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B&K PRECISION ®

Instruction Manual

Model 2880B and 2890A Dual Display 51,000 count True-RMS Digital Multimeter

Contents

SAFETY INFORMATION

This meter is a hand-held, battery-operated instrument for testing and troubleshooting power electronic systems. If this device is damaged or something is missing, contact the purchasing place immediately.

A **WARNING** identifies conditions and actions that may cause hazard(s) to the user; a **CAUTION** identifies conditions and actions that may damage this Device. Following **Table-1** explain international electrical symbols used on this meter.

Table- 1 International Electrical Symbols

∿	AC - Alternating Current
▬▬▬	DC - Direct Current
∿	AC and DC - Alternating and Direct Current
⏚	Ground
▣	Double Insulation
⚠	See Explanation In The Manual

☐ SAFETY INFORMATION

⚠ *Warnings and Cautions*

To avoid electric shock, injury, or damage to this instrument and ensure that you use the meter safely, follow the safety guidelines listed below:

- Read this operation manual completely before using this device and follow all safety instructions.
- This device is for indoor use, altitude up to 2,000m.
- Avoid working alone.
- Use the device only as specified in this manual; otherwise, the protection provided by the meter may be impaired.
- Never measure Voltage when the current measurement is selected.
- Do not use this device if it looks damaged.
- Inspect the leads for damaged insulation or exposed metal. Replace damaged leads.
- Disconnect the power and discharge all high-voltage capacitors before testing in the resistance, continuity, and diode function.
- Be cautions when working above 70VDC or 33VRMS and 46.7V peak, such voltages may cause a shock hazard.
- Always keep your hands behind the protective guard of the probe as measuring.
- Select the proper function and disconnect the test leads from test points before changing functions.
- Always use specified battery.
- The meter is safety-certified in compliance with EN61010 (IEC 1010-1, IEC 1010-2-031) Installation Category IV 600V/ III 1000V Pollution Degree 2. In order to maintain its insulation properties, please be sure to use with the standard or compatible test probes.
- CE requirement: Under the influence of RF field according to standard, the supplied test leads will pick up induced noise. To have better shielding effect, a short-twisted lead should be used.

QUICK START

1. Turn the function switch to select combined function for "**V**".
2. Press the "**Dual**" button momentarily to set frequency measuring on secondary display.
3. Connect the **INPUT** terminals by test leads to the source to be tested.
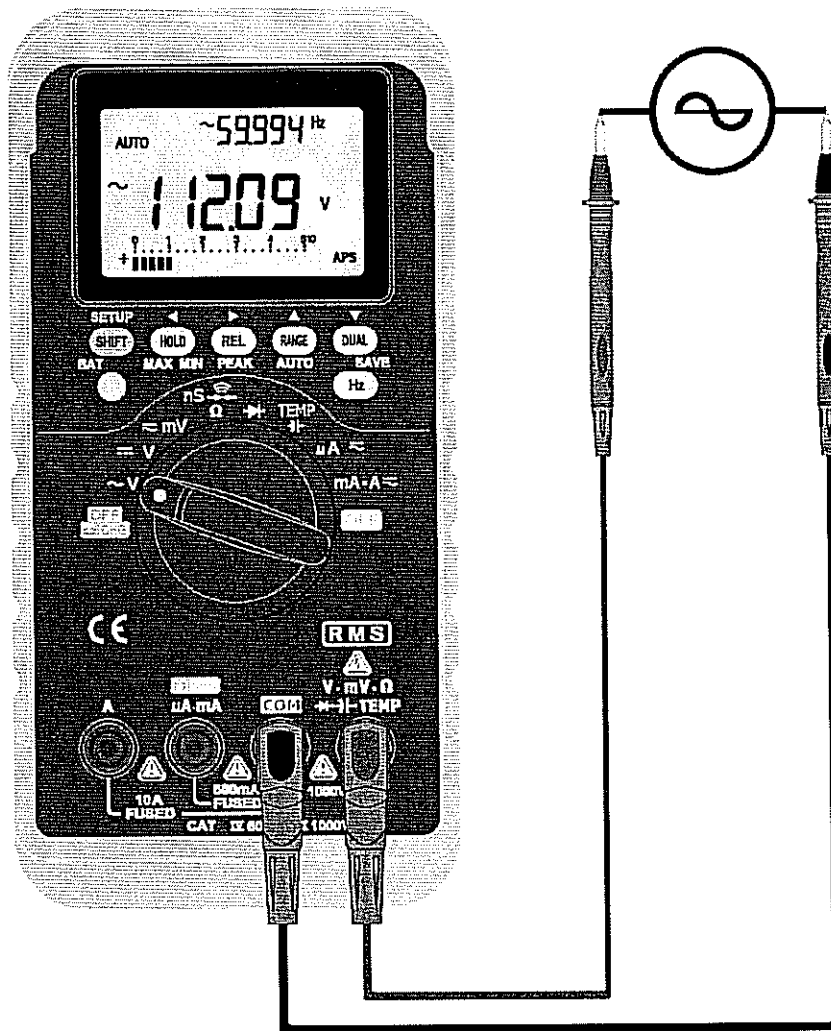
Figure- 1 Dual display for ACV/Hz Measurement

MULTI-DISPLAY MULTIMETER

■ *INTRODUCTION*

The meter is robust for industrial fields and laboratories. The ambient temperature can be display with main measurement, which can help you to monitor the electrical value and record environment variation, simultaneously.

