



**FEATURES**

- Gain (span) adjustment
- Input divider network for attenuating voltages up to 250Vdc
- Operate meter and board from +5V supply or 9/12V battery
- On-board solder gaps for decimal point placement
- On-board I/O connector for easy power and signal input

The DMS-EB2 Application Board was designed for quick and easy application/evaluation of DATEL's subminiature DMS-20PC/LCD Series, 3½ Digit, LED/LCD Display, Digital Panel Voltmeters. The DMS-EB2's versatility, low cost and direct DMS-20PC/LCD plug-in compatibility makes interfacing a breeze. The DMS-EB2 covers many common panel-meter applications while providing easy signal and power I/O terminations (via a standard MOLEX connector) and plug-in versatility when changing from one application to another.

The DMS-EB2 has provisions for such common applications as input dividers for high input voltages, gain (span) adjustment, 9/12Vdc battery operation, and decimal point placement. The board permits direct signal I/O wiring via the interface connector or soldering directly to the board. The DMS-EB2 is fully compatible with all four versions of the DMS-20PC/LCD ( $\pm 200\text{mV}$ ,  $\pm 2\text{V}$ ,  $\pm 20\text{V}$ ,  $\pm 200\text{V}$ ) making it interchangeable from meter to meter and application to application. Solder gaps are conveniently placed on the board and may be quickly bridged or cut as required.

This low-cost addition to DATEL's expanding line of subminiature meters demonstrates our continuing commitment to offer the most versatile, easy-to-use panel-meter products.

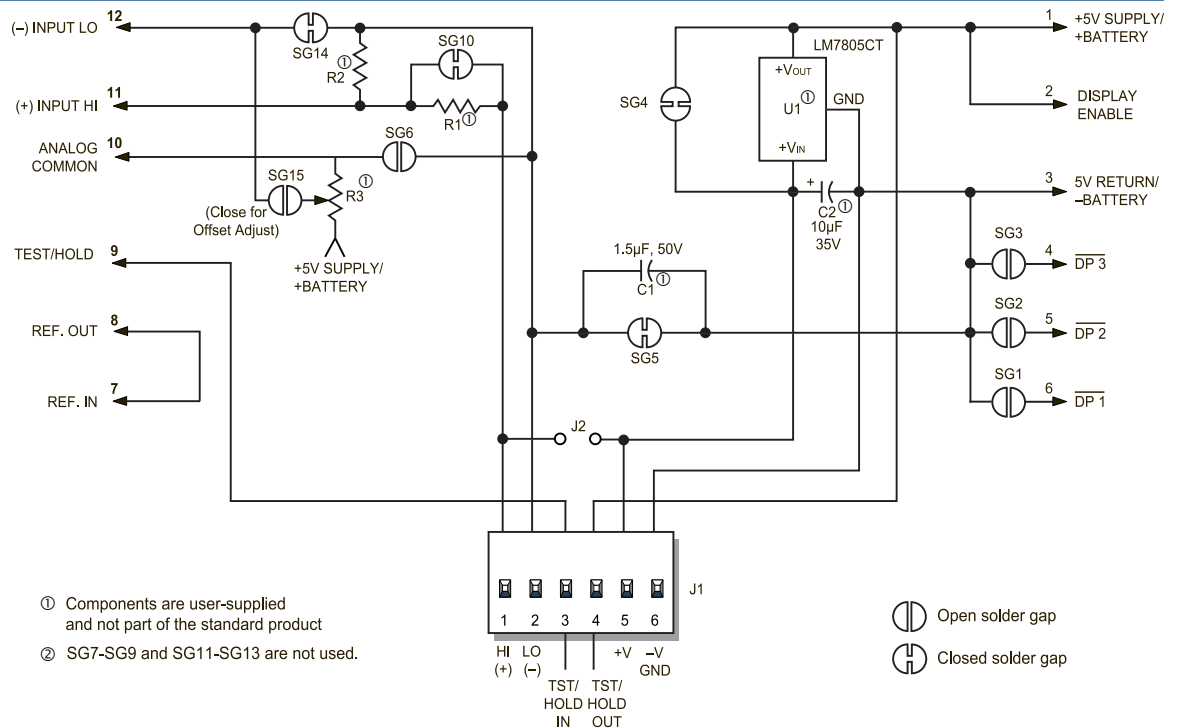
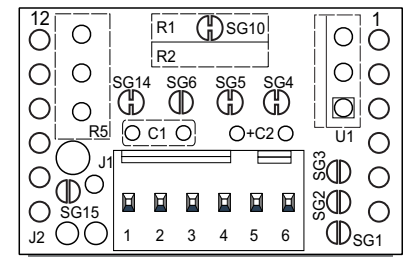


