Unidirectional Captive Displacement Prover

Operating Manual

Part Number: 000-100300-DOC Rev C
5225 South 37th St. Suite 4 Phoenix, AZ 85040 Phone (602) 233-9885 Fax (602) 233-9887 Website: www.FlowMD.com

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1.0 Introduction

The Unidirectional Captive Displacement Prover manufactured by Flow Management Devices, LLC (Flow MD) ™ is a complex piece of industrial equipment and will require trained and qualified personal with safety training and common sense to install and operate this equipment.

The FMD-XXX Unidirectional Captive Displacement Prover or Small Volume Prover is a precision instrument a with state of the art control system consisting of a PIM (Prover interface Module) and software. The PATENTED design has many features and allows for smooth and quite operation. This manual will cover the operation and maintenance of the FMD-XXX in detail.

Specification

1. **Standard Material of Construction**
    a. The flow tube is precision machined 304L stainless steel (316L SS optional) material and it contains all other components that contact the fluid (wetted parts)
    b. Wetted parts or any component with direct contact with liquid are manufactured with 304L stainless steel (316L SS optional) material
    c. The switch bar is made of 304 SS material
    d. The frame is galvanized per *ASTM A123 Grade 100*
    e. The drive end components are steel with a nitro carburized or Zinc plated finish for corrosion resistance
    f. The belts are high strength carbon fiber
    g. The Electronic enclosures are explosion proof cast aluminum (stainless steel optional)
    h. The drive covers are 304 stainless steel (316 SS optional)

2. **Technical Specification**
    a. Designed and manufactured in the United States
    b. Industry standard double chronometry per API 4.6
    c. Conforms to API 4.2 "Displacement Provers"
    d. Equal upstream and downstream displaced volumes
    e. Stainless Steel and PTFE material used on all liquid contacting surfaces
    f. Shock mounted isolation pads provide independent drive end support
    g. Three point installation for secure mounting on uneven surfaces
    h. 2" flanges allow rapid draining
    i. Drain orientation provides the ability to point drain valves in multiple clocked directions
    j. 2" vents with check thermo well and pressure verification ports
    k. Tool-less access to most common serviceable components
    l. Standard horizontally mounted units
    m. Designed for Class 1 Div 1 environments
    n. NACE compliant

3. **Prover Interface Module (PIM) Specification**

    a. Low Power (3 Watts nominal from 11 to 26 Volt Power Supply)
    b. Status code display with red and green LED's. Display may be remotely mounted
    c. Fully configurable using PC via serial port or local keyboard
    d. Multi level Password protection based on user level
    e. Direct reading for configured volume(s) with timing displayed in seconds or microseconds
    f. 4 status / diagnostic outputs to host flow computer
    g. Prover cycle counter with programmable limits provide preventative maintenance planning
    h. Timer provides accurate elapsed time between optical switches
    i. Intrinsic safe design
    j. Compatible with most flow computers
    k. Loop-Back signal verification of volume output pulses on host flow computer
    l. 25 MHz processor with;
        a. 2 serial ports
        b. Counters
        c. 64KB flash memory
        d. 32KB external memory with 10 year expected life battery back-up
        e. RS232 or 485 interface

4. **Special Order- Consult Factory**

Safety Notes-

Prior to operating the FMD Prover read the user manual completely*! *Failure to comprehend this material may result in personal injury and damage to the Prover. Warranty may be voided if the instructions are not followed properly.

- The Flow MD ™ Prover must be installed with proper orientation for flow direction.
  Incorrect flow direction can cause serious damage to the Prover

- Verify that there are no foreign parts such as weld slug, nuts, bolts or any other solid material in the pipeline. Proper strainer installation can eliminate damage to the Prover

- Verify that all the connection and mounting hardware are of appropriate strength and length and are torque to the specification

- Verify that electrical wiring is complete per code. Electrical connection of the FMD Prover is the responsibility of the user

