FC9Y-B644-04

MICROSmart

idec

FC4A SERIES

Micro Programmable Logic Controller

FC4A-AS62M
AS-Interface Master Module

User's Manual

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SAFETY PRECAUTIONS

- Read this user's manual to make sure of correct operation before starting installation, wiring, operation, maintenance, and inspection of the MicroSmart AS-Interface master module.
- All MicroSmart AS-Interface master modules are manufactured under IDEC's rigorous quality control system, but users must add a backup or failsafe provision to the control system using the MicroSmart AS-Interface master module in applications where heavy damage or personal injury may be caused in case the MicroSmart AS-Interface master module should fail.
- In this user's manual, safety precautions are categorized in order of importance to Warning and Caution:

⚠ Warning **Warning notices are used to emphasize that improper operation may cause severe personal injury or death.**

- Turn off the power to the MicroSmart before starting installation, removal, wiring, maintenance, and inspection of the MicroSmart AS-Interface master module. Failure to turn power off may cause electrical shocks or fire hazard.
- Special expertise is required to install, wire, program, and operate the MicroSmart AS-Interface master module. People without such expertise must not use the MicroSmart AS-Interface master module.
- Emergency stop and interlocking circuits must be configured outside the MicroSmart. If such a circuit is configured inside the MicroSmart, failure of the MicroSmart may cause disorder of the control system, damage, or accidents.
- Install the MicroSmart AS-Interface master module according to the instructions described in this user's manual. Improper installation will result in falling, failure, or malfunction of the MicroSmart AS-Interface master module.

⚠ Caution **Caution notices are used where inattention might cause personal injury or damage to equipment.**

- The MicroSmart AS-Interface master module is designed for installation in a cabinet. Do not install the MicroSmart AS-Interface master module outside a cabinet.
- Install the MicroSmart AS-Interface master module in environments described in this user's manual. If the MicroSmart AS-Interface master module is used in places where the MicroSmart AS-Interface master module is subjected to high-temperature, high-humidity, condensation, corrosive gases, excessive vibrations, and excessive shocks, then electrical shocks, fire hazard, or malfunction will result.
- The environment for using the MicroSmart AS-Interface master module is "Pollution degree 2." Use the MicroSmart AS-Interface master module in environments of pollution degree 2 (according to IEC 60664-1).
- Prevent the MicroSmart AS-Interface master module from falling while moving or transporting the MicroSmart AS-Interface master module, otherwise damage or malfunction of the MicroSmart AS-Interface master module will result.
- Prevent metal fragments and pieces of wire from dropping inside the MicroSmart AS-Interface master module housing. Put a cover on the MicroSmart AS-Interface master module during installation and wiring. Ingress of such fragments and chips may cause fire hazard, damage, or malfunction.
- Use a power supply of the rated value. Use of a wrong power supply may cause fire hazard.
- Use an IEC 60127-approved fuse on the power line outside the MicroSmart. This is required when equipment containing the MicroSmart is destined for Europe.
- Use an IEC 60127-approved fuse on the output circuit. This is required when equipment containing the MicroSmart is destined for Europe.
- Use an EU-approved circuit breaker. This is required when equipment containing the MicroSmart is destined for Europe.
- Make sure of safety before starting and stopping the MicroSmart or when operating the MicroSmart to force outputs on or off. Incorrect operation on the MicroSmart may cause machine damage or accidents.
- Do not connect the ground wire directly to the MicroSmart. Connect a protective ground to the cabinet containing the MicroSmart using an M4 or larger screw. This is required when equipment containing the MicroSmart is destined for Europe.
- Do not disassemble, repair, or modify the MicroSmart modules.
- When disposing of the MicroSmart modules, do so as an industrial waste.

About This Manual

This user's manual describes brief information about the AS-Interface and the entire functions, installation, and programming of the MicroSmart AS-Interface interface module.

Note: WindLDR Ver. 4.21 and higher are compatible with the AS-Interface master module. This manual describes procedures for using WindLDR Ver. 4.30.

CHAPTER 1: AS-INTERFACE

General information about of the Actuator-Sensor-Interface, abbreviated AS-Interface.

CHAPTER 2: MODULE SPECIFICATIONS

Specifications of the AS-Interface master module and applicable cables.

CHAPTER 3: INSTALLATION AND WIRING

Methods and precautions for installing and wiring the AS-Interface master module.

CHAPTER 4: OPERATION BASICS

General information about simple operating procedures for the basic AS-Interface system from programming WindLDR on a computer to monitoring the slave operation.

CHAPTER 5: PUSHBUTTONS AND LED INDICATORS

Operation of pushbuttons PB1 and PB2 on the AS-Interface master module to change operation modes, and also the functions of address and I/O LED indicators.

CHAPTER 6: AS-INTERFACE OPERANDS

AS-Interface operands, or internal relays M1300 through M1997 and data registers D1700 through D1999, assigned in the CPU module to control and monitor the AS-Interface bus. Provides detailed description about internal relays allocated to SwitchNet™ control units for use as slaves in the AS-Interface network. Also describes ASI commands used to update AS-Interface operands in the CPU module or to control the AS-Interface master module.

CHAPTER 7: USING WINDLDR

Procedures to use WindLDR ver. 4.30 for the AS-Interface system.

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Alphabetical listing of key words.

SwitchNet™ SwitchNet is an IDEC trademark for pushbuttons, pilot lights, and other control units capable of direct connection to the AS-Interface. SwitchNet devices are completely compatible with AS-Interface Ver. 2.1.

Note: In this manual, "ASI" is short for "AS-Interface" and is not intended to represent any particular product.

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1: AS-INTERFACE

Introduction

This chapter describes general information about the Actuator-Sensor-Interface, abbreviated AS-Interface.

AS-Interface is a type of field bus that is primarily intended to be used to control sensors and actuators. AS-Interface is a network system that is compatible with the IEC62026 standard and is not proprietary to any one manufacturer. A master device can communicate with slave devices such as sensors, actuators, and remote I/Os, using digital and analog signals transmitted over the AS-Interface bus.

The AS-Interface system is comprised of the following three major components:

- One master, such as the MicroSmart AS-Interface master module (FC4A-AS62M)
- One or more slave devices, such as sensors, actuators, switches, and indicators
- Dedicated 30V DC AS-Interface power supply (26.5 to 31.6V DC)

These components are connected using a two-core cable for both data transmission and AS-Interface power supply. AS-Interface employs a simple yet efficient wiring system and features automatic slave address assignment function, while installation and maintenance are also very easy.

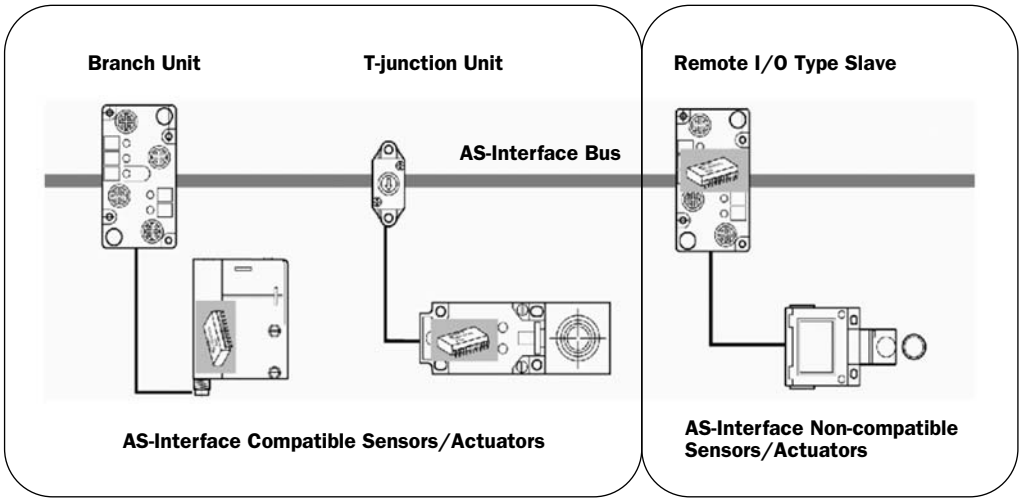
Applicable Sensors and Actuators for AS-Interface

AS-Interface Compatible Sensors and Actuators

AS-Interface compatible sensors and actuators communicate using the built-in AS-Interface function, and serve as AS-Interface slaves when connected directly to the AS-Interface bus via a branch unit or a T-junction unit.

Sensors/Actuators Not Compatible with AS-Interface

Conventional sensors and actuators that are not compatible with the AS-Interface can also be connected to the AS-Interface bus using a remote I/O slave and be handled in the same way as devices that are compatible with the AS-Interface.



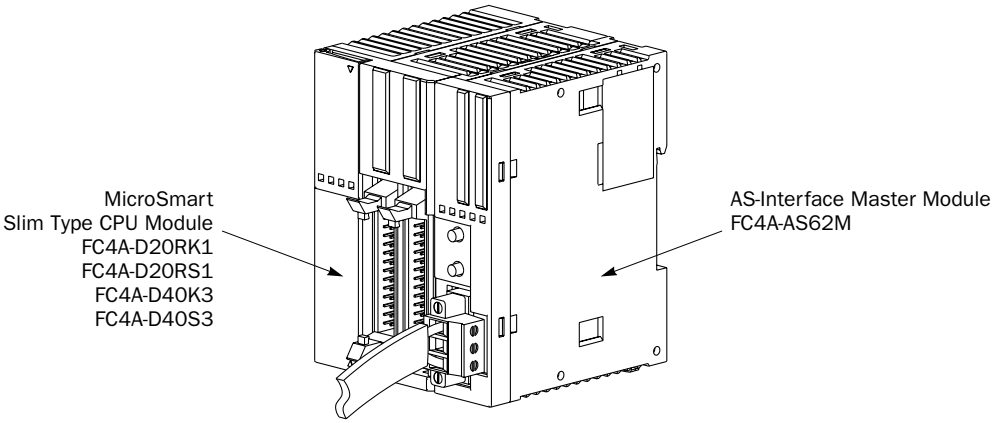
- **62 slaves maximum**
- **434 I/O points maximum (248 inputs and 186 outputs)**
- **Maximum Communication Distance**
  Without repeater: 100m
  With 2 repeaters: 300m

AS-Interface System Requirements

Master

The AS-Interface master controls and monitors the status of slave devices connected to the AS-Interface bus.

Normally, the AS-Interface master is connected to a PLC (sometimes called 'host') or a gateway. For example, the MicroSmart AS-Interface master module is connected to the MicroSmart CPU module.



Slaves

Various types of slave devices can be connected to the AS-Interface bus, including sensors, actuators, and remote I/O devices. Analog slaves can also be connected to process analog data.

Slaves are available in standard slaves and A/B slaves. Standard slaves have an address of 1 trough 31 in the standard address range. A/B slaves have an address of 1A through 31A in the standard address range or 1B through 31B in the expanded address range. Among the A/B slaves, slaves with an address of 1A through 31A are called A slaves, and slaves with an address of 1B through 31B are called B slaves.

AS-Interface Power Supply

The AS-Interface bus uses a dedicated 30V DC power supply (AS-Interface power supply), which is indicated with the AS-Interface mark. General-purpose power supply units cannot be used for the AS-Interface bus.

AS-Interface Marks

Caution

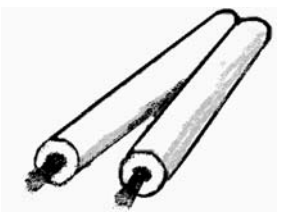
- Use a VLSV (very low safety voltage) to power the AS-Interface bus. The normal output voltage of the AS-Interface power supply is 30V DC.

Cables

The AS-Interface bus uses only one cable to transmit signals and power. Use one of the following cable types (the wire does not have to be stranded).

- Standard yellow unshielded AS-Interface cable (with polarity)
- Ordinary two-wire flat cable

AS-Interface Cable



Two-wire Flat Cable

Main Features of AS-Interface V2 with Slave Expansion Capability

The AS-Interface is a reliable bus management system in which one master periodically monitors each slave device connected on the AS-Interface bus in sequence. The master manages the I/O data, parameters, and identification codes of each slave in addition to slave addresses. The management data depends on the type of the slave as follows:

Standard Slaves

- A maximum of four inputs and four outputs for each slave
- Four parameters for setting a slave's operation mode (P3, P2, P1, P0)
- Four identification codes (ID code, I/O code, ID2 code, and ID1 code)

A/B Slaves

- A maximum of four inputs and three outputs for each slave
- Three parameters for setting a slave's operation mode (P2, P1, P0)
- Four identification codes (ID code, I/O code, ID2 code, and ID1 code)

Note 1: Parameters P3 through P0 are used to set an operation mode of the slave. For details, see the user's manual for the slave.

Note 2: The slaves connected to the AS-Interface bus are distinguished from each other by the ID code and I/O code contained in each slave. Some slaves have ID2 code and ID1 code to indicate the internal functions of the slave. For example, analog slaves use the ID2 code to represent the channel number of the slave.

Note 3: The MicroSmart AS-Interface master module is also compatible with AS-Interface ver. 2.1 and earlier slaves.

Slave Addresses

Each standard slave connected to the AS-Interface bus can be allocated an address of 1 through 31. Each A/B slave can be allocated an address of 1A through 31A or 1B through 31B. All slaves are set to address 0 at factory before shipment. The address of a slave can be changed using the "addressing tool." Using WindLDR, the addresses of slaves connected to the AS-Interface master module can be changed (see page 7-1).

When a slave fails during operation and needs to be replaced, if the auto addressing function is enabled on the master module, just replace the slave with a new one (with address 0 and the same identification codes). The new slave will automatically be allocated the same address as the slave that was removed, and you do not have to set the address again. For details of the ASI command to enable auto addressing, see page 6-17.

Slave Identification

Slaves have the following four identification codes. The master checks the identification codes to determine the type and feature of the slave connected on the AS-Interface bus.

ID Code

The ID code consists of 4 bits to indicate the type of the slave, such as sensor, actuator, standard slave, or A/B slave. For example, the ID code for a standard remote I/O is 0, and that for an A/B slave is A (hex).

I/O Code

The I/O code consists of 4 bits to indicate the quantity and allocation of I/O points on a slave.

I/O Code	Allocation	I/O Code	Allocation	I/O Code	Allocation	I/O Code	Allocation
0h	I, I, I, I	4h	I, I, B, B	8h	O, O, O, O	Ch	O, O, B, B
1h	I, I, I, O	5h	I, O, O, O	9h	O, O, O, I	Dh	O, I, I, I
2h	I, I, I, B	6h	I, B, B, B	Ah	O, O, O, B	Eh	O, B, B, B
3h	I, I, O, O	7h	B, B, B, B	Bh	O, O, I, I	Fh	(reserved)

I: input, O: output, B: input and output

ID2 Code

The ID2 code consists of 4 bits to indicate the internal function of the slave.

ID1 Code

The ID1 code consists of 4 bits to indicate additional identification of the slave. Standard slaves can have an ID1 code of 0000 through 1111 (bin). A/B slaves use the MSB to indicate A or B slave, and can have a unique value only for the lower three bits. The MSB of A slaves is set to 0, and that of B slaves is set to 1.

Quantities of Slaves and I/O Points

The quantity of slaves that can be connected to one AS-Interface bus is as follows.

- Standard slaves: 31 maximum
- A/B slaves: 62 maximum

The limits for slave quantities given above apply when the slaves are either all standard slaves or are all A/B slaves.

When 62 A/B slaves (with four inputs and three outputs) are connected, a maximum of 434 I/O points (248 inputs and 186 outputs) can be controlled over the bus.

When using a mix of standard slaves and A/B slaves together, the standard slaves can only use addresses 1(A) through 31(A). Also, when a standard slave takes a certain address, the B address of the same number cannot be used for A/B slaves.

AS-Interface Bus Topology and Maximum Length

The AS-Interface bus topology is flexible, and you can wire the bus freely according to your requirements.

When repeaters or extenders are not used, the bus length can be 100m (328 feet) at the maximum.

AS-Interface Bus Cycle Time

The AS-Interface bus cycle time is the amount of time required for a master to cycle through every slave on the bus.

The information for each slave is continuously transmitted over the bus in sequence, so the AS-Interface bus cycle time depends on the quantity of active slaves.

- When up to 19 slaves are active, the bus cycle time is 3 msec.
- When 20 to 31 slaves are active, the bus cycle time is $0.156 \times (1+N)$ msec where N is the number of slaves.

When A slave and B slave have the same address number (e.g. 12A and 12B), the two slaves are alternately updated each cycle. Therefore, when the system consists of 31 A slaves and 31 B slaves, then the AS-Interface bus cycle time will be 10 msec.

Maximum AS-Interface Bus Cycle Time

- When 31 slaves are connected, the maximum bus cycle time is 5 msec.
- When 62 slaves are connected, the maximum bus cycle time is 10 msec.

High Reliability and Security

The AS-Interface employs a transfer process of high reliability and high security. The master monitors the AS-Interface power supply voltage and data transmitted on the bus, and detects slave failures and data errors.

Even when a slave is replaced or a new slave is added during operation, the AS-Interface master module need not be shut down and can continue uninterrupted communication with other active slaves on the bus.

2: MODULE SPECIFICATIONS

Introduction

This chapter describes specifications of the MicroSmart AS-Interface master module and applicable cables.

AS-Interface Master Module Type Number

Module Name	Type No.
AS-Interface Master Module	FC4A-AS62M

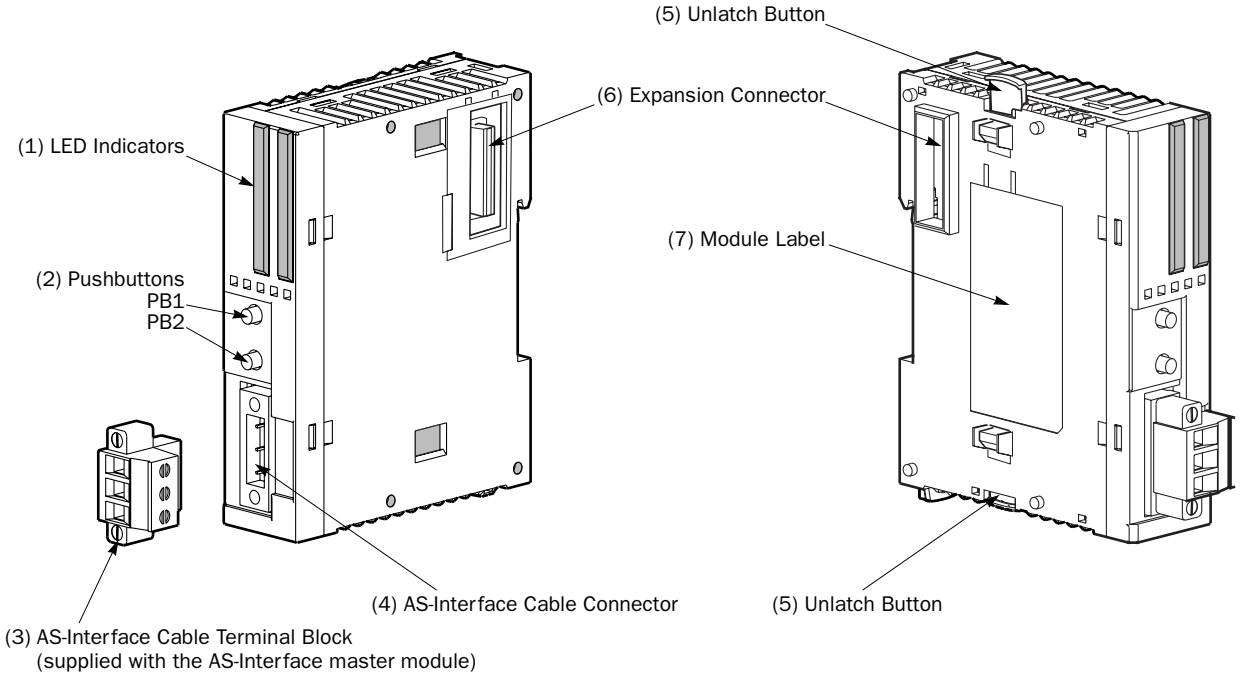
The AS-Interface master module can connect a maximum of 62 digital I/O slaves. A maximum of seven analog I/O slaves can also be connected to the AS-Interface master module (compliant with AS-Interface ver. 2.1 and analog slave profile 7.3).

