Calibration Module

Overview

The Calibration module enables you to keep track of the calibrations made to the instruments in your plant. This way you can monitor the calibration history of each instrument and compare it with new calibration values.

You can specify a large variety of calibration parameters such as calibration ranges, trip point values, and alarms. You can also keep a history record of tag calibration values. The calibration user interface allows you to easily compare current measured values with the appropriate specifications. This interface also enables you to simultaneously maintain the calibration data of a group of selected tags.

You can also calculate the error of tags in a given loop.



 The Calibration module is available only if it is included in the software license that you purchased from Intergraph.

Calibration Flow of Activities

The flow of activities is as follows:

Defining Calibration Settings

The first step in creating the tag calibration history is to define calibration settings, which determine the calibration points for the selected instrument tags.

Calibration Data Entry

Having specified the calibration settings, you can enter calibration data — the parameter values before the calibration (As Found) and after the calibration (As Left).

Calibration History

The calibration history options allows you to browse through the calibration entry list of a selected tag. This option also allows you to view the selected calibration entry data, modify it, or add a new calibration entry for the selected tag.

Reports

You can view and print out reports of calibration settings, calibration data, and calibration history.

Starting the Calibration Module

The following procedure explains how to start the Calibration module.



 The Calibration module is available only if it is included in the software license that you purchased from Intergraph.

> To start the Calibration module

- 1. Do one of the following:
 - On the **Modules** menu, click **Calibration** or click on the **Main** toolbar.
 - Open an Instrument Index Standard Browser view, select the tag numbers that require calibration, and do one of the following:
 - On the Modules menu, click Calibration.
 - On the main toolbar, click 🔑 .

Accessing Calibration Windows

When you start the Calibration module, you can access the following calibration windows:

- Calibration Settings
- Calibration Data Entry
- Calibration History

You can also open the **Calibration Reports** dialog box, where you define filter conditions for generating a required calibration report.

> To access a calibration window

- 1. Start the Calibration module, and do one of the following:
 - Click the required icon on the Calibration toolbar.
 - On the **Actions** menu select the required option.
- 2. In the **Enter Tag Number** dialog box, type the tag number of the required instrument or click **Find** to search for the required instrument tags.

Calibration Error Calculations

This section describes how the software calculates the calibration errors.

As Found and As Left Errors (% of Span) Calculation

The following formula is used to calculate the **As Found** and the **As Left** errors (% of **Span**):

i = calibration point number

As Found and As Left Errors (% of Reading) Calculation

The following formula is used to calculate the **As Found** and the **As Left** errors (% of **Reading**):

$$AF / AL \% of Reading = \frac{AF_{\hat{i}} - ENG_{\hat{i}}}{ENG_{\hat{i}}} \times 100\%$$

i = calibration point number

Error Calculation of Square Root Extraction

Calibration errors for differential pressure flow instruments that require a square root extraction are calculated according to the following formula:

Example:

OUT.SIGNALmin = 4 mA

OUT.SIGNALmax = 20 mA

OUT.SIGNAL RANGE = OUT.SIGNALmax - OUT.SIGNALmin = 16mA

% of Input	Output Value				
0	4 +	16 *	0	=	4
25%	4 +	16 *	0.25	=	12
50%	4 +	16 *	0.5	=	15.3137
75%	4 +	16 *	0.75	=	17.8564
100%	4 +	16 *	1	=	20

Searching for Tag Numbers in the Calibration Module

This option enables you to find tag numbers in the Calibration module using search parameters in the **Find Tag** dialog box. Entering search parameters enables you to narrow down your search. You can narrow your search to the maximum by entering all the search parameters. It is up to you what search parameters to specify. You can use wildcards in the fields where you type values: underscore (_) for single characters, and percent (%) for multiple characters.

Leaving some of the search parameter fields empty widens the search. If you do not specify any search parameters, the software finds all the existing tag numbers.

After the search is complete, the software displays the tag numbers that match your search parameters in the **Search results** data window of the **Find Tag** dialog box.



The following procedure describes how to find tags using search parameters.
 If needed, you can also find tag numbers without defining any search parameters.

> To search for tag numbers in the Calibration module

- 1. With the Calibration Module window open, do one of the following:
 - On the Actions menu, click one of the following:
 - Click Settings to find the required tag numbers and display them in the Calibration Settings window.
 - Click Data Entry to find the required tag numbers and display them in the Calibration Data Entry window.
 - Click History to find the required tag numbers and display them in the Calibration History window.
 - On the Calibration module toolbar, click \(\bigsim \), \(\overline{\pi} \), or \(\overline{\pi} \).
- 2. In the Enter Tag Number dialog box, click Find.

