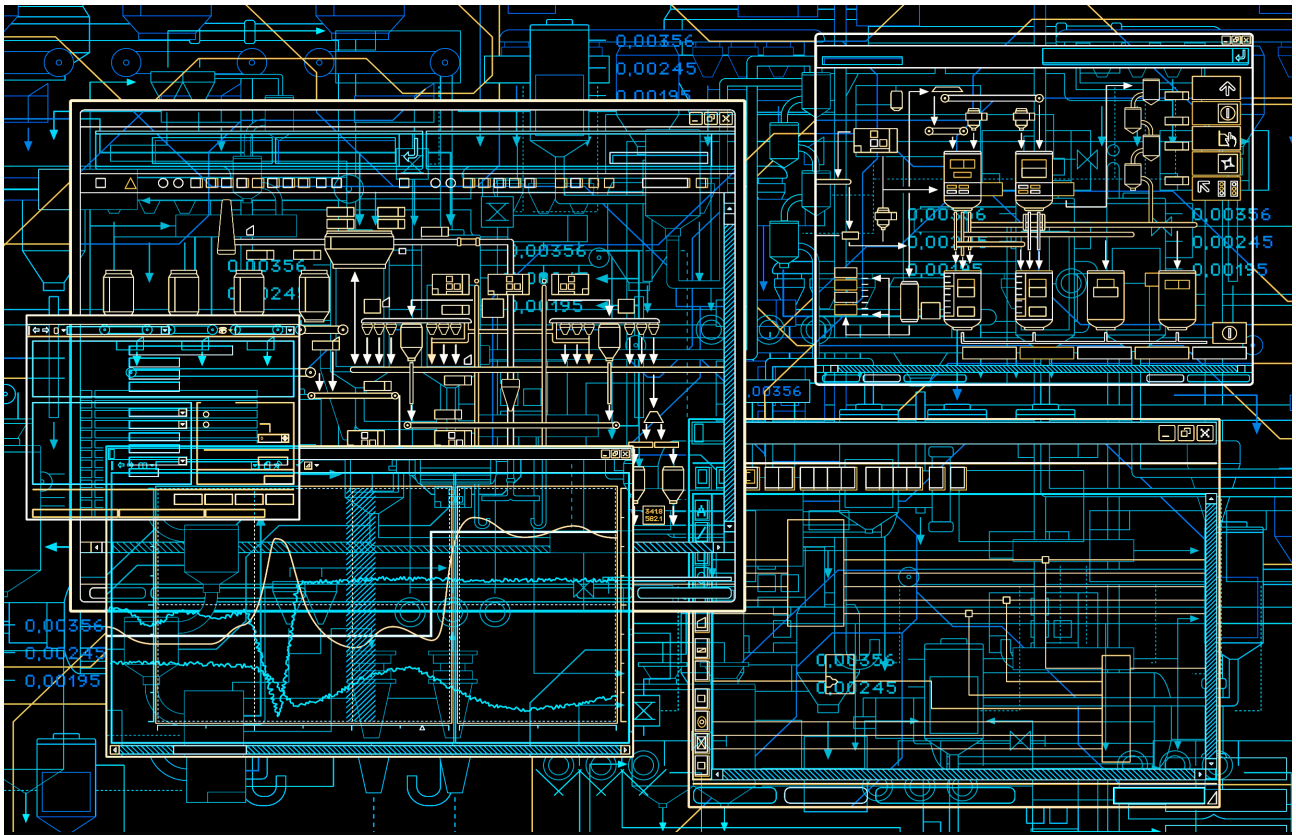

Device Management

Basic HART DTM 6.0

System Version 6.0

Power and productivity
for a better world™

Device Management

Basic HART DTM 6.0

System Version 6.0

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About This User Manual

General

Any security measures described in this User Manual, for example, for user access, password security, network security, firewalls, virus protection, etc., represent possible steps that a user of an 800xA System may want to consider based on a risk assessment for a particular application and installation. This risk assessment, as well as the proper implementation, configuration, installation, operation, administration, and maintenance of all relevant security related equipment, software, and procedures, are the responsibility of the user of the 800xA System.

This User Manual contains a detailed description on how to use the Basic HART DTM. For the latest information, refer to the corresponding Release Notes.

User Manual Conventions

Microsoft Windows conventions are normally used for the standard presentation of material when entering text, key sequences, prompts, messages, menu items, screen elements, etc.

Feature Pack

The Feature Pack content (including text, tables, and figures) included in this User Manual is distinguished from the existing content using the following two separators:

Feature Pack Functionality

<Feature Pack Content>

Feature Pack functionality included in an existing table is indicated using a table footnote (*):

*Feature Pack Functionality

Unless noted, all other information in this User Manual applies to 800xA Systems with or without a Feature Pack installed.

Warning, Caution, Information, and Tip Icons

This User Manual includes Warning, Caution, and Information where appropriate to point out safety related or other important information. It also includes Tip to point out useful hints to the reader. The corresponding symbols should be interpreted as follows:

Electrical warning icon indicates the presence of a hazard that could result in *electrical shock.*

Warning icon indicates the presence of a hazard that could result in *personal injury.*

Caution icon indicates important information or warning related to the concept discussed in the text. It might indicate the presence of a hazard that could result in *corruption of software or damage to equipment/property.*

Information icon alerts the reader to pertinent facts and conditions.

Tip icon indicates advice on, for example, how to design your project or how to use a certain function

Although Warning hazards are related to personal injury, and Caution hazards are associated with equipment or property damage, it should be understood that operation of damaged equipment could, under certain operational conditions, result in degraded process performance leading to personal injury or death. Therefore, fully comply with all Warning and Caution notices.

Terminology

A complete and comprehensive list of Terms is included in the *System Guide, Functional Description (3BSE038018*)*. The listing includes terms and definitions that apply to the 800xA System where the usage is different from commonly accepted industry standard definitions and definitions given in standard dictionaries such as Webster's Dictionary of Computer Terms. Terms that uniquely apply to this User Manual are listed in the following table

The following is a list of terms associated with the Basic HART DTM that the user should be familiar with. The list contains terms and abbreviations that are unique to ABB or have a usage or definition that is different from standard industry usage.

Term/Acronym	Description
ACK	Acknowledge
BACK	Burst Acknowledge
HART DTM	Device Type Manager for HART devices. It also serves as runtime environment (since version V3.1) for device specific DTMs built with the HART DTM Builder.
HART DTM Builder	Software product consisting of a command editor, an application editor and a diagnostic text editor to define device specific DTMs, to be executed by the Basic HART DTM. This software product is not released and is only for ABB internal use.
Device Type Manager (DTM)	Software component (device driver) for configuring, diagnosing, forcing, displaying the measured variables, and so on of a field device. It is compatible with the device and supplies device-specific documentation.
FDT Frame Tool	Frame application (run time environment) in accordance with the FDT specification for operating DTMs

Term/Acronym	Description
Field Device Tool (FDT)	The FDT concept describes the interface between a frame application and the device-specific software of the device manufacturer. It enables devices produced by different manufacturers and different fieldbuses to be integrated in a single system. Also, it supports fieldbus protocols for PROFIBUS and HART.
Highway Addressable Remote Transducer (HART)	Digital communication protocol developed for industrial process application.
GUI	Graphical User Interface
OLE for Process Control (OPC)	Interface specification for data exchange based on the Microsoft COM/DCOM technology
System Application	A software package that provides functionality in the System 800xA. System applications cooperate according to rules defined by the System 800xAarchitecture, using mechanism provided by the Process Portal A. They are normally bundled into System Products. To participate in Aspect Object operations, and thus be an integrated part of an System 800xA, a system application must present itself as an aspect system. The term Application also refers to System Application, and must not be confused with User Application.
STX	Start of a Transaction

Released User Manuals and Release Notes

A complete list of all User Manuals and Release Notes applicable to System 800xA is provided in *System 800xA Released User Manuals (3BUA000263*)*.

System 800xA Released User Manuals (3BUA000263)* is updated each time a document is updated or a new document is released. It is in pdf format and is provided in the following ways:

- Included on the documentation media provided with the system and published to ABB SolutionsBank when released as part of a major or minor release, Service Pack, Feature Pack, or System Revision.
- Published to ABB SolutionsBank when a User Manual or Release Note is updated in between any of the release cycles listed in the first bullet.

A product bulletin is published each time *System 800xA Released User Manuals (3BUA000263*)* is updated and published to ABB SolutionsBank.

The table below contains a list of relevant documentation.

Title	Description
Basic HART DTM, Installation 3BDD011942*	This manual describes how to install the Basic HART DTM.
Device Management, HART DTM Builder, 3BDD011946*	This manual describes how to build device specific HART DTMs using the HART DTM Builder
Basic HART DTM, Release Notes 3BDD011944*	This manual provides a brief overview of the product's functionalities and also enumerates problems encountered during the final testing of this product release.

Section 1 Introduction

Product Overview

The FDT (Field Device Tool) concept describes the interface between a frame application and the device-specific software, the **D**evice **T**ype **M**anager (DTM), from the device manufacturer. It enables devices produced by different manufacturers and different fieldbuses to be integrated in a single system.

The **D**evice **T**ype **M**anager is a software component, which is usually supplied by the manufacturer together with the intelligent field device. The DTM is familiar with the way the field device works (plausibility), offers graphical user dialogs, manages device configuration and diagnostics, and supplies the device-specific documentation.

ABB provides a basic DTM, called the Basic HART DTM, for HART field devices which do not have a dedicated DTM. The Basic HART DTM enables the field devices to be operated in a frame application conforming to FDT 1.2.

Product Scope

The Basic HART DTM is suitable for executing various tasks, also referred to as applications. The various tasks are also called "applications" in later descriptions. The applications with a graphical user interface for data visualization and data entry are listed below:

- **Identification**

  Shows information about the connected device type in online and offline mode.

- **Configuration**

  Offers configuration functions for a device type in offline mode.

- **Wireless Configuration**

Offers wireless configuration functions for a Wireless HART device type in online mode.

- **Parameterization**

  Offers configuration function for a device type in online mode.

- **Device Communication Statistics**

  Shows communication statistics for connected device in online mode.

- **Observe**

  Shows the process values of the connected device type in online mode.

- **Diagnosis**

  Offers diagnosis functions for a connected device type in online mode.

- **Force**

  Allows a loop-test by simulating the process value in online mode.

- **Parameter Exchange**

  Comparison of device and instance configuration data in online mode.

- **List View**

  Shows all the parameters and values available in the DTM in offline and online mode.

- **About DTM**

  Shows information about DTM version, vendor, and so on. The application is available in offline and online mode.

- **Registration**

  Allows to expand the Basic DTM to a DTM Builder (offline mode).

- **User Applications (via HART DTM Builder templates)**

  Available only if new DTM applications have been created using DTM Builder function. The applications are available in offline and online mode depending on the configured mode support.

Installation

The installation as well as the PC requirements of the Basic HART DTM is described in *Basic HART DTM, Installation (3BDD011942*)*.

Intended User

This configuration guide is designed for application engineers and commissioning engineers. It explains how to use the Basic HART DTM in connection with a HART device.

The users of this manual should be familiar with the basics of the HART protocol.

Section 2 Basic HART DTM

Overview

This section describes all device-specific applications, both graphical and non-graphical user interfaces, that are available as standard with the Basic HART DTM. In order for the applications to run properly, in addition to the *universal commands,* the field device must also support the *common practice commands*, which are also used.

The Basic HART DTM informs the FDT frame tool about the applications provided as pull-down menu for selection by the user. Depending on the user's rights or the operating state (online/offline), some applications may not be available for selection. Also, the application names can differ depending on the FDT frame tool or depending on HART Device Revision.

The title bar and toolbar shown in the examples should be made available by a FDT frame tool. They provide assistance when working with several DTMs or applications in parallel.
More detailed information about the selection and presentation of the DTM can be found in the instruction manual for the frame application.

HART Commands

The Basic HART DTM is based on Revision 7 of the HART protocol specification. The DTM executes the *universal commands* and *common practice commands* described in the HART specifications for each application. However, it does not use all the commands, as some contain redundant information or are not useful for a basic DTM.

Table 1. Supported HART commands

Universal commands	Common practice commands
0, 2, 3, 8, 9, 12 - 20, 22, 38 & 48. Wireless commands: 768, 769, 771, 772, 773, 774, 778 & 779.	34 - 37, 39 - 42, 44 - 49, 72, 89, 90, 95, 512, & 513.

Some field devices do not support all common practice commands, for example, `write transducer serial number`. When downloading or uploading such parameters, the message "command not implemented" gets displayed. The above mentioned behavior may result in an inconsistent parameter value (instance data not equal to device data). Use the *Parameter Exchange* application in order to re-establish data consistency.

Data Storage

The data (parameters) is only available temporarily in the DTM for processing. When a user interface is closed or data is buffered, the DTM saves the data permanently.
In offline mode, data is saved to the workstation computer database as instance data. In online mode, data is saved first to the field device and then to the database. However, the DTM will update the data in the database only if the field device has accepted the data. It is always possible that, for technical reasons, a device may not be able to use the value in the exact format in which it was entered and will therefore use a value very similar to that entered.

Additional measures (EEPROM commands) are required to save data to non-volatile memory on the field device or to restore the shadow RAM.

