Telelogic
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Tutorial

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Tutorial

Before using the information in this manual, be sure to read the "Notices" section of the Help or the PDF file available from **Help > List of Books**.

Contents

Creating a Vehicle Rear Defogger System

This tutorial teaches the Statemate design fundamentals as you follow the steps to design and validate a Vehicle Rear Defogger system based on the following requirements.

Tutorial Project Definition

These descriptions and requirements describe the rear defogger being designed in Statemate.

Basic System Description

When the system is activated, it needs to time out automatically and shut its on-vehicle speed and load management. The system must provide the vehicle operator with an indictator of the current state of the system. The operator may request a change in the state of the system.

The system provides a safe temperature for defogging the rear window without overloading the electrical system nor depriving critical resources of power. Since the system performs some automatic operations, the vehicle operator needs to know if the system is on or off.

To trigger the system, the vehicle operator requests a change in state of the rear defog control system.

Non-Functional Requirements

The system must respond to user requests and changes in load within 100 milliseconds. Vehicle speed must be checked at least every 10 seconds. The indicator must reflect the current state of the rear defog control system within 100 milliseconds of a user request.

Exception Notes

A service technician can recalibrate the timing parameters. The rear defogger system may become nonfunctioning.

Lab Setup

Prior to starting the exercises it is necessary to set up your system and create a project within Statemate using these steps:

1. Create a folder/directory called "stm_projects" on your system in which to store your project.

2. Start Statemate using the appropriate method:
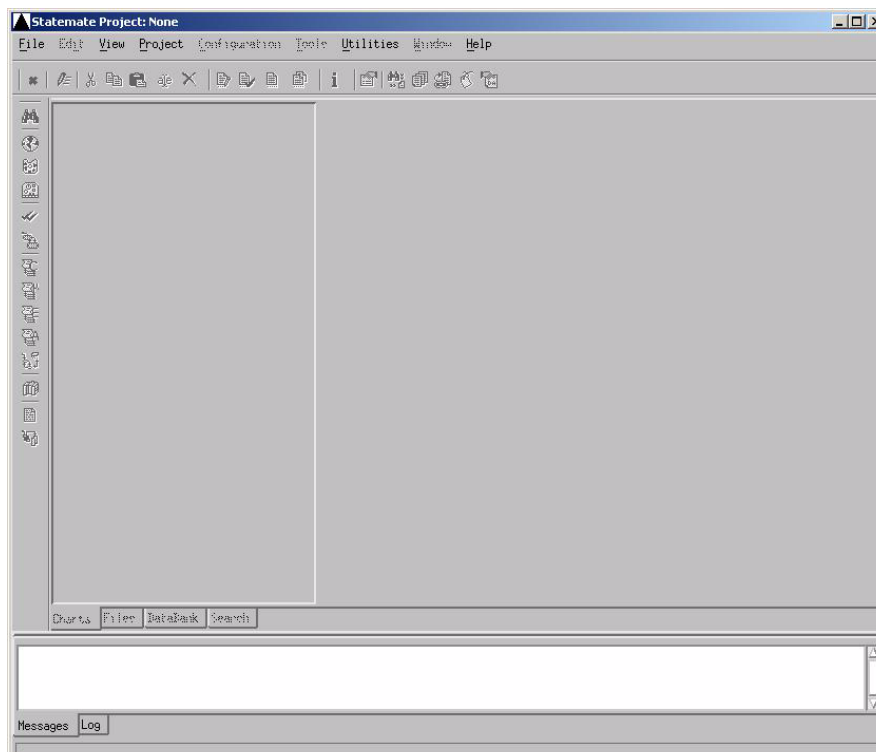
   - **From Windows:**

     Select **Start > All Programs > Telelogic > Statemate > Statemate <version>**.
   - **From UNIX:**

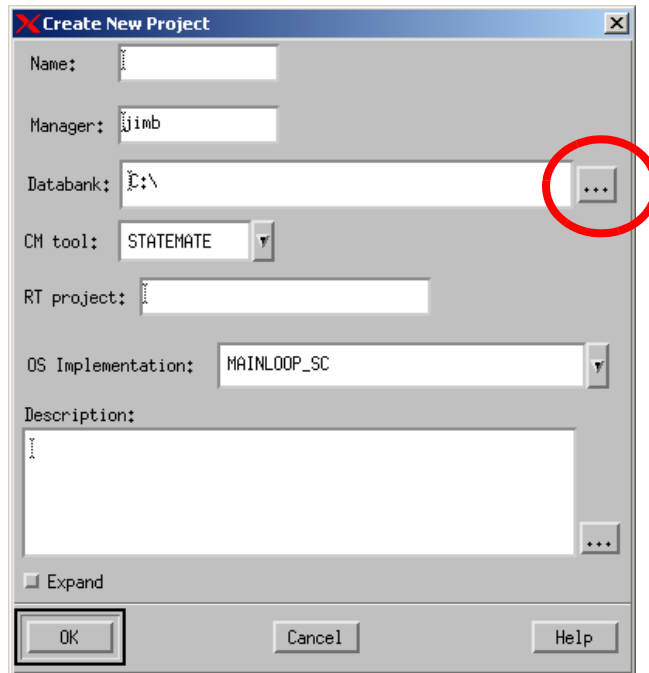 $STM_ROOT/run_stmm.bat

   The Statemate Main Window opens without a project.

   Statemate Main Window (Without a Project)

3. Select **File > New Project** from the Statemate window. The Create New Project window opens.

Creat New Project

Clicking on the '…' opens an Explorer window for browsing.
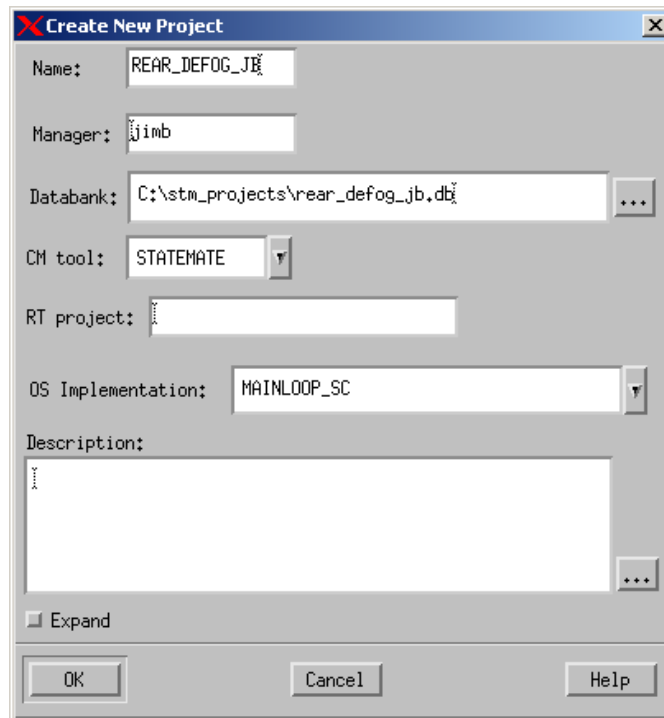
The Explorer window may become minimized.

4. Enter the following information in the Create New Project window.

- ◆ **Name**: REAR_DEFOG_<your_initials>
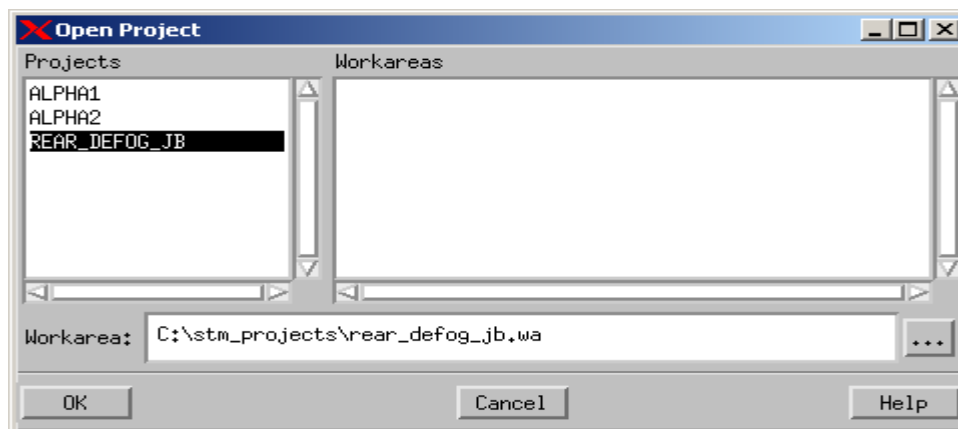- ◆ **Databank**: <path>\stm_projects\rear_defog_<your_initials>.db

Note:

- ◆ Blank spaces are not allowed within the form.
- ◆ Leave all other entries with their default values.

Create New Project (Information Entered)

5. Click **OK** to create the project. The Open Project window opens.

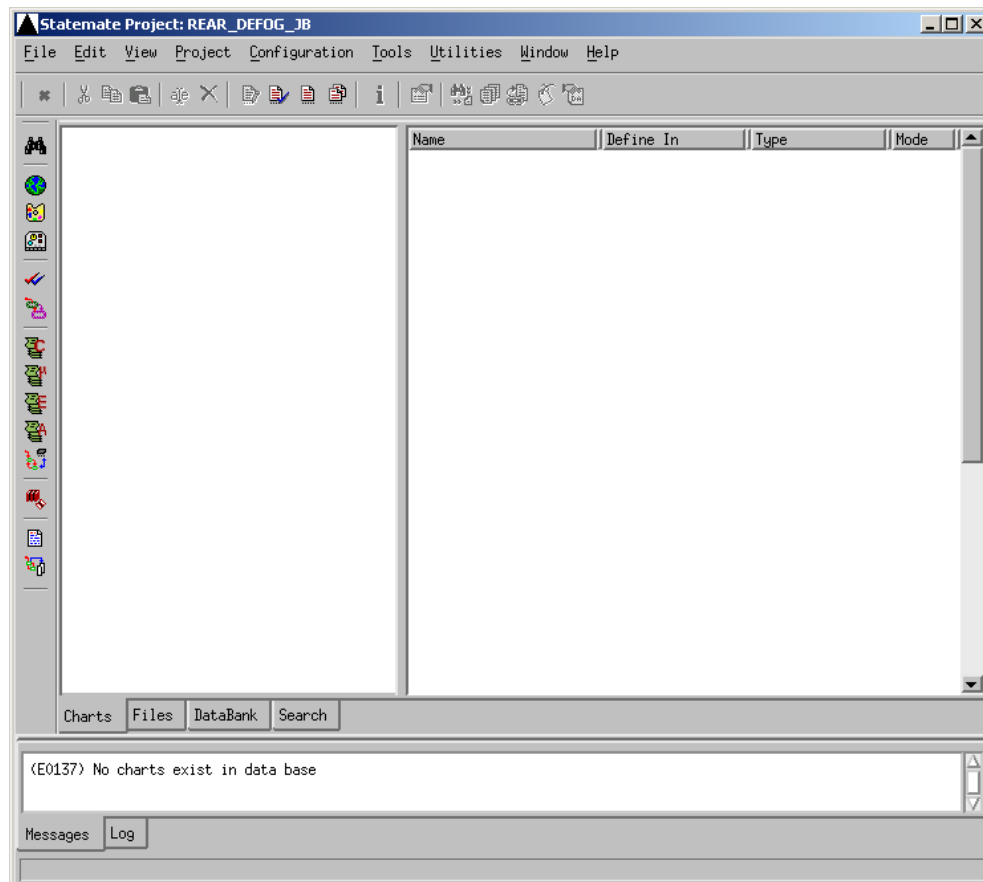**Open Project**

6. Select the project that you just created, **REAR_DEFOG_<your_initials>**.

7. Enter the following information to create a Workarea for the project that you just created.

Workarea: `<path>\stm_projects\rear_defog_<your_initials>.wa`

8. Click **OK** to open the project. The Statemate Main Window (Project Open) opens.
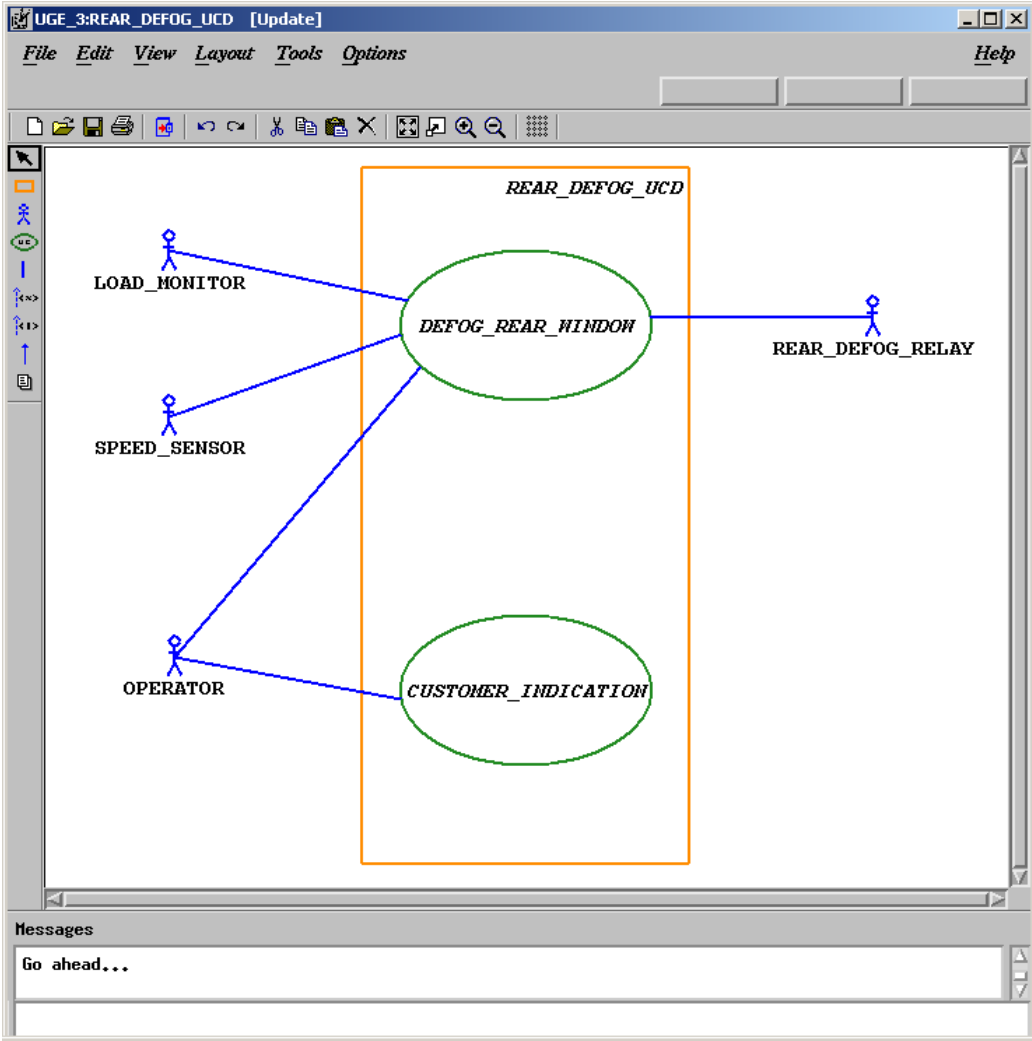
Statemate Main Window (Project Open)
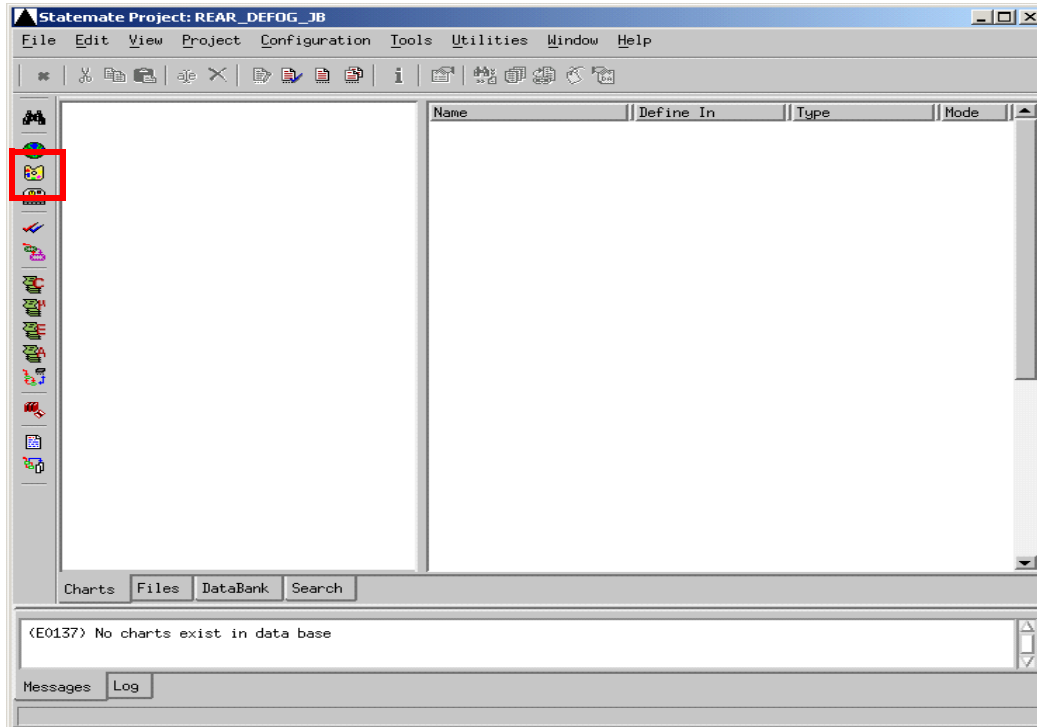
Exercise 1 - Constructing a Use Case Diagram

This exercise provides a walk-through the process to create a Use Case Diagram. The following example depicts the completed diagram for this exercise.

Use Case Diagram 'REAR_DEFOG_UCD'

1. Click **Graphic Editors** from the main Statemate window.

Statemate Main Window (Graphics Editor Icon)

Note: The Graphics Editor window allows you to open any available charts as well as create new charts.

2. Enter the following information to create a Use Case diagram (chart) called REAR_DEFOG_UCD. Refer to the following figure.

Note: Do not use spaces in the chart names.

- ◆ **Type**: Use-Case Diagram
- ◆ **Usage**: Regular - It defaults to this value based upon Type.
- ◆ **Name Pattern**: REAR_DEFOG_UCD

Open/Create Chart
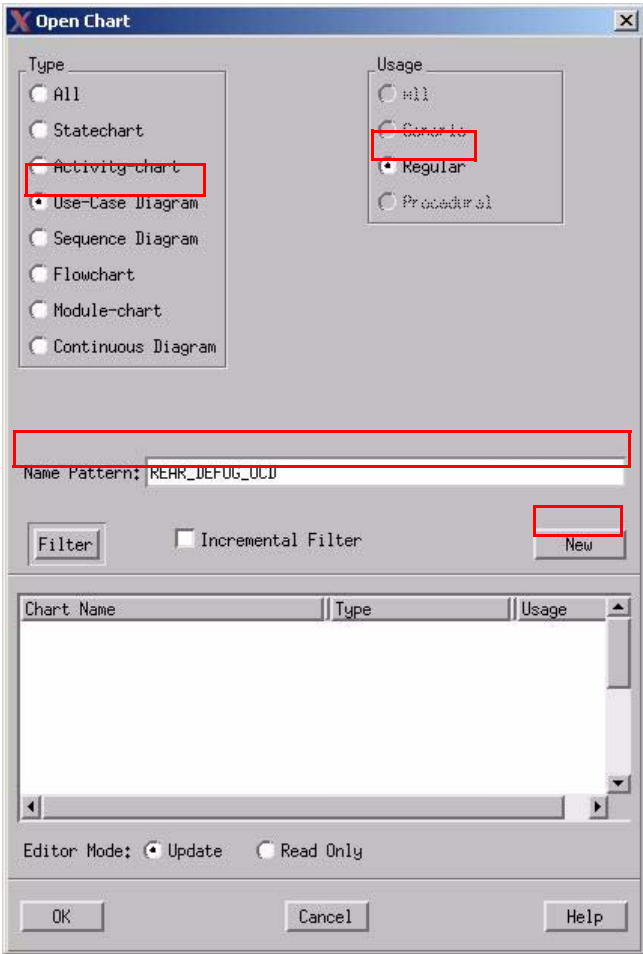
3. Click **New** from the Open Chart window. The use-case diagram displays and is available for editing (see the following figure).

Use-Case Daigram Icons

4. Click **Create Boundary Box** ▭ .

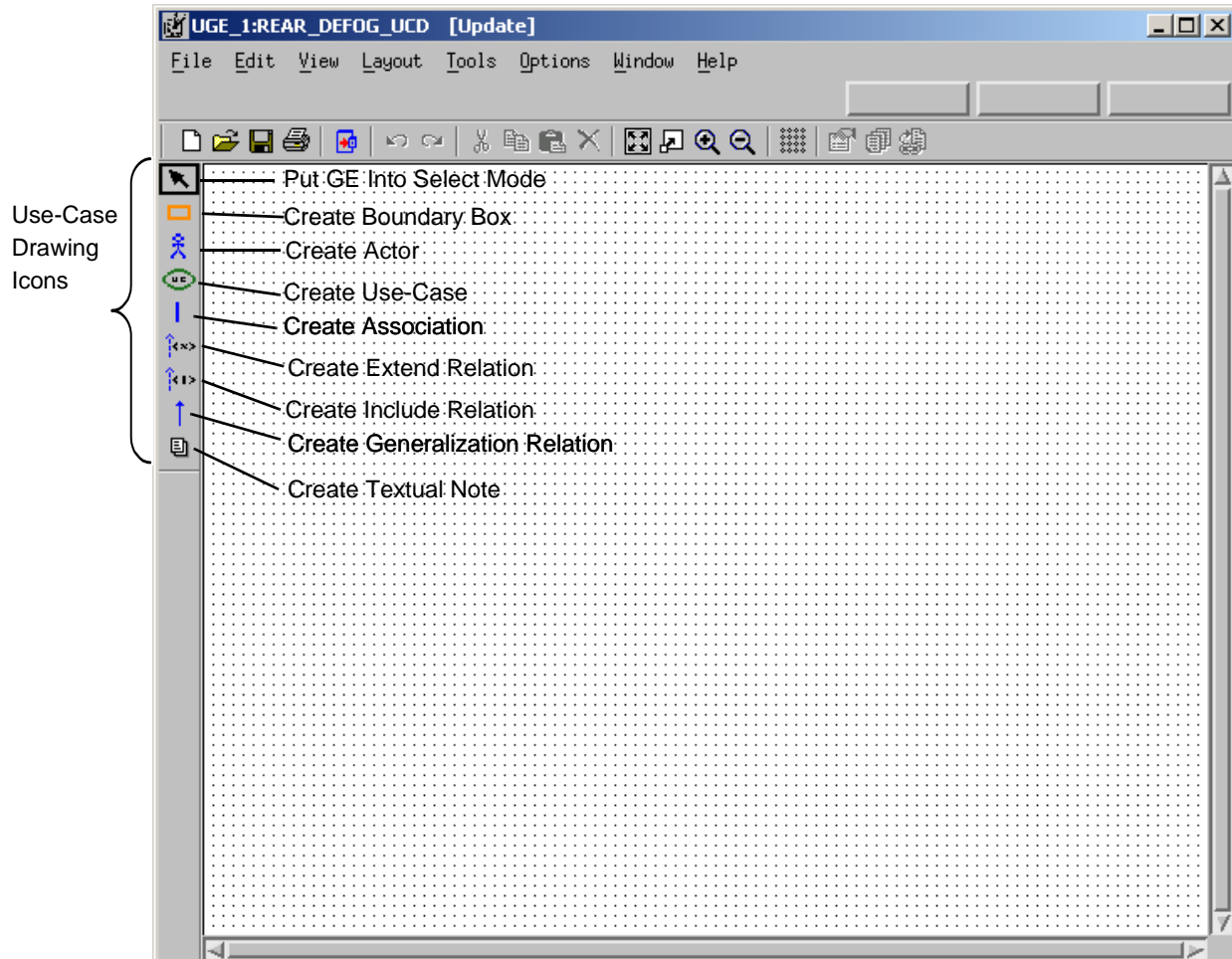5. To draw the Boundary Box for the REAR_DEFOG_UCD, place the cursor at the desired location for the upper, left-hand corner of the boundary box and click and drag to the desired location of the lower, right-hand corner of the boundary box.

   Note: The boundary box is named by default.

6. With the Create Boundary Box icon selected, enter REAR_DEFOG_UCD.

   Note:

   ◆ Click the location you want the text to reside within the boundary box. If a name already exists, double-click on the text to rename the item.

   ◆ Enter the names for boxes using **lowercase letters only**! Statemate, where appropriate, automatically performs the conversion to uppercase letters. Do **not** select the CAPS LOCK key before typing. Doing so may prevent you from making further selections within the tool.

7. Click **Create Use-Case** ⬭ .

8. Draw two use-cases as shown in the **Use Case Diagram 'REAR_DEFOG_UCD'** figure.

9. Name one use-case **DEFOG_REAR_WINDOW** and the other **CUSTOMER_INDICATION**.

10. Click **Create Actor** 🚶 .

11. Draw four actors as shown in the **Use Case Diagram 'REAR_DEFOG_UCD'** figure.

12. Name the actors:

   ◆ **'LOAD_MONITOR'**
   ◆ **'SPEED_SENSOR'**
   ◆ **'OPERATOR'**
   ◆ **'REAR_DEFOG_RELAY'**.

   Note: When an actor is added to a diagram, it is given a default name. To change the name of an actor, double-click on the text and enter the new information.

13. Select **Create Association** ▮ .

14. Draw the associations between the Actors and the Use-Cases as shown in the **Use Case Diagram 'REAR_DEFOG_UCD'** figure.

    a. Locate an actor and place the cursor on the edge of the actor.

    b. Click and release the left mouse button to enter the tail of the arrow.

    c. Locate the use-case and place the cursor on the edge of the use-case

    d. Click the middle mouse button to enter the arrowhead.

15. Select **File > Save** from the diagram and then **File > Exit**.

Exercise 2 - Constructing a Sequence Diagram

In this exercise, you will create two Sequence Diagrams. The '**Sequence Diagram 'REAR_DEFOG_LO_SPEED_NO_LOAD**' and **Sequence Diagram 'REAR_DEFOG_2HI_SPEED_2LOAD1**' figures depict what the diagrams will look like at completion of this exercise.
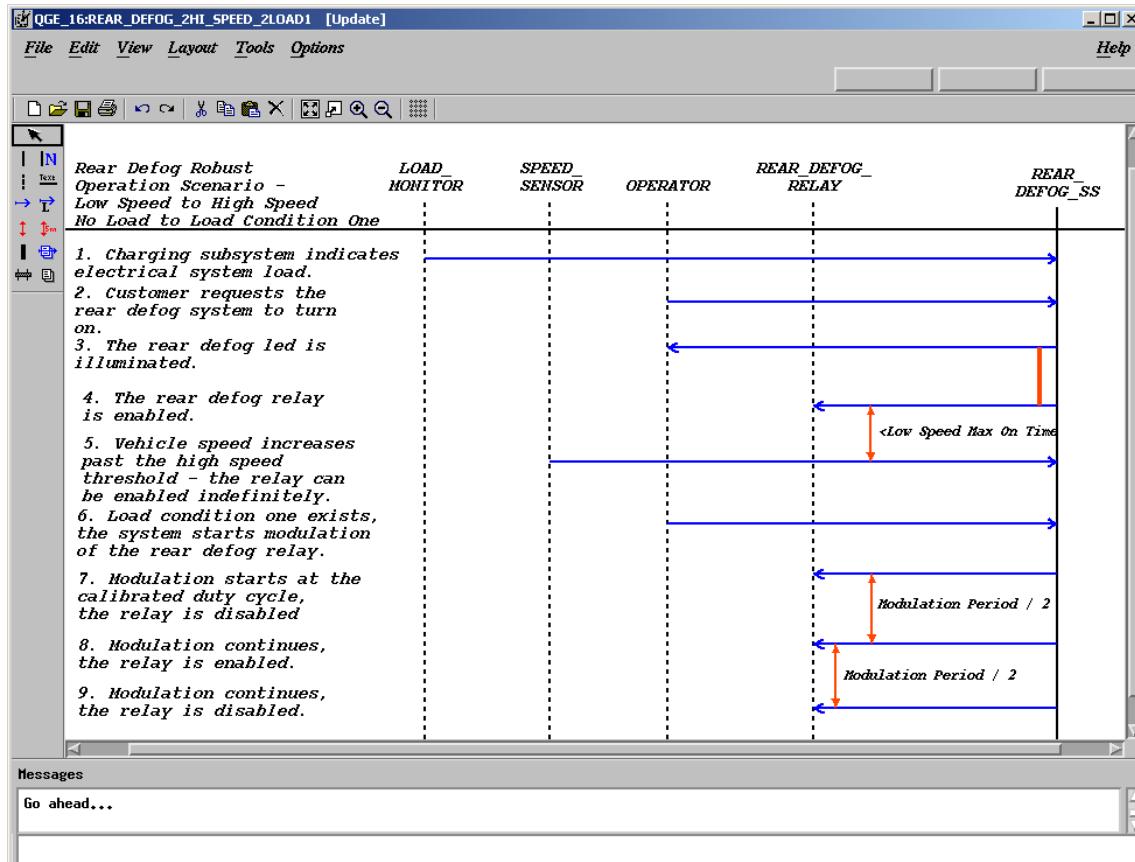
Sequence Diagram 'REAR_DEFOG_LO_SPEED_NO_LOAD
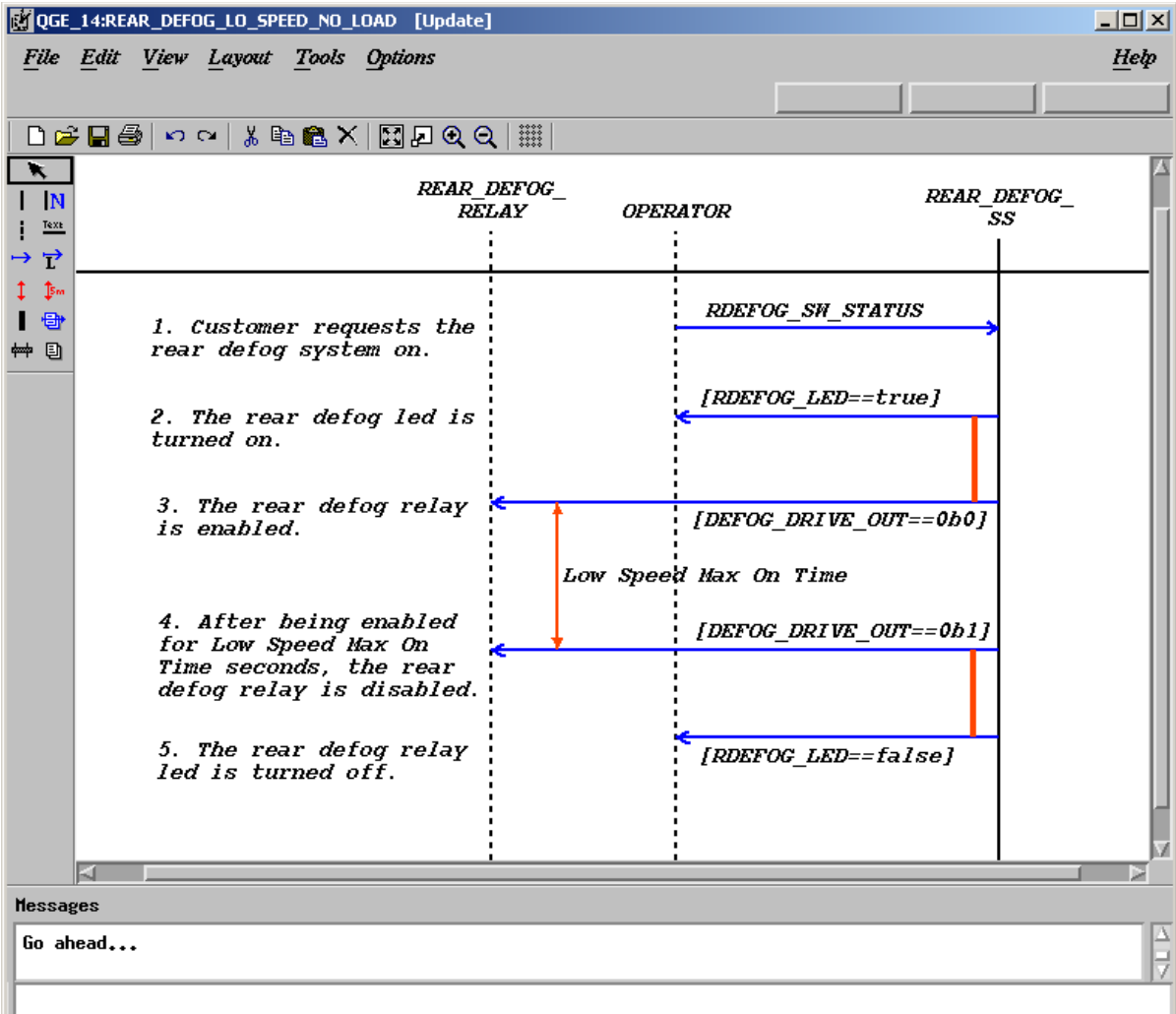
Sequence Diagram 'REAR_DEFOG_2HI_SPEED_2LOAD1

1. Click **Graphic Editors** (refer to the following figure) from the main Statemate window.

Statemate Graphic Editors Icon Selection
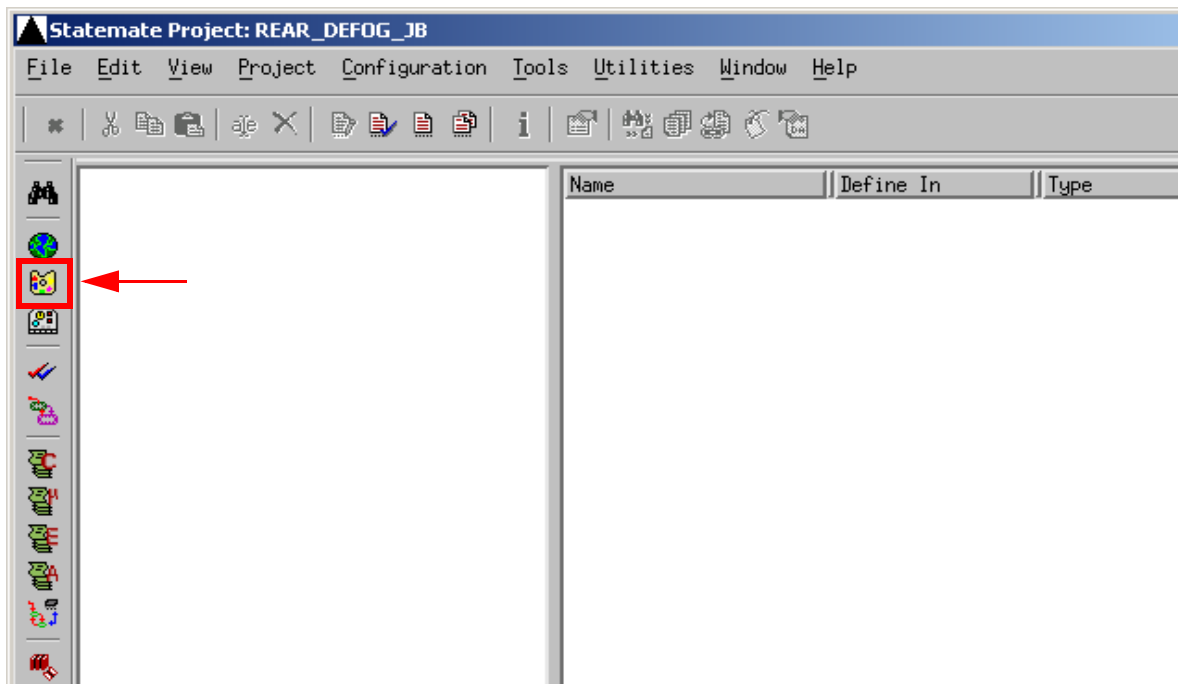
2. Create a Sequence Diagram called **REAR_DEFOG_LO_SPEED_NO_LOAD** based upon the selections shown in the following figure.

