ISO 9001:2008 CE Patented Reg.No:0441398

**CONOTEC®**
**CONOTEC CO., LTD.**
www.conotec.co.kr
**FOX-300SERIES**

Digital Temperature Controller

## User's Manual

## 1 Safety Precautions

Be sure to read cautions before use for correct use.
※ The specifications and exterior sizes described in this manual may be subject to change for improving product capacity.

### ⚠ Safety Precautions

1. This product was not manufactured as a safety device. Therefore, in case of using it as a controller such as for a device that may cause casualty, serious damage to peripheral devices, and tremendous loss of property, be sure to attach double safety devices.
2. Do not wire or inspect or repair while power is on.
3. In case of supplying power, be sure to check a terminal number for connection.
4. This device should not be dissembled, processed, improved, or repaired.

### ⚠ Caution

• Before the installation of this device, understand fully how to use, safety regulations or warnings, and be sure to use within specified related specifications or related capacities.
• Do not wire or install it for a motor or solenoid with great inductive load.
• During the extension of a sensor, use a shielding wire, and do not make it unnecessarily longer.
• Do not use the same power supply or any part that generates arc during closing or opening directly near the power supply.
• A power line should be far apart from a high-tension wire, and the device should not be installed in a place containing much water, oil, or dust.
• Do not install it in a place under direct light or exposed to rain.
• Do not install it in a place with strong magnetism or noise or vibration or impact.
• Put it far apart from a place that may release strongly alkaline or strongly acidic substance, and use an independent pipe.
• Do not spray water directly on it for cleaning in case of installing it in the kitchen.
• Do not install it in a place where temperature/humidity exceeds rating.
• Take caution not to break a sensor wire or make any scratch.
• A sensor wire should be away from a signal line, power, and load line, and use an independent pipe.
• In case of dissembling or modifying this product voluntarily, it may not be applied with warranty service.
• A ⚠ mark on the terminal circuit diagram is a safety mark as warning or caution.
• Do not use it near any device (harmonics welder, harmonics radio, and large capacity SCR controller) that generates strong harmonics noise.
• In case of using it with any other method than one designated by a manufacturer, injury or loss of properties may occur.
• As it is not a toy, keep out of the reach of children.
• Installation must be done by a relevant professional or a qualified person.
• Our company shall not be responsible for any damage caused by failing to observe the contents specified in the above warnings or cautions or by the fault of a consumer.

### ⚠ Danger

■ Caution, risk of electric shock
● Electric Shock - Do not contact with AC terminal during current carrying. This may cause electric shock.
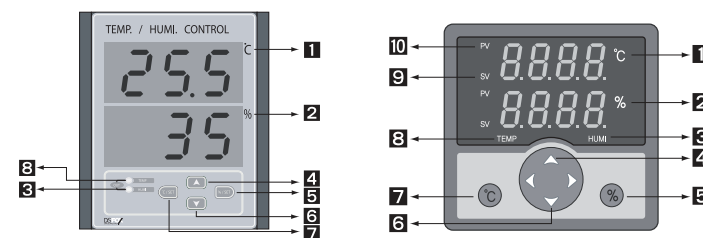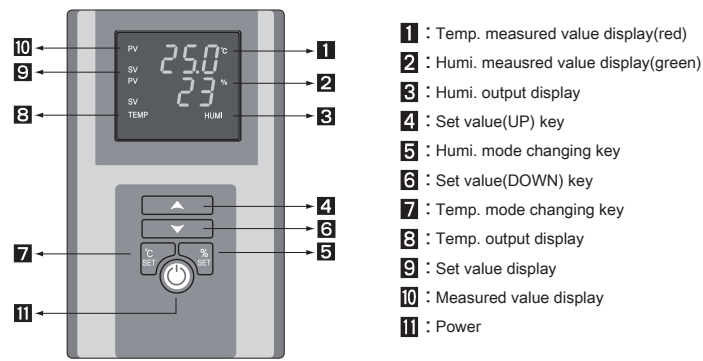● Input power must be blocked when checking input power.

