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ISO 9001:2008

CONOTEC® Digital Temperature Controller

www.conotec.co.kr

Instruction Manual NF-7XR5 Series

- **Main output (contact or SSR+DC24V)**
- Alarm output or 3-stage output(contact)
- Communication output(RS485/RS232-select)
- Auto Save and Manual setting for Main output ON/OFF time
  - Applicable operation when sensor not work properly

* Thank you for purchasing CONOTEC products.

1 Directions for the Safety

Please read the directions before you use for the proper operation.

※ Specification and dimension of the product written in the instruction manual are subject to change without prior notice for the improvement of the product.

⚠ Warning

1. This product was not designed as safety equipment, so please use after attaching safety devices when you use this product as a control unit for the equipments that may cause accident, damage of the peripherals, or perperty damage.
2. Do not make connection, inspection or repair with the power turned on.
3. Make sure to check terminal number when you connect the power.
4. Never disassemble, alter, modity or repair this equipment.

⚠ Caution

- Please be well acquainted with the safety regulation or warning before you install this equipment and use it according to the defined specification or within related capacity only.
-
- Use shield cable for sensor extension and do not make it longer than necessary.
- Do not use the components that generate arc when you open or close using same power source or near to it.
- Keep pressure wire away from high-voltage wire and do not install at the place where there is water, oil or lots of dusts.
- Do not install it at the place exposed to direct sunlight or rain.
- Do not install at the place where there is strong magnetism, noise, vibration or shock.
- Avoid the place where generates strong alkali or acid material and use individual piping.
- Do not sprinkle water for cleaning when it is installed in the kitchen.
- Do not install at the place where temperature/humidity is beyond the rating.
- Do not make sensor wire cut or scratched.
- Sensor wire must be away from signal cable, power source, power and load line and use individual piping.
- Maintenance cannot be provided for the product that disassembled or altered.
- ⚠ mark at terminal connection diagram is safety remark like warning or caution.
- Do not use it near to the equipments (high-frequency welder, high-frequency sewing machine, high-frequency radio, large volume SCR controller) that generate high-frequency noise.
- You may have injury or property damage when you use it with methods other than specified by the manufacturer.
- It is not a toy and you need to keep it out of the reach of the children.
- Installation should be done by professional worker or authorized person.
- We are not responsible for any losses caused by non-compliance of warnings or cautions specified above or by the fault of user.

⚠ Danger

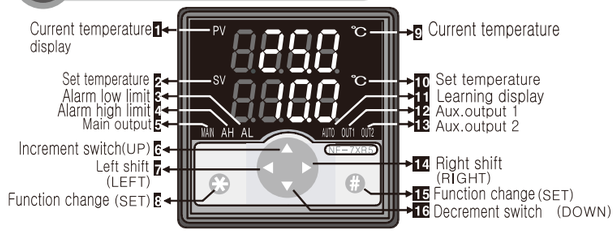
■ Caution, Danger of Electric Shock

- Electric shock - Do not touch AC terminal while the power is being supplied. You may have electric shock.
- Block the input power when you check the input power.

2 Configuration by Model

Model	Main output	Sensor	Range	Power spec.	Dimension	Function
NF-7PR5	Contact	PT100Ω	-199.9°C ~ 400.0°C	100~240 VAC 50/60Hz	72(W) * 72(H)	•Aux.output select (2R,3R) -Alarm output (HI,LOW) -3-phase output (OUT1,OUT2) •485/232 com output(option)
NF-7PS5	SSR(DC+24V)					
NF-7CR5	Contact	CA(K)	-50°C ~ 1200°C			
NF-7CS5	SSR(DC+24V)					
NF-7NR5	Contact	NTC 10KΩ	-55.0°C ~ 99.9 °C			
NF-7NS5	SSR(DC+24V)					

3 Name of each Part



◆ User mode change(temperature setting)

- Set temperature change of main output

  When ✱ or # key is pressed, SEt is displayed at upper FND, set value is displayed with a flash at lower FND.

  Set value is increased or decreased by ▲ or ▼ key and is transferred by ◀ or ▶ key.

