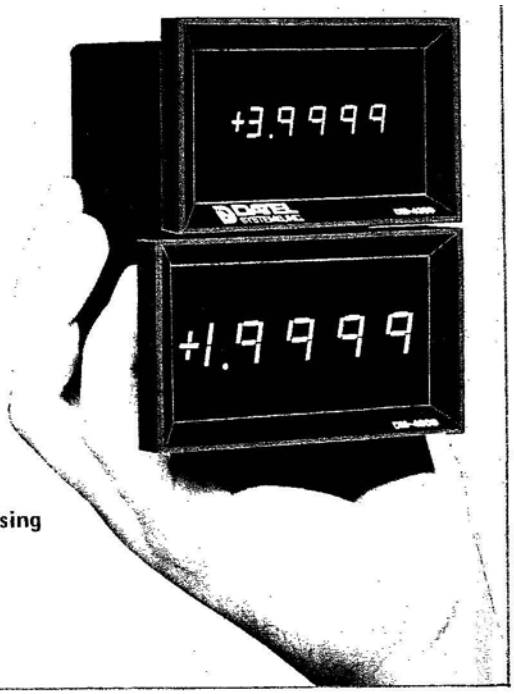
Murata Power Solutions

DM-4000 and 4300

4-1/2 and 4-3/4 Digit Miniature Digital Panel Meter

Discontinued



- **Miniature Case With 5 Large, Red LED Displays**
- **Autozeroing, Optoisolated Floating Input**
- **Operates From +5VDC Logic Power**
- **High Noise Immunity using 120 dB CMR, ±300 V_{CM} Bipolar Floating Input**
- **AC Hum Rejection (60 dB NMR) using Line-synchronized Quartz Crystal Counter**
- **3-Wire Ratiometric Input Reduces Drift Errors from Bridge Inputs**

GENERAL DESCRIPTION

The Murata Models DM-4000 and DM-4300 are, respectively, the world's smallest 4½ and 4¾ digit LED digital panel meters, and include input offset autozeroing.

Both models feature large, easy to read red LED displays that are 0.43" high in the DM-4000 and 0.3" high in the DM-4300. Input power for either model is +5VDC at 1 Amp max.

These DPM's employ a differential, optically isolated floating input that withstands ±300 volts common mode to digital ground with 120 dB common mode rejection from DC to 60 Hz. This provides high noise immunity in industrial applications.

The counter circuits are driven by a stable crystal controlled oscillator which may be specified to synchronize with either 50 or 60 Hz, the common AC power line frequencies. Dual slope integration synchronized to 50 or 60 Hz provides 60 dB of normal mode rejection to power hum on the signal input.

An internal ±6.4 VDC reference and the reference input may be externally connected for 3-wire, TC-tracking ratiometric measurements. This configuration reduces temperature drift errors by normalizing to a single positive reference voltage.

Model DM-4000 measures and displays a full scale input of ±1.9999V. The full scale input/display range of Model DM-4300 is ±3.9999V. Both models have an input impedance in excess of 100 megohms, input bias current of 100 pA max. — which doubles each 10°C.

