Root Cause Analysis

Contents

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Overview

Overview of the Root Cause Analysis (RCA) Module

The GE Digital APM Root Cause Analysis (RCA) module lets you conduct a root cause analysis, which allows you to analyze causes of failures. A root cause analysis also allows you to track the performance of the equipment by following implementation of recommendations. When you create a Root Cause analysis, you are using GE Digital APM tools to facilitate a standard process that is based on the PROACT® for Meridium methodology.

Note: The RCA module is based on the PROACT® RCA Methodology, © Copyright 1996 - 2017, RCI-Reliability Center Incorporated. All rights reserved. Used with Permission.

More Details

A root cause analysis is the process of analyzing failures down to their root causes, which can include but is not limited to physical causes, human causes, and latent causes of the failure.

In the GE Digital APM system, elements of a Root Cause analysis store all the information necessary for the team to identify a root cause for failure of and asset.

When the Root Cause analysis is complete, it can be published and made available to users who are not members of the analysis team, allowing them to view the results using GE Digital APM tools.

When a failure occurs in your facility, there could be any number of causes that led to the failure. If you investigate the causes, you might find that each failure is caused by another higher-level cause. If this root cause remains unidentified, the failures will likely persist.

For instance, consider an example of a car that has had trouble starting every month for the past three months. In this case, you might determine that:

- In the first month, the cold weather caused the failure.
- In the second month, the battery was low.
- In the third month, the warning to check engine was displayed in the dashboard.

If you were to conduct a root cause analysis on the car, you may find that while each month's failure had its own apparent cause, the root cause of each failure was that a voltage regulator was malfunctioning.

To help you identify the root causes of failures in your facility, you can assemble an RCA Team that will:

- Collect data relevant to the failure.
- Analyze the data.
- Develop hypotheses about the root cause.
- Develop recommendations for preventing the failure from occurring or lessen the impact of the failure in the future.
- Implement recommended solutions.
- Track implemented solutions and re-evaluate them, as needed.

Access the RCA Overview Page

About This Task

This topic describes how to access the **RCA Overview** page on which you can view all the information and perform various tasks related to Root Cause Analyses for various Asset Hierarchy Levels.

You can perform various tasks on this page based on the Security Groups to which you are assigned.

Procedure

In the module navigation menu, select **Reliability** > **Root Cause Analysis**.

The **RCA Overview** page appears.
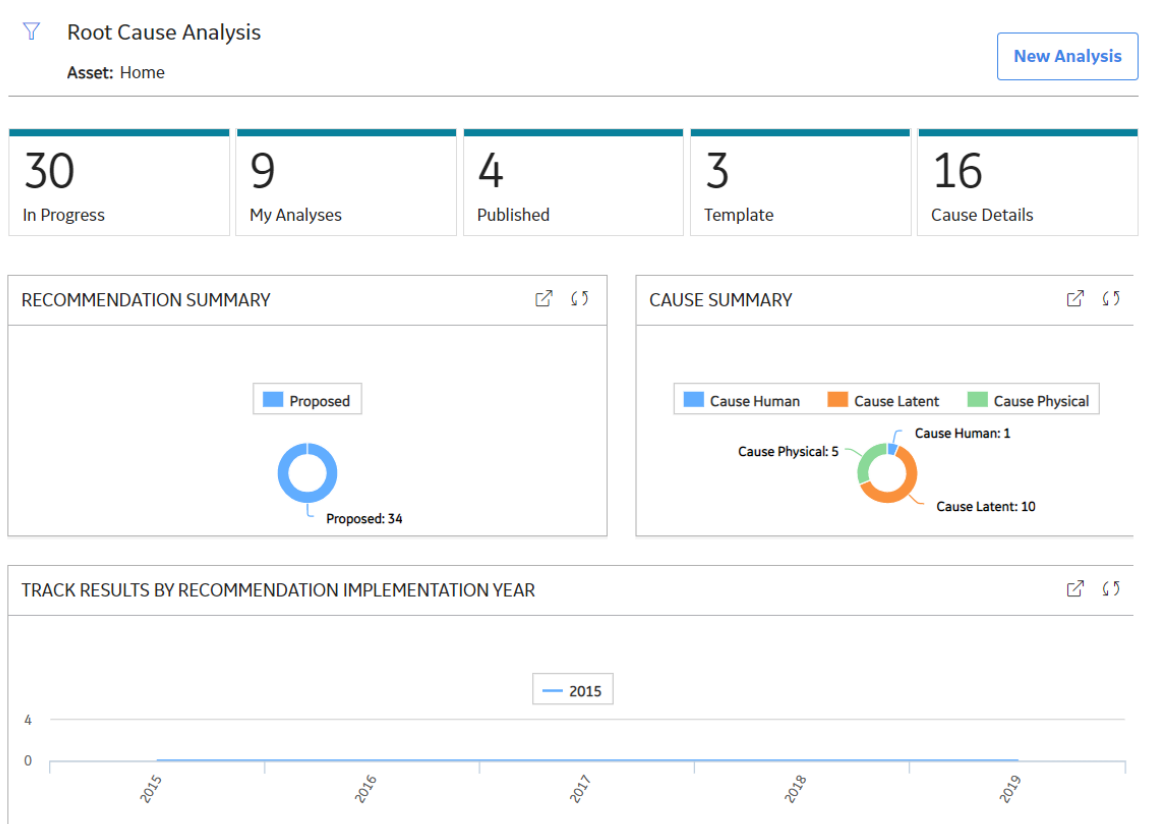
The tabs at the top of the page summarize the number of items in each category. You can select a tab to view one of the following lists:

- **In Progress** : Displays Root Cause Analyses that have not yet been completed.
- **My Analyses** : Displays Root Cause Analyses to which you are assigned as a team member.
- **Published** : Displays Root Cause Analyses that have been completed and published.
- **Template** : Displays Root Cause Analyses that you can use to create new Root Cause Analyses. The Root Cause Analyses in the Template state are identical to Root Cause Analyses that are in the In Progress state, except that they do not have an analysis team defined.
- **Cause Details** : Displays Root Cause Analyses that have their cause type defined in the Logic Tree. You can select the hyperlink for an analysis to view the details of the Root Cause Analysis. The Root Cause Analyses in the Template state are not included.

On the page, you can also view the following sections:

- **Recommendation Summary** graph: Displays the number of recommendations in each state.
- **Cause Summary** graph: Displays the number of Hypotheses, for the selected Asset Hierarchy Level and its children, that are related to each type of cause (i.e., Physical, Human, and Latent). The Root Cause Analyses in the Template state are not included.

- **Track Results by Recommendation Implementation Year** graph: Displays yearly performance of Asset Hierarchy levels on which RCA recommendations have been implemented. The chart displays sum of all the maintenance costs and production costs from the work history family associated with all the Asset Hierarchy levels related to the RCA recommendations that have been accomplished within the year. The chart plots the maintenance costs of the Asset Hierarchy levels for the current year and the previous four years.

  Note: Optionally, if you have an active license for PLA and access to the required PLA families, you can change this graph to one that includes the production costs associated with Production Loss Analysis (PLA). To do so, access the dashboard configuration for the **RCA Dashboard-V4** dashboard, which is stored in the Catalog folder `\\Public\Meridium\Modules\Failure Elimination \Dashboards`, and then modify the graph widget to reference the query `\\Public\Meridium \Modules\Failure Elimination\Queries\FE Dashboard Query - Track Result - Total for Graph-V4`.

Note: For more information, refer to the Dashboards section of the documentation.

While viewing any of the graphs on the **RCA Overview** page, you can select ⬈ to customize the appearance of the graph.

By default, the hierarchy level is set to Home. You can filter the hierarchy level by selecting ▽ in the upper-left corner of the page. By default, the Root Cause Analysis information that will appear on the page is related to an Asset and children of the Asset.

RCA Workflow

This workflow provides the basic, high-level steps for using Root Cause Analysis. The steps and links in this workflow do not necessarily reference every possible procedure.

1. Define when an RCA should be performed.
2. Create a Root Cause Analysis.
3. Add Critical Success Factors to an RCA.
4. Select the members of the RCA team.
5. Modify the Team Charter in the **Definition** section.

   Note: The user that completes tasks listed in Step 2 to Step 6 will be added to the RCA Team automatically as the Principal Analyst. After completing these steps, you can designate a different team member as the Principal Analyst. For information on designating a team member as a Principal Analyst, refer to the Teams documentation.

6. Link the Assets on which the RCA is based.
7. Link the RCA to Reference Documents, which contain reference material relevant to the analysis.
8. Create RCA Preserve records and assign them to team members.

   Note: While the PROACT acronym lists the Preserve step first, the order in which you perform the associated task in GE Digital APM can differ.

9. Create an Event Diagram or a Logic Tree to provide a visual representation of the data that was collected. You can create an Event Diagram or a Logic Tree depending on your requirement.

   Note: Interaction with diagramming and design canvases is not available on touch-screen devices.

10. Create RCA Recommendations, communicate findings, and generate reports to present the team's conclusions to the decision makers in your organization. After you have successfully communicated the team's findings and the proposed recommendations have been approved, the recommendations should then be implemented within the organization.

11. Create RCA Tracking Items to track the success or failure of the solutions that were implemented.

Workflow

Root Cause Analysis Workflow

This workflow describes the process for conducting a root cause analysis to analyze causes of failures and tracking performance of the equipment.

In the following workflow diagram, the blue text in a shape indicates that a corresponding description has been provided in the sections that follow the diagram. For more information, refer to the topic Interpreting the Workflow Diagrams.
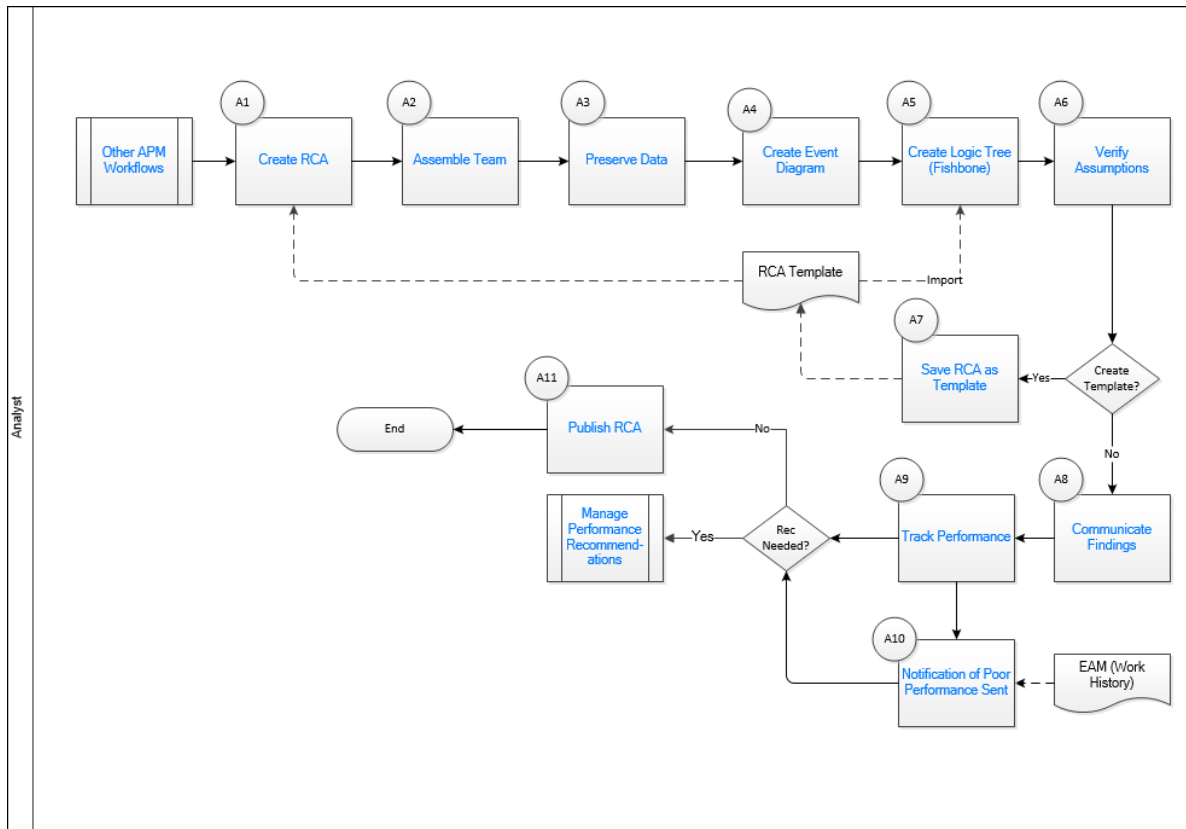
1. Other Workflows on page 6
2. Create RCA on page 5
3. Assemble Team on page 5
4. Preserve Data on page 5
5. Create Event Diagram on page 5
6. Create Logic Tree (Fishbone) on page 5
7. Verify Assumptions on page 5
8. Save RCA as Template on page 5
9. Communicate Findings on page 5
10. Track Performance on page 6
11. Notification of Poor Performance Sent on page 6
12. Manage Performance Recommendations on page 6
13. Publish RCA on page 6

Create RCA

Persona: Analyst

Create a new RCA Analysis and save.

Assemble Team

Persona: Analyst

Assemble team members to perform an RCA.

Preserve Data

Persona: Analyst

Collect data for task assignments and task management.

Create Event Diagram

Persona: Analyst

Create an event diagram of all contributing factors that are possible causes of a failure event.

Create Logic Tree (Fishbone)

Persona: Analyst

View a complex logic diagram analysis of the event and all of the causes that led up to the event.

Verify Assumptions

Persona: Analyst

Prove or disprove a specific hypotheses based on detailed analysis.

Save RCA as Template

Persona: Analyst

Use an RCA to save as a template.

Communicate Findings

Persona: Analyst

Send the results of a comprehensive analysis report to one or more email recipients.

Track Performance

Persona: Analyst

Specify tracking parameters related to an asset and provide notifications when the specified criteria has been exceeded.

Notification of Poor Performance Sent

Persona: Analyst

When any of the conditions set as tracking items are met, the designated individuals are alerted of the poor performance via an automated email alert.

Publish RCA

Persona: Analyst

Publish the completed analysis to enable the RCA to be viewed by all RCA users.

Manage Performance Recommendations

Persona: Analyst

Create and manage recommendations designed to improve future performance.

Go to the Manage Performance Recommendations workflow.

Other Workflows

Persona: Analyst

Other Workflows provide production data from: SAP, EAM, Recommendations.

Root Cause Analyses

About Root Cause Analysis

This topic provides a listing of all overviews and high-level explanatory information to help you understand the Root Cause Analysis module.

About PROACT for Meridium

PROACT for Meridium is a comprehensive methodology that is used in the RCA module that allows you to conduct a root cause analysis.

The PROACT acronym consists of the following steps, where the letters that make up the acronym are capitalized:

- Preserve: Team members gather and information (i.e., failure data) about an Asset's failure.
- Order: The Principal Analyst:
  - Defines the goals of the RCA.
  - Assembles the team members who will conduct the RCA.
- Analyze: Team members review and analyze the available information and then any conclusions.
- Communicate: Team members submit, to the decision makers in the organization, their hypotheses about the cause of the failure and their recommendations for solutions to the failure.
- Track: Team members track the success of the solutions that were implemented. A re-evaluation can be performed, as needed.

You can use these steps as a guideline for conducting a Root Cause Analysis in the RCA module, which consists of creating the data in GE Digital APM that is necessary to complete these five steps of the PROACT for Meridium methodology and implement successful solutions.

Note: You are not required to complete these steps in the exact order that they are listed above. It is important, however, that all steps of the methodology be completed. For more information, see the workflow for conducting a Root Cause Analysis.

About State Management in RCA

The Root Cause Analysis Module uses standard State Management functionality to manage RCA Analysis records.

Note: For more information, refer to the State Management section of the documentation.

Details

Actions that you take in the RCA module determine the state of an RCA Analysis. When you perform an action, the value in the State field changes automatically, which transitions the analysis from one state to another.

The state of an RCA Analysis record is stored in the State field, which is not included on any of the baseline datasheets that exist for the RCA Analysis family.

If State Management has been configured, then Root Cause Analyses can have one of the states in the following list.

Note: Only super users, MI PROACT Administrators and Principal members can change the state of an analysis.

- Not Started: Indicates that an RCA has not yet started.
- In Progress: Indicates that an RCA has not yet been completed.
- On Hold: Indicates that an RCA is on hold.
- Deferred: Indicates that an RCA has been postponed.
- Completed: Indicates that an RCA has been completed.

About Analysis Statuses in RCA

Actions that you take in the RCA module determine the state of an RCA Analysis. Statuses do not require configuration like State Management, and are used to track the progress of analyses.

Root Cause Analyses can have one of the states in the following list.

- In Progress: Indicates that an RCA has not yet been completed. Only GE Digital APM users who are members of the RCA Team and members of the MI PROACT Administrator Security Group can view and modify an RCA when it is in the In Progress status. RCA Analyses will remain In Progress until the Principal Analyst publishes the analysis. Additionally, a Published RCA that is unpublished will return to the In Progress status.
- Published: Indicates that an RCA has been completed. After the RCA is complete, the Principal Analyst can publish the analysis, which will assign the Published status to the analysis and populate the Date Published field in the RCA Analysis record with the date on which it was published. When an RCA is published, GE Digital APM users, regardless of whether they are members of the analysis team or not, will have read-only access to the RCA as long as they have the following security permissions:
  - View privileges to all RCA Analysis families, including the RCA Analysis Relationships and RCA System Relationships families.
  - Insert privileges on the RCA Analysis family.
  - Update privileges on the RCA Image family.

  If a Published RCA is unpublished, the RCA will return to the In Progress state, but the value in the Date Published field will not be updated until the analysis is published again.

- Template: Indicates that an RCA has been produced from an existing analysis using the Produce Template link. RCA Analyses in the Template status are identical to Root Cause Analyses that are in the In Progress status, except that they do not have an analysis team defined. To modify or transition analyses with a Template status, you need to be a user with one of the following permissions.
  - Super Users, members of the MI PROACT Administrators Security Group, and Principal Analysts can transition analyses to the Template state.
  - Super Users and members of the MI PROACT Administrators Security Group can modify an RCA Analysis that is in the Template state.

About Analysis Templates

An Analysis Template is a Root Cause Analysis that is in the Template state.

Analysis Templates are the same as other Root Cause Analyses except that they do not have team members assigned to them and they are always in the Template state (i.e., they never become published). The Analysis Templates can be created either from Root Cause Analyses in either the Published or In-Progress state and can be used for creating Root Cause Analyses.

About Team Charter

The Team Charter is a statement that defines the goal that the RCA Team wants to achieve by conducting an RCA. The RCA Team can refer to the Team Charter throughout the analysis to determine if the goal is being achieved. A Team Charter is provided in the baseline GE Digital APM database and appears in the **Team Charter** workspace of the **RCA Administrator** page. An administrative user can specify the default Team Charter, which can be modified as needed.

About the RCA Team

The RCA team is the group of individuals who will complete the steps required for a comprehensive root cause analysis. Security permissions in the Root Cause Analysis module are based on family-level privileges and a user's role within a given Root Cause Analysis. Root Cause Analysis users who are members of the RCA Team will have one of the following RCA team member roles:

- Principal Analyst: The user who is responsible for facilitating and coordinating the Root Cause Analysis.
- Analysis Team Member: Any user who is a member of an RCA Team.

You can add GE Digital APM users and non-GE Digital APM users to the RCA Team.

- GE Digital APM users will have an existing GE Digital APM Security User account and an associated Human Resource that is created automatically when the Security User account is created.
- Non-GE Digital APM users will not have a GE Digital APM Security User account. To add a non-GE Digital APM user to the RCA Team, you first need to create a Human Resource for that user.

When you add new members to the RCA Team, an RCA Team Member is created automatically and linked to the Root Cause Analysis and the individual's Human Resource. If the same team member is linked to multiple analyses, an RCA Team Member will exist for each RCA team in which it is a member. The RCA Team Member stores the RCA Team member's role (i.e., Team Member or Principal Analyst).

RCA Team Members and Security

In RCA, Security Group membership is used in conjunction with a user's role within a given analysis to determine what that user can and cannot do with that analysis. A given team member's role determines the security privileges that the user has in Root Cause Analysis. After you add a new team member to the RCA Team, that user will inherit the security privileges associated with the user's team member role (e.g., Principal Analyst).

Each analysis has:

- A Principal Analyst who can perform all functions related to the analysis.
- Analysis team members, who can perform most functions related to analysis but are restricted from performing some tasks that are reserved for the Principal Analyst.
- Viewers, who can only view the analysis.

For a complete description of the functions that are allowed and not allowed based on a user's role within an analysis, see the RCA Security Groups. Privileges granted through roles are done through data filters that are defined on the baseline Analysis family for Root Cause Analyses.

About Assets in RCA

Assets are Equipment and Functional Locations that you can link to a Root Cause Analysis. Each RCA is linked to one or more Equipment and Functional Locations to indicate the equipment and locations that are experiencing problems.

You can link only Equipments, only Functional Locations, or both to a Root Cause Analysis. The type of asset to which you link depends on the type of situation that you are analyzing. Consider the following examples.

1. You want to run a Root Cause Analysis on a pump, which is always located in the same place. You link the pump's Equipment to the Root Cause Analysis.
2. You want to run a Root Cause Analysis on an incident that occurred at a specific plant and you aren't sure which pump was involved. You link the plant's Functional Location to the Root Cause Analysis.
3. You want to run a Root Cause Analysis on a pump that was previously located in another plant and has been installed in a new plant. You link both the pump's Equipment (which is already linked to the new plant's Functional Location) and the old plant's Functional Location to the Root Cause Analysis.
4. You want to run a Root Cause Analysis involving multiple pumps that are all experiencing similar failures. You link multiple Equipments to the same Root Cause Analysis.

You can link Equipment or Functional Locations to the Root Cause Analysis after you complete the initial steps required for an Root Cause Analysis, or you can link Equipment or Functional Locations to an existing Root Cause Analysis in the **Linked Assets** section.

Define When a Root Cause Analysis Should be Performed

Before you begin conducting a Root Cause Analysis using the Root Cause Analysis module, you should determine which events require further investigation through a Root Cause Analysis. This involves defining criteria that standardizes when a Root Cause Analysis should always be performed.

The criteria to perform a Root Cause Analysis should be defined according to the needs and resources within your organization. For instance, the criteria can be based strictly on the data collected in Failures. For example, the criteria might be that a Root Cause Analysis is automatically performed when an asset fails more than two times in a 12-month period. The criteria can also be less restrictive, allowing an area manager or reliability engineer to initiate a Root Cause analysis even if a failure does not meet the standard criteria.

Regardless of the specific criteria that you use, your goal should be to define criteria that will allow personnel to know when a Root Cause Analysis should always be conducted, ensuring that failure events are analyzed in a consistent and methodical way.

Next Steps

• Create an RCA

Access a Root Cause Analysis

Procedure

1. Access the **RCA Overview** page.
2. Select one of the following tabs:

- **In Progress:** Select this tab if you want to view an RCA in In Progress state.
- **My Analyses:** Select this tab if you want to view an RCA in Published, In Progress, or Template state to which you are assigned as a team member.
- **Published:** Select this tab if you want to view an RCA in Published state.
- **Template:** Select this tab if you want to view an RCA in Template state.

A list of available analyses appears based on the tab that you selected.

3. In the **Analysis ID** column, select the link for the Root Cause Analysis that you want to view.

The **Analysis Summary** workspace appears, displaying the **Overview** section.

The following sections exist in the workspace:

- **Definition:** Contains the **Analysis Details** and **Plant & Equipment Info** datasheets for the selected analysis. The **Plant & Equipment Info** subsection provides information about the asset that is associated with the selected RCA.

  Note: As needed, in the **Definition** section, you can modify the values in the available fields, and then select 🖫 to save your changes.

- **Overview:** Contains the following information for the selected analysis:
  - **Hypothesis Verification:** Contains a chart that represents the summary of status (i.e., Completed or Pending) of Hypothesis Verifications associated with the selected analysis. When you select this chart, a list of Hypothesis Verifications for the selected analysis appears in the grid.
  - **Recommendations:** Contains a chart that displays the number of recommendations filtered by state for the selected analysis. When you select this chart, a list of recommendations for the selected analysis appears in the grid.

- ◦ **Track Item:** Contains a bar chart that provides an overview of the assets that are being tracked using the selected analysis. The chart displays the following values for a tracked Asset from the time the tracking began:
  - ◦ Total cost associated with an Asset
  - ◦ Total number of work histories for an Asset

  When you select this chart, a list of Assets that are being tracked appears in the grid.
- **Critical Success Factors:** Contains a list of Critical Success Factors associated with the selected analysis.
- **Team Members:** Contains a list of Team Members associated with the selected analysis.
- **Linked Assets:** Contains a list of assets associated with the selected analysis.
- **Linked Events:** Contains a list of events associated with the selected analysis.
- **Reference Documents:** Contains a list of Reference Documents associated with the selected analysis.

The tabs in the left pane can be used to access the following workspaces:

- **Preserve Records:** Contains a list of Preserve records associated with the selected analysis.
- **Event Diagram:** Contains the Event Diagram associated with the selected analysis.
- **Logic Tree:** Contains the Logic Tree associated with the selected analysis.
- **Communicate Findings:** Contains the Analysis Details datasheet, which includes root cause of the Asset failure. Via this workspace, you can communicate team findings and propose recommendations to the appropriate individuals within your organization.
- **Track:** Contains a list of tracking items that allow you to track the effectiveness of your recommendations.
- **Reports:** Contains the **Master Report** and **Individual Reports** sections, as well as custom reports, which have links to access various reports for the selected analysis.

Create a Root Cause Analysis

Before You Begin

- Define when a Root Cause Analysis should be performed.

Procedure

1. Access the **RCA Overview** page.
2. In the upper-right corner of the page, select **New Analysis**.

   A blank datasheet appears in the **Analysis Summary** workspace.

3. As needed, enter values in the available fields.

4. Select 💾.

   The Root Cause Analysis is saved.

Next Steps

- Create a Critical Success Factor

Copy a Root Cause Analysis

About This Task

This topic describes how to copy an analysis. You can also create a Root Cause Analysis from the **RCA Overview** page or create an analysis using the RCA Templates.

Procedure

1. Access the **RCA Overview** page.
2. Select one of the following tabs:
   - **In Progress**: Select this tab if you want to view an RCA in In Progress state.
   - **Published**: Select this tab if you want to view an RCA in Published state.

   A list of available analyses appears based on the tab that you selected.
3. Select the row that contains the Root Cause Analysis that you want to copy.
4. In the upper-right corner, select ⧉.

The **Copy Analysis** dialog box appears, asking you to confirm that you want to create a new Root Cause Analysis based on the selected Root Cause Analysis.

5. Select **Yes**.

The **Analysis Summary** workspace appears in a new tab, displaying a blank datasheet for the new Root Cause Analysis.

6. As needed, enter values in the available fields.

7. Select 💾.

The new Root Cause Analysis is created and saved. The list of analyses on the **RCA Overview** page is updated.

Results

When you copy a Root Cause Analysis, any of the following items that exist in the original Root Cause Analysis will be copied to the new Root Cause analysis:

- RCA Preserve records. The values in the remain the same except:
  - The value in the Date Due field is set to 30 days after the date the copy is performed.
  - The value in the Completed field is set to No.
  - The Date Completed field is disabled, and the value is removed.
- The Logic Tree and any associated (e.g., Hypothesis, Failure Mode). The values in theses remain the same.
- RCA Verifications. The values in the remain the same except:
  - The value in the Outcome field is removed.
  - The value in the Due Date field is set to 30 days after the date the copy is performed.
  - The value in the Completed field is set to No.
  - The Date Completed field is disabled, and the value is removed.

- Event Diagram and any associated (i.e., RCA Sequence Nodes). The values in theses remain the same.
- RCA Team Charter.

Create an RCA Template

About This Task

To create an RCA template from a Root Cause analysis that is in the In Progress or Published state, you will use the Save As feature.

Procedure

1. Access the **RCA Overview** page.
2. Select one of the following tabs:
   - **In Progress**: Select this tab if you want to view an RCA in In Progress state.
   - **Published**: Select this tab if you want to view an RCA in Published state.
   - **Template**: Select this tab if you want to view an RCA in Template state.

   A list of analysis available appears based on the tab that you selected.
3. Select the row that contains the Root Cause Analysis that you want to save as template, and then select ⊡.

   The **Save As Template** dialog box appears, asking you to confirm that you want to create the template.
4. Select **Yes**.

   The **Save As Template** window appears.

Save as Template

New Analysis Name:

Template - Unit 97 Slowdown

Cancel   Save

   By default, the **New Analysis Name** box contains the name of the Root Cause Analysis that you selected along with the prefix Template.
5. In the **New Analysis Name** box, enter a name for the RCA Template to distinguish it from the original Root Cause analysis.

Note: If you attempt to save an RCA Template with a name that is already being used by an Root Cause analysis or RCA Template, an error message will appear, warning you that the name already exists and prompting you to enter another name.

6. Select **Save**.

   The new RCA Template is created and saved. The list of available analyses in the **RCA Overview** page is updated.

   Note: Any GE Digital APM user that has View privileges to the Root Cause Analysis can view RCA Templates. Only members of the MI PROACT Administrator Security Group and Super Users can modify RCA Templates.

Create an RCA using an RCA Template

Before You Begin

- Create an RCA Template

Procedure

1. Access the **RCA Overview** page.
2. Select the **Template** tab.

   A list of available templates appears.

3. Select the row that contains the RCA Template that you want to use to create new RCA, and then select ╋.

   The **Template Analysis** dialog box appears, asking you to confirm that you want to create a new Root Cause analysis based on the selected RCA Template.

4. Select **Yes**.

   The **Analysis Summary** workspace appears, displaying a datasheet. All the fields on the datasheet are populated from the template except the Analysis Name field.

5. In the **Analysis Name** box, enter a unique name for the analysis. This is a required field.

6. As needed, modify the values in the remaining fields, and then select 💾.

   The new Root Cause analysis is created and saved. The list of available analyses on the **Templates** section is updated.

Results

When you create a new RCA from an Analysis Template, any of the following items that exist in the original RCA Template will be copied to the new Root Cause analysis:

- RCA Preserve records. The values in the remain the same except:

  ◦ The value in the Date Due field is set to 30 days after the date the copy is performed.
  ◦ The value in the Completed field is set to No.
  ◦ The Date Completed field is disabled, and the value is removed.

- The Logic Tree and any associates (e.g., Hypothesis, Failure Mode). The values in theses remain the same.
- RCA Verifications. The values in the remain the same except:

  ◦ The value in the Outcome field is removed.
  ◦ The value in the Due Date field is set to 30 days after the date the copy is performed.
  ◦ The value in the Completed field is set to No.
  ◦ The Date Completed field is disabled, and the value is removed.

- Event Diagram and any associated (i.e., RCA Sequence Nodes). The values in theses remain the same.
- RCA Team Charter.

Publish a Root Cause Analysis (RCA)

About This Task

Important: You must be a Principal Analyst to publish an analysis.

Procedure

1. Access the **RCA Overview** page.
2. Select the **In Progress** tab.

   A list of available analyses appears.
3. Select the row for the analysis that you want to publish.

   The row is highlighted.
4. Select **Publish**.

   The **Publish Analysis** dialog box appears.
5. Select **Yes**.

   The analysis is published and is now in read-only format.

Unpublish a Root Cause Analysis (RCA)

About This Task

Important: You must be a Principal Analyst to unpublish an analysis.

Procedure

1. Access the **RCA Overview** page.
2. Select the **Published** tab.

A list of available published analyses appears.

3. Select the row for the analysis that you want to unpublish.

   The row is highlighted.

4. Select **Unpublish**.

   The **Unpublish Analysis** dialog box appears.

5. Select **Yes**.

   The analysis is unpublished.

Publish an RCA Template

About This Task

Important: You must be a Principal Analyst to publish an RCA Template.

Procedure

1. Access the **RCA Overview** page.
2. Select the **Template** tab.

   A list of available templates appears.

3. Select the row for each template that you want to publish.

   Note: If more than one template is selected, ✛ is disabled.

4. Select **Publish**.

   The **Publish Analysis Template** dialog box appears.

5. Select **Yes**.

   The template is published and is now in read-only format.

Unpublish an RCA Template

About This Task

Important: You must be a Principal Analyst to unpublish an RCA Template.

Procedure

1. Access the **RCA Overview** page.
2. Select the **Template** tab.

   A list of available templates appears.

3. Select the row for each template that you want to unpublish.

   Note: If more than one template is selected, ✛ is disabled.

4. Select **Unpublish**.

   The **Unpublish Analysis Template** dialog box appears.

5. Select **Yes**.

   The template is published and is now in read-only format.

Access the Reference Documents in an RCA

Procedure

1. Access the Root Cause Analysis whose Reference Documents you want to access.
2. In the workspace, select the **Reference Documents** tab.

   A list of Reference Documents linked to the selected RCA appears.

Note: For additional options when working with reference documents, refer to the Manage Reference Documents section in the Record Manager documentation.

Next Steps

- Create a Preserve Record

Related Information

Link an Asset to an RCA

Procedure

1. Access the Root Cause Analysis to which you want to link an Asset.
2. Select the **Linked Assets** tab.

   A list of Assets associated with the selected analysis appears.

3. Select $+$.

   The **Asset Finder** window appears.

4. Select an Asset that you want to associate with the selected RCA, and then select **Done**.

   The selected Asset appears in the **Linked Assets** section.

Note: For more information, refer to the Assets section of the documentation.

Next Steps

- Access the Reference Documents in an RCA

Unlink an Asset from an RCA

Procedure

1. Access the Root Cause Analysis from which you want to unlink an Asset.
2. Select the **Linked Assets** tab.

   A list of Assets associated with the selected analysis appears.

3. Select the row containing the Asset that you want to unlink from the analysis, and then select 🗑.

   The **Delete Linked Asset** dialog box appears, asking if you to confirm that you want to unlink the selected Asset.
4. Select **Yes**.

   The association between the selected Asset and the RCA is deleted.

Link an Event to an RCA

Procedure

1. Access the Root Cause Analysis to which you want to link a Production Event.
2. Select the **Linked Events** tab.

   The **Linked Events** section appears.

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| | Preserve Records |
| Event Diagram |
| 5 Whys |
| Logic Tree |
| Event Timeline |
| Communicate Findings |
| Track |
| Reports |

| Definition | Overview | Critical Success Factors | 3 Team Members | 1 Linked Assets | 0 Linked Events | 1 Reference Documents |

	HEADLINE	START DATE	END DATE	TOTAL COST	LINKED ASSET

No Data

3. Select ✛.

The **Import Production Events** window appears, displaying a list of Production Events with the same causing asset as assets linked to the analysis, which have not previously been linked to the Analysis.

Import Production Events

	HEADLINE	START DATE	END DATE	TOTAL COST	LINKED ASSET
☐	Shutdown event	12/31/2010	1/4/2011		MRD-ROA ~ Meridium Roanok

1 - 1 of 1 Results   ← Page 1 of 1 →

Cancel   Done

4. Select a Production Event that you want to associate with the selected RCA, and then select **Done**.

   The selected Production Event appears in the **Linked Events** section.

Unlink an Event from an RCA

Procedure

1. Access the Root Cause Analysis from which you want to unlink a Production Event.
2. Select the **Linked Events** tab.

   A list of Production Events that have been linked to the selected analysis appears.

3. Select the row containing the Production Event that you want to unlink from the analysis, and then select 🗑.

   A confirmation message appears.

4. Select **Yes**.

The association between the selected Production Event and the RCA is deleted.

Access the Root Cause Analysis Team Members Section

About This Task

This topic describes how to access the **Team Members** section in an RCA. You can access a list of Team Members in the analysis, add new ones, assign roles to Team Members, modify or delete them.

Procedure

1. Access the Root Cause Analysis for which you want to view a list of Team Members.
2. In the workspace, select the **Team Members** tab.

The **Team Members** section appears, displaying a list of Team Members in the analysis.

Tip: For details about working with teams and the **Team Members** section, refer to the Teams section of the documentation.

Delete an RCA or an RCA Template

About This Task

When you delete an RCA or RCA Template, the record is deleted along with all the records that are linked to the Root Cause Analysis except for the:

- RCA Recommendations.
- RCA Template based on Reliability Center Incorporated (RCI) Intellectual Property.

  Note: Super User or a member of the MI PROACT Administrator Security Group cannot modify or delete the RCA Template based on Reliability Center Incorporated (RCI) Intellectual Property.

Procedure

1. Access the **RCA Overview** page.
2. Select one of the following tabs:

   - **In Progress**: Select this tab if you want to view an RCA in In Progress state.
   - **Published**: Select this tab if you want to view an RCA in Published state.
   - **Template**: Select this tab if you want to view an RCA in Template state.

   A list of available analyses appears based on the tab that you selected.
3. Select the row that contains the Root Cause Analysis that you want to delete.
4. In the upper-right corner of the section, select 🗑.

   The **Delete Analysis** dialog box appears, asking you to confirm that you want to delete the selected analysis.
5. Select **Yes**.

   The selected Root Cause Analysis is deleted.

Critical Success Factors

About Critical Success Factors (CSFs)

Critical Success Factors are elements of a Root Cause Analysis that allow the analysis team to evaluate whether or not the analysis effort has been successful. The effort is considered to be successful if the analysis team adheres to and meets the standards defined by the Critical Success Factors. The Root Cause Analysis Team can define Critical Success Factors that are specific to a given Root Cause Analysis or that are more generic to the work process.

RCA uses the following two types of Critical Success Factors:

- **Default CSFs**: RCA Critical Success Factors that are available for use in all Root Cause Analyses. Default Critical Success Factors are stored as system preferences and appear in the **Critical Success Factors** workspace on the **RCA Administrator** page, where an administrative user can modify them and define their own default Critical Success Factors. Default Critical Success Factors are not stored until they are added to an RCA. When a default Critical Success Factor is added, a new Critical Success Factor is created and populated automatically with the **Default CSF** text, then linked to the Root Cause Analysis.
- Custom CSFs: RCA Critical Success Factors that are created for specific Root Cause Analyses. You can define custom Critical Success Factors for each Root Cause analysis via the **Critical Success Factors** section. Custom Critical Success Factors are defined for a single Root Cause Analysis and stored in RCA Critical Success Factors. When Custom Critical Success Factors are created for a Root Cause Analysis, a new RCA Critical Success Factor is created and linked to the Root Cause Analysis.

You can select one or more Critical Success Factor from the default Critical Success Factors, create a custom Critical Success Factor, or you can choose not to define a Critical Success Factor.

Access a Critical Success Factor

Procedure

1. Access the Root Cause Analysis for which you want to view a Critical Success Factor.
2. Select the **Critical Success Factors** tab.

   The **CSF** section appears, displaying a list of Critical Success Factors associated with the selected RCA.

3. Select the hyperlink for the Critical Success Factor that you want to view.

   The **Edit Critical Success Factor** window appears, displaying the details of the selected CSF.
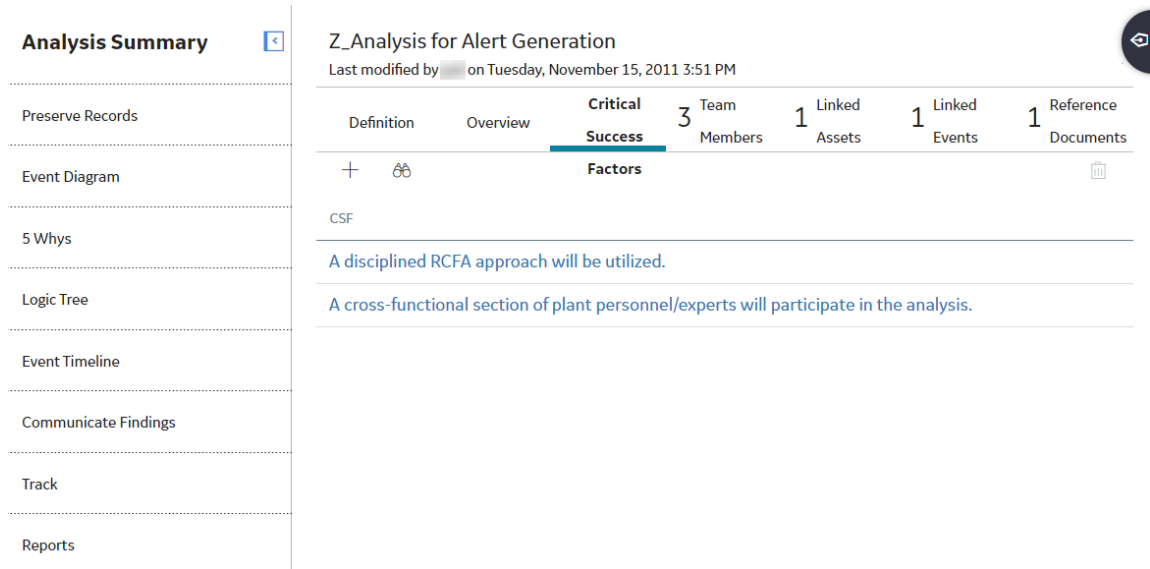
Note: As needed, you can modify the CSF, and then select ⊟ to save your changes.

