Crude & Refined Product Sampler

SYSTEM SUPPORT MANUAL

CNR-2LM-6M

YZ SYSTEMS
MILTON ROY

CNR-2LM-6M
INSTRUCTION & OPERATING MANUAL

Version: 01122005

CNR-2LM-6 M Table of Contents

Section 1: First Things To Know About The CNR-2

How to Use this Manual

The CNR-LM-6M Operations Manual is a step-by-step guide containing the procedures needed to work with the CNR-LM-6M System.

The CNR-2LM System Series of samplers implement the most advanced technology available in the industry. It is recommended that the technicians working with the CNR-2LM Systems study the manual prior to initiating work on the system for the first time.

Typographic Conventions

To aide in readability, this manual uses several typographic conventions. References to illustrations, photographs, and other related content will appear in *italicized text* along with the location of where to find the item in the manual. Digital versions of the manual, available in Adobe Acrobat™ PDF format, will be highlighted further in *blue italic text* indicating the copy retains a hyperlink to the referenced item.

Measurement units are listed in italic parenthesis text following their US standard equivalent. As an example, for defining a distance, 15' *(4.5 meters)*, is how the text will appear throughout the manual.

Items that require action, for example the pressing of a key for programming the controller, will feature the action item in sentence case **Bold Text** followed in normal text by the item such as, the **Up Arrow** key or **Main Power** switch.

Getting Help

This manual provides solutions to typical questions about the CNR-LM-6 system. If the answer can not be found within this manual, contact YZ Systems at:

T: 1.936.788.5593
T: 1.800.653.9435
F: 1.936.788.5720
Em: Service@yzhq.com

When calling, have this manual close at hand. Whether calling or writing, please include in your communique the following information:

- The serial number of the CNR-2LM System and the version number of this manual. The serial number is located on the inside of the enclosure door. The version number of this manual is located at the bottom of each page.

- A description of the problem and, if applicable the actions of the technical personnel when the problem occurred.

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SECTION 1: FIRST THINGS TO KNOW ABOUT THE CNR-2

Operation Specifications

Maximum Output:	6.8 gallons/day *(25.3 liters/day)*
Maximum Operating Pressure:	1,800 psig *(124 Bar (g)*
Pump Displacement:	.25 - 1.8 cc/Stroke
Operating Temp Range:	0 to 140 degrees F. *(17°C to 60°C)*
Power Supply:	Battery Pack
Actuation Gas;	100 psi Instrument Quality Gas
Product Sample Input Signal:	Dry Contact Pulse

Note: *at temperatures below 32º F (0º C), conditioning of the actuation gas supply may be required. Where the actuation gas supply has a high water content and/or a low hydrocarbon dew point, additional actuation gas filtration or heating of the actuation gas supply may be necessary. Bottled nitrogen can also be used during cold operating conditions to avoid condensation in the actuation gas supply line. In addition, operation at extreme temperatures may affect system performance. To enhance the performance of this system, adequate heat should be provided to maintain an operating environment above 30° F (-1º C).*

Section 1: First Things To Know About The CNR-2

Theory of Operation

The YZ Crude & Refined Product Sampling System is designed to capture and combine thousands of individual samples into a representative, composite sample of the flowing pipeline.

Operation of the system centers around the CNR-2 Sample Pump and the Electronic Control System. All equipment, except the pump assembly is mounted on a stainless steel panel. These components are shown in the diagram on the following pages.

The system operates on a simple concept. There are two modes of operation.

Proportional-To Flow
The YZ Crude & Refined Product Sampling System operates on a simple concept. In the counter mode, the PIM-100 interfaces with magnetic pulses provided via the customers magnetic pickup on the flow meter. The Z-65 controller then receives a closed contact pulse from the PIM-100 after a predetermined count, the electronic control unit energizes the system solenoid valve. Energizing the solenoid valve in turn energizes the pneumatic relay. Energizing the pneumatic relay valve allows a pneumatic signal 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 into the product accumulator vessel. Once the solenoid valve is de-energized, the sample pump plunger returns to its normal position. This action allows a new sample into the pump. When the system receives the appropriate number of pulses, the cycle begins again.

Time Based
In this mode the Z-65 controller energize the solenoid valve, pneumatic relay, and pump actuation repeatedly based on a time value programed into the Z-65.

The purpose of the YZ Crude & Refined Product 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.

Once the sample period is complete, the YZ DuraSite, portable sample vessel, refer to page 20, should be exchanged with a fresh one. The system is then ready for a new sample period.

System Accessories

- **DuraSite**, portable DOT approved constant pressure sample vessels. Available in 150, 300, 500, 800, and 1000 cc sizes.
- **KK-1, KK-2, & KK-3:** carrying cases for DuraSites that meet DOT requirements for transporting portable sample vessels.
- 1/4" stainless steel tubing **Dielectric Isolator Union**. These should be installed in every tubing line that attaches the sampler to the pipeline in any manner. For example the supply gas, product connection to the system, and differential pressure switch connections, *(P/N A1-0182)*.

A complete line of sampling accessories ranging from sample probes to sample vessels is available through YZ. Please contact your local representative or YZ toll free at 800.344.5399. For technical support call 800.653.9435.

Notes

SECTION 2: SYSTEM INSTALLATION

Standard System Components

Standard primary components of the CNR-2LM include the following:

- **Sample Pump/Balance Valve,** *figure 1*. Probe mounted, pneumatically actuated CNR-2P Sample Pump.
- **System Enclosure**, *figure 2*. Five-Way Cross, Pneumatic Control Components, System Control Electronics.
- **System Vessel Support Rack,** *figure 2*. Stainless Steel support rack for customer's 2" DuraSite portable Sample Vessel.
- **Five-Way Cross,** *figure 2*. mounts the Pressure Gage, Relief Valve, Product Isolation, and Product Removal Valves.

figure 1

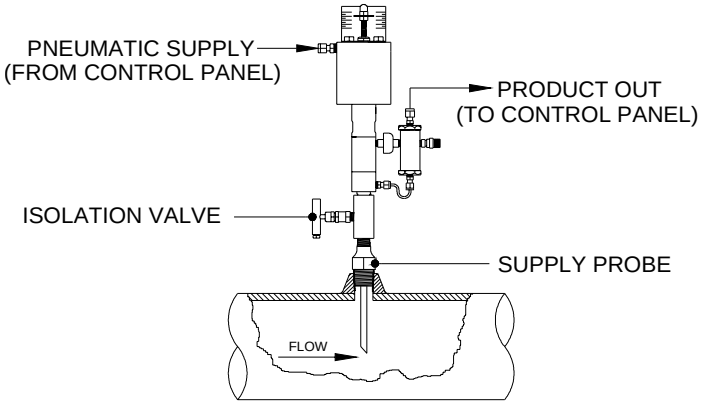
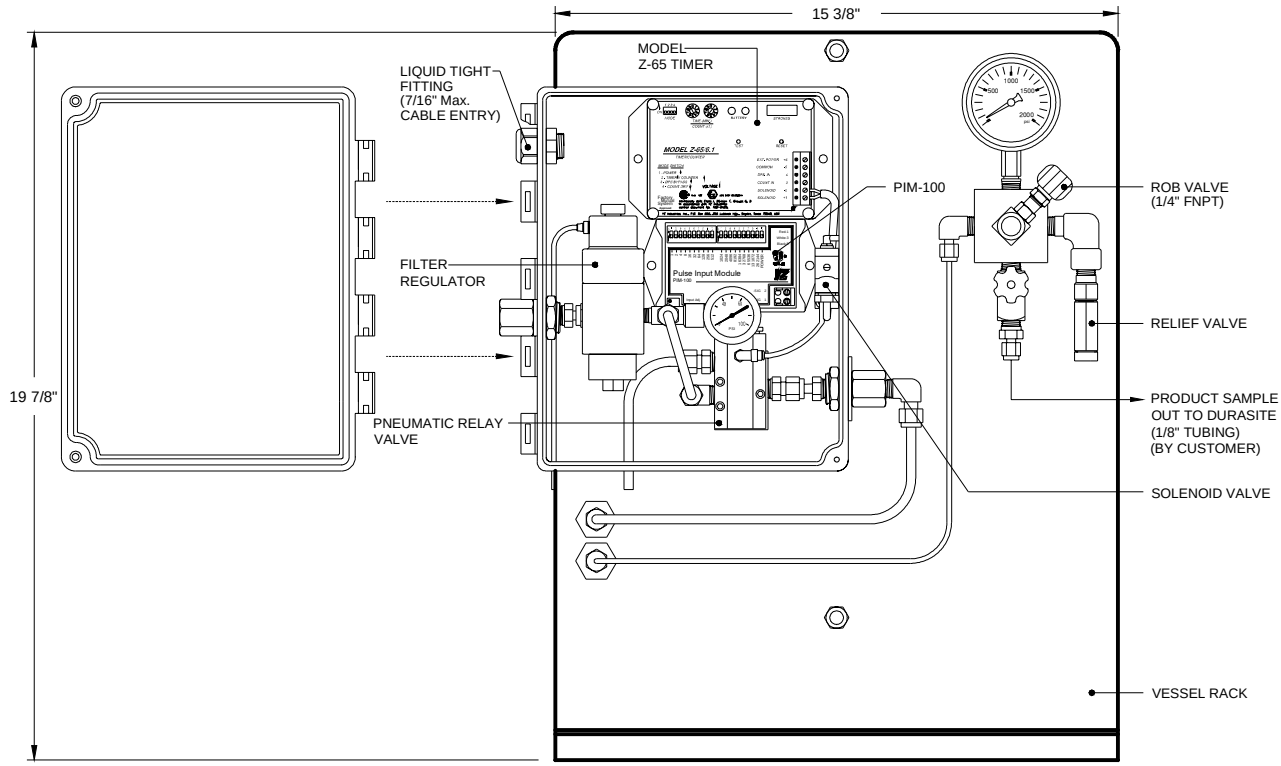