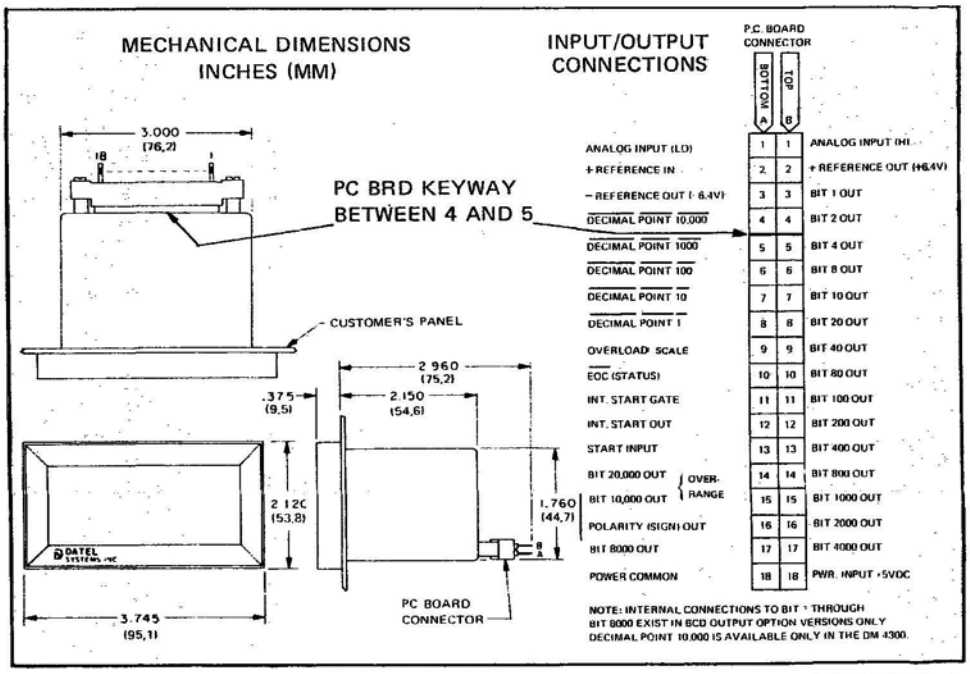
Accuracy of Models DM-4000/4300 is ±0.01% of reading ± 1 digit, with a temperature coefficient of 15 ppm/°C max. over the 0 to +50°C operating range. When operating from the internal clock both models update their display at a 2 sample per second rate, but when driven by an external start pulse the DM-4000 sampling rate can be varied from 0 to 5 per second and the DM-4300 from 0 to 3.3 per second. Calibration adjustments after a 15 minute warmup are easily accessible behind the front panel filter.

The red LED seven segment digits provide automatic display of overrange, overload, polarity and decimal point: Overload is indicated by alternate flashing of the center bars of the sign and 4 LSD displays. The decimal points are illuminated by grounding the appropriate connector pin.

DTL/TTL compatible overrange, polarity, overload and EOC outputs are available at the rear case, 18-pin dual PC board connector in both models. Sixteen lines of BCD data are optionally available at the rear connector in full parallel, 8-4-2-1 positive true format.

These DPM's are housed in a high-impact polycarbonate case that measures only 3" W x 1.75" H x 2.25" D.

High immunity to common mode and normal mode voltages combined with the ratiometric feature especially recommend these DPM's for use with many bridge transducers. Applications include temperature measurement, motion, stress and many other physical phenomena.



SEE NORMAL CONNECTIONS, PG. 4.

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Specifications (Typical @ 25 °C unless noted)

INPUT CHARACTERISICS

Input Voltage Range (Full Scale)	DM-4000: ±1.9999 Volts DM-4300: ±3.9999 Volts
Input Impedance	Greater than 100 megohms
Input Bias Current	100pA max. @ 25°C (doubles/10°C)
Input Configuration	Single-ended floating. Optical isolation to digital ground employed for differential characteristics.
Input Polarity	Automatic bipolar with polarity display indication.
Common Mode Rejection	120 dB, DC to 60 Hz with up to 1K ohm source unbalance.
Common Mode Voltage Range	±300 Volts to digital ground.
Input Overvoltage	±50V min. (sustained) between inputs without damage. ±100V to 5 seconds without damage.

PERFORMANCE

Accuracy (@ 25°C)	±.01% of reading ± 1 digit.
Resolution	100μV
Temperature Coefficient of Reading	15ppm/°C max.
Conversion Speed (Adjustable using ext. trigger)	DM-4000: 0 to 5 conversions/sec. DM-4300: 0 to 3-1/3 conversions/sec.
Input Settling Time	50 mS integration for 60 Hz line. 60 mS integration for 50 Hz line optional.
Operating Temperature Range	0 to +50°C.
Storage Temperature Range	−55°C to +85°C.
Warm Up Time	15 minutes to rated accuracy.
Adjustments	Full scale (Gain) trim located behind front bezel. Separate ± adjustment and ratio zero trim. Autozeroing.
Input Power	+5 ± .25 VDC @ 1 Amp max. (with input logic spikes 10mV max.). Suggested power supply is a Datel UPM-5/1000B or equivalent highly regulated type. Power current varies rapidly with digits displayed, conversion rate, etc.

DISPLAY OUTPUT

Display Type	Red, LED seven segment digits with automatic display of overrange, overload, polarity and decimal point: DM-4000: Digits 0.43" high DM-4300: Digits 0.30" high
Overload Scale	Sign and 4 LSD's display center bars blink.
Decimal Points	Selectable at rear connector. Left of each full digit.

