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Conductivity Controller

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Preface

This manual serves to explain the use of CDCN-961 controller / transmitter. This instruction manual is written to cover as many anticipated applications of CDCN-961 controller / transmitter. If you have doubts in the use of the instrument, please do not hesitate to contact local customer service center.

The information presented in this manual is subject to change without notice as improvements are made, and does not represent a commitment of OMEGA brand from OMEGA ENGINEERING, INC.

OMEGA ENGINEERING, INC. can not accept any responsibility for damage or malfunction of the unit due to improper use of the instrument.

Safety information

CDCN-961 Controller / Transmitter shall be installed and operated only in the manner specified in the Instruction manual. Only skilled, trained or authorized person should carry out installation, setup and operation of the instrument.

Before powering up the unit, make sure that power source is connected to, is as specified in the top label. Failure to do so may result in a permanent damage to the unit.

Protect level against electric shock mainly depends on relevan installation rules.

TABLE OF CONTENTS

1 PREFACE

BEFORE USE

Thank you for using CDCN-961 CON/TDS/RES controller / transmitter.

Although this controller / transmitter use advanced technology and meet the requirements of current safety rules, improper use can also threaten the safety of users, and / or cause harmful influences to factory and other equipments. Therefore, before using CDCN-961 controller / transmitter, relevant person must read and understand contents of this instruction manual.

Following symbols used in this instruction manual are to mark safety instruction and appendix information：

	This symbol means contents and safety instructions and warming of potential dangerous. If they are neglected, person may be hunted and property may be damaged.
	This symbol means the contents are appendix information. If they are neglected, it will cause low efficient and even losing products.

Instruction manual should be kept accessible within the person who use CDCN-961 controllers / transmitters.

If you have problems which are not mentioned or can not be explained in this manual, please contact with your local customer service center. They will be very glad to help you.

IN USE

CDCN-961 controller / transmitter, as described instruction manual are intended to separate conductivity and temperature measurement.

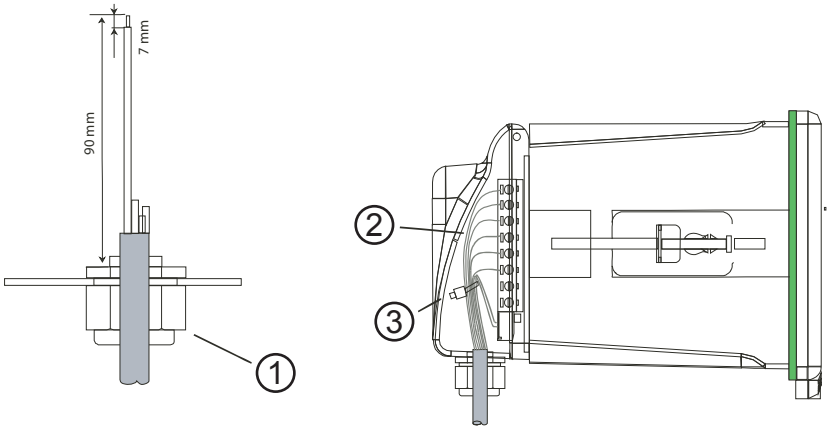
Any other uses, or other unmentioned use in instruction manual, are not acceptable when they contradict the technical parameters. User must be responsible for any results of damage for abuse.

Other conditions of right use include:

- Notice remarks and requirements stated in instruction manual.
- Notice local safety regulations about safe operation.
- Notice information and warning of products that are used together with the transmitters in the contract. (shell, electrode, etc.)
- Notice required using environment and working condition.

SAFETY INSTRUCTION

⚠	Conductivity transmitters should be installed and operated by qualified person who are familiar with the work.
	Transmitters with problems should not be installed and used.
	Conductivity transmitters should be used under the required working condition.
	Conductivity transmitters should be open and repaired by clients themselves.
	Mollified conductivity transmitters should not be used. Producers and suppliers do not bear responsibility for the damage and lose caused by modifying instruments without permission. Clients should bear all the risks. This instrument has a protection level of IP65. Please use waterproof cable glands when you connect the line. Also, please loose it when you open the cover. After connecting the line, please tighten the cable conductor according to the above table 3 with attached tie line, or it will cause danger because cable conductor or interface falls off when open the cover. ⚠ Please make sure to cut the power when you open the cover to carry through any operation.



1. Waterproof cable glands
2. Cable (recommended stripping lengths for cables at least 90mm, please use 0.5 to 1 square meter's wire)
3. Cable ties

2 PRODUCT DESCRIPTION

2.1 DESCRIPTION OF INSTRUMENT SPECIALITY

CON transmitters are used to measure conductivity and temperature value.

Transmitters can be used as monitor in water treatment, in process of chemical industry, in food process, in cleaning water or wastewater treatment and in neutralization process.

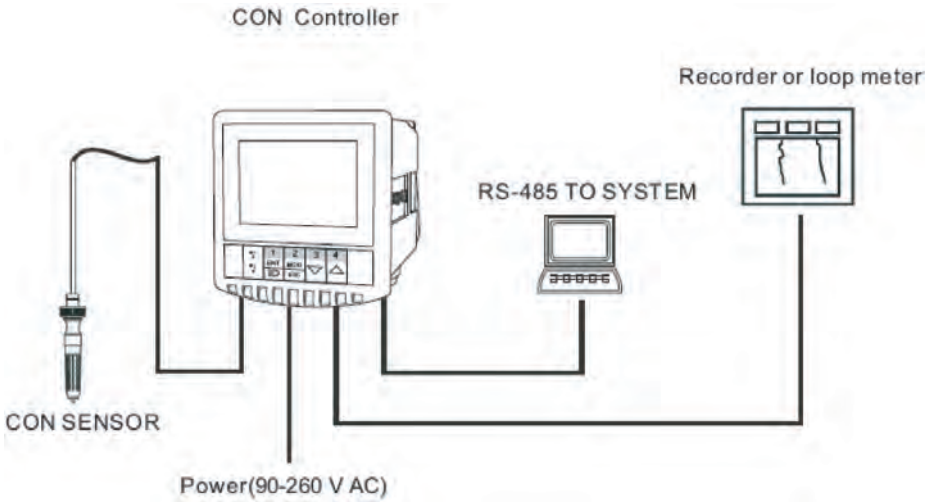
This transmitter has many user-friendly and safety features which include:

- Menu-driven program that simplifies set-up.
- Built-in memory backup to ensure that set-up parameter and calibration information are not erased if power off or power off in abnormal condition.
- Long-life micro-switch key
- IP65 all-day water and air proofing can be used in any adverse circumstances.
- Adjustment of electrode offset value
- Automatic temperature compensation mode, manual set-up of process temperature and calibration temperature.
- Separately adjustable high and low set point hysteresis (dead bands) prevents oscillating of relays around the set points.
- Large dual display LCD for easy reading with clear multiple annunciators, alarm status and operational message annunciators
- Back－light LCD can be also used in dark industrial situation.
- Two switch on/off relays and one alarm relay
- Independent alarm relay can be set up as calibration remind or clean relay, which can move with control relay under alarm mode.
- Anti-interference of electromagnetism—electric isolation of 0/4-20mA output, ensure the safety of data collection and control effect.
- RS-485 output

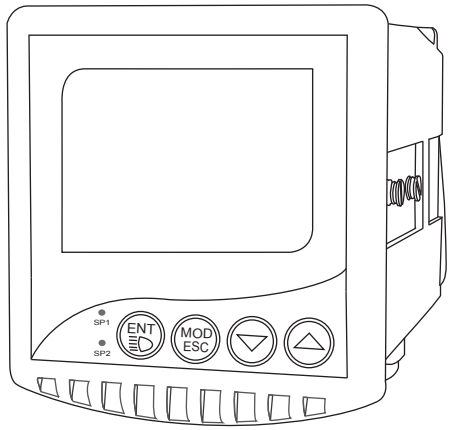
2.2 MEASUREMENT AND CONTROL SYSTEM

Typical measurement system includes:

- Conductivity on-line transmitter
- United or separated temperature sensing instrument PT1000 of con compound electrode
- Suitable con measurement electric cable
- Immersion, flow or processing parts
- Terminating controlling parts
- 0/4~20mA can connect with recording instrument
- RS-485 can be used as multi-instrument communication
- RL3 relay can be used as alarm or washing function



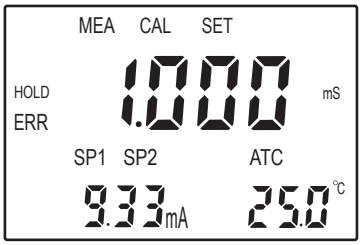
2.3 APPEARANCE



CDCN-961 CON/TDS/RES controller / transmitter

2.3.1 INTRODUCTION OF DISPLAY

Two liquid crystal regions show measured value and indication and parameters of various status.



Mode Indications：

- **MEA**：measurement mode
- **SET**：set-up mode
- **CAL**：calibration mode

Status Indications：

- **HOLD**：relay actions and electric current output are hold.
- **ATC**：automatic temperature compensation indication, manual temperature compensation is not displayed.
- **ERR**：error or warning indication

2.3.2 KEY INSTRUCTION

KEY	Description
2 MOD ESC	● Mode switch key or quit key
1 ENT	● Confirm key ● Entering sub-function form of function group in setting mode ● Confirm setting parameter and value ● Starting calibrating in calibration mode ● Back light on and off switch in measurement mode
3 ▽ 4 △	● Choose function group to set-up parameters and value（If hold on pressing, value changing will be quicker.） ● Press these two at the same time under measuring mode, electrode constant and measuring range will be showed.

2.3.3 LED INDUCTION

Relay Induction

SP1 \ SP2 LED shows relevant working status of relays.

