

FEATURES

- Allows meters to operate from 100 to 240Vac (50/60Hz)
- Screw-type terminal block connections
- Provides 1500V isolation between AC supply and input signal
- Has prototyping features of the standard DMS-EB board
- On-board solder gaps for decimal point placement
- Same size as DMS-30/40 meters 2.02" (51.3mm)L x 0.82" (20.8mm)W
- Low cost

PRODUCT OVERVIEW

This low-cost accessory board provides an easy way of powering all DMS-30PC-X-RL (red low-power models only), as well as all DMS-30LCD and DMS-40LCD (non-backlit, +5V-powered models only) panel meters from 100-264Vac (50/60Hz). The on-board AC/DC converter provides an isolated +5Vdc to power the meter's electronics, while providing 1500Vac isolation between the AC supply and the input signal being measured. Line power and input signals connect to two rugged, screw-style terminal blocks (TB1 & TB2) permanently mounted on the DMS-EB-AC/DC. This type of terminal block provides reliable mechanical connections and eliminates the need for any extra wiring harness connectors.

The DMS-EB-AC/DC board includes provisions for installing several usersupplied components that are required when the meter must be scaled to display non-standard input ranges. The DMS-EB-AC/DC has provisions for such common applications as attenuation of high input voltages, gain (span) and offset (zero) adjustments, and direct decimal point placement. The DMS-EB-AC/DC is compatible with all four input versions of the DMS-30 Series meters ($\pm 200\text{mV}$, $\pm 2\text{V}$, $\pm 20\text{V}$ and $\pm 200\text{V}$). Solder gaps, conveniently placed on the board, are easily bridged or cut to configure the board to meet each application's specific requirements.

SIMPLIFIED SCHEMATIC

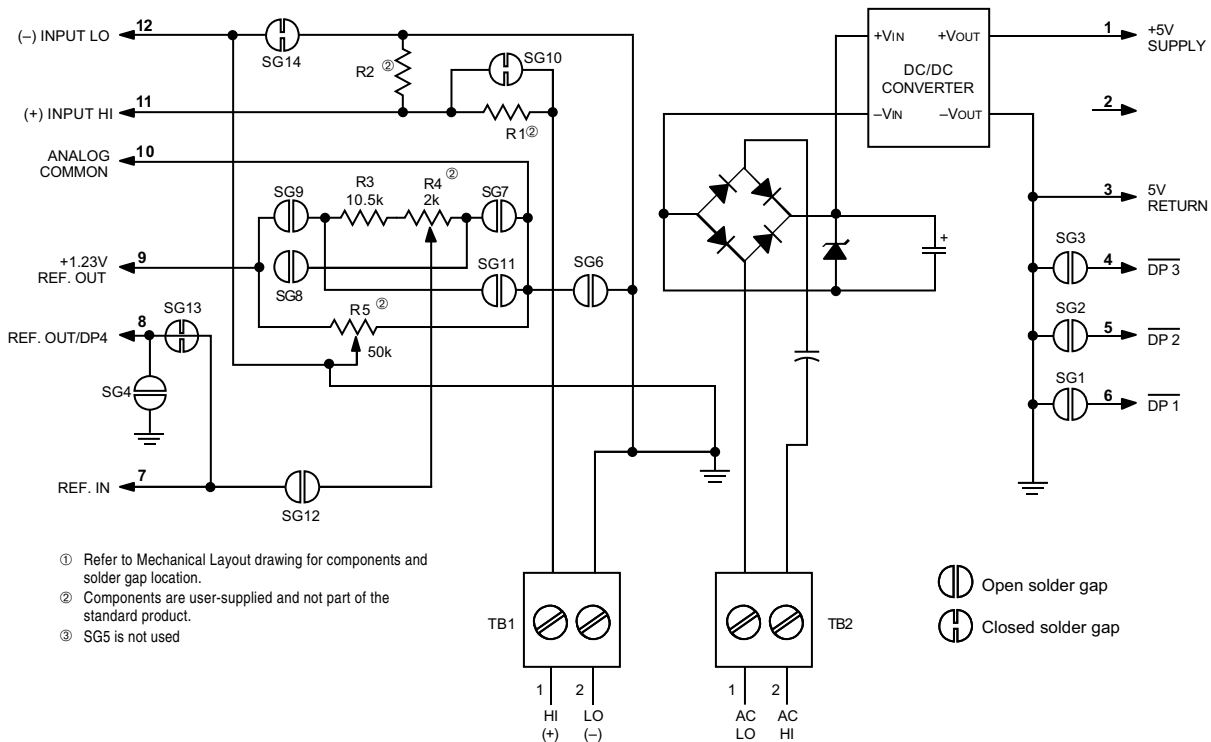


Figure 1. DMS-EB-AC/DC Simplified Schematic Diagram



Ordering Information

DMS-EB-AC/DC-C	AC power supply board
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Functional Specifications

