

Setting Procedures for Linking FBR-100AN/FBR-100 and Patlite AirGRID®

Application Note:
AN2007fbrp_01
silex technology, Inc.



 When it **Absolutely Must** Connect

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1. Outline

This document describes how to link FBR-100AN/FBR-100, a protocol converter for CNC machine tools, with Patlite AirGRID®.

2. Structure

1. Device Structure

This document describes how to link the following communication devices.

(1) AirGRID® WDT (Transmitter)

- A ZigBee wireless transmitter to be used for Patlite signal tower lights.
- Collects the data of signal tower lights and transmits them to AirGRID® WDR (receiver).



(2) AirGRID® WDR (receiver)

- A ZigBee wireless receiver to collect data of Patlite signal tower lights from AirGRID® WDT.
- Supports up to 30 AirGRID transmitters' connection*1 (WDT).

*1 The maximum number of connections depends on models.



(3) FBR-100AN/FBR-100

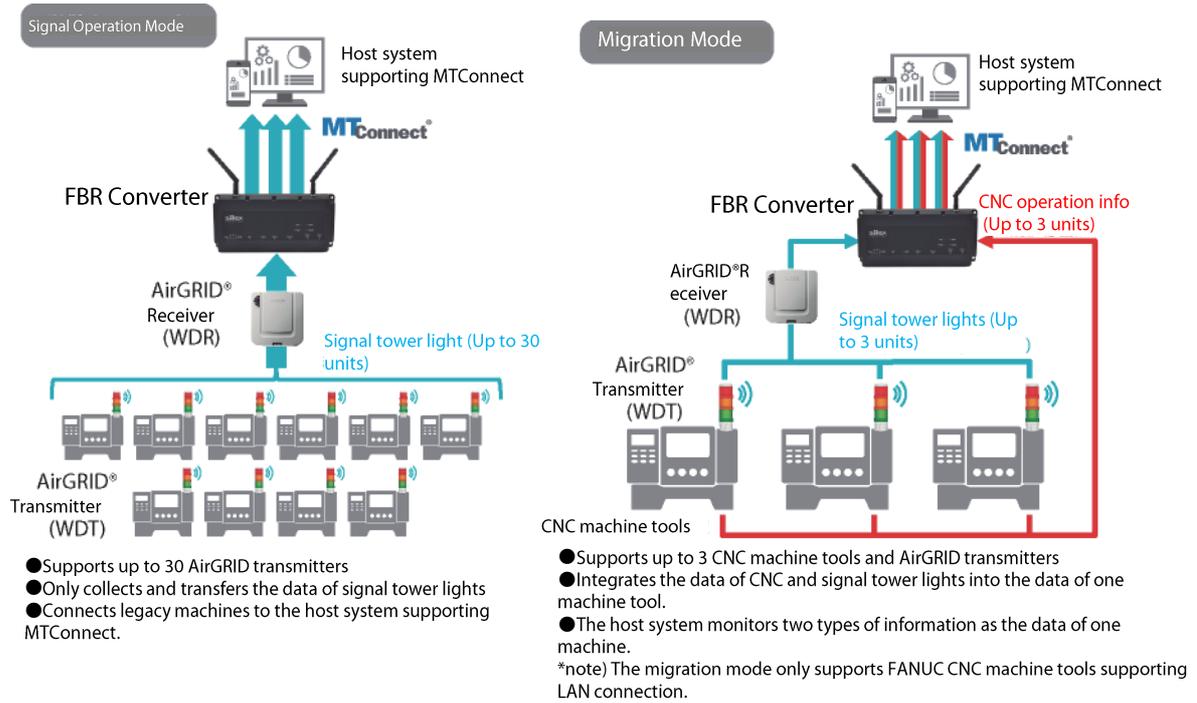
- silex protocol converter supporting MTConnect/Wireless LAN*2.
- Collects the data of signal tower lights via CNC machine tools and AirGRID® receivers.
- Transmits the data of CNC machine tools and signal tower lights to the host system (monitoring software) supporting MTConnect.

*2 Wireless LAN is available with the FBR-100AN.



2.2 Connection Structure

FBR converter supports two modes: one is the signal operation mode to only collect the data of signal tower lights. The other is the migration mode to collect the data of CNC machine tools and signal tower lights as a set. Both modes can be selected and set exclusively.



