Applicable Product:

- **Range-free Multi-controller FA-M3**
  - Model code: F3LB01-0N
  - Name: PROFIBUS-DP Interface Module

The document number and document model code for this manual are given below. Refer to the document number in all communications; also refer to the document number or the document model code when purchasing additional copies of this manual.

- Document No.: IM 34M6H34-01E
- Document Model Code: DOCIM
Important

■ About This Manual
- This Manual should be passed on to the end user.
- Before using the controller, read this manual thoroughly to have a clear understanding of the controller.
- This manual explains the functions of this product, but there is no guarantee that they will suit the particular purpose of the user.
- Under absolutely no circumstances may the contents of this manual be transcribed or copied, in part or in whole, without permission.
- The contents of this manual are subject to change without prior notice.
- Every effort has been made to ensure accuracy in the preparation of this manual. However, should any errors or omissions come to the attention of the user, please contact the nearest Yokogawa Electric representative or sales office.

■ Safety Precautions when Using/Maintaining the Product
- The following safety symbols are used on the product as well as in this manual.

⚠️ **Danger.** This symbol on the product indicates that the operator must follow the instructions laid out in this instruction manual to avoid the risk of personnel injuries, fatalities, or damage to the instrument. Where indicated by this symbol, the manual describes what special care the operator must exercise to prevent electrical shock or other dangers that may result in injury or the loss of life.

🛡️ **Protective Ground Terminal.** Before using the instrument, be sure to ground this terminal.

⚡ **Function Ground Terminal.** Before using the instrument, be sure to ground this terminal.

Alternating current. Indicates alternating current.

Direct current. Indicates direct current.
The following symbols are used only in the instruction manual.

⚠️ **WARNING**

Indicates a “Warning”.
Draws attention to information essential to prevent hardware damage, software
damage or system failure.

⚠️ **CAUTION**

Indicates a “Caution”
Draws attention to information essential to the understanding of operation and functions.

**TIP**

Indicates a “TIP”
Gives information that complements the present topic.

**SEE ALSO**

Indicates a “SEE ALSO” reference.
Identifies a source to which to refer.

- For the protection and safe use of the product and the system controlled by it, be
sure to follow the instructions and precautions on safety stated in this manual
whenever handling the product. Take special note that if you handle the product in
a manner other than prescribed in these instructions, the protection feature of the
product may be damaged or impaired. In such cases, Yokogawa cannot guarantee
the quality, performance, function and safety of the product.

- When installing protection and/or safety circuits such as lightning protection devices
and equipment for the product and control system as well as designing or installing
separate protection and/or safety circuits for fool-proof design and fail-safe design of
processes and lines using the product and the system controlled by it, the user
should implement it using devices and equipment, additional to this product.

- If component parts or consumable are to be replaced, be sure to use parts specified
by the company.

- This product is not designed or manufactured to be used in critical applications
which directly affect or threaten human lives and safety — such as nuclear power
equipment, devices using radioactivity, railway facilities, aviation equipment, air
navigation facilities, aviation facilities or medical equipment. If so used, it is the
user’s responsibility to include in the system additional equipment and devices that
ensure personnel safety.

- Do not attempt to modify the product.

### Exemption from Responsibility

- Yokogawa Electric Corporation (hereinafter simply referred to as Yokogawa Electric)
makes no warranties regarding the product except those stated in the WARRANTY
that is provided separately.

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indirect, caused by the use or any unpredictable defect of the product.
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- Yokogawa Electric makes no other warranties expressed or implied except as provided in its warranty clause for software supplied by the company.
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- Copying the software for any purposes other than backup is strictly prohibited.
- Store the original media, such as floppy disks, that contain the software in a safe place.
- Reverse engineering, such as decompiling of the software, is strictly prohibited.
- No portion of the software supplied by Yokogawa Electric may be transferred, exchanged, or sublet or leased for use by any third party without prior permission by Yokogawa Electric.
General Requirements for Using the FA-M3 Controller

- Avoid installing the FA-M3 controller in the following locations:
  - Where the instrument will be exposed to direct sunlight, or where the operating temperature exceeds the range 0°C to 55°C.
  - Where the relative humidity is outside the range 10 to 90%, or where sudden temperature changes may occur and cause condensation.
  - Where corrosive or flammable gases are present.
  - Where the instrument will be exposed to direct mechanical vibration or shock.
  - Where the instrument may be exposed to extreme levels of radioactivity.

- Use the correct types of wire for external wiring:
  - Use copper wire with temperature ratings greater than 75°C.

- Securely tighten screws:
  - Securely tighten module mounting screws and terminal screws to avoid problems such as faulty operation.
  - Tighten terminal block screws with the correct tightening torque as given in this manual.

- Securely lock connecting cables:
  - Securely lock the connectors of cables, and check them thoroughly before turning on the power.

- Interlock with emergency-stop circuitry using external relays:
  - Equipment incorporating the FA-M3 controller must be furnished with emergency-stop circuitry that uses external relays. This circuitry should be set up to interlock correctly with controller status (stop/run).

- Low impedance grounding:
  - For safety reasons, connect the [FG] grounding terminal to a Japanese Industrial Standards (JIS) Class D Ground*1 (Japanese Industrial Standards (JIS) Class 3 Ground). For compliance to CE Marking, use braided or other wires that can ensure low impedance even at high frequencies for grounding.

*1 Japanese Industrial Standard (JIS) Class D Ground means grounding resistance of 100Ω max.

- Configure and route cables with noise control considerations:
  - Perform installation and wiring that segregates system parts that may likely become noise sources and system parts that are susceptible to noise. Segregation can be achieved by measures such as segregating by distance, installing a filter or segregating the grounding system.

- Configure for CE Marking Conformance:
  - For compliance to CE Marking, perform installation and cable routing according to the description on compliance to CE Marking in the “Hardware Manual” (IM34M6C11-01E).
- Keep spare parts on hand:
  - Stock up on maintenance parts including spare modules, in advance.

- Discharge static electricity before operating the system:
  - Because static charge can accumulate in dry conditions, first touch grounded metal to discharge any static electricity before touching the system.

- Never use solvents such as paint thinner for cleaning:
  - Gently clean the surfaces of the FA-M3 controller with a cloth that has been soaked in water or a neutral detergent and wringed.
  - Do not use volatile solvents such as benzine or paint thinner or chemicals for cleaning, as they may cause deformity, discoloration, or malfunctioning.

- Avoid storing the FA-M3 controller in places with high temperature or humidity:
  - Since the CPU module has a built-in battery, avoid storage in places with high temperature or humidity.
  - Since the service life of the battery is drastically reduced by exposure to high temperatures, take special care (storage temperature should be from –20°C to 75°C).
  - There is a built-in lithium battery in a CPU module and temperature control module which serves as backup power supply for programs, device information and configuration information. The service life of this battery is more than 10 years in standby mode at room temperature. Take note that the service life of the battery may be shortened when installed or stored at locations of extreme low or high temperatures. Therefore, we recommend that modules with built-in batteries be stored at room temperature.

- Always turn off the power before installing or removing modules:
  - Failing to turn off the power supply when installing or removing modules, may result in damage.

- Do not touch components in the module:
  - In some modules you can remove the right-side cover and install ROM packs or change switch settings. While doing this, do not touch any components on the printed-circuit board, otherwise components may be damaged and modules may fail to work.

- Do not wire unused terminals:
  - Do not wire unused terminals of external connection terminal blocks or unused pins of connectors of the module. Doing so may affect the function of the module.
**Waste Electrical and Electronic Equipment**

Waste Electrical and Electronic Equipment (WEEE), Directive 2002/96/EC  
(This directive is only valid in the EU.)

This product complies with the WEEE Directive (2002/96/EC) marking requirement.  
The following marking indicates that you must not discard this electrical/electronic  
product in domestic household waste.

**Product Category**  
With reference to the equipment types in the WEEE directive Annex 1, this product is  
classified as a "Monitoring and Control instrumentation" product.  
Do not dispose in domestic household waste.  
When disposing products in the EU, contact your local Yokogawa Europe B. V. office.
Introduction

■ Overview of the Manual

This manual describes the specifications, handling and communications control procedure of the PROFIBUS-DP Interface Module.

■ Other Instruction Manuals

The reference manuals depend on the CPU module to be used. You should read the latest versions of the following instructions manuals, as required.

- **F3SP28, F3SP38, F3SP53, F3SP58, F3SP59**
  - For information on sequence CPU functions, refer to:
    - Sequence CPU Instruction Manual - Functions (for F3SP28-3N/3S, F3SP38-6N/6S, F3SP53-4H/4S, F3SP58-6H/6S and F3SP59-7S) (IM34M6P13-01E)
  - For information on sequence CPU instructions, refer to:
    - Sequence CPU Instruction Manual - Instructions (IM34M6P12-03E)
  - For information on creating ladder programs, refer to:
    - FA-M3 Programming Tool WideField2 (IM34M6Q15-01E)

- **F3SP21, F3SP25, F3SP35, F3SP05, F3SP08**
  - For information on sequence CPU functions, refer to:
    - Sequence CPU Instruction Manual - Functions (for F3SP21, F3SP25 and F3SP35) (IM34M6P12-02E)
  - For information on sequence CPU instructions, refer to:
    - Sequence CPU Instruction Manual - Instructions (IM34M6P12-03E)
  - For information on creating ladder programs, refer to:
    - FA-M3 Programming Tool WideField2 (IM34M6Q15-01E)

- **F3BP20, F3BP30**
  - BASIC CPU Modules and YM-BASIC/FA Programming Language (IM34M6Q22-01E)

- **For the FA-M3 specifications and configurations**, installation and wiring, test run, maintenance, and module installation restrictions for the whole system:

  *1: Refer to the relevant product manuals for specifications except for power supply modules, base modules, input/output modules, cables and terminal units.

  - Hardware Manual (IM 34M6C11-01E)
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1. **Overview**

The PROFIBUS-DP Interface Module (F3LB01-0N, sometimes abbreviated as "this module" in this book) is a PROFIBUS-DP master module to be installed in an I/O slot of the range-free controller FA-M3. It provides one port, uses a D-sub 9-pin female connector, and allows up to 125 nodes (including the module itself, slaves and repeaters) to be connected.

### Features

The F3LB01-0N module provides PROFIBUS-DP master functions (DPM1: Class 1), which enable control of connected slaves and data exchange with connected slaves.

This module has the following features:
- Allows up to 121 slaves to be connected.
- Supports transmission rate of 9.6 kbps to 12 Mbps.
- Supports up to 8192 I/O data points (4096 input points, and 4096 output points).
- Supports multi-master configuration with distributed control.
- Allows I/O data synchronization with slaves using commands.
- Diagnosis function provides detailed error information on master and slaves.
- Configuration connector (D-sub 9-pin male connector) enables network configuration from a PC.
1.1 What is PROFIBUS-DP?

PROFIBUS-DP is the most popular bus among the PROFIBUS family. This chapter provides an overview of PROFIBUS, and the three bus types within the PROFIBUS family.

- PROFIBUS
  PROFIBUS is a vendor-independent, open fieldbus standard (EN50170), which finds wide applications in factory automation and process automation.

