condition.
Value	The value of the condition.
Conditions group – Bespoke Tab	
Bespoke Conditions	Enables complex range of conditions to be defined e.g., ~SEX~ EQ 'F' AND ~SALARY~ GT 30000 would be only accepted if the person was female with a salary greater than 30,000.

BUTTON NAME	DESCRIPTION
[Delete	Will delete the Data Model Entry Point and return to the Data Model Maintenance screen.
A	
R OK	Will add the Data Model Entry Point and return to the Data Model Maintenance screen.
I	
S Cancel	Cancel the Data Model Entry Point process and return to the Data Model Maintenance screen.
]	
Apply	Will save the Data Model Entry Point.

Maintain Database Source and Targets Screen

The Maintain Database Source and Targets screen is accessed by selecting the Sources & Targets button on the [Data Model Maintenance Screen](#).

This is a mandatory process that has to be performed before [Data Masking Execution](#) is performed.

This screen allows the definition of database and file ids of the files that are to be modified. If extracting from a production environment to transfer to a test environment then a Source DBID/FNR and Target DBID/FNR needs to be specified.

If the file to be modified is loaded into a database on a test environment, then the 'Update the Database Directly' flag should be selected and only Source DBID/FNR needs to be specified.

The following Figure 4-11 illustrates the Maintain Database Source and Targets screen.

DDM	From DBID	FNR	To DBID	FNR
EMPLOYEES	12	11	15	11
VEHICLES	12	12	15	12

Figure 4-11 Maintain Database Source and Targets screen

SCREEN ITEMS	DESCRIPTION
Update the Database Directly?	Should be set on only if the database to be updated resides in a test environment.
Database Sources & Targets group	
DDM	The name of the DDM.
From DBID	The Database ID of the Source Database.
From FNR	The File Number of the Source File.
To DBID	The Database ID of the Target Database. <i>Note: This is not available if the Update the Database Directly flag is selected.</i>
To FNR	The File Number of the Target File. <i>Note: This is not available if the Update the Database Directly flag is selected.</i>

BUTTON NAME	DESCRIPTION
[OK	Will add the Maintain Database Sources & Targets details and return to the Data Model Maintenance screen.
A	
R Cancel	Cancel the Maintain Database Sources & Targets process and return to the Data Model Maintenance screen.
I	
S Apply	Will save the Maintain Database Sources & Targets details.
] Prev	Scrolls the list to previous page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.
More	Scrolls the list forward one page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.

Note: For more information on the NATENG.INI file parameter LISTBOXMAX refer to Chapter 1 in the Natural Engineer Administration Guide for Windows manual.

Maintain Database Sources and Targets Screen Context Menu

The Maintain Database Sources and Targets Screen context menu is invoked by placing the cursor on any of the rows listed and using the right hand mouse button with a single click.

CONTEXT MENU ITEM	DESCRIPTION										
Change Start Position of DDMs List...	<p>Reposition the list of DDMs to start from a particular DDM.</p> <p>The reposition value can be input using either a complete name or part name using an '*' (asterisk) wildcard.</p> <p>The reposition value is appended to the entity list title to highlight the type of repositioning being applied.</p> <p>Possible reposition values are:</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>' ' (blank)</td> <td>Reposition to the top of the DDM list.</td> </tr> <tr> <td>*</td> <td>Reposition to the top of the DDM list.</td> </tr> <tr> <td>ABC*</td> <td>Only show DDMs that are prefixed by 'ABC'.</td> </tr> <tr> <td>XYZ</td> <td>Reposition to the first DDM that either matches or is greater than 'XYZ' and then continue the DDM list from that point.</td> </tr> </tbody> </table>	Value	Result	' ' (blank)	Reposition to the top of the DDM list.	*	Reposition to the top of the DDM list.	ABC*	Only show DDMs that are prefixed by 'ABC'.	XYZ	Reposition to the first DDM that either matches or is greater than 'XYZ' and then continue the DDM list from that point.
Value	Result										
' ' (blank)	Reposition to the top of the DDM list.										
*	Reposition to the top of the DDM list.										
ABC*	Only show DDMs that are prefixed by 'ABC'.										
XYZ	Reposition to the first DDM that either matches or is greater than 'XYZ' and then continue the DDM list from that point.										

