

**Sigma Controls, Inc.**  
PROCESS CONTROLS AND INSTRUMENTATION



217 S. Fifth Street, Perkasie, PA 18944  
PH: 215-257-3412 FAX: 215-257-3416

**MODEL 8000MP LEVEL SENSOR**



**INSTRUCTIONS FOR INSTALLATION,  
OPERATION & MAINTENANCE**

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**VISIT OUR WEBSITE [SIGMACONTROLS.COM](http://SIGMACONTROLS.COM)**

## SERIES 8000MP LEVEL SENSOR

### 1. DESCRIPTION

The Model 8000MP Submersible Level Sensor is a microprocessor based instrument designed to continuously measure and transmit liquid level data. The sensing element is a media isolated piezoresistive silicon chip with an integral Wheatstone Bridge circuit, mounted within a submersible housing and protected by a 316SS diaphragm. The electrical connection is a four-wire, 20 gauge shielded polyurethane jacketed waterproof cable, attached to a terminal strip with screwed connections.

There are a variety of outputs available on the microprocessor based 8000MP. Base output is 4/20MA two wire. Additional digital outputs include MVNET, (Sigma propriety output RS485 @ 19.2K Baud), ASCII (which also contains temperature data), and MODBUS® when using the available MVNET to MODBUS converter, Sigma part number MV132.

Digital output is useful for several applications:

- A) Direct transducer to radio modem for telemetry application
- B) Multiple transducers may be connected together over a two-wire network to reduce cabling costs where multiple sensors are deployed over a wide area. (Contact Sigma Controls for more information.)

### 2. SPECIFICATIONS

#### Operating Data:

Operating Temperature Range	-40°C to 120°C (-40°F to 248°F)
Compensated Temperature Range	0°C to 50°C (32°F to 122°F)
Stability	Less than .2% output span/year
Overpressure	300% of range

#### Performance Specifications @ 25°C (77°F)

Null Offset	+/.5% output span for all ranges above 0-30PSI
Span Offset	+/.5% output span for all ranges above 0-30PSI

NOTE: Span is full scale output to zero output.  
Accuracy (linearity, hysteresis and repeatability)  
is +/-0.1% output span (best fit straight line)

#### Temperature Error

Output change when temperature changes +/-25°C (=/-45°F) within the comp. Temperature range.      +/-0.25% for all ranges above 0-30PSI

#### 4-20MA Output

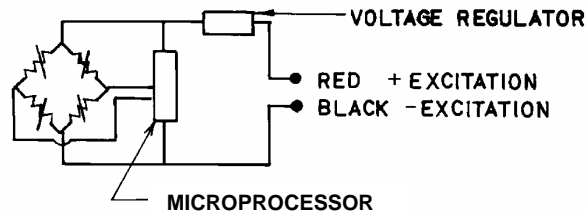
Recommended Excitation	7.8 - 36 VDC
Line Regulation	+0.01% / Volt

Loop Resistance = (Excitation Voltage – 15 X 50

Example: With 45 VDC Excitation

$$\text{Loop Resistance} = (45-15) \times 50 = 1500 \text{ OHMS}$$

7.8 - 36 VDC Input/4-20MA Output



### Physical Characteristics

Materials of Construction:

8000MP Series

Housing: 316SS

Diaphragm: 316SS

Nut: 316 Series SS

Process Connection: PVC Nose 'Cone'

Electrical Connection: 20 gauge shielded cable

Cable Connection: See outline drawing and color code designations.

### 3. INSTALLATION

**Model 8000MP**, contains a removable 'nose cone'. For submergence applications the nose cone should be left in place to protect the process diaphragm from damage during installation or in-process hazards.

**Model 8000MP**, in submerged applications the sensor may be supported by its cable alone, however, where long cable lengths are used or where there is severe turbulence it is recommended to use optional SB cable bracket which permits the sensor to be supported by a stainless steel support cable.

As an alternative in shallow applications the CD (conduit adaptor) option may be used to attach a ½ inch (user supplied) conduit to the back of the sensor which may in turn be affixed to a wall mount bracket.

