

FieldMate: Versatile Device Management Wizard Evolving with Field Instruments

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FieldMate is field instrument adjustment and configuration software applying Electric Device Description Language (EDDL) and Field Device Tool/Device Type Manager (FDT/DTM) technologies. The main purposes of this software include supporting a wide range of models of field instruments and field communication protocols. IT and communication technologies are advancing at a rapid rate, accompanied by the advance of field digital technologies, which has led to the increasing release of new field devices, and progress of field communication protocols. The FieldMate should support these new devices and protocols, and Yokogawa has continued efforts to this end since its release. As part of such efforts, Yokogawa has released FieldMate R2.02 which boasts improved usability as well as supports new devices and protocols. This report introduces new features of FieldMate R2.02.

INTRODUCTION

FieldMate is field device adjustment and configuration software applying Electric Device Description Language (EDDL) and Field Device Tool/Device Type Manager (FDT/DTM) technologies. The FDT/DTM is being standardized and disseminated by the FDT Group, a nonprofit organization. Yokogawa is also aggressively participating in those activities.

IT and communication technologies are advancing at a rapid rate, accompanied by the advance of field digital technologies, which has led to the increasing release of new field devices, and progress of field communication protocols. The essential aim of the FieldMate is to support these new devices and protocols. Since its release in 2006⁽¹⁾, Yokogawa has enhanced its features under the concepts of "My PC installation" (easily installable and usable in a user PC), "Easy connection and operations," and "One tool for all" (supporting as many field devices and field communication protocols as possible).

As part of such efforts, Yokogawa has released FieldMate R2.02, which offers improved ease of use as well as support for new field devices and field communication protocols. This paper introduces the new features of the FieldMate R2.02.

OVERVIEW OF FIELDMATE R2.02

The FDT defines the software architecture (including interfaces) that makes it possible to adjust and configure field devices on an open framework. Figure 1 shows the software configuration of the FieldMate R2.02 based on the FDT and the connection to field devices.

The FDT frame application is a dedicated application program using the DTM. The DTMWorks is an FDT frame application for performing field device-specific adjustment and configuration using a device DTM. The device DTM is an application program (ActiveX control) provided with display screens. The communication DTM performs processing specific to field communication protocols. The Built-in DTM is a program built into the FieldMate R2.02, details of which are described later.

The Parameter Manager is used to adjust and configure field devices, manage field device parameter values, etc. using Electric Device Description (EDD) files. The EDD files are a data dictionary that defines field device parameters and access methods for these parameters and are provided by each field device vendor. The Parameter Manager cannot perform such sophisticated processing as the DTMWorks, but provides the same user interface for all field devices.

EDD files and device DTMs corresponding to Yokogawa's field instruments are combined as Device Files and supplied to users. The Device Files is not simply provided as a part of the FieldMate software package, but allows the owner of newly released Yokogawa's field instruments to purchase the latest version separately or download it from the Yokogawa's website.

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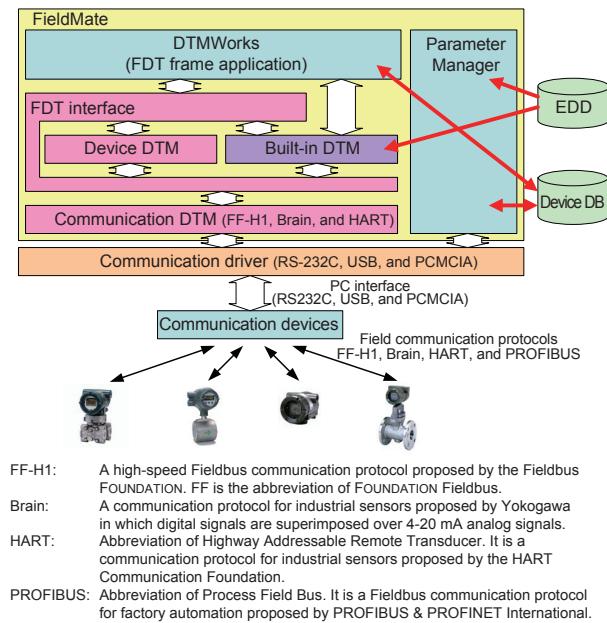


Figure 1 FieldMate R2.02 Software Configuration and Connection to Field Devices

Table 1 shows the field communication protocols supported by the FieldMate R2.02. The required communication devices are shown at the intersection of the communication protocol rows and the PC interface columns. The FieldMate R2.02 newly supports those in bold type.