- PROFIBUS-DP
  PROFIBUS-DP (Decentralized Periphery) is used for communications between PLC and remote I/O devices, and allows high-speed data transmission between field devices.

- PROFIBUS-FMS
  PROFIBUS-FMS (Fieldbus Message Specification) is used for communications between PC, PLCs and other devices in factory automation, and supports powerful application-layer functions for communications between intelligent stations.

- PROFIBUS-PA
  The PROFIBUS-PA (Process Automation) solution extends on the functions of the PROFIBUS-DP and is designed for process automation that demands explosion-proof or other special requirements. It allows power to be supplied to individual nodes using communication bus cables.

SEE ALSO
For details on PROFIBUS specifications and other related information, refer to literature published by PROFIBUS International.
1.2 Network Configuration

The following diagram shows the typical configuration of a PROFIBUS-DP network.

Figure 1.1 Network Configuration Diagram

The network elements are described below.

- **Station**
  A station is a general term that refers to a device (master, slave, repeater) in a network. With no repeater, up to 32 stations can be connected. With repeaters, up to 126 stations can be connected. Up to 121 slaves can be connected.
  Example: 1 master
  3 repeaters
  121 slaves
  1 special-purpose station (one station is usually reserved for special purposes)

- **Class 1 DP Master (DPM1)**
  A class 1 DP master is a central controller that performs cyclical information exchange of defined messages with distributed stations (slaves). Typical devices are programmable logic controllers and personal computers.
  The F3LB01-0N module is a class 1 DP master.

- **Class 2 DP Master (DPM1)**
  A class 2 DP master may be an engineering device, a configuration device or an operation device. These devices are used in startup, maintenance and diagnosis of connected devices to perform set up, evaluate measured values or parameters, or request for status information.

- **Slave**
  A slave is a peripheral device (I/O device, drive, HMI, valve, transducer) that collects input information, and transmits output information to peripheral equipment. Some slaves provide only input information, while others provide only output information.
  The input or output data size is device-dependent. Up to 246 bytes of input data and 246 bytes of output type are allowed.
● **Repeater**

To connect more than 32 stations in a network, or to extend the area of a network, repeaters can be used to connect individual bus segments and provide line signal amplification. Note that repeaters are also counted as stations, when considering the upper limit on the number of connectable stations.

● **Terminating Resistor**

Active terminating resistors must be connected at both ends of each bus segment. To ensure error-free operation, bus terminating resistors must always be supplied with power. In most cases, you can either use the terminating resistor inside a device, or the terminating resistor inside a bus terminating resistor connector as the bus terminating resistor.

By setting a switch on the module front, you can specify whether to use its built-in terminating resistor as the bus terminating resistor.

![Figure 1.2 Terminating Resistor of Bus](image)

● **Cable Connector**

Devices should be connected to a PROFIBUS-DP bus using cables and connectors compliant to the PROFIBUS specification (EN 50170).

PROFIBUS-compliant cables and connectors are available from many vendors.

● **Configurator**

PROFIBUS-DP requires pre-registration of configuration of devices on a bus.

The F3LB01-0N module uses a SyCon configurator software to register configuration information on a PC.

Use the following product as the SyCon configurator.

- **Manufacturer**: HMS Industrial Networks AB
  - Pilefeltsgatan 93-95
  - 302 50 Halmstad Sweden
  - Tel: +46 35 17 29 00
  - Email: sales@hms-networks.com

- **Product model**: KONF-PDP (Configurator for PROFIBUS-DP)
1.3 Communications

Concepts of Communication

PROFIBUS allows configuration of a mono-master system, which has one master in a network or a multi-master system, which has more than one masters in a network.

By using a token-passing protocol between masters, bus access rights (token) are allocated to individual masters within strict defined time frames.

A master owning a token is permitted to access its assigned slaves to send and receive I/O data.

A master cyclically reads input data from its slaves, and writes output data to its slaves.

A master may broadcast control commands to a predefined group of slaves (multicast communication).

![Diagram of PROFIBUS Communications](image)

**Figure 1.3 Conceptual Diagram of PROFIBUS Communications**

Data Exchange

Data exchange refers to the module (master) cyclically reading input data from its slaves, and cyclically writing output data to its slaves.

Global Control

The F3LB01-0N module (master) can send control commands (global control) to specified groups. (multicast communications).

Control commands include "SYNC/UNSYNC" and "FREEZE/UNFREEZE" commands, which controls synchronization of output data or input data with slaves.
### Group Selection

This module supports group registration for registering selected slaves to a group. It also allows transmission of control commands (global control) to selected groups.

To register slaves to a group, use the “Settings - Group Membership - Group Assignment” function of the SyCon configurator. By default, all slaves are registered to all groups.

### Synchronism and Concurrency

This module supports synchronization of output data or input data with slaves through transmission of SYNC and FREEZE control commands (global control).

**Figure 1.4 Conceptual Diagram of Slave I/O Data Synchronization and Group Selection**

This module supports Relay Activated mode, which ensures concurrency of input/output data longer than 16 bits through proper send/receive protocol.

**Figure 1.5 Conceptual Diagram of I/O Data Concurrency**
Transmission Rate

In PROFIBUS-DP, it takes about 1 ms to perform distributed transmission 512 bits of input data and 512 bits of output data to 32 stations at transmission rate of 12Mbit/s. Figure 1.6 shows typical transmission time versus number of stations and transmission rate in PROFIBUS-DP.

![Figure 1.6: Bus Cycle Time for a PROFIBUS-DP Mono-Master System](image)

Maximum Cable Length

The maximum permissible cable length of a PROFIBUS-DP depends on the transmission rate. For details, see Table 1.1. The cable length specification given in Table 1.1 assumes PROFIBUS cable type A, with the following parameter values.

- Impedance : 135 to 165 Ω
- Capacitance : <30 pf/m
- Loop resistance : 110 Ω/km
- Diameter of conductor : 0.64 mm
- Cross-sectional area of conductor : >0.34 mm²

<table>
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<tr>
<th>Baud Rate (kbps)</th>
<th>9.6</th>
<th>19.2</th>
<th>93.75</th>
<th>187.5</th>
<th>500</th>
<th>1500</th>
<th>12000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance per Segment</td>
<td>1200 m</td>
<td>1200 m</td>
<td>1200 m</td>
<td>1000 m</td>
<td>400 m</td>
<td>200 m</td>
<td>100 m</td>
</tr>
</tbody>
</table>
1.4 Configuration

Before performing operations over a PROFIBUS network, you need to first configure the network.

To achieve simple plug-and-play configuration in PROFIBUS, communication functions of devices are pre-defined in individual electronic data sheets (GSD files), which enable easy configuration of a PROFIBUS network containing devices from different manufacturers using the GSD files.

GSDs file of PROFIBUS-compliant devices can be downloaded freely from the GSD library at the official web site of PROFIBUS (http://www.profibus.com), or be obtained from device manufacturers.

![Conceptual Diagram of Network Configuration](image)

**Figure 1.7 Conceptual Diagram of Network Configuration**

**CAUTION**

Network configuration of the F3LB01-0N module requires the use of SyCon PROFIBUS Configurator from HMS Industrial Networks AB, which must be purchased separately.

---

**TIP**

Use the following products for the SyCon configurator.

Manufacturer : HMS Industrial Networks AB
  Pilefeltsgatan 93-95
  302 50 Halmstad Sweden
  Tel: +46 35 17 29 00
  Email: sales@hms-networks.com

Product model : KONF-PDP (Configurator for PROFIBUS-DP)

---

**TIP**

The GSD file of the F3LB01-0N module is provided in a folder on the SyCon CD.
2. F3LB01-0N

2.1 General Specifications

- Model and Suffix Codes

<table>
<thead>
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<th>Style Code</th>
<th>Option Code</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>F3LB01</td>
<td>-0N</td>
<td>—</td>
<td>—</td>
<td>12M bps max., PROFIBUS-DP, 1 port</td>
</tr>
</tbody>
</table>

- Operating Environment

The F3LB01-0N module is compatible with sequence CPU modules and AT-compatible CPU modules.

- General Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interface</td>
<td>PROFIBUS-DP, DPM1 (Class 1) compliant</td>
</tr>
<tr>
<td>Transmission medium</td>
<td>Special cable (containing two signal lines)</td>
</tr>
<tr>
<td>Transmission rate /</td>
<td>Transmission Rate</td>
</tr>
<tr>
<td>Transmission distance</td>
<td>9.6 kbps</td>
</tr>
<tr>
<td></td>
<td>19.2 kbps</td>
</tr>
<tr>
<td></td>
<td>93.75 kbps</td>
</tr>
<tr>
<td></td>
<td>187.5 kbps</td>
</tr>
<tr>
<td></td>
<td>500 kbps</td>
</tr>
<tr>
<td></td>
<td>1500 kbps</td>
</tr>
<tr>
<td></td>
<td>3M bps</td>
</tr>
<tr>
<td></td>
<td>6M bps</td>
</tr>
<tr>
<td></td>
<td>12M bps</td>
</tr>
<tr>
<td>Electrical standard</td>
<td>EIA RS-485, (Configuration connector EIA RS-232-C)</td>
</tr>
<tr>
<td>Connection mode</td>
<td>Bus connection</td>
</tr>
<tr>
<td>Maximum number of nodes</td>
<td>125 (including module itself)</td>
</tr>
<tr>
<td>Number of I/O points</td>
<td>8192 points (4096 input points and 4096 output points)</td>
</tr>
<tr>
<td>Terminating resistor</td>
<td>220Ω (built-in resistor should be enabled by switch when module is connected at the end of a bus)</td>
</tr>
<tr>
<td>Network configuration</td>
<td>Uses proprietary PROFIBUS Configurator software from HMS Industrial Networks AB</td>
</tr>
<tr>
<td>Operating temperature range</td>
<td>0°C to 45°C</td>
</tr>
<tr>
<td>Current consumption</td>
<td>610 mA</td>
</tr>
<tr>
<td>External dimensions</td>
<td>28.9 (W)×100 (H)×83.2(D) mm</td>
</tr>
<tr>
<td>Weight</td>
<td>170 g</td>
</tr>
</tbody>
</table>

* Excluding protrusions (for details, see "External Dimensions")
Components and Functions

- Front View

  Display
  - RDY: Lit when the internal circuitry is functioning normally.
  - MST: Shows module status.
  - NST: Lit when module is functioning normally.
  - ERR: Shows network status.
  - Lit when communicating with slaves.
  - ERR: Lit when an error is detected.

  Configuration connector

  Terminating resistor switch

  PROFIBUS-DP connector

External Dimensions

(Unit: mm)
2.2 LED Display

Four LED indicators can be found at the top of the front side of the module.

These LED lamps indicate the status of the module and the network.

- **RDY LED**
  
The RDY LED is lit when the module is operating normally. It is off when there is no proper power supply to the module, or when an error has occurred in the module. When the module is switched on, the RDY LED turns on after self-diagnosis is completed.

- **MST LED**
  
The MST LED shows the status of the F3LB01-0N module as a master. For details on interpretation of the LED states, see Table 2.1 below.