DTM Applications and Functions

The Basic HART DTM contains graphical user interfaces for displaying variables, input/output parameter values or executing commands.

In addition, the DTM supports the following FDT specific functions without a graphical user interface, which are controlled exclusively by the FDT frame application (the DTM works in the background):

- Download
- Upload
- Online Compare
- Verify
- Printing

Detailed information about the supported applications and functions are described in this document.

The images (*screenshots*) in this document were created on a workstation with standard Windows color settings. Any other settings will result in a different image or, in extreme cases, may distort information so that it can no longer be seen on the screen.

As a standard, the Basic HART DTM and its applications can be used for all HART devices. If a device type is replaced by a different one, the device instance with the Basic HART DTM must work properly.

The Basic HART DTM can be extended to a device-specific DTM by using template files. A template file is registered as specific to a DTM and will be displayed in the DTM catalog of the FDT frame tool. Use of those template files as instance allows to access the specific device type (commands are listed in the template file). Otherwise, an information message will occur telling the mismatch of DTM and connected device type.

Figure 1. Device Mismatch

As a result, either the connected device type or the used DTM template file must be changed.

User Roles and Access Rights

The DTM checks the user rights when an application (Graphical User Interface) starts up. Certain users may be barred from using some applications. If access to an application is permitted, a distinction is made between restricted access (read-only) and full access (read and write) to its functions

Table 2. User Roles and Access Rights.

Applications	User Roles			
	Observer	Operator	Maintenance	Planning Engineer
Identification	*R*	*R*	*R/W*	*R/W*
Configuration	*R*	*R*	*R*	*R/W*
Wireless Configuration	*R*	*R*	*R*	*R/W*
Parameterization	*R*	*R*	*R/W*	*R/W*
Device Communication Statistics	*R*	*R*	*R*	*R*
Observation	*R*	*R*	*R*	*R*
Diagnosis	*R*	*R*	*R/W*	*R/W*
Force	*R*	*R*	*R/W*	*R/W*
Parameter Exchange	*-/-*	*-/-*	*-/-*	*R/W*
List view	*R*	*R*	*R*	*R/W*
About DTM	*R*	*R*	*R*	*R*
Upload(1)	*-/-*	*-/-*	*-/-*	*R/W*
Download(1)	*-/-*	*-/-*	*-/-*	*R/W*
Verify(1)	*R*	*R*	*R*	*R*

Online Compare[1]	*R*	*R*	*R*	*R*
Registration [2]	*-/-*	*-/-*	*R/W*	*R/W*
Printing	*R*	*R*	*R*	*R*

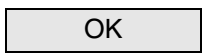
(1) Available via FDT frame tool, if supported
(2) Only required for HART DTM Builder support

-/- = The user interface is not available for selection
R = Data output only (read)
R/W = Data input (write) and output (read)

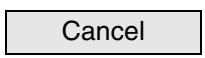
If, in addition to the roles above, a user has Administrator or OEM service rights, the role of an Observer will grant the user unrestricted access to all applications.

Buttons

The following buttons are not application-specific and always have the same function.

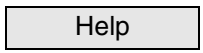


Click on the **[OK]** button to save all data and close the graphical interface. The DTM will then save the data for that application to the database and/or device.



If **[Cancel]** is clicked, the DTM will reject all data inputs, since the last time data was applied, and close the interface.

Click on the **[Apply]** button to apply the numbers or text input and menu selections made. The DTM will save all modifications made since the last time data was applied. The interface remains open.

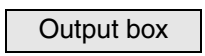


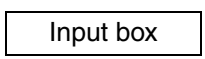
Click on the **[Help]** button to access the online help of an application.

The application-specific buttons are described in the section related to each application.

Input/Output Boxes

The Input/Output boxes are used to display and enter data (parameter values). Depending on the type of the parameter, numerical values or character strings can be entered. In some cases, these values must be selected from a list containing a fixed number of default entries.
Input and output boxes are identified by means of the background brightness. The DTM highlights the fields containing modified data. Clicking on the **[Apply]**, **[OK]** or **[Cancel]** buttons and performing a save prompts the DTM to remove the highlighting.





When data is entered in an input box, the DTM checks the data format, value ranges, and other data fields. The data plausibility check can only be carried out once all data has been entered. The DTM carries out the plausibility check once when the **[Apply]** or **[OK]** button has been clicked. Entries that conflict with other entries on this user interface are identified accordingly in the appropriate fields. They must be corrected before the data can be applied.

Status Bar

The status bar at the bottom of the user interface has three fields. The left most field provides the following information.tod

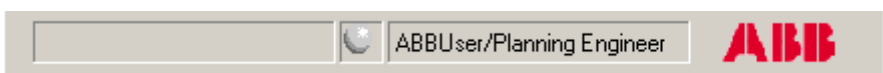
Data locked		

Table 3. Status Bar

Messages	Meaning
Data locked	Another user has already started an application for this device and has reserved the data record. Data can only be entered once the user has quit the application.
Start communication	The DTM tries to establish communication with the field device
Data transmission...	A command has been sent and the DTM is waiting for a reply from the field device
Stopped	The communication to the field device cannot be established. As a result the communication is stopped.

The status bar may also include other messages not described here. Those messages have been sent from higher-level DTMs like a HART master DTM to provide additional information.

The current user name and the user role will be displayed in the status bar.



The field in the center of the bar displays a LED icon. This icon is referred to as LED in the subsequent sections. Once the connection to the device is established (online mode), the LED flashes green. The flashes stop once the communication finishes or if no communication actions are made.

Graphical User Interfaces (Applications)

This section describes in detail the graphical user interfaces available and supported by the DTM.

Identification

This interface contains all the information needed to identify the field device, such as the name of the manufacturer, the serial number and the revision level.

As the *Identification* application works exclusively with the data from the instance data record, the operating state (online/offline) is of no significance.
The default data in the data record appears first. During commissioning and the associated *Upload* or *Parameter Exchange*, the default data is overwritten with the real device data.

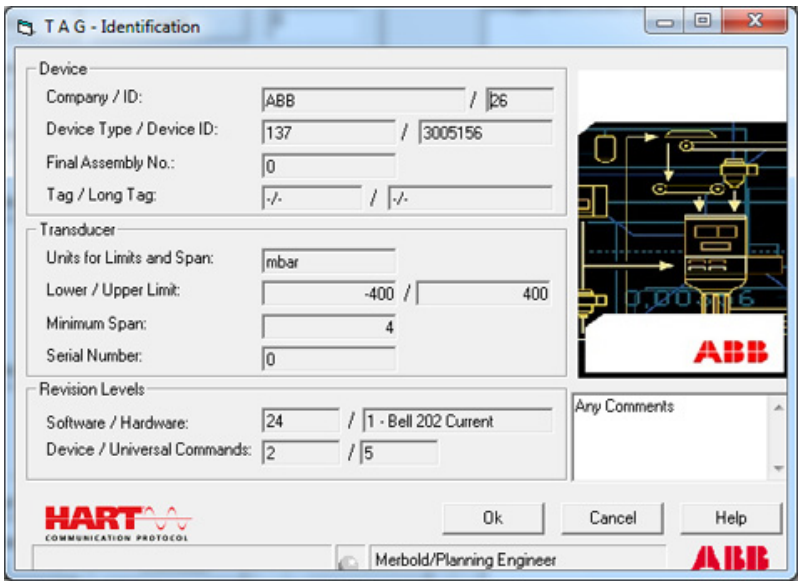


Figure 2. Identification

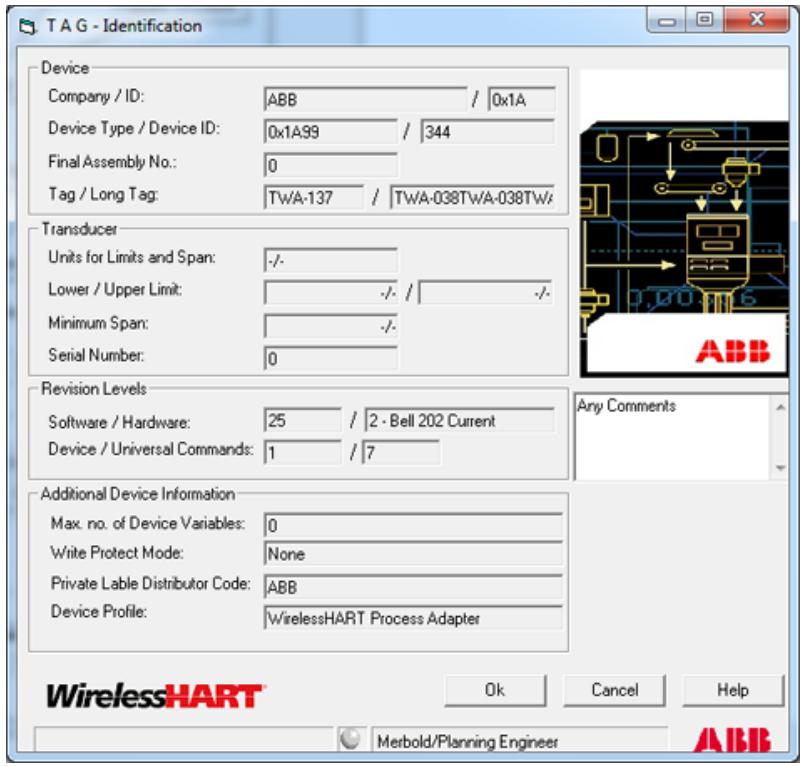


Figure 3. Identification (HART 7)

Device Area

This area of the user interface contains the essential data for identifying the field device. The information in the *Company*, *Device Type*, and *Device ID* fields combines to create a unique identifier for a field device. No other field device may have the same identifier.

Table 4. Device Area

Field	Description
Company / ID	The manufacturer identifier saved in the device is interpreted in accordance with the table specified in the HART protocol and stored in the DTM (identifier <=> manufacturer name), and displayed in plain text.
Device Type	The device type code saved in the device appears in this field. The plain text designation (device name = type code) can be found in the manufacturer-specific tables in the HART Common Tables Specification.
Device ID	The device identification number ID saved in the device appears in this field. Each device has a unique number, which is produced by means of a given manufacturer and device type code.
Final Assembly No.	The serial number for the entire device saved in the device appears in this field.
Tag / Long Tag	The *Tag* is used as bus identifier for alternative communication establishment. The *Long Tag* is used as unique identifier (32 character) according to the AKS/KKS coding system (HART 6 revision onwards).

Transducer Area

All information in this area relates to the transducer. Except for the serial number and unit, all other information relates to permanent properties of the transducer and therefore the field device.

Revision Levels Area

The Revision Levels are permanent characteristics of the field device. This window will show the universal revision of the HART device.

The HART data format does not support the display of standard revision levels, for example, V3.1. To display such a revision level, some manufactures use the integer number 31 as an alternative.

Table 5. Revision Levels Area

Field	Description
Hardware	Displays the device hardware revision number and physical signal code. Data format = unsigned integer
Software	Displays the device firmware revision number Data format = unsigned integer
Device	Displays the revision number for the entire device Data format = unsigned integer
Universal Commands	Displays the universal commands document revision number or major HART revision number (4, 5 or higher) Data format = unsigned integer

Additional Device Information Area

This area of the user interface contains the additional device information.

Table 6. Additional Device Information Area

Field	Description
Max. no. of Device Variables	Displays the Maximum no. of device variables. Data format = Unsigned Integer.
Write Protect Mode	Displays Write Protect designation from the Write Protect Codes tables in the HART Common Tables Specification. Data format = Unsigned Integer.

Table 6. Additional Device Information Area

Field	Description
Private Lable Distributor Code	This is same as Manufacturer ID. The Private Label Distributed code designation can be found in Manufacturer Identification Codes tables in the HART Common Tables Specification. Data format = Unsigned Integer.
Device Profile	Displays the type of connected device. The Device profile designation can be found in Device Profile Codes tables in the HART Common Tables Specification. Data format = Unsigned Integer.

Comments Field Area

Any comments or notes relating to the device can be entered in this field, which has a white background and appears underneath the image. The DTM saves the information in the corresponding instance data record. All characters according to the set keyboard layout can be used.

Device Images Area

The DTM can use the manufacturer and device type code to reference device-specific image files. The code will be displayed on the *Identification* GUI as soon as the DTM goes online for the first time.
When preparing an image file during the planning phase, reference can be made to the HART Common Table Specification in order to obtain the codes in advance.

Example:

Name of image file = Manufacturer_DeviceType.JPG = 26_133.JPG

26 = ABB Automation
133 = AS800

The images are stored in the *MediaFiles* folder of the installation directory. Once a device instance has been created, the FDT/DTM logo is displayed first using the default data available at this time.

For multi-user systems, the image files have to be stored on every workstation on which the Basic HART DTM is installed.

Path:

<System drive>\ABB Industrial IT\Engineer IT\DTM\Basic HART DTM\MediaFiles\.....

The optimum display resolution for an image is 210 x 270 pixels. To keep file size to a minimum, the JPEG format is required.

Configuration

The *Configuration* application can only be called in offline mode and works exclusively with the data from the instance data record. If an upload has not yet been performed for the field device (read data from device), the default values in the instance data record will appear.