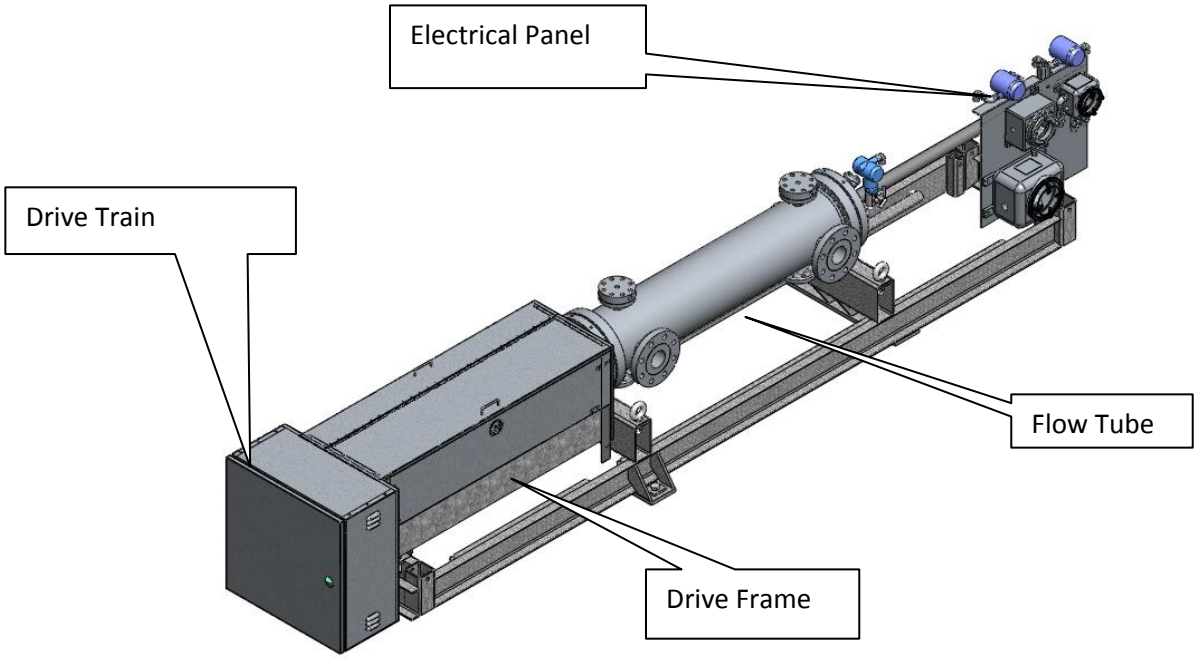
- Verify that the Prover frame is properly connected to earth ground
- Verify that the covers on the Explosion proof enclosures are tight
- Verify that all the drain and ventilation valves are closed and the connections are tight
- Verify that the instrumentation connection, especially the pressure connection is tight and the instrument valve is closed
- Verify that all drive covers are properly installed and secured
- Verify that system pressure safety valve is installed properly and it is designed for the pressure rating of the line
- Pressurize the system slowly and per code to avoid any shock to the Prover and or cause harm to the operators
- Verify that the system is depressurized prior to opening the vent or drain valves
- Use of this equipment for any use other than its intended purpose may result in product damage or personal injury or death

If any one item from above list is not clear, please contact
Flow Management Devices LLC
602-233-9885

Relevant Standards-

API MPMS 4.8 “Operation of Prover”
ASME B2D
API 520 Sections (3.8), Equation (3.9)

Figure 1.1FMD-XXX



FMD Prover Model Numbers					
MODEL NUMBER	MAX FLOW RATE GALONS/MIN	MAX FLOW RATE BARRELS/HR	MAX FLOW RATE METERS^3/HR	DISPLACED VOLUME GALLONS	FLANGE SIZE (STANDARD)
FMD-007	**700**	**1000**	**150**	**5**	**3”**
FMD-015	**1,500**	**2,100**	**330**	**10**	**4"**
FMD-025	**2,500**	**3,570**	**560**	**20**	**6”**
FMD-035	**3,500**	**5,000**	**790**	**25**	**6"**
FMD-A35	**3,500**	**5,000**	**790**	**25**	**8"**
FMD-060	**6,000**	**8,500**	**1,350**	**40**	**10"**
FMD-090	**9,000**	**12,850**	**2,000**	**75**	**12"**
FMD-130	**13,000**	**18,500**	**2,900**	**90**	**16"**
FMD-200	**20,000**	**28,500**	**4,500**	**140**	**20"**

