SIO-A-300

Serial (RS485) Analog I/O

User Manual

Version 1.1

Infosystem Technology Corporation, Ltd.

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Product Information

A. Introduction

SIO is an I/O controller product with Serial Port on its data communication and makes data acquisition easier through ModBus Protocol of RTU mode on Serial Bus. For different conditions, SIO basically has been design into four models. SIO-R is Relay I/O Controller. SIO-A is Analog I/O. SIO-D is Digital I/O. And SIO-T is Thermo Coupler I/O Controller. By using these products, the controlling and monitoring of distributed control system can easily be accomplished.

SIO-A-300 uses 8051's family microprocessor for implementing the framework. Basically, it supports both current and voltage inputs and performs as an Analog I/O controller. It also applies multi-channel solutions for the input and output. With no doubt, SIO-A-300 will bring you the best integration in your applications.

Product Information

B. Features

- Support ModBus Protocol
  - ✓ *ModBus RTU Mode*
- High Reliability
  - ✓ *Stable and Robust*
  - ✓ *Working 24Hours per day*
- Multi-Channel and High Resolution
  - ✓ *8 single-ended input channel with 16-bit resolution*
- Support Four Operation Model
  - ✓ *Voltage Inputs: 0~10V*
  - ✓ *Voltage Inputs: 1-5V*
  - ✓ *Current Inputs: 0~20mA*
  - ✓ *Current Inputs: 4~20mA*
- Built-in high/low limitation detection capabilities
  - ✓ *Users Engineering Limitations could be manually adjusted.*

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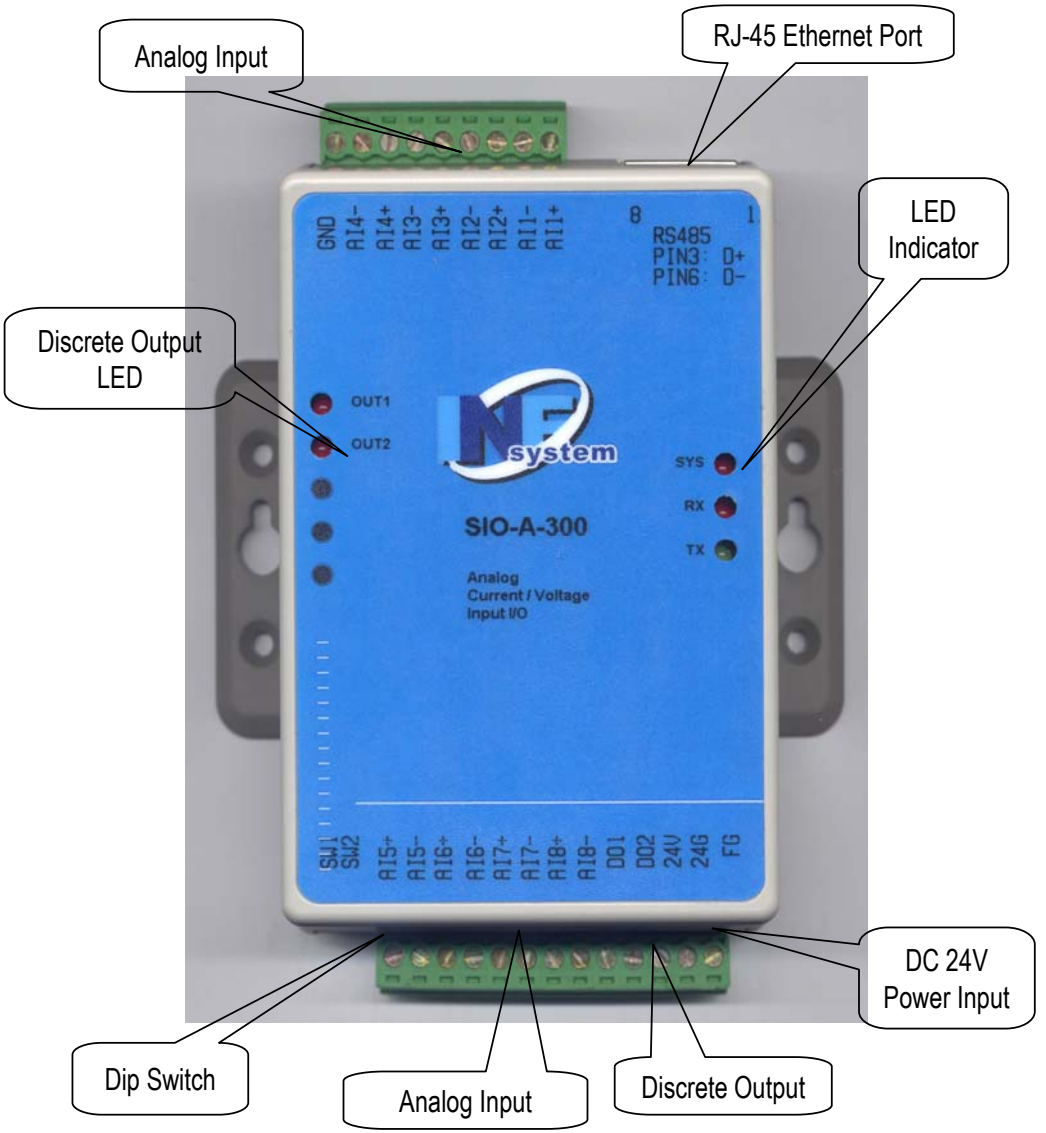
Product Information

