ABT DIGITAL INDICATING CONTROLLER

OPERATIONAL INSTRUCTION MANUAL

ABT digital indicating controller Operational Instruction Manual V17.1

Please read through the manual before installment and operation
Please keep the manual for future use

Chapter 1. General introduction

ABT digital display controller can be applied in high-precision measurement, control and alarm of temperature.

The key features include:

★ 18 kinds of input signals including signals of thermocouple, resistance thermometer detector(RTD), direct voltage, direct current can be input freely.

★ Freely changeable with on-off control or PID control with configurable direct reverse action modes. It has the self-tuning function of PID parameter.

★ Control output supports relay contact switch, solid-state relay (SSR) driving voltage, and single-phase thyristor zero-crossing trigger signal, direct voltage, direct current.

★ One way of programmable alarm outputs is provided with a number of alarm modes including higher limit, lower limit. In addition, the alarm feature can also be temporarily disabled when applying the power.

★ Comprehensive self-detection and protection-- In case of error, it provides automatic repair or prompt message and closes the output.

Chapter 2. Product specifications

ABT – □ □ □

- Alarm output :
  - None: with no alarm outputs K: With one channel of relay contact switching output
- Control output:
  - R: relay contact switching output
  - S: Solid-state relay driving voltage output
  - G: Single-phase thyristor zero-crossing trigger signal output
  - U: DC voltage(0-5V, 1-5V)
  - I: DC current(0-10mA, 0-20mA, 4-20mA)
- Panel size code:
  - A: 96X96mm D: 72X72mm E: 48X96mm F: 96X48mm G: 48X48mm
- Digital indicating controller

Chapter 3. Technical Parameters

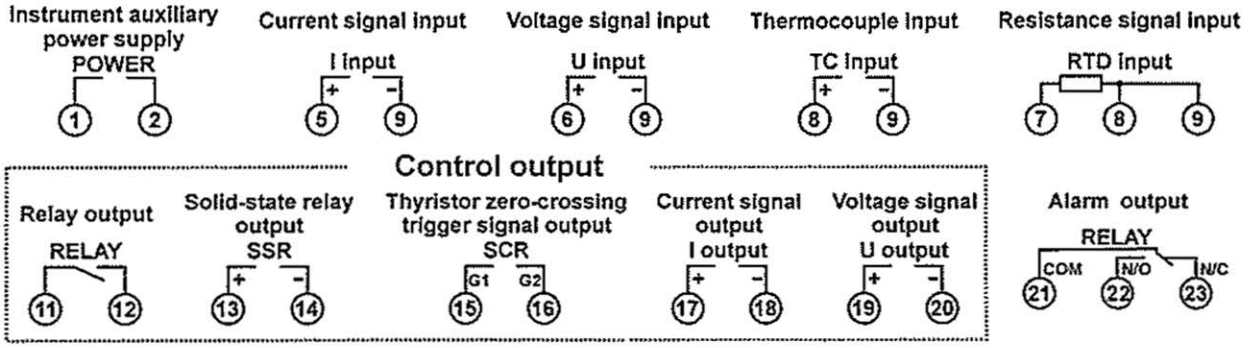
3.1 Input specification and measuring range(changable freely)

Input type	Code	Measuring range	Input type	Code	Measuring range
Thermocouple (TC)	K	-100～+1350°C	Resistance thermometer detector (RTD)	Cu50	-50～+150°C
	S	-50～+1750°C		Pt100	-200～+850°C
	R	-50～+1750°C	DC voltage U	0-5V	Customized range within -1999～+9999
	T	-200～+400°C		1-5V	
	E	-100～+1000°C		0-10V	
	J	-100～+1200°C	DC current I	0-20mA	Customized range within -1999～+9999
	B	600～1800°C		4-20mA	
	N	-100～+1300°C			
	L	-100～+800°C			
	WRe3-WRe25	0～2300°C			
	WRe5-WRe26	0～2300°C			