- **NST LED**
  
The NST LED shows the status of the network. For details on interpretation of the LED states, see Table 2.1 below.

### Table 2.1 Description of LED States

<table>
<thead>
<tr>
<th>LED</th>
<th>Color</th>
<th>State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MST</td>
<td>—</td>
<td>Off</td>
<td>Hardware error</td>
</tr>
<tr>
<td></td>
<td>Green</td>
<td>On</td>
<td>Normal operation</td>
</tr>
<tr>
<td></td>
<td>Green</td>
<td>Slow blinking (Blinking cycle: 1 Hz, 50% ON, 50% OFF)</td>
<td>The flash memory contains only the boot loader routine. Valid firmware and configuration are not stored.</td>
</tr>
<tr>
<td></td>
<td>Green</td>
<td>Fast blinking (Blinking cycle: 2 Hz, 50% ON, 50% OFF)</td>
<td>Hardware/system error. Downloading firmware configuration data.</td>
</tr>
<tr>
<td>NST</td>
<td>—</td>
<td>Off</td>
<td>Communications with slaves is not allowed.</td>
</tr>
<tr>
<td></td>
<td>Green</td>
<td>On</td>
<td>Communicating with slaves.</td>
</tr>
<tr>
<td></td>
<td>Green</td>
<td>Slow blinking (Blinking cycle: 1 Hz, 50% ON, 50% OFF)</td>
<td>Communications with slaves is allowed.</td>
</tr>
<tr>
<td></td>
<td>Green</td>
<td>Fast blinking (Blinking cycle: 2 Hz, 50% ON, 50% OFF)</td>
<td>A communications error or fatal error has occurred.</td>
</tr>
</tbody>
</table>

- **ERR LED**
  
The ERR LED lights up when an internal error, a master error, a communications error or a slave diagnosis error is detected.
2.3 Switch Settings

Setting Terminating Resistor Switch

The terminating resistor switch located on the module front can be used to specify whether to use the module's built-in resistor as a terminator resistor of the bus. The resistor should be used only when the module is installed at the end of a bus. In place of the built-in resistor of the module, the built-in terminating resistor of the PROFIBUS connector attached to the PROFIBUS-DP port may be used by setting the terminating resistor switch on the module to OFF and that on the connector to ON.

If the terminating resistor of the module is enabled when the module is not installed at the end of a bus, it may result in incorrect operation.

By default, the terminating resistor is set to OFF.

ON: Enable terminating resistor
OFF: Disable terminating resistor

Set either terminating resistor to ON if module is configured at the end of a bus.
Set both terminating resistors to OFF if module is not configured at the end of a bus.
2.4 External Connections

- PROFIBUS-DP Port

The PROFIBUS-DP port connector on the module is used for connecting to a PROFIBUS-DP bus via a cable-connector set conforming to the PROFIBUS standard (EN50170).

- Connector Pin Assignment

![Pin Assignment Diagram]

Table 2.2 PROFIBUS-DP Connector Signals

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Signal Name</th>
<th>Description</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Shield</td>
<td>Shield</td>
<td>Shield ground</td>
</tr>
<tr>
<td>3</td>
<td>B-Line</td>
<td>B-Signal (RXD/TXD-P)</td>
<td>Data signal</td>
</tr>
<tr>
<td>4</td>
<td>RTS</td>
<td>Request to Send</td>
<td>TTL control signal (for use by repeater)</td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
<td>Signal Ground (DGND)</td>
<td>Signal ground (DGND) (for terminating resistor)</td>
</tr>
<tr>
<td>6</td>
<td>+5V</td>
<td>5 V Power Supply (VP)</td>
<td>+5 V Power supply (for terminating resistor)</td>
</tr>
<tr>
<td>8</td>
<td>A-Line</td>
<td>A-Signal (RXD/TXD-N)</td>
<td>Data signal</td>
</tr>
</tbody>
</table>

- Wiring Diagram

![Wiring Diagram]

- Connection Diagram

![Connection Diagram]

**CAUTION**

To ground the cable, strip off part of the cable insulation to expose the internal shield, and secure and ground with an FG clamp.

For details on internal wiring of the PROFIBUS connector, see the user’s manual for the PROFIBUS connector.
CAUTION

If an angled-type PROFIBUS connector is attached to the PROFIBUS-DP port, it will obstruct connection of an RS-232-C cross cable to the configuration port. Therefore, you should use a straight-type PROFIBUS connector instead when performing configuration.

Configuration Port

The configuration port connector on the module is used for connecting to the serial port of a PC via an RS-232-C cross cable.

● Connector Pin Assignment

Configuration connector

![Configuration Port Connector](image)

Figure 2.2 External View of Configuration Port Connector

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Signal</th>
<th>Signal Name</th>
<th>Signal Direction FA-M3</th>
<th>Signal Direction PC</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>2</td>
<td>RD</td>
<td>Read Data</td>
<td>—</td>
<td>—</td>
<td>Used for configuration (RS-232-C)</td>
</tr>
<tr>
<td>3</td>
<td>SD</td>
<td>Send Data</td>
<td>—</td>
<td>—</td>
<td>Used for configuration (RS-232-C)</td>
</tr>
<tr>
<td>4</td>
<td>ER</td>
<td>Data Terminal Ready</td>
<td>—</td>
<td>—</td>
<td>Used for configuration (RS-232-C)</td>
</tr>
<tr>
<td>5</td>
<td>SG</td>
<td>Signal Ground</td>
<td>—</td>
<td>—</td>
<td>Used for configuration (RS-232-C)</td>
</tr>
<tr>
<td>6</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>7</td>
<td>RS</td>
<td>Request to Send</td>
<td>—</td>
<td>—</td>
<td>Used for configuration (RS-232-C)</td>
</tr>
<tr>
<td>8</td>
<td>CS</td>
<td>Clear to Send</td>
<td>—</td>
<td>—</td>
<td>Used for configuration (RS-232-C)</td>
</tr>
<tr>
<td>9</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>
- **Wiring Diagram**

![Wiring Diagram](image1)

- **Connection Diagram**

![Connection Diagram](image2)
2.5 Attaching/Detaching the Module

Attaching a Module

Figure 2.3 shows how to attach this module to the base module. First hook the anchor slot at the bottom of the module to be attached onto the anchor pin on the bottom of the base module. Push the top of the module toward the base module until the anchor/release button clicks into place.

**CAUTION**

Always switch off the power before attaching or detaching a module.

![Diagram](image)

**CAUTION**

DO NOT bend the connector on the rear of the module by force during the above operation. If the module is pushed with excessive force, the connector pins may bend, causing in an error.

**Detaching a Module**

To remove the module from the base module, reverse the above operation. Press the anchor/release button on the top of the module to unlock it, and tilt the module away from the base module.
Attaching Modules in Intense Vibration Environments

If the module is used in intense vibration environments, fasten the module with a screw. Use screws of type listed in the table below. Insert these screws into the screw holes on top of the module and tighten them with a Phillips screwdriver.

<table>
<thead>
<tr>
<th>Screw Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>M4-size Binder screw 12 to 15 mm long (or 14 to 15 mm if fitted with a washer)</td>
</tr>
</tbody>
</table>

Figure 2.4  Securing the Module with a Screw
3. Input/Output Relays

The PROFIBUS-DP Interface module provides 32 output relays and 32 input relays for interfacing with the CPU module of a FA-M3 system.

All input relays can be interrupted.

3.1 Output Relays

Table 3.1 Output Relays

<table>
<thead>
<tr>
<th>Output Relay Number</th>
<th>Relay Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y□□□□□33</td>
<td>Request to start data exchange</td>
<td>Turn on this relay to start input/output data transfer between this module (master) and its slaves. When data transfer ends, relay X□□□□□□01 turns on.</td>
</tr>
<tr>
<td>Y□□□□□34</td>
<td>Request to turn off Error Detected relay</td>
<td>Turn on this relay to turn off the Error Detected relay (X□□□□□□02), as well as clear the error information registers and extended error information registers. When error information registers and extended error information registers are cleared, relay X□□□□□□02 turns off.</td>
</tr>
<tr>
<td>Y□□□□□35</td>
<td>Request to issue global control</td>
<td>Turn on this relay to issue global control commands. If the request completes normally, relay X□□□□□□03 turns on. If request data is invalid, relay X□□□□□□04 turns on.</td>
</tr>
<tr>
<td>Y□□□□□36</td>
<td>Master reset request</td>
<td>Turn on this relay to perform a warm start of the master. When a master reset request is accepted, relay X□□□□□□07 turns on.</td>
</tr>
<tr>
<td>Y□□□□□37</td>
<td>Transfer mode setup request</td>
<td>Turn on this relay to set the input/output data transfer mode between the CPU module and this module to Relay Activated mode or Normal mode. When setup completes, relay X□□□□□□08 turns on. If the value of the Input/Output Data Transfer Mode register is invalid, relay X□□□□□□09 turns on.</td>
</tr>
<tr>
<td>Y□□□□□38</td>
<td>Request to start transfer</td>
<td>Turn on this relay to start input/output data transfer between the CPU module and this module in Relay Activated transfer mode. You can specify the data to be transferred as input/output data, input data or output data using the Transfer Data Selection register. When transfer ends, relay X□□□□□□10 turns on. If the value of the Transfer Data Selection register is invalid, relay X□□□□□□11 turns on.</td>
</tr>
<tr>
<td>Y□□□□□39 to Y□□□□□64</td>
<td>Reserved</td>
<td></td>
</tr>
</tbody>
</table>
### 3.2 Input Relays

<table>
<thead>
<tr>
<th>Input Relay Number</th>
<th>Relay Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>X□□□01</td>
<td>Start data exchange completed</td>
<td>This relay turns on when input/output data transfer between this module (master) and its slaves are started. Turning on Y□□□36 turns off this relay. This relay also turns off when end of data exchange is detected.</td>
</tr>
<tr>
<td>X□□□02</td>
<td>Error detected</td>
<td>This relay turns on when an internal error, a master error, a communications error or a diagnostic error is detected. Turning on relay Y□□□34 turns off this relay.</td>
</tr>
<tr>
<td>X□□□03</td>
<td>Global control completed</td>
<td>This relay turns on when a global control request exits normally. Turning off relay Y□□□35 turns off this relay.</td>
</tr>
<tr>
<td>X□□□04</td>
<td>Global control error exit</td>
<td>This relay turns on when a global control request is invalid. Turning off relay Y□□□35 turns off this relay.</td>
</tr>
<tr>
<td>X□□□05</td>
<td>Network ready</td>
<td>This relay turns on when communications between this module (master) and its slaves is allowed, or in process. This relay turns off when communications is not allowed. Turning on relay Y□□□36 turns off this relay.</td>
</tr>
<tr>
<td>X□□□06</td>
<td>Master ready</td>
<td>This relay turns on while the master is operating normally. It turns off when a master error is detected. Turning on relay Y□□□36 turns off this relay.</td>
</tr>
<tr>
<td>X□□□07</td>
<td>Master reset received</td>
<td>This relay turns on when a master reset request is received. Turning off relay Y□□□36 turns off this relay.</td>
</tr>
<tr>
<td>X□□□08</td>
<td>Transfer mode setup completed</td>
<td>This relay turns on when setup of input/output data transfer mode between the CPU module and this module is completed. Turning off relay Y□□□37 turns off this relay.</td>
</tr>
<tr>
<td>X□□□09</td>
<td>Transfer mode setup error exit</td>
<td>This relay turns on if the value of the Input/output Data Transfer Mode register is found to be invalid during transfer mode setup for input/output data transfer between the CPU module and this module. In this case, the setup value of the transfer mode remains unchanged. Turning off relay Y□□□37 turns off this relay.</td>
</tr>
<tr>
<td>X□□□10</td>
<td>End of transfer</td>
<td>This relay turns on at the end of input/output data transfer between the CPU module and this module in Relay Activated transfer mode. In Normal transfer mode, this relay remains unchanged. Turning off relay Y□□□38 turns off this relay.</td>
</tr>
<tr>
<td>X□□□11</td>
<td>Transfer error exit</td>
<td>This relay turns on if the value of the Transfer Data Selection register is found to be invalid at the start of input/output data transfer between the CPU module and this module in Relay Activated transfer mode. In Normal transfer mode, this relay remains unchanged. Turning off relay Y□□□38 turns off this relay.</td>
</tr>
<tr>
<td>X□□□12 to X□□□32</td>
<td>Reserved</td>
<td></td>
</tr>
</tbody>
</table>
## 4. List of Registers

The PROFIBUS-DP Interface Module provides the following input/output registers for interfacing with the CPU module of a FA-M3 system.

