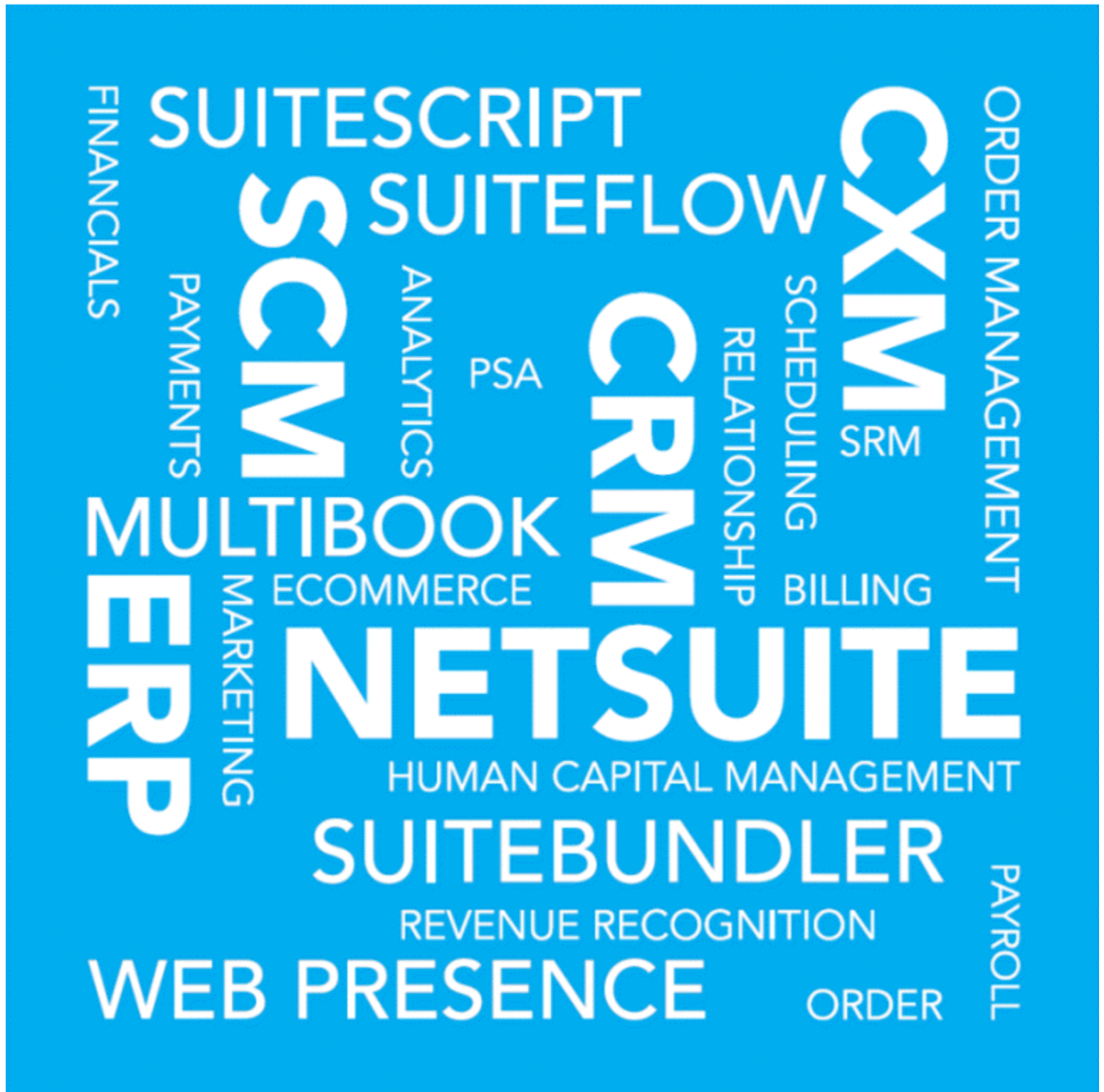


Manufacturing Routing and Work Centers



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Manufacturing Routing

The Manufacturing Routing and Work Center feature enables you to schedule and record manufacturing operational activities against a complex work order that requires multiple teams of employees, or work centers. For example, you may have a set of operations for the following: a preparation team, an assembly run team, and a quality assurance team.

You can use Manufacturing Routing to record quantity assembly completions, team resource costs, and process overhead costs against individual work order operations.

The following roles represent members of your organization who can benefit from using Manufacturing Routing.

Operational Planner or Production Manager

Your Operational Planner or Production Manager can benefit from improved planning efficiency:

- Set up a routing record that defines multiple steps for building a complex assembly.
- Assign default scheduling parameters against each step.
- Use backward scheduling to establish a supply plan based on manufacturing scheduling requirements.

Production Manager

Your Production Manager can refine the shop floor tracking activities using the following:

- Facilitate scheduling by assigning work center groups to operation steps.
- Record progress of activities such as completion and component issue against multiple tasks or one task at a time
- Record actual machine and labor times against anticipated times.

Cost Accountant

Your Cost Accountant can identify opportunity areas:

- Assign labor and machine overheads against completion activities.
- Develop a costing template for standard rates used in multiple routings.
- Track cost variances between actual and standard at a per service item and cost category level.

Please note the following:

- Manufacturing Routing can be used only with assembly items using standard costing or average costing.
- Manufacturing Routing can be used only with work orders that are marked as Work In Process (WIP).
- Manufacturing Routing creates variances based on per-service item and cost categories.

To set up Manufacturing Routing, you must enable the feature, define cost categories, define charge items, create cost templates, define resources, create routings, and if needed, set up standard costing.

- Complete the [Setting Up Manufacturing Routing](#) procedures.

This enables you to use routings on WIP designated work orders.

- Steps required to complete the assembly are detailed in operation task records. To learn more, see [Manufacturing Routing and Work Orders](#).

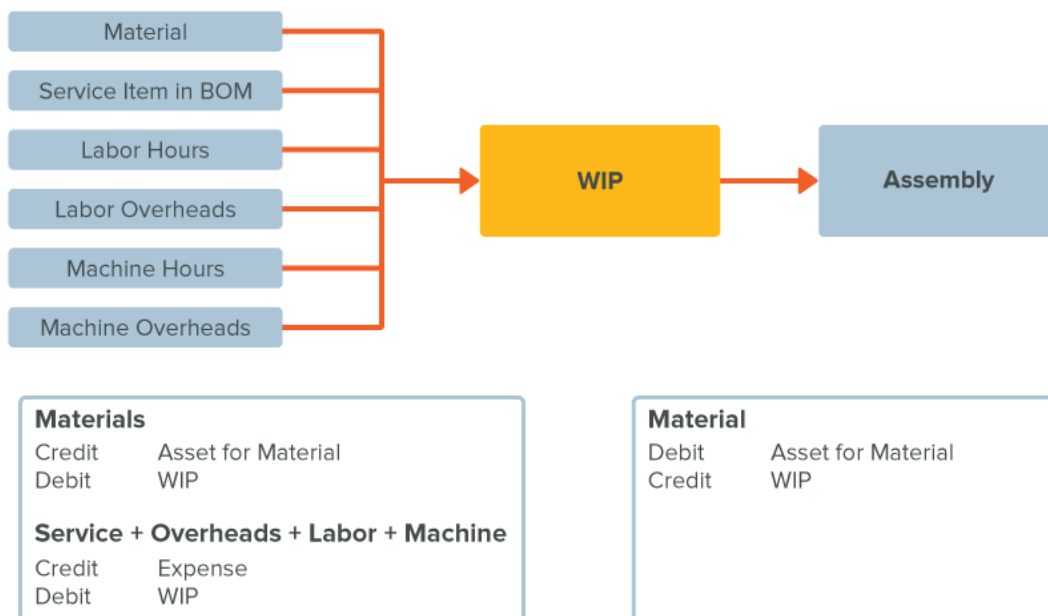
These task records designate what needs to be done and when, as well as how much work has been completed and how much remains to be done. They define how much time you expect to spend on the task and the rates to be charged for it. Task records designate work centers to assign tasks to certain labor resources.

- During the assembly process, time is logged against tasks to show progress towards completion. By entering data on the completion form you determine the following:
 - Starting and Ending Operation – operation tasks that have been completed
 - Quantity Completed – The time logged against each operation

Completion records show the actual time machines and labor were used. When time is entered against an operation task, the scheduling for all tasks related to the work order are updated to accurately portray progress against each operation.

For more information, see [Manufacturing Routing Completions and Time Entry](#).

Values for assets and expenses associated with a routing work order are posted to the designated Work In Process (WIP) account during the assembly process.



Values are added to the WIP account based on time logged against operation tasks or quantity produced in a run. After the assembly process is complete, the values are removed from the WIP account and added to the Asset for Assembly account.

For more information, see [Manufacturing Routing Costing](#).

Setting Up Manufacturing Routing

The following steps must be completed to set up your account to use the Manufacturing Routing and Work Center feature. Click one of the following links get more information:

1. To enable the feature, see [Enabling the Manufacturing Routing Feature](#).
2. To set preferences, see [Setting Routing Preferences](#).
3. To define cost categories, see [Defining Cost Categories for Routing](#).
4. To define manufacturing charge items, see [Defining a Manufacturing Charge Item](#).
5. To group manufacturing charge items into a cost template, see [Creating Manufacturing Cost Templates](#).
6. To define resources, see [Creating Manufacturing Work Centers or Groups and Work Center Calendars](#).
Click Help and read [Creating Manufacturing Work Centers or Groups](#).
7. To create routings, see [Creating a Manufacturing Routing](#).
8. To set up standard costing, (for accounts using the Standard Costing feature), see [Standard Costing for Manufacturing Routing](#).

Enabling the Manufacturing Routing Feature

Before you can use the Manufacturing Routing and Work Center feature, you must it in your NetSuite account. To do so, complete the steps below.

To enable manufacturing routing:

1. Go to Setup > Company > Setup Tasks > Enable Features.
2. Click the **Items & Inventory** subtab.
3. Check the **Manufacturing Routing and Work Center** box.
4. Click **Save**.




Note: The following features must also be enabled to use the Manufacturing Routing and Work Center feature:

- Manufacturing Work In Process
- Multi-Location Inventory
- Work Orders
- Assembly Items
- Project Management

Setting Routing Preferences

When you use the Manufacturing Routing and Work Center feature, you have the option to enable the Show Planned Capacity on Work Orders preference to help manage work order planning. This preference lets production managers and planners monitor planned completion times for work order builds against work center capacity.

Setting this preference enables NetSuite to create planned time entries automatically when processing manufacturing work orders. When this preference is enabled, work orders display a new Planned Time subtab. NetSuite generates planned time entries showing the amount of time being allocated to each work center per day. The Planned Time subtab displays the duration of each operation and the associated work center. This aggregated planned time data can be accessed to determine if the resource capacity is enough to meet these needs, enabling more efficient manufacturing planning.


 **Note:** These generated planned times cannot be edited.

When this preference is enabled, planned time is automatically recalculated after each completion. For example, your process requires Operation 10 which produces a completed quantity of 30. Next, you report the completion of Operation 10 with a quantity of 15 and the planned time is recalculated for the remaining quantity. Because planned time is automatically updated, this preference simplifies production management.

To set routing preferences:

1. Go to Setup > Accounting > Preferences > Accounting Preferences.
2. Click the **Order Management** subtab.
3. Check the **Show Planned Capacity on Work Orders** box to show the **Planned Time** subtab on work orders and for NetSuite to create planned time entries automatically.
4. In the **Default Scheduling Method** field, choose either **Forward** or **Backward** scheduling. Your selection here will show by default in the Scheduling Method field on new work orders you enter. For more details, read [Production Scheduling Methods Overview](#).
5. In the **Generate Work Orders in Supply Planning** field, select one of the following to define the default for supply planning work orders:
 - **Do Not Generate**
 - **Generate in Planned Firm Status**
 - **Generate in Planned Open Status**
 - **Generate in Released Status**

Your selection defines the default status of new work orders generated by a planning engine run.