Serial no.	Parameter code	Parameter name	Setting range	Description
B-level parameters (No. 4 ~ 17)				
4	Sn	Input specification Sn	K S r t E J b n L 3-25 5-26 Cu50 Pt U0-5 U1-5 U:0 0-20 4-20	Sn is used to select input specifications: K index thermocouple (factory default) S index thermocouple R index thermocouple T index thermocouple E index thermocouple J index thermocouple B index thermocouple N index thermocouple L index thermocouple WRe3-WRe25 index thermocouple WRe5-WRe26 index thermocouple Cu50 index thermal resistance Pt100 index thermal resistance 0-5V DC voltage 1-5V DC voltage 0-10V DC voltage 0-20mA DC current 4-20mA DC current
5	dP	Decimal point position dP	0~3	DP=0, the display format is XXXX, with no decimal point; DP=1, the display format is XXX.X, with decimal point at tens place; DP=2, the display format is XX.XX, with decimal point at hundreds place; DP=3, the display format is X.XXX, with decimal point at thousands place; When applying thermocouple or thermal resistance input, DP can only be set as 0 or 1; When DP=0, the temperature display resolution is 1 ℃ (the internal part resolution remaining 0.1 ℃ for control calculation) ; When DP=1, the temperature display resolution is 0.1 ℃ ; Changing the position of the decimal point only affects the display, and it does not affect the accuracy of measurement and control.
6	inPL	Display value of input lower limit inPL	-1999~9999	For defining the corresponding display value of the input signal lower limit when DC voltage or DC current input. It is also the display value corresponding to the minimum value of the SV and AL1 parameters and the transmitting output lower limit.
7	inPH	Display value of input higher limit inPH	-1999~9999	For defining the corresponding display value of the input signal higher limit when DC voltage or DC current input. It is also the display value corresponding to the maximum value of the SV and AL1 parameters and the transmitting output higher limit.
8	Sc	Display value translation correction SC	-1000~1000	SC parameter is used for correction of input to compensate the errors from sensor, input signal or Automatic compensation for thermocouple cold junction. PV(after)=PV(before)+SC(default as 0)
9	SoT	Output specification of DC voltage or DC current output SOT	When DC voltage output: b0-5 b1-5 c0-5 c1-5 When DC current output: b020 b420 c020 c420 c010	Sot is used to select DC voltage or DC current output is for control or for transmission. b0-5 0-5V voltage transmitting output b1-5 1-5V voltage transmitting output c0-5 0-5V voltage control output c1-5 1-5V voltage control output b020 0-20mA current transmitting output b420 4-20mA current transmitting output c020 0-20mA current control output c420 4-20mA current control output c010 0-10mA current control output
10	CtrL	Control mode CtrL	oFF bit.r bit.d Pid.r Pid.d	oFF control is closed. bit.r On-off control, reverse action (used for heating control: factory default) bit.d On-off control, direct action(For refrigeration control) Pid.r PID control, reverse action(used for heating control) Pid.d PID control, direct action(For refrigeration control)

