



GENERATIONS AHEAD IN SONAR & ULTRASONIC TECHNOLOGY

## Model M-301/140 Low Cost Ultrasonic Sensor

The Massa Model M-301/140 Sensor measures target distances over a range of 7 inches (180 mm) to 5 feet (1.5 meters). It is a member of the Massa M-300 family that includes several models of RoHS compliant low cost ultrasonic sensors that produce detection ranges from as close as 4 inches (100 mm) to greater than 15 feet (4.5 meters). Incorporating state-of-the-art ultrasonic technology, the sensors provide precision non-contact distance measurement for factory automation or industrial process control. The M-300 Family of Sensors stand out over all other systems because of their affordability, extraordinary ease of operation, genuinely user-friendly software, versatility in user-controlled outputs, and the ability to be set up without using a target. They transmit narrow beam sound pulses at a user-selected rate (or they can be software triggered), process return echoes, and produce several outputs dependent on the position of the target.

Operating from 12 to 24 V DC, the M-301/140 Sensor provides a linear output of 0 to 10 V DC, which is proportional to the measured distance to the target. This output voltage range can be easily reprogrammed to start and end anywhere between 0 and 10 V DC. The corresponding target distance span can also be set to start and stop at any two target ranges. In addition, this output voltage can be programmed to operate as a digital switch at a specified target setpoint distance.

The system parameters and outputs are programmable via an RS-485 data link, thereby eliminating problems associated with adjustment potentiometers or pushbuttons. Some additional programmable adjustments include: analog output slope, sampling rate, averaging of multiple distance measurements, loss-of-echo time-out, setpoint hysteresis when operating in the digital switch mode, and a software sensor transmit trigger.

The Model M-301/140 includes an advanced diagnostic feature that will retrieve the ultrasonic waveform for analysis and display it on a computer using the sensor's software. Users will find this very useful for debugging and correcting more difficult applications without using an oscilloscope.

The M-301/140 Sensor's user-friendly software operates with MS Windows® operating systems using an RS-232/RS-485 or USB/RS-485 converter. This data link allows up to 32 sensors to be connected in parallel onto the same multi-drop communication network using the supplied protocol. This network also allows users to remotely program their sensors and read target distances for quick integration into their process control application.

Other features include a totally sealed PVC housing containing an industry standard 1 inch NPT fitting for mounting, operation from -20°C to 65°C with built-in temperature compensation, diagnostic and monitoring outputs, and protection from over-voltage, short circuits, and reverse polarity.

For more information visit our web site at [www.massa.com](http://www.massa.com).

### MASSA PRODUCTS CORPORATION

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### FEATURES

- Low Cost
- RoHS Compliant
- 1" NPT Mounting Fitting
- Analog or Setpoint Outputs
- Plug & Play Setup
  - No Target Needed
- Software Set Span and Zero
  - No Pots or Pushbuttons
  - Tamperproof Settings
- Easy to Use Setup Software
  - Windows®
  - 98/NT/2000/XP
- Built-in Temperature/Sound Speed Compensation
- Up to 32 Sensors on RS-485 Multi-drop Network

### APPLICATIONS

- Liquid Level Control
- Mechanical Positioning
- Roll Diameter Measurement
- Web Loop Monitoring
- Automatic Filling Operations
- Automatic Packaging
- Bulk Level Control
- Paper/Plastic Film Processing



## ORDERING INFORMATION

Massa Model M-301/140 Sensor:  
P/N 200668-501

### OPTIONAL ITEMS:

#### Mounting Bracket:

P/N 200671-1

#### Locknut *(one included with each sensor):*

P/N 8195-1, For use when installing on a bracket or plate.

#### Serial Port Converter:

P/N 7868-1, RS-232 (DB9)/RS-485 Converter

#### USB Port Converter:

P/N 8220-1, USB/RS-485 Converter

#### M-300 Software:

P/N 8224-1, See [www.massa.com](http://www.massa.com) to download the latest version, or contact the factory for a CD.

Custom configurations available  
for OEM quantities.