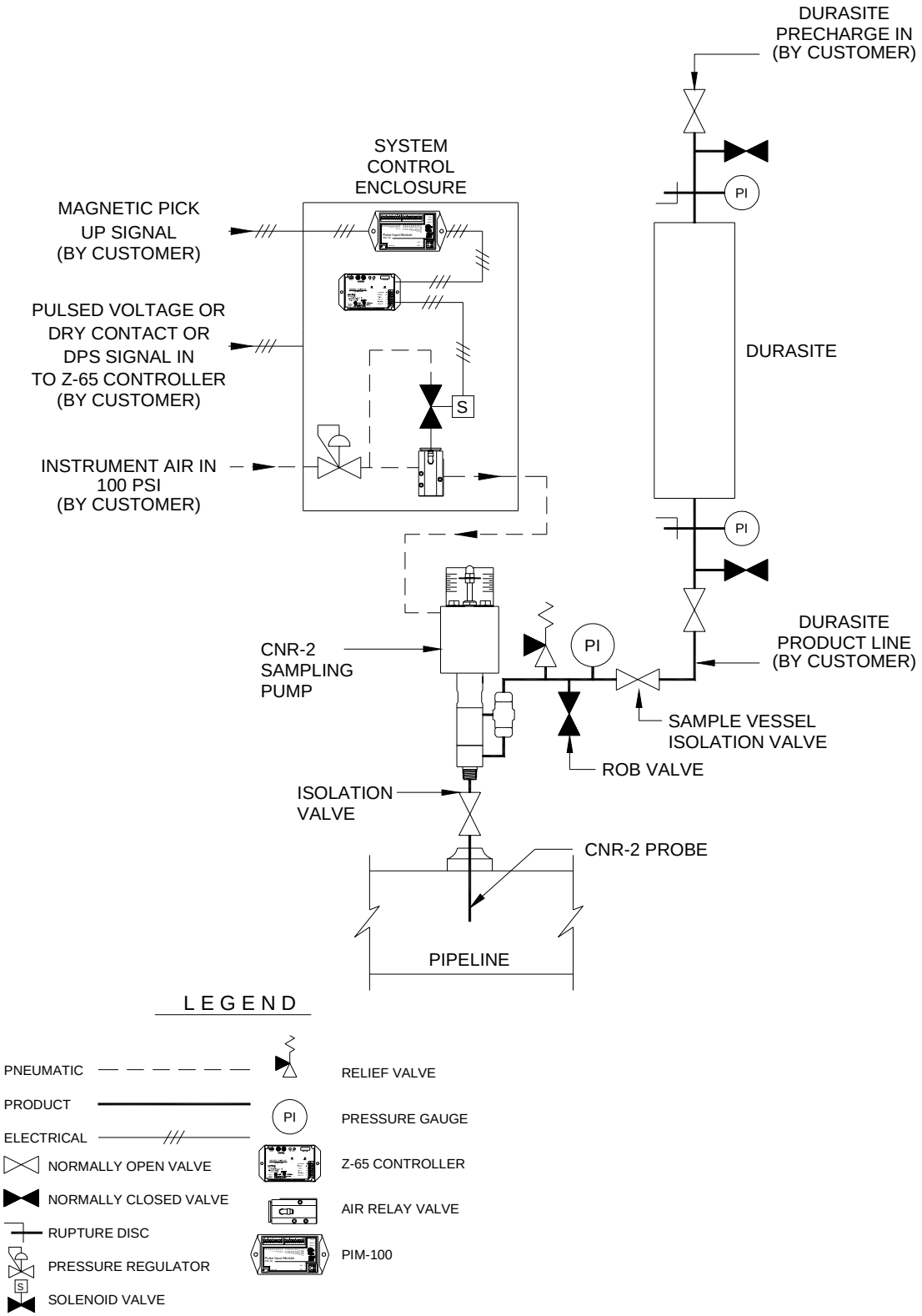
figure 2



FRONT VIEW

System Flow Schematic

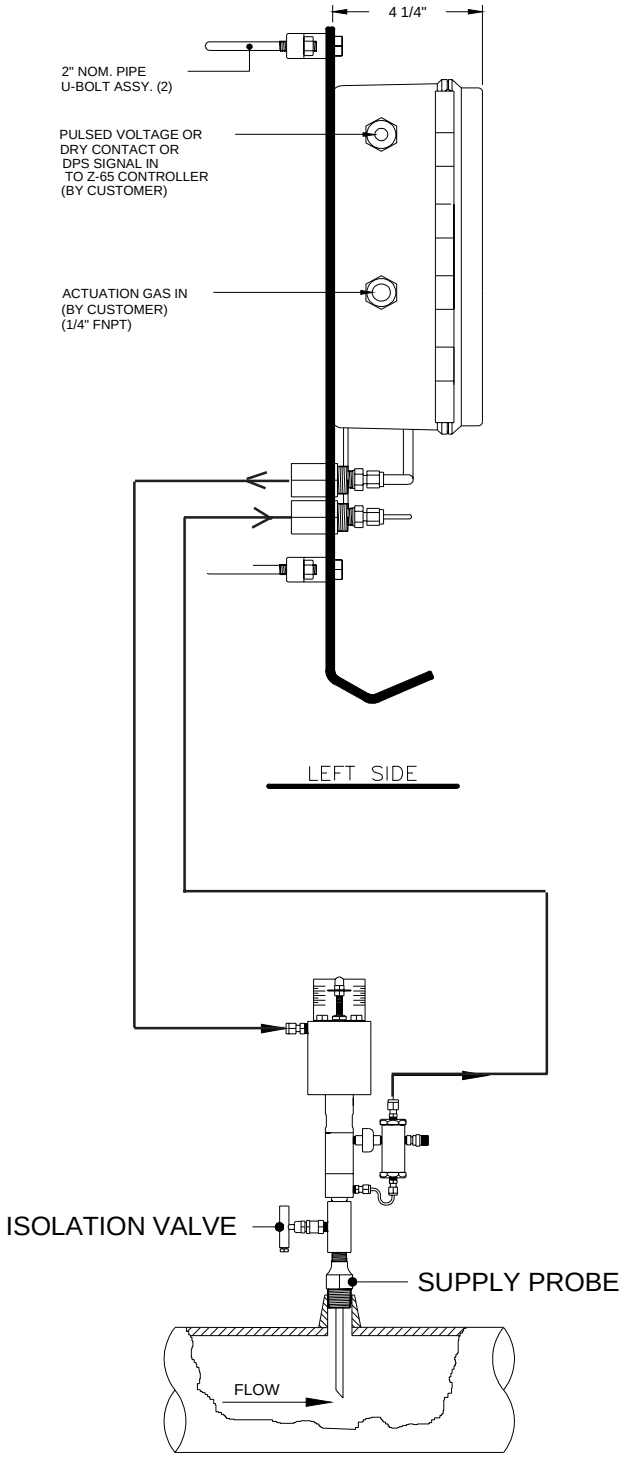
figure 3



SECTION 2: SYSTEM INSTALLATION

Standard System Mounting

figure 4



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 panel is provided for a continuous pneumatic supply (100 psi). The necessary regulator, solenoid valve, etc. is provided on the sampling panel.

Pump Installation
The CNR-2 sample pump is designed to be mounted directly to a threaded connection on the pipeline. The probe should be installed such that the tip of the probe will be located in the center 1/3 of the pipeline after installation. Next you must install 1/4" stainless steel tubing between the connection on the back of the panel marked for pump actuation, and the connection at the top of the pump. Finally connect 1/4" stainless steel tubing from the discharge connection of the pump balance valve to the connection on the back of the panel marked for product.

CAUTION:

Excessive tubing lengths should be avoided. Installation of the sample system enclosure should be as close to the point of sample removal and the sample pump as possible. If longer tubing lengths are required consult YZ Systems Technical Services at; 800.653.9435 or 1.936.788.5593.

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, refer to Appendix A, page33.

Notes

SECTION 3: SYSTEM CONTROL & ELECTRONICS

Overview

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 valve 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 and the jumper located under the faceplate.

In the 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 battery pack. You are also required to provide dry contacts at terminals 3 and 5 if you will be operating the unit in counter mode without the PIM-100 interface. All electronics are certified intrinsically safe and are rated for use in Class I, Division 1, Groups C and D hazardous locations, refer to electronic control document, on page 41.

SAFETY NOTES

- Always use extreme care when performing maintenance on Sampling Systems. Always take necessary measures to assure that electrical classification in the area is considered, before, and during all repairs, and that necessary steps are taken to maintain proper electrical procedures for the classification of the area.

Notes

SECTION 4: PROGRAMMING FOR PROPORTIONAL-TO-FLOW OPERATION

Setting Operator Input Parameters

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. This will provide 1 dry contact pulse to the Z-65 for each barrel of product.

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

Table 1

Switch S1		Switch S2	
Position	Divisor Value	Position	Divisor Value
1	1	1	1024
2	2	2	2048
3	4	3	4096
4	8	4	8192
5	16	5	16384
6	32	6	32768
7	64	7	65536
8	128	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.

SECTION 4: PROGRAMMING FOR PROPORTIONAL-TO-FLOW OPERATION

Setting Operator Input Parameters *figure 5*

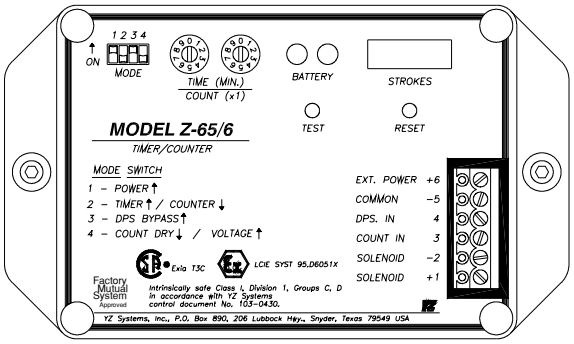
Z-65 Controller Set Up
Proportional To Flow Mode

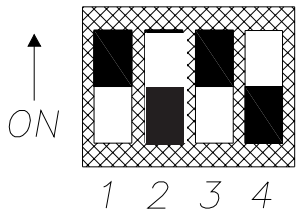
The Mode Switches should be set as follows:
#1 Power "On" ⬆

#2 Timer/Counter ⬇

#3 DPS Bypass ⬆

#4 Count Dry ⬇





SECTION 4: PROGRAMMING FOR PROPORTIONAL-TO-FLOW OPERATION

Setting Operator Input Parameters

Z-65 Controller Set Up

The two orange time/count totalization knobs should be set to achieve the desired number of input pulses to count before initiating a stroke of the pump. This number should be determined using the example on the following page.

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

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

Pulse/Metered Volume (from PIM-100) 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 (Z-65 Counter Setting)
Grabs Required

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

Round The Pulses/Grab calculation up to the next whole number and enter in the Z-65 counter setting. The two orange time/count totalization knobs should be set to achieve the desired number of input pulses to count before initiating a stroke of the pump.

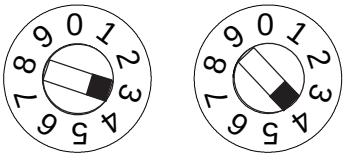
Verify switch positions & Press the TEST Button to begin sampling.

NOTE: The counter setting (34 pulses) corresponds to the dial setting shown for the Z65 model with the counter range setting in the factory position (jumper on the two left pins).

figure 6

Example

34 pulses



TIME (MIN.)

