

FA-M3
VITESSE™



Leading Edge Controller

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Range-free Controller FA-M3 System Upgrade Guide (AS-interface → DeviceNet)

TI 34M06H33-01E 1st Edition

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Introduction

■ Overview

This document provides reference information on how to use the Anybus X-gateway from HMS Industrial Networks to perform gateway connection between slaves controlled by an ASi Master Module (F3LA01-0N) and the DeviceNet Scanner Module (F3LD01-0N) in an FA-M3 control system. It primarily describes how to set up the Anybus X-gateway. Read the respective equipment manuals for details on operation and equipment usage after setup.

■ Introduction to Manufacturer and product

HMS Industrial Networks

<https://www.anybus.com>

Anybus X-gateway product website:

<https://www.anybus.com/products/gateway-index/anybus-xgateway>

■ Related instruction manuals

Refer to the following manuals, along with this manual.

- | | |
|--|----------------|
| • Sequence CPU Instruction Manual - Instructions | IM34M06P12-03E |
| • Sequence CPU Instruction Manual – Functions (for F3SP71,76) | IM34M06P15-01E |
| • FA-M3 Programming Tool WideField3 (Offline) | IM34M06Q16-02E |
| • FA-M3 Programming Tool WideField3 (Online) | IM34M06Q16-03E |
| • DeviceNet Scanner Module | IM34M06H28-01E |
| • ASi Master Module | IM34M06H33-01E |
| • Various user guides and manuals published by HMS Industrial Networks | |

- The content contained herein is current as of November 2016. Product functions and specifications are subject to change thereafter.

1. Setup Workflow

■ Equipment used

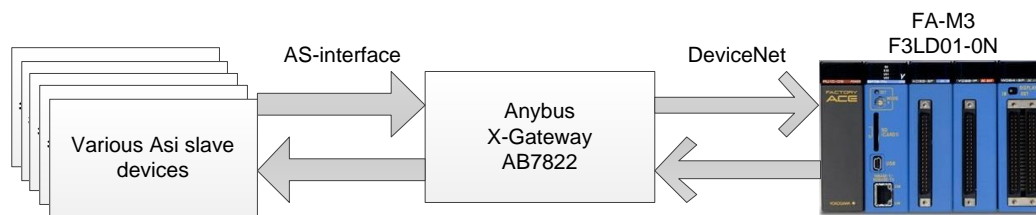
- FA-M3: F3LD01-0N

- Anybus X-gateway: AB7822 AS-interface V3.0 compliant (including V2.0, V2.1)
<https://www.anybus.com/products/gateway-index/anybus-xgateway/detail/anybus-x-gateway---as-interface-master-to-devicenet-adapter>

(The above URL information is current as of November 2016 but subject to change).

■ Functional overview

The Anybus X-gateway provides a gateway for data exchange between different networks. It enables a DeviceNet scanner module in an FA-M3 system to monitor and control input/output data of AS-interface slave devices.



Data supported by gateway

- Up to 434 contact inputs/outputs (248 inputs and 186 outputs)
- Up to 124 analog data
- ASi slave status flags (Live List, Valid Data List and ASi Status)

Transmission time reference value

Under the conditions described below, the average time taken for contact output operations of F3LD01-0N to reach ASi slaves and conversely for data of ASi slaves to be received as input data by the F3LD01-0N is approximately 102.8 ms.

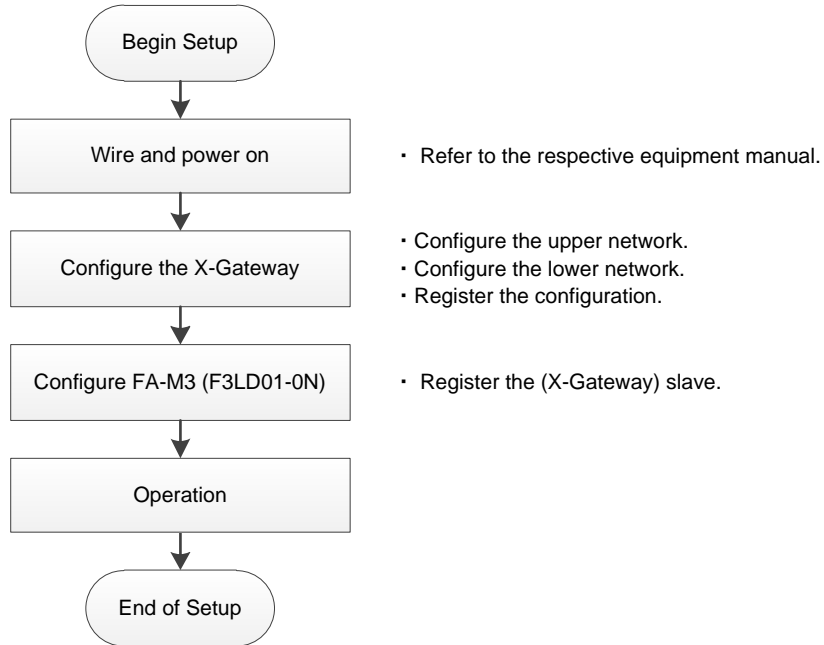
This is a reference value and may vary, depending on the number of connected slaves, slave specifications and transmission speed.