- Main output ON/OFF time check

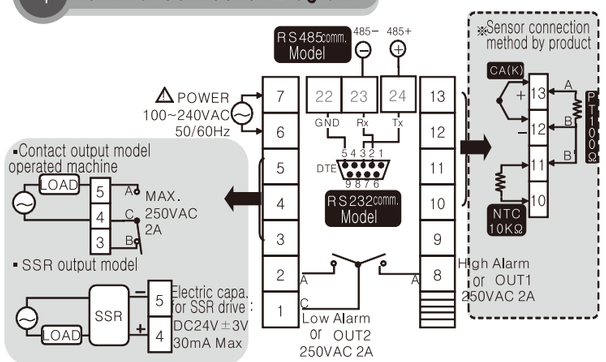
  When you press ▲ once at current temperature display state, learning ON-time and learning OFF-time are displayed alternately for 10 seconds and return to current temperature display state.

◆ Installer Mode Function Setting

When ✱ or # key is pressed for more than 5 seconds, menu name is displayed at upper FND, set value is displayed at lower FND

Set value is increased or decreased by ▲ or ▼ key and is transferred by ◀ or ▶ key.

4 Terminal Connection Diagram



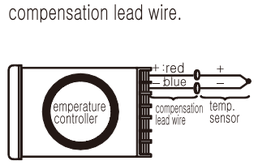
⚠ ※ Relay connection capacity is less than 250VAC 2A. If you use the load beyond conrtact capacity, it will lead to contact deposition, contact failure or relay damage.

◆ Cold contact compensation circuit(for CA sensor applied products)

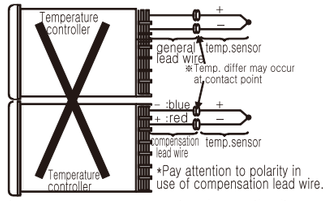
When thermocouple sensor is connected to input terminal of temperature controller, error occurs due to the generation of thermal electromotive force in proportion to ambient temperature at the contact area of input terminal metal and thermocouple sensor wire.
To prevent it, this product has built-in cold contact compensation circuit.

◆ Compensation lead wire is a lead wire used for the extension of sensor wire when distance between temperature controller and thermocouple sensor is big. When the distance between thermocouple and temperature controller is big and it is extened by general wiring, error occurs since contact area of thermocouple wire and general wiring becomes another thermocouple sensor.
To remove this kind of error occurrence, line should be extended using metal wire like thermocouple metal wire.
There are red wire indicating + polarity and blue (or white) wire indicating - polarity in compensation lead wires.

Be careful to connect + and - polarity properly not to make error when you use compensation lead wire.