Create a Critical Success Factor

Procedure

1. Access the Root Cause Analysis for which you want to create a Critical Success Factor.
2. Select the **Critical Success Factors** tab.

   The **CSF** section appears, displaying a list of Critical Success Factors associated with the selected RCA.

3. In the upper-left corner of the workspace, select ✛.

   The **Available CSFs** and the **CSFs for this Analysis** subsections appear. The **Available CSFs** section contains a list of Critical Success Factors that an administrative user has pre-configured for use with Root Cause Analyses. The **CSFs for this Analysis** section contains a list of Critical Success Factors associated with this analysis.

Analysis Summary

- Preserve Records
- Event Diagram
- 5 Whys
- Logic Tree
- Event Timeline
- Communicate Findings
- Track
- Reports

Z_Analysis for Alert Generation
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| Definition | Overview | **Critical Success Factors** | 3 Team Members | 1 Linked Assets | 1 Linked Events | 1 Reference Documents |

Available CSFs

- A measurement process will be used to track the progress of approved recommendations.
- All analysis hypothesis will be verified or disproven.
- Management agrees to fairly evaluate the analysis team findings and recommendations.
- No one will be disciplined for honest mistakes.

CSFs for this Analysis

- A disciplined RCFA approach will be utilized.
- A cross-functional section of plant personnel/experts will participate in the analysis.

Cancel   Done

4. If you want to add a new Critical Success Factor to the RCA, in the **Available CSFs** subsection, select ✛.

   In the **Add Critical Success Factor** window that appears, enter the necessary text, and then select **Save**. The name of the Critical Success Factor must be unique for the Root Cause analysis to which you are adding the Critical Success Factor. The new Critical Success Factor appears in the **CSFs for this Analysis** subsection.

   Tip: You can add more than one custom CSF to an analysis.

   -or-

   If you want to add an existing CSF to the RCA, in the **Available CSF** subsection, select check box to the left of the Critical Success Factor that you want to add. Select 📑 to add it to the **CSFs for this Analysis** subsection.

   Tip: You can remove a pre-configured CSF from the **CSFs for this Analysis** subsection. To do this, in the **CSFs for this Analysis** subsection, select the check box to the left of the CSF, and then selecting the 📑 to add it back to the **Available CSF** subsection.

5. In the lower-right corner of the workspace, select **Done** to save your changes.

Next Steps

- Access the Root Cause Analysis Team Members Section

Access the Reference Documents for a Critical Success Factor

Procedure

1. Access the Critical Success Factor whose Reference Documents you want to access.

2. In the **Edit Critical Success Factor** window, select ⦙ , and then select **Reference Documents**.

   A list of Reference Documents linked to the selected CSF appears.

Note: For more information, refer to the Manage Reference Documents section of the documentation for additional options when working with reference documents.

Delete a Critical Success Factor

Procedure

1. Access the RCA for which you want to delete a Critical Success Factor.
2. Select the **Critical Success Factors** tab.

The **CSF** section appears.

3. Select the row containing the Critical Success Factor that you want to delete, and then select 🗑.

   The **Delete Critical Success Factor** dialog box appears, asking you to confirm that you want to delete the selected Critical Success Factor.

4. Select **Yes**.

   The selected Critical Success Factor is deleted.

RCA Preserve Item Records

About Preserve Failure Data

In a Root Cause Analysis, preserving failure data involves collecting a wide range of information related to the failure that the team will analyze. The collected data is stored in RCA Preserve Item records, which contain task-related data for the collection of the failure data. The RCA Preserve Item records are tasks that are assigned to the team member who should collect the failure data specified by a certain date. For example, an RCA Preserve Item may contain a task to collect all the broken pieces of a piece of equipment.

The 5 P's

When you create an RCA Preserve Item, the type of data that you want a member of the Root Cause Analysis Team to collect is identified by one of the following categories, known as the 5 P's:

- People: Indicates that human witnesses should be questioned about the incident. Witnesses might include the person who is responsible for the maintenance of the piece of equipment or location associated with the failure event, the operator, or even the stock room attendant.
- Parts: Indicates that physical pieces of the equipment should be collected (i.e., the broken pieces). This may also include collecting a functional piece of equipment to test against the broken one.
- Paper: Indicates that any data or information that exists about the piece of equipment or location should be gathered. This could include recent performance reports, schedules, GE Digital APM data, specifications, and so on.
- Position: Indicates that the environment in which the piece of equipment or location exists should be documented and considered. This could include, for example, the temperature of the room at the time of the incident or the proximity of one piece of equipment or location to another.
- Paradigms: Indicates that any trends or common assumptions about the cause of the incident should be considered. The intent of noting these paradigms is to remove this assumption from the investigation (i.e., remove any bias from the analysis).

You can select one of the 5 P's on the RCA Preserve records datasheet, in the **Data Category** box.

Access an RCA Preserve Item Record

Procedure

1. Access the Root Cause Analysis for which you want to view the details of a RCA Preserve Item Record.
2. In the left pane, select the **Preserve Records** tab.

   The **Preserve Records** workspace appears, displaying the list of RCA Preserve Item Records associated with the selected RCA. The workspace contains the following columns of information:
   - **Data to Collect**
   - **Data Category**
   - **Collection Strategy**
   - **Due Date**
   - **Date Completed**
   - **Team Members**

3. In the **Data to Collect** column, select the hyperlink for the RCA Preserve Item Record whose details you want to view.

Note: You can also search for an existing RCA Preserve Item Record by selecting 👓 .

The datasheet for the selected RCA Preserve Item Record appears.

Note: As needed, you can modify values in the available fields, and then select 💾. You can modify a RCA Preserve Item Record based on the state of the analysis.

Create an RCA Preserve Item Record

About This Task
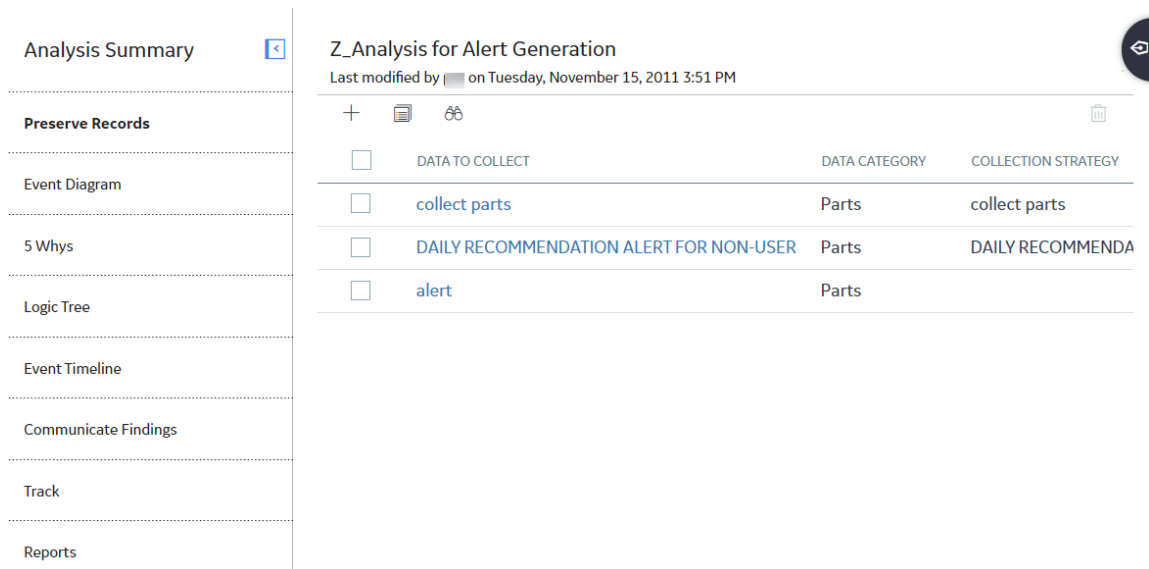
This topic describes how to create a new RCA Preserve Item Record. You can also copy an RCA Preserve Item Record.

You can create multiple RCA Preserve Item Records for one Root Cause analysis using different data categories. You can use the 5 P's in the **Data Category** list to categorize the type of data that should be collected.

Procedure

1. Access the Root Cause Analysis for which you want to create an RCA Preserve Item Record.
2. In the left pane, select the **Preserve Records** tab.

   The **Preserve Records** workspace appears, displaying a list of Preserve Records that are associated with the selected RCA.

Analysis Summary		Z_Analysis for Alert Generation Last modified by ▢ on Tuesday, November 15, 2011 3:51 PM		
		＋ ▤ ᦚ		🗑
Preserve Records		☐ DATA TO COLLECT	DATA CATEGORY	COLLECTION STRATEGY
Event Diagram		☐ collect parts	Parts	collect parts
5 Whys		☐ DAILY RECOMMENDATION ALERT FOR NON-USER	Parts	DAILY RECOMMENDA
Logic Tree		☐ alert	Parts	
Event Timeline				
Communicate Findings				
Track				
Reports				

3. In the upper-left corner of the workspace, select ＋.

   The **New Preserve Record** window appears in the workspace.

4. In the **Assigned to** list, enter or select the team member to whom you want to assign the Preserve Records.

   The datasheet for a new Preserve Record appears.

5. As needed, enter the details in the available fields.

6. Select 💾.

   The Preserve Record is saved.

Next Steps

- [Create an Event Diagram](#)
- [Create a Logic Tree Diagram](#)

Copy a Preserve Record
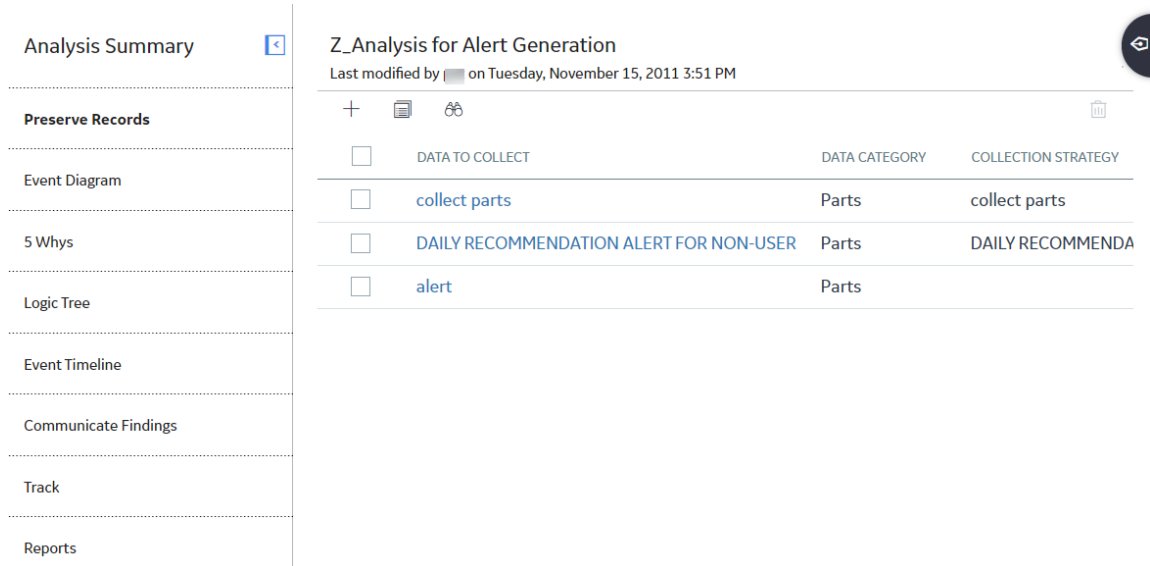
About This Task

This topic describes how to copy an RCA Preserve Item Record. You can also [create a new RCA Preserve Item Record](#).

Procedure

1. [Access the Root Cause Analysis](#) for which you want to create an RCA Preserve Item Record.
2. In the left pane, select the **Preserve Records** tab.

   The **Preserve Records** workspace appears, displaying the list of Preserve Records that are associated with the selected RCA.

Analysis Summary	Z_Analysis for Alert Generation

   Last modified by ▉ on Tuesday, November 15, 2011 3:51 PM

	DATA TO COLLECT	DATA CATEGORY	COLLECTION STRATEGY
☐	collect parts	Parts	collect parts
☐	DAILY RECOMMENDATION ALERT FOR NON-USER	Parts	DAILY RECOMMENDA
☐	alert	Parts	

   Left pane items: **Preserve Records**, Event Diagram, 5 Whys, Logic Tree, Event Timeline, Communicate Findings, Track, Reports

3. In the upper-left corner, select 📄.

   The **All Preserve Records** window appears, displaying the list of RCA Preserve Item Records that are available for all the Root Cause Analyses in the database.

All Preserve Records

👓

	DATA TO COLLECT	DATA CATEGORY	COLLECTION STRATEGY
☐	Sample Parts Preserve Record.	Parts	Sample Collection Strat
☐	Test Analysis_A - Data to Collect field	Parts	Test Analysis_A - Collec
☐	Analysis 1 - Data to Collect field #2	Parts	Analysis 1 - Collection S
☐	Test Analysis_B - Data to Collect field #2	Parts	Test Analysis_B - Collec
☐	Analysis 1 - Data to Collect field	Parts	Analysis 1 - Collection S
☐	Collect data for BL test analysis.	Parts	Find data and collect it.
☐	Analysis 1 - Data to Collect field #2	Parts	Analysis 1 - Collection S
☐	Analysis 1 - Data to Collect field	Parts	Analysis 1 - Collection S
☐	Analysis 1 - Data to Collect field #2	Parts	Analysis 1 - Collection S
☐	Analysis 1 - Data to Collect field	Parts	Analysis 1 - Collection S

1 - 43 of 43 Results ← Page 1 of 1 →

Cancel   Done

4. Select the check box to the left of the RCA Preserve Item Record that you want to copy.

   Tip: You can select one or more Preserve Records.

5. Select **Done**.

   The **All Preserve Records** window closes.

   The **Preserve Records** workspace appears, displaying the copied RCA Preserve Item Record in the list of Preserve Records.

Results

- The RCA Preserve Item Record is saved to the database and linked to the selected RCA.
- The copied Record does not contain any value in the Assigned To, Date Due, and Date Completed fields.

Access the Reference Documents for a Preserve Record

Procedure

1. Access the RCA Preserve Item Record whose Reference Documents you want to access.

2. On the datasheet that appears, select ⦙ , and then select **Reference Documents**.

A list of Reference Documents linked to the selected RCA Preserve Item Record appears.

Note: For more information, refer to the Manage Reference Documents section of the documentation for additional options when working with reference documents.

Delete RCA Preserve Item Records

Procedure

1. Access the Root Cause Analysis for which you want to delete RCA Preserve Item records.
2. In the left pane, select **Preserve Records**.

   The **Preserve Records** workspace appears, displaying the list of RCA Preserve Item records associated with the Root Cause Analysis.

3. Select check box to the left of each RCA Preserve Item record that you want to delete.

4. In the upper-right corner of the workspace, select 🗑.

   Note: You cannot delete an RCA Preserve Item record from an analysis that is in a Published state. RCA Preserve Item records in a completed state can be deleted if the analysis is in an In Progress state.

   The **Delete Preserve Record(s)** dialog box appears, asking you to confirm that you want to delete the selected RCA Preserve Item records.
5. Select **Yes**.

   The select RCA Preserve Item records are deleted.

5 Whys Analyses

About 5 Whys Analyses

A 5 Whys Analysis is a simplified, interrogative analysis that explores the cause-and-effect relationships of a failure. The goal of this analysis is to determine the root cause of an issue by repeating the question of "why." Each time a "why" is answered, a new question can be formed to determine the root cause of an issue.

By asking a series of five questions, you can avoid making assumptions and falling into logic traps. Instead, you can see a direct line of cause-and-effect relationships that determines how an issue was reached and the root cause of that issue.

Pump Failure

A pump has failed, and a system shutdown has occurred. Using the 5 Whys methodology, you can ask the following questions to find out why:

Question	Why	Reason
1	Why did the system shutdown?	Safety cutout applied when the cooling pump failed.
2	Why did the pump fail?	The bearing seized.
3	Why did the bearing seize?	The bearing was dry and overheated.
4	Why was the bearing dry and overheated?	Scheduled lubrication inspections were not completed.
5	Why weren't the scheduled inspections completed?	The inspection schedule is missing the appropriate tasks for pump lubrication.

For each question in the **Why** column, the answer in the **Reason** helps to generate the following Why, eventually leading to the root cause of an issue. Based on this table, you can see that the system shutdown is the direct result of incomplete inspections for pump lubrication.

Create a 5 Whys Analysis

Procedure

1. Access the 5 Whys Analysis for the selected RCA.
2. In the workspace, enter values in the available fields.

3. As needed, in the **Why** and **Reason** boxes of one or more rows, enter the questions and answers that illustrate the direct line of cause-and-effect relationships through which an issue was reached, ultimately determining the root cause of that issue.

   Note:

   For an example of a 5 Whys Analysis and an explanation of the concept, see About 5 Whys Analyses.

4. Select 💾.
   The 5 Whys Analysis is saved for the selected RCA.

Access a 5 Whys Analysis

Before You Begin

To access a 5 Whys Analysis, you must first configure RCA to display 5 Whys Analyses. 5 Whys Analyses are not configured to appear in baseline GE Digital APM.

Procedure

1. Access the Root Cause Analysis containing the 5 Whys Analysis that you want to access.
2. In the pane, select the **5 Whys** tab.

   The 5 Whys Analysis for the selected RCA appears in the workspace.

   Note: If there is not currently a 5 Whys Analysis for the RCA, a blank datasheet appears.

Modify a 5 Whys Analysis

Procedure

1. Access the 5 Whys Analysis for the selected RCA.
2. In the workspace, modify values in the available fields.
3. As needed, in one or more **Why** or **Reason** boxes, modify the text.
4. Select .
   The 5 Whys Analysis is saved for the selected RCA.

Event Diagram

About Event Diagram

In an RCA, analyzing data involves compiling the information that has been collected so far in the Root Cause Analysis and representing it visually to facilitate discussion. An Event Diagram is an organizational tool that you can use to diagram a sequence of events, which are possible causes of a failure event.

The Event Diagram lets you represent visually the events that are associated with a failure and the cause-and-effect relationships that may have led to a failure event. The Event Diagram depicts how the events affect each other and enables you to identify possible work process issues. Each event is represented by a labeled icon, called a node. You can add nodes to the Failure Event node that represent components of the Root Cause Analysis. For example, if you define the Failure Event node as a fire, in the Event Diagram you can add to the Failure Event node upstream nodes that depict the chain of events that preceded the failure event.

The following list provides the types of nodes that you can use in an Event Diagram:

Node Icon	Node Name	Can be used to represent…
	Start/Finish	A step that marks the starting point or the ending point of the event.
	References	A printed document or report.
	Process	A single step or an entire sub-process within a larger process.
	Decision	A decision or branching point.
	Operation	Material or information entering or leaving the system, such as customer order (input) or a product (output).

You can create connections between the nodes in the Event Diagram to establish a relationship between the nodes. Each node in the diagram canvas has two ports that are used for connecting nodes to another node. Each port is designated by a circle on the right and left of the node. You can initiate a connection only from right circle (output port) of the predecessor node to the left circle (input port) of the successor node. You can create as many connections as you need to build the Event Diagram. More than one connector can be attached to the same port of a node, allowing you to create parallel events. As you connect the nodes to build the Event Diagram, links are created between the items using a predecessor-successor relationship definition that exists between them.

Note: The predecessor is the node that precedes the node that is currently selected in the Event Diagram. The successor is the node that succeeds the node that is currently selected in the Event Diagram.

About Failure Events

The failure event is a short description of the problem that you and your team are analyzing. Your team could be analyzing a failure event that comprises several failures over a specified period of time, or one failure (e.g., a larger event, such as a fire). The first time that you access the **Event Diagram** workspace or

the **Logic Tree** workspace for a given RCA, you will be prompted to define the failure event in an RCA Event, which will be used as the Failure Event node. The following image shows an example of a completed RCA Event.
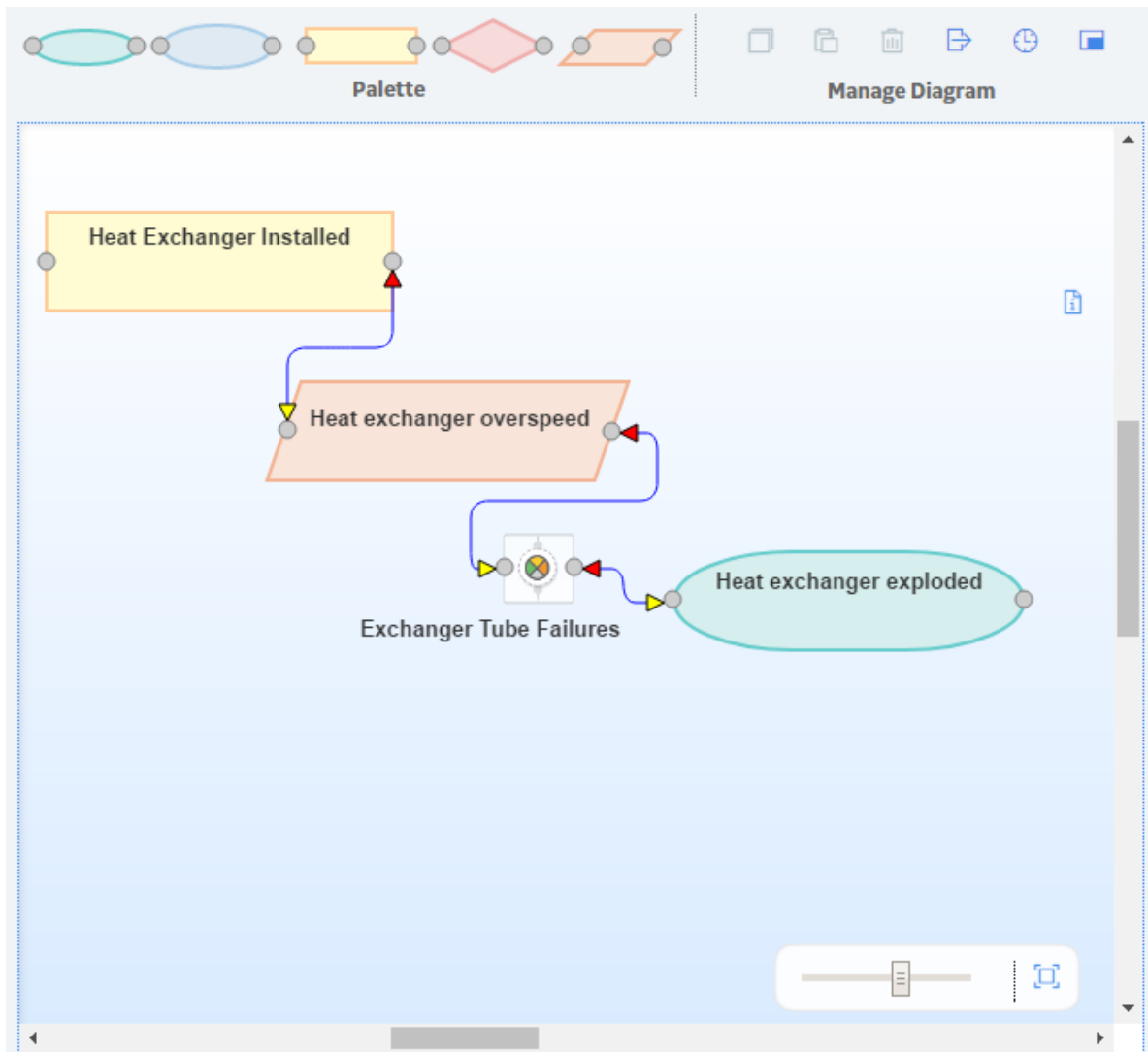
Each RCA will have one Failure Event node, which will always appear at the root level of the Logic Tree hierarchy and as the first node in the Event Diagram. For example, the following image shows the Failure Event node as it appears in the Logic Tree in our Cooling Water Pump example.
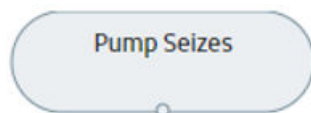
You cannot remove the Failure Event node from the Logic Tree or the Event Diagram. You can, however, modify the RCA Event, as needed.

Access an Event Diagram

Before You Begin

To access the Event Diagram, you must first configure RCA to display the Event Diagram. The Event Diagram is not configured to appear in baseline GE Digital APM

Procedure

1. Access the Root Cause Analysis for which you want to view an Event Diagram.
2. In the left pane, select the **Event Diagram** tab.

   The Event Diagram for the selected RCA appears in the workspace.

Tip:
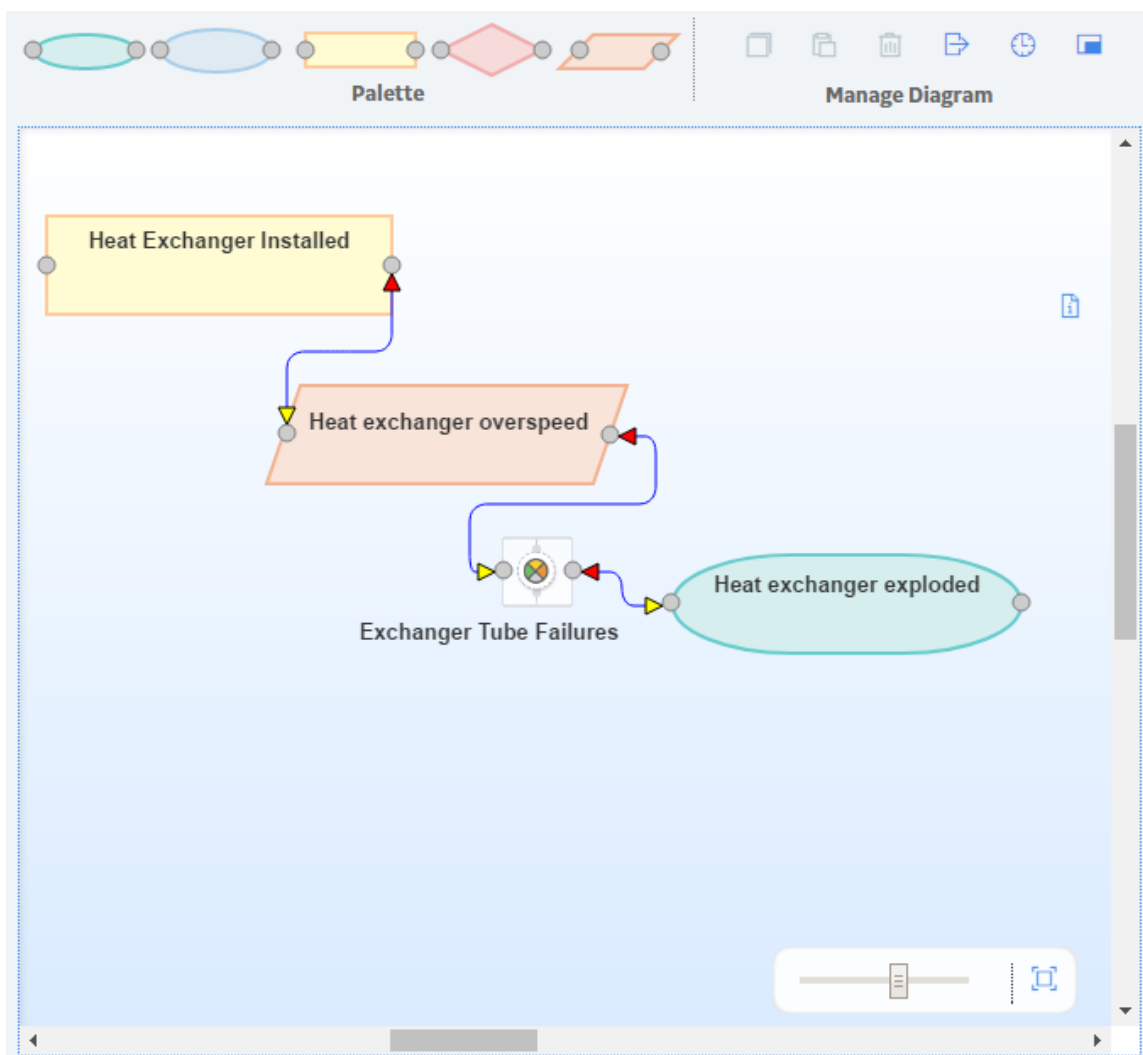
- Select ⏱ to display the event dates.
- Select ⤢ to display the diagram in full screen.
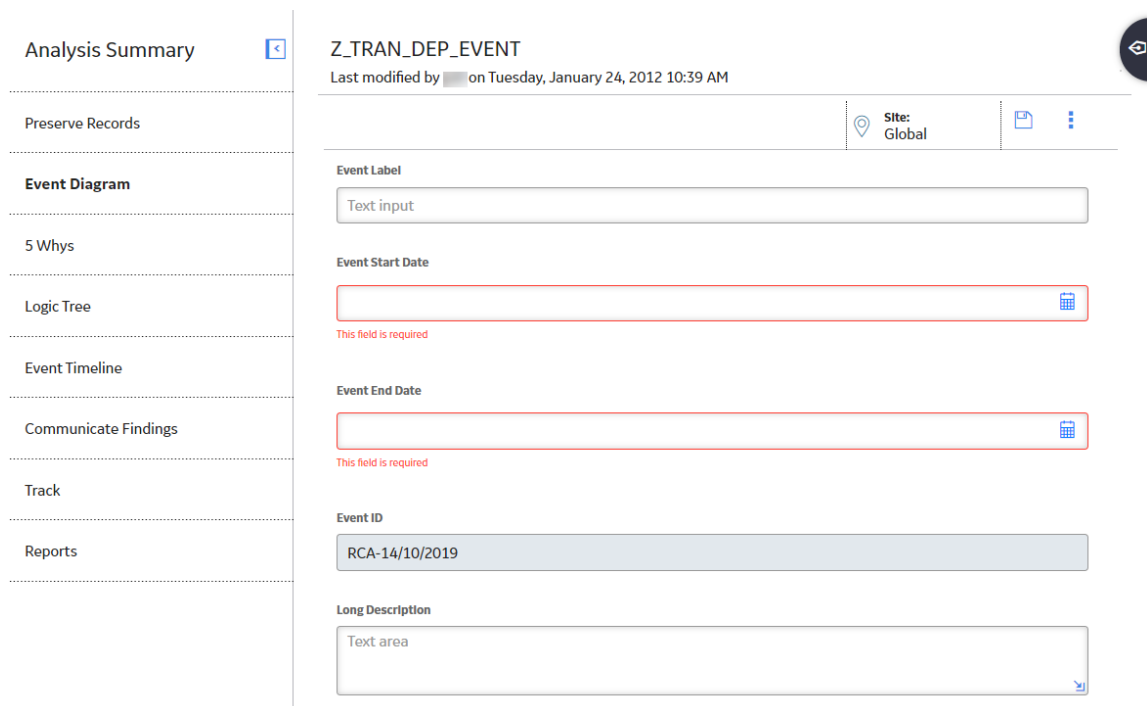
Note: If you access the **Event Diagram** tab for the first time, the **RCA Failure Event** datasheet will appear in the workspace. In this datasheet, you can define an RCA Failure Event. If you previously accessed the **Event Diagram** tab and defined a Failure Event, you will see the Failure Event node in the main display area (i.e., the design canvas).

Create a Failure Event

Procedure

1. Access the Root Cause Analysis for which you want to create a Failure Event.
2. In the left pane, select the **Event Diagram** tab.

   A blank datasheet appears.

3. As needed, enter values in the available fields.
4. Select 🖫.

   The RCA Failure Event is created and linked automatically to the RCA. The Failure Event node appears in the design canvas.

Next Steps

- Add a Node to the Event Diagram

Create a Secondary Failure Event

Before You Begin

To create a secondary Failure Event, you must first create a primary Failure Event.

Procedure

1. Access the Root Cause Analysis for which you want to create a secondary Failure Event.
2. In the left pane, select the **Event Diagram** tab.

   The **Event Diagram** workspace for the selected analysis appears.
3. In the **Event Diagram** workspace, select ╋

   A blank datasheet appears.
4. As needed, enter values in the available fields.
5. Select ⬚.

   A secondary RCA Failure Event is created and linked automatically to the RCA. The Failure Event node appears in the design canvas.

Next Steps

- Add a Node to the Event Diagram

Add a Node to the Event Diagram

Before You Begin

- Define a Failure Event

Procedure

1. Access the Event Diagram to which you want to add a node.
2. In the upper portion of the workspace, in the **Palette** section, select the icon that represents the type of node you want to add, and then drag it to the required location on the design canvas.
3. In the upper-right corner of the workspace, select ⬚ .

   The **Properties** window appears, displaying the datasheet for the selected node.
4. As needed, enter values in the available fields.
5. Select ⬚.

   The node is saved and linked automatically to the selected RCA.

Next Steps

- Connect Nodes

Copy a Node

About This Task

After you create nodes in your Event Diagram, you can copy and paste them within the same Event Diagram. You can copy an existing node or add a node to the Event Diagram from the Palette in the design canvas.

Procedure

1. Access the Event Diagram containing the node that you want to copy.
2. On the design canvas, select the node that you want to copy.
3. At the top of the workspace, in the **Manage Diagram** section, select [icon], and then select [icon].

   Note: The **Paste** option is available only after you have copied a node.

   The node is pasted to the design canvas.

Next Steps

- Connect Nodes

Connect Nodes

Before You Begin

- Add Node to the Event Diagram

Procedure

1. Access the Event Diagram for which you want to connect two nodes.
2. On the design canvas, select the circle on the node from which you want to initiate the connection, and then drag your pointer to the port of the successor node.

   As you drag your pointer, a line appears.
3. When your pointer touches the port of the successor node, release the pointer.

   An arrow appears, connecting the two nodes. A link between the two nodes is created.

Next Steps

- Track and Reevaluate the Analysis Results

Modify an Event Diagram Node

Procedure

1. Access the Event Diagram containing the node whose details you want to modify.
2. On the design canvas, select the node whose details you want to modify.
3. In the upper-right corner of the workspace, select [icon] .

   The datasheet for the selected node appears in the **Properties** window.
4. As needed, modify the available fields, and then select [icon].

   Your changes are saved to the database.

Access Reference Documents for a Failure Event Node

Procedure

1. Access the Event Diagram whose Reference Documents you want to access.
2. On the design canvas, select the Failure Event node.
3. In the upper-right corner of the workspace, select ⬚ .

   The **Properties** window appears, displaying the datasheet for the selected Failure Event node.
4. On the datasheet, select ⁝ , and then select **Reference Documents**.

   A list of Reference Documents linked to the selected Failure Event node appears.

   Note: For more information, refer to the Manage Reference Documents section of the documentation for additional options when working with reference documents.

Export an Event Diagram

About This Task

You can export an Event Diagram as an image and save it to another location, such as your local hard drive.

Note: The zoom factor does not affect the size of the image that you want to export. Regardless of the zoom factor that is currently applied to the Event Diagram, the entire diagram will be included in the image, even if part of the Event Diagram is cut off at the time you perform the export.

Procedure

1. Access the Event Diagram that you want to export.
2. In the upper portion of the workspace, in the **Edit** section, select ↑ .

   The **Save as** window appears.
3. Navigate to the location to which you want to save an image of the Event Diagram.
4. In the **File name** box, enter the name of the file.
5. From the **Save as type** list, select the format in which you want to save the image, and then select **Save**.

   Note: The above steps might change depending on the browser and browser settings that you use.

   The Event Diagram is saved to the selected location in the selected image format.

Delete Nodes from the Event Diagram

About This Task

When you delete a node from the Event Diagram, you are deleting the associated RCA Sequence Node and any links to the associated RCA Sequence Node.

Tip: If you do not want to delete successor nodes, you should remove the connectors before deleting the predecessor node. If you delete a predecessor node without first deleting the connector between it and the successor nodes, the records that are associated with the successor nodes will also be deleted.

Procedure

1. Access the Event Diagram containing the node that you want to delete.
2. On the design canvas, select the node that you want to delete.
3. At the top of the workspace, in the **Edit** section, select 🗑.

   The **Delete Node** dialog box appears, asking you to confirm that you want to delete the selected node.
4. Select **Yes**.

   The selected node is deleted along with any associated successor nodes.

Delete Node Connectors

Procedure

1. Access the Event Diagram containing the node and the associated connectors that you want to delete.
2. On the design canvas, hover or tap on the connector that you want to delete.

   The ❌ icon appears.
3. Select ❌.

   The connector is deleted from the Event Diagram. The GE Digital APM system also updates the links for each node when one or more connectors attached to the node are deleted.

Event Timeline

About the Event Timeline

In Root Cause Analysis, a Failure Event is often the result of a sequence of contributing events. The Event Timeline is an organizational tool that enables RCA Team Members to collate and display Event data in a form that provides a visual representation of the timeline in which a sequence of contributing events have played out.

Once you have added a primary Event to the Event Timeline, you can add Secondary Events to create a more detailed representation of events associated with the failure.

Access the Event Timeline

Procedure

1. Access the Root Cause Analysis for which you want to view the Event Timeline.
2. In the pane, select the **Event Timeline** tab.

   The Event Timeline for the selected RCA appears in the workspace.

   Tip: Select to display the diagram in full screen.

   Note: If you access the Event Timeline tab for the first time, the RCA Event datasheet will appear in the workspace. In this datasheet, you can define an RCA Failure Event. If you previously accessed the Event Timeline tab and defined a Failure Event, you will see the Event node in the main display area.

Tip: To scroll or to view a specific portion of the Event Timeline, click in the year-denoted bar under the timeline and adjust the selection to match what you want to view.
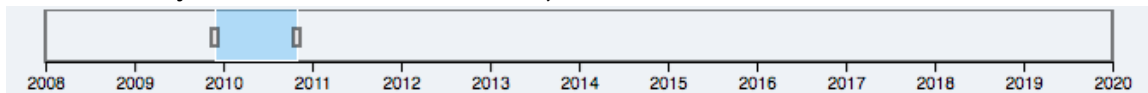
Next Steps

Add an Event to the Event Timeline.

Add an Event to the Event Timeline

Procedure

1. Access the Event Timeline.

2. Select ╋.
   A blank Event Datasheet appears.

3. In the Event Datasheet, enter values in the available fields.

4. Select 💾.
   The secondary event is saved and appears in the Event Timeline.

Next Steps

Export the Event Timeline.

Modify an Event in the Event Timeline

Procedure

1. Access the Event Timeline.
2. In the Event Timeline, select the event that you want to modify.
   The Event Datasheet for the selected event appears.
3. In the Event Datasheet, modify the available fields.
4. Select 💾.
   The event is modified and appears in the Event Timeline.

Export the Event Timeline

Procedure

1. Access the Event Timeline.
2. Select ⬆
   The Event Timeline appears in a new page, and a window appears displaying printing options.

Delete an Event from the Event Timeline

Before You Begin

You cannot delete the primary event in the Event Timeline.

Procedure

1. Access the Event Timeline.
2. In the Event Timeline, select the event that you want to delete.
   The Event Datasheet for the selected event appears below the timeline.
3. In the heading of the **Event Timeline** section, select 🗑.
   A message appears, asking you to confirm that you want to delete the secondary event.
4. Select **Yes**.
   The secondary event is deleted.

