

# **CNR-2S-(1.5,3,5)P-6M Crude & Refined Product Sampler System Support Manual**

Version 12192001 ATEX Rev.

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# About This Manual...

The purpose of this manual is to provide a step-by-step guide to the operation, installation and maintenance of your YZ Crude & Refined Product Sampling System. It should be read by both first-time and experienced measurement technicians who want to learn about the components and operation of the system. The manual has been organized into sections, which are summarized as follows:

- **Section 1 - "System Introduction"**  
*Includes an overview of the system components, a description of how the system operates, a schematic system diagram, and a system layout of the skid.*
- **Section 2 - "Sample Pump and Balance Valve"**
- **Section 3 - "Five-way Cross"**
- **Section 4 - "Product Accumulator Vessel"**
- **Section 5 - "Precharge Gas System"**
- **Section 6 - "Actuation/Mixing System Power Source"**
- **Section 7 - "System Electronic Control"**  
*These sections include details on the function, location, operation and maintenance of individual components of the sampling system.*
- **Section 8 - "System Installation and Start-up"**  
*Includes detailed instruction on the proper way to install your YZ sampler. Likewise, a step-by-step start-up procedure is to guide you through commissioning the unit.*
- **Section 9 - "DuraSite Vessel Instructions"**  
*These sections include details of the DuraSite portable constant pressure sample vessel., operation and maintenance .*



# Section 1 - System Introduction

## Theory of Operation

The sampling systems are designed to sample Crude & Refined Products. Thousands of individual samples are captured and combined to develop a representative, composite sample of the flowing pipeline.

Operation of the sampling system centers around the following primary components: the Sample Pump, the Product Accumulator Vessel, and the Precharge Gas Vessel. All equipment except the probe mounted Sample Pump, is mounted on a 2' x 2' structural steel skid. These components are shown in the diagrams on the following pages.

The system may be configured to operate in one of two modes; Proportional-To-Time, or Proportional-To-Flow.

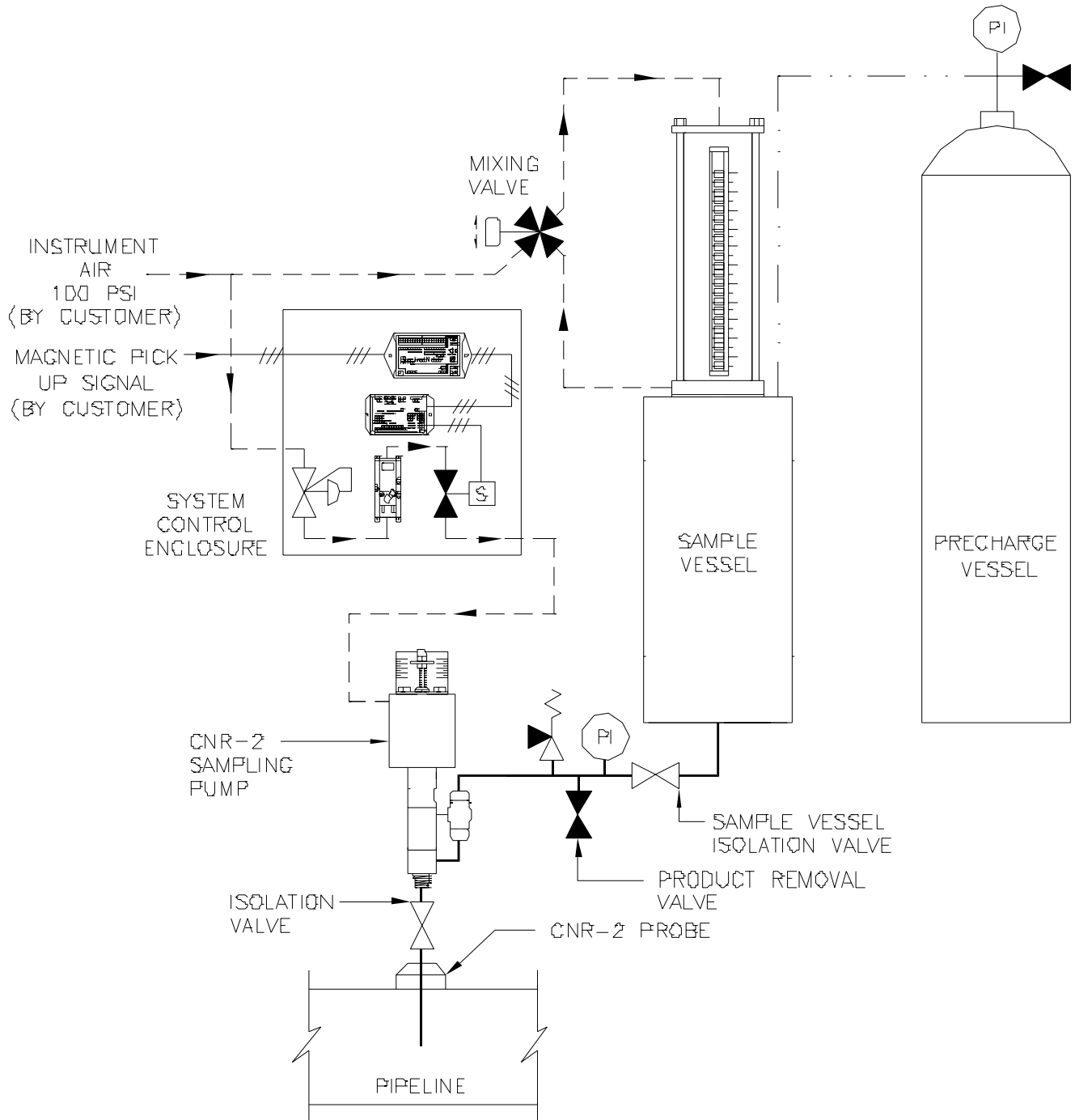
In the **Proportional-To-Time** mode, the Z-65 acts as a simple recycling timer, which initiates a sample actuation process, each time the programmed amount of time has elapsed.

The **Proportion-To-Flow** system operates on a simple concept. When the system receives pulses provided magnetic pick-up on a turbine meter, the PIM-100 totalizes and conditions the pulses. The conditioned pulses are then sent to the Z-65 where final totalization for proportional to flow sampling occurs. Once the programmed number of conditioned pulses has been received by the Z-65, a pneumatic solenoid valve is energized. Energizing the solenoid valve allows a pneumatic signal to trigger the pneumatic relay, which sends a burst of actuation gas into the actuation cylinder of the sample pump, which in turn causes the pump to stroke. When the pump strokes, a small sample is displaced. Once the solenoid valve is de-energized the sample pump plunger returns to its normal position. This action allows a new sample to be captured into the pump. When the system receives a pulse again, the cycle begins over.

By properly adjusting both the sample size and the sample frequency, the sample vessel will fill to 80% capacity at the end of the sample period. Once the sample period is complete, the product within the sample receiver is thoroughly mixed using the power mixer. A representative sample can then be removed from the product accumulator vessel using the YZ DuraSite, a DOT approved constant pressure sample vessel. After removing the remainder of the product from the accumulator vessel, the system is then ready for a new sample period.

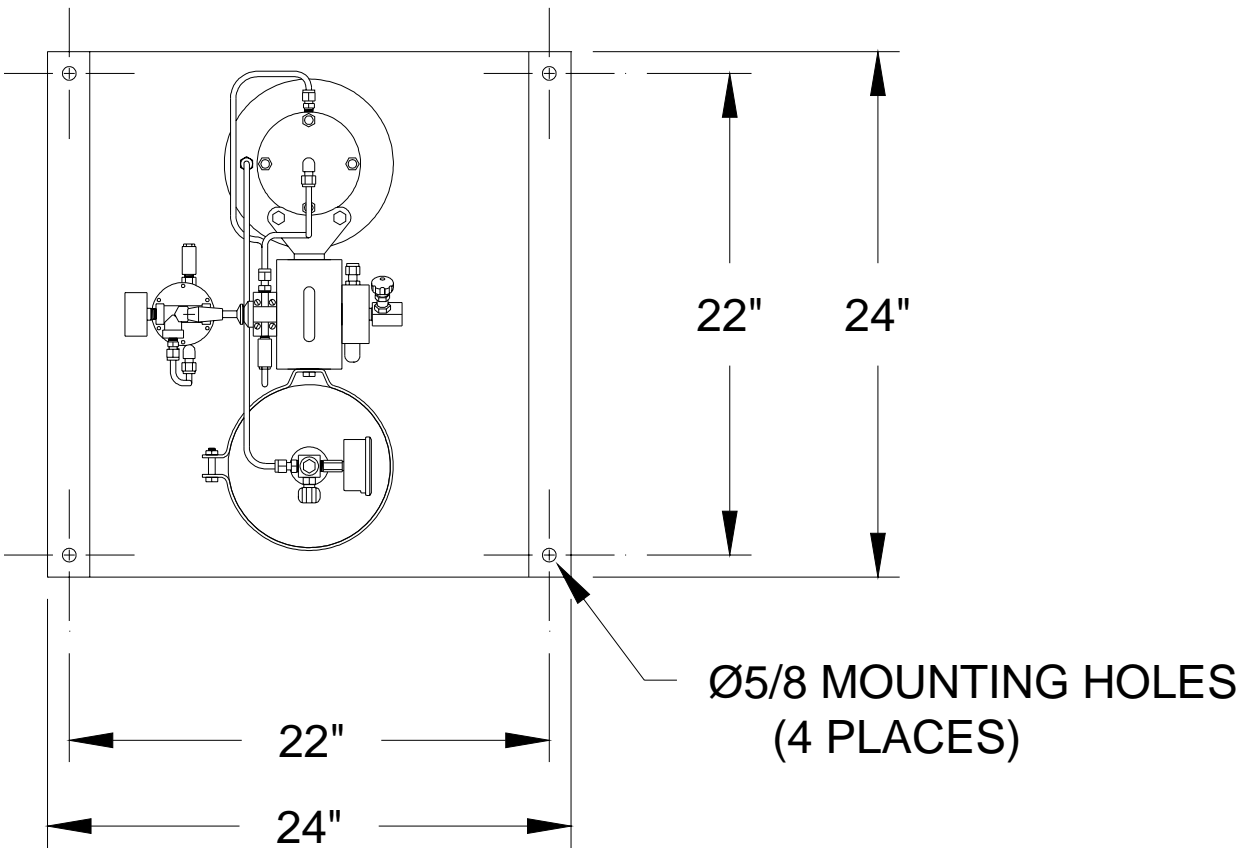
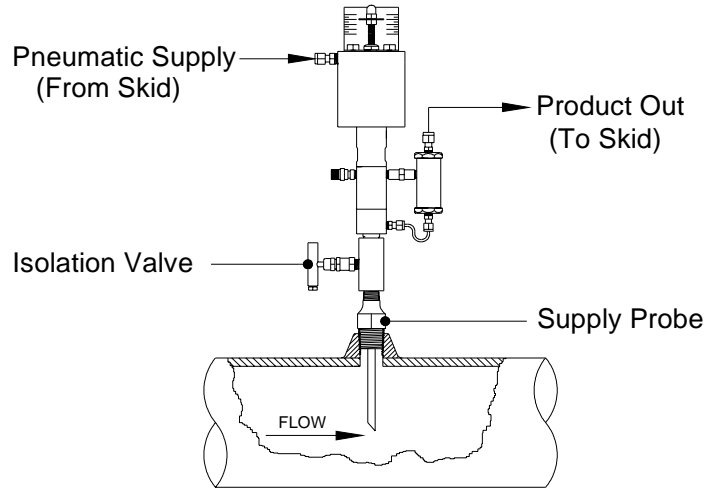
The purpose of the YZ Crude & Refined Product sampling system is to capture and maintain a representative liquid sample of the pipeline product. In order for the system to function properly, a pipeline product must be single phase, liquid product. The sampled product is maintained in a liquid phase by the product accumulator vessel's free floating piston and the precharge gas system.