In the R2.02, the functions have been enhanced to offer greater ease of use for users, as before. The major enhancements are as follows:

- Support for HART7, the latest HART protocol
- Support for the Softing USB interface for FF-H1 protocol
- Addition of the Built-in DTM
- Addition of an FF software download tool
- Automatic configuration of a COM port for a HART modem
- Functional improvements of DTMSetup a DTM setting tool
- Functional improvements of the Brain DTM
- Support for the MACTek Bluetooth HART modem

This paper describes the first three of these items, which are expected to be significantly effective.

SUPPORT FOR HART7

When supporting HART7, we focused on the handling of Long Tag to ensure usability when existing devices such as HART5-compatible devices are mixed with HART7-compatible devices. The HART Communication Foundation has been actively promoting the HART7, and device vendors including Yokogawa is releasing HART7-compatible devices, and so usage of HART7-compatible devices will steadily increase.

The HART7 includes various specification additions and extensions, of which the following four should be supported by the FieldMate.

- Long Tag
- Polling address range extension
- Extended field device status
- Extended device type/manufacturer ID

This section describes the support of Long Tag.

Tags are important information used to identify specific devices in a plant where a large number of field devices exist. Tags often describe the role of a device, and more characters are required as many devices are used. Therefore, R2.01.10 of FieldMate introduced an “extended device tag function” that logically extends conventional tags (eight characters) for HART5-compatible devices. This function allows device descriptions (descriptors) and messages in HART5 to be handled as tag-equivalent, and provides the following alternatives:

- Eight-character tag
- Eight-character tag, 16-character descriptor
- 16-character descriptor
- 32-character message

The Long Tag allows up to 32 characters equivalent to the message. Initially, we considered implementing the Long Tag as an alternative handled by the extended device tag function. However, with that approach, users who have introduced HART7-compatible devices using the extended device tag function would no longer be able to use the existing configurations as before. Moreover, since many users use both HART7-compatible devices and HART5-compatible devices mixed, merely increasing the alternatives would prevent the use of variations of the extended device tag function that were

Table 1 Field Communication Protocols Supported by FieldMate R2.02

PC interface Communication protocol	RS232C	USB	Bluetooth	PCMCIA
FF-H1	—	Softing FF-H1 USB interface	—	NI PCMCIA-FBUS card
Brain	—	Yokogawa FieldMate modem	—	—
HART (HART5, HART7)	MACTek HART modem	Yokogawa FieldMate modem MACTek HART modem	MACTek HART modem	—
PROFIBUS	—	Softing PROFIBUS USB interface	—	—

Note: FieldMate R2.02 supports those indicated in **bold type**.

used for HART5-compatible devices. Due to these limitations, we decided to support an independent operation mode in which the Long Tag for HART7-compatible devices can be configured separately from the existing alternatives.

ADDITION OF FF-H1 USB INTERFACE

The FieldMate R2.02 supports the Softing FF-H1 USB interface, shown in Figure 2, for the FF-H1 protocol in addition to National Instruments (NI) PCMCIA-FBUS cards.

Up to now, the FieldMate supported PCMCIA cards for the FF-H1 protocol. However, the USB is becoming the mainstream since interface extension using the USB is easier than using a PCMCIA card, and it occupies a relatively small space in environments where space is valuable, such as notebook PCs.



Figure 2 Softing FF-H1 USB Interface

As FF-H1 protocol interfaces, both the NI PCMCIA-FBUS cards and Softing USB interface are supported, but their structure and features are naturally different. Representing these differences as they are in the FieldMate causes confusion to users, and may also hinder the existing functions. Therefore, we have designed the system so that these two types of interface are operated in the same way for users. We have also provided a function for selecting which interface to use, in case the two types of interface are installed in the same PC.

