

Performance/Functional Specifications

Typical at T_A = +25°C and supply voltage = +5V (using the single-ended input circuit) or +9V (using the differential input circuit), unless otherwise noted.

Analog Inputs	Min.	Typ.	Max.	Units
Full Scale Input Range:				
DMS-20LCD-0	–	±200	–	mV
DMS-20LCD-1	–	±2	–	Volts
DMS-20LCD-2	–	±20	–	Volts
DMS-20LCD-3	–	±200	–	Volts
Input Impedence:				
DMS-20LCD-0, -1	100	1000	–	MΩ
DMS-20LCD-2, -3	0.8	1	–	MΩ
Overvoltage Protection ①				
DMS-20LCD-0, -1, -2	–	–	±100	Volts
DMS-20LCD-3	–	–	±250	Volts
Common Mode Voltage Range				
	–	–	±2	Volts
CMRR (dc to 60Hz)				
	–	86	–	dB
Control Inputs ②				
Decimal Pt. Placement (Pins 4-6)		Tie to pin 3 to activate		
Functionality		Tie to pin 3 to activate		
Logic Compatibility		TTL (on 5V-powered models)		
Backlight (Pin 9)		Tie to pin 3 to turn on backlight		
Performance				
Sampling Rate		2.5 reading per second		
Accuracy (1 minute warm-up):				
DMS-20PC-0 (Vin = +0.19V)	–	±1	±2	Counts
DMS-20PC-1 (Vin = +1.9V)	–	±1	±2	Counts
DMS-20PC-2 (Vin = +19V)	–	±2	±3	Counts
DMS-20PC-3 (Vin = +190V)	–	±2	±3	Counts
Zero Reading (Vin = 0 Volts)		“–001”	“000”	“001”
Temperature Drift (0 = +60°C)		–	±0.2	±0.4 Cnts/°C
Power Supply Requirements (5V Models)				
Supply Voltage	+4.75	+5.00	+5.25	Volts
Supply Current:				
Standard Models	–	+400	+650	μA
Backlit Models	–	+35	+50	mA
Power Supply Requirements (9V Models)				
Supply Voltage	+7.5	+9.0	+14.0	Volts
Supply Current:				
Standard Models	–	+230	+350	μA
Backlit Models	–	+35	+50	mA
Display				
Display Type and Size	3½ digit, 0.37"/9.4mm high LCD			
Polarity Indication	Autopolarity (“–” for negative Vin)			
Overrange Indication	“–1___” for negative Vin “1___” for positive Vin			

Physical/Environmental				
Operating Temperature	0	–	+60	°C
Storage Temperature	–20	–	+75	°C
Humidity (non-condensing)	0	–	95	%
Case Material	Polycarbonate			
Weight	0.4 ounces (11 grams)			

- ① Applies for transient or continuous overvoltages applied to (+) INPUT HI (pin 11) with (–) INPUT LO (pin 12) properly connected. Pin 12 is not overvoltage protected (see Figure 1). Voltages applied to pin 12 should not exceed the supply voltage.
- ② Listed spec applies to 5V-powered models only. For 9V-powered models, both (–) INPUT LO (pin 12) and (+) INPUT HIGH (pin 11) must always be at least 1.5V above –BATTERY (pin 3) and at least 1.5V below +BATTERY (pin 1).
- ③ See Technical Notes.

Ordering Information

DMS-20LCD - 1 - 5 - C

Input Range:

- 0 = ±200mV
- 1 = ±2V
- 2 = ±20V
- 3 = ±200V

Power Source:

- 5 = +5V
- 9 = +9V

Accessories:

- DMS-20-CP** Panel cutout punch
- DMS-BZL3-C** DMS-20 bezel assembly
- DMS-BZL4-C** DMS-20 bezel assembly with sealing gasket
- DMS-EB2-C** Application/evaluation board with standard MOLEX connector, decimal point solder pads and attenuation resistor pads.

Add -C for RoHS

Leave blank for standard models.
Add **B** for backlit models.

A panel-mount retaining clip is supplied with each model.

See www.murata-ps.com/dpm-availability for model-specific availability.