# Section 1 - System Introduction

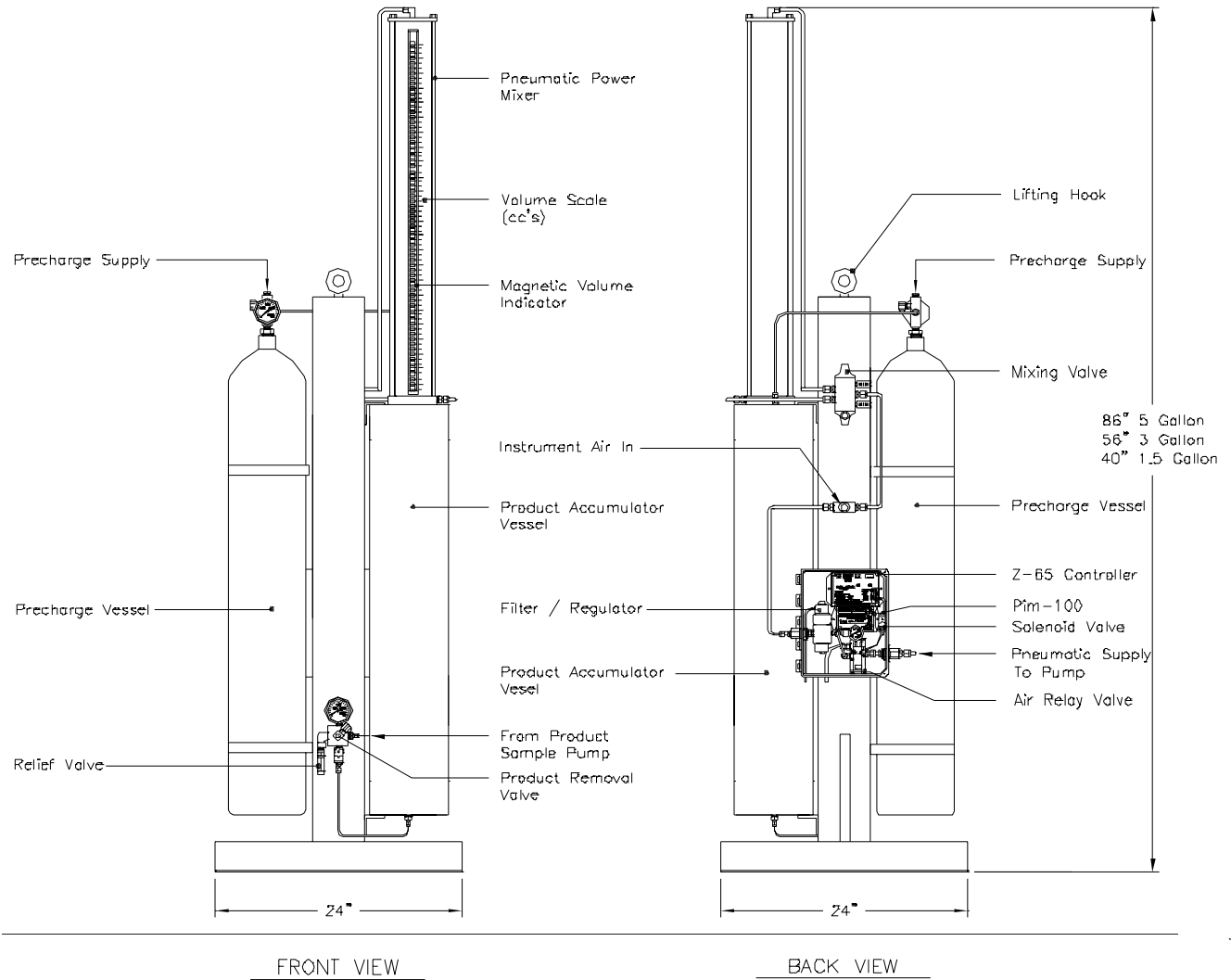


# Section 1 - System Introduction

## System Diagram



# Section 1 - System Introduction



## ***Section 2: CNR Sample Pump***

The CNR Sample Pump is a positive displacement, plunger pump designed to mount directly to the pipeline. It has an adjustable displacement of 0.25 to 1.8cc and achieves proportional-to-flow sampling through adjustment of the system electronic control discussed in Section 3.

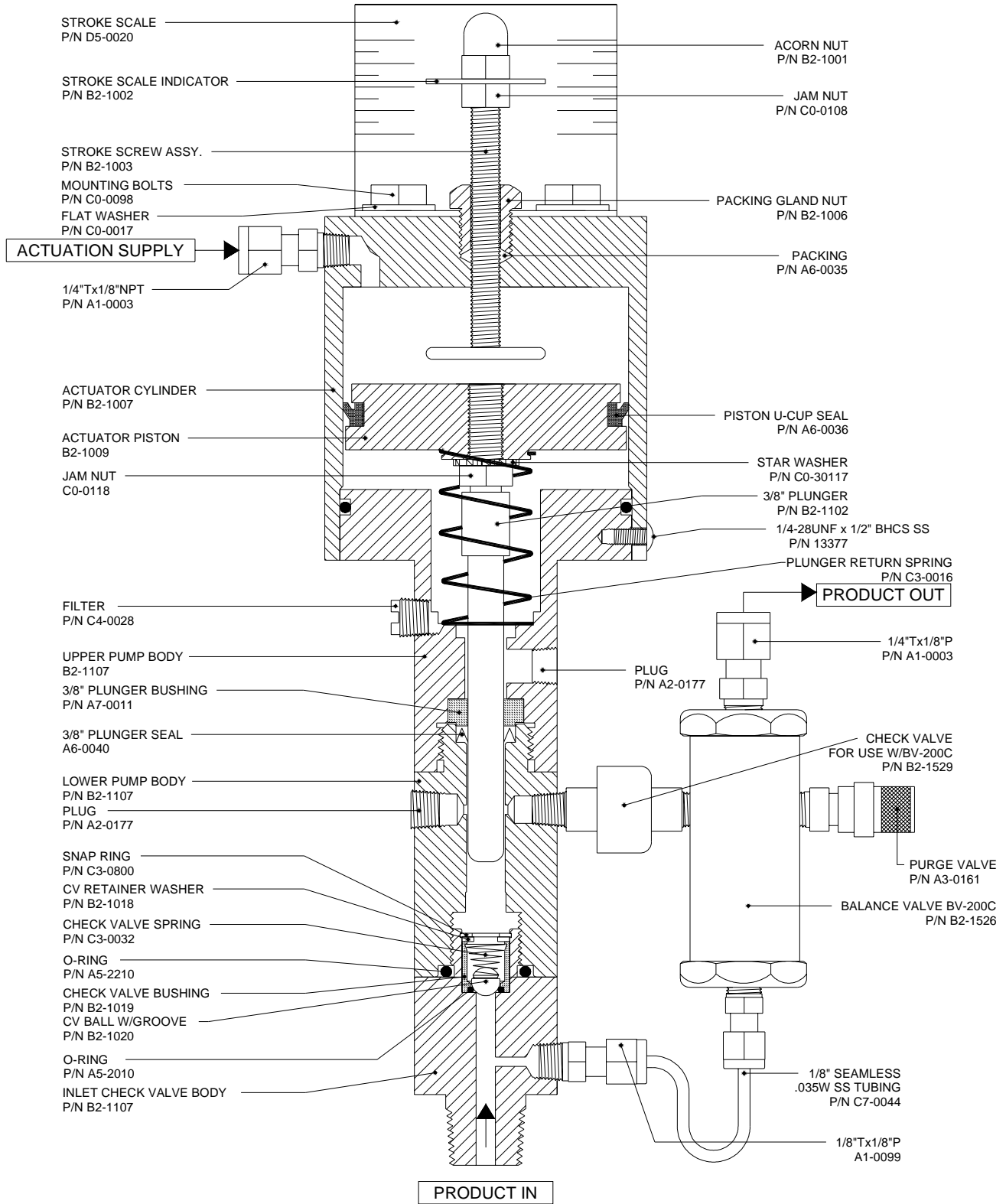
As the plunger returns upward after completing a stroke, the pump chamber fills with product through the inlet check valve. The inlet check valve is a ball type valve designed to seat on an O-ring. The inlet check valve is spring loaded to ensure a positive seating action after every stroke. When the pump is actuated, the plunger moves downward, displacing product through the discharge check valve known as the balance valve.

The balance valve automatically senses pipeline pressure and adjusts to ensure that product is not allowed to free flow to the product vessel. When the pipeline pressure is greater than the precharge pressure on the accumulator vessel, the balance valve dart is pushed up against the seat and the top head of the balance valve. As the pump strokes, the pressure created in the pump chamber forces the balance valve dart off the seat, allowing product to be pumped to the accumulator vessel. Once the pump completes its stroke, the pressure across the balance valve equalizes and the dart is returned to a sealing position by its spring.

