SAP Manufacturing Execution

How-To Guide

# How To Set Up and Use SAP ME Complex Assembly

**Applicable Release: ME 6.0**

**Version 1.0**

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# Document History

| Document Version | Description | Author |
|---|---|---|
| 1.0 | Initial version | Chet Moutrie |
| | | |
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# 1 Introduction

## 1.1 Purpose

The SAP ME How-To-Guide for Complex Assembly is intended to provide sufficient information to enable complex assembly scenarios to be easily configured and readily utilized to meet business needs, making use of available best practices.

## 1.2 Scope

This document covers a couple aspects of setting up and performing complex assembly using SAP ME. This includes the automatic creation and pegging of installation orders for an end unit, which gets re-serialized, and the use of phantom BOMs.

## 1.3 Glossary

| | |
|---|---|
| Activity | An executable software unit in SAP ME |
| Activity Hook | See Hook Activity and Hook Point |
| Child Order | A shop order for a material being installed into an end unit |
| End Item | See End Unit |
| End Unit | The final product being assembled |
| End Unit Number | A unique identifier for the final product being assembled – typically the final assembly sequence number or, in aerospace, the tail number of the aircraft |
| Hook Activity | An SAP ME activity that can be executed automatically at a hook point |
| Hook Point | A processing point in SAP ME where the execution of an activity can be configured to occur automatically (e.g. at Pre-Complete for an operation) |
| Material | A unique manufactured or purchased part that is processed or consumed on the shop floor |
| Parent Order | A collector shop order for the end unit |
| Phantom BOM | The entries in a BOM that correspond to a phantom part |
| Phantom Part | An assembly or sub-assembly that is built during manufacturing and is immediately consumed by a higher level assembly, but is not put into inventory, and whose creation and consumption are not reported to ERP |
| POD | Production Operator Dashboard - configurable SAP ME module designed for use by factory floor operators |
| SFC | Shop Floor Control unit - a single material or a batch of materials being processed on the shop floor |

# 2 Overview of Complex Assembly

## 2.1 Description and Applicability

Complex assembly, in SAP ME, provides support for the final assembly of an end product or of a significant sub-assembly. It includes the identification of the end unit, automatic creation of installation type shop orders for the components, special collector shop orders for the end units, the pegging of installation orders to the collector shop orders and collecting of a serial number for the end unit.

SAP ME complex assembly is applicable wherever products with large serialized sub-assemblies are installed into an end product. It is especially applicable to the Aerospace and Defense industry for supporting the final assembly of aircraft, missiles, etc.

It is not a separate feature in SAP ME, but rather involves additional attributes for some SAP ME objects, special hook activities and a POD plug-in to collect the serial number for the end unit.

## 2.2 Business Purposes / Functions

SAP ME complex assembly facilitates the recording of information for the final assembly process by automating the creation of shop orders for the installation of the component assemblies. These shop orders are automatically pegged to the shop order for the end unit.

The specific functions supporting complex assembly, and described in section 3, include the following:

- Configuring activities at activity hook points
- Setting system rules for complex assembly
- Setting up a POD for complex assembly
- Defining the collector material
- Defining the material to trigger serialization
- Creating the numbering pattern for serialization
- Utilizing phantom BOMs as needed
- Creating a shop order for the end product
- Serializing the end unit

In addition, the following SAP ME features provide support for complex assembly in discrete manufacturing industries:

- Buyoffs – See Buyoff in SAP ME Help
- Buyoff Report – See Buyoff Report in SAP ME Help
- Earned Standards – See the SAP ME How-To-Guide - Earned Standards and see Earned Standards in SAP ME Help
- Log Reject - See Log NC Reject in SAP ME Help
- Shop Workbench – See the SAP ME How-To-Guide – Shop Workbench and see Shop Workbench in SAP ME Help
- Supervisor Work Assignment – See Supervisor Work Assignment in SAP ME Help
- Tooling – See Tool Management in SAP ME Help

# 3 Functions for Complex Assembly

## 3.1 Configuring Activities at Activity Hook Points

Activity hook points are used in complex assembly to execute activities to automatically assemble components and to automatically create and update as-built information. Complex assembly can use the activities and hook points shown in the following table.

| Hook Activity | Activity Hook Point | Purpose |
|---|---|---|
| AUTOASSY_COMPONENT | POST_ORDER_RELEASE | Automatically assembles components for an SFC |
| AUTO_ASBUILT | POST_ORDER_RELEASE | Creates "planned" as-built configuration records for all the installation orders that have been released with a production order |
| AUTO_ASBUILT | POST_ORDER_CLOSE | Updates "planned" as-built configuration records to "assembled" for all the installation orders that have been released with a production order |

For more information about activity hook points, see Activity Hooks in this document and the SAP ME How-To-Guide – Setting up Activity Hooks.

## 3.2 Setting System Rules for Complex Assembly

For the most effective use of complex assembly, the following system rules should be set as indicated in the table.

| System Rule | Setting |
|---|---|
| Allow Assemble Quantity as Required | True |
| Display Auto Fill Components | True |
| Enable Pegging on Release | True |
| Enable Pegging on Consumption | True |
| Specific BOM Component Revision Required | False |
| Archive Component when Parent is Archived | True |
| Create Subassys on Shop Order Release | True |
| Display End Unit Number | True |

For more information on these system rules, see System Rules later in this document.

## 3.3 Setting up a POD for Complex Assembly

The Work Center POD was added to SAP ME specifically to support complex assembly. It is designed to support the type of work done at final assembly stations. For more information, see Work Center PODs in SAP ME Help.

If a new serial number is to be assigned to the end unit, the POD should be configured to execute the Collect Parent Serial activity. This can be accomplished by creating a button specifically for this activity or by adding this activity to the Activities group button. For more information, see POD Maintenance later in this document.

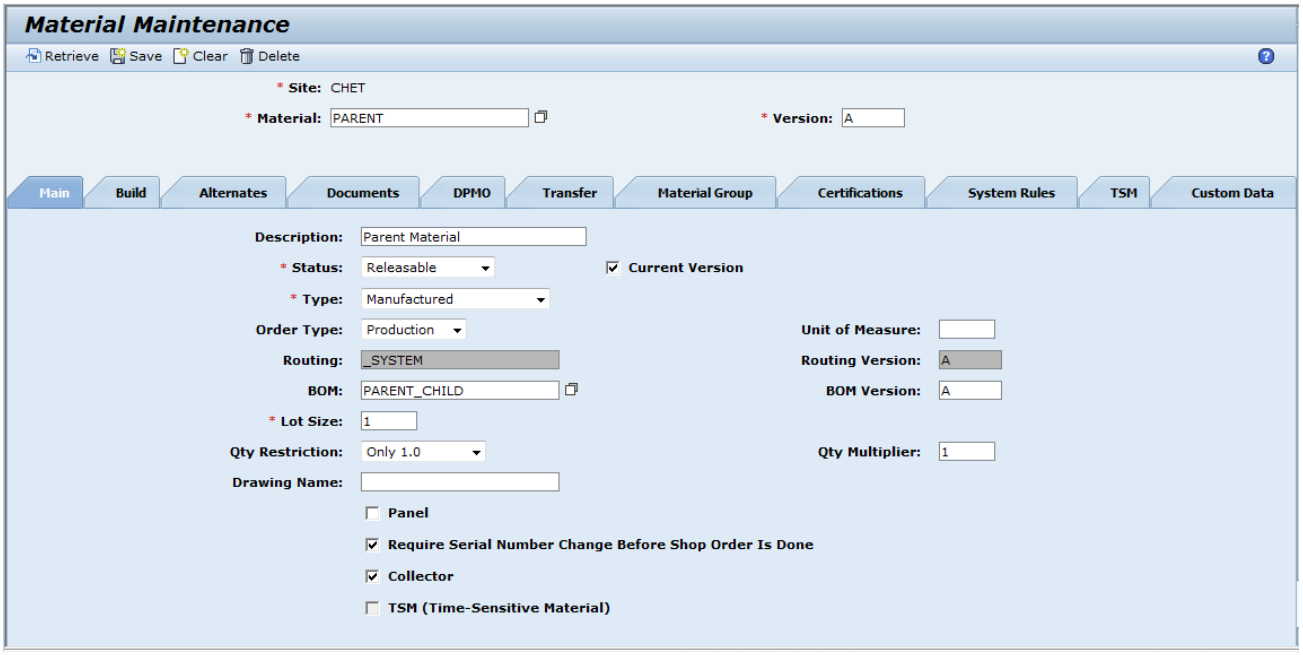
## 3.4 Defining the Collector Material

The collector material represents the final product. Define a material using Material Maintenance and set fields as indicated in the following table.

| Material Maintenance Field | Setting |
|---|---|
| Type | Manufactured |
| Order Type | Production |
| Require Serial Number Change Before Shop Order Is Done | Selected* |
| Collector | Selected |

* Optional

The following screenshot shows these settings.