(T_A = +25°C)

AC Supply Voltage:	100 to 264Vac @ 47-68Hz
AC Supply Current @ 264Vac/60Hz	60mA, maximum
Isolation	1500Vac, minimum
Operating Temperature Range	0 to +60°C
Storage Temperature Range	-25 to +75°C
Humidity	0 to 95%, non-condensing
Dimensions	2.02" (51.31mm)L x 0.82" (20.8mm)W x 0.60" (15.3mm)D
TB1 and TB2 Wire Size and Strip Length	
Wire Size	16 to 22 AWG (solid or stranded)
Strip Length	0.25" (6.35mm)
Screw Torque	3.6 pound-inches (0.4Nm)
Rated Voltage	310Vac

Introduction

As shipped, the DMS-EB-AC/DC is configured for use with +5V-powered DMS-30PC or DMS-30LCD 3½ digit meters using the meter's internal reference (SG13 is closed). This configuration is the most common and works well for most simple voltage measurements. Please read all of the following technical notes and perform any required modifications before soldering the DMS-EB-AC/DC onto the host meter.

Many of the applications described below apply to both DMS-30 (3½ digit resolution) and DMS-40 (4½ digit resolution) meters. However, Application 5, installing the span (R4) and offset (R5) adjust potentiometers, can only be used with DMS-30PC/LCD meters. Also note that some of the other applications require the installation of R4 and R5. **See Technical Note 4 when using the DMS-EB-AC/DC with DMS-40LCD meters.**

IMPORTANT! AC power must be disconnected from TB2 terminals 1 and 2 before making modifications or installing user-supplied components on the DMS-EB-AC/DC board! In many applications, the DMS-EB-AC/DC installation is subject to electrical-code requirements (for example, the NEC in the USA). Fusing, grounding, wire gauges, and leakage currents may be regulated items. Since the DMS-EB-AC/DC is a line-operated device, it presents a shock hazard and should be installed only by qualified personnel. Do not hesitate to contact DATEL if you have any questions.

TECHNICAL NOTES

1. Soldering and Wiring: DATEL recommends the use of "no-clean" solders when installing components or making modifications to the DMS-EB-AC/DC. Before mating the DMS-EB-AC/DC to the host meter, ensure that modifications, if any, have been correctly made and that all cut solder-gaps are fully open. Align pin 1 of the meter with pin 1 of the DMS-EB-AC/DC, slide the board down flush to the meter's housing and solder all 12 pins. Lastly, carefully cut the meter's 12 pins as close as possible to the pc-board surface.

Making absolutely sure that the AC supply is de-energized (OFF), connect the AC supply to TB2 terminals 1 (AC LO) and 2 (AC HI). Connect the input signal being measured to TB1 terminals 1 (+HI) and 2 (-LO).

- 2. Grounding/Isolation:** Because DMS-30 and DMS-40 meters are housed in a plastic case, a connection to AC earth ground is not required. When wired per the instructions above, the DMS-EB-AC/DC board provides a minimum of 1500V isolation between its AC supply input (TB2) and its input signal (TB1). However, please keep in mind that in many applications the LO side of the input signal may be connected to AC ground (i.e., earth ground) elsewhere in the system. **Any issues pertaining to grounding and/or isolation of the DMS-EB-AC/DC power supply board must be referred to qualified technical personnel.**
- 3. Input Resistor Dividers** (See Figure 4): Use 1%, or better, metal film resistors for R1 and R2 in DMS-30 applications, and 0.5%, or better, in DMS-40LCD applications. Make sure the resistor's power and voltage ratings are adequate for the given application. Using tight-tolerance resistors in input scaling circuits allows most calibration adjustments to be made with the meter's internal rear-mounted potentiometers, through the access holes provided (see Technical Note 5 below).
- 4. DMS-40LCD Meters:** To change the input range on DMS-40LCD meters from the default low-range (i.e., with pin 2 of the meter open) to the high range, short pin 2 to pin 1 (+5V) on the top right side of DMS-EB-AC/DC board (refer to Figure 2 and the DMS-40LCD data sheet for more information).
- 5. Calibration Potentiometer Adjustment Holes:** Two overlapping holes on the DMS-EB-AC/DC provide access to the built-in ¼-turn calibration potentiometer on DMS-30 meters or the 3-turn potentiometer on DMS-40LCD meters. The adjustment range of both pots is very narrow. See the applicable product data sheet for more information on each meter's calibration potentiometers.
- 6. Solder Gap Identification** (See Figure 2): Each solder gap's respective number is printed directly on the pc-board surface in copper etch. Be sure to double check all solder gap modifications before applying ac power and the input signal to the DMS-EB-AC/DC.
- 7. AC Supply Transients:** The DMS-EB-AC/DC can withstand transients typically found in instrumentation environments. Installations which contain ac-powered equipment capable of generating large voltage and/or current surges should use external energy-clamping devices. A 1500 Watt bi-directional transorb with a minimum stand-off voltage rating that matches the highest line-voltage **peaks** will provide additional protection under severe fault conditions. If a transorb or other energy limiting device is used, the ac supply feeding the DMS-EB-AC/DC should have its own fuse. Refer to the fusing section for more information.
- 8. AC Supply Fusing:** The DMS-EB-AC/DC board does not have an internal fusing device. If required, a 0.2A slow-acting fuse is recommended. Be sure the fuse is rated for the applied line voltage.

