

Protek B4100

Programmable Digital Multimeter

Programmable Digital Multimeter



Protek



Programmable Digital MultiMeter

Safety rules to using his device

Safety Regulations

1. Do not touch any part of high voltage circuit or make any unnecessary high voltage measurements. Do not remove the top or bottom covers of this unit unless you are a qualified service person. Remove the power from this unit before removing the top and bottom covers.
2. When servicing this unit, the work area should be free from any electrical hazards. The floor and workbench where the unit is operated should be insulated and free from any exposed high voltage conductors. Remove any source of water or other conductive liquids in the working area.
3. Connect this unit only to a 3-prong AC outlet, which conforms to electrical safety, codes. Do not use any adapters to connect this unit to an AC receptacle.
4. Before operating or servicing, this instrument, read the instruction manual and fully understand the operating procedures. If you are servicing the unit, check the circuit you are testing for high voltage.
5. Do not use this device in a room alone, be sure there are other people in the vicinity of your work area in case of an emergency arises. Have emergency telephone numbers posted in the work area in case a quick response is necessary.

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Chapter 1. General specification

1. Product summary

This programmable digital MultiMeter is one of a programmable test instruments that has enhanced features over similar type of test instruments on the market today. This instrument features:

- 1) Resolution of 5 1/2 DIGITS, 0.001mV, 0.001 Ω .
- 2) Eleven measurement functions: DCV, ACV, OHM, BEEP, DIODE, FREQ, CAP, DC mA, DCA, AC mA, ACA.
- 3) The bar graph of the 41 segment and responses 20 times per second.
- 4) Plots a Trend Graph on the LCD.
- 5) Compare, Relative, Error, MIN/MAX and real Average value functions.
- 6) Setting and functions may be selected and stored in memory from the front panel. Eight setups may be stored in memory.
- 7) Function and ranges may be controlled from a PC via the RS232 or the optional GP-IB interface.
- 8) May be used with any line voltages from 85V to 270V AC may be used with out any internal changes.
- 9) Have many applications in research and development, service, production line, the satellite broadcasting and telecommunications industries.

2. General specifications

- 1) AC line and fuse rating:

Rated voltage	Fuse	Power consumption (max)
85V to 270Vac($\pm 10\%$, 48 to 66Hz)	2A/250V	15W

- 2) Operational Temperature:
0°C to +40°C (+32°F to +104°F) at a relative humidity 85% or less
- 3) Storage Temperature:
-20°C to +70°C (-4°F to +158°F) with a relative humidity of 85% less
- 4) Dimensions:
235mm (width) x 296mm (depth) x 85 mm (height)
9.25" (width) x 11.65" (depth) x 3.34" (height)
- 5) Weight: about 1.5 kg (4.4lbs)

3. Electrical Specifications

Note: Electrical specifications are at 25°C.

1) DC Voltage

Range	Resolution	Accuracy	Impedance	Overload Protection
200.000 mV	0.001 mV	±0.05% ±3digits	>200MΩ	±1,000 V
2.00000 V	0.00001 V		10MΩ	
20.0000 V	0.0001 V			
200.000 V	0.001 V			
1000.00 V	0.01 V			

2) AC Voltage

Range	Resolution	Accuracy	Impedance	Overload Protection
2.00000 V	0.00001 V	±0.5% ±5digits	10MΩ	±1,000 V
20.0000 V	0.0001 V			
200.000 V	0.001 V			
1000.00 V	0.01 V			

- **Crest Factor is 3 : 1.**

3) OHM

Range	Resolution	Accuracy	Max. Burden	Overload Protection
200.000 Ω	0.001 Ω	±0.05% ±5digits	200 mV	±600 V
2.00000 kΩ	0.00001 kΩ			
20.0000 kΩ	0.0001 kΩ			
200.000 kΩ	0.001 kΩ			
2.00000 MΩ	0.00001 MΩ			
10.0000 MΩ	0.0001 MΩ			

4) Continuity Buzzer → 100Ω or less

5) Diode

Range	Resolution	Max Test Current	Max. Burden	Overload Protection
4V	0.001 V	About 2.5mA	200 mV	Fused

6) Frequency

Range	Resolution	Accuracy	Overload Protection
200 Hz	0.01 Hz	± 0.05% ±2digits	Fused
2 kHz	0.0001 kHz		
20 kHz	0.001 kHz		
200 kHz	0.01 kHz		

7) Capacitance

Range	Resolution	Accuracy	Overload Protection
1 uF	0.01 uF	±3% ±5digits	250 V DC or 250V AC Peak
10 uF	0.1 uF		
1000 uF	1 uF		
10000 uF	1 uF	±4% ±15digits	

8) DC mA

Range	Resolution	Accuracy	Max. Burden	Overload Protection
2.00000 mA	0.00001mA	±0.1% ±5digits	200 mV	Fused
200.000 mA	0.001mA			

9) DC Ampere

Range	Resolution	Accuracy	Max. Burden	Overload Protection
2.0000 A	0.0001A	±0.1% ±5digits	200 mV	Fused
10.0000 A	0.0001A			

- **Maximum input current: 10A**

10) AC mA

Range	Resolution	Accuracy	Max. Burden	Overload Protection
2.00000 mA	0.00001mA	±0.5% ±5digits	200 mV	Fused
200.000 mA	0.001mA			

11) AC Ampere

Range	Resolution	Accuracy	Max. Burden	Overload Protection
2.0000 A	0.0001A	±0.5% ±5digits	200 mV	Fused
10.0000 A	0.0001A			

- **Crest Factor is 3 : 1.**
- **Maximum input current: 10A**

4. Accessories

This unit is shipped with the following accessories:

- 1) Manual..... 1 copy
- 2) Test Cord..... 1 unit
- 3) Line Cord..... 1 unit
- 4) Spare fuse (2A, 250V)..... 1 unit
- 5) RS232 Cable (9Pin to 9Pin) 1 unit
- 6) RS232 Program..... 1 unit

Note:

The accessories may be changed to improve the product quality without notifying the customers. Optional accessories will be made available at a later date.

Chapter 2. Installation of the equipment

This chapter supplies all the necessary information to install this equipment. It includes: initial inspection, preparation for use, appropriate voltage selection, packing for the return, etc.

1. Initial inspection

- 1) When received, inspect the shipping box for damage. If the shipping carton is damaged verify that there is no mechanical damage to the instrument and it is functional. Verify that all accessories are present.
- 2) Save the shipping carton and packing material until the unit is verified functional and within specification.
- 3) If the unit is not functional or accessories are missing, report all problems to the vendor where the unit was purchased as soon as possible to arrange for repair or replacement.
- 4) Report any shipping damaged to the shipping carrier's agent.