 **Note:** If you make a selection to generate orders and also use the Manufacturing Routing and Demand Planning features, you will have the option to define production scheduling methods on work orders. For details, read [Production Scheduling Methods Overview](#) and [Supply Planning and Routing](#).

6. Click **Save**.

You can also activate the Planned Time subtab on work orders that were entered prior to enabling the preference. To do so, after you have enabled the preference, open the work order in Edit mode and then click Save. The Planned Time subtab and planned time entries show on the work order.

Defining Cost Categories for Routing

You can create one of eight cost categories to use with Manufacturing Routing. These cost categories help define expenditures associated with a work order.

For example, you have a warehouse and employ workers to assemble widgets that you sell. You need to track costs associated with employee labor, warehouse machines, and overhead associated with each work order.

The cost categories below can be used to help track these costs:

Direct Cost

The costs are calculated when you record time for these items.

- **Labor Setup** – Cost of time for labor to set up a run
For example, this is the cost of paying an employee to set up the machine that will be used to paint the widget.
- **Labor Run** – Cost of time for labor to run an assembly
For example, this is the cost of paying an employee to use the machine that paints the widget during the assembly run.
- **Machine Setup** – Cost of time spent to set up a machine to be used in a run
For example, each time you set up the machine that paints the widget, wear and tear costs you .02 cents.
- **Machine Run** – Cost of time spent to run a machine during assembly
For example, each time you use the machine that paints the widget for an assembly run, wear and tear costs you .04 cents.

Overheads

- **Labor Setup Overhead** – Cost of overhead associated with labor to set up a run
For example, this is the safety training expense incurred for an employee who sets up the machine used to paint the widget.
- **Labor Run Overhead** – Cost of overhead associated with labor to run an assembly
For example, this is the safety training expense incurred for an employee completes an assembly run.
- **Machine Setup Overhead** – Cost of overhead associated with setting up a machine used in a run
For example, this is the water expense incurred by running a machine during the machine set up.
- **Machine Run Overhead** – cost of overhead associated with running a machine during assembly
For example, this is the water expense incurred by running a machine during an assembly run.

To set up a cost category for Manufacturing Routing:

1. To add choices to this list, go to Setup > Accounting > Setup Tasks > Accounting Lists..
2. Click **New**.
3. Click **Cost Category**.
4. Enter a name for the cost category. For example, US Labor Run Standard.
5. Select a cost type for this category. Choose from the following:
 - **Labor Run**
 - **Labor Run Overhead**
 - **Labor Setup**
 - **Labor Setup Overhead**
 - **Machine Run**
 - **Machine Run Overhead**
 - **Machine Setup**
 - **Machine Setup Overhead**
6. Check the **Inactive** box if you do NOT want this category to show in lists.

For details about creating a new cost category, read [Creating Cost Categories](#) .

Defining a Manufacturing Charge Item

With manufacturing routing, when a specific routing operation is recorded you can use items to define charges for the activity. For example, you can define the hourly cost of activities being performed and the expense account charges are logged against.

To do so, you must set up the item record to define the item as a manufacturing charge item.

To define an item as a manufacturing charge item:

1. Go to Lists > Accounting > Items > New.
2. Click a link to create a charge item. You can track routing charges and expenses using the following item types:
 - Other Charge for Purchase
 - Service (for Purchase or for Resale)
3. Enter a name. For example, enter Machine Run Time Cost.
4. If you use NetSuite OneWorld, select a subsidiary.
A manufacturing charge item can be associated with only one subsidiary.
5. On the item record, check the **Manufacturing Charge Item** box.
The Manufacturing Charge Item box cannot be cleared if the item is included in a cost template.
6. After the **Manufacturing Charge Item** box is checked, you can select a **Cost Category** in the field below.
The cost category cannot be changed if the manufacturing charge item is included in a cost template.
You cannot check the Include Children box on the item record when the Manufacturing Charge Item box is checked.
Only manufacturing charge items can use the labor and machine cost categories.
7. Define an hourly rate in the **Purchase Price** field up to 7 decimal places.
Charges are based on hourly rate (Amount/Hour)
8. Click the **Accounting** subtab.
9. Select the expense account these hourly charges should be logged against.
10. Complete any additional necessary fields.
11. Click **Save**.

A manufacturing charge item cannot be associated with a unit type even if you use the Multiple Units of Measure feature.

For more details about creating a new item record, read the help topic [Creating Item Records](#).

Creating Manufacturing Cost Templates

A manufacturing cost template is a list of rates that can be associated with completing a specific operation. The template defines the activities that occur and related costs to be recorded each time this step is completed.

For example, an employee works 10 hours on an assembly activity. A manufacturing operator needs to record the hours worked or a completion for this step. The cost template used defines costs associated with the step completed: the rate for each activity as well as what accounts these amounts should post to.

Using a manufacturing cost template streamlines tracking assembly process costs by making it easier to know which rates and accounts are commonly used for each step in an assembly process.

To create a manufacturing cost template:

1. Go to Lists > Supply Chain > Manufacturing Cost Template > New.
2. Enter a name for the template.
3. Optionally enter a memo. You can search for text you enter here to find this template later.
4. Check the **Inactive** box if you do not want this template to show in lists on forms and records. Clear this box if you do want this template to show in lists.
5. Select a cost category.
For details about creating a cost category, read [Defining Cost Categories for Routing](#).
6. Select an item.
Only items that have been marked as Manufacturing Charge Items show on this list.
For details, read [Defining a Manufacturing Charge Item](#).
7. Enter rates for this line item up to 7 decimal places.
 - If this is a Setup category, enter a fixed rate. This is a one-time charge for a setup activity.
 - If this is a Run category, enter a run rate. This is an amount charged for each run completed.
8. Click **Add**.
9. Repeat steps 5 through 8 for each category. Enter one category for each activity associated with this operational step.
You can add only one of each of the following cost category types: Labor Run, Machine Setup, or Machine Run. However, you can add multiple categories for Overhead cost category types.
10. When all necessary categories have been added, click **Save**.

Cost Template Examples

A manufacturing cost template shows rates for many possible activities that are associated with an assembly step, such as the examples below:

| Activity Type | Example | Rate Type | Rate Amount | Cost Category |
|--|-------------------------------|-----------|---------------|------------------------|
| Manufacturing Labor Setup Service | Warm up molding machine | Fixed | \$10 per run | Labor Setup |
| Manufacturing Labor Setup Overhead | Facility rental | Fixed | \$16 per run | Labor Setup Overhead 1 |
| Manufacturing Labor Run Service | Costs to complete one run | Run | \$14 per hour | Labor Run |
| Manufacturing Labor Run Overhead Service | Electric utility cost per run | Run | \$13 per hour | Labor Run Overhead 1 |

Creating Manufacturing Work Centers or Groups


A work center is a group of people that perform a specific step in the manufacturing process. After you have defined a work center group, that work center can be assigned to cover specific steps in the manufacturing process.

For example, your assembly process might require the following: a manufacturing group, a quality assurance group, and a packing machine group.

Work centers are set by creating a static group and identifying it as a manufacturing work center.

To create a manufacturing work center:

1. Go to Lists > Relationships > Groups > New.
2. Select **Static** as the kind of group.
3. Select **Employee** as the kind of members.
4. Click **Continue**.
5. On Create Static Employee Group page, enter a name for this group. For example, enter Packing Machine Group. This name shows in work center lists on records and forms.
6. Select the owner of this group.

 **Note:** You are selected by default. Only the owner of a group can add or remove members or delete the group.

7. Check the **Manufacturing Work Center** box. This enables this group to be used as a work center with routing records.
8. Click the **Manufacturing Work Center Settings** subtab.
9. Select one or more locations to associate with this work center.
If you use NetSuite OneWorld, you can select multiple locations within a subsidiary.
10. Enter number of machine resources for this work center.
11. Enter number of labor resources for this work center.
12. Complete any additional fields necessary for this group record.
13. Click **Save**.

NetSuite uses the associated work calendar to schedule the operation tasks associated with each work center.

For more details about creating a static group record, read the help topic [Creating a Static Group](#).

Work Center Calendars

For each work center, you can create a work calendar specific to the needs of that work center that represents the times the center is available to process work orders. Specified work center calendars enable you to manufacture products efficiently within time and resource constraints.

For example, your work centers operate as follows:

- Work Center 1: Operates five days a week for eight hours
- Work Center 2: Operates four days a week for ten hours

Your production manager can set up a work calendar for each work center that specifies the hours available for each. Based on this work center calendar information, you have real-time visibility into total scheduling capacity, as well as intelligent manufacturing routing that calculates the processing time .

After you have created the necessary calendar, define that work calendar on the work center record. Then, NetSuite can use the designated work calendar to determine the time when resources should be scheduled for associated manufacturing operation tasks.

Based on the requirement date, the supply planning engine determines the start date of a planned order using backward scheduling considering the work calendar assigned. The supply planning engine also considers work center calendars for forward scheduling when creating work orders.

To use work center calendars, complete the following steps:

- To set up a work center calendar:
- To assign a work calendar to a work center:

To set up a work center calendar:

1. Go to Lists > Employees > Work Calendars > New.
2. Enter a name for the calendar.
3. On the **Working Days** subtab, define the working hours and days.
4. On the **Non-working days** subtab, define exceptions to the working days rules.
5. Click **Save**.

For additional details, read the help topic [Setting Up a Work Calendar](#).

To assign a work calendar to a work center:

1. Click the **Static** button.
2. In the members list, select **Employee**.
3. Click **Continue**.
4. Check the **Manufacturing Work Center** box. This enables the **Work Calendar** field on the **Manufacturing Work Center Settings** subtab.
5. Click the **Manufacturing Work Center Settings** subtab.
6. In the **Work Calendar** field, select the appropriate work calendar from the list.
7. Enter additional information as needed. For details, read the help topic [Creating a Static Group](#).
8. Click **Save**.

Creating a Manufacturing Routing

A manufacturing routing is a template that contains a list of steps required to build an assembly item. Each step is in a sequential order necessary to complete the operational sequence for completing the assembly.

After you have created a routing record, that routing can be selected on a work order to direct the completion of the assembly. The routing determines the work center, cost template, labor resources, and machine resources that will be used during the assembly.

Routings are unique for each assembly item, but routings may be shared across multiple locations.

To enter a manufacturing routing:

1. Go to Lists > Supply Chain > Manufacturing Routing > New.
2. Select the **Item** you are creating an assembly sequence for.
3. Enter one or more **Location**s where this assembly will be performed.
4. Enter a routing template **Name**. This name will be displayed in the list of routings in the Manufacturing Routing field on records and forms. For example, enter Beta Alternate Supply Routing.
5. Optionally, enter a **Memo**. You can search for the text you enter in this field. For example, enter Use Beta Alternate when primary widget supply is unavailable.
6. Check the **Default** box to use this routing by default for this item on forms. This denotes the default steps for creating a new special work orders and mass created work orders.

Clear this box if you do not want this routing to be used by default.

7. Check the **Inactive** box if you do not want this routing to show in routing lists on records and forms. Clear this box if you do want this routing to show in lists.
8. Check the **Auto-calculate Lag** box if you want NetSuite to calculate lag times for operation tasks. For more information, read [Operations Overlap](#).
9. Click the **Routing Steps** subtab.

