Murata Power Solutions

DM-3100x

3-1/2 Digit Microprocessor LCD Digital Panel Meter

OBSOLETE PRODUCT

Contact Factory for Replacement Model

FEATURES

- Ultra-low power, 3 mA from 9V battery, short depth case
- .5" high Liquid Crystal Display
- 3½ digits, 5V or 9-15V powered, ratiometric reference for drift correction
- Balanced differential inputs, 5 pA bias current, autozeroing with 80 db CMR noise rejection
- 1000 MΩ CMOS high impedance inputs, ±1.999 Vdc FS range

  Internal user-options:
  1. Accepts shunts for ±20 μA to ±2A FS ranges
  2. Accepts attenuators for ±2V to ±1KV FS ranges
  3. Digital ohmmeter, 2KΩ to 10 MΩ. FSR



GENERAL DESCRIPTION

The DM-3100X is a 3½ Digit Liquid Crystal Display (LCD) Digital Panel Meter that uses extremely low power (+5V @ 6 mA or +9V @ 3 mA) and has a power voltage range of +4V to +15 Vdc. The large 0.5" display can be seen from many feet away under normal room lighting conditions. This DPM is contained in a short depth case which measures only 2.15" (54,6 mm) deep. Besides measuring dc voltages, components can be internally placed to make ohm and current readings possible along with attenuators to measure higher voltages. Also, the decimal point can be internally selected by jumpering appropriate pins.

The versatility of this meter is further enhanced by its autozeroing circuits which eliminate zero drift.

This DPM accepts a dc or slowly varying input voltage between ±1.999V and displays that input on front panel numerical indicators. It employs a conventional dual-slope A/D converter plus 7 segment display decoder-drivers all in one LSI microcircuit. Since this microcircuit requires approximately 9V to power the A/D section, an internal DC/DC converter generates −5V from +5V power input. Together these two voltage sources form a bipolar power supply to power the A/D converter. The DM-3100X may also be powered directly from a single 9V battery @ 3 mA without using the DC/DC converter.

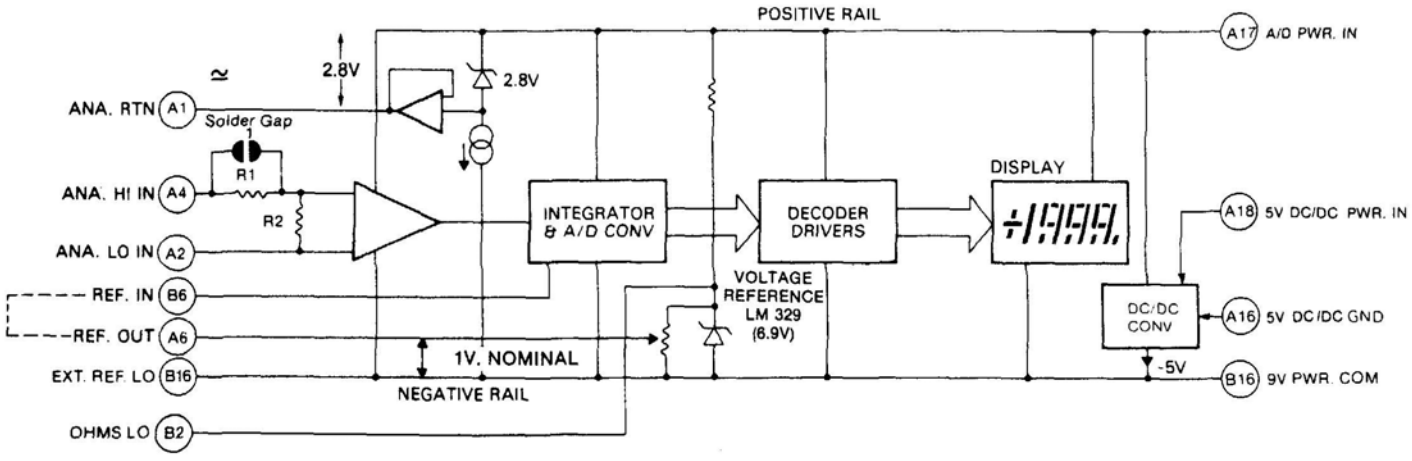
NOTE: DPM's are normally supplied without Bezel Labels or Logos.

Another feature of the DM-3100X is that it employs a balanced differential input. When used with a bridge or transducer input, it offers high noise immunity and can accurately measure very small signals in the presence of much larger common mode noise. Another characteristic of this balanced differential input is that it will not load down sensitive input circuits due to its high input impedance of 1000 megohms, and low 5 pA bias current.