OPTIONAL DATA OUTPUTS

BCD Outputs	16 parallel lines (8-4-2-1) positive true. Loading: 2 TTL loads.
Overrange	DM-4000: 10000 to 19999 counts indicated by HIGH on pin A15 with LOW on overflow (pin A9). DM-4300: 10000 to 39999 counts indicated by a positive true 2-1 BCD code on pins A14 and A15 along with a LOW on overflow (pin A9)
Polarity (pin A16)	Input signal polarity positive indicated with a HIGH. Negative polarity indicated with a LOW.
Overload Scale (pin A9)	DM-4000: Greater than 19999 counts indicated by a HIGH (positive true) on overflow (pin A9). Less than 19999 counts indicated by a LOW. DM-4300: Greater than 39999 indicated by HIGH on overflow (pin A9). Less than 39999 counts indicated by a LOW.
End of Conversion (EOC) (pin A10)	HIGH — during conversion, BCD outputs counting and invalid. LOW — conversion complete. BCD outputs valid 500 μsec after EOC. (See timing diagram)

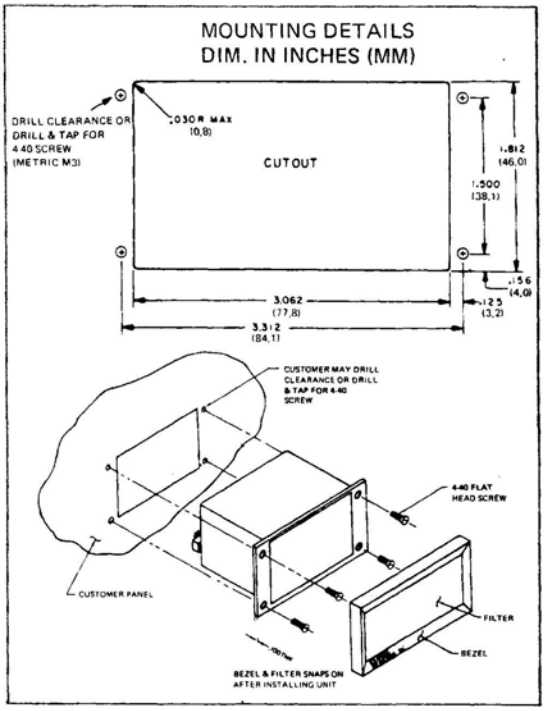
INPUT/OUTPUT CONTROL

External Start Conversion Command (pin A13)	Positive pulse 100 nsec. min. width. 2.0V min. 5V max. height. Conversion initiated upon return from "HIGH" to "LOW".
Internal Clock Start Gate (pin A11)	Controls internal start clock "HIGH" — Run "LOW" — Stop Loading — 1 TTL load.
Internal Start Output (pin A12)	Positive pulse output of internal start clock. 2 pulses/second.
Decimal Point Inputs (pins A4—A8)	Grounding these inputs illuminates corresponding decimal points on the display.
Ratiometric Output (pin B2 +Ref) (pin A3 -Ref)	Derived from internal reference for TC-tracking. Provides ±6.4V @ 2mA max. for 3-wire ratiometric measurement. Ratiometric inputs can be normalized to a single positive reference voltage.
Ratiometric Input (pin A2, input impedance 5Kohms)	Calibrated for +6.4 V±5% input (avail. from ratiometric output, above). May be varied from +3V to +10 VDC for TC-tracking bridge applications. Reading (volts) = $\frac{V_{IN} \times 6.4}{V_{REF\ IN}}$

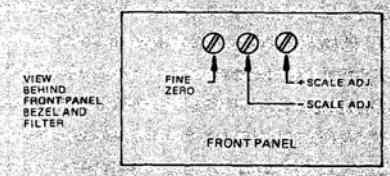
PHYSICAL

Case Size	3"W x 1.75"H x 2.25"D
Case Material	Black high-impact polycarbonate plastic.
Weight	8-10 oz.
Mounting	Through a 1.812" x 3.062" cutout secured with four 4-40 screws.
Connector	Dual 18-pin PC edgeboard type, 0.1" centers (not included, see ordering guide)