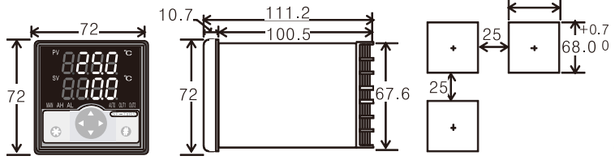


<Normal sensor wire extension method>



<Abnormal sensor wire extension method>

5 Dimension & Panel size(Unit:mm)



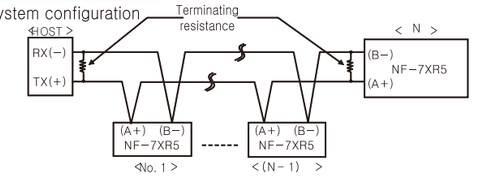
6 Setting range & factory set value

Set menu	Setting range PT	Setting range CA	Setting range NTC	Factory set value PT	Factory set value CA	Factory set value NTC
SEt	LSP ~ HSP	LSP ~ HSP	LSP ~ HSP	10.0°C	30°C	10.0°C
HSP	LSP~400.0°C	LSP ~ 1200°C	LSP ~ 99.9°C	400.0°C	1200°C	99.9°C
LSP	-199.9°C~HSP	-50°C~ HSP	-55.0°C~ HSP	-199.9°C	-50°C	-55.0°C
tYP	CoL / HEt			CoL		
diS	P / Pn			P		
diF	0.1°C~25.0°C	1°C~50°C	0.1°C~25.0°C	0.1°C	1°C	0.1°C
dLt	00min 00sec ~ 19min 59sec			00min 00sec		
Cor	-30.0°C ~30.0°C	-50°C ~50°C	-10.0°C ~10.0°C	0.0°C	0°C	0.0°C
Addr	1 ~ 99			1		
bAUd	1200/2400/4800/9600/19200			9600		
PtS	dS.P / nod.P			dS.P (MODBUS : to be added)		
LoC	L.on / L.oF			L.oF		
PSE	ALn / 3SP			ALn		
ALS	A.on / A.oF			A.oF		
A.dF	0.1°C~25.0°C	1°C~50°C	0.1°C~25.0°C	0.1°C	1°C	0.1°C
HPr	LPr~400.0°C	LPr~ 1200°C	LPr~99.9°C	400.0°C	1200°C	99.9°C
LPr	-199.9°C~HPr	-50°C~HPr	-55.0°C~HPr	-199.9°C	-50°C	-55.0°C
SLt	S.on / S.oF			S.oF		
St1	-199.9°C~400.0°C	-50°C~1200°C	-50.0°C~99.9°C	10.0°C	30°C	10.0°C
tY1	CoL / HEt			CoL		
dF1	0.1°C~25.0°C	1°C~50°C	0.1°C~25.0°C	0.1°C	1°C	0.1°C
dt1	00min 00sec ~ 19min 59sec			00min 00sec		
St2	-199.9°C~400.0°C	-50°C~1200°C	-50.0°C~99.9°C	10.0°C	30°C	10.0°C
tY2	CoL / HEt			CoL		
dF2	0.1°C~25.0°C	1°C~50°C	0.1°C~25.0°C	0.1°C	1°C	0.1°C
dt2	00min 00sec ~ 19min 59sec			00min 00sec		
So.S	no / nAnU / AUto			no		
n.on	00hr 00min 00sec ~ 17hrs 59min 59sec			00hr 00min 00sec		
n.oF	00hr 00min 00sec ~ 17hrs 59min 59sec			00hr 00min 00sec		
S.CL	CLr? is displayed if automatic learning on / oFF time was saved. CLr is displayed if automatic on / oFF time was erased by decrement switch.					

7 Communication

Applied standard	EIA RS485
Max.number of occupations	32units(but, Address setting : 01~99)
Communication method	2-wire half duplex
Synchronized system	Asynchronous system
Communication distance	Within 1.2km
Communication speed	1200/2400/4800/9600/19200bps(selectable)
Start Bit	Fixed as 1bit
Stop Bit	Fixed as 1bit
Parity Bit	None
Data Bit	Fixed as 8bit
Protocol	BCC

◆System configuration



◆ Communication Command and Definition of Block

< HOST Query Format >

STX	10¹	10⁰	R/W	X/D	T	P	0	ETX	BCC
START CODE	ADDRESS CODE		HEADER CODE					END CODE	BCC CODE

Calculating Range of BCC

< NF-7XR5 Response Format >

STX	10¹	10⁰	R/W	X/D	T	P	0					decimal point	Error	Output	ETX	BCC
START CODE	ADDRESS CODE		HEADER CODE					temp./humi. Data							END CODE	BCC CODE

Calculating Range of BCC

①START CODE
It shows the head of the BLOCK.
STX [02H]

②ADDRESS CODE
It is a CODE which host system identifies NF-7XR5, and it can be set within the range of 01~99(BCD ASCII). (ex. If Code is 01, it is 30H, 31H)

③HEADER CODE :It displays COMMAND name as characters.
RX(Read request) R[52H],X[58H]
RD(Read response) R[52H],D[44H]
WX(Write request) W[57H] X[58H]
WD(Write response) W[57H],D[44H]
TP0(Temp. measured value)T[54H],P[50H],0[30H]

④DATA Composition :DATA is expressed as Hexadecimal number.
(Negative number: 2's Complement)

⑤Decimal point : 0[30H] :No decimal point //1[31H]:Decimal point

⑥Error: 0[30H] :No error//1[31H] : Sensor open Error // 2[32H]:Sensor Short Error

⑦Output

When auxiliary output is used as alarm output			
Output	Main	AH	AL
'A'(0x41)	X	X	X
'B'(0x42)	X	X	O
'C'(0x43)	X	O	X
'D'(0x44)	X	O	O
'E'(0x45)	O	X	X
'F'(0x46)	O	X	O
'G'(0x47)	O	O	X
'H'(0x48)	O	O	O

When auxiliary output is used as 3-stage output			
Output	Main	OUT1	OUT2
'a'(0x61)	X	X	X
'b'(0x62)	X	X	O
'c'(0x63)	X	O	X
'd'(0x64)	X	O	O
'e'(0x65)	O	X	X
'f'(0x66)	O	X	O
'g'(0x67)	O	O	X
'h'(0x68)	O	O	O