2. Preparation for use

- 1) Before tuning the unit on verify that the AC line is within 85V to 270Vac($\pm 10\%$), at a line frequency of 48 to 66Hz.
- 2) Check to see if the fuse has the correct rating. (2A / 250V)
- 3) Make sure the unit is connected properly and is being used within the specifications listed above.

3. Environmental

- 1) This equipment should be operated in a well ventilated, with in a temperature range of 0 to +40°C (+32°F to 104°F) and a relative humidity 85% or less and stored in a dry place within temperature range between -20°C to +70°C (-4°F to +158°F) with a relative humidity 85% less.

DCV	F1	Press F5 Button	⇒	Prev ▲	F1	Press F5 Button	⇒	Prev ▲	F1
ACV	F2		DIODE	F2	DCmA		F2		
OHM	F3		FREQ.	F3	DCA		F3		
BEEP	F4		CAP.	F4	ACmA		F4		
More ▼	F5		More ▼	F5	ACA		F5		

[Table 1] FUN Button layout

7)  Button

Toggles the cursor between the selection mode cursor displayed as a (< or >) symbol and the edit mode cursor displayed as a (◀ or ▶) symbol when changing counter settings and functions.

It also toggles the cursor between the digit selection cursor, which is displayed as a (◀▶) symbol, and the digits edit cursor displayed as a (◆) symbol when changing Relative values or Hi/LO limit values in the Relative or compare mode.

8) **[PRO]** Button

Displays the current settings along with a corresponding F button on the LCD as shown in **Table 2**. Pressing the F button changes the current setting to the alternate menu setting.

Pressing the PRO button again will returns the display to the normal screen.

REC	F1	Records MAX, MIN and AVG value
REL	F2	Relative mode, Displays REF values and % ERROR
COMP	F3	Comparison, Displays HI, LO limit values
NONE	F4	Cancels the Program mode
EXIT	F5	Exit

[Table 2] PRO Button layout

9) **[EDIT]** Button

Displays the cursor in the setup or Equipment menus for editing counter settings or data values. It will display the cursor in the bottom section of the LCD when REL (relative) or Comp (comparison) mode is selected. The cursor will indicate the Reference values in the relative (REL) mode and the HI/LO limit values in the comparison (COMP) mode.

Pressing the EDIT button a second time will cause the cursor to disappear.

10) **[LOCK]** Button:

This button makes all buttons not to operate except the [LOCK] button.

11) **[HOLD]** Button

Freezes the displayed LCD value and displays an H on the LCD.

12) [PWR] Button

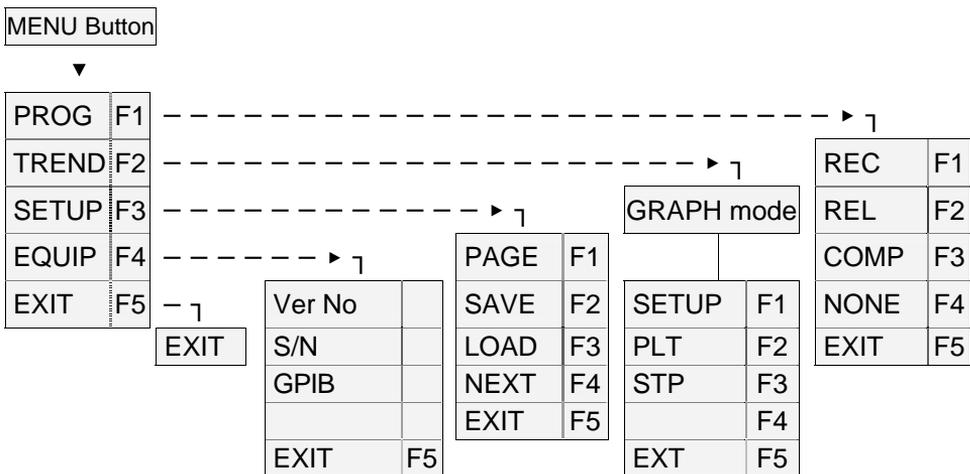
Pressing this button for 1.5 to 2 second will turn the unit on. Pressing this button again for 1.5 to 2 seconds will turn the power off.

13) [F1, F2, F3, F4, F5] Buttons

These buttons have a corresponding menu item displayed on the LCD when the MENU, FUN or PRO, buttons are pressed. Pressing the F button selects the desired item. (See **Table 1** and **2**)

14) [MENU] Button

Displays the MENU and submenus as shown in **Figure 2**. The menu is explained in detail in a later chapter.

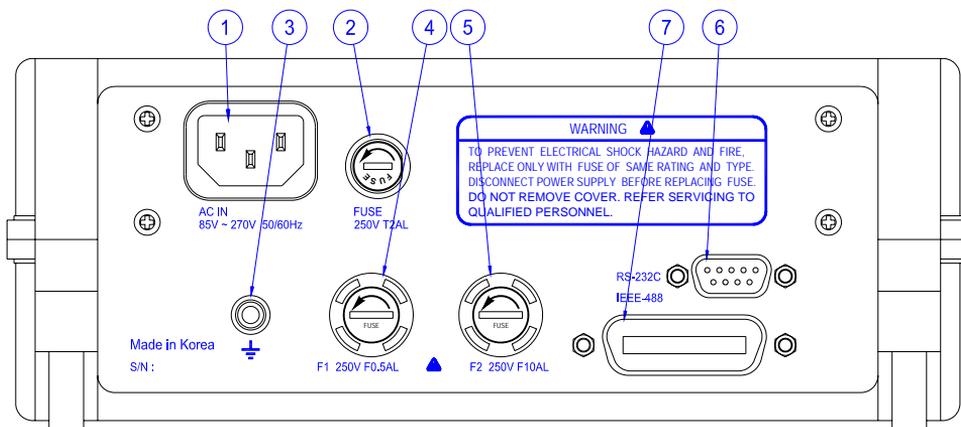


[Figure 2] Menu Layout

15) LCD

Displays the measurement data, menu, etc. See **[Figure 5]**.

2. Rear Panel



[Figure 3] Rear Panel

CAUTION

Before using, check that the AC line voltage is within the specified line voltage range.

1) AC input

The AC line cord is inserted in to this connector. The allowable AC voltage range is 85V to 270Vac ($\pm 10\%$), 48 to 66 Hz.

2) Fuse Holder

Holds the 2amp 250-volt fuse.

CAUTION

Remove the AC line power when changing this fuse.

3) GND TERMINAL

Chassis ground terminal

4) Fuse (F1 F600V F0.5AL)

Holds the F1 F600V F0.5AL.

5) Fuse (F1 F600V F10AL)

Holds the F1 F600V F10AL.