A very noteworthy feature of this meter is that it can be operated ratiometrically. This means that it has internal circuits that can automatically compensate for reference drifts in the supplies of balanced bridge or transducer sensors and still give accurate readings.

The DM-3100X finds use in analytical instruments, industrial process controllers, portable diagnostic instruments, automatic test equipment, medical and patient monitoring instruments, airborne, marine, and ground vehicles, and data acquisition/data logging systems.

SIMPLIFIED BLOCK DIAGRAM



SPECIFICATIONS (Typical at +25° C, unless noted)

ANALOG INPUT

Configuration
True-balanced differential bipolar

Full Scale Input Range
−1.999 Vdc to +1.999 Vdc. Input pad area will accept user-installed range change

Input Bias Current
5 pA typical, 50 pA maximum

Displayed Accuracy @ +25° C
Adjustable to ±0.1% of reading, ±1 count

Resolution
1 mV

Temperature Drift of Zero
Autozeroed ±1 count over 0 to +50° C

Temperature Drift of Gain
±50 ppm of Reading/° C typ. ±100 ppm of Reading/° C max.

Input Impedance
100 Megohms, minimum

Input Overvoltage
±250 Volts dc 175 VRMS continuous max.
±300 Volts intermittent max.

Common Mode Rejection
80 dB, DC to 60 Hz, 1 Kilohm unbalance

Common Mode Voltage Range
Within +Vs - .5V and −Vs +1V where +Vs is the positive rail (Pin A 17) and −Vs is the negative rail (Pin B16). −Vs is approximately equal to −5V below PWR. COM.

Reference
Internal, referred to the negative rail (−Vs). External, user-supplied reference optional for *ratiometric operation.*

External Ref. Range
+100 mV to +2V, referred to $-V_S$

Ramp-up Time (Integration Period)
83.3 mS

DISPLAY

Number of Digits
3 decimal digits and most significant "1" digit (3½ digits)

Decimal Points
Selectable decimal points are included for scale multipliers.

Display Type
Field effect liquid crystal displays (LCD) requiring room light for viewing. Black digits against a light background

Display Height
0.5 inches (12,7 mm)

Overscale
Inputs exceeding the full scale range blank the display, leaving a "1" MSD and sign

Autopolarity
A minus sign is automatically displayed for negative inputs, and may also be blanked

Sampling Rate
Factory set at 3 conversions per second. May be rewired up to 20 conversions/second.

I/O CONNECTIONS

Analog HI Input (Pin A4)
Analog LO Input (Pin A2)
Differential input voltages are connected between these inputs. A bias current path to POWER COMMON (if 5V-powered) or ANALOG RETURN from both these inputs must be externally provided. External circuits must constrain these inputs to be within the common mode voltage range.

Analog Return (Pin A1)
This pin may be used as a low-noise bias current for some floating inputs. If not possible, inputs may be referenced to POWER COMMON (if 5V-powered). Analog Return is approximately −2.8V below +Vs and can sink 30 mA to −Vs.

Reference In/Out (Pins B6/A6)
Normally, REF. IN and REF. OUT should be jumpered together. An external floating source referred to EXT. REF. LO (Pin B16) may be substituted for ratiometric operation.

Decimal Points
Connect selected pin to DECIMAL POINT COMMON (Pin B13). See Backplane Out.

Display Test (Pin B14)
Connect this input to Pin A17 or +Vs to test all display segments.

Horizontal Polarity In (Pin B15)
Horizontal Polarity Out (Pin B9)
Normally these inputs are jumpered together to continuously display the horizontal portion of the polarity sign. Omit the jumper for applications not requiring sign display. See Backplane Out

Vertical Polarity In (Pin B17)
Vertical Polarity Out (Pin B18)
Jumper these inputs when HORIZ. POL. is jumpered for automatic sign display with bipolar inputs. For reverse sensing applications, VERT. POL. OUT may be jumpered to HORIZ. POL. IN (no other connections). This will display a minus sign with positive inputs and no sign (implied positive) with negative inputs. See Backplane Out

Ohms Lo (Pin B2)
This connection is used in the ohmmeter configuration, otherwise do not use.

Backplane Out (Pin A13)
Connect all unused Polarity, and Decimal Points to Backplane Out. For VOM or DVM applications, a 470 kΩ resistor may be used for each Decimal Point. A rotary switch pole to B13 will then select the desired Decimal Point.