Logic Tree
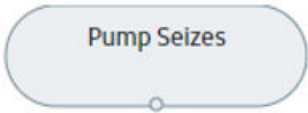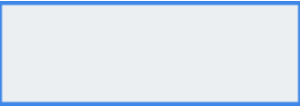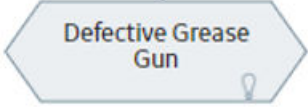
About Logic Tree

In a Root Cause Analysis, analyzing data involves compiling the information that has been collected so far in the Root Cause Analysis and representing it visually to facilitate discussion. A Logic Tree is an organizational tool that you can use to diagram all the possible causes of a failure event.

Details

The Logic Tree lets you represent visually the events that are associated with a failure and the cause-and-effect relationships that may have led to a failure event. The structure of the Logic Tree is hierarchical so that you can easily reference which event caused which effect. Each cause or effect is represented by a labeled icon called a node. You can add nodes to the Failure Event node that represent components of the Root Cause Analysis. For example, if you define the Failure Event node as a fire, in the Logic Tree, you would add to the Failure Event node downstream nodes that represent all the possible causes for the failure event.

The following table provides the types of nodes that you can use in a Logic Tree Diagram.

Icon	Node
Pump Seizes	Failure Event
	Failure Mode
Defective Grease Gun	Hypothesis
or	Logic Gate

Each node has an associated node, which participates in a predecessor-successor relationship. For example, each Failure Mode node that appears in the Logic Tree has an associated RCA Failure Mode that is linked to the root RCA Event. Additionally, for each Hypothesis node that appears in the Logic Tree, an associated RCA Hypothesis exists that is linked to the predecessor RCA Failure Mode and the root RCA Event. Additionally, when you add a node to the Logic Tree, a link is created between that node and the RCA.

Difference Between an Event Diagram and a Logic Tree

The Event Diagram can depict the cause-and-effect of events that led to the failure event and post-failure activities. The Logic Tree, however, can depict, starting with the failure event, possible causes and hypotheses related to the event itself.

The Event Diagram enables the RCA Team to view and organize the chain of events prior to the failure event and identify possible work process issues. The following image shows an Event Diagram that was created in the **Event Diagram** workspace.
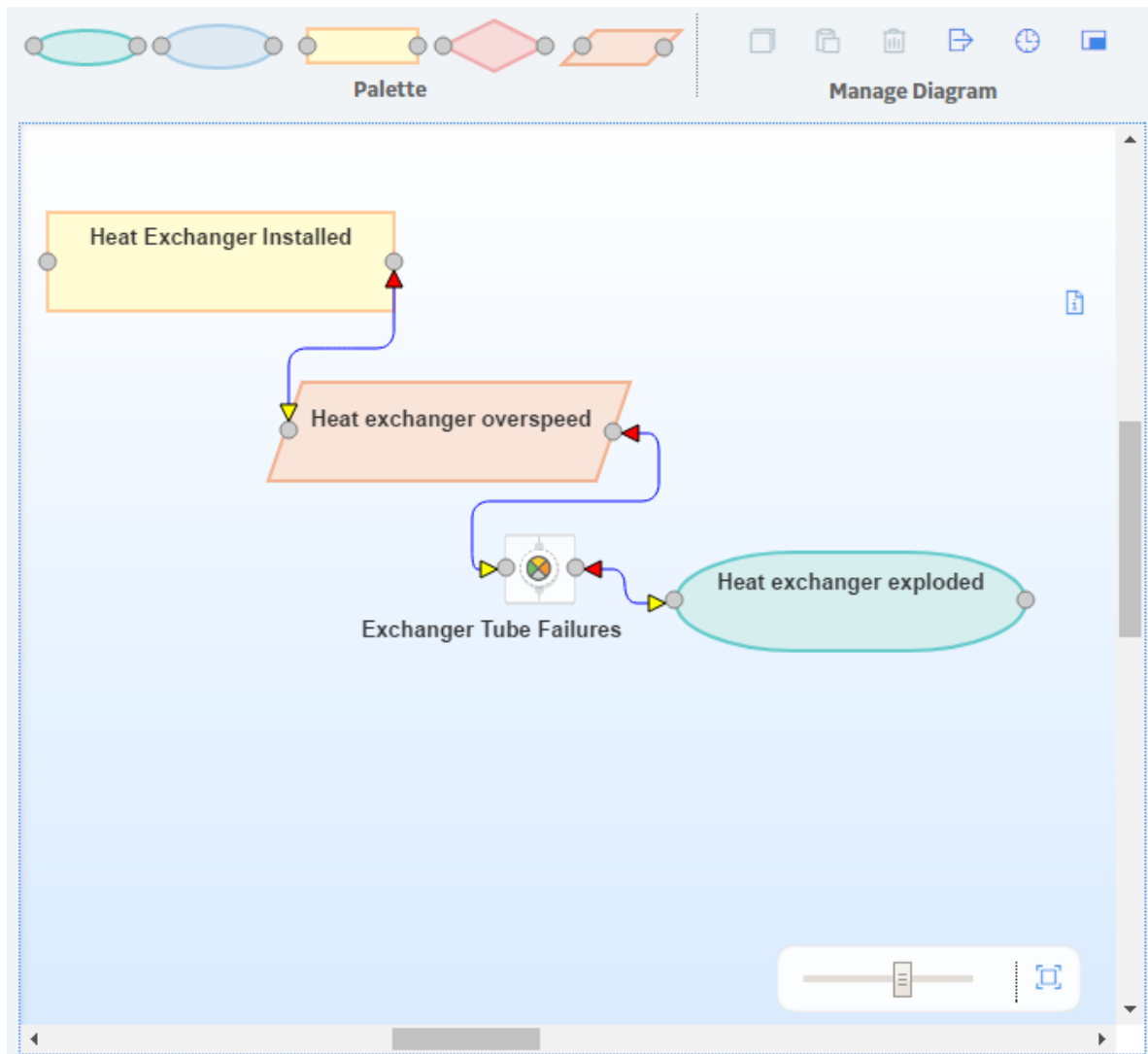
The Logic Tree can depict, starting with the failure event, possible causes and hypotheses related to the event itself. The Logic Tree enables the RCA Team to organize and discussion points on the possible causes of the failure event. The following image shows a Logic Tree that was created using options in the **Logic Tree** workspace.
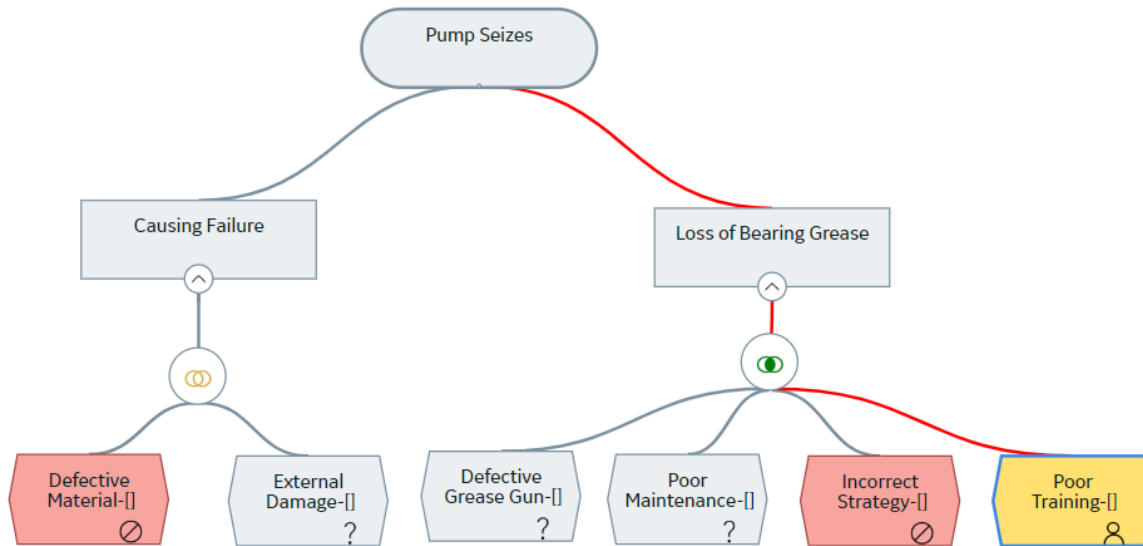
Event Diagram and Logic Tree Data Model

An Event Diagram and a Logic Tree consist of an RCA Event and all the records that are linked to it directly or indirectly. For example, after you define the failure event, you can create RCA Failure Modes to link to the RCA Event, and then you can link RCA Hypothesis to the RCA Failure Modes, and so on.

The following image shows the entity families and relationship families that are used to create an Event Diagram and a Logic Tree in Root Cause Analysis. The Logic Tree and the Event Diagram share an RCA Event. The RCA Sequence Node family is used only by the Event Diagram. All of the other families are used by the Logic Tree.
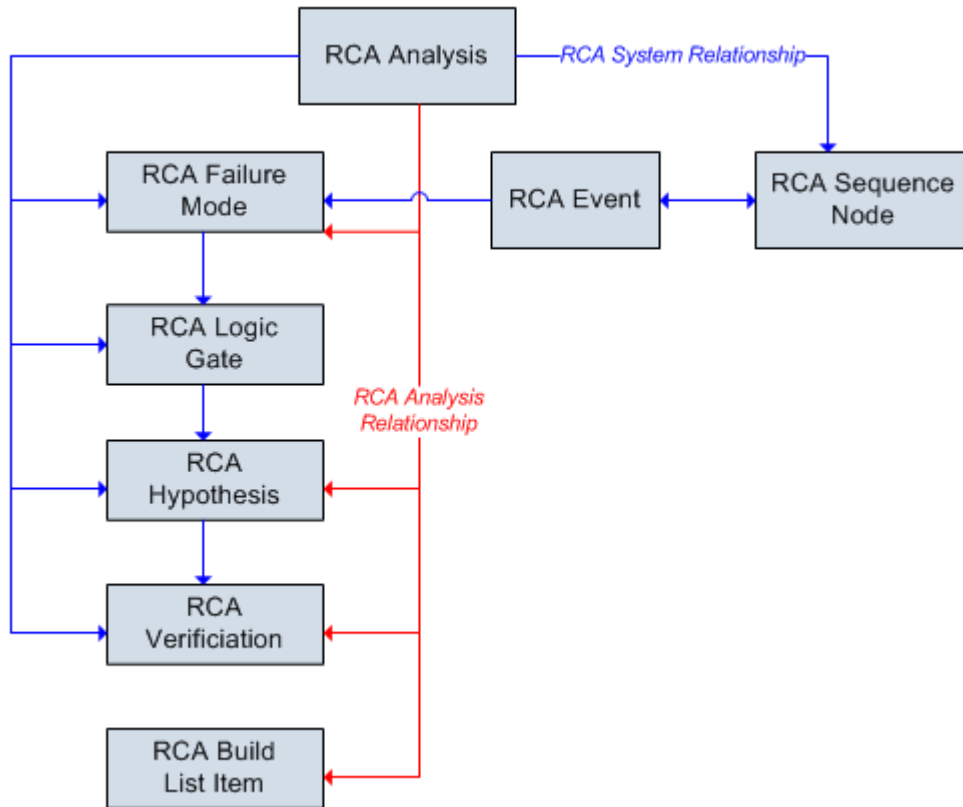
Records in the RCA Logic Gate family can be linked to others in the RCA Logic Gate family. Additionally, records in the RCA Sequence Node family can be linked to others in the RCA Sequence Node family.

In addition to the relationships that appear in the images, the following families can be linked to records in the RCA Reference Document family through a relationship definition on the Has Reference Documents family:

- RCA Event
- RCA Hypothesis
- RCA Logic Gate

About Failure Modes

A failure mode is a possible cause associated with the failure event. The failure mode is represented by a node, called the Failure Mode node, which appears below the Failure Event node. When you add a Failure Mode node to the Logic Tree, you are defining the RCA Failure Mode. When you define an RCA Failure Mode, a link is created between the RCA Failure Mode and the root RCA Event and between the RCA Failure Mode and the RCA.

Failure Mode nodes exist on the second level of the tree, under the Failure Event node. Multiple Failure Mode nodes can be linked to the Failure Event node. The following image shows an example of how a Failure Mode node will look in the Logic Tree.
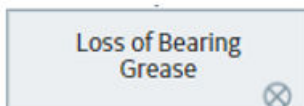
A given failure event can have multiple failure modes. For example, the image shows the failure modes from our Cooling Water Pump failure example. The Failure Event node (i.e., the overheated pump) is associated with the following Failure Mode nodes:

- No Spare Parts: There were no spare parts when the pump overheated, which caused the pump to be down for a longer amount of time and a greater loss of production. This failure mode did not cause the failure, so there are no hypotheses associated with it, but it is included as part of the failure event.
- Motor tripped due to high temperature: This failure was the cause of the overheated pump event. There are additional hypotheses associated with this node so that the cause of the event can be determined.

About Hypotheses

By definition, a hypothesis is a tentative assumption intended to explain certain facts or observations. For a Root Cause Analysis, a hypothesis represents a theory about the root cause of a failure event. RCA Hypotheses are then assigned a state that indicates the validity of the hypothesis.

Details

In the Logic Tree, a hypothesis is represented by a Hypothesis node, which is defined in an associated RCA Hypothesis. Hypothesis nodes can appear below Failure Mode nodes and other Hypothesis nodes in the Logic Tree. When you add a Hypothesis node to the Logic Tree, a link is created between the RCA Hypothesis and the RCA. A link is also created between the RCA Hypothesis and either the RCA Failure Mode or the predecessor RCA Hypothesis.

The following image shows an example of how a Hypothesis node and the associated RCA Hypothesis will look in the Logic Tree when it is first created.
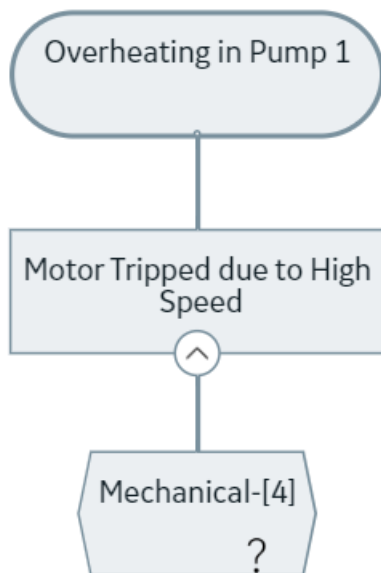
To the right of the label that you assign to the Hypothesis node, a number appears, indicating the level of confidence that the team has in the hypothesis being true. After a given RCA Hypothesis has been created, the team can create an RCA Verification to test the hypothesis. The team will then change the state of the RCA Hypothesis according to the results of the RCA Verification.

You can define multiple Hypothesis nodes for any RCA Failure Mode or RCA Hypothesis, meaning that multiple factors could be responsible for a given cause. For example, a lubrication issue may cause a cooling water pump to overheat, but that lubrication issue was caused by an operator who did not apply enough lubricant, which was caused by inadequate accountability of workers. In this case, the lubrication issue is a physical cause, too little lubrication applied is a human cause, and the latent root cause is the inadequate accountability of workers. The following image shows how this scenario would appear in the Logic Tree.
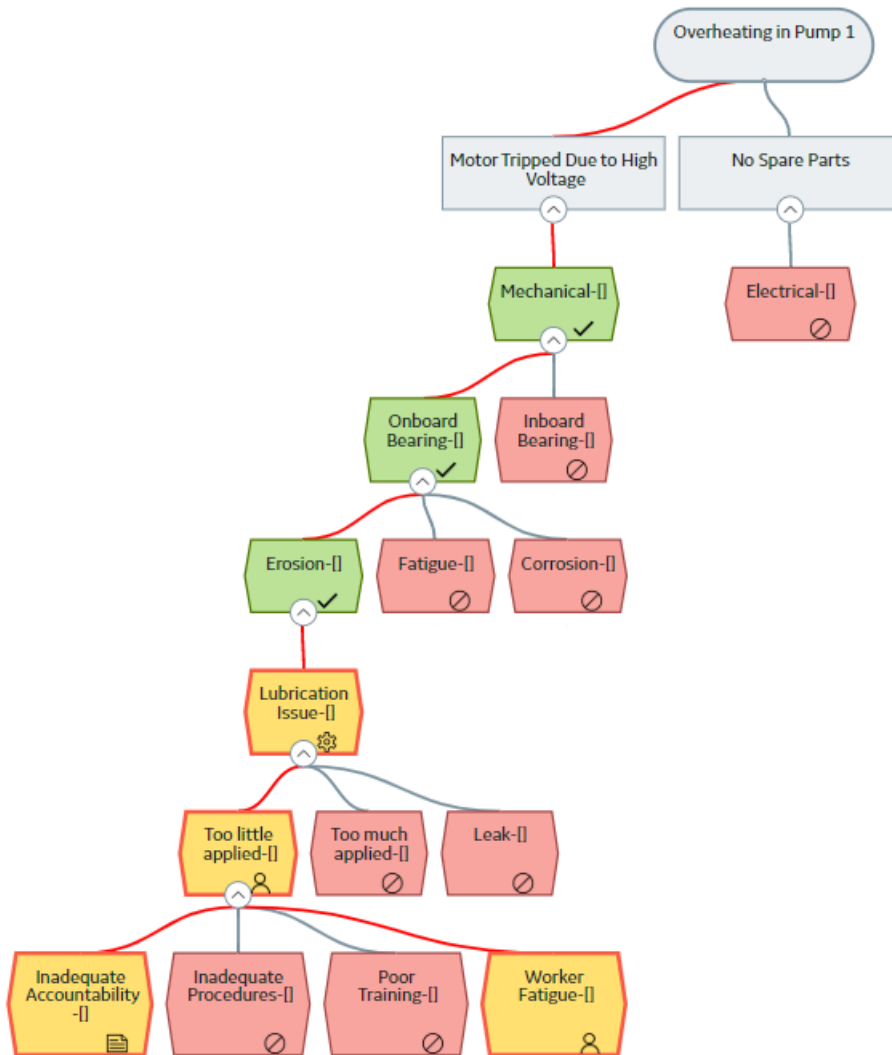
About Hypothesis States

RCA Hypotheses are assigned a state that indicates the validity of the hypothesis. When a Hypothesis node is first created, it is assigned the Hypothesis state by default.

Tip: You can add your own Hypothesis state and assign it an image by updating the RCA Hypothesis State System Code Table in Configuration Manager.
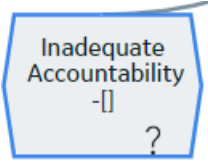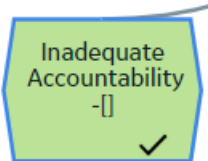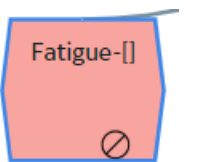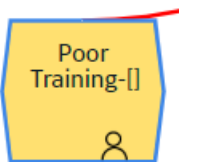
After the hypothesis has been tested through the completion of an RCA Verification, the state of the Hypothesis node can then be changed to True or Not True. If a hypothesis is proven to be incorrect, after
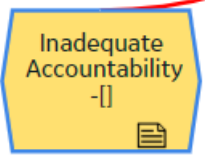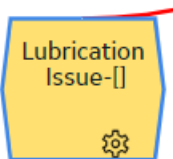
you change the Hypothesis state to Not True, you are finished working with that hypothesis. If a hypothesis is proven to be true and you change the Hypothesis state to True, you can:

- Create additional RCA Hypothesis records that provide further information on a root cause and link them to the RCA Hypothesis.
- Create RCA Verifications to test the additional hypotheses, determine if the hypotheses are true or not true, and then change the state of the associated RCA Hypothesis records accordingly.
- Create additional RCA Verifications to test the hypothesis to further identify the root cause as physical, human, or latent.

After the root cause has been identified, you can change the state of the associated RCA Hypothesis to indicate your conclusions (i.e., Cause Human, Cause Latent, or Cause Physical).

When you change the state of a Hypothesis node, the node icon changes to indicate the new state. The following table describes all the possible states of an RCA Hypothesis and how the associated Hypothesis node will appear in the Logic Tree.

Hypothesis Node	Hypothesis State	Description	For example, the team may determine that:
Inadequate Accountability -[] ?	Hypothesis	The hypothesis is proposed and no conclusions can be drawn at this point. This is the default state.	The piece of equipment may have failed due to a pressure leak.
Inadequate Accountability -[] ✓	Hypothesis True	The hypothesis has been tested and proven to be correct. Further conclusions can be drawn.	The piece of equipment failed due to a pressure leak.
Fatigue-[] ⊘	Hypothesis Not True	The hypothesis has been tested and proven to be incorrect. No further conclusions can be drawn.	The piece of equipment did not fail due to a pressure leak.
Poor Training-[] ⚥	Cause Human	The hypothesis has been proven correct and further testing has revealed that the root cause of the Failure Event was caused by human interaction.	The operator failed to increase the pressure when it reached the critical level, therefore causing a pressure leak and the failure.

Hypothesis Node	Hypothesis State	Description	For example, the team may determine that:
Inadequate Accountability -[]	Cause Latent	The hypothesis has been proven correct and further testing has revealed that the root cause of the Failure Event was caused by flaw(s) in procedure or the system that caused incorrect decisions to be made. This is often due to poor data or communication between individuals within the organization. In the vast majority of events, there will be at least one latent cause.	Management failed to adhere to the recommended safety guidelines for the piece of equipment, thus the operator failed to increase the pressure when it reached the critical level, causing the pressure leak and the failure.
Lubrication Issue-[]	Cause Physical	The hypothesis has been proven correct, and further testing has revealed that the root cause of the Failure Event was caused by a physical piece of equipment.	The seals on the pressure relief valve are worn and require replacement, which caused the pressure leak and the failure.

About Verification

A verification is a task to prove or disprove a hypothesis. An RCA Verification contains the task-related information required to verify a hypothesis. The RCA Verifications are assigned to team members, similar to the way in which RCA Preserve Records are assigned. For example, if you wanted to verify whether a pump overheated because of a mechanical or electrical problem, you would need to inspect the pump's wiring.

About Logic Gates

You can add logic gates to the Logic Tree to define a connection between nodes. A logic gate is defined in an RCA Logic Gate and is represented in the Logic Tree by a Logic Gate node. You can use Logic Gate nodes to add Boolean logic between nodes (i.e., AND and OR statements). The AND Logic Gate is

represented by the symbol in the Logic Tree. The OR Logic Gate is represented by the symbol in the Logic Tree.

Details

Adding a Logic Gate node between other nodes in the Logic Tree indicates a conditional relationship between the nodes, which you can define in the description fields in the RCA Logic Gate. These conditional relationships are defined in logical statements (e.g., if B is true, then A is true).

When two or more hypotheses are linked to a common predecessor node, the hypotheses nodes are by default connected using the OR Logic Gates, whether the Logic Gates are visible or not.

Example: Logic Gates

Suppose that you want to indicate in the Logic Tree that Failure Mode is true only if Hypothesis 1 and Hypothesis 2 or Hypothesis 2A and Hypothesis 2B are true.

You would organize the nodes in the Logic Tree as shown in the following image.
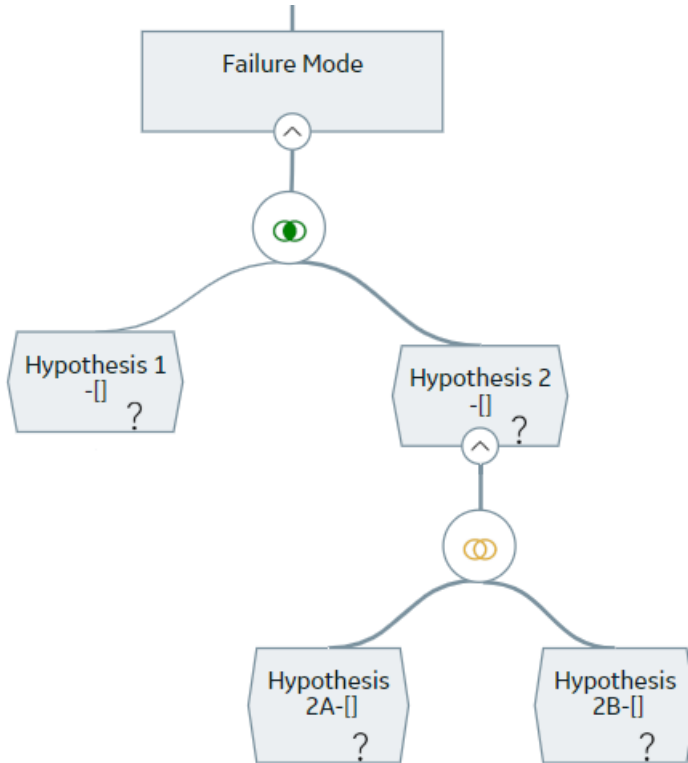
Access the Logic Tree Diagram

Procedure

1. Access the Root Cause Analysis for which you want to view the Logic Tree diagram.
2. In the left pane, select the **Logic Tree** tab.

   The Logic Tree diagram for the selected RCA appears in the workspace.
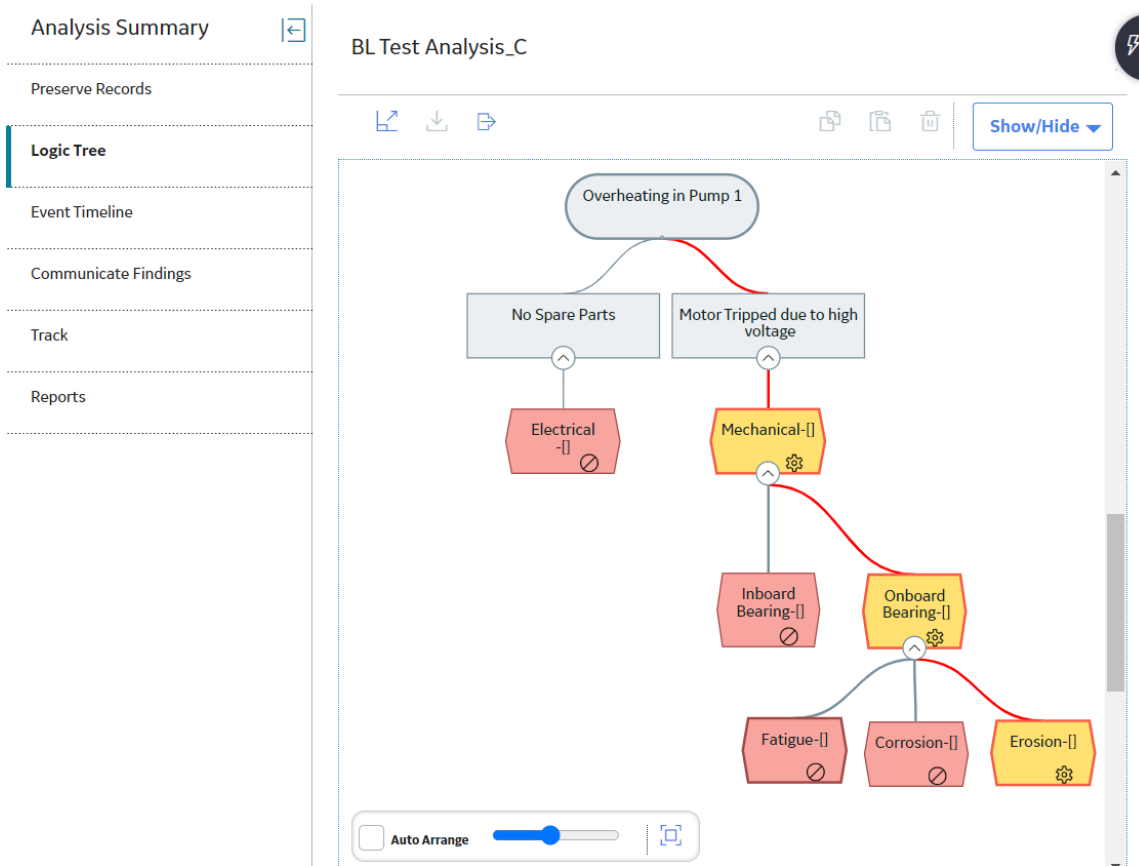
Tip: Select ⬏ to display the diagram in full screen.

Note: If you access the **Logic Tree** tab for the first time, the **RCA Failure Event** window will appear, where you can define an RCA Failure Event. If you previously accessed the **Logic Tree** tab and defined a Failure Event, you will see the Failure Event node in the main display area (i.e., the design canvas).

Create a Failure Event

About This Task

When you create an RCA Event, you are also defining the associated Failure Event node. After you create a Failure Event node, you cannot delete it via Root Cause Analysis, but you can modify the RCA Event. Only one RCA Event can be defined for each RCA.

This topic describes how to define a failure event.

Note: A Failure Event can only be defined from the Logic Tree if no Failure Event currently exists.

Procedure

1. Access the RCA for which you want to create a Failure Event.
2. In the left pane, select the **Logic Tree** tab.

   A blank datasheet appears.

3. As needed, enter values in the available fields.

4. Select 🖫.

   The RCA Failure Event is created and linked automatically to the selected RCA. The Failure Event node appears in the design canvas in Logic Tree workspace.

Next Steps

- Add a Failure Mode Node to the Logic Tree

Add a Failure Mode Node to the Logic Tree

Before You Begin

- Define a Failure Event.

Procedure

1. Access the Logic Tree Diagram to which you want to add the Failure Mode node.
2. In the design canvas, double-click the Failure Event node.
   A window appears, displaying the datasheet of the Failure Event node.
3. In the window, select the **Failure Mode** tab.
4. In the text box, enter a name for the failure mode as you want it to appear on the Logic Tree, and then select **Add** to automatically assign the failure mode to the Failure Event node.
   The new failure mode appears in the **Assigned Nodes** section of the window.
5. In the **Assigned Nodes** section of the window, select the link corresponding to the failure mode that you want to update.
6. In the **Description** box that appears, enter a description for the failure mode.

7. Select 🖫.

   The RCA Failure Mode node is saved.

   Next Steps

   - Add a Hypothesis to the Failure Mode Node

Access a Logic Tree Node

Procedure

1. Access the Logic Tree Diagram for which you want to view the details of a node.
2. On the design canvas, double-click the Logic Tree node whose properties you want to view.

   The **Properties** window appears, displaying the datasheet for the selected node.

   Note: As needed, you can modify the details of the selected node, and then select 🖫 to save your changes.

Copy a Logic Tree Node

About This Task

After you create various nodes in your Logic Tree, you can copy and paste them within the same Logic Tree.

You can add:

- Failure Mode nodes to the Failure Event node.
- Hypothesis nodes to the Failure Mode nodes and Hypothesis nodes.
- Verification nodes to Hypothesis nodes.

Procedure

1. Access the Logic Tree Diagram containing the Logic Tree node that you want to copy.
2. In the design canvas, select the Logic Tree node that you want to copy.
3. In the upper portion of the workspace, in the **Manage Diagram** section, select 🗐
4. Select the node onto which you want to paste the copied node, and then in the upper portion of the workspace, in the **Manage Diagram** section, select 🗐.

   - If the selected node is a valid location to paste the copied node, the nodes that were copied appear at the levels below the selected node.
   - If the selected node is not a valid node to paste the copied node, an error message appears indicating that this is not a valid location. You will need to select a different location to paste the node.

Results

- When you copy a Hypothesis node, if the RCA Hypothesis is linked to an RCA Verification, the verifications for that Hypothesis will also be copied. When you paste the Hypothesis, new RCA Hypothesis and RCA Verification will be created and will contains the same information as the sources.

Access Reference Documents for a Logic Tree Node

About This Task

You can link a Reference Document to any of the following Logic Tree elements represented in the Logic Tree:

- Failure Event
- Failure Mode
- Hypothesis
- Logic Gate

Procedure

1. Access the Logic Tree Diagram for which you want to link a reference document to an existing node represented in the Logic Tree.
2. On the design canvas, double-click the node to which you want to link a Reference Document.

   The **Properties** window appears, displaying the datasheet for the selected node.

3. On the datasheet, select ⦂, and then select **Reference Documents**.

   A list of Reference Documents linked to the selected Failure Event node appears.

   Note: For more information, refer to the Manage Reference Documents section of the documentation for additional options when working with reference documents.

Import Existing Failure Modes and Hypotheses

About This Task

You can import Failure Modes or Hypotheses from an existing RCA analysis or analysis template into a Logic Tree Diagram. When you do so, you can import:

- Failure Modes below Events
- Hypotheses below Failure Modes
- Hypotheses below other Hypotheses

Procedure

1. Access the Logic Tree Diagram containing the node to which you want to attach imported Failure Modes or Hypotheses.
2. On the design canvas, select the node to which you want to attach imported Failure Modes or Hypotheses.
3. At the top of the workspace, in the **Manage Diagram** section, select ⭳, and then select **Import From RCA**.

   The **Import** window appears, displaying the **Select Analysis/Template** section.

Import   ✕

1. Select Analysis/Template   2. Select Failure modes/H...

Search in: **Search Results**

Environmental ⌄

Choose RCA Event ⌄

Choose Failure Mode ⌄

Choose Hypothesis ⌄

Search

Next

4. In the **Search In** subsection, if necessary, select an analysis type within which you want to search for RCA analyses and templates containing the items you want to import to the Logic Tree diagram. If the analysis does not contain an Analysis Type, then select No Analysis Type Assigned.

   Tip: You can refine the search by selecting values in the **Choose RCA Event**, **Choose Failure Mode**, or **Choose Hypothesis** boxes. In the **Choose Hypothesis** box, you can use wildcard characters to modify the selected value as needed.

5. Select **Search**.

   The analyses and templates that meet the specified criteria appear in the **Search Results** subsection. For each analysis, the label that appears in the search results is the value in the Analysis Name field in the Root Cause Analysis record for that analysis.

6. In the **Search Results** subsection, select the check box in the row for each RCA containing Failure Modes and Hypotheses that you want to import, and then select **Next**.

   Note: Although you can select the check box in the row for an RCA, you cannot import an RCA into the Logic Tree.

   The **Select Failure modes/Hypothesis** section appears, displaying a list of RCAs.

Import   ✕

1. Select Analysis/Template / 2. Select Failure modes/H...

Import	⌄
☐ 🗂️ Z_Analysis for Alert Generation	

☐ **Verifications** ☐ **Children**

[Previous] [Finish]

7. In the row for the RCA name containing the Failure Mode or Hypothesis that you want to import, select the link.

   The label for an RCA Failure Event is the value in the Label field of the RCA Failure Event record for that RCA Failure Event. If the Label field is empty, then the label will appear as RCA Event: Undefined.

   Note: Although you can select the check box next to the RCA Failure Event, you cannot import an RCA Failure Event into the Logic Tree.

8. Select the RCA Failure Event name to display the list of Failure Modes available for the analysis.

   Note: You can continue to select links in the rows for RCA Failure Events to display additional hierarchical levels.

9. Select the check box next to each RCA Failure Event that you want to import, and then select **Finish**.

   Note: The **Verifications** check box is enabled only if you import a Hypothesis. If you want to import the RCA Verifications associated with the selected Hypothesis, select the **Verifications** check box. The **Children** check box allows you to import a selected node and any associated children.

   The **Import** window is closed. The **Logic Tree** workspace appears, displaying the newly added Failure Mode or Hypothesis to the Logic Tree diagram for the selected analysis.
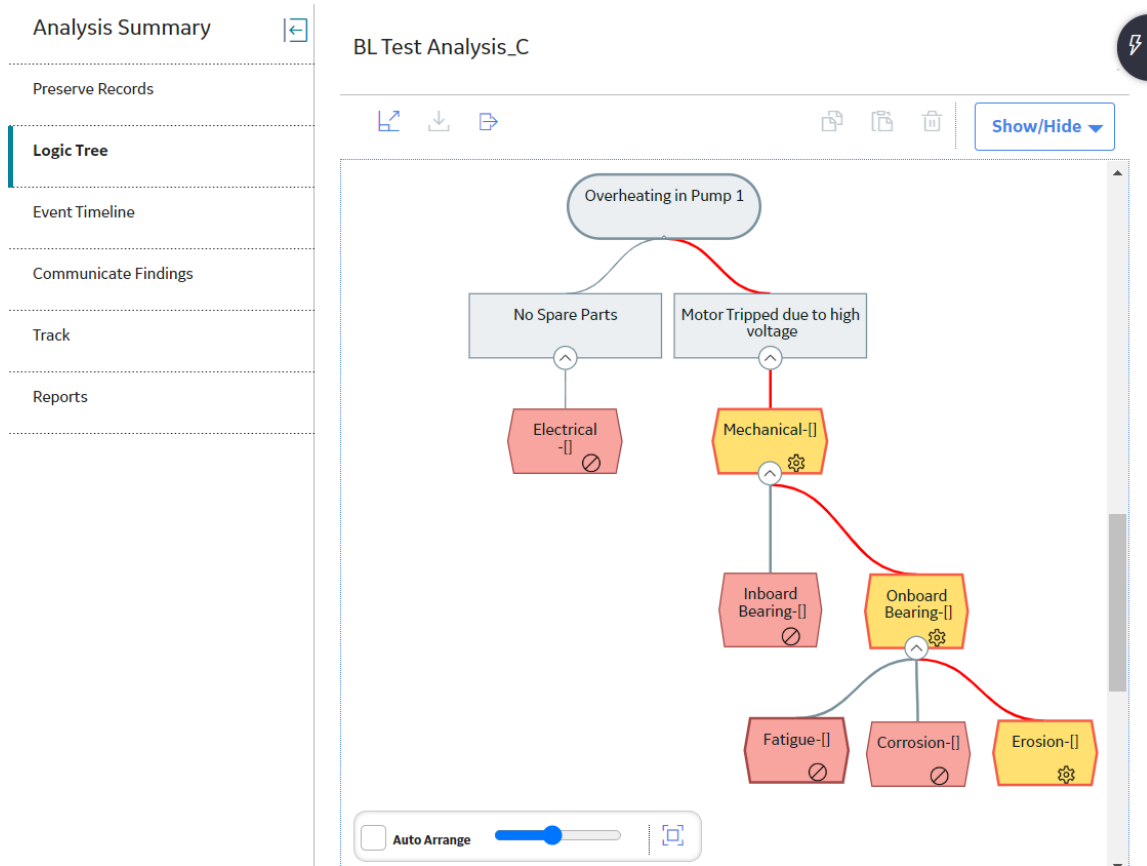
Results

- If you import an RCA Hypothesis along with the linked Verification, a new Verification is created and linked to the Hypothesis that is created from the imported Hypothesis. Values from the following fields in the Verification are copied to a new RCA Verification:
  - Method
  - Send Alert on Due Date
  - Alert Email Text Fields

Import Failure Modes from Failure Modes and Effects Analysis (FMEA) and Reliability Centered Maintenance (RCM)

About This Task

Note: You can only import Failure Modes from RCM and FMEA if the assets are linked to the RCA.

Procedure

1. Access the Logic Tree Diagram containing the event to which you want to attach imported Failure Modes from FMEA and RCM.
2. On the design canvas, select the Event node.
3. At the top of the workspace, in the **Manage Diagram** section, select ⬇, and then select **Import From RCM and FMEA**.

