CSA INTERNATIONAL

# Descriptive Report and Test Results

**MASTER CONTRACT:** 155976
**REPORT:** 2195545
**PROJECT:** 2195545

**Edition 1:** August 21, 2009; Project 2195545 – Cleveland
Issued by Andrew Sargent

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Descriptive Documents – *Engineering files only*

## PRODUCTS

Class 2258 02 - PROCESS CONTROL EQUIPMENT - For Hazardous Locations
Class 2258 82 - PROCESS CONTROL EQUIPMENT - For Hazardous Locations - Certified to US Standards

**Class I, Division 2, Groups A, B, C, D**

- Controller for Particle Contamination Monitor - Model AT3-1001-0010-G. Input rated: 85-265V ac, 50/60 Hz, 40W. Output relays rated 20-265V ac, 50/60 Hz, 0.005-1.0 A. Analog output 4-20 mA. Ambient temperature -10 to 50°C. Temperature Code T4. Enclosure Type 4X. Type Z Purged when supplied with continuous air supply pressure of 4-8 barg.

Notes:
1) Wiring to or from this equipment, which enters or leaves the system enclosure, must utilize wiring methods suitable for Class I, Division 2 Hazardous Locations, as appropriate for the installation.

2) Purge assembly alarm switch contact leads must be wired in an intrinsically safe circuit per Expo drawing EP80-2-11.

- Sensor for Particle Contamination Monitor – AS3-0805-5000-0. Ambient temperature -10 to 50°C. Enclosure Type 4. Temperature Code T6. MWP 1034 kPa (150 psig)

Notes:
1) Wiring to or from this equipment, which enters or leaves the enclosure, must utilize wiring methods suitable for Class I, Division 2 Hazardous Locations, as appropriate for the installation.

2) To be used only with Galvanic Applied Science Controller for Particle Contamination Monitor - Model AT3.

## APPLICABLE REQUIREMENTS

| | |
|---|---|
| CAN/CSA Standard C22.2 No. 0-M91 *(Reaffirmed 2006)* | General Requirements - Canadian Electrical Code, Part II |
| CSA Standard C22.2 No. 94.1-07 *(First Edition - September 2007)* | Enclosures for Electrical Equipment, Non-Environmental Considerations |
| CSA Standard C22.2 No. 94.2-07 *(First Edition - September 2007)* | Enclosures for Electrical Equipment, Environmental Considerations |
| CSA Standard C22.2 No. 142-M1987 *(Reaffirmed 2000)* | Process Control Equipment |
| CSA Standard C22.2 No. 213-M1987 *(Reaffirmed 2008)* | Non-incendive Electrical Equipment for Use in Class I, Division 2 Hazardous Locations |
| LTR E-010-2005 | Purged and Pressurized Enclosures for Use in Class I, Division 1 or 2 Hazardous Locations |
| NFPA 496 *(2008 Edition)* | Standard for Purged and Pressurized Enclosures for Electrical Equipment |
| ANSI/UL Standard 50 *(Twelfth Edition, September 2007)* | Enclosures for Electrical Equipment, Non-Environmental Considerations |
| ANSI/UL Standard 50E *(First Edition, September 2007)* | Enclosures for Electrical Equipment, Environmental Considerations |
| ANSI/UL Standard 508 *(Seventeenth Edition, Dated January 28, 1999. With revisions through and including September 19, 2008.)* | Industrial Control Equipment |
| ANSI/ISA-12.12.01-2007 | Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Division 1 and 2 Hazardous (Classified) Locations |

## MARKINGS

The following markings are provided on the controller enclosure using one or more CSA Certified (Class 7923-01) adhesive label(s), which is (are) suitable for indoor or outdoor use on stainless steel, at a maximum service temperature of 90°C or higher.

- Manufacturers name: "Galvanic Applied Sciences".
- Model number: "AT3-1001-0010-G".
- Electrical ratings: "INPUT 85-265 Vac, 50/60 Hz, 40W. Relay Output: 20-280Vac, 50/60 Hz, 0.005 – 1A. Analog Output: 0-20 mA."
- Ambient temperature rating: "0°C ≤ Ta ≤ 50°C", or "0°C to 50°C".
- Hazardous Location designation: "Class I, Division 2, Group A, B, C, D" (may be abbreviated).
- Temperature code: "T4".
- The words: "Type Z Purge"
- The words: "WARNING: THE SAFETY OF THIS EQUIPMENT RELIES ON THE PROVISION OF PROPER PURGING AND PRESSURIZING WHEN USED IN HAZARDOUS LOCATIONS. IT MUST NOT BE PUT INTO USE WITHOUT "SPECIAL PERMISSION" FROM THE INSPECTION AUTHORITY HAVING JURISDICTION."

- The words "WARNING – PRESSURIZED ENCLOSURE. This pressurized enclosure shall not be opened, even when all devices within have been de-energized, unless the area is known to be free of flammable materials."
- The words: “Power must not be restored after enclosure has been opened until the enclosure has been purged for 3 minutes at a flow rate of 0.4 scfm.”
- The words “Enclosure Type 4X”

The following markings are provided on the sensor enclosure using a stainless steel metal nameplate, affixed with rivets, drive screws, or threaded screws in blind holes that do not pass through to the interior of the enclosure, or one or more CSA Certified (Class 7922-01) adhesive label(s), which is (are) suitable for indoor or outdoor use on aluminum, at a maximum service temperature of 90°C or higher:

- Manufacturers name: "Galvanic Applied Sciences".
- Model number: "AS3-0805-5000-0 ".
- Ambient temperature rating: "0°C ≤ Ta ≤ 50°C", or "0°C to 50°C".
- Hazardous Location designation: "Class I, Division 2, Group A, B, C, D" (may be abbreviated).
- Temperature code: "T6".
- The words “USE ONLY WITH MANUFACTURERS MODEL AT3 SYSTEM”, or equivalent.
- Maximum process pressure rating: 1034 kPa (150 psig).

The following markings are provided on the explosionproof sensor enclosure using a separate stainless steel metal nameplate, affixed with rivets or drive screws in blind holes:

- The words: “CAUTION To reduce the risk of ignition of hazardous atmospheres, disconnect the equipment from the supply circuit before opening. Keep assembly tightly closed when in operation”, or equivalent wording.

