Light Liquid Sampler

SYSTEM SUPPORT MANUAL

PNR-2LM-0(1)

YZ SYSTEMS
MILTON ROY

PNR-2LM-0(1)
Light Liquid Sampler
System Support Manual

Version 05202004

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About This Manual...

Introduction

The purpose of this manual is to provided a step-by-step guide to the operation, installation and maintenance of your YZ Light Liquid Hydrocarbon 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 compo nents, a description of how the system operates, a schematic system diagram, and a system layout.

- Section 2 - **Sample Pump and Balance Valve**

- Section 3 - **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 the commissioning of the unit.

- Section 4 - **DuraSite Vessel Instructions**
  These sections include details of the DuraSite portable constant pressure sample vessel., operation and maintenance .

Section 1 System Introduction

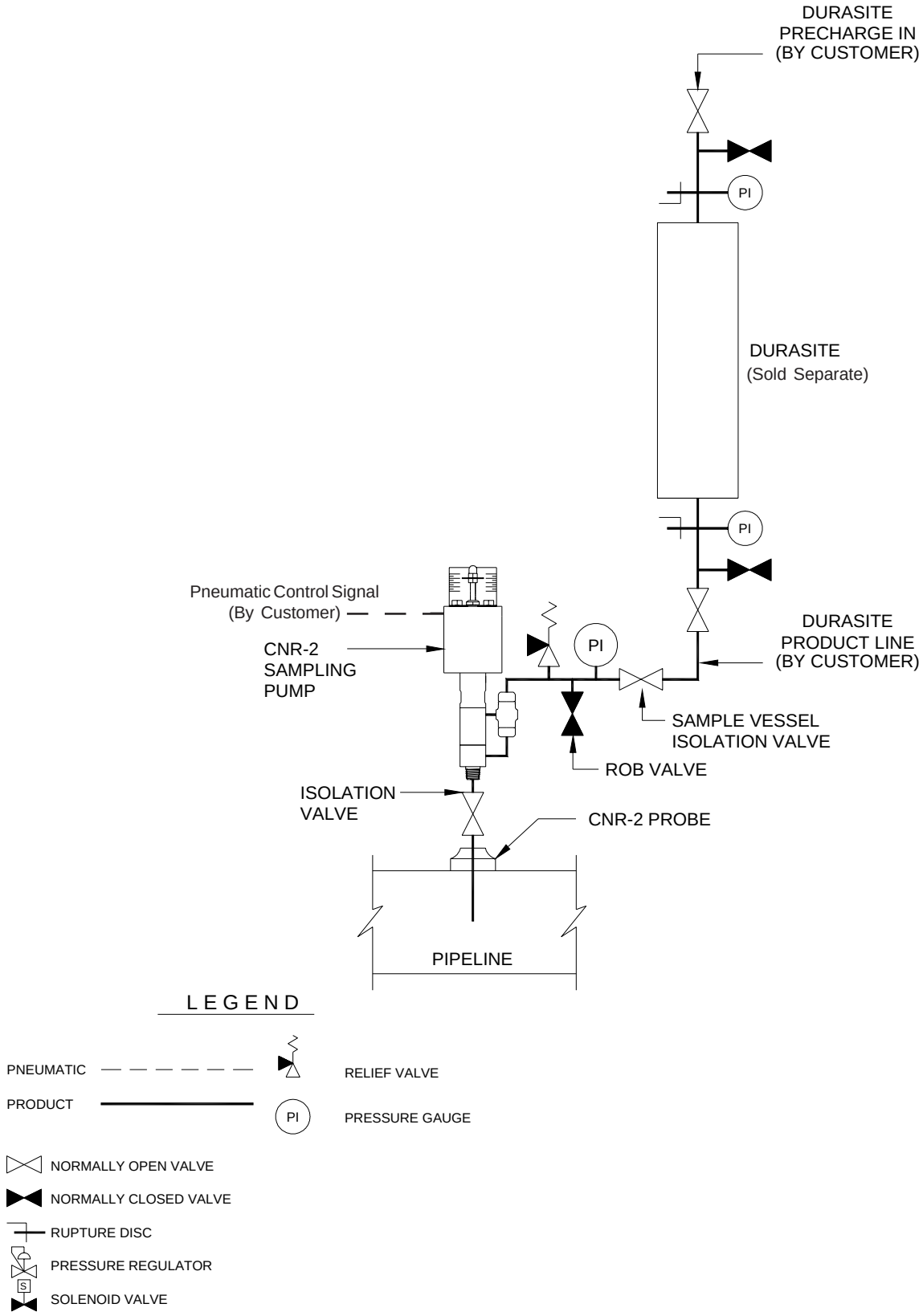
The PNR-2LM-0(1) is a sampling system designed to sample light liquid hydrocarbons.

