

Baldwin™-Series
Model 45 Dilution Probe
User's Manual



PERMA PURE LLC

A HALMA COMPANY

8 Executive Drive • P.O. Box 2105 • Toms River, NJ 08754

Contents

Unpacking	3
Introduction	3
General description	4
Specifications	5
Utility Requirements & Connections	5
Important Safety Warnings	6
Installation	7
Mounting	7
Connections (Refer to figures 3 & 4)	8
Heated sample line	8
Electrical	9
Heaters	9
Blowback valve	9
Calibration	10
Troubleshooting and Maintenance Guide	11
Replacement Parts	12
Appendix A: Dilution Probe Drawings	13
A1: Parts list, dwg # 4P-45-03-01, p1	13
A2: Exploded view – filter assembly, p2	13
A3: Exploded view - eductor assembly, p3	13
A4: Exploded view – assembly, p4	13
A5: Enclosure cutaway view, p5	13
A6: Electrical wiring diagram, 4P-45-04-01	13
Appendix B: Fast Loop Configuration	14
Appendix C: Warranty and Disclaimers	15



Unpacking

Perma Pure has made every effort to ship you a high quality product that has been thoroughly inspected and tested. It has been carefully packed to ensure that it arrives at your facility in good condition. Even though every effort has been made to prevent damage during the transportation process, damage can occur by the carrier. This is out of control of Perma Pure and is the responsibility of the carrier to ensure that your equipment arrives intact and undamaged.

- ❖ Inspect outside packaging. If there is any visible damage, inform the carrier at the time of deliver. ***This inspection is important! Once the package is signed for, responsibility for any visible damage then transfers to the consignee.***
- ❖ Unpack your equipment. Visually inspect the outside of your equipment for any damage. If there is any damage, ***contact the carrier immediately.*** Generally, a carrier must be notified within 24 hours of the delivery to make a hidden damage claim.

Items in the carton include:

- (1) Model 4P-45 Dilution probe
- (1) Umbilical connector
- (1) User's Manual

Optional Items:

- (1) Stinger
- (1) Mounting flange with gasket and bolts

If any of the above parts are missing or damaged, call the helpline at **(800) 337-3762 ext-145.**

Introduction

Thank you for purchasing this product from Perma Pure LLC. This manual has been assembled so that it can answer all questions regarding operation. Please keep the operators manual near the equipment for future reference. There may also be optional equipment available that was not ordered at the time of original purchase, which may be described and/or illustrated in this manual.

If you still have any questions regarding your equipment's operation, available options or technical support, please contact your purchasing dealer or contact Perma Pure directly.

Perma Pure LLC
P.O. Box 2105
8 Executive Drive
Toms River, NJ 08754
website: www.permapure.com

Tel: 732-244-0010
Tel: 800-337-3762 (toll free US)
Fax: 732-244-8140
e-mail: info@permasure.com

General description

The Model 45 Dilution Probe conditioning system filters and dilutes sample gases in preparation for analysis. The out-of-stack conditioning system dilutes the sample gas 10 to 250 times with a dry gas, reducing the water vapor content and eliminating high-cost heated lines. The sample passes through a stinger and filter probe to remove particulate. The filter element is selected for its inertness to the sample gas; a ceramic element is standard.

A precision, low flow, heated dilution eductor assembly mixes the dry gas with the sample gas extracted from the process. The flow through the critical orifice in the eductor creates the vacuum that pulls the sample gas through the dilution probe system. This gas mixes with the sample, diluting the gas to a lower concentration and dew point. The dilution gas and sample gas flow rate may be set by selecting a different orifice size. This orifice is made from precisely machined Monel. The design of the orifice restricts the gas flow to achieve sonic levels or the speed of sound, eliminating the effects of pressure fluctuations downstream.

To maintain a constant dilution ratio, the precision dilution eductor draws the sample in at a slow rate 25-700 cc/min. An optional fast loop eductor is available to reduce lag time between the probe tip and filter body, ensuring adequate sample supply.

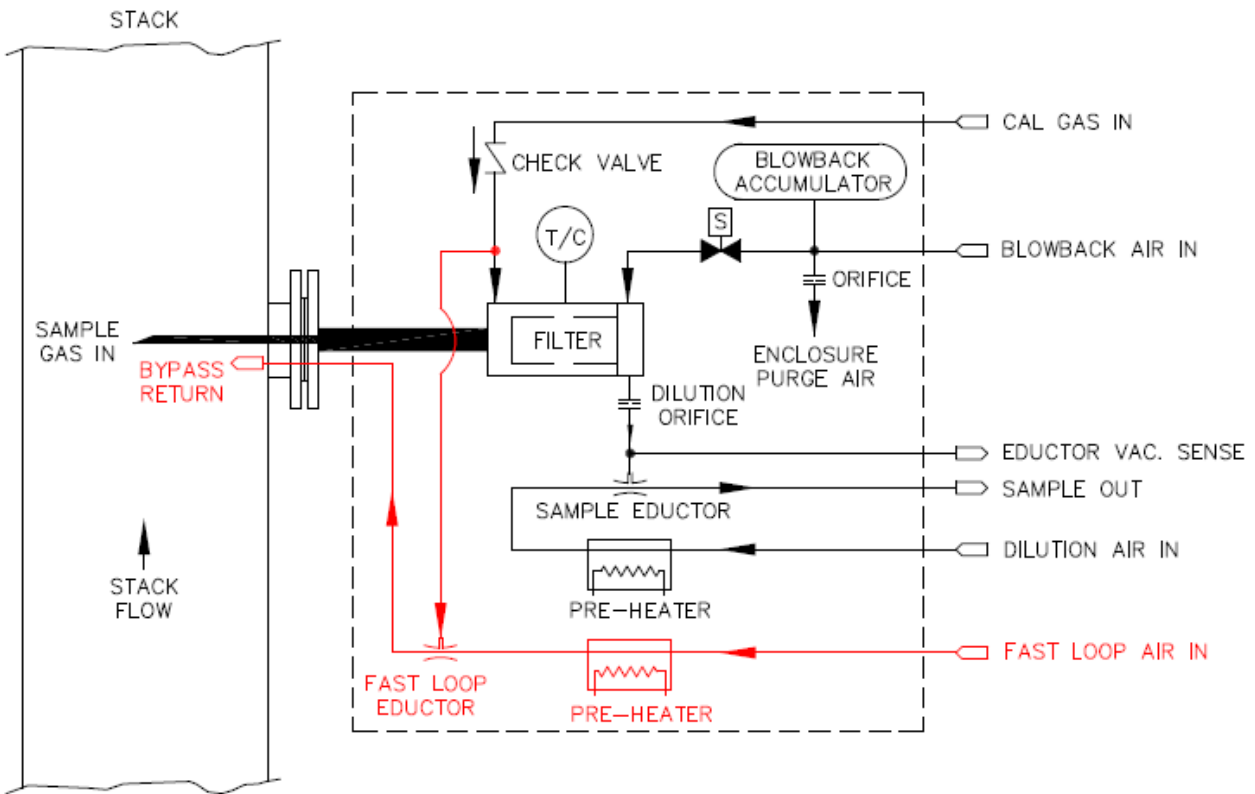


Figure 1 - Mode 45 Flow Schematic



Specifications

- Critical flow dilution orifice: Monel
- Dilution ratios: 250:1, 100:1, 40:1, 10:1
- Eductor vacuum: -15"Hg
- Stack gas absolute pressure range: -10 inches H₂O to +20 psig
- Maximum sample inlet temperature:
 - 45°F / 230°C with Viton[®] rubber o-rings
 - 600°F / 318°C with Kalrez[®] o-rings
- Enclosure: NEMA 4X, fiberglass with 3/8" Rubatex/silicone insulation
- Dimensions: 19" x 17" x 10" HWD; 25 lbs w/o stinger & flange
- Filter element: 2 µm, 3" ceramic, 90cc internal vol. (optional Teflon[®], SS, SS mesh 0.1-20µm)
- Filter housing: 316L stainless steel, 160cc internal volume (optional Teflon or Durinert coating)

Utility Requirements & Connections

- Dilution gas
 - Flow: 7 lpm; 50 psig minimum required
 - Purity: -20°C dew point, less than 1 ppm CO, CO₂, NO_x, Sox
 - Connection: 3/8" tube compression fitting
 - Eductor vacuum sense: 1/4" tube compression fitting
- Electrical requirements:
 - Probe: 90-260 VAC, 50/60 Hz, 600 Watts
 - Blowback solenoid: 115AC standard; 230 VAC, 24 VDC, optional
- Cal gas inlet: 3/8" tube compression fitting
- Blowback air inlet: 3/8" tube compression fitting
- Sample outlet: 3/8" tube compression fitting
- Fast loop air (option): 3/8" tube compression
- 1-1/4" MNPT for connection to 2", 4" or 6" mounting flange
- 1/2" FNPT for stinger

Important Safety Warnings

Please be sure to review the following basic safety procedures. These procedures represent the **MINIMUM** requirements to operate the equipment safely. It is the ultimate responsibility of the operator to ensure proper safety practices are utilized at the point of operation.

