DPM-3

SERIAL COMMUNICATION MANUAL
(Option T)

Transducer Techniques®

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REVISED 05/11

FOR TECHNICAL SUPPORT, CALL

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2. INTRODUCTION, CUSTOM ASCII SERIAL PROTOCOL

The Custom ASCII Protocol is a simple serial communications protocol which is optimized for use with the DPM-3 digital panel meter. This meter accepts an optional serial communications plug-in board, which can be an RS232 board with a single RF11 jack or an RS485 board with dual RJ11 jacks.

The RS232 board allows easy connection of a single meter to a PC.

The RS485 board allows up to 31 meters to be digitally addressed on the same RS485 line. Its dual RJ11 jacks are wired in parallel and allow daisy-chaining using readily available, straight-through 6-wire data cables (not 4-wire telephone cables or crossover cables).

3. JUMPER SETTINGS & FIELD WIRING

SAFETY WARNINGS

The DPM-3 may be powered with AC (mains) from 85-264 Vac or 90-300 Vdc with standard high voltage power, or 12-32V ac or 10-48 Vdc with the low voltage power supply option. To avoid the possibility of electrical shock or damaging short circuits, always unplug the device before opening the case. Please refer to the DPM-3 Operator Manual for full safety information and instruction on how to open the case. Signal wiring changes external to the case can be made safely while the units are under power.

JUMPERS ON SERIAL METER BOARDS

RS232 Board

e - Normal operation.
f - Slave display to RS232 from another meter.
g - Pull-up resistor on RTS line.

Note: Board is shipped with jumpers **e** and **g** installed

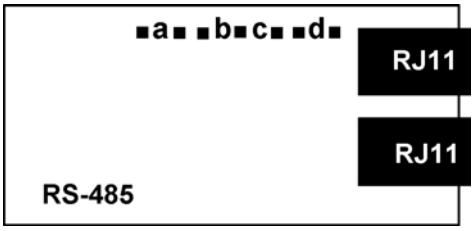
RS485 Board, Full Duplex Operation

b & d - Installed on last meter in long cable run.

RS485 Board, Half Duplex Operation

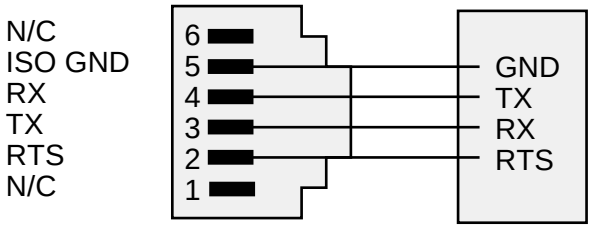
a & c - Installed for half duplex operation.
d - Installed on last meter in line with long cable runs.

Note: Board is shipped with no jumpers installed.

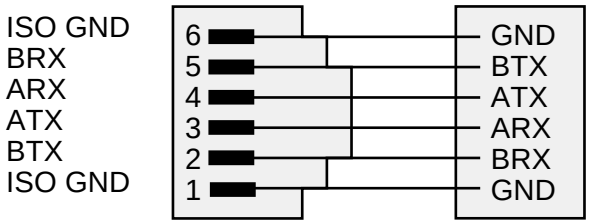


CONNECTOR WIRING, SERIAL BOARD TO COMPUTER

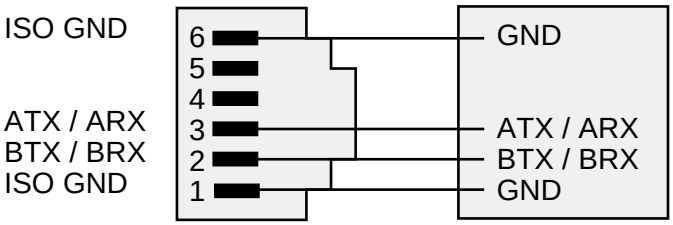
RS232 INTERFACE



RS485 INTERFACE - FULL DUPLEX



RS485 INTERFACE - HALF DUPLEX



4. PROGRAMMING THE DPM-3

OVERVIEW

The DPM-3 is easily programmed via an RS232 serial port using Windows-based **Instrument Setup (IS)** software, which provides a graphical user interface and is available at no charge. This software allows uploading, editing, downloading and saving of setup data, execution of commands under computer control, listing, plotting and graphing of data, and computer prompted calibration. The DPM-3 can also be programmed via its 4-key front panel as explained in the DPM-3 Operator Manual.

GETTING STARTED WITH INSTRUMENT SETUP SOFTWARE

To install IS software, download the file *DPM-3-IS.exe* from our website, double-click on the file name to extract three files, double-click *on setup.exe*, and follow the prompts. To launch IS software, press *Start => Programs => DPM-3 Digital Panel Meter => DPM-3 Instrument Setup* Establish communications by selecting matching settings between the instrument and PC, and click on *Establish*. Once communications have been established, click on *Main Menu*.