3. Settings

1. FBR converter Single Operation Mode Setting

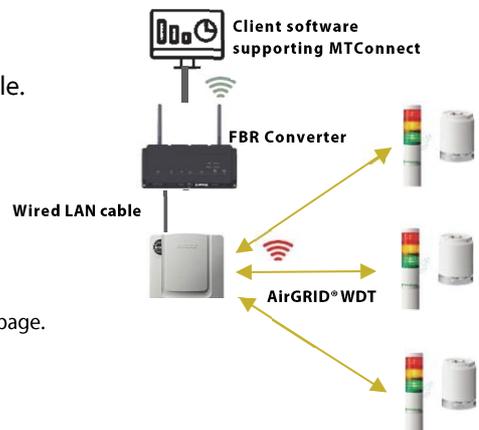
In this mode, the FBR converter collects data on up to 30 signal tower lights with WDT (transmitter) mounted, and transfers the data to the host system supporting MTConnect.

3.1.1 Setting Steps

- (1) Connect the FBR converter to WDR (receiver) with a LAN cable.
- (2) Set WDR's IP address in the FBR converter.
- (3) Set WDT's MAC address^{*3} in the FBR converter.
- (4) Access the FBR converter from MTConnect client software^{*4}
How to connect: <http://<FBR IP address>:port number/current>

^{*3} You can do searching and auto settings on the FBR converter's configuration page.

^{*4} Each WDT connection is identified by the port number set in the FBR converter

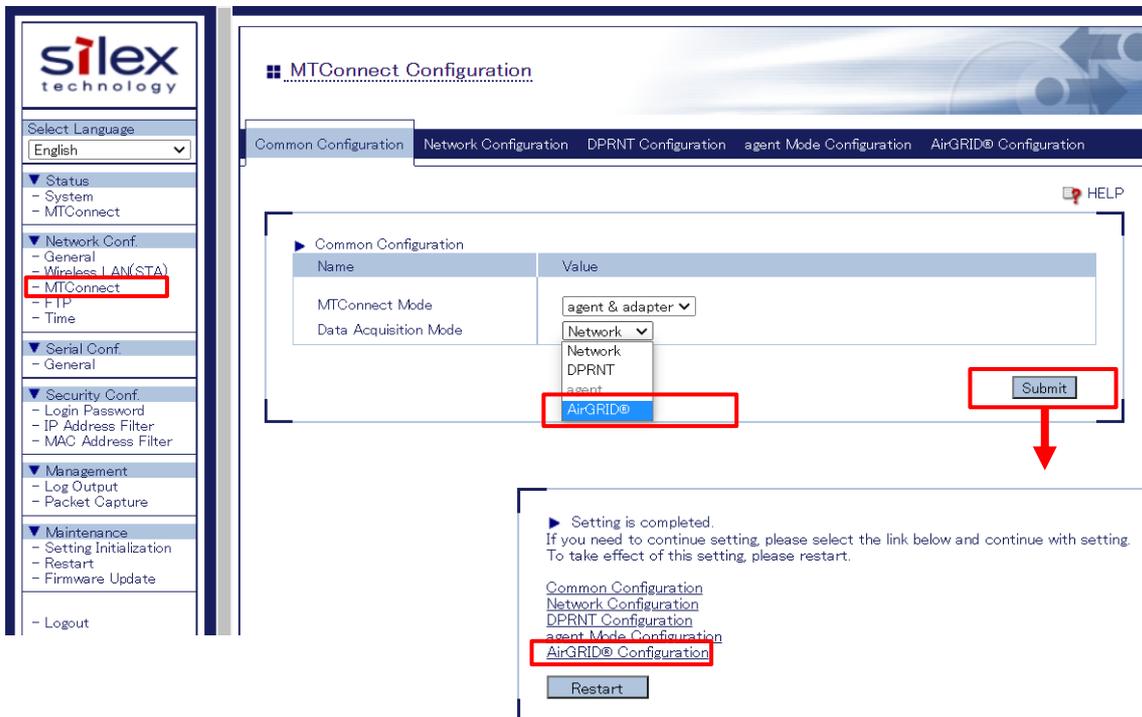


3.1.2 FBR Converter Setting

Use a Web browser from a PC to access the FBR converter setting page. See the Setup Guide that came with the FBR converter for more information.

