Murata Power Solutions

# DM-4101D

Micro-Bussable 4-1/2 Digit Digital Panel Meter

## OBSOLETE PRODUCT

Contact Factory for Replacement Model

Note: DPM's are normally supplied without Bezel Labels or Logos

### FEATURES

- Micro-bussable meter provides BCD data outputs for compatibility with microprocessors.
- BCD data out is 3-state-gated, to share bus with other devices.
- Data gated in 4-bit groups for use with 4-, 8-, 12-, or 16-bit data bus widths.
- Full parallel output selectable.
- "Data Ready" output pulse is ideal for interrupt or print command.
- DPM has super high impedance (1000 megohms), super low bias current (5 pA), differential in.
- Ultra-compact, low profile case—2.53"W x 3.34"D x 0.94"H (64,3 x 84,8 x 23,8 mm)
- 5V powered @ 450 mA
- Bright 0.39"H LED digits
- Autozeroed, ratiometric,
- Low Cost

### APPLICATIONS

- Signal Monitor and A/D—Use meter to monitor voltage, current, temp; BCD outputs permit CPU control or printout.
- Data Logger—Simple interconnection with Datel-Intersil's DPP-Q7 Thermal Printer
- Ammeter—Accepts user-supplied shunts for ±20 μA to ±2A Full Scale Ranges.
- Voltmeter—Accepts user-supplied attenuators for ±2V to ±1kV Full Scale Ranges.

### DESCRIPTION

The DM-4101D combines full 4½ digit DPM performance with 3-state BCD outputs, an ultra-compact size, and a very low price. The meter has differential analog inputs which are both ultra high in impedance (1000 megohms) and ultra low in bias current (5 picoamperes)—the DM-4101D will not load down sensitive input signals. The unit is accurate to within .02% FSR (±2 counts). Input circuitry is autozeroed on each conversion cycle to reduce zero drift. All this performance has been packed into a low-profile black polycarbonate case only 2.53" wide x 3.34" deep x 0.94" high (64,3 x 84,8 x 23,8 mm). The price of the meter is small as well: it costs no more than many less sophisticated, display-only DPM's.

The DM-4101D's 3-state BCD outputs take it beyond many so-called "microprocessor compatible" DPM's. 3-state outputs mean that the meter can be connected directly to a microcomputer's data bus. They also permit multiple DM-4101D's to be daisy-chained to a single set of computer or printer input connections—the computer inputs "see" only those meter outputs which have been enabled. And, since each 4-bit group (corresponding to a single BCD-encoded numeral) may be gated separately, a single rear-panel change makes the DM-4101D compatible with processors using 4-, 8-, 12-, or 16-bit data words. Digital outputs for the Display Polarity Underrange, Out of Range, E.O.C., "Data Ready" (a 10 μsec pulse occurring 10 μsec after the digital data is valid), and meter Run/Hold status make microcomputer control of the meter possible with minimal external hardware. Sufficient control circuitry is already built into the DM-4101D that it can interface directly with Datel-Intersil's DPP-Q7 thermal printer (or a similar printer) to become a functional data logger.

The DM-4101D input CMOS circuitry can safely handle over-voltages to ±250 Vdc. The meter's converter board contains blank circuit pads to accept input attenuation resistors or current shunts. Temperature drift of the autozeroed input amplifier is ±1 count from 0 to +50°C. Temperature drift of gain measures ±50 ppm of FSR/°C (typical) and ±100 ppm of FSR/°C maximum.

The DM-4101D uses a dual slope integrating converter which provides normal mode rejection of AC power line noise. It provides an input-to-output conversion linearity to within ±.02% of reading ±2 counts. The standard sampling rate is 3 conversions per second.

Power to the meter is +5 Vdc @ 380 mA typical (450 mA max), and may be supplied directly from a microcomputer bus. A built-in dc-dc converter (to power the meter's analog input circuitry) provides ±5 Vdc ±5% (@ ±15 mA max.) to power user-supplied circuitry. The ±5V output was specifically intended to power an external instrumentation or CAZ amp, to provide the DM-4101D with a differential analog input. Datel-Intersil's UPA-5/500, 5V @ .5A AC power supply is available as an accessory.

IN THIS DATA SHEET


| | |
|---|---|
| Page 2 & 3 | Specifications |
| Page 3 | Ordering Information |
| Page 4 | Outline Dimensions<br>Panel Mounting<br>Block Diagram |
| Page 5 | Input-Output Connections<br>Component Locations<br>Other Voltage and Current Ranges |
| Page 6 | DM-4101D Interface with DPP-Q7 Thermal Printer<br>Differential Input<br>Decimal Point Wiring<br>Timing Diagram |
| Page 7 | Applications<br>Introduction<br>DM-4101D Bus Interface |
| Page 8 | Bus Interface Block Diagram<br>Motorola 6800/6502 P.I.A. Interface |