The submersible cable must be handled with care during installation to prevent any nicks, cuts or abrasion to the outer jacket. Cuts or nicks in the outer jacket will compromise its waterproof capability and allow liquid to leak down into the sensor causing premature failure. **THIS TYPE OF FAILURE IS NOT COVERED UNDER THE WARRANTY.**

Should the ordered length of cable be too long, it may be cut shorter to facilitate installation without affecting sensor calibration.

The sensor/cable is shipped as an assembly. The instrument connection end of the cable has two or four exposed leads that have been stripped and tinned to facilitate instrument connection. These leads are as follows: shield drain wire, connect to ground to reduce signal noise pick-up; red insulated lead which is the positive; power and black insulated lead which is the negative power. Refer to the enclosed typical hook-up Drawing #2.

During installation, any use of wrenches should be limited to the wrench flats on the upper and lower housings. **DO NOT LOOSEN THE GLAND NUT ON THE CABLE CONNECTOR.**

Should a conduit running from the well to the control room be used, the cable may be cut to facilitate fishing the cable through the conduit, see Drawing #3, enclosed. The following conditions should be considered for a problem-free installation:

- A) The cable attached to the sensor should only be cut at a point significantly above any potential floodout level (up out of the actual well area).
- B) The junction box used for splicing the sensor cable must be waterproof and sealed.
- C) Should the conduit run be longer than planned, any good quality two-lead twisted shielded cable of 20 gauge or larger can be used from the junction box to the control room.

Installation of the sensor in the well should include an installation tube whenever possible. This need be nothing more than PVC tubing open at both ends and of a large enough inner diameter to allow the sensor to slide down easily. The use of the tube will prevent hang-up of the sensor, especially in deep wells, during installation and removal. The sensor should be positioned out of the turbulence of the pick-up screen or pump to prevent errors in the level signal. Refer to Drawing #3.

#### **4. LIGHTNING AND VOLTAGE SURGE PROTECTION**

The solid state circuitry of sensors, displays and controllers can be affected by voltage surges and lightning strike transient voltage spikes. The optional surge protectors available provide adequate protection for all but the most severe surges and transient voltage spikes normally caused by a near-by or direct lightning strike.

These units provide protection for electronic equipment installations and should be used in any area where lightning may occur.

Should cable length from the sensor to the control room exceed 200 feet, a surge suppressor should be installed as close to the sensor as possible. Miniature units that can be fitted inside a junction box are available (contact factory). Refer to Drawing #1.

#### **5) ELECTRICAL CONNECTION OF THE SENSOR**

The Sigma level sensor may have been supplied with an optional indicator/controller, or alone for use with user supplied instrumentation. Drawings have been enclosed to cover the majority of installations (2 through 3).

Drawing #1 covers most user supplied instrumentation. It details a standard two-wire loop installation with all components connected in series.

Drawing #2 shows customer connections to the optional Sigma display/controller in a Nema 4 housing. These options are supplied with internal terminal blocks to facilitate wiring connections. Labels are applied to the terminal strip to indicate the proper connections.

For display/controllers supplied for panel mount, (not Nema 4 box), refer to the actual manual supplied for the particular meter supplied.