## 2 Models

| Model | Sensor | Range | Dimension | Function |
|---|---|---|---|---|
| FOX-300JSHR | SHT11 | −29 ~ 99.9℃ / 0.0 ~ 99.9% | W194 x H241mm | Temp./Humi. control RS485 |
| FOX-300-2S | SH-104 | −29.9 ~ 99.9℃ / 0 ~ 100% | W72 x H72mm | |
| FOX-300A-1 | HCPV-220NH | −40.0 ~ 65.0℃ / 10 ~ 95% | W72 x H72mm | Temp./Humi. control |
| FOX-300AR1 | | | | Temp./Humi. control RS485 |
| FOX-300JR1 | | | W194 x H241mm | |
| FOX-8300R1 | | | W94 x H150mm | |

※ FOX-300 series model

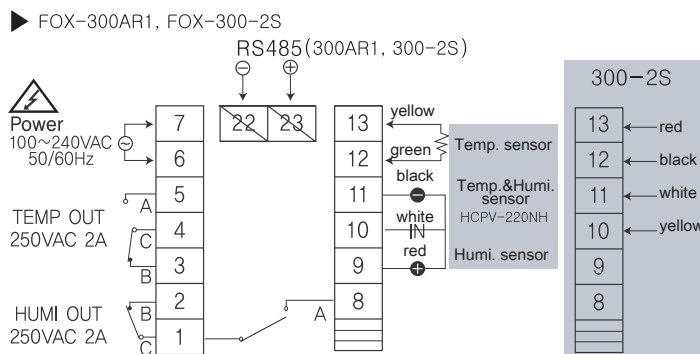The sensor HCPV-220NH (Temp./Humi) is replaceable with Temp. : FS-200N(NTC10K) Humi. : HCPV-220

Temp. & Humi. ranges are also available upto −55.0℃ ~ 99.9℃ 10 ~ 95%

## 3 Name of each parts

1 : Temp. measured value display(red)
2 : Humi. meausred value display(green)
3 : Humi. output display
4 : Set value(UP) key
5 : Humi. mode changing key
6 : Set value(DOWN) key
7 : Temp. mode changing key
8 : Temp. output display
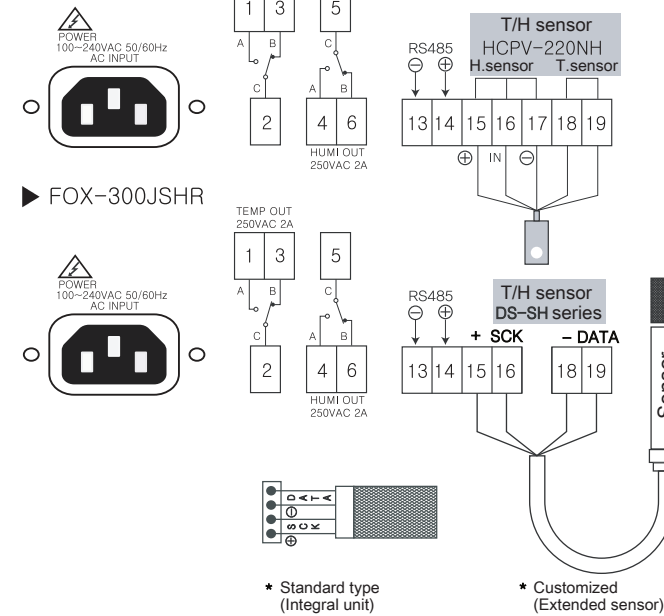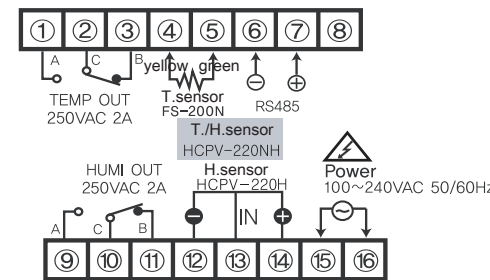9 : Set value display
10 : Measured value display
11 : Power

## 4 Wiring terminal

Output : 250VAC 2A
Please make sure to use the power relay or a suitable magnet .