- Up to 20 slaves can be connected (contact input/output, Byte Mode)
- Sequence CPU scan time: 2.0ms
- DeviceNet transmission rate: 500kpps

■ Setup Workflow

The figure below shows a flowchart of the main steps required from setup to operation.

The X-gateway and the F3LD01-0N are to be configured using their respective dedicated tools provided.



2. Setting up X-gateway and Registering Configuration

■ Tool preparation

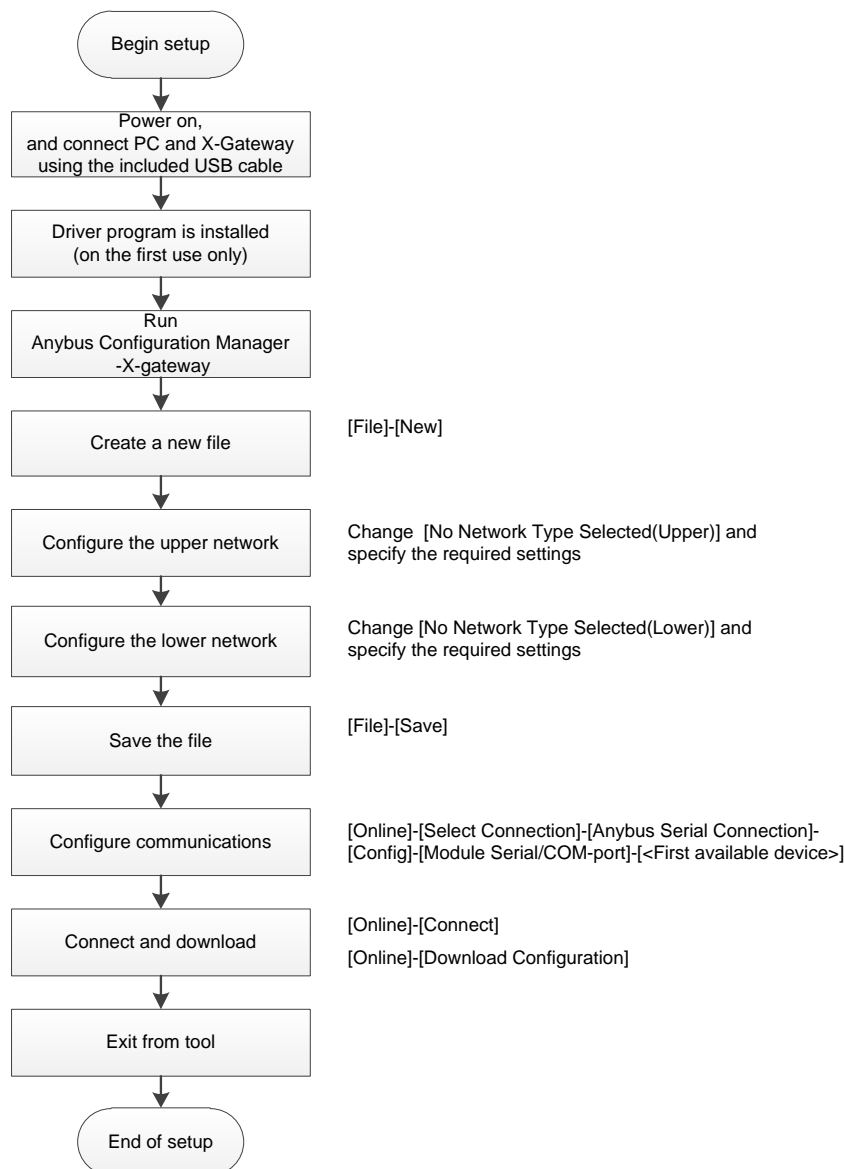
Download the following software from the HMS company website, and install it on a PC.

- Anybus Configuration Manager -X-gateway

<https://www.anybus.com/support/file-doc-downloads/x-gateway-specific/?ordercode=AB7822>

■ Tool setup and operation

The figure below shows the procedure for tool setup and tool operation. For full details on how to use the Anybus Configuration Manager -X-gateway, read the relevant manual provided by HMS.



■ Configure upper network

Define the following settings.

■ Network Type	
• Name	: Select "AS-interface Master"
■ General	
• Offline option	: Select Clear/Freeze
■ Fieldbus Specific	
• Live list	: Select Disabled/Enabled
• Valid data list	: Select Disabled/Enabled
• Data representation	: Select Byte Mode/Nibble Mode
• Synchronous I/O mode	: Select Disabled/Enabled

Functional Description

- Offline option
Select whether to Clear (to zero) or Freeze (hold) output data to be sent to the DeviceNet end in the event of communications error on the AS-interface end.
- Live list
The active status of each slave to be sent to the DeviceNet end
It takes up 8 bytes of the DeviceNet input data.
- Valid data list
The validity status of each AS-interface slave analog data to be sent to the DeviceNet end
The AS-interface status flags are also sent.
It takes up 18 bytes of the DeviceNet input data.
- Data representation
Byte Mode: Data of each slave is handled as a byte (8 bits).
Nibble Mode: Data of each slave is handled as a nibble (4 bits).
- Synchronous I/O mode
Synchronize I/O data and analog data.