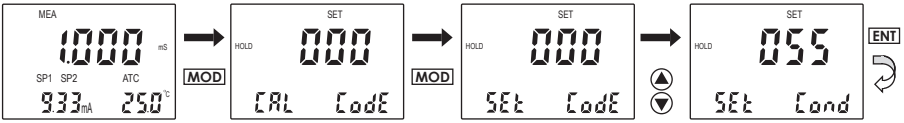
SP1 \ SP2 LED light-on shows that relays are under working status.

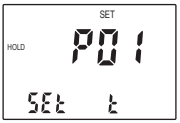
2.3.4 PASSWORD

When entering calibration mode and setting mode, there are passwords. Passwords are set by factory and users cannot modify them by themselves. Followings are those passwords:

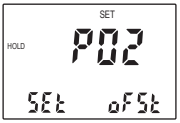
Password	Mode / Instruction
020	System set-up mode
028	Calibration Mode
055	Action set-up mode

2.3.5 PREVIEW OF FUNCTION

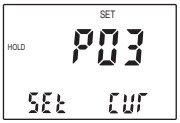




Temperature set-up sub-function: can modify relevant parameters such as auto or manual temperature compensation, set-up of manual temperature compensation.

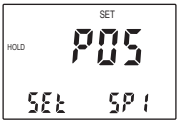


Offset set-up sub-function: can modify measuring value and cable resistance.

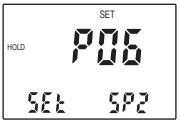


Electric current set-up sub-function: can set up output electric current.

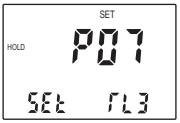
Control mode set-up sub-function: can set up working mode of relays, can set up limit control and ratio impulse control mode.



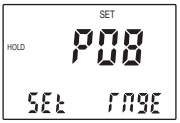
SP1 set-up sub-function：can set up action of relay 1, carry out auto control.



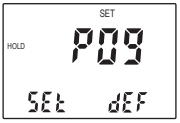
SP2 set-up sub-function：can set up action of relay 2, carry out auto control.



Relay 3 set-up sub-function: can set up action of relay 3, carry out functions of cleaning, reminding of calibration and alarm.



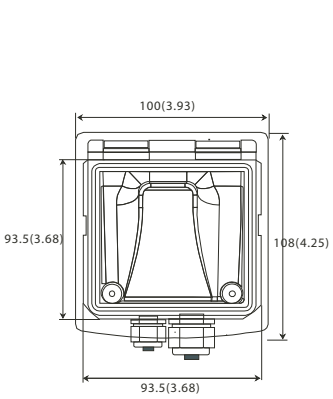
Measurement range set-up sub-function: can set up Conductivity and TDS measuring range.

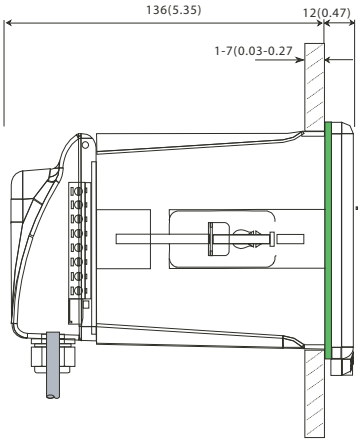


Reverting to factory default setting sub-function: this function can revert all setting values and calibration values to factory default setting.

3 INSTALLATION AND ACCESSORY

INSTALLATION



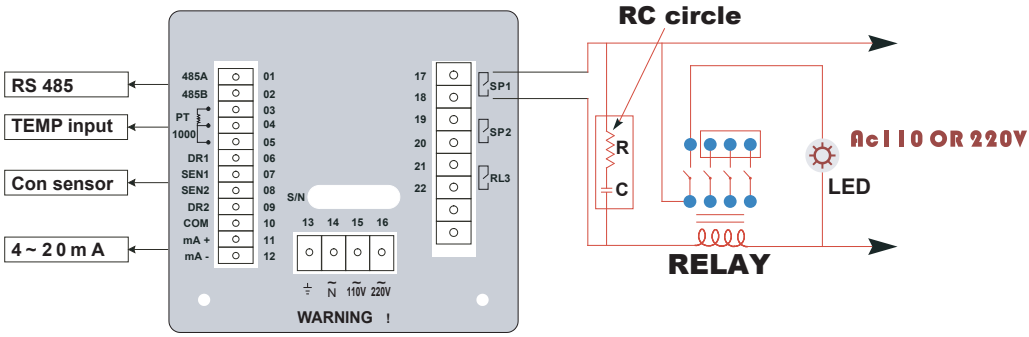


Panel cutout : 93.5*93.5mm (inch)
(panel installation)

CDCN-961 CONNECTION DIAGRAM

Warning: Make sure to power off before connecting. The back panel consists of three connectors.

CDCN-961 connection diagram



1. 485A output A	12. 4～20mA-
2. 485B output B	13. Earth wire
3. Temperature electrode input terminal (PT1000) red	14. Input of alternating current
4. Temperature electrode input terminal (PT1000) blue	15. Electric source input 110V alternating current (no 220V)
5. CABL compensation terminal, use short circuit between 4	16. Electric source input 220V alternating current (no 110V)
6. Con drive 1 (2-wire system, use short circuit between 6 and 7) yellow	17. Relay A (SP1)
7. Con sense 1	18. Relay A (SP1)
8. Con drive 2 (2-wire system, use short circuit between 8 and 9) green	19. Relay B (SP2)
9. Con sense 2	20. Relay B (SP2)
10. COM	21. Clearing Relay (RL3)
11. 4～20mA+	22. Clearing Relay (RL3)

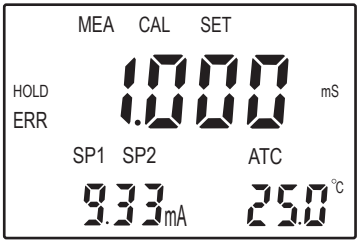
NOTE: CDCN-961 can use 2 cell electrode and 4 cell electrode. Please note the type of electrode and connecting way in the process of connecting electrodes. When use 2 cell electrode, please connect 6 and 8, use short circuit between 6 and 7, also 8 and 9. When use 4 cell electrode, please connect with relevant pins.

Notice: Relay contactor volume of our instrument is 220 VAC/0.5A. Please do not connect with bigger appliance. Please install bridge relay to transit according the above diagram, or bear the responsibility by them. There is RC parameter, which is 100 ohm/0.22uF on the relay contactor. Please pay attention to that.

MEASUREMENT MODE

When the controller is initially powered on, it automatically enters into the Measurement mode after the large dual LCD displays all segments briefly.

	**Please notice:** in order to get exact measurement information, users should calibrate measurement system (transmitter and electrode).



MEA at the top of the LCD shows that the instrument is under the status of measuring.
The upper display shows CON value, while the lower display shows temperature value under Con measurement mode.
Annunciator at the left lower side of the display show the value of transmitting output electric circuit, which as the way that users calibrate the output electric circuit.

Such annunciators or icons, as mS, at the upper right side of the display show the current different measurement mode of transmitters.

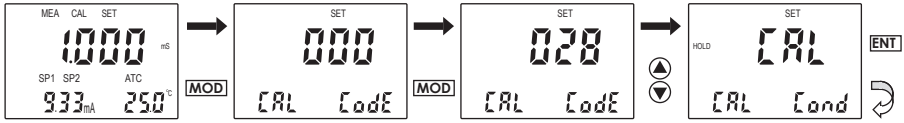
In measurement mode, you can press **2** MOD ESC key once or twice to enter into the function form of calibration or set password input.
Then input relevant password to enter into calibration mode or set up mode. Please refer to Item 4(Calibration Mode) or Item 5 (set up mode).

Press **1** ENT key under measurement mode, you can open or close back light of LCD.

4 CALIBRATION MODE

You can press 2 MOD ESC once under measurement mode and then input password 028 to get access to calibration mode. Please operate according to following squares.

4.1 ENTERING CALIBRATION MODE

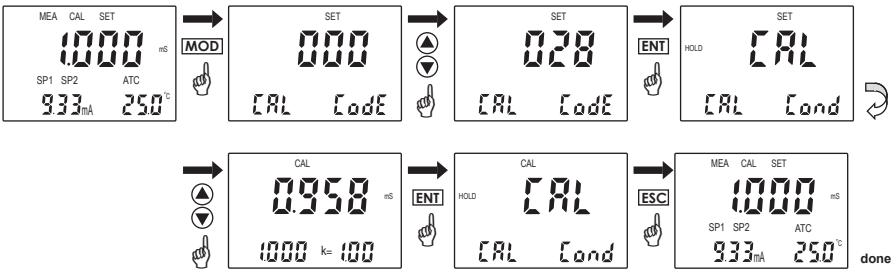


1. Press 2 MOD ESC twice in measurement mode and enter into form for password input of calibration mode.
2. After entering function form of calibration password input, LCD will ask you to input password. Press ▲ or▼ to input calibration password 28, then press ENTER to confirm the password.
3. Press ENTER to enter into calibration sub function form, lower display will show CAL cond. If you want to calibrate, please refer to relevant items.(please refer to upper pictures).

NOTE: Anytime press 2 MOD ESC to quit calibration mode and return to upper function. If return to measurement mode, old calibration information will be kept and used. After returning to measurement mode, password will automatically set up from 28 to 000 when entering calibration mode.

4.2 CALIBRATION OF CONDUCTIVITY

You can press 2 MOD / ESC once under measurement mode and then input password 028 to get access to calibration mode. Please operate according to following squares.