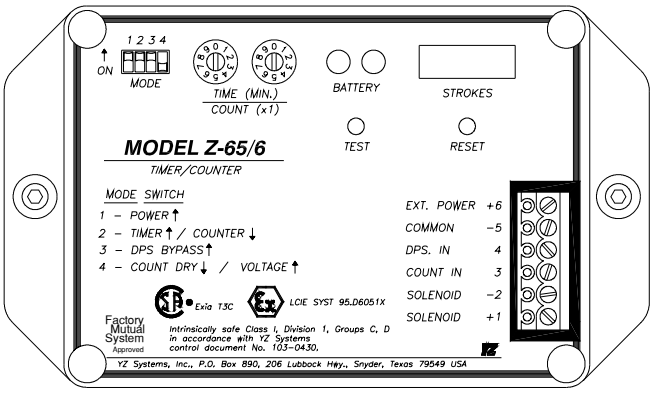
COUNT (x1)

Notes

SECTION 5: PROGRAMMING FOR PROPORTIONAL-TO-TIME OPERATION

Setting Operator Input Parameters *figure 7*

Z-65 Controller Set Up
Proportional To Time Mode



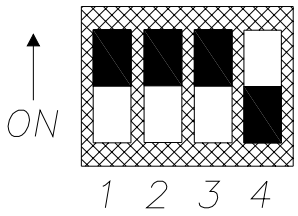
The Mode Switches should be set as follows

#1 Power "On" ↑

#2 Timer/Counter ↑

#3 DPS Bypass ↑

#4 Count Dry ↓



SECTION 5: PROGRAMMING FOR PROPORTIONAL-TO-TIME 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

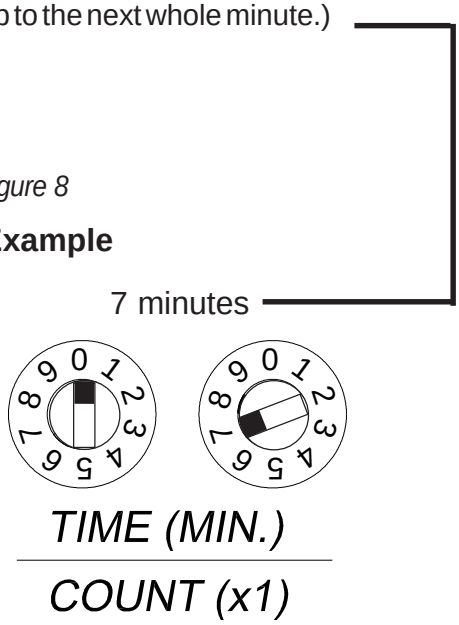
$$\frac{\text{400 cc (500cc DuraSite filled to 80\% Volume)}}{\text{.25cc Pump Displacement/Stroke}} = \textbf{1600 Pump Strokes Required/Sample Cycle}$$

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

The two orange time/count totalization knobs should be set to achieve the desired time between strokes to initiate a stroke of the pump.

figure 8

Example



NOTE: The time (7 minutes) above corresponds to the dial setting shown for the Z65 model with the timer range setting in the factory position (jumper on the two left pins).

SECTION 6: MECHANICAL SYSTEM

Overview

The CNR-2LM mechanical system, *figures 9 and 10* are composed of the sample pump, balance valve, and panel mounted controls. Individual components of the system are shown here and described in the following pages.

figure 9

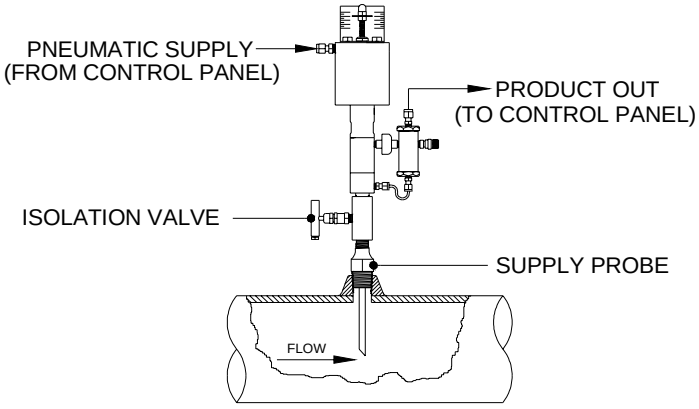
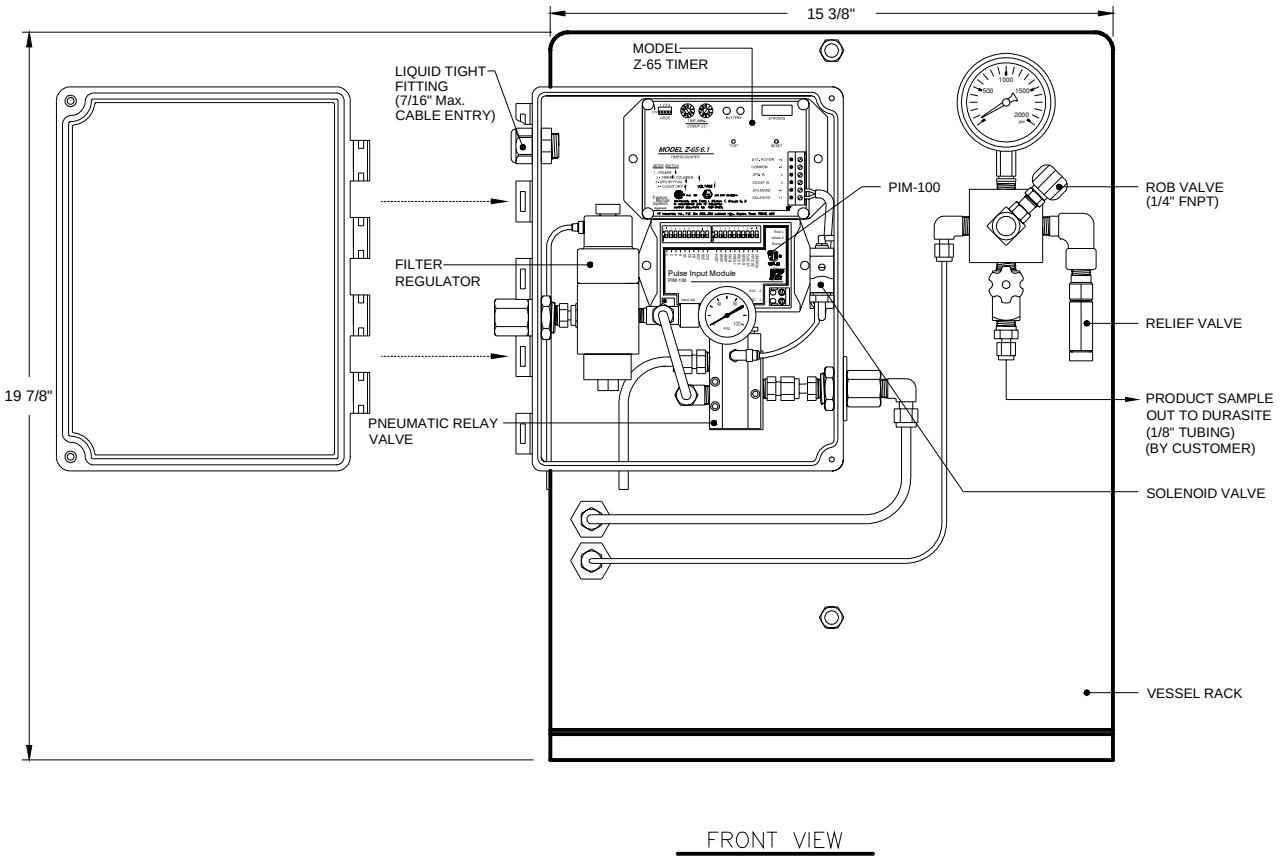


figure 10



SECTION 6: MECHANICAL SYSTEM

CNR-2P Sample Pump & Balance Valve

The CNR-2P Sample Pump, refer to Appendix A, page 33, 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 system electronic control discussed in Section 4, page 11.

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 check 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, refer to Appendix A, page 34, 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 DuraSite portable sample 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 DuraSite portable sample vessel, precharge pressure is greater than the pipeline pressure, the balance valve dart and seat are pushed apart by the product pressure in the DuraSite portable sample 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 DuraSite portable sample 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 DuraSite portable sample 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.

Filter Regulator

The YZ stainless steel Filter Regulator, refer to Appendix A, page 37, is capable of taking input pressures of up to 1500 psi, and regulating to a discharge pressure of as low as 20 psi. Most typical installations will need a 30 psi discharge pressure setting. A debris filter is built into the base of the filter regulator to assist in providing a clean supply of actuation gas to your low powered solenoid, and pneumatic relay valve. This gas is ultimately used to provide the pneumatic actuation of the Sample Pump.

Pneumatic Relay

The YZ pneumatic relay, refer to Appendix A, page 39, works in conjunction with the low powered solenoid to provide the pneumatic actuation of the Sample Pump. The very low power available from the controller in the intrinsically safe electrical environment, restricts the size of solenoid that may be operated. The low powered solenoid provides a very low volume of gas, which is not capable of stroking the sample pump, but works well as a pneumatic trigger for the pneumatic relay. The pneumatic relay then allows the pump to receive sufficient gas volume in a very short period of time to allow the pump to make a complete stroke.

SECTION 6: MECHANICAL SYSTEM

5-Way Cross

The Five-way Cross Assembly, refer to Appendix A, page 35, is located on the front of the panel 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 6: MECHANICAL SYSTEM

DuraSite Portable Sample Vessel

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.

STEP 2: DIRECT CONNECTION TO SAMPLER.
2a: Connect the sampler discharge port to the product inlet port to the DuraSite using 1/8" stainless steel tubing.

2b: 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.)

2c: 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.

2d: Close purge valves and begin sample cycle.

2e: 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 3: (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 4: 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 5: 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 7: SYSTEM OPERATION

Preparing The System for Operation

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/Balance Valve, refer to Apendix A, page 33, 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 side of the CNR-2 Sample Pump/ Balance Valve assembly. 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, refer to Apendix A, page 35. 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.

Sample Vessel Connection
Connect a constant pressure portable sample vessel (DuraSite) to the product sample to Durasite connection on the bottom of the 5-way Cross Assembly, refer to Apendix A, page 35 using a short section of 1/8" or 1/4" stainless steel tubing. The portable sample vessel must also be precharged to 100-150 psi above the vapor pressure of the product, and a pressure relief valve installed, on the pre-charge end of the DuraSite, refer to page 36. Open the DuraSite product valve, pre-charge valve, and the isolation valve on the bottom of the 5-way cross assembly.

Notes

SECTION 8: SYSTEM MAINTENANCE

Preventative Maintenance Schedule

A preventative maintenance program serves to anticipate maintenance issues prior to waiting until the system requires service. Like changing the oil & filters in an automobile, by choosing to service the various parts and operation in the Sampling System at regular intervals, the technician can perform the maintenance service when desired, rather than when required, such as in the middle of night.

The key is to perform maintenance before it is required. The preventative maintenance schedule implemented should consider the application of the sampler. Many of these considerations include: the weather environment; the condition of, the actuation gas, the product condition and quality, and the pump stroke frequency. All of these issues must be considered when establishing a preventative maintenance schedule.