3.1.3 MTConnect Setting

- Select Common Configuration under MTConnect on the FBR converter setting page.
- Select "AirGRID® for Data Acquisition Mode.
- Click "Submit" and select "AirGRID Configuration" link on the message box.



The screenshot displays the Silex Technology web interface for MTConnect Configuration. On the left is a navigation menu with categories like Status, Network Conf., Serial Conf., Security Conf., Management, and Maintenance. The 'MTConnect' option under Network Conf. is highlighted with a red box. The main content area shows the 'MTConnect Configuration' page with tabs for Common Configuration, Network Configuration, DPRNT Configuration, agent Mode Configuration, and AirGRID® Configuration. The 'Common Configuration' tab is active, showing a table with 'Name' and 'Value' columns. The 'Data Acquisition Mode' is set to 'AirGRID®', which is highlighted with a red box. A 'Submit' button is also highlighted with a red box and has a red arrow pointing to a message box below. The message box contains the following text:

▶ Setting is completed.
If you need to continue setting, please select the link below and continue with setting.
To take effect of this setting, please restart.

Common Configuration
Network Configuration
DPRNT Configuration
agent Mode Configuration
AirGRID® Configuration

Restart

3.1.4 AirGRID® Single Operation Mode Setting

- Set WDR’s IP address on AirGRID® Configuration for Single Operation.
- Set WDT’s MAC address which can be monitored by the FBR converter and set port numbers to identify WDT. *5

*5 A MAC address cannot be registered on more than one WDT.



AirGRID® Configuration for Single Operation

Name	Value																								
WDR IP Address	<input type="text" value="10.0.0.0"/> <input type="button" value="Check Connection"/>																								
WDT1	<table border="1"> <thead> <tr> <th>MAC Address</th> <th>Acquisition</th> <th>MTConnect Port(HTTP)</th> <th>MTConnect Port(HTTPS)</th> </tr> </thead> <tbody> <tr> <td><input type="text" value="0000000000000000"/></td> <td><input type="button" value="Acquisition"/></td> <td><input type="text" value="5000"/></td> <td><input type="text" value="5443"/></td> </tr> <tr> <td><input type="text" value="0000000000000000"/></td> <td><input type="button" value="Acquisition"/></td> <td><input type="text" value="5001"/></td> <td><input type="text" value="5444"/></td> </tr> <tr> <td><input type="text" value="0000000000000000"/></td> <td><input type="button" value="Acquisition"/></td> <td><input type="text" value="5002"/></td> <td><input type="text" value="5445"/></td> </tr> <tr> <td><input type="text" value="0000000000000000"/></td> <td><input type="button" value="Acquisition"/></td> <td><input type="text" value="5003"/></td> <td><input type="text" value="5446"/></td> </tr> <tr> <td><input type="text" value="0000000000000000"/></td> <td><input type="button" value="Acquisition"/></td> <td><input type="text" value="5004"/></td> <td><input type="text" value="5447"/></td> </tr> </tbody> </table>	MAC Address	Acquisition	MTConnect Port(HTTP)	MTConnect Port(HTTPS)	<input type="text" value="0000000000000000"/>	<input type="button" value="Acquisition"/>	<input type="text" value="5000"/>	<input type="text" value="5443"/>	<input type="text" value="0000000000000000"/>	<input type="button" value="Acquisition"/>	<input type="text" value="5001"/>	<input type="text" value="5444"/>	<input type="text" value="0000000000000000"/>	<input type="button" value="Acquisition"/>	<input type="text" value="5002"/>	<input type="text" value="5445"/>	<input type="text" value="0000000000000000"/>	<input type="button" value="Acquisition"/>	<input type="text" value="5003"/>	<input type="text" value="5446"/>	<input type="text" value="0000000000000000"/>	<input type="button" value="Acquisition"/>	<input type="text" value="5004"/>	<input type="text" value="5447"/>
MAC Address	Acquisition	MTConnect Port(HTTP)	MTConnect Port(HTTPS)																						
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<input type="text" value="0000000000000000"/>	<input type="button" value="Acquisition"/>	<input type="text" value="5004"/>	<input type="text" value="5447"/>																						
WDT2																									
WDT3																									
WDT4																									
WDT5																									

Additional info)

When you click MAC Address’s “Acquisition” button, FBR-100AN retrieves WDT’s MAC address which is being connected to WDR, and automatically fills in the form. “Acquisition” button becomes **enabled only when all WDT’s MAC addresses are initial values.**

Note) Set WDR’s IP address, and then click “Submit” and “Restart” to establish communication between the FBR converter and WDR.