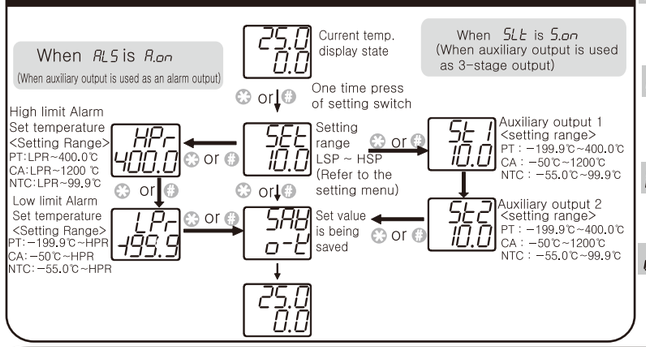
⑧END CODE :It shows the end of BLOCK content. ETX [03H]

⑨BCC : It is an abbreviationof Black Check Character, and it shows XOR calculation value from the start of protocol (STX) to end of protocol(ETX).

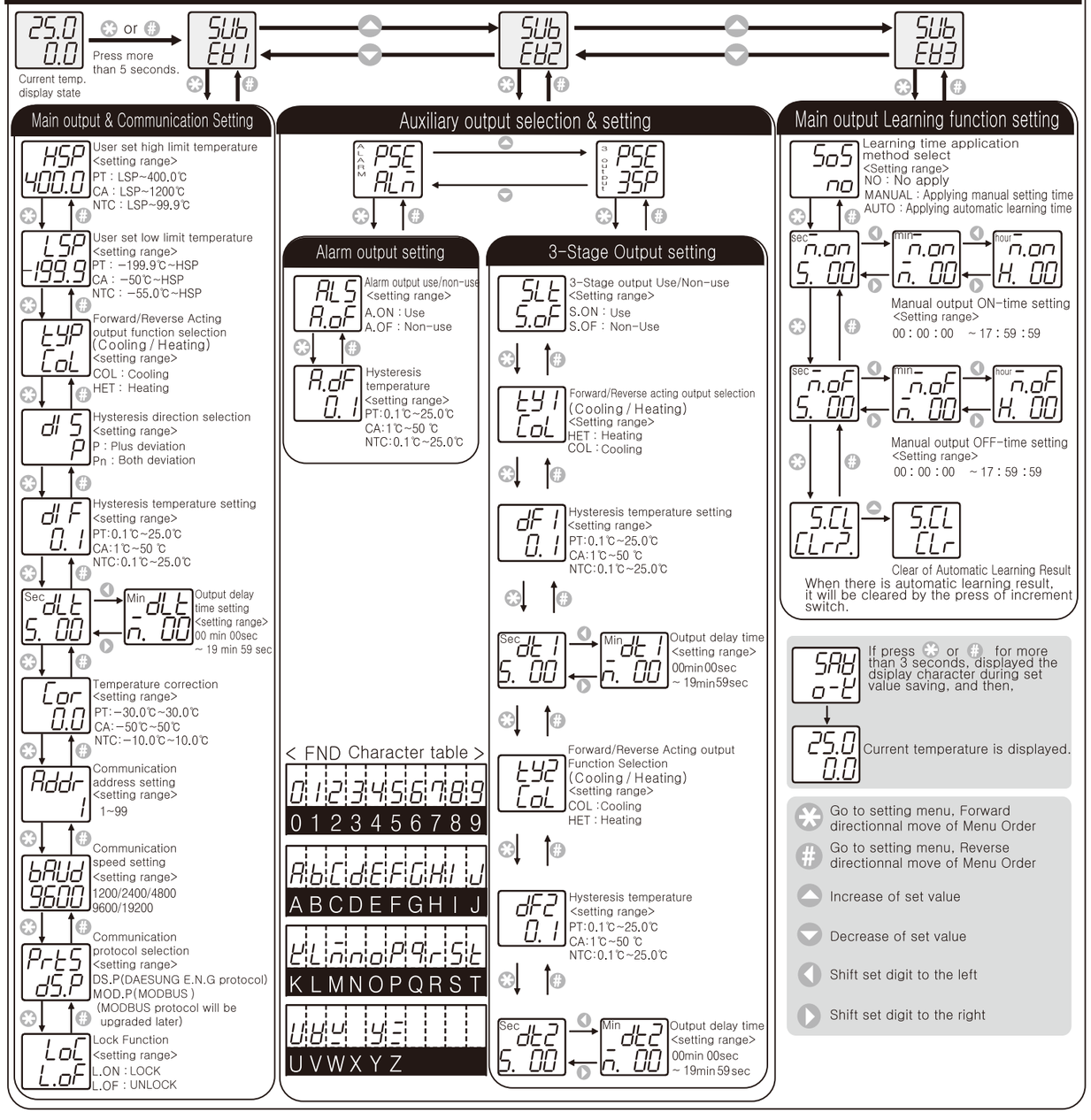
※Others
- When there's no ACK response.
① When the code is not correct.
② When Receive Buffer Overflow occurs.
③ When Baud rate or other communication set values are not correct.
- Treatment when no ACK response.
① Check line situation
② Check communication condition(set value)
③ If communication problem is caused by noise, execute communication around 3 times until it is recovered.
④ If frequent communication problem occurs, adjust communication speed.