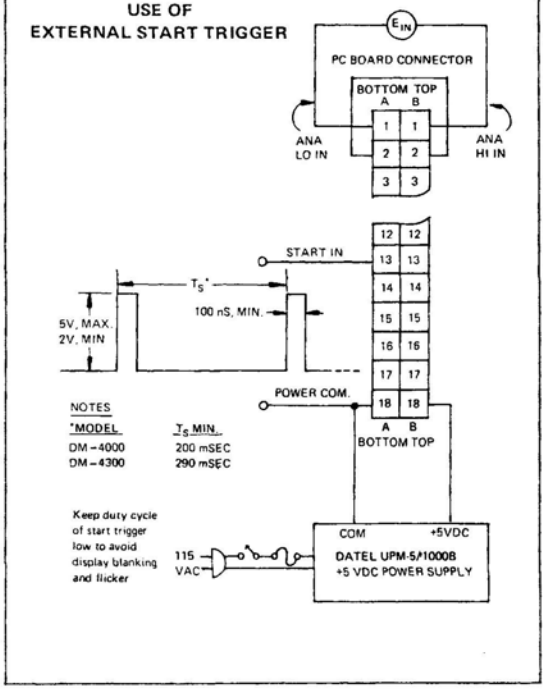
MOUNTING DETAILS
DIM. IN INCHES (MM)



