

BULLETIN 344F

INSTALLATION & OPERATION

SiloPatrol® Auxiliary Output Enclosure (AOE)



Thank you for purchasing a quality product manufactured by Monitor Technologies LLC. We realize that you do have a choice of vendors when procuring level measurement equipment and we sincerely appreciate your business!



This manual contains the information necessary to ensure a safe and successful installation. Please read and comply with the section on page 6 of this manual pertaining to SAFETY. Doing so will ensure proper operation of the equipment and the safety of all personnel.

In the event that information contained herein does not completely satisfy your requirements or answer your questions, you may contact Technical Support on our website www.monitortech.com, by telephone at 800-766-6486 (630-365-9403), or by fax at 630-365-5646. If your SMU ever requires service either in or out of warranty, please contact us and obtain an RMA number prior to shipping the unit to us.



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PRE-INSTALLATION CONSIDERATIONS

Product Identification

On the AOE, observe the specification label on the top of the enclosure. Verify the voltage and indicated.

Choosing a Location for the AOE

- 1) Environment** - This product is suitable for ordinary locations only. It can be used in either indoor or outdoor environments. Note the temperature limits in the specifications.
- 2) Placement** - The hardened communication network used to interconnect the SMUs, HMI, RDU and AOE's permits the ends of the network to be extended as much as 4000 feet. This permits placement of the particular product in the area best suited. For example, the RDU could be mounted at the silo base for operator viewing, the HMI could be mounted in

the main control room, and the AOE's could be mounted closest to the equipment to be controlled by the outputs thereby minimizing installation cost.

MECHANICAL INSTALLATION

AOE Mounting (See Figure 1)

- 1) Location:** Select a mounting location in accordance with the Pre-Installation Considerations.
- 2) Preparation:** Open the AOE cover and locate the four corner mounting locations. These mounting points are located outside of the environmentally protected area of the enclosure. Use the AOE as a template to mark the locations of the four corner mounting points.