An installation manual or data sheet shall be supplied with each unit, containing the following minimum marking information:

- Manufacturers name and address
- Electrical ratings: "INPUT 85-265Vac, 50/60 Hz, 40W. Relay Output: 20-280Vac, 50/60 Hz, 0.005 – 1A. Analog Output: 0-20 mA.”
- Specification for ambient temperature rating: "0°C ≤ Ta ≤ 50°C", or “"0°C to 50°C".
- Specification for appropriate wiring to the terminals, including definition of terminal functions, and specification for appropriate wire gauge or range of wire gauge.
- Mounting and installation instructions, including dimensions, and the following words, or equivalent (applicable to the control enclosure):
  - Wiring to or from this device, which enters or leaves the system enclosure, must utilize wiring methods suitable for Class I, Division 2 Hazardous Locations, as appropriate for the installation.
- A copy of Expo drawing EP80-2-11.
- The following words, or suitable equivalent:
  - This equipment is suitable for installation in Class I, Division 2, Group A, B, C, D hazardous locations or nonhazardous locations only.
  - (applicable to the control enclosure) WARNING – PRESSURIZED ENCLOSURE. This pressurized enclosure shall not be opened, even when all devices within have been de-energized, unless the area is known to be free of flammable materials."
  - (applicable to the control enclosure) Power must not be restored after enclosure has been opened until the enclosure has been purged for 3 minutes at a flow rate of 0.4 scfm.

- WARNING - Explosion Hazard. Substitution of components may impair suitability for Class I, Division 2.

- Specification for control enclosure as: “Type Z Purge”
- The words: “WARNING: THE SAFETY OF THIS EQUIPMENT RELIES ON THE PROVISION OF PROPER PURGING AND PRESSURIZING WHEN USED IN HAZARDOUS LOCATIONS. IT MUST NOT BE PUT INTO USE WITHOUT "SPECIAL PERMISSION" FROM THE INSPECTION AUTHORITY HAVING JURISDICTION.”

*Note - Jurisdictions in Canada may require these markings to also be provided in French language. It is the responsibility of the manufacturer to provide bilingual marking, where applicable, in accordance with the requirements of the Provincial Regulatory Authorities. It is the responsibility of the manufacturer to determine this requirement and have bilingual wording added to the "Markings".*

## ALTERATIONS

N/A

## SPECIAL INSTRUCTIONS FOR FIELD SERVICES

This report contains reference to certain construction and engineering documents that have been deemed critical to ensuring continued compliance with applicable construction and performance requirements. A list of these documents, with drawing numbers and the appropriate revision levels is summarized in this report. Documents detailed herein are subject to inspection by CSA International personnel and shall be made available in the manufacturing location upon request. Failure to produce these documents in a timely manner constitutes noncompliance and is subject to the actions outlined in the CSA Product Service Agreement.

## FACTORY TESTS

At the conclusion of manufacture, and before shipping, each unit shall be subjected to a dielectric strength test at a potential of 1500V ac rms, for a period of 60 seconds, without breakdown, between the following points:

- Between the relay output terminals and all other circuits, including ground.

Notes:
1) A potential of 1800V ac rms may alternately be applied for a period of one second.
2) A potential of 2121V dc may alternatively be applied for a period of 60 seconds.
3) A potential of 2545V dc may alternatively be applied for a period of one second.

Additionally, each unit shall be subjected to a dielectric strength test at a potential of 1272V ac rms, for a period of 60 seconds, without breakdown, between the following points:

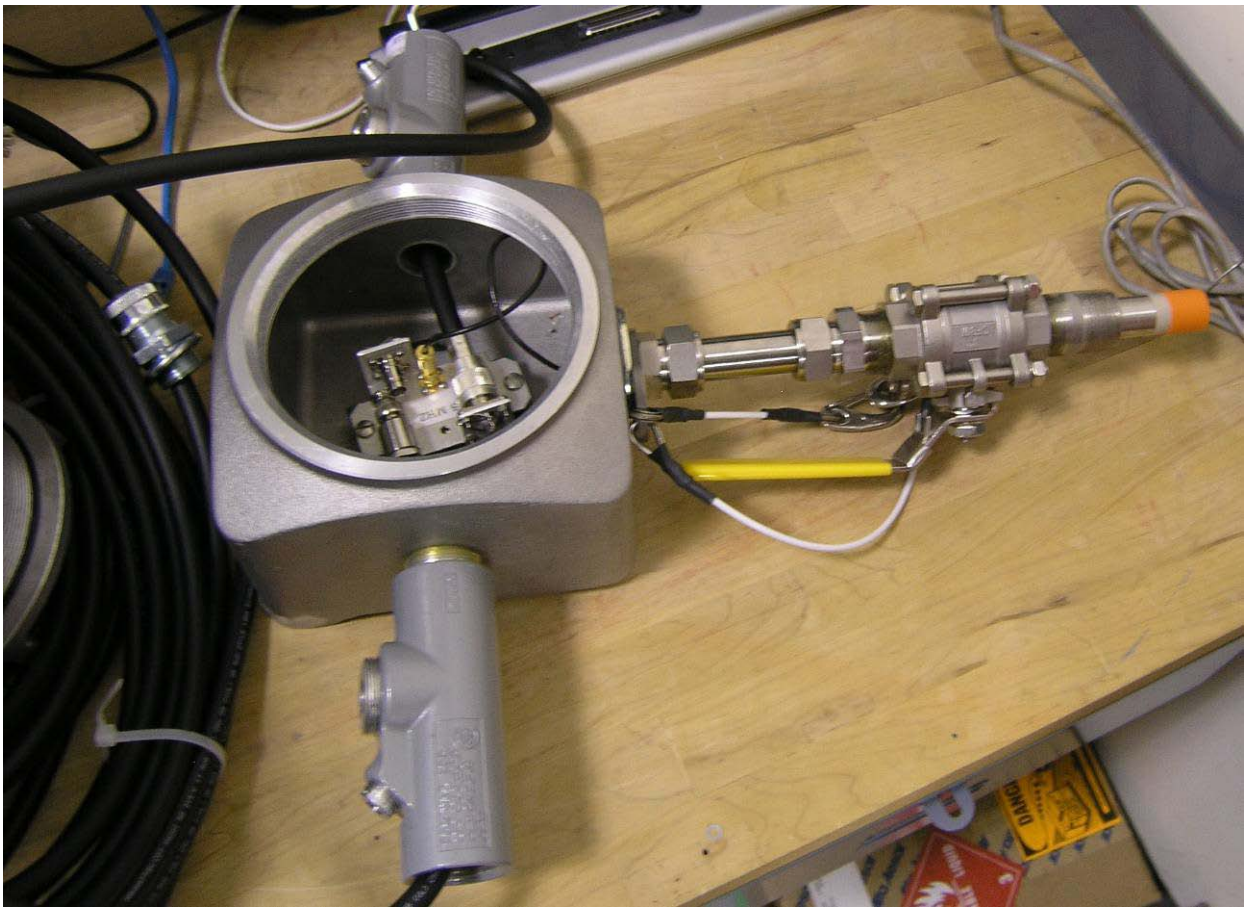
- Between Line Input terminals and all other circuits, including ground.

Notes:
1) A potential of 1525V ac rms may alternately be applied for a period of one second.
2) A potential of 1800V dc may alternatively be applied for a period of 60 seconds.
3) A potential of 2160V dc may alternatively be applied for a period of one second.

