



QAD Enterprise Applications

Training Guide QAD Configurator

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QAD Enterprise Applications
Configurator 5.3
June 2012

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Change Summary

The following table summarizes significant differences between this document and the last published version.

Date/Version	Description	Reference
June 2012/5.3	Rebranded for QAD Configurator 5.3	---

About This Course

Course Description

This course is designed to cover the basics of using QAD Configurator to configure customizable products to meet specific customers' requirements.

The course includes:

- An introduction to the QAD Configurator product.
- Instructions on how to perform data and system setup prior to using QAD Configurator.
- Instructions on how to implement the sales configuration process.
- Instructions on how to implement the product configuration process.
- Instructions on how to use the guided sales process to configure products.
- Activities and exercises throughout the course (for students to practice key concepts and processes)

Course Objectives

By the end of this class, students should be able to:

- Understand the underlying key business concepts behind QAD Configurator.
- Use Configurator to customize configurable products.

Audience

The audience for this course includes:

- Engineers
- Customer service representatives
- Implementation consultants
- Members of implementation teams

Prerequisites

The prerequisites for attending this course are:

- Basic knowledge of QAD Enterprise Applications as it is used in the industry today.
- Knowledge of QAD Enterprise Applications product structures and routing functionality
- Working knowledge of the manufacturing industry in general

Note Students unfamiliar with QAD Enterprise Applications should read the *User Guide: Introduction to QAD Enterprise Applications* before attending this class.

Course Credit and Scheduling

This course is typically taught in four days.

Virtual Environment Information

The hands-on exercises in this book should be used with the latest Enterprise Edition with Addons learning environment in the 10USA > 10USACO workspace. When prompted to log in, specify *demo* for user ID and *qad* for password.

Additional Resources

If you encounter questions on QAD software that are not addressed in this book, several resources are available. The QAD corporate Web site provides product and company overviews. From the main site, you can access the QAD Learning or Support site and the QAD Document Library. Access to some portions of these sites depends on having a registered account.

<http://www.qad.com/>

QAD Learning Center

To view available training courses, locations, and materials, use the QAD Learning Center. Choose Education under the Services tab to access this resource. In the Learning Center, you can reserve a learning environment if you want to perform self-study and follow a training guide on your own.

QAD Document Library

To access release notes, user guides, training guides, and installation and conversion guides by product and release, visit the QAD Document Library. Choose Document Library under the Support tab. In the QAD Document Library, you can view HTML pages online, print specific pages, or download a PDF of an entire book.

To find a resource, you can use the navigation tree on the left or use a powerful cross-document search, which finds all documents with your search terms and lets you refine the search by book type, product suite or module, and date published.

QAD Support

Support also offers an array of tools depending on your company's maintenance agreement with QAD. These include the Knowledgebase and QAD Forums, where you can post questions and search for topics of interest. To access these, choose Visit Online Support Center under the Support tab.

Introduction to QAD Configurator

This chapter will give you a basic understanding of the QAD Configurator product by answering the following questions:

- What is QAD Configurator?
- What does QAD Configurator do?
- What benefits does QAD Configurator provide?
- What manufacturing strategies can QAD Configurator most likely help you implement?
- What is the relationship between QAD Configurator and QAD Enterprise Applications?

We will also take a brief look at the basic workflow of using QAD Configurator and navigate around in the QAD Configurator workspace.

At the end of this chapter, you should be able to:

- Describe the main features of QAD Configurator
- Describe the key benefits of using QAD Configurator
- Identify the manufacturing environments QAD Configurator best works in
- Understand how QAD Configurator is integrated with QAD Enterprise Applications
- Describe the basic Configurator workflow
- Know your way around the QAD Configurator workspace

Business Considerations

Business Considerations



More Customizations



Less Inventory



Less Delivery Lead Time



In this increasingly competitive market, many manufacturing companies are seeking to address three key issues to increase customer satisfaction and gain a competitive edge:

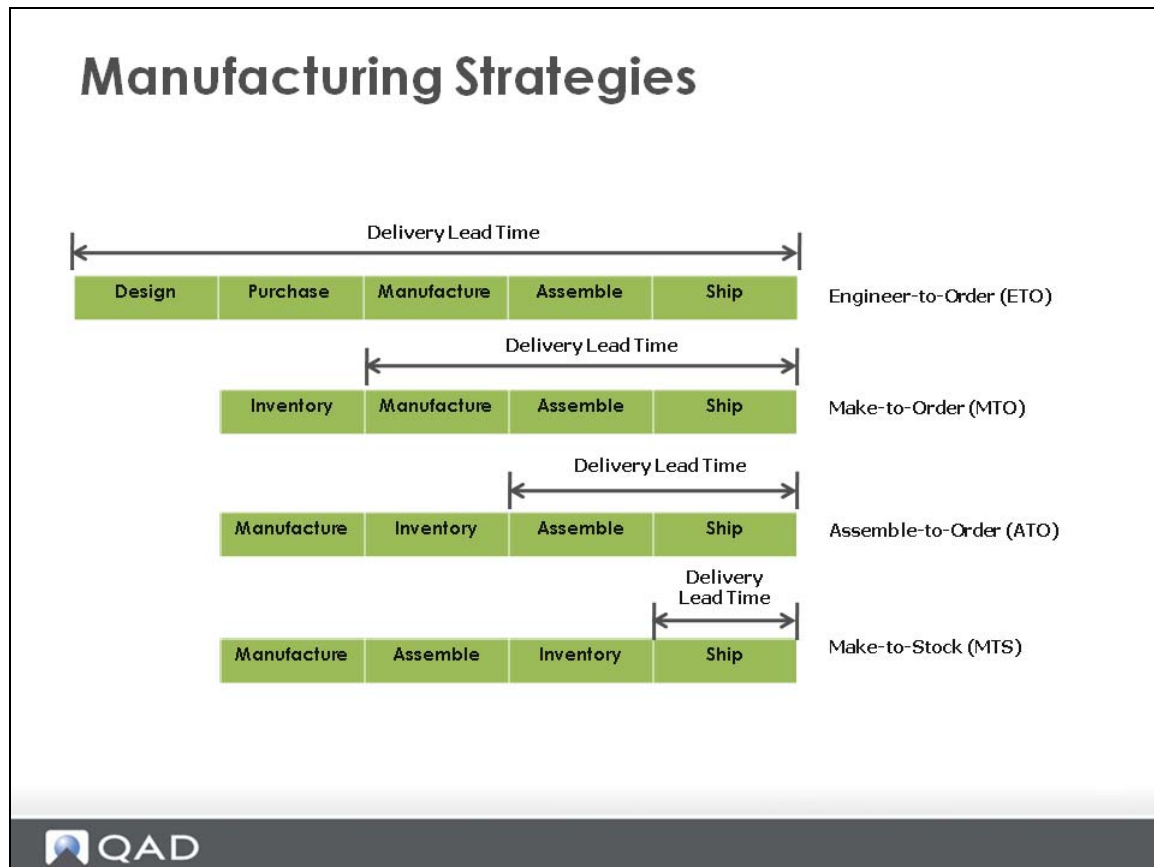
- Meet customers' increasingly varied and personalized demands
- Minimize inventory
- Minimize delivery lead time

To tailor products to customers' needs, a manufacturer must possess the capability and flexibility to accept customized orders and configure products according to specific requirements.

To keep inventory as low as possible, a postponement strategy should be adopted to delay manufacturing or assembling products until customer orders are received.

To shorten delivery lead time, the ability to swiftly convert customers' requirements into manufacturing requirements is crucial.

Manufacturing Strategies



A highly market-oriented company will focus on meeting or exceeding customer expectations. In such a company all functions must contribute toward a winning strategy. Thus, operations must have a strategy that allows it to supply the needs of the marketplace and provide fast on-time delivery.

From the supplier's perspective, delivery lead time is the time from placing an order to the delivery of the product. From the customer's perspective it may also include time for order preparation and transmittal. Customers want delivery lead time to be as short as possible, and manufacturing must design a strategy to achieve this.

There are four basic strategies: engineer-to-order, make-to-order, assemble-to-order, and make-to-stock. Customer involvement in the product design, delivery lead time, and inventory state are influenced by each strategy.

Engineer-to-order means that the customer's specifications require unique engineering design or significant customization. Usually the customer is highly involved in the product design: Inventory will not normally be purchased until needed by manufacturing. Delivery lead time is long because it includes not only purchase lead time, but design lead time as well.

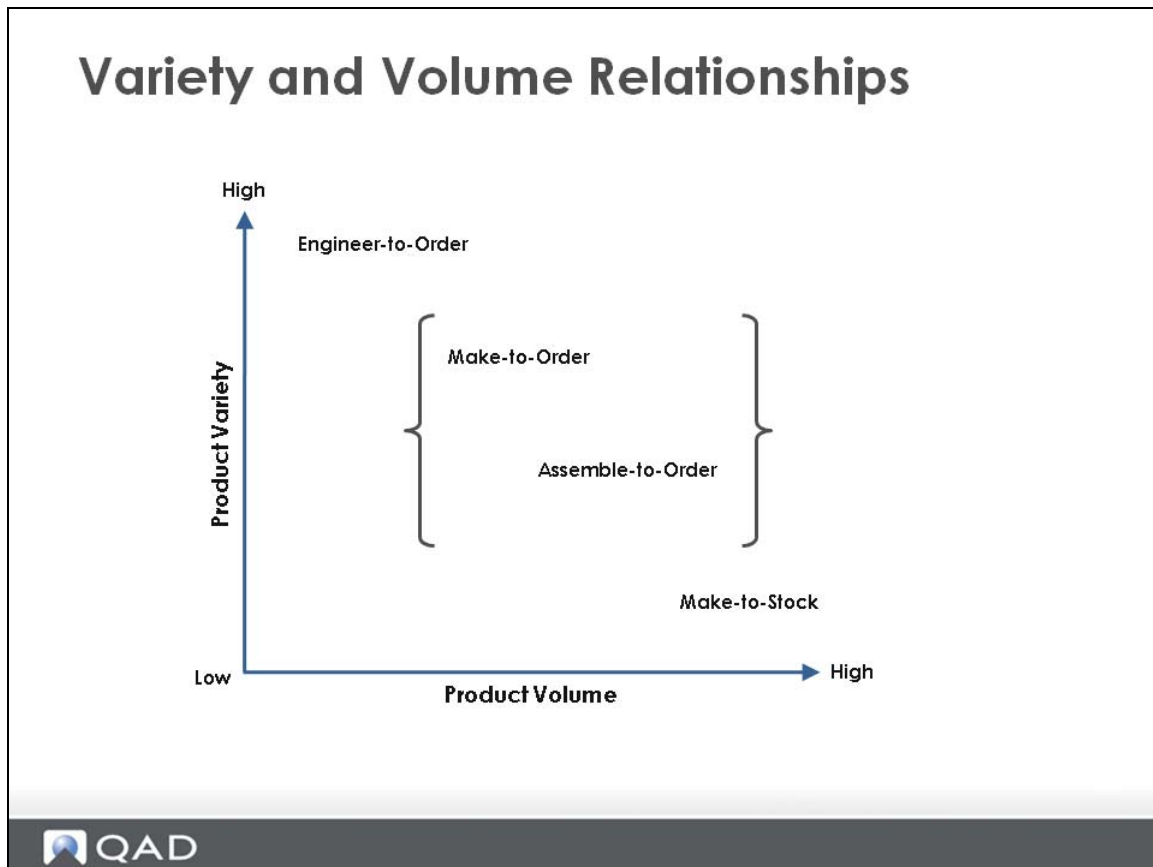
Make-to-order means that the manufacturer does not start to make the product until a customer's order is received. The final product is usually made from standard items but may include custom-designed components as well. Delivery lead time is reduced because there is little design time required and inventory is held as raw material.

Assemble-to-order means that the product is made from standard components that the manufacturer can inventory and assemble according to a customer order. Delivery lead time is reduced further because there is no design time needed and inventory is held ready for assembly. Customer involvement in the design of the product is limited to selecting the component part options needed.

Make-to-stock means that the supplier manufactures the goods and sells from finished goods inventory. Delivery lead time is shortest. The customer has little direct involvement in the product design.

Question Can you think of some examples for each of these four manufacturing environments?

Variety and Volume Relationships



The relationship of the Variety/Volume matrix is between the volume and variety of products produced and the particular manufacturing strategy chosen to accomplish the production.

As you can see in the matrix, if you adopt the make-to-order and assemble-to-order strategies, you may have a fairly large number of product varieties as well as a fairly large number of volumes. Three key questions are to be answered in this area for the strategies to be successful:

- How can you effectively create and maintain all possible product configurations?
- How can you efficiently collect customers' specific requirements?
- How can you swiftly translate customers' requirements into manufacturing requirements?

QAD Configurator can help you answer these questions.

QAD Configurator Key Features

Configurator Key Features

- Powerful and flexible questionnaire design
- Questionnaire-guided sales for customizable products
- Powerful and flexible price calculations
- Powerful and flexible product configuration rule definition capabilities
- Instant conversion of customer requirements into manufacturing requirements
- Seamless integration with QAD Enterprise Applications



QAD Configurator is a product configuration and guided selling tool that allows make-to-order and assemble-to-order companies to quickly and efficiently create sales orders based on specific customer requirements and ultimately manufacture and fulfill complex, customized products and services. It is an add-on module to QAD Enterprise Applications and provides flexible and powerful product configuration and computer-aided order entry capabilities.

QAD Configurator is specifically designed for manufacturing companies who produce products that are highly configurable or are routinely customized to meet the unique needs of their customers. By seamlessly integrating into QAD's order entry process, QAD Configurator ensures complete and valid product configuration during order entry and instantaneously translates customers' unique product requests into quotations, sales orders, bills of material, and routings.

QAD Configurator Key Benefits

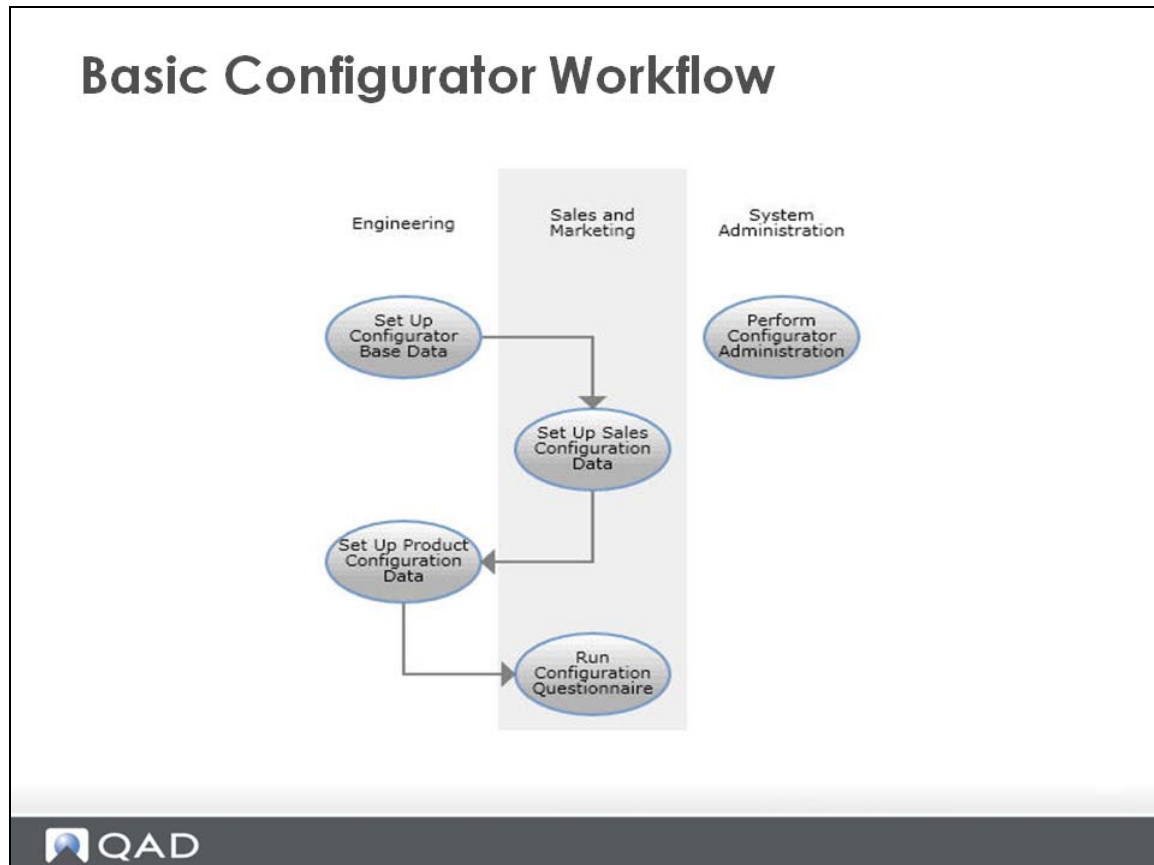
Configurator Key Benefits

- Bridges the information and knowledge gap between sales and engineering
- Easily configure products to meet customers' specific requirements
- Streamlined sales order and quotation entry process for configurable products
- Reduces lead time to fulfill orders for configured products
- Reduced error rates



QAD Configurator effectively bridges the information and knowledge gap between product engineering and sales by allowing sales personnel to access the most current product data maintained by engineering personnel and enter orders with complex configurations based on customers' specific requirements without having to know the product details and possess a strong technical background.

Basic Configurator Workflow



- **System Setup**

Prior to using QAD Configurator, perform system setup including setting up data in QAD ERP and configuring Configurator settings.

- **Sales Configuration**

Sales personnel maintain variables and features that define configurable product characteristics, designate how to present features as questions in the guided sales questionnaire, as well as set up sales configuration rules to ensure data collected from the questionnaire is valid.

- **Product Configuration**

Engineering personnel define product configuration rules that translate feature data collected from questionnaires into product structures and routings of configured products.

- **Guided Sales**

Sales personnel run the questionnaire during order or quotation entry to configure products to meet specific customer needs. Data collected in this guided sales process identify new product configurations and translate new customer requirements into new product structures and routings.

- **Administration**

Use a range of administrative functions to maintain the system for optimal performance.

