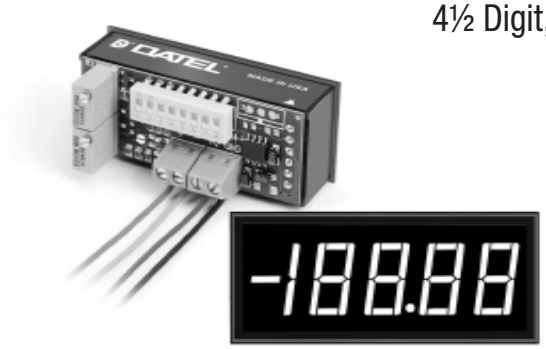
Murata Power Solutions

DMS-40PC-4/20S

4½ Digit, 4-20mA Input, LED Display Meters



FEATURES

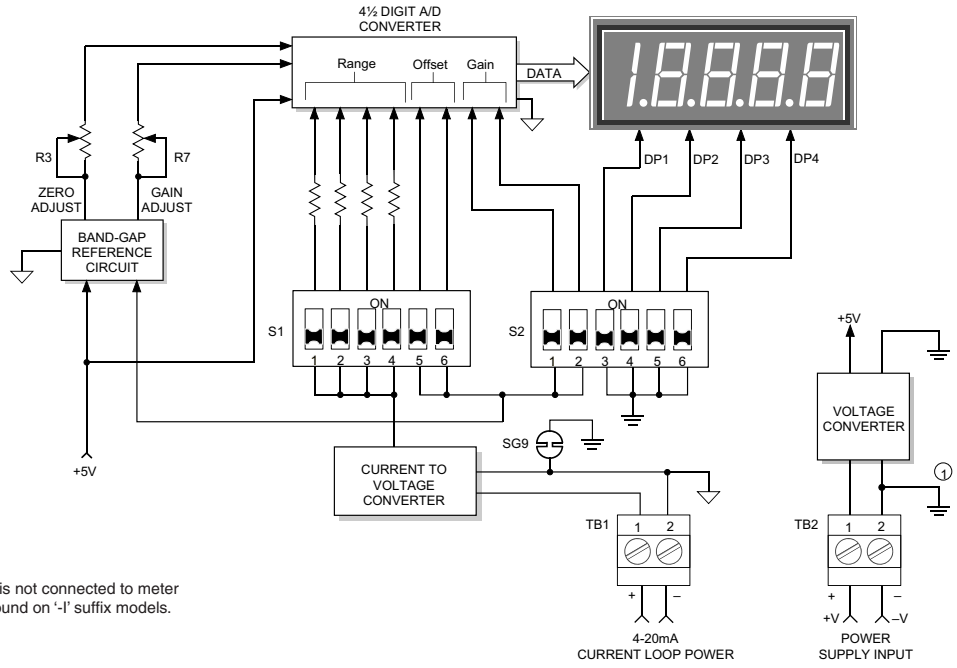
- Full-size, 0.52" (13.2mm) high, LED digits
- +7.5- 32Vdc model draws 30mA
- +24V Isolated-power models
- Dip-switch selectable range, offset, and decimal points
- Non-interacting, 20-turn, gain (span) and offset (zero) adjustments
- Insensitive to ground loops
- 103 Ohm max. loop burden
- Vibration-resistant package; reliable screw-terminal connections
- Hundreds of different input/readout combinations
- Miniature size: 2.17" x 0.92" x 1.02" (55mm x 23mm x 26mm)

The DMS-40PC-4/20S Series' superior design makes them ideal for use in demanding 4-20mA process monitoring applications requiring a full 4½ digits (0-19999) of display resolution. Their full-size, 0.52" (13.2mm) high, LED displays can be read in virtually any lighting condition and are available in green, high-intensity red, or low-power red.

Two operating power supply ranges are available: a wide-input +7.5 to 32V model for use with popular +12Vdc and +24Vdc industrial supplies, and +4.75 to 5.25V models for use with +5V logic supplies. The reverse-polarity protected +7.5-32V red LED model consumes only 30mA from a +24V supply, but still provides excellent display brightness.

