



Yudian (H.K.) Automation Technology Co. Ltd.

Website: <http://www.yudian.us> <http://www.yudian.com.hk>

Email: sales@yudian.com.hk

Tel: +852-2770 8785 Fax: +852-2770 8796

YUDI'AN Communication Protocol V8.x

- AIBUS
- MODBUS

1. AI instrument read/write parameter code (V8.0 518/518P/708/708P/719/719P)

AIBUS Parameter Code	MODBUS Parameter Code	AI-518/518P	Description
00H	40001	SV (setpoint)	Same unit as PV
01H	40002	HiAL (High limit alarm)	Same unit as PV
02H	40003	LoAL (Low limit alarm)	Same unit as PV
03H	40004	dHAL (High deviation alarm)	Same unit as PV
04H	40005	dLAL (Low deviation alarm)	Same unit as PV
05H	40006	AHYS (Alarm hysteresis)	Same unit as PV
06H	40007	Ctrl (Control mode)	0 , ONOFF ; 1 , APID ; 2 , nPID ; 3 , PoP ; 4 , SoP
07H	40008	P (Proportional band)	Same unit as PV
08H	40009	I (Time of intergral)	Second
09H	40010	d (Time of derivative)	0.1 second
0AH	40011	Ctl (Control Period)	0.1 second
0BH	40012	InP (Input Spec.)	Refer to manual
0CH	40013	dPt (Decimal point)	0 -> 0, 1 -> 0.0, 2 -> 0.00, 3 -> 0.000. If the return value is larger than +128, it implies that all PV and parameter using the same unit (including temperature and linear signal) have to be divided by 10 and round off to display. E.g. when dPt=128+1=129 , the 16-bit return PV and related parameters is 1000 , the actual display should be 100.0. If dPt=1 , the actual display should be 100.0 ; This parameter is writable but it is no need to add 128. The range is 0~3.
0DH	40014	ScL (Signal scale low limit)	Same unit as PV
0EH	40015	ScH(Signal scale high limit)	Same unit as PV
0FH	40016	ALP (Alarm allocation)	Refer to manual
10H	40017	Sc (Input shift adjustment)	Same unit as PV
11H	40018	oP1 (Main output type)	0 , SSR ; 1 , rELy ; 2 , 0-20 ; 3 , 4-20

12H	40019	OPL (Output low limit)	%
13H	40020	OPH (Output high limit)	%
14H	40021	CF (Advance function)	Refer to manual
15H	40022	Instrument mode identity	5180(AI-518) or 5187 (AI-518P)
16H	40023	Addr (Communication Address)	
17H	40024	FILt (PV input filter)	
18H**	40025	AMAn (Auto/manual selection)	0 , MAN ; 1 , Auto ; 2 , FMAAn ; 3 , FAut
19H	40026	Loc (Parameter Lock)	
1AH**	40027	MV (Manual output valve)	
1BH	40028	Srun (Running Status)	0 , run ; 1 , StoP ; 2 , HoLd
1CH	40029	CHYS (Control Hysteresis)	Same unit as PV
1DH	40030	At (Auto-tuning)	0 , OFF ; 1 , on ; 2 ; FoFF
1EH	40031	SPL (Low limit of SV)	Same unit as PV
1FH	40032	SPH (High limit of SV)	Same unit as PV
20H	40033	Fru (Power frequency and temperature scale)	0 , 50C ; 1 , 50F ; 2 , 60C ; 3 , 60F
21H	40034	OHEF OPH (Work range of OPH)	Same unit as PV
22H	40035	Act (Acting method)	0 , rE ; 1 , dr ; 2 , rEbA ; 3 , drbA
23H	40036	AdIS (Alarm display)	0 , OFF ; 1 , on
24H	40037	Aut (Auxiliary output type)	0 , SSR ; 1 , rELy ; 2 , 0-20 ; 3 , 4-20
25H	40038	P2 (Second proportional band)	Same unit as PV
26H	40039	I2 (Second time of integral)	Second

