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# Extending TestStand Functionality by Custom Step Types

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CLD

TestStand Developer

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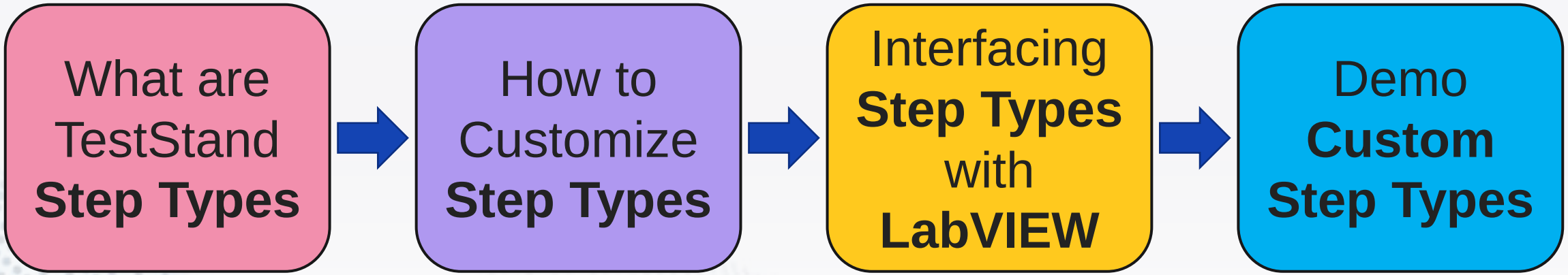
# Agenda



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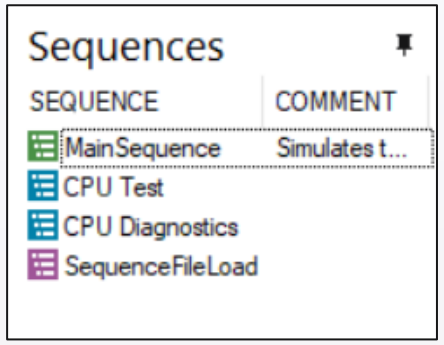
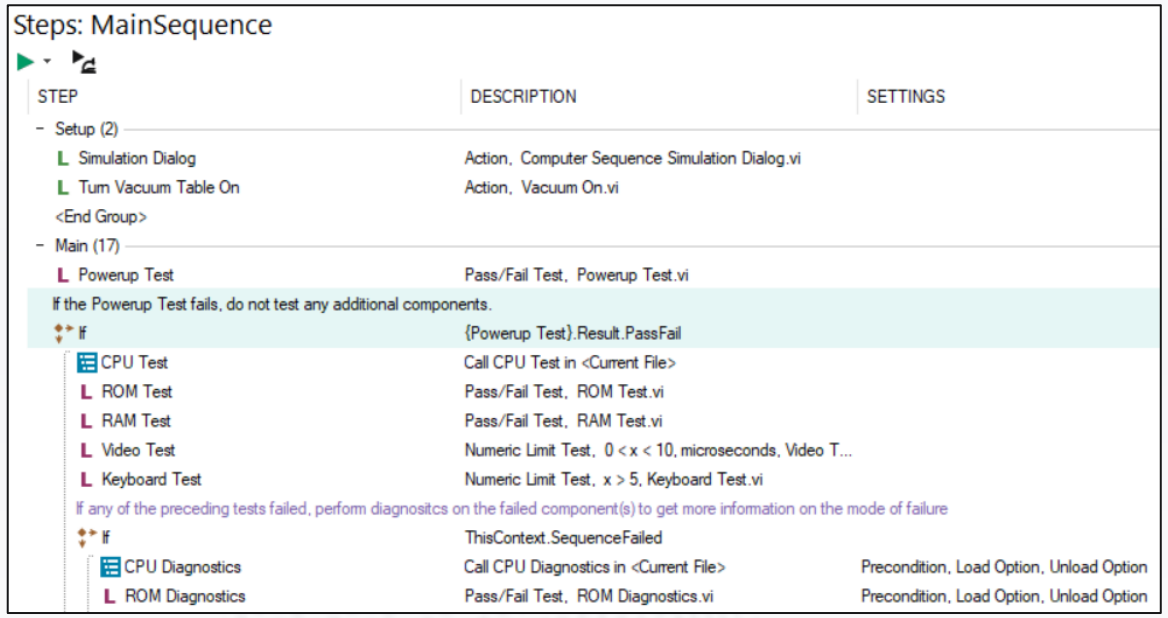
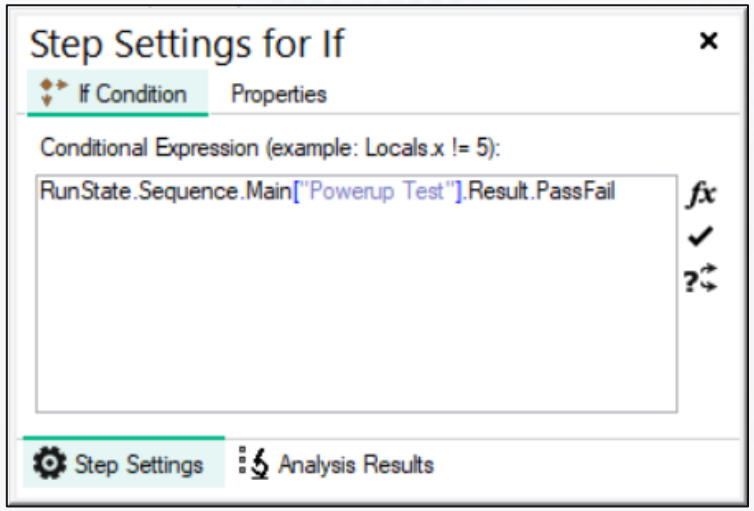
# What Are TestStand Step Types ?

Step Types are the basic components of a TestStand Sequence




Basically, every step of TestStand Sequence is a **Step Type**

What are TestStand **Step Types**

How to Customize **Step Types**

Interfacing **Step Types** with LabVIEW

Demo **Custom** Step Types

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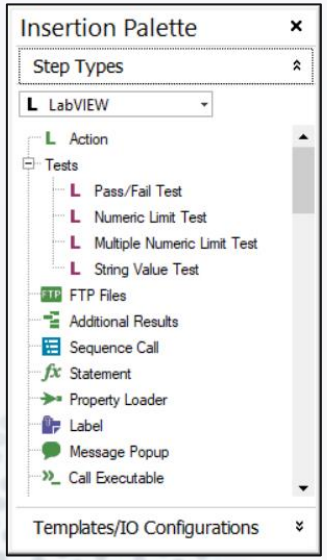
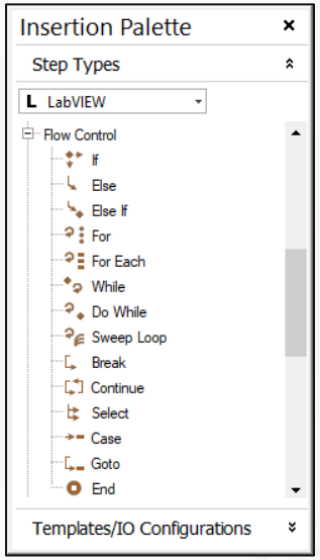
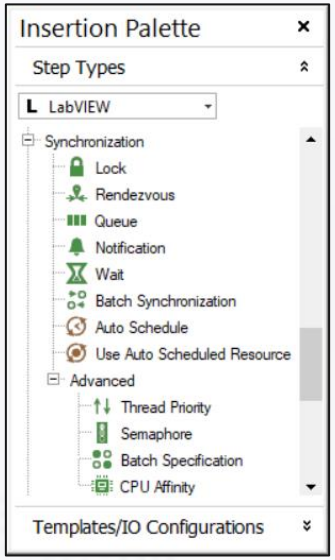
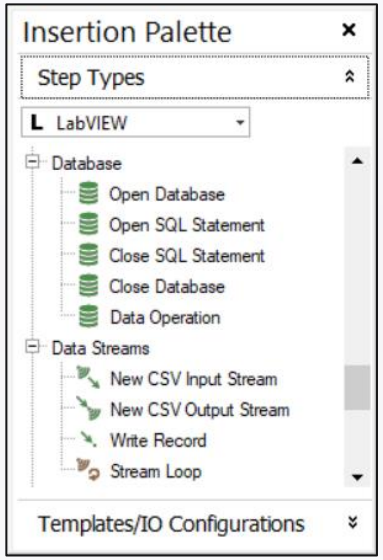
# Built-In Step Types

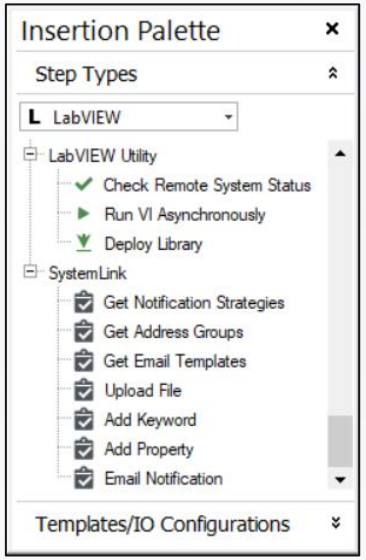
TestStand has lot of Built-in Step Types available from Insertion Palette




These Step Types can be used to create any kind of sequence flows

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# Are they sufficient🤔?

