

SUGGESTED SPECIFICATIONS

Note To Consultants and Designers: Use this document as a guide when writing specifications for Storage Tank Liquid Level Management Systems requiring 0.1 GPH or 0.2 GPH In-Tank leak detection, and/or secondary containment leak detection capabilities, which meet or exceed the current Standard EPA required protocols.

Client _____

Project Name _____

Project Number _____

EPA Compliant TMS4000 Color, Touchscreen-based Precision In-Tank Liquid Level Control and External Leak Sensor Management System for both Underground and Aboveground Liquid Storage Tanks

I. General: These specifications are provided to prospective bidders and engineering consultants as a guide to understanding the requirements relative to furnishing and installing an electronic monitoring system for underground liquid storage tanks (USTs), associated buried piping and containment areas. This document will address and describe the capabilities and performance standards of the model **TMS4000** Tank Management and Leak Detection system as set forth and in accordance with the USEPA Federal standards for (USTs) as described in Subpart D, 40 CFR Part 280.

II. Relevant Documents: The tank monitoring system shall meet all of the applicable performance specifications and regulatory agency requirements set forth by the following organizations:

- American Petroleum Institute (API)
- American Society for Testing and Materials (ASTM)
- Environmental Protection Agency (EPA)
- Federal Communications Commission (FCC)
- National Electric Code (NEC)
- National Fire Protection Agency (NFPA)
- Underground Storage Tank: Subpart D, 40 CFR Part 280
- Underwriters Laboratories (UL)

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III. Tank Management Console: The console shall be microprocessor-based, and shall be designed and constructed with modular architecture easily permitting either factory or field upgrades and servicing. The console shall be housed in a lockable, wall-mounted or panel-mount NEMA 12 enclosure, and shall optionally be available in a NEMA 4X, weatherproof and corrosion-proof outdoor configuration. The user interface shall be a 10.4" color SVGA LCD display with integral touchscreen having a minimum 2mm thick protective glass touch surface. To assure durability, the touchscreen glass shall be chemically treated to provide a minimum 7H hardness. Touchscreen surfaces made from plastic materials shall not be acceptable. Gloved-hand operation shall be supported when installed outdoors, and manufacturer shall guarantee the display against fogging or the collection of condensate on the interior of the viewing window. Screen saver modes shall be provided to enhance display longevity. Display presentation shall provide real-time tank measurement data, statuses and alarms in three different formats simultaneously; large-font numerics readable from 50'; detailed spreadsheet; and quick-view bar graphs. Each format shall be user-configurable, and active or alarming tanks shall have visual priority. Dedicated touch buttons shall be provided for quick access to alarm conditions and display brightness control. Dedicated front panel LEDs shall be provided to indicate POWER, NORMAL and ALARM conditions.

System shall maintain set-up and configuration files in non-volatile memory having a minimum fifty (50) year data retention without requiring power of any kind, and shall provide a means for importing or exporting these files via USB flash drive or through serial, Ethernet or cellular communications. Historical log data, such as inventory, delivery, bulk sales, theft, water removal, product order, alarm, error, tank leak, and leak history reports shall be maintained in non-volatile, removable SD card memory format with a minimum fifty (50) year data retention in the event of a power outage. All log data shall be encrypted for security purposes. A Real-Time clock shall be provided and maintained with a high-value capacitor for maintenance-free operation.

E-mail/SMS alerts and Web-based access to real-time data and alarms, historical logs, configuration and firmware updates shall be supported as standard feature via Ethernet TCP/IP or optional cellular connectivity.

The system shall be independently third-party certified for UST petroleum storage tanks and have the capability to automatically or manually conduct a static volumetric tank tightness test to an accuracy of 0.2 GPH for monthly monitoring and 0.1 GPH for annual precision testing, with minimum test times of two hours and eight hours respectively. System shall be capable of performing both tests with as little as 20% of tank capacity. The system shall also be independently third-party certified for secondary containment leak detection, including 3 GPH catastrophic line leak detection on pressurized piping systems.