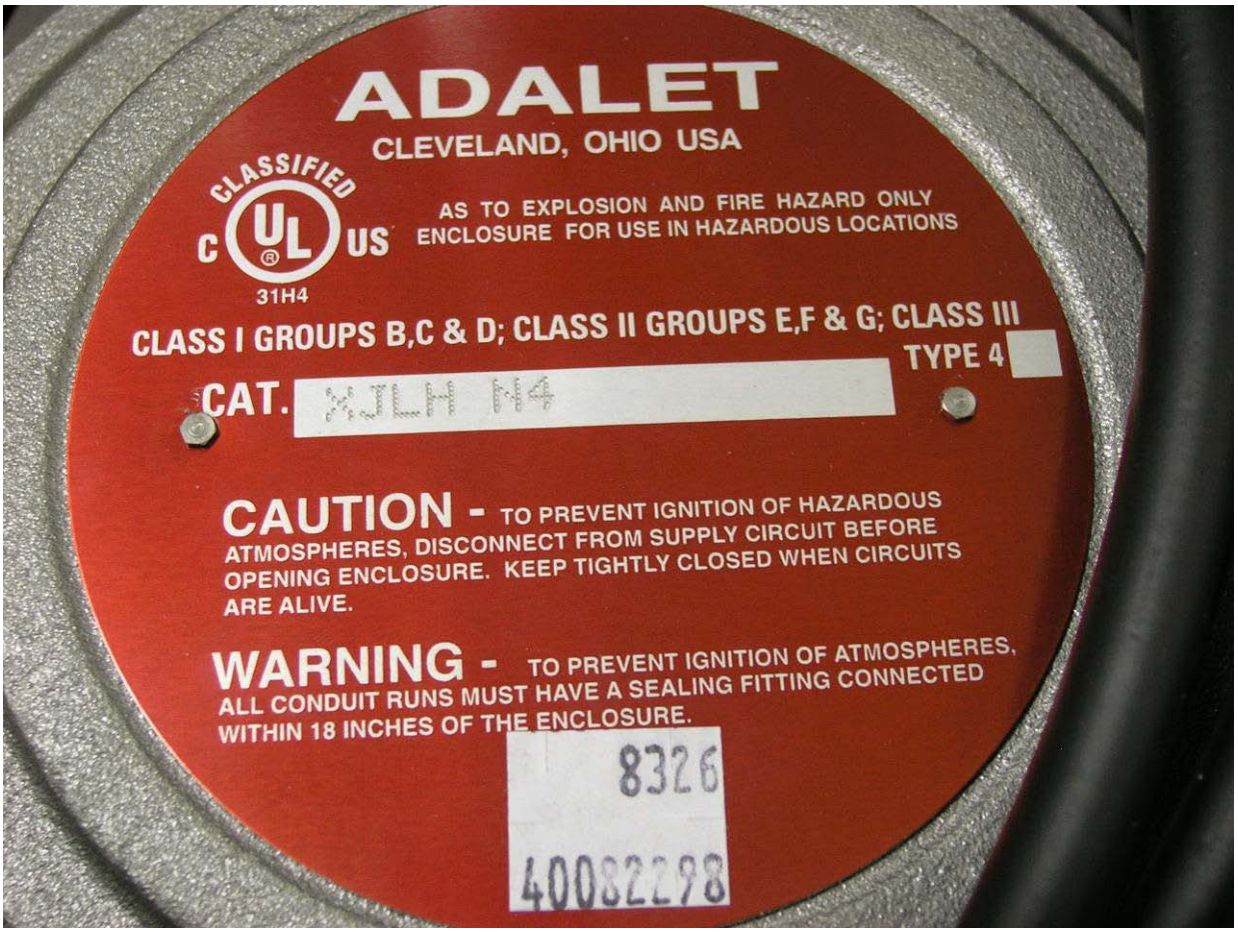
*Warning: The factory test(s) specified above may present a hazard of injury to personnel and/or property and should only be performed by persons knowledgeable of such hazards and under conditions designed to minimize the possibility of injury.*

## DESCRIPTION

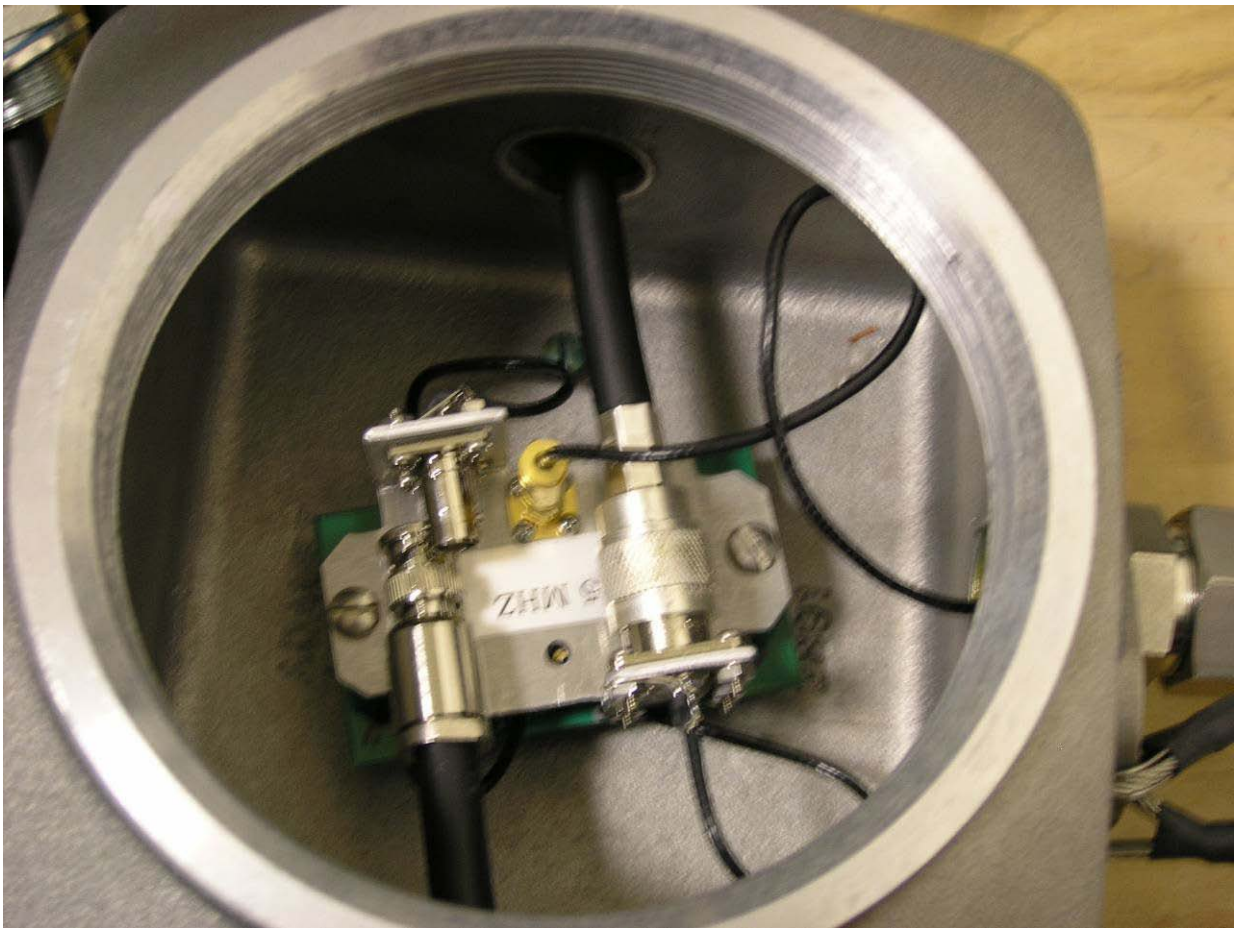
The system consists of 2 enclosures. One Type Z purged and pressurized enclosure contains the field wiring connection facilities, power supply, and controller subassembly in an aluminum chassis. The second enclosure contains the sensor tube and an interface assembly for connection of RF signals via coaxial cables to the controller assembly.