TECHNICAL NOTES

- 1. REFERENCE OUTPUT (Pin 8) and INPUT (Pin 7):** Pin 8 is a precision reference actively trimmed at the factory. In normal operation, pin 8 must be tied to pin 7 to achieve all listed accuracy and drift specifications.
- 2. ANALOG COMMON (Pin 10):** This pin is connected to an internal, low-noise, “relative” ground. It is used in certain differential and “floating” measurements as described in the Applications section of this data sheet and Ap Note DMS-AN3 at <http://www.murata-ps.com/data/meters/dms-an3.pdf>. **Pin 10 should not be connected to pin 3 (5V RETURN/–BATTERY) or to your system’s analog ground.**
- 3. Decimal Point Placement:** The location of the decimal point is user-selectable, and the decimal point control pins (DP1-DP3) are active low functions. Select the appropriate decimal point by tying the appropriate

pin (pin 4, 5 or 6) to pin 3 (5V RETURN/-BATTERY). Unused decimal point location pins should be left open. For 5V-powered models, the decimal location pins are TTL compatible and may be hard wired as described above or driven with 5V TTL logic gates.

- 4. BACKLIGHT (Pin 9) Function:** Grounding pin 9 (i.e. connecting it to pin 3) turns on the backlighting LED's. For non-backlit models, pin 9 has no internal connection. All backlit models include internal current-limiting resistors. With nominal +5V or 9V supplies, backlit devices typically draw 35mA of supply current. The current drawn by the backlight (and therefore the current drawn by the meter) can be reduced by installing a 1/4 Watt resistor between pins 3 and 9. The brightness of the meter will be reduced proportionately.

9V-powered backlit models function with supply voltages up to +14V, however, activating the backlight with voltages greater than 9.2V can damage the meter. Therefore, a 1/4 Watt series resistor must be installed between pins 3 and 9 in these situations. The value of the series resistor is determined using the following formula:

$$R_{Series} = \frac{+BATTERY - 9.2V}{0.035} \text{ Ohms}$$

Example: If +BATTERY (pin 1 with respect to pin 3) is +12.6V,

$$R_{Series} = \frac{+12.6 - 9.2V}{0.035} \text{ Ohms}$$

$$R_{Series} = 97 \text{ Ohms}$$

- 5. Low Battery Annunciator:** The "B" annunciator in the upper left-hand corner of the display turns on when the supply voltage for 5V-powered models falls below approximately +3.7V, or when the supply voltage for 9V-powered models falls below approximately 7.2V. However, the low-battery annunciator's turn-on threshold can vary significantly from unit-to-unit: as low as 2.7V for 5V-powered meters, and as low as 5.4V for 9V-powered models. Applications that use the LOW BAT annunciator must be fully tested by the user, using a combination of low supply voltages and the input signal's minimum and maximum levels, to ensure that all display readings are valid as long as the LOW BAT annunciator remains off.
- 6. Gain Adjust:** There is a gain-adjust potentiometer on the back of each meter. It has approximately ±50 counts (±2.5%) range of adjustment. Since these devices essentially have no zero/offset errors, a gain adjustment is effectively an overall accuracy adjustment. Though they may be performed at any point (except zero), accuracy adjustments are most effective when performed with higher level input signals. The circuit shown in Figure 9 provides ±10% range of adjustment.
- 7. Soldering Methods:** All models in the DMS-20LCD Series easily withstand most common wave soldering operations. We recommend, however, that you evaluate the effects your particular soldering techniques may have on the meter's plastic case and high-precision electrical performance. We recommend the use of no-clean solders.

8. Suggested Mating Connectors:

Panel mounted:

Connector housing	Murata Power Solutions P/N 4320-01069-0
Terminal type	Murata Power Solutions P/N 4400-01032-0
Crimping tool	Murata Power Solutions P/N 39-2099000
Wire size	22 to 26 AWG
Insulation diameter	0.062" (1.57mm) maximum
Stripping length	0.100 to 0.125" (2.54 to 3.17mm)

Board mounted:

Socket	Murata Power Solutions P/N 4320-01074-0
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APPLICATIONS

DMS-20LCD meters are available in either 5V-powered or 9V-powered models. 9V devices operate directly from 7.5V to 14V supplies (usually batteries) without the need for external voltage regulators. 9V devices, however, can not be used to measure voltages referenced to the negative battery terminal (pin 3) because the minus input to the meter (pin 12, (-) INPUT LO) must always be at least 1.5V above pin 3. 9V-powered meters can only be used to make differential and not single-ended measurements.

5V-powered devices operate from any well-regulated +5V supply and will accurately measure voltages both above and below pin 3 (5V RETURN) in either single-ended or differential configurations.

- 1. Single-Ended Input Configurations:** True single-ended measurements can only be made with 5V-powered meters. The circuit of Figure 2 avoids problems normally associated with ground-loop currents. Separate ground runs should be used for 5V RETURN (pin 3) and (-) INPUT LO (pin 12).