1. Intrinsically Safe Probe/Sensor Inputs: Console shall have provisions for accepting three (3) intrinsically safe expansion cards providing the capability to continuously monitor in varying combinations, up to forty-eight (48) dual-float magnetostrictive in-tank level probes and/or up to forty-eight (48) secondary containment leak/point-level sensors. Leak and point-level sensor inputs shall support a means to detect sensor open-circuit and short-circuit wiring faults as a standard feature when used in conjunction with fault-reporting sensors. Intrinsically Safe options shall include:

- 4-Probe/8-Sensor Card, Pneumercator **Part Number 900436-1**
- 16-Sensor Card, Pneumercator **Part Number 900568-1**
- 16-Probe Card, Pneumercator **Part Number 900999-1**

2. Non-Intrinsically Safe Inputs: Console shall have provisions for accepting two (2) non-hazardous I/O expansion cards providing support for optional relay or analog output cards. Console shall have support for up to 64 relay outputs, and all relays and contact closure inputs shall be user-programmable for activation by the following event types; Theft, Power Fail Recovery, System Error, Tank Leak, Product Setpoints, Water Setpoints, Temperature Setpoints, Leak/Point Level Sensors, Contact Closure inputs and Line Leak. Optional 6 or 12-channel Analog Output card shall be available to provide 0-20ma/4-20ma/0-24ma/0-1ma signals for tank-related real-time data. I/O options shall include:

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- 4 Input/4 Output Relay Card, Pneumercator **Part Number 900428-1**
- 8 Input/8 Output Relay Card, Pneumercator **Part Number 900550-1**
- 16-Relay Output Card, Pneumercator **Part Number 900519-1**
- 32-Relay Output Card, Pneumercator **Part Number 900986-1**
- 6-channel Analog Output Card (one per console), Pneumercator **Part Number 900496-1**
- 12-channel Analog Output Card (one per console), Pneumercator **Part Number 900496-2**

3. Communications: Standard communications shall include Ethernet TCP/IP, USB host and client, two (2) RS232 serial ports and one (1) RS485 serial port for connection to "smart" peripherals, such as remote "slave" display and annunciator panels. Options shall be available for up to four (4) additional RS232/RS485 or ModBus RS485 ports, telephone modem or cellular modem. Communications options shall include:

- 14,400 Baud Modem, Pneumercator **Part Number 900433-10**
- Auxiliary RS-232 Interface Card, Pneumercator **Part Number 900571-2**
- Dual RS-232/RS-485 Serial Interface Card, Pneumercator **Part Number 900571-4**
- Modbus RTU Interface Card, Pneumercator **Part Number 900552-10**
- Isolated Modbus RTU Interface Card, Pneumercator **Part Number 901050-10**
- Dual-Modbus RTU Interface Card, Pneumercator **Part Number 900665-5-5**
- Isolated, Dual-Modbus RTU Interface Card, Pneumercator **Part Number 900665-R-R**
- Isolated Quad-Modbus RTU Interface Card, Pneumercator **Part Number 900931-3-4**
- Cellular Modem, Pneumercator **Part Number 901040-1**

4. Input Power: Standard system power supply shall automatically operate on 95-250 VAC, 50/60 Hz, and options shall be provided for 10-50 VDC negative ground sources. Maximum power consumption shall be 80 watts.

5. Hardcopy Reports: The system shall be optionally available with internally-installed thermal or impact printer providing 24-column portrait mode or 133-column landscape mode hardcopy reports. Printer option shall be field-upgradeable and be available for outdoor use. Printer options shall include:

- Thermal Printer Kit **Part Number 10721-1**
- Impact Printer Kit **Part Number 10721-2**

Console shall be Pneumercator **Model Series TMS4000**.

IV. Tank Gauging Probe: Probe shall be designed for both AST and UST applications and shall have performance characteristics permitting 0.1 GPH or better in-tank leak test with continuous gauging accuracy of +/- 0.0005 inches for product, +/- 0.001 for water and +/- 0.001 degrees F for (relative) temperature. Probe shall contain an array of at least five (5) temperature sensors along its length for accurate volumetric temperature compensation. Probe to console communication shall employ digital transmission techniques carried over standard, readily available two-conductor, shielded cable, with a maximum cable length restriction of no less than 4000 feet. Probe operating temperature and pressure shall be -40 to +175 degrees F and 150 PSIG respectively. Probes shall be supplied with product float, water float, six (6) foot leader cable with watertight connector, and centering rings for riser mounted applications. Probe shall be UL/CSA approved for use in Class I, Division I, Group C & D hazardous locations.