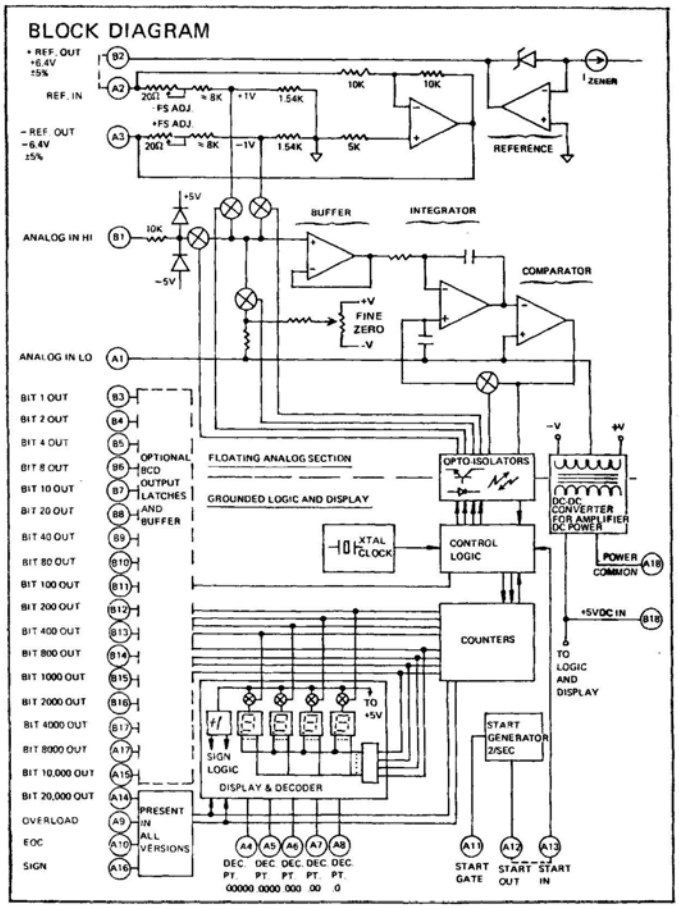
CALIBRATION POTENTIOMETERS
SEE CALIBRATION PROCEDURE, PG. 4



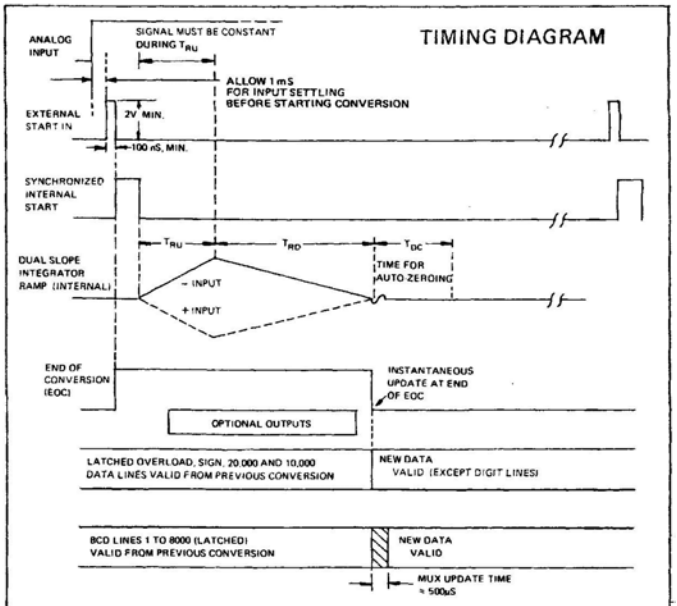
USE OF EXTERNAL START TRIGGER



BLOCK DIAGRAM



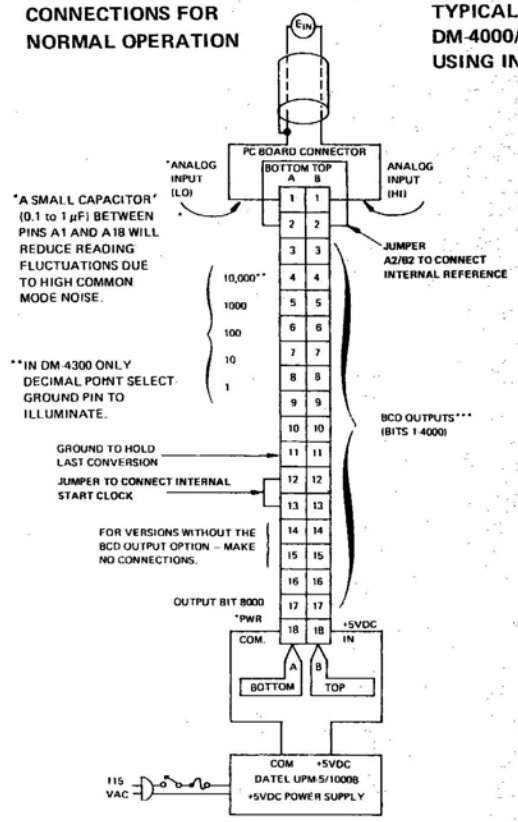
TIMING DIAGRAM



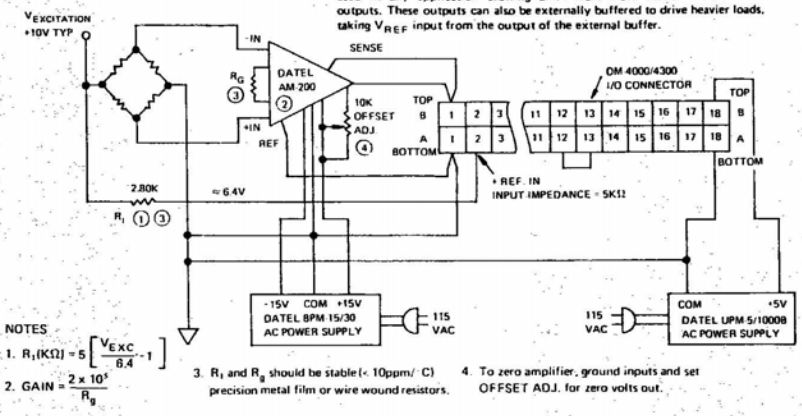
MODEL	T_{RU} RAMP UP TIME	T_{RD} MAX. RAMP DOWN TIME	T_{DC} DRIFT CORRECT TIME	TOTAL
DM-4000 A & B/5	60 mS ± 0.02%	120 mS	80 mS	260 mS
DM-4000 A & B/6	50 mS ± 0.02%	100 mS	80 mS	230 mS
DM-4300 A & B/5	60 mS ± 0.02%	240 mS	80 mS	380 mS
DM-4300 A & B/6	50 mS ± 0.02%	200 mS	80 mS	330 mS

NOTE: BCD OUTPUTS NOT VALID UNTIL 500 µSEC AFTER EOC FALLING EDGE.

CONNECTIONS FOR NORMAL OPERATION



TYPICAL RATIOMETRIC CONNECTION OF DM-4000/4300 TO BRIDGE TRANSDUCER USING INSTRUMENTATION AMPLIFIER



Ratiometric operation uses a single voltage reference in a measurement system to reduce errors caused when two or more references are used. In the typical bridge circuit application shown here, an external excitation or reference voltage is required to power the bridge. The DPM also requires a nominal +6.4 VDC reference voltage input (to pin A2). The DM-4000 and DM-4300 DPM's include an internal +6.4 VDC reference voltage output (pin B2) which may be connected back into the reference voltage input using the rear PC board connectors.