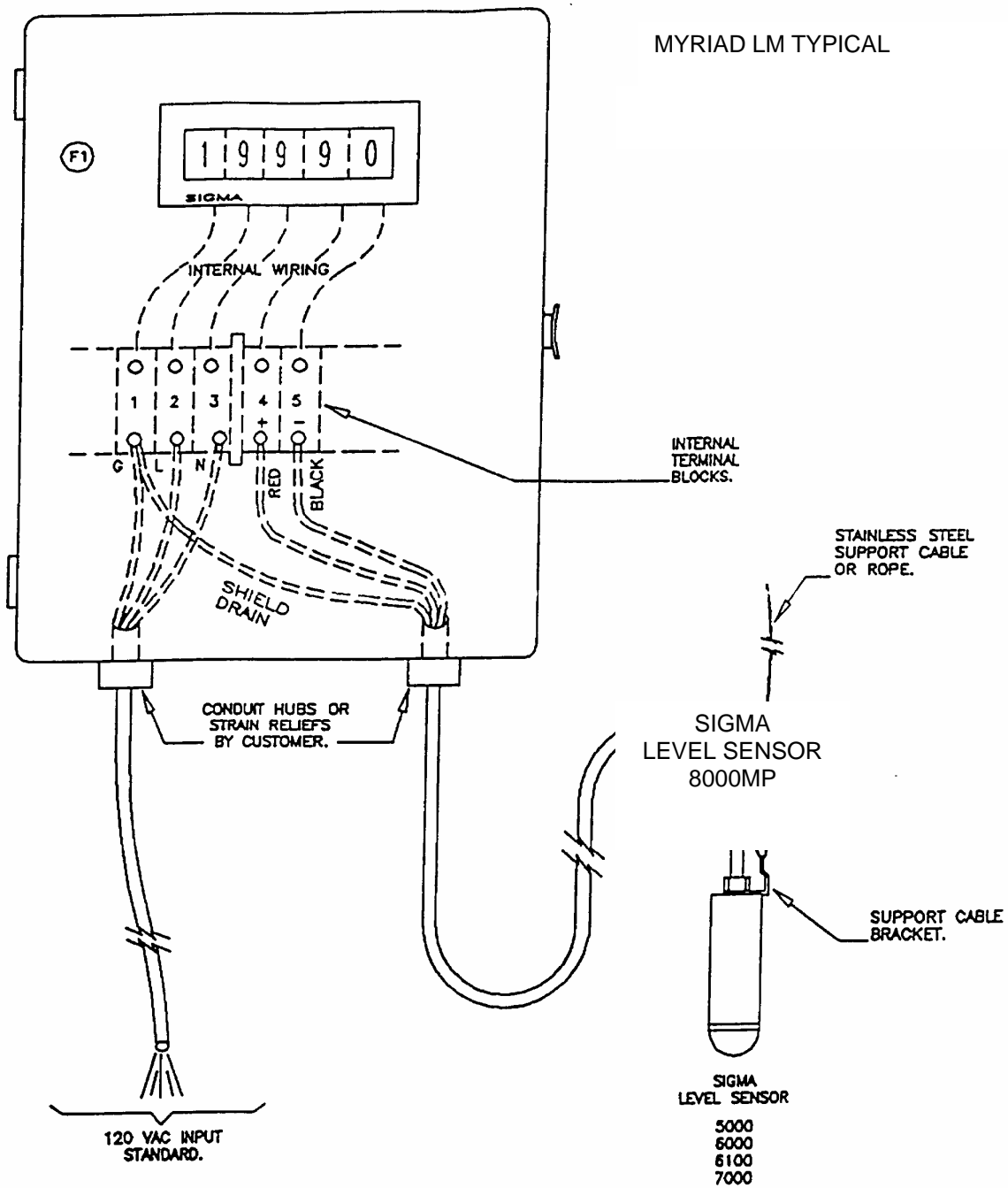
**CAUTION: BLUE & YELLOW DATA OUTPUT WIRES MUST NEVER BE CONNECTED TO DC POWER, DAMAGE TO CIRCUIT BOARD CAN RESULT.**