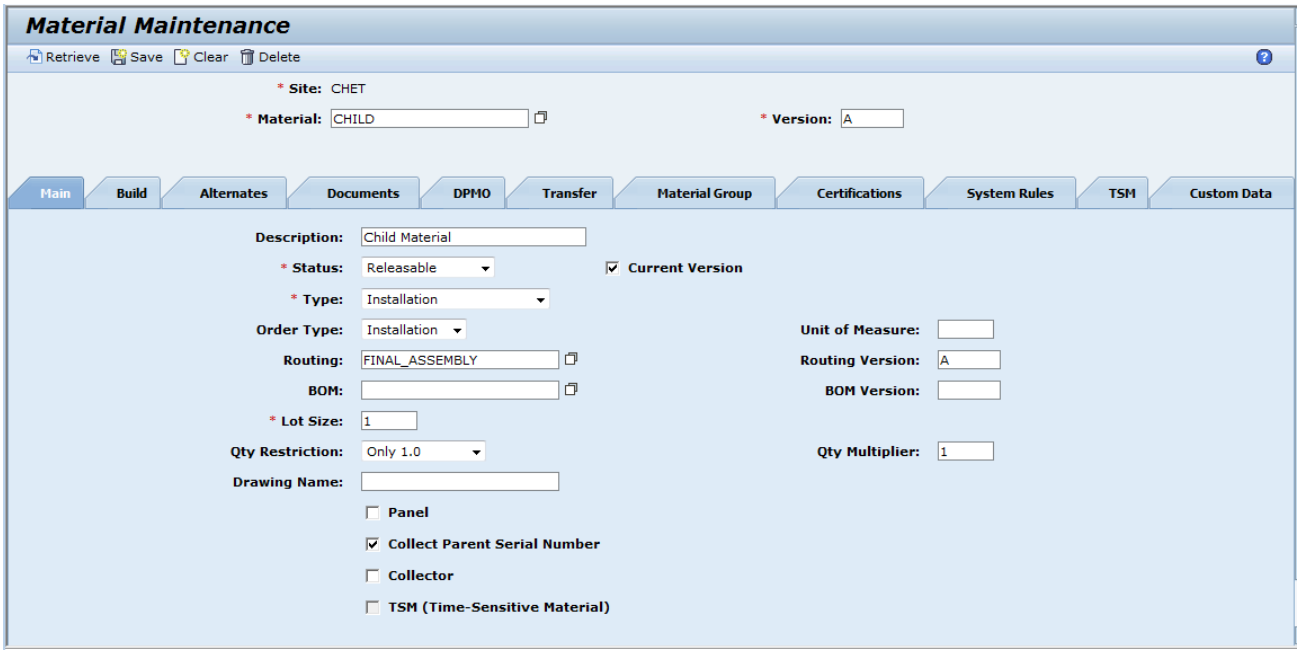

The collector material has a special system routing. The components for this material are assembled via installation shop orders. See Creating and Releasing a Shop Order for the End Product later in this document.

## 3.5 Defining the Material to Trigger Serialization

If the end unit is to be re-serialized (i.e. have its SFC number changed), one of the components in the BOM for the collector material must be configured for triggering this action. Define the component in Material Maintenance, and set fields as indicated in the following table.

| Material Maintenance Field | Setting |
|---|---|
| Type | Installation |
| Order Type | Installation |
| Lot Size | 1 |
| Collect Parent Serial Number | Selected |

The following screenshot shows these settings.




## 3.6 Creating the Numbering Pattern for Serialization

The new serial number for the end unit can be entered by the user in the Collect Parent Serial Number activity (PR555) or it can be created automatically by the system. Which of these will occur is determined by the GENERATE_ID activity rule for the Collect Parent Serial Number activity (see Activity Rules later in this document).

If the new serial number is to be created by the system, the numbering pattern for SFC Serialize needs to be set up in the Next Number Maintenance activity (see Next Number Maintenance later in this document).

## 3.7 Utilizing Phantom BOM as Needed

The phantom BOM feature is not specifically for complex assembly, but is likely to be utilized in this type of manufacturing. It enables the identification of a sub-assembly which is produced and consumed during manufacturing, but is not placed into inventory nor managed by ERP. Such a sub-assembly is typically referred to in manufacturing as a phantom part.

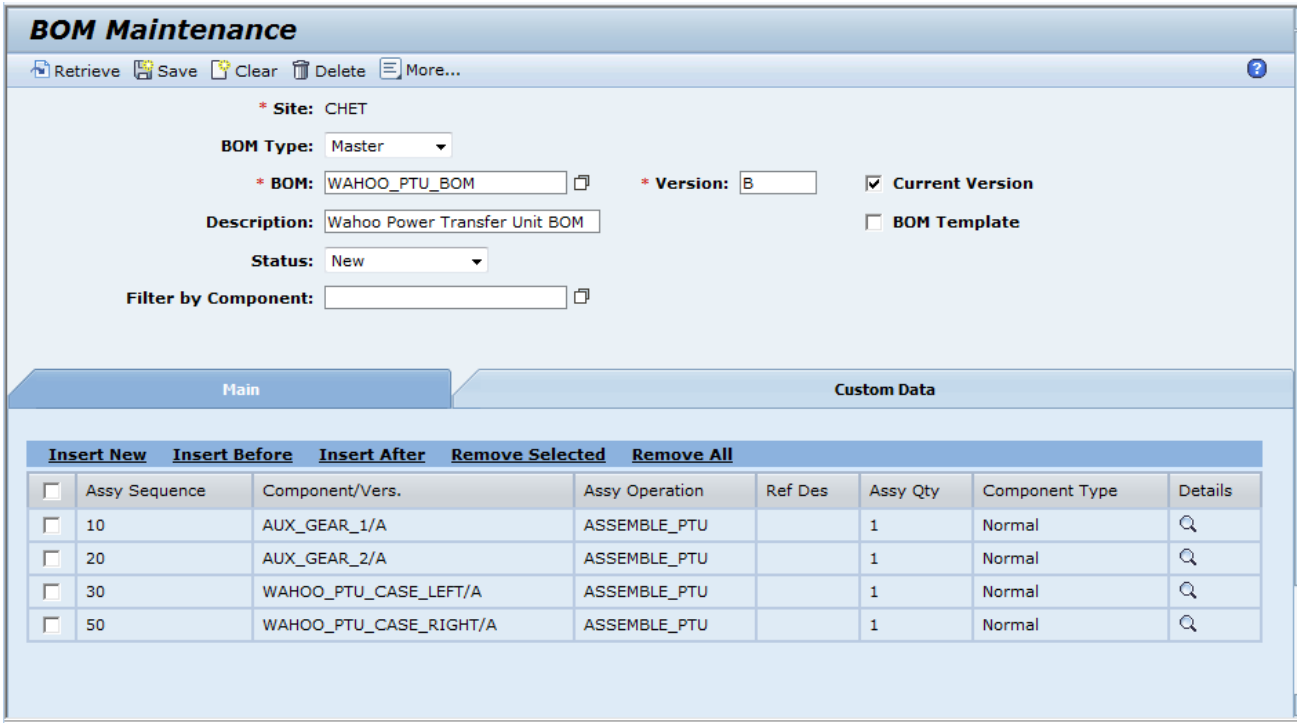
The phantom part must be defined in the system as a material. It should have a Type of Manufactured and can have an Assembly Operation and Assembly Data Type specified. No shop order or SFC should be created for this material.