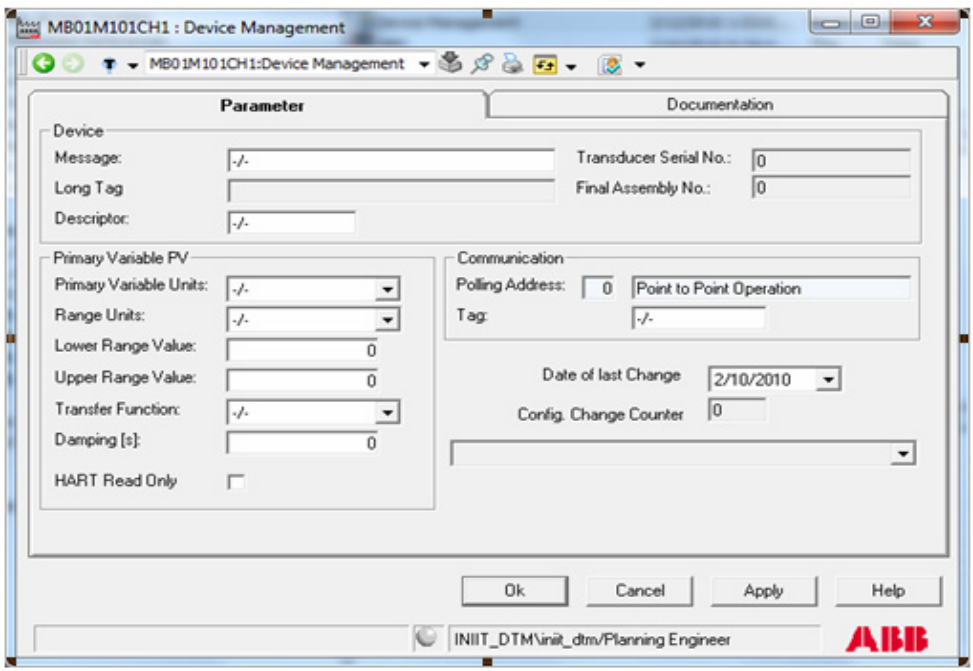


Figure 4. Configuration

Parameter Tab

The Parameter tab allows to pre-configure a HART device type in offline mode. The configured data set will be stored in the instance data record of the FDT frame tool

Note that the entries or selections will only take effect once the field device has been started up, that is once the data has been downloaded.

Device Area

This input area allows the configuration of additional device identifiers such as Long Tag, message, and descriptor.

Table 7. Device Area

Field	Description
Message	HART message text, maximum 32 characters. Upper case letters, numbers, and special characters conforming to the HART specification are permitted. Can be used e.g. as a unique identifier or for other purposes. Data format = Packed ASCII
Long Tag	The *Long Tag* is used as unique identifier (max. 32 characters) according to the AKS/KKS coding system (HART 6 revision onwards). Data format = Packed ASCII
Descriptor	Enter a plant identifier (descriptor), up to 16 characters allowed. Upper case letters, numbers, and special characters conforming to the HART specification are permitted. Data format = Packed ASCII

Table 7. Device Area (Continued)

Field	Description
Final Assembly No.	Entering the serial number for the entire device is only possible with a HART DTM Builder license. Leading zeros will be deleted. Letters and special characters are not permitted. The Final Assembly Number is stored in the device hardware by the device vendor and will be displayed in this field after upload of the device data. Data format = Unsigned integer
Transducer Serial No.	Entering the serial number for the transducer is only possible with a HART DTM Builder license. Leading zeros will be deleted. Letters and special characters are not permitted. The Transducer Serial Number is stored in the device hardware by the device vendor and will be displayed in this field after upload of the device data. Data format = Unsigned integer

Communication Area

All information in this area relates to communication, that is for the establishment of a connection and the associated addressing of the field devices. The current topology is the output criterion. The connection is usually established using the polling address and command 0. Alternatively, some HART masters address the connected slaves with the HART *tag* or Long *tag*.

Once the connection has been established, addressing can take place using the *unique ID* ("manufacturer" + "device type" + "device ID").

Primary Variable PV Area

The diagram in Figure 5 shows the individual function blocks through which the signal passes.
The first block with the transducer is used to detect the process value. The transducer limits and the minimum span characterize the permanent properties of

the transducer. The primary variable (*PV*) is available as a digital value at the output of the first block.

Table 8. Primary Variable PV Area

Field	Description
Polling Address	Polling address = 0 (Point to Point Operation) Only one field device is connected on the bus. The primary variable is available as an analog 4 … 20 mA signal and as a digital signal. Polling address > 0 (Multi-Drop Operation) It is possible to connect up to 15 devices to one HART master channel. The primary variable is available as digital signal only and the analog signal is fixed for all connected devices. Multi-Drop operation is possible only, if the HART master does support this feature. The specific polling address for the HART device is set and assigned through HART master and its DTM.
Tag	HART tag, used as a bus identifier, maximum 8 characters. Upper case letters, numbers, and special characters conforming to the HART specification are permitted. Data format = Packed ASCII

The measuring range can be set in the second block by specifying the lower and upper range limits. Both values are used to standardize the variable between 0 and 100%. Some devices permit the lower range value to be higher than the upper range value. This peculiarity enables the characteristic curve to be inverted (rising <=> falling). The device-specific description will indicate if this setting is permitted. Note that the measuring range must always lie within the defined limits of the transducer. In addition, a time constant for signal damping can also be entered in this block and a transfer function can be selected.

The D/A converter in the last block converts the percentage format variable into a proportional 4 … 20 mA output current. The zero point and gain can be adjusted using the DTM application *Force*.

Table 9. Measuring Range

Field	Description
Primary Variable Units	Selection of the physical unit for the primary variable PV. The unit for the primary process variable and the unit for the limits and span of the transducer should not conflict with the physical unit for the PV.
Range Units	Select the physical unit for the lower and upper range values.
Lower Range Value	Enter the lower range value. This value corresponds to 0% or 4 mA. Data format = Floating (IEEE 754)
Upper Range Value	Enter the upper range value. This value corresponds to 100% or 20 mA. Data format = Floating (IEEE 754)

Table 9. Measuring Range

Transfer Function	Select the transfer function. Depending on the device, one of the following functions can be selected: • Linear • Square root • Square Root 3rd power • Square Root 5th power • Special Curve • Square • Discrete (Switch)
Damping [s]	Enter the time constant (in seconds) for damping. During this time, the output signal, on a signal step change from 0 … 100% at the input, has approached the upper range value by 63%. Data format = Floating (IEEE 754)

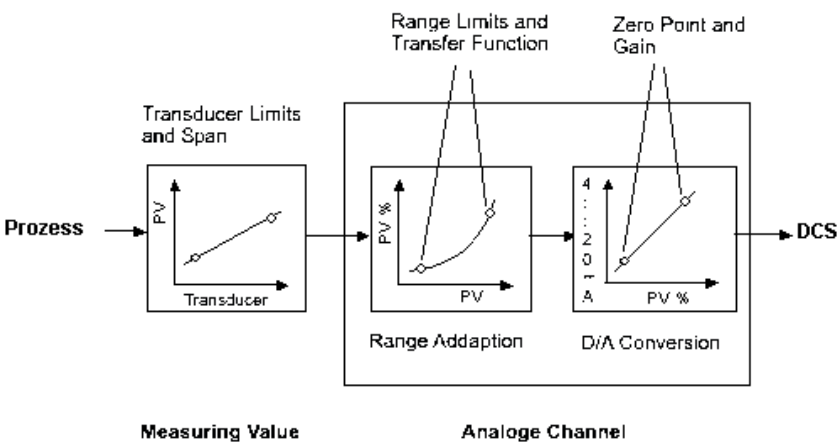


Figure 5. Signal conditioning

The measuring range can be set in the second block by specifying the lower and upper range limits. Both values are used to standardize the variable between 0 and 100%. Some devices permit the lower range value to be higher than the upper range value. This peculiarity enables the characteristic curve to be inverted (rising <=> falling). The device-specific description will indicate if this setting is permitted. Note that the measuring range must always lie within the defined limits of the transducer. In addition, a time constant for signal damping can also be entered in this block and a transfer function can be selected.

The D/A converter in the last block converts the percentage format variable into a proportional 4 … 20 mA output current. The zero point and gain can be adjusted using the DTM application Force.

Table 10. Measuring Range

Field	Description
Primary Variable Units	Selection of the physical unit for the primary variable PV. The unit for the primary process variable and the unit for the limits and span of the transducer should not conflict with the physical unit for the PV.
Range Units	Select the physical unit for the lower and upper range values.
Lower Range Value	Enter the lower range value. This value corresponds to 0% or 4 mA. Data format = Floating (IEEE 754)
Upper Range Value	Enter the upper range value. This value corresponds to 100% or 20 mA. Data format = Floating (IEEE 754)

Table 10. Measuring Range

Transfer Function	Select the transfer function. Depending on the device, one of the following functions can be selected: • Linear • Square root • Square Root 3rd power • Square Root 5th power • Special Curve • Square • Discrete (Switch)
Damping [s]	Enter the time constant (in seconds) for damping. During this time, the output signal, on a signal step change from 0 … 100% at the input, has approached the upper range value by 63%. Data format = Floating (IEEE 754)

Date of Last Change Area

A calendar can be activated here in which the date when the latest change occurred can be entered. The date will then appear in the output box.

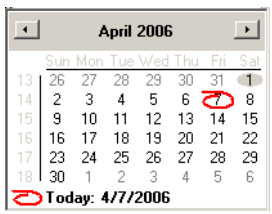


Figure 6. Calendar

Configuration Change Counter Area

The configuration change counter indicates how often a device configuration has changed in the past. It requires the device to be compatible with HART Revision 6 onwards.

The counter value is provided by the device and cannot be configured.

Configuration change counter value in Basic HART DTM may not get updated if gateway does not have updated value.

HART Read Only Mode

To fulfill the safety specification, the AI880 boards are set to HART Read Only mode that blocks all “write commands” of Universal HART commands and Common Practice HART commands. Currently, the Generic HART DTM is enhanced to handle the AI880 read only mode.

The *HART Read Only Mode* feature, which is enabled through a check box, appears when the Generic HART DTM is instantiated under S800 Series, AI880 Input module. It is mandatory to save the configuration immediately after instantiating. The *HART Read Only Mode* feature does not appear when instantiated under other IO Modules that support HART protocol.

During offline configuration, which is **Configuration** GUI, the entry is similar to all other parameter fields.

When the *HART Read Only Mode* feature is selected, displayed in **Configuration** GUI, the Instance is transited to the online state and the fields in parameterization window gets disabled.

When the HART read only mode is enabled, the user cannot change any fields.

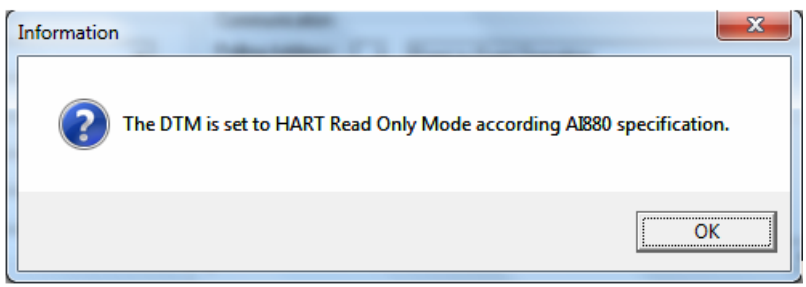


Figure 7. Message Alert when HART Read Only Mode is enabled

A pop-up message alerts the user when the *HART Read Only Mode* feature is enabled.

A pop-up message alerts the user when the *HART Read Only Mode* feature is disabled.

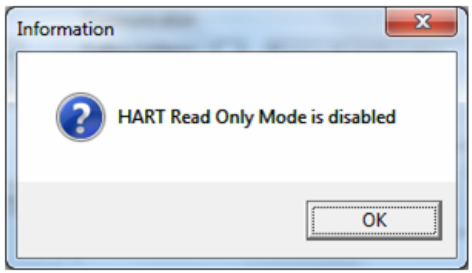


Figure 8. Message Alert when HART Read Only Mode is disabled

Documentation Tab

A link to device-specific documentation can be specified under the Documentation tab. The user can specify the link using the [**Browse**] button or can specify a website link. This link is available only during the offline mode. The link will be locked when DTM is either online or locked.

If a link is present, an additional DTM application menu item called *Documentation* will appear. This *Documentation* application can be removed from the DTMs pull-down menu by using an empty field.

Appropriate software for displaying the document, e.g. Adobe Acrobat Reader, must be installed on the workstation computer.

