DESCRIPTION OF OPTIONS



MIC-2 MKII I/O module user's manual

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Please read this manual carefully before installation, operation and maintenance of the MIC-2 MKII multi-instrument.
The following symbols are used in this user's manual and on the MIC-2 MKII multi-instrument:

High voltage symbol. Electrical hazard voltage can cause shock, burns or person injury or death. Failure to observe the information may result in injury or death.

Danger symbol. Observe the information after the symbol to avoid possible injury or death.

Installation and maintenance of the MIC-2 MKII multi-instrument should only be performed by qualified, competent personnel trained and experienced in working with high voltages and currents.

This document is not fit for any untrained people. DEIF is not responsible or liable for any damages cause by improper installation and/or operation.

This manual describes I/O modules for the MIC-2 MKII, which can extend the MIC-2 MKII functionality substantially.

Please read this manual carefully before operating or setting the MIC-2 MKII to avoid unnecessary trouble.

Chapter 1 helps you understand the basic function and application area of I/O modules.
Chapter 2 describes installation and wiring of I/O modules in detail.
Chapter 3 describes the functions of I/O modules and parameter setting method.

The MIC-2 MKII does not have any I/O functions itself, but it can realise multi I/O functions with I/O modules, such as digital input, counter of pulses, relay output, analogueue output, and analogueue input and so on.

There are three types of I/O modules, AXM-IO1, AXM-IO2 and AXM-IO3. A maximum of 1 communication and 2 input/output modules can be used for each MIC-2 MKII.

If two of the same I/O module types are required, the second of them must use one of the following DEIF numbers:

AXM-IO1 (2) - DEIF no.: 1211020018

AXM-IO2 (2) - DEIF no.: 1211020019

AXM-IO3 (2) - DEIF no.: 1211020020

The AXM-IO1 module, which is adapted to low voltage power distribution, is composed of:

- 6 digital inputs (DI), each digital input can be used to detect remote signals, or be used as a counter of input pulses. When it is used to detect remote signals, it can also enable SOE (sequence of events), recording the event and time of the event.
- 2 relay outputs (RO), it can work in controlling mode, or in alarm mode. Both of 2 relay outputs work in the same mode. When it works in controlling mode, it has two optional output modes, latching mode and pulse mode. When it works in alarm mode, it has one latching output mode only.
- 24V isolated power supply – used as an auxiliary power supply for digital inputs.

The AXM-IO2 module, which is adapted to factory DCS (or processing controlling, BA), is composed of:

- 4 digital inputs (DI), each digital input can be used to detect remote signals, or be used as a counter of input pulses. When it is used to detect remote signals, it can also enable SOE (sequence of events), recording the events and time of the events.
- 2 analogue outputs (AO), it can output analogue voltage or analogue current. When it outputs analogue current, the range of current is from 0 to 20mA or from 4 to 20mA. Please note that the functionality is limited.
- 2 digital outputs (DO), it can work in alarm mode, or work in energy pulse output mode. Both of 2 digital outputs work in the same mode. When it works in energy pulse output mode, it can output various types of energy.

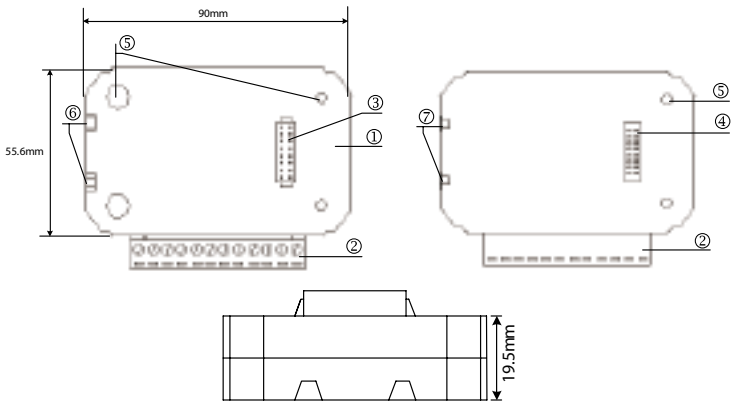
The AXM-IO3 module, which is adapted to electrical devices, is composed of:

- 4 digital inputs (DI), each digital input can be used to detect remote signals, or be used as a counter of input pulses. When it is used to detect remote signals, it can also enable SOE (sequence of events), recording the events and time of the events.
- 2 relay outputs (RO), it can work in controlling mode, or work in alarm mode. Both of 2 relay outputs work in the same mode. When it works in controlling mode, it has two optional output modes, latching mode and pulse mode. When it works in alarm mode, it has only one latching output mode.
- 2 analogue inputs (AI), the MIC-2 MKII can detect currents ranging from 0 to 20mA or 4 to 20mA.

Extensibility: by linking I/O modules, MIC-2 MKII can extend variable I/O functions.
Practicability: IO modules can be easily linked to MIC-2 MKII.

Functions	AXM-IO1	AXM-IO2	AXM-IO3
Detection of remote signals	3	3	3
Recording of SOE	3	3	3
Counting of input pulses	3	3	3
Output remote controlling by relay	3		3
Output alarm by relay	3		3
Output alarm by digital output		3	
Output power pulses by digital output		3	
Analogue output		3	
Analogue input			3
24V isolated voltage output	3		

Figure 2-1 shows a structure configuration of I/O module.



①	Enclosing	⑤	Installation screw
②	Wiring terminals	⑥	Counterpart of clip
③	Linking pins	⑦	Installation clip
④	Linking socket		

Figure 2-1 structure configuration of I/O modules

Environment
Please check the environment temperature and humidity to ensure they fall within the MIC-2 MKII and optional modules requirement before installing the unit.

Temperature
Operation: -25°C to 70°C
Storage: -40°C to 85°C

Humidity
5% to 95% non-condensing.

Position
The MIC-2 MKII and modules should be installed in a dry and dust-free environment. Avoid heat, radiation and high electrical noise sources.

Installation method
With the link pins, optional modules are linked to the MIC-2 MKII and each other. The maximum number of extended modules linked to MIC-2 MKII, including I/O module, Ethernet module and PROFIBUS module, is three. The communication modules must be installed first. No other module can be installed before them.

