SAP Manufacturing Execution

How-To Guide

How To Set Up and Use the SAP ME Barcode Scanning Feature

Applicable Release: ME 15.1

Version 1.2

December 4, 2015

Document History

Document Version	Description	Author
1.0	Initial version	Chet Moutrie
1.1	Added 5.2.5 and 5.2.6 to incorporate 2D Barcode enhancements	Jon Wagner
1.2	Add 6.3 scenario for new 2D barcode enhancement for CT500	Peggy Enriquez

Table of Contents

1 Introduction

1.1 Purpose

The SAP ME How-To-Guide for the Barcode Scanning feature is intended to provide sufficient information to enable the feature to be easily configured and readily utilized to meet business needs, making use of available best practices.

1.2 Scope

This document covers all aspects of the Barcode Scanning feature and how to set it up.

1.3 Glossary

2D Barcode	A barcode that represents a collection of alphanumeric information using a two dimensional pattern of black squares or dots
Barcode	A machine readable representation of information using a pattern of black lines or squares
Barcode Reader	An optical or laser scanning device capable of reading a barcode
Linear Barcode	A barcode that represents an alphanumeric string of characters using a series of parallel black lines of varying width and spacing
PC	Personal Computer
Software Wedge	Software available from a barcode reader vendor that enables a barcode reader to be plugged into a serial port but still put data into the keyboard buffer, like with a wedge reader
Wedge Reader	Special cable that enables a barcode reader and a keyboard to be plugged into the same port on a PC

2 Barcode Scanning Feature Overview

This overview provides a high level description of the SAP ME Barcode Scanning feature. For more details, see Barcode Scanning Functions below.

2.1 Description and Applicability

The Barcode Scanning feature enables the user to collect data to fill one or more SAP ME fields by scanning a barcode. Scanning a linear barcode fills in only the currently selected field, whereas scanning a 2D barcode can fill in multiple SAP ME fields. Scanning 2D barcodes is supported in the following activities:

- Assembly Point (CT500)
- As-Built Configuration (CT510)
- Floor Stock Receipt (IN500)
- Maintain Floor Stock (MAINT_INV)

In order to utilize linear barcode scanning, the client device must provide an optical or laser scanning capability that places data in the keyboard buffer of the client device. For a PC client, the usual approach used to achieve this is to connect a "Keyboard interface scanner" via a PS/2 or AT keyboard–compatible adaptor cable.
In order to utilize 2D barcode scanning, the client device must provide an optical or laser 2D scanning capability. For a PC client, the usual approach used to achieve this is to connect a 2D scanner to a serial port via a special adaptor cable.

2.2 Business Purposes / Functions

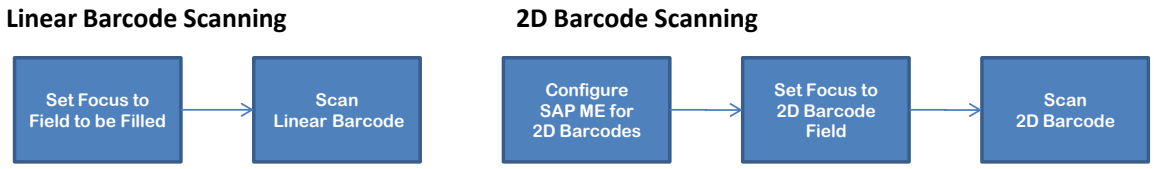
The SAP ME Barcode Scanning feature reduces user effort by eliminating the keystrokes needed to key in the data. It also reduces input errors and increases data accuracy and integrity.

Section 3 describes the following barcode scanning functions:

- Scanning linear barcodes
- Scanning 2D barcodes
- Printing barcodes

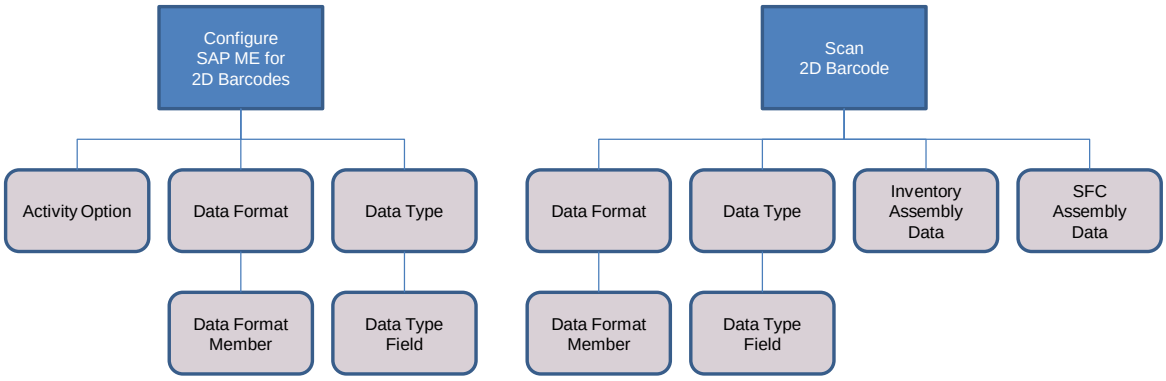
2.3 High-Level Process Flows

This figure illustrates the primary flows of user actions when setting up and utilizing the Barcode Scanning feature.