3. If needed, select **Search by category** to find only tag numbers that you have associated with tag categories in the <u>Instrument Index</u> module.



- Search tag numbers by category if you have created user-defined tag
 categories and associated tag numbers with these categories. You can
 also type a category in the Category field to narrow your search to tags
 associated with this category only. Use wildcards and not case-insensitive
 characters if needed.
- When searching for tag numbers by tag category, you can narrow down your search by typing a specific tag category or loop name, or by selecting the required instrument type and process function. Note that you cannot use certain search parameters together with the tag category parameter. These fields become view-only.
- 4. Define you search criteria using the required combination of the following search parameters:

Search Parameter	Explanation	Example		
Tag number	Type the whole tag number you are looking for. Include any prefix, suffix, and separator characters. You can use	101-FT –2225/1 Or use a wildcard:		
	wildcards if needed.	101-FT%		
Process function	Select a process function to narrow your search to tags belonging to this process function.	Flow Pressure		
Instrument type	Select an instrument type to narrow your search to tags belonging to this instrument type.	D/P Type Flow Element (FE), Mass Flow Transmitter (FT)		
Status	Select a tag status to narrow your search to tags associated with this status.	An existing device, a new instrument, a relocated device		
Location	Select a tag location, e.g., Field, to narrow your search to tags for which you have defined this location.	Equipment room, junction box		
System I/O Type	Select a system I/O type to narrow your search to tags for which you have defined this system I/O type.	AO (analog output) DI (Digital input)		
Prefix	Type the tag number prefix to find all the tag numbers that contain this prefix in their names. Do not include the separator characters. The unit number segment in the tag number name is usually the tag number prefix. You can also use wildcards if needed.	101		
Number	Type the numeric segment of a tag number to find all the tag numbers that contain this numeric segment. You can also use wildcards if needed.	2315		

Search Parameter	Explanation	Example		
Suffix	Type the suffix segment of the tag number to find all the tags that contain this suffix. Do not type the slash character before the suffix. You can also use wildcards if needed.	1 (the number following the slash (/) in tag number 101-FT –2225/1)		
Equipment	Select the equipment to narrow your search to tags for which you have defined this equipment.			
Line	Select a line to narrow your search to tags with which you have associated this line.			

- 5. If required, select **Look in all units** to look for the defined search criteria in all the units of the current plant.
- 6. Click **Find** to display the tag numbers in the **Search results** data window.



- Select the **Show more search results** check box to hide the search criteria fields and enlarge the Search results data window to display more tag rows. Clear this check box to return to normal view.
- 7. Select the required tag numbers in the **Search results** data window.



- You can also select the Select all check box to select all the displayed tag numbers.
- 8. Click **OK** to open the appropriate window (**Calibration Settings**, **Calibration** Data Entry, or Calibration History) and proceed with the Calibration module activities.

Calibration Settings

Copying Existing Process Data

If you are defining calibration settings for a tag number associated with process data, you can copy existing maximum and minimum process data range values into the **Variable Min** and **Variable Max** fields in the **Ranges** data window; you can also copy existing alarm and trip data into the appropriate **Alarm/Trips** data window.

> To copy the existing process data

- 1. Open the desired instrument tag in the **Calibration Settings** window.
- 2. On the module toolbar, click 4.
- 3. Examine the values displayed in the **Process Data** pop-up window, and then click to copy the data.
- 4. If some of the process data is not appropriate, edit the data.



- The data in the Process Data pop-up window overwrite your previous settings in the Calibration Settings window.
- If you defined multiple process data cases for the current tag, the data displayed in the **Process Data** pop-up window is determined by the governing case. See <u>Multiple Process Data Cases</u> for more details.
- The From and To values beside Required range are copied to the Variable Min and Variable Max fields in the Ranges data window.
- The alarm and trip data is copied to the appropriate Alarm/Trips data window: Hi-Hi data is copied to the First Point, Hi data is copied to the Second Point, Lo data is copied to the Third Point, and Lo-Lo data is copied to the Fourth Point data window.

Defining Calibration Settings

The calibration settings for an instrument tag are the prerequisite of the calibration procedure. They serve as a reference for the calibrations performed on the selected tag. If settings already exist for an instrument tag, you can modify them. You enter parameter values such as range, alarm settings, and trip point settings. These values will later serve as reference values for any calibrations you will perform on the device associated with that tag.