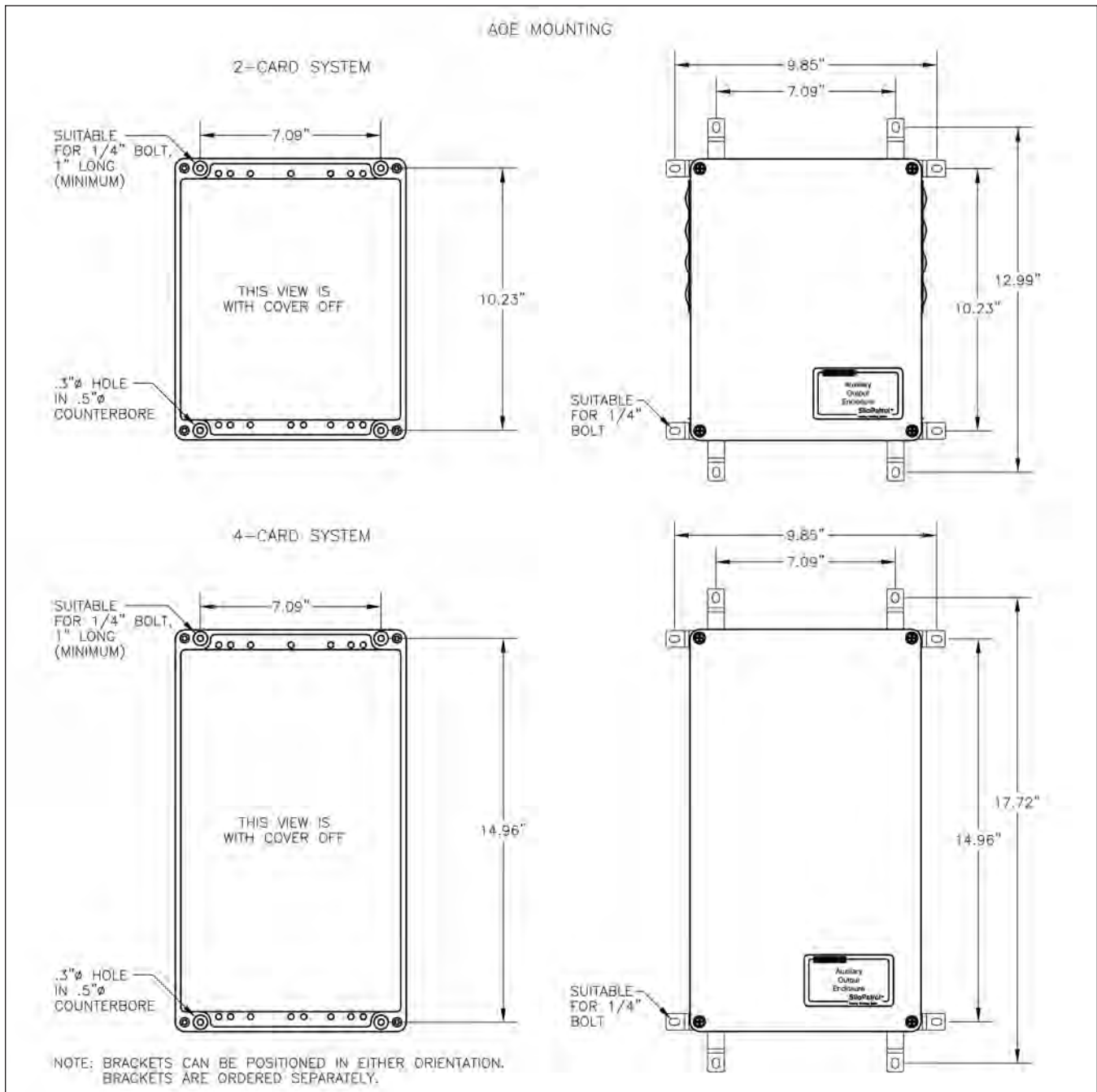


Figure 1

- 3) **Mounting:** Secure the AOE to the wall with 1/4" bolts. Note head size must be smaller than 1/2" and the bolts must be at least 1" long to reach through enclosure.
- 4) **Accessory Mounting Brackets:** If mounting through the enclosure is undesirable, external mounting brackets can be purchased as an accessory. The brackets can be oriented vertically or horizontally.

ELECTRICAL INSTALLATION

- 1) **⚠ Permanently Connected Equipment** - Disconnecting devices shall be included in the system installation. In installations where multiple circuits are used (i.e. independent circuits for power input, cycle, count, sound and standpipe heater), individual disconnects are required. The disconnects shall be within close proximity of the equipment, accessible to operators, and marked appropriately as the disconnect for the associated circuit. Assure the disconnect ratings are appropriately sized for the circuit protected (See Specifications).
- 2) **Circuit Separation** - Two cable entry locations are provided to aid in maintaining separation of "hazardous live" (typically mains voltages such as 115Vac and 230Vac) and limited circuits (typically control voltages less than 30Vrms or 42.4VDC). However, since the SMU's single wiring compartment can not absolutely protect against physical contact between multiple circuits, it is required that all wiring have an insulation rating of 300v minimum, and a temperature rating of 80°C (176°F) minimum.

- 3) **⚠ Protective Earthing** - Each AOE is provided with a "protective conductor terminal" ⊕ which shall be terminated to the local earth ground potential. This terminal shall be used to eliminate shock hazard in the unlikely event of internal insulation breakdown. Select wire size that can carry in excess of the sum of all circuit's maximum amperage.
- 4) **Power Input** - The AOE is designed to accept either 115 VAC or 230 VAC (factory set). Verify the intended voltage supply is compatible with the voltage configuration indicated on the electronics and the external nameplate. Connect power as shown to "L1" and "N" being sure to observe polarity. The AOE features a specific cord connector entry for power suitable for a cable with a diameter of .17" through .47". The cord connector can be removed leaving a .875 through-hole suitable for 1/2" conduit fittings.
- 5) **Communications Link** - The AOE features a cord connector entry for communications suitable for a cable with a diameter of .17" through .47". The cord connector can be removed leaving a .875 through-hole suitable for 1/2" conduit fittings. Interconnection of the network is performed by a 2-conductor shielded cable (such as Belden 9322). All products are interconnected in a daisy-chain, multi-drop configuration. Order of connection is not important. Communication networks such as this operate best when the interconnection has only two ends. "T"s should be avoided whenever possible. Observe polarity when making the communication interconnection (D+ and D-). Attach cable shield in terminal provided.

