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# Receiving and Storage

# Definition of Symbols



WARNING - EXPLOSION HAZARD - DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS.

WARNING - EXPLOSION HAZARD - SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR HAZARDOUS AREA INSTALLATION.

THE SUPPLY POWER CIRCUIT MUST INCLUDE AN OVERPROTECTION DEVICE WITH A MAXIMUM RATING OF 20A. A DISCONNECT SWITCH MUST BE LOCATED IN CLOSE PROXIMITY TO THE PROBE.

IF THE EQUIPMENT IS USED IN A MANNER NOT SPECIFIED BY THE MANUFACTURER, THE PROTECTION PROVIDED BY THE EQUIPMENT MAY BE IMPAIRED PER CLAUSE 5.4.4(i) IN STANDARD EN 61010-1.

CAUTION, RISK OF DANGER SYMBOL INDICATES INJURY MAY OCCUR IF MANUFACTURER'S INSTRUCTIONS ARE NOT ADHERED TO. PLEASE READ MANUAL CAREFULLY WHEN SYMBOL IS DISPLAYED.

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CAUTION, HOT SURFACE SYMBOL INDICATES EXPOSED SURFACE TEMPERATURE CAN CAUSE BURNS OR PERSONAL INJURY. CARE SHOULD BE TAKEN WHEN CONTACT IS REQUIRED.

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CAUTION, RISK OF ELECTRICAL SHOCK SYMBOL INDICATES ELECTRICAL SHOCK MAY OCCUR. CAUTION SHOULD BE TAKEN BEFORE DISCONNECTING OR CONTACTING ANY ELECTRICAL CONNECTIONS.

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PROTECTIVE CONDUCTOR TERMINAL SYMBOL INDICATES THE TERMINAL LOCATION FOR THE PROTECTIVE CONDUCTOR. FAILURE TO CONNECT TO THE PROTECTIVE CONDUCTOR TERMINAL MAY RESULT IN A SHOCK HAZARD.

# Specifications

<b>OPERATING SPECIFICATIONS</b>	
<b>Dilution Air Flow Rate Range</b>	5 to 15 l/m
<b>Dilution Air Pressure Range</b>	20 to 80 psig
<b>Dilution Air Dew Point</b>	-30°C maximum (Lower is better)
<b>Dimensions</b>	5 1/4" H x 19" W x 13" D
<b>Weight</b>	15 lbs (6.8kg)
<b>Operating Connections Provided</b>	Dilution air inlet Dilution air to sample probe Diluted sample from sample probe Cal gas inlet (6 maximum) Sample/Cal gas outlet to analyzer bank Vacuum gauge line inlet to monitor Condition of eductor
<b>MATERIAL SPECIFICATIONS</b>	
<b>Chassis</b>	Aluminum
<b>Block and Bleed Manifold</b>	316SS
<b>Cal Gas Regulator</b>	316SS
<b>Solenoid Valve Wetted Parts</b>	316SS with Viton O-Rings
<b>Internal Tubing</b>	TFE Teflon

# Description and Principle of Operation

## DESCRIPTION

Dilution air having a low water dew point and clean of any of the measured components is to be provided to the Dilution Air Inlet at a pressure of up to 100 psig. A precision regulator adjusts the pressure and flow rate to a value that provides the eductor in the Dilution Probe with enough vacuum to create a sonic flow of sample through the Critical Orifice in the Dilution Probe to be diluted by the Dilution Air. The resulting diluted sample is carried back to the Sample Inlet in the Dilution Control Drawer to pass through the flow meters to be carried to the bank of Analyzers.

A bank of solenoid valves (up to six allowed) mounted to a manifold is provided to introduce Cal Gas through a block and bleed valve. Then the calibration gas goes through a pressure regulator and flow meter up to the probe. If the block and bleed valve is energized the sample would be sent through the Cal Gas Outlet to the Probe to calibrate the entire sample system. Drawing P1144, Sheet 2 de-energized as shown. In order to send cal gas directly to the analyzers, SV11 and SV3-SV9 (only one) should be energized.

A needle valve is provided on each of the flow meters that run to an analyzer to throttle flow. There is no needle valve on the bypass and the cal gas lines. A dilution system must be maintained at **AMBIENT PRESSURE AT ALL TIMES!** If your system is malfunctioning check that the system is not pressurized for any reason.

A vacuum tap inlet from the dilution eductor in the probe is provided to allow the operator to watch the action of the eductor. If the eductor fails, the vacuum gauge indicate a drop back close to atmospheric pressure. This should be relatively constant. If not that indicates a blockage or that they system is being pressurized.

## APPLICATION

The Model 728 Dilution Probe Control Drawer is designed to control the pressure of dry dilution air to a Dilution Extractive Probe and to indicate the flow rate of that dilution air. Provision are made for feeding any one of up to six calibration gasses directly to the Dilution Probe to serve as a total system calibration check.