To define calibration settings

- 1. Start the Calibration module.
- 2. Do one of the following:
 - On the **Actions** menu, click **Settings**.
 - Click
- 3. In the **Enter Tag Number** dialog box, type the required tag number or click **Find** to search instrument tags.



- If you selected multiple tag numbers, click (on the Actions menu, click List Tags) and then click a tag number to define the settings for that instrument.
- 4. Define the general calibration settings.
- 5. Define the alarm / trip settings.
- 6. Define the set point.
- 7. Click to save the settings.

Defining General Calibration Settings

General calibration settings include the instrument calibration ranges, errors/points settings, custom settings, and the display scale definition.

> To define general calibration settings

- 1. Start the Calibration module.
- 2. Do one of the following:
 - On the Actions menu, click Settings.
 - Click 1
- 3. In the Calibration Settings tree, click Ranges to define the calibration range.
- 4. In the Ranges data window, enter all the values by typing or selecting from the lists.



- If you are defining calibration settings for a tag number associated with process data, you can copy existing process data minimum and maximum range values.
- 5. In the Calibration Settings tree, click Errors/Points to define the calibration error values, set the number of points and the required direction.
- 6. In the Errors/Points data window, enter all the values by typing or selecting from the lists.



- The **Measuring Point** parameter is available for calibration types that require a single calibration point only.
- The fields in the **Set values** group box are available only if under **Error** calculation type you selected Switch set point.

7. To define custom fields, in the Calibration Settings tree, click Custom.



- The Domain Administrator can enable or disable the use of custom fields in the Calibration module.
- The custom fields in the Calibration Settings window are independent of the custom fields in the Calibration Data Entry window.
- 8. In the **Calibration Settings** tree, click **Scales** to define the required display scales.
- 9. In the **Scales** data window, for each scale required, type the minimum and maximum values, and select the units of measure from the list.
- 10. Click .



 You are now ready to define the alarm / trip settings for the current tag number.

Defining Alarm / Trip Settings

You enter the required alarm / trip settings in the appropriate **Point** data window. You can specify up to four different trip or alarm indication points and select them from four different alarm/trip levels: Hi-Hi-Hi, Hi, Lo, Lo-Lo, Lo-Lo. You select the required unit of measure, enter the point values, direction, and type a brief description.

> To define the alarm / trip settings

- 1. Start the Calibration module.
- 2. Do one of the following:
 - On the Actions menu, click Settings.
 - Click
- 3. Under the **Alarm/Trips** category in the **Settings** tree, click **First Point** to define the first calibration point.

4. In the **First Point** data window, type the required values or select them from the lists. When done, click **Second Point** in the **Settings** tree to define the second calibration point. As you continue defining the rest of the calibration points, the values you entered appear in the **Alarm/Trips** data window.



- To define additional levels for alarms or trips, click to open the Calibration Point dialog box. New levels you have defined will then become available in the Point Level list.
- If you are defining calibration settings for a tag number associated with process data, you can copy existing process data minimum and maximum range values.
- 5. Click to save all your calibration settings.



 You are now ready to make the set point definitions for the current tag number.

Defining the Set Point

After defining the alarm and trip settings, you can also define the set point of the selected instrument. You can either define the set point to be identical to one of the four alarm/trip points you have already defined, or you can define the set point manually.

> To define the set point

- 1. Start the Calibration module.
- 2. Do one of the following:
 - On the **Actions** menu, click **Settings**.
 - Click 1.
- 3. Enter a tag number.

4. Click **Set Point** in the **Settings** tree.



- For better viewing, drag the data windows to reposition them on your screen. You can also resize the data windows as required. On the Windows menu, click the Save Position and Restore Position commands to save or restore the data window positions on your screen.
- 5. From the **Point** list, select one of the following:
 - 1st Point, 2nd Point, 3rd Point, and so forth (any defined calibration point up to the 6th point): The set point will be identical to the selected alarm/trip point and the rest of the fields in this data window become unavailable. Note that this option is possible only after making your alarm/trip definitions.
 - Free: You can define the set point yourself.
 - None: You can make no set point definitions.
- 6. Type the required values or select them from the lists.
- 7. Click to save all your calibration settings.

Clearing the Calibration Ranges

This option is useful if you discontinue calibration of an instrument or if you need to clear the values of the input ranges. Note that this option does not clear the output signal values.