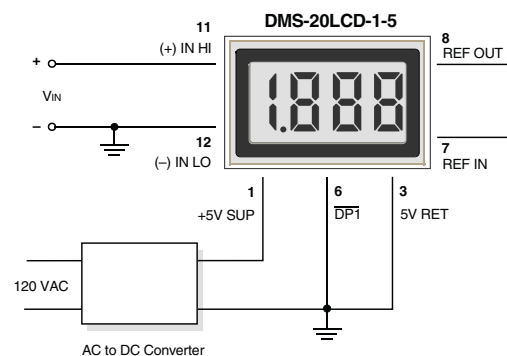


Figure 2. Single-Ended Input Configuration (5V-Powered Models)

APPLICATIONS

2. Differential Input Configurations: Differential measurements can be made with either 5V-powered or 9V-powered meters. Figure 3, though not a practical real-world application, uses a voltage divider to demonstrate the concept of a differential input signal. Be careful not to exceed the ±2V common mode voltage limitation for 5V powered meters.

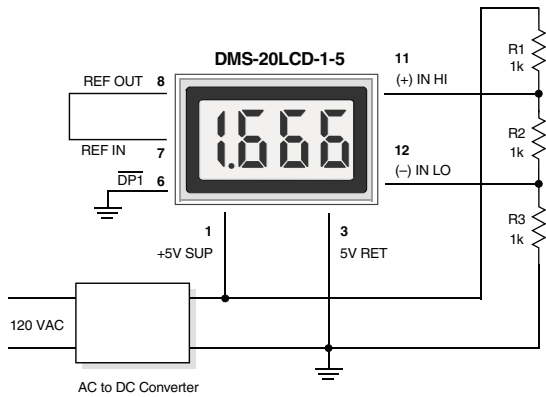


Figure 3. Differential Input Configuration (5V-Powered Models)

3. Engineering Scaling: For measuring voltages greater than the full scale input range of a given meter, the input signal must be attenuated. A simple voltage divider (similar to that shown in Figure 4) will scale the input to within the range of the selected meter. R1 and R2 should be precision, ±1%, metal-film resistors with absolute TCR's less than 50ppm/°C. See Ap Note 4 for more information on engineering scaling.

$$50k\Omega < R1 + R2 < 10M\Omega$$

$$\frac{R2}{R1 + R2} \times V_{IN} = \text{Reading}$$

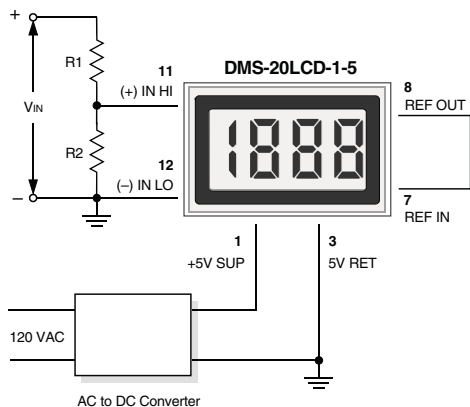


Figure 4. Input Attenuation Circuit

4. Floating Signal Source Measurements: Floating signals can be measured using the circuits shown in Figures 5 and 6. Figure 5 uses a 5V-powered meter. Figure 6 uses a 9V-powered meter. Connecting pin 10 (ANALOG COMMON) to (-) INPUT LO (pin 12) provides the reference point for the meter's input.

A “floating” input is a signal that has no galvanic connection to the meter’s power supply. In the figures below, the 1.5V battery illustrates a true floating input.

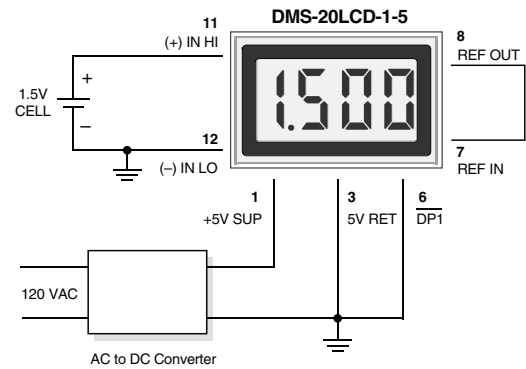


Figure 5. Floating Input Measurements (5V-Powered Models)