- **NEVER** attempt to operate this equipment in an explosive or otherwise hazardous area.
- **NEVER** exceed any specified rating for the equipment. Voltage, temperature and pressure ratings must be closely observed and not exceeded. Voltage rating of the equipment **MUST** match the rating on the data label. Please make sure that it matches before powering up the equipment.
- This equipment is **NOT** designed to be used in an explosive environment.
- **Sample gas is potentially dangerous.** A leak test is recommended at initial startup and as often as necessary to maintain a safe working environment around the equipment. The gas stream exhaust must exit away from all personnel to prevent dangerous exposure.
- **NEVER operate the equipment with any part of the enclosure unsecured.** All operated doors and covers must be in place and secured prior to operation. Electrical current may be present behind covers or doors, even if tools are not necessary to access these components.
- **NEVER** attempt service on this equipment without first disconnecting all energy sources. Repair of this equipment should only be done by properly trained personnel that are familiar with the potential risks involved with servicing of the equipment.
- **NEVER** replace fuses with types other than the sample specification of type and current. Do not bypass this or any other safety device.
- **NEVER** operate this equipment if it is visibly damaged or the possibility exists that it may have been damaged.
- The use of components that have not been purchased through an authorized Perma Pure dealer or directly from Perma Pure may compromise the safety of the operator. Additionally, use of non-authorized components may change the operating characteristics of this equipment. Any changes to the equipment, that modify its operation in any way, are dangerous, and are strictly prohibited.
- Read the entire operating manual before attempting to set up or operate the equipment.
- Please heed all warning labels that are on the equipment. They are there to remind you of possible hazardous conditions.
- Verify the integrity of any mechanical and/or electrical connections that are made to the unit.
 - Verify that the unit is connected to the proper rated power for the system
 - Verify that the unit is plumbed properly to operate effectively



Installation

Tools and hardware recommended for installation:

- Appropriate wrenches for flange bolts
- (1) 5/8" and 11/16" wrenches for compression fittings
- Teflon tape or pipe thread sealant
- Flat screwdriver for electrical connections

Mounting

The Model 45 is designed to be mounted directly on a stack or duct with a 2", 4", or 6" 150# flange. The cable entry seal at the bottom of the probe enclosure is heat shrinkable and should be shrunk to the sample line when installation is complete.

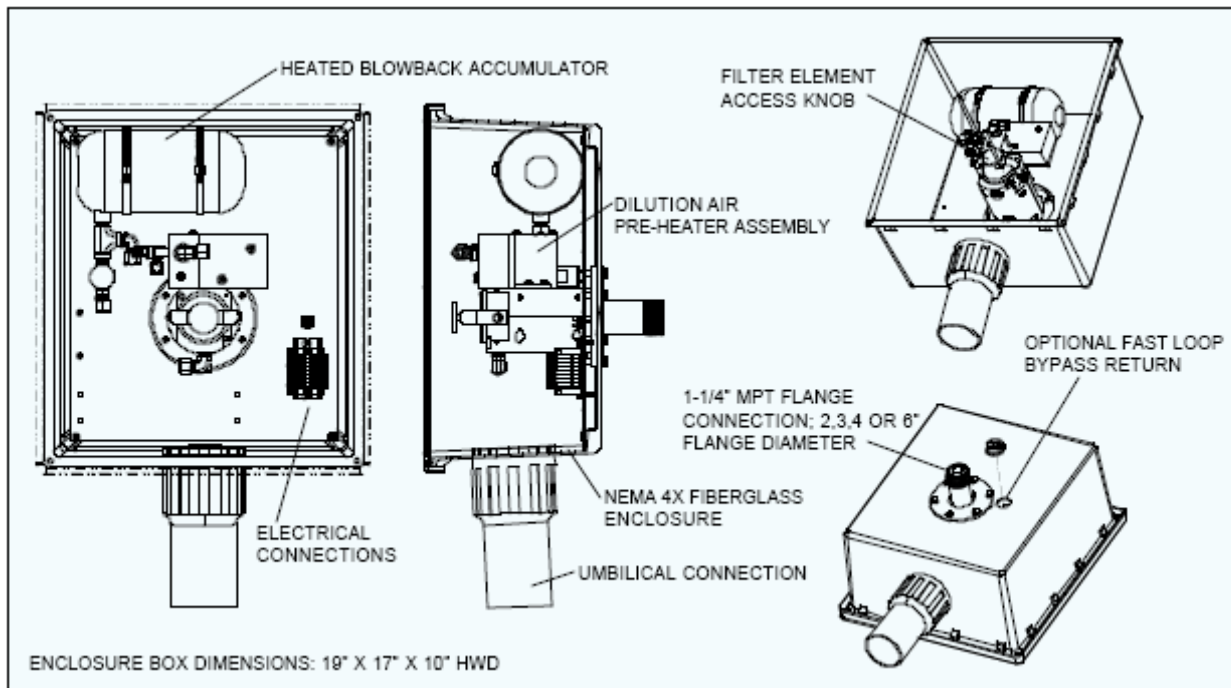


Figure 2 -Model 45 Dilution probe

Connections (Refer to figures 3 & 4)

Heated sample line

1. Install heated line sealing fitting by threading hub into sleeve, #1.
2. Ensure o-ring seal is installed on outside of enclosure (between sleeve & enclosure wall).
3. Run heated sample line through entry seal and into enclosure.

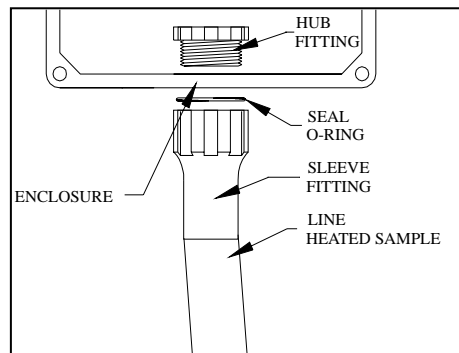


Figure 3 - Heat seal fitting

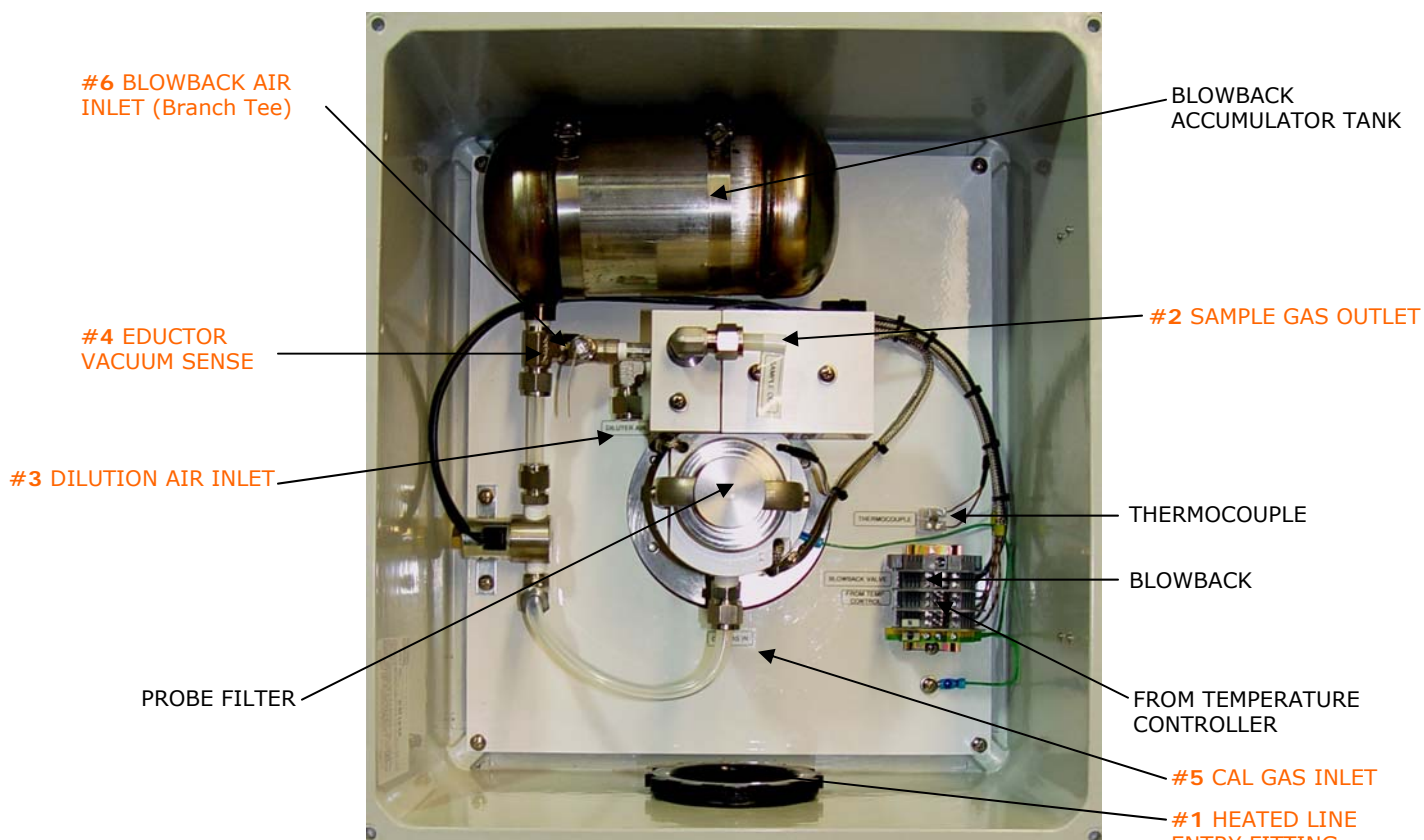


Figure 4 - Model 45 enclosure connections

4. Continue with the following connections:
 - #2 Sample gas outlet
 - #3 Dilution air inlet (Dil. air needs to be supplied via a precision pressure regulator)
 - #4 Eductor vacuum sense
 - #5 Calibration gas inlet
 - #6 Blowback air inlet
5. Shrink entry seal tubing around heated sample line with heat gun.