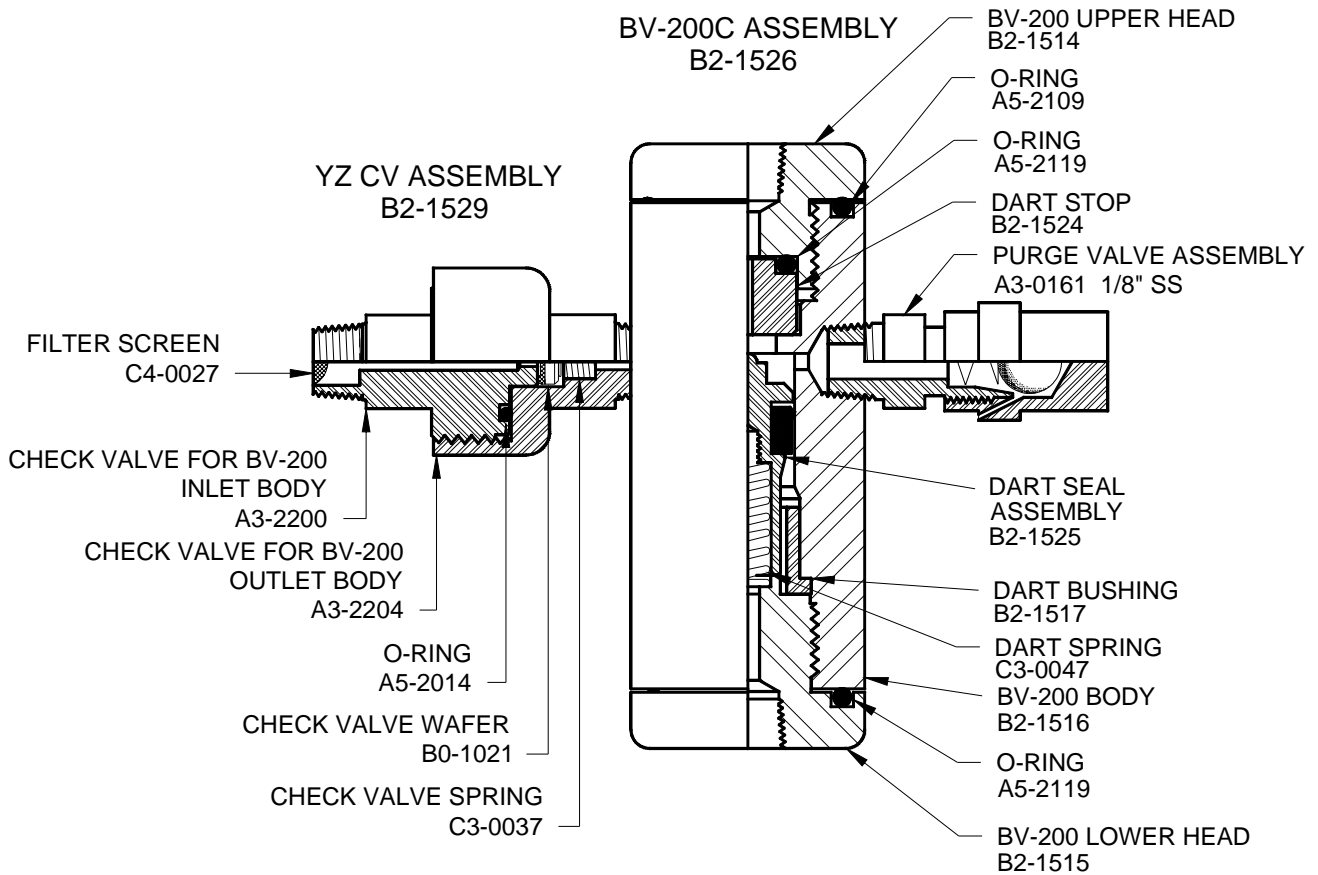
In the event that the accumulator vessel precharge pressure is greater than the pipeline pressure, the balance valve dart and seat are pushed apart by the product pressure in the accumulator vessel. In this situation the check valve wafer located between the balance valve and the sample pump acts as a back check to prevent the escape of product previously captured in the accumulator vessel. As the pump strokes, the pressure created in the pump chamber forces the check valve wafer off the seat, allowing product to be pumped to the accumulator vessel. Once the pump completes its stroke, the pressure across the check valve equalizes and the wafer is returned to a sealing position by its spring.



# Section 2: CNR Sample Pump



# Section 2: CNR Sample Pump/ Balance Valve





## Section 3 - Five-way Cross Assembly

The Five-way cross assembly is located on the front of the skid and includes the following items: product inlet tubing fitting, pressure gauge, relief valve, rob valve, accumulator vessel isolation valve/ discharge tubing fitting, and the five-way cross.

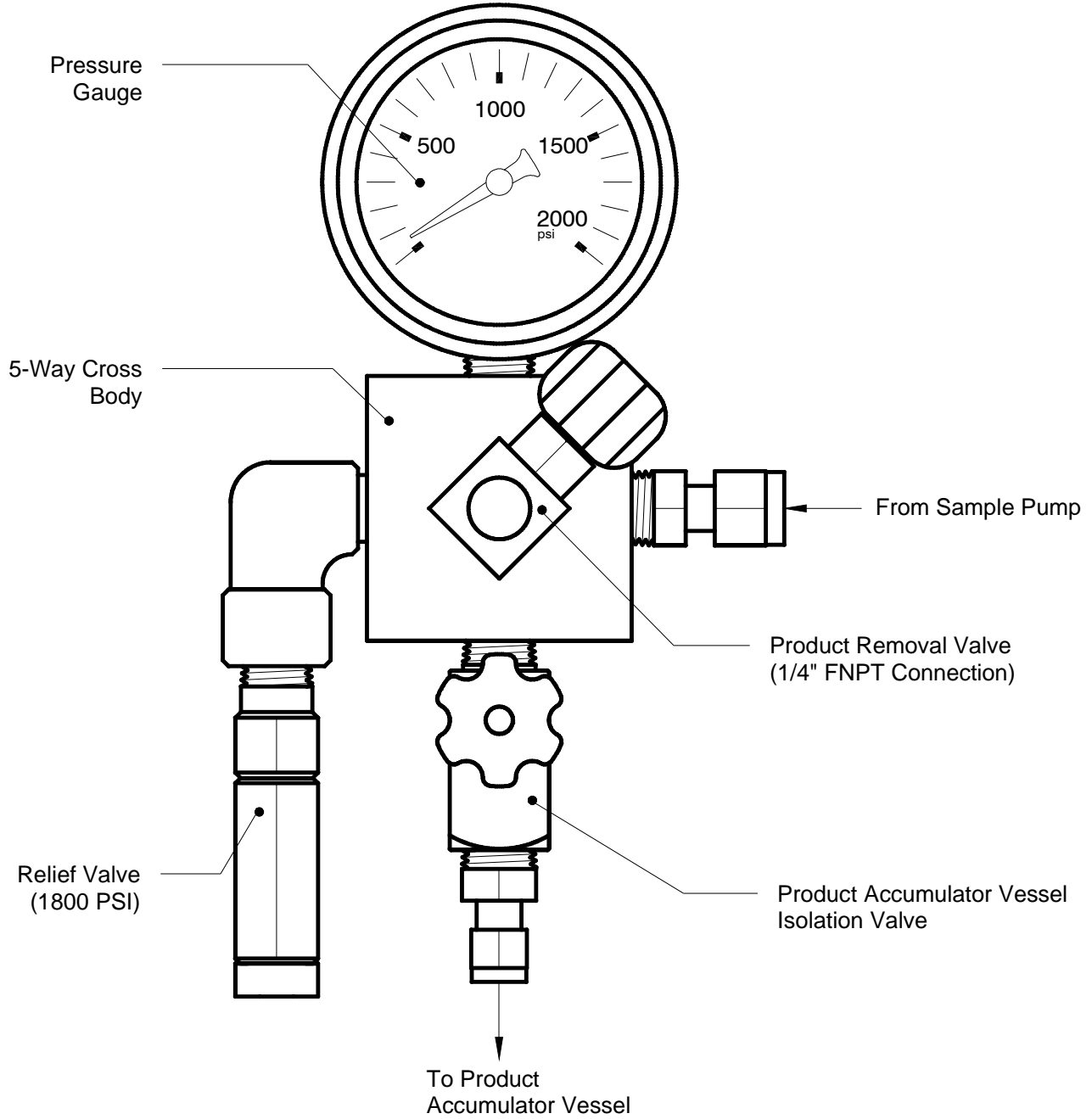
The pressure gauge is used during normal operation to indicate the pressure within the accumulator vessel. During start-up and troubleshooting procedures it is used in conjunction with the accumulator vessel isolation valve to check pump performance.

The YZ relief valve is a reseating type valve which is factory set to relieve at 1800 psi. Also incorporated into the relief valve design is a positive indication feature which indicates that it has relieved. If the system reaches a pressure greater than the relief valve setting, the resulting release of product pushes the black relief valve indicator outside the relief valve body. This informs the system operator during his next system check that an over pressure condition has occurred. The indicator is reset by pushing it back into the relief valve body.

The rob valve is a YZ needle valve which is used to remove product from the accumulator vessel at the end of the sample period. This valve is normally closed.

The accumulator vessel isolation valve is used to isolate the accumulator vessel from the rest of the product carrying portion of the sampling system. This valve is normally open.