Main Features:

- **DCV, ACV, DCA, ACA, OHM, Diode check, Audible continuity, Temperature, Frequency, Duty cycle and Pulse Width tests**
- **AC+DC true RMS measurement for both voltage and current (model 2890A only)**
- **AC true RMS measurement for both voltage and current**
- **Ambient temperature display with main measurement**
- **Battery capacity indication**
- **Brightness LED backlight**
- **Resistance measurement up to 50MΩ**
- **Conductance measurement from 0.01nS (100GΩ) ~ 50nS**
- **Capacitance measurement up to 100mF.**
- **Frequency counter up to 20MHz**
- **The % scale readout for 4-20mA or 0-20mA measurement**
- **dBm with selectable reference impedance**
- **1ms Peak hold to catch inrush voltage and current easily**
- **Temperature test with the selectable 0°C compensation (optional Temp adapter required)**
- **K type temperature with environment compensation selection (optional Temp adapter required)**
- **Frequency, Duty cycle and Pulse width measurements.**
- **Dynamic Recording for Min/Max/Average**
- **Data Hold with Manual or Auto Trigger and Relative modes**
- **Diode and Audible Continuity Test**
- **Bi-directional optic computer interface with SCPI commands**
- **Safe, precision and speed closed case calibration**
- **50,000 count precision True-RMS digital multi-meter and designed to meet IEC-1010 CAT. III 1000V and CAT. IV 600V standards**
- **Built-in rechargeable battery**
- **Smart Charger design without battery removal** (optional accessory)
-

■ *Display Illustration*

0°C Without ambient temperature compensation

Square Wave Output for Hz, % (Model 2890A only)

Alternating/ Direct Current

Thermal type for temperature test

Secondary Display for Square wave Output and other

Remote control

Secondary display units

Auto Range

Diode/Audible continuity

Dynamic Recording

Alternating/ Direct Current

% **0-20** : 0-20mA

% **4-20** : 4-20 mA

Relative Mode

Primary Display units

+ or - trigger slope for % and ms tests

Measuring Range

Low Battery

Bar-graph display for input function

Auto Power Saving Sign

Data Hold (Manual Trigger)

Primary Display

Figure- 2 LCD Display

■ *Rotary Switch*

To turn this device ON and select a function you want by turning the rotary switch.

Table- 2 Rotary Switch position

Position	Function
1	
2	$\sim$ V
3	$\overline{}$ V
4	$\sim$ mV
5	Resistance/ Continuity/ nS
6	⊸⊢/ Hz (FC) (Hz model 2890A only)
7	⊣⊢ TEMP (TEMP requires optional adapter)
8	$\sim$ μA
9	$\sim$ mA
	$\sim$ A
10	OFF
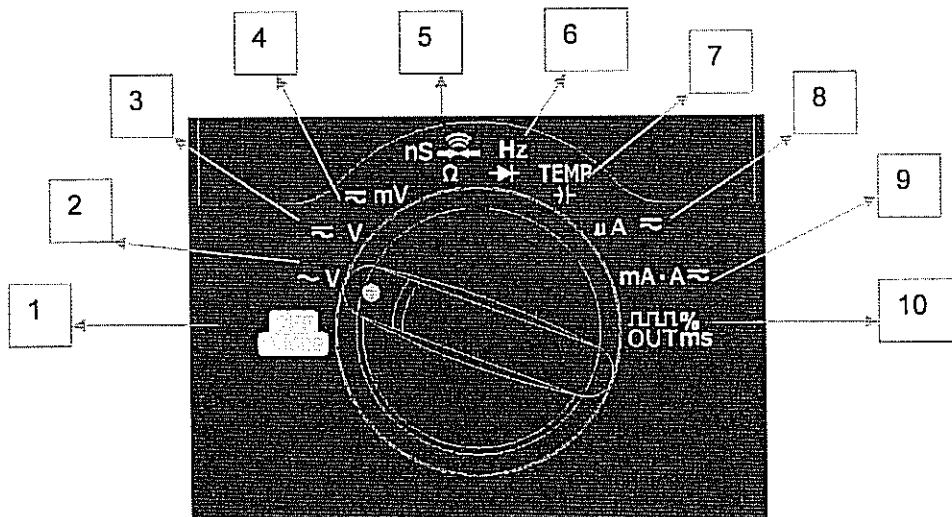
Figure- 3 Rotary Switch for selecting function

8

■ TERMINALS

> ⚠ **WARNING**
> To avoid damaging this device, do not exceed the input limit.

To avoid damaging the meter, do not exceed the input limit as below table:

Table- 3 Input limit specification

ROTARY SWITCH FUNCTION	INPUT TERMINAL		OVERLOAD PROTECTION
∼V	v.Ω.⊣⊢	COM	1000 V R.M.S.
∼V			
∼mV			1000V for the circuits <0.3A short circuit.
Ω			
⊣⊢ (Diode)			
Capacitance ⊣⊦			
Temperature			
∼ µA	µA mA	COM	440mA/ 1000V 30kA fast-acting
∼ mA			
∼ A	A	COM	11A/ 1000V 30kA fast-acting
ЛЛЛ OUT	ЛЛЛ OUT	COM	
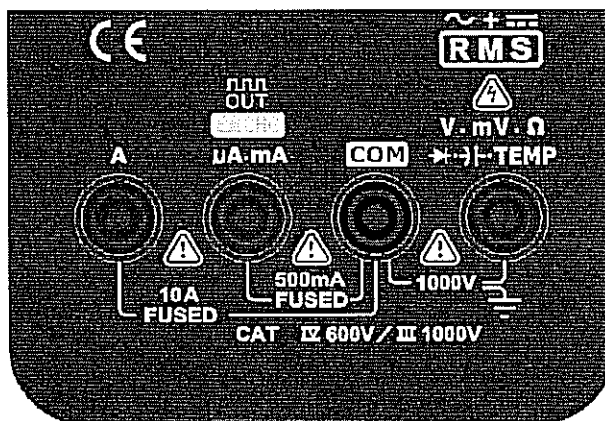
Figure- 4 Terminals

■ PUSH-BUTTON OPERATIONS

The operation of push-button is shown as below. When push the button, a related symbol will be lit, and the beeper will sound. Turning the rotary switch to another position will reset current operation of push buttons.