The AS-Interface master module can be used with the 20-I/O relay output slim type CPU modules (FC4A-D20RK1 and FC4A-D20RS1) and the 40-I/O slim type CPU modules (FC4A-D40K3 and FC4A-D40S3). Use a CPU module version of 201 or higher. When using WindLDR, use ver. 4.21 or higher.

⚠ Caution

- The AS-Interface master module cannot be used with the all-in-one type CPU modules and the 20-I/O transistor output slim type CPU modules.
- Only one AS-Interface master module can be connected to the slim type CPU module. If more than one AS-Interface master module is connected, an error occurs and special data register D8037 (quantity of expansion I/O modules) stores error code 40 (hex).
- Normally, a maximum of seven expansion I/O modules can be connected to the slim type CPU module. But when the AS-Interface master module is connected, only a total of six expansion modules can be connected, including the AS-Interface master module. Do not connect more than six expansion modules due to the amount of heat generated. If more than six expansion modules, including the AS-Interface master module, are connected, an error occurs and special data register D8037 (quantity of expansion I/O modules) stores error code 20 (hex).
- The AS-Interface master module can connect a maximum of seven analog I/O slaves. When more than seven analog I/O slaves are connected, the AS-Interface system will not operate correctly.

Parts Description



(1) LED Indicators

Status LEDs:	Indicate the AS-Interface bus status.
I/O LEDs:	Indicate the I/O status of the slave specified by the address LEDs.
Address LEDs:	Indicate slave addresses.

(2) Pushbuttons Used to select slave addresses, change modes, and store configuration.

(3) AS-Interface Cable Terminal Block

Connects the AS-Interface cable.
One terminal block is supplied with the AS-Interface master module.
When ordering separately, specify Type No. FC4A-PMT3P and quantity (package quantity: 2).

(4) AS-Interface Cable Connector

Installs the AS-Interface cable terminal block.

(5) Unlatch Button Used to unlatch the AS-Interface master module from the CPU or I/O module.

(6) Expansion Connector Connects to the CPU and other I/O modules.
(Applicable CPU modules are 20-I/O relay output and 40-I/O slim types.)

(7) Module Label Indicates the AS-Interface master module Type No. and specifications.

Specifications

General Specifications

Operating Temperature	0 to 55°C (operating ambient temperature, no freezing)
Storage Temperature	–25 to +70°C (no freezing)
Relative Humidity	Level RH1, 30 to 95% (non-condensing)
Pollution Degree	2 (IEC 60664)
Degree of Protection	IP20
Corrosion Immunity	Free from corrosive gases
Altitude	Operation: 0 to 2,000m (0 to 6,565 feet) Transport: 0 to 3,000m (0 to 9,840 feet)
Vibration Resistance	When mounted on a DIN rail: 10 to 57 Hz amplitude 0.075 mm, 57 to 150 Hz acceleration 9.8 m/s^2 2 hours per axis on each of three mutually perpendicular axes When mounted on a panel surface: 2 to 25 Hz amplitude 1.6 mm, 25 to 100 Hz acceleration 39.2 m/s^2 90 minutes per axis on each of three mutually perpendicular axes
Shock Resistance	147 m/s^2, 11 msec duration, 3 shocks per axis, on three mutually perpendicular axes (IEC 61131)
External Power Supply	AS-Interface power supply, 29.5 to 31.6V DC
AS-Interface Current Draw	65 mA (normal operation) 110 mA maximum
Effect of Improper Input Connection	No damage
Connector on Mother Board	MSTB2.5/3-GF-5.08BK (Phoenix Contact)
Connector Insertion/Removal Durability	100 times minimum
Internal Current Draw	80 mA (5V DC) 0 mA (24V DC)
AS-Interface Master Module Power Consumption	540 mW (24V DC)
Weight	85g

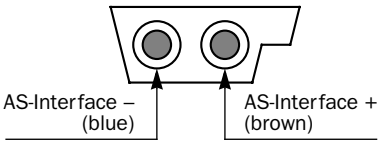
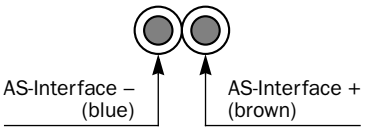
Communication Specifications

Maximum Bus Cycle	When 1 through 19 slaves are connected: 3 msec When 20 through 62 slaves are connected: 0.156 × (1 + N) msec where N is the number of active slaves 5 msec maximum when 31 standard or A/B slaves are connected 10 msec maximum when 62 A/B slaves are connected	
Maximum Slaves	Standard slaves: 31 A/B slaves: 62 When using a mix of standard slaves and A/B slaves together, the standard slaves can only use addresses 1(A) through 31(A). Also, when a standard slave takes a certain address, the B address of the same number cannot be used for A/B slaves.	
Maximum I/O Points	Standard slaves: 248 total (124 inputs + 124 outputs) A/B slaves: 434 total (248 inputs + 186 outputs)	
Maximum Cable Length	AS-Interface Cable 2-wire Flat Cable	When using no repeater or extender: 100m When using a total of 2 repeaters or extenders: 300m
	Single Wires	200 mm
Rated Bus Voltage	30V DC	

Applicable Cables

The AS-Interface cable transfers data and supplies power to the sensors and actuators connected to the bus. The following cables can be used with the AS-Interface master module.

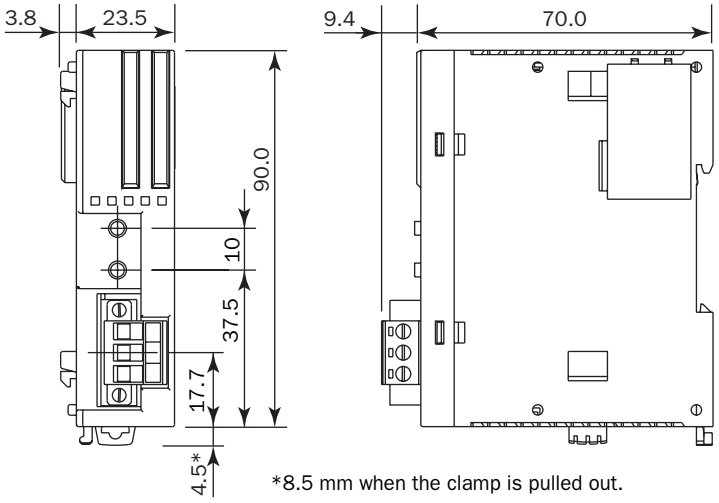
Applicable Cable Specifications

Cable Type	Cable Size/Manufacturer	Cross-sectional View
AS-Interface Standard Cable	Cable sheath color: Yellow Conductor cross section: 1.5 mm^2 LAPP's Cables Type No: 2170228 (sheath material EPDM) Type No: 2170230 (sheath material TPE)	
2-wire Flat Cable or **Single Wires** (See Note)	Conductor cross section Stranded wire: 0.5 to 1.0 mm^2 Solid wire: 0.75 to 1.5 mm^2 AWG: 20 to 16	

Note: When using single wires, the maximum cable length is 200 mm. See "Maximum Cable Length" on page 2-3.

Dimensions

The AS-Interface master module has the same profile as all other MicroSmart modules for consistent mounting on a DIN rail.



*8.5 mm when the clamp is pulled out.

All dimensions in mm.

3: INSTALLATION AND WIRING

Introduction

This chapter describes the methods and precautions for installing and wiring the AS-Interface master module.

Before starting installation and wiring, be sure to read "Safety Precautions" in the beginning of this manual and understand precautions described under Warning and Caution.

⚠ Warning

- Turn off the power to the AS-Interface master module before starting installation, removal, wiring, maintenance, and inspection of the AS-Interface master module. Failure to turn power off may cause electrical shocks or fire hazard.
- Emergency stop and interlocking circuits must be configured outside the MicroSmart. If such a circuit is configured inside the MicroSmart, failure of the MicroSmart may cause disorder of the control system, damage, or accidents.
- Special expertise is required to install, wire, program, and operate the MicroSmart. People without such expertise must not use the MicroSmart.

⚠ Caution

- Prevent metal fragments and pieces of wire from dropping inside the MicroSmart housing. Put a cover on the MicroSmart modules during installation and wiring. Ingress of such fragments and chips may cause fire hazard, damage, or malfunction.
- Do not touch the connector pins with hand, otherwise electrostatic discharge may damage the internal elements.

Installation Location

The MicroSmart modules must be installed correctly for optimum performance.

The MicroSmart is designed for installation in a cabinet. Do not install the MicroSmart outside a cabinet.

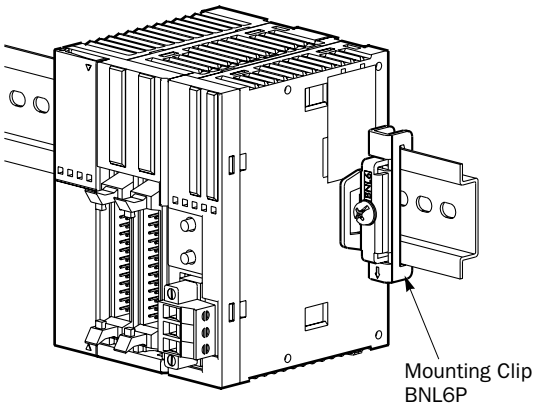
The environment for using the MicroSmart is "Pollution degree 2." Use the MicroSmart in environments of pollution degree 2 (according to IEC 60664-1).

Make sure that the operating temperature does not drop below 0°C or exceed 55°C. If the temperature does exceed 55°C, use a fan or cooler.

Mount the MicroSmart on a vertical plane as shown at right.

To eliminate excessive temperature build-up, provide ample ventilation. Do not install the MicroSmart near, and especially above, any device which generates considerable heat, such as a heater, transformer, or large-capacity resistor. The relative humidity should be above 30% and below 95%.

The MicroSmart should not be exposed to excessive dust, dirt, salt, direct sunlight, vibrations, or shocks. Do not use the MicroSmart in an area where corrosive chemicals or flammable gases are present. The modules should not be exposed to chemical, oil, or water splashes.



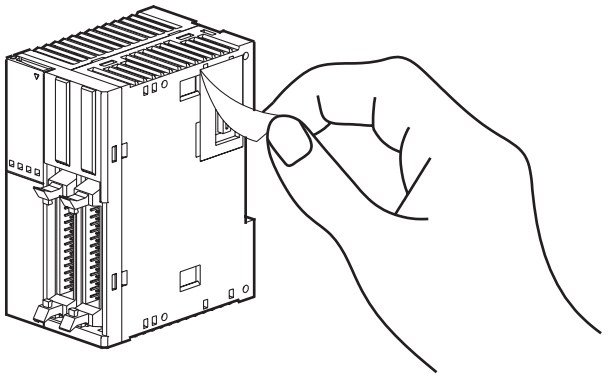
Assembling Modules

Caution

- Assemble MicroSmart modules together before mounting the modules onto a DIN rail. Attempt to assemble modules on a DIN rail may cause damage to the modules.
- Turn off the power to the MicroSmart before assembling the modules. Failure to turn power off may cause electrical shocks.

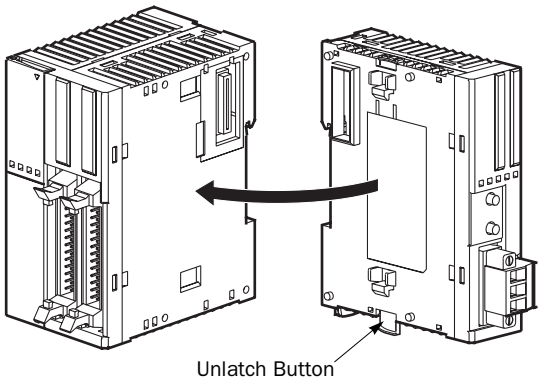
The following example demonstrates the procedure for assembling the 40-I/O type CPU module and the AS-Interface master module together. When assembling the 20-I/O relay output type CPU module, take the same procedure.

1. When assembling an AS-Interface master module, remove the expansion connector seal from the 40-I/O type CPU module.



2. Place the CPU module and AS-Interface master module side by side. Put the expansion connectors together for easy alignment.
3. With the expansion connectors aligned correctly and the blue unlatch button in the down position, press the CPU module and AS-Interface master module together until the latches click to attach the modules together firmly. If the unlatch button is in the up position, push down the button to engage the latches.

Note: When assembling other I/O modules with the AS-Interface master module, take the same procedure.



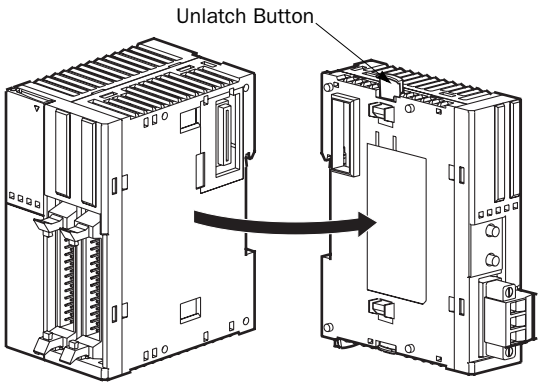
Disassembling Modules

Caution

- Remove the MicroSmart modules from the DIN rail before disassembling the modules. Attempt to disassemble modules on a DIN rail may cause damage to the modules.
- Turn off the power to the MicroSmart before disassembling the modules. Failure to turn power off may cause electrical shocks.

1. If the modules are mounted on a DIN rail, first remove the modules from the DIN rail as described on page 3-3.
2. Push up the blue unlatch button to disengage the latches, and pull the modules apart as shown.

Note: When disassembling other I/O modules from the AS-Interface master module, take the same procedure.

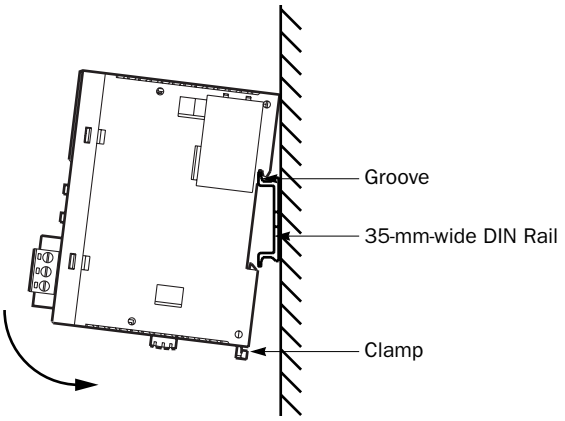


Mounting on DIN Rail

⚠ Caution

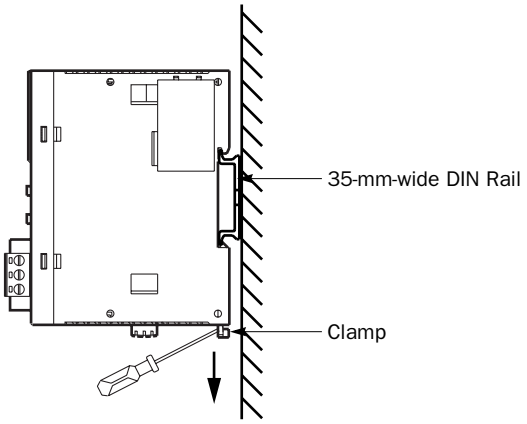
- Install the MicroSmart modules according to instructions described in this user's manual. Improper installation will result in falling, failure, or malfunction of the MicroSmart.
- Mount the MicroSmart modules on a 35-mm-wide DIN rail or a panel surface. Applicable DIN rail: IDEC's BAA1000NP or BAP1000NP (1000mm/39.4" long)

1. Fasten the DIN rail to a panel using screws firmly.
2. Pull out the clamp from each MicroSmart module, and put the groove of the module on the DIN rail. Press the modules towards the DIN rail and push in the clamps as shown on the right.
3. Use BNL6P mounting clips on both sides of the MicroSmart modules to prevent moving sideways.



Removing from DIN Rail

1. Insert a flat screwdriver into the slot in the clamp.
2. Pull out the clamps from the modules.
3. Turn the MicroSmart modules bottom out.

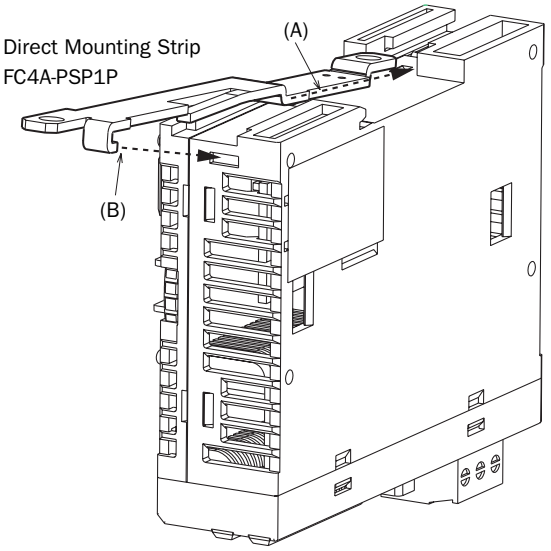


Direct Mounting on Panel Surface

MicroSmart modules can also be mounted on a panel surface inside a console. When mounting a slim type CPU module, AS-Interface master module, and other expansion modules, use optional direct mounting strip FC4A-PSP1P as described below.

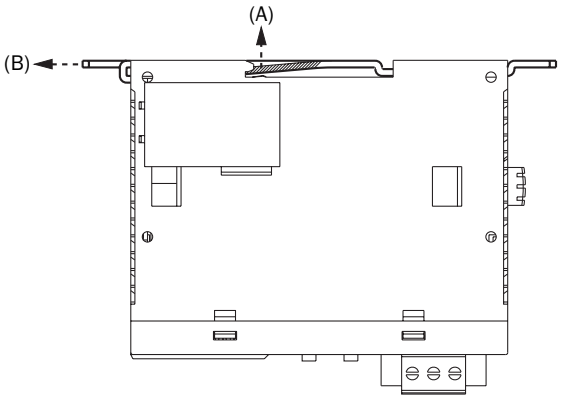
Installing the Direct Mounting Strip

1. Remove the clamp from the module by pushing the clamp inward.
2. Insert the direct mounting strip into the slot where the clamp has been removed (A). Further insert the direct mounting strip until the hook enters into the recess in the module (B).



Removing the Direct Mounting Strip

1. Insert a flat screwdriver under the latch of the direct mounting strip to release the latch (A).
2. Pull out the direct mounting strip (B).

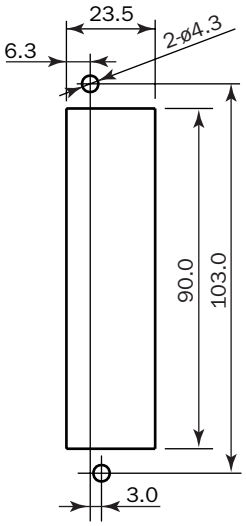


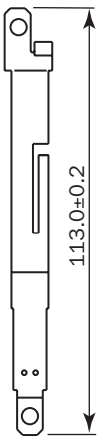
Caution

- Reusing the Direct Mounting Strip
  When you attempt to reuse a direct mounting strip, the hook may not catch on the recess sufficiently and may come out easily. When using a direct mounting strip again, be certain to push the hook deeply into the recess.

Mounting Hole Layout for Direct Mounting on Panel Surface

Make mounting holes of ø4.3 mm as shown below and use M4 screws (6 or 8 mm long) to mount the AS-Interface master module on the panel surface.





Direct Mounting Strip
FC4A-PSP1P

Terminal Connection

⚠ Caution

- Make sure that the operating conditions and environments are within the specification values.
- Be sure to connect the ground terminal on the CPU module to a proper ground, otherwise electrical shocks may be caused.
- Do not touch live terminals, otherwise electrical shocks may be caused.
- Do not touch terminals immediately after power is turned off, otherwise electrical shocks may be caused.
- When using ferrules, insert a wire to the bottom of the ferrule and crimp the ferrule.
- When connecting a stranded wire or multiple solid wires to a screw terminal block, use a ferrule. Otherwise the wire may slip off the terminal block.

