- Widget orders
- Policies & procedures
- Environment factors
- Worker factors

Assemble widgets

Parts
- Worker
- Tools & equipment

Completed widgets

Waste, recycles

Part requests

Node: C1
Title: Widgets
Number: Pg 1
Node: C4 Title: A1: Restock parts

For Official Use Only
A2: Get widget parts

1. Identify parts to be installed
2. Locate parts in storage
3. Retrieve parts from storage
4. Unpackage parts
5. Re-inspect parts

- Parts for widgets
- Used packaging from assembly
- Unpackaged parts to be inspected
- Parts to be unpackaged
- Location of parts
- Location of parts
- Stocked parts
- Which parts to be installed
- Stock levels
- Widget assembly procedure
- Widget orders
- Worker factors
- Environment factors

- Worker
- Worker

For Official Use Only
A3: Assemble parts

Repository: IDEF0 Process Analysis & Modeling; Date: 10/9/2009

Context:
- Widget orders
- Worker factors
- Environment factors
- Widget assembly procedure
- Worker

Node: C3
Title: A3: Assemble parts
Assemble parts

Description
The process of using parts, tools, and equipment to assemble widgets.
Includes reworking widgets that do not yet meet design specifications.

Assemble widgets

Description
The process of assembling and inspecting widgets and the logistics to support widget assembly.

Determine which parts to restock

Description
Use immediate part demand plus reordering policies and procedures to determine which parts to request and restock.

Get widget parts

Description
The process of getting widget parts from the stock areas so that widgets may be assembled.

Hold widget base for assembly

Description
The process of holding the base part of the widget securely so that other parts may be attached to it. In the case of rework, the base may already be attached to the other parts.

Identify parts to be installed

Description
Determine which parts are to be installed on the widget base.

Inspect new parts

Description
Inspect the newly arrived parts to make sure that they meet specifications in the part inspection procedures. Reject and dispose of those that do not.
**Inspect widgets**

**Description**
The process of inspecting widgets to make sure that they meet design specifications.

**Install widgets in test fixture**

**Description**
Place each widget in the test fixture and secure it.

**Locate parts in storage**

**Description**
Determine where the proper parts are stored. If a part is not available or the supply is nearly depleted, note that it must be restocked.

**Manage work**

**Perform functional test**

**Description**
Apply power to each widget, observe functioning widget, and assure that it functions properly. Widgets not in compliance are released from the test fixture and sent to rework.

**Position parts in place**

**Description**
The process of placing (or re-placing, in the case of rework) parts on the widget base so that they may be secured.

**Prepare and send part requests**

**Description**
Write up the part requests and send them to the central warehouse.

**Re-inspect parts**

**Description**
Quickly re-inspect the parts to make sure that they are suitable for installation.

**Receive and unpack new parts**

**Description**
Receive packages of parts from the central warehouse and remove the packaging.

**Release assembled widget**

**Description**
The process of releasing the assembled widget from its securements so that it can be moved out of the workstation.

**Remove widgets from test fixture**

**Description**
Remove each widget from test fixture.

**Restock parts**

**Description**
The process of ordering and restocking parts needed for widget assembly.

**Retrieve parts from storage**

**Description**
Retrieve the proper parts from their storage locations.

**Secure parts to base**

**Description**
The process of using fasteners to secure the other parts to the base part. In the case of rework, this may involve removing original fasteners and replacing them, or loosening and re-tightening the original ones.

**Store new parts**

**Description**
Store the newly received parts in their proper storage containers at the workstation.
Unpackage parts

Description
Remove individual packaging material from the parts themselves.

Verify fasteners & tightness

Description
Verify that the proper fasteners have been used to secure the parts on each widget and that they are tight. Widgets not in compliance are released from the test fixture and sent to rework.

Verify part locations, orientations

Description
Verify that each proper parts are in the proper locations on each widget. Widgets not in compliance are released from the test fixture and sent to rework.
Assembled widgets

Description
Widgets that have been assembled and are ready for inspection.