## ☺ Sufficient

*when*

- Sequence needs only standard/basic step functionalities
- Steps are configured from typing in Step Settings

## Need More ☹

*when*

- Sequence needs custom step functionalities
- Needs more intuitive interface for configuring step settings

Okay, let's see how to customize them ↴

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# Customizing Step Types

## Let us understand first how a Step Type works

[Step Execution TestStand Help]

**Step Execution**

Depending on the options you specify when you configure a step, a step performs multiple actions as it executes. The following table lists the most common actions a step can take, in the order the step performs them.

| Action Number | Description | Remarks |
|---|---|---|
| 1 | Allocate step result | |
| 2 | Enter batch synchronization section | |
| 3 | Check run mode for Skip | |
| 4 | Evaluate precondition | |
| 5 | Acquire step lock | |
| 6 | Check run mode for Force Pass or Force Fail | |
| 7 | Load module if not already loaded | |
| 8 | Execute step switching | |
| 9 | Evaluate Loop Initialization expression | |
| 10 | Evaluate Loop While expression, skip to Action Number 26 when `False` | |
| 11 | Allocate loop iteration result | |
| 12 | Call Pre-Step Engine callbacks | |
| 13 | Evaluate Pre-Expression | |
| 14 | Call Pre-Step substeps for step type | |
| 15 | Process additional results for input parameters | |
| 16 | Call module | |
| 17 | Process additional results for output parameters | |
| 18 | Call Post-Step substeps for step type | |
| 19 | Evaluate Post-Expression | |
| 20 | Evaluate Status expression | |
| 21 | Call Post-Step Engine callbacks | |
| 22 | Call Post-Step Failure Engine callback | |
| 23 | Populate loop iteration result | |
| 24 | Call Post-ResultList Entry Engine callback | |
| 25 | Call Post-Results Engine callback | |
| 26 | Evaluate Loop Status expression | |
| 27 | Disconnect switching routes with step lifetime | |
| 28 | Unload module when required | |
| 29 | Update sequence failed state | |
| 30 | Call Post-Step Failure Engine callback | Only when step fails |
| 31 | Execute post action | — |
| 32 | Release step lock | When option is set |
| 33 | Exit batch synchronization section | When option is set |
| 34 | Populate step result | Custom additional results also populate at this time. However, additional results for input and output parameters populate immediately before and after Action Number 16, respectively. |
| 35 | Call Post-ResultList Entry Engine callback | — |
| 36 | Call Post-Results Engine callback | — |

Usually, a step performs only a subset of these actions depending on the configuration of the step and the test station.

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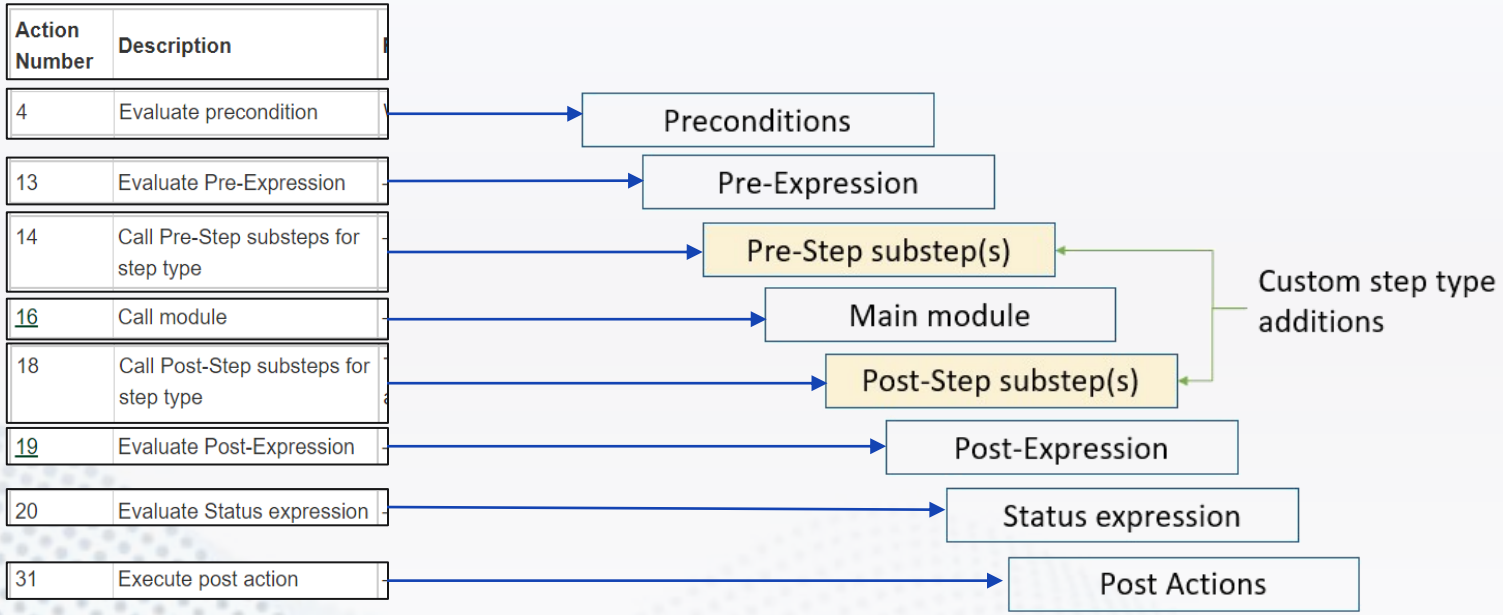
# Customizing Step Types

To Customize a Step Type, we are mainly focusing on **Custom Step Type Additions** in the execution order,




- Most of the Step Types which does not call any other Code Module will not have a Main Module (that we don't need)
- And we can add our own Code Modules to Pre/Post – Step Substep(s)

So, whenever the step is executed, our custom Substep Code Modules get executed too.

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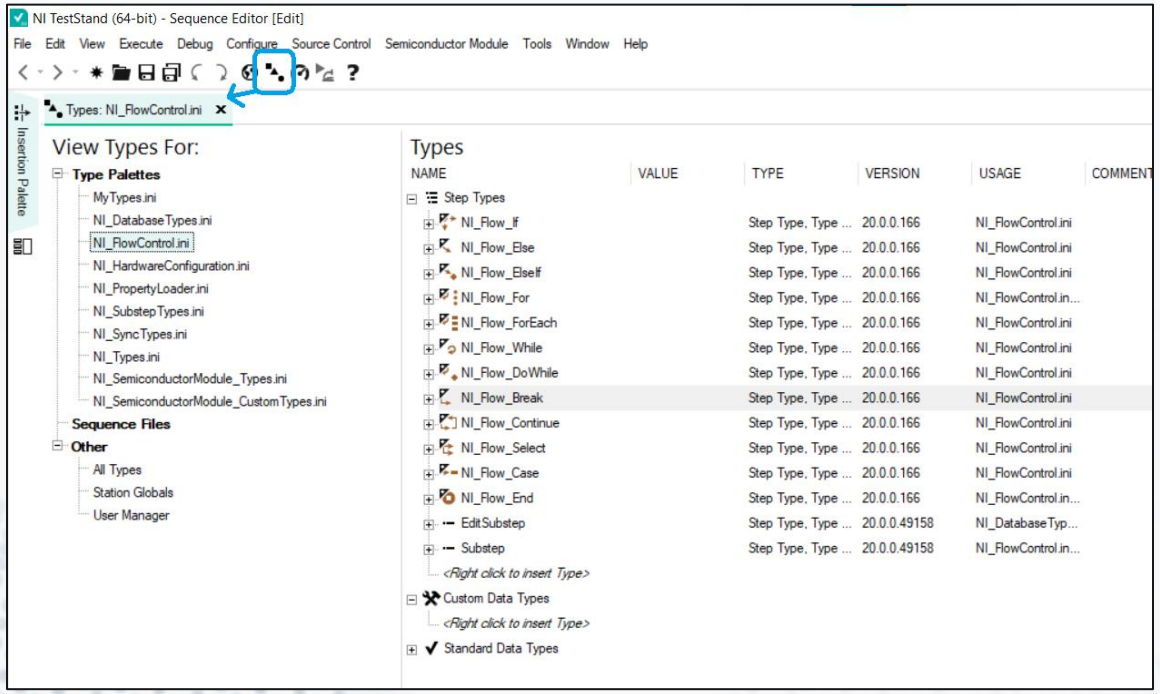
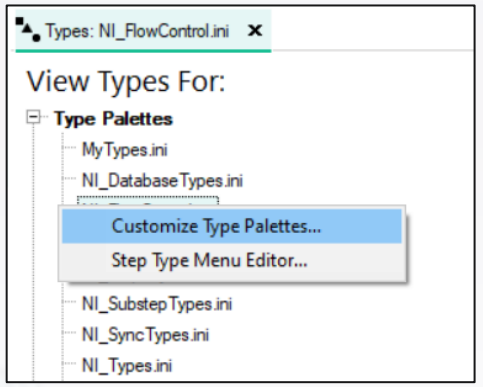
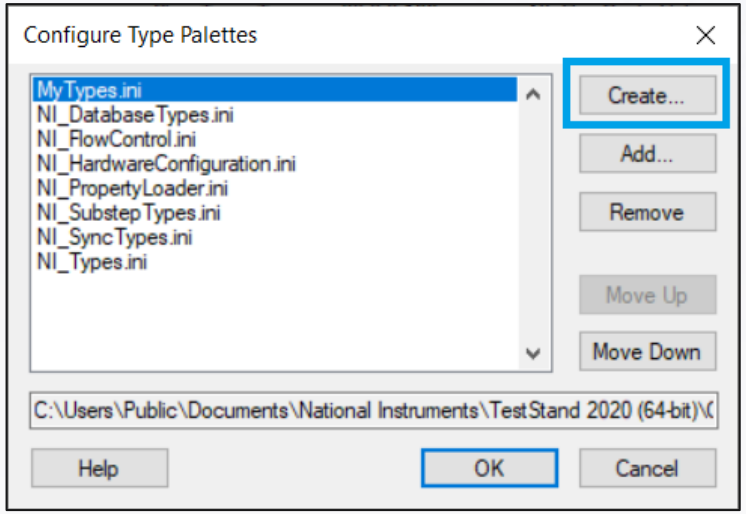
# Creating a Custom Step Type




Navigate to Types (Ctrl + T)