■ Configure lower network

Define the following settings.

■ Network Type	
• Name	: Select “DeviceNet Adapter/Slave”
■ General	
• Input I/O data Size (bytes)	: Specify 312 if using Byte Mode; Specify 280 if using Nibble Mode *1
• Output I/O data Size (bytes)	: Specify 312 if using Byte Mode; Specify 280 if using Nibble Mode *2
• Input Explicit message size (bytes)	: Specify 0
• Output Explicit message size (bytes)	: Specify 0
• Offline option	: Select Clear/Freeze
• Control word/Status word	: Select Disabled/Enabled

Functional Description

- Input I/O data Size (bytes)
Specify the total number of bytes of input data to be sent to the DeviceNet scanner (F3LD01-0N).

*1: Add 8 to the input data size if using Live list;
Add 18 to the input data size if using Valid data list.

- Output I/O data Size(bytes)
Specify the total number of bytes of output data to receive from the DeviceNet scanner (F3LD01-0N).

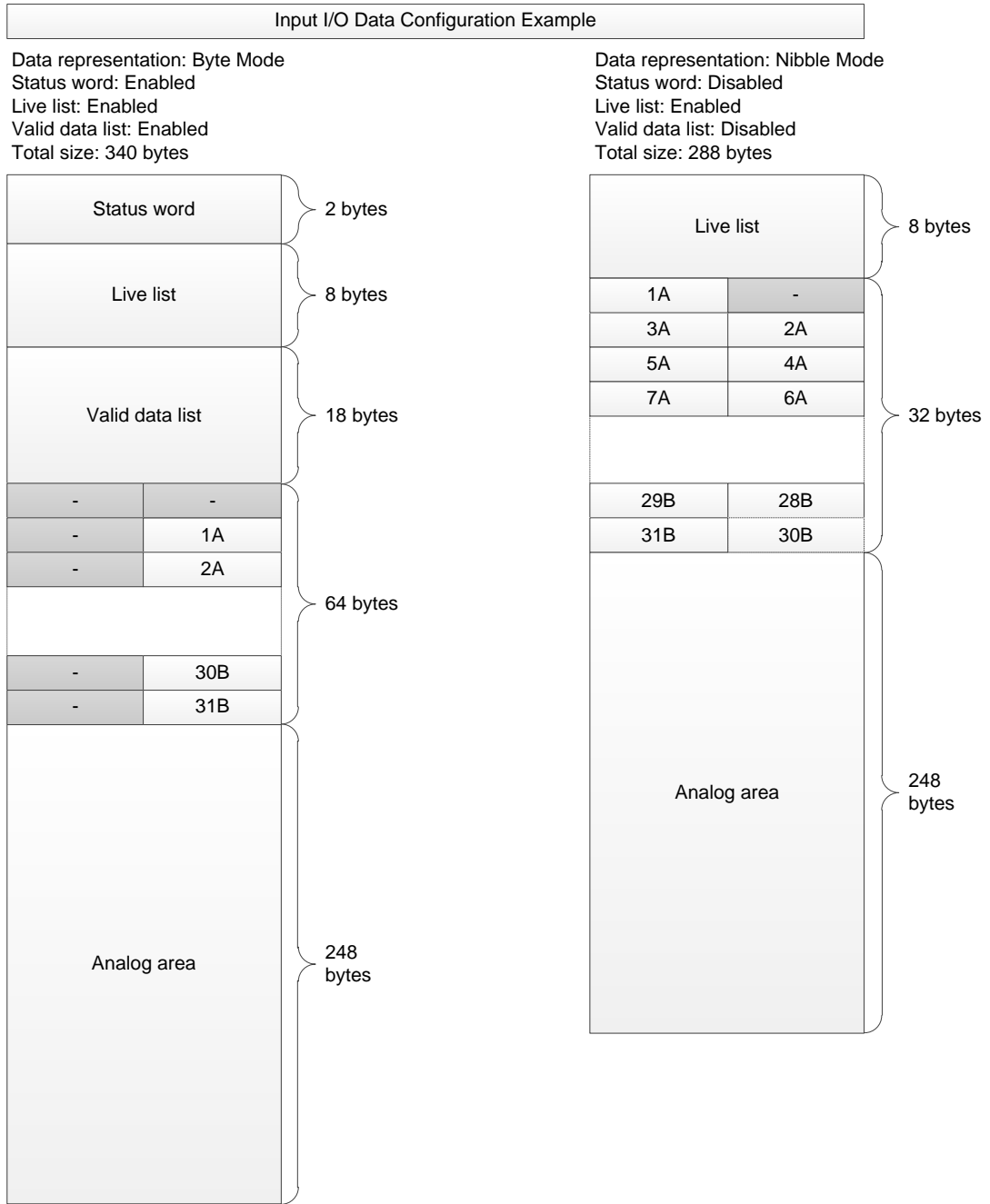
*2: Add 2 to the output data size if using Control word/Status word.

