Conceptual Data Model User’s Guide

Sybase® PowerDesigner®

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Message Format Libraries, Sybase Central, Sybase Client/Server Interfaces, Sybase Development Framework, Sybase Financial Server, Sybase Gateways, Sybase IQ, Sybase Learning Connection, Sybase MPP, Sybase SQL Desktop, Sybase SQL Lifecycle, Sybase SQL Workgroup, Sybase Synergy Program, Sybase Virtual Server Architecture, Sybase User Workbench, SybaseWare, Syber Financial, SyberAssist, SybFlex, SybMD, SyBooks, System 10, System 11, System XI (logo), SystemTools, Tabular Data Stream, The Enterprise Client/Server Company, The Extensible Software Platform, The Future Is Wide Open, The Learning Connection, The Model For Client/Server Solutions, The Online Information Center, The Power of One, TotalFix, TradeForce, Transact-SQL, Translation Toolkit, Turning Imagination Into Reality, UltraLite, UltraLite.NET, UNIBOM, Unilib, Uninull, Unisep, Unistring, URK Runtime Kit for UniCode, Viewer, VisualWriter, VQL, WarehouseArchitect, Warehouse Control Center, Warehouse Studio, Warehouse WORKS, Watcom, Watcom SQL, Watcom SQL Server, Web Deployment Kit, Web.PB, Web.SQL, WebSights, WebViewer, Work As One, WorkGroup SQL Server, XA-Library, XA-Server, XcelleNet, and XP Server are trademarks of Sybase, Inc. or its subsidiaries.

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Contents

About This Manual

Subject

This book describes the PowerDesigner Conceptual Data Model data modeling environment. It shows you how to do the following:

- Build a Conceptual Data Model (CDM)
- Create and use business rules and other model objects
- Verify the model and import an ERwin model
- Generate other models from the CDM

Audience

This book is for anyone who will be building data models with the PowerDesigner Conceptual Data Model. Although it does not assume you have knowledge about any particular topic, having some familiarity with relational databases, SQL, and design methodology is helpful. For more information, see the Bibliography section at the end of this chapter.

Documentation primer

The PowerDesigner modeling environment supports several types of models:

- **Conceptual Data Model (CDM)** to model the overall logical structure of a database, independent from any software or data storage structure considerations
- **Physical Data Model (PDM)** to model the overall physical structure of a database, taking into account DBMS software or data storage structure considerations
- **Object Oriented Model (OOM)** to model a software system using an object-oriented approach for Java or other object languages
- **Business Process Model (BPM)** to model the means by which one or more processes are accomplished in operating business practices
- **XML Model (XSM)** to model the structure of an XML file using a DTD or an XML schema
- **Requirements Model (RQM)** to list and document the customer needs that must be satisfied during a development process

- **Information Liquidity Model (ILM)** to model the replication of information from a source database to one or several remote databases using replication engines

- **Free Model (FEM)** to create any kind of chart diagram, in a context-free environment

This book only explains the Conceptual Data Model. For information on other models or aspects of PowerDesigner, consult the following books:

General Features Guide To get familiar with the PowerDesigner interface before learning how to use any of the models.

Physical Data Model User's Guide To work with the PDM.

Object Oriented Model User's Guide To work with the OOM.

Business Process Model User's Guide To work with the BPM.

XML Model User's Guide To work with an XSM.

Information Liquidity Model User's Guide To work with an ILM.

Requirements Model User's Guide To work with an RQM.

Reports User's Guide To create reports for any or all models.

Repository User's Guide To work in a multi-user environment using a central repository.

Typographic conventions

PowerDesigner documentation uses specific typefaces to help you readily identify specific items:

- `monospace text (normal and bold)`

  Used for: Code samples, commands, compiled functions and files, references to variables.

  Example: `declare user_defined...`, the `BeforeInsertTrigger` template.

- **bold text**

  Any new term.

  Example: A **shortcut** has a target object.

- SMALL CAPS

  Any key name.

  Example: Press the ENTER key.

Bibliography

Data Modeling Essentials

Graeme Simsion, Van Nostrand Reinhold, 1994, 310 pages; paperbound; ISBN 1850328773

Information Engineering

James Martin, Prentice Hall, 1990, three volumes of 178, 497, and 625 pages respectively; clothbound, ISBN 0-13-464462-X (vol. 1), 0-13-464885-4 (vol. 2), and 0-13-465501-X (vol. 3).

Celko95

Joe Celko, Joe Celko's SQL for Smarties (Morgan Kaufmann Publishers, Inc., 1995), 467 pages; paperbound; ISBN 1-55860-323-9.

CHAPTER 1

Conceptual Data Model Basics

About this chapter

This chapter presents the Conceptual Data Model (CDM) and explains the role of conceptual modeling in the design process.

Contents

What is a CDM?

When designing a database, the design process normally starts at the conceptual level. At the conceptual level, you do not need to consider the details of actual physical implementation.

A CDM represents the overall logical structure of a database, which is independent of any software or data storage structure. A conceptual model often contains data objects not yet implemented in the physical database. It gives a formal representation of the data needed to run an enterprise or a business activity.

CDM roles

The CDM allows you to:

- Represent the organization of data in a graphic format to create Entity Relationship Diagrams (ERD)
- Verify the validity of data design
- Generate a Physical Data Model (PDM), which specifies the physical implementation of the database
- Generate an Object-Oriented Model (OOM), which specifies an object representation of the CDM using the UML standard
- Generate a Conceptual Data Model (CDM), to create another model version in order to represent different design stages

☞ For more information on ERD, see the following book *Information Engineering* , James Martin, Prentice Hall, 1990, three volumes of 178, 497, and 625 pages respectively

Logical model

The logical model allows you to design the database structure and perform some database denormalization actions.

In PowerDesigner, you design a logical model using a PDM with the <Logical Model> DBMS. This PDM is a physical model with standard objects, and without DBMS specific physical options and generation capabilities.

In the database design process, you use a logical model as an intermediary step between conceptual and physical design:

- Start with a CDM containing entities, attributes, relationships, domains, data items and business rules

- Generate a logical model (PDM with the <Logical Model> DBMS). Create indexes and specify FK column names and other common features

- Generate a set of PDMs, each targeted to a specific DBMS implementation

If need be, you may develop the CDM in several design steps starting from a high level model to a low level CDM.

This design process allows you to keep everything consistent in a large development effort.

☞ For more information on the physical data model, see the *PDM User's Guide* .

Objects in a CDM

A CDM represents the interaction of the following objects:

Object	**Tool**	**Description**
Domain	—	Set of values for which a data item is valid
Data item	—	Elementary piece of information
Entity	⊟	Person, place, thing, or concept that has characteristics of interest to the enterprise and about which you want to store information
Entity attribute	—	Elementary piece of information attached to an entity
Identifier	—	Entity attribute, or a combination of entity attributes, whose values uniquely identify each occurrence of the entity
Relationship	⧉	Named connection or relation between entities (Entity Relationship (ER) modeling methodology)
Inheritance	⋔	Special relationship that defines an entity as a special case of a more general entity
Association	⊖	Named connection or association between entities (Merise modeling methodology)
Association link	⧉	Link that connects an association to an entity and on which you define the cardinality an entity has relative to another

Defining the CDM environment

The CDM environment includes a set of parameters and configuration options that define various aspects of the model content and behavior. You can set these parameters:

- At model creation
- After creating a model with default options and parameters
- When creating a model template

CDM options

- You can set the following CDM options:
- All Objects, see section "All objects" on page 5
- Notation, see section "Notation" on page 6
- Data item, see section "Data item" on page 9
- Relationship, see section "Relationship" on page 10
- Domain/attribute, see section "Domain and attribute" on page 10

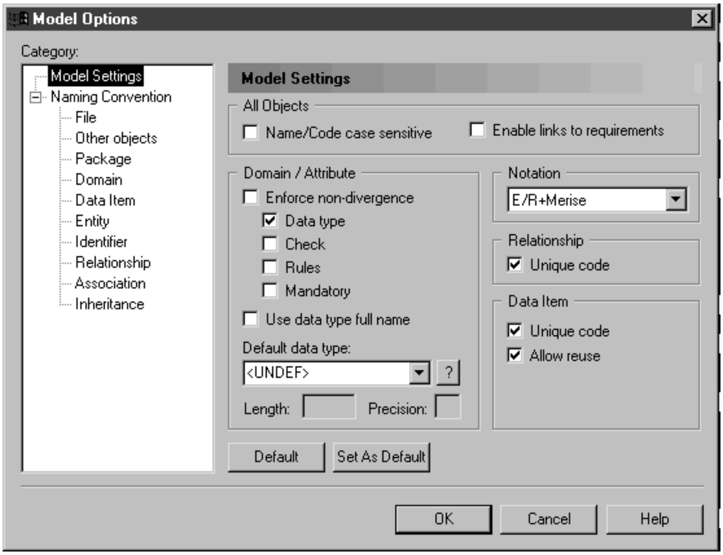
❖ To define CDM options

1. Select Tools ➤ Model options.

   or

   Right-click the diagram background, and select Model Options from the contextual menu.

   The Model Options dialog box opens to the Model Settings page.



Model Settings

All Objects

☐ Name/Code case sensitive

☐ Enable links to requirements

Domain / Attribute

☐ Enforce non-divergence

☑ Data type

☐ Check

☐ Rules

☐ Mandatory

☐ Use data type full name

Default data type: <UNDEF>

Length:

Precision:

Notation: E/R+Merise

Relationship

☑ Unique code

Data Item

☑ Unique code

☑ Allow reuse

2. Select CDM options in the different groupboxes.

3. Click OK.

All objects

Name/Code case sensitive

You can define the case sensitivity of names and codes for all objects in the current model. When this check box is selected, it implies that you can have two objects with identical name or code but different case in the same namespace.

Unlike other model options, you can modify the name and code case sensitivity during the design process. However, if you do so, make sure you run the check model feature to verify if the model does not contain any duplicate object.

Enable links to requirements

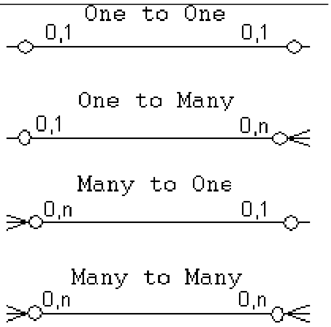
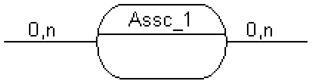
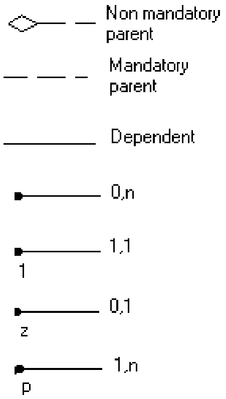
Requirements are descriptions of customer needs that must be satisfied during development processes.

You can enable links to requirements for all objects in the current model. When this check box is selected, it implies that the **Requirements** tab appears in the objects property sheet. The Requirements page allows you to attach requirements to objects; these requirements are defined in the Requirements models open in the workspace. Attached requirements and Requirements models are synchronized.

☞ For more information on requirements, see the *Requirements Model User's Guide* .

Notation

You can choose to use one or both of the following notation types in the current model:

Option	Description	Symbols
Entity / Relationships	Entity/relationship notation connects entities with links representing one of four relationships between them. These relationships have properties that apply to both entities involved in the relationship	 One to One 0,1 0,1 One to Many 0,1 0,n Many to One 0,n 0,1 Many to Many 0,n 0,n
Merise	Merise notation uses associations instead of relationships	
E/R + Merise	Both entity/relationship and Merise are used in the same model	Both types of symbols
IDEF1X	Data modeling notation for relationships and entities. In this notation, each set of relationship symbols describes a combination of the optionality and cardinality of the entity next to it	 Non mandatory parent Mandatory parent Dependent 0,n 1,1 1 0,1 z 1,n p

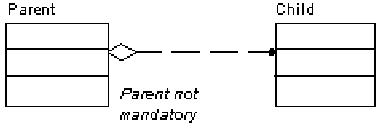
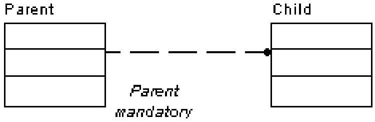
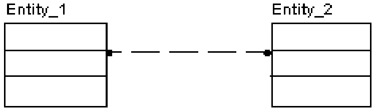
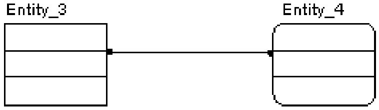
The Entity / Relationships notation is the default notation used in this manual.

When you change notation, all symbols in all diagrams are updated accordingly.

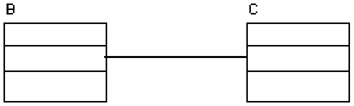
IDEF1X notation

Entities display rounded rectangles when they depend on another entity either through an inheritance link or when the relationship has the dependent property selected.

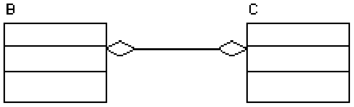
Relationships: unlike the other notations, relationship symbols cannot be parsed in terms of optionality and cardinality independently. Each set of symbols describes a combination of the optionality and cardinality of the entity next to it.

Cardinality	Representation
One - Many	 
One - One or Many - Many	
One - One dependent displays a continuous line and entity with rounded angles	

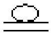
PowerDesigner does not support the following notation:



or



Sub-type or inheritance symbol changes according to the Complete property:

Complete	Symbol
Yes	
No	

Data item

You can choose to use one or both of the following data item options in the current model:

Option	Description
Unique code	When selected, requires that data items have unique codes
Allow reuse	When selected, makes it possible to reuse one data item as an attribute for more than one entity provided the attributes have same name and data type and do not belong to a primary key. When deselected or when the attribute belongs to a primary key, the data item cannot be reused. In this case, if the Unique code check box is selected, a new data item with identical name but different code is created, otherwise a new data item with identical name and code is created

Deleting entity attributes

When you delete an entity or entity attributes, data item options determine whether or not the corresponding data items are also deleted.

The following rules apply to deleted entity attributes:

Data item options	Result of deleting an entity attribute
Unique Code Allow Reuse	Deletes entity attribute Does not delete corresponding data item
Unique Code only	Deletes entity attribute Does not delete corresponding data item
Allow Reuse only	Deletes entity attribute Deletes corresponding data item if it is not used by another entity
None	Deletes entity attribute Deletes corresponding data item

Relationship

You can choose to select or clear the Unique code option. When selected, it requires that relationships have unique codes.

Domain and attribute

From the Attribute and Domain groupbox in Model Options, you can choose to enforce non-divergence between a domain definition and the attributes using the domain, for the following attribute properties:

Property	Attributes in the domain cannot have divergent
Data type	Data type, length, and precision
Check	Check parameters
Rules	Business rules
Mandatory	Entity, association and inheritance attribute mandatory property

Enforce non-divergence selected

In this mode, the selected attribute properties must be consistent with the domain properties.

When you apply the Enforce non-divergence options You are asked if you want to apply domain properties to attributes attached to the domain in the current model.

- If you **accept** to apply domain properties, the attribute properties are modified in order to be consistent with domain properties. However, if the check parameters, business rules, and mandatory value of an attribute are more constrained than those of the domain, these properties will not be modified. You may indeed need to define a shorter range of values in the attribute check parameters, or set an attribute as mandatory while the domain is not
- If you **refuse** to apply domain properties, the attribute is detached from the domain

When you modify the properties of a domain The properties of the attributes attached to the domain are updated provided these properties are selected in the Model Options dialog box.

Attributes cannot be modified When you select an attribute property under Enforce non-divergence, each instance of that attribute property in the lists of attributes and the property sheets of attributes appears grayed and can not be modified.

If you want to modify an attribute property that is defined as non-divergent, you must detach the attribute from its domain, or clear the Enforce non-divergence check box in Model Options.

Enforce non-divergence deselected

In this mode, it is still possible to select attribute properties under Enforce non-divergence.

If you select one or more of the attribute properties When you modify an attribute property so that it diverges from its current domain definition, you are asked if you want to keep the modifications and diverge from the domain.

If you do not select attribute properties When you modify an attribute or domain property resulting in a divergence, you are not warned, and you can no longer cascade the change on the attribute properties.

Default data type

In a CDM, you can select a Default data type to apply to domains and attributes if no data type is selected for them.

If you modify CDM options, these options apply only to the current CDM.

☞ For information on other model options, see chapter Working with Models.

CDM extended model definitions

An extended model definition allows you to expand object definitions and complement the generation targets and commands. Extended model definitions are created and saved in files with the XEM extension. You can create or attach one or several extended model definitions to a model.

Extended model definitions may contain:

- Extended attributes for applicable objects in order to further define their properties

Stereotypes to define extended dependencies established between model objects

☞ For more information on extended dependencies, see “CDM extended dependencies” on page 12.

- Generation targets and commands to complement the generation of an object model, or to perform an extended generation

☞ For more information on extended model definitions, see chapter Extended Model Definitions Reference Guide in the Advanced User Documentation.

CDM extended dependencies

Extended dependencies are links between CDM objects. These links help to make object relationships clearer but are not interpreted and checked by PowerDesigner, as they are meant to be used for documentation purposes only.

You can complement these links by applying stereotypes. Stereotypes are used to define extended dependencies between objects in the CDM.

You can type stereotypes directly in the Stereotype column of the object property sheet or select a value from the dropdown listbox if you have previously defined stereotypes in an embedded or imported extended model definition (.XEM).

☞ For more information on extended dependencies, see section Using Extended Dependencies in chapter Using the PowerDesigner Interface in the *General Features Guide*.

Defining a CDM

You can create a new CDM, or open an existing CDM.

CDM properties

The Model property sheet displays the definition of the current model. From this property sheet you can modify the model definition.

A CDM has the following model properties:

Property	Description
Name	The name of the item which should be clear and meaningful, and should convey the item's purpose to non-technical users
Code	The technical name of the item used for generating code or scripts, which may be abbreviated, and should not generally include spaces
Comment	Descriptive label for the model
Filename	Location of the model file. This box is empty if the model has never been saved
Author	Author of the model. You can insert a name, a space, or nothing. If you insert a space, the Author field in the title box remains empty. If you intentionally leave the box empty, the Author field in the title box displays the user name from the Version Info page of the model property sheet
Version	Version of the model. You can use this box to display the repository version or a user defined version of the model. This parameter is defined in the Title page of the model display preferences
Default diagram	Diagram displayed by default when you open the model

❖ To modify CDM properties

1. Select Model ➤ Model Properties.

   or

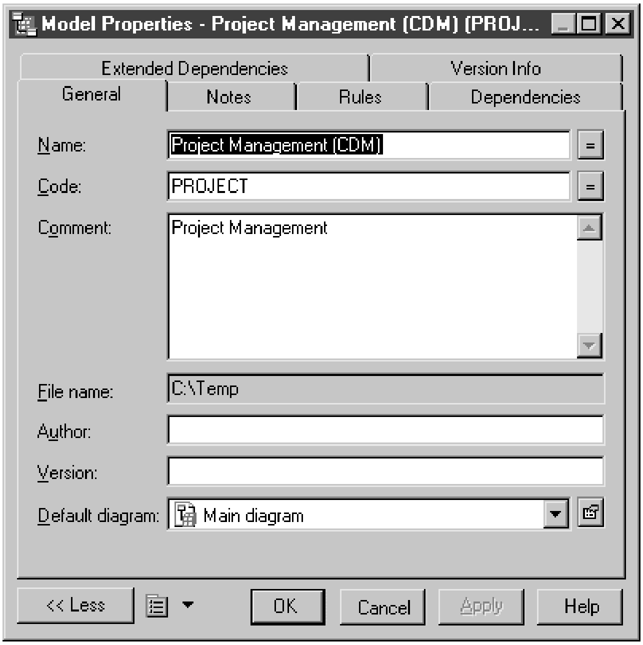
   Right-click the diagram background, and select Properties from the contextual menu.

or

If you have inserted a title box, click the Property tool and then click the title box.

The model property sheet appears.

2. Type changes to model properties.



Name: Project Management (CDM)

Code: PROJECT

Comment: Project Management

File name: C:\Temp

Author:

Version:

Default diagram: Main diagram

3. Click OK.

Creating a CDM

There are several ways to create a CDM:

- Create a new CDM
- Create a new CDM using a template
- Create a new CDM using existing elements (importing one or more CDMs, importing a ProcessAnalyst Model (.PAM) or an ERwin model (.ERX) or generating from a PDM or OOM, etc.)

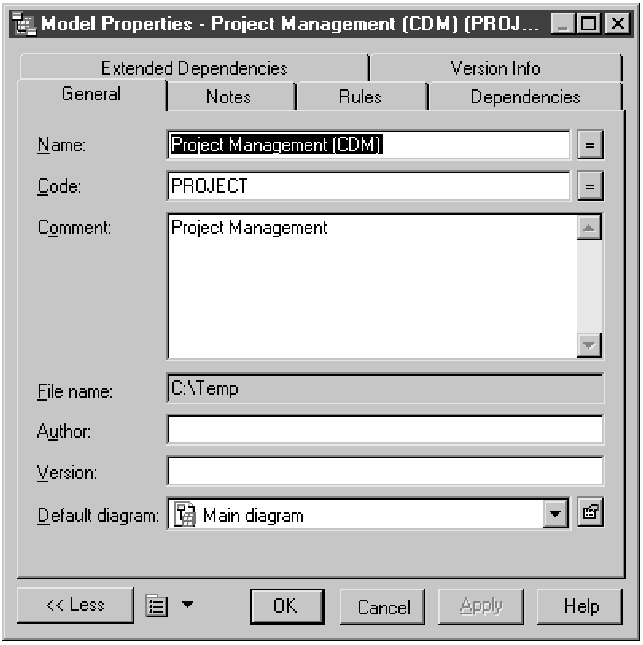
Creating a CDM using the New model option

❖ To create a new CDM using the New model option

1. Select File ➤ New to display the New dialog box.
2. Select Conceptual Data Model in the list of model types.
3. Select the New model radio button in the upper right part of the dialog box.
4. Type a model name in the Model name box. The code of the model, which may be used for script or code generation, is derived from this name according to the model naming conventions.
5. Click OK.

   A new CDM is created in the Workspace.
6. Select Model ➤ Model Properties.

   The model property sheet appears.
7. Modify the name and code of the model.



Model Properties - Project Management (CDM) (PROJ...

Name: Project Management (CDM)

Code: PROJECT

Comment: Project Management

File name: C:\Temp

Author:

Version:

Default diagram: Main diagram

8. Click OK.

Demo example
An example of a CDM is available in the Examples directory.

Creating a CDM using the New model from template option

❖ To create a new CDM using the New model from template option

1. Select File ➤ New to display the New dialog box.
2. Select Conceptual Data Model in the list of model types.
3. Select the New model from template radio button in the upper right part of the dialog box.
4. Select a model template from the list.

   List of templates
   You can select user-defined model templates (use the Change User-Defined Model Templates Folder tool to specify the user templates folder) and copy some existing models as model templates using the Copy Model to User-Defined Model Templates Folder tool.

   ☞ For more information on model templates, see section Creating a model in chapter Managing Models, in the *General Features Guide.*

5. Click OK.

   A new CDM is created in the Workspace.

6. Select Model ➤ Model Properties.

   The model property sheet appears.

7. Type a model name and code.
8. Click OK.

Demo example
An example of an CDM is available in the Examples directory.

Opening an existing CDM

A Conceptual Data Model has the file extension .CDM.

❖ To open an existing CDM

1. Select File ➤ Open to display a standard open file dialog box.
2. Select a file with the .CDM extension.

3. Click Open.

   The model appears in the Browser and the diagram opens in the diagram window.

Detaching a CDM from the workspace

You can detach a CDM from a workspace. When a CDM is detached from a Workspace its node is removed from the Browser and it is no longer defined in the workspace, but the file is not deleted from your operating environment.

❖ To detach a CDM from a workspace

1. Right-click the CDM node in the Browser and select Detach From Workspace from the contextual menu.

   A confirmation box asks if you want to save the CDM.

2. Click Yes if you want to save modifications to the CDM.

   Select or browse to a directory.

   Type a name for the file and click the Save button.

   or

   Click No if you do not want to save modifications to the file.

   The CDM is removed from the workspace.

Saving and closing a CDM

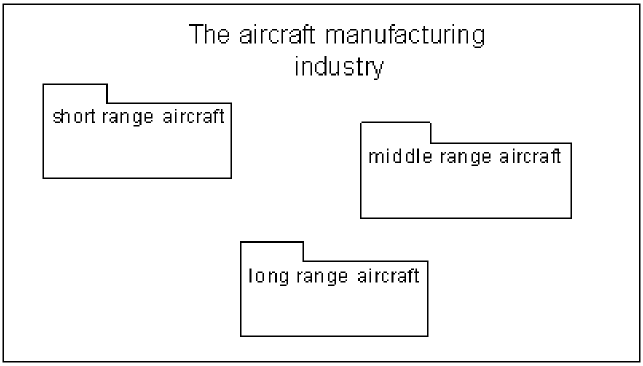
You save a CDM by selecting File ➤ Save.

You close a CDM by selecting File ➤ Close.

Defining packages in a CDM

A package is a piece of a model.

☞ When working with a large model, you can split the model into smaller subdivisions to avoid manipulating the entire set of model objects. Packages can be useful to assign portions of a model, representing different tasks and subject areas, to different development teams.



Package hierarchy

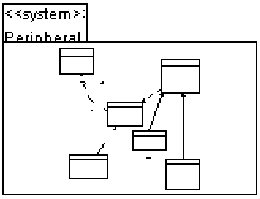
You can create several packages at the same hierarchical level within a model or decompose a package into other packages and continue this process without limitation in decomposition depth. Each package appears with a default diagram window. At each level of decomposition you can create several diagrams.

☞ For more information on packages, see the *General Features Guide* .

Composite view

You can expand a package to have a global view of the whole diagram content.

To do so, you have to right-click a package and select Composite View from the contextual menu. You must resize the composite package symbol to visualize its content:



To return to the package normal view, re-select the Composite View command in the contextual menu of the expanded package.

Note that if you double-click the composite view, you automatically open the sub-package diagram.

☞ For more information on the composite view feature, see section Expanding the symbol of a composite object in chapter Model Graphics in the General Features Guide.

CDM package properties

Packages have properties displayed on property sheets. All packages share the following common properties:

Property	Description
Name	The name of the item which should be clear and meaningful, and should convey the item's purpose to non-technical users
Code	The technical name of the item used for generating code or scripts, which may be abbreviated, and should not generally include spaces
Comment	Optional label that describes a package and provides additional information
Stereotype	Sub-classification used to extend the semantics of an object without changing its structure; it can be predefined or user-defined
Default diagram	Diagram displayed by default when you open the package
Use Parent Namespace	Defines the package as being the area in which the name of an object must be unique in order to be used.

Creating a CDM package

A package always belongs to a model. You create a package like any other model objects.

The name of each package must be unique in the model.

There are several ways to create a package:

- From a diagram
- From the Browser
- From the list of packages

At creation, a package has a default name including a number, this number is assigned in the order of creation.

☞ For more information on the different ways to create a package, see section Creating an object in chapter managing Objects.

Modifying package display preference

You can modify the following display preference for packages using the Tools ➤ Display Preferences command:

Preference	Description
Stereotype	Displays the stereotype of the package

CHAPTER 2

Using Business Rules in a CDM

About this chapter

This chapter describes how business rules help you model information.

Contents

What is a business rule in CDM?

A business rule is a rule that your business follows. A business rule could be a government-imposed law, a customer requirement, or an internal guideline.

Starts as an observation

Business rules often start as simple observations, for example "customers call toll-free numbers to place orders." During the design process they develop into more detailed expressions, for example what information a customer supplies when placing an order or how much a customer can spend based on a credit limit.

Guides modeling

Business rules guide and document the creation of a model. For example, the rule "an employee belongs to only one division" can help you graphically build the link between an employee and a division.

Complements graphics

Business rules complement model graphics with information that is not easily represented graphically. For example, some rules specify physical concerns in the form of formulas and validation rules. These technical expressions do not have a graphical representation.

CDM to PDM generation

During generation of a Physical Data Model (PDM), or an Object-Oriented Model (OOM), from a CDM, the business rules transfer directly into the PDM or OOM. In the generated model, you further specify business rules to suit physical concerns.

Defining a business rule in a CDM

You can define a business rule which can be attached to CDM objects.