Routing Steps

To enter routing steps:

1. Enter the **Operation Sequence** number for the step you are entering. For example, if you are entering the first step to be performed to build this assembly, enter 1.
Sequence number determines dependencies between different operations. For example, operation 1 comes before operation 3 in the assembly process.
2. Enter the **Operation Name**. For example enter Assembly Setup.
3. Select a **Manufacturing Work Center**. This is the labor team that will complete this step.
After you select a work center, the labor resources and machine resources are automatically entered from the work center record.
4. Select a **Manufacturing Cost Template** for this operation.
5. Enter the operation **Setup Time** in minutes. This is the amount of time required (fixed time per step) to prepare for this step in the sequence.
For example, this could represent the time in minutes required to warm up a molding machine to bring the mold to the proper temperature.
There is one setup time per order.
6. Enter the operation **Run Rate** in minutes. This is the amount of time required to complete a run and produce one unit.
 - The setup time and run rate recorded here are used in conjunction with the default calendar to schedule the completion of each step when a work order is created using this routing.
 - If you use the Demand Planning feature, backwards scheduling is used to determine the appropriate start date. There is one run time per base unit.
 - The setup time + run time = total manufacturing task time.
7. If you did not enable auto-calculate lag in the header, set **Lag Type**, **Lag Amount**, and **Lag Unit** as necessary.
For more information about lag, see [Operations Overlap](#).
8. Click **Save**.

You can create a new routing by clicking the New Manufacturing Routing button on the Manufacturing subtab of an assembly item record.

Standard Costing for Manufacturing Routing

When both the Standard Costing feature and the Manufacturing Routing and Work Centers feature are enabled, NetSuite calculates the assembly cost by incorporating the labor and machine costs based on the default routing.

Using Standard Costing with routings requires the following:

1. Cost Version

Verify that you have created a cost version.

For details, read [Defining Cost Versions](#).

2. Planned Standard Cost Rollup

Run a cost rollup to calculate assembly cost. When you perform a cost rollup, NetSuite checks for a default routing to calculate costs for the assembly.

If the Manufacturing Routing and Work Centers feature is enabled, but no default routings are defined, NetSuite uses the first routing created as the default routing to calculate the assembly cost.

Planned Standard cost is a consolidation of cost based on the component and cost category.

For subassemblies, each of the cost categories are rolled up to the next level in the Bill of Materials (BOM) hierarchy. The differentiation between the cost categories of this level and lower levels in the roll up results are based on the items associated with the rollup.

When you review the cost of an assembly item based on the cost rollup, the lower level routing cost incurred by building the subassembly is denoted with the subassembly item as a component on the planned standard cost record. The routing cost incurred by building the final assembly at this level is denoted with Service and Other charge items as a component on the planned standard cost record.

For details, read [Standard Cost Rollup](#).

3. Inventory Revaluation

Run update production cost to establish standard cost in production when Standard Costing features are used

For details, read [Revaluing Standard Cost Inventory](#).

Manufacturing Routing Cost Calculation

The cost of each step in a routing is calculated as follows:

■ Part 1: Definition of Time / Quantity

Total Setup Time = (number of resources x setup time)

Total Run Time = (number resources x run time)

■ Part 2: Rate

Based on the manufacturing charge item, the quantity is the total hours required.

The total unit cost is derived at a component level per cost category and per operation sequence.

- Number of resources (from the work center) x Setup Time (from the routing record) x Manufacturing Charge Item Unit Cost (from the item record)
- Number of resources (from the work center) x Run Rate (from the routing record) x Manufacturing Charge Item Unit Cost (from the item record)

For more details about costing, read [Manufacturing Routing Costing](#).

Manufacturing Routing and Work Orders

When the Manufacturing Routing and Work Center feature is enabled, you can use routings on work orders to manage your assembly process.

A routing you select on a work order is a template describing a list of sequential steps required to build the assembly item. The routing directs the completion of the assembly by determining the work center, cost template, labor resources and machine resources to be utilized during the assembly.

To use routings with work orders, be sure you have completed the routing setup process. [Setting Up Manufacturing Routing](#).

To use Manufacturing Routing on a work order:

1. Create a work order new work order.
2. Select a location. If you use NetSuite OneWorld, select a subsidiary.
3. Designate the Work Order as **Work In Process (WIP)**.

A routing can be designated on an assembly work orders that is designated as Work In Process (WIP). NetSuite uses WIP accounting to issue materials in the designated WIP account.

If the **WIP** box is not checked on a work order, you are not able to select a routing for that assembly.

For details about WIP work orders, read Manufacturing Work In Process (WIP) .[Manufacturing Work In Process \(WIP\)](#)

4. Select the appropriate **Manufacturing Routing**.

After you select an assembly on the work order, NetSuite shows the default routing for the assembly based on the location setting. If you wish to select an alternate routing, the Manufacturing Routing field displays all routings associated with the assembly for the specified location.

For details about associating a routing with an assembly, read [Creating a Manufacturing Routing](#).

5. Save the work order. After it is saved, you can see the following:
 - The **Items** subtab shows components that are issued.
 - The **Operations** subtab shows all operation tasks required for a particular assembly run

Operation tasks are created based on the routing. These tasks define the list of steps that must be completed to finish the assembly process. Tasks can be viewed and edited from the **Operations** subtab of the work order.

For details, read:

 - [Manufacturing Operation Tasks](#)
 - [Editing a Manufacturing Operation Task](#)

Changing Work Order Quantities

If you change the assembly item quantity on the work order and re-save it, the Operations subtab information is updated to reflect the new requirements. For example, entering a higher quantity on the work order results in more time being required to complete the run.

Routing and Time Zones

The associated work calendar applies for all routing work orders created.

- If you *do not use* NetSuite OneWorld, the time zone of the schedule is based on the time zone selected for the company.
- If you *do use* NetSuite OneWorld, the time zone of the schedule is based on the time zone of the subsidiary selected on the work order.

For details, read the help topic [Configuring Company Information](#).

Planned Time Subtab

When you use the Manufacturing Routing and Work Center feature and enable the Show Planned Capacity on Work Orders preference, work orders show a Planned Time subtab that details work allocated to each work center and NetSuite automatically generates planned time entries. For more details, read [Setting Routing Preferences](#).

Manufacturing Operation Tasks

After you save a WIP work order that has a designated routing, manufacturing operation tasks are created based on the routing.

Each of these tasks is a step that must be done in order for the assembly process to be finished. After work for the task has been done, manufacturing operators can log progress against each task on a work order completion form.

To view a list of operation tasks:

1. Go to Transactions > Manufacturing > Enter Work Orders > List.
2. Click **View** next to the work order.
3. Click the **Operations** subtab.
4. Optionally select a custom view for the operations list.

The list displays the following for each operation task:

- Operation Sequence
- Operation Name
- Predecessor
- Start Date
- End Date
- Input Quantity
- Completed Quantity
- Setup Time (Min)
- Run Rate (Min/Unit)

Click an operation name to open the task record.



Note: You can also modify tasks from the work order by going to Transactions > Manufacturing > Enter Work Orders > List and clicking Edit next to the work order to be edited. Then click the Operations subtab to view a list of operation tasks.

Adding or Deleting Tasks

On the Operations subtab of a work order, you can add a new operation task and you can delete an existing task. However, note that you can add or delete only the LAST task in the sequence.

For example, you have operation tasks with these sequence numbers: 10, 20, 30, 40.

- You can add a new task with a sequence number 41.
- You *cannot* add a new task with a sequence number 21.
- You can delete task sequence number 40.
- You *cannot* delete task sequence number 20.

After task records have been created, they can also be opened and modified individually. For details, read [Editing a Manufacturing Operation Task](#).

Operations Overlap

When you use the Manufacturing Routing feature, manufacturing planners can use the operations overlap function to schedule overlapping manufacturing operations. Overlapping of manufacturing operations can reduce work order lead times and allow more efficient utilization of manufacturing resources. When you set up operations to overlap, work order operations can be processed in a staggered method through the production cycle rather than one at a time.

For example, a manufacturing routing requires two steps to complete a work order. However, work on Step 2 requires that only half of Step 1 is completed. Therefore, it is more efficient to start Step 2 when Step 1 is half-complete rather than waiting until all of Step 1 is complete to begin step 2. This can be accomplished by defining overlap for operations on the routing record.

To use operations overlap, you must enable these features:

- Manufacturing Routing and Work Center
- Manufacturing Work In Process
- Work Order Completion

First, a planning operator defines how a subsequent operation can overlap an earlier operation by entering the lag amount based on time, quantity or percentage on the manufacturing routing. After the defined portion of the first operation is completed, the second operation automatically begins.

Defining Lag on a Routing

The Lag Amount defines what portion of an operation needs to be completed before the next operation can start. In other words, it defines lag between beginning of an operation (run time) and beginning of consequent operation (setup time).

For each sequence of the routing, you can define a lag type using the following types:

- Time (in minutes)
- Quantity (in assembly units)
- Time Percentage
- Quantity Percentage

Autocalculating Lag

If you choose to autocalculate the routing, NetSuite can automatically calculate the optimal Lag Amount, which is the shortest possible lead time for each work order.

To autocalculate lag, check the Auto-Calculate Lag box on the routing record. Then, define the following on the manufacturing routing record:

- Lag Type
- Lag Amount
- Lag Unit of Measure

After you define these values on the routing, they default on work orders. The auto-calculated lag amount is the Optimal (Minimal) Lag Amount. Optimizing lag means that operations on a work order are scheduled strategically to minimize the lead time of the order and maximize the utilization of work centers within the work order.

If lag settings are changed on the operation record, NetSuite reschedules the operation when the task is saved with the new settings and reschedules all affected subsequent tasks.

When a work order is scheduled, NetSuite calculates the Optimal (Minimal) Lag Amount and Maximal Lag Amount for each operation that has a preceding operation and has a defined lag type. Then, NetSuite does not allow the lag amount to be defined outside of this range.

The autocalculation setting can be changed only when the status of a work order is Planned or Released.

- When Auto-calculate Lag is enabled, lag amounts on operations cannot be edited.
- When Auto-calculate Lag is enabled, the only lag type available is Quantity.

After being created, you can click the Operations subtab on work orders to view the Start Date/Time and End Date/Time of each operation.

On the operation task record under the Predecessor section, the Lag Type and Lag Amount can be edited. Upon saving, NetSuite validates that each lag amount entered falls between the Optimal (Minimal) Lag Amount and Maximal Lag Amount. If the lag amount entered is outside this range, an error displays the valid range.

Operations Overlap and Supply Plans

As a supply plan generates supply plan lines for assemblies or work orders, calculations do account for lag related settings on the assembly routing. NetSuite verifies that the defined lag amounts fall in the valid range between the Optimal (Minimal) Lag Amount and Maximal Lag Amount. If not, the supply plan is automatically adjusted.

- If the lag amount defined on the routing is less than the Optimal (Minimal) Lag Amount, it is adjusted to the optimal lag amount.
- If the lag amount defined on the routing is greater than the Maximal Lag Amount, it is adjusted to equal the maximal lag amount.

Editing a Manufacturing Operation Task

For any work order with a status of *Pending Build*, you can make changes to operation tasks on the order. For example, due to specifications particular to one order, you may wish to change information defaulted on tasks from the routing template.

After work is logged against the order and the status is In Process, you can no longer edit the operation tasks.

On individual task records, you can view the following:

- **Manufacturing charge items** – Charge items are derived from the routing template, but can be modified as necessary for individual orders.
- **Estimated time required for completion**
When you enter a setup time or run time on the task record, these times are planned estimates and are used for scheduling. It is only after completion time is entered against a task is the actual time updated in the Actual Hours field.


Task dependencies are assigned based on the numeric order of the operation sequence and are not editable.