Integration with QAD ERP

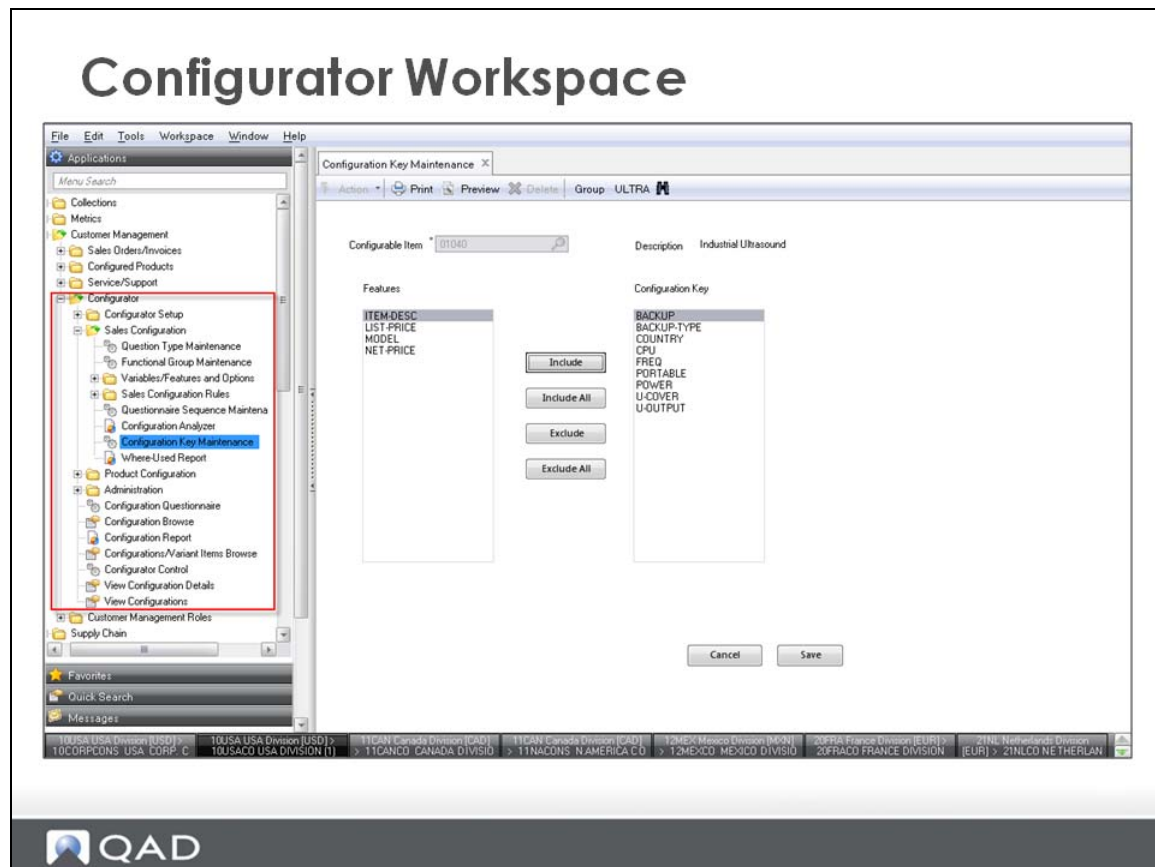
Integration with QAD Enterprise Applications

- Integrated with the following QAD Enterprise Applications functions:
 - Sales Quote Maintenance (7.12.1)
 - Sales Order Maintenance (7.1.1)
 - Item Master Maintenance (1.4.1)
 - Product Structure Maintenance (13.5)
 - Routing Maintenance (14.13.1)
 - Item-Site Inventory Data Maintenance (1.4.16)
 - Item-Site Planning Maintenance (1.4.17)
 - Item-Site Cost Maintenance (1.4.18)



- You can access QAD Configurator functions by using either the Menu Search field or the menu tree in the Applications pane in the QAD .NET user interface.
- After you install QAD Configurator, QAD Configurator functions are grouped under Customer Management|Configurator by default in QAD Enterprise Applications. For earlier versions of QAD ERP, QAD Configurator functions can be found under Distribution|Configurator.
- The Questionnaire module is automatically launched when you select a configurable item in the order line in Sales Order Maintenance (7.1.1) or Sales Quote Maintenance (7.12.1) in the QAD ERP .NET UI environment.

QAD Configurator Workspace



Integrated with QAD ERP, QAD Configurator is embedded in the application area of the QAD .NET user interface and, therefore, is consistent with the rest of the QAD ERP applications in terms of look and feel and navigation.

Performance Check

- 1 QAD Configurator is NOT suitable for companies manufacturing which of the following products?
 - A. Cars
 - B. Hamburgers
 - C. Personal computers
 - D. DIY furniture
- 2 QAD Configurator lets you do all of the following EXCEPT:
 - A. Design questionnaires
 - B. Collect customers' requirements
 - C. Generate generic routings
 - D. Forecast customers' demands
- 3 Which user interface does QAD Configurator support?
 - A. CHUI
 - B. Windows GUI
 - C. Web
 - D. QAD .NET UI
- 4 QAD Configurator provides the following benefits EXCEPT:
 - A. Sales and engineering data consolidation
 - B. Easy product configuration
 - C. Streamlined order processing for configurable products
 - D. Reduced delivery lead time
- 5 Engineering personnel define rules that translate feature data collected from questionnaires into product structures and routings of configured products in:
 - A. System setup
 - B. Sales configuration
 - C. Product configuration
 - D. Guided sales questionnaire

Chapter 2

System Setup

Scenario

The Industrial Ultrasound used in this training is a configurable item that is made to order out of standardized components.

With QAD Configurator, the configurable product structure of an item contains all component items that could possibly be needed to build any variant (configuration) of it. A variant product structure will always consist of a subset of the components of the generic product structure.

The following diagram shows the configurable product structure of the Industrial Ultrasound. In this product structure 50020 is also a configurable items.

Parent Item/BOM Code: 01040		Industrial Ultrasound		EA	
As Of: 02/01/11 Levels:		Rev:			
PCO Number:		ID:		Domain:	
				Output: PAGE	
Level	Component Item	Description	Quantity	Per	UM Ph T Iss
Parent	01040	Industrial Ultrasound			EA
1	02003	Standard Connector	2.0		EA
.2	62050	Beryllium Copper	0.0001		RL
.2	62050	Beryllium Copper	0.0001		RL
.2	90031	Packaging	2.0		EA
1	50001	Probe Unit - 10 Mhz	1.0		EA
.2	02003	Standard Connector	1.0		EA
.3	62050	Beryllium Copper	0.0001		RL
.3	62050	Beryllium Copper	0.0001		RL
.3	90031	Packaging	2.0		EA
.2	60004	Transducer - 10 Mhz	1.0		EA
1	50002	Probe Unit - 500 kHz	1.0		EA
.2	02004	Laptop Connector	1.0		EA
.3	62050	Beryllium Copper	0.0001		RL
.3	62050	Beryllium Copper	0.0001		RL
.3	90031	Packaging	2.0		EA
.2	60016	Transducer -500 kHz	1.0		EA
1	50020	Industrial Housing	1.0		EA
.2	60060	White Paint	1.0		GA
.2	60061	Black Paint	1.0		GA
.2	60062	Paint, Other	1.0		GA
.2	60090	Small Sheet Steel	1.0		EA
		80X 120 cm			
.2	60091	Large Sheet Steel	1.0		EA
		160 x 200 cm			
.2	60093	Stainless Steel Sheet	1.0		EA
1	60003	Keyboard	1.0		EA
1	60008	Printer	1.0		EA
1	60015	Keyboard Cover	1.0		EA
1	60020	Cooling Fan	1.0		EA
1	60021	Battery Backup, Alkaline	4.0		EA
1	60022	Battery Backup, Lithium	4.0		EA
1	60050	Base Unit / CPU	1.0		EA
1	60052	High Performance CPU	1.0		EA
1	60080	Power Cord - UK	1.0		EA
1	60081	Power Cord - US	1.0		EA
1	60082	Power Cord - Australia	1.0		EA
1	60083	Power Cord - Universal	1.0		EA
1	60088	Power Converter-Standard	1.0		EA
1	60089	Power Converter - Smart	1.0		EA
1	90093	Shipping Carton	1.0		EA

In this scenario both the product structure for a variant and the corresponding routing will be configured using QAD Configurator. Both will be configured across multiple levels of the product structure.

QAD Enterprise Applications Setup

The Configurator training is based on the following QAD Enterprise Applications data:

- Items
- Product Structures
- Work Center and Routings

This data is already in the system and is part of the QMI set of data. Please refer to the appendix and review this data.

QAD Configurator Setup

Start QAD Configurator from the QAD Enterprise Applications menu by choosing menu Configurator. You can also run the Configurator using the process maps.

Configurator Control

Configurator Control is used to define the QAD Configurator system settings such as the directories in which created sources are written by QAD Configurator.

Exercise 1: Configurator Control

Run Configurator Control to verify the default settings for using QAD Configurator or to enter new ones. Make sure the entries are consistent with those in the following image.

The screenshot shows the 'Configurator Control' window with the following settings:

- System Control**
 - Appserver Questionnaire Directory: /home/demo/quest
 - Appserver Variant Directory: /home/demo/var
- Variant Level**
 - SQ Maintenance: ☒ Product Structure ☐ Off
 - SD Maintenance: ☒ Product Structure ☐ Off
- Configurator Questionnaire**
 - ☒ Pegging for Re-Analyze
- WebSpeed Settings**
 - WebSpeed URL: http://qaddemo/cgi-bin/wspd.cgi.sh/WService=cpd_WSlive
 - Web URL: http://qaddemo/qadcpd
 - Web Timeout: 100000
 - Property Path: /dr01/qadapps/cpd

Master Group Maintenance

Whenever you have a large quantity of manufacturing data in your QAD ERP database, you can simplify the process of using QAD Configurator by setting up additional groups to subdivide and categorize the products and product families that your company produces.

When you create a new group, you can also set up various defaults and settings that control the way QAD Configurator operates within this group only. For example, you can set up the default number of digits and decimals that are used for numeric variables and features created in the group; you can select a default rounding method; you can specify whether single-level or multi-level product structures are used; and you can specify whether you require QAD Configurator to generate variant routings for products configured in this group.

When you have defined different groups, you can categorize information in QAD Configurator by storing it in the correct group. This enables you to store and maintain various models (such as configurable items, variables, features, sales or product configuration rules) separately.

Exercise 2: Master Group Maintenance

Master Group Maintenance

Action | Print | Preview | Delete

Master Group: * ULTRA

Description: ULTRASOUND PRODUCTS

General Settings

- ☒ Allow Multi-Level Product Structure
- ☒ Create Variant Routings
- ☒ Use Standard Options

UOM: EA

Default Numeric Format Settings

Digits: 8 Rounding Method: Standard

Decimals: 0

☐ Allow Negative Values

Configurable Item Selection

P/M Type:

- ☒ Blank
- ☒ C - Configured
- ☒ D - DRP
- ☒ F - Family
- ☒ L - Line Manufactured
- ☒ M - Manufactured
- ☒ P - Purchased
- ☒ R - Routable
- ☒ W - Flow Scheduled
- ☒ Include Phantom Items
- ☒ Effective Only
- ☒ Others

Comment

Language Comment

Run Master Group Maintenance to verify the default settings for using QAD Configurator or to enter them. Make sure your entries are consistent with the data in the following table.

Field	Entry
Master Group	ULTRA
Description	Ultrasound Products
General Settings	
Allow Multi-Level Product Structure	Selected

Field	Entry
Create Variant Routings	Selected
Use Standard Options	Selected
UOM	EA
Default Numeric Format Settings	
Digits	8
Decimals	0
Allow Negative Values	Not selected
Rounding Method	Standard

Configurable Item Selection	
P/M Type	Select all check boxes
Phantom Item	Selected
Effective Only	Selected

Note Many QAD Configurator menus contain information that belongs to a certain group. If this is the case the current group will be shown in the toolbar at the top of the screen.

Configurable Item Maintenance

In the scenario at the beginning of the System Setup section we reviewed the product structure of the Industrial Ultrasound. If you want QAD Configurator to configure variants of this item, you must tell QAD Configurator where it can find the list of components to choose from. You do this by defining the Industrial Ultrasound as a configurable item in QAD Configurator. But that is not enough if you are dealing with a multi-level product structure. In this case you must define every lower-level configurable item in the product structure as a configurable item in QAD Configurator as well, because all of these items have a number of (mutually exclusive) components themselves. If it recognizes an item as a configurable item, QAD Configurator will reference the product structure entered in the Manufacturing module whenever it has to.

The item number is copied to the QAD Configurator database when you define an item as a configurable item using Configurable Item Maintenance.

Note All item data, such as product structures and routings, are only maintained in the QAD Enterprise Applications database. There is no duplication of data.

Exercise 3: Configurable Item Maintenance

The screenshot shows the 'Configurable Item Maintenance' window. At the top, there is a toolbar with buttons for Action, Print, Preview, Delete, and Group. The 'Group' button is set to 'ULTRA'. Below the toolbar, the 'Configurable Item' field contains '01040' and a 'New' button. The 'Description' field contains 'Industrial Ultrasound'. The 'SO Type' field is a dropdown menu set to 'BOM'. There is a 'Lock Configurable Item' checkbox. The 'Analyzed On' field shows '1/6/2011 12:13:49 PM' and an 'Analyze' button. The 'Configuration Creation Rule' section includes 'Variant P/M' (M), 'Configurable P/M' (M), 'Configuration Selection' (Select Last Matching), 'Configuration Retention' (No Duplicates), 'Variant Item-Site Record' (None), and 'Site Variable'. The 'Configuration Questionnaire' section includes 'Show Existing Configurations' (Second). The 'Cost' section includes 'Variant Item Cost Roll-Up' (checked) and 'Cost Set' (Standard). The 'Pricing' section includes 'Calculate Configuration Price' (checked), 'Create a Price List' (checked), 'Allow Net Price Change' (unchecked), 'Allow Manual Price List Change' (unchecked), 'Store All Pricing Information' (checked), 'List Price Variable' (LIST-PRICE), and 'Net Price Variable' (NET-PRICE). At the bottom, there is a 'Language' field and a 'Comment' field. The bottom right corner has 'Cancel', 'Save', and 'New' buttons.

Once an item is a configurable item, QAD Configurator will automatically be started when this item is entered on a sales quotation or sales order line.

Run Configurable Item Maintenance and click the New button to display the item browse. Now select the items listed in the table below and set the following attributes (make sure that group ULTRA is selected). Accept the default value of all the other fields.

Configurable Item	Description	SO Type	Configuration Selection / Retention	Variant Item Cost Roll-Up	Cost Set
01040	Industrial Ultrasound	BOM	Select Last Matching Auto Select: Off No Duplicates	yes	Standard
50020	Industrial Housing	BOM	Select Last Matching Auto Select: Off No Duplicates	yes	Standard
50020	Control Unit	BOM	Select Last Matching Auto Select: Off No Duplicates	yes	Standard

Note Many QAD Configurator menus contain information that belongs to a certain configurable item. If this is the case, the current configurable item will be shown in the title bar of the window.

Sales Configuration

In this chapter we define the questionnaire. This is done using the programs in the Sales Configuration menu. Earlier in this course we reviewed the generic product structure and routing of the Industrial Ultrasound. We will now add the variables and features that define the characteristics of this configurable product. We will also specify how to present features as questions in the guided sales process (questionnaire), as well as set up sales configuration rules to ensure data collected from the questionnaire is valid.

Question Type Maintenance

A customer who wants to buy an Industrial Ultrasound must specify which variant he prefers. To help him select his preferred configuration you will offer him a list of questions and potential answers. When the customer has completed this questionnaire, QAD Configurator can create a product structure and corresponding routing for the chosen variant.

To help organize a configuration model, questions in the QAD Configurator Questionnaire can be categorized into Question Types.

Example Suppose that defining a variant requires that an engineer reviews the answers given by the customer and answers some additional questions himself. In that case the questions to be answered by the engineer should not be presented to the customer in the questionnaire. Now if you do not want a question to be shown in the questionnaire you can tell QAD Configurator by defining the question as a background question. So in the situation described, you would define the questions to be answered by the engineer as background questions. Furthermore, to make the purpose of the set of background questions clear, you would define a question type Special and attach these background questions to it. The questions of type Special would then be the ones to be answered by the engineer.

Exercise 4: Question Type Maintenance

Question Type Maintenance

Action Print Preview Delete Group ULTRA

Question Type: * NORMAL

Description: NORMAL

Level: ☒ Foreground ☐ Background

Cancel Save New

Use Question Type Maintenance to add the following Question Types (Enter your own Description):

Question Type	Description	Level
Normal	Normal Questions	Foreground
Special	Special Questions	Background

Functional Group Maintenance

Functional groups are used to categorize variants and features by their functions. For example, you can group features of a computer product into hardware, software, and accessories. Similarly, the features of the Industrial Ultrasound can be grouped into technical specifications, style and size, and accessories.

Exercise 5: Functional Group Maintenance

Functional Group Maintenance

Action Print Preview Delete Group ULTRA

Functional Group: * ACCESSORIES

Description: ACCESSORIES

Run Functional Group Maintenance and add the functional groups listed below.

Functional Group	Description
Technical Specs	Technical Specs
Style and Size	Style and Size
Accessories	Accessories

Variable and Variable Options Definition

Variables are general characteristics of items. Because many items can share the same characteristics, it would not be a good idea to maintain the characteristics of every item separately. That is why we will first define the characteristics (variables) we need and link them to the items later on. Depending on the data type of a variable we can define a set of possible values for it.

Exercise 6: Variable Maintenance

Variable Maintenance

Action
Print
Preview
Delete
Group: ULTRA

Variable: * BACKUP-TYPE
Data Type: * Text
Extent: * 1
Description: SPECIFIES TYE TYPE OF BATTERY BACKUP

Variable Details
Data Format
Variable Options
Comments

Functional Group: ACCESSORIES
Question Type: * NORMAL
Short Question: * BACKUP-TYPE
UOM: EA
Long Question: ALKALINE OR LITHIUM BATTERY BACKUP

☒ Question
☐ Temporary

☐ Allow Fill-in

Cancel
Save
New

Variable Maintenance

Action | Print | Preview | Delete | Group: ULTRA

Variable: * BACKUP-TYPE Data Type: * Text

Extent: * 1

Description: SPECIFIES TYE TYPE OF BATTERY BACKUP

Variable Details | Data Format | Variable Options | Comments

Se	Default	Option	Description	Short Answer	Long Answer	Pricing Part	Qty Based	UOM
1	☒	ALKALINE		ALKALINE	FOUR ALKALINE	60021	☐	EA
2	☐	LITHIUM		LITHIUM	FOUR LITHIUM B	60022	☐	EA
3	☐	N.A.		N.A.	NOT APPLICABLE		☐	

Cancel Save New

Run Variable Maintenance. This is where we define the variables and options that will be used for the configurable items.

Create the variables that are listed in the following table. Keep the default value 1 for Extent. You can add Long Question texts to the variables. The options are specified in the Variable Options tab, the numeric parameters are specified in the Data Format tab.

When you enter variable options, use the arrow buttons on the toolbar to define the order in which you want the options to appear in the questionnaire. By default, the first option in the list will be the default answer for the associated question. You need not stick to the order that is shown in the table.

The entry N.A. stands for not applicable. Suppose that the answer to one question makes another question superfluous. You can then inform the customer and the salesperson that this question need not be answered by assigning the default answer not applicable to it.

