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About This User Manual

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 a control 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 control system.

This User manual provides a description of the S900 I/O DTM product which includes DTMs for the S900 I/O and control systems (see S900 DTM Features on page 11). It provides instructions for installation and for operation of the DTMs and control systems.

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.

Use of Caution, Information, and Tip Icons

This publication includes Warnings, 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 a 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.

The information icon draws the reader’s attention to pertinent facts and conditions.

The tip icon provides advice about how, for example, to design your project or 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 System 800xA 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.

<table>
<thead>
<tr>
<th>Term/Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACK</td>
<td>Acknowledge</td>
</tr>
<tr>
<td>BACK</td>
<td>Burst Acknowledge</td>
</tr>
<tr>
<td>Device Type Manager (DTM)</td>
<td>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.</td>
</tr>
<tr>
<td>FDT Frame Tool</td>
<td>Frame application (run time environment) in accordance with the FDT specification for operating DTMs</td>
</tr>
</tbody>
</table>
### 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
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.
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.
Section 1  Functionality

FDT / DTM - General

The FDT/DTM technology describes an interface between the field instrument level and the supervisory process control system or configuration tool. Basically, a DTM can be considered as a device driver, similar to the printer driver known from the world of interoffice communication. The DTM encapsulates the device-specific functions of the process control system in such a way that it can access every field device via identical interface functions (like parameterization, configuration, diagnosis, channel description).

The FDT 1.2 specification describes a set of interface to integrate the device-specific driver software (DTM) of the device manufacturer into the frame application.

S900 DTM Features

General

The DTM is a software component, which is usually supplied by the manufacturer together with the field device. Like a printer driver, the DTM maps the field device and its features regarding configuration, parameterization, input and output data or diagnosis to the process control system's configuration interface. DTMs allow for vendor-independent field device integration into a process control system.

Functions

The DTM represents the S900 I/O System in an FDT 1.2 compatible engineering tool. The functions provided by the DTM are:

- Configuration
Parameterization

With parameterization the characteristic of I/O channels are adjusted (range, supervision, failsafe strategy...)

Diagnosis

As an alternative to the standard PROFIBUS diagnosis the DTM provides another graphical access to device-specific diagnostic data. Note that the diagnosis function is available in online mode only.

Identification

The Identification function is used for reading from the individual S900 I/O modules the module type, serial number, batch code, and hardware and firmware revision level and displays this information. The information is saved in the DTM and is also available in 'Offline' mode.

Configuration

Configuration determines the layout of the S900 station with its I/O modules and as a consequence the structure of the cyclic input and output data. As a result, configuration is only possible in 'Offline' mode, as PROFIBUS does not allow changing the volume and structure of I/O data while operation is in progress (i.e. in 'Online' mode).
I/O Modules Supported

The ABB DTM S900-DP has a modular design and describes the S900 basic components (termination units, power supplies) and all I/O modules. The DTM supports the following S900 I/O modules:

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>DTM</td>
<td></td>
<td>DTM CI920/CI920A</td>
</tr>
<tr>
<td>Binary input / output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DI920</td>
<td>Binary input, 4 x 1 channel (NAMUR contact)</td>
<td>2.8.x -&gt; (1)</td>
</tr>
<tr>
<td>DO910</td>
<td>Binary output, 4 x 1 channel (valve control module)</td>
<td>2.0.x -&gt;</td>
</tr>
<tr>
<td>DO930</td>
<td>Binary output, 4 x 1 channel (valve control module)</td>
<td>2.8.x -&gt;</td>
</tr>
<tr>
<td>DX910</td>
<td>Binary input/output, 1 x 8 channels</td>
<td>2.0.x -&gt;</td>
</tr>
<tr>
<td>Analog input / output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI910</td>
<td>Analog input, 1 x 4 channels, active</td>
<td>2.4.x -&gt;</td>
</tr>
<tr>
<td>AI920</td>
<td>Analog input, 4 x 1 channel, active / passive</td>
<td>2.8.x -&gt;</td>
</tr>
<tr>
<td>AI921</td>
<td>Analog input, 4 x 1 channel, current / voltage</td>
<td>2.5.x -&gt;</td>
</tr>
<tr>
<td>AI922</td>
<td>Analog input, 4 x 1 channel, active</td>
<td>2.8.x -&gt;</td>
</tr>
<tr>
<td>AI923</td>
<td>Analog input, 4 x 1 channel, passive</td>
<td>2.8.x -&gt;</td>
</tr>
<tr>
<td>AI930</td>
<td>Analog input, 1 x 4 channels, active, HART</td>
<td>2.0.x -&gt;</td>
</tr>
<tr>
<td>AI931</td>
<td>Analog input, 1 x 4 channels, passive, HART</td>
<td>2.0.x -&gt;</td>
</tr>
<tr>
<td>AO910</td>
<td>Analog output, 1 x 4 channels</td>
<td>2.4.x -&gt;</td>
</tr>
</tbody>
</table>
### I/O Modules Supported