Right Click & select
**Customize Type Palettes...**




Create new Type Palette

What are TestStand Step Types

How to Customize **Step Types**

Interfacing Step Types with LabVIEW

Demo Custom Step Types

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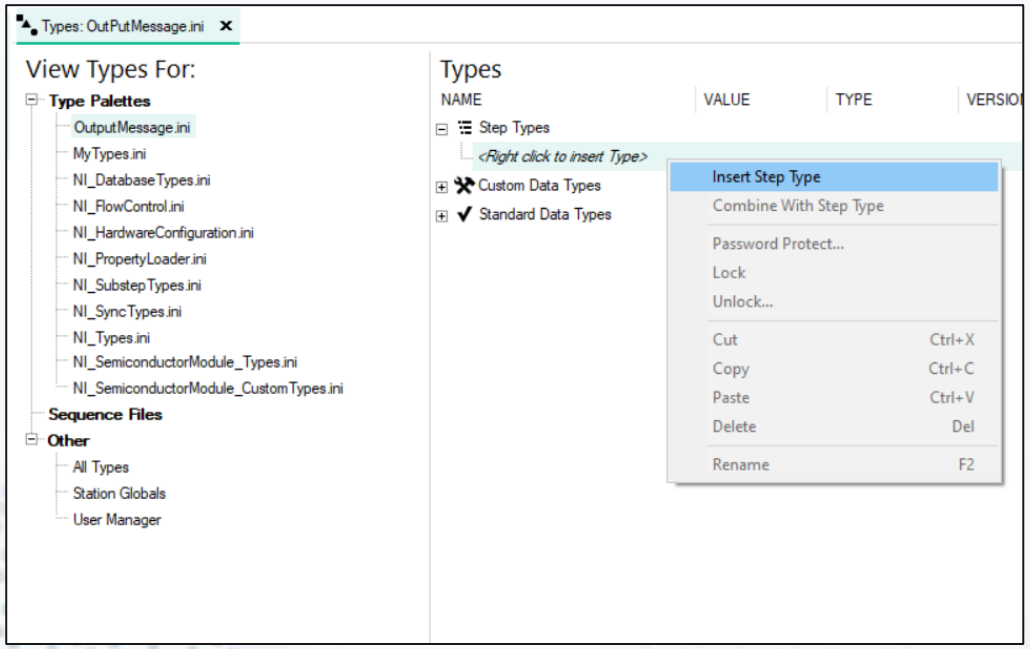
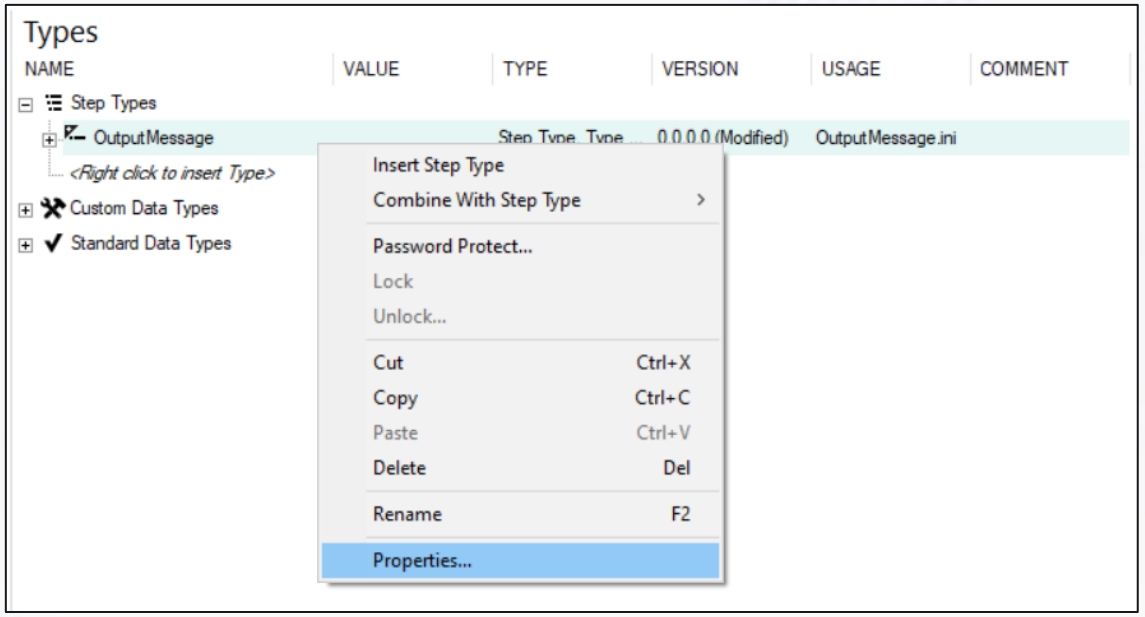
# Creating a Custom Step Type




Insert Step Type




Open Properties (Double Click)

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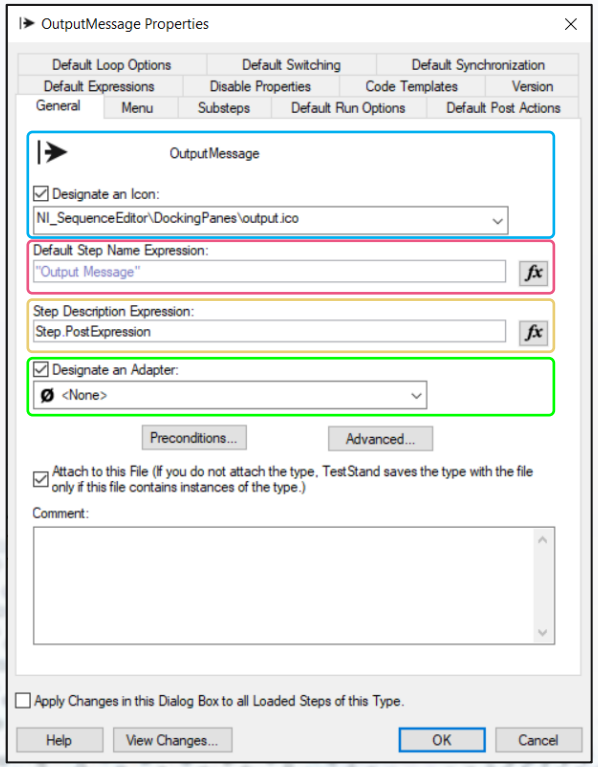
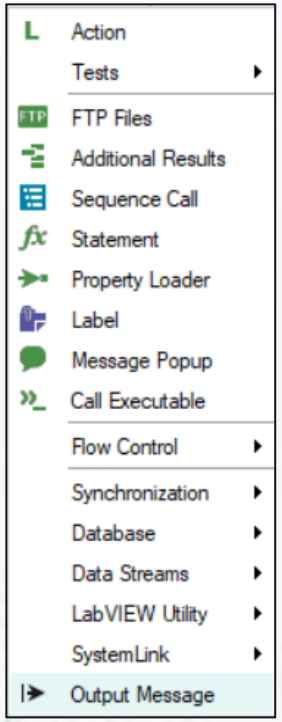
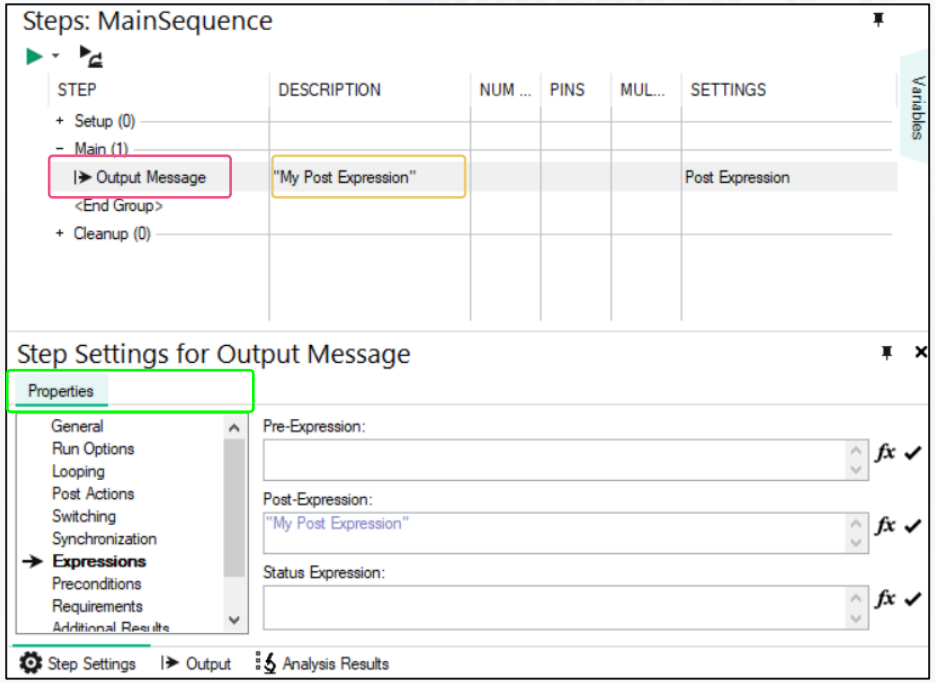
# Creating a Custom Step Type