#### **6) TROUBLE SHOOTING GUIDE**

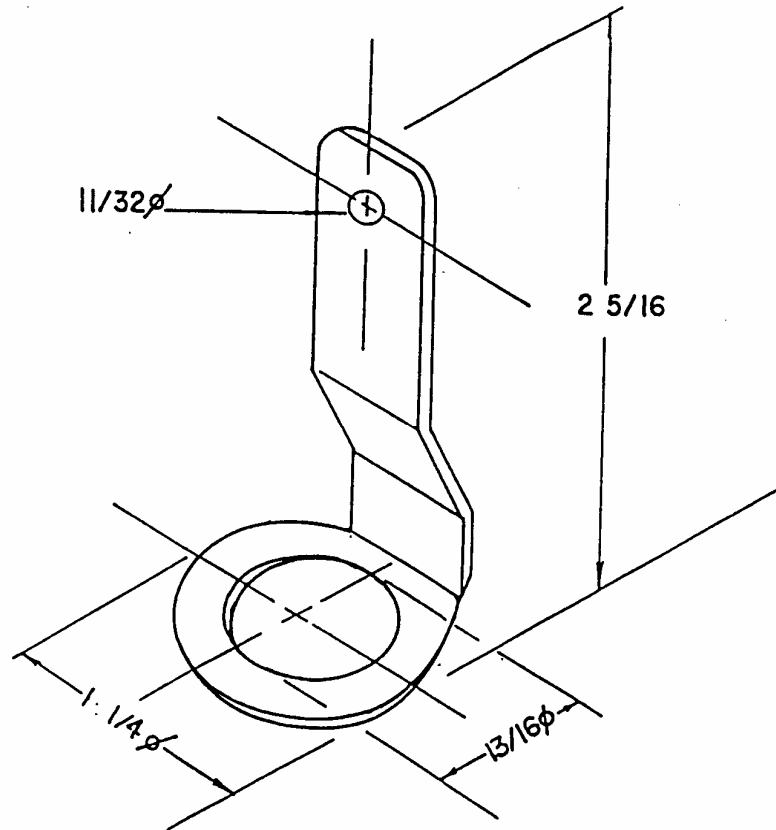
- A) Sigma sensors connected to user-supplied indicating and or controlling equipment.
  - 1) Equipment does not turn on:
    - a) Check for proper supply voltage (120VAC, 240VAC, or other)
    - b) Check fuses, if any
    - c) Check wiring terminations
  - 2) Equipment operates, but no level is indicated, or indicated level is incorrect.
    - a) Check polarity of sensor leads, red to positive terminal, black to negative
    - b) Test for DC voltage across sensor lead connections; minimum 13VDC, nominal 24VDC
    - c) Determine input signal required by equipment, 4-20MA, 1-5VDC, 1-10VDC? The Sigma sensor supplies a 4-20MADC signal. See Drawing #1, R1 note.
    - d) Lift sensor several feet in well. Does the indicated level change?
      - Yes -- Equipment not calibrated for the range of the 4-20MA output of the sensor. Check sensor calibration sheet supplied with manual. Recalibrate equipment.
- 3) Equipment works, but indicated level is incorrect, (major or minor error):
  - a) Level indication changes when cable pulled to raise and lower sensor, and calibration is correct. Sensor is not at required depth; or level is not at anticipated height.
  - b) Pulling cable up to raise, then lower, sensor does not affect indication. Sensor probably hung up and not completely down well; continue pulling the cable out until sensor is freed. Re-lower sensor to proper depth.

B) Sigma sensor and Sigma indicator/controller.

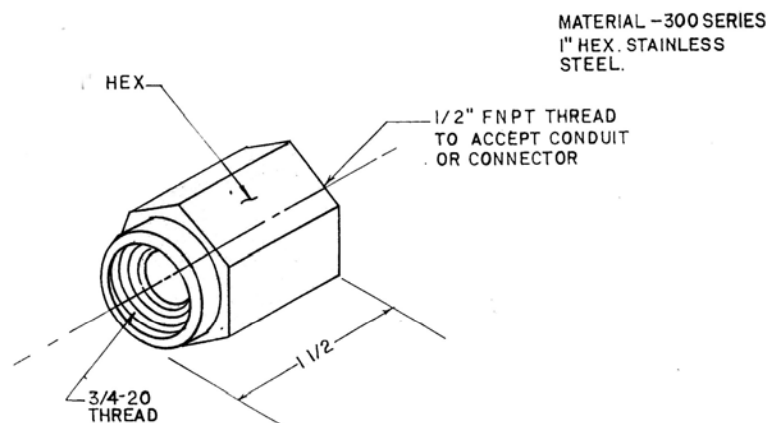
- 1) Digital display does not light up when power is applied:
  - a) See preceding (1) a & b. Standard is 120VAC.
- 2) Display lights up, but indication of level is incorrect.
  - a) Check fuse F1 for 4-20 signal loop.
  - b) Check polarity of sensor leads, red to positive, black to negative terminals. Normally terminals 4 & 5.
- c) See preceding (2) b & d, (3) a & b.