> To clear the calibration ranges

- In the Calibration Settings window, do one of the following:
 - On the Actions menu, click Clear Settings.
 - On the module toolbar, click X.

Data Entry and Calibration

Entering Calibration Data

This is the second stage in building a tag's calibration history. When you record the calibration results, you add a new calibration result entry to the tag's calibration history.

You can record the calibration results for a selected tag only after you have defined that tag's calibration settings.

> To enter calibration data

- 1. In the Calibration Settings window, do one of the following:
 - On the Actions menu, click Data Entry.
 - On the module toolbar, click [©]
 - Finish entering the tag's calibration settings and click . You are prompted to open the **Calibration Data Entry** window for the current tag.



- You can access the Calibration Data Entry window directly from the Calibration Module main window.
- 2. In the Calibration Data Entry window, on the module toolbar, click
- 3. In the Calibration Data Entry tree, click Result Points.
- In the Result Points data window, type the pre-calibration values in the As Found column.



- Values highlighted in red exceed the permissible error.
- Values highlighted in cyan exceed the intermediate error tolerances, but do not exceed the permissible error.

5. In the **As Left** column, type the values after calibration.



- Any **As Left** or **As Found** values still highlighted in red show that this instrument's calibration failed. When you save the updated data, the software prompts you to create a Work Request (see Performing Breakdown Maintenance).
- 6. Do the following for each of the points that you defined for the current tag in the Calibration Settings window:
 - a) In the Calibration Data Entry tree, under Alarms / Trips, click First Point, Second Point, Third Point, Fourth Point, Fifth Point, or Sixth Point.
 - b) Under **As Found**, type the value before calibration.
 - c) Under **As left**, type the value after calibration.
- 7. In the Calibration Data Entry tree, click Miscellaneous to enter general calibration information as follows:
 - a) Type the preventive maintenance (PM) order number if required.
 - b) From the **Done By** list, select the name of the user responsible for entering this calibration data.
 - c) From the Result Code list, select the required standard result code, or custom result code predefined in the Result Code dialog box.
 - d) If from the **Result code** list you selected Failed or any other option that indicates a calibration result failure, from the Diagnostic Code list select the required calibration diagnostic code for this kind of failure.
 - e) If from the **Result code** list you selected Failed or any other option that indicates a calibration result failure, from the Action Code list select the action code associated with a solution description for this kind of failure.
 - If from the Result code list you selected Failed or any other option that indicates a calibration result failure, from the Damage Code list select the damage code associated with a solution description for this kind of failure.



- If a required Result, Diagnostic, Damage, or Action code is not available from the list, you can define additional codes by selecting the appropriate item on the Options menu.
- g) Enter additional values, and a short note if needed.

8. To enter data for custom fields, click Custom.



- The Domain Administrator can enable or disable the use of custom fields.
 The custom fields in the Calibration Settings window are independent of the custom fields in the Calibration Data Entry window.
- 9. To select equipment for calibrating the current instrument tag, in the **Calibration Data Entry** tree click **Test Equipment**.
- 10. Click .
- 11. To browse through the tags that you selected, click or .

Viewing the Latest Calibration Results

This option allows you to view the latest calibration results for the current instrument tag in a read-only pop-up window.

- > To view the latest calibration results
 - In the Calibration Data Entry window, do one of the following:
 - On the **Actions** menu, click **Show Latest Calibration Results**.
 - Click 🛂 .

Selecting Test Equipment

Test equipment is equipment you use for calibrating and recalibrating instrument tags. Selecting test equipment enables you to view its detailed information in the Calibration History window. You will be able to see this information when viewing calibration history results for this instrument tag. Selecting test equipment also allows including test equipment detailed information in the Instrument Calibration Results report.

For the current instrument tag, you are allowed to select the same equipment up to four times (you may need to do so when using the same equipment for different calibration purposes). Then, in the Calibration History window, you can see detailed information about the test equipment that has been used for each calibration entry. This information is retrieved from the **Test Equipment** supporting table.



If the Test Equipment lists contain no data, you can customize test equipment data in the Test Equipment dialog box.

> To select test equipment

- 1. Start the Calibration module.
- 2. In the Calibration Data Entry window, click Test Equipment in the Data Entry tree.
- 3. In the **Test Equipment** data window, select the required predefined test equipment from the Test Equipment A, B, C, and D lists.



- The data in the **Test Equipment A**, **Test Equipment B**, **Test Equipment** C, and Test Equipment D lists is identical. So, if you have used the same test equipment for calibrating the current tag, you can select this equipment from these lists up to four times.
- Click ...