Data Masking Rules Maintenance

The Data Masking Rules Maintenance option allows for the definition of masking rules that will be applied against the data within the specified files.

Data Masking Rules Maintenance Screen

The Data Masking Rules Maintenance screen is accessed using the following menu navigation: Advanced Services → Data Masking → Data Masking Rules Maintenance.

Selecting a Rule will display the [Maintain a Rule](#) screen to review or edit the rule definition.

The following Figure 4-12 illustrates the Data Masking Rules Maintenance screen.

Field	Rule Type	Summary
* ADDRESS-LINE	Replace with a random value...	This field will be replaced with a random value from file UK-ADDR
* FIRST-NAME	Replace with a random value...	This field will be replaced with a random value from file UK-FN-M when SEX ...
* FIRST-NAME	Replace with a random value...	This field will be replaced with a random value from file UK-FN-F when SEX E...
* MIDDLE-NAME	Replace with a random value...	This field will be replaced with a random value from file UK-FN-M
* NAME	Replace with a random value...	This field will be replaced with a random value from file UK-LN

* indicates a Rule that applies to this field in ALL Data Models

Figure 4-12 Data Masking Rules Maintenance screen

SCREEN ITEMS	DESCRIPTION
Data Model	The name of the Data Model. NB: If ALL is selected it will only show those rules that are applicable to every Data Model. It does not show ALL rules regardless.
DDM	The name of the DDM.
Add New Rule group	
Field	The name of the field to be applied to the Rule.
Rule Type	The type of Rule to be applied. Default options are: <ul style="list-style-type: none"> • Replaced with a FIXED value Will replace the field contents with a fixed value. • Add a FIXED value Will increment the field contents by a +/- value. • Add a %age value Will increment the field contents by a +/- percentage value. • Replace with a random value from a file Will replace the field contents with a random value from a user defined file. <i>Note: The file location is determined by the MASK-LOCATION= setting in the [DATA-MASKING] section of the NATENG.INI file. This will point to a Natural FUSER library.</i> • Execute a user defined subprogram Will replace the field contents with the value generated by a user defined subprogram. • Add a nbr of days to a date Will increment the field contents by a random number of days.
Rules group	
Field	The name of the field related to the Rule.
Rule Type	The name of the Rule specified.
Summary	Short description of the type of Rule specified.

4

Natural Engineer Advanced Services

BUTTON NAME	DESCRIPTION
Define	Invoke the Maintain Rule screen.
Prev	Scrolls the Rules list to previous page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.
More	Scrolls the Rules list forward one page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.

Note: For more information on the NATENG.INI file parameter LISTBOXMAX or MASK-LOCATION refer to Chapter 1 in the Natural Engineer Administration Guide for Windows manual.

Data Masking Rules Maintenance Screen Context Menu

The Data Masking Rules Maintenance Screen context menu is invoked by placing the cursor on any of the rows listed and using the right hand mouse button with a single click.

CONTEXT MENU ITEM	DESCRIPTION										
Change Start Position of Rules List...	<p>Reposition the list of Rules to start from a particular Rule.</p> <p>The reposition value can be input using either a complete name or part name using an '*' (asterisk) wildcard.</p> <p>The reposition value is appended to the entity list title to highlight the type of repositioning being applied.</p> <p>Possible reposition values are:</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>' ' (blank)</td> <td>Reposition to the top of the Rule list.</td> </tr> <tr> <td>*</td> <td>Reposition to the top of the Rule list.</td> </tr> <tr> <td>ABC*</td> <td>Only show Rules that are prefixed by 'ABC'.</td> </tr> <tr> <td>XYZ</td> <td>Reposition to the first Rule that either matches or is greater than 'XYZ' and then continue the Rule list from that point.</td> </tr> </tbody> </table>	Value	Result	' ' (blank)	Reposition to the top of the Rule list.	*	Reposition to the top of the Rule list.	ABC*	Only show Rules that are prefixed by 'ABC'.	XYZ	Reposition to the first Rule that either matches or is greater than 'XYZ' and then continue the Rule list from that point.
Value	Result										
' ' (blank)	Reposition to the top of the Rule list.										
*	Reposition to the top of the Rule list.										
ABC*	Only show Rules that are prefixed by 'ABC'.										
XYZ	Reposition to the first Rule that either matches or is greater than 'XYZ' and then continue the Rule list from that point.										