HOLD: Freeze existing measuring value. Press again to trigger next measuring value Press and hold for more than 1sec. to exit trigger hold.

REL: Set the value on the display to be subtracted.
PEAK: Press and hold for more than 1 sec. to toggle PEAK Hold ON/OFF for V/mA

RANGE: Change measuring range.
AUTO: Press and hold for more than 1 sec. to set Auto-range

BLUE: To shift measuring function.

DUAL: Select different combination displays
START: Re-start peak or recording mode.

O: Press and hold for more than 1 sec. to see battery capacity
O: Press to toggle backlit ON/OFF

MAX MIN: Press and hold for more than 1 sec to toggle Dynamic recording mode. Press this button momentarily to cycle through **MAX, MIN, AVG** and present (**MAX MIN AVG**) readings at recording mode.

Hz: Select Hz, % and Pulse width tests on Primary display. Press and hold for more than 1 sec. to quit.

Figure- 5 Pushbuttons

1. **AC/ DC (BLUE):** Select Blue function
   - Push this button momentarily to step through DC, AC for mV measurement.
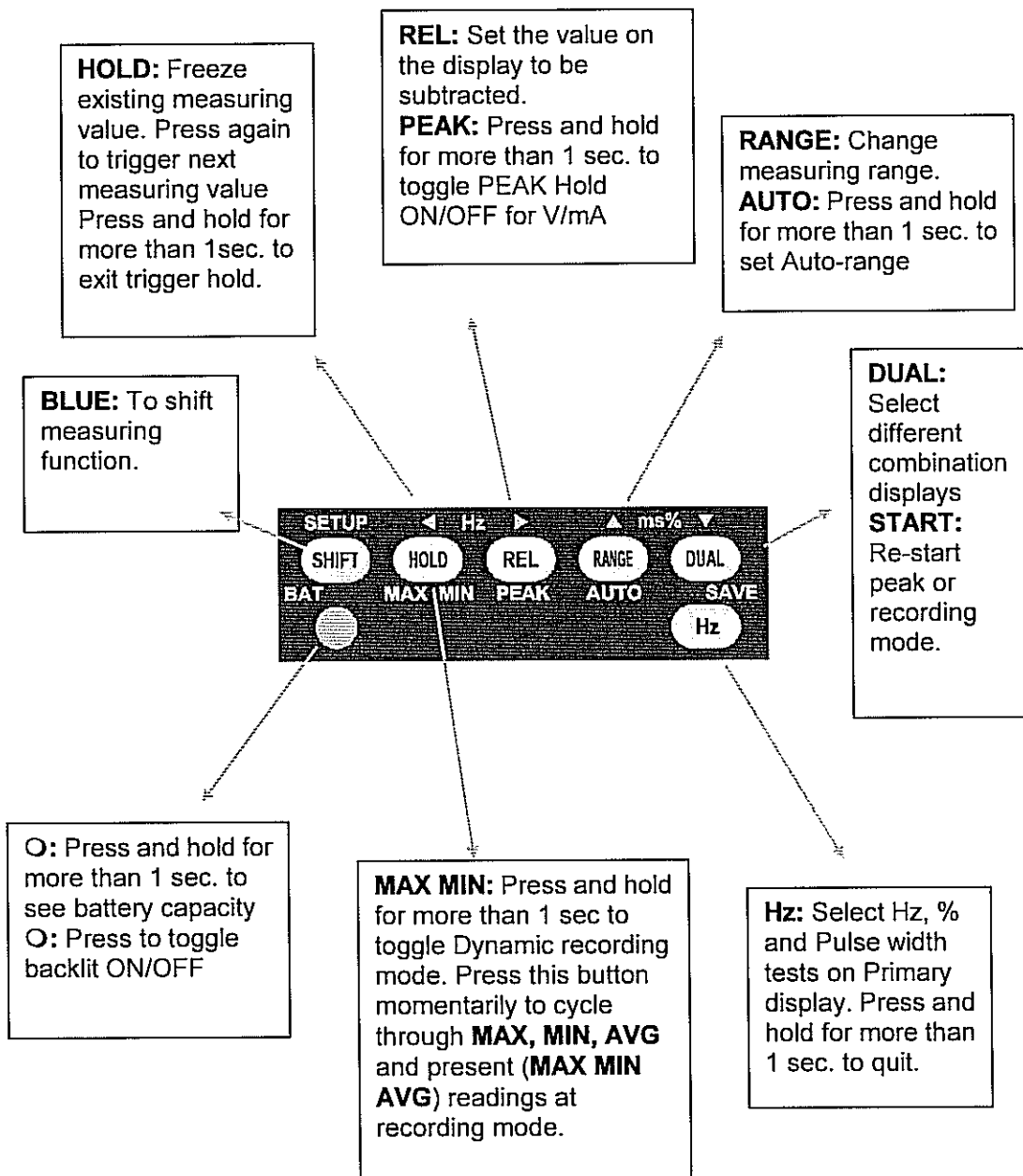   - Push this button momentarily to step through DC, AC and % of mA for Current measurement.
   - For Ohm test, push this button momentarily to step through continuity "⭧", nS and Auto ranging Ohm test.
   - For Duty cycle and Pulse width tests, press this button for more than 1 second to change the trigger slope + (⎍) or – (⎍).
   - For ⫞ / TEMP measurement, press this button to select Capacitance test, ETC ON (environment temperature compensation) and **0°C** (non-ETC) temperature test.

2. **HOLD:** DATA HOLD (Trigger) or Refresh Data Hold (Auto trigger)
   - Press this button momentarily to hold the existing displayed digital value and waiting for trigger. The sign of **HOLD** will be indicated.
   - Press this button momentarily again to trigger another data hold. The sign of **TRIG** will be flashed before finished or updated measurement
   - Press this button for more than one second to exit trigger mode.
   - To select Refresh Hold by setup mode. The reading can be updated automatically when the reading is changed, and the beeper sounds a tone to remind user, simultaneously.