Variable	Data Type	Functional Group	Question Type	Short Question	UM	Question / Temporary	Variable Options or Data Format
backup	Logical	Accessories	Normal	Backup	EA	Question	Yes No
backup-type	Text	Accessories	Normal	Backup Type	EA	Question	Alkaline NiCd LiS N.A.
country	Text	Technical Specs	Normal	Country to be installed in	EA	Question	N/A [See note below]
CPU	Text	Technical Specs	Normal	CPU	EA	Question	Standard High
Freq	Text	Technical	Normal	Frequency	EA	Question	500 kHz. 10 MHZ
Painted	Text	Technical	Normal	Painted	EA	Question	Painted Stainless
Portable	Logical	Technical Specs	Normal	Portable	EA	Question	Yes No
U-area	Numeric	Style and Size	Special	Area	EA	Question	Digits: 8 Decimals: 0
U-color	Text	Style and Size	Normal	Color	EA	Question	Black White Other
U-Cover	Logical	Accessories	Normal	Keyboard Cover	EA	Question	Yes No
U-height	Numeric	Style and Size	Normal	Height	EA	Question	Digits: 3 Decimals: 0 Minimum: 80 Maximum: 200 Multiplier: 40 Default: 120
U-depth	Numeric	Style and Size	Normal	Length	EA	Question	Digits: 3 Decimals: 0 Minimum: 60 Maximum: 100 Multiplier: 20 Default: 60
U-type	Text	Style and Size	Normal	Display Type	EA	Question	Top Display Front Display

Variable	Data Type	Functional Group	Question Type	Short Question	UM	Question / Temporary	Variable Options or Data Format
U-width	Numeric	Style and Size	Normal	Width	EA	Question	Digits: 3 Decimals: 0 Minimum: 60 Maximum: 160 Multiplier: 20 Default: 60
U-output	Logical	Accessories	Normal	Printer	EA	Question	Yes No
power	Text	Technical Specs	Special	Power Converter	EA	Question	Smart Standard
steel-large	Numeric	Style and Size	Special	Qty - Large Steel	EA	Question	Digits: 8 Decimals: 0
steel-small	Numeric	Style and Size	Special	Qty - Small Steel	EA	Question	Digits: 8 Decimals: 0

Note A single variable might have more than one meaning. By defining a number of extents for such a variable you can distinguish between its various meanings. For instance, if both the housing and the icemaker have a color, you can define a variable color and give it extent 2. Then you can use color[1] as if it were the color of the housing and color[2] as if it were the color of the icemaker.

Note The industrial ultrasound can be sold in many countries. To avoid having to enter each country as a variable option we will use the QAD Configurator browse feature. When Allow Fill-In is selected, you can associate the variable with an existing browse so that the question respondent can select a value from the browse instead of manually typing in an answer in the questionnaire. If you assign a browse code to the variable, the answer to the corresponding question must be a value from the browse.

Assign the following values to variable country.

Variable	Allow Fill-In	Browse Code
country	Yes	ad015

Feature and Feature Options Definition

We can now link the defined variables to the configurable items to which they apply. Once we have done this, the variables become features of those items. The variable itself remains available, so that we can use it again at some later time. The feature inherits the detail data we specified for the variable in Variable Maintenance. However, this data can be overruled on the item level in Feature Maintenance.

Apart from the detail data, a feature might also inherit options from the corresponding variable, if not of type numeric. Whether or not this happens depends on whether Standard Options is selected in the Feature Options tab. Remember we also saw Use Standard Options in Master Group Maintenance. Now suppose that the Use Standard Options check box was selected in Master Group Maintenance. This means that the options of a feature will always be exactly those you defined for the corresponding variable. If the check box was not selected in Master Group Maintenance, then it is possible to delete options from the list of variable options and to add item-specific options. If the Use Standard Options check box was not selected in Master Group Maintenance, it is possible to select it in Feature Options tab, thus overruling the setting in Master Group Maintenance and making it impossible again to add or delete options in the Feature Options tab.

Exercise 7: Feature Maintenance

Feature Maintenance

Action | Print | Preview | Delete | Group: ULTRA | Configurable Item: 01040

Feature: * BACKUP-TYPE | Copy from Variable | Data Type: Text

Extent: 1

Description: SPECIFIES TYE TYPE OF BATTERY BACKUP

Feature Details | Feature Options | Comments

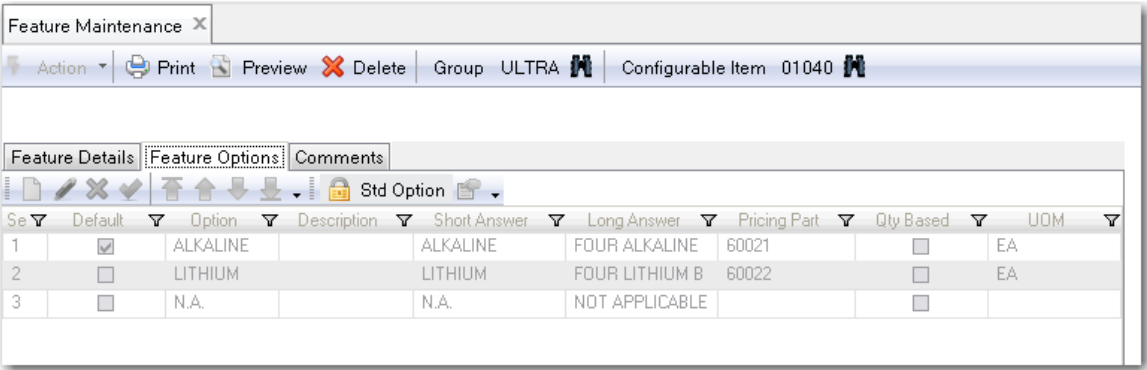
Functional Group: ACCESSORIES | Question Type: * NORMAL

Short Question: * BACKUP-TYPE | UOM: EA

Long Question: ALKALINE OR LITHIUM BATTERY BACKUP

☒ Question ☐ Temporary

☒ Allow Fill-in



Run Feature Maintenance and select the configurable items listed in the toolbar. Add the features by using the button Copy from Variable.

Notice that when Standard Options is selected, you cannot use the buttons — Insert, Delete, and so on — on the toolbar in the Feature Options tab. When it is deselected these buttons are available.

Notice also that besides being able to remove feature options from the variable options list, you can also add options, and/or change the default answer by using the arrow buttons on the toolbar.

Make sure Standard Options is deselected for the feature housing-color and selected for all other features.

Configurable Item	Feature
01040 Industrial Ultrasound	backup
	backup-type
	coolperform
	country
	CPU
	freq
	portable
	power
	U-cover
	U-output
50020 Industrial Housing	U-area
	U-cover
	U-height
	U-depth
	U-type
	U-width
	steel-large
	steel-small
	painted

Feature Sequence Maintenance

Now we will look at how we can influence the order in which the questions are presented in the questionnaire. The default order is the alphanumeric order of the feature identifiers.

Note Rules influence the order in which the questions are presented in the questionnaire. The system will automatically assign a sequence, based on the dependencies of questions that follow from the rules entered in the Sales Configuration Rules menu. (For instance: if A depends on B, then B must be answered before A.) You, as a user, can influence the sequence, as long as you do not choose an order that is in conflict with these dependencies. In the case of a conflict the system will overrule your sequence.

Exercise 8: Feature Sequence Maintenance

Feature	Data Type	Question Type	Description
BACKUP	Logical	NORMAL	ADDS AN EMERGENCY BATTERY BACKUP
BACKUP-TYPE	Text	NORMAL	SPECIFIES TYE TYPE OF BATTERY BACKUP
U-COVER	Logical	NORMAL	ADDS A KEYBOARD COVER
U-OUTPUT	Logical	NORMAL	ADDS A PRINTER TO THE UNIT

Run Feature Sequence Maintenance. Use the buttons on the toolbar to define the order in which you want the features to be displayed and save your changes.

You can also change the order of functional groups by dragging and dropping the functional group tab to your required position.

Sales Configuration Rules

Sales configuration rules determine the dependencies between the options of variables/features. They also influence the order in which the questions are presented in the questionnaire. Besides, rules determine which options become invalid as a result of answers to former questions and can even answer a question automatically if there is only one valid answer left.

In general rules consist of clauses. A clause is an expression. The so-called IF clause represents a condition. The THEN clause and the ELSE clause represent a conclusion.

Example In the rule if $A = a$ then $B = b$ else $C = c$, the IF clause is $A = a$, the THEN clause is $B = b$ and the ELSE clause is $C = c$.

First of all an overview of the functions that you can use to define sales configuration rules:

- General Rule Maintenance
- Rule-Group Maintenance
- Item Rule Maintenance
- General Rule Table Maintenance
- Item Rule Table Maintenance

In General Rule Maintenance you can define rules irrespective of a configurable item. These are rules that might be true for more than one configurable item. They are defined independently of the items and linked to them at a later stage.

In Rule-Group Maintenance you can group general rules into a defined rule-group. A rule-group contains instance of rules concerning the same topic.

You can use Item Rule Maintenance to:

- Link general rules directly to an item, without grouping them first.
- Link a whole rule-group to an item.
- Define item-specific rules for an item.

Rule tables offer an easy way to enter a number of rules of a certain type that look very much alike. A general rule table contains rules that can be valid for more than one configurable item; an item-specific rule table contains rules that are only valid for the item for which the rule table was defined.

General Rule Maintenance

If a rule applies to more than one item, we do not have to enter it for every item separately. Instead, we can define it once and then link it to as many items as we want. To do this, we must enter the rule as a general rule in QAD Configurator.

A characteristic of a general rule is that any modification to it is visible wherever this general rule is used; for instance, in every rule-group it belongs to and for every item to which it is linked.

Exercise 9: General Rule Maintenance

General Rule Maintenance

Action Print Preview Delete Group ULTRA

Rule ID: * GR-001 Copy from Rule

Description: DETERMINES BACKUP TYPE

Rule Detail Edit

Conditional

If BACKUP Value = No

Then BACKUP-TYPE Value = N.A.

Else BACKUP-TYPE Value <> N.A.

Switch to Free Format

Update

Preview

IF:
BACKUP = No
THEN:
BACKUP-TYPE = N.A.
ELSE:
BACKUP-TYPE <> N.A.

Check Syntax
Status: Passed

Cancel Save New

Run General Rule Maintenance and create the following rule by following the instructions.

Rule ID	Rule Syntax
GR001	if backup = no then backup-type = N.A. else backup-type <> N.A.

- 1 Enter GR001 in the Rule ID field and press Enter.
- 2 In the Rule Editor pane, select Conditional rule type. If, Then, and Else statements display.
- 3 In the If statement, select backup, Value, =; then click the Browse button and select No from the Variable Options box.
- 4 In the Then statement, select backup-type, value, =; then click the Browse button and select N.A. from the Variable Options box.
- 5 In the Else statement, select backup-type, value, <>; then click the Browse button and select N.A. from the Variable Options box.
- 6 Click the Update button to display the rule you are composing in the Preview pane.
- 7 Click the Check Syntax button to check whether the rule syntax is correct. If the rule is valid, you can see the status Passed under the button; otherwise, a Rule Check Configuration window will pop up displaying detailed error messages.
- 8 Click Save to save the rule.

Rule Group Maintenance

To categorize rules we must first create one or more empty rule-groups. Once these have been defined we can link existing general rules to them.

When linking a general rule to a rule-group, you can decide to copy the rule to a rule-group-specific rule. In this case the general rule remains available, but a copy of the general rule is linked to the rule-group and made specific for that particular rule-group. That way a modification to the general rule will not change the specific rule.

Exercise 10: Rule Group Maintenance

Rule Group Maintenance

Action Print Preview Delete Group ULTRA

Rule-Group ID: * RG-001

Description: BACKUP AND POWER CONVERTER RULES

Rule-Group Details

Rule Type : General Rule (2 items)

Selected	Rule ID	Description	Syntax OK	Rule Detail
☒	GR-001	DETERMINES BACKU	Yes	IF: BACKUP = No THEN: BACKUP-TYPE
☒	GR-002	DETERMINES POWER	Yes	IF: COUNTRY <> UNITED KINGDOM AND

Preview

Summary

- General Rule
 - GR-001
 - GR-002
 - Rule-Group Specific Rule

Cancel Save New

Run Rule-Group Maintenance and create a rule-group General. Select the general rule GR001 and link it to the rule group. Save it, and the Summary pane will show the link you created.

Rule-Group ID	Description	Rule ID of General Rule Linked
RG-001	Backup and power converter rules	GR001

In the Rule Group Details tab you select the available rules in this group in order of linking them to the rule group. A Copy symbol in the toolbar of the tab allows you to create a rule-group specific copy of any of the displayed rules.

Item Rule Maintenance

In Item Rule Maintenance you can link general rules or rule groups (with general rules attached) to configurable items. You can also create new rules that just apply for the specific configurable item selected. New item-specific rules can be entered directly or copied from a general rule.

Exercise 11: Item Rule Maintenance: Link Rule-Group

Item Rule Maintenance

Action | Print | Preview | Delete | Group: ULTRA

Configurable Item: * 01040 Description: Industrial Ultrasound

Item Rule Details

Rule Type : General Rule (2 items)					
Selected	Rule ID	Description	Syntax OK	Rule Detail	
☐	GR-001	DETERMINES BACKU	Yes	IF: BACKUP = No THEN: BACKUP-	
☐	GR-002	DETERMINES POWER	Yes	IF: COUNTRY <> UNITED KINGDO	

Rule Type : Item Rule (3 items)					
Selected	Rule ID	Description	Syntax OK	Rule Detail	
☒	IR-001	DETERMINES IF WE P	Yes	IF: PORTABLE = Yes THEN: COUN	
☒	IR-002	Assign Base Model to C	Yes	ASSIGN: MODEL = 1	
☒	IR-1002	SETS PRICING	Yes	ASSIGN: BACKUP-TYPE:pricing_qty	

Rule Type : Rule-Group (1 item)					
Selected	Rule ID	Description	Syntax OK	Rule Detail	
☐	RG-001				

Preview

Summary

- General Rule
 - Item Rule
 - IR-001
 - IR-002
 - IR-1002
 - Rule-Group
 - RG-001
 - GR-001

Cancel Save

Use Item Rule Maintenance to link the rule group RG-001 to the Industrial Ultrasound by selecting it. Save it, and the Summary pane will show the link you created.

Rule-Group ID	Item to link this rule to
RG001	01040 (Industrial Ultrasound)

So far we have discussed how we can define general rules, how we can link general rules to items through rule groups and how we can link them to items directly. And we saw how we can define an item-specific rule by converting a general rule.

Item-specific rules can be entered directly — that is, without first entering a general rule and then modifying it. An item-specific rule that is entered directly only exists for that particular item and cannot be used elsewhere.

Exercise 12: Item Rule Maintenance: Create Item Rule

The screenshot shows the 'Item Rule Maintenance' window. At the top, there's a 'Rule ID' field with 'IR-1001' and a 'Copy from Rule' button. Below it is a 'Description' field containing 'DETERMINES IF WE PROMPT FOR COUNTRY'. The 'Rule Detail Edit' section has a dropdown set to 'Conditional'. It contains three rows: 'If' with 'PORTABLE' = 'Yes', 'Then' with 'COUNTRY' = 'N/A', and 'Else' with 'COUNTRY' <> 'N/A'. Each row has edit icons (magnifying glass, up/down arrows, plus, minus, and delete). A 'Switch to Free Format' checkbox is to the right. An 'Update' button is at the bottom right of the edit section. The 'Preview' section shows the rule logic: 'IF: PORTABLE = Yes', 'THEN: COUNTRY = N/A', and 'ELSE: COUNTRY <> N/A'. A 'Check Syntax' button shows 'Status: Passed'. An 'OK' button is at the bottom right.

We now want to add the rules for the various levels of configurable items. Run Item Rule Maintenance to add the item-specific rules listed in the table below. Some of the rules for item 50020 require the use of attributes.

Item	Rule ID	Item-Specific Rule
01040	IR-001	if portable=Yes then country=N.A. else country <> N.A.
01040	IR-002	ASSIGN:model=1
50020	IR-5002	If U-type=Front Display then U-width=160
50020	IR-5003	If painted=Stainless then U-color=N.A.

Note Rules cannot only be used to set values of feature, they can also be used to set defaults and - for numeric features - minimum, maximum, and multiple quantities. We use item rule IR-5001 to set the maximum height of the unit to 120, if the unit type is top display.

Remarks and Exercises on Rule Modes

A rule generally consists of one preposition (IF), one conclusion (THEN), and possibly one alternative (ELSE). These clauses can contain one or more lines and can have different formats: basic, advanced, and free format.

A basic clause looks like this:

```
Variable = option.
```

The rules you entered previously are of this type (all clauses are now in normal mode), for instance:

```
If portable = Yes then country = "N/A" else country <> "N/A"
```

An advanced clause is used to enter slightly more complicated expressions. It looks like this:

```
Variable = expression.
```

Example The THEN clause here is in advanced mode.

```
If housing-type = Single Door Front then housing-length = 0.5 * housing-width + 0.1 * housing-height.
```

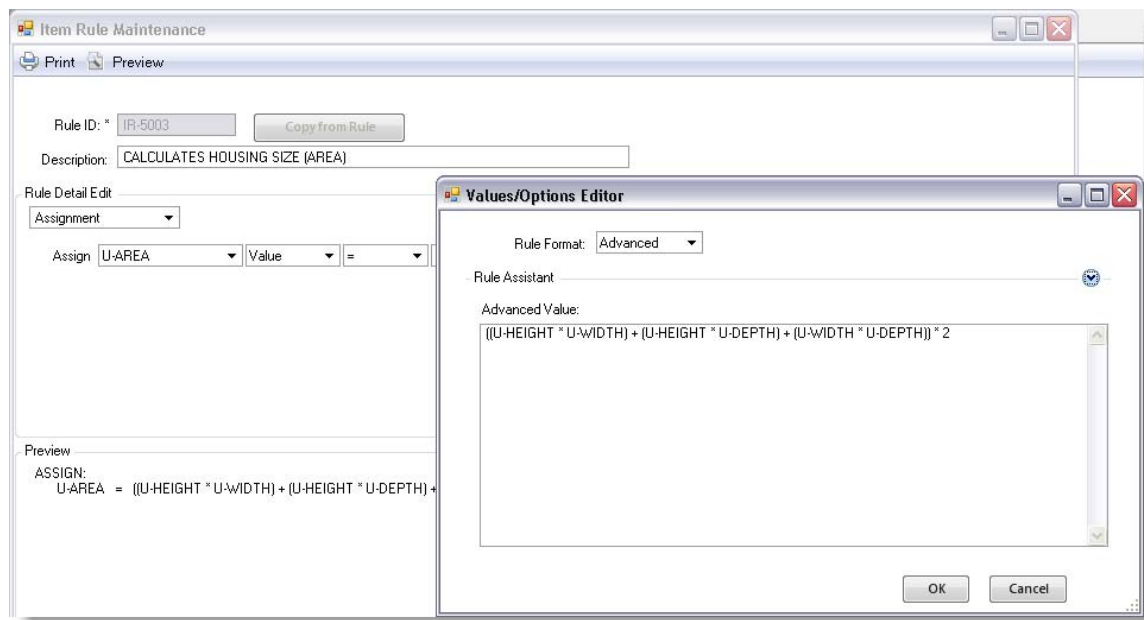
A free format clause can be used to create really complex rules. A clause of this type contains a Boolean expression which is true or false. This rule mode is only available for if-clauses. A rule of the free format type cannot be converted back to another rule format. That is why QAD Configurator will always prompt you to confirm your choice if you select the free format rule mode.