- Offline option
Select whether to Clear (to zero) or Freeze (hold) output data to be sent to the AS-interface end in the event of communications error on the DeviceNet end.

- Control word/Status word
Control word: Used to start and stop ASi communications and reset the X-Gateway.
If Control word is enabled, the DeviceNet scanner needs to write to the Control Word to initiate communications.
If Control word is disabled, communications begin automatically.
Status word: Indicates the operating status of the X-Gateway

SEE ALSO:

the configuration example on the next page for more details on the I/O data size.

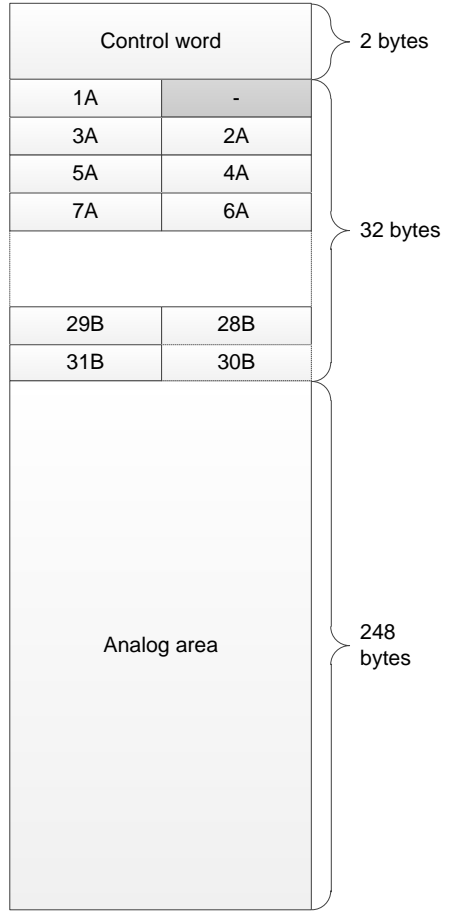


Output I/O Data Configuration Example

Data representation: Byte Mode
 Control word: Disabled
 Total size: 312 bytes



Data representation: Nibble Mode
 Control word: Enabled
 Total size: 282 bytes



■ Bitmap of Live List

Indicates the active status of each slave.

- 1: Slave is active
- 0: Slave is inactive

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
7A	6A	5A	4A	3A	2A	1A	-	15A	14A	13A	12A	11A	10A	9A	8A
23A	22A	21A	20A	19A	18A	17A	16A	31A	30A	29A	28A	27A	26A	25A	24A
7B	6B	5B	4B	3B	2B	1B	-	15B	14B	13B	12B	11B	10B	9B	8B
23B	22B	21B	20B	19B	18B	17B	16B	31B	30B	29B	28B	27B	26B	25B	24B

■ Bitmap of Valid Data List

Indicates the data validity of each analog slave.

- 1: Data of slave is valid.
- 0: Data of slave is invalid.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
4B:1	4B:0	4A:1	4A:0	3B:1	3B:0	3A:1	3A:0	2B:1	2B:0	2A:1	2A:0	1B:1	1B:0	1A:1	1A:0
8B:1	8B:0	8A:1	8A:0	7B:1	7B:0	7A:1	7A:0	6B:1	6B:0	6A:1	6A:0	5B:1	5B:0	5A:1	5A:0
12B:1	12B:0	12A:1	12A:0	11B:1	11B:0	11A:1	11A:0	10B:1	10B:0	10A:1	10A:0	9B:1	9B:0	9A:1	9A:0
16B:1	16B:0	16A:1	16A:0	15B:1	15B:0	15A:1	15A:0	14B:1	14B:0	14A:1	14A:0	13B:1	13B:0	13A:1	13A:0
20B:1	20B:0	20A:1	20A:0	19B:1	19B:0	19A:1	19A:0	18B:1	18B:0	18A:1	18A:0	17B:1	17B:0	17A:1	17A:0
24B:1	24B:0	24A:1	24A:0	23B:1	23B:0	23A:1	23A:0	22B:1	22B:0	22A:1	22A:0	21B:1	21B:0	21A:1	21A:0
28B:1	28B:0	28A:1	28A:0	27B:1	27B:0	27A:1	27A:0	26B:1	26B:0	26A:1	26A:0	25B:1	25B:0	25A:1	25A:0
-	-	-	-	31B:1	31B:0	31A:1	31A:0	30B:1	30B:0	30A:1	30A:0	29B:1	29B:0	29A:1	29A:0
ASi Status Flags 1								ASi Status Flags 2							

■ Bitmap of ASi Status Flags

The ASi Status Flags are stored at the lower end of the Valid Data List area. The flags indicate various statuses.