3. **HOLD (MAX • MIN):** Dynamic Recording
   - Record maximum, minimum, and calculates true average.
   - Press this button for more than 1 second to toggle recording mode on or off at continuous mode (non data hold).
   - Press this button momentarily to cycle through **MAX, MIN, AVG** and present (**MAX MIN AVG**) readings.
   - The beeper sounds when a new maximum or minimum value is recorded.
   - Press this button momentarily to cycle through **Peak +**, **Peak –** reading after setting peak mode. The screen shows "**HOLD** MAX" to indicate the PEAK + and show "**HOLD** MIN" to indicate the PEAK -.

4. **REL (ZERO):** Relative function
   - The relative function shows the difference between the measured value and the stored value.
   - Press to toggle **Relative (REL)** ON or OFF.
   - For Voltage and current measurements, press this button for more than 1 second to toggle 1 ms peak hold ON/OFF. The display will show "**HOLD** MAX" to indicate the PEAK + and show "**HOLD** MIN" to indicate the PEAK -.

11

5. RANGE:
- In auto-range, press this button to select manual range and turn off the sign of "**AUTO**".
- In manual range, press this button momentarily to step up 1 range at one time, press this button for more than 1 second to select auto-range.
- In auto-range, the " **AUTO** " is lit and the meter will select an appropriate range for resolution if a reading is greater than maximum available range, " OL "(overload) will be displayed on the display. The meter will select a lower range when reading is less than about 9% of full scale.
- Push this button momentarily to change measuring range and re-start the PEAK+ and PEAK- measurements after setting the peak mode.

6. **DUAL:** Dual Display Combination
- Press this button momentarily to select different combination displays. Detail combination displays, please refer to the chapter of **MULTI-DISPLAY MULTIMETER.**
- Push this button momentarily to re-start a new peak or recording mode after setting peak or recording mode.

7. **Hz:** Select Frequency, Duty Cycle and Pulse Width Tests
- For, Voltage or Current test, press this button momentarily to enter Frequency test and Voltage or Current will be indicated in secondary display. Press this button again to step through Frequency, Duty cycle, Pulse width test. Press this button for more than one second to come back voltage or current measurement.
- The combination displays by pushing "Hz" button, please refer to the chapter of **MULTI-DISPLAY MULTIMETER.**

8. O: BAT/ Back-lit
- Press this button for more than 1 second to see battery capacity. It will return to normal function automatically after 3 seconds.
- Press this button momentarily to toggle backlit ON or OFF. Backlit turns off automatically after setting period.

POWER-ON OPTION

■ *How to enter setup mode*

Press and hold **SETUP (Blue)** button, then turn rotary switch to any on position form OFF. Release push button when you hear a tone, the meter will enter setup mode then. These parameters will be remained in non-versatile memory even the meter is turned off.

User can configure related parameters on setup mode by following procedures:

1. Press " ▶ (LEFT)" or "▶ (RIGHT)" button to select which menu item to be set.
2. Press "▲ (UP) or ▼ (DOWN)" button to change the parameter.
3. Press "BLUE" button to select which digit to be adjust, the selected digit will be flashed.
4. Push "SAVE" button momentarily to save your change.
5. Push "BLUE" button for more than one second to exit setup mode.

■ *Factory Default*

Following Table describes the outline of the setup menu item and indicates the factory settings.

13

Table- 4 Descriptions for Outline of Setup Menu Item

Menu item	Factory Setting	Selectable Parameters
Baud Rate	9600	2400, 4800, 9600, 19200
Parity	None	Odd, even or none
Data bits	8	8 bits or 7 bits (Stop bit is always 1 bit)
ECHO	OFF	ON or OFF
Print	OFF	ON or OFF
Percentage scale	4-20mA	4-20mA and 0-20mA for % scale readout
Frequency	0.5Hz	Set minimum measuring frequency, 0.5Hz, 1Hz, 2Hz or 5Hz.
Beep	2400	The driving frequency can be set for 2400, 1200, 600 or 300 Hz. "OFF" means to disable beep.
Temperature · n1	°C	Four combinations can be selected: 1. °C only 2. °C/ °F can be selected. 3. °F only 4. °F/ °C can be selected.
Refresh Hold	OFF	OFF means Data Hold (Manual Trigger), set 100~1000 variation counts to enable refresh hold.
Auto power off	15	1~99 minutes, "OFF" means to disable auto power off.
Backlit	30	1~99 seconds, "OFF" means to disable turning off backlit automatically.
Temperature type	K	K type or J type
decibel	dBm	dBm or dBV
Ref	600Ω	Reference impedance for dBm display can be set from 1~9999Ω.
EtEMP	OFF	Enable (On)/ Disable (OFF) Environment temperature (EtEMP) to be displayed with main measurements.

Notes:
1. The temperature menu item will be selected by pushing "O" button for more than one second to enter temperature option.