Disconnect your MIC-2 MKII from any live voltages and currents before following the below instructions!

1. Remove the Ext. Port protection lid.

1. Insert the installation clips in the counterpart of MIC-2 MKII, and then press the I/O module gently, so linking is established. Handle the installation with care to avoid damage to the optional module and/or the MIC-2 MKII unit.

2. Tighten the installation screw.

3. Install other modules in the same way.

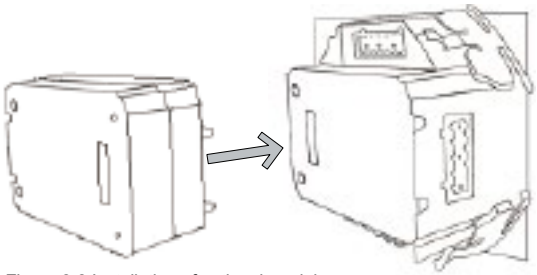


Figure 2-2 Installation of optional modules

Terminal strips of AXM-IO1 module:

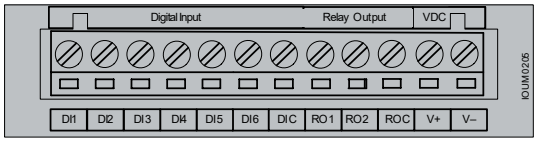


Figure2-3 Terminal strips of AXM-IO1 module

DI1 to DIC: digital input terminals, where DIC is the common terminal for DI1 to DI6 circuits.
RO1 to ROC: relay output terminals, where ROC is the common terminal for RO1 and RO2 circuits.
V24+ and V24-: auxiliary voltage supply terminals.

Terminal Strips of AXM-IO2 Module:

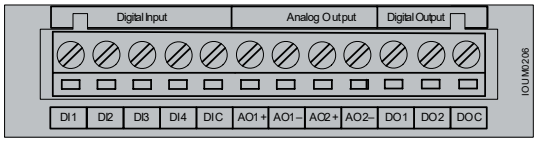


Figure2-4 Terminal strips of AXM-IO2 module

DI1 to DIC: digital input terminals, where DIC is the common terminal for DI1 to DI4 circuits.
AO1+, AO1-, AO2+, AO2-: analogue output terminals.
DO1 to DOC: digital output terminals, where DOC is the common terminals for DO1 to DO2.

Terminals strips of AXM-IO3 module:

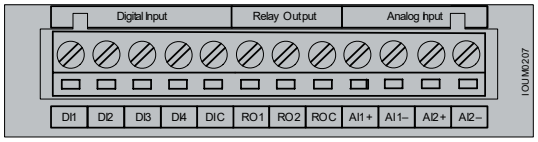


Figure2-5 Terminal strips of AXM-IO3 module

DI1 to DIC: digital input terminals, where DIC is the common terminal for DI1 to DI4 circuits.
RO1 to ROC: relay output terminals, where ROC is the common terminal for RO1 and RO2 circuits.
AI1+, AI1-, AI2+, AI2-: analogue input terminals.
Sequence of DI, RO, DO, AO, AI in I/O modules (according to the logical order in the communication address table of the main body):

DI Sequence:

AXM-IO11:	DI1-6
AXM-IO21:	DI7-10
AXM-IO31:	DI11-14
AXM-IO12 (if AXM-IO1 (2) is used):	DI15-20
AXM-IO22 (if AXM-IO2 (2) is used):	DI21-24
AXM-IO32 (if AXM-IO3 (2) is used):	DI25-28

RO Sequence:

AXM-IO11:	RO1-2
AXM-IO31:	RO3-4
AXM-IO12 (if AXM-IO1 (2)is used):	RO5-6
AXM-IO32 (if AXM-IO3 (2) is used):	RO7-8

DO Sequence:

AXM-IO21:	DO1-2
AXM-IO22 (if AXM-IO2 (2)is used):	DO3-4

AO Sequence:

AXM-IO21:	AO1-2
AXM-IO22 (if AXM-IO2 (2) is used:	AO3-4

AI Sequence:

AXM-IO31:	AI1-2
AXM-IO32 (if AXM-IO3 (2) is used):	AI3-4

Wiring of digital input circuit:
There are 6 digital input circuits, 4 digital input circuits and 4 digital input circuits in AXM-IO1, AXM-IO2 and AXM-IO3 modules respectively. The digital input circuit can be used to detect remote signals, or be used as a counter of input pulses.

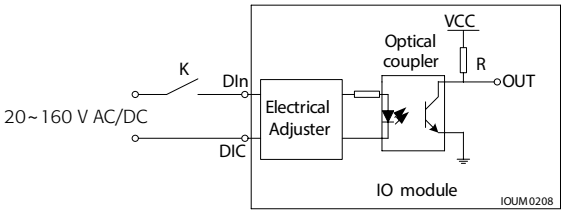


Figure 2-6 schematic diagram of digital input circuit

The circuit drawing of the digital input is simplified as figure 2-6. When K is switched off, OUT is in high state. When K is switched on, OUT is in low state.

Auxiliary power supply for the digital input is 20~160 V AC/DC. The max current in the loop line is 2 mA.

The wire of the digital input should be chosen between AWG22~16 or 0.5~ 1.3 mm^2.

Wiring of relay output circuit:
There are 2 relay output circuits in AXM-IO1 and AXM-IO3 modules respectively. The relay output circuit can work in controlling state or in alarm state. In controlling state, it has two optional output modes, latching mode and pulse mode. In alarm state, it only has one latching output mode.

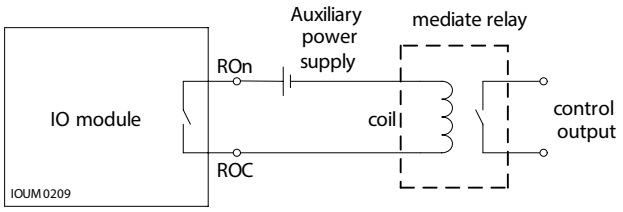


Figure 2-7 schematic diagram of relay output circuit

Relay type is mechanical Form A contact with 3A/250V AC or 3A/30V DC. A mediate relay is recommended in the output circuit as in figure 2-7. The wire of relay output should be chosen between AWG22~16 or 0.5~1.3 mm^2.