The **Import From RCM and FMEA** window appears, displaying a list of assets that are linked to the analysis.
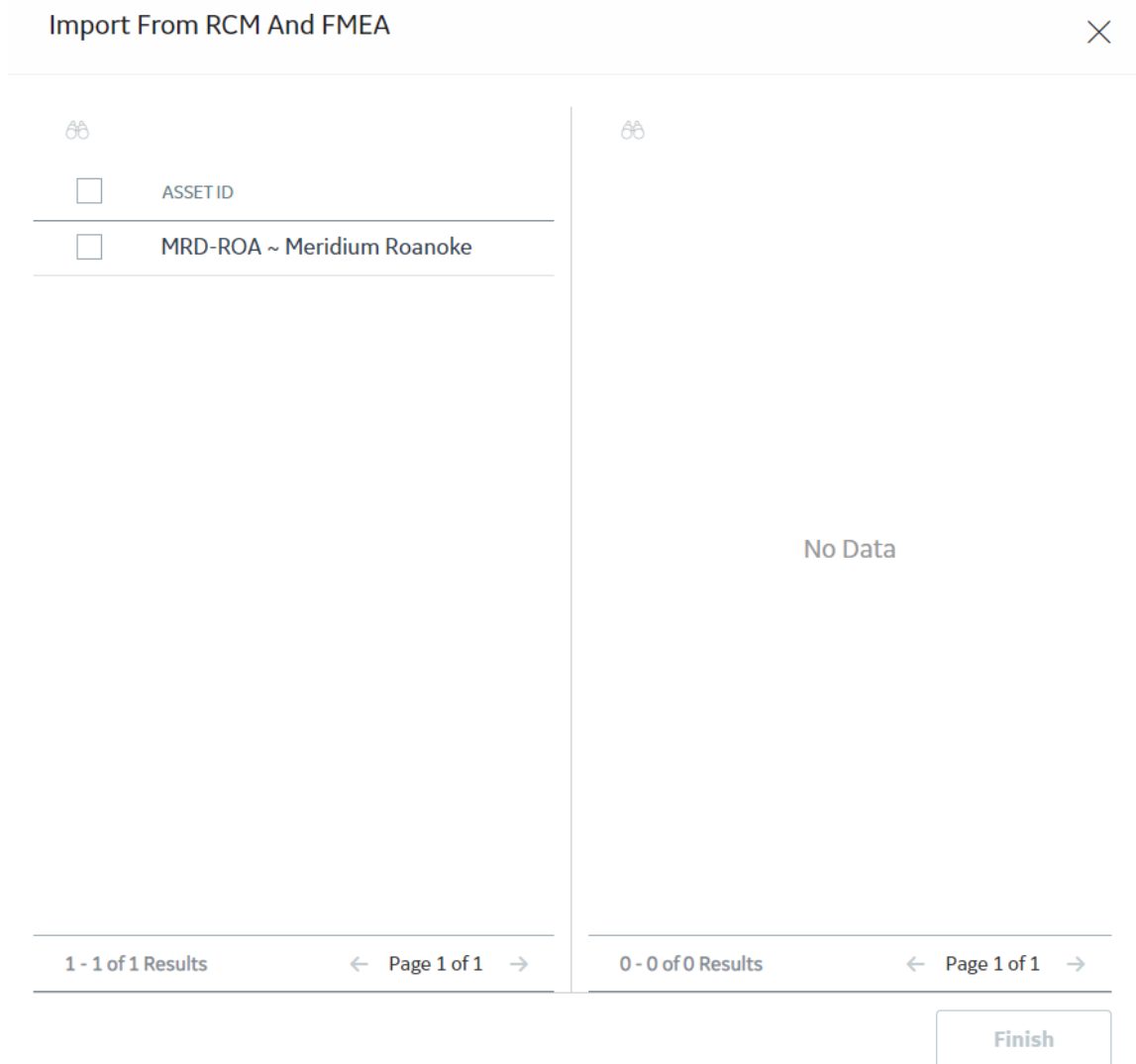
4. Select the assets containing Failure Modes that you want to import.

   A list of Failure Modes linked to the selected assets appears.

5. Select the Failure Modes that you want to import, and then select **Finish**.

   The **Logic Tree** workspace appears, displaying the newly added Failure Mode to the Logic Tree diagram for the selected analysis.

Arrange Nodes Manually Within the Logic Tree

About This Task

If you manually arrange nodes, the arrangements are saved. The GE Digital APM system only automatically arranges the presentation of the nodes of the Logic Tree diagram in the design canvas when the Auto Arrange option is enabled.

Procedure

1. Access the Logic Tree Diagram for which you want to arrange the nodes.

2. In the design canvas, clear the **Auto Arrange** check box.

3. In the design canvas, select and drag the required node to the required location in the Logic Tree.

4. In the pane, select the **Analysis Summary** tab.

    The logic tree diagram is saved, and the **Analysis Summary** workspace appears.

    Note: The node arrangement is not saved in the database if you refresh the page, close the browser, or log out of GE Digital APM before selecting the **Analysis Summary** tab.

Delete Nodes from the Logic Tree

Procedure

1. Access the Logic Tree diagram within which you want to delete a node.

2. In the design canvas, select the node that you want to delete.

    Note: Any node except the Failure Event node can be deleted from a Logic Tree.

3. In the upper portion of the workspace, select 🗑.

    The **Delete Logic Tree Items** dialog box appears, asking you to confirm that you want to delete the selected node and its successor nodes.

4. Select **OK**.

    The selected node is deleted from the database, and the node does not appear in the Logic Tree.

Results

• All the child nodes of the deleted node are deleted.

• The link between the deleted node and the node to which it was linked is removed.

Export a Logic Tree Diagram

About This Task

You can export a Logic Tree as an image and save it to another location, such as your local hard drive.

Note: The zoom factor does not affect the size of the image that you want to export. Regardless of the zoom factor that is currently applied to the Logic Tree, the entire tree will be included in the image, even if part of the tree is cut off at the time you perform the export.

Procedure

1. Access the Logic Tree diagram that you want to export.

2. At the top of the workspace, in the **Manage Diagram** section, select ⤴.
    A new tab appears with a message asking you to print an image of the Logic Tree.

3. Select **Print** to print the image of the exported Logic Tree, or go to the location to which you want to save the image of the Logic Tree in the PDF format.

4. In the **File name** box, enter the name of the file.

5. In the **Save as type** list, select the format in which you want to save the image, and then select **Save**.

The Logic Tree is saved to the selected location in the selected image format.

Add a Hypothesis to a Logic Tree

Before You Begin

- Add a Failure Mode Node to the Logic Tree.

Procedure

1. Access the Logic Tree diagram to which you want to add a hypothesis.
2. In the design canvas, double-click the Failure Mode node to which you want to add a hypothesis.
   A window appears, displaying the datasheet of the Failure Mode node.
3. In the window, select the **Hypothesis** tab.
4. In the text box, enter a name for the hypothesis, and then select **Add**.
   A hypothesis is created, and assigned only to the Failure Mode node that is already selected as the target node in the design canvas.

Next Steps

- Add a Verification to a Hypothesis

Change the State of an RCA Hypothesis

About This Task

When an RCA Hypothesis is created, the state is set to Hypothesis by default. Based on the verifications, each RCA Hypothesis can then be tested and proven True or Not True, and then you can change the state of the hypothesis accordingly.

Procedure

1. Access the Logic Tree diagram in which you want to change the state of a hypothesis.
2. In the design canvas, double-click the hypothesis whose state you want to change.
   A window appears, displaying the datasheet of the hypothesis.
3. In the window, in the **State** drop-down list box, select one of the following options:
   - **Hypothesis True:** If the hypothesis has been confirmed. After you determine a hypothesis to be true, you can identify the root cause of the Failure Event.
   - **Hypothesis Not True:** If the hypothesis has been ruled out.
4. Select 💾.
   The state of the hypothesis is saved.

Identify the Root Cause for Hypotheses Proven True

Procedure

1. Access the Logic Tree diagram in which you want to specify the root cause for a hypothesis.

2. In the design canvas, double-click the hypothesis for which you want to specify the root cause.
   A window appears, displaying the datasheet for the hypothesis.
3. In the **State** drop-down list box, select one of the following options:

   - **Cause - Physical**
   - **Cause - Human**
   - **Cause - Latent**

4. Select 💾.
   Your changes are saved.

Results

After you select a cause:

- A red line is drawn to show the path to failure.
- The icon used to identify the hypothesis node changes to indicate the specific cause.
- The team can communicate their findings to the decision makers in your organization.

Delete a Hypothesis from the Hypothesis List

Procedure

1. Access the Logic Tree diagram from which you want to delete a hypothesis from the Hypothesis List.
2. In the design canvas, double-click any node.
   A window appears, displaying the datasheet for the node.
3. Select the **Hypothesis** tab.
   A list of hypotheses for the analysis appears.
4. In the **Assigned Nodes** section, next to the hypothesis that you want to delete, select 🗑.
   A window appears, asking if you want to delete the hypothesis.
5. Select **Yes**.
   The hypothesis is deleted from the hypothesis list.

Access a Verification

Procedure

1. Access the Logic Tree diagram that contains the hypothesis for which you want to access a verification.
2. In the design canvas, double-click the hypothesis for which you want to access the verification.
   A window appears, displaying the datasheet for the hypothesis.
3. In the window, select the **Verifications** tab.
   A list of verifications that are available for the selected hypothesis appears.
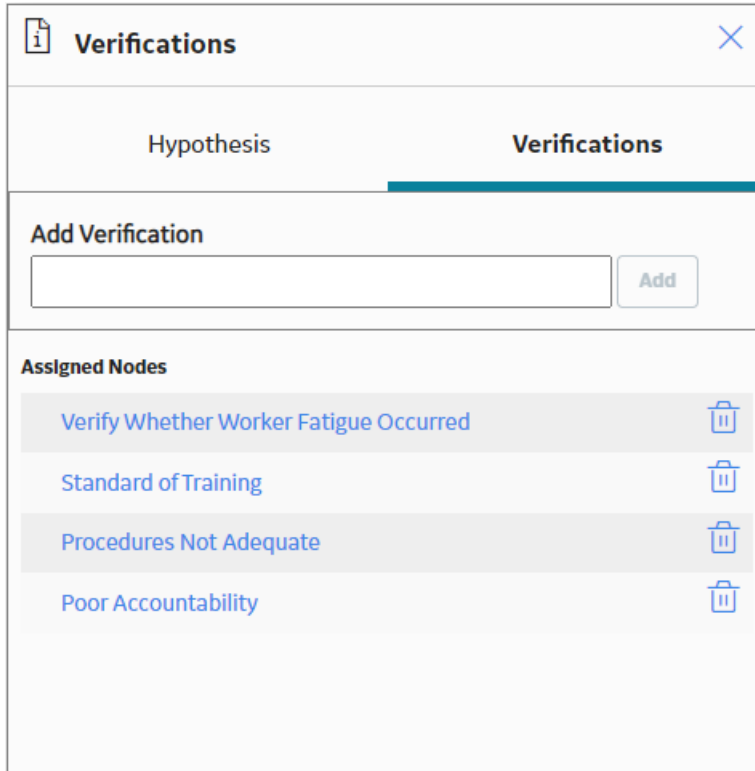
4. Select the verification whose details you want to access.
   The datasheet for the verification appears.

   Note: As needed, you can modify the values in the available fields, and then select 💾 to save your changes.

Create a Verification

Procedure

1. Access the Logic Tree diagram for which you want to create a verification.
2. In the design canvas, double-click the hypothesis to which you want to create a verification.
   A window appears, displaying the **Hypothesis** section that contains the datasheet for the hypothesis.
3. In the window, select the **Verifications** tab.
   The **Verifications** section appears in the window.
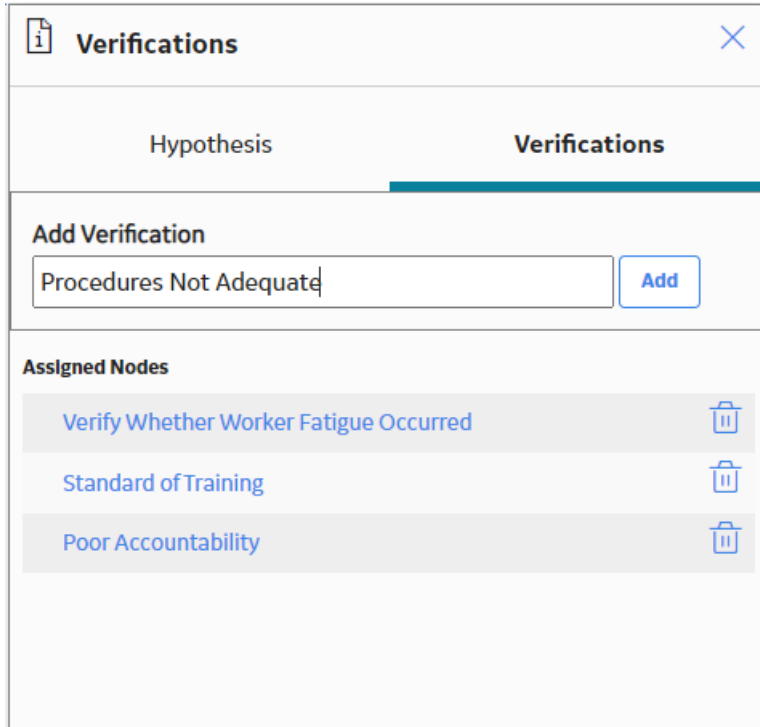
4. In the **Add Verification** text box, enter the name for the new verification, and then select **Add**.
   The verification is created and assigned to the hypothesis. The verification appears in the **Assigned Nodes** list.

Add Verification Details

Procedure

1. Access the Logic Tree diagram for which you want to add the verification details.
2. In the design canvas, double-click the hypothesis for which you want to add the verification details.
   A window appears, displaying the **Hypothesis** section.
3. In the window, select the **Verifications** tab.
   A list of verifications that are available for the selected hypothesis appears.
4. Select the verification for which you want to add details.
   The **Verifications** window appears.

5. As needed, enter values in the available fields, and then select ▣.
   The RCA Verification details are saved.

Add a Verification to a Hypothesis

Before You Begin

- Add the hypothesis nodes to the Logic Tree.

Procedure

1. Access the Logic Tree diagram that contains the hypothesis to which you want to add a verification.
2. In the design canvas, double-click the hypothesis for which you want to add the verification.
   A window appears, displaying the **Hypothesis** section.
3. In the window, select the **Verifications** tab.
   A list of verifications that are available for the selected hypothesis appears.
4. In the **Add Verification** text box, enter the name for the new verification, and then select **Add**.
   The verification is assigned to the selected hypothesis.

   Note:

- RCA Verifications are associated only with RCA Hypotheses.
- A verification can be assigned only to the hypothesis node that is already selected as the target node in the design canvas.

Delete a Verification

Procedure

1. Access the Logic Tree diagram that contains the hypothesis for which you want to delete a verification.
2. In the design canvas, double-click the hypothesis.
   A window appears, displaying the datasheet of the hypothesis.
3. In the window, select the **Verifications** tab.
   A list of Verifications that are available for the selected hypothesis node appears in the **Assigned Nodes** section of the window.
4. Next to the Verification that you want to delete, select 🗑.
   The **Delete Verification** window appears, asking you to confirm that you want to delete the verification.
5. Select **Yes**.
   The Verification is deleted.

Enable Logic Gates

Procedure

1. Access the Logic Tree within which you want to enable Logic Gates.
2. In the **Logic Tree** workspace, select **Show/Hide**, and then select **Show Logic Gates**.

   Note: If the **Show Logic Gates** option is enabled, **Hide Logic Gate** will appear in the options.

   The Logic Gates appear in the design canvas.

Change the Gate Type of a Logic Gate

Procedure

1. Access the Logic Tree that contains the Logic Gate whose Gate Type you want to change.
2. In the design canvas, select the Logic Gate whose Gate Type you want to change, and then select 🗋 .

   The **Properties** window appears, displaying the datasheet for the selected Logic Gate.
3. In the **Gate Type** field, select the type of Logic Gate that you want to include: AND or OR.
4. Select 💾.

   The Gate Type is updated.

Results

Track and Reevaluate the Analysis Results

After your team's findings have been communicated successfully to the necessary individuals in your organization, the next step in the PROACT workflow is to track the effectiveness of your recommendations through RCA Tracking Items. The goal of tracking recommendations is to make sure that the recommendation that was implemented has produced the required results. Depending on the results, you may need to reevaluate the solution that was implemented to address the underlying issues.

During the tracking process, the team should decide on a set of conditions on which reevaluation notifications should be based. The Principal Analyst should specify these conditions in the associated fields in the RCA Tracking Item. These notifications should be based on event criteria.

Criteria that is event-based includes a number of failure events and/or the failure cost that the piece of equipment or location has incurred after the implementation of a recommendation. When the criteria defined in the RCA Tracking Item is exceeded, the RCA Tracking Item will be updated automatically to a Reevaluate status, and an email reminder will notify the responsible party to reexamine the recommendation.

About Recommendations

A recommendation is a suggested solution for preventing or lessening the impact of future failures for the piece of equipment or location that the RCA Team is analyzing, such as making changes to maintenance schedules or providing additional training to operators. The RCA Team should develop these solutions based on the evidence that was collected and the conclusions that were drawn in the Preserve and Analyze steps of the Root Cause analysis.

RCA Recommendations store the details of the team's recommendation and provide functionality that lets you send alert emails to a human resource for the person responsible for implementing the recommendation. In this way, RCA Recommendations represent tasks assigned to a person with human resource.

After the recommendation is completed, the value in the Status field of the RCA Recommendation can be marked as Implemented. The success of the implemented recommendation, however, should continue to be tracked. If the piece of equipment or location continues to fail after the recommendation has been implemented, the RCA Recommendation can be flagged for reevaluation.

About Equipment, Locations, and RCA Recommendations

The details of the recommendations and the progress associated with getting the recommendation approved and implemented can be tracked using fields in RCA Recommendations records. When you create an RCA Recommendation, a link is created between the RCA Recommendation and the Root Cause analysis. You can then choose to link the RCA Recommendation to an Equipment or Functional Location. Depending on the nature of the recommendation, RCA Recommendations may or may not be linked to the same Equipment and Functional Locations that are linked to the Root Cause analysis.

For example, suppose you created a root cause analysis for a piece of equipment called Pump 1 that was shutting down more frequently than normal. You find that the pump is one of several pumps that are more than 10 years old. You create an RCA Recommendation to increase inspection rounds for Pump 1. Although the root cause analysis was performed for Pump 1, another similar pump, Pump 2, is the same age. You can create a new RCA Recommendation and populate the value in the Equipment ID field to Pump 2 so that the same recommendation can be applied.

Furthermore, if the Equipment Pump 1 is already linked to the Functional Location Row 12, you can change the value in the Functional Location ID field of the RCA Recommendation from Row 12 to reflect a higher level Functional Location, such as Statesville Plant. This value can serve as an indicator that pumps located at the Statesville Plant are older than other plants, which is more relevant than the information that Pump 1 is located in a certain row.

Workflow for Proposing and Implementing Recommendations

RCA and the fields in the RCA Recommendation facilitate the following general workflow for proposing and implementing recommendations:

1. After a hypothesis is proven true and a root cause is identified, the RCA Team discusses possible solutions.
2. After a recommendation has been developed, the analysis team creates an RCA Recommendation from the analysis. When the RCA Recommendation is created, the value in the Status field is populated by default.
3. The Analysis Team defines the details of the recommendation in the RCA Recommendation. If the recommendation is specific to a piece of equipment or location, the Analysis Team can define values in the Equipment ID and Functional Location ID fields to link the RCA Recommendation to the Equipment or Functional Locations that represents that equipment and locations.
4. After the RCA Recommendation is created to track the progress of the recommendation, an RCA Team member proposes the recommended solution to the decision makers in your organization using the details stored in the RCA Recommendation.
5. Your organization makes decisions about the recommendation (e.g., approve or reject), and the necessary fields (including the Status field) in the RCA Recommendation are updated to reflect these decisions.
6. After a recommendation has been approved (i.e., the value in the Status field is changed to Approved), it should be implemented within your organization. Alert emails can be scheduled and sent to a human resource for the person responsible for implementing the recommendation.
7. To implement the recommendation, you can create a work request in a maintenance management system (e.g., an SAP Notification, an Oracle EBS eAM Work Request) by setting the value in the Create Work Request field in the RCA Recommendation to True.
8. After the recommendation is implemented, the value in the Status field in the RCA Recommendation should be changed to Implemented, and the RCA Recommendation is considered complete.

   Note: This step is part of the Tracking and Reevaluating Analysis Results step in an RCA.
9. If the piece of equipment or location continues to fail, the RCA Recommendation should be flagged for reevaluation.
10. The team should meet to discuss the implemented recommendation, propose new recommendations, amend the original recommendations, and so on until an implemented solution prevents the piece of equipment or location from failing in the same manner that triggered the RCA.

Access a Recommendation

Procedure

1. Access the Root Cause Analysis for which you want to view a Recommendation.

2. In the upper-right corner the workspace, select the .

   The **Recommended Actions** pane appears, displaying a list of recommendations associated with the selected analysis.

2 Recommended Actions   ⧉ **Action Management**

+   👓   ⅀   Select Items to Manage State

☐   Updated by: Baseline Super User On   Friday, Oct...   Proposed

☐   Updated by: Baseline Super User On   Friday, Oct...   Proposed

3. Select the row containing the recommendation that you want to view.

   The RCA Recommendation datasheet appears, displaying the **General Information** and **Alert** tabs.

Tip: For information about additional options available when working with the Recommendation records, refer to the Action Management section of the documentation.

Next Steps

- Create a Tracking Item

Send a Summary of Findings Via Email

About This Task

After the RCA Team has successfully identified the root causes associated with the failure that was investigated, the next step involves communicating the team's findings and proposing recommendations to the appropriate individuals within your organization. To do so, you can:
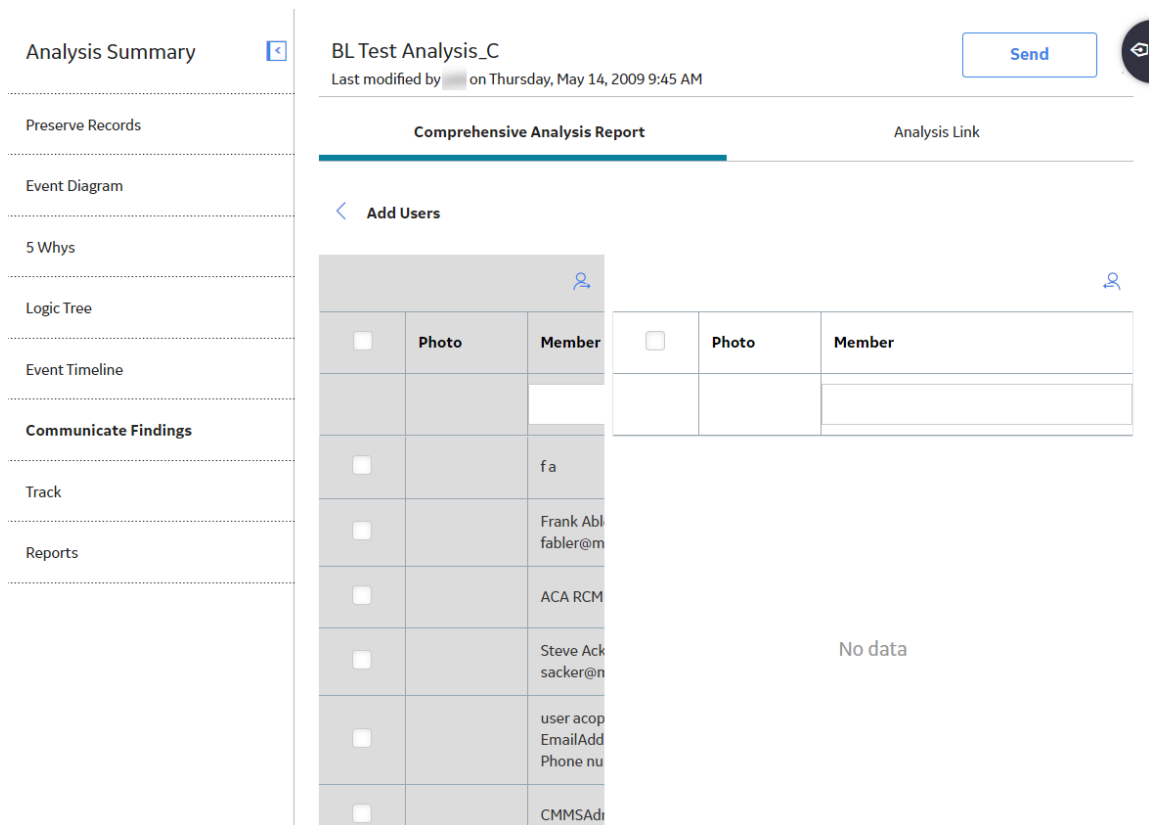
- Complete the fields in the RCA Communicate datasheet in the **Comprehensive Analysis Report** section to provide a summary of findings and acknowledge those who participated in the root cause analysis but who were not members of the RCA Team.
- Associate RCA Recommendations to the Root Cause Analysis.

Procedure

1. Access the Root Cause Analysis for which you want to communicate the findings.
2. In the left pane, select the **Communicate Findings** tab.

   The **Communicate Findings** workspace appears. The **Comprehensive Analysis Report** tab is selected by default, displaying the **Comprehensive Analysis Report** section.

3. Select ⛭ to add one or more users to whom you want to send the Comprehensive Analysis Report.

   The **Add Users** section appears, displaying the list of human resources in the left section.

4. In the left side of the section, select the Human Resource record, and then select ⛭.

   The user represented by the Human Resource record is added to the right side of the section.

Tip: You can add more than one user.

5. Select $\langle$ to go back to the **Comprehensive Analysis Report** section.
6. In the RCA Communicate datasheet, modify the values in the available fields as needed.
7. In the upper-right corner of the workspace, select **Send**.

   The Comprehensive Analysis Report is sent to the selected user via an email. The email contains the Comprehensive Analysis Report as an attachment as well as the following information:

   • Summary of Findings field
   • Acknowledgments field

Next Steps

• Create a Tracking Item

Send a Link to an RCA Via Email
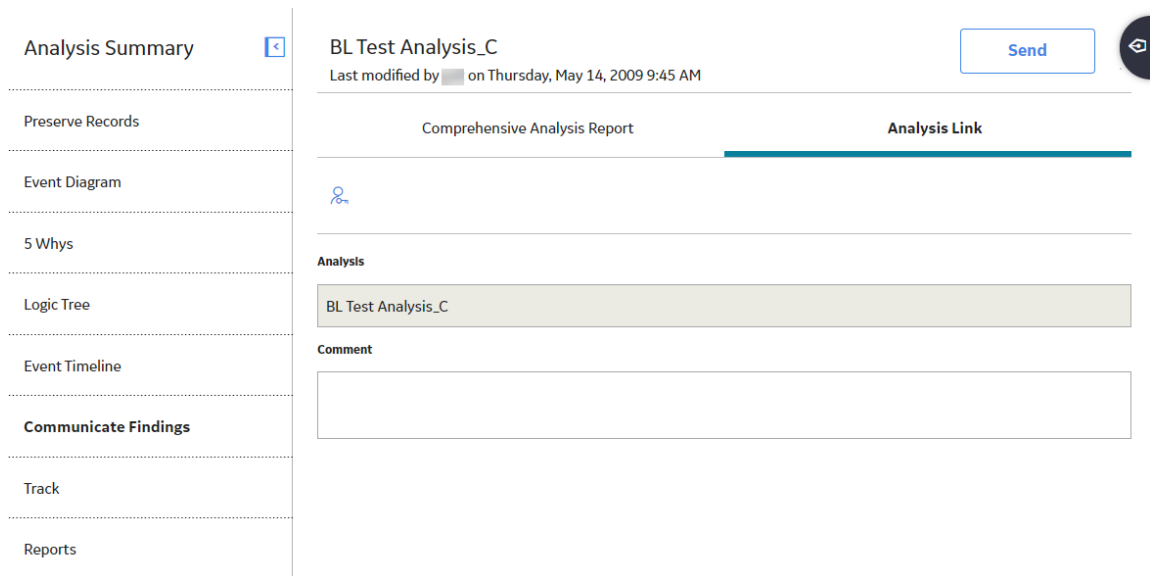
Procedure

1. Access the Root Cause Analysis whose link you want to send.
2. In the left pane, select the **Communicate Findings** tab.

   The **Communicate Findings** workspace appears.
3. In the workspace, select the **Analysis Link** tab.

   The **Analysis Link** section appears.

4. Select to add one or more users to whom you want to send the link to the analysis.

   The **Add Users** section appears, displaying the list of human resources in the left section.

Analysis Summary		
Preserve Records		
Event Diagram		
5 Whys		
Logic Tree		
Event Timeline		
Communicate Findings		
Track		
Reports		

BL Test Analysis_C
Last modified by ___ on Thursday, May 14, 2009 9:45 AM

Send

Comprehensive Analysis Report   Analysis Link

< **Add Users**

☐	Photo	Member
☐		
☐		f a
☐		Frank Abl fabler@m
☐		ACA RCM
☐		Steve Ack sacker@n
☐		user acop EmailAdd Phone nu
☐		CMMSAd

☐	Photo	Member
☐		

No data

5. On the left side of the section, select the Human Resource record, and then select ⇗.

The user represented by the Human Resource record is added to the right side of the section.

Tip: You can add more than one user.

6. Select ‹
   Analysis Link
7. In the **Comment** box, enter any additional information about the selected analysis.
8. In the upper-right corner of the workspace, select **Send**.

An email to the selected user is sent.

Next Steps

• Create a Tracking Item

Generate a Report

Procedure

1. Access the Root Cause Analysis for which you want to generate a report.
2. In the left pane, select the **Reports** tab.

The **Reports** workspace appears, displaying the following sections:

- **Master Report** : Displays the Catalog caption of the Comprehensive report as hyperlink. The report is stored in the Catalog folder `\\Public\Meridium\Modules\RCA\SSRS` along with the subreports that support the main report.
- **Individual Reports** : Displays the Catalog captions of all the reports that exist in the Catalog folder `\\Public\Meridium\Modules\RCA` as hyperlinks. This list includes any baseline reports provided with the Root Cause Analysis product and any custom reports that you have saved in this location.

Analysis Summary ◁	BL Test Analysis_C			
	Last modified by ▢ on Thursday, May 14, 2009 9:45 AM			
Preserve Records	**Master Report**	**Custom Reports**		
	Comprehensive Analysis Report	🔍		
Event Diagram				
		REPORT ID	MODIFIED BY	LAST MODIFIED
5 Whys				
	Individual Reports			
Logic Tree	5 Whys Report			
	Analysis Summary Report			
	Analyze- Cause Report			
Event Timeline	Analyze- Logic Tree Summary Report			
	Analyze- Verification Report			
Communicate Findings	Communicate- Recommendation Report			
	Order - Team Member Report			
Track	Preserve Item Report- Group by Category			
	Preserve Item Report- Group by Team Member			
Reports		No Data		

3. Select one of the following links to generate a report:

- Comprehensive Analysis Report

   Note:

   If this is the first time the Comprehensive Analysis Report has been generated by any user, that user must have View, Update, and Insert privileges to the RCA Image family to view the report.

   ◦ To open the Comprehensive Analysis Report, you must have View privileges to all families included in the underlying queries and datasets. You must also have View and Update privileges to the RCA Image family.
   ◦ To ensure that you will be able to run the report, you should not delete or rename any of the reports or queries that exist by default in the folder `\\Public\Meridium\Modules\RCA\SSRS`.
   ◦ Reference document images are added to the report.

- Analysis Summary Report
- Cause Report
- Logic Tree Summary Report
- Verification Report
- Team Member Report
- Preserve Items Report - Group by Category
- Preserve Items Report - Group by Team Member

   The selected report appears in a new browser tab.

   Next Steps

- Create a Tracking Item

Tracking Items

About Tracking Items

A Tracking Item allows you to monitor the performance of an Asset and set up notifications to be sent when specific reevaluation criteria have been met (i.e. cost and the number of failures).

A Tracking Item queries the failure and cost data from work history records linked to the selected equipment or functional location. Queries are automatically initiated when the track item Start Date is reached. By default, the values in the Work History Total Cost field for Maintenance Work are used to derive the cost value used for the Count. The work history costs that occur prior to the track item Start Date will not be included in the Count. A track item alert is triggered when either the total cost or total number of failure events threshold count is met. After an alert is sent, the Count reverts to zero, and the process is repeated until the track items instruction is terminated.

Access a Tracking Item

Procedure

1. Access the Root Cause Analysis that contains the Tracking Item whose details you want to view.
2. In the left pane, select the **Track** tab.

   The **Track** workspace appears, displaying the list of Tracking Items associated with the selected RCA. The following columns of information appear in the workspace:

   - **Start Date**
   - **Is Active?**
   - **Count**
   - **Cost**
   - **Equipment**

3. In the **Start Date** column, select the hyperlink for the Tracking Item whose details you want to view.

   The **Add/Edit Tracking Item** window appears, displaying the datasheet for the selected Tracking Item.

   Note: As needed, you can modify the values in the available fields, and then select 💾 to save your changes.

Create a Tracking Item

About This Task

As part of the reevaluation process, you can create an RCA Tracking Item and set up tracking notifications. In the **Track** workspace, you will define the:

- User to whom the notification will be sent.
- Time interval or event-based conditions that should be met before the notification can be sent.

You can create a new Tracking Item or copy a Tracking Item.

Procedure

1. Access the RCA within which you want to create a new Tracking Item.
2. In the left pane, select the **Track** tab.

   A list of Tracking Items associated with the selected RCA appears in the workspace.

3. In the upper-left corner of the workspace, select ＋.

   The **Add/Edit Tracking Item** window appears, displaying a blank datasheet.

4. As needed, enter values in the available fields.

   Note: Above the **Tracking Item Details** datasheet, the **Related Assets** box appears, which contains the ID of the Asset to which the RCA Tracking Item is linked. If the RCA Tracking Item is not linked to an Asset, this box will be blank. You can select **Search** next to the **Related Assets** box to search for an Asset and link the Asset to the Tracking Item.

5. Select 💾.

   The Tracking Item is saved.

Results

- When you create a Tracking item, a link is automatically created between the Tracking Item and the RCA.

Copy a Tracking Item

About This Task

You can copy a Tracking Item or create a new Tracking Item.

Procedure

1. Access the RCA that contains the Tracking Item that you want to copy.
2. In the left pane, select **Track**.

   A list of Tracking Items associated with the selected RCA appears in the workspace.

3. Select the check box to the left of the Tracking Item that you want to copy.

   Tip: You can select one or more Tracking Item.

4. In the upper-right corner of the workspace, select ⧉.

   The **Copy Track Item(s)** dialog box appears, asking you to confirm that you want to copy the selected Tracking Item(s).

5. Select **Yes**.

   The Tracking Items are copied and are associated with the selected RCA.

Results

- The values in all of the fields on the Tracking Items are copied except for the value in the **Related Assets** box.

Access Reference Documents for a Tracking Item

Procedure

1. Access the Tracking Item whose Reference Documents you want to access.
2. On the datasheet that appears, select ⋮ , and then select **Reference Documents**.

   A list of Reference Documents linked to the selected Tracking Item appears.

   Note: For more information, refer to the Manage Reference Documents section of the documentation for additional options when working with reference documents.

Delete a Tracking Item

Procedure

1. Access the RCA that contains the Tracking Item that you want to delete.
2. In the left pane, select the **Track** tab.

   A list of Tracking Items associated with the selected RCA appears in the workspace.

3. Select the check box to the left of the Tracking Item(s) that you want to delete, and then select 🗑.

   Tip: You can select one or more Tracking Item.

   The **Delete Track Item(s)** dialog box appears, asking you to confirm that you want to delete the selected Tracking Item(s).

4. Select **Yes**.

   The selected Tracking Item is deleted.

Admin

Overview of the Root Cause Analysis (RCA) Module

The GE Digital APM Root Cause Analysis (RCA) module lets you conduct a root cause analysis, which allows you to analyze causes of failures. A root cause analysis also allows you to track the performance of the equipment by following implementation of recommendations. When you create a Root Cause analysis, you are using GE Digital APM tools to facilitate a standard process that is based on the PROACT® for Meridium methodology.

Note: The RCA module is based on the PROACT® RCA Methodology, © Copyright 1996 - 2017, RCI-Reliability Center Incorporated. All rights reserved. Used with Permission.

More Details

A root cause analysis is the process of analyzing failures down to their root causes, which can include but is not limited to physical causes, human causes, and latent causes of the failure.

In the GE Digital APM system, elements of a Root Cause analysis store all the information necessary for the team to identify a root cause for failure of and asset.

When the Root Cause analysis is complete, it can be published and made available to users who are not members of the analysis team, allowing them to view the results using GE Digital APM tools.

When a failure occurs in your facility, there could be any number of causes that led to the failure. If you investigate the causes, you might find that each failure is caused by another higher-level cause. If this root cause remains unidentified, the failures will likely persist.

For instance, consider an example of a car that has had trouble starting every month for the past three months. In this case, you might determine that:

- In the first month, the cold weather caused the failure.
- In the second month, the battery was low.
- In the third month, the warning to check engine was displayed in the dashboard.

If you were to conduct a root cause analysis on the car, you may find that while each month's failure had its own apparent cause, the root cause of each failure was that a voltage regulator was malfunctioning.

To help you identify the root causes of failures in your facility, you can assemble an RCA Team that will:

- Collect data relevant to the failure.
- Analyze the data.
- Develop hypotheses about the root cause.
- Develop recommendations for preventing the failure from occurring or lessen the impact of the failure in the future.
- Implement recommended solutions.
- Track implemented solutions and re-evaluate them, as needed.

Access the RCA Administrator Page

About This Task

To access the **RCA Administrator** page, you must be a Super User or a member of the MI PROACT Administrator Security Group.

Procedure

In the module navigation menu, select **Admin** > **Application Settings** > **Root Cause Analysis**.

The **RCA Administrator** page appears, displaying the following tabs:

- **Team Charter**: Contains the default Team Charter. You can specify the Team Charter that will appear when you access the **Team Charter** section for an RCA.
- **Critical Success Factors**: Contains a list of the Critical Success Factors (CSFs) that will appear by default in the **Available CSF** section when you access a CSF for an RCA.
- **Default Settings:** Contains the following settings:
  - **Queries**: Contains the Catalog path to the Tracking Evaluation Query that is provided in the baseline GE Digital APM database.
  - **Logic Tree Auto-Arrange**: Allows you to determine whether or not the nodes on a Logic Tree can be repositioned.
  - **Recommended Status and State**: Allows you to select how the state of a recommendation is determined.
  - **Restricted Access**: Allows you to decide whether or not access is restricted.
- **Email Settings:** Contains the alert settings for and State Management emails.
- **Event Color Settings:** Contains color mappings for events on the Event Timeline.
- **RCA Pages Setting:** Contains a selections for the diagram and process pages that appear in the RCA module.

Modify the Default Team Charter

Procedure

1. Access the **RCA Administrator** page.

   The default Team Charter appears in the workspace.
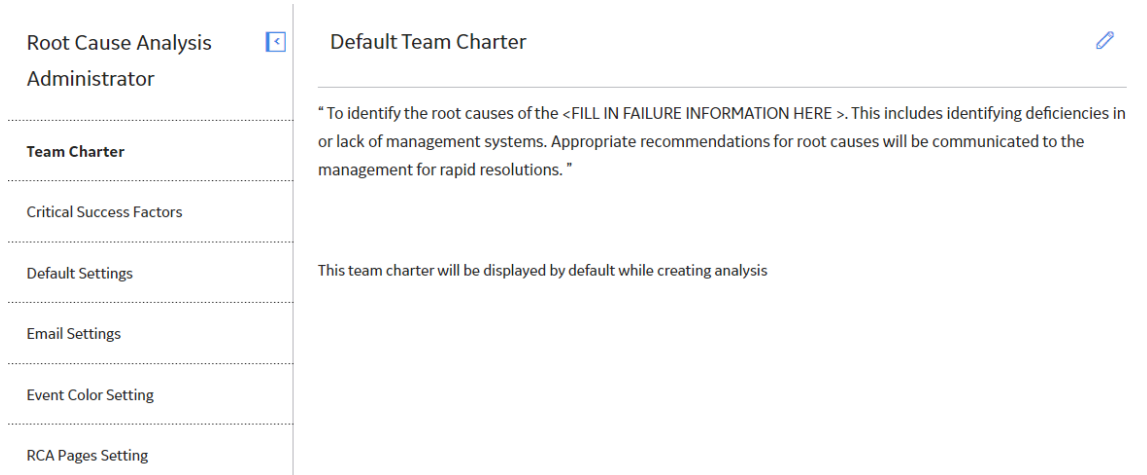
2. In the upper-right corner of the workspace, select ✏.

   The default Team Charter appears in a box.

3. As needed, modify the text, and then select 💾.

   Your changes are saved.

Results

After you modify the default Team Charter, your changes will appear in:

- The **Team Charter** workspace on the **RCA Administrator** page.
- The **Team Charter** section in the **Analysis Summary** workspace, if you use the default Team Charter in an RCA.

Create a New Default Critical Success Factor

About This Task

You can create default Critical Success Factors that are specific to a certain RCA or that are generic to any RCA.