## SPECIFICATIONS, DM-4101D
(typical @ −25° C, unless noted)

### ANALOG INPUT

| | |
|---|---|
| **Configuration and full scale Input range** | Differential bipolar; − 1.9999 Vdc to +1.9999 Vdc Input pad area will accept user-installed range change. |
| **Input Bias Current** | 5 pA typical, 50 pA maximum |
| **Displayed Accuracy @ +25° C** | Adjustable to ±0.02% of reading, ±2 counts |
| **Resolution** | 100 μV in Least Significant Digit |
| **Temperature Drift of Zero** | Autozeroed; ±1 count over 0 to +50° C |
| **Temperature Drift of Gain** | ± 50 ppm of Reading/° C typical ±100ppm of Reading/° C maximum |
| **Input Impedance** | 1000 megohms, typical, 100 megohms, minimum |
| **Input Overvoltage** | ±250 Volts dc, 155 VRMS continuous max. ±300 Volts intermittent max. |
| **Warm-Up Time** | Within 10 minutes |
| **Reference** | Internal, referred to Power Common. External, user-supplied reference optional for ratiometric operation. |
| **External Ref. Range** | +100 mV to +2V, referred to Analog Common |
| **Common Mode Voltage Range** | ± 2V max to power gnd. |
| **Common Mode Rejection Ratio** | 80dB typ. |

### DISPLAY

| | |
|---|---|
| **Number of Digits** | 4 decimal digits and most significant "1" digit (4½ digits) |
| **Decimal Points** | Selectable decimal points are included for scale multipliers. |
| **Display Type** | Red, light-emitting diode (LED), self-illuminated |
| **Display Height** | 0.39" (9,9 mm) |
| **Overscale** | Inputs exceeding the full scale range cause the display to blink |
| **Autopolarity** | A polarity sign is automatically displayed for bipolar inputs, and may be disabled. |
| **Sampling Rate** | Typically 3 conversions per second. |

NOTE: The DM-4101D's display is not latched; the display may not track the meter's BCD data out.

## I/O CONNECTIONS

### J2 ANALOG CONNECTOR (LOWER)

| | |
|---|---|
| **Reference In (Pin B1)/ Reference Out (Pin A1)** | Normally REFERENCE IN and REFERENCE OUT should be jumpered together. An external high quality reference, grounded to ANALOG COMMON may be connected to REFERENCE IN or used for ratiometric applications. |
| **Analog Common (Pin A2)** | ANALOG COMMON is *not* internally connected to POWER COMMON, but *must* be connected externally. An external bias current path between *both* inputs and pin A2 must be supplied by the user to stay within CMV range. |
| **Analog LO Input (Pin B2) Analog HI Input (Pin B5)** | Signal input Normal voltage range is −1.9999 to +1.9999 Vdc, but an internal attenuator or current shunt resistors may be installed (R1 and R2) |
| **$\overline{\text{Display Test}}$ Input (Pin A7)** | Connect this to POWER COMMON, displays 18888 to test display segments. |
| **Decimal Points (Pins A8 to A11)** | Connect selected pin to DECIMAL POINT COMMON (Pin A12). *Do not connect D.P. to POWER COMMON as this will destroy D.P.* |
| **$\overline{\text{Polarity Enable}}$ Input (Pin B8)** | Ground to POWER COMMON (Pin A14) to enable +/− sign on display. |
| **+5V In (Pin B14)** | Power input to the meter; connections made between +5V IN and POWER COMMON (pins J1-A14 and B13 and J2-B14); requires regulated supply (± 5%), capable of supplying 450 mA max. |
| **Display Enable Input (Pin B15) (Not a Logic Input)** | Connect to +5V (B14) to enable all display segments and decimal points. (Disabling display reduces power consumption to 250 mA, typically). |
| **Power Common (Pins A14/B13)** | Power supply common must be connected externally to ANALOG COMMON. |
| **+ 5Vout (Pin B12) − 5Vout (Pin B11)** | These voltage outputs provide + 1A and − 15 mA respectively to power user-supplied external circuitry. May be used to power an instrumentation or C.A.Z. amplifier. **Caution:** these outputs are *not* short-circuit-proof. Shorting either of them to ground, or drawing more than the ± 15 mA specified, can damage the meter's DC-DC converter. |
| **Pins A3 to A6; A13, A15; B3, B4,B6,B7,B9,B10** | No internal connection |

## SPECIFICATIONS (Cont'd):

### I/O CONNECTIONS (Cont'd)

**J1 DATA CONNECTOR (UPPER)**

**Digit Enable Input** ..... These are active high, and operate on data in groups of 4 bits (e.g., Enable 10's controls BCD 10, 20, 40 and 80; Enable 10,000's controls BCD 10,000 (overrange), PLUS/MINUS, OUT OF RANGE, and UNDERRANGE. For full parallel output, all Enables should be left open or connected to +5V. 74LS295 are used as latches, and timing is as specified for these devices.