Electrical

Refer to figure 5 and Appendix page A6 for wiring diagram.

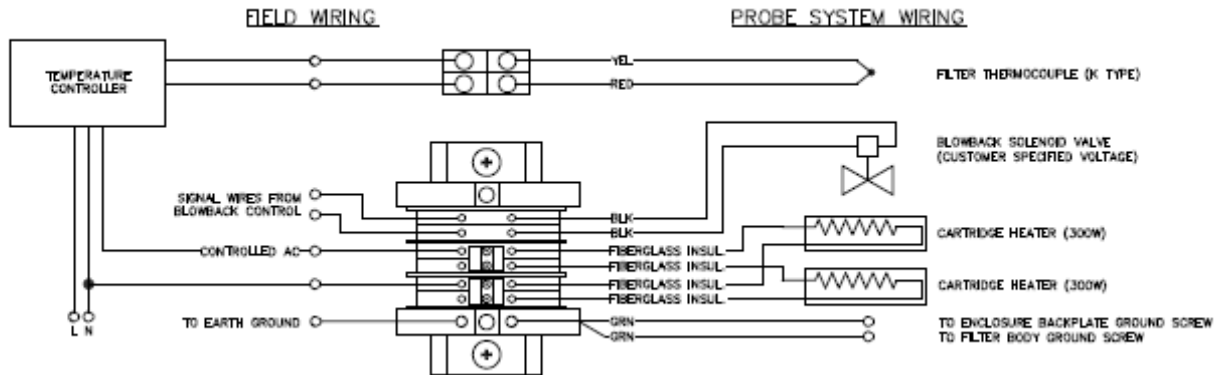


Figure 5 - Electrical connections

Heaters

The model 4P-45 has no provision for temperature control and must be performed by a customer supplied controller. Power (3) supplied to the system's heater must be done so only via the external temperature controller otherwise, overheating will occur. A type-k thermocouple (1) is provided to sense filter body temperature and is intended for feedback to the customer supplied temperature controller.

Blowback valve

Blowback valve (2) is operated at customer specified voltage by an external timer or PLC control.

Make the following connections:

- #1 Filter thermocouple to temperature controller
- #2 Blowback solenoid valve to controller
- #3 Controlled AC power from temperature control
- #4 Neutral wire
- #5 Ground wire

Calibration

NOTE: The optional fast loop setup requires a different method of calibration, see Appendix B. To operate calibration gas to the probe, open the user supplied calibration gas control valve, adjust the cylinder pressure to >25 psig, and adjust the calibration gas flow rate to 1 lpm.

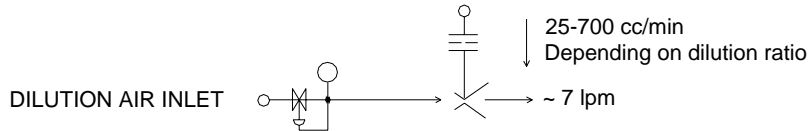


Figure 6 - Dilution eductor

The dilution air pressure should be regulated to produce a flow of 7 lpm. The desired ratio can be reached at a lower pressure, but will be difficult to maintain. Keeping the pressure in the sonic range will eliminate any fluctuations due to any lags in pressure.

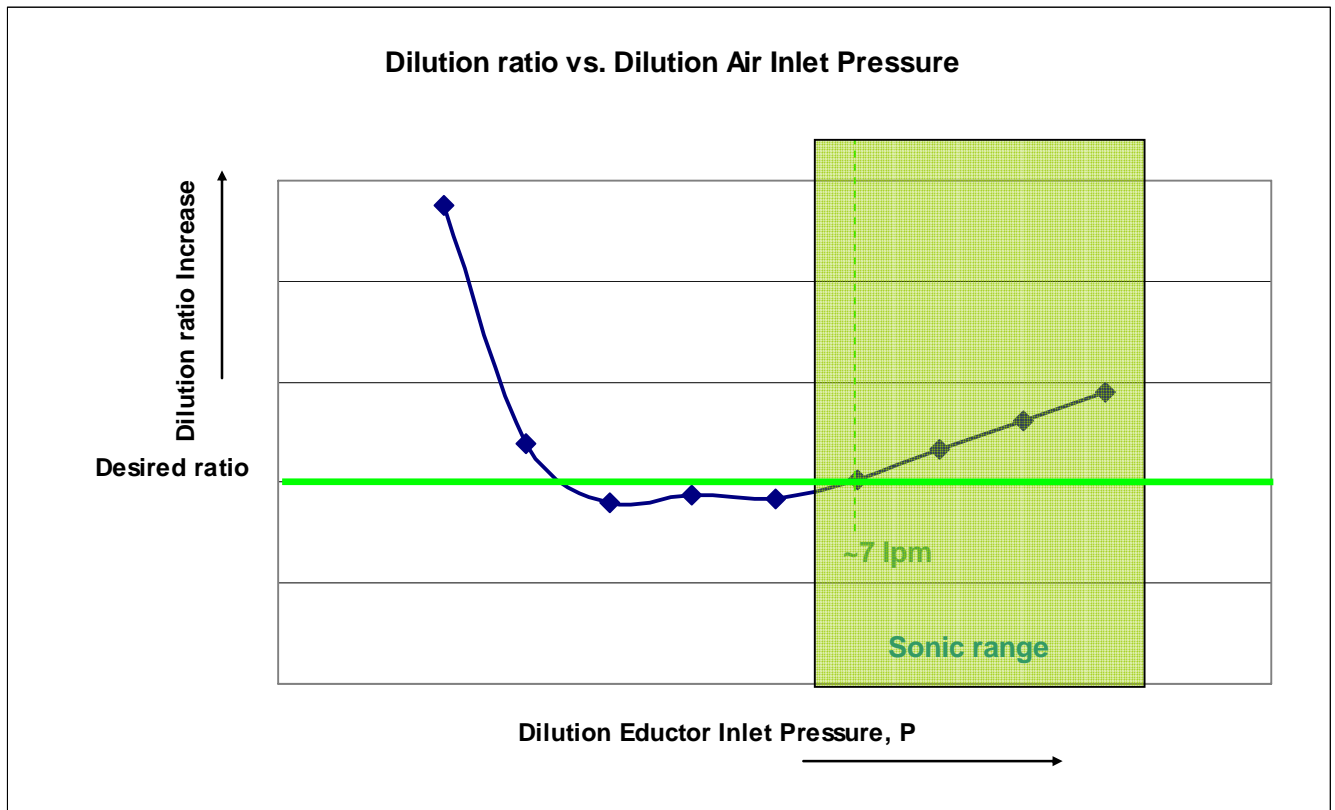


Figure 7 - Pressure effects on dilution air flow rate



Troubleshooting and Maintenance Guide

The Model 45 does not require routine maintenance for the filter head or externally-regulated probe body heater jacket.

The filter element requires periodic replacement, depending upon application and dust loading. See the replacement parts list for part numbers.

If the Model 45 is used in conjunction with the Baldwin™-Series Flow Control Drawer, monitoring the sample vacuum will warn the operator when to change the filter element. The operator should log the beginning sample vacuum when the system is first started up. If the sample vacuum is consistently 25% higher than at start-up, the operator should replace the filter element with a new filter. Visual inspection will also confirm the condition of the filter element.

Symptom	Diagnostic	Fix
120 VAC heater jacket is not heating	CAUTION - Disconnect power from the system. Check the resistance between the neutral and hot terminal block. Resistance should be about 30-35 ohms.	If the measurement is out of range for heater resistance, one or both of the heater cartridges are damaged. Both should be replaced.
220 VAC heater jacket is not heating	CAUTION - Disconnect power from the system. Check the resistance between the neutral and hot terminal block. Resistance should be about 120-130 ohms.	If the measurement is out of range for heater resistance, one or both of the heater cartridges are damaged. Both should be replaced.