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>DTM</td>
</tr>
<tr>
<td><strong>AO920</strong></td>
<td>Analog output, 4 x 1 channel (electrically isolated)</td>
<td>2.0.x -&gt;</td>
</tr>
<tr>
<td><strong>AO930</strong></td>
<td>Analog output, 1 x 4 channels, HART</td>
<td>2.0.x -&gt;</td>
</tr>
<tr>
<td><strong>Temperature</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>AI950</strong></td>
<td>Temperature input, 4 x 1 channel, resistance / thermocouple</td>
<td>2.0.x -&gt;</td>
</tr>
<tr>
<td><strong>Counter / frequency</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DP910</strong></td>
<td>Frequency input and counter, 2 blocks</td>
<td>2.0.x -&gt;</td>
</tr>
</tbody>
</table>

(1) = 'and higher '

For details about the availability of the above listed I/O modules please refer to the S900 price list 3BDD010429. The range of supported I/O modules depends not only on the DTM, but also on the firmware revision level of the S900 communication interface CI920 / CI920A. The configuration and handling of CI920 and CI920A within the system is same for both versions. Hence, they are commonly referred to as CI920 throughout this manual.
Prerequisites and Requirements

Operating Systems

The DTM has been tested and can be run with the following operation systems:

- Windows 8.1 Professional or Enterprise edition.
  - 32-bit (x86).
  - 64-bit (x64).

FDT Frame Applications

The DTM has been tested and can be run with the ABB 800xA frame application.

For the compatibility of the above-stated frame applications, observe the version-specific documentation for limitations or extensions.
Section 2  Installation

System Requirements

The ABB DTM S900-DP version 2.0.x and higher will not run in frame applications conforming to version 0.98 of the FDT specification.

Make sure you have administrator rights when logging in to your PC. Close all other Windows applications, especially the FDT frame applications to be used.

Language Setting

The setup program (Install Shield) opens with the set operating system language. English is the default setting if it does not support the local language. During the installation procedure the desired language (for setup) can be selected. The setup program supports English and German.

Backup

It is recommended to create a backup of your memory medium prior to starting the installation process. This backup will enable the user to restore your data if the medium is damaged, or in the event of a fatal error on your computer. Make sure that the backup is clearly marked and carefully maintained.
Initial Installation

The S900 DTM can be installed by 800xA System Installer. Refer to *System 800xA Getting Started (2PAA111708*) for detailed information.

In case automatic installation by system installer is not done or manual installation is done in other control system, then follow this procedure.

To install the S900 I/O DTM component through command prompt, do the following steps:

1. Run the command prompt (administrator login) and change it to the drive where the builds are copied, for example D drive would be `D:/`.

2. Enter `cd <space> Path`.

3. Enter `msiexec <space> i <space>"MSIname"` and press enter. The system prepares for installation.

![Windows Installer](image)

*Figure 1. Windows Installer*
4. Follow the instructions on the screen and accordingly and then click **Next**.

*Figure 2. InstallShield Wizard*
5. Enter the **User Name** and the **Company Name** and then click **Next**.

![Figure 3. Customer Information Screen](image)

*Figure 3. Customer Information Screen*
6. Read and Acknowledge the license agreement and then Yes.

Figure 4. License Agreement
7. Click **Next** or click **Change** to install to a different folder.

![Choose Destination Folder](Image)

*Figure 5. Choose Destination Folder*
8. In the Custom Setup window, select the required components and click **Next**.

![Custom Setup Window](image)

*Figure 6. Selecting Components*

This dialog window allows the user not to install the DTMs for some S900 I/O modules. By default, the DTMs of all available I/O modules are activated in the Install Shield.
9. Select the required S900 DP settings and click **Next**.

![Selecting the FDT Frame](image)

**Figure 7. Selecting the FDT Frame**

With these options, the user can adapt the DTM to the specific characteristics of the 800xA with AC 800M ABB process control system.