The Model 728 Dilution Probe Control Drawer used along with a Dilution Extractive Probe, and dilution air cleanup kit, makes up a complete Sample Conditioning System for a CEMS Installation. Analyzers having appropriate sensitivity for the dilution ratio used in the Dilution Probe and Cal Gas bottles make up the balance of the CEMS Installation. Note that dilution analyzers require a pump inside of them. They are designed to be bypassed around and draw their own sample using the internal pump. Use care when purchasing an analyzer to ensure it is the correct one for your dilution system.

# Installation



**TO COMPLY WITH HAZARDOUS AREA STANDARDS, UNIT MUST BE INSTALLED IN A MINIMUM IP54 ENCLOSURE AND PROTECTED FROM DUST/ WATER INGRESS. ADEQUATE VENTILATION MUST BE PROVIDED FOR DISSIPATION OF A MINIMUM OF 1200 BTU/HR (1265 KJ/HR)**

The Controller should be mounted in a 19" relay rack or placed on a shelf in view of and handy to be adjusted by the operator of the CEMS facility.

The wiring from the solenoid valves should be connected to the PLC, data logger, or Analyzer's as required to operate the appropriate solenoid to control the flow of calibration gas and sample flow.

A source of dry, purified dilution air should be provided (dew point below  $-30^{\circ}\text{C}$ ) and brought to the Dilution Air Inlet fitting on the Controller. A line from the Dilution Air Outlet should be connected to the inlet of the Eductor in the Dilution Probe.

The Cal Gas Outlet fitting on the Controller should be connected to the Cal Gas Inlet fitting on the Dilution Probe.

The Sample Inlet fitting on the Controller should be connected to the outlet of the Dilution Eductor supplied as part of the Dilution Probe.

The Vacuum Tap Inlet fitting on the Controller should be connected to the vacuum tap on the Dilution Eductor supplied as part of the Dilution Probe.

Calibration gasses, span and zero gas, should be connected from the cal gas tank regulators as part of the tank manifold assembly associated with the gas bottles to the Calibration Gas fittings, CG1 through CG6 or as many calibration gasses as are provided (up to a total of 6).

# Start-Up

Apply power to the Special Dilution Probe. Allow an hour for the enclosure to come up to temperature and stabilize. This warm-up period is extremely important to avoid the presence of condensation within the Swirlklean filter. Condensation within a filter causes the particles to be cemented to the filter surface.

Open the dilution air valve SV2 by flipping the dilution motive air switch to enable. Note that if that switch is disabled or a low temperature condition exists (Temperature controller on drawer is being used) then the valve will not open. Adjust the pressure to 50 psig at the start to produce a vacuum within the eductor. Monitor the vacuum produced by observing the vacuum gage connected to the Dilution Probe Controller.

Select your zero gas using the selection switch. When the analyzer is lined out, adjust the zero on the analyzer.

Select your span gas using the selection switch. Determine from a ratio of the indicated concentration on the analyzer and the actual concentration of the span gas what dilution ratio is being provided by the Dilution Probe. The dilution ratio can be adjusted by varying the pressure of the dilution air control regulator. A higher pressure will increase the flow of air and provide a higher dilution ratio. A lower pressure will decrease the flow of dilution air and reduce the dilution ratio. When the dilution ratio is judged to be satisfactory, (great enough to insure no condensation will occur in the sample line), the span control on the analyzer can be adjusted to the desired value for reporting purposes.

# Shutdown

All that is generally required is the power entry module be switched off to perform maintenance or repairs on the drawer. It is recommended the power cord be removed from the back as well as a separate safety precaution. If performing any operations on the air side of the systems you should secure those air flows to the drawer.



# Maintenance

The only periodic maintenance required should be to blow any dust out of the drawer every 6 months. The rest of the equipment is tested by already performing your system calibrations.

# Troubleshooting

As mentioned in the product description, there are very few faults that can happen to the dilution drawer. The most likely being a leak due to a O-Ring, a faulty relay, or a faulty solenoid. If the desired value cannot be obtained you likely have a leak somewhere or your motive air isn't at the correct pressure. Refer to the 275HD manual for dilution air pressure vs dilution ratio graphs.