8 Set Value Change Sequence

Set temperature of main output & auxiliary output



Current temperature display



9 Description of Function

HSP : User's Set temperature high limit setting(max. set point allowed for last user)Set temperature cannot be made more than HSP set value.

Ex) At HSP = 25℃ setting ⟶ Set temperature cannot be raised more than 25℃.

LSP : User's Set temperature low limit setting(minimum.set point allowed for last user)Set temperature cannot be made more than LSP set value.

Ex) At LSP = 10℃ setting ⟶ Set temperature cannot be lowered more than 10℃.

tyP : Forward/Reverse setting for auxiliary output 1 (Cooling/Heating selectable)

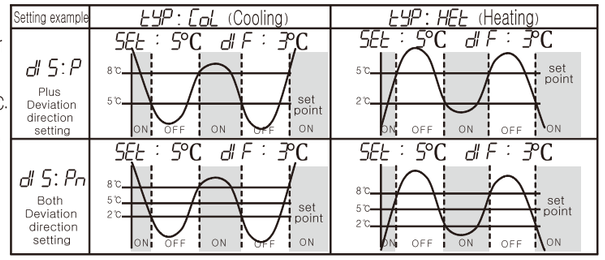
At CoL selection : Use as a Cooler

At HEt selection : Use as a Heater

dIS : Hysteresis Applying method selection

- P : Apply deviation value(DIF) to + direction only (OFF at set point)
- Pn : Apply deviation value(DIF) to +− both directions (Set point is based)

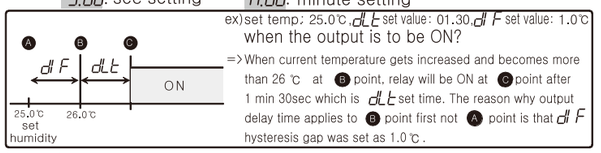
dIF : Regular gap between ON and OFF is required in ON/OFF control, (ON/OFF gap setting). When ON and OFF are activated too frequently, relay or other output contacts are easily damaged or hunting (oscillation,chattering) occurs. Damage of contacts or other equipments can be prevented by hysteresis temperature gap setting.



dLt : Output delay time

When control object has a problem due to frequent ON/OFF action (refrigerator compressor etc.,) it protects operating machine at momentary power failure or re-supply of power.

S.00: sec setting n.00: minute setting



ex) set temp: 25.0℃, dLt set value: 01.30, dIF set value: 1.0℃ when the output is to be ON?

=> When current temperature gets increased and becomes more than 26 ℃ at B point, relay will be ON at C point after 1 min 30sec which is dLt set time. The reason why output delay time applies to B point first not A point is that dIF hysteresis gap was set as 1.0℃.

Cor : Current temperature correction

When there is no problem in the product but actual temperature is different from displayed temperature in the equipment, it corrects current temperature as same as actual temperature by correction of it. (Compare with mercury thermometer or exisiting thermometer)

ex) When there is 3℃ gap between actual temperature : 25.0℃ and displayed one : 28.0℃

If Cor is corrected from 0.0 -> −3.0, 25.0℃ is diplayed.