Probe shall be Pneumercator **Model MP450S** for rigid lengths from 24 to 216 inches.

Probe shall be Pneumercator **Model MP451S** for rigid lengths from 217 to 288 inches.

Probe shall be Pneumercator **Model MP452S** for oil/water separator tanks.

Probe shall be Pneumercator **Model MP461S** for flexible lengths from 12 to 216 inches.

Probe shall be Pneumercator **Model MP462S** for flexible lengths from 217 to 288 inches.

Probe shall be Pneumercator **Model MP463S** for flexible lengths from 289 to 600 inches.

Probe shall be Pneumercator **Model MP464S** for flexible lengths from 601 to 840 inches.

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V. Secondary Containment Leak Sensors: Both non-discriminating and product/water-discriminating leak sensors shall be available for liquid detection in interstitial spaces, containment areas, sumps, brine reservoirs, dispenser pans and piping locations. All sensors shall be optionally available with a wiring fault detection feature.

Non-Discriminating Type Liquid Sensors

3A. Alternate sump, dispenser pan and steel tank double-wall sensor shall be a 2-wire type consisting of a magnetic, Buna-N float encased within a 1-1/2 inch diameter, stainless steel outer housing and supplied with twenty-five (25) feet of 2-conductor #22 AWG gage wire. Sensor shall be rated to 50 PSIG at 160F with an accuracy of 1/2-inch of liquid. Sensor shall optionally be available with tamper-resistant feature to detect improper installation. Optional configuration utilizing 1-3/4 inch diameter stainless steel/Teflon housing, stainless steel float and Teflon-jacketed cable shall be available for solvent/fuel additive applications. Sensor shall optionally be available with tamper-resistant feature to detect improper installation. All sensors shall be available with wiring fault detection option [F].

Petroleum sump, dispenser pan and steel tank double-wall leak sensor shall be

Pneumercator **Model LS600LDBN-1-[F]**.

Petroleum sump, dispenser pan and steel tank double-wall leak sensor with tamper-resistant feature shall be

Pneumercator **Model LS600LDBN-1-FT**.

Solvent sump, dispenser pan and steel tank double-wall leak sensor shall be

Pneumercator **Model LS600LDSS-[F]**.

Solvent sump, dispenser pan and steel tank double-wall leak sensor with tamper-resistant feature shall be

Pneumercator **Model LS600LDSS-FT**.

3B. Alternate dispenser pan or fiberglass tank annular sensor shall be a 2-wire type consisting of a horizontally-oriented magnetic float encased within a fabricated PVC outer housing and supplied with twenty-five (25) feet of 2 conductor #22 AWG gage wire. Sensor shall pass through a fiberglass double-wall tank annular space tank opening. Sensor shall provide an accuracy of 1/2 inch of liquid.

Dispenser pan or fiberglass tank annular leak sensor shall be Pneumercator **Model LS610**.

3C. Wet annular reservoir sensor shall be 3-wire type consisting of dual magnetic floats capable of detecting breached inner or outer walls of a double-wall fiberglass tank. The reservoir sensor and its components shall be provided with a non-corroding PVC outer housing, float and guide stem assembly, and sixteen (16) feet of 3-conductor #22 AWG gage wire. Sensor shall mount in a specified manway on top of each tank and rest on the reservoir floor. The Hydrostatic sensor shall detect changes in the reservoir brine or glycol solution when the level drops below 2 inches or rises above 11 inches of liquid. An alternate 2-wire type shall be available with built-in wiring fault detection.

3-wire wet annular reservoir leak sensor shall be Pneumercator **Model RSU800-2**.

2-wire wet annular reservoir leak sensor shall be Pneumercator **Model RSU801-[F]**.

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3D. An electronic sump, dispenser pan and dry annular sensor utilizing optical technology and no moving parts shall be available to sense the presence of liquid within a secondary containment space. Sensor shall operate reliably with cable lengths up to 4000 feet and shall include both wiring and sensor fault detection as a standard feature. Sensor assembly shall be provided with a twenty-five (25) foot, 3-conductor, #22 AWG gage wire cable. Sensor shall be optionally available with an extended low operating temperature of -40 degrees F. Sensor shall be optionally available in materials of construction suitable for use in solvent or chemical applications.