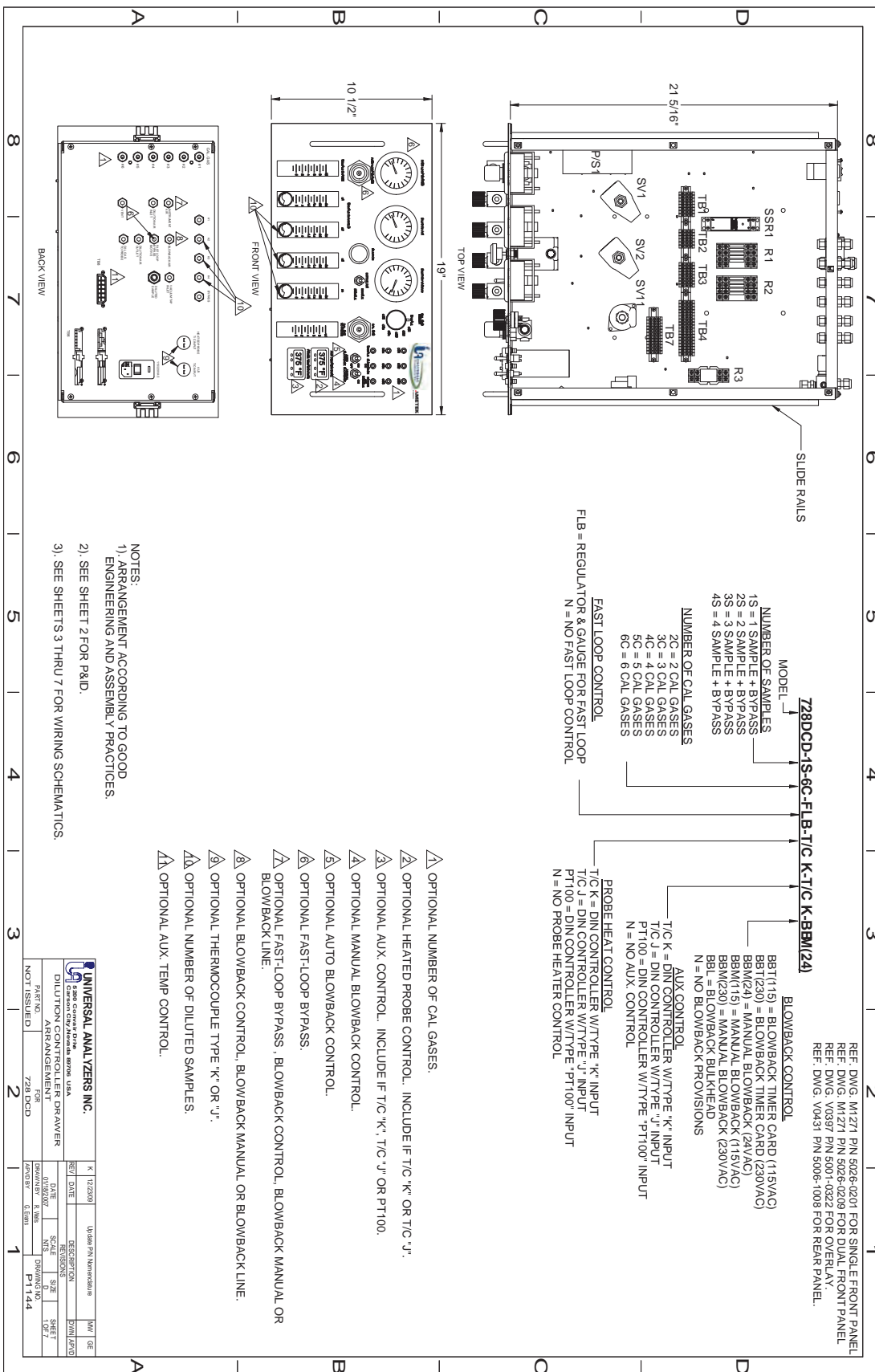
If you are still obtaining incorrect readings check the vacuum gauge for any potential blockages or that the educator is not achieving sonic flow.

If your system is not vented to atmosphere then you will have issues that cannot be easily explained with an electrical fault or failed regulator.