Assembly procedure

Assembly tools & equipment

Description
Tools and equipment specifically used for widget assembly: [TBC].

Completed widgets

Description
Widgets that have been assembled and pass inspection and are ready for delivery.

Defective widgets

Description
Widgets that not only do not meet design specifications, but are so defective that they cannot be reworked and must be scrapped or their materials recycled.

Environment factors

Description
Factors of the work environment that may affect worker performance: illumination, noise, temperature, humidity [TBC].

Held bases

Description
The widget base part, held in the fixture so that other parts may be attached.

Held, assembled widgets

Description

Inspection procedures

Description
Specific procedures for inspecting widgets to see that they conform to design specifications. Includes part location and orientation information and fastener specifications.

Inspection tools

Inspection tools & equipment

Description
Tools and equipment used for widget inspection: [TBC].

Location of parts

Description
Knowledge of where the parts are stored in the workstation.

Other widget parts

Description
Non-base parts of the widget, not including fasteners.

Packaged parts to be inspected

Description
Parts to be installed, still in packaging materials.

Part demand

Description
The need for parts to assemble ordered widgets. If stock is insufficient, part requests are generated.

Part inspection procedures

Description
<table>
<thead>
<tr>
<th><strong>Description</strong></th>
<th><strong>Part request procedure</strong></th>
<th><strong>Part requests</strong></th>
<th><strong>Part storage policy</strong></th>
<th><strong>Part storage policy</strong></th>
<th><strong>Parts</strong></th>
<th><strong>Parts to request</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Part request procedure</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Part requests</strong></td>
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<td></td>
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<tr>
<td><strong>Part storage policy</strong></td>
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<tr>
<td><strong>Parts</strong></td>
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<tr>
<td><strong>Parts to request</strong></td>
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<td></td>
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</tr>
</tbody>
</table>

**Part requests**

Requests for more widget parts. When the parts come in, they will be restocked.

**Part storage policy**

Instructions on how and where each part is to be stored in the workstation.

**Parts**

Parts used to assemble widgets.

**Parts to be installed**

Parts to be unpackaged

**Parts to be installed**

Parts to be unpackaged

**Part storage policy**

Instructions on how and where each part is to be stored in the workstation.

**Positioned parts**

The non-base parts of the widget, positioned in place so that they may be secured with fasteners.

**Received parts**

Parts just received that have been removed from packaging and are ready to inspect.

**Rejected parts**

Parts that fail to meet specifications and are therefore discarded for rework or recycling.

**Reorder level policies**

Specifications as to when to reorder parts.