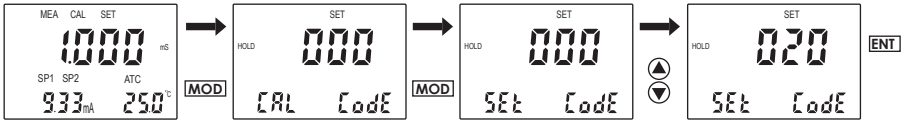
1. Entering calibration mode as Item 4.1 described. LCD will show CAL cond (Con Calibration mode).
2. Press 1 ENT key to enter into calibration, LCD will show electrode constant and show menu. The lower display will show 1.000 K=1.00，this function form shows the electrode constant of last calibration. The upper display will show CAL and the main display zone will show conductivity measuring value. Users can press ▲or▼ key to select electrode constant to calibrate, also, users can use standard solution to select the value to calibrate.
3. Put electrode into the prepared standard solution. You should put temperature electrode into the same solution under the automatic temperature compensation mode.
4. Press ▲ or ▼ key to select electrode constant to calibrate, also, users can use standard solution to select the value to calibrate. Press 1 ENT to confirm when finished, and return to calibration remind mode.
5.Press 2 MOD / ESC once to return to calibration mode and finish the calibration process.
NOTE: Press 2 MOD / ESC key to quit set up mode at any time. Instrument will return to measurement mode automatically.

	NOTE: Transmitter will show ERR when calibration is error. Under this situation, press 2 MOD / ESC to quit and calibrate again from step 1. It will show ERR again under following situations: (1) Use wrong standard solution or standard solution is expired. (2) Electrode is aging, constant is over permitting range. (3) Electrode wire is broken or leakage because of joint corrosion.
	NOTE: When calibrating under manual temperature compensation, transmitter will automatically switch to calibration temperature from pre-set measurement temperature. When leaving calibration mode, transmitter will switch to measurement temperature again. (Please refer to Item 5.2 for setting measurement temperature and calibration temperature)
	NOTE: ELE K=1.00 presents the standard constant of electrode is 1.0, the left 1.000 present the actual constant of electrode.

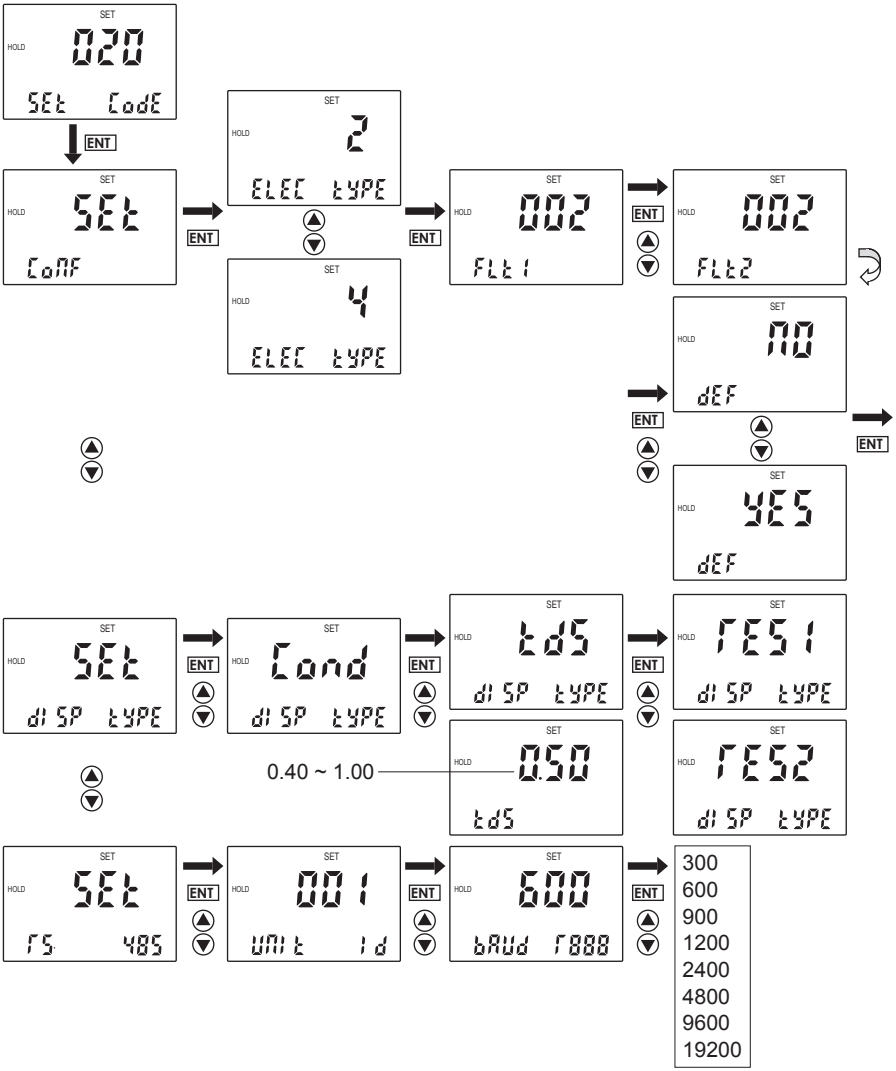
4.3 SYSTEM SET UP

You can press 2 MOD / ESC twice under measurement mode and then input password 020 to get access to System set-up mode. Please operate according to following squares.

Entering System set-up mode



Entering system mode according to following diagram :



1. Entering system set-up mode as Item 4.3 described. LCD display CONF (configuration sub-function).

2. Press 1 ENT to enter, LCD show to choose conductivity electrode. Lower of LCD will show ELEC TYPE, upper will show 2 (2 way electrode). Users can press ▲ or ▼ to choose 4 (4

way electrode). Press 1 ENT to enter into number filtering set up menu. Press ▲ or ▼ to modify number filtering value. Press ENT to confirm and enter into reverting to factory setting menu.

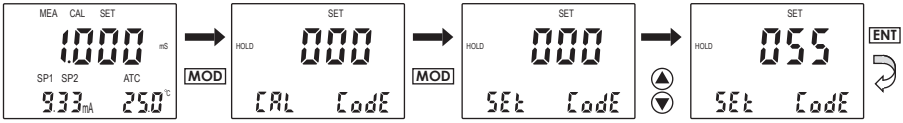
3. Under measurement mode, users can choose measurement mode of conductivity, TDS, resistance. The upper LCD will show SET, the lower LCD will show DISP TYPE. Press ENT to enter or press ▲ or ▼ to choose relevant measurement mode, press ENT to confirm. Under TDS measurement mode, users can set up the transit parameter of TDS from 0.40 to 1.00. The relationship between TDS and conductivity is: CON * TDS parameter = TDS. Two measurement range, RES1 and RES2, can be chosen among resistance. RES1 is correspondent to 3.0M～300.0M，RES2 is correspondent to 0.3M～30.0M.

4. RS-485 set up menu, upper LCD shows SET, lower LCD shows RS-485, press 1 ENT to enter instrument remind ID number. Press ▲ or ▼ to input number, press ENT to confirm and enter into baud rate set up menu. Press ▲ or ▼ to choose relevant value, press ENT to confirm.

5 SET UP MODE

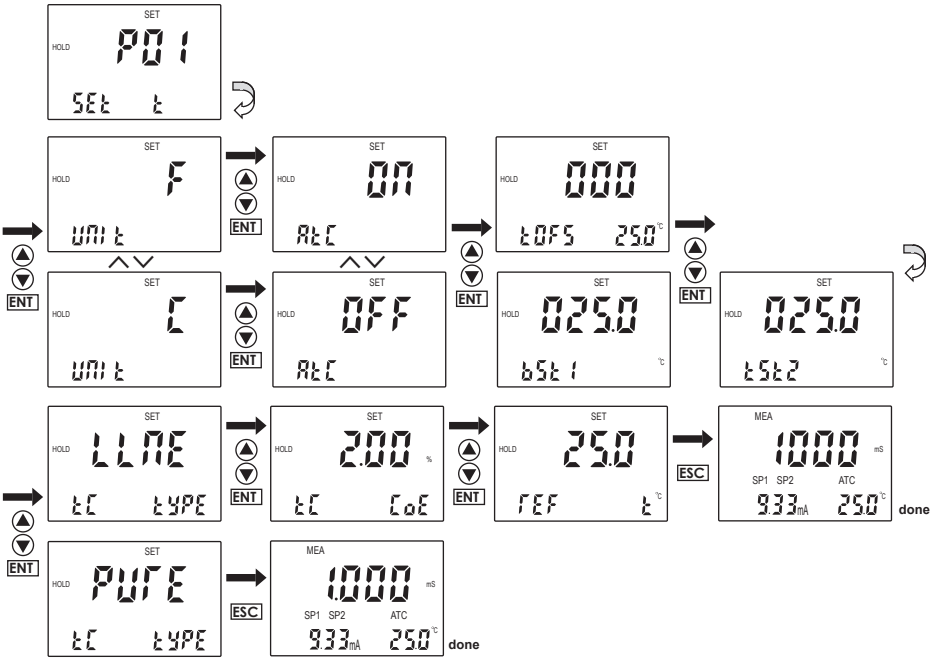
ENTERING SET UP MODE

In set up mode, transmitter can be set up according to your need.



1. Press 2 MOD / ESC twice in measurement mode.
2. LCD ask you to input password. Use ▲ or ▼ to input the password. – Input 055 to change parameter. Press 1 ENT / ☰D to confirm.
NOTE: Press 2 MOD / ESC twice to quit set up mode at anytime. Instrument will return to measurement mode automatically.

