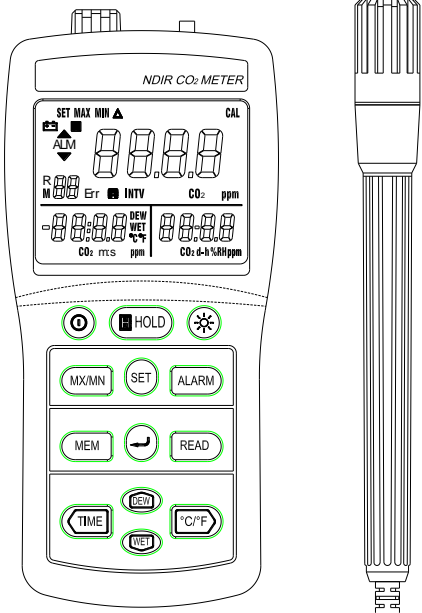


TES THERMO-HYGRO- NDIR CO₂ METER

TES-1370

INSTRUCTION MANUAL



TES ELECTRICAL ELECTRONIC CORP.

I. SAFETY INFORMATION

Safety

When using the meter to check for CO₂ values, make certain that you can safely raise and hold the instrument while making measurements. Be especially careful when working on a ladder.

Observe all necessary precautions so that the unit does not become caught in moving machinery or touch any exposed electrical wiring.

Ventilation systems should be designed to bring in enough outside air to keep the ambient air below 1,000 PPM CO₂. CO₂ comes from people exhaling CO₂ in the concentration of approximately 40,000 PPM. The more people in a room or building, the more CO₂ is present.

Unlike CO (carbon monoxide), people can sense CO₂. As CO₂ levels go up, people can become unproductive, irritable, uncomfortable and tired.

The way to bring CO₂ levels down is to bring in more outside air. ASHRAE Standard 62-1989 contains guidelines to determine ventilation rate by measuring CO₂ content of air. If CO₂ is higher than 1,000PPM, ventilation system modifications may be necessary to insure IAQ conditions are met as established by ASHRAE.

Danger

Use with corrosive or other dangerous or explosive gas mixtures is not recommended.

II. INTRODUCTION

General Description

The meter is a handheld meter to measure ambient Temperature ($^{\circ}\text{C}/^{\circ}\text{F}$), Relative Humidity (%RH) and Carbon Dioxide (CO_2 , ppm). An CO_2 NDIR sensor in the top of the meter measures gas content by diffusion through sensing holes. The meter sensing holes are on the top of the instrument case. The meter measures carbon dioxide concentration by relying on one of the natural properties of CO_2 molecules. CO_2 molecules **absorb** light at a specific wavelength. High concentrations of CO_2 molecules absorb more light than low concentrations. This technique is called non-dispersive infrared (NDIR) detection.

Don't exhale into sample air

When measuring ambient air, do not exhale into air surrounding the meter! Your breath contains 40,000 PPM CO_2 . While it won't hurt the meter sensor, it doesn't take much to throw your reading off.


When taking measurements, place the meter in the mixed air that desire to measure. In this way, you won't contaminate the gas measured by the instrument with your breath. Up high, near the return vent might be a good spot. On a table surrounded by people looking at the meter (and breathing on it) would be a very bad spot.

III. SPECIFICATIONS

General Specifications

Display : LCD triple display.

Display Rate : One time per second.

Low Battery Indication : The "" is displayed when the battery voltage drops below the operating voltage.

Power Supply : ① Six (6) AAA-size alkaline (large current) batteries.
② Regulated AC adapter.

Battery Life : Approx. 8 hours by using alkaline (large current) batteries (without backlight or Alarm function).
For long time datalogging, please use AC adapter.

Manual Data Memory Capacity : 99 sets.

Auto Datalogging Capacity ; 20,000 sets (maximum 99 blocks)

Operating Temperature Range : 5°C to 50°C (41°F to 122°F)

Storage Temperature Range : -10°C to 60°C (-14°F to 140°F)

Operating Humidity Range : 10%RH to 90%RH, non-condensing.

Storage Humidity Range : 10%RH to 90%RH, non-condensing.