2.4 High Level Data Model

The following figure shows the relationship between some of the Barcode Scanning functions and ME database tables.



3 Barcode Scanning Functions

3.1 Scanning Linear Barcodes

3.1.1 Description and Applicability

A linear barcode is a series of parallel lines of varying widths and spacing that represent an alphanumeric string, as shown in the example below.

Other than connecting a barcode scanning device to the client PC, no setup is required for the use of linear barcode scanning with SAP ME.

To scan a linear barcode into SAP ME, set the focus on (move the cursor to) the input field where the barcode data is to go. Then scan the linear barcode. The alphanumeric string from the barcode will be displayed in the input field just as if it had been typed in via the keyboard. This will work for any field where keyboard input is accepted.

Some barcode scanning devices can be configured to append additional characters to the end of the alphanumeric string from the linear barcode. This is typically used to append a "Tab" or "Enter" character to cause the input field to be processed or to move focus to another field.

3.1.2 Best Practices

Often, it is good practice to configure the barcode scanning device to append a "Tab" character to the end of the barcode string. This minimizes user keystrokes in many situations.

3.2 Scanning 2D Barcodes

3.2.1 Description and Applicability

A 2D barcode is a two dimensional pattern of black squares or dots. This is typically a matrix (or grid) pattern, but can also be a circular pattern. Two examples of a 2D barcode are shown below.

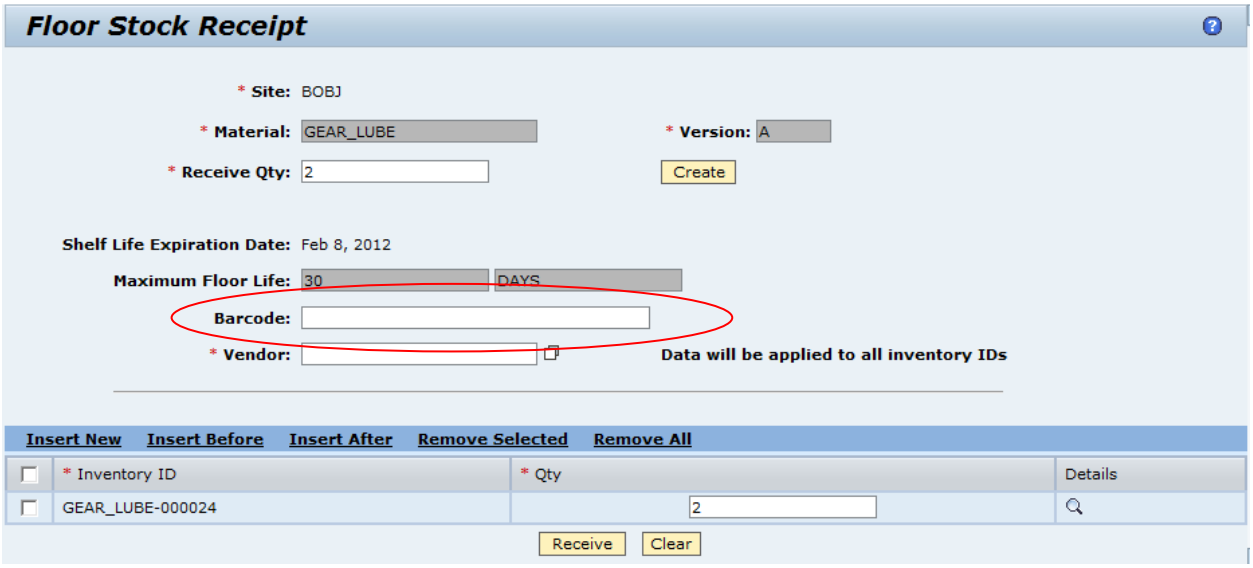
"Wikipedia, the free encyclopedia" in Data Matrix code

Wikipedia URL in Quick Response (QR) Code

In addition to connecting a 2D barcode scanner to the client PC, some configuration of SAP ME is required in order to scan 2D barcodes into SAP ME:

- The barcode data format must be specified and data elements from the 2D barcode must be mapped to SAP ME data type data fields (see Barcode Data Format Maintenance)
- The 2D barcode parser activity (BARCODE_PARSER) must be attached to the SAP ME site as a hook point activity or to a material as the assembly point parsing activity (see Activity Hooks and Material Maintenance)
- A data type identifying the data fields to collect must be specified for each activity where 2D barcode scanning is to be used (see Material Maintenance)
- The DISPLAY_BARCODE activity rule must be set to Yes for the activities where 2D barcodes are to be scanned (see Activity Maintenance)

To scan a 2D barcode into SAP ME, set the focus on (move the cursor to) the special 2D Barcode input field, as shown in the screenshot below.

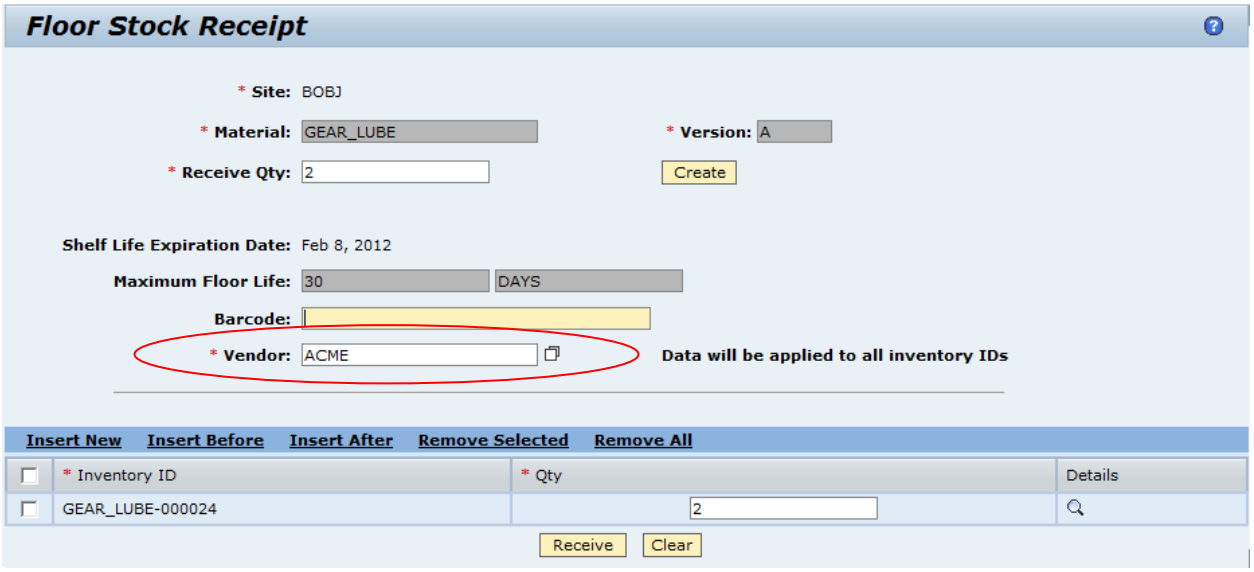


Then scan the 2D barcode. The barcode parser activity will parse the 2D barcode into its constituent data elements. It will map each data element into the associated data field for the data type specified for the activity that is displaying the special 2D barcode input field.

For example:

- Data type VENDOR_DATA is created with a data field VENDOR
- Data type VENDOR_DATA is specified in the *Data to Collect on Shop Floor Receipt* field in the Material Maintenance activity for material WIDGET_1023
- A 2D barcode is scanned into the Barcode field in the Floor Stock Receipt activity for material WIDGET_1023
- The 2D barcode is parsed, the barcode data format is determined and a value (ACME) is found for data element 1V

- The value ACME is placed into the data field VENDOR for data type VENDOR_DATA for the floor stock item being received



3.3 Printing Barcodes

3.3.1 Description and Applicability

Linear and 2D barcode definition and printing software / hardware is available online from several third party vendors, including: 2PTech, Cristallight Software, Edibar-RMS, Pro Data Doctor, TALtech and Zebra Technologies, among others.

4 Integration

4.1 Integration within SAP ME

The scanning of 2D barcodes is integrated into the following SAP ME activities:

- Assembly Point (CT500)
- As-Built Configuration (CT510)
- Floor Stock Receipt (IN500)
- Maintain Floor Stock (MAINT_INV)

The Barcode Scanning feature utilizes data fields defined in Data Field Maintenance and data types defined in Data Field Assignment Maintenance.

4.2 Barcode Scanner Integration

For information on barcode scanner integration, see External Configuration.

