Panel Mount Digital Multimeters

Features

- **Low power consumption**
- **5 or 9 volt dc operation (customer selectable)**
- **Multi-turn voltage-reference potentiometer for accurate adjustment of display reading (HED281/HED282)**
- **Annunciators for common engineering units**
- **Large character height, 10mm on HED271/DPM951 and 14mm HED282/DPM952**
- **DIN standard housings, 24x48mm HED281/ DPM951 and 36x72mm on HED282/DPM952**
- **Low cost versions available (DPM951/DPM952)**

These modules are low profile LCD digital panel meters conforming to DIN standard panel cut-outs. They use advanced components and construction techniques to provide performance combined with elegant appearance at a cost previously unattainable. The LED backlight (-T/BL version) provides a clear, easy to read display under all lighting conditions. The very low power consumption makes either module ideally suited to battery powered applications.

Features include 200mV full scale reading, programmable annunciators and decimal point, auto-polarity and operation from 5V or 9V supplies. In 5V mode each module generates its own -5V supply which enables it to measure signals with the same common zero as the supply. Connections are brought out to enable the module to operate in various modes including single ended, ratio measurement and differential. Different modes are selected by linking PCB solder pads which are provided for the purpose.

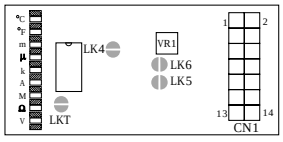
Specification Connections

	Min	Typ	Max	Units
Accuracy (±1 Count)		0.1	0.1	%
Linearity			±1	count
Sample Rate		3		per sec
Temperature Stability		30		ppm/°C
Operating temp range	0		50	°C
Storage temp range	-20		70	°C
Supply voltage (5V mode)	3	5	7	Vdc
Supply voltage (9V mode)	7	9	12	Vdc
Supply current		2		mA
Backlight Current (HED281-TDPM951-BL)			80	mA
Backlight Current (HED282-TDPM952-BL)			160	mA
Input impedance	100			MΩ

Rear views showing connections and links

HED281/DPM951

Annunciator Connectors
De-select
LEGEND
Select

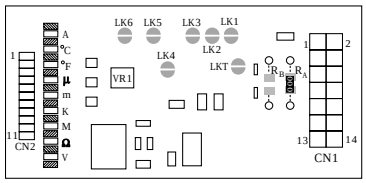


HED282/DPM952

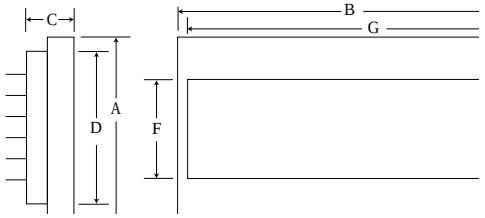
CN2 not present on DPM952

Supplied with 0Ω link in R_A and R_B open. See Scaling Config below.

(The block schematic of the HED 082 shows how the links relate to the internal circuitry on the PCB.)



Dimensions



	HED281 / DPM951	HED282 / DPM952
A	24mm (0.95")	36mm (1.42")
B	3.5mm (0.14")	9mm (0.35")
C	2.54mm (0.1")	2.54mm (0.1")
D	22mm (0.87")	33mm (1.3")
E	48mm (1.89")	72mm (2.83")
F	37mm (1.46")	61mm (2.4")
G	45mm (1.77")	68mm (2.68")
H	14mm (0.55")	14mm (0.55")
J	5mm (0.2")	6mm (0.24")
K	5mm (0.2")	6mm (0.24")
L	2.54mm (0.1")	2.54mm (0.1")
M	3mm (0.12")	3mm (0.12")
N	13mm (0.51")	18mm (0.7")