Wiring of digital output circuit:
There are 2 digital output circuits in AXM-IO2 module. The digital output circuit can work in alarm state, or work in energy pulse output state. Digital output circuit form is Photo-MOS. The simplified circuit is as figure 2-8.

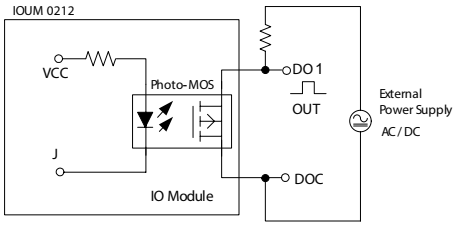


Figure 2-8 schematic diagram of digital output circuit 1

When J is in low state in figure 2-8, OUT is in low state. When J is in high state, OUT is in high state too. So OUT can output pulse signals under the control of J.
The max output voltage and current of digital output circuit are 250V and 100 mA respectively.

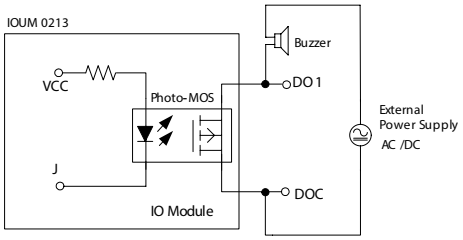
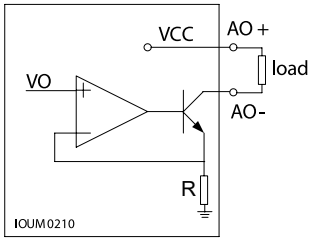


Figure 2-9 schematic diagram of digital output circuit 2

Another drawing of the alarming output with beeper is as figure 2-9.

The wire of digital output circuit should be chosen between AWG22~16 or 0.5~1.3 mm^2.

Wiring of analogue output circuit:
There are 2 analogue output circuits in AXM-IO2 modules. The terminals of the analogue output circuits are AO1+, AO1- and AO2+, AO2-. The analogue output circuit can convert anyone of 30 electrical quantities, which is selected by user. The analogue output circuit supplies 2 output modes, 0 to 20 mA mode and 4 to 20 mA mode.



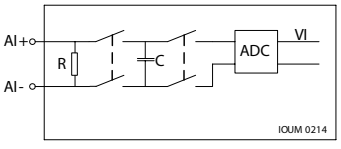
Current analog output

Figure 2-10 schematic diagram of analogue output circuit

The simplified circuit is as figure 2-10.

The load capability of analogue output circuit:
0 to 20mA mode: the max load resistance is 500Ω.
4 to 20mA mode: the max load resistance is 500Ω.

Wiring of analogue input circuit:
There are 2 analogue input circuits in AXM-IO3 modules. The terminals of analogue input circuit are AI1+, AI1- and AI2+, AI2-. The analogue input circuit supplies 2 input modes, 0 to 20 mA mode and 4 to 20 mA mode.



Current analog input

Figure 2-11 schematic diagram of analogue input circuit

The simplified circuit is as figure 2-11.

24V isolated power supply:
For the convenience of the factory field used, there is a DI auxiliary power supply provided in AXM-IO1 module. The voltage of the DI auxiliary power supply is 24V DC (1W). This power supply can not be used for other purpose.

Figure 3-1 shows the function of I/O modules, which is shown in the utility software as follows, where AXM-IO12 (AXM-IO1 (2) is used), AXM-IO22 (AXM-IO2(2) is used) and AXM-IO32 (AXM-IO3 (2) is used) are have been mounted on the MIC-2 MKII.

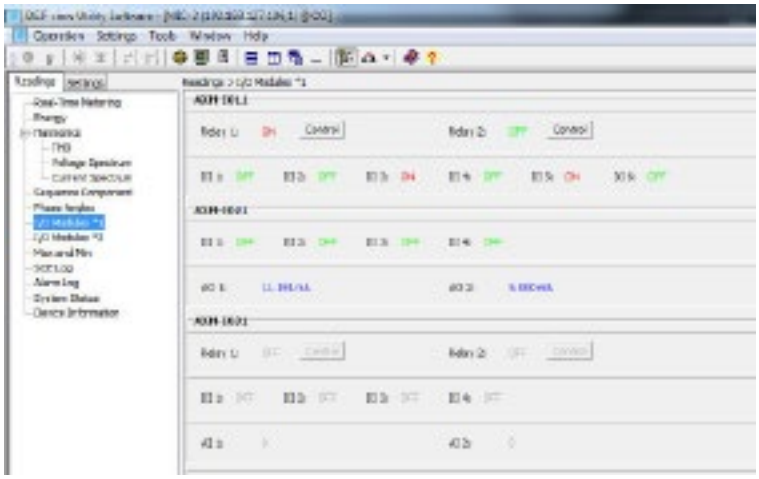


Figure 3-1 functions of I/O modules

3.1 Detection of remote signals

The digital input circuit can be set to detect remote signals.

1. Detection of remote signals

   When digital input circuit detects a qualified voltage input, it will show “1” on the screen and “ON” in utility software. Otherwise, it will show “0” on screen and “OFF” in utility software.

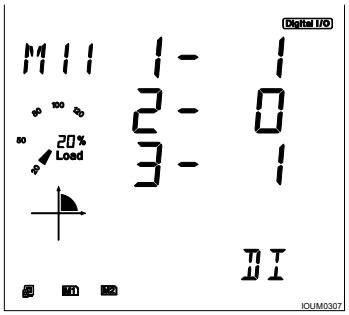


Figure 3-2 showing DI state on screen

2. Record of SOE

   When digital input circuit is set to detect remote signals, function of record of SOE can be enabled. So when the remote signals change, I/O module can record changing information, such as the time and the change.

   SOE Record: including “4399H to 4439H” address registers. “4399H to 4438H” address registers record 20 groups of SOE records. “4439H” records the I/O module which generates the SOE records. For example, if register “4439H” is 1, the 20 groups of SOE records are all generated by AXM-IO11.