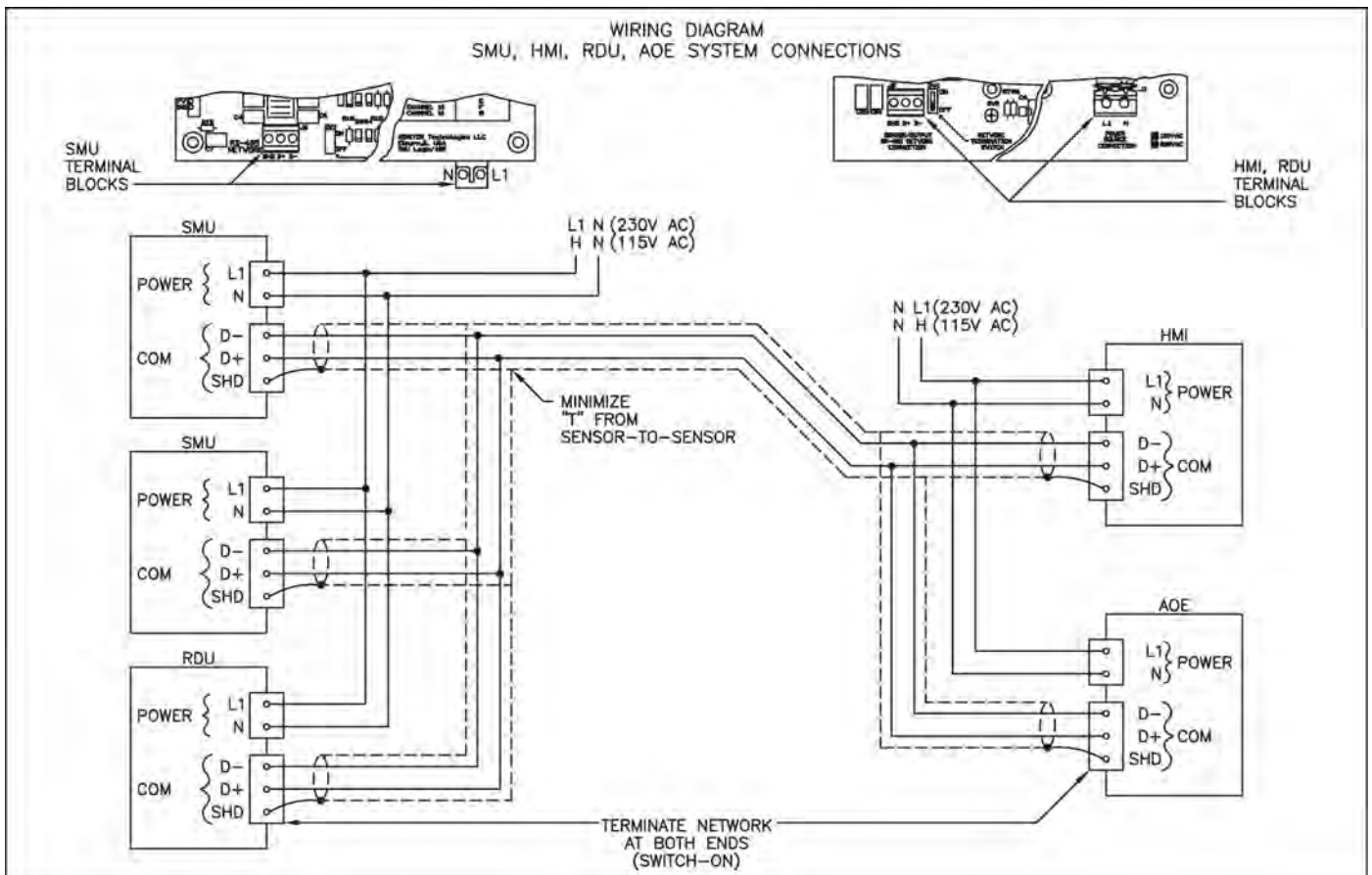


Figure 2

6) Output Connections - The AOE features additional access ports for connection of required outputs. The two-card system has eight (8) ports, four on each side of the enclosure. The four-card system has sixteen (16) ports, eight on each side of the enclosure. Each port is plugged to exclude dust and water infiltration. When needed, the plug can be removed leaving a .875 through-hole suitable for 1/2" conduit fittings. The output connection cabling utilized should be suitable for the environment and electrical requirements of the loads. The analog outputs are non-isolated and self-powered. Observe polarity when making interconnection. The relay outputs are non-powered (dry) and are SPST.