To modify operation tasks:

1. Go to Transactions > Manufacturing > Manufacturing Operations Tasks.

2. Click **Edit** next to the operation to be modified.

The Manufacturing Operation Task record displays the details described below. To make changes, click the field and enter new appropriate values. Fields that cannot be edited are noted.

 **Note:** When you modify task settings from the original template entries, labor and machine scheduling is updated to reflect calculations based on the new entries after the task changes are saved.

3. When all changes are complete, click **Save**.

You can also modify tasks from the work order by going to Transactions > Manufacturing > Enter Work Orders > List and clicking Edit next to the work order to be edited. Then click the Operations subtab to view a list of operation tasks.

Primary Information

- **Operation Name** – Name of the sequence task. This name can be edited.
- **Operation Sequence** – Number of the sequence task. This determines which tasks are precedents for other tasks. This number cannot be edited here.
- **Work Order** – The associated work order number is entered automatically and cannot be edited here.
- **Insert Before** – If this task is a precedent to another, the subsequent task shows here. This data is entered automatically based on the sequence number and cannot be edited here.
- **Status** – This field displays if the task is started and what stage it has progressed to. This data is entered automatically and cannot be edited here.
- **Comments** – You can optionally enter comments here. You can search for this text later to find this record.

Operation Overview

- **Estimated Hours** – NetSuite calculates the time expected to be required to complete this task based on the following:

Total setup time + Quantity x Run rate

- **Actual Hours** – This data is entered automatically based on time logged against the task and cannot be edited here.
- **Remaining Hours** – This data is entered automatically based on the calculated estimated hours and cannot be edited here.
- **Input Quantity** – This data is entered automatically and is based on the Quantity field in the form header and cannot be edited here.
- **Completed Quantity** – This data is entered automatically based on completions entered against this task.
- **Setup Time (Min)** – This data is entered automatically from the routing template but can be edited as needed for individual orders.
- **Run Rate (Min/Unit)** – This data is entered automatically from the routing template but can be edited as needed for individual orders.

Operation Schedule

If you are using the Manufacturing Routing and Work Center feature or Demand Planning feature, the work order shows a Start Date field and End Date field.

- If a routing is selected the Start Date defaults to the current date, but can be edited as needed. The End Date field is disabled and NetSuite uses forward scheduling to calculate the end date based on this information from the operation tasks:
 - Associated work calendar schedule for each of the required resources
 - Scheduling parameters set up on the routing record, such as setup time and run time
- If *no routing is selected*, NetSuite calculates the Start and End dates for the order based on work order lead times defined on the assembly record.


Cost Detail Subtab

- **Manufacturing Cost Template** – Costs recorded for the task are based on the cost template selected. Then, when time is recorded against this task, the cost is updated based on the service charges or other charges listed on the template. This selection can be edited as needed.
- Click the Cost Category field to add new category lines and rates.

Assignees Subtab

These are entered automatically from the routing template, but can be modified as necessary for individual orders.


- Work Center
- Machine Resources
- Labor Resources

 **Note:** These resources denote the machine and labor resources utilized to perform concurrently to complete a manufacturing operation task. The resources parameters are used for costing purposes.

Predecessors Subtab

This subtab details information about the sequence of tasks required to be completed before this operation task. For each preceding task, the following are displayed:

- Task name
- Task type
- Start date
- End date

 **Note:** This information cannot be changed here. It must be edited on the originating task record. Click the task name to open the task record.

Communication Subtab and System Information Subtab

For details, read the help topic [Transaction System Information and Communication Subtabs](#).

Customization

When a manufacturing operation task is open in edit mode, you have customization options available to you for viewing the form.

- Click the Customize Form button to customize the subtabs, fields, lists, names and more.
- Add custom fields at Customization > Lists, Records, & Fields > CRM fields. Check the Manufacturing Operation Task box on the Applies To subtab.

Work Centers and Manufacturing Operations Tasks

You can view the Manufacturing Operations Tasks list to process work orders based on work centers. This enables you to see which centers have completed tasks that are predecessors for other tasks to be worked on.

You can view the operation tasks list and filter the list to show only tasks associated with Work Center 2. If you customize the view to show the Predecessor and Predecessor Completed Quantity, you can determine which tasks that Work Center 2 is due to work on next. (Create a custom view for the task list to display specific columns and information by clicking *Edit View*.)

For example, if the task list shows that two work orders have tasks for which the predecessors are completed, you know that Work Center 2 needs to work on those tasks. When Work Center 2 finishes their requirement for the tasks, click View next to those tasks in the task list to enter completions. The completions entered then update associated work orders with new predecessor data and the work center task lists display the updated task statuses.

Also, after completions are entered for tasks, scheduling is updated for labor and machines to reflect calculations based on the new entries. For example, if you complete work earlier than anticipated, subsequent tasks are moved up and start and end dates are scheduled to be earlier. Likewise, if a completion reflects that work is falling behind, subsequent tasks are moved out and start and end dates are scheduled to be later.

To view the operation tasks list:

1. Go to Transactions > Manufacturing > Manufacturing Operations Tasks.
2. Optionally filter the list by selecting a work center.

Manufacturing Task Scheduler

The NetSuite Manufacturing Task Scheduler provides a graphical view of operation tasks assigned and scheduled per work center. As a production planner or operations manager, you get a real-time view of each work center and their assigned operation task. You can quickly identify issues in how operation tasks are operated, and then resolve these issues within the Manufacturing Task Scheduler itself. Use the task scheduler to facilitate the monitoring and management of operation tasks, to help you ensure that they are being worked on efficiently.

The Manufacturing Task Scheduler enables you to:

- Identify work centers that are overloaded or underloaded.
- Reassign or reschedule tasks from overloaded work centers by dragging and dropping them to a different time slot or work center.
- Update the details of a work order on the Manufacturing Operation Task Detail form.

Availability

The Manufacturing Task Scheduler is available in the shared Supply Chain Management SuiteApp. For more information about this SuiteApp, see the Availability section of [Supply Chain Management Reports](#). You may also contact your NetSuite account manager.

Limitation

Users of Internet Explorer may encounter issues when displaying the chart. Press F12 on an open browser and verify the settings on the menu bar:


- Browser Mode: IE10
- Document Mode: IE9 standards and above

Setting Up the Manufacturing Task Scheduler

Prerequisites

Before installing the Manufacturing Task Scheduler, be sure to enable the required features:

- Go to Setup > Company > Enable Features. On the **Items & Inventory** subtab, check the box for the two features below:
 - Manufacturing Work In Process
 - Manufacturing Routing and Work Center
- Go to Setup > Accounting > Accounting Preferences. On the **Order Management** tab, check the **Show Planned Capacity on Work Orders** box to correctly calculate and display the summary bars, especially those with overlapping schedules.

 **Note:** This accounting preference applies only to newly created work orders. Records created prior to enabling this preference may still not correctly show the summary bars.

For more information on enabling features and preferences, see the help topic [Enabling Features](#).

Installing Supply Chain Management

Install the Supply Chain Management SuiteApp with the following details:

- Bundle Name: Supply Chain Management
- Bundle Id: 47193

For instructions, see the help topic [Installing Supply Chain Management](#). For more information on installing bundles, see the help topic [Installing a Bundle](#).

Supply Chain Management is a managed SuiteApp and is automatically updated whenever there are changes. Issue fixes and enhancements are available after the SuiteApp is updated in your account.

Roles and Permissions

The following table shows the list of required permissions to use the Manufacturing Task Scheduler:

| Subtab | Permission | Level |
|--------------|---|-------|
| Transactions | Work Order | Full |
| Lists | CRM Group | View |
| Lists | Work Calendar | View |
| Lists | Locations | View |
| Lists | Subsidiaries (for OneWorld Accounts only) | View |

| Subtab | Permission | Level |
|---------------|----------------------|-------|
| Custom Record | SCM DPS Task View | Full |
| Custom Record | SCM DPS User Display | Full |

By default, the following standard roles are granted Full access to the two custom records that are listed in the table:

- CEO
- CFO
- Sales Vice President
- Accountant
- Accountant (Reviewer)
- Bookkeeper
- Warehouse Manager

Aside from the two custom records, be sure to assign the other permissions to standard or custom roles. To edit or customize a role, go to Setup > Users/Roles > Manage Roles. On the Manage Roles page, click the Role name to open the record and verify that the permissions are set to the required level. For more information on editing or customizing roles, see the help topic [Customizing or Creating NetSuite Roles](#).

Based on your role, you can access the Manufacturing Task Scheduler by following the appropriate path:

- Warehouse Manager
Inventory > Manufacturing > Manufacturing Task Scheduler
- Administrator
Transaction > Manufacturing > Manufacturing Task Scheduler
- Executive or Accounting
Financial > Manufacturing > Manufacturing Task Scheduler

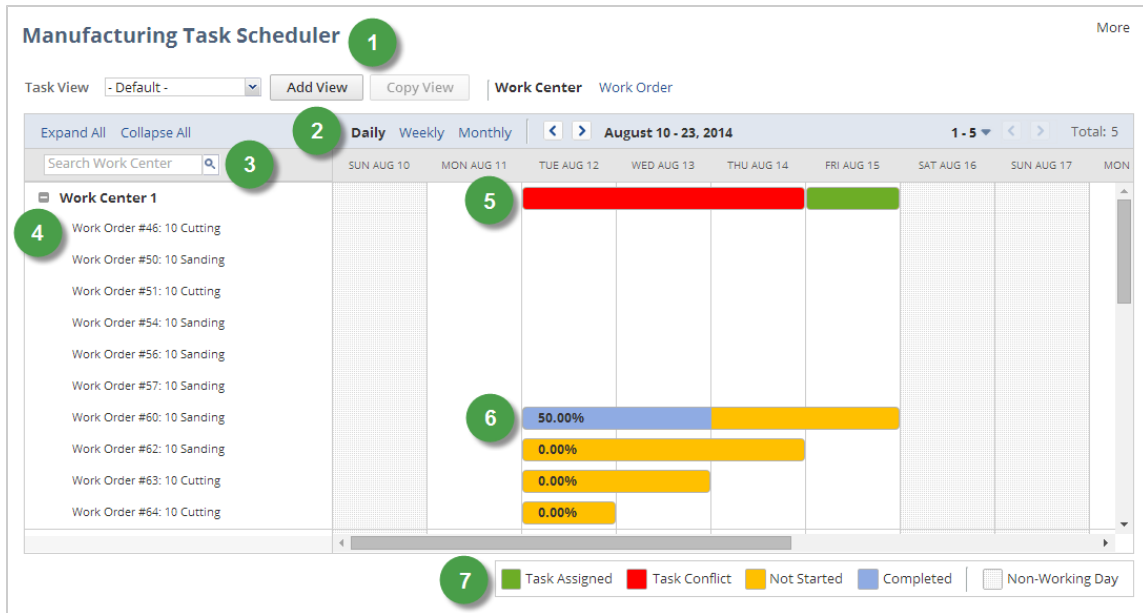
Using the Manufacturing Task Scheduler

The Manufacturing Task Scheduler page contains the chart, work center list, the task view filter, and the time period bar. On the left pane, you can view the list of work centers along with the manufacturing operation tasks that correspond to their work order. On the chart, the task bar represents each task under a work order. You can determine the schedule, duration and status of a work order from its task bar. The summary bar across each work center provides you with a quick view of all its assigned work orders. To help you decode the color-coded status of summary and task bars, refer to the legend at the bottom right.

