

Entech Design, Inc.

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Expansion Pro Analyzer - Model: EPA 2000 Media Depth & Expansion Analyzer Specification

Part 1. General

1.1 Scope

- A. This section describes the requirements for a Media Depth and Expansion Analyzer inclusive of transducer(s) and analyzer/transmitter.
- B. Under this item, the contractor shall furnish and install the Media Depth and Expansion Analyzer equipment and accessories as indicated on the plans and as herein specified.

1.2 Submittals

- A. The following information shall be included in the submittal for this section:
 - 1. Data sheets and product literature for microprocessor based transmitter and transducer.
 - 2. Connections and dimensional drawings.
 - 3. List of spare parts.

Part 2. Products

2.1 Media Depth & Expansion Analyzer

- A. The Media Depth and Expansion Analyzer shall be a microprocessor based echo-time measuring type. It shall consist of a four-channel controller signal processor and one to four transducers.

B. Transducer:

1. Operating principle: Acoustic impulses emitted from a transducer are reflected back from filter media and are received by the transducer.

The transmit time of pulse travel from generation to echo is measured. The elapsed time is proportional to the distance between the transducer and material surface(s). The relative strength of the return echo is plotted on a proportional graphic display indicating the surface of the filter media and the expanded media.

2. Primary Sensor: The transducer shall at a frequency from 500 - 750 KHZ.
 - a. The measurement range of the transducer shall be seven (7) feet.
 - b. Process connection shall be ¾ inch NPT.
 - c. Sensor shall have integral self-cleaning wiper system to automatically remove air bubbles and particulate from the face of the sensor.
 - c. Process water temperature shall be +1° C to +50°C.
 - d. Transducer housing shall be constructed of PVC.

C. Transmitter

1. Transmitter shall utilize a 32 bit microprocessor
 2. Enclosures shall be NEMA 4X molded fiberglass polyester
 3. Power supply shall be 110 to 230 VAC +/- 10% @ 50/60Hz.
- A. Temperature range shall be -20°C to +60°C

5. Outputs:
 - a. Four, 4-20mA proportional outputs. Output values shall be referenced to Media Depth and are scaled to a range of \pm two feet of Media Depth.
 - b. Four SPDT Echo Loss Alarm Relays rated at 10A @ 250V AC; 10A @ 30V DC

- A. Control and Programming
 - a. All parameters and commands shall be entered via an integral membrane keypad. No additional equipment shall be required for programming, or echo evaluation.

- B. Modes of Operation
 - a. There shall be two modes of operation: Continuous Sequential, and HOLD for Filter Backwash.
 - b. In the Continuous Sequential mode of operation, the unit shall automatically switch through the measurement points at intervals determined by user-selected parameters.
 - c. In the HOLD for Filter Backwash mode of operation, the user may isolate a selected measurement point for continuous operation during filter backwashing. The selected filter is released by pressing the HOLD key or by preset time default.

7. Transmitter shall process all echoes from stored memory that is continually updated after echo enhancement.

- D. Transmitter and Transducer Performance

1. Measurement Range shall be 1 to 7 feet from the transducer.
2. Accuracy shall be $\pm .25\%$ of measurement range or one half inch, whichever is greater.
3. Maximum separation between transmitter and transducer shall be 1000 feet.

E. Indication

1. Display shall be a multi-function LCD with back-light. The user may access three display Views, and the Menu System. The Media Expansion View shall provide an indication of Media Expansion in Inches or Centimeters and as a percent of Current Media Depth. The Media Depth View shall provide an indication of the Current Media Depth of each filter and a separate indication of Media Loss. The Echo Waveform View is accessible with Factory parameters turned to: ON. This View displays a graphic representation of the return echo signal pattern in terms of the strength of the echo relative to distance.

F. Equipment

1. The Media Depth and Expansion Analyzer shall an Expansion Pro Analyzer 2000™ with one (1) to four (4) Self-cleaning Wiper Transducers, by Entech Design, Inc.

Part 3. Operator Functions

3.1 Calibration

- A. Calibration of the Media Depth and Expansion Analyzer shall be accomplished by the entry of all operating data through the integral membrane keypad. No additional equipment shall be required.
- B. When powered, or in the event the Reboot command is called by the user, the user shall be prompted to enter: 1) the distance between the transducer and the

media, and 2) the depth of the filter media. System Sound Speed calibration, referencing of the range measurement to Media Depth, and setting of operating Gain shall be accomplished automatically from these parameters.

- A. Acoustic echo evaluation and interpretation shall be accomplished through the LCD graphic display. No additional equipment shall be required.

3.2 Transmitter Function Details

- A. The transmitter shall provide a 4-20 mA signal that is proportional across a four ft. span. The span is centered at the Media Depth value established by the user when the unit is initialized.
- B. The transmitter shall provide a 4-20 mA signal that is associated with each individual transducer by discrete mA voltage.
- C. The transducer shall be permanently mounted at the measuring site and shall be installed in accordance with the manufacturer's recommendations.
- D. The transducer shall transmit and receive an acoustic signal to accurately measure media expansion and settled media depth based on a measurement that is referenced to a range measurement.
- E. The power to operate the transducer(s) shall come solely from the transmitter over the signal interconnection cable. No additional equipment shall be required between the transmitter and the transducer.
- F. The Echo Loss Alarm Relays shall operate to open or close the relay circuit in response to an indication of loss of echo sufficient to secure a dependable measurement. Each relay shall have a programmable delay time feature to determine the amount of time that the echo loss condition must persist for the relay to activate. The programmable delay time shall range from two (2) to 120 seconds.

- G. The transmitter shall have an EPROM memory and shall not require a battery to ensure protection of stored data.
- H. The transmitter shall have Automatic Initialization and Automatic Gain features that establish the primary operating parameters and adjust the operating Gain.

Part 4. Execution

a. Installation

- A. Locate the transducer four inches below the top of the filter wash trough and a minimum of six inches to the side of the trough. The transducer should be at least 24 inches above the media with the filter on-line.
- B. The transducer mounting pipe should be secured so as to prevent movement or excessive vibration of the transducer during normal operation and backwashing.
- C. Mount the transducer in a position that ensures that there is no fixed obstruction between the transducer and the filter media.
- D. Wiring between the transmitter and the transducer shall be routed through grounded metal conduit.

Part 5. Warranty

5.1 Terms

- A. The manufacturer of the equipment shall guarantee for twelve (12) months from delivery that the equipment shall be free from defects in design, workmanship or materials.
- B. In the event the equipment fails to perform as specified or is proven defective in service during the warranty period, the manufacturer shall promptly repair or replace the defective part at no cost to the owner.
- C. This is a specific-use instrument designed for water and wastewater treatment gravity filters. Use in other applications is not recommended and may not

produce the desired measurement results.

Part 6.

Options

- A. Transmitter mounting plate and mounting hardware for handrail or wall mount.
- B. Transducer mounting hardware.

Part 7.

Spare Parts

7.1 Recommended Spare Parts

- A. None