After the FBR converter restarts, the connection between WDR and WDT will be reestablished. Make sure that the communication between WDR and WDT is ready (WDT status: LED turns on green.) after rebooting and press the “Acquisition” button after waiting for a short time.

3.2 FBR Converter “Migration Mode” Setting

In this mode, the FBR converter can collect data of up to three CNC machine tools and up to three signal tower lights with WDT (transmitter) mounted. The FBR converter can migrate their data for each CNC machine tool and send the data to the host system supporting MTConnect.

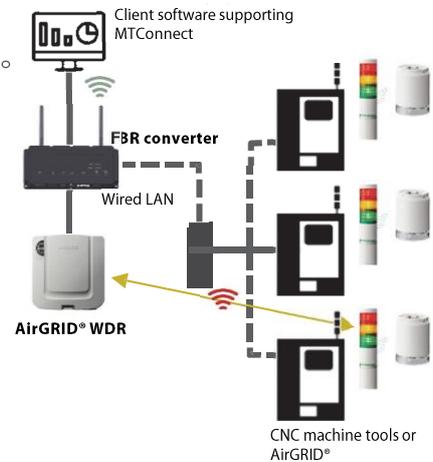
In this mode, the FBR converter can directly collect information of CNC machine tools over wired LAN and can integrate information of signal tower lights over wireless communication via AirGRID® WDR.

This mode is only available when you enable “AirGRID mode” under the FBR converter AirGRID’s “Network Data Acquisition Mode” to monitor FUNAC’s machine tools supporting LAN connection.

When serial/DPRNT communication is used and an activation key for special CNC machine tools and machine tools is used, this mode cannot be used.

3.2.1 Setting Steps

- (1) Connect the FBR converter to WDR (receiver) with a LAN cable.
- (2) Connect the FBR converter to CNC machine tools with LAN cables.
- (3) Set WDR's IP address in the FBR converter.
- (4) Set WDT's MAC address*6 in the FBR converter.
- (5) Access the FBR converter from MTConnect client software*7.



How to access) `http://<FBR IP address>:Port number/current`

*6 You can do searching and auto settings in the FBR converter configuration page.

*7 Each WDT connection is identified by the port number set in the FBR converter.

3.2.2 FBR Converter Setting

Use a Web browser from a PC to access the FBR converter setting page. See the Setup Guide that came with the product for more information.