Connector CN1

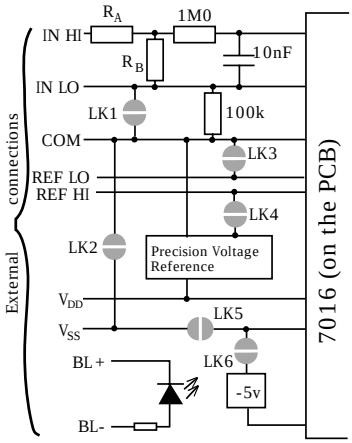
Pin	Name	Function
1	IN HI	Positive measuring input
2	IN LO	Negative measuring input
3	VDD	DC positive supply +5V or +9V
4	VSS	DC negative supply 0V
5	COMMON	Analog common input
6	BACKLIGHT (+ve)	Connect to +5V or with external resistor for +9Vsupply *(see below)
7	REF LO	Negative reference voltage input
8	REF HI	Positive reference voltage input
9	ANNUNCIATOR ON (BP)	Connect to pin 12, 13 or 14 to select decimal point position
10	ANNUNCIATOR OFF ($\overline{BP}$)	Connect to all unused annunciators or decimal point inputs
11	NOT USED	No function in this model
12	DP3	Decimal point 1.999
13	DP2	Decimal point 19.99
14	DP1	Decimal point 199.9

*Resistorfor HED281/DPM951 Backlight = 68Ω
*Resistor for HED282/DPM952 Backlight = 33Ω

Panel Mount Digital Multimeters

Block Schematic Diagram showing PCB Links

Note: Links LK1 and LK2 are not present on HED281/DPM951



Links & Mode Connections

Function (Note: There is no LK3 link on either model)	**On HED281/ DPM951**	**On HED282/ DPM952**
Links ANALOGUE COMMON to IN LO	Connect CN1 pins 2-5	Solder LK1
Links ANALOGUE COMMON to VSS	Connect CN1 pins 4-5	Solder LK2
Links ANALOGUE COMMON to REF LO	Connect CN1 pins 5-7	Solder LK3
Links REF HI to VR1 (remove link if using external reference voltage circuit)	Solder LK4	Solder LK4
Power supply voltage mode link (see Power Supply Mode Selection)	Solder LK5	Solder LK5
Power supply voltage mode link (see Power Supply Mode Selection)	Solder LK6	Solder LK6
TEST LINK. Forces display to 1888. Do not use for more than 2 seconds or damage to the display may occur	Briefly bridge LKT	Briefly bridge LKT

Internal Reference Voltage

The internal reference voltage (REF HI) is set by VR1. This is a 9 turn pot for greatest accuracy (single turn for DPM951 and DPM952). The voltage is factory set at 100.0mV but may be trimmed to suit individual applications,
eg. to compensate for the inaccuracy of external resistors when using scaling configurations.

Analogue Inputs

IN HI, IN LO and REF HI are all differential inputs. They respond to the voltage across them and not to the voltage with respect to the power supply. The only exception to this is in 5V mode where the analogue common and VSS have been connected together (using pins 4/5 on HED281/DPM951 and LK2 on HED282/DPM952).
There is a limit to the voltage which can be measured using a differential input and this is known as the common mode range. No input may be taken outside the range V+ minus 0.5V and V- plus 1.0v. If there is a danger that any input may be taken outside these limits, it is necessary to fit a resistor of suitable value to limit the current to 100µA in series with the input or damage to the unit may occur.

Power Supply Mode Selection

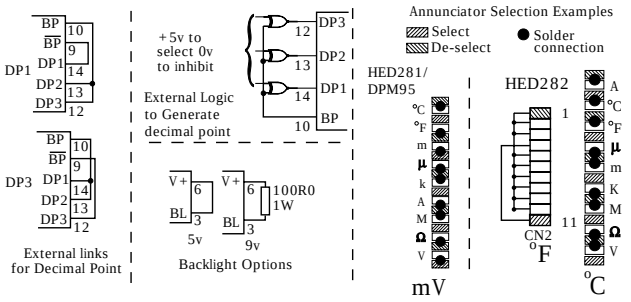
The following power supply mode connections apply to both models.