5 Feature Setup

5.1 External Configuration

5.1.1 Installation

A barcode reader (optical or laser scanning device) must be connected to the client device, unless the client device has one built-in. Linear barcode readers are typically connected to a PC via a PS/2 or AT keyboard compatible adaptor cable (sometimes called a wedge reader). 2D barcode readers are typically connected to a PC via a serial port and a special adaptor cable. For more information, refer to the barcode reader manufacturer's installation manual.

5.1.2 External Program Setup

Some linear barcode readers provide the capability to configure the barcode reader to append characters to the end of the alphanumeric string from the barcode. For more information, refer to the manufacturer's installation manual for the barcode reader.

5.1.3 Client Device

For client devices, SAP ME currently only supports a PC running a Microsoft operating system with an Internet Explorer browser.

5.2 Maintenance Activities

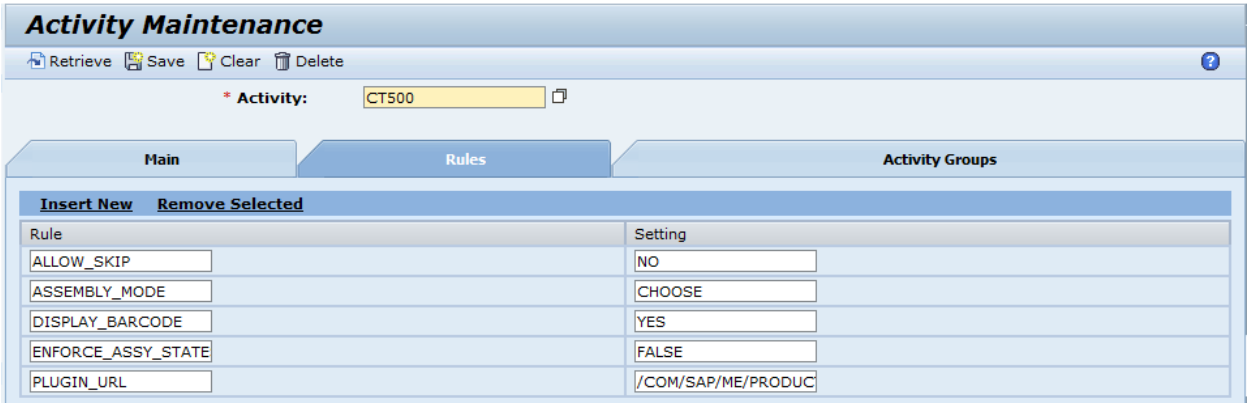
5.2.1 Activity Rules

5.2.1.1 DISPLAY_BARCODE

In order for the special 2D barcode input field to be displayed in an activity, the DISPLAY_BARCODE activity rule must be set to Yes for that activity. This applies to the following activities:

- Assembly Point (CT500)
- As-Built Configuration (CT510)
- Floor Stock Receipt (IN500)
- Maintain Floor Stock (MAINT_INV)

The following screenshot shows the activity rule for the Assembly Point activity.



5.2.2 Activity Hooks

5.2.2.1 Site Maintenance

The 2D barcode parser activity (BARCODE_PARSER) must be either attached as a hook point activity at the site level or specified as the assembly point parsing activity for a material.

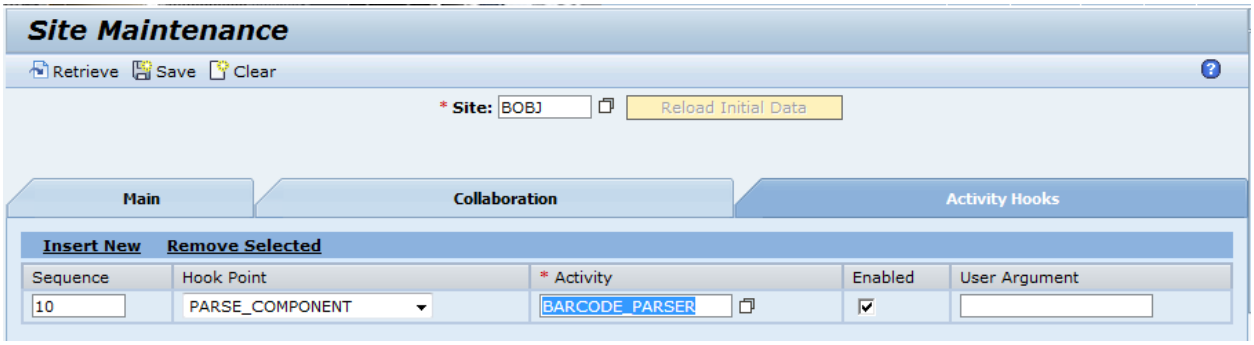
5.2.2.1.1 Purpose / Effects

The 2D barcode parser activity parses the 2D barcode to determine the 2D barcode format and to then parse the barcode into its constituent data elements. It stores the value of each data element into the SAP ME data field associated to that data element in Barcode Data Format Maintenance.