6) RS232 PORT

A 9pin DIN connector for connecting an RS-232 cable from the instrument to the PC. This is used along with the software for controlling the instrument from a PC.

7) GP-IB port [Option]

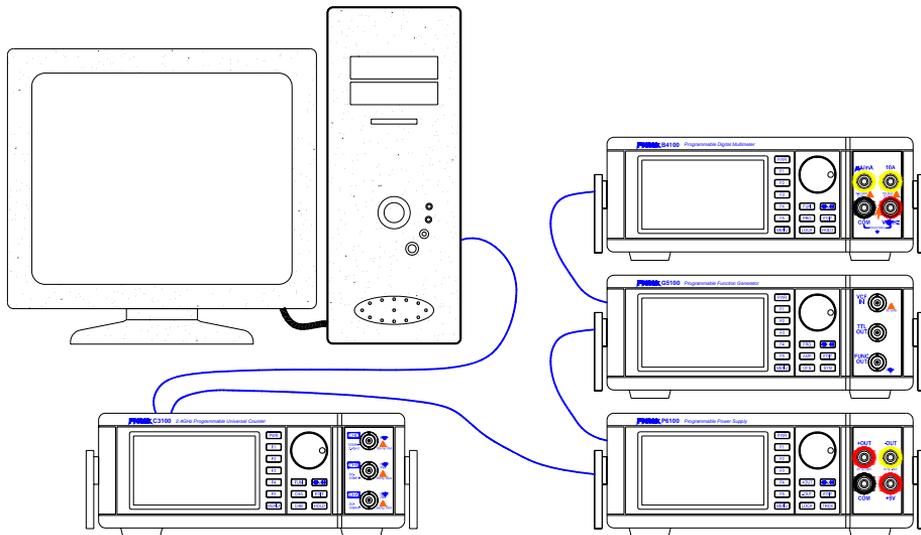
Standard IEEE-488 connector for connecting multiple devices to the GP-IB interface.

* Note

The total cable length should be less than 25m(80ft) and the maximum number of device connections (including controller) is 15.

◆ GP-IB Example

Figure 4 is an example of connecting multiple devices to the GP-IB port.



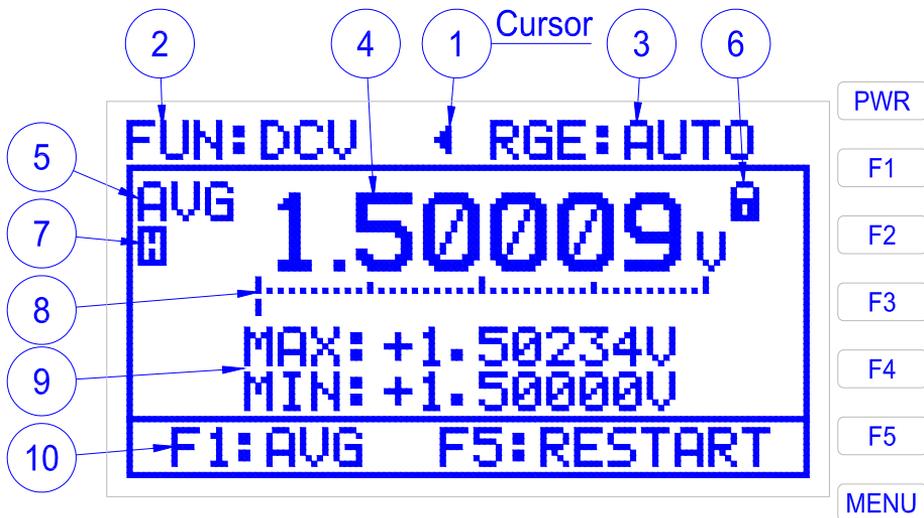
[Figure 4] GP-IB (Example of connecting the connector)

Chapter 4. LCD, Front panel buttons and menus description

1. LCD display description

Section 1-TOP DISPLAY	<p>← Displays The current setup values and the selection/edit cursor</p>
Section 2-MAIN-DISPLAY	<p>← Displays The measured values and the bar graph. Pass/ fail when in the compare mode</p>
Section 3-BOTTOM-DISPLAY	<p>← Displays:</p> <ul style="list-style-type: none"> • MAX, MAX, when in REC, • REF and % error when in REL • HI/LO limits when in COMP • Selection/Edit cursor when the EDIT button is pressed

[Table 3] LCD display areas



[Figure 5] LCD Display

1) Cursor

- (1) The cursor is displayed in the upper part of the LCD when the unit is first turned on as shown in **Figure 5**. It is used to indicate and change counter settings and functions. When the cursor is displayed as a (< or >) symbol it is the selection cursor and can be moved from one menu item to another by turning the rotary dial. When the cursor appears as a (◀ or ▶) it is the edit cursor and is used to change the setting it is indicating by turning the rotary dial.
- (2) The cursor is also displayed in the setup menu or the bottom of the LCD in the REL or COMP program modes when the EDIT button is pressed. The cursor can be used to change settings as explained in the above paragraph or the numerical values in the REL or COMP program modes.
- (3) When a numerical value is to be changed, indicate it with the selection cursor(< or >), then press the  Button to display the edit cursor(◀ or ▶). Rotating the rotary dial changes the cursor to a (◀▶) symbol and highlights a digit. Turning the rotary dial further moves the highlight to the next consecutive digit. Pressing the  Button changes the cursor to the Digit edit cursor displayed as a (◀▶) symbol. Turning the rotary dial clockwise increases the digit value; counter clockwise decreases the digit value.

2) FUN (Function)

- ▣ Displays the currently selected function.
 - ▣ DCV, ACV, OHM, BEEP, DIODE, FRQ, CAP, DCmA, DCA, ACmA, ACA may be selected and displayed
- (1) To change the function, press the FUN button then press the corresponding F button for the new function.

3) RGE (Range)

- ▣ Display current Range value.
- ▣ Each function has different ranges as you can see the following below.

Function	Range
DCV, ACV	AUTO, 200mV, 2V, 20V, 200V, 1000V
OHM	AUTO, 200Ω , 2kΩ , 20kΩ , 200kΩ , 2MΩ , 20MΩ
BEEP, DIODE	2kΩ
FREQ.	AUTO, 200Hz, 2kHz
CAP.	AUTO, 2uF, 20uF, 200uF
DCmA, ACmA	AUTO, 20mA, 200mA
DCA, ACA	AUTO, 2A, 10A

4) Measurement value:

The current measured values is displayed or PASS/Fail when in the compare (**COMP**) mode.