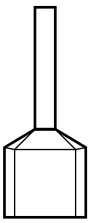
Ferrules, Crimping Tool, and Screwdriver for Phoenix Terminal Blocks

The screw terminal block for the AS-Interface cable can be wired with or without using ferrules on the end of the cable. Applicable ferrules for the Phoenix terminal blocks and crimping tool for the ferrules are listed below. The screwdriver is used for tightening the terminal screws and mounting screws on the terminal block. These ferrules, crimping tool, and screwdriver are made by Phoenix Contact and are available from Phoenix Contact.

Type numbers of the ferrules, crimping tool, and screwdriver listed below are the type numbers of Phoenix Contact. When ordering these products from Phoenix Contact, specify the Order No. and quantity listed below.

Ferrule Order No.

Quantity of Cables	Cable Size	Phoenix Type	Order No.	Pcs./Pkt.
For 1-cable connection	0.5 mm^2 AWG20	AI 0,5-8 WH	32 00 01 4	100
	0.75 mm^2 AWG18	AI 0,75-8 GY	32 00 51 9	100
	1.5 mm^2 AWG16	AI 1,5-8 BK	32 00 04 3	100
For 2-cable connection	0.5 mm^2 AWG20	AI-TWIN 2 x 0,5-8 WH	32 00 93 3	100
	0.75 mm^2 AWG18	AI-TWIN 2 x 0,75-8 GY	32 00 80 7	100



Crimping Tool and Screwdriver Order No.

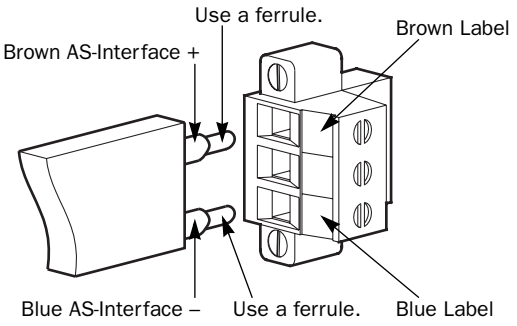
Tool Name	Phoenix Type	Order No.	Pcs./Pkt.	Tightening Torque	Description
Crimping Tool	CRIMPFOX ZA 3	12 01 88 2	1	—	For crimping ferrules
Screwdriver	SZS 0,6 x 3,5	12 05 05 3	10	0.5 to 0.6 N·m	For tightening terminal screws
				0.3 to 0.5 N·m	For tightening mounting screws

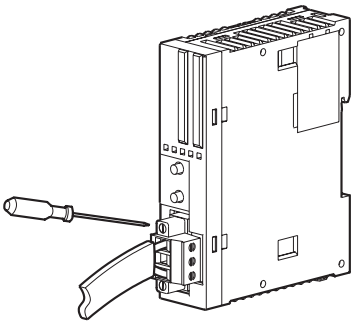
AS-Interface Cable Wiring

Before wiring the AS-Interface cable, remove the AS-Interface cable terminal block from the AS-Interface cable connector on the AS-Interface master module.

AS-Interface specifies use of brown cables for the AS-Interface + line, and blue cables for the AS-Interface – line. Connect the cables to match the color labels on the terminal block. Tighten the terminal screws to a torque of 0.5 to 0.6 N·m.

Insert the terminal block to the connector on the AS-Interface master module, and tighten the mounting screws to a torque of 0.3 to 0.5 N·m.





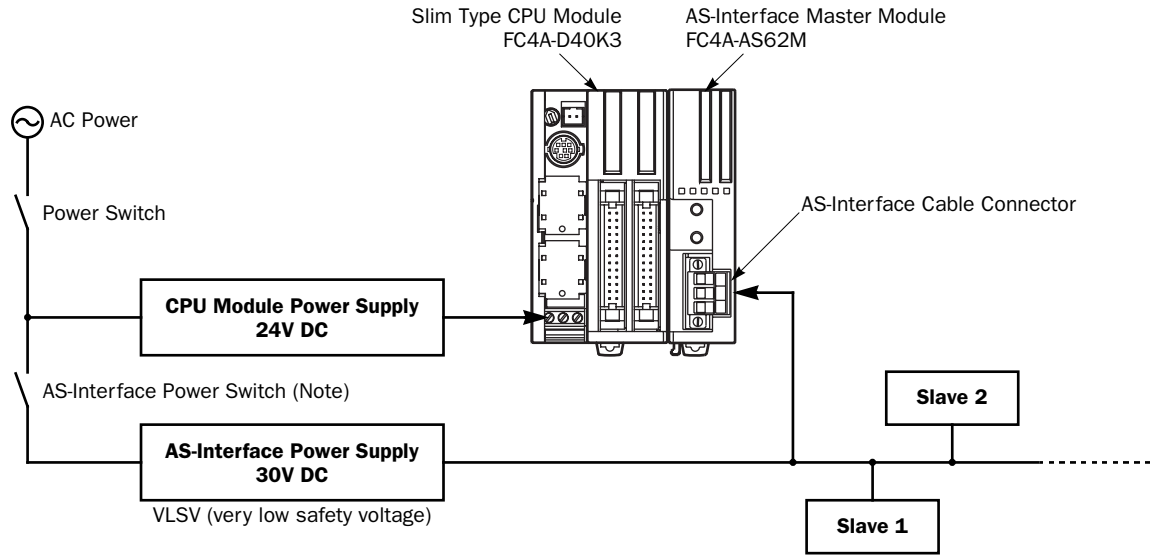
Power Supply

⚠ Caution

- When turning off the power to the CPU module, also turn off the AS-Interface power supply. If the CPU module is powered down and up while the AS-Interface power remains on, AS-Interface communication may stop due to a configuration error, resulting in a communication error.
- Turn on the AS-Interface power supply no later than the CPU module power supply, except when slave address 0 exists on the network. The two power supplies may be turned off in any order.

Power Supply Wiring Diagram

A recommended power supply wiring diagram is shown below. Use a common power switch for both the CPU module power supply and AS-Interface power supply to make sure that both power supplies are turned on and off at the same time.



Note: A failed slave can be replaced with a new slave with address 0 without turning off the power to the CPU module and the AS-Interface line. But, if power has been turned off before replacing the slaves, install a new slave with address 0 and take one of the following steps, because the AS-Interface master module has to be initialized to enable communication.

- Disconnect the AS-Interface cable connector and turn on both power supplies. Five seconds later, connect the AS-Interface cable connector.
- Turn on the CPU module power supply first. Five seconds later, turn on the AS-Interface power supply.

4: OPERATION BASICS

Introduction

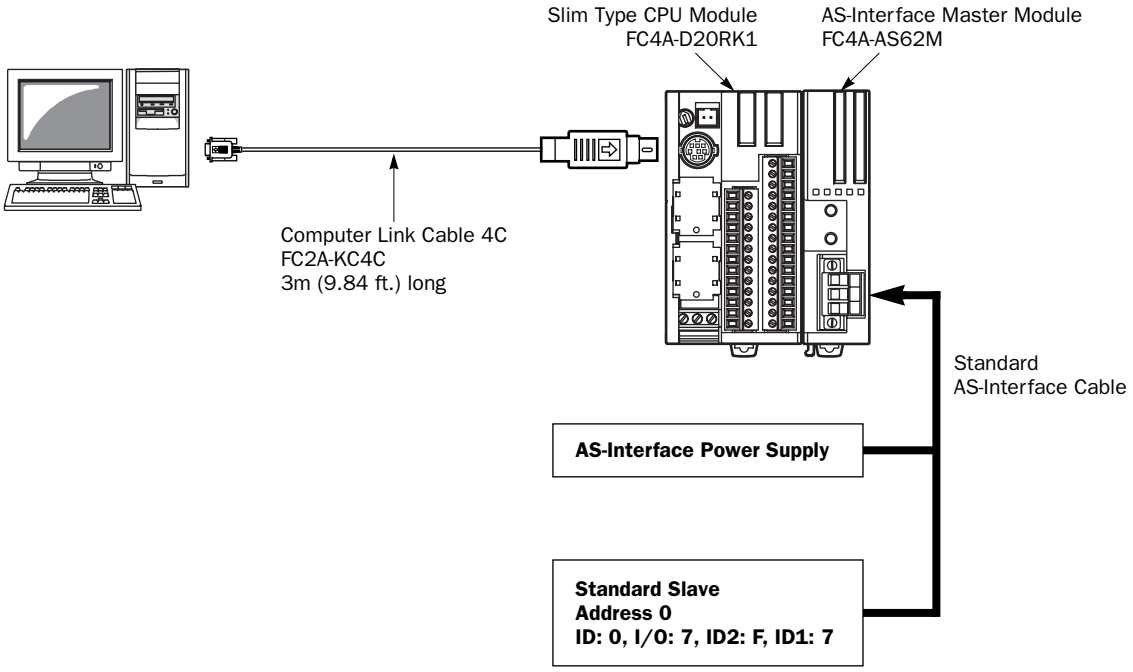
This chapter describes general information about simple operating procedures for the basic AS-Interface system from programming WindLDR on a computer to monitoring the slave operation.

AS-Interface System Setup

The sample AS-Interface system consists of the following devices:

Name	Type No.	Description
MicroSmart Slim Type CPU Module	FC4A-D20RK1	System program version 201 or later
MicroSmart AS-Interface Master Module	FC4A-AS62M	—
WindLDR	FC9Y-LP2CDW	Version 4.21 or higher
AS-Interface Standard Slave	—	1 unit Address 0 ID: 0, I/O: 7, ID2: F, ID1: 7
AS-Interface Power Supply	PS2R-Q30ABL	Output 30.5V DC, 2.4A (73W)

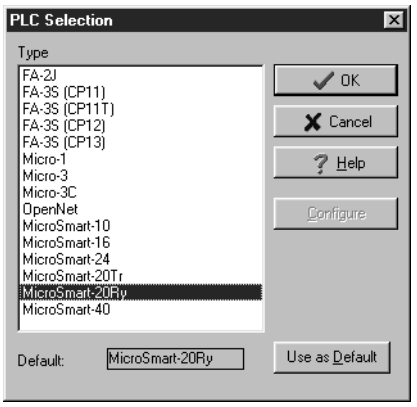
Connect the devices as shown below.



Selecting the PLC Type

Start WindLDR on a computer.

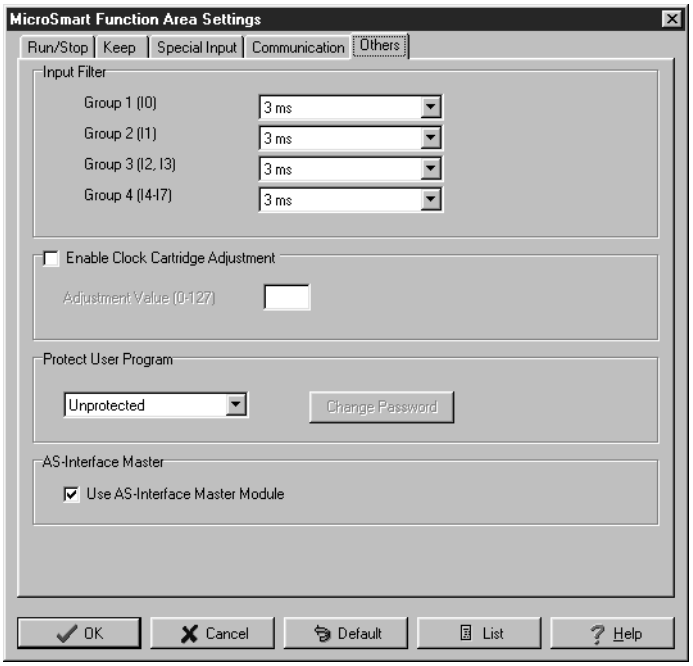
1. From the WindLDR menu bar, select **Configure** > **PLC Selection**. The PLC Selection dialog box appears.
2. Select **MicroSmart-20Ry**.
3. Click **OK** to save changes and return to the ladder editing screen.



Function Area Settings

Use of the AS-Interface master module must be selected in the Function Area Settings dialog box.

1. From the WindLDR menu bar, select **Configure** > **Function Area Settings**. The Function Area Settings dialog box appears.
2. Select the **Others** tab.



3. Make sure of a check mark in the check box on the left of **Use AS-Interface Master Module**.

This check box is checked as default. Since this setting relates to the user program, download the user program to the CPU module after changing any of these settings.

If the ERR LED on the CPU module goes on when the AS-Interface master module is connected, download the user program to the CPU module after making the above setting.

Assigning a Slave Address

AS-Interface compatible slave devices are set to address 0 at factory. Connect the slave to the AS-Interface master module as shown on page 4-1. Do not connect two or more slaves with slave address 0, otherwise the AS-Interface master module cannot recognize slave addresses correctly.

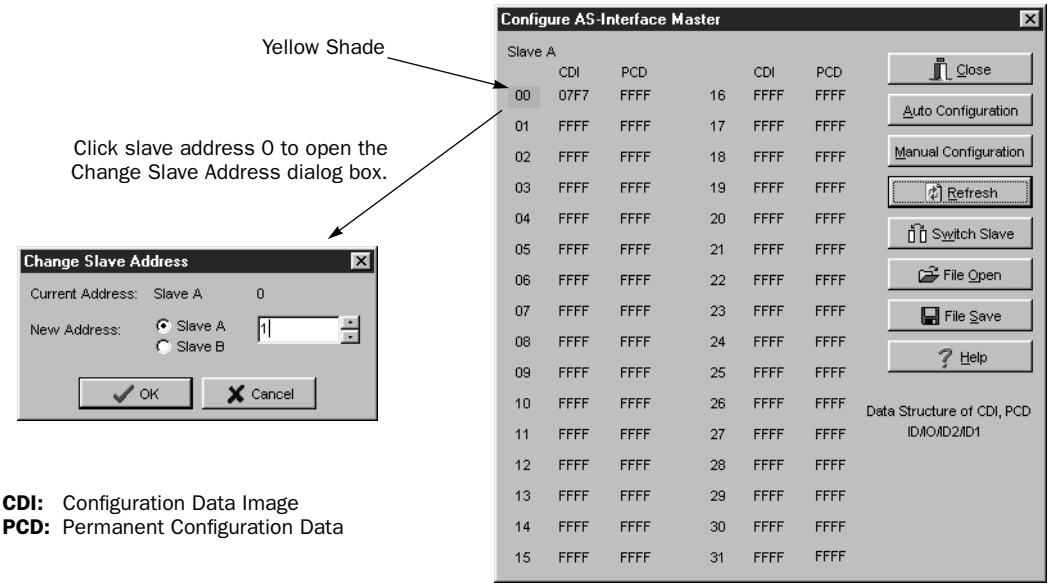
1. Power up the MicroSmart CPU module first. Approximately 5 seconds later, turn on the AS-Interface power supply.

Note: When slave address 0 is not mounted on the AS-Interface bus, the CPU module power supply and the AS-Interface power supply can be turned on at the same time. See page 3-6.

2. From the WindLDR menu bar, select **Configure** > **AS-Interface Master** to open the Configure AS-Interface Master dialog box. Press **Refresh** to collect slave information and update the screen display. (When configuration in the master module is complete, you do not have to press **Refresh** since the screen display is updated automatically.)

On the Configure AS-Interface Master dialog box, slave address 0 is shaded with yellow. This means that the master module has found slave address 0 on the AS-Interface bus. The CDI for address 0 shows 07F7 (ID: 0, I/O: 7, ID2: F, ID1: 7).

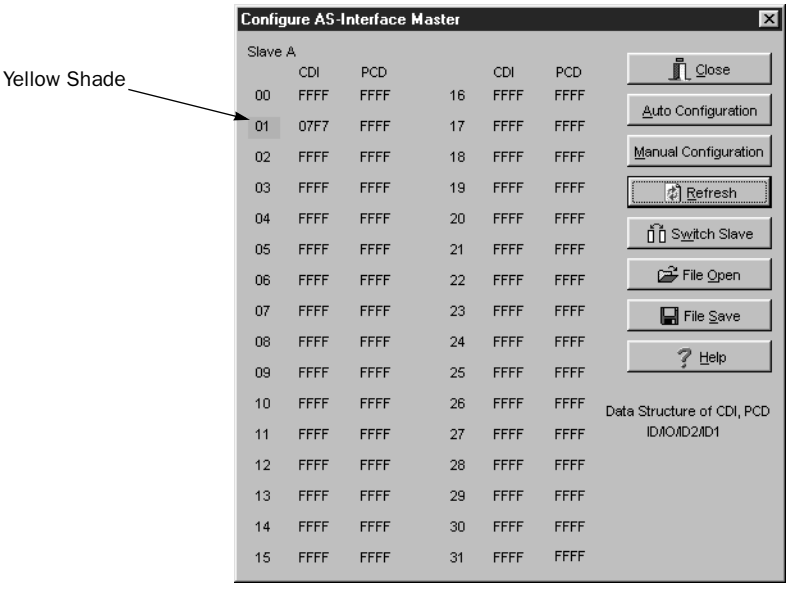
3. Click the slave address "00" to open the Change Slave Address dialog box for slave 0. To assign slave address 1 to the slave, enter **1** in the New Address field and click **OK**.



CDI: Configuration Data Image
PCD: Permanent Configuration Data

The new address "01" is shaded with yellow to indicate that the address assignment is complete.

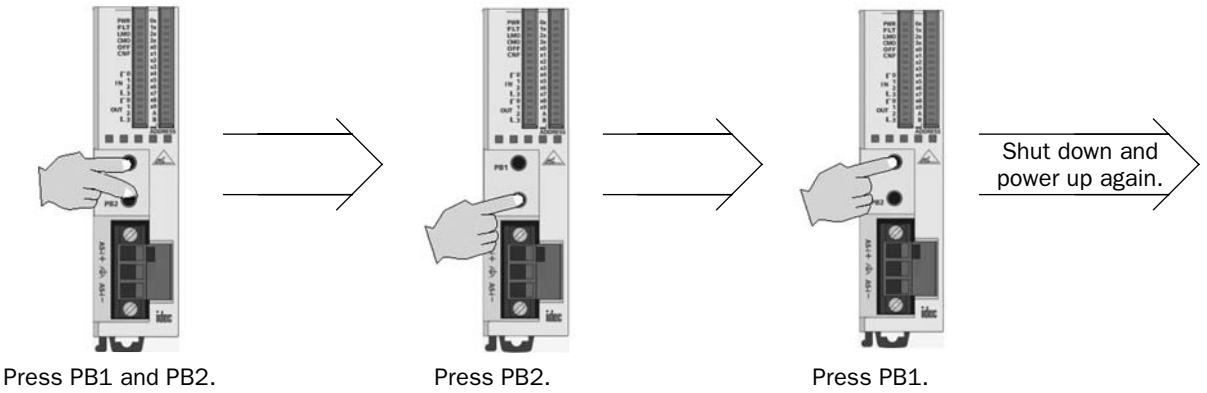
4. When changing slave addresses on other slaves, continue from step 3 if it is possible to wire the slave without turning off power, or from step 1 if the CPU module is shut down.



Configuring a Slave

Next, you have to set the slave configuration in the AS-Interface master module, either by using pushbuttons PB1 and PB2 on the AS-Interface master module or WindLDR.

Configuration Using Pushbuttons PB1 and PB2



1. Check that PWR LED and CMO LED on the AS-Interface master module are on (normal protection mode).
2. Press pushbuttons PB1 and PB2 together for 3 seconds. CMO LED turns off and LMO LED turns on (protected mode).
3. Press pushbutton PB2 for 3 seconds. CNF LED flashes (configuration mode).
4. About 5 seconds later, press pushbutton PB1 for 3 seconds. All I/O LEDs blink once to complete configuration.
5. Shut down the CPU module and AS-Interface master module, and power up again. Check that FLT LED is off, which indicates that configuration is complete.
6. Use WindLDR to view slave information on the Configure AS-Interface Master dialog box and check that all slaves are recognized correctly.