▶ FOX-300AR1, FOX-300-2S

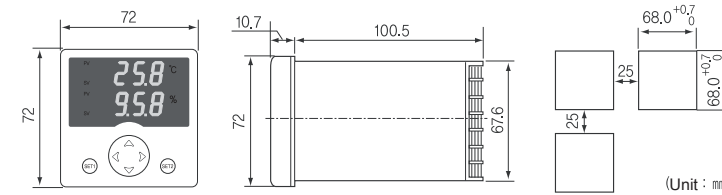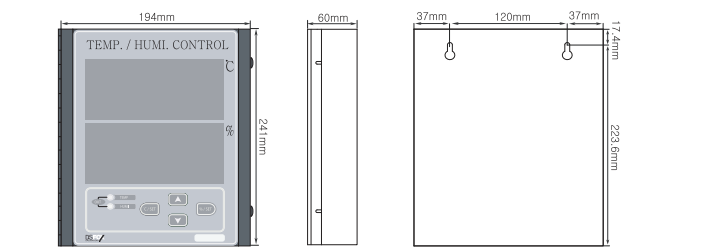RS485(300AR1, 300-2S)

Power 100~240VAC 50/60Hz
TEMP OUT 250VAC 2A
HUMI OUT 250VAC 2A

| 300−2S | | |
|---|---|---|
| 13 | ← | red |
| 12 | ← | black |
| 11 | ← | white |
| 10 | ← | yellow |
| 9 | | |
| 8 | | |

yellow / green / black — Temp. sensor
white / red IN — Temp.&Humi. sensor HCPV-220NH
Humi. sensor

▶ FOX-300JR1

POWER 100~240VAC 50/60Hz AC INPUT

TEMP OUT 250VAC 2A: 1 3 5 — 2 4 6 : HUMI OUT 250VAC 2A

RS485 ⊖ ⊕
T/H sensor HCPV-220NH H.sensor T.sensor
13 14 15 16 17 18 19
IN ⊕ ⊖

* Standard type (Integral unit)
* Customized (Extended sensor)

▶ FOX-300JSHR

POWER 100~240VAC 50/60Hz AC INPUT

TEMP OUT 250VAC 2A: 1 3 5 — 2 4 6 : HUMI OUT 250VAC 2A

RS485 ⊖ ⊕
T/H sensor DS–SH series
+ SCK − DATA
13 14 15 16 18 19

Sensor

▶ FOX-8300R1

A C B yellow green
TEMP OUT 250VAC 2A
T.sensor FS-200N
RS485
HUMI OUT 250VAC 2A
T./H.sensor HCPV-220NH
H.sensor HCPV-220H
IN
Power 100~240VAC 50/60Hz

① ② ③ ④ ⑤ ⑥ ⑦ ⑧
⑨ ⑩ ⑪ ⑫ ⑬ ⑭ ⑮ ⑯

## 5 Product exterior dimension

▶ FOX-300AR1, FOX-300-2S(72x72x110mm)

72, 10.7, 100.5, 68.0⁺⁰·⁷, 72, 67.6, 25, 25, 68.0⁻⁰·² (Unit : mm)

▶ FOX-300JR1(194x241x60mm)

194mm, 60mm, 37mm, 120mm, 37mm, 241mm, 17.4mm, 223.6mm

TEMP. / HUMI. CONTROL

▶ FOX-8300R1(94x150x39mm)

94.00, 39.00, 39.00, 8.00, 84.00
150.00
11.00, 24.00
<Front>  <Wall-hanging>  <Panel type>  <Panel hole>