Replacement Parts

Part No.	Description
1PCG-002	Connector: Heated Line Entry Seal
3FES-015PK	Filter Element Seals: Silicone, Used w/ Screen Mesh 3FES-010 (10 pack)
3FES-010	Filter Element: 316L SS Screen Mesh, 2.0 Micron
3FES-004	Filter Element: 316L SS, 1.25" x 2.975", 10 Micron
3FES-003	Filter Element: 316L SS, 1.25" x 2.975", 20 Micron
3FES-005	Filter Element: 316L SS, 1.25" x 2.975", 5 Micron
3FEC-002	Filter Element: Ceramic 2 Micron
3FEG-001	Filter Element: Glass, 0.1 Micron
3FEG-003	Filter Element: Glass/TFE Coated, 0.7 Micron
3PAM-006PK	Gasket: Graphoil 1.25" (10 pack)
2HTR-016	Heater Cartridge, 200W, 110 VAC
3PAM-028PK	O- Ring: Silicone, 50 Durometer (10 pack)
3PAM-010PK	O- Ring: Viton, 50 Durometer (10 pack)
2RFU-0065	Orifice Assy. 0.0065"
2VS2-007	Blow Back Valve: Solenoid, 2 Way, 120VAC/60Hz, 100 psig, Hi Temp
2VS2-006	Blow Back Valve: Solenoid, 2 Way, 220VAC/50Hz, 100 psig, Hi Temp



Appendix A: Dilution Probe Drawings

- A1: Parts list, dwg # 4P-45-03-01, p1
- A2: Exploded view – filter assembly, p2
- A3: Exploded view - eductor assembly, p3
- A4: Exploded view – assembly, p4
- A5: Enclosure cutaway view, p5
- A6: Electrical wiring diagram, 4P-45-04-01

4

3

2

1

B

B

A

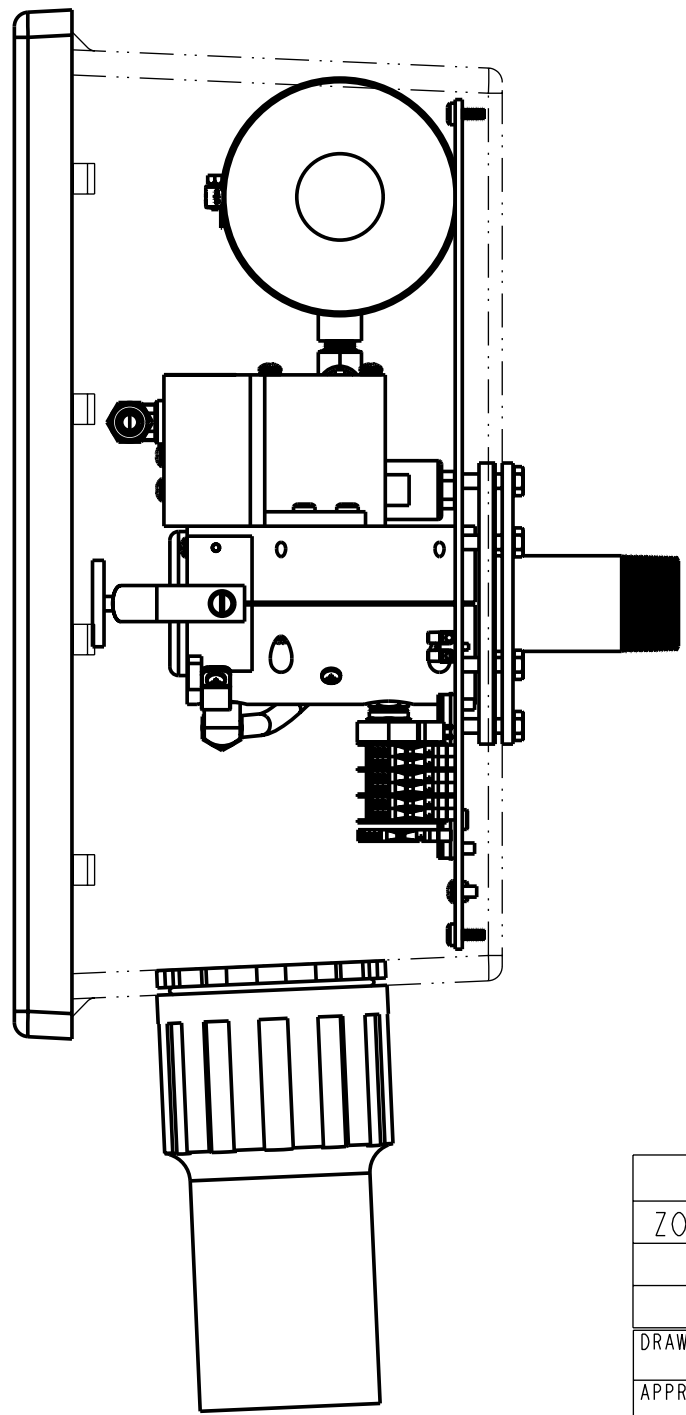
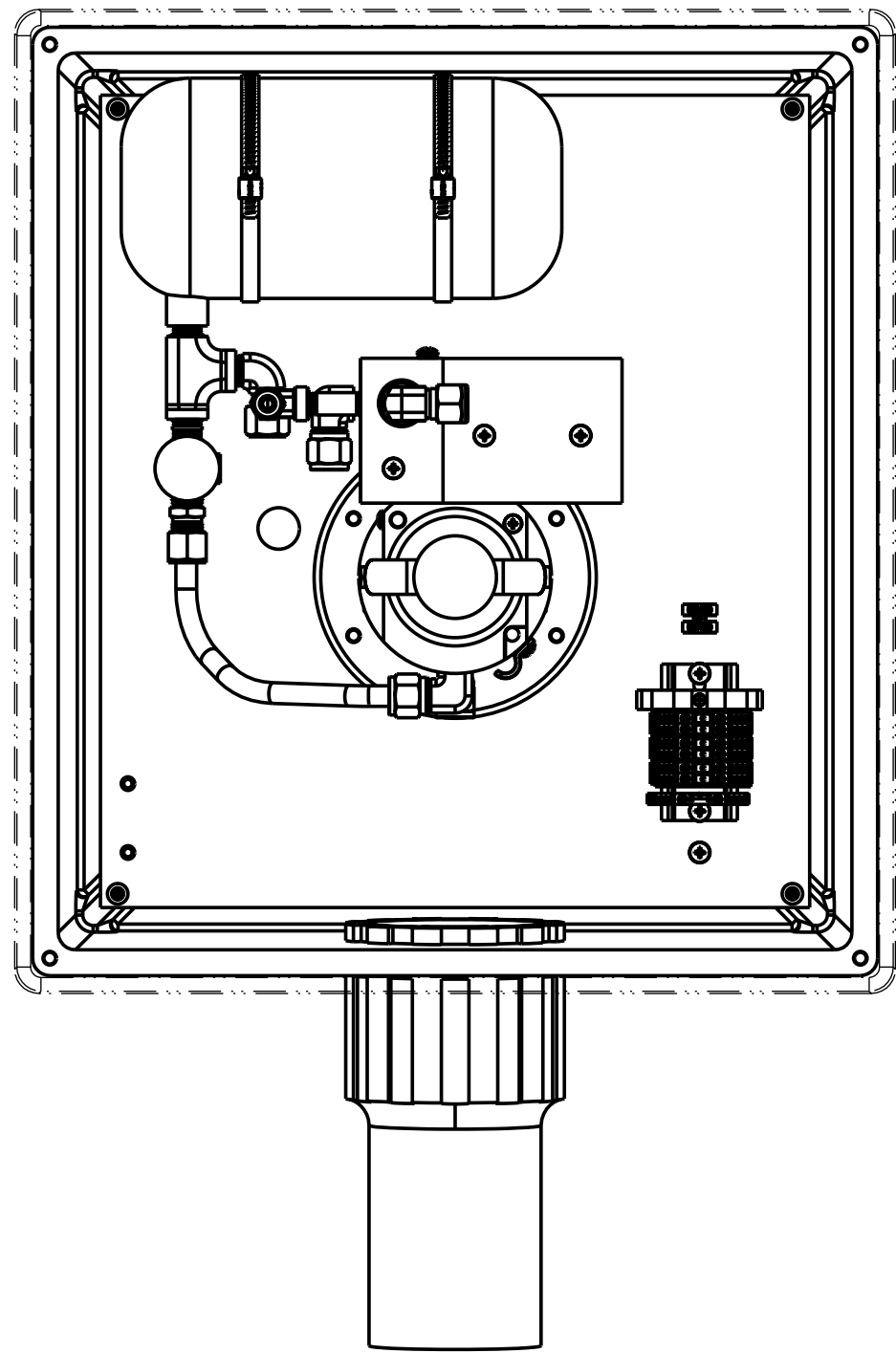
A