The DMS-40PC-4/20's input, span, and offset circuits all employ super-stable, ±0.5% thin-film chip resistors. Long-term stability and accuracy are assured by driving these tight-tolerance resistors with an ultra-stable, ±0.2% bandgap voltage reference. And, unlike many competing designs, the two precision 20-turn span and zero adjust potentiometers do not interact with one another.

All range-change and decimal point selections are made by configuring two gold-plated, vibration-resistant, six-position DIP switches. To further enhance reliability, both power supply and current loop connections are made via reliable screw-type terminal blocks. All these outstanding features make the DMS-40PC-4/20S Series meters the most rugged 4½ digit LED display process monitors available.



① -V is not connected to meter ground on '-I' suffix models.

Figure 1. DMS-40PC-4/20S Simplified Schematic

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For full details go to www.murata-ps.com/rohs

Performance/Functional Specifications

Typical at T_A = +25°C, unless otherwise noted.

Current Loop Input	Min.	Typ.	Max.	Units
Full Scale Input Range (1)	+3.7	–	+20.4	mA
Loop Burden (2)	12	–	103	Ohms
Voltage Drop (2)	–	–	2.1	Volts
Overcurrent Protection	–	–	±40	mA
Performance				
Sampling Rate	2.5 reading per second			
Accuracy (1 minute warm-up)	To ±0.01%FS ±2 Count			
Temperature Drift of Span (3)	–	±0.3	±0.6	Cnts/°C
Temperature Drift of Zero (3)	–	±0.2	±0.5	Cnts/°C
Power Supply Requirements (4)				
DMS-40PC-4/20S-5RS	+4.75 to +5.25Vdc at 140mA max.			
DMS-40PC-4/20S-5GS	+4.75 to +5.25Vdc at 140mA max.			
DMS-40PC-4/20S-5RH	+4.75 to +5.25Vdc at 140mA max.			
DMS-40PC-4/20S-RL	+4.75 to +5.25Vdc at 50mA max.			
DMS-40PC-4/20S-24RL	+7.5 to +32Vdc at 50mA max.			
DMS-40PC-4/20S-24XX-I (models)	+21.6 to +26.4Vdc at 60mA max.			
Display				
Display Type and Size	4½ digit, 0.52"/13.2mm high LED			
Polarity Indication	"–" for negative readings			
Overrange Indication	"–1___" for negative inputs "1___" for positive inputs			
Physical/Environmental				
Operating Temperature	0	–	+50	°C
Storage Temperature	–40	–	+75	°C
Humidity (non-condensing)	0	–	95	°C
Case Material	Polycarbonate			
Weight	0.1 ounces (28 grams)			

Ordering Information

DMS-40PC-4/20S-5RS	+5V supply, standard-intensity red LED's
DMS-40PC-4/20S-5GS	+5V supply, standard-intensity green LED's
DMS-40PC-4/20S-5RL	+5V supply, low-power red LED's
DMS-40PC-4/20S-5RH	+5V supply, high-intensity red LED's
DMS-40PC-4/20S-24RL	+7.5V to +32V supply, low-power red LED's
DMS-40PC-4/20S-24RS-I	+24V isolated supply, standard-intensity red LED's
DMS-40PC-4/20S-24RH-I	+24V isolated supply, high-intensity red LED's
DMS-40PC-4/20S-24GS-I	+24V isolated supply, standard-intensity green LED's
DMS-BZL1	Panel-mount bezel assembly
DMS-BZL2	Panel-mount bezel assembly with sealing gasket
DMS-30-CP	Panel cutout punch

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

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TECHNICAL NOTES

(1) Full Scale Input: The DIP Switch settings display readings in Table 1 can typically be obtained with transmitters having a low-level output of 3.7 to 4.3mA and a full-scale output of 19.4 to 20.4mA. When using transmitters whose outputs fall outside these ranges, try using the next highest DIP switch setting if the desired reading is too low, or the next lowest setting if the desired display reading is too high. Example number 2 illustrates this point.

Please keep in mind that the DMS-40PC meter from which the DMS-40PC-4/20S is derived has an accuracy specification of ±3 counts (max.); thus, it may not always be possible to obtain the exact desired display readings. A change of ±1 count is defined as the right-hand most digit (the"ones" LED) going up or down by one.