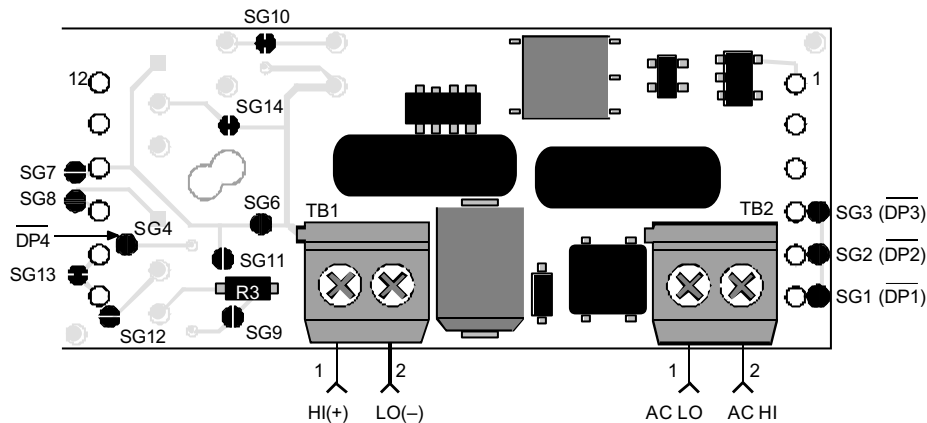


Figure 2. DMS-EB-AC/DC Board

APPLICATIONS

1. Decimal Point Placement: DATEL ships the DMS-EB-AC/DC with all decimal point solder gaps (SG1, SG2, SG3 and SG4) open. To enable a specific decimal point, close its respective solder gap with solder. When reassigning decimal places for subsequent applications, remember to open any previously closed solder gaps.

- Close SG1 for 1.999 (DP1)
- Close SG2 for 19.99 (DP2)
- Close SG3 for 199.9 (DP3)
- Close SG4 for 1999.9 (DP4 on DMS-40LCD)

2. Span (Gain) and Zero (Offset) Adjustments (See Figure 3): Locations are included on the DMS-EB-AC/DC to add user-supplied potentiometers R4 and R5. Recommended values for these two components are as follows: R4: 2KΩ, 10-20-turns; R5: 50KΩ, 10-20 turns. Vishay's T93YA series potentiometers are suitable for this application. Make sure to use only RoHS-compliant components and solders when making modifications to DMS-EB-AC/DC.

Once installed, these components permit the span and zero adjustments described in the following sections. R4 provides span adjust, while R5 applies and offset voltage to (-) IN LO (J1, pin 2).

Using Potentiometer R4 for Span Adjustment (DMS-30PC and DMS-30LCD Meters Only)

1. For DMS-30-1, -2, and -3 models (+/-2V, +/-20V, +/-200V ranges): Configuring the DMS-EB-AC/DC for span adjustment is simply a matter of installing potentiometer R4, opening SG13, and then closing SG8, SG11, and SG12.
2. For DMS-30-0 models (+/-200mV ranges): Span adjustment requires that you open SG8, SG11 (if closed) and SG13 and then close SG7, SG and SG12. Then install R4.

Adjust span as desired. DMS-30-1, -2, and -3 span adjustment range is typically +10% and -5%. The DMS-30-0 has a much wider span adjust, however, it should be limited to ±10% for optimum accuracy and stability.

Using Potentiometer R5 to Apply a Positive Offset to Pin 12 (-) IN LO

1. Open SG14 and close SG6.
2. Install 50K potentiometer R5.

Potentiometer R5 applies a stable, positive dc-offset voltage to the meter's IN LO terminal. This offset voltage has a range of 0 to +1.2Vdc, measured with respect to TB1 terminal 2 (LO). It can be used to null (or cancel) the effects of an input whose zero level is not exactly zero volts. For example, adjusting R5 allows the display to read "000" with an input whose lowest level is slightly above zero volts. Please note, R5 cannot compensate for inputs whose zero level is negative (i.e., if TB1 HI is more negative than TB1 LO).