5) AVG (Average)

- It displays indication of average value when REC (**record mode**) is selected from the (**PROG**) menu

6) (Lock)

- When you push the [LOCK] button it tells you the LOCKING state.
- It makes all buttons not to perform except the [LOCK] button.

7) (Hold)

- This symbol is displayed when the [HOLD] button is pressed.

8) Bar graph

- It responses 20 times per second

9) Data from one of the following (**PROG**) program modes is displayed in this area of the LCD:

(1) MAXIMUM and MINIMUM values when REC (**record mode**) is selected from the (**PROG**) menu. To select REC Press the following button sequence: MENU → PROG(**F1**) → REC(**F1**). This mode records and displays the maximum and minimum values that the input value deviates over a period of time.

(2) REFERENCE and the % ERROR value in the Relative (REL) mode. To select REL press the following button sequence: MENU → PROG(**F1**) → REL(**F2**). The relative mode measures how much the input value deviates from a reference value and displays the deviation as a % error according the formula: $(1 - \text{measured value} / \text{REF value}) \times 100$.

(a) The REFERENCE (REF) value is changed by pressing the [**EDIT**] button and then the  button to display the Edit cursor(◀). When the Rotary dial is turned, the cursor changes to a (◀▶) symbol and highlights a digit. Rotate the dial until the digit to be changed is highlighted. Press the  button again to select digit edit mode cursor(◆) and turn the Rotary dial to change the digit value.

(b) To change another digit press the  button, turn the rotary dial to highlight the next digit to be changed and repeat step (2a).

(3) HI and LO limit values in the COMPARE (**COMP**) mode. To select COMP press the following button sequence MENU → **PROG(F1)** → **COMP (F3)**. This mode compares the input value to a high and low limit value. A LO is displayed if the input value is lower than the low limit, PASS if the input value is within the high and low limit values and Hi if the input is greater than the high limit.

(a) The HI and LO limit values are entered and edited the same way as explained in the procedure for Reference value in (2a)

(4) When the MENU → **PROG(F1)** → **NONE(F4)** buttons are pressed no program data is displayed.

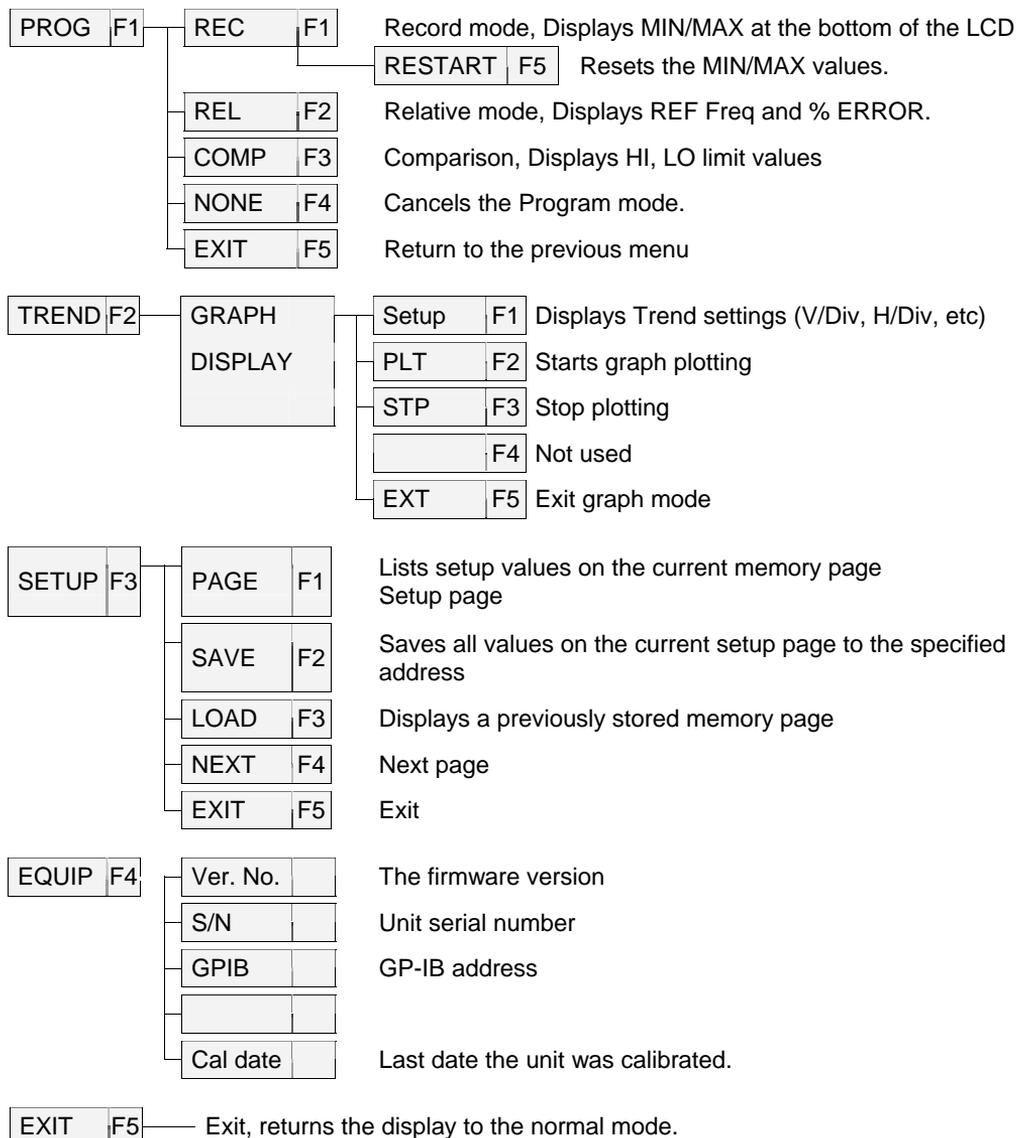
10) Help Menu

- ▣ It is a help-menu displayed to inform you menu key for the user's convenience for the established function.

2. MENU description

This section explains the items in the menus and sub menus and the F soft buttons [F1], [F2], [F3], [F4], [F5] for selecting items in the menus.

Table 4 is the diagram of the Menu structure that is displayed when the MENU button is pressed.