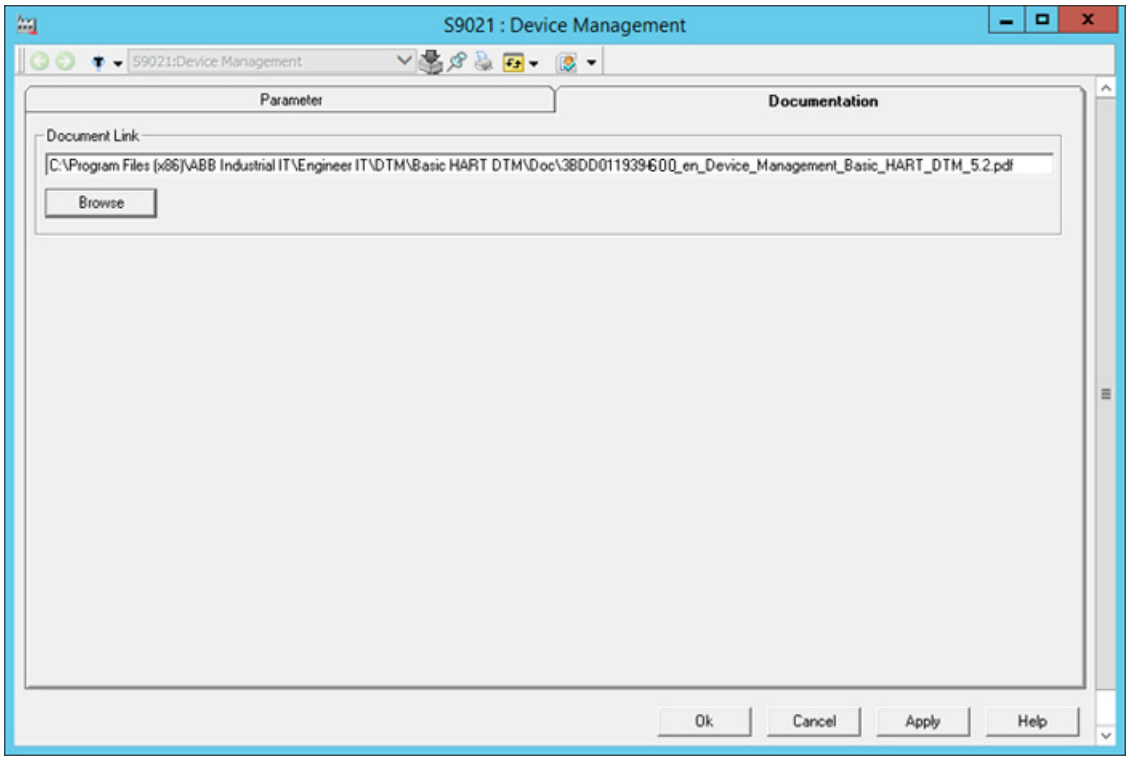


Figure 9. Document Link

Wireless Configuration

The Wireless Configuration application can only be called in online mode. An online operation such as device upload or observe window must have been done once before this window can be seen. Once GUI gets loaded; by default, all Wireless configuration data will be read such as Network ID, Join mode configuration, Device health, Join status, and Flow of join status information.

Commissioning a Wireless HART Device using Basic HART DTM

1. Connect the device through HART modem.
2. Create the HART modem instance in frame application.
3. Under HART modem instance, create an instance of Basic HART DTM.
4. Enable communication.
5. Upload or Open the observation GUI to enable features of Wireless HART.
6. Open the Wireless Configuration GUI. Provide proper Network ID & Join Key to join the device in Wireless Network.
7. Force the device to join in Wireless Network by providing “Join Mode” & “Join Shed Time” by clicking **Apply**.

8. Remove the HART modem. Device starts communicating over wireless network.

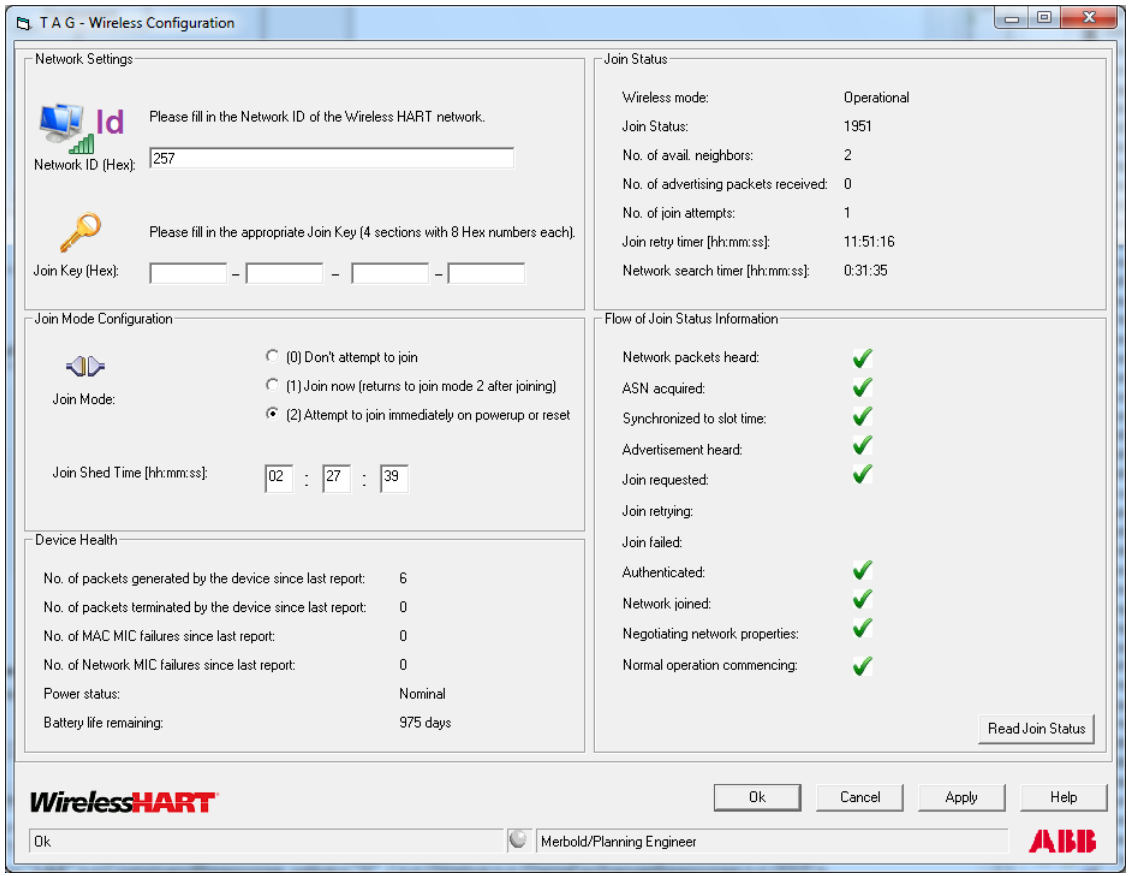


Figure 10. Wireless Configuration

Command 768 (Write Join Key) and command 773 (Write Network ID) can only be issued by the Network Manager or via the maintenance port. All other sources are responded to with “Access Restricted”

Network Settings Area

All information in this area relates to communication for the establishment of a Wireless connection and the associated addressing of the field devices. The connection is established using the Long tag (in command20), Network ID, & Join key.

Table 11. Network Settings Area

Field	Description
Network ID	Network ID, maximum 32767. Only numbers are conforming to the HART 7 specifications are permitted. Data format = Unsigned Integer.
Join Key	Enter a Join Key, 4 sections with 8 hex numbers each. Upper case letters, numbers, and special characters Conforming to the HART 7 specifications are permitted. Data format = Unsigned Integer

Join Mode Configuration Area

All information in this area relates to setting joining mode to the network and duration for joining in the network.

Table 12. Join Mode Configuration Area

Field	Description
Join Mode	Select the Join Mode option from the following listed options. • (0) Don't attempt to join • (1) Join now (returns to join mode 2 after joining) • (2) Attempt to join immediately on power up or reset
Join Shed Time	Enter the time duration for joining in the network. During this time, the device will be in active search mode. Once time exceeds, then the device may go into Deep Sleep/Ultra Low Power mode. Data format = Time

Device Health Area

This area of the user interface contains the essential data of device health information.

Table 13. Device Health Area

Field	Description
No. of packets generated by the device since last report	Displays the no. of packets generated by the device since last report. Data format = Unsigned Integer.
No. of packets terminated by the device since last report	Displays the no. of packets terminated by the device since last report. Data format = Unsigned Integer.
No. of MAC MIC failures since last report	Displays the no. of MAC MIC failures since last report. Data format = Unsigned Integer.
No. of Network MIC failures since last report	Displays the no. of Network MIC failures since last report. Data format = Unsigned Integer.
Power status	The device power status saved in the device appears in this field. The power status designation can be found in the Device Power Status tables in the HART Common Tables Specification. Data format = Unsigned Integer.
Battery life remaining	The battery life remaining days saved in the device appears in this field. Data format = Unsigned Integer.

Join Status Area

All information in this area relates to, monitoring a field device as it transitions through the Wireless HART joining process.

Table 14. Join Status Area

Field	Description
Wireless mode	The wireless mode designation can be found in the Wireless Operation Mode tables in the HART Common Tables Specification. Data format = Unsigned Integer.
Join status	The join status mode designation can be found in the Join Process Status tables in the HART Common Tables Specification. Data format = Unsigned Integer.
No. of avail. Neighbors	The no. of available neighbors count saved in the device appears in this field. Data format = Unsigned Integer.
No. of advertising packets received	The no. of advertising packets received count saved in the device appears in this field. Data format = Unsigned Integer.
No. of join attempts	The no. of join attempts count saved in the device appears in this field. Data format = Unsigned Integer.
Join retry timer	The join retry timer duration saved in the device appears in this field. Data format = Time.
Network search timer	The network search timer duration saved in the device appears in this field. Data format = Time.

Flow of Join Status Information Area

It shows the current state of the Network Joining status.

Parameterization

The *Parameterization* application can only be called in online mode and works with the physical device data and the device instance data record. If an upload has not yet been performed for the field device (read data from device), the default values in the data record will appear.

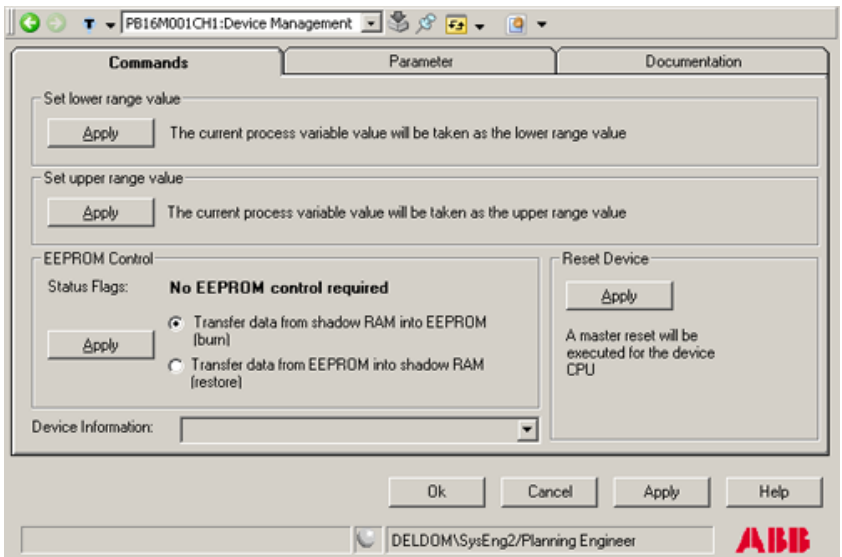


Figure 11. Commands Tab in Parameterization application

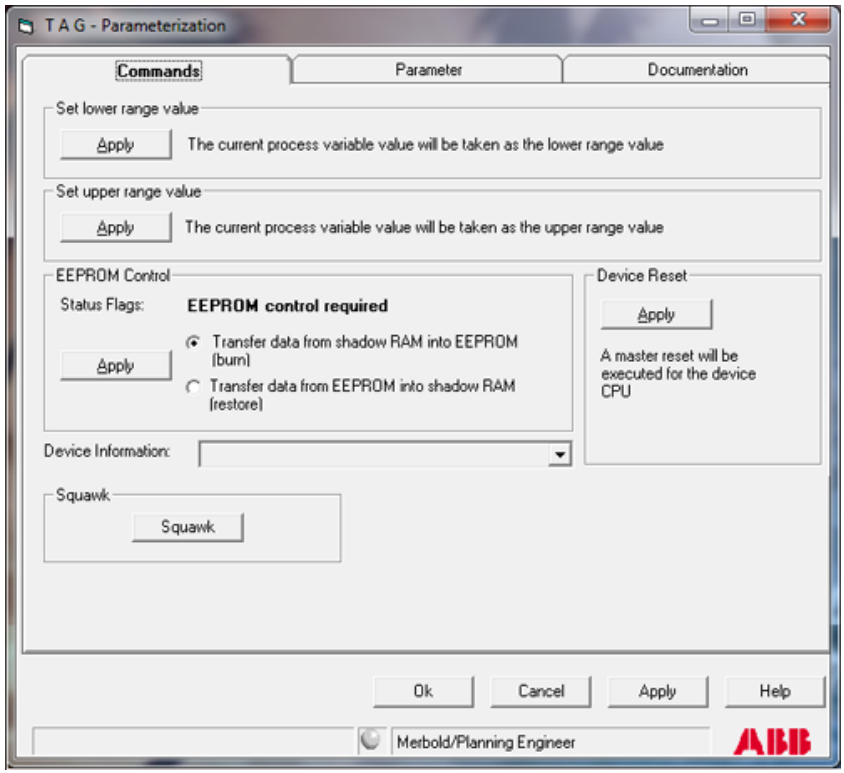


Figure 12. Commands Tab in Parameterization application (HART 7)

Note that the data transferred to the device needs to be made persistent. To do this, execute the device-specific command, burn EEPROM, on the first tab. Refer to the field device manual for further instructions.

Commands Tab

The commands from the tab are sent directly to the device and processed there. The user will be prompted to confirm the command again.