C. Applications

- Data collection and Security Terminals
- Access Control Terminals
- Security Devices
- Time Recorders
- Warehouse Terminals
- Shop floor automation Terminals
- Remote Sensors and Meters
- Power monitors
- Power meters
- Environmental monitors
- Temperature monitors
- Data loggers
- Auto-ID Scanners
- Barcode Scanners
- Magnetic Card Readers
- Basic Input/Output Operation

Exterior

A. Overview



Exterior

B. Front Panel

a. Connector 1 (CONN1)

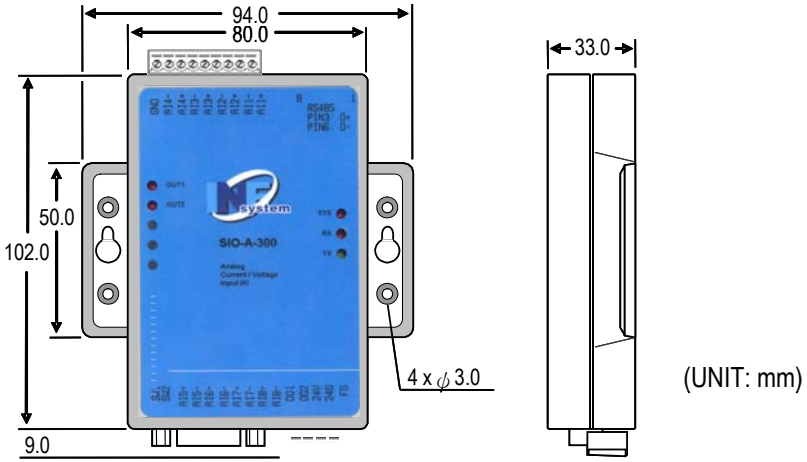
b. Serial Port with RJ45 Connector

c. Discrete Output LED Indication

d. LED Indicator

e. Connector 2 (CONN2)

C. Dimension



Specifications

A. Basic Specifications

– Part 1 –

Entry	Description
Network Interface	RS485, RJ-45
Protocol	Modbus/RTU
Number of channels	8 (differential input)
Input ranges	0-10V, 1-5V (input impedance 10MΩ) 0-20mA, 4~20mA (input impedance 250Ω)
Resolution	16 bit
Inaccuracy	±0.2% max at 25℃
Zero drift	+/-0.06 μV/℃
Span drift	+/-30 PPM/℃
Conversion speed	800 ms/8 channel
Channel isolation	Non-isolated (one common)
Power consumption	0.2A
Range selection	Dip switches
Number of output points	2 points
Insulation method	Photo coupler
Rated load voltage	24VDC
Type	NPN/Sink

