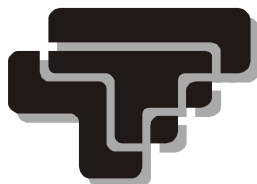


# SSI

## **SMART SENSOR INDICATOR PLUG & PLAY IEEE 1451.4 COMPLIANT OPERATOR MANUAL (USB)**



Transducer  
Techniques®

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

## 2. SSI SERIAL COMMUNICATIONS OVERVIEW

The SSI Smart Sensor Indicator includes a USB 2.0 serial port, which allows the instrument to be connected to the USB port of a PC or other device by means of a USB cable. Serial communications can be used for five purposes:

1. **Meter setup using Instrument Setup Software.** This is a Windows application which can perform all functions of front panel setup. In addition, it allows uploading, editing and downloading of setup data, execution of commands under computer control, and computer prompted calibration. Please see the SSI Operator Manual, Section 11.
2. **TEDS setup using TEDS Reader\_Editor Software.** This is a Windows application which can read and alter data from a TEDS Plug and Play load cell that is connected to the meter.
3. **Data Logging Software.** This is a Windows application with an easy interface to the meter to simplify logging, recalling, listing, plotting and graphing of measurement data.
4. **Command mode operation,** where the instrument is controlled remotely by commands from a PC or other device.
5. **Continuous data output** to a printer or computer for datalogging purposes.

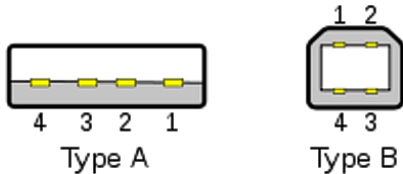
### PHYSICAL CONNECTION



— Type B USB connector



SSI-USB/ACA power adapter with detachable USB cable



Industry standard USB pinout

Pin	Name	Description
1	VBUS	+5V
2	D-	Data -
3	D+	Data +
4	GND	Ground

### SOFTWARE DRIVER

If your computer does not have an FTDI USB driver installed, download and install it from [www.ftdichip.com/Drivers/VCP.htm](http://www.ftdichip.com/Drivers/VCP.htm)

## SERIAL COMMUNICATION FORMAT

- Signal type:** USB2.0
- Baud rate:** 300, 600, 1200, 2400, 4800, 9600, 19200, 38400. Selectable by front panel Menu item SEr\_1, Digit 4.
- Parity:** None
- Word length:** 8 data bits
- Stop bit:** 1
- Data format:** The basic value data format consists of 7 characters: +999.99  
The first character is either a space (for + sign) or a - sign. A decimal point is always furnished, even when it follows the last digit and is not required.

### 3. SERIAL DATA TRANSMISSION

Data can be transmitted via the serial data protocol from the meter to a computer, printer or other collection device. Data transmission can be controlled by the meter or by a computer executing a program such as the SSI-DLS Data Logging software.

Data can be sent continuously without intervention, as single records each requiring a user command, or as a predetermined number of records from memory. The continuous Output Rate is set by menu item SEr\_1, Digit 5. The term "Logging" refers to the transmission of real time data or recall from memory of stored data.

#### THREE TYPES OF DATA FORMAT

##### 1. VALUE FORMAT

**GVVVVV.GVVVVV.GVVVVV.X<cr><lf>**

1 to 3 Values of Reading, Peak or Valley), where **GVVVVV.** is the sign and value, **X** is a coded alarm character (optional), and **<lf>** is an optional line feed. **X** is a letter from A to H, which supplies the alarm and overload status of the meter as follows:

Alarm Status	No Overload	Overload
Neither alarm set	A	E
Alarm 1 set only	B	F
Alarm 2 set only	C	G
Both alarms set	D	H

As described in Section 4, the Value Format of 1 to 3 values is set by the menu item SEr\_3, Digit 5. Optional alarms are set by SEr\_2, Digit 4. Optional line feed is set by SEr\_2, Digit 3.

##### 2. DATA ITEM FORMAT

**##### MM/DD/YY HH:MM:SS GVVVVV.GVVVVV.GVVVVV.UUUU TTT AAF<cr><lf>**

where each letter represents a character.