Configure the General Properties

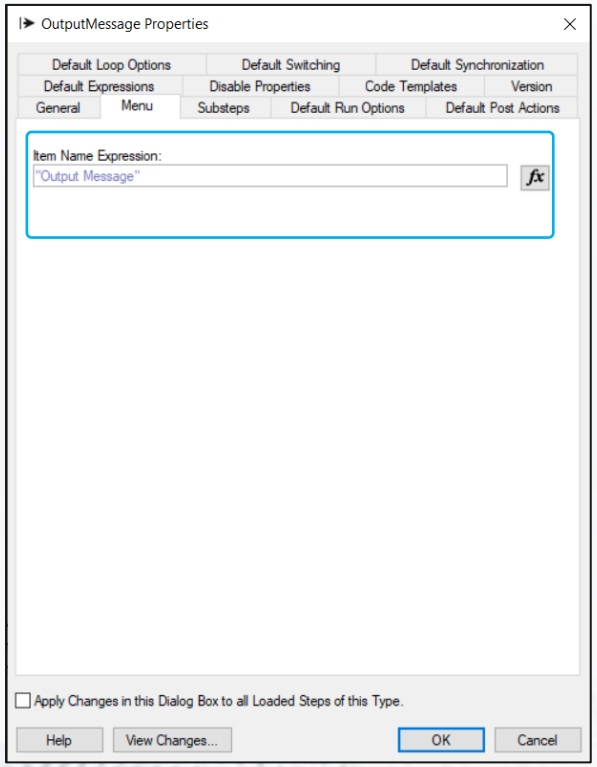



Icon

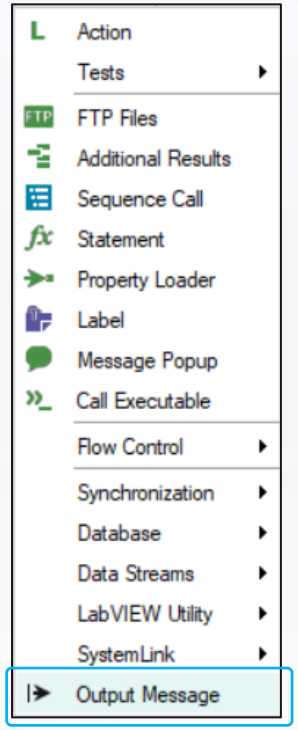



Default Step Name, Step Description & No Main Module

# Creating a Custom Step Type




Configure the Menu




Item Name under Insertion Palette

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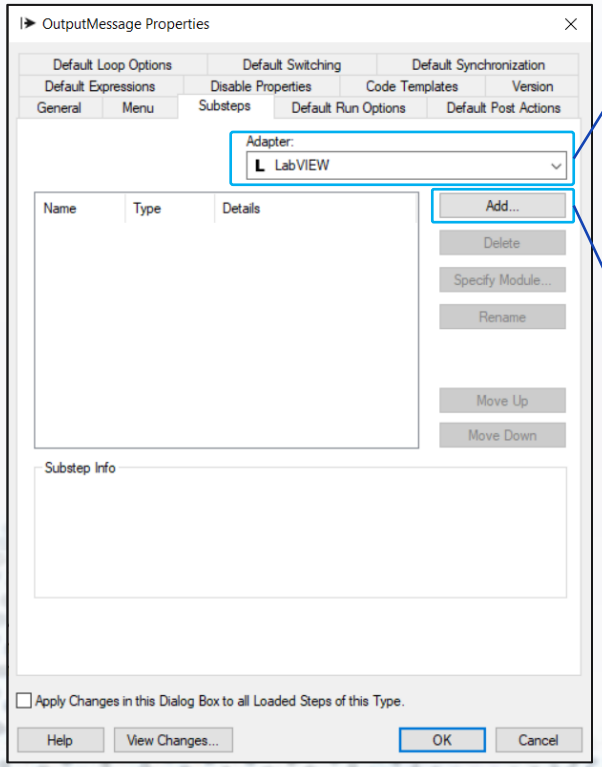
# Creating a Custom Step Type




Select the Adapter
(for the Substep modules)

- Post-Step
- Pre-Step
- Edit
- Custom

**Edit Substep**

The Edit substep typically calls a substep code module that launches a dialog box in which you can edit the values of the custom step properties. For example, an Edit substep might launch a dialog box in which you specify the high and low limits for a test. The Edit substep might then store the high and low limit values as step properties.

**Custom Substeps**

You can create a custom substep named **OnNewStep** for TestStand to call each time you create a new step of that type. For example, the built-in If step type uses an OnNewStep substep to insert a matching End step.

Configure the Substeps

[Using Substeps TestStand Help]

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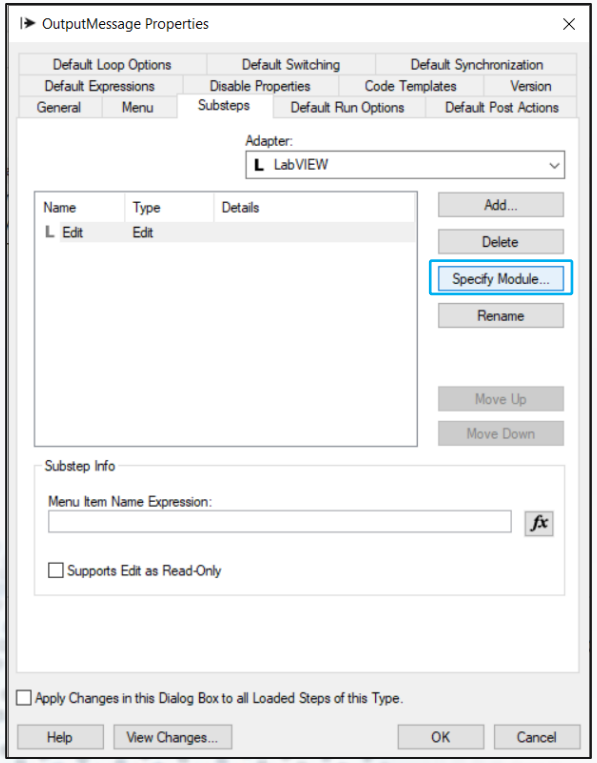
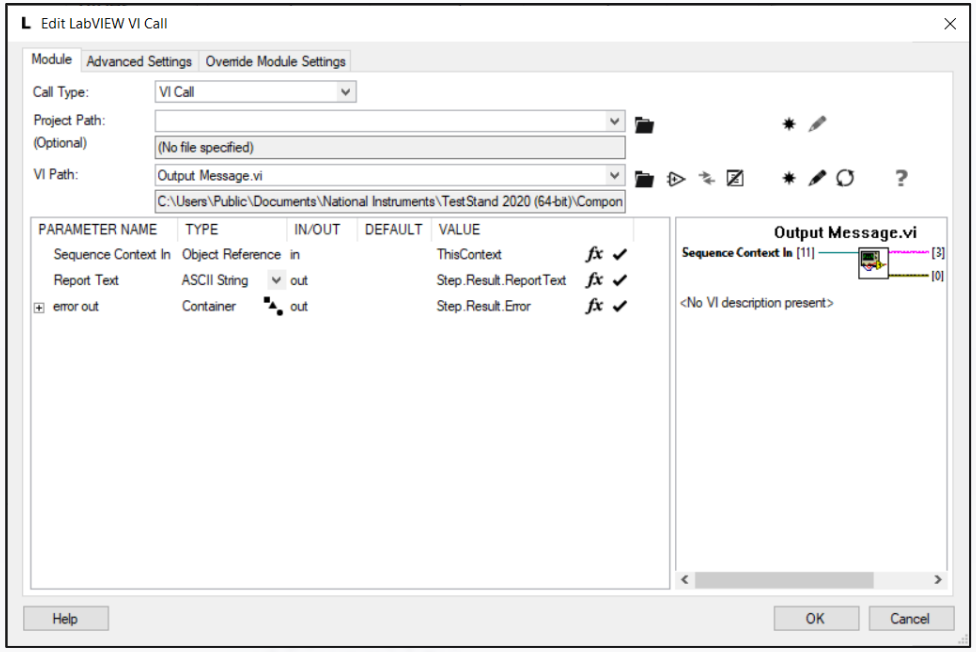
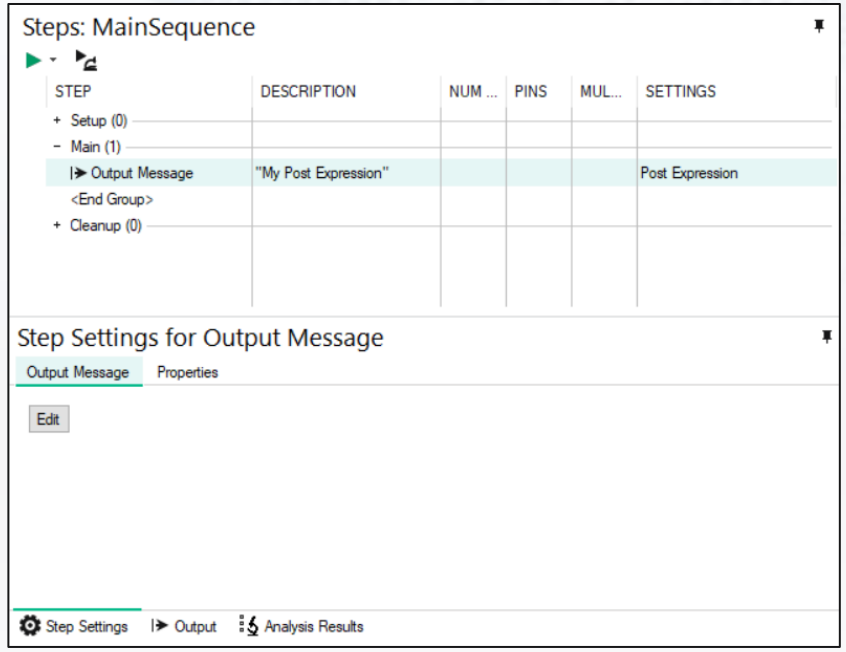
# Creating a Custom Step Type




Add an Edit Substep & Specify Module




Create a New VI for Edit Substep




An Edit button will appear, by which we can invoke the Edit Substep Code module (the VI)