[Table 4] Menu structure

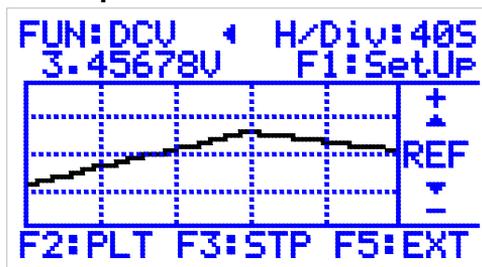
1) MENU Description

- [F1] **PROG** (Program mode): REC(record), REL(relative), COMP (comparison), NONE and EXIT sub menus are displayed.
- [F2] **TREND**: Displays the trend graph with the reference value as the center value.
- [F3] **SETUP**: Displays a list of a settings and data values and the PAGE, SAVE, LOAD, NEXT, EXIT soft Keys for setting a memory page, saving the current screen or recalling a previously saved counter setup screen. Eight setup screens may be saved or recalled from memory.
- [F4] **EQUIP**: Displays information about your instrument including the serial number, CALIBRATION date, GP-IB address and Firmware revision.
- [F5] **EXIT**: Exit the menu and return to the normal screen.

2) PROG Menu description

- [F1] **REC** (Record): Records and displays the MAX and MIN values of the input value at the bottom of LCD.
- [F2] **REL** (Relative): Displays Reference value and the deviation of the measured value from the reference value as a % error.
- [F3] **COMP** (Comparison): The high and low limit values are displayed at the bottom of LCD. The LCD will display PASS if the input value is with in the HI/LO limits, LO if the value is lower than the LO limit and HI if the value is higher than the HI limit.
- [F4] **NONE**: Removes the displayed data from the bottom of the LCD screen.
- [F5] **EXIT**: Returns to the counter display.

3) TREND display description



[Figure 6] Trend Display

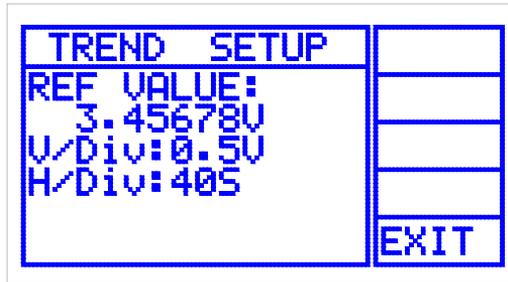
- [F1] **SET UP**: The Reference value, horizontal and vertical axis values (REF, H/Div, V/Div) are displayed. The REF is the centerline value on the trend graph, H/Div is the X axis (time) and V/DIV is the Y axis (amplitude). Pressing the EDIT button and following the procedure on pages 13 or 18 for editing digit values, the REF, V/Div and H/Div

values may be entered or changed. To return to TREND screen press the EXIT button (F5).

[F2] **PLT**: Starts the graph plotting using REF value as the centerline.

[F3] **STP**: Stops the graph from plotting further values.

[F5] **EXT**: Exit from the TREND screen and return to the normal screen.



Trend setup menu screen

[F5] **EXIT**: Return to the TREND graph

4) **SETUP Menu Description**

[F1] **PAGE**: Selects the page in memory where the currently displayed list of settings is to be saved. Eight setups may be stored from Addresses 0 to 7. To select a memory page press and release the F1 button until the desired memory page is displayed.

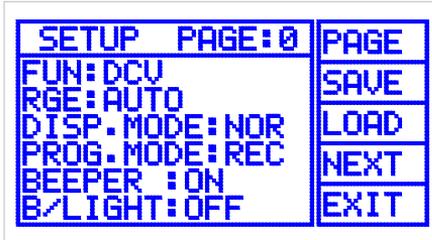
[F2] **SAVE**: Saves the displayed list of settings to the selected address page. The functions and data displayed in this list may be changed prior to saving by pressing the EDIT button and using the editing procedures as described on page, 13 or 18.

[F3] **LOAD**: Loads a previously saved memory address page to the display. This list now becomes the operating parameters of the counter. Press and release the F1 button until the desired paged is displayed.

[F4] **NEXT**: Go to the next page of menu items.

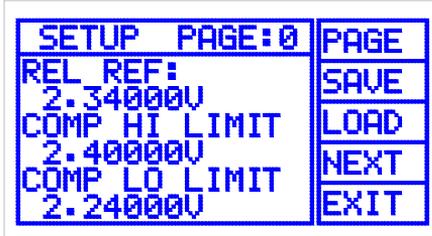
[F5] **EXIT**: Exit the setup menu.

(1) **SETUP** menu displays the current counter settings, Reference value, Compare HI limit and Compare Lo limit values. Pressing the NEXT (F4) button advances the display to the next menu screen; exit returns the display to the normal screen.



Selects memory page address: 0 to 7

- ◆ **FUN:** Displays the currently selected function
- ◆ **RNG:** RANG setting
- ◆ Display mode: Normal or Trend display
- ◆ Program mode: currently selected program mode(REC, REL, COMP or None)
- ◆ Beeper on/off
- ◆ Back light on/off



- ◆ **RELATIVE REF:** Reference value
- ◆ **COMPARE:** HI Limit and LO Limit values



- ◆ RS 232 Baud rate selection
- ◆ LCD Contrast adjust

[Figure 8] Setup menu screen

- (2) The above screens may be edited to enter new settings or data values by using the following procedure:
 - (a) Press the **[EDIT]** button to display the Selection mode cursor(◀).
 - (b) Turn the Rotary dial until the cursor is indicating the item to be changed.
 - (c) Press the  button to select the Edit cursor(◀).
 - (d) Turn the Rotary dial until the new setting is displayed.
 - (e) To change another item in the menu, press the , and repeat steps (b) through (d).

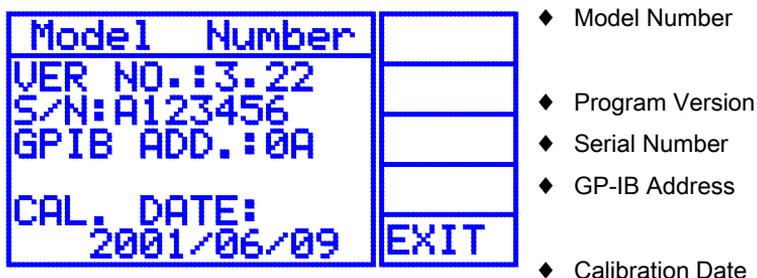
- (3) To edit numerical data (Relative Reference, HI/LO Comp) values:
 - (a) Turn the rotary dial to indicate the data value to be changed with the selection cursor(◀).
 - (b) Press the  button to select the edit cursor(◀).
 - (c) Turning the rotary dial the cursor changes to a (◀▶) symbol and highlights a digit or label (V, kV, etc). Turn the rotary dial to highlight the digit to be changed.

- (d) Press the  button to select the digit edits mode cursor(). Turn the rotary dial until the new digit or label is displayed.
- (e) To change another digit, press the  button and repeat steps (c) and (d).
- (4) To save this menu page, press and release the [F1] button until the desired address page is displayed, then press the [F2] button. To exit the menu, press the [F5] button.
- (5) To load and display a previously saved menu page. Press and release the [F1] button until the desired menu page is displayed. Press the [F3] LOAD button.
- (6) Press the [F5] EXIT button to exit this menu.