Maintain a Rule Screen

The Maintain a Rule screen is accessed by selecting an already defined Rule from the [Data Masking Rule Maintenance](#) screen or by hitting the Define button on the same screen to create a new one.

Different Rule Types will display different screens depending on what type of rule needs to be applied.

The following Figure 4-13 illustrates the Maintain a Rule screen for an Add a nbr of days rule.

Define a Rule for EMP-VEH

DDM: EMPLOYEES Field: LEAVE-START

Rule Type: The date field will be incremented by a random number of days.

The random number can be within a specific range.
If this is the case, enter the lowest random number in the field marked 1. and the highest in the field marked 2.
If the resulting date should be within certain bounds, enter the lowest date in the field

Mask Reference: Keep Nulls? Mask:

Business Day? Calendar: GBR - UK-Calendar Move back to a business day Move forward to a business day

Value 1: Value 2:

Value 3: Value 4:

Condition

Simple Bespoke

Delete OK Cancel Apply

Figure 4-13 Maintain a Rule screen

SCREEN ITEMS	DESCRIPTION
Fields displayed for every Rule Type	
DDM	The name of the DDM.
Field	The name of the DDM field.
Rule Type	The description of the Rule Type that has been selected. <i>Note: The text for this field is provided by DM* Text members in the SYSNEE library.</i>
Mask Reference	The Mask Reference is an identifier to ensure that the same masking values are utilized within a set of data created from an Entry Point Record. This is especially important with key data. It should be set to the same value on each related rule.
Keep Nulls?	If selected this will not modify the contents of the field by the masking value if the value is null.
Conditions group – Simple Tab	
Field	The name of the field to be used as a condition in determining which records are to be read.
Operator	The Operator of the condition.
Value	The value of the condition.
Conditions group – Bespoke Tab	
Bespoke Conditions	Enables complex range of conditions to be defined e.g., ~SEX~ EQ 'F' AND ~SALARY~ GT 30000 would be only accepted if the person was female with a salary greater than 30,000.
Individual Rule Type options	
Replaced with a FIXED value Rule options	
Value 1	Contains the fixed value that will be used to replace the selected field.
Add a FIXED value Rule options	
Value 1	Contains the fixed +/- value that will be used to increment the selected field.

4

Natural Engineer Advanced Services

SCREEN ITEMS	DESCRIPTION
Value 3	Contains the lowest value that the field could be if the result should be in certain bounds.
Value 4	Contains the highest value that the field could be if the result should be in certain bounds.
Add a %age value Rule options	
Value 1	Contains the fixed +/- percentage value that will be used to increment the selected field.
Value 3	Contains the lowest value that the field could be if the result should be in certain bounds.
Value 4	Contains the highest value that the field could be if the result should be in certain bounds.
Replaced with a random value from a file Rule options	
File	Contains the file name which a random value will be chosen from to replace the selected field.
Execute a user defined subprogram Rule options	
File	Contains the text member name if a data source is required.
Executable	The name of the user defined subprogram which will generate the value to replace the field.
Add a nbr of days to a date Rule options	
Mask	If the selected field format is other than D (Date), the Mask input field will be visible. Enter the data mask as stored in the database in the field marked Mask e.g. for a date stored as 31122017 in an N08 field then enter the Mask as DDMMYYYY
Business Day	If the resulting date is to be a business day then this should be checked.
Calendar	The Calendar to use to check if the date is a business day. This would have been set up by the Data Masking Calendar Maintenance function.

SCREEN ITEMS	DESCRIPTION
Move back to a business day	Select this if to ensure that the result is a business day the result should be moved back to a business day as defined by the calendar.
Move forward to a business day	Select this if to ensure that the result is a business day the result should be moved forward to a business day as defined by the calendar.
Value 1	Contains the lowest random number of days that the date field will be incremented by.
Value 2	Contains the highest random number of days that the date field will be incremented by.
Value 3	Contains the lowest value that the field could be if the result should be in certain bounds. The date should be in the format YYYYMMDD.
Value 4	Contains the highest value that the field could be if the result should be in certain bounds. The date should be in the format YYYYMMDD.