5.2.2.1.2 Hook Points

The 2D barcode parser activity can be attached at the Parse Component hook point in Site Maintenance.

5.2.2.1.3 Example



5.2.3 Product Configuration

5.2.3.1 Material Maintenance

5.2.3.1.1 Purpose / Effects

In Material Maintenance, a data type can be specified to collect data during assembly or removal of the component or to collect data during shop floor receipt. The barcode parser can use the data fields associated to the data type to store data from a 2D barcode.

5.2.3.1.2 Settings / Example

A data type can be specified in the following Material Maintenance fields:

- Data to Collect on Assembly
- Data to Collect on Removal
- Data to Collect on Floor Stock Receipt

5.2.4 System Configuration

5.2.4.1 Activity Maintenance

5.2.4.1.1 Purpose / Effects

Activity Maintenance can be used to set the system rule DISPLAY_BARCODE for the following activities:

- Assembly Point (CT500)
- As-Built Configuration (CT510)
- Floor Stock Receipt (IN500)
- Maintain Floor Stock (MAINT_INV)

5.2.4.1.2 Settings / Example

Setting the DISPLAY_BARCODE activity rule to Yes for an activity causes the special 2D Barcode input field to be displayed in the user interface of that activity. See Activity Rules for an example.

5.2.4.2 Barcode Data Format Maintenance

5.2.4.2.1 Purpose / Effects

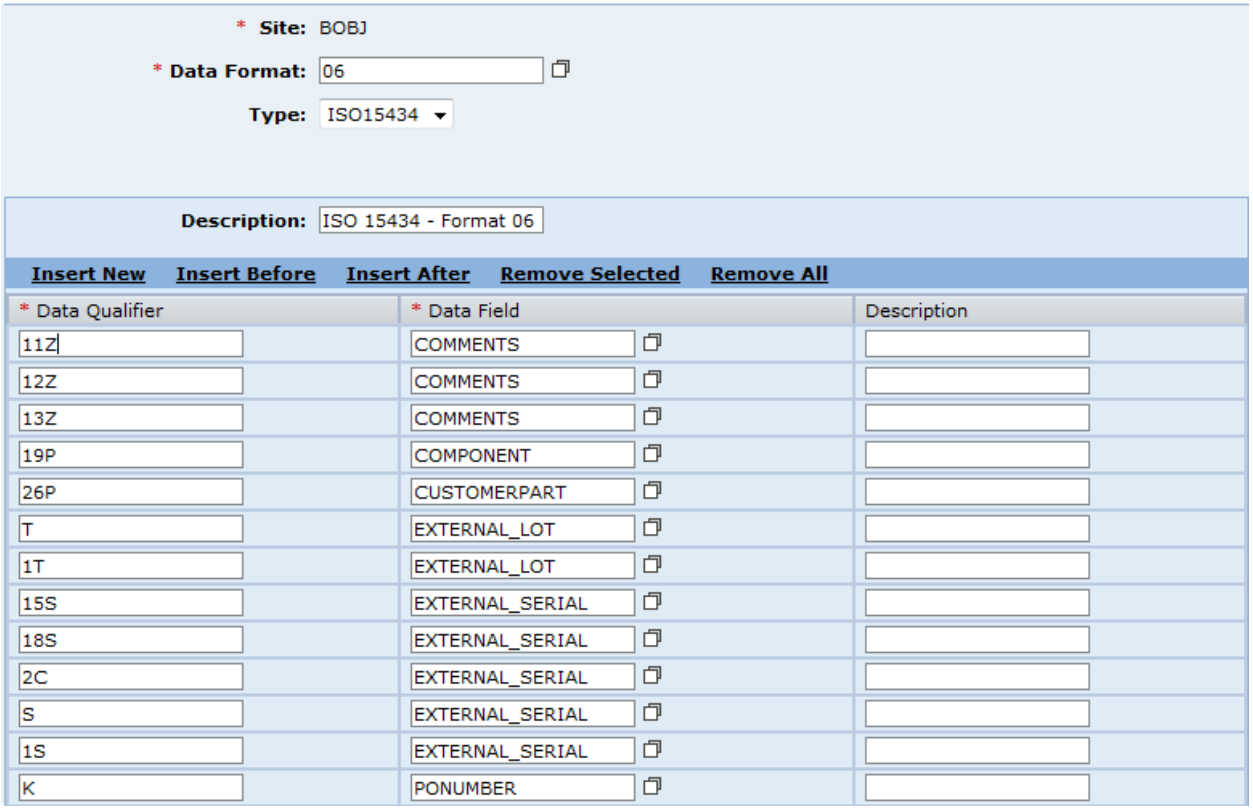
Barcode Data Format Maintenance is used to specify the 2D barcode formats that can be used and to map data elements (data qualifiers) from the 2D barcode format to SAP ME data fields. SAP ME provides one pre-defined 2D barcode data format (06). Please ensure that the appropriate user groups have permission to run Barcode Data Format Maintenance, as it is not available by default (see User Group Maintenance).