Here is an example:

```
If 0.1 * (U-width * U-depth) > 0.5 * (U-width + U-height) then backup = yes.
```

We will now practice with the different rule modes that are available.

Exercise 13: Item Rule Maintenance: Advanced Mode



When only a Then clause is defined, an assignment rule is created. An assignment rule is executed each time a question is answered in the questionnaire.

We will now run Item Rule Maintenance and enter the rule IR-5004 as defined in the table below. In the Rule Detail Edit frame select Assignment from the list box. Select the feature to be used from the Assign list box (according to the table), then click Values/Options and select the Advanced rule format. You will now have an advanced window in which you can type the remaining part of your then-statement. You can also use the Rule Assistant to enter it.

Item	Rule ID	Item-Specific Rule
50020	IR-5004	U-area = ((U-height * U-width) + (U-height * U-depth) + (U-width * U-depth)) * 2

Notice that this clause is now saved as an assignment rule because it only contains a THEN-clause.

Note In rule IR007 we are converting from cubic centimeters to liters and reducing the volume by 25% to take into consideration the insulation inside the Ultrasound.

Exercise 14: General Rule Maintenance: Free Format Mode

General Rule Maintenance

Action Print Preview Delete Group ULTRA

Rule ID: * GR-002 Copy from Rule

Description: DETERMINES POWER CONVERTER TYPE

Rule Detail Edit

Conditional

If (COUNTRY <> "UNITED KINGDOM") AND (COUNTRY <> "UNITED STATES") AND (COUNTRY <> "AUSTRALIA")

Then POWER Value = SMART

Else POWER Value = STANDARD

Update

Preview

IF:
(COUNTRY <> "UNITED KINGDOM") AND (COUNTRY <> "UNITED STATES") AND (COUNTRY <> "AUSTRALIA")
THEN:
POWER = SMART
ELSE:
POWER = STANDARD

Check Syntax
Status: Not Run

Cancel Save New

Run General Rule Maintenance. Enter the rule that is listed in the table below by selecting Switch to Free Format in the If clause:

Rule ID	If Clause	Then Clause	ELSE Clause
GR002	(country <> "AUSTRALIA") AND country <> "UNITED STATES") AND (country <> "UNITED KINGDOM")	power = Standard	power = Smart

Update the rule and verify your rule using the Check Syntax button.

Now run Rule Group Maintenance and link rule GR-002 to Rule Group RG-001

General Rule ID	Rule Group to link this rule to
GR002	RG-001

Rule Tables

With a rule table you can define rules in a different, sometimes easier way. This can be especially useful in situations where the rules are quite simple, but where there are many different combinations of the options. Just by selecting some variables and filling in a rule table you can let QAD Configurator automatically create a number of IF...THEN... rules for you.

Note Rules containing ELSE clauses cannot be entered by way of a rule table.

Rule tables can be either general or item-specific. Like in the case of separate rules you can define a general rule table and link it to one or more items. If you decide to change such a general rule table, then it is automatically changed for every item to which it is connected. You can also define an item-specific rule table; it can only be maintained for the particular item for which it was created.

QAD Configurator guides you through defining a rule table, according to the following steps:

- 1 Select Condition
- 2 Set Value for Condition
- 3 Select Conclusion
- 4 Set Value for Conclusion

When defining an item-specific rule table you use features instead of variables.

The maximum number of variables in a single rule table is 20. You can have as many condition variables (if) and as many result variables (then) as you want, provided the total does not exceed 20 and provided you have at least one condition and one result variable. A variable is characterized by the combination of its ID, its extent, and its attribute. The variables you choose are shown above the columns of the rule table. The type of clause they are in is indicated as well. Each row in the table represents a rule.

Example The rule:

```
if U-height <= 120 and U-width >80 and U-depth <= 80
then steel-small = 2 and steel-large = 4
```

will be shown as follows:

IF U-height: Value	IF U-width: Value	IF U-length: Value	THEN steel-small: Value	THEN steel-large: Value
:120	[:80]	:80	2	4

Special syntax-rules have been devised for the contents of the cells of the rule tables.

The following entries are possible:

Entry	Meaning
value1	value1
value1 value2 value3	value1 or value2 or value3
value1:value2	>= value1 and <= value2
:value1	<= value1
value1:	>= value1
[value1]	not value1
[value1 value2 value3]	not value1 and not value2 and not value3
[value1:value2]	< value1 or > value2
[:value1]	> value1
[value1:]	< value1
[value1]:value2	> value1 and <= value2
[value1]:[value2]	> value1 and < value2
value1:[value2]	>= value1 and < value2
:[value1]	< value1
[value1]:	> value1
[[value1]:value2]	<= value1 or > value2
[[value1]:[value2]]	<= value1 or >= value2
[value1:[value2]]	< value1 or >= value2
:[value1]]	>= value1
[[value1]:]	<= value1

Entering a list of values and/or using exclusions for a result variable is only possible if all of the following conditions are met:

- The result variable is of the type Text, Numeric List, or Date
- The attribute of the result variable is value.
- In other cases lists and exclusions are generally meaningless and therefore not allowed.

You can move through the cells of a table by using Tab, Shift + Tab, Page Up, Page Down, Up Arrow and Down Arrow on the keyboard.

Note For rule tables there is no equivalent to the concept of rule groups.

Rules in a table can only be built from the variables that appear in the table. However, a rule in a table need not use every variable that is available in the table. This means that a column belonging to a variable can have empty cells for one or more rules (rows) in the table.

General Rule Table Maintenance

Using General Rule Table Maintenance you can define general rule tables. They can be linked to one or more items later on.

Exercise 15: General Rule Table Maintenance — Manual entry

General Rule Table Maintenance

Action Print Preview Delete Group ULTRA

Rule Table: * GRT-5001

Description: USE HEIGHT, WIDTH, DEPTH TO CALCULATE NUMBER OF SHEETS

	IF: U-HEIGHT:Value	IF: U-WIDTH:Value	IF: U-DEPTH:Value	THEN: STEEL-SMALL:Value	THEN: STEEL-LARGE:Value
1	:120	:60	:60	4	0
2	:120	:60	[:60]	2	1
3	:120	[:60]	:60	2	1
4	:120	[:60]	[:60]	1	2
5	[:120]	:60	:60	1	2
6	[:120]	:60	[:60]	1	3
7	[:120]	[:60]	:60	1	3
8	[:120]	[:60]	[:60]	0	4
9					

Interpolation: Disabled
Accelerated: Disabled

Accelerator Modify Cancel Save New

Run General Rule Table Maintenance. Enter the table ID and a description. Now go to Step 1 and select the variables as follows (you can select several condition variables at the same time).

Rule Table	Condition Variables
GR-5001	U-height (value) U-length (value) U-width (value)

Press Next twice to skip Step 2 and go to Step 3. Select the result variables as follows (again, you can select several condition variables at the same time).

Rule Table	Result Variables
GR-5001	steel-small (value) steel-large (value)

Press Finish (the system will tell you that no records have been created automatically) and go to the Rule Table tab.

Now enter these rules in the table:

Row	IF U-height: Value	IF U-width: Value	IF U-depth: Value	THEN steel-small: Value	THEN steel-large: Value
1	[:120]	[:60]	[:60]	0	4
2	[:120]	[:60]	:60	1	3
3	[:120]	:60	[:60]	1	3
4	[:120]	:60	:60	1	2
5	:120	[:60]	[:60]	1	2
6	:120	[:60]	:60	1	1
7	:120	:60	[:60]	2	1
8	:120	:60	:60	4	0

(Row 1 says: If housing-U > 120 and U-width > 60 and U-depth > 60, then steel-small = 0 and steel-large = 4.)

Have a look at the formula by choosing the Preview button on the toolbar. It shows the contents of the selected row, in the form of a complex rule.

Some special keys for navigating through the Table and for doing some simple actions are listed in the following table.

Keyboard Keys	Meaning
Arrow key up	Go one cell up
Arrow key down	Go one cell down
Page Up	Go 12 cells up (if available)
Page Down	Go 12 cells down (if available)
Home	Go to the first row in the rule table
End	Go to the last row in the rule table
Tab	Go one column to the right
Shift+Tab	Go one column to the left
Ctrl+G	Go to the row with the given row number
Ctrl+F	Start the Search and Replace function

Exercise 16: General Rule Table Maintenance: Auto-Generation

General Rule Table Maintenance

Action Print Preview Delete Group ULTRA

Rule Table: * GRT-5001

Description: USE HEIGHT, WIDTH, DEPTH TO CALCULATE NUMBER OF SHEETS

Generation Rule Table

Step 1 - Select Condition Step 2 - Set Value for Condition Step 3 - Select Conclusion Step 4 - Set Value for Conclusion

Available Variables:

- BACKUP
- BACKUP-TYPE
- COUNTRY
- CPU
- FREQ
- ITEM-DESC
- LIST-PRICE
- MODEL
- NET-PRICE
- PAINTED
- PORTABLE
- POWER
- STEEL-LARGE
- STEEL-SMALL

Attributes:

Include Exclude

Selected Variables:

- U-HEIGHT : Value
- U-WIDTH : Value
- U-DEPTH : Value

Action: Add Rows

☐ Interpolation

Cancel Finish Next

General Rule Table Maintenance also enables you to add rows (rules) to a table or to delete rows from a table in an easy way. It is especially useful when the rules you want to add or delete are reflecting most combinations of input (If) and output (Then) criteria.

We will use this capability to enter the following rules in the table: GRT002:

Row	IF country: Value	IF freq: Value	IF CPU: Value	THEN power: Value
1	AUSTRALIA	500 kHz	Standard	Standard
2	AUSTRALIA	10 MHz	High	Smart
3	UNITED KINGDOM	500 kHz	Standard	Standard
4	UNITED KINGDOM	10 MHz	High	Smart
5	UNITED STATES	500 kHz	Standard	Standard
6	UNITED STATES	10 MHz	High	Smart

Run General Rule Table Maintenance. Enter the table ID (GRT002) and a description. Now go to Step 1 and select the variables as follows (you can select several condition variables at the same time).

Rule Table	Condition Variables
GRT002	country (value) freq (value) CPU (value)

Press Next to go to Step 2 and select the following values:

- country is AUSTRALIA, UNITED KINGDOM, or UNITED STATES
- freq is either 500 kHz or 10 MHz
- CPU is either Standard or High Performance

Note The options for variable country are provided by a browse. Click the Add Value button to manually add the required countries.

Press Next to go to Step 3. Select the result variables as follows:

Rule Table	Result Variables
GRT002	power (value)

Press Next to go to Step 4 and select the following values:

Select power is Standard.

Note Because power is a result variable and because you are adding rows, you can only enter one option for power.

Press Finish and the system will then generate all possible combinations of the options you entered and add a rule (row) to the table for every combination it created. It will report the number of rows it has added to the table. Click OK to close this message and move to the Rule Table tab. The table should contain 12 rows.

Now you can manually edit the rules to arrive at the 6 rules specified in the table above. Delete the rules that have been created that you do not need. You will also have to manually change the cells in which power does not have the correct value.

Note When you delete a row, the numbers of the remaining ones will be updated immediately. Therefore, it is better to delete the rows in descending order. To delete a rule (row), position the cursor in the cell containing the row number, click the mouse to select the row, then press the Delete button on the toolbar.

Any rules added automatically to a rule table can be modified manually at any time.

Experiment a little with the different formats of the entries (see the list of possible formats that was given earlier). To enter something in a cell you can type it directly in the cell, or select it from the option list you can switch on using the Options icon on the toolbar. You can enter the straight brackets by hand or click the Exclusion check box in the option list. You also can create lists by highlighting more than one option in the option list. Other special symbols need to be typed by hand.

We will not link this general rule table to any item.

Item Rule Table Maintenance

Apart from the general rule tables (which are characterized by the fact that you only need to enter/modify them once), you can also create item-specific rule tables, which can only be maintained for the item for which they were created. An item-specific rule table is either a modified general rule table or a completely new rule table that is entered only for a particular item.

The Item Rule Table Maintenance window looks very much like that of Item Rule Maintenance. The available general rule tables are shown in a list and you can link them to the current item by selecting them and clicking the check box. To copy a general rule table, you must highlight it, and select the Copy button on the toolbar. This will create a copy that will then be shown in the Specific section in the Summary pane.

You can also create an item-specific rule table directly. To do so, you enter the new table in the same way as when you used General Rule Table Maintenance.

Exercise 17: Item Rule Table Maintenance

Item Rule Table Maintenance X

Action Print Preview Delete Group ULTRA

Configurable Item: 01040 Description: Industrial Ultrasound

Rule Table Type : General (1 item)

Selected	Rule Table	Description
☒	GRT-5001	USE HEIGHT, WIDTH, DEPTH TO CALCULATE NUMBER OF SHEETS

Preview

```

1 if U-HEIGHT:value = :120 and
  U-WIDTH:value = :60 and
  U-DEPTH:value = :60
  then STEEL-SMALL:value = 4
  STEEL-LARGE:value = 0
2 if U-HEIGHT:value = :120 and
  U-WIDTH:value = :60 and
  U-DEPTH:value = :60
  then STEEL-SMALL:value = 2
  STEEL-LARGE:value = 1
  
```

Summary

- General
- Specific

Cancel Save

Run Item Rule Table Maintenance and link the general rule table you created (GRT-5001) to item C50020:

Rule Table	Item to link the table to
GRT-5001	50020

Configuration Key Maintenance

If you want the system to check whether or not a certain configuration has been defined before, you should use Configuration Key Maintenance first in order to specify which features uniquely identify a configuration. The system will then automatically match every new configuration with the existing ones based on the configuration key. If it finds one or more existing configurations that match the one you defined, QAD Configurator will suggest you use an existing one instead of creating a new one that is identical to it. This is done in order to make sure that the item database does not grow unnecessarily. QAD Configurator will create a configuration for every variant of a configurable item. That means that when you have a multi-level generic product structure, the system will create a configuration for every variant item. That is also why you have to define configuration keys for each configurable item in the generic product structure.

Now suppose that after some time you would like to change the configuration key you defined earlier. Since the configuration key is stored with each configuration, every configuration that was created while the old configuration key was still valid will need to be updated so that QAD Configurator can check whether or not these existing configurations match the new configuration key. The system automatically updates the configuration key of existing configurations when a record is saved in Configuration Key Maintenance.

Exercise 18: Configuration Key Maintenance

Configuration Key Maintenance

Action Print Preview Delete Group ULTRA

Configurable Item * 01040 Description Industrial Ultrasound

Features

ITEM-DESC
LIST-PRICE
MODEL
NET-PRICE

Configuration Key

BACKUP
BACKUP-TYPE
COUNTRY
CPU
FREQ
PORTABLE
POWER
U-COVER
U-OUTPUT

Include
Include All
Exclude
Exclude All

Run Configuration Key Maintenance. Select the Industrial Ultrasound (item 01040) and create a configuration key consisting of the features that are shown in the following table. Repeat this procedure for the lower level configurable item 50020

Item	Configuration Key
01040	backup backup-type country CPU freq portable power U-cover U-output
50020	painted U-type

To specify configuration keys for a configurable item:

- 1 Specify a configurable item in the Configurable Item field.
- 2 To set a feature as a configuration key, select it in the Features list box and click Include to move it to the Configuration Keys list box. Click Include All to set all available features as configuration keys.
To remove a configuration key, select it in the Configuration list box and click Exclude to move it to the Feature list box. Click Exclude All to remove all configuration keys.
- 3 Click Save.

Product Configuration

In this chapter we will define how the system should translate the answers to the questions in the questionnaire into actual product structures and routings for the new configurations.

Within these exercises we start with the product configuration rules and then we analyze the model to ensure there are no inconsistencies in the rules we have entered.

Product Configuration Rules

This set of rules lets you define how the variant item, variant product structure, and variant routing are generated. Product configuration rules define the relationships between the answers to the questions in the questionnaire and the component items to be selected from the generic product structure, as well as the operations to be selected from the generic routing.

Variant Item Number Rule Maintenance

Use Variant Item Number Rule Maintenance to define how QAD Configurator assigns item numbers to new variant items. You do this by defining definition rules for each configurable item from which you intend to create variant items. It is compulsory to enter variant item number definitions for all configurable items in your model. If one or more definitions are missing, QAD Configurator cannot store the configuration correctly and will not continue generating the variant until you have entered all necessary definitions (Configuration Analyzer will terminate with an error).

Exercise 19: Variant Item Number Rule Maintenance

Variant Item Number Rule Maint

Action | Print | Preview | Delete | Group: ULTRA

Configurable Item: * 01040 Description: Industrial Ultrasound

Function: ☒ Item ☐ Sales Quote ☐ Sales Order [Copy Rules](#)

Rule Detail

Variant Item Number Format: 01040-999

Element: Fixed [Add](#)

Element	Input	Multiplier	From	To	Length	
Current Configurabl	01040		1	5	5	
Character	-				1	
Numeric Sequence	1	1			3	

[Cancel](#) [Save](#)

Run Variant Item Number Rule Maintenance and define the following variant item number definition for the configurable items 01040, C-S320, and C-S410. Select Function equals Item.

Element	Input	Multiplier	From	To	Length
Current Configurable Item			1	5	5
Character	-				
Numeric Sequence	1	1			3

Variant Item Data Rule Maintenance

Use Variant Item Data Rule Maintenance to assign values to fields in the QAD Enterprise Applications Item Master table (pt_mstr) for the new variant items.

Exercise 20: Variant Item Data Rules Maintenance

Variant Item Data Rule Maint

Action Print Preview Delete Group ULTRA

Configurable Item: * 01040 Description: Industrial Ultrasound

Field: * pt_desc2 Label: Description

Rule Assistant

Assignment Rule: * SUBSTRING(U-TYPE,1,5) + "" + SUBSTRING(FREQ,1,6) + "" + SUBSTRING(CPU,1,8)

Check Syntax

Status:Passed

Run Variant Item Data Rule Maintenance and enter the following information to tell the system that it must concatenate the first two characters of the variables temprange, coolperform, housing-type, stainless-steel and the variable volume and store the resulting value in the pt_desc2 field of configurable item 01040.

Configurable Item	Field	Assignment Rule
01040	pt_desc2	SUBSTRING(U-type,1,5) + "" + SUBSTRING(freq,1,6) + "" + SUBSTRING(CPU,1,8)

General Product Structure Rule Maintenance

Use General Product Structure Rule Maintenance to define general selection rules for selecting components into variant product structures that are not specific to configurable items. This means that a certain component will always be selected when the conditions in the selection rules are met, regardless of the configurable item for which you are configuring a variant.