Specifications

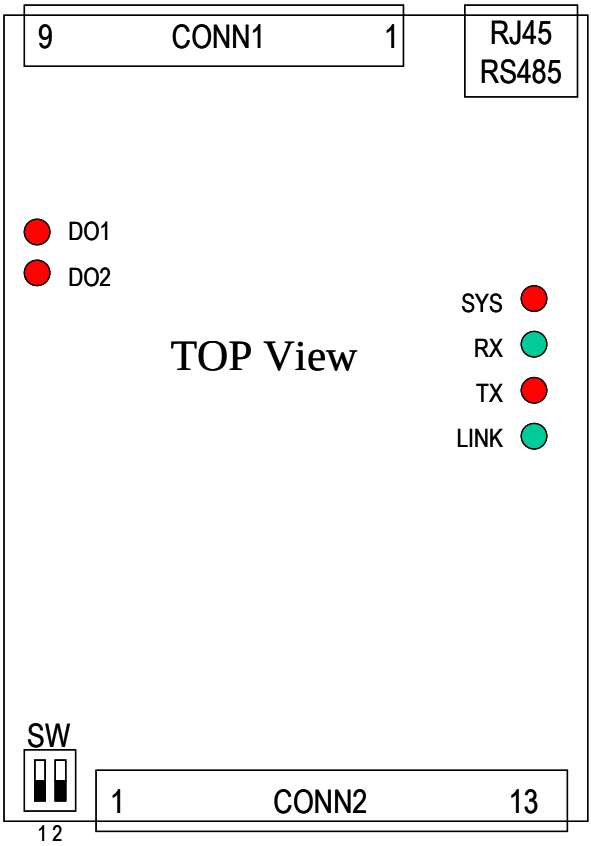
A. Basic Specifications

– Part 2 –

Entry		Description
Max. load current		0.5A/pt
Leakage current at OFF circuit		0.1mA or less
Max. voltage drop at ON circuit		1.5V or less
Response time	*OFF* (ON	8 msec or less
	ON (OFF	8 msec or less
Common terminal arrangement		2 points/common
External power supply	Voltage	24VDC (21.6VDC～26.4VDC)
	Current	100mA
International current consumption		50 mA (type, all points on)
Operating temperature		0 ~60℃
Storage temperature		-20 ~ 80℃
Relative humidity		15 ~ 95 % RH (non-condensing)
Environment air		No corrosive gases permitted
External power supply	Voltage	24Vdc (7Vdc～36Vdc)
	Current	80mA
International current consumption		50 mA (type, all points on)

B. LED Indicator and Switch Description

– Top View –



Specifications

B. LED Indicator and Switch Description

– Description –

LED Indicator:

LED	Description
SYS	The SYS LED blinks at a rate of 1.5Hz and indicating normal work.
RX	Received data.
TX	Transmitted data.
DO1~DO2	The DC outputs1~2.

Switch Description: Defining Operation Range

Users may set the positions of the dip switches which are located on the bottom side of the module to choose one of the operation ranges provided by the SIO-A-300 module.

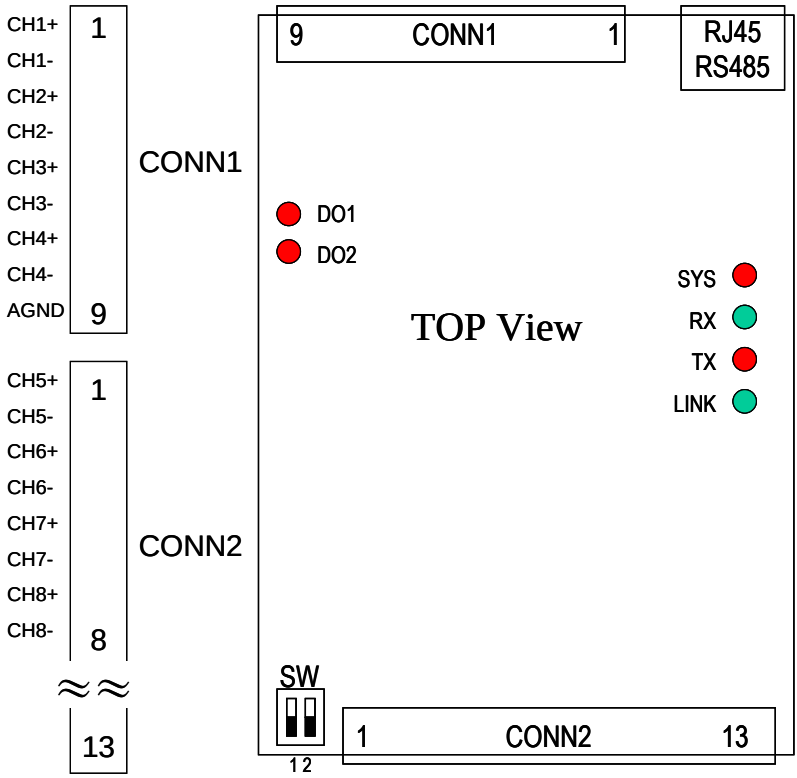
SW1	SW2	AD030 OPERATION RANGE
ON	OFF	Voltage inputs: 0~10V
ON	ON	Voltage inputs: 1~5V
OFF	OFF	Current inputs: 0~20mA
OFF	ON	Current inputs: 4~20mA