The best way to learn IS software is to experiment with it. From the Main Menu, click on *Get Setup* to retrieve (or get) the existing setup data from your device. Click on *View = > Setup* to bring up screens which allow you to edit the setup file using pull-down menus and other selection tools. You can save your file to disk by clicking on *File = > Save Setup*. You can download (or put) your edited file into the device by clicking on *Put Setup*. Programmable items will only be displayed if the appropriate hardware has been detected, such as the dual relay option. Pressing the *F1* key at any time will bring up detailed help information.

An analog output is defined in two steps. The input to the device is first scaled to a digital reading in engineering units, and this reading is then scaled to the analog output. The digital reading is also used for setpoint control and can be transmitted as serial data.

ADDITIONAL FEATURES

- **The Commands pull-down menu** allows you to execute certain functions by using your computer mouse. The *Commands* pull-down menu will be grayed out unless a *Get Setup* has been executed.
- **The Readings pull-down menu** provides three formats to display input data on your PC monitor. In all formats, use the *Pause* and *Continue* buttons to control the timing of data collection, then press *Print* for a hardcopy on your PC printer. **List** presents the latest digital readings in a 20-row by 10-column table. **Plot** generates a plot of digital readings vs. time in seconds, like an oscilloscope. **Graph** generates a histogram, where the horizontal axis is the reading and the vertical axis is the number of readings.

5. FRONT PANEL SETUP, SERIAL COMMUNICATIONS

MENU > Press Menu Select Key	> PEAK Press Digit Select Key	∧ RESET Press Value Select Key
SEr 1 Press the Menu key until *Ser 1* is displayed. Fixed Parameters: - No parity - 8 data bits - 1 stop bit	**_000** Output filtering	**0** Send unfiltered signal **1** Send filtered signal
	_000 Baud rate	**0** 300 baud **1** 600 baud **2** 1200 baud **3** 2400 baud **4** 4800 baud **5** 9600 baud **6** 19200 baud
	_000 Output update rate, Continuous Data Output Mode.	60 Hz / 50 Hz **0** 0.017 sec / 0.020 sec **1** 0.28 sec / 0.34 sec **2** 0.57 sec / 0.68 sec **3** 1.1 sec / 1.4 sec **4** 2.3 sec / 2.7 sec **5** 4.5 sec / 5.4 sec **6** 9.1 sec / 10.9 sec **7** 18.1 sec / 21.8 sec **8** 36.6 sec / 43.5 sec **9** 72.5 sec / 86.7 sec
SEr 2 Serial Setup 2	**_0000** Line feed	**0** No <LF> following <CR> **1** <LF> following <CR>
	_0000 Alarm data with readings	**0** No alarm data with reading **1** Alarm data with reading
	_0000 Control of data output	**0** Continuous data output **1** Data output on ASCII command only
	_0000 Meter address	Select **1** thru **F** for addresses 1 thru 15. Select **0.** thru **F.** (with decimal point) for addresses 16 thru 31.

Press Menu Select Key	Press Digit Select Key	Press Value Select Key
SEr 3 Serial Setup 3	00000 RS485 half or full duplex	0 Full duplex 1 Half duplex
	00000 Special start & stop char. (entered using Instrument Setup Software)	0 * Start, <CR> Stop characters 1 Special Start & Stop characters
	00000 RTS mode (for RS232)	0 Normal non-latching RTS 1 Single transmission, latching RTS
	00000 Termination characters	0 Only at end of all items 1 At end of each item
	00000 Data sent, digital panel meter only	0 Reading 1 Peak 2 Valley 3 Reading + Peak 4 Reading + Valley 5 Reading + Peak + Valley
	00000 Data sent, scale meter only	0 Net + Gross 1 Net only 2 Gross only 3 Peak only (Net or Gross) 4 Net + Gross + Peak 5 Valley only
SEr 4 Serial Setup 4	000 Modbus ASCII gap timeout*	0 1 sec 2 5 sec 1 3 sec 3 10 sec
	000 Serial protocol	0 Custom ASCII 1 Modbus RTU* 2 Modbus ASCII*
	000 Parity	0 None 1 Odd (Modbus only)* 2 Even (Modbus only)*
Addr Modbus Address*	000 000 000 Select digit to flash.	158 Select 0 through 9 for flashing digit. Address range is 1 to 247.

6. CUSTOM ASCII COMMUNICATION PROTOCOL

SERIAL COMMUNICATION FORMAT

The Custom ASCII serial communication format for RS232, RS485 and USB is the following:

Duplex ..... Full duplex for RS232 & RS485. Half duplex selectable for RS485.
Baud Rate ..... 300, 600, 1200, 2400, 4800, 9600, 19200 selectable by front panel Menu item “Ser 1”, Sub-menu item “Digit 4”.
Parity ..... None
Word length ..... 8 data bits
Stop bit 1

MEASUREMENT DATA FORMAT

The basic measurement data format consists of 8 ASCII characters for the DPM-3, such as <SP>999.99<CR>, where <SP> is the space character and <CR> is the carriage return character. The first character is always a space character or minus sign. A decimal point is always furnished, even when it follows the last digit.