Table 15. Commands Tab

Field	Description
Set Lower Range Value	The current process variable is used as the lower range value for the primary variable PV. It is not possible to set the lower range value higher than the upper range value.
Set Upper Range Value	The current process variable is used as the upper range value for the primary variable PV. It is not possible to set the upper range value lower than the lower range value.
EEPROM Control	Two functions can be performed using EEPROM commands: a.) Write data to the EEPROM (burn) and save it to non-volatile memory b.) Write data from the EEPROM to the shadow RAM (restore).
Device Reset	Resets the entire software of the field device and restarts the device automatically. During this time, the device is out of operation and it is not possible to communicate with it. The behavior of the device during the reset phase and the duration of this phase is a device-specific property (see the device specific user manual).
Device Information	Using the list box the user can view the device and communication status messages posted since the time the DTM application was started. The list box displays the last valid message. Click the pull-down button to view the history of device messages.
Squawk	Squawk command is used for identifying devices (Specially HART 7 supported devices) in Field. This command enables the device to respond with a visible, audio or mechanical response.

Parameter Tab

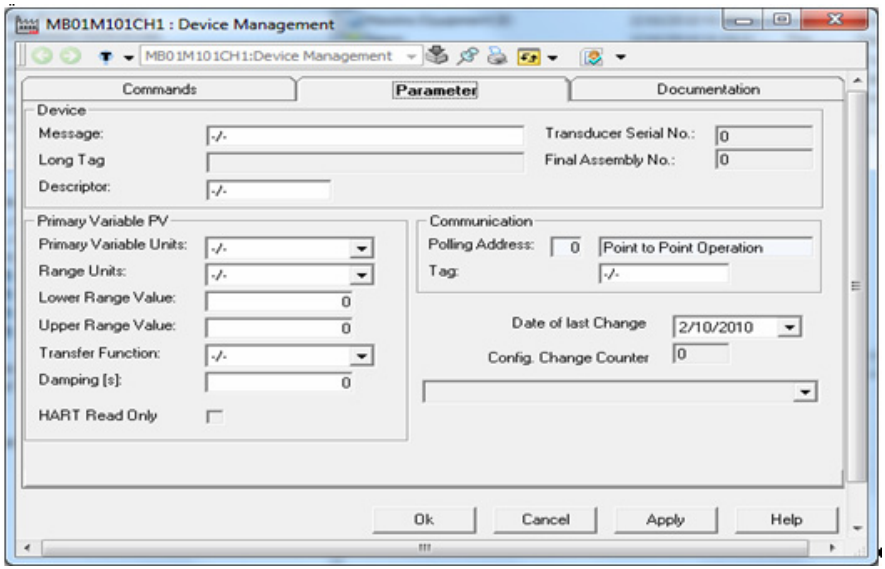


Figure 13. Parameter Tab in the Parameterization application

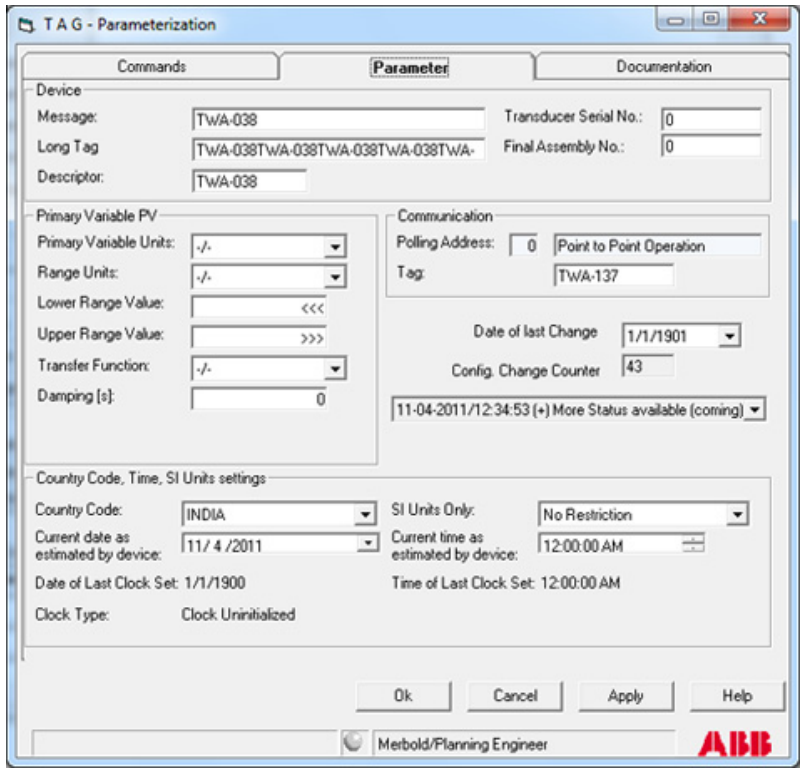


Figure 14. Parameter Tab in Parameterization application (HART 7)

When the *HART Read Only* feature is selected, the Write functionality is blocked. For example, [**Write**] button of list view is disabled while online, when the HART Read Only mode is enabled.

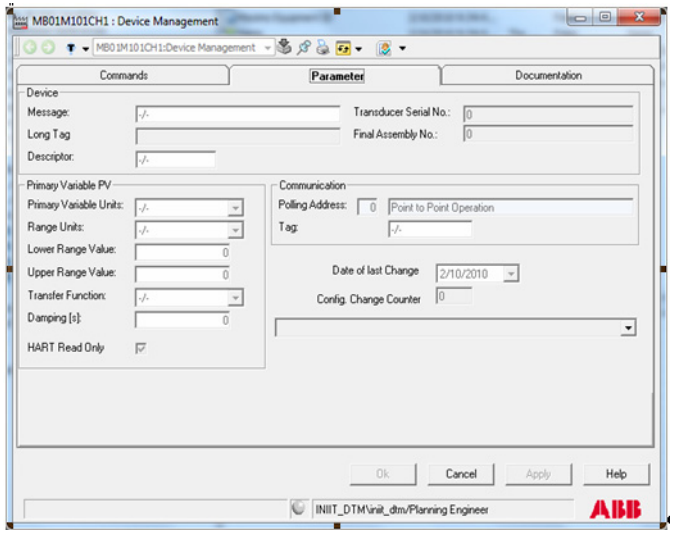


Figure 15. Parameter Tab in the Parameterization application with Read-Only mode enabled

The *Parameter* tab contains the same parameters and settings as described in detail for the DTM application Configuration on page 29. The only difference is that the user is now working online with the device and not offline with the instance data record.
All entries are sent directly to the device and processed there. Once the device has accepted the modified data, it is saved to the instance data record.

Note that for some parameters, if one is modified and transferred to the device, the response may contain several associated parameter values. The DTM will update both the GUI and the instance database with these values, e.g. HART commands 18 (process point, plant identifier, date) and 35 (upper range limit, lower range limit, unit).

Using the list box the *Configuration Change Counter* the user can view the device and communication status messages posted since the time the DTM application was

started. The list box displays the last valid message. Click the pull-down button to view the history of device messages.

Country Code, Time, SI Units settings area (Figure 14) is explained in detail below.

Country Code, Time, SI Units settings Area

Table 16. Country Code, Time, SI Units settings Area

Field	Description
Country Code	Select the country code from the list. Data format = Unsigned Integer.
SI Units Only	Select the SI units from the listed options • No Restrictions • Unit Codes limited to the SI units only Data format = Unsigned Integer.
Current date as estimated by device	Displays the real date saved in the device. A calendar can be activated here in which the real date can be entered. The date will then appear in the output box. Data format = Date.
Current time as estimated by device	The Real time clock saved in the device appears in this Field. A time control can be activated here in which the real time can be entered. Data format: Time.
Date of Last Clock Set	The Date of last clock has set data saved in the device appears in this Field. Data format = Date.
Time of Last Clock Set	The time of last clock has set data saved in the device appears in this Field. Data format: Time.
Clock Type	The clock type designation can be found in the Real time Clock Flags tables in the HART Common Tables Specification. Data format = Unsigned Integer.

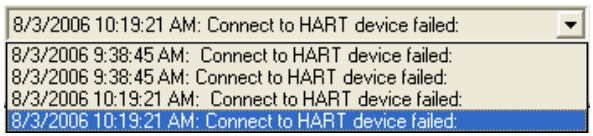


Figure 16. Status Messages

The following matrix shows the behavior of the Generic HART DTM when instantiated under AI880:

Table 17. Matrix

AI880	Generic HART DTM	Upload	Download	Read From DTM GUIs	Write From DTM GUIs
Full[1] Mode	**HART Read Only Enabled**	NOT ALLOWED No up/download is possible during the DTM is set to HART Read Only mode! Upload or download request failed Download could not be started	NOT ALLOWED No up-/download is possible during the DTM is set to HART Read Only mode! Upload or download request failed Download could not be started	ALLOWED	NOT ALLOWED (All buttons for write is disabled- User cannot select write option)
Full Mode	**HART Read Only Disabled**	ALLOWED	ALLOWED	ALLOWED	ALLOWED

Table 17. Matrix (Continued)

AI880	Generic HART DTM	Upload	Download	Read From DTM GUIs	Write From DTM GUIs
Read[(2)] Only	**HART Read Only Enabled**	NOT ALLOWED No up/download is possible during the DTM is set to HART Read Only mode! Upload or download request failed Download could not be started	NOT ALLOWED No up-/download is possible during the DTM is set to HART Read Only mode! Upload or download request failed Download could not be started	ALLOWED	NOT ALLOWED (All buttons for write is disabled- User cannot select write option)
Read Only	**HART Read Only Disabled**	NOT ALLOWED by AI880 Upload started ModuleBus: noConnection 38- No Connection 38- ModuleBus Error Upload Failed	NOT ALLOWED by AI880 Download started ModuleBus: noConnection 17- No Connection 17- ModuleBus Error Download Failed	ALLOWED	NOT ALLOWED BY AI880 ModuleBus: noConnection

Table 17. Matrix (Continued)

AI880	Generic HART DTM	Upload	Download	Read From DTM GUIs	Write From DTM GUIs
Disabled(3)	**HART Read Only Enabled**	NOT ALLOWED No up/download is possible during the DTM is set to HART Read Only mode! Upload or download request failed Download could not be started	NOT ALLOWED No up-/download is possible during the DTM is set to HART Read Only mode! Upload or download request failed Download could not be started	NOT ALLOWED BY AI880	NOT ALLOWED
Disabled	**HART Read Only Disabled**	NOT ALLOWED Upload started ModuleBus: noConnection Connection to device could not be established! Upload Failed	NOT ALLOWED Download started ModuleBus: noConnection Connection to device could not be established! Download Failed	NOT ALLOWED BY AI880	NOT ALLOWED

(1) Full Mode: All HART commands are supported

(2) Read Only Mode: Supports Universal HART read only commands and Common Practice HART read only commands only.
(3) Disabled Mode: No HART support is provided

For more details on AI880's Full Mode, Read Only Mode and Disabled Mode support, refer to the document *ABB Third Party DTM library Handling for Safety Mode (2PAA105446*)*

Documentation Tab

A link to the device-specific documentation is visible in this field. Changes can be done in offline mode only. For details see Documentation Tab on page 38.

Device Communication Statistics

The Device Communication Statistics application can only be called in online mode. An online operation such as device upload or observe window must have been done once before this window can be seen.

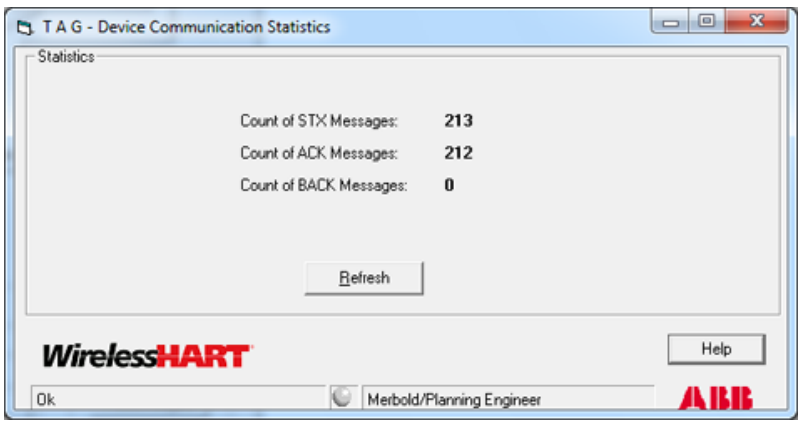


Figure 17. Device Communication Statistics (When Wireless HART device is connected)

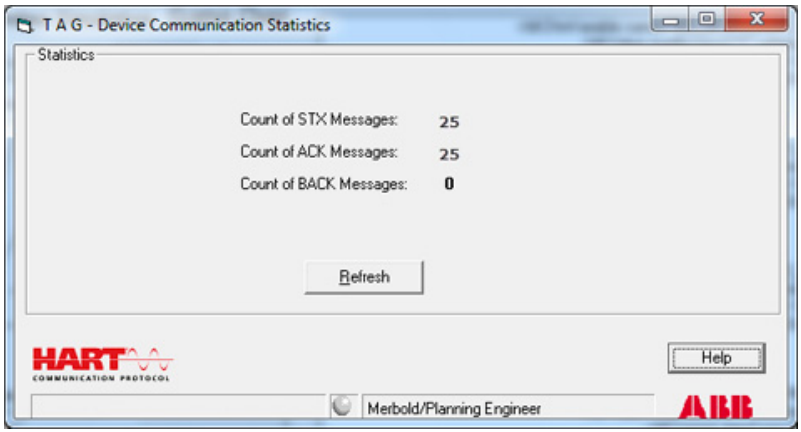


Figure 18. Device Communication Statistics (When Wired HART 7 device is connected)

Statistics Area

All information in this area relates to, statistics for its communication interfaces of the connected device type in online mode.