- #####** is the Memory # (location) at the which the Displayed value is stored if also logging to Memory (optional Data Item).
- MM/DD/YY** is the Date (optional Data Item).
- HH:MM:SS** is the Time (optional Data Item).
- GVVVVV** is one Value.
- UUUU** is the Units (optional Data Item).
- TTT** is the Value Type of the 1 to 3 Values sent (optional Data Item).
- AAF** is the status of Alarms 1 & 2 and overflow (optional Data Item).
- <cr>** is the carriage return.
- <lf>** is the line feed (optional).

Each Data Item is optional, except that one Value must be included. The optional items are selected by the Menu items LoG, SEr\_2 and SEr\_3, as described in Section 4.

### 3. PACKED DATA FORMAT

LLLL LLLL LLLL LLLL LLLL YYYY YYMM MMDD DDDH HHHH NNNN  
NNSS SSSS GPPP TTTV VVVV VVVV VVVV VVVV AAFU UUUU

where each letter represents 1 bit, and each nibble (4 bits) is sent as an ASCII Hex character:

**L** = Memory location #  
**Y** = Year  
**M** = Month  
**D** = Day  
**H** = Hour  
**N** = Minute  
**S** = Second

**G** = Sign of Data  
**P** = Decimal Point location  
**T** = Type of Data  
**V** = Value of Data  
**A** = Alarm status  
**F** = Overload status  
**U** = Units

### FOUR CATEGORIES OF SERIAL DATA TRANSMISSION

#### 1. Meter-Controlled Logging

##### A. Value Format

The Value Format is transmitted continuously at the selected Output Rate when the Meter is set to the Continuous mode (Ser 2, Digit 5 = 0).

##### B. Data Item Format

The Data Item selection for transmission is set by the Meter menu items LoG and SEr\_2 as described in Section 4. In the RUN mode, a single Logging record is transmitted with each push of the **LOG** key. Continuous Logging records are transmitted at the Output Rate when the **LOG** key is held for 2 seconds and terminated with a subsequent short push of the **LOG** key.

#### 2. Meter-Controlled Memory Recall

##### A. Data Item Format

The Data Item selection for transmission is set by the Meter menu items LoG and SEr\_2 as described in Section 4. In the RECALL mode, a single Memory Recall record is transmitted with each push of the **LOG** key. Continuous Logging records are transmitted when the **LOG** key is held for 2 seconds and terminated with a subsequent short push of the **LOG** key.

#### 3. Computer-Controlled Logging - Meter in the RUN mode

##### A. Value Format

The Value Format is transmitted as a single record with each "\*1B1" command issued by the Computer in the Command mode. The Value Format is transmitted continuously at the Output Rate when a "\*1A0" command is issued by the Computer. Continuous Transmission is terminated with a "\*1A1" command.

##### B. Data Item Format

The Data Item selection for transmission is set by the Meter menu items LoG and SEr\_2 as described in Section 4. A single Logging record is transmitted when a \*1MD command is issued by the computer followed within 2 seconds by a \*1ME command. Continuous Logging records are transmitted at the Output Rate when a \*1MD command is issued by the computer, and are terminated more than 2 seconds later with a \*1ME command.

#### 4. Computer-Controlled Memory Recall - Meter in the RUN or RECALL mode

##### A. Data Item Format

A block of records in the Data Item Format is recalled from Meter memory and transmitted with a **\*1MN#####SSSSSS** command, where **#####** = Number of Records (0001 to 8000), and **SSSSSS** = Starting Memory address (0000 to 15999).

##### B. Packed Data Format

A block of records in the Packed Data Format is recalled from Meter memory and is transmitted with a **\*1MN#####SSSSSP** command, where **#####** = Number of Records (0001 to 16000), **SSSSSS** = Starting Memory address (0000 to 15999), and **P** = Packed Data designator.

The Meter is placed in the RECALL mode from the RUN mode and reverts to the RUN mode at the conclusion of the RECALL mode.

## 4. SERIAL INTERFACE SETUP FROM KEYPAD

If certain Menu items do not appear, please refer to Section 9 of the SSI Operator Manual, subsection "Keypad Lockouts."