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## M-301/140 SPECIFICATIONS

### PERFORMANCE *(Typical at 24 V DC, 22° C, and 50% RH)*

Ultrasonic Frequency:	140 kHz, nominal
System Beam Angle:	15 degrees conical
Target Detection	
Minimum Distance:	7 inches (180 mm)
Maximum Distance:	Up to 5 feet (1.5 m), dependent on target
Measurement Resolution:	.01 inches (0.25 mm)
Echo Detection Sensitivity:	User selectable
Power Required:	12 V DC to 24 V DC (reverse polarity protected), 30 mA, typical
Temperature Compensation:	Internal probe

### PROGRAMMABLE VOLTAGE OUTPUTS

Output Impedance: 100 ohms for both modes of operation

#### Proportional Voltage Output Mode

Zero & Span Distance: Programmable from 7 inches to over 5 feet  
*(factory default: 7 inches to 5 feet)*

Zero & Span Voltages: Programmable from 0 to 10.25 V DC  
*(factory default: 0 to 10.0 V DC)*

Loss of Echo Voltage: Programmable from 0 to 10.25 V DC  
*(factory default: 10.25 V DC)*

Response Time: 60 ms

Resolution: 10 bits

#### Switched Setpoint Output Mode

Setpoint Distances: Programmable from 7 inches to over 5 feet

Setpoint Voltages: 0 or 10.25 V DC

Setpoint Hysteresis: Programmable from 0% to 75%

Response Time: < 1 ms

### PROGRAMMABLE SAMPLING SETTINGS

Sampling Rate: 0.1 Hz to 50 Hz in 0.1 Hz increments  
*(factory default: 10 Hz)*

Trigger Modes: Internal, software trigger

Target Distance Averaging: Rolling Average: from 1 to 32 samples, or  
Boxcar Average: from 1 to 1,024 samples  
*(factory default: Boxcar, 1 sample)*

Loss-of-Echo Time-out: From 1 to 254 consecutive samples missed  
before time-out  
*(factory default: 1 sample)*

### MECHANICAL *(see outline drawing)*

Housing Material: PVC

Transducer Surface: MassaPlast™102 (custom PPA)

Cable: 5 conductor, PVC jacket, 22 AWG, 8" (200 mm)  
pigtail [user-extendable for RS-485  
Communication to 5,000 ft. (1,500 m)]

### ENVIRONMENTAL

Operating Temperature: -20°C to 65°C

Storage Temperature: -40°C to 85°C

Relative Humidity: 0 to 95%, non-condensing

Enclosure Rating: IP67

### PROGRAMMING REQUIREMENTS

Communications Converter: RS-232 (or USB)/RS-485 with automatic send  
data control