   The 20 groups of SOE records are arranged based on time. When more than 20 groups of SOE records are generated, the records will begin at the first one.

   When the MIC-2 MKII is powered on, the SOE records will begin at the first one. The data of SOE records will not be lost during power off. When the I/O module, in which the SOE function is enabled, is changed, the SOE records will be lost.

All groups of SOE records have the same data style. Take the first group of SOE records for example, “4399H to 439fH” registers record the time information, including year, month, day, hour, minute, second and millisecond. “43a0H” register records the state information, which is an unsigned integer, where bit 0 records DI1 state, bit 1 records DI2 state, and so on. For example, if “43a0H” is “1”, it means that DI1 is “1”, and others are all “0”.

Note: If one of digital input circuits is set to be counter of pulses when the I/O module is SOE enabled, then the counterpart bit of “43a0H” register will always be “0”.

Data of SOE records can only be read by the utility software, it can not be read on screen.

Figure 3-3 shows the data information of SOE records of AXM-IO12 (AXM-IO1 (2) is used) read by the utility software.

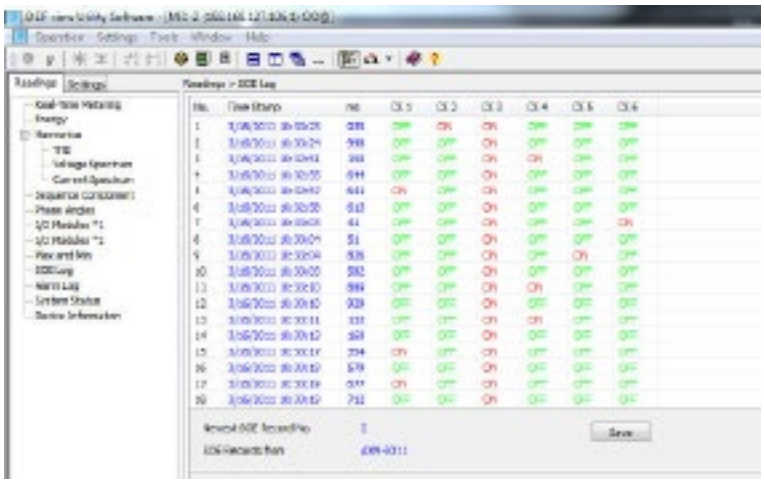


Figure 3-3 data information of SOE records read by the utility software

3. Parameter setting of detection of remote signals
Take parameter setting of AXM-IO11 for example.

“109eH” register: this register is an unsigned integer, where bit0 determines DI1’s working mode, bit1 determines DI2’s working mode, and so on. If the bit is “1”, then the DI circuit is set to be counter of pulses. Otherwise, the DI circuit is set to detect remote signals. Figure 3-13 shows the parameter setting of digital input circuits.

“101bH” register: this register is an unsigned integer, it determines that which IO module will be SOE enabled.

If register is “0”, then any IO module is SOE disabled.
If register is “1”, then AXM-IO11 is SOE enabled.
If register is “2”, then AXM-IO21 is SOE enabled.
If register is “3”, then AXM-IO31 is SOE enabled.
If register is “4”, then AXM-IO12 (AXM-IO1 (2) is used) is SOE enabled.
If register is “5”, then AXM-IO22 (AXM-IO2 (2) is used) is SOE enabled.
If register is “6”, then AXM-IO32 (AXM-IO3 (2) is used) is SOE enabled.

Only one I/O module can be SOE enabled at one time. If the I/O module is not linked to MIC-2 MKII power meter, then it is meaningless to enable this I/O module’s SOE function.

Figure 3-4 shows the parameters setting of I/O module’s SOE function.

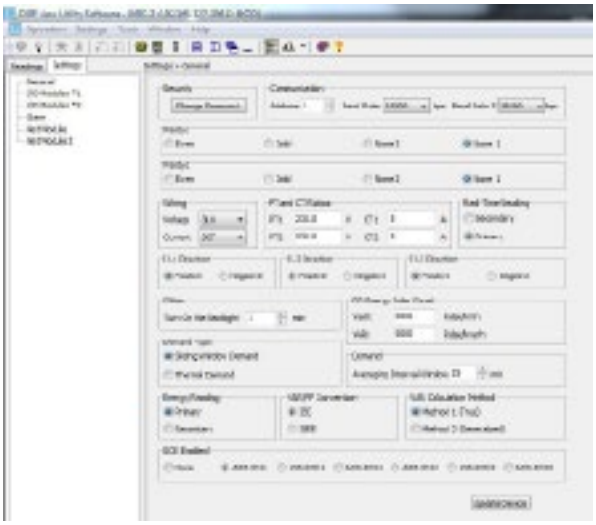


Figure 3-4 parameters setting of I/O module’s SOE function

The digital input circuit can also be set to be counter of pulses.

Recorded number of pulses: including “4349H to 4380H” address registers. “4349H to 4380H” registers record 28 groups of number of pulses, including 6 groups of records for AXM-IO11, 4 groups of records for AXM-IO21, 4 groups of records for AXM-IO31, 6 groups of records for AXM-IO12 (AXM-IO1 (2) is used), 4 groups of records for AXM-IO22 (AXM-IO2 (2) is used) and 4 groups of records for AXM-IO32 (AXM-IO3 (2) is used) in sequence. One group of records is an unsigned long integer, for example, “4349H to 434aH” registers record the number of pulses for DI1 circuit of AXM-IO11.

Figure 3-5 shows the recorded number of pulses read on screen.

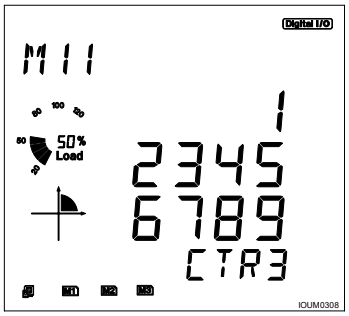


Figure 3-5 recorded number of pulses read on the screen

Figure 3-6 recorded number of pulses read by the utility software

Figure 3-6 shows the recorded number of pulses read by the utility software.