Press  Key	Press  Key	Press  Key
<p><b>Ser_1</b> Serial Config 1</p> <p>Fixed Parameters:            No parity            8 data bits            1 stop bit</p> <p>* Filtered is not available for Fast conversion rates.</p>	<p><input type="text" value="000"/> Sent value source</p>	<p><input type="text" value="0"/> Unfiltered    <input type="text" value="1"/> Filtered*</p>
	<p><input type="text" value="000"/> Serial baud rate</p>	<p><input type="text" value="0"/> 300 baud    <input type="text" value="4"/> 4800 baud  <input type="text" value="1"/> 600 baud    <input type="text" value="5"/> 9600 baud  <input type="text" value="2"/> 1200 baud    <input type="text" value="6"/> 19.2 kbaud  <input type="text" value="3"/> 2400 baud    <input type="text" value="7"/> 38.4 kbaud</p>
	<p><input type="text" value="000"/> Output rate</p> <p>Rates shown are for 60 Hz. Divide by 1.2 for 50 Hz. Selection <b>0</b> is line frequency. Selection <b>1</b> is normal display interval.</p>	<p><input type="text" value="0"/> 60/sec    <input type="text" value="8"/> 1/34 sec  <input type="text" value="1"/> 3.8/sec    <input type="text" value="9"/> 1/68 sec  <input type="text" value="2"/> 1.9/sec    <input type="text" value="A"/> 1/137 sec  <input type="text" value="3"/> 0.94/sec    <input type="text" value="B"/> 1/273 sec  <input type="text" value="4"/> 1/2.1 sec    <input type="text" value="C"/> 1/546 sec  <input type="text" value="5"/> 1/4.3 sec    <input type="text" value="D"/> 1/1092 sec  <input type="text" value="6"/> 1/8.5 sec    <input type="text" value="E"/> 1/2185 sec  <input type="text" value="7"/> 1/17 sec    <input type="text" value="F"/> 1/4369 sec</p>
<p><b>Ser_2</b> Serial Config 2</p>	<p><input type="text" value="000"/> &lt;LF&gt; character. Normally used with data to printers.</p>	<p><input type="text" value="0"/> No &lt;LF&gt; following &lt;CR&gt;  <input type="text" value="1"/> &lt;LF&gt; following &lt;CR&gt;</p>
	<p><input type="text" value="000"/> Serial alarm data</p>	<p><input type="text" value="0"/> No alarm data appended  <input type="text" value="1"/> Alarm data appended</p>
	<p><input type="text" value="000"/> Operating mode</p>	<p><input type="text" value="0"/> Continuous mode  <input type="text" value="1"/> Command mode</p>
<p><b>Ser_3</b> Serial Config 3</p>	<p><input type="text" value="00"/> Serial termination characters for multiple items</p>	<p><input type="text" value="0"/> At end of all items.  <input type="text" value="1"/> At end of each item. Alarm data, if selected, only at end.</p>
	<p><input type="text" value="00"/> Serial data sent</p>	<p><input type="text" value="0"/> Reading  <input type="text" value="1"/> Peak  <input type="text" value="2"/> Valley  <input type="text" value="3"/> Reading + Peak  <input type="text" value="4"/> Reading + Valley  <input type="text" value="5"/> Reading + Peak + Valley  <input type="text" value="6"/> Displayed Value</p>



<p><b>LoG</b> Data Logging</p> <p>Items logged to USB are selectable to conserve bandwidth. The same selection applies to Items recalled from Memory via USB.</p> <p>Items logged to Memory are the Displayed Value, Date, Time, Units, Value Type, Alarms, Overload.</p> <p>Recall of data by Memory # by a PC via USB is a selectable function.</p>	<p><b>00000</b> Units of measure and Value Type (Reading, First Peak, Peak, Valley) logged via USB.</p>	<p><b>0</b> Do not send Units or Value Type.  <b>1</b> Send Units, not Value Type.  <b>2</b> Send Value type, not Units.  <b>3</b> Send both Value type and Units.</p>
	<p><b>00000</b> Time and Date logged via USB.</p>	<p><b>0</b> Don't send Time or Date.  <b>1</b> Send Time, not Date.  <b>2</b> Send Date, not Time.  <b>3</b> Send both Date and Time.</p>
	<p><b>00000</b> Memory # logged via USB.</p>	<p><b>0</b> Don't send Memory # address.  <b>1</b> Send Memory # address.</p>
	<p><b>00000</b> Memory Protect to prevent overwriting.</p>	<p><b>0</b> Memory Protect enabled.  <b>1</b> Memory Protect disabled.</p>
	<p><b>00000</b> Logging destination and USB Recall selections.</p>	<p><b>0</b> Logging disabled.  <b>1</b> Log to Memory only.  <b>2</b> Log to USB only.  <b>3</b> Log to Memory &amp; USB.</p>