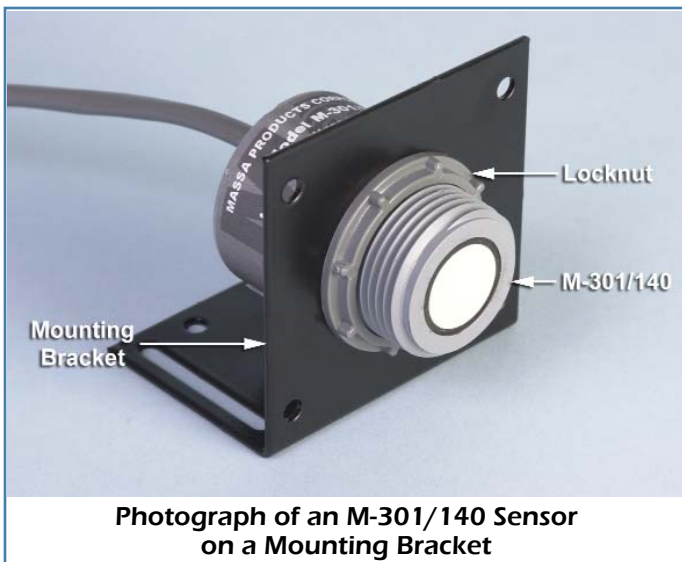
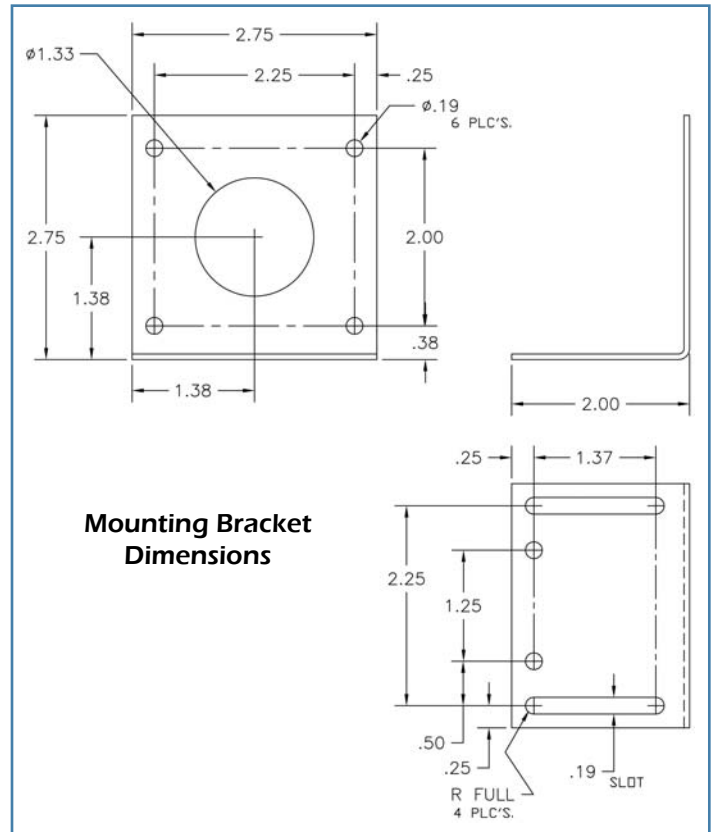
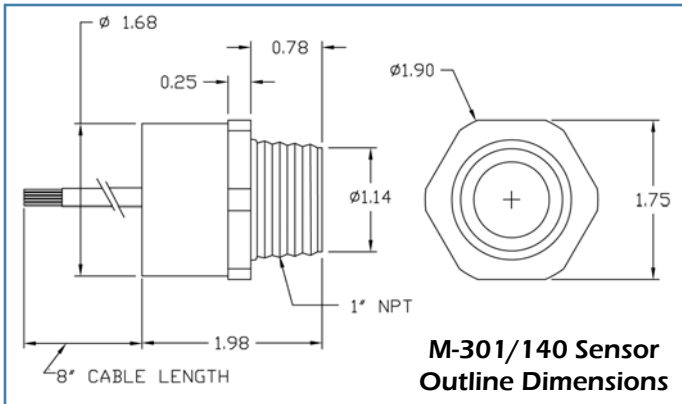
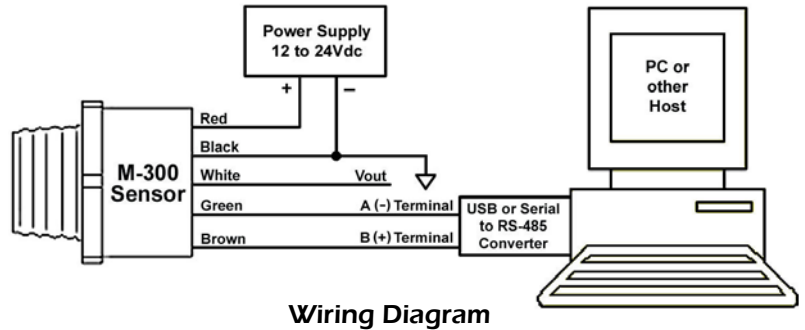
Operating System: Windows® 95/98/NT/2000/XP

# Massa Model M-301/140 Sensor WIRING AND MOUNTING INFORMATION

## Guide for Connecting an M-300 Sensor to a Power Supply and a Computer

To operate any of the Massa M-300 Family of Low Cost Ultrasonic Sensors, it is only necessary to connect its red and black wires to a 12 to 24 V DC battery or power supply, as shown in the diagram below. The voltage output on the white wire will then indicate the distance to the target or its position relative to the setpoint.

To change the programmable parameters or to observe the target distance digitally with the user-friendly software, the M-300 Sensor can be connected to a computer or other host system with either an optionally supplied RS-485/RS-232 Serial Converter or an RS-485/USB Converter. Before more than one M-300 Sensor can be used simultaneously on the same RS-485 Communication Bus, each sensor must first be programmed with its own unique ID Tag. After this has been completed, the green and brown communication wires for all of the M-300 Sensors should all be connected in parallel. Terminating resistors are not required for the RS-485 Network.



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