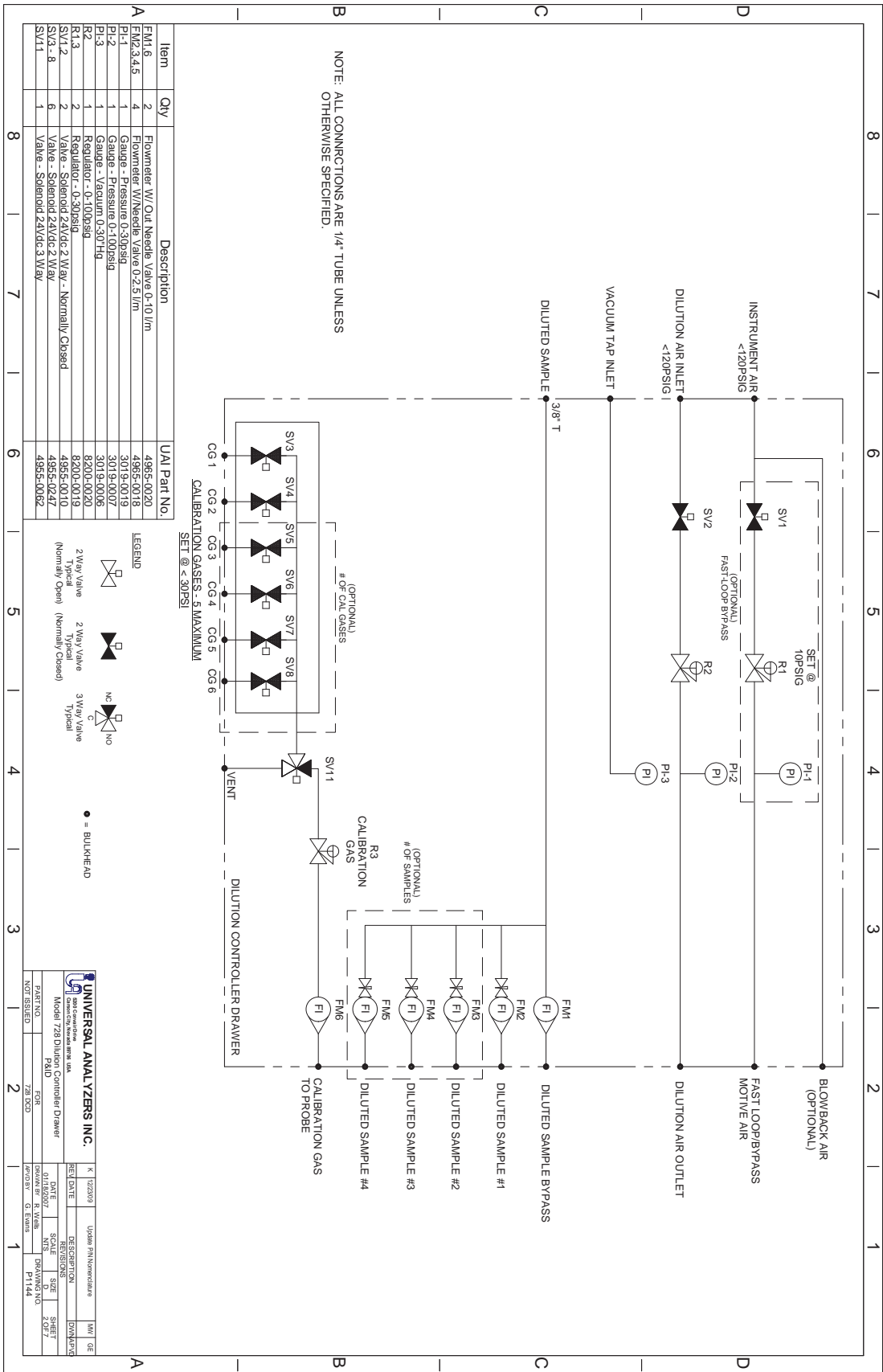
# Spare Parts

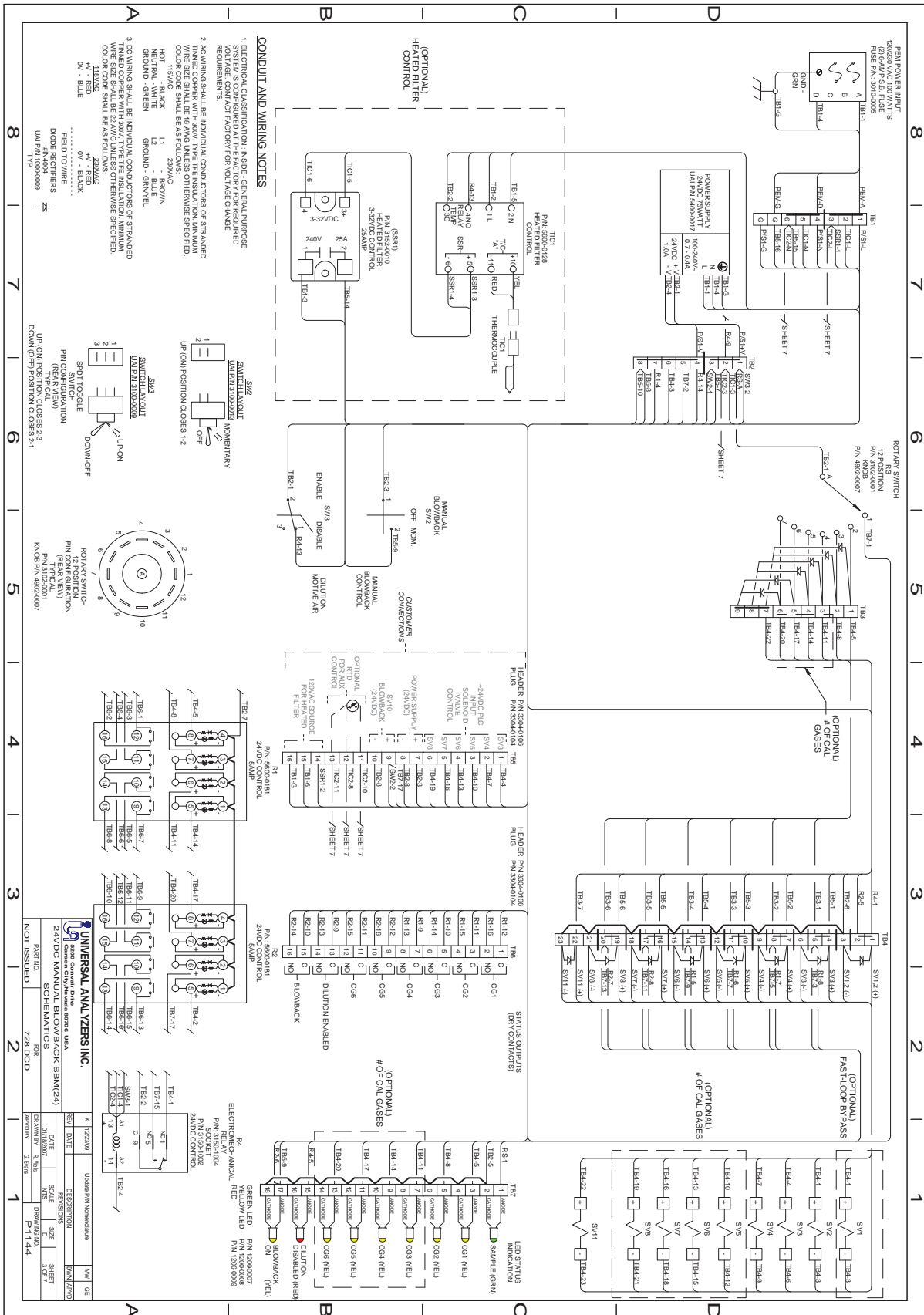
Refer to most recent revision of drawing P1144. No spares are required as only a fault would necessitate replacement. All potential part numbers are located on the drawings.