## 5. OPERATING MODES, COMMANDS, RAM DATA

There are two (2) operating modes of the SSI meter: Continuous mode and Command mode. The mode selection can be made from front panel menu item "SEr\_2". One, two or three values in the Value Format may be sent as selected in menu item SEr\_3.

### 1. CONTINUOUS MODE

In this mode, Value data is continuously transmitted by the SSI in a standard data format using printable ASCII characters and at a selectable rate extending from line frequency down to one measurement every 4369 seconds. This data may be received by a printer, by a computer for data logging and analysis, or by a remote display. The transmission rate of Value data can be selected in menu item "SEr\_1". Any baud rate may be used, but if less than the minimum baud rate in the table, the transmission rate is reduced.

SEr_1 setting	Output Rate 50 Hz / 60 Hz	Minimum Baud Rate		
		1 Value sent	2 Values sent	3 Values sent
0	50 / 60 per sec	9600	9600	19200
1	3.1 / 3.8 per sec	600	600 / 1200	1200
2	1.6 / 1.9 per sec	300	300 / 600	600
3 to 9	0.8 / 0.94 per sec	300	300	300

The SSI does not respond to computer commands in the Continuous mode, except the command \*1A1, which puts the meter into the Command mode.

### 2. COMMAND MODE

In this mode, the SSI meter does not send any data automatically, but instead responds to commands received from the host computer. These commands can be:

- 1) To transmit the Reading, Peak or Valley Value.
- 2) To reset itself completely or just the Peak and Valley Values and/or latched alarms.
- 3) To transmit existing setup parameters.
- 4) To receive new setup parameters.
- 5) To monitor or alter parameters in selected memory locations of the meter.

In the Command mode, the SSI also transmits a logging record of selected data items when the **LOG** key is pressed.

### 3. COMMAND MODE FORMAT

The Command mode format information below is only required by users who wish to write custom software to read or control the SSI, or to change setup parameters. Transducer Techniques offers SSI-DLS Data Logging Software, which is easy to use and does not require programming. The SSI commands are available to advanced users. The minimum format is 4 characters: Example: \*1A1

## Chars 1-2, Command Identifier and Device Address

All commands begin with \*1 followed by a command letter, followed by a subcommand number or letter. Additional characters may be appended. All commands are terminated by a <cr>. An optional <lf> is ignored.

Char #	Character	Description
1	*	Recognition character
2	1	Device address (always 1)
3	A-Z	Command Function
4	0-U	Subcommand (or number of bytes or words of data being transferred)

## Chars 3 & 4, Commands and Subcommands

Terminate the command sequences shown must terminate with a <cr>.

### Communications Mode

- \*1A0 Continuous mode
- \*1A1 Command mode

### Request Value

- \*1B1 Get reading. Value or values selected in SEr\_3, Digit 5.
- \*1B2 Peak value
- \*1B3 Valley value

### Activate & Reset Functions

- \*1C0 Cold reset. Reinitializes & restarts program.
- \*1C1 Warm reset. Restarts program.
- \*1C2 Latched alarms reset
- \*1C3 Peak & First Peak value reset
- \*1C4 Function reset
- \*1C5 Activate external input B
- \*1C6 Deactivate external input B
- \*1C7 Activate external input A
- \*1C8 Deactivate external input A
- \*1C9 Valley value reset
- \*1CA Activate tare
- \*1CB Reset tare value

The following commands are more fully described in Section 3 above.