Operation of the system centers around the PNR-2 Sample Pump, and control functions that are totally customer supplied. The pump is mounted on a stainless steel panel, with a support tray for a portable sample. The pump and panel are shown in the diagram on the following page.

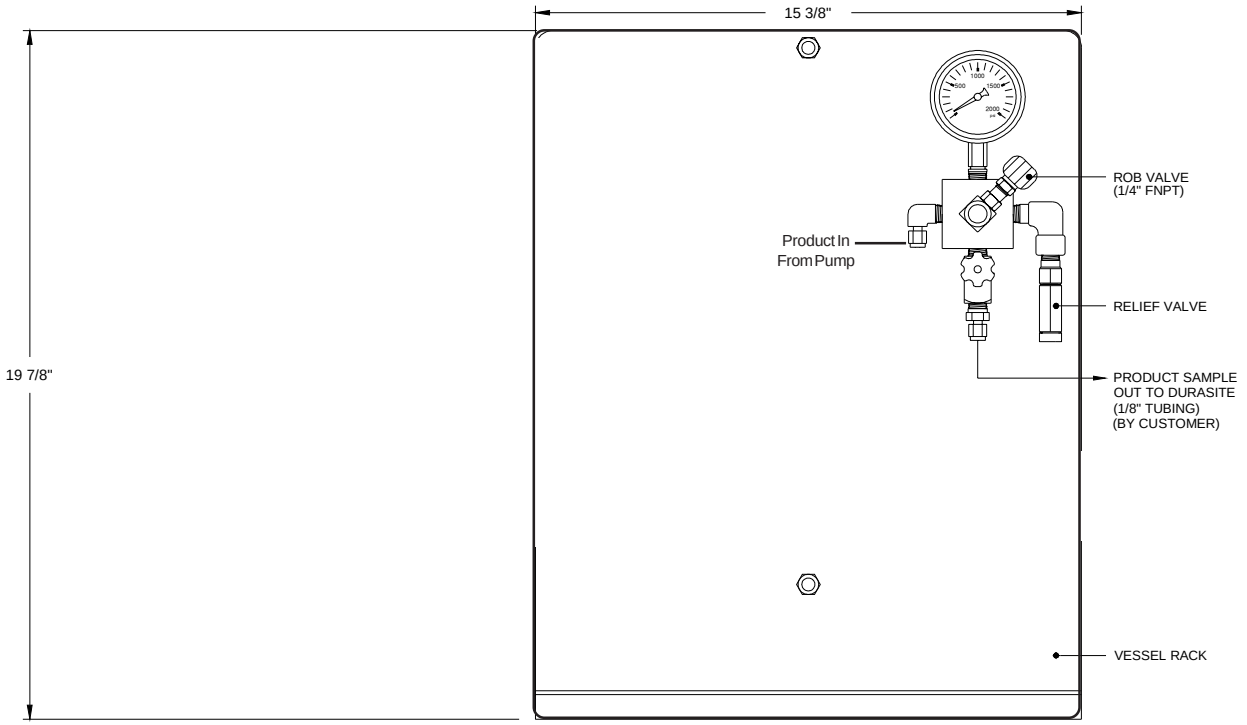
The purpose of the YZ light liquid hydrocarbon sampling system is to capture a representative liquid sample of the pipeline product. In order for the system to function properly, a pipeline product must be single phase, liquid product. By properly adjusting both the sample size and the sample frequency, the sample vessel will fill to 80% capacity at the end of the sample period.

The system operates on a simple concept. Each time the sample pump is actuated a preset volume of sample is gathered at pipeline pressure and collected into a portable sample vessel for transfer to a lab for analysis.