The BOM for the material is created in BOM maintenance during the definition of the BOM for the material which is the higher level assembly. It is during the production of this higher level assembly that the phantom part is physically assembled and installed.

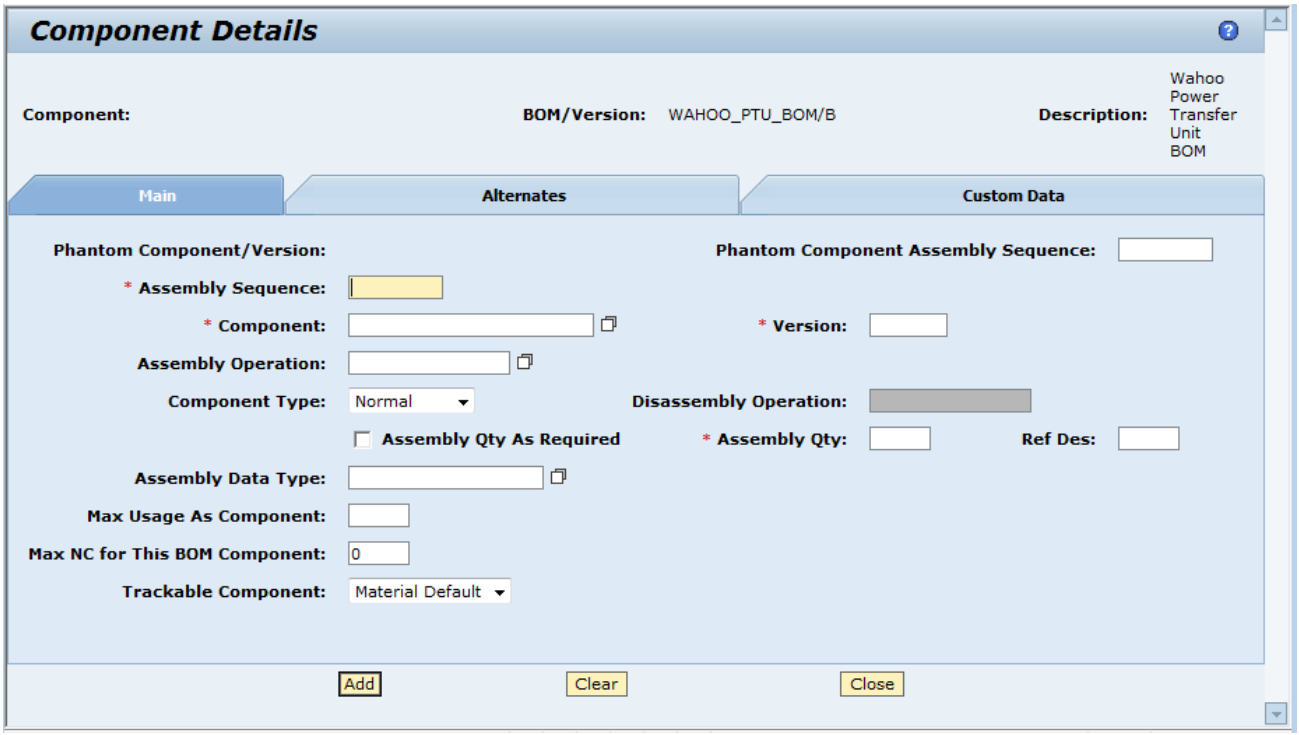
In the following example, a power take-off unit (PTU) is being assembled. It consists of two auxiliary gears, a main gear assembly and a case. The main gear assembly consists of the main gear, two

secondary gears and a shaft. An example of creating the phantom BOM for the main gear assembly is described below.

Open BOM maintenance and retrieve the partially completed BOM for the next higher level assembly. Note in the following screenshot that a gap in the sequence numbers has been left for the main gear assembly.



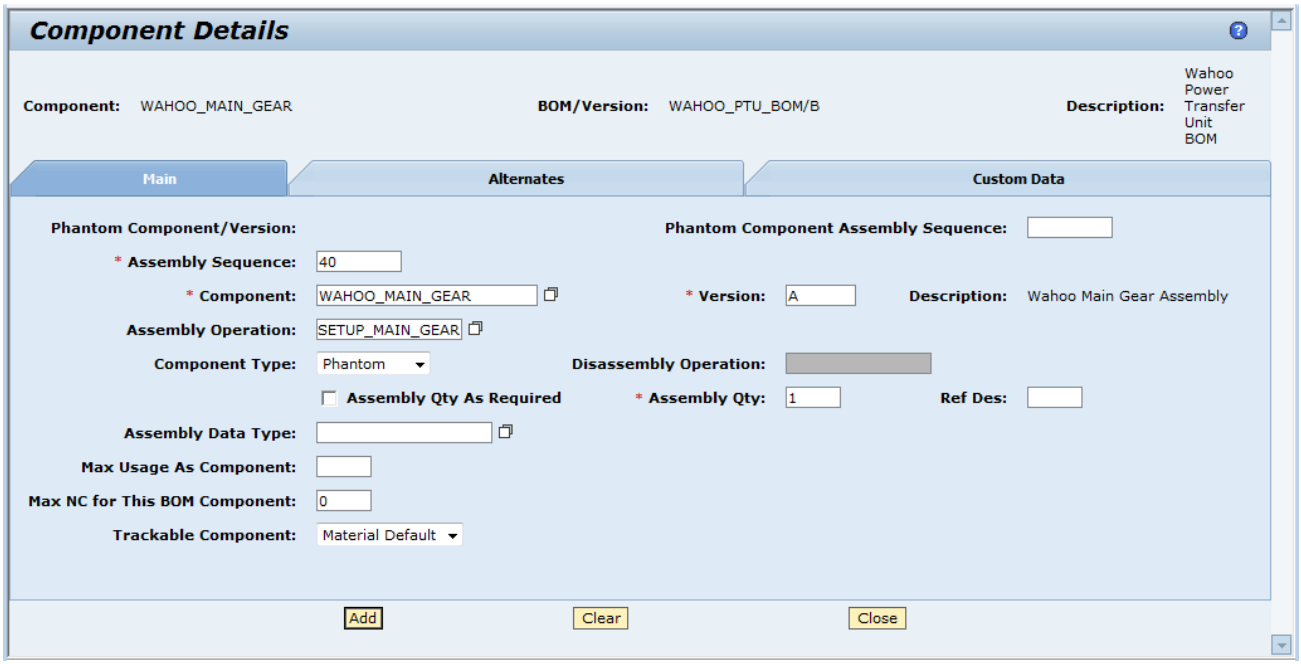

Select the row for assembly sequence 30 and select the Insert After link. This will display the Component Details screen as shown in the following screenshot.