Business rule properties in a CDM

A business rule definition includes the following properties:

Property	Description
Name	The name of the item which should be clear and meaningful, and should convey the item's purpose to non-technical users
Code	The technical name of the item used for generating code or scripts, which may be abbreviated, and should not generally include spaces
Comment	Descriptive label for the rule
Stereotype	Sub-classification used to extend the semantics of an object without changing its structure; it can be predefined or user-defined
Type	Indicates whether the rule is a definition, a fact, a formula, or a validation

A business rule definition also includes the following properties, each with their respective page:

Property	Description
Expression	Presence of associated expression
Notes	Presence of associated notes

Types of business rule in an CDM

The different business rule types that you can define in a CDM are described below:

Rule type	Describes	Example
Definition	Properties of the element in the information system	A customer is a person identified by a name and an address
Fact	Certainty, existence in the information system	A client may place one or more orders
Formula	Calculation used in the information system	The total order is the sum of all the order line costs
Requirement	Functional specification in the information system	The model is designed so that total losses do not exceed 10% of total sales
Validation	Constraint on a value in the information system	The sum of all orders for a client must not be greater than that client's allowance
Constraint	Additional check constraint on a value. Constraint business rules are used in the PDM, they are generated in the database	The start date should be inferior to the end date of a project

☞ For more information on constraint type, see section Using constraint business rules in a PDM in chapter Using Business Rules in a PDM in the *Physical Data Model User's Guide* .

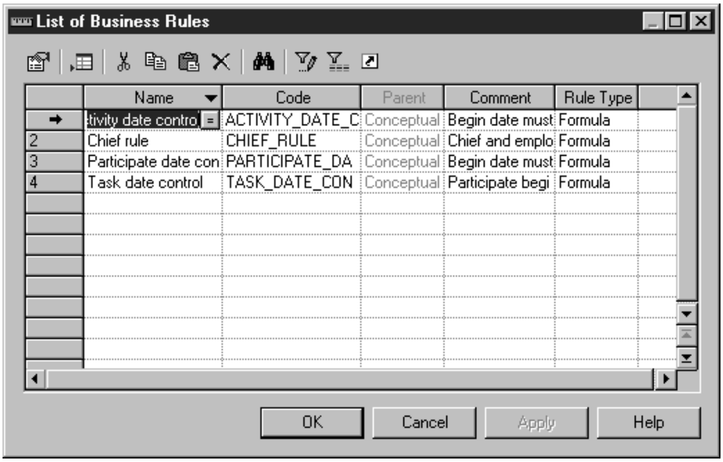
Creating a business rule in a CDM

Before you create business rules, formulate your rules by asking yourself the following questions:

- What business problems do I want to address?
- Are there any procedures that my system must respect?
- Do any specifications dictate the scope of my project?
- Do any constraints limit my options?
- How do I describe each of these procedures, specifications, and constraints?
- How do I classify these descriptions: as definitions, facts, formulas, or validation rules?

❖ To create a business rule in a CDM

1. Select Model ➤ Business Rules to display the List of Business Rules. It displays the business rules defined for the model.



	Name	Code	Parent	Comment	Rule Type
→	tivity date contro	ACTIVITY_DATE_C	Conceptual	Begin date must	Formula
2	Chief rule	CHIEF_RULE	Conceptual	Chief and emplo	Formula
3	Participate date con	PARTICIPATE_DA	Conceptual	Begin date must	Formula
4	Task date control	TASK_DATE_CON	Conceptual	Participate begi	Formula

2. Click a blank line in the list.

   or

   Click the Add a Row tool.

   An arrow appears at the beginning of the line.

3. Type a name and a code for the business rule.

4. Click Apply.

   The creation of the new business rule is committed.

5. Click the new business rule line.

   An arrow appears at the beginning of the line.

6. Click the Properties tool.

   or

   Double click the arrow at the beginning of the line.

   The property sheet for the new business rule appears.

7. Click the General tab and select a business rule type from the Type dropdown listbox.

8. Click OK in each of the dialog boxes.

Attaching an expression to a business rule in a CDM

A business rule typically starts out as a description. As you develop your model and analyze your business problem, you can complete a rule by adding a technical expression. The syntax of expressions depends on the target database.

Each business rule can include two types of expression:

♦ Server

♦ Client

Only the server expression can be generated to a database. You can generate server expressions as check parameters if they are attached to tables, domains, or columns.

A client expression is used mainly for documentation purposes. However, you can insert both types of expression into a trigger or a stored procedure.

❖ To attach an expression to a business rule in a CDM

1. Select Model ➤ Business Rules to display the List of Business Rules.
2. Double-click the new business rule line to display the business rule property sheet.
3. Click the Expression tab to display the Expression page.
4. Click the Server tab at the bottom of the page to define a server expression.

   or

   Click the Client tab at the bottom of the page to define a client expression.
5. Type an expression in the Expression textbox.
6. Click OK in each of the dialog boxes.

Working with business rules in a CDM

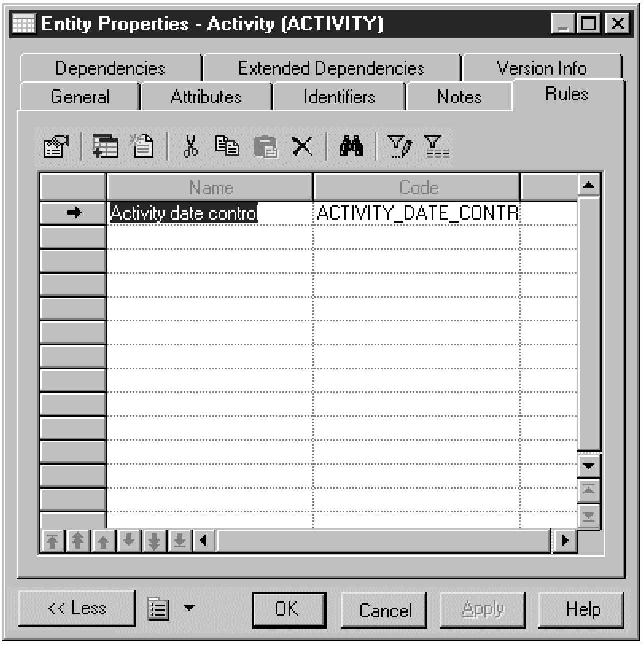
You can apply a business rule to an object from its property sheet.

Applying a business rule to the current CDM object

You can choose a rule to apply to the current object from its property sheet.

❖ To apply a business rule to the current CDM object

1. Double-click an object in the diagram to display the object property sheet.
2. Click the Rules tab to display the Rules page showing any business rules attached to the object.



Name	Code
Activity date contro	ACTIVITY_DATE_CONTR

3. Click the Add Objects tool to display a selection list of business rules.

   It contains a list of all the business rules of the model, except the rules that already belong to the object.
4. Select the business rules you want to add to the object.
5. Click OK.

   The business rules are added to the object and appear in the list of business rules for the object.

6. Click OK.

U Column in the List of business rules

When you apply a business rule to an object, the U (Used) column beside this business rule is automatically checked in the List of business rules to indicate that the business rule is used by at least one object in the model. The U column allows you to visualize unused business rules, you can then delete them if necessary.

CHAPTER 3

Building Conceptual Data Models

About this chapter

This chapter describes how to build a Conceptual Data Model (CDM). It explains the role of each object in a conceptual model and shows how to modify them in a conceptual diagram.

Contents

Defining data items in a CDM

A **data item** is an elementary piece of information in a model. It represents a fact or a definition in an information system, which may or may not have any eventual existence as a modeled object.

You can attach a data item to an entity. It then becomes an entity attribute of that entity. When a physical data model (PDM) is generated from a CDM, an entity attribute generates a column in a table.

You can also define a data item, but not attach it to an entity. It remains defined in the model and can be attached to an entity at any time.

Depending on its defined model options, a data item can be unique in the model, or unique only for a particular entity. In the latter case, a data item is equivalent to an entity attribute.

Example

In the information system for a publishing company, the last names for authors and customers are both important pieces of business information. The data item LAST NAME is created to represent this information. It is attached to the entities AUTHOR and CUSTOMER, and becomes entity attributes of those entities.

Another piece of information is the date of birth of each author. The data item BIRTH DATE is created in the CDM, but as there is no immediate need for this information in the model, it remains in the CDM, but is not attached to any entity.

Data item properties

You can access data item properties from the list of data items. Each data item definition includes the following general properties:

Property	Description
Name	The name of the item which should be clear and meaningful, and should convey the item's purpose to non-technical users
Code	The technical name of the item used for generating code or scripts, which may be abbreviated, and should not generally include spaces
Comment	Descriptive label for the data item
Stereotype	Sub-classification used to extend the semantics of an object without changing its structure; it can be predefined or user-defined

Property	Description
Data type	Code indicating the data format, such as N for numeric or A for alphanumeric, followed by the number of characters
Length	Maximum number of characters
Precision	Number of places after the decimal point, for data values that can take a decimal point
Domain	Name of the associated domain

A data item definition also includes the following properties, each with their own respective property sheets:

Property	Description
Standard checks	Check parameters defined for the domain
Additional checks	Domain constraints or validation rules not defined by standard check parameters
Rules	Business rules attached to the domain

Creating a data item

There are several ways to create a data item:

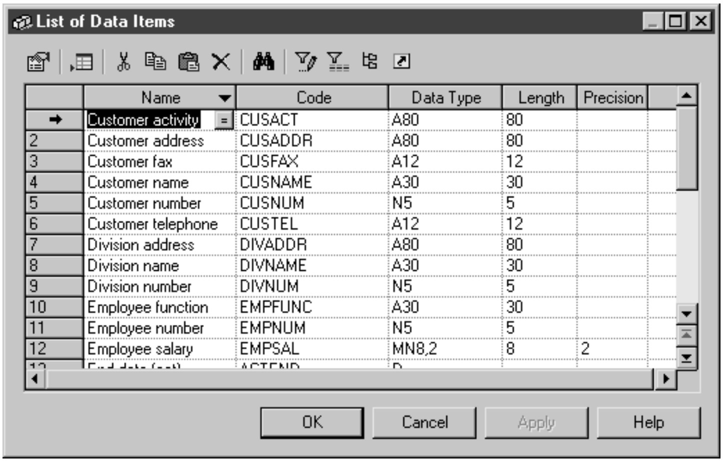
- From the list of data items
- From the Browser

At creation, a data item has a default name including a number. This number is assigned in the order of creation of objects.

☞ For more information on the different ways to create a data item, see section Creating an object in chapter Managing objects in the *General Features Guide* .

❖ To create a data item from the list of data items

1. Select Model ➤ Data Items to display the list of data items.



	Name	Code	Data Type	Length	Precision
➜	Customer activity	CUSACT	A80	80	
2	Customer address	CUSADDR	A80	80	
3	Customer fax	CUSFAX	A12	12	
4	Customer name	CUSNAME	A30	30	
5	Customer number	CUSNUM	N5	5	
6	Customer telephone	CUSTEL	A12	12	
7	Division address	DIVADDR	A80	80	
8	Division name	DIVNAME	A30	30	
9	Division number	DIVNUM	N5	5	
10	Employee function	EMPFUNC	A30	30	
11	Employee number	EMPNUM	N5	5	
12	Employee salary	EMPSAL	MN8,2	8	2
13	End date (act)	ACTEND	D		

2. Click a blank line in the list.

   or

   Click the Add a Row tool.

   An arrow appears at the beginning of the line.

3. Type a data item name and a data item code.

4. (Optional) Click the Data Type column for the same row.

   Display the column you need
   If you do not see the column you need, display it with the Customize Columns and Filter tool. For details, see the *General Features Guide* .

   Click the down arrowhead and select a data type from the dropdown listbox.

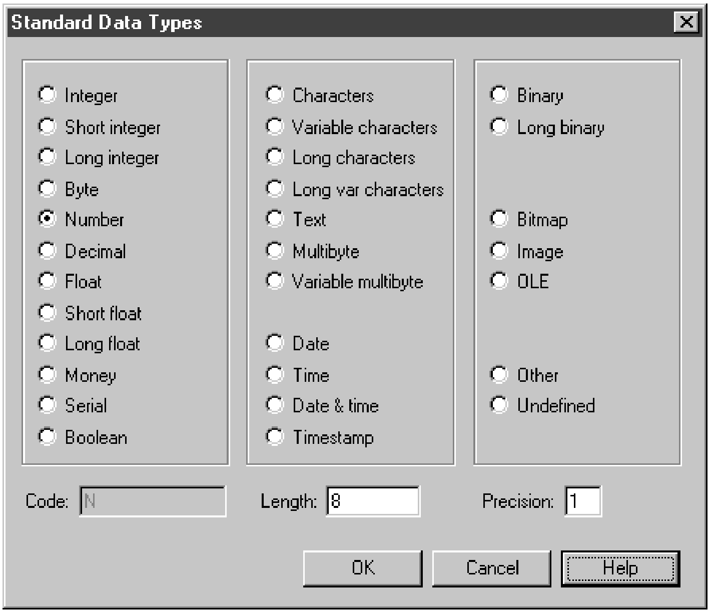
   or

   Click the ellipsis button to display the list of standard data types and click the radio button corresponding to the data type you want to apply.

   Type the maximum number of characters for the data item in the Length box.

   If the data type can include values that take a decimal point, type the number of places after the decimal point in the Precision box.

   Click OK.



Standard Data Types

○ Integer	○ Characters	○ Binary
○ Short integer	○ Variable characters	○ Long binary
○ Long integer	○ Long characters	
○ Byte	○ Long var characters	
● Number	○ Text	○ Bitmap
○ Decimal	○ Multibyte	○ Image
○ Float	○ Variable multibyte	○ OLE
○ Short float		
○ Long float	○ Date	
○ Money	○ Time	○ Other
○ Serial	○ Date & time	○ Undefined
○ Boolean	○ Timestamp	

Code: N Length: 8 Precision: 1

5. (Optional) Click the Domain column for the same row.

   Select a domain from the dropdown listbox.

6. Click OK.

☞ For more information on selecting a data type for a domain see section "Selecting a data type for a domain in a CDM" on page 42.

☞ For information on indicating data type length and precision, see section "Indicating data type, length, and precision in a CDM" on page 42.

☞ For more information on attaching a data item to a domain, see section "Attaching a data item to a domain" on page 36.

Deleting a data item

You delete a data item from the list of data items. When you delete a data item you also delete all entity attributes using that data item.

❖ To delete a data item

1. Select ➤ Model ➤ Data Items to display the list of data items.

2. Click a data item in the list.

   An arrow appears at the beginning of the line.

Selecting a line in a list
You can select a line in a list by clicking the number at the beginning of the line. An arrow replaces the number and the line is selected.

3. Click the arrow at the beginning of the line.

   The line is selected.

4. Click the Delete tool.

   or

   Press DELETE.

   The data item and all entity attributes using the data item are deleted.

5. Click OK.

Copying a data item in the list

You can copy and paste a data item in the list of data items. Copying a data item creates a new data item.

Same code for different data items
If you do not choose the Unique Code data item option, you can use the same code for different data items as long as each of these data items is attached to a different entity. You access data item options by selecting Tools ➤ Model Options.

❖ To copy a data item in the list

1. Select Model ➤ Data Items to display the list of data items.

   It lists the data items defined in the model.

2. Click the line for the data item that you want to copy.

   An arrow appears at the beginning of the line.

3. Click the arrow at the beginning of the line.

   The line is selected.

4. Click the Copy tool.

5. Click the Paste tool.

   The data item is copied to the next line in the list. If the Unique code data item option is selected in Model Options, the copied data item is renamed.

Defining code and reuse options for data items

You can define the following options for data items:

Option	Result when selected	Result when cleared
Unique code	Each data item has a unique code	Different data items can have the same code
Allow reuse	One data item can be an entity attribute for more than one entity	One data item can be an entity attribute for only one entity

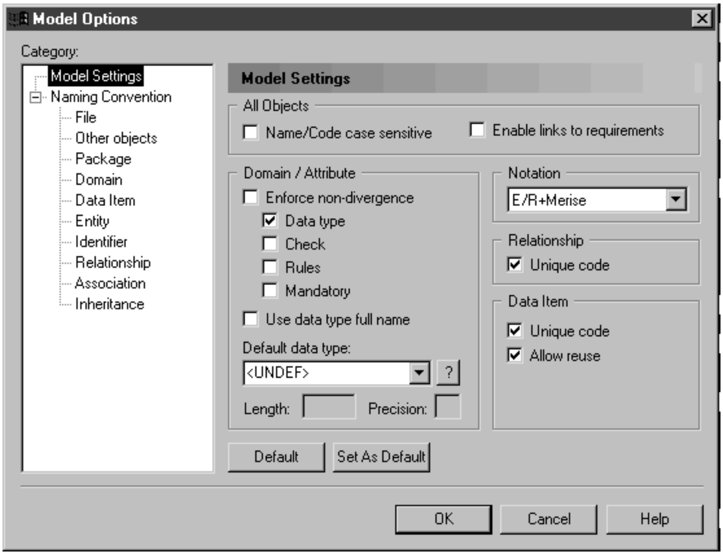
If you do not select Unique Code, two data items can have the same code. In this case, you differentiate the data items by the entities that use them. The entities are listed in the Dependencies column of the list of data items.

Item not visible in list
To make an item visible in a list, click the Customize Columns and Filter tool in the list toolbar, select the appropriate check box from the list of filter options that appears, and click OK.

❖ To define code and reuse options for data items

1. Select Tools ➤ Model Options.

   The Model Options dialog box opens to the Model Settings page.



Model Options

Model Settings

All Objects
☐ Name/Code case sensitive
☐ Enable links to requirements

Domain / Attribute
☐ Enforce non-divergence
☑ Data type
☐ Check
☐ Rules
☐ Mandatory
☐ Use data type full name
Default data type: <UNDEF>
Length:
Precision:

Notation: E/R+Merise

Relationship
☑ Unique code

Data Item
☑ Unique code
☑ Allow reuse

2. Select the Unique Code check box in the Data Item groupbox to require a unique code for each data item.

   or

   Clear the Unique Code check box in the Data Item groupbox to allow more than one data item to have the same code.

3. Select the Allow Reuse check box to allow the one data item to be an entity attribute for more than one entity.

   or

   Clear the Allow Reuse check box to prohibit the one data item from being an entity attribute for more than one entity.

4. Click OK.

Error message

The following error message appear when you select the Unique Code, when it is incompatible with the current CDM:

Error message	**Solution**
Unique Code option could not be selected because two data items have the same code: *data_item_code*.	Assign unique codes to all data items

Attaching a data item to a domain

If you attach a data item to a domain, the domain supplies the data type and related data characteristics.

The domain applies a standard data type to the data item. It can also apply length, decimal precision, and check parameters.

❖ To attach a data item to a domain

1. Select Model ➤ Data Items to display the list of data items.

2. Click the data item to define.

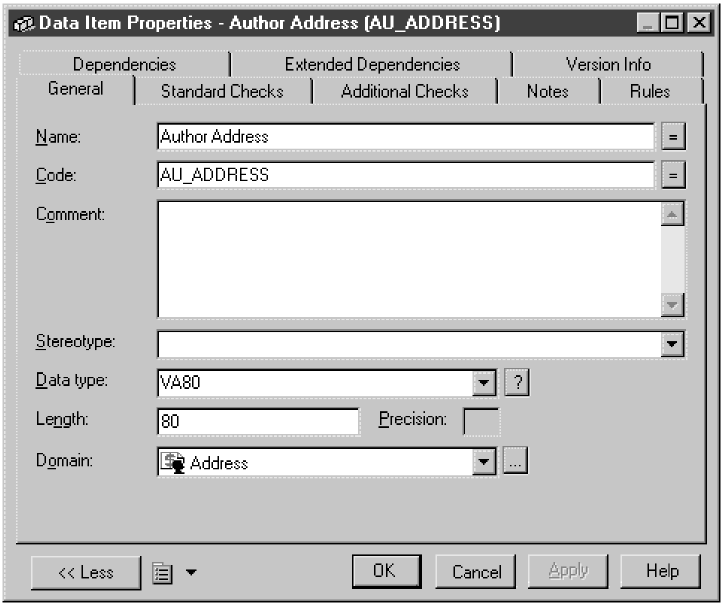
   An arrow appears at the beginning of the line.

3. Click the Properties tool.

   or

   Double-click the arrow at the beginning of the line.

   The data item property sheet opens to the General page.



Data Item Properties - Author Address (AU_ADDRESS)

Name: Author Address

Code: AU_ADDRESS

Comment:

Stereotype:

Data type: VA80

Length: 80

Precision:

Domain: Address

Opening property sheets at last accessed page
You can choose to open property sheets at the last accessed page by selecting Tools ➤ General Options ➤ Dialog, and selecting the option Keep Last Tab in the Property Sheets groupbox.

4. Select a domain from the Domain dropdown listbox at the bottom of the dialog box and click OK.

   or

   Click the Ellipsis button at the end of the Domain dropdown listbox.

   Select a domain from the list that appears and click OK.

   You return to the list of data items. In the Data Type column, the data type for the domain replaces the data type previously defined for the data item.

5. Click OK.

Selecting a data type for a data item

There are two ways to select a data type for a data item.

- **Attach the data item to a domain** The domain dictates a standard data type, a length, and a level of precision, as well as optional check parameters

- **Manually select a data type** You select a standard data type along with a length, a level of precision, and optional check parameters

☞ For more information on attaching a data item to a domain, see section "Attaching a data item to a domain" on page 36.

About check parameters
Check parameters indicate data ranges and validation rules. You can attach check parameters to entity attributes, data items, or domains.

❖ To select a data type for a data item

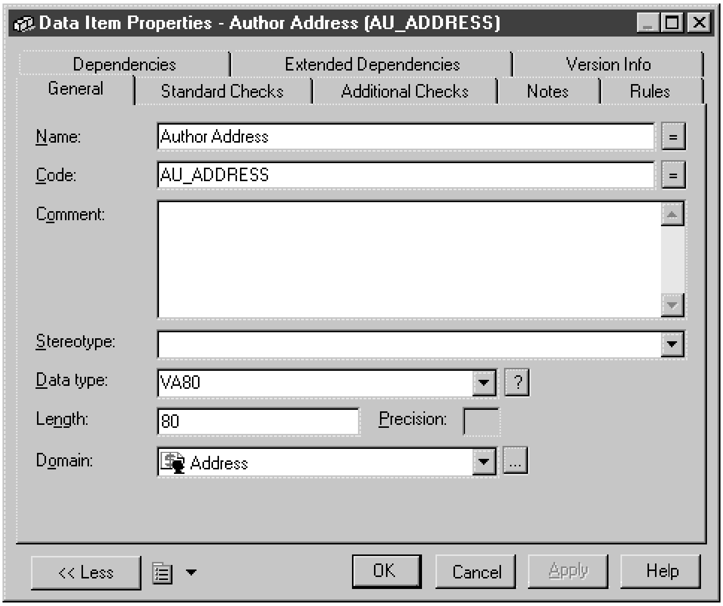
1. Select Model ➤ Data Items to display the list of data items.
2. Click the data item to define.

   An arrow appears at the beginning of the line.
3. Click the Properties tool.

   or

   Double-click the arrow at the beginning of the line.

   The data item property sheet opens to the General page.



Data Item Properties - Author Address (AU_ADDRESS)

Name: Author Address

Code: AU_ADDRESS

Comment:

Stereotype:

Data type: VA80

Length: 80

Precision:

Domain: Address

4. Select a data type from the Data Type dropdown listbox.

   or

   Click the Question mark button at the end of the Data Type dropdown listbox.

A list of standard data types appears.

Select the radio button corresponding to the data type you want to apply.

Click OK.

Undefined data type
If you do not want to select a data type immediately, you can choose the <UNDEF> data type.

5. Type the maximum number of characters for the data type in the Length box.

6. If the data type can include values that take a decimal point, type the number of places after the decimal point in the Precision box.

7. Click OK.

   The new data type appears in the list of data items.

Configuring the display of the list of data items

You can sort the data items in the list:

- By any property that appears in the column header in the lists
- Alphabetical or reverse alphabetical order

The listed order is indicated by an arrowhead that appears in the property column header. Each time you click a column header, you change the listed order for that column, according to the displayed arrow.

Each arrow type corresponds to the following list orders:

Arrow type	Listed order
Down arrow	Alphabetically
Up arrow	Reverse alphabetically

For example, when you click the column header Name, the data items are listed by name alphabetically when the Down arrow is indicated, and in reverse order when the Up arrow is indicated.

❖ To configure the display of the list of data items

1. Select Model ➤ Data Items to display the list of data items.

2. Click a property title bar.

   The listed columns are ordered by the indicated property.

3. Click OK.

Defining domains in a CDM

Domains help you identify the types of information in your model. Applying domains to data items makes it easier to standardize data characteristics for entity attributes in different entities.

In a CDM, you can associate the following information with the domain:

- Data type, length, and precision
- Check parameters
- Business rules
- Mandatory

Domain properties in a CDM

You can access domain properties from the list of domains.

Each domain definition includes the following general properties:

Property	**Description**
Name	The name of the item which should be clear and meaningful, and should convey the item's purpose to non-technical users
Code	The technical name of the item used for generating code or scripts, which may be abbreviated, and should not generally include spaces
Comment	Descriptive label for the domain
Stereotype	Sub-classification used to extend the semantics of an object without changing its structure; it can be predefined or user-defined
Data type	Form of the data corresponding to the domain, such as numeric, alphanumeric, boolean, or others
Length	Maximum number of characters
Precision	Number of places after the decimal point, for data values that can take a decimal point
Mandatory	Domain values are mandatory for all entity attributes using that domain

A domain definition can also include the following properties, which have associated values or information used by entity attributes using the domain:

Property	Description
Standard checks	Check parameters defined for the domain
Additional checks	Domain constraints or validation rules not defined by standard check parameters
Rules	Business rules attached to the domain

Creating a domain in a CDM

There are several ways to create a domain:

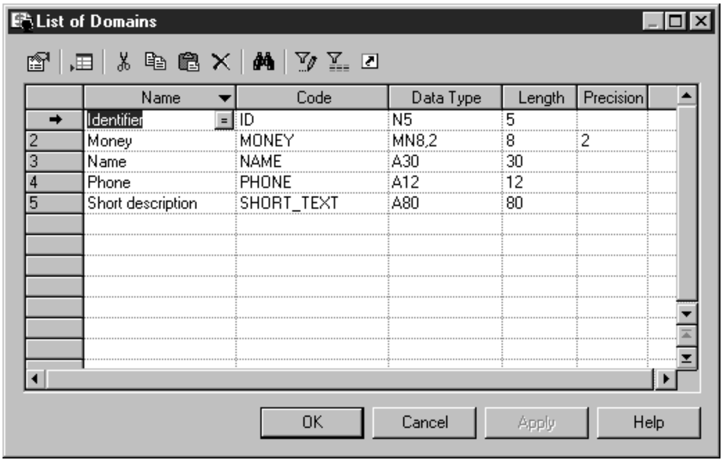
- From the list of domains
- From the Browser

At creation, a domain has a default name including a number. This number is assigned in the order of creation of objects.

☞ For more information on the different ways to create a domain, see section Creating an object in chapter Managing objects in the *General Features Guide* .

❖ To create a domain in a CDM from the list of domain

1. Select Model ➤ Domains to display the list of domains.



	Name	Code	Data Type	Length	Precision
→	Identifier	ID	N5	5	
2	Money	MONEY	MN8,2	8	2
3	Name	NAME	A30	30	
4	Phone	PHONE	A12	12	
5	Short description	SHORT_TEXT	A80	80	

2. Click a blank line in the list.

   or

   Click the Add a Row tool.

An arrow appears at the beginning of the line.

3. Type a domain name and a domain code.
4. Click Apply.
5. Click the Properties tool.

   or

   Double-click the arrow at the beginning of the line.
6. Select a data type from the dropdown listbox.
7. Specify length and precision as required.
8. Click OK in each of the dialog boxes.

Indicating data type, length, and precision in a CDM

Length and precision

The properties length and precision do not apply to all data types. Depending on data type, length may indicate a maximum or a fixed number of characters.

In the list of available data types, a variable indicates where you have to type a length or precision, as follows:

Variable	Replace with
%n	Length
%s	Length with precision
%p	Decimal precision

For example, if you are using Sybase Adaptive Server Anywhere and you choose the data type `char(%n)`, you can choose a length of ten by typing `char(10)`.

Undefined data type

All target DBMS allow you to select the <undefined> data type. The <undefined> data type indicates which domains remain without data types. If an <undefined> data type is present when you generate your database, it is replaced by the default data type for your database.

Selecting a data type for a domain in a CDM

You can select a data type for a domain in two ways:

- From the list of domains
- From the domain property sheet

The list of standard data types

When you select a data type for a domain from its property sheet, you can choose from a list of standard data types. This list presents the available data types in full details instead of the abbreviated format used in the data type dropdown listbox in the list of domains.

Selecting a data type for a CDM domain from the list

❖ To select a data type for a CDM domain from the list

1. Select Model ➤ Domains to display the list of domains.
2. Click the domain to define.

   An arrow appears at the beginning of the line.
3. Click the Data Type column.
4. Select a data type from the Data Type dropdown listbox.

   Defining a data type later
   If you do not want to select a data type immediately, you can choose the <UNDEF> data type.
5. Click OK.

   The data type appears in the Data Type column of the list of domains.