POWER CONNECTIONS

A/D Power IN (Pin A17)
Connect this pin to +5 Vdc regulated to power the A/D converter and displays. Connect to +9V for 9V configuration.

5V DC/DC Power Common (Pin A16)
Use only for the 5V power configuration. This provides power return for the DC/DC converter.

5V DC/DC Power IN (Pin A18)
Connect to +5V if a single +5V supply is to be used. This will power the DC/DC converter to generate −5V. Don't use this pin in the 9V power configuration.

PHYSICAL-ENVIRONMENTAL

Short-Depth Case
Interchangeable with other Datel-Intersil cases.

Outline Dimensions
3.00"W × 2.15"D × 1.76"H (76,2 × 54,6 × 44,7 mm)

Cutout Dimensions
1.812"H × 3.062"W (46,0 × 77,7 mm)

Mounting Method
Through a front panel cutout secured by (4) 4-40 front access screws which are concealed by the bezel.

Weight
Approximately 5 ounces (142g)

Connector
Double-sided edgeboard PC type, solder tab, gold-plated fingers, Dual 18-pin, 0.100" centers, Datel-Intersil #58-2075010, (not included)

Mounting Position
Any

Operating Temperature Range
0 to +50° C

Storage Temperature Range *
0° C to +55° C
**WARNING: Avoid long exposure to high temperatures, store at room temperature.*

Altitude
0 to 15,000 feet (4600m)

Relative Humidity
20% to 80% non-condensing

Calibration
A multiturn screwdriver pot adjusts the full scale reading (gain). Zero is automatic (autozeroing). Suggested recalibration in stable conditions is 90 days.

CAUTION: Observe CMV range limits on single - supply applications referred to PIN B16. Differential input mode or battery power is preferred. Contact Datel for assistance.

POWER PIN CONNECTIONS

Power Configuration	A17	A18	A16	B16	Signal Ground	Power Consumption
(DC/DC Converter On) 5V	+5 Vdc	Conn. to A17	Power Common	Do Not Use	Ground = A16 (Single-ended configuration must use A16) OR Ground = A1 (Differential Only)	12 mA typ. 15 mA max.
(DC/DC Converter Off) 9V	+9 Vdc	No. Conn.	No Conn.	Power Common	Ground = B16 or A1 (Both inputs must be *differential* using either ground.)	6 mA typ. 9 mA max.
12V	+12 Vdc	"	"	"	"	12 mA typ. 15 mA max.
15V	+15 Vdc	"	"	"	"	18 mA typ. 20 mA max.

ORDERING INFORMATION

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DM-3100X-1 ±2Vdc Input Range (Supplied With Free Connector)

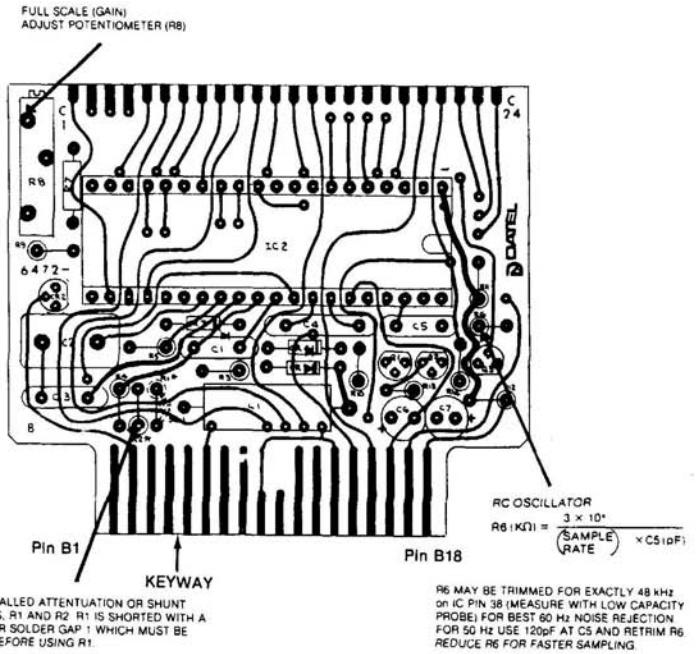
Contact Factory for Replacement Model

RN-3100/4100: Range-Change Acessory Kit for DM-Series Meters

DM-3100X COMPONENT LOCATIONS*

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*Refer to DATEL RN3100/4100 Range-Change Accessory Kit data sheet for detailed modification instructions and R1 and R2 locations