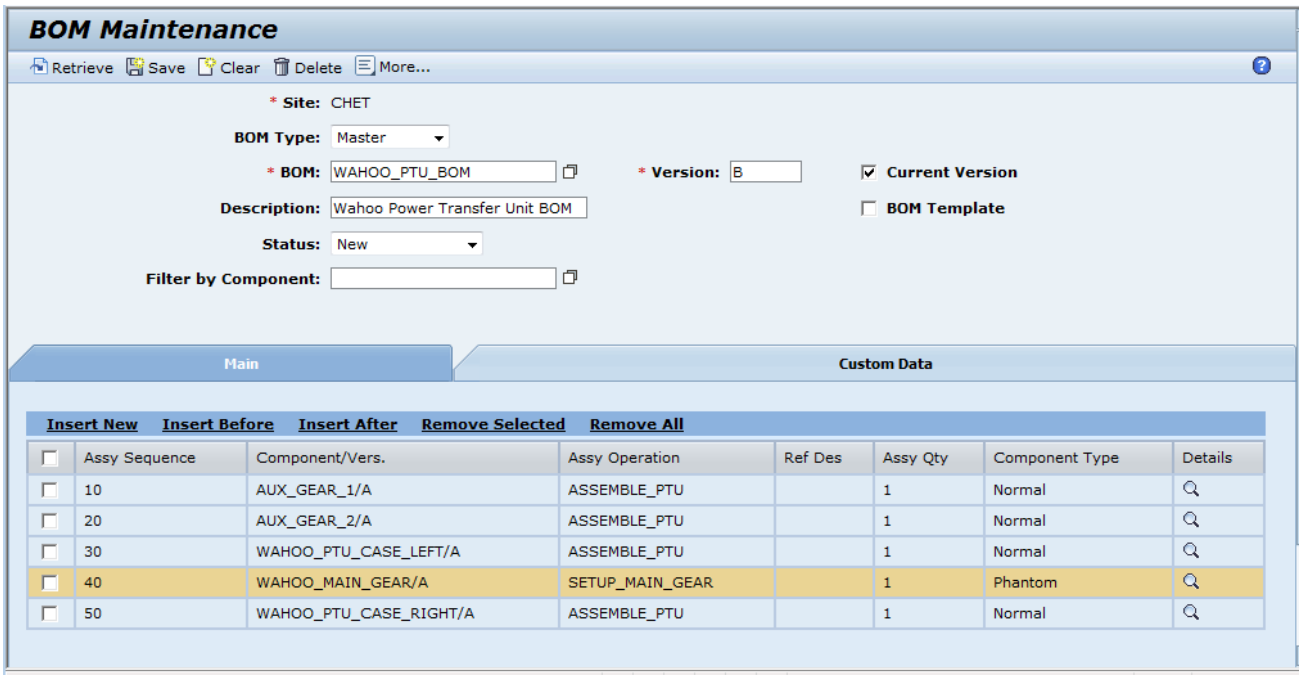

To add the phantom component:

1. Specify the Assembly Sequence as 40
2. Browse and select the material defined for the phantom Component (WAHOO_MAIN_GEAR)
3. Specify the Assembly Operation
4. Select Phantom as the Component Type
5. Specify the Assembly Qty as 1

The results are shown in the following screenshot.




By selecting the Add button, the phantom component is added to the BOM. For this example, we will select the Close button to see that the phantom component has been added to the BOM, as shown in the following screenshot.

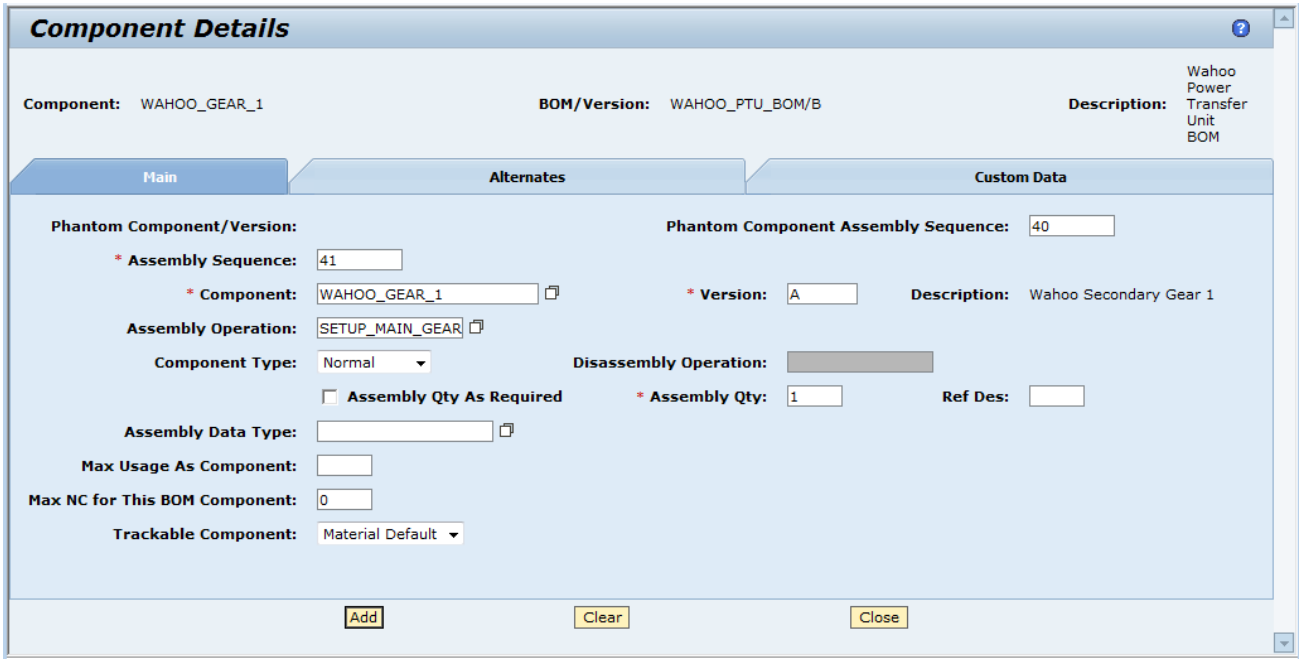



Next, we will add the components that make up the phantom component.

6. Select the Insert After link
7. Specify the Phantom Component Assembly Sequence as 40
8. Specify the Assembly Sequence as 41
9. Browse and select the component WAHOO_GEAR_1

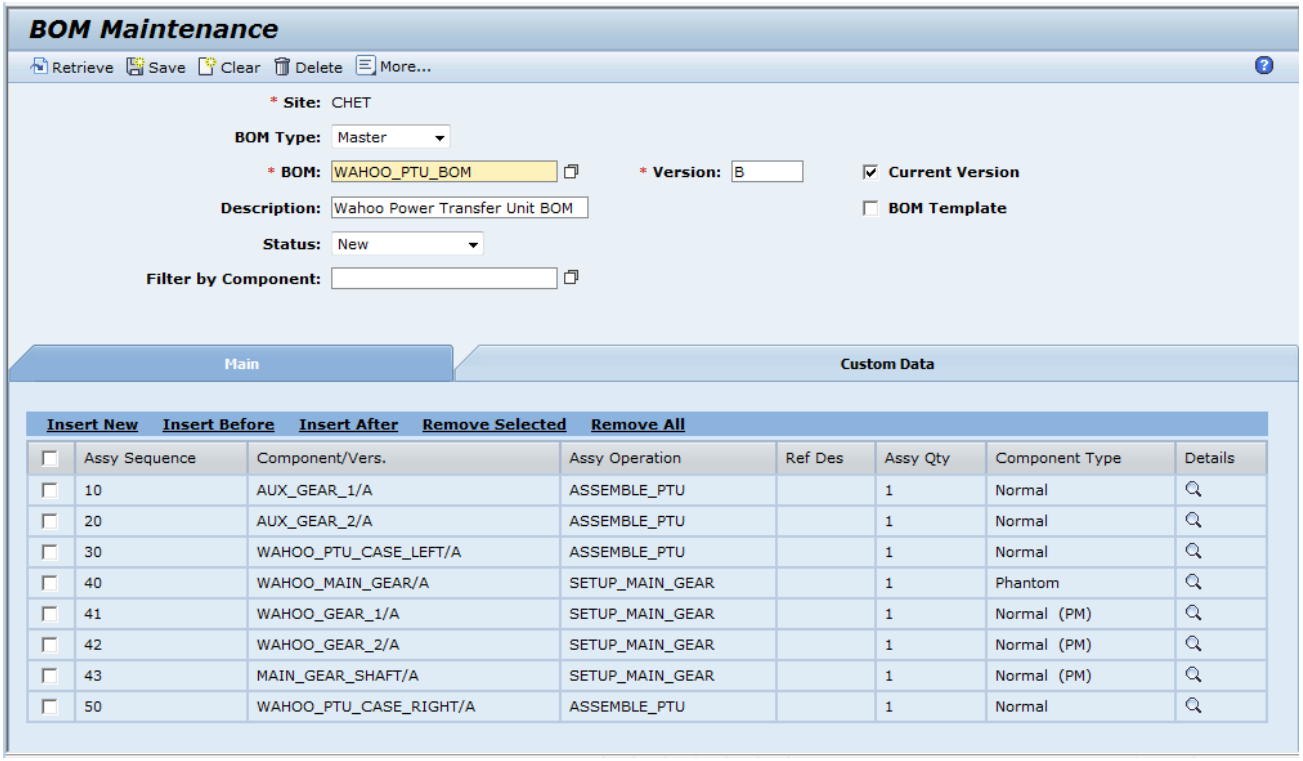
10. Specify the Assembly Operation
11. Leave the Component Type as Normal
12. Specify the Assembly Qty as 1