- \*1MN#####SSSSSS Recall data items from SSI memory.
- \*1MN#####SSSSSP Recall packed data from SSI memory.  
Where ##### is the number of records recalled, and  
SSSSSS is the starting (LS) memory address.
- \*1MD Start continuous logging.
- \*1ME End continuous logging.

#### 4. READ AND WRITE TO RAM AND NONVOLATILE MEMORY

##### (1) Read and Write RAM Data

RAM 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 is 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** (followed by WARM reset)  
Write lower RAM data: \***1Fnaa** (data string)  
Read upper RAM data: \***1Rnaa** (followed by WARM reset)  
Write upper RAM data: \***1Qnaa** (data string)

Where: **n** is the number of bytes to be read or written.

**aa** is the most significant address in RAM 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 character representing values from 1 to 30 as shown below. See Section 5 for RAM memory addresses and data definitions.

Code #	Code #	Code #	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	V = 31
8 = 8	C = 16	O = 24	W = 32

##### (2) Read and Write 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 is 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**  
Write nonvolatile memory data: \***1Wnaa (data string)**

Where: **n** is the number of words to be read or written.

**aa** is the most significant address in nonvolatile memory of the words.

**data** is n words of 2 bytes or 4 hex characters per word in order from the most to the least significant address.

The number of words **n** consists of a single character representing values from 1 to 30 as shown above. The most significant address **aa** consists of 2 hex characters as shown below under Nonvolatile Memory Addresses (Section 8).