What are TestStand Step Types

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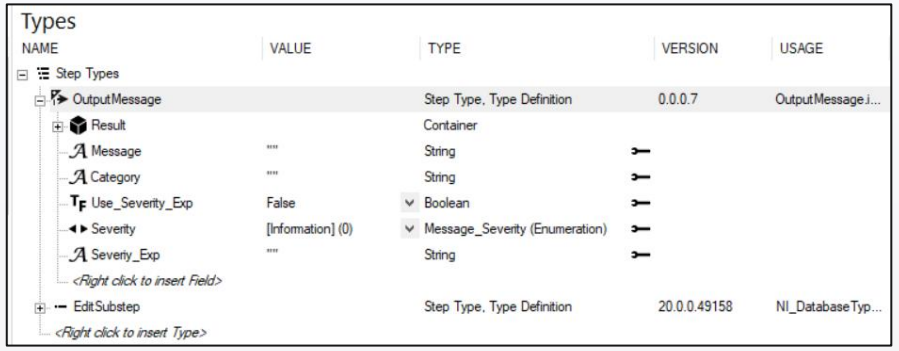
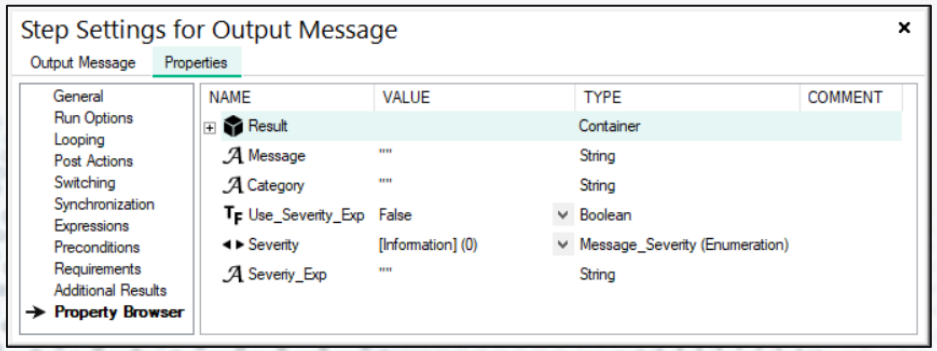
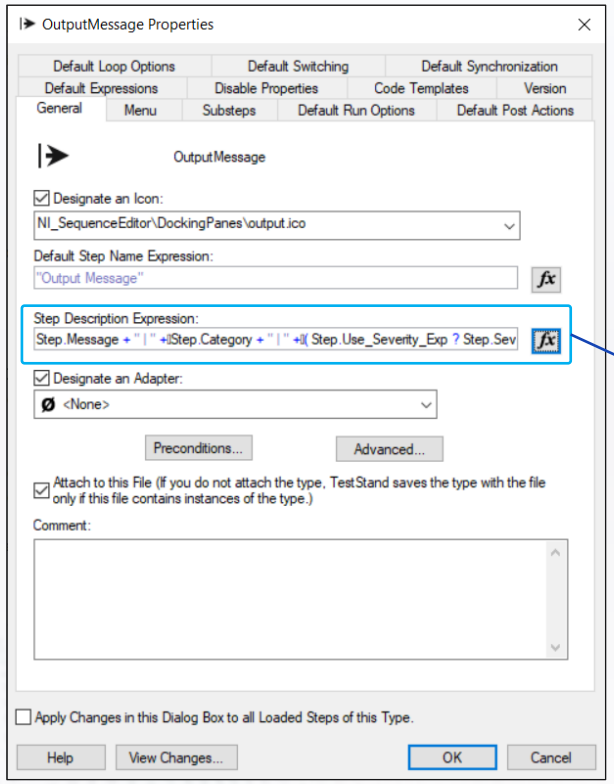
# Customize the Step Type as Required

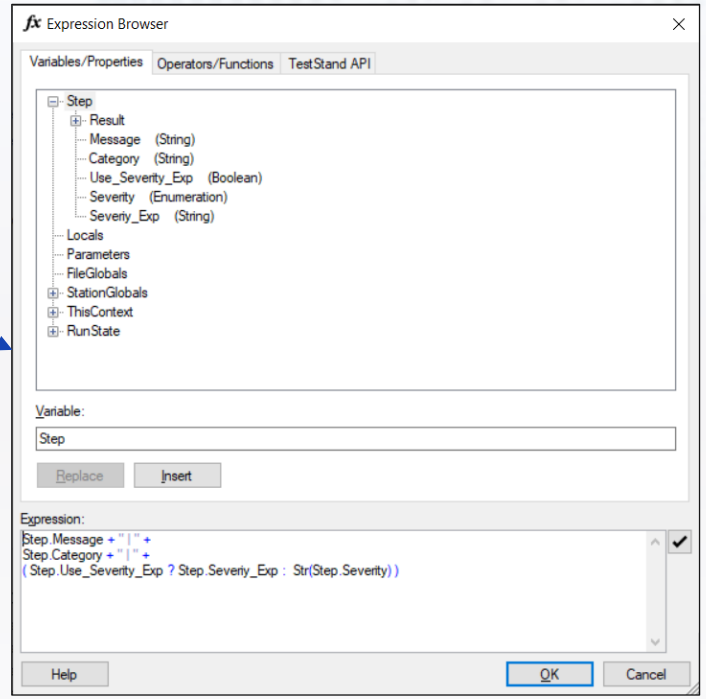
## Add Required Variables under the Step




Step Variables are stored under Property Browser




## Custom build the Step Description String

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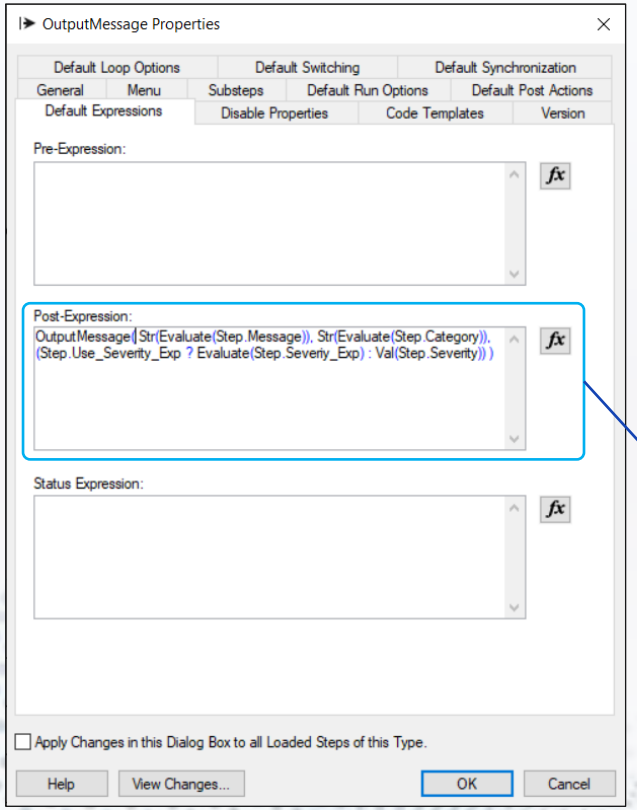
# Customize the Step Type as Required




Add Custom Post Expression

OutputMessage(**String message**, String category = "", Number severity = 0, [Number textColor], [String icon])

Parameter 1: A string containing the message to be displayed in the output window.
Parameter 2: (Optional) Specifies the category of the message. If you do not specify a category, the output message will be considered uncategorized. You can define your own categories. The default value is an empty string.
Parameter 3: (Optional) Specifies the severity of the message. The valid values are:
0 - (Default) OutputMessageSeverity_Information.
1 - OutputMessageSeverity_Warning.
2 - OutputMessageSeverity_Error.
Parameter 4: (Optional) Specifies the text color used to display the message. Use a color constant such as tsBlack, or use the RGB function to specify a color using component color values.
Parameter 5:(Optional) Specifies the name of the icon file related to the output message. The TestStand Engine obtains the icons from the <TestStand>ComponentsIcons and <TestStand Public>ComponentsIcons directories. This parameter is optional and the default icon is selected based on the severity of the message.
Returns: This function always returns 0.

Method Reference

| Parameter | Expression |
|---|---|
| Message | Str(Evaluate(Step.Message)) |
| Category | Str(Evaluate(Step.Category)) |
| Severity | Step.Use_Severity_Exp ? Evaluate(Step.Severiy_Exp) : Val(Step.Severity)) |