The results are shown in the following screenshot.




13. Select the Add button and then, using the same procedure as above, add component WAHOO_GEAR_2 as Assembly Sequence 42 and MAIN_GEAR_SHAFT as Assembly sequence 43
14. Select the Close button

This results in the phantom BOM as shown in the following screenshot.




| Assy Sequence | Component/Vers. | Assy Operation | Ref Des | Assy Qty | Component Type | Details |
|---|---|---|---|---|---|---|
| 10 | AUX_GEAR_1/A | ASSEMBLE_PTU | | 1 | Normal | |
| 20 | AUX_GEAR_2/A | ASSEMBLE_PTU | | 1 | Normal | |
| 30 | WAHOO_PTU_CASE_LEFT/A | ASSEMBLE_PTU | | 1 | Normal | |
| 40 | WAHOO_MAIN_GEAR/A | SETUP_MAIN_GEAR | | 1 | Phantom | |
| 41 | WAHOO_GEAR_1/A | SETUP_MAIN_GEAR | | 1 | Normal (PM) | |
| 42 | WAHOO_GEAR_2/A | SETUP_MAIN_GEAR | | 1 | Normal (PM) | |
| 43 | MAIN_GEAR_SHAFT/A | SETUP_MAIN_GEAR | | 1 | Normal (PM) | |
| 50 | WAHOO_PTU_CASE_RIGHT/A | ASSEMBLE_PTU | | 1 | Normal | |

The (PM) in the Component Type column indicates that the component is a phantom member of phantom component specified with Assy Sequence 40.

For more information on phantom BOM creation, see BOM Maintenance later in this document.

## 3.8 Creating and Releasing a Shop Order for the End Product

When a shop order is created for the collector material, installation shop orders are created for the components in the BOM specified for the shop order of the collector material. These shop orders are created automatically by the system, when it is configured as indicated in this document. A shop order is automatically created and released for each component in the BOM.

## 3.9 Serializing the End Unit

If it is necessary to change the serial number (SFC number) for the end unit, the Collect Parent Serial Number activity (PR555) is designed to be used for this purpose. Prior to completing the last operation in the routing, of the component of the end unit that has been identified for collecting the parent serial number, select to run the Collect Parent Serial Number activity. If the activity rule, GENERATE_ID, is set to True, the system will automatically create a new serial number and use it as the new SFC number for the end unit. If the activity rule is False, the user will be prompted to enter the new serial number.

The Collect Parent Serial Number activity can only be run for an automatically created shop order for a component that has been specified to collect the parent serial number (see Defining the Material to Trigger Serialization and Material Maintenance in this document).

## 3.10 Functional Walkthrough

The following provides a step by step walkthrough of using complex assembly and re-serializing the end unit.

1. Configure SAP ME as indicated in this document
2. Create a material for the end unit product, specify it as a Collector and, if needed, require that the serial number be changed before the shop order is done
3. Create a material for each component of the end unit product
4. For at least one of the components, specify it to collect parent serial number
5. Create and release a shop order (Build Qty equal to 1) for the end unit
6. The system will automatically create and release an installation shop order for each component in the BOM for the end unit product
7. If the activity hooks are set as indicated in this document, the system will automatically assemble the end unit and components and will create and update the as-built configurations
8. If needed, at an active operation in the routing for a component designated to collect parent serial number, select to run the Collect Parent Serial number activity
9. The system will either change the SFC number for the end unit based upon the next number settings, or it will prompt for the entry of the new SFC number (serial number)

# 4 Integration

There is no additional integration specific to complex assembly.

# 5 Setting up Complex Assembly

## 5.1 Maintenance Activities

### 5.1.1 System Rules

#### 5.1.1.1 Allow Assemble Quantity as Required

This Component Traceability system rule enables the user to assemble a quantity of a component that is larger or smaller than the quantity specified in the BOM.

#### 5.1.1.2 Display Auto Fill Components

This Component Traceability system rule displays automatically filled components in the Component Data table during assembly.

#### 5.1.1.3 Enable Pegging on Release

This Component Traceability system rule associates a subassembly with the top-level shop order during release activities.

#### 5.1.1.4 Enable Pegging on Consumption

This Component Traceability system rule allows only the associated component subassembly, that was released with the top-level SFC, to be assembled during Genealogy activities (Assembly Point or As-Built Configuration).

#### 5.1.1.5 Specific BOM Component Revision Required

This Component Traceability system rule requires users to enter a version for each BOM component on the Component Details screen in BOM Maintenance.

#### 5.1.1.6 Archive Component when Parent is Archived

This Miscellaneous system rule, if set to True, archives components only when the parent assembly is archived, instead of when the component's status is Done; the system does not archive components until it archives their parent assembly. This setting can be used in Material Maintenance to override the rule for materials that should be kept in floor stock.

This rule, if set to False (default), archives components when their status is Done. This setting results in fewer records in the WIP database at a given time. However, by the time components are consumed out of finished goods inventory into a top level assembly, their WIP records may have already been archived.

#### 5.1.1.7 Create Subassys on Shop Order Release

This Order system rule creates and releases subassembly shop orders when the parent shop order is released. The system determines the subassemblies to be created based on the shop order BOM and ignores phantom components on release.

#### 5.1.1.8 Display End Unit Number

This Order system rule displays the End Unit Number field in Shop Order Maintenance, Shop Order Release, the SFC Current Information section of the Shop Workbench plug-in and the header of the Earned Standards plug-in.

### 5.1.2 Activity Rules

The following activity rule is available for the Collect Parent Serial Number activity (PR555):

| Rule | Setting |
|---|---|
| GENERATE_ID | **TRUE** (default): The system automatically creates the new serial number to be used as the SFC number for the parent material<br>**False**: The user is prompted to enter the new serial number |

### 5.1.3 Activity Hook Points

The following table identifies the hook points that are specifically used by complex assembly.

| Hook Point | When the Hook Activity Executes |
|---|---|
| POST_ORDER_RELEASE | After the user releases a shop order |
| POST_ORDER_CLOSE | After all SFCs for a shop order have gone to a completed, scrapped or deleted state |

### 5.1.1 Hook Activities

The following hook activities are used for complex assembly.