# Section 3 - Five-way Cross Assembly (Chemraz)



## Section 4 - Product Accumulator Vessel

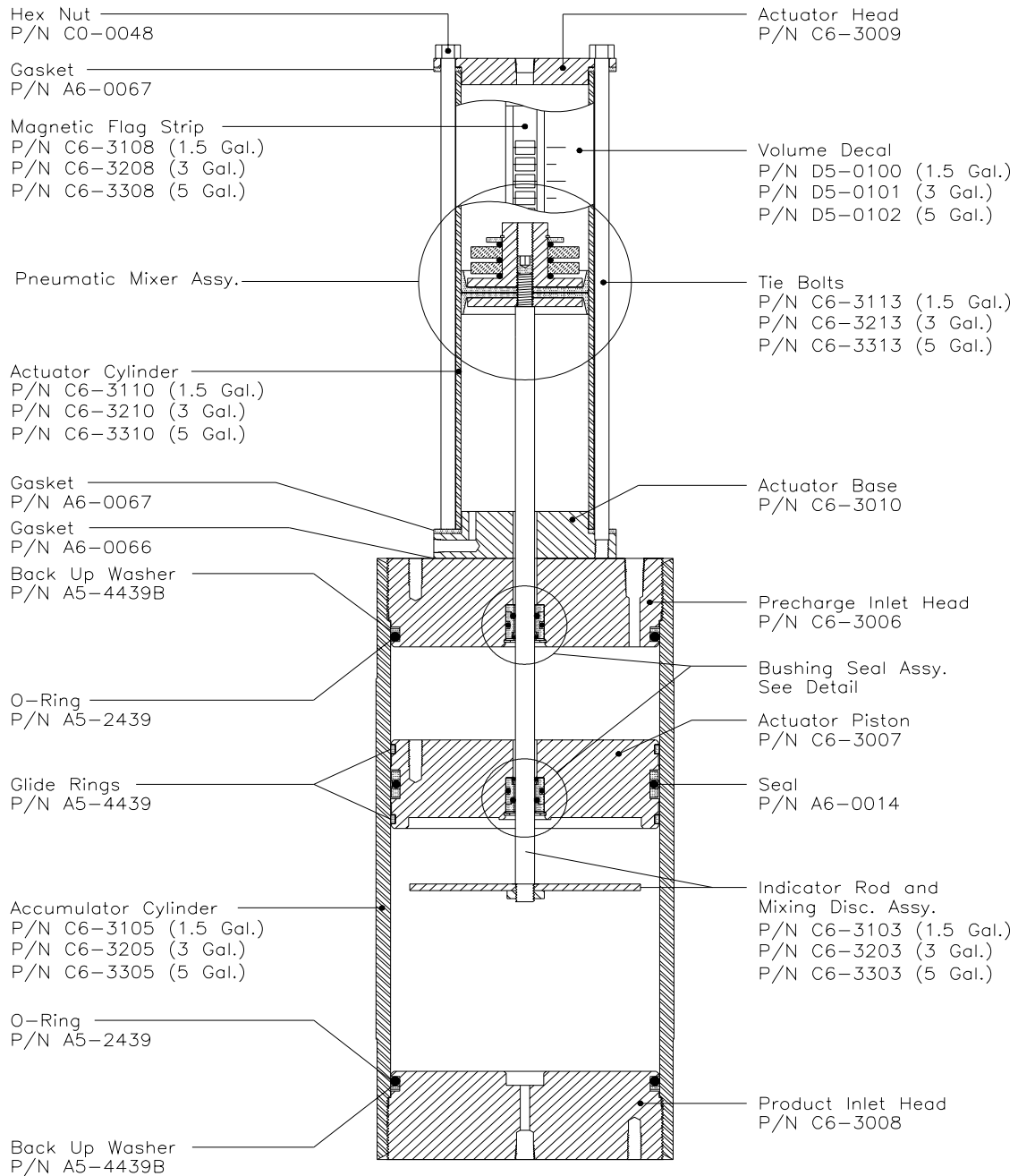
The YZ Product Accumulator Vessel is designed to maintain a composite sample in the liquid phase. This is accomplished by using a free-floating piston design and an inert precharge gas system. As product is collected in the accumulator vessel, the precharge gas system maintains a constant pressure on top of the vessel piston. If this pressure is at least 100 to 150 psi above the vapor pressure of the product being sampled, the sampled product will be prevented from flashing to the vapor phase.

Product enters the cylinder through the head in the bottom of the cylinder. This head is the accumulator vessel product head. The precharge gas is communicated to the accumulator vessel through the precharge head, which is located on the top of the accumulator cylinder.

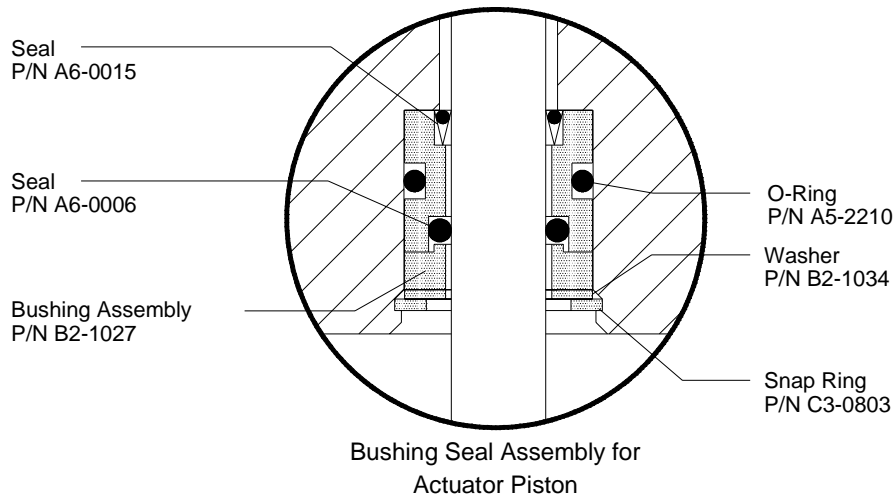
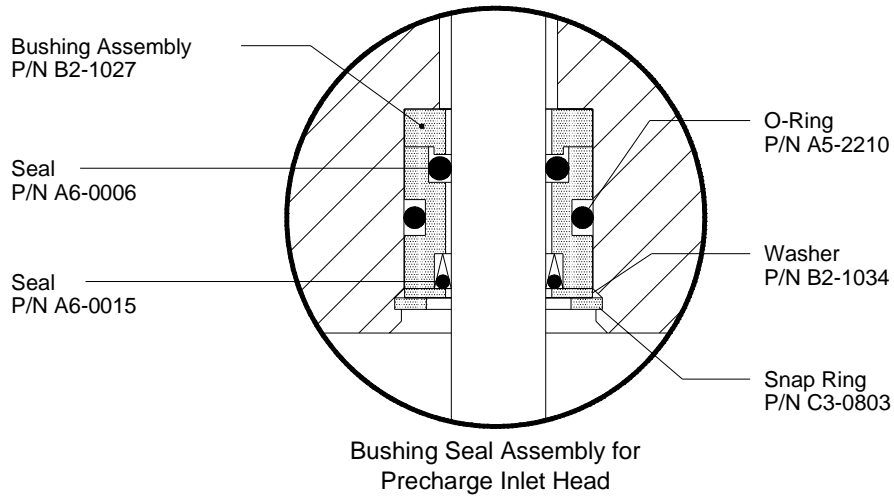
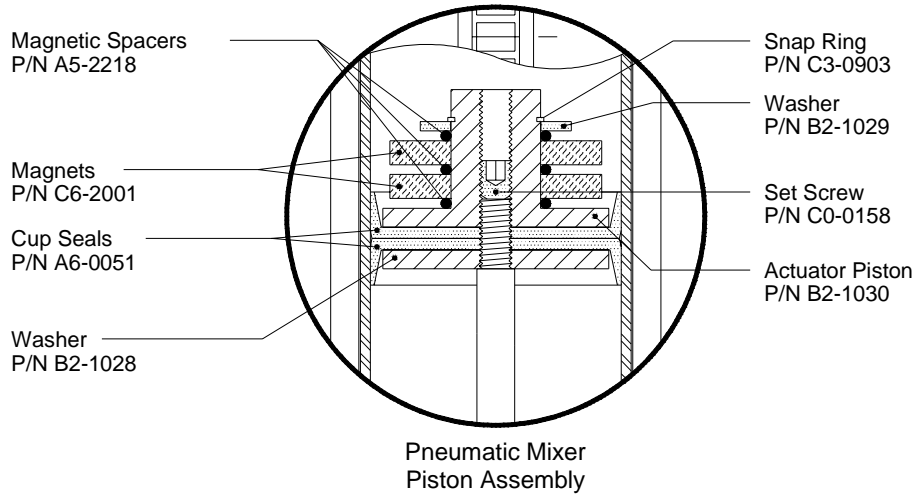
The actuator assembly is located on the top of the accumulator cylinder and serves two functions. The first is to provide mixing of the sampled product by moving the mixing disc up and down within the product portion of the accumulator cylinder. This is done by introducing pressure to one side of the mixer piston assembly and then by applying pressure to the opposite side of the mixer piston assembly.

The second function of the actuator assembly is to provide indication of the amount of product collected within the vessel. This is shown locally on the magnetic volume scale mounted on the actuator assembly cylinder.

# Section 4 - Product Accumulator Vessel



# Section 4 - Product Accumulator Vessel





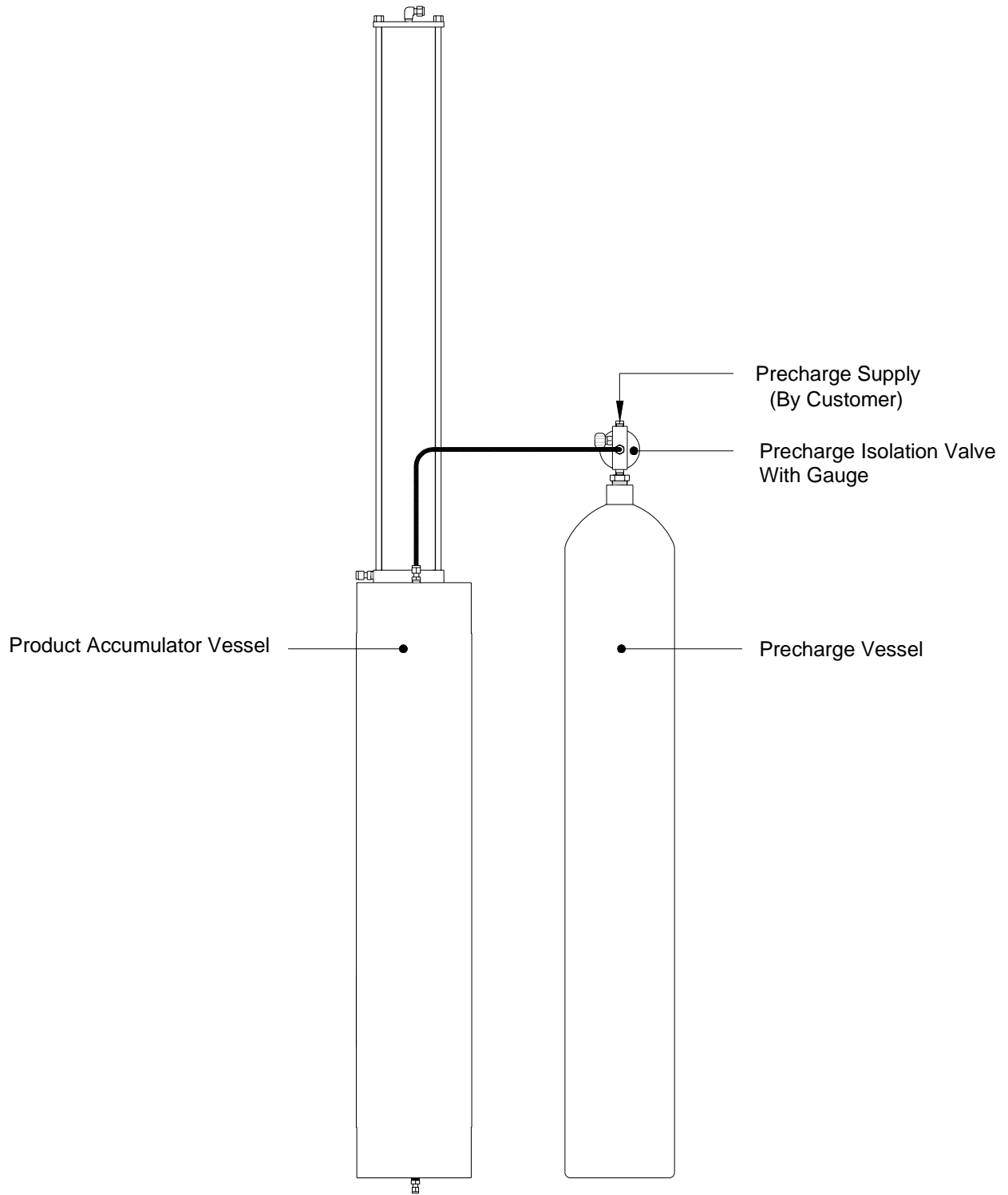


## Section 5 - Precharge Gas System

The purpose of the precharge system is to keep the sampled product in a liquid phase. This is accomplished by maintaining a precharge pressure on top of the accumulator vessel piston. The precharge vessel provides additional volume to the precharge system, which minimizes the pressure increase within the product accumulator as it fills.