5 volt mode	**9 volt mode**
LK5 Open	LK5 Shorted
LK6 Shorted	LK6 Open

Annunciators

There are annunciator connections, each with its legend, provided on the PCB. Refer to the connections diagram. To display an annunciator, solder a connection between the required LEGEND solder pad and the adjacent SELECTED solder pad. For the annunciators that are not in use, solder a connection between the associated LEGEND and the adjacent NOT SELECTED solder pad to ensure that they do not appear.

Wiring Examples for Options



Connector CN2 (HED282 only)

(Note: provision is made for this connector on the DPM952 but is not included).

Pin	**Annunciator**	**Function**
1	BP	SEGMENT NOT SELECTED
2	A	Amps
3	°C	degrees Celsius
4	°F	degrees Fahrenheit
5	µ	micro
6	m	milli
7	K	Kilo
8	M	Mega
9	Ω	ohms
10	V	Volts
11	$\overline{BP}$	SEGMENT SELECTED

Application Circuits

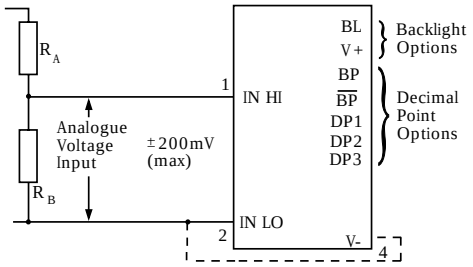
Note: In the application circuits, power is supplied on pins V+ and V-.
Caution: Where the measurement voltage is referenced to the supply voltage (in either current or voltage applications) the voltage on IN HI or IN LO must not exceed ±4.5V for 5V supply or ±3.5V for 9V supply.

Scaling Configuration

You can configure the module (semi-permanently) for different voltage ranges by soldering resistors in the positions RA and RB. As supplied RA has a 0Ω resistor fitted. (For switching between ranges see Multi-voltage). On the HED281/DPM951 RA and RB must be fitted externally.

Note: 0.1% resistors are required to maintain an accuracy of 0.1%. This may be relaxed if an accuracy less than this is required.

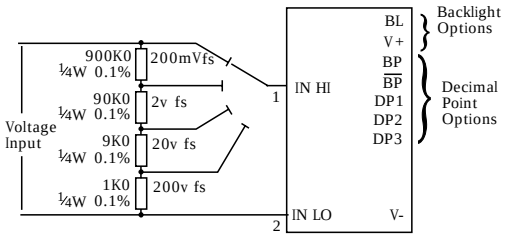
Voltage Measurement



Link:	HED282/DPM952	HED281/DPM951
Floating I/P voltage (5V)	LK2,3, 4 & 6	LK4 & 6 and connect CN1 pins 4, 5 & 7
Floating I/P voltage (9V)	LK3, 4 & 5	LK4 & 5 and connect CN1 pins 5 & 7
I/P common to 0V (5V)	LK1, 2, 3, 4 & 6	LK4 & 6 and connect CN1 pins 2, 4, 5 & 7
I/P common to 0V (9V)	Not possible	Not possible

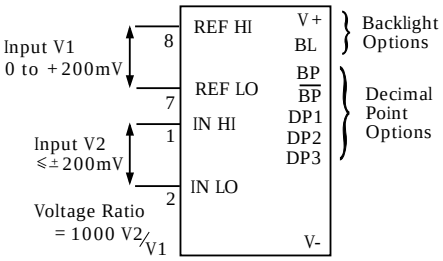
Required full scale	RA(Ω)	RB(Ω)
200mv	0R	Open
2V	900K	100K
20V	990K	10K
200V	999K	1K

Multi - Voltage Measurement



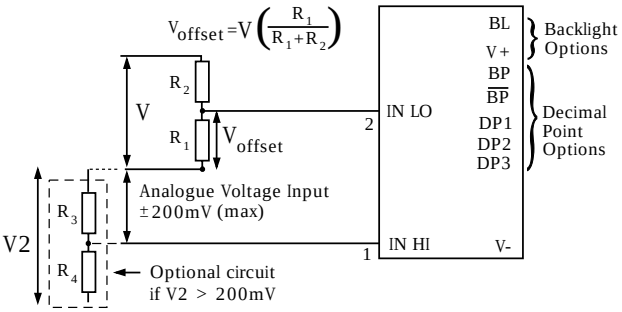
Link:	HED282/DPM952	HED281/DPM951
Floating I/P voltage (5V)	LK2,3, 4 & 6	LK4 & 6 and connect CN1 pins 4, 5 & 7
Floating I/P voltage (9V)	LK3, 4 & 5	LK4 & 5 and connect CN1 pins 5 & 7
I/P common to 0V (5V)	LK1, 2, 3, 4 & 6	LK4 & 6 and connect CN1 pins 2, 4, 5 & 7
I/P common to 0V (9V)	Not possible	Not possible