Asi Status Flags 1								ASi Status Flags 2							
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

bit	Name	Meaning
0	OFFLINE	ON: Offline mode OFF: Online mode
1	-	Reserved
2	EEPROM_OK	ON: EEPROM normal OFF: EEPROM error
3	AUTO_ADDRESS_ENABLE	ON: Automatic addressing enabled OFF: Automatic addressing disabled (set by user)
4	PERIPHERAL_FAULT (V2.1)	ON: Slave peripheral fault detected OFF: No slave peripheral fault
5	ADDRESS_COLLISION	ON: Address collision detected OFF: No address collision
6	-	Reserved
7	-	Reserved
8	OFFLINE_READY	ON: Offline OFF: Online
9	POWER_FAIL	ON: ASi-dedicated power failure OFF: ASi-dedicated power normal
10	NORMAL_OPERATION	ON: Normal operation OFF: Communication unavailable due to initialization, etc.
11	OPERATION_MODE	ON: Configuration mode OFF: Protected mode
12	AUTO_PROG_AVIL	ON: Auto programming is available State where AUTO_ADDRESS_ENABLE=1 and one slave is dropped in Protected mode OFF: Automatic address assignment is prohibited. Said function is enabled but slave is not dropped
13	AUTO ADDRESS ASSIGN	ON: Automatic address assignment possible OFF: Automatic address assignment not possible
14	LDS_0	ON: Blank slave (slave with zero address) exists OFF: No blank slave (slave with zero address)
15	CONFIG_OK	ON: Detected and registered slave configurations match OFF: Detected and registered slave configurations differ

n

■ Bitmap of Control Word and Status Word

Control word

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
								Reset					Mode		

Reset setting	Meaning
0	Normal operation
1	Reset gateway

Mode setting	Meaning
00	Idle (inter-Asi-network data exchange active)
01	Idle (inter-Asi-network data exchange inactive)
10	Running
11	

- **Reset**
The Reset bit can be manipulated using bit operations to reset the X-Gateway.
- **Mode**
The Mode bits can be manipulated using bit operations to stop and start the ASI Network.

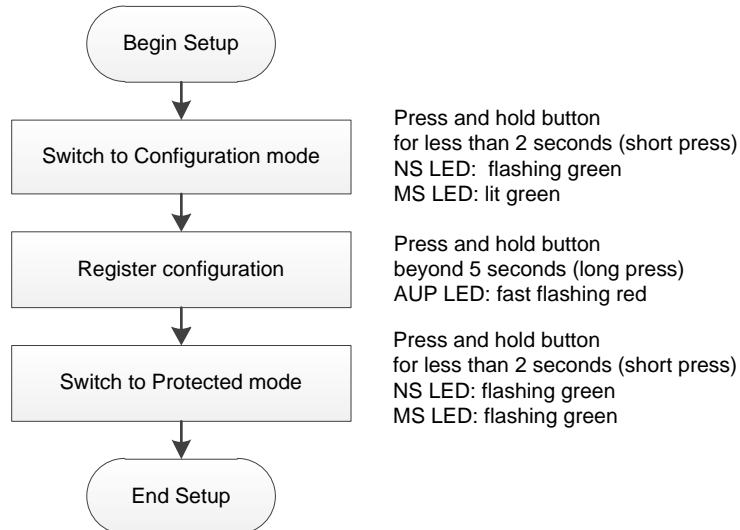
Status word

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Gateway Cycle Counter				Gateway Error Counter				(Reserved)				Master Mode	Init	Run	

- **Gateway Cycle Counter**
A counter incremented each time data is successfully transferred between the network interfaces
- **Gateway Error Counter**
A counter incremented each time the throughput of the gateway exceeds 100 milliseconds
- **Master Mode**
Reflects the Operation Mode setting value written to the Control Word.
- **Init**
Indicates if the other network interface has been initialized.
1: Other network interface successfully initialized
0: Could not initialize other network interface
- **Run**
Indicates the operating status of the other network.
1: Other network is online or running
0: Other network is offline or not running

■ Register Configuration

Register slaves using the Configuration button located on top of the equipment.



How to toggle mode

Press and hold the button for less than 2 seconds (short press) to toggle between Configuration mode and Protected mode.

- LED indicators
Configuration mode: NS LED flashing green; MS LED: lit green
Protected mode: NS LED: flashing green; MS LED: flashing green

How to register configuration

Long press and hold button beyond 5 seconds to register a configuration. This operation is valid only in Configuration mode.

- LED indicators
After pressing and holding the button beyond 5 seconds (long press), the AUP LED fast flashes red while the button is held.

For details on the other LED indicators and X-gateway, read the relevant manual provided by HMS.

The above description of LED indicator colors and states is current as of November 2016.

X-gateway operation is subject to change along with product specification changes.

3. F3LD01-0N Setup

■ Tool and EDS file preparation

Download the “FA-M3 Configuration Tool DeviceNet Interface Module” application software from Yokogawa’s Partner Portal and install it on a PC.

(Member registration and login is required at the Partner Portal for the download).

<https://partner.yokogawa.com/global/>

After logging in, select Products>Controllers (PLC/PAC (FA-M3)).

Scroll to the bottom of the screen, and select “Configuration Tool”.