Exercise 21: General Product Structure Rule Maintenance

General Prod Struct Rule Maint

Action Print Preview Delete Group ULTRA

Component: * 50001 Description: Probe Unit - 10 Mhz

Rule Assistant

Selection Rule: freq="10MHz"

Check Syntax

Status:Passed

Run General Product Structure Rule Maintenance and enter the selection rules that are listed in the table below. They state that component 50001 should be selected whenever the frequency is 10 MHz and that component 50002 should be selected whenever the frequency is 500 kHz, as well as that component 60050 should be selected whenever a standard CPU is required and that component 60052 should be selected whenever a high performance CPU is required.

Component	Description	Selection Rule
50001	Probe Unit - 10 MHz	Freq = "10 MHz"
50002	Probe Unit - 500 kHz	Freq = "500 kHz"
60050	Base Unit / CPU	CPU = "Standard"
60052	High Performance CPU	CPU = "High"

Note If required you can use the Rule Assistant to enter the selection rule.

Variant Product Structure Rule Maintenance

Use Variant Product Structure Rule Maintenance to define selection and assignment rules for component items in the generic product structure of a configurable item. If no selection rule has been defined for a component in the generic product structure, the component will always be selected into the variant product structure, unless its parent item is excluded from the variant product structure by its selection rules.

Exercise 22: Variant Product Structure Rule Maintenance

The screenshot shows the 'Variant Prod Struct Rule Maint' window. At the top, there's a toolbar with 'Action', 'Print', 'Preview', and 'Delete' buttons, along with a 'Group' dropdown set to 'ULTRA'. Below the toolbar, the 'Configurable Item' is '01040' and the 'Description' is 'Industrial Ultrasound'. The 'Levels' dropdown is set to '2[All]'. A table lists components with columns: Component Item, Description, UOM, Qty Per, Reference, Start Date, End Date, Phantom, P/M, Pricing, and Selection Rule. Component 50001, 'Probe Unit - 10 Mhz', is selected. Below the table, the 'Selection Rule' tab is active, showing the 'Rule Assistant' section with 'Use General Product Structure Rule' checked. The rule text is 'freq="10MHz"'. On the right, there are buttons for 'Syntax Check', 'Status: Passed', 'Copy From General Rule', and 'Copy to General Rule'. At the bottom are 'Cancel' and 'Save' buttons.

Component Item	Description	UOM	Qty Per	Reference	Start Date	End Date	Phantom	P/M	Pricing	Selection Rule
01040	Industrial Ultrasound	EA	1					M	☐	
02003	Standard Connector	EA	2					M	☐	
50001	Probe Unit - 10 Mhz	EA	1					M	☒	freq="10MHz"
50002	Probe Unit - 500 kHz	EA	1					M	☐	freq="500KHz"
50020	Industrial Housing	EA	1					M	☐	
60060	White Paint	GA	1					P	☐	painted="painted" and u-c
60061	Black Paint	GA	1					P	☐	painted="painted" and u-c
60062	Paint, Other	GA	1					P	☐	painted="painted" and u-c
60090	Small Sheet Steel 80x120	EA	1					P	☐	painted="painted" and steel
60091	Large Sheet Steel 160 x 2	EA	1					P	☐	painted="painted" and steel
60093	Stainless Steel Sheet	EA	1					P	☐	painted="stainless"

Run Variant Product Structure Rule Maintenance and select configurable item 01040. Clicking on a certain component will show you the Selection Rule tab in the lower part of the screen, where you can enter the rule that specifies when that component is selected.

In the Assignment Rule tab in the lower part of the screen you can assign values to all fields in QAD Enterprise Applications Product Structure Master table (ps_mstr). You can view all field names by using the Insert/Update button and then clicking on the browse.

If you do not specify a selection rule, the component item will always be selected. If you do not specify any assignment rules, the system will copy the values from the generic product structure into the variant product structure.

We will now add the first selection rule step by step. This is what we will enter:

Configurable	Component	Description	Selection Rule
01040	60080	Power cord, UK	Portable = No and country = "UNITED KINGDOM"

This rule says: if the questionnaire is run for configurable item 01040 then select component item 60080 into the product structure of the variant item if the answer to the Country question equals “UNITED KINGDOM” And if it is no portable device. Otherwise do not select item 60080 into the variant product structure.

Enter this rule by following these steps:

- 1 Run Variant Product Structure Rule Maintenance.
- 2 Enter the parent configurable item 01040, and select Level 2(All).
- 3 Click component item 60080.
- 4 Position the cursor in the Selection Rule field in the Selection Rule tab.
- 5 Now type: portable = No and country= “UNITED KINGDOM” or use the Rule Assistant to enter this expression.
- 6 Click the Check Syntax button.
- 7 If the rule is not correctly entered, solve the problems.
- 8 Click the Save button.

Now add the following selection rules as well. Try to understand why they are specified this way. Notice that the configurable item 50020 will always be selected, since it does not have a selection rule. Similarly, components 02003, 60001, 60003, 60020 and 90093 will always be selected.

Note Leave the Use General Product Structure Rule check box unchecked.

Do not enter anything for the other components. These items will always be selected.

Configurable Item	Component	Description	Selection Rule
01040	60005	Battery	portable = Yes
	60008	Printer	U-output = Yes
	60015	Keyboard Cover	U-cover = Yes
	60080	Power Cord - UK	Portable = No and country = “UNITED KINGDOM”
	60081	Power Cord - Australia	Portable = No and country = “AUSTRALIA”
	60082	Power Cord - USA	Portable = No and country = “UNITED STATES”
	60083	Power Cord - Universal	Portable = No and country <> “UNITED KINGDOM” AND country <> “AUSTRALIA” AND country <> “UNITED STATES”
	60021	Battery Backup, Alkaline	backup-type = “Alkaline”
	60023	Battery Backup, NiCd	backup-type = “NiCd”
	60022	Battery Backup, Lithium	backup-type = “Lithium”
	60088	Power Converter - Standard	Power = “Standard”
	C-S820	Power Converter - Smart	Power = “Smart”
50020	60060	White Paint	Painted = “painted” and u-color = “white”
	60061	Black Paint	Painted = “painted” and u-color= “black”

Configurable Item	Component	Description	Selection Rule
	60062	Paint, Other	Painted = "painted" and u-color <> "white" and u-color <> "black"
	60090	Small Sheet Steel, 80x120 cm	Painted = "painted" and steel-small > 0
	60091	Large Sheet Steel, 160x200 cm	Painted = "painted" and steel-large > 0
	60093	Stainless Steel Sheet, 80x120 cm	Painted = "stainless"
	60093	Stainless Steel Sheet, 160*200 cm	Painted = "stainless"

Now go back to configurable item 01040 and make sure the following selection rules are added.

Note These components use General Product Structure Rules.

Configurable Item	Component	Description	Selection Rule
01040	50001	Probe Unit - 10 MHz	freq = "10MHz"
	50002	Probe Unit - 500kHz	freq = "500kHz"
	60050	Base Unit / CPU	CPU = "Standard"
	50052	High Performance CPU	CPU = "High"

Now enter the following assignment rule for component item 60089:

Configurable Item	Component	Field	Assignment Rule
01040	60089	ps_rmks	"This ultrasound unit requires a small power converter. Include instructions."

Now go back to configurable item 50020 and enter the following assignment rules as specified in the table below:

Configurable Item	Component	Field	Assignment Rule
50020	60060	ps_qty_per	ps_qty_per * U-area / 100000
	600601	ps_qty_per	ps_qty_per * U-area / 100000
	60062	ps_qty_per	ps_qty_per * U-area / 100000
	60062	Ps_rmks	"Customer has specified non-standard color - check order for details"
	60090	ps_qty_per	steel-small
	60091	ps_qty_per	steel-large

Variant Routing Rule Maintenance

Use Variant Routing Rule Maintenance to define selection and assignment rules for operations in the generic routing. If no selection rule has been defined for an operation in the generic routing, the operation will always be selected into the variant product structure.

Exercise 23: Variant Routing Rule Maintenance

Variant Routing Rule Maint

Action Print Preview Delete Group ULTRA

Configurable Item: 01040 Description: Industrial Ultrasound

Operation	Description	Machine	Start Effective	Selection Rule	Assignment Rule
10	ASSEMBLE COMPONENTS	1001			Yes
20	TEST FINISHED UNIT	1001			
30	PACK FOR SHIPPING	1001			

Selection Rule Assignment Rule

Rule Assistant

Selection Rule:

Check Syntax

Status: Passed

Run Variant Routing Rule Maintenance and select configurable item 01040.

The system now lists all the operations in the item's generic routing. Again, this screen has two parts: Selection Rule and Assignment Rule. In the former you define when a certain operation is to be selected. In the latter you can assign values to all fields in QAD Enterprise Applications Routing Operation Detail table (ro_det). You can see all the available fields by using the Insert/Update button and then clicking on the browse.

If you do not enter a Selection Rule, the operation will always be selected. If you leave the Assignment Rule empty, the system will copy the values from the generic routing into the variant routing.

Now add the Selection and Assignment Rules for the configurable items 01040 and 50020 as listed in the table. The first Assignment Rule says: if backup is yes then the runtime for operation 10 is the current runtime of the configurable operation 10 plus 0.15 hour; in every other case the runtime is the current runtime of the configurable operation 10. The second Assignment Rule says: if unit depth, width and height exceed 80, 80 and 120 respectively, then the runtime for operation 10 is 1.5 hour; in other cases it is 1 hour. The third assignment rule updates the operation description of operation 20 with the color of the paint to use.

Configurable Item	Operation	Selection Rule	Field	Assignment Rule
01040	10		ro_run	if backup = yes then (ro_run + 0.15) else ro_run
C-S320	10		ro_run	if u-height>120 and u-width>80 and u-depth>80 then 1.5 else 1
	20	painted <> "stainless"	ro_desc	"Paint" + u-color

Notice that the operations for 01040 are always selected. The same is true for operation 10, 30 and 40 of item 50020. Operation 20 for item 50020 is only selected if bee stainless steel has not been selected.

Exercise 24: Variant Routing Maintenance

Features can also be used to populate comments in the variant routing. Those comments can provide additional instructions and information to the personnel operating the assembly line.

Use Routing Maintenance (14.13.1) in the Manufacturing module to enter the following comment for Routing Code 50020 and Operation 10. Enter Yes in the Comment field of this operation and then add the following comments:

Please Note:

The depth of the housing is: [U-depth]

The width of the housing is: [U-width]

The height of the housing is: [U-height]

When the variant routing is created, QAD Configurator replaces the placeholders with the actual value of the feature.

Element Roll-Up Rule Maintenance

Using the element roll-up rules it is possible to calculate (roll-up) non-cost related data elements in a variant product structure/routing created by the questionnaire. Because QAD Enterprise Applications contains a special routine to roll up costs, Element Roll-up Rule Maintenance is not designed to roll up cost element related data.

The roll-up can be composed of:

- Item data (pt_mstr)
- Operation data (opm_mstr)
- Product structure data (ps_mstr)
- Routing data (ro_det)

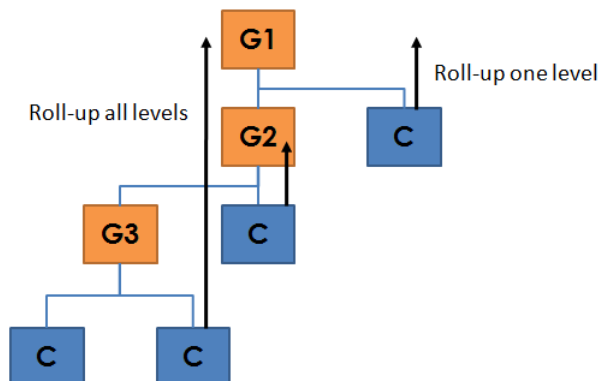
Some examples of data that can be rolled up are: runtimes, selling prices, weights, numbers and sizes.

Roll-up rules can be executed one level up or all levels up and can consist of:

- Simple expressions containing a single element; for example: roll up pt_mfg_lead, which rolls up the production lead time of all components
- Complex expressions containing calculations; for example: roll up (component: pt_abc_qty / master: pt_dec01) * ps_qty_per

When rolling up data through all levels of the variant product structure, QAD Configurator will not store intermediate results in lower level configurable items. Only the total will be stored with the variant item.

The next diagram shows examples of a one level roll-up (to the nearest parent item) and an all-level roll-up (to the uppermost parent item) for a variant product structure. A variant routing is handled similarly.



Exercise 25: Element Roll-up Rule Maintenance

Run Element Roll-Up Rule Maintenance and enter the rule as listed in the table. It says that the net weights of all components (taking into account their quantities in the product structure) are to be rolled up into the net weight of the end product (the new variant item).

Use Element Rule Roll-Up Maintenance to create the following element roll-up rule for item 01040 and 50020:

Field	Entry
Master Element	pt_net_wt
Take Product Structure Qty's into Account	Yes
Rule Type	Basic
Roll-Up Type	Product Structure
Roll-Up Data	Item
Roll-Up Element	pt_net_wt

Configuration Analyzer/Cross Validation Analyzer

Before we can run the questionnaire to start the configuration process, we must check the sales configuration rules we have entered in order to identify any inconsistencies. The Configuration Analyzer will perform this task for us. It will also include all features and rules in the building up of the sequence of questions in the questionnaire.

The Cross Validation Analyzer does the same validation on the product configuration rules and also matches all product configuration definitions and rules with the features and rules in sales configuration. This analyzer detects any discrepancies between the two modules and produces a report.

Exercise 26: Configuration Analyzer and Cross Validation Analyzer

The screenshot shows the Configuration Analyzer application window. The 'Analyze Report' sub-window is open, displaying the following report:

```

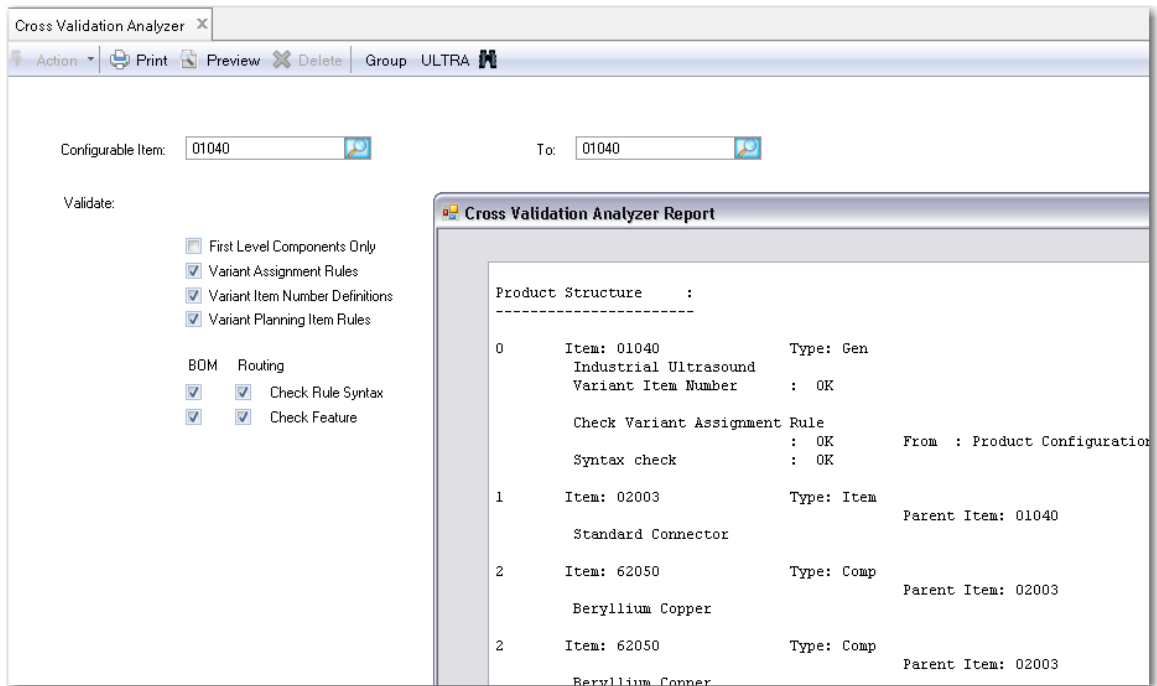
19:21:15 Start Analysing...

-----
Analyse. Item: 50020
-----

```

Low Level Code	Feature	Feature	Seq.
0	PAINTED	[1] U-COLOR	6
0	U-TYPE	[1] U-DEPTH	7
0	U-TYPE	[1] U-HEIGHT	8
0	U-TYPE	[1] U-WIDTH	10
0	U-COVER	[0]	999999
1	U-WIDTH	[1] STEEL-LARGE	3
1	U-DEPTH	[1] STEEL-LARGE	3
1	U-HEIGHT	[1] STEEL-LARGE	3
1	U-WIDTH	[1] STEEL-SMALL	4
1	U-HEIGHT	[1] STEEL-SMALL	4
1	U-DEPTH	[1] STEEL-SMALL	4
1	U-HEIGHT	[1] U-AREA	5
1	U-DEPTH	[1] U-AREA	5
1	U-WIDTH	[1] U-AREA	5
1	U-COLOR	[0]	999999
2	U-AREA	[0]	999999
2	STEEL-SMALL	[0]	999999
2	STEEL-LARGE	[0]	999999

The bottom status bar shows 'JSD] > 11' and 'QN (1) > 11' on the left, and 'ds Division' and 'NETHER' on the right.



Run the Configuration Analyzer for the Industrial Ultrasound now. Review the report to ensure no errors occurred (in case of errors, please verify your setup, following the suggestions of the report).

Run the Cross Validation Analyzer for the Industrial Ultrasound as well. Leave all check boxes the way they are. Review the resulting report and solve the inconsistencies, if any.

Configurator Questionnaire

In this chapter we will practice with the questionnaire. There are two ways you can launch the questionnaire.

- Use Configurator Questionnaire.
- Select a configurable item in the order line in Sales Order Maintenance (7.1.1) or Sales Quote Maintenance (7.12.1) in the Sales Order/Invoices module. The Questionnaire window is automatically launched. Selecting a variant item in the order line does not trigger the product configuration process.

The process of configuring a variant item consists of three phases:

- You answer the questions in the questionnaire.
- QAD Configurator stores these answers as a configuration in the QAD Configurator database.
- QAD Configurator creates a variant item, variant product structure and/or a variant routing and stores it in the QAD Enterprise Applications database.

The questionnaire coordinates the whole process.

Questionnaire Sequence Maintenance

The sequence in which questions are presented in the questionnaire is determined by the Configuration Analyzer. Questionnaire Sequence Maintenance lets you manually rearrange the questions.

Exercise 27: Questionnaire Sequence Maintenance

Feature	Data Type	Question Type	Description
U-OUTPUT	Logical	NORMAL	ADDS A PRINTER TO THE UNIT
U-COVER	Logical	NORMAL	ADDS A KEYBOARD COVER
BACKUP	Logical	NORMAL	ADDS AN EMERGENCY BATTERY BACKUP
BACKUP-TYPE	Text	NORMAL	SPECIFIES TYE TYPE OF BATTERY BACKUP

Run Questionnaire Sequence Maintenance. Select configurable item 01040 and use the buttons on the toolbar to define the order in which you want the features to be displayed and save your changes.