5) Equipment menu description:

This menu displays the specific information about a unit. It contains the Model number, Program Version, Serial number, GP-IB Address, Reference Oscillator and Calibration date.

- (1) The GP-IB address and Cal date may be changed using the edit cursor as described above.



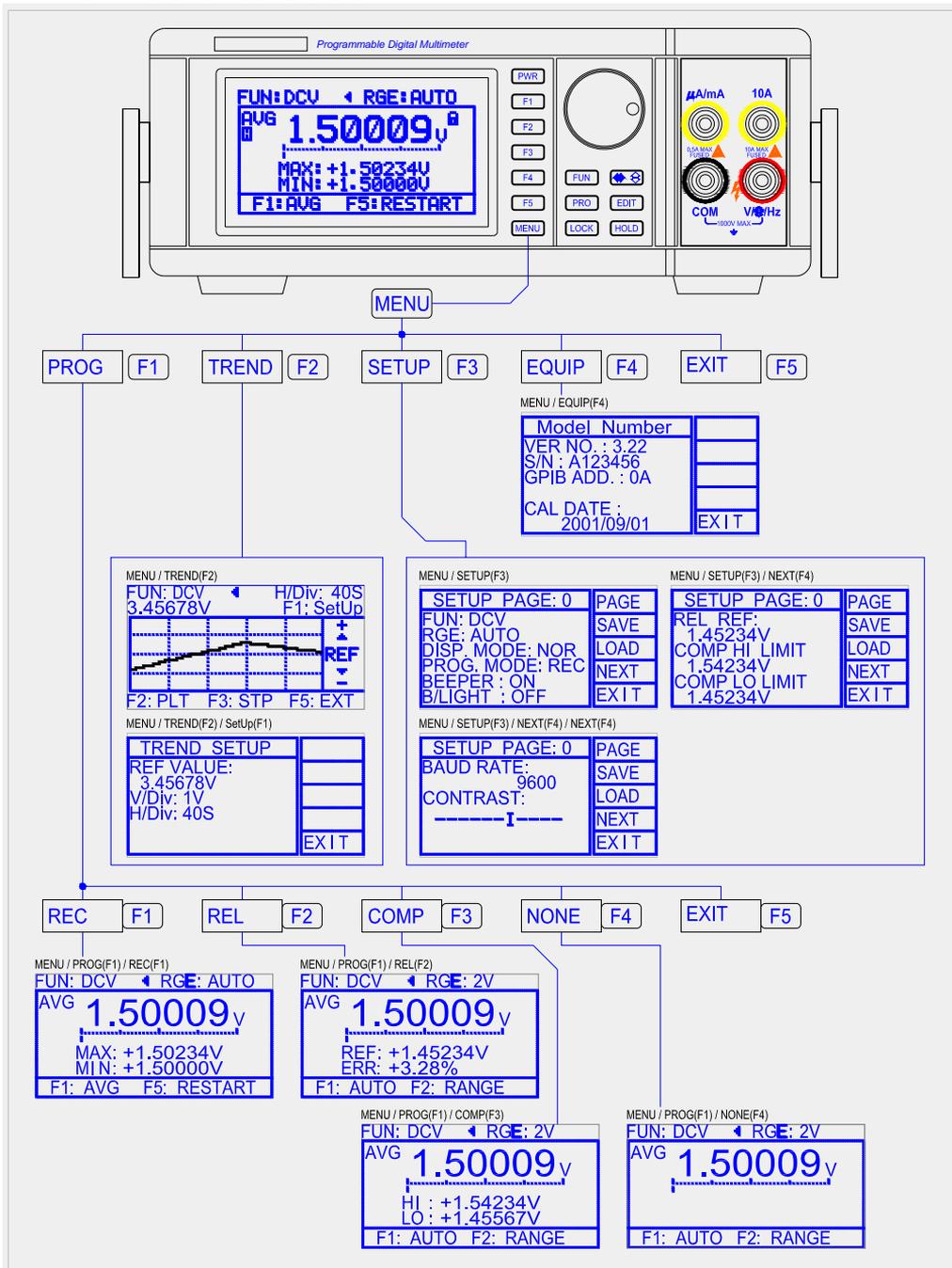
[Figure 9] Equipment menu screen

[F5] EXIT button: Pressing the [F5] button returns the to the counter display.

3. Rotary Dial:

- 1) The Rotary dial is used to move the selection cursor(< or >) from one item to another in the top section of the LCD or in the set up menu. It changes the value of the settings when it is indicated by the edit cursor(◀ or ▶). It is also used to change numerical data (Relative value or HI/LO limit values) when REL or COMP program modes are selected or in the setup menu.

4. Quick Reference Guide



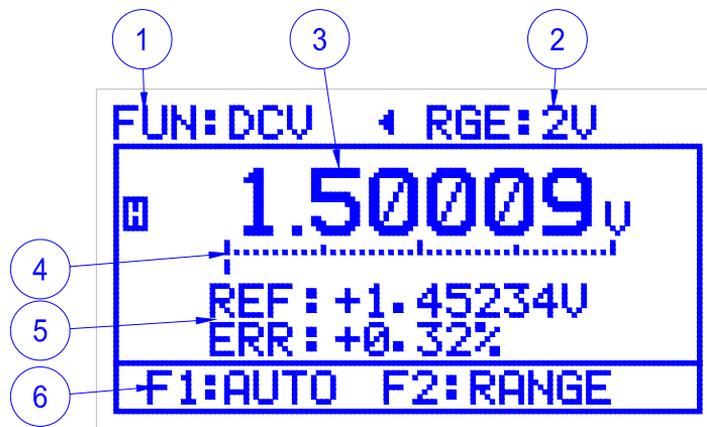
Chapter 5. Using this instrument

1. Preliminary setup

- 1) Check whether the AC input voltage is within the specified range before turning the unit on. See [Figure 3].
- 2) Connect the AC power cord to the receptacle on the rear panel.
- 3) Turn on the power on by pressing the [PWR] button for 1.5~2 seconds.
- 4) Let the unit Warm up for about 10 to 20 minutes before taking measurements.

2. DMM operations

This chapter explains the LCD setting indicators and the 11 modes of operation by showing a typical LCD display and explaining the various indicators.



[Figure 10] LCD Display Screen

1) LCD display description

This section explains the LCD display in [Figure 10]. This example uses the **DCV** input but it also applies to the **ACV** input.