Electro-optical sump, dispenser pan and dry annular leak sensor shall be Pneumercator **Model ES 825-100F**.
(Standard)

Electro-optical sump, dispenser pan and dry annular leak sensor shall be Pneumercator **Model ES 825-100XF**.
(Extended Temperature)

Electro-optical sump, dispenser pan and dry annular leak sensor shall be Pneumercator **Model ES 825-100CF**.
(Chemical/Solvent Resistant)

Discriminating Type Liquid Sensors

3E. A discriminating electronic sump, dispenser pan and dry annular sensor utilizing both electro-optical and conductivity technologies shall be available for detecting and differentiating between the presence liquid hydrocarbon and water within a secondary containment space. Sensor shall operate reliably with cable lengths up to 4000 feet and shall include both wiring and sensor fault detection as a standard feature. Sensor assemblies shall be provided with a twenty-five (25) foot, 3-conductor, #22 AWG gage wire cable. Sensor shall be optionally available with an extended low operating temperature of -40 degrees F.

Discriminating sump, dispenser pan and dry annular leak sensor shall be Pneumercator **Model ES 825-200F**.
(Standard)

Discriminating sump, dispenser pan and dry annular leak sensor shall be Pneumercator **Model ES 825-200XF**.
(Extended Temperature)

3F. A discriminating, flexible electronic wet well sensor utilizing conductive polymer technology shall be available for detecting the presence of hydrocarbon-based liquids floating on water anywhere along its sensing length. The sensor shall be unaffected by the presence of water or hydrocarbon vapor. Sensor shall operate reliably with cable lengths up to 4000 feet. Sensor assembly shall be provided with a four-foot, 3-conductor leader cable with mating sensor connector. Sensor shall provide separate alarms for “hydrocarbon present” or “dry well” conditions.

Wet well leak sensor shall be Pneumercator **Model HS100D2** (Separate hydrocarbon and dry well alarms)

3G. A discriminating, flexible electronic wet well sensor utilizing conductive polymer technology shall be available for detecting the presence of hydrocarbon-based liquids floating on water anywhere along its sensing length. The sensor shall be unaffected by the presence of water or hydrocarbon vapor. Sensor shall operate reliably with cable lengths up to 4000 feet. Sensor assembly shall be supplied with twenty-five (25) feet of 2 conductor #22 AWG gage wire. Sensor shall alarm for “hydrocarbon present” conditions.

Hydrocarbon leak sensor shall be Pneumercator **Model HS100ND**

3H. A USEPA-compliant line leak sensor shall be available for detecting a 3 GPH catastrophic leak on pressurized liquid piping systems operating at up to 120 psi. A detected leak shall provide an audible/visual alarm, and in support of critical power applications, shall be programmable to enable or disable pump shutdown. All wetted components of the sensing body shall be constructed of 316SS, and the exterior housing shall be available in aluminum or 316SS. Sensor shall operate reliably with cable lengths up to 4000 feet. Sensor assembly shall be supplied with weathertight, quick-disconnect and six (6) foot leader cable.

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3 GPH Pressure Line Leak sensor with aluminum outer housing shall be Pneumercator **Model LLP203-1**

3 GPH Pressure Line Leak sensor with 316SS outer housing shall be Pneumercator **Model LLP203-2**

3 GPH Pressure Line Leak sensor with Hastelloy C-276 outer housing shall be Pneumercator **Model LLP203-3**

VI. External Remote Audible/Visual Displays and Annunciators:

4A. Remote Audible/Visual Alarm Annunciator shall consist of a solid-state electronic wall-mounted Strobe/Siren combination housed in a NEMA 4X weatherproof enclosure. The audible annunciator shall have a minimum rating of 101db at ten (10) feet. The visual annunciator shall be Xenon strobe type with a minimum rating of fifteen (15) candelas. Multiple annunciators shall have the capability of being connected in a daisy chain or parallel configuration. A separate Test/Reset remote switch assembly shall also be available in a NEMA 4X enclosure to be used in conjunction with the remote audible/visual alarm, permitting the annunciator to be mounted with an optimal mounting height for maximum visual and audible range, yet providing access to Test/Reset functions. Acknowledging alarms shall only silence the audible alarm, while the visual alarm remains until the condition is corrected. The Test button shall be provided to verify operation of both the audible and visual alarms. System shall operate on switch selectable 110/220VAC(+/- 10%), 50/60 Hz line voltage. Maximum power consumption shall be less than 5 watts.