View the following topics for the correct usage of the Manufacturing Task Scheduler:

- [Working with Task Views](#)
- [Viewing a Time Period](#)
- [Switching Work Views](#)
- [Searching for a Work Center](#)
- [Decoding the Status Colors](#)

See the following figure and table to learn the sections and tools of the Manufacturing Task Scheduler:



| No. | Control Name | Description |
|-----|-------------------------|---|
| 1 | Task View Filter | Enables selection of the default or custom view |
| | Add View | Adds a new custom view |
| | Copy View | Copies an existing custom view |
| | Work View options | Switches the work view: Work Center or Work Order |
| 2 | Expand All/Collapse All | Displays all or hides all tasks within a work center or work order |
| | Time Period | Changes the time period displayed on the chart: Daily, Weekly, Monthly |
| | Date Range | Displays the start and end date of a time period |
| | Date Range icons | Moves the start date from the previous or next date |
| | Pagination | Enables selection of a page range |
| 3 | Page Range icons | Displays the previous or next page |
| | Page Count | Displays the total number of pages |
| | Search Work Center | Enables searching of a work center |
| 4 | Chart Header | Displays the specific day, week, or month within the current date range |
| 5 | Manufacturing Operation | Displays the list of tasks within a work center or work order |
| 6 | Summary Bar | Represents all tasks on the chart assigned to a work center or work order |
| 7 | Task Bar | Represents a specific task on the chart |
| 7 | Legend | Provides a short description of each color on the summary and task bar |

Working with Task Views

The default Task View displays all your work orders, excluding work orders on **Planned**, **Built**, and **Closed** Status, and those from the subsidiary. Use the default view or create a custom view if you need

to closely monitor a specific set of tasks. When creating a custom view, set your preferences for any of the following filters: Production Date From and To, Subsidiary, Location, Work Center, and Work Order Status.

Note: The Manufacturing Task Scheduler can only display a maximum of 2000 operation tasks per page. Creating a custom view can be helpful in limiting the number of tasks to be displayed on the chart.

On the Task View Filter bar, the **Add View** button is only displayed on the default view. The **Edit View** and **Copy View** buttons are only displayed on a custom view. Follow the instructions below to use any of these task view controls.

- **To add a view**

To create a custom view, click **Add View**. Assign a name to the view and select your preference for any of the filters.

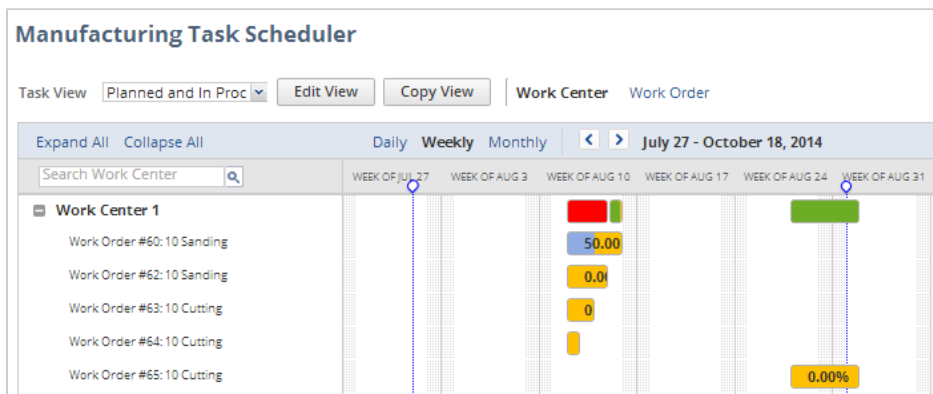
- **To edit a view**

To make changes to a custom view, select the name of the view and then click **Edit View**. The current preferences for the selected view are displayed on the form, which you can change or update.

- **To copy a view**

To make a slight variation of an existing view, use the **Copy View** option.

When you choose a custom view with a specified date range for the production start date, the start and end of the range are marked with vertical bars. All production start dates that fall within the range are included inside the bars.



On the sample screenshot, the vertical bars on the chart are placed on the week of July 27 and August 31. The production start date of all tasks fall within the vertical bars, as well as the date range.

Viewing a Time Period

On the time period bar, click any of the period options to change the current chart view. Changing the time period adjusts the entries on the date header above the chart:

- **Daily:** shows the day, month, and date on the date header. A total of 14 days are displayed at a time.

On the Daily chart, task bars cover the entire day, regardless of the number of work hours.

- **Weekly:** shows the month and date of the first day of the week, on the date header. A total of 12 weeks are displayed at a time.

- **Monthly:** shows the month and year on the date header. A total of 6 months are displayed at a time.


Based on your selected time period, the date range is automatically adjusted. The date range displays the start and end date of the current period covered, for the daily and weekly time period. When you select the monthly option, it displays the start and end month along with the year.

Click the previous or next icon located beside the date range to move the start and end date or month before or after the current selection, respectively. This automatically adjusts the date header and chart view.

Switching Work Views


Beside the task view controls, click either the Work Center or Work Order link to change the operation task grouping on the left pane. By default, the left pane displays the Work Center view where operation tasks are listed under their assigned work centers. You have the option of switching to the Work Order view if you need to see all tasks that belong to each work order.

In Work Order view, aside from the operation task, you can also see the assembly item of each work order and the work center where the task is assigned. Also, the pagination at the right side of the time period bar represents the number of work orders on the current page. On the chart, the summary bar across each work order represents all tasks under it.

 **Note:** Reassignment and rescheduling of tasks cannot be done through drag and drop of the task bars. You have to switch back to Work Center view to update the tasks directly on the chart.

Searching for a Work Center

On the Work Center view, use the search tool located below the time period bar to search for a work center that is not displayed on the current page. Enter the complete or partial Work Center name as search criteria. Press Enter on your keyboard or click the search icon to start the search. Only the retrieved work center and its assigned work orders are displayed on the chart.

 **Note:** At least 3 characters are required as search criteria.

To return to the initial list of work centers, remove any criteria on the search tool and then click the search icon.

Click the Expand All or Collapse All links to display or hide the work orders of all work centers at the same time. This expands or collapses work centers across all pages and is carried out even when you move from one page to another.

When work centers or work orders are collapsed, the chart displays only the summary bars. This is useful in the following ways:

- You can compare the summary bars across all work centers or work orders.
- In the Work Center view, displaying only the summary bars highlights any overloaded or underloaded resource.

You can also use the pagination controls at the right side of the time period bar to help in searching for a work center. It displays the current number of work centers displayed on the page. Click the down arrow to view and select another page. Use the previous and next arrows to move from one page to the next.

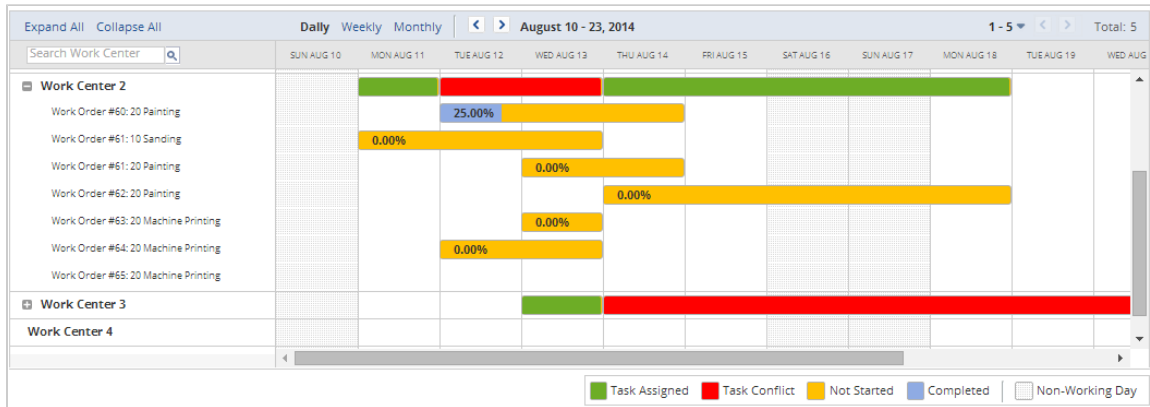
The Manufacturing Task Scheduler can display a maximum of 20 work centers or work orders per page.

Decoding the Status Colors

The color of the task bar indicates the current status of a task as seen in its operation task record. Any status change that is made on the record is also reflected on the bar. The initial task status is **Not**

Started, in yellow. As soon as it is **In Progress**, the percentage of task completion is indicated in blue, and the rest of the task bar remains yellow.

All work orders are represented on the summary bar across each work center, in green. You can check for conflicting tasks with overlapping schedules, which are indicated in red.



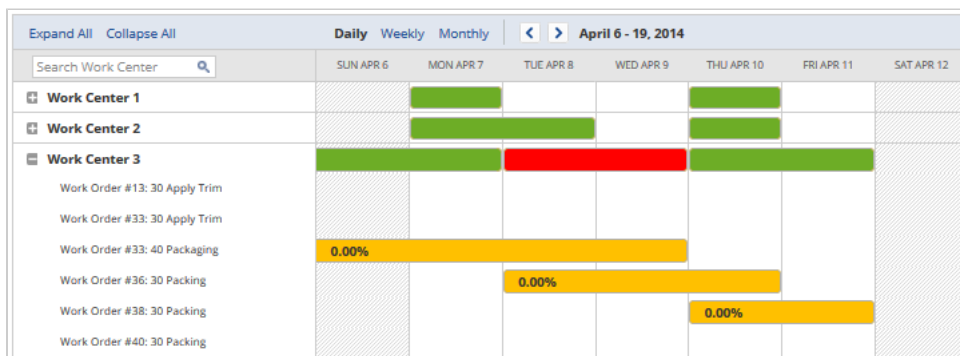
Check the color codes on the legend bar located below the chart. Use the table below as a guide to the definition or description of colors used in the task bar, summary bar, and chart.

| Color | Definition |
|------------------------|---|
| Green (Task Assigned) | Summary bar color that indicates an assigned task |
| Red (Task Conflict) | Summary bar color that indicates one or more tasks with overlapping schedules |
| Yellow (Not Started) | Task bar color that indicates a task that has not started |
| Blue (Completed) | Task bar color that indicates a task's percentage of completion |
| Gray (Non-Working Day) | Column color that indicates a non-working day |

Understanding Task Conflicts

On Work Center view, the summary bar displays all operation tasks assigned to a work center. The summary bar may display a task conflict, in red, if two or more overlapping tasks exceed the total working hours per day.

The sample screenshot shows overlapping tasks in conflict for April 8 and 9, but not for April 10. This is derived by comparing the duration of all tasks for a certain day against the total working hours allotted for the work center.



The following table shows the duration or working hours for each task and the total duration per day. You can see how the overlapping tasks are shown as such in the summary bar. For April 8 and 9, the total task duration exceeds the allotted 8 working hours for Work Center 3.

Work Center 3: Total working hours per day = 8.

| | April 8 | April 9 | April 10 |
|------------------------------------|---------|---------|----------|
| Work Order #33: 40 Packaging | 8 | 2.1 | |
| Work Order #36: 30 Packing | 7.33 | 8 | 1.83 |
| Work Order #38: 30 Packing | | | 2.5 |
| Total task duration per day | 15.33 | 10.1 | 4.33 |


The duration is indicated in the planned time details of a work order. To view the duration of tasks in a work order, go to Transactions > Manufacturing > Enter Work Orders > List. On a specific Work Order page, you can see the duration on the **Planned Time** tab. For more information, see [Manufacturing Routing and Work Orders](#).

On the chart, you can adjust the schedule of a task or reassign a task to another work center to resolve a task conflict. For more information, see [Updating Tasks Using the Manufacturing Task Scheduler](#).

Updating Tasks Using the Manufacturing Task Scheduler





By looking at the summary bar of a work center, you can check for overlapping tasks indicating that a work center is overutilized. In this case, you have the option of scheduling a work order to a later date or assigning it to another resource. You can perform the following updates or changes to a task using the Manufacturing Task Scheduler:

- [Reassigning a Task](#)
- [Forward Scheduling on the Manufacturing Task Scheduler](#)
- [Backward Scheduling on the Manufacturing Task Scheduler](#)
- [Updating a Task Record](#)

 **Note:** You can update tasks directly on the chart only when you are on the Work Center view. Use the task view filters to help limit the view to specific work centers where the reassignment or rescheduling are going to be performed.