Procedure

1. Access the **RCA Administrator** page.
2. Select the **Critical Success Factors** tab.

   A list of default Critical Success Factors appears in the workspace.

	Root Cause Analysis Administrator	◀	Default Critical Success Factors

Root Cause Analysis Administrator

- Team Charter
- **Critical Success Factors**
- Default Settings
- Email Settings
- Event Color Setting
- RCA Pages Setting

Default Critical Success Factors

+   👓   🗑

	CSF
☐	A cross-functional section of plant personnel/experts will participate in the analysis.
☐	A disciplined RCFA approach will be utilized.
☐	A measurement process will be used to track the progress of approved recommendations.
☐	All analysis hypothesis will be verified or disproven.
☐	Management agrees to fairly evaluate the analysis team findings and recommendations.
☐	No one will be disciplined for honest mistakes.

1 - 6 of 6 Results   ← Page 1 of 1 →

3. In the upper-left corner of the workspace, select ✛.

   The **Add Critical Success Factor** window appears.

Add Critical Success Factor

Cancel   Save

4. As needed, enter the text that defines the Critical Success Factor, and then select **Save**.

   A new default Critical Success Factor is created.

Results

After you create a default Critical Success Factor, it appears in:

- The **Default Critical Success Factors** list in the **Critical Success Factors** workspace on the **RCA Administrator** page.
- The **Available CSFs** list in the **Analysis Summary** workspace, when you try to create a new Critical Success Factor.

Modify a Default Critical Success Factor

About This Task

You can modify a default Critical Success Factor to make it more relevant to a specific RCA, or you can modify a default Critical Success Factor to make it generic to your work process.

Procedure

1. Access the **RCA Administrator** page.
2. Select the **Critical Success Factors** tab.

   A list of default Critical Success Factors appears in the workspace.

3. In the **CSF** column, select the hyperlink to the Critical Success Factor that you want to modify.

   The **Edit Critical Success Factor** window appears.

4. As needed, modify the text, and then select **Save**.

   The Critical Success Factor is updated.

Results

After you modify a default CSF, your changes will appear in:

- The **Default Critical Success Factors** list in the **Critical Success Factors** workspace on the **RCA Administrator** page.
- The **Available CSFs** list in the **Analysis Summary** workspace, when you try to create a new Critical Success Factor.

Delete a Default Critical Success Factor

About This Task

If desired, you can delete a default Critical Success Factor that you do not want use for any RCA.

Procedure

1. Access the **RCA Administrator** page.
2. Select the **Critical Success Factors** tab.

   A list of default Critical Success Factors appears in the workspace.

Root Cause Analysis Administrator	Default Critical Success Factors
	+ 👓 🗑
	☐ CSF
Team Charter	☐ A cross-functional section of plant personnel/experts will participate in the analysis.
Critical Success Factors	☐ A disciplined RCFA approach will be utilized.
Default Settings	☐ A measurement process will be used to track the progress of approved recommendations.
Email Settings	☐ All analysis hypothesis will be verified or disproven.
Event Color Setting	☐ Management agrees to fairly evaluate the analysis team findings and recommendations.
RCA Pages Setting	☐ No one will be disciplined for honest mistakes.
	1 - 6 of 6 Results ← Page 1 of 1 →

3. Select the check boxes in the rows containing the Critical Success Factor that you want to delete.

   Tip: You can select more than one Critical Success Factor to delete.

4. In the upper-right corner of the workspace, select 🗑.

   The **Delete Critical Success Factor** dialog box appears, asking you to confirm that you want to delete the selected Critical Success Factor.

5. Select **Yes**.

   The selected Critical Success Factors are deleted.

Results

When you delete a default Critical Success Factor, it will be removed from:

- The **Default Critical Success Factors** list in the **Critical Success Factors** workspace on the **RCA Administrator** page.
- The **Available CSFs** list in the **Analysis Summary** workspace, when you try to create a new Critical Success Factor.

Specify the Tracking Evaluation Query

About This Task
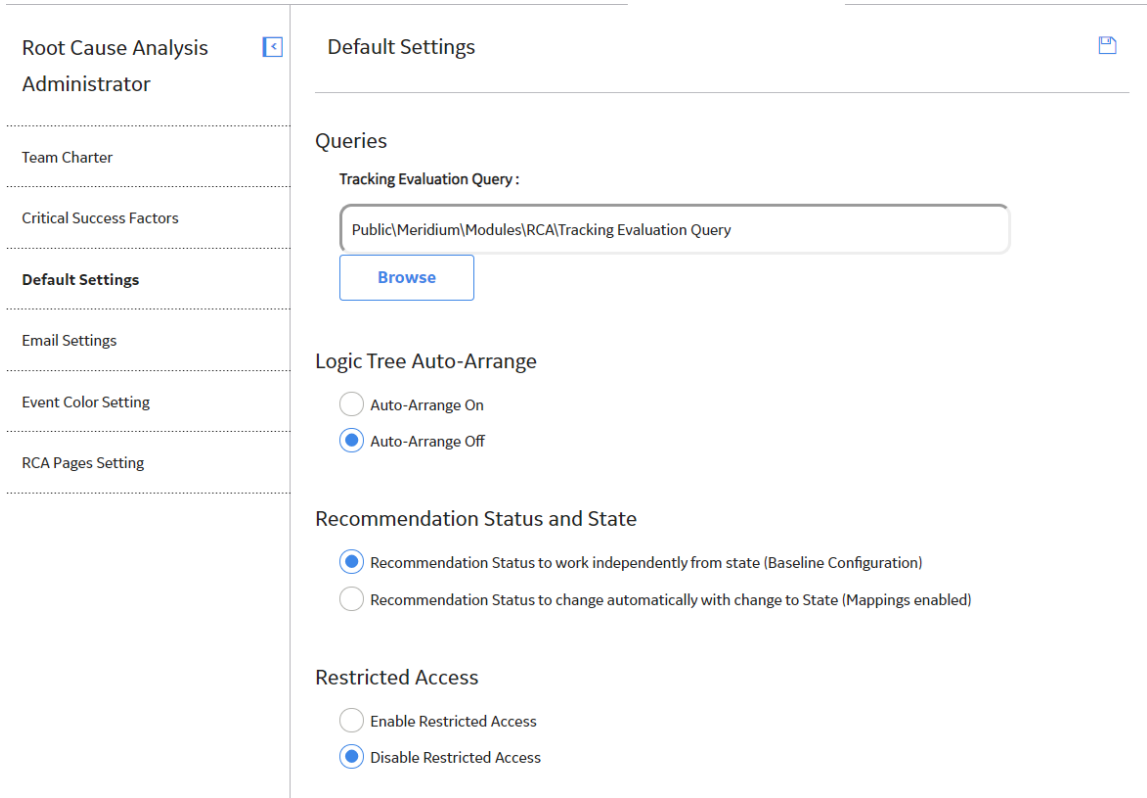
If you do not want to use the baseline Tracking Evaluation Query, then you can specify a custom Tracking Evaluation Query to track the success of a recommendation that was implemented as the result of an RCA.

Procedure

1. Access the **RCA Administrator** page.
2. Select the **Default Settings** tab.

   The default Tracking Evaluation Query appears in the workspace.

Root Cause Analysis Administrator ◁	Default Settings ✎
Team Charter	**Queries**
Critical Success Factors	Tracking Evaluation Query :
Default Settings	Public\Meridium\Modules\RCA\Tracking Evaluation Query
Email Settings	**Logic Tree Auto-Arrange**
Event Color Setting	○ Auto-Arrange On
RCA Pages Setting	● Auto-Arrange Off
	Recommendation Status and State
	● Recommendation Status to work independently from state (Baseline Configuration)
	○ Recommendation Status to change automatically with change to State (Mappings enabled)
	Restricted Access
	○ Enable Restricted Access
	● Disable Restricted Access

3. In the upper-right corner of the workspace, select ✎ .

   The default Tracking Evaluation Query appears in a box.

Root Cause Analysis Administrator

Team Charter

Critical Success Factors

Default Settings

Email Settings

Event Color Setting

RCA Pages Setting

Default Settings

Queries

Tracking Evaluation Query :

Public\Meridium\Modules\RCA\Tracking Evaluation Query

[Browse]

Logic Tree Auto-Arrange

○ Auto-Arrange On
● Auto-Arrange Off

Recommendation Status and State

● Recommendation Status to work independently from state (Baseline Configuration)
○ Recommendation Status to change automatically with change to State (Mappings enabled)

Restricted Access

○ Enable Restricted Access
● Disable Restricted Access

4. Select **Browse**.

   The **Select a query from the catalog** window appears.

Select a APM Query from the catalog

Name	^	Caption	Description	Type

Catalog

< 🔭 ⌃

Home

Personal

Public

Baseline ⌄

Client

Meridium

Public

Rules Library

Open Cancel

5. Navigate to the desired query, and then select **Open**.

The path and file name of the query appears in the **Tracking Evaluation Query** box.

6. Select 💾.

Your changes are saved.

Specify Logic Tree Auto-Arrange

Procedure

1. Access the RCA Administrator page.
2. Select the **Default Settings** tab.

The **Default Settings** workspace appears.

Root Cause Analysis
Administrator

Team Charter

Critical Success Factors

Default Settings

Email Settings

Event Color Setting

RCA Pages Setting

Default Settings

Queries

Tracking Evaluation Query :

Public\Meridium\Modules\RCA\Tracking Evaluation Query

Logic Tree Auto-Arrange

○ Auto-Arrange On

● Auto-Arrange Off

Recommendation Status and State

● Recommendation Status to work independently from state (Baseline Configuration)

○ Recommendation Status to change automatically with change to State (Mappings enabled)

Restricted Access

○ Enable Restricted Access

● Disable Restricted Access

3. Select ✎ , and then select the Logic Tree Auto-Arrange setting that you want to apply. Select one of the following options:

- **Auto-Arrange On**: The Logic Tree diagram will auto-arrange by default.
- **Auto-Arrange Off**: The Logic Tree diagram will auto-arrange only when the **Auto-Arrange** check box on the Logic Tree diagram in an RCA Analysis is selected.

4. Select 💾.

The Logic Tree Auto-Arrange setting is saved.

Configure the Email Setting

Procedure

1. Access the **RCA Administrator** page.
2. Select the **Email Settings** tab.
The **Email Settings** workspace appears.

Root Cause Analysis
Administrator

Team Charter

Critical Success Factors

Default Settings

Email Settings

Event Color Setting

RCA Pages Setting

Email Settings

Configure System Email

Define the source email address for Preserve Records, Communicate Findings and Recommendation Alerts from RCA Analysis

From

Manager@ge.com

State Management Email

Send email when user publish/unpublish RCA anlaysis.

○ Enable

● Disable

Email recipient(s)

Email subject

RCA analysis state changed - [ANALYSIS_KEY]

Email body format

The state of analysis [ANALYSIS_ID] has been changed to [STATE] by [USER] on [MI_RCA_ANALY_DATE_PUBLI_DT]

3. In the From field, enter a valid email address, and then select 💾.
   The email is saved and will now appear when you send a summary of Preserve records, findings, and Recommendation Alerts via email.

Add an Event Color Setting

You can select map specific colors to appear for different event types in the Event Timeline. After mapping a color to an event type, any Event records of that type appear in the Event Timeline in the selected color.

Procedure
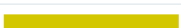
1. Access the **RCA Administrator** page.
2. Select the **Event Color Settings** tab.

   The **Event Color Setting** workspace appears, displaying the default event type settings.

Event Color Setting

	EVENT TYPE	EVENT COLOR
☐	Failure	
☐	General	
☐	Generation	
☐	Health	
☐	Human	
☐	Maintenance	
☐	Production	
☐	Safety	
☐	Shutdown	

Root Cause Analysis Administrator

- Team Charter
- Critical Success Factors
- Default Settings
- Email Settings
- **Event Color Setting**
- RCA Pages Setting

1 - 9 of 9 Results

Page 1 of 1

3. Select ╋.

The **Add New Event Color Mapping** window appears.

Add New Event Color Mapping

Event Type

Event Color

Cancel

4. In the **Add New Event Color Mapping** window:

a) In the **Event Type** drop-down list box, select an event type.
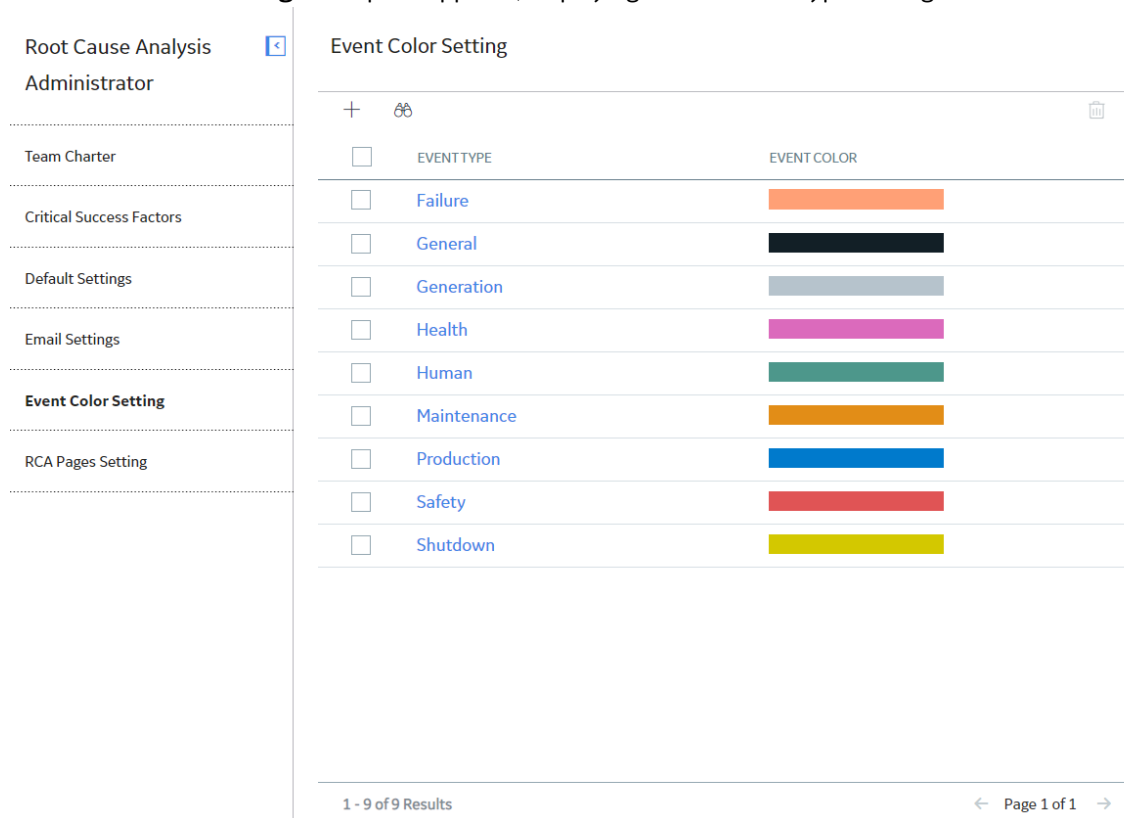
b) In the **Event Color** drop-down list box, select a color to map to the selected event type.

5. Select 💾.
    The selected color is mapped to the event type.
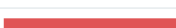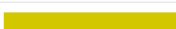
Modify an Event Color Setting

Procedure

1.
2. Select the **Event Color Settings** tab.

    The **Event Color Setting** workspace appears, displaying a list of event type settings.

Root Cause Analysis Administrator	Event Color Setting	
	＋　🔭	🗑
Team Charter	☐　EVENT TYPE	EVENT COLOR
Critical Success Factors	☐　Failure	
Default Settings	☐　General	
Email Settings	☐　Generation	
	☐　Health	
Event Color Setting	☐　Human	
RCA Pages Setting	☐　Maintenance	
	☐　Production	
	☐　Safety	
	☐　Shutdown	
	1 - 9 of 9 Results	← Page 1 of 1 →

3. In the **Event Color Setting** workspace, select the Event Type setting that you want to modify.
    The **Edit Event Color Mapping** window appears.

Edit Event Color Mapping

Event Type

Failure

Event Color

Spindle

Cancel

4. In the **Edit Event Color Mapping** window:

   a) In the **Event Type** drop-down list box, select an event type.
   b) In the **Event Color** drop-down list box, select a color to map to the selected event type.

5. Select 🖫.
   The event color mapping is modified.

Delete Event Color Settings

Procedure
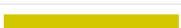
1. Access the **RCA Administrator** page.
2. Select the **Event Color Setting** tab.

   The **Event Color Setting** workspace appears, displaying a list of event type settings.

Root Cause Analysis Administrator ◁

Team Charter

Critical Success Factors

Default Settings

Email Settings

Event Color Setting

RCA Pages Setting

Event Color Setting

+	ᵔᵔ		🗑
☐	**EVENT TYPE**	**EVENT COLOR**	
☐	Failure	▬▬▬	
☐	General	▬▬▬	
☐	Generation	▬▬▬	
☐	Health	▬▬▬	
☐	Human	▬▬▬	
☐	Maintenance	▬▬▬	
☐	Production	▬▬▬	
☐	Safety	▬▬▬	
☐	Shutdown	▬▬▬	

1 - 9 of 9 Results   ← Page 1 of 1 →

3. In the **Event Color Setting** workspace, next to each event color settings that you want to delete,

   select the check box, and then select 🗑.
   A window appears, asking if you want to delete the selected event color setting.
4. Select **Yes**.
   The selected event color settings are deleted.

Configure RCA Pages Setting

You can configure which diagrams and processes appear by default within the RCA module.

Procedure

1. Access the **RCA Administrator** page.
2. Select the **RCA Pages Setting** tab.

   The **RCA Pages Setting** workspace appears.

Root Cause Analysis Administrator

Team Charter

Critical Success Factors

Default Settings

Email Settings

Event Color Setting

RCA Pages Setting

RCA Pages Setting
Select which diagram and process pages you wish to appear in the RCA Module. Deselected default pages will ...

Pages Setting

☑ **Event Timeline**

☑ **Event Diagram**

☑ **5 Whys**

3. In the **RCA Pages Settings** workspace, next to each diagram and process that you want to appear in the RCA module, select the check box.

4. Select 💾.
   The diagrams and processes page preferences are saved.

Data Loader

About the Root Cause Analysis (RCA) Data Loader

The Root Cause Analysis (RCA) Data Loader allows both primary and third-party content to be delivered to GE Digital APM through either the RCA Data Model. The imported data can then be used to maintain relationships between the RCA data and the Failure Modes and Hypotheses. Users can deploy the data loader to import:

- Legacy analysis data for performance comparisons.
- Third-party template content.

The Root Cause Analysis (RCA) Data Loader transfers data from a fixed-format Excel workbook into either the RCA Data Model or the RCA Logic Tree. The imported data can be:

- An RCA Analysis.
- An RCA Event.
- A Failure Mode.
- A Logic Gate.
- An RCA Hypothesis.
- An RCA Diagram Relationship.

Note: The Root Cause Analysis (RCA) Data Loader will not be backwards compatible to earlier versions of GE Digital APM.

About the Root Cause Analysis (RCA) Data Loader Requirements

To use the Root Cause Analysis (RCA) Data Loader, your organization must have completed the deployment of the Root Cause Analysis module.

Security Settings

The Security User performing the data load operation must be associated with either the MI Data Loader User or MI Data Loader Admin Security Role, and must also be associated with the MI PROACT Administrator Security Group or a Security Role that is associated with this Security Group.

About the Root Cause Analysis (RCA) Data Loader Data Models

RCA Data Model
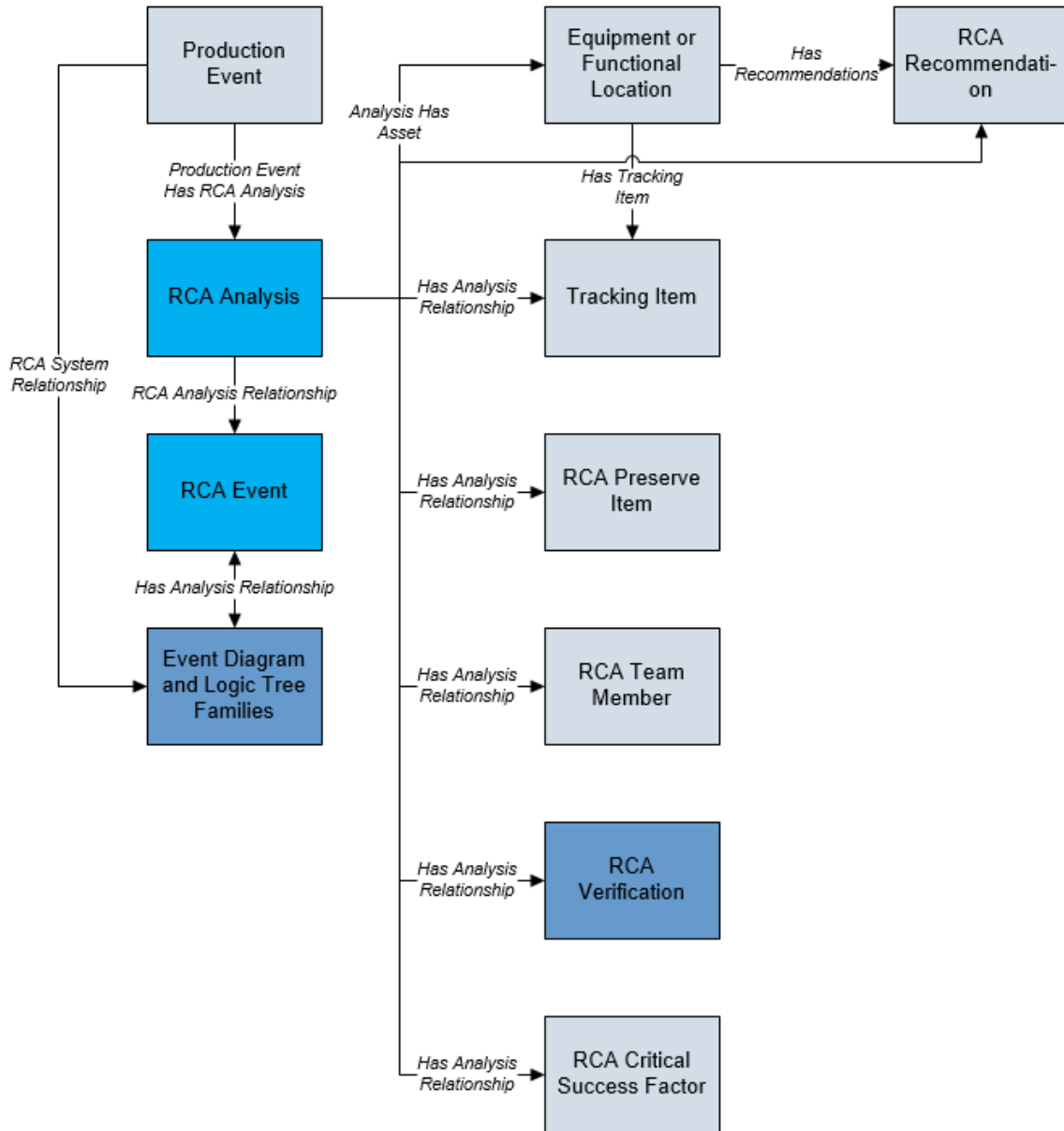
RCA Logic Tree Data Model
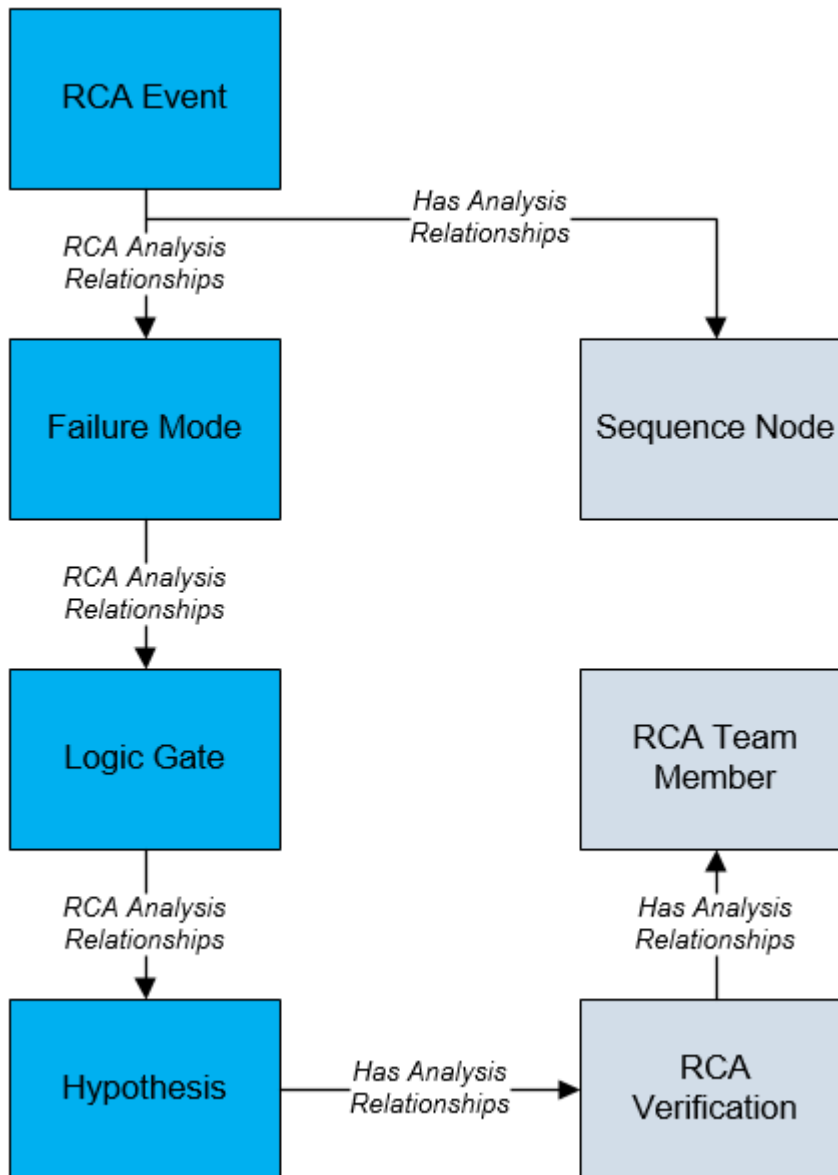
About the Root Cause Analysis (RCA) Data Loader General Loading Strategy

Best Practices

When importing data using the Root Cause Analysis (RCA) Data Loader, you must use the following best practices:

- ID fields (row 2 of each worksheet) must not include special characters or spaces.
- Columns in the worksheets should be formatted as either text or dates.

- The first two rows of each worksheet should not be edited.
- Only import a maximum of 500 analyses in each data load.

Limitations

This section documents a list of the limitations for the Root Cause Analysis (RCA) Data Loader:

1. The user must use the Root Cause Analysis (RCA) Data Loader workbook (`Root Cause Analysis (RCA).xlsx`). Any modifications made by the user to the values in column headings in any of the worksheets will not be imported.

   Note: Any column values in a customized format will not be imported by the Root Cause Analysis (RCA) Data Loader.
2. If the user imports the same data multiple times, the most recently imported data is included in the database. If a record currently resides in the database and is then reimported, the newly imported file will replace the existing file in the database. The Root Cause Analysis (RCA) Data Loader does not append the existing record.

Load Sequence

1. Create an RCA Analysis.
2. Create an RCA Event.
3. Link the RCA Event to the RCA Analysis through the RCA Analysis Relationship.
4. Create and link one or more Failure Modes to the RCA Event through the RCA Analysis Relationship.
5. Create and link one or more Logic Gates to a specific Failure Mode through the Has Analysis Relationship, where the Failure Mode is the predecessor of the Logic Gate.
6. Create and link one or more Hypotheses to a specific Logic Gate, through the Has Analysis Relationship, where the Hypothesis is the successor of the Logic Gate.

About the RCA Template Data Loader Workbook Layout and Use

In order to import data using the Root Cause Analysis (RCA) Data Loader, GE Digital provides an Excel workbook (Root Cause Analysis (RCA).xlsx) that supports baseline Root Cause Analysis in GE Digital APM. This template must be used to perform the data load. Using custom changes in code and in design, you can modify the Excel template to include custom fields used by your organization.

The following table lists the worksheets that are included in the Root Cause Analysis (RCA).xlsx workbook:

Worksheet	Description
RCA_Analysis_Template	This worksheet is used to define Analysis records.
RCA_Event	This worksheet is used to define Event records.
RCA_Failure_Mode	This worksheet is used to specify Failure Mode details.
RCA_Logic_Gate	This worksheet is used to specify Logic Gate details.
RCA_Hypothesis	This worksheet is used to specify Hypothesis details.
RCA_Diagram_Relationship	This worksheet is used to specify Diagram Relationship details.

Example: RCA Diagram Relationship

The following Logic Tree diagram depicts an RCA Diagram Relationship for a Pump Failure. The Logic Tree displays two distinct parent nodes and their subsequent child nodes:
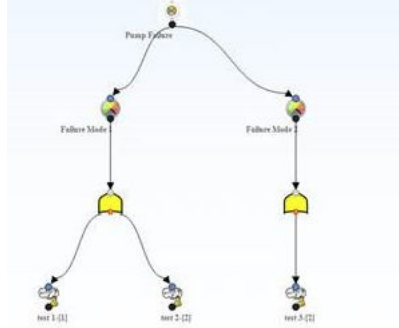
Using the Logic Tree diagram, you can parse the parent/child relationships into the RCA_Diagram_Relationship worksheet provided by the Root Cause Analysis (RCA) Data Loader workbook. Once the workbook is complete, the Root Cause Analysis (RCA) Data Loader can be employed.

RCA Template Key	Parent Node Key	Child Node Key	Parent Node Type	Child Node Type
RCA_TEMPLATE_KEY	PARENT_NODE_KEY	CHILD_NODE_KEY	PARENT_NODE_TYPE	CHILD_NODE_TYPE
1234	None	101	RCA_Analysis_Template	RCA_Event
1234	101	201	RCA_Event	RCA_Failure_Mode
1234	101	202	RCA_Event	RCA_Failure_Mode
1234	201	301	RCA_Failure_Mode	RCA_Logic_Gate
1234	202	302	RCA_Failure_Mode	RCA_Logic_Gate
1234	301	401	RCA_Logic_Gate	RCA_Hypothesis
1234	301	402	RCA_Logic_Gate	RCA_Hypothesis
1234	302	403	RCA_Logic_Gate	RCA_Hypothesis

System Code Tables

The following table lists the fields from the RCA System Codes table that must be configured:

Field Name	Field ID
Analysis Type	MI_AN_ANALY_TYPE_CHR
Hypothesis Confidence Factors	MI_RCA_HYPOTHESIS_CONFIDENCE_FACTORS
Hypothesis State	RCA_Hypothesis_State

RCA_Analysis_Template Worksheet

RCA Analysis records store basic information about a Root Cause Analysis created to track and analyze causes of Asset failures.

Field Caption	Field ID	Data Type (Length)	Comments
Analysis Description	MI_AN_SHORT_DESCR_CHR	Character (255)	None
Analysis ID	MI_AN_ANALY_ID_CHR	Character (255)	This field is required and must be unique.
Analysis Type	MI_AN_ANALY_TYPE_CHR	Character (50)	This field contains a list of the following values: • Mechanical • Operational • Quality • Safety • Environmental You can select the value that defines the type of analysis you are performing.
Comments	MI_RCA_ANALY_COMME_TX	Text	None
Cost Number	MI_RCA_ANALY_COST_NBR	Numeric	This field specifies the estimated cost of the failure event(s) you are analyzing. By default, the currency is set to $.
End Date	MI_RCA_ANALY_END_DATE_DT	Date	You can select a date using the Calendar tool. The date specified in the End Date field must be greater than the date specified in the Start Date field. The value that you enter in this field must be formatted in the following way based on your local time zone: YYYY-MM-DD HH:mm:ss (e.g. 2015-01-31 17:30:00).
Event Narration	MI_RCA_ANALY_EVENT_NARRA_TX	Text	The value of this field is information about the equipment failure.
Frequency Number	MI_RCA_ANALY_FREQU_NBR	Numeric	None

Field Caption	Field ID	Data Type (Length)	Comments
RCA Template Key	RCA_TEMPLATE_KEY	Numeric	This field is required and must be unique.
Start date	MI_RCA_ANALY_START_DATE_DT	Date	The value that you enter in this field must be formatted in the following way, dependent on your local time zone: YYYY-MM-DD HH:mm:ss (e.g., 2015-01-31 17:30:00).

RCA_Event Worksheet

RCA Event records store basic information about a failure event.

Field Caption	Field ID	Data Type (Length)	Comments
Event End Date	MI_EVENT_END_DT	Date	If the Root Cause Analysis was created from a Production Event, this field will be populated automatically with the value in the End Date field of that Production Event. Otherwise, you can define this value manually when you create the RCA Event. The date specified in the End Date field must be greater than the date specified in the Start Date field.
Event Label	MI_RCA_EVENT_LABEL_CHR	Character (255)	If the RCA was created from a Production Event, this field will be populated automatically with the value in the Headline field of that Production Event. Otherwise, you can define this value manually when you create the RCA Event. This field is required.
Event Long Description	MI_EVENT_LNG_DSC_TX	Text	If the RCA was created from a Production Event, this field will be populated automatically with the value in the Description field of that Production Event. Otherwise, you can define this value manually when you create the RCA Event.

Field Caption	Field ID	Data Type (Length)	Comments
Event Start Date	MI_EVENT_STRT_DT	Date	If the RCA was created from a Production Event, this field will be populated automatically with the value in the Start Date field of that Production Event. Otherwise, you can define this value manually when you create the RCA Event.
Event X Position Number	MI_RCA_EVENT_XPOSI_NBR	Numeric	The RCA Event Node is placed in the diagram at a predefined position, where the X Position Number is 350. A different value can be entered, but 350 is recommended.
Event Y Position Number	MI_RCA_EVENT_YPOSI_NBR	Numeric	The RCA Event Node is placed in the diagram at a predefined position, where the Y Position Number is 30. A different value can be entered, but 30 is recommended.
RCA Event Key	RCA_EVENT_KEY	Numeric	This field is required and must be unique.
RCA Template Key	RCA_TEMPLATE_KEY	Numeric	This field is required and must match the template key provided in the RCA_Analysis_Template worksheet.

RCA_Failure_Mode Worksheet

RCA Failure Mode records are possible causes associated with failure events.

Field Caption	Field ID	Data Type (Length)	Comments
Failure Mode Description	MI_RCA_FAILU_MODE_DESCR_TX	Text	The value of this field is a detailed description of the failure mode.
Failure Mode Label	MI_RCA_FAILU_MODE_LABEL_CHR	Character (255)	The name of the failure mode that you want to appear on the Logic Tree.

Field Caption	Field ID	Data Type (Length)	Comments
RCA Failure Mode Key	RCA_FAILU_MODE_KEY	Numeric	This field must contain a unique value that identifies a RCA Failure Mode. This field is required.
RCA Template Key	RCA_TEMPLATE_KEY	Numeric	This field is required and must match the template key provided in the RCA_Analysis_Template worksheet.

RCA_Logic_Gate Worksheet

RCA Logic Gate records define connections between logic nodes.

Field Caption	Field ID	Data Type (Length)	Comments
Logic Gate Type	MI_RCA_LOGIC_GATE_GATE_TYPE_CH	Character (50)	The value in this field must be either: • and • or This field is required.
Long Description	MI_RCA_LOGIC_GATE_LONG_DESCR_T	Text	The value of this field is a detailed description of the logic gate.
RCA Logic Gate Key	RCA_LOGICGATE_KEY	Numeric	This field is required and must be unique.
RCA Template Key	RCA_TEMPLATE_KEY	Numeric	This field is required and must match the template key provided in the RCA_Analysis_Template worksheet.
Short Description	MI_RCA_LOGIC_GATE_SHORT_DESCR_CHR	Character (255)	None

RCA_Hypothesis Worksheet

RCA Hypothesis records store basic information about the root cause of a failure event.

Field Caption	Field ID	Data Type (Length)	Comments
Confidence Factor Number	MI_RCA_HYPOT_CONFI_FACTO_NBR	Numeric	You can choose from the following values: • Not True (0) • Somewhat true (1) • Possibly • True (2) • Likely (3) • Highly Likely (4) • True (5) If you select a value in this field, the value that you select will appear in brackets to the right of the hypothesis name in the Logic Tree.
Description	MI_RCA_HYPOT_DESCR_TX	Text	The value of this field is a detailed description of the hypothesis.
Hypothesis State	MI_RCA_HYPOT_STATE_CHR	Character (255)	You can choose from the following states: • Hypothesis • Hypothesis True • Hypothesis Not True • Cause Human • Cause Latent • Cause Physical This field is set to Hypothesis by default.
Label	MI_RCA_HYPOT_LABEL_CHR	Character (255)	The value of this field is a description of the hypothesis as you want it to appear on the Logic Tree.
RCA Hypothesis Key	RCA_HYPOTHESIS_KEY	Numeric	This field is required and must be unique.
RCA Template Key	RCA_TEMPLATE_KEY	Numeric	This field is required and must match the template key provided in the RCA_Analysis_Template worksheet.

RCA_Diagram_Relationship Worksheet

RCA Diagram Relationship records display the parent-child relationship of the RCA families in Logic Tree diagrams.

Field Caption	Field ID	Data Type (Length)	Comments
RCA Template Key	RCA_TEMPLATE_KEY	Numeric	This field is required and must match the template key provided in the RCA_Analysis_Template worksheet.
Parent Node Key	PARENT_NODE_KEY	Numeric	The value of this field is the node key of the parent node. The parent node key is blank only when the parent-child relationship is created by an RCA Event.
Child Node Key	CHILD_NODE_KEY	Numeric	This field is required and must be unique.
Parent Node Type	PARENT_NODE_TYPE	Character (50)	This field is required.
Child Node Type	CHILD_NODE_TYPE	Character (50)	This field is required.

About the Root Cause Analysis (RCA) Data Loader Load Verification

About This Task

Following a successful data load, you can navigate to the **RCA Overview** page and view any of the imported workbooks, to view the details and logic tree associated with the workbook, and to import workbook content into an analysis.

A successful import can also be defined as an event where partial data on a worksheet was loaded into GE Digital APM, and where the user was given appropriate messaging that enabled him or her to identify and correct issues resulting from the import.

Deployment

Deployment and Upgrade

Deployment and Upgrade content for various GE Digital APM modules has been consolidated into a single document. For more information, refer to the module-specific information in the APM Module Deployment and Upgrade document.

Reference

General Reference

An Example of a Root Cause Analysis

The sections in this topic correspond to each step in the workflow for developing a Root Cause Analysis. In each section, the workflow for creating an RCA will be illustrated through examining the recurring failure(s) of a cooling water pump. The data used in each of the sections is listed in tables. In the tables, we list only the fields that contain a value. In the case of numeric fields, this includes fields that contain a value of zero (0). Fields that contain no value are not listed in the tables. The information in tables is provided for your reference.

Note: The information contained in these topics assumes that you are the user who will be performing the associated step in Root Cause Analysis and that all RCA administrative tasks have been completed.

Define criteria for when an RCA should be performed

Before you can begin conducting an RCA, you must establish the criteria that standardizes when an RCA should be performed. For example, the manager of the plant, where a cooling water pump exists, might specify criteria as:

- If any pump fails one or more times per week for more than two successive weeks, regardless of the cost for repairs, an RCA study should be conducted.

  -or-

- If any pump fails catastrophically (e.g., causes the system to shut off), an RCA should be conducted.

Now, assume that in January 2015, the bearing temperature alarm, on the outboard bearing of a cooling water pump, sounded. By the time the operator arrived, the motor bearing temperature had increased to a point that the protective bearing temperature circuit caused the pump to shut down, resulting in loss of production. According to the criteria that was developed, these conditions dictate that an RCA should be performed. The first step is to create the analysis.

Create an RCA

If water pump failure meets the criteria for requiring an RCA, the first step is to create the analysis. The user who will serve as the Principal Analyst can complete this step and initiate the development of the RCA for the recurring failures of the cooling water pump.