External Remote Annunciator shall be Pneumercator **Model RA200**.

External Remote Test/Reset Switch Assembly shall be Pneumercator **Model RS2**.

4B. An electronic remote audible/visual alarm shall provide independent, remote annunciation of user-selected alarms from a distance up to 4000 feet from the main console. Communications shall be over an RS-485 multi-drop topology supporting the connection of up to 16 remote annunciators to one tank management system. The remote annunciator shall be housed in a NEMA 4X enclosure for harsh industrial/outdoor environments. The visual alarm shall be sunlight-readable LED technology for maximum reliability in extreme temperatures. Pushbutton controls shall be provided for audible/visual test and audible silence. Pushbuttons shall be minimum one inch on centers for easy operation with gloved hands.

External Remote Audible/Visual Alarm shall be Pneumercator **Model RA400**

4C. An electronic tank display shall provide independent, remote access to all real-time tank data and alarms from a distance up to 4000 feet from the main console. Communications shall be over an RS-485 multi-drop topology supporting the connection of up to 16 remote displays to one tank management system. The remote display shall be housed in a lockable, wall-mounted or panel-mount NEMA 12 enclosure, and shall optionally be available in a NEMA 4X, weatherproof and corrosion-proof outdoor configuration. The user interface shall be a 10.4" color SVGA LCD display with integral touchscreen having a minimum 2mm thick protective glass touch surface. To assure durability, the touchscreen glass shall be chemically treated to provide a minimum 7H hardness. Touchscreen surfaces made from plastic materials shall not be acceptable. Gloved-hand operation shall be supported when installed outdoors, and manufacturer shall guarantee the display against fogging or the collection of condensate on the interior of the viewing window. Screen saver modes shall be provided to enhance display longevity. Display presentation shall provide real-time tank measurement data, statuses and alarms in two different formats simultaneously; large-font numerics readable from 50'; and quick-view bar graphs. Each format shall be user-configurable, and active or alarming tanks shall have visual priority. Dedicated touch buttons shall be provided for quick access to alarm conditions and display brightness control. Dedicated front panel LEDs shall be provided to indicate POWER, NORMAL and ALARM conditions.

External Remote Electronic Tank Display shall be Pneumercator **Model ETD1000T**

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4D. An electronic tank display shall provide independent, remote access to all real-time tank data and alarms from a distance up to 4000 feet from the main console. Communications shall be over an RS-485 multi-drop topology supporting the connection of up to 16 remote displays to one tank management system. The remote display shall be housed in a NEMA 4X enclosure for harsh industrial/outdoor environments. The display shall be sunlight-readable LED technology for maximum reliability in extreme temperatures. Pushbutton controls shall be one inch on centers for easy operation with gloved hands.

External Remote Electronic Tank Display shall be Pneumercator **Model ETD1000**

4E. An electronic remote audible/visual alarm shall provide independent, remote annunciation of user-selected alarms via wireless 900Mhz or 2.4Ghz radio supporting the connection of up to 16 remote annunciators to one tank management system via a single wireless peripheral server. The remote annunciator and wireless server shall be housed in NEMA 4X enclosures for harsh industrial/outdoor environments. The visual alarm shall be sunlight-readable LED technology for maximum reliability in extreme temperatures. Pushbutton controls shall be provided for audible/visual test and audible silence. Pushbuttons shall be minimum one inch on centers for easy operation with gloved hands.