Prior to placing the sampler into service, it is necessary that the precharge system be charged to a pressure at least 100 psi greater than the product vapor pressure. For example, if a product with a vapor pressure of 300 psi is being sampled, a precharge pressure of 400 psi would be required. Servicing the precharge vessel is done using the isolation valve located on top of the precharge vessel. Please note that the valve isolates the precharge system from the atmosphere, and does not separate the precharge vessel from the accumulator vessel. Also, the precharge vessel is shipped with 10 psi of blanket pressure.

# Section 5 - Precharge Gas System



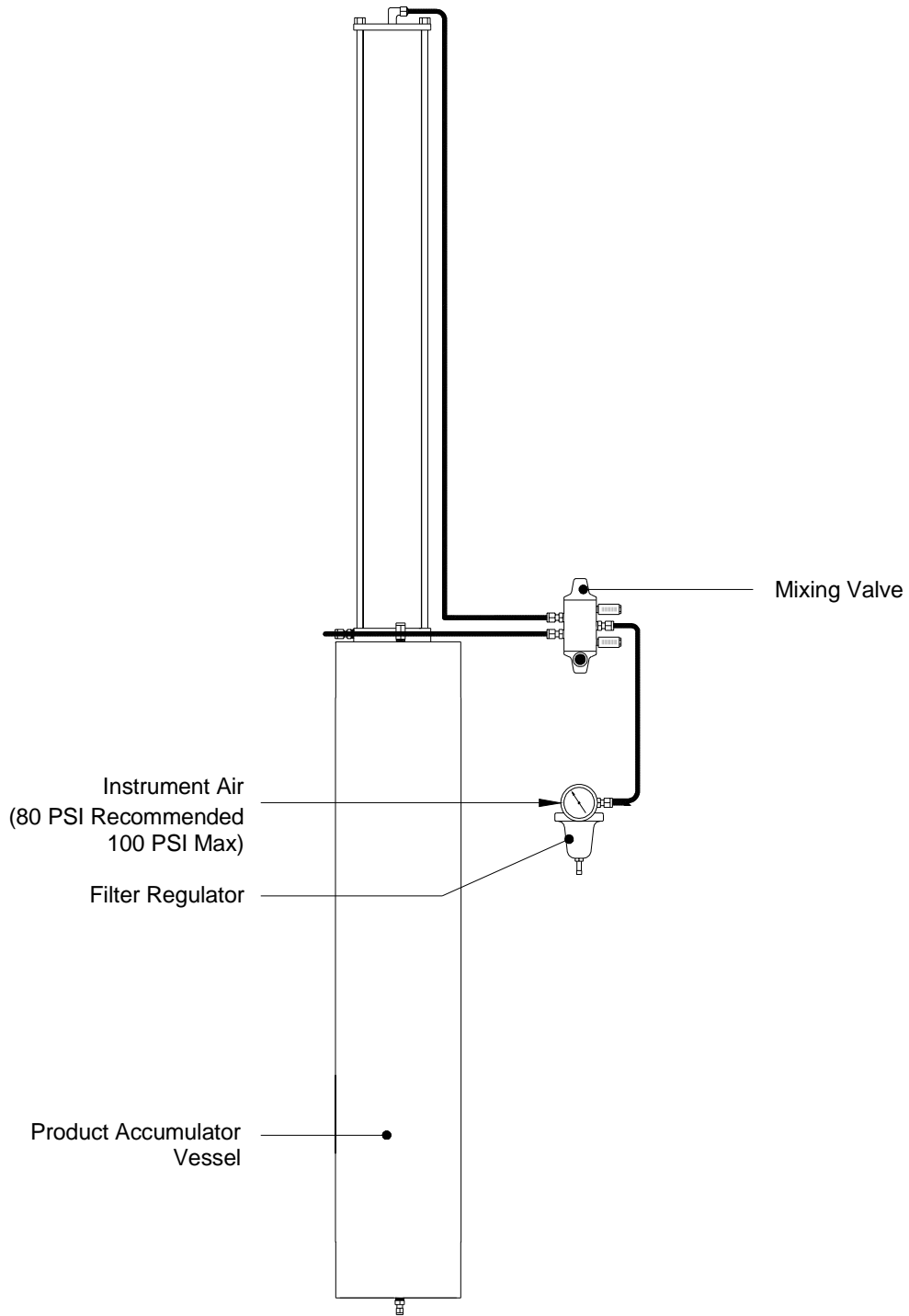
## Section 6 - Actuation/Mixing Power Source (PNEU)

The function of the 80 psi instrument air supply is to provide an actuation power source for the sample pump and the accumulator vessel mixing system. Constructed as an integral component of the entire sampling system, the entire system is pressure tested at the factory prior to shipment.

The instrument air source is connected to a tee welded onto the sample skid. It is this tee that splits the pneumatic source between sample pump actuation and accumulator vessel mixing. The "actuation" leg of the tee is piped to a pressure regulator (factory set at 38 psi) and on to a three-way proof solenoid valve. This solenoid valve is normally closed and is mounted on the enclosure provided with the sample skid. It is opened when energized by the sampler electronic control package. Opening the solenoid valve allows pneumatic pressure to actuate the sample pump. The actuation tubing must be field installed by the customer.

The "mixing" leg of the welded tee is tubed directly to the inlet of the accumulator mixing valve. The inlet is located on the right side of the switch. The mixing switch is a three position switch, with the center position being the off position. When the mixing switch is moved to the up position, the mixing disc is moved up in the product accumulator. Moving the mixing switch to the down position causes the product accumulator mixing disc to move down in the product accumulator. The sample in the accumulator vessel is mixed by moving the mixing handle alternately up and then down. Four or five passes through the sample should provide sufficient mixing.

# Section 6 - Actuation/Mixing Power Source (PNEU)



## Section 7 Electronic Control (-6M)

The electronic control package provided with your sampling system consists of a Z-65/6.1 Timer/Counter, and a PIM-100 pulse interface module. The Z-65 drives a low power solenoid that in turn drives a pneumatic relay capable of actuating a large volume pump.

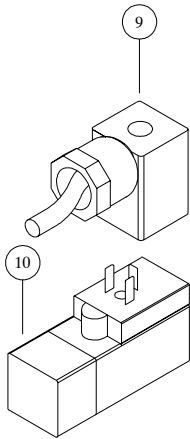
**In the timer mode**, the Z-65 can be programmed to act a recycling timer and actuates the pump after a preset amount of time passes. This time is set with the rotary and mode switches on the face of the Z-65.

**In the proportional to flow-counter mode**, the Z-65 can be set up to count a dry contact pulse provided by PIM-100, which is generated after a configured number of magnetic pulses from the customers flow meter have arrived. After the unit receives a specified number of pulses, it will stroke the pump. The time is set with the rotary and mode switches on the face of the Z-65 and the jumper located under the faceplate.

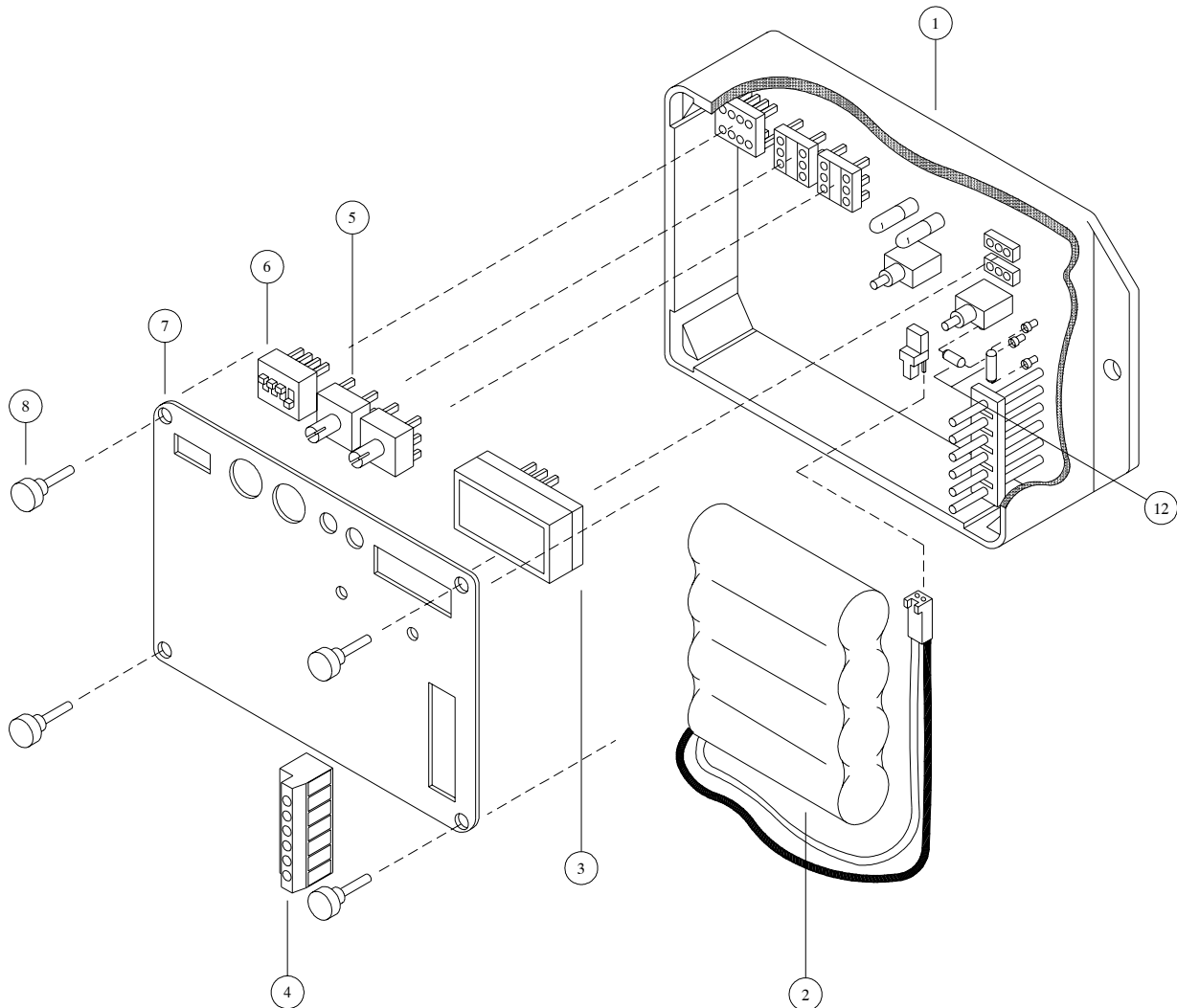
The control package is powered by an on-board Lithium battery pack. The Z-65 controller is certified intrinsically safe and is rated for use in Class I, Division 1, Groups C and D hazardous locations.