<table>
<thead>
<tr>
<th>Register Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Output data registers</td>
</tr>
<tr>
<td>256</td>
<td></td>
</tr>
<tr>
<td>257</td>
<td></td>
</tr>
<tr>
<td>512</td>
<td>Input data registers</td>
</tr>
<tr>
<td>513</td>
<td>Global control data</td>
</tr>
<tr>
<td>514</td>
<td>Error Non-Reporting Time register</td>
</tr>
<tr>
<td>515</td>
<td>Input/output Data Transfer Mode register</td>
</tr>
<tr>
<td>516</td>
<td>Transfer Data Selection register</td>
</tr>
<tr>
<td>520</td>
<td>Error information registers</td>
</tr>
<tr>
<td>523</td>
<td></td>
</tr>
<tr>
<td>524</td>
<td></td>
</tr>
<tr>
<td>577</td>
<td>Extended error information registers</td>
</tr>
<tr>
<td>578</td>
<td></td>
</tr>
<tr>
<td>586</td>
<td>Reserved</td>
</tr>
<tr>
<td>587</td>
<td></td>
</tr>
<tr>
<td>594</td>
<td>Slave configuration information registers</td>
</tr>
<tr>
<td>595</td>
<td></td>
</tr>
<tr>
<td>602</td>
<td>Slave state information registers</td>
</tr>
<tr>
<td>603</td>
<td>Network Status register</td>
</tr>
</tbody>
</table>
## 4.1 Input/Output Data Registers

### Output Data Registers

Output data registers store output data to be sent to slave modules.

Example: Content of output data registers with 19 bytes, 6 bytes and 1 byte of output data to be sent to stations 1, 2 and 3 respectively.

<table>
<thead>
<tr>
<th>Register No.</th>
<th>Output data</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1 for station 1, 2 for station 1</td>
</tr>
<tr>
<td>10</td>
<td>3 for station 1, 4 for station 1</td>
</tr>
<tr>
<td>11</td>
<td>5 for station 1, 6 for station 1</td>
</tr>
<tr>
<td>13</td>
<td>7 for station 1, 8 for station 1</td>
</tr>
<tr>
<td>14</td>
<td>9 for station 1, 10 for station 1</td>
</tr>
<tr>
<td>15</td>
<td>11 for station 1, 12 for station 1</td>
</tr>
<tr>
<td>16</td>
<td>13 for station 1, 14 for station 1</td>
</tr>
<tr>
<td>17</td>
<td>15 for station 1, 16 for station 1</td>
</tr>
<tr>
<td>18</td>
<td>17 for station 1, 18 for station 1</td>
</tr>
<tr>
<td>19</td>
<td>19 for station 1</td>
</tr>
<tr>
<td>20</td>
<td>1 for station 2, 2 for station 2</td>
</tr>
<tr>
<td>21</td>
<td>3 for station 2, 4 for station 2</td>
</tr>
<tr>
<td>22</td>
<td>5 for station 2, 6 for station 2</td>
</tr>
<tr>
<td>23</td>
<td>16 for station 1</td>
</tr>
<tr>
<td>24</td>
<td>17 for station 1</td>
</tr>
<tr>
<td>25</td>
<td>18 for station 1</td>
</tr>
<tr>
<td>26</td>
<td>19 for station 1</td>
</tr>
</tbody>
</table>

### Input Data Registers

Input data registers store input data from slave modules.

Example: Content of input data registers with 23 bytes, 8 bytes and 1 byte of input data from stations 1, 2 and 3.

<table>
<thead>
<tr>
<th>Register No.</th>
<th>Input data</th>
</tr>
</thead>
<tbody>
<tr>
<td>257</td>
<td>1 for station 1, 2 for station 1</td>
</tr>
<tr>
<td>258</td>
<td>3 for station 1, 4 for station 1</td>
</tr>
<tr>
<td>259</td>
<td>5 for station 1, 6 for station 1</td>
</tr>
<tr>
<td>260</td>
<td>7 for station 1, 8 for station 1</td>
</tr>
<tr>
<td>261</td>
<td>9 for station 1, 10 for station 1</td>
</tr>
<tr>
<td>262</td>
<td>11 for station 1, 12 for station 1</td>
</tr>
<tr>
<td>263</td>
<td>13 for station 1, 14 for station 1</td>
</tr>
<tr>
<td>264</td>
<td>15 for station 1, 16 for station 1</td>
</tr>
<tr>
<td>265</td>
<td>17 for station 1, 18 for station 1</td>
</tr>
<tr>
<td>266</td>
<td>19 for station 1, 20 for station 1</td>
</tr>
<tr>
<td>267</td>
<td>21 for station 1, 22 for station 1</td>
</tr>
<tr>
<td>268</td>
<td>23 for station 1</td>
</tr>
<tr>
<td>269</td>
<td>1 for station 2, 2 for station 2</td>
</tr>
<tr>
<td>270</td>
<td>3 for station 2, 4 for station 2</td>
</tr>
<tr>
<td>271</td>
<td>5 for station 2, 6 for station 2</td>
</tr>
<tr>
<td>272</td>
<td>7 for station 2, 8 for station 2</td>
</tr>
<tr>
<td>273</td>
<td>1 for station 3</td>
</tr>
</tbody>
</table>
CAUTION

Output data and input data are not stored in the station address order; they are stored in the insertion (Insert-Slave) order of the slaves into the configuration using the SyCon configurator.

Always check the actual storage location for output data and input data for slave modules by referring to the View-Address Table of the SyCon configurator.

Always check the layout and contents of output data and input data inside an individual slave module by referring to its instruction manuals.
4.2 Setup Area

Global Control Data

The global control data area defines parameters for the global control function.

![Diagram of global control data area]

<table>
<thead>
<tr>
<th>Bit</th>
<th>Value (On/off)</th>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 to 15</td>
<td>1 / 0</td>
<td>Group 1 to 8 selection</td>
<td>Bits 8-15 define to which of groups 1-8 should &quot;SYNC/UNSYNC&quot; and &quot;FREEZE/UNFREEZE&quot; commands be transmitted (see above diagram for details on bit mapping). More than one group can be selected each time. * When bits 8-15 contain all zeroes, the global control command is transmitted to all slaves. * To transmit control commands to slaves that are not registered to groups using the SyCon configurator, set bits 8-15 to all zeroes.</td>
</tr>
<tr>
<td>5</td>
<td>1 / 0</td>
<td>SYNC</td>
<td>Output data is written to slaves. Their output data is held at that value.</td>
</tr>
<tr>
<td>4</td>
<td>1 / 0</td>
<td>UNSYNC</td>
<td>Holding of output data of slaves is cancelled.</td>
</tr>
<tr>
<td>3</td>
<td>1 / 0</td>
<td>FREEZE</td>
<td>Input data of slaves is held at current value to prepare for reading.</td>
</tr>
<tr>
<td>2</td>
<td>1 / 0</td>
<td>UNFREEZE</td>
<td>Holding of input data of slaves is cancelled.</td>
</tr>
</tbody>
</table>

The content of these registers remain unchanged even after execution of a Master Reset (Y□□□36) request.

Slaves on the network are assigned to individual groups on this module using group registration. To perform group registration, assign each slave to all desired groups using the "Settings-Group Membership-Group Assignment" function of the SyCon configurator, and then save and download the configuration file. For details on the procedure, see the description on "Setup Using Configurator" in Chapter 5. By default, no slave is assigned to any group.
The following table describes the actions associated with individual command bit combinations in the global control data area.

<table>
<thead>
<tr>
<th>SYNC</th>
<th>UNSYNC</th>
<th>FREEZE</th>
<th>UNFREEZE</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>No command is transmitted. The Global Control Error Exit relay turns on.</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
<td>0</td>
<td>1</td>
<td>Transmits global control command to slaves. Cancels &quot;FREEZE&quot; action on input data of slaves.</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
<td>1</td>
<td>0</td>
<td>Transmits global control command to slaves. Applies &quot;FREEZE&quot; action on input data of slaves.</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
<td>1</td>
<td>1</td>
<td>No command is transmitted. The Global Control Error Exit relay turns on.</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>X</td>
<td>X</td>
<td>Transmits global control command to slaves. Cancels &quot;SYNC&quot; action on output data of slaves.</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>X</td>
<td>X</td>
<td>Transmits global control command to slaves. Applies &quot;SYNC&quot; action on output data of slaves.</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>X</td>
<td>X</td>
<td>No command is transmitted. The Global Control Error Exit relay turns on.</td>
</tr>
</tbody>
</table>

Note: You can set up SYNC/UNSYNC and FREEZE/UNFREEZE at the same time so long as the bit values are valid. 'X' indicate 'don't-care' values.

**CAUTION**

Before performing setup of this module or turning on the Request to Issue Global Control relay (Y□□□□35), always ensure that the Start Data Exchange Completed relay (X□□□□01) is turned on.

### Error Non-Reporting Time Register

The Error Non-Reporting Time register defines the period in seconds during which errors will not be reported after data exchange is started by a user turning on the Request to Start Data Exchange relay. You can define any period up to 99 seconds. Setting the register to a value exceeding 99 will set the period to 99 seconds. The default value is 0 second.

This register can be used to ignore temporary errors caused by delays in slave startup after starting data exchange.

The value of this register remains unchanged even after execution of a Master Reset (Y□□□□36) request.

**Register No.** b15  b0

| 514 |

Valid data range is from 0 to 99 seconds.

### Input/Output Data Transfer Mode Register

You can set the transfer mode for input/output data register transfers between this module and the CPU module by turning on the Transfer Mode Setup Request relay. The default value is Normal mode (=0000).