> **Note:** Do not use spaces in chart names.

- ◆ **Type**: Sequence Diagram
- ◆ **Usage**: Regular (will default to this value based upon Type)
- ◆ **Name Pattern**: REAR_DEFOG_LO_SPEED_NO_LOAD

Open/Create Chart
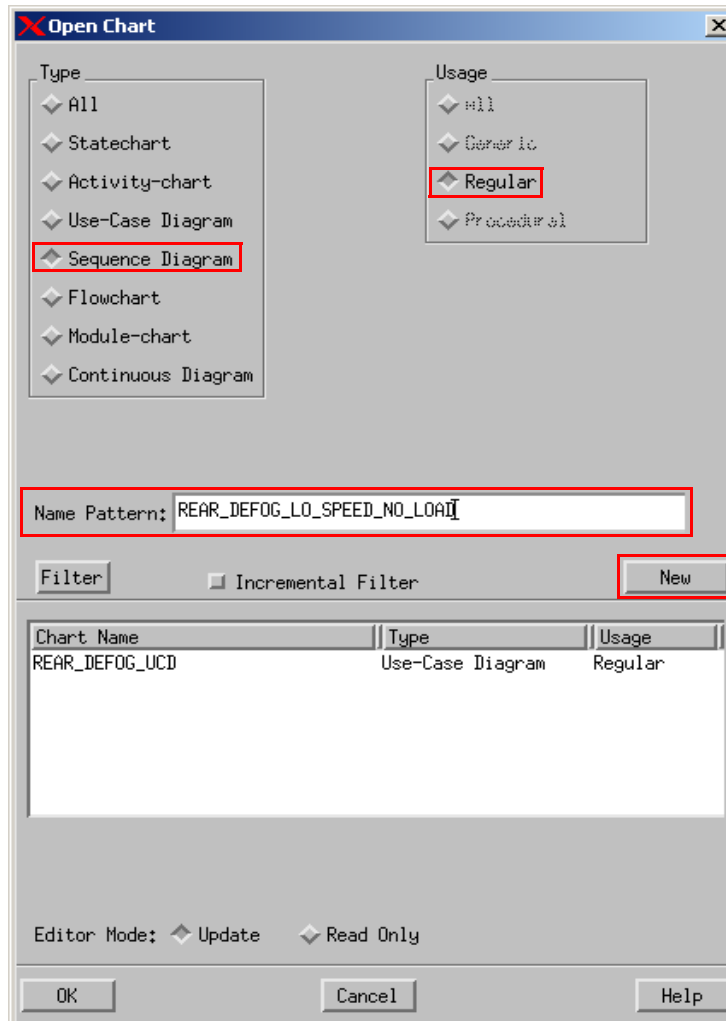
3. Click **New** from the Open Chart window to create and open a new diagram (refer to the following figure). The chart is now available for editing.

New Sequence Diagram
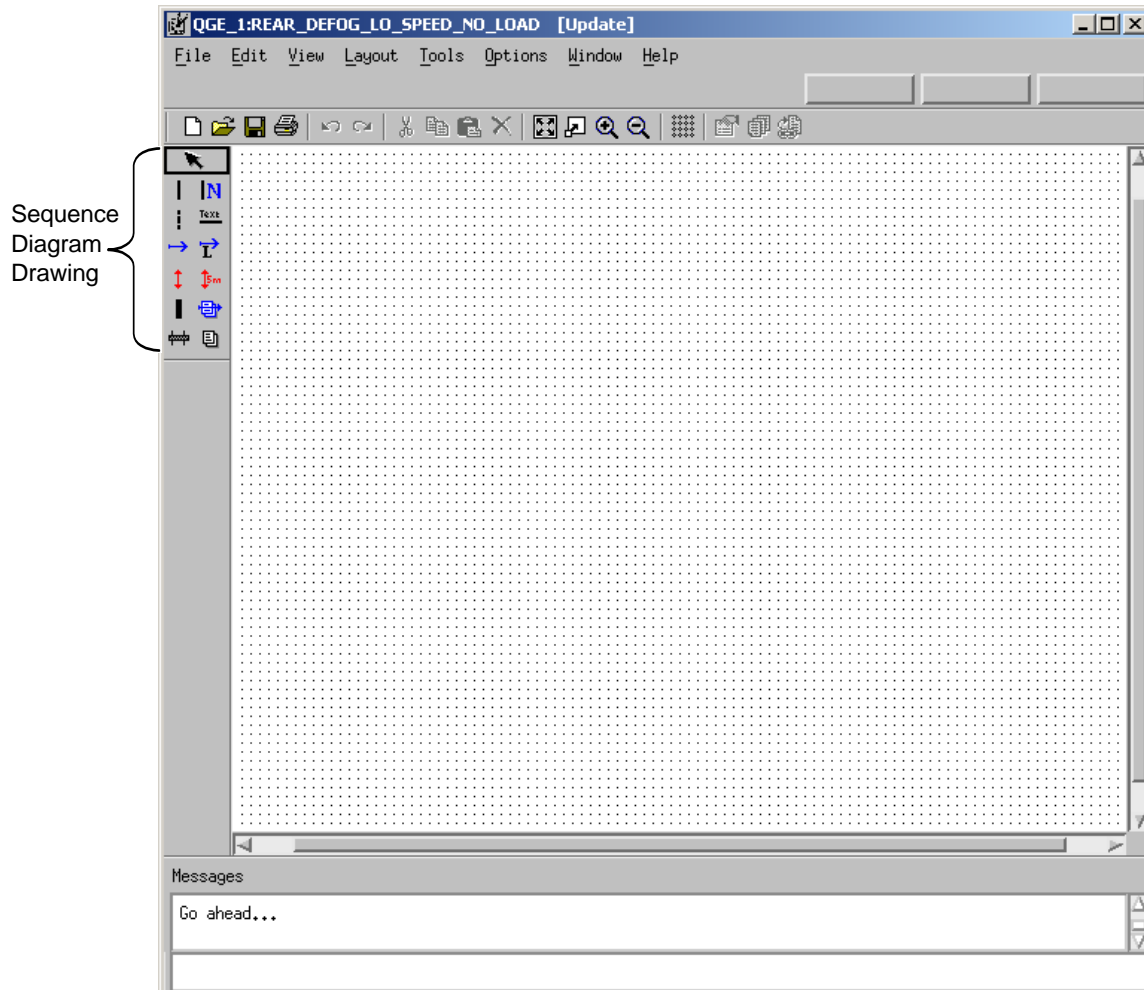
4. Click **Create Partition Line** Text.

5. Draw a Partition Line within the Sequence Diagram.

Place the cursor at the desired location and drag the mouse slightly to the right and release the mouse. This line extends "infinitely."

Partition Line
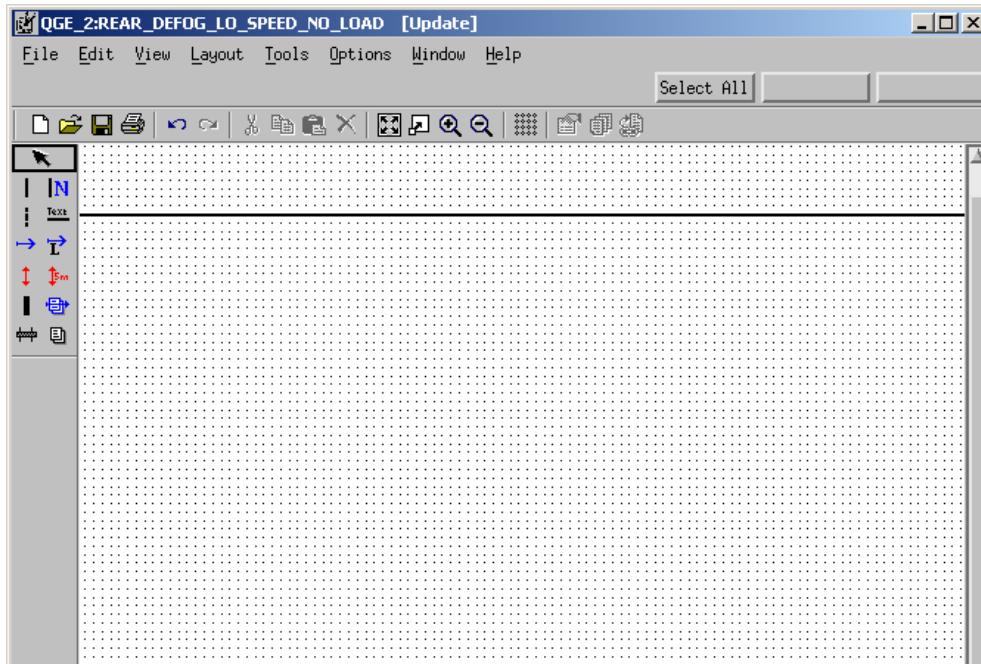
6. Click **Create External Life Line** ⋮ .

7. Draw two external lifelines in the Sequence Diagram.

Place the cursor at the desired location and double-click the mouse. A vertical line extends 'infinitely'. When a lifeline is added to a diagram it is given a default name. To change the names of lifeline, double-click on the text and enter the new name.

8. Name the external lifelines **REAR_DEFOG_RELAY** and **OPERATOR**.

9. Click **Create Life Line** | .

10. Draw a lifeline called '**REAR_DEFOG_SS**'. This is done the same way as the external lifelines. See the **Sequence Diagram - Life Lines** figure.

Sequence Diagram - Life Lines
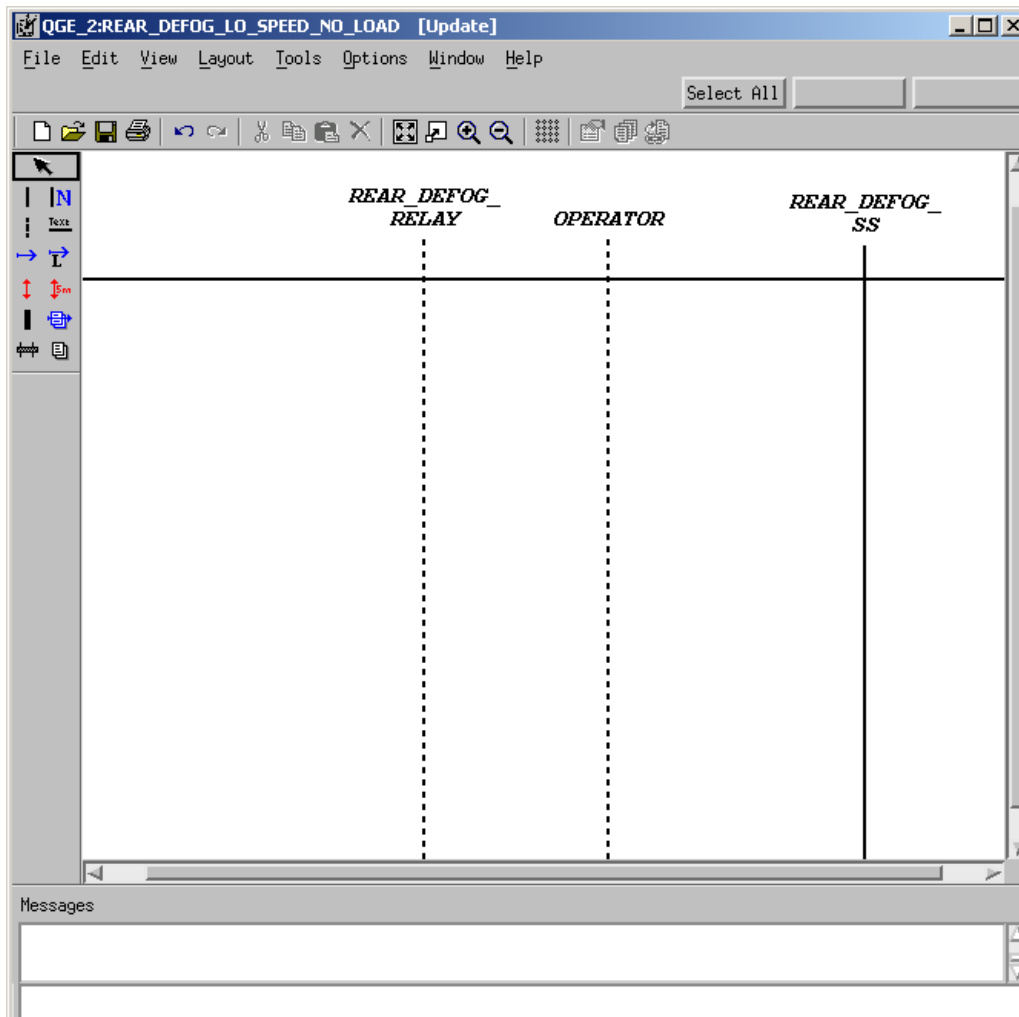
11. Click **Create Simple Message** ⟶.

> **Note:** Simple messages have to be drawn between the various lifelines. The following table shows the source and target of each lifeline.

12. Locate a lifeline and place the cursor on the edge of the lifeline and click to enter the tail of the arrow.

13. Locate the targeted lifeline and place the cursor on the edge of the targeted lifeline, and click to enter the arrowhead.

Simple Message

Source	Target
OPERATOR	REAR_DEFOG_SS
REAR_DEFOG_SS	OPERATOR
REAR_DEFOG_SS	REAR_DEFOG_RELAY
REAR_DEFOG_SS	REAR_DEFOG_RELAY
REAR_DEFOG_SS	OPERATOR

14. With the Create Simple Message icon still selected, label the messages as shown in the following table - Simple Message Labels.

Simple Message Labels

Source	Target	Label
OPERATOR	REAR_DEFOG_SS	RDEFOG_SW_STATUS
REAR_DEFOG_SS	OPERATOR	[RDEFOG_LED= =true]
REAR_DEFOG_SS	REAR_DEFOG_RELAY	[DEFOG_DRIVE_OUT= = 0b0]
REAR_DEFOG_SS	REAR_DEFOG_RELAY	[DEFOG_DRIVE_OUT= = 0b1]
REAR_DEFOG_SS	OPERATOR	[RDEFOG_LED= =false]

15. Click **Create Message Note** 🖼 to add message notes to the diagram.

16. Select and add the flowing notes to the messages as shown in the following table. The message notes are free text that is associated to particular message lines. Attach the text to the message by clicking on the message line.

Simple Message Notes

Source	Target	Message Note
OPERATOR	REAR_DEFOG_SS	1. Customer requests the rear defog system on.
REAR_DEFOG_SS	OPERATOR	2. The rear defog led is turned on.
REAR_DEFOG_SS	REAR_DEFOG_RELAY	3. The rear defog relay is enabled.
REAR_DEFOG_SS	REAR_DEFOG_RELAY	4. After being enabled for Low Speed Max On Time seconds, the rear defog relay is disabled.
REAR_DEFOG_SS	OPERATOR	5. The rear defog relay led is turned off.

17. Click **Create Order Insignificant Line** ▌ and place this between two of the messages. Between messages 2 and 3, and messages 4 and 5. See the **Sequence Diagram 'REAR_DEFOG_LO_SPEED_NO_LOAD** figure.

18. Click **Create Timing Constraint** ↕ and add this between message 3 and 4. See the **Sequence Diagram 'REAR_DEFOG_LO_SPEED_NO_LOAD** figure.

19. Select **File > Save** from the diagram and then **File > Exit**.

20. Repeat steps 1-3 to create another sequence diagram called **'REAR_DEFOG_2HI_SPEED_2LOAD1'**.

21. Create a partition line and four (4) external lifelines with the following names:

- ◆ **'LOAD_MONITOR'**
- ◆ **'SPEED_SENSOR'**
- ◆ **'OPERATOR'**
- ◆ **'REAR_DEFOG_RELAY'**.

22. Draw a lifeline in the called **'REAR_DEFOG_SS'**. This is done in the same manner as was done with the external lifelines.

23. Create simple messages between the various lifelines, based upon the information in the following table, Simple Messages, that show the source and target of each lifeline.

Simple Messages

Source	Target
LOAD_MONITOR	REAR_DEFOG_SS
OPERATOR	REAR_DEFOG_SS
REAR_DEFOG_SS	OPERATOR
REAR_DEFOG_SS	REAR_DEFOG_RELAY
SPEED_SENSOR	REAR_DEFOG_SS
OPERATOR	REAR_DEFOG_SS
REAR_DEFOG_SS	REAR_DEFOG_RELAY
REAR_DEFOG_SS	REAR_DEFOG_RELAY
REAR_DEFOG_SS	REAR_DEFOG_RELAY

24. Add message notes to the messages within the diagram. Refer to the following table, Message Notes, for the messages that need to be added.

Note

Labels are not be added to the diagram yet.

Message Notes

| Source	Target	Message Note
LOAD_MONITOR	REAR_DEFOG_SS	1. Charging subsystem indicates electrical system load.
OPERATOR	REAR_DEFOG_SS	2. Customer requests the rear defog system to turn on.
REAR_DEFOG_SS	REAR_DEFOG_RELAY	3. The rear defog LED is illuminated.
REAR_DEFOG_SS	REAR_DEFOG_RELAY	4. The rear defog relay is enabled.
SPEED_SENSOR	REAR_DEFOG_SS	5. Vehicle speed increases past the high-speed threshold - the relay can be enabled indefinitely.
OPERATOR	REAR_DEFOG_SS	6. Load condition one exists, the system starts modulation of the rear defog relay.
REAR_DEFOG_SS	REAR_DEFOG_RELAY	7. Modulation starts at the calibrated duty cycle; the relay is disabled.
REAR_DEFOG_SS	REAR_DEFOG_RELAY	8. Modulation continues; the relay is enabled.
REAR_DEFOG_SS	REAR_DEFOG_RELAY	9. Modulation continues; the relay is disabled.

25. Select **File > Save** from the diagram and then **File > Exit**.

Exercise 3 - Linking Use-Cases to Scenarios

In this exercise, you will use use-cases to create possible scenarios utilizing elements properties.
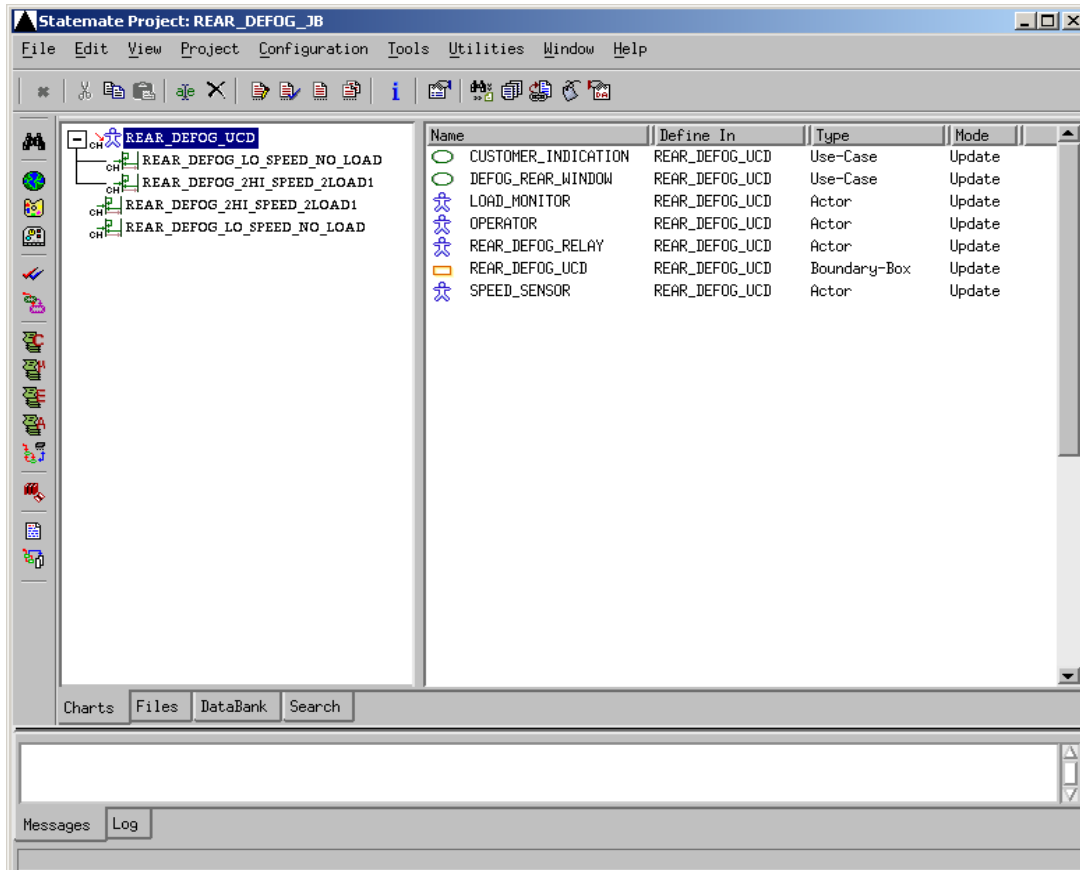
1. Select the **Charts** tab from the main Statemate window.

Charts Tab
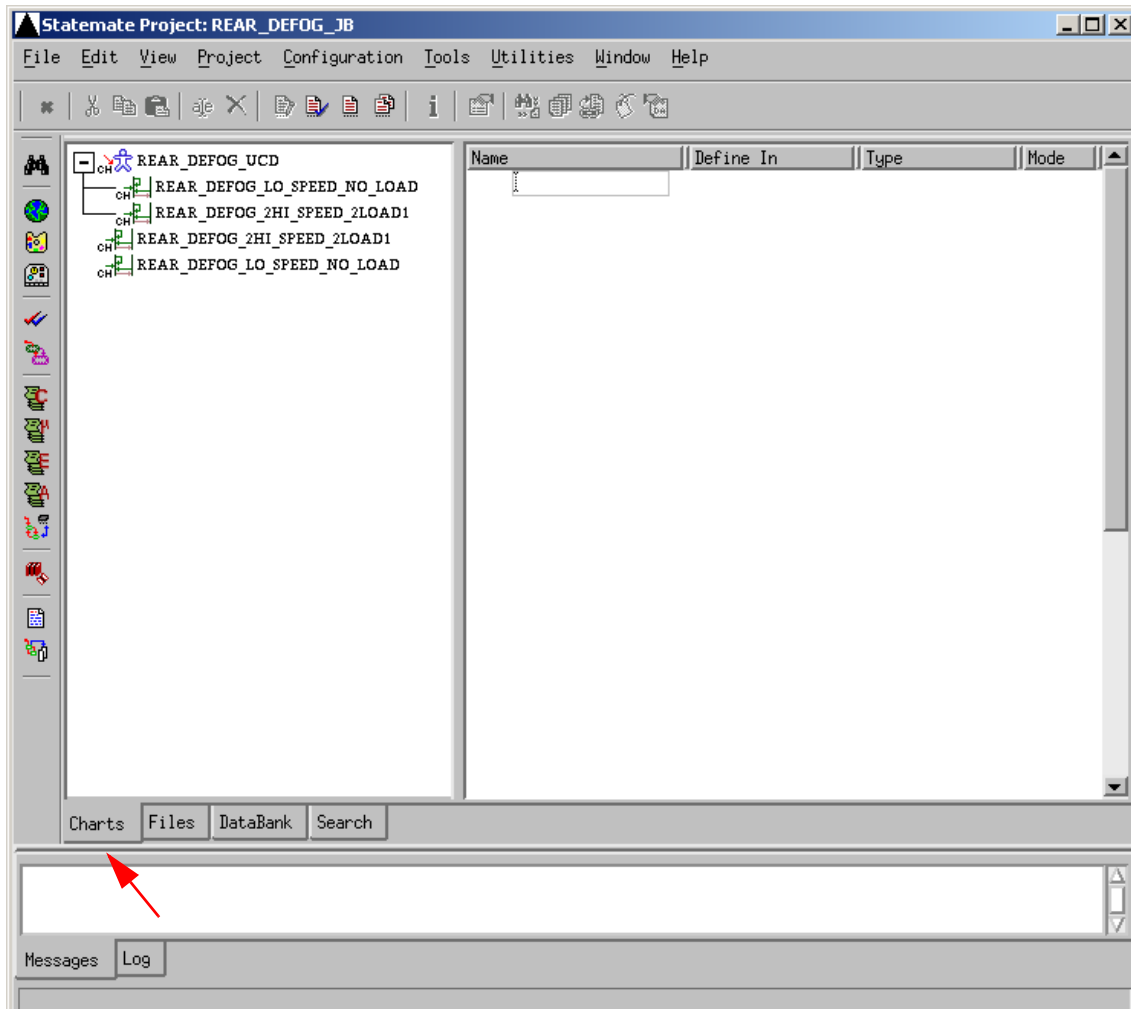
2. Select the **REAR_DEFOG_UCD** diagram from within the Chart View (refer to the following figure). This provides a list all of the diagram elements associated within the diagram in the Element Matrix.

Element Matrix

3. Select the use-case within the Use Case Diagram called '**DEFOG_REAR_WINDOW**' and then select **Edit > Properties…** (refer to the following figure).

**Properties for DEFOG_REAR_WINDOW**
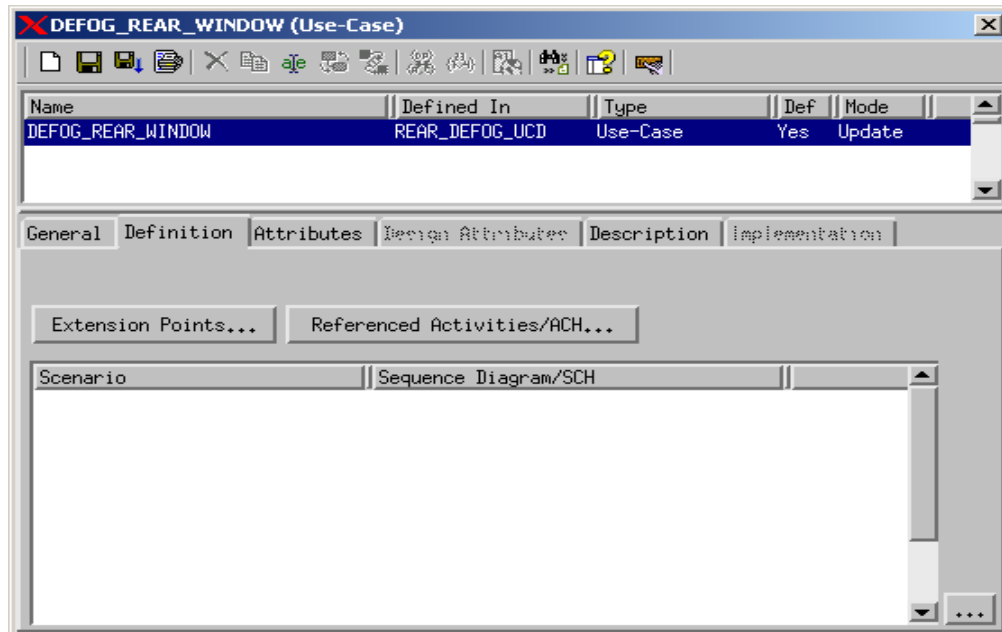
> **Note:** Double-clicking on the item within the Element Matrix also opens the Properties window. Selecting a diagram within the chart view displays all elements within the diagram in the Element Matrix.

4. Select the **Description** tab and enter the following text in the Use-Case Long Description field:

```
'The customer may request a change in state of the rear defog control
system. Once the system has been activated, it shall automatically time
out and turns itself off without any customer interaction. The timing
function can be modified by vehicle speed and load management.'
```
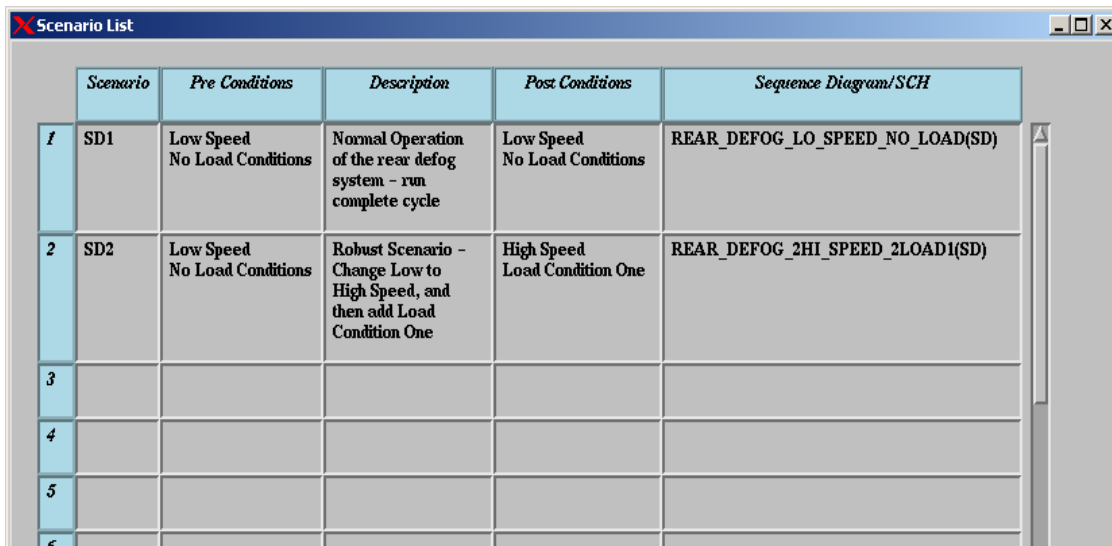
5. Select the **Definition** tab and then click [···] to invoke the Scenario List, (refer to the following figure) to create the mapping between the use-case and the scenario(s). The Scenario List is invoked by clicking [···] at the bottom of the Properties form.

Scenario List
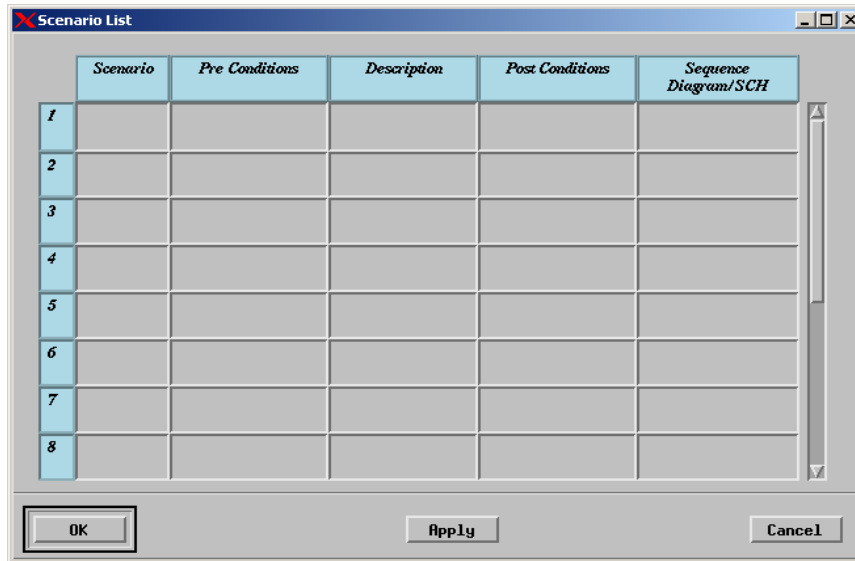
6. Fill out the Scenario List with the following data (refer to the following figure) to create the necessary links.