Adding a Line Feed Character to the Basic Format

Printers and other devices that receive the measurement data may require a line feed character <LF> following the <CR>. The line feed character <LF> may be selected in “Ser 2”.

Adding a Coded Data Character to the Basic Format

It is possible to add a coded character from A to h to the data string according to the following table to indicate the alarm and overload status of the device. If used, this character precedes the <CR>, so it is the last printable character in the string. With the optional <LF> and coded character selected, the data string will consist of 10 characters for the DPM-3: <SP>999.99A <CR><LF>.

Alarm # 4 3 2 1	Alarm with No Overload	Alarm with Overload
0 0 0 0	A	E
0 0 0 1	B	F
0 0 1 0	C	G
0 0 1 1	D	H
0 1 0 0	I	M
0 1 0 1	J	N
0 1 1 0	K	O
0 1 1 1	L	P

1 0 0 0	Q	U
1 0 0 1	R	V
1 0 1 0	S	W
1 0 1 1	T	X
1 1 0 0	a	e
1 1 0 1	b	f
1 1 1 0	c	g
1 1 1 1	d	h

For example, a coded character "G" indicates that Alarm 2 only is set and that the DPM-3 is in the overload condition. This information is useful when data is supplied to a computer for listing and analysis, or when data is supplied to a Remote Display in a Master-Slave configuration.

Values are transmitted in a continuous string with no space between them. If the 5th digit in "Ser 3" is set to 1, the termination characters of <CR> and optional <LF> appear after each value. If the 5th digit is set to 0, the termination characters appear only once at the end of the string. In either case, if included, the coded character appears at the end of the last value only.

NETWORK CONFIGURATIONS

The DPM-3 can operate in a point-to-point mode using RS-232 or RS-485, or in a multi-point mode using RS-485.

The point-to-point mode is a direct connection between a computer (or other digital device) and the DPM-3.

The multi-point mode is a connection from a host computer to a multiplicity of DPM-3's bused together with their inputs and outputs connected in parallel. For long cable runs, the first and last devices should have a termination resistor installed. It is necessary to set up each device on the bus with a different address from 1 to 31. To command a particular device, its address is used in conjunction with the command, and only that device responds. The outputs of all of the devices on the bus are set to a high impedance state, except the device being addressed. The device addresses range from 1 to 31. A special address to which all meters respond is 0 and should not be used in the multi-point mode. Addressing of meters can be set in "Ser 2". A DPM-3 operating in a point-to-point mode must also be addressed. Although any address will suffice, it is suggested address = 1 be selected for the point-to-point mode.

OPERATING MODES

In the Continuous Mode, measurements are continuously transmitted by the DPM-3 in a standard data format. Please see the next manual section.

In the Command Mode, the DPM-3 does not send any data automatically, but responds to commands received from a host computer. Please see the manual section following the Continuous Mode.

7. CONTINUOUS MODE

OVERVIEW

In the Continuous Operating Mode, measurements are continuously transmitted by the DPM-3 in a standard data format using printable ASCII characters at a user-selectable rate ranging from 50 or 60 Hz line frequency down to one measurement every 72 seconds. This data may be received by a remote display at a distant location, by a printer for data logging purposes, or by a host computer for data analysis or system control. Both hardware (RTS) and software (XON/XOFF) handshaking are available for RS232, but neither is available for RS485.

OUTPUT RATE

The transmission rate of the measurement data can be selected in "Ser 1". The meter conversion rate equals the AC power frequency (50 or 60 Hz). Any baud rate may be used, but if less than the minimum baud rate in the table, the transmission rate will decrease accordingly.

Output Rate	Data Output Rate	Minimum Baud Rate		
"Ser 1" Setting	50 Hz / 60 Hz	1 Item Sent	2 Items Sent	3 Items Sent
0	0.021s / .018 s	9600	9600	19200
1	0.34 s / 0.28 s	600	600 / 1200	1200
2	0.68 s / 0.57 s	300	300 / 600	600
3	1.4 s / 1.1 s	300	300	300
4	2.7 s / 2.3 s	300	300	300
5	5.4 s / 4.5 s	300	300	300
6	10.9 s / 9.1 s	300	300	300
7	21.8 s / 18.1 s	300	300	300
8	43.5 s / 36.3 s	300	300	300
9	86.7s / 72.3 s	300	300	300

The data transmission rate may be reduced by sending data every other reading, every fourth reading, or less. This selection is made in "Ser 1". A computer, if busy with other tasks, may be unable to keep up with the faster data rates of the meter, so a handshake function is available that provides the computer with control over the meters' data transmissions.

RTS CONTROL

RTS control does not apply to RS485. The DPM-3 has two RS232 RTS modes: unlatched and latched. These modes are selected in "Ser3".