Serial no.	Parameter code	Parameter name	Setting range	Description
11	dFcE	Differential gap of on-off control (DFCT)	0~2000	When it is on-off control, the efforts of DFCT on control output is as following: if the SV setting value is 200, DFCT is set as 0.5, take reverse action as example: 1) when it is on, it will be off when the measuring value≥200.5(SV+DFCT); 2) when it is off, it will be on when the measuring value<199.5(SV-DFCT).
12	AL 1t	Alarm mode AL1t	oFF HJ HJb LJ LJb HP HPb LP LPb HLPb	oFF Alarm is off HJ Higher limit absolute value alarm(default) Hjb Higher limit absolute value alarm(holding when power on) LJ Lower limit absolute value alarm Ljb Lower limit absolute value alarm(holding when power on) HP Higher limit deviation alarm Hpb Higher limit deviation alarm(holding when power on) LP Lower limit deviation alarm Lpb Lower limit deviation alarm(holding when power on) HLPb Higher and lower limit deviation alarm(holding when power on) Higher limit absolute value alarm: When measuring value≥AL1, it will operate the alarm. When measuring value<(AL1-dFAL), it will release the alarm. Lower limit absolute value alarm: When measuring value≤AL1, it will operate the alarm. When measuring value>(AL1+dFAL), it will release the alarm. Higher limit deviation alarm: When measuring value≥(SV+AL1), it will operate the alarm. When measuring value<SV+AL1-dFAL), it will release the alarm. Lower limit deviation alarm: When measuring value≤(SV-AL1), it will operate the alarm. When measuring value>(SV-AL1+dFAL), it will release the alarm. Higher and lower limit deviation alarm: When measuring value≥(SV+AL1) or ≤(SV-AL1), it will operate the alarm. When measuring value<(SV+AL1-dFAL) and >(SV-AL1+dFAL), it will release the alarm. Holding when power on: For a heating control system, the actual temperature may be much lower than SV when power on. In this case, if user has set the lower limit alarm, the alarm conditions are fulfilled at the moment when the power is turned on, whereas the control system has no problem. On the contrary, a higher limit alarm could happen when applying power for cooling control system. The alarm holding enables the instrument to prevent alarm when it is power on. The instrument will not output alarm instantly when the power is turned on, although the alarm condition is fulfilled. After cancelling this alarm condition, the alarm will output if the alarm condition happens again.
13	dFAL	Alarm differential gap dFAL	0~2000	The impact of dFAL on alarm output is shown by the AL1t parameter description.
14	P	Proportional band P	1~9999	The proportional band parameters in the PID regulator are with the same unit with the PV value, not the percentage of the measuring range. It is suggested that the parameters of P, I and D are determined by PID self setting function.
15	I	itegral time i	0~9999s	The integral parameter in the PID regulator is used to eliminate the system statics and to cancel the integral function when setting up the i=0. The smaller the i, the stronger the integration, the easier it is to eliminate the static difference, but it is easy to make the system overshoot.
16	d	Differential time d	0~3200s	The differential parameters in the PID regulator are used to produce an advanced control action to suppress the fluctuation of the system and to cancel the differential action when setting up the d=0. The larger the D, the stronger the differential action, but it is easy to make the system oscillate.
	t	Output cycle		The differentiation parameter of PID regulator, when D=0, it will cancel the differentiation action. t is the control output cycle: 1) when output the solid state relay ,SCR, DC current or

Chapter 7. Terminal description



Explanations:

Auxiliary power supply : POWER

default 220V ±15% 50/60Hz

(please consult us when you need other auxiliary power supply)

Signal input:

TC: Thermocouple Input

RTD: Thermal resistance input

U: direct voltage input

I: direct current input

Control output: OUT

RELAY: normally-open contact output of relay

SSR: Drive voltage output of solid state relay

SCR: Unindirectional SCR zero-crossing trigger signal output

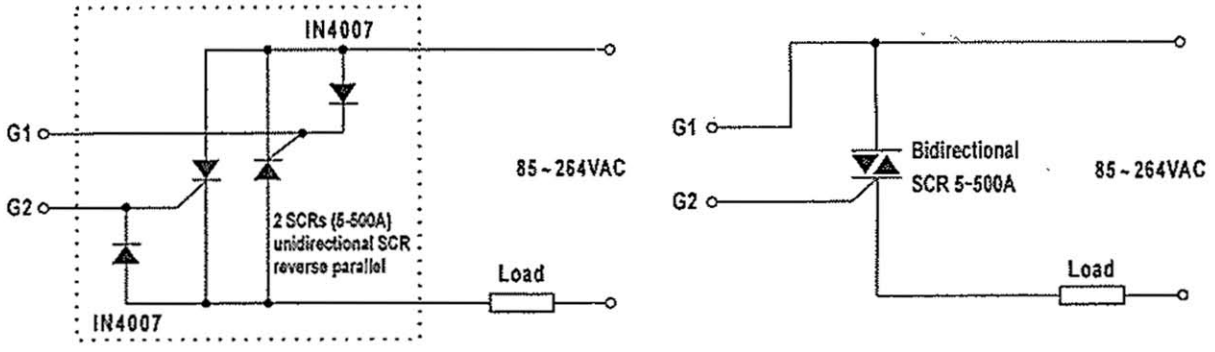
mA: direct current output

V: direct voltage output

Alarm output: ALARM

RELAY: Relay contact switch output(COM, N/O, N/C are respectively common port, normally-open port and normally-closed port)