Now you can open the **Calibration History** window to view the instrument tag history with detailed test equipment information, or generate a report that will contain detailed information about the selected test equipment.

Loop Error Calculation

The loop error feature offers you three different methods to calculate the total error of a selected loop. The calculation is performed per loop. Furthermore, you can select the loop tags that you want to include in the calculation. To make a valid loop error calculation, make sure that your calibration and calculation have been time stamped on the same day. The error is measured at several points that you predefine in the **Calibration Settings** window. The error is calculated at the default point that you define in the **Preferences** dialog box. The loop error is measured relatively to the tolerance that you set in the calibration settings per tag.



The default point that SmartPlant Instrumentation is shipped with is at 75%.

Loop Error Flow of Activities

SmartPlant Instrumentation calculates the loop error of a selected loop according to the following flow of activities:

- Preferences —The preferences allow you to set the loop error default calculation point.
- Settings Tags have their predefined settings which you enter in the Calibration Settings window. When you calculate the loop error of a specific loop you should use the settings to include at least one tag that belongs to the designated loop.
- Calibration Entering Calibration Data.



- To make a valid loop error calculation, make sure that your calibration and calculation have been time stamped on the same day.
- Select the required calculation method and perform the actual calculation.
- Generate a loop error report.

Setting Tags for Loop Error Calculation

This Calibration module procedure explains how to set tags associated with a certain loop for inclusion in the loop error calculation.



- You must calibrate the tags before you perform the actual loop error calculation.
- You can also set the tags for inclusion from a view that you create in the Browser module. If you use a browser view to set the tags, make sure that you include the Tag Number, Loop Number, and Calibration Required columns.

To set tags for loop error calculation

- 1. Start the Calibration module.
- 2. Do one of the following:
 - On the Actions menu, click Settings.
 - Click 🖫
- 3. In the Enter Tag Number dialog box, type the required tag number or click Find to find the required instrument tags.



- If you selected more than one tag, click (on the **Actions** menu, click List Tags) and click the required tag number to define the settings for that instrument.
- 4. In the Calibration Settings window, on the settings tree, click Errors/Points.
- 5. On the Include in Loop Error list, select Yes.
- 6. Define all the remaining settings as required.
- Click late to save the settings.



😽 Tip

You can now start entering calibration data by selecting Yes when prompted after saving the data or continue to define calibration settings for another tag number (Click **No** when prompted to start the data entry).

Calculating Loop Error

After you set tags for loop error calculation, use this procedure to do the following:

- Select tags from a given loop for loop error calculation
- Select a loop error calculation method
- Perform the loop error calculation

To calculate the loop error

- 1. In the Calibration Module window, click 🗗 .
- In the Enter Tag Number dialog box, click Find to open the Find Tag dialog box.
- 3. Under **Search parameters**, set conditions to filter the tag display as necessary, and click **OK**.



Note

- A necessary condition for including a tag in a loop error calculation is that in the Calibration Settings window, you set Include in loop error to Yes for that tag.
- 4. Under **Search results**, select the tags that you want to include in the loop error calculation, and click **OK**.
- 5. In the **Calibration Data Entry** window, enter the calibration data for the tags that you selected.



Notes

- Do one of the following to navigate among the tags that you selected for error calculation.
 - On the module toolbar, click to open the Selected Tags pop-up window, and click the tag for which you want to enter calibration data.
 - On the module toolbar, click to display the next tag or click to display the previous tag.
- You have to enter the calibration data for all the tags that you want to include in a loop error calculation on the same day that you intend to perform the calculation. If you enter tag calibration data more than once on a calculation day, the calculation is performed using the results that deviated the most from the predefined tolerance.

- 6. On the module toolbar, click
- 7. If the **Components for Calibration** dialog box opens to display a list of the tags not yet calibrated, do the following:
 - a) In the **Calibration Data Entry** window, enter the calibration data for the required tags.
 - b) On the module toolbar, click .
- 8. In the **Loop Error Calculation Method** dialog box, select the required calculation method.



- The calculation method that you set here cannot be changed later. Make sure that you set the optimal calculation method for the selected loop.
- 9. Click OK.
- 10. In the **Loop Error Result** dialog box, after you view the results, click **Close**.

Calibration History

Maintaining Calibration History

This option allows you to view a tag calibration entry settings and results. Using this option, you can easily browse through the displayed entries and select a calibration record to view or delete. See Entering Calibration Data to learn how to add new calibration entries using the Calibration Data Entry window.