Specifications

C. Wiring

Users may refer to the following diagram to connect the external wiring for the SIO-A-300 module. (Wires for analog input signals are recommended to have the shielding protection)

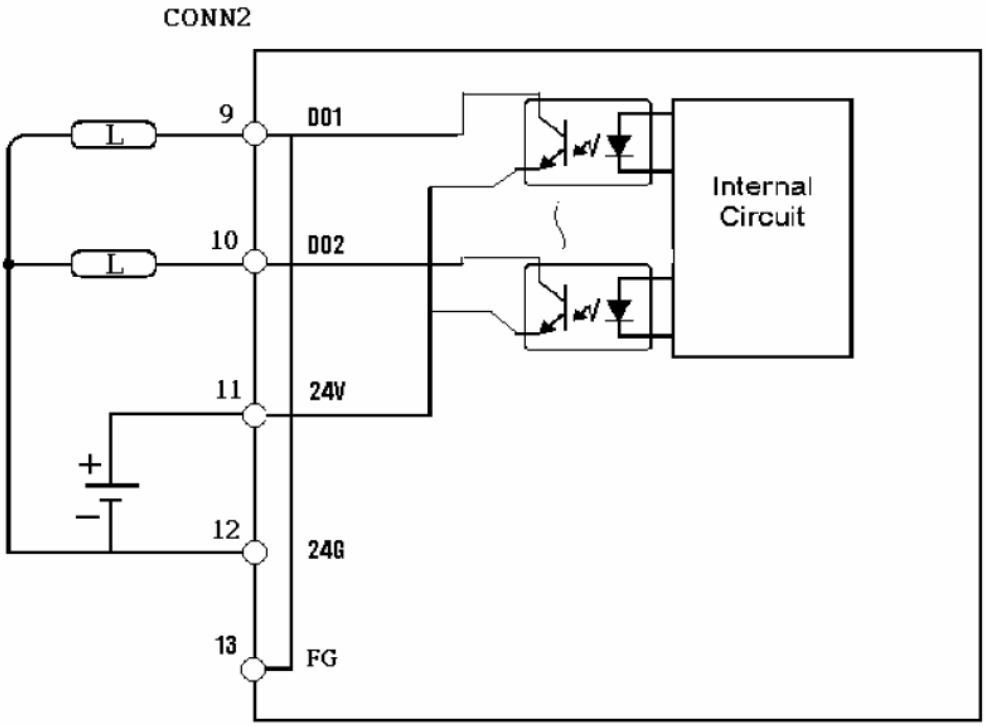
– Analog Input Channels–



Specifications

C. Wiring

– DC 0.5A Digital Output x 2 (DO1, DO2) –



Specifications

D. ModBus Holding Register Definition

The SIO-A-300 module provides 11 registers (words) for users to access the status of the module and read the data from the input channels or write the data to the output register. These 11 registers are called scan data registers. The definitions of the 11 registers are described as follows:

EIO-A-200 Scan Data Address (ModBus Holding Register Address)	Description
40001	Digital Output Register
40003	Line Broken Detection Flags
40004	Status Register
40005	Channel 1 Input Register
40006	Channel 2 Input Register
40007	Channel 3 Input Register
40008	Channel 4 Input Register
40009	Channel 5 Input Register
40010	Channel 6 Input Register
40011	Channel 7 Input Register
40012	Channel 8 Input Register

Specifications

D. ModBus Holding Register Definition

Digital output register: (40001)

Bit 1: DO1 output status

Bit 2: DO2 output status

Bit 3 to Bit 16 are reserved.

Line broken detection flags: (40003)

Bit1 ~ Bit8 are corresponding to the channel 1 ~ channel 8

Bit status = 1 (line broken)

= 0 (normal)

Status (flag) register: (40004)

Bit 1: low limitation flag of channel 1
Bit 2: high limitation flag of channel 1
Bit 3: low limitation flag of channel 2
Bit 4: high limitation flag of channel 2
Bit 5: low limitation flag of channel 3
Bit 6: high limitation flag of channel 3.
Bit 7: low limitation flag of channel 4
Bit 8: high limitation flag of channel 4
Bit 9: low limitation flag of channel 5
Bit 10: high limitation flag of channel 5
Bit 11: low limitation flag of channel 6
Bit 12: high limitation flag of channel 6
Bit 13: low limitation flag of channel 7
Bit 14: high limitation flag of channel 7
Bit 15: low limitation flag of channel 8
Bit 16: high limitation flag of channel 8