## 6 Temperature

### Setting for temperature

℃ SET

10.0  99.9℃ ~ −55.0℃

| SHT11 sensor | −29℃ ~ 99.9℃ |
|---|---|
| SH–104 sensor | −29.9℃ ~ 99.9℃ |

℃ SET
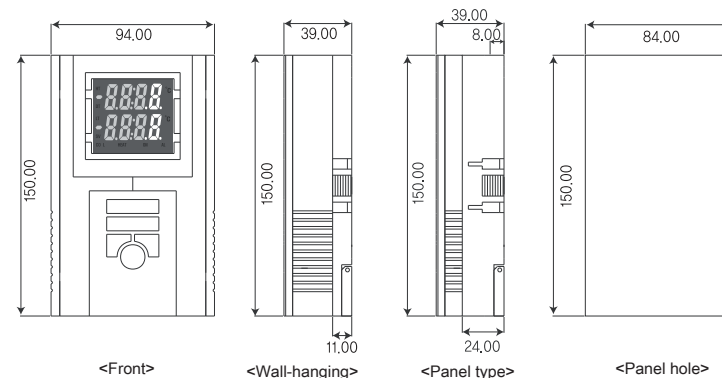
25.0  present temperature
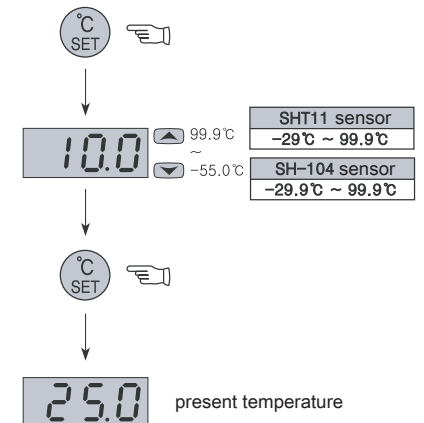
### Setting for temperature programs

press for more than 5 sec.

℃ SET → **tYP** selection of type
↓
℃ SET → **C** H / C change
↓
℃ SET → **dLt** setting for the delay time
↓
℃ SET → **0** 10 ~ 0
↓
℃ SET → **dIF** setting for the temp. deviation
↓
℃ SET → **0.1** 19.9℃ ~ 0.1℃

℃ SET → **Cor** correction of the present temperature

| SHT11 sensor | −9.9℃ ~ 9.9℃ |
|---|---|

℃ SET → **0.0** +10.0℃ ~ −10.0℃
↓
℃ SET → **Adr** communication address
↓
℃ SET → **00** 99 ~ 1
↓
℃ SET → **bPS** communication speed
↓
℃ SET → **1200** 192~ ~ 1200