- **Enable 1's (Pin A1)**
- **Enable 10's (Pin A6)**
- **Enable 100's (Pin B1)**
- **Enable 1000's (Pin B6)**
- **Enable 10,000's (Pin A11)**

**Run/Hold Input (Pin B13)** .... When open or high the D.P.M. will run continuously at its maximum rate (3 readings/second). When low, the D.P.M. will hold a reading after completion of any conversion in process. Momentarily bringing the RUN/HOLD high (for a minimum of 300 µS) will initiate a conversion, after which the D.P.M. will remain in hold until receipt of another RUN/HOLD pulse. This provides a means of externally triggering the D.P.M.

**BCD Data Outputs** ..... 1,2,4,8 (and 10,20,40,80, etc) BCD data is fully latched. Outputs are 3-state and controlled in groups of 4. Outputs are DTL/TTL compatible, positive true, and sink 4.0 mA @ 0.4V (2½ TTL loads).

- **BCD 1 (Pin A2), 2 (Pin A3), 4 (Pin A4), 8 (Pin A5)**
- **BCD 10 (Pin A7), 20 (Pin A8), 40 (Pin A9), 80 (Pin A10)**
- **BCD 100 (Pin B2), 200 (Pin B3), 400 (Pin B4), 800 (Pin B5)**
- **BCD 1000 (Pin B7), 2000 (Pin B8), 4000 (Pin B9), 8000 (Pin B10)**
- **BCD 10,000 (Pin A12)**

**Plus/Minus Polarity Out (Pin A13)** ..... This is true for positive input. 3-state latch enabled by pin A11

**Out of Range Output (Pin A14)** ..... This is true when reading is greater than +1.9999 Vdc or less than −1.9999 Vdc. 3-state latch enabled by pin A11.

**Underrange Output (Pin A15)** ..... This is true when the magnitude of the reading is less than 1800. OUT OF RANGE and OVERRANGE may be used to drive auto-ranging circuitry external to the D.P.M. Three-state latch enabled by pin A11.

**E.O.C. Output (Pin B11)** ..... The E.O.C. output is high during a conversion (fan out 2½ TTL loads).

**Data Ready (Pin B12)** ..... The DATA READY is a short pulse (10 µS) which is produced 10 µS after the data is valid in the D.P.M. latches. It may be used to trigger a printer, to load external latches, or to interrupt a computer.

**+5V (Pin B14) and Digital Common (Pin B15)** ..... Pin B15 is internally connected to J2-A14/B13, Pin J1-B14 (+5V) must be externally connected to +5V (J2-B14).

### BCD OUTPUT

**Format** ..... BCD outputs 3-state, gatable in 4-bit groups, full parallel output available.

**Fanout** ..... 2½ TTL loads

**Logic Controls** ..... E.O.C. pulse, "Data Ready" (Print Pulse), Overrange, Underrange, Out of Range, PLUS/MINUS Polarity OUT, and RUN/HOLD.

**Calibration** ..... A multiturn screwdriver pot (rear-panel mounted) adjusts the full scale reading (gain). Zero is automatic (autozeroed). Suggested recalibration in stable conditions is 90 days.

### PHYSICAL-ENVIRONMENTAL

**Low-Profile Case** ..... Interchangeable with other Datel-Intersil cases.

**Outline Dimensions** ..... 2.53"W x 3.34"D x 0.94"H (64,3 x 84,8 x 23,8 mm)

**Cutout Dimensions** ..... 2.562"W x 0.969"H (minimum) (65,1 x 24,6 mm)

**Mounting Method** ..... Through a front panel cutout secured by brackets and two removable side case screws. Panel thickness 0.62" (15,9 mm).

**Weight** ..... 4.1 oz (116 grams)

**Connectors (2 Required)** .... Dual 15 pin, 0.1" centers, Datel-Intersil #58-2073083

**Mounting Position** ..... Any

**Operating Temperature Range** ..... 0 to +50° C

**Storage Temperature Range** ..... −25 to +85° C

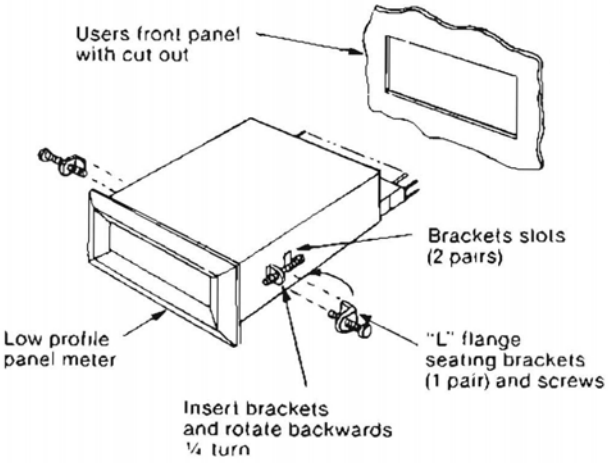
**Altitude** ..... 0 to 15,000 feet (4600m)