Exercise 28: Configurator Questionnaire

Run Configuration Questionnaire. Select the Industrial Ultrasound (01040), leave the Customer field blank and click the OK button. QAD Configurator will now present a list of Configuration IDs of previously created configurations, along with their variant item number (if available) and some other characteristics. If there are no existing configurations, the list is empty.

Configuration Questionnaire X

QAD Configurator [ULTRA] Customer: Item: 01040

Existing Configuration | Configure Item | Configuration Summary

 [New Configuration](#)

Search: Select criteria... Select operator... To

All existing configurations for Item 01040

Configuration ID	00000318 	00000253 	00000250 	00000247 
Variant Item	01040-004	01040-003	01040-002	01040-001
Customer	22C1002	22C1002	10C1005	10C1005
Status	F	F	F	F
List Price (USD)	8,314.00	8,071.00	7,605.00	7,669.00
Net Price (USD)	8,314.00	8,071.00	7,605.00	7,669.00
Create date	01/12/11	01/06/11	01/06/11	01/06/11
User ID	qmi	qmi	qmi	qmi
Description				
FREQUENCY	10 MHZ	500 KHZ	10 MHZ	500 KHZ
CPU	HIGH	HIGH	STANDARD	STANDARD
PORTABLE	Yes	Yes	Yes	Yes
DISPLAY TYPE	TOP DISPLAY	FRONT DISPLAY	TOP DISPLAY	TOP DISPLAY
PAINTED	PAINTED	PAINTED	PAINTED	PAINTED
LENGTH	100	100	100	100
HEIGHT	120	80	80	120
WIDTH	80	160	100	80
PRINTER	Yes	Yes	No	Yes
KEYBOARD COVER	Yes	Yes	No	Yes
BATTERY BACKUP	Yes	Yes	No	Yes
BACKUP TYPE	Δ1 K&I INF	I ITHIIM	N Δ	Δ1 K&I INF

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Choose New Configuration to indicate that you want to create a completely new configuration. The window you are looking at now contains the actual questionnaire. The left section of the screen displays the questions specified using the programs in the Sales Configuration menu. On the right side you can see a summary panel.

Configuration Questionnaire X

QAD Configurator [ULTRA] Customer: Item: 01040

Existing Configuration | **Configure Item** | Configuration Summary

TECHNICAL SPECS | STYLE AND SIZE | ACCESSORIES

FREQUENCY UM:EA

- ☒ 500 KHZ [945.00 UM:EA]
- ☐ 10 MHZ [1,320.00 UM:EA]

CPU UM:EA

- ☐ STANDARD [1,460.00 UM:EA]
- ☒ HIGH [1,730.00 UM:EA]

PORTABLE UM:EA

- ☒ Yes [255.00 UM:EA]
- ☐ No

Summary >>

Configuration ID: 00000319
Net Price: 7,245.00(USD)

TECHNICAL SPECS

FREQUENCY	500 KHZ
CPU	HIGH
PORTABLE	Not answered

STYLE AND SIZE +

ACCESSORIES +

Reset | Answer All | Edit Comment | View Summary | Cancel

If you defined some variables (features) as background or temporary variables, you can keep these from being displayed in the questionnaire. To customize the questionnaire, click the Customize icon next to the message bar in the Configure Item screen. You can customize the questionnaire settings to display temporary and background questions as well, and show questions in the long question format.

To automatically answer the questionnaire, click the Answer All button to answer all the questions using their default options. For questions with no default answers, the first option will be used. Errors occur when you provide an invalid value for an answer or when your answer violates option dependency rules. When this happens, an alert icon appears next to the question and the message bar displays relevant error messages. You must fix all errors to successfully complete the questionnaire.

Now create a new configuration by answering the questions. Note how the answer to one question can affect the list of feasible answers to other questions.

When you have answered all questions click the View Summary button. The Configuration Summary screen lets you review the answers you have provided so far, save your configuration, and view similar configurations, and finally create and order a variant item based on your configuration.

All existing configurations for Item 01040

Configuration ID	00000318	00000318			
Variant Item		01040-004 			
Customer	22C1002				
Status	F	F			
List Price (USD)	8,314.00	8,314.00			
Net Price (USD)	8,314.00	8,314.00			
Create date	01/12/11				
User ID	qmi				
Description					
ITEM-DESC	Industrial Ultraso...	Industrial Ultraso...			
FREQ	10MHZ	10MHZ			
CPU	HIGH	HIGH			
POWER	SMART	SMART			

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Cancel

To submit your completed configuration, click the Save Configuration button at the bottom of the Configuration Summary screen. A new configuration record is created with a new configuration ID.

Note Different combinations of configuration-selection, auto-select, and configuration-retention values in Configurable Item Maintenance determine how the system behaves when a configuration is saved and how variant items are created.

Your current configuration is displayed on the left of the Existing Configurations screen with all the configurable item questions and the answers you have provided.

Create a new variant from your new configuration by clicking the “C” icon on the Variant Item row.

Exercise 29: Verifying the structure of the Variant Item

We will now check whether or not the data resulting from the configuration process has been stored correctly in the QAD Enterprise Applications database.

Run Product Structure Inquiry (13.6) in the Manufacturing module.

Enter the item number of the created variant of the Industrial Ultrasound (01040) and verify that the correct items have been selected from the generic product structure by comparing the items to the answers and the selection rules that you entered in the exercises on product configuration rules. Also verify that the weights have been rolled up in the new item master, according to the exercise on Element Roll-Up Rule Maintenance.

Run Routing Maintenance (14.13.1) in the Manufacturing module to check that the system has selected the correct operations. Also check that the routing comments have been updated for the variant of item 50010.

Exercise 30: Starting the Questionnaire from Sales Order Maintenance

Run Sales Order Maintenance (7.1.1) in the Sales Orders/Invoices module. Enter a new sales order for your selected customer. When you get to the sales order line, enter 01040 in the Item Number field. The system will automatically launch the questionnaire.

Exercise 31: Examining the Questionnaire

Run Configuration Questionnaire. Enter item number 01040 but leave the Customer field blank. Click OK. Choose New Configuration to indicate that you want to create a completely new configuration. You will now see the actual questionnaire. By answering the questions in the list you in fact define the characteristics of the product you need. We will now examine this list and discuss its characteristics.

Note The exact characteristics depend on the set of exercises you went through. If you skipped some of them, the questionnaire can look different to the one discussed here.

The questionnaire has the following characteristics:

- The current group (Master Group Maintenance) and the item for which the questionnaire is run are shown in the title bar of the screen. So is the customer when the questionnaire is launched from Sales Order Maintenance or Sales Quote Maintenance.
- Although the questionnaire is run for item 01040, it also shows the questions associated with the features of item 50020. This is because the questions of all lower level configurable items are always collected at the level of the item for which the questionnaire is run.
- The questions are ordered according to the feature sequence you specified. However, due to dependencies resulting from the rules you entered, the system may have changed this original order.
- The questions display on the Technical Specs, Style and Size and Accessories tabs. The tabs correspond to the functional groups assigned to the features. Features that do not have an assigned functional group display on the No Group tab.
- Place the cursor over the Question icon to display the rules that apply to a feature.
- Click the Customize icon next to the message bar in the Configure Item screen. You can customize the questionnaire settings to display temporary and background questions as well, and show questions in the long question format. When you deselect the check box Show Background Questions, some questions will disappear (power-converter). The remaining ones are the foreground questions (the ones that have question type Normal); those that have disappeared are the background questions (question type is Special). When you select the check box again they will reappear.
- The variable housing-area is a temporary variable. This means that its value cannot be manipulated. A temporary variable should get its value from a rule. If there is no specific rule available the system will use the default value as the answer to the associated question. You can use this kind of variable to let the system calculate a value in the background that you want

to have available when you are running the questionnaire. To display temporary variables in the questionnaire you must select the Show Temporary Questions check box in the Customize window.

Exercise 32: Show Existing Configurations Option

The screenshot shows the 'Configurable Item Maintenance' window. The 'Configurable Item' is '01040' with a description of 'Industrial Ultrasound'. The 'SO Type' is 'BOM'. The 'Configuration Creation Rule' section includes 'Variant P/M: M', 'Configurable P/M: M', 'Configuration Selection: Select Last Matching', 'Configuration Retention: No Duplicates', 'Variant Item-Site Record: None', and 'Site Variable'. The 'Configurator Questionnaire' section shows 'Show Existing Configurations: Second'. The 'Cost' section has 'Variant Item Cost Roll-Up' checked and 'Cost Set: Standard'. The 'Pricing' section has 'Calculate Configuration Price', 'Create a Price List', 'Allow Net Price Change', 'Allow Manual Price List Change', and 'Store All Pricing Information' checked. The 'List Price Variable' is 'LIST-PRICE' and the 'Net Price Variable' is 'NET-PRICE'. The 'Language' and 'Comment' fields are at the bottom, along with 'Cancel', 'Save', and 'New' buttons.

You can customize the configuration process using the Show Existing Configurations option in Configurable Item Maintenance. Its value determines whether and how the Existing Configurations screen is displayed in the questionnaire. The following options are available:

- First: Display existing configurations on launching the questionnaire.
- Second: Display the new configuration on launching the questionnaire.
- On request: When launching the questionnaire, display a message asking the user whether to show existing configurations.
- No: Hide the Existing Configurations tab in the questionnaire.

Experiment with this feature and select your preferred value.

Pricing

In this chapter we will look at the QAD Configurator pricing functionality. The pricing functionality calculates the price of a configuration while you are defining that configuration in the questionnaire. This lets you base the answers that you give on the price of the configuration as it is at that moment.

In many situations the price of a configuration is equal to the sum of the prices of its components. Now suppose that each component is only chosen if a certain option is selected as an answer (a one-to-one relationship between the options and the components). Instead of assigning a price to a component, an alternative approach is to assign a price to the associated option and sum the prices of the options. This is the method QAD Configurator uses.

To assign a price to an option you must define a pricing part for that option. QAD Configurator will use the price and price lists (if any) of this pricing part to find the best net price and the best list price of the feature option. Any item can serve as a pricing part. QAD Configurator uses the standard QAD Enterprise Applications “best pricing” engine to determine the best list and net price of a pricing part.

If there is a one-to-one relationship between the options and the components, then all QAD Configurator has to do is sum the prices assigned to the selected options. But if selecting a certain option leads to selecting more than one unit of a component, then you want to incorporate the price of this component that same number of times in the price of the configuration. How you can do this depends on the type of the feature to which the option belongs.

For numeric and numeric list features you can tell QAD Configurator to interpret the value of this feature as the number of units of the component. You do this by selecting the Quantity Based check box in Variable Maintenance or Feature Maintenance. If you do not select this check box QAD Configurator will act as if only one unit of the component is added to the configuration.

For all other types of features the Quantity Based check box is not available. In these cases you can use a pricing rule. This is a special type of rule in which the pricing quantity (pricing_qty) attribute of the feature is set. QAD Configurator interprets the value of this attribute as the number of units of the component. If you do not define a pricing rule a quantity of 1 is used.

The general case shown so far can be extended very easily. To see that the pricing functionality offers many more possibilities for defining the price of a configuration, you should realize that:

- The pricing part of an option does not have to be the component that is selected if you choose that option. This means you can assign any price you want to an option by specifying a dummy item and using that item as a pricing part for the option.

- If a pricing part is not the component that is selected when you choose an option, then the number of units is not the number of units of the actual component, but the number of units of the item that serves as the pricing part. In fact, the pricing quantity is only used to help you find a price in a price list and thus it does not even have to refer to a number of units that is selected in the variant product structure. This means that you can force the price of a configuration to go up when a certain option is selected, even if you do not want the choice to result in the selection of a component.
- If one or more components are always selected (independent of the answers given) then you can define a separate price or separate price lists containing the total price of this collection of items and link these to a dummy item. Then you can use this dummy item as a pricing part and make sure that its price is always incorporated in the price of the configuration, for instance by having a rule that makes sure that the relevant option of this (dummy) feature is always selected.
- If choosing a certain option means that more than one different component is selected, then you can create a new price or new price lists containing the prices of the relevant collection of components and link these to the pricing part that you associate with the option.

Apart from a pricing part and a pricing quantity, you also need to provide a pricing unit of measure to the engine that calculates the best prices. The pricing quantity of a pricing part associated with an option is always expressed in terms of the pricing unit of measure you enter in QAD Configurator. For example, if the unit of measure of an item or a price list is grams and the unit of measure as entered in QAD Configurator is kilograms, then a pricing quantity of 2 in the questionnaire means a quantity of 2 kilograms. As QAD Configurator calls the standard QAD Enterprise Applications “best pricing” engine, the alternate unit of measure, the conversion factor and the prices and price lists for the original unit of measure are used in the normal way to calculate the price of 2 kilograms in the questionnaire.

So far we have discussed pricing part, pricing quantity, quantity based and unit of measure. You enter pricing part, quantity based and unit of measure in Variable Maintenance and Feature Maintenance. In general the data entered in Feature Maintenance is used, but there are two exceptions to this rule:

- If Std Options is selected in Feature Maintenance, the data from the variable option is used.
- If the feature is a logical and the answer in the questionnaire is equal to no, then QAD Configurator uses 0 as the price for the feature. If the answer is yes, then QAD Configurator uses the pricing information as specified in Feature Maintenance.

The way the pricing functionality works is partly guided by a number of check boxes in Configurable Item Maintenance. The exercises will explain their meaning and help you to understand the details of the pricing functionality. They also contain additional general information on some check boxes that are associated with the pricing functionality.

Note The price of the configuration as shown in the questionnaire is always the price of one unit of the configuration.

When QAD Configurator creates a variant item it also stores two new price lists in the QAD Enterprise Applications database: the best list unit price of the variant item and the best net unit price of the variant item. QAD Configurator needs the information in these price lists to complete fields on the sales order line.

Pricing: Use Pricing Without Pricing Rules

Exercise 33: Use Pricing Without Pricing Rules

Variable Option Maintenance

Option: ALKALINE

Description:

Detail Comment

Short Answer: ALKALINE

Long Answer: FOUR ALKALINE BATTERIES WILL BE INCLUDED FOR BATTERY BACKUP

Qty Based

Pricing Part: 60021 UOM: EA

Save New Cancel

Before you start entering data, please read the flow of the exercise:

- In this example we calculate the price of a variant of item 01040. We will base the price of a variant item on the technical specifications, the style, and the accessories selected to illustrate the pricing functionality.
- To include the steel that is used to build the housing in the price of the variant item, we assign pricing parts to the variables steel-large and steel-small. As these are numeric variables, we will select the Quantity Based check box in Variable Maintenance to tell QAD Configurator to interpret the value entered in the questionnaire as the number of units of the component.
- The prices of the remaining features are incorporated by linking the respective items as pricing parts to the options that can be in the questionnaire.
- This exercise does not contain pricing rules. The use of pricing rules is illustrated in the next exercise.

The items which are used in this example have selling prices defined in Item Master Maintenance.

Note QAD Configurator supports best pricing so you can also use Price List Maintenance (1.10.1.1) in the Master Data module to define list prices and discounts for pricing parts.

Run Variable Maintenance and add the following pricing information to the variables:

Variable	Pricing Part	UM	Quantity Based
steel-large	60091	EA	Selected
steel-small	60090	EA	Selected

Run Variable Maintenance and add the following pricing information to the existing options:

Variable	Option	Pricing Part	UM
backup-type	Alkaline	60021	EA
	NiCd	60023	EA
	Lithium	60022	EA
CPU	High	60052	EA
	Standard	60050	EA
Freq	500 kHz	50002	EA
	10 MHz	50001	EA
Portable	Yes	60005	EA
Power	Smart	60089	EA
	Standard	60088	EA
U-color	Black	60061	GL
	White	60020	GL
	Standard	60062	GL
U-cover	Yes	60015	EA
U-output	Yes	60008	EA

Note You must run Feature Maintenance to specify pricing information for the feature options that do not have Std Options selected. It is not necessary to Run Feature Maintenance in this exercise because all the feature options we are using for pricing have Std Options selected.

Run Variable Maintenance and define two new numeric variables in which the total best list unit price and the total best net unit price of the configuration can be stored.

Variable	Data Type	Extent	Question/Temporary	Question Type	Functional Group
list-price	Numeric	1	Question	Special	Technical Specs
list-price	Numeric	1	Question	Special	Technical Specs

Now run Configurable Item Maintenance. Select the Industrial Ultrasound (item 01040) and enter the data shown below.

Item	Calculate Configuration Price	List Price Variable	Net Price Variable
01040	Selected	list-price	net-price

The last two entries tell QAD Configurator to store the best list unit price and the best net unit price of the configuration in the variables list-price and net-price respectively. QAD Configurator automatically converts the variables list-price and net-price to features of the item so you do not have to link them to an item yourself first. You can use these features for all kinds of purposes; for instance, for calculations or to assign one of these prices to the Price field of the variant item (using Variant Item Data Rule Maintenance).

Run the Configuration Analyzer for item 01040.

Run Variant Item Data Rule Maintenance to tell the system to store the best net price of the configuration in the pt_price field of the variant item by entering the following assignment rule.

Item	Field	Assignment Rule
01040	pt_price	net-price

Now run Configuration Questionnaire for item 01040 and select New Configuration.

Answer the questions for frequency, CPU, portable and the accessories. While you do so, check the following:

- View the Summary pane. The price of the configuration in the Summary pane changes when questions on the frequency, CPU, portable, or on the accessories are answered. The price is updated by the price of the new option selected based on the price of the pricing part.
- The price of the configuration in the Summary pane only increases by the price of one unit of the selected battery. The product structure states that 4 batteries are required, which means the price of 4 batteries should be added to the configuration price. The price of multiple batteries will be included in a later exercise using a pricing rule.
- The price of the configuration in the Summary pane only increases by the price of one unit of the selected battery. The product structure states that 4 batteries are required, which means the price of 4 batteries should be added to the configuration price. The price of multiple batteries will be included in a later exercise using a pricing rule.
- Even though the question type of the features net-price and list-price is normal, these two features do not display in the questionnaire.
- Click the Customize icon next to the message bar in the Configure Item screen. A Customize screen displays. Experiment with the different values in the Price Type list.
 - List Price: Displays the best list price of the pricing part associated with the current option multiplied by the current value of the pricing quantity.
 - Net Price: Displays the best net price of the pricing part multiplied by the current value of the pricing quantity.
 - Discount: The discount percentage for the option displays. The discount in the Summary pane displays the discount percentage for the total configuration including only the questions that are answered.
 - Manual Price List: Displays the ID of any manual price lists that have been selected. Manual price lists are covered later in the training.
- The price of the configuration displayed in the questionnaire is always the price of one unit of the configuration.

Now make sure that Price Type is set to Net Price, answer all questions, memorize the price of the configuration as shown in the Summary pane, and create a new variant item.

Finally run Item Master Inquiry (1.4.2) in the Master Data module for the created variant item and check that the net price of the configuration is now stored in the Price field of the variant item.