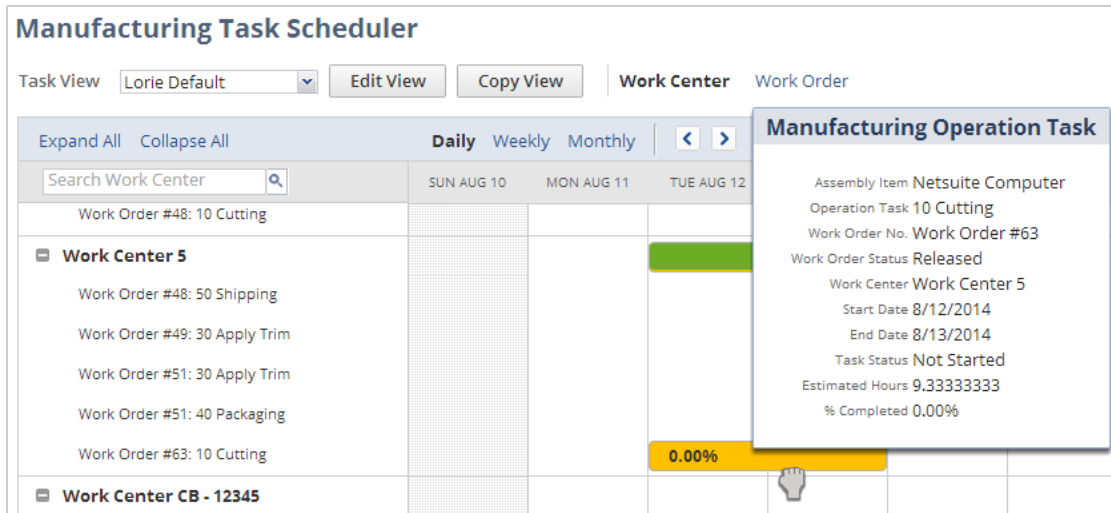
For more information on task conflicts, see [Understanding Task Conflicts](#).

When updating the chart, appropriate icons are displayed to inform you which tasks can be reassigned and updated. Refer to the list of icons used on the chart:

- : This lock icon on the cursor indicates that the task is not open for reassignment or rescheduling.
- : No lock on the cursor means that the task can be transferred to another chart location.
- : This icon indicates that the task can be transferred to the new chart location.
- : This icon indicates that the task cannot be transferred to the new chart location.

You can also check the work order status of the task to determine if the details can be updated or changed. Only tasks with **Planned** or **Released** work order status can be updated.

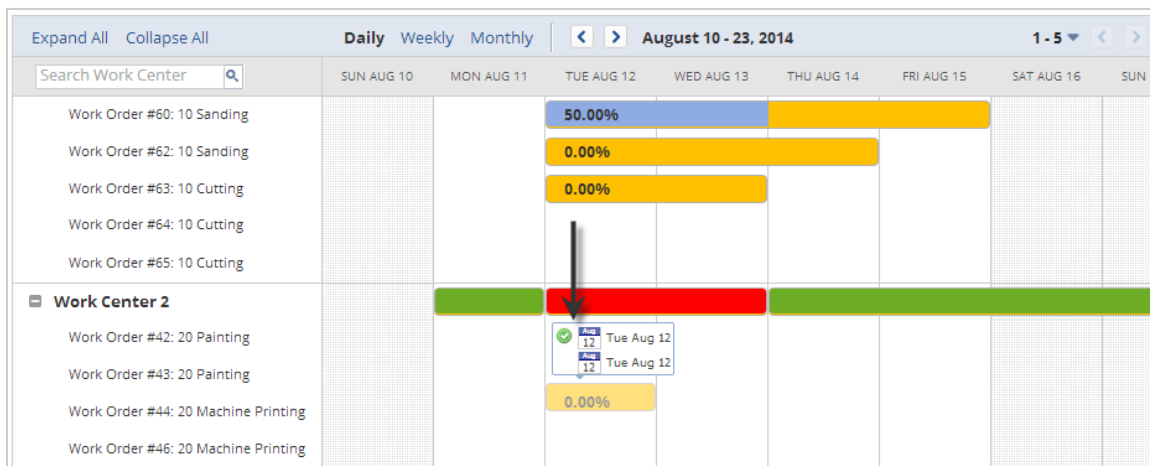
To check the work order status, place the cursor on the task bar to display specific details from its manufacturing operation task record.



Reassigning a Task

To reassign a task, drag the task bar upward or downward within the same column, toward the new work center.

Note: You cannot reassign a task to an inactive work center or one that belongs to a different subsidiary.



As you drag the task bar, the check icon is displayed beside the start and end dates. This indicates that you can drop the task onto the specific chart location on the new work center. The reassigned task retains all its details, except for the new work center number.

Forward Scheduling on the Manufacturing Task Scheduler

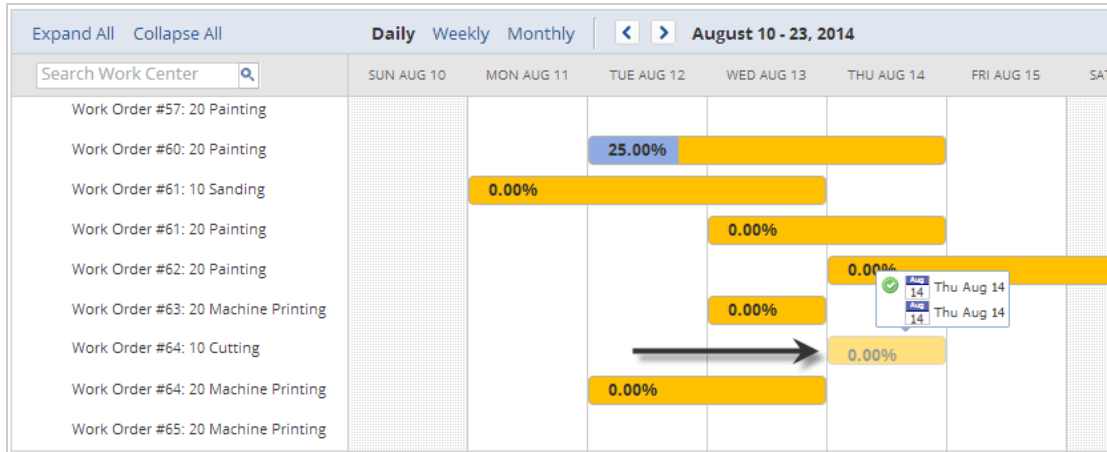
To perform forward scheduling on the chart, you can change the start date of the first task in the work order. This applies to work orders set to **Forward** scheduling method. For more information on scheduling methods, see [Production Scheduling Methods Overview](#).

Set your chart to the Work Center view to start forward scheduling. To locate the first task in the work order, verify that the sequence number located beside the work order number is the first in the operation process. To move the schedule to an earlier or later date, drag the task bar to the left or right

of the original start date, within the same row. You can drop the task to the new location when you see the new start date displayed with a check icon.

Note: Select the appropriate time period option to have an easier time locating a new date on a different week or month. Use the previous and next date range arrows to adjust the dates on the view accordingly.

After moving the date of the first operation task, the schedules of the succeeding tasks are automatically adjusted. You can switch to the Work Order view to review the new schedule of tasks within the work order. The changes made on the chart are also applied to the work order and operation task records.



Backward Scheduling on the Manufacturing Task Scheduler

Backward scheduling on the chart applies to work orders set to the **Backward** scheduling method. To perform this, you can move the end date of the last operation task in the work order. Changes to the schedule are also reflected on the corresponding work order and operation task records. For more information on scheduling methods, see [Production Scheduling Methods Overview](#).

To start backward scheduling, be sure to set your chart to the Work Center view by clicking its link located above the chart header. On the left pane, look for the last operation task of the work order to be rescheduled. On the chart, drag and drop the task bar of the last operation task to the new date.

- Drag to the right of the current date to move the schedule to a later date.
- Drag to the left of the current date to move the schedule to an earlier date.

After moving the last operation task bar to the new date, the preceding tasks within the work order are automatically adjusted to accommodate the new schedule. You can review the new task schedules by switching to the Work Order view.

Updating a Task Record

You may update a task record, but after a task is changed to **In Progress** status, its details can no longer be edited. To display the manufacturing record, double-click its corresponding task bar on the chart. You can edit the following details:

- Setup Time
- Run Time
- Work Center

- Machine Resources
- Labor Resources

After a record is changed, any adjustments to the time or date are automatically reflected on any dependent fields. For more information about editing the task details, see [Editing a Manufacturing Operation Task](#).

Supply Planning and Routing

If you use the Demand Planning feature in addition to the Manufacturing Routing and Work Center feature, routings on work orders can affect your supply planning. This is because supply planning uses backwards scheduling to meet manufacturing due dates.

Note: Procurement lead times do not affect these time requirement calculations.

The supply planning method used depends on whether or not a default routing is identified.

Without a Default Routing

When you generate a supply plan on the Generate Supply Plan page, NetSuite calculates the order date (or release date) based on the due date using the following formula for assembly items that are required to be built:

Order Date = Due Date - (Quantity x Work Order Lead Time)

Note:

- Quantity = Quantity of items required
- Work Order Lead Time = Number of days required to build, per unit
- Due Date = Date when the additional supply is required



Note that without a default routing, calculations are made without reference to any calendar or resource requirements.

With a Default Routing

When the Manufacturing Routing and Work Center feature is enabled, the supply planning engine on the Generate Supply Plan page considers the default routing and associated work calendar for scheduling purposes.

When an assembly build is required and a default routing is defined, NetSuite calculates the cumulative lead time across all operation sequences using the following formula:

Total time =

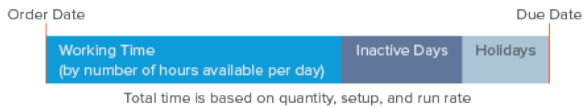
[Sum of Setup Time for all operation tasks + (Sum of Run Rate x Quantity)] x Total Hours per day

Note:

- Setup Time = Total cumulative setup time across all operation sequences in the default routing

- Run Rate = Total cumulative run time across all operation sequences in the default routing
- Total Hours per day = Total number of hours available on the associated work calendar

The order is calculated by backward scheduling from the due date. NetSuite does consider the associated work calendar for days available as well as holidays.



If changes are made to the associated work calendar or to the routing record, the supply plan should be regenerated. These changes can include:

- modifying the work calendar (such as to increase/decrease the working days or add/remove holidays)
- editing the routing to increase/decrease a setup time or run rate

After regeneration, the order dates are modified to reflect the new requirements and still meet the due date deadline.

Routings and the Generate Work Order in Supply Plan Preference

NetSuite supply plan processing for an assembly that has a routing defined depends on your setting for the Generate Work Order in Supply Plan preference, as described below:

| Generate Work Order in Supply Plan Setting | Default Scheduling Method | Result |
|--|---------------------------|--|
| Do Not Generate | — | The supply plan uses backward scheduling to determine order date. In this case, only the supply plan line is created, not the actual Work Order. |
| Not Do Not Generate | Forward | The supply plan uses backward scheduling to determine the order date. Within the supply plan run, NetSuite automatically creates a work order and sets the production start date the same as the order date. When the work order is created, NetSuite uses forward scheduling to calculate the work order production end date and sets the production start date. In this case, the supply plan creates an actual order. |
| Not Do Not Generate | Backward | NetSuite creates a work order right away using the receipt date from the demand plan. The production end date is set at one day prior to the receipt date to allow time to complete production and be available on the required date. The work order then uses backward scheduling to calculate the work order production start date. In this case, the supply plan creates an actual order. |

For details about setting the Generate Work Order in Supply Plan preference, read [Setting Routing Preferences](#).