**Relative Humidity** ..... 20% to 80%, non-condensing

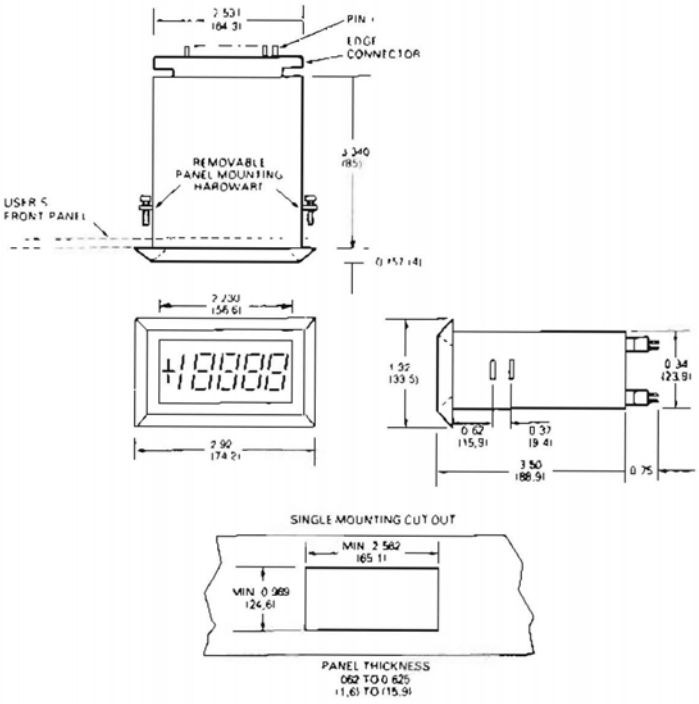
## ORDERING INFORMATION

| MODEL | DESCRIPTION |
|---|---|
| DM-4101D | Micro-bussable 4½ Digit DPM |
| UPA-5/500 | 115 VAC-to-5 Vdc Power Adapter |
| 58-2073083 | Dual 15-pin connector, .100" ctrs., solder-tabs (not included with meter, 2 required) |

## PANEL MOUNTING

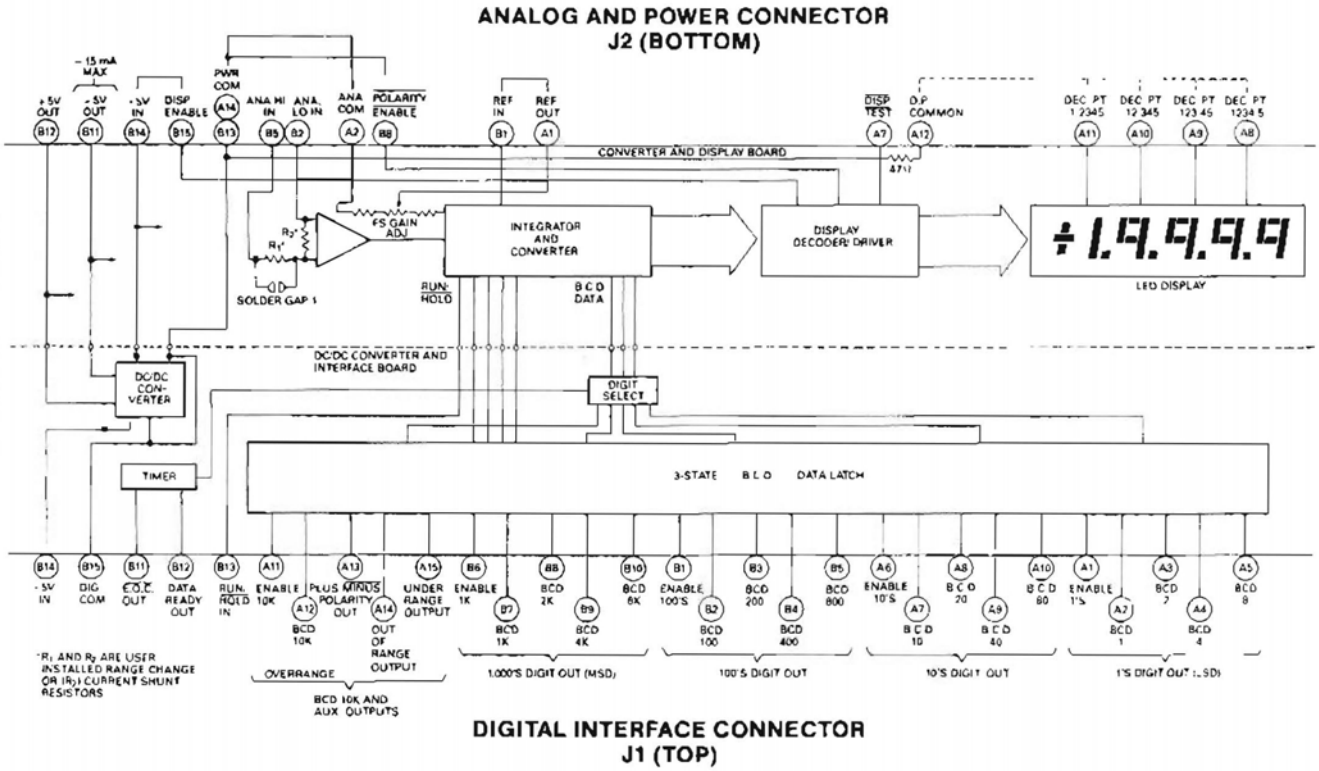



## OUTLINE DIMENSIONS




INCHES (MM)

## BLOCK DIAGRAM



## DM-4101D INPUT-OUTPUT CONNECTIONS (REAR VIEW)

(This view shows DPM turned on its side.)