Selecting a data type for a CDM domain from its property sheet

❖ To select a data type for a CDM domain from its property sheet

1. Select Model ➤ Domains to display the list of domains.
2. Click the domain to define.

   An arrow appears at the beginning of the line.
3. Click the Properties tool.

   or

   Double-click the arrow at the beginning of the line.

   The domain property sheet appears.
4. Select a data type from the Data Type dropdown listbox.

   Selecting a data type from a list of standard data types
   To select a data type from a list of standard data types, click the Question Mark button at the end of the Data Type dropdown listbox, and select the radio button for a data type from the list that appears.

5. Type the maximum number of characters for the data item in the Length box.

6. If the data type can include values that take a decimal point, type the number of places after the decimal point in the Precision box.

7. Click OK.

   The change of data type appears in the list of domains.

Undefined data type
If you do not want to select a data type immediately, you can choose the <Undefined> data type.

Selecting a data type from a list of standard data types in a CDM

You can select a data type from a list of standard data types. This is the same list that is available in the Physical Data Model. PowerDesigner automatically maps the standard data type to a conceptual data type.

The length and precision are properties that do not apply to all data types. Furthermore, depending on data type, length may indicate a maximum or a fixed number of characters.

The tables below indicates the data types for which you can specify:

- Fixed length
- Maximum length
- Decimal precision

Numeric data types

Conceptual data type	Physical data type (depending on the DBMS)	Content	Length
Integer	int / INTEGER	32-bit integer	—
Short Integer	smallint / SMALLINT	16-bit integer	—
Long Integer	int / INTEGER	32-bit integer	—
Byte	tinyint / SMALLINT	256 values	—
Number	numeric / NUMBER	Numbers with a fixed decimal point	Fixed

Conceptual data type	**Physical data type (depending on the DBMS)**	**Content**	**Length**
Decimal	decimal / NUMBER	Numbers with a fixed decimal point	Fixed
Float	float / FLOAT	32-bit floating point numbers	Fixed
Short Float	real / FLOAT	Less than 32-bit point decimal number	♦ —
Long Float	double precision / BINARY DOUBLE	64-bit floating point numbers	—
Money	money / NUMBER	Numbers with a fixed decimal point	Fixed
Serial	numeric / NUMBER	Automatically incremented numbers	Fixed
Boolean	bit / SMALLINT	Two opposing values (true/false; yes/no; 1/0)	—

Character data types

Conceptual data type	Physical data type (depending on the DBMS)	Content	Length
Characters	char / CHAR	Character strings	Fixed
Variable Characters	varchar / VARCHAR2	Character strings	Maximum
Long Characters	varchar / CLOB	Character strings	Maximum
Long Var Characters	text / CLOB	Character strings	Maximum
Text	text / CLOB	Character strings	Maximum
Multibyte	nchar / NCHAR	Multibyte character strings	Fixed
Variable Multibyte	nvarchar / NVARCHAR2	Multibyte character strings	Maximum

Time data types

Conceptual data type	Physical data type (depending on the DBMS)	Content
Date	date / DATE	Day, month, year
Time	time / DATE	Hour, minute, and second
Date & Time	datetime / DATE	Date and time
Timestamp	timestamp / TIMESTAMP	System date and time

Other data types

Conceptual data type	**Physical data type (depending on the DBMS)**	**Content**	**Length**
Binary	binary / RAW	Binary strings	Maximum
Long Binary	image / BLOB	Binary strings	Maximum
Bitmap	image / BLOB	Images in bitmap format (BMP)	Maximum
Image	image / BLOB	Images	Maximum
OLE	image / BLOB	OLE links	Maximum
Other	—	User-defined data type	—
Undefined	undefined	Not yet defined data type	—

❖ To select a data type from a list of standard data types in a CDM

1. Select Model ➤ Domains to display the list of domains.

2. Click the domain to define and display an arrow at the beginning of the line.

3. Click the Properties tool.

   or

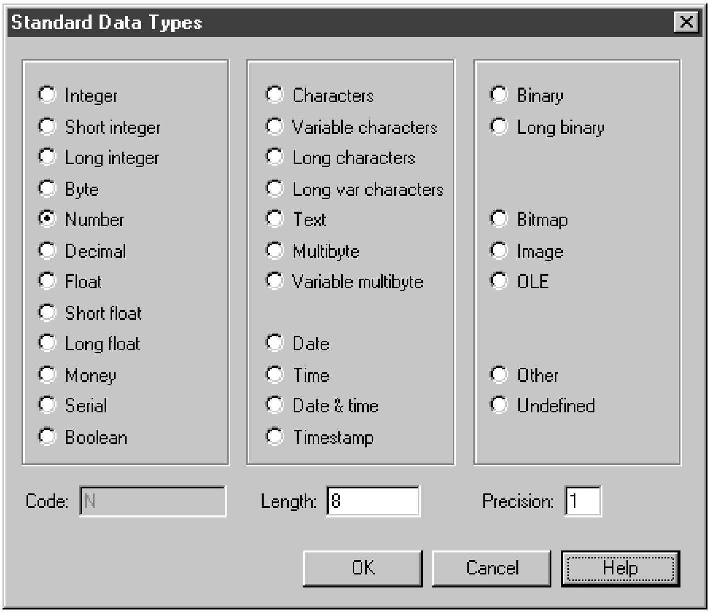
   Double-click the arrow at the beginning of the line.

   The domain property sheet appears.

4. Click the Question Mark button next to the Data Type dropdown listbox.

   > **Selecting from the Data Type dropdown listbox**
   > You can also select a data type directly from the Data Type dropdown listbox.

   A list of standard data types appears.



Code: N

Length: 8

Precision: 1

5. Click the radio button corresponding to the data type you want to apply.

   The code for the data type appears in the Code box.

Undefined data type
If you do not want to select a data type immediately, you can choose the Undefined data type.

6. Type the maximum number of characters for the data type in the Length box.

7. If the data type includes values after a decimal point, type the number of places after the decimal point in the Precision box.

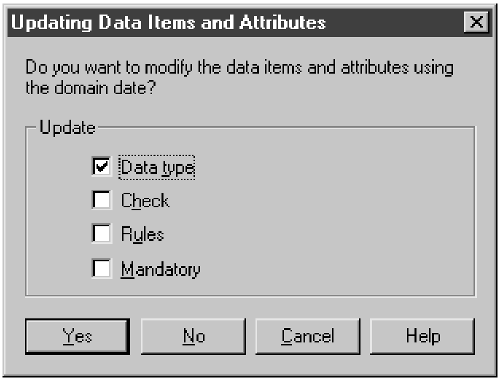
8. Click OK.

   The change of data type appears in the Data Type box.

Modifying domain properties in a CDM

You can modify domain properties from the domain property sheet.

When you modify domain properties, a confirmation box appears asking if you want to modify the data items and attributes currently using the domain.



Updating Data Items and Attributes

Do you want to modify the data items and attributes using the domain date?

Update

☑ Data type

□ Check

□ Rules

□ Mandatory

The Data Type check box is automatically selected and available for an update, depending on the options set to enforce non-divergence from a domain.

For information on domain divergence, see section "Enforcing non-divergence from domains in a CDM" on page 50.

You can also select other properties (Check, Rules) that will be updated in their use of the domain.

You can now click one of the following buttons with the following effects:

Button	Effect
Yes	The data items currently using the domain are modified according to the update
No	The data items currently using the domain are not modified according to the update but the current modification is accepted if domain divergence is allowed in the model options
Cancel	The update is cancelled and nothing is changed

❖ To modify domain properties in a CDM

1. Select Model ➤ Domains to display the list of domains.
2. Click a domain from the list.

   An arrow appears at the beginning of the line.
3. Click the Properties tool.

   or

   Double-click the arrow at the beginning of the line.

   The Domain property sheet appears.

4. Type changes to domain properties.

   or

   Click on a page tab.

   Type or select domain properties as required.

5. Click OK.

   If the domain is used by one or more data items, an update confirmation box appears asking if you want to modify domain properties for the data items using the domain.

6. Select the properties that you want to update for all data items using the domain.

7. Click Yes.

Enforcing non-divergence from domains in a CDM

From the Model Options dialog box, you can choose to enforce non-divergence between a domain and the data items and attributes that use the domain.

☞ For more information on non-divergence enforcement, see section Defining CDM Options in chapter Conceptual Data Model Basics.

❖ To enforce domain non-divergence in a CDM

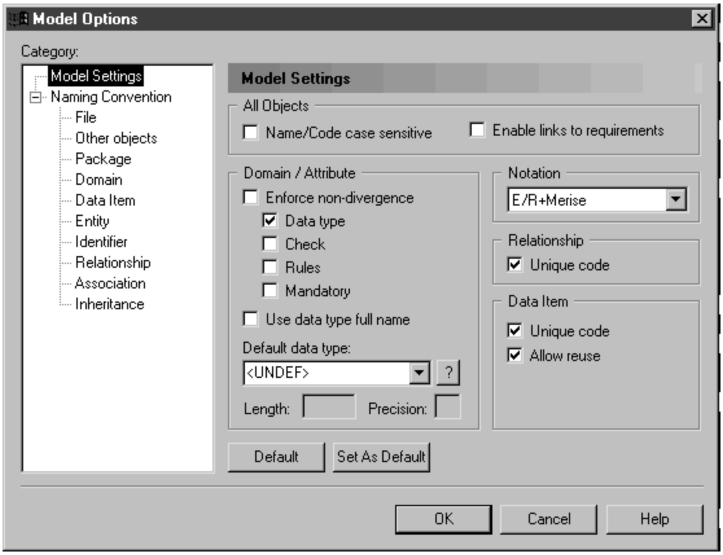
1. Select Tools ➤ Model Options.

   or

   Right click the diagram background.

   Select Model Options from the contextual menu.

   The Model Options dialog box opens to the Model Settings page.



Model Settings

All Objects
□ Name/Code case sensitive
□ Enable links to requirements

Domain / Attribute
□ Enforce non-divergence
☑ Data type
□ Check
□ Rules
□ Mandatory
□ Use data type full name
Default data type: <UNDEF>
Length:
Precision:

Notation: E/R+Merise

Relationship
☑ Unique code

Data Item
☑ Unique code
☑ Allow reuse

2. Select the Enforce non-divergence check box in the Domain/Attribute groupbox.

3. Select check boxes for the entity attribute properties that are not permitted to diverge from the domain definition.

4. Click OK.

Defining entities in a CDM

An entity represents an object defined within the information system about which you want to store information. For example, in a model concerning employees and divisions, the entities are Employee and Division.

An occurrence of an entity is an individual element belonging to the entity. For example, the employee Martin is one occurrence of the entity Employee.

Entity properties

You can double-click any entity symbol in the diagram to display its property sheet:

Property	Description
Name	The name of the item which should be clear and meaningful, and should convey the item's purpose to non-technical users
Code	The technical name of the item used for generating code or scripts, which may be abbreviated, and should not generally include spaces
Comment	Descriptive label for the entity
Stereotype	Sub-classification used to extend the semantics of an object without changing its structure; it can be predefined or user-defined
Number	Estimated number of occurrences in the physical database for the entity (the number of records)
Generate	Indicates if the entity will generate a table in a PDM

An entity definition also includes the following properties, each with their own respective property sheets that can be accessed independently of the entity:

- Attributes
- Identifiers
- Rules

Creating an entity

There are several ways to create an entity:

- From a diagram

- From the Browser
- From the list of entities

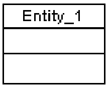
At creation, an entity has a default name including a number. This number is assigned in the order of creation of objects.

☞ For more information on the different ways to create an entity, see section Creating an object in chapter Managing objects in the *General Features Guide* .

❖ To create an entity from a diagram

1. Click the Entity tool in the Palette.
2. Click anywhere in the diagram.

   The following symbol appears at the click position:

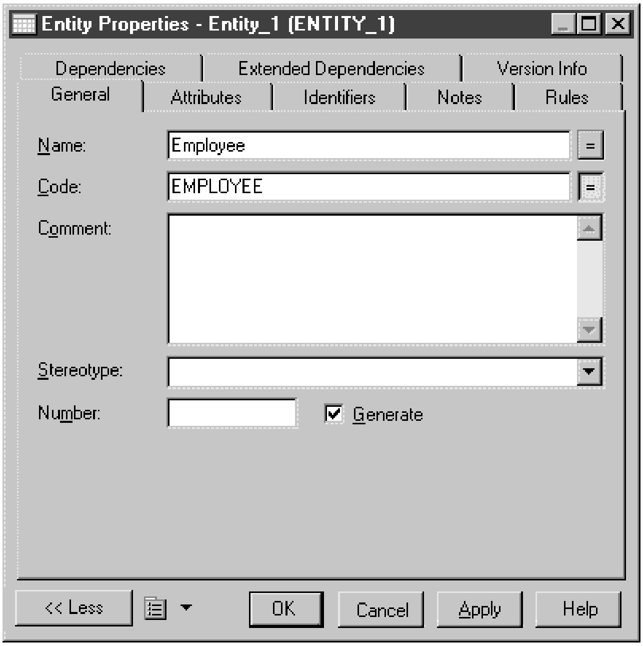
3. Click the Pointer tool.

   or

   Click the right mouse button.

   You release the Entity tool.

4. Double-click the new entity symbol in the diagram to display the entity property sheet.
5. Type a name and a code.



Entity Properties - Entity_1 (ENTITY_1)

Name: Employee

Code: EMPLOYEE

Comment:

Stereotype:

Number:

☑ Generate

6. Click OK.

Modifying entity properties

You can modify the entity properties using the following methods:

- From the entity property sheet
- From the list of entities

☞ For more information on the different ways to modify the entity properties, see section Modifying object properties in chapter Managing objects in the *General Features Guide* .

Copying an entity

You can make a copy of an entity within the same model or between models.

When you copy an entity, the selections for the model options Unique code and Allow reuse determine the way that identifiers and entity attributes are copied and named.

The following rules apply to copied entities. The indicated selections for Unique code and Allow reuse apply to the model that receives the copied entity:

Data item options selected	Result of copying an entity
Unique Code Allow Reuse	New entity with new name and code New identifier with new name code Reuses other entity attributes
Unique Code only	New entity with new name and code New identifier with new name and code New attributes with new names and codes
Allow Reuse only	New entity with new name and code New identifier with same name and code Reuses other entity attributes
None	New entity with new name and code New identifier with same name code New entity attributes with same names and codes

❖ To copy an entity within a model

1. Select an entity in the CDM.
2. Select Edit ➤ Copy.

   Select Edit ➤ Paste.

   or

   Press CTRL and drag the entity to a new position in the diagram.

   The new entity appears in the diagram

❖ To copy an entity to a different model

1. Select an entity in a CDM.
2. Select Edit ➤ Copy.

   Click in the diagram of the target model.

   Select Edit ➤ Paste.

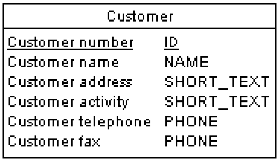
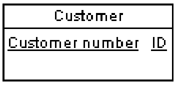
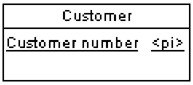
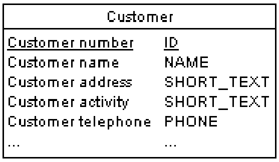
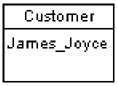
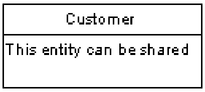
   or

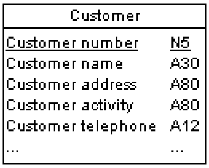
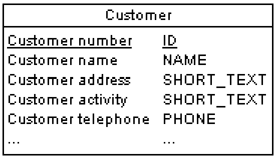
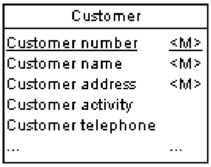
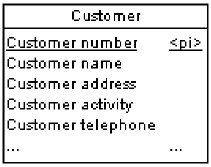
   Press CTRL and drag the entity to the diagram of the target model.

   The new entity appears in the diagram of the target model.

Modifying the entity display preferences

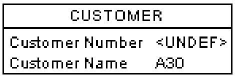
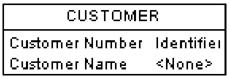
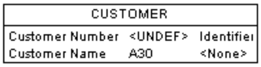
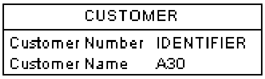
You can modify the following display preferences for an entity using the Tools ➤ Display Preferences command:

Preference	Display description	Examples
All attributes	All attributes including all identifying attributes	 Customer Customer number ID Customer name NAME Customer address SHORT_TEXT Customer activity SHORT_TEXT Customer telephone PHONE Customer fax PHONE
Primary attributes	Only entity attributes that are primary identifier attributes	 Customer Customer number ID
Identifying attributes	All attributes that are defined as identifier attributes for the entity, including primary identifier attributes	 Customer Customer number <pi>
Display limit	(x) Number of entity attributes shown depending on defined value of x. In the example, x is 5	 Customer Customer number ID Customer name NAME Customer address SHORT_TEXT Customer activity SHORT_TEXT Customer telephone PHONE ... ...
Identifiers	All identifier attributes for the entity are listed at the bottom of the entity symbol	 Customer James_Joyce
Stereotype	Stereotype of the entity	—
Comment	Comment of the entity. When selected, all other check boxes are deselected, except for Stereotype	 Customer This entity can be shared

Preference	Display description	Examples
Data types	Data type for each entity attribute	 Customer Customer number N5 Customer name A30 Customer address A80 Customer activity A80 Customer telephone A12 ... ...
Replace by Domains	Domain for each entity attribute. You can only display domains when the Data type check box is selected	 Customer Customer number ID Customer name NAME Customer address SHORT_TEXT Customer activity SHORT_TEXT Customer telephone PHONE ... ...
Domains	Domain of an attribute in an entity. This display option interacts with the selection for Data types. As a result, there are four display options	See Display domain and data type for options and examples
Mandatory	The letter <*M*> beside each entity attribute when it is mandatory	 Customer Customer number <M> Customer name <M> Customer address <M> Customer activity Customer telephone ... ...
Identifier indicators	<*pi*> indicators next to attributes that are primary identifier attributes <*ai*> indicators next to identifier attributes that are not primary identifier attributes	 Customer Customer number <pi> Customer name Customer address Customer activity Customer telephone ... ...
Stereotype (Entity attributes)	Stereotype of the entity attributes	—
Stereotype (Entity identifiers)	Stereotype of the entity identifiers	—

Display domain and data type

You can display the domain of an attribute in the symbol of an entity. There are four display options available:

Selected check box	Result	Symbol
Data type	Displays only the data type, if it exists	 CUSTOMER Customer Number <UNDEF> Customer Name A30
Domains	Displays only the domain, if it exists	 CUSTOMER Customer Number Identifie Customer Name <None>
Data types Domains	Displays both data type and domain, if they exist	 CUSTOMER Customer Number <UNDEF> Identifie Customer Name A30 <None>
Data types Replace by domains	If domain exists and data type does not exist, then displays domain. If domain does not exist and data type exists, then displays data type.	 CUSTOMER Customer Number IDENTIFIER Customer Name A30

Defining entity attributes in a CDM

Entity attributes are data items attached to an entity. When you generate a Physical Data Model (PDM) from a Conceptual Data Model (CDM), entity attributes are generated as columns in tables (entities).

Entity attribute properties

You can access entity attribute properties from the list of entity attributes or from the entity property sheet.

Each entity attribute definition includes the following properties:

Property	Description
Name	The name of the item which should be clear and meaningful, and should convey the item's purpose to non-technical users
Code	The technical name of the item used for generating code or scripts, which may be abbreviated, and should not generally include spaces
Comment	Descriptive label for the entity attribute
Stereotype	Sub-classification used to extend the semantics of an object without changing its structure; it can be predefined or user-defined
Data type	Form of the data corresponding to the entity attribute, such as numeric, alphanumeric, boolean, or others
Length	Maximum length of the data type
Precision	Maximum number of places after the decimal point
Domain	Name of the associated domain
Primary Identifier	Indicates whether or not the entity attribute is the primary identifier of the current entity
Displayed	When selected, the attribute is displayed in the entity symbol. When cleared, the attribute is not displayed in the entity symbol
Mandatory	Indicates whether or not this entity attribute must be assigned a value

An entity attribute also includes the following properties:

Property	Description
Rules	Business rules associated with entity attribute
Standard Checks	Common data constraints
Additional Checks	Customized rules for data validation
Notes	Description associated with entity

Creating an entity attribute

There are several ways to create an entity attribute:

- From a data item used as an entity attribute
- From the attribute list for an entity

At creation, an entity attribute has a default name including a number. This number is assigned in the order of creation of objects.

Using a data item as an entity attribute

You can use the data item as an entity attribute by attaching it to an entity. This choice does not create a new data item. The resulting entity attribute has the same code as the data item.

Reusing a data item as an entity attribute

If you select Allow Reuse as a data item option, the same data item can be an entity attribute for more than one entity. However, you cannot reuse a data item that is an identifier.

Reusing a data item does not create a new data item. The data item and the corresponding entity attributes have the same code.

Setting data item options
You set data item options by selecting Tools ➤ Model Options.

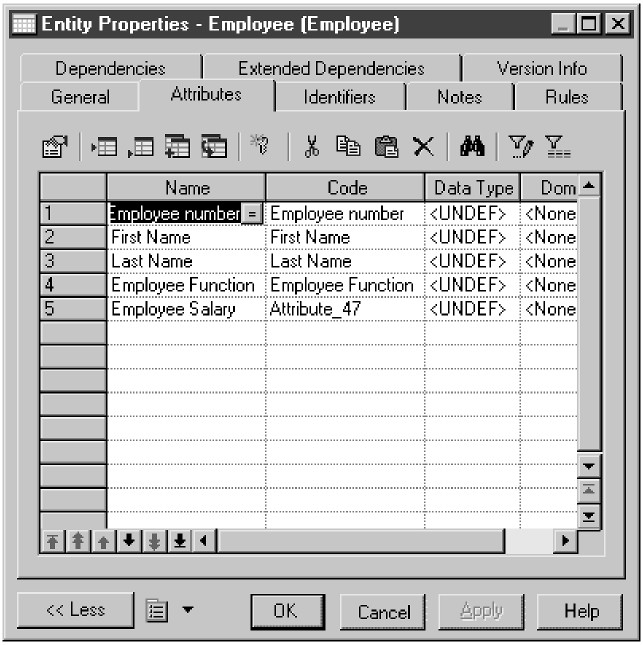
A new data item can be added by creating a new one or copying an existing one as the basis for a new one. The following specific tools are available to add data items:

Tool	**Description/Effect of Model Options**
Add Data Item	This tool is only available if the Allow Reuse option is selected in Model Options. This tool displays all model data items. If you click this tool and select a data item that is unused in the list of entity attributes, a new data item is created and added to the list. If you click this tool and select a currently used data item, the data item is copied and used as the basis for a new data item
Reuse Data Item	No new unused data item can be created with this tool. This tool displays all model data items. If you click this tool and select a data item that is used in the list of entity attributes, the data item is copied, added to the list and used as the basis for a new data item

❖ To use a data item as an entity attribute

1. Select the Attributes tab in the entity property sheet to display the corresponding page.

   It lists entity attributes associated with the entity.

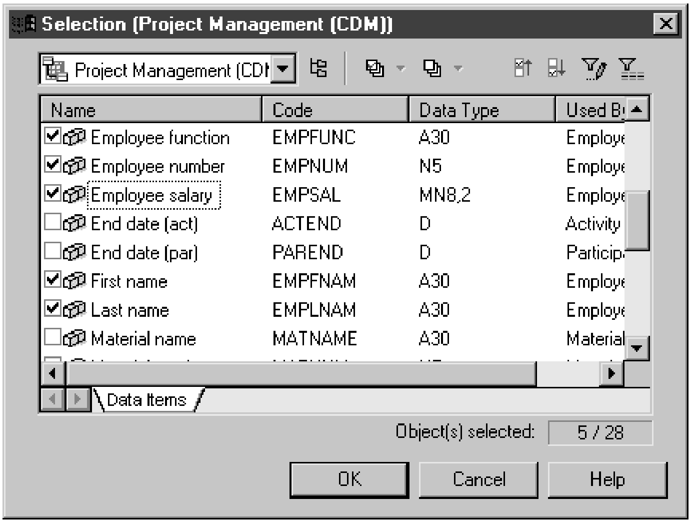


	Name	Code	Data Type	Dom
1	Employee number	Employee number	<UNDEF>	<None
2	First Name	First Name	<UNDEF>	<None
3	Last Name	Last Name	<UNDEF>	<None
4	Employee Function	Employee Function	<UNDEF>	<None
5	Employee Salary	Attribute_47	<UNDEF>	<None

2. Click the Add Data Item tool.

A Selection box appears listing all of the available data items.

3. Select one or more data items.



Name	Code	Data Type	Used B
☑ Employee function	EMPFUNC	A30	Employe
☑ Employee number	EMPNUM	N5	Employe
☑ Employee salary	EMPSAL	MN8,2	Employe
□ End date (act)	ACTEND	D	Activity
□ End date (par)	PAREND	D	Particip
☑ First name	EMPFNAM	A30	Employe
☑ Last name	EMPLNAM	A30	Employe
□ Material name	MATNAME	A30	Material

Object(s) selected: 5 / 28

4. Click OK.

   The selected data items are added to the list of entity attributes.

5. Click OK in each of the dialog boxes.

Creating an entity attribute from the list of entity attributes

You can create an entity attribute directly in the list of entity attributes for an entity. When you create an entity attribute, it is automatically added to the list of data items. If you select Allow Reuse as a model option, the new data item can be used as an entity attribute for other entities.

❖ To create an entity attribute from the list of entity attributes

1. Select the Attributes tab in the entity property sheet to display the corresponding page.

   It lists entity attributes associated with the entity.

2. Click a blank line in the list.

   or

   Click the Add a Row tool.

   An arrow appears at the beginning of the line.

3. Type an entity attribute name and an entity attribute code.

> **Automatically reuse a data item**
> If you select the data item options Allow Reuse and Unique Code and you type the name of a data item that is already in use, you automatically reuse the data item.

4. Click OK.

Attaching an entity attribute to a domain

If you attach an entity attribute to a domain, the domain supplies the data type and related data characteristics. It may also indicate check parameters and business rules.

❖ To attach an entity attribute to a domain

1. Double-click an entity in the diagram to display its property sheet.

2. Click the Attributes tab to display the corresponding page.

   It list entity attributes associated with the entity.

3. Click an entity attribute to define.

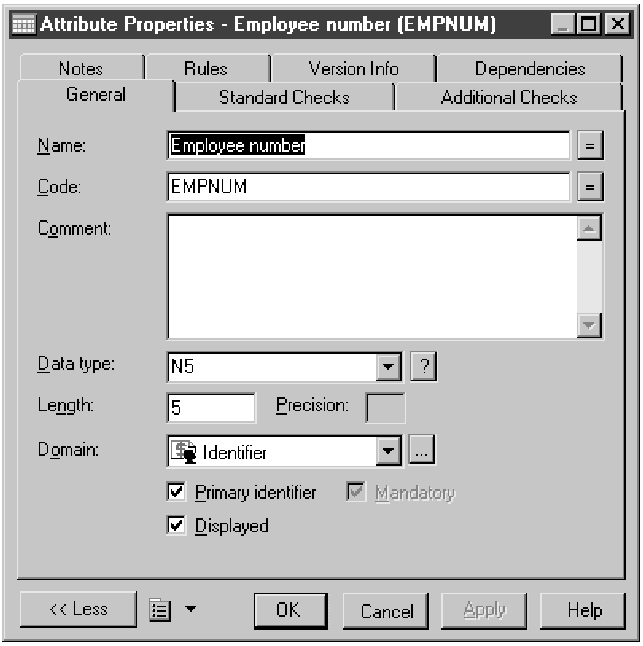
   An arrow appears at the beginning of the line.

4. Click the Properties tool.

   or

   Double-click the arrow at the beginning of the line.

   The entity attribute property sheet opens to the General page.



Name: Employee number

Code: EMPNUM

Comment:

Data type: N5

Length: 5 Precision:

Domain: Identifier

☑ Primary identifier ☑ Mandatory

☑ Displayed

> **Opening property sheets at last accessed page**
> You can choose to open property sheets at the last accessed page by selecting Tools ➤ General Options ➤ Dialog, and selecting the option Keep Last Tab in the Property Sheets groupbox.

5. Select a domain from the Domain dropdown listbox at the bottom of the dialog box.

   or

   Click the Ellipsis button at the end of the Domain dropdown listbox.

   The list of domains appears.

   Select a domain from the list.

   Click OK.

6. Click OK.

   You return to the Entity attributes page. In the Data Type column, the data type of the domain replaces the data type previously defined for the entity attribute.

7. Click OK.

Selecting a data type for an entity attribute

There are two ways to select a data type for an entity attribute:

- **Attach the entity attribute to a domain** The domain dictates a standard data type, a length, and a level of precision, as well as optional check parameters.