1. Access the **RCA Overview** page.
2. In the upper-right corner of the page, select **New Analysis**.

   A blank datasheet appears in the **Analysis Summary** workspace.

3. Enter the values in the fields on the datasheet. For this example, you should create root cause analysis that contains the information as it appears in the following table:

Field	Value
Analysis Name	Cooling Water Pump
Analysis Description	An analysis to determine the root cause of the pump overheating.
Start Date	01/06/2018
End Date	01/15/2018
Comments	Comments
Analysis Type	Mechanical
Event Narrative	Investigate what caused the motor temperature in the water pump to increase and overheat.
Cost	20,000
Frequency	1 Number 1 represents the number of failures that occurred for the cooling water pump

4. Select 💾.

The Root Cause Analysis is saved.

Link the Assets on which the RCA is based

1. In the workspace, select the **Linked Assets** tab.

   The **Linked Assets** section appears.

Analysis Summary		Pump Failure Investigation
		Last modified by MIADMIN on Wednesday, August 28, 2019 1:51 PM

Preserve Records

Event Diagram

5 Whys

Logic Tree

Event Timeline

Communicate Findings

Track

Reports

Definition · Overview · Critical Success Factors · 1 Team Members · **0 Linked Assets** · 0 Linked Events · 0 Reference Documents

	RECORD ID	FAMILY

No Data

2. Select ➕.

   The **Asset Finder** window appears.

Asset Finder

Hierarchy	Group

Search

+ ▽ Filter

▼ Home

~ +

▶ 00000-HealthMicrotesterRoot ~ TestFL20190827_12:06 +

0001-010-RF-01 ~ +

▶ 0001-010-RF-01 ~ RFID enabled Packaging Line 10 +

00-SLB-3 ~ Sludge processing - postthickening +

01-B02-1 ~ Compressor +

~ ~ Z_PLA Causing Asset 1 Equipment ID ✕

Cancel   **Done**

3. Search for PUMP and select it.

   PUMP is listed in the **Linked Assets** section.

Select the members of the RCA team

1. Access the **Team Members** section.

2. Select ✎ .

   The list of human resources appears in the left section and the list of team members appears in the right section.

Analysis Summary

- Preserve Records
- Event Diagram
- 5 Whys
- Logic Tree
- Event Timeline
- Communicate Findings
- Track
- Reports

Pump Failure Investigation
Last modified by MIADMIN on Wednesday, August 28, 2019 1:51 PM

| Definition | Overview | Critical Success Factors | 1 Team Members | 0 Linked Assets | 0 Linked Events | 0 Reference Documents |

	Photo	Member		Photo	Member	Role
☐		f a	☐		Meridium Admi...	Principal
☐		Frank Ab... fabler@...				
☐		ACA RC...				

3. From the list of human resources, select the check box to the left of the following names to add as team members:

   - The analyst, Suzie Jones, to help gather information surrounding the failure.
   - The mechanic, Pete Handy, because he will repair the cooling water pump.
   - The engineer, Bob Speck, because he is an expert on systems and safety guidelines.

4. Select ⤴.

   The selected names are added to the list of team members in the right section.

   The Principal Analyst is Jane Doe, who is an expert on facilitating team discussion and documenting discussion notes.

   Note: By default, the human resource that created an analysis will be added automatically as a team member and assigned the Principal Analyst role. You can change the Principal Analyst for an RCA.

Add Critical Success Factors

1. In the workspace, select the **Critical Success Factors** tab.
   The **CSF** section appears.

Analysis Summary ◁	Pump Failure Investigation											

Analysis Summary ◁

Pump Failure Investigation
Last modified by MIADMIN on Wednesday, August 28, 2019 1:51 PM

Definition	Overview	Critical Success Factors	1	Team Members	0	Linked Assets	0	Linked Events	0	Reference Documents

Preserve Records

Event Diagram

5 Whys

Logic Tree

Event Timeline

Communicate Findings

Track

Reports

+ 🔍

Factors   🗑

CSF

No Data

2. In the upper-left corner of the workspace, select ┼.

The **Available CSFs** and the **CSFs for this Analysis** subsections appear. The **Available CSFs** subsection contains the following Critical Success Factors that an administrative user has pre-configured for use with RCA:

- A cross-functional section of plant personnel/experts will participate in the analysis.
- A disciplined RCFA approach will be utilized.
- A measurement process will be used to track the progress of approved recommendations.
- All analysis hypothesis will be verified or disapproved.
- Management agrees to fairly evaluate the analysis team findings and recommendations.
- No one will be disciplined for honest mistakes.

Specify the Team Charter

1. In the workspace, select the **Definition** tab.

   The **Definition** section appears.

2. In the **Charter** field, enter the following text:

   To identify the root causes of the cooling water pump failure. This includes identifying deficiencies in or lack of management systems. Necessary recommendations for root causes will be communicated to the management for rapid resolutions.

3. Select ⊡.

   The **Charter** field is updated.

Preserve Failure Event Data

You can preserve failure event data by creating an RCA Preserve Record, which contains a data-collection task that should be completed by the team member to whom the Preserve Record is assigned. Each task can be categorized according to the 5 P's (i.e., Parts, Paper, People, Position, Paradigms), which indicates the type of data that should be collected.

1. In the left pane, select the **Preserve Records** tab.

   The **Preserve Records** workspace appears.

2. In the upper-left corner of the workspace, select ＋.

   The **New Preserve Record** window appears.

Z_Analysis for Alert Generation
Last modified by ▭ on Tuesday, November 15, 2011 3:51 PM

Preserve Records

Event Diagram

5 Whys

Logic Tree

Event Timeline

Communicate Findings

Track

Reports

New Preserve Record

Assigned to : Choose Assigned To ⌄

3. In the **Assigned to** list, select the team member to whom you want to assign the Preserve Records, and then enter values in the available fields on the Preserve Records datasheet.

For this example, you should create RCA Preserve records that contain the information as it appears in each of the following tables:

RCA Preserve Record 1	
Field	Value (s)
Assigned To	Pete Handy
Data Category	Parts
Data to Collect	The pieces of the cooling water pump that could have caused the pump to overheat.
Collection Strategy	Document (pictures and observations) the condition of the components of the pump.
Date Due	01/08/2018
Send Alert on Due Date?	True
Days Before Due Date to Be Notified	1
Frequency of Alert After Due Date	Daily
Alert Email Body	This is a reminder to gather and document the pieces of the pump that could have caused the pump to overheat and report back to the team.
Completed?	No
Date Completed	N/A

RCA Preserve 2	
Field	Value (s)
Assigned To	Suzie Jones
Data Category	Paper
Data to Collect	Standard operating procedures and frequent failure information
Collection Strategy	Research
Date Due	01/9/2018
Send Alert on Due Date?	True
Days Before Due Date to Be Notified	1
Frequency of Alert After Due Date	Daily
Alert Email Body	This is a reminder to gather the standard operating procedures and frequent failure information and report back to the team.
Completed?	No
Date Completed	N/A

RCA Preserve Record 3	
Field	Value (s)
Assigned To	Bob Speck
Data Category	People
Data to Collect	Operating procedures used by those who maintain the pump.
Collection Strategy	Interview the floor operators who are assigned to the pump.
Date Due	01/10/2018
Send Alert on Due Date?	True
Days Before Due Date to Be Notified	1
Frequency of Alert After Due Date	Daily
Alert Email Body	This is a reminder to interview operators assigned to the pump and document their operating procedures and report back to the team.
Completed?	No
Date Completed	N/A

RCA Preserve Record 4	
Field	Value (s)
Assign To	Bob Speck
Data Category	People
Data to Collect	Environment surrounding the pump.
Collection Strategy	Tools, pictures, diagrams
Date Due	01/10/2018
Send Alert on Due Date?	True
Days Before Due Date to Be Notified	1
Frequency of Alert After Due Date	Daily
Alert Email Body	This is a reminder to investigate the environment where the pump exists and report back to the team.
Completed?	No
Date Completed	N/A

RCA Preserve Record 5	
Field	Value (s)
Assigned To	Jane Doe (Principal Analyst)
Data Category	Paradigms
Data to Collect	Common assumptions made when a pump fails.
Collection Strategy	Research and interview.
Date Due	01/10/2018
Send Alert on Due Date?	False
Completed?	No
Date Completed	N/A

After each team member has collected the data that is specified in the RCA Preserve Record, they should record their findings for the rest of the team through artifacts, including Reference Documents and hard copies of documents. After all the RCA Preserve Records have been completed, the team can begin to analyze the data.

Analyzing data

After the team has preserved the failure data, the team can begin to analyze the data. To help you visualize the event and organize the team's hypotheses and analysis, you should create an Event Diagram or a Logic Tree depending on your requirement. For our example, we will create a Logic Tree diagram.

1. In the left pane, select the **Logic Tree** tab.
   A blank datasheet appears.

2. Enter the following values:

Field	Value (s)
Event End Date	01/15/2018
Event ID	RCA-01/15/2018 **Note:** The Event ID field is populated automatically with the date the is created and is disabled so that value cannot be changed. If you choose to re-create this example RCA Event, your Event ID value will be different from the value listed here.
Event Start Date	01/06/2018
Label	Overheating in Pump 1
Long Description	Investigate the cause of a cooling water pump to overheat and shut down the system.

3. Select 🖫.

   The Failure Event node appears in the design canvas in the **Logic Tree** workspace.
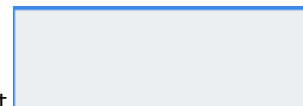
4. In the upper portion of the workspace, in the **Palette** section, select [_____], and then use the drag-and-drop method to add the icon to the Failure Event node in the design canvas.

5. Select the Failure Mode that you added.

   The Properties window appears.

6. Enter the following information to define the Failure Mode, and then select 🖫:

RCA Failure Mode ID	Value (s)
No Spare Parts	**Label**: No Spare Parts **Description**: No spare parts caused the pump to be out of commission for a longer amount of time.

7. Add another Failure Mode using the following information:

RCA Failure Mode ID	Value (s)
Motor tripped due to high temperature.	**Label**: Motor tripped due to high temperature. **Description**: The motor shut off because the temperature became too hot and the system was shut down.

8. Diagram the events that led up to and immediately followed the failure event. For this example, you would create the Event Diagram as shown in the following image. The team should note the trend in the failures that occurred in the past. In this way, the team may be able to identify a pattern in the events prior to the RCA that may indicate the underlying cause(s) for these failures.
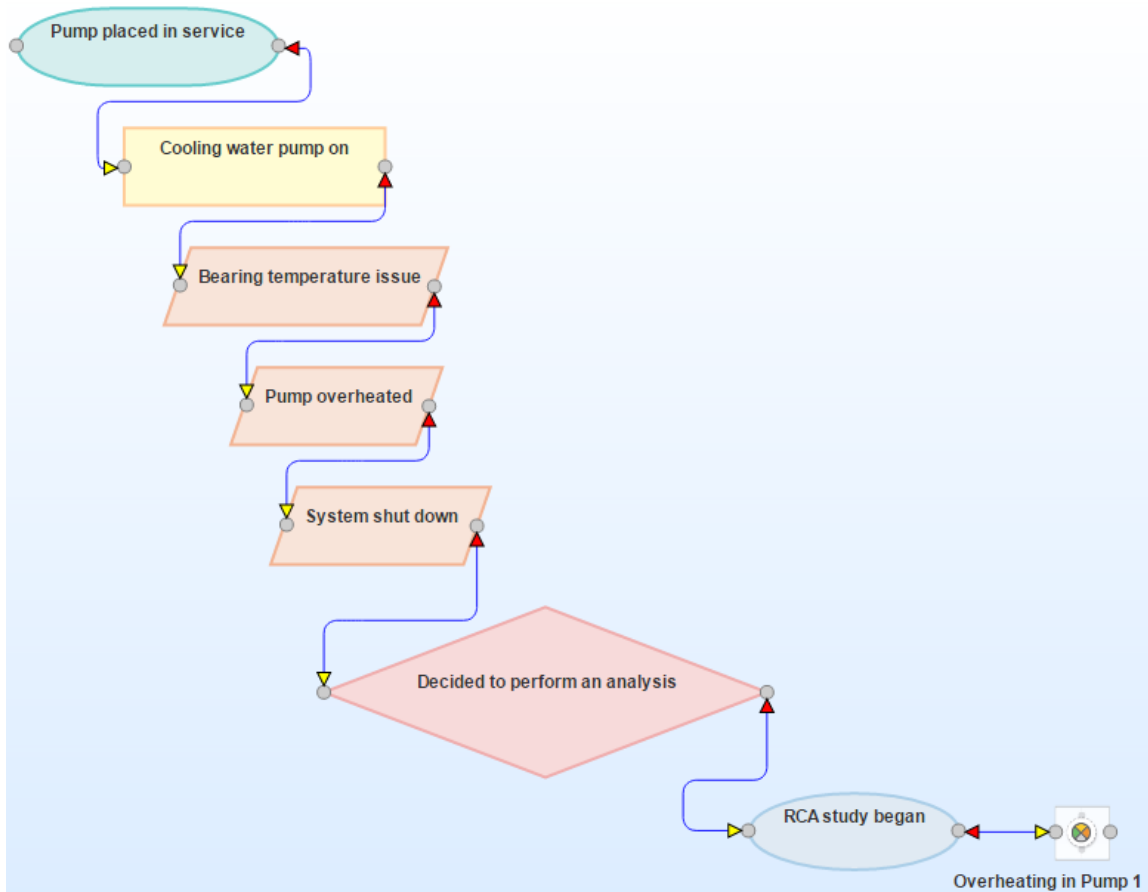
This example contains nine RCA Sequence Nodes, which are displayed on the Event Diagram.

Sequence Nodes in Event Diagram

For each RCA Sequence Node, the following table lists the type of node and the values that exist in the RCA Sequence Node.

Type of Node	Values
Start/Finish	**Label**: Pump place into service **Event Start Date**: 1/1/2014 12:00 AM **Event End Date**: 1/1/2014 12:00 AM
Process	**Label**: Cooling water pump turned on daily **Event Start Date**: 1/1/2014 12:00 AM **Event End Date**: 1/6/2015 12:00 AM
Operation	**Label**: Bearing Temperature Alarm sounded **Event Start Date**: 1/6/2015 12:00 AM **Event End Date**: 1/6/2015 12:00 AM
Operation	**Label**: Pump Overheated **Event Start Date**: 1/6/2015 12:00 AM **Event End Date**: 1/6/2015 12:00 AM
Operation	**Label**: System shut down **Event Start Date**: 1/6/2015 12:00 AM **Event End Date**: 1/6/2015 12:00 AM
Decision	**Label**: Decided to perform an analysis **Event Start Date**: 1/6/2015 12:00 AM **Event End Date**: 1/6/2015 12:00 AM
Start/Finish	**Label**: RCA Study began **Event Start Date**: 1/6/2015 12:00 AM **Event End Date**: 1/16/2015 12:00 AM

9. At the top of the workspace, in the **Palette** section, select

above the design canvas, and then use the drag-and-drop method to add the icon to the Hypothesis in the design canvas.

10. Select the Hypothesis that you added.
    The **Properties** window appears.

11. Enter the following information to define each of the Hypotheses required for our example.

RCA Hypothesis ID	Value (s)
Level 1	
Mechanical	**Label**: Mechanical **Descriptions**: The increase in temperature was due to a mechanical failure. **Confidence Factor**: Likely (3) **State**: Hypothesis True
Electrical	**Label**: Electrical **Descriptions**: The increase in temperature was due to an electrical failure. **Confidence Factor**: Possibly True (2) **State**: Hypothesis Not True
Level 2	
Outboard bearing	**Label**: Outboard bearing **Descriptions**: The outboard bearing had a mechanical problem. **Confidence Factor**: Highly Likely (4) **State**: Hypothesis True
Inboard bearing	**Label**: Inboard bearing **Descriptions**: The inboard bearing had a mechanical problem. **Confidence Factor**: Somewhat True (1) **State**: Hypothesis Not True
Level 3	
Erosion	**Label**: Erosion **Descriptions**: The outboard bearing eroded after overuse. **Confidence Factor**: Somewhat True (1) **State**: Hypothesis Not True
Corrosion	**Label**: Corrosion **Descriptions**: The outboard bearing corroded and was rusty. **Confidence Factor**: Somewhat True (1) **State**: Hypothesis Not True
Fatigue	**Label**: Fatigue **Descriptions**: The outboard bearing was overheated due to a weakness of materials. **Confidence Factor**: Highly Likely (4) **State**: Hypothesis Not True

RCA Hypothesis ID	Value (s)
Level 4	
Misalignment	**Label**: Misalignment **Descriptions**: The outboard bearing was not aligned correctly. **Confidence Factor**: Possibly True (2) **State**: Hypothesis Not True
Loose Bolts	**Label**: Loose Bolts **Descriptions**: Bolts were loose and caused the outboard bearing to become loose. **Confidence Factor**: Possibly True (2) **State**: Hypothesis Not True
Lubrication Issue	**Label**: Lubrication Issue **Descriptions**: The outboard bearing was not receiving the right amount of lubrication. **Confidence Factor**: Highly Likely (4) **State**: Cause Physical
Level 5	
Leak	**Label**: Leak **Descriptions**: The lubricant was leaking from the pump. **Confidence Factor**: Possibly True (2) **State**: Hypothesis Not True
Too Much Applied	**Label**: Too much applied **Descriptions**: There was too much lubricant, causing, the bearing to operate too quickly and overheat. **Confidence Factor**: Possibly True (2) **State**: Hypothesis Not True
Too Little Applied	**Label**: Too little applied **Descriptions**: There was not enough lubricant, causing friction and an increase in temperature. **Confidence Factor**: Likely (3) **State**: Cause Human
Level 6	
Poor Training	**Label**: Poor training **Descriptions**: Workers were not properly training on applying lubricant to the bearing. **Confidence Factor**: Possibly True (2) **State**: Hypothesis Not True

RCA Hypothesis ID	Value (s)
Inadequate Procedures Documented	**Label**: Inadequate Procedures Documented **Descriptions**: Workers are referencing procedure documentation that is not clear. **Confidence Factor**: Possibly True (2) **State**: Hypothesis Not True
Worker Fatigue	**Label**: Worker Fatigue **Descriptions**: Workers are overworked and are not able to perform at an acceptable level. **Confidence Factor**: Likely (3) **State**: Cause Physical
Inadequate Accountability of Workers	**Label**: Inadequate Accountability of Workers **Descriptions**: Workers are not being held accountable for the maintenance procedures they are required to perform. **Confidence Factor**: Highly Likely (4) **State**: Cause Latent

Diagram each failure mode in detail. For this example, you would create a Logic Tree like the one shown in the following image:
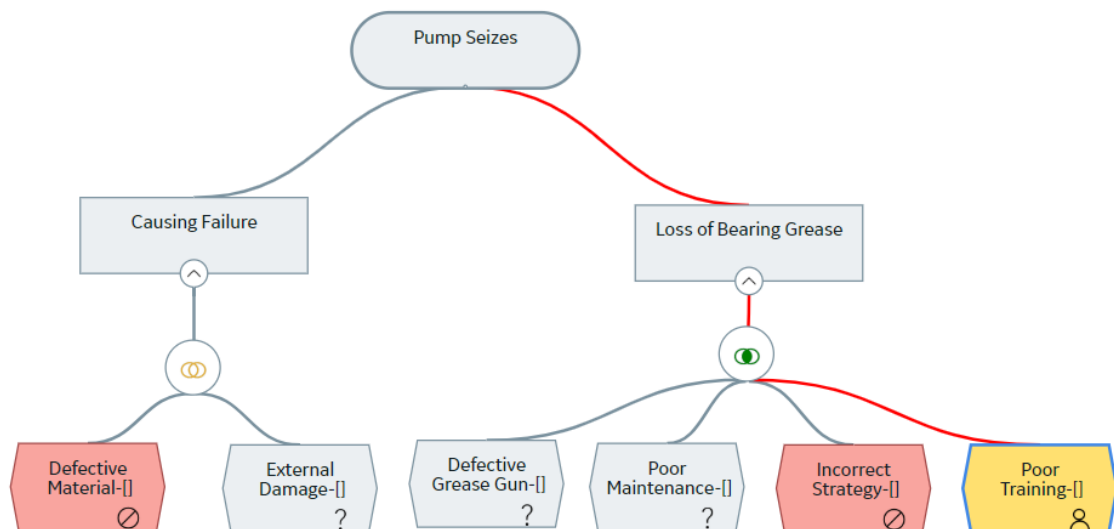
In the Logic Tree in this image, you can see that two Failure Mode nodes are linked to the Failure Event node, and multiple Hypothesis nodes are linked to the Motor Tripped due to high temperature Failure Mode node.

This example contains four RCA Logic Gates, which represent Logic Gate nodes and are used in the Logic Tree. You must enable Logic Gates to view them on the Logic Tree.

Example Data in Logic Gates

In the following table, the Logic Gates are numbered as they appear in the Logic Tree from left to right. For each RCA Logic Gate, the table displays the value in the Gate Type field of the RCA Logic Gate and identifying information about the node (e.g., RCA Failure Mode) to which it is linked.

RCA Logic Gate	Value Specified	Linked To
1	**Gate Type**: OR	**RCA Failure Mode**: Motor tripped due to high temperature **RCA Hypothesis**: Mechanical **RCA Hypothesis**: Electrical
2	**Gate Type**: OR	**RCA Failure Mode**: Motor tripped due to high temperature **RCA Hypothesis**: Mechanical **RCA Hypothesis**: Inboard bearing **RCA Hypothesis**: Outboard bearing
3	**Gate Type**: OR	**RCA Failure Mode**: Motor tripped due to high temperature **RCA Hypothesis**: Outboard bearing **RCA Hypothesis**: Corrosion **RCA Hypothesis**: Erosion **RCA Hypothesis**: Fatigue
4	**Gate Type**: OR	**RCA Failure Mode**: Motor tripped due to high temperature **RCA Hypothesis**: Fatigue **RCA Hypothesis**: Loose Bolts **RCA Hypothesis**: Lubrication Issue **RCA Hypothesis**: Misalignment
5	**Gate Type**: OR	**RCA Failure Mode**: Motor tripped due to high temperature **RCA Hypothesis**: Lubrication Issue **RCA Hypothesis**: Leak **RCA Hypothesis**: Too Little Applied **RCA Hypothesis**: Too Much Applied
6	**Gate Type**: OR	**RCA Failure Mode**: Motor tripped due to high temperature **RCA Hypothesis**: Too Little Applied **RCA Hypothesis**: Inadequate Accountability of Workers **RCA Hypothesis**: Inadequate Procedures Documented **RCA Hypothesis**: Poor Training **RCA Hypothesis**: Worker Fatigue

Now that several likely hypotheses have been introduced, the team will need to rule out hypotheses. To rule out a hypothesis or prove a hypothesis, the hypothesis will need to be tested against the data that is available to the team (i.e., the failure event data and the team of experts).

As described in the next step, the Principal Analyst should create RCA Verifications and assign them to team members who will be responsible for completing the associated task.

12. Select the Hypothesis that you want to verify.
13. In the lower-left corner of the workspace, select the **Verifications** tab.

    The **Verifications** pane appears.
14. Above the list, select ✛.

    The **Create Verification** pane appears.
15. In the **Assigned to** list, select the team member to whom you want to assign the Verification.

    A blank datasheet appears.
16. Enter the details in the available fields based on the following information to define each of the

    Verification required for our example, and then select 💾.

RCA Verification ID	Values Specified
Inspect wiring to make sure that the cause was not electrical.	**Due Date**: 1/10/2015 **Method**: Inspect wiring to make sure that the cause was not electrical. **Completed**: No
Perform a metallurgical analysis to determine why the bearing failed.	**Due Date**: 1/10/2015 **Method**: Perform a metallurgical analysis to determine why the bearing failed. **Completed**: False

The following image shows an example of an RCA Verification that contains a task to test the Mechanical hypothesis.

The task defined in this RCA Verification instructs the team member to inspect the wiring for the cooling water pump to ensure that the problem was not electrical, but mechanical.

When a hypothesis has been tested, you must change the state of the associated RCA Hypothesis, as described in the next step.

17. Select the Hypothesis whose state you want to change.

18. At the top of the workspace, in the **States** panel, select one of the following options, and then select 💾 :

- **Hypothesis True** if the hypothesis has been confirmed. After you determine a hypothesis to be true, you can identify the root cause of the Failure Event.
- **Hypothesis Not True** if the hypothesis has been ruled out.

For example, the following image shows the Logic Tree after Pete Handy has completed the RCA Verification to which he was assigned. Pete Handy concluded that the wiring did not the cause the pump to overheat, so the problem must be mechanical.
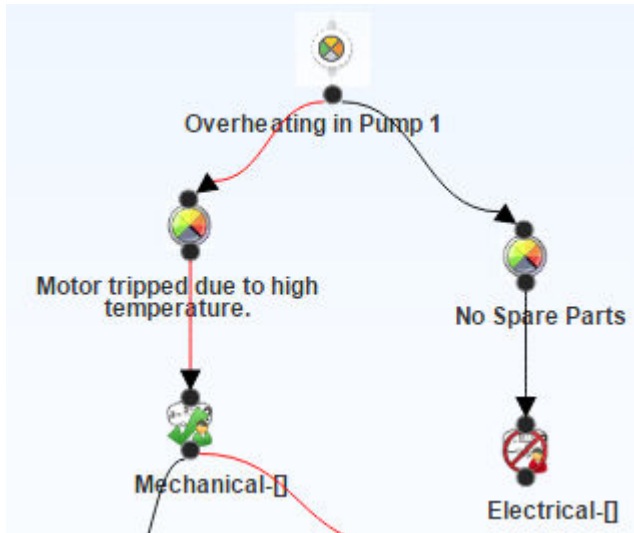
After the state of the Mechanical RCA Hypothesis is set to True, the team can continue down the Logic Tree until they identify the root cause. Causes can be further identified as physical, human, or latent. For example, the following image shows the Logic Tree after ALL the RCA Verifications have been completed. The team has concluded that inadequate accountability of workers has led to insufficient lubricant being applied to the outboard bearing, which caused the motor's temperature to increase and the pump to overheat.
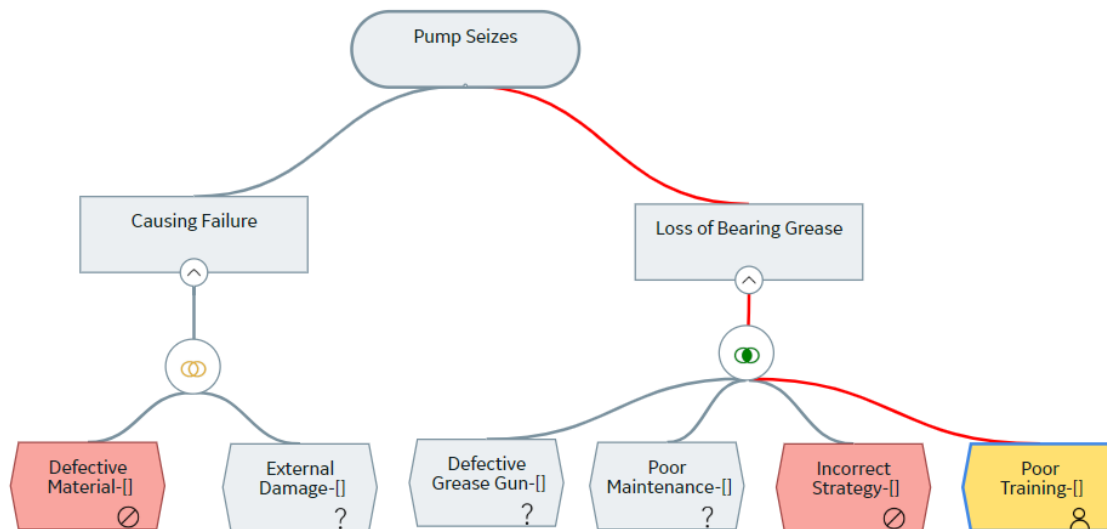
In this case, the root cause for the pump failure would be identified as latent (i.e., inadequate accountability of workers), which lead to human (i.e., too little applied) and physical (i.e., lubrication issue) causes. Now that a hypothesis has been verified and the root cause has been determined, you can create RCA Recommendations to communicate your findings on how to prevent this failure in the future.

If the hypothesis is not true but you cannot rule out the hypothesis and set the state to False, you can assign a probability to the hypothesis to include the team in determining the possibility of the hypothetical cause.

Communicating findings and recommendations

Now that the team has determined the root cause of the cooling water pump failure to be inadequate accountability of workers, you will want to record your findings and create RCA Recommendations. After recommendations have been implemented, you can share the results of the RCA with others. You can access the **RCA Overview** page to view the financial effects of implementing the recommendations. For our example, we will create one Recommendation record.

1. Access the Root Cause Analysis for which you want to create a recommendation.

2. In the upper-right corner the workspace, select the .
   The **Recommendations** pane appears.

3. Select ＋.
   The RCA Recommendation datasheet appears.

4. On the **General Information** tab, enter the following details in the available fields:

Field	Description
Alert Responsible Party When Due?	True
Analysis ID	Cooling Water Pump
Assigned to Name	Suzie Jones
Author Name	Jane Doe
Business Impact	Production (PRODUCTION)
Cause	Inadequate accountability of workers.
Cause Type	Cause Latent
Days Before Due Date To Be Alerted?	4
Final Approver Name	Jane Doe
Frequency of Alert After Due Date	Daily
Implementation Alert Text	You have less than 4 days to complete the new required report.
Mandatory Date	2/28/2015
Recommendation Description	This report will require workers to document each time they perform a routine procedure, which will hold them accountable for pump maintenance.
Recommendation Headline	Create a new performed maintenance report.
Recommendation ID	REC-1376
Recommendation Priority	Medium (Medium)
Required Equipment Status	On-Line (ON-LINE)
Reviewer Name	Jane Doe

Field	Description
Status	Created (CREATED)
Target Completion Date	Monday, February 20, 2015

5. If you want to schedule a recommendation alert email to be sent to a specified recipient, select the **Alert** tab, and enter the necessary information on the datasheet.

6. Select 💾.
   The RCA Recommendation is saved to the database and linked to the analysis for the selected Root Cause analysis.

After you have successfully identified the root causes associated with the failure that was investigated, you can communicate the findings and propose recommendations to the appropriate individuals within your organization. You can communicate the findings via a hyperlink to the analysis or via a summary report through email to selected recipients.

Tracking Results

After the RCA findings have been communicated and the recommendation has been implemented, the team will want to track the effectiveness of the recommendation to see if the new report has prevented the cooling water pump from failing thus far. Tracking for results involves creating RCA Tracking Items, scheduling the Tracking Evaluations in the GE Digital APM Schedule Manager, and modifying the existing recommendation or creating a new one based on the discoveries that are made through reevaluation.

For our example, we will create one tracking item.

1. Access the RCA within which you want to create a new Tracking Item.
2. In the left pane, select the **Track** tab.
   The **Track** workspace appears.
3. In the upper-left corner of the workspace, select ➕.
   The **Add/Edit Tracking Item** window appears, displaying a blank datasheet.
4. Enter the following information in the available fields:

Field	Description
Active	True
Start Date	3/1/2015
Count	2
Cost	10,000
Alert	Williams, Bob **Note:** Williams, Bob will receive an e-mail that alerts him that the performance of the cooling pump has again fallen below the tolerable limits or that the corrective actions from the first RCA were ineffective.

Field	Description
Message Subject	Cooling Water Pump Improvement
Message Text	Cooling water pump 1 has failed and needs to be re-evaluated. The reason for the failure is that the performance of the cooling pump has again fallen below the tolerable limits or that the corrective actions from the first RCA were ineffective.

5. Select 🖫.
   The Tracking Item is saved.

RCA Data Model

The Root Cause Analysis data model uses families to represent the various components of an RCA, as defined by the standard, accepted PROACT for RCA methodology. GE Digital APM leverages its fundamental entity and relationship family infrastructure to store data related to an RCA.

Each RCA is represented at the root level by an RCA. The RCA can be linked to an RCA Event through the RCA Relationship. RCA Events can, in turn, be linked to RCA Failure Modes, RCA Sequence Nodes, and so on for all components of the RCA. Together, the RCA and all the records that are linked to it, either directly or indirectly, make up the Root Cause Analysis.

The following image shows the entity families and relationship families that are used to create an RCA.
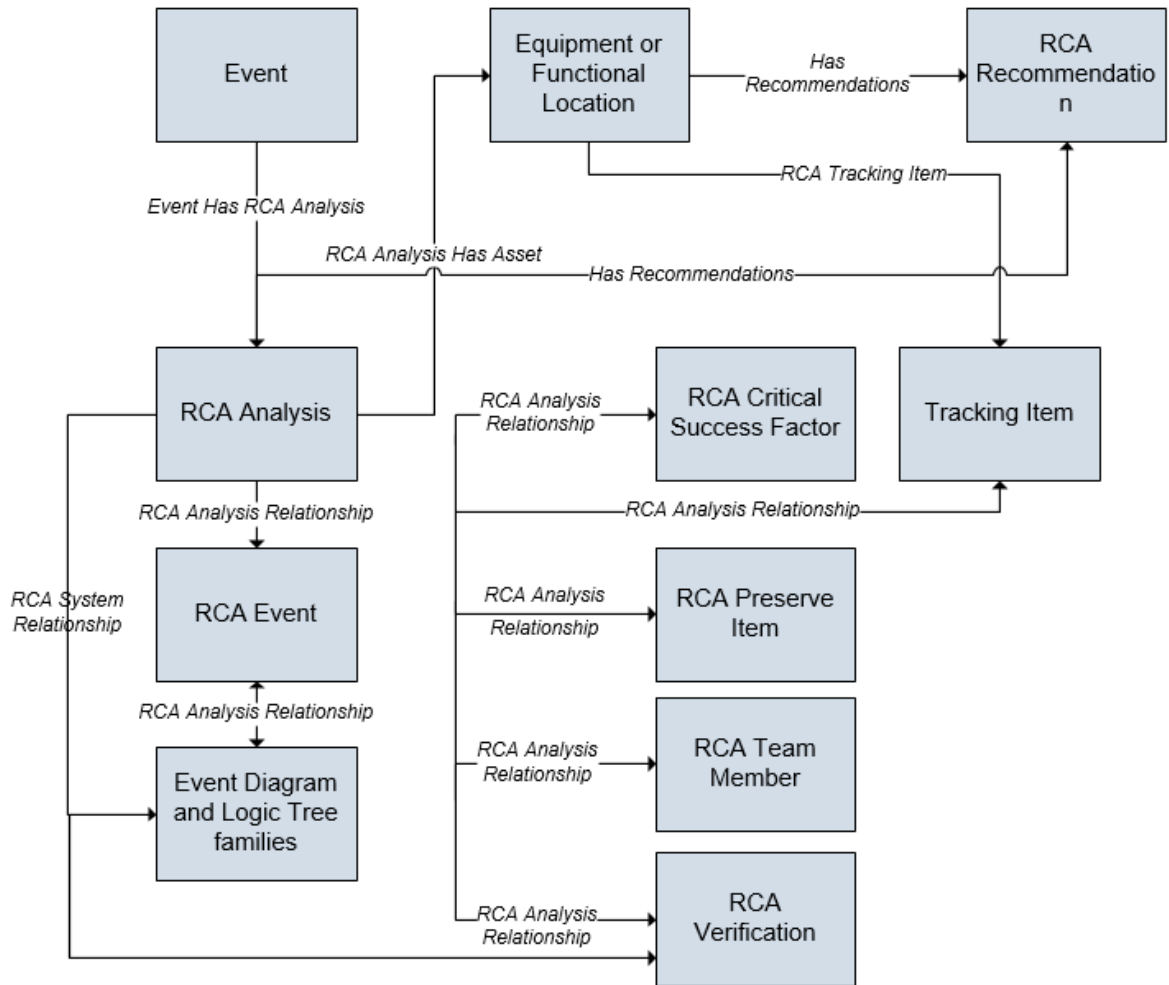
Note: In the diagram, boxes represent entity families and arrows represent relationship families that are configured in the baseline database. You can determine the direction of the each relationship definition from the direction of the arrow head: the box from which the arrow originates is the predecessor, and the box to which the arrow head points is the successor.

Note: RCA Recommendations can be linked to any Equipment and any Functional Location. They may or may not be the same Equipment or Functional Locations that are linked to the RCA.

The Root Cause Analysis Best Practice specifies that you will create RCA Analyses either for equipment or functional locations. Either option may be valid, depending on the analysis. Throughout the RCA documentation, we assume that you are following the GE Digital APM best practice and storing your equipment and functional location information in Equipment and Functional Location records. Additionally, we assume that you are following the RCA Best Practice and linking your RCA records to either Equipment or Functional Location records.

In addition to the relationships that appear in this image, records in the following families can be linked to records in the RCA Reference Document family through a relationship definition on the Has Reference Documents family:

- RCA Analysis
- RCA Critical Success Factor
- RCA Event
- RCA Failure Mode

- RCA Preserve Item
- RCA Recommendation
- RCA Team Member
- RCA Tracking Item
- RCA Verification

Additionally, the following families are used by the RCA module but are not related to any other family in the data model:

- The RCA Image family is used to display an image of the Event Diagram and the Logic Tree in the Comprehensive Analysis Report.
- The Alert family is used to send alert emails.

RCA Security Groups

The following table lists the baseline Security Groups available for users within this module, as well as the baseline Roles to which those Security Groups are assigned.

Important: Assigning a Security User to a Role grants that user the privileges associated with all of the Security Groups that are assigned to that Role. To avoid granting a Security User unintended privileges, before assigning a Security User to a Role, be sure to review all of the privileges associated with the Security Groups assigned to that Role. Also, be aware that additional Roles, as well as Security Groups assigned to existing Roles, can be added via Security Manager.

Security Group	Roles
MI PROACT Viewer	MI APM Viewer
MI PROACT Team Member	MI FE PowerUser MI FE User
MI PROACT Administrator	MI FE Admin MI FE PowerUser MI FE User MI APM Viewer

The baseline family-level privileges that exist for these Security Groups are summarized in the following table.

Family	MI PROACT Administrator	MI PROACT Team Member	MI PROACT Viewer
Entity Families			
Equipment	View	View	View
Functional Location	View	View	View
Human Resource	View, Update, Insert	View, Update, Insert	View
Notification	View, Update, Insert, Delete	View, Update, Insert, Delete	View
RCA Analysis	View, Update, Insert, Delete	View, Update, Insert, Delete	View
RCA Build List Item	View, Update, Insert, Delete	View, Update, Insert, Delete	View
RCA Critical Success Factor	View, Update, Insert, Delete	View, Update, Insert, Delete	View

Family	MI PROACT Administrator	MI PROACT Team Member	MI PROACT Viewer
RCA Event	View, Update, Insert, Delete	View, Update, Insert, Delete	View
RCA Failure Mode	View, Update, Insert, Delete	View, Update, Insert, Delete	View
RCA Hypothesis	View, Update, Insert, Delete	View, Update, Insert, Delete	View
RCA Image	View, Update, Insert, Delete	View, Update, Insert, Delete	View
RCA Logic Gate	View, Update, Insert, Delete	View, Update, Insert, Delete	View
RCA Preserve Item	View, Update, Insert, Delete	View, Update, Insert, Delete	View
RCA Recommendation	View, Update, Insert, Delete	View, Update, Insert, Delete	View
RCA Sequence Node	View, Update, Insert, Delete	View, Update, Insert, Delete	View
RCA Team Member	View, Update, Insert, Delete	View, Update, Insert, Delete	View
RCA Tracking Item	View, Update, Insert, Delete	View, Update, Insert, Delete	View
RCA Verification	View, Update, Insert, Delete	View, Update, Insert, Delete	View
Reference Document	View, Update, Insert, Delete	View, Update, Insert, Delete	View
Security User	View	View	View
Relationship Families			
Has Consolidated Recommendations	View	View	View
Has Recommendations	View, Update, Insert, Delete	View, Update, Insert, Delete	View
Has Reference Documents	View, Update, Insert, Delete	View, Update, Insert, Delete	View
Is a User	View, Update, Insert	View, Update, Insert	View
Group Assignment	View, Update, Insert	View, Update, Insert	View
Production Event Has RCA Analysis	View, Update, Insert, Delete	View, Update, Insert, Delete	View
RCA Analysis Has Asset	View, Update, Insert, Delete	View, Update, Insert, Delete	View
RCA Analysis Relationships	View, Update, Insert, Delete	View, Update, Insert, Delete	View
RCA System Relationships	View, Update, Insert, Delete	View, Update, Insert, Delete	View
RCA Tracking Item Relationships	View, Update, Insert, Delete	View, Update, Insert, Delete	View
User Assignment	View, Update, Insert	View, Update, Insert	View
Equipment Has Equipment	View	View	View
Functional Location Has Equipment	View	View	View
Functional Location Has Functional Location(s)	View	View	View

RCA URLs

There is one URL route associated with Root Cause Analysis: **rca**. The following table describes the various paths that build on the route, and the elements that you can specify for each.