In Normal mode (=0000), input data registers and output data registers at the module end are automatically updated.

In Relay Activated mode (=0001), input data registers and output data registers are updated when the Request to Startup Transfer relay is turned on.

The value of this register remains unchanged even after execution of a Master Reset (Y□□□□36) request.

**Register No.** b15  b0

| 515 |

$0000=Normal mode (Asynchronous between CPU module and this module)

$0001=Relay Activated mode (Synchronous between CPU module and this module)
CAUTION

- Before performing setup of this module or turning on the Transfer Mode Setup Request relay (Y□□□37), always ensure that the Start Data Exchange Completed relay (X□□□01) is turned on.
- You must first perform module setup and turn on the Transfer Mode Setup Request relay (Y□□□37) before turning on the Request to Start Transfer relay (Y□□□38).

Transfer Data Selection Register

The Transfer Data Selection register defines the data type for input/output data register transfers between this module and the CPU module when the Request to Start Transfer relay is turned on. Its default value is Input/Output Data (=0000).

When its value is set to Input Data (=0001), only input data registers are transferred; when its value is set to Output Data (=0002), only output data registers are transferred. The value of this register remains unchanged even after execution of a Master Reset (Y□□□36) request.

<table>
<thead>
<tr>
<th>Register No.</th>
<th>b15</th>
<th>b0</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>516</td>
<td></td>
<td>$0000=Input/Output Data (Transfers input data and output data)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$0001=Input Data (Transfers input data only)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$0002=Output Data (Transfers output data only)</td>
<td></td>
</tr>
</tbody>
</table>

The value of this register is significant only if the Input/Output Data Transfer Mode is set to Relay Activated mode.

CAUTION

- Before performing setup of this module, always ensure that the Start Data Exchange Completed relay (X□□□01) is turned on.
- You must perform module setup before turning on the Request to Start Transfer relay (Y□□□38).
4.3 Status Area

- Error Information Registers

The error information registers store detailed error information when an internal error, a master error, a communications error or a diagnostic error occurs.

<table>
<thead>
<tr>
<th>Register No.</th>
<th>Error Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>520-523</td>
<td>520</td>
<td>Master Station Address</td>
</tr>
<tr>
<td></td>
<td>521</td>
<td>Slave Station Address</td>
</tr>
<tr>
<td></td>
<td>522</td>
<td>Slave ID</td>
</tr>
</tbody>
</table>

Valid only for diagnostic error.

List of Error Codes

<table>
<thead>
<tr>
<th>Error Code</th>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0003</td>
<td>Slave error</td>
<td>Function is not activated on remote node.</td>
</tr>
<tr>
<td>$0009</td>
<td>Slave error</td>
<td>No answer data.</td>
</tr>
<tr>
<td>$0011</td>
<td>Slave error</td>
<td>No response from slave.</td>
</tr>
<tr>
<td>$0012</td>
<td>Slave error</td>
<td>Device is not in token ring state.</td>
</tr>
<tr>
<td>$0032-$0035</td>
<td>Master error</td>
<td>Master module internal error</td>
</tr>
<tr>
<td>$0036</td>
<td>Master error</td>
<td>Missing master parameter</td>
</tr>
<tr>
<td>$0037</td>
<td>Master error</td>
<td>Invalid master parameter value</td>
</tr>
<tr>
<td>$0038</td>
<td>Master error</td>
<td>Missing remote node parameter</td>
</tr>
<tr>
<td>$0039</td>
<td>Master error</td>
<td>Invalid remote node parameter value</td>
</tr>
<tr>
<td>$003A</td>
<td>Master error</td>
<td>Duplicate remote node address</td>
</tr>
<tr>
<td>$003B</td>
<td>Master error</td>
<td>Offset address of send process data of node is out of permissible range.</td>
</tr>
<tr>
<td>$003C</td>
<td>Master error</td>
<td>Offset address of receive process data of node is out of permissible range.</td>
</tr>
<tr>
<td>$003D</td>
<td>Master error</td>
<td>Data area of remote node overlaps the receive process data area.</td>
</tr>
<tr>
<td>$003E</td>
<td>Master error</td>
<td>Data area of remote node overlaps the send process data area.</td>
</tr>
<tr>
<td>$003A</td>
<td>Master error</td>
<td>No empty segment.</td>
</tr>
<tr>
<td>$003D</td>
<td>Master error</td>
<td>Error reading configuration data</td>
</tr>
<tr>
<td>$003D</td>
<td>Master error</td>
<td>Master module system fault</td>
</tr>
<tr>
<td>$003D</td>
<td>Master error</td>
<td>Not allowed by master module.</td>
</tr>
<tr>
<td>$1000</td>
<td>Diagnostic error</td>
<td>Error detected during slave diagnosis.</td>
</tr>
<tr>
<td>$2000</td>
<td>Internal error</td>
<td>Error response received during slave diagnosis (Diagnosis request is processed internally).</td>
</tr>
<tr>
<td>$2001</td>
<td>Internal error</td>
<td>SRAM check error</td>
</tr>
<tr>
<td>$2002</td>
<td>Internal error</td>
<td>FROM checksum error</td>
</tr>
<tr>
<td>$2003</td>
<td>Internal error</td>
<td>Master module response timeout</td>
</tr>
</tbody>
</table>
**1: Diagnostic Error Information**

<table>
<thead>
<tr>
<th>Bit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>Reserved</td>
</tr>
<tr>
<td>14</td>
<td>Reserved</td>
</tr>
<tr>
<td>13</td>
<td>Reserved</td>
</tr>
<tr>
<td>12</td>
<td>Reserved</td>
</tr>
<tr>
<td>11</td>
<td>Reserved</td>
</tr>
<tr>
<td>10</td>
<td>Controlled by another master.</td>
</tr>
<tr>
<td>9</td>
<td>Invalid parameter sent from master.</td>
</tr>
<tr>
<td>8</td>
<td>Invalid response from slave.</td>
</tr>
<tr>
<td>7</td>
<td>Function requested by master is not supported.</td>
</tr>
<tr>
<td>6</td>
<td>Extended error information is available.</td>
</tr>
<tr>
<td>5</td>
<td>Environment data received from master is not compatible with slave.</td>
</tr>
<tr>
<td>4</td>
<td>Slave is not ready for data exchange.</td>
</tr>
<tr>
<td>3</td>
<td>Data exchange with slave failed.</td>
</tr>
<tr>
<td>2</td>
<td>Excluded from cyclic exchange by parameter setup.</td>
</tr>
<tr>
<td>1</td>
<td>Request to read diagnostic error</td>
</tr>
<tr>
<td>0</td>
<td>Parameter allocation request from slave</td>
</tr>
</tbody>
</table>

The Extended Error Information register contains valid information when bit 6 of the Diagnostic Error Information register is 1.

**2: Master Station Address**

This byte stores the station address of the master station controlling the slave station where a diagnostic error is detected. In the event of a non-diagnostic error, its value is FFh.

**3: Slave Station Address**

This byte stores the station address of the slave station where an error is detected. In the event of a master station error, its value is FFh.

**4: Slave ID**

This register stores a unique identification number assigned by the PROFIBUS association to a slave. Its value is FFFFh in the event of a non-diagnostic error.
**Extended Error Information Registers**

Extended error information registers store extended information for an error detected during slave diagnosis.

### Extended Error Information Register No.

<table>
<thead>
<tr>
<th>Register No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>524</td>
<td>Extended Error Information Data Size</td>
</tr>
<tr>
<td>525</td>
<td>Application-related info. (1)</td>
</tr>
<tr>
<td>526</td>
<td>Application-related info. (2)</td>
</tr>
<tr>
<td>527</td>
<td>Application-related info. (3)</td>
</tr>
<tr>
<td>528</td>
<td>Application-related info. (4)</td>
</tr>
<tr>
<td>529</td>
<td>ID no. related info. (1)</td>
</tr>
<tr>
<td>530</td>
<td>ID no. related info. (2)</td>
</tr>
<tr>
<td>531</td>
<td>ID no. related info. (3)</td>
</tr>
<tr>
<td>532</td>
<td>ID no. related info. (4)</td>
</tr>
<tr>
<td>533</td>
<td>Channel-related info. (1-1)</td>
</tr>
<tr>
<td>534</td>
<td>Channel-related info. (1-2)</td>
</tr>
<tr>
<td>535</td>
<td>Channel-related info. (1-3)</td>
</tr>
<tr>
<td>536</td>
<td>Channel-related info. (1-4)</td>
</tr>
<tr>
<td>537</td>
<td>Channel-related info. (2-1)</td>
</tr>
<tr>
<td>538</td>
<td>Channel-related info. (2-2)</td>
</tr>
<tr>
<td>539</td>
<td>Channel-related info. (2-3)</td>
</tr>
<tr>
<td>540</td>
<td>Channel-related info. (2-4)</td>
</tr>
</tbody>
</table>

**1. Application-related diagnostic information**

Byte 1 of header

<table>
<thead>
<tr>
<th>Byte 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Byte 3</td>
</tr>
<tr>
<td>Byte 4</td>
</tr>
</tbody>
</table>

**Header:**

<table>
<thead>
<tr>
<th>Bit position</th>
<th>7</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit positions 6,7 is set to 00.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Diagnostic information:**

Stores diagnostic code defined in the header of the slave module. For details, refer to the instruction manual of the slave module.

**2: ID number-related diagnostic information:**

(Byte 1 of header)

<table>
<thead>
<tr>
<th>Byte 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Byte 3</td>
</tr>
<tr>
<td>Byte 4</td>
</tr>
</tbody>
</table>

**Header:**

<table>
<thead>
<tr>
<th>Bit position</th>
<th>7</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit positions 6,7 is set to 01.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Bit position | MSB | LSB
---|---|---
Byte 2 | | 7 6 5 4 3 2 1 0
Byte 3 | 15 14 13 12 11 10 9 8

*3: Channel-related diagnostic error

(Byte 1)
ID number 1

(Byte 2)
Channel number 1

(Byte 3)
Error type 1

(Byte 4)
ID number 2

(Byte 5)
Channel number 2

(Byte 6)
Error type 2

---

Byte 1:
ID number

Bit position | MSB | LSB
---|---|---
| 7 6 5 4 3 2 1 0

ID number (0 to 63)

Bit positions 6, 7 is set to 10.

Byte 2:
Channel no.

Bit position | MSB | LSB
---|---|---
| 7 6 5 4 3 2 1 0

Channel no. (0-6)

Input/Output
00=Reserved
01=Input
10=Output
11=Input/Output

Byte 3:
Error type

Bit position | MSB | LSB
---|---|---
| 7 6 5 4 3 2 1 0

Channel type
000 = Reserved
001 = Bit
010 = 2 bits
011 = 4 bits
100 = Byte
101 = Word
110 = 2 words
111 = Reserved

Error type
0: Undefined
1: Short circuit
2: Voltage too low
3: Voltage too high
4: Overcurrent
5: Temperature too high
6: Wire discontinuity
7: Upper limited exceeded
8: Lower limit exceeded
9: Fault
10: Reserved
15: Reserved
16: Vendor-defined
31: Vendor-defined

If this bit is 1, module 1 is in error.
If this bit is 1, module 8 is in error.
Slave Configuration Information Registers

These registers indicate whether configuration setup has been done for each slave station.