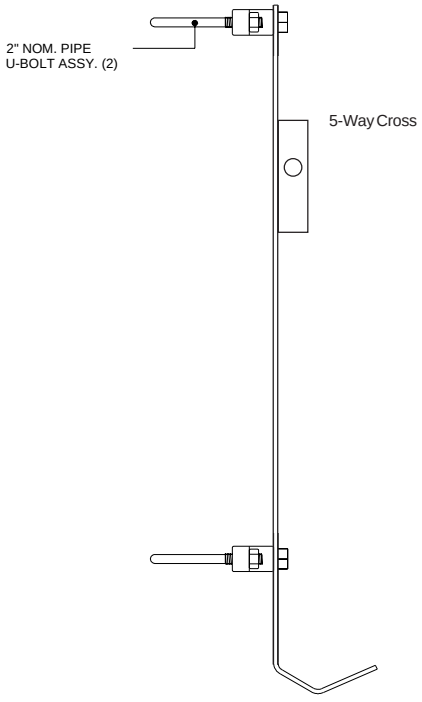
Section 1 System Introduction



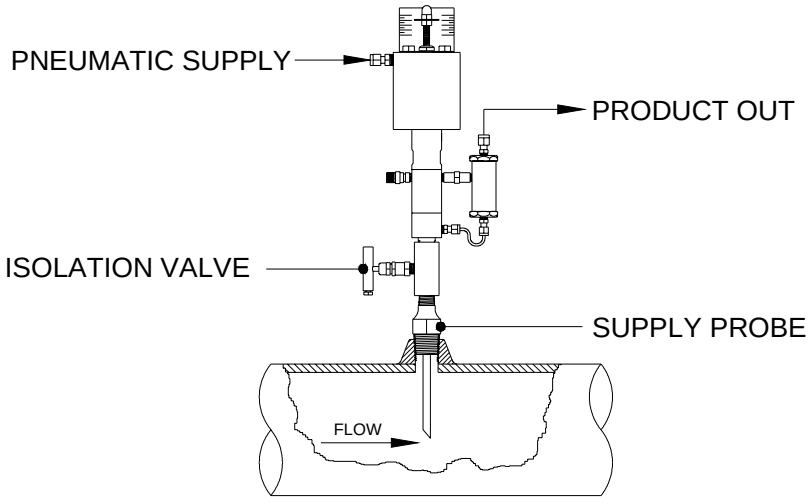
Section 1 System Introduction



FRONT VIEW



LEFT SIDE



Section 2 PNR Sample Pump

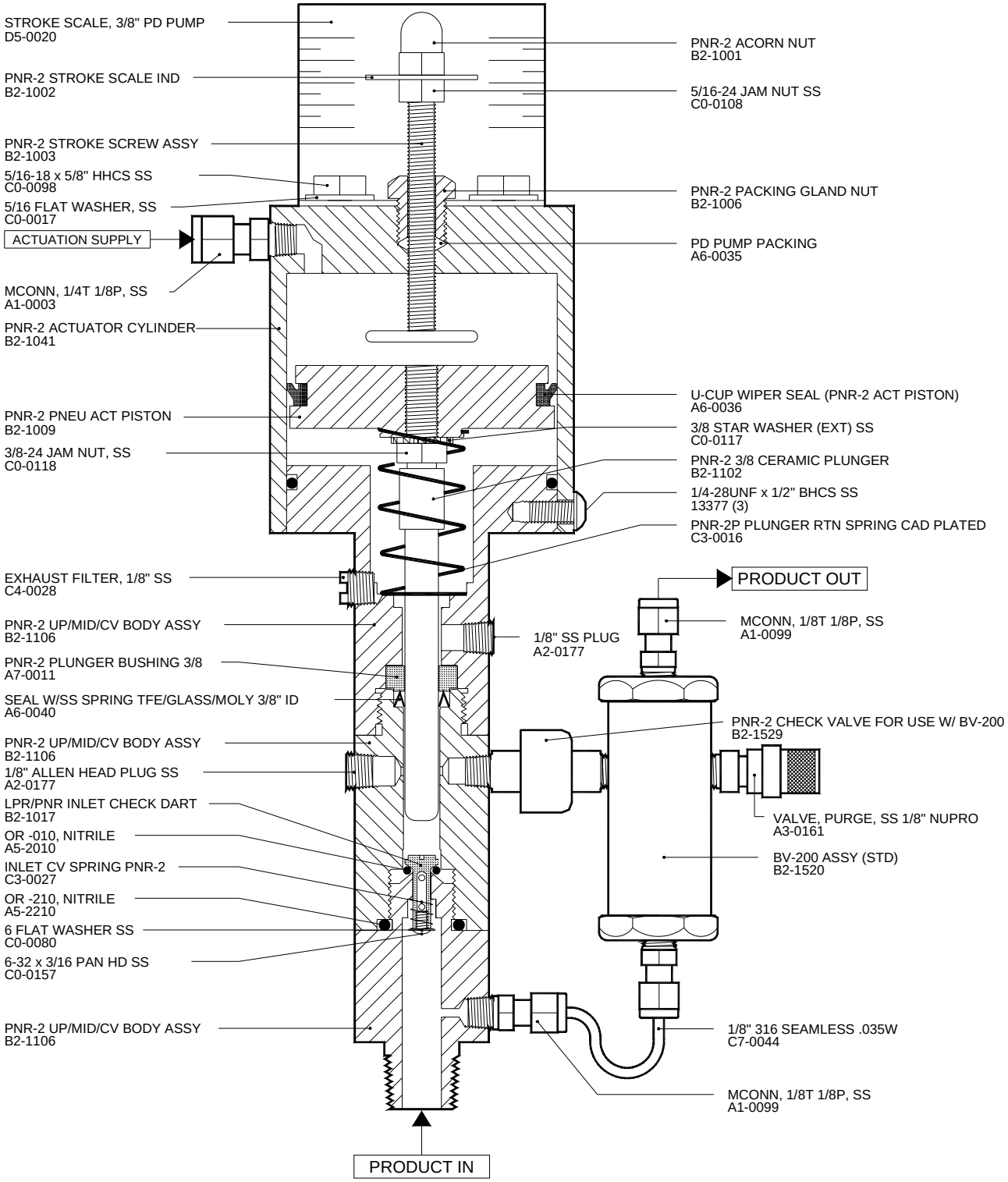
The PNR-2P Sample Pump is a positive displacement plunger pump designed to be mounted directly on the pipeline. It has an adjustable displacement of 0.25 to 1.8cc and achieves proportional-to-flow sampling through adjustment of the customer supplied, and customer controlled pneumatic signal.