Read the displayed license agreement, agree to its terms as desired, and download the software. You can choose not to agree with the terms of the agreement but in this case, you may not install the software.

In addition, download the EDS file from HMS website.

The EDS file is not mandatory for registration but will simplify data input.

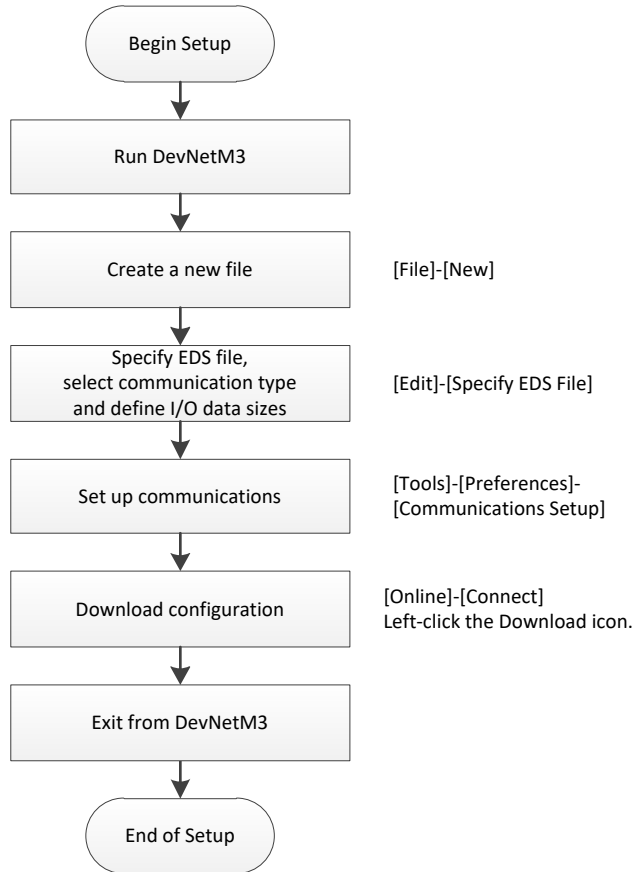
- EDS File For DeviceNet Slave

<https://www.anybus.com/support/file-doc-downloads/x-gateway-specific/?ordercode=AB7822>

■ Setup procedure

Follow the procedure given below to register the slave (X-gateway) to the F3LD01-0N.

For more details on the tool, read the FA-M3 Configuration Tool DeviceNet Interface Module Manual.



■ Settings

Define the following settings.

Node Number	:	Specify the node number (MAC ID) defined in X-Gateway
Vendor Code	:	90
Device Type	:	12
Product Code	:	74
Communication type	:	Polling
Input Data Size	:	312 if using Byte Mode; 280 if using Nibble Mode *1
Output Data Size	:	312 if using Byte Mode; 280 if using Nibble Mode *2

- Be sure to match the Input Data Size and Output Data Size to the number of points as defined for the X-gateway. If the specified values are different, communications will fail with node information mismatch error.

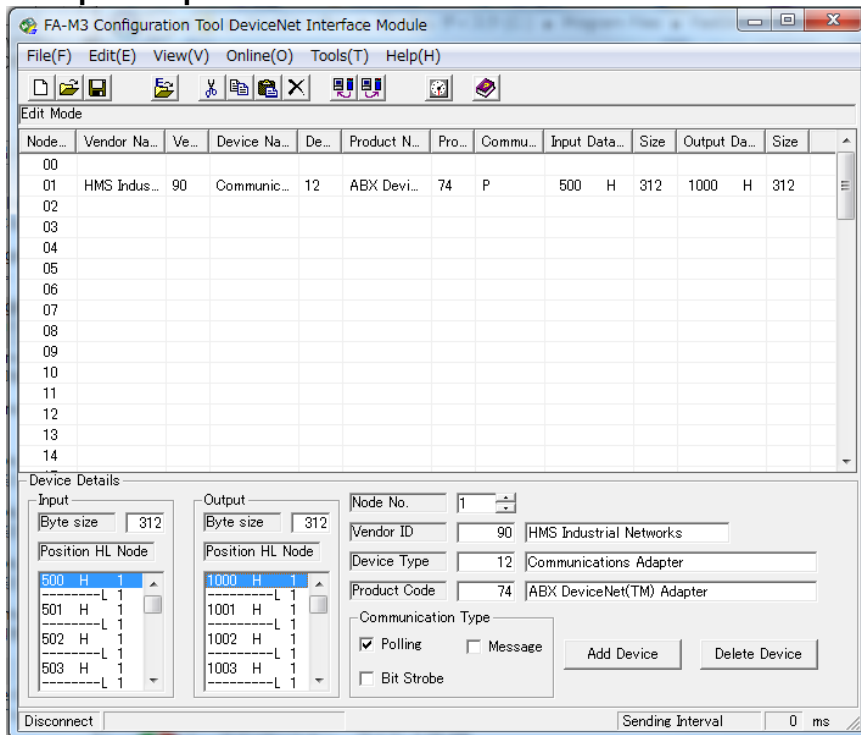
*1

- Add 2 to the Input Data Size if using Control Word/Status Word.
- Add 8 to the Input Data Size if using Live List.
- Add 18 to the Input Data Size if using Valid Data List
- (For example, if using full features in Byte Mode, specify Input Data Size as 312+2+8+18=340 bytes.)