### BOTTOM BOARD (J2) ANALOG AND POWER CONNECTOR

| A (Lower) | Pin # | B (Upper) |
|---|---|---|
| Ref. Out | 1 | Ref. In |
| Analog Common | 2 | Analog Lo In |
| No Etch | 3 | No Etch |
| No Etch | 4 | No Etch |
| Keyway | | Keyway |
| No Etch | 5 | Ana. Hi In |
| No Etch | 6 | No Etch |
| Display Test | 7 | No Etch |
| D.P. 1234.5 | 8 | Polarity Enable |
| D.P. 123.45 | 9 | No Connection |
| D.P. 12.345 | 10 | No Etch |
| D.P. 1.2345 | 11 | – 5V out (15mA) |
| D.P. Common | 12 | + 5V out (1A) |
| No Etch | 13 | Power Common |
| Power Common | 14 | +5V In |
| Display Blank | 15 | Display Enable |

Bottom of Meter

Input Voltage, ±1.9999V, Across B2 and B5

$E_{in}$

User-supplied connection to Power Common necessary to enable "±" on Display

User-supplied jumper, B14 to B15, necessary to Enable Display

User must externally wire Analog Common to Power Common

### TOP BOARD (J1) DIGITAL INTERFACE CONNECTOR

| A (Lower) | Pin # | B (Upper) |
|---|---|---|
| Enable 1's | 1 | Enable 100's |
| BCD 1 | 2 | BCD 100 |
| Keyway | | Keyway |
| BCD 2 | 3 | BCD 200 |
| BCD 4 | 4 | BCD 400 |
| BCD 8 | 5 | BCD 800 |
| Enable 10 | 6 | Enable 1K |
| BCD 10 | 7 | BCD 1K |
| BCD 20 | 8 | BCD 2K |
| BCD 40 | 9 | BCD 4K |
| BCD 80 | 10 | BCD 8K |
| Enable 10K | 11 | E.O.C. |
| BCD 10K | 12 | Data Ready |
| Plus/Minus Out | 13 | Run/Hold |
| Out of Range | 14 | +5V In |
| Underrange | 15 | Digital Common |

Top of Meter

CAUTION: CMOS Inputs. Avoid damage from static discharge. Handle only with ground protection.

**Normal External Connections Are Shown**

NOTES: 1. All BCD outputs are 3-state, enabled high, and can drive 2½ TTL loads. 74LS295 3-state latches are used.

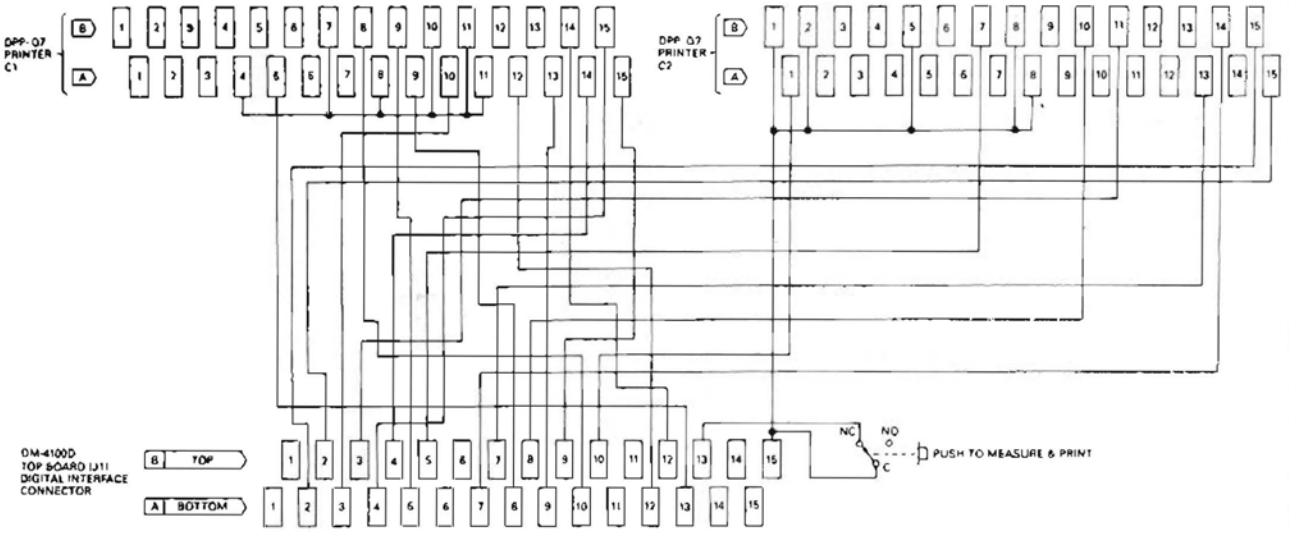
2. – 5V is 15 mA max. and is not current limited. **Sustained overloads or short circuits can result in damage to the meter's DC-DC converter.**