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 dart 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 pre-charge 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.

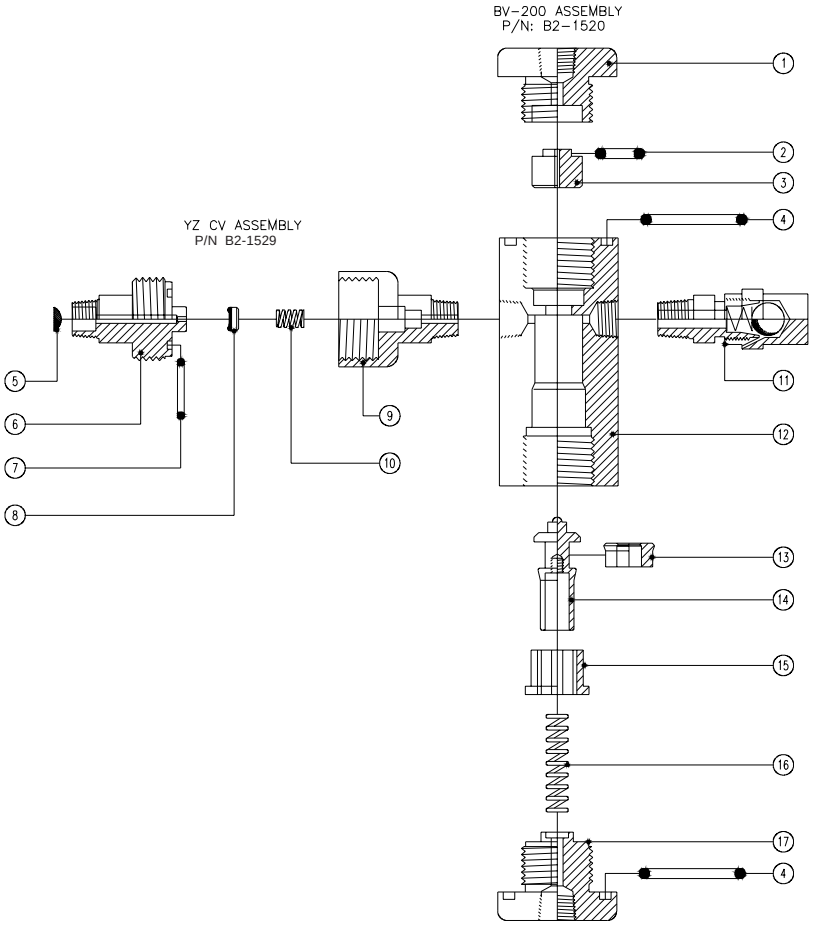
In the event that the accumulator vessel pre-charge pressure is greater than the pipeline pressure, the balance valve dart and seat are pushed apart by the product pressure in the accumulator vessel. In this situation the check valve wafer located between the balance valve and the sample pump acts as 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 PNR Sample Pump
Pump Diagram