Activate the respective option to run the DTM with these process control systems.

When selecting the 'ABB Mixed Systems and FDT Standard Frames' option, note that the DTM functions "Offline Parameterize", "Observation" and "Simulation" are not supported, since they are already available in the 800xA System with AC800M.
10. Click **Install** to confirm the installation process.

![InstallShield Wizard](image)

*Figure 8. Installation Start*
As soon as installation is complete, a dialog window appears. In this window, click [Finish] to complete the end of successful installation.

*Figure 9. Installation Complete*

The Install Shield automatically determines whether the PC must be restarted after the installation. If the user is not requested to restart the PC, the Install Shield will copy or register all the required data and the user need not perform a restart.
Section 3  System Environment

DTM Runs inside the Engineering Tool

The preferred operation of the ABB DTM S900-DP is the integration in the engineering tool of the PROFIBUS master or process control system. This ensures absolute data consistency: Both master and slaves operate with identical configuration and parameterization data. The engineering tool for ABB’s 800xA is frame applications with FDT 1.2 interface for integrated DTMs.

Figure 10. S900 DTM in a single user environment
Multi-User Environment

A multi-user environment allows the user to use more than one engineering tool in a process control system at the same time. The S900 DTM can be run in a multi-user environment under the provision that the data sets are protected against simultaneous multiple access. A system like 800xA allows the user to open several DTMs in parallel.

*Figure 11. S900 DTM in a multi-user environment*
The PROFIBUS-DP configuration means arranging the individual I/O modules of a modular slave. The configuration is done by Control Builder M. This configuration makes changes that have an effect on the structure of the I/O data telegrams.

Every component of an S900 I/O System in 800xA is represented by its own DTM. The basic DTM (S900-DP) can be seen as an empty termination unit without any modules plugged in.

To add an S900 Station to your project, proceed as follows:

1. Add a new PROFIBUS Slave (S900-DP) to the hardware tree under the PROFIBUS master. The assignment of the slave address is not performed by the DTM, but by the FDT frame, as only the FDT frame is informed of already existing addresses.

2. The CI920 module (CIPB) is plugged to slot #0 of the still empty station.

3. Select for all slots the desired module type from the list of available I/O modules. Each time when a module is added, a dialog appears which helps the user to select the slot address. No empty slot has to be configured.

When creating the modules, their input and output data (channels) are described in parallel.

Adding and removing of a S900 Station and / or its I/O modules require an installed DTM. To uninstall a DTM, first delete all slaves configured with the DTM. Update of the DTM is possible without deleting of S900 Stations, if both, old and new DTM have version 6.x.y.
Section 5  Offline Parameterization

The PROFIBUS-DP parameterization means defining the properties of already configured modules. The parameterization is done by Control Builder M in 800xA.

This dialog is available for all I/O modules and the CI920 Communication Interface, but not for the S900 Station itself, because it has no own parameters. The DTM ensures always a consistent parameter set. The meaning of the parameters is described in the manuals of the respective module types.

By clicking the [Apply] or [OK] button, all settings are written into the database of the FDT frame application. Use the [Cancel] button to close the window without saving the entered data.

The new parameter settings only become active upon downloading them to the S900 Station.
Section 6  Identification of Connected S900 Components

This dialog window is available in online and offline mode and shows the following information:

- Manufacturer
- Serial number
- Order number
- Short description
- Hardware and software revision level
- I/O module type, version number and Slot number
Figure 12. Identification of Connected S900 Components

This information is also available in offline mode for maintenance purposes. When this dialog is opened in online mode, the data is automatically updated and saved in the FDT frame application's database. In the 'Last update' field the date of the last update is shown when this dialog is opened in offline mode.
Section 7  Diagnosis of S900 Components

The DTM diagnosis function is an enhancement of the standard mechanisms provided by the PROFIBUS diagnosis function. The diagnosis displayed by the DTM is transmitted on demand, not triggered by an event like the standard PROFIBUS diagnosis. So it cannot be ensured, that every short-term failure is caught.

The DTM diagnosis function should be seen as a help for commissioning and as an enhancement of the PROFIBUS standard diagnosis. It displays the diagnosis information in a user friendly way.