#### 5.1.1.1 Auto Assemble Component

When a BOM for an SFC contains components whose assembly data type is NONE, and the BOM specifies an assemble operation, these components will be automatically assembled and saved to the SFC Build History record by the Auto Assemble Component hook activity (AUTOASSY_COMPONENT). This can occur upon shop order release, by using the site level hook point POST_ORDER_RELEASE, or at a specific operation, by using an operation hook point.

#### 5.1.1.2 Auto As-Built

When used at the site level hook point POST_ORDER_RELEASE, the Auto As-Built hook activity (AUTO_ASBUILT) creates "planned" as-built configuration records for all the installation orders that have been released with a production order. When used at the site level hook point POST_ORDER_CLOSE, it updates "planned" as-built configuration records to "assembled" for all the installation orders that have been released with a production order.

### 5.1.2 Product Configuration

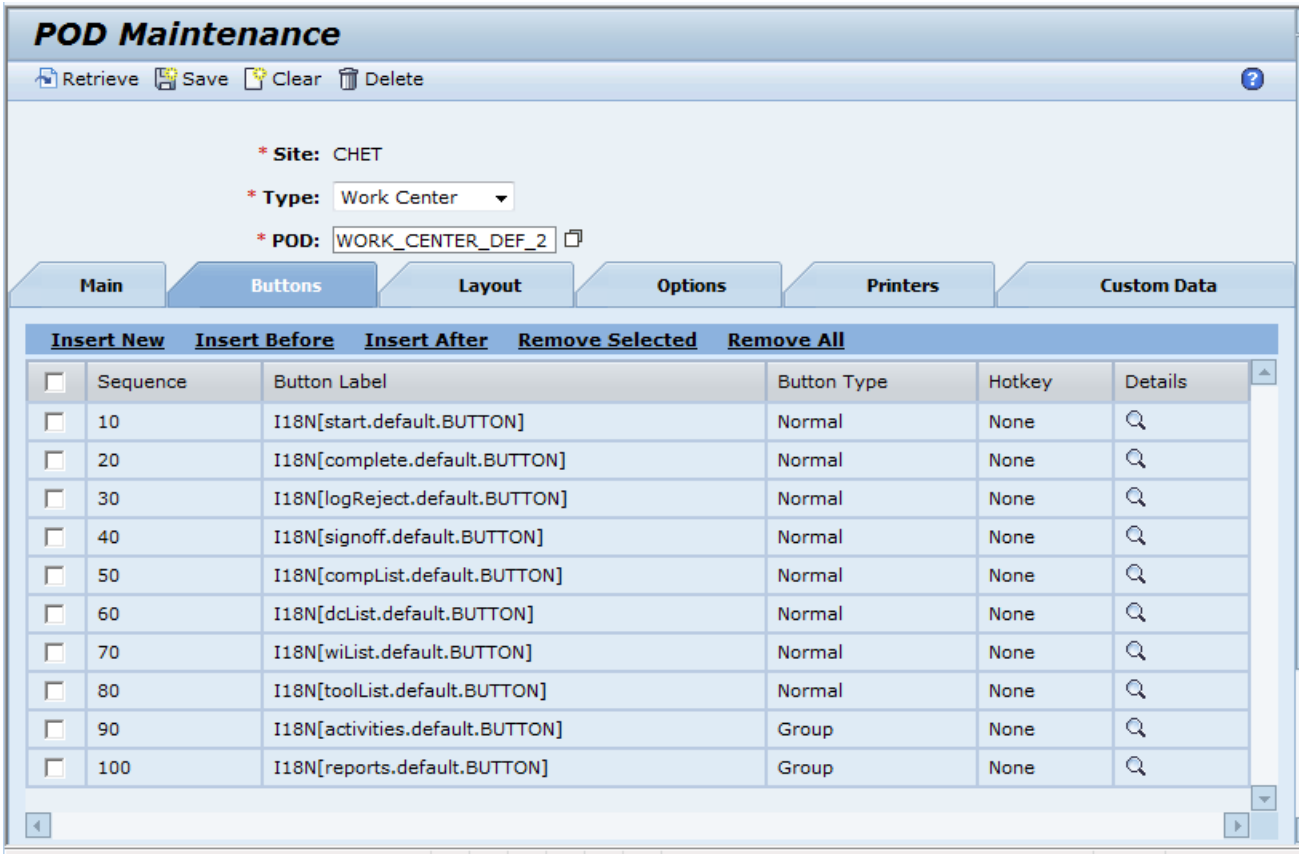
#### 5.1.2.1 Material Maintenance

In Material Maintenance you can configure materials for special complex assembly processing, as described in Defining the Collector Material and Defining the Material to Trigger Serialization earlier in this document.

### 5.1.3 System Configuration

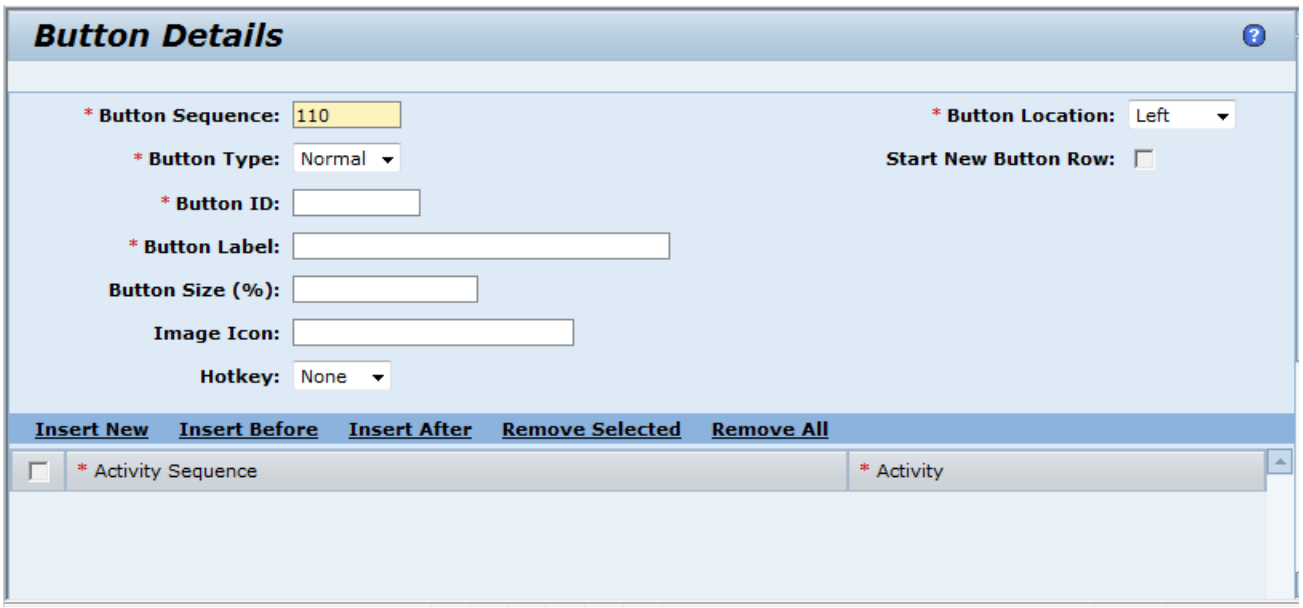
#### 5.1.3.1 POD Maintenance

For complex assembly, POD maintenance can be used to add an activity button, or to add an activity to the list of activities for the Activities button, for the Collect Parent Serial Number activity. To add a button, open the POD Maintenance activity (EN090), select the Work Center type, retrieve a POD to be modified and select the Buttons tab. The following screen will be displayed.




Then select the Insert New link.