In the unlatched mode, the measurement transmission is enabled by a high RTS level and is disabled by a low RTS level. When disabled, any character being sent is completed. When enabled, any characters remaining in the data format are transmitted before the next measu-

rement transmission. The computer, when its receive buffer is nearly full, takes the RTS line low to halt data transmission. When its receive buffer has emptied, it takes the RTS line high to enable more data transmissions. Some measurements could be missed in the process.

In the latched mode, the RTS input is polled every 3.3 ms. When a high level is detected, RTS is latched true, even though the RTS line may go low immediately thereafter. At the end of each calculation, the latched RTS value is checked. If it is true, a complete measurement transmission (from 1 to 3 values) is made without interruption, regardless of the state of the RTS line during that time. At the end of the complete transmission, the latched RTS value is reset false, even though the RTS line may be high at that instant. The RTS latch does not go true again until the RTS line is detected at a low level after the completion of the transmission, and is then is taken high again. Latched control provides "print command" operation by sending a transmission for each RTS pulse. If a second pulse occurs during the transmission, it is not recognized.

XON / XOFF CONTROL

Applicable to RS232, not RS485. A measurement transmission is enabled by the receipt of an ASCII XON character. It is disabled by the receipt of an ASCII XOFF character.

8. COMMAND MODE

OVERVIEW

In the Command Mode, the DPM-3 does not send any data automatically, but responds to commands received from a host computer. These commands can be:

- To transmit the latest, peak, or valley measurement.
- To reset the meter completely or just the peak and valley values and latched alarms.
- To display a value sent from the computer.
- To transmit present setup parameters.
- To receive new setup parameters.
- To monitor or alter data in selected memory locations of the meter.

The selection of either the Continuous mode or the Command Mode can be made from the front panel Menu selection "Ser 2". The meter will not respond to a command in the Continuous Mode, except the command "A1", which puts the meter into the Command Mode.

COMMAND MODE FORMAT

The minimum format is 4 characters. Example: *5A1

CHAR 1 - COMMAND IDENTIFIER

All commands begin with "*" followed by the meter address, then a command letter followed by a sub-command number or letter. Additional characters may be appended. All commands terminate with <CR> (<LF> ignored).

Char #	Character	Description
1	*	Command Identifier (Recognition Character)
2	0-V	Device Address (0 addresses all devices, 1-V specific)
3	A-Z	Command Function
4	0-U	Sub-command (or # Bytes or Words of data being transferred)

CHAR 2 - ADDRESS CODES

The next table is the Serial Communication Address Codes following the "*" for each meter address number. Also shown is the corresponding character that is set in menu item "SER 2".

Meter #	Meter SER 2 Digit 5(6)	Serial Comm Address Code
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
10	A	A
11	B	B
12	C	C
13	D	D
14	E	E
15	F	F

Meter #	Meter SER 2 Digit 5(6)	Serial Comm Address Code
16	0.	G
17	1.	H
18	2.	I
19	3.	J
20	4.	K
21	5.	L
22	6.	M
23	7.	N
24	8.	O
25	9.	P
26	A.	Q
27	B.	R
28	C.	S
29	D.	T
30	E.	U
31	F.	V

CHARS 3 & 4 - COMMANDS AND SUBCOMMANDS

The examples below use a default address of 1 following the "*". Substitute the desired address from the above table of Serial Comm Address Codes. All command sequences shown must terminate with <CR>, followed by an optional <LF>.

COMMUNICATIONS MODE

Continuous mode	*1A0
Command mode	*1A1

REQUEST DPM-3 VALUES

Get reading**	*1B1
Peak reading	*1B2
Valley reading	*1B3

** The meter transmits the value or values selected in Ser 3.

RESET FUNCTIONS, DPM-3

Cold reset	*1C0	Reads NVMEM into RAM locations after RAM is zeroed.
Latched alarms reset	*1C2	
Peak value reset	*1C3	
Remote display reset	*1C4	
External Input B true	*1C5	
External Input B false	*1C6	
External Input A true	*1C7	
External Input A false	*1C8	
Valley reset	*1C9	
Tare function	*1CA	
Tare reset	*1CB	

READING AND WRITING TO RAM AND NONVOLATILE MEMORY

CHARACTERS 1, 2

The Recognition character and Meter Address Code are the same as shown in previous table.

CHARACTER 3: Command character:

- G Read bytes from RAM Memory
- F Write bytes to RAM Memory (DPM and Scale meter only)
- R Read bytes from Upper RAM Memory
- Q Write bytes to Upper RAM Memory
- X Read words from Non-Volatile Memory
- W Write words to Non-Volatile Memory

CHARACTER 4: Number of bytes (G, F, R, Q) or words (X, W)

Code #			
1 = 1	9 = 9	H = 17	P = 25
2 = 2	A = 10	I = 18	Q = 26
3 = 3	B = 11	J = 19	R = 27
4 = 4	C = 12	K = 20	S = 28
5 = 5	D = 13	L = 21	T = 29
6 = 6	E = 14	M = 22	U = 30
7 = 7	F = 15	N = 23	
8 = 8	G = 16	O = 24	

CHARACTERS 5, 6

See tables for the RAM MEMORY ADDRESSES and NONVOLATILE MEMORY ADDRESSES with their respective data definitions.