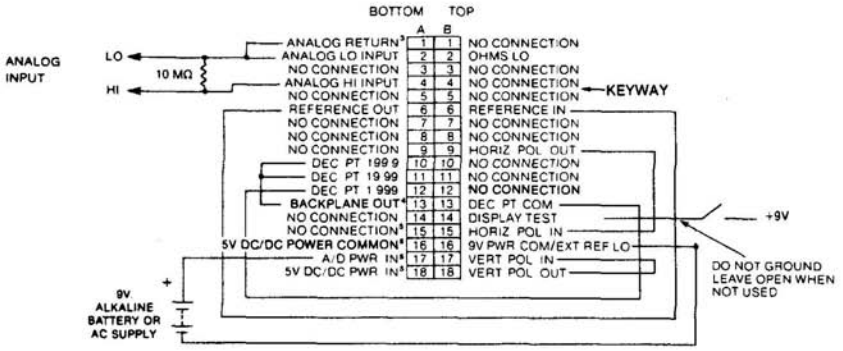
NOTES:

(1) R1, R2 ARE USER-INSTALLED ATTENUATION OR (R2) SHUNT RESISTORS. BEFORE INSTALLING RESISTORS AT R1, OPEN SOLDER GAP (SG1) ON COMP. SIDE OF BOARD WITH A SOLDERING IRON. NOTE THAT, IF R1 IS LATER REMOVED, THE USER MUST CLOSE THE SOLDER GAP.

(2) R1 AND R2 FOR VOLTAGE RANGES ARE RN60C EXCEPT *RN70C. CURRENT SHUNTS SHOULD BE 1%, 10 PPM/° C OR BETTER. 1W AND 1/4W RESISTORS MAY NOT FIT FLUSH TO BOARD.

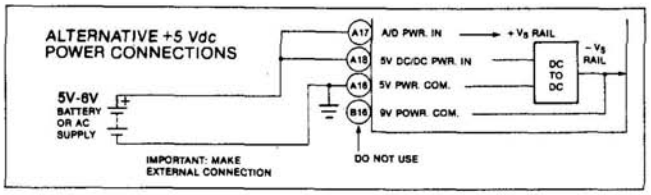
(3) CONNECT ALL UNUSED DECIMAL POINTS TO BACKPLANE OUT (PIN A13).

INPUT/OUTPUT CONNECTIONS WITH SINGLE-ENDED INPUT



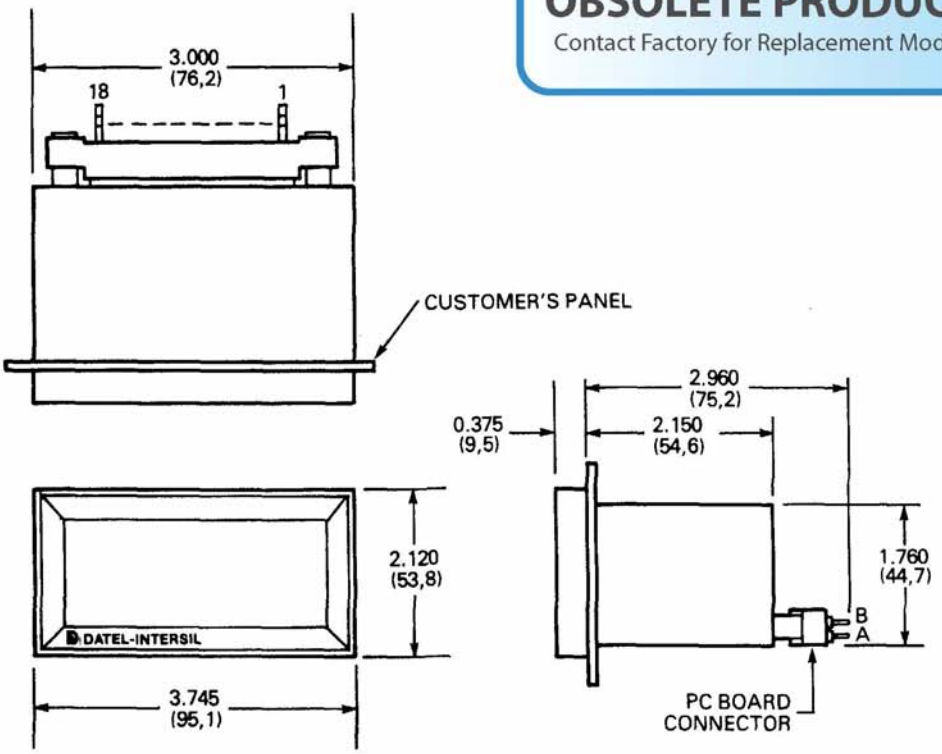
NOTES:

1. This shows the connector rear view with the DPM tilted on its side.
2. CAUTION: This DPM employs high impedance CMOS inputs. Although internal protection is provided for several hundred volt overloads, this DPM will be destroyed by kilovolts of static discharge which is especially prevalent in low humidity environments. Always handle the DPM with ground protection.
3. ANALOG RETURN = +Vs – 2.8 Vdc.
4. Connect all unused Decimal Points to BACKPLANE OUT (Pin A13).
5. A17 and A18 are internally connected.
6. Hold Meter in DISPLAY TEST no longer than 1 minute to prevent damage to display.



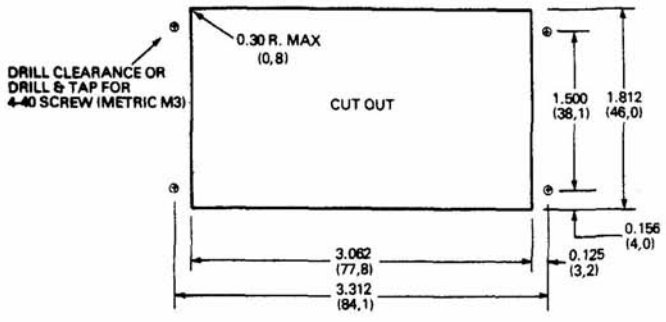
MECHANICAL DIMENSIONS
INCHES (MM)

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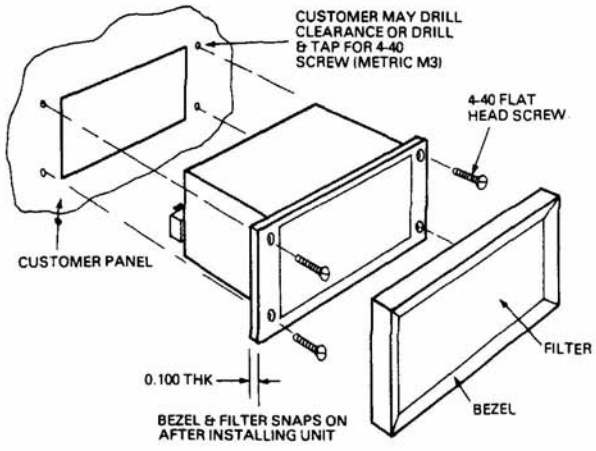