Specifications

D. ModBus Holding Register Definition

Besides the scan data registers, the SIO-A-300 module also provides other Modbus holding registers for users to fill in the high/low limit value and define the conversion data type. High- and low-limit values will be used by the module for comparing the channel's input signal to detect if the input signal is higher or lower than the limitation value set by the user. If the value of an input channel is higher or lower than the corresponding data stored in these holding registers, the corresponding flag bit of the status register in the scan data registers will be set to '1'.

The conversion data for each channel may be represented by the raw conversion data defined by the module or engineering data defined by users. If users define the conversion data type to be an engineering data, users may set the low engineering value and the high engineering value using the specified holding registers from 40033~40048 for each of the input channel instead of the raw data range defined by the module. The corresponding input signals will be linearly converted to the engineering data corresponding to the defined range of high/low engineering setting value to the corresponding channel input registers in scan data registers.
Users will be requested to use the engineering data to define the high/low limitation values for the corresponding channels if users select the conversion data type with engineering data.

Specifications

D. ModBus Holding Register Definition

Holding Register	Description
40013	Flags for control A/D conversion
40014	High/low limit control flags
40015	Low limitation value of CH1
40016	High limitation value of CH1
40017	Low limitation value of CH2
40018	High limitation value of CH2
40019	Low limitation value of CH3
40020	High limitation value of CH3
40021	Low limitation value of CH4
40022	High limitation value of CH4
40023	Low limitation value of CH5
40024	High limitation value of CH5
40025	Low limitation value of CH6
40026	High limitation value of CH6
40027	Low limitation value of CH7
40028	High limitation value of CH7
40029	Low limitation value of CH8
40030	High limitation value of CH8
40031	Reserved

Specifications

D. ModBus Holding Register Definition

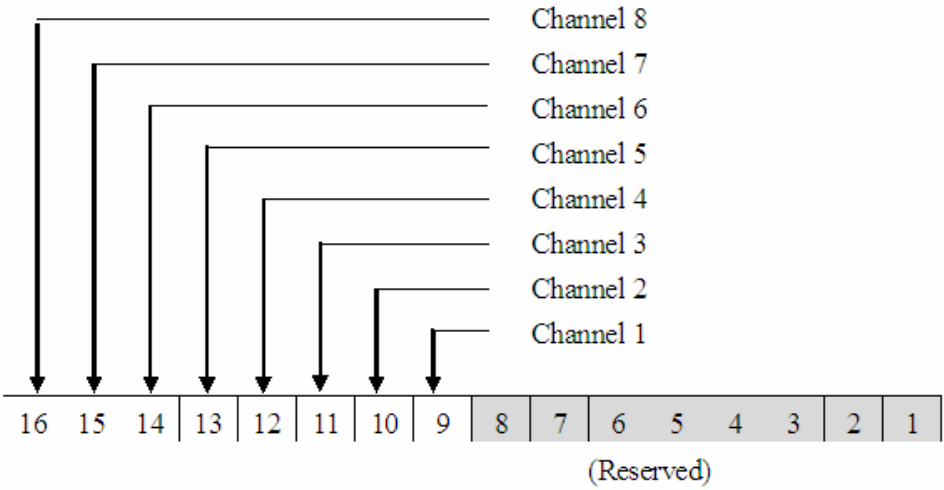
Holding Register	Description
40032	Conversion data type (row data or engineering data)
40033	Low engineering setting value of CH1
40034	High engineering setting value of CH1
40035	Low engineering setting value of CH2
40036	High engineering setting value of CH2
40037	Low engineering setting value of CH3
40038	High engineering setting value of CH3
40039	Low engineering setting value of CH4
40040	High engineering setting value of CH4
40041	Low engineering setting value of CH5
40042	High engineering setting value of CH5
40043	Low engineering setting value of CH6
40044	High engineering setting value of CH6
40045	Low engineering setting value of CH7
40046	High engineering setting value of CH7
40047	Low engineering setting value of CH8
40048	High engineering setting value of CH8

Specifications

D. ModBus Holding Register Definition

Conversion control/speed flags: (40013)