5.1 P01：TEMPERATURE SET-UP SUB-FUNCTION



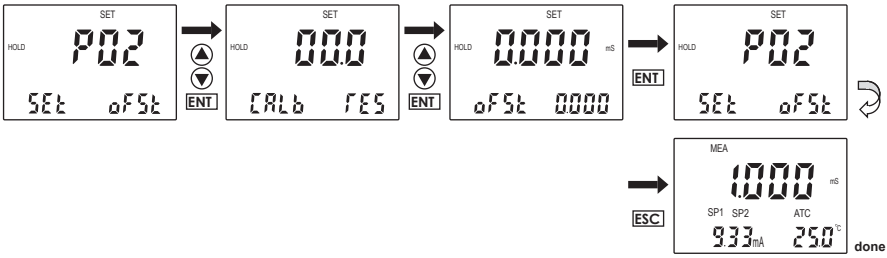
1. Press 1 ENT to enter from P01 screen. LCD main display zone show C, which means temperature unit is centigrade. Press can press ▲ or ▼ to switch to F，which means temperature unit is Fahrenheit. Press 1 ENT to confirm and enter into next item.

2. LCD main display zone shows ON, which means automatic temperature compensation function is open. User can press ▲ or ▼ to switch to OFF and close automatic temperature compensation function to use manual temperature compensation instead.

Press 1 ENT to confirm item. If users choose auto temperature compensation, press 1 ENT , instrument enters into modifying status of temperature measurement value. LCD main display zone show current measurement value of temperature. The lower display TOFS tell users that they can use ▲ or ▼ to modify current temperature display value. Press 1 ENT to confirm and return to P01 Sub-function form. Use ▲ or ▼ to select other sub functions or press 2 MOD ESC to return to measurement status.

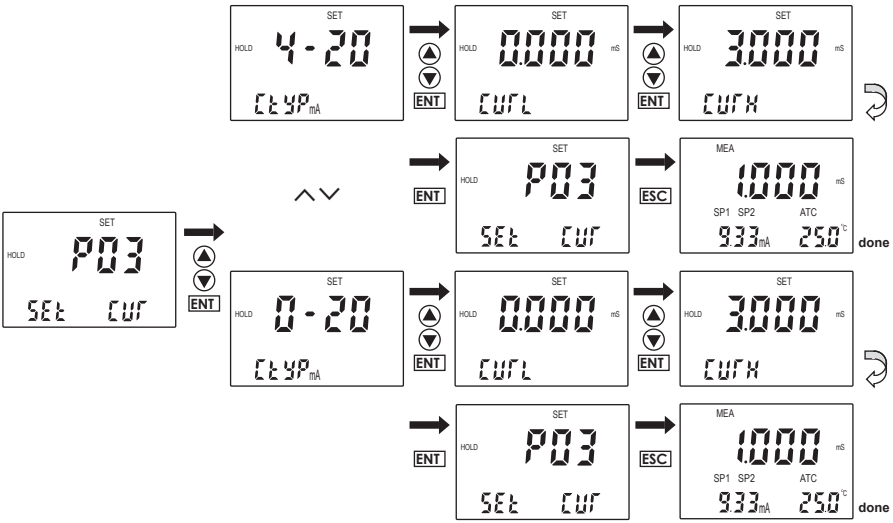
3. In the status of manual temperature compensation, press 1 ENT ≣D and instrument enter set up status of manual temperature compensation user can use ▲ or ▼ to set up process temperature TST1 and calibration temperature TST2. Press 1 ENT ≣D to confirm and return to P01 Sub-function form or press ▲ or ▼ to select other sub functions to set up or press 2 MOD ESC to return to measurement status. TST1 is the compensation temperature under normal measurement while TST2 is the compensation temperature under calibration. Since temperatures are not the same in calibration and normal measurement when instrument is used, two set up values under manual temperature compensation status are convenient. Users will not set manual temperature compensation value back and forth. For example, if user's process temperature is 50.0℃ and the temperature of standard solution when calibrating is 10.0℃, use can set TST1 as 50.0℃ and set TST2 as 10.0℃ for afterwards convenient use. Press ENT to confirm and enter into set-up of temperature compensation parameter. LCD shows LINE (linear compensation), use ▲ or ▼ to switch to PURE (pure water compensation). Choose LINE to set up temperature compensation parameter and basic temperature.

5.2 P02：OFFSET SET-UP SUB-FUNCTION



1. In P02 sub-function form, press **1** ENT. LCD shows CABL RES, users can set up resistance of cable to compensate indication. Compensation of CABL RES is only valid between 0.0 to 300.0mS. Press ENT to confirm and enter into offset set-up.
2. User can press ▲ or ▲ to adjust offset to modify measurement value. Press **1** ENT to confirm and return to P02 sub-function form or press ▲ or ▲ to select other sub-function to set up.
Note: Press **2** MOD ESC to quit set-up mode at anytime. Instrument will return to measurement mode automatically.

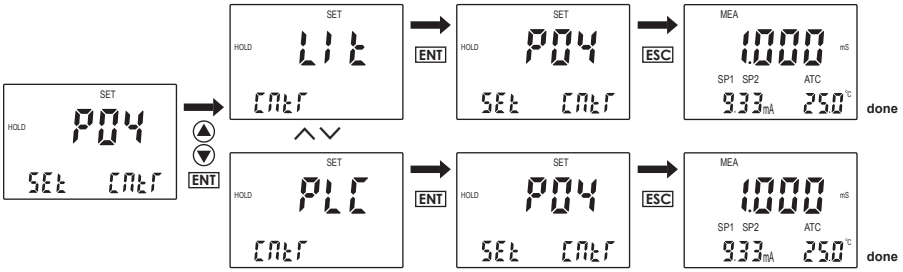
5.3 P03: OUTPUT CURRENT SUB-FUNCTION



1. Press [1 ENT] to confirm in P03 sub-function. Entering set up of the sub-function.
2. The lower display shows CTYP. The upper display shows 4-20 (it means electric circuit output from 4 mA to 20 mA). User can press ▲ or ▼ select 0-20 (it means electric circuit output from 0 to 20 mA). Press [1 ENT] to confirm and enter into set-up of transmitting range.
3. The lower display shows CURL while the upper display shows 0.00, which means that 0.00 mA transmitting range indicates 0.00 ms. User can press ▲ or ▼ to adjust the actual value. Press [1 ENT] to confirm. The lower display shows CURH while the upper display shows 30.00, which means 20.00mA transmitting range indicates 10.00 ms. User can press ▲ or ▼ key to adjust the actual value. Press [1 ENT] to confirm and return to P03 sub-function firm or press ▲ or ▼ to select other sub-functions and to set up.
For example, set CTYP to 0 or 4, set CURL to 2.00 and set CURH to 10.00, which means 0 / 4 to 20 mA output mode is selected as circuit output. 0 / 4.00 mA indicates 2.00 ms, 20.00 mA indicates 10.00 ms

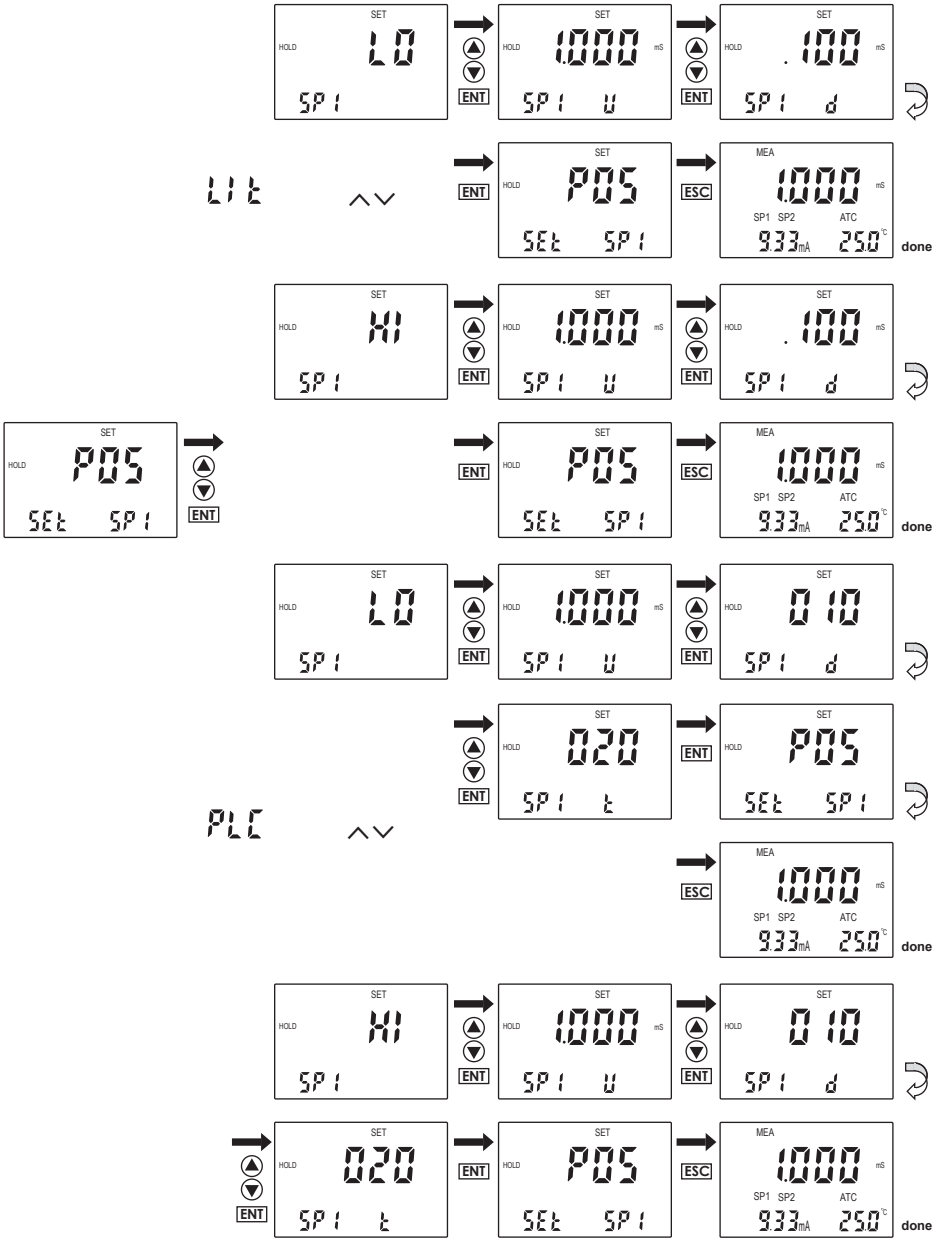
	**Note**: Press [2 MOD ESC] to quit set-up mode at anytime. Instrument will return to measurement mode automatically.
	**Note**: This parameter allows you to set range of circuit output, but transmitting high point and low point can't be overlapped.