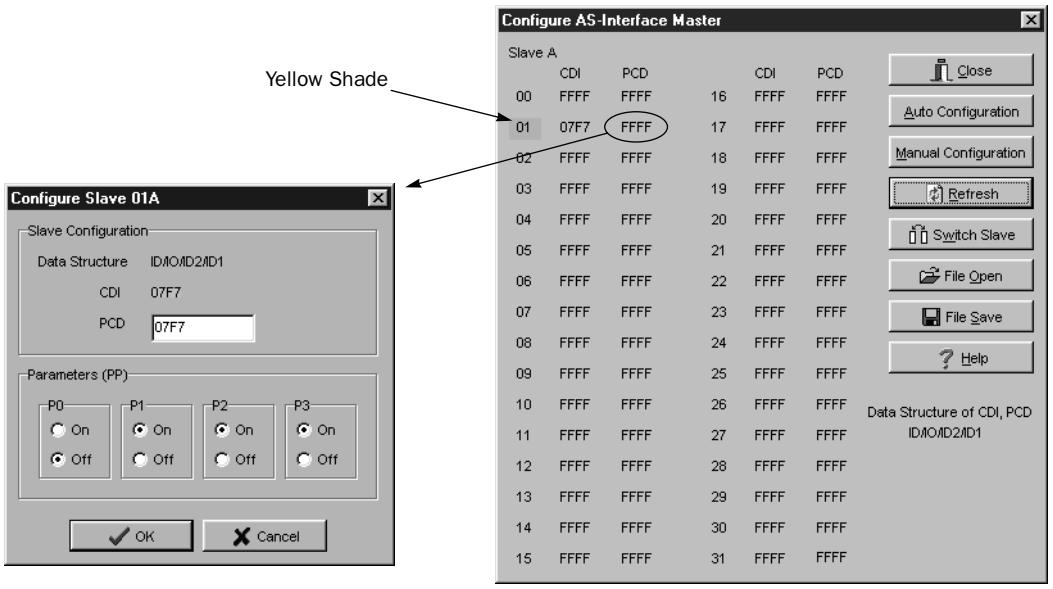
Configuration Using WindLDR

Slave configuration can be set using WindLDR in two ways; using the **Auto Configuration** or **Manual Configuration** button on the Configure AS-Interface Master dialog box.

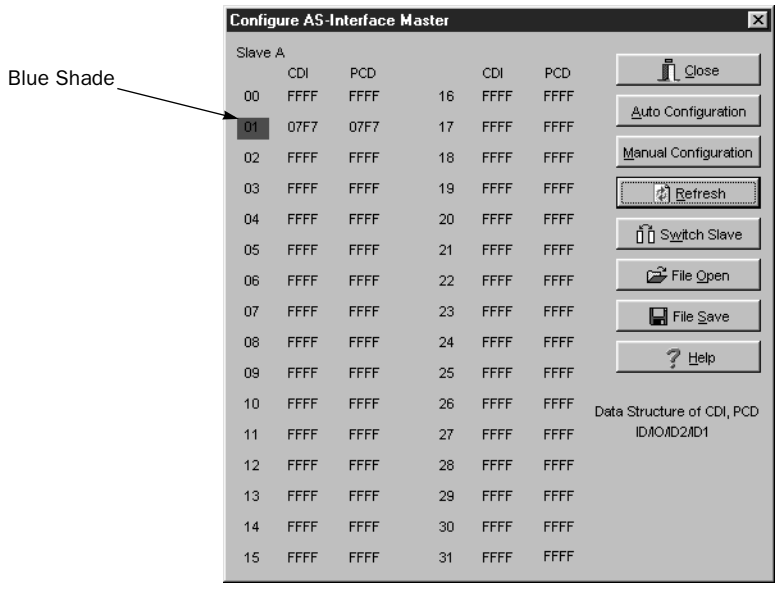
1. Click the **Auto Configuration** button to store the configuration information (LDS, CDI, PI) of the connected slaves to the EEPROM (LPS, PCD, PP) in the AS-Interface master module. For details, see page 7-3.

The auto configuration automatically stores the information of slaves found on the AS-Interface bus to the EEPROM in the master module, and this completes configuration. Another method of configuration is manual configuration as follows.

2. Click the PCD value “FFFF” of slave address 01 to open the Configure Slave 01A dialog box.
3. Enter the same value as CDI “07F7” to the PCD field. (Set FFFF to PCD values of all unused slaves.)
4. Select initial settings of parameters 0 through 3, if required.



5. Click the **Manual Configuration** button to store the selected PCD and parameter values to the master module.
6. Check that the blue shade appears at slave address 01. Now, configuration is complete.



Monitoring Digital I/O, and Changing Output Status and Parameters

While the MicroSmart is communicating with AS-Interface slaves through the AS-Interface bus, operating status of AS-Interface slaves can be monitored using WindLDR on a PC. Output statuses and parameter image (PI) of slaves connected to the AS-Interface master module can also be changed using WindLDR.

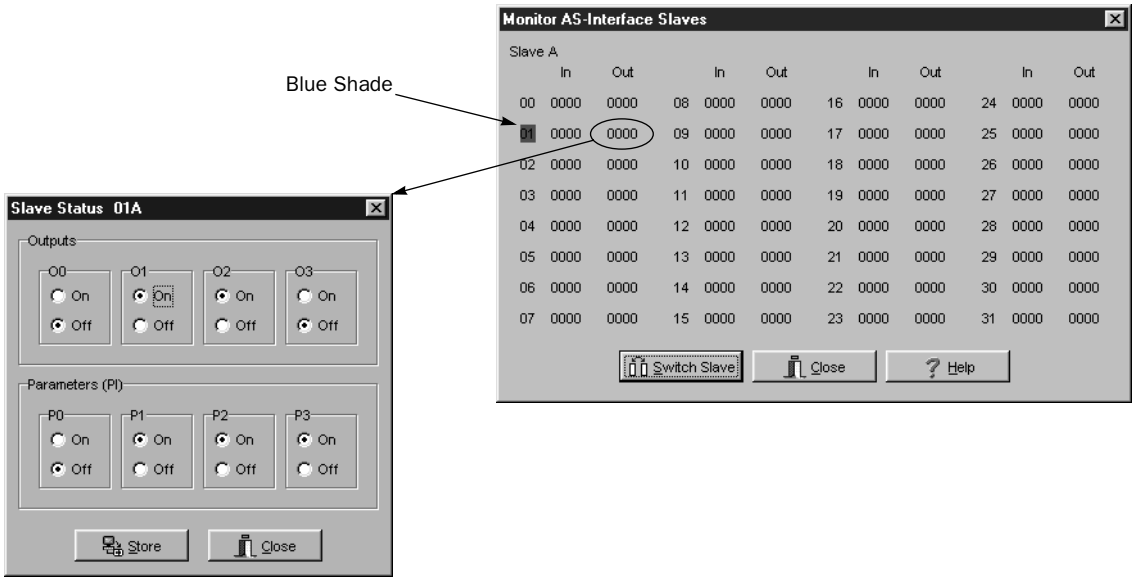
1. From the WindLDR menu bar, select **Online** > **Monitor**. From the WindLDR menu bar, select **Online**, and select **Monitor AS-Interface Slaves** in the pull-down menu. The Monitor AS-Interface Slaves dialog box appears.

Active slaves are indicated with blue shade.

Next step is to change output status of the active slave.

2. Click the output of slave address 01 to open the Slave Status 01A dialog box.

3. Click the On or Off button to change the statuses of outputs O0 through O3 and parameters (PI) P0 through P3 as required.



The selected parameters (PI) are in effect until the CPU module is shut down. When the CPU module is powered up again, the parameter values (PP) selected in the slave configuration procedure (page 4-4) will take effect. To store the changed parameter values to the AS-Interface master module EEPROM, execute the Copy PI to PP command by storing 0306, 0100, 0000, 0000, 0001 to data registers D1941 through D1945. See page 6-17.

Troubles at System Start-up

The following table summarizes possible troubles at system start-up, probable causes and actions to be taken.

Trouble	Cause and Action
PWR LED is off. (power)	• AS-Interface power is not supplied to the AS-Interface master module. Check that wiring is correct and AS-Interface power is supplied. • Power is not supplied from the CPU module to the AS-Interface master module. Check the connection between the CPU module and the AS-Interface master module.
FLT LED is on. (fault)	• Slave configuration on the bus is incorrect. Use the WindLDR slave monitor function to check that slaves are connected correctly. Perform configuration, if necessary. For the configuration method, see page 7-1. If FLT LED remains on even though slaves are connected correctly and configuration is completed, either disconnect and reconnect the AS-Interface connector, or turn off and on the AS-Interface power supply.
LMO LED is on. (local mode)	The CPU module fails to communicate with the AS-Interface master module. Check the following points. • Is the CPU module compatible with AS-Interface? Check the Type No. of the CPU module. • Is the system program of the CPU module 201 or higher? Check the system program version in the Online > PLC Status dialog box in WindLDR. • Is a check mark put in the check box “Use AS-Interface Master Module” in WindLDR Function Area Settings? The box is checked as default. If not, put a check mark and download the user program to the CPU module.
OFF LED is on. (offline)	• While a slave of address 0 was connected, power was turned on. After changing the slave address, power up again. For the address changing method, see page 7-2.
Slave operation is unstable.	• Check if there are two or more slaves with the same address. Each slave must have a unique address. If two slaves have the same address and same identification codes (ID, I/O, ID2, ID1), the AS-Interface master module may fail to detect an error. When changing the duplicate slave address using WindLDR, remove one of the slaves from the bus.

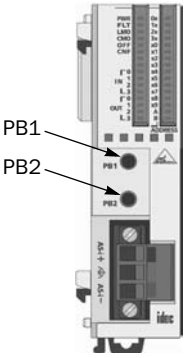
5: PUSHBUTTONS AND LED INDICATORS

Introduction

This chapter describes the operation of pushbuttons PB1 and PB2 on the AS-Interface master module to change operation modes, and also explains the functions of address and I/O LED indicators.

Pushbutton Operation

The operations performed by pushbuttons PB1 and PB2 on the front of the AS-Interface master module depend on the duration of being pressed. A “long press” switches the operation mode, and a “short press” switches the slave being monitored on the I/O LEDs. If the duration of pressing PB1 or PB2 does not correspond to either of these, the status of the AS-Interface master module does not change.



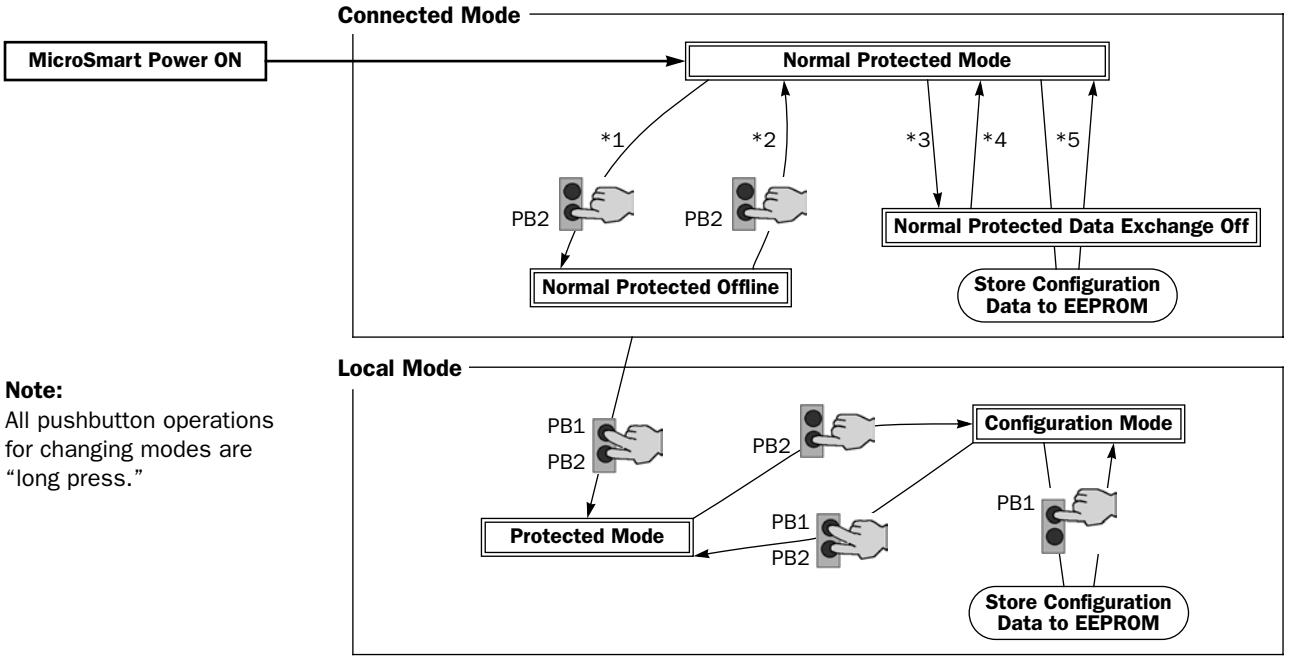
Long Press

A “long press” takes effect when you press either pushbutton PB1 or PB2 or both for 3 seconds or more. Use the long press to change the operation mode of the AS-Interface master module or to save the configuration data to the AS-Interface master module EEPROM.

Short Press

A “short press” takes effect when you press either pushbutton PB1 or PB2 for 0.5 second or less. Use the short press to change the slave address when monitoring slave I/O status on the AS-Interface master module LED indicators.

Transition of AS-Interface Master Module Modes Using Pushbuttons



Note:
All pushbutton operations for changing modes are “long press.”

*1 Pushbutton operation or execution of the ASI command Go to Normal Protected Offline.

*2 Pushbutton operation or execution of the ASI command Go to Normal Protected Mode.

*3 Execution of the ASI command Prohibit Data Exchange.

*4 Execution of the ASI command Enable Data Exchange.

*5 Configuration is done by clicking the Auto Configuration or Manual Configuration button in WindLDR. The configuration data is saved to the AS-Interface master module EEPROM.

AS-Interface Master Module Operation Modes

The AS-Interface master module has two modes of operation: connected mode is used for actual operation, and local mode is used for maintenance purposes.

Connected Mode

In connected mode, the CPU module communicates with the AS-Interface master module to monitor and control each slave. Connected mode is comprised of the following three modes.

Normal Protected Mode

When the CPU module is powered up, the AS-Interface master module initially enters normal protected mode of connected mode if no error occurs. This is the normal operation mode for the AS-Interface master module to perform data communication with the connected slaves.

If the configuration data stored in the AS-Interface master module do not match the currently connected slave configuration, the FLT LED on the front of the AS-Interface master module goes on. Execute configuration using the pushbuttons on the AS-Interface master module. Configuration can also be done using WindLDR. See page 7-3.

Normal Protected Offline

The AS-Interface master module stops communication with all slaves and enables offline operation (initialization of the master module). In this mode, the CPU module cannot monitor the slave status.

To enter normal protected offline from normal protected mode, either long-press the PB2 button or execute the ASI command Go to Normal Protected Offline. To return to normal protected mode and resume data communication, either long-press the PB2 button again or execute the ASI command Go to Normal Protected Mode. For details about the ASI commands, see page 6-17.

Normal Protected Data Exchange Off

Data communication with all slaves is prohibited. To enter this mode, execute the ASI command Prohibit Data Exchange. To return to normal protected mode and resume data communication, execute the ASI command Enable Data Exchange. For details about the ASI commands, see page 6-17.

When auto configuration or manual configuration is executed on WindLDR, the AS-Interface master module enters this mode during configuration.

Local Mode

In local mode, the CPU module does not communicate with the AS-Interface master module. Local mode is used to carry out maintenance operations such as checking the configuration and slave inputs. Use the input LEDs to check the slave input data during operation.

When the CPU module is powered up, the AS-Interface master module initially enters normal protected mode of connected mode if no error occurs. To switch from any of connected mode to local mode (protected mode), long-press the PB1 and PB2 buttons simultaneously. It is not possible to switch from local mode back to connected mode using the pushbuttons. To return to connected mode, shut down the CPU module and power up again.

Local mode is comprised of two modes: protected mode and configuration mode.

Protected Mode

This mode operates the slaves in accordance with the slave configuration data stored in the AS-Interface master module. If the configuration data stored in the AS-Interface master module does not match the currently connected slave configuration, the FLT LED on the front of the AS-Interface master module goes on, and slaves are not operated correctly.

To enter protected mode from any of connected mode, long-press the PB1 and PB2 buttons simultaneously.

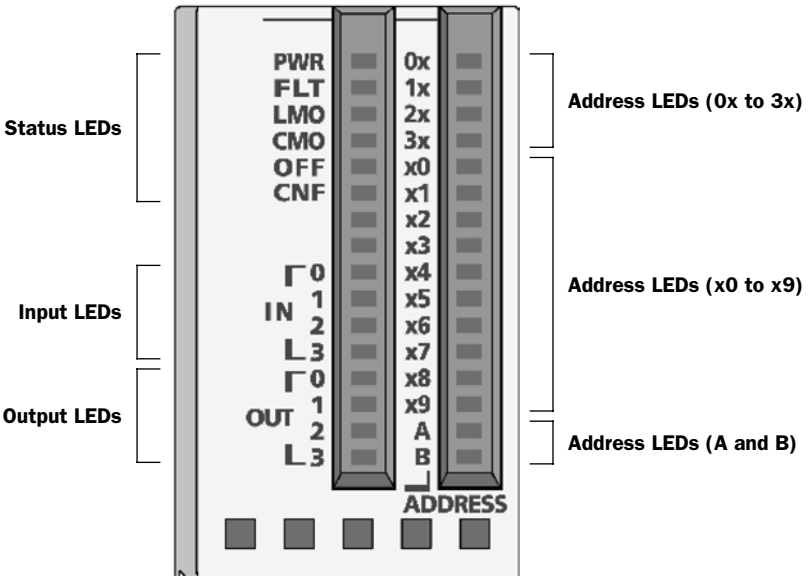
Configuration Mode

This mode switches all currently connected slaves to active, regardless of the slave configuration data stored in the AS-Interface master module. To store the current slave configuration data to the AS-Interface master module EEPROM, long press the PB1 button. This way, configuration is executed.

To enter configuration mode from protected mode, long-press the PB2 button. To return to protected mode, long-press the PB1 and PB2 buttons simultaneously.

LED Indicators

The LED indicators on the AS-Interface master module consist of status LEDs, I/O LEDs, and address LEDs.



LED Indicators		Description
Status LEDs	**PWR** (AS-Interface power supply)	Indicates the status of the AS-Interface power supply for the AS-Interface master module. Goes on when the AS-Interface power is supplied sufficiently.
	FLT (Fault)	Indicates the AS-Interface configuration status. Goes on when the permanent configuration data (PCD) stored in the AS-Interface master module EEPROM does not match the current slave configuration, or configuration data image (CDI). Then, configuration is not complete or an error was found on the AS-Interface bus.
	LMO (Local mode)	Indicates the mode of the AS-Interface master module. Goes on when the AS-Interface master module is in local mode. Goes off when the AS-Interface master module is in connected mode.
	CMO (Connected mode)	Indicates the mode of the AS-Interface master module. Goes on when the AS-Interface master module is in connected mode. Goes off when the AS-Interface master module is in local mode.
	OFF (Offline)	Indicates the operating status of the AS-Interface master module. Goes on when the AS-Interface master module is in normal protected offline.
	CNF (Configuration)	Indicates the configuration status of the AS-Interface master module. Flashes when the AS-Interface master module is in configuration mode.
Input LEDs	**IN0-IN3**	Indicates the operating status of four inputs at the address indicated by the address LEDs. Goes on when the corresponding input at the indicated address is on.
Output LEDs	**OUT0-OUT3**	Indicates the operating status of four outputs at the address indicated by the address LEDs. Goes on when the corresponding output at the indicated address is on.
Address LEDs	**0x-3x** (place of 10) **x0-x9** (place of 1) **A, B** (A or B slave)	Indicates the slave address of 0A through 32B. Goes on when the selected address exists. Flashes when the selected address does not exist.