5. RAM ADDRESSES AND DATA DEFINITIONS (Lower RAM unless noted otherwise)

Hex Address	Item Name	Bit Assignment																																																																																																																																																																																																														
2D	Setup	<table border="0"> <tr> <td>Bit7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td> <td>External A:</td> <td>External B:</td> <td>Both A&amp;B:</td> </tr> <tr> <td></td><td></td><td></td><td></td><td>0</td><td>0</td><td>0</td><td>0</td> <td>Meter reset</td> <td>Func. reset</td> <td>Meter reset</td> </tr> <tr> <td></td><td></td><td></td><td></td><td>0</td><td>0</td><td>0</td><td>1</td> <td>Meter reset</td> <td>Disp. Pk/Vy</td> <td>Meter reset</td> </tr> <tr> <td></td><td></td><td></td><td></td><td>0</td><td>0</td><td>1</td><td>0</td> <td>Meter reset</td> <td>Tare</td> <td>Meter reset</td> </tr> <tr> <td></td><td></td><td></td><td></td><td>0</td><td>0</td><td>1</td><td>1</td> <td>Meter reset</td> <td>Log</td> <td>Meter reset</td> </tr> <tr> <td></td><td></td><td></td><td></td><td>0</td><td>1</td><td>0</td><td>0</td> <td>Func. reset</td> <td>Disp. Pk/Vy</td> <td>Meter reset</td> </tr> <tr> <td></td><td></td><td></td><td></td><td>0</td><td>1</td><td>0</td><td>1</td> <td>Func. reset</td> <td>Tare</td> <td>Meter reset</td> </tr> <tr> <td></td><td></td><td></td><td></td><td>0</td><td>1</td><td>1</td><td>0</td> <td>Func. reset</td> <td>Log</td> <td>Meter reset</td> </tr> <tr> <td></td><td></td><td></td><td></td><td>0</td><td>1</td><td>1</td><td>1</td> <td>Disp. Pk/Vy</td> <td>Tare</td> <td>Func. reset</td> </tr> <tr> <td></td><td></td><td></td><td></td><td>1</td><td>0</td><td>0</td><td>0</td> <td>Disp. Pk/Vy</td> <td>Log</td> <td>Func. reset</td> </tr> <tr> <td></td><td></td><td></td><td></td><td>1</td><td>0</td><td>0</td><td>1</td> <td>Tare</td> <td>Log</td> <td>Func. reset</td> </tr> <tr> <td></td><td></td><td></td><td></td><td>1</td><td>0</td><td>1</td><td>0</td> <td>Tare</td> <td>Tare reset</td> <td>Func. reset</td> </tr> <tr> <td></td><td></td><td></td><td></td><td>1</td><td>0</td><td>1</td><td>1</td> <td>Valley</td> <td>Peak</td> <td>Func. reset</td> </tr> <tr> <td></td><td></td><td></td><td>0</td><td>0</td> <td colspan="6">Not used</td> </tr> <tr> <td></td><td></td><td></td><td>0</td><td>1</td> <td colspan="6">Scale using coordinates of 2 points</td> </tr> <tr> <td></td><td></td><td></td><td>1</td><td>0</td> <td colspan="6">Scale using reading of coordinates</td> </tr> <tr> <td></td><td></td><td></td><td>0</td> <td colspan="6">Spare</td> </tr> <tr> <td></td><td></td><td></td><td>0</td> <td colspan="6">60 Hz environment</td> </tr> <tr> <td></td><td></td><td></td><td>1</td> <td colspan="6">50 Hz environment</td> </tr> </table>	Bit7	6	5	4	3	2	1	0	External A:	External B:	Both A&B:					0	0	0	0	Meter reset	Func. reset	Meter reset					0	0	0	1	Meter reset	Disp. Pk/Vy	Meter reset					0	0	1	0	Meter reset	Tare	Meter reset					0	0	1	1	Meter reset	Log	Meter reset					0	1	0	0	Func. reset	Disp. Pk/Vy	Meter reset					0	1	0	1	Func. reset	Tare	Meter reset					0	1	1	0	Func. reset	Log	Meter reset					0	1	1	1	Disp. Pk/Vy	Tare	Func. reset					1	0	0	0	Disp. Pk/Vy	Log	Func. reset					1	0	0	1	Tare	Log	Func. reset					1	0	1	0	Tare	Tare reset	Func. reset					1	0	1	1	Valley	Peak	Func. reset				0	0	Not used									0	1	Scale using coordinates of 2 points									1	0	Scale using reading of coordinates									0	Spare									0	60 Hz environment									1	50 Hz environment					
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12	<p>Units of Load</p> <p><i>Units menu items will only appear if not in TEDS, or Plug &amp; Play is disabled.</i></p> <p>Units of Torque</p> <p>Units of Pressure</p>	<table border="0"> <tr> <td>Bit7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td><td></td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>0 0 0 0 0 0 0 0 none</td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>0 0 0 1 0 0 0 0 oz</td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>0 0 0 1 0 0 0 1 lb</td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>0 0 0 1 0 0 1 0 ton</td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>0 0 0 1 0 0 1 1 Mton</td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>0 0 0 1 0 1 0 0 g</td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>0 0 0 1 0 1 0 1 N</td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>0 0 0 1 0 1 1 0 kgf</td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>0 0 0 1 0 1 1 1 kN</td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>0 0 1 0 0 0 0 0 in-oz</td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>0 0 1 0 0 0 0 1 in-lb</td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>0 0 1 0 0 0 1 0 ft-lb</td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>0 0 1 0 0 0 1 1 kgf-m</td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>0 0 1 0 0 1 0 0 N-m</td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>0 0 1 0 0 1 0 1 kgf-cm</td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>0 0 1 0 0 1 1 0 N-cm</td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>0 0 1 1 0 0 0 0 Pa</td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>0 0 1 1 0 0 0 1 psi</td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>0 0 1 1 0 0 1 0 bar</td> </tr> </table>	Bit7	6	5	4	3	2	1	0										0 0 0 0 0 0 0 0 none									0 0 0 1 0 0 0 0 oz									0 0 0 1 0 0 0 1 lb									0 0 0 1 0 0 1 0 ton									0 0 0 1 0 0 1 1 Mton									0 0 0 1 0 1 0 0 g									0 0 0 1 0 1 0 1 N									0 0 0 1 0 1 1 0 kgf									0 0 0 1 0 1 1 1 kN									0 0 1 0 0 0 0 0 in-oz									0 0 1 0 0 0 0 1 in-lb									0 0 1 0 0 0 1 0 ft-lb									0 0 1 0 0 0 1 1 kgf-m									0 0 1 0 0 1 0 0 N-m									0 0 1 0 0 1 0 1 kgf-cm									0 0 1 0 0 1 1 0 N-cm									0 0 1 1 0 0 0 0 Pa									0 0 1 1 0 0 0 1 psi									0 0 1 1 0 0 1 0 bar
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60 (upper memory)	Zero Width Trigger Level	Bit7 6 5 4 3 2 1 0 0 0 None 0 1 0.5% of span 1 0 1% of span 1 1 2% of span
	First Peak Trigger Level	Bit7 6 5 4 3 2 1 0 0 0 0 1 1% of First Peak 0 0 1 0 2% of First Peak 0 0 1 1 3% of First Peak 0 1 0 0 4% of First Peak 0 1 0 1 5% of First Peak 0 1 1 0 6% of First Peak 0 1 1 1 7% of First Peak 1 0 0 0 8% of First Peak 1 0 0 1 9% of First Peak
06 (upper memory)	Alarm Config2	Bit7 6 5 4 3 2 1 0 0 0 0 1 reading suffices for alarm 0 0 1 2 consecutive readings for alarm 0 1 0 4 consecutive readings for alarm 0 1 1 8 consecutive readings for alarm 1 0 0 16 consecutive readings for alarm 1 0 1 32 consecutive readings for alarm 1 1 0 64 consecutive readings for alarm 1 1 1 128 consecutive readings for alarm 0 0 0 AL1 band deviation, AL2 band dev. 0 0 1 AL1 hysteresis, AL2 band deviation 0 1 0 AL1 band deviation, AL2 hysteresis 0 1 1 AL1 hysteresis, AL2 hysteresis 1 0 0 No deviation in menus or calculations
05 (upper memory)	Alarm Config1	Bit7 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 ALI1 non-latching, ALI2 latching 1 1 ALI1 & ALI2 latching Relay state when alarm is active: 0 0 Relay 1 On, Relay 2 On 0 1 Relay 1 Off, Relay 2 On 1 0 Relay 1 On, Relay 2 Off 1 1 Relay 1 Off, Relay 2 Off