Table 18. Statistics Area

Field	Description
Count of STX Messages	A master to salve message. A transaction consists of an STX and a corresponding ACK. Data format = Unsigned Integer.
Count of ACK Messages	The response of a slave device to a master message. (I.e. a slave to master message). Data format = Unsigned Integer.
Count of BACK Messages	A Slave message transmitted to a master without a corresponding master request. Data format = Unsigned Integer.

Observe

Observe is an online application, which can be executed only if communication with the field device is running without errors. Depending on the functionality of the field device, the primary variable PV and up to three other variables will appear on the screen. The DTM updates these values cyclically. Disabling **Read cyclically** option stops the communication and displays the last read value. This measure reduces data traffic through bus couplers and I/O modules when operating several HART devices in parallel.

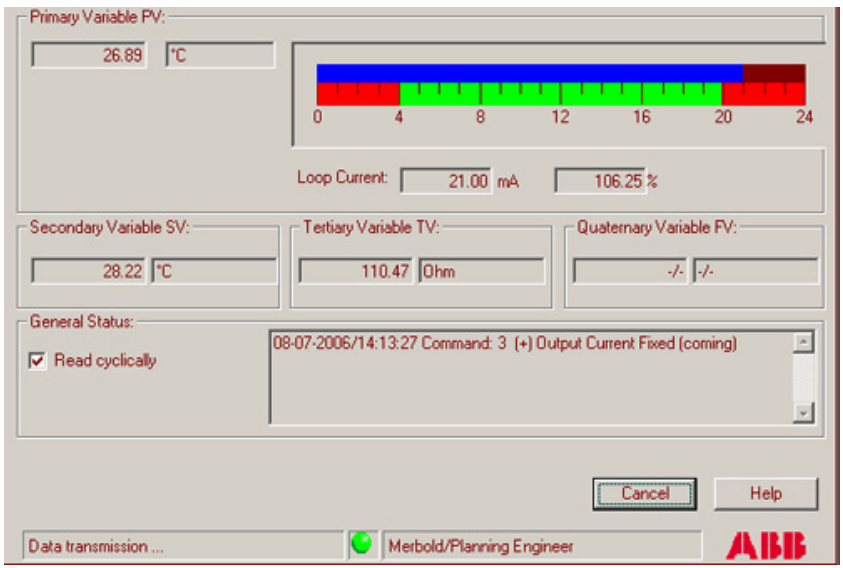


Figure 19. Observation Application

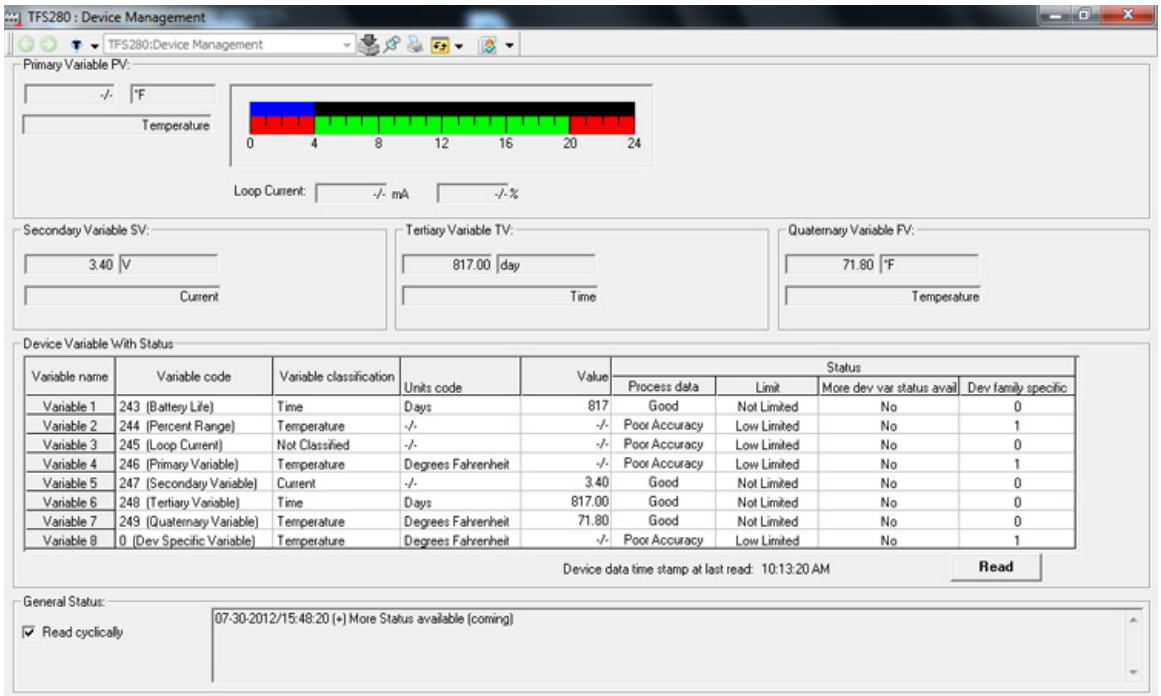


Figure 20. Observation Application (HART 7)

If the device variable classification is not supported by the device or not classified in the device, then the Unit codes will be shown as "-/-".

Primary Variable PV Area

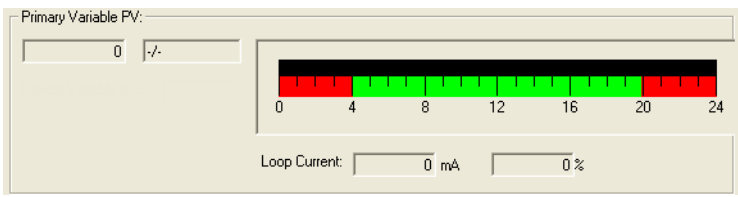


Figure 21. Primary Value Area

The first value on the top left corner shows the primary variable and its physical unit.

The additional values displayed in the analog indicator (bar graph) and the output boxes below are standardized and shows the primary current value in percent (%) and analog value (mA). These values may changed depending on the upper and lower range value set during *Configuration* or *Online Parameterization*.

Any changes to the upper and lower range values will have a direct effect on the standardized values.

Table 19. Primary Variable Area

Field	Description
Primary Variable PV	Numerical display of the primary variable and the associated physical unit. Depending on the unit, the PV can be different from the loop current.
Loop Current [%]	Numerical display of the physical current as a percentage value (%)
Loop Current [mA]	Numerical display of the physical current as a current value (mA)
Analog Display [mA] (Bar Graph)	Graphical display of the physical current as a current value (mA). The bar graph's input data corresponds to the loop current.
PV Classification	Displays the Primary variable classification as per HART Common Tables Specification. Data format = Unsigned Integer.

Additional Variables Area (SV, TV, FV)

Some field devices provide three values in addition to the primary variable. While the primary variable is usually output as a current between 4 and 20 mA, the additional variables are only available in digital format. The DTM attempts to read these values and the associated units cyclically through the Bus. If the field device

does not have any additional variables, the character string "-/-" will appear in the corresponding display fields.

Table 20. Additional Variables Area

Field	Description
Secondary Variable SV	Numerical display of the second variable and the associated physical unit
SV Classification	Displays the Secondary variable classification as per HART Common Tables Specification. Data format = Unsigned Integer.
Tertiary Variable TV	Numerical display of the third variable and the associated physical unit
TV Classification	Displays the Tertiary variable classification as per HART Common Tables Specification. Data format = Unsigned Integer.
Quarternary Variable FV	Numerical display of the fourth variable and the associated physical unit
QV Classification	Displays the Quaternary variable classification as per HART Common Tables Specification. Data format = Unsigned Integer.

Device Variable with Status Area

Command 9 allows a Master to request the value and status of up to eight Device or Dynamic Variables. Maximum number of device variables can be offered by

device can be read from command 0 byte 13 and those many variables can be offered.

Table 21. Device Variable with Status Area

Field	Description
Variable Code	Displays the default variable code as per HART 7 Specifications and can change the variable code. Data format = Byte.
Variable Classification	Displays the variable classification of device variable codes as per HART Common Tables Specification. Data format = Byte.
Units Code	Displays the unit code based on variable classification and Units code designation as per HART Common Tables Specification. Data format = Byte.
Value	Numerical value of the device variable code. Data format = Float.
Status	All cyclical process data (i.e., Device Variables and Dynamic Variables) include a Device Variable Status byte. Data format = Byte.
Process Data	The most significant two bits (i.e., bits 6 and 7) of every Device Variable Status byte return the overall status of the Device or Dynamic Variable value.
Limit	The most significant two bits (i.e., bits 4 and 5) indicate whether the Device Variable value is limited (i.e., not responding to the process).
More dev status avail?	The most significant bit (i.e., bit 3) indicate whether More Device Variable status is available.
Dev Family Specific	The content of the lower 4 bits depend on the Device Variable Family. Each Device Family can have its own Device Family-Specific status defining the least significant bits.

Table 21. Device Variable with Status Area (Continued)

Field	Description
Last data received at	a four byte time stamp to the response generated by the field device. The value corresponds to the time that Device Variable in Slot 0 of Command 9 was calculated.
Read	It reads the data from device based on the selected/entered variable codes. If any changes are done in the Variable code column, click **Read** to save and update the values.

General Status Area

This field offers the possibility to read cyclically the measuring values and the status information by enabling the *Read Cyclically* check box. Otherwise, the values will be read only once.

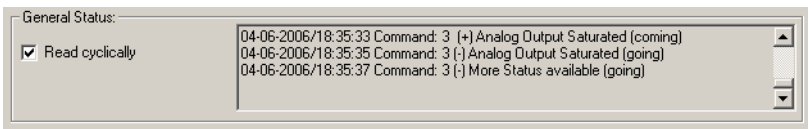


Figure 22. General Status Area

During each read cycle, the field device transfers the variables and, as standard, two status bytes. The status area provides information about the device itself, the primary variable and the additional variables. The DTM interprets the bits/response codes in the status and outputs a message accordingly. Each displayed message contains the event's time stamp, the involved HART command, the clear text message, and information on whether the event was coming (+) or going (-).

For more information on device status, refer to the application Diagnosis on page 63.

Diagnosis

The *Diagnosis* application of the Basic HART DTM displays notes, warnings, and errors relating to the communication, the field device, the commands, and the variables. The status bytes fed back as standard on a HART command are evaluated. All actions take place online.

For cyclic reading of the device status and the primary value, check the corresponding check box.

The *Diagnosis* application also offers the option of accessing additional device-specific status bytes. The number of additional status bytes depends on the connected device type. The displayed diagnosis bytes must be interpreted manually by using the device-specific user documentation.

Master Reset, *Reset Changed Flag* and *Perform Device Selftest* operations can be executed manually by clicking on the specific button.

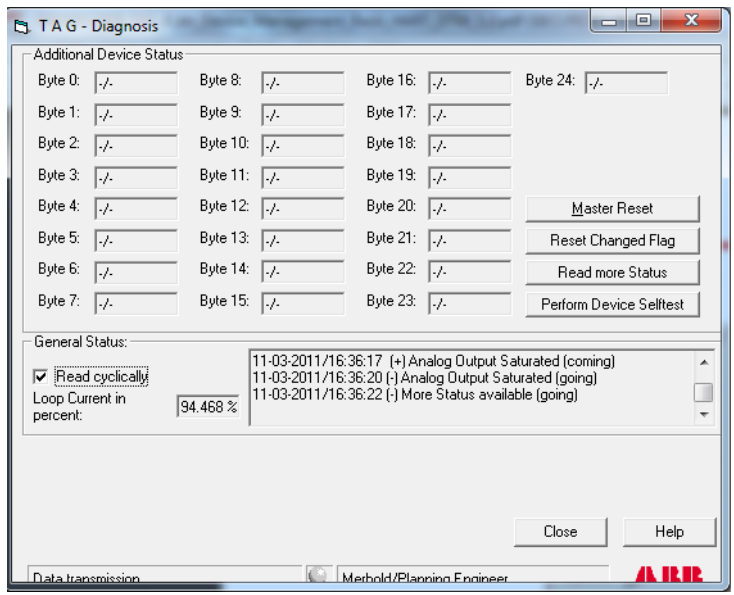


Figure 23. Diagnosis

The loop current, in percentage, can be monitored in parallel with the diagnostic information. Open the *Observe* application to display the additional variables.

Additional Device Status Area

If required, manufacturers can provide additional status bytes containing device-specific diagnostic information. Up to 25 bytes are available in the field device for this purpose. However the number of supported bytes depends on the connected device type.

The field device will use the general status to inform if any additional status information is present in the device. The following HART message will appear in the list box: *more status available*

The additional status bytes are not read cyclically by the DTM, but are only read on demand. To read the information in the bytes click on the **[Read More Status]** button. It may take the DTM a few seconds to obtain the status bytes from the field device. The meaning of the additional status bytes and their content can be found in the instruction manual for the field device. If no information is present, the display fields allocated to the individual bytes will remain empty (-/-).