Status LEDs

The operation modes of the AS-Interface master module can be changed by pressing the pushbuttons on the front of the AS-Interface master module or by executing ASI commands. The operation modes can be confirmed on the six status LEDs on the AS-Interface master module. For details about the ASI commands, see page 6-17.

Status LED Indication

Status LED		PWR	FLT	LMO	CMO	OFF	CNF
Connected Mode	Normal Protected Mode	ON *1	OFF *2	OFF	ON	OFF	OFF
	Normal Protected Offline	ON *1	ON	OFF	ON	ON	OFF
	Normal Protected Data Exchange Off	ON *1	ON	OFF	ON	OFF	OFF
Local Mode	Protected Mode	ON *1	OFF *2	ON	OFF	OFF	OFF
	Configuration Mode	ON *1	OFF *2	ON	OFF	OFF	Flash

*1: Goes off when AS-Interface power is not supplied.
*2: Goes on when an error is found on the AS-Interface bus.

Address LEDs and I/O LEDs

The operating status and I/O status of each slave can be monitored on the address LEDs and I/O LEDs on the front of the AS-Interface master module.

Slave Operating Status

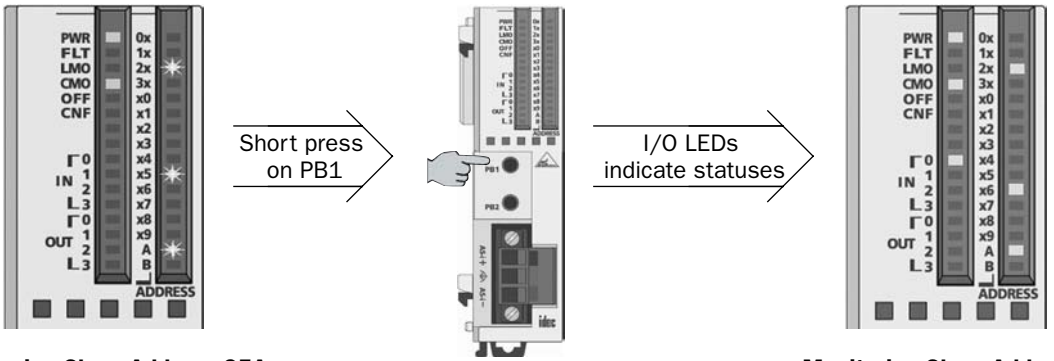
The operating status of each slave can be determined by viewing the address LEDs and I/O LEDs.

Address LED	I/O LED	Description
ON	ON or OFF	The slave at this address is active.
ON	Flash	The slave at this address is active, but has an error.
Flash	OFF	This address is not assigned a slave.
OFF	OFF	The AS-Interface bus communication is disabled because the AS-Interface power is not supplied or the AS-Interface master module is in normal protected offline.

Slave I/O Status

The I/O status of each slave can be monitored on the address LEDs and I/O LEDs. Use the short press to change the slave address when monitoring slave I/O status on the AS-Interface master module. A short press on PB1 increments the address. At the last address (31B), another short press will return to the first address (0A). A short press on PB2 decrements the address. At the first address (0A), another short press will return to the last address (31B).

The figures below illustrate what happens when you press the PB1 button while the address LEDs indicate 25A. The address LEDs increment to 26A where a slave is assigned. Note that the address LEDs flash if no slave is assigned.



Monitoring Slave Address 25A
Address LEDs are flashing since no slave is assigned.

Monitoring Slave Address 26A
Address LEDs go on and I/O LEDs indicate the statuses.

6: AS-INTERFACE OPERANDS

Introduction

This chapter describes AS-Interface operands, or internal relays M1300 through M1997 and data registers D1700 through D1999, assigned in the CPU module to control and monitor the AS-Interface bus, and provides detailed description about internal relays allocated to SwitchNet™ control units for use as slaves in the AS-Interface network. Also describes ASI commands used to update AS-Interface operands in the CPU module or to control the AS-Interface master module.

AS-Interface Operand Allocation Numbers

The I/O data and parameters of slaves on the AS-Interface bus, the status of the AS-Interface bus, and various list information of the slaves are allocated to the AS-Interface master module EEPROM. This information is called AS-Interface objects, which can be accessed through the AS-Interface operands. The allocation is shown in the table below.

MicroSmart CPU Module		Precessing Time (msec) *1	Read/ Write	AS-Interface Master Module EEPROM	Operand Updated
Operand	Allocation No.			AS-Interface Object	
AS-Interface Internal Relays	M1300-M1617	3.0	R *2	Digital input (IDI) *4	Every scan
	M1620-M1937	3.0	W *2	Digital output (ODI) *4	
	M1940-M1997	1.0	R	Status information	
AS-Interface Data Registers	D1700-D1731	5.2	R	Analog input *5	
	D1732-D1763	5.2	W	Analog output *5	
	D1764-D1767	1.0	R *2	List of active slaves (LAS)	
	D1768-D1771	1.0	R *2	List of detected slaves (LDS)	
	D1772-D1775	1.0	R *2	List of peripheral fault slaves (LPF)	
	D1776-D1779	1.0	R/W *2*3	List of projected slaves (LPS)	Each time ASI command is executed
	D1780-D1843	10.4	R *2	Configuration data image (CDI)	
	D1844-D1907	10.4	R/W *2*3	Permanent configuration data (PCD)	
	D1908-D1923	3.0	R *2	Parameter image (PI)	
	D1924-D1939	3.0	R/W *2*3	Permanent parameter (PP)	
	D1940	0.7	R/W	Slave 0 ID1 code	
	D1941-D1945	—	R/W	For ASI command description	—
	D1946-D1999	—	—	(reserved)	—

*1: The time required to update the operand data. When using the AS-Interface master module, the scan time increases by a minimum of 10 msec.

*2: These AS-Interface operand data can be read or written using WindLDR. For details, see page 7-1.

*3: The LPS, PCD, and PP are set and downloaded to a PLC using WindLDR. For details, see page 7-3.

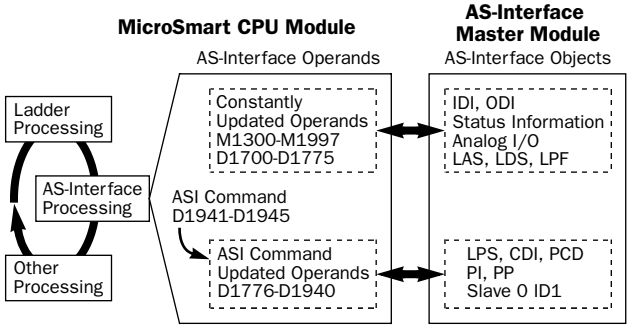
*4: IDI (input data image), ODI (output data image)

*5: The analog I/O data is updated only when an analog slave is connected to the AS-Interface bus.

Processing Time

AS-Interface internal relays for digital I/O and status information, and data registers for LAS, LDS, LPF are updated in every scan. Data registers for analog I/O operands are also updated in every scan only when analog I/O are connected to the AS-Interface bus. The processing times for these AS-Interface operands are shown in the table above.

Other AS-Interface data registers are updated when an ASI command is executed in the CPU module. For the processing times of the ASI commands, see page 6-17.



I/O Data

The AS-Interface master module can process digital I/O data and analog I/O data. Digital I/O data can be a maximum of 4 digital inputs and 4 digital outputs per slave. Analog I/O data consists of 4 channels of 16-bit analog input or output data per slave.

Digital I/O Data of Standard Slaves and Expansion Slaves

The digital I/O data for standard slaves and A/B slaves (sensors and actuators) on the AS-Interface bus are allocated to the AS-Interface internal relays in the ascending order starting with slave 0. The input data image (IDI) for each slave is allocated to M1300 through M1617, and the output data image (ODI) is allocated to M1620 through M1937. For example, in the case of slave 3A, the input data is allocated to M1314 (DI0) through M1317 (DI3), and the output data is allocated to M1634 (DO0) through M1637 (DO3).

• Digital Input Data Image

Input Data Image (IDI)		Data Format							
		7 (DI3)	6 (DI2)	5 (DI1)	4 (DI0)	3 (DI3)	2 (DI2)	1 (DI1)	0 (DI0)
M1300	Byte 0	Slave 1(A)				(Slave 0)			
M1310	Byte 1	Slave 3(A)				Slave 2(A)			
M1320	Byte 2	Slave 5(A)				Slave 4(A)			
M1330	Byte 3	Slave 7(A)				Slave 6(A)			
M1340	Byte 4	Slave 9(A)				Slave 8(A)			
M1350	Byte 5	Slave 11(A)				Slave 10(A)			
M1360	Byte 6	Slave 13(A)				Slave 12(A)			
M1370	Byte 7	Slave 15(A)				Slave 14(A)			
M1380	Byte 8	Slave 17(A)				Slave 16(A)			
M1390	Byte 9	Slave 19(A)				Slave 18(A)			
M1400	Byte 10	Slave 21(A)				Slave 20(A)			
M1410	Byte 11	Slave 23(A)				Slave 22(A)			
M1420	Byte 12	Slave 25(A)				Slave 24(A)			
M1430	Byte 13	Slave 27(A)				Slave 26(A)			
M1440	Byte 14	Slave 29(A)				Slave 28(A)			
M1450	Byte 15	Slave 31(A)				Slave 30(A)			
M1460	Byte 16	Slave 1B				—			
M1470	Byte 17	Slave 3B				Slave 2B			
M1480	Byte 18	Slave 5B				Slave 4B			
M1490	Byte 19	Slave 7B				Slave 6B			
M1500	Byte 20	Slave 9B				Slave 8B			
M1510	Byte 21	Slave 11B				Slave 10B			
M1520	Byte 22	Slave 13B				Slave 12B			
M1530	Byte 23	Slave 15B				Slave 14B			
M1540	Byte 24	Slave 17B				Slave 16B			
M1550	Byte 25	Slave 19B				Slave 18B			
M1560	Byte 26	Slave 21B				Slave 20B			
M1570	Byte 27	Slave 23B				Slave 22B			
M1580	Byte 28	Slave 25B				Slave 24B			
M1590	Byte 29	Slave 27B				Slave 26B			
M1600	Byte 30	Slave 29B				Slave 28B			
M1610	Byte 31	Slave 31B				Slave 30B			

• **Digital Output Data Image**

Output Data Image (ODI)		Data Format							
		7 (D03)	6 (D02)	5 (D01)	4 (D00)	3 (D03)	2 (D02)	1 (D01)	0 (D00)
M1620	Byte 0	Slave 1(A)				(Slave 0)			
M1630	Byte 1	Slave 3(A)				Slave 2(A)			
M1640	Byte 2	Slave 5(A)				Slave 4(A)			
M1650	Byte 3	Slave 7(A)				Slave 6(A)			
M1660	Byte 4	Slave 9(A)				Slave 8(A)			
M1670	Byte 5	Slave 11(A)				Slave 10(A)			
M1680	Byte 6	Slave 13(A)				Slave 12(A)			
M1690	Byte 7	Slave 15(A)				Slave 14(A)			
M1700	Byte 8	Slave 17(A)				Slave 16(A)			
M1710	Byte 9	Slave 19(A)				Slave 18(A)			
M1720	Byte 10	Slave 21(A)				Slave 20(A)			
M1730	Byte 11	Slave 23(A)				Slave 22(A)			
M1740	Byte 12	Slave 25(A)				Slave 24(A)			
M1750	Byte 13	Slave 27(A)				Slave 26(A)			
M1760	Byte 14	Slave 29(A)				Slave 28(A)			
M1770	Byte 15	Slave 31(A)				Slave 30(A)			
M1780	Byte 16	Slave 1B				—			
M1790	Byte 17	Slave 3B				Slave 2B			
M1800	Byte 18	Slave 5B				Slave 4B			
M1810	Byte 19	Slave 7B				Slave 6B			
M1820	Byte 20	Slave 9B				Slave 8B			
M1830	Byte 21	Slave 11B				Slave 10B			
M1840	Byte 22	Slave 13B				Slave 12B			
M1850	Byte 23	Slave 15B				Slave 14B			
M1860	Byte 24	Slave 17B				Slave 16B			
M1870	Byte 25	Slave 19B				Slave 18B			
M1880	Byte 26	Slave 21B				Slave 20B			
M1890	Byte 27	Slave 23B				Slave 22B			
M1900	Byte 28	Slave 25B				Slave 24B			
M1910	Byte 29	Slave 27B				Slave 26B			
M1920	Byte 30	Slave 29B				Slave 28B			
M1930	Byte 31	Slave 31B				Slave 30B			

⚠ Caution

- Immediately after power up, the digital I/O data of standard slaves and expansion slaves cannot be accessed. Data communication between the CPU module and the connected slaves starts when special internal relay M1945 (Normal_Operation_Active) turns on. Make sure that M1945 is on before starting to access the slave I/O data.

Analog I/O Data of Analog Slaves

The I/O data for a maximum of seven analog slaves (four channels for each slave) on the AS-Interface bus is stored to AS-Interface data registers in the CPU module. The analog slave addresses (1 to 31) are in the ascending order. The input data for each analog slave is allocated to data registers D1700 to D1731, and the output data is allocated to D1732 to D1763.

The AS-Interface master module is compliant with analog slave profile 7.3.

⚠ Caution

- The maximum number of analog slaves that can be connected to the AS-Interface bus is seven. Do not connect eight or more analog slaves to one bus, otherwise the slaves will not function correctly.
- When data registers D1700 through D1731 allocated to analog inputs contain 7FFF, do not use this data for programming, because this value is reserved for a special meaning as follows:

  Unused channel on a slave allocated to analog slave. (For a channel on a slave not allocated an analog slave, the corresponding data register holds an indefinite value.)
  Data overflow.
  Communication between the master and analog slave is out of synchronism.
- When using analog slaves, read the user's manual for the analog slave to process the data properly.

• Analog Input Data

Analog Input		Channel No.	Data Format
D1700	Bytes 0 and 1	Channel 1	1st data (AI0)
D1701	Bytes 2 and 3	Channel 2	
D1702	Bytes 4 and 5	Channel 3	
D1703	Bytes 6 and 7	Channel 4	
D1704	Bytes 8 and 9	Channel 1	2nd data (AI1)
D1705	Bytes 10 and 11	Channel 2	
D1706	Bytes 12 and 13	Channel 3	
D1707	Bytes 14 and 15	Channel 4	
D1708	Bytes 16 and 17	Channel 1	3rd data (AI2)
D1709	Bytes 18 and 19	Channel 2	
D1710	Bytes 20 and 21	Channel 3	
D1711	Bytes 22 and 23	Channel 4	
D1712	Bytes 24 and 25	Channel 1	4th data (AI3)
D1713	Bytes 26 and 27	Channel 2	
D1714	Bytes 28 and 29	Channel 3	
D1715	Bytes 30 and 31	Channel 4	
D1716	Bytes 32 and 33	Channel 1	5th data (AI4)
D1717	Bytes 34 and 35	Channel 2	
D1718	Bytes 36 and 37	Channel 3	
D1719	Bytes 38 and 39	Channel 4	
D1720	Bytes 40 and 41	Channel 1	6th data (AI5)
D1721	Bytes 42 and 43	Channel 2	
D1722	Bytes 44 and 45	Channel 3	
D1723	Bytes 46 and 47	Channel 4	
D1724	Bytes 48 and 49	Channel 1	7th data (AI6)
D1725	Bytes 50 and 51	Channel 2	
D1726	Bytes 52 and 53	Channel 3	
D1727	Bytes 54 and 55	Channel 4	
D1728	Bytes 56 and 57	—	(reserved)
D1729	Bytes 58 and 59	—	
D1730	Bytes 60 and 61	—	
D1731	Bytes 62 and 63	—	

• **Analog Output Data**

Analog Output		Channel No.	Data Format
D1732	Bytes 0 and 1	Channel 1	1st data (AO0)
D1733	Bytes 2 and 3	Channel 2	
D1734	Bytes 4 and 5	Channel 3	
D1735	Bytes 6 and 7	Channel 4	
D1736	Bytes 8 and 9	Channel 1	2nd data (AO1)
D1737	Bytes 10 and 11	Channel 2	
D1738	Bytes 12 and 13	Channel 3	
D1739	Bytes 14 and 15	Channel 4	
D1740	Bytes 16 and 17	Channel 1	3rd data (AO2)
D1741	Bytes 18 and 19	Channel 2	
D1742	Bytes 20 and 21	Channel 3	
D1743	Bytes 22 and 23	Channel 4	
D1744	Bytes 24 and 25	Channel 1	4th data (AO3)
D1745	Bytes 26 and 27	Channel 2	
D1746	Bytes 28 and 29	Channel 3	
D1747	Bytes 30 and 31	Channel 4	
D1748	Bytes 32 and 33	Channel 1	5th data (AO4)
D1749	Bytes 34 and 35	Channel 2	
D1750	Bytes 36 and 37	Channel 3	
D1751	Bytes 38 and 39	Channel 4	
D1752	Bytes 40 and 41	Channel 1	6th data (AO5)
D1753	Bytes 42 and 43	Channel 2	
D1754	Bytes 44 and 45	Channel 3	
D1755	Bytes 46 and 47	Channel 4	
D1756	Bytes 48 and 49	Channel 1	7th data (AO6)
D1757	Bytes 50 and 51	Channel 2	
D1758	Bytes 52 and 53	Channel 3	
D1759	Bytes 54 and 55	Channel 4	
D1760	Bytes 56 and 57	—	(reserved)
D1761	Bytes 58 and 59	—	
D1762	Bytes 60 and 61	—	
D1763	Bytes 62 and 63	—	

For example, when analog input slaves 1, 13 and 20, analog output slaves 5 and 25, and analog I/O slaves 14 and 21 are used, the analog I/O slave data will be allocated by configuration as shown below and maintained until the next configuration is executed. Four channels (8 bytes) are always reserved for each slave.

Analog Slave Module	Data Storage	Analog Input Slave	Data Storage	Analog Output Slave
1st	D1700-D1703	**Slave 1**	D1732-D1735	Unused
2nd	D1704-D1707	Unused	D1736-D1739	**Slave 5**
3rd	D1708-D1711	**Slave 13**	D1740-D1743	Unused
4th	D1712-D1715	**Slave 14**	D1744-D1747	**Slave 14**
5th	D1716-D1719	**Slave 20**	D1748-D1751	Unused
6th	D1720-D1723	**Slave 21**	D1752-D1755	**Slave 21**
7th	D1724-D1727	Unused	D1756-D1759	**Slave 25**
(8th)	(D1728-D1731)	(reserved)	(D1760-D1763)	(reserved)

Status Information

The status information is allocated to AS-Interface internal relays M1940 through M1997. These internal relays are used to monitor the status of the AS-Interface bus. If an error occurs on the bus, you can also confirm the error with the status LEDs on the front of the AS-Interface master module in addition to these status internal relays.

• Status Information Internal Relays

Internal Relays	Status	Description	
		ON	OFF
M1940	Config_OK	Configuration is complete.	Configuration is incomplete.
M1941	LDS.0	Slave address 0 is detected on the AS-Interface bus.	Slave address 0 is not detected on the AS-Interface bus.
M1942	Auto_Address_Assign	Auto addressing is enabled.	Auto addressing is disabled.
M1943	Auto_Address_Available	Auto addressing is ready.	Auto addressing is not ready.
M1944	Configuration	Configuration mode is enabled.	Other than configuration mode.
M1945	Normal_Operation_Active	Normal protected mode is enabled.	Other than normal protected mode.
M1946	APF/not APO	AS-Interface power supply failure.	AS-Interface power supply is normal.
M1947	Offline_Ready	Normal protected offline is enabled.	Other than normal protected offline.
M1950	Periphery_OK	Peripheral devices are normal.	Peripheral devices are abnormal.
M1951-M1957	(reserved)	—	—
M1960	Data_Exchange_Active	Data exchange is enabled.	Data exchange is prohibited.
M1961	Off-line	Command to go to normal protected offline was issued by the pushbutton or WindLDR.	Command to go to normal protected offline was not issued.
M1962	Connected Mode	Connected mode is enabled.	Local mode is enabled.
M1963-M1997	(reserved)	—	—

M1940 Config_OK

M1940 indicates the configuration status. M1940 goes on when the permanent configuration data (PCD) stored in the AS-Interface master module EEPROM matches the configuration data image (CDI). When configuration is changed, e.g. a new slave is added or a slave fails, M1940 goes off. Then, the FLT LED goes on.