## 7 Humidity

### Setting for the humidity

```
%
SET  ☞
  30.0  ▲ 100    SHT11 sensor
        ▼ 0      0.0 ~ 99.9%

%
SET  ☞
  50.0  current humidity
```
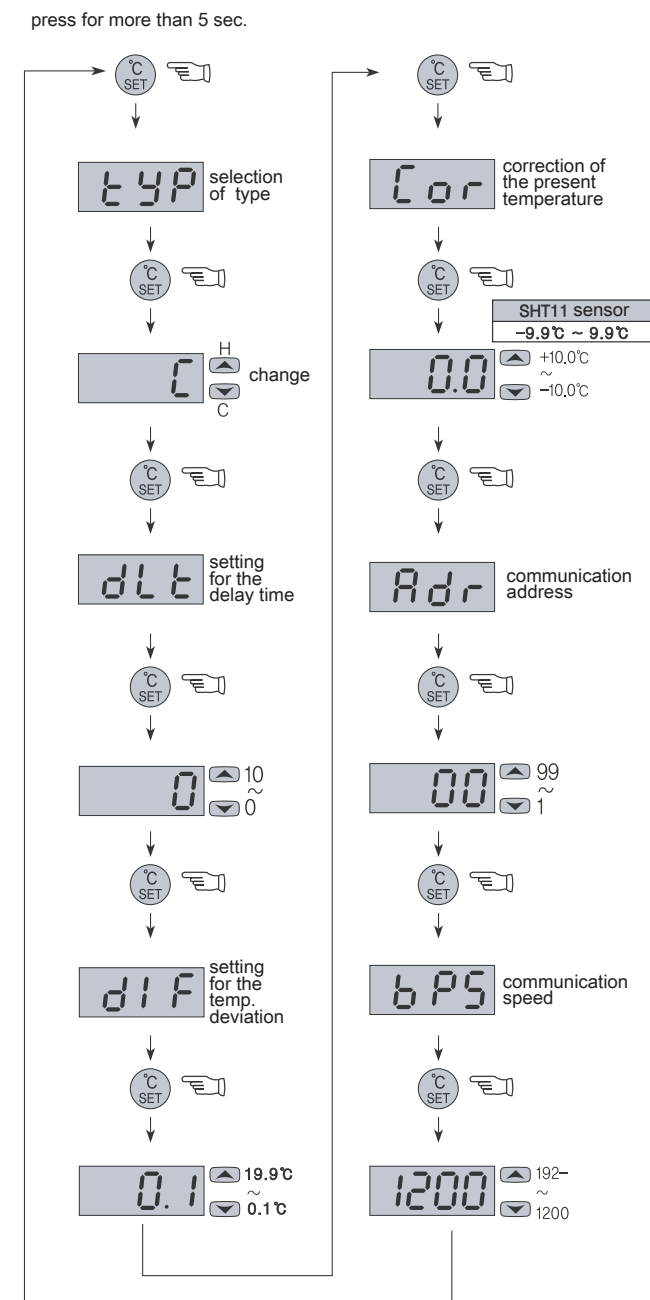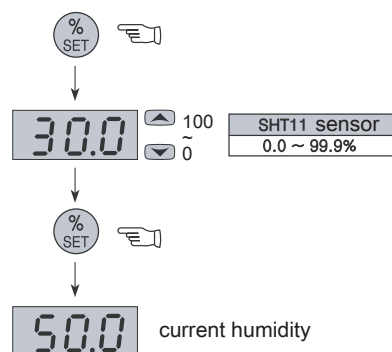
### Setting for the humidity program

Press for more than 5 second

```
%
SET  ☞
 tYP   selection of the type
%
SET  ☞
  d    ▲ (H) Humidity
       ▼ (d) Dehumi. change
%
SET  ☞
 dLt   Delay time
%
SET  ☞
  0    ▲ 10 minute
       ▼ 0
```

```
%
SET  ☞
 dIF   setting for the humidity deviation
%
SET  ☞              SHT11 sensor
  1    ▲ 29%        0.1 ~ 29.9%
       ▼ 1%
%
SET  ☞
 Cor   Current humidity correction
%
SET  ☞              SHT11 sensor
  0    ▲ +10%       -9.9 ~ 9.9%
       ▼ -10%
```
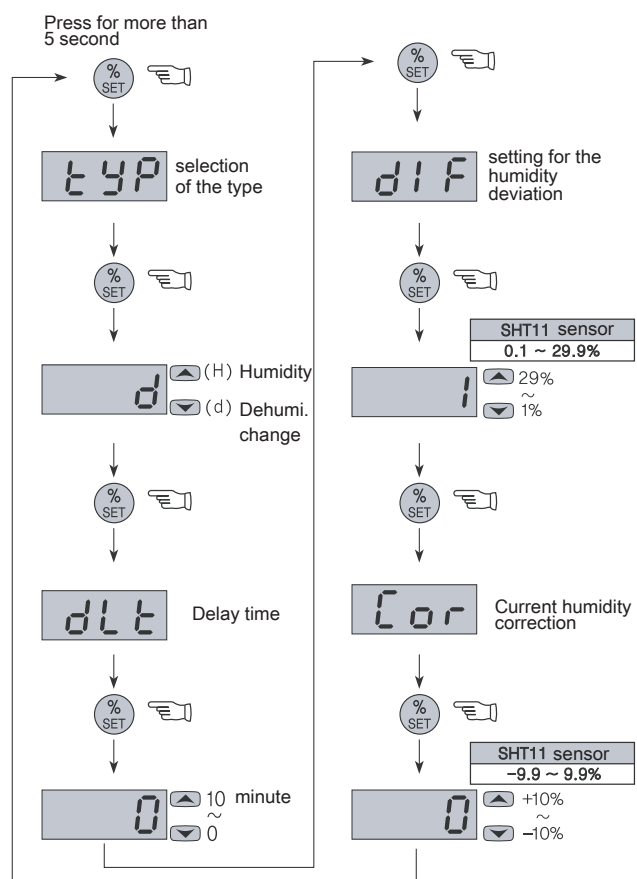
※ Pressing SET key for 5 sec. in the state of current temperature display, can be entered the program setting mode.