Dimensions : 158 (L)x72(W)x35(H)mm, (6.22"x2.83"x1.38")

Weight : approx. 255g (including batteries)

Accessories : Instruction Manual, Battery, AC Adaptor,
Software CD Rom & RS232 Cable.

Electrical Specifications

CO_2 Specifications :

Sensing Range : 0 to 6000ppm

Sensing Resolution : 1ppm

Accuracy : @ 101.4 kPa (29.92 inHg) and @ 25°C (77°F)

$\pm 3\%$ of reading or $\pm 50\text{ppm}$, whichever is greater.

Sensing Method : Dual wavelength detector with non-dispersive infrared (NDIR) sensor.

Gas Sampling Mode : Diffusion.

Warm up time : 10 seconds.

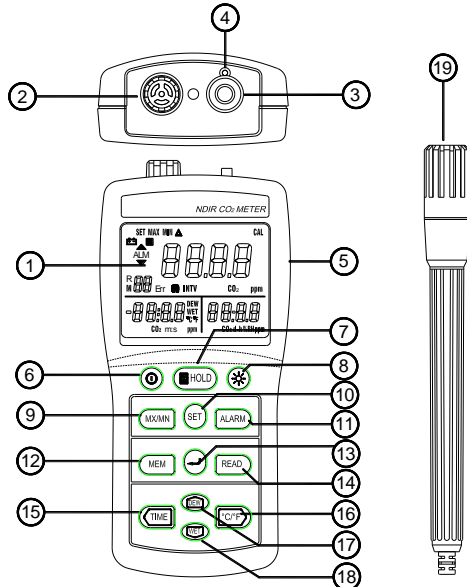
Response time : < 10 minutes in still air.

Temperature Coefficient : Add $\pm 0.36\%$ of reading per $^{\circ}\text{C}$ ($\pm 0.2\%$ of reading per $^{\circ}\text{F}$) away from calibration temperature.

Temperature & Humidity Specifications :

	Relative Humidity	Temperature
Range	10% ~ 95%RH.	-20°C~+60°C/-4°F~+140°F
Resolution	0.1%RH	0.1°C, 0.1°F
Accuracy	±3%RH(at 25°C, 30~95%RH) ±5%RH(at 25°C, 10~30%RH)	±0.5°C, ±0.9°F
Sensor type	Precision capacitance sensor.	Thermistor
Response time	45%RH→95%RH≤1min 95%RH→45%RH≤3min	10°C / 2sec

IV. PARTS & CONTROLS



1). **Display.**

2). **Gas exhaust.**

3). **RS232**

4). **Gas inlet connector.**

5). **AC adapter socket (9V, 300mA).**

6). **⓪ Power key** : Press ⓪ power key to turn the meter on or off.

7). **⏸ HOLD key** : Press ⏸ HOLD key to freeze or unfreeze the display reading.

8). **⊗ key** : Press ⊗ key to turn the backlight on or off.

9). **MX/MN Key**: Press MX/MN key to enter MAX/MIN mode and cycle through the CO₂ maximum (MAX) / minimum (MIN) / current(Δ) reading, maximum reading with stamp time, minimum reading with stamp time and current reading with time. Press ↵ key to exit the MAX/MIN mode.

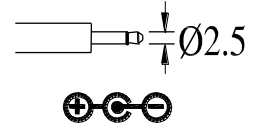
10). **SET key** :

- ① Press SET key one time to enter real-time setting mode.
- ② Press SET key two times to enter auto datalogging interval time setting mode.
- ③ Press SET key three times to enter clear manual memorized data mode.
- ④ Press SET key four times to enter clear auto datalogged memorized data mode.
- ⑤ In the alarm mode, press SET key to enter alarm Hi/Lo limit value setting mode.

11). **ALARM key** : Press ALARM key to turn on or off the alarm function.

12). **MEM key** : Manual memorizes data.

13). **↵ (Enter) key** : Press ↵ key can exit MX/MN mode, real-time setting mode, alarm setting mode and manual memory data reading mode.



14). **READ key** : Recall and Read Manual memorized data.

15). **TIME key** :

- ① Press this key to turn on or off the time display.
- ② In the setting modes, press this key to move the flickering cursor to left position.

16). **°C/°F key** :

- ① Press this key to change the temperature units.
- ② In the setting modes, press this key to move the flickering cursor to right position.