Production Scheduling Methods Overview

When you use the Routing and Demand Planning features to generate supply work orders, you can choose the method NetSuite uses to calculate production requirements. These calculations assess

the time, materials, and resources required to complete an order and set a start or end date for the production run accordingly.

The two methods available are as follows:

■ Forward Scheduling

When you use forward scheduling, you set a production start date and NetSuite calculates the time, materials, and resources required to complete all necessary operations to finish the task. The production end date is determined based on these calculations.

When using the Forward Scheduling method, on work orders, the Production Start Date field is required and defaults to the current date. The Production End Date field is dimmed because it will be calculated.

■ Backward Scheduling

When you use backward scheduling, you set the production end date, which is the date you need to have the completed items. Then, based on data from the associated routing, as well as the related work center calendar, NetSuite calculates the time, materials, and resources required to complete all necessary operations. The production start date is determined based on these calculations.

When using the Backward Scheduling method, on work orders, the Production End Date field is required. The Production Start Date field is dimmed because it will be calculated.



Note: This calculated start date may be a date in the past, prior to the current date.

When Backward Scheduling is set as the default scheduling method, different factors determine the production end date on generated work orders. To learn more, see [Backward Scheduling](#).

These scheduling methods can be used both when generating individual work orders and by generating work orders using supply planning.

When a work order is saved, or generated, the supply planning engine calculates requirements and then generates necessary work orders. On the work order Operations subtab you can click an operation name to view or edit details about the operation.

To choose a production scheduling method, you must first set these preferences:

Generate Work Orders in Supply Planning

To set production scheduling methods on work orders, you must first enable the preference to Generate Work Orders in Supply Planning. For more details about this preference, read the help topic [Automatically Generate Planned Work Orders](#). After you have set this preference to generate orders, you can select a scheduling method on orders and set a default scheduling method. When the Generate Work Orders during Supply Plan preference is enabled, the supply plan schedules work orders based on the default scheduling method.

Default Scheduling Method

Choose a default production scheduling method to determine the method that shows by default in the Scheduling Method field on work orders created manually and by automated supply planning.

To set default scheduling method preferences:

1. Go to Setup > Accounting > Preferences > Accounting Preferences.
2. Click the **Order Management** subtab.

3. In the **Default Scheduling Method** field, choose either **Forward** or **Backward**.

This field defaults to the Forward scheduling.

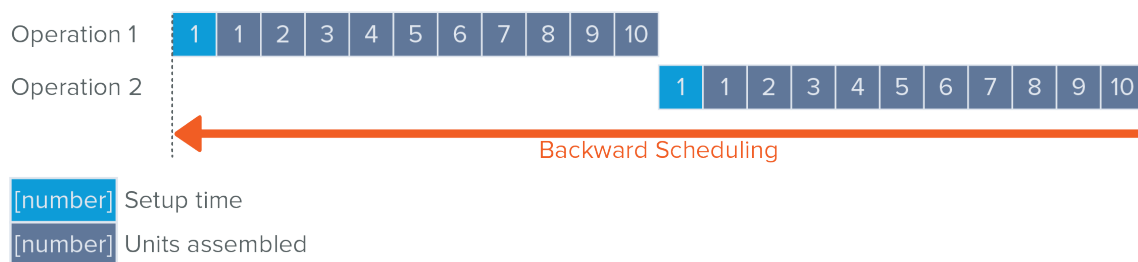
4. Click **Save**.

This method you select automatically completes work orders, but you can change the method on individual orders with a status of Planned or Released.

Backward Scheduling

When you use the backward scheduling method for production planning, you set the production end date, which is the date you need to have the completed items. Then, based on data from the associated routing, as well as the related work center calendar, NetSuite calculates the time, materials, and resources required to complete all necessary operations. The production start date and time is determined based on these calculations.

For example, you need to schedule an order of widgets that requires two operations to complete a production run. Each operation requires 1 day of setup time and 10 days of production time. Operation 1 must be complete before Operation 2 can start. These production requirements are depicted below:



Using backward scheduling, when you enter the date you need the items completed, NetSuite can use the information above to calculate the day work must begin to complete production on time. When a work order is created by a supply plan, NetSuite schedules work so that the last operation is completed before the due date. Because the due date time is 00:01 AM, the last operation on the work order is scheduled to be completed by 11:59 PM on the day before the due date.

The time displayed for each operation is based on work hours set for each work center. Read [Creating Manufacturing Work Centers or Groups](#).

| Custom Work Order Operations | | | | | | | |
|------------------------------|--------------------|-----------------|--------------------|--------------------|------------------|---------------------|----------|
| EDIT | OPERATION SEQUENCE | OPERATION NAME | START DATE/TIME | END DATE/TIME | SETUP TIME (MIN) | RUN RATE (MIN/UNIT) | LAG TYPE |
| Edit | 10 | <operation-1.1> | 4/18/2014 12:04 pm | 4/21/2014 1:14 pm | 50 | 50 | |
| Edit | 20 | <operation-1.2> | 4/21/2014 1:14 pm | 4/21/2014 4:54 pm | 20 | 20 | |
| Edit | 30 | <operation-1.3> | 4/21/2014 4:54 pm | 4/23/2014 10:59 am | 55 | 55 | |
| Edit | 40 | <operation-1.4> | 4/23/2014 10:59 am | 4/23/2014 1:57 pm | 18 | 16 | |
| Edit | 50 | <operation-1.5> | 4/23/2014 1:57 pm | 4/23/2014 3:10 pm | 3 | 7 | |
| Edit | 60 | <operation-1.6> | 4/23/2014 3:10 pm | 4/23/2014 5:00 pm | 10 | 10 | |

[Edit](#)
[Back](#)
[Issue Components](#)
[Enter Completion](#)
[Enter Completion with Backflush](#)
[Close](#)
[Print BOM](#)
[More Actions](#)

Planners who use the Backward Scheduling method can appreciate accuracy that can help reduce waste of manufacturing resources. Because NetSuite calculates start dates automatically, time is not wasted trying to figure out when a work order production needs to start to finish by certain date. Work order production is scheduled to start as late as possible, giving planners flexibility to cancel or change an order, if needed.

Note: The NetSuite planning engine calculations may set a production start date in the past, depending on the end date entered.

Production work is not automatically re-allocated based on resource capacity. After work orders are created, you may need to assess resource assignments.

When Backward Scheduling is enabled as the default scheduling method, the production end date on generated work orders is determined using the following factors:

- **Sales Order** — When you check the box in the **Create WO** column on the **Items** subtab for an item that uses the WIP multi-step production process, a work order is generated for your assembly item. The production end date on the work order will be set to one day before the expected ship date indicated on the work order. If no expected ship date is entered, the production end date will be set to the same day as the sales order date.
 - **Work Order** — When you check the box in the **Create WO** column on the **Items** subtab, a work order is generated for a sub-assembly. The sub-assembly's production end date will be set to the same date as the parent item's production start date.
 - **Supply Plan** — When a work order is generated during a supply plan, the production end date for a sub-assembly will be set to the same date as the parent item's production start date.
- The Generate Work Orders preference must be set to any option except Do not Generate.
- **Mass Creating Work Orders** — If you select **Reorder point** as the Replenishment Method, the system will use Forward Scheduling for the work orders regardless of the default scheduling method set in the account preferences.

Manufacturing Routing Completions and Time Entry

For work orders that use manufacturing routings, enter time and completions against the operation tasks to track the assembly process and monitor associated scheduling and costs.

Click one of the following links for details about completions and time entry:

- [Routing Work Order Completions](#)
- [Routing Completion Labor and Machine Time Entry](#)
- [Time and Status Updates on Tasks](#)

Routing Work Order Completions

After an assembly task has been completed, record a completion against the operation. The completion logs time and activities against the operation. Updating records to keep information current in the work order records enables you to track costs and expenditures up to the current point in time.

You can enter a completion in three ways:

- [Enter a Completion from a Work Order](#)
- [Enter a Completion on a Task Record](#)
- Bulk enter completions (Read the help topic [Entering Work Order Completions](#)).

After you have entered an operation task completion, you can go to More Actions > GL Impact to see effects of the completion on the general ledger. The GL Impact page shows the overheads and labor expenses recorded against the WIP account.

When you enter the final required task work for an assembly as completed, saving the completion records the items as put into inventory. If you view the GL Impact page, note that the value is removed from the WIP account and added to the inventory account.

Completion Validation Preference

You can set a preference to validate that routing operation sequences are always followed in accordance with the work order. NetSuite uses this validation to ensure that the correct quantity is completed for each operational step before permitting the work order to continue being processed.

When this preference is enabled and you are entering a work order completion, this validation can function to restrict the completed quantity amount you can enter on a work order completion for a particular operation. If completing Operation B requires a set amount of items that are generated during Operation A, you can verify that the requirements of the predecessor have been met before saving the completion for Operation B.

For this example, the below is true:

- Creating 5 units during Operation A is a predecessor for creating 5 units during Operation B.
- You choose the preference setting Do Not Allow Saving. This means the total completed quantity of Operation B cannot be greater than the total completed quantity of Operation A.
- If Operation B of your routing requires 5 units that are created during Operation A, NetSuite can verify that 5 units are completed during Operation A before Operation B can begin. If you try to enter a completion with more units than are allowed, an error dialog is presented.


Such verification helps prevent problems due to out-of-sequence processing.

For orders completed across multiple days or shifts, partial quantities can be logged over time.

| Operation | Qty Day 1 | Qty Day 2 | Qty Day 3 | Qty Day 4 |
|-------------|-----------|-----------|-----------|-----------|
| Operation A | 50 | 30 | 15 | 5 |
| Operation B | 40 | 40 | 5 | 15 |
| Operation C | 35 | 45 | 0 | 20 |

For the Check Completed Quantity in Prior Operations During Operation Completion preference, choose from the following settings:

- **No Verification** – Choose this setting if you do not want to receive verification warnings.
- **Require Confirmation before Saving** – Choose this setting to receive verification warnings. NetSuite will permit the completed quantity to be greater than the predecessor completed quantity after the warning is acknowledged.
- **Do Not Allow Saving** – Choose this setting to require that the completed quantity is not greater than the predecessor completed quantity.


 **Note:** This field defaults to the No Verification selection. If you do not change this default setting, unverified completions can be entered.

For details about setting this preference, read the help topic [Order Management Accounting Preferences](#).

Enter a Completion from a Work Order

When using the completion buttons on a routing work order, you can choose from the following options:

- **Enter Completion** (completion only)
Records one of the following:
 - completion of a single operation or a range of operations
 - completion of entire assembly
- **Enter Completion with Backflush** (completion + issue components)
Records one of the following:
 - completion of a single operation or a range of operations **AND** issue components
 - completion of entire assembly **AND** issue components

 **Note:** When a completion and issue occurs and the status is not closed or built, the operation status automatically changes to in-progress.

For detailed steps on entering a completion from a work order, read [Enter a Completion for an Individual Work Order](#).

Enter a Completion on a Task Record

You can open the complete list of task records to enter a completion for an operation task.

To view an operation task record:

1. Go to Transactions > Manufacturing > Manufacturing Operations Tasks.
2. Click **View** next to the completed task.
3. On the operation task record, enter the completed quantity.
After you enter the quantity, NetSuite automatically enters data on the **Components** subtab and **Operations** subtab based on the necessary requirements.
For additional details, read [Routing Completion Labor and Machine Time Entry](#).
4. Click **Save**.