※ All programs are returned automatically in 30 sec. to the present temperature after displaying `o-t` by pressing SET key once after set value changing.

## 8 About Detailed Function

1. `tYP` : Temperature : Select Cooling(C) or Heating(H)
   Humidity : Select Dehumidity(d) or Humidity(H)

2. `dIF` : Deviation temperature setting
   - A regular interval is required between ON and OFF in the ON/OFF control (set up ON/OFF width)
   - Frequent ON and OFF will shorten the lifespan of the relay or the output contact or cause hunting (generation, chattering) by noise from outside. The temperature deviation function is used to setup temperature deviation to protect the equipment contact, etc.

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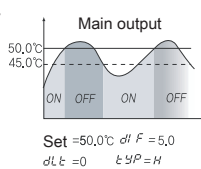「Method of temperature deviation when ON/OFF control」

For Cooling/Dehumidifying
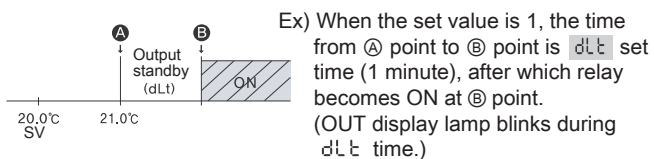- PV ﹥ SV + DV → output `on`
- PV ≦ SV → output `oFF`

Main output
```
-20.0℃
-25.0℃
ON OFF ON OFF
Set =-25.0℃  dIF =5.0
dLt =0   tYP=C
```
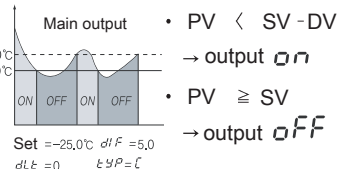
For Heating/Humidifying
- PV ﹤ SV - DV → output `on`
- PV ≧ SV → output `oFF`

Main output
```
50.0℃
45.0℃
ON OFF ON OFF
Set =50.0℃  dIF =5.0
dLt =0   tYP=H
```

3. `dLt` : Output Delay Time
   - This function should be used when an object subject to control repeats ON/OFF actions and cause problems (chillers, compressors).
   - A function to protect the working machine upon momentary power failure or power is reapplied.

```
Ⓐ        Ⓑ
  Output
  standby   ON
  (dLt)

20.0℃  21.0℃
SV
```

Ex) When the set value is 1, the time from Ⓐ point to Ⓑ point is `dLt` set time (1 minute), after which relay becomes ON at Ⓑ point. (OUT display lamp blinks during `dLt` time.)

4. `Cor` : Current temperature calibration function
   - While there is no problem in the product, a function to calibrate when temperature is different error and reference standard that occur in the input sensor (e.g. Mercury thermometer or a thermometer currently use, a temperature controller)

e.g.) Actual temperature : 10.0℃ → `Cor` : 0.0 ⇒ -2.0
Display Window : 12.0℃

Display in → 10.0℃ (corrected current temperature)

5. `Adr` : Communication station settings
   − When using the RS485 communication, specify a station number between 1-99.