# Drawings Model 728

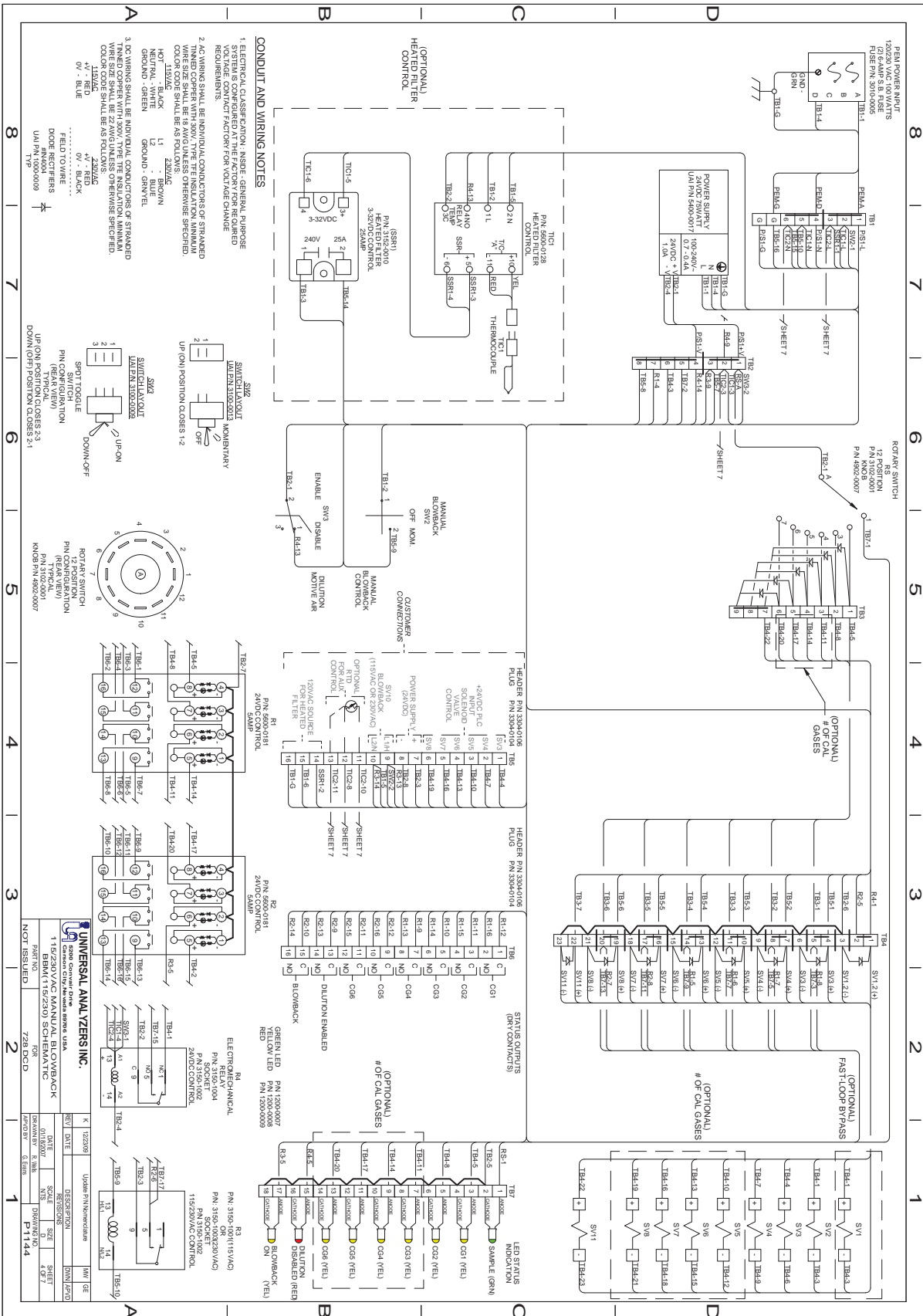


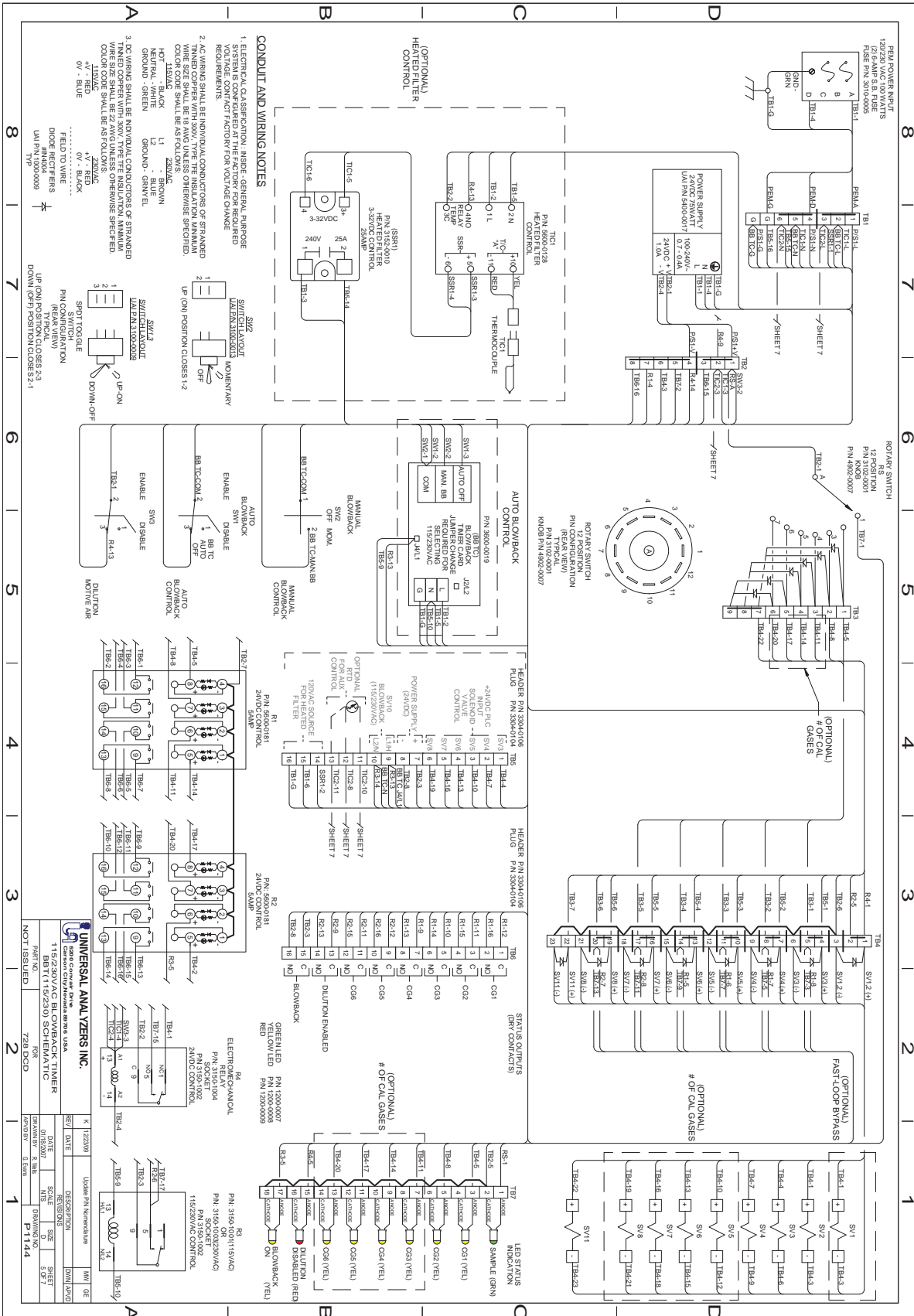
# Drawings Model 728





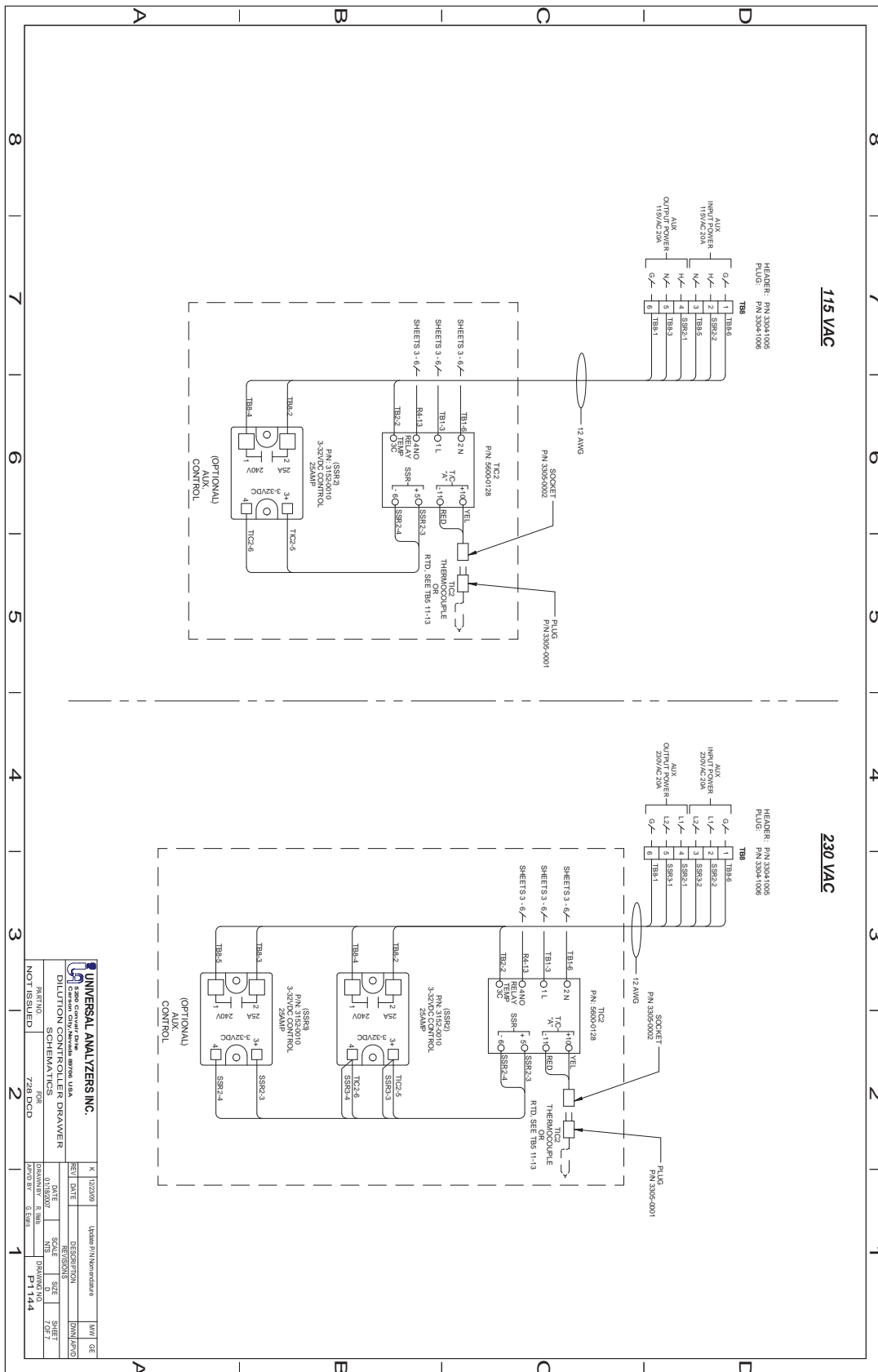
# Drawings Model 728











<b>UNIVERSAL ANALYZERS INC.</b>		K 122001		Universal P/Nomenclature		MKT GE	
3000 Central Express Drive St. Louis, MO 63103 USA		REV DATE		DESCRIPTION		DRAWING	
DILUTION CONTROLLER DRAWER SCHEMATICS		DATE 01/19/2002		SHEET 0		SHEET 7 OF 7	
PART NO 728ACD		FOR PART NO 728ACD		DRAWING 2. 1881		DATE 01/19/02	
NOT ISSUED		2		1		4	

# Limited Warranty

## I. Limited Warranty

1. Limited Warranty. Universal Analyzers, Inc (UAI) offers a limited warranty on each of its products against failure due to defects in material and workmanship for a period ending the earlier of (i) fifteen (15) months from the date of the invoice relating to the sale of the product and (ii) twelve (12) months from the date