Recommended Maintenance Schedule Monthly Inspection

1. Verify system pressures
2. Check for leaks

Annual Inspection

1. Rebuild pump
2. Clean and service the pneumatic relay valve
4. Test the relief valve and service, as needed
5. Test regulators and service, as needed
6. Clean and Service DuraSite Vessels
7. Test the Sampler System performance

Bi-Annual Inspection

1. Perform the annual inspection listed above
2. Replace solenoid

Recommended Spare Parts List

Part #	Description	Recommended Quantity
E3-2001	Z-65 Replacement Battery	1
D3-0142	Z-65/200 fuse replacement kit	1
A4-0001	3-way solenoid valve	1
D3-0154	CNR-2P pump seal replacement kit	1
D3-0137C	Balance Valve Repair Kit	1

Notes

SECTION 9: SYSTEM TROUBLESHOOTING

How to Use This Section

The recommendations contained in this section should be used as a preliminary information resource to remedy operational issues with the CNR-2LM Sampling System. It is important to read all of the definitions and notes prior to initiating work.

Each subsection contains a description of the indicators followed by a step-by-step trouble shooting procedure.

For Additional Help

Any issue that can not be resolved through the use of this reference, please contact YZ Technical Service at:

T: 1.800.653.9435
T: 1.936.788.5526, International Calls
F: 1.936.788.5720
Em: Service@yzhq.com

SAFETY NOTES

- Always use extreme care when performing maintenance on Sampling Systems. Always take necessary measures to assure that electrical classification in the area is considered, before, and during all repairs, and that necessary steps are taken to maintain proper electrical procedures for the classification of the area.

- Take special care when disconnecting any fitting, to assure that product and/or pressure will not be released when the connection is broken. This system may contain liquid and/or gas at high pressures.

Step-by-Step Resolution

Using a step-by-step method to resolve issues on the Sampling System will reduce maintenance time and assist in returning the system to service quicker.

The following represent the recommended chronology to resolve issues:

Resolve issues to the following order:

a. *Actuation Gas System*, *page 26*
b. *Controller Electrical Power*, *page 26*
c. *Controller Counter Mode*, *page 27*
d. *Controller Timer Mode*, *page 30*
e. *Pump*, *page 31*

SECTION 9: SYSTEM TROUBLESHOOTING

Actuation Gas System

The CNR-2P Sample Pump is a pneumatically actuated positive displacement pump. Pump performance is dependant on the controller, solenoid, pneumatic relay, actuation supply gas, and of course the pump itself. This section should be used to troubleshoot sampler performance, when the Sample Pump will not actuate.

Actuation Gas Troubleshooting Steps

1. Verify the supply gas valves, and regulators supplying gas to the sampler system are properly functioning, and adjusted.

2. Disconnect the Pneumatic Supply connection at the top of the Sample Pump.

    a. There should NOT be any gas pressure present. Gas pressure should be present for ONLY seconds each time a sample pulse is generated by the Z-65 controller.

    b. Initiate a sample by pressing the **TEST** button on the Z-65 controller, and observe to see if a burst of gas is expelled from the connection loosened in step 2 above.

    c. If a burst of gas is expelled from the connection loosened in step 2, the actuation system to the pump is functioning properly. Reconnect the Pneumatic Supply connection to the top of the Sample Pump. Proceed to pump performance troubleshooting, if the problem seems to be with your pump, or proceed to step 3 to troubleshoot the Solenoid, or Pneumatic Relay

3. If a burst of gas was not detected in step 2c above, you should now begin troubleshooting the solenoid and pneumatic relay.

    a. Disconnect the plastic hose from the Filter/Regulator to the solenoid and verify that gas is constantly present at that connection. If not the Filter/Regulator should be adjusted, refer to page 18, or repaired.

    b. Once gas is continually present as indicated in Step 3a, re-connect the plastic hose, and then remove the plastic hose that goes from the solenoid to the Pneumatic Relay.

    c. Gas should only be present at this connection for a second each time a sample is called for. Initiate a sample by pressing the **TEST** button on the Z-65 controller, and observe to see if a burst of gas is expelled from this connection.

    d. If no gas comes from the solenoid during the test, the solenoid should be replaced, and/or the controller tested.

    e. Once the solenoid functions properly, re-connect the plastic hose to the Pneumatic Relay, and repeat Actuation Test 2. If no there still is no burst of gas to the Pump, the Pneumatic Relay should be cleaned, and lubricated.

Z-65 Controller

IMPORTANT NOTE:

All electronics are rated for use in Class I, Division 1, Groups C and D hazardous locations.

The power supply for the controller comes from a Battery Pack located under the cover of the Z-65 Controller Assembly, refer to page 40. There are also two fuses that are a part of the Z-65 electrical power circuit. Often electrical storms, or other electrical surges that occur at the sampler site may cause damage to the battery pack, and/or fuses. The typical symptoms to lead a technician to this step would be that the sample pump is not being actuated when the Actuation System checks out O.K., the Z-65 LCD display is blank, the red Battery Light comes on intermittently when the **TEST** button is pressed, or neither light comes on when the **TEST** button is pressed.

SECTION 9: SYSTEM TROUBLESHOOTING

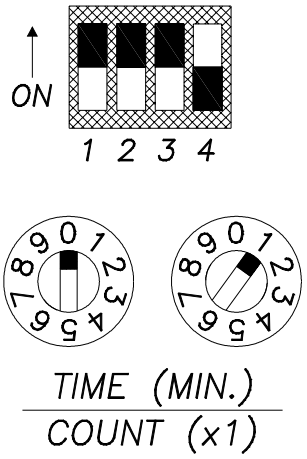
Controller Electrical Power Troubleshooting Steps

1. Battery Test:

   a. Set the mode switches as follows: Mode Switch Position 1, 2 and 3 **ON.**

   b. Set the time switches to the **01 position.** This will set the solenoid output rate to one actuation every one minute (based on the factory set time range for the Z-65 model).

figure 11



NOTE:

- *Time switches must **not** be in 00 position to test the battery.*
- *The solenoid must be connected to test the battery condition. **Battery condition cannot be tested with a volt meter.***

   c. Depress the test switch to test the battery. A green LED will illuminate if the battery is good and a red LED will illuminate if the battery is low.

2. Replacing a Depleted Battery:

   a. Remove the four thumb screws, cover plate and orange terminal connector.

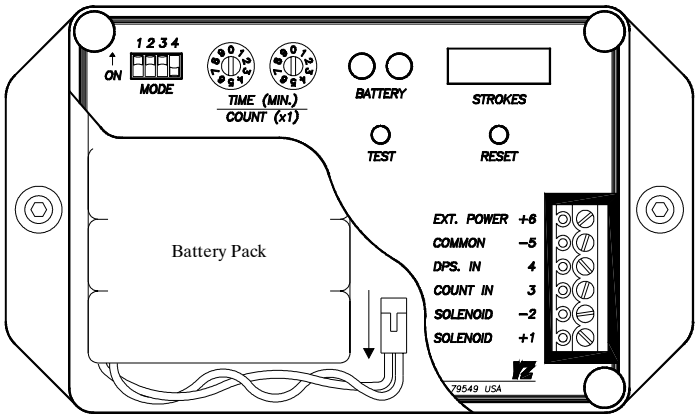
   b. The battery is located in the lower left hand corner of the Z-65 controller assembly.

   c. Unclip the battery plug from the battery receptacle.

   d. Replace the depleted battery with a fresh battery pack (part No. E3-2001).

   e. Return the mode switches to their original positions.

figure 12



NOTE:

- *Follow the illustration to assure proper battery wire placement in the Z-65 enclosure.*
- Send your depleted battery to:
  YZ Systems, Inc.
  206 Lubbock Hwy.
  Snyder, TX 79549 USA

SECTION 9: SYSTEM TROUBLESHOOTING

Controller Counter Mode Troubleshooting Steps

1. Input Pulse Test

   a. Set the mode switches as follows:
   Position 1 and 3 **ON**, 2 and 4 **OFF**.

   b. Set the count switches to 00 to enter the diagnostic mode. This mode enables the user to determine if the proper input pulses are being received at the count input (ter. #3).

figure 13

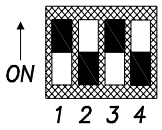
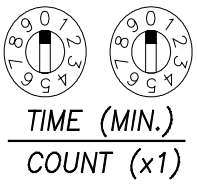
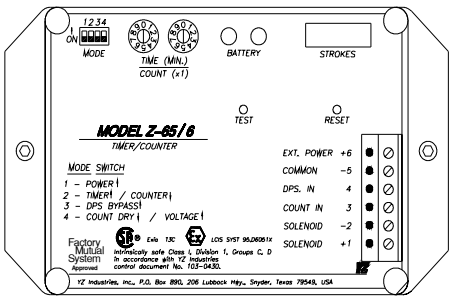


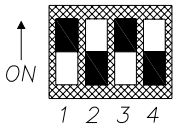
figure 14



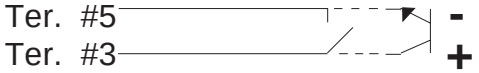


2. Dry Contact Input: mode switch 4 should be in the off position. Depress the test switch and hold. A red LED should illuminate. When the dry contact input is received at the counter input (ter. #3) the green LED will turn on and off and the red LED will illuminate again. This will normally occur very quickly and give the appearance that the green LED blinks on when the pulse input is received and removed.

figure 15

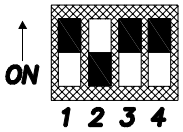


dry contact
open collector
(20 mSec duration min.)



3. Voltage Pulse Input: move mode switch 4 to the on position. Depress the test switch and hold. A green LED should illuminate. When the voltage pulse input is received at the count input (ter. #3) the red LED will turn on and off and the green LED will illuminate again. This will normally occur very quickly and give the appearance that the red LED blinks on when the pulse input is received and removed.

figure 16



voltage pulse
5-24 VDC
(20 mSec duration min.)

SECTION 9: SYSTEM TROUBLESHOOTING

4. Mechanical Operation Test:
   a. Set the mode switches as follows:
      Positions 1, 2 and 3 **ON**.
      Position 4 **OFF.**

   b. Set the time switches to 00 to enter the diagnostic mode. This mode enables the user to increase the solenoid output rate to one pulse every two seconds.

5. LCD Stroke Indicator Test Mode:
   a. To test the stroke counter, set the mode switches as follows:
      Positions 1, 2 and 3 **ON**.
      Position 4 **OFF**.

   b. Set the time switches to 00.

   c. Unscrew the thumbscrews and remove the six position terminal strip and cover. This will expose the battery pack and the three position configuration jumper (located in the lower right corner of the Z-65 controller assembly).

   d. Set the configuration jumper to the far right position marked stroke indicator test.

   e. This will cause all six digits to become active on the stroke counter. Depress the reset. The stroke counter should increment 000000, 111111, etc., up to 999999 each time the solenoid fires. When the counter display reads 999999, the test is complete.