Voltage Ratio Measurement



Link:	HED282/DPM952	HED281/DPM951
Floating I/P voltage (5V)	LK2 & 6	LK6 and connect CN1 pins 4 & 5
Floating I/P voltage (9V)	LK5	LK5 and connect CN1 pins 5 & 7
I/P common to 0V (5V)	LK1, 2, 3 & 6	LK6 and connect CN1 pins 2, 4, 5 & 7
I/P common to 0V (9V)	Not possible	Not possible

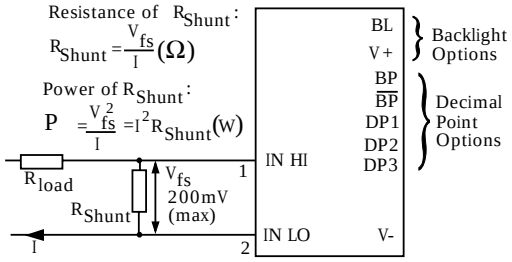
Voltage Offset Measurement



Current Measurement

Link:	HED282/DPM952	HED281/DPM951
Floating I/P voltage (5V)	LK2, 3, 4 & 6	LK4 & 6 and connect CN1 pins 4 ,5 & 7
Floating I/P voltage (9V)	LK3, 4 & 5	LK4 & 5 and connect CN1 pins 5 & 7

(Note: in 5V mode common is linked to V5)

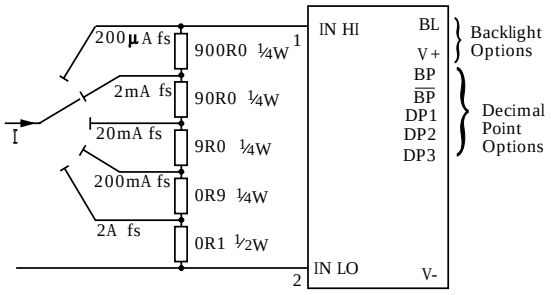


Link:	HED282/DPM952	HED281/DPM951
5V Supply	LK2, 3, 4 & 6	LK4 & 6 and connect CN1 pins 4, 5 & 7
9V Supply	LK3, 4 & 5	LK4 & 5 and connect CN1 pins 5 & 7

Current	R Shunt (Ω)	P (R Shunt) (W)
200 mA	1	0.04
2A	0.1	0.4
20A	0.01	4.0

Application Circuits

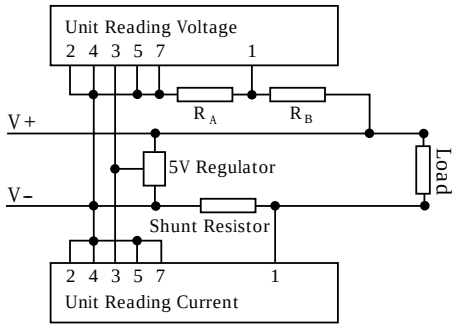
Multi-current Measurement



Link:	HED282/DPM952	HED281/DPM951
Floating I/P voltage (5V)	LK2,3, 4 & 6	LK4 & 6 and connect CN1 pins 4, 5 & 7
Floating I/P voltage (9V)	LK3, 4 & 5	LK4 & 5 and connect CN1 pins 5 & 7
I/P common to 0V (5V)	LK1, 2, 3, 4 & 6	LK4 & 6 and connect CN1 pins 2, 4, 5 & 7
I/P common to 0V (9V)	Not possible	Not possible