Scenario List Mapping

|	Scenario	Pre Conditions	Description	Post Conditions	Sequence Diagram/SCH
1	SD1	Low Speed No Load Conditions	Normal Operation of the rear defog system – run complete cycle	Low Speed No Load Conditions	REAR_DEFOG_LO_SPEED_NO_LOAD(SD)
2	SD2	Low Speed No Load Conditions	Robust Scenario – Change Low to High Speed, and then add Load Condition One	High Speed Load Condition One	REAR_DEFOG_2HI_SPEED_2LOAD1(SD)
3					
4					
5					
6					

7. Select **Save** from the Properties window and then **Exit**.
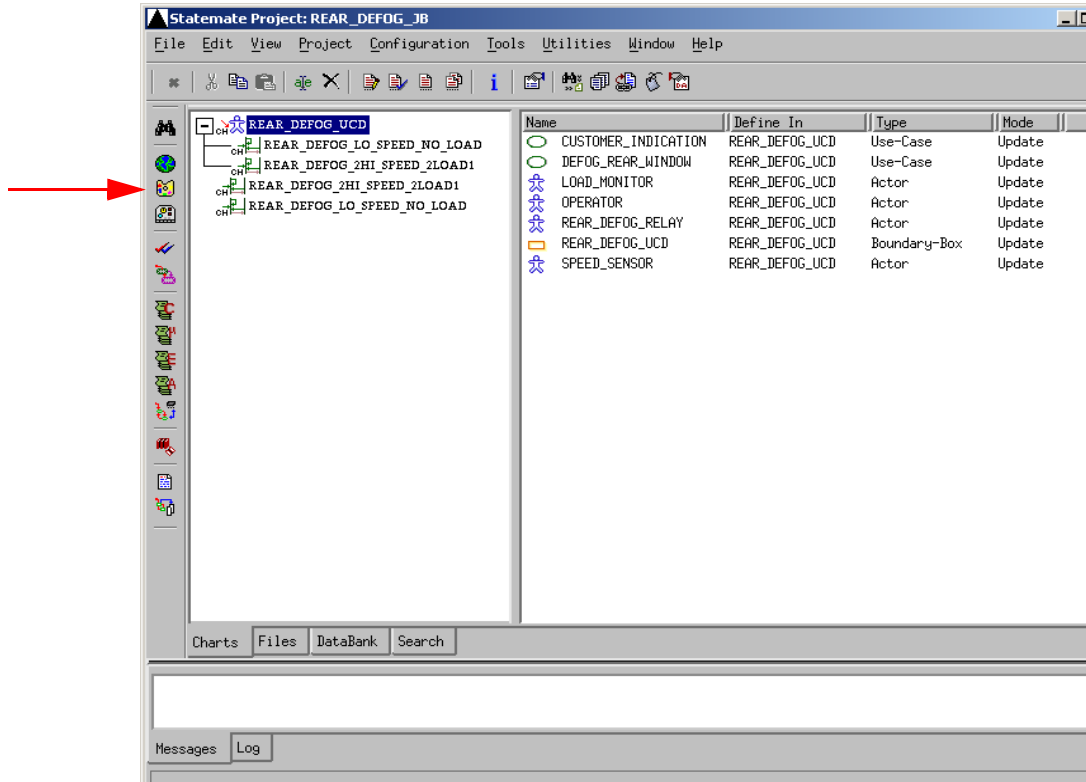
Exercise 4 - Constructing an Activity-Chart

In this exercise, you will develop the top-level system diagram for the rear defog system, as shown in the following figure.

Activity-Chart - REAR_DEFOG_SS
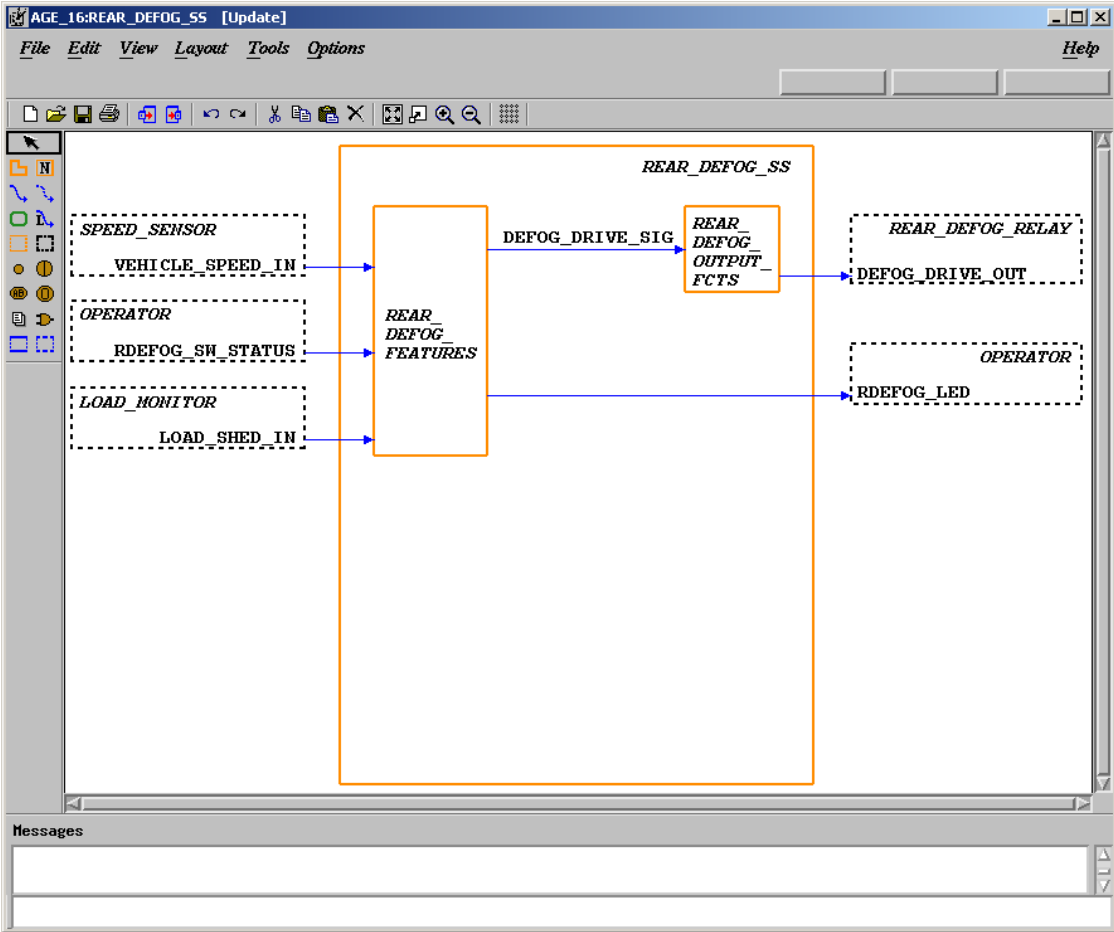
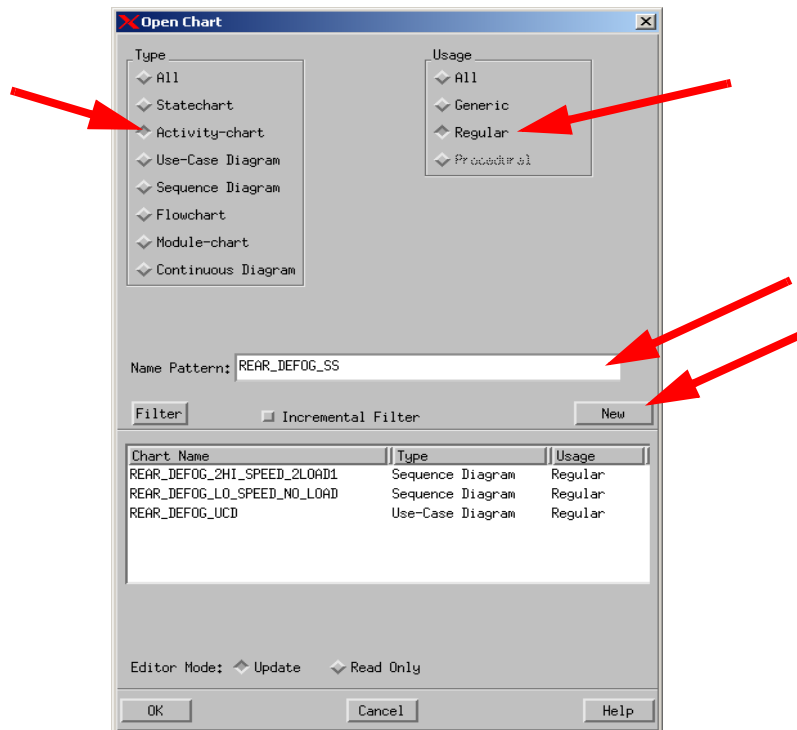1. Click **Graphic Editors** from the main Statemate window.

Graphics Editor Icon

2. Create an Activity-chart called '**REAR_DEFOG_SS**' based on the selections shown in the following figure.
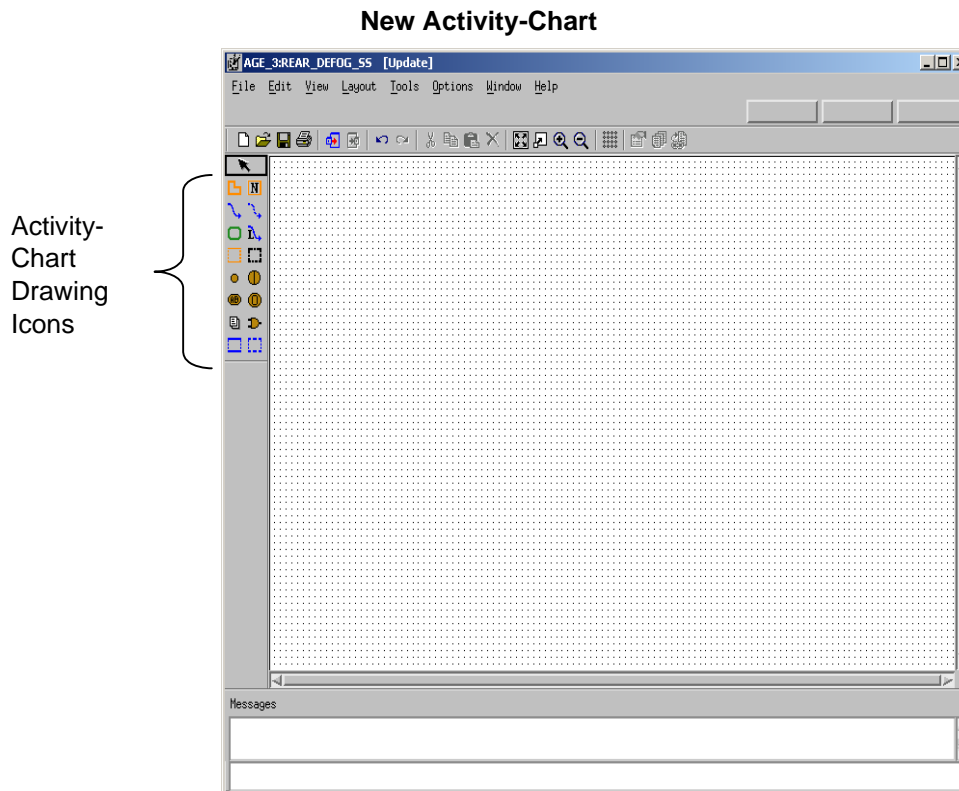
> **Note:** Do not use spaces in chart names.

♦ **Type**: Activity

♦ **Usage**: Regular

♦ **Name Pattern:** REAR_DEFOG_SS

Open/Create Chart

3. Click **New** from the Open Chart window to create and open a new diagram. The chart is now available for editing.

New Activity-Chart


Activity-Chart Drawing Icons

4. Click **Create Internal Activity** 📙.

5. Draw the internal activity called '**REAR_DEFOG_SS**'.

   Place the cursor at the desired location for the upper, left-hand corner of the activity and drag to the desired location of the lower, right-hand corner of the activity and release the mouse. A ghost image shows the activity outline.

6. Click **Create Internal Activity** or **Name Existing Activity** and start entering the name of the activity. Click and release tat the location in which you want the text to reside within the activity.

7. Enter the names for boxes using lowercase letters.

   Note: Statemate, where appropriate, automatically performs the conversion to uppercase letters. Do not select the CAPS LOCK key before typing. Doing so may prevent you from making further selections.

8. Using the **Activity-Chart - REAR_DEFOG_SS** figure and the previous instructions as a guide, create and name two internal activities called '**REAR_DEFOG_FEATURES**' and '**REAR_DEFOG_OUTPUT_FCTS**'.

9. Click **Create External Activity** ⬚.

10. Draw the external activities for the **REAR_DEFOG_SS**. The same drawing rules apply for drawing and naming external activities Use the following figure as a guide as to which external activities should be on the left and which external activities should be on the right.

Partial Chart Design
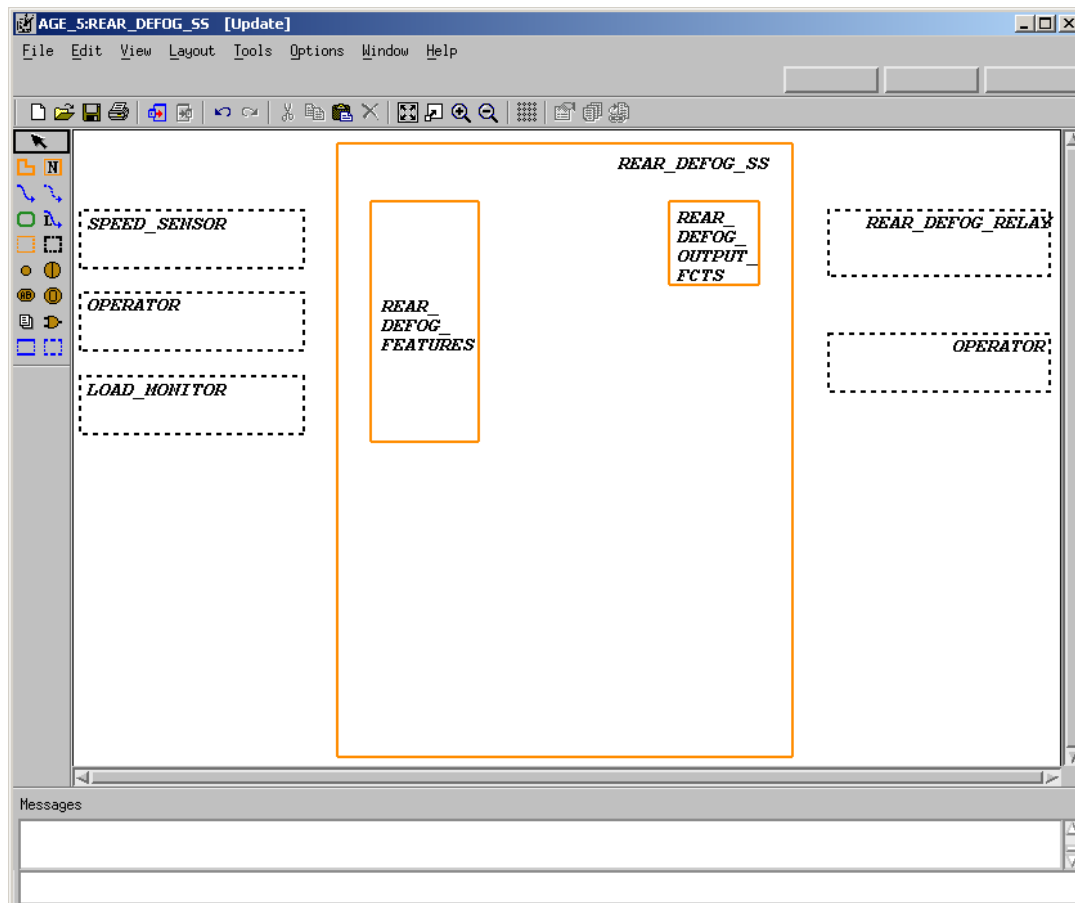
11. Click **Create Data-Flow** ⬎.

12. Draw a flow line from the external activity called '**SPEED_SENSOR**' to the internal activity called '**REAR_DEFOG_FEATURES**'.

13. Locate the external activity called '**SPEED_SENSOR**'. This is the source activity. Place the cursor on the edge of the box and click and drag to enter the tail of the arrow.

14. Locate the internal activity called '**REAR_DEFOG_FEATURES**'. This is the target activity. Place the cursor on the edge of the box and click and drag to enter the arrowhead.

> **Note:** In order to create flow lines with angles, you may click/release the left mouse button at each location.

15. Label the flow line '**VEHICLE_SPEED_IN**'.

With the Create Data-Flow or the Label Existing Flow-Line icon selected, start entering the desired name for the label. Click the flow line that you want to label.

16. Draw a flow line from the external activity called '**OPERATOR**' to the internal activity '**REAR_DEFOG_FEATURES**' and label the flow '**RDEFOG_SW_STATUS**'.

17. Draw a flow line from the external activity called '**LOAD_MONITOR**' to the internal activity '**REAR_DEFOG_FEATURES**' and label the flow '**LOAD_SHED_IN**'.

18. Draw a flow line from the internal activity called '**REAR_DEFOG_FEATURES**' to the internal activity '**REAR_DEFOG_OUTPUT_FCTS**' and label the flow '**DEFOG_DRIVE_SIG**'.

19. Draw a flow line from the internal activity called '**REAR_DEFOG_FEATURES**' to the external activity '**OPERATOR**' and label the flow '**RDEFOG_LED'**.

20. Draw a flow line from the internal activity called '**REAR_DEFOG_OUTPUT_FCTS**' to the external activity '**REAR_DEFOG_RELAY**' and label the flow '**DEFOG_DRIVE_OUT**'.

21. Select **File > Save** from the chart and then **File > Exit.**

Exercise 5 - Defining Textual Elements

In this exercise. you will formally define the textual elements that were entered into the activity-chart '**REAR_DEFOG_SS**'.

1. Select the chart called '**REAR_DEFOG_SS**' from right panel of the Chart Tab. Refer to the following figure.

Element Matrix for Chart REAR_DEFOG_SS

2. Select the element called '**VEHICLE_SPEED_IN**'.

3. Select **Edit > Properties**. This opens the Properties window for this element (refer to the following figure). Double-clicking on the element name also opens the properties window for this element.

Properties - Vehicle Speed In
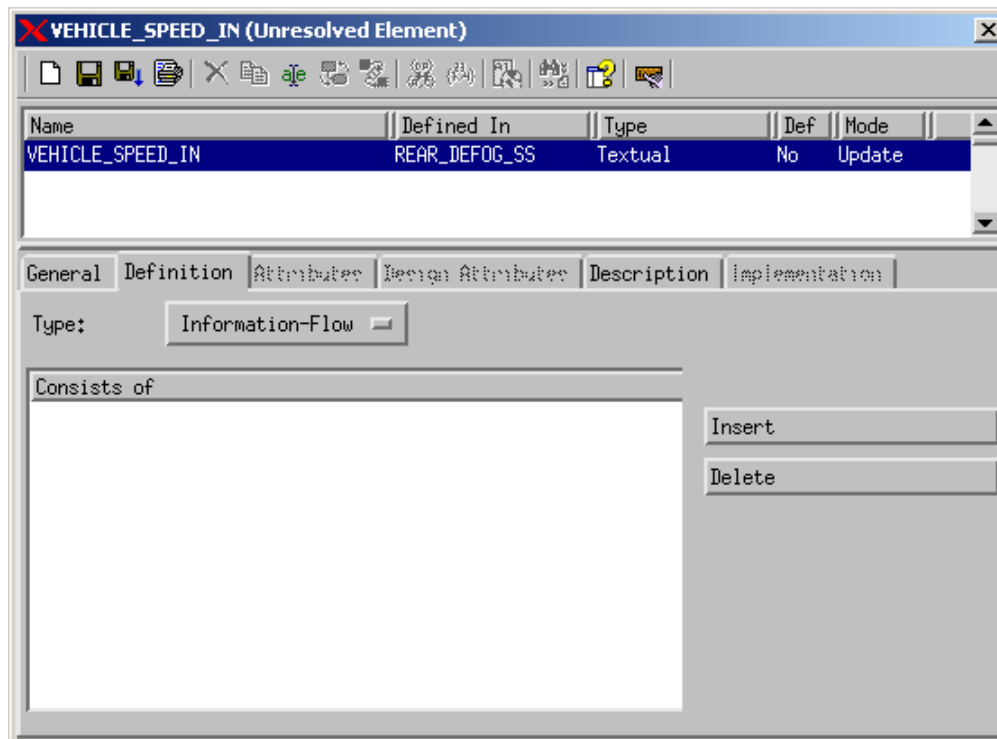
4. You now need to define the textual element 'VEHICLE_SPEED_IN'.

a. Change the type from **Information Flow** to **Data-Item** from the pull-down menu. See the following figure.

Unresolved Element - Vehicle Speed In
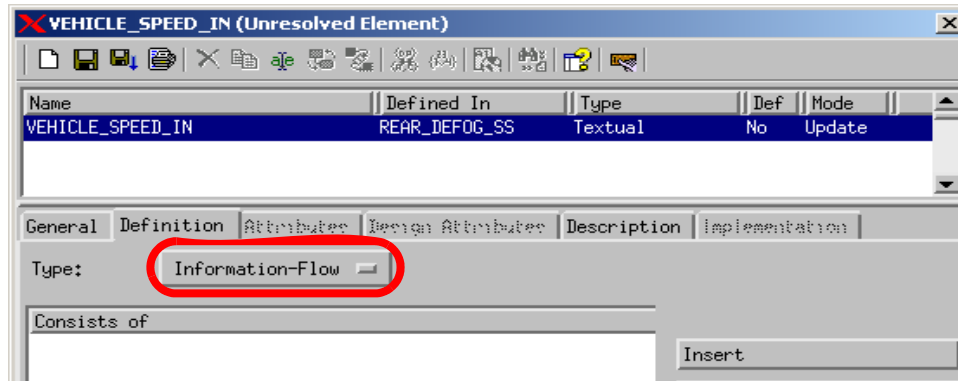
b. Change the **Data Type** from None to Integer from the pull-down menu.

c. Enter a **Min Value** of 0. See the following figure.

Property Form - Data Item Vehicle Speed In

    d.   Enter a **Max Value** of 150.

    e.   Enter a **Default Value** of 50.

    f.   Enter the following text in the Description field: '**Vehicle Speed from Powertrain (KPH)**.'

    g.   Click **Save**.

    h.   Exit.

5.   Select the flow line and define the textual element called 'RDEFOG_SW_STATUS'.
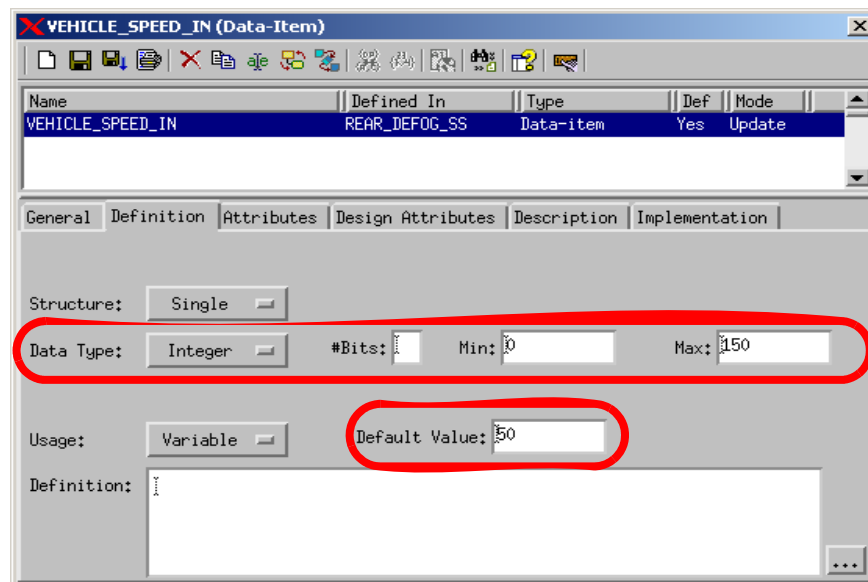
6.   Change the **Data Type** from Information Flow to Event.

7.   Enter the following text in the Description field:

    `'Rear Defog switch status from Operator'`

8.   Click **Save**.

9.   Exit.

10.   Select the flow line and define the textual element called '**DEFOG_DRIVE_SIG**'.

11.   Change the **Type** from Information Flow to Condition.

12.   Enter the following text in the **Description** field:

    `'Logical output to turn on/off relay.'`

13.   Click **Save**.

14.   Exit.

15.   Select the flow line and define the textual element called '**DEFOG_DRIVE_OUT**'.

16.   Change the **Type** from Information Flow to Data-Item.

17.   Change the **Data Type** from None to Bit.

18.   Enter the following text in the Description field:

    `'Low side drive to relay.'`

19.   Click **Save**.

20.   Exit.

21.   Select the flow line and define the textual element called '**RDEFOG_LED**'.

22. Change the **Type** from Information Flow to Condition.

23. Enter the following text in the Description field:

```
'Rear defog light output to Operator.'
```

24. Click **Save**.

25. Exit.

> **Note:** The final element that needs to be defined is the element '**LOAD_SHED_IN**'. This element can be one of four possible values. To accomplish this, an enumerated type will be created.

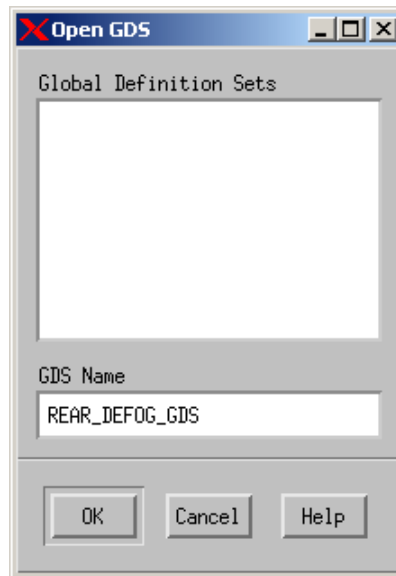**26.** From the main Statemate window, click **GDS Editor** (refer to the following figure).

GDS Editor Icon
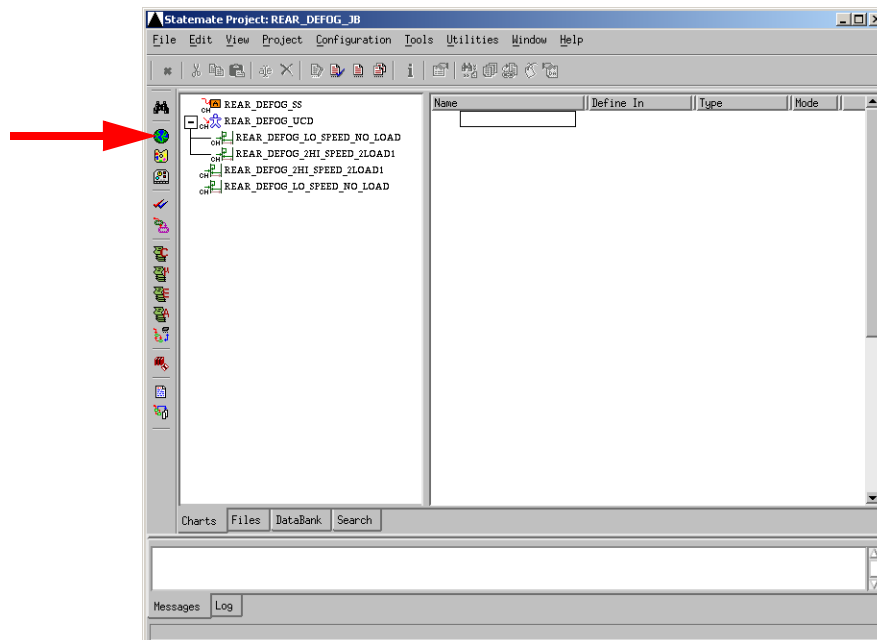
> **Note:** An Open GDS window (refer to the following figure) becomes invoked.

27. Enter the name '**REAR_DEFOG_GDS'** for the GDS name and click **OK**.

Open GDS

28. Click **New** from the Properties window.

29. Create the new element type using the values shown in the following figure.

  ◆ **Element Name**: LOAD_MGMT_CMD_TYPE

  ◆ **Chart Name**: REAR_DEFOG_GDS

  ◆ **Element Type**: User-Defined Type

New GDS Element
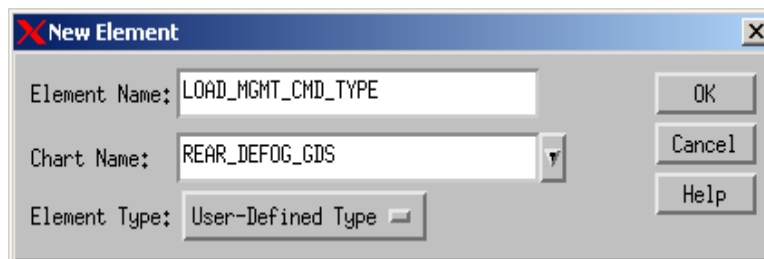
Note: You now need to define the User-Defined Type called '**LOAD_MGMT_CMD_TYPE**' (refer to the following figure).

User-Defined Type

30. Change the Change the **Data Type** from None to Enum Type from the pull-down menu.
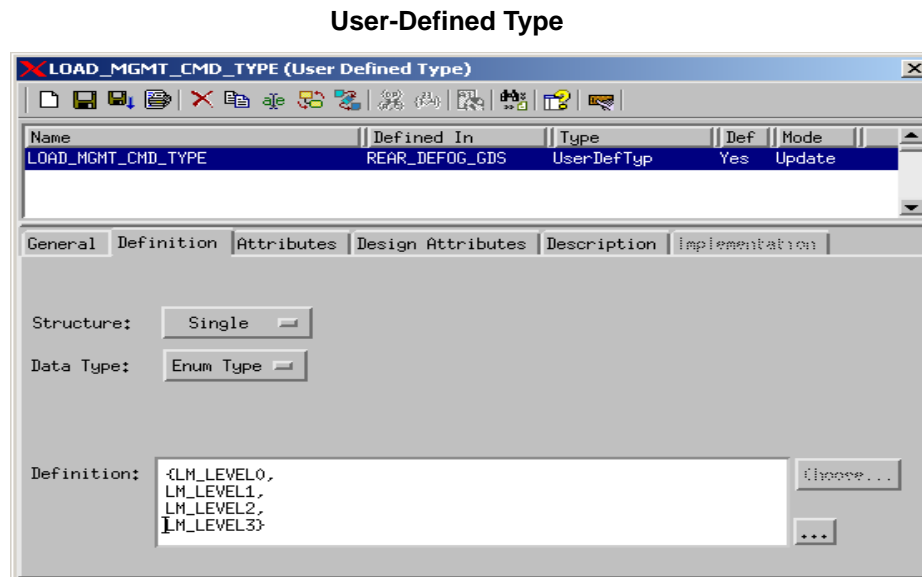
31. Enter the following text in the Definition field:

    {LM_LEVEL0, LM_LEVEL1, LM_LEVEL2, LM_LEVEL3}

32. Enter the following text in the Description field:

    'Load Management Types.'

33. Click **Save**.

34. Exit.

    Note: You can now return to the Chart Tab view and select the activity-chart "**REAR_DEFOG_SS**" and define the textual element called '**LOAD_SHED_IN**'.

35. Double-click on the element called "**LOAD_SHED_IN**" to bring up the properties window (refer to the following figure).

36. Change the **Type** from Information Flow to Data-Item from the pull-down menu.

37. Change the **Data Type** from None to User Type.

38. Select '**LOAD_MGMT_CMD_TYPE**' from the drop down selection window next to the Data Type.
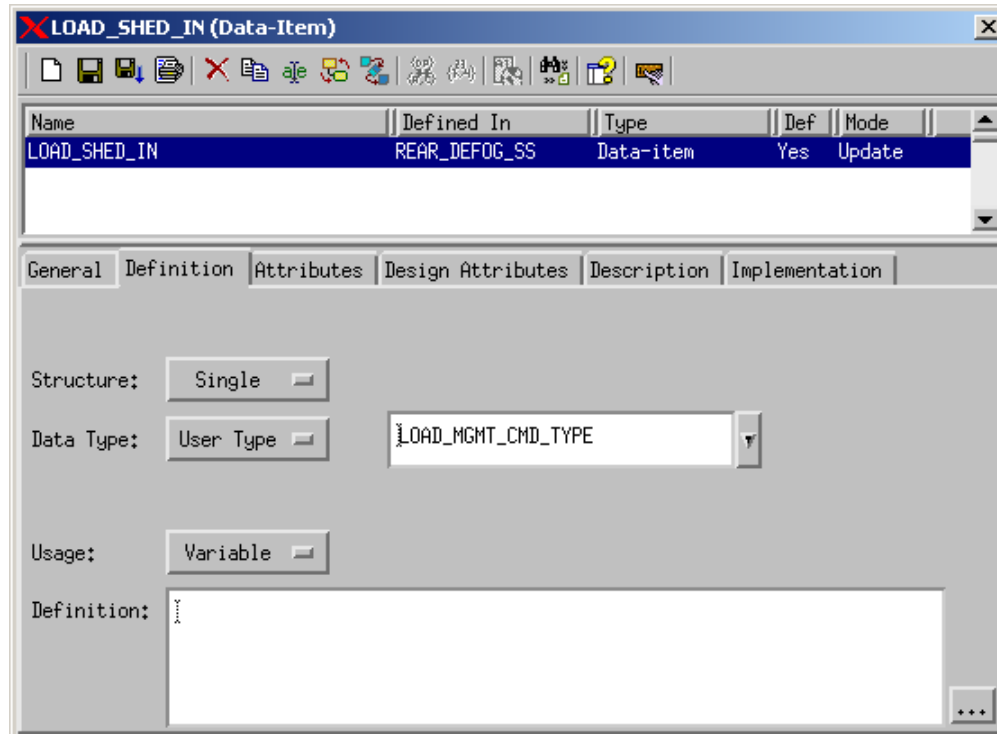
39. Enter the following text in the Description field:

```
'Load management levels (0-3)'
```

40. Click **Save**.

41. Exit.

Property Window - User Type

Exercise 6 - System Decomposition

In this exercise, you will create three activity-charts that show the decomposition of the top-level activity-chart that was developed in **Exercise 4 - Constructing an Activity-Chart**. The same modeling techniques should be used in this exercise as in Exercise 4. The following three figures show the three activity-charts that need to be created.