Other display readings not shown in Table 1 are obtainable. For example, some negative readings with a 4mA input are possible. Consult DATEL for more information regarding display readings not shown in the table.

(2) Loop Impedance/Drop: The maximum loop impedance and the maximum loop voltage-drop are both specified with DIP switch setting #20 enabled. The maximum loop voltage drop is specified with a 20.0mA input current.

(3) Temperature Drift: Temperature drift of zero and temperature drift of gain are both specified with the meter configured for range #20 with 4mA adjusted (using R3) to read "0000" ±1 count, and 20mA adjusted (using R7) to read "19000" ±2 counts.

The temperature drift of gain is proportional to the full scale range being used. It is typically less pronounced at the lower range settings, that is, if the observed gain drift of a particular meter is +12 counts when reading "19000" on range #20 at 40°C, the same meter will most likely have a drift of only +6 counts when reading "9000" on range #12 at 40°C.

The normally very accurate autozeroing feature of the DMS-40PC-4/20S's internal analog-to-digital converter (A/D) is not a factor in determining the meter's zero-reading stability over temperature due to the fact that an offset voltage is applied to the A/D's LO input. This offset voltage is used to null the voltage developed with a 4ma input. To function properly, the autozeroing feature found in most digital panel meters requires both A/D inputs to remain at zero volts with varying temperature. The meter's zero-reading stability over its specified operating temperature is affected by the drift of three terms: the voltage developed by the meter's offset circuitry; the voltage developed across the meter's input resistor(s) with a 4mA input; and the stability of the applied 4mA input signal itself. In the lower DIP switch settings (ranges #1-4), the meter's parasitic etch and switch interconnect resistances also contribute a small error.

The meter's performance with regards to span stability over temperature is affected by the drift of the meter's gain circuitry and the drift of the input resistor(s). To counter these drifts in applications requiring the utmost in temperature stability, where possible, the meter should be calibrated at its anticipated operating temperature. For these applications, use of the DMS-40PC-4/20S-5RL model is highly recommended because of its inherently lower power consumption and self-heating.

Table 1. DIP-Switch Settings

Display Reading			Switch S1						Switch S2	
	4mA	20mA	SW1	SW2	SW3	SW4	SW5	SW6	SW1	SW2
1.	0000	2250-2500	Off	On	On	On	Off	Off	On	On
2.	0000	2500-2800	Off	On	On	On	Off	Off	Off	On
3.	0000	2800-3200	Off	On	On	On	Off	Off	On	Off
4.	0000	3200-3850	Off	On	On	On	Off	Off	Off	Off
5.	0000	3850-4300	On	Off	On	On	Off	Off	On	On
6.	0000	4300-4900	On	Off	On	On	Off	Off	Off	On
7.	0000	4900-5600	On	Off	On	On	Off	Off	On	Off
8.	0000	5600-6200	On	Off	On	On	Off	Off	Off	Off
9.	0000	6200-6800	Off	Off	On	On	On	Off	On	On
10.	0000	6800-7750	Off	Off	On	On	On	Off	Off	On
11.	0000	7750-8600	On	On	Off	On	On	Off	On	On
12.	0000	8600-9850	On	On	Off	On	On	Off	Off	On
13.	0000	9850-11000	On	On	On	Off	Off	On	On	On
14.	0000	11000-12000	On	On	On	Off	Off	On	Off	On
15.	0000	12000-13000	On	Off	Off	On	Off	On	On	On
16.	0000	13000-14000	On	Off	Off	On	Off	On	Off	On
17.	0000	14000-15300	On	Off	On	Off	On	On	On	On
18.	0000	15300-16300	On	Off	On	Off	On	On	Off	On
19.	0000	16300-17800	Off	Off	On	Off	On	On	On	On
20.	0000	17800-20000	Off	Off	On	Off	On	On	Off	On

Since the DMS-40PC-4/20S uses extremely-stable thin-film chip resistors, periodic re-calibration is typically required only in environmentally demanding applications where shock, vibration and temperature extremes may have a detrimental affect on the 20-turn potentiometers.