Refer to the instructions, figures, and control drawings on the following pages for information on system wiring layout and replacement parts.

# Section 7 Electronic Control (-6M) Z-65 Controller



Ref. No.	Description	Part No.	Qty.
1	Z-65/6 Controller Assembly Model Z-65/6.1	F2-0001	1
	Model Z-65/6.03	F2-0018	
2	Battery Pack	E3-2001	1
3*	Stroke Counter Assembly	G1-0001	1
4*	Terminal Strip, 6 Position	H1-0001	1
5*	BCD Switch	E1-0001	2
6*	Mode Switch	E1-0002	1
7	Face Plate Model Z-65/6.1	A9-3001	
	Model Z-65/6.03	A9-3029	
8	Thumb Screw	A9-1001	4
9	Cable Assembly	G2-0001	1
10	Solenoid Valve	A4-0001	1
11	Repair Kit*	D3-0005	1
12	Z-65/200 Fuse Replacement Kit (2 Fuses Per Kit)	D3-0142	1



## Section 7 Electronic Control (-6M)

### PIM-100

The PIM-100 Pulse Input Module is a low power device designed to interface between a DynaPak Z-65 controller and a magnetic pickup input. The PIM-100 provides fixed width logic level output pulses used to drive the count input of a Z-65 controller at a rate determined by a user configured divisor. The switch selectable divisor, ranging from 1 to 524,287, divides the input pulses from a turbine flow meter by the cumulative number represented by the "ON" divisor switches. An input adjustment potentiometer is provided to allow adjusting the input sensitivity. Power is derived from the Z-65 battery pack.

#### Operation Specifications:

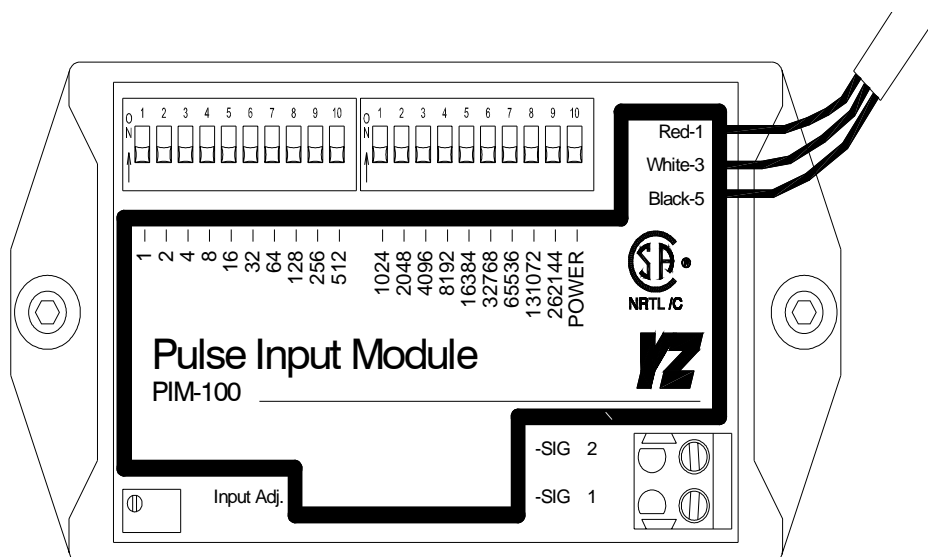
Power Requirements: 14.5V from Z-65  
battery pack  
85 microamperes  
quiescent  
110  
microamperes  
Max.

Minimum Input Signal: 20mV peak to peak  
300mH  $\leq$   
Inductance

Operating Temperature Range: -40° to 140° F  
(-40° to 60° C)

Divider Capability: 1 to 524,287

Maximum Input Frequency: 3khz Theory **Of Operation:**



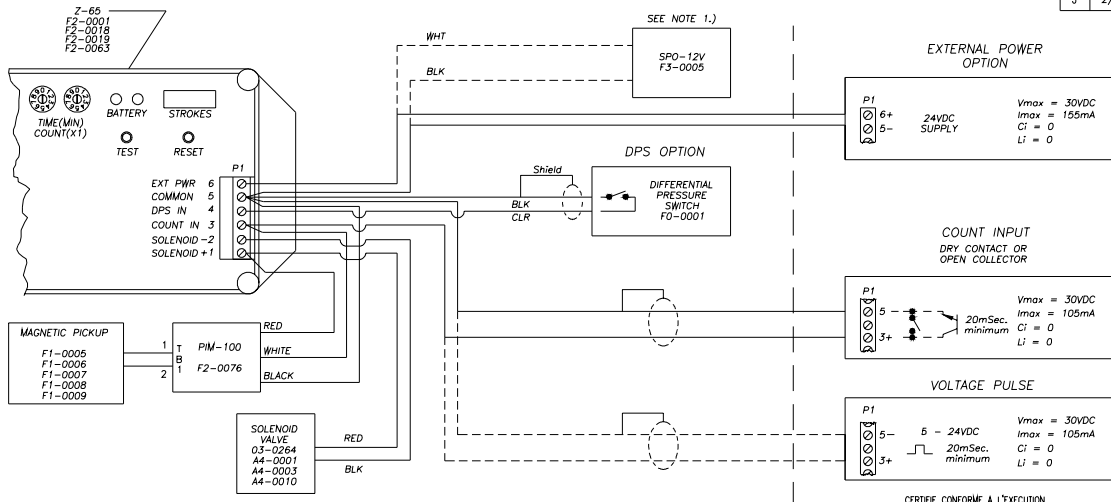


# Section 7 Electronic Control (-6M)

## System Installation Notes and Recommendations

The manufacturer's system installation instructions and the National Electric Code, Canadian Electrical Code where applicable, must be followed when installing this equipment. Tampering or replacement with non-factory components may adversely effect the safe use of the system. Only the specified batteries should be used with this apparatus. For guidance on installation see ANSI/ISA 12.6 Installation of Intrinsically Safe Instrument Systems in Class I Hazardous Locations.

REVISIONS		
REV	DATE	DESCRIPTION
D	5/15/92	
E	10/7/93	
F	2/06/95	
G	3/20/97	
H	7/13/98	ECO-088
J	2/3/04	ECO-259 [REH]



CLASS I, DIVISION 1, GROUP C,D T3C HAZARDOUS AREA EExia IIB ZONE 0 T4

$$\begin{aligned}
 W_{MAX} &\geq V_{OC} \\
 I_{MAX} &\geq I_{SC} \\
 C_A &\geq C_1 + C_{CABLE} \\
 L_A &\geq L_1 + L_{CABLE}
 \end{aligned}$$

CONTROL EQUIPMENT SHALL NOT USE OR GENERATE MORE THAN 250VAC

Exia INTRINSICALLY SAFE / SECURITE INTRINSEQUE

### Z-65 WIRING DIAGRAM

#### NOTES

1.) NOT FOR USE IN EExia IIB T4 ZONE 0 AREA.

CERTIFIE CONFORME A L'EXECUTION  
SIGNATURE \_\_\_\_\_ DATE \_\_\_\_\_  
\*\* NO CHANGES ARE TO BE MADE TO THIS DRAWING WITHOUT PRIOR CSA APPROVAL.

	DRAWING NO: 103-0430
	SCALE: NTS
DESCRIPTION: Z-65 WIRING CONTROL DOCUMENT	SHEET 1 OF 1 B SIZE
THIS DRAWING, AND ALL INFORMATION CONTAINED HEREIN REMAINS THE PROPERTY OF YZ SYSTEMS, INC. ALL RIGHTS ARE EXPRESSLY RESERVED AND MAY NOT BE REPRODUCED IN WHOLE OR IN PART WITHOUT YZ SYSTEMS, INC. WRITTEN CONSENT.	DRAWN: <i>20</i> DATE: 11-20-91
	CHECKED: _____ DATE: _____
	APPROVED: _____ DATE: _____



## 8. Sampler Set-Up

### Continuous time-based sampling

8.1 Calculate the sampling rate using the following formula and example:

The two orange count totalization knobs should be set to achieve the final totalization to initiate a stroke of the pump. Use the following example to calculate your values:

5 gallon vessel X 80% = 4 gallons of product to be collected over the entire sample cycle

4 gallons X 3785cc/gallon = 15140cc of product to be collected over the entire sample cycle.

$$\frac{15140\text{cc}}{30 \text{ days}} = 504\text{cc/day}$$

$$\frac{504\text{cc/day}}{1.8 \text{ cc/pump stroke}} = 280 \text{ strokes per day}$$

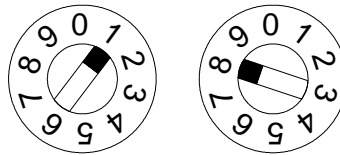
$$\frac{600 \text{ bbl/ Day (Maximum Daily Flow Rate)}}{280 \text{ strokes/Day}} = 2.14 \text{ bbl/pump stroke}$$

Since counts must be counted to the nearest whole count set the Z-65 totalization at 2.