DWG. C-1561-4

PANEL MOUNTING



DWG. C-1561-3



DWG. C-1561-5

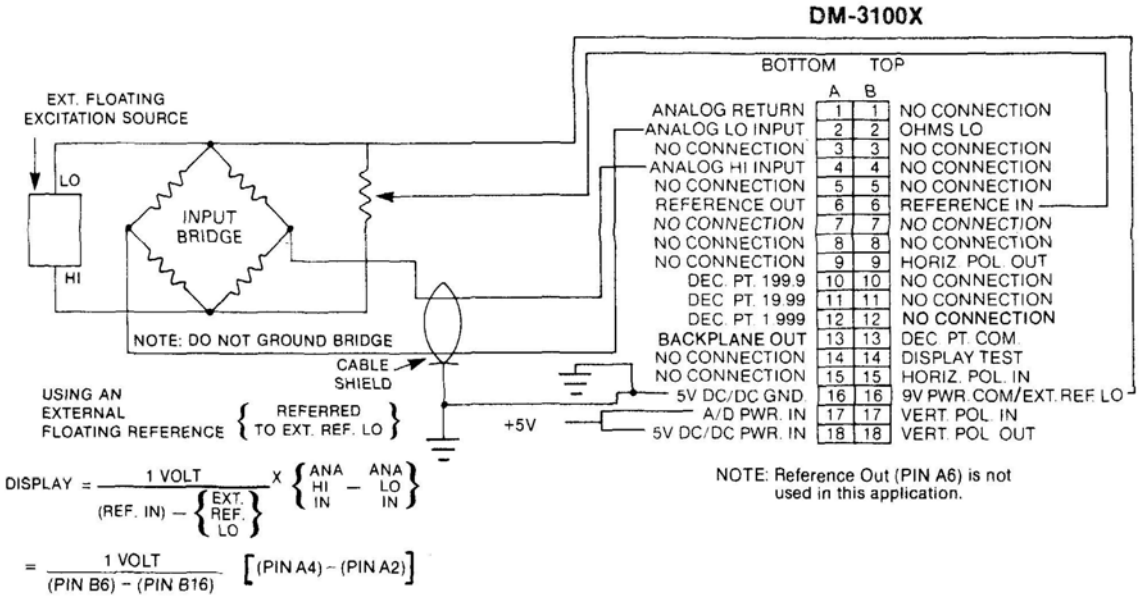
DIFFERENTIAL INPUT WITH SAMPLE RATIOMETRIC CONNECTIONS

The DM-3100X has a reference in-out loop which makes possible ratiometric measurements. Representative connections are illustrated below. Ratiometric operation eliminates changes in the DPM reading due to voltage variations in the Bridge's external excitation source. The input gain on the DM-3100X varies inversely with voltage at Reference In — as REF IN voltage increases, meter gain decreases. Meter input gain thus can be made to compensate for variations in the bridge excitation source voltage. (The DPM is set for unity gain when REF IN V equals +1V as referred to EXT. REF. LO).

For all applications, $V_{IN} = 2\ V_{REF}$ at full scale (1999 counts). For small values of V_{REF} (100 mV or lower), increased display noise, nonlinearity, rollover and CMR errors will be apparent. Avoid V_{REF} inputs beyond about 2V to prevent integrator saturation with full scale inputs. Variable V_{REF} is not intended for wide gain changes as in multimeter applications. Instead, it should be used for drift correction, scaling to engineering units, or for modest amounts of gain.

A note on grounding: the DM-3100X's internal voltage reference source is biased against the internal negative supply rail (EXT. REF. LO). Note that this is *not* the same electrical connection as the 5V Power Common connection. Refer to the Simplified Block Diagram.

Because of this configuration, external reference sources should be isolated from the 5V Power Common and should have the Reference Lo Output from the external source connected to the negative supply rail.



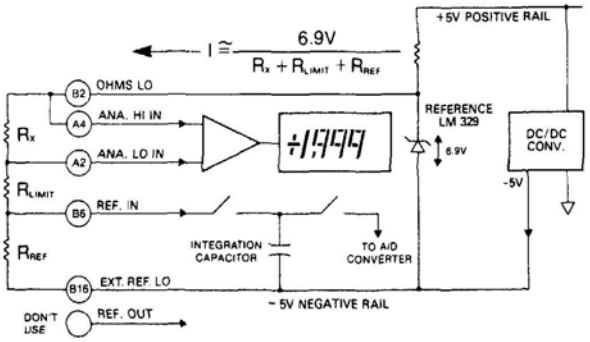
$$\text{DISPLAY} = \frac{1\ \text{VOLT}}{(\text{REF. IN}) - \{\text{EXT. REF. LO}\}} \times \{\text{ANA HI IN} - \text{ANA LO IN}\}$$

$$= \frac{1\ \text{VOLT}}{(\text{PIN B6}) - (\text{PIN B16})} \left[(\text{PIN A4}) - (\text{PIN A2})\right]$$

DIGITAL OHMMETER CONNECTIONS

The digital ohmmeter circuit uses the DM-3100X's ratiometric capability. An external reference resistor of known resistance, accuracy, and temperature drift is connected in series with the unknown resistance. A constant, stable voltage from the DPM's internal reference diode is applied to the resistor pair to produce a constant current. This current develops two voltage drops across the resistors which are proportional only to the ratio of the resistances since the current through them is identical.

The chart below lists recommended R_{REF} and R_{LIMIT} resistance values corresponding to different ohmmeter ranges. Values of R_{LIMIT} were selected to limit the current through R_{REF} and R_X to 1 milliampere maximum.



RANGE	RESOLUTION	R_{LIMIT}[1]	R_{REF}[1]	DECIMAL POINT
19.99 MΩ	10 kΩ	22 MΩ	10 MΩ	A11 to B13
1.999 MΩ	1 kΩ	3.6 MΩ	1 MΩ	A 12 to B13
199.9 kΩ	100 Ω	360 kΩ	100 kΩ	A10 to B13
19.99 kΩ	10 Ω	36 kΩ	10 kΩ	A11 to B13
1.999 kΩ	1 Ω	6.2 kΩ	1 kΩ	A12 to B13

1. ^{R}Limit and ^{R}Ref should be metal film, High Stability Resistors (AS RN60C).

$$\text{DISPLAY} = \frac{E_{IN}}{V_{REF}} \times 1V = \frac{IR_x}{IR_{REF}} \times 1V = \frac{R_x}{R_{REF}} \times 1V$$

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