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Figure 1.2 Model Table

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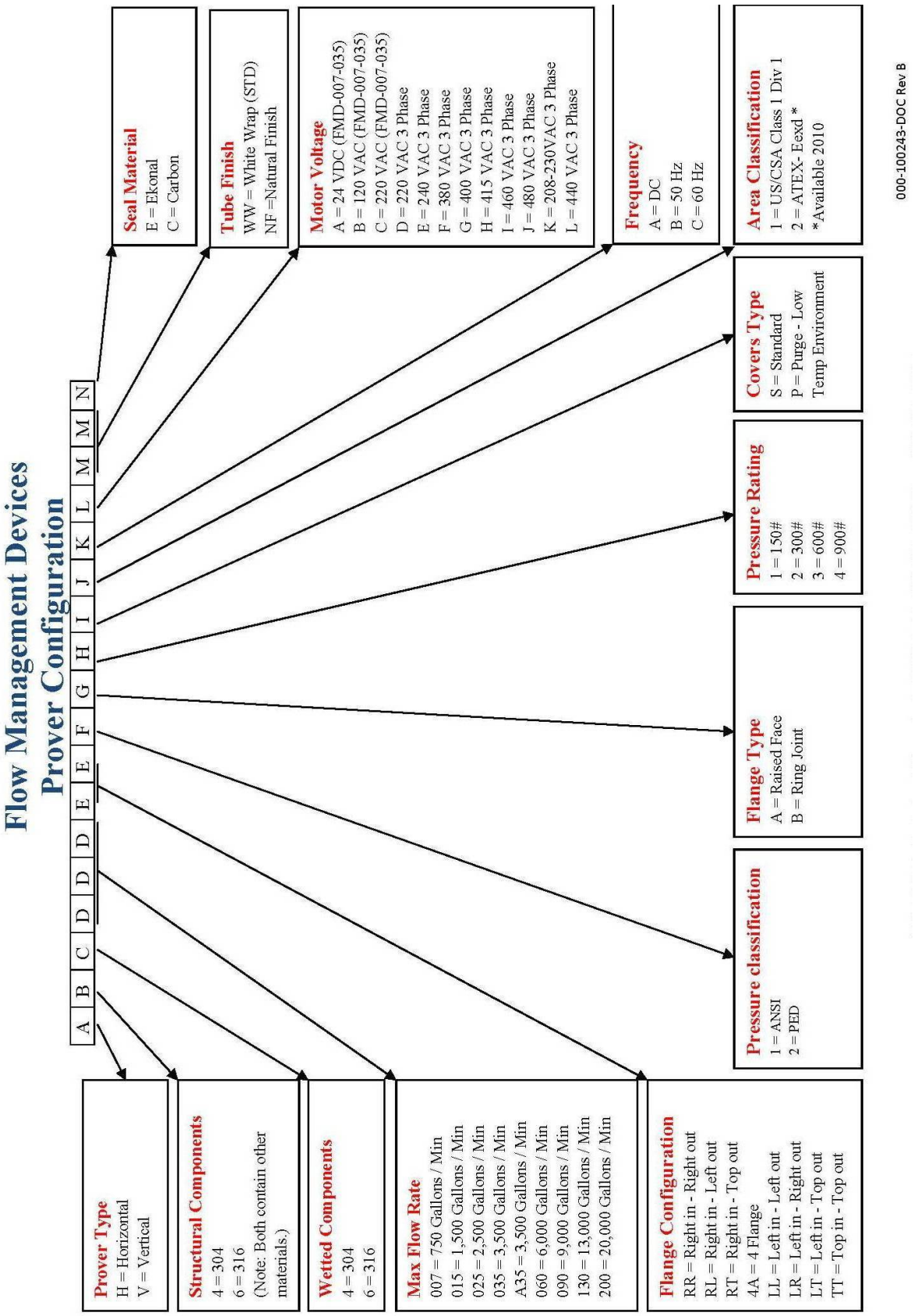
Figure 1.3 Configurations



2. WARNINGS-
YOUR SAFETY IS VERY IMPORTANT

Electrical Hazard- FMD-XXX contains high voltage and ESD (Electro Static Discharge) sensitive components

- Please follow National Electric Safety Code during the installation and maintenance.
- Please follow proper Lock and Tag procedures
- Please make sure that the SVP frame is grounded per instruction
- Do not remove the cover from Explosion Proof enclosure without creating a SAFE ZONE
- Please Protect the electronic circuits from ESD
- ***Any unauthorized modification to electrical wiring will result in loss of electrical classification for hazardous area and Product Warranty***