## DM-4100D COMPARISON TO DM-4101D

| | DM-4100D | DM-4101D |
|---|---|---|
| 1. Input type | Single-ended | Differential, CMV ± 2V max to power ground (non-isolated). CMR 80dB typ. |
| 2. Power for optional external signal-conditioners | + 13.5V @ 20mA max | + 5V @ 1A max (no reflected spikes). |
| | – 13.5V @ 20mA max | – 5V @ 15mA max (may require external filtering) |
| | | ± 5V power out current must be added to the DM-4101D + 5V power input. |
| 3. + 5V power input | 580mA max | 450 mA max (if additional ± 5 power output is used, this current must be added to the above figure). |
| 4. Display size | 0.3 inches high | 0.39 inches high |
| 5. Pinout differences | J2-B2: Analog Common (signal ground) | J2-B2: Analog LO In (Differential Inverting Input). J2-A2 is retained as Analog Common |
| | J2-B12: + 13.5Vdc out | J2-B12: + 5Vdc out |
| | J2-B11: – 13.5Vdc out | J2-B11: – 5Vdc out |
| | J1-B14: + 5Vdc power is internally connected (no external connection is required) | J1-B14: + 5Vdc power must be externally connected. |
| | J2-A15: No connection | J2-A15: Display Blank. Pin open or logic H1: Display lights. Pin logic LO: Display blanks (Pin includes an internal pullup resistor to + 5V). |
| | | J2-B15 must still be externally connected to power the display. With J2-B15 open, the A/D converter stays running for low drift. |
| | J2-B9: 3½/4½ Mode | J2-B9: No Connection |

## DM-4101D INTERFACE WITH DPP-Q7 THERMAL PRINTER

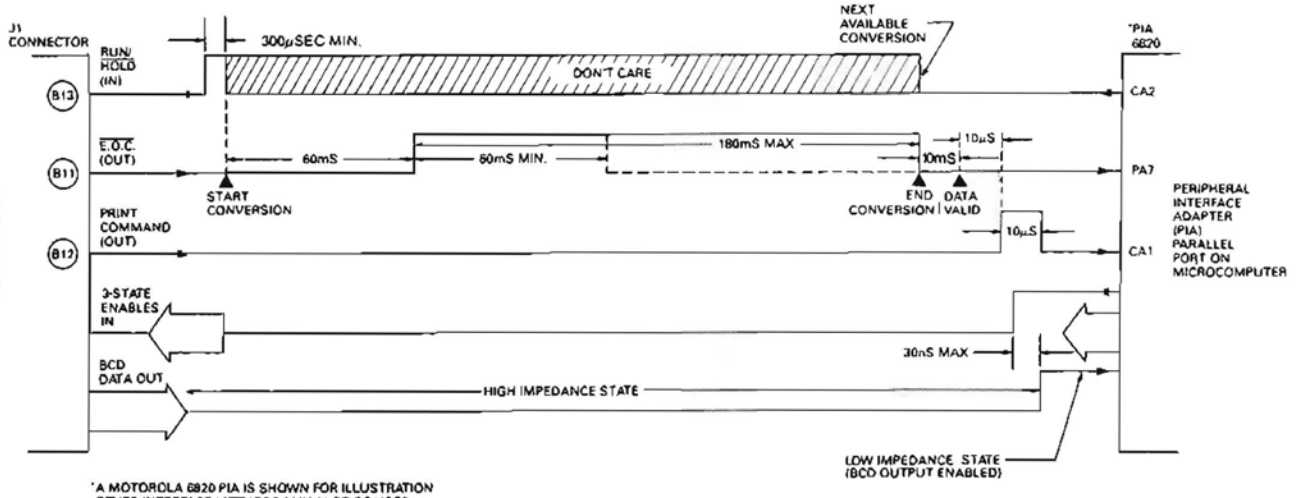
The DM-4101D may be connected directly to Datel-Intersil's DPP-Q7 Miniature Printer to form a functional data logger. The required connections are shown below.




Notes:

1. Leading zero suppression on the printer may be activated by grounding printer pin B4 on connector C1 (join B4 to A4 on C1).
2. To select the desired decimal point on the printer, ground all unused decimal points to C1 pin A4. Only the unconnected decimal point is enabled.
3. The Run/$\overline{\text{Hold}}$ input on the D.P.M. can be used to trigger a Measure/Print cycle. A logic input or contact opening can be used (no debounce is necessary). Leaving the Run/$\overline{\text{Hold}}$ open or high will cause the system to free run at about 3 measurements per second.

