



Temposonics® Display Unit (TDU)
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U s e r ' s M a n u a l

P/N 550260 Revision C

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GENERAL INFORMATION

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MTS Systems Corporation Sensors Division 3001 Sheldon Drive Cary, North Carolina 27513	Monday - Thursday 7:30 a.m. to 6:30 p.m. EST/EDT Friday 7:30 a.m. to 5:00 p.m. EST/EDT

1 INTRODUCTION

The Temposonics Display Unit (TDU) provides a large, 5 1/4 digit, LED readout of accurate measurement data. It is ideal for use in applications where immediate visual verification of position is required, such as plastic and woodworking applications.

The TDU is designed to function with Temposonics LH, Temposonics II, and Temposonics LP position sensors with START/STOP output. All communication between the display and transducer is transmitted via RS422 Start/Stop protocol. Together, the TDU and Temposonics sensors provide a highly accurate, reliable, and easy to use position display system.

This document identifies the performance specifications, set-up procedures and wiring configurations.

2 SPECIFICATIONS

<i>Parameter</i>	<i>Specification</i>
Supply Voltage:	<ul style="list-style-type: none"> w/Temposonics LH: + 15 Vdc @ 250 mA or +20-24 Vdc @ 250 mA w/Temposonics II: ± 15 Vdc (bipolar, ±10%, 250 mA) w/Temposonics LP: +15 Vdc @ 250 mA or 20- 24 Vdc @ 250 mA
Sensor Product Life:	Active Sensing Element: 4x 10 ⁶ MTBF
Display Enclosure:	Drip, dust and rust resistant
Non-linearity: (transducer)	<ul style="list-style-type: none"> Temposonics LH: ≤ ± 0.05% of full stroke or ≤ ± 0.002 in. (± 0.05 mm) * Temposonics II: ≤ ± 0.05% of full stroke or ≤ ± 0.002 in. (± 0.05 mm) * Temposonics LP: ± 0.1% of F.S., minimum of ± 0.004 in. independent BSL
Repeatability: (transducer)	±0.001% of full stroke, or ±0.0001 in. (± 0.0025 mm)
Resolution:	<ul style="list-style-type: none"> 0.005 in. (standard) 0.001 in. available, contact MTS for details <p>NOTE: Resolution for stroke lengths beyond 199.999 inches is reduced to 0.01 in. due to 5 1/4 digit display limitation.</p>
Measuring Range: (transducer)	<ul style="list-style-type: none"> Temposonics LH: up to 200 inches (standard) Temposonics II: Up to 200 inches (standard) Temposonics LP: Up to 60 inches <p>NOTE: Temposonics LH and Temposonics II sensors are available up to 300 inches, however the resolution will be reduced to 0.01 in.</p>
Operating Temperature	32 to 158°F (0 to 70°C)
Output:	5 1/4 digit LED display
<i>Inches: 199.999</i> <i>Millimeters: 5080.0</i> <i>Centimeters: 508.00</i> <i>Meters: 5.0800</i>	<i>0.001 inches</i> <i>0.1 millimeters</i> <i>0.01 centimeters</i> <i>0.0001 meters</i>
	<ul style="list-style-type: none"> NOTE: Scaling is selectable via internal dip switches

Zero Reset:	Available on front of panel
Gradient Input:	Available on front of panel

* Whichever is greater

3 INSTALLATION KIT

Each TDU (Model # TDU100) is provided with an installation kit for mounting. Installation kits includes:

- Mounting brackets and screws (Part No. 560488)
- Front panel gasket (Part No. 560496)

The TDU comes complete with mounting brackets , screws and gasket, these items may also be ordered separately

Accessories that can be ordered separately, at additional cost, are as follows:

- NEMA 4 Environmental Enclosure (Part No. 251188)
- 20 Vdc Power Supply (Part No. 380045)
- ±15 Vdc Power Supply (Part No. 380017)

4 SCALING THE OUTPUT

The output is selectable via dip switch settings to provide an output scaled for inches, millimeters, centimeters or meters. There are four dip switches, positioned as indicated in Figure 1. To gain access to these switches you must pull off the J1 and J2 terminal blocks and remove the rear cover that is held in place by 4 screws. Position the switches as indicated in the table below to set the desired scaling. Replace the rear cover and the J1 and J2 terminal blocks immediately after setting scaling to prevent any foreign debris from entering the enclosure and potentially interfering with the performance of the TDU.