**Restocking policies & procedures**

Policies and procedures dealing specifically with the ordering and restocking of parts for widgets.
<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stock levels</strong></td>
<td><strong>Description</strong></td>
</tr>
<tr>
<td></td>
<td>The current levels of part stocks available at the workstation for assembly.</td>
</tr>
<tr>
<td><strong>Stocked parts</strong></td>
<td><strong>Description</strong></td>
</tr>
<tr>
<td></td>
<td>Parts available at the workstation for assembly.</td>
</tr>
<tr>
<td><strong>Test fixture</strong></td>
<td><strong>Tools &amp; equipment</strong></td>
</tr>
<tr>
<td></td>
<td>The tools, equipment, facilities, etc. the worker uses to assemble and inspect widgets. These include the the workstation itself.</td>
</tr>
<tr>
<td><strong>Unpackagead parts to be inspected</strong></td>
<td><strong>Description</strong></td>
</tr>
<tr>
<td></td>
<td>Parts that must be inspected prior to installation.</td>
</tr>
<tr>
<td></td>
<td><strong>Used packaging from assembly</strong></td>
</tr>
<tr>
<td></td>
<td>Packaging materials removed from the parts themselves that are to be discarded or recycled.</td>
</tr>
<tr>
<td></td>
<td><strong>Used packaging from restocking</strong></td>
</tr>
<tr>
<td></td>
<td>Empty boxes, crates, etc. from which widget parts are removed when they come in for restocking.</td>
</tr>
<tr>
<td><strong>Waste, recycles</strong></td>
<td><strong>Description</strong></td>
</tr>
<tr>
<td></td>
<td>Materials produced during assembly, inspection, and logistics that are not reusable: packaging waste, scrap, etc.</td>
</tr>
<tr>
<td><strong>Which parts to be installed</strong></td>
<td><strong>Description</strong></td>
</tr>
<tr>
<td></td>
<td>Knowledge of which parts to be installed on the widget base, according to assembly procedures.</td>
</tr>
<tr>
<td></td>
<td><strong>Widget assembly procedure</strong></td>
</tr>
<tr>
<td></td>
<td>Specific procedures for assembling widgets.</td>
</tr>
<tr>
<td></td>
<td><strong>Widget base part</strong></td>
</tr>
<tr>
<td></td>
<td>Base part of widget to which others are attached.</td>
</tr>
<tr>
<td></td>
<td><strong>Widget fasteners</strong></td>
</tr>
<tr>
<td></td>
<td>Nuts, bolts, screws, washers, etc. for securing non-base parts to the widget base.</td>
</tr>
<tr>
<td></td>
<td><strong>Widget fixture</strong></td>
</tr>
<tr>
<td></td>
<td>Equipment that holds a widget base in place so that other parts may be attached.</td>
</tr>
<tr>
<td></td>
<td><strong>Widget orders</strong></td>
</tr>
<tr>
<td></td>
<td>Customer orders for widgets.</td>
</tr>
<tr>
<td></td>
<td><strong>Widgets for rework</strong></td>
</tr>
<tr>
<td></td>
<td>Widgets that do not meet design specifications but can be reworked so that they do.</td>
</tr>
<tr>
<td></td>
<td><strong>Widgets in test fixture</strong></td>
</tr>
</tbody>
</table>
Description
Widgets ready to be inspected.

**Widgets passing fastener inspection**

Description
Widgets whose fasteners are correct and tight.

**Widgets passing part inspection**

Description
Widgets whose parts are in the proper locations and orientations.

**Worker**

Description
The worker who assembles and inspects widgets and performs the logistic activities of restocking parts, etc.

**Worker factors**

Description
Factors of the worker her/himself that affect performance: knowledge, experience, visual acuity, fatigue, ... [TBC].

**Wrenches & screwdrivers**

Description
Wrenches and screwdrivers used to fasten the fasteners to secure the non-base parts to the base part.

---

**Model Summary**

**Name:** Widgets

**Purpose**
To illustrate IDEF0 modeling for the Work Systems Engineering process.

**Viewpoint**
Industrial/manufacturing engineer.
Activities in Diagram "Widgets"

A0: Assemble widgets

Description:
The process of assembling and inspecting widgets and the logistics to support widget assembly.

Concepts in Diagram "Widgets"

Parts
Description:
Parts used to assemble widgets.

Completed widgets
Description:
Widgets that have been assembled and pass inspection and are ready for delivery.

Widget orders
Description:
Customer orders for widgets.

Policies & procedures
Description:
Company policies and procedures for assembling and inspecting widgets as well as support processes, like restocking.

Environment factors
Description:
Factors of the work environment that may affect worker performance: illumination, noise, temperature, humidity [TBC].

Worker factors
Description:
Factors of the worker her/himself that affect performance: knowledge, experience, visual acuity, fatigue, ... [TBC].

Worker
Description:
The worker who assembles and inspects widgets and performs the logistic
Activities of restocking parts, etc.

**Tools & equipment**

*Description:*
The tools, equipment, facilities, etc. the worker uses to assemble and inspect widgets. These include the workstation itself.

**Waste, recyclables**

*Description:*
Materials produced during assembly, inspection, and logistics that are not (re)usable: packaging waste, scrap, etc.

**Part requests**

*Description:*
Requests for more widget parts. When the parts come in, they will be restocked.