4

3

2

1



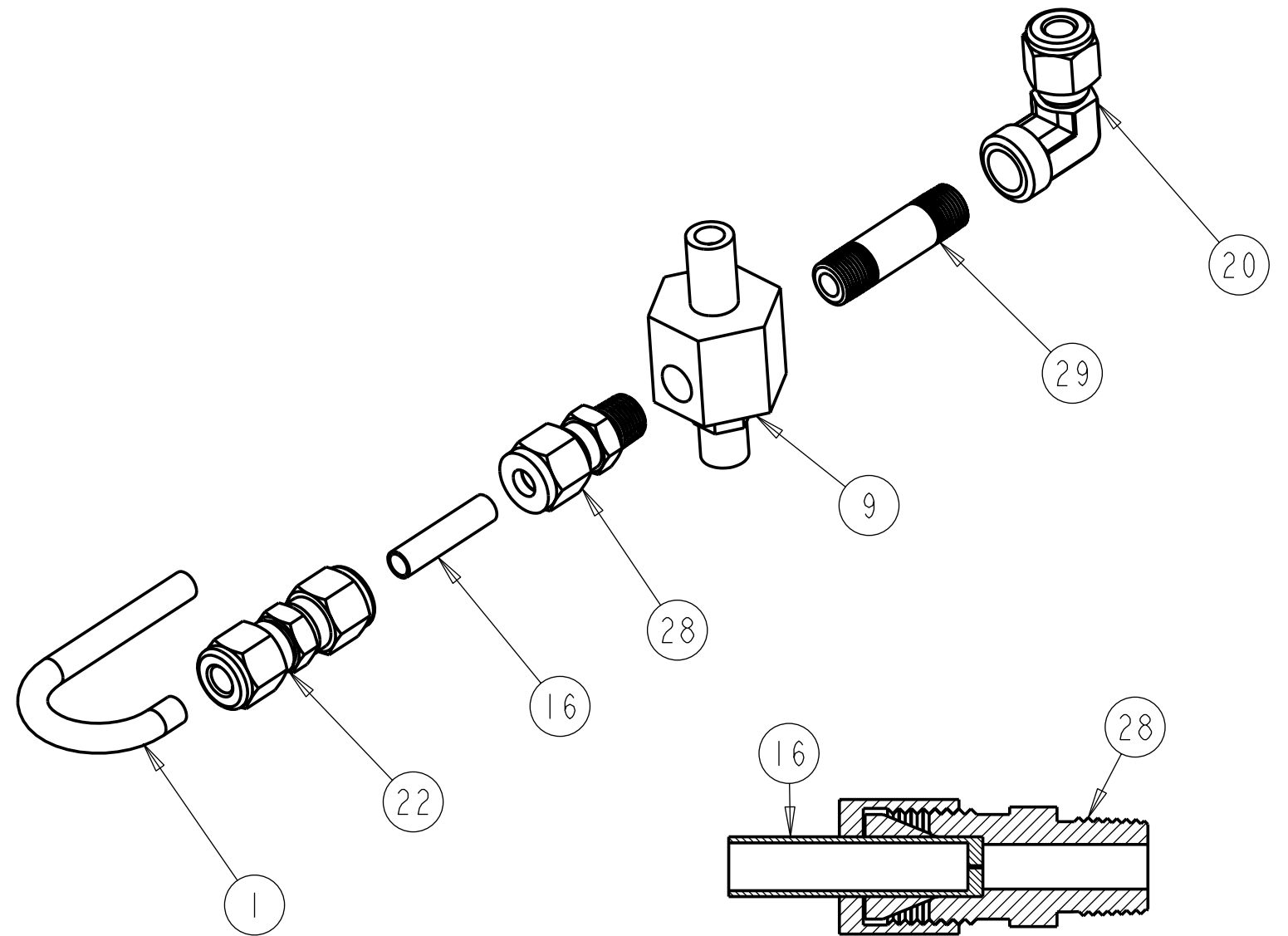
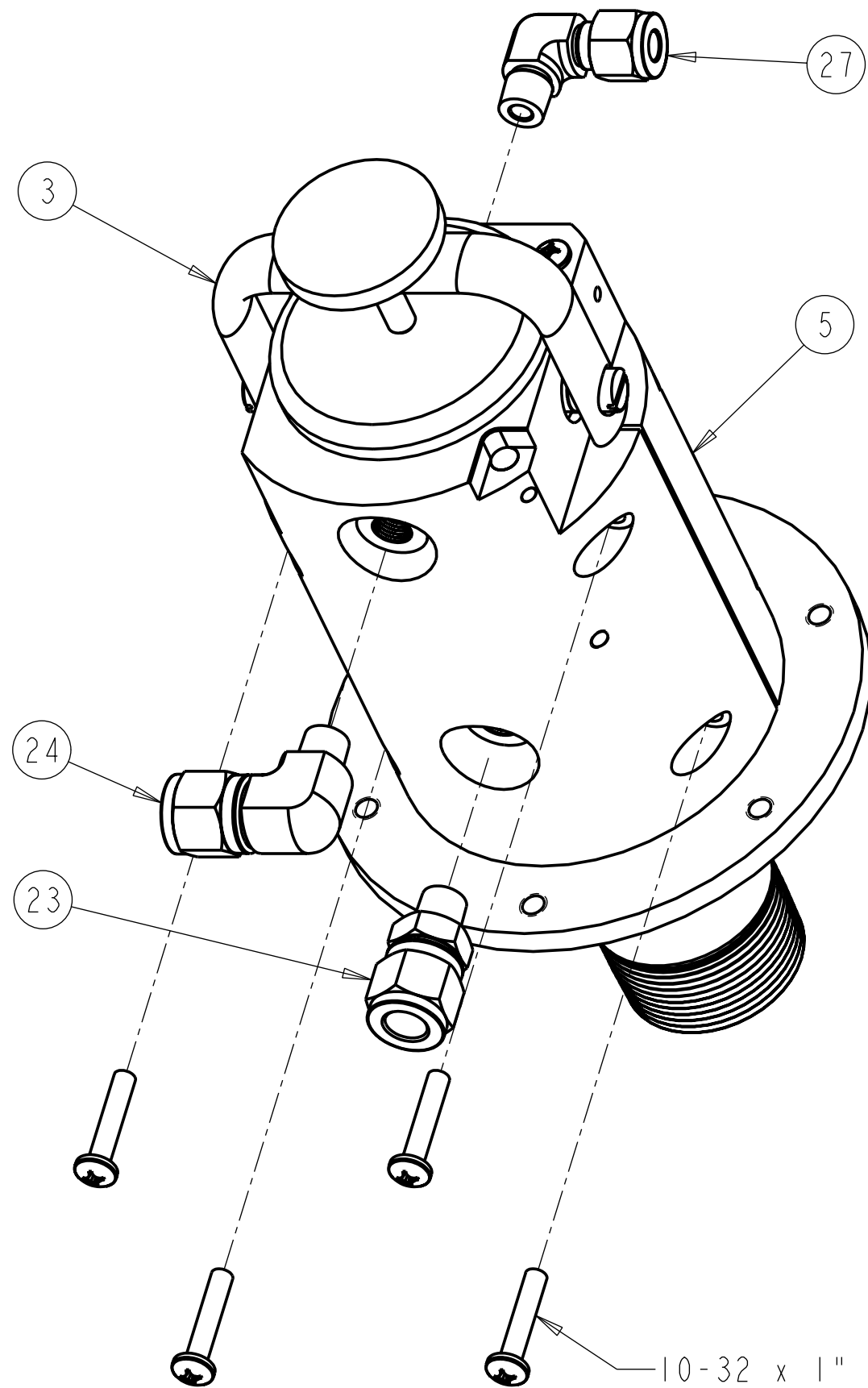
PARTS LIST

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	3TUG-005	TUBING, TEFLON 1/4"
2	1	3PLG-006	BACKPLATE ASSEMBLY
3	1	3PHS-300	PROBE ASSEMBLY
4	1	3PAA-007	BLOWBACK TANK
5	1	3JKG-002	PROBE SLEEVE
6	1	3GSG-004	GASKET, FILTER HOUSING, PROBES
7	1	3FGG-010	FLANGE, (NO THREADS)
8	1	3ENG-003	ENCLOSURE, FIBERGLASS
9	1	3ECG-004	Eductor, Modified, Dilution Probe
10	1	3CVG-006	ANGLE SUPPORT BRACKET
11	1	3CVG-005	COVER, FIXED
12	1	3CVG-004	COVER, REMOVABLE
13	1	3BLG-002	FILTER HOUSING
14	1	2VS2-007	VALVE, SOLENOID, 2-WAY
15	1	2RGS-018	O-Ring, Silicone, Size 018
16	1	2RFM-0090	Orifice, Monel, .0090" Diam. 1-1/16" length
17	2	2HTR-023	HEATER, CARTRIDGE, 1/4 x 4, 300W
18	1	2FTS-146	Ftg, Nipple, 1/4"MPT, 316SS
19	1	2FTS-145	Fitting, Tee, 1/4 Street, 316S
20	1	2FTS-124	ELBOW, 316SS, 1/4"Tx1/8"FPT
21	1	2FTS-122	FTG. Elbow, Female, 316SS, 3/8"Tx1/8"FPT
22	1	2FTS-070	Union, 316SS, 1/4"Tube
23	1	2FTS-064	Connector, Male, 316SS, 3/8"Tx1/8"MPT
24	2	2FTS-018	Elbow, 316SS, 3/8"Tx1/8"MPT
25	1	2FTS-014	Elbow, Male, 316SS, 3/8"Tx1/4"MPT
26	1	2FTS-008	Adapter, 316SS, 3/8"Tx1/4"MPT
27	1	2FTS-005	FTG, EL, 1/8MPT X 1/4T
28	1	2FTS-002	Connector, 316SS, 1/4"Tx1/8"MPT
29	1	2FPS-048	FTG, NIPPLE, 1/8 X 1 1/2
30	2	2CHS-004	HOSE CLAMP
31	1	1TTC-013	Thermocouple, Temperature, Type K, 24
32	1	1TBB-042	TERMINAL BLOCK, 2 POLE
33	1	1TBB-036	RAIL, DIN 35
34	1	1PCG-002	ENTRY SEAL ASSEMBLY
35	1	102425	One-Hole Strap, for 1/4" OD Tubing,
36	1	102420	Block, Terminal, Ground, 35mm, 10AWG
37	4	102225	TERMINAL SEPARATOR
38	1	102217	Bracket, End, 35mm
39	6	102216	Block, Terminal, 35mm, 12AWG