5.4 P04：CONTROL MODE SUB-FUNCTION



1. Press 1 ENT in P04 sub-function form to enter into concrete set up procedure.
2. The lower display shows CNTR while the upper display shows LIT. This form allows users set up limited control mode. User can press ▲ or ▲ to select PLC mode. Press 1 ENT to confirm and return to P04 sub-function form. Use ▲ or ▲ to select other sub-functions and to set up.
Note：Press 2 MOD ESC to quit set up mode at any time. Instrument will return to measurement mode automatically.

5.5 P05：RELAY 1 SET-UP SUB-FUNCTION



1. In P05 sub-function form. Press 1 ENT to enter into concrete set-up procedure.

2. The lower display shows SP1 while the upper display shows HI, which means set point 1 is under high-point control status, relay begins to work when the measured value up to set value. Press 1 ENT to confirm and enter into next set up procedure.

3. The lower display shows SP1 U while the upper display shows concrete value. User of the function form can press ▲ or ▼ to adjust the value to confirm concrete set up value. Press 1 ENT to confirm and enter into next set up procedure.

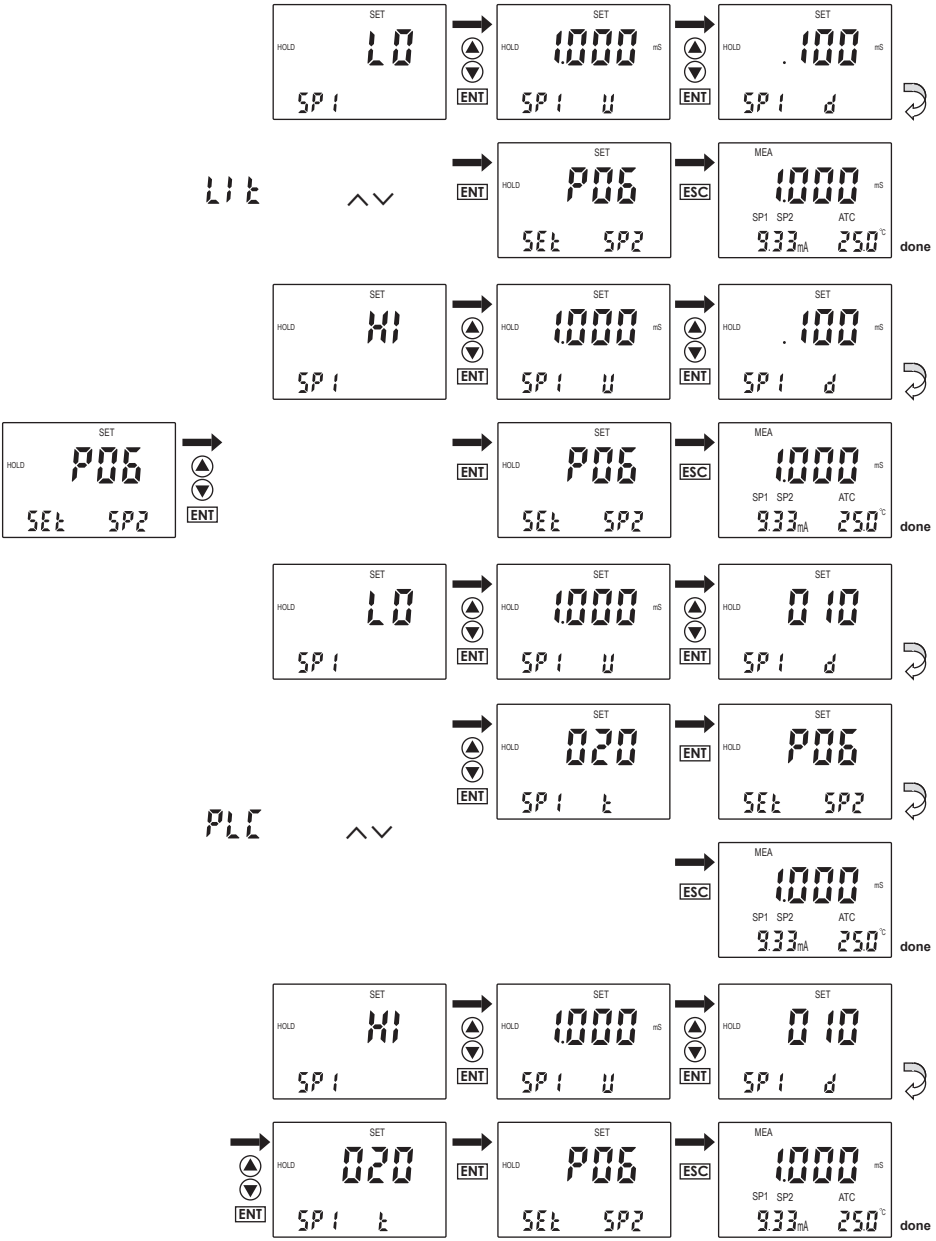
4. The lower display shows SP1 d, this function form sets hysteresis band under limited control mode to protect relay, which may oscillate frequently around set point and be damaged. Press 1 ENT to confirm and enter into next set up procedure.

Note: There are two modes of relay set-up: LIT and PLC. Please refer to next page about PLC.

Note: Press 2 MOD ESC to quit set up mode at any time.
Instrument will return to measurement mode automatically.

5.6 P06：RELAY 2 SET-UP SUB-FUNCTION

Working principle of this part is the same as which of P05 relay 1 set-up sub-function. Please operate according to P05.



NOTE: Set-up value range of hysteresis band under limited control mode is from 0.00 to 2.0 ms. For example, if high point is 7.00 ms and hysteresis band is 0.50 ms, movement range of the relay is from 6.50 ms to 7.00 ms. If low point is 6.00 ms and hysteresis band is 0.20 ms, movement range of the relay is from 6.00ms to 6.20 ms.

NOTE: In PLC control mode, movements of the relay meet following formulas:

C * (VM – VS) * U * T / 14

C is discriminate parameter for high / low point.

It is +1 when set to high point and it is -1 when set to low point.

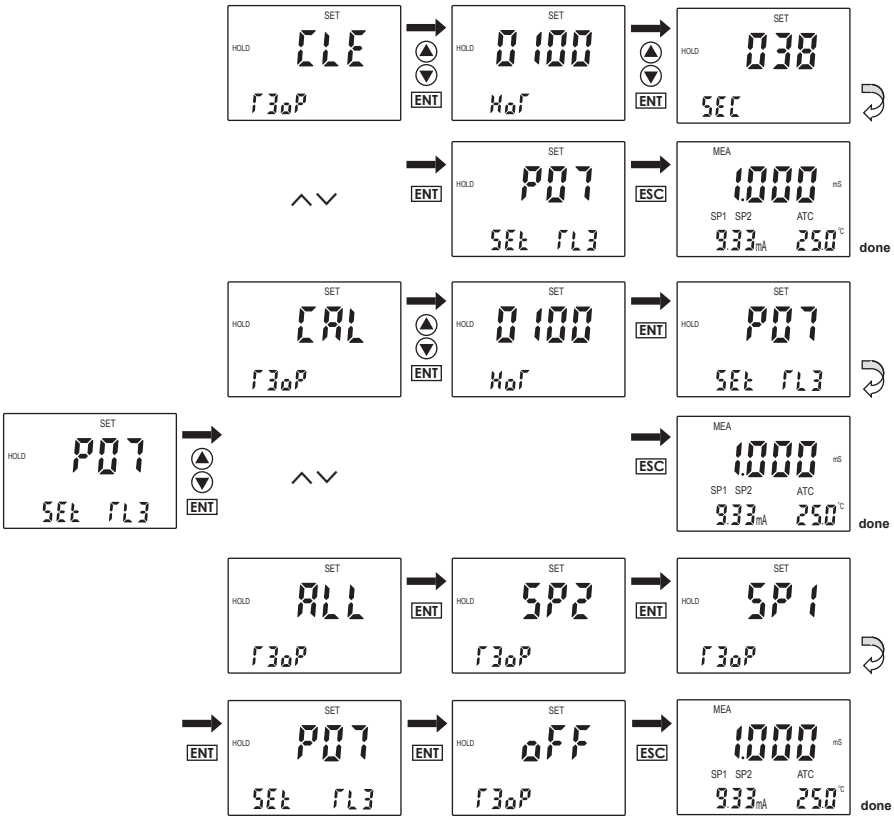
VM is measured value.

VS is set value.