8.2 Set the timer dials on the Z-65/6.1 to the sample rate from step 7.1.

*NOTE: to obtain maximum battery life, choose the longest time interval and largest pump displacement setting possible.*

**Example** 18 Minutes



**TIME (MIN.)**

**COUNT (x1)**

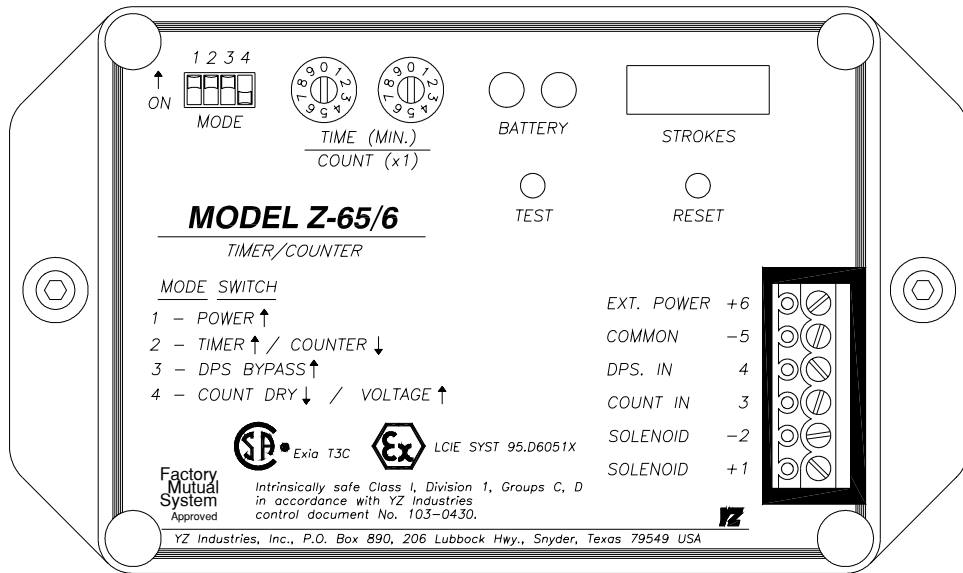
*NOTE: The time (18 minutes) above corresponds to the dial setting shown for the Z-65/6.1 model with the timer range setting in the factory position (jumper on the two left pins). See Section 10.4 Timer Range Setting.*

# 8. Sampler Set-Up

## Continuous time-based sampling

8.3 Adjust the pump volume adjustment knob to the value used in the calculations in step 7.1.

Sample pump displacement per stroke	Number of turns open on the pump volume knob
.1cc	3
.2cc	6
.4cc	12



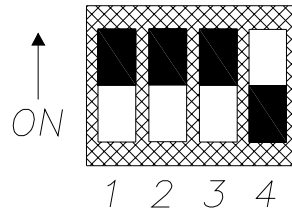
8.4 Turn mode switch 1 to on.

8.5 Turn mode switch 2 to on.

8.6 Turn mode switch 3 to on.

8.7 Turn mode switch 4 to off.

8.8 Press the test button once to initiate the timer sequence.



## 8. Sampler Set-Up

### Proportional to Flow Mode

#### Sampler Control Set-up

*The pump displacement should be set at 1.8cc/stroke for this type application.*

#### PIM-100 Set Up:

Determining the Divisor: The Divisor is determined by taking the nominal flow meter output pulse rate and calculating how many output pulses you want for that number or input pulses.

#### **For example:**

If your flow meter is calibrated for 2300 pulses per barrel, and you want one output pulse per barrel from the PIM-100, your divisor would be 2300. In Table 1, lookup the largest switch value that is less than or equal to the divisor. Subtract that switch value from the divisor. Next locate the largest switch value that will go into the remainder of the divisor. Repeat this process until the remainder is zero.

To set this value turn on switch positions **S2-2, S1-8, S1-7, S1-6, S1-5, S1-4, and S1-3.** Turning a switch "ON" enables the divisor value.

Switch divisor values are cumulative.

2300

- 2048 **S2-2 "ON"**

252

- 128 **S1-8 "ON"**

124

- 64 **S1-7 "ON"**

60

- 32 **S1-6 "ON"**

28

- 16 **S1-5 "ON"**

12

- 8 **S1-4 "ON"**

4

- 4 **S1-3 "ON"**

0

**Table1**

Switch S1		Switch S2	
Position	Divisor Value	Position	Divisor Value
1	1	1	1024
2	2	<b>2</b>	<b>2048</b>
<b>3</b>	<b>4</b>	3	4096
<b>4</b>	<b>8</b>	4	8192
<b>5</b>	<b>16</b>	5	16384
<b>6</b>	<b>32</b>	6	32768
<b>7</b>	<b>64</b>	7	65536
<b>8</b>	<b>128</b>	8	121072
9	264	9	262144
10	512	10	POWER

The input signal threshold level is set from the factory to work with most applications. However, due to varying cable lengths and wire types, the threshold level may need to be adjusted for certain applications. The threshold level can be adjusted using the "Input Adj." potentiometer. If pulses occur too often, not at all, and/or erratically, you may need to change the threshold setting. Turning the Input Adj. Potentiometer clockwise will decrease the input sensitivity, and counterclockwise will increase the input sensitivity.

## 8. Sampler Set-Up

### Proportional to Flow Mode

#### Z-65 Controller Set Up:

The Mode Switch should be set as follows:

#1 Power "On" ↑

#2 Counter ↓

#3 DPS Bypass ↑

#4 Count Dry ↓

The two orange count totalization knobs should be set to achieve the final totalization to initiate a stroke of the pump. Use the following example to calculate your values:

5 gallon vessel X 80% = 4 gallons of product to be collected over the entire sample cycle

4 gallons X 3785cc/gallon = 15140cc of product to be collected over the entire sample cycle.

$\frac{15140\text{cc}}{30 \text{ days}} = 504\text{cc/day}$

$\frac{504\text{cc/day}}{1.8 \text{ cc/pump stroke}} = 280 \text{ strokes per day}$

$\frac{600 \text{ bbl/ Day (Maximum Daily Flow Rate)}}{280 \text{ strokes/Day}} = 2.14 \text{ bbl/pump stroke}$

*Since counts must be counted to the nearest whole count set the Z-65 totalization at 2.*

Verify Power switch positions:

Turn on the Z-65 and PIM-100 power switches (Z-65 mode S#1, PIM-100 S2-10).



## 8. Sampler Set-Up

### Proportional to Flow Mode

#### 10.2 Z-65/6.1 Set Up:

Calculate the Z65/6.1 counter setting using the following chart:

1. your pump displacement (from .1 to .4cc's)	=	a. _____
2. your sample cylinder volume in cc's (300cc, 500cc, etc.)	=	b. _____
3. average flow rate (Metered Volume per day)	=	c. _____
4. sample period in days	=	d. _____
5. pulses per volume metered (pulses per Metered Volume)	=	e. _____
6. counter setting	=	$\frac{a \times c \times d \times e}{(b)}$

#### EXAMPLE:

pump displacement	(a.)	=	.2cc
sample cylinder size	(b.)	=	300cc
average flow rate	(c.)	=	100 Metered Volumes per day
sample period	(d.)	=	30 days
pulses per volume metered	(e.)	=	10 pulses per Bbl

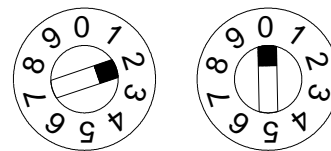
$$\text{counter setting} = \frac{.2\text{cc} \times 100 \text{ Bbl/day} \times 30 \text{ days} \times 10 \text{ pulses/Bbl}}{300 \text{ cc}} = 20 \text{ pulses}$$

*NOTE: if the calculated counter setting is less than 1 or greater than 99, the pulses per volume metered will need to be adjusted. This can be programmed in most flow meters to the desired rate. If the calculated counter setting is less than 1, increase the pulses per volume metered. If the calculated counter setting is greater than 99, decrease the pulses per volume metered.*

Turn the count dials to the appropriate number of pulses you want to count before the sample pump strokes.

Example: 20 pulses; turn dials to 20.

Press the test button once to load the value into the memory.



**COUNT (x1)**

# 8. Sampler Set-Up

## Proportional to Flow Mode

10.3 Adjust the pump volume adjustment knob to the value used in the calculation in step 8.1.

Sample pump displacement per stroke	Number of turns open on the pump volume knob
.1cc	3
.2cc	6
.4cc	12

10.4 Input from the PIM-100 is a dry contact:

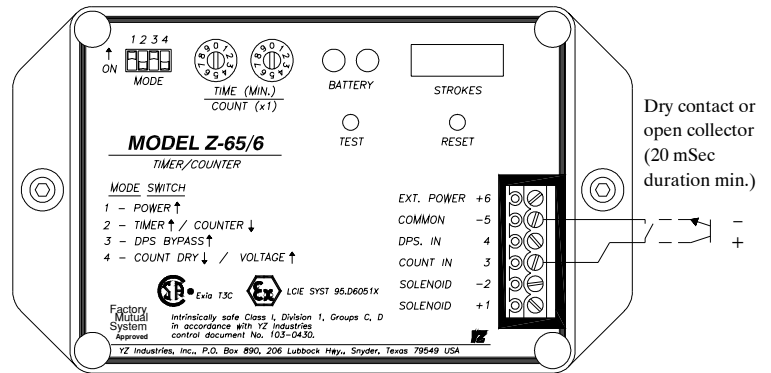
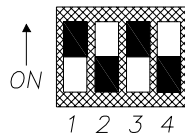
a. interface between the PIM-100 and the Z-65/6.1 terminal strip will be pre-wired.

b. Turn mode switch 1 to on.

c. Turn mode switch 2 to off.

d. Turn mode switch 3 to on.

e. Turn mode switch 4 to off.



## Section 8 - Installation/Start-up/Operation

### Pump Installation

The CNR-2 sample pump is designed to be mounted directly to a threaded connection on the pipeline. The probe tubing should be cut such that the tip of the probe will be located in the center 1/3 of the pipeline after installation. After the pipeline has been depressurized, the threads on the probe body should be taped and doped and the pump installed into the pipeline connection.

### Skid Installation

The skid portion of the sampler should be located as close as possible to the sample pump. 1/4" stainless steel tubing should be field routed from the balance valve discharge (product out) to the five-way cross product connection (product in) on the skid. Care should be taken in routing this tubing to prevent traps, long runs, etc.

1/4" stainless steel tubing should also be field routed from the connection on the pump labeled pneumatic supply to the solenoid valve on the skid.

### Pneumatic Supply

A 1/4" connection is provided on the skid for a continuous pneumatic supply (80-100 psi). The necessary regulator, solenoid valve, etc. is provided with the sampling unit.

### Electrical Connections

The pulse connection from the turbine meter to the PIM-100 must be connected for Proportional-To-Flow mode of operation.