NOTE:

- When the test is complete, move the jumper back to the factory position (far left position)

figure 17

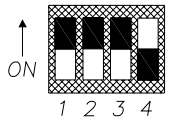
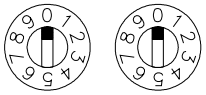
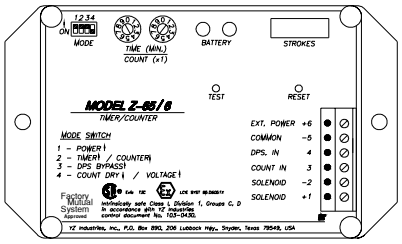


figure 18





Mechanical Operation Test

figure 19

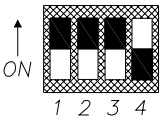
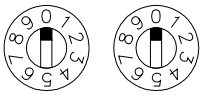


figure 20



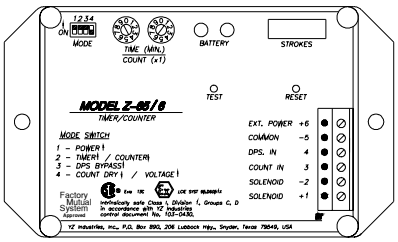
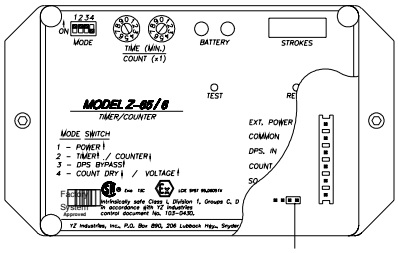
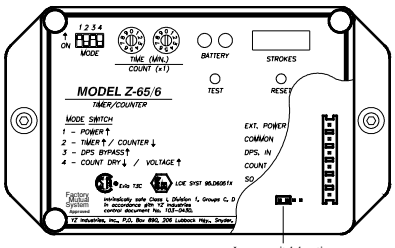


figure 21



12.3 d - Jumper switch location

figure 22



Jumper switch location
for 1 - 99 counts (xx)
factory positioned

SECTION 9: SYSTEM TROUBLESHOOTING

Controller Timer Mode Troubleshooting Steps

6. Timer Range Setting
   There are two Z-65 models: the Z-65/6.1 and Z-65/6.03. Each Z-65 timer has two ranges for the timer setting dials.

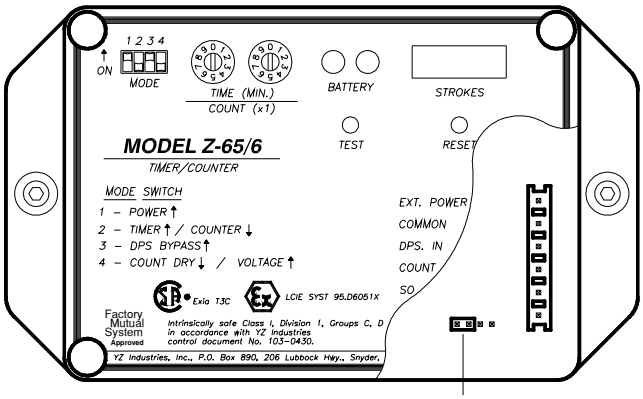
   a. Z-65/6.1 Range Setting:
      xx minutes: set the configuration jumper to the far left position (factory setting).
      x.x minutes: set the configuration jumper to the center position.

Note: To obtain maximum battery life, choose the longest solenoid stroke rate possible.

   b. Z-65/6.03 Range Setting:
      x.x minutes: set the configuration jumper to the far left position (factory setting).
      .xx minutes: set the configuration jumper to the center position.

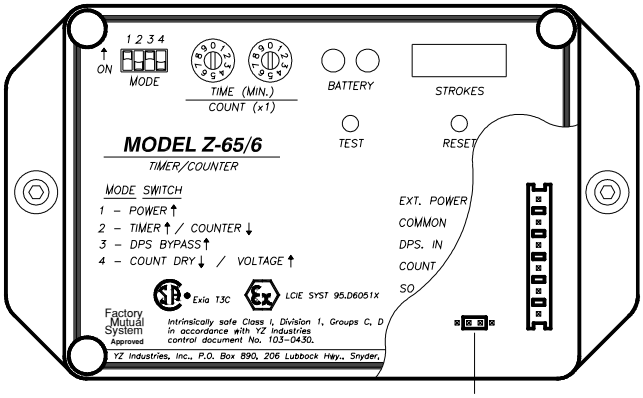
Note: To obtain maximum battery life, choose the longest solenoid stroke rate possible.

figure 23



Jumper switch location
for .1 - 9.9 counts (x.x)
factory positioned

figure 24



Jumper switch location
for .03 - .99 counts (.xx)

SECTION 9: SYSTEM TROUBLESHOOTING

Pump Performance

There are many factors that affect pump performance. Some are within the pump, while others are outside factors that affect pump performance.

Pump Performance Troubleshooting Steps

1. Actual performance of the Actuation Gas, and Electrical Power issues should have already been dealt with, If not , perform those troubleshooting steps before proceeding to step 2.

2. Close the isolation valve located on the bottom of the Five-way Cross Assembly. Stroke the sample pump while observing the pressure reading on the Five-way Cross Assembly Gauge. The system pressure should steadily build to 1800 psi . 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. Completion of this test verifies the pump performance is O.K.

3. The next step, if the pump did not pass the test in step 2, is to verify that the pump is fully liquid packed with liquid product to be pumped. The Sample Pump must be purged of all air in the sample chamber, before it can pump liquid product. 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 properly, it will not function properly.

    a. Open the purge valve located on the left side of the CNR-2 sample pump.

    b. Next open the product supply valve to allow pipeline product to purge the air within the pump.

    c. Once product begins exiting the purge valve, close the purge valve. The sample pump is now ready to begin operation. Perform pump test #2 again. If your product is not consistently in a single phase liquid state the pump will vapor lock again, and repriming will be necessary, repeatedly, till the phase condition of the product is resolved.

4. If during the pump troubleshooting step 2, you observed the pressure on the Five-way Cross Assembly Gauge jumping from pipeline pressure to a higher pressure, during the pump stroke, but immediately returning to pipeline pressure after the stroke, the Balance Valve Assembly should be rebuilt using a YZ Repair Kit P/N D3-0137C.

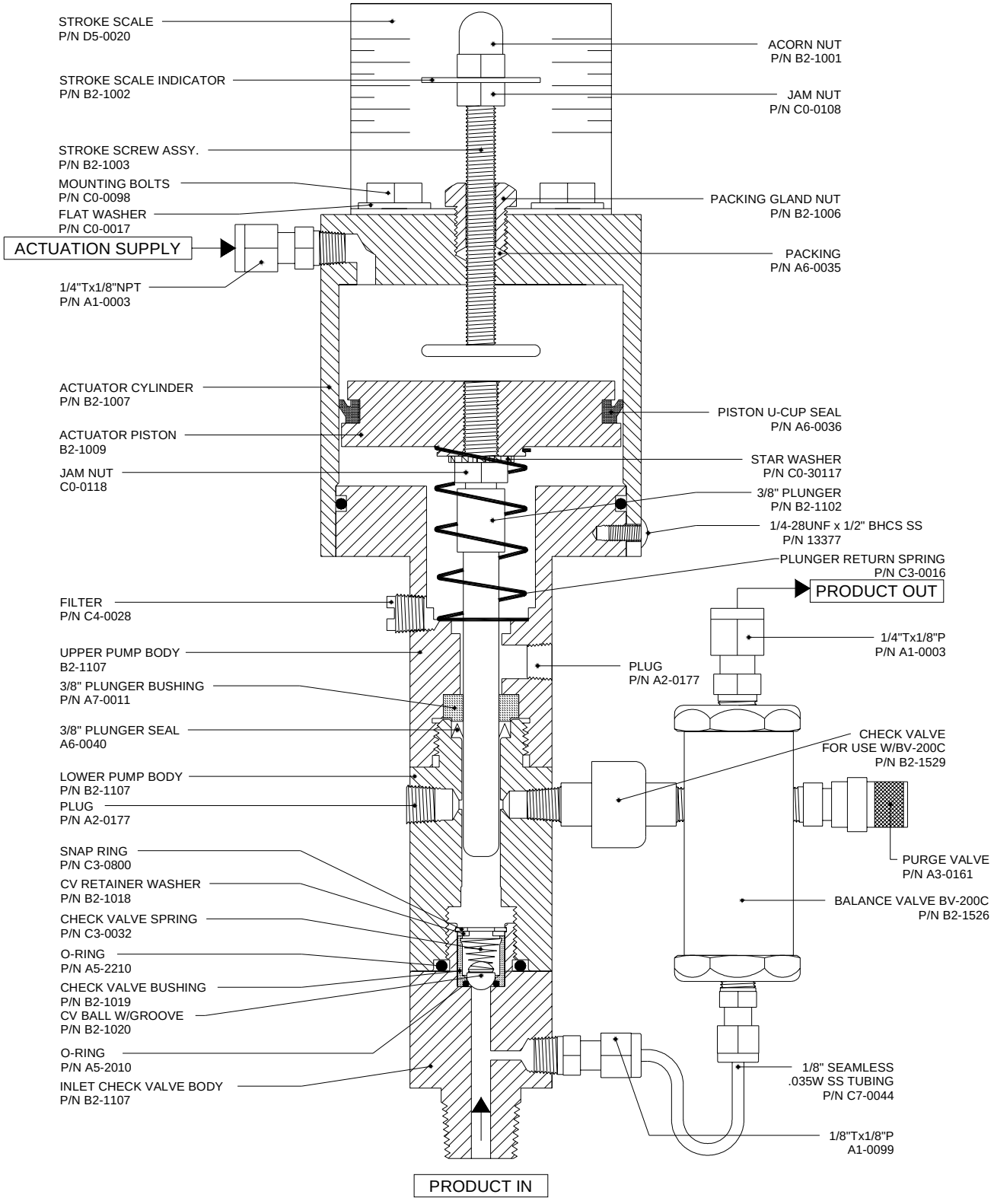
5. If during the pump troubleshooting step 2, you observed the pressure on the Five-way Cross Assembly Gauge build steadily to pipeline pressure, then stop building at pipeline pressure, the Sample Pump inlet check is not holding. Typically installing a YZ Repair Kit P/N D3-0154, will resolve this situation.