SETUP

(See Figure 3, 4, 5 and 6)

- 1) AOE Address Selection Switch** - Each AOE must be given a unique network address that is determined by the rotary switch setting within the AOE. The network address will correspond with the output link established in the HMI. If multiple AOE's have the same network address, communication will be successful to each without error indication, however each AOE will have identical outputs. Note that the selected switch setting is denoted by the "arrow/dot" on the shaft, not the slot in the shaft. Switch selections "1, 2, 3, 4" are acceptable address selections and refer to AOE addresses 1-4. Switch selection "8" will force all relays "off". Switch selection "9" will force all relays "on". Switch selection "A" will force all analog outputs to "4mA". Switch selection "B" will force all analog outputs to "20mA".
- 2) AOE Network Termination Switch** - Each AOE has a network termination switch in close proximity to the RS-485 network terminal block. The two products of the SMU/HMI/RDU/AOE system positioned at the network ends must have their termination switches "on". The rest of the devices on the network must have their termination switches "off".

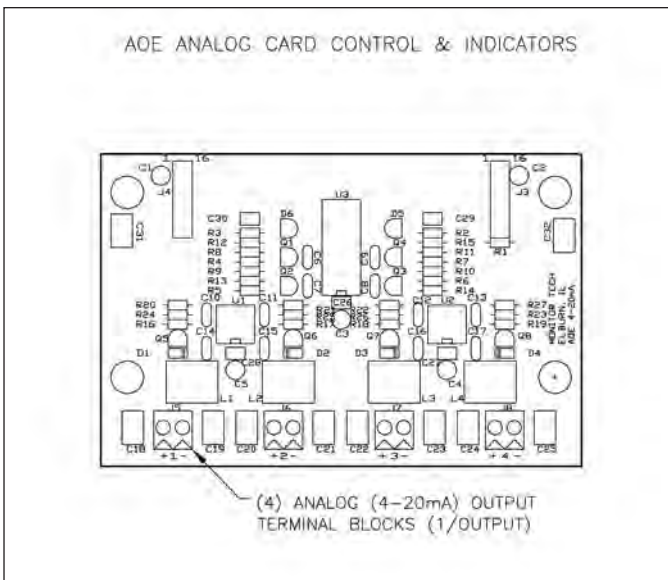