General Device Status Area

The DTM reads the primary variable PV only once or reads cyclically and evaluates status bytes 1 and 2, which are returned by the field device in its response. The meaning of the individual bits/response code is set in the HART Common Response Code Specification. All status information will be displayed as text in a list box. Each displayed messages contains the events time stamp, the involved HART command, the clear text message, and an information on whether the event was coming (+) or going (-).

Table 22. Communication Errors

Communication errors	
parity error	checksum error
overrun error	buffer overflow
framing error	- /-

The following two tables are relevant only if there are no communication errors. A distinction is drawn between command-independent and command-dependent error messages and warnings.

Table 23. Command Independent Messages

Communication errors	
invalid selection	field device malfunction
passed parameter too long	configuration changed
passed parameter too small	cold start
too few data bytes received	more status available
Communication errors	
in write protection mode	analog output current fixed
access restricted	analog output saturated
device is busy	non-primary variable out of limits
command not implemented	primary variable out of limits

The following table shows error messages and warnings whose display is determined by the initiated HART command.

Table 24. Command Dependant Messages

Command-dependent (multiple meaning)	
update failure	update in progress
multidrop not supported	in multidrop mode
set to nearest possible value	applied process too low/high
lower range value too low/high	pushed upper range value over limit
upper range value too low/high	span too small
both range values out of limits	- / -

Button Control

The *Diagnosis* application offers specific functions to operate with the device.

Master Reset

This functionality performs a warmstart (command: 42) at the device. All data which are not stored at the device EEPROM are lost after this operation. To activate the master reset click on the **[Master Reset]** button. After performing the master reset the *read more status* function is called, which shows the additional device status.

Reset Changed Flag

If something was changed at the device configuration, an internal flag will be set automatically by the device. To reset this flag use the **[Reset Changed Flag]** button. In general, the DTM always resets this flag after a successful download into or upload from the device.

Perform Device Selftest

During a self test, the field device carries out internal test routines. To activate the self test, click on the **[Perform Selftest]** button. The command is sent directly to the device and is irreversible. The user will be prompted to confirm the command. Depending on the number and complexity of the test routines, it may take a while for the device to complete the self test. The result of the test is contained in the additional status bytes, which the DTM will automatically scan and display. The meaning of the status bytes and their content can be found in the instruction manual for the field device.

Read More Status

The additional status bytes are not read cyclically by the DTM, but are only read on demand. To read the information in the bytes click on the **[Read More Status]** button. Refer to **Additional Device Status Area** in this section.

Force / Simulation

This application enables the user to force/simulate the current output of the field device at a constant current of 4 to 20 mA. This function can be used for example to test signal lines or the I/O module and to check the limits set. *Force* is only possible online, that is if the DTM can communicate with the HART field device through the I/O module.

The *Force* function shall not be used to force the position of an Actuator. Actuator and Positioner control the position with input current, whereas this application set the output current.

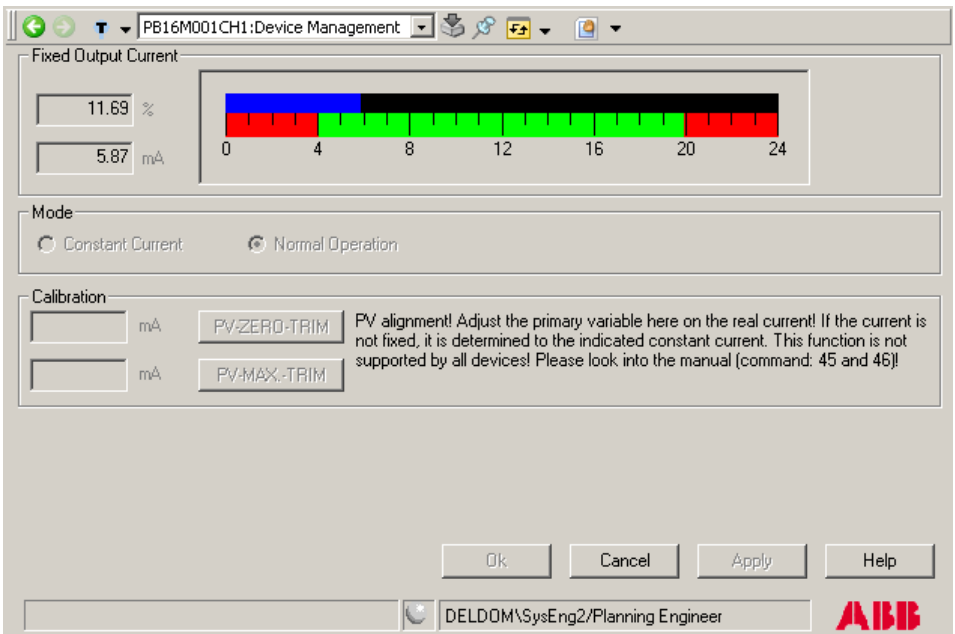


Figure 24. Force

The *Force* application also offers the possibility to calibrate the device to adjust the primary value to the physical output current.

Run the *Observe* application in parallel for monitoring the live process variable PV and additional variables.

Fixed Output Current Area

The required constant current can be selected in this section in three ways.

Table 25. Fixed Output Current Area

Field	Description
[%]	Numerical input of the constant current as a percentage value
[mA]	Numerical input of the constant current in mA
Slider [%]	Set the constant current as a percentage value using the slider

Mode Selection Area

Table 26. Mode Selection Area

Field	Description
Constant Current	Selects the "Constant Current" mode for the output of the set constant current
Normal Mode	Selects the "Normal Operation" mode for the output of the current process value. This mode releases the fixed output current.

Note that if *Constant Current* mode is selected by clicking **[OK]**, the mode will still be active even after closing the application.

If *Constant Current* mode is still active, the DTM will inform the user of this by means of a dialog window and prompt the user to confirm, if it is still required.

The preset constant current and the selected mode ("Constant Current/Normal Operation") can only be activated by clicking **[Apply]** or **[OK]**. As the entries are sent directly to the device and processed there, the DTM will prompt the users to confirm their selection.

Calibration Area

In this frame, a calibration of the loop current can be performed. This means aligning of the digital value to the analog value. To do this, the following conditions must be fulfilled:

- The device must support this functionality.
- The device is set to fixed output current (Constant Current) and set to the specific force value dependent to the Calibrations set (4mA for zero trim; 20mA for Max trim). For more details, refer to the Sequence of execution.
- The user has knowledge of the corresponding analog value.
- The device does not affect the plant process, as the output current will be forced.

Sequence of execution

The steps to perform calibration of the loop current is given below:

1. Switch to Constant Current radio button in the mode area.
2. Fix output at low (4mA) level (fix level can be from 2 mA up to 6 mA).
3. Click on the [**Apply]** button.
4. Measure analog value externally (e.g. 4.13 mA).
5. Enter the low analogue value (e.g. 4.13) in the proper text box of the calibration area.
6. Click the [**PV-ZERO-TRIM**] button.
7. Confirm the message that appears.
8. Fix output at high (20mA) level (fix level can be from 18 mA up to 22 mA).
9. Click on the [**Apply]** button.
10. Measure analog value externally (e.g. 19.91mA).
11. Enter the high analog value (e.g. 19.91) in the proper text box of the calibration area.
12. Click [**PV-MAX.-TRIM]** button.

13. Confirm the message that appears.
14. Switch back to the Normal Operation radio button in the mode frame.

If the gap between analog and digital value is known, the user has to only enter the two values (fixing point and measured value). The output will be fixed automatically and released after successful operation.

List View

The *List View* displays all HART parameters used from the Basic HART DTM (incl. DTM extensions through DTM Builder, if applicable). It therefore provides a means of checking the current device configuration and enables the parameters selected by the user to be read and/or written in online mode. Clicking at the headline sorts the rows alphabetically or numerically. Commands that cannot be modified are shown in grey color.

List View application can be called up in offline mode also. Read/Write access is disabled in offline mode.

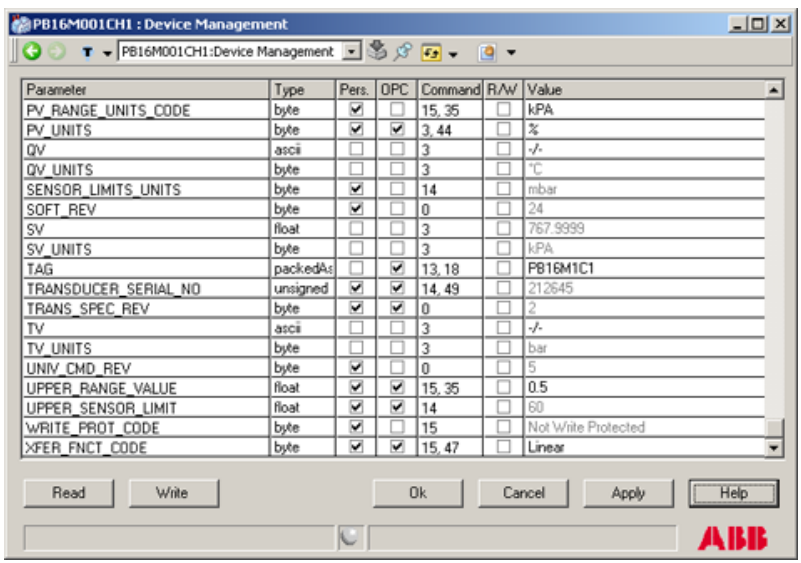


Figure 25. List View in online mode

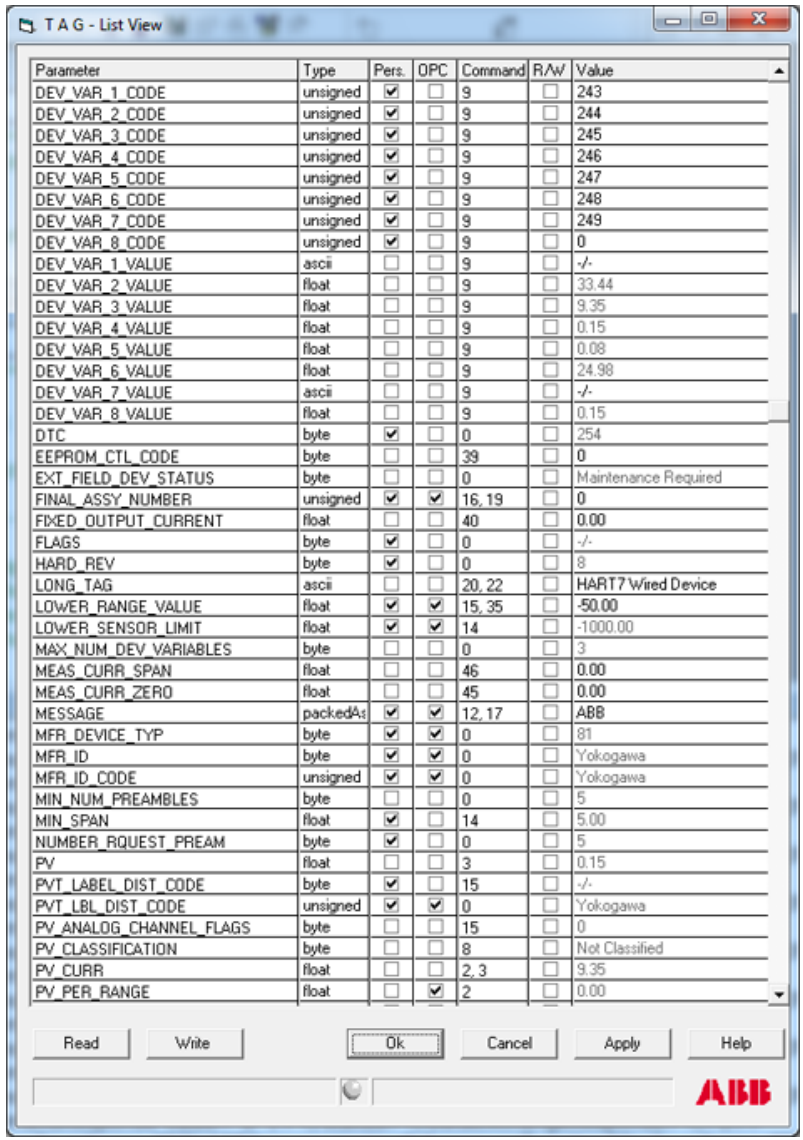


Figure 26. List View in online mode (HART 7)

This application offers the possibility to change single configuration data without calling another specific DTM application. The parameter that needs to be changed must be checked in the R/W column. Click on the [**Read**] button to read the value from the device. Click on the [**Write**] button to write the data to the device. The instance data set is also updated.

Table 27. List View

Field	Description
Parameter	Name of the HART parameter
Type	Data type
Pers.	Save parameter permanently to the field device instance data set, that is persistence.
OPC	Parameter value is available through the OPC Server
Command	HART command in which the parameters in this device configuration are used
R/W	Defines whether the parameter is written and/or read in online mode, according to parameter's definition.
Value	Current value of the parameter. When user select the value entry a combo box appears. User can select a value from the pull down menu. If no combo box appears, values corresponding to the type in the type column can be entered.
	The values of all parameters marked R/W are read in again by the device.