Tip: For more information, refer to the URLs section of the documentation.

Element	Description	Accepted Value(s)	Notes
rca/dashboard/<EntityKey>: Displays the **Root Cause Analysis** overview page.			
<EntityKey>	Specifies which analysis you want to view.	The Entity Key of the desired analysis.	This parameter is required and refers to the analysis. Without the Entity Key, the URL will not be supported.
		0	Displays the home level of the asset hierarchy.
rca/shell/<EntityKey>/mainrca: Displays the **Analysis Summary** workspace of the desired analysis.			
rca/shell/<EntityKey>/preserverecord: Displays the **Preserve Records** workspace of the desired analysis.			
rca/shell/<EntityKey>/ediag: Displays the **Event Diagram** workspace of the desired analysis.			
rca/shell/<EntityKey>/ltree: Displays the **Logic Tree** workspace of the desired analysis.			
rca/shell/<EntityKey>/cfindings: Displays the **Communicate Findings** workspace of the desired analysis.			
rca/shell/<EntityKey>/track: Displays the **Track** workspace of the desired analysis.			
rca/shell/<EntityKey>/reports: Displays the **Reports** workspace of the desired analysis.			
<EntityKey>	Specifies the analysis that you want to view.	The Entity Key of the desired analysis.	This parameter is required and refers to the analysis. Without the Entity Key, the URL will not be supported.

Example URLs

Example URL	Destination
rca/dashboard/0	Opens the **Root Cause Analysis** dashboard at the home level of the asset hierarchy.
rca/shell/2842234/mainrca	Opens the **Analysis Summary** workspace for the Entity Key 2842234.
rca/shell/2842234/preserverecord	Opens the **Preserve Records** workspace for the Entity Key 2842234.
rca/shell/2842234/ediag	Opens the **Event Diagram** workspace for the Entity Key 2842234.
rca/shell/2842234/ltree	Opens the **Logic Tree** workspace for the Entity Key 2842234.
rca/shell/2842234/cfindings	Opens the **Communicate Findings** workspace for the Entity Key 2842234.

Example URL	Destination
rca/shell/2842234/track	Opens the **Track** workspace for the Entity Key 2842234.
rca/shell/2842234/reports	Opens the **Reports** workspace for the Entity Key 2842234.

RCA System Code Tables

The following table lists the System Code Tables that are used by Root Cause Analysis.

Table ID	Table Description	Function
MI_RCA_BUSINESS_IMPACT	Business Impact	Populates the Business Impact field in the **General Information** section of the RCA Recommendation datasheet.
MI_RCA_HYPOTHESIS_CONFIDENCE_FACTORS	Hypothesis Confidence Factors	Populates the Confidence Factor field in the **Hypothesis Details** section of the RCA Hypothesis datasheet.
MI_RCA_REFERENCES	RCA Recommendation Status	Populates the Status field in the **General Information** section of the RCA Recommendation datasheet.
RCA Analysis Type	RCA Analysis Type	Populates the Analysis Type field in the **Analysis Details** section of the RCA Analysis Detail datasheet.
RCA Hypothesis State	RCA Hypothesis State	Populates the State field in the **Hypothesis Details** section of the RCA Hypothesis datasheet.
RCA Secondary Event Types	RCA Secondary Event Types	Populates the Event Type field in the Secondary Events datasheet.
RCA Team Member Type	RCA Team Member Type	Populates the Member Type field in the **Team Member Details** section of the RCA Team Members datasheet.

RCA Site Filtering

An RCA is assigned a site on the **Definition** workspace and spread to all the related records, such as Logic Tree records and RCA Event records.

Tip: For more information, refer to the Site Filtering section of the documentation.

In RCA, users will see only Root Cause Analyses that are assigned to their site(s) or that are global records. In the Linked Assets section for a Root Cause Analysis, users will see all of the assets linked to the Root Cause Analysis, but will only be able to access those assets to which they have the necessary permissions.

Note: RCA Templates are designated as global records.

Example

Consider an organization that has three sites, Site X, Site Y, and Site Z. The following RCA Analysis records exist:

- RCA Analysis A: Assigned to Site X
- RCA Analysis B: Assigned to Site Y
- RCA Analysis C: Assigned to Site Z
- RCA Analysis D: No site assigned (global record)

Scenario 1: User assigned to only Site X

This user will see RCA Analysis A and RCA Analysis D.

Scenario 2: User assigned to both Site X and Site Y

This user will see RCA Analyses A, B and D.

Scenario 3: Super User

This will see RCA Analyses A, B, C and D.

Important: If a multi-site user, or a Super User, links child records from multiple sites to a parent record designated as Global, another user who does not have access to all sites may only see a portion of the data associated with that record. In the example above, if a child record assigned to Site X and a child record assigned to Site Y are linked to RCA Analysis D, the Site X user will not be able to see all the records associated with RCA Analysis D.

Family Field Descriptions

RCA Analysis Records

RCA Analysis records store basic information about a Root Cause Analysis created to track and analyze causes of Asset failures. The following table provides an alphabetical list and description of the fields that exist for the Root Cause Analysis family and appear by default on the RCA Analysis, RCA Analysis Summary, and Plant & Equipment Info datasheets. The information in the table reflects the baseline state and behavior of these fields. This list is not comprehensive.

This family is enabled for site filtering, which means that records in this family can be assigned to a specific site, and will only be accessible to users who are assigned to the same site and have the appropriate license and family privileges. For more information, refer to the Sites section of the documentation.

Field	Data Type	Description	Behavior
Acknowledgments	Text	People who contribute to the analysis but are not members of the RCA team.	You can enter a list of people who are not members of the RCA Team but who contributed expertise to the root cause analysis. For example, you may want to include the name, position, and company of each person who contributed to the development of the hypotheses, root cause, and recommendations for the pump failure that was analyzed.
Analysis Name	Character	A value that identifies the Root Cause Analysis throughout the GE Digital APM product.	This is a required field, and it must be unique.
Analysis Type	Character	The type of RCA you are conducting.	This field contains a list of the following values: • Mechanical • Operational • Quality • Safety • Environmental You can select the value that defines the type of analysis you are performing. This field is available on the RCA Analysis and RCA Analysis Detail datasheets.
Asset Category	Character	The category of equipment associated with the RCA.	You can enter a value in this field to describe the Asset identified in the Asset ID field. This field appears on the Plant & Equipment Info datasheet and is labeled Equipment Category.
Asset Class	Character	The class of equipment associated with the RCA.	You can enter a value in this field to describe the Asset identified in the Asset ID field. This field appears on the Plant & Equipment Info datasheet and is labeled Equipment Class.

Field	Data Type	Description	Behavior
Asset Type	Character	The type of equipment associated with the RCA.	You can enter a value in this field to describe Asset identified in the Asset ID field. This field appears on the Plant & Equipment Info datasheet and is labeled as Equipment Type.
Charter	Text	The purpose of and requirements associated with conducting the RCA.	You can enter a value in this field to describe the goal that the RCA Team wants to achieve by conducting an RCA. This value is populated automatically with the charter that you entered in the **Team Charter** section of the RCA Application Settings.
Comments	Text	Any additional information about the current analysis.	You can enter comments in this field.
Cost	Number	The estimated cost of the failure event(s) you are analyzing. By default, the currency is set to $.	You can enter a value in this field to specify the estimated cost.
Date Published	Date	The date on which the RCA was published.	This field is disabled. When the RCA is published, this field is updated automatically with the published date.
Division	Character	The division of the equipment on which the RCA is being performed.	You can enter a value in this field to describe the piece of equipment identified in the Asset ID field. This field appears on the Plant & Equipment Info datasheet.
End Date	Date	The end date of the analysis, if applicable.	You can select a date using the Calendar tool. The date specified in the End Date field must be greater than the date specified in the Start Date field.
Event Narrative	Text	Information about the equipment failure.	You can enter a description of the event in this field.
Frequency	Number	The number of times the equipment failure occurred.	You can enter a value in this field.

Field	Data Type	Description	Behavior
Long Description	Text	A brief description of the current RCA.	You can enter text in the **Analysis Description** dialog box. This field is labeled Analysis Description on the datasheet.
Manufacturer	Character	The manufacturer of the piece of equipment on which you are performing the analysis.	You can enter a value in this field to describe the manufacturer of the Asset identified in the Asset ID field. This field appears on the Plant & Equipment Info datasheet.
Mechanism	Text	A brief description of the findings from the analysis.	This field appears on the RCA Communicate datasheet and is labeled Summary of Findings.
Plant Location	Character	The plant where the equipment failure occurred.	You can enter a value in this field to describe the plant location of the asset identified in the Asset ID field. This field appears on the Plant & Equipment Info datasheet.
Start Date	Date	The start date of the analysis.	You can select a date using the Calendar tool.
Unit	Character	The ID of the unit containing the piece of equipment for which you are conducting the RCA.	You can enter a value in this field to describe the unit of the asset identified in the Asset ID field. This field appears on the Plant & Equipment Info datasheet.

RCA Event Records

RCA Event records store basic information about a failure event. The following table provides an alphabetical list and description of the fields that exist for the RCA Event family and appear by default on the RCA Failure Event datasheet. The information in the table reflects the baseline state and behavior of these fields. This list is not comprehensive.

This family is enabled for site filtering, which means that records in this family can be assigned to a specific site, and will only be accessible to users who are assigned to the same site and have the appropriate license and family privileges. For more information, refer to the Sites section of the documentation.

Field	Type	Description	Behavior and Usage
Event End Date	Date	The end date of the failure event, if applicable.	If the Root Cause Analysis was created from a Production Event, this field will be populated automatically with the value in the End Date field of that Production Event. Otherwise, you can define this value manually when you create the RCA Event. The date specified in the End Date field must be greater than the date specified in the Start Date field.
Event ID	Character	The ID for the failure event.	The Event ID field is populated automatically with RCA-[Current Date] and is disabled.
Event Start Date	Date	The start date of the failure event.	This field is required. If the RCA was created from a Production Event, this field will be populated automatically with the value in the Start Date field of that Production Event. Otherwise, you can define this value manually when you create the RCA Event.
Label	Character	The name of the failure event as you want it to appear for the Failure Event node in the diagram.	If the RCA was created from a Production Event, this field will be populated automatically with the value in the Headline field of that Production Event. Otherwise, you can define this value manually when you create the RCA Event.
Long Description	Text	A detailed description of the failure event.	If the RCA was created from a Production Event, this field will be populated automatically with the value in the Description field of that Production Event. Otherwise, you can define this value manually when you create the RCA Event.
Short Description	Character	A brief description of the failure event.	This field does not appear on the RCA Failure Event datasheet by default.

RCA Hypothesis Records

RCA Hypothesis records store basic information about root cause of a failure event. The following table provides an alphabetical list and description of the fields that exist for the RCA Hypothesis family and appear by default on the RCA Hypothesis datasheet. The information in the table reflects the baseline state and behavior of these fields. This list is not comprehensive.

This family is enabled for site filtering, which means that records in this family can be assigned to a specific site, and will only be accessible to users who are assigned to the same site and have the appropriate license and family privileges. For more information, refer to the Sites section of the documentation.

Field Caption	Data Type	Description	Behavior and Usage
Confidence Factor	Character	A value that indicates the probability that the hypothesis is true.	You can choose from the following values: • Not True (0) • Somewhat true (1) • Possibly True (2) • Likely (3) • Highly Likely (4) • True (5) If you select a value in this field, the value that you select will appear in brackets to the right of the hypothesis name in the Logic Tree.
Description	Text	A detailed description of the hypothesis.	You can define this value manually when you create the RCA Hypothesis.
ID	Character	The ID for the Hypothesis.	This field is automatically populated and is disabled.
Label	Character	A description of the hypothesis as you want it to appear on the Logic Tree.	You can define this value manually when you create the RCA Hypothesis.
State	Character	The state of the Hypothesis node.	You can choose from the following states: • Hypothesis • Hypothesis True • Hypothesis Not True • Cause Human • Cause Latent • Cause Physical This field is set to Hypothesis by default.

RCA Preserve Item Records

RCA Preserve Item records store information about tasks assigned to team members to collect failure data by a certain date. The following table provides an alphabetical list and description of the fields that exist in the RCA Preserve Item family and appear by default on the RCA Preserve records datasheet. The information in the table reflects the baseline state and behavior of these fields.

This family is enabled for site filtering, which means that records in this family can be assigned to a specific site, and will only be accessible to users who are assigned to the same site and have the appropriate license and family privileges. For more information, refer to the Sites section of the documentation.

Field	Data Type	Description	Behavior and Usage
Alert Email Body	Text	The body of the alert that will be sent via email.	You can enter text to define this value manually.
Collection Strategy	Text	A description of the way in which the data should be collected (e.g., acquire production logs from a line supervisor).	You can enter text to define this value manually.
Completed?	Character	A value that specifies whether or not the data collection is completed.	You can choose Yes or No depending on the status of the data collection. When you set this value to Yes, the Date Completed field will be populated automatically with the current date.
Data Category	Character	The type of data you want a team member to collect.	This field contains a list of the following values representing the 5 P's: • Parts • Paper • People • Position • Paradigms You can select the option that defines the type of data that should be collected.
Data to Collect	Character	A description of the data that will be collected for the category that you selected in the Data Category field.	The text that is specified in this cell will appear on the **Preserve Records** workspace as a hyperlink that you can select to access the RCA Preserve Records datasheet.

Field	Data Type	Description	Behavior and Usage
Date Completed	Date	The date on which the data-collection was completed.	When the Completed? field is set to True, the Date Completed field will be populated automatically with the current date and time. You can modify the date, as needed.
Date Due	Date	The deadline for collecting the data.	You can select a date using the Calendar tool.
Days Before Due Date to be Notified	Number	The number of days prior to the due date that an alert message is sent to the team member to whom the record is assigned.	This field is enabled only when the **Send Alert on Due Date?** check box is selected, and then, this field is required. You must enter a numeric value in this field, or an error message will appear. The units for this field are automatically set to Days.
Frequency of Alert After Due Date	Character	The frequency after the due date that an alert message will be sent to the team member to whom the record is assigned.	This field is enabled only when the **Send Alert on Due Date?** check box is selected and then, this field is required. This field contains a list of the following values: • Never • Daily • Weekly • Monthly • Yearly You can select the option that defines how frequently an alert should be sent after the due date of the Preserve Record.
Send Alert on Due Date?	Logical	A check box that specifies whether or not an alert email message will be sent to the team member to whom the Preserve Record is assigned.	This check box is selected when there is a value in the Date Due field. If this check box is selected, when you save the Preserve Record, an Alert will be created automatically in the GE Digital APM database. The Alert that was created automatically will not be linked automatically to the selected Root Cause Analysis.

RCA Recommendation Records

RCA Recommendation records store details of a recommendation and the progress associated with getting the recommendation approved and implemented. The following table provides an alphabetical list and description of the fields that exist for the RCA Recommendation family. The information in the table reflects the baseline state and behavior of these fields. This list is not comprehensive.

This family is enabled for site filtering, which means that records in this family can be assigned to a specific site, and will only be accessible to users who are assigned to the same site and have the appropriate license and family privileges. For more information, refer to the Sites section of the documentation.

Field	Data Type	Description	Behavior and Usage
Alert Assignee When Due?	Logical	An option that lets you send an alert to the person responsible for implementing the recommendation.	If this field is selected, the GE Digital APM system will send an alert to the person in the Assigned to Name field on the date defined in the Target Completion Date field. This field is labeled Alert Responsible Party When Due? and is available in the **Alert** section of the datasheet.
Analysis ID	Character	The ID of the RCA associated with the recommendation.	This field is automatically populated when an RCA Recommendation is linked to an RCA, and is disabled. This field is labeled RCA Analysis ID and is available in the **General Information** section of the datasheet.
Asset ID	Character	The ID for the Equipment associated with the recommendation.	You can define this field by selecting ⣿ and searching for the required Asset. You can then select the Asset, and then select **OK** to link it to the RCA Recommendation. This field is labeled Equipment ID and is available in the **General Information** section of the datasheet.

Field	Data Type	Description	Behavior and Usage
Assigned to Name	Character	The name of the person responsible for ensuring the recommendation is implemented.	This field is required. You can select a Human Resource from the list. This field is available on the **General Information** tab on the datasheet.
Author Name	Character	The name of the person proposing the recommendation.	You can select a team member from a list of current RCA Team Members. This field is available in the **General Information** section of the datasheet.
Business Impact	Character	The impact to the manufacturing process during the recommendation implementation.	You can choose this value from a list of the following options: • Safety • Environmental • Production • Economic This field is available in the **General Information** section of the datasheet.
Cause	Character	A description of the cause of the problem the recommendation has been created to fix.	You can choose from a list of RCA Hypothesis that you have identified as causes in the Logic Tree for the RCA. This field is available in the **General Information** section of the datasheet.
Cause Type	Character	The type of cause of the problem the recommendation has been created to fix.	This field is disabled and populated automatically with the value in the State field of the RCA Hypothesis identified in the Cause field. This field is available in the **General Information** section of the datasheet.
Completed	Logical	Indicates that the recommendation is complete.	You can set this value to True to indicate that this recommendation is complete.

Field	Data Type	Description	Behavior and Usage
Completion Comments	Text	Details about the completed recommendation.	This field is required if the value in the Status field is Rejected, Canceled, or Superseded. This field is labeled Close-Out Comments and is available on the **General Information** tab on the datasheet.
Create SAP Notification?	Logical	Creates an SAP Notification for the corresponding recommendation.	If the SAP Interfaces module has been implemented and this field is set to True, when the RCA Recommendation is saved, a notification will be created in SAP, and the Work Reference Request, Work Request Equipment, and Work Request Functional Location fields will be populated with values from the corresponding notification. This field is labeled Create Work Request? and is available in the **General Information** section of the datasheet.
Creation Date	Date	The date the recommendation was created.	This field is disabled and populated automatically with the date on which the RCA Recommendation was created. This field is available in the **General Information** section of the datasheet.
Date Reviewed	Date	The date the recommendation status was changed to Reviewed.	This field is populated automatically with the current date when the Status field is updated to Reviewed.
Days Before Due Date to be Notified	Number	The numbers of days prior to the target date that the email message should be sent.	This field is enabled only when the Alert Responsible Part When Due? field is set to True, in which case this field is required. This field is labeled Days before Due Date to be Alerted and is available in the **Alert** section of the datasheet.

Field	Data Type	Description	Behavior and Usage
Equipment Technical Number	Character	The technical number of the piece of equipment for which the recommendation is being made.	When you select a value in the Equipment ID field, this field is populated automatically with the value in the Equipment Technical Number field of the associated Equipment. This field is labeled Technical Number and is available in the **General Information** section of the datasheet.
Final Action Taken	Text	The actions taken to implement the recommendation.	You can define this field manually by typing a description of final actions in this field.
Final Approver Name	Character	The name of the person ultimately responsible for approving the recommendation and the associated cost.	You can select a Human Resource from the list. This field is required if the Alert Responsible Party When Due? field is True. This field is available in the **General Information** section of the datasheet.
Frequency of Alert After Due Date	Character	The frequency after the target date that the alert will be resent.	This field is enabled only when the value in the Alert Responsible Party When Due? field is True, in which case this field is required, and you can choose a value from the list of following values: • Never • Daily • Weekly • Monthly • Yearly This field is available in the **Alert** section of the datasheet.

Field	Data Type	Description	Behavior and Usage
Functional Location ID	Character	The ID of the Functional Location that is either linked to the Equipment that appears in the Equipment ID field or linked separately to the RCA Recommendation.	This value is populated automatically if a Functional Location exists and is linked to the Equipment that appears in the Equipment ID field. You can also select <insert ellipsis icon> to search for the Functional Location that you want, select it. When you select **OK**, the Functional Location is linked to the RCA Recommendation. This field is available in the **General Information** section of the datasheet. This field is labeled as Location ID on the datasheet.
Hypothesis ID	Number	The ID of the hypothesis associated with the corresponding RCA.	This field is populated automatically if the RCA Recommendation is linked to an RCA.
Implementation Alert Text	Text	Text the user can add that will be sent in the body of the alert to the assignee to remind them the recommendation must be met by the target date.	You can enter the text you wish to appear in the Alert email. This field is available in the **Alert** section of the datasheet.
Implemented Date	Date	The date the recommendation was implemented.	This field is populated automatically when the RCA Recommendation is implemented. When this occurs, the field becomes disabled. This field is available in the **General Information** section of the datasheet.
Mandatory Date	Date	The date by which the recommendation must be implemented.	You can select a date using the Calendar tool. This field is available in the **General Information** section of the datasheet.

Field	Data Type	Description	Behavior and Usage
Recommendation Basis	Character	Background information about why the recommendation is being made.	You can enter any necessary background information in this field. This field is available in the **General Information** section of the datasheet.
Recommendation Closure Date	Date	The date the recommendation status is changed to Implemented, Rejected, or Superseded.	This field is populated automatically with the current date when the value in the status field is changed to Implemented, Rejected, or Superseded.
Recommendation Description	Text	A detailed description of the recommendation.	You can enter a description of the recommendation in this field. This field is available in the **General Information** section of the datasheet.
Recommendation Headline	Character	A brief summary of the recommendation.	You can enter a brief summary of the recommendation in this field. This field is available in the **General Information** section of the datasheet.
Recommendation ID	Character	The ID for the RCA Recommendation.	This field is populated automatically with a unique name (e.g., REC_888) when the recommendation is created. You can change this value if you want. This field is available in the **General Information** section of the datasheet.
Recommendation Priority	Character	A value that represents the priority or criticality level of the recommendation for implementation.	You can chose from a list of the following values: • High • Medium • Low This field is available in the **General Information** section of the datasheet.

Field	Data Type	Description	Behavior and Usage
Reevaluate?	Logical	Indicates whether team members should evaluate the recommendation again.	If this check box is selected, an alert will be sent to users specified in the Reevaluation Notification List field. This field is available in the **Alert** section of the datasheet.
Reevaluation Alert Body Text	Text	The message text in the body of the reevaluation alert, which will be sent to users in the reevaluation notification list.	This field is enabled only when the Reevaluate? field check box is selected. Then the field is required. This field is available in the **Alert** section of the datasheet.
Reevaluation Date	Date	The date on which an alert is sent out to tell the alert recipient to re-evaluate the recommendation.	This field is enabled only when the Reevaluate? field is set to True. Then the field is required. You can select a date using the Calendar tool. This field is available in the **Alert** section of the datasheet.
Reevaluation Notification List	Character	Individuals that will be sent to the reevaluation alert.	This field is enabled only when the Reevaluate? field is set to True. Then the field is required. You can select from a list of names with Human Resources. This field is labeled Reevaluation Alert List and is available in the **Alert** section of the datasheet.
Required Equipment Status	Character	The operating status the piece of equipment must be under, in order for the recommendation to be implemented.	You can choose from a list of the following values: • On-line • Off-line • Not Applicable This field is available in the **General Information** section of the datasheet.
Reviewer Name	Character	The first and last name of the person who should review the information in the Recommendation before the recommended action is performed.	You can select a team member from a list of current RCA Team Members. This field is available in the **General Information** section of the datasheet.

Field	Data Type	Description	Behavior and Usage
Status	Character	The status of the recommendation.	You can choose from a list of the following values: • Approved • Created • Pending Review • Reviewed • Rejected • Canceled • Superseded • In Progress • Implemented When the Recommendation is created, the field is set to Created, but can be modified if needed. This field is required. You can send an alert only if the Status field is set to Approved or In Progress value. This field is available in the **General Information** section of the datasheet.
Status Changed By	Character	The ID of the user who last changed value in the Status field.	This field is populated automatically when the Status field is updated. This value does not appear on the datasheet by default.
Status Changed by Name	Character	The name of the person who last changed the Status field.	This field is populated automatically when the Status field is updated. This value does not appear on the datasheet by default.
Status Date	Date	The date the Status field was most recently changed.	This field is populated automatically with the current date when the Status field is updated. This value does not appear on the datasheet by default.
Target Completion Date	Date	The date the recommendation is intended to be implemented.	You can select a date using the Calendar tool. This field is required. This field is available in the **General Information** section of the datasheet.

Field	Data Type	Description	Behavior and Usage
Work Order Number	Character	The ID of the work order arising from the work request.	This field is populated automatically after a notification has been created in SAP. This value does not appear on the datasheet by default.
Work Request Equipment	Character	The ID of the Asset in SAP that is associated with the SAP Notification that was created.	This field is populated automatically after a notification has been created in SAP. This field is available in the **General Information** section of the datasheet.
Work Request Functional Location	Character	The ID of the Asset in SAP that is associated with the SAP Notification that was created.	This field is populated automatically after a notification has been created in SAP. This field is available in the **General Information** section of the datasheet.
Work Request Reference	Character	The ID of the SAP Notification.	This field is populated automatically after a notification has been created in SAP. This field is available on the **General Information** tab on the datasheet.

RCA Tracking Item Records

RCA Tracking Item records store a set of conditions on which reevaluation notifications should be based. The following table provides an alphabetical list and description of the fields that exist for the Tracking Item family and appear by default on the RCA Tracking Item Details datasheet. The information in the table reflects the baseline state and behavior of these fields.

This family is enabled for site filtering, which means that records in this family can be assigned to a specific site, and will only be accessible to users who are assigned to the same site and have the appropriate license and family privileges. For more information, refer to the Sites section of the documentation.

Field	Data Type	Description	Behavior and Usage
Active	Logical	Indicates whether the RCA Tracking Item is included in the tracking and reevaluation process (i.e., active).	When you create a new Tracking Item, the **Active** check box is selected by default. You can clear the check box to indicate that the Tracking Item is inactive.
Alert	Character	Name of the team member to whom an alert will be sent based on the specified criteria.	This field is optional.
Cost	Number	The failure cost that must be met for a revaluation email to be sent to the team member specified in the Alert field.	When you create a new Tracking Item, you can manually enter a value in this field, but the value must be numeric, or an error message will appear when you move to another field.
Count	Number	The number of failures that must occur before a reevaluation email is sent to the team member specified in the Alert field.	When you create a new Tracking Item, you can manually enter a value in this field, but the value must be numeric, or en error message will appear when you move to another field.
Message Subject	Character	The text that you that want to appear in the subject line of the email message.	You can manually enter the subject of the email message in this field. This is a required field.
Message Text	Text	The text that you want to appear in the body of the email message.	You can manually enter text in this field. This is a required field.
Notification List	Character	The names of the team members to which a notification should be sent when the specified reevaluation criteria is met (i.e., the values stored in the Count and Cost fields).	You can select a team member from a list of current RCA Team Members. When you select a name in the list, the email address that is stored in the corresponding Security User appears, and after you navigate away from the Alert field, the user's name appears in the Alert field. This is a required field. This field is labeled Alert on the datasheet.
Start Date	Date	The date on which the evaluation will begin.	You can select a date using the Calendar tool. This is a required field.

RCA Verification Records

RCA Verification records store task-related information necessary to verify a hypothesis. The following table provides an alphabetical list and description of the fields that exist for the RCA Verification family and appear by default on the RCA Verification datasheet. The information in the table reflects the baseline state and behavior of these fields.

This family is enabled for site filtering, which means that records in this family can be assigned to a specific site, and will only be accessible to users who are assigned to the same site and have the appropriate license and family privileges. For more information, refer to the Sites section of the documentation.

Field	Data Type	Description	Behavior and Usage
Completed?	Character	A value that specifies whether or not the task is completed.	You can choose Yes or No from the list. When you set this value to Yes, the Date Completed field will be populated with the current date.
Date Completed	Date	The date on which the task was completed.	This field is populated with the current date when the Completed? field is set to Yes.
Days Before Due Date to be Notified	Number	The number of days prior to the due date that an alert message is sent to the team member to whom the record is assigned.	This field is enabled only when the Send Alert on Due Date? field is set to True. Then this field is required. You must enter a numeric value in this field, or an error message will appear. The units for this field are automatically set to Days.
Due Date	Date	The deadline for completing the task.	You can select a date using the Calendar tool.
Frequency After Due Date to be Notified	Character	The frequency after the due date that an alert message will be sent to the team member to whom the record is assigned.	This field is enabled only when the Send Alert on Due Date? field is set to True. Then this field is required. This field contains a list of the following values: • Never • Daily • Weekly • Monthly • Yearly You can select the option that defines how frequently an alert should be sent after the due date of the Preserve Record.

Field	Data Type	Description	Behavior and Usage
Method	Text	How the task was completed.	You can enter text manually to define this field.
Notification Email Text	Text	The body of the alert that will be sent via email.	You can enter text to define this field manually. This field is labeled Alert Email Text on the datasheet.
Outcome	Text	The result of completing the task.	You can enter text manually to define this field.
Send Notification on Due Date?	Logical	A value that specifies whether or not an alert email message will be sent to the team member to whom the is assigned.	This field is enabled when there is a value in the Due Date field. When the Send Notification on Due Date? field is set to True, after you save the RCA Verification, an Alert will be created automatically in the GE Digital APM database and a Scheduled Item will be created automatically in the Schedule Manager. The Alert that was created automatically will not be linked automatically to the current root cause analysis. This field is labeled Send Alert on Due Date? on the datasheet.

Catalog Items

About the Catalog Items Used by PROACT Reports

The Catalog folders `\\Public\Meridium\Modules\RCA` and `\\Public\Meridium\Modules\RCA\SSRS` contain items that are used to support RCA reports. The Catalog items used by the Comprehensive Analysis Report are located in the SSRS folder, and the catalog items used by the individual reports are located in the RCA folder.

Note: A copy of the catalog items used by the individual reports also exists in the SSRS folder, but the GE Digital APM system does not use these items.

Catalog Items Used by the Comprehensive Analysis Report

The following table lists the name and description of the subreports that are used to generate the Comprehensive Analysis Report, any queries that support the subreports, and the Comprehensive Analysis Report sections that the subreports and supporting queries are used to generate.

SubReport Name	Supporting Query	Behavior and Usage	Comprehensive Analysis Report Section
AAAGPage	None	Provides an introduction to the **PROACT RCA Analysis-At-A-Glance Overview** section.	Analysis-At-A-Glance
AAAGReview	• HypothesisCount • RecommendationMatrix Query • RootCauseCountTaskAssignedCount Query • TaskAssignedCount Query • TaskCompletedCount Query • VerificationAssignedCount • VerificationCompletedCount	Provides a summary of the RCA, which includes data such as the name of the RCA, the name of the Principal Analyst, the start date, and the estimated completion date.	PROACT RCA Analysis-At-A-Glance Overview
AnalzyePage	None	Provides information about the Analyze step of a Root Cause Analysis.	Analyze
CommunicatePage	None	Provides information about the Communicate step of a Root Cause Analysis.	Communicate
Comprehensive Report	None	Provides necessary input for the Comprehensive Analysis Report.	None
Cover	Cover Query	Provides basic analysis information, such as the Analysis Name, Principal Analyst, and the date on which the report was generated.	Cover Page
CSF	CSF Query	Provides a list of the Critical Success Factors that are defined for the RCA.	Critical Success Factors
CSFMain	CSF Query	Provides the charter and the Critical Success Factors that are defined for the RCA.	• Charter • Critical Success Factors
DataCollection	DataCollection Query	Provides a list of the RCA Preserve Items that are included in the RCA.	Data Collection
DataCollectionFileLink	DataCollectionFileLink Query	Provides a list of the RCA Preserve Items that are included in the RCA.	Data Collection File Links

SubReport Name	Supporting Query	Behavior and Usage	Comprehensive Analysis Report Section
EventDiagram	EventDiagramImage Query	Provides an image of the Event Diagram that exists for the RCA	Event Diagram
EventSummary	None	Provides information stored in the Event Narrative and the Mechanism fields of the Root Cause analysis.	Event Summary
LogicTree	LogicTreeImage Query	Provides an image of the Logic Tree that exists for the RCA.	Logic Tree
OrderPage	None	Provides information about the Order step of a Root Cause Analysis.	Order
PreservePage	None	Provides information about the Preserve step of a Root Cause Analysis.	Preserve (5 P's)
RecommendationFileLinks	RecommendationFileLinks Query	Provides a list of the Reference Documents that are linked to the RCA Recommendations that are included in the RCA.	Recommendation File Links
RecommendationSummary	None	Provides a list of the RCA Recommendations that are included in the RCA.	Executive Summary Recommendations
TableOfContent	None	Provides a list of the titles of the sections that are included in the Comprehensive Analysis Report.	Topics Included in this Report
TeamMemberPrincipal	TeamMemberPrincipal Query	Identifies the Principal Analyst and identifying information from the associated Human Resource (e.g., name and contact information).	Team Members
TeamMembers	TeamMember Query	Provides a list of the team members who belong to the RCA Team, including various identifying information from the associated Human Resources (e.g., name and contact information).	Team Members
TrackingSummary	Tracking Query	Provides information from the RCA Tracking Items that are linked to the RCA.	Tracking Item Summary

SubReport Name	Supporting Query	Behavior and Usage	Comprehensive Analysis Report Section
TrackPage	None	Provides information about the Track step of a Root Cause Analysis.	Track
VerificationFileLinks	VerificationFileLink Query	Provides a list of the Reference Documents that are linked to the RCA Verifications that are included in the RCA.	Verification Log File Links
VerificationLogs	Verification Query	Provides a list of the RCA Verifications that are included in the RCA.	Verification Logs

Each supporting query that is listed in this table contains a prompt on the ENTY_KEY field of the RCA family. When you run a report from the Reports List page, the ENTY_KEY of the RCA associated with the current RCA is passed automatically to the prompt. After the ENTY_KEY is passed, the results for the current RCA are displayed. If you run an RCA report or query from the Catalog, however, you will need to supply the ENTY_KEY for an RCA manually to retrieve results.

Catalog Items Used by the Individual Reports

The following table provides a description of the baseline individual RCA reports. Each report is built upon a supporting query or dataset that is stored in the same folder as the report itself. Each report is a formatted view of the corresponding query or dataset. For additional details on the data that is included in the report, you can run the query itself.

Report Name	Supporting Query	Behavior and Usage
Analysis Summary Report	Analysis Summary Query	Provides a summary of the information that is stored in a given RCA, including information about the piece of equipment or location associated with the RCA.
Cause Report	Analyze - Cause Query	For a given RCA, provides a list of the associated RCA Hypotheses whose State field contains the value Cause Human, Cause Latent, or Cause Physical.
Logic Tree Summary Report	Analyze - Logic Tree Summary Query	Provides a summary of the RCA Hypotheses that exist in the Logic Tree of a given RCA. This report includes a graph that provides a visual representation of the number of RCA Hypotheses that are designated as Cause Human, Cause Latent, and Cause Physical and a count of the total number of RCA Hypotheses not designated as any "cause."

Report Name	Supporting Query	Behavior and Usage
Verification Report	Analyze - Verification Query	Provides a list of the RCA Verifications that are associated with an RCA, including the outcome of each verification and the name of the RCA Hypothesis to which it is linked.
Team Member Report	Order - Team Member Query	Provides a list of the team members who belong to an RCA Team, including various identifying information from the associated Human Resource (e.g., name and contact information).
Preserve Items Report - Group by Category	Preserve - Report Query	Provides a list of the RCA Preserve records that are linked to an RCA, grouped according to the following Data Categories: Parts, Paper, People, Position, Paradigms.
Preserve Items Report - Group by Team Member	Preserve - Report Query	Provides a list of the RCA Preserve records that are linked to an RCA, grouped according to the team member who is responsible for the item.

Each supporting query contains a prompt on the ENTY_KEY field of the RCA family. When you run a report from the Reports List page, the ENTY_KEY of the RCA associated with the current RCA is passed automatically to the prompt. After the ENTY_KEY is passed, the results for the current RCA are displayed. If you run an RCA report or query from the Catalog, however, you will need to supply the ENTY_KEY for an RCA manually to retrieve results.

Reports

Comprehensive Analysis Report

About RCA Reports

The baseline RCA module provides the following types of baseline reports:

- **Comprehensive** : The Comprehensive Analysis report includes information about the entire RCA. You can customize the data that appears in the report to display data associated with all stages of the RCA. The Comprehensive Analysis report is stored in the following folder in the GE Digital APM Catalog: `\\Public\Meridium\Modules\RCA\SSRS`.

  Important: This report is built from the queries and reports stored in the SSRS folder. You should not change the name of the SSRS Catalog folder, the name or content of any item within the folder, or remove from the folder any item that is being used by the comprehensive report. Modifying or moving any of these items could cause the Comprehensive Analysis Report to stop working.

- **Individual** : Multiple reports that display data associated with specific areas of an RCA Analysis. The individual reports are stored in the GE Digital APM Catalog folder \\Public\Meridium\Modules\RCA. Keep in mind that the Reports List page displays all reports that are stored in the RCA folder.

Note: All items in the Public folder are also available in the corresponding Baseline folder. Throughout this documentation, however, we refer to items in the Public folder.

About the Comprehensive Analysis Report

The Comprehensive Analysis report contains the following sections:

- Cover Page
- Topics Included in this Report
- Preserve (5 P's)
- Data Collection
- Data Collection File Links
- Order
- Team Members
- Charter
- Critical Success Factors
- Analyze
- Event Diagram
- Event Timeline
- 5 Whys
- Logic Tree
- Verification Logs
- Verification Log File Links
- Communicate
- Event Summary
- Summary of Findings
- Executive Summary Recommendations
- Recommendation File Links
- Acknowledgments
- Track
- Tracking Item Summary
- Analysis-At-A-Glance
- PROACT RCA Analysis-At-A-Glance Overview

Cover Page

The cover page displays introductory information for the Comprehensive Analysis Report. The cover page is always included in the Comprehensive Analysis Report.

The following image shows an example of the cover page as it appears in the Comprehensive Analysis Report for the example RCA.

Analysis Name: Cooling Water Pump

Principal Analyst: Jane Smith

Printed: 5/15/2017

The cover page displays the name of the report, which is always Comprehensive Analysis Report, and the following information:

- **Analysis Name**: Contains the name of the RCA. This value is stored in the Analysis Name field of the RCA Analysis record.
- **Principal Analyst**: Contains the name of the Principal Analyst. This value is stored in the First Name and Last Name fields of the Human Resource record that is linked to the RCA Team Member record that contains the value Principal Analyst.
- **Printed**: Contains the date on which the report was generated.

Topics Included in this Report

The **Topics Included in this Report** section displays the titles of the sections that are included in the Comprehensive Analysis report. The **Topics Included in this Report** section will always be included in the Comprehensive Analysis Report and cannot be excluded from the report.

The following image shows an example of the **Topics Included in this Report** section as it appears in the Comprehensive Analysis Report for the example RCA.

Topics Included in this Report

PRESERVE
    Data Collection
    Data Collection File Links
ORDER
    Team Members
    Critical Success Factors
ANALYZE
    Event Diagram
    Logic Tree
    Verification Logs
    Verification File Links
COMMUNICATE
    Event and Cause Summaries
    Executive Summary Recommendations
    Recommendation File Links
    Acknowledgements
TRACK
    Tracking Items Summary
ANALYSIS-AT-A-GLANCE
    Overview
REFERENCE DOCUMENTS

Preserve (5P's)

The **Preserve (5 P's)** section of the Comprehensive Analysis report displays a description of the Preserve step of a Root Cause Analysis.

The following image shows an example of the **Preserve (5 P's)** section as it appears in the Comprehensive Analysis Report for the example RCA Analysis.