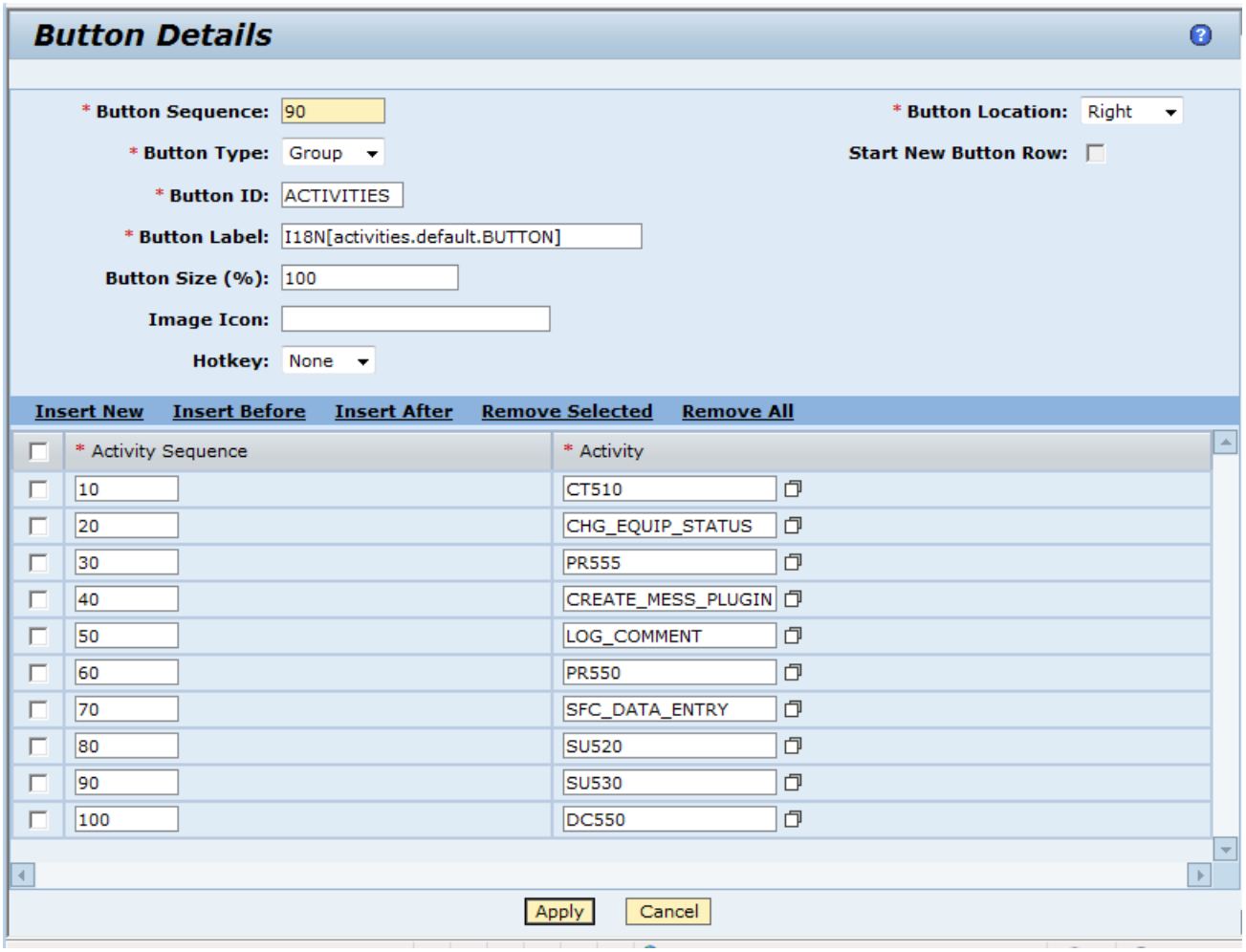
This will display the following screen.



Enter a Button ID (e.g. COLLECT_PSN) and a button label (e.g. Collect PSN). Then select the Insert New link. This will display the following screen. This will add a row to the table, where you can browse and select the Collect Parent Serial activity (PR555). Then select the Apply button (at the bottom of the screen). This will redisplay the Buttons tab with the Collect PSN button added. Select the Save icon.

Alternatively, instead of adding a new button, the Collect Parent Serial Number activity can be added to the Activities button. Instead of selecting the Insert New link on the Buttons tab, select the Details icon in the row for the Activities button group.

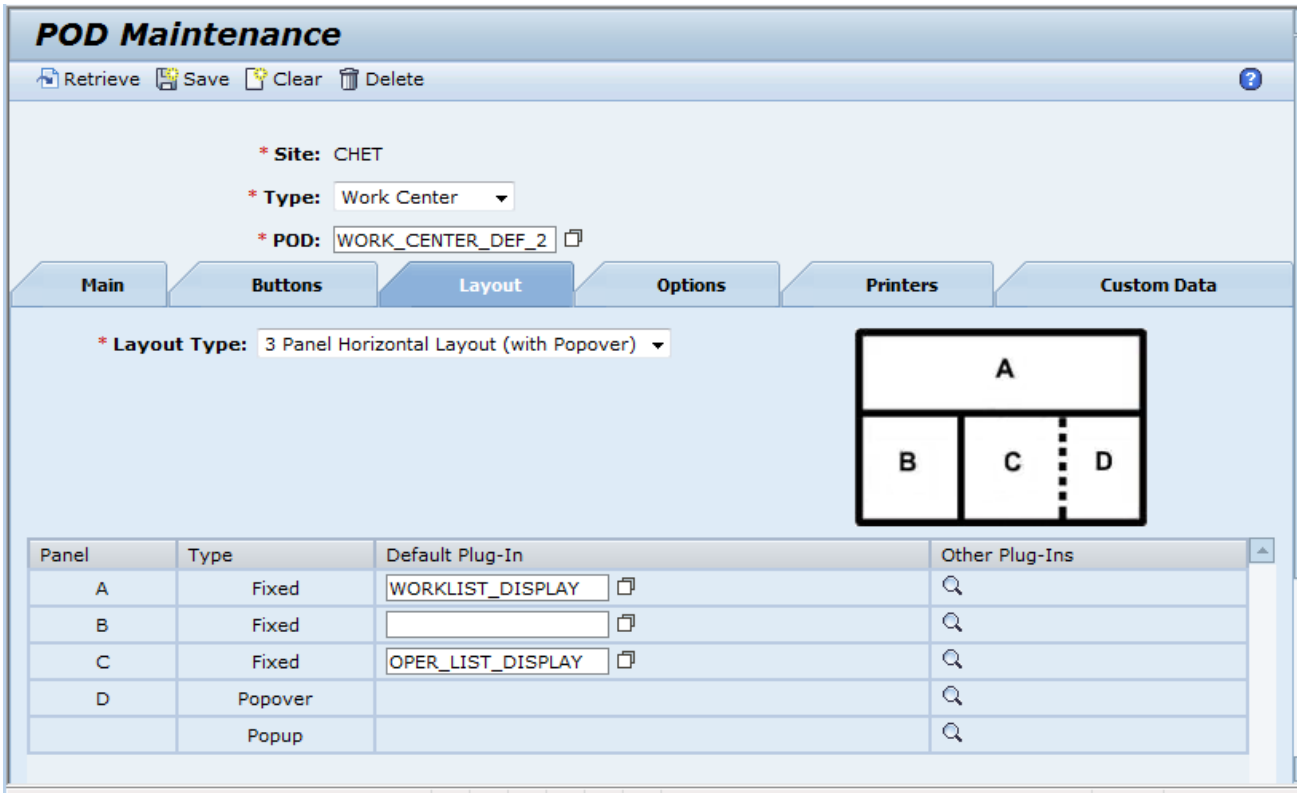
This will display the following screen.