■ *Baud Rate*

The baud rate is selected for remote control. It can be set to 2400, 4800, 9600 or 19200 Hz. To select your request as follows:
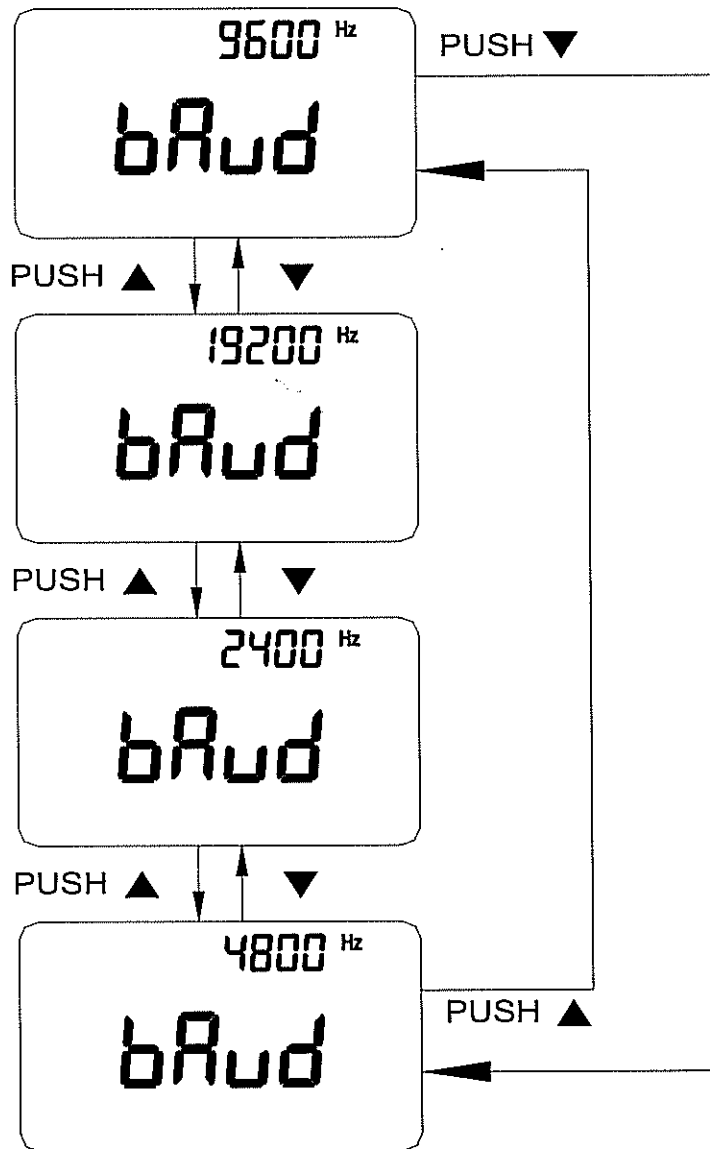
```
         9600 Hz    PUSH ▼
         bAud

PUSH ▲  │↑▼
         19200 Hz
         bAud

PUSH ▲  │↑▼
         2400 Hz
         bAud

PUSH ▲  │↑▼
         4800 Hz         PUSH ▲
         bAud
```

Figure- 6 Baud rate setup for remote control

■ Parity Check

The parity check is selected for remote control. It can be set to none, even or odd bit. To select the parity as follows:
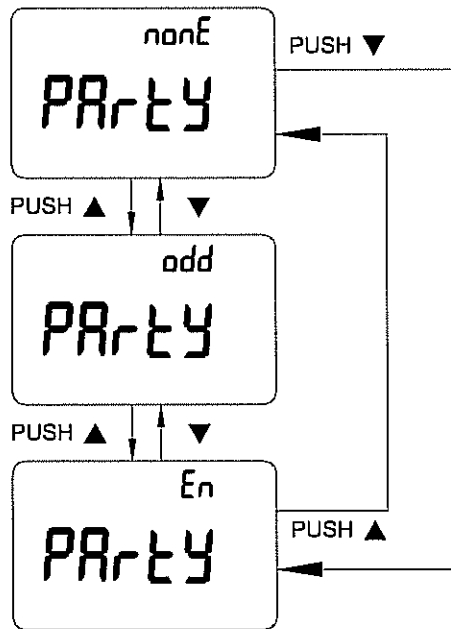
Figure- 7 Parity Check setup for remote control

■ Data Bit

The data bit is selected for remote control. It can be set to 8 or 7 bits. The stop bit is defined to 1 bit and can't be changed. To select the data bit as follows:
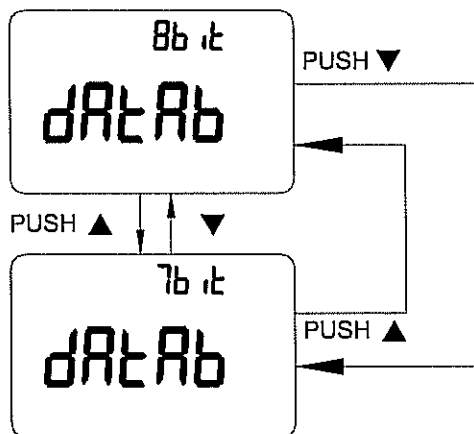

Figure- 8 Data bit setup for remote control

■ *Echo*

With ECHO ON, the meter echoes (returns) all the characters whatever it receives. To enable the Echo as follows:
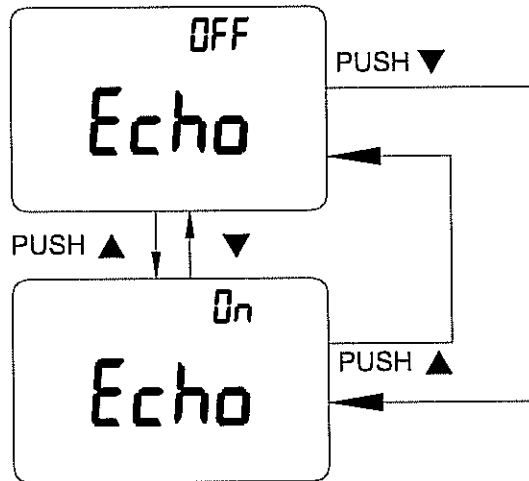