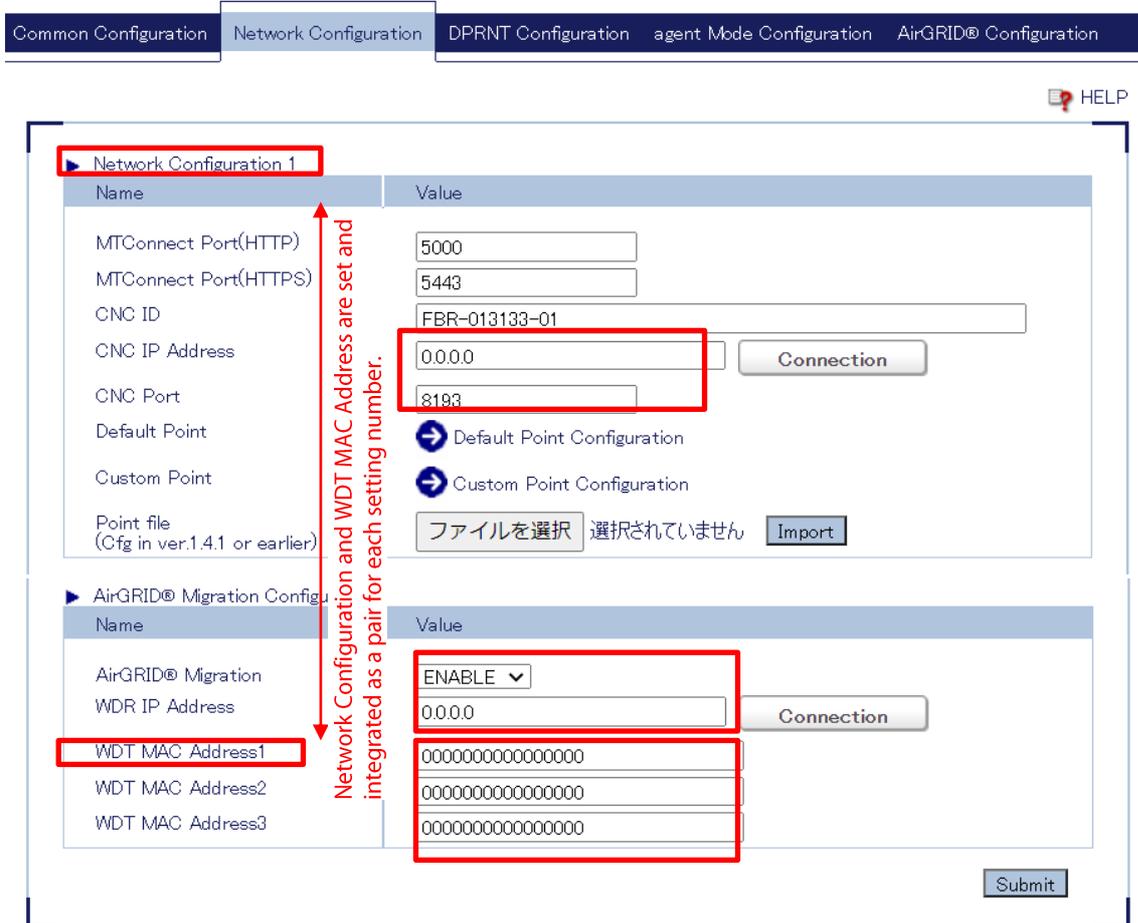
3.2.3 MTConnect Setting

- Select Common Configuration under MTConnect Configuration in the FBR converter setting page.
- Select "Network" for Data Acquisition Mode.
- Click "Submit" and select "Network Configuration" on the message box.

3.2.4 AirGRID® Migration Setting

- Set CNC machine tool's IP address/port number to be monitored in "Network Configuration" of the FBR converter.
- Enable "AirGRID® Migration" in the lower part of "Network Configuration", and specify WDR's IP address.
- Register each number of (CNC's) "Network Configuration" as a pair with the setting number of WDT's MAC address.*⁸

*⁸ The WDT's MAC address 2 is paired with the Network Configuration 2, and the WDT's MAC address 3 is paired with the Network Configuration 3.



Common Configuration | **Network Configuration** | DPRNT Configuration | agent Mode Configuration | AirGRID® Configuration

HELP

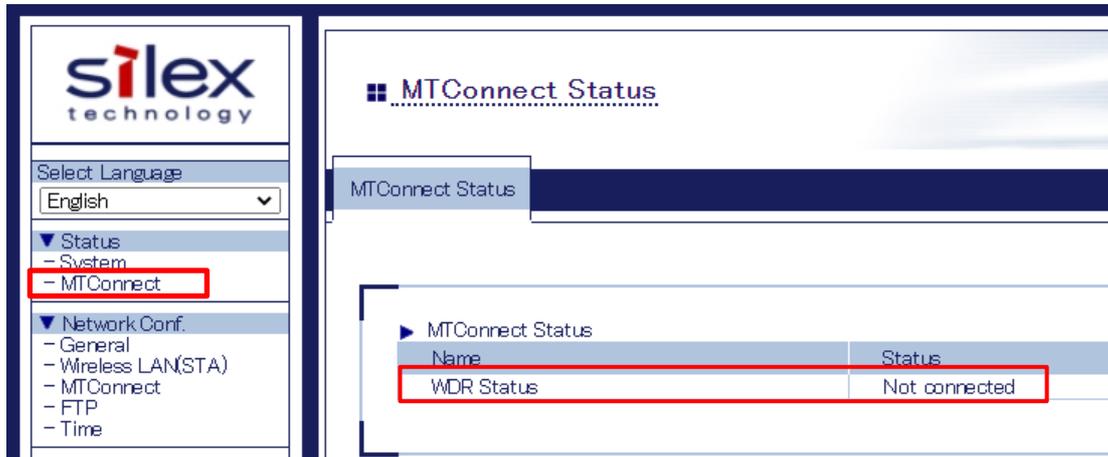
Network Configuration 1	
Name	Value
MTConnect Port(HTTP)	5000
MTConnect Port(HTTPS)	5443
CNC ID	FBR-013133-01
CNC IP Address	0.0.0.0 <input type="button" value="Connection"/>
CNC Port	8193
Default Point	<input type="button" value="Default Point Configuration"/>
Custom Point	<input type="button" value="Custom Point Configuration"/>
Point file (Cfg in ver.1.4.1 or earlier)	<input type="button" value="ファイルを選択"/> 選択されていません <input type="button" value="Import"/>