5.2.4.2.2 Settings / Example

The following table describes the user interface fields requiring explanation.

Field	Description
Format	The name of the 2D barcode format
Type	The type of 2D barcode format – either ISO15434 or Custom
Data Qualifier	The identifier of a data element in the 2D barcode format
Data Field	An SAP ME data field defined in Data Field Maintenance
Description (in table)	A free form description of the data qualifier and/or the data field

The following screenshot shows a portion of the information for the predefined 2D barcode data format.



* Site: BOBJ

* Data Format: 06

Type: ISO15434

Description: ISO 15434 - Format 06

Insert New | Insert Before | Insert After | Remove Selected | Remove All

* Data Qualifier	* Data Field	Description
11Z	COMMENTS	
12Z	COMMENTS	
13Z	COMMENTS	
19P	COMPONENT	
26P	CUSTOMERPART	
T	EXTERNAL_LOT	
1T	EXTERNAL_LOT	
15S	EXTERNAL_SERIAL	
18S	EXTERNAL_SERIAL	
2C	EXTERNAL_SERIAL	
S	EXTERNAL_SERIAL	
1S	EXTERNAL_SERIAL	
K	PONUMBER	

Multiple data qualifiers are mapped to the same SAP ME data field because different variations of the 2D barcode data format use different data qualifiers.

5.2.4.3 Data Field Maintenance

Data Field Maintenance is used to define SAP ME data fields which can be mapped to 2D barcode data elements (data qualifiers) as shown above. For more information see Data Field Definition Maintenance in SAP ME Help.

5.2.4.4 Data Field Assignment Maintenance

This activity is used to associate SAP ME data fields to data types. Data types are associated to activities, which act on components, in Material Maintenance. For more information see Data Field Assignment Maintenance in SAP ME Help.

5.2.4.5 Site Maintenance

Site Maintenance can be used to make a site level attachment of the barcode parser activity to component actions. For more information see Activity Hooks above and Site Maintenance is SAP ME Help.

5.2.4.6 User Group Maintenance

User Group Maintenance can be used to give user groups permission to run SAP ME activities. Permission to run Barcode Data Format Maintenance is not available by default. For more information see User Group Maintenance in SAP ME Help.

5.2.5 Enhanced 2D Barcode Steps

Scanning ISO 15434 barcodes have demonstrated issues with several major browsers. The control character sequences used for the Group Separator <GS>, Record Separator <RS> and End of Transmission <EOT> will often cause various browser shortcut keys to be invoked. A solution has been implemented within SAP ME to replace these unprintable characters with strings that won't cause interaction with the browser. The following table identifies the (non-visible) control character and it's replacement value that will allow proper barcode scanning within SAP ME:

Control Character	Replace With
<GS> ASC II of 29	{GS}
<RS> ASC II of 30	{RS}
<EOT> ASC II of 4	{EOT}

The Barcode parser in SAP ME 6.1.4 (and above) has been modified to recognize the {GS}, {RS} and {EOT} string values as an alternative means of parsing characters which do not interact well with the web browser. This alternative form of encoding will require that each handheld scanner is re-programmed to search for the unprintable characters and replace them with the values noted in the table above. This change does not require any modification to the printed barcodes themselves, only the way the 2D scanner decodes the values.

For example, when properly configured, a barcode read from the scanner will resemble the following:

```
[)>-06{GS}11ZThis is a test{GS}19PBRACKET{GS}26PPART_0001{GS}T002-
001_LOT{GS}15S1234-4567-00-ES{GS}KPO-001-0003993{GS}1WRCO-0003-
003939923{GS}VVENDOR_1{GS}D12122009{GS}TVL-000010200231{RS}{EOT}
```

5.2.6 2D Replacement Character Programming

Most scanner manufacturers provide a means of programming the replacement characters identified in section 6.2.4 using an application. Please refer to the specific barcode scanner vendor's device manual for details regarding the applications available for your particular model scanner(s).

One utility available for Symbol and Motorola brand scanners is 123Scan[2]. This utility can be downloaded from their website and can be used to program various models. The following identifies the configuration settings for the HID Keyboard Emulation (USB) which allows the scanner to emulate a keyboard by typing in the barcode contents directly into an SAP ME barcode-aware field.

***Note-** The USB settings indicated in bold are highly recommended for reliable scanning.

Cable Connection Settings

USB

Caps Lock Override	***Enable^***
Emulate Keypad	***Enable^***
Emulate Keypad with Leading Zero	*Enable^*
USB Polling Interval	*4 msec^*
Quick Emulation	*Enable^*

Modify Data

	Erase All Rules
Rule 1: Replace Spec Chars	
	Begin New Rule
	1. Move To All Patterns and Replace <GS> with {GS}
	2. Move To All Patterns and Replace <RS> with {RS}
	3. Move To All Patterns and Replace <EOT> with {EOT}
	4. Skip To Start
	5. Send All that remains
	6. Send Extended Key <Tab>
	Save Rule

***NOTE:**
{RS} = ASC 30
{GS} = ASC 29
{EOT} = ASC 4

6 Usage Scenario Examples

6.1 Linear Barcode Scenario

6.1.1 Purpose / Goal

The purpose of this scenario is to use a linear barcode reader to scan in the inventory ID for components being assembled.

6.1.2 Scenario Specific Settings

6.1.2.1 Attach Barcode Reader

A linear barcode reader has been attached to the PC's AT port with a special cable

6.1.2.2 Configure Data Type to Collect at Assembly

- Select the Material Maintenance activity
- Select PTU_CASE_L and OK in the Material browse
- Select Retrieve

- Select the Build tab
- Select INV and OK in the Data to Collect at Assembly browse
- Select Save
- Select the Create and Release SFC activity
- Select PTU_CASE_L and OK in the Material browse
- Enter 1 in the Qty field
- Select the Create button
- SFC PTU-000022 for material PTU is created and is available to be started at operation ASSEMBLE_PTU

6.1.3 Scenario Steps

1. Open the Operator POD
2. Select ASSEMBLE_PTU in the browse for operation
3. Select the Tab key twice
4. Select PTU-000022 and OK in the browse for SFC
5. Select the Start button
6. Select the Assemble button
7. Select the row for component PTU_CASE_L in the Component List table (the cursor will then be automatically displayed in the Inventory ID field)
8. Scan the barcode on the physical component PTU_CASE_L to be assembled
9. The barcode reader will put the barcode data (string of characters representing the inventory ID) into the Inventory ID field
10. Tab out of the Inventory ID field (the cursor will move to the Add button)
11. Select the Enter key
12. The component has now been added to the As-Built record for the SFC PTU-000022

6.2 2D Barcode Scenario-Floor Stock Receipt

6.2.1 Purpose / Goal

The purpose of this scenario is to automatically populate vendor data fields by scanning a 2D barcode during floor stock receipt.

6.2.2 Scenario Specific Settings

6.2.2.1 Attach and Install 2D Barcode Reader

- Attach a 2D barcode reader to a serial port on the PC
- Install the vendor software for the 2D barcode reader

6.2.2.2 Configure SAP ME for 2D Barcode Use

- Select the Material Maintenance activity
- Select GEAR_ LUBE and OK in the Material browse
- Select Retrieve
- Select the Build tab
- Select VENDOR and OK in the Data to Collect on Floor Stock Receipt browse
- Select Save

- Select Activity Maintenance
- Select IN500 (Floor Stock Receipt) and OK in the Activity browse
- Select Retrieve
- Select the Rules tab
- Change the DISPLAY_BARCODE rule setting to YES
- Select Save
- Select the Site Maintenance activity
- Select Retrieve
- Select the Activity Hooks tab
- Select Insert New
- Select PARSE_COMPONENT in the Hook Point drop down in the new row
- Select BARCODE_PARSER and OK in the Activity browse in the new row
- Select the Enabled checkbox in the new row
- Select Save

Note: SAP ME comes with the data type VENDOR configured with data fields VENDOR, VENDOR_LOT and VENDOR_DATE_CODE and with the barcode data format 06 configured for the above data fields, as shown in the following table.

Data Qualifier	Data Field
V	VENDOR
1V	VENDOR
6V	VENDOR
D	VENDOR_DATE_CODE
T	VENDOR_LOT
1T	VENDOR_LOT

6.2.3 Scenario Steps

- Create and print a 2D barcode using the Matrix Code ISO15434 format with data elements defined as shown in the following table:

Data Element	Value
V	ACME
D	01092012
T	22

- Select the Floor Stock Receipt activity
- Select GEAR_LUBE and OK in the Material browse
- Enter 2 in the Receive Qty field
- Select Create (the cursor will be automatically placed in the Barcode field)
- Scan the 2D barcode
- The Vendor, Vendor Date Code and Vendor Lot fields will be filled in with the values ACME, 01092012 and 22 respectively

6.3 2D Barcode Scenario-Assembly Point

6.3.1 Purpose / Goal

The purpose of this scenario is to automatically populate vendor data fields by scanning a 2D barcode during Assembly Point.

6.3.2 Scenario Specific Settings

6.3.2.1 Attach and Install 2D Barcode Reader

- Attach a 2D barcode reader to a serial port on the PC
- Install the vendor software for the 2D barcode reader

6.3.2.2 Configure SAP ME for 2D Barcode Use

- Select Data Field Assignment Maintenance
  - Create a new Data Field Type
    - Category:Assembly
    - Type: ASSY_DEF_FIELDS
    - Description: Assy Data Type Default Fields
    - SEQUENCE: 10 Data Field: COMMENTS
    - SEQUENCE: 20 Data Field: COMPONENT
    - SEQUENCE: 30 Data Field: EXTERNAL_LOT
- Select BOM Maintenance Activity
  - Create GEAR_ASSEMBLY BOM
  - Add Assy Sequence: 10 Component: GEAR_DRIVE Qty:1
  - Add Assy Sequence: 20 Component: GEAR_LUBE Qty: 1
  - Add Assy Sequence: 30 Component: GEAR_PLATE Qty:1
- Select Save Select the Material Maintenance activity
  - Select GEAR_ LUBE and OK in the Material browse
  - Select Retrieve
  - Select the Build tab
  - Select ASSY_DEF_FIELDS and OK in the Data to Collect on Assembly browse
  - Select Save
  - Select GEAR_ ASSEMBLY and OK in the Material browse
  - Select Retrieve
  - Set BOM to GEAR_ASSEMBLY
  - Select Save
- Select Activity Maintenance
  - Select CT500 (Assembly Point) and OK in the Activity browse
  - Select Retrieve
  - Select the Rules tab
  - Set ASSEMBLY_MODE to CHOOSE
  - Set the DISPLAY_BARCODE rule setting to YES
  - Set AUTO_ADD_ON_TAB to YES
  - Select Save

- Select the Site Maintenance activity
  - Select Retrieve
  - Select the Activity Hooks tab
  - Select Insert New
  - Select PARSE_COMPONENT in the Hook Point drop down in the new row
  - Select BARCODE_PARSER and OK in the Activity browse in the new row
  - Select the Enabled checkbox in the new row
  - Select Save

6.3.3 Scenario Steps

- Create and print a 2D barcode using the Matrix Code ISO15434 format with data elements defined as shown in the following table:

Data Element	Value
11Z	Gear Lube Comments
19P	GEAR_LUBE
S	LOT123456

- Select Create and Release SFC
  - Select GEAR_ASSEMBLY from Material browse
  - Set Qty=1
  - Input a Shop Order
  - Select Create
  - Note SFC number- SFC123 for this example
- Launch Touch Operation POD
- Select SFC123 from the Work List or from the SFC Browse in POD Selection
- Select Assemble button
- Select the Assemble next to the GEAR_DRIVE component
- Fill in Assembly Data
- Select Add button
- *Component has been added* message; Find Component and Barcode fields display
- Scan 2D barcode into Barcode field
  - Note: since Component is part of the 2D barcode, the GEAR_LUBE component is automatically retrieved and then assembly data fields are filled in
- Hit Tab
  - Since AUTO_ADD_ON_TAB is set to YES and the cursor is in the last data field, the Add occurs
    - Note: if you program your scanner to do the tab at the end of a scan, the Add will occur automatically after the scan
- *Component has been added* message; Find Component and Barcode fields display
- Input GEAR_PLATE into Find Component field; click Enter

- Fill in Assembly Data
- Select Add button
- Assembly Point plugin closes and returns to POD Work List
- *All Components assembled at this operation* message

7 Links to Additional Information

Two-Dimensional (2D) Barcode Scanning in SAP ME Help

Barcode Data Format Maintenance in SAP ME Help

8 Other Reference Material

Wikipedia article on barcodes

9 Overview of Changes

2D Barcode scanning is a new feature in SAP ME 6.0.

For SAP ME 15.1:

- 2D Barcode scanning enhanced to receive printable characters for he control character sequences separators to solve browser issues
- 2D Barcode scanning enhanced for CT500 to extract the component if the COMPONENT data field is included in the 2D Barcode. Once scanned into the Barcode field, it retrieve the component and then load the assembly data for that component.