## TIMING DIAGRAM




*A MOTOROLA 6820 PIA IS SHOWN FOR ILLUSTRATION OTHER INTERFACE METHODS MAY ALSO BE USED

TIMING DIAGRAM IS NOT TO SCALE

This applications information shows typical suggested circuits to illustrate design examples. Since Datel-Intersil has no control over the selection, mounting, interconnection, fabrication and environmental factors of external apparatus and components to this product, specific performance cannot be warranted. This information is believed to be accurate and reliable. No responsibility is assumed for any errors or omissions. Nor does Datel-Intersil, Inc. assume responsibility for the use of such information or for any infringement of present or future patents or other third party rights resulting from such use. No license is granted by implication or otherwise under any patent, patent rights, or otherwise of Datel-Intersil, Inc. Prices and specifications are subject to change without notice.

## APPLICATIONS

### INTRODUCTION

The DM-4101D may be used to interface with a variety of microcomputers, thermal printers, data loggers and so on. The discussion below of DM-4101D BUS INTERFACING provides the general information necessary to any application in which the BCD data from the DM-4101D will be used. Reference should also be made to the BUS INTERFACE BLOCK DIAGRAM on page 8.

A specific interface is also given, as an example: the Motorola 6800/6502 P.I.A. INTERFACE. The diagram and notes describe interconnection of the meter with this particular Motorola microcomputer.

Similar connections with other microcomputers are possible, but are beyond the scope of this data sheet.

### BUS INTERFACE

In order to fully implement a typical interface between the DM-4101D and a microcomputer, three functions must be considered. The first function is to start A/D conversion in the DPM. The second function is to recognize that the DPM is ready to transfer valid output data. The third function is to transfer this data.

The microcomputer has two common methods to output start signals to the DPM and two methods to input End of Conversion (Data Valid) signals into the computer. The DPM's start signal can be supplied from a parallel port output on the computer. This port output line is latched and separated from the other busses of the computer and has TTL drive. If the port method is not desired, the start input may be derived from the address decoder technique to be used later in the data transfer section.

The two methods to input the EOC signal from the DPM are the parallel port and an interrupt input line to the computer. The port method is straightforward in that the user's operating program for the computer periodically scans ("polls") an input bit on the computer's parallel port which is connected to the DPM's EOC output. When the EOC port bit goes low (true), and the polling routine discovers this, the program jumps to a routine which transfers the DPM's BCD data. The only problem with the polling routine method is that excessive computer time (and lost efficiency) might be dedicated to sampling the port bit. If sampling is done less often, valid BCD data could sit ready for an excessive time, thereby lowering the total data acquisition throughput, if that is important (it may not be important in many applications with slowly-varying data).

The interrupt method is more efficient if throughput is at a premium. Interrupt involves a separate line or lines to the CPU which get immediate attention when the interrupt is set. There are two types of interrupts found on microcomputers. The less common type found on some controller-type microprocessors requires only a momentary pulse to set the interrupt. This interrupt type is ideal for a pulse version of the EOC Output called the Data Ready Output (pin 812) which is supplied on the DM-4101D.

The more conventional interrupt input requires a handshake procedure as follows: The interrupt input is set and the CPU detects it as fast as possible, given the preselected priority which you, the programmer have written into the software. The CPU responds with an Interrupt Acknowledge (INTA) Output which is intended to clear the original interrupt and avoid retriggering that same interrupt until its function is performed. Since INTA must clear the interrupt, an additional external flip flop is required or other method since the DPM's EOC Output cannot be externally reset. Some external interface circuitry may be needed in any event, so the flip flop will be easy to add.

Once the EOC is detected, either through the polled port or interrupt, it is time to take the data. If the user has persisted with a parallel port so far it may be tempting to tie all 20-odd bits to the rest of the parallel port, assuming a Peripheral Interface device or Peripheral Interface Adapter (Intel 8255 or Motorola 6820) are used. This simplifies matters but sacrifices the great advantage of the 3-state BCD data outputs which is that one data bus can *share* several DM-4101D's, depending on distance, loading, etc.

A more elegant method is to wire up the DM-4101D's data outputs in three parallel groups of eight bits (assuming an 8-bit microcomputer). Thus, two decades (8 bits) of BCD data may be strobed onto the bus simultaneously by wiring their 2 Enable Inputs together and by toggling these paired Enables in 1-2-3 sequence to strobe out each 2-digit byte. Using this method, three 8-bit bytes completely transfer 4½ decimal digits plus signs and flags.