Routing Completion Labor and Machine Time Entry

When you enter a completion for a routing work order, the Operations subtab is available to record labor and machine time completed against an operation task.

For more details on entering a completion, read [Routing Work Order Completions](#).

By entering data on the completion form you determine the answers to these questions:

- Starting and Ending Operation – Which operation tasks have been completed?
- Quantity Completed – How much time should be logged against each operation?

The Operations subtab shows which operations are being completed and the amount of labor and machine time to record against each of those operations.

First, identify which operations have been completed:

1. Enter the starting operation. This identifies the *first* operation task you want to identify as being completed.
2. Enter the ending operation. This identifies the *last* operation task you want to identify as being completed.

Operation tasks that will be logged as completed include the indicated starting operation, the ending operation, *and all operation tasks in between* the starting and ending operation tasks.

Next, enter the quantity completed. Then, this quantity is used to calculate the appropriate amount of labor and machine time for sequences completed.

Note: The completed quantity must be entered in the Operation Completion section of the form. The Completed Quantity field on the Operations sub is display only and cannot be changed.

For example, you enter the following:

- A completed quantity of 1 is entered, along with the starting operation of 10 and ending operation of 30.
- For operations 10, 20 and 30, NetSuite multiplies the completed quantity against the labor and machine time requirements set on the operation task record. The results of this calculation populate the labor and machine time fields on the Operations subtab.

Labor Time and Machine Time for Completed Operations

After the operations being marked complete are identified, details about labor and machine time can be entered for each operation.

The Operations subtab can be used as follows for each operation completed:

- The completed quantity defaults to the same amount entered in the Completed Quantity field.
- You may or may not record setup time:
 - If you *have not* previously recorded any setup time against an operation, the setup columns default to show the full setup time for the operation. This total setup time is based on the setup time indicated on the operation task record.
In this case, the Record Setup Time box defaults to be checked.
For each operation, you have these options:
 - Modify the default setup time quantity.
 - Clear the Record Setup Time box.
 - If you *have* previously recorded some setup time against an operation, the Record Setup Time box defaults to be cleared. On any subsequent completion entry, if you want to log setup time, you must check this box manually and enter the setup time to be recorded.
- Machine and labor run times for each operation are automatically entered based on the quantity completed using the following formula:

Default run time = Qty completed x Run rate on the operation record

After the labor and machine times have been entered for all completed operation tasks, these times are used to calculate both the progress of the assembly and also the costs of the assembly.

- For details about assembly progress and time updates, read [Time and Status Updates on Tasks](#).
- For details about costing implications of routing assembly completions, read [Manufacturing Routing Costing](#).

Time and Status Updates on Tasks

When time is entered against an operation task, the scheduling for all tasks related to the work order are updated to accurately portray progress against each operation.

Often machine and labor resources working concurrently are fully utilized against a certain operation task. In such cases, both resource types are weighted equally to determine the actual time recorded on the operation task record.

Sometimes, one resource may have a higher value than the other resource for a certain task. For example, on a task, the machine run time is less than labor run time. In such a case, the critical path is the labor time since it is the greater of the two. The production schedule is updated based on the larger requirement of the two.

In such a case, of the two time values recorded, the greater is used as the actual hours on the operation task record. This applies to setup time as well as run time.

In another example, the recorded machine time is larger than the labor time because the machine can run without constantly being overseen by labor. In this case, the machine time is the critical path and is used to update scheduling. It is worth noting that the labor time is used for costing purposes.

For an operation, if the labor run time is larger than the machine run time then the labor run time is used as the actual hours.



Note: The default values that show for machine run and labor run times can be modified to accommodate individual run times.

After the appropriate time values have been determined, the amount shows in the Actual Hours field on the operation task record.

Based on the actual hours recorded, NetSuite adjusts the schedule of subsequent tasks to provide a realistic view for completions.

Operation Task Status Updates

The status of an operation task is updated automatically based on data entered for the work order or tasks. Possible status options include the following:

- **Not Started**
 - No time is recorded against the task.
 - No quantity completed is recorded on the task.
- **In Progress**
 - Some time is recorded against the task.
 - Some quantity completed is recorded on the task AND the completed quantity is less than the input quantity required.
- **Completed**
 - The completed quantity is equal to/greater than the input quantity required OR
 - The work order is closed.

Marking a Routing Work Order as Built or Closed

For some orders, you may want to show the items as being assembled without finishing all the individual steps for each operation task. In such a case you can do one of the following:

■ Mark an Order Built

When you mark an order as built, the required items are marked built and added to inventory. Note that associated variances *are not* created when you do so.

To mark a work order built go to Transactions > Manufacturing > Mark Work Orders Built.

For details, read Marking Work Orders Built. [Marking Work Orders Built](#)

■ Mark an Order Closed

When you mark an order as closed, the required items are marked built and added to inventory. Note that associated variances *are* created when you do so.

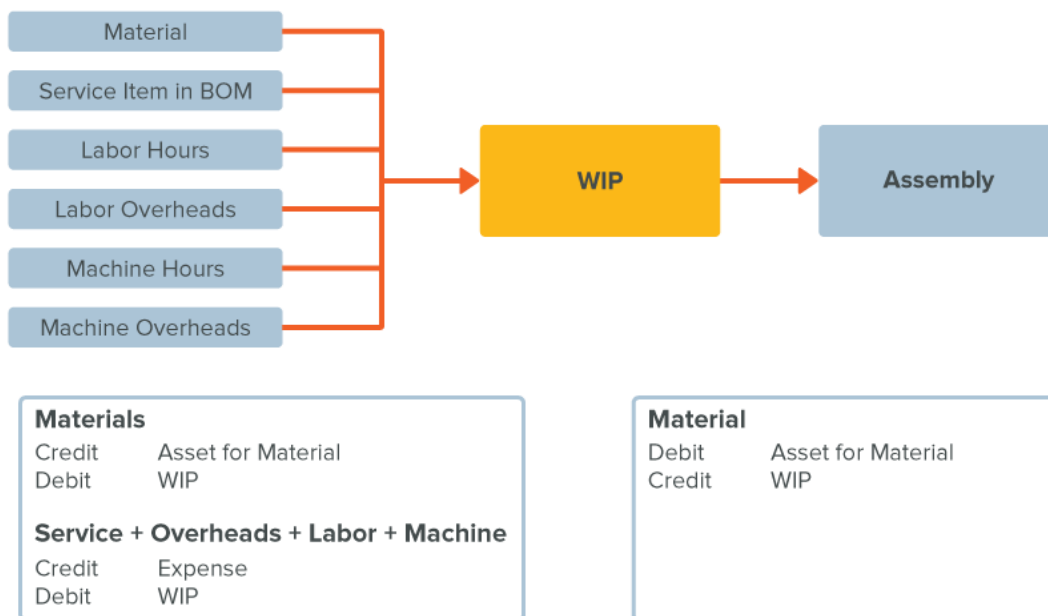
To mark a work order closed go to Transactions > Manufacturing > Mark Work Orders Built..

For details, read Marking Work Orders Closed. [Marking Work Orders Closed](#)

After you mark an order as Built or Closed, if you view an operational task record associated with that order, the task status displays as Completed.

Manufacturing Routing Costing

Values for assets and expenses associated with a routing work order are posted to the designated Work In Process (WIP) account during the assembly process.



Values are added to the WIP account based on time logged against operation tasks or quantity produced in a run. After the assembly process is complete, the values are removed from the WIP account and added to the Asset for Assembly account.

Time Updates and Costing

When time is logged against an operation task for an assembly, this time is used to calculate costs associated with the assembly. For example, when completion time is logged against an operation task, the following accounting entries are generated:

| | Account | Formula |
|----|--------------------------|--------------------------|
| CR | Labor | Rate x Resources x Hours |
| DR | WIP account for assembly | Rate x Resources x Hours |

- Hours – time logged on a completion record
- Resources – sourced from the completion record
- Rate – sourced from the operation task record

Then, the result of these calculations posts to the WIP account for the assembly.

Costs can be one of two types: setup costs or run costs.

Setup Costs

Costs need to be logged for expenses related to setting up for an assembly run. These costs are defined on the operation task record and are based on time logged against the task.

Note: Setup costs are only time dependent, not based on quantity produced.

For example, the operation task *Staging* defines costs on the Cost Detail subtab. One cost category defined is Labor Setup. Using this category on a task defines the following:

- The Labor Setup cost category record indicates the item *Other Charge for Purchase - Labor Setup*.
- The task record defines the fixed rate for using the item *Other Charge for Purchase - Labor Setup* at \$30.
- The item record for *Other Charge for Purchase - Labor Setup* indicates the *Assembly Staging Expense* expense account.

Therefore, when you log time against the *Staging* task, the appropriate amount posts to the *Assembly Staging Expense* account. This appropriate amount is calculated as follows:

Expense amount = Setup time logged x Labor setup fixed rate

If 2 hours of time are logged against the *Staging* task, then \$60 is logged to the *Assembly Staging Expense* account.

| Labor Setup | Account | |
|-------------|--------------------------|--------------------------|
| CR | Labor Setup | Rate x Resources x Hours |
| DR | WIP account for assembly | Rate x Resources x Hours |

Similar calculations are also made for other categories that may be defined on a task record, such as overheads (Overhead expense amount = Setup time logged x overhead rate.)

| Labor Setup Overhead | Account | |
|----------------------|------------------------------|--------------------------|
| CR | Labor Overhead Setup Account | Rate x Resources x Hours |
| DR | WIP account for assembly | Rate x Resources x Hours |

Run Costs

Costs need to be logged for expenses related to processing an assembly run. These costs are defined on the operation task record and are based on quantity completed during the assembly run.

For example, the operation task *Staging* defines costs on the Cost Detail subtab. One cost category defined is Labor Run. Using this category on a task defines the following:

Note: Run costs are only based on quantity produced and are not time dependent.

- The Labor Setup cost category record indicates the item *Other Charge for Purchase - Labor Run*.
- The task record defines the run rate for using the item *Other Charge for Purchase - Labor Run* at \$65 .
- The item record for *Other Charge for Purchase - Labor Setup* indicates the *Assembly Staging Expense* account.

Therefore, when you log time against the *Staging* task, the appropriate amount posts to the *Assembly Staging Expense* account. This appropriate amount is calculated as follows:

Expense amount = Setup time logged x Labor setup fixed rate

So, if 10 units are completed for the *Staging* task, then \$650 is logged to the *Assembly Staging Expense* expense account.

| Labor Run | Account | |
|-----------|--------------------------|--------------------------|
| CR | Labor Run | Rate x Resources x Hours |
| DR | WIP account for assembly | Rate x Resources x Hours |

Similar calculations are also made for other categories that may be defined on a task record, such as overheads (Overhead expense amount = Run quantity logged x overhead rate.)

| Labor Run Overhead | Account | |
|--------------------|----------------------------|--------------------------|
| CR | Labor Overhead Run Account | Rate x Resources x Hours |
| DR | WIP account for assembly | Rate x Resources x Hours |

Costing Lot Size

If you have enabled the Standard Costing feature and the Manufacturing Routing and Work Center feature, the Costing Lot Size field shows on the Locations subtab of assembly item records. The default value for this field is 1 and the minimum value for this field is 0.01.

If you also use the Multiple Units of measure feature, the value is in base units of measure.

During the cost rollup process, NetSuite calculates the routing cost of assemblies as follows:

| Setup Cost | Run Cost |
|---|--|
| # of Resources (work center) x Setup Time (routing record) x Manufacturing Charge Item Unit Cost (item record) / Standard Cost Lot Size (assembly item - item location map) | # of Resources (work center) x Run Rate (routing record) x Manufacturing Charge Item Unit Cost (item record) |