6. `bPS` : Communication speed settings
   − `120`, `1200` : 1200bps
   − `240`, `2400` : 2400bps
   − `480`, `4800` : 4800bps
   − `960`, `9600` : 9600bps
   − `19-`, `192-` : 19200bps
   (Start bit 1, Stop bit 1, Non parity)

## 9 Temperature setting range and default set

| | Function | Display | Range | Default | Remarks |
|---|---|---|---|---|---|
| Setting temperature | Temperature setting (HCPV-220NH) | | -55.0 ~ 99.9 | 10.0 | SH-104 : -29.9 ~ 99.9 / SHT11 : -29 ~ 99.9 |
| Settings | Function selection | tYP | C / H | C | H : For Heating / C : For Cooling |
| | Deviation temperature | dIF | 0.1 ~ 19.9 | 1.0 | |
| | Output delay time | dLt | 0 ~ 10 | 0 | Minute |
| | Temperature correction (HCPV-220NH, SH-104) | Cor | -10.0 ~ 10.0 | 0.0 | Differs from displayed and actual value SHT11 : -9.9 ~ 9.9 |
| | Address | Adr | 01~ 99 | 0 | RS485 communication |
| | Speed | bPS | 1200/2400/4800/9600/19200 | 9600 | |

## 10 Setting range and default set

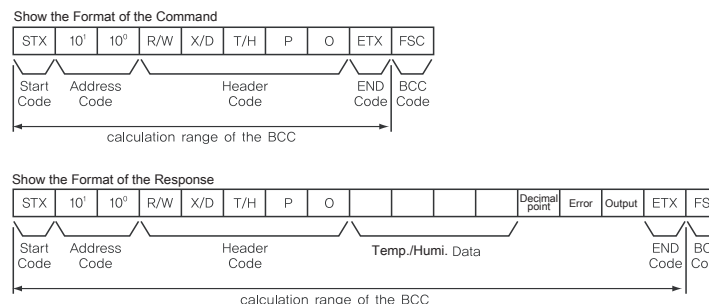| | Function | Display | Range | Default | Remarks |
|---|---|---|---|---|---|
| Set humidity | Humidity setting (HCPV-220H) | | 0 ~ 100% | 30 | SHT11 : 0.0 ~ 99.9 |
| Program Settings | Selection of function | tYP | d / H | d | d : For dehumidifying H : For humidifying |
| | Humidity deviation (HCPV-220H, SH-104) | dIF | 1 ~ 29 | 1 | SHT11 : 0.1 ~ 29.9 |
| | Output delay time | dLt | 0 ~ 10 | 0 | Minute |
| | Correction of the humidity (HCPV-220H, SH-104) | Cor | -10 ~ 10 | 0 | correct discrepancy between the value in displayed and actual value SHT11 : -9.9 ~ 9.9 |

## 11 Communication

### ■ Interface

| Specification | In confirmity EIA RS485 |
|---|---|
| Maximum connection lines | 32 units (However, Address setting is available from 01 to 99) |
| Method | 2-wire half-duplex |
| Synchronous system | Asynchronous |
| Distance | Within 1.2Km |
| Speed | 1200/2400/4800/9600/19200bps (selectable) |
| Start bit | 1 Bit fixed |
| Stop bit | 1 Bit fixed |
| Parity bit | None |
| Data bit | 8 Bit Fixed |
| Protocol | BCC |

### ■ System Configuration

```
                    terminal resistance              N
high rank                                          (B-)
RX(-) ⌇⌇                                ⌇⌇          300 Series
TX(+) ⌇⌇                                ⌇⌇          (A+)

(A+) (B-)              (A+) (B-)
300 Series  ----------  300 Series
   1                     (N-1)
```
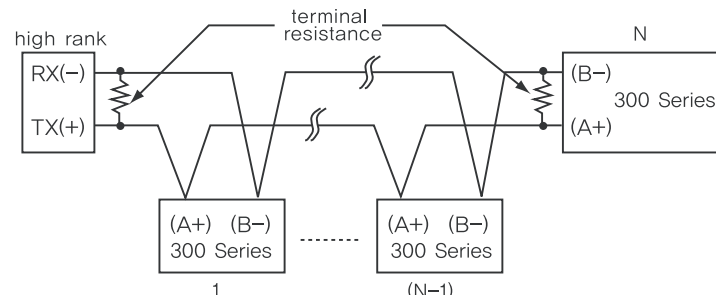
### ■ Definition of Communication Command and Block