(4) Input Grounding: Except for the "-I" suffix models which feature isolated current loop inputs, all other DMS-40PC-4/20S meters are supplied with their 4-20mA negative-input terminals (TB1-2, "-") internally connected to their power supply ground terminal (TB2-2, "-V"). This single-ended input configuration is compatible with most grounded-referenced 4-20mA transmitters.

Applications in which the DMS-40PC-4/20S and its associated 4-20mA transmitter are connected to a common ground and the transmitter drives two or more loads (for example, the meter is in series with a PLC) must have the meter connected as the **first** device in the current loop, that is, closest to the system ground (see Figure 2). If this connection scheme is not possible and/or the meter must be connected in the middle of the current loop, then'-I' suffix models **must be used** to provide the required isolation between the meter's current loop input and the power supply ground ("-V"). See Figures 2, 3, 4, and 5 for typical loop connections.

Table 2. Decimal Point Settings

Switch S2			
SW3	SW4	SW5	SW6
DP1	DP2	DP3	DP4

Using the Decimal Point Settings Table as a guide, the DMS-40PC-4/20S's decimal points can be enabled to suit the user's particular readout requirements. Place the selected decimal point's DIP switch to the ON position (up) to illuminate the decimal point. The decimal points are merely placeholders, that is, they can all be illuminated or all turned off; they have no affect on the meter's operation and/or display readings.

OPERATING AND SETUP INSTRUCTIONS

The following procedure must be performed as the first re-calibration step every time DIP switches S1 and S2 are changed to select a new display range. The following procedure also assumes the DMS-40PC-4/20S is initially completely mis-adjusted, i.e., both potentiometers and both DIP switches S1 and S2 are randomly set. When performing switch settings, make sure that the DIP switch's small actuator is pushed up as far as it will go to ensure that the switch is truly set to the ON (closed) position.

1. Set R7 (gain/span adjust) and R3 (zero/offset adjust) fully clockwise, roughly 20 turns, then using the settings found in the selected range, place the DIP switches on S1 and S2 to the appropriate positions for the desired display reading.
2. Apply a precision 4mA input with proper polarity and adjust R3 (top 20-turn potentiometer) until the meter's display reads "0000".
3. Apply a precision 20mA input and adjust R7 (bottom 20-turn potentiometer) until the display reads the maximum desired reading. Repeat steps 2 and 3 to make sure the adjustments did not affect one another.

4. If necessary, select the appropriate decimal point by setting either SW3, SW4, SW5, or SW6 of S2 to ON (DP1, DP2, DP3, or DP4, respectively, as shown in Table 2).

NOTE: Please keep in mind that the transmitter's 4mA and 20mA output accuracy may affect display readings which are at, or very close to, the high and low extremes of the selected range. See Example #2 below and Technical Note 1 for more information.

Examples

The examples below illustrate how to configure the meter to perform some typical measurements. Remember to first set R3 and R7 to their full clockwise position before calibrating the meter.

1. Desired display readings are:

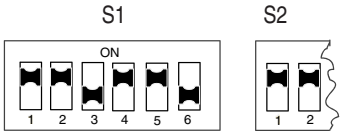
4mA = "0.000"
20mA = "3.000"



Use DIP-switch setting #3 and enable decimal point DP2 by placing SW4 of switch S2 to ON. Apply 4mA and adjust R3 so the display reads "0.000". Apply 20mA and adjust R7 so the display reads "3.000".

2. Desired display readings are:

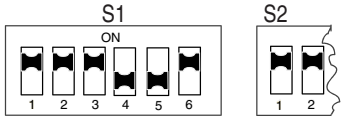
4mA = "0000"
20mA = "8600"



Use DIP-switch setting #11. Apply 4mA and adjust R3 so the display reads "0000". Apply 20mA and adjust R7 so the display reads "8600". If the transmitter's full-scale output is less than 20.0mA, it may not be possible to adjust R7 for a reading of "8600" with setting #11. If this occurs, select setting #12 and re-calibrate both R3 and R7 to obtain "0000" and "8600". Note that for these display readings no decimal points are used. Set SW3, SW4, SW5 and SW6 on switch S2 to OFF.