	SW1*	SW2	SW3	SW4**
<i>Inches (default)</i>	ON	ON	ON	ON
<i>Millimeters</i>	ON	OFF	ON	ON
<i>Centimeters</i>	ON	ON	OFF	ON
<i>Meters</i>	ON	OFF	OFF	ON

* When SW1 is OFF the Gradient Mode and Zero functions are disabled.

** SW4 is reserved for future use.

5 WIRING

Wiring from the transducer terminates at the TDU on terminal block J2 (Refer to Figure 1, below). Tables 5.1, 5.2, 5.3, below, illustrate the appropriate connections for wiring the Temposonics LH, Temposonics II, or Temposonics LP, to the TDU and power supply (i.e., 15 Vdc, ± 15 Vdc, or 20-24 Vdc power supply).

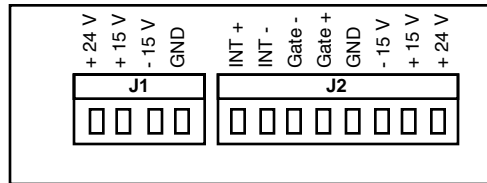


Figure 1
Rear Panel of TDU w/Terminal Blocks

5.1 TDU w/Temposonics LH

<i>w/+15 Vdc or + 20 - 24 Vdc Power Supply (See Notes 1 & 2)</i>				
<i>TDU Pin #</i>	<i>Functional Description</i>	<i>6-Conductor Integral Cable</i>	<i>Striped Wire RB / RC Extension Cable</i>	<i>Solid Wire RB / RC Extension Cable</i>
J1-1	-	-	-	-
J1-2	+ 15 Vdc (Note 1)	Customer Provided	Customer Provided	Customer Provided
J1-3	+ 20 - 24 Vdc (Note 2)	Customer Provided	Customer Provided	Customer Provided
J1-4	GND	Customer Provided	Customer Provided	Customer Provided
J2-1	INT +	Yellow	White/Gray Stripe	Yellow
J2-2	INT -	Green	Gray/White Stripe	Green
J2-3	Gate -	Gray	White/Orange Stripe	Gray
J2-4	Gate +	Pink	Orange/White Stripe	Pink
J2-5	GND	White Drain Wire	White/Blue Stripe Blue/White Stripe	White Brown
J2-6	-	-	-	-
J2-7	+ 15 Vdc (Note 1)	Red	White/Green Stripe	Red
J2-8	+ 20 - 24 Vdc (Note 2)	Red	White/Green Stripe	Red

NOTES:

1. Use J1-2 if power supply is +15 Vdc, this pin is not used if using a 20-24 Vdc supply.
2. Use J1-3 if using a 20-24 Vdc power supply, this pin is not used if using a 15 Vdc supply.

5.2 TDU w/Temposonics LP

<i>w/+15 Vdc Power Supply</i>			<i>w/ 20 - 24 Vdc Power Supply</i>		
<i>TDU Pin #</i>	<i>Functional Description</i>	<i>Sensor Wire Color</i>	<i>TDU Pin #</i>	<i>Functional Description</i>	<i>Sensor Wire Color</i>
J1-1	-	-	J1-1	20 to 24 Vdc	Customer Provided
J1-2	+ 15 Vdc,	Customer Provided	J1-2	-	-
J1-3	-	-	J1-3	-	-
J1-4	GND	Customer Provided	J1-4	GND	Customer Provided
J2-1	INT +	Orange	J2-1	INT +	Orange
J2-2	INT -	Yellow	J2-2	INT -	Yellow
J2-3	Gate -	Blue	J2-3	Gate -	Blue
J2-4	Gate +	Green	J2-4	Gate +	Green
J2-5	GND	Black & Shield	J2-5	GND	Black & Shield
J2-6	-	Not Used	J2-6	-	-
J2-7	+15 Vdc	Red	J2-7	-	-
J2-8	-	Not used	J2-8	20 to 24 Vdc	Red