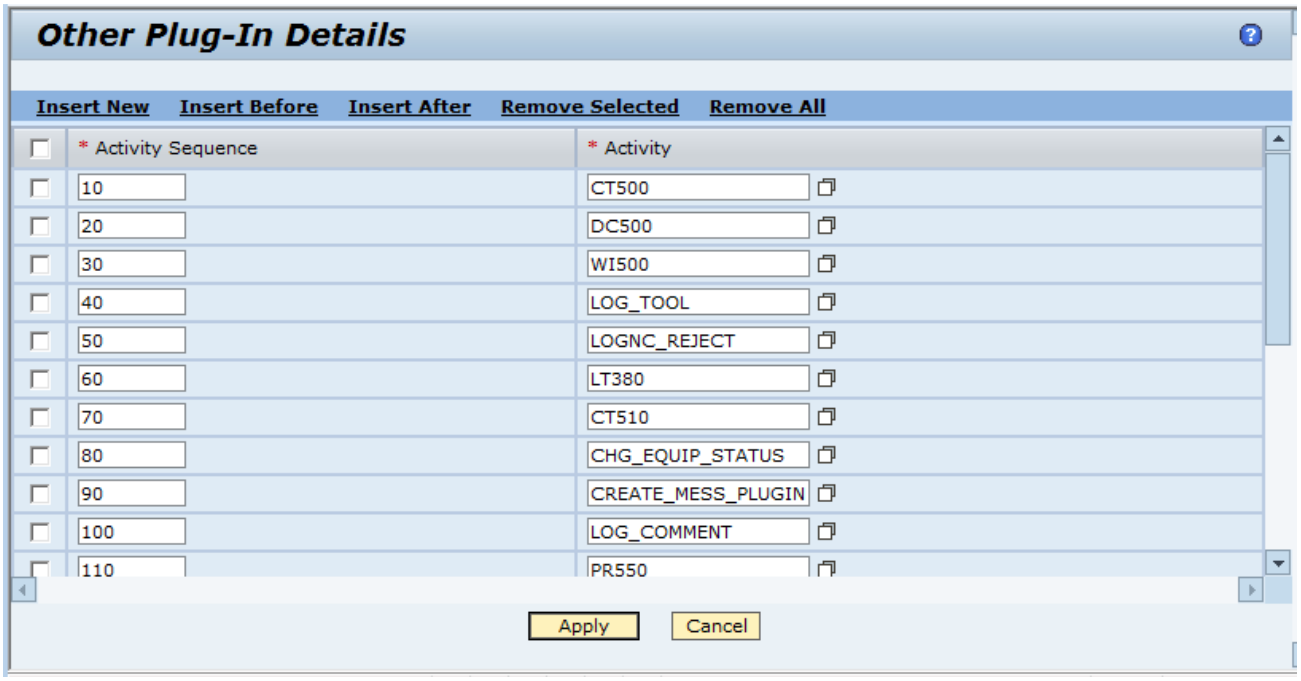

Select the Insert New link. This will add a new row to the table, where you can browse and select the Collect Parent Serial activity (PR555). Then select the Apply button and then select the Save icon. This will add the Collect Parent Serial activity to the list of activities displayed when the Activities button is selected.

Regardless of which of the above approaches you use, the Collect Parent Serial activity must also be added to the Layout tab. Select the Layout tab on the POD Maintenance screen.

This will display the following screen.




Select the icon in the Other Plug-Ins column of the Popup row. This will display the following screen.



Select the Insert New link. This will add a new row to the table, where you can browse and select the Collect Parent Serial activity (PR555). Then select the Apply button and select the Save icon. This will cause the Collect Parent Serial activity to be displayed in a separate pop-up window when the Collect PSN button, or the Collect Parent Serial activity in the Activities list, is selected.

#### 5.1.3.2 Next Number Maintenance

The Next Number Maintenance activity is used to set up the numbering scheme for the SFC Serialize function for complex assembly. For more information, see Next Number Maintenance in the SAP ME help.

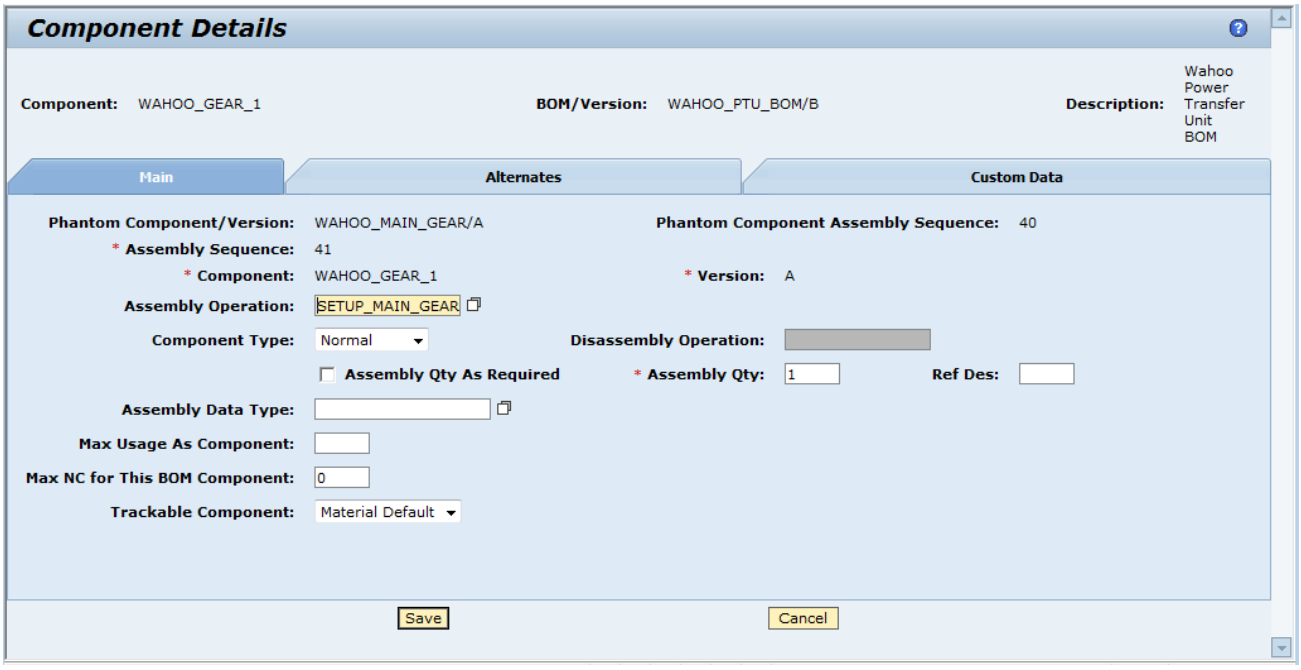
### 5.1.4 Other Maintenance Activities

#### 5.1.4.1 BOM Maintenance (PD050)

The BOM Maintenance activity can be used to create a phantom BOM (the BOM entries for a phantom component). These BOM entries are created in the BOM for the material representing the next higher level assembly. The Component Details screen provides special fields and settings for the creation of a phantom BOM. These fields and settings are described in the following table.

| Field | Setting | Description |
|---|---|---|
| Phantom Component / Version | | Displays the name of the phantom component for a phantom component member, after the phantom component member has been saved and retrieved. |
| Phantom Component Assembly Sequence | | Specifies the assembly sequence number of the parent phantom component for a phantom component member. |
| Component Type | Phantom | Specifies that the component is a phantom component |

The following screenshot shows an example.



# 6 Usage Scenario Examples

None provided.

# 7 Links to Additional Information

SAP ME online Help

# 8 Other Reference Material

SAP ME How-To-Guide – Setting up Activity Hooks

SAP ME How-To-Guide – Setting up Activity Rules

SAP ME How-To-Guide - Earned Standards

SAP ME How-To-Guide – Shop Workbench

# 9 Overview of Changes

The following features, applicable to complex assembly, were added in SAP ME 6.0:

- Earned Standards – See the SAP ME How-To-Guide - Earned Standards and see Earned Standards in SAP ME Help
- Phantom BOM – See BOM Maintenance in SAP ME Help
- Shop Workbench – See the SAP ME How-To-Guide – Shop Workbench and see Shop Workbench in SAP ME Help