Form the **OutputMessage()** method call with step variables

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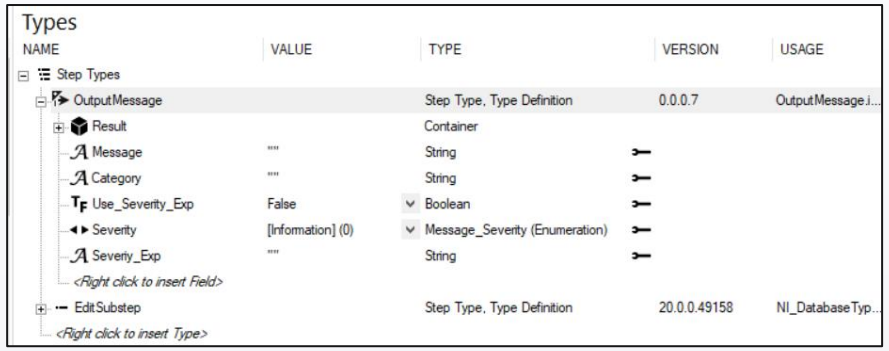
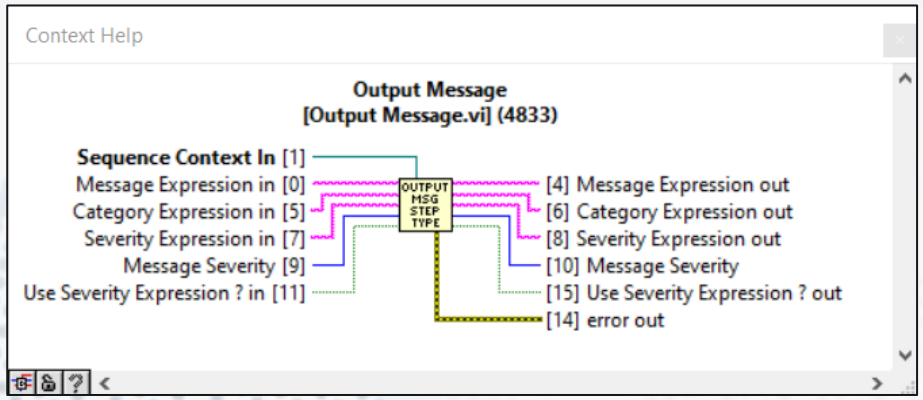
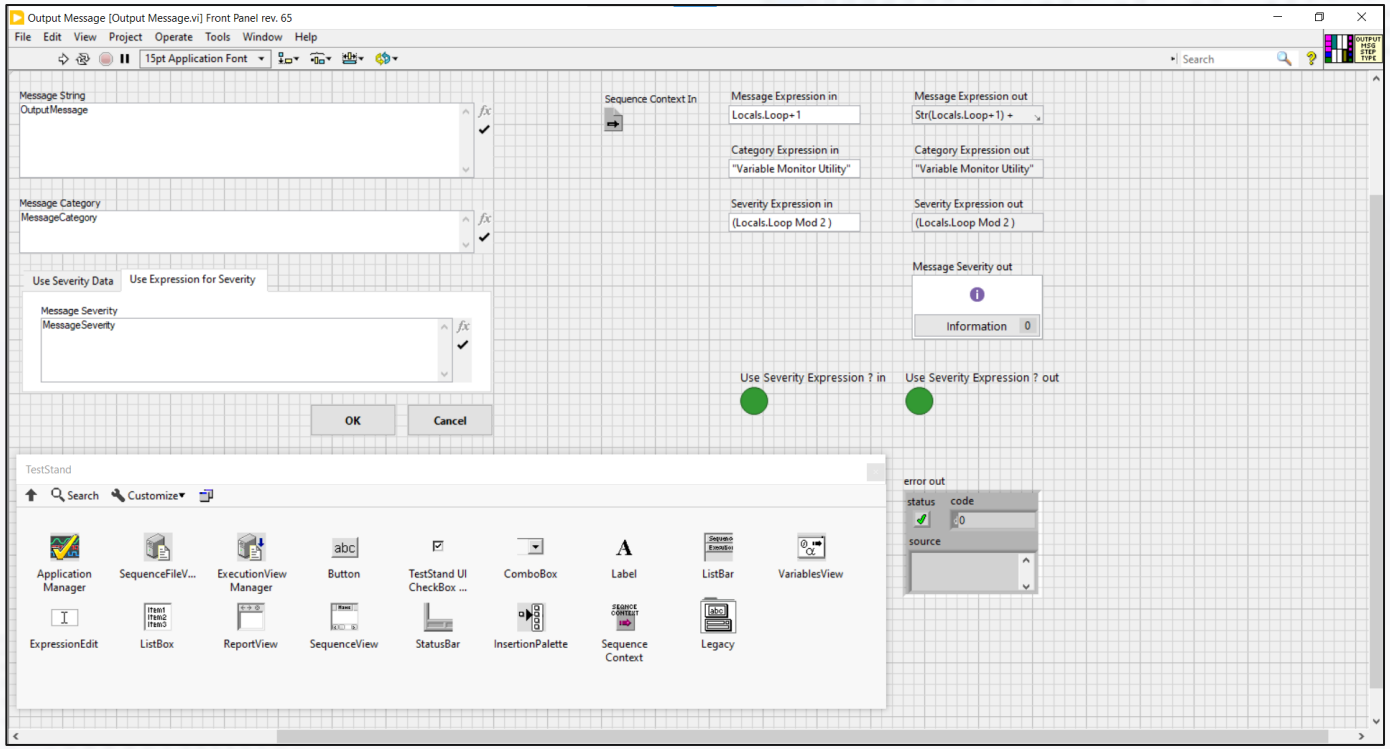
# Interfacing Step Types with LabVIEW




Customize the VI Front Panel & Connector Pane to Handle the Step Variables

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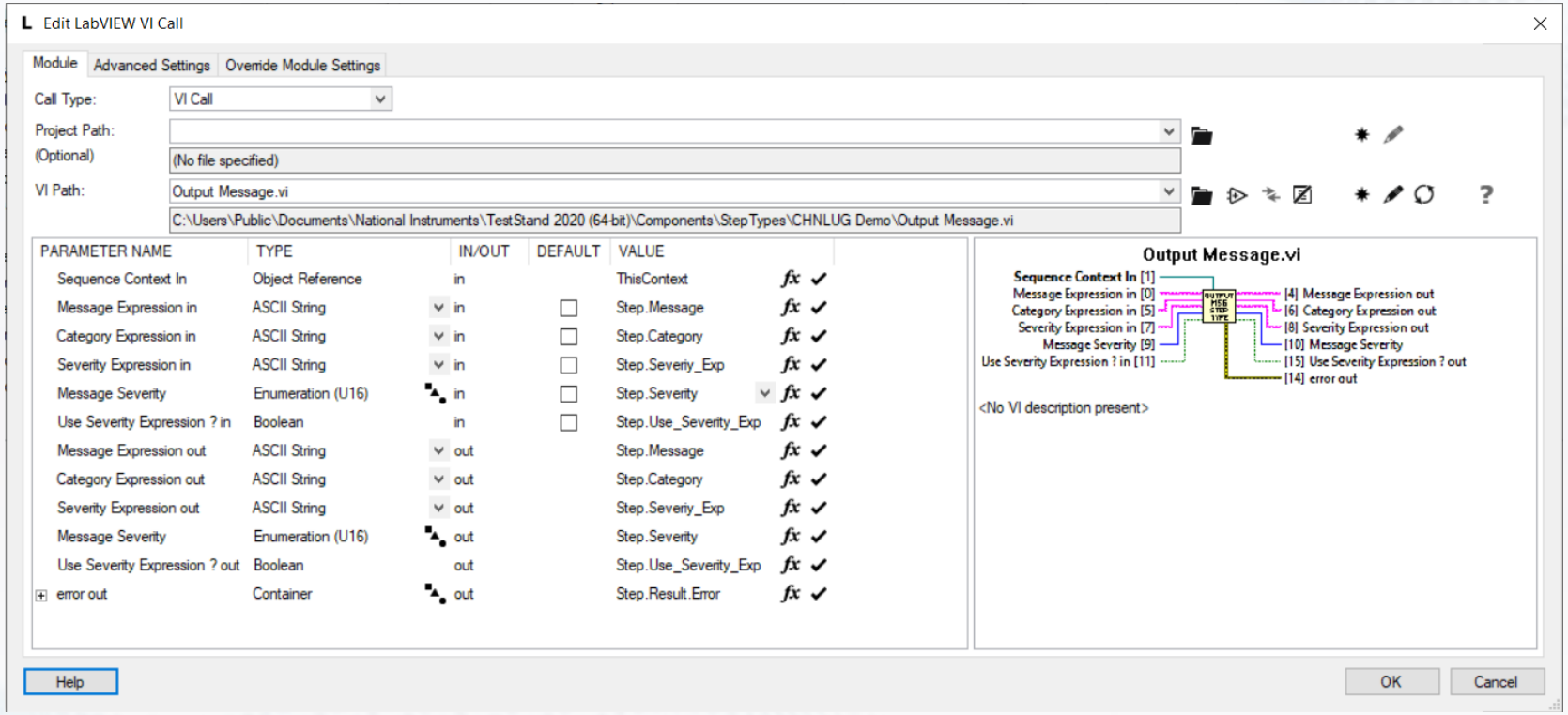
# Interfacing Step Types with LabVIEW




Configure the Edit Substep VI Module Call

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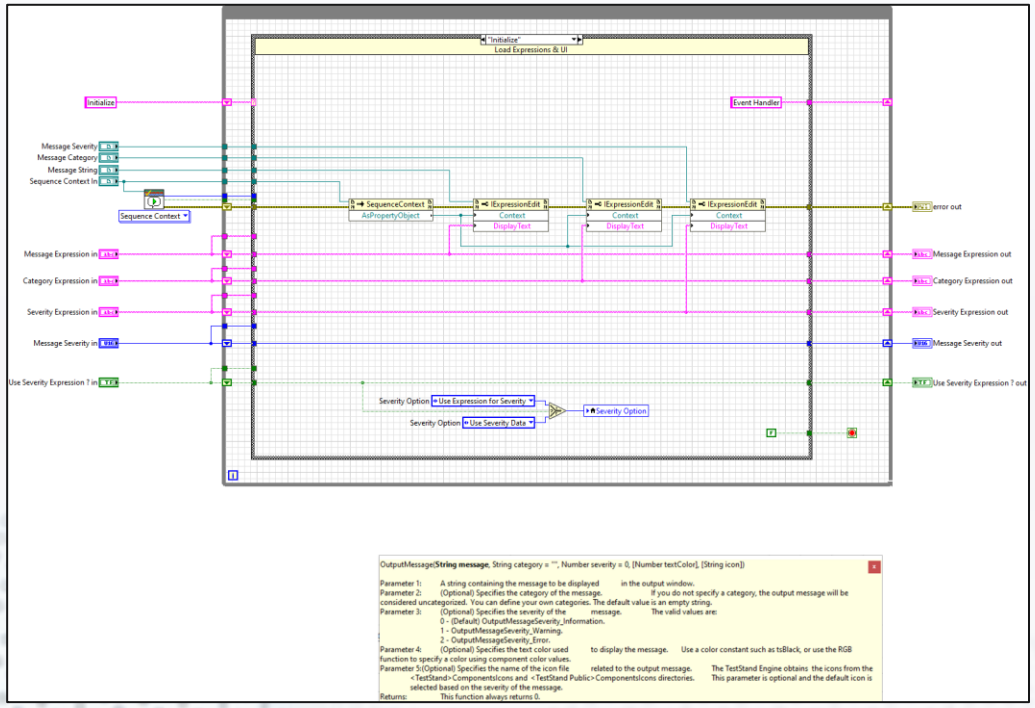
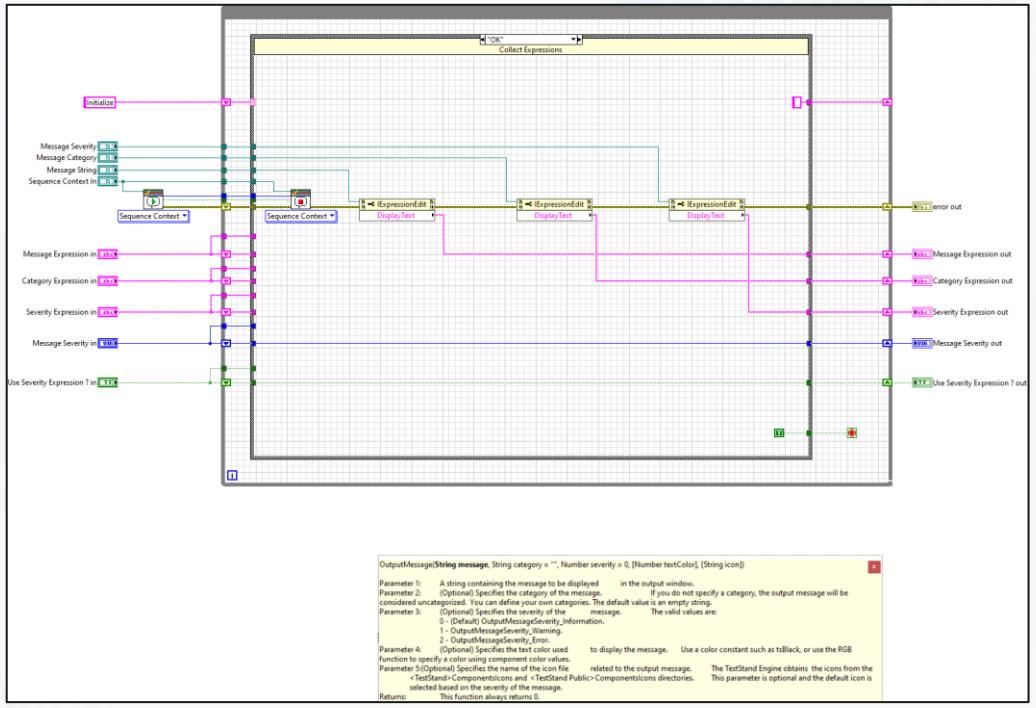