Figure 3

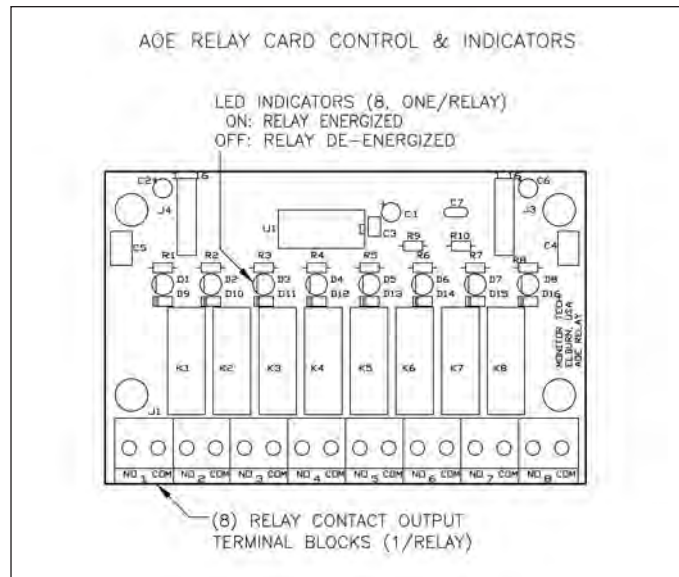


Figure 4

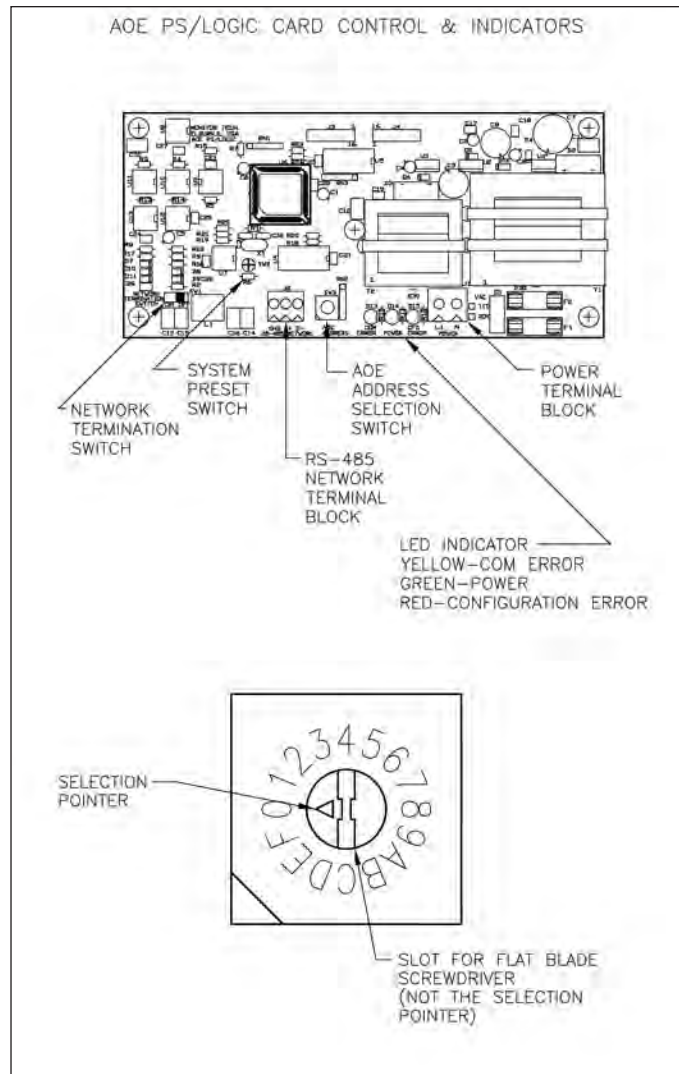


Figure 5

- 3) **AOE Indicators** - Three LEDs depict the status of the AOE.
- "Power" (green): When lit, it indicates that the AOE power supply and firmware is functioning.
 - "Com Error" (yellow): When lit, it indicates that no network communication is being made with the AOE. This can be caused by the absence of any HMI links to the AOE address selected, or the halting of communication caused by the HMI exiting the DSPLY mode.
 - "Config Error" (red): When lit, it indicates that an instruction being received via the network communication is being sent to an AOE card location that is "empty" or occupied by a different output type. A "blink" condition means two instructions are for the same card, one being valid (the correct output type) and the second being invalid (the incorrect output type).
- 4) **AOE System Reset Switch** - Momentary closure of the pushbutton switch will "restart" the entire AOE system. All relay outputs are "shut off" and all analog outputs are forced to "4mA" until new conditions are received via the network communication and sent to the respective outputs.