### Precharge Gas Installation

Connect the precharge gas source (normally nitrogen) to the isolation valve 1/4" NPT connection located on top of the precharge vessel. Open the isolation valve. Fill the precharge vessel with gas until the pressure in the vessel is 100 to 150 psi above the vapor pressure of the product to be sampled. Once the vessel is filled, close the isolation valve and remove the precharge gas source. Leak test all connections between the precharge vessel and the product accumulator vessel.



## Section 8 - Installation/Start-up/Operation

### Pump Sample Size

The sample size of the CNR-2 is adjustable from 0.25 to 1.8 cc/stroke. The sample grab size of the pump is adjusted by loosening the lock/seal nut on top of the pump and turning the volume adjustment screw in to decrease the sample volume or out to increase the sample volume. Once the new sample size has been set, the lock/seal nut should be retightened.

### Sample Pump Priming

Before the pump begins normal operation after initial installation or maintenance, the sample pump must be purged of all air in the sample chamber. The purge valve on the sample pump is used to evacuate the air from the chamber and to make sure the pump is liquid-packed. If the pump is not purged before being placed into operation, it will not function properly.

To purge the pump, open the purge valve located on the left side of the CNR-2 sample pump. The product supply valve can then be opened to allow pipeline product to purge the air within the pump. Once product begins exiting the purge valve, close the purge valve. The sample pump is now ready to begin operation.

### Product Line Test

Close the isolation valve located on the bottom of the Five-way Cross Assembly. Stroke the sample pump until the system pressure reaches 1800 psi on the Five-way Cross Assembly Gauge. The pressure should hold steady between pump strokes. Once the system is at 1800 psi, leak test all connections. Once the system has been tested, open the isolation valve located on the bottom of the Five-way Cross Assembly.



## Section 9 - DuraSite Portable Sample Vessel Instructions

**Purpose:** The DuraSite Portable Sample Vessel permits the user to remove a liquid or gas hydrocarbon sample from a pipeline or a sampling device. This is accomplished without changing the pressure of the product or exposing it to a contaminant fluid. If properly used and maintained the DuraSite will provide many years of safe, accurate and clean sampling.

**Use:** The DuraSite is a very safe device to use. As with any equipment dealing with flammable products, it is mandatory that a good, thorough operator training procedure be established prior to use.

Typical use of the cylinder would be as follows:

**Step 1: (In The Lab)** Connect a regulated inert gas supply to the pre-charge valve. The product valve should be open. By carefully controlling the pre-charge valve and the regulator, the cylinder can be slowly charged with pre-charge gas (NOTE: This should be done slowly to prevent slamming the piston down to the opposite end). The pressure on the pre-charge pressure gauge should be brought to a reading of 10-50 psi above the expected pressure of the product in the field. Close the pre-charge valve and disconnect the gas supply. Check the pre-charge valve, relief device, and the pre-charge pressure gauge for leaks. Any leaks should be stopped before continuing. The vessel should be placed in a padded carrying case and made ready for field use.

**Proceed to EITHER Step 2, or Step 3 as required for your application.**

### STEP 2: FOR COLLECTION OF SAMPLE VIA SPOT SAMPLE OR FROM COMPOSITE ACCUMULATOR VESSEL.

**2a:** Connect the product end of the pre-charged sample vessel to the product supply. (Sampler product removal valve, or Pipeline sample probe)

**NOTE: the pre-charge pressure gauge reading should be greater than the product supply pressure reading. If not, repeat Step 1 above.**

**2b:** Once the vessel is connected to the product supply, it is necessary to vent a small amount of product prior to filling the vessel. This assures fresh product and removes any air or gas when dealing with liquids. This can be done by loosening the product purge valve a very small amount until the product is purged. After thorough purging, the product purge valve should be tightened.

**2c:** The product pressure gauge reading should be 10-50 psi below the pre-charge pressure gauge reading. By carefully opening the pre-charge valve, the pressure becomes equalized, then begins to drop below the product pressure. The pre-charge valve should be carefully controlled so as to not vent the pre-charge gas too fast.

**2d:** When the cylinder becomes a maximum of 80% full (see volume indicator), all valves should be closed. The product connection is slowly broken in order to vent any trapped product. After vessel removal, all connections should be checked for leaks and the pre-charge and product valve ports capped to prevent leakage.

**2e:** Pack the DuraSite in appropriate carrying case to meet D.O.T. guideline, with D.O.T. paperwork and transport to lab for analysis.

### STEP 3: FOR DIRECT CONNECTION TO SAMPLER.

**3a:** Connect the sampler discharge port to the product inlet port to the DuraSite using 1/8" stainless steel tubing.

**3b: (Gas sampling)** Connect the pre-charge port to the DuraSite to the pipeline for pre-charge pressure (Proceed to step 3d), or configured like the liquid sample application below. (Step 3c)

**3c: (Light sampling)** Pre-charge the DuraSite as indicated in Step 1, then install a pressure relief valve to the pre-charge port and open the pre-charge valve on the DuraSite. (The pressure relief valve should have a relief pressure setting of approximately 100 psi above line pressure.)

**3d:** Open the product inlet valve of the DuraSite and the purge valve on the sampler. Next open the purge valve on the product end of the DuraSite and allow product to purge all lines and connections out.

**3e:** Close purge valves and begin sample cycle.

**3f:** At the end of sample cycle, close product inlet valve on the DuraSite and remove the DuraSite. Pack the DuraSite in appropriate carrying case to meet D.O.T. guideline, with D.O.T. paperwork and transport to lab for analysis.

**Step 4: (In The Lab)** Prior to analysis, the product should be mixed. This is accomplished simply and efficiently by inverting the cylinder end-over-end, causing the mixing ball to fall through the product. Approximately 10-12 trips of the mixing ball through the product assures a homogenous solution.

**Step 5:** The regulated pre-charge gas should be reconnected to the pre-charge side of the cylinder. The pre-charge gas supply should remain open during analysis.

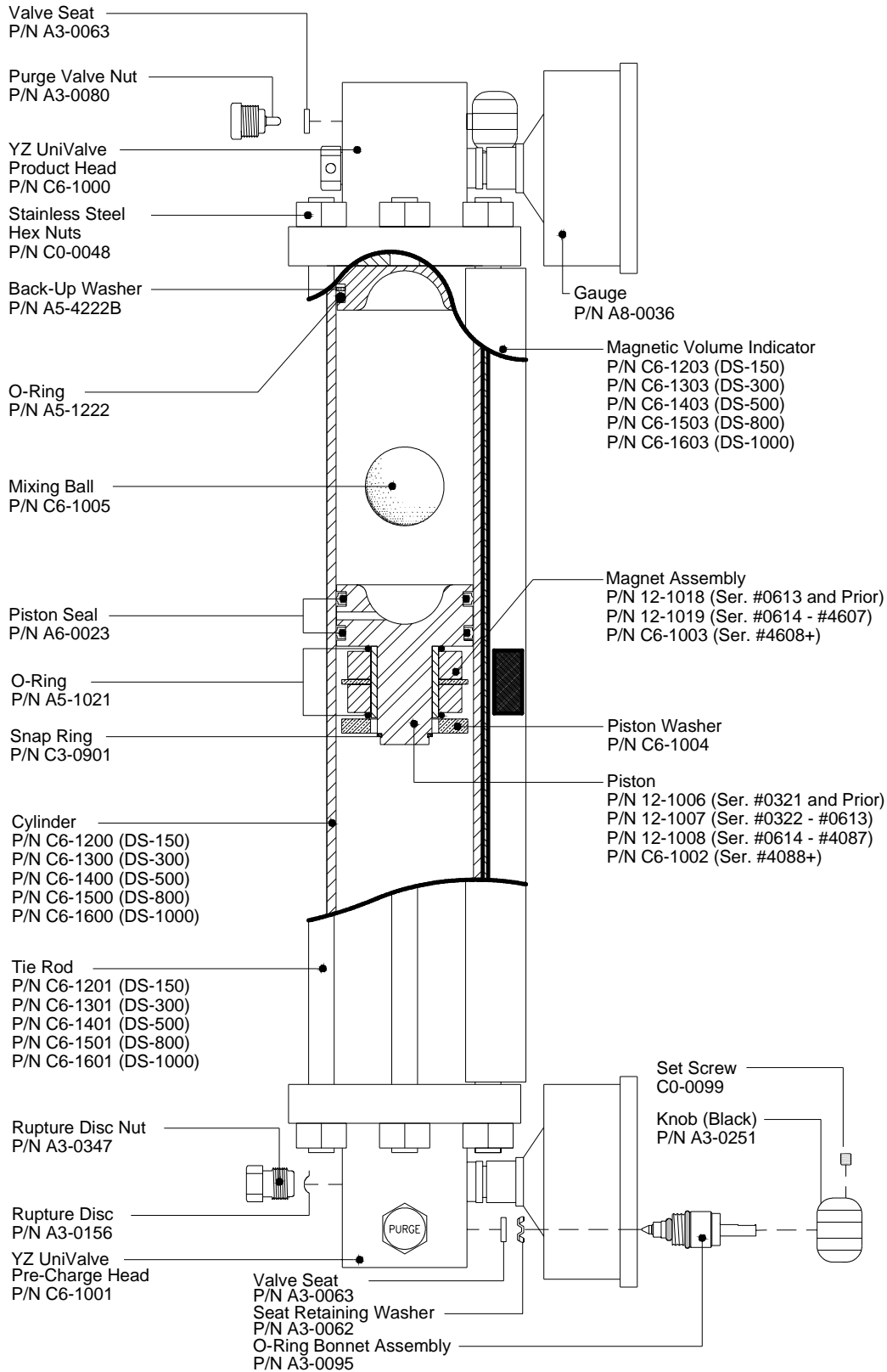
**Step 6:** Purging a small amount of product from the vessel removes unmixed product from the tee, relief device, gauge, etc. The unit can now be connected to a chromatograph and the product analyzed.

**Step 7:** After analyzing, the remainder of the product should be dumped and the vessel properly cleaned. Normal cleaning can be accomplished by rinsing the product end with a petroleum solvent and flushing with acetone. If a more thorough cleaning is required, the vessel should be disassembled.

**WARNING: A portable sample vessel should never be filled to more than 80%. This allows a 20% pre-charge cushion to absorb thermal expansion of the product.**

Shipping: Extreme care should be taken when preparing a vessel for shipment. Both valves should be capped to prevent possible leakage. The vessel should be placed in a snug-fitting, well-padded and durable case. All applicable DOT regulations should be adhered to.

# Section 9 - DuraSite ( STD. illustrated)









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