You can view calibration history for a specific instrument tag in the following data windows:

- **Calibration History** contains the existing calibration history records for the current tag.
- Result Points displays the result points for the record selected in the Calibration History data window.
- Alarm/Trips displays alarm and trip point settings defined for the selected calibration record.
- Test Equipment displays the test equipment used for calibrating the current record.

Viewing Test Equipment Information

In the **Calibration History** window, while viewing calibration history results for a specific instrument tag, you can also see detailed information about the test equipment that was used to calibrate this tag.



Note

• You can view the test equipment information provided that you have selected this test equipment in the **Calibration Data Entry** window.

> To view test equipment information

- 1. In the Calibration History window, in the Calibration History tree, select Testing Equipment.
- 2. In the **Calibration History** data window, highlight a required calibration history record for the current instrument type.



The Test Equipment (History) data window is read-only.

Deleting a Calibration Result Entry

Use the following procedure to delete a calibration result entry. Note that you cannot delete the calibration settings even if you delete all the calibration result entries.

> To delete a calibration result entry

- 1. Open the Calibration History window.
- 2. In the Calibration History data window, highlight the required record and click ×
- 3. At the prompt, click **OK** to delete the selected calibration history entry from the database.
- 4. Click 🔲

Viewing and Modifying Calibration Results

You can modify the calibration results when viewing a selected calibration history record in the Calibration History window.

> To view or modify the calibration results

- 1. Start the Calibration module, and do one of the following to open the Calibration History window:
 - In the Calibration Settings window, on the Actions menu click History.
 - In the Calibration Data Entry window, on the Actions menu click History.



- You can also open the Calibration History window from the Calibration Module main window.
- 2. In the Calibration History data window, click any calibration record to display its details in the Result Points data window below.



You can also open the **Result Points** data window by clicking **Result** Points in the History tree.

3. Click to be able to select another result code from the **Result Code** list in the **Calibration History** data window.



- If you want to disregard the calibration results for a particular tag, you can select Bad Result from the Result Code list.
- 4. Click to make the As Found and As Left values in the **Result Points** data window accessible for editing.
- 5. In the **History** tree, click **Alarm/Trips** to display the alarm and trip information for the current tag. Note that this data window fields are read-only.
- 6. Click .

Managing Supporting Tables

Managing Action Codes

An action code is a code associated with a description of a solution of a calibration failure. You can customize your own action codes that will become available for selection from the Action code list in the Miscellaneous data window.

> To manage action codes

- 1. In the Calibration Data Entry window, on the Options menu, click Action Codes.
- 2. In the **Action Codes** dialog box, do one of the following:
 - To add a new data row, click **New**.
 - To edit an existing code, click the field that you want to edit.



- In the **Find** box, start typing a required action code name. The software finds and highlights the matching row in the data window as you type.
- 3. In the **Action Code** field, type the action code.
- 4. In the **Description** field, type the solution description associated with this action code.



- You can permanently delete action code data by highlighting a required row and clicking **Delete**. The deleted action code will be subsequently removed from the Action code list in the Miscellaneous data window.
- 5. Click **OK** to accept the values and close the dialog box.

Managing Damage Codes

A damage code is a code associated with a description of a calibration failure. You can customize your own damage codes that will become available for selection from the Diagnostic code list in the Miscellaneous data window.

> To manage damage codes

- 1. In the Calibration Data Entry window, on the Options menu, click Damage Codes.
- 2. In the **Damage Codes** dialog box, do one of the following:
 - To add a new data row, click **New**.
 - To edit an existing code, click the value that you want to edit.



- In the **Find** box, start typing a required diagnostic code. The software finds and highlights the matching row in the data window as you type.
- 3. In the **Damage Code** field, type the required code.
- 4. In the **Description** field, type the description of a particular type of equipment damage.



- You can permanently delete a damage code by highlighting a required row and clicking **Delete**. The deleted code will be subsequently removed from the Damage code list in the Miscellaneous data window.
- 5. Click **OK** to accept the values and close the dialog box.

Managing Diagnostic Codes

A diagnostic code is a code associated with a description of a calibration failure cause. You can customize your own diagnostic codes that will become available for selection from the **Diagnostic code** list in the **Miscellaneous** data window.

> To manage diagnostic codes

- 1. In the Calibration Data Entry window, on the Options menu, click Diagnostic Codes.
- 2. In the **Diagnostic Codes** dialog box, do one of the following:
 - To add a new data row, click New.
 - To edit an existing code, click the value that you want to edit.