- (1) **FUN:** Displays the function that is currently being used in an application. There are eleven functions to choose from [**DCV**, **ACV**, **OHM**, **BEEP**, **DIODE**, **FREQ**, **CAP**, **DC mA**, **DCA**, **AC mA** or **ACA**]. In [Figure 10] **DCV** is selected. To change to another function press the **FUN** button and then its corresponding **F** button.
- (2) **RGE:** Displays the current Range. In the above example the range is 2V. To set another range use the following procedure:
 - (a) Press the edit button to display the selection cursor (< >) and turn the rotary dial until it indicates RGE: __

- (b) Press the  to select the edit mode cursor (). Turn the rotary dial until the appropriate range is displayed on the LCD, and then press the  button.
- (3) The measured voltage value applied to DCV input is displayed.
- (4) **Bar graph:** It responses 20 times per second. The LCD will display the measured value along with the Bar graph.
- (5) The Ref value and Err is displayed when REL is selected from the Program (PROG) menu. To set the Reference value:
- Press MENU → PROG (F1) → REL (F2) buttons.
 - Press the **EDIT** button to display the selection cursor ()
 - Press the , button to display the edit cursor (). When the rotary dial is turned the cursor changes to a () symbol and highlights a digit.
 - Turn the rotary dial to highlight the first digit to be changed.
 - Press the . Button to select the digit edit cursor displayed as a () symbol. Turn the rotary dial to change the digit value. Turning the rotary dial clockwise increases the digit value; counter clockwise decreases the digit value.
 - When the function units are highlighted, rotating the rotary dial clockwise increases the function units by a factor of 10 (1kV, 10kV, 100kV, etc and the decimal point is adjusted accordingly.
Example: 150.000 kV → 1.5MV → 15.000MV
 - To change another digit press the . Button and repeat steps (d) through (g).
 - The Error is calculated from the equation.
 $(1 - \text{Measured value} / \text{Reference value}) \times 100$.
- (6) **Help-Menu:** It is a help-menu displayed to inform you menu key for the user's convenience for the set function.

3. DMM Function descriptions

The 11 functions performed by this instrument and how to use them are explained in this section. These functions include:

1) DCV [FUN + F1]

- (1) Insert the **BLACK** test lead into the input socket marked as "**COM**".
- (2) Insert the **RED** test lead into the input socket marked as "**V/Ω/Hz**".
- (3) Press the [FUN] → [F1] button to select **DCV**.
- (4) Adjusts Range. (Refer to Page 21.)
- (5) Attach the probe tips to the voltage source.
- (6) The LCD will display the measured value along with the Bar graph.
- (7) If the measured is too high, "**OL**" will appear.

2) ACV [FUN + F2]

- (1) Insert the **BLACK** test lead into the input socket marked as "**COM**".
- (2) Insert the **RED** test lead into the input socket marked as "**V/Ω/Hz**".
- (3) Press the [FUN] → [F2] button to select **ACV**.
- (4) Attach the probe tips to the voltage source.
- (5) The voltage will appear on the display.
- (6) Bar-graph indicator will move to the appropriate position on the Bar-graph scale.
- (7) If the voltage is too high, the measurement range will be changed to the next higher range automatically. Then the range is in the highest or in the manual range, too high voltage makes the display read "**OL**".

3) OHM [FUN + F3]

- (1) Insert the **BLACK** test lead into the input socket marked as "**COM**".
- (2) Insert the **RED** test lead into the input socket marked as "**V/Ω/Hz**".
- (3) Press the [FUN] → [F3] button to select **OHM**.
- (4) "Open" leads will display "**OL**" appeared on the display.

(5) "Shorting" the test leads will display zero or extremely low value resistance (Test Lead Resistance).

(6) Relative mode is useful to get rid of this error by subtract the test lead resistance from the measured resistance

4) BEEP [FUN + F4]

(1) Insert the **BLACK** test lead into the input socket marked as "**COM**".

(2) Insert the **RED** test lead into the input socket marked as "**V/Ω/Hz**".

(3) Press the [FUN] → [F4] button to select **BEEP**.

(4) Listen for the buzzer to confirm continuity..

5) DIODE [FUN + F5 + F2]

(1) Insert the **BLACK** test lead into the input socket marked as "**COM**".

(2) Insert the **RED** test lead into the input socket marked as "**V/Ω/Hz**".

(3) Press the [FUN] → [F5] → [F2] button to select **DIODE**.

(4) Read the displayed voltage value of a measured diode.

6) FREQ [FUN + F5 + F3]

(1) Insert the **BLACK** test lead into the input socket marked as "**COM**".

(2) Insert the **RED** test lead into the input socket marked as "**V/Ω/Hz**".

(3) Press the [FUN] → [F5] → [F3] button to select **FREQ**.

(4) Attach the test lead tips to signal source.

(5) Read the measured frequency.

7) CAP [FUN + F5 + F4]

(1) Insert the **BLACK** test lead into the input socket marked as "**COM**".

(2) Insert the **RED** test lead into the input socket marked as "**V/Ω/Hz**".

(3) Press the [FUN] → [F5] → [F4] button to select **CAP**.

(4) Discharge the capacitor to be measured.

(5) Attach the test lead tips to the capacitor.

(6) Read the measured capacitor.

8) DCmA [FUN + F5 + F5 + F2]

(1) Insert the **BLACK** test lead into the input socket marked as “**COM**”.

(2) Insert the **RED** test lead into the input socket marked as “**μA/mA**”.

(3) Press the [FUN] → [F5]→[F5]→[F2] button to select **DCA**.

(4) Connect the test leads in series to the circuit to be measured.

(5) Reconnect power to circuit to be measured.

(6) The measured value will appear on the LCD display.

(7) Bar-graph indicator will move to the appropriate position on the Bar-graph scale.

(8) If the measured current is too high, the display will indicate “**OL**”. In this case, the higher current range (**10A**) should be selected.

9) DCA [FUN + F5 + F5 + F3]

(1) Insert the **BLACK** test lead into the input socket marked as “**COM**”.

(2) Insert the **RED** test lead into the input socket marked as “**10A**”.

(3) Press the [FUN] → [F5]→[F5]→[F3] button to select **DCA**.

(4) The measuring procedure is the same as that of **DC mA**.

* The 10A input socket has a special function designed for safety, which is called “Warning Beep”.

When the FUN: DCA is set up to other than the 10A function, wrong insertion of the test lead plug into the 10A input socket will cause the warning beeper to sound.

* Do not continue measuring current above 10A for more than 30sec. to avoid opening fuse or overheating.

10) ACmA [FUN + F5 + F5 + F4]

- (1) Insert the **BLACK** test lead into the input socket marked as "**COM**".
- (2) Insert the **RED** test lead into the input socket marked as "**μA/mA**".
- (3) Press the **[FUN] → [F5] → [F5] → [F4]** button to select **ACmA**.
- (4) The measuring procedure is the same as for **DCmA**.