of installation of the product (collectively, the "Initial Warranty"). During the Initial Warranty, UAI offers a limited warranty against failure due to defects in material and workmanship on each part of a product repaired or replaced by an authorized service person for a period ending the later of (a) the remaining term of the Initial Warranty of the product and (b) ninety (90) days from the date of such repair or replacement. After expiration of the Initial Warranty, UAI offers a limited warranty against failure due to defects in material and workmanship on each part of a product repaired or replaced by an authorized service person for a period ending ninety (90) days from the date of such repair or replacement. UAI further offers a limited warranty that the products and parts it sells will conform to UAI's written specifications therefor. The foregoing limited warranties cover parts and labor only and UAI does not warrant and will not reimburse the buyer of its products ("Buyer") for any costs relating to the access by service persons of UAI to the product at issue. The foregoing limited warranties cover only the repair or replacement of defective parts and such determination will be in the sole discretion of UAI. In its sole discretion, UAI may make repairs or replacements under these limited warranties with either new or refurbished parts. To the extent Buyer's product cannot be remedied under these limited warranties through repair or replacement of parts, Buyer may return the product for a refund of the purchase price, less a reasonable reduction in such purchase price equal to the depreciation expense incurred by Buyer relating to such product. The limited warranties of this Section I.1. are further subject to those warranty exclusions set forth below in Section I.2.