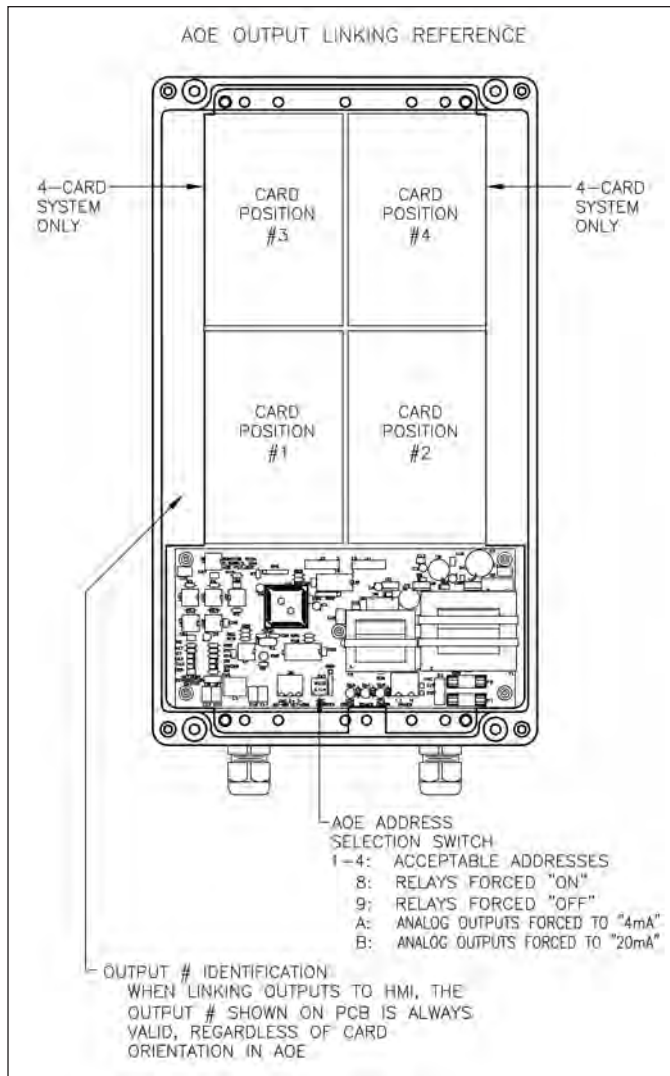


Figure 6

- 5) **AOE Card Positions** - The analog and relay cards are universal and can be placed in any position within the AOE. However, the card position numbers are fixed must be referenced when establishing the link between channel number and output within the HMI. Card position #1 must be in place in order to use Card position #3. Card position #2 must be in place in order to use Card position #4.

TROUBLESHOOTING

PROBLEM: AOE's green LED is "off" indicating operational problem

CAUSE/SOLUTION:

- 1) This condition is caused by the AOE unable to boot its internal software.
- 2) Verify electrical power is connected to the AOE.
- 3) Verify proper alignment of PCB-to-PCB connectors.
- 4) Press and release "system reset switch" to restart the AOE.

PROBLEM: AOE's yellow LED is "on" indicating a communication error

CAUSE/SOLUTION:

- 1) This error is caused by the AOE's inability to receive any commands designated for the particular AOE address. The yellow LED will be "off" when the AOE detects that an incoming message belongs to it.
- 2) Verify communication connection has been made to the AOE from HMI or SiloTrack.
- 3) Verify polarity of the communication connection.
- 4) Verify electrical power is connected to the HMI or SiloTrack.
- 5) Verify that the HMI or SiloTrack has been programmed to send data to the AOE address.
- 6) Verify the AOE's address selection switch matches that of the HMI or SiloTrack programmed link.
- 7) Verify that the HMI is in "DSPLY" mode, otherwise no AOE updates are sent resulting in this error condition after a 3-second timeout.

PROBLEM: AOE red LED is "on" or "blinks" indicating a configuration error

CAUSE/SOLUTION:

- 1) This error is caused by the mismatch of incoming data and the type of output (empty, analog or relay) that is located at the particular link location.
- 2) Verify the links assigned from HMI or SiloTrack match the type of cards positioned in AOE. The address convention if controlled by an HMI is AOE # (1, 2, 3, or 4), Card Position # (1, 2, 3, or 4), and Output # (1-4 for an analog card and 1-8 for a relay card). When using SiloTrack, this convention is preceded by the network # (1-8).

MAINTENANCE

No periodic maintenance is required for an AOE.

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SAFETY

General Safety



CAUTION: It is essential that all instructions in this manual be followed to ensure proper operation of the equipment and safety of operating personnel. The use of this symbol is used throughout this manual to highlight important safety issues. Please pay particular attention to these items.

Electrical Shock Caution



AOE Auxiliary Output Enclosures are powered with HIGH VOLTAGE. No operator serviceable parts are inside. All servicing is to be performed by qualified personnel. Each AOE is provided with a "protective conductor terminal" ⊕ which shall be terminated to earth ground potential (see Electrical Installation). This product's design complies with EN61010-1 installation category II and pollution degree 2.

Electromagnetic Compatibility (EMC)

The AOE was tested and found to comply with the standards listed below. The AOE should not be used in residential or commercial environments. Compliance to the EMC standards was demonstrated by means of a test setup using the following installation methods.

- 1) AOE enclosure was connected to earth ground (protective earth).
- 2) Shielded cable was used to interconnect the RS-485 network (connections D+ and D-). The shield drain was connected to earth ground (SHD terminal) at each end.