44	Tare	<table border="0"> <tr> <td>Bit7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td> <td></td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>0</td> <td>TEDS Plug &amp; Play enabled</td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>1</td> <td>TEDS Plug &amp; Play disabled</td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td>1</td><td></td> <td>Spare</td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td>0</td><td></td><td></td> <td>Auto-tare enabled</td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td>1</td><td></td><td></td> <td>Auto-tare disabled</td> </tr> <tr> <td></td><td></td><td></td><td></td><td>0</td><td></td><td></td><td></td> <td>Front panel tare enabled</td> </tr> <tr> <td></td><td></td><td></td><td></td><td>1</td><td></td><td></td><td></td> <td>Front panel tare disabled</td> </tr> </table>	Bit7	6	5	4	3	2	1	0									0	TEDS Plug & Play enabled								1	TEDS Plug & Play disabled							1		Spare						0			Auto-tare enabled						1			Auto-tare disabled					0				Front panel tare enabled					1				Front panel tare disabled																																																																																																																																																																											
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6E	Serial 3	<p>Bit7 6 5 4 3 2 1 0</p> <p>0 0 0 Send Reading</p> <p>0 0 1 Send Peak</p> <p>0 1 0 Send Valley</p> <p>0 1 1 Send Reading + Peak</p> <p>1 0 0 Send Reading + Valley</p> <p>1 0 1 Send Reading + Peak + Valley</p> <p>1 1 0 Send Displayed Value</p> <p>0 Termination chars at end of all Items</p> <p>1 Termination chars at end of each Item (one optional Alarm character at end)</p>
15	Log	<p>Bit7 6 5 4 3 2 1 0</p> <p>0 0 Logging (&amp; Recall) switch disabled.</p> <p>0 1 Log to internal memory only.</p> <p>1 0 Log to USB only.</p> <p>1 1 Log to both internal memory &amp; USB.</p> <p>0 Memory Protect enabled.</p> <p>1 Memory Protect disabled.</p> <p>0 Do not send Memory address.</p> <p>1 Send Memory address.</p> <p>0 0 Do not send Time or Date.</p> <p>0 1 Send Time, not Date.</p> <p>1 0 Send Date, not Time.</p> <p>1 1 Send both Date and Time.</p> <p>0 0 Do not send Units or Value Type.</p> <p>0 1 Send Units, not Value Type.</p> <p>1 0 Send Value Type, not Units.</p> <p>1 1 Send both Units and Value Type</p>
1A (upper memory)	Alert	<p>Bit7 6 5 4 3 2 1 0</p> <p>0 0 Non-use power-off interval disabled</p> <p>0 1 15-minute non-use power-off interval.</p> <p>1 0 30-minute non-use power-off interval.</p> <p>1 1 60-minute non-use power-off interval.</p> <p>0 Audible warning before auto power off.</p> <p>1 No audible warning before power off</p> <p>0 Green alarm light active.</p> <p>1 Green light inactive to conserve power</p> <p>0 Audible tone for alarms.</p> <p>1 No audible tone for alarms.</p>
33	Lockout 1 (Loc_1) 0 = unlocked 1 = locked	<p>Bit7 6 5 4 3 2 1 0</p> <p>1 Menu item &amp; front panel lockout:</p> <p>1 Lo, Hi Rd, Hi End</p> <p>1 Lo, Hi In, Rd0</p> <p>1 Filter, Zero Width</p> <p>1 Setup, Config &amp; Decimal Point</p> <p>1 Non-TEDS Units</p>