Section 2 PNR Sample Pump

Balance Valve Diagram



BILL OF MATERIALS			
REF.	PART NO.	DESCRIPTION	QTY.
1	B2-1514	BV-200 UPPER HEAD	1
2	A5-2109	OR -109 NITRILE	1
3	B2-1518	BV-200 DART STOP (STD)	1
4	A5-2119	OR -119 NITRILE	2
5	C4-0027	BALANCE VALVE FILTER SCREEN	1
6	A3-2200	YZ CV 1/8MNPT 1/4W INLET FOR CV2X-1MXX MODELS	1
7	A5-2014	OR -014 NITRILE	1
8	B0-1021	1/4" VITON WAFER	1
9	A3-2204	YZ CV 1/8MNPT 1/4W OUTLET FOR CV2X-1MXX MODELS	1
10	C3-0037	SPRING, DCV, 6000 PUMP	1
11	A3-0161	VALVE, PURGE, SS 1/8"	1
12	B2-1516	BV-200 BODY	1
13	A6-0092	B/V 200 SEAL 1/4 x 1/2	1
14	B2-1519	BV-200 DART (STD)	1
15	B2-1517	BV-200 BUSHING GUIDE	1
16	C3-0047	BV-200 SPRING	1
17	B2-1515	BV-200 LOWER HEAD	1