<table>
<thead>
<tr>
<th>Register no.</th>
<th>b15</th>
<th>b0</th>
</tr>
</thead>
<tbody>
<tr>
<td>587</td>
<td></td>
<td></td>
</tr>
<tr>
<td>588</td>
<td></td>
<td></td>
</tr>
<tr>
<td>589</td>
<td></td>
<td></td>
</tr>
<tr>
<td>590</td>
<td></td>
<td></td>
</tr>
<tr>
<td>591</td>
<td></td>
<td></td>
</tr>
<tr>
<td>592</td>
<td></td>
<td></td>
</tr>
<tr>
<td>593</td>
<td></td>
<td></td>
</tr>
<tr>
<td>594</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[ Configuration \text{ information} \]
\( (\text{station address 0 to station address 125}) \)

Configuration information for each station

Shows the status of configuration setup for each station using 1 bit per station

0: undefined
1: defined

Always 0

Example: Contents of registers when configuration is defined for stations 2 (remote node address=2) to 6 (remote node address=6)

<table>
<thead>
<tr>
<th>Register no.</th>
<th>bit15</th>
<th>bit0</th>
</tr>
</thead>
<tbody>
<tr>
<td>587</td>
<td>0 0 0 0 0 0 0 0 0 1 1 1 1 0 0</td>
<td></td>
</tr>
<tr>
<td>588</td>
<td>0 0 0 0 0 0 0 0 0 0 0 0 0 0 0</td>
<td></td>
</tr>
<tr>
<td>589</td>
<td>0 0 0 0 0 0 0 0 0 0 0 0 0 0 0</td>
<td></td>
</tr>
<tr>
<td>590</td>
<td>0 0 0 0 0 0 0 0 0 0 0 0 0 0 0</td>
<td></td>
</tr>
<tr>
<td>591</td>
<td>0 0 0 0 0 0 0 0 0 0 0 0 0 0 0</td>
<td></td>
</tr>
<tr>
<td>592</td>
<td>0 0 0 0 0 0 0 0 0 0 0 0 0 0 0</td>
<td></td>
</tr>
<tr>
<td>593</td>
<td>0 0 0 0 0 0 0 0 0 0 0 0 0 0 0</td>
<td></td>
</tr>
<tr>
<td>594</td>
<td>0 0 0 0 0 0 0 0 0 0 0 0 0 0 0</td>
<td></td>
</tr>
</tbody>
</table>

-- Station address 0 -15
-- Station address 16 - 31
-- Station address 32 - 47
-- Station address 48 - 63
-- Station address 64 - 79
-- Station address 80 - 95
-- Station address 96 - 111
-- Station address 112 - 125
**Slave State Information Register**

These registers store the operating status of each slave station.

### Operating status
(for station address 0 to station address 125)

<table>
<thead>
<tr>
<th>Register no.</th>
<th>b15</th>
<th>b0</th>
</tr>
</thead>
<tbody>
<tr>
<td>595</td>
<td></td>
<td></td>
</tr>
<tr>
<td>596</td>
<td></td>
<td></td>
</tr>
<tr>
<td>597</td>
<td></td>
<td></td>
</tr>
<tr>
<td>598</td>
<td></td>
<td></td>
</tr>
<tr>
<td>599</td>
<td></td>
<td></td>
</tr>
<tr>
<td>600</td>
<td></td>
<td></td>
</tr>
<tr>
<td>601</td>
<td></td>
<td></td>
</tr>
<tr>
<td>602</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Operating status of each station

- Shows the operating status of each station using 1 bit per station
- 0: not running
- 1: running

### Example: Content of registers when stations 2 (remote node address=2) to 7 (remote node address=7) and station 15 (remote node address=15) is running.

<table>
<thead>
<tr>
<th>Register no.</th>
<th>bit15</th>
<th>bit0</th>
</tr>
</thead>
<tbody>
<tr>
<td>595</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>596</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>597</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>598</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>599</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>600</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>601</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>602</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Always 0

- Station address 0 - 15
- Station address 16 - 31
- Station address 32 - 63
- Station address 64 - 95
- Station address 96 - 125
## Network Status Registers

These registers define the network status.

<table>
<thead>
<tr>
<th>Register no.</th>
<th>b15</th>
<th>b0</th>
</tr>
</thead>
<tbody>
<tr>
<td>603</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Value</th>
<th>Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0000</td>
<td>OFFLINE</td>
<td>Not communicating with any slave on the network.</td>
</tr>
<tr>
<td>$0040</td>
<td>STOP</td>
<td>Module is participating in the network, but not performing data exchange with slave.</td>
</tr>
<tr>
<td>$0080</td>
<td>CLEAR</td>
<td>Module is exchanging input data with assigned slaves. Output data is being cleared. *</td>
</tr>
<tr>
<td>$00C0</td>
<td>OPERATE</td>
<td>Module is communicating with assigned slaves.</td>
</tr>
</tbody>
</table>

*: This module does not support this network status.
5. Startup Preparation

This chapter gives an overview of the procedure for startup preparation of the PROFIBUS-DP Interface module.

■ Module Setup

Start

Set up switches of PROFIBUS module

Mount PROFIBUS module to base module

Set up and install slave devices

Wire cables

Switch on slave devices. Apply power to network

Switch on master

Set up configuration

Test run

Is operation normal?

NO

Set up configuration

Test run

Is operation normal?

YES

End

See flowchart for configuration setup. This step may be skipped if configuration setup is already done.
Setup Using Configurator

Creation and downloading of configuration files for this module and the network requires the use of the SyCon configurator supplied by HMS Industrial Networks AB.

Use the SyCon configurator to set up and register (download) configuration data such as station addresses for devices to be connected, baud rate, module configuration of slaves and data allocation.

For details on the installation and operation of the SyCon configurator software, see its software manual.

TIP

You may use the following "SyCon" configurator.

Manufacturer : HMS Industrial Networks AB
Pilefeltsgatan 93-95
302 50 Halmstad Sweden
Tel: +46 35 17 29 00
Email: sales@hms-networks.com
Product model : KONF-PDP (Configurator for PROFIBUS-DP)

Setup Example

1. Connect configuration connector of module to COM port of PC using RS-232C cross cable
2. Run SyCon software on PC
3. Copy GSD files for slaves to be used ("File - Copy GSD")
4. Create a new file ("File - New")
5. Insert master (Select PROFIBUS-DP Master) ("Insert - Master")
6. Insert slave - Select installed slaves. - Assign to master. ("Insert - Slave")
7. Specify PC COM port that is connected to configuration port of this module ("Settings - Device Assignment")
8. Download configuration ("Online - Download")

* The GSD file for this module is provided in a specific folder of SyCon.
* Station address is automatically assigned at this point.
Before performing setup, you should first set up station address for each slave device to be used on the network using device switches or other means. You should also complete cabling and startup of slave devices.
6. Data Communications

This chapter describes data communications involving the PROFIBUS-DP Interface module using input/output relay control from a CPU module.

Procedure for Starting Data Exchange

The above procedure starts data exchange between this module and its slaves in UNSYNC/UNFREEZE mode. Note that values of input/output data registers are not valid until the Start Data Exchange Completed relay (X□□□01) turns on.
After powering up, this module does not perform data exchange with its slaves. A request to start data exchange should always be executed before requests to issue global control and other requests. We recommend executing a request to start data exchange right at the beginning.
Procedure for Storing Error Information

This module notifies the CPU module of an error occurrence by turning on the Error Detected relay. After storing the error information, you should issue a request to turn off the Error Detected relay so as to enable the module to send notification of new errors.
Procedure for Setting Transfer Mode

The input/output data transfer mode between this module and the CPU module can be set to Normal (asynchronous) mode or Relay Activated (synchronous) mode. The default mode is Normal (asynchronous) mode.

In Normal (asynchronous) mode, input/output data is automatically transferred by this module. In Relay Activated (synchronous) mode, input/output data transfer is triggered by the CPU module turning on the Request to Start Transfer (Y□□□38) relay. The data to be transferred can be specified by setting the Transfer Data Selection register. By default, both input and output data is transferred.
The procedure for sending data to slaves in Normal mode and UNSYNC mode involves the following steps:

1. **Start**
2. **Is Start Data Exchange Completed (X□□□01) relay on?**
   - **NO**
   - **YES**
     - Set output data registers to output data.
3. **End**

In Normal (asynchronous) transfer mode with slaves operating in UNSYNC mode, contents of the output data registers are automatically sent to slaves. Note that data concurrency is not ensured for data exceeding 16 bits as this module and the CPU module are operating asynchronously. For applications that require concurrency of data output exceeding 16 bits, you should set the transfer mode to Relay Activated (synchronous) mode.
Procedure for Sending Data to Slaves: Normal mode, SYNC mode

Start

Is Start Data Exchange Completed (X□□□01) relay on?

YES

Set output data registers to the output data to be transmitted.

Select SYNC command and the destination groups using the Global Control Data register.

Turn on the Request to Issue Global Control (Y□□□35) relay.

YES

Is Global Control Completed relay (X□□□03) on?

NO

Is Global Control Error Exit (X□□□04) relay on?

NO

YES

Turn off the Request to Issue Global Control (Y□□□35) relay.

End
The above procedure sends output data to selected slaves by issuing global control commands to all groups specified in the Global Control Data register. The Global Control Completed relay (X□□□03) turns on if the request to issue global control exits normally, while the Global Control Error Exit relay (X□□□04) turns on if the request exits with an error.

Take note that in Normal (asynchronous) transfer mode, data concurrency is not ensured for data exceeding 16 bits as this module and the CPU module are operating asynchronously. For applications that require concurrency of data output exceeding 16 bits, you should set the transfer mode to Relay Activated (synchronous) mode.
Procedure for Sending Data to Slaves: Relay Activated mode, UNSYNC mode

In Relay Activated (synchronous) transfer mode with slaves operating in UNSYNC mode, contents of the output data registers are transferred by turning on the Start Transfer relay (Y□□□38). Data concurrency is ensured for data exceeding 16 bits as this module and the CPU module are operating synchronously.

Note that output data is not transferred if the Transfer Data Selection register is set to Input Data.
Procedure for Sending Data to Slaves: Relay Activated mode, SYNC mode

Start

Is Start Data Exchange Completed (X□□□□01) relay on?

YES

Set the Transfer Data Selection register to the required data type (Input/Output Data or Output Data).

Set the output data registers to the output data to be transmitted.

Turn on the Start Transfer (Y□□□□38) relay.

NO

Is the End of Transfer (X□□□□10) relay on?

NO

Select SYNC command and the destination groups using the Global Control Data register

Turn on the Request to Issue Global Command (Y□□□□35) relay.

YES

1
The above procedure sends output data to selected slaves by issuing global control commands to all groups specified in the Global Control Data register. The Global Control Completed relay (X□□□03) turns on if the request to issue global control exits normally, while the Global Control Error Exit relay (X□□□04) turns on if the request exits with an error.