Notes

APPENDIX A: ILLUSTRATIONS

CNR-2P Sample Pump, Assembled

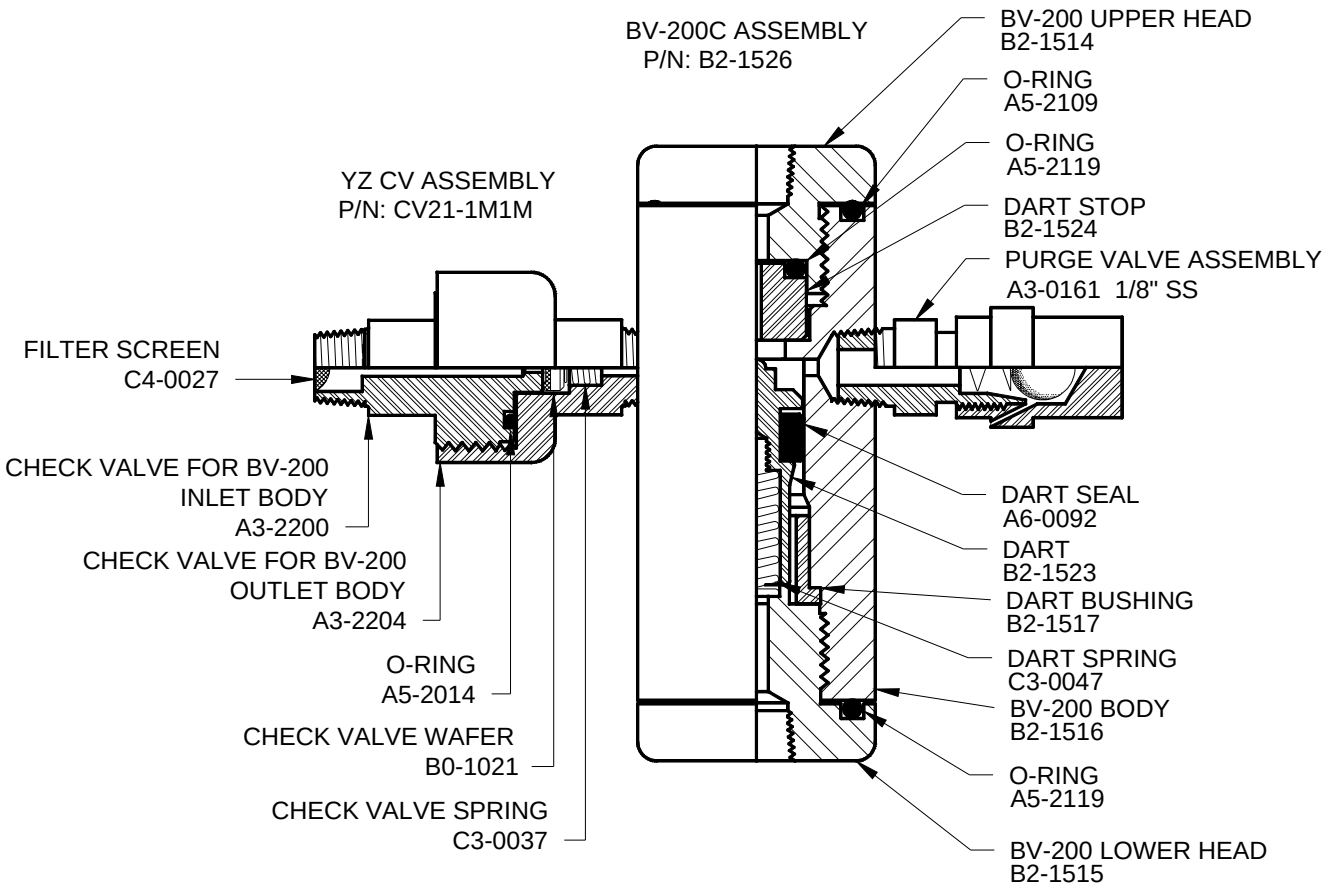
Figure 25



APPENDIX A: ILLUSTRATIONS

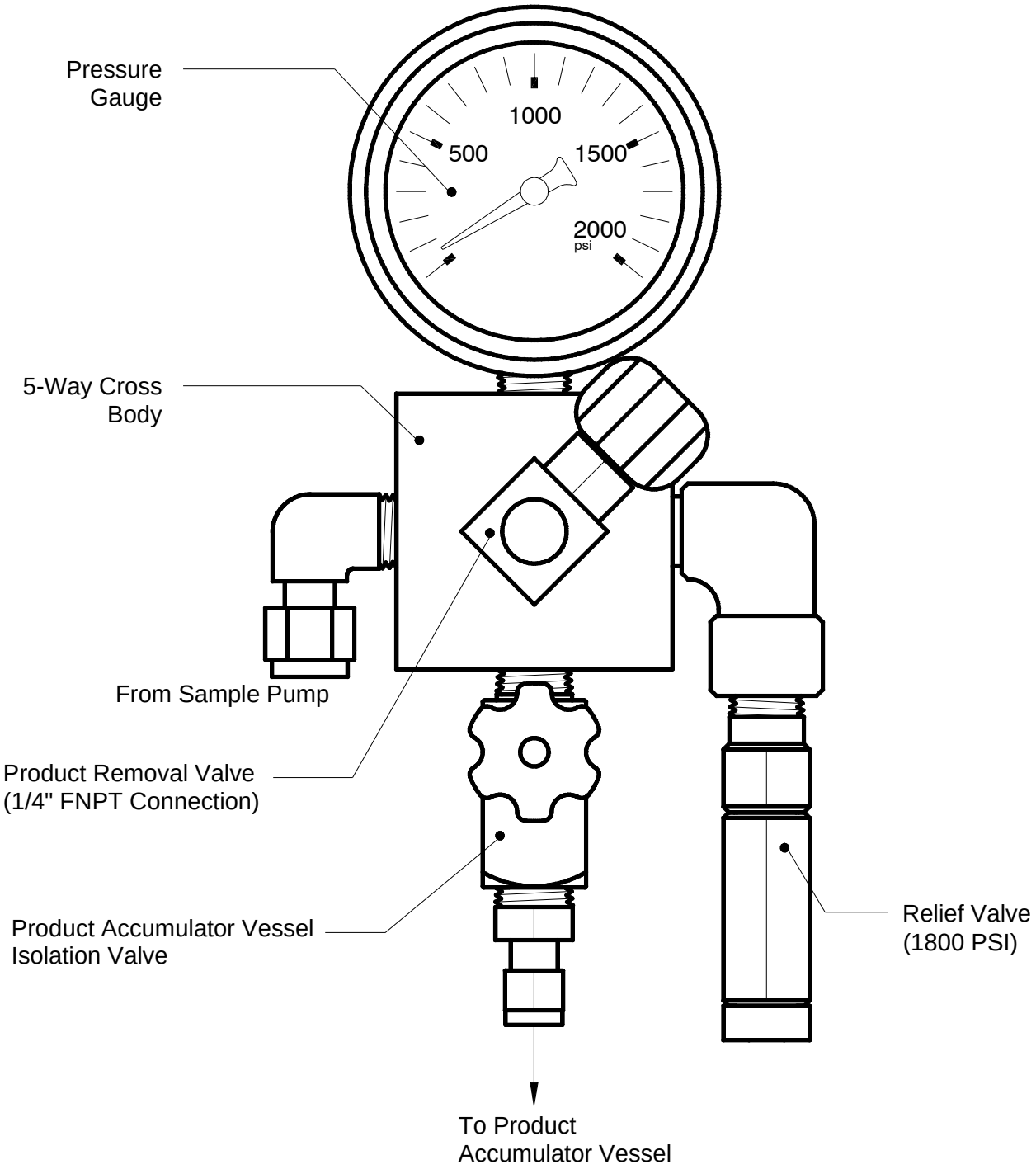
CNR-2P Balance Valve,

Figure 26



5-Way Cross Assembly,

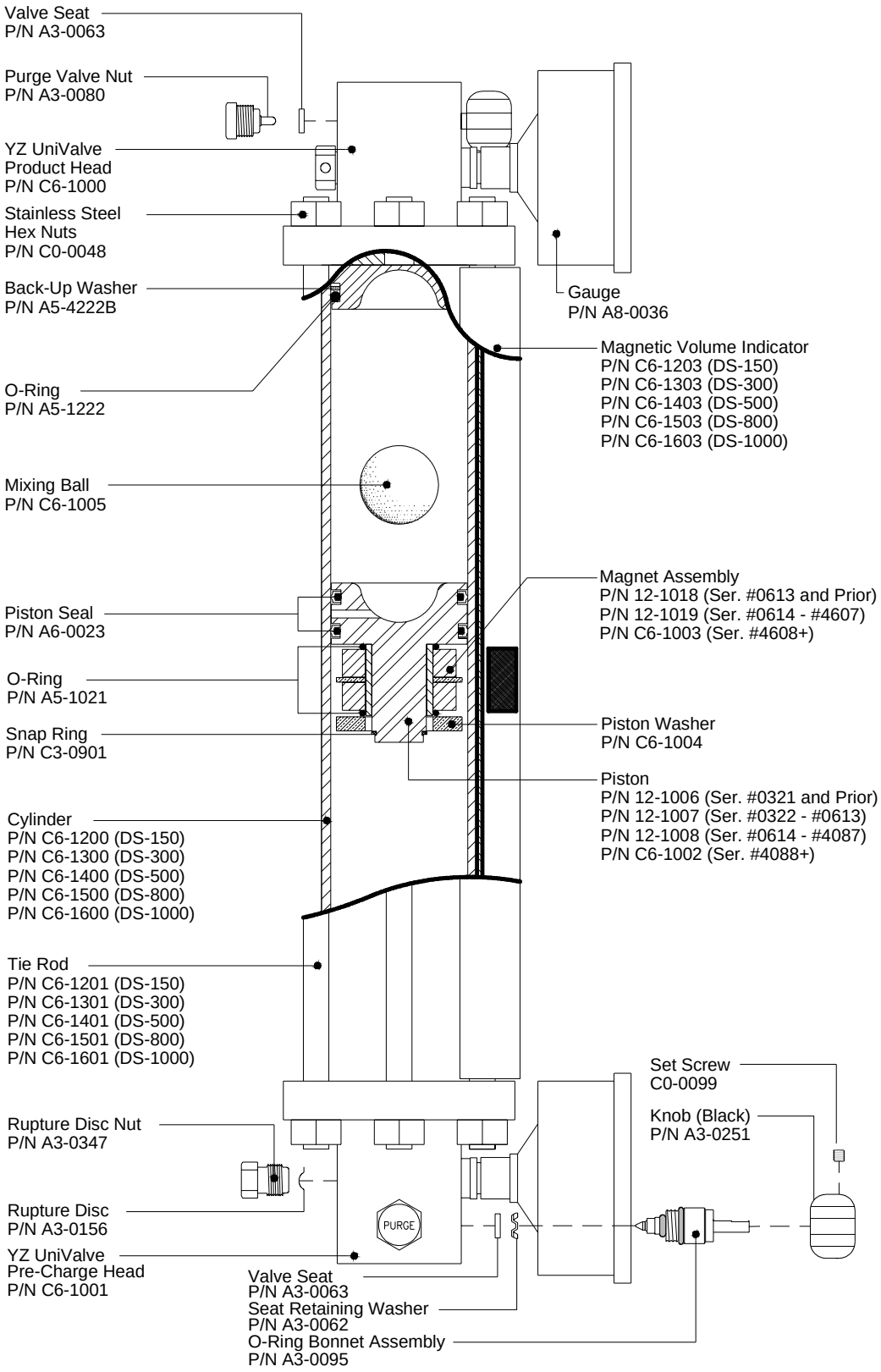
Figure 27



APPENDIX A: ILLUSTRATIONS

DuraSite,