CHARACTERS 7 & UP: Data to be written (F, Q, W).

GENERAL, READING AND WRITING RAM MEMORY DATA

RAM memory data is read and written as a continuous string of bytes consisting of 2 hex characters (0-9,A-F) per byte. Included in the command are the total number of bytes to be transferred and the most significant address in RAM of the continuous string of bytes. The format is:

Read lower RAM data *1Gnaa
Write lower RAM data *1Fnaa<data>
Read upper RAM data *1Rnaa
Write upper RAM data *1Qnaa<data>
where: n is the number of bytes to be read or written.
aa is the most significant RAM address in of the bytes to be read or written.
<data> is n bytes of 2 hex characters per byte in order from the most to the least significant byte.

The number of bytes n consists of a single code character representing values from 1 to 30 as shown above under CHARACTER 4. The most significant address aa consists of 2 hex characters as shown below under RAM MEMORY ADDRESSES AND DATA DEFINITIONS.

GENERAL, READING AND WRITING NONVOLATILE MEMORY DATA

Nonvolatile data is read and written as a continuous string of words consisting of 2 bytes or 4 hex characters (0-9,A-F) per word. Included in the command are the total number of words to be transferred and the most significant address in nonvolatile memory of the continuous string of words. The format is:

Read nonvolatile memory data *1Xnaa (Meter reset occurs after all data is read.)
Write non-volatile memory data *1Wnaa <data> (Meter reset occurs after data is written.)
where: n is the number of words to be read or written.
aa is the most significant address of the words to be read or written in nonvolatile memory.
<data> is n words of 2 bytes or 4 hex characters per word in order from the most to the least significant address

The coded number of words n consists of a single character representing values from 1 to 30 as shown under CHARACTER 4. The most significant address aa consists of 2 hex characters as shown under NONVOLATILE MEMORY ADDRESSES.

9. APPENDIX: DPM-3 MEMORY ADDRESSES AND DATA DEFINITIONS

DPM 1-BYTE RAM MEMORY DATA

(L) = Lower memory, (U) = Upper memory.

The bit assignments below constitute an 8-bit binary number, which needs to be converted to Hex using a program such a Scientific Calculator under MS Windows Accessories. To change an Item in DPM RAM Memory, write the converted Hex value to the Hex Address shown in the left column. To change an Item in Nonvolatile Memory, go to table 10.4, read the existing two-byte word (MS byte and LS byte) from the DPM for the Hex Address which includes the Item to be changed, edit the MS or LS byte as appropriate, and write the edited word back to the Hex Address. Be careful not to overwrite the Sig Cond Type LS byte under Hex Address 15.

Hex Address	Item Name	Bit Assignment
DE (L)	Configuration	Bit 7 6 5 4 3 2 1 0
		0 Linear data
		1 Custom curve (Extended DPM)
		0 Spare
		0 No Auto-Tare
		1 Auto-Tare
		0 0 Peak button displays Peak
		0 1 Peak button displays Valley
		1 0 Peak b. displays Peak then Valley
		1 1 Peak button tares the meter
		0 0 0 Not rate
		0 0 1 Rate x 0.1
		0 1 0 Rate x 1
		0 1 1 Rate x 10
		1 0 0 Rate x 100
		1 0 1 Rate x 1000
		1 1 0 Rate x 10,000
BF (L)	Analog Setup	Bit 7 6 5 4 3 2 1 0
		0 Analog output unfiltered
		1 Analog output filtered
		0 0 0-20 mA current output
		0 1 0-10V voltage output
		1 0 4-20 mA current output
		1 1 -10V to +10V output

69 (L)	Serial Cnfg3	Bit 7 6 5 4 3 2 1 0 0 0 0 Send Reading 0 0 1 Send Peak 0 1 0 Send Valley 0 1 1 Send Reading + Peak 1 0 0 Send Reading + Valley 1 0 1 Send Reading + Peak + Valley 0 <CR> or <CR><LF> at end of all Items 1 <CR> or <CR><LF> at end of each Item (if no Alarm character) 0 Non-latching RTS 1 Latching RTS 0 Normal continuous TX 1 Special Start & Stop characters 0 Full duplex 1 Half duplex
35 (L)	Decimal Point	01 Byte values in hex XXXXX. 02 (2 hex characters/byte) XXXX.X 03 XXX.XX 04 XX.XXX 05 X.XXXX 06 .XXXXX
34 (L)	Lockout2 0 = unlocked 1 = locked	Bit 7 6 5 4 3 2 1 0 <u>Menu item & front panel lockout</u> 1 Serial configuration 1 Analog output scaling 1 Alarm setpoint programming 1 Alarm setup 1 Front panel DPM reset 1 Front panel Peak & Alarm reset 1 View alarm setpoints 1 View Peak value & Tare function
33 (L)	Lockout1 0 = unlocked 1 = locked	Bit 7 6 5 4 3 2 1 0 <u>Menu item & front panel lockout</u> 1 Offset, Lo & Hi readings 1 Scale, Lo In, Hi In 1 Filter Setup 1 Setup, Config & Decimal Point 1 InPut Menu Item