Some points to be aware of:

- If you start the questionnaire from the sales order line and enter the quantity ordered, then the List Price, Discount and Net Price fields on the sales order line are automatically filled with the values for one unit of the variant item.
- The price displayed in the Summary pane can differ from what you expect because unseen background features (if any) can have pricing information as well.

- You can view the temporary and background features by selecting the Show Temporary Questions and Show Background Questions check boxes in the Customize screen.
- It is not compulsory to enter a variable in the List Price Variable and Net Price Variable fields in Configurable Item Maintenance. If you do not enter anything, the best list unit price and the best net unit price of the configuration are still calculated and displayed in the Summary pane but not stored.

Pricing: Use Pricing With Pricing Rules

You can compose pricing rules for text, date, logical, and element type variables. A pricing rule is a special type of rule that sets the value of the attribute `pricing_qty` of a feature. Pricing rules are used to set the quantity to be used by the QAD pricing engine for non-numeric features. The right side of the THEN, ELSE or ASSIGN statement does not contain an option as in the rules you have seen so far, but they contain a numeric feature or a formula that yields a numeric value.

Exercise 34: Pricing with Pricing Rules

The screenshot shows the 'Item Rule Maintenance' window. At the top, there are 'Print' and 'Preview' buttons. Below them, the 'Rule ID' is set to 'IR-1002' with a 'Copy from Rule' button next to it. The 'Description' field contains 'SETS PRICING'. Under the 'Rule Detail Edit' section, the 'Assignment' dropdown is selected. The rule is configured as 'Assign BACKUP-TYPE Pricing Qty = 4'. To the right of the rule configuration are icons for help, undo, redo, and delete. At the bottom right of the rule configuration area is an 'Update' button. Below the rule configuration is a 'Preview' section showing 'ASSIGN: BACKUP-TYPE:pricing_qty = 4'. To the right of the preview is a 'Check Syntax' button and a status indicator showing 'Status: Passed'. At the very bottom right is an 'OK' button.

We will now create a pricing rule for the batteries (items 60021, 60022 and 60033). In the generic product structure of 01040 each battery has a product structure quantity of 4. This means that when a battery is selected in the questionnaire, the price of 4 batteries should be added to the configured price.

Run Item Rule Maintenance and enter the following rule.

Item	Rule ID	Rule
01040	IR-002	Assign backup-type:pricing_qty = 4

Start the Configuration Analyzer and analyze item 01040.

Now run Configuration Questionnaire for item 01040 and select New Configuration.

Answer the questions for backup and battery type.

- The batteries have a pricing quantity of 4.
- The option N.A. does not have a linked pricing part and therefore does not have a price.

Pricing: Numeric List Example

Let us assume the product structure of item 01040 has 10 Alkaline, 6 Nickel Cadmium and 4 Lithium Sulphur batteries. In this scenario we want the price of 10, 6 or 4 batteries to be added to the configuration price. One approach is to use a numeric list type variable where the variable options specify the required quantities.

Exercise 35: Pricing With Numeric Lists

Run Variable Maintenance and create the following variable.

Variable	Data Type	Extent	Functional Group	Question Type	Short Question	Question/ Temporary
battery-type	Numeric List	1	Accessories	Normal	Battery Type	Question

Enter the following values on the Variable Options tab

Seq	Option	Short Answer	Pricing Part	Qty Based	UM
1	10	Alkaline	60021	Selected	EA
2	6	NiCadmium	60023	Selected	EA
3	4	Lithium	60022	Selected	EA
4	100	N.A		Not selected	

Run Feature Maintenance and make this new variable a feature of item 01040.

Note Select Std Options so the variable options are copied to the feature.

Run Item Rule Maintenance and enter the following rule.

Item	Rule ID	Rule
01040	IR210	If backup = No then battery-type = 100 else battery-type <> 100

Start the Configuration Analyzer and analyze item 01040.

Now run Configuration Questionnaire for item 01040 and select New Configuration.

Answer the questions for backup and battery type.

- The batteries have a pricing quantity of 10, 6 and 4.
- The option N.A. does not have a linked pricing part and therefore does not have a price.

Note The purpose of this exercise is to provide an example of a numeric list type variable and the quantity based pricing functionality. You can delete item rule IR210 and feature battery-type as they are no longer needed in this training.

Pricing: Allow Net Price Changes

The check box Allow Net Price Change in Configurable Item Maintenance enables you to change the calculated net price for an option while you run the questionnaire.

Exercise 36: Net Price Changes

Run Configurable Item Maintenance. Select the Industrial Ultrasound (item 01040) and select the check box Allow Net Price Change. Leave the other data intact.

Item	Allow Net Price Change
01040	Selected

Start the Configuration Analyzer and analyze item 01040.

Now run Configuration Questionnaire for item 01040 and select New Configuration.

Click the Customize icon next to the message bar in the Configure Item screen. A Customize screen displays. Make sure that Price Type is set to Net Price.

Answer the questions that determine the pricing, for instance frequency, CPU and backup type. While you do so, check the following:

- The net price displays next to the feature option. This net price field contains the unit net price of the pricing part associated with the option.
- You can change the value of the net price manually. To do so move the cursor over the net price field and double-click. A Pricing window displays. You can update the Net Price field in the Pricing window.

The new net price value is included in the Net Price in the Summary pane when the question is answered.

Pricing: Manual Price List Selection

The check box Allow Manual Price List Change in Configurable Item Maintenance enables you to select a manual price list for an option when running the questionnaire. If the manual price list is valid for the pricing part that is linked to an option, QAD Configurator takes this price list into account when it determines the best net unit price and the best list unit price for that option. If the manual price list you select is not valid for the pricing part of the option, then QAD Configurator disregards the manual price list and uses the other applicable price lists (if any) to calculate the best prices.

Exercise 37: Manual Price List Selection

Use Price List Maintenance (1.10.1.1) in the Master Data module to define the manual price list shown in the table below. Item 60015 is the pricing part for the keyboard cover.

Price List	Item/Analysis Code	Currency	Amount Type	Quantity Type	Comb Type	Manual	Min Qty	Net Price
MPM60015	60015	USD	Net Price	Quantity	Base	Selected	1	145.00

Run Configurable Item Maintenance and select the check box shown below. Leave the other data intact.

Item	Allow Manual Price Change
01040	Selected

Now run Configuration Questionnaire for item 01040 and select New Configuration.

Go straight to the question for the keyboard cover in the questionnaire. The manual price list in the table below is available for the keyboard cover Yes option.

Feature	Option	Manual Price List
Icemaker	Yes	MPM207

Move the cursor over the net price field of the Yes option of the keyboard cover and double click. A Pricing window displays. The pricing Window now contains a Manual Price List field. Select the appropriate manual price list. The system considers the selected manual price list and calculates a new net price. Click the Save button in the pricing window to accept the new net price.

Pricing: Store All Pricing Info

The check box Store All Pricing Information in Configurable Item Maintenance lets you choose between storing the pricing information for all options or storing only the pricing information of the chosen options when creating a configuration.

If you deselect Store All Pricing Information and create a configuration, only the best net unit price and the best list unit price for each chosen option are stored in the database. But if you select Store All Pricing Information and create a configuration, both prices are stored for all possible options of all features. Obviously if you have a lot of options this causes the database to grow very fast and can cause performance problems. Therefore, it is recommended not to select this check box unless it is absolutely necessary.

We will not experiment with this option in this training.

Chapter 7

Additional Subjects

Configurable Item Data Copy

You can use Configurable Item Data Copy to copy the features and rules attached to an existing configurable item to another configurable item in the same group.

Exercise 38: Configurable Item Data Copy

Configurable Item Data Copy

Action Print Preview Delete Group ULTRA

Source Item: 01040 Description: Industrial Ultrasound

Target Item: 01041 Description:

Copy

- ☒ Features
 - ☒ Feature Options
 - ☒ Configuration Keys
- ☒ Sales Configuration Rules
 - ☒ General Rules
 - ☒ Rule-Groups
 - ☒ Item Rules
 - ☒ General Rule Tables
 - ☒ Item Rule Tables
- ☒ Product Configuration Rules
 - ☒ Variant Item Number Rules
 - ☒ Variant Item Data Rules
 - ☒ Variant Product Structure Rules
 - ☒ Variant Routing Rules
 - ☒ Variant SQ Line Rules
 - ☒ Variant Planning Item Rules

Use Item Master Copy (1.4.12) in the Master Data module and copy item 01040 to item 01040X.

Run Configurable Item Maintenance and define a new configurable 01040X.

Now run Configurable Item Data Copy to copy all the features and rules from 01040 to the new configurable item.

Source Item	Target Item
01040	01040X

When you have done this, activate some of the reports or menu programs to check the result of the copy function.

Note Please be aware that fields in the source configurable item (such as Configuration Selection, Show Existing Configurations and Cost Set) are not copied to the target item. You must use Configurable Item Maintenance to set fields in the target configurable item record to their required values.

Displaying Warning Messages in the Questionnaire

When constructing sales configuration rules, you can define warning messages to display when a particular rule condition is met during the questionnaire entry process.

To define a warning message:

- Define a logical type variable.
- Create a sales configuration rule and assign the following function to the logical variable:

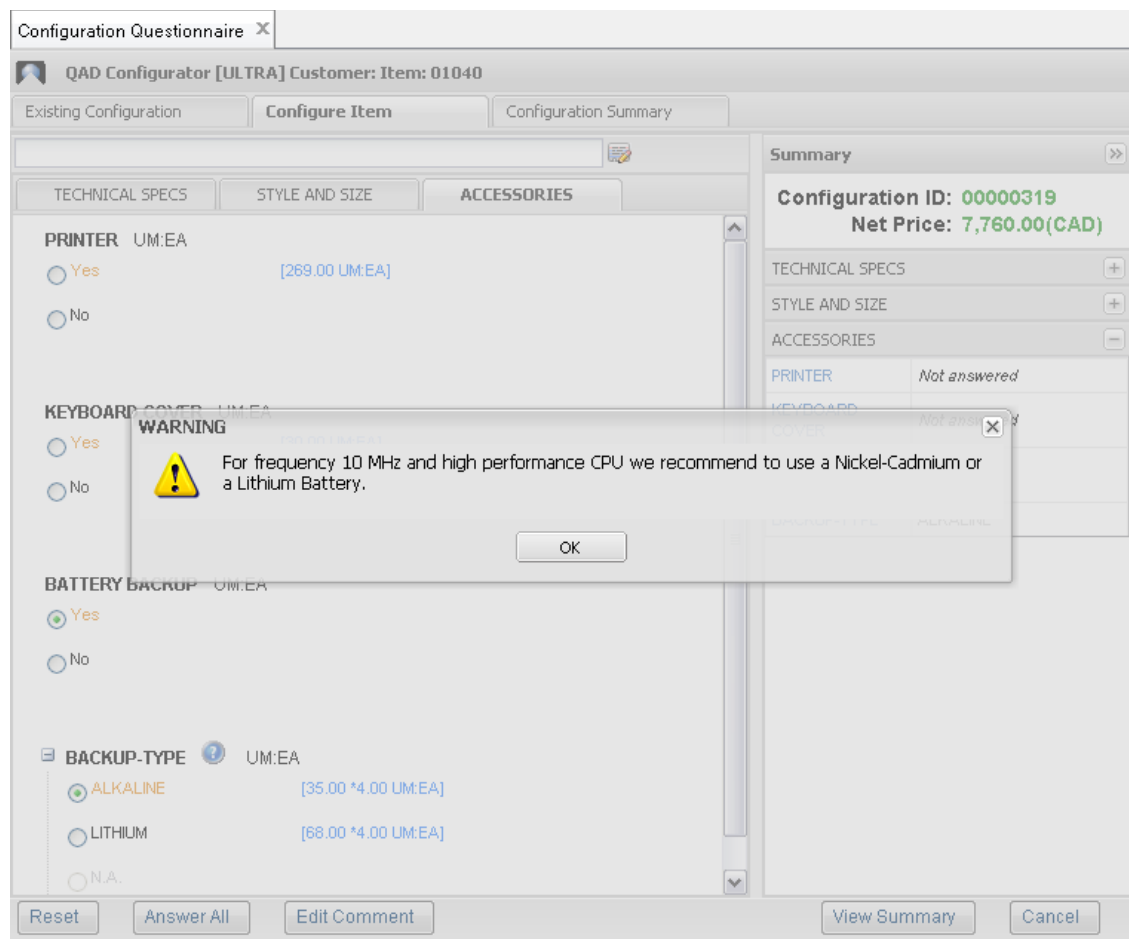
```
showMessageBox(title, message)
```

Where title is the title of the warning message box and message is the warning message you want to display.

- Attach the rule to an item. When the system processes the rule in the questionnaire, the warning message will appear.

In the next exercise we will display a warning message in the questionnaire if the user selects the cooler temperature range on a Ultrasound for Australia.

Exercise 39: Display a Warning Message in the Questionnaire



Run Variable Maintenance and create the following variable.

Variable	Data Type	Extent	Functional Group	Question Type	Short Question	Question/ Temporary
mess-var	Logical	1	Technical Specs	Normal	mess-var	Temporary

Run Feature Maintenance and assign this variable to configurable item 01040.

Run Item Rule Maintenance and enter the following rule.

Item	Rule ID	Rule
01040	IR-003	If freq = "10 MHz" and CPU = "high" and backup-type = "Alkaline" then mess-var = showMessageBox ("WARNING", "For frequency 10 MHz and high performance CPU we recommend to use a Nickel-Cadmium or a Lithium Battery.")

Now run the Configuration Analyzer for item 01040.

Run the questionnaire for item 01040 and select New Configuration.

Select Frequency equals 10 MHz, CPU equals high, and Backup Type Alkaline. The system displays the warning message "For frequency 10 MHz and high performance CPU we recommend to use a Nickel-Cadmium or a Lithium Battery."

Note This is a warning message only and does not prevent the user from continuing.

Variant Item-Site Records

The Variant Item-Site Record field in Configurable Item Maintenance is used to specify whether to create item-site data along with item master records when the system generates variants from the configurable item, and if so, which sites to use to create item-site data. The options are:

- **None:** The variants to be generated are non-site-specific and no variant item-site data will be created.
- **Current Site Only:** The system will generate variant item-site data specific to a particular site. If you choose this option, you must specify a valid site variable for creating item-site data in the Configuration Questionnaire. This variable is specified in the Site Variable field in Configurable Item Maintenance.
- **All Sites:** The system will generate variant item-site data specific to all the sites associated with the configurable item as defined in Item-Site Planning Maintenance.

Note The item-site data creation feature is enabled or disabled during system installation. See *Installation Guide: QAD Configurator* for details. When the item-site data creation feature is disabled, the Variant Item-Site Record and Site Variable fields are grayed. Enabling and disabling the item-site data creation feature during installation is not covered in this course.

Exercise 40: Variant Item-Site Records

Your company has decided to manufacture high frequency ultrasounds in site 10-100 and lower frequency ultrasounds in site 10-201. Sales orders for these industrial refrigerators will continue to be taken in site 10-100.

Run Item-Site Planning Maintenance (1.4.17) in the Master Data module and add an item-site record for the configurable item 50020 for site 10-201. This configurable item-site record will be used as a template when item-site records for the variant item are created by the system.

Run Variable Maintenance and create the following variable.

Variable	Data Type	Functional Group	Question Type	Short Question	Question/Temporary	Variable Options or Data Format
config-site	Text	Style and Size	Normal	config-site	Temporary	10-100 10-201

Now run Configurable Item Maintenance and update the following items as described below.

Item	Variant Item-Site Record	Site Variable
01040	All Sites	
50020	Current Site Only	config-site

Note QAD Configurator automatically converts the variable config-site to a feature of the configurable item. However, you should run Feature Maintenance to ensure that the variable options are copied to the features. They will only be copied automatically if Use Standard Options is enabled.

Assign freq as a feature of 50020, so that you can use it in a item rule for 50020 (it currently is only a feature of configurable item 10040). Run Item Rule Maintenance and add the following rule for item 50020.

Item	Rule ID	Item-Specific Rule
50020	1R-5005	If freq = "10 Mhz" then config-site = "10-100" else config-site = "10-201"

Start the Configuration Analyzer and analyze item 01040.

Run the questionnaire for item 01040 and select New Configuration. Complete the questionnaire and create a variant item.

Run Item-Site Planning Inquiry (1.4.8) in the Master Data module and verify that system created item-site records for the variant items.

Element Variables

An element variable is directly associated with a field in a database table. You will see a variable of the element type, but, in the background, QAD Configurator changes the type so that the value of the variable can be compared to the value in the database. Comparisons require identical data types. QAD Configurator supports element variable links to two types of entities: Internal Entities, which are defaults within QAD Configurator, and External Entities, which you have to define using External Entity Maintenance.

An internal entity is an entity that is known by, and supported by, QAD Configurator. The following tables in the QAD Enterprise Applications database are internal entities:

- Item Master
- Customer Master
- Sales Order Master
- Sales Order Detail
- Sales Quote Header
- Sales Quote Detail

An external entity is a new entity, defined by the user using External Entity Maintenance. External entities will be covered in the next section.

Exercise 41: Element Variable and Internal Entities

In this exercise we will use an element variable to select specific information from the Item Master record associated with configurable item 01040 and display it in the questionnaire.

Run Variable Maintenance and create the following variable.

Variable	Data Type	Extent	Functional Group	Question Type	Short Question	Question/ Temporary
confitemdesc	Element	1	Technical Specs	Normal	Item Description	Question

Enter the following values on the Data Format Tab.

Variable	Element Type	Entity	Field
confitemdesc	Internal	Configurable Item	pt_desc1

Run Feature Maintenance and make this new variable a feature of the 01040.

Run Questionnaire Sequence Maintenance and make item-desc the first feature to be displayed on the Technical Specs tab.

Now run the Configuration Analyzer for item 01040. Solve any inconsistencies then run the questionnaire for the Industrial Ultrasound and select New Configuration. You will see the item description displayed in the questionnaire.

External Entity Maintenance

This function allows you to select specific information from the QAD Enterprise Applications database or from the QAD Configurator database or any other connected database and to use it in the questionnaire. An external entity is a reference to a record in the database. After defining an entity you can create a new variable of the type element, link this variable to the external entity, and specify a field from the external entity record to be used. The correct record is determined by the selection rule defined for the external entity.

An external entity is a new entity, defined by the user using External Entity Maintenance.

Exercise 42: External Entity Maintenance

The screenshot shows the 'External Entity Maintenance' window. At the top, there is a toolbar with 'Action', 'Print', 'Preview', 'Delete', and 'Group' buttons, along with a 'ULTRA' logo. The main area contains the following fields:

- External Entity:** A text box containing 'pline' with a magnifying glass icon to its right.
- Description:** A text box containing 'Product Line'.
- Database:** A dropdown menu showing 'qaddb'.
- Table:** A dropdown menu showing 'pl_mstr'.
- Description:** A text box containing 'Product Line Master'.
- Rule Assistant:** A horizontal line with a blue arrow pointing right.
- Selection Rule:** A large text area containing the text 'pl_prod_line = pline-id'.
- Check Syntax:** A button to the right of the Selection Rule text area.
- Status:** A text box containing 'Not Run'.