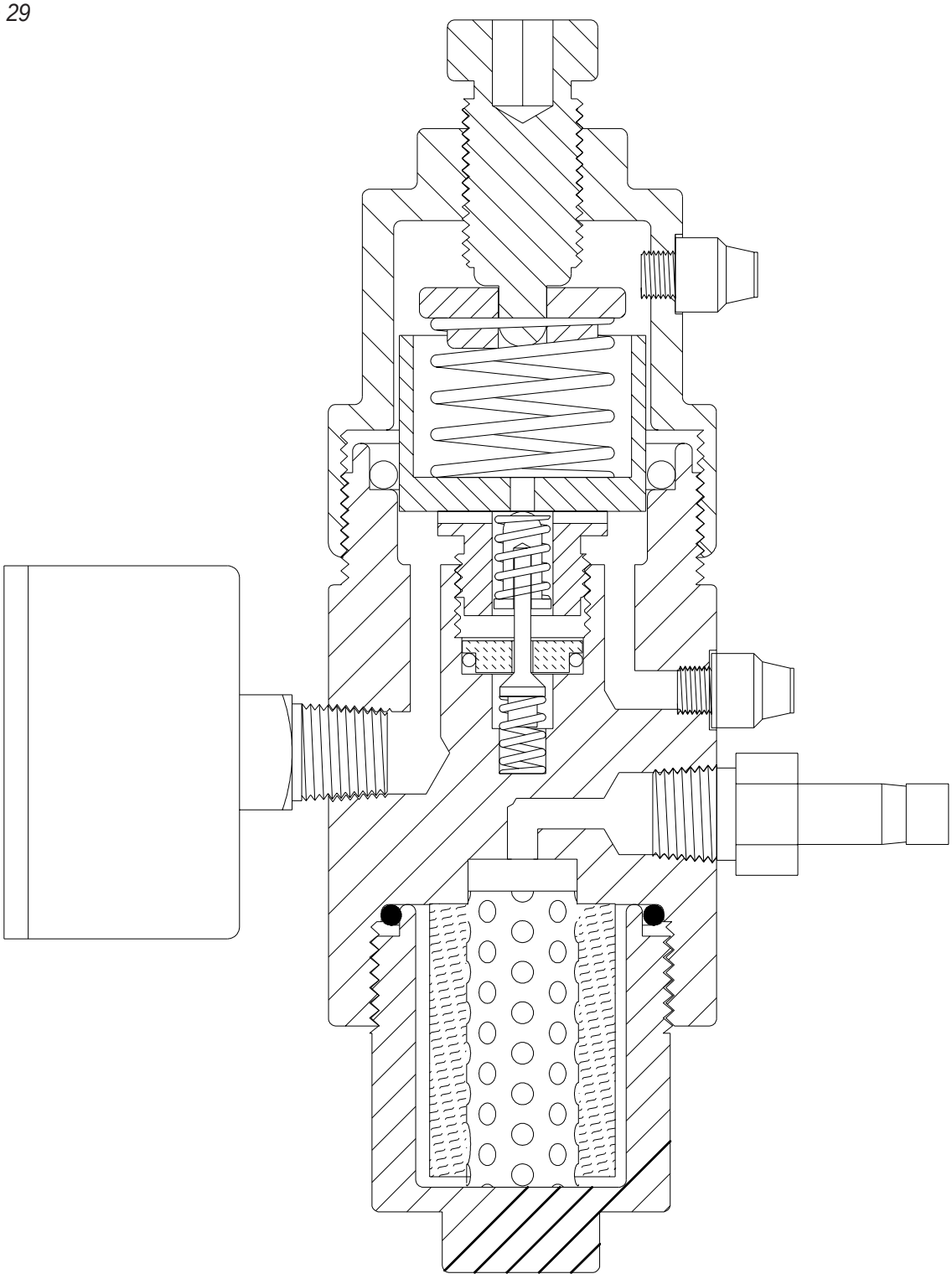
Figure 2



APPENDIX A: ILLUSTRATIONS

Filter Regulator, Assembled

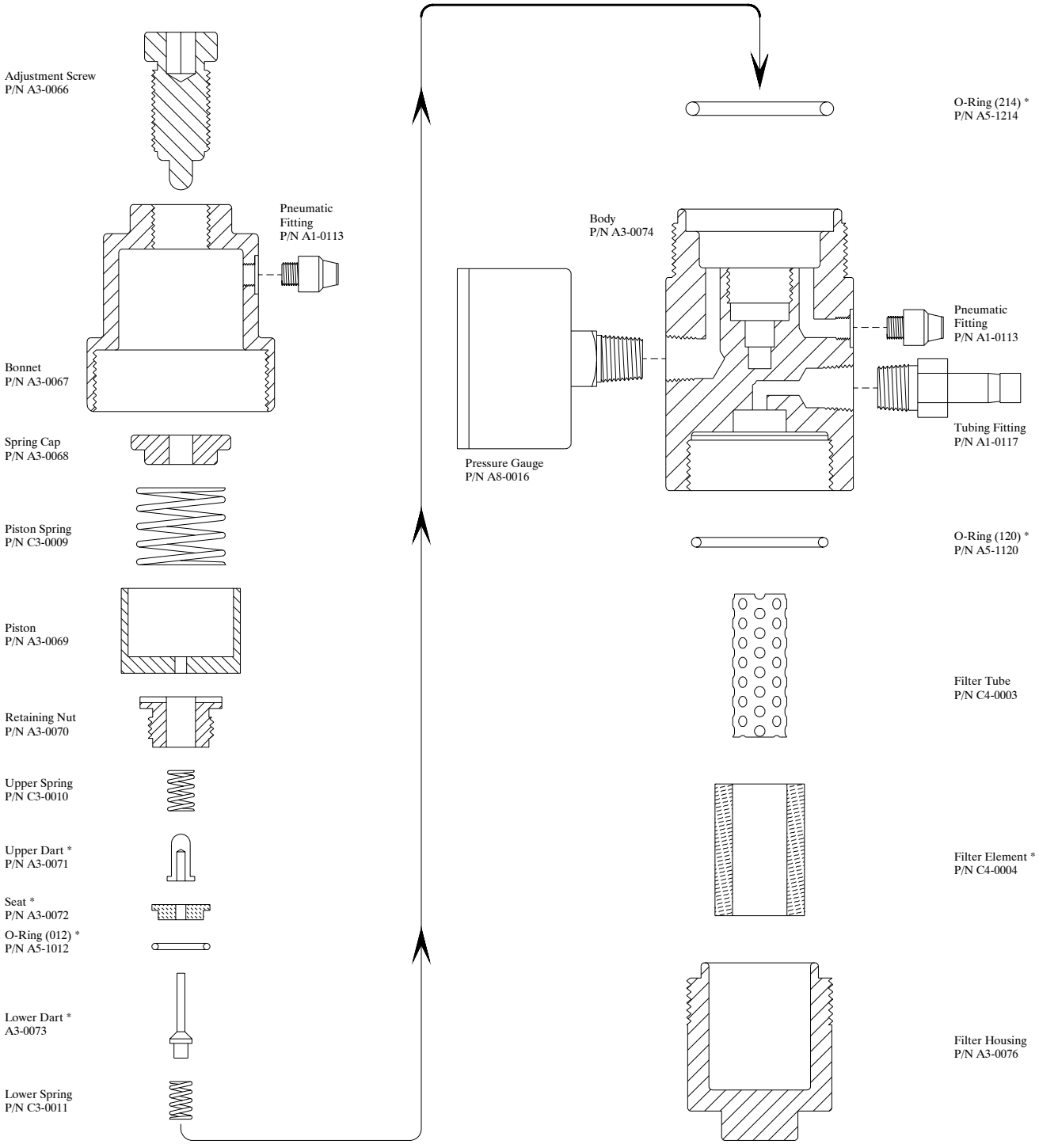
Figure 29



APPENDIX A: ILLUSTRATIONS

Filter Regulator, Exploded View

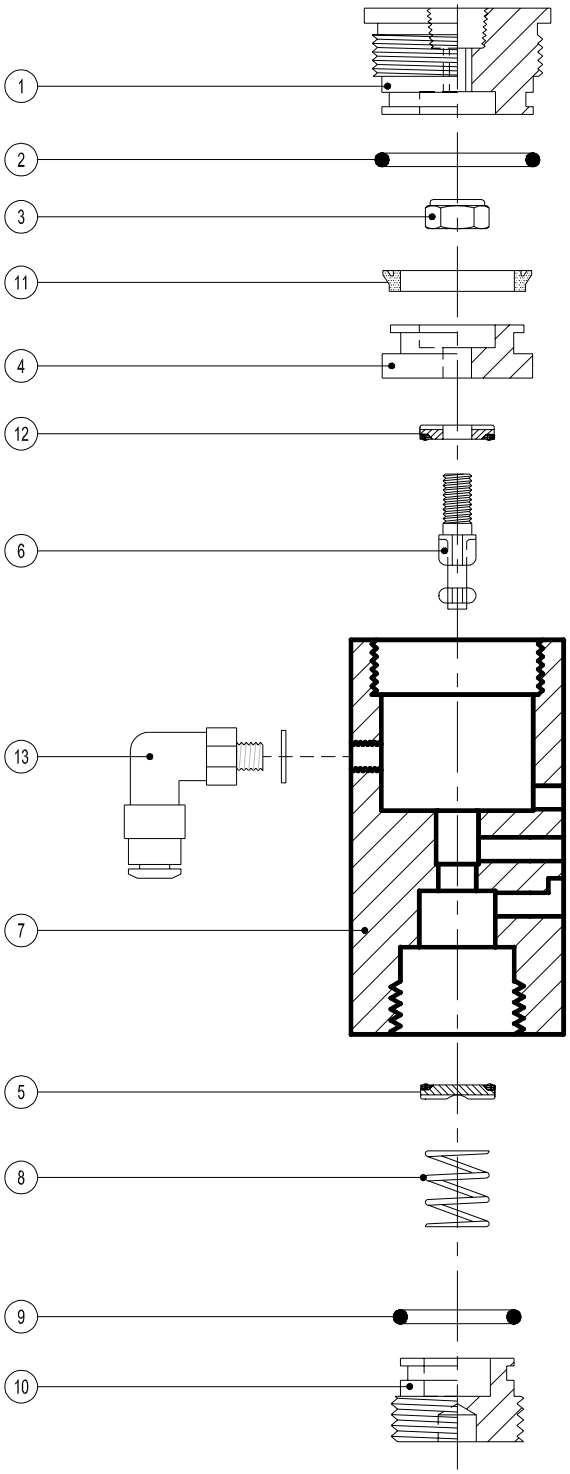
Figure 30



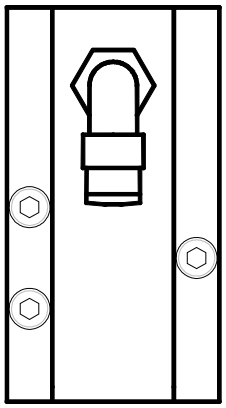
* Filter/Regulator Repair Kit P/N D3-0003