However, the entire measurement system (excitation voltage, bridge, DPM, etc.) will have better drift performance if only one of these two voltage sources is used.

This better drift performance using one reference results because the DPM effectively changes its gain inversely with its reference input according to the expression Reading (in volts) = $\frac{V_{IN} \times 6.4}{V_{REF}}$. The DPM is calibrated when V_{REF} (pin A2) equals +6.4V but V_{REF} may be varied over a limited range (+3 to +10 VDC).

By using a voltage divider (R_1 plus the DPM's 5 K ohms resistance to ground at A2, the V_{REF} input), the DPM derives its reference voltage input directly from the +10V bridge excitation voltage. Then, if the excitation voltage varies, (with a corresponding variation in bridge output to the DPM's analog input) the DPM reference will vary and effectively change the DPM's gain inversely. This scheme tends to cancel out errors normally caused by excitation voltage variations.

In this example the DPM's own reference source was not used but it could be used in any application drawing 2mA max. from the DPM's reference outputs. These outputs can also be externally buffered to drive heavier loads, taking V_{REF} input from the output of the external buffer.

NOTES

1. $R_1(K\Omega) = 5\left[\frac{V_{EXC}}{6.4} - 1\right]$
2. GAIN = $\frac{2 \times 10^5}{R_g}$
3. R_1 and R_g should be stable (< 10ppm/°C) precision metal film or wire wound resistors.
4. To zero amplifier, ground inputs and set OFFSET ADJ. for zero volts out.

JUMPER A12/A13 TO USE INTERNAL START CLOCK, JUMPER A2/B2 TO CONNECT INT. REFERENCE

CALIBRATION PROCEDURE (see figure, middle left, pg. 3)

1. For normal operation (see figure) jumper pin A12 to A13 and pin A2 to B2.
2. Apply power to the DPM and a precision calibrated DC voltage source and allow both at least fifteen minutes for warm up before proceeding.
   a) Short the input leads (A1 and B1) to ground. Adjust the FINE ZERO so that the display reads all zero's and the sign flickers between plus and minus. Disconnect the input leads from ground and connect them to the precision voltage source.
3. For both models, zeroing is automatic and the calibration adjustments are accessible after the front panel bezel and filter are removed.
   a) FOR MODEL DM-4000: Apply an input of +1.99905 volts and set the + SCALE ADJ. potentiometer so that the display flickers equally between +1.9990 and +1.9991 VDC. Reverse the input polarity and set the -SCALE ADJ. potentiometer for a display that flickers between -1.9990 and -1.9991.
   b) FOR MODEL DM-4300: Apply an input of +3.99905 Volts and set the +SCALE ADJ. potentiometer so that the display flickers between +3.9990 and +3.9991 VDC. Reverse the input polarity and Set -SCALE ADJ. for display that flickers between -3.9990 and -3.9991 VDC.
4. For ratiometric operation (see figure showing typical connection) the previous steps must first be performed.

PRICES (1-9)

	Without BCD Option	With BCD Option
(4½ digit)	DM-4000A . . .$219.00	DM-4000B . . .$239.00
(4¾ digit)	DM-4300A . . .$235.00	DM-4300B . . .$255.00

Suggested Power Supply:

UPM-5/1000B +5VDC Modular Power Supply $49.00
(115VAC Input)
UPM-5/1000BE +5VDC Modular Power Supply $54.00
(230 VAC Input)
MS-7 Mating Power Supply Socket $3.50

Connectors (Not included with DPM. Please order with your DPM)

Solder Tab, Datel #2335-1 (Viking 3VH18/1JN-5 . . . . . $4.95
or equivalent with key)
Wire Wrap, Datel #2335-2 (Viking 3VH18/1JHD-5 . . . . . $4.95
or equivalent with key)

ORDERING GUIDE

DM-

MODEL	PARALLEL BCD OUTPUT OPTION	SYNCH. TO AC LINE FREQUENCY
4000 = 4½ Digit 4300 = 4¾ Digit	A = Without B = With	5 = 50 Hz 6 = 60 Hz

GSA Contracted: Datel's Digital Panel Meters are covered by GSA Contract GS-00S-27959

Murata Power Solutions, Inc.
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ISO 9001 and 14001 REGISTERED

This product is subject to the following operating requirements and the Life and Safety Critical Application Sales Policy:
Refer to: http://www.murata-ps.com/requirements/