External Wireless Remote Audible/Visual Alarm shall be Pneumercator **Model RA400W**
Wireless Peripheral Server shall be Pneumercator **Model MPX200**

4F. An electronic tank display shall provide independent, remote access to all real-time tank data and alarms via wireless 900Mhz or 2.4Ghz radio supporting the connection of up to 16 remote displays to one tank management system via a single wireless peripheral server. The remote annunciator and wireless server shall be housed in NEMA 4X enclosures for harsh industrial/outdoor environments. The display shall be sunlight-readable LED technology for maximum reliability in extreme temperatures. Pushbutton controls shall be one inch on centers for easy operation with gloved hands.

External Wireless Remote Electronic Tank Display shall be Pneumercator **Model ETD1000W**
Wireless Peripheral Server shall be Pneumercator **Model MPX200**

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VII. Acceptable Products:

1. Control Console shall be Pneumercator Co. Model **TMS4000**.
2. Probe shall be Pneumercator **Model MP450S** for rigid lengths from 24 to 216 inches.
Probe shall be Pneumercator **Model MP451S** for rigid lengths from 217 to 288 inches.
Probe shall be Pneumercator **Model MP452S** for oil/water separator tanks.
Probe shall be Pneumercator **Model MP461S** for flexible lengths from 12 to 216 inches.
Probe shall be Pneumercator **Model MP462S** for flexible lengths from 217 to 288 inches.
Probe shall be Pneumercator **Model MP463S** for flexible lengths from 289 to 600 inches.
Probe shall be Pneumercator **Model MP464S** for flexible lengths from 601 to 840 inches.
- 3a. Petroleum sump, dispenser pan and steel tank double-wall leak sensor shall be Pneumercator **Model LS600LDBN-1-[F]** or **LS600LDBN-1-FT** with tamper-resistant feature.
- 3b. Solvent sump, dispenser pan and steel tank double-wall leak sensor shall be Pneumercator **Model LS600LDSS-[F]** or **LS600LDSS-1-FT** with tamper-resistant feature.
4. Dispenser pan or fiberglass tank annular leak sensor shall be Pneumercator **Model LS610**.
- 5a. 3-wire wet annular reservoir leak sensor shall be Pneumercator **Model RSU800-2**.
- 5b. 2-wire wet annular reservoir leak sensor shall be Pneumercator **Model RSU801-F**.
- 6a. Electro-optical sump, dispenser pan and dry annular leak sensor shall be Pneumercator **Model ES 825-100F**.
(Standard)
- 6b. Electro-optical sump, dispenser pan and dry annular leak sensor shall be Pneumercator **Model ES 825-100XF**.
(Extended Temperature)
- 6c. Electro-optical sump, dispenser pan and dry annular leak sensor shall be Pneumercator **Model ES 825-100CF**.
(Chemical/Solvent Resistant)
- 7a. Discriminating sump, dispenser pan and dry annular leak sensor shall be Pneumercator **Model ES 825-200F**.
(Standard)
- 7b. Discriminating sump, dispenser pan and dry annular leak sensor shall be Pneumercator **Model ES 825-200XF**.
(Extended Temperature)
8. Wet well leak sensor shall be Pneumercator **Model HS100D2** (Separate hydrocarbon and dry well alarms)
9. Hydrocarbon leak sensor shall be Pneumercator **Model HS100ND**
- 10a. 3 GPH Catastrophic line leak sensor with aluminum outer housing shall be Pneumercator **Model LLP203-1**
- 10b. 3 GPH Catastrophic line leak sensor with 316SS outer housing shall be Pneumercator **Model LLP203-2**
- 10c. 3 GPH Catastrophic line leak sensor with Hastelloy C-276 outer housing shall be Pneumercator **Model LLP203-3**
- 11a. External Remote Annunciator shall be Pneumercator **Model RA200**.
- 11b. Optional External Remote Test/Reset Switch Assembly shall be Pneumercator **Model RS2**.
12. External Remote Audible/Visual Alarm shall be Pneumercator **Model RA400**
13. External Remote Electronic Touchscreen Display shall be Pneumercator **Model ETD1000T**
14. External Remote Electronic Tank Display shall be Pneumercator **Model ETD1000**
15. External Wireless Remote Audible/Visual Alarm shall be Pneumercator **Model RA400W**
16. External Wireless Remote Electronic Tank Display shall be Pneumercator **Model ETD1000W**
17. Wireless Peripheral Server shall be Pneumercator **Model MPX200**