REVISION HISTORY

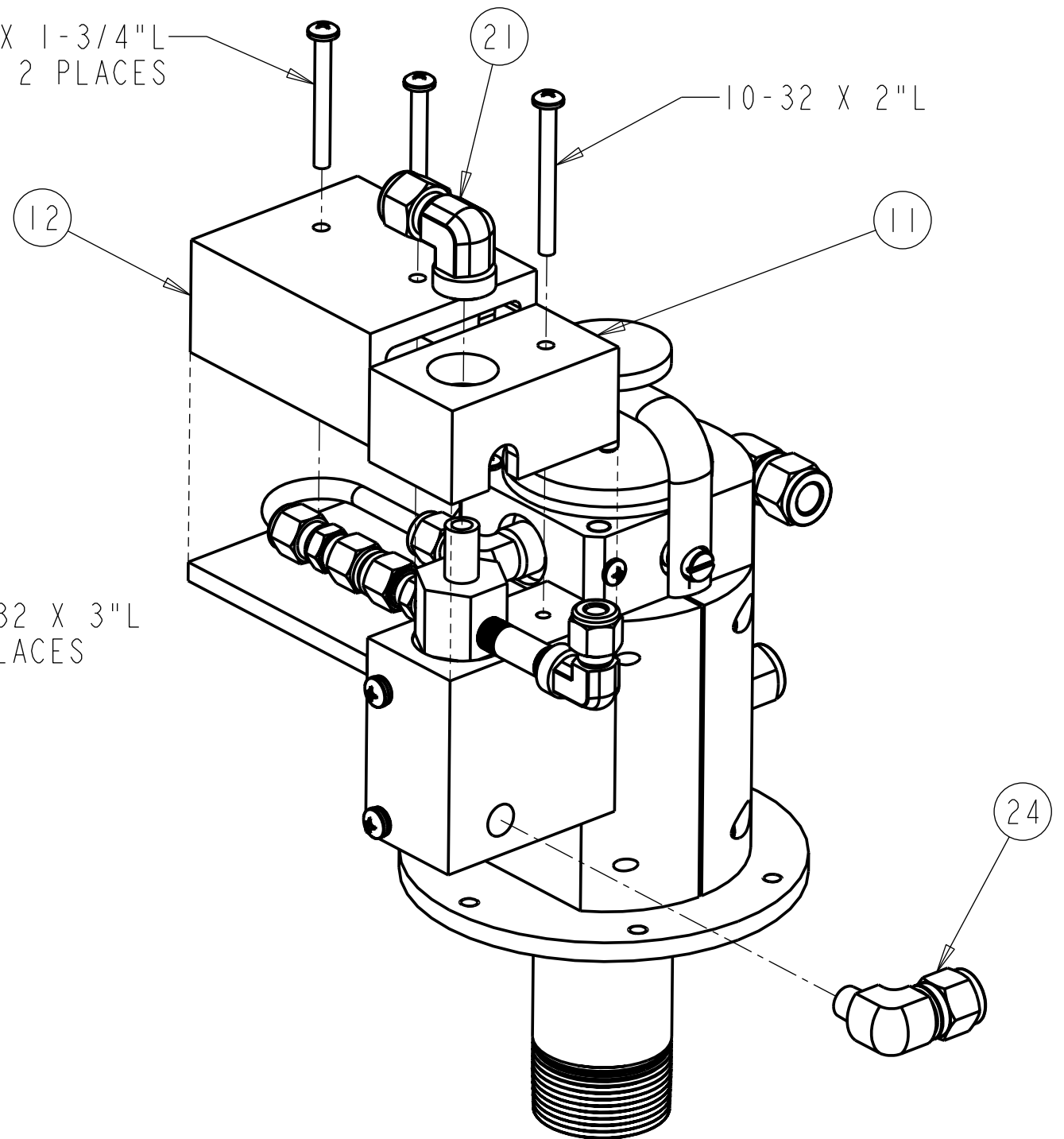
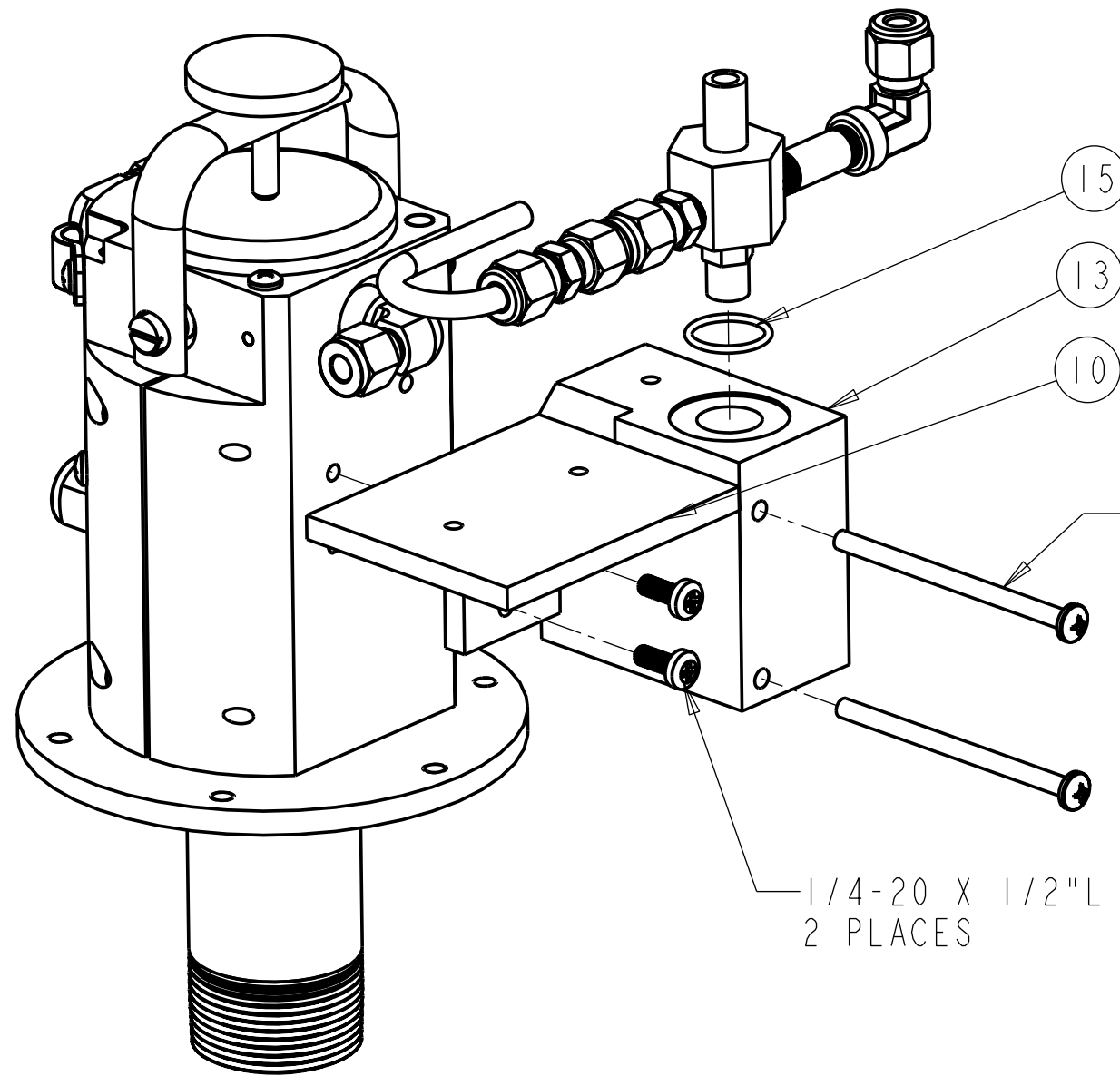
ZONE	REV	DESCRIPTION	DATE	AUTH

DRAWN TJA	06-Mar-07	PERMA PURE LLC 8 EXECUTIVE DRIVE, TOMS RIVER, NJ 08754		
APPROVED				
REFERENCE MODEL 45	TITLE PROBE, DILUTION, MODEL 45			
TOLERANCES (EXCEPT AS NOTED)		SIZE B	DWG NO	REV
FRACTIONAL & X.XX DECIMAL	± 0.01		4P-45-03-01	-
X.XXX DECIMAL	± 0.005			
ANGULAR	± 1/2°	SCALE 1.000	UNITS IN INCHES	SHEET 1 of 5