- ◆ **Activity-chart REAR_DEFOG_FEATURES**
- ◆ **Activity-chart CALC_REAR_DEFOG_STATE**
- ◆ **Activity-Chart REAR_DEFOG_RELAY_MGMT**

Activity-chart REAR_DEFOG_FEATURES
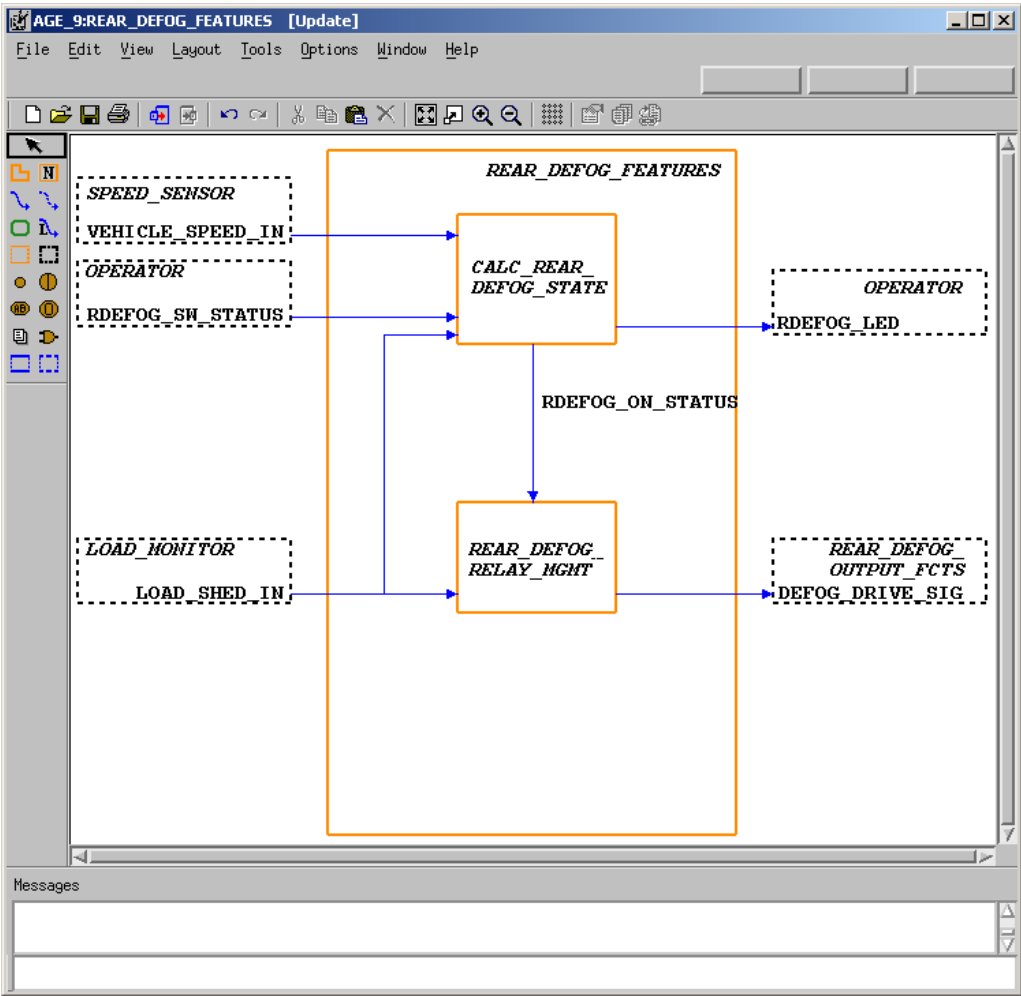
Activity-chart CALC_REAR_DEFOG_STATE
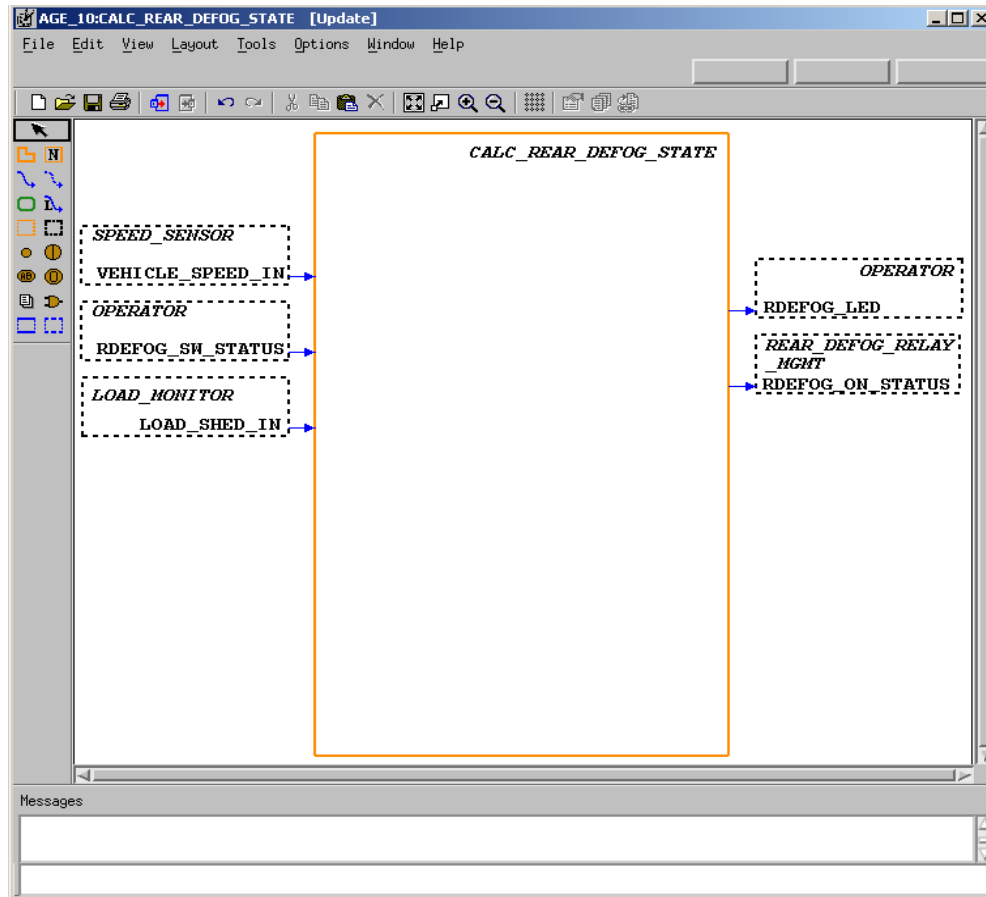
Activity-Chart REAR_DEFOG_RELAY_MGMT

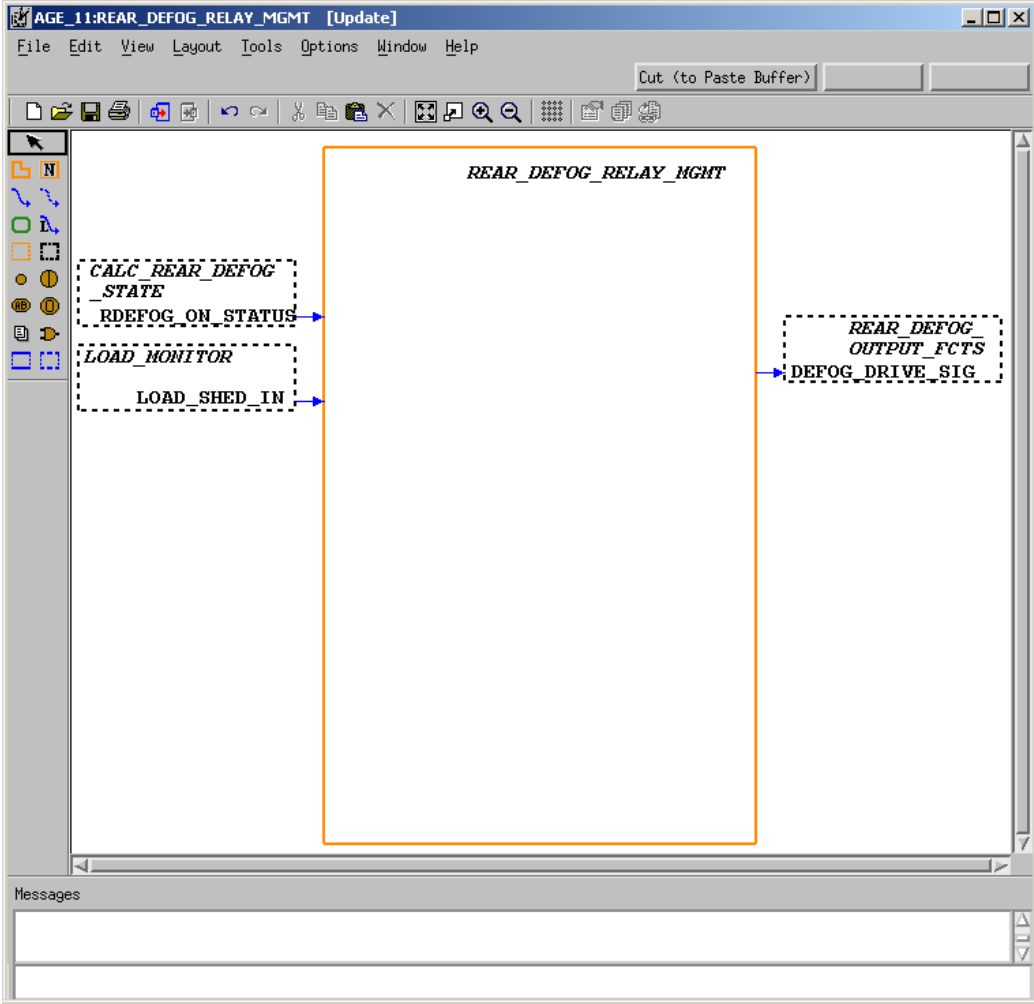1. Create and design the above three activity-charts based upon the modeling techniques used in **Exercise 4 - Constructing an Activity-Chart**.

    Note: During the following step, you need to create the relationship between the activity-charts that have been created within the exercises.

2. Open the chart called '**REAR_DEFOG_SS**' and modify the name of the activity called '**REAR_DEFOG_FEATURES**' by adding a '@' symbol to the beginning of the name. Refer to the following figure.

Creating System Decomposition
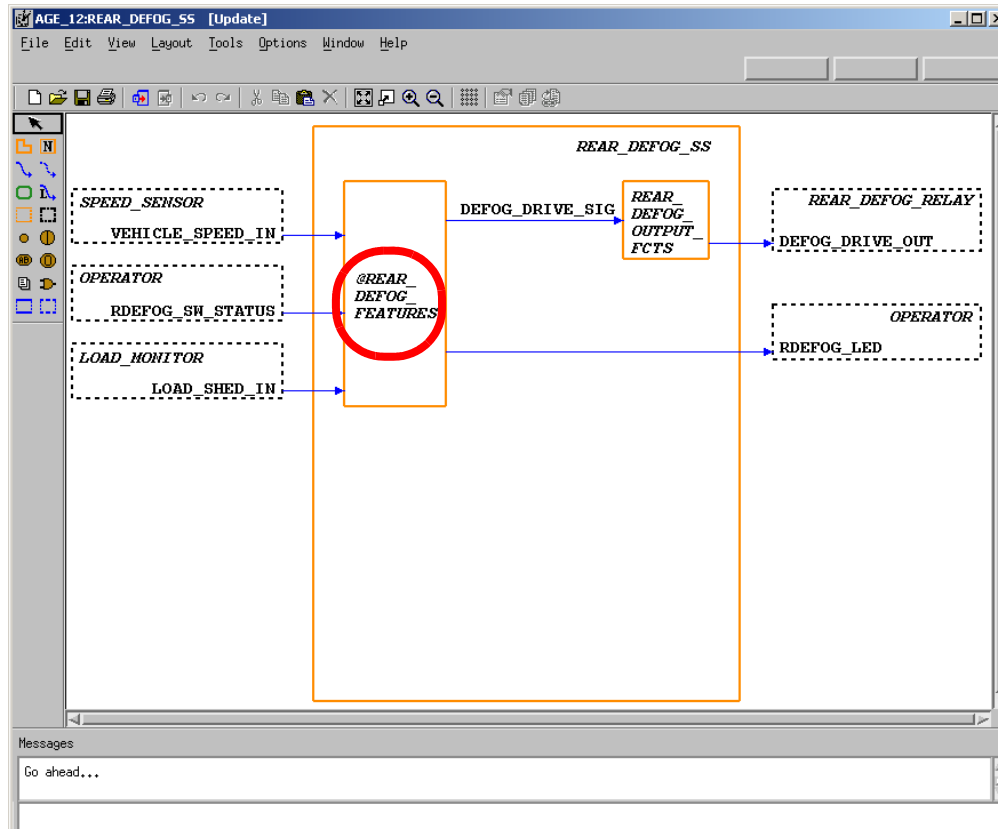
3. Once the '@' symbol has been added to the activities name, select the activity and then select **File > Open Sub-Chart**.

4. From within the activity-chart REAR_DEFOG_FEATURES, edit the names of the activities **CALC_REAR_DEFOG_STATE** and **REAR_DEFOG_RELAY_MGMT** by adding a '@' symbol to the beginning of their names.

    Note: You also need to define the textual element added to the activity-chart **REAR_DEFOG_FEATURES** called '**RDEFOG_ON_STATUS**'.

5. Open the Properties window for the element by selecting the flow line and then selecting **Edit > Properties.**

6. Change the **Type** from Information Flow to Condition.

7. Enter the following text in the Description field:

   '**Indicates that the rear defog is on or off**.'

8. Select **Save**.

9. Exit.

10. Select **View > Refresh** from the main Statemate window. You can see how the charts are now decomposed within the model (refer to the following figure).

11. Select **File > Save** from the charts and then **File > Exit**.

Chart View of Static Structure
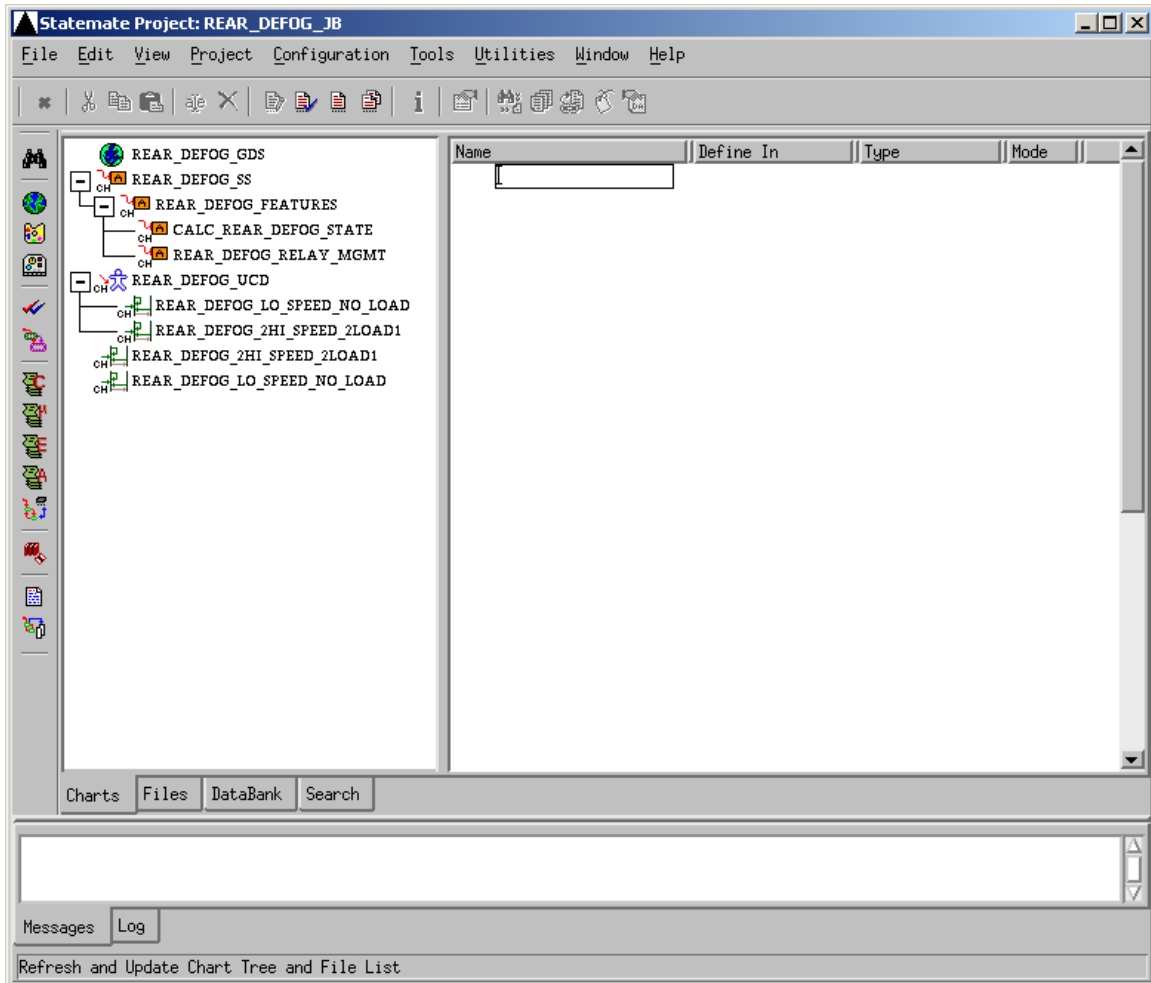
Exercise 7 - Defining Environment Activities

In this exercise, you will formally define the external activities within the root chart 'REAR_DEFOG_SS'.

1. Double-click the chart called '**REAR_DEFOG_SS**' from the workarea. This opens the chart.

2. Select all of the **external activities** within the chart.

3. Select **Tools > Properties**. This invokes the Properties window for these elements (refer to the following figure).

**External Activity Properties Window**
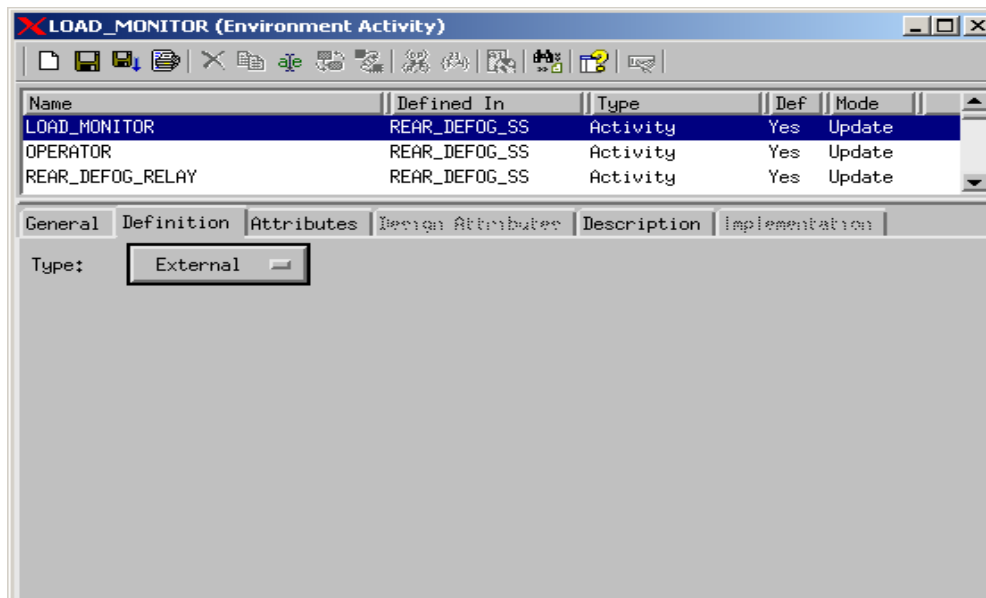
Note: You need to define the external activities within the chart. Modify the activities within the Properties window with the following settings:

4. Change the **Type** from External to Environment.

5. Select **Save** and **Next**.

6. Exit after the last element is saved.

Exercise 8 - Constructing Statecharts

In this exercise, you will construct two statecharts that describe behavioral aspects of the rear defog system. The **Statechart CALC_REAR_DEFOG_STATE_BHVR** and **Statechart REAR_DEFOG_RELAY_MGMT_BHVR** figures show the two intended statecharts.

Statechart CALC_REAR_DEFOG_STATE_BHVR
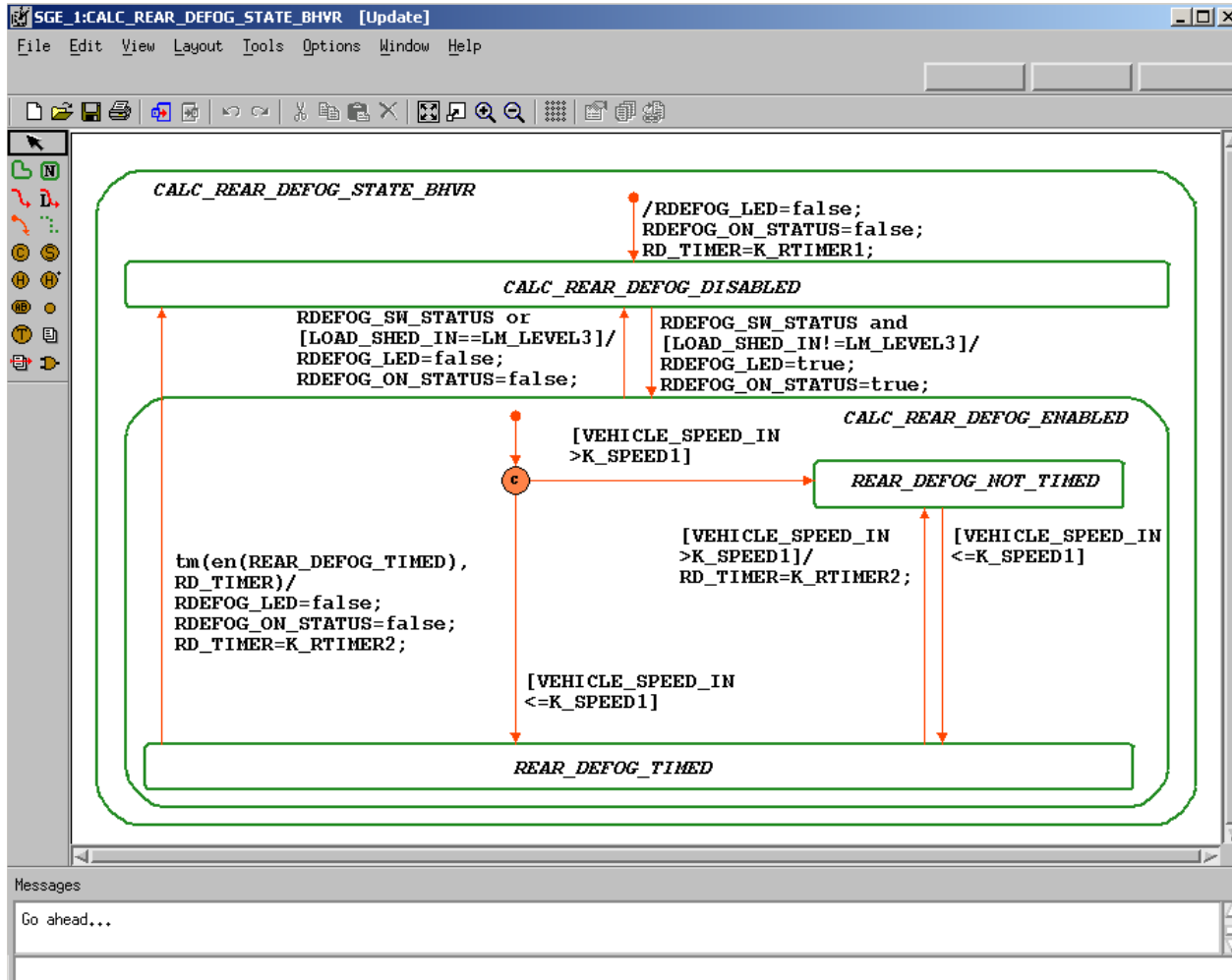
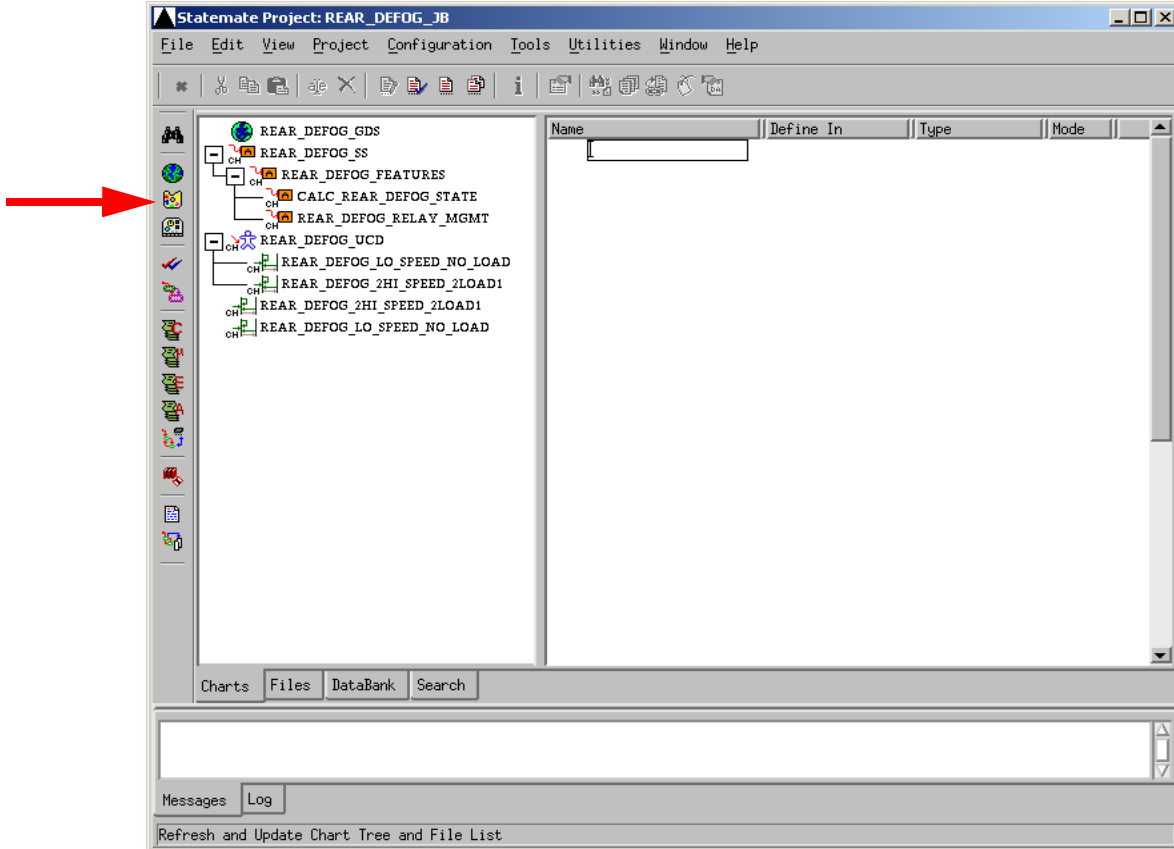**Statechart REAR_DEFOG_RELAY_MGMT_BHVR**
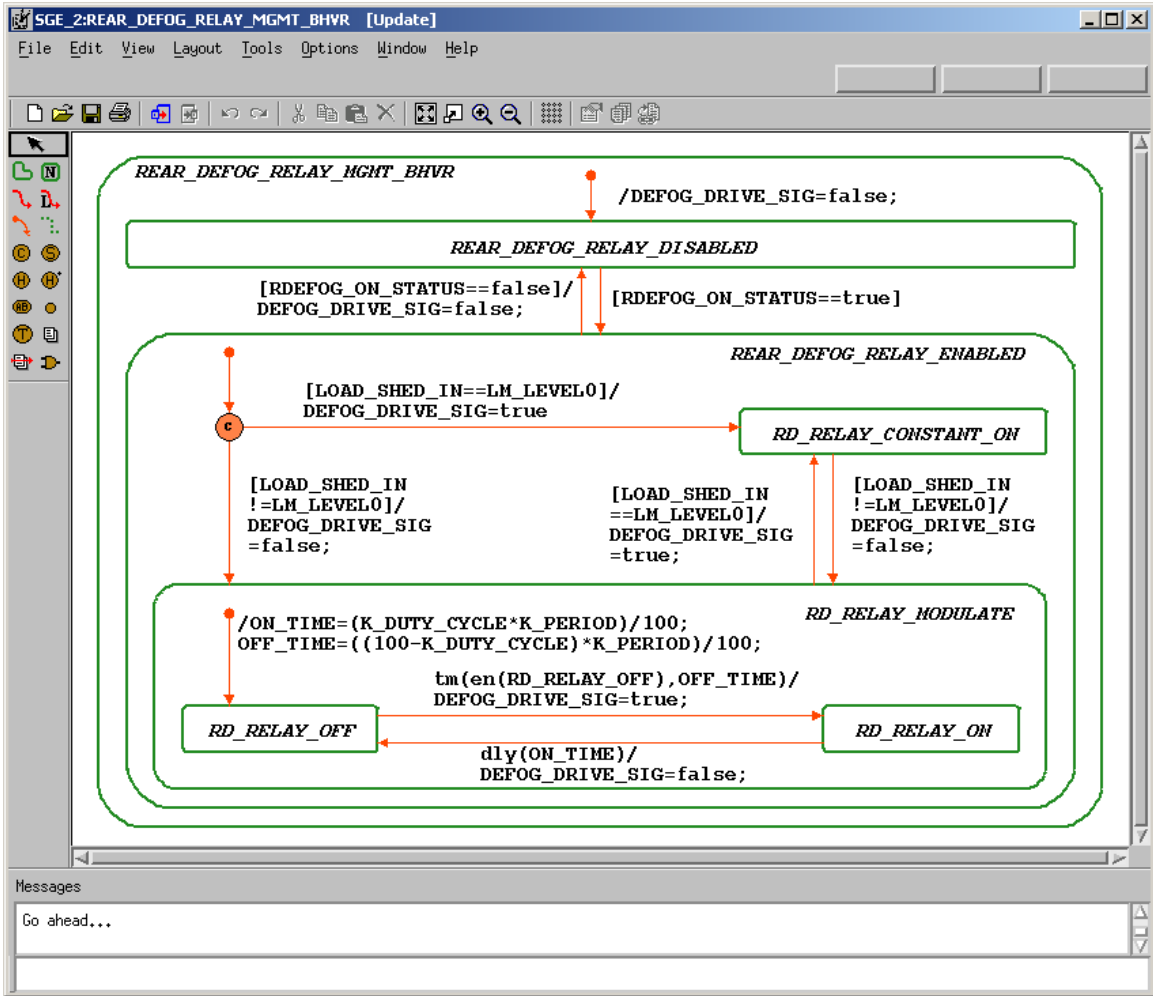
1. Click **Graphic Editor** from the main Statemate window.
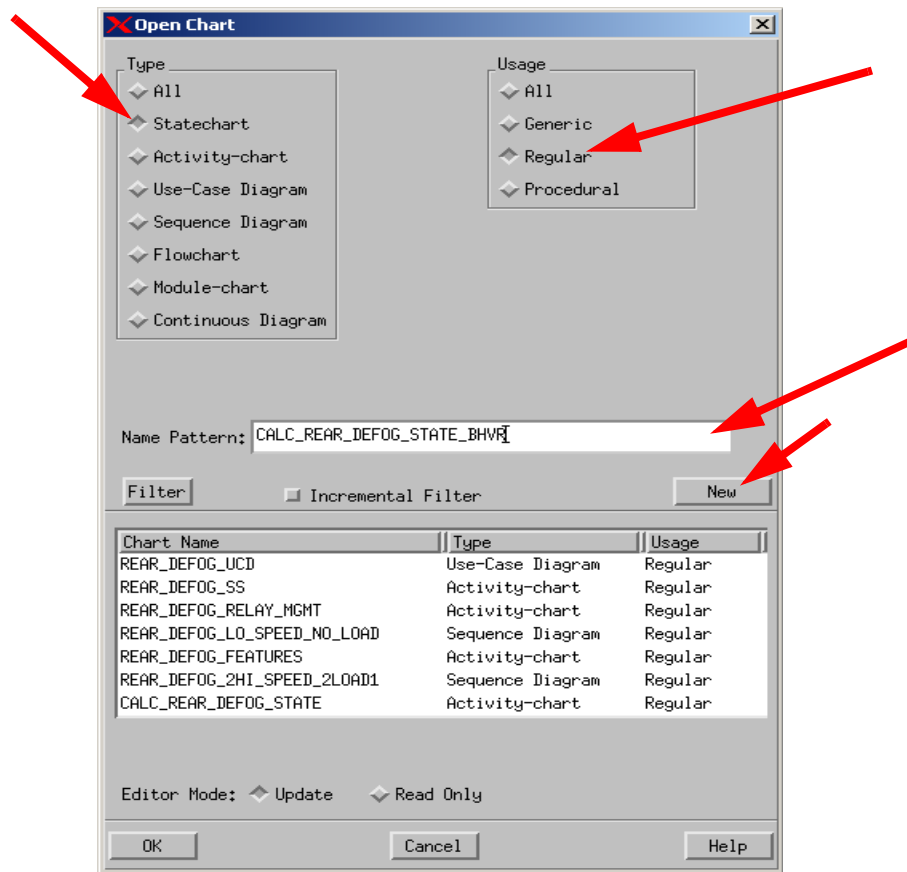
Graphics Editor Icon

2. Create a statechart called 'CALC_REAR_DEFOG_STATE_BHVR' based on the selections shown in the following figure.

> **Note:** Do not use spaces in chart names.

- ◆ **Type**: Statechart
- ◆ **Usage**: Regular
- ◆ **Name Pattern**: CALC_REAR_DEFOG_STATE_BHVR

Open/Create Chart

3. Select **New** from the Open Chart window to create and open a new diagram. The chart is now available for editing. Refer to the following figure.