- In the **Find** box, start typing a required diagnostic code. The software finds and highlights the matching row in the data window as you type.
- 3. In the **Diagnostic Code** field, type the required diagnostic code.
- 4. In the **Description** field, type the description of a particular failure cause.



- You can permanently delete a diagnostic code by highlighting a required row and clicking **Delete**. The deleted code will be subsequently removed from the **Diagnostic code** list in the **Miscellaneous** data window.
- 5. Click **OK** to accept the values and close the dialog box.

Managing Result Codes

A result code is a code associated with a description of a calibration result. SmartPlant Instrumentation provides three predefined standard result codes Passed, Failed, and None. You can customize your own result codes in addition to the standard ones if required. The customized result codes will then become available for selection from the Result code list in the Miscellaneous data window.



The standard result codes Passed, Failed, and None cannot be edited or deleted and, therefore, do not appear in the **Result Codes** dialog box.

> To manage result codes

- 1. In the Calibration Data Entry window, on the Options menu, click Result Codes.
- In the Result Codes dialog box, do one of the following:
 - Click **New** to add a new data row.
 - Highlight the existing required code in the data window and click **Edit**.



- In the **Find Result Code** box, start typing a required result code. The software finds and highlights the matching row in the data window as you type.
- 3. Type the required result code and its description in the data fields.



- You can permanently delete a customized result code by highlighting a required row and clicking **Delete**. The deleted result code will be subsequently removed from the Result code list in the Miscellaneous data window.
- 4. Click **OK** to accept the values and close the dialog box.

Managing Test Equipment Data

Use this option to define, edit, and delete your test equipment data. Test equipment is equipment you use for calibrating and recalibrating instrument tags.

After you define your test equipment, it becomes available in the **Test Equipment** data window, where you can select the equipment used for calibration of a particular instrument tag.

Then, in the **Calibration History** window, you can track the calibration history results for the tag that has been calibrated using this equipment and view detailed information of test equipment history data for each calibration record. This information is retrieved from the Test Equipment supporting table.

> To manage test equipment data

- 1. In the Calibration module, open the Calibration Data Entry window and on the Options menu, click Test Equipment.
- 2. In the **Test Equipment** dialog box, to add a new record row to the data window, click **New** and fill out the fields as follows:
 - a) Type the required equipment name, description and serial number in the appropriate fields.
 - b) In the **Test Date** field, select or type the date of testing this equipment.
 - c) In the **Tested By** field, type the name of the employee who tested this equipment.
 - d) In the **Accuracy** field, type the accuracy of this equipment, and from the **UOM** field, select the accuracy unit of measure.
- 3. To edit an existing test equipment record, do the following:
 - a) Click a field that you want to edit.
 - b) In the fields, enter new data as required.



 To find an equipment record in a long list of records, start typing the required equipment name in the **Find Equipment** box. If this record exists, the software highlights it in the data window as you type.

- 4. To delete an existing test equipment record, do the following:
 - a) Select the record that you want to delete.
 - b) Click **Delete**.



- After you delete a record, it is permanently deleted from the Test Equipment supporting table and will no longer be available in the Test Equipment data window lists.
- 5. Click **OK** to save the settings and close the **Test Equipment** dialog box.

Calibration Reports

Generating Calibration Reports

Use the following procedure to generate calibration reports.

> To generate calibration reports

- 1. In the appropriate Calibration module window, on the Reports menu, click the report that you want to generate.
- 2. In the Calibration Report Properties dialog box, do the following, as available:
 - a) In the **Date range** group box, do one of the following to set the date range for the report:
 - To set a specific date range, select **Specified dates**, and then in the From and To lists enter the date range.
 - To generate a report for the [previous, current, or next] [week, month, or year], select Predefined period, and then in the lists to the right, select the options that you need.
 - b) In the Filter by group box, use the options to set a filter condition for the report that you are generating.
- 3. Click OK.



- For reports by tag or by loop, click ____ to search for the required entities.
- The loop error report can be displayed even if a loop error calculation was not performed on that day; however, the report is only of an earlier calculation date. The default calculation method that the report depends upon is Normal values. However, if you select a calculation method other than Normal for a certain loop the calculation report changes respectively.
- To generate a calibration equipment report, type the name of the test equipment, with or without wildcards, in the Test Equipment field. If you do not enter a test equipment name, you can click **OK** and select the required test equipment from the Select Test Equipment dialog box.