34	Lockout 2 (Loc_2) 0 = unlocked 1 = locked	Bit7 6 5 4 3 2 1 0 Menu item & front panel lockout: 1 Serial configuration Tare, Log, Alert, Time, Date Alarm setpoint programming Alarm configuration
	Lockout 2 (Loc_3) 0 = unlocked 1 = locked	Bit7 6 5 4 3 2 1 0 Menu item & front panel lockout: Front panel reset, Cold Reset only. FP reset, Peak & latched alarms only. View alarm setpoints. View Peak / Valley value.
6C	Lockout 3 (Loc_4) 0 = unlocked 1 = locked	Bit7 6 5 4 3 2 1 0 Menu item & front panel lockout: 1 TEDS Calibration Period TEDS Calibration Initials, Measure ID TEDS Calibration Date TEDS Units of Measure TEDS Serial Number

## 6. 3-BYTE RAM DATA

All items except Scale Factor use this format: MS byte      Mid byte      LS byte  
XX XX XX value = 2's complement                      X X                      X X                      X X

The Scale Factor uses this format:                      MS byte      Mid byte      LS byte  
MS nibble N = Polarity and Decimal Point      N X                      X X                      X X  
X XX XX value = absolute values

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

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

## 7. 3-BYTE RAM TABLE

MS	Mid	LS	Description
9F	9E	9D	Deviation, Alarm2
9C	9B	9A	Deviation, Alarm1
8D	8C	8B	Setpoint 2
8A	89	88	Setpoint 1
DD	DC	DB	RD0

**8. NONVOLATILE MEMORY ADDRESSES (2 bytes/address)**

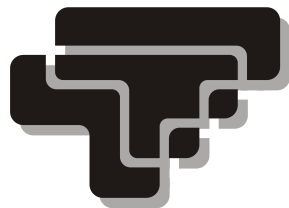
See the corresponding items in RAM for data significance.

Address	MS	LS
1B	Lockout 3	Spare
75	Spare	Serial 3
6E	Spare	Units
6D	Version	M Type
39	Highmem 2	Highmem 1
38	Currmem 2	Currmem 1
37	Alert	Log
36	Tare	Trigger
1D	RD03	RD02
1C	RD01	Spare
18	Deviation 2 3	Deviation 2 2
17	Deviation 2 1	Deviation 1 3
16	Deviation 1 2	Deviation 1 1
15	Configuration	Sig Cond Type
14	Spare	Decimal Point
13	Lockout 2	Lockout 1
12	Serial 2	Serial 1
11	Options	Filter
10	Setup	Input Type
0F	Alarm Cnfg 2	Alarm Cnfg 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	High End 3	High End 2
04	High End 1	Spare
02	Setpoint 2 3	Setpoint 2 2
01	Setpoint 2 1	Setpoint 1 3
00	Setpoint 1 2	Setpoint 1 1

# **Load Cells Force/Torque Sensors™**

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