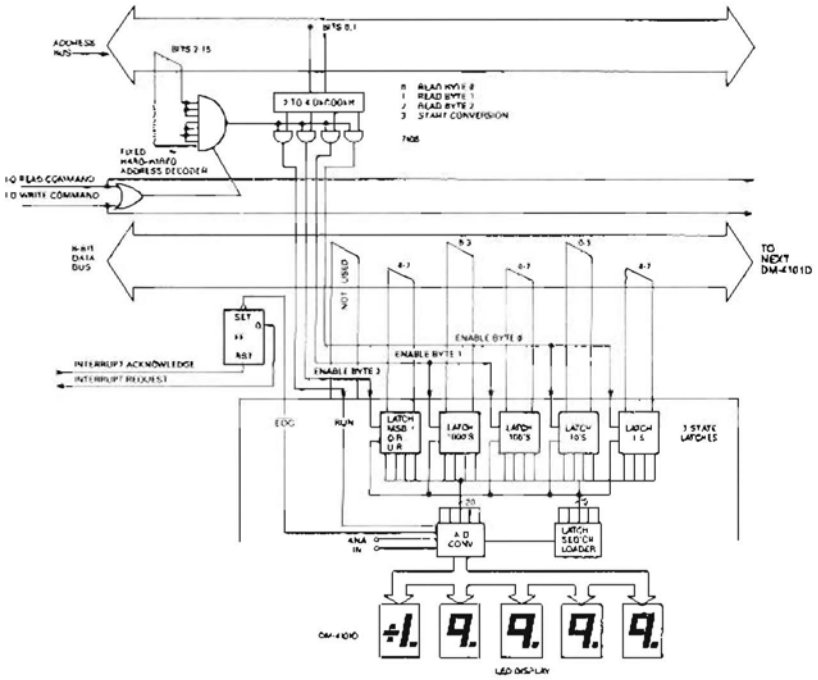
The Enable inputs are supplied by the computer's CPU and are derived from the memory bus. The Enables may be treated either as I/O Addresses or as Memory Read locations (so called memory-mapped architecture). In either case, the CPU sends an address down the memory bus. An external address decoder is used to create a single pulse input to each Enable input pair by first ANDing the decoder output with either the I/O Read Command output or Memory Read Command Output from the CPU. While this pulse input enables the BCD data gates, the CPU's data bus reads these BCD data bits and routes them to the accumulator. From there they are routed to memory for further processing according to the user's program. If this decoder method is used, it will be noted that the program instruction which moves BCD data from the DPM to the CPU is an I/O Read command: IN N, in 8080 assembly language, for example. It will use the I/O Read Command Output line (IORC) from the computer. The complementary instruction, OUT N may be used with the identical address to start A/D conversion in the DPM, as discussed earlier. If start is used this way, the I/O Write Command (IOWC) Output will be ANDed with the decoder's output to create a start pulse.

With the appropriate address decoder circuit, successive IN N instructions will be physically routed to ascending sets of paired Enable inputs. For example, (in 8080 language)

```
IN N+0
STA M+0
IN N+1
STA M+1
IN N+2
STA M+2
```

will completely strobe out 4½ digits, signs and flags into three successive memory locations. Since the next data sample will write over the previous data, M+0, M+1 and M+2 should be thought of as temporary scratchpad intersample storage and full data manipulation should occur between samples.

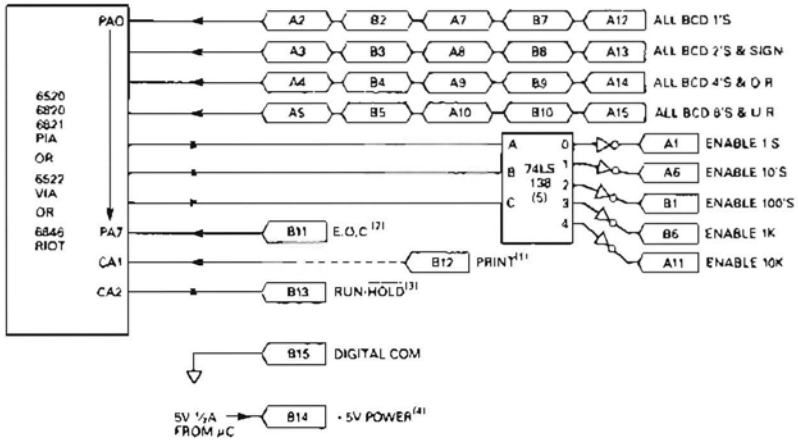
## BUS INTERFACE BLOCK DIAGRAM



## APPLICATIONS (Cont'd)

### MOTOROLA 6800/6502 P.I.A. INTERFACE

The diagram below indicates wiring between the DM-4101D and a Motorola Peripheral Interface Adapter. Please note that an external 74LS138 decoder is specified: this permits both 3-state control lines, and BCD data lines, to interface on a single port of the P.I.A. If preferred, the P.I.A.'s B port may be used, and the decoder omitted.




Notes

1) For interrupt at end of conversion, connect B12 to CA1 & program PIA to negative or positive edge.
2) Due to auto-zero, $\overline{\text{E.O.C.}}$ will go high approx. 60mS after initiation of conversion of RUN/$\overline{\text{HOLD}}$. $\overline{\text{E.O.C.}}$ will remain high for a minimum of 60mS for zero analog input, to 180mS for ± full scale. If polling of the $\overline{\text{E.O.C.}}$ is used as check on valid data, the polling sequence should not commence until 100mS after initiation of conversion.
3) To initiate a conversion RUN/$\overline{\text{HOLD}}$ should be pulsed high for a minimum of 300µS. Additional RUN/$\overline{\text{HOLD}}$ pulses after initiation of conversion until $\overline{\text{E.O.C.}}$ goes low will have no effect. If RUN/$\overline{\text{HOLD}}$ is held high continuously, DM-4100D will perform conversions continuously at about 3 conversions/sec.
4) 5V @ ½ A may be derived from the µC buss if power supplies have capacity.

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