Suppose you want to run the questionnaire for the Industrial Ultrasound and show the ID and description of the product line of that item in the questionnaire.

This is how you find out what to do.

The description of the product line can be found in the field `pl_prod_line` of the `pl_mstr` table in the QAD Enterprise Applications database.

The `pl_mstr` table cannot be accessed directly in QAD Configurator. This means you that you must define an external entity.

Once the database and the table to be used are determined, you need a selection rule to select the correct record.

In this example, the record to be selected is the one for which `pl_mstr.pl_prod_line` equals the product line number of the Industrial Ultrasound.

In order to specify the selection rule, you will need another variable in which you store this product line number. This variable must be of the type element and must refer to the configurable item and to the product line field.

First run Variable Maintenance and define the following variable.

Variable	Data Type	Extent	Functional Group	Short Question	Question / Temporary	Question Type
pline-id	Element	1	Technical Specs	Product Line ID	Question	Special

Enter the following values on the Data Format Tab.

Variable	Element Type	Entity	Field
pline-id	Internal	Configurable Item	pt_prod_line

Now run External Entity Maintenance and enter the data as follows.

External Entity	Database	Table	Selection Rule
pline	qadbb	pl_mstr	pl_prod_line = pline-id

Note If required you can use the Rule Assistant to enter the selection rule.

The next step is to run Variable Maintenance and add the following variable.

Variable	Data Type	Extent	Functional Group	Short Question	Question / Temporary	Question Type
pline-desc	Element	1	Technical Specs	Product Line	Question	Normal

Enter the following values on the Data Format Tab.

Variable	Element Type	Entity	Field
pline-desc	External	pline	pl_desc

Finally use Feature Maintenance to add the new variables to the Industrial Ultrasound.

Item	Feature
01040	pline-id
	pline-desc

Now run the Configuration Analyzer for item 01040.

Run the questionnaire for item 01040 and select New Configuration. You will see the product line description displayed in the questionnaire.

Note You can view the product line ID by selecting the Show Background Questions check box in the Customize screen.

External Entity Rule Maintenance

Use External Entity Rule Maintenance to assign values to fields in databases defined as external entities.

We will not experiment with this function in this training.

Configurable Item Maintenance Cost Roll-Up

Cost roll-up enables you to calculate the costs of manufacturing an item. In order to do so QAD Enterprise Applications will take into account the various types of costs that appear in the product structure of the item. Because QAD Configurator adds the product structure of any items that you configure to the QAD Enterprise Applications database, the cost roll-up functionality is incorporated in QAD Configurator as well.

Calculating the costs for an item involves adding the following five types of costs:

- Material costs
- Labor costs
- Burden costs
- Subcontract costs
- Overhead Costs

The roll-up of the total costs consists of a routing cost roll-up and a product structure cost roll-up. Refer to the relevant QAD Enterprise Applications user guides for a detailed description of routing and product structure cost roll-up.

During configuration of a variant, QAD Configurator will calculate the costs of manufacturing the item. To see these costs, run Product Structure Cost Report (13.12.4) in the Manufacturing module for items 01040, 50020 and the variant items. Enter the correct site (10-100) and the correct cost set (Standard).

You can also use Item Master Maintenance (1.4.1) in the Master Data module to see the costs associated with items.

Element Roll-Up

As we have seen, you can use Element Roll-Up Maintenance to calculate (roll up) non-cost element related data. The roll-up calculation is made during the process of creating a variant product structure and/or a variant routing and the outcome is stored in a field belonging to this variant.

Element Roll-Up allows us to execute a calculation afterwards — that is, after the variant product structure or routing has been created. This can be useful if you want to change the original formula that was used in the calculation, or if you want to roll up other data that you did not think of or did not need when you created the variant.

Before you can run Element Roll-Up, you must first define the element roll-up rules for configurable items. You do this using Element Roll-Up Rule Maintenance.

The input to Element Roll-Up can either be variant items or configurable items for which you want to update all variants.

We will not experiment with this function in this training.

Manual Configuration Maintenance

Suppose that there are items in the QAD Enterprise Applications item and product structure tables that are valid variants (configuration descriptions), but which were not created using the QAD Configurator questionnaire. These variants do not have a configuration ID in QAD Configurator and can never be selected as existing variants. Using Manual Configuration Maintenance, it is possible to create this configuration description afterward and link it to the item in QAD Enterprise Applications.

Using Manual Configuration Maintenance is a way to enable QAD Configurator to substitute existing variants in a product structure, without having to go through the entire process of analyzing and answering all the questions in the questionnaire.

Note The variant that is linked to the configuration must be an item in QAD Enterprise Applications but cannot be a configurable item in QAD Configurator, since a configurable item can never be a variant of another configurable item.

We will not experiment with this function in this training.

Configuration Rebuild

Over time, new features can be introduced, existing features can become obsolete, and product structures can change. When this occurs existing configurations might need to be updated to reflect these changes.

You can use Configuration Rebuild to quickly make batch changes to multiple configurations and update variant items data without having to go through the questionnaire entry process. You can also reprice configurations as well as update variant product structures and routings for selected variant items during the rebuild process.

The Configuration Rebuild function does not create new variant items from existing configurations. For configurations without variant items, only features and price information can be updated.

The system runs the following product configuration rules when rebuilding a configuration:

- Variant item data rule
- Variant product structure rule
- Variant routing rule

Currently, the system does not process sales configuration rules during configuration rebuilds.

Exercise 43: Configuration Rebuild

Sales of black ultrasounds have been disappointing and market analysis has indicated that gray is a more popular color. Your company's marketing department has decided to remove black as a standard color option and replace it with gray.

Run Configuration Browse to view your existing configurations. If you do not have a configuration with feature Color = Black you will need to create one for this exercise. Run the Configuration Questionnaire and select New Configuration. Select Color = Black. Complete the questionnaire and create a variant item.

Run Feature Maintenance for configurable item 50020 (Industrial Housing) and update the feature housing-color as indicated below.

- Delete feature option Black.
- Add feature option Gray.

Use Item Master Maintenance (1.4.1) in the Master Data module to create the new item listed below.

Item Number.	UM	Description	Net Weight & Measure	Pur/Mfg	Price	Standard Material Cost
60063	GA	Paint, Gray	1.0 KG	P	0.00	6.00

Note You could create item 60063 using Item Master Copy (1.4.12) and copying item 60061 (Paint, Black)

As gray paint is replacing black paint we must:

- Update the generic product structure.
- Update the affected product configuration rules.

Run Product Structure Maintenance (13.5) in the Manufacturing module to update the product structure for the Industrial Housing (50020). Delete component 60061 (Paint, Black) and add component 60063 as indicated below.

Level	Component Item	Description	Quantity Per	UM
Parent	60061	Industrial Housing		EA
1	60063	Paint, Gray	0.75	GA

Run Variant Product Structure Rule Maintenance for configurable item 50020 and enter the selection rules that are listed in the table below.

Configurable Item	Component	Description	Selection Rule
50020	C-P363	Paint, Other	Painted = "painted" and u-color <> "white" and u-color <> "black" and u-color <> "gray"
	60063	Paint, Gray	Painted = "painted" and u-color = "gray"

Now we will update the existing configurations that have Color = Black.

Run Configuration Rebuild.

- Select configurable item 01040.
- A Configuration Browse window is displayed. Use the search box to filter records and look up the configurations where Color = Black. Click OK to select all the configurations displayed in the browse.
- To make batch changes to features in all the selected configurations, select Feature Options. In the expanded box, specify changes to be applied to features of the selected configurations across the board during the rebuild process. Select Add/Update and assign housing-color = Gray.
- Select the Product Structure/Routing check box to update the product structures and routings of the variant items. Next specify whether you want to obsolete or delete the old product structures and routings.
- Select Show Detail to display detailed change information in the rebuild report.

- Click Rebuild. The system displays the number of configurations and variant items to rebuild and tells you that the rebuild process might take a long time. Click OK to start the rebuild process.

Run Configuration Browse to view your existing configurations. Verify that the configurations that previously had Color = Black now have Color = Gray.

Note Configuration Rebuild will only update the product structure of the selected configurable item. It will not update the product structure of the lower-level configurable items, such as 50020. You must run Configuration Rebuild for item 50020 if you want to update the product structure of 50020.

Forecasting Configurable Items

Some companies have a requirement to forecast configurable items in order to effectively drive MRP. As configurable items are not sold, we need to consume the forecast of a configurable item when a confirmed sales order line for a variant item is created.

The recommended approach is to create a planning item (an item with Pur/Mfg set to F) that represents a configurable item. This planning item would have the forecast for the associated configurable item. Using the industrial ultrasound as an example, 01040 is a configurable item and 01040-P would be the associated planning item. Variant Planning Item Rule Maintenance is used to link a configurable item to a planning item.

For the forecast of a planning item to be consumed, variant items must be components of the planning item's product structure. When a new variant item is created using the Configuration Questionnaire, the system will add the variant item to the product structure of the associated planning item.

A variant item is added to the planning bill as a component with the following values:

- Structure Type is P (planning)
- Forecast Percent is zero to prevent MRP from generating planned orders for the components of the variant item from the forecast of the planning item.
- Quantity Per is 1

Because Structure Type is P, the system will consume the forecast of the planning item with the variant item order quantity on the sales order line when the sales order line is confirmed.

The planning bill can also contain the components from the configurable item's generic product structure that are to be forecast. These components would be set up in the planning bill with Structure Type set to O (option) and Forecast Percent set to the required value.

Exercise 44: Forecasting a Configurable Item

Variant Planning Item Rule Mai... x

Action Print Preview Group ULTRA

Configurable Item: * 01040 Description: Industrial Ultrasound

Planning Item Rule Details

Planning Item	Description	Rule Detail	Syntax OK
01041	Portable 10mhz Ultrasound	CPU = "HIGH"	Yes
01042	Portable 500khz Ultrasound	CPU = "Standard"	Yes

Preview
CPU = "HIGH"

In this exercise we will illustrate how to create and consume the forecast of a configurable item.

Use Item Master Maintenance (1.4.1) in the Master Data module to create the new item listed below

Item Number	UM	Description 1	Description 2	Pur/Mfg
01040-P	EA	Industrial Ultrasound	Planning Item	F

Run Forecast Maintenance (22.1) in the Manufacturing module and enter a forecast for item 01040-P. Create this forecast in the default site of item 01040-P. Forecast a quantity of 100 a week for this week and the next 3 weeks.

Now use Variant Planning Item Rule Maintenance to link the configurable item 01040 to its associated planning item. In this exercise we will leave the selection rule blank.

Configurable Item	Planning Item
01040	01040-P

Run Sales Order Maintenance (7.1.1) in the Sales Orders/Invoices module. Enter a new sales order for your selected customer. When you get to the sales order line, enter 01040 in the Item Number field. The system will automatically launch the questionnaire. Select New Configuration, complete the questionnaire and create a variant item. Order a quantity of 5 and complete the sales order line. Ensure that Consume Forecast is selected on the sales order line.

Run Forecast Maintenance (22.3) and verify that the forecast of 01040-P has been consumed by the quantity ordered on the sales order line.

Run Product Structure Inquiry (13.6) in the Manufacturing module and view the product structure of planning item 01040-P. Verify that the variant item created by the questionnaire in Sales Order Maintenance has been added as a component of the product structure of 01040-P.

Deleting and Archiving Configurations

Each time you complete the questions in the questionnaire and click OK, QAD Configurator generates a new configuration in the database, containing all the answers to the questions for the configurable item. The configuration is created even if no variant is generated. As a consequence, the configuration table in the QAD Configurator database can grow rapidly

You can use Configuration Delete/Archive to archive one or more configurations to a file for later use, or permanently delete configurations from the set of configurations available in QAD Configurator.

This function lets you limit the set of available configurations in your QAD Configurator session by storing old configurations in a file or deleting them. This is a way to purge the configuration table, which will grow quite rapidly when you are creating configurations regularly. The available configurations are the ones that QAD Configurator will display when you are using the questionnaire. QAD Configurator will not be able access the configurations in the file.

We will not experiment with this function in this training.

Note When you enter no selection criteria in the fields all configurations, will be transferred or deleted.

Batch Compiler

While running, QAD Configurator uses temporary code tables based on the product configuration selection and quantity rules. Whenever these rules change, these tables must be changed as well to guarantee that QAD Configurator uses the most recent version of the rules. Normally, the variant generator, which is incorporated in the questionnaire, checks the validity of the files and creates new ones if necessary.

If there is doubt as to the validity of the objects, for example after a re-creation of the database, it is necessary to re-create all code files. Using the Batch Compiler, you can do this without investigating first whether it is necessary or not.

We will not experiment with this function in this training.

Rule Table Accelerator

Use Rule Table Accelerator to make an indexed search on one or more rule tables possible. If you do not accelerate a rule table, you cannot perform an indexed search on that table. When you accelerate a rule table the accelerator stores additional information needed for the indexed search in the database. Suppose that you use General Rule Table Maintenance to delete a rule table, and that you accelerated this same table sometime in the past. If QAD Configurator not only deleted the rule table itself, but also started searching the database for any corresponding additional information that may have become obsolete as a result, the deletion of the table would take quite

some time. To avoid this, Rule Table Accelerator rather than General Rule Table Maintenance is responsible for deleting this information. It starts searching the database and deleting the information as soon as it has finished accelerating the tables you specified.

Rule Table Accelerator can operate on general rule tables or on item rule tables but it cannot accelerate both types of tables at the same time.

We will not experiment with this function in this training.

Configurator Reports

Most of the reports offer a way to get an overview of the information you entered in the associated function. You could also view this information within the function itself. However, a report is generally more useful, since it collects data that would otherwise be in subsequent windows and thus makes it easier to compare the data. Besides, the report programs make it possible to collect only data that meets certain selection criteria and sometimes even to influence the way it is presented.

Exercise 45: Configurator Reports

Now experiment a little with the various Configurator reports yourself.

Appendix A

QAD Enterprise Applications Setup

QAD Enterprise Applications Setup

Domain: 10USA > 10USACO

Items used in the training:

Item Number	UM	Description	Net Weight & Measure	Pur/Mfg	Price	Standard Material Cost
01040	EA	Industrial Ultrasound	7.24 KG	C	4,570.00	0.00
02003	EA	Standard Connector	0.048 KG	M	2.34	0.00
50001	EA	Probe Unit - 10 Mhz	0.00 KG	M	1,320.00	0.00
50002	EA	Probe Unit – 500 kHz	0.00 KG	M	1,045.00	0.00
50020	EA	Industrial Housing	0.00 KG	M	0.00	67.95
60001	EA	Durable Plastic Housing	0.00 KG	P	0.00	127.00
60003	EA	Keyboard	0.20 KG	P	55.00	55.00
60005	EA	Battery	0.00 KG	P	255.00	2.35
60008	EA	Printer	1.50 KG	P	269.00	12.50
60015	EA	Keyboard Cover	0.10 KG	P	30.00	24.00
60020	EA	Cooling Fan	0.00 KG	P	0.00	75.00
60021	EA	Battery Backup, Alkaline	0.00 KG	P	150.00	2.50
60022	EA	Battery Backup, Lithium	0.00 KG	P	252.00	5.00
60023	EA	Battery Backup, NiCd	0.00 KG	P	180.00	3.50
60050	EA	Base Unit / CPU	0.00 KG	P	1,460.00	375.00
60052	EA	High Performance CPU	0.00 KG	P	1,730.00	390.00
60060	GA	White Paint	1.00 KG	P	0.00	6.00
60061	GA	Black Paint	1.00 KG	P	0.00	6.00
60062	GA	Paint, other	1.00 KG	P	0.00	6.00
60080	EA	Power Cord - UK	0.00 KG	P	15.00	13.00
60081	EA	Power Cord - Australia	0.00 KG	P	15.00	13.00
60082	EA	Power Cord - USA	0.00 KG	P	15.00	13.00
60083	EA	Power Cord - Universal	0.00 KG	P	15.00	13.00
60088	EA	Power Converter-Standard	0.35 KG	P	0.00	47.50
60089	EA	Power Converter – Smart	0.35 KG	P	0.00	47.50
60090	EA	Small Sheet Steel	1.65 KG	P	0.00	23.04
60091	EA	Large Sheet Steel	1.95 KG	P	0.00	68.00
60093	EA	Stainless Steel Sheet	6.10 KG	P	0.00	2.50
90093	EA	Shipping Carton	0.00 KG	P	00.00	0.85

In Product Structure of the Industrial Ultrasound (01040):

Level	Component Item	Description	Quantity Per	UM
Parent	01040	Industrial Ultrasound		EA
1	02003	Standard Connector	2.0	EA
1	50001	Probe Unit - 10 Mhz	1.0	EA
1	50002	Probe Unit – 500 kHz	1.0	EA
1	50020	Industrial Housing	1.0	EA
1	60001	Durable Plastic Housing	1.0	EA
1	60003	Keyboard	1.0	EA
1	60005	Battery	1.0	EA
1	60008	Printer	1.0	EA
1	60015	Keyboard Cover	1.0	EA
1	60020	Cooling Fan	1.0	EA
1	60080	Power Cord - UK	1.0	EA
1	60081	Power Cord - Australia	1.0	EA
1	60082	Power Cord - USA	1.0	EA
1	60083	Power Cord - Universal	1.0	EA
1	60050	Base Unit / CPU	1.0	EA
1	60052	High Performance CPU	1.0	EA
1	60021	Battery Backup, Alkaline	4.0	EA
1	60022	Battery Backup, Lithium	4.0	EA
1	60023	Battery Backup, NiCd	4.0	EA
1	60088	Power Converter-Standard	1.0	EA
1	60089	Power Converter – Smart	1.0	EA
1	90093	Shipping Carton	1.0	EA

Product Structure Maintenance of the Industrial Housing (50020).

Level	Component Item	Description	Quantity Per	UM
Parent	50020	Industrial Housing		EA
1	60060	White Paint	1.0	GA
1	60061	Black Paint	1.0	GA
1	60062	Paint, other	1.0	GA
1	60090	Small Sheet Steel	1.0	EA
1	60091	Large Sheet Steel	1.0	EA
1	60093	Stainless Steel Sheet	1.0	EA

Work Center Maintenance:

Work Center	Machine	Description
1000		General Assembly
1020		Fabrication
1050		Product Test
1060		Pack
2310		E-Coat Paint Line 1

Operations for Routing Code 01040 and 50020.

Routing Code	Operation Number	Work Center	Machine	Description of Operation	Setup Time	Run Time
01040	10	1000	1001	Assemble components	10.0	40.0
	20	1050	1001	Test finished unit	2.0	5.0
	30	1060		Pack for shipping	0.5	2.0
50020	10	1020		Cut steel	0.5	0.2
	20	1020		Assemble housing	0.5	0.5
	30	1020		Weld housing	0.5	0.5
	40	2310		Paint	0.5	0.5