ADDITION OF BUILT-IN DTM

The Built-in DTM is software that interprets EDD and provides a similar function as the device DTM without any device DTMs, although the functionality is slightly different from that of the proper device DTM. It supports Enhanced EDD, and automatically creates powerfully-expressive device DTM equivalents for devices that have Enhanced EDD. As communication protocols, it supports both the FF-H1 and HART protocols, whose interpreters required for interpreting EDD are provided by the relevant foundations, and covers many field devices.

Conventionally, Yokogawa starts developing the device DTM after the release of a field device, and releases the device DTM about three or, in worst case, even six months after the release of the device itself. Other companies do likewise. But this is really inconvenient for users who wish to adjust and

configure field devices using the device DTM, and they have had to rely on other tools using EDD, etc. until the device DTM was released. The Built-in DTM resolves this issue.

The Built-in DTM dynamically interprets EDD which is always released simultaneously with a field device and drives an automatically created device DTM. Therefore, the user can adjust and configure a new field device in the same way as an ordinary device DTM if EDD for the device concerned is obtained at the same time as a new device is released.

For Yokogawa's field instruments, the Built-in DTM also supports functions that cannot be implemented simply by EDD information and is structured so that its functions can be flexibly extended to meet users' needs in future.

Built-in DTM Software Configuration and Behavior

Figure 3 shows the software configuration of the Built-in DTM. The following three parts are clearly divided and are designed so that highly probable modifications in the future, such as changes in protocol specifications, addition of new protocols, or FDT specification changes, can be flexibly handled.

- Protocol-dependent part
- FDT/DTM-dependent part
- Common part

The FieldMate starts up the device DTM for the device provided by the vendor when it has been installed, or the Built-in DTM if the corresponding device DTM is not installed and only the corresponding EDD is provided. Figure 4 shows a screen example when the Built-in DTM is started. This is an example of a virtual device for testing contained in the Host Test Kit (HTK) for FF-H1 provided by the Fieldbus Foundation. If the Enhanced EDD is available, the bit map, chart, etc. shown in the figure are displayed.

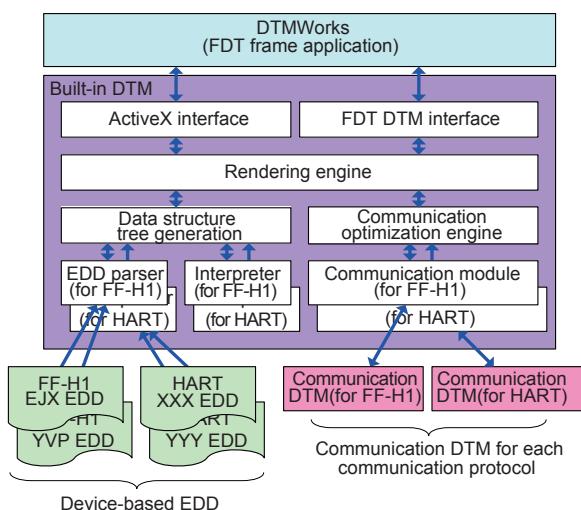


Figure 3 Built-in DTM Software Configuration

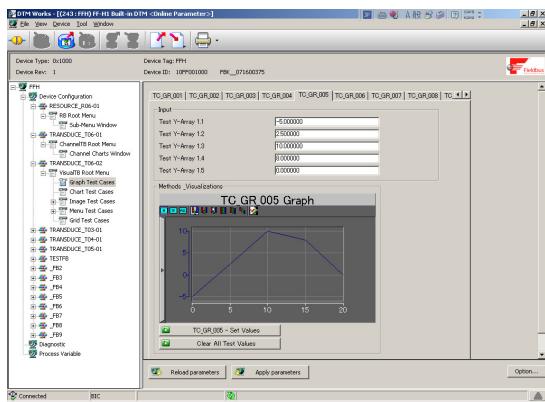


Figure 4 Example of Built-in DTM Startup Screen
(FF-H1 HTK)