---

**Activities in Diagram "A0: Assemble widgets"**

**A1: Restock parts**

*Description:*
The process of ordering and restocking parts needed for widget assembly.

**A2: Get widget parts**

*Description:*
The process of getting widget parts from the stock areas so that widgets may be assembled.

**A3: Assemble parts**

*Description:*
The process of using parts, tools, and equipment to assemble widgets. Includes reworking widgets that do not yet meet design specifications.

**A4: Inspect widgets**

*Description:*
The process of inspecting widgets to make sure that they meet design specifications.
Concepts in Diagram:"A0: Assemble widgets"

**Parts**
Description:
Parts used to assemble widgets.

**Widget orders**
Description:
Customer orders for widgets.

**Policies & procedures**
Description:
Company policies and procedures for assembling and inspecting widgets as well as support processes, like restocking.

**Environment factors**
Description:
Factors of the work environment that may affect worker performance: illumination, noise, temperature, humidity [TBC].

**Worker factors**
Description:
Factors of the worker her/himself that affect performance: knowledge, experience, visual acuity, fatigue, ... [TBC].

**Completed widgets**
Description:
Widgets that have been assembled and pass inspection and are ready for delivery.

**Waste, recycles**
Description:
Materials produced during assembly, inspection, and logistics that are not (re)usable: packaging waste, scrap, etc.

**Worker**
Description:
The worker who assembles and inspects widgets and performs the logistic activities of restocking parts, etc.

**Tools & equipment**
Description:
The tools, equipment, facilities, etc. the worker uses to assemble and inspect widgets. These include the the workstation itself.

**Widget assembly procedure**
Description:
Specific procedures for assembling widgets.

**Restocking policies & procedures**
Description:
Policies and procedures dealing specifically with the ordering and restocking of parts for widgets.

**Inspection procedures**
Description:
Specific procedures for inspecting widgets to see that they conform to design specifications. Includes part location and orientation information and fasterner specifications.

**Stocked parts**
Description:
Parts available at the workstation for assembly.

**Parts for widgets**
Description:
Parts retrieved from the workstation stock areas and ready to be used in assembly.
Assembled widgets

Description:
Widgets that have been assembled and are ready for inspection.

Widgets for rework

Description:
Widgets that do not meet design specifications but can be reworked so that they do.

Defective widgets

Description:
Widgets that not only do not meet design specifications, but are so defective that they cannot be reworked and must be scrapped or their materials recycled.

Assembly tools & equipment

Description:
Tools and equipment specifically used for widget assembly: [TBC].

Inspection tools & equipment

Description:
Tools and equipment used for widget inspection: [TBC].

Used packaging from restocking

Description:
Empty boxes, crates, etc. from which widget parts are removed when they come in for restocking.

Used packaging from assembly

Description:
Packaging materials removed from the parts themselves that are to be discarded or recycled.

Part demand

Description:
The need for parts to assemble ordered widgets. If stock is insufficient, part requests are generated.

Part requests

Description:
Requests for more widget parts. When the parts come in, they will be restocked.

Stock levels
Activities in Diagram "A1: Restock parts"

A1: Determine which parts to restock
Description:
Use immediate part demand plus reordering policies and procedures to determine which parts to request and restock.

A12: Prepare and send part requests
Description:
Write up the part requests and send them to the central warehouse.

A13: Receive and unpackage new parts
Description:
Receive packages of parts from the central warehouse and remove the packaging.

A14: Inspect new parts
Description:
Inspect the newly arrived parts to make sure that they meet specifications in the part inspection procedures. Reject and dispose of those that do not.

A15: Store new parts
Description:
Store the newly received parts in their proper storage containers at the workstation.

Concepts in Diagram "A1: Restock parts"

Parts
Description:
Parts used to assemble widgets.

Restocking policies & procedures
Description:
Policies and procedures dealing specifically with the ordering and restocking of parts for widgets.

Part demand
Description:
The need for parts to assemble ordered widgets. If stock is insufficient, part requests are generated.