5.3 TDU w/Temposonics II & ±15 Vdc Power Supply

<i>TDU Pin #</i>	<i>Functional Description</i>	<i>Striped Leads</i>	<i>Solid Leads</i>
J1-1	-	-	-
J1-2	+ 15 Vdc;	Customer Provided	Customer Provided
J1-3	- 15 Vdc;	Customer Provided	Customer Provided
J1-4	GND	Customer Provided	Customer Provided
J2-1	INT +	White/Gray Stripe	Yellow
J2-2	INT -	Gray/White Stripe	Green
J2-3	Gate -	White/Orange Stripe	Gray
J2-4	Gate +	Orange/White Stripe	Pink
J2-5	GND	White/Blue Stripe Blue/White Stripe	White Brown
J2-6	-15 Vdc	Green/White Stripe	Blue
J2-7	+15 Vdc	White/Green Stripe	Red
J2-8	-	-	-

NOTES:

1. Customer Provided Cable
2. Your Temposonics II transducer may have a cable with striped leads or with solid color leads. Both cables are identified in the wiring chart and have identical performance specifications. Solid color leads are now standard (since February, 1994).

6 ZERO

Press the left push button on the front panel of the TDU (labeled "Zero", Figure 2) to set the display value to "0". Dip Switch 1 (refer to Figure 3 for dip switch locations) when set to OFF, disables this function. The default setting for Dip Switch 1 is ON.

- a.) To enter a **Permanent ZERO**, press and hold the left (ZERO) push button. As soon as the display reads "0.000", press the right push button. Release both push buttons.
- b.) To enter a **Relative ZERO**, press and release the left (ZERO) push button. To recover the permanent zero setting, press and release the ZERO push button once again.

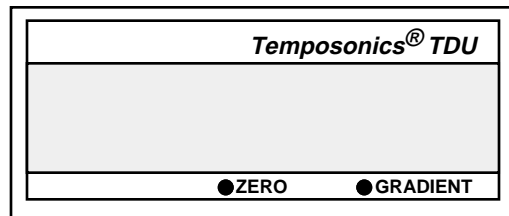


Figure 2
Front panel/TDU, Zero and Gradient Push-buttons

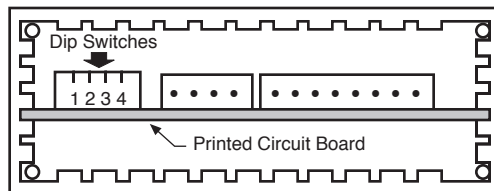


Figure 3
Rear View of TDU w/Cover Removed

7 GRADIENT

The Gradient is unique for each transducer manufactured. It represents the inverse of the velocity of the return pulses that travel along the waveguide of the transducer (measured in microseconds per inch). Although this velocity is very consistent from transducer to transducer and is extremely repeatable for a particular transducer, there are slight variances. To compensate for these slight variances, the TDU offers a Gradient Mode which allows you to precisely program the gradient of a particular transducer into the TDU. The following steps define the procedure for setting the gradient. The gradient will be displayed in "μs/inch" (microseconds per inch) if dip switches SW2 and SW3 are ON prior to entering the gradient mode. Otherwise, the gradient is displayed in "m/s" (meters per second).

Gradient conversion

To convert gradient from microseconds per inch to meters per seconds, the following formula applies:

$$25400/\text{gradient } (\mu\text{s/in.}) = \text{m/s}$$

Example:

$$\begin{aligned} \text{Gradient} &= 9.050 \mu\text{s/in.} \\ 25400/9.05 &= \underline{2806.62 \text{ m/s}} \end{aligned}$$

1. Ensure that Dip Switch 1 (refer to Figure 3 for switch location) is set to ON (If Dip Switch 1 is set to OFF, this function will be disabled). Press and hold the right push button (labeled "Gradient") on the front panel of the TDU for about 6 seconds. The TDU will respond by displaying the current Gradient value
2. Release the Gradient push button
3. Use the right or left push buttons (labeled Gradient and Zero, respectively) to increase or decrease the gradient value. The Gradient for each Temposonics transducer is identified on the label attached to the transducer.
4. To exit the Gradient Mode and to set the new Gradient value, press both front panel push buttons simultaneously. Release both push buttons as soon as the screen goes blank. The TDU will respond by returning to its normal operating mode.