New Statechart
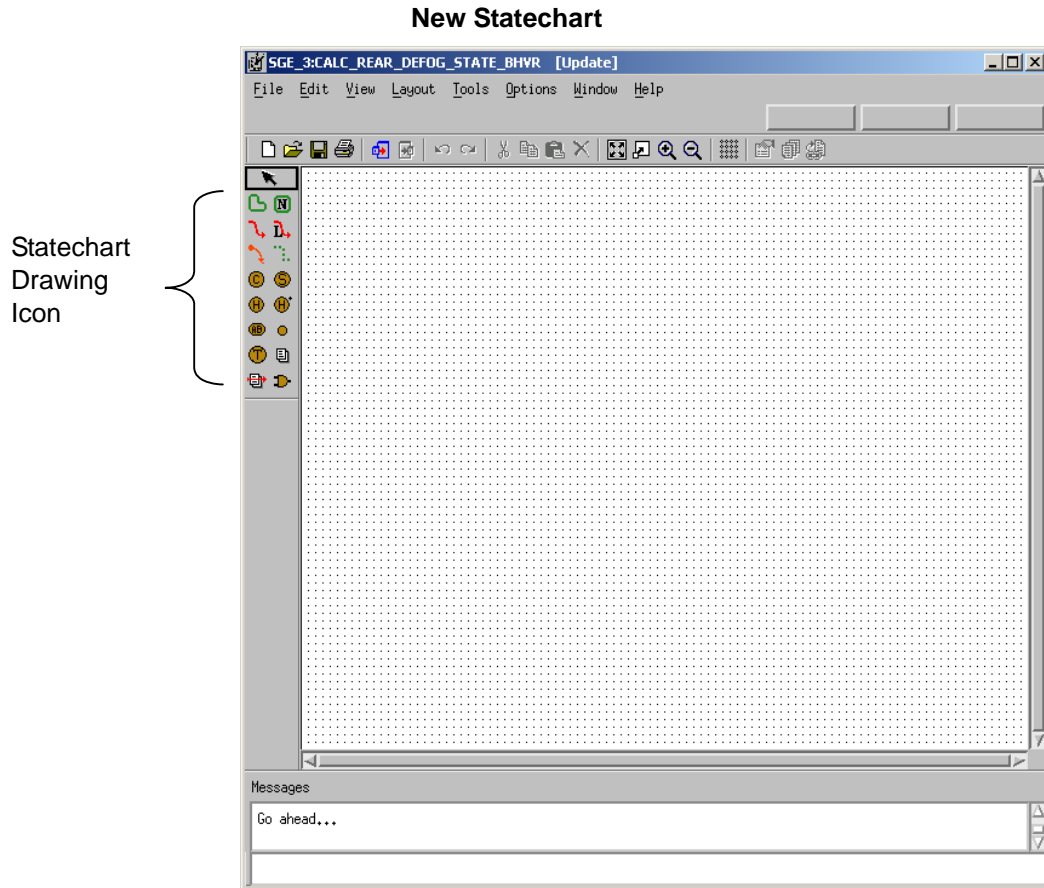
4. Click **Create State drawing** 🔲.

5. Draw a state called **CALC_REAR_DEFOG_STATE_BHVR**.

Place the cursor at the desired location for the upper, left-hand corner of the state and drag to the desired location of the lower, right-hand corner of the state. A ghost image shows the state outline.

6. With the Create State or the Name Existing State icon selected, start enter the name of the state.

7. Click at the location you want the text to reside within the state.

> **Note:** Enter the names for boxes using lowercase letters. Statemate, where appropriate, will automatically perform the conversion to uppercase letters. Do not select the CAPS LOCK key before typing.

8. Using the **Statechart CALC_REAR_DEFOG_STATE_BHVR** figure as a guideline, create and name the other states within your chart.

9. Click **Create Transition** 🔧.

10. Draw a transition from the state called '**CALC_REAR_DEFOG_DISABLED**' to the state called '**CALC_REAR_DEFOG_ENABLED**'.

    Locate the state called '**CALC_REAR_DEFOG_DISABLED**'. This is the source state. Place the cursor on the edge of the box and click to enter the tail of the arrow.

11. Locate the state called 'CALC_REAR_DEFOG_ENABLED'. This is the target state. Place the cursor on the edge of the state and click to enter the arrowhead.

12. With the Create Transition icon still selected, label the transition 'RDEFOG_SW_STATUS and [LOAD_SHED_IN!=LM_LEVEL3]/ RDEFOG_LED=true; RDEFOG_ON_STATUS=true;

13. With the Create Transition or the Label Existing Transition icon selected, enter the desired transition label. Click the location you want the text to reside.

14. Click **Create Default Transition** 🔧.

15. Draw a Default Transition into the state 'CALC_REAR_DEFOG_DISABLED'.

> **Note:** Default transitions do not have a source state and may not have triggers. Use the **Statechart CALC_REAR_DEFOG_STATE_BHVR** figure as a guide as where to draw the default transition.

16. With **Create Default Transition** still selected, label the transition '**RDEFOG_LED=false**; **RDEFOG_ON_STATUS=false**; **RD_TIMER=KTIMER1**;'

17. Using the techniques in the previous steps, complete the design of the statechart based on the **Statechart CALC_REAR_DEFOG_STATE_BHVR** figure.

18. Select **File > Save** from the chart and then **File > Exit**.

19. Using the steps outlined above, create and design the statechart called '**REAR_DEFOG_RELAY_MGMT_BHVR**' as shown in the **Statechart REAR_DEFOG_RELAY_MGMT_BHVR** figure.

>   **Note:** The statecharts that were developed for this tutorial were used to describe the behavior for the activities, '**CALC_REAR_DEFOG_STATE**' and '**REAR_DEFOG_RELAY_MGMT**'. To associate the statecharts with the activities, complete the following steps:

20. Open the activity-chart called '**CALC_REAR_DEFOG_STATE**'.

21. Click **Create Control Activity** ▭ in the activity-chart.

22. Draw and name the control activity ('**@CALC_REAR_DEFOG_STATE**') as shown in the following figure.

23. Select **File > Save** from the chart and then **File > Exit**.

24. Repeat the above 4 steps and create the association between activity '**REAR_DEFOG_RELAY_MGMT**' and the statechart '**REAR_DEFOG_RELAY_MGMT_BHVR**'.

Control Activity CALC_REAR_DEFOG_STATE_BHVR
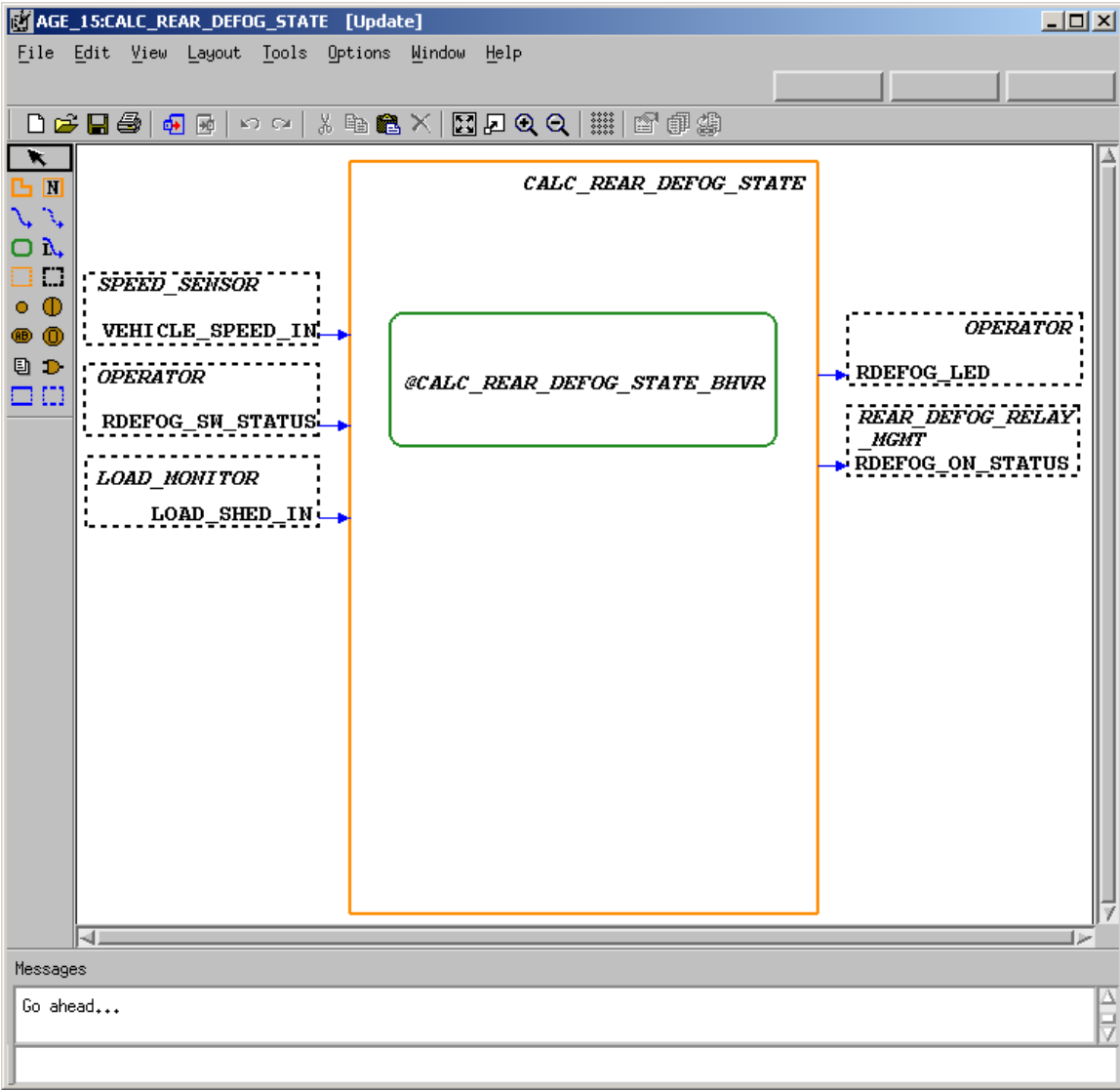
Exercise 9 - Describing Behavior

In this exercise, you will learn two new methods for describing behavior within Statemate - Mini-Specs and Truth Tables.

1. Select the activity-chart called '**REAR_DEFOG_SS**' from the Chart View.

2. Select the activity called '**REAR_DEFOG_OUTPUT_FCTS**' and then select **Edit > Properties** (refer to the following figure).

Properties for Activity
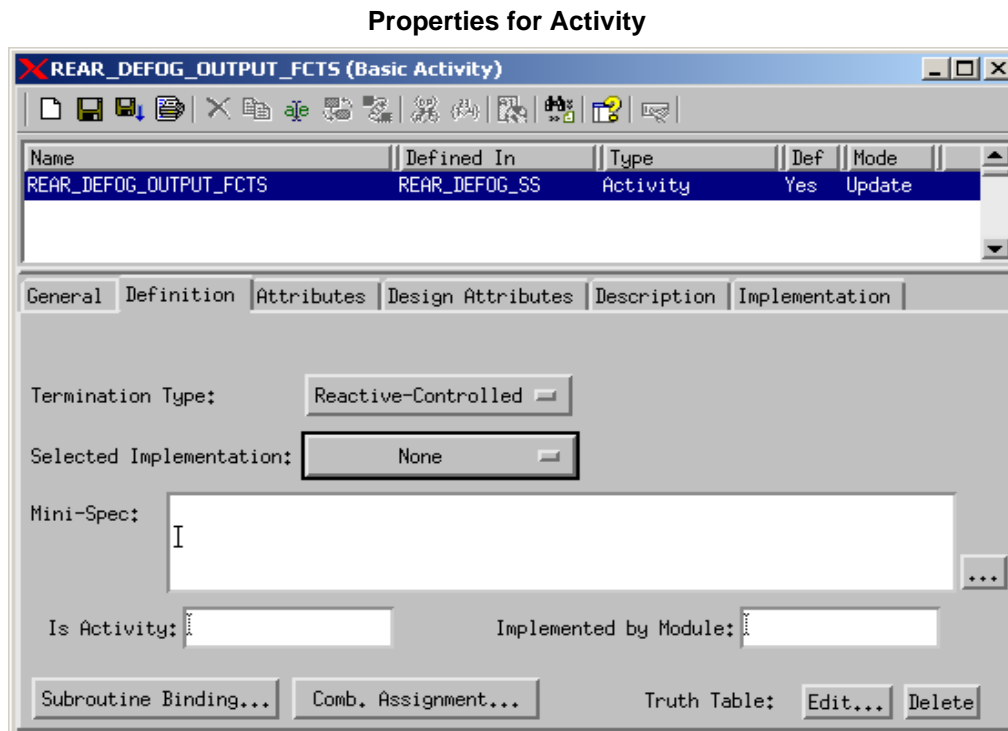
3. Change the **Selected Implementation** from None to Mini-Spec.

4. Within the Mini-Spec section of the Properties window, enter in the following logic:

```
started/
DEFOG_DRIVE_OUT=0b1;;          /* initialize to off*/


ch(DEFOG_DRIVE_SIG)/REAR_DEFOG_OUTPUT_TT;;


// The following is an alternative behavior if you did not want to use
// a truth table.
//
//   ch(DEFOG_DRIVE_SIG)/
//   if DEFOG_DRIVE_SIG then
//        DEFOG_DRIVE_OUT=0b1;
//   else
//        DEFOG_DRIVE_OUT=0b0;
//   end if;;
```

5. Click **Save**.

6. Click **Open References** (refer to the following figure).

Open References
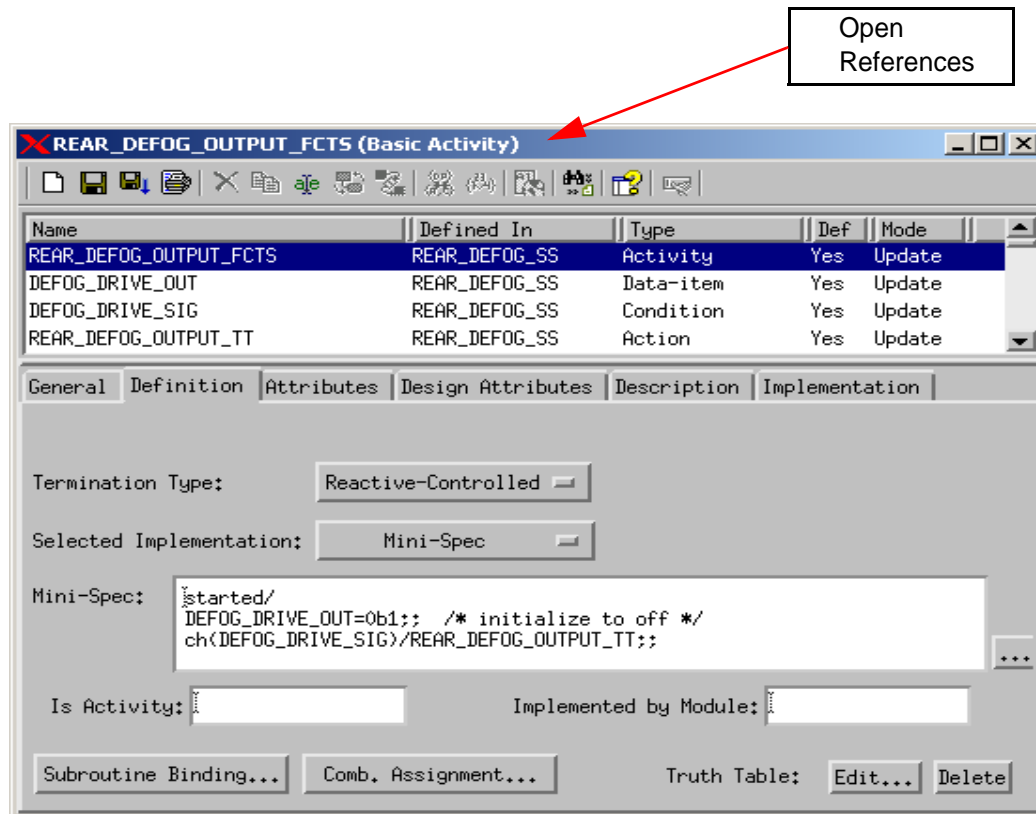
7. Select the textual element within the reference list called '**REAR_DEFOG_OUTPUT_TT**'.

8. Change the element **Type** from Event to Action and the Selected Implementation should be defined as Truth Table.

9. Click **Save**. This enables the Truth Table Editor for this element. Selection is near the bottom of the form. Refer to the following figure.

Truth Table Implementation
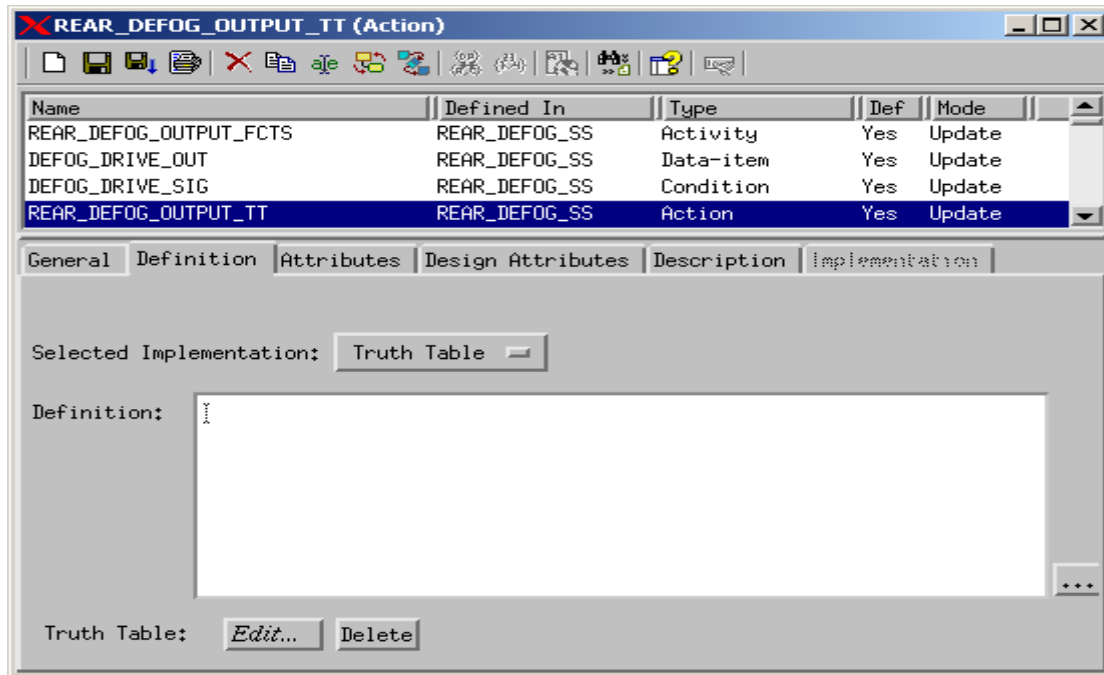
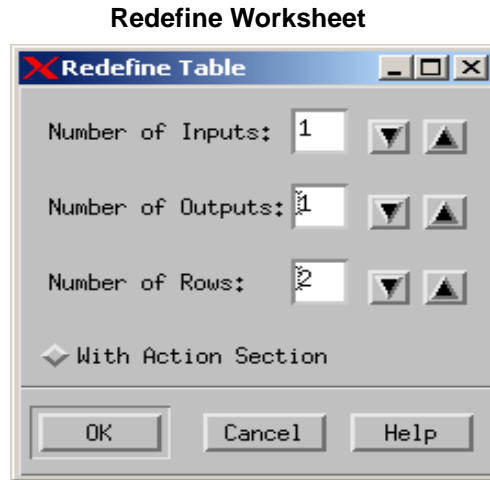10. For the action statement 'REAR_DEFOG_OUTPUT_TT', click **Edit** to invoke a truth table editor. Refer to the following figure.
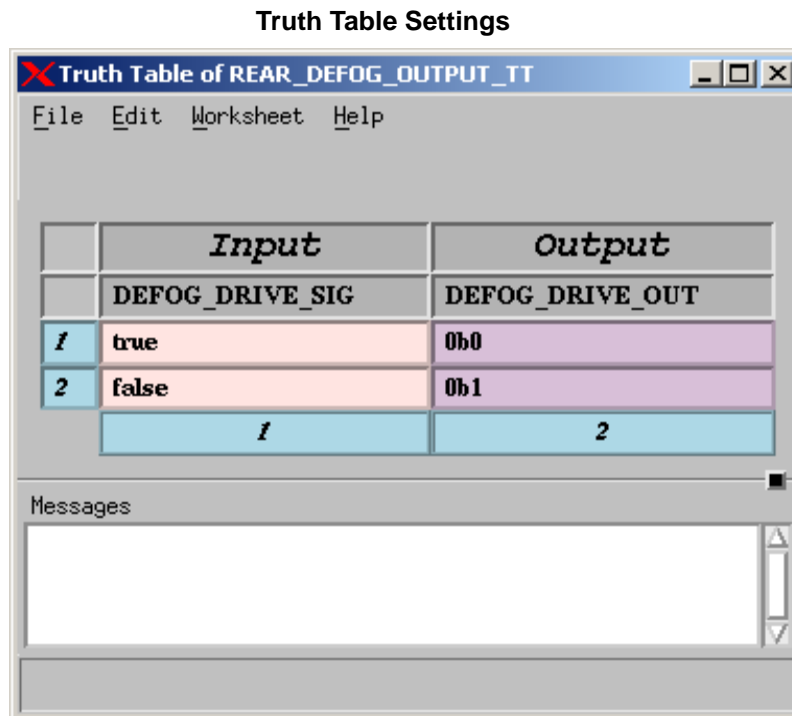
Truth Table Editor
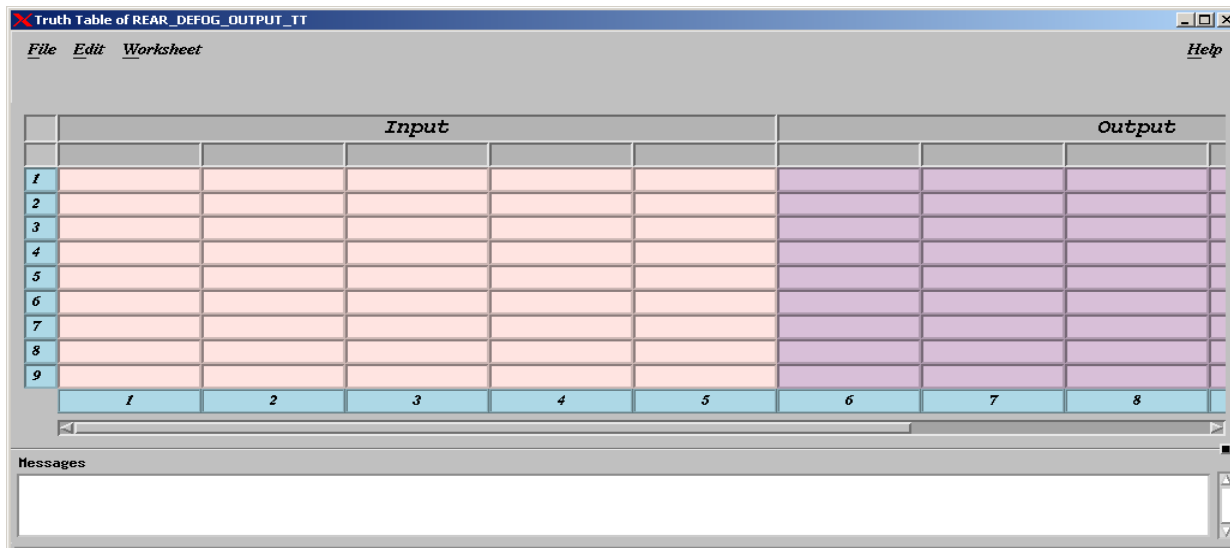
11. Select **Worksheet > Redefine Table** from the truth table editor window and input the settings as shown in the following figure.

Redefine Worksheet

12. Fill out the new truth table with the entries as shown in the following figure.

Truth Table Settings

Exercise 10 - Check Model

In this exercise, you will use the Check Model facility to verify that the model is syntactically correct and complete.

1. Click **Check Model** from the main Statemate window. Refer to the following figure.

Check Model Icon
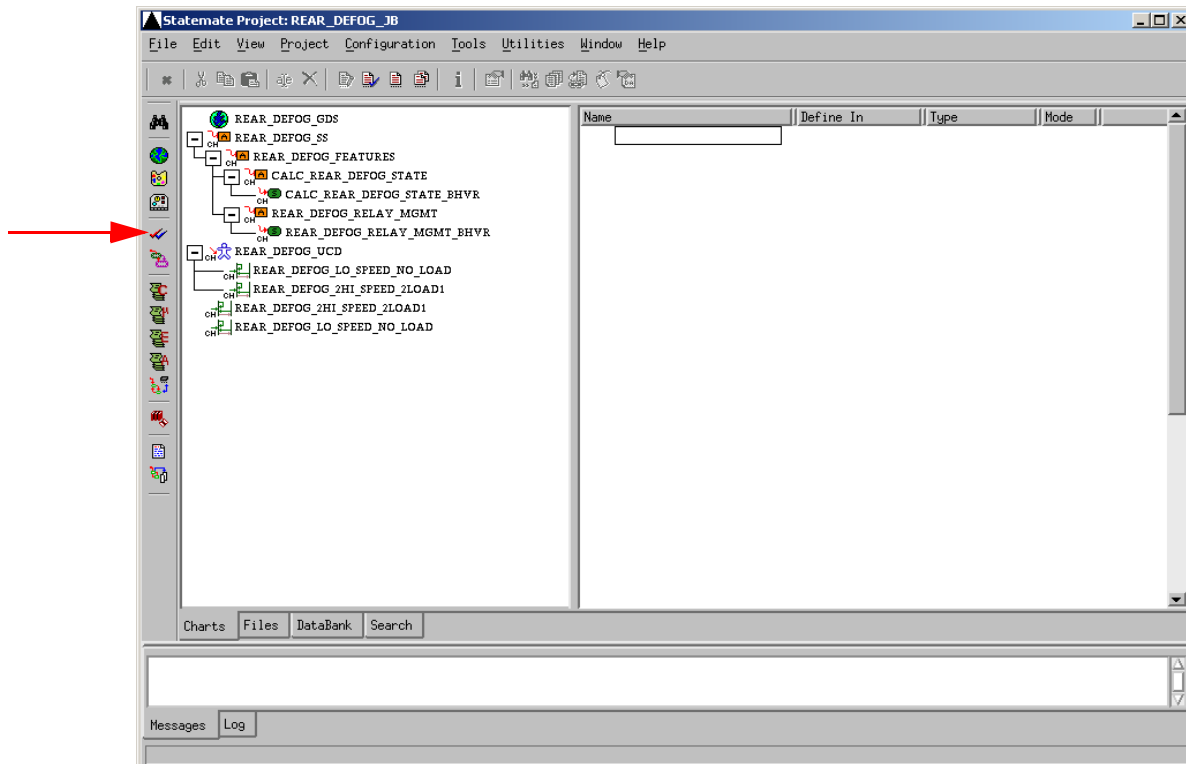
2. Select **File > New Profile** from the profile window (refer to the following figure) and enter "**REAR_DEFOG_CHK**" for the profile name that you are creating. If no profile exists, a New Profile window automatically opens.
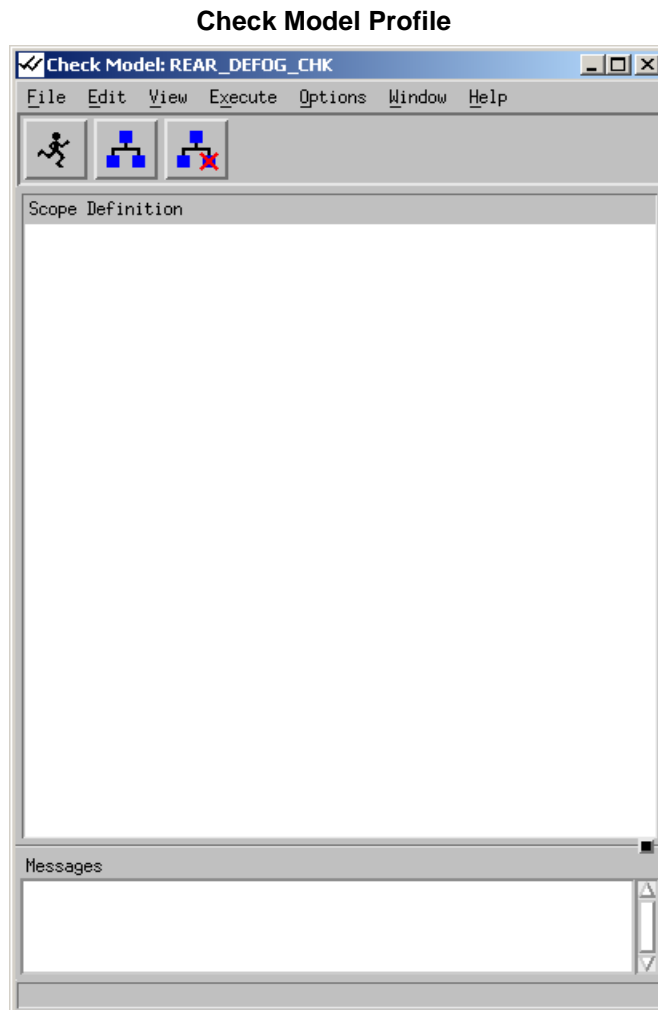
Check Model Profile

Check Model: REAR_DEFOG_CHK

File Edit View Execute Options Window Help

Scope Definition

Messages

3. Click **Add Selected Chart with Descendents to Profile** ⊞. This opens a Chart Tree View of your current design (see the following figure).
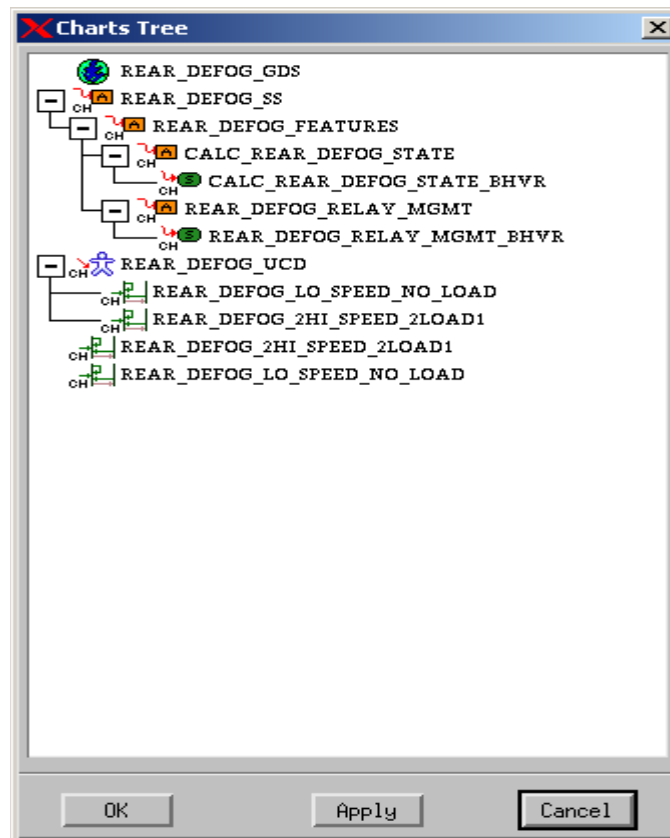
Chart Tree View

4. Select the chart called "**REAR_DEFOG_SS**" from the Chart Tree View (see the previous figure) then click **OK**.

5. Click **Execute Current Check Model Profile** 🏃 from the Check Model profile window.

6. Fix any warnings and/or errors within your design. Refer to the following figure.

> **Note:** If the previous exercises were done without any mistakes, you should receive 13 completeness warnings. The only warnings that we are concerned with are the unresolved elements warnings. The next few steps take you through resolving a number of known warnings that you should have received during the modeling.

Check Model Results


```
Check Model Results: REAR_DEFOG_CHK                    _|□|x|
File  View  Execute  Help

□ Completeness
   □ Statechart tests
      □ Tested Statechart:  CALC_REAR_DEFOG_STATE_BHVR
         □ (C2045)  Unresolved elements:
            data-item K_SPEED1
            data-item K_RTIMER2
            data-item K_RTIMER1
            data-item RD_TIMER
      □ Tested Statechart:  REAR_DEFOG_RELAY_MGMT_BHVR
         □ (C2045)  Unresolved elements:
            data-item ON_TIME
            data-item K_DUTY_CYCLE
            data-item K_PERIOD
            data-item OFF_TIME
   □ Statechart/Flowchart and activity-chart relations test
      □ Tested Activity-chart CALC_REAR_DEFOG_STATE starting
         □ (C7211)  Elements that are used in a statechart/fl
            K_SPEED1
            K_RTIMER2
            K_RTIMER1
      □ Tested Activity-chart REAR_DEFOG_RELAY_MGMT starting
         □ (C7211)  Elements that are used in a statechart/fl
            K_DUTY_CYCLE

Messages
```

7. Right-click on one of the textual elements and select **Properties** to fix the unresolved elements. Refer to the following figure.

Resolve Warnings
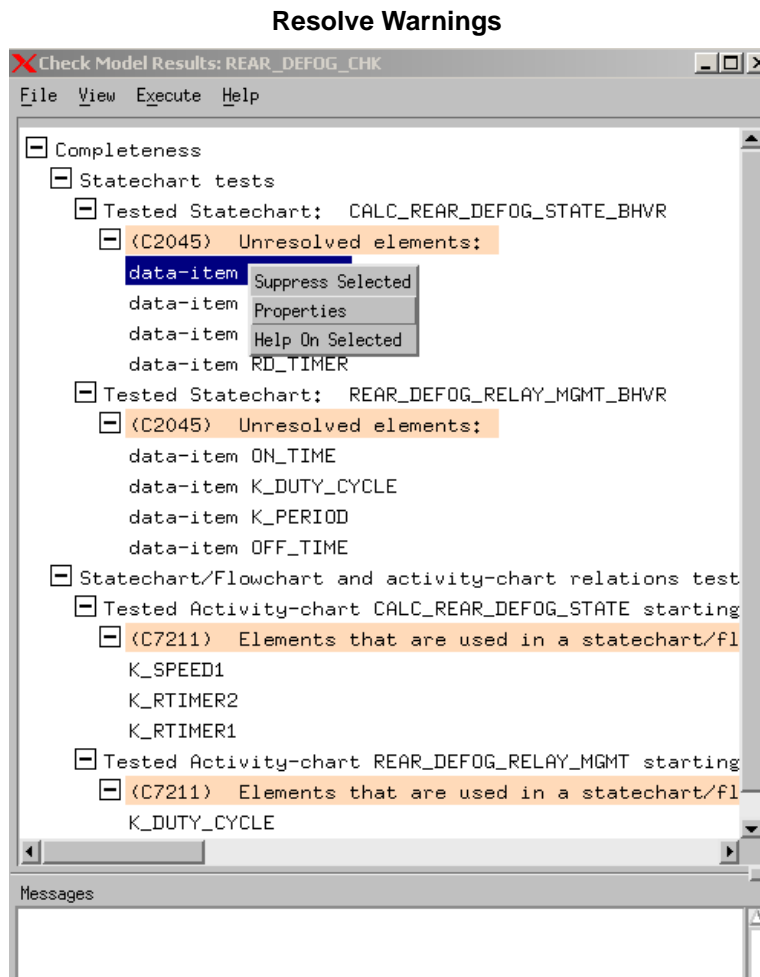
8. Define the textual element 'K_SPEED1'. Refer to the following figure.

   a. Define the **Type** to Data-Item.

   b. Change the **Data Type** from None to Integer.

   c. Enter a **Min Value** of 0.

   d. Enter a **Max Value** of 100.

   e. Enter a **Default Value** of 80.

   f. Click **Save**.