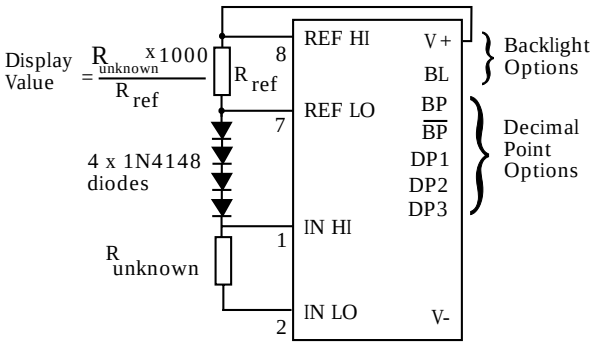
Caution: In 5V operation on both the HED281/DPM951 and HED282/DPM952, the shunt resistor must be between the load and OV/ground or the module will be damaged.

Two HED28 measuring current and voltage from common supply



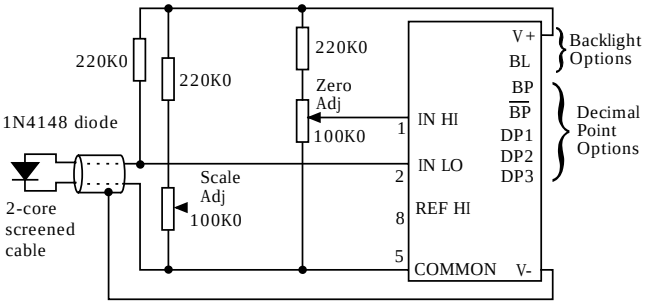
The shunt resistor must be between the load and Ov/ground or the module will be damaged.

Resistance Ratio Measurement



Link:	HED282/DPM952	HED281/DPM951
5V Supply	LK2 & 6	LK6 and connect CN1 pins 4 & 5
9V Supply	LK5	LK5

Temperature Measurement using a Signal Diode



Temperature Measurement Set Up

1 Adjust the SCALE ADJ pot to read 100mV between REF HI (pin8) and COM (pin 5)

2 With the temperature probe diode at 0ºC adjust the ZERO ADJ pot to indicate 00.0 on the display.

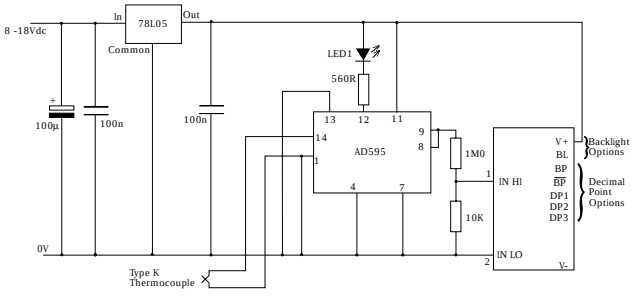
3 Increase the temperature of the probe to a known value (xºC). When the display has stabilised, take a reading (yºC).

4 Calculate the new value for REF HI voltage as yºC/xºC x 100mV.

5 Adjust the SCALE ADJ pot to read the new REF HI value between REF HI (pin 8) and COM (pin 5)

Link:	HED282/DPM952	HED281DPM951
5V Supply	LK2, 3 & 6	LK6 and connect CN1 pins 4, 5 & 7
9V Supply	LK3 & 5	LK5 and connect CN1 pins 5 & 7

Temperature Measurement using a Thermocouple



Theoretical Range using 'K' Thermocouple: 0-2,000ºC (Practical range depends on range of thermocouple used) LED1 provides indication of overload or themocouple open circuit.

Link:	HED282/DPM952	HED281/DPM951
	LK1, 2, 3, 4 & 6	LK4 & 6 and connect CN1 pins 2, 4, 5 & 7

Ordering Information

HED281-R / DPM951-R	24x48mm Multimeter.
HED281-T / DPM951-T	24x48mm Multimeter with backlight.
HED282-R / DPM952-R	36x72mm Multimeter.
HED282-T / DPM952-T	36x72mm Multimeter with backlight.