Figure- 9 ECHO Setup

■ *Print only*

If the remote interface of the meter is under Print-only mode, the meter will print out the measured data when the measuring cycle is completed. The meter will auto send the newest data to a host continuously. The meter doesn't accept any commands from the host under Print-Only enabled. The remote indicator of the meter will be flashed during operation as Print-only ON. To enable the print-only as follows:
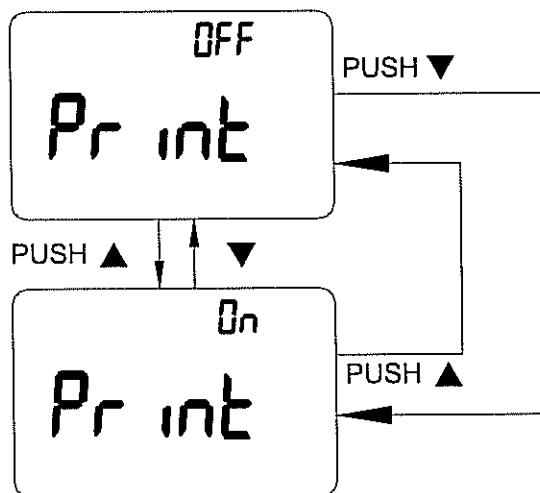

Figure- 10 Print-only Setup

17

■ *Percentage (%) scale for 4-20mA or 0-20mA measuring*

To set the DC current measuring display with % scale readout. Set 4-20mA or 0-20mA for proportional to 0%~100%. The 25% scale readout represents DC 8mA at 4-20mA, and DC 5mA at 0-20mA. To set % scale proportional as follows:
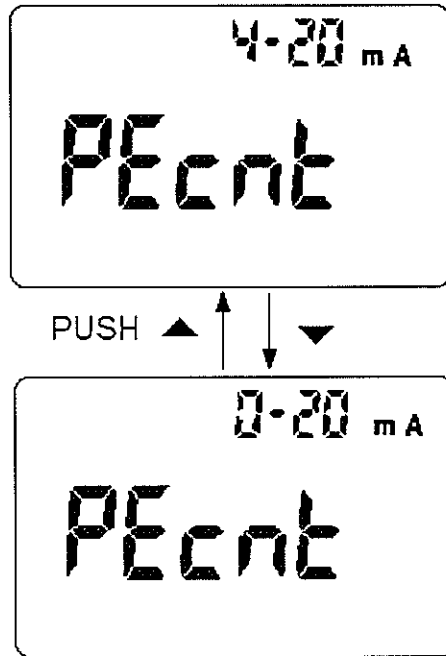

Figure- 11 The % scale Setup for mA measuring.

■ *Minimum Frequency measuring*

To set minimum measurement frequency, will influence the measuring rate for frequency, duty cycle, and pulse width measurement. Normally, the measuring rate defined at general specification is based on the minimum frequency is 1 Hz.
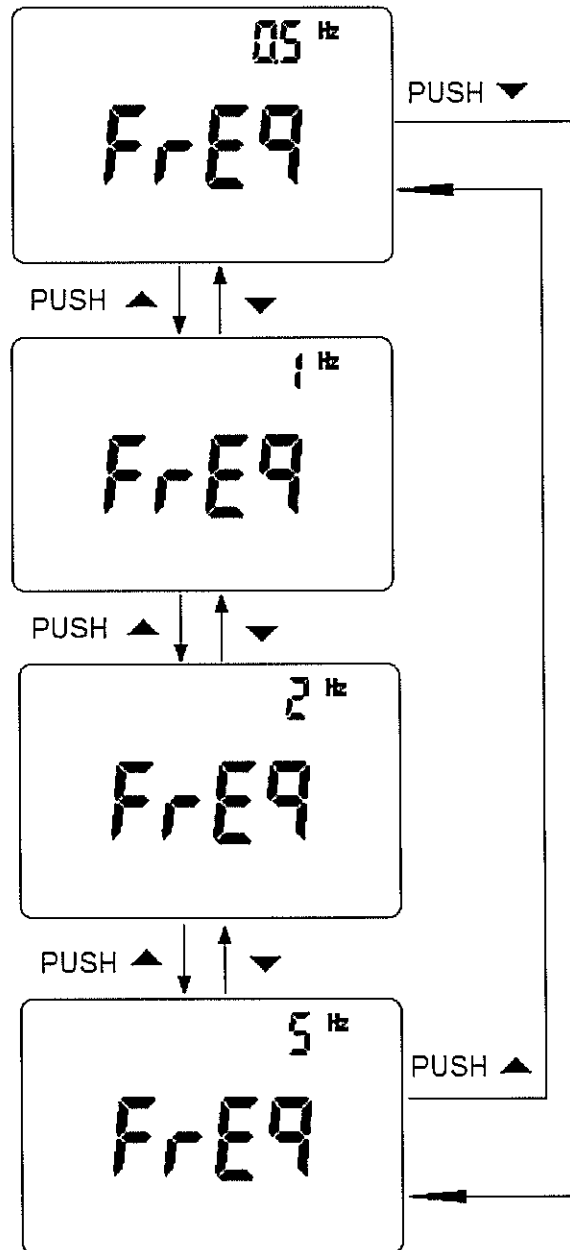