11) ACA [FUN + F5 + F5 + F5]

- (1) Insert the **BLACK** test lead into the input socket marked as "**μA/mA**".
- (2) Insert the **RED** test lead into the input socket marked as "**μA/mA**".
- (3) Press the **[FUN] → [F5] → [F5] → [F5]** button to select **ACA**.
- (4) The measuring procedure hereafter is the same as for **DCA**.

4. Program examples

1) The procedure for Setting the HI and LO limit value in the COMP mode:

- (1) Select The Compare (COMP) by pressing MENU → PROG(F1) → COMP(F3)
- (2) Press the EDIT button, to display the selection cursor (<). The cursor will be indicating the HI limit value.
- (3) Press the , to select the edit cursor (◀)
- (4) Turn the dial until the cursor highlights the most significant digit. Note: when the rotary dial is turned, the cursor changes to a (◀▶) symbol and highlights a digit Example: 025.125 kV. Turning the rotary dial further highlights the next consecutive digit.
- (5) When the digit to be changed is highlighted press the . Button, the cursor then changes to a (◀) symbol. The highlighted digit will increase if the rotary dial is turned clockwise; counter clockwise decreases the digit value
- (6) When changing a highlighted function unit, rotating the rotary dial clockwise increases the value by factors of 10 (1kV, 10kV, 100kV, etc) and the decimal point is adjusted accordingly.
Example 1.0000kV → 10.000kV → 100.00kV
- (7) When finished changing digits, turn the rotary dial clockwise until the (◀) symbol for the cursor is displayed.
- (8) Press the . Button to display the selection cursor (<). Turn the rotary dial to indicate the LO limit value
- (9) Repeat steps 3 through 7 to change the LO limit value.

2) Trend Plot Setup:

The trend plot displays a graph on the LCD. The trend plot and setup screen is shown in **Figure 11A** and **B**.

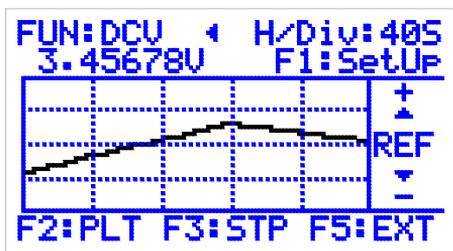
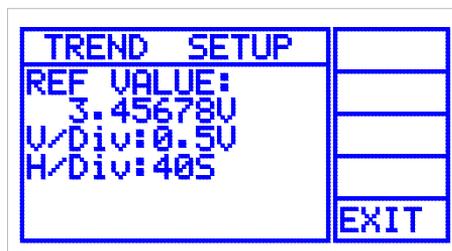


Figure 11A



11B

- (1) The reference value is centerline as shown in **Figure 11B**. The Horizontal divisions in the example are 40 seconds per divisions. The H/Divisions may be set from 20S/Div to 5Hrs/DIV. The V/DIV may be

set to any value and depends on the desired resolution; in this example the V/DIV is 0.5V/Div.

- (a) To select The Trend graph, press the MENU → Trend (F2) then Press [F1] to display the setup screen
 - (b) Press the EDIT button, to display the selection cursor(←). The cursor will be indicating the REF value. Press the , to display the edit cursor(◀).
 - (c) Turn the dial counter clockwise until the cursor highlights the first digit to be changed. Note: when the rotary dial is turned, the cursor changes to a (◀▶) symbol and highlights a digit. Turning the rotary dial further highlights the next consecutive digit.
 - (d) Press the . Button to display the Digit Edit cursor(◆). Turn the dial to display the desired digit. Turning the dial clockwise increases the digit value; counter clockwise decreases the digit value.
 - (e) To edit another digit, press the . Button and turn the dial to highlight the next digit and repeat step (d).
 - (f) When changing the highlighted function unit, rotating the rotary dial clockwise increases the value by factors of 10 (1kHz, 10kHz, 100kHz, 1MHz, etc) and the decimal point is adjusted accordingly.
 - (g) When finished changing the digits, turn the rotary dial clockwise until the (◀) symbol for the cursor is displayed.
- (2) Setting the V/DIV
- (a) Press the . Button to display the selection cursor(←). Turn the rotary dial to indicate V/DIV. Repeat steps 1c thru 2g to set the V/DIV value.

(3) Setting the H/Div.

The H/DIV is the rate the plot moves across the screen. It can be set from 20S/div to 5Hours/Div.

To set the H/Div:

- (a) Press the Press the . Button to display the selection cursor(←). Turn the rotary dial to indicate H/DIV.
- (b) Press the . Button to select the Edit cursor(◀) and turn the rotary dial to select the desired H/DIV.
- (c) Press the [F5](EXIT) button when finish with the set up to return to the Trend graph.
- (d) Press the [F2](PLT) button to start the Plot, [F3](STP) to stop the plot.

5. RS232C Interface

1) Hardware and Software requirement:

- (1) IBM PC/XT/AT (8088,80286,80386,80486) or Compatible Computer.
- (2) Microsoft Windows VER 3.1 OR Windows 95,98, 2000.
- (3) Serial Port for Connection with Instrument.

2) RS232 Cable Pin Connection

Instrument		Computer		
D-sub 9-Pin Male		D-sub 9-Pin Female	D-sub 25-Pin Female	Pin Name
2	_____	2	3	Rx
3	_____	3	2	Tx
4	_____	4	20	DTR
5	_____	5	7	GRD
6	_____	6	6	DSR
7	_____	7	4	RTS
8	_____	8	5	CTS

3) Installation of Supplied Software

- (1) Insert the supplied diskette into the Drive A. (or B).
- (2) Select File from the Program Manager screen, and then select Run.
- (3) Type A:\(or B:\) Setup.exe. Then ENTER.
- (4) If you are using Windows 95/98/2000/ME click the mouse on MY computer ICON, then Floppy Drive A icon. When the menu is displayed click on SETUP.EXE
- (5) Monitor Program will be installed and create a directory named "**Model No.**" automatically in Hard Disk.

4) Connection of PC and Instrument:

Connect the RS-232 cable to the built-in RS-232 connector in the Instrument and to the PC serial port.

5) Communication with PC

- (1) Start the program by clicking the mouse on the icon.
- (2) Click on the **Setup** Button to open the setup dialog. Then select appropriate Serial Port and Baud Rate and click on the **OK** button.
- (3) Click on the S TIME button and type in the appropriate sampling time
- (4) Click the "START" button with mouse to start the program.
 - Start**: Starts the program.
 - Stop**: Stops the program.

Note

For detailed operation instructions, refer to the "Readme.doc" file on the supplied diskette.