Use the TestStand API to update UI




Upon exit with OK, collect the Data from TestStand ActiveX Controls

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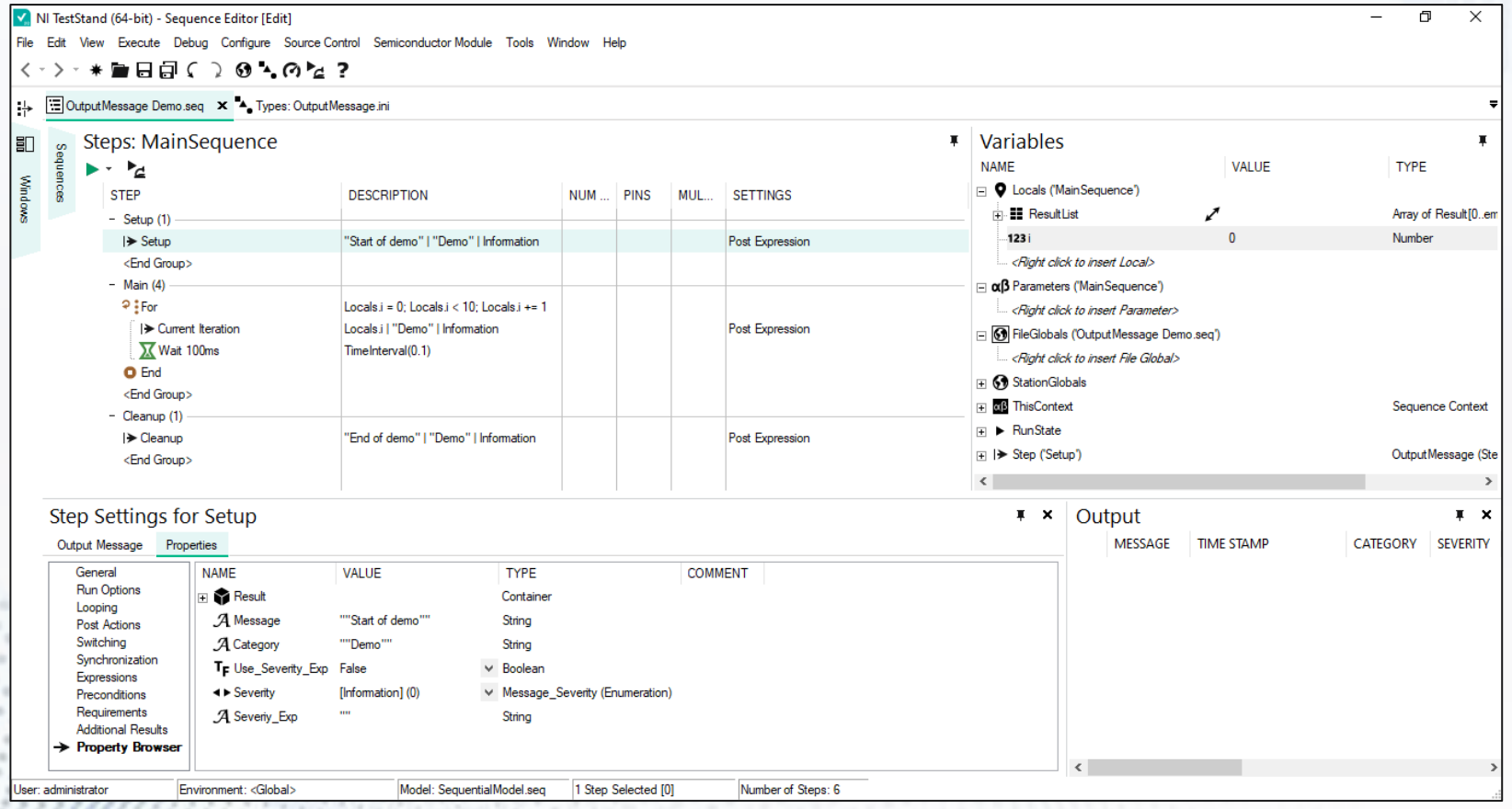
# Live Demo




Use **Edit** button or **Ctrl + E** shortcut to invoke the edit module

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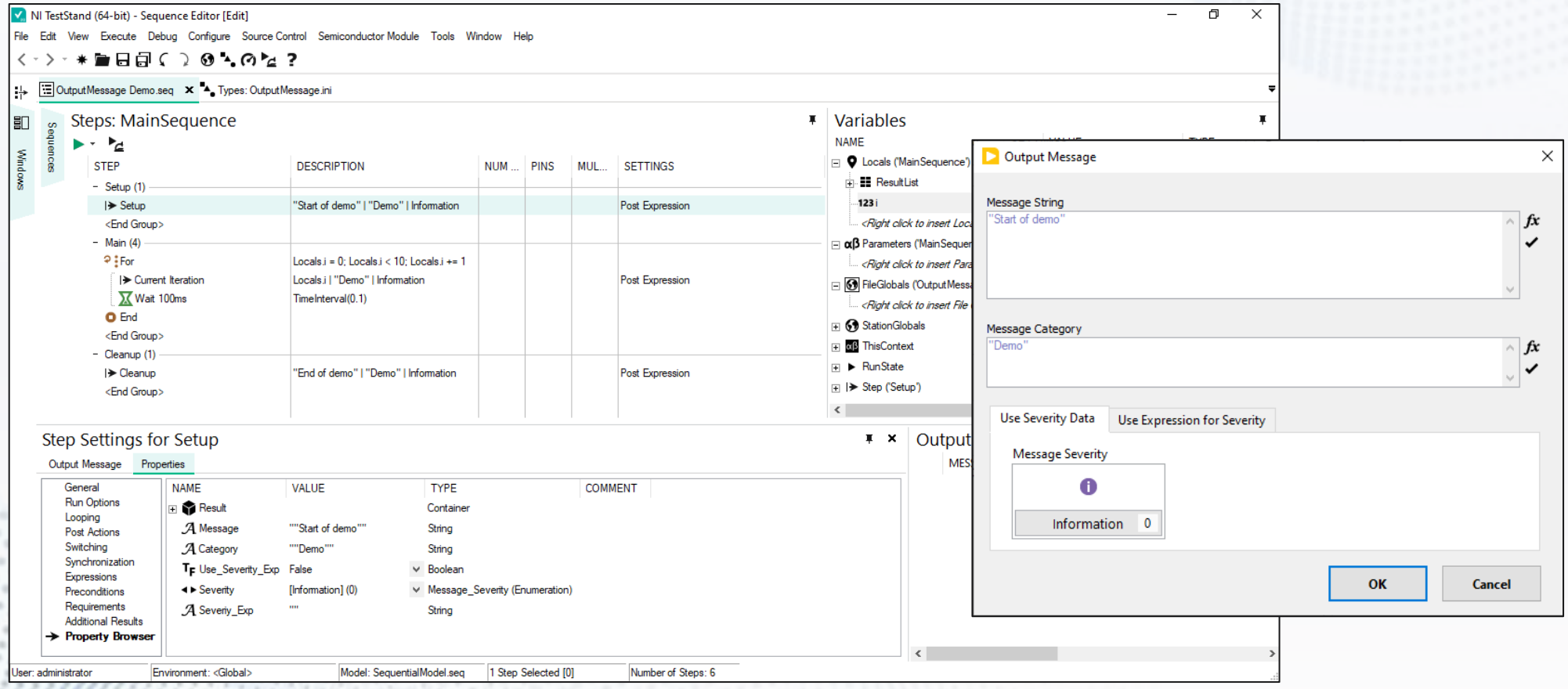