M1941 LDS.0

M1941 is used to check for the presence of a slave with address 0 on the AS-Interface bus. M1941 goes on when a slave with address 0 (the factory setting) is detected on the AS-Interface bus in normal protected mode or protected mode, or when a slave address is changed to 0 while the AS-Interface master module is in normal protected mode.

M1942 Auto_Address_Assign

M1942 indicates that the auto addressing function is enabled. The default setting is “enabled,” and M1942 is normally on. This setting can be changed using the ASI commands Enable Auto Addressing and Disable Auto Addressing.

Note: When the auto addressing function is enabled at the AS-Interface master module and a slave fails, you can replace the slave with a new slave which has the same identification codes without stopping the AS-Interface bus.

- If the replacement slave is assigned the same address and has the same identification codes as the failed slave, the replacement slave is automatically added to the LDS (list of detected slaves) to continue operation. If the assigned address or the identification codes of the replacement slave are different from the failed slave, the FLT LED will go on.
- When replacing a failed slave with a new slave which is assigned address 0 (factory setting) and has the same identification codes, the new slave will be assigned the address of the failed slave and added to the LDS and LAS (list of active slaves). If the identification codes of the replacement slave are different from the failed slave, the FLT LED will go on.
- The auto addressing function for a replacement slave works only when one slave has failed. This function cannot be used to replace multiple slaves.

M1943 Auto_Address_Available

M1943 indicates whether or not the conditions for the auto addressing function are satisfied. M1943 goes on when the auto addressing function is enabled and there is one faulty slave (a slave which cannot be recognized by the AS-Interface master module) on the AS-Interface bus.

M1944 Configuration

M1944 indicates whether the AS-Interface master module is in configuration mode (on) or other mode (off). While configuration mode is enabled, M1944 remains on, and the CNF LED flashes.

M1945 Normal_Operation_Active

M1945 remains on while the AS-Interface master module is in normal protected mode. M1945 is off while in other modes. When M1945 turns on, the CPU module starts to exchange data communication with the connected slaves.

M1946 APF/not APO

M1946 goes on when the AS-Interface power supply has failed, then the PWR LED goes off.

M1947 Offline_Ready

M1947 indicates that the AS-Interface master module is in normal protected offline. While in normal protected offline, M1947 remains on and the OFF LED also remains on.

M1950 Periphery_OK

M1950 remains on while the AS-Interface master module does not detect a failure in peripheral devices. When a failure is found, M1950 goes off.

M1960 Data_Exchange_Active

M1960 indicates that data exchange is enabled. While M1960 is on, the AS-Interface master module is in normal protected mode, and data exchange between the AS-Interface master module and slaves is enabled. The data exchange can be enabled and disabled using the ASI commands Enable Data Exchange and Prohibit Data Exchange.

M1961 Off-line

M1961 goes on when a command to switch to normal protected offline is issued. To switch to normal protected offline from normal protected mode, either press the PB2 button on the AS-Interface master module or issue the ASI command Go to Normal Protected Offline. M1961 remains on until normal protected offline is exited.

M1962 Connected Mode

M1962 indicates that the AS-Interface master module is in connected mode. While in connected mode, M1962 remains on. Then, LMO LED remains off and the CMO LED remains on.

Slave List Information

Data registers D1764 through D1779 are assigned to slave list information to determine the operating status of the slaves. The slave list information is grouped into four lists. List of active slaves (LAS) shows the slaves currently in operation. List of detected slaves (LDS) the slaves detected on the AS-Interface bus. List of peripheral fault slaves (LPF) the faulty slaves. List of projected slaves (LPS) the slave configuration stored in the AS-Interface master module.

List of Active Slaves (LAS)

Data registers D1764 through D1767 are allocated to read the LAS. You can check the register bits to determine the operating status of each slave. When a bit is on, it indicates that the corresponding slave is active.

LAS		Data Format	
		Bits 15 to 8	Bits 7 to 0
D1764	Bytes 0 and 1	Slaves 15(A) to 8(A)	Slaves 7(A) to 0
D1765	Bytes 2 and 3	Slaves 31(A) to 24(A)	Slaves 23(A) to 16(A)
D1766	Bytes 4 and 5	Slaves 15B to 8B	Slaves 7B to (0B)
D1767	Bytes 6 and 7	Slaves 31B to 24B	Slaves 23B to 16B

List of Detected Slaves (LDS)

Data registers D1768 through D1771 are allocated to read the LDS. You can check the register bits to determine the detection status of each slave. When a bit is on, it indicates that the corresponding slave has been detected by the master.

LDS		Data Format	
		Bits 15 to 8	Bits 7 to 0
D1768	Bytes 0 and 1	Slaves 15(A) to 8(A)	Slaves 7(A) to 0
D1769	Bytes 2 and 3	Slaves 31(A) to 24(A)	Slaves 23(A) to 16(A)
D1770	Bytes 4 and 5	Slaves 15B to 8B	Slaves 7B to (0B)
D1771	Bytes 6 and 7	Slaves 31B to 24B	Slaves 23B to 16B

List of Peripheral Fault Slaves (LPF)

Data registers D1772 through D1775 are allocated to read the LPF. You can check the register bits to determine the fault status of each slave. When a bit is on, it indicates that the corresponding slave is faulty.

LPF		Data Format	
		Bits 15 to 8	Bits 7 to 0
D1772	Bytes 0 and 1	Slaves 15(A) to 8(A)	Slaves 7(A) to 0
D1773	Bytes 2 and 3	Slaves 31(A) to 24(A)	Slaves 23(A) to 16(A)
D1774	Bytes 4 and 5	Slaves 15B to 8B	Slaves 7B to (0B)
D1775	Bytes 6 and 7	Slaves 31B to 24B	Slaves 23B to 16B

List of Projected Slaves (LPS)

Data registers D1776 through D1779 are allocated to read and write the LPS. The LPS settings are stored to the AS-Interface master module when either Auto Configuration or Manual Configuration is executed on WindLDR. The ASI command Read LPS can be used to read the LPS data to data registers D1776 through D1779. Then, you can check the register bits to determine the slave projection. When a bit is on, it indicates that the corresponding slave is set as a projected slave. After changing the LPS settings, execute the ASI command Read LPS, then you can use the updated data for program execution.

LPS		Data Format	
		Bits 15 to 8	Bits 7 to 0
D1776	Bytes 0 and 1	Slaves 15(A) to 8(A)	Slaves 7(A) to 0
D1777	Bytes 2 and 3	Slaves 31(A) to 24(A)	Slaves 23(A) to 16(A)
D1778	Bytes 4 and 5	Slaves 15B to 8B	Slaves 7B to (0B)
D1779	Bytes 6 and 7	Slaves 31B to 24B	Slaves 23B to 16B

Slave Identification Information (Slave Profile)

Data registers D1780 through D1940 are assigned to the slave identification information, or the slave profile. The slave profile includes configuration data and parameters to indicate the slave type and slave operation, respectively.

Configuration Data Image (CDI)

Data registers D1780 through D1843 are allocated to read the CDI of each slave. The CDI is the current slave configuration data collected by the AS-Interface master module at power-up and stored in the AS-Interface master module.

The CDI is made up of four codes: the ID code, I/O code, ID2 code, and ID1 code. The CDI of slaves not connected to the AS-Interface bus is FFFFh.

The ASI command Read CDI can be used to read the CDI data to data registers D1780 through D1843. Execute the ASI command Read CDI before using the CDI data for program execution.

CDI		Data Format			
		Bits 15 to 12 ID Code	Bits 11 to 8 I/O Code	Bits 7 to 4 ID2 Code	Bits 3 to 0 ID1 Code
D1780	Bytes 0 and 1	Slave 0			
D1781	Bytes 2 and 3	Slave 1(A)			
D1782	Bytes 4 and 5	Slave 2(A)			
D(1780+N)		Slave N(A)			
D1811	Bytes 62 and 63	Slave 31(A)			
D1812	Bytes 64 and 65	(unused)			
D1813	Bytes 66 and 67	Slave 1B			
D(1812+N)		Slave NB			
D1843	Bytes 126 and 127	Slave 31B			

Permanent Configuration Data (PCD)

Data registers D1844 through D1907 are allocated to read and write the PCD of each slave. Like the CDI, the PCD is made up of four codes: the ID code, I/O code, ID2 code, and ID1 code.

When auto configuration is executed, the CDI is copied to the PCD and stored in the EEPROM of the AS-Interface master module. When you execute manual configuration, you can set the PCD using the Configure Slave dialog box on WindLDR. Set the PCD of each slave to the same value as its CDI. If the PCD is different from the CDI for a slave, then that slave does not function correctly. Set FFFFh to the PCD of vacant slave numbers.

The ASI command Read PCD can be used to read the PCD data to data registers D1844 through D1907. Execute the ASI command Read PCD before using the PCD data for program execution.

PCD		Data Format			
		Bits 15 to 12 ID Code	Bits 11 to 8 I/O Code	Bits 7 to 4 ID2 Code	Bits 3 to 0 ID1 Code
D1844	Bytes 0 and 1	Slave 0			
D1845	Bytes 2 and 3	Slave 1(A)			
D1846	Bytes 4 and 5	Slave 2(A)			
D(1844+N)		Slave N(A)			
D1875	Bytes 62 and 63	Slave 31(A)			
D1876	Bytes 64 and 65	(unused)			
D1877	Bytes 66 and 67	Slave 1B			
D(1876+N)		Slave NB			
D1907	Bytes 126 and 127	Slave 31B			

Parameter Image (PI)

Data registers D1908 through D1923 are allocated to read the PI of each slave. The PI is made up of four parameters: the P3, P2, P1, and P0. The PI is the current slave parameter data collected by the AS-Interface master module at power-up and stored in the AS-Interface master module. To change the PI settings, use WindLDR (Slave Status dialog box) or execute the ASI command Change Slave PI.

The ASI command Read PI can be used to read PI data to data registers D1908 through D1923. After changing the PI settings, execute the ASI command Read PI, then you can use the updated PI data for program execution.

PI		Data Format			
		Bits 15 to 12 P3/P2/P1/P0	**Bits 11 to 8** P3/P2/P1/P0	**Bits 7 to 4** P3/P2/P1/P0	**Bits 3 to 0** P3/P2/P1/P0
D1908	Bytes 0 and 1	Slave 3(A)	Slave 2(A)	Slave 1(A)	Slave 0
D1909	Bytes 2 and 3	Slave 7(A)	Slave 6(A)	Slave 5(A)	Slave 4(A)
D1910	Bytes 4 and 5	Slave 11(A)	Slave 10(A)	Slave 9(A)	Slave 8(A)
D(1908+N/4)		Slave (N+3)(A)	Slave (N+2)(A)	Slave (N+1)(A)	Slave N(A)
D1915	Bytes 14 and 15	Slave 31(A)	Slave 30(A)	Slave 29(A)	Slave 28(A)
D1916	Bytes 16 and 17	Slave 3B	Slave 2B	Slave 1B	(unused)
D1917	Bytes 18 and 19	Slave 7B	Slave 6B	Slave 5B	Slave 4B
D(1916+N/4)		Slave (N+3)B	Slave (N+2)B	Slave (N+1)B	Slave NB
D1923	Bytes 30 and 31	Slave 31B	Slave 30B	Slave 29B	Slave 28B

Permanent Parameter (PP)

Data registers D1924 through D1939 are allocated to read and write the PP of each slave. Like the PI, the PP is made up of four parameters: the P3, P2, P1, and P0. When auto configuration is executed, the PI is copied to the PP and stored in the EEPROM of the AS-Interface master module. When you execute manual configuration, you can set the PP using the Configure Slave dialog box on WindLDR.

The ASI command Read PP can be used to read PP data to data registers D1924 through D1939. After changing the PP settings, execute the ASI command Read PP, then you can use the updated PP data for program execution.

PP		Data Format			
		Bits 15 to 12 P3/P2/P1/P0	**Bits 11 to 8** P3/P2/P1/P0	**Bits 7 to 4** P3/P2/P1/P0	**Bits 3 to 0** P3/P2/P1/P0
D1924	Bytes 0 and 1	Slave 3(A)	Slave 2(A)	Slave 1(A)	Slave 0
D1925	Bytes 2 and 3	Slave 7(A)	Slave 6(A)	Slave 5(A)	Slave 4(A)
D1926	Bytes 4 and 5	Slave 11(A)	Slave 10(A)	Slave 9(A)	Slave 8(A)
D(1924+N/4)		Slave (N+3)(A)	Slave (N+2)(A)	Slave (N+1)(A)	Slave N(A)
D1931	Bytes 14 and 15	Slave 31(A)	Slave 30(A)	Slave 29(A)	Slave 28(A)
D1932	Bytes 16 and 17	Slave 3B	Slave 2B	Slave 1B	(unused)
D1933	Bytes 18 and 19	Slave 7B	Slave 6B	Slave 5B	Slave 4B
D(1932+N/4)		Slave (N+3)B	Slave (N+2)B	Slave (N+1)B	Slave NB
D1939	Bytes 30 and 31	Slave 31B	Slave 30B	Slave 29B	Slave 28B

Changing ID1 Code of Slave 0

Data register D1940 is allocated to read and write the ID1 code of slave 0. To change the slave 0 ID1 settings, store a required value in D1940 and execute the ASI command Write Slave 0 ID1. The ASI command Read Slave 0 ID1 can be used to read slave 0 ID1 data to data register D1940. After changing the slave 0 ID1 settings, execute the ASI command Read Slave 0 ID1, then you can use the updated slave 0 ID1 data for program execution.

Slave 0 ID1 Code		Data Format			
		Bits 15 to 12	**Bits 11 to 8**	**Bits 7 to 4**	**Bits 3 to 0**
D1940	Bytes 0 and 1	—	—	—	ID1 code

SwitchNet Data I/O Port

SwitchNet control units can be used as slaves in the AS-Interface network and are available in ø16mm L6 series and ø22mm HW series. Input signals to the MicroSmart AS-Interface master module are read to internal relays allocated to each input point designated by a slave number and a DI number. Similarly, output signals from the MicroSmart AS-Interface master module are written to internal relays allocated to each output point designated by a slave number and a DO number. When programming a ladder diagram for the MicroSmart, use internal relays allocated to input signals and output signals of SwitchNet control units.

L6 series and HW series SwitchNet control units have slightly different digital I/O data allocations.

L6 Series Digital I/O Data Allocation

Input data is sent from slaves to the AS-Interface master. Output data is sent from the AS-Interface master to slaves.

SwitchNet L6 Series Slave Unit	Used I/O	Input Data (slave send data)				Output Data (slave receive data)			
		DI3	DI2	DI1	DI0	DO3	DO2	DO1	DO0
Pushbutton	1 in	0	X1	1	1	*	—	—	—
Pilot light	1 out	0	0	1	1	*	—	—	X1
Illuminated pushbutton	1 in/1 out	0	X1	1	1	*	—	—	X1
Selector, Key selector, Lever: 2-position	1 in	0	X2	1	1	*	—	—	—
Selector, Key selector, Lever: 3-position	2 in	X3	X3	1	1	*	—	—	—
Illuminated selector: 2-position	1 in/1 out	0	X2	1	1	*	—	—	X1
Illuminated selector: 3-position	2 in/1 out	X3	X3	1	1	*	—	—	X1

Notes:

1. * The AS-Interface master uses bit DO3 for addressing A/B slaves.
2. In the above table, bits marked with X1, X2, and X3 are used for SwitchNet I/O data.
3. X1: When pushbutton is pressed, input data is 1 (on). When not pressed, input data is 0 (off). When output data is 1 (on), LED is on. When output data is 0 (off), LED is off.
4. X2: The input data from 2-position selector, key selector, and illuminated selector switches and 2-position lever switches depend on the operator position as shown below.

2-position Operator	Selector: Left 1, Right 2 / Lever: 2 Up, 1 Down	
Operator Position	1	2
DI2	0	1

5. X3: The input data from 3-position selector, key selector, and illuminated selector switches and 3-position lever switches depend on the operator position as shown below.

3-position Operator	Selector: Left 1, Center 0, Right 2 / Lever: 2 Up, 0 Center, 1 Down		
Operator Position	1	0	2
DI3	0	0	1
DI2	1	0	0

6. Unused input bits DI3 and DI2 are 0 (off), and unused input bits DI1 and DI0 are 1 (on). Slaves ignore unused output data (—) sent from the master.

HW Series Digital I/O Data Allocation

Input data is sent from slaves to the AS-Interface master. Output data is sent from the AS-Interface master to slaves.

SwitchNet HW Series Slave Unit	Used I/O	Communication Block Mounting Position	Input Data (slave send data)				Output Data (slave receive data)			
			DI3	DI2	DI1	DI0	DO3	DO2	DO1	DO0
Pushbutton	1 in	②	0	X1	1	1	*	—	—	—
Pilot light	1 out	②	0	0	1	1	*	—	—	X1
Illuminated pushbutton	1 in/1 out	②	0	X1	1	1	*	—	—	X1
Selector, Key selector: 2-position	1 in	②	0	X2	1	1	*	—	—	—
Selector, Key selector: 3-position	1 in	①	0	X3	1	1	*	—	—	—
	1 in	②	0	X3	1	1	*	—	—	—
Illuminated selector: 2-position	1 in/1 out	②	0	X2	1	1	*	—	—	X1
Illuminated selector: 3-position	1 in	①	0	X3	1	1	*	—	—	—
	1 in/1 out	②	0	X3	1	1	*	—	—	X1

Notes:

1. * The AS-Interface master uses bit DO3 for addressing A/B slaves.
2. In the above table, bits marked with X1, X2, and X3 are used for SwitchNet I/O data.
3. X1: When pushbutton is pressed, input data is 1 (on). When not pressed, input data is 0 (off). When output data is 1 (on), LED is on. When output data is 0 (off), LED is off.
4. X2: The input data from 2-position selector, key selector, and illuminated selector switches depend on the operator position as shown below.

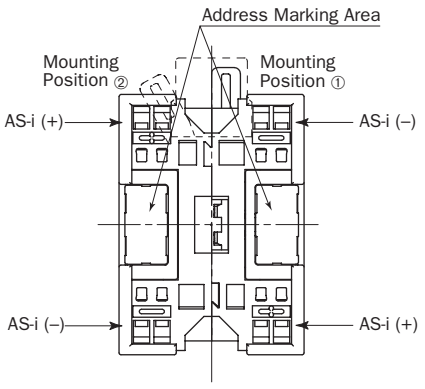
2-position Operator	Selector: Left 1	Selector: Right 2
Operator Position	1	2
DI2	0	1

5. X3: The input data from 3-position selector, key selector, and illuminated selector switches depend on the operator position as shown below.

3-position Operator		Selector: Left 1	Selector: Center 0	Selector: Right 2
Operator Position		1	0	2
Communication Block Mounting Position	Input Data Bit			
①	DI2	1	0	0
②	DI2	0	0	1

As shown in the table and figure, 3-position selector, key selector, and illuminated selector switches use two communication blocks. Each communication block must have a unique address, therefore the 3-position selectors require 2 slave addresses.

Communication Block Mounting Position (Rear View)



On 3-position selector, key selector, and illuminated selector switches, communication blocks ① and ② are mounted in positions shown above.

6. Unused input bits DI3 and DI2 are 0 (off), and unused input bits DI1 and DI0 are 1 (on). Slaves ignore unused output data (—) sent from the master.