BUTTON NAME	DESCRIPTION
Delete	Will delete the Rule and return to the Data Masking Rule Maintenance screen.
OK	Will add the Rule and return to the Data Masking Rule Maintenance screen.
Cancel	Cancel the Maintain a Rule process and return to the Data Masking Rule Maintenance screen.
Apply	Will save the Rule.

Data Masking Calendar Maintenance

The Data Masking Calendar Maintenance option allows for the definition of Calendars to assist in determining whether a date is a business day or not. It is used by Calendar Rules such as “Add a nbr of days to a date”. These would be defined and maintained by the [Maintain a Rule](#) screen accessible from the [Data Masking Rules Maintenance](#) screen.

Data Masking Calendar Maintenance Selection Screen

The Data Masking Calendar Maintenance Selection screen is accessed using the following menu navigation: Advanced Services → Data Masking → Data Masking Calendar Maintenance.

The following Figure 4-14 illustrates the Data Masking Calendar Maintenance Selection screen.

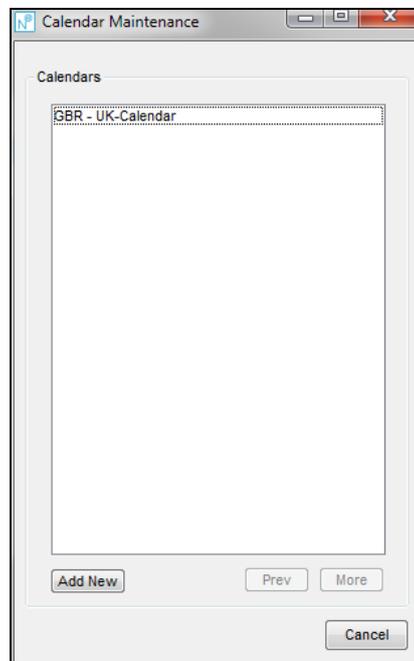


Figure 4-14 Data Masking Calendar Maintenance Selection screen

SCREEN ITEMS	DESCRIPTION
Calendars	Displays the list of Calendars already defined. Selecting a Calendar will display the Data Masking Calendar Maintenance Screen to allow the Calendar details to be amended.

BUTTON NAME	DESCRIPTION
Add New	Invoke the Data Masking Calendar Maintenance Screen to add a new Calendar.
Prev	Scrolls the Calendar list to previous page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.
More	Scrolls the Calendar list forward one page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.
Cancel	Cancel the Data Masking Calendar Maintenance process and return to the main Natural Engineer screen.

Note: For more information on the NATENG.INI file parameter LISTBOXMAX refer to Chapter 1 in the Natural Engineer Administration Guide for Windows manual.

Data Masking Calendar Maintenance Selection Screen Context Menu

The Data Masking Calendar Maintenance Selection Screen context menu is invoked by placing the cursor on any Calendars listed and using the right hand mouse button with a single click.

CONTEXT MENU ITEM	DESCRIPTION										
Change Start Position of Calendar List...	<p>Reposition the list of Calendars to start from a particular Calendar.</p> <p>The reposition value can be input using either a complete name or part name using an '*' (asterisk) wildcard.</p> <p>The reposition value is appended to the entity list title to highlight the type of repositioning being applied.</p> <p>Possible reposition values are:</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>' ' (blank)</td> <td>Reposition to the top of the Calendar list.</td> </tr> <tr> <td>*</td> <td>Reposition to the top of the Calendar list.</td> </tr> <tr> <td>ABC*</td> <td>Only show Calendars that are prefixed by 'ABC'.</td> </tr> <tr> <td>XYZ</td> <td>Reposition to the first Calendar that either matches or is greater than 'XYZ' and then continue the Calendar list from that point.</td> </tr> </tbody> </table>	Value	Result	' ' (blank)	Reposition to the top of the Calendar list.	*	Reposition to the top of the Calendar list.	ABC*	Only show Calendars that are prefixed by 'ABC'.	XYZ	Reposition to the first Calendar that either matches or is greater than 'XYZ' and then continue the Calendar list from that point.
Value	Result										
' ' (blank)	Reposition to the top of the Calendar list.										
*	Reposition to the top of the Calendar list.										
ABC*	Only show Calendars that are prefixed by 'ABC'.										
XYZ	Reposition to the first Calendar that either matches or is greater than 'XYZ' and then continue the Calendar list from that point.										