- **Manually select the data type** You select a standard data type along with a length, a level of precision, and optional check parameters

About check parameters
Check parameters indicate data ranges and validation rule. You can attach check parameters to entity attributes, data items, or domains.

❖ To select a data type for an entity attribute

1. Double-click an entity in the diagram to display the entity property sheet.
2. Click the Attributes tab to display the corresponding page.

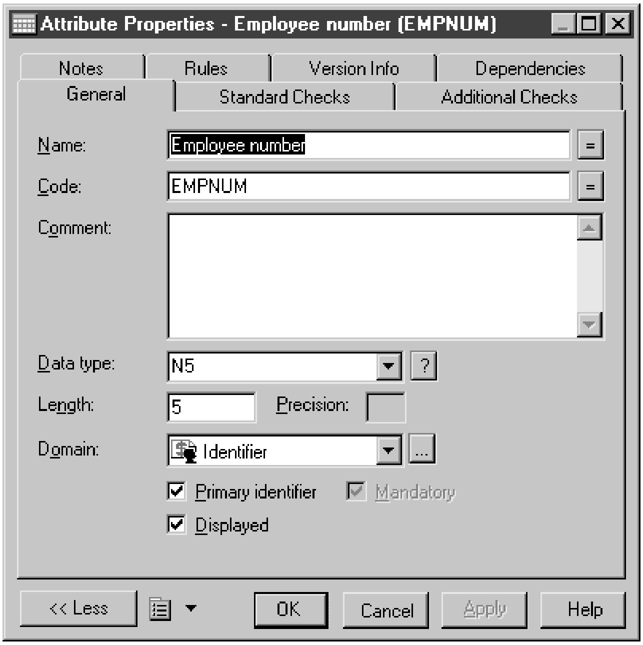
   It lists entity attributes associated with the entity.
3. Click the Entity attribute to define.

   An arrow appears at the beginning of the line.
4. Click the Properties tool.

   or

   Double-click the arrow at the beginning of the line.

   The entity attribute property sheet opens to the General page.



Name: Employee number

Code: EMPNUM

Comment:

Data type: N5

Length: 5 Precision:

Domain: Identifier

☑ Primary identifier ☑ Mandatory

☑ Displayed

5. Select a data type from the Data Type dropdown listbox.

   or

   Click the Question mark button at the end of the Data Type dropdown listbox.

   A list of standard data types supported by PowerDesigner appears.

   Select the radio button corresponding to the data type you want to apply.

   > **Undefined data type**
   > If you do not want to select a data type immediately, you can choose the <UNDEF> data type.

6. Type the maximum number of characters for the data type in the Length box.

7. If the data type can include values that take a decimal point, type the number of places after the decimal point in the Precision box.

8. Click OK.

   You return to the Entity attributes page. The change of data type appears in the list of entity attributes.

Defining an entity attribute as mandatory or optional

If an entity attribute is mandatory, every entity occurrence must have a value for that entity attribute. If an entity attribute is optional, entity occurrences do not have to have a value for that entity attribute.

By default all identifiers are mandatory.

❖ To define an entity attribute as mandatory or optional

1. Double-click an entity in the diagram to display the entity property sheet.

2. Click the Attributes tab to display the corresponding page.

   It lists entity attributes associated with the entity.

3. Click the Entity attribute to define.

   An arrow appears at the beginning of the line.

4. Click the Properties tool.

   or

   Double-click the arrow at the beginning of the line.

   The entity attribute property sheet opens to the General page.

5. Select the Mandatory check box at the bottom of the dialog box to make the entity attribute mandatory.

   or

   Clear the Mandatory check box to make the entity attribute optional.

   You cannot clear the Mandatory check box for an identifier because it must always be mandatory.

6. Click OK in each of the dialog boxes.

Deleting entity attributes

When you delete an entity or entity attributes, data item options determine whether or not the corresponding data items are also deleted.

The following rules apply to deleted entity attributes:

Data item options	Result of deleting an entity attribute
Unique Code Allow Reuse	Deletes entity attribute Does not delete corresponding data item
Unique Code only	Deletes entity attribute Does not delete corresponding data item
Allow Reuse only	Deletes entity attribute Deletes corresponding data item if it is not used by another entity
None	Deletes entity attribute Deletes corresponding data item

Arranging a list of entity attributes

Each entity has its own list of entity attributes.

In a list of entity attributes, you can arrange items in any order. When you generate a PDM, the order of entity attributes becomes the order of column generation.

❖ To arrange a list of entity attributes

1. Double-click an entity symbol to display the entity property sheet.

2. Click the Attributes tab to display the corresponding page.

It lists the data items attached to the entity.

3. Select one or more entity attributes in the list.
4. Use the arrow buttons at the bottom left corner of the list to move the items in the list.
5. Click OK.

Defining identifiers in a CDM

An **identifier** is an entity attribute, or a combination of entity attributes, whose values uniquely identify each occurrence of the entity. An identifier is the CDM equivalent of a primary key or an alternate key in a physical data model (PDM).

Each entity must have at least one identifier. If an entity has only one identifier, it is designated by default as the primary identifier for the entity. A primary identifier is the main identifier for an entity.

Designating an identifier

You designate an identifier from the Identifiers page of the entity property sheet.

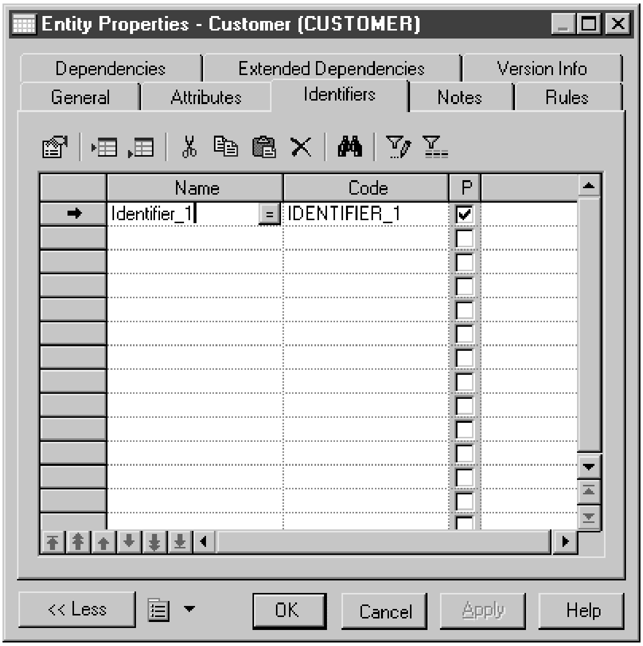
☞ For information on how to display identifiers in an entity symbol, see section "Modifying the entity display preferences" on page 56.

You can also create an identifier from the list of entity attributes: click the Attributes tab in the entity property sheet, select one or more attributes to include into the identifier and click the Create Identifier tool.

❖ To designate an identifier

1. Double-click an entity in the diagram to display the entity property sheet.
2. Click the Identifiers tab to display the corresponding page.

   It lists identifiers defined for the entity.



	Name	Code	P
➜	Identifier_1	IDENTIFIER_1	☑

3. Click a blank line in the list.

   or

   Click the Add a Row tool.

   An arrow appears at the beginning of the line.

4. Type an identifier name and code.

5. Click Apply.

   The constraint name and code are committed.

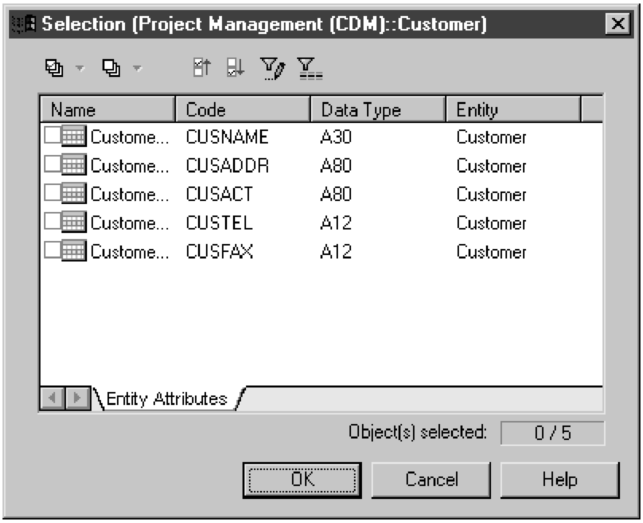
6. Double-click the new identifier name to display the identifier property sheet.

7. Click the Attributes tab to display the corresponding page.

   It lists all entity attributes defined for the identifier. At identifier creation, the list is empty.

8. Click the Add Attributes tool.

   A list of entity attributes defined for the entity appears.



Name	Code	Data Type	Entity
□ Custome...	CUSNAME	A30	Customer
□ Custome...	CUSADDR	A80	Customer
□ Custome...	CUSACT	A80	Customer
□ Custome...	CUSTEL	A12	Customer
□ Custome...	CUSFAX	A12	Customer

Object(s) selected: 0 / 5

9. Select check boxes for one or more entity attributes that you want to designate as an identifier.

10. Click OK in each of the dialog boxes.

Adding attributes to an entity identifier

You can add attributes to an entity identifier.

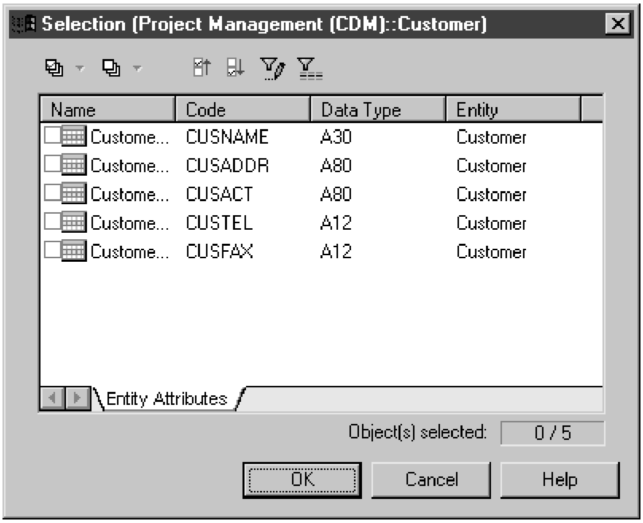
❖ To add attributes to an identifier

1. Click the Attributes tab in the identifier property sheet to display the corresponding page.

   It lists the attributes currently defined for the identifier.

2. Click the Add Attributes tool.

   A list of entity attributes defined for the entity appears.



Selection (Project Management (CDM)::Customer)

Name	Code	Data Type	Entity
□ Custome...	CUSNAME	A30	Customer
□ Custome...	CUSADDR	A80	Customer
□ Custome...	CUSACT	A80	Customer
□ Custome...	CUSTEL	A12	Customer
□ Custome...	CUSFAX	A12	Customer

Object(s) selected: 0 / 5

3. Select check boxes for one or more entity attributes that you want to designate as an identifier.

4. Click OK in each of the dialog boxes.

Designating a primary identifier

A **primary identifier** is an identifier that has been designated as the main identifier for the entity. It generates a primary key in a PDM.

❖ To designate a primary identifier

1. Double-click an entity in the diagram to display the entity property sheet.

2. Click the Identifiers tab to display the corresponding page.

   It lists the Identifiers defined for the entity.

3. Select an identifier from the list.

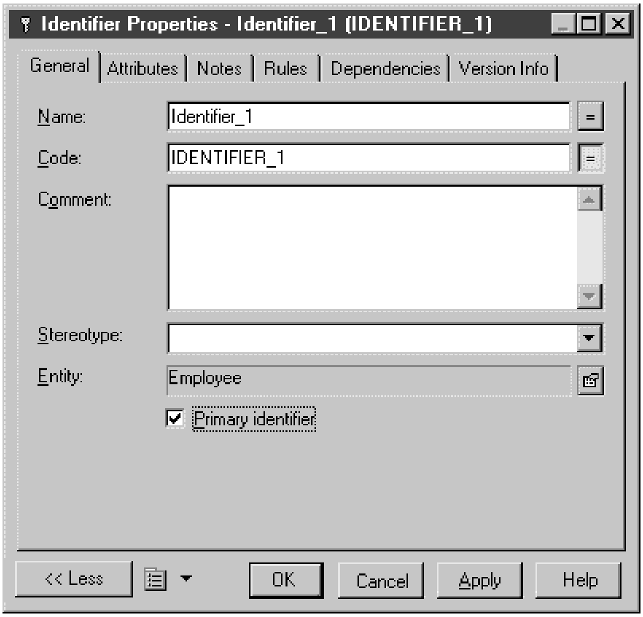
   An arrow appears at the beginning of the line.

4. Click the Property tool.

   or

   Double-click the arrow at the beginning of the line.

   The identifier property sheet appears.



Name: Identifier_1

Code: IDENTIFIER_1

Comment:

Stereotype:

Entity: Employee

☑ Primary identifier

5. Select the Primary Identifier check box.

6. Click OK.

   You return to the Identifiers page. The P column is selected for the new primary identifier.

Item not visible in list
To make an item visible in a list, click the Customize Columns and Filter tool in the list toolbar, select the appropriate check box from the list of filter options that appears, and click OK.

7. Click OK.

Modifying an identifier name or code from the list

You can modify an identifier name and code using the following methods:

- From the identifier property sheet accessible from the entity property sheet

- From the list of identifiers

☞ For more information on the different ways to modify the identifier properties, see section Modifying object properties in chapter Managing objects in the *General Features Guide* .

Defining relationships in a CDM

A relationship is a link between entities. For example, in a CDM that manages human resources, the relationship Member links the entities Employee and Team, because employees can be members of teams. This relationship expresses that each employee works in a team and that each team has employees.

An occurrence of a relationship corresponds to one instance of each of the two entities involved in the relationship. For example, *the employee Martin working in the Marketing team* is one occurrence of the relationship Member.

Relationships and association

Relationships are used in the Entity Relationship (ER) and IDEF1X modeling methodologies. In PowerDesigner you can also use associations used in the Merise methodology to link entities. You can use either relationships or associations exclusively, or combine the two methodologies in the same model.

☞ For more information on using associations, see section "Defining associations in a CDM" on page 95.

This section analyzes relationships in the Entity Relationship methodology, for more information on IDEF1X, see section CDM Options in chapter Conceptual Data Model Basics.

Relationship properties

You can double-click any relationship symbol in the diagram to display its properties:

Property	Description
Name	The name of the item which should be clear and meaningful, and should convey the item's purpose to non-technical users
Code	The technical name of the item used for generating code or scripts, which may be abbreviated, and should not generally include spaces
Comment	Descriptive label for the relationship
Stereotype	Sub-classification used to extend the semantics of an object without changing its structure; it can be predefined or user-defined
Entity1 Entity2	The two entities linked by the relationship

Property	Description
Generate	Indicates to generate a reference in PDM
Cardinalities	Contains data about cardinality as the number of instances of one entity in relation to another entity

Creating a relationship

There are several ways to create a relationship between entities:

- From a diagram
- From the Browser
- From the list of relationships

At creation, a relationship has a default name including a number. This number is assigned in the order of creation of objects.

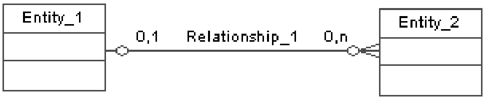
When you create a relationship from the Browser or from the list of relationships, you must previously define source and destination objects for the relationship.

☞ For more information on the different ways to create a relationship, see section Creating an object in chapter Managing objects in the *General Features Guide* .

❖ To create a relationship from a diagram

1. Click the Relationship tool in the Palette.
2. Click inside the first entity and while continuing to hold down the mouse button, drag the cursor to a second entity. Release the mouse button inside the second entity.

   A relationship symbol appears between the two entities.



Dragging a relationship to a different entity
You change the entity at either end of a relationship by clicking the relationship to select it, holding the CTRL key down, and dragging one of the attach points to a different entity.

3. Click the Pointer tool.

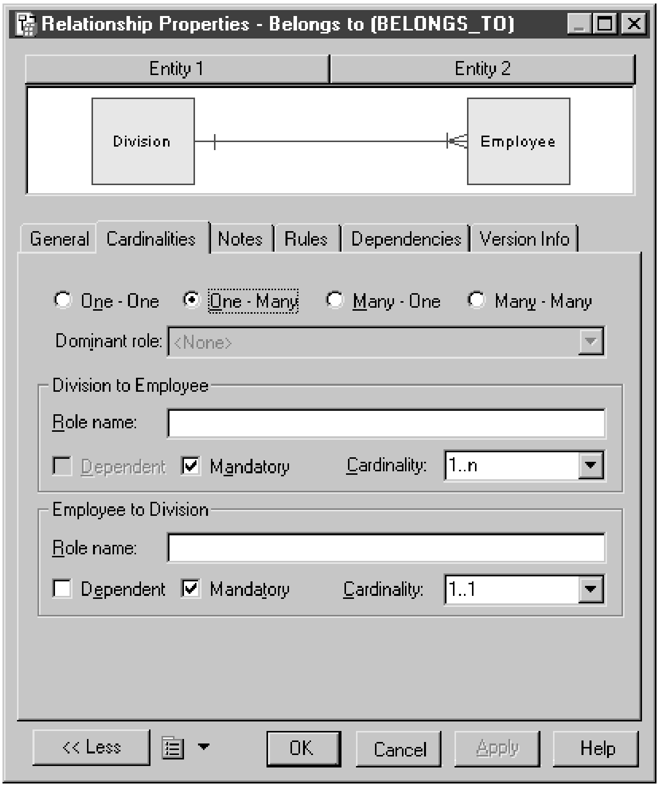
   or

   Click the right mouse button.

   You release the Relationship tool.

4. Double-click the new relationship symbol in the diagram to display the relationship property sheet. It displays the definition of the selected relationship.

5. Type a relationship name and a relationship code.



○ One - One ● One - Many ○ Many - One ○ Many - Many

Dominant role: <None>

Division to Employee

Role name:

□ Dependent ☑ Mandatory Cardinality: 1..n

Employee to Division

Role name:

□ Dependent ☑ Mandatory Cardinality: 1..1

Opening the property sheet of objects at ends

You can open the property sheet of the source and destination objects by clicking the Entity 1 and Entity 2 buttons located in the upper part of the flow property sheet.

6. Type or select relationship properties as required in the tabbed pages.

7. Click OK.

Displaying relationships from the entity property sheet

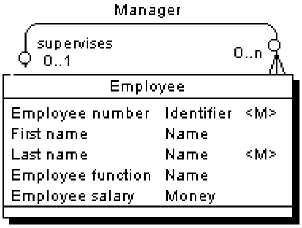
Relationships linked to an entity are also displayed in the entity property sheet. You can display those relationships from the Relationships tabbed page of the Dependencies page.

Creating a reflexive relationship

A reflexive relationship is a relationship between an entity and itself.

Example

The reflexive relationship *Supervise* expresses that an employee (Manager) can supervise other employees.



Getting neat relationship lines
To obtain clean lines with rounded corners when you create a reflexive relationship, select Display Preferences ➤ Format ➤ Relationship and modify the Line Style with the appropriate type from the Corners dropdown listbox.

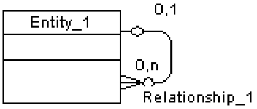
❖ To create a reflexive relationship

1. Click the Relationship tool in the Palette.

2. Click inside the first entity and while continuing to hold down the mouse button, drag the cursor to a space next to the entity.

3. Click the entity.

   A relationship symbol loops back to the same entity.



Entity dependencies
In the Dependencies page of the entity, you can see two identical occurrences of the relationship, this is to indicate that the relationship is reflexive and serves as origin and destination for the link

Modifying relationship properties

You can modify the relationship properties using the following methods:

- From the relationship property sheet
- From the list of relationships

☞ For more information on the different ways to modify the relationship properties, see section Modifying object properties in chapter Managing objects in the *General Features Guide* .

Defining a code option for relationships

You can define the following code option for relationships:

Option	Result when selected	Result when cleared
Unique code	Each relationship has a unique code	Different relationships can have the same code

If you do not select Unique Code, two relationships can have the same code. In this case, you differentiate the relationships by the entities they link.

Error message

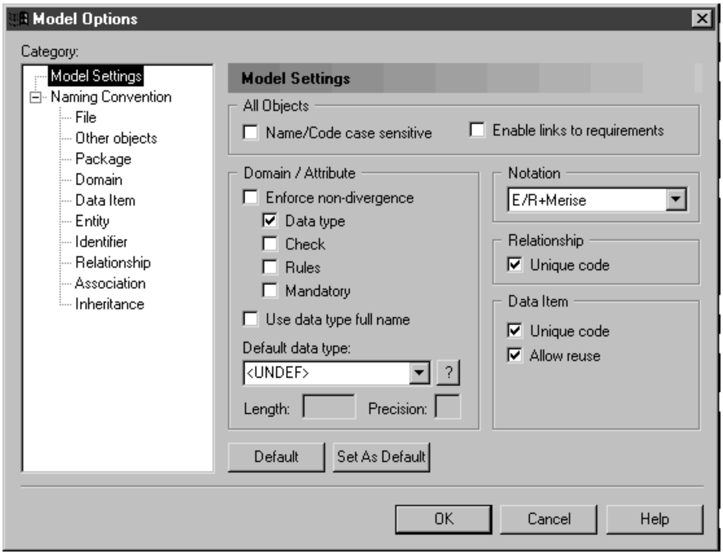
The following error message appears when the option you choose is incompatible with the current CDM:

Error message	Solution
Unique Code option could not be selected because at least two relationships have the same code: *relationship_code.*	Change the code of one relationship

❖ To define a code option for relationships

1. Select Tools ➤ Model Options.

   The Model Options dialog box opens to the Model Settings page.



Model Settings

All Objects
☐ Name/Code case sensitive
☐ Enable links to requirements

Domain / Attribute
☐ Enforce non-divergence
☑ Data type
☐ Check
☐ Rules
☐ Mandatory
☐ Use data type full name
Default data type: <UNDEF>
Length:
Precision:

Notation: E/R+Merise

Relationship
☑ Unique code

Data Item
☑ Unique code
☑ Allow reuse

2. Select the Unique Code check box in the Relationship groupbox to require a unique code for each relationship.

   or

   Clear the Unique Code check box in the Relationship groupbox to allow more than one relationship to have the same code.

3. Click OK.

Defining cardinality for relationships

Cardinality indicates the number of instances (none, one, or many) of an entity in relation to another entity. You can select the following values for cardinality:

Cardinality	Symbol	Description
One-to-one	<1..1>	One instance of the first entity can correspond to only one instance of the second entity
One-to-many	<1..n>	One instance of the first entity can correspond to more than one instance of the second entity
Many-to-one	<n..1>	More than one instance of the first entity can correspond to the same one instance of the second entity
Many-to-many	<n..n>	More than one instance of the first entity can correspond to more than one instance of the second entity

The Cardinalities page contains a groupbox for each direction of the relationship. The title of the groupbox takes the following form:

' EntityA' **to** *' EntityB'*

The following properties apply to each direction of the relationship:

Property	Description
Dominant role	In a One to One relationship, indicates to generate a reference in the PDM for this direction of the relationship only
Role name	Text that describes the relationship of EntityA to EntityB
Dependent	Indicates that each instance of the EntityA is identified by an instance of EntityB
Mandatory	Indicates that each instance of the EntityA requires an instance of the EntityB
Cardinality	Maximum and minimum number of instances of EntityA in relation to EntityB (if mandatory, at least 1). You can indicate the following cardinalities: 0..1 0..n 1..1 1..n

Termination points

In a diagram, termination points indicate cardinality at each end of a relationship. A termination with a single contact point denotes a cardinality of one. A termination with three contact points denotes a cardinality of many.

Termination point	Cardinality
├○	One
⊳○	Many

☞ For more information on IDEF1X cardinality notation, see section CDM options in chapter Conceptual Data Model Basics.

❖ To define cardinality

1. Double-click the relationship to display the relationship property sheet.

   It displays the definition of the selected relationship.

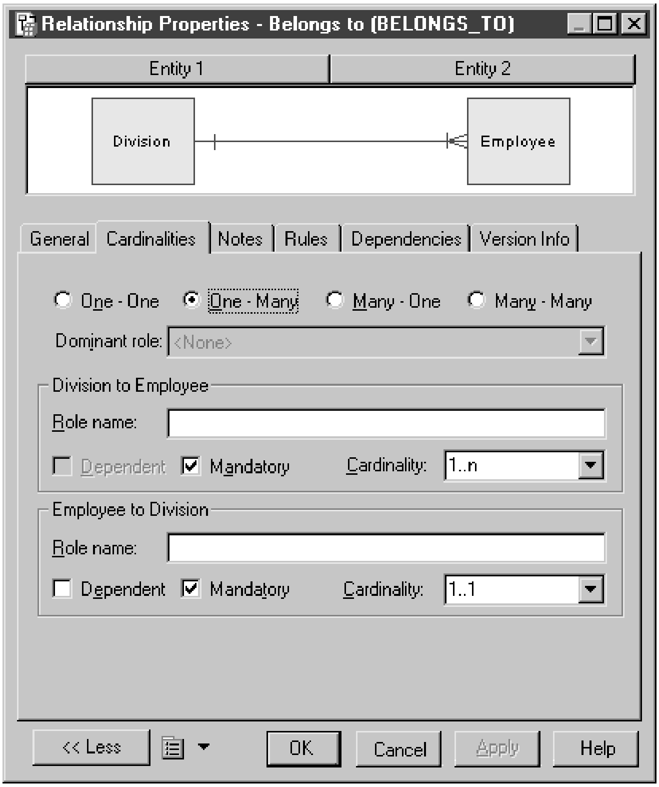
2. Click the Cardinalities tab to display the corresponding page.

3. Select one of the cardinality radio buttons.

4. Click OK.

Example

The Cardinalities page below indicates that an employee must belong to one and only one division, while a division must include one or more employees.



○ One - One ● One - Many ○ Many - One ○ Many - Many

Dominant role: <None>

Division to Employee

Role name:

□ Dependent ☑ Mandatory Cardinality: 1..n

Employee to Division

Role name:

□ Dependent ☑ Mandatory Cardinality: 1..1

Defining a mandatory relationship

The property Mandatory indicates whether the relationship between entities is mandatory or optional. You define options from the point of view of both entities in the relationship.

Termination points

In the resulting relationship symbol, a bar represents a mandatory relationship. A circle represents an optional relationship.

Termination point	Existence	Cardinality	Description
	Mandatory	One	Must exist one and only one
	Mandatory	Many	Must exist one or more
	Optional	One	May exist one, or none
	Optional	Many	May exist one or more, or none

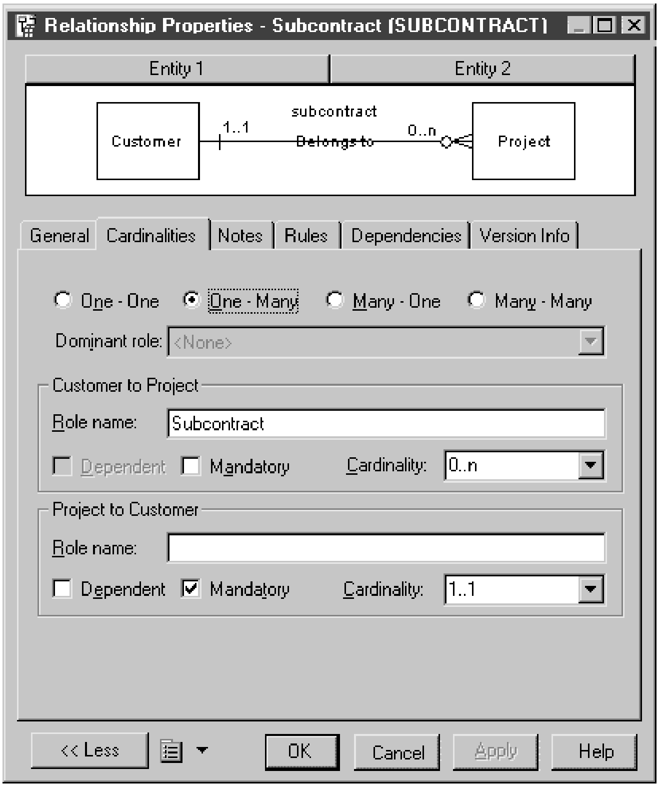
☞ For more information on IDEF1X existence notation, see section CDM options in chapter Conceptual Data Model Basics.

❖ To define a mandatory relationship

1. Double-click the relationship symbol to display the relationship property sheet.
2. Click the Cardinalities tab to display the corresponding page.
3. Select the Mandatory check box in one or both of the groupboxes corresponding to a relationship direction.
4. Click OK.

Example

The Cardinalities page below indicates that the subcontract relationship is optional from customer to project, and mandatory from project to customer. Each project must have a customer, while each customer does not have to have a project.