Generating Calibration History Reports

You can generate and print out the following calibration reports from the **Calibration History** window only:

Select this item	To generate the following report			
Instrument Calibration Results Report	A summary of calibration settings, calibration results, a graphic presentation of the error percentage for the selected tag, and test equipment used for calibrating this tag.			
Calibration Points Summary Report	A summary of trip and alarm point data of all instruments.			

> To generate calibration history reports

- 1. Open the Calibration History window.
- 2. On the **Reports** menu, click one of the following, as needed:
 - Instrument Calibration Results Report
 - Calibration Points Summary Report
- 3. In the **Print Preview Request** prompt, do one of the following:
 - To display the report preview, click Yes.
 - To print the report without preview, click **No**.

Working with the Fluke Interface

This interface allows you to exchange calibration data with Fluke Documenting Process Calibrator models 743B and 744. By means of wizards, you can download (export) tag number data to the calibrator, and after collecting the calibration data, you can upload (import) calibration data into SmartPlant Instrumentation for all of the calibrated tag numbers.

Downloading Data from SmartPlant Instrumentation to the Fluke Calibrator

- Connect the Fluke Documenting Process Calibrator to your computer's COM port and switch on as described in the Fluke Users Manual.
- 2. Open the Calibration module and from the Calibration Settings window, define the source and output value ranges and units of measure for the desired tag numbers.
- 3. On the Actions menu, click Fluke Interface.
- Click Next.
- 5. On the Connection Options page, define your connection setting and click Test.



- If the connection test is successful, an appropriate message appears in the Connection result box. If the connection fails, check the physical connections and if necessary, select a different communication port and retry.
- 6. Click **Next** to go to the **Activity Selector** page.



- If you first want to clear the calibrator, click **Flush calibrator memory**. ensure that the **Upload default memlist and procedures** check box is selected, and then click **Next**. On completion of the process click **Back**.
- Click Download data from SmartPlant Instrumentation to the calibrator.
- 8. On the **Tag Selection for Download** page, select the **Export** check box beside each tag that you want to download to the calibrator, and then click Next.
- 9. On the **Download Data** page, click **Start** to begin the download.



The progress bars indicate the current activity. You will also see an indication on the calibrator that data is uploading to it.



- This procedure downloads the following data to the Fluke calibrator:
 - Tag number.
 - Component_ID value this is a unique value that SmartPlant
 Instrumentation automatically generates on creation of a tag number. This
 number is displayed in the Fluke calibrator interface as the tag serial
 number. Do not modify this number, either from the calibrator or from
 the SmartPlant Instrumentation database.
 - Source maximum and minimum range values and their units of measure.
 - Output measurement maximum and minimum range values and their units of measure.
 - Calibration strategy.
 - Tolerance.

The following table shows a sample set of download data values:

	Source				Measure			
Tag number	Range Min.	Range Max.	Range UOM	Output Signal Min.	Output Signal Max.	Output Signal UOM	Strategy (Calibration error type)	Tolerance
101-TT -100	100	200	°C	4	20	mA	3↑↓	1
101-PT -200	0	10	Bar (G)	4	20	mA	5↑	1.5
101-LT -300	0	1000	mm	4	20	mA	3↑	2

Uploading Data from the Fluke Calibrator to SmartPlant Instrumentation

- 1. After calibrating your instruments, connect the Fluke Documenting Process Calibrator to your computer's COM port and switch on as described in the Fluke Users Manual.
- 2. Open the Calibration module.
- 3. On the Actions menu, click Fluke Interface.
- 4. Click Next.
- 5. On the **Connection Options** page, define your connection setting and click **Test**.



- If the connection test is successful, an appropriate message appears in the Connection result box. If the connection fails, check the physical connections and if necessary, select a different communication port and retry.
- 6. Click **Next** to go to the **Activity Selector** page.
- 7. Click Upload data into SmartPlant Instrumentation from the calibrator.
- 8. Click Next.
- On the Upload Data page, click Start to begin uploading data from the calibrator.



- The progress bars indicate the current activity. You will also see an indication on the calibrator that data is downloading from it.
- 10. On completion of the upload process, click **Next**.
- 11. On the **Upload Summary** page, view the tags for which the interface has uploaded calibration data into SmartPlant Instrumentation.
- 12. Click **Finish** to complete the operation.
- 13. In SmartPlant Instrumentation, open the Calibration module and from the Calibration History window, view the tag calibration data.