Data Masking Calendar Maintenance Screen

The Data Masking Calendar Maintenance screen is accessed by selecting an already defined Calendar from the list of Calendars displayed on the [Data Masking Calendar Maintenance Selection](#) screen or by hitting the Add New button on the same screen to define a new Calendar.

The following Figure 4-15 illustrates the Data Masking Calendar Maintenance screen.

The screenshot shows a software window titled "Data Masking Calendar Maintenance". The window contains the following elements:

- Country Details:** Code: GBR, Name: UK-Calendar
- Working Days:** A list of days with checkboxes: Monday (checked), Tuesday (checked), Wednesday (checked), Thursday (checked), Friday (checked), Saturday (unchecked), Sunday (unchecked).
- Public Holidays:** A date picker showing "17 July 2018" and an "Add" button. Below it is a list of public holidays: "Tuesday 25 December 2018", "Wednesday 26 December 2018", and "Tuesday 1 January 2019". There are "Prev" and "More" buttons at the bottom of this section.
- Bottom Buttons:** "Delete", "OK", "Cancel", and "Apply".

Figure 4-15 Data Masking Calendar Maintenance screen

4

Natural Engineer Advanced Services

SCREEN ITEMS	DESCRIPTION
Code	A unique identifier for the Calendar.
Name	The name of the Calendar.
Working Days	Select which days are to be working days for this Calendar.
Public Holidays	The list of Public Holidays defined for this particular Calendar.

BUTTON NAME	DESCRIPTION
Country Details group	
Delete	Will delete the Calendar and return to the Data Masking Calendar Maintenance Selection screen.
OK	Will add the Calendar and return to the Data Masking Calendar Maintenance Selection screen.
Cancel	Cancel the Data Masking Calendar Maintenance process and return to the Data Masking Calendar Maintenance Selection screen.
Apply	Will save the Calendar.
Public Holidays group	
Add	Will add the specified date as a Public Holiday for this Calendar.
Prev	Scrolls the Public Holidays list to previous page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.
More	Scrolls the Public Holidays list forward one page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.

Note: For more information on the NATENG.INI file parameter LISTBOXMAX refer to Chapter 1 in the Natural Engineer Administration Guide for Windows manual.

Data Masking Calendar Maintenance Screen Context Menu

The Data Masking Calendar Maintenance Screen context menu is invoked by placing the cursor on any of the Public Holidays listed and using the right hand mouse button with a single click.

CONTEXT MENU ITEM	DESCRIPTION										
Delete	Will delete the selected Public Holiday.										
Reposition list of Holidays...	<p>Reposition the list of Public Holidays to start from a particular Public Holiday.</p> <p>The reposition value can be input using either a complete name or part name using an '*' (asterisk) wildcard.</p> <p>The reposition value is appended to the entity list title to highlight the type of repositioning being applied.</p> <p>Possible reposition values are:</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>' ' (blank)</td> <td>Reposition to the top of the Public Holiday list.</td> </tr> <tr> <td>*</td> <td>Reposition to the top of the Public Holiday list.</td> </tr> <tr> <td>ABC*</td> <td>Only show Public Holiday that are prefixed by 'ABC'.</td> </tr> <tr> <td>XYZ</td> <td>Reposition to the first Public Holiday that either matches or is greater than 'XYZ' and then continue the Public Holiday list from that point.</td> </tr> </tbody> </table>	Value	Result	' ' (blank)	Reposition to the top of the Public Holiday list.	*	Reposition to the top of the Public Holiday list.	ABC*	Only show Public Holiday that are prefixed by 'ABC'.	XYZ	Reposition to the first Public Holiday that either matches or is greater than 'XYZ' and then continue the Public Holiday list from that point.
Value	Result										
' ' (blank)	Reposition to the top of the Public Holiday list.										
*	Reposition to the top of the Public Holiday list.										
ABC*	Only show Public Holiday that are prefixed by 'ABC'.										
XYZ	Reposition to the first Public Holiday that either matches or is greater than 'XYZ' and then continue the Public Holiday list from that point.										

Data Masking Execution

The Data Masking Execution allows for the execution of the previously defined rules against the required data.