Complete sensor assembly

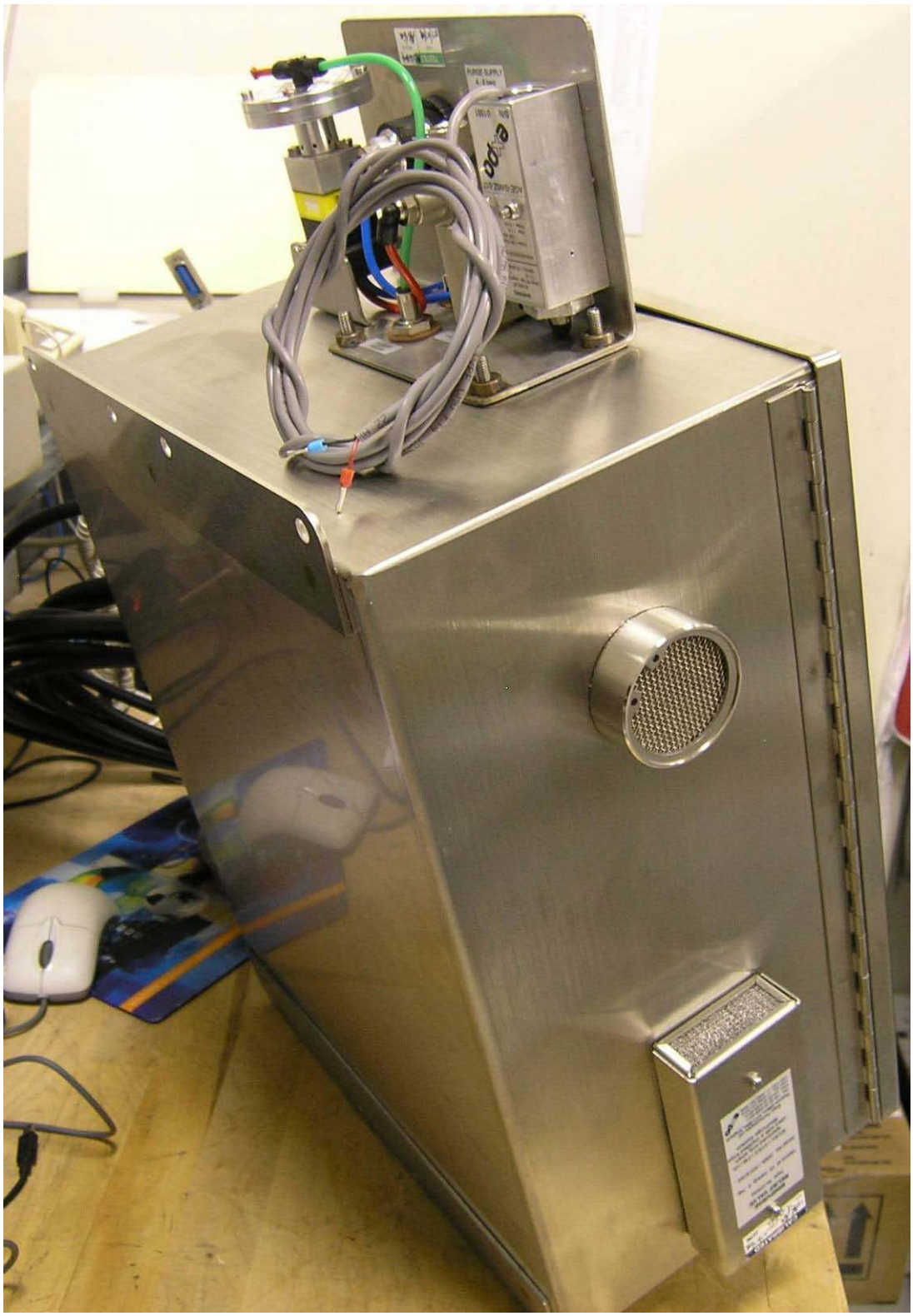


Sensor housing cover



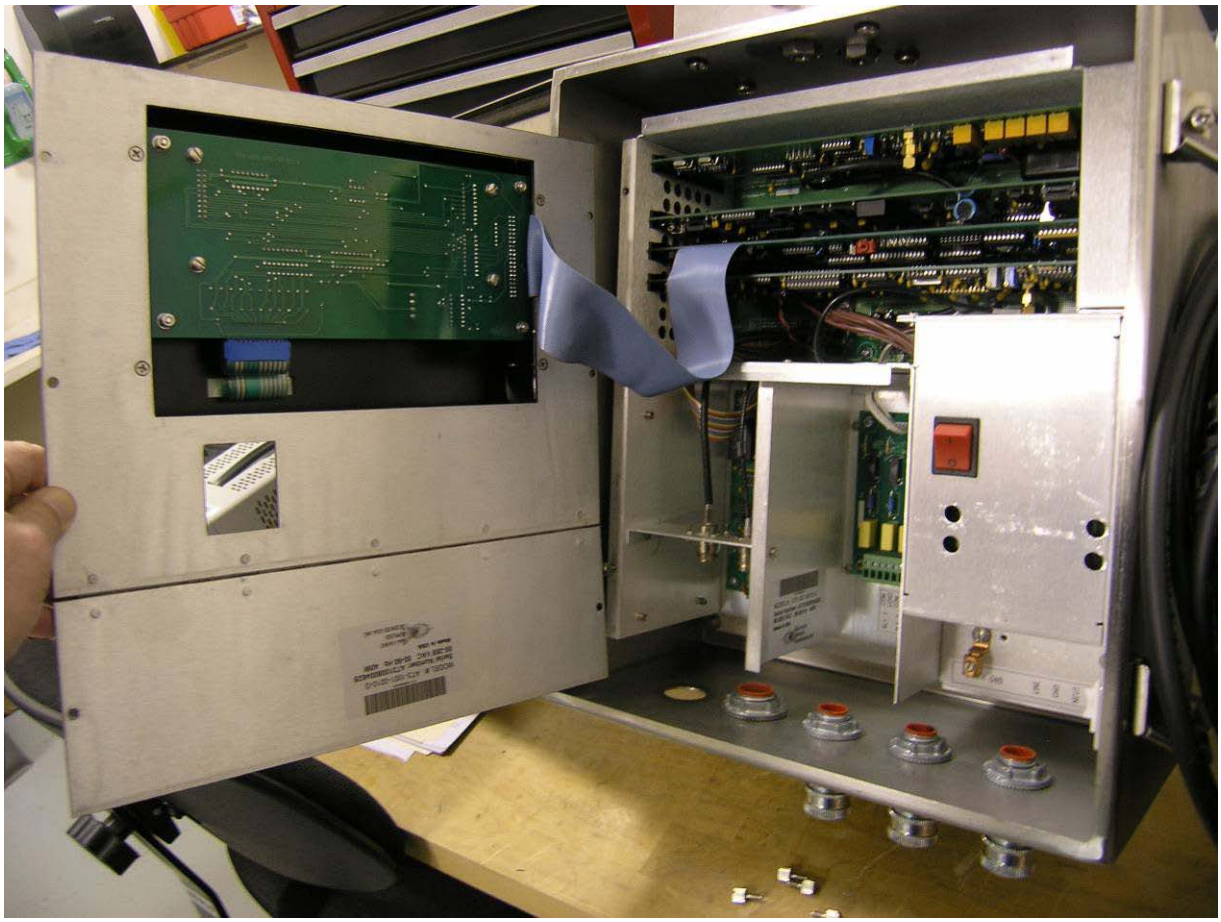

Interior of sensor housing.


Overall view of control enclosure.