3. Desired display readings are:

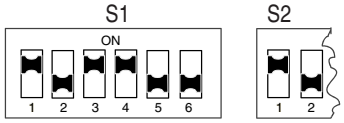
4mA = "0000"
20mA = "10000"



Use DIP-switch setting #13. Apply 4mA and adjust R3 so the display reads "0000". Apply 20mA and adjust R7 so the display reads "10000". For these display readings no decimal points are used. Set SW3, SW4, SW5 and SW6 on switch S2 to OFF.

4. Desired display readings are:

4mA = ".0000"
12mA = ".2500"



This example is not as straightforward as the previous three. Notice that 12mA is exactly halfway between 4mA and 20mA. If we assume the input could go up to 20mA, the display reading would then be 2 x .2500 or ".5000". From the table, we can select DIP-switch setting #7 and enable DP1 via SW3 of switch S2. Apply 4mA and adjust R3 so the display reads ".0000". Apply 12mA and adjust R7 so the display reads ".2500".

CONNECTION DIAGRAMS

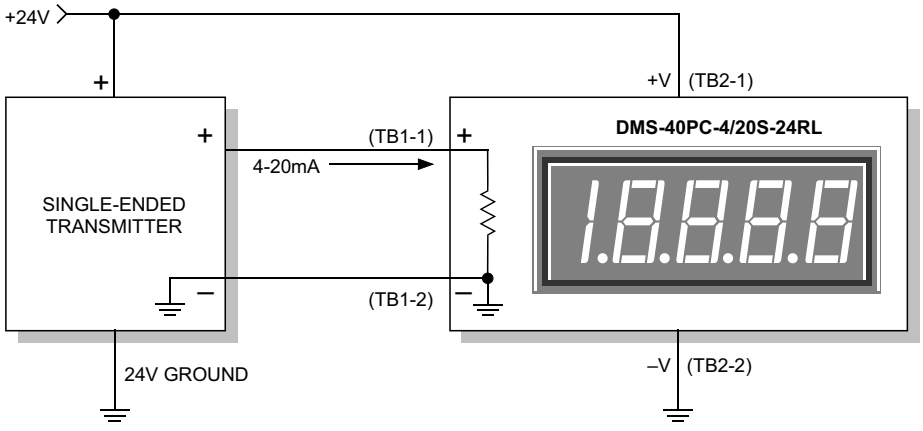


Figure 2. Typical Connections for Single-Ended Transmitters Driving Single-Ended +24V Powered Meters.

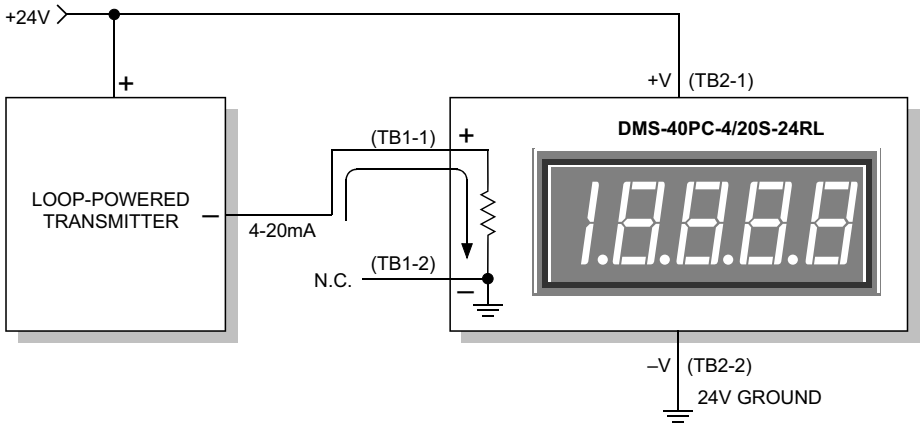


Figure 3. Typical Connections for Loop-Powered Transmitters Driving Single-Ended Meters.