In Relay Activated (synchronous) transfer mode, data concurrency is ensured for data exceeding 16 bits as this module and the CPU module are operating synchronously. Note that output data is not transferred if the Transfer Data Selection register is set to Input Data.
Procedure for Receiving Data from Slaves: Normal mode, UNFREEZE mode

- Start
- Is Start Data Exchange Completed (X□□□□□01) relay on?
  - NO
  - YES: Read input data from input data registers.
- End

In Normal (asynchronous) transfer mode with slaves operating in UNFREEZE mode, this module automatically reads input data from slaves and saves the data to the input data registers. Note that data concurrency is not ensured for data exceeding 16 bits as this module and the CPU module are operating asynchronously. For applications that require concurrency of data input exceeding 16 bits, you should set the transfer mode to Relay Activated (synchronous) mode.
Procedure for Receiving Data from Slaves: Normal mode, FREEZE mode

Start

Is Start Data Exchange Completed relay (X□□□01) on?

YES

Select FREEZE command and the groups for reading data using the Global Control Data register.

Turn on the Request to Issue Global Command (Y□□□35) relay.

YES

Is Global Control Completed relay (X□□□03) on?

NO

Is Global Control Error Exit (X□□□04) relay on?

NO

YES

Read input data from the input data registers.

Turn off the Request to Issue Global Control (Y□□□35) relay.

End
The above procedure receives input data from selected slaves by issuing global control commands to all groups specified in the Global Control Data register. The Global Control Completed relay (X□□□03) turns on if the request to issue global control exits normally, while the Global Control Error Exit relay (X□□□04) turns on if the request exits with an error. Note that in Normal (asynchronous) transfer mode, data concurrency is not ensured for data exceeding 16 bits as this module and the CPU module are operating asynchronously. For applications that require concurrency of data input exceeding 16 bits, you should set the transfer mode to Relay Activated (synchronous) mode.
### Procedure for Receiving Data from Slaves: Relay Activated mode, UNFREEZE mode

In Relay Activated (synchronous) transfer mode with slaves operating in UNFREEZE mode, contents of the input data registers are read by turning on the Start Transfer relay (Y□□□38). Data concurrency is ensured for data exceeding 16 bits as this module and the CPU module are operating synchronously. Note that input data is not transferred if the Transfer Data Selection register is set to Output Data.
Procedure for Receiving Data from Slaves: Relay Activated mode, FREEZE mode

Start

Is Start Data Exchange Completed (X□□□01) relay on?

YES

Select FREEZE command and the groups for reading data using the Global Control Data register.

Turn on the Request to Issue Global Command (Y□□□35) relay.

NO

Is Global Control Completed relay (X□□□03) on?

YES

NO

Is Global Control Error Exit (X□□□04) relay on?

NO

YES

1

2
The above procedure receives input data from selected slaves by issuing global control commands to all groups specified in the Global Control Data register.

The Global Control Completed relay (X□□□03) turns on if the request to issue global control exits normally, while the Global Control Error Exit relay (X□□□04) turns on if the request exits with an error.

In Relay Activated (synchronous) transfer mode, data concurrency is ensured for data exceeding 16 bits as this module and the CPU module are operating synchronously. Note that input data is not transferred if the Transfer Data Selection register is set to Output Data.
### Procedure for Resetting Master

This above procedure issues a reset request to the PROFIBUS-DP master controller of this module.
7. Sample Programs

- Sample Program for Starting Data Exchange

  When relay X305 (Network Ready) turns on, this sample program sets the Error Non-Reporting Time register to 5 seconds for the PROFIBUS-DP Interface module (F3LB01-0N) installed in slot 3, and starts data exchange.

- Sample Program for Storing Error Information

  This sample program reads 4 words of error information from the F3LB01-0N module installed in slot 3, and stores it to D520. It then reads 54 words of extended error information, and stores it to D524.
## Sample Program for Setting Transfer Mode

This sample program sets the data transfer mode of the F3LB01-0N module installed in slot 3 to Relay Activated mode.

### Setup completed successfully

### Setup error

## Sample Program for Sending Data to Slaves: Normal mode, UNSYNC mode

This sample program writes 256 words of data stored at D001 to output data registers of the F3LB01-0N module installed in slot 3.

### Copy data from D1 register to output data registers
**Sample Program for Sending Data to Slaves: Normal mode, SYNC mode**

This sample program writes 256 words of data stored at D001 to output data registers of the F3LB01-0N module installed in slot 3. It then issues SYNC commands to all slaves using global control.

1. Issue SYNC command to all slaves.

2. Global control completes successfully.

3. Global control exits with error.

---

**Sample Program for Sending Data to Slaves: Relay Activated mode, UNSYNC mode**

This sample program sets the Transfer Mode Selection register to Output Data for the F3LB01-0N module installed in slot 3. It then writes 256 words of data stored in D001 to the output data registers, and starts data transfer.

1. Set up output data to be transferred; start transfer.

2. End of transfer.
This sample program sets the Transfer Mode Selection register to Output Data for the F3LB01-0N module installed in slot 3. It then writes 256 words of data stored in D001 to the output data registers, and starts data transfer. At end of data transfer, it issues SYNC commands to all slaves using global control.

Set Transfer Data Selection register to Output Data; start transfer.

Transfer completed. Issue SYNC command to all slaves.

Request to issue global control completed successfully.

Request to issue global control exited with error.
Sample Program for Receiving Data from Slaves: Normal mode, UNFREEZE mode

This sample program reads 256 words of data from input data registers of the F3LB01-0N module installed in slot 3, and stores the data in D257.

Read input data from input data registers and save it to D257.

Sample Program for Receiving Data from Slaves: Normal mode, FREEZE mode

This sample program issues FREEZE commands to all slaves using global control for the F3LB01-0N module installed in slot 3. After the global control request completes successfully, it reads 256 words of data from the input data registers, and saves it to D257.

Issue FREEZE commands to all slaves.

Request to issue global control completed successfully.

Request to issue global control exited with error.
**Sample Program for Receiving Data from Slaves: Relay Activated mode, UNFREEZE mode**

This sample program sets the Transfer Data Selection register to Input Data for the F3LB01-0N module installed in slot 3, and starts transfer. At end of data transfer, it reads 256 words of data from the input data registers, and stores it in D257.

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
<th>Value</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>00002</td>
<td>WRITE</td>
<td>$1$</td>
<td>3</td>
</tr>
<tr>
<td>00003</td>
<td>SET</td>
<td>Y00300</td>
<td></td>
</tr>
<tr>
<td>00004</td>
<td>END</td>
<td></td>
<td></td>
</tr>
<tr>
<td>00005</td>
<td>RST</td>
<td>Y00300</td>
<td></td>
</tr>
<tr>
<td>00006</td>
<td>READ</td>
<td>3</td>
<td>257</td>
</tr>
</tbody>
</table>
Sample Program for Receiving Data from Slaves: Relay Activated mode, FREEZE mode

This sample program issues FREEZE commands to all slaves using global control for the F3LB01-0N module installed in slot 3. After the global control request completes successfully, it sets the Transfer Data Selection register to Input Data, and starts data transfer. At the end of data transfer, it reads 256 words of data from the input data registers, and stores the data to D257.

```
00001
Issue FREEZE commands to all slaves.

00002
WRITE $03

00003
SET Y00305

00004
Request to issue global control completed successfully.
Set Transfer Data Selection register to Input Data and start transfer.

00006
WRITE $1

00007
SET Y00306

00008
At end of transfer, read input data from input data registers and store it in D257.

00010
READ $257 00257 256

00011
Request to issue global control exited with error.

00012
RST Y00304
```


Sample Program for Resetting Master

This program performs master reset of the F3LB01-0N module installed in slot 3 when relay I001 turns on.

1. Request to reset master.
2. Master reset request received.

Diagram:

- 00001: Request to reset master.
- 00002: Master reset request received.
- 00003: SET Y01300
- 00004: RST Y01300
8. Troubleshooting

This chapter shows troubleshooting flowcharts for the PROFIBUS-DP Interface module.

Error

Is RDY LED lit?

NO

Sequence CPU error?

YES

Go to Section 8.1, "RDY LED Is Not Lit"

NO

Rectify cause of sequence CPU error

Status of MST LED?

Off

Replace module

Blinking at 1 Hz

Download configuration

Change in blinking interval?

YES

Blinking at 2 Hz

LED lit after downloading?

YES

Go to Section 8.2, "Checking NST LED"

NO

Replace module

Replace module

Replace module
8.1 RDY LED Is Not Lit

RDY LED Is Not Lit

- Is power supply module supplied with proper voltage?
  - NO: Apply proper voltage
  - YES:
    - Is RDY LED lit on other modules?
      - NO: Replace power supply module or base module
      - YES:
        - Is module properly mounted in slot?
          - NO: Push module inwards until you hear a clicking sound
          - YES:
            - Is RDY LED off even when module is installed in another slot?
              - NO: Replace base module
              - YES: Replace module
8.2 Checking NST LED

SEE ALSO
For details on error codes, see Section 8.3, "Checking Error Code".
### 8.3 Checking Error Code

<table>
<thead>
<tr>
<th>Error Code</th>
<th>Description</th>
<th>Troubleshooting</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0003</td>
<td>Function is not activated on remote node.</td>
<td>Check whether slave is PROFIBUS-DP-compatible, and if so, whether the correct GSD file is used.</td>
</tr>
<tr>
<td>$0009</td>
<td>No answer data</td>
<td>Check cables.</td>
</tr>
<tr>
<td>$0011</td>
<td>No response from slave</td>
<td>Check cables. Check address setup of slave.</td>
</tr>
<tr>
<td>$0012</td>
<td>Device is not in token ring state.</td>
<td>Check address of master. Check highest station address of other master systems.</td>
</tr>
<tr>
<td>$003 to $0035</td>
<td>Master module internal error</td>
<td>Contact Yokogawa Electric Corporation.</td>
</tr>
<tr>
<td>$0036</td>
<td>Missing master parameter</td>
<td>Download configuration again.</td>
</tr>
<tr>
<td>$0037</td>
<td>Invalid master parameter value</td>
<td>Contact Yokogawa Electric Corporation.</td>
</tr>
<tr>
<td>$0038</td>
<td>Missing remote node parameter</td>
<td>Download configuration again.</td>
</tr>
<tr>
<td>$0039</td>
<td>Invalid remote node parameter value</td>
<td>Contact Yokogawa Electric Corporation.</td>
</tr>
<tr>
<td>$003A</td>
<td>Duplicate remote node address</td>
<td>Check addresses of slaves.</td>
</tr>
<tr>
<td>$003B</td>
<td>Offset address of send process data of node is out of permissible range.</td>
<td>Check offset address setup for output data.</td>
</tr>
<tr>
<td>$003C</td>
<td>Offset address of receive process data of node is out of permissible range.</td>
<td>Check offset address setup for input data.</td>
</tr>
<tr>
<td>$003D</td>
<td>Data area of remote node overlaps receive process data area.</td>
<td>Check offset address setup for input data.</td>
</tr>
<tr>
<td>$003E</td>
<td>Data area of remote node overlaps send process data area.</td>
<td>Check offset address setup for output data.</td>
</tr>
<tr>
<td>$00CA</td>
<td>No empty segment</td>
<td>Contact Yokogawa Electric Corporation.</td>
</tr>
<tr>
<td>$00D4</td>
<td>Error reading configuration data</td>
<td>Download configuration again.</td>
</tr>
<tr>
<td>$00D5</td>
<td>Master module system fault</td>
<td>Contact Yokogawa Electric Corporation.</td>
</tr>
<tr>
<td>$00D6 to $00FF</td>
<td>Not allowed by master module.</td>
<td>Contact Yokogawa Electric Corporation.</td>
</tr>
<tr>
<td>$1000</td>
<td>Error detected during slave diagnosis.</td>
<td>See table on diagnostic error information on the next page.</td>
</tr>
<tr>
<td>$2000</td>
<td>Error response received during slave diagnosis (Diagnosis request is processed internally)</td>
<td>Contact Yokogawa Electric Corporation.</td>
</tr>
<tr>
<td>$2001</td>
<td>SRAM check error</td>
<td>Contact Yokogawa Electric Corporation.</td>
</tr>
<tr>
<td>$2002</td>
<td>FROM checksum error</td>
<td>Contact Yokogawa Electric Corporation.</td>
</tr>
<tr>
<td>$2003</td>
<td>Master module response timeout</td>
<td>Contact Yokogawa Electric Corporation.</td>
</tr>
</tbody>
</table>