EMC Emissions:

Meets EN 61326-1	Electrical Equipment for Control Use, EMC
EN 55011	Radiated and conducted emissions (Class A- industrial)
EN 61000-3	Fluctuation/Flicker
Meets FCC Part 15B	RF Devices, Unintentional Radiators
CISPR 11	Radiated and conducted emissions (Class A- industrial)

EMC Immunity:

Meets EN 61326-1	Electrical Equipment for Control Use, EMC
IEC 1000-4-2	Electrostatic discharge (industrial)
IEC 1000-4-3	RF radiated EM fields (industrial)
IEC 1000-4-4	Electrical fast transients (industrial)
IEC 1000-4-5	Electrical surges (industrial)
IEC 1000-4-6	RF conducted EM energy (industrial)
IEC 1000-4-8	Power frequency magnetic fields (industrial)
IEC 1000-4-11	Source voltage deviation



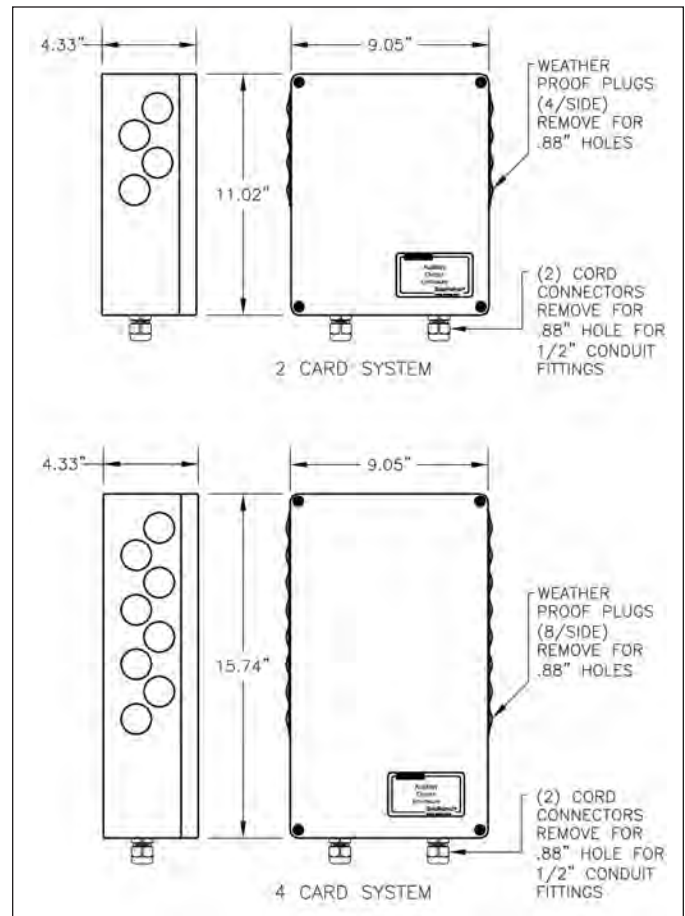
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MECHANICALS



SPECIFICATIONS

Power Requirements:	115 VAC or 230 VAC, 50/60 Hz
Power Consumption:	25 VA Max
Operating Temp:	-4° F to 131° F (-20° C to 55° C)
Communication:	RS-485 half-duplex, isolated, proprietary protocol
Analog Outputs:	4-20mA, 16 max, 4 per card, non-isolated, 500 ohm, 10 bit resolution, zero/span set via HMI or SiloTrack
Relay Outputs:	SPST, 5A @ 250 VAC, 32 max, 8 per card, visual LED per relay, assignment and action set via HMI or SiloTrack
Enclosure:	Painted Aluminum
Overall Dimensions:	11.02" x 9.05" x 4.33" (2-card) (Hght x Wdth x Dpth) 15.74" x 9.05" x 4.33" (4-card)
Certifications/Protection:	NEMA 4, IP66, CE Mark

WARRANTY

Monitor Technologies LLC warrants each **SiloPatrol**® inventory monitoring system it manufactures to be free from defects in material and workmanship under normal use and service for two (2) years from the date of purchase within North America, and one (1) year from the date of purchase outside of North America. The purchaser must give notify Monitor of any defects within the warranty period, return the product intact, and prepay transportation charges. The obligation of Monitor Technologies LLC under this warranty is limited to repair or replacement at its factory. This warranty does not apply to any product which is repaired or altered outside of Monitor Technologies' factory, or which has been subject to misuse, negligence, accident, incorrect wiring by others, or improper installation. Monitor Technologies LLC reserves the right to change the design and/or specifications without prior notice.