Show the Format of the Command
```
STX | 10¹ | 10⁰ | R/W | X/D | T/H | P | O | ETX | FSC
Start  Address     Header            END  BCC
Code   Code        Code              Code Code
       calculation range of the BCC
```

Show the Format of the Response
```
STX | 10¹ | 10⁰ | R/W | X/D | T/H | P | O | | | | Decimal point | Error | Output | ETX | FSC
Start  Address     Header                Temp./Humi. Data           END  BCC
Code   Code        Code                                             Code Code
       calculation range of the BCC
```

① Start Code
   Displays the head of BLOCK.
   STX → [02H], ACK will be added in case of RESPONSE

② Address Code
   A code of which the host system identifies FOX-300 series, and can be set from 01 to 99 (BCD ASCII).

③ Header Code
   The name of command is shown in text.
   RX(Read demand ) → R[52H], X[58H]
   RD( Read response ) → R[52H], D[44H]
   WX( Write demand ) → W[57H], X[58H]

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WD(Write response) → W[57H], D[44H]
TPO(Temp.measured value ) → W[54H], P[50H], O[30H]
HPO(Humi.measured value ) → H[48H], P[50H], O[30H]

④ Data Configuration
   Data is expressed in Hexadecimal

⑤ Decimal point → 0[30H] No decimal point
   1[31H] There is a decimal point

⑥ Error → 0[30H] No error,
   1[31H] Sensor open error
   2[32] Sensor short error

⑦ Output → 1[31H] T/H OUT ON
   3[33H] T/H OUT OFF

⑧ END Code
   Displays termination of Block. ETX → [03H]

⑨ BCC
   Block Check Character. It shows the XOR operation value from the beginning (STX) protocol to ETX

• Others : If there is no ACK response
   ① If code numbers are inconsistent after receiving STX
   ② If Receive Buffer Overflow occurred
   ③ If borate or other communication SV is inconsistent

• Handling when there is no ACK response
   ① Check the status of line.
   ② Check communication condition (SV).
   ③ In the case of communication abnormality caused by noise, perform communication for 3 times for recovery.
   ④ Change the communication speed if communication abnormality is too frequent.

## 12 Simple troubleshooting tip

### ■ If error is displayed while using the product:

● `Er1` is displayed when the DATA memory element is damaged inside the product as it is affected by powerful noise from outside while in use. In this case, contact our company for customer service.
   · While the controller is equipped with supplementary measures for outside nose, it cannot endure infinite noise.
   · The interior of the product may be damaged if noise (2KV) is introduced.

● The sensor has defect when `o-E` (Open Error) or `S-E` (Short Error) is displayed. Please check the sensor.

◈ Installation Precautions
■ WARNING: To avoid the risk of electric shock, this equipment must be connected to protective grounding and to a supply voltage.
■ Do not block the vents.

◈ Handling Precautions
※ This instrument is suitable for the following environments.
■ Ambient temp. : 0℃~60℃    ■ Ambient humi. : Less than 80% RH
■ Used indoors only    ■ Pollution Degree 2
■ Altitude : less than 2000m    ■ Installation Category II
■ Avoid placing equipment that is difficult to operate power coding.
■ Use of the equipment in a manner not specified by the equipment manufacturer may impair the protection provided by the equipment.
■ Rated power : 100~240Vac   50/60Hz   9VA

■ Major products and development
   − Digital temperature, humidity controller
   − Digital timer, current/voltage meter
   − Other product development