**SEE ALSO**

For details on where and how error code is stored, see description on error information registers in Chapter 3, "Input/Output Relays" and Chapter 4, "Registers".
## Diagnostic Error Information

<table>
<thead>
<tr>
<th>Bit</th>
<th>Description</th>
<th>Troubleshooting</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>Reserved</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Reserved</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Reserved</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Reserved</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Reserved</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Controlled by another master.</td>
<td>Check whether another master exists on the network. If so, either deassign the</td>
</tr>
<tr>
<td></td>
<td></td>
<td>slave from the master, or remove the master from the network.</td>
</tr>
<tr>
<td>9</td>
<td>Invalid parameter sent from master</td>
<td>Ensure that the correct GSD file is used in configuration of slave.</td>
</tr>
<tr>
<td>8</td>
<td>Invalid response from slave</td>
<td>Ensure that no PROFIBUS-FMS slave is assigned to the master.</td>
</tr>
<tr>
<td>7</td>
<td>Function requested by master is not supported.</td>
<td>Ensure that slave supports SYNC and FREEZE modes. (Check with manufacturer of</td>
</tr>
<tr>
<td></td>
<td></td>
<td>slave device whether another GSD file is available, and whether this error code</td>
</tr>
<tr>
<td></td>
<td></td>
<td>is reported for other invalid parameter data errors.</td>
</tr>
<tr>
<td>6</td>
<td>Extended error information is available.</td>
<td>Check extended error information against user's manual for slave device.</td>
</tr>
<tr>
<td>5</td>
<td>Environment data received from master is not</td>
<td>Ensure that the actual configuration of slave is consistent with the configuration</td>
</tr>
<tr>
<td></td>
<td>compatible with slave.</td>
<td>created using the SyCon configurator software.</td>
</tr>
<tr>
<td>4</td>
<td>Slave is not ready for data exchange.</td>
<td>This bit is often set with other error bits for various reasons.</td>
</tr>
<tr>
<td>3</td>
<td>Data exchange with slave failed.</td>
<td>Check whether specified baud rate is supported by slave, or check cables.</td>
</tr>
<tr>
<td>2</td>
<td>Excluded from cyclic data exchange by parameter</td>
<td>Check that slave is not set to inactive in its parameter setup.</td>
</tr>
<tr>
<td></td>
<td>setup</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Request to read diagnostic data</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>Parameter allocation request from slave</td>
<td>Download configuration again.</td>
</tr>
</tbody>
</table>
Appendix 1. Input/Output Response Time

Input/output response time refers to the time lapse from slave input, through ladder program processing, to slave output.

Input/output response time includes the following time elements:
- Slave’s data response time
- F3LB01 module’s processing time (approx. 2 ms)
- CPU module’s scan time
- Slave’s network response time

The calculation example below illustrates how to estimate the input/output response time from the above time elements.

● Operation Environment for Example
This calculation example assumes the following operating environment system configuration.

Appendix Figure 1.1 Operating Environment System Configuration for Calculation Example

- Network baud rate: 12Mbps
- Single master
- Slave configuration as shown above
- Data transfer mode between CPU module and F3LB01 module and slave’s operating mode
  (1) Normal mode and UNSYNC/UNFREEZE mode see Appendix 1.1.
  (2) Relay Activated mode and UNSYNC/UNFREEZE mode see Appendix 1.2.
  (3) Relay Activated mode and SYNC/FREEZE mode see Appendix 1.3.
- Loop back of the output to the input of slave 1 through the F3LB01 module. The ladder program reverses the value from slave 1 before returning the result to the same slave. The same value is sent to all the other slaves.
- The input/output response time is the output time for slave 1.
Appendix 1.1 Normal Mode and UNSYNC/UNFREEZE Mode

Appendix Figure 1.2 Sequence for One-master Configuration

Appendix Figure 1.3 Sequence for Two-master Configuration

Input/output response time (1) = \( \text{①} + \text{②} \times 2 + \text{③} \times 2 + (\text{④} \times \text{number of stations} + \text{④}) \)

Elements of input/output response time:
① Slave's data response time
② F3LB01 module's processing time (approx. 2 ms)
③ CPU module's scan time
④ Slave's network response time
Appendix 1.2 Relay Activated Mode and UNSYNC/UNFREEZE Mode

* Description of timing
*1. CPU module : Turns on Start Transfer relay (Outputs the reverse of input data = "1")
*2. F3LB01 : Detects Start Transfer relay on
*3. F3LB01 : Turns on End of Transfer relay (Transfers input data = "1")
*4. CPU module : Detects End of Transfer relay on
*5. CPU module : Turns off Start Transfer relay
*6. F3LB01 : Detects Start Transfer relay off
*7. F3LB01 : Turns off End of Transfer relay
*8. CPU module : Detects End of Transfer relay off
*9. CPU module : Turns on Start Transfer relay (Outputs the reverse of input data = "1")
*10. F3LB01 : Detects Start Transfer relay on
*11. F3LB01 : Turns on End of Transfer relay (Transfers input data = "0")
*12. CPU module : Detects End of Transfer relay on
*13. CPU module : Turns off Start Transfer relay
*14. F3LB01 : Detects Start Transfer relay off
*15. F3LB01 : Turns off End of Transfer relay
*16. CPU module : Detects End of Transfer relay off
*17. CPU module : Turns on Start Transfer relay (Outputs the reverse of input data = "0")
*18. F3LB01 : Detects Start Transfer relay on
*19. F3LB01 : Turns on End of Transfer relay (Transfers input data = "0")

Input/output response time (2-1)=①+②×4+(④× number of stations+④)

Elements of input/output response time:
① Slave's data response time
② F3LB01 module's processing time (approx. 2 ms)
③ CPU module's scan time
④ Slave's network response time

Appendix Figure 1.4 Timing Chart When CPU Module Scan Time < F3LB01 Module Processing Time
CPU module scan cycles

F3LB01 execution cycles

Ladder processing

Firmware processing

Send processing

Receive processing

Data exchange between master and slaves

Slave output

Slave input delay

Description of timing for items *1 to *19 is the same as previous case.

Input/output response time (2-2) = \[1 + 3 \times 4 + (4 \times \text{number of stations} + 4)\]

Elements of input/output response time:

1. Slave's data response time
2. F3LB01 module's processing time (approx. 2 ms)
3. CPU module's scan time
4. Slave's network response time

Appendix Figure 1.5 Timing Chart When CPU Module Scan Time > F3LB01 Module Processing Time
Appendix 1.3  Relay Activated Mode and SYNC/FREEZE Mode

The following figure shows an overview of the actions involved.

Before the output of slaves can be switched (either 1→0 or 0→1), four requests to issue global control must be issued, and three requests to start transfer must be issued.

Appendix Figure 1.6  Overview of Actions in Relay Activated Mode and SYNC/FREEZE Mode
Control Timing When CPU Module Scan Time < F3LB01 Module Processing Time

Appendix Figure 1.7  Control Sequence for Global Control (SYNC/FREEZE)

Appendix Figure 1.8  Control Sequence for Starting Transfer

Description of timing:

1. CPU module: Turns on Y relay
2. F3LB01: Detects Y relay on
3. F3LB01: Turns on X relay
4. CPU module: Detects X relay on
5. CPU module: Turns off Y relay
6. F3LB01: Detects Y relay off
7. F3LB01: Turns off X relay
8. CPU module: Detects X relay off
9. CPU module: Turns on next Y relay
10. F3LB01: Detects next Y relay on

Time from issue to completion of global control: F3LB01 execution time × 4 + CPU module scan time × 2
Time from start to end of transfer: F3LB01 execution time × 3 + CPU module scan time × 2

Input/output response time (3-1) = ① + (② × 4) × 4 + (② × 3) × 3 + ③ × 14 + (④ × number of stations + ④)

Elements of input/output response time:
① Slave's data response time
② F3LB01 module's processing time (approx. 2 ms)
③ CPU module's scan time
④ Slave's network response time
Control Timing When CPU Module Scan Time > F3LB01 Module Processing Time

Appendix Figure 1.9  Control Sequence for Global Control (SYNC/FREEZE)

Appendix Figure 1.10  Control Sequence for Starting Transfer

Description of timing for items *1 to *10 is the same as the previous case.

Time from issue to completion of global control : CPU module scan time × 3 + F3LB01 execution time × 2
Time from start to end of transfer : CPU module scan time × 3 + F3LB01 execution time × 2

Input/output response time (3-2)=①+②×14+(③×3)×7+(④×number of stations+④)

Elements of input/output response time:
① Slave's data response time
② F3LB01 module's processing time (approx. 2 ms)
③ CPU module's scan time
④ Slave's network response time
Appendix 2. Third Party Products

PROFIBUS-DP is a multi-vendor network, that is, PROFIBUS-DP compatible devices, cables and connectors are non-proprietary and hence available from many vendors. Enquiries on PROFIBUS-DP compliant devices, cables and connectors can be made to PROFIBUS International or the Japanese PROFIBUS Organization. Such information is also available at their respective websites.

URL of PROFIBUS International  http://www.profibus.com/
URL of Japanese PROFIBUS Organization http://www.profibus.jp/

TIP
The URL addresses of the above websites may not be the most up-to-date.

- Configurator

Network configuration of the F3LB01-0N module requires the use of the SyCon PROFIBUS configurator supplied by HMS Industrial Networks, which must be separately purchased.

For sales enquiries on the Configurator, please contact:

Manufacturer : HMS Industrial Networks AB
Pilefältsgatan 93-95
302 50 Halmstad Sweden
Tel: +46 35 17 29 00
Email: sales@hms-networks.com

Product model : KONF-PDP (Configurator for PROFIBUS-DP)
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