Pneumatic Relay,

Figure 31



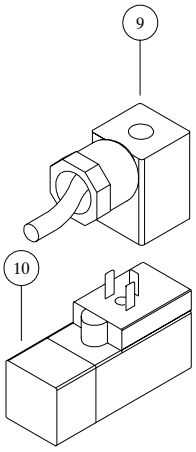
BILL OF MATERIALS			
REF.	PART NO.	DESCRIPTION	QTY.
1	B0-0111	PNEUMATIC RELAY TOP PLUG	1
2	A5-2020	OR -020 NITRILE	1
3	C0-0350	10-32 HEX NY-LOCK NUT	1
4	B0-0112	PNEUMATIC RELAY PISTON	1
5	B0-0074	CV WAFER - 1/2" STD.	1
6	A6-0113	PNEUMATIC RELAY PUSHROD	1
7	A3-0291	PNEUMATIC RELAY BODY	1
8	C3-0048	FV-3 SPRING	1
9	A5-2016	OR -016 NITRILE	1
10	B0-0113	PNEUMATIC RELAY BOTTOM PLUG	1
11	A6-0099	'K' SEAL, 1" #KP-125-01.000 C-44 ACT.	1
12	B0-0115	NJEX RELAY VALVE WAFER	1
13	A1-0236	MELBOW 5/32T x #10-32	1



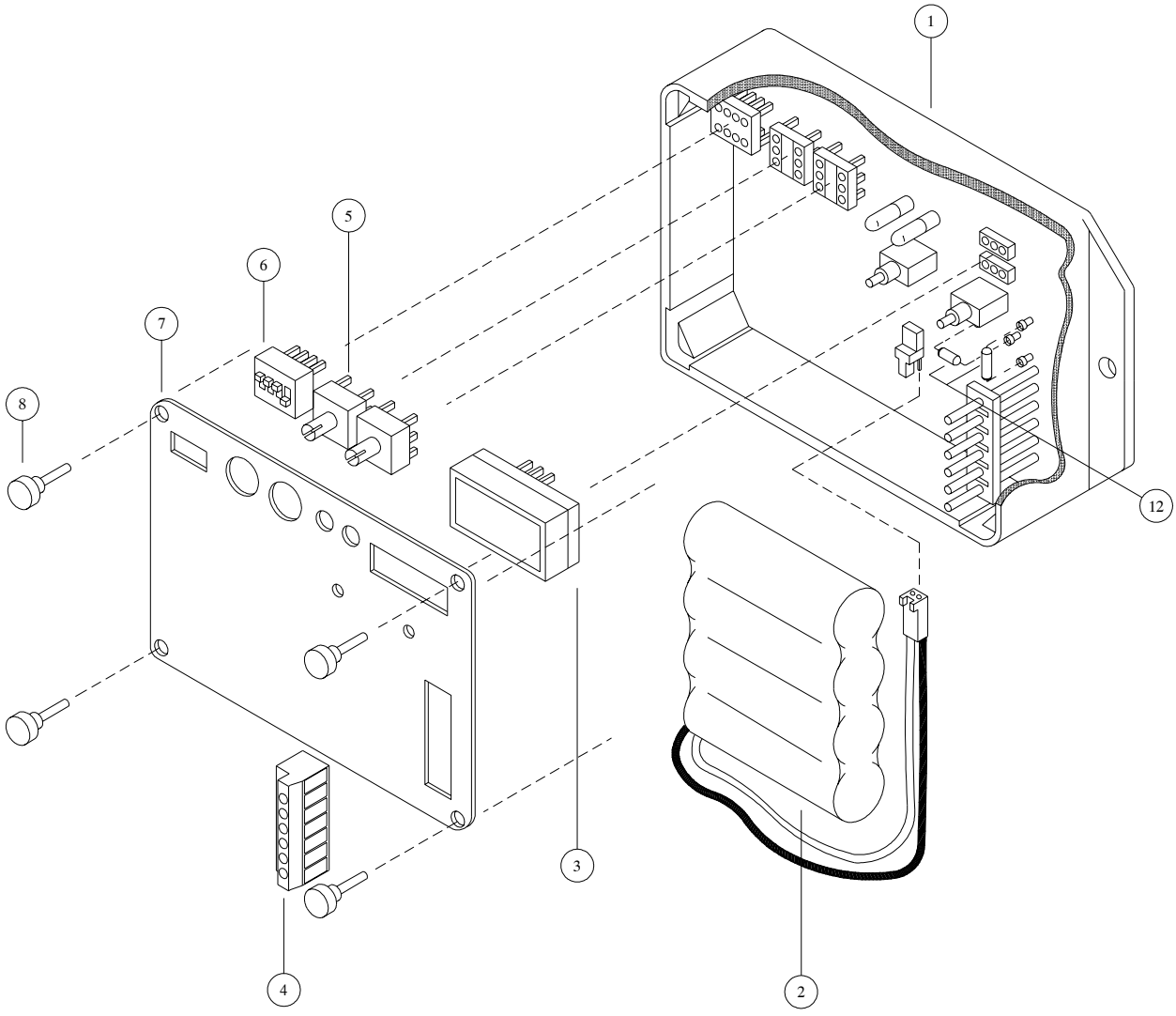
APPENDIX A: ILLUSTRATIONS

Electronic -6 Control,

Figure 32



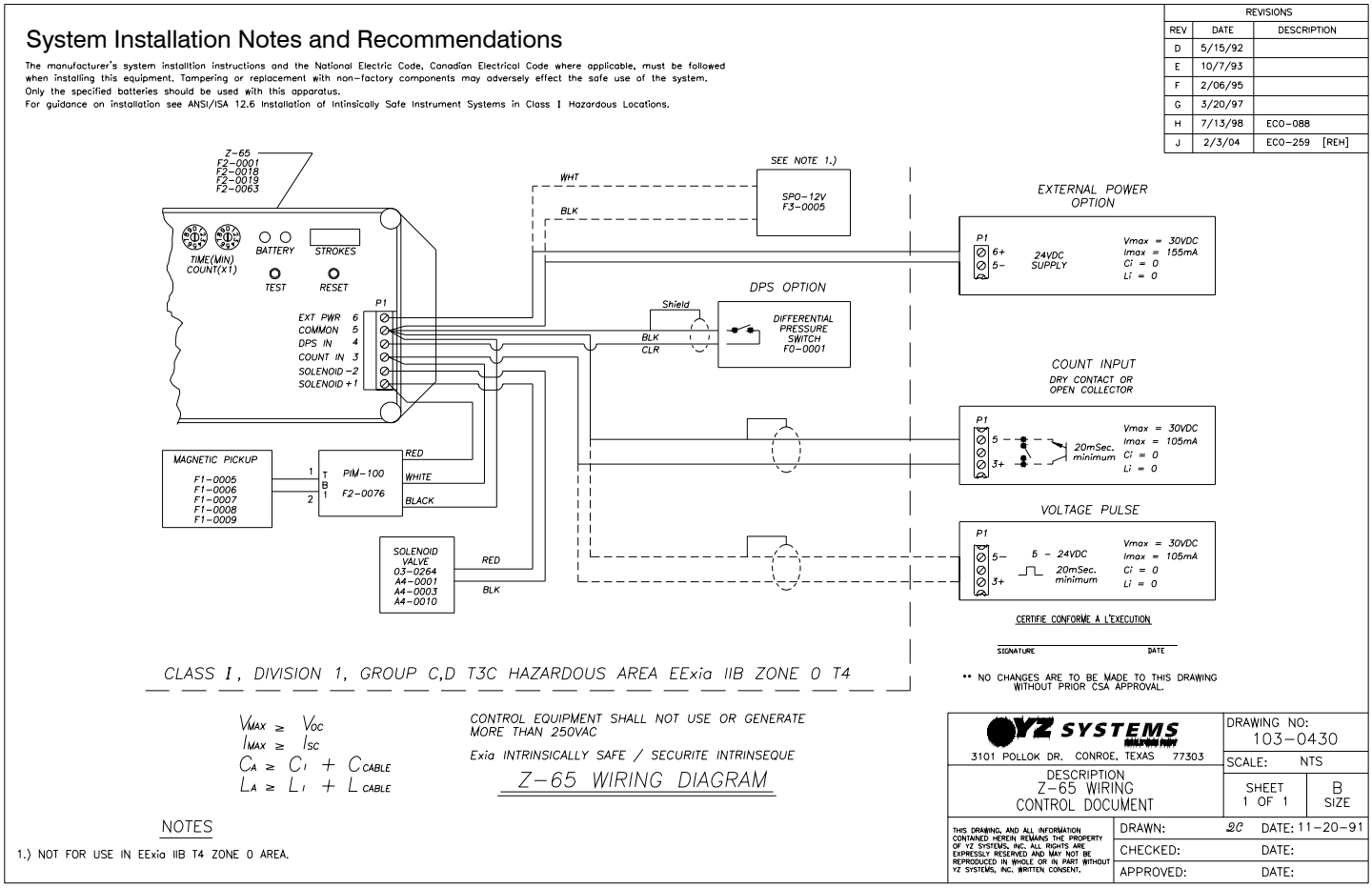
Ref. No.	Description	Part No.	Qty.
1	Z-65/6 Controller Assembly		1
	Model Z-65/6.1	F2-0001	
	Model Z-65/6.03	F2-0018	
2	Battery Pack	E3-2001	1
3*	Stroke Counter Assembly	G1-0001	1
4*	Terminal Strip, 6 Position	H1-0001	1
5*	BCD Switch	E1-0001	2
6*	Mode Switch	E1-0002	1
7	Face Plate		1
	Model Z-65/6.1	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



APPENDIX A: ILLUSTRATIONS

Electronic Wiring Control Document,

Figure 33



Notes:

3101 Pollok Drive

Conroe, Texas 77303

800.653.9435

P: 936.788.5593

F: 936.788.5698

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