U is control parameter, such as sp1 d or sp2 d

T is time constant (represent the whole movement circle of relay): SP1 t or SP2 t

5.7 P07：ALARM RELAY 3 SET-UP SUB-FUNCTION



1. Select P07 sub function, Press [1 ENT] to confirm. Enter into concrete set-up procedure.

2. Select concrete working mode. Press [3 ▽] or [4 △] to select suitable control mode.

- **CAL**＝Relay 3 as calibrationg alarm relay
- **ALL**＝move with two relays simultaneously
- **SP1**＝relay 3 moves with SP1
- **SP2**＝relay 3 moves with SP2
- **OFF**＝relay 3 is off

Press **ENTER** to confirm your set up.

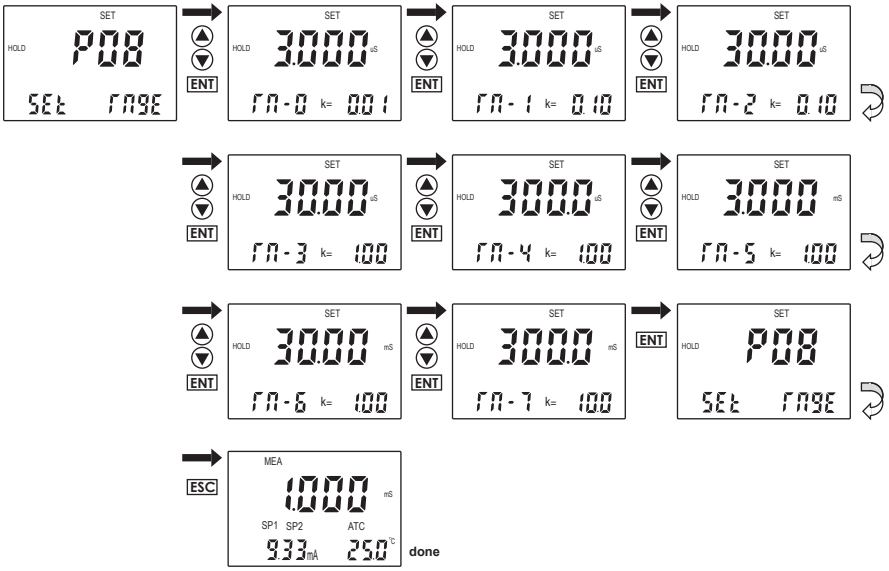
If user select CAL working mode, he can set calibration indicate intervals in the function form, use houras the unit. In this way, instrument and electrode can keep their reliability.

If user select CLE working mode, he can set cleaning time intervals in the function form, use hour as the unit; cleaning continuous time, use second as the unit. In this way, instrument and electrode can keep their reliability. User can install cleaning equipment to increase service life and reliability of electrode.

Press [1 ENT] to confirm and return to P07 sub-function form. Use [3 ▽] or [4 △] to select other sub-functions to set up.

NOTE: Press [2 MOD ESC] to quit set up mode at any time.
Instrument will return to measurement mode automatically.

5.8 P08：MEASUREMENT RANGE CHOOSE SUB FUNCTION

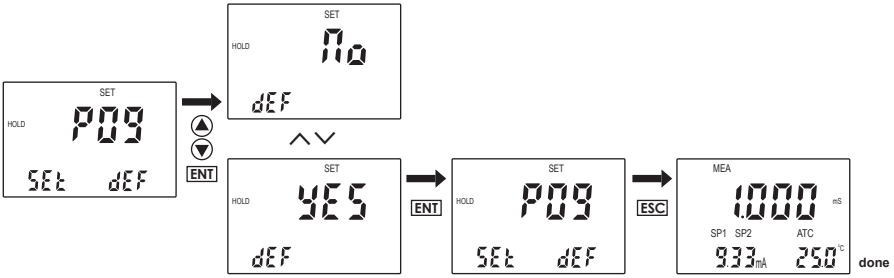


1. Press key to confirm in P08 and enter in concrete set-up procedures.
2. You can set up measurement range of conductivity and TDS in this sub-function. Use ▲ or ▼ to select the measurement range and press **1 ENT** to confirm.
 **Note**: Press **2 MOD ESC** to quit set-up mode at any time. Instrument will return to measurement mode automatically.

Form of Measurement Range

Type of temperature compensation	Measurement Mode	Code of measurement range	Constant	Measurement range
PURE	RES1	X	0.01	3.0~300.0 MΩ
	RES2			0.3~30.0 MΩ
	CON/TDS			3.000 μS / ppm
LINE	RES1			3.0～300.0 MΩ
	RES2			0.3～30.0 MΩ
	CON/TDS	7	10.0	300.0 mS / ppt
		6	1.00	30.00 mS / ppt
		5		3.000 mS / ppt
		4		300.0 μS / ppm
		3		30.00 μS / ppm
		2	0.10	30.00 μS / ppm
		1		3.000 μS / ppm
		0	0.01	3.000 μS / ppm

5.9 P09：TRANSMITTING RATE SUB FUNCTION



1. Press **1** ENT in P09 to enter into concrete set-up procedures.
2. The lower display of the instrument shows DEF while the upper display shows NO (YES). User can press ▲ or ▲ to select necessary items. If select YES, all settings will be reset to factory default. User's setting will be lost.
Note: Press **2** MOD ESC to quit set up mode at any time. Instrument will return to measurement mode automatically.

COMMUNICATION AGREEMENT

1. The parameters for communication setting

Instruments using the 485 (two-wire) interface for communication, which is used from 1 to 64 instruments to connect in one communication line. Two lines are available to make more than one instrument to communicate with computers and the communication distance is up to 1200 m.
Communication data format are 1 start bit, 8 data bits, 1 stop bit, and no parity.
Communication speed is 300 ~ 38400 bit /s (commonly used 9600 bit /s).

The set up of instrument is the machine number (nb), and then press the appropriate Baud Rate from the following table (bt):

Bt	0	1	2	3	4	5	6	7
Baud Rate	300	600	1200	2400	4800	9600	19200	38400

The status of instrument is usually on receiving state. Only the host computer sends the corresponding call from meter data in accordance with the requirements of the host MACHINE. Return the receiving state after send data completely.
To avoid conflict, the instrument must be set for each line does not duplicate ID numbers (determined by NB).
All instruments and host MACHINE must have the same communication rate (determined by BT, commonly used 9600 bit / s).

2 The data format

All double-byte parameters (from -32767 to 32767), with a hexadecimal number, and the highest bit is the sign with the value represented by the original code .
All single-byte number is a positive integer.
All data is transmitted by ASCII code: starting character is @ (40H), and the end of the character CR (0DH).
All the characters data is represented by ASCII code for one hexadecimal data format.
For the start flag, end flag, and command characters, the remaining data should be between 30H ~ 39H and 41H ~ 46H.
For double-byte parameter transmission, low byte first, and high byte last.
Each byte is transmitted, the high nibble first, and low nibble last.

A complete instruction for communication is: 40, ID number, instruction sequence (address adr, length lth,) CRC, 0D
‘
The ID number is the guest MACHINE number (NB);
Check the following instruction sequences;
Address (adr) is the first parameter;

Length (lth) is the parameter to be transmitted;
CRC word is ID number, instruction sequences, adr, lth XOR result.

3 the acceptable communication instruction is :
1) RD: read float data;
2) RE: read specified starting address (adr) and numbers of bytes (lth) (not exceeding the parameters of the highest address);
3) RR: read all operating parameters;

Each command description (set guest MACHINE number ID = 1)
1) RD (read float data) : Host MACHINE : 40,30,31,52,44, CRCH, CRCL, 0D (8 bytes) .

Byte 1 (40) : Starting flag ;
Byte 2,3 (3031) : The next bit machine ID number (hexadecimal : 0 ~ 3FH; ASCII: 30 30 ~ 33 46);
Byte 4,5 (5244) : Instruction letters R, D;
Byte 6,7 (CRCH, CRCL): checksum byte , byte XOR checksum value of 2 to 5 ;
Byte 8 (0D): end flag.

Guest machine response:
40,30,31,52,44 , (2,3 byte is the ID number, and the rest is prescribed bytes.)
V1LH, V1LL, V1HH, V1HL, (PH / ORP / DO /Dd measured value)
3X (the decimal point position , 30 to 33 , corresponding to 0 to 3 decimal places)
IOLH, IOLL, IOHH, IOHL (current output)
FATC (30: OFF; 31H: ON)
V2LH, V2LL, V2HH, V2HL, (temperature measurements, the default is one decimal)
JD1 (Relay 1 status , 30: release ; 31: Closed)
JD2 (Relay 2 status , 30: release ; 31: Closed)
JD3 (3 state relay , 30: release ; 31: Closed)
FKER (KERR state, 30 : normal ; 31: error)
FCHG (parameter modification status , 30: no modification ; 31: There are modifications)
CRCH, CRCL, (2 bytes from the beginning to the FKER (23 bytes) XOR checksum)
0D (end flag)
(27 bytes) .

2) RE (read the specified operating parameters) :
Host machine: 40,30,31,52,45,30,30, adrH, adrL, lthH, lthL, CRH, CRL, 0D (14 bytes) .

Byte 1 (40) : Starting flag ;
Byte 2,3 (3031) : The next bit machine ID number (hexadecimal : 0 ~ 3FH; ASCII: 30 30 ~ 33 46);
Byte 4,5 (5245) : Command letters R, E;
Byte 6,7 (3030) : Reserved Byte
Byte 8,9 (adrH adrL): Parameter starting byte address adr;
Byte 10,11 (lthH lthL): Add the parameter length lth;
Byte 12,13 (CRCH CRCL): checksum byte , byte XOR checksum value of 2 to 11 ;

Byte 14 (0D): end flag.