Figure- 12 Minimum Frequency Setup

■ *Beep Frequency*

The driving frequency can be set for 2400, 1200, 600 or 300 Hz. The beeper can be set to "OFF" as you want kept silent during operation, to select a tone you like according to follows:
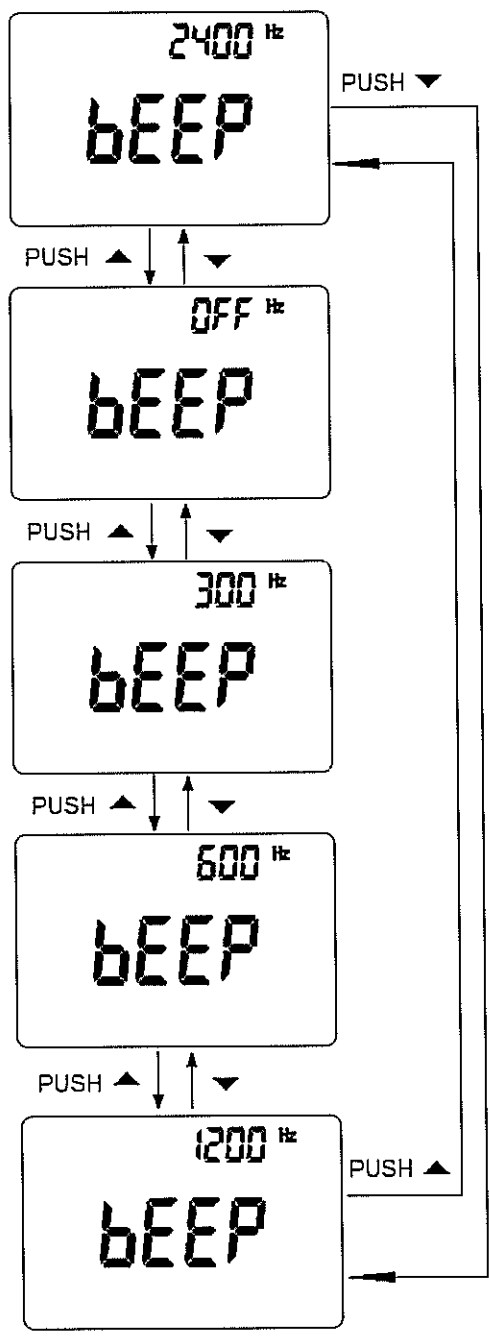
```
        2400 Hz

        bEEP
                    PUSH ▼

PUSH ▲    ▼

        OFF Hz

        bEEP

PUSH ▲    ▼

        300 Hz

        bEEP

PUSH ▲    ▼

        600 Hz

        bEEP

PUSH ▲    ▼

        1200 Hz
                    PUSH ▲
        bEEP
```

Figure- 13 Driving frequency of Beeper setup

■ *Temperature Unit (requires optional adapter)*

⚠ CAUTION

**Always set the temperature unit display for official
requirements and comply with National law.**

Normally, the temperature unit is different for various areas. To select an official
required scale unit by setup mode. Four combination displays can be selected:

1. Celsius only (°C on primary display)
2. Celsius/ Fahrenheit (°C/ °F) display can be switched by pushing DUAL
    button.
3. Fahrenheit only (°F on primary display)
4. Fahrenheit / Celsius/ (°F/ °C) display can be switched by pushing
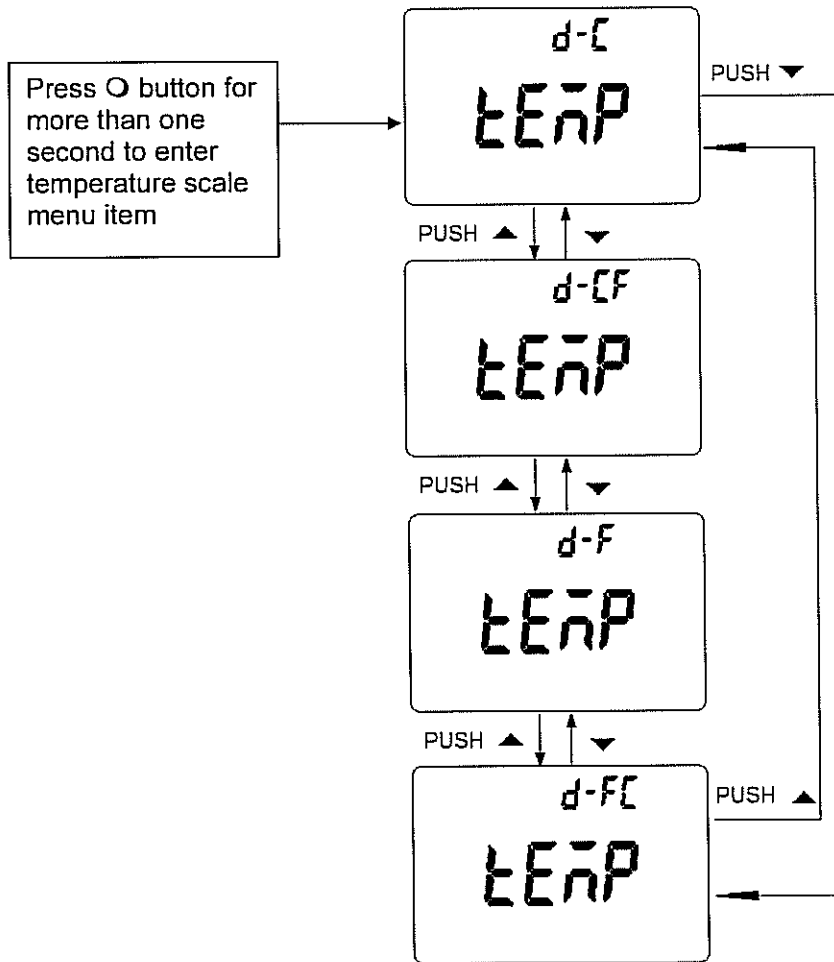   DUAL button.