Parameter setting of counting of input pulses:

Take AXM-IO11 for example.

1. “109eH” register: if the bit is set as “1”, the counterpart digital input circuit is set to be a counter of input pulses.
2. “109fH” register: this register is an unsigned integer. If this register is A, and the digital input circuit is set to be a counter of pulses, then the real number of pulses counted by this DI circuit will be as follow:

   real number of pulses = A × recorded number of pulses.

   For example, if A=20, the recorded number of pulses counted by DI1 circuit of AXM-IO11 is 100 (4349H to 434aH registers), then the real number of pulses is 20×100=2000.

The parameter setting is shown in figure 3-13.

Relays in I/O modules can work in two different modes, one is controlling mode, and the other is alarm mode. For controlling mode, relays can be switched on and off directly. For alarm mode, action of relays is controlled by whether the alarm is occurred or not.
There are two mode selections for relay output, one is latching, and the other is pulse. For the latching mode, the relay can be used to output two statues on or off. For the pulse mode, the output of the relay changes from off to on for a period time 'Ton' and then goes off. 'Ton' can be set from 50 to 3000ms.
Note: when relay is working in alarm mode, the default output mode is latching mode.

1. Display of relay state
If relay state is "ON", it means that relay is switched on. If relay state is "OFF", it means that relay is switched off.
Figure 3-7 shows the states of relays read on screen.
Figure 3-1 shows the states of relays read by the utility software.

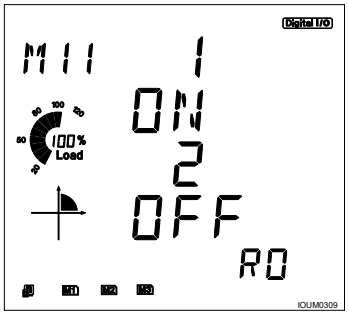


Figure 3-7 states of relays read on screen

2. Parameter setting
Take AXM-IO11 for example.

"RO working mode (10a0H)" register: this register determines the working mode of relays. If the register is "0", then RO1 and RO2 will work in controlling mode. If the register is "1", then RO1 and RO2 will work in alarm mode.

"RO output mode (10a1H)" register: this register determines the output mode of relays. If the register is "0", then RO1 and RO2 will work in latching output mode. If the register is "1", then RO1 and RO2 will work in pulse output mode.

"RO pulse width (10a2H)" register: when the relays are working in pulse mode, this register determines the period of time 'Ton' which can be set from 50 to 3000 ms. For example, if this register is "100", the relay (RO1 or RO2) will be switched on for 100ms after receiving ON instruction and then be switched off.

The parameter setting is shown in figure 3-13.

There are two mode selections for digital output circuit, one is alarm mode, and the other is energy output mode. For alarm mode, action of digital output circuit is controlled by whether the alarm is occurred or not. For energy output mode, digital output circuits can output various types of energy, such as import active energy, export active energy, import reactive energy and export reactive energy. When outputting energy pulses, pulse width can be set from 20 to 1000 ms. The minimum interval between two pulses is 20 ms. The DO Energy Pulse Constant (DOEPC) is a number from 1 to 60000 pulses/kWh. (secondary side of MIC-2 MKII). See calculations between primary and secondary at the ending of this chapter 3.4 Digital output.

Parameter Setting:
Take AXM-IO21 for example.

“DO working mode (10a5H)” register: this register determines the working mode of DO circuits. If the register is “0”, then DO1 and DO2 will work in energy output mode. If the register is “1”, then DO1 and DO2 will work in alarm mode.

“DO pulse width (10a6H)” register: when DO circuits work in energy output mode, this register determines the width of energy pulses.

“DO1 output type (10a7H)” register: when DO circuits work in energy output mode, this register determines the energy output type for DO1. If this register is “0”, DO1 outputs nothing. If this register is “1”, DO1 outputs import active energy. If this register is “2”, DO1 outputs export active energy. If this register is “3”, DO1 outputs import reactive energy. If this register is “4”, DO1 outputs export reactive energy.

“DO2 output type (10a8H)” register: when DO circuits work in energy output mode, this register determines the energy output type for DO2. The value of this register is defined as the same as “DO1 output type” register.

“DO1 output type” register and “DO2 output type” register can be set to the same value or not.

The parameter setting is shown in figure 3-13.

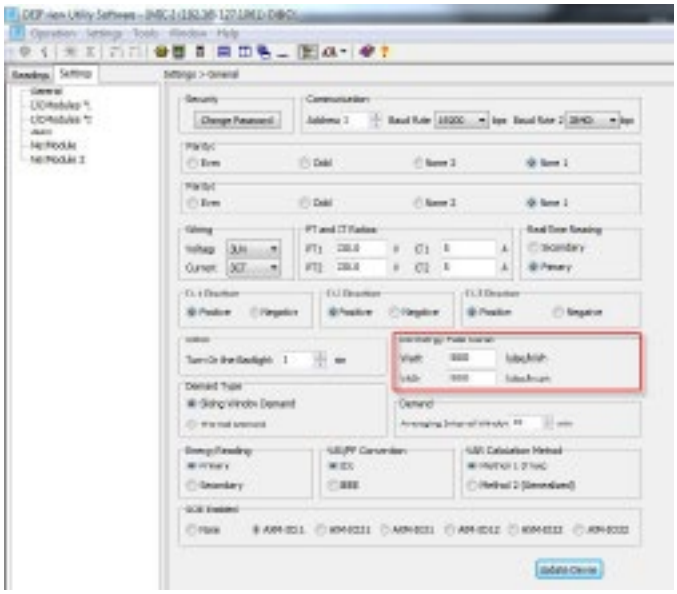


Figure 3-8 parameter setting of DO energy pulse constant

The DO Energy Pulse Constant refers to the numbers of pulses given on an amount of consumed energy (pulses/kWh). This consumed energy is the secondary energy which runs through the meter. This describes how to convert the pulses to pulses/kWh (primary energy):

E.g. DO Energy Pulse Constant (DOEPC) = 800; this means that you will have 800 pulses/kWh, namely, one pulse is 1/800 kWh (secondary side). The primary side pulse ratio; the DOEPC has to be multiplied with the PT and CT ratio.