Parameters address arrangement, please see the "OMEGA meter address table"

adr	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D
para	TST1	TST1	TST2	TST2	SP1U	SP1U	SP2U	SP2U	CURL	CURL	CURH	CURH	POFS	POFS
adr	0E	0F	10	11	12	13	14	15	16	17	18	19	1A	1B
para	HOR	HOR	AAA	FUNC	R3OP	TOFS	SEC	SP1D	SP1T	SP2D	SP2T	NB	BT	CONF

If adr larger or adr + lth beyond the parameters address, or the length of bit is zero, it returns an error signal : 40,30,31,52,45,2 A, 2A, CRH, CRL, 0D
Where 2A 2A (**) is the error flag.
If the address range is correct, the next crew to return: 40,30,31,52,45, D1, D2, D3, ... Dn, CRH, CRL, 0D
Where:
40,30,31,52,45 (2,3 byte is the ID number , and the rest is prescribed bytes.)
D1 ~ Dn: upload parameters (two for each parameter byte ASCII byte transfer , n = 2 * lth);
CRCH, CRCL, (2 bytes from the beginning to the CRCH previous byte XOR checksum)
0D (end flag)
Total number of bytes = 5 + 2 × lth + 3

3) RR (read all operating parameters) : Host machine : 40,30,31,52,52, CRH, CRL, 0D (8 bytes) .

Byte 1 (40) : Start flag ;
Byte 2,3 (3031) : The next bit machine ID number (hexadecimal : 0 ~ 3FH; ASCII: 30 30 ~ 33 46);
Byte 4,5 (5252) : Command letters R, R;
Byte 6,7 (CRCH, CRCL): checksum byte , byte XOR checksum value of 2 to 5 ;
Byte 8 (0D): end flag.

Guest machine response: 40,30,31,52,52, D1, D2, ..., Dn-1, Dn, CRH, CRL, 0D (n number of bytes depending on the instrument model)
Where:
40,30,31,52,52 , (2,3 is in addition to the native byte ID number , and the rest is prescribed bytes.)
D1 ~ Dn: upload parameters (two for each parameter byte ASCII bytes transferred) ;
CRCH, CRCL, (2 bytes from the beginning to the Dn -byte XOR checksum)
0D (end marker)
Total number of bytes = 5 + 2 × n + 3

5, the notice for communication programming:

1) When the instrument receives the length of the instruction sequence starting with 40H is larger than 16 bytes and still dose not find the 0D, the data series is failed, and the instrument send no response messages.
2) The instrument shows no response messages when adr, lth and data sequence contains information beyond 00H ~ 0FH (ASCII code 30 to 39, 41 to 46).
Other errors, such as illegal orders, adr wrong, too long lth, CRC error, etc.,and the instrument sends back

an error message.
3) All parameters are sent by integers, and some parameters are not sent with a decimal point decimal, when the host machine is displayed according to the agreed deal decimal point position (see " OMEGA instrument parameters decimal table"), the host machine and the instrument should display the actual parameters of the decimal point same measurements decimal places .
4) Some single-byte parameters with negative sign is the absolute value (0 to 255), so the host machine displays the parameter should be plus / minus its OFS value, and then show with symbols.
5) Some parameters are displayed on guest machine with sign but it is transmitted by the value. "Please refer the Effective range" for host machine to display the contents of the instrument parameters or direct display its value.
6) AAA is reserved for the single-byte parameter, the guest machine is not displayed, but sent communication.
7) CONF instrument contains eight statuses for parameters by converted to binary codes, and display the discrimination of bits. See the definition of “OMEGA instrument parameters decimal Table"

CDCN-961 float data protocol description							
Byte	Add	Float data	command description	Example 1	command description	Example 2	command description
1	0	40H	Starting flag	40	Fix format	40	Fix format
2	1	（30H）	High byte	30		30	
3	2	（31H）	Low byte	31		31	
4	3	52H	Instruction letter R	52		52	
5	4	44H	Instruction letter D	44		44	
6	5	V1L-H	DO measured value	30	DO reading 0001(H) = 0.01ppm	45	DO reading 02E0(H) = 7.36ppm
7	6	V1L-L		31		30	
8	7	V1H-H		30		30	
9	8	V1H-L		30		32	
10	9	POT	decimal point position	32	2 decimal point	32	2 decimal point
11	0A	OUTL-H	current output	39	Current reading 0190(H) = 4.00(mA)	32	Current reading 062F(H) = 15.83(mA)
12	0B	OUTL-L		30		46	
13	0C	OUTH-H		30		30	
14	0D	OUTH-L		31		36	
15	0E	FATC	MTC/ATC	30	0：MTC	30	0：MTC
16	0F	V2L-H	Temp. measured Value	43	Temp. reading 00C8(H) = 20.0℃	46	Temp. reading 00FA(H) = 25.0℃
17	10	V2L-L		38		41	
18	11	V2H-H		30		30	
19	12	V2H-L		30		30	
20	13	JD1	Relay 1 status	31	1：ON	30	0：OFF
21	14	JD2	Relay 1 status	30	0：OFF	31	1：ON
22	15	JD3	Relay 1 status	30	0：OFF	30	0：OFF
23	16	FKER	KERR status	30	0：normal	30	0：normal
24	17	FCHG	parameter modify-cation status	30	0：no modification	30	0：no modification
25	18	CRCH	Checksum high byte	35	XOR checksum	32	XOR checksum ,Generate automatically
26	19	CRCL	Checksum low byte	36		35	
27	1A	0DH	End flag	0D	Fix format	0D	Fix format

Table for parameter decimal point												
Model	PHCN-961				CDCN-961				DOCN-961			
Byte	Parameter	Add.	POT	OFS	Parameter	Add.	POT	OFS	Parameter	Add.	POT	OFS
	PH		2		Dd/TDS		1～3		PPM		2	
	ORP		0		RES		1		DO(%)		1	
	Temp		1		Temp		1		Temp		1	
1	TST1	0	1		TST1	0	1		TST1	0	1	
2	TST2	2	1		TST2	2	1		TST2	2	1	
3	SP1U	4	0/2		SP1U	4	1～3		SP1U	4		
4	SP2U	6	0/2		SP2U	6	1～3		SP2U	6		
5	CURL	8	0/2		CURL	8	1～3		SAL	8	1	
6	CURH	0A	0/2		CURH	0A	1～3		AIR	0A	0	
7	POFS	0C	0/2		POFS	0C	1～3		CURL	0C		
8	HOR	0E	0		HOR	0E	0		CURH	0E		
9	REVS	10	0		KUSE	10	3	800	POFS	10		
10	FUNC	11	0		SP1D	12	1～3		HOR	12	0	
11	R3OP	12	0		SP2D	13	1～3		TANK	14	2	
12	TOFS	13	1	-100	TOFS	14	1	-100	SP1D	16		
13	SEC	14	0		SEC	15	0		SP2D	17		
14	SP1D	15	0/2		R3OP	16	0		TOFS	18	1	-100
15	SP1T	16	0		REFT	17	1	150	SEC	19	0	
16	SP2D	17	0/2		TCOE	18	2	100	R3OP	1A	0	
17	SP2T	18	0		CABR	19	1		LIQ	1B	1	
18	NB	19	0		RNGE	1A	0		NB	1C	0	
19	BT	1A	0		SP1T	1B	0		BT	1D	0	
20	CONF	1B	0		SPTT	1C	0		CONF	1E	0	
21					CONF	1D	0		REVS	1F		
22					CTDS	1E	2	40				
23					DISP	1F	0					
24					NB	20	0					
25					BT	21	0					
26					FLT1	22	0					
27					FLT2	23	0					
	CONF:7～0				CONF:7～0				CONF:7～0			
	C.7:1=Auto/0=Man.				C.7:1=Auto/0=Man.				C.7:1=Auto/0=Man.			
	C.6:4～20mA/0～20mA				C.6:4～20mA/0～20mA				C.6:4～20mA /0～20mA			
	C.5(SP1):1=HIG/0=LO				C.5(SP1):1=HIG/0=LO				C.5(SP1):1=HIG/0=LO			
	C.4(SP2):1=HIG/0=LO				C.4(SP2):1=HIG/0=LO				C.4(SP2):1=HIG/0=LO			
	C.3:1=PLC/0=Lit				C.3:1=F/0=℃				C.3:1=F/0=℃			
	C.2:1=ANTI/0=GLAS				C.2:1=PURE/0=LINE				C.2:1=GA/0=GLAS			
	C.1:1=NTS/0=USA				C.1:1=PLC/0=Lit				C.1:1=PPm/0=%			
	C.0:keep				C.1:1=4 极/0=2 极				C.1:1=t℃/0=25℃			

Address table for protocol					
	Model	PHCN-961		CDCN-961	DOCN-961
Byte	Add.	Float data	Parameter	Parameter	Parameter
1	0	40H	TST1-L	TST1-L	TST1-L
2	1	（30H）	TST1-H	TST1-H	TST1-H
3	2	（31H）	TST2-L	TST2-L	TST2-L
4	3	52H	TST2-H	TST2-H	TST2-H
5	4	44H	SP1U-L	SP1U-L	SP1U-L
6	5	V1L-H	SP1U-H	SP1U-H	SP1U-H
7	6	V1L-L	SP2U-L	SP2U-L	SP2U-L
8	7	V1H-H	SP2U-H	SP2U-H	SP2U-H
9	8	V1H-L	CURL-L	CURL-L	SAL-L
10	9	POT	CURL-H	CURL-H	SAL-H
11	0A	OUTL-H	CURH-L	CURH-L	AIR-L
12	0B	OUTL-L	CURH-H	CURH-H	AIR-H
13	0C	OUTH-H	POFS-L	POFS-L	CURL-L
14	0D	OUTH-L	POFS-H	POFS-H	CURL-H
15	0E	FATC	HOR-L	HOR-L	CURH-L
16	0F	V2L-H	HOR-H	HOR-H	CURH-H
17	10	V2L-L	AAA	KUSE-L	POFS-L
18	11	V2H-H	FUNC	KUSE-H	POFS-H
19	12	V2H-L	R3OP	SP1D	HOR-L
20	13	JD1	TOFS	SP2D	HOR-H
21	14	JD2	SEC	TOFS	TANK-L
22	15	JD3	SP1D	SEC	TANK-H
23	16	FKER	SP1T	R3OP	SP1D
24	17	FCH2	SP2D	REFT	SP2D
25	18	CRCH	SP2T	TCOE	TOFS
26	19	CRCL	NB	CABR	SEC
27	1A	0DH	BT	RNGE	R3OP
28	1B		CONF	SP1T	LIQ
29	1C			SP2T	NB
30	1D			CONF	BT
31	1E			CTDS	CONF
32	1F			DISP	AAA
33	20			NB	
34	21			BT	
35	22			FLT1	
36	23			FLT2	
37	24				
38	25				
1、For double-byte parameter transmission, low byte first, and high byte last.					
2、Each byte is transmitted, the high nibble first, and low nibble last.					