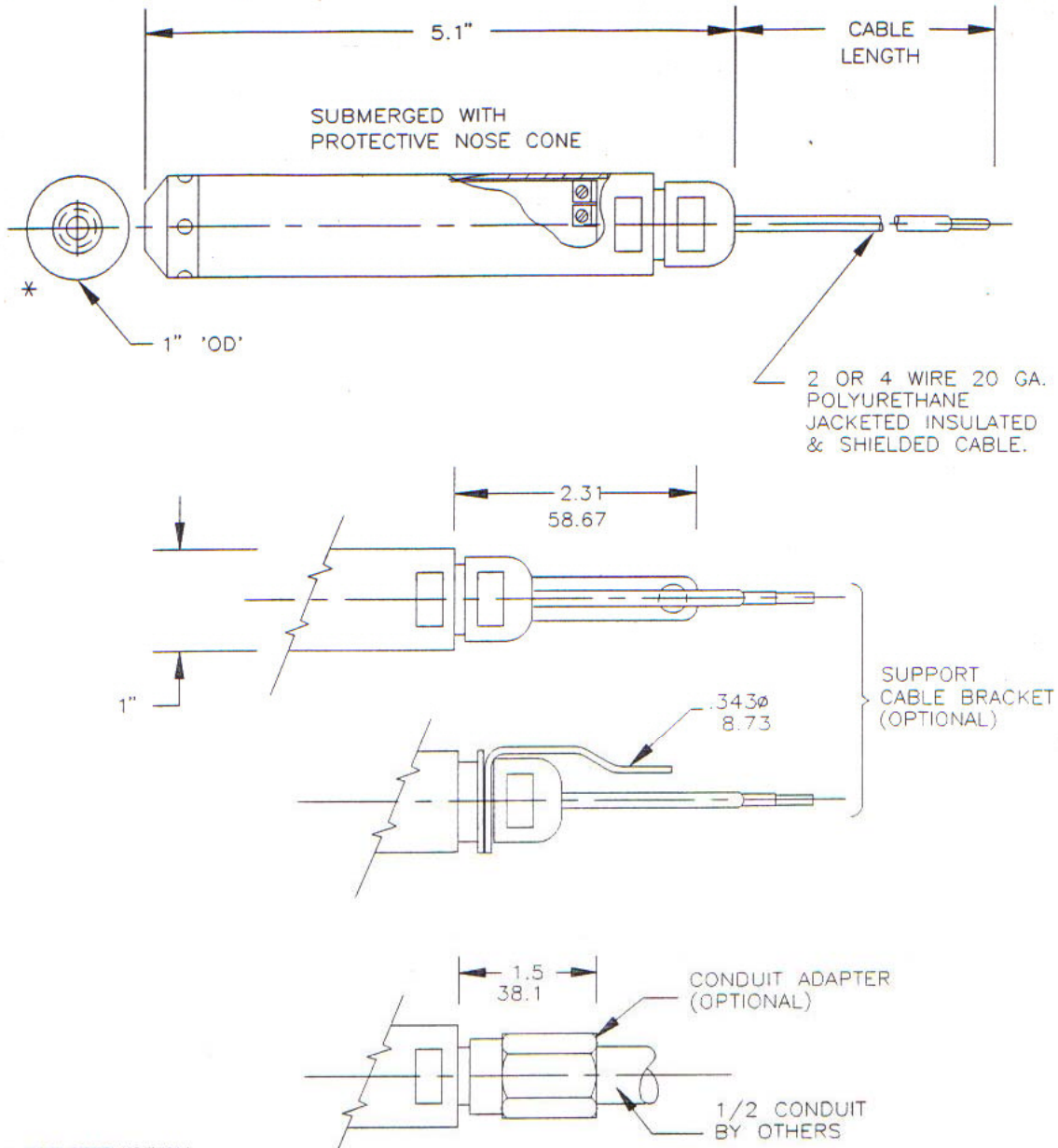
TYPICAL WIRING DIAGRAM #2



**CABLE SUPPORT BRACKET**



**CONDUIT ADAPTOR**



\* CONSTRUCTION

BODY & NUT: 316s.s.  
NOSE: PVC STANDARD

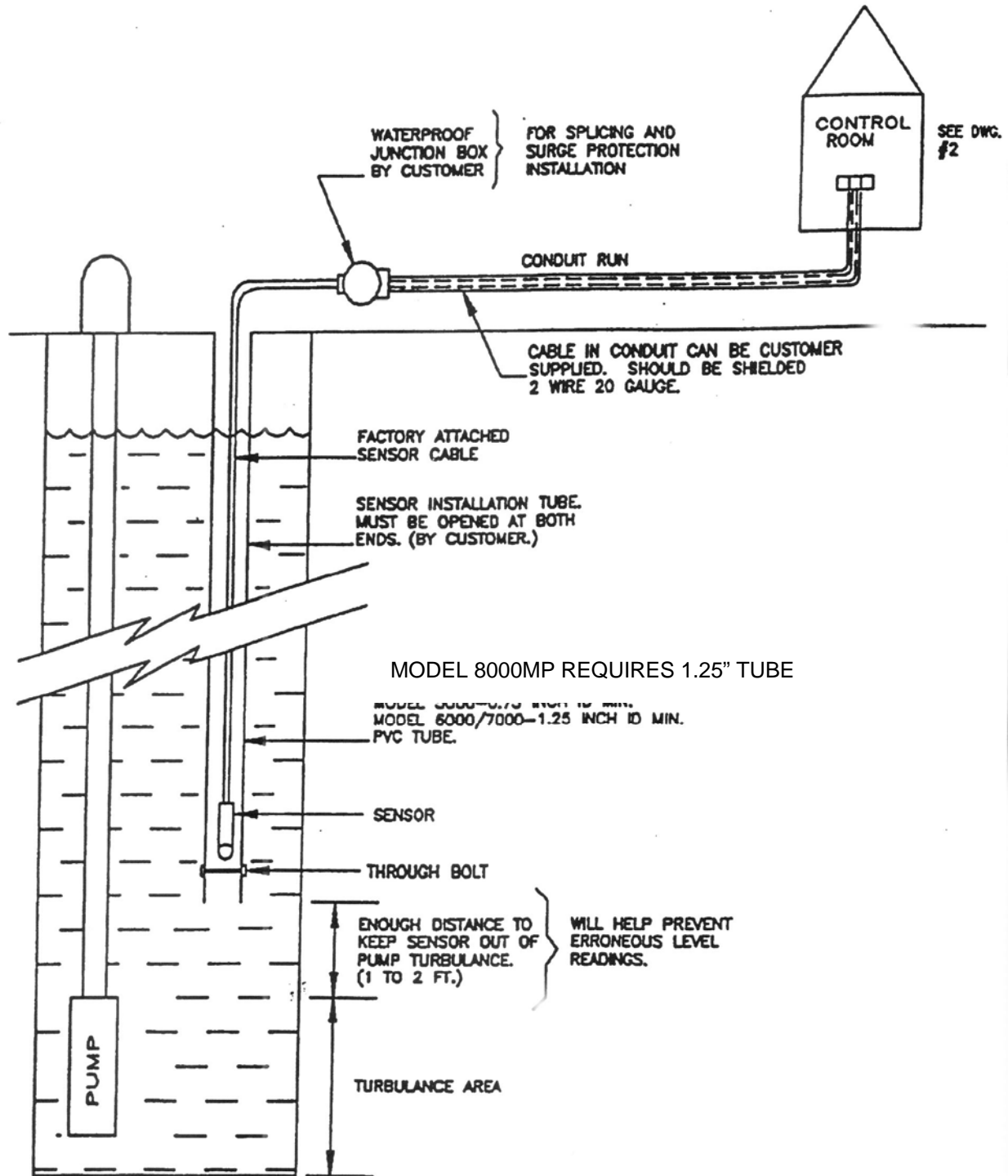
**SIGMA**  
Controls, Inc.

Dwg. No. 03-343  
Date : 12-20-03  
Scale : N.T.S.  
Revision:

MODEL 8000  
SENSOR  
OUTLINE DRAWING WITH OPTIONS.

514 W. Walnut Street, Perkasi, Pa. 18944 — (215) 257-3412





**JUNCTION BOX/PUMP DRAWING #3**