Internal Relays for SwitchNet Slaves

• L6 Series

Slave Number	Pushbutton	Pilot Light	Illuminated Pushbutton		Selector, Key selector, Lever: 2-position
	Input DI2	Output DO0	Input DI2	Output DO0	Input DI2
(Slave 0)	M1302	M1620	M1302	M1620	M1302
Slave 1(A)	M1306	M1624	M1306	M1624	M1306
Slave 2(A)	M1312	M1630	M1312	M1630	M1312
Slave 3(A)	M1316	M1634	M1316	M1634	M1316
Slave 4(A)	M1322	M1640	M1322	M1640	M1322
Slave 5(A)	M1326	M1644	M1326	M1644	M1326
Slave 6(A)	M1332	M1650	M1332	M1650	M1332
Slave 7(A)	M1336	M1654	M1336	M1654	M1336
Slave 8(A)	M1342	M1660	M1342	M1660	M1342
Slave 9(A)	M1346	M1664	M1346	M1664	M1346
Slave 10(A)	M1352	M1670	M1352	M1670	M1352
Slave 11(A)	M1356	M1674	M1356	M1674	M1356
Slave 12(A)	M1362	M1680	M1362	M1680	M1362
Slave 13(A)	M1366	M1684	M1366	M1684	M1366
Slave 14(A)	M1372	M1690	M1372	M1690	M1372
Slave 15(A)	M1376	M1694	M1376	M1694	M1376
Slave 16(A)	M1382	M1700	M1382	M1700	M1382
Slave 17(A)	M1386	M1704	M1386	M1704	M1386
Slave 18(A)	M1392	M1710	M1392	M1710	M1392
Slave 19(A)	M1396	M1714	M1396	M1714	M1396
Slave 20(A)	M1402	M1720	M1402	M1720	M1402
Slave 21(A)	M1406	M1724	M1406	M1724	M1406
Slave 22(A)	M1412	M1730	M1412	M1730	M1412
Slave 23(A)	M1416	M1734	M1416	M1734	M1416
Slave 24(A)	M1422	M1740	M1422	M1740	M1422
Slave 25(A)	M1426	M1744	M1426	M1744	M1426
Slave 26(A)	M1432	M1750	M1432	M1750	M1432
Slave 27(A)	M1436	M1754	M1436	M1754	M1436
Slave 28(A)	M1442	M1760	M1442	M1760	M1442
Slave 29(A)	M1446	M1764	M1446	M1764	M1446
Slave 30(A)	M1452	M1770	M1452	M1770	M1452
Slave 31(A)	M1456	M1774	M1456	M1774	M1456
Slave 1B	M1466	M1784	M1466	M1784	M1466
Slave 2B	M1472	M1790	M1472	M1790	M1472
Slave 3B	M1476	M1794	M1476	M1794	M1476
Slave 4B	M1482	M1800	M1482	M1800	M1482
Slave 5B	M1486	M1804	M1486	M1804	M1486
Slave 6B	M1492	M1810	M1492	M1810	M1492
Slave 7B	M1496	M1814	M1496	M1814	M1496
Slave 8B	M1502	M1820	M1502	M1820	M1502
Slave 9B	M1506	M1824	M1506	M1824	M1506
Slave 10B	M1512	M1830	M1512	M1830	M1512
Slave 11B	M1516	M1834	M1516	M1834	M1516
Slave 12B	M1522	M1840	M1522	M1840	M1522
Slave 13B	M1526	M1844	M1526	M1844	M1526
Slave 14B	M1532	M1850	M1532	M1850	M1532
Slave 15B	M1536	M1854	M1536	M1854	M1536
Slave 16B	M1542	M1860	M1542	M1860	M1542
Slave 17B	M1546	M1864	M1546	M1864	M1546
Slave 18B	M1552	M1870	M1552	M1870	M1552
Slave 19B	M1556	M1874	M1556	M1874	M1556
Slave 20B	M1562	M1880	M1562	M1880	M1562
Slave 21B	M1566	M1884	M1566	M1884	M1566
Slave 22B	M1572	M1890	M1572	M1890	M1572
Slave 23B	M1576	M1894	M1576	M1894	M1576
Slave 24B	M1582	M1900	M1582	M1900	M1582
Slave 25B	M1586	M1904	M1586	M1904	M1586
Slave 26B	M1592	M1910	M1592	M1910	M1592
Slave 27B	M1596	M1914	M1596	M1914	M1596
Slave 28B	M1602	M1920	M1602	M1920	M1602
Slave 29B	M1606	M1924	M1606	M1924	M1606
Slave 30B	M1612	M1930	M1612	M1930	M1612
Slave 31B	M1616	M1934	M1616	M1934	M1616

• **L6 Series (continued)**

Slave Number	Selector, Key selector, Lever: 3-position		Illuminated selector: 2-position		Illuminated selector: 3-position		
	Input DI3	Input DI2	Input DI2	Output DO0	Input DI3	Input DI2	Output DO0
(Slave 0)	M1303	M1302	M1302	M1620	M1303	M1302	M1620
Slave 1(A)	M1307	M1306	M1306	M1624	M1307	M1306	M1624
Slave 2(A)	M1313	M1312	M1312	M1630	M1313	M1312	M1630
Slave 3(A)	M1317	M1316	M1316	M1634	M1317	M1316	M1634
Slave 4(A)	M1323	M1322	M1322	M1640	M1323	M1322	M1640
Slave 5(A)	M1327	M1326	M1326	M1644	M1327	M1326	M1644
Slave 6(A)	M1333	M1332	M1332	M1650	M1333	M1332	M1650
Slave 7(A)	M1337	M1336	M1336	M1654	M1337	M1336	M1654
Slave 8(A)	M1343	M1342	M1342	M1660	M1343	M1342	M1660
Slave 9(A)	M1347	M1346	M1346	M1664	M1347	M1346	M1664
Slave 10(A)	M1353	M1352	M1352	M1670	M1353	M1352	M1670
Slave 11(A)	M1357	M1356	M1356	M1674	M1357	M1356	M1674
Slave 12(A)	M1363	M1362	M1362	M1680	M1363	M1362	M1680
Slave 13(A)	M1367	M1366	M1366	M1684	M1367	M1366	M1684
Slave 14(A)	M1373	M1372	M1372	M1690	M1373	M1372	M1690
Slave 15(A)	M1377	M1376	M1376	M1694	M1377	M1376	M1694
Slave 16(A)	M1383	M1382	M1382	M1700	M1383	M1382	M1700
Slave 17(A)	M1387	M1386	M1386	M1704	M1387	M1386	M1704
Slave 18(A)	M1393	M1392	M1392	M1710	M1393	M1392	M1710
Slave 19(A)	M1397	M1396	M1396	M1714	M1397	M1396	M1714
Slave 20(A)	M1403	M1402	M1402	M1720	M1403	M1402	M1720
Slave 21(A)	M1407	M1406	M1406	M1724	M1407	M1406	M1724
Slave 22(A)	M1413	M1412	M1412	M1730	M1413	M1412	M1730
Slave 23(A)	M1417	M1416	M1416	M1734	M1417	M1416	M1734
Slave 24(A)	M1423	M1422	M1422	M1740	M1423	M1422	M1740
Slave 25(A)	M1427	M1426	M1426	M1744	M1427	M1426	M1744
Slave 26(A)	M1433	M1432	M1432	M1750	M1433	M1432	M1750
Slave 27(A)	M1437	M1436	M1436	M1754	M1437	M1436	M1754
Slave 28(A)	M1443	M1442	M1442	M1760	M1443	M1442	M1760
Slave 29(A)	M1447	M1446	M1446	M1764	M1447	M1446	M1764
Slave 30(A)	M1453	M1452	M1452	M1770	M1453	M1452	M1770
Slave 31(A)	M1457	M1456	M1456	M1774	M1457	M1456	M1774
Slave 1B	M1467	M1466	M1466	M1784	M1467	M1466	M1784
Slave 2B	M1473	M1472	M1472	M1790	M1473	M1472	M1790
Slave 3B	M1477	M1476	M1476	M1794	M1477	M1476	M1794
Slave 4B	M1483	M1482	M1482	M1800	M1483	M1482	M1800
Slave 5B	M1487	M1486	M1486	M1804	M1487	M1486	M1804
Slave 6B	M1493	M1492	M1492	M1810	M1493	M1492	M1810
Slave 7B	M1497	M1496	M1496	M1814	M1497	M1496	M1814
Slave 8B	M1503	M1502	M1502	M1820	M1503	M1502	M1820
Slave 9B	M1507	M1506	M1506	M1824	M1507	M1506	M1824
Slave 10B	M1513	M1512	M1512	M1830	M1513	M1512	M1830
Slave 11B	M1517	M1516	M1516	M1834	M1517	M1516	M1834
Slave 12B	M1523	M1522	M1522	M1840	M1523	M1522	M1840
Slave 13B	M1527	M1526	M1526	M1844	M1527	M1526	M1844
Slave 14B	M1533	M1532	M1532	M1850	M1533	M1532	M1850
Slave 15B	M1537	M1536	M1536	M1854	M1537	M1536	M1854
Slave 16B	M1543	M1542	M1542	M1860	M1543	M1542	M1860
Slave 17B	M1547	M1546	M1546	M1864	M1547	M1546	M1864
Slave 18B	M1553	M1552	M1552	M1870	M1553	M1552	M1870
Slave 19B	M1557	M1556	M1556	M1874	M1557	M1556	M1874
Slave 20B	M1563	M1562	M1562	M1880	M1563	M1562	M1880
Slave 21B	M1567	M1566	M1566	M1884	M1567	M1566	M1884
Slave 22B	M1573	M1572	M1572	M1890	M1573	M1572	M1890
Slave 23B	M1577	M1576	M1576	M1894	M1577	M1576	M1894
Slave 24B	M1583	M1582	M1582	M1900	M1583	M1582	M1900
Slave 25B	M1587	M1586	M1586	M1904	M1587	M1586	M1904
Slave 26B	M1593	M1592	M1592	M1910	M1593	M1592	M1910
Slave 27B	M1597	M1596	M1596	M1914	M1597	M1596	M1914
Slave 28B	M1603	M1602	M1602	M1920	M1603	M1602	M1920
Slave 29B	M1607	M1606	M1606	M1924	M1607	M1606	M1924
Slave 30B	M1613	M1612	M1612	M1930	M1613	M1612	M1930
Slave 31B	M1617	M1616	M1616	M1934	M1617	M1616	M1934

• **HW Series**

Slave Number	Pushbutton	Pilot Light	Illuminated Pushbutton		Selector, Key selector: 2-position
	Input DI2	Output DO0	Input DI2	Output DO0	Input DI2
(Slave 0)	M1302	M1620	M1302	M1620	M1302
Slave 1(A)	M1306	M1624	M1306	M1624	M1306
Slave 2(A)	M1312	M1630	M1312	M1630	M1312
Slave 3(A)	M1316	M1634	M1316	M1634	M1316
Slave 4(A)	M1322	M1640	M1322	M1640	M1322
Slave 5(A)	M1326	M1644	M1326	M1644	M1326
Slave 6(A)	M1332	M1650	M1332	M1650	M1332
Slave 7(A)	M1336	M1654	M1336	M1654	M1336
Slave 8(A)	M1342	M1660	M1342	M1660	M1342
Slave 9(A)	M1346	M1664	M1346	M1664	M1346
Slave 10(A)	M1352	M1670	M1352	M1670	M1352
Slave 11(A)	M1356	M1674	M1356	M1674	M1356
Slave 12(A)	M1362	M1680	M1362	M1680	M1362
Slave 13(A)	M1366	M1684	M1366	M1684	M1366
Slave 14(A)	M1372	M1690	M1372	M1690	M1372
Slave 15(A)	M1376	M1694	M1376	M1694	M1376
Slave 16(A)	M1382	M1700	M1382	M1700	M1382
Slave 17(A)	M1386	M1704	M1386	M1704	M1386
Slave 18(A)	M1392	M1710	M1392	M1710	M1392
Slave 19(A)	M1396	M1714	M1396	M1714	M1396
Slave 20(A)	M1402	M1720	M1402	M1720	M1402
Slave 21(A)	M1406	M1724	M1406	M1724	M1406
Slave 22(A)	M1412	M1730	M1412	M1730	M1412
Slave 23(A)	M1416	M1734	M1416	M1734	M1416
Slave 24(A)	M1422	M1740	M1422	M1740	M1422
Slave 25(A)	M1426	M1744	M1426	M1744	M1426
Slave 26(A)	M1432	M1750	M1432	M1750	M1432
Slave 27(A)	M1436	M1754	M1436	M1754	M1436
Slave 28(A)	M1442	M1760	M1442	M1760	M1442
Slave 29(A)	M1446	M1764	M1446	M1764	M1446
Slave 30(A)	M1452	M1770	M1452	M1770	M1452
Slave 31(A)	M1456	M1774	M1456	M1774	M1456
Slave 1B	M1466	M1784	M1466	M1784	M1466
Slave 2B	M1472	M1790	M1472	M1790	M1472
Slave 3B	M1476	M1794	M1476	M1794	M1476
Slave 4B	M1482	M1800	M1482	M1800	M1482
Slave 5B	M1486	M1804	M1486	M1804	M1486
Slave 6B	M1492	M1810	M1492	M1810	M1492
Slave 7B	M1496	M1814	M1496	M1814	M1496
Slave 8B	M1502	M1820	M1502	M1820	M1502
Slave 9B	M1506	M1824	M1506	M1824	M1506
Slave 10B	M1512	M1830	M1512	M1830	M1512
Slave 11B	M1516	M1834	M1516	M1834	M1516
Slave 12B	M1522	M1840	M1522	M1840	M1522
Slave 13B	M1526	M1844	M1526	M1844	M1526
Slave 14B	M1532	M1850	M1532	M1850	M1532
Slave 15B	M1536	M1854	M1536	M1854	M1536
Slave 16B	M1542	M1860	M1542	M1860	M1542
Slave 17B	M1546	M1864	M1546	M1864	M1546
Slave 18B	M1552	M1870	M1552	M1870	M1552
Slave 19B	M1556	M1874	M1556	M1874	M1556
Slave 20B	M1562	M1880	M1562	M1880	M1562
Slave 21B	M1566	M1884	M1566	M1884	M1566
Slave 22B	M1572	M1890	M1572	M1890	M1572
Slave 23B	M1576	M1894	M1576	M1894	M1576
Slave 24B	M1582	M1900	M1582	M1900	M1582
Slave 25B	M1586	M1904	M1586	M1904	M1586
Slave 26B	M1592	M1910	M1592	M1910	M1592
Slave 27B	M1596	M1914	M1596	M1914	M1596
Slave 28B	M1602	M1920	M1602	M1920	M1602
Slave 29B	M1606	M1924	M1606	M1924	M1606
Slave 30B	M1612	M1930	M1612	M1930	M1612
Slave 31B	M1616	M1934	M1616	M1934	M1616

• **HW Series (continued)**

Slave Number	Selector, Key selector: 3-position	Illuminated selector: 2-position		Illuminated selector: 3-position	
	Input DI2 (Comm. Block ① ②)	Input DI2	Output DO0	Input DI2 (Comm. Block ① ②)	Output DO0 (Comm. Block ②)
(Slave 0)	M1302	M1302	M1620	M1302	M1620
Slave 1(A)	M1306	M1306	M1624	M1306	M1624
Slave 2(A)	M1312	M1312	M1630	M1312	M1630
Slave 3(A)	M1316	M1316	M1634	M1316	M1634
Slave 4(A)	M1322	M1322	M1640	M1322	M1640
Slave 5(A)	M1326	M1326	M1644	M1326	M1644
Slave 6(A)	M1332	M1332	M1650	M1332	M1650
Slave 7(A)	M1336	M1336	M1654	M1336	M1654
Slave 8(A)	M1342	M1342	M1660	M1342	M1660
Slave 9(A)	M1346	M1346	M1664	M1346	M1664
Slave 10(A)	M1352	M1352	M1670	M1352	M1670
Slave 11(A)	M1356	M1356	M1674	M1356	M1674
Slave 12(A)	M1362	M1362	M1680	M1362	M1680
Slave 13(A)	M1366	M1366	M1684	M1366	M1684
Slave 14(A)	M1372	M1372	M1690	M1372	M1690
Slave 15(A)	M1376	M1376	M1694	M1376	M1694
Slave 16(A)	M1382	M1382	M1700	M1382	M1700
Slave 17(A)	M1386	M1386	M1704	M1386	M1704
Slave 18(A)	M1392	M1392	M1710	M1392	M1710
Slave 19(A)	M1396	M1396	M1714	M1396	M1714
Slave 20(A)	M1402	M1402	M1720	M1402	M1720
Slave 21(A)	M1406	M1406	M1724	M1406	M1724
Slave 22(A)	M1412	M1412	M1730	M1412	M1730
Slave 23(A)	M1416	M1416	M1734	M1416	M1734
Slave 24(A)	M1422	M1422	M1740	M1422	M1740
Slave 25(A)	M1426	M1426	M1744	M1426	M1744
Slave 26(A)	M1432	M1432	M1750	M1432	M1750
Slave 27(A)	M1436	M1436	M1754	M1436	M1754
Slave 28(A)	M1442	M1442	M1760	M1442	M1760
Slave 29(A)	M1446	M1446	M1764	M1446	M1764
Slave 30(A)	M1452	M1452	M1770	M1452	M1770
Slave 31(A)	M1456	M1456	M1774	M1456	M1774
Slave 1B	M1466	M1466	M1784	M1466	M1784
Slave 2B	M1472	M1472	M1790	M1472	M1790
Slave 3B	M1476	M1476	M1794	M1476	M1794
Slave 4B	M1482	M1482	M1800	M1482	M1800
Slave 5B	M1486	M1486	M1804	M1486	M1804
Slave 6B	M1492	M1492	M1810	M1492	M1810
Slave 7B	M1496	M1496	M1814	M1496	M1814
Slave 8B	M1502	M1502	M1820	M1502	M1820
Slave 9B	M1506	M1506	M1824	M1506	M1824
Slave 10B	M1512	M1512	M1830	M1512	M1830
Slave 11B	M1516	M1516	M1834	M1516	M1834
Slave 12B	M1522	M1522	M1840	M1522	M1840
Slave 13B	M1526	M1526	M1844	M1526	M1844
Slave 14B	M1532	M1532	M1850	M1532	M1850
Slave 15B	M1536	M1536	M1854	M1536	M1854
Slave 16B	M1542	M1542	M1860	M1542	M1860
Slave 17B	M1546	M1546	M1864	M1546	M1864
Slave 18B	M1552	M1552	M1870	M1552	M1870
Slave 19B	M1556	M1556	M1874	M1556	M1874
Slave 20B	M1562	M1562	M1880	M1562	M1880
Slave 21B	M1566	M1566	M1884	M1566	M1884
Slave 22B	M1572	M1572	M1890	M1572	M1890
Slave 23B	M1576	M1576	M1894	M1576	M1894
Slave 24B	M1582	M1582	M1900	M1582	M1900
Slave 25B	M1586	M1586	M1904	M1586	M1904
Slave 26B	M1592	M1592	M1910	M1592	M1910
Slave 27B	M1596	M1596	M1914	M1596	M1914
Slave 28B	M1602	M1602	M1920	M1602	M1920
Slave 29B	M1606	M1606	M1924	M1606	M1924
Slave 30B	M1612	M1612	M1930	M1612	M1930
Slave 31B	M1616	M1616	M1934	M1616	M1934

Note: Three-position selector, key selector, and illuminated selector switches use two communication blocks, therefore require two slave addresses. For the communication block mounting position, see page 6-12.

ASI Commands

The ASI commands are used to update AS-Interface operands in the CPU module or to control the AS-Interface master module. Data registers D1941 through D1944 are used to store command data. D1945 is used to store a request code before executing the command. While the command is executed, D1945 stores status and result codes.