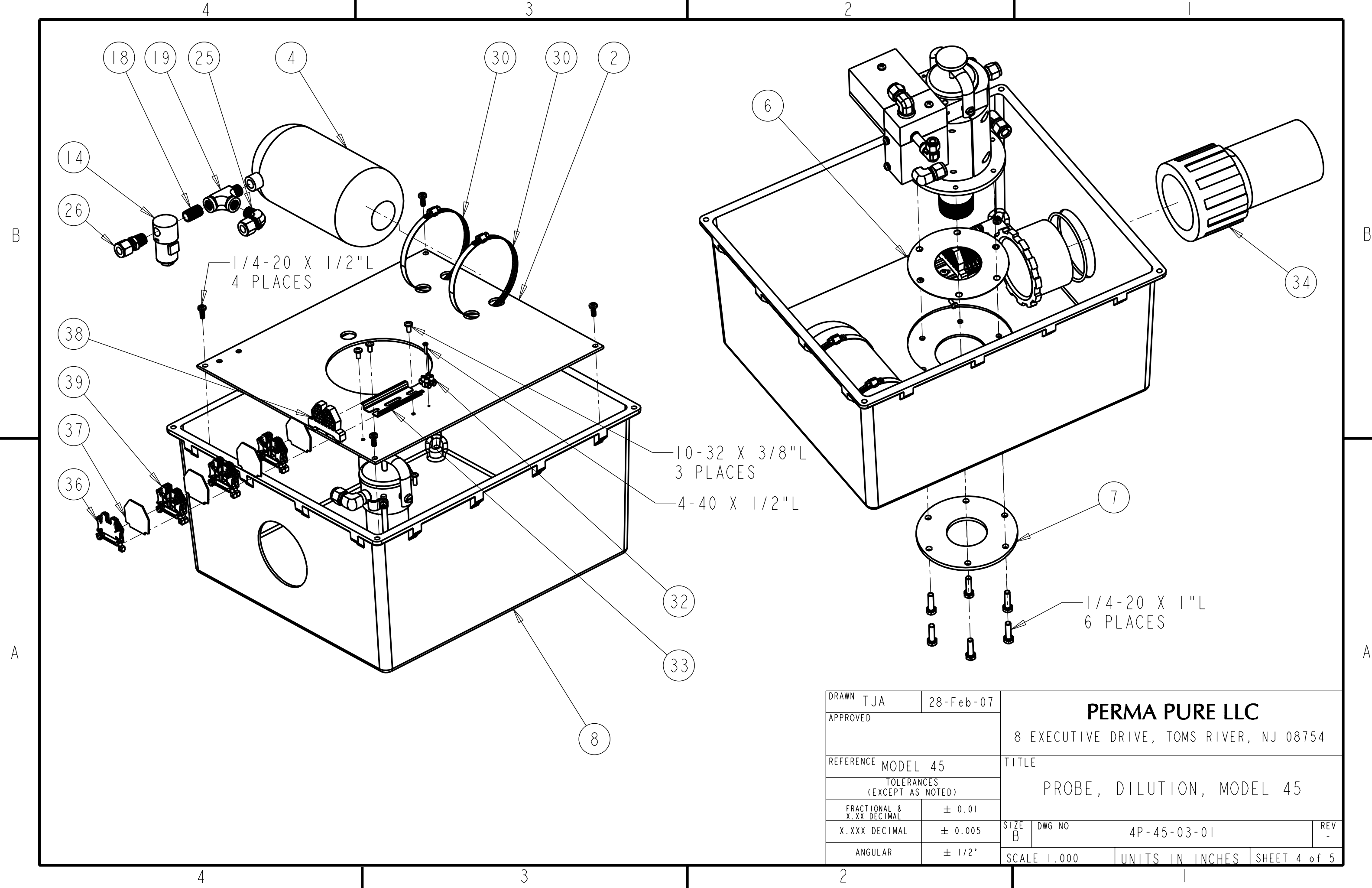


NOTE:
 INSERT ITEM 16 (ORIFICE)
 COMPLETELY INTO ITEM 28.

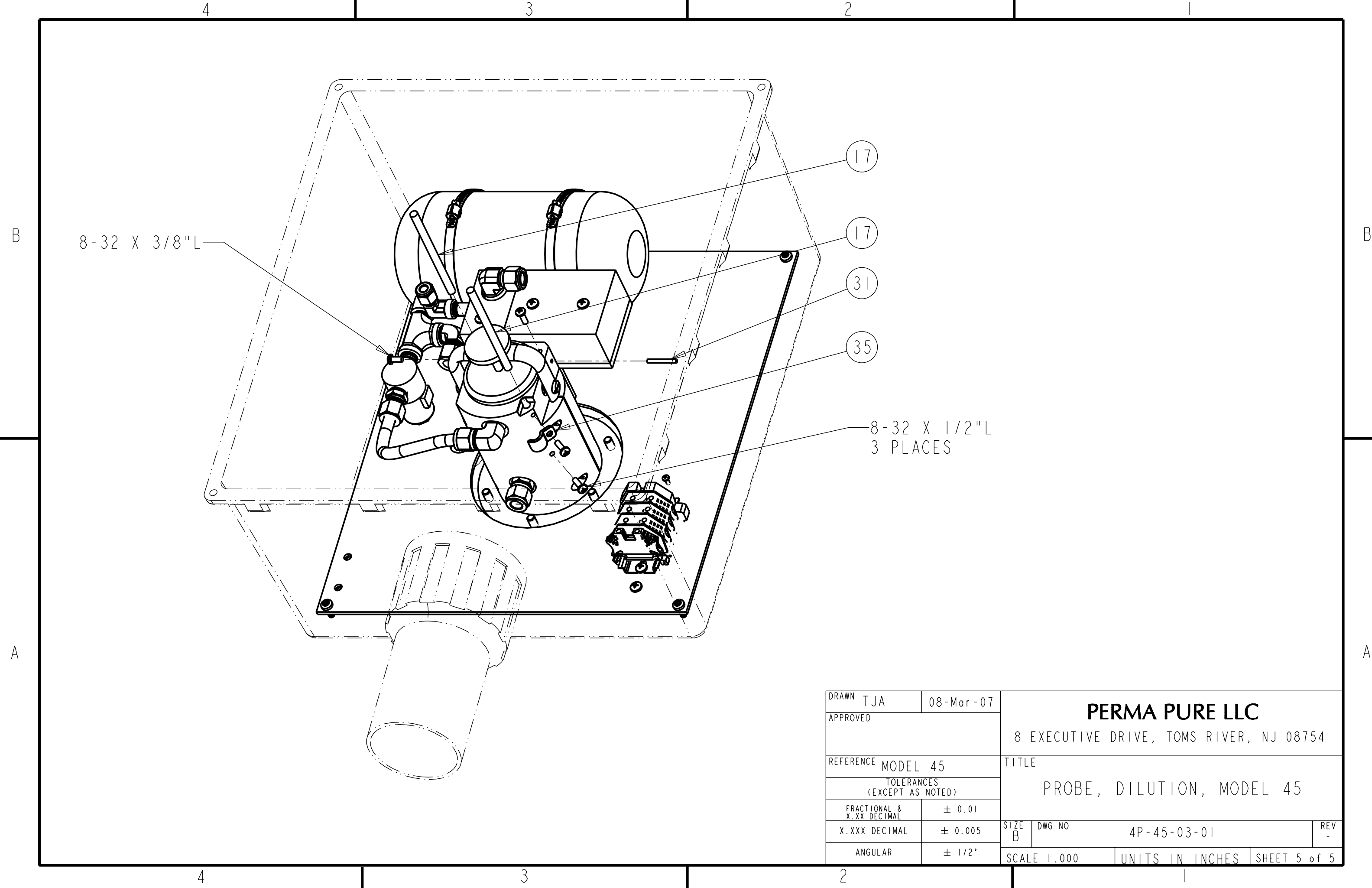
DRAWN TJA	07-Mar-07	PERMA PURE LLC 8 EXECUTIVE DRIVE, TOMS RIVER, NJ 08754	
APPROVED			
REFERENCE MODEL 45		TITLE PROBE, DILUTION, MODEL 45	
TOLERANCES (EXCEPT AS NOTED)		SIZE B	DWG NO 4P-45-03-01
FRACTIONAL & X.XX DECIMAL	± 0.01	SCALE 1.000	UNITS IN INCHES
X.XXX DECIMAL	± 0.005	REV -	
ANGULAR	± 1/2°	SHEET 2 of 5	



DRAWN TJA		28-Feb-07		PERMA PURE LLC 8 EXECUTIVE DRIVE, TOMS RIVER, NJ 08754	
APPROVED					
REFERENCE MODEL 45		TITLE			
TOLERANCES (EXCEPT AS NOTED)		PROBE, DILUTION, MODEL 45			
FRACTIONAL & X.XX DECIMAL	± 0.01	SIZE B	DWG NO	4P-45-03-01	REV -
X.XXX DECIMAL	± 0.005	SCALE 1.000		UNITS IN INCHES	SHEET 3 of 5
ANGULAR	± 1/2°				



DRAWN TJA		28-Feb-07		PERMA PURE LLC	
APPROVED					
REFERENCE MODEL 45				TITLE	
TOLERANCES (EXCEPT AS NOTED)				PROBE, DILUTION, MODEL 45	
FRACTIONAL & X.XX DECIMAL	± 0.01	SIZE B	DWG NO	4P-45-03-01	REV -
X.XXX DECIMAL	± 0.005	SCALE 1.000		UNITS IN INCHES	SHEET 4 of 5
ANGULAR	± 1/2°				