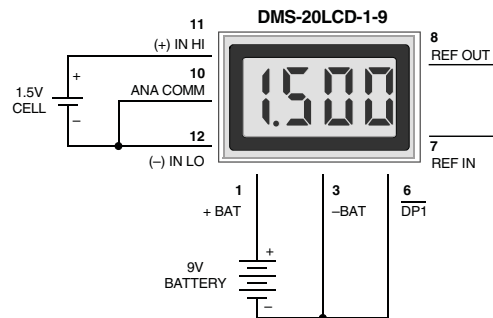


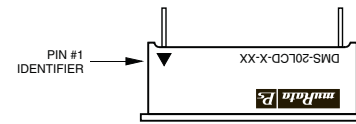
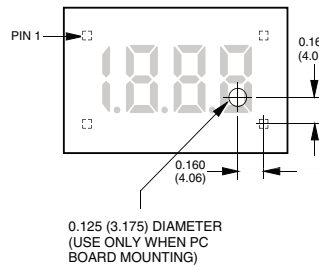
Figure 6. Floating Input Measurements (9V-Powered Models)

5. Process Control (4-to-20mA) Measurements: In many common process-control applications, a 4-to-20mA current loop is used to transmit information. Because DMS-20LCD meters have such high input impedance, a simple shunt resistor across the meter’s input can be used to convert the loop current to a voltage. See Figure 7. The value of the shunt resistor is a function of the scaling requirements of the particular application and can be calculated using the following equation:

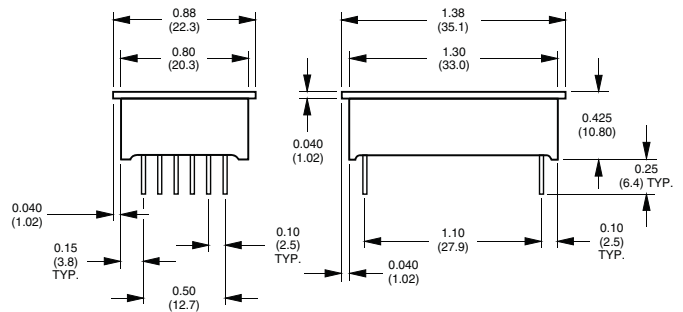
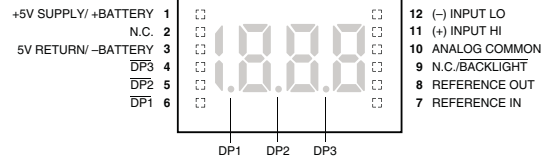
MECHANICAL SPECIFICATIONS

MECHANICAL DIMENSIONS: Inches (mm)
 TOLERANCES: 2 PL DEC ±0.02 (±0.51)
 3 PL DEC ±0.010 (±0.254)
 LEAD DIMENSIONS: 0.025 (0.635) x 0.025 (0.635) NOMINAL
 RECOMMENDED PC BOARD FINISHED HOLE DIAMETER:
 0.042 ±0.003 (1.067 ±0.076)

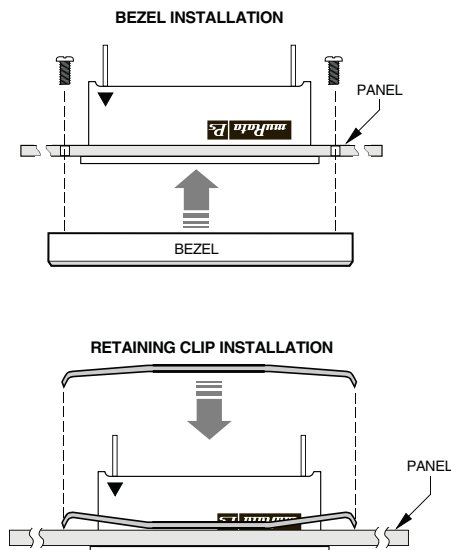
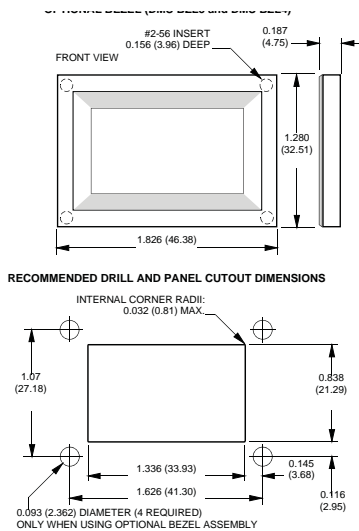
CALIBRATION POTENTIOMETER HOLE LOCATION



FRONT VIEW



BEZEL INSTALLATION AND RECOMMENDED DRILL AND PANEL CUTOUT



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