*2

- Add 2 to the Output Data Size if using Control Word/Status Word (312+2=314 bytes)

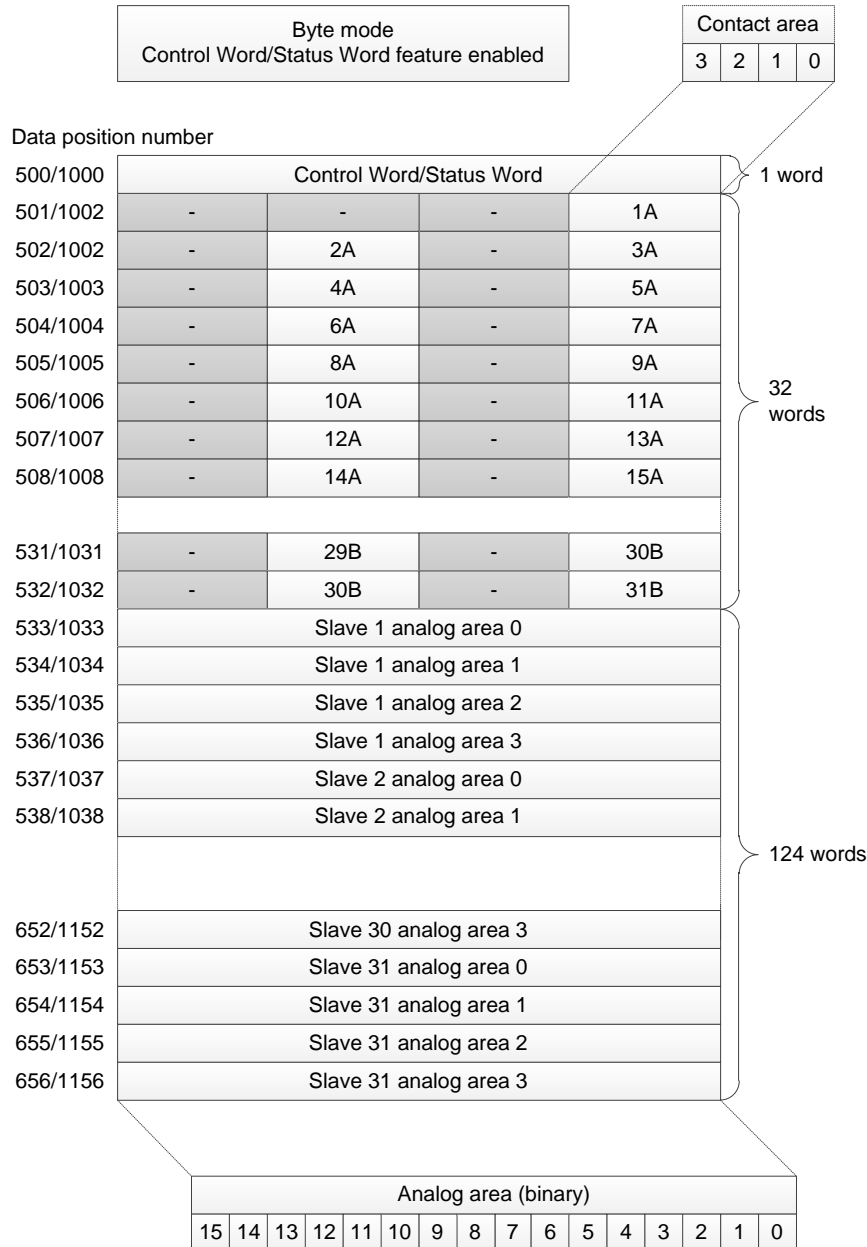
Setup Example

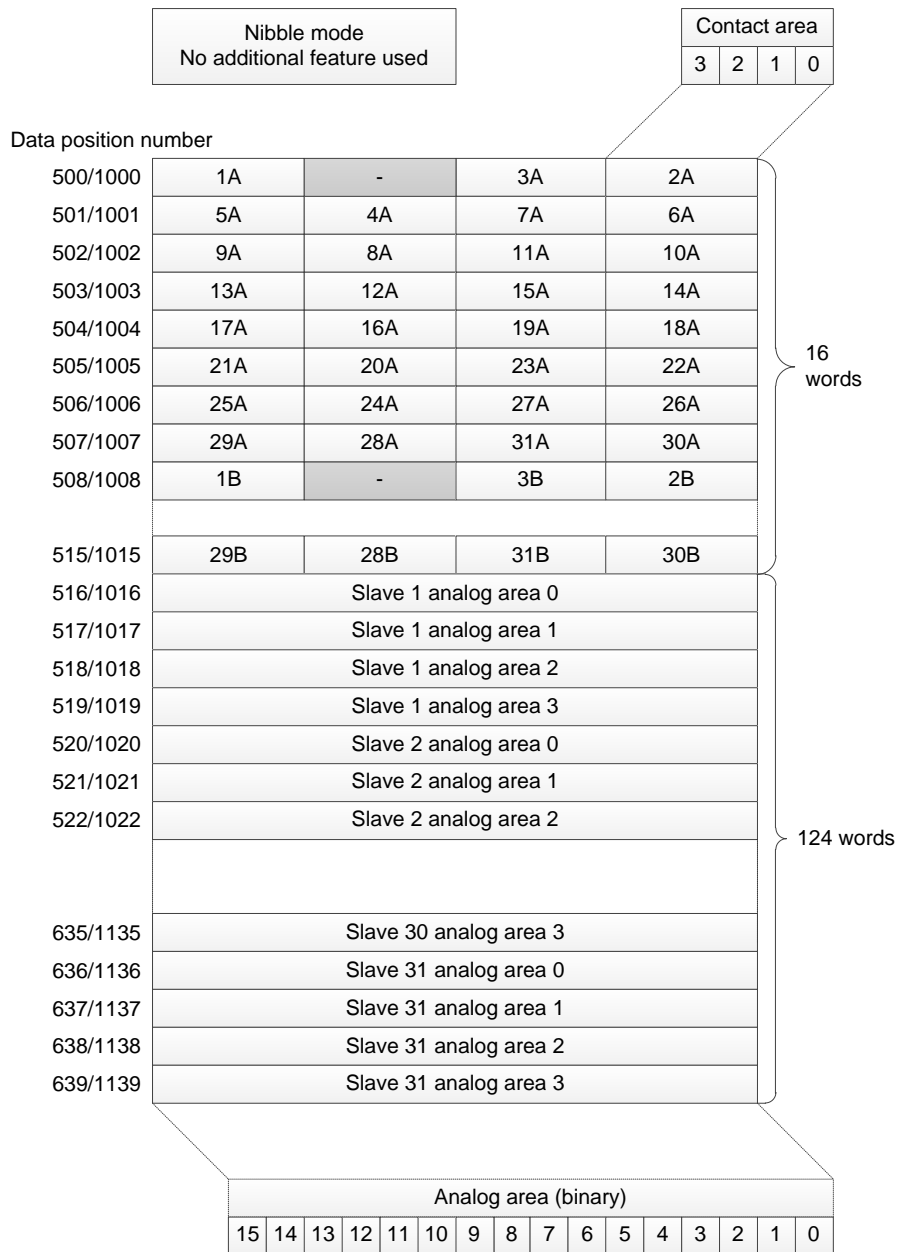


■ I/O data map as seen from F3LD01-0N

We describe below the relationship between slave information and data position numbers as seen from F3LD01.

Data position numbers are offset by the number of words taken up by Live List and other functions used, if any. The data mapping for input and output is similar. Disregarding the offset, the input area (to be read using READ instructions) starts from data position number 500 and the output area (to be written using WRITE instructions) starts from data position number 1000. The following figure shows an example where input is specified to start from number 500 and output is specified to start from 1000.





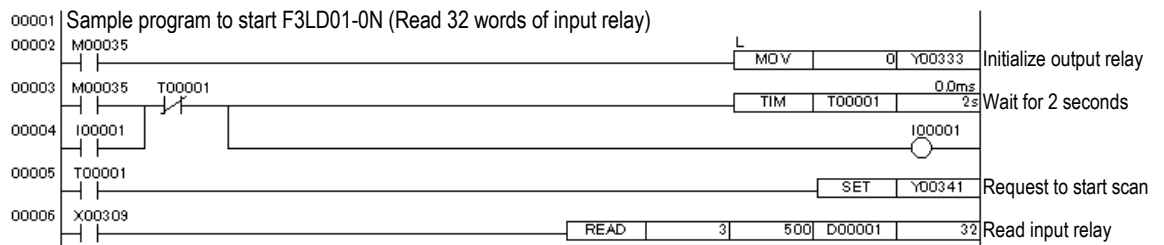
4. F3LD01-0N Operation

■ Ladder program

Turn on output relay Y□□□41 (Start Scan) to start scanning. Input relay X□□□09 (Scan Status) turns on automatically when scanning is started successfully. Check the Scan Status relay before reading input data and writing output data.

Sample Ladder Program

The following sample program assumes that F3LD01-0N is installed in slot 3. The program issues a request to start scanning two seconds after FA-M3 operation begins. It then reads 32 words (64 bytes) of input data starting from data position number 500 into data registers D00001 to D00032. (Initialization of an output relay and a two-second timer are included but not required.)



For details on the functions and usage of F3LD01-0N, read the DeviceNet Scanner Module Instruction Manual (IM 34M06H28-01E).

5. Appendix

■ Information about purchasing the Anybus X-gateway

Dealers: HMS/Anybus systems partners

Check website <https://www.anybus.com/contact>
for the latest information.

For this manual, we ordered the product from HMS dealer in Japan at the end of September and received the product in mid-November. (Delivery time is about 30 days).

Note: Actual delivery time may vary.
For more information, contact Anybus systems partners.