8 OFFSET ADJUST MODE

The Offset Adjust Mode allows you to enter an offset in the displayed output. To enter this mode, position the transducer's magnet at the desired location following the steps below:

1. Press and hold the right push button (labeled Gradient) for approximately 6 seconds. The TDU will respond by showing the gradient currently in use. (SW1 = OFF disables this function).
2. While depressing the right push button (Gradient), press and release the left push button (Zero). The display will go blank.
3. Release the right push button (Gradient). The display will flash the magnet position. This indicates the Offset Adjust Mode is active.
4. Use the right or left push button until the desired position value is displayed. (Note that if either push button is depressed for approximately 20 seconds, a rapid value increment or decrement will occur).
5. To exit the Offset Adjust Mode, press both push buttons simultaneously. Release both push buttons as soon as the display goes blank. The TDU will respond by returning to its normal operating mode.

IMPORTANT NOTES:

1. *Span should not exceed ± 199.995 in.*
2. *The TDU will display 'E7' if it receives no input from the Temposonics transducer. This could mean either the transducer is incorrectly wired to the TDU, the transducer is malfunctioning, or that the magnet has exited the active area of the transducer. If the E7 code is displayed because the magnet is no longer in the active zone of the transducer, when the magnet returns to the active zone, the TDU will resume normal operation.*

9 TDU DIMENSIONS

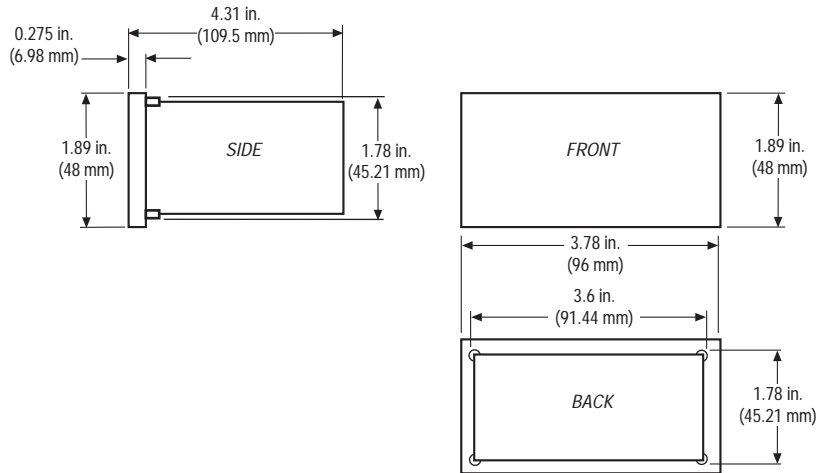


Figure 4
TDU Dimensions

ADDENDUM A

Subject: Installing Optional NEMA 4 Enclosure for TDU

Part No. for NEMA 4 Enclosure: 251188

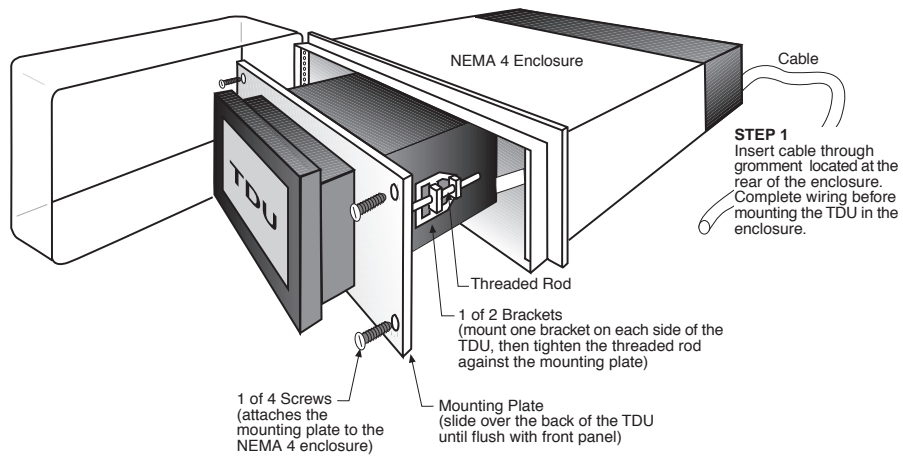


Figure 5
NEMA 4 Enclosure



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