32 (L)	Serial Cnfg2	Bit 7	6	5	4	3	2	1	0	
					X	X	X	X	X	Binary Custom ASCII addr. 0-31
				0						Continuous mode
				1						Command mode
			0							Alarm data not included with rdg.
			1							Alarm data included with rdg.
		0								No <LF> following <CR>
		1								<LF> following <CR>
31 (L)	Serial Cnfg1	Bit 7	6	5	4	3	2	1	0	Continuous Output Data Rate
										60 Hz 50 Hz
						0	0	0	0	0.017s 0.02s
						0	0	0	1	0.28 0.34
						0	0	1	0	0.57 0.68
						0	0	1	1	1.1 1.4
						0	1	0	0	2.3 2.7
						0	1	0	1	4.5 5.4
						0	1	1	0	9.1 10.9
						0	1	1	1	18.1 21.8
						1	0	0	0	36.3 43.5
						1	0	0	1	1:13 1:27
						1	0	1	0	2:25 2:54
						1	0	1	1	4:50 5:48
						1	1	0	0	9:40 11:36
						1	1	0	1	19:20 23:13
						1	1	1	0	38:41 46:25
						1	1	1	1	1:17:21 1:32:51
			0	0	0					300 baud
			0	0	1					600 baud
			0	1	0					1200 baud
			0	1	1					2400 baud
			1	0	0					4800 baud
			1	0	1					9600 baud
			1	1	0					19200 baud
		0								Send unfiltered value
		1								Send filtered value

2F (L)	Filter	Bit 7 6 5 4 3 2 1 0 0 0 0 0 Auto Filter 0 0 0 1 Batch (16 samples) filter Time constant 60 Hz 50 Hz 0 0 1 0 Moving average 0.07 s 0.085 s 0 0 1 1 Moving average 0.14 0.17 0 1 0 0 Moving average 0.28 0.34 0 1 0 1 Moving average 0.57 0.68 0 1 1 0 Moving average 1.13 1.36 0 1 1 1 Moving average 2.27 2.72 1 0 0 0 Moving average 4.53 5.44 1 0 0 1 Moving average 9.06 10.88 1 0 1 0 Unfiltered 0 Low adaptive threshold 1 High adaptive threshold 0 Display batch 1 Display filtered signal 0 Take peak of unfiltered signal 1 Take peak of filtered signal 0 Alarm from unfiltered signal 1 Alarm from filtered signal
2D (L)	Setup	Bit 7 6 5 4 3 2 1 0 EXT IN 1 EXT IN 2 BOTH 0 0 0 0 Mtr Reset Mtr Hold Mtr Reset 0 0 0 1 Fct Reset Rd Pk/Vl Mtr Reset 0 0 1 0 Mtr Hold Rd Pk/Vl Fct Reset 0 0 1 1 Mtr Hold Tare Mtr Reset 0 1 0 0 Rd Pk/Vl Tare Fct Reset 0 1 0 1 Tare Mtr Reset Mtr Reset 0 1 1 0 DP2 DP3 DP4 0 1 1 1 DP3 DP4 DP5 1 0 0 0 Fct Reset Disp Blank Mtr Reset 1 0 0 1 Mtr Hold Disp Blank Mtr Reset 1 0 1 0 Rd Pk/Vl Disp Blank Fct Reset 1 0 1 1 Tare Disp Blank Mtr Reset 1 1 0 0 Rd Valley Read Peak Fct Reset 1 1 0 1 Tare Tare Reset Mtr Reset 0 0 Scale using Scale & Offset method 0 1 Scale using Coordinates of 2 Points method 1 1 Scale using Reading Coordinates of 2 Points 0 60 Hz power 1 50 Hz power