Addr : Communication address setting

Address 1~99 should be designated when RS485 is used.

bAUd : Communication speed setting

1200BPS/2400BPS/4800BPS/9600BPS/19200BPS

PrtS : Communication protocol setting

- dS.P : DAE SUNG E.N.G's owned protocol
- Mod.P : MODBUS Protocol (It will be upgraded later)

LoC : Program Lock setting

- L.on : Program Lock
- L.oF : Program Lock OFF

PSE : Auxiliary output selection

- ALn : Auxiliary output is used as alarm function
- 3SP : Auxiliary output is used as 3-stage output function

ALS : Alarm output selection

- A.on : Alarm output is used
- A.oF : Alarm output is not used

R.dF : Hysteresis temperature gap setting for alarm output

Set the ON/OFF gap to prevent frequent ON/OFF of alarm output

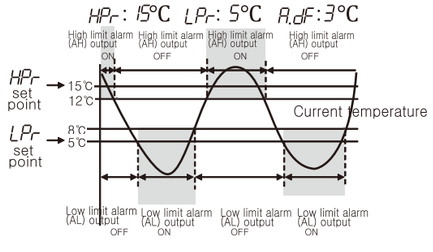
HPr : Alarm output high limit temperature setting

LPr : Alarm output low limit temperature setting

SLt : 3-stage output use selection

St1 : Auxiliary output 1 temperature setting

- S.on : Use of 3-stage output
- S.oF : Non-use of 3-stage output



tY1 : Auxiliary output 1's forward/reverse selection(Cooling/heating selectable)

At CoL selection : Use as a Cooler / HEt : Use as a Heater

dF1 : Auxiliary output 1's hysteresis temperature gap setting

dt1 : Auxiliary 1's output delay time(same as dLt of main output)

S.00 : Sec setting n.00 : Min setting

St2 : Auxiliary 2's temperature setting

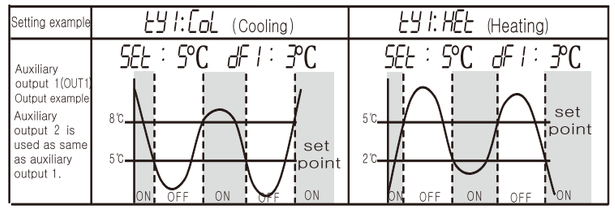
tY2 : Auxiliary 2's forward/reverse setting(cooling / heating selection)

At CoL selection : Use as a cooler / HEt : Use as a Heater

dF2 : Auxiliary 2's hysteresis temperature gap setting

dt2 : Auxiliary 2's output delay time

S.00 : Sec setting n.00 : Min setting



So.S : Learning time application method selection

- no : Not apply
  Make OFF for all outputs when sensor error occurs.
- MAnU : Applying Manual set time
  ON/OFF control by ON/OFF time which was set when sensor error occurred.
- AUto : Applying automatic learning time
  ON/OFF control by ON/OFF time which was learned at normal state when sensor error occurred.

n.on : Manual ON time setting

Main output is ON during this time when sensor error occurs (When So.S sets MAnU)

S.00 : Sec setting n.00 : Min setting H.00 : Hour setting

n.oF : Manual OFF time setting

Main output is OFF during this time when sensor error occurs (When So.S sets MAnU)

S.00 : Sec setting n.00 : Min setting H.00 : Hour setting

S.CL : Automatic Learning time clear command.

When automatic learning time is saved, stored automatic learning time is erased by the press of decrement switch.

- CLr?. It is displayed when there is automatic learning time.
- CLr It indicates automatic learning time has been erased.

10 Simple Diagnosis

■ When ERROR is displayed during the use of the product

- In the case of Er1 , it means that storage cell of each data has been destroyed by strong noise received from outside during the use of the product.
- In this case, please contact our service department.
- This controller is equipped with supplementary measures against outside noise, however, it cannot tolerate noise infinitely.
- Product may be damaged when the noise more than 2KV flows in.
- When o-E (Open Error) or S-E (Short Error) is displayed, it indicates that sensor has problem. Please check the sensor.

※ Above specification of the product is subject to change without prior notice for the improvement of the product.
Please be well acquainted with the contents specified in the instruction manual and make sure to conform to them.

※ Regarding the English−language manual, please download it at our homepage.

■ H. Office : 56, Ballyongsandan 1-ro, Jangan-eup, Gijang, Busan, Republic of Korea
■ Factory : 56, Ballyongsandan 1-ro, Jangan-eup, Gijang, Busan, Republic of Korea
■ TEL : +82-51-819-0426
■ FAX : +82-51-819-4562
■ e-mail : conotec@conotec.co.kr
■ URL : www.conotec.co.kr

■ Main products & development
- Digital temperature/humidity controller
- Digital timer, current/voltage meter
- Other Products development