Table 27. List View (Continued)

Write	The values of all parameters marked R/W are written to the device. Unlike a complete download, this enables the parameters used in the device configuration to be modified selectively.
Apply	All parameters are checked for plausibility and if found ok, then written to the device's instance data set. In case plausibility check fails, corresponding parameters become red colored and have to be corrected by the user.

Only writable parameters can be modified. In offline mode, the changed configuration data will be directly written to the instance data set by clicking on the [**Apply**] or [**OK**] button. To synchronize device and instance data set, an upload/download must be initiated by the user.

The maximum length of an hexstring parameter is twice the declared length of this parameter (e.g hexstring length=12 allows a parameter input up to 24 characters).

Parameter Exchange

Before starting the system or replacing a defective device, it is recommend to carry out a data comparison. Once the parameter values have been compared, the user can

decide whether an upload, download, or selective parameter exchange is the most appropriate measure to maintain consistent data.

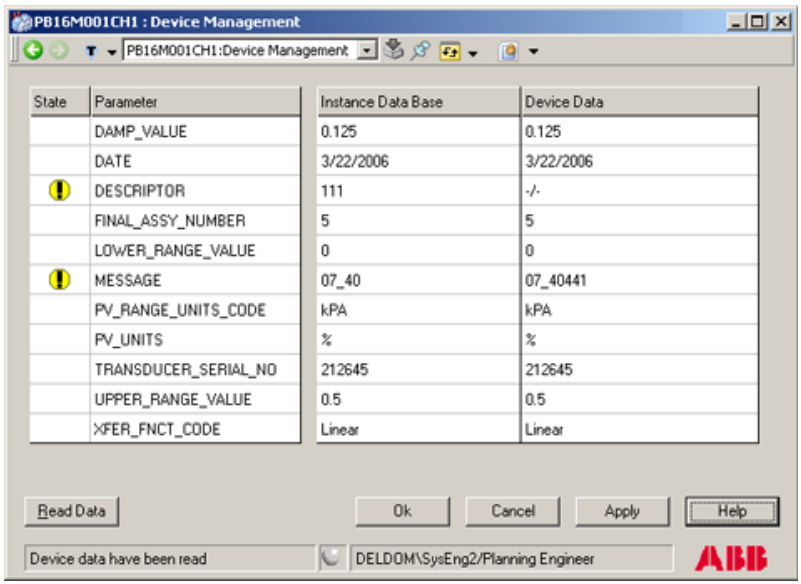


Figure 27. Parameter Exchange

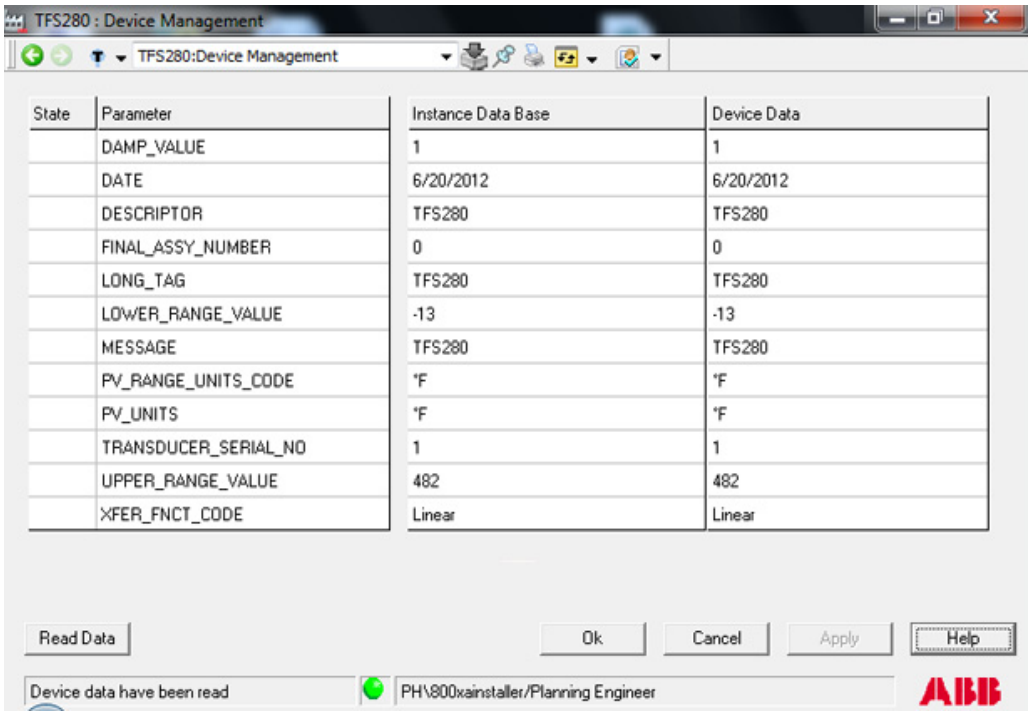


Figure 28. Parameter Exchange (HART 7)

= Conflicting parameter values identified

Conflicting Parameter Values

For data comparison of the persistent data supported by the DTM, click the [**Read Data**] button. The application reads data from the instance data record and also the current data from the field device. The two sets of data are displayed in the table and highlights any parameters with conflicting values in the first column of the table. This application covers only writable parameters as defined in the HART command specifications.

Exchanging Parameter Values

The *Parameter Exchange* function enables the user to align conflicting parameter values. Select the values in the instance data record (left-hand column) and drag & drop them into the device data column (right-hand column), or vice versa. At this point, any modifications made affects only the data displayed in the table and are highlighted accordingly by the DTM. The data in the field device and the computer database will not be modified.

Click on the **[OK]** or **[Apply]** buttons once it is confirmed that the modifications that are done are correct. Once the modifications have been confirmed, the DTM will update the data in the instance record and the device in accordance with the updated table. The highlighting is removed from the table. Data transferred to the device may need to be made non-volatile. To do this, execute the EEPROM commands on the first tab of the *Online Parameterization* GUI.

During *Parameter Exchange*, if modifications happen in the wrong direction or if a communication error occurs, then the values can be corrected. To correct the parameter values, open the *Online Parameterization* or *Configuration* application and repeat the parameter exchange process.

Once the application has been closed, the DTM deletes the temporary data required for comparison and exchange. This means that the device data must be read each time this application is carried out. This ensures that the user is always working with the current device data and not with obsolete data.

About DTM

For general information directly related to the product software, select the *About DTM* menu item. It contains all the information needed to identify the Basic HART DTM software version and user data entered during software installation.

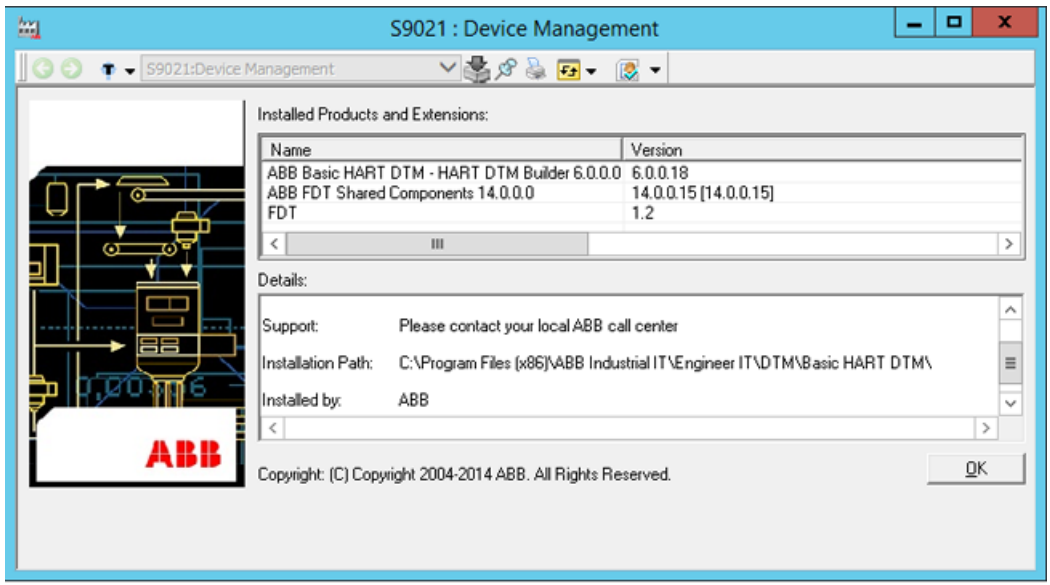


Figure 29. About DTM

Name/Version

For any queries about the product, it is essential to provide the name of the internal software component and the version. The build indices in brackets are also important.

Table 28. Software Component Information

Component	Description
Basic HART DTM	Version and build index of the *Basic HART DTM*

Table 28. Software Component Information (Continued)

Shared Components	Version and build index of the *FDT Shared Component*
FDT	Supported FDT version DTM was developed in accordance with specification FDT1.2

Details

This field contains important information about DTM vendor, support, installation path and the licensee, which was entered during installation.

Registration

The Basic HART DTM can be expanded with HART DTM Builder functionality. By default, only the Basic HART DTM is licensed for use.

A separate license key is required for the HART DTM Builder. This is associated with the one workstation computer on which the software is to be installed and operated.

Notice that the HART DTM Builder is for ABB internal use only. ABB provides limited support for the HART DTM Builder functionality.

This application is not required by the standard user and shall not be used.

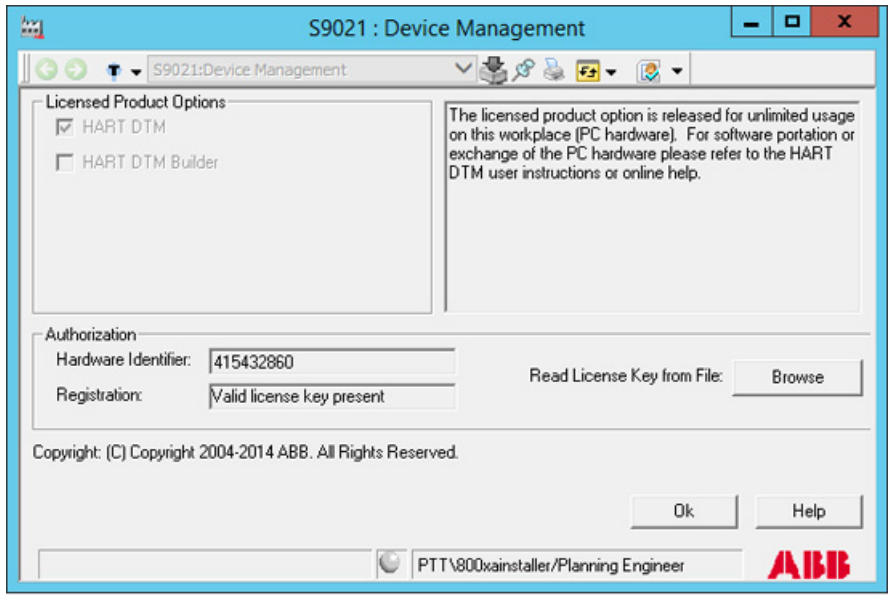


Figure 30. Registering the license key

Non-Graphical User Applications

There are certain functions that are supported by the DTM but are available from the frame application. They do not have a dedicated graphical user interface but are available through a context menu from the frame application. Following are the ones that do not have a dedicated graphical user interface but are still available.

Upload

During *Upload,* all data required for the applications is read from the field device and saved to the corresponding instance data record. An upload can be used for commissioning (initial startup) if a device-specific configuration is not available (planning phase), meaning that the instance data record only contains the default

values. An upload, during commissioning, reads the factory-set data from the field device and writes it to the instance data record.

An upload completely overwrites the data in the instance data record.

The application has no GUI and is called directly by the frame application, for example, bulk data management.

Download

If concrete parameter values have already been loaded to the database (instance data record) during the planning phase by means of the configuration, these can be written to the field device by performing a download.

A download completely overwrites the data in the field device. Data transferred to the device may need to be made non-volatile. To do this, execute the EEPROM commands on the first tab of the *Online Parameterization* GUI.

The *Parameter Exchange* application can be used to apply data selectively. This application is useful if factory-set data such as the process point, serial numbers, etc. is not to be overwritten with the default values from the instance data record. The application has no GUI and is called directly by the frame application, for example, for bulk data management.

Upload and download is not possible from the Fieldbus Management when the HART Read Only mode is enable in the HART DTM Configuration.

Verify

Verify validates the complete data set by internal business rules of the DTM. It returns the value *True* to the application if the complete data set is valid. The application has no GUI and is called directly by the frame application, for example, for bulk data management.

Online Compare

Online Compare compares the complete set of device parameters. This is different for the *Parameter Exchange* application, which focuses on writable parameters only. The instance data stored in the database is compared with the same set of data

uploaded from the field device. The application returns the value *False* to the frame application in the event of conflicting values.

Even though all writable parameters are balanced with the help of the *Parameter Exchange* application, the overall result of the *Online Compare* application could be FALSE due to conflicting readable parameters. Perform an *Upload* in order to read factory-set data from the field device and write it to the instance data record.

The application has no GUI and is called directly by the frame application, for example, for bulk data management.

Printing

If the frame application supports printing feature, then the DTM allows the user to print out the actual set of persistent stored data and their actual values.The application has no GUI and is called directly by the frame application. For example, for bulk data management.

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