ASI Command Format

Command Part (8 bytes)				Request/Result
D1941	D1942	D1943	D1944	D1945

ASI Command Data

To execute an ASI command, store required values to data resisters D1941 through D1945 as listed in the table below:

ASI Command	Processing Time (ms)	Description	Command Data (Hexadecimal)				
			D1941	D1942	D1943	D1944	D1945
Read LPS	1.0 *3	Reads LPS to D1776-D1779	010B	084C	0000	0000	0001
Read CDI	10.4 *3	Reads CDI to D1780-D1843	010C	4050	0000	0000	0001
Read PCD	10.4 *3	Reads PCD to D1844-D1907	010E	4090	0000	0000	0001
Read PI	3.0 *3	Reads PI to D1908-D1923	0107	20D0	0000	0000	0001
Read PP	3.0 *3	Reads PP to D1924-D1939	0108	20E0	0000	0000	0001
Read Slave 0 ID1	0.7 *3	Reads slave 0 ID1 to D1940	0109	02F0	0000	0000	0001
Write Slave 0 ID1	0.7 *3	Writes D1940 to slave 0 ID1	0209	02F0	0000	0000	0001
Copy PI to PP	0.8 *4	Copies parameter image to permanent parameter	0306	0100	0000	0000	0001
Change Slave PI *1	0.8 *4	Writes PI (∗) to slave (∗∗) (Note)	0306	0102	000∗	00∗∗	0001
Go to Normal Protected Offline	0.8 *4	From normal protected mode to normal protected offline	0306	0301	0000	0000	0001
Go to Normal Protected Mode	0.8 *4	From normal protected offline to normal protected mode	0306	0300	0000	0000	0001
Prohibit Data Exchange	0.8 *4	From normal protected mode to normal protected data exchange off	0306	0401	0000	0000	0001
Enable Data Exchange	0.8 *4	From normal protected data exchange off to normal protected mode	0306	0400	0000	0000	0001
Change Slave Address *2	0.8 *4	Change slave address (∗∗) to new address (++) (Note)	0306	0500	00∗∗	00++	0001
Enable Auto Addressing	0.8 *4	Enables auto address assign (default)	0306	0800	0000	0000	0001
Disable Auto Addressing	0.8 *4	Disables auto address assign	0306	0801	0000	0000	0001

*1: WindLDR has the Slave Status dialog box to execute this command to write a PI value to a designated slave. See Sample Program on page 6-18.

*2: WindLDR has the Change Slave Address dialog box to execute this command.

*3: Completed in a scan when the five data registers store respective values. When completed, D1945 stores 4. See Request and Result Codes on page 6-18. Other commands takes several scans to complete execution.

*4: Each scan time extends by 0.8 msec. At least 1 sec is required until the ASI command takes effect.

Note: Specify the slave address in the data register as shown in the table below:

Slave Address	Data Register Value		Slave Address	Data Register Value	
	Hexadecimal	Decimal		Hexadecimal	Decimal
0(A)	0h	0	—	—	—
1(A)	1h	1	1B	21h	33
2(A)	2h	2	2B	22h	34
⋮	⋮	⋮	⋮	⋮	⋮
31(A)	1Fh	31	31B	3Fh	63

Request and Result Codes

D1945 Value Lower Byte	Description	Note
00h	Initial value at power up	While D1945 lower byte stores 01h, 02h, or 08h, do not write any value to D1945, otherwise the ASI command is not executed correctly. The CPU module stores all values automatically, except for 01h.
01h	Request	
02h	Processing ASI command	
04h	Completed normally	
08h	(Executing configuration)	
14h	Peripheral device failure	
24h	ASI command error	
74h	Impossible to execute	
84h	Execution resulting in error	

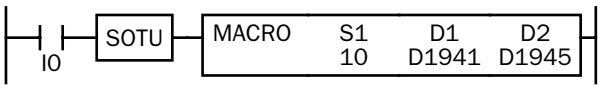
Sample Program: Change Slave PI

This sample program changes the PI value of slave 1A to 3. To use the ASI command Change Slave PI, store new parameter value 3 to D1943 and 1 to D1944 to designate the slave address using the MACRO instruction on WindLDR.

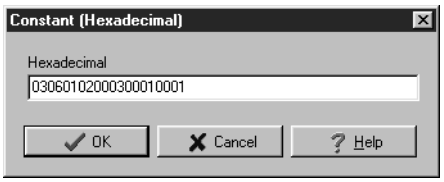
Program	Command Data (Hexadecimal)				
	D1941	D1942	D1943	D1944	D1945
Write PI parameter “3” to slave 1A	0306	0102	0003	0001	0001

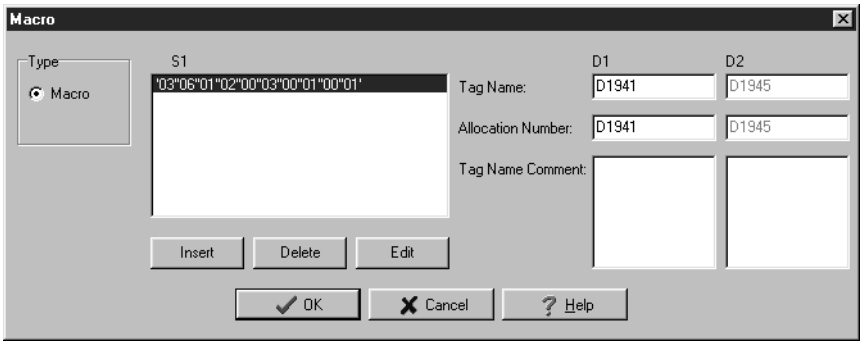
Parameters P3 through P0 are weighted as shown in the table below. When the PI parameter is set to 3, P3 and P2 are turned off, and P1 and P0 are turned on.

Parameter	P3	P2	P1	P0
Weight	8	4	2	1
ON/OFF	OFF	OFF	ON	ON



When input I0 turns on, the MACRO instruction stores hexadecimal values 0306, 0102, 0003, 0001, and 0001 to five data registers D1941 through D1945.





7: USING WINDLDR

Introduction

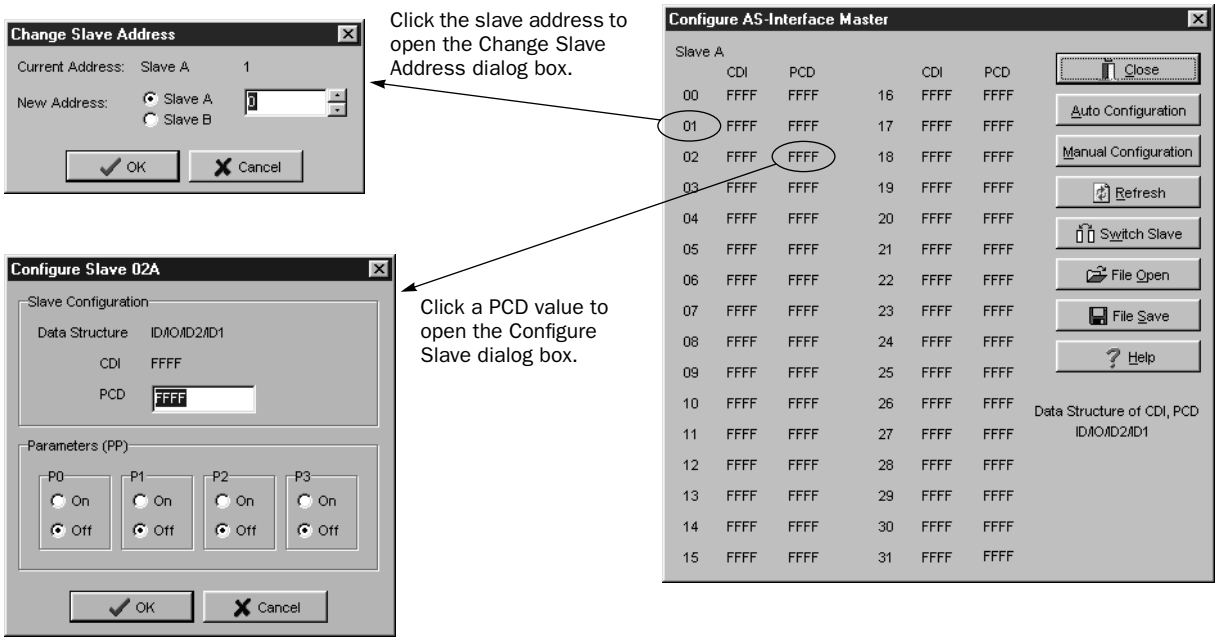
This chapter describes the procedures to use WindLDR for the AS-Interface system. WindLDR contains the Configure AS-Interface Master dialog box to configure slaves and to change slave addresses, and the Monitor AS-Interface Slave dialog box to monitor the slave operation.

For the procedures to select the PLC type and Function Area Settings, see page 4-2.

Configure AS-Interface Master

AS-Interface compatible slave devices are set to address 0 at factory and must be assigned a unique slave address so that the master can communicate with the slave correctly.

From the WindLDR menu bar, select **Configure** > **AS-Interface Master**. The Configure AS-Interface Master dialog box appears.



Dialog Box	Button	Description
Configure AS-Interface Master	**Auto Configuration**	Writes the currently connected AS-Interface slave configuration (LDS, CDI, PI) information to the AS-Interface master module EEPROM (LPS, PCD, PP). Auto configuration takes about 1 minute.
	Manual Configuration	Writes the slave PCD and parameters configured by the user to the AS-Interface master module EEPROM (LPS, PCD, PP).
	Refresh	Refreshes the screen display. Refreshing takes about 40 seconds.
	Switch Slave	Switches between the Slave A and Slave B setting screens.
	File Open	Opens the configuration (LPS, PCD, PP) file.
	File Save	Saves the configuration (LPS, PCD, PP) file.
	Help	Displays explanations for functions on the screen.
Change Slave Address	**OK**	Changes the slave address.
	Cancel	Discards the changes and closes the window.
Configure Slave	**OK**	Updates the PCD and PP. Not written to the master module yet.
	Cancel	Discards the changes and closes the window.

Slave Address Shading Colors

Operating status of the slave can be confirmed by viewing the shading color at the slave address on the Configure AS-Interface Master dialog box. The screen display can be updated by clicking the **Refresh** button.

Address Shading	Description	LAS List of active slaves	LDS List of detected slaves	LPF List of peripheral fault slaves	LPS List of projected slaves
No Shade	The slave is not recognized by the master.	OFF	OFF	OFF	ON/OFF
Blue Shade	The slave is active.	ON	ON	OFF	ON
Yellow Shade	The slave is recognized but not enabled to operate.	OFF	ON	OFF	OFF
Red Shade	An error was found in the slave.	ON/OFF	ON/OFF	ON	ON/OFF

Change Slave Address

When a slave is connected to the AS-Interface master module, the slave address can be changed using WindLDR.

⚠ Warning

- Duplicate slave addresses

Each slave must have a unique address. Do not connect two or more slaves with the same address, otherwise the AS-Interface master module cannot locate the slave correctly. When two slaves have the same address and different identification codes (ID, I/O, ID2, ID1), the AS-Interface master module detects an error. When two slaves have the same address and same identification codes, the AS-Interface master module cannot detect an error. Failure to observe this warning may cause severe personal injury or heavy damage to property.

⚠ Caution

- When a slave with address 0 is connected to the AS-Interface master module, power up the MicroSmart CPU module first. Approximately 5 seconds later, turn on the AS-Interface power supply. If the CPU module and AS-Interface power supply are turned on at the same time, the AS-Interface master module enters normal protected offline. In this mode, slave addresses can be changed, but the slave status cannot be confirmed on WindLDR.

To change a slave address, from the WindLDR menu bar, select **Configure** > **AS-Interface Master**. The Configure AS-Interface Master dialog box appears.

Click a slave address to open the Change Slave Address dialog box. Select Slave A or Slave B, enter a required address in the New Address field, and click **OK**. The Change Slave Address dialog box is closed. The new slave address is stored in the slave module nonvolatile memory.

Changing slave addresses takes approximately 40 seconds.

If the command is not processed correctly, the error message “AS-Interface Master Error” and an error code will appear. See page 7-5.

The address cannot be changed in the following cases.

Error Code	Description
1	• An error was found on the expansion I/O bus.
7	• The AS-Interface master module is in local mode.
8	• The slave you are trying to change does not exist. • A slave of the designated new address already exists. • While a standard slave was set at A address, attempt was made to set an A/B slave at B address of the same number. • While an A/B slave was set at B address, attempt was made to set a standard slave at A address of the same number.

Configuration

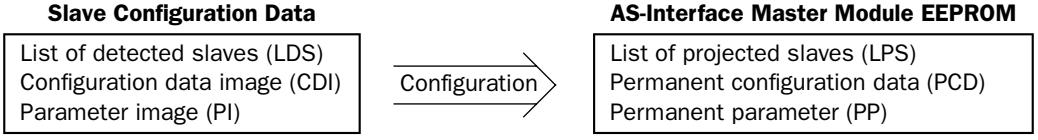
Before commissioning the AS-Interface master module, configuration must be done using either WindLDR or the pushbuttons on the front of the AS-Interface master module. This section describes the method of configuration using WindLDR. Configuration is the procedure to store the following information to the AS-Interface master module EEPROM.

- A list of slave addresses to be used
- Configuration data to specify slave types, or identification codes (ID, I/O, ID2, ID1)
- Parameters (P3, P2, P1, P0) to designate the slave operation at power-up

WindLDR provides two options for configuration: auto configuration to execute automatic configuration and manual configuration to execute configuration according to the data selected by the user.

Auto Configuration

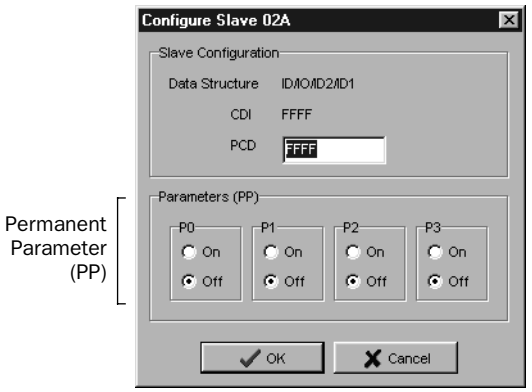
Auto configuration stores the current slave configuration data (LDS, CDI, PI) to the AS-Interface master module EEPROM (LPS, PCD, PP). To execute auto configuration, press **Auto Configuration** in the Configure AS-Interface Master dialog box. Auto configuration takes approximately 1 minute, and has the same effect as the configuration using the pushbuttons on the AS-Interface master module.



Manual Configuration

Manual configuration is the procedure to write the LPS, PCD, and PP designated on WindLDR to the AS-Interface master module EEPROM. LPS is automatically generated by WindLDR based on the value for PCD.

PCD	LPS
FFFFh	0
Other values	1



To change PCD and PP, use the Configure Slave dialog box. Set the PCD of each slave to the same value as its CDI. If the PCD is different from the CDI for a slave, then that slave does not function correctly. Set FFFFh to the PCD of vacant slave numbers.

After entering a PCD value and selecting parameter statuses, click **OK**. At this point, the configuration data are not stored to the AS-Interface master module EEPROM. To store the changes, click **Manual Configuration** on the Configure AS-Interface Master dialog box. The screen display of the Configure AS-Interface Master dialog box can be updated using **Refresh**.

If you save the configuration data to a file, you can open the file to configure other AS-Interface master modules using the same data. To save and open the configuration file, click **File Save** or **File Open**.

If the configuration command is not processed correctly, the error message "AS-Interface Master Error" and an error code will appear. See page 7-5.

If the error message "Configuration failure. Confirm the slave setup, and perform configuration again." is shown, and the FLT LED is on, then remove the cause of the error, referring to page 4-7, and repeat configuration.

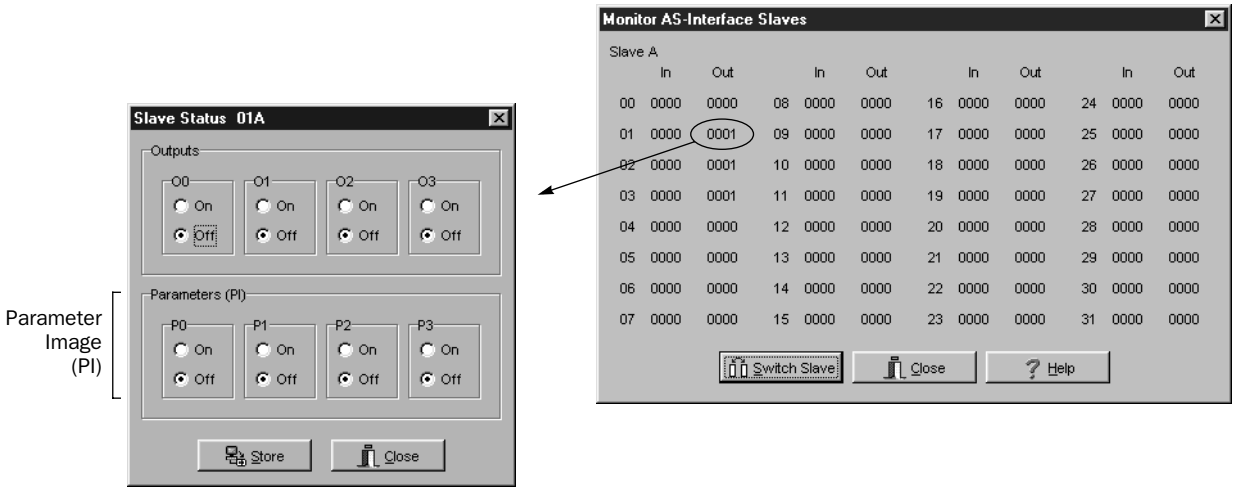
The configuration cannot be done in the following cases.

Error Code	Description
1	• An error was found on the expansion I/O bus.
2	• While the AS-Interface master module was in offline mode, attempt was made to execute auto configuration or manual configuration.
7	• While slave address 0 existed on the bus, attempt was made to execute auto configuration or manual configuration. • The AS-Interface master module is in local mode.

Monitor AS-Interface Slave

While the MicroSmart is communicating with AS-Interface slaves through the AS-Interface bus, operating status of AS-Interface slaves can be monitored using WindLDR on a PC. Output statuses and parameter image (PI) can also be changed using WindLDR.

To open the Monitor AS-Interface Slaves dialog box, from the WindLDR menu bar, select **Online** > **Monitor**. From the WindLDR menu bar, select **Online**, and select **Monitor AS-Interface Slaves** in the pull-down menu.



Dialog Box	Button	Description
Monitor AS-Interface Slaves	**Switch Slaves**	Switches between Slave A screen and Slave B screen.
	Close	Closes the window.
	Help	Displays explanations for functions on the screen.
Slave Status	**Store**	Stores output statuses and parameters to the slave.
	Close	Closes the window.

Change Slave Output Statuses and Parameters

The output statuses and parameter image (PI) of the slaves connected to the AS-Interface master module can be changed. To open the Slave Status dialog box, click the output of a required slave address in the Monitor AS-Interface Slaves dialog box. Then, click the On or Off button to change the statuses of outputs O0 through O3 and parameters P0 through P3 as required. Click **Store** to save the changes to the slave module.

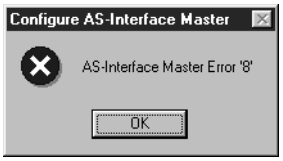
If the command is not processed correctly, the error message “AS-Interface Master Error” and an error code will appear. See page 7-5.

The output statuses and parameters cannot be changed in the following cases.

Error Code	Description
1	• An error was found on the expansion I/O bus.
7	• The AS-Interface master module is in local mode.
8	• Attempt was made to change the parameters of a slave which did not exist.

Error Messages

When an error is returned from the AS-Interface master module, WindLDR will display an error message. The error codes and their meanings are given below.



Error Code	Description
1	• An error was found on the expansion I/O bus.
2	• While the AS-Interface master module was in offline mode, attempt was made to perform auto configuration or manual configuration. • An incorrect command was sent.
7	• While slave address 0 existed on the bus, attempt was made to perform auto configuration or manual configuration. • The AS-Interface master module is in local mode.
8	• The slave you are trying to change does not exist. • A slave of the designated new address already exists. • While a standard slave was set at A address, attempt was made to set an A/B slave at B address of the same number. • While an A/B slave was set at B address, attempt was made to set a standard slave at A address of the same number. • Attempt was made to change the parameters of a slave which did not exist.

When a reply message is not returned from the AS-Interface master module, the following error message will be displayed.

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