Station Diagnosis

Station diagnosis gives an overview (status) of the whole S900 Station. An error free slot is displayed in white color. Modules with channel errors are colored yellow. Slots with configuration errors are colored red.
I/O Module Diagnosis

The module diagnosis "looks into" the selected I/O module. All module and channel related errors are displayed. To help the service personnel to locate the failure, the module block diagram is shown and the affected field terminals are marked red.
Figure 14. I/O Module Diagnosis
Section 8  HART Communication

A benefit of using the S900 Process I/O System is that the routing of HART commands is done through the PROFIBUS network. HART commands are encoded into acyclic PROFIBUS data telegrams. The ABB DTM S900-DP and the S900 CI920 Communication Interface handle the encoding and decoding. As the ABB DTM S900-DP is the proxy of the S900 Station, for the HART field device also a DTM is required.

The following S900 I/O modules support HART communication with a subordinate HART field device DTM:

- AI930S/N/B Analog input, 4..20 mA, active (with supply voltage).
- AI931S/N/B Analog input, 4..20 mA, passive (without supply voltage)
- AO930S/N/B Analog output, 4..20 mA

The S900 I/O module acts as Primary Master for the HART communication, while a Hand Held Terminal (HHT) is a Secondary Master. The Primary Master is prioritized to communicate with the device but an additional Secondary Master is tolerated.

Communication with a Hand Held Terminal in parallel with the DTM is possible but not recommended. The low transmission rate provided by the HART Protocol results in a long response time. Additionally, data inconsistency may be caused by the quasi-parallel access in the HART field device.

Addressing Scheme

When a HART field device is connected to an S900 I/O module, a point-to-point connection is established between them. The HART field device can be addressed unambiguously in the network by its S900 station address, module slot and channel. The long address and TAG of the HART field device are not needed for this.
The TAG handling in the DTM of the HART field device is not product-specific. Seen from the S900 or S900 point of view the TAG is not required. Some HART device DTMs, however, needs consistent TAG information in both the database and the field device. In this case the TAG information in the database must be matched with the HART field device by using the HART field device DTM.

**Adding a HART DTM**

In the commissioning phase adding a new component is initiated at the module or channel level. The FDT frame application offers only HART field devices from a device catalog for adding. The HART field device DTM is then connected under the S900 I/O module DTM to the same channel in the same way as the HART field itself is connected to the S900 I/O module.

The following illustration shows the relation between the physical bus topology and the DTM as the proxy of each communication component.
The S900 DTM supports a top-down strategy for the HART field devices. All parameters are set in offline mode and then downloaded into the field device in the commissioning phase. Additionally, the DTM supports the bottom-up method, where the data of pre-selected field devices is copied into the process control system's database during commissioning. Pure online parameterization where data is written to both the database and the HART field device in parallel is also possible.

Usually, HART devices store their parameter settings in the non-volatile memory. However, after replacement of a HART device it must be checked in any case if the device parameters are consistent with the set point values stored in the database. If required, all parameters must be uploaded or downloaded again.
Compatibility

The S900 DTM complies with the FDT 1.2 standard and will only communicate with HART devices that are also in accordance with the standard. In case of doubt, contact ABB (DIC@in.abb.com) to have your HART field device DTM checked prior to working with it.
Section 9 Using CI920 in CB220

All S900 I/O modules and the CI920 can be used either on the termination unit TU921 or in the field device CB220. The scope of this document is the use on the TU921. For use at CB220 the following deviations have to be considered.

- The special properties of CB220 are described in S900 Manual CB220 (3BDD010437*) manual.
- The layout of S900 components (I/O modules) within the S900-CB220 differs from those with "standard" termination unit TU921. The layout in the DTM matches the TU921. The real layout of the S900 components in S900-CB220 looks as follows:

- PROFIBUS addresses can be set from 1 to 99 only. The adjustment of the PROFIBUS address is described in the CB220 manual.
- Redundancy is not supported. The parameters 'Power supply redundancy' and 'Fieldbus redundancy' must be set to single / off. These are the default values, too. If redundancy is parameterized for a CB220 it will report redundancy errors at PROFIBUS diagnosis, but nevertheless the station would enter the cyclic data exchange state.
- The CB220 offers 4 I/O module slots only, compared to 16 slots of the TU921 termination unit. During configuration in the master's engineering tool either by GSD or DTM (Device Type Manager) the user has to observe the slot limit.
The PROFIBUS diagnosis to cyclic master and DTM's diagnosis view assumes a termination unit with 16 slots. If the target configuration contains 4 or less I/O modules the remaining slots 5..16 will not report errors on CB220.