8-32 X 3/8"L

17

17

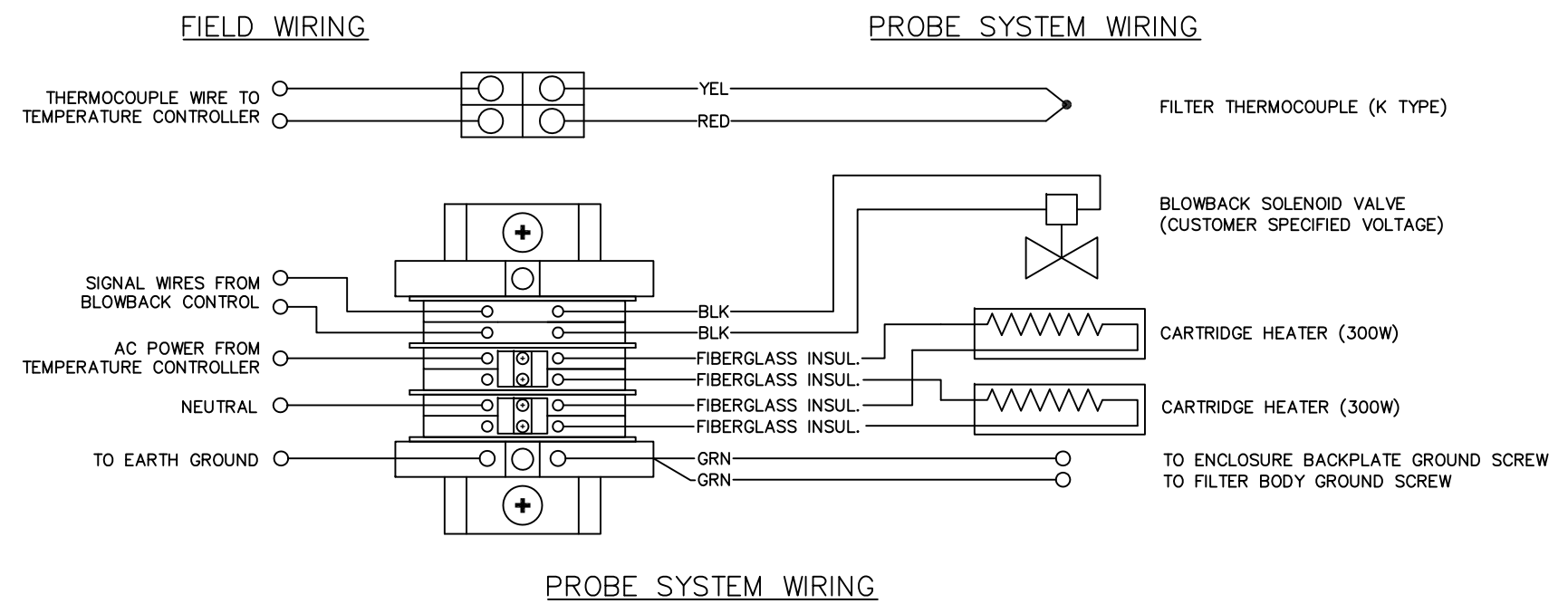
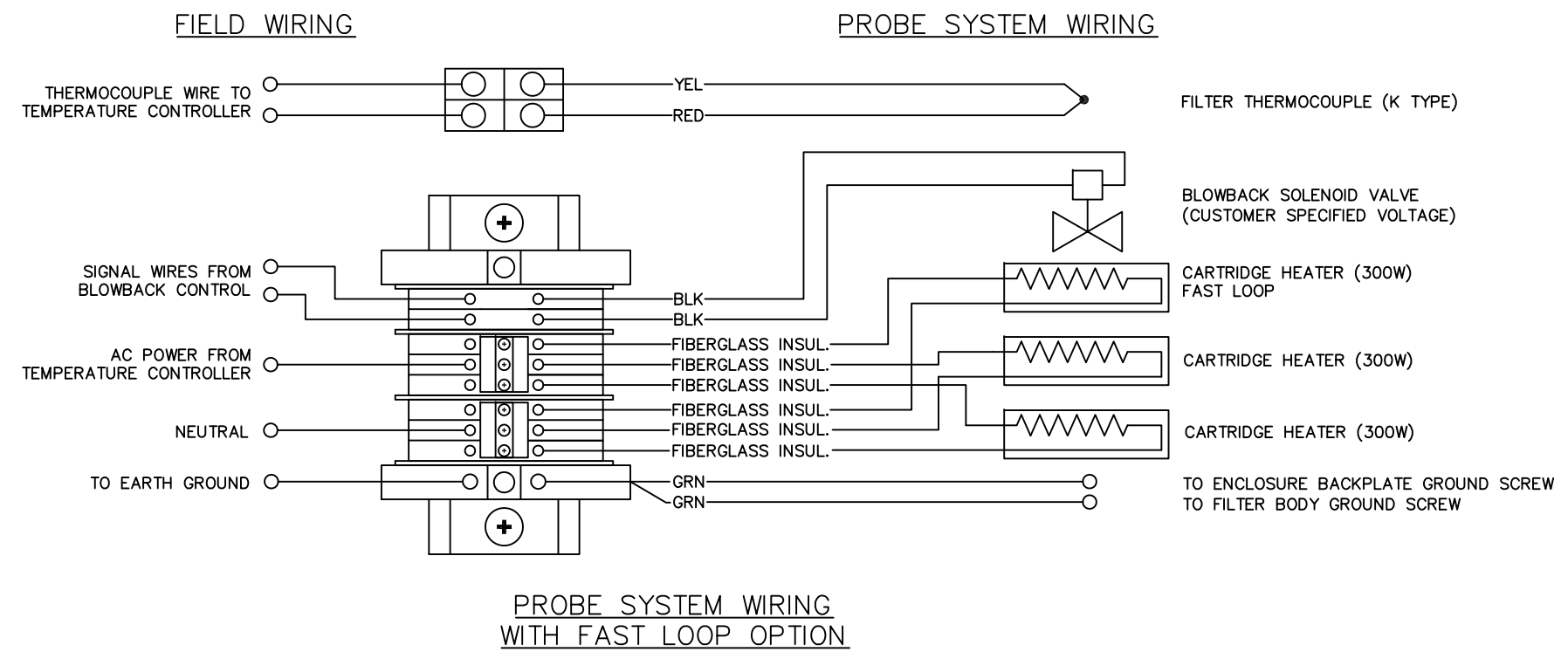
31

35

8-32 X 1/2"L
3 PLACES

DRAWN TJA		08-Mar-07		PERMA PURE LLC 8 EXECUTIVE DRIVE, TOMS RIVER, NJ 08754	
APPROVED					
REFERENCE MODEL 45		TITLE			
TOLERANCES (EXCEPT AS NOTED)		PROBE, DILUTION, MODEL 45			
FRACTIONAL & X.XX DECIMAL	± 0.01	SIZE B	DWG NO	4P-45-03-01	REV -
X.XXX DECIMAL	± 0.005	SCALE 1.000		UNITS IN INCHES	SHEET 5 of 5
ANGULAR	± 1/2°				

DATE	SYM	REVISION RECORD	AUTH.	DR.	CK.



NOTES:
 1. ALL FACTORY INSTALLED HOOKUP WIRING TO BE 18AWG, TEFLON INSULATED.
 2. CUSTOMER FIELD WIRING TO BE IN ACCORDANCE WITH LOCAL ELECTRICAL CODE

TOLERANCES (EXCEPT AS NOTED)		PERMA PURE LLC 8 EXECUTIVE DRIVE, TOMS RIVER N.J. 08754			
DECIMAL ±.005"	REFERENCE	SCALE	DRAWN BY TPS	DATE 3/13/08	
FRACTIONAL ±1/64"			APPROVED BY	DATE	
ANGULAR ± 1/2°	TITLE DILUTION PROBE WIRING DIAGRAM				
JOB REF.	DATE 3/13/08	SIZE B	DRAWING NUMBER 4P-45-04-01	REV. -	

Appendix B: Fast Loop Configuration

The fast loop option has not been purchased.



Appendix C: Warranty and Disclaimers

Perma Pure LLC

Perma Pure (Seller) warrants that product supplied hereunder shall, at the time of delivery to Buyer, conform to the published specifications of Seller and be free from defects in material and workmanship under normal use and service. Seller's sole obligation and liability under this warranty is limited to the repair or replacement at its factory, at Seller's option, of any such product which proves defective within one year after the date of original shipment from seller's factory (or for a normal usable lifetime if the product is a disposable or expendable item) and is found to be defective in material or workmanship by Seller's inspection.

Buyer agrees that (1) any technical advice, information, suggestions, or recommendations given to Buyer by Seller or any representative of Seller with respect to the product or the suitability or desirability of the product for an particular use or application are based solely on the general knowledge of Seller, are intended for information guidance only, and do not constitute any representation or warranty by Seller that the product shall in fact be suitable or desirable for any particular use or application; (2) Buyer takes sole responsibility for the use and applications to which the product is put and Buyer shall conduct all testing and analysis necessary to validate the use and application to which Buyer puts the product for which Buyer may recommend the use or application of the product by others; and (3) the characteristics, specifications, and/or properties of the product may be affected by the processing, treatment, handling, and/or manufacturing of the product by Buyer or others and Seller takes no responsibility for the nature or consequence of such operations or as to the suitability of the product for the purposes intended to be used by Buyer or others after being subjected to such operations.

SELLER MAKES NO OTHER WARRANTY, EXPRESS OR IMPLIED, OF THE PRODUCT SUPPLIED HEREUNDER, INCLUDING, WITHOUT LIMITATION, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSE, AND ALL SUCH WARRANTIES ARE HEREBY EXPRESSLY EXCLUDED. SELLER SHALL HAVE NO LIABILITY FOR LOSS OF PROFITS, OR SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES UNDER ANY CIRCUMSTANCES OR LEGAL THEORY, WHETHER BASED ON NEGLIGENCE, BREACH OF WARRANTY, STRICT LIABILITY, TORT, CONTRACT, OR OTHERWISE. SELLER SHALL IN NO EVENT BE LIABLE IN RESPECT OF THIS ORDER AND OR PRODUCT DELIVERED ON ACCOUNT OF THIS ORDER FOR ANY AMOUNT GREATER THAN THAT PAID TO SELLER ON ACCOUNT OF THIS ORDER.