○ One - One ● One - Many ○ Many - One ○ Many - Many

Dominant role: <None>

Customer to Project

Role name: Subcontract

□ Dependent □ Mandatory Cardinality: 0..n

Project to Customer

Role name:

□ Dependent ☑ Mandatory Cardinality: 1..1

Defining a dependent relationship

In a dependent relationship, one entity is partially identified by another. Each entity must have an identifier. In some cases, however, the attributes of an entity are not sufficient to identify an occurrence of the entity. For these entities, their identifiers incorporate the identifier of another entity with which they have a dependent relationship.

Example

An entity named Task has two entity attributes, TASK NAME and TASK COST. A task may be performed in many different projects and the task cost will vary with each project. To identify each occurrence of TASK COST the unique Task entity identifier is the compound of its *Task name* entity attribute and the *Project number* identifier from the Project entity.

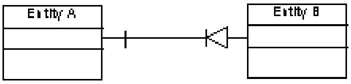
Many to many relationship

A many-to-many relationship cannot be a dependent relationship.

Termination points

In the resulting model, a triangle just before the termination point of the relationship indicates a dependent relationship. The triangle points away from the dependent entity.

For example, here Entity B depends on Entity A.



The bar indicates that the relationship in not only dependent, but also mandatory. The single contact point indicates the one-to-one cardinality of the relationship. In this case, for each occurrence of Entity B there must be only one occurrence of Entity A.

The tip of the triangle shown above has a bar to note a mandatory relationship: every occurrence of Entity A requires an occurrence of Entity B.

☞ For more information on IDEF1X notation, see section CDM options in chapter Conceptual Data Model Basics.

❖ To define a dependent relationship

1. Double-click the relationship symbol to display the relationship property sheet.

   It displays the definition of the selected relationship.

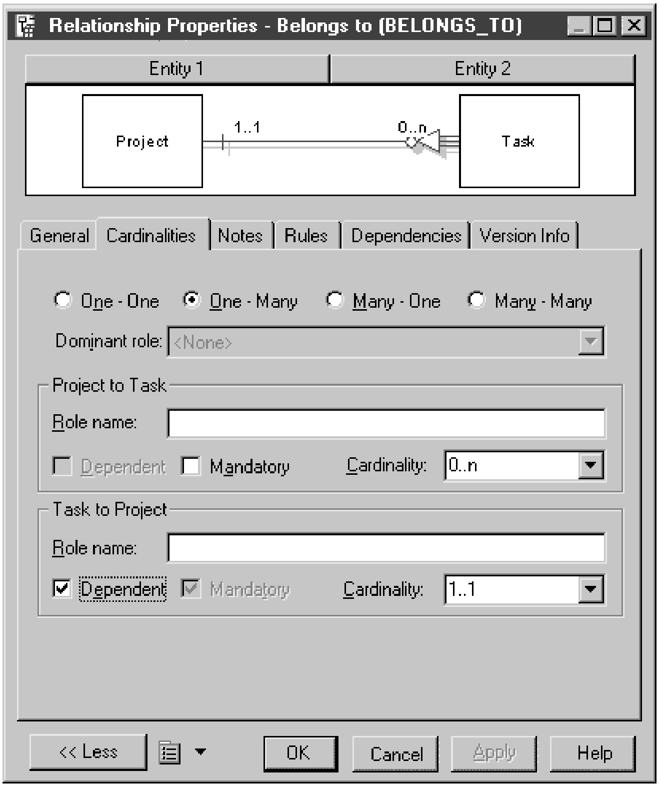
2. Click the Cardinalities tab to display the corresponding page.

3. Select or clear the Dependent check box in each groupbox corresponding to a relationship direction.

4. Click OK.

Example

The property sheet below shows that the Task entity is dependent on the Project entity.



○ One - One ● One - Many ○ Many - One ○ Many - Many

Dominant role: <None>

Project to Task

Role name:

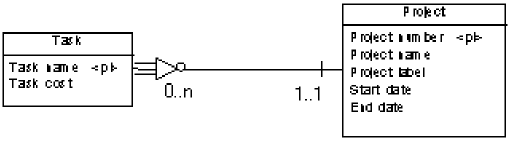
□ Dependent □ Mandatory Cardinality: 0..n

Task to Project

Role name:

☑ Dependent ☑ Mandatory Cardinality: 1..1

The relationship pictured here expresses this dependency.



The circle at the tip of the triangle indicates that occurrences of the Project entity do not require an occurrence of the Task entity. But an occurrence of the Task entity requires an occurrence of the Project entity on which it depends.

Defining a dominant relationship

In a one-to-one relationship, you can define one direction of the relationship as dominant. If you define a dominant direction, the one-to-one relationship generates one reference in the PDM. The dominant entity becomes the parent table. If you do not define a dominant direction, the one-to-one relationship generates two references.

❖ To define a dominant relationship

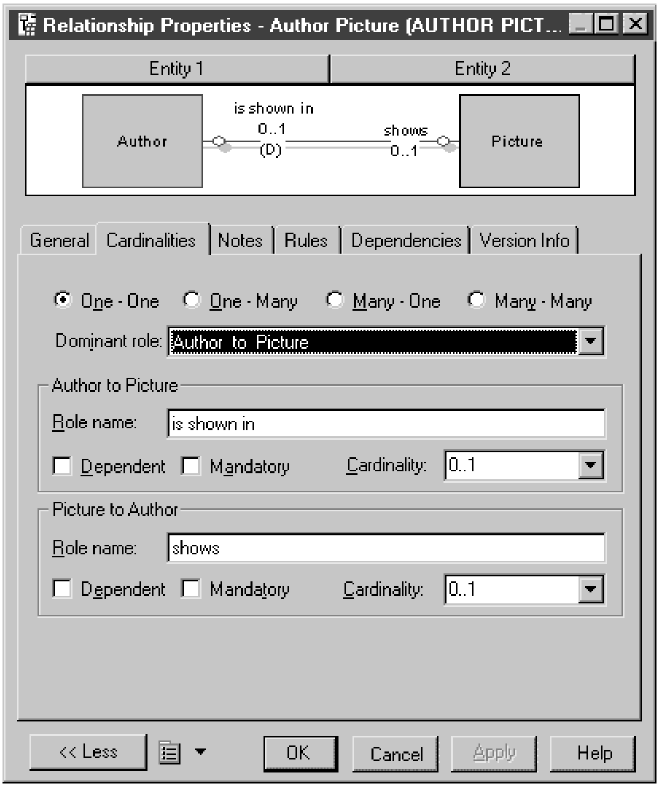
1. Double-click a relationship symbol in the diagram to display the relationship property sheet.

   It displays the definition of the selected relationship.

2. Click the Cardinalities tab to display the corresponding page.
3. Select the One to One check box.
4. Select the direction for the dominance from the Dominant Role dropdown listbox.
5. Click OK.

Example

For example, in the property sheet below, the Author to Picture direction is dominant in the relationship.



● One - One ○ One - Many ○ Many - One ○ Many - Many

Dominant role: Author to Picture

Author to Picture

Role name: is shown in

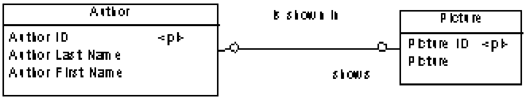
□ Dependent □ Mandatory Cardinality: 0..1

Picture to Author

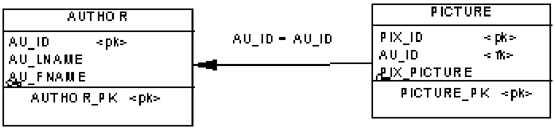
Role name: shows

□ Dependent □ Mandatory Cardinality: 0..1

The relationship pictured here shows the one-to-one relationship.



In a PDM, this relationship generates the following reference: Author is the parent table, and its primary key migrates to the Picture table as foreign key.



Changing a relationship into an associative entity

You can transform a relationship into an associative entity linked by two relationships. Next, you can attach entity attributes to this associative entity, that you could not attach to the relationship.

The associative entity gets the name and code of the relationship. The two new relationships handle cardinality properties.

❖ To change a relationship into an associative entity

1. Right-click a relationship symbol.

   The relationship contextual menu appears.

2. Select Change to Entity ➤ Standard from the contextual menu.

> **Customizing entity wizard**
> You can also select Change to Entity ➤ Wizard from the contextual menu. A step by step wizard takes you through a more detailed procedure for defining an associative entity.

An associative entity with two relationships replaces the relationship. The associative entity takes the name of the original relationship.

Creating an associative entity using the Change to Entity Wizard

You can use the Change to Entity wizard to transform a relationship into an associative entity linked by two relationships.

You create the associative entity in three stages. Each stage corresponds to a page in the wizard process. You move through each stage by clicking the Next button.

You can enter the following information for each stage of the wizard:

Stage	Description
Customizing entity	You type the name and code for the new entity. You can also type a description in the Comment box
Customizing Relationship (New entity to first entity)	You type the name and code for the relationship that will be created between the first entity and the new entity. The first entity is defined as Entity 1 in the property sheet for the original relationship. You can also enter a role name for the relationship and a cardinality value
Customizing Relationship (New entity to second entity)	You type the name and code for the relationship that will be created between the new entity and the second entity. The second entity is defined as Entity 2 in the property sheet for the original relationship. You can also enter a role name for the relationship and a cardinality value

❖ To create an associative entity using the Change to Entity Wizard

1. Right-click a relationship symbol.

   A contextual menu appears.

2. Select ➤ Change to Entity ➤ Wizard to display the Customizing Entity page.

3. Type an entity name and an entity code.

4. Click Next.

   The Customizing Relationship page appears.

5. Fill in details for the first entity to new entity relationship.

6. Click Next.

   The second Customizing Relationship page appears.

7. Fill in details for the new entity to second entity relationship.

8. Click Finish.

   The associative entity with two relationships replaces the relationship.

Sorting the list of relationships

You can sort the list of relationships alphabetically or in reverse alphabetical order by any list property.

The listed order is indicated by an arrowhead that appears at the end of the column heading for the property as follows:

Arrow type	Listed order
Down arrow	Alphabetically
Up arrow	Reverse alphabetically

For example, when you click the column heading Name, the relationships are listed by relationship name alphabetically when the down arrow is indicated, and in reverse order when the up arrow is indicated.

> **Item not visible in list**
> To make an item visible in a list, click the Customize Columns and Filter tool in the list, and from the list of filter options that appears, select the appropriate item check box and click OK.

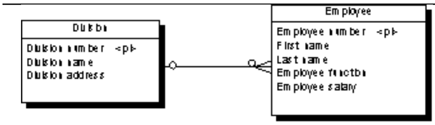
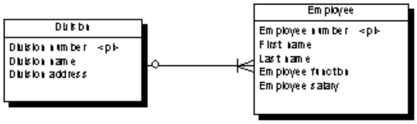
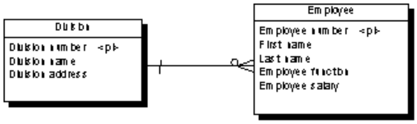
❖ To sort the list of relationships

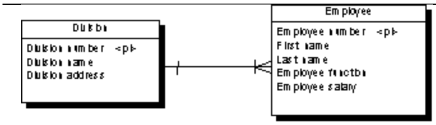
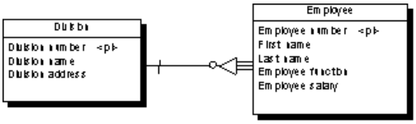
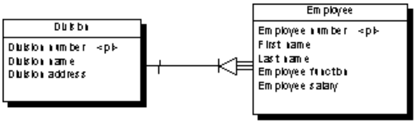
1. Select Model ➤ Relationships to display the list of relationships.
2. Click a column header.

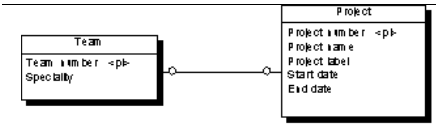
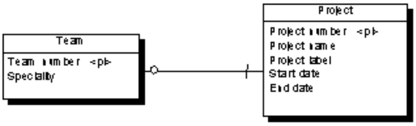
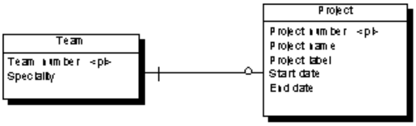
   The listed references are ordered by the indicated property.
3. Click OK.

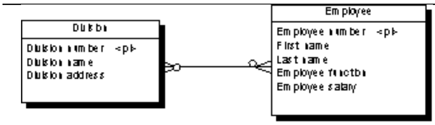
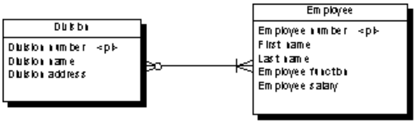
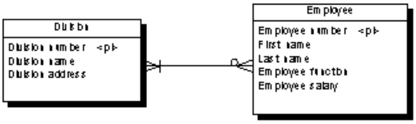
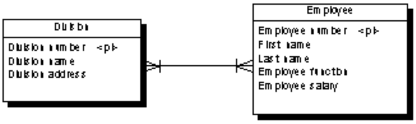
Relationship examples

This section shows the graphic representation of various relationship properties.

One-to-many relationship	Description
 Division Division number <pi> Division name Division address Employee Employee number <pi> First name Last name Employee function Employee salary	Each division may have zero or more employees Each employee may belong to zero or one division
 Division Division number <pi> Division name Division address Employee Employee number <pi> First name Last name Employee function Employee salary	Each division must have one or more employees Each employee may belong to zero or one division
 Division Division number <pi> Division name Division address Employee Employee number <pi> First name Last name Employee function Employee salary	Each division may have zero or more employees Each employee must belong to one and only one division

One-to-many relationship	Description
 Division Division number <pi> Division name Division address Employee Employee number <pi> First name Last name Employee function Employee salary	Each division must have one or more employees Each employee must belong to one and only one division
 Division Division number <pi> Division name Division address Employee Employee number <pi> First name Last name Employee function Employee salary	Each division may have zero or more employees Each employee must belong to one and only one division Each employee is identified uniquely by division number and employee number
 Division Division number <pi> Division name Division address Employee Employee number <pi> First name Last name Employee function Employee salary	Each division must have one or more employees Each employee must belong to one and only one division Each employee is identified uniquely by division number and employee number

One-to-one relationship	Description
 Team Team number <pi> Speciality Project Project number <pi> Project name Project label Start date End date	Each team works on zero or one project Each project is managed by zero or one team
 Team Team number <pi> Speciality Project Project number <pi> Project name Project label Start date End date	Each team works on one and one project only Each project is managed by zero or one team
 Team Team number <pi> Speciality Project Project number <pi> Project name Project label Start date End date	Each team works on zero or one project Each project is managed by one and one team only

Many-to-many relationship	Description
 Division Division number <pi> Division name Division address Employee Employee number <pi> First name Last name Employee function Employee salary	Each division may have zero or more employees Each employee may belong to zero or more divisions
 Division Division number <pi> Division name Division address Employee Employee number <pi> First name Last name Employee function Employee salary	Each division must have one or more employees Each employee may belong to zero or more divisions
 Division Division number <pi> Division name Division address Employee Employee number <pi> First name Last name Employee function Employee salary	Each division may have zero or more employees Each employee must belong to one or more divisions
 Division Division number <pi> Division name Division address Employee Employee number <pi> First name Last name Employee function Employee salary	Each division must have one or more employees Each employee must belong to one or more divisions

Modifying the relationship display preferences

You can modify the following display preferences for a relationship using the Tools ➤ Display Preferences command:

Preference	Display description
Name	Name or code of the relationship*
Role	Role of each direction in the relationship
Cardinality	Minimum and maximum number of instances that the first entity can have relative to the second entity
Dominance	Letter *D* on the dominant entity side of the relationship
Stereotype	Stereotype of the relationship

*Displayed text depends on whether the Name or Code radio button is selected.

Modifying a relationship graphically

From the CDM graphic, you can modify a relationship as follows:

- Bend a relationship symbol
- Straighten a relationship symbol
- Drag a relationship to a different entity

Bending a relationship symbol

❖ To bend a relationship symbol

1. Press CTRL while you click a point on the relationship to insert an angle.

   The point becomes a handle.

2. Release CTRL.

3. Drag and drop the handle to create the bend.

Straightening a relationship symbol

❖ To straighten a relationship symbol

1. Click a relationship symbol that has angles.

   Handles appear on the relationship symbol.

2. Press CTRL while you click a handle.

   The handle and its angle disappear.

Dragging a relationship to a different entity

❖ To drag a relationship to a different entity

1. Click a relationship.

2. Press CTRL while you drag one of its attach points to a different entity.

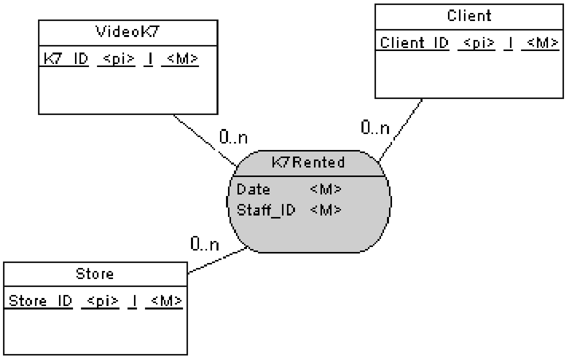
Defining associations in a CDM

An **association** is a connection between entities. In the Merise modeling methodology an association is used to connect several entities that each represents clearly defined objects, but are linked by an event, which may not be so clearly represented by another entity.

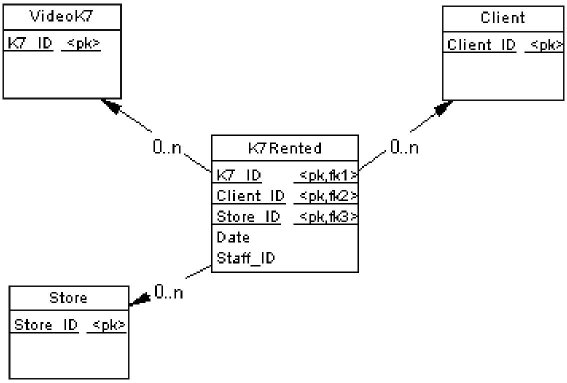
Each instance of an association corresponds to an instance of each entity linked to the association.

Example

Three entities VIDEOK7, CLIENT, and STORE contain video cassette, client, and store information. They are linked by an association which represents a video cassette rental (K7RENTAL). The K7RENTAL association also contains the attributes DATE and STAFF_ID, which give the date of the rental, and the identity of the staff member who rented out the video cassette.



When you generate a PDM, K7RENTED is generated as a table with five columns, STORE_ID,K7_ID, CLIENT_ID, DATE, and STAFF_ID.



In PowerDesigner you can use associations exclusively in your CDM, or use both associations and relationships in the same model.

Association links

An association is connected to an entity by an association link. An **Association Link** symbolizes the role and the cardinality between an association and an entity.

Association properties in CDM

You can double-click any association symbol in the diagram to display its properties:

Property	Description
Name	The name of the item which should be clear and meaningful, and should convey the item's purpose to non-technical users
Code	The technical name of the item used for generating code or scripts, which may be abbreviated, and should not generally include spaces
Comment	Descriptive label for the association
Stereotype	Sub-classification used to extend the semantics of an object without changing its structure; it can be predefined or user-defined
Number	Estimated number of occurrences in the physical database for the association (the number of records)
Generate	Indicates if the association will generate a table in a PDM
Attributes	Data item attached to an association
Rules	Business rules associated with the association

Association link properties

You can double-click any association link symbol in the diagram to display its properties:

Property	Description
Entity	Entity connected by the association link
Association	Association connected by the association link
Role	Label indicating the role of the association link
Identifier	Indicates if the entity is dependent on the other entity
Cardinality	Number of occurrences (one or many) of one entity to another entity
Stereotype	Sub-classification used to extend the semantics of an object without changing its structure; it can be predefined or user-defined

Creating an association in a CDM

There are several ways to create an association:

- From a diagram
- From the Browser
- From the list of associations

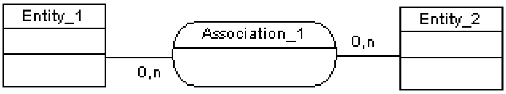
At creation, an association has a default name including a number. This number is assigned in the order of creation of objects.

☞ For more information on the different ways to create an association, see section Creating an object in chapter Managing objects in the *General Features Guide* .

❖ To create an association from a diagram

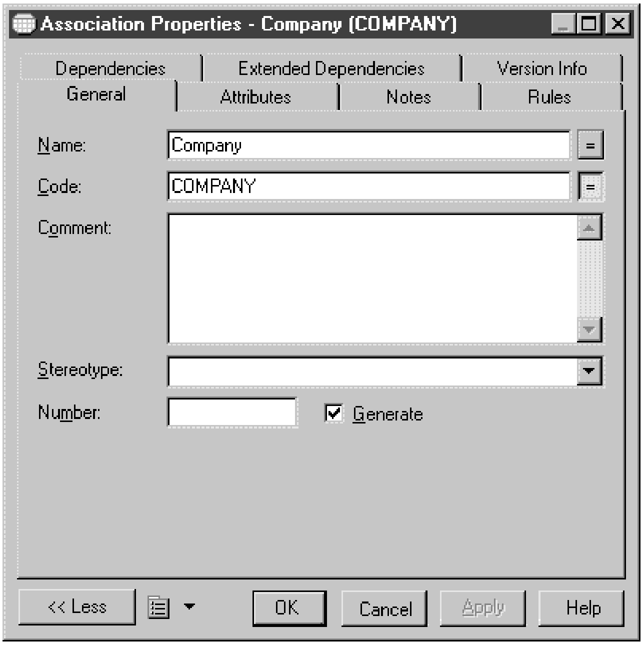
1. Click the Association Link tool in the Palette.
2. Click inside the first entity and while continuing to hold down the mouse button, drag the cursor to a second entity. Release the mouse button.

   An association symbol is created between the two entities.



3. Double-click the new association symbol in the diagram to display the association property sheet.

4. Type an association name and an association code.



Association Properties - Company (COMPANY)

Name: Company

Code: COMPANY

Comment:

Stereotype:

Number:

☑ Generate

5. Click OK.

Creating an association link

There are several ways to create an association link between an entity and an association:

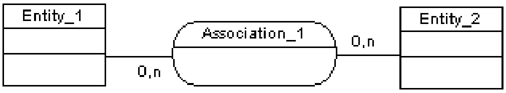
- From a diagram
- From the list of associations links

Creating an association link from a diagram:

❖ To create an association link from a diagram

1. Click the Association Link tool in the Palette.
2. Click inside the first entity and while continuing to hold down the mouse button, drag the cursor to a second entity. Release the mouse button.

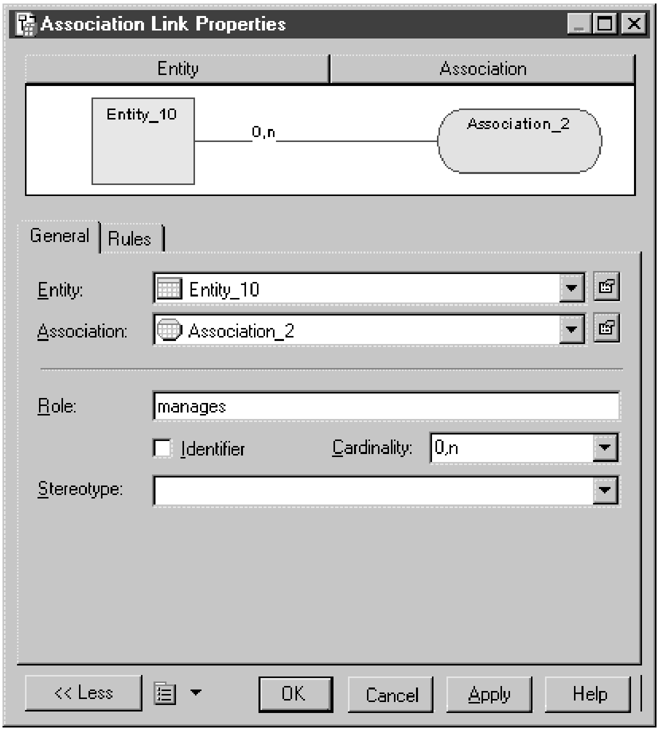
   An association symbol with two associations links is created between the two entities.



3. Double-click one of the two associations links symbols in the diagram to open the association link property sheet.

   It displays the definition of the selected association link.

4. Type or select association link properties as required.



Entity: Entity_10

Association: Association_2

Role: manages

□ Identifier

Cardinality: 0,n

Stereotype:

5. Click OK.

Creating an association link from the list of associations links

❖ To create an association link from the list of associations links

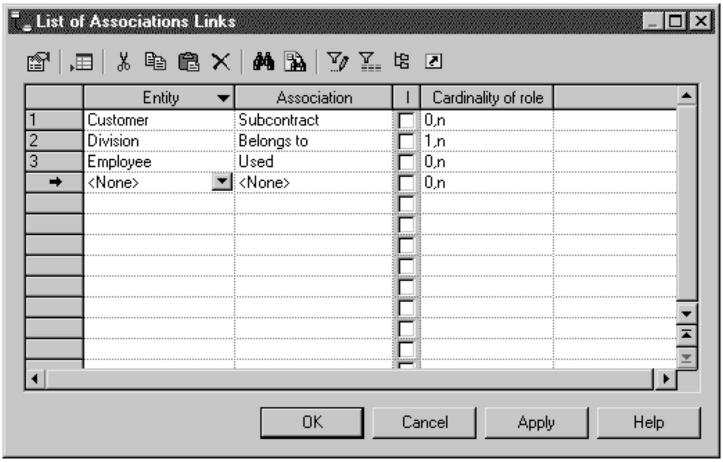
1. Select Model ➤ Links to display the list of associations links.

2. Click a blank line in the list.

   or

   Click the Add a Row tool.

   An arrow appears at the beginning of the line. <None> is displayed by default in the Entity and Association columns.



	Entity	Association	I	Cardinality of role
1	Customer	Subcontract	□	0,n
2	Division	Belongs to	□	1,n
3	Employee	Used	□	0,n
➜	<None>	<None>	□	0,n

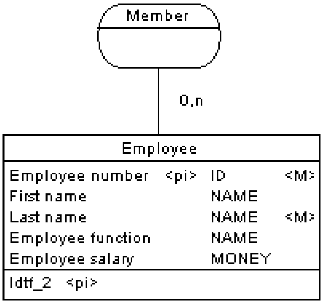
3. Click the down arrowhead in the Entity column and select an entity from the dropdown listbox.

4. Click the Association column to display the down arrowhead and select an association from the dropdown listbox.

5. Click the Cardinality of role column to display the down arrowhead and select a cardinality from the dropdown listbox.

6. Click OK.

   A symbol for this association link is created between the entity and the association in the current diagram.

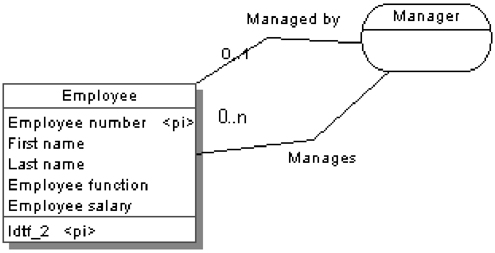


Creating a reflexive association in a CDM

A reflexive association is a relationship between an entity and itself.

Example

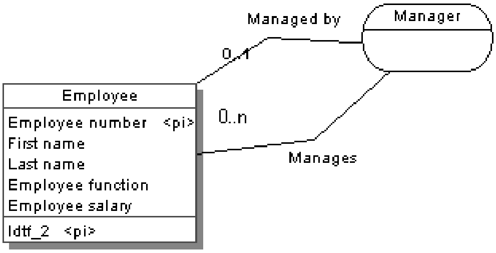
The reflexive association Manager expresses that an employee (Manager) can manage other employees.



❖ To create a reflexive association

1. Click the Association Link tool in the Palette.
2. Click inside the entity and while continuing to hold down the mouse button, drag the cursor to a space next to the entity.
3. Click the entity.

   An association symbol loops back to the same entity.



Defining cardinality for an association link

Cardinality indicates the number of occurrences (one or many) that one entity has relative to another. You define the cardinality for each association link between the association and the entity.