2. Limited Warranty Exclusions. Excluding the warranties provided for in Section I.1., UAI provides all products to Buyer "as-is," without any other warranty of any kind. UAI disclaims any and all express or implied warranties of merchantability, fitness for a particular purpose and non-infringement of the intellectual property of others. UAI makes no warranty, express or implied, as to the design, sale, installation or use of its products. UAI's warranties will not be enlarged by, nor will any obligation or liability of UAI arise due to UAI providing technical advice, facilities or service in connection with any product. There is no warranty by UAI with respect to any product's: (i) uninterrupted or error-free operation; (ii) actual performance, other than the product's capability to meet UAI's specifications therefor; (iii) removal or installation from a worksite or process; (iv) electronic components or associated accessories (including without limitation circuit boards and integrated circuits); (v) maintenance (including without limitation gasket and seal replacements, adjustments, minor repairs and other inspection requirements, preventative or otherwise); (vi) use under inappropriate conditions or not in accordance with operating instructions; or (vii) use in connection with the operation of a nuclear facility. There is no warranty for labor expenses associated with field repairs or the repair or replacement of defective parts in the engine or power unit of any product if such product has been in the possession of the owner or operator for greater than twelve (12) months. There is no warranty for products determined to be, in UAI's sole discretion, damaged as a result of (a) misuse, neglect or accident; (b) improper application, installation, storage or use; (c) improper or inadequate maintenance or calibration; (d) operation outside of the published environmental specification; (e) improper site preparation or maintenance; (f) unauthorized repairs or replacements; (g) modifications negligently or otherwise improperly made or performed by persons other than UAI; (h) Buyer-supplied software or supplies; (i) use in conjunction with or interfacing with unapproved accessory equipment; (j) use of ABC-style or dry powder fire suppression agents; or (k) leaked sample materials. To the extent a UAI product is used in connection with the operation of a nuclear power facility, Buyer agrees to indemnify and hold UAI harmless from any and all actions, claims, suits, damages and expenses arising from such use. UAI provides no warranty on the oral representations made by its personnel while they are attempting to assist Buyer in the operation of a product. This Standard Limited Warranty does not apply to items consumed by the products during their ordinary use, including but not limited to fuses, batteries, paper, septa, fittings, screws, fuses, pyrolysis, dryer or scrubber tubes, sample boats, furnaces or UV lamps.

3. Non-UAI Products. UAI does not in any way warrant products it does not manufacture except to the extent the warranty of the manufacturer of the product at issue passes through or is otherwise assigned to UAI. If a manufacturer warranty is so assigned to UAI, UAI will only be bound to comply with the length of time associated with such warranty. All other terms of such warranty will be governed by this Standard Limited Warranty and UAI's General Terms and Conditions incorporated herein by reference.

# Limited Warranty

4. Expenses on Non-Warranty Work. All repairs or replacements by UAI after the expiration of any applicable limited warranty period will be performed in accordance with UAI's standard rate for parts and labor. Further, if upon UAI's inspection and review, UAI determines the condition of the products is not caused by a defect in UAI's material and workmanship, but is the result of some other condition, including but not limited to damage caused by any of the events or conditions set forth in Section I.2., Buyer shall be liable for all direct expenses incurred by UAI to conduct the inspection and review of the product.

5. Exclusive Remedy. The foregoing limited warranty constitutes Buyer's exclusive remedy with respect to products sold by UAI and UAI's liability shall be exclusively limited to the written limited warranty specified herein. No employee, representative or agent of UAI is authorized to either expressly or impliedly modify, extend, alter or change any of the limited warranties expressed herein to Buyer.

6. Procedure and Costs. All limited warranty claims must be made in writing promptly following discovery of any defect. Buyer must hold defective products for inspection by UAI. If requested by UAI, Buyer must send the product to UAI for inspection. Any such returns by Buyer will be at Buyer's expense and Buyer will remain liable for any loss of or damage to the product during such product's transportation to UAI. No products will be sent to UAI for inspection unless UAI has authorized Buyer to do so.

7. Terms and Conditions. UAI's General Terms and Conditions are incorporated herein by reference and Buyer accordingly agrees to be bound by the terms thereof.

## II. Limitations on UAI Liability

1. In General. Buyer agrees UAI shall not be liable for any direct, indirect, incidental, punitive or consequential damages, including lost profits, lost savings or loss of use, whether Buyer's claim is based in contract, tort, warranty, strict liability or otherwise, which Buyer may suffer for any reason, including reasons attributable to UAI. Buyer agrees these limitations on UAI's liability are reasonable and reflected in the amounts charged by UAI for its products.

2. Force Majeure. This Standard Limited Warranty does not cover and UAI shall not be liable for either direct or consequential damage caused, either directly or indirectly, as a result of: (i) any act of God, including but not limited to natural disaster, such as floods, earthquakes, or tornadoes; (ii) damages resulting from or under the conditions of strikes or riots, war, damages or improper operation due to intermittent power line voltage, frequency, electrical spikes or surges, unusual shock or electrical damage; or (iii) accident, fire or water damage, neglect, corrosive atmosphere or causes other than ordinary use.

3. Limitation on Warranty Claims. Prior to any obligation of UAI to perform any limited warranty service as set forth herein, Buyer must have: (i) paid all invoices to UAI in full, whether or not they are specifically related to the product at issue; and (ii) notified UAI of the limited warranty claim within sixty (60) days from the date Buyer knew or had reason to know of the defect



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