09 (U)	Setup1* * Cannot be written to RAM	Bit 7	6	5	4	3	2	1	0	
								0	0	4-1/2 digit display (0.1° temp.)
								0	1	Remote display
								1	0	4-1/2 digit count by 10 (0.01° t.)
								1	1	3-1/2 digit display (1° temp.)
0D (U)	Alarm Confg4	Bit 7	6	5	4	3	2	1	0	Alarm Trigger Delay
										60 Hz 50Hz
							0	0	0	0.018 s 0.021 s
							0	0	1	0.035 0.043
							0	1	0	0.07 0.085
							0	1	1	0.14 0.17
							1	0	0	0.28 0.34
							1	0	1	0.56 0.68
							1	1	0	1.13 1.36
							1	1	1	2.27 2.72
				0	0	0				AI3 Band Dev, AI4 Band Dev
				0	0	1				AI3 Hysteresis, AI4 Band Dev
				0	1	0				AI3 Band Dev, AI4 Hysteresis
				0	1	1				AI3 Hysteresis, AI4 Hysteresis
				1	0	0				No deviation in menus or calc
0C (U)	Alarm Confg3	Bit 7	6	5	4	3	2	1	0	
						0	0	0	0	AI3 Hi active, AI4 Hi active
						0	0	0	1	AI3 Lo active, AI4 Hi active
						0	0	1	0	AI3 Disabled, AI4 Hi active
						0	1	0	0	AI3 Hi active, AI4 Lo active
						0	1	0	1	AI3 Lo active, AI4 Lo active
						0	1	1	0	AI3 disabled, AI4 Lo active
						1	0	0	0	AI3 Hi active, AI4 disabled
						1	0	0	1	AI3 Lo active, AI4 disabled
						1	0	1	0	AI3 disabled, AI4 disabled
				0	0					AI3 non-latch, AI4 non-latch
				0	1					AI3 latch, AI4 non-latch
				1	0					AI3 non-latch, AI4 latch
				1	1					AI3 latch, AI4 latch
		0	0	Relay3 On when AI3 active, Relay4 On when AI4 active						
		0	1	Relay3 Off when AI3 active, Relay4 On when AI4 active						
		1	0	Relay3 On when AI3 active, Relay4 Off when AI4 active						
		1	1	Relay3 Off when AI3 active, Relay4 Off when AI4 active						

0B (U)	Alarm Confg2	Bit 7	6	5	4	3	2	1	0	Alarm Trigger Delay	
										60 Hz	50Hz
							0	0	0	0.018s	0.021s
							0	0	1	0.035	0.043
							0	1	0	0.07	0.085
							0	1	1	0.14	0.17
							1	0	0	0.28	0.34
							1	0	1	0.56	0.68
							1	1	0	1.13	1.36
							1	1	1	2.27	2.72
				0	0	0				Al1 Band Dev, Al2 Band Dev	
				0	0	1				Al1 Hysteresis, Al2 Band Dev	
				0	1	0				Al1 Band Dev, Al2 Hysteresis	
				0	1	1				Al1 Hysteresis, Al2 Hysteresis	
				1	0	0				No deviation in menus or calc	
0A (U)	Alarm Confg1	Bit 7	6	5	4	3	2	1	0		
						0	0	0	0	Al1 Hi active, Al2 Hi active	
						0	0	0	1	Al1 Lo active, Al2 Hi active	
						0	0	1	0	Al1 Disabled, Al2 Hi active	
						0	1	0	0	Al1 Hi active, Al2 Lo active	
						0	1	0	1	Al1 Lo active, Al2 Lo active	
						0	1	1	0	Al1 disabled, Al2 Lo active	
						1	0	0	0	Al1 Hi active, Al2 disabled	
						1	0	0	1	Al1 Lo active, Al2 disabled	
						1	0	1	0	Al1 disabled, Al2 disabled	
				0	0					Al1 & Al2 non-latching	
				0	1					Al1 latching, Al2 non-latching	
				1	0					Al1 non-latching, Al2 latching	
				1	1					Al1 & Al2 latching	
		0	0	Relay1 On when Al1 active, Relay2 On when Al2 active							
		0	1	Relay1 Off when Al1 active, Relay2 On when Al2 active							
		1	0	Relay1 On when Al1 active, Relay2 Off when Al2 active							
		1	1	Relay1 Off when Al1 active, Relay2 Off when Al2 active							

00 (U)	Serial Cnfg4	Bit	7	6	5	4	3	2	1	0	Serial Protocol
									0	0	No Parity
									0	1	Odd Parity
									1	0	Even Parity
							0	0			Custom ASCII protocol (8 bits)
							0	1			Modbus RTU protocol (8 bits)
							1	0			Modbus ASCII protocol (7 bits)
					0	0					1 s Modbus ASCII gap timeout
					0	1					3 s Modbus ASCII gap timeout
					1	0					5 s Modbus ASCII gap timeout
					1	1					10 s Modbus ASCII gap timeout
35 (U)	Modbus Addr.	00 to FF									Modbus address 0-255 (in Hex format)

DPM-3 3-BYTE RAM MEMORY DATA

	MS byte	Mid byte	LS byte
Format for all items except Scale Factor:	XX	XX	XX
Format for Scale Factor:	*X	XX	XX

The 4-bit MS nibble "*" sets the polarity and decimal point according to the following table:

Positive	Negative	Decimal Point
1	9	XXXXX.
2	A	XXXX.X
3	B	XXX.XX
4	C	XX.XXX
5	D	X.XXXX
6	E	.XXXXX

DPM-3 HEX ADDRESSES **Note:** Hex values are 2's complement and absolute values.