The cardinality of an association link can have the following values:

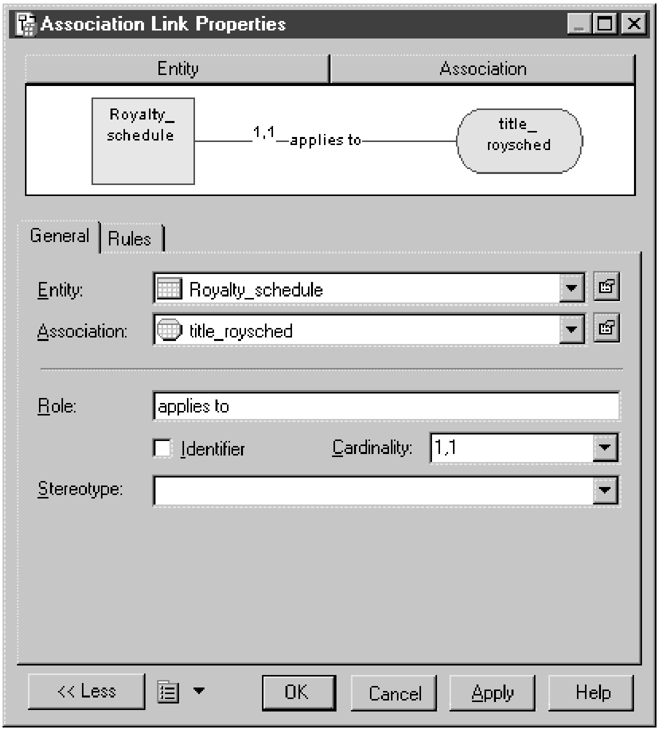
Cardinality	Description
0,1	There can be zero or one occurrence of the association in relation to one instance of the entity. The association is not mandatory
0,n	There can be zero or many occurrences of the association in relation to one instance of the entity. The association is not mandatory
1,1	One occurrence of the entity can be related to only one occurrence of the association. The association is mandatory
1,n	One occurrence of the entity can be related to one or many occurrences of the association. The association is mandatory

You can change the default format of cardinalities from the registry:

```
HKEY_CURRENT_USER\Software\Sybase\PowerDesigner 11\ModelOptions\
         Conceptual Options
CardinalityNotation=1 (0..1) or 2 (0,1)
```

❖ To define cardinality for an association link

1. Double-click the association link between an association and an entity to display the association link property sheet.



Entity: Royalty_schedule

Association: title_roysched

Role: applies to

☐ Identifier Cardinality: 1,1

Stereotype:

2. Select a cardinality from the Cardinality dropdown listbox.
3. Click OK.

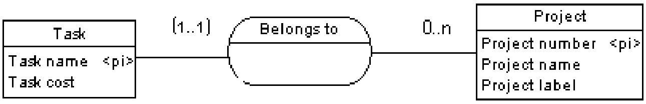
   You can repeat the procedure for each association link.

Defining a dependent association in a CDM

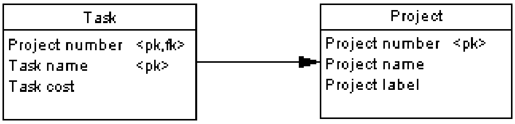
In a dependent association, one entity is partially identified by another. Each entity must have an identifier. In some cases, however, the attributes of an entity are not sufficient to identify an occurrence of the entity. For these entities, their identifiers incorporate the identifier of another entity with which they have a dependent association.

Example

An entity named Task has two entity attributes, TASK NAME and TASK COST. A task may be performed in many different projects and the task cost will vary with each project. To identify each occurrence of TASK COST the unique Task entity identifier is the compound of its *Task name* entity attribute and the *Project number* identifier from the Project entity.



When you generate a PDM, the TASK table contains the PROJECT NUMBER column as a foreign key, which is also a primary key column. The primary key therefore consists of both PROJECT NUMBER and TASK NAME columns.



Association link identifiers and associations
The same association can not have two identifier association links.

❖ To define a dependent association

1. Double-click an association link symbol to display the association link property sheet.
2. Select the Identifier check box.
3. Click OK.

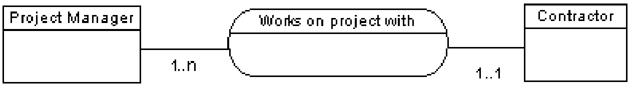
   The cardinality of the association link is enclosed in parenthesis to indicate that the association link is an identifier.

Changing an association into an associative entity

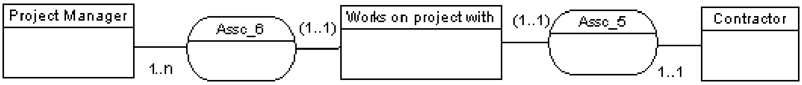
You can transform an association into an associative entity linked by two associations. The associative entity gets the name and code of the association. The two new associations handle cardinality properties.

Example

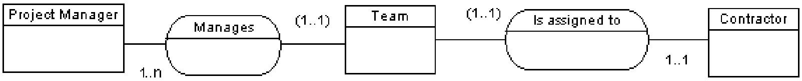
Two entities PROJECT MANAGER and CONTRACTOR are linked by the association WORKS ON PROJECT WITH:



You can represent this association with an associative entity:



The two new associations can be represented as follows:



❖ To change an association into an associative entity

1. Right-click an association symbol.

   The association contextual menu appears.

2. Select Change to Entity from the contextual menu.

   An associative entity that is linked to two associations replaces the original association. The associative entity takes the name of the original association.

Creating an association attribute

There are several ways to create an association attribute:

- From a data item used as an association attribute
- From the attribute list for an association

At creation, an association attribute has a default name including a number. This number is assigned in the order of creation of objects.

Using a data item as an association attribute

You can use a data item defined in the model as an attribute for an association.

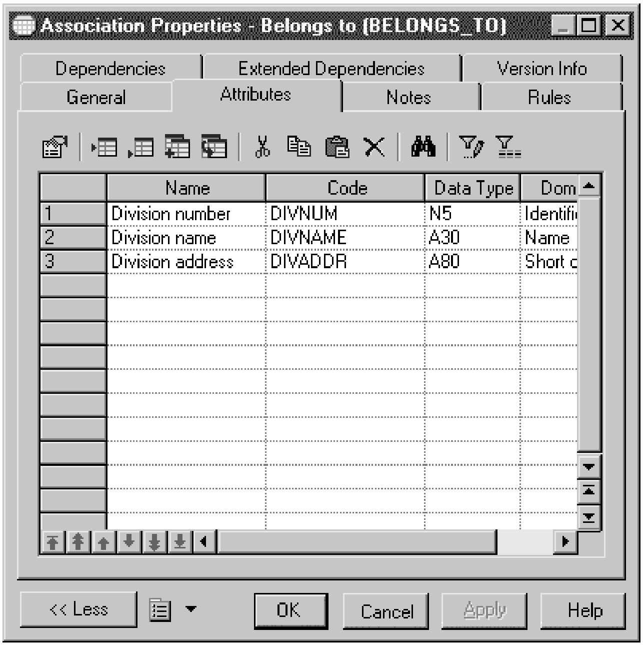
Allow Reuse
If the model option Allow Reuse is not selected, you can not create an association attribute by reusing an existing data item. In this case the Add Data Items tool is not available.

❖ To use a data item as an association attribute

1. Double-click the association in the diagram to display the association property sheet.

2. Click the Attributes tab to display the corresponding page.

   It lists attributes associated with the association.

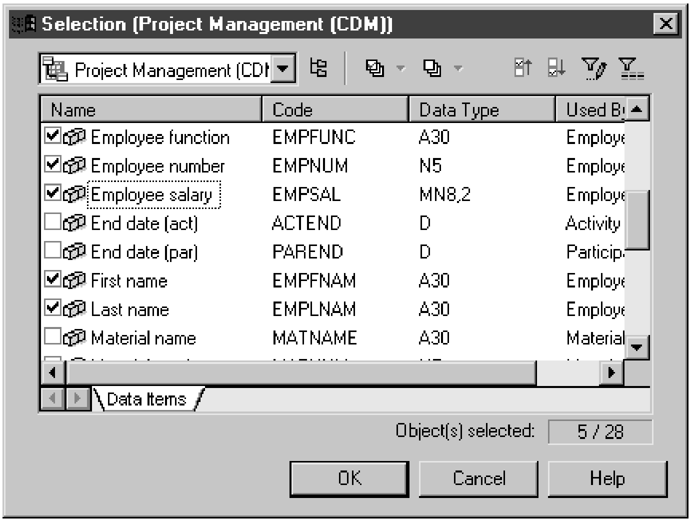


	Name	Code	Data Type	Dom
1	Division number	DIVNUM	N5	Identifi
2	Division name	DIVNAME	A30	Name
3	Division address	DIVADDR	A80	Short c

3. Click the Add Data items tool.

   A Selection box appears listing all of the available data items.

4. Select one or more data items.



Name	Code	Data Type	Used B
☑ Employee function	EMPFUNC	A30	Employe
☑ Employee number	EMPNUM	N5	Employe
☑ Employee salary	EMPSAL	MN8,2	Employe
□ End date (act)	ACTEND	D	Activity
□ End date (par)	PAREND	D	Particip
☑ First name	EMPFNAM	A30	Employe
☑ Last name	EMPLNAM	A30	Employe
□ Material name	MATNAME	A30	Material

Object(s) selected: 5 / 28

5. Click OK.

   The selected data items are added to the list of attributes for the association.

6. Click OK in each of the dialog boxes.

Creating an association attribute from the list of association attributes

You can create an association attribute directly in the list of attributes for an association. When you create an association attribute, it is automatically added to the list of data items. If you select Allow Reuse as a model option, the new data item can be used as an attribute for other associations or entities.

❖ To create an association attribute from the list of association attributes

1. Double-click the association to display the association property sheet.

2. Click the Attributes tab to display the corresponding page.

   It lists association attributes associated with the association.

3. Click a blank line in the list.

   or

   Click the Add a Row tool.

   An arrow appears at the beginning of the line.

4. Type an association attribute name and an association attribute code.

Automatically reuse a data item
If you select the data item model options Allow Reuse and Unique Code and you type the name of a data item that is already in use, you automatically reuse the data item.

5. Click OK.

Modifying the association display preferences in a CDM

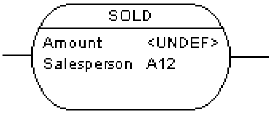
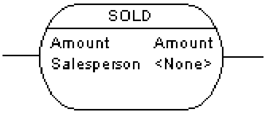
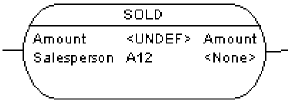
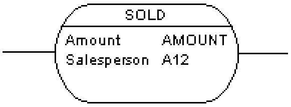
You can modify the following display preferences of an association using the Tools ➤ Display Preferences command:

Group box	Preference	Display description
Association	Attributes	Name or code of the association*
	Display Limit	Maximum number of attributes displayed in symbol
	Stereotype	Stereotype of the association
	Comment	Comment of the association. When selected, all other check boxes are deselected, except for Stereotype
Association attributes	Data types	Data type of association attribute
	Replace by domains	Domain for each association attribute. You can only display domains when the Data types check box is selected
	Domains	Domain of each association attribute
	Mandatory	Letter *M* beside each mandatory association attribute
	Stereotype	Stereotype of the association attributes

*Displayed text depends on whether the Name or Code radio button is selected.

Display domain and data type

You can display the domain and data types in the symbol of an association. There are four display options available:

Selected checkbox	Result	Symbol
Data types	Displays only the data type, if it exists	
Domains	Displays only the domain, if it exists	
Data types Domains	Displays both data type and domain, if they exist	
Data types Replace by domains	If domain exists and data type does not exist, then displays domain. If domain does not exist and data type exists, then displays data type.	

Moving text on a relationship symbol
When a relationship symbol displays text, the text position is based on the position of handles. You can add a handle on the relationship symbol by pressing CTRL while you click the symbol.

Modifying the association link display preferences

You can modify the following display preferences of an association link using the Tools ➤ Display Preferences command:

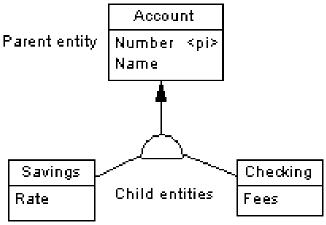
Preference	Description
Role	Displays the role of the association link
Cardinality	Displays the cardinality of the association link
Stereotype	Stereotype of the association link

Defining inheritances in a CDM

Inheritance allows you to define an entity as a special case of a more general entity. The entities involved in an inheritance have many similar characteristics but are nonetheless different. The general entity is known as a supertype (or parent) entity and contains all of the common characteristics. The special case entity is known as a subtype (or child), entity and contains all of the particular characteristics.

Between entities, it is also possible to define an inheritance link. In an inheritance link, one or more subtype (or child) entities inherit, at the physical level, all or part of the entity attributes carried by one supertype (or parent) entity.

The Account entity below represents all the bank accounts in the information system. It includes two subtypes: checking accounts and savings accounts. The notion of inheritance represents the entities Checking and Savings as specialized types of the parent entity Account.



Inheritance properties

You can double-click any inheritance symbol in the diagram to display its properties:

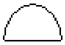
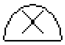
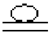
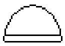
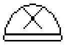
Property	Description
Name	The name of the item which should be clear and meaningful, and should convey the item's purpose to non-technical users
Code	The technical name of the item used for generating code or scripts, which may be abbreviated, and should not generally include spaces
Comment	Descriptive label for the inheritance link
Stereotype	Sub-classification used to extend the semantics of an object without changing its structure; it can be predefined or user-defined
Parent	Name of the parent entity
Mutually exclusive children	Indicates if only one child can exist for one occurrence of the parent entity.
Complete	Indicates that all instances of the parent entity (surtype) must belong to one of the children (subtypes). For example, entity Person has 2 sub-types Male and Female; each instance of entity Person is either a male or a female

An inheritance link definition also includes the following properties, which are defined on associated property sheets:

Property	Description
Generation	Group of properties that affect physical implementation
Children	List of child entities
Notes	Description associated with inheritance link
Rules	Business rules attached to the inheritance link

Inheritance display

Depending on the model notation, the inheritance symbol displays the inheritance status:

IDEF1X	E/R and Merise notation	Description
		Standard
—		Mutually exclusive inheritance
		Complete inheritance
—		Mutually exclusive and complete inheritance

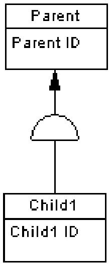
Creating an inheritance link

You can create an inheritance link graphically in the diagram by dragging and dropping an inheritance link symbol from the child entity to the parent entity using the Inheritance tool.

❖ To create an inheritance link

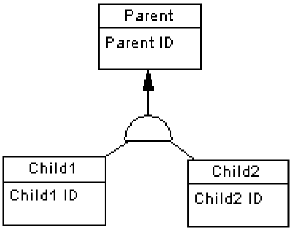
1. Click the Inheritance tool in the Palette.
2. Click the child entity, while continuing to hold down the mouse button, drag the cursor to the parent entity. Release the mouse button inside the child entity.

   The link appears between the two entities and has a half-circle in the middle and an arrowhead that points to the parent entity.



3. If you want to create additional child entities for the same link, drag and drop an inheritance link from the half-circle to the additional child entity.

   The symbol links all the child entities to the parent.

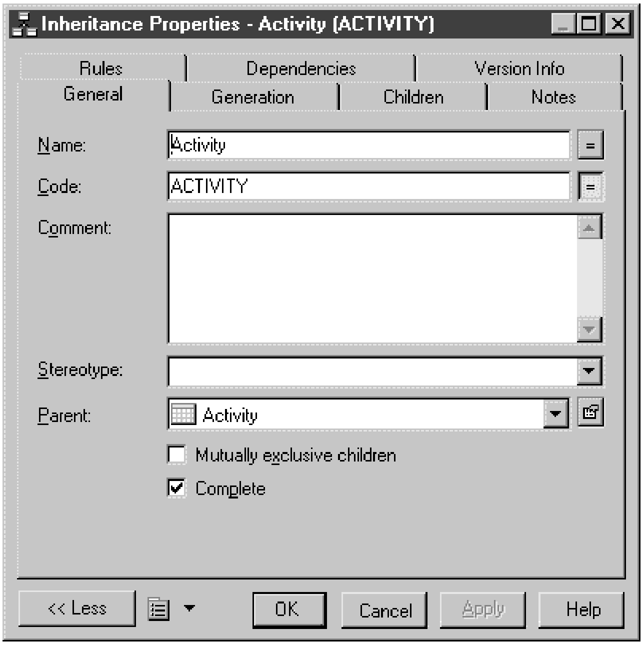


Dragging an inheritance link to a different child entity

You can change the child entity at the end of an inheritance link by clicking the inheritance link and holding down CTRL as you drag one of its attach points to a different entity.

4. Double-click the new link in the diagram to display the inheritance property sheet.

5. Type an inheritance name and an inheritance code.



Inheritance Properties - Activity (ACTIVITY)

Name: Activity

Code: ACTIVITY

Comment:

Stereotype:

Parent: Activity

☐ Mutually exclusive children

☑ Complete

6. Click OK.

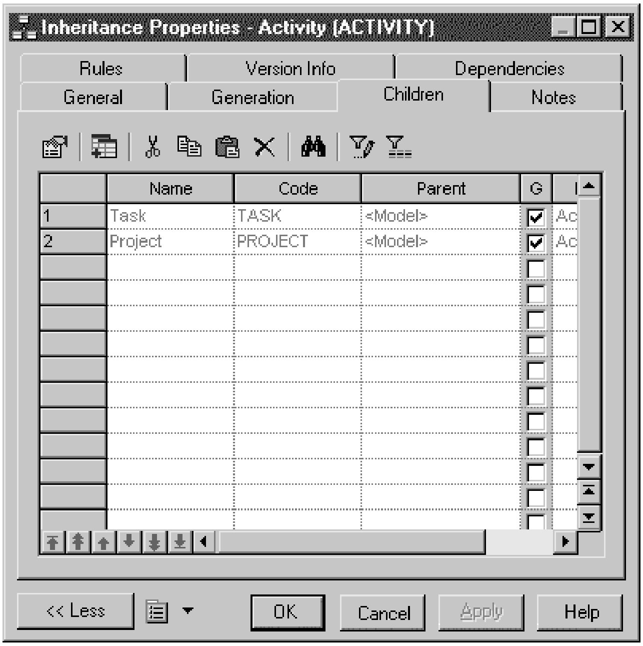
Adding a child entity to an inheritance link

You can add a child entity to an inheritance link.

❖ To add a child entity to an inheritance link

1. Double-click an inheritance symbol to display the inheritance property sheet.

2. Click the Children tab to display the corresponding page.

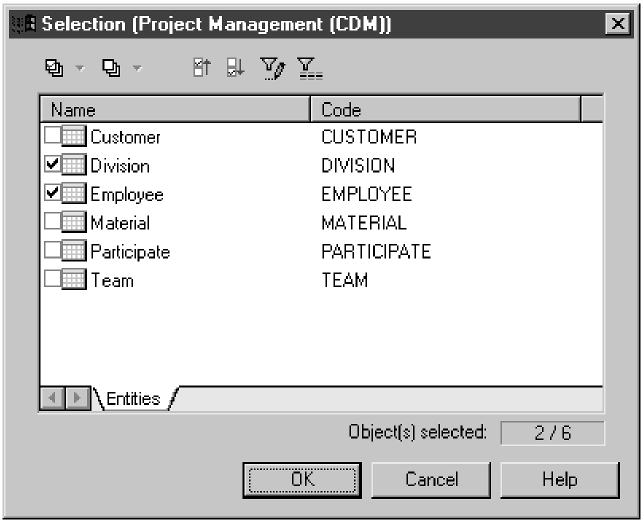


	Name	Code	Parent	G	I
1	Task	TASK	<Model>	☑	Ac
2	Project	PROJECT	<Model>	☑	Ac
				☐	
				☐	
				☐	
				☐	
				☐	
				☐	
				☐	
				☐	
				☐	
				☐	
				☐	
				☐	

3. Click the Add Children tool.

   A selection box appears. It lists the entities available in the model.

4. Select one or more entities.



Name	Code
□ Customer	CUSTOMER
☑ Division	DIVISION
☑ Employee	EMPLOYEE
□ Material	MATERIAL
□ Participate	PARTICIPATE
□ Team	TEAM

Object(s) selected: 2 / 6

5. Click OK.

   The new entity is added to the list of child entities on the Children page.

6. Click OK.

   The new child entity is linked to the inheritance symbol in the diagram.

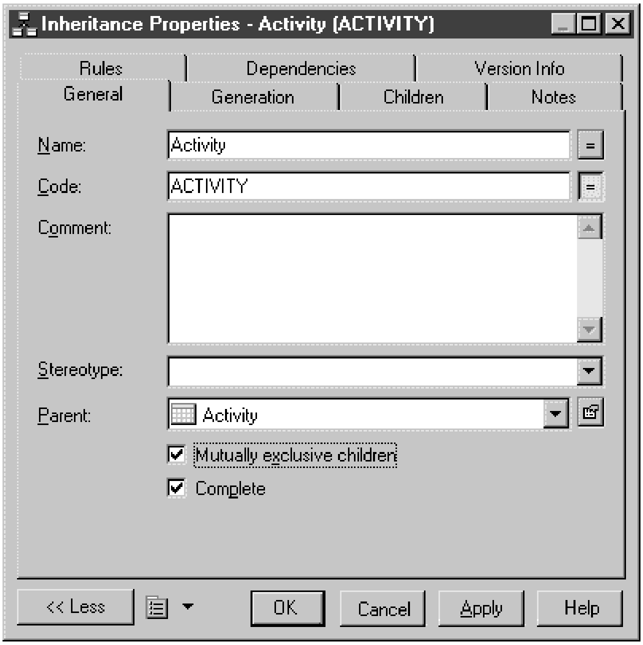
Making inheritance links mutually exclusive

When an inheritance link is mutually exclusive between children, one occurrence of the parent entity cannot be matched to more than one child entity.

This information is for documentation only and has no impact in generating the PDM.

❖ To make an inheritance link mutually exclusive

1. Double-click the inheritance link in the diagram to display the inheritance link property sheet.



Inheritance Properties - Activity (ACTIVITY)

Name: Activity

Code: ACTIVITY

Comment:

Stereotype:

Parent: Activity

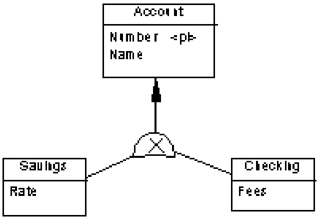
☑ Mutually exclusive children

☑ Complete

2. Select the Mutually Exclusive Children check box.

3. Click OK.

   The mutually exclusive inheritance links display an X on the half-circle symbol.



The inheritance link shown above is mutually exclusive. It means that an account is either checking or savings, never both.

Generation mode properties

Generation mode defines the physical implementation of an inheritance structure.

In the CDM, the generation mode indicates which entities in an inheritance structure should correspond to tables in the PDM, as follows:

Generation mode	Generates table(s) corresponding to	Which have the following properties
Generate parent	Parent entity	Inherits entity attributes of each child entity Is affected by child entity relationships. Contains reference to any table which has a many-to-one relationship with child entity
Generate children Inherit all attributes	Each child entity	Inherits all entity attributes of the parent entity
Generate children Inherit only primary attributes	Each child entity	Inherits only the identifier of the parent entity

Primary keys for child tables
When you generate a child table, its primary key is the concatenation of the child entity identifier and the parent entity identifier.

Defining generation mode

You define the generation mode which specifies the physical implementation of an inheritance structure.

Generating specifying attributes

In the case of parent only generation, you can choose to define a specifying attribute to differentiate occurrences of a child.

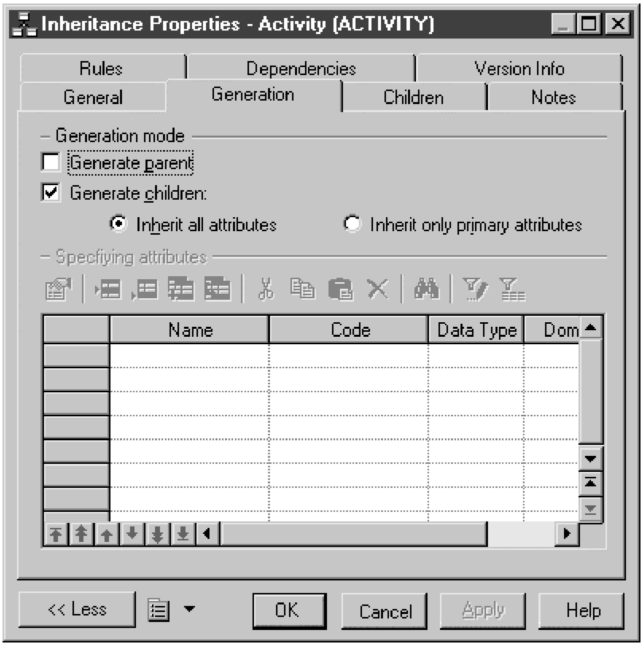
☞ For more information on specifying attribute properties see section "Specifying entity attribute properties" on page 118.

☞ For more information on defining a specifying attribute, see section "Defining a specifying entity attribute" on page 120.

❖ To define generation mode

1. Double-click the inheritance link in the diagram to display the inheritance property sheet.

2. Click the Generation tab to display the corresponding page.



Generation mode

☐ Generate parent

☑ Generate children:

● Inherit all attributes ○ Inherit only primary attributes

Specifying attributes

3. Select Generate Parent.

   or

   Select Generate Children.

   or

   Select both Generate Parent and Generate Children.

4. If you selected Generate Children, do one of the following actions:

   Click the Inherit All Attributes radio button.

   or

   Click the Only Primary Attributes radio button. Primary attributes are the attributes defined in the primary identifier.

5. Click OK.

Specifying entity attribute properties

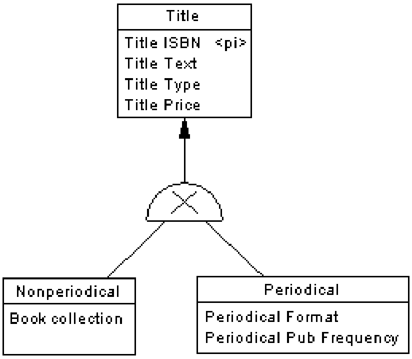
A **specifying entity attribute** is an entity attribute that is defined for a parent entity which differentiates occurrences of each child. It only applies to parent only generation.

Example

In the example below, the TITLE entity has two children, NONPERIODICAL and PERIODICAL.

As only the parent table TITLE will be generated in a PDM, a specifying entity attribute PERIODICAL is defined for the inheritance link to differentiate between the two child entities.

In the PDM, each of the child entity attributes will generate columns in the table TITLE, however the specifying entity attribute PERIODICAL will generate a corresponding column PERIODICAL. The values of this column indicate whether an instance of TITLE is a periodical or not.



You can specify the following properties for a specifying entity attribute:

Property	Description
Name	The name of the item which should be clear and meaningful, and should convey the item’s purpose to non-technical users
Code	The technical name of the item used for generating code or scripts, which may be abbreviated, and should not generally include spaces
Comment	Descriptive label for the specifying entity attribute
Data type	Data type that you want to apply to the specifying entity attribute
Length	Maximum length of the data type
Precision	Number of places after the decimal point, for data values that can take a decimal point
Domain	Name of the associated domain
Mandatory	Indicates whether or not the specifying entity attribute must be assigned a value

Defining a specifying entity attribute

You define a specifying entity attribute only in the case of parent only generation. In a PDM the specifying attribute differentiates occurrences of each child. There are several ways to create a specifying attribute:

- From a data item used as a specifying attribute
- From the specifying attribute list for an inheritance

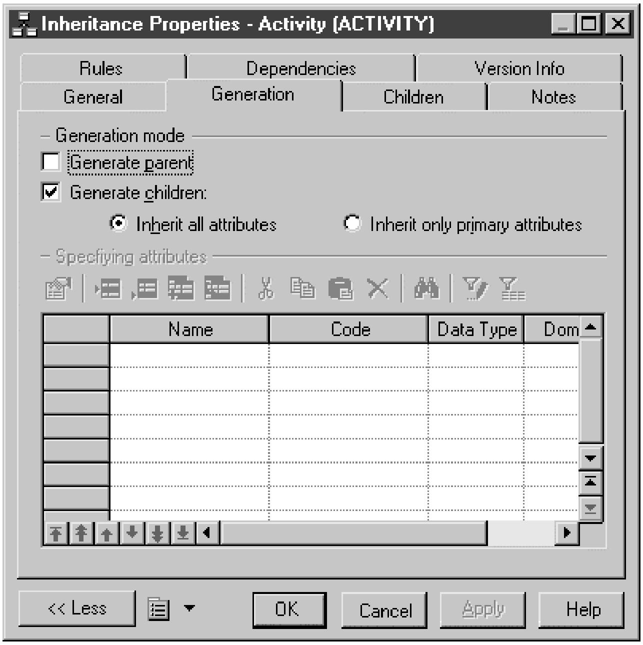
Using a data item as a specifying attribute

You can use a data item defined in the model as an specifying attribute.

Allow Reuse
If the model option Allow Reuse is not selected, you can not create an specifying attribute by reusing an existing data item. In this case the Add Data Item tool is not available.

❖ To use a data item as a specifying attribute

1. Double-click an inheritance symbol to display the inheritance property sheet.
2. Click the Generation tab to display the corresponding page.



3. Select the Generate Parent check box.

4. Clear the Generate Children check box.

5. Click the Add Data items tool.

   A Selection box appears listing all of the available data items.

6. Select a data item.

7. Click OK.

   The selected data item is added to the list of specifying attributes for the inheritance.

8. Click OK.

> **Using the Generate option**
> The option Generate Children generates a table for each child in the inheritance. If you do not select Generate Children, you can control the generation of child tables using the option Generate in the property sheet of each child entity.