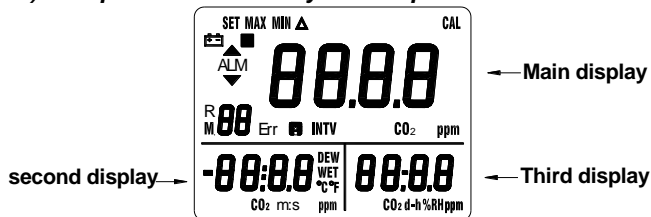
17). **DEW key** :

- ① Press this key to select the ambient temperature or dew point temperature displays.
- ② In the READ mode, press this key to increase the select memory location.
- ③ In the data setting mode, press this key to increase the setting value.

18). **WET key** :

- ① Press this key to select the ambient temperature or wet bulb temperature displays.
- ② In the READ mode, press this key to decrease the select memory location.
- ③ In the data setting mode, press this key to decrease the setting value.

19). **Temperature / Humidity sensor probe.**




V. BEFORE OPERATION

5-1 Power Supply

The meter can be powered by two ways : Six AAA-size alkaline batteries or the AC adapter.

5-2 Install the Batteries

Insert six AAA-size batteries as indicated by the diagram located on the inside of the battery compartment. The meter is designed to operate only with alkaline batteries. When the battery voltage drop below the operating voltage, the “” indicator will be displayed, it indicates the batteries need to be changed.

5-3 AC Adapter

The AC adapter allows you to power the meter from a wall outlet.

When using the AC adapter, the batteries (if installed) will be bypassed. The AC adapter is not a battery charger.

5-4 Gas Inlet



Always ensures that the meter gas inlet connector and gas exhaust are not blocked and open to the atmosphere.

VI. OPERATION

Note

Do not hold the instrument close to your face. CO₂ exhaled by humans will affect the accuracy of the reading.

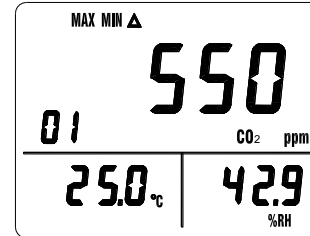
6-1 CO₂ Measurement

1. Press  key to turn on the meter, LCD will shows 30 seconds count up then display CO₂ measured values. (Warm-up time: 30 sec.)
2. Press  **HOLD** key to freeze and unfreeze the data reading.

3. The meter sensor needs about 10 minutes to stabilize in still air, after that the readings can be considered accurately. Moving the meter may decrease this stabilization time.

6-2 Humidity Measurement

1. Press the “**ⓘ**” key to power on the meter.
2. The display will show the humidity reading value (% RH) directly on the third display.
3. When humidity value of the tested environment changes, please wait for few minutes to get the stable “%RH” reading.

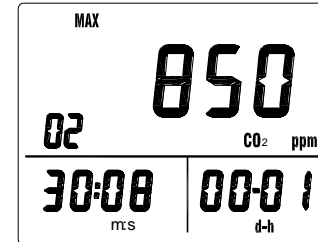


6-3 Temperature Measurement

1. Press the “**ⓘ**” key to power on the meter.
2. Press “**°C / °F**” button to select “**°C**” or “**°F**” unit.
3. The display will show the Temperature reading (°C or °F) directly on the second display.

6-4 Dew Point Temperature Measurement

1. Press the “**ⓘ**” key to power on the meter.
2. Press “**DEW**” key to display dew point temperature reading on the second display, press “**DEW**” key again to exit dew point temperature reading.



2. Press “**TIME**” key to enter time display mode, LCD displays the “**MAX**” mark, maximum value and its stamp time.

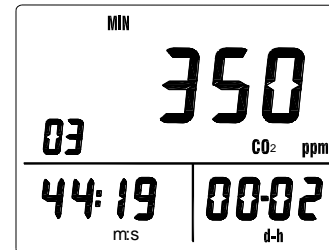
6-5 Wet Bulb Temperature Measurement

1. Press the “**ⓘ**” key to power on the meter.
2. Press “**WET**” key to display wet bulb temperature reading on the second display. Press “**WET**” key again to exit the display.