9. Exit.

Textual Element 'K_SPEED1'
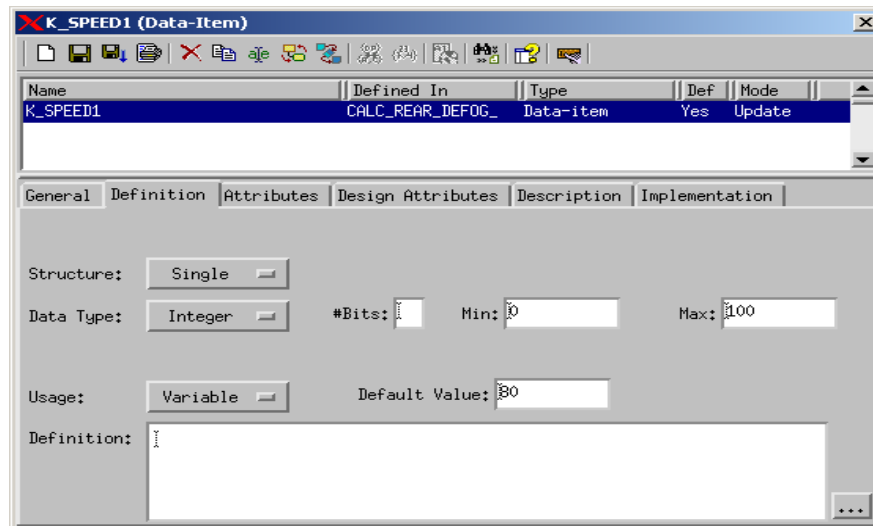
10. Define the textual element '**K_RTIMER1**'.

    a. Define the **Type** to Data-Item.

    b. Change the **Data Type** from None to Integer.

    c. Enter a **Min Value** of 10.

    d. Enter a **Max Value** of 100.

    e. Enter a **Default Value** of 12.

    f. Click **Save**.

    g. Exit.

11. Define the textual element 'K_RTIMER2'.

    a. Define the **Type** to Data-Item.

    b. Change the **Data Type** from None to Integer.

    c. Enter a **Min Value** of 5**.**

    d. Enter a **Max Value** of 10.

    e. Enter a **Default Value** of 6.

    f. Click **Save** button.

    g. Exit.

12. Define the textual element '**RD_TIMER**'.

    a. Define the **Type** to Data-Item.

    b. Change the **Data Type** from None to Integer.

    c. Enter a **Min Value** of 0.

    d. Enter a **Max Value** of 100.

    e. Click **Save**.

    f. Exit.

13. Define the textual element '**K_DUTY_CYCLE**'.

    a. Define the **Type** to Data-Item.

    b. Change the **Data Type** from None to Integer.

    c. Enter a **Min Value** of 0.

    d. Enter a **Max Value** of 100.

    e. Enter a **Default Value** of 50

    f. Click Save.

    g. Exit.

14. Define the textual element '**K_PERIOD**'.

    a. Define the **Type** to Data-Item.

    b. Change the **Data Type** from None to Integer.

    c. Enter a **Min Value** of 0.

    d. Enter a **Max Value** of 100.

    e. Enter a **Default Value** of 2

    f. Click '**Save**'.

    g. Exit.

15. Define the textual element '**OFF_TIME**'.

    a. Define the **Type** to Data-Item.

    b. Change the **Data Type** from None to Integer.

    c. Enter a **Min Value** of 0.

    d. Enter a **Max Value** of 100.

    e. Click **Save**.

    f. Exit.

16. Define the textual element '**ON_TIME**'.

    a. Define the **Type** to Data-Item.

    b. Change the **Data Type** from None to Integer.

    c. Enter a **Min Value** of 0.

    d. Enter a **Max Value** of 100.

    e. Click **Save**.

    f. Exit.

17. Select **File > Exit** from the Check Model profile window.

Finishing and Managing the Project

This section demonstrates the techniques used to simulate the model and other project completion and management processes.

Exercise 11 - Simulation

You use the Simulator to validate the dynamic behavior for part of the design.

1. Open the statechart '**REAR_DEFOG_RELAY_MGMT_BHVR**' and select **Tools > Simulation**. The Simulation Execution window opens. Refer to the following figure.
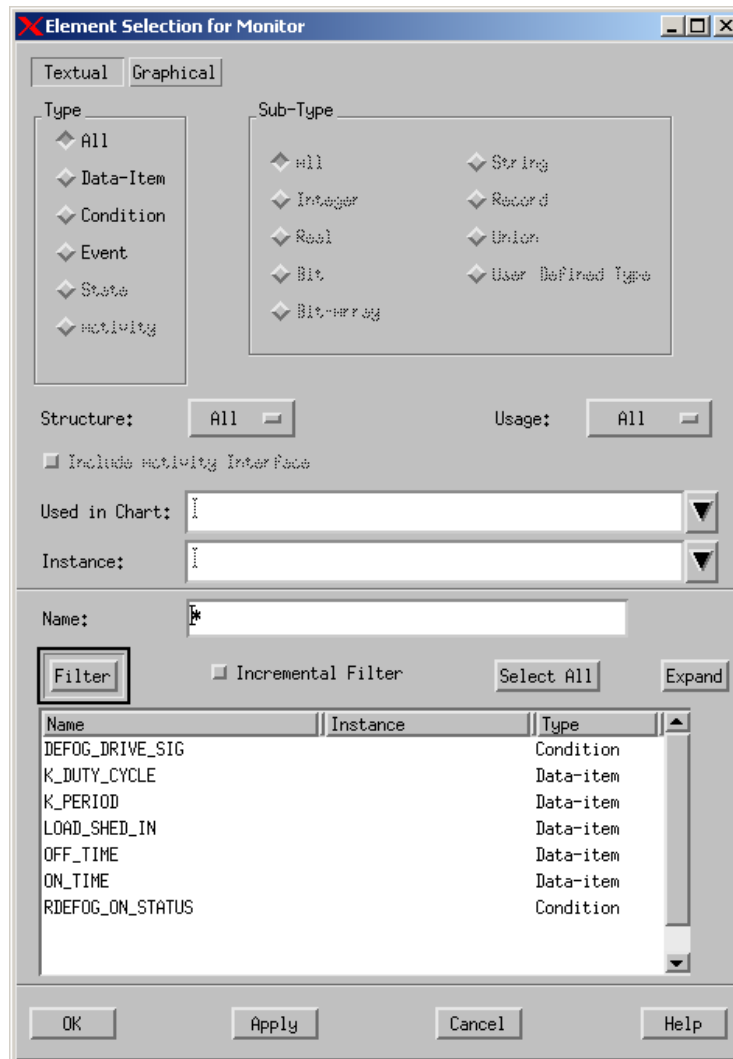
Simulation Execution
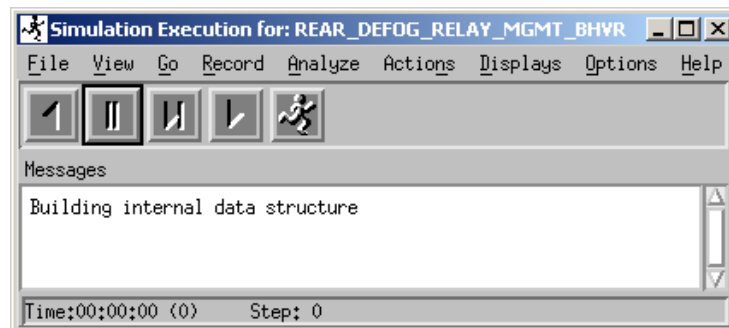
2. Select **Displays > Monitors** from the Simulation Execution window. The Monitor window (refer to the following figure) allows you to add model elements into the form to edit and/or view their value.

Simulation Monitor
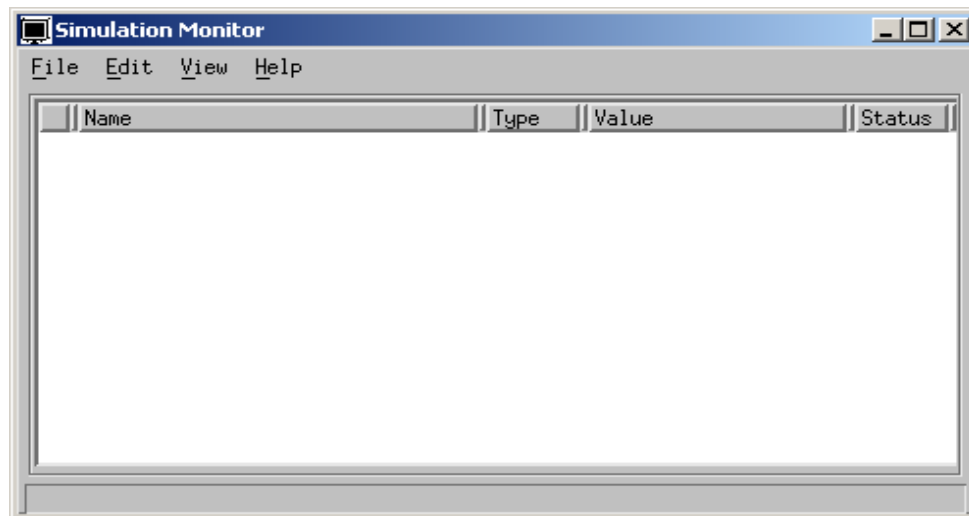
3. Select **Edit > Add** from the Simulation Monitor window. The Element Selection for Monitor window opens (refer to the following figure).

4. Click **All** for the element type and then click Filter.

5. Click **Select All** and then the **OK** button to add these elements to the Simulation Monitor Window.

Element Selection for Monitor

> **Note:** Arrange the statechart, Simulation Monitor, and Simulation Execution windows within your system monitor so that they are all assessable. Minimize any other open windows.

6. Click **GoStep** ⬊ from the Simulation Execution window. The default transition within the statechart is highlighted. Select **GoStep** again. You should notice that you are now only in the default state. If you continue to select **GoStep**, no steps are taken.

7. Click on the **Value** field for the Name 'RDEFOG_ON_STATUS' in the Simulation Monitor window. You should see (refer to the following figure) that the value changes from FALSE to TRUE.

Simulation Monitor Value
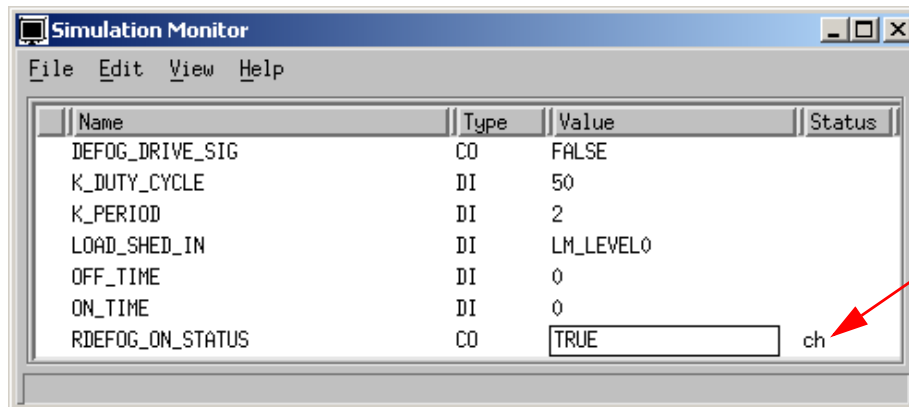
8. Click **GoStep** again and view the changes within the statechart.

9. Click on the value for 'LOAD_SHED_IN' and change the value. Click **GoStep** again. This should place you into the 'RD_RELAY_OFF' state.

10. The trigger that takes you from the 'RD_RELAY_OFF' state to the 'RD_RELAY_ON' state is based upon the passage of time. Click **AutoRun** to start simulating as in real-time mode.

11. The model should now be transitioning to and from the states 'RD_RELAY_OFF' state to the 'RD_RELAY_ON'. Click **Pause** icon to temporarily halt the simulation execution.

12. Select **File > Restart Simulation to** restart the simulation from the Simulation Execution window.

13. Using the previous methods, simulate and study the model using different scenarios of the simulation. Also try using the various Step Operations provided by Statemate and notice the effect on the simulation.
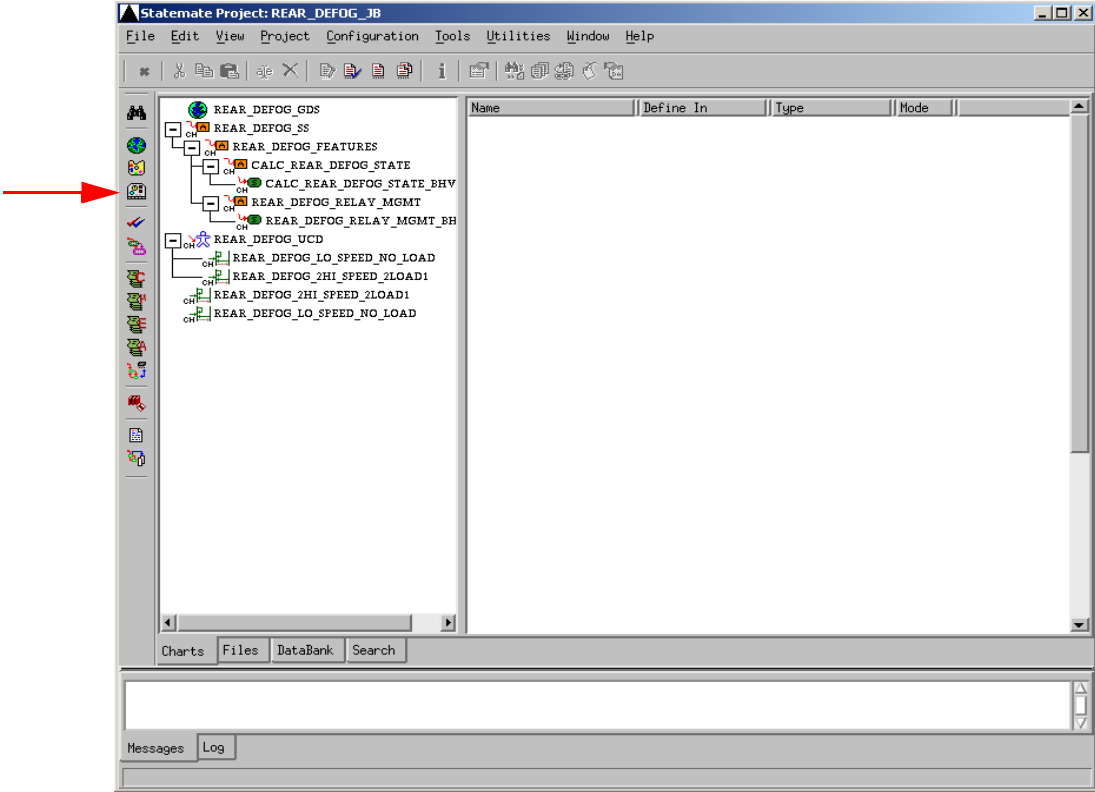
Exercise 12 - Constructing a Panel

In this exercise, you will construct the panel as shown in the following figure.
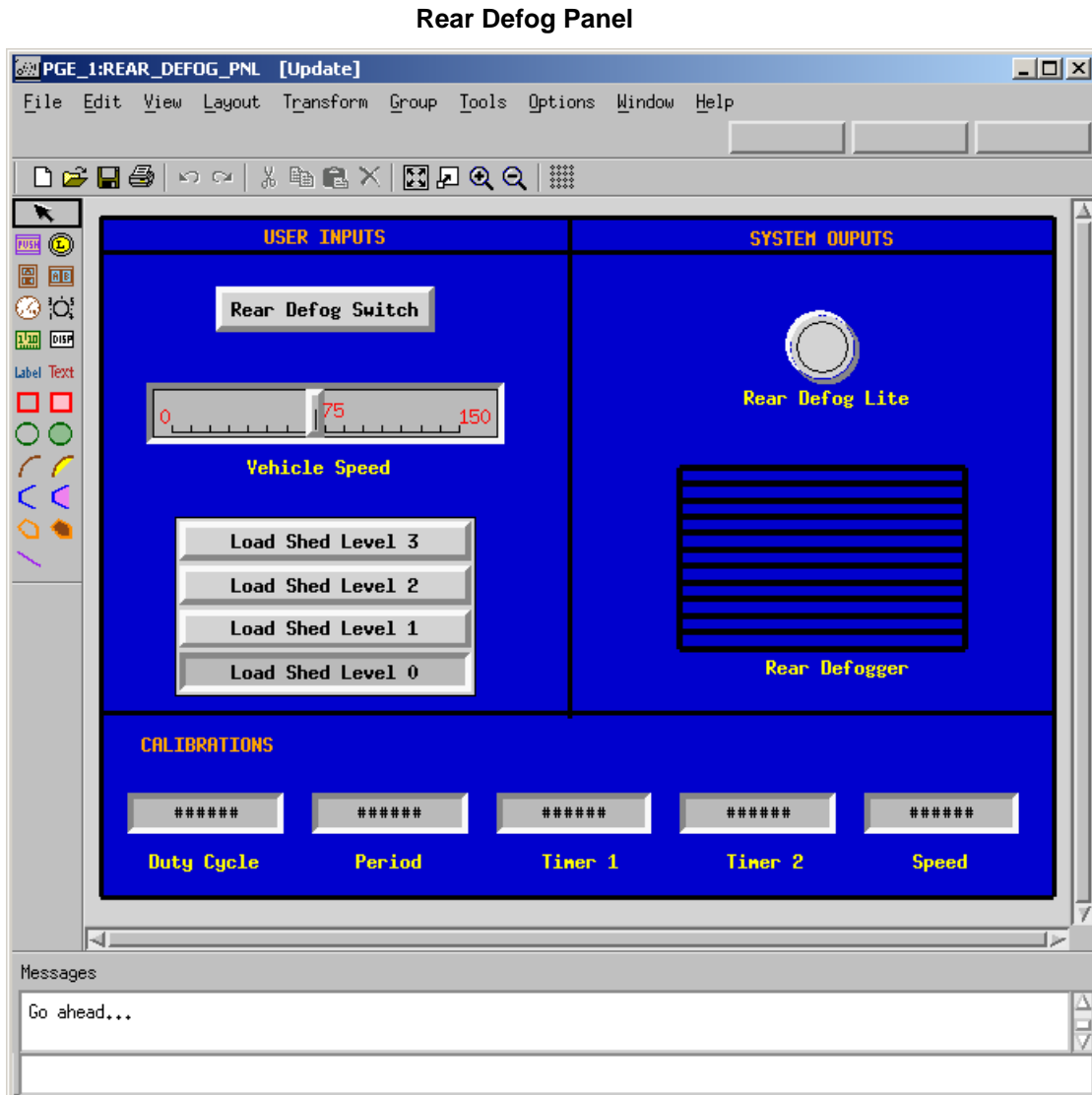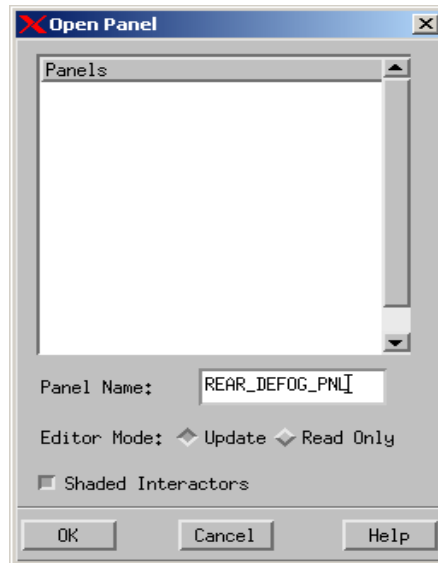
Rear Defog Panel

1. Click **Panel Editor** from the main Statemate window (refer to the following figure).

Panel Editor Icon

**2.** Enter the name '**REAR_DEFOG_PNL**' for the Panel Name (refer to the following figure).

Open/Create Panel

Note: The first part of the panel design is to add some graphical elements that are used as a background and to separate a number of the input and output elements.

3. Click **Create Filled Box** 🟥 from the Panel Graphic Editor (PGE) and stretch this to fill most of the panel canvas (refer to the following figure).

Create Filled Box
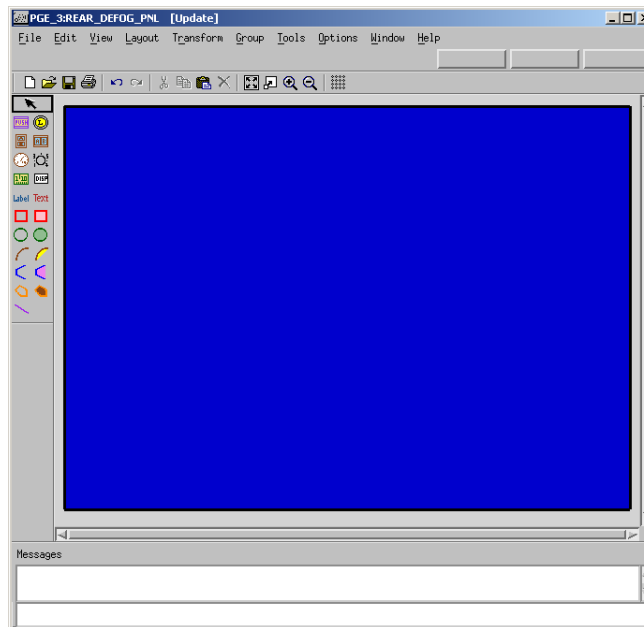
4. Select the **Filled Box** that you just created

5. Select **Tools > Properties**. Change the Fill color to BLUE 3 (or any color that you may wish) and the Line Width to 3 (refer to the following figure).
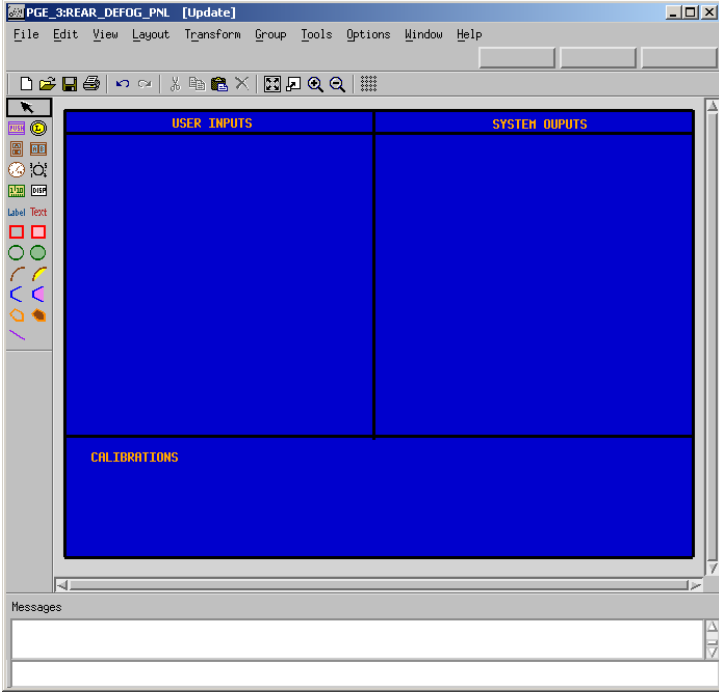
Filled Box Properties
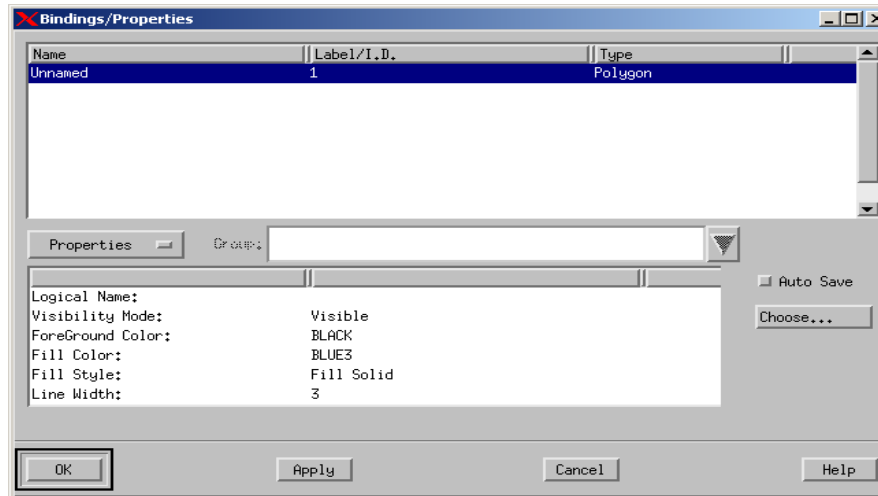
6. Select **Create Line Graphic** and draw the lines as shown in the following figure.

7. Change the properties for the lines so the Line Width is 3.
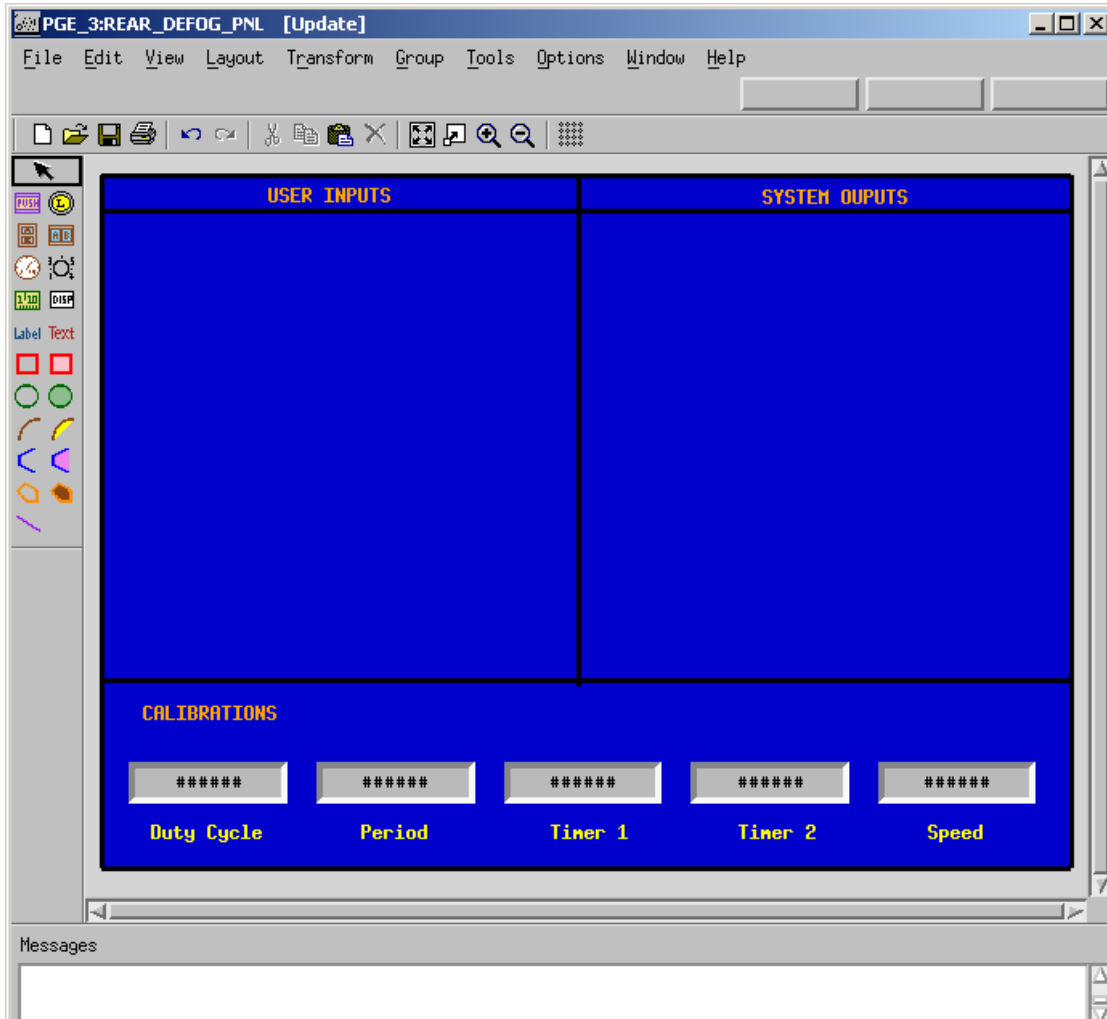
Line Graphics
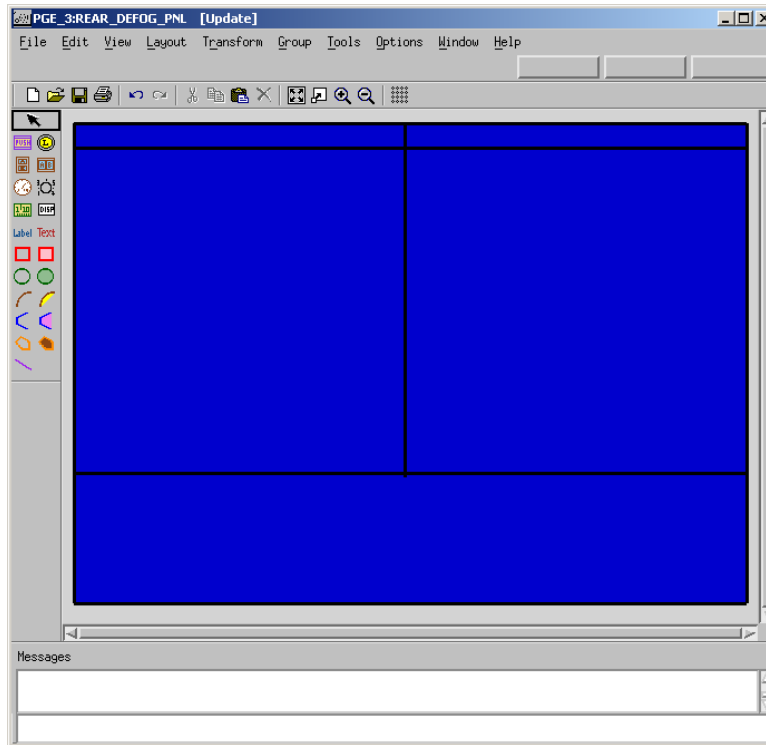
8. Click **Create Free Text'** and enter the text as shown in the following figure. Select all of the text within the panel and then select **Edit > Properties > Color** and change the text color.

Free Text

9. Click **Create Textual Display Interactor** [DISP]. Create five of them as shown in the following figure.

Display Interactors

10. Click **Label Existing Interactor** and label each of the Display Interactors. To attach a label, enter the name of the particular interactor and then click the mouse on the object.

11. Select the Display Interactor labeled **'Duty Cycle'** and then select **Tools > Bind** to invoke the objects Bindings/Properties window (refer to the following figure).