Environment factors
Description:
Factors of the work environment that may affect worker performance: illumination, noise, temperature, humidity [TBC].

Worker factors
Description:
Factors of the worker herself/himself that affect performance: knowledge, experience, visual acuity, fatigue, ... [TBC].

Used packaging from restocking
Description:
Empty boxes, crates, etc. from which widget parts are removed when they come in for restocking.

Part requests
Description:
Requests for more widget parts. When the parts come in, they will be restocked.

**Stock levels**

Description: The current levels of part stocks available at the workstation for assembly.

**Stocked parts**

Description: Parts available at the workstation for assembly.

**Worker**

Description: The worker who assembles and inspects widgets and performs the logistic activities of restocking parts, etc.

**Reorder level policies**

Description: Specifications as to when to reorder parts.

**Part request procedure**

Description: The procedure for preparing and sending part requests.

**Part inspection procedures**

Description: Procedures for inspecting parts, with specifications and standards for each part.

**Part storage policy**

Description: Instructions on how and where each part is to be stored in the workstation.

**Parts to request**

Description: IDs of the parts to be requested and restocked.

**Received parts**

Description: Parts just received that have been removed from packaging and are ready to inspect.

**Rejected parts**

Description: Parts that fail to meet specifications and are therefore discarded for rework or recycling.

**Parts to restock**

Description: Parts that have passed inspection and are ready to be placed in storage in the workstation.
Activities in Diagram "A2: Get widget parts"

A21: Identify parts to be installed

Description:
Determine which parts are to be installed on the widget base.

A22: Locate parts in storage

Description:
Determine where the proper parts are stored. If a part is not available or the supply is nearly depleted, note that it must be restocked.

A23: Retrieve parts from storage

Description:
Retrieve the proper parts from their storage locations.

A24: Unpackage parts

Description:
Remove individual packaging material from the parts themselves.

A25: Re-inspect parts

Description:
Quickly re-inspect the parts to make sure that they are suitable for installation.

Concepts in Diagram "A2: Get widget parts"

Stocked parts

Description:
Parts available at the workstation for assembly.

Stock levels

Description:
The current levels of part stocks available at the workstation for assembly.

Environment factors

Description:
Factors of the work environment that may affect worker performance: illumination, noise, temperature, humidity [TBC].

Widget assembly procedure

Description:
Specific procedures for assembling widgets.

Worker factors

Description:
Factors of the worker herself that affect performance: knowledge, experience, visual acuity, fatigue, ... [TBC].

Widget orders

Description:
Customer orders for widgets.

Part demand

Description:
The need for parts to assemble ordered widgets. If stock is insufficient, part requests are generated.
Used packaging from assembly

Description:
Packaging materials removed from the parts themselves that are to be discarded or recycled.

Parts for widgets

Description:
Parts retrieved from the workstation stock areas and ready to be used in assembly.

Worker

Description:
The worker who assembles and inspects widgets and performs the logistic activities of restocking parts, etc.

Which parts to be installed

Description:
Knowledge of which parts to be installed on the widget base, according to assembly procedures.

Location of parts

Description:
Knowledge of where the parts are stored in the workstation.

Parts to be unpackaged

Description:
Retrieved parts that must be unpackaged and inspected before installation.

Unpackaged parts to be inspected

Description:
Parts that must be inspected prior to installation.

Activities in Diagram "A3: Assemble parts"

A31: Hold widget base for assembly

Description:
The process of holding the base part of the widget securely so that other parts may be attached to it. In the case of rework, the base may already be attached to the other parts.

A32: Position parts in place

Description:
The process of placing (or re-placing, in the case of rework) parts on the widget base so that they may be secured.

A33: Secure parts to base

Description:
The process of using fasteners to secure the other parts to the base part. In the case of rework, this may involve removing original fasteners and replacing them, or loosening and re-tightening the original ones.