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**Demo Custom Step Types**

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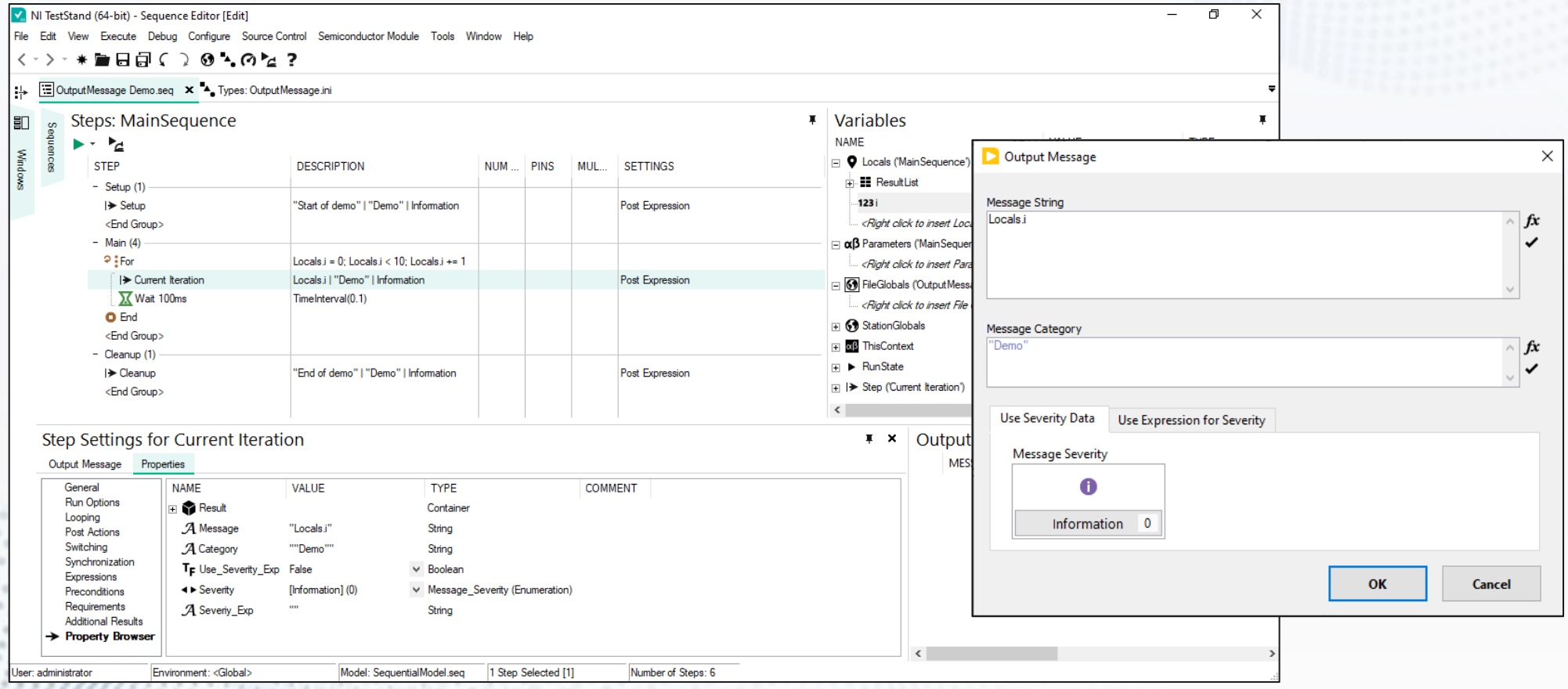


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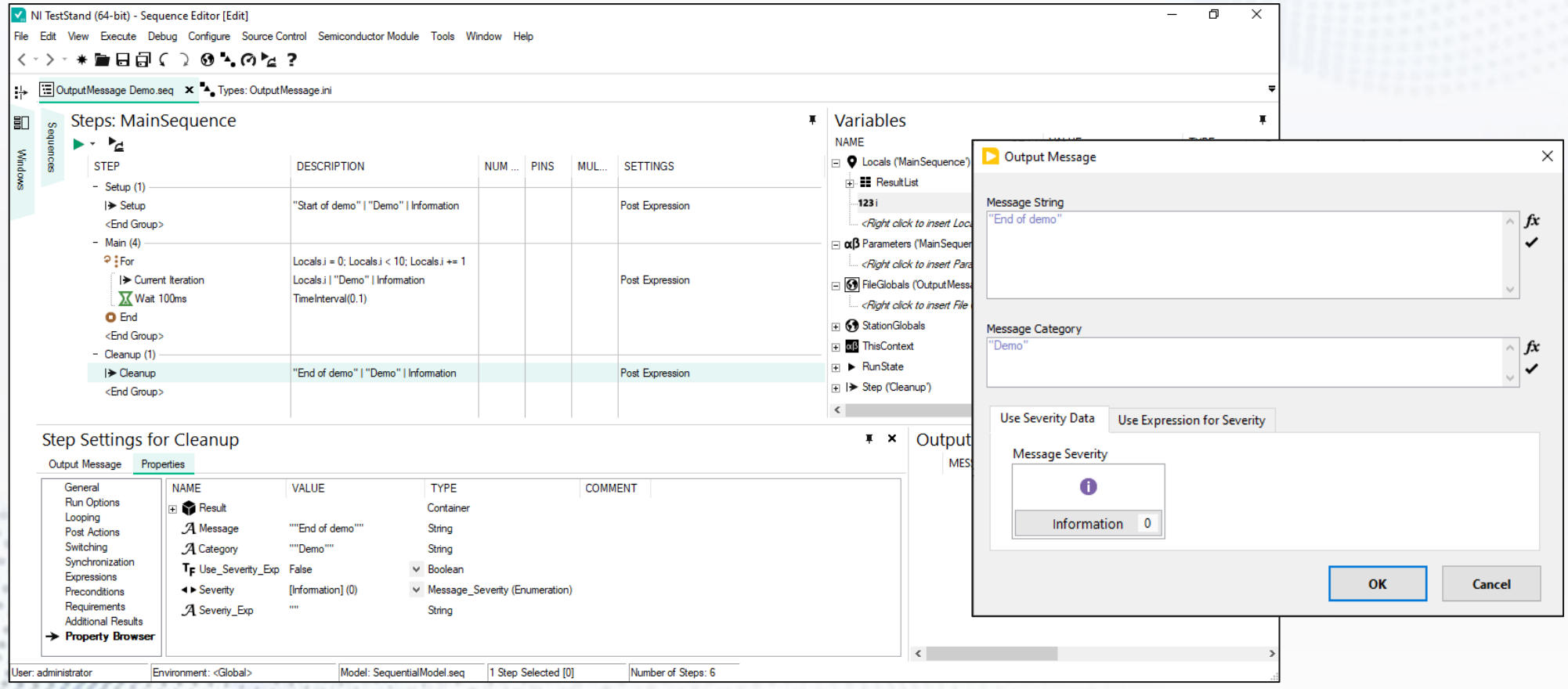


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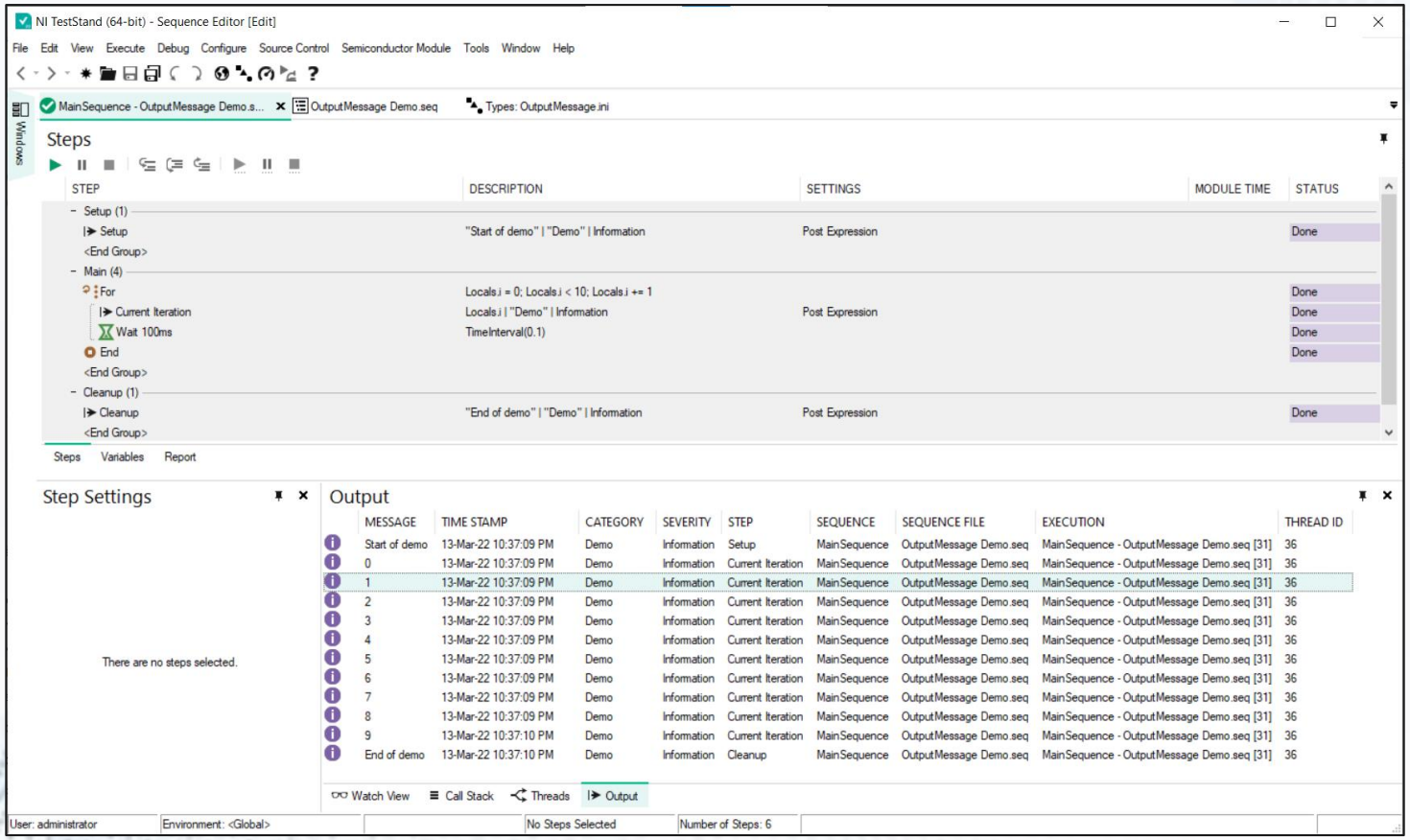


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# Thank You

https://github.com/ItsMeAshiq/TestStand-OutputMessage