Bindings/Properties Window
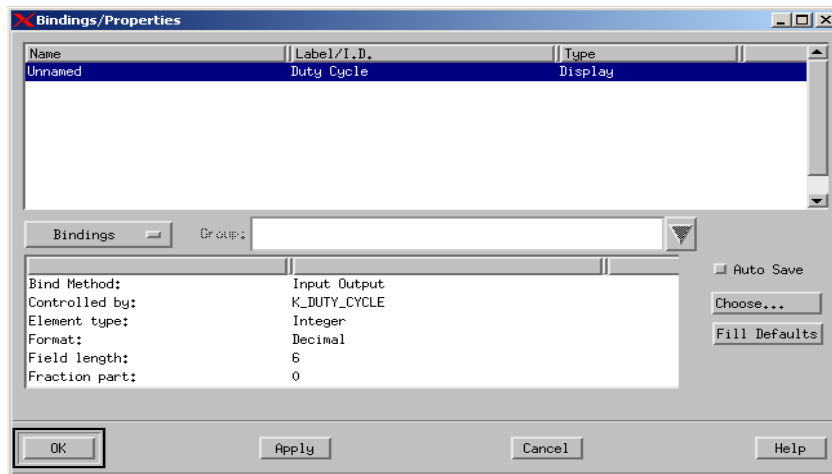
12. Enter the following for the binding values for the object labeled 'Duty Cycle':

   ◆ **Bind Method**: Input Output

   ◆ **Controlled by**: K_DUTY_CYCLE

   ◆ **Element type**: Integer

   ◆ **Format**: Decimal

   ◆ **Field length**: 6

   ◆ **Fraction part**: 0

13. Click **Apply**.

14. Select **Bindings** and change it to '**Properties**' from the Bindings/Properties window.

15. Change the T**ext Color value** to BLACK (refer to the following figure). Click **OK**.
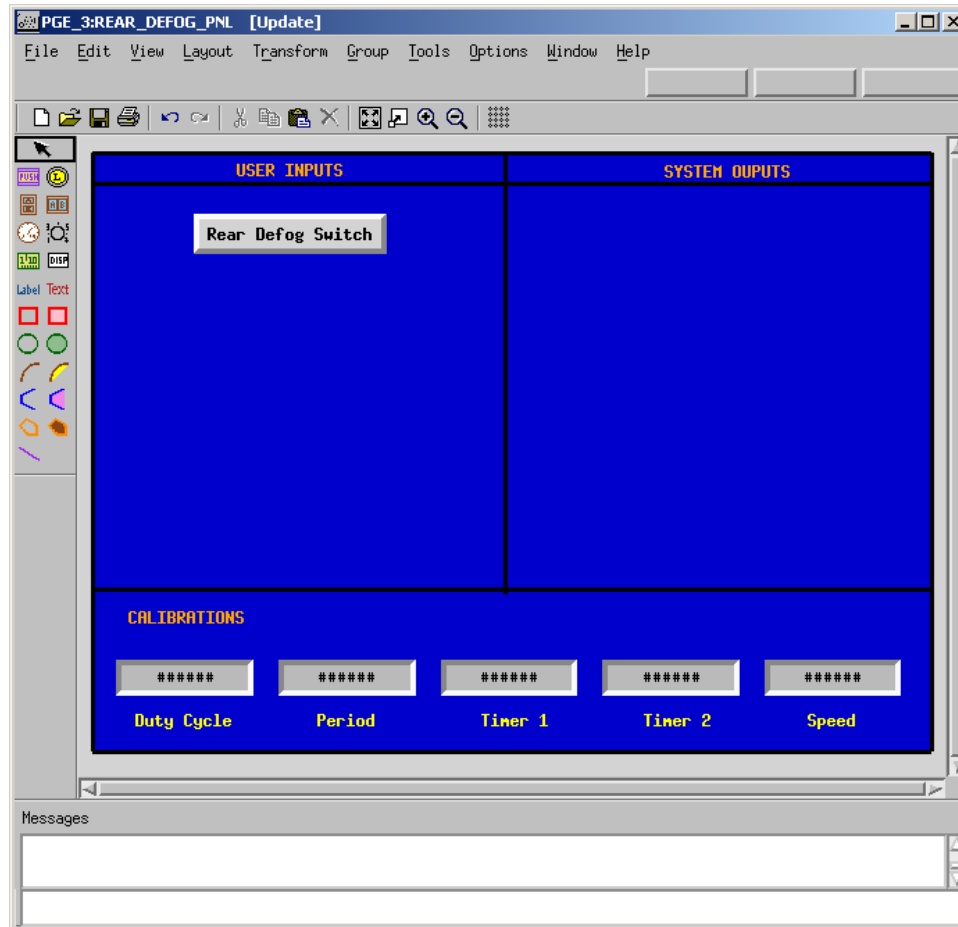
Properties Window
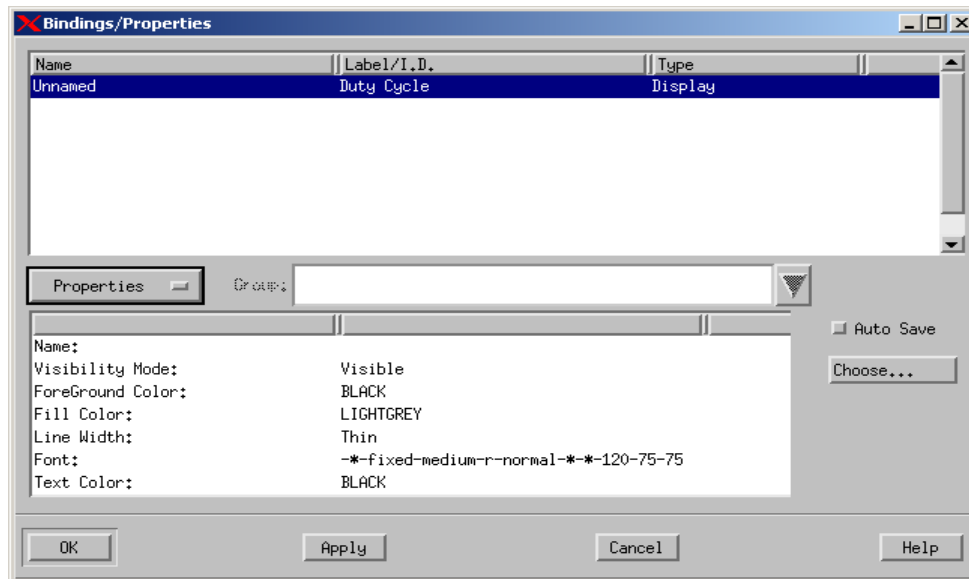
16. Enter the following for the binding values for the object labeled 'Period':

    ◆ **Bind Method**: Input Output

    ◆ **Controlled by**: K_Period

    ◆ **Element type**: Integer

    ◆ **Format**: Decimal

    ◆ **Field length**: 6

    ◆ **Fraction part**: 0

17. Click **Apply**.

18. Change the T**ext Color value** to BLACK and click **OK**.

19. Enter the following for the binding values for the object labeled 'Timer 1':

    ◆ **Bind Method**: Input Output

    ◆ **Controlled by**: K_RTIMER1

    ◆ **Element type**: Integer

    ◆ **Format**: Decimal

    ◆ **Field length**: 6

   ◆ **Fraction part**: 0

20. Click **Apply**.

21. Change the **Text Color value** to BLACK and click **OK**.

22. Enter the following for the binding values for the object labeled 'Timer 2':

- ◆ **Bind Method**: Input Output
- ◆ **Controlled by**: K_RTIMER2
- ◆ **Element type**: Integer
- ◆ **Format**: Decimal
- ◆ **Field length**: 6
- ◆ **Fraction part**: 0

23. Click **Apply**.

24. Change the **Text Color value** to BLACK and click **OK**.

25. Enter the following for the binding values for the object labeled 'Speed':

- ◆ **Bind Method**: Input Output
- ◆ **Controlled by**: K_SPEED1
- ◆ **Element type**: Integer
- ◆ **Format**: Decimal
- ◆ **Field length:** 6
- ◆ **Fraction part:** 0

26. Click **Apply**.

27. Change the **Text Color value** to BLACK and click **OK**.

28. Click **Create Push Button Interactor** and create a push button labeled '**Rear Defog Switch**', as shown in the following figure.

Push Button Interactor

29. Select the **Push Button Interactor** labeled '**Rear Defog Switch**' and then select **Tools > Bind** to open the object's Bindings/Properties window.

30. Enter the following for the binding values for the object labeled 'Rear Defog Switch':

- **Bind Method**: Input Output
- **Controlled by**: RDEFOG_SW_STATUS
- **Element type**: Event
- **Button type**:   Flash

31. Select **Create Slider Interactor** icon and create a slider labeled 'Vehicle Speed' as shown in the following figure.

Vehicle Speed Interactor
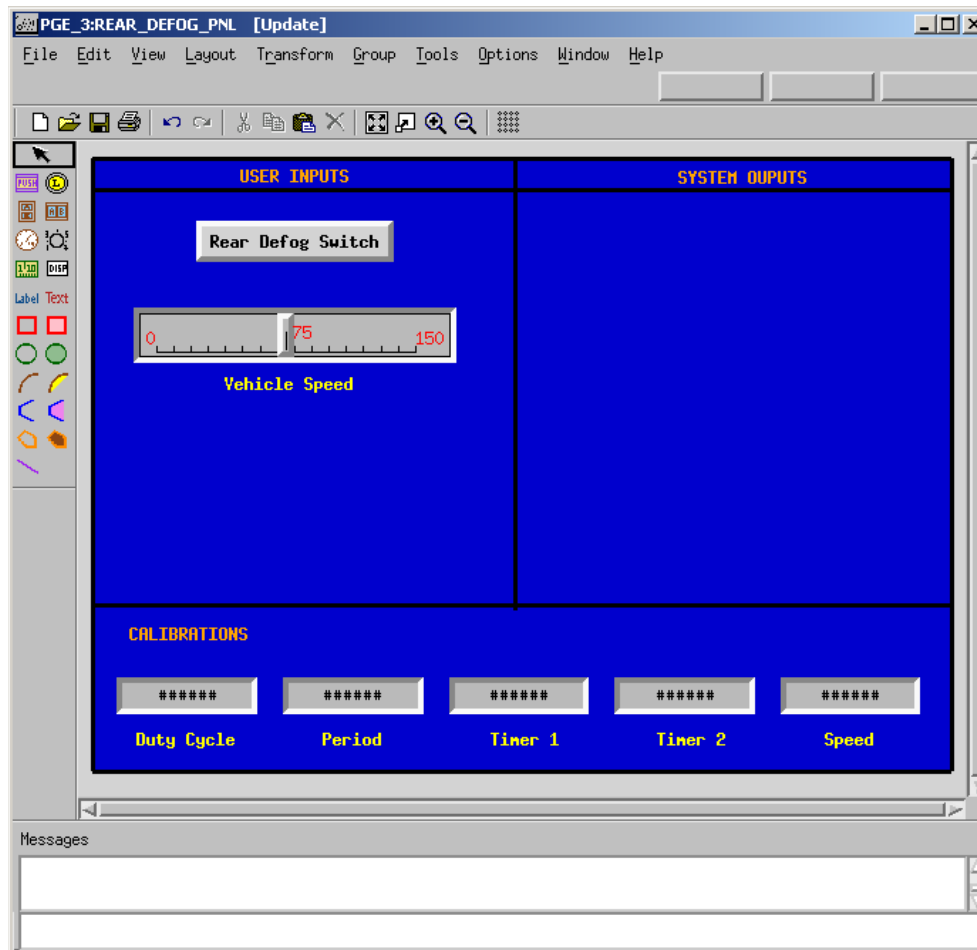
32. Select the **Slider Interactor** labeled **'Vehicle Speed'** and then select **Tools > Bind** to open the object's Bindings/Properties window. See the previous figure.

33. Enter the following for the binding values for the object labeled 'Vehicle Speed':

   ◆ **Bind Method**: Input Output
   ◆ **Controlled by**: VEHICLE_SPEED_IN
   ◆ **Element type**: Integer

34. Click **Apply**.

35. Select the '**Bindings**' button and change it to '**Properties**' in the Bindings/Properties window. Enter the following values for the properties settings:

- ◆ **Minimum Value:** 0.0

- ◆ **Maximum Value:** 150.0

- ◆ **Primary Scale Step**: 10.0

- ◆ **No. of Secondary Partitions**: 1

All other values can remain unchanged.

36. Click **OK**.

37. Select **Create Vertical Multi-Choice Interactor** and place it below the Vehicle Speed object as shown in the following figure. For the number of buttons, enter **4**.

Vertical Multi-Choice Interactor
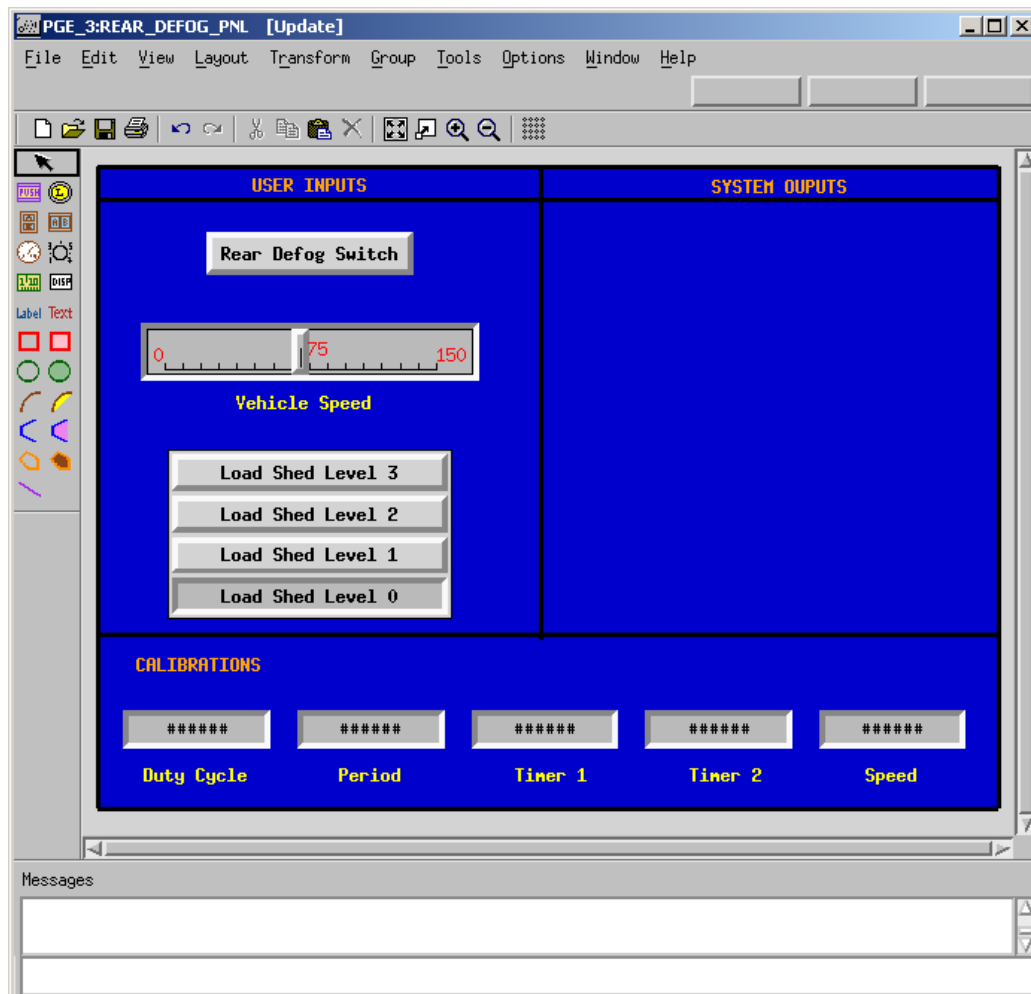
38. Select the **Create Label Interactor** and label each button of the interactor as shown in the previous figure.

39. Select the **Vertical Multi-Choice Interactor** and then select **Tools > Bind** to invoke the object's Bindings/Properties window.

40. Enter the following for the binding values for the object labeled 'Vehicle Speed':

- ◆ **Bind Method**: Input Output
- ◆ **Controlled by**: LOAD_SHED_IN
- ◆ **Element type**: Enum Type
- ◆ **Load Shed Level 0**: LM_LEVEL0
- ◆ **Load Shed Level 1**: LM_LEVEL1
- ◆ **Load Shed Level 2**: LM_LEVEL2
- ◆ **Load Shed Level 3**: LM_LEVEL3
- ◆ Click **OK**.

41. Select **Create Lamp Interactor** and create a lamp labeled 'Rear Defog Lite' as shown in the following figure.
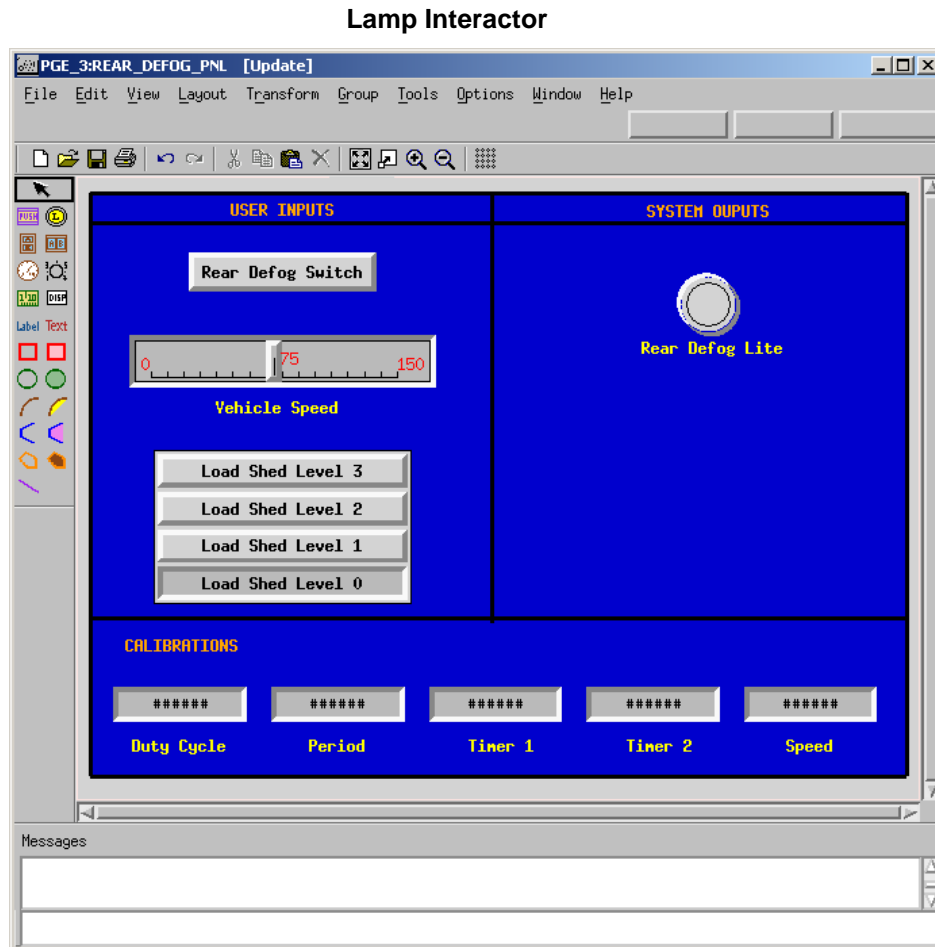
Lamp Interactor

42. Select the **Lamp Interactor** and then select **Tools > Bind** to invoke the object's Bindings/ Properties window.

43. Enter the following for the binding values for the object labeled 'Rear Defog Lite':

- **Bind Method**: Output
- **Controlled by**: RDEFOG_LED
- **Element type:** Condition
- **Button type**: Toggle

44. Click **OK**.

45. Select **Create Box Graphic** and create a box under the Rear Defog Lite'.

46. Select the **Create Line Graphic** and draw horizontal lines in the box that you just created (refer to the following figure).

User Drawing
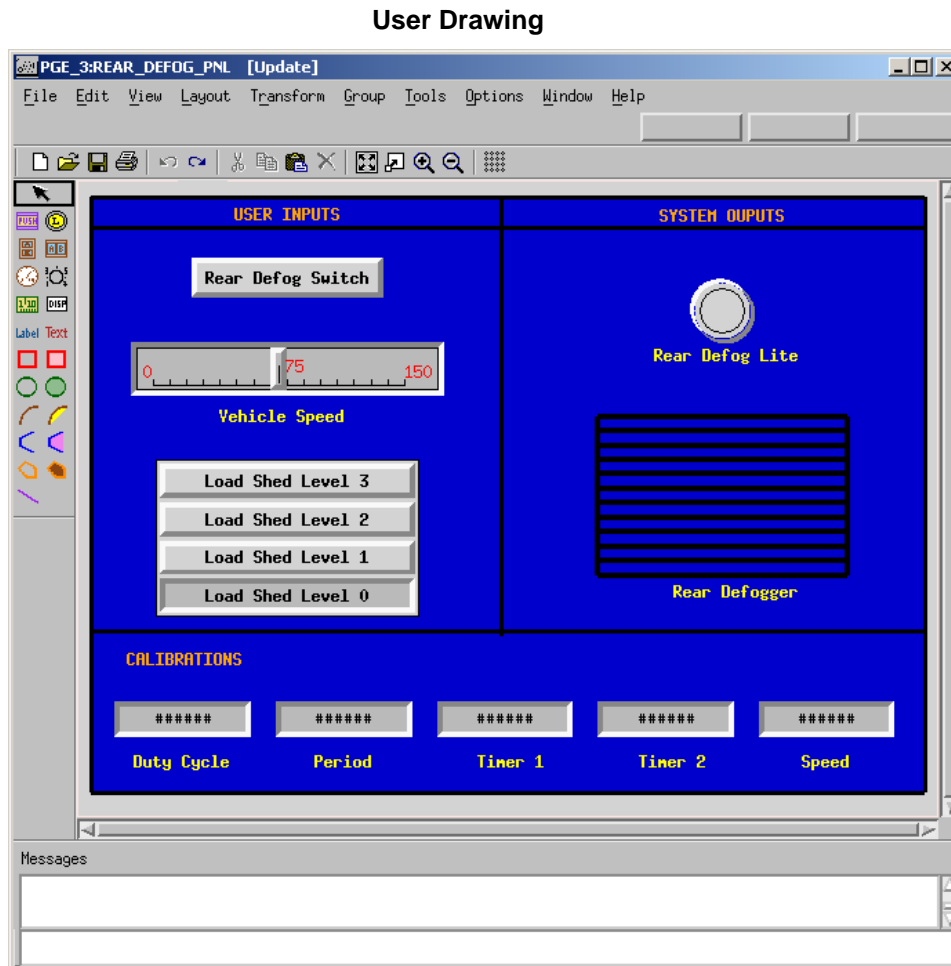
47. Select the box and all of the lines that were just drawn. Then, select **Group > Make Group**. This combines the elements into a single object.

48. Select the **group** and then select **Tools > Bind** to open the object's Bindings/Properties window.

49. Select **Group: Group Color** (refer to the following figure) from the Bindings window.

Group Bindings
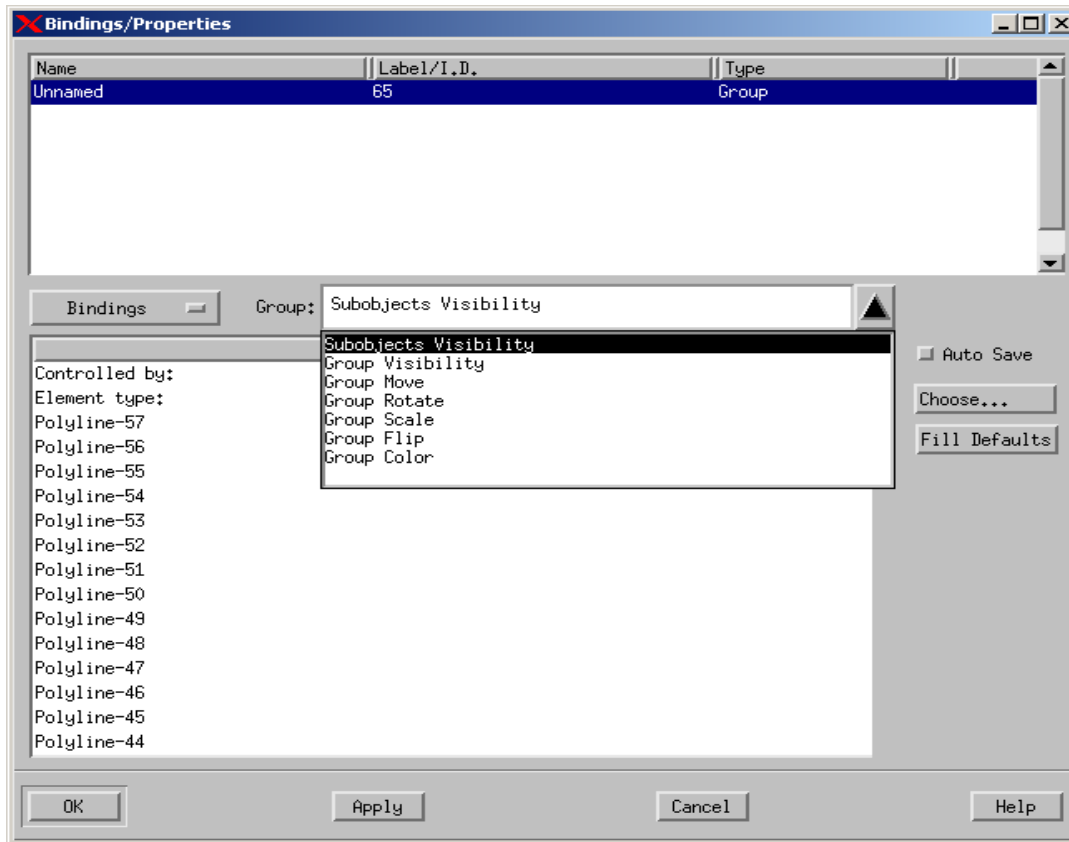
50. Enter the following for the binding values for the object labeled 'Rear Defog Lite':

   ◆ **Controlled by**: DEFOG_DRIVE_OUT

   ◆ **Element type**: Bit

   ◆ Select **Add Color** and choose **Red** with a value of 0.

   ◆ Select **Add Color** and choose **Black** with a value of 1.

51. Click **OK**.

Group Color
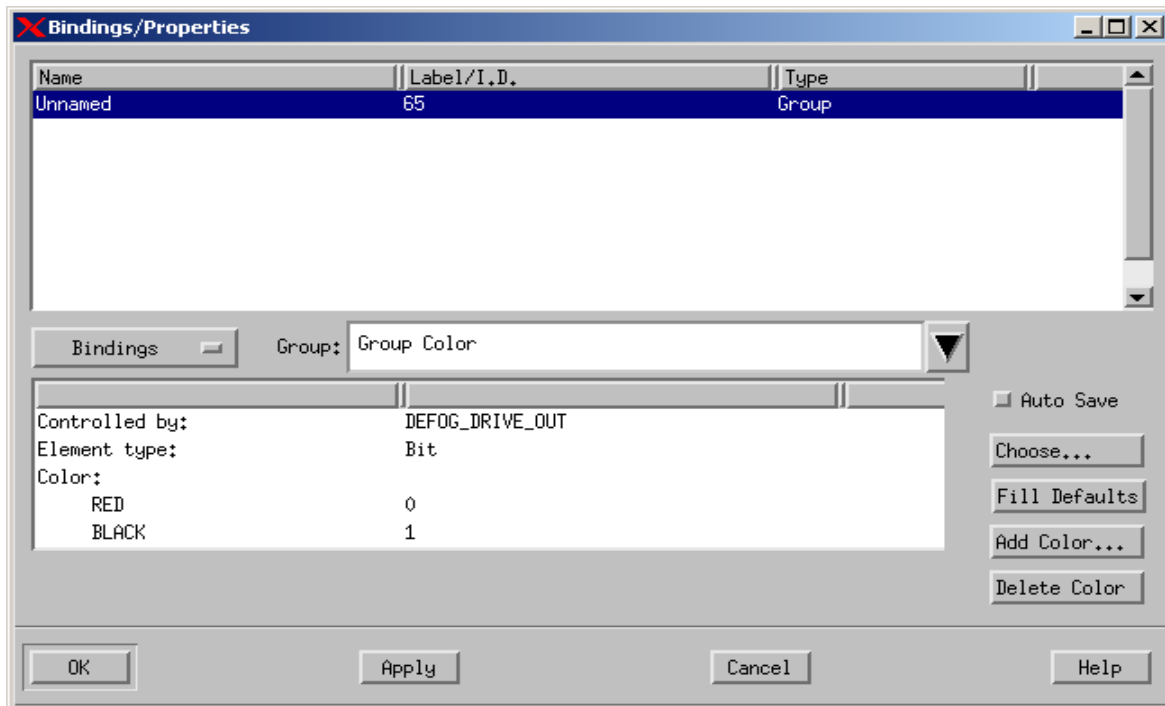
52. Select **Create Free Text** and enter **Rear Defogger**. Place it under the Rear Defogger object.

Note

Groups cannot be labeled.

53. Select **File > Save** from the PGE and then **File > Exit**.

Exercise 13 - System Analysis - Part 1

In this exercise, you will simulate the entire Rear Defog System. A simulation profile is created to capture the environment for analysis.
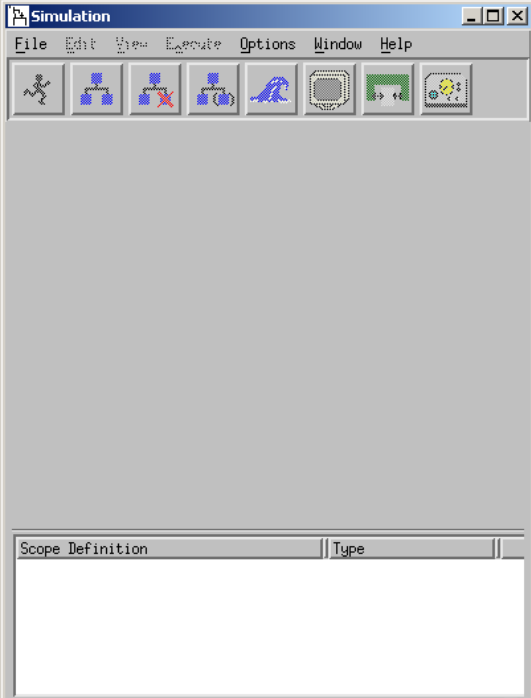
1. Click **Simulation** from the main Statemate window.

Simulation Icon
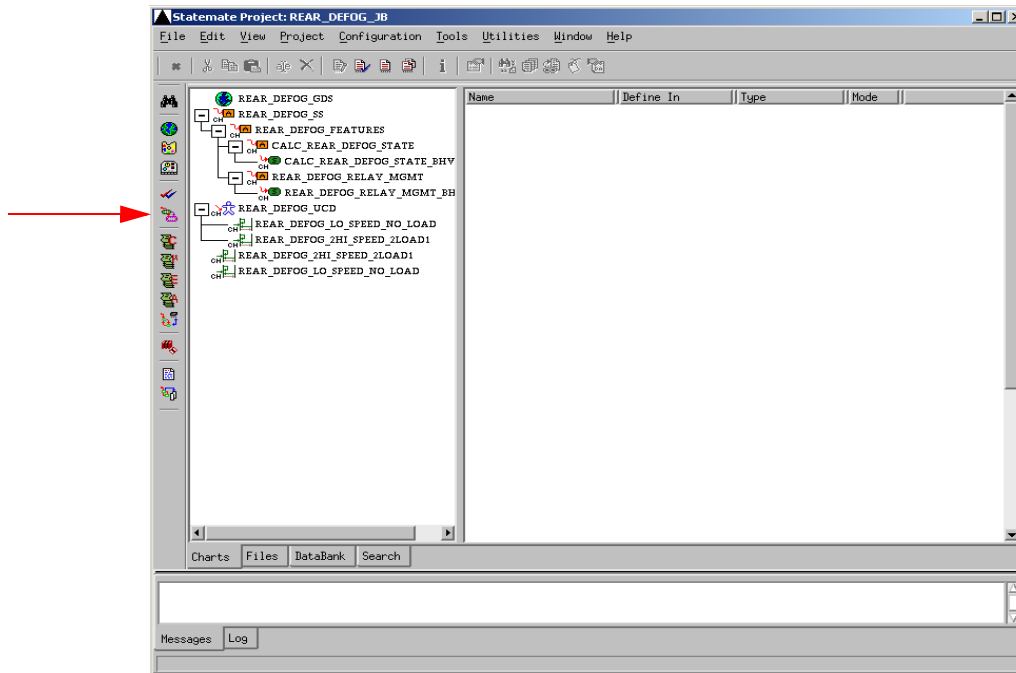
2. Select **File > New Profile** from the profile window and enter "**REAR_DEFOG_SIM**" for the profile name that you are creating. Refer to the following figure.
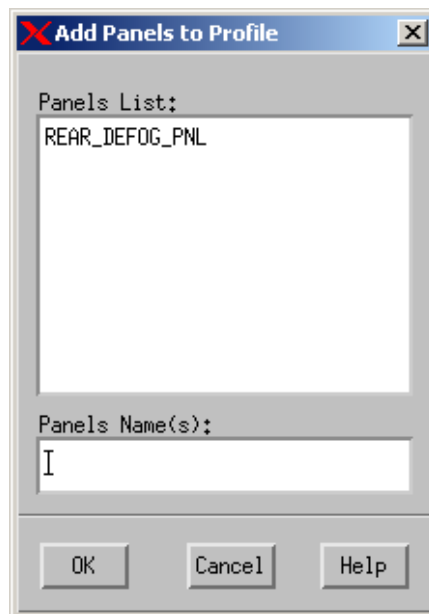
Simulation Profile

3. Click **Add Selected Chart with Descendents to Profile** ⊞. This opens a Chart Tree View of your current design (refer to the following figure).
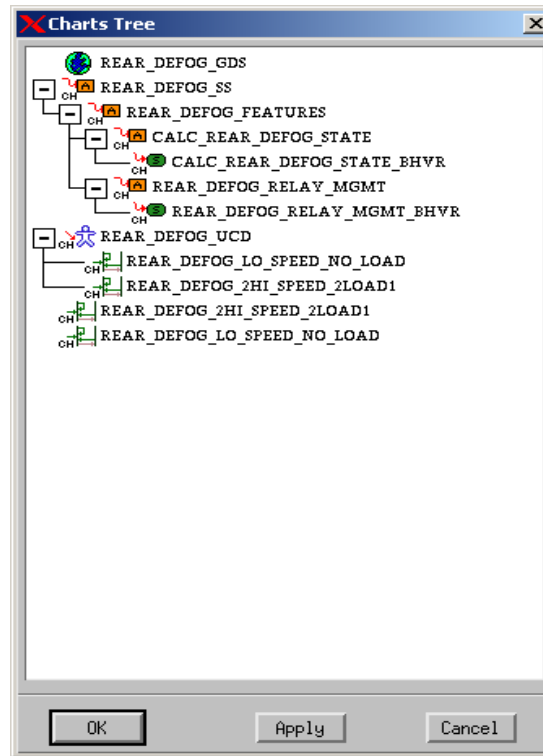
Chart Tree View

4. Select the chart named '**REAR_DEFOG_SS**' from the Chart Tree view and then click **OK**.

5. Click **Add Selected Panel to Profile** ⟨icon⟩ from the Simulation profile window and add the panel to the profile that was created in the earlier exercise. Refer to the following figure.

Add Panel to Profil

6. Select **File > Save** from the Simulation window.

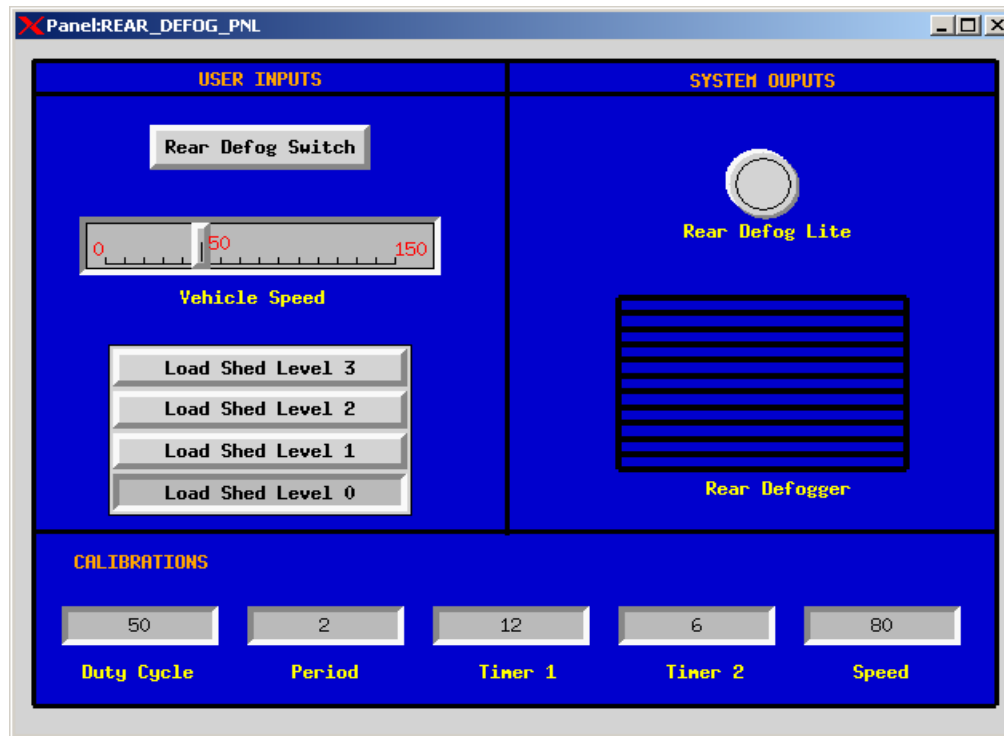7. Click **Invoke Simulation Based on the Current Profile** 🏃 from the simulation window.