Figure 1. DMS-EB2 Schematic Diagram



**Multi-Purpose Application Board  
for DMS-20PC/LCD Meters**

**Functional Specifications (T<sub>A</sub> = 25°C)**

**Input Supply Range**

See applicable meter's data sheet

**Input Supply Range U1 (LM7805CT) Installed:**

DMS-20PC-X-XS	+7.5 to +12.6V
DMS-20PC-X-XL	+7.5 to +32.0V
DMS-20LCD-X-5	+7.5 to +32.0V
DMS-20LCD-X-5B	+7.5 to +12.6V

**Operating and Storage Temperature**

See applicable meter's data sheet

**Humidity**

0 to 95%, non-condensing

**Dimensions**

1.25" (31.8mm)L x 0.75" (19.1mm)H

**J1 Connector & Wire Information**

Terminal Type	DATEL P/N 39-2099090
Crimp Tool	DATEL P/N 39-2099000
Wire Size	22 to 26 AWG
Insulation Diameter	0.062" (1.57mm) max.
Stripping Length	0.100" to 0.125" (2.54 to 3.17mm)

**Ordering Information**

<b>DMS-EB2</b>	Application board with mating connector and terminals
<b>DMS-BZL3</b>	DMS-20 bezel assembly
<b>DMS-BZL4</b>	DMS-20 bezel assembly with sealing gasket
<b>39-0304000</b>	LM7805CT (U1), +5V-output, three-terminal regulator
<b>39-2359625</b>	6-position pc-board socket

**TECHNICAL NOTES**

- LCD Backlighting:** To backlight a DMS-20LCD meter, connect J1, pin 3 (TEST/HOLD IN) to J1, pin 6 (GND). This allows for external control, via a switch, of the backlight feature. The switch should be rated for low voltage operation at 35mA.
- 9V LCD Meters:** DMS-20LCD-X-9 meters cannot be used in a single-ended configuration, i.e., with (-) IN LO tied to GND. On these models, both (-) IN LO and (+) IN HI have to be a minimum of 1.5V above and 1.5V below J1 pins 6 and 5, respectively. To operate from a 9V or 12V battery with (-) IN LO tied to GND, use a 5V-powered meter (DMS-20LCD-X-5), install U1 (LM7805CT) and open SG4.
- Input Resistor Dividers:** Always use 1%, or better, metal-film resistors for R1 and R2, and also make sure their power and voltage ratings are adequate for the given application.
- Using U1 (LM7805CT):** The input power range specified in the Battery Operation section is rated conservatively assuming a 100mA LED meter or a 35mA backlit LCD meter. If a non-backlit LCD model or the low-power LED model is used, the input voltage range can be extended up to 32Vdc.

A 10µF/35V tantalum capacitor (C2 on schematic) should be installed with the polarized end next to the + symbol on the DMS-EB2. This is especially important if the power source is located far from U1.

- Soldering:** DATEL recommends the use of "no-clean" solders when making modifications to the DMS-EB2.

**APPLICATIONS**

As shipped, the DMS-EB2 is configured for single-ended operation. This configuration is preferred for simple voltage measurements and will generally cover most standard applications. Figure 1 indicates which solder gaps are shipped closed from the factory.

Simply solder the board onto the meter (pin 1 to pin 1), connect the power supply to J1, pin 5 (+V) and the power return to J1, pin 6 (GROUND).

- | Pin | Function                           |
|-----|------------------------------------|
| 1   | (+) INPUT HI                       |
| 2   | (-) INPUT LO                       |
| 3   | TEST/HOLD IN                       |
| 4   | TEST/HOLD OUT                      |
| 5   | +V (Positive power connection)     |
| 6   | -V (Ground, negative power return) |

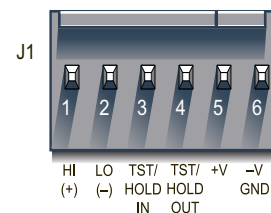


Figure 2. J1 Connector Pinout

- Decimal Point Placement:** DATEL ships the DMS-EB2 with all decimal point solder gaps (SG1, SG2 and SG3) open. To enable a specific decimal point, close its respective solder gap with solder. When re-assigning decimal places for subsequent applications, remember to unsolder previously closed solder gaps.

Close SG1 for 1.999 (DP1)  
Close SG2 for 19.99 (DP2)  
Close SG3 for 199.9 (DP3)

- Display Test (Not Available on LCD Models):** Tie pin 4 (TEST/HOLD OUT) to pin 3 (TEST/HOLD IN) to test the display of the DMS-20PC. Do not leave the meter in the test mode for more than 10 seconds. On LED meters with the HOLD option, tying pins 3 and 4 together freezes the display reading.

- Battery Operation:** Open SG4 and install U1 (LM7805CT) with its metal tab facing to the left as shown in Figure 3. Allowable input power ranges (J1, pins 5 and 6) are as follows:

DMS-20PC-X-XS +7.5 to +12.6Vdc  
DMS-20PC-X-XL +7.5 to +32Vdc

C2 (10µF/35V) can be added to reduce noise. Observe correct polarity. Refer to Technical Note 4 for more information.