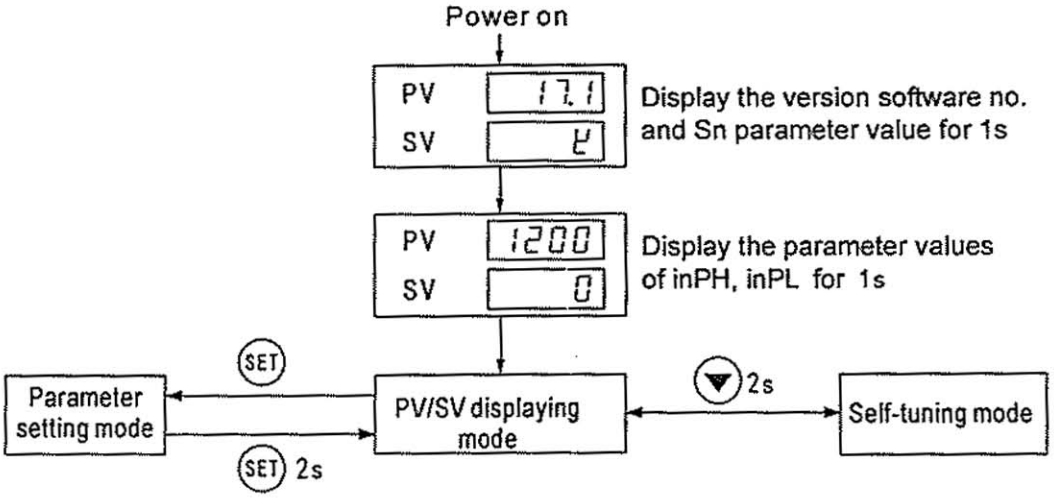
Wiring diagram of SCR trigger output



Chapter 8. Maintenance and repair

1. This instrument uses the automatic zero adjustment and digital calibration technology,no need the calibration and maintenance. If it is error when metrological verification and can not recovery the accuracy after cleaning and drying the instrument. If this instrument is considered as a fault instrument, it should be sent back to the factory for repair.
2. The instrument is guaranteed of 18-month free maintenance after the date when the product leaves the factory. For product damaged by misuse or product with expired warranty, the maintenance will require some charge.

5.2: Display startus



5.3 How to operate

The instrument will automatically enter PV/SV displaying mode 2s after applying power. The PV window shows the measured value and the SV window shows the set value.

5.3.1 Parameter setting mode (see Loc parameter description)

In the PV / SV display mode, press the SET button once, the instrument will enter the parameter setting mode: PV window shows the parameter code, SV window shows the parameter value and the last digit flashes. It can modify the parameter value by◀▲▼.Then press the SET button to confirm the change and switch to the next parameter or press and hold the SET button 2s to confirm the change and return to the PV / SV display mode. The meter will automatically return to PV / SV display mode if no key actions for more than 120s .

5.3.3 Self-tuning mode(available when Ctrl is in PID control mode and LOC=0)

Under PV/SV display mode, it will enter the self-tuning block by pressing "▼" key for 2s. The PV window shows the measured value and the SV window blinks a flashing "AT". On completion of self-tuning, the PID parameters of the instrument will be automatically changed and saved and the instrument will return to PV/SV displaying mode automatically. Press the "▼" key for 2s when the SV screen stops flashing to exit the self-tuning block during self-tuning process.

Chpter 6 Parameter Description

Serial no.	Parameter code	Parameter name	Setting range	Description
A-level parameters (No. 1 ~ 3)				
1	SV	Control setting value SV	inPL~inPH	
2	AL1	Alarm setting value AL1	inPL~inPH	
3	Loc	Parameter modification level Loc	0~9999	Loc=0: allow to modify the A-level parameters, allow to enter PID self-tuning mode Loc=1: allow to modify the A-level parameters, prohibit to enter PID self-tuning mode Loc≠0 or 1, prohibit to modify the A-level parameters, prohibit to enter PID self-tuning mode Loc=508, allow to enter and modify the B-level parameters, after exiting parameter setting mode, Loc automatically returns to the parameter value before entering. The Loc parameter itself can be modified always.