Section 3 Installation/Start-up/Operation

Panel Installation

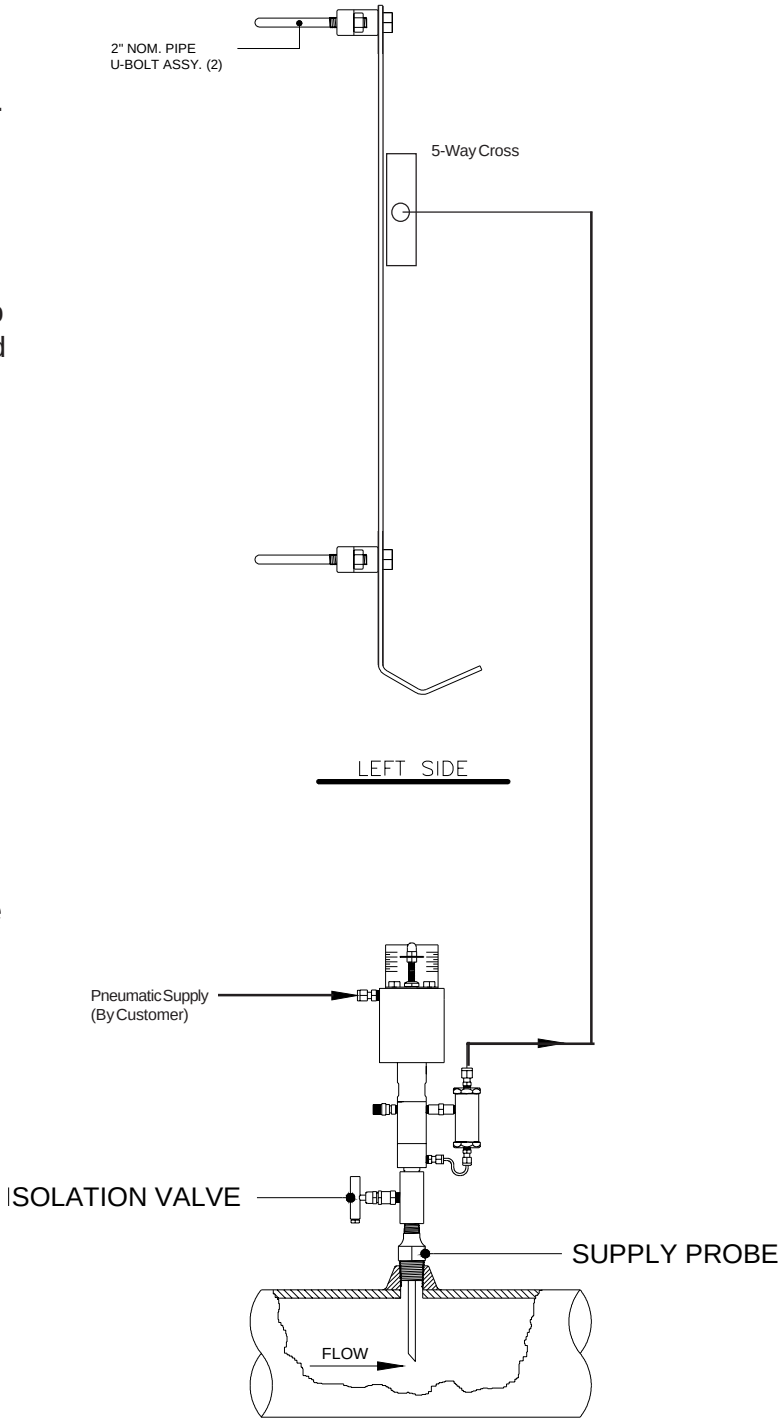
The sampling system should be located as close as possible to the pipeline. 2" U-bolt assemblies are provided to mount the panel to a 2" vertical pole.

Pneumatic Supply

A 1/4" connection on the Pump is provided for a pulsed pneumatic supply (40 - 60 psi). The necessary regulators, solenoid valve, control functions, etc. are customer provided. The pneumatic pulse to operate the sampler typically will require 2-3 second dwell time to assure proper pump operation.

Pump Installation

The PNR-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. Next you must install 1/4" stainless steel tubing between the connection top of the pump, to the source of the pulsed pneumatic actuation, upplied by the customer. Finally connect 1/4" stainless steel tubing from the discharge connection of the pump balance valve to the connection for product in from pump on the 5-way cross.



Section 3 Installation/Start-up/Operation

Pump Sample Size

The sample size is adjustable from 0.25 to 1.8 cc/stroke. The sample size 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 sample pump balance valve. 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.

Section 3 Installation/Start-up/Operation

Z-65 Controller Set Up
Proportional To Time Mode

Calculating Time-

$$\frac{\text{Sample Volume Desired}}{\text{Pump Displacement}} = \textbf{\# of Pump Strokes Required/Sample Cycle}$$

$$\frac{\text{Number of Minutes/Sample Cycle}}{\textbf{\#of Pump Strokes Required/Sample Cycle}} = \text{Time in Minutes Between Strokes}$$

Example

$$\frac{\text{400 cc(500cc DuraSite filled to 80\% Volume)}}{\text{.25cc Pump Displacement/Stroke}} = \textbf{1600 Pump Strokes Required/Sample Cycle}$$

$$\frac{\text{10,080 (Minutes in Week)}}{\textbf{1600 Pump Strokes Required/Sample Cycle}} = \text{6.3 Minutes Between Strokes (Round up to the next whole minute.)}$$

Section 3 Installation/Start-up/Operation

Z-65 Controller Set Up
Proportional To Flow Mode

Sample Vessel Size x 80% = Grabs Required/Sample Cycle.
Sample Grab Size

ie: 500cc Vessel x 80% = 400cc / .9 cc/Grabie = 444 Grabs Required

Pulse/Metered Volume x Monthly Average Flow = Pulses/Sample Cycle

ie: 1 Pulse/BBL x 15,000 BBL/Month = 15,000 Pulses/Sample Cycle

Pulses/Sample Cycle = Pulses/Grab
Grabs Required

ie: 15,000 Pulses/Sample Cycle = 33.78 Pulses/Grab
444 Grabs Required

Section 4 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.