E.g. PT1/PT2 = 230/230 = 1, CT1/CT2 = 150/5 = 30, one pulse will be 1/800 kWh * 1 * 30 = 30/800 = 0.0375 kWh => 26.67 pulses/kWh (primary side).

The same calculation with a DOEPC at 6000 will give 200 pulses/kWh (primary side).
In this example, a pulse setting range from 26.67-200 pulses/kWh (primary side) is possible.
This calculation is easily done by “Calculate Pulse Constant” tools located under “Tools”.

1. Analogue output relationship with electrical quantities

The analogue output circuit can convert anyone of 30 electrical quantities (frequency, volt, current, watt, var, VA, PF ect.) (see 5.3.5 “AO transforming parameter settings” in “INSTALLATION INSTRUCTIONS AND REFERENCE HANDBOOK”), or by DEIF View “Raw Channel of AO”, to analogue voltage or current.

The analogue output circuit supplies 4 output modes, including 0 to 20 mA mode, 4 to 20 mA mode, 0 to 5 V mode and 1 to 5 V mode.

Figure 3-8 shows the relationship between analogue output and various electrical quantities.

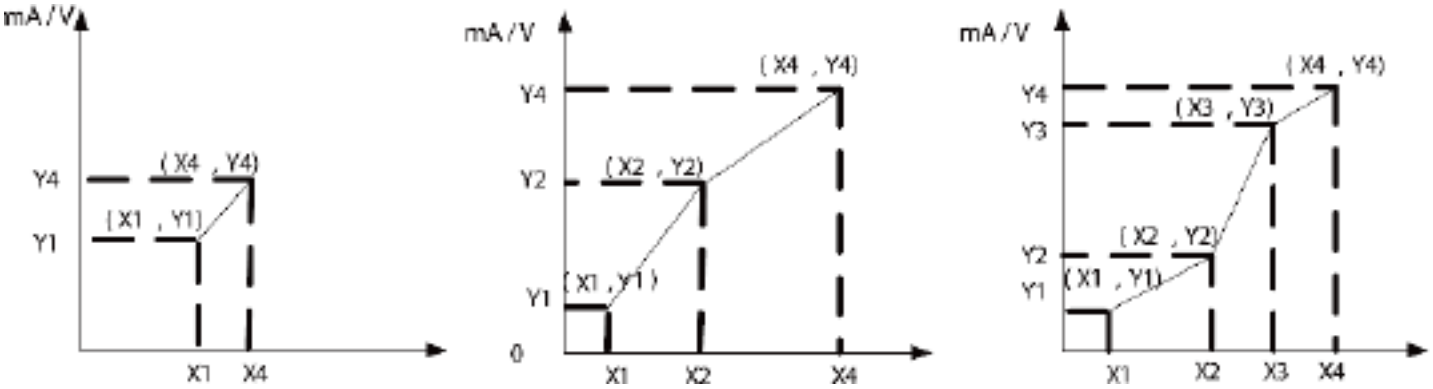


Fig 3-8 Relationship between analogue output and various electrical quantities

Note: The following part introduces how the AO function works.

Addresses about AO function are from 10D0H to 10F3H (see table below), which include three groups of parameters, such as Gradient Number, AO following value range, AO output range.

1) AO Gradient Number Selection of input/output transfer curve

When the number is 1, which includes (X1, Y1) and (X4, Y4), only AO following value range setting start point, AO following value range setting end point, AO1 output range setting start point and AO1 output range setting end point should be set.

When the number is 2, which includes (X1, Y1), (X2, Y2) and (X4, Y4), only AO following value range setting start point, AO1 following value range setting point 2, AO following value range setting end point, AO1 output range setting start point , AO1 output range setting point 2 and AO1 output range setting end point should be set.

When the number is 3, which includes (X1, Y1), (X2, Y2) , (X3, Y3) and (X4, Y4), only AO following value range setting start point, AO1 following value range setting point 2, AO1 following value range setting point 3 and AO following value range setting end point should be set. At the same time, AO1 output range setting start point, AO1 output range setting point 2, AO1 output range setting point 3 and AO1 output range setting end point should be set.

2) Following value range setting:

AO following value range setting start point (X1), AO1 following value range setting point 2 (X2), AO1 following value range setting point 3 (X3) and AO following value range setting end point (X4) are increasing values and should be within range of AO following value. Otherwise, the function of AO will be affected.

Frequency: 45 HZ~65 HZ, real setting value is 4500~6500.

Phase voltage V1, V2, V3 and average phase voltage: 0~480 V, real setting value is 0~4800.

Line voltage V12, V23, V31 and average line voltage: 0~831 V, real setting value is 0~8310.

Current I1, I2, I3 and average current: 0~10 A, real setting value is 0~10000.

Power Pa, Pb and Pc: -4800~4800 W, real setting value is -4800~4800

System power: -14400~14400 W, real setting value is -14400~14400.

Reactive power Qa, Qb and Qc: -4800~4800 var, real setting value is -4800~4800.

System reactive power: -14400~14400 var.

Apparent power Sa, Sb and Sc: 0~4800 VA, real setting value is 0~4800.

System apparent power: 0~14400 VA, real setting value is 0~14400.

Power factor PFa, PFb, PFc and system power factor: -1~1, real setting value is -1000~1000.

3) AO output range setting:

AO output value range setting start point (Y1), AO1 output value range setting point 2 (Y2), AO1 output value range setting point 3 (Y3) and AO output value range setting end point (Y4) are increasing values and should be within range of AO output value.

When AO type is 0~20 mA, the corresponding range is 0~24 mA, the setting value range is 0~ 4915,
and the relationship is mA = setting value*20/4096.

When AO type is 4~20 mA, the corresponding range is 4~24 mA, the setting value range is 819~ 4915,
and the relationship is mA = setting value*20/4096.

When AO type is 0~5 V, the corresponding range is 0~6 V, the setting value range is 0~ 4915,
and the relationship is V = setting value*5/4096.