There are two main methods of execution:

1. Extract from a Production Database for loading to a Test Database.

Will utilize a Work File to migrate data from Production LPAR to Test.

The Extraction Process will read data based on the Entry Point (EPT) that has been defined by the [Data Model Entry Point Maintenance](#) process. For each EPT Record returned, it will process all Relationships with Parent = 0. As it processes a Relationship, it will recursively call any Relationship with Parent = this.Relationship (nested Relationships).

Once it has finished processing an EPT record (the whole set of data linked to that EPT Record), it will then process the next EPT Record.

Records have any Data Masking rules applied & are then written to a Work File.

As the Data Masking is applied as the records are processed before being written to the intermediate work file the original data is never seen.

Data is written as compressed records (Format Buffer = C.). This file may then be transferred to the Test environment for loading into the Test Database.

2. Execute directly against a Test Database

Will execute directly against files loaded in a Test Database.

Processing is the same as Execution from a Production Database, except that instead of writing to the Work File it will directly issue the updates to the Test Database to apply the masking.

Data Masking Execution Screen

The Data Masking Execution screen is accessed using the following menu navigation: Advanced Services → Data Masking → Data Masking Execution.

To enable the execution to run each Data Model has to have an [Entry Point](#) and [Database Sources & Targets](#) defined.

The following Figure 4-16 illustrates the Data Masking Execution screen.

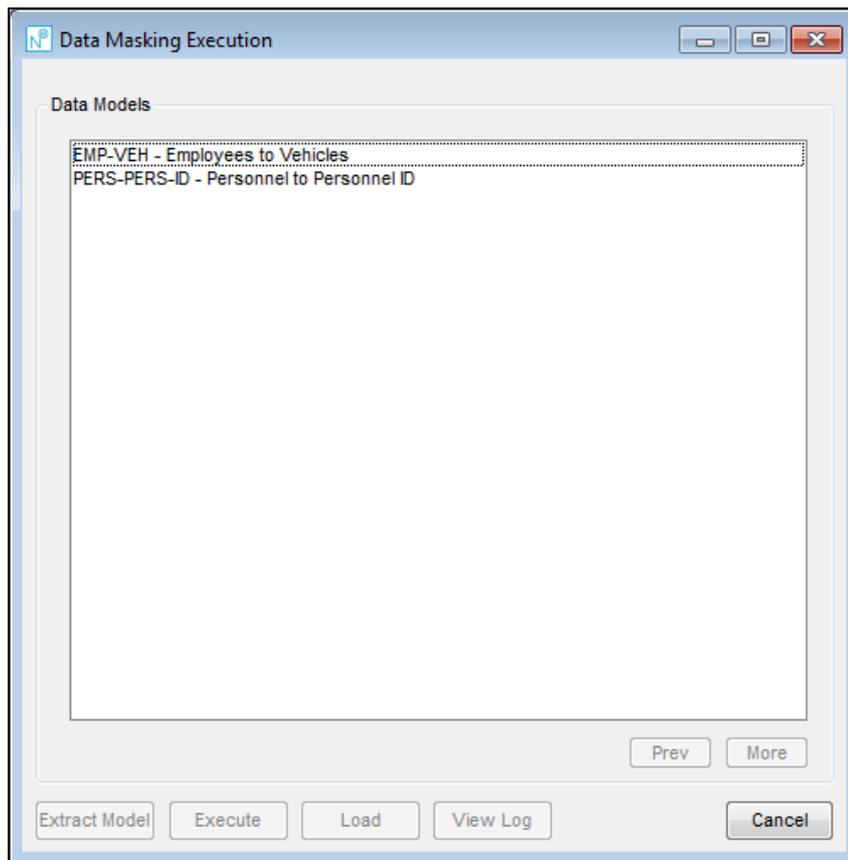


Figure 4-16 Data Masking Execution screen

SCREEN ITEMS	DESCRIPTION
Data Models	Displays the list of Data Models already defined.