Note

The simulation execution (**Simulation Execution**) window opens, as well as an executable model of the panel (**Executable Panel**). The panel allows you to make inputs and view outputs of the system design.

Simulation Execution
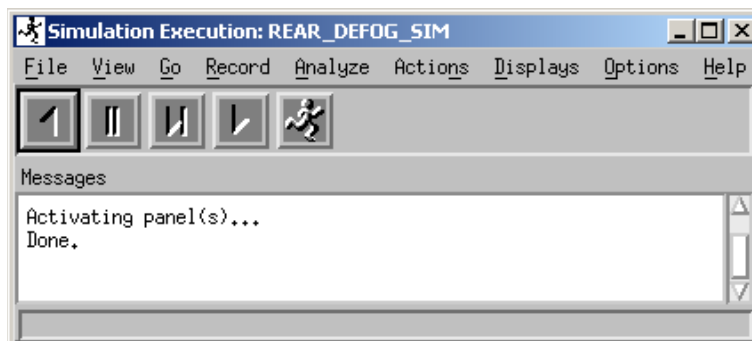
Executable Panel

8. Click **AutoRun** ![icon] to start simulating as in real-time mode.

9. Use the panel to input changes into the system and view the effects on the activity-charts and statecharts, and verify that all transitions can be taken.

Exercise 14 - System Analysis - Part 2

In **Exercise 13 - System Analysis - Part 1**, you validated the model to ensure it behaved as designed. In this exercise, you will simulate the model and verify that the requirements are being met.

1. Open the simulation profile named '**REAR_DEFOG_SIM**'.

2. Click **Add Selected Chart with Descendents to Profile** 🔲. This opens a Chart Tree View of your current design

3. Select the sequence diagram named '**REAR_DEFOG_LO_SPEED_NO_LOAD**' from the Chart Tree View and then click **OK**.

4. Open the sequence diagram named '**REAR_DEFOG_LO_SPEED_NO_LOAD**'.

5. Select **File > Save** from the Simulation window.

6. Click **Invoke Simulation Based on the Current Profile** 🏃 .

7. Click **AutoRun** 🏃 to start simulating as in real-time mode.

8. Use the panel to input changes into the system and view the effects on the sequence diagram to verify that all transitions are taken.

Exercise 15 - Iterative Design

In the process of system development, all of the requirements may not be available or defined in the early stages. Some requirements may not be formalized and only later in the design process completely captured.

1. Open the simulation profile named '**REAR_DEFOG_SIM**'. Refer to the following figure.
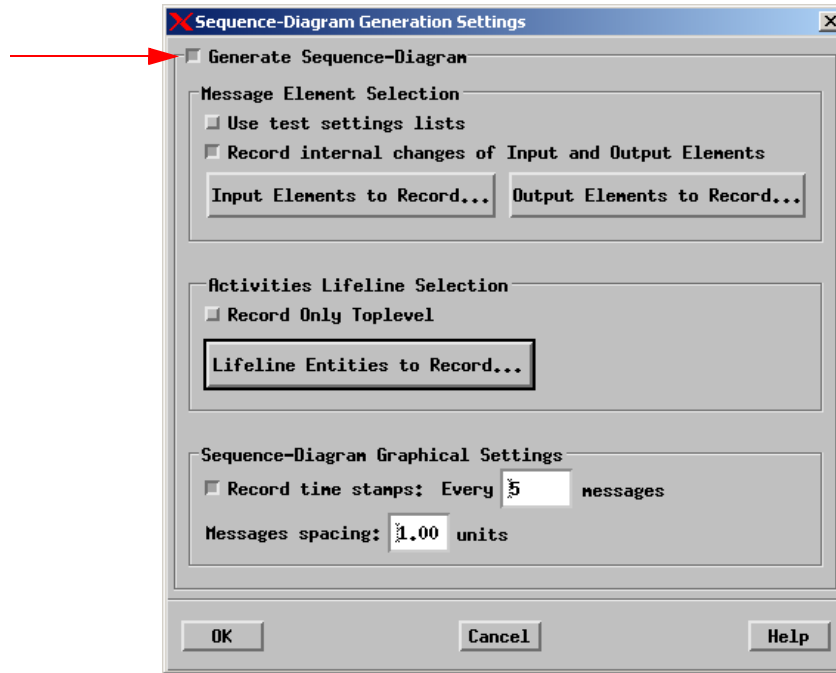
Simulation Profile: REAR_DEFOG_SIM
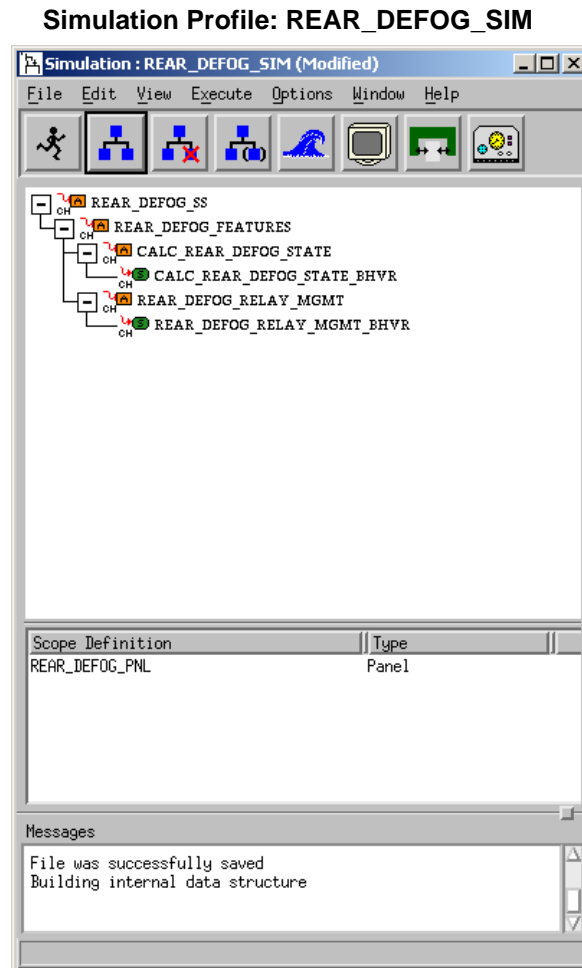
2. Select **Options > Sequence-diagram Generation…**from the Simulation Profile window. Refer to the following figure.

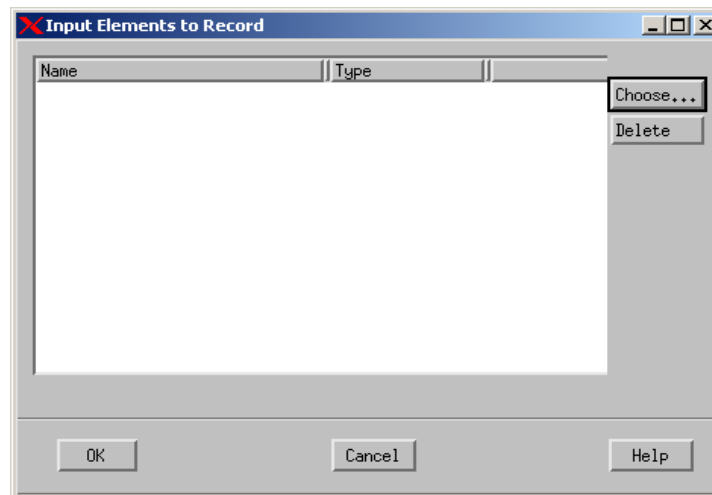**Sequence-Diagram Generation Settings**
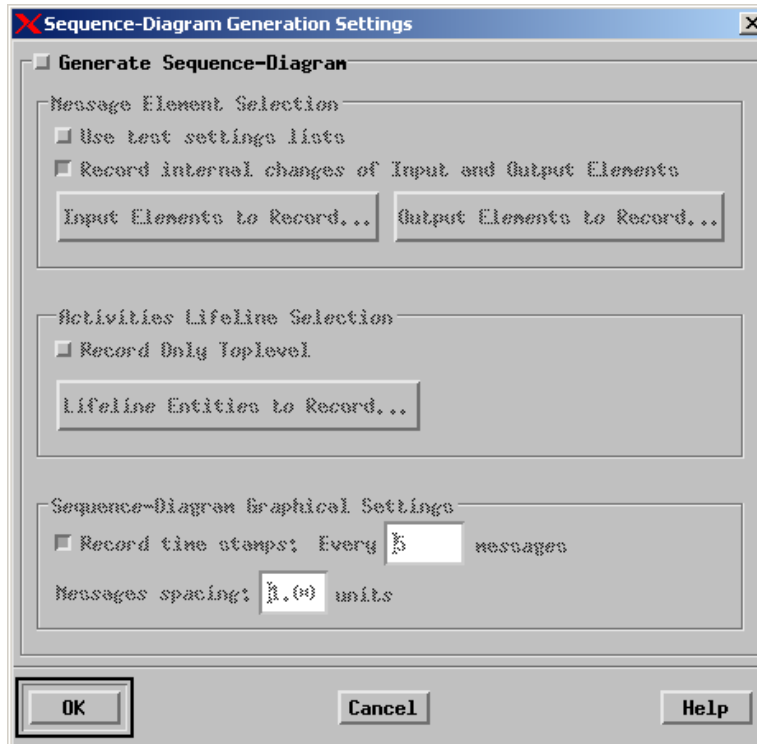
3. Click **Generate Sequence-Diagram** from within the Sequence Diagram Generation Settings window. Refer to the following figure.
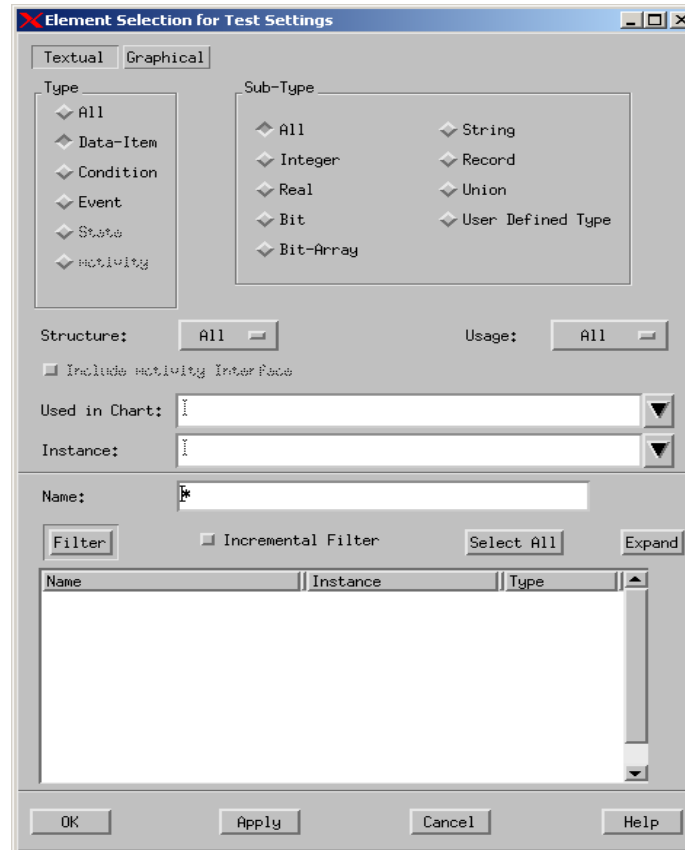
Active Sequence Diagram Generation

4. Click **Input Elements to Record**… to select the input elements to record within the simulation (refer to the following figure).
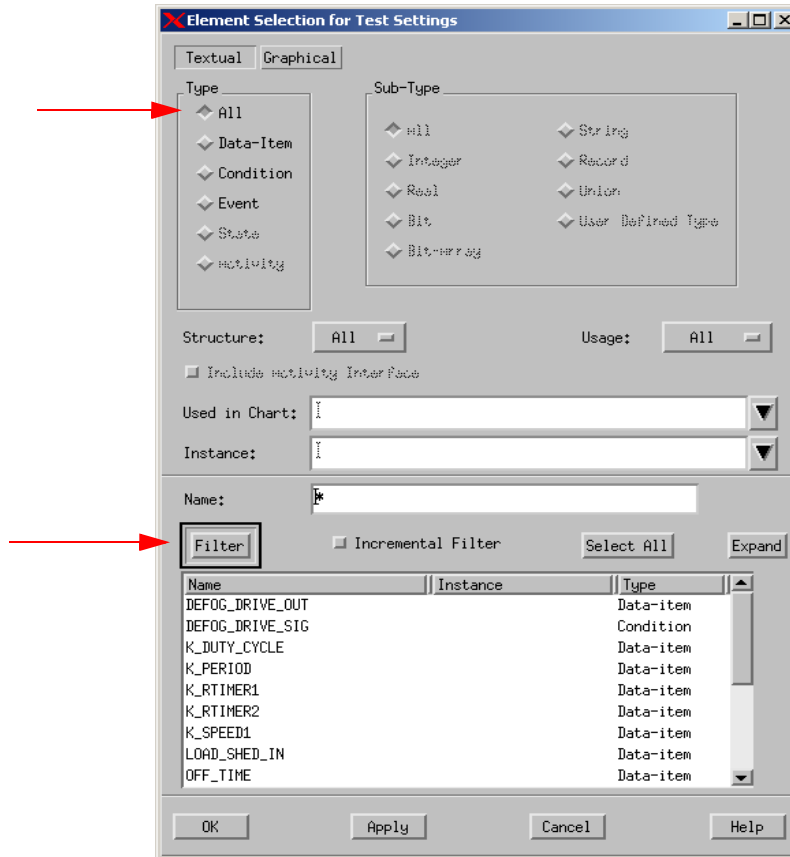
Input Elements to Record

5. Click 'Choose...' within the Input Elements to Record window to add elements to record. This invokes the Element Selection window for the test settings. Refer to the following figure.

Element Selection Window

6. Within the element selection window click '**All**' under the Type and then select **Filter** to create a list of elements. Refer to the following figure.

Filtered Element List

7. Select the following three elements within the Element Selection List - **LOAD_SHED_IN, RDEFOG_SW_STATUS**, and **VEHICLE_SPEED_IN** and then click **OK**.

8. Click **OK** within the Input Elements to Record window (refer to the following figure).
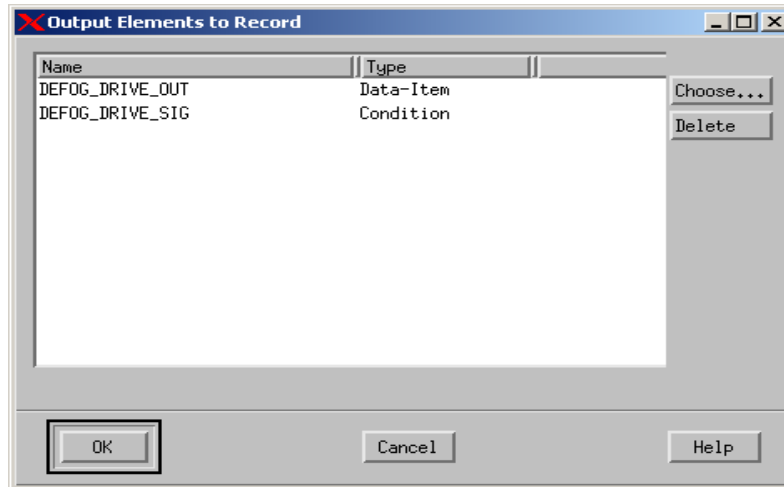
Selected Input Elements
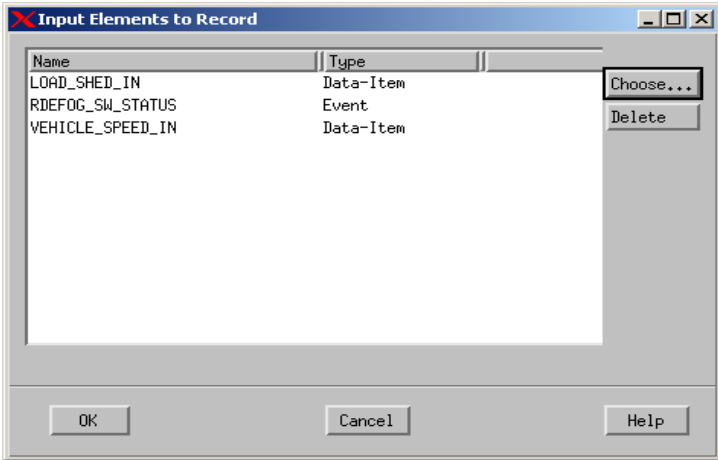
9. Select **Output Elements to Record…** to select the output elements to record within the simulation (refer to the following figure).

Output Elements to Record
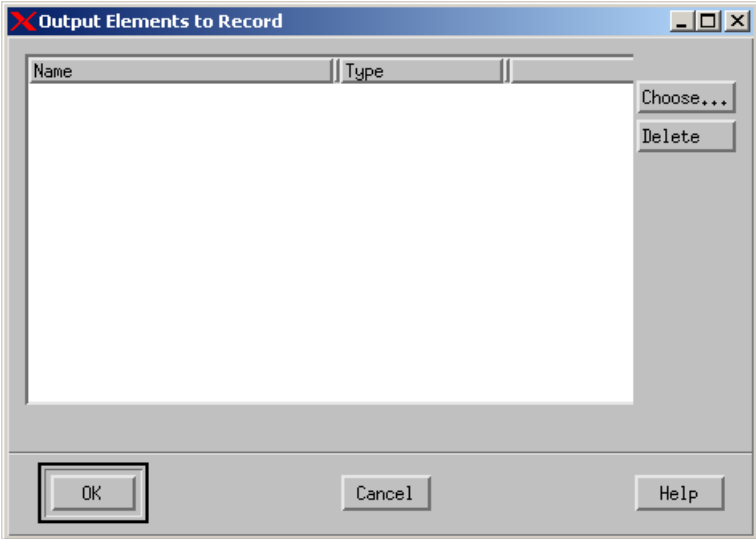
10. Using the steps outlined above, add the following two output elements to record - **DEFOG_DRIVE_OUT** and **DEFOG_DRIVE_SIG**. Refer to the following figure.

Selected Output Elements

11. Select **Lifeline Entities to Record** within the activities lifeline section of the Sequence Diagram Generation Settings window (refer to the following figure). These lifelines will be used within the generated diagram.

Lifeline Entities Window
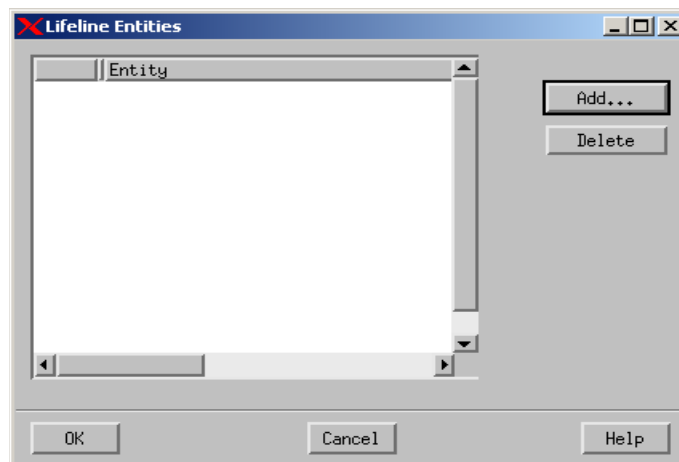
12. Click **'Add…'** within the Lifelines Entities window to invoke the Lifeline Entities and select the items as shown in the following figure.

Selected Lifelines

13. Click **OK** within the selected Lifeline Entity window.

14. Click **OK** within the Lifeline Entities window.
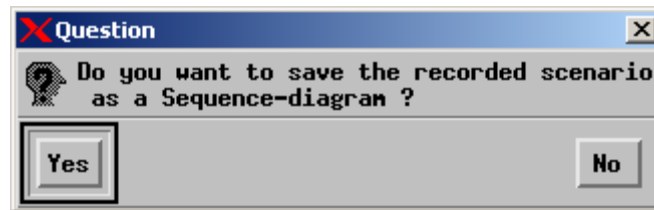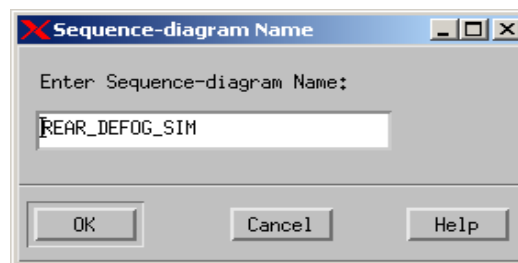
15. Click **OK** within the Sequence Diagram Generation Settings window.

16. Select **File > Save** from the simulation profile window.

17. Select **Invoke Simulation Based on the Current Profile** from the simulation profile window.

 > **Note:** The simulation window and an executable model of the panel open. The panel allows you to make inputs and view outputs of the system design.

18. Click **AutoRun** ⚡ to start simulating as in real-time mode.

19. Use the panel to input changes into the system.

20. Once the simulation is complete and you exit the simulation execution window, you are prompted to save the recorded sequence diagram (refer to the following figure). Click **Yes**.
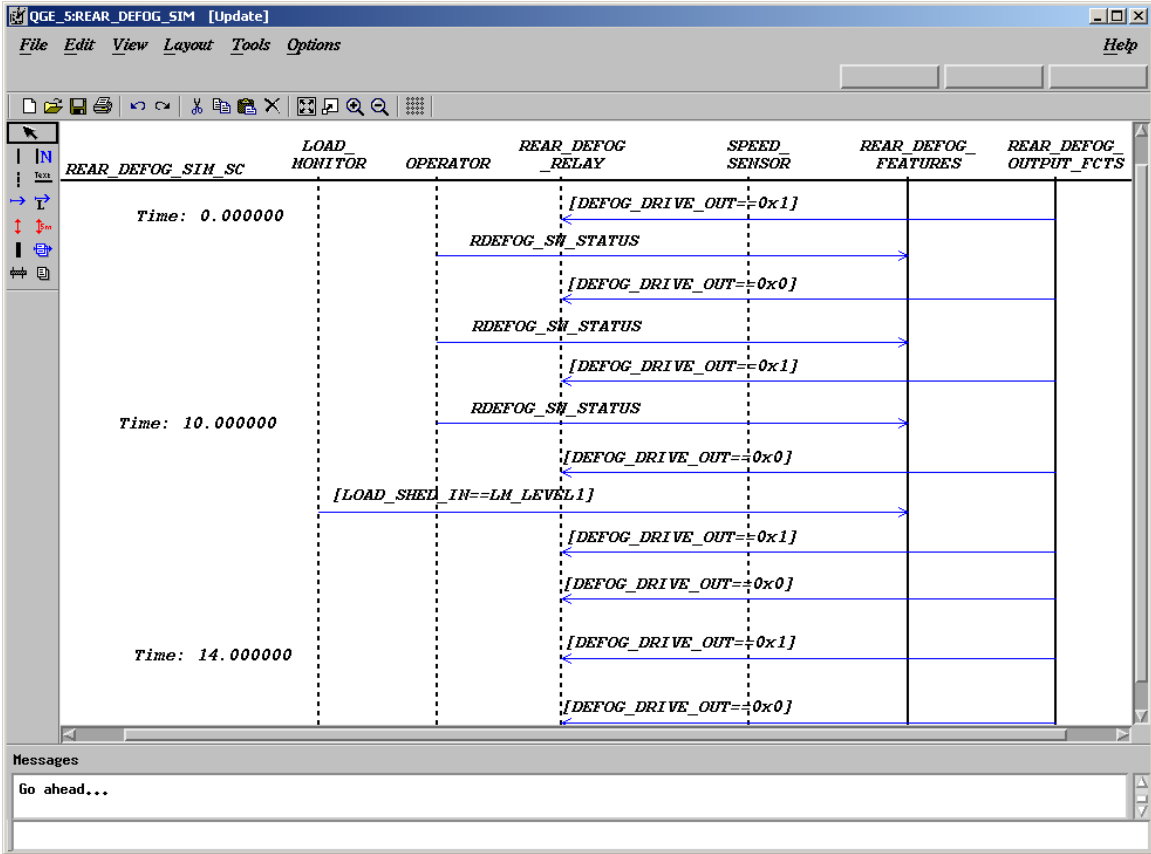
Save a Sequence Diagram

21. Enter the name of the recorded Sequence Diagram and click **OK**. Refer to the following figure.

Sequence Diagram Name

22. Open and review the sequence diagram that was generated from the simulation (refer to the following figure). The diagram can be found within the Workarea.

Generated Sequence Diagram

Exercise 16 - Project Management

Now that the project has been designed and validated, a released version of the design may need to be produced. This exercise creates a configuration file that captures the charts and files within the workarea.

1. Select **Configuration > Create Configuration** (refer to the following figure) from the main Statemate window.

Create Configuration

2. The Create Configuration window opens (refer to the following figure).
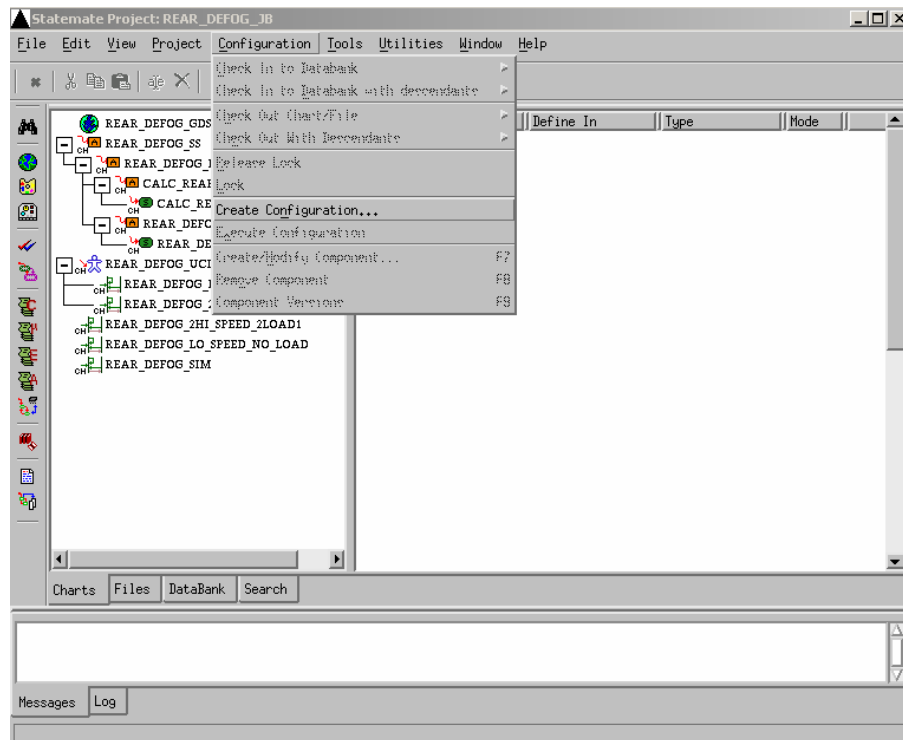
Create Configuration Window
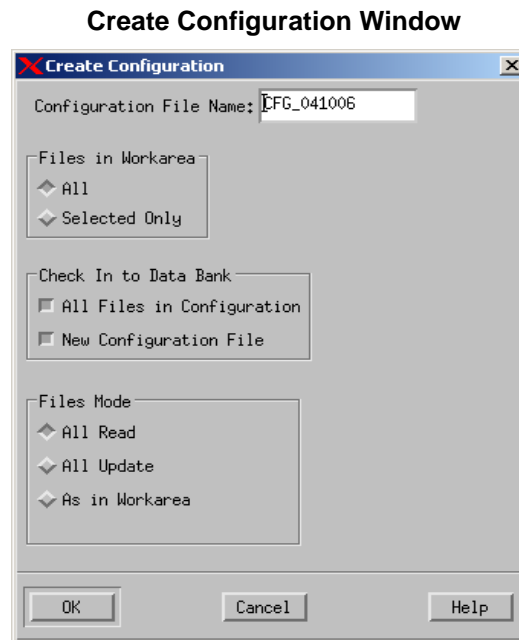
3. Make the following selections within the Create Configuration window.

- ◆ **Configuration File Name** - Rename it or leave default name.
- ◆ **Files In Workarea** - Change the selection to All.
- ◆ **Check In to Data Bank** - All Files in Configuration and New Configuration File should be selected.
- ◆ **File Mode** - select All Update.

4. Click **OK**.

> **Note:** These selections check all of the charts and files within the workarea into the databank, as well as creating a configuration file and checking it into the databank.

5. Select the **DataBank Tab** from the main Statemate window.

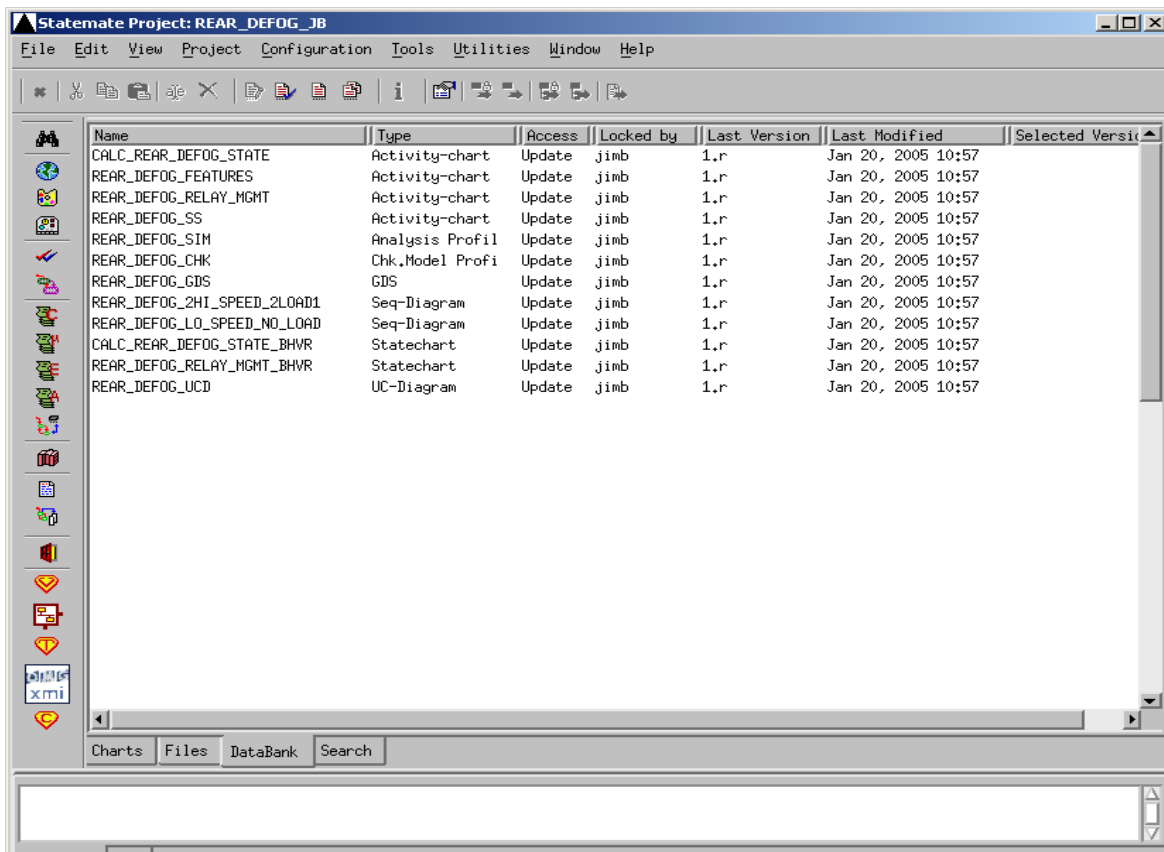**6.** Select **View > View Filter** in the DataBank View. The Show Files window opens.

> **Note:** This window allows you to select which files to show within the DataBank.

7. Select "**All Charts**" and "**All Files**" and then select **OK**.

View Filter
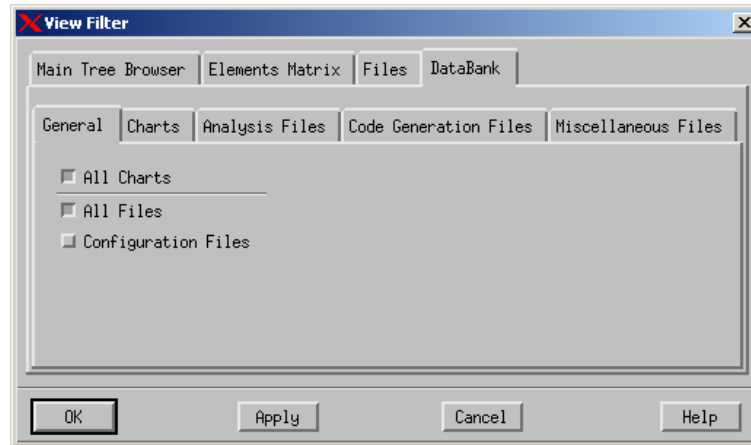
Note: The DataBank lists the files that are within the databank with their current status. Refer to the following figure.

DataBank View

8. Select **Edit > Select All From** in the Charts Tab.

9. Select **Edit > Delete** from the Charts.

10. Select **View > Show…** from the Databank. Make the same selections as in step 3 and click **OK**. The 'Locked By' field within the Databank should now be empty.

11. Select the configuration file from the Databank that was created in step 3 and then select **Configuration > Execute Configuration** (refer to the following figure). This checks all of the files back into the users' workarea. Review and check the workarea to ensure all files have been checked into the workarea.

Databank Configuration