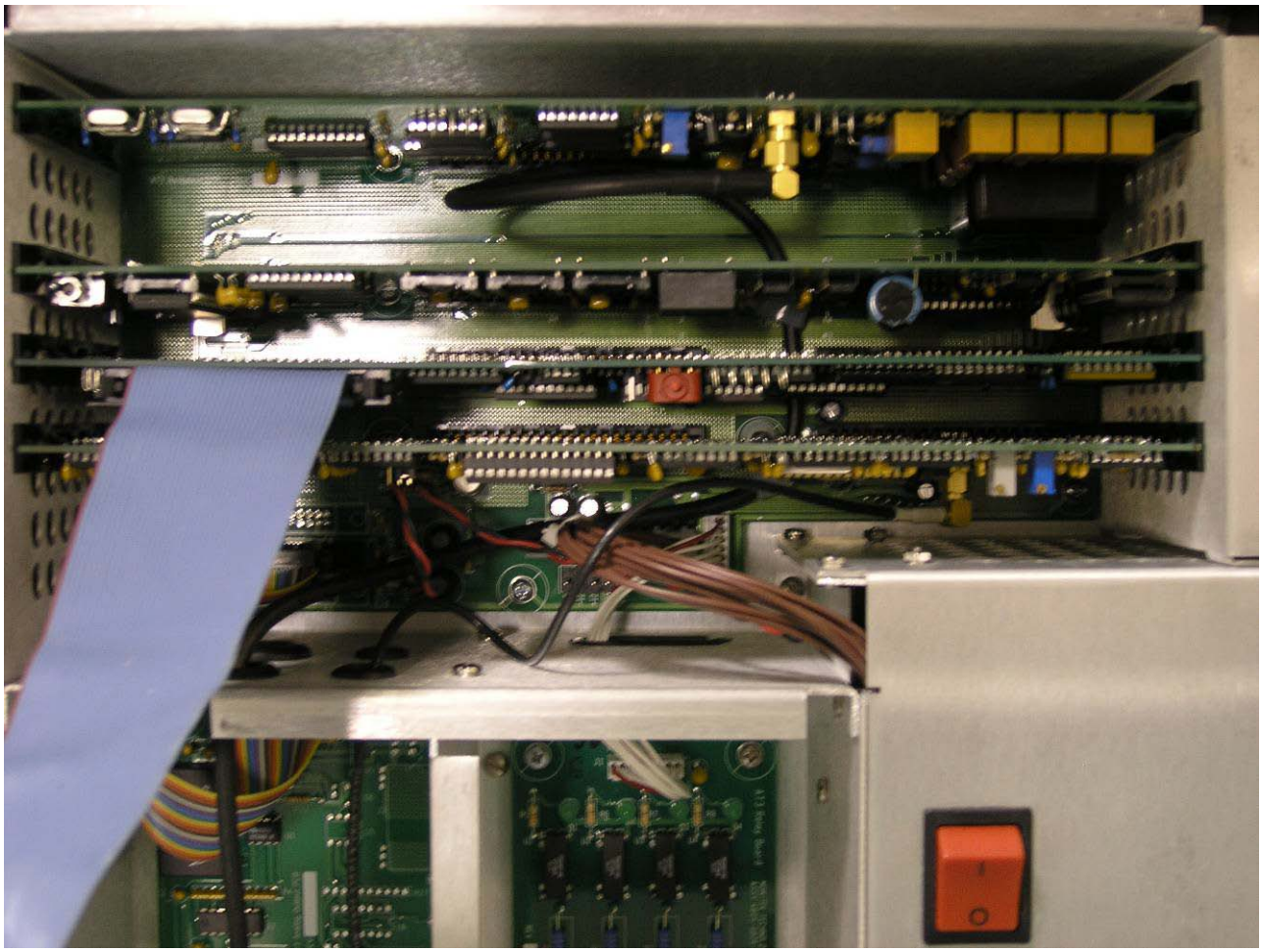


Purge system on exterior of enclosure

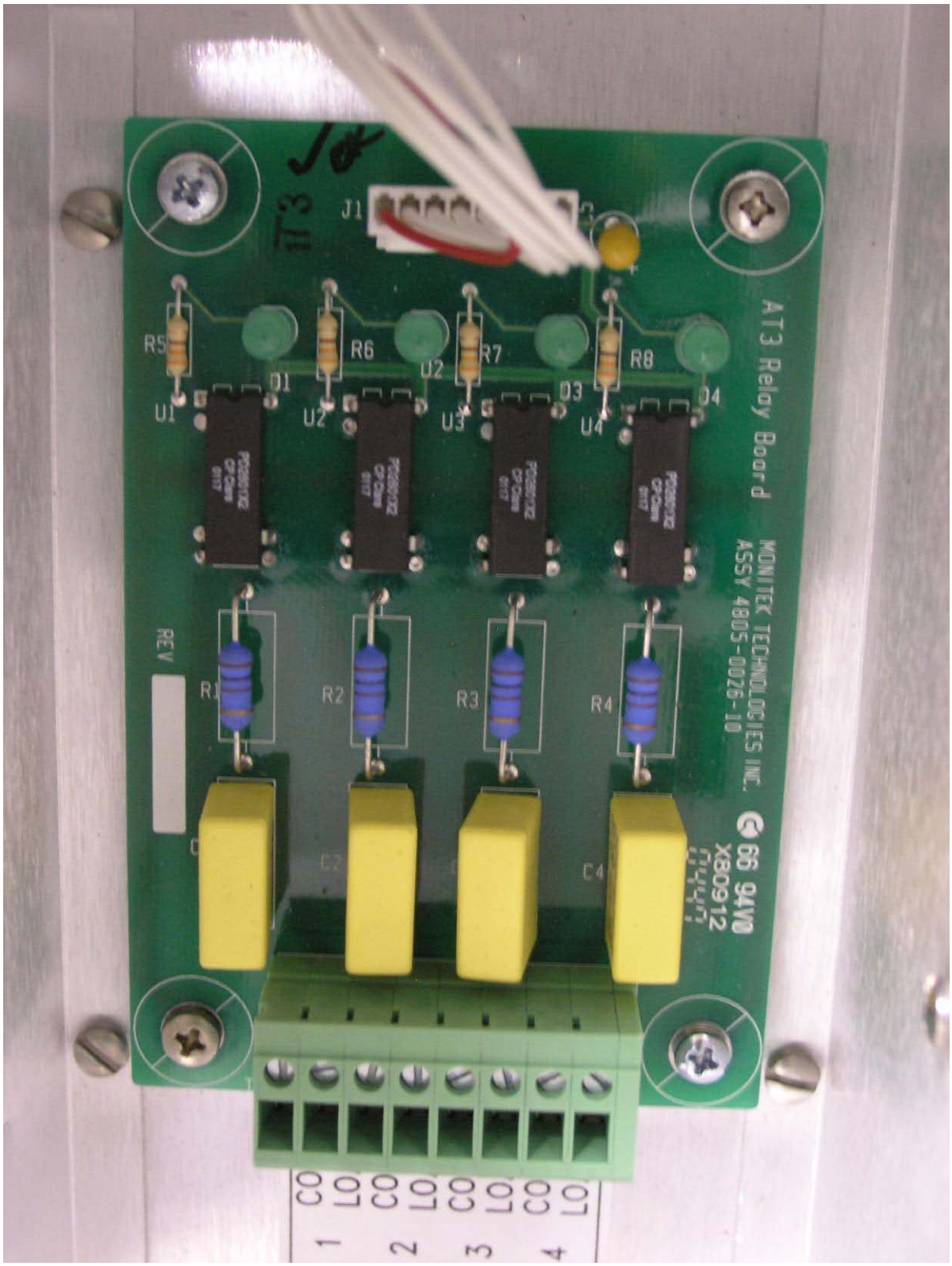

Overall view of controller – Interior



AT3 system behind front panel
(left side) Front panel PCB Part Number: 4805-0051-10
(left side) Display PCB Part Number: Optrex 20-20193-2 Rev A - DMF5005
Top to bottom in the rack:
"Pulser" PCB Part Number: 4805-0021-10
CPU PCB Part Number: 3000-1050-11
I/O PCB Part Number: 4805-023-10
Receiver PCB Part Number: 4805-022-10
(behind above boards) Backplane PCB Part Number 4805-0020-00
(bottom left) Analog PCB Part Number: 4805-024-10
(bottom center) Relay PCB Part Number: 4805-0026-10



Top to bottom:
"Pulser" PCB Part Number: 4805-0021-10
CPU PCB Part Number: 3000-1050-11
I/O PCB Part Number: 4805-023-10
Receiver PCB Part Number: 4805-022-10
(behind the above boards) Backplane PCB Part Number 4805-0020-00
(bottom left) Analog PCB Part Number: 4805-024-10
(bottom center) Relay PCB Part Number: 4805-0026-10




Close-up of relay board P/N 4805-0026-10

The following components are critical to the construction and performance of this equipment:

Sensor Assembly

1. Explosionproof enclosure –UL Classified for US (FTRV) and Canada (FTRV7), rated Class I, Groups B, C, D; Type 4. Manufactured by Adalet, catalog number XJLH N4.

2. Sensor tube – 316 stainless steel seamless tubing (0.065 wall) with approximate overall dimensions 11.25 inches long, by 0.875 inches diameter. Provided with machined stainless steel fitting on one end (manufactured by VIRAJ IMPOEXPO LIMITE - Order # L15991). Fabrication per manufacturers drawing 4800-0226-10. Fitted with measuring tip, manufactured by QUADRANT.

3. Compression fitting – Fitted to conduit entry of explosionproof enclosure, and securing the sensor tube. Manufactured by Swagelok, part number SS1410-1-16.

Controller assembly:

4. Enclosure – Stainless steel, having approximate overall dimensions 16”, by 14”, by 8”. UL Listed for Canada (NITW7) and US (NITW), rated type 4X. Provided with factory installed polymeric viewing window approximately 7-1/2” square and stainless steel bezel. Manufactured by Hoffman Enclosures, Inc., part number 16X14X8 CHNNFSS W/HLS/SP

5. Purge controller – Installed on top exterior of enclosure using supplied gasket. UL Classified for the US (RFPW) and Canada (RFPW7), rated Class I, Division 2, Groups A, B, C, D. Manufactured by Expo Technologies, Ltd., Model 07-1ZCF/bp/IS.

6. Purge Vent / Spark Arrestor – Installed in left side of enclosure using supplied gasket. Manufactured by Expo Technologies, Ltd., Model SAU25, with orifice plate, model 1.

7. Purge Relief Valve – Installed in left side of enclosure using supplied gasket. UL Classified for the US (RFPW) and Canada (RFPW7), rated Class I, Division 2, Groups A, B, C, D. Manufactured by Expo Technologies, Ltd., Model RLV25SS.

8. Chassis – Fabricated from aluminum sheet per manufacturers drawings 4805-101-00 (base plate), 4805-0102-00 (card cage), 4805-0103-00 / 4805-0104-00 (sides), 4805-0105-00 (top), 4805-0106-00 (divider), 4805-0107-00 (connector brace), and 4805-0108-00 (divider).

9. Front Panel Assembly – Mounted to front of chassis, above. Formed from painted aluminum sheet per manufacturers drawings 4805-0083-00, 4805-0084-00, and 4805-0090-00. Provided with keyboard overlay / display viewing window (manufacturers part number C400-0135-00) affixed to front with permanent pressure sensitive adhesive.

10. Terminal block – CSA Certified (class 6228 01) and UL Recognized (XCFR2) rated 600V, 10A or more, 75°C max., suitable for field wiring applications in industrial control equipment. Manufactured by Wieland, Model 10E, part number 21-331-5353, mounted over “Shim” (between terminal block and equipment chassis) manufactured by Wieland, part number 07-471.1380.0.

11. Ground terminal – CSA Certified (class 6223 02) and UL Listed (ZMVV), rated #14 AWG – #6 AWG, 50A. Manufactured by Panduit, part number CB35-36-CY.