When AO type is 1~5 V, the corresponding range is 1~6 V, the setting value range is 819~ 4915,
and the relationship is V = setting value*5/4096.

Please note:

a> If the voltage input wiring of the meter is 2LL or 3LL, then the analogue outputs relative to phase voltage, neutral current, phase active/reactive/apparent power and phase power factor will always be 0.

b> The maximum of analogue output is 1.2 times the range.

Address	Parameter	Relationship	Range	Datatype	Property
10a9H	Raw Channel of AO1 AO2		0: 0~20 mA, 1: 4~20 mA, 2: 0~5 V, 3: 1~5 V	Word	R/W
10bbH	Raw Channel of AO3 AO4		0: 0~20 mA, 1: 4~20 mA, 2: 0~5 V, 3: 1~5 V	Word	R/W
10d0H	Gradient Number AO 1		1: 1 slope 2: 2 slopes 3: 3 slopes	Word	R/W
10d1H	Input X1	=(Rx/1000) × (CT1/CT2)	0~10000	Word	R/W
10d2H	Input X2	=(Rx/1000) × (CT1/CT2)	0~10000	Word	R/W
10d3H	Input X3	=(Rx/1000) × (CT1/CT2)	0~10000	Word	R/W
10d4H	Input X4	=(Rx/1000) × (CT1/CT2)	0~10000	Word	R/W
10d5H	Output Y1	=(Rx/4096) × 10a9H	0~10000	Word	R/W
10d6H	Output Y2	=(Rx/4096) × 10a9H	0~10000	Word	R/W
10d7H	Output Y3	=(Rx/4096) × 10a9H	0~10000	Word	R/W
10d8H	Output Y4	=(Rx/4096) × 10a9H	0~10000	Word	R/W
10d9H	Gradient Number AO 2		1: 1 slope 2: 2 slopes 3: 3 slopes	Word	R/W
10daH	Input X1	=(Rx/1000) × (CT1/CT2)	-14400~14400	Word	R/W
10dbH	Input X2	=(Rx/1000) × (CT1/CT2)	-14400~14400	Word	R/W
10dcH	Input X3	=(Rx/1000) × (CT1/CT2)	-14400~14400	Word	R/W
10ddH	Input X4	=(Rx/1000) × (CT1/CT2)	-14400~14400	Word	R/W
10deH	Output Y1	=(Rx/4096) × 10a9H	0~10000	Word	R/W
10dfH	Output Y2	=(Rx/4096) × 10a9H	0~10000	Word	R/W
10e0H	Output Y3	=(Rx/4096) × 10a9H	0~10000	Word	R/W
10e1H	Output Y4	=(Rx/4096) × 10a9H	0~10000	Word	R/W
10e2H	Gradient Number AO 3		1: 1 slope 2: 2 slopes 3: 3 slopes	Word	R/W
10e3H	Input X1	=(Rx/1000) × (CT1/CT2)	-14400~14400	Word	R/W
10e4H	Input X2	=(Rx/1000) × (CT1/CT2)	-14400~14400	Word	R/W
10e5H	Input X3	=(Rx/1000) × (CT1/CT2)	-14400~14400	Word	R/W
10e6H	Input X4	=(Rx/1000) × (CT1/CT2)	-14400~14400	Word	R/W
10e7H	Output Y1	=(Rx/4096) × 10bbH	0~10000	Word	R/W
10e8H	Output Y2	=(Rx/4096) × 10bbH	0~10000	Word	R/W
10e9H	Output Y3	=(Rx/4096) × 10bbH	0~10000	Word	R/W
10eaH	Output Y4	=(Rx/4096) × 10bbH	0~10000	Word	R/W
10ebH	Gradient Number AO 4		1: 1 slope 2: 2 slopes 3: 3 slopes	Word	R/W
10ecH	Input X1	=(Rx/1000) × (CT1/CT2)	-14400~14400	Word	R/W
10edH	Input X2	=(Rx/1000) × (CT1/CT2)	-14400~14400	Word	R/W
10eeH	Input X3	=(Rx/1000) × (CT1/CT2)	-14400~14400	Word	R/W
10efH	Input X4	=(Rx/1000) × (CT1/CT2)	-14400~14400	Word	R/W
10f0H	Output Y1	=(Rx/4096) × 10bbH	0~10000	Word	R/W
10f1H	Output Y2	=(Rx/4096) × 10bbH	0~10000	Word	R/W
10f2H	Output Y3	=(Rx/4096) × 10bbH	0~10000	Word	R/W
10f3H	Output Y4	=(Rx/4096) × 10bbH	0~10000	Word	R/W

Example:

Wanted: Dual slope function, regulated output from 4 to 6 mA in the span 0 to 500 A, and regulating 6 to 20 mA in the span of 500 to 1000 A (real value). The CT ration is 100/1 and can be set under “General” in the DEIF View.

Select current (A) in Raw Channel and 4 – 20 mA as type. (See figure 3.9)

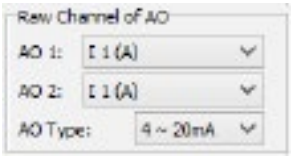


Figure 3.9

Select Dual Slope. Setup Input Range 0…500...1000 and Output Range 4...6…20 as shown in figure 3.10.

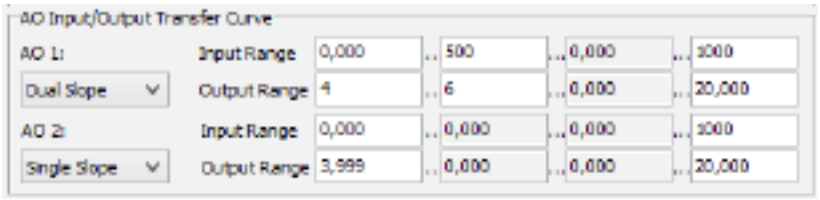


Figure 3.10

The relationship between analogue output (Y-axis) and current measurement (X-axis) would be as shown on figure 3.11.