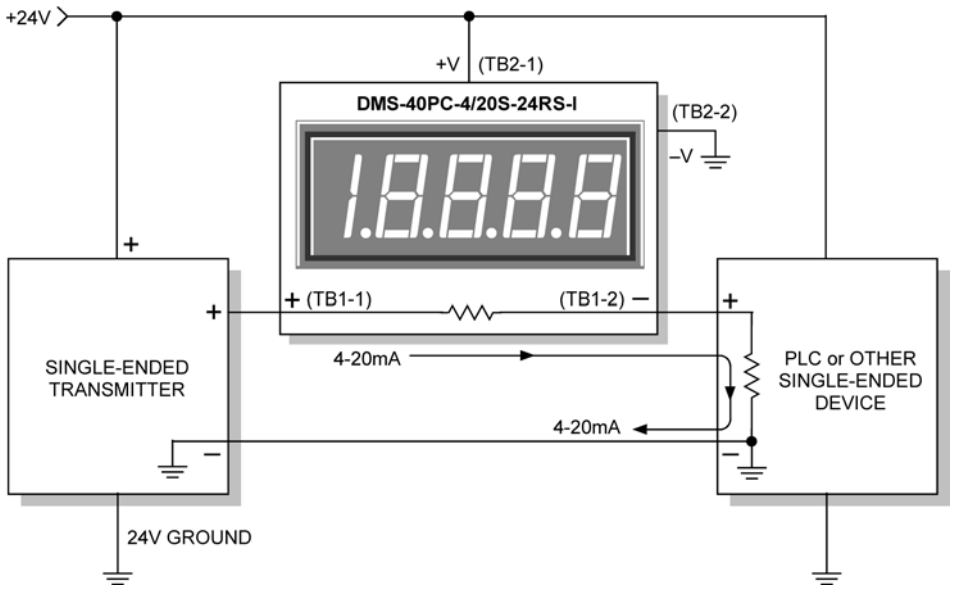


Figure 4. Typical Connections for Isolated-Supply Meters in Series with an Auxiliary Device.

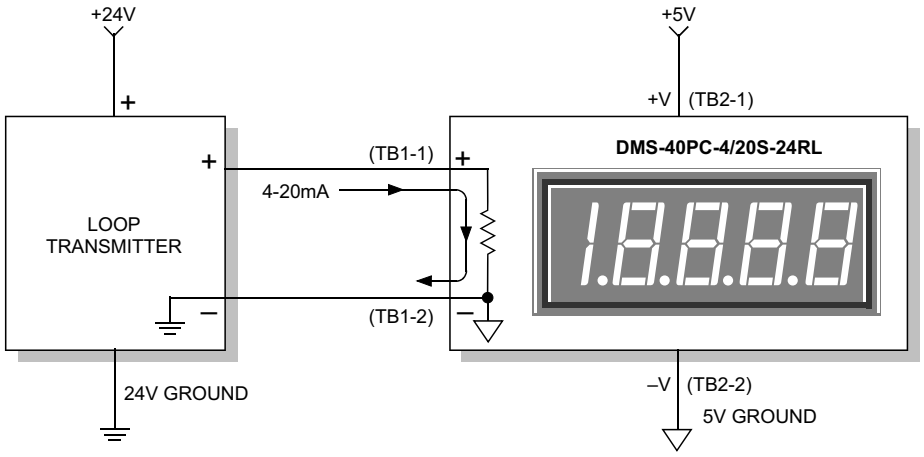
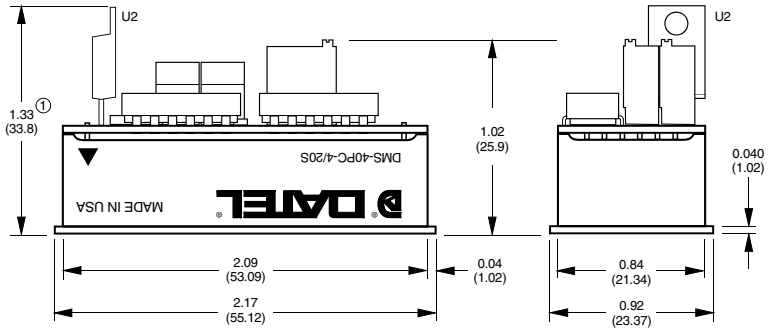


Figure 5. Typical Connections for +5V Powered Meters. Note that 5V Ground and 24V Ground are Tied Together Inside the Meter.