Utilization of Built-in DTM as a Device DTM Prototype

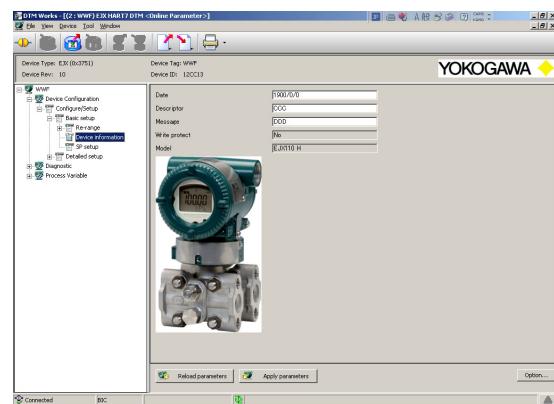
The device DTM provides easy-to-use adjustment and configuration methods for users and enables field devices to offer differentiated features. Therefore, field device vendors supply DTMs for their own devices and, likewise, Yokogawa has also been supplying device DTMs for transmitters, flowmeters, analyzers, etc. available in the market. However, the device and its device DTM were released at different timings, because the device DTM is a software product separated from the field device, which was inconvenient.

Therefore, Yokogawa has developed the device DTM concurrently with the device itself, by using the Built-in DTM as a prototype of the device DTM. We developed the device DTM as follows.

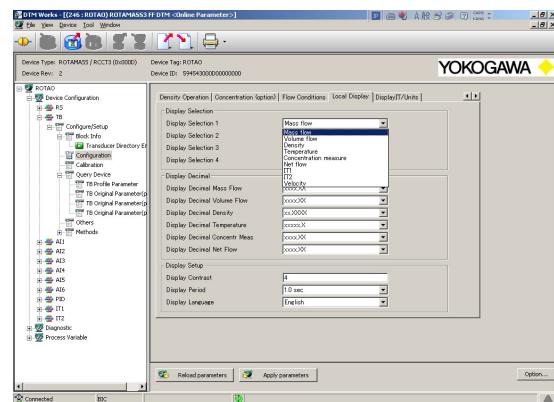
- 1) Obtain the EDD evaluation version of a device
- 2) Check the EDD-based functions using the built-in DTM
- 3) Hold detailed discussions between the device and device DTM developers on the functions to be added
- 4) Incorporate additional functions and develop a prototype of the device DTM
- 5) Hold a functional review again between the device and device DTM developers for further improvement

This approach enables clarification of the functions required for the device DTM at an early stage and sharing of the concept of the final product with those concerned. Figure 5 shows the screen images of the device DTMs developed based on the Built-in DTM. This allows the standardization of the screens of the Yokogawa's device DTM. As for the EJX110 differential pressure and pressure transmitters (HART7-compatible versions), we were able to develop the device DTM concurrently with the devices, and release it simultaneously.

When developing device DTMs in the future, we intend to concurrently develop a function that adds greater value specific to the device and continue to make improvements so that the device DTM can be released at the same time as the device.



(a) Device DTM for EJX110 Differential Pressure/
Pressure Transmitters (HART7-compatible versions)



(b) Device DTM for RotaMass Coriolis Flowmeters
(FF-H1-compatible version)

Figure 5 Unified Screen Images of Device DTMs

CONCLUSION

This paper has described the major features of the FieldMate R2.02. In this development, we made many functional improvements and additions to provide better usability and convenience for users other than those described so far.

The FieldMate should introduce the convenience thanks to the evolution of field digital technologies as quickly as possible and make it available to users. Field digital technologies will continue to advance, leading to progress in field devices and field communication protocols. Yokogawa will evolve the FieldMate in synchronization with these devices and protocols to provide solutions to customers utilizing the field digital technologies.

REFERENCES

- (1) Isao Hirooka, Youji Saitou, et al., "FieldMate Field Device Management Tool for the New Era," Yokogawa Technical Report English Edition, No. 44, 2007, pp. 9-12

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