Figure- 14 Temperature Unit Setup

21

■ *Data Hold/Refresh Hold*

Normal, factory default the hold mode to Data Hold (Manual Trigger by key/ BUS trigger by remote control). Set "OFF" for Data Hold (Manual Trigger), and set 100~1000 variation counts to enable Refresh Hold. The variation of measuring value exceed the setting of variation count, the refresh hold will be ready to trigger. To enable refresh hold as follows:
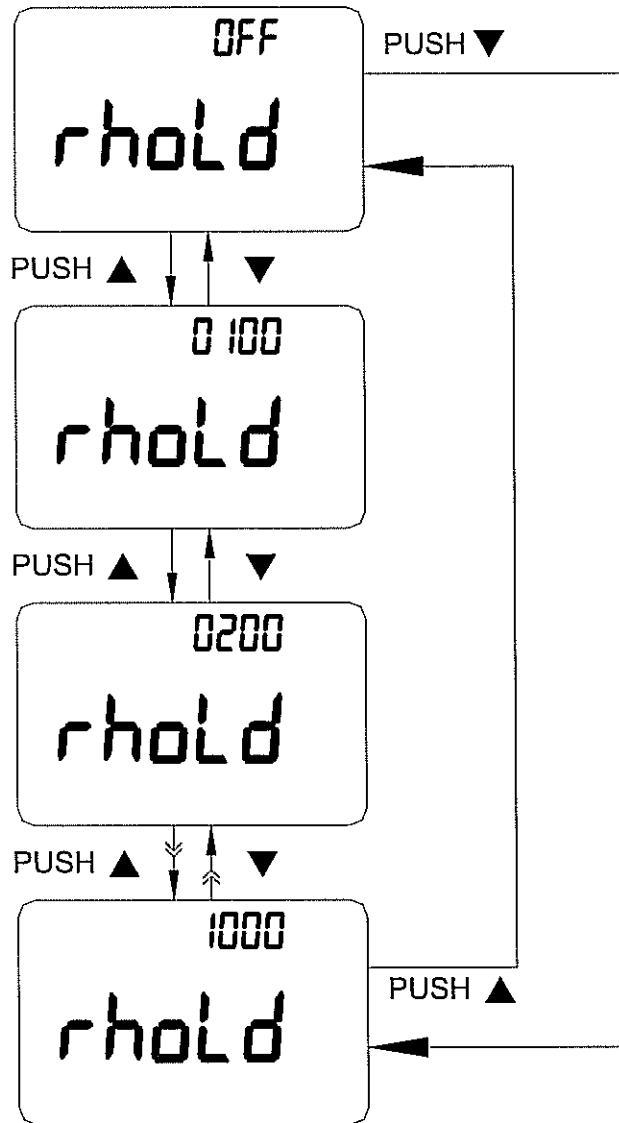

Figure- 15 Data Hold/ Refresh Hold Setup

■ *Environment temperature*

Normal, factory default the environment temperature to be disabled. To enable this test accompanies with other functions, will slight reduce the display updated rate. You can know environment temperature with main parameter measurement as enabled environment temperature measurement. To enable environment temperature as follows:
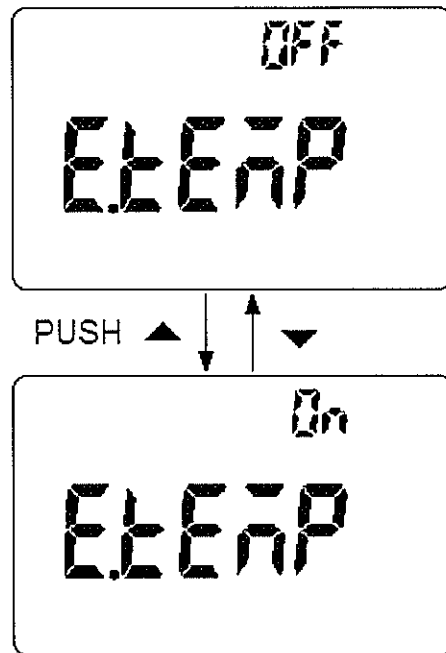

Figure- 16 Enable Environment Temperature display

■ *Auto Power Saving*

The timer for APS (Auto Power Saving) can be set to 1~99 minutes, "OFF" means to disable APS. To set timer of APS as follows:
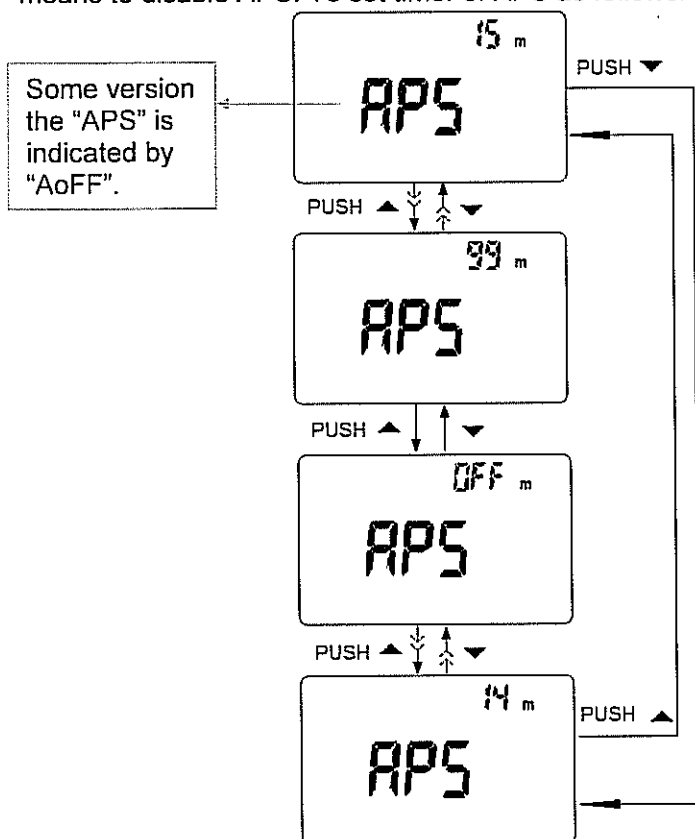

> Some version the "APS" is indicated by "AoFF".

Figure- 17 Auto power saving setup

The instrument may automatic turn off within a setting period, if none of the following happens.
- a. Push buttons are used.
- b. Measurement function is changed.
- c. Dynamic recording is set.
- d. 1 ms peak hold is set.
- e. Auto power off has been disabled by Setup mode.

You can turn the rotary switch to the OFF position, then turn on again to activate the meter after auto power off, or push any button to wake up. Only DUAL, RANGE, REL and HOLD buttons can wake meter up when set on square wave output (square wave output only on model 2890A). When the meter is to be used for longer periods, you may disable the APS. The sign **"APS"** will be turned off when APS disabled. The meter will stay on continuously as the APS is disabled. To shut off the meter by turning the rotary switch to the off position.

24