MS	Mid	LS	Description
A1 (L)	A0	9F	Analog high value
9E (L)	9D	9C	Analog low value
1B (U)	1A	19	Deviation, Alarm4
18 (U)	17	16	Deviation, Alarm3
9B (L)	9A	99	Deviation, Alarm2
98 (L)	97	96	Deviation, Alarm1
8F (L)	8E	8D	Offset value
8C (L)	8B	8A	Scale factor

15 (U)	14	13	Setpoint4
12 (U)	11	10	Setpoint3
89 (L)	88	87	Setpoint2
86 (L)	85	84	Setpoint1

DPM-3 NONVOLATILE MEMORY ADDRESSES (2 bytes/address)

Hex Address	MS Byte	LS Byte
75	Setup1	Serial Confg3
74	Deviation4 3	Deviation4 2
73	Deviation4 1	Deviation3 3
72	Deviation3 2	Deviation3 1
71	Setpoint4 3	Setpoint4 2
70	Setpoint4 1	Setpoint3 3
6F	Setpoint3 2	Setpoint3 1
6E	Alarm Cnfg4	Alarm Confg3
18	Deviation2 3	Deviation2 2
17	Deviation2 1	Deviation1 3
16	Deviation1 2	Deviation1 1
15	Configuration	Sig Cond Type (do not change)
14	Analog Setup	System Decimal Point
13	Lockout2	Lockout 1
12	Serial Cnfg2	Serial Cnfg 1
11	Options	Filter
10	Setup	Input Type
0F	Alarm Cnfg2	Alarm Cnfg 1
0E	Analog High 3	Analog High 2
0D	Analog High 1	Analog Low 3
0C	Analog Low 2	Analog Low 1
0B	High Reading 3	High Reading 2
0A	High Reading 1	High Input 3
09	High Input 2	High Input 1
08	Low Reading 3	Low Reading 2
07	Low Reading 1	Low Input 3
06	Low Input 2	Low Input 1
05	Offset 3	Offset 2
04	Offset 1	Scale Factor 3
03	Scale Factor 2	Scale Factor 1
02	Setpoint2 3	Setpoint2 2
01	Setpoint2 1	Setpoint1 3
00	Setpoint1 2	Setpoint1 1

10. WARRANTY & REPAIR POLICY

Limited Warranty on Products

Any of our products which, under normal operating conditions, proves defective in material or in workmanship within one (1) year from the date of shipment by Transducer Techniques, will be repaired or replaced free of charge provided that you obtain a return material authorization from Transducer Techniques and send the defective product, transportation charges prepaid with notice of the defect, and establish that the product has been properly installed, maintained, and operated within the limits of rated and normal usage. Replacement product will be shipped F.O.B. our plant. The terms of this warranty do not extend to any product or part thereof which, under normal usage, has an inherently shorter useful life than one year. The replacement warranty detailed here is the Buyer's exclusive remedy, and will satisfy all obligations of Transducer Techniques, whether based on contract, negligence, or otherwise. Transducer Techniques is not responsible for any incidental or consequential loss or damage which might result from a failure of any Transducer Techniques' product. This express warranty is made in lieu of any and all other warranties, expressed or implied, including implied warranty of merchantability or fitness for particular purpose. Any unauthorized disassembly or attempt to repair voids this warranty.

Obtaining Service Under Warranty

Advance authorization is required prior to the return to Transducer Techniques. Before returning the item(s), either write to the Repair Department c/o Transducer Techniques, 42480 Rio Nedo, Temecula, CA 92590, or call (951) 719-3965 with: 1) a part number; 2) a serial number for the defective product; 3) a technical description of the defect; 4) a no-charge purchase order number (so products can be returned to you correctly); and, 5) ship to and bill to addresses. Shipment to Transducer Techniques shall be at Buyer's expense, and repaired or replacement items will be shipped F.O.B. our plant in Temecula CA. Non-verified problems or defects may be subject to a $75 evaluation charge. Please return the original calibration data with the unit.

Obtaining Non-Warranty Service

Advance authorization is required prior to the return to Transducer Techniques. Before returning the item(s), either write to the Repair Department c/o Transducer Techniques, 42480 Rio Nedo, Temecula, CA 92590, or call (951) 719-3965 with: 1) a model number; 2) a serial number for the defective product; 3) a technical description of the malfunction; 4) a purchase order number to cover Transducer Techniques' repair cost; and 5) ship to and bill to addresses. After the product is evaluated by Transducer Techniques, we will contact you to provide the estimated repair costs before proceeding. The minimum evaluation charge is $75. Shipment to Transducer Techniques shall be at Buyer's expense, and repaired items will be shipped to you F.O.B. our plant in Temecula, CA. Please return the original calibration data with the unit.

Repair Warranty

All repairs of Transducer Techniques' products are warranted for a period of 90 days from the date of shipment. This warranty applies only to those items which were found defective and repaired; it does not apply to products in which no defect was found and returned as is, or merely re-calibrated. Out of warranty products may not be capable of being returned to the exact original specifications or dimensions.

FOR TECHNICAL SUPPORT, CALL (800) 344-3965 OR FAX (951) 719-3900

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E-mail: tti@ttloadcells.com
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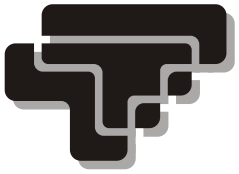

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