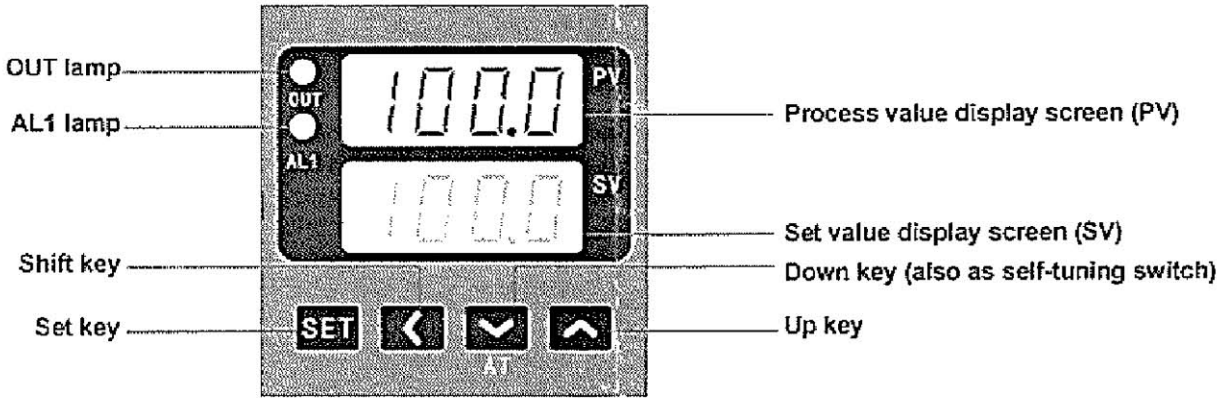
3.2 Accuracy of measurement: class 0.2 (±0.2%FS±0.1℃)
Thermocouple cold end compensation: ±2℃
3.3 Sampling period : 0.25s
3.4 Control modes: 1~120s (freely changeable with keypad)
3.4 Control modes (freely changeable with keypad)
On-off control (configurable direct/reverse action and differential gap)
PID control (configurable direct/reverse action, manual or automatic configuration of PID parameters)
3.6 Output specifications
Relay contact switch output: 250VAC/2A、30VDC/2A, resistance load
Solid-state relay (SSR) driving voltage output: 5~12VDC/25mA
Single-phase thyristor zero-crossing trigger signal: load power supply 85~264V/50~60Hz, capable of triggering 5~500A or 2 SCRs in inverse parallel connection or thyristor power module
DC voltage output: 0-5V, 1-5V switchable£linearity<0.3%, load resistance≥1kΩ, electrically isolated from the signal input and auxiliary power supply
DC current output: 0-10mA, 0-20mA, 4-20mA switchable, linearity<0.3%, load resistance≤300Ω,electrically isolated from the signal input and auxiliary power supply.
3.7 Alarm mode (free switchable)
There are 5 kinds of alarm mode, he higher limit absolute value, lower limit absolute value, higher limit deviation, lower limit deviation value, higher and lower limit deviation, which can set the characteristics of "holding when power on" to avoid the alarm misoperation.
3.8 Working power supply: 220V±15% /50~60Hz, power consumption<3W
3.9 Operational environment: places free of corruption with temperature of 0~50℃, and relative humidity≤85%RH

Chapter 4. Weight and outline dimension(unit:mm)

Panel dimension code	Panel dimension		Case dimension			Hole cutout dimension	
	W	H	W	H	D	W	H
A	96	96	91	91	80	92	92
D	72	72	67	67	80	68	68
E	48	96	44	91	80	45	92
F	96	48	91	44	80	92	45
G	48	48	44	44	100	45	45

Chapter 5.Description of Panel and Operation

5.1. Description of panel



OUT lamp: it will be lit when the control output action.(but when the control output is DC voltage or DC current, the big or small of the output will be indicated by changing the duty ratio of the indicator light
Al1 Lamp: it will be lit when the alarm output action.