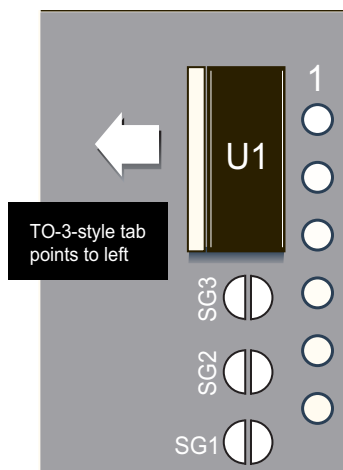


Figure 3. Installing U1

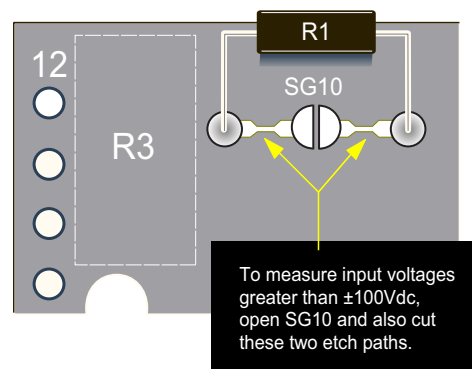


Figure 4. Installing R1

4. Calibrate the meter using a known voltage source. Adjust the internal gain potentiometer to compensate for variations in R1 and R2.

**Example**

$V_{IN}$  is 199.9Vdc, and the display reading must be "199.9".

1. Assume  $R1 = 1.0M\Omega$ .
2.  $R2 = (FSI \times R1) / (|V_{IN}| - FSI)$   
 $R2 = (1.999 \times 1,000,000) / (199.9 - 1.999)$   
 $R2 = 10101.01\Omega$  or  $10k\Omega$

7. **Current Measurements** (Use 200mV Model, DMS-20PC/LCD-0): The following instructions are for measuring current derived from the DMS-20PC/LCD's power source. When measuring current that is floating with respect to J1, pin 6 (GROUND), leave SG5 closed.

**CAUTION:** Do not exceed 1 Ampere input current.

1. Install R2 ( $R2 = FSR / (I_{MAX} \times 10000)$ ) where FSR is the desired reading (0-1999) and  $I_{MAX}$  is between 0-1 Ampere.
2. Open SG5.
3. Apply input signal (current) to (+)IN HI and (-) IN LO.
4. Adjust internal gain pot for desired full scale readings.
5. Enable decimal points using either SG1, SG2 or SG3.

**Example**

A 1.0 Ampere input must read "1.000" on the display.

- $$R2 = 1000 / (1 \times 10000)$$
- $$R2 = 0.1 \text{ Ohm}$$
- Enable DP1 via SG1 for reading of 1.000

8. **Displaying DMS-20PC/LCD's Power Source** (Use DMS-20PC/LCD-2, 5V-Powered Models Only):

1. If the power source is higher than 5Vdc, be sure to install U1 and cut SG4. See Battery Operation section and Technical Note 4.
2. Solder a short piece of jumper wire across the two holes labeled J2.
3. Close SG2 to enable DP2.

4. **Calibration Adjustment:** The DMS-EB2 has provisions for adjusting the calibration of the DMS-20 meter. Calibration adjustment is useful when an input divider (using R1 and R2) is necessary to scale the input voltage. The calibration potentiometer allows "tweaking" of the display reading.

**Using the calibration potentiometer**

Adjust the calibration pot on the back of the meter as desired. The adjustment range is only 3/4 of a turn. Do not force the pot past its end stops.

5. **Differential Input Signals** (Signal Referenced to Power Source): Open SG5. Apply the input signal to pin 1, (+) IN HI, and pin 2, (-) IN LO, of J1.

**NOTE:** Common mode voltage must not exceed  $\pm 2V_{dc}$ .

6. **Measuring Input Voltages Greater than 1.999Vdc** (Use DMS-20PC/LCD-1 Only):

**CAUTION:** Do not exceed 250Vdc input signal.

1. Open SG10. For applications in which input voltages exceed  $\pm 100V_{dc}$ , also cut the 2 adjoining traces.
2. Calculate values for R1 and R2 as follows:

$$R2 = (FSI \times R1) / (|V_{IN}| - FSI)$$

Where:

FSI = The attenuated voltage, between the meter's (-) IN LO and (+) IN HI pins, needed to achieve the desired display readings

$V_{IN}$  = Input voltage at J1 (between pins 1 and 2)

A typical value for R1 is  $1M\Omega$ . The sum of  $R1 + R2$  should be between  $50k\Omega$  and  $10M\Omega$ .

3. Enable DP3 by soldering SG3.





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