27H	40040	d2 (Second time of derivative)	0.1 second
28H	40041	Ctl2 (Second control period)	0.1 second
29H	40042	Et (Event input type)	0 , nonE ; 1 , ruSt ; 2 , SP1.2 ; 3 , Pld2
2AH***	40043	SPr (Ramp Slope limit)	Unit of PV/minute (required process of unit)
2BH*	40044	Pno (No. of program step)	Integer
2CH*	40045	PonP (Program run mode after power restart)	0 , Cont ; 1 , StoP ; 2 , run1 ; 3 , dASt ; 4 , HoLd
2DH*	40046	PAF (Program running mode)	Refer to manual
2EH*	40047	STEP (Program step no)	Integer
2FH*	40048	Time of program already run	0.1 minute or 0.1 hour, depending on PAF parameter
30H*	40049	Event output status	0 , No event output ; 1 , Event 1 (AL1) activated ; 2 , AL2 activtated ; 3 , AL1 and AL2 activated
31H**	40050	OPrt (Time of soft start)	
32H**	40051	Strt (Valve rotating time)	Define valve rotating time required
33H**	40052	SPSL (Low limit of external setpoint)	When external setpoint is used as valve feedback signal, set the valve position to 1.
34H**	40053	SPSH (High limit of external setpoint)	When external setpoint is used as valve feedback signal, set the valve position to 2.
35H**	40054	Ero (Error output)	Define the output valve of controller when there is a sensor input error or out of range
36H**	40055	AF2	Advance function 2
37H~3FH	40056~ 40064	Reserved	
40H~47H	40065~ 40072	EP1~EP8	
48H**	40073	Valve position (read only)	Value 0~25600 proportional to 0~100% , return data divided by 256 will be the percentage
49H~4FH	40074~	Reserved	

	40080		
50H~51H	40081~ 40082	SP 1、 t 1	SP1 refers to setpoint 1 , t1 refer to first program step
52H~	40083~	SP2 ~ Program step data , quantity is defined by parameter Pno	

Remark

- Parameters with * are exclusive for AI-518P/708P/719P. They are invalid for AI-518/708/719. Parameters with ** are exclusive for AI-719. Parameters with *** are exclusive for AI-518P/708P/719/ 719P.
- If the requesting parameter code is out of the table (invalid code or reserved code), the instrument will return the high value 127. (Integer is 32512~32767 , since the maximum value of parameters among AI-series instruments is 32000 , parameter larger than 32512 is known as invalid) This will be processed by the computer. If the parameter code is larger than the last value (0B4H) of the effective program segment, the instrument will not response as the same as transmission error.
- When the instrument which has manual adjust function is in manual mode, the output value can be adjusted by writing to parameter 1AH.
- 15H refers to instrument model identity:

	Instrument model identity
AI-518(V8.0) Artificial intelligent temperature controller	5180
AI-518P(V8.0) Programmable artificial intelligent temperature controller	5187
AI-708(V8.0) High precision artificial intelligent temperature controller	7080
AI-708P(V8.0) High precision programmable artificial intelligent temperature controller	7087
AI-719(V8.0)	7190

High precision artificial intelligent temperature controller/regulator	
AI-719P(V8.0) High precision programmable artificial intelligent temperature controller/regulator	7197
AI-702M/704M/706M	768
AI-708H/808H Flow channel	256 (Usual accumulation mode) ; 257 (Batch control mode)
AI-808H (Temperature and pressure channel)	258
AI-301M	512
AI-7048 (4-channel PID controller)	7048

The computer should have different process mode to different model of instrument.

2. MODBUS Compatible Command

Since instrument firmware version V8.2, AI-series instruments have been added MODBUS support. The instrument support two command in MODBUS protocol, thus they are able to communication with more devices including MODBUS devices. To ensure the speed, AI-series instrument use the RTU (binary) mode and BAUD rate must be set at 9600 bit/s. There is no parity check. The two commands which are support are:

- 03H (read/write) data, and
- 06H (write one single parameter).

Read command / 03 command, requesting reading four data in one time:

ADDR + 03H + 0 + <parameter code to read> + 0 + 4 + CRC verification code

The return data is

Addr + 03H + 08H + Hi(PV) + Lo(PV) + Hi(SV) + Lo(SV) + ALM + MV + Hi(Val) + Lo(Val) + Lo(CRC) + Hi(CRC)

* Hi() is high byte, Lo() is low byte and Val is the parameter to be read.

Writing one single parameter:

ADDR + 06H + 0 + <parameter code to write> + <high byte of data to write> + < low byte of data to write > + CRC verification code



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There is limited of MODBUS protocol. It is impossible to return measurement value when using write command. The measurement value will not refresh during write action. Therefore write command should be avoided in order not to slow down the system performance.