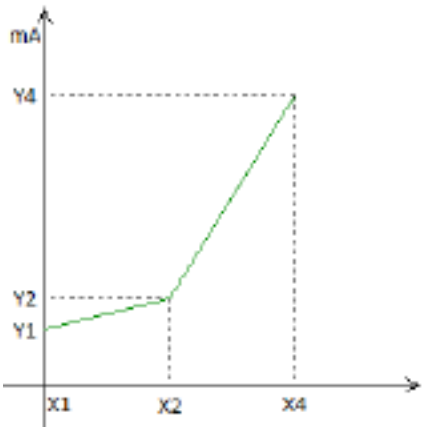


Figure 3.11

2. Display of analogue output

The value of analogue output is displayed in hex on the screen. The relationship between displayed value and real value of analogue output is:

$$\text{Real value} = \frac{\text{Displayed Value}}{4096} \times 20\ \text{mA (current output mode)}$$

or

$$\text{Real value} = \frac{\text{Displayed Value}}{4096} \times 5\ \text{V (voltage output mode)}$$

As shown in Figure 3-12, the displayed value of AO1 is 0 × 0800, so the real value of AO1 is (0 × 0800/4096) × 5 V or (0 × 800/4096) × 20 mA.

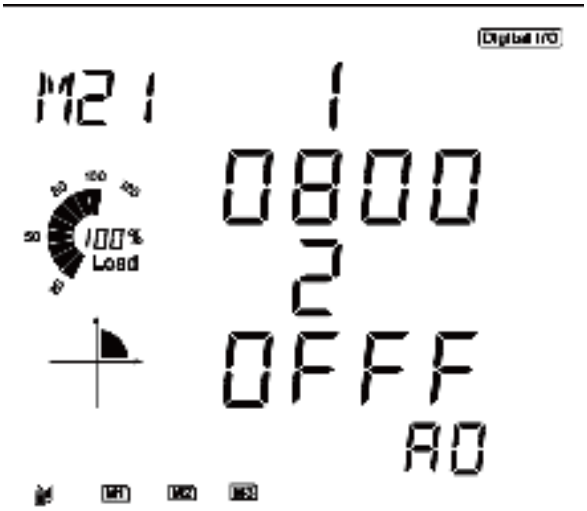


Fig 3-12 AO value read on screen

3. Parameter Setting

Take AXM-IO21 (AXM-IO2 module in logic NO.1) for example.

“Electrical quantities relative to AO1 (10c2H)” register: this register determines which electrical quantity AO1 should be relative to. For example, if this register is “0”, then AO1 is relative to “Frequency” (see tables below).

“Electrical quantities relative to AO2 (10c3H)” register: this register determines which electrical quantity AO2 should be relative to. The value of this register is defined as the same as “Electrical quantities relative to AO1 (10c2H)” register.

“Electrical quantities relative to AO1 (10c2H)” register and “Electrical quantities relative to AO2 (10c3H)” register can be set to the same value.

AO transforming select

Address	Parameter	Default	Range	Data type	Property
10c2H	AO1 transforming parameter	0	Refer to following table	word	R/W
10c3H	AO2 transforming parameter	0	Refer to following table	word	R/W
10c4H	AO3 transforming parameter	0	Refer to following table	word	R/W
10c5H	AO4 transforming parameter	0	Refer to following table	word	R/W

AO transforming parameter settings

Setting value	Transforming object	Setting value	Transforming object	Setting value	Transforming object
0	Frequency	1	V1	2	V2
3	V3	4	Average phase voltage	5	V12
6	V23	7	V31	8	Average line voltage
9	Line current of phase L1	10	Line current of phase L2	11	Line current of phase L3
12	Average line current	13	Neutral current	14	Power of phase L1
15	Power of phase L2	16	Power of phase L3	17	Power of all
18	Reactive power of phase L1	19	Reactive power of phase L2	20	Reactive power of phase L3
21	Reactive power of all	22	Apparent power of phase L1	23	Apparent power of phase L2
24	Apparent power of phase L3	25	Apparent power of all	26	PF of L1
27	PF of L2	28	PF of L3	29	PF

The parameter setting from the DEIF View is shown in Figure 3-13

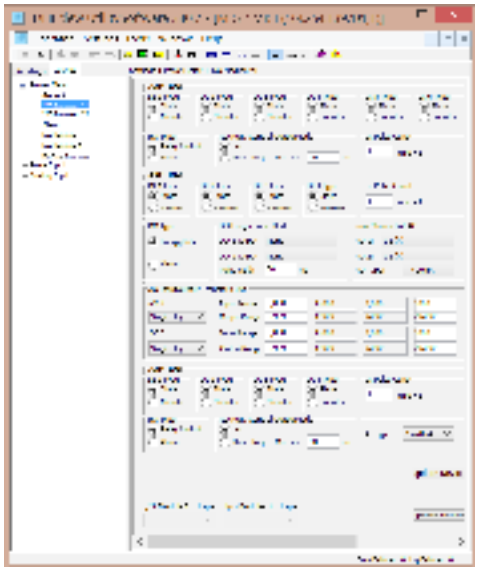


Fig 3-13 Parameter setting from the DEIF View of IO modules

1. Data dispose of analogue input

The analogue input circuits supply 2 types of input modes, including 0 to 20 mA mode and 4 to 20 mA mode.

Figure 3-14 shows the relationship between AI value and input analogue value.

AI value is ranged from 0 to 4095 without any unit. AI value is displayed in hex on screen.

Figure 3-15 shows the AI value read on screen.

Figure 3-1 shows the AI value read by the utility software.

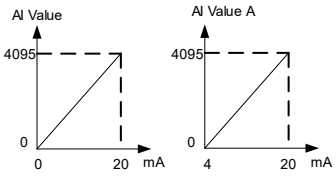


Figure 3-14 relationship between AI value and input analogue value

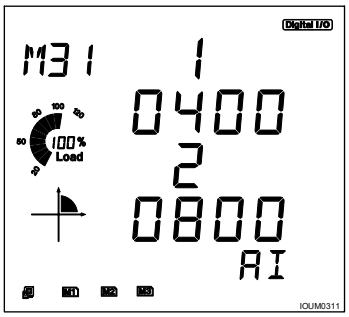


Figure 3-15 AI value read on screen