12. Wire – Between all line connected components of input circuit. 18 AWG stranded. CSA Certified type TEW, UL Listed style 1061, rated 300V or more, 105C or higher.

13. Quick-Connect terminal lugs – Female. CSA Certified (class 6227 01) and UL Listed (RFWV), rated 300V or more, #18 to #22 AWG. Manufactured by Molex, part number 19003-0001 (AA-2201).

14. Switch – DPST type. UL Recognized Component for US (WOYR2) and Canada (WOYR8) rated 250V, 16A. Manufactured by Lamb Industries, Inc., model RB2-D, part number RB242D1121.

15. Circuit breaker – CSA Certified Component (class 3215 30), UL Recognized Component (QVNU2) supplementary protector, rated 250V, 2A. Manufactured by Tyco, part number W28-XQ1A-2.

16. Varistor – 3 provided, soldered at input to line filter. CSA Certified (class 2221 01) and UL Recognized (XUHT2), rated 320V rms, 80J, 85C max. Manufactured by Littelfuse Inc., part number V320LA20A.

17. Insulation sleeving – Provided on leads of varistor components. CSA Certified (class 9032 01) and UL Recognized (YDPU2) rated 600V, 125°C. Manufactured by 3M Company, designated FP-301 Black.

18. Line Filter – CSA Certified (class 2221 02) and UL Recognized (FOKY2) rated 120/250V ac, 1A. 40°C max. Manufactured by Corcom Tyco Electronics Corp, model 1VR1.

19. Connector – 5 pin. Provided on end of wires at power supply input. CSA Certified (class 6233 01) and UL Recognized (ECBT2) rated 250V, 5A max. Manufactured by Molex 09-50-3051, Series 2139.

20. Connector –2 pin. Provided on end of wires at fan connection. CSA Certified (class 6233 01) and UL Recognized (ECBT2) rated 250V, 5A max. Manufactured by Molex 09-50-3021, Series 2139.

21. Pins for connectors, above – Crimp-on type. Rated 5A or more. Manufactured by Molex, part number 08-50-0106.

22. Power Supply – CSA Certified Component (class 5311 03) and UL Recognized Component (QQGQ2), with SELV output. Input rated 100-250V ac, 50/60 Hz., 3.2A max. Output rated 11A @ +5V dc, 5A @ +12V dc, 1A @ -12V dc, 3A @ -5 to +25V dc (adjustable). Manufacturers temperature rating is 50°C max., 70°C with forced air cooling and de-rating of outputs. Manufactured by Astec International Ltd., model LPQ112.

23. Fan – Mounted to chassis with inlet side at top of power supply. Rated 12V dc, 80 mA. Manufactured by Panasonic, part number FBA09A24L1A.

24. Front Panel PCB assembly – Consists of 2 PC Board assemblies, mounted together using ½" long standoffs and screws/nuts.

    24.1. AT3 Front Panel PC Board assembly – Manufacturers part number 4805-0051-00. Circuits are per manufacturers schematic drawing 4805-0051-20.

    24.2. LCD Display assembly – Manufactured by Optrex, marked 20-20193-2 Rev A - DMF5005, and modified by adding connector headers, per submittor's drawing 4805-0052-10.

25. PC Board assemblies in chassis – 7 assemblies, as follows:

    25.1. Backplane PC Board assembly – Manufacturers part number 4805-0020-00. Circuits are per manufacturer's schematic drawing 4805-0020-20. Critical components of this assembly are as follows:

25.1.1. Printed circuit board - Approximate overall dimensions 11” wide, by 4.5” deep, by 0.062” thick (2 layers). Any UL Recognized (ZPMV2) material rated 120°C or higher, flammability rated V-2 or better, marked to indicate manufacturer and certified ratings, as verified in the UL Recognized Component Directory.

25.2. “Pulser” PC Board assembly – Manufacturers part number 4805-0021-10. Circuits are per manufacturer’s schematic drawing 4805-0021-20. Critical components of this assembly are as follows:

25.2.1. Printed circuit board - Approximate overall dimensions 11” wide, by 4” deep, by 0.062” thick (2 layers). Any UL Recognized (ZPMV2) material rated 120°C or higher, flammability rated V-2 or better, marked to indicate manufacturer and certified ratings, as verified in the UL Recognized Component Directory.

25.3. CPU PC Board assembly – Manufacturers part number 3000-1050-11. Circuits are per manufacturer’s schematic drawing 3000-1050-20. Critical components of this assembly are as follows:

25.3.1. Printed circuit board - Approximate overall dimensions 11” wide, by 4” deep, by 0.062” thick (2 layers). Any UL Recognized (ZPMV2) material rated 120°C or higher, flammability rated V-2 or better, marked to indicate manufacturer and certified ratings, as verified in the UL Recognized Component Directory.

25.4. I/O PC Board assembly – Manufacturers part number 4805-023-10. Circuits are per manufacturer’s schematic drawing 4805-0023-20. Critical components of this assembly are as follows:

25.4.1. Printed circuit board - Approximate overall dimensions 11” wide, by 4” deep, by 0.062” thick (2 layers). Any UL Recognized (ZPMV2) material rated 120°C or higher, flammability rated V-2 or better, marked to indicate manufacturer and certified ratings, as verified in the UL Recognized Component Directory.

25.5. Receiver PC Board assembly – Manufacturers part number 4805-022-10. Circuits are per manufacturer’s schematic drawing 4805-0022-20. Critical components of this assembly are as follows:

25.5.1. Printed circuit board - Approximate overall dimensions 11” wide, by 4” deep, by 0.062” thick (2 layers). Any UL Recognized (ZPMV2) material rated 120°C or higher, flammability rated V-2 or better, marked to indicate manufacturer and certified ratings, as verified in the UL Recognized Component Directory.

25.6. Analog PC Board assembly – Manufacturers part number 4805-024-10. Circuits are per manufacturer’s schematic drawing 4805-0024-2X. Critical components of this assembly are as follows:

25.6.1. Printed circuit board - Approximate overall dimensions 3.5” wide, by 6” high, by 0.062” thick (2 layers). Any UL Recognized (ZPMV2) material rated 120°C or higher, flammability rated V-2 or better, marked to indicate manufacturer and certified ratings, as verified in the UL Recognized Component Directory.

25.7. Relay PC Board assembly – Manufacturers part number 4805-0026-10. Circuits are per manufacturer’s schematic drawing 4805-0026-20. Critical components of this assembly are as follows:

25.7.1. Printed circuit board - Approximate overall dimensions 3” wide, by 4.5” high, by 0.062” thick (2 layers). Any UL Recognized (ZPMV2) material rated 120°C or higher, flammability rated V-2 or

better, suitable for direct support of live parts, being marked to indicate manufacturer and certified ratings, as verified in the UL Recognized Component Directory.