AirGRID® Migration Config.	
Name	Value
AirGRID® Migration	ENABLE <input type="button" value="Connection"/>
WDR IP Address	0.0.0.0
WDT MAC Address1	0000000000000000
WDT MAC Address2	0000000000000000
WDT MAC Address3	0000000000000000

4. MTConnect Status Checking

The FBR converter's "MTConnect Status" page allows users to check the communication status with monitored WDT or CNC machine tools. If no operational data is available in the host system, check the status of communication with FBR-100AN, WDR, WDT and CNC machine tools in this page. The status checking page depends on the acquisition mode.

- When AirGRID® Single Operation Mode is Selected
 - Only WDR connection status and connected WDT's MAC address are shown.



- When AirGRID® Migration Mode is Selected
 - CNC machine tool's status, WDR connection status and connected WDT's MAC address are shown.

▶ MTConnect Status	
Name	Status
Network1	
Series Name (Version)	-- (--)
PMC path	--
CNC path	--
Status	IP address of CNC is not set.
Link to MTConnect page	--
Network2	
Series Name (Version)	-- (--)
PMC path	--
CNC path	--
Status	IP address of CNC is not set.
Link to MTConnect page	--
Network3	
Series Name (Version)	-- (--)
PMC path	--
CNC path	--
Status	IP address of CNC is not set.
Link to MTConnect page	--
WDR Status	Not connected

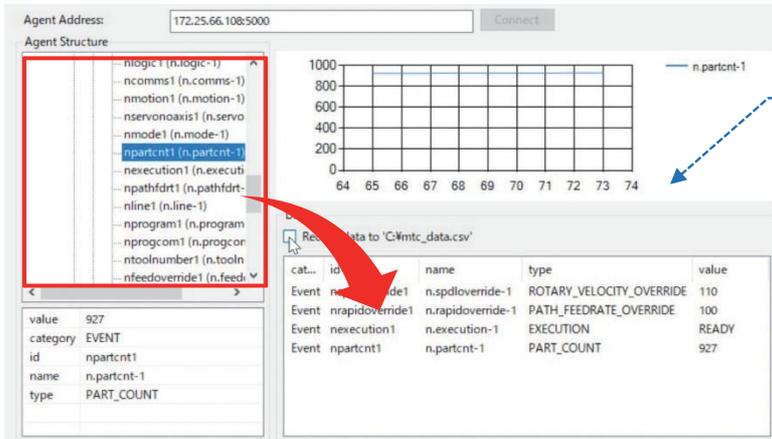
5. Information of Signal Tower Light Collected/Transferred by FBR Converter over MTConnect Communication

Here are the items of signal tower light information collected by the FBR converter and transferred over MTConnect. All AirGRID statuses are handled as category="EVENT" and type="MESSAGE" on MTConnect.