Creating a specifying attribute from the specifying attributes list for an inheritance

You can create a specifying attribute directly in the list of specifying attributes for an inheritance. When you create an specifying attribute, it is automatically added to the list of data items. If you select Allow Reuse as a model option, the new data item is available to be re-used as an attribute for an entity, association, or inheritance.

❖ To create a specifying attribute from the specifying attributes list for an inheritance

1. Double-click the inheritance symbol to display the inheritance property sheet.

2. Click the Generation tab to display the corresponding page.

3. Select the Generate Parent check box.

4. Clear the Generate Children check box.

5. Click a blank line in the list.

   or

   Click the Add a Row tool.

   An arrow appears at the beginning of the line.

6. Type a specifying attribute name and a specifying attribute code.
7. Click Apply.

   You commit the creation of the new attribute.
8. Click the new attribute line.

   An arrow appears at the beginning of the line.
9. Click the Properties tool.

   or

   Double-click the arrow at the beginning of the line.

   The attribute property sheet appears.
10. Type or select attribute properties.
11. Click OK.

Modifying the inheritance display preferences

You can modify the following display preference of an inheritance using the Tools ➤ Display Preferences command:

Preference	Description
Name	Displays the name of the inheritance
Stereotype	Stereotype of the inheritance

Defining check parameters in a CDM

Check parameters are set of conditions which data must satisfy to remain valid.

There are three types of check parameters:

Parameter type	Description	Can be attached to
Standard check parameters	Common data constraints which define a data range. For example minimum and maximum values for a column	Entity attributes Domains
Additional check parameters	SQL expression defining a data constraint using the %MINMAX%, %LISTVAL%, and %RULES% variables that are instantiated with standard parameter values	Entity attributes Domains
Validation rule	Business rule that is defined as a server expression, and is attached to one of the following listed objects	Entities Entity attributes Domains

Setting standard parameters for objects in a CDM

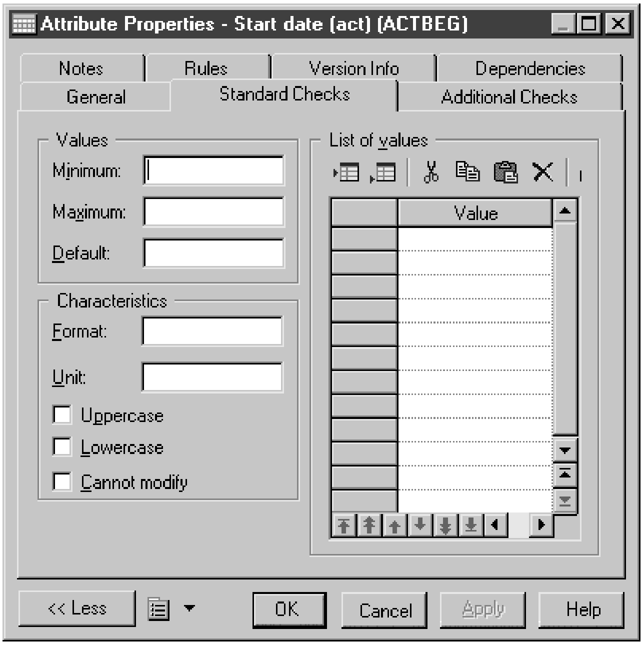
Standard parameters indicate common data constraints. The following table lists standard parameters:

Parameter	Description
Minimum	Lowest acceptable numeric value
Maximum	Highest acceptable numeric value
Default	Value assigned in absence of an expressly entered value
Unit	Standard measure
Format	Data format (for example, 9999.99)
Lowercase	Forces all alphabetical characters to lowercase
Uppercase	Forces all alphabetical characters to uppercase
Cannot Modify	Protects from changes, results in a non-modifiable column in the physical data table

Parameter	Description
List of Values	Authorized values
Label	String that identifies an authorized value in the list

❖ To set standard parameters for objects in a CDM

1. Click the Standard Checks tab in the property sheet of a domain or an entity attribute to display the corresponding page.



2. Type your choice of Standard Parameters.

3. Click OK.

Defining additional check parameters for objects in a CDM

You can write an SQL statement using the following standard variables defined as standard check parameters and validation rules:

Variable	Description
%MINMAX%,	Minimum and maximum values defined in Values groupbox on Standard Checks page
%LISTVAL%	Customized values defined in List Values groupbox on Standard Checks page
%RULES%	Validation rule expression defined on Expression page of the Rules property sheet

You define additional check parameters for data constraints where standard check parameters are not sufficient.

Example

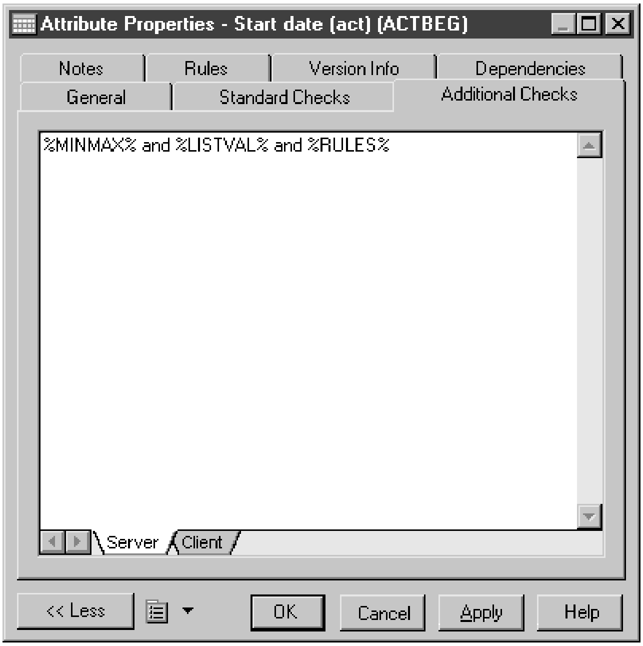
An entity in a data model for a clothing shop may contain check parameters defined for an entity attribute SIZE, which depend on the check parameters defined for another entity attribute COUNTRY, as clothing size for a skirt in France may be different from the same size in the United States.

In this case an expression is required to create a constraint which uses check parameters defined for both entity attributes.

❖ To define additional check parameters for objects

1. Click the Additional Checks tab in the property sheet of a domain or an entity attribute to display the corresponding page.

2. Type SQL expression using the variables %MINMAX%, %LISTVAL%, and %RULES%.



```
%MINMAX% and %LISTVAL% and %RULES%
```

3. Click OK.

Using a validation rule in check parameters in a CDM

A validation rule is a rule that validates data based on a corresponding business rule. A validation rule can be generated as a check parameter when the following conditions apply:

- Validation rule is attached to an entity, entity attribute, or domain
- Validation rule is defined as a server expression

At generation, validation rule variables are instantiated with the following values:

Variable	Value
%COLUMN%	Code of the column to which the business rule applies
%DOMAIN%	Code of the domain to which the business rule applies
%TABLE%	Code of the table to which the business rule applies
%MINMAX%	Minimum and maximum values for the entity attribute or domain
%LISTVAL%	List values for the entity attribute or domain
%RULES%	Server validation rules for the entity attribute or domain

☞ For more information on defining business rules, see section Defining a business rule in a CDM in chapter Using Business Rules in a CDM.

❖ To use a validation rule in check parameters

1. Click the Rules tab in the property sheet of a domain, an entity or an entity attribute to display the corresponding page.
2. Click the Add Rules tool.

   A list appears displaying the available business rules in the model.
3. Select a business rule in the list.
4. Click OK in each of the dialog boxes.

Validation rule expressions
You must click the Rules button to modify the expression attached to a validation rule. You can also modify validation rule expressions from the list of business rules, by clicking the Define button.

CHAPTER 4

Working with Conceptual Data Models

About this chapter

This chapter describes how to check the validity of a Conceptual Data Model and how you can import an ERwin model into a CDM. It also gives information on how you can open a ProcessAnalyst Model (PAM) into a CDM.

Contents

Checking a CDM

You can use the Check Model to check the validity of a CDM at any time.

A valid CDM conforms to the following rules:

- Each object name must be unique
- Each entity must have at least one attribute
- Each relationship must be attached to at least one entity

CDM check options

When you check a CDM, you can define levels of severity for problems that Check model finds and have certain problems automatically corrected.

Levels of problem severity

You can set a level of problem severity for each object parameter that is verified by the Check model. This severity level can depend on the degree of normalization that you want to achieve in a your model.

When you check a CDM, you can display an invalid parameter with one of two types of messages, depending on the degree of problem severity you assigned to that parameter:

Message	Description
Error	Major problem that impedes database generation
Warning	Minor problem or recommendation

Automatic correction

You can choose to have certain problems corrected automatically by PowerDesigner. Automatic correction primarily fixes non-unique names in the CDM. However, before using automatic correction, make sure you understand how it will affect your model.

☞ As automatic correction is not available for most object parameters, they must be corrected manually.

☞ For more information on manual and automatic correction, see "Object parameters verified by Check model" on page 136.

Setting problem severity and automatic correction

You can use the following tools from the Check Model Parameters dialog box to set either an error or warning level of problem severity, and also if you want PowerDesigner to automatically correct an error:

Tool	Indicates	Description
⊗	Error	Indicates a major problem that impedes database generation
⚠	Warning	Indicates a minor problem or recommendation
⊞	Automatic correction	Indicates that PowerDesigner will correct the problem automatically

CDM object selection in the Check Model

You select objects to be checked from the Selection page of the Check Model Parameters dialog box (Tools ➤ Check Model).

You can list all objects created in the current model, current package, or sub-packages by selecting the Include Sub-Objects tool.

You have the following selection options:

Parent object	Include Sub-Objects selected	Include Sub-Objects not selected
Model	All objects created in model including those in packages and sub-packages	All objects created in model except those in packages and sub-packages
Package	All objects created in package including those in sub-packages	All objects created in package except those in sub-packages

Selecting objects in the diagram
If you graphically select objects in your diagram before starting the Check Model, they can be automatically selected for verification by the Check Model by clicking the Use Graphical Selection tool in the Selection page toolbar.

Checking a global CDM

❖ To check a global CDM

1. Select Tools ➤ Check Model.

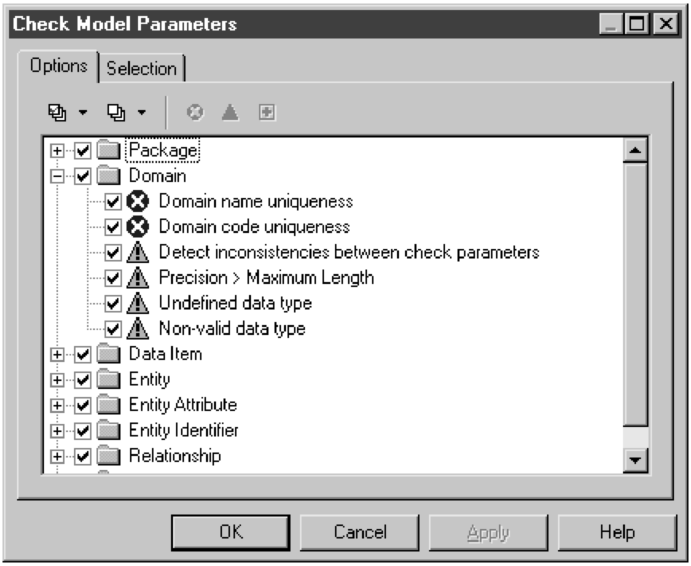
   or

   Right-click the diagram background and select Check Model from the contextual menu.

   The Check Model Parameters dialog box opens to the Options page.

2. Expand an object parameter node.

   The object parameters which are verified by the Check Model are displayed with the symbols indicating a degree of problem severity.



Check Model Parameters

- ☑ Package
- ☑ Domain
  - ☑ Domain name uniqueness
  - ☑ Domain code uniqueness
  - ☑ Detect inconsistencies between check parameters
  - ☑ Precision > Maximum Length
  - ☑ Undefined data type
  - ☑ Non-valid data type
- ☑ Data Item
- ☑ Entity
- ☑ Entity Attribute
- ☑ Entity Identifier
- ☑ Relationship

3. If you want to change a degree of problem severity, select the object parameter and then select either the Error or Warning tool.

   The symbol changes to the appropriate severity level.

4. If you want PowerDesigner to automatically correct a problem, select the object parameter and then select the Automatic Correction tool.

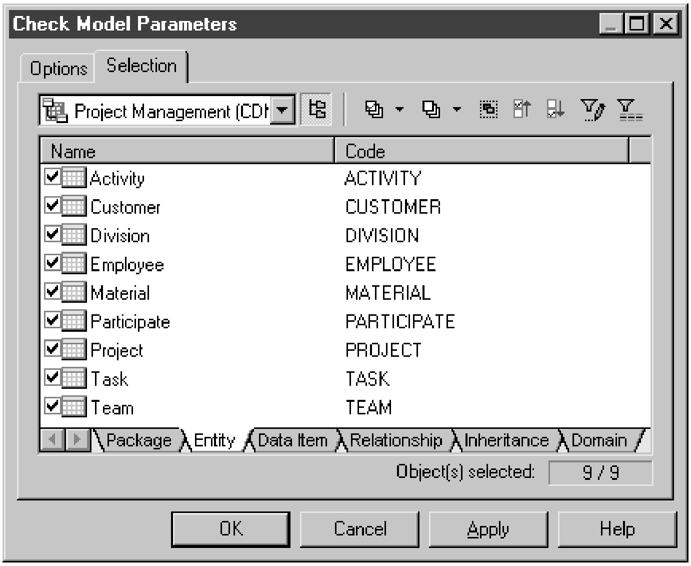
   The Automatic Correction symbol appears superimposed on the Error or Warning symbol for that object parameter.

5. Click the Selection tab to display the corresponding page.

6. Select a model from the dropdown list at the top of the dialog box.

7. Click an object tab.

   The corresponding object page displays all the objects in the current CDM.



Name	Code
☑ Activity	ACTIVITY
☑ Customer	CUSTOMER
☑ Division	DIVISION
☑ Employee	EMPLOYEE
☑ Material	MATERIAL
☑ Participate	PARTICIPATE
☑ Project	PROJECT
☑ Task	TASK
☑ Team	TEAM

Object(s) selected: 9 / 9

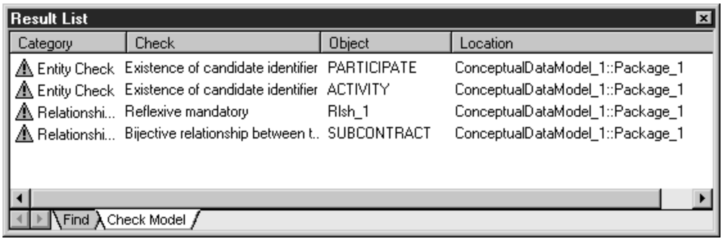
8. Select check boxes for objects that you want to be checked.

   Clear check boxes for objects that you do not want to be checked.

> **Selecting all or clearing all check boxes**
> You can select all object check boxes by clicking the Select All tool. You can clear all object check boxes by clicking the Deselect All tool.

9. Click OK.

   The Check Model Result List dialog box displays errors and warnings, based on your choice of check options.



Category	Check	Object	Location
⚠ Entity Check	Existence of candidate identifier	PARTICIPATE	ConceptualDataModel_1::Package_1
⚠ Entity Check	Existence of candidate identifier	ACTIVITY	ConceptualDataModel_1::Package_1
⚠ Relationshi...	Reflexive mandatory	Rlsh_1	ConceptualDataModel_1::Package_1
⚠ Relationshi...	Bijective relationship between t..	SUBCONTRACT	ConceptualDataModel_1::Package_1

> **Dockable result window**
> When you right-click an object parameter a menu appears listing correction options. Among these, you can also select options to clear, dock or hide the result window.

Displaying previously applied check options

If you click the Apply button in the Check Model Parameters dialog box, all error and warning selections are stored in memory.

❖ To display errors and warnings selected in the last check

1. Select Tools ➤ Check Model.

   The Check Model Parameters dialog box opens to the Options page. The object parameters are displayed with the Error or Warning icons selected in the last check.

Making corrections based on CDM check results

You can use the Check Model to locate and correct problems in the CDM.

You can choose one of the following correction options from the Check toolbar:

Symbol	Option	Description
✓	Manual correction	Displays property sheet of problem object
✓	Display help	Displays description of the error and suggestion for correction
✓	Check again	Checks selected object parameter, normally after a correction has been done
✓	Automatic correction	Automatically corrects certain errors

Navigating in the error list

The Check tool bar also contains navigation tools that you can use to move to the first, previous, next, or last errors that are listed. You can also navigate in the list of errors by right-clicking an object parameter and selecting Go To First error, Previous error, Next error, or Last error from the contextual menu.

Contextual menu

When you right-click an object parameter in the Result List to open a contextual menu that lists the following correction options: Correct (manual correction), Help (error description), Check again, and Automatic Correction. You can also select options to navigate among errors, clear the Result List, dock and hide the result window.

Making manual corrections to a CDM

❖ To make manual corrections to a CDM

1. Select an object parameter from the Result List.
2. Right-click the object parameter and select Correct from the contextual menu.

   The object property sheet appears.
3. Select the appropriate tab and make the necessary correction.
4. Close the property sheet.
5. Re-select the object parameter.
6. Right-click the object parameter and select Check again from the contextual menu.

   Verify that the problem has been corrected.

Making automatic corrections to a CDM

❖ To make automatic corrections to a CDM

1. Select an object parameter, from the Result List.
2. Right-click the object parameter and select Automatic Correction from the contextual menu.
3. Right-click the object parameter and select Check again from the contextual menu.

   Verify that the problem has been corrected.

Object parameters verified by Check model

The Check Model verifies the validity of the following CDM objects.

When errors are encountered during a check model, corrections can be made manually or automatically. Manual corrections depend on how you are using your model.

Use the Help command to select object control options
When you right-click a CDM object control in the Check Model Parameters page, a menu appears listing several options. The Help command opens a contextual help page explaining the checks performed for the selected object type.

Business Rule check in a CDM

During a business rule check, the following object controls are made.

Business rule name and code uniqueness

A model cannot contain two business rules with identical name and/or code.

Manual correction	Automatic correction
Modify the duplicated business rule name/code	Modifies the business rule name/code of a selected object by appending a number to its current name

Unused business rule

The business rule you have created is not used in the model.

Manual correction	Automatic correction
Apply the business rule to an object in the model	—

Package check

During a package check, the following object controls are made.

Circular dependency

A circular dependency occurs when an entity depends on another and so on until a dependency loop is created between entities. A package cannot contain circular dependencies.

Manual correction	Automatic correction
Clear the Dependent check box for the link or delete an inheritance link	—

Circularity with mandatory links

A circular dependency occurs when an entity depends on another and so on until a dependency loop is created between entities through mandatory links.

Manual correction	Automatic correction
Clear the Mandatory parent check box or delete a dependency on a relationship	—

Shortcut code uniqueness

Two shortcuts with the same code cannot be in the same namespace.

Manual correction	Automatic correction
Change the code of one of the shortcuts	—

Shortcut potentially generated as child table of a reference

The package should not contain associations or relationships with an external shortcut as child entity. Although this can be tolerated in the CDM, the association or relationship will not be generated in a PDM if the external shortcut is generated as a shortcut.

Manual correction	Automatic correction
Modify the design of your model in order to create the association or relationship in the package where the child entity is defined	—

Domain check

During a domain check, the following object controls are made.

Domain name and code uniqueness

Domain names and codes cannot be used more than once in the model.

Manual correction	Automatic correction
Modify the duplicate domain name/code	Modifies the domain name/code of a selected object by appending a number to its current name

Inconsistency in check parameters

The values entered in the check parameters page are inconsistent for numeric and string data types: default does not respect minimum and maximum values, or default does not belong to list of values, or values in list are not included in minimum and maximum values, or minimum is greater than maximum value. Check parameters must be defined consistently.

Manual correction	Automatic correction
Modify default, minimum, maximum or list of values in the check parameters page	—

Data type precision and length

The data type precision should not be greater than or equal to the length.

Manual correction	Automatic correction
Make the data type length greater than or equal to the precision	—

Undefined data type

Undefined data types for domains exist. To be complete, a model should have all its domain data types defined.

Manual correction	Automatic correction
While undefined data types are tolerated, you must select data types for currently undefined data types before you can generate a PDM	—

Non-valid data type

Invalid data types for domains exist. To be complete, a model should have all its domain data types correctly defined.

Manual correction	Automatic correction
While tolerated, you must select valid data types for currently non-valid data types to generate the PDM	—

Data item check

During a data item check, the following object controls are made.

Data item name and code uniqueness

Data item names and codes cannot be used more than once in the namespace.

Manual correction	Automatic correction
Modify the duplicate data item name/code	Modifies the data item name/code of a selected object by appending a number to its current name

Unused data items

There are unused data items. These are useless for PDM generation.

Manual correction	Automatic correction
To use a data item, add it to an entity. If you do not need an unused data item, delete it to allow PDM generation	—

Re-used data items

There are entities using the same data items. This can be tolerated if you defined this check as a warning.

Manual correction	Automatic correction
Take care to ensure consistency when defining data item properties	—

Data item and domain divergence

There is a divergence between data items and associated domains. This can be tolerated if you defined this check as a warning.

Manual correction	Automatic correction
Ensure consistency when defining data item properties	Restores divergent attributes from domain to data items (domain values overwrite data item values)

Inconsistency in check parameters

The values entered in the check parameters page are inconsistent for numeric and string data types: default does not respect minimum and maximum values, or default does not belong to list of values, or values in list are not included in minimum and maximum values, or minimum is greater than maximum value. Check parameters must be defined consistently.

Manual correction	Automatic correction
Modify default, minimum, maximum or list of values in the check parameters page	—

Data type precision and length

The data type precision should not be greater than or equal to the length.

Manual correction	Automatic correction
Make the data type length greater than or equal to the precision	—

Undefined data type

Undefined data types for data items exist. To be complete, a model should have all its data items data types defined.

Manual correction	Automatic correction
While undefined data types are tolerated, you must select data types for currently undefined data types before you can generate a PDM	—

Non-valid data type

Invalid data types for data items exist. To be complete, a model should have all its data types for data items correctly defined.

Manual correction	Automatic correction
While tolerated, you must select valid data types for currently non-valid data types to generate the PDM	—

Entity check

During an entity check, the following object controls are made.

Entity name and code uniqueness

Entity names and codes cannot be used more than once in the namespace.

Manual correction	Automatic correction
Modify the duplicate entity name/code	Modifies the entity name/code of a selected object by appending a number to its current name

Entity name and code length

The entity name and code length are limited to a maximum length of 254 characters specified in the naming conventions of the model options.

Manual correction	Automatic correction
Modify the entity name/code length to meet this requirement	Truncates the entity name/code length to the maximum length specified in the naming conventions

Existence of attributes

An entity must always contain at least one attribute.

Manual correction	Automatic correction
Add an attribute to the entity or delete the entity	—

Number of serial types greater than 1

An entity cannot have more than one serial type attribute. Serial types are automatically calculated values.

Manual correction	Automatic correction
Change the types of the appropriate entity attributes to have only one serial type attribute	—

Existence of identifiers

An entity must contain at least one identifier.

Manual correction	Automatic correction
Add an identifier to the entity or delete the entity	—

Existence of relationship or association link

An entity must have at least one relationship or association link.

Manual correction	Automatic correction
Add a relationship or an association link to the entity or delete the entity	—

Redundant inheritance

An entity inherits from another entity more than once. This is redundant and adds nothing to the model.

Manual correction	Automatic correction
Delete redundant inheritances	—

Multiple inheritance

An entity has multiple inheritance. This is unusual but can be tolerated if you defined this check as a warning.

Manual correction	Automatic correction
Make sure that the multiple inheritance is necessary in your model	—

Parent of several inheritances

An entity is the parent of multiple inheritances. This is unusual but can be tolerated if you defined this check as a warning.

Manual correction	Automatic correction
Verify if the multiple inheritances could not be merged	—

Entity attribute check

During an entity attribute check, the following object controls are made.

Entity attribute name and code uniqueness

Attribute names and codes cannot be used more than once in the entity.

Manual correction	Automatic correction
Modify the duplicate entity attribute name/code	Modifies the entity attribute name/code of a selected object by appending a number to its current name

Entity identifier check

During an entity identifier check, the following object controls are made.

Entity identifier name and code uniqueness

Entity identifier names and codes cannot be used more than once in the namespace.

Manual correction	Automatic correction
Modify duplicate entity identifier names and codes	Modifies the entity identifier name/code of a selected object by appending a number to its current name

Existence of an attribute

At least one attribute must exist for an entity identifier.

Manual correction	Automatic correction
Add an attribute to the entity identifier or delete the identifier	—

Identifier inclusion

An identifier cannot include another one.

Manual correction	Automatic correction
Delete the identifier that includes an existing identifier	—

Relationship check

During a relationship check, the following object controls are made.

Relationship name and code uniqueness

Relationship names and codes cannot be used more than once in the model.

Manual correction	Automatic correction
Modify the duplicate relationship name/code	Modifies the relationship name/code of a selected object by appending a number to its current name

Reflexive dependency

A dependency means that one entity is defined through a relationship with another. A dependent relationship cannot therefore be reflexive.

Manual correction	Automatic correction
Change or delete the reflexive dependency	—

Reflexive mandatory relationship

A reflexive mandatory relationship exists.

Manual correction	Automatic correction
Deselect the Mandatory check boxes for the relationship to be non-mandatory	—

Bijective relationship between two entities

There is a bijective relationship between two entities when there is a two-way one to one relationship between the entities. This is equivalent to a merge of two entities.

Manual correction	Automatic correction
Merge the entities or modify the relationship	—

Name uniqueness constraint for many to many relationships and entities

A many-to-many relationship and an entity cannot have the same name or code.

Manual correction	Automatic correction
Change the name or code of the many-to-many relationship or the name or code of the entity. If you do not, PDM generation will rename the generated table	—

Consistency between dominant and dependent relationships

A dependent relationship between entities cannot also be a dominant relationship.

Manual correction	Automatic correction
Select the Dominant check box on the other (correct) side of the relationship	—

Association check

During an association check, the following object controls are made.

Association name and code uniqueness

Association names and codes cannot be used more than once in the namespace.

Manual correction	Automatic correction
Modify the duplicate association name/code	Modifies the association name/code of a selected object by appending a number to its current name

Association has at least two links

An association is isolated and therefore does not define a relationship between entities.

Manual correction	Automatic correction
Define at least two links between the isolated association and one or several entities	—

Association has two links with identifier link

An identifier link introduces a dependency between two entities. An association with this type of link must be binary.

Manual correction	Automatic correction
Delete the unnecessary links or clear the Identifier check box for a link	—

Association has no more than one identifier link

An identifier link introduces a dependency between two entities. There can only be one identifier link between two entities otherwise a circular dependency is created.

Manual correction	Automatic correction
Clear the Identifier check box for one of the links	—

Absence of properties with identifier links

An association with an identifier link cannot have any properties.

Manual correction	Automatic correction
Move the association properties into the dependent entity (the one linked to the association with an identifier link)	—

Bijective association between two entities

There are bijective associations between two entities when a two-way one to one association between the entities exist. This is equivalent to a merge of two entities.

Manual correction	Automatic correction
Merge the entities or modify the cardinality links	—

Maximum cardinality links

An association with more than two links can only have links with a maximum cardinality greater than one.

Manual correction	Automatic correction
Change the maximum cardinality of such links to be greater than 1	—

Reflexive identifier links

An identifier link introduces a dependency between two entities. An association with this type of link cannot therefore be reflexive.

Manual correction	Automatic correction
Change the relationship between the entities or clear the Identifier check box for a link	—

Name unicity constraint between many-to-many associations and entities

A many-to-many association and an entity cannot have the same name or code.

Manual correction	Automatic correction
Change the name or code of the many-to-many association or the name or code of the entity. If you do not, PDM generation will rename the generated table	—

Inheritance check

During an inheritance check, the following object controls are made.

Inheritance name and code uniqueness

Inheritance names and codes cannot be used more than once in the model.

Manual correction	Automatic correction
Modify the duplicate inheritance name/code	Modifies the inheritance name/code of a selected object by appending a number to its current name

Existence of inheritance link

An inheritance must have at least one inheritance link, from the inheritance to the parent entity.

Manual correction	Automatic correction
Define the inheritance link or delete the inheritance	—

File object check

During a file object check, the following object controls are made.

Embedded file name uniqueness

You cannot have two embedded file objects with the same name in a model.

Manual correction	Automatic correction
Rename one of the embedded file objects	Renames the file object by appending a number to its name

Existence of external file location

External file objects must have a valid location path.

Manual correction	Automatic correction
Define a valid path location	—

Replication check

During a replication check, the following object controls are made.

Partial replication

A replica object is partially synchronized with its replicated object.