Preserve Event Data

As in any investigative occupation, it is a REQUIREMENT that data (evidence) be collected from the scene and preserved in such a fashion as is appropriate for further analysis. As with the detective at a crime scene, the area is roped off and the scene preserved for the professionals who will come in and collect the necessary data.

PROACT® utilizes a data collection technique called the 5-P's. The 5-P's stand for the following five (5) data categories:

1. Parts – Physical or tangible evidence. Examples include process equipment, diagnostic equipment, fluid samples, etc..

2. Paper – Documentation. Examples include procedures, specifications, records, policies, test results, literature searches, etc.

3. Positional - Elements of time and space. Examples include times of occurrences, location of occurrences, frequency of occurrences, etc..

4. People - People sought to be interviewed regarding an event. Examples include management, administration, witnesses, engineers, hourly personnel, purchasing, etc.

5. Paradigms - People's belief systems that contribute to decision errors."Cost reduction is #1","It's the manufacturer's fault","Poor design", etc..

Data Collection

The **Data Collection** section of the Comprehensive Analysis report displays information that is stored in each RCA Preserve Item record that is linked to the RCA Analysis record. It also displays information stored in the Human Resource record that is linked to the RCA Team Member record that is linked to each RCA Preserve Item record.

The following image shows an example of the **Data Collection** section as it appears in the Comprehensive Analysis report for the example RCA.

Data Collection

Category	Data	Strategy	Team Members	Date	Completed?
Parts	The pieces of the cooling water pump that could have caused the pump to overheat.	Document (pictures and observations) the condition of the components of the pump.	Baseline Super User	7/8/2015	No
Paper	Standard operating procedures and frequent failure information	Research	Baseline Super User	7/9/2015	No
People	Operating procedures used by those who maintain the pump.	Interview the floor operators who are assigned to the pump.	Baseline Super User	7/9/2015	No

Data Collection File Links

The **Data Collection File Links** section of the Comprehensive Analysis report displays a list of the Reference Document records that are linked to the RCA Preserve Item records that are linked to the RCA Analysis record.

The following image shows an example of the **Data Collection File Links** section as it would appear in a Comprehensive Analysis report.

Data Collection File Links

Category	Data	Team Members	Document Path	ID
Parts	The pieces of the cooling water pump that could have caused the pump to overheat.	Baseline Super User	Recommendation by State chart_Asset Context.docx	Data collection - Ref erence File 1
Parts	The pieces of the cooling water pump that could have caused the pump to overheat.	Baseline Super User	ReferenceDoc2.docx	Data collection - Reference doc 2
Paper	Standard operating procedures and frequent failure information	Baseline Super User	Reference doc 3.docx	Data collection - Reference doc 3

The following table lists each item in the **Data Collection File Links** section and the corresponding RCA Preserve Item, Human Resource, or Reference Document record field whose data is displayed in the report.

Report Column	Record Family	Record Field
Category	RCA Preserve Item	Data Category
Data	RCA Preserve Item	Data to Collect
Team Members	Human Resource	First Name, Last Name
Document Path	Reference Document	Document Path
ID	Reference Document	ID

Order

The **Order** section of the Comprehensive Analysis report displays a description of the Order step of a Root Cause Analysis.

The following image shows an example of the **Order** section as it appears in the Comprehensive Analysis Report for the example RCA.

ORDER

Ordering the Analysis Team

Another prerequisite to the PROACT® RCA approach is that an appropriate team be formed for the analysis at hand. Such an effort involves the following:

1. Providing an unbiased team facilitator - Assigning a person to lead the analysis who has nothing to gain or lose by the outcome; an expert in the facilitation of the PROACT® RCA methodology.

2. Amassing a team of cross-functional members - Ensuring that the team itself is not biased with one perspective; allowing team members to be experts as well as objective observers.

3. Establishing a Team Charter (Terminal Objective) for the analysis - Gaining consensus on a one (1) paragraph statement that outlines the reason the team is together.

4. Establishing Critical Success Factors (CSF's) - Establishing CSF's that outline how the team will know when they have been successful.

Team Members

The **Team Members** section of the Comprehensive Analysis report displays information that is stored in Human Resource records that are linked to RCA Team Member records that are linked to the RCA Analysis record.

The following image shows an example of the **Team Members** section as it appears in the Comprehensive Analysis report.

Note: In order for a team member's information to appear in the Comprehensive Analysis report, in addition to the Human Resource record, the Team Member must also have a Security User record. Using the GE Digital APM system, you can promote a Human Resource record to a Security User record.

The following table lists each item in the **Team Members** section and the corresponding Human Resource record field whose data is displayed in the report.

Report Item	Record Field
Principal Analyst	First Name, Last Name **Note:** These values are stored in the Human Resource record that is linked to the RCA Team Member record that contains the value Principal Analyst.
Name	First Name, Last Name
Facility	Facility
E-mail	Email Address
Phone	Phone

Charter

The **Charter** section of the Comprehensive Analysis report displays the value that is stored in the Charter field of the RCA Analysis record.

The following image shows an example of the **Charter** section as it appears in the Comprehensive Analysis report for the example RCA.

Comprehensive Analysis Report

Charter

Cooling Water Pump Team

Critical Success Factors

The **Critical Success Factors** section of the Comprehensive Analysis report displays information that is stored in RCA Critical Success Factor records and important dates that are stored in the RCA Analysis record (e.g., the start date and publish date).

The following image shows an example of the **Critical Success Factors** section, outlined in red, as it appears in the Comprehensive Analysis report for the example RCA.

Critical Success Factors

Dates

Analysis Start Date:	5/01/2017
Analysis End Date:	5/15/2017
Date Published:	5/15/2017
Comments:	None

The following table lists each item in the **Critical Success Factors** section and the corresponding RCA Critical Success Factor or RCA Analysis record field whose data is displayed in the report.

Report Item	Record Family	Record Field
Critical Success Factors	RCA Critical Success Factor	CSF
Analysis Start Date	RCA Analysis	Start Date
Analysis End Date	RCA Analysis	End Date
Date Published	RCA Analysis	Date Published
Comments	RCA Analysis	Comments

Analyze

The **Analyze** section of the Comprehensive Analysis report displays a description of the Analyze step of a Root Cause Analysis.

The following image shows an example of the Analyze section as it appears in the Comprehensive Analysis report for the example RCA.

Analyze the Event Data

Any undesirable outcome is a result of a series of "cause-and-effect" relationships. The data collected in the 5-P's section of this report will ultimately serve as proof (evidence) as to what actually did or did not occur.

A logic tree will be used in the PROACT® RCA approach to graphically express the "cause-and-effect" relationships discussed earlier. In this approach, the top two levels of blocks represent the Event (Level 1) and the Modes (Level 2). From level to level represents a "cause-and-effect" relationship. These levels specifically represent the "undesirable outcomes" that did occur (facts only)!

From the MODE level, we do not know why they have occurred, just that they did. From this point we become hypothetical and repeatedly ask the question "How Can?".

As hypotheses are developed in this fashion, we use our 5-P's data to verify what is true and what is not true.In this fashion, facts lead our analyses not assumptions. This process is reiterated until we start to uncover the real root causes; the reasons that people make decision errors that lead to undesirable outcome.

Root causes originate from flawed systems in which people depend on to make informed decisions. We call these Latent Root Causes or Organizational Root Causes.Flawed organizational systems lead to poor decisions being made by well-intentioned individuals. We call these the Human Root Causes.Decision errors lead to Physical Root Causes, or events or conditions that are visible.

Only when we uncover the Latent Roots or Organizational System Roots are we actually conducting a "real" ROOT CAUSE analysis.

Event Diagram

The **Event Diagram** section of the Comprehensive Analysis report displays an image of the Event Diagram that exists for the RCA.

The following image shows an example of the **Event Diagram** section as it appears in the Comprehensive Analysis report for the example RCA.

Event Diagram
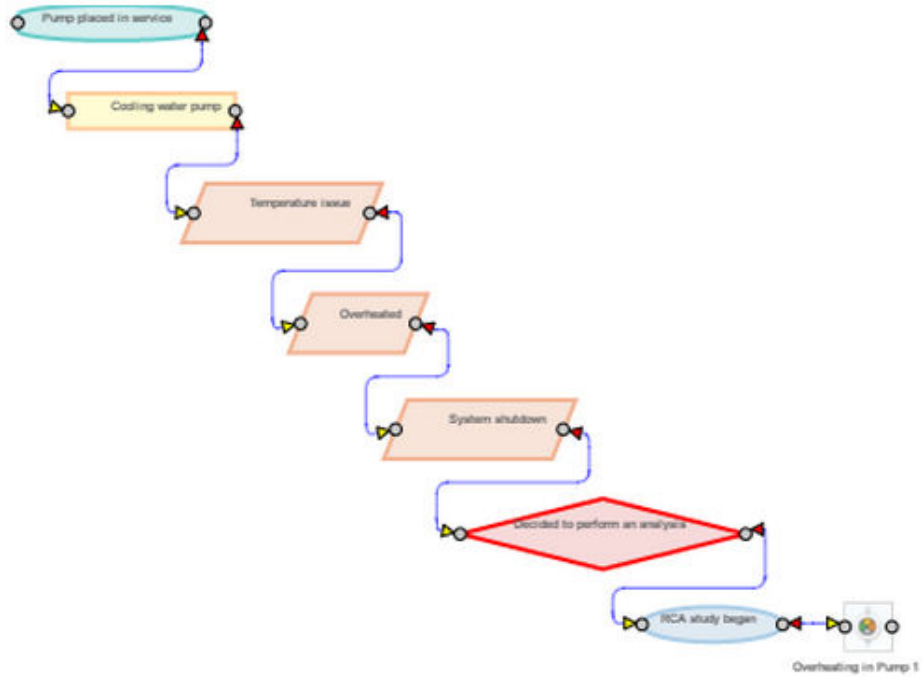
Event Timeline

The **Event Timeline** section of the Comprehensive Analysis report displays an image of the Event Timeline that exists for the RCA.

The following image shows an example of the **Event Timeline** section as it appears in the Comprehensive Analysis report for the example RCA.

Event Timeline
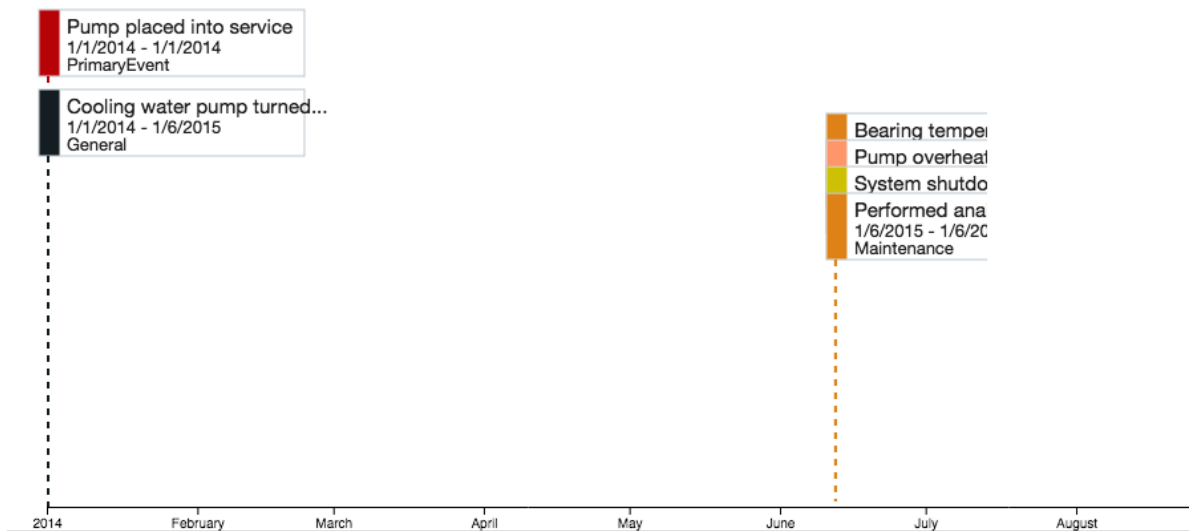
5 Whys

The **5 Whys** section of the Comprehensive Analysis report displays an image of the 5 Whys Analysis that exists for the RCA.

The following image shows an example of the **5 Whys** section as it appears in the Comprehensive Analysis report for the example RCA.

Comprehensive Analysis Report

<u>*5 Whys*</u>

Pump Failure

Why	Reason
Why did the system shutdown?	Safety cutout applied when the cooling pump failed.
Why did the pump fail?	The bearing seized.
Why did the bearing seize?	The bearing was dry and overheated.
Why was the bearing dry and overheated?	Scheduled lubrication inspections were not completed.
Why weren't the scheduled inspections completed?	The inspection schedule is missing the appropriate tasks for pump lubrication.

Logic Tree

The **Logic Tree** section of the Comprehensive Analysis report displays an image of the Logic Tree that exists for the RCA Analysis.

The following image shows an example of the **Logic Tree** section as it appears in the Comprehensive Analysis for the example RCA.

Logic Tree

Verification Logs

The **Verification Logs** section of the Comprehensive Analysis report displays information that is stored in each RCA Verification record and the RCA Hypothesis record that is linked to an RCA Verification record. It also displays information stored in the Human Resource record that is linked to the RCA Team Member record that is linked to the RCA Verification record.

The following image shows an example of the **Verification Logs** section as it appears in the Comprehensive Analysis report for the example RCA.

Verification Logs

Hypothesis	Description	Team Members	Verification Method	Outcome
Inboard Bearing	The inboard bearing had a mechanical problem.	Jane Smith	Verification through Inspection	

The following table lists each item in the **Verification Logs** section and the corresponding RCA Verification, RCA Hypothesis, or Human Resource record field whose data is displayed in the report.

Report Column	Record Family	Record Field
Hypothesis	RCA Hypothesis	ID
Description	RCA Hypothesis	Description
Team Member	Human Resource	First Name, Last Name

Report Column	Record Family	Record Field
Verification Method	RCA Verification	Method
Outcome	RCA Verification	Outcome

Verification Log File Links

The **Verification Log File Links** section of the Comprehensive Analysis report contains a list of the Reference Document records that are linked to the RCA Verification records that are linked to the RCA Analysis record. It also displays information stored in the Human Resource record that is linked to the RCA Team Member record that is linked to the RCA Verification record.

The following image shows an example of the **Verification Log File Links** section as it would appear in a Comprehensive Analysis Report.

The following table lists each item in the **Verification Log File Links** section and the corresponding RCA Verification, Human Resource, or Reference Document record field whose data is displayed in the report.

Report Column	Record Family	Record Field
Method	RCA Verification	Method
Team Members	Human Resource	Start Date
Document Path	Reference Document	Document Path
ID	Reference Document	ID

Communicate

The **Communicate** section of the Comprehensive Analysis report displays a description of the Communicate step of a Root Cause Analysis.

The following image shows an example of the **Communicate** section as it appears in the Comprehensive Analysis report for the example RCA.

Communicate Findings and Recommendations

As with this report, an effective means of communication is necessary to get RCA recommendations approved and implemented. This primarily involves communicating the conclusions of the RCA and the recommendations as a result of the RCA.

The elements of this section are intended to communicate the summary of the findings of the RCA for management, as well as the detailed recommendations made by the RCA team members for resolution of the causes identified.

A RCA cannot be successful without the approval and implementation of the analysis recommendations.

Event Summary

The **Event Summary** section of the Comprehensive Analysis report displays the value that is stored in the Event Narrative field in the RCA Analysis record.

The following image shows an example of the **Event Summary** section as it appears in the Comprehensive Analysis report for the example RCA.

Event Summary

Investigate what caused the motor temperature in the water pump to increase and overheat.

Summary of Findings

The **Summary of Findings** section of the Comprehensive Analysis report displays the value that is stored in the Mechanism field of the RCA Analysis record. This field is labeled Summary of Findings on the RCA Communicate datasheet.

The following image shows an example of the **Summary of Findings** section as it appears in the Comprehensive Analysis Report for the example RCA.

Summary of Findings

Inadequate accountability of workers led to insufficient lubricant being applied to the outboard bearing of the pump.

Executive Summary Recommendations

The **Executive Summary Recommendations** section of the Comprehensive Analysis report displays information that is stored in RCA Recommendation records that are linked to the RCA Analysis record.

The following image shows an example of the **Executive Summary Recommendations** section.

Executive Summary Recommendations

Root Cause	Type	Recommendation	Team Members	Target Completion Date	Implemented Date
Analysis 1 - Hypothesis 4B Label Field	Cause Latent	Test Analysis_A - Recommendation REC-201 Recommendation Headline Field	Smith, Jane	5/15/2017	
Analysis 1 - Hypothesis 4B Label Field	Cause Latent	Test Analysis_A-Recommendation REC-202 Recommendation Headline Field	User, Proact	5/15/2017	

The following table lists each item in the **Executive Summary Recommendations** section and the corresponding RCA Recommendation record field whose data is displayed in the report.

Report Column	Record Field
Root Cause	Cause
Type	Cause Type
Recommendation	Recommendation Headline
Team Members	Assigned to Name, Assigned To User ID
Target Completion Date	Target Completion Date
Implemented Date	Implemented Date

Recommendation File Links

The **Recommendation File Links** section of the Comprehensive Analysis report contains a list of the Reference Document records that are linked to the RCA Recommendation records that are linked to the RCA Analysis record.

The following table lists each item in the **Recommendation File Links** section and the corresponding RCA Recommendation or Reference Document record field whose data is displayed in the report.

Report Column	Record Family	Record Field
Cause	RCA Recommendation	Cause
Team Members	RCA Recommendation	Assigned to Name, Assigned To User ID
Document Path	Reference Document	Document Path
ID	Reference Document	ID

Acknowledgments

The **Acknowledgments** section of the Comprehensive Analysis report displays the value that is stored in the Acknowledgments field in the RCA Analysis record.

The following image shows an example of the **Acknowledgments** section as it appears in the Comprehensive Analysis Report for the example RCA.

Acknowledgements

Jane Smith for helping with the investigation of the pump.

Track

The **Track** section of the Comprehensive Analysis report displays a description of the Track step of a Root Cause Analysis.

The following image shows an example of the **Track** section as it appears in the Comprehensive Analysis Report for the example RCA.

TRACK

Tracking For Results

Once you have successfully communicated your finding and your recommendations have been implemented you must now track the effectiveness of those recommendations to ensure that you are getting the results that you have anticipated.

Tracking Evaluations help ensure that the approved PROACT® Recommendations are effective in addressing the underlying issues. During the evaluation process, the PROACT® Principal Analyst specifies a set of conditions (event-based) on which re-evaluation notifications for Tracking Items are based.

Event-based criteria represent a threshold for the number of failure events or the failure cost over a period of time following the implementation of the Recommendation. When the defined thresholds are exceeded, the Tracking Item is updated to a Re-evaluate status, and an e-mail reminder notifies the responsible party to re-examine the defined analysis information. For example, you may specify that a Tracking Item be evaluated if a failure that the analysis was intended to prevent actually occurs.

Tracking Item Summary

The **Tracking Item Summary** section of the Comprehensive Analysis report contains information that is stored in an RCA Tracking Item record and the Equipment or Functional Location record that is linked to the RCA Tracking Item record.

The following image shows an example of the **Tracking Item Summary** section as it would appear in the Comprehensive Analysis report.

Tracking Items Summary

Related Equipment	Start Date	Count	Cost
PMP-5817 IC5 COOLING WATER	3/1/2015	2	10000
A001 ~ ~ 1234	4/1/2015	3	20000
A006 ~ ~ 123456	7/1/2015	5	5000
A007 ~ ~ 1234567	6/3/2015	2	4000

The following table lists each item in the **Tracking Items Summary** section and the corresponding RCA Tracking Item record whose data is displayed in the report.

Report Column	Record Family	Record Field
Related Equipment	Equipment or Functional Location	Record ID
Start Date	RCA Tracking Item	Start Date
Count	RCA Tracking Item	Count
Cost	RCA Tracking Item	Cost

Analysis-At-A-Glance

The **Analysis-At-A-Glance** section of the Comprehensive Analysis report contains an introduction to the **PROACT RCA Analysis-At-A-Glance Overview** section, which includes information such as the names of the RCA Analysis Team members and the status of Communicate stage of the RCA.

The following image shows an example of the **Analysis-At-A-Glance** section as it appears in the Comprehensive Analysis Report for the example RCA.
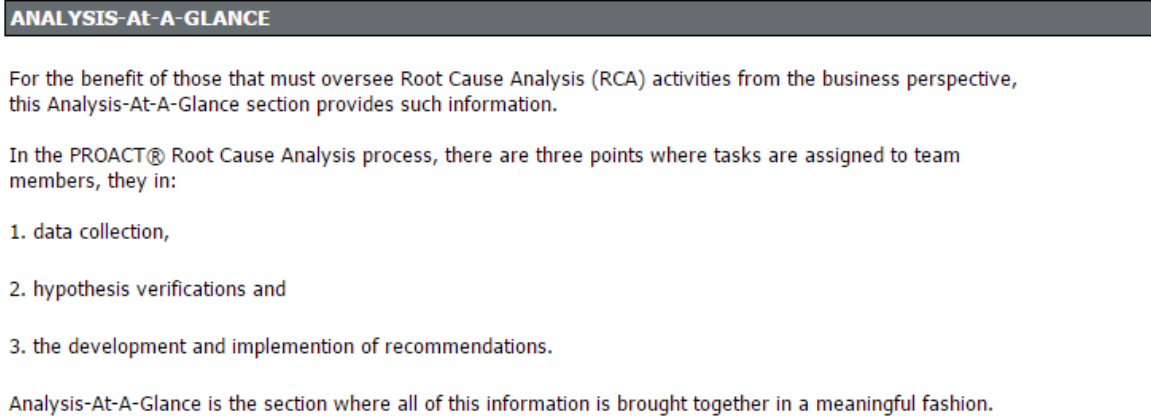
PROACT® RCA Analysis-At-A-Glance Overview

About PROACT® RCA Analysis-At-A-Glance Overview

The **PROACT® RCA Analysis-At-A-Glance Overview** section of the Comprehensive Analysis report displays a summary of the RCA. This section includes the following subsections:

- Analyze and Team Data
- Assets
- Status of Preserve
- Status of Analyze
- Status of Communicate

Analysis and Team Data Subsection

The **Analysis and Team Data** subsection contains summary information about the RCA.

The following image shows an example of the **Analysis and Team Data** subsection of the **PROACT® RCA Analysis-At-A-Glance Overview** section for the example RCA.

PROACT® RCA Analysis-At-A-Glance Overview

Analysis and Team Data

Analysis Name:	Cooling Water Pump
Principal Analyst:	Jane Smith
Team Members:	Jane Smith
Team Charter:	Cooling Water Pump Team
Critical Success Factors:	
Start Date:	5/01/2017
Estimated Completion Date:	5/15/2017
Estimated Cost of Event:	$0.00

The following table lists each item in the **Analysis and Team Data** subsection and the corresponding record field whose data is displayed in the report.

Report Item	Record Family	Record Field
Analysis Name	RCA Analysis	Analysis Name
Principal Analyst	Human Resource	First Name, Last Name **Note:** These values are stored in the Human Resource record that is linked to the RCA Team Member record that contains the value Principal Analyst.
Team Members	Human Resource	First Name, Last Name
Team Charter	RCA Analysis	Charter
Critical Success Factors	RCA Critical Success Factor	CSF
Start Date	RCA Analysis	Start Date
Estimated Completion Date	RCA Analysis	End Date
Estimated Cost of Event	RCA Analysis	Cost

Assets

The **Assets** subsection contains information about the Asset records that are linked to the RCA Analysis record. The following image shows an example of the **Assets** subsection of the **PROACT® RCA Analysis-At-A-Glance Overview** section for the example RCA.

Assets

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The following table lists each item in the **Assets** subsection and the corresponding record field whose data is displayed in the report.

Report Item	Record Family	Record Field
Record ID	Equipment or Functional Location	Equipment ID or Functional Location ID **Note:** This column contains the Record ID of each Equipment or Functional Location record that is linked to the RCA Analysis record.
Family	None	**Note:** This field is populated automatically with the name of the family to which the piece of equipment or location belongs. If it belongs to the Equipment family, this field will be populated automatically with Equipment. If it belongs to the Functional Location family, this field will be populated automatically with Functional Location.

Status of Preserve

The **Status of Preserve** subsection contains the number of Preserve Records that have been created, completed, or assigned to RCA Team Members.

The following image shows an example of the **Status of Preserve** subsection of the **PROACT RCA Analysis-At-A-Glance Overview** section for the example RCA.

Status of Preserve

Number of Data Collection Tasks Assigned:	1
Number of Data Collection Tasks Completed:	0
% of Data Collection Tasks Completed:	0.00%

The following table lists each item displayed in the **Status of Preserve** subsection.

Report Item	Description
Number of Data Collection Tasks Assigned	The total number of RCA Preserve Item records linked to the RCA Analysis record.
Number of Data Collection Tasks Completed	The number of RCA Preserve Item records that contain the value True in the Completed? field.
% of Data Collection Tasks Completed	The percentage of RCA Preserve Items records that contain the value True in the Completed? field.

Status of Analyze

The **Status of Analyze** subsection contains the number of Hypothesis and Verifications that have been created, completed, or assigned to RCA Team Members.

The following image shows an example of the **Status of Analyze** subsection of the **PROACT RCA Analysis-At-A-Glance Overview** section for the example RCA.

Status of Analyze

Number of Hypothesis:	1
Number of Verification Assigned:	1
Number of Verification Completed:	0
% of Verifications Completed:	0.00%

The following table lists each item displayed in the **Status of Analyze** subsection.

Report Item	Description
Number of Hypothesis	The total number of RCA Hypothesis records that are linked to the RCA Analysis record.
Number of Verification Assigned	The total number of RCA Verification records that are linked to RCA Hypothesis records.
Number of Verification Completed	The number of RCA Verification records that contain the value True in the Completed? field.
% of Verification Completed	The percentage of RCA Verification records that contain the value True in the Completed? field.

Status of Communicate

The **Status of Communicate** subsection contains the number of Root Causes and Recommendations that have been created, completed, or assigned to RCA Team Members.

The following image shows an example of the **Status of Communicate** subsection of the **PROACT RCA Analysis-At-A-Glance Overview** section for the example RCA.

Status of Communicate

Number of Root Causes Identified:	0
Number of Recommendations	
CREATED	1

The following table lists each item displayed in the **Status of Communicate** subsection.

Report Item	Description
Number of Root Causes Identified	The number of RCA Hypothesis records that contain the value Cause - Human, Cause - Latent, or Cause - Physical in the State field.
Number of Recommendations • Approved • Created • Pending Review • Reviewed • Rejected • Superseded • In Progress • Implemented	The number of RCA Recommendation records that contain a certain value (e.g., Created) in the Status field. **Note:** If there are no records that contain a certain value in the Status field, they do not appear in the report. For example, if an RCA Recommendation record contained the value Reviewed in the Status field, the value Reviewed would appear under the Number of Recommendations field, and the number 1 would appear next to it. If there are no RCA Recommendation records with the value Reviewed in the Status field, the value Reviewed does not appear under the Number of Recommendations field.

Individual Reports

Analysis Summary Report

The **Analysis Summary Report** displays summary information that is stored in the RCA Analysis record. The report is divided into the following sections:

• **Analysis Data :** Contains general information about the analysis.
• **Location Data :** Contains information about the location of the piece of equipment being analyzed.
• **Equipment Data :** Contains information about the piece of equipment that is being analyzed.

Analysis Summary Report

Cooling Water Pump

Analysis Data

Analysis Type:	Mechanical	**Analysis Start Date:**	06/01/2015
Cost of Event:	20000	**Analysis End Date:**	06/15/2015
Frequency:	1		
Acknowledgements:			

Location Data

Plant Location:	Roanoke, VA
Division:	Area 1
Functional Location:	MRD-ROA-REFN-RF074-E0011A-074
Unit:	74

Equipment Data

Asset Category:	Fixed Asset
Asset Class:	Heat Exchanger
Asset Type:	Shell and Tbe Heat Exchanger
Asset ID:	000001041828
Manufacturer:	HEAT TRANSFER EQUIP

The name of the analysis, which is stored in the Analysis Name field in the RCA Analysis record, is displayed at the top of the Analysis Summary Report. The following table lists each item in the report and the corresponding RCA Analysis record field whose data is displayed in the report.

Note: The **Location Data** and **Equipment Data :** sections exist in the Analysis Summary Report so that you can view this information in analyses where it existed in previous releases. In the product, the **Definition** tab on the **Analysis Summary** workspace allows you to link Equipment and Functional Location records to the RCA Analysis record. Asset information is no longer stored in fields in the RCA Analysis record, which are used to populate values in the **Analysis Summary Report**. You can view information in Equipment and Functional Location records that are linked to the RCA Analysis record using the **Assets** subsection of the PROACT RCA Analysis-At-A-Glance Overview section in the Comprehensive Analysis report.

Report Item	RCA Analysis Field
Analysis Data	
Analysis Type	Analysis Type
Cost of Event	Cost
Frequency	Frequency
Acknowledgements	Acknowledgements
Analysis Start Date	Start Date
Analysis End Date	End Date

Report Item	RCA Analysis Field
Location Data	
Plant Location	Plant Location
Division	Division
Functional Location	Functional Location
Unit	Unit
Equipment Data	
Asset Category	Asset Category
Asset Class	Asset Class
Asset Type	Asset Type
Asset ID	Asset ID
Manufacturer	Manufacturer

Cause Report

The **Cause Report** displays information that is stored in RCA Hypothesis records that are linked to the RCA Analysis record and contain a value of Cause - Physical, Cause - Latent, or Cause - Human in the State field. This information is displayed in two different formats:

- The Type of Causes graph.
- A table below the graph.

The following image displays the **Types of Causes** graph. The x-axis displays the types of cause (i.e., human, physical, and latent). The y-axis displays the number of RCA Hypothesis records that contain a cause in the State field, which is also viewed in the **Logic Tree** section.
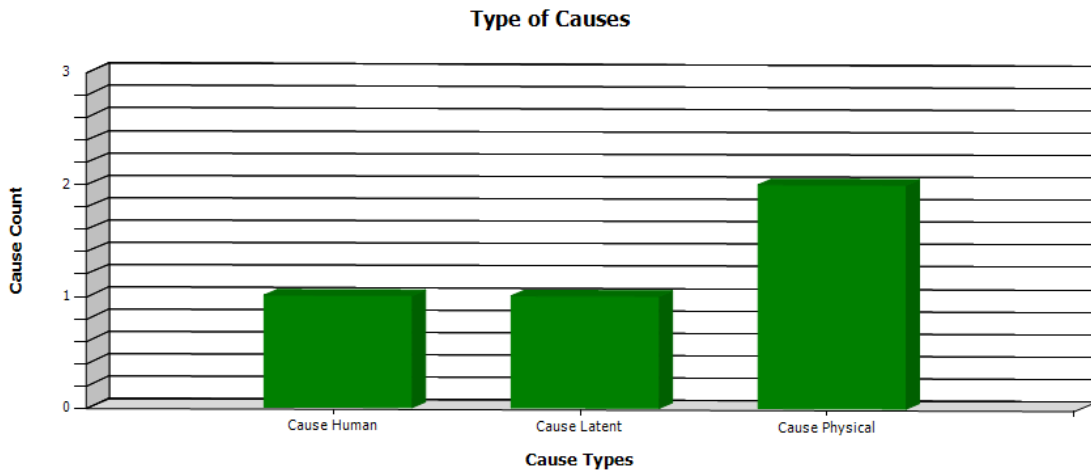
The table below the graph displays information related to each RCA Hypothesis record that is linked to the RCA Analysis record.

Hypothesis	Hypothesis Description	Confidence Factor
Cause Physical		
Lubrication issue	The outboard bearing was not receiving the right amount of lubrication.	4
Worker fatigue	Workers are overworked and are not able to perform at an acceptable level.	3
Cause Human		
Too little applied	There was not enough lubricant, causing friction and an increase in temperature.	3
Cause Latent		
Inadequate Accountability of Workers	Workers are not being held accountable for the maintenance procedures they are required to perform.	4

The following table lists each item in the Cause Report and the corresponding RCA Hypothesis record field whose data is displayed in the report. A row exists for each RCA Hypothesis record and is categorized by the cause state (i.e., physical, latent, or human), which is stored in the State field of the RCA Hypothesis record.

Report Column	RCA Hypothesis Field
Hypothesis	ID
Hypothesis Description	Description
Confidence Factor	Confidence Factor

Logic Tree Summary Report

The **Logic Tree Summary** Report consists of two parts:

- The Logic Tree Summary By Node Type graph.
- A table that displays the information in the graph.

The following image displays the **Logic Tree Summary By Node Type** graph. The x-axis displays the hypothesis state of the node, which is stored in the State field of each corresponding RCA Hypothesis record. The y-axis displays the number of nodes that exist in the Logic Tree for each type of state.

Logic Tree Summary by Node Type
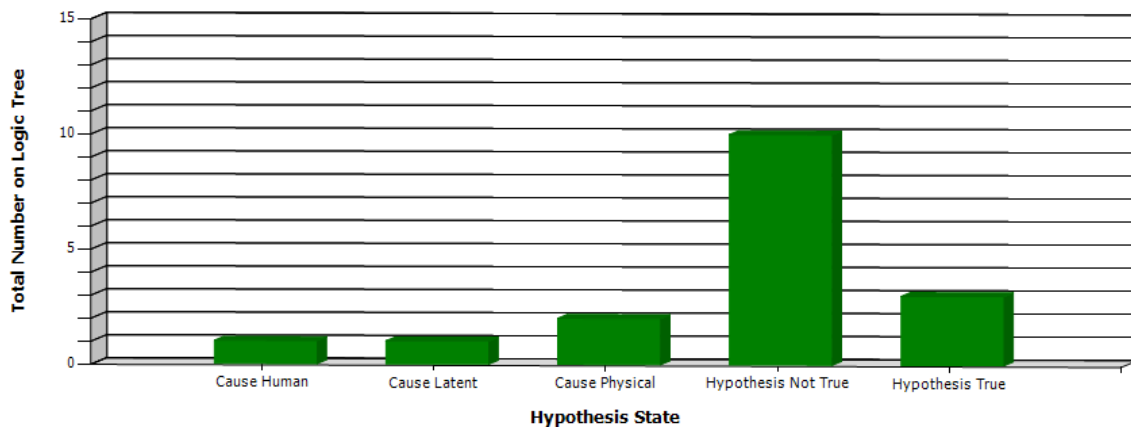
The table below the graph contains the same information in a chart form. In this case, the values in the **Node State** column are equivalent to the Hypothesis State values in the graph, and the values in the **Node Count** column are equivalent to the Total Number on Logic Tree values in the graph. The value in

the **Total** row is the total number of nodes that exist in the Logic Tree with a value in the State field in the corresponding RCA Hypothesis record.

Node State	Node Count
Cause Human	1
Cause Latent	1
Cause Physical	2
Hypothesis Not True	10
Hypothesis True	3
Total :	17

Verification Report

The **Verification Report** displays information that is stored in each RCA Verification record and the RCA Hypothesis record that is linked to an RCA Verification record. It also displays information stored in the Human Resource record that is linked to the RCA Team Member record, which is linked to the RCA Verification record. The report includes each RCA Verification record that is linked to the RCA Analysis record.

Cooling Water Pump

Hypothesis	Verification Method	Outcome	Responsible	Due Date
Mechanical	Inspect wiring to make sure that the cause was not electrical.		Pete Handy	

Total Number of Verifications for this analysis: 1

The name of the analysis, which is stored in the Analysis Name field in the RCA Analysis record, is displayed at the top of the **Verification Report**. The following table lists each item in the report and the corresponding RCA Verification, RCA Hypothesis, or Human Resource record field whose data is displayed in the report.

Report Column	RCA Verification or RCA Hypothesis Record	Record Field
Hypothesis	RCA Hypothesis	ID
Verification Method	RCA Verification	Method
Outcome	RCA Verification	Outcome
Responsible	Human Resource	First Name, Last Name
Due Date	RCA Verification	Due Date

Recommendation Report

The Recommendation Report displays information that is stored in each RCA Recommendation record that is linked to an RCA Analysis record.

The name of the analysis, which is stored in the Analysis Name field in the RCA Analysis record, is displayed at the top of the Recommendation Report. The following table lists each item in the report and the corresponding RCA Recommendation record field whose data is displayed in the report.

Report Column	RCA Recommendation Field
Recommendation	Recommendation Headline
Assigned to	Assigned to Name
Target Completion Date	Target Completion Date
Status	Status
Completed?	Completed
Completion Date	Implemented Date

Team Member Report

The **Team Member Report** displays information that is stored in an RCA Team Member record and the Human Resource record that is linked to the RCA Team Member record. The report includes each RCA Team Member record that is linked to the RCA Analysis record.

Team Member Report

Baseline Super User - bl

Team Member Type:	Principal		
Job Title:	Engineer	**Address:**	207, Bullitt Ave.
Company:		**City:**	Roanoke
Site:	XXX	**State:**	Virginia
Facility:	Plant 1	**Zip Code:**	24013
Business Unit:	Unit 1	**Email:**	
Country:	United States	**Phone:**	555-5555

The name of the analysis, which is stored in the Analysis Name field in the RCA Analysis record, is displayed at the top of the Team Member Report. The following table lists each item in the report and the corresponding RCA Team Member or Human Resource record field whose data is displayed in the report.

Report Field	RCA Team Member or Human Resource record	Record Field
Team Member Report	RCA Team Member	Type
Job Title	Human Resource	Job Title
Company	Human Resource	Company
Site	Human Resource	Site Code
Facility	Human Resource	Facility
Business Unit	Human Resource	Business Unit
Country	Human Resource	Country
Address	Human Resource	Address

Report Field	RCA Team Member or Human Resource record	Record Field
City	Human Resource	City
State	Human Resource	State
Zip Code	Human Resource	Postal Code
Email	Human Resource	Email Address
Phone	Human Resource	Phone

Preserve Items Report - Group by Category

The **Preserve Items Report - Group by Category** report displays information that is stored in each RCA Preserve Record that is linked to an RCA Analysis record and information stored in the Human Resource record that is linked to an RCA Team Member record that is linked to the RCA Preserve Item record. This report displays information for each Preserve Record in an analysis according to the value in the Data Category field (e.g., paper) in the RCA Preserve Item record.

The name of the analysis, which is stored in the Analysis Name field in the RCA Analysis record, is displayed at the top of the **Preserve Items Report - Group by Category**. The following table lists each item in the report and the corresponding RCA Preserve Item or Human Resource record field whose data is displayed in the report.

Report Item	RCA Preserve Item or Human Resource Record	Record Field
Data to Collect	RCA Preserve Item	Data to Collect
Collection Strategy	RCA Preserve Item	Collection Strategy
Due Date	RCA Preserve Item	Due Date
Completed?	RCA Preserve Item	Completed?
Responsible	Human Resource	First Name, Last Name

Preserve Items Report - Group by Team Member

The **Preserve Items Report Group - Group by Team Member** displays information that is stored in each RCA Preserve Item record that is linked to an RCA Analysis record. This report displays information for each RCA Preserve Item record according to the RCA Team Member to whom the Preserve Record is assigned. Each Team Member (e.g., Analyst) is identified in the report by the value stored in the Last Name and First Name fields of the Human Resource record that is linked to the RCA Team Member record that is linked to the RCA Preserve Item record.

Cooling Water Pump

Data to Collect	Collection Strategy	Due Date	Completed?	Data Category
Baseline Super User				
The pieces of the cooling water pump that could have caused the pump to overheat.	Document (pictures and observations) the condition of the components of the pump.	07/08/2015	No	Parts
Standard operating procedures and frequent failure information	Research	07/09/2015	No	Paper
Operating procedures used by those who maintain the pump.	Interview the floor operators who are assigned to the pump.	07/09/2015	No	People

The name of the analysis, which is stored in the Analysis Name field in the RCA Analysis record, is displayed at the top of the **Preserve Items Report Group - Group by Team Member**. The following table lists each item in the report and the corresponding RCA Preserve Item record field whose data is displayed in the report.

Report Item	RCA Preserve Item Field
Data to Collect	Data to Collect
Collection Strategy	Collection Strategy
Due Date	Due Date
Completed?	Completed?
Data Category	Data Category