3. Press “**MX/MN**” key again, LCD displays the “**MIN**” mark, minimum value and its stamp time.

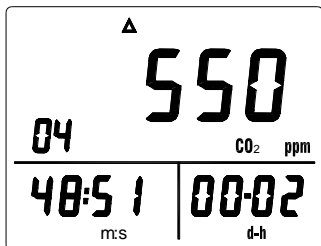
6-6 CO₂ Maximum and Minimum Recording Measurement

1. Press “**MX/MN**” key one time to enter maximum / minimum recording mode, the “**MAX**” (maximum), “**MIN**” (minimum), “**Δ**” (current) marks and the recorded values are displayed. Press “**MEM**” key to memorize the display reading and then press “**READ**” key to recall the reading again.



-9-

- Press “MX/MN” key again, LCD displays the “△” mark, current value and current time.

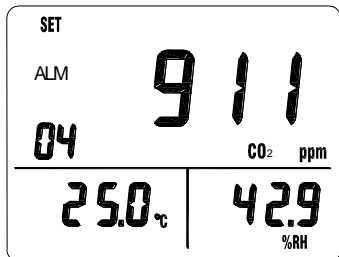


- Press “MX/MN” key again will recycle procedure 2 to 4.
- Press “↵” key to exit this mode. The meter does not store these recorded readings, when exit this mode, all previous data is lost. Press “MEM” key to memorize these display readings before exit the MX/MN mode.
- Press “TIME” key exit time display mode.

6-7 CO₂ Alarm Operation

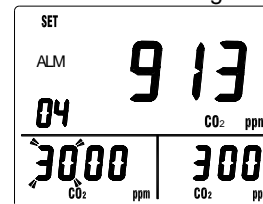
1. To Set the Alarm Limit Values

- Press “ALARM” key to turn on the alarm function, the “ALM” mark, and current value are displayed.



-10-

- Press “SET” key to enter High/Low limit value setting mode, the “SET” mark is displayed and the left two digits of the high limit value is flickering.



- Press “▲” or “▼” key to set desired value.
- Press “▶” key to move the flickering cursor to the right two digits of the high limit value.
- Press “▲” or “▼” key to set desired value.
- Press “▶” key to move the flickering cursor to the left two digits of the low limit value.
- Press “▲” or “▼” key to set desired value.
- Press “▶” key to move the flickering cursor to the right two flicking digits of the low limit value.
- Press “▲” or “▼” key to set desired value.
- To change any setting, press “▶” or “◀” key to move the flickering cursor to desired high or low limit value position.
- Press “↵” key to store these setting and exit this mode.

2. To Turn-On and Turn-Off Alarm function

- Press “ALARM” key to turn on the alarm function, the “ALM” mark is displayed.
- When the CO₂ value is below to the low limit value, the “▼” mark is displayed and beep.
- When the CO₂ value is upper to the high limit value, the “▲” mark is displayed and beep.
- To exit the ALARM function, press “ALARM” key again.

6-8 To Set-Up the Real-Time

1. Press "SET" key one time to enter the real-time setting mode, the "SET" mark is displayed and the numbers of minute are flickering.
2. Press "▲" or "▼" key to set the minute of the real-time.
3. Press "▶" key to move the flickering cursor to second.
4. Press "▲" or "▼" key to set the second of the real-time.
5. Press "▶" key to move the flickering cursor to day.
6. Press "▲" or "▼" key to set the day of the real-date.
7. Press "▶" key to move the flickering cursor to hour.
8. Press "▲" or "▼" key to set hour of the real-time.
9. To change any setting, press "▶" or "◀" key to move the flickering cursor to desired position.
10. Press "↵" key to store these setting and exit this mode.

6-9 Manual Data Memory and Read Mode

1. To Memorize the reading

- ① Press "MEM" key one time, one set of reading will be stored to the memory. At this moment, LCD will show the "M" mark and the memory address number. Total memory size is 99 sets.
- ② When the memory address number is displayed "99", that means the memory is full.

2. To Recall and Read Manual memorized reading

- ① Press "READ" key to enter READ mode, the LCD will show "R" mark and the memory address number.
- ② Press "▲" or "▼" key to select the desired memory address number data for display.
- ③ Press "↵" enter key to exit this mode.