Manual correction	Automatic correction
Modify the list of replicated attributes from the replication property sheet	Enforces the replication of desynchronized attributes of the replica object in the replication property sheet

Extended object check

During an extended object check, the following object controls are made.

Extended object name and code uniqueness

Extended object names and codes must be unique in the namespace.

Manual correction	Automatic correction
Modify the duplicate extended object name/code	Modifies the extended object name or code of a selected object by appending a number to its current name or code

Extended link check

During an extended link check, the following object controls are made.

Extended link name and code uniqueness

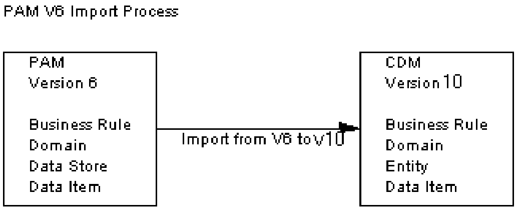
Extended link names and codes must be unique in the namespace.

Manual correction	Automatic correction
Modify the duplicate extended link name/code	Modifies the extended link name or code of a selected object by appending a number to its current name or code

Opening a PAM into a CDM

You can recover process model information into a conceptual model by opening a PAM into a CDM.

You will then retrieve PAM objects into your CDM.



The open process translates PAM objects into CDM objects as follows:

Object in a PAM	Imported object in a CDM
Business rule	Business rule
Domain	Domain
Data store	Entity
Data item	Data item

When opening a PAM, you are asked to choose between opening into a BPM or opening into a CDM knowing that opening a PAM into a BPM allows you to recover processes.

☞ For more information on opening a PAM into a BPM, see the *BPM User's Guide* .

❖ To open a PAM into a CDM

1. Select File ➤ Open.

   An open file dialog box appears.

2. Select or browse to the folder that contains the PAM file.

3. Select ProcessAnalyst Model (*.pam) file from the Files As Type dropdown list box to display only PAM files.

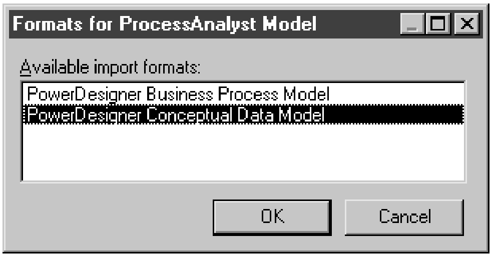
   The available PAM files are listed.

4. Select a file.

5. Click Open.

   The Formats for ProcessAnalyst Model window appears.

6. Select PowerDesigner Conceptual Data Model and click OK.



Formats for ProcessAnalyst Model

Available import formats:

PowerDesigner Business Process Model

PowerDesigner Conceptual Data Model

The Output window displays a message following the successful import and the default diagram of the model appears. Each imported object type can be viewed from its respective list.

CHAPTER 5

Generating from a Conceptual Data Model

About this chapter

This chapter describes how you can generate a CDM, a PDM, and an OOM from a Conceptual Data Model.

Contents

Generation basics

You can generate a CDM, a PDM, or an OOM from a CDM.

☞ For more information on model to model or inter-model generation common features, see the “Linking and Synchronizing Models in PowerDesigner” chapter in the *General Features Guide* .

Generating a Conceptual Data Model from a Conceptual Data Model

This section explains how to generate a Conceptual Data Model from a Conceptual Data Model.

Why generate a CDM into a CDM?

You can generate a CDM into a CDM when you need to keep two models synchronized during the design process.

This kind of generation allows you to create a copy of a given model and define generation links between objects in the source CDM and their equivalent in the generated CDM. When changes are made to the source model, they can then be easily propagated to the generated models using the Update Existing Model generation mode.

The generated model is the one that usually contains more information.

Generating and updating a CDM

To generate a CDM, you must choose between one of the following methods:

- Generate new Conceptual Data Model
- Update existing Conceptual Data Model

You must indicate the following parameters when you generate a new CDM:

Parameter	Description
Name	File name for the resulting CDM
Code	Reference code for the resulting CDM
Configure Model Options	Lets you define the model options for the new CDM

☞ For more information, see the “Linking and Synchronizing Models in PowerDesigner” chapter in the *General Features Guide* .

Defining CDM generation options

You can set the following general generation options:

Option	Description
Check Model	When selected, verifies the model before generating the CDM, and stops generation if an error is found
Save Generation Dependencies	When selected, PowerDesigner keeps track of the identity of the origin of each generated object. It is useful when merging two CDM which have been generated from the same CDM. Objects can be compared and recognized as the same object, even if the object has been modified in the merged CDM. If not selected, origin objects have no link with generated objects
Enable transformations	This button is used to activate transformations during generation. When you click this button, the Pre-generation tab appears if the source model contains transformations. You can select the transformations to execute before generation. The Extended Model Definitions tab also appears for you to select extended model definition files to attach to the generated model. These files may contain post-generation transformations, in this case, the Post-Generation tab appears to let you select the transformations you want to be executed in the generated model. If the generation is an update, and the generated model contains extended model definitions with post-generation transformations, the Post-generation tab automatically appears as soon as you click the Enable Transformations button

Check model before generation

If you select the Check Model option, the procedure to generate a CDM starts by checking the validity of the CDM . A CDM results when no errors are found. You can set check options by selecting Tools ➤ Check Model.

Generating a Physical Data Model from a Conceptual Data Model

This section explains how to generate a Physical Data Model from a Conceptual Data Model.

Generating PDM objects

When you generate a physical data model (PDM) from a CDM, PowerDesigner converts CDM objects and data types to PDM objects and data types supported by the current DBMS.

Converting CDM to PDM objects

PDM generation converts conceptual objects into physical objects as follows:

CDM objects	Generated object in a PDM
Entity	Table
Entity attribute	Table column
Primary identifier	Primary or foreign key depending on independent or dependent relationship
Identifier	Alternate key
Relationship	Reference

Changing the name of a column automatically
Two columns in the same table cannot have the same name. If column names conflict due to foreign key migration, PowerDesigner automatically renames the migrated columns. The new name is composed of the first three letters of the original entity name followed by the code of the attribute.

Generating keys from identifiers

Primary identifiers generate primary and foreign keys in the PDM. Identifiers that are not primary identifiers generate alternate keys.

The type of key that is generated in the PDM depends on the cardinality and type of dependency defined for a relationship in the CDM.

A **primary key** is a column or columns whose values uniquely identify a row in a table.

A **foreign key** is a column or columns that depend on and migrate from a primary key column in another table.

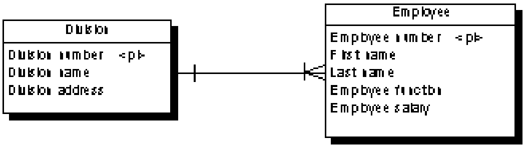
An **alternate key** is a column or columns whose values uniquely identify a row in a table, and is not a primary key.

Independent one-to-many relationships

In independent one-to-many relationships, the primary identifier of the entity on the one side of the relationship becomes a:

- Primary key in the table generated by the entity on the one side of the relationship
- Foreign key in the table generated by the entity on the many side of the relationship

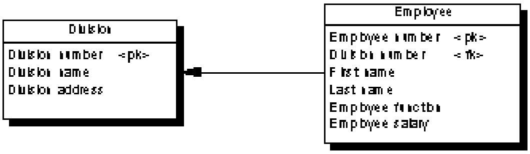
The CDM below shows an independent relationship. Each division contains one or more employees:



The CDM above generates two tables:

Table	Primary key	Foreign key
Division	Division number	—
Employee	Employee number	Division number

The following PDM results from generation:

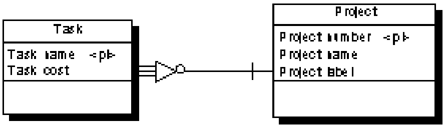


Dependent one-to-many relationships

In dependent relationships, the primary identifier of the nondependent entity becomes a primary/foreign key in the table generated by the dependent entity.

The migrated column is integrated into the primary key if it already exists.

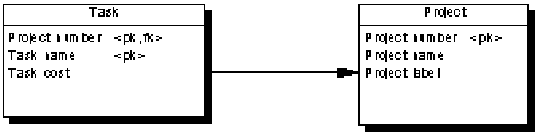
The CDM below shows a dependent relationship. Each task must have a project number.



The CDM above generates two tables:

Table	Primary key	Foreign key
Project	Project number	—
Task	Project number/Task number	Project number

The following PDM results from generation.



Independent many-to-many relationships

In independent many-to-many relationships, the primary identifiers of both entities migrate to a join table as primary/foreign keys. The CDM below shows an independent relationship. Each employee can be a member of one or more teams, and each team can have one or more employees as members.

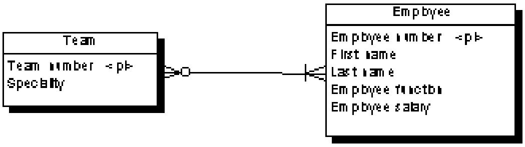
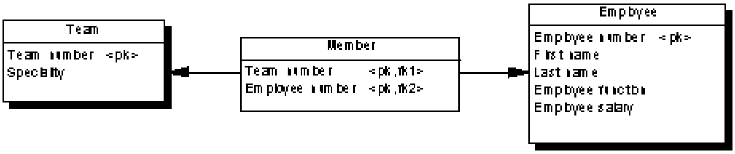


Table	Primary key	Foreign key
Team	Team number	—
Employee	Employee number	—
Member	Team number/Employee number	Team number/Employee number

The following PDM results from generation.



Independent one-to-one relationships

In independent one-to-one relationships, the primary identifier of one entity migrates to the other generated table as a foreign key.

Generating tables from entities with inheritance links

Two properties influence the generation of tables from entities with inheritance links.

Object	Property	When selected generates
Entity	Generate table	Table for the entity (parent or child)
Inheritance	Generation mode	Parent and/or children as indicated

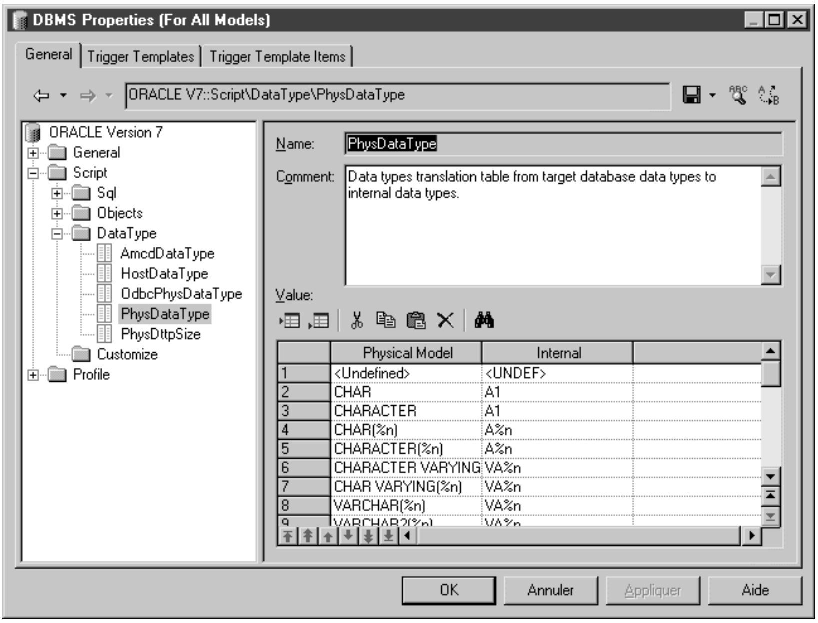
Converting CDM to PDM data types

PowerDesigner supports both conceptual and physical data types. Data types that you select in the CDM are not always supported by the current DBMS. In this case, the data type is converted to a data type supported by the current DBMS when you generate the PDM.

Accessing the DBMS to define data type conversions

Each DBMS contains rules for data type conversion.

The correspondence between the PowerDesigner data type and the physical data type for the current DBMS is listed under the Data Type node, under the Script node in the DBMS tree view.



ORACLE V7::Script\DataType\PhysDataType

Name: PhysDataType

Comment: Data types translation table from target database data types to internal data types.

Value:

	Physical Model	Internal
1	<Undefined>	<UNDEF>
2	CHAR	A1
3	CHARACTER	A1
4	CHAR(%n)	A%n
5	CHARACTER(%n)	A%n
6	CHARACTER VARYING	VA%n
7	CHAR VARYING(%n)	VA%n
8	VARCHAR(%n)	VA%n
9	VARCHAR2(%n)	VA%n

The Physical Model column lists the data types for the current DBMS and the Internal column lists the PowerDesigner equivalent. You can modify the definition of an existing physical data type by making modifications directly to either of the two columns.

> **Modifying the DBMS**
> You should only modify a copy of the DBMS shipped with PowerDesigner. Once a modification has been committed in the DBMS you cannot return to the default value for the data type.

☞ For more information on modifying a DBMS, see chapter DBMS Basics in the Physical Data Model User's Guide.

❖ To access a DBMS

1. Select Tools ➤ Resources ➤ DBMS to display the List of DBMS.
2. Select a DBMS from the list.

   Click the Properties tool.

   or

   Double-click a DBMS name in the list.

   The DBMS property sheet appears.
3. From the General page, expand the Script node, then expand the Data Type node.
4. Select the item PhysDataType.

   The values for the DBMS data types and the corresponding PowerDesigner data types appear in the Value pane to the left of the tree view.
5. Click OK.

Converting conceptual data types

The following table lists the conceptual data types to which the DBMS assigns conversions:

Numeric data types

Conceptual data type	Code in DBMS	What it stores	Conversion example for SQL Anywhere
Integer	I	32-bit integer	integer
Short Integer	SI	16-bit integer	smallint

Conceptual data type	Code in DBMS	What it stores	Conversion example for SQL Anywhere
Long Integer	LI	32-bit integer	integer
Byte	BT	256 values	smallint
Number	N	Numbers with a fixed decimal point	numeric
Decimal	DC	Numbers with a fixed decimal point	decimal
Float	F	32-bit floating point decimal numbers	float
Short Float	SF	Less than 32-bit floating point decimal number	real
Long Float	LF	64-bit floating point decimal numbers	double
Money	MN	Numbers with a fixed decimal point	numeric
Serial	NO	Automatically incremented numbers	numeric
Boolean	BL	Two opposing values (true/false; yes/no; 1/0)	numeric(1)

Character data types

Conceptual data type	DBMS	What it stores	Conversion example for SQL Anywhere
Characters	A	Character strings	char
Variable Characters	VA	Character strings	varchar
Long Characters	LA	Character strings	varchar
Long Var Characters	LVA	Character strings	long varchar
Text	TXT	Character strings	long varchar
Multibyte	MB	Multibyte character strings	char
Variable Multibyte	VMB	Multibyte character strings	varchar

Time data types

Conceptual data type	DBMS	What it stores	Conversion example for SQL Anywhere
Date	D	Day, month, year	date
Time	T	Hour, minute, and second	time
Date & Time	DT	Date and time	timestamp
Timestamp	TS	System date and time	timestamp

Other data types

Conceptual data type	DBMS	What it stores	Conversion example for SQL Anywhere
Binary	BIN	Binary strings	binary
Long Binary	LBIN	Binary strings	long binary
Image	PIC	Images	long binary
Bitmap	BMP	Images in bitmap format (BMP)	long binary
OLE	OLE	OLE links	long binary
Other	*	User-defined data type	char(10)
Undefined	<UNDEF>	Not yet defined data type	<undefined>

Generating and updating a PDM

To generate a PDM, you must choose between one of the following methods:

- ♦ Generate new Physical Data Model
- ♦ Update existing Physical data Model

You must indicate the following parameters when you generate a new PDM:

Parameter	Description
DBMS	Database Management System definition (DBMS) for the resulting PDM
Share	The resulting PDM uses a shared DBMS definition file stored in the DBMS library
Copy	The resulting PDM uses a copy of the DBMS definition file stored in the model
Name	File name for the resulting PDM
Code	Reference code for the resulting PDM
Configure Model Options	Lets you define the model options for the new PDM

☞ For more information, see the “Linking and Synchronizing Models in PowerDesigner” chapter in the *General Features Guide* .

Configuring the generated PDM options

When you configure the options of a PDM to generate, you may define options diverging from the CDM options.

To avoid conflicts, PowerDesigner applies the following rule for default values of PDM options: an option defined for the generated PDM should respect the equivalent option of the CDM.

Equivalent options are model options found in both models. The Enforce non-divergence option exists in both CDM and PDM.

CDM option	PDM option	Result in generated PDM
✔ Enforce non-divergence	—	Enforce non-divergence in model according to CDM options. Columns attached to the domain cannot have divergent definitions
—	✔ Enforce non-divergence	Enforce non-divergence in model according to PDM options defined using the Configure Model Options feature

References unique code

Unique Code for references is not selected by default in the PDM options. However, if you select Unique Code for references in the PDM options, relationships are renamed during the generation of a CDM to a PDM.

Options with no equivalent, like Use Data Type Full Name in the CDM without any corresponding option in a PDM, are generated using default values found in the registry.

Defining PDM generation options

You can set the following general generation options from the Detail page:

Option	Description
Check Model	When selected, checks the model before generating the PDM, and stops generation if an error is found
Save Generation Dependencies	When selected, PowerDesigner keeps track of the identity of the origin of each generated object. This is useful when merging two PDM which have been generated from the same CDM. Objects can be compared and recognized as the same object, even if the object has been modified in the target PDM. If not selected, origin objects have no link with generated objects
Convert Names into Codes	When selected, object codes are generated from names using the corresponding conversion script. This is useful when generating models with very different naming conventions . For example a Java class attribute code may be “customerName” whereas a PDM table column code may be “CUSTOMER_NAME”. With this option selected, both objects will have their codes generated from their names. If you do not select this option, generated object codes will be copied from original object codes
Rebuild Triggers	When selected, allows to build triggers with preservation option, after the PDM generation. Rebuild takes place after merge if you are updating an existing PDM
Enable transformations	This button is used to activate transformations during generation. When you click this button, the Pre-generation tab appears if the source model contains transformations. You can select the transformations to execute before generation. The Extended Model Definitions tab also appears for you to select extended model definition files to attach to the generated model. These files may contain post-generation transformations, in this case, the Post-Generation tab appears to let you select the transformations you want to be executed in the generated model. If the generation is an update, and the generated model contains extended model definitions with post-generation transformations, the Post-generation tab automatically appears as soon as you click the Enable Transformations button

☞ For more information conversion scripts, see section Using a conversion script in chapter Managing models in the *General Features Guide* .

Check model before generation
If you select the Check Model option, the procedure to generate a PDM starts by checking the validity of the CDM . A PDM results when no errors are found. You can set check options by selecting Tools ➤ Check Model.

Table parameters

The following parameter defines the naming convention for tables:

Parameter	Description
Table Prefix	Prefix for the names of tables generated from entities in the CDM

Reference parameters

The following parameters define default referential integrity constraints:

Parameter	Description
Update Rule	Default update constraint for referential integrity
Delete Rule	Default delete constraint for referential integrity

Foreign key name

By default, the name of the migrated foreign keys generated in a PDM is identical to the name of the primary key. In case of column name conflict, the first 3 letters of the name of the parent table are added before the name of the migrated column.

You can modify this default behavior and use templates for naming the migrated foreign keys. In the Reference groupbox, you can select one of the predefined templates in the FK Column Name Template dropdown listbox. These templates are saved in the registry, you can modify them, but their default value is preserved.

You can also create your own foreign key naming templates by typing a template directly in the FK Column Name Template box using the following variables:

Variable	Value
%REFR%	Name / Code of the reference
%PARENT%	Name / Code of the parent table
%COLUMN%	Name / Code of the parent column
%KEY%	Name / Code of the key constraint attached to the reference
%CONSTNAME%	Name of the key constraint attached to the reference (same as %KEY%)
%PROLE%	Role of the entity that generated the parent table, this variable proceeds from the conceptual environment. If no role is defined on the relationship or association, %PROLE% takes the content of %PARENT% to avoid generating a column with no name

You can use the default PowerDesigner formatting variables in the template as explained in section List of PowerDesigner formatting variables in chapter Variables in PowerDesigner in the *PDM User's Guide* .

You can also use square brackets [ ] for evaluating optional variables as explained in “Optional strings and variables” in the “DBMS Reference Guide” chapter in the *Advanced User Documentation* .

Customized naming templates reappear in the generation dialog box the next time you open it, but are not saved in the registry thus not added to the dropdown list of predefined templates.

For example, if you define the template %PROLE%, the name of the foreign key will be made of the role beside the entity that generated the parent table containing the primary key. If the parent table contains multiple keys, the foreign key names will be automatically renamed.

Other example:

```
[%PROLE%=%PARENT%?%.3:PARENT%_%COLUMN%:%PROLE%]
```

This checks the %PROLE% value; if it is equal to the parent name (which is the replacement value) then the template “%.3:PARENT%_%COLUMN%” will be used, otherwise template “%PROLE%” will be used because the user has entered a parent role for the relationship.

In the Reference groupbox, you can select the Always Use Template radio button to always use the default or customized template for naming FK columns, even if there is no conflict with an existing column.

Index parameters

The following parameters define naming conventions for indexes:

Parameter	Description
PK index names	Naming convention for primary keys, by default %TABLE%_PK
Key index names	Naming convention for alternate keys, by default %TABLE%_AK
FK index names	Naming convention for foreign keys, by default %REFR%_FK
FK threshold	Minimum number of estimated occurrences of an entity necessary to create an index on a foreign key

If you enter a value for the index threshold, indexes on foreign keys are only generated if the number of estimated occurrences is greater than the threshold. The estimated number of occurrences is an entity property that you can include in the entity definition.

If the entity has no specified number of occurrences, the foreign key indexes are generated by default.

PK index name variables

You can use the following variables in the PK index names and Key Index Names fields:

Variable	Value
%TABLE%	Generated code of the table. This is the table code that is generated in the database. It may or may not be truncated if the code contains characters not supported by the DBMS
%TNAME%	Table name
%TCODE%	Table code
%TLABL%	Table comment

FK index name variables

You can use the following variables in the FK index name field. The generated code of a variable is the code defined in the object property sheet, but which may or may not be truncated when generated if the code contains characters not supported by the DBMS

Variable	Value
%REFR%	Generated code of the reference

Variable	Value
%REFNAME%	Reference name
%REFRCODE%	Reference code
%PARENT%	Generated code of the parent table
%PNAME%	Parent table name
%PCODE%	Parent table code
%CHILD%	Generated code of the child
%CNAME%	Child table name
%CCODE%	Child table code
%PQUALIFIER%	Parent table qualifier
%CQUALIFIER%	Child table qualifier

Preserving a modified primary key

If you modify a primary key in a PDM, then regenerate the PDM from a CDM, the modified primary key is not preserved. If you want to preserve a modified primary key, you need to modify the identifier in the CDM before regeneration.

Generating an Object Oriented Model from a Conceptual Data Model

This section explains how to generate an Object Oriented Model from a Conceptual Data Model.

Generating OOM Objects

When you generate an Object Oriented Model (OOM) from a CDM, PowerDesigner converts CDM objects into specified object language objects as follows:

CDM Objects	Generated object in an OOM
Entity	Class
Attribute	Attribute
Association	Relationship or association
Binary association with attributes	Association class
Inheritance	Generalization

Persistent entities

All entities are generated as persistent classes with the “Generate table” persistence mode.

When the Generate check box of an entity is not selected, the generated class has the “Migrate columns” persistence mode.

OOM naming conventions

If the code of the generated OOM objects does not correspond to the target language naming conventions, you can define a code naming convention script to convert object names into codes. For more information on conversion scripts, see section .convert_name & .convert_code macros in chapter Managing Models in the *General Features Guide.*

Converting CDM to OOM data types

PowerDesigner supports both conceptual and object language data types.

The following table lists the conceptual data types to which the object language definition assigns conversions:

Conceptual data type	Code in CDM	What it stores	Conversion example with Java
Characters	A	Character strings	Char
Boolean	BL	Two opposing values (true/false; yes/no; 1/0)	Boolean
Byte	BT	256 values	Byte
Short Integer	SI	16-bit integer	Short
Long Integer	LI	32 bit integer	Long integer
Integer	I	32 bit integer	Integer
Float	F	32 floating decimal numbers	Float
Number	N	Numbers with a fixed decimal point	Double
Text	TXT	Character strings	*

Generating and updating an OOM

To generate an OOM, you must choose between one of the following methods:

- Generate new Object-Oriented Model
- Update existing Object-Oriented Model

You must indicate the following parameters when you generate a new OOM:

Parameter	Description
Object Language	Target object language
Share	Object language for the resulting OOM uses a shared Object language definition file stored in the Object language library
Copy	Object language for the resulting OOM uses a copy of the Object language definition file stored in the Object language library
Name	File name for the resulting OOM
Code	Reference code for the resulting OOM
Configure Model Options	Lets you define the model options for the new OOM, you can select the naming conventions corresponding to the target language for example

☞ For more information, see the "Linking and Synchronizing Models in PowerDesigner" chapter in the *General Features Guide* .

Configuring the generated OOM options

When you configure the options of an OOM to generate, you may define options diverging from the CDM options.

To avoid conflicts, PowerDesigner applies the following rule for default values of OOM options: an option defined for the generated OOM should respect the equivalent option of the CDM.

Equivalent options are model options found in both models. The Enforce non-divergence option exists in both CDM and OOM.

CDM option	OOM option	Result in generated OOM
✔ Enforce non-divergence	—	Enforce non-divergence in model according to CDM options
—	✔ Enforce non-divergence	Enforce non-divergence in model according to OOM options defined using the Configure Model Options feature

Options with no equivalent, like Use Data Type Full Name in the CDM without any corresponding option in an OOM, are generated using default values found in the registry.

Defining OOM generation options

You can set the following general generation options from the Detail page:

Option	Description
Check Model	When selected, checks the model before generating the OOM, and stops generation if an error is found
Save Generation Dependencies	When selected, PowerDesigner keeps track of the identity of the origin of each generated object. It is useful when merging two OOM which have been generated from the same CDM. Objects can be compared and recognized as the same object, even if the object has been modified in the target OOM. If not selected, origin objects have no link with generated objects
Convert Names into Codes	When selected, object codes are generated from names using the corresponding conversion script. This is useful when generating models with very different naming conventions since conversion macros are used to modify codes. For example a Java class attribute code may be “customerName” whereas a PDM table column may be “CUSTOMER_NAME”. With this option selected, both objects will have their codes generated from their names. If you do not select this option, generated object codes will be copied from original object codes
Enable transformations	This button is used to activate transformations during generation. When you click this button, the Pre-generation tab appears if the source model contains transformations. You can select the transformations to execute before generation. The Extended Model Definitions tab also appears for you to select extended model definition files to attach to the generated model. These files may contain post-generation transformations, in this case, the Post-Generation tab appears to let you select the transformations you want to be executed in the generated model. If the generation is an update, and the generated model contains extended model definitions with post-generation transformations, the Post-generation tab automatically appears as soon as you click the Enable Transformations button
Class Prefix	Prefix for a class. It can help identify a class in a model

☞ For more information conversion scripts, see section Using a conversion script in chapter Managing models in the *General Features Guide* .

Check model before generation

If you select the Check Model option, the procedure to generate an OOM starts by checking the validity of the CDM . An OOM results when no errors are found. You can set check options by selecting Tools ➤ Check Model.

CHAPTER 6

CDM Glossary

association	In the Merise modeling methodology an association is a connection between entities
business rule	Written statement specifying what the information system must do or how it must be structured to support business needs
column	Data structure that contains an individual data item within a row in a PDM
Conceptual Data Model (CDM)	Entity-relationship diagram that models the information system without considering the details of physical implementation
constraint	Named check that enforces data requirements, default values, or referential integrity on an entity or a entity attribute
data item	Elementary piece of information
domain	Set of values for which a data item is valid
entity	Person, place, thing, or concept that has characteristics of interest to the enterprise and about which you want to store information
entity attribute	Elementary piece of information attached to an entity
foreign key	Column or columns in a PDM whose values depend on and migrate from a primary key, or an alternate key, in another table
Identifier	Entity attribute, or a combination of entity attributes, whose values uniquely identify each occurrence of the entity
Inheritance	Special relationship that defines an entity as a special case of a more general entity
Object-Oriented Model (OOM)	Structure that is the logical design view of a software system. An OOM is a conceptual model of a software system
Physical Data Model (PDM)	Table-reference diagram that models the information system including the details of physical implementation
primary key	Column or columns whose values uniquely identify a row in a table in PDM
property sheet	Window that displays the properties of an object
reference	Link between a parent table and a child table in a PDM. A reference can link

tables by shared keys or by specified columns

referential integrity — Rules governing data consistency, specifically the relationships among primary keys and foreign keys of different tables in a PDM

relationship — Named connection or association between entities

stereotype — Sub-classification used to extend the semantics of an object without changing its structure; it can be predefined or user-defined

table — Collection of rows (records) in a PDM that have associated columns (fields)

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