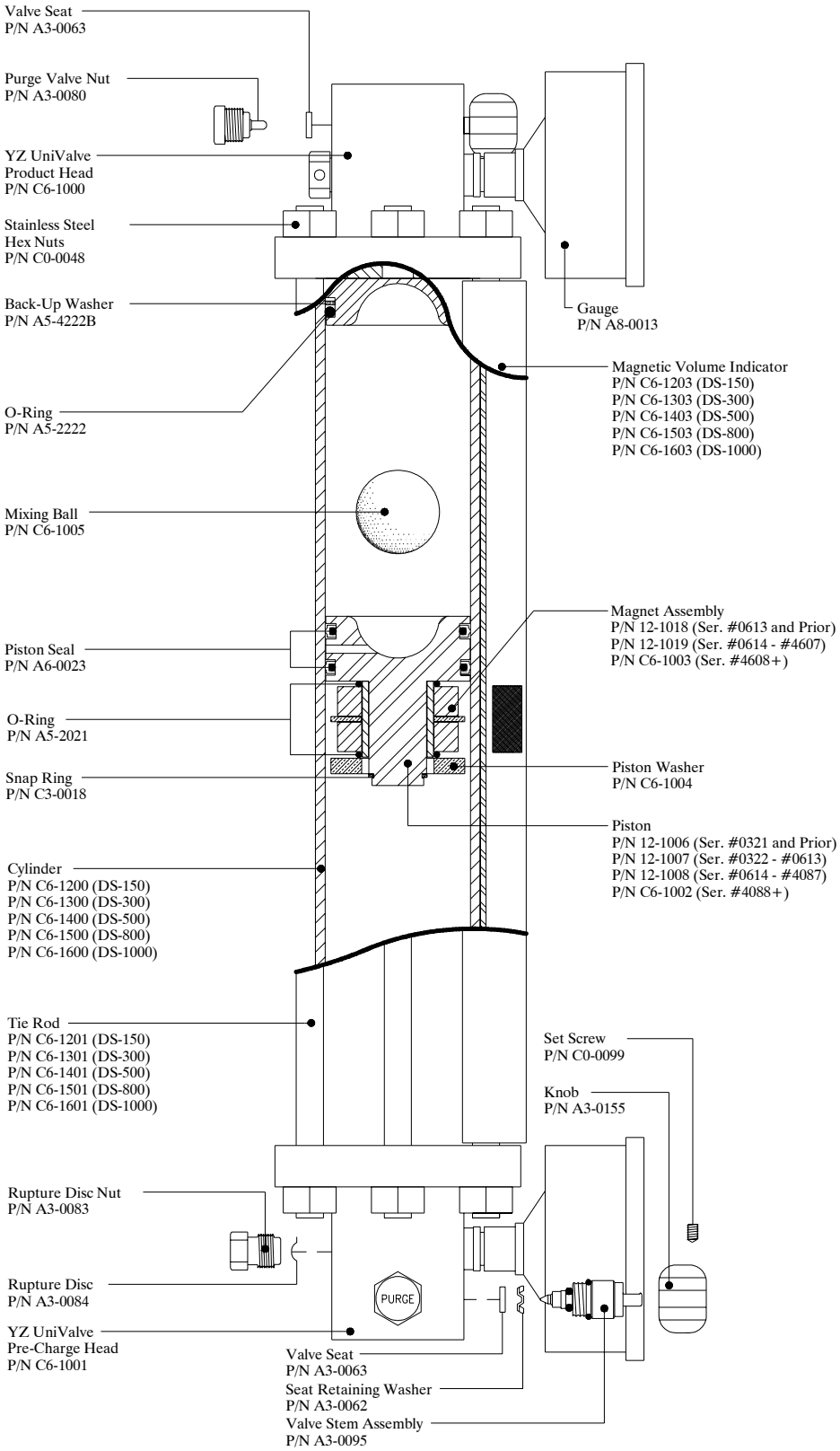
Step 5: The regulated pre-charge gas should be reconnected to the pre-charge side of the cylinder. The pre-charge gas supply should remain open during analysis.

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 4 DuraSite Portable Sample Vessel Instructions
DuraSite (illustrated)



Notes

Notes

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