HART Instruments

Working with HART Instruments: An Overview

HART (Highway Addressable Remote Transducer) technology is one of the first fieldbus digital communication techniques that were implemented in instrumentation. HART is a widely acceptable and recognized standard for digitally enhanced 4-20 milliamp smart instrumentation communication. This technology extends the 4-20 mA standard analog transmission with a superimposed digital signal that contains process and instrument data.

The advantage of HART instruments is that they can be connected to standard 4-20 milliamperes systems and, at the same time, make use of digital communication to collect additional data.

Flow of Activities for HART Instrumentation

The following is a suggested flow of activities for HART instrumentation. Note that you can carry out some of the procedures in a different order, depending on your preferences or requirements.

1. Define appropriate instrument types for HART instruments. Note that when defining the profile for HART instrument types you must select HART AI or HART AO as the system I/O type. For details, see Defining an Instrument Type.

2. Create your HART instruments. See Creating HART Instruments.

3. Create the required virtual digital tags. See Creating Virtual Digital Tags.

4. Create I/O cards compatible with HART instruments. See Creating I/O Cards Compatible with HART Instruments.

5. Connect the HART instruments to the appropriate HART I/O cards. Note that you make this connection the regular way. In the **Domain Explorer**, right-click the required I/O card, then on the shortcut menu, point to **Actions** and click **Connection**.

6. Effect I/O assignment for your HART instruments. See Effecting I/O Assignment for HART Instruments.

Creating HART Instruments

The following procedure explains how to create a HART instrument. HART instruments can be HART transmitters, HART I/P converters, and so on.

➢ To create a HART instrument

1. Press F7 to open the **Domain Explorer**.
2. Expand the plant hierarchy to display the **Instruments** and **Loops** folders.
3. Do one of the following:
   - To create an instrument unassociated with a loop number, right-click the **Instruments** folder, point to **New** and then click **Instrument**.
   - To create an instrument that is associated with a specific loop number, expand the **Loops** folder, right-click a loop, and then on the shortcut menu, point to **New** and click **Instrument**.
4. In the **New Tag Number** dialog box, do the following:
   a) From the **Tag class** list, under **Tag class**, select HART.
   b) Type the name of the new tag number.

Note

- If you are working with the **Free** naming convention, select the **Select instrument type** check box to open a pop-up window that allows you to select the appropriate instrument type.

5. Click **OK**.

6. In the **Select Instrument Type** dialog box, select the required instrument type and click **OK**.

Caution

- Remember that you have to define appropriate instrument types for your HART tag numbers before you start creating them. HART instrument type profiles must include a system I/O type, which is either HART AI or HART AO. For details, see Defining an Instrument Type.

Notes

- If the tag number does not correspond to an existing loop name, SmartPlant Instrumentation prompts you to enter a loop name based on the tag number you have entered. If the loop identifier already matches an existing loop, the software will automatically associate the new tag number with the loop.

- If the loop convention includes the loop function parameter, the prompt will always appear. In this case, you have to complete the loop number.
  If a profile exists for the selected instrument type, any new tags for that instrument type will be created with the selected defaults.

7. In the **Loop Name** dialog box, do one of the following:

   - Type the loop number that the new tag is associated with.

   - Accept the displayed loop number.

   - Click **Cancel** to create the tag number without a loop association. Note that if a loop with the same name exists, the tag number is automatically associated with it, without creating a new loop.

8. Click **OK** to create the loop number.

9. In the **Loop Number Properties** dialog box, accept the loop number properties or modify them as you require and then click **OK**.

10. In the **Tag Number Properties** dialog box, on the **General** tab, enter the tag number attributes that you require.

11. To enter power supply properties, see Entering Power Supply Data for Panels and Instrument Tags.

12. Click the **HART** tab to define the instrument parameters and create virtual digital tags.

13. Select a signal type and linearity type values if needed.

14. From the **Analog signal parameter** list, select a parameter appropriate for the analog signal of the current HART instrument.

Note

- Note that this selection is available only if the system I/O type of the current instrument is HART AI.

15. Enter the required DC consumption, capacitance, minimum transmit level, and operating voltage.

16. Create the required virtual digital tags. For details, see Creating Virtual Digital Tags.

Creating Virtual Digital Tags

The following procedure explains how to create virtual digital tags for your HART instruments. Each HART instrument has a different set of digital signals. The digital signals depend on the system I/O type (AI or AO) and on the instrument manufacturer who supplies the HART instruments with a specified variety of possible digital signals.

➢ To create a virtual digital tag

1. In the **Tag Number Properties** dialog box, click the **HART** tab.

2. From the **Analog signal parameter** list, select an appropriate signal parameter.

3. In the **Virtual tags** group box, click **New**.

4. Click **Yes** in the prompt to save the changes to the tag properties.

5. In the **New Virtual HART Tag Number** dialog box, select a signal parameter, enter the tag number name, and click **OK**.

Note

- The signal parameter depends on whether the system I/O type of the current HART instrument is HART AI or HART AO.

Creating I/O Cards Compatible with HART Instruments

To make an I/O card compatible with a HART instrument, you must select one of the following system I/O types when defining the control system properties of a new I/O card:

- HART AI
- HART AO
- AI
- AO
- MIXED

See Creating I/O Cards to learn how to create I/O cards.

Effecting I/O Assignment for HART Instruments

You effect I/O assignment for your HART instruments like with any other instruments that require I/O assignment. In the **Domain Explorer**, right-click the required I/O card, then on the shortcut menu, point to **Actions** and click **I/O Assignment**. For details, see I/O Assignment: An Overview.

The following table shows the instruments and cards for which you can effect I/O assignment.

Instruments	**Cards**			
	AI	**AO**	**HART AI**	**HART AO**
AI	Yes	No	Yes (see note 1)	No
AO	No	Yes	No	Yes (see note 1)
HART AI	Yes (see note 2)	No	Yes	No
HART AO	No	Yes (see note 2)	No	Yes
Mixed	Yes	Yes	Yes (see note 3)	Yes (see note 3)

Notes

- When assigning non HART" analog instruments to HART-compatible I/O cards, the software assigns only the analog signals. (DI or DO are not allowed anyway).
- You can assign HART instruments to conventional I/O cards (AI to HART AI, AO to HART AO), but the software assigns only the analog signals and not the virtual digital tags.
- You can assign HART instruments to I/O cards with MIXED system I/O type, but the software assigns only the analog signals and not the virtual digital tags.