1. Bit 1 to Bit 8 is reserved.
2. Bit 9 to Bit 16 are A/D conversion control flags.
   ‘0’: enable A/D conversion (default)
   ‘1’: disable A/D conversion



Specifications

D. ModBus Holding Register Definition

High/low limit control flags: (40014)

Bit 1: low limitation control bit for CH1
Bit 2: high limitation control bit for CH1
Bit 3: low limitation control bit for CH2
Bit 4: high limitation control bit for CH2
Bit 5: low limitation control bit for CH3
Bit 6: high limitation control bit for CH3
Bit 7: low limitation control bit for CH4
Bit 8: high limitation control bit for CH4
Bit 9: low limitation control bit for CH5
Bit 10: high limitation control bit for CH5
Bit 11: low limitation control bit for CH6
Bit 12: high limitation control bit for CH6
Bit 13: low limitation control bit for CH7
Bit 14: high limitation control bit for CH7
Bit 15: low limitation control bit for CH8
Bit 16: high limitation control bit for CH8

Specifications

D. ModBus Holding Register Definition

Remarks:

1. If some bits of the high/low limit control flags are set to ‘1’, the input Signals of corresponding channels will be compared with the corresponding limitation values which were stored in the specified holding registers. If the corresponding channel’s input value is higher or lower than the corresponding limitation value stored in the specified holding register, the corresponding flag bit of **the status register (40004)** will be set to ‘1’.
2. Users do not need to set the control bit or initiate the data to the specified holding registers if high/low limit detection is not required in the application.

Conversion data type: (40032)

Bit 1: CH1’s conversion data type
Bit 2: CH2’s conversion data type
Bit 3: CH3’s conversion data type
Bit 4: CH4’s conversion data type
Bit 5: CH5’s conversion data type
Bit 6: CH6’s conversion data type
Bit 7: CH7’s conversion data type
Bit 8: CH8’s conversion data type

D. ModBus Holding Register Definition

Remark:

1. The default status of the above bits is ‘0’. In other words, the default conversion data type for each channel is raw data.
2. If some bits of the data conversion bits are set to ‘1’, the input signals of corresponding channels will be converted to the corresponding engineering data and stored to the channel input registers in scan data registers.

High/low engineering setting values: (40033~40048)

1. Users may fill in the low engineering values and high engineering values to the corresponding holding registers from 40033 to 40048 for each of the channel instead of the raw data range defined by the module. Users may check the raw data conversion table in the following chapter.
2. If users set the module’s conversion data type to be an engineering data, the module will use to the range of the high/low engineering setting values defined by the users and linearly convert the input signal to the corresponding engineering data to the corresponding channel input register in the scan data register.

Specifications

D. ModBus Holding Register Definition

Holding Register	Description
40050	Write to the Flash
40060 ~ 40092	System setting values (Don't modify)
40100	Device ID
40101	Baud Rate Type

Write to the flash: (40050)

- ✓ After changing any value of the holding register, users must set this holding register to be '0x5555', and the return value will be '0xAAAA' to write the changing value to the flash.
- ✓ When users set the value of the holding register to be '0x1111', the return value will be '0x0000', and the values of all holding register will return to default values.

System setting values: (40060~40092)

- ✓ This range of the holding registers is reserved for system setting values, users should not change.

Specifications

D. ModBus Holding Register Definition

Device id: (40100)

- ✓ The default device id is set to be '1', and users can decide the device id by changing the value of this holding register.
- ✓ After changing the device id, users must to reconnect to SIO-A-300 with new device id, and set the value of the write to flash register (40050) to be '0x5555'.
- ✓ The broadcast id is set to be '0'.

Baud rate type: (40101)

- ✓ Users can fill in the baud rate type to set the connecting baud rate.
- ✓ The default value of the baud rate type is 38400(bps), and users can change the type by setting the value of this holding register as follows:
  - 0x01 " 4800 bps
  - 0x02 " 9600 bps
  - 0x03 " 14400 bps
  - 0x04 " 19200 bps
  - 0x05 " 38400 bps (default)
  - 0x06 " 57600 bps
  - 0x07 " 115200 bps
- ✓ The changed baud rate type will be effective after resetting the SIOAD030.

Infosystem®

Infosystem Technology Corporation, Ltd.
No. 45, Lane 167, Dongnan St.
Hsinchu, Taiwan 300, R.O.C.
TEL: +886-3-562-7187
FAX: +886-3-561-1435

Service E-mail: services@infosystem.com.tw
Web page URL:http://www.infosystem.com.tw