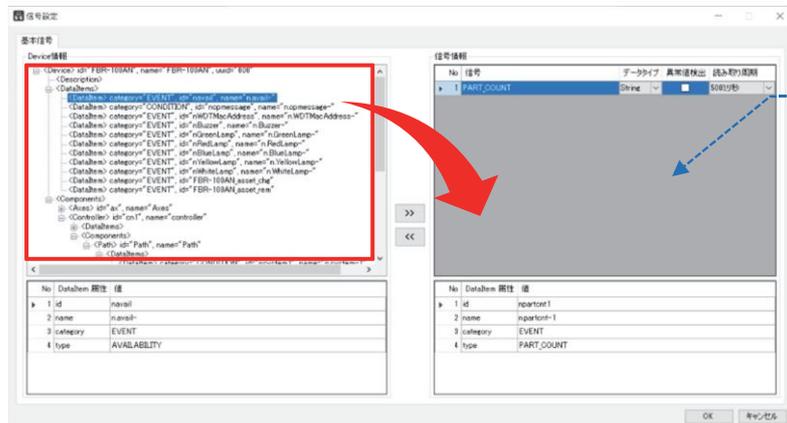
Item	id	name	nativeCode	value
WDT's MAC address	nWDTMacAddress	n.WDTMacAddress	Web WDT #	MAC address
Buzzer	nBuzzer	n.Buzzer-	0: Off 1: On -: Not obtain	Off On UNAVAILABLE
Green	nGreenLamp	n.GreenLamp-	0: Off	Off
Red	nRedLamp	n.RedLamp-	1: On	On
Blue	nBlueLamp	n.BlueLamp-	2: Blinking	Blinking
Yellow	nYellowLamp	n.YellowLamp-	9: Not register, Unused	Unused
White	nWhiteLamp	n.WhiteLamp-	-: Not obtain	UNAVAILABLE

6. MTConnect Client Software Monitoring Example

Connect MTConnect client to the FBR converter (operate as MTConnect server) using MTConnect client software. Select information that you want to monitor from the list of available id and names on the client software. The following is an example of the selection window.



MTConnect Sample Client distributed at silex's website. Select items by dragging and dropping items you want to monitor from "Agent Structure" on the left side of the window to the lower right area.



FANUC MT-LINKI Select items you want to monitor from <Dataitems> on the left side of the window and put them in the right area

Note) Data selection or display settings on MTConnect Client depends on software.

7. FAQ

Q1: Are there any precautions when the FBR converter and AirGRID® are used together?

A1: The FBR converter linkage function is available only when "Operation in the Immediate Transmission Mode" is selected in WDT settings. In addition, the TCP port used for communication between the FBR converter and WDR is fixed at 10001.

Q2: The communication between the FBR converter and WDR is successful, but WDT is not visible.

A2: There may be multiple WDRs around. When WDR and WDT are used with the factory default settings, WDT may be connected to other WDRs wirelessly. Please configure the group settings at AirGRID®.

Q3: We are going to use wireless LAN to establish a communication between the FBR-100AN and client software supporting MTConnect. Will this affect the wireless communication of AirGRID®?

A3: Like wireless LAN, ZigBee communication using 2.4 GHz band is used to establish a communication between AirGRID® WDR and AirGRID®WDT. However, ZigBee is a standard that allows for channels not used by wireless LAN, so that wireless LAN and ZigBee can coexist. Since the FBR-100AN supports wireless LAN of 5GHz band, the FBR-100AN can operate on separate frequencies.

Q4: When LAN communication between the FBR-100 converter and WDR, or between the FBR converter and MTConnect Client software is temporarily interrupted, how will the operation data of the signal tower light be dealt with?

A4: It depends on interrupted paths, and also depends on MTConnect Client communication specifications and settings.

(1) When there is no communication between FBR-100AN (MTConnect server) and MTConnect Client.

MTConnect communication has two ways. One is that MTConnect Client retrieves the latest data called "current" from MTConnect server. The other is that MTConnect Client retrieves data accumulated in MTConnect server, which is called "sample", after you specify a data item, a sequence number and a count number. In the former case, only the latest information is retrieved when the communication is restored, while in the latter case, all data, including past information, is retrieved.

(2) When there is no communication between the FBR converter and WDR.

FBR-100AN linkage function only supports "Operating in the Immediate Transmission Mode" in the WDT mode setting. Therefore, when the communication between the FBR converter and WDR is restored, the FBR converter will retrieve WDT status information at the time of recovery if WDT (Signal Tower Light) remains unchanged after the communication is interrupted.

About silex technology, Inc. (Silex)

Silex (headquarters : Seika-cho, Kyoto) is a research and development company with a focus on hardware and software technology that connects devices to networks with or without cables. Silex offers products by leveraging the know-how of networking and wireless connectivity to equipment that requires absolute connectivity, such as industrial machinery, medical devices, and display devices, resulting in expansion of the business range. In order to maintain quality standards strictly, the company consolidates a series of processes such as designing, development, manufacturing and quality assurance in the Keihanna Headquarters. For global business development, Silex has offices in North America, Europe, China, and India to collaborate with overseas partners, explore new markets, and acquire the information of new technologies to develop.

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