6 TECHNICAL PARAMETERS

6.1 TECHNICAL PARAMETERS FORM

CDCN-961 Transmitter / Controller	
Measurement Range	0.000 to 3.000 µS/cm 0.000 to 3.000 ppm 0.00 to 30.00 µS/cm 0.00 to 30.00 ppm 0.0 to 300.0 µS/cm 0.0 to 300.0 ppm 0 to 3.000 mS/cm 0 to 3.000 ppt 0 to 30.00 mS/cm 0 to 30.00 ppt 0 to 300.0 mS/cm 0 to 300.0 ppt 0.3 to 30.0 MΩ * cm 3 to 300.0 MΩ * cm
Analytical degree & precision	0.001 µS/cm , 0.1 MΩ * cm / ±1% full range
Temperature	- 5.0 to 130 ˚C
Analytical degree & precision	0.1 & ± 0.5 ˚C
Temperature electrode	Pt-1000
Temperature compensation	Automatic (± 10 ˚C offset adjustment) / manual
Set point and control function	
Control function	Limited point
Cleaning circle	From 1 to 999 hours
Cleaning time	From 1 to 999 seconds
Control hysteresis band	10%
Relay	**output**
RS-485	**client program**
Electric current information and connection	
Electric source	220 V AC
Signal output / load	0 / 4 - 20 mA isolated current output, can be set up freely
Signal output load	600 Ω
Connection terminal	Connection terminal
Main fuse wire	Main fuse wire
Alarm function	
Function (switchable)	Alarm, calibration remind, clean control
Display	
LCD (liquid crystal display)	Big-size screen of crystal display, orange back light
EMC Specification	
Electromagnetic emission	EN 50081-1
Electromagnetic induction	EN 50082-1
Environmental conditions	
Working temperature	- 10 to 50 ˚C (14 to 122 ˚F)
Humidity	10 to 95% (no frozen dew)
Protection grade	NEMA 4X，IP 65

6.2 PARAMETER SETTING AND FACTORY PRELIMINARY VALUE

NO.	Indication	Parameter	Symbol	Contents	Remark	Valid range	Factory value
01		LOCK	LOC	Password function		0～200	0
02	P1 TC	ATC	AtC	Auto/Manual TEMP compensation		ON/OFF	OFF
03		TSET1	tSt1	TEMP set up of manual	Only valid for manual	-10～100℃	25.0
04		TSET2	tSt2	Calibration TEMP set		0.0～60.0℃	25.0
05		TOFS	tOFS	TEMP measurement offset	Only valid for auto	-10～10℃	0.0
06		LINE	LINE	TEMP line compensation		LINE	LINE
07		PURE	PURE	Pure temperature compensation			
08	P2 OFS	POFS	POFS	measurement value offset		000～20.00	0.00
09		CABL	CABL	CABL	Constant K＝10.0 is valid	0.0～20.0 ohm	0.0
10	P3 CUr	CTYP	CtyP	Type of current output		0/4～20mA	4
11		CURL	CUrL	Low limit of transmitting output	ppm mode 0.01 unit % mode is 0.1 unit	0.00～40.00	0
12		CURH	CUrH	High limit of transmitting output		0.0～400.0	1000
13	P4 SAL	LIT	LIT	Limitation control			LIT
		PLC	PLC	pulse length contro			
14	P5 SP1	SP1	SP1	Way set up of relay 1		HI /LO	LO
15		SP1U	SP1U	Setting value of relay 1	ppm mode 0.01 unit % mode is 0.1 unit	0.00～40.00	2.00
16		SP1D	SP1d	Relay 1 hysteresis / proportion		0.00～2.00	0.10
17	P6 SP2	SP2	SP2	Way set up of relay 2		HI /LO	HI
18		SP2U	SP2U	Setting value of relay 2	ppm mode 0.01 unit % mode is 0.1 unit	0.00～40.00	6.00
19		SP2D	SP2d	Relay 2 hysteresis / proportion		0～2.00	0.10
20	P7 rL3	R3OP	R3OP	Working mode of relay 3		OFF/SP1/SP2/ ALL/CAL/CL E	CAL
21		IN	HOr	Interval (hour)	valid for calibration and cleaning mode	0-999	100
22		DUR	SEC	Operating time (second)	valid for cleaning mode	0-200	30
23	P8 CONF	RNGE	RNGE	measurement range	1,2,3,4,5,6,7		5
24	P9 DEF	NB	nb	Set ID number for 485		0-63	1
25		BT	b	Communication rate		0-7	5
26		NB	nb	Set ID number for 485		0-63	1
27		BT	bt	Communication rate		0-7	5

7 GENERAL INFORMATION

WARRANTY

OMEGA ENGINEERING, INC. warrants this product to be free from significant deviations in material and workmanship for a period of one year from the date of purchase. If repair is necessary and has not been the result of abuse or misuse within the warranty period, please return to OMEGA ENGINEERING, INC. and amendment will be made without any charge. OMEGA ENGINEERING, INC. Customer Service Center will determine if product problem is due to deviations or customer abuse. Out of warranty products will be repaired on a charge basis.

RETURN OF MALFUNCTION INSTRUMENTS

Authorisation must be obtained from OMEGA ENGINEERING, INC. Customer Service Center to issue a RIR number before returning items for any reason. When applying for authorisation, please include date requiring the reason of return. Instruments must be carefully packed to prevent damage in shipment and insured against possible damage or loss.
OMEGA ENGINEERING, INC. will not be responsible for any damage resulting from careless or insufficient packing.

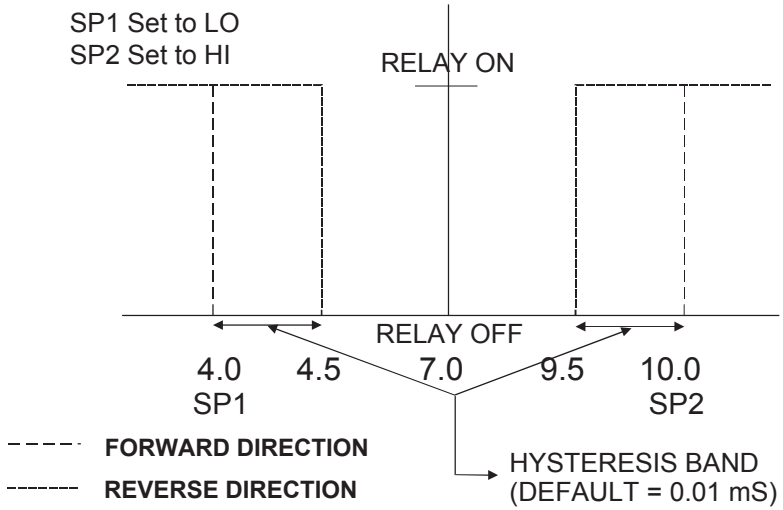
Warring: Damage as a result of inadequate packaging is the User / distributor's responsibility. Please follow the guidelines below before transporting.

GUIDELINES OR RETURNING UNIT FOR REPAIR

Use the original packaging material, if possible when transporting back the unit for repair. Otherwise wrap it with bubble pack and use a corrugated box for better protection. Include a brief description of any faults suspected for the convenience of Customer Service Center, if possible.

APPENDIX 3 – HYSTERESIS BAND

Simple Explanation on the Function of Hysteresis Band



The controller relay activates when the set-point is reached. In the reverse direction, it closes. Relay continues to be active till the value reaches the amount set by hysteresis band.

ACCESSORY 5 - ABBREVIATIONS IN FUNTION FORM

Character	Meaning	Character	Meaning
MEA	Measurement mode	C	Centigrade
CAL	Calibration mode	F	Fahrenheit
ENT	Confirm	UNIT	Unit
OFS	Zero point offset		
SET	Set up	PPt	Salty Unit
ATC	Automatic temperature compensation	LINE	Temperature line compensation
SP1	Set point 1	PURE	Pure temperature compensation
SP2	Set point 2	RNGE	Measurement range
LO	Low limit	CABL	CABL
HI	High limit	COND	Conductivity
CNtr	Control	TDS	TDS
LIt	Output signal	RES	Resistivity
PLC	Configuration	FLT1	Number filter 1
RL3	Clean	FLT2	Number filter 2
OUT	Glass electrode		
CONF	Antimony electrode		
CLE	USA standard buffer		

NOTES:

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components in which wear is not warranted, include but are not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by the company will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and, additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of theproduct, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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- Pumps & Tubing
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- Industrial Water & Wastewater Treatment
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