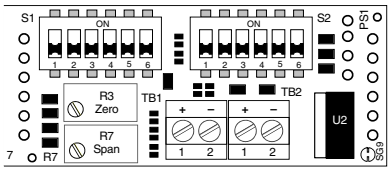
MECHANICAL DIMENSIONS: Inches (mm)

TOLERANCES:	2 PL DEC ±0.02 (±0.51) 3 PL DEC ±0.010 (±0.254)
WIRE SIZE:	18 to 26 AWG (Solid or stranded)
STRIPPING LENGTH:	0.20" (5.08mm)



① Depth dimension for the DMS-40PC-4/20S-24RL model only.
U2 is not used on 5V-powered models.

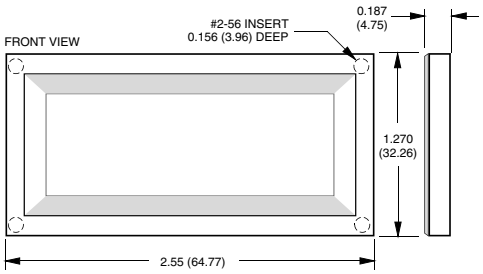
Back View



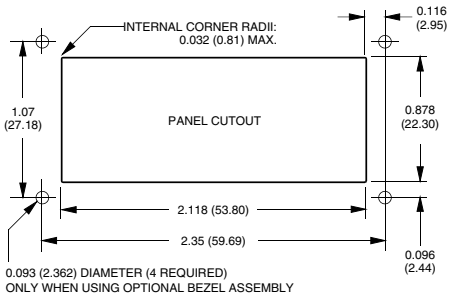
Front View



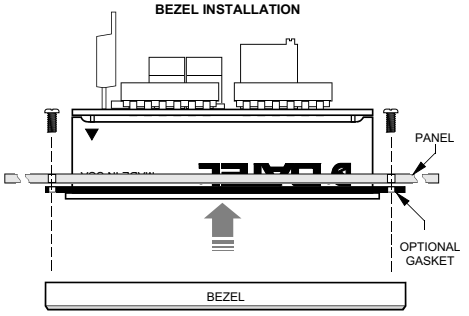
DP1 S2 (SW3) | DP2 S2 (SW4) | DP3 S2 (SW5) | DP4 S2 (SW6)



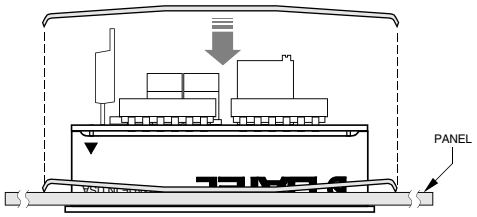
RECOMMENDED DRILL AND PANEL CUTOUT DIMENSIONS



BEZEL INSTALLATION



RETAINING CLIP INSTALLATION



A panel-mount retaining clip is supplied with all models.

Murata Power Solutions

Murata Power Solutions, Inc.
11 Cabot Boulevard, Mansfield, MA 02048-1151 U.S.A.
Tel: (508) 339-3000 (800) 233-2765 Fax: (508) 339-6356
www.murata-ps.com email: sales@murata-ps.com ISO 9001 and 14001 REGISTERED

11/25/08

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USA:	Mansfield (MA), Tel: (508) 339-3000, email: sales@murata-ps.com
Canada:	Toronto, Tel: (866) 740-1232, email: toronto@murata-ps.com
UK:	Milton Keynes, Tel: +44 (0)1908 615232, email: mk@murata-ps.com
France:	Montigny Le Bretonneux, Tel: +33 (0)1 34 60 01 01, email: france@murata-ps.com
Germany:	München, Tel: +49 (0)89-544334-0, email: munich@murata-ps.com
Japan:	Tokyo, Tel: 3-3779-1031, email: sales_tokyo@murata-ps.com Osaka, Tel: 6-6354-2025, email: sales_osaka@murata-ps.com
China:	Shanghai, Tel: +86 215 027 3678, email: shanghai@murata-ps.com Guangzhou, Tel: +86 208 221 8066, email: guangzhou@murata-ps.com
Singapore:	Parkway Centre, Tel: +65 6348 9096, email: singapore@murata-ps.com