BUTTON NAME	DESCRIPTION
Data Models group	
Prev	Scrolls the Data Models list to previous page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.
More	Scrolls the Data Models list forward one page. This button will be available/unavailable depending on the value specified in the LISTBOXMAX parameter in the NATENG.INI file.
Data Masking Execution screen	
Extract Model	The Extract Model will create a file of the Data Model and associated masking rules. This file could then be transferred to a different machine if required and would be used as an input to a Data Masking Batch job.
Execute	This will execute the Data Masking rules for the Data Model against the Source Database as specified in the Maintain Database Sources and Targets based on the Entry Point specified. If executing directly against a Database it will directly issue the updates to that Database to apply the masking. If not a work file will be created that may be loaded into an alternate Database using the Load function.
Load	This will load a previously executed masked work file as created by the Execute process into the Target Database as specified in the Maintain Database Sources and Targets .
View Log	Displays the Data Masking Execution log. The log resides in the Data/DATAMASK directory of your Natural Engineer Installation.
Cancel	Cancel the Data Masking Execution process and return to the main Natural Engineer screen.

Note: For more information on the NATENG.INI file parameter LISTBOXMAX refer to Chapter 1 in the Natural Engineer Administration Guide for Windows manual.

INDEX

B

- Business Rules, 105
 - Candidate Creation
 - Overview, 112
 - Candidate Maintenance
 - Overview, 115
 - Window, 115
 - Component Generation
 - Generated Object Structure, 130
 - Overview, 127
 - Window, 127
 - Overview, 106
 - Rule Definition
 - Maintain Description and Keywords, 122
 - Overview, 118
 - Select Snippets, 124
 - Window, 118
 - Rule Type Maintenance
 - Overview, 109
 - Window, 109
 - Screen, 107

D

- Data Masking, 133
 - Add New Data Model Screen, 137
 - Chapter Overview, 133
 - Data Masking Calendar Maintenance, 162
 - Data Masking Calendar Maintenance Screen, 165
 - Data Masking Calendar Maintenance Selection Screen, 162
 - Data Masking Execution, 168
 - Data Masking Execution Screen, 169
 - Data Masking Rules Maintenance, 154

- Data Masking Rules Maintenance Screen, 154
- Data Model Entry Point Maintenance Screen, 149
- Data Model Maintenance, 134
- Data Model Maintenance Screen, 139
- Data Model Maintenance Selection Screen, 134
- Data Model Relationship Maintenance Screen, 141
- Maintain a Rule Screen, 158
- Maintain Database Source and Targets Screen, 151

N

- Natural for Ajax Conversion, 9
 - Code Conversion
 - Context Menu, 34
 - Overview, 30
 - Window, 31
 - Cross Reference to Adapters
 - Context Menus, 27
 - Overview, 23
 - Window, 24
 - Inline Map Extraction
 - Context Menu, 22
 - Overview, 19
 - Window, 19
 - Natural Map Extraction
 - Context Menu, 18
 - Overview, 15
 - Window, 15
 - Overview, 10
 - Separate Processing Rules from Maps, 14
 - Workflow window, 11

R

Refactoring, 35

- Chapter Overview, 35

- Componentization, 75

 - Component Builder, 77

 - Screen, 78

 - Screen, 76

 - Similar Code Identifier, 84

 - Screen, 86

- Data Definition Module Selection, 94

 - Screen, 95

- Database Split, 92

 - Screen, 93

- Preparation Tasks, 36

 - Check for Conversational DB Loops,

 - 60

 - Impact Analysis, 61

 - Modification, 62

 - Check for Redundant Code, 57

 - Impact Analysis, 58

 - Modification, 59

 - Check for Unused Variables, 63

 - Impact Analysis, 64

 - Modification, 65

 - Convert Back References to Labels, 54

 - Impact Analysis, 55

 - Modification, 56

 - Expand Copycodes, 66

 - Exclusion Screen, 71

 - Expansion Screen, 67

 - Processes, 40

 - Reporting to Structured Mode

 - Conversion, 41

 - Screen, 36

 - Separate Processing Rules from Maps,

 - 42

 - Apply Separated Rules to Objects

 - Screen, 49

 - Restart Processing Rule Separation, 53

 - Separate Rules from Maps Screen, 45

- Refactor Database Access, 100

 - Screen, 101

- Similar Code Identifier

 - Impact Element Maintenance, 91

 - Modification Element Maintenance, 91

- User View Analysis, 99

- Refactoring Processes

 - Separate Processing Rules from Maps

 - Processing Rule Separation Screen, 43