Moving Parts- FMD-XXX contains many moving parts that can cause serious injury and dismemberment

- Do not operate with open enclosures and covers (water draw test will require open cover)
- ***Any unauthorized modification to the mechanical parts or improper installation will void the warranty***

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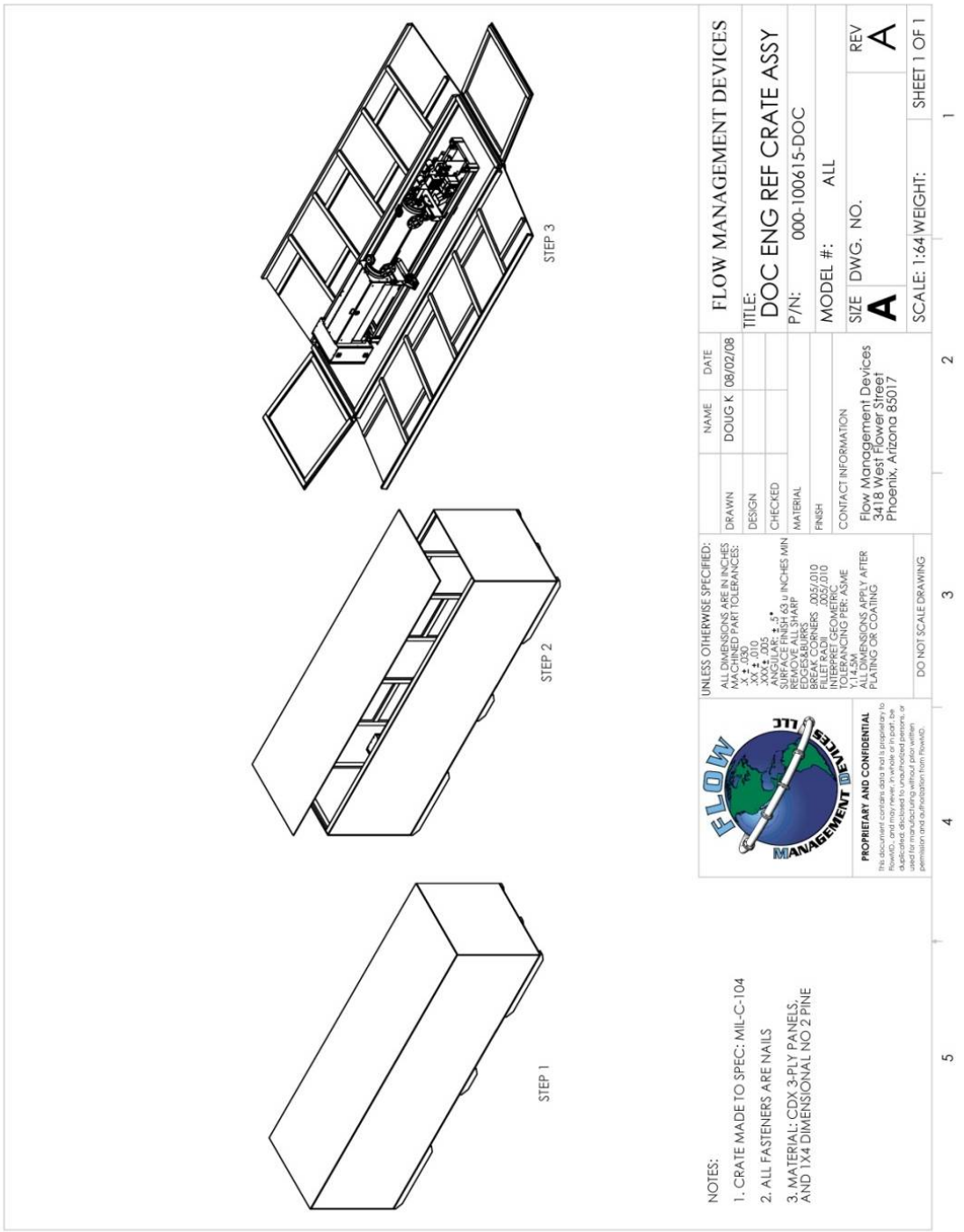
3. Installation-