3. To Clear the manual memorized data

- ① Press "SET" key three times, the "CLr" mark is displayed and enter the clear memory mode.
- ② Press "↵" key to clear the manual memorized data and exit this mode.

- ③ To not clear the memory, press "SET" key two times then press "↵" key to exit the clear memory mode.

6-10 Auto Datalogging Function

1. To Setting interval time

- ① Press "SET" key two times, the "INTV" mark is displayed and enter to the setting interval time mode.
- ② Press "▲" or "▼" key to select desired interval time from 1 second to 255 seconds.
- ③ Press "↵" key to store the setting value and exit this mode.

2. To Enter Auto Datalogging mode

- ① Press "MEM" key two seconds, the "■" mark and the memory block number are displayed.
- ② The "M" mark is displayed one time, one set of reading is stored to the memory.
- ③ The maximum memory capacity is 20,000 sets and can be divided to 99 blocks max.
- ④ Press "↵" key to exit this mode.

3. To Clear Auto Datalogged memorized data


CAUTION

Before perform the clear auto datalogged memorized data, user must to download the previous memorized data to PC.

- ① Press "SET" key four times, the "CLr" and "■" mark are displayed, and enter to the clear auto datalogged memorized data mode.
- ② Press "↵" key to clear the auto datalogged memorized data and exit this mode.
- ③ To Not clear the memory, press "SET" key again then press "↵" key to exit the clear memory mode.


6-11 Standard Reference Reading

Use Standard CO₂ meter to verify the reading


- ① Press  key to turn on the meter, get fresh air for 10 minutes, and be careful for your every breath to the meter.

- ② Press “SET” key 5 times, till the “C-0XXXXX” shows on LCD (calibration mode).
- ③ Press “▶” or “◀” key to expected position.
- ④ Press “▲” or “▼” key until the LCD value is same as the standard CO₂ meter.
- ⑤ Press “↵” key to store the calibrated value and exit calibration mode.


Perform CO₂ zero calibration (if need)

- ① Press  key to turn on the meter. Use Nitrogen gas has a CO₂ concentration of zero ppm into the meter Gas inlet connector.
- ② Press “SET” key 6 times, till the “SET CAL” and “CO2” show on LCD.
- ③ Press “▲” or “▼” key select LCD third display shows “0” or “- -”, symbol “0” means perform zero calibration, and symbol “- -” means back to factory default value.
- ④ Waiting about 10 minutes, until the meter reading is stable.
- ⑤ Press “↵” key to store the zero calibration value and exit calibration mode. Waiting about 1 minute, the meter will display 0 ppm.

Use Standard humidity meter to verify the reading

- ① Press  key to turn on the meter.
- ② Press “SET” key 7 times, till the “SET CAL” shows on LCD.
- ③ Waiting about 60 minutes, until the meter Temperature/ Humidity sensor probe and standard humidity meter are environment humidity balance.
- ④ Press “▲” or “▼” key until the LCD value is same as the Standard humidity meter.
- ⑤ Press “↵” key to store the calibrated value and exit calibration mode.

Use Standard temperature meter to verify the reading

- ① Press  key to turn on the meter.
- ② Press “SET” key 8 times, till the “SET CAL” shows on LCD.


- ③ Press “▲” or “▼” key until the LCD value is same as the Standard temperature meter.
- ④ Press “↵” key to store the calibrated value and exit calibration mode.

VII. MAINTENANCE

7-1 Cleaning

Periodically wipe the case with a dry cloth or a damp cloth with mild detergent.
Do not use abrasives or solvents to clean this instrument.

7-2 Battery Replacement

When the “ **Low**” symbol appears on the LCD, the six 1.5V ‘AAA’ alkaline (large current) batteries must be replaced.

- ① Turn the meter off.
- ② Remove the meter’s battery cover
- ③ Replace the batteries observing polarity
- ④ Affix the battery cover and secure the rear screws.

VIII. RS-232 INTERFACE, SOFTWARE INSTALLATION and OPERATION

- For the detailed instruction, please refer to the content of attached CD-ROM, which has the complete instruction of RS-232 interface, software operation and relevant information.
- RS-232 protocol : are enclosed within the content of CD-ROM, please open the CD-ROM for details.



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Apr-2007-3