25.7.2. Terminal block – 8 provided. CSA Certified (class 6228 01) and UL Recognized (XCFR2) rated 300V or higher, 10A or more, and suitable for field wiring applications in industrial control equipment. Manufactured by Phoenix Contact, part number 1700037, FRONT 2.5-V/SA 5. Provided with end cap manufactured by Phoenix Contact, part number 1700011 D-FRONT 2.5-V-O.Z.

25.7.3. Solid State Relay – Designated U1, U2, U3, and U4. UL Recognized Component (NRNT2) and CSA Certified (class 3211 07), rated 250V, 1A, General Purpose. Manufactured by Clare Inc., part number PD2601.

**DESCRIPTIVE DOCUMENTS LIST:**

Documents detailed herein are subject to inspection by CSA International personnel and shall be made available in the manufacturing location upon request.

| Drawing Number | Revision | Title |
|---|---|---|
| 3000-1050-20 | C | CPU board schematic |
| 4800-0226-00 | D | Transducer pipe assembly |
| 4800-0226-23 | 3 | Transducer pipe |
| 4805-0020-20 | C | Backplane schematic |
| 4805-0021-20 | A | Pulser schematic |
| 4805-0022-20 | B | Receiver schematic |
| 4805-0023-20 | - | I/O board schematic |
| 4805-0024-20 | - | Analog output board schematic |
| 4805-0026-20 | A | Relay board schematic |
| 4805-0051-10 | C | Front panel assembly |
| 4805-0051-20 | A | Front panel schematic |
| 4805-0052-10 | A | LCD display assembly |
| 4805-0083-00 | D | Display mounting plate |
| 4805-0084-00 | E | Vertical wall display bracket |
| 4805-0090-00 | G | Chassis Door |
| 4805-0097-00 | D | Chassis plate assembly |
| 4805-0098-00 | A | Power wiring harness assembly |
| 4805-0101-00 | E | Chassis base plate |
| 4805-0102-00 | H | Card cage wall |
| 4805-0103-00 | D | Chassis left wall |
| 4805-0104-00 | D | Chassis right wall |
| 4805-0105-00 | D | Top cover |
| 4805-0106-00 | C | Power shelf |
| 4805-0107-00 | F | Co-ax wall connector brace |
| 4805-0108-00 | D | Median wall |
| 5027-0100-02 | B | Pipe insertion adapter |

## TEST RESULTS

Edition 1:
The following tests and analysis were performed on CSA Field Certification Project 2107047, are representative of the models covered in this report. No changes have been made to the hardware design. Results are copied below.

Components of the sensor assembly are powered from a certified SELV source of less than 30V, and current limited to values of less than 1A by the RF transmitter and receiver in the controller assembly. No shock or fire hazard exists in this assembly.

Components between the line input terminals and the input of the certified power supply are certified and used within their certified ratings. Spacing between the primary circuits and all others meets the applicable requirements.

The relay output circuits are at hazardous live potentials. Components within the relay output circuits are certified and used within their certified ratings. Spacings within and between these circuits and all others meet the applicable requirements. These circuits utilize materials that have a flammability rating of V-2 or better to reduce the spread of fire should it occur.

The power supply component is certified as having an SELV output of less than 30V, but at current levels greater than 5A on the +5V dc output. Current limiting components on the PC Board subassemblies within the controller assembly reduce the available current to the circuits utilizing this energy to levels below 5A. No shock or fire hazard exists within these circuits.

The power supply output circuits are provided with short-circuit protection. The circuits between the +5V dc power supply output and the current limiting components on the subassemblies utilize materials that have a flammability rating of V-2 or better to reduce the spread of fire should it occur. Spacing within and between these circuits and all others meet the applicable requirements.

The following applicable tests were conducted with satisfactory results.

Ratings – C22.2 No. 142, Clause 4.1.3, 6.2, and 6.3; ANSI/UL 508, Section 173B;
Equipment marked “INPUT 85-265Vac, 50/60 Hz, 40W”. With all circuits powered and operating, input power measured 0.257A, 31.8W @ 265.0V, 60Hz and 0.261A, 31.8W @ 265.0V, 50Hz.

Temperature – C22.2 No. 142, Clause 6.4; C22.2 No. 213, Clause 6.2; UL 508, Section 43; ANSI/ISA-12.12.01, Section 10; LTR E-010-2005, Clause 5.3; NFPA 496, Section 4.5;
Equipment tested for normal operation temperature with all circuits powered and active at the rated maximum ambient of 50°C. All components are utilized within their rated temperature limits and did not attain a temperature at any point so high as to constitute a risk of fire or adversely affect any materials employed in the equipment. The hottest component surface temperature measured 115.37 °C. A 5 degree factor of measurement uncertainty yields a temperature of 120.37°C. Equipment marked with temperature code T4.

Dielectric – C22.2 No. 142, Clause 6.8; ANSI/UL 508, Sections 35 and 49.
At the conclusion of the temperature test, the dielectric strength was tested to withstand a potential of 2210V dc, between the relay output terminals and all other circuits, including ground, for a period of 60 seconds. No breakdown occurred. The dielectric strength was tested to withstand a potential of 1800V dc, between the Line Input terminals and all other circuits, including ground, for a period of 60 seconds. No breakdown occurred. The varistors in the input circuit were disconnected.

Enclosure hosedown (type 4) – C22.2 No. 94.2-07 (aka ANSI/UL 50E), Clause 8.4.1.2 and 8.6;
The empty sensor enclosure is certified with a Type 4 ratings. The sensor enclosure, with sensor tube installed, was subjected to a stream of water from a hose having a 1-inch (25.4-mm) inside diameter nozzle that delivers at least 65 gallons (246 L) of water per minute, for a period of 90 seconds (directed at the sensor entry into the enclosure). No water entered the enclosure.

The control enclosure was subjected to a stream of water from a hose having a 1-inch (25.4-mm) inside diameter nozzle that delivers at least 65 gallons (246 L) of water per minute, for a period of 5 minutes. Although the basic enclosure (without purge system installed) is rated Type 4, water entered the enclosure from multiple locations. Submittor confirmed that the purge assembly was incorrectly installed. The equipment was returned to the submittor, where the purge assembly was removed and reinstalled. The enclosure manufacturer (Hoffman) worked directly with the submittor to troubleshoot and re-work potentially incorrect gasket installation problems on door and window joints. Subsequent hosedown testing by the submittor confirms that the problem has been repaired and no water entered the enclosure.

Verification of purge time marking – LTR E-010-2005, Clause 3.2; NFPA 496, Section 5.4.1;
Enclosure dimensions are 16", by 14", by 8", with a maximum volume of 1792 $in^3$ or 1.037 $ft^3$. The vent fitting installed in the enclosure passes a flow of 0.4 scfm. The volume of air will be changed 4 times in the period of 2.6 minutes (156 seconds). Enclosure is marked for a purge time of 3 minutes, at a flow rated of 0.4 scfm.
A certified relief valve is provided to prevent overpressure.

End of Report