3. Measuring Input Voltages Greater than 1.999Vdc (Use DMS-30-0 or DMS-30-1 Only): If possible, the resistors used for R1 and R2 should be ±1% metal-film types with TCR's less than or equal to 100ppm/°C. More information on selecting 1% resistors can be found in Application Note 14.

CAUTION: Do not apply inputs greater than +/-250Vdc.

1. Open SG10. For applications in which input voltages exceed ±100Vdc, also cut the 2 adjoining traces.
2. Configure the DMS-EB-AC/DC for span adjust using the procedure previously outlined.
3. Calculate values for R1 and R2 as follows:

A typical value for R1 is 1MΩ. The sum of R1 + R2 should be between 50kΩ and 10MΩ.

$$R2 = (FSI \times R1) / (|Vin| - FSI)$$

Where:

FSI = The attenuated voltage between the meter's (-) IN LO and (+) IN HI pins (pins 12 and 11, respectively) needed to achieve the desired display readings

Vin = Input signal at TB1 terminals 1 and 2, disregarding polarity

APPLICATIONS

Example

Using a DMS-30-1 meter (+/-2V range), Vin is 0-5Vdc and the display reading must be "000" to "1500"

1. Assume $R1 = 1.0M\Omega$.
2. $R2 = (FSI \times R1) / (|Vin| - FSI)$
 $R2 = (1.500 \times 1,000,000) / (5.0 - 1.500)$
 $R2 = 428,571\Omega$ or $432k\Omega$
3. Calibrate the meter using a known voltage source. Adjust R4 to compensate for tolerances in R1 and R2.

4. DC Current Measurements (Use +/-200mV Range DMS-30-0 Meters):

When using R2 location for a dc current-shunt, please note that the pc-board copper traces which short out R1 can only carry currents up to 0.2A (200mA). However, dc currents up to 2A can be accommodated if a 20AWG jumper wire is soldered in location R1. Be sure R2 has a sufficient power rating to safely carry the full load current. Refer to DMS Application Note 6 for more information on dc ammeters.

1. Install R2: $R2 = FSR / (I_{max} \times 10000)$ where FSR is the desired meter reading (0 up to 1999, disregarding any decimal points), and I_{max} is current in Amperes.
2. Configure the DMS-EB for span adjust using the procedure previously outlined for the DMS-30-0 (+/-200mV range).
3. Apply the input signal (current) to TB1 (+) HI and (-) LO.
4. Adjust R4 for desired full scale readings.
5. Enable the appropriate decimal point using SG1, SG2, or SG3.

Example

Using a DMS-30-0 meter, a 0.100 Ampere input must read "100.0" mA on the display.

$$R2 = 1000 / (0.1 \times 10000)$$

$$R2 = 1 \text{ Ohm}$$

Enable DP3 via SG3 for a display reading of "100.0."

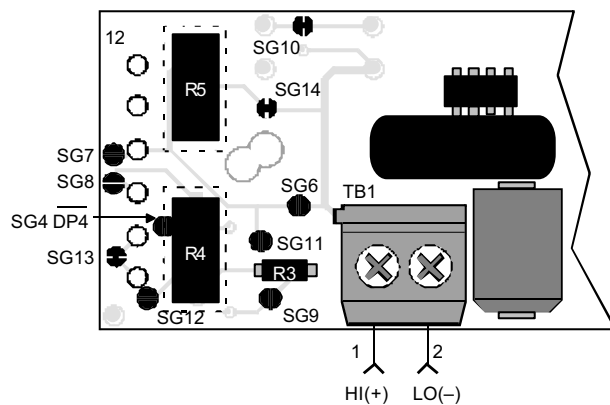


Figure 3. R4 and R5 Installation

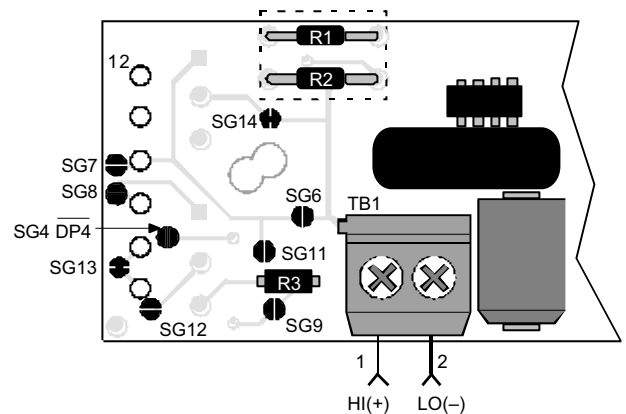


Figure 4. R1 and R2 Installation