A34: Release assembled widget

Description:
The process of releasing the assembled widget from its securengs so that it can be moved out of the workstation.
Concepts in Diagram "A3: Assemble parts"

**Parts for widgets**
*Description:*
Parts retrieved from the workstation stock areas and ready to be used in assembly.

**Widgets for rework**
*Description:*
Widgets that do not meet design specifications but can be reworked so that they do.

**Environment factors**
*Description:*
Factors of the work environment that may affect worker performance: illumination, noise, temperature, humidity [TBC].

**Widget assembly procedure**
*Description:*
Specific procedures for assembling widgets.

**Worker factors**
*Description:*
Factors of the worker herself/himself that affect performance: knowledge, experience, visual acuity, fatigue, ... [TBC].

**Assembled widgets**
*Description:*
Widgets that have been assembled and are ready for inspection.

**Worker**
*Description:*
The worker who assembles and inspects widgets and performs the logistic activities of restocking parts, etc.

**Assembly tools & equipment**
*Description:*
Tools and equipment specifically used for widget assembly: [TBC].

**Widget base part**
*Description:*
Base part of widget to which others are attached.

**Other widget parts**
*Description:*
Non-base parts of the widget, not including fasteners.

**Held bases**
*Description:*
The widget base part, held in the fixture so that other parts may be attached.

**Positioned parts**
*Description:*
The non-base parts of the widget, positioned in place so that they may be secured with fasteners.

**Held, assembled widgets**
*Description:*
The assembled widget, still held in place in the fixture, but ready to be released for inspection.

**Widget fixture**
*Description:*
Equipment that holds a widget base in place so that other parts may be attached.
Wrenches & screwdrivers

Description:
Wrenches and screwdrivers used to fasten the fasteners to secure the non-base parts to the base part.

Widget fasteners

Description:
Nuts, bolts, screws, washers, etc. for securing non-base parts to the widget base.

Widget orders

Description:
Customer orders for widgets.

Activities in Diagram "A4: Inspect widgets"

A41: Install widgets in test fixture

Description:
Place each widget in the test fixture and secure it.

A42: Verify part locations, orientations

Description:
Verify that each proper parts are in the proper locations on each widget. Widgets not in compliance are released from the test fixture and sent to rework.

A43: Verify fasteners & tightness

Description:
Verify that the proper fasteners have been used to secure the parts on each widget and that they are tight. Widgets not in compliance are released from the test fixture and sent to rework.

A44: Perform functional test

Description:
Apply power to each widget, observe functioning widget, and assure that it functions properly. Widgets not in compliance are released from the test fixture and sent to rework.
Concepts in Diagram

**Assembled widgets**
- **Description:** Widgets that have been assembled and are ready for inspection.

**Worker factors**
- **Description:** Factors of the worker herself that affect performance: knowledge, experience, visual acuity, fatigue, ... [TBC].

**Environment factors**
- **Description:** Factors of the work environment that may affect worker performance: illumination, noise, temperature, humidity [TBC].

**Inspection procedures**
- **Description:** Specific procedures for inspecting widgets to see that they conform to design specifications. Includes part location and orientation information and fastener specifications.

**Defective widgets**
- **Description:** Widgets that not only do not meet design specifications, but are so defective that they cannot be reworked and must be scrapped or their materials recycled.

**Completed widgets**
- **Description:** Widgets that have been assembled and pass inspection and are ready for delivery.

**Widgets for rework**
- **Description:** Widgets that do not meet design specifications but can be reworked so that they do.

**Worker**
- **Description:** The worker who assembles and inspects widgets and performs the logistic activities of restocking parts, etc.

**Inspection tools & equipment**
- **Description:** Tools and equipment used for widget inspection: [TBC].

**Test fixture**

**Inspection tools**

**Widgets in test fixture**
- **Description:** Widgets ready to be inspected.

**Widgets passing part inspection**
- **Description:** Widgets whose parts are in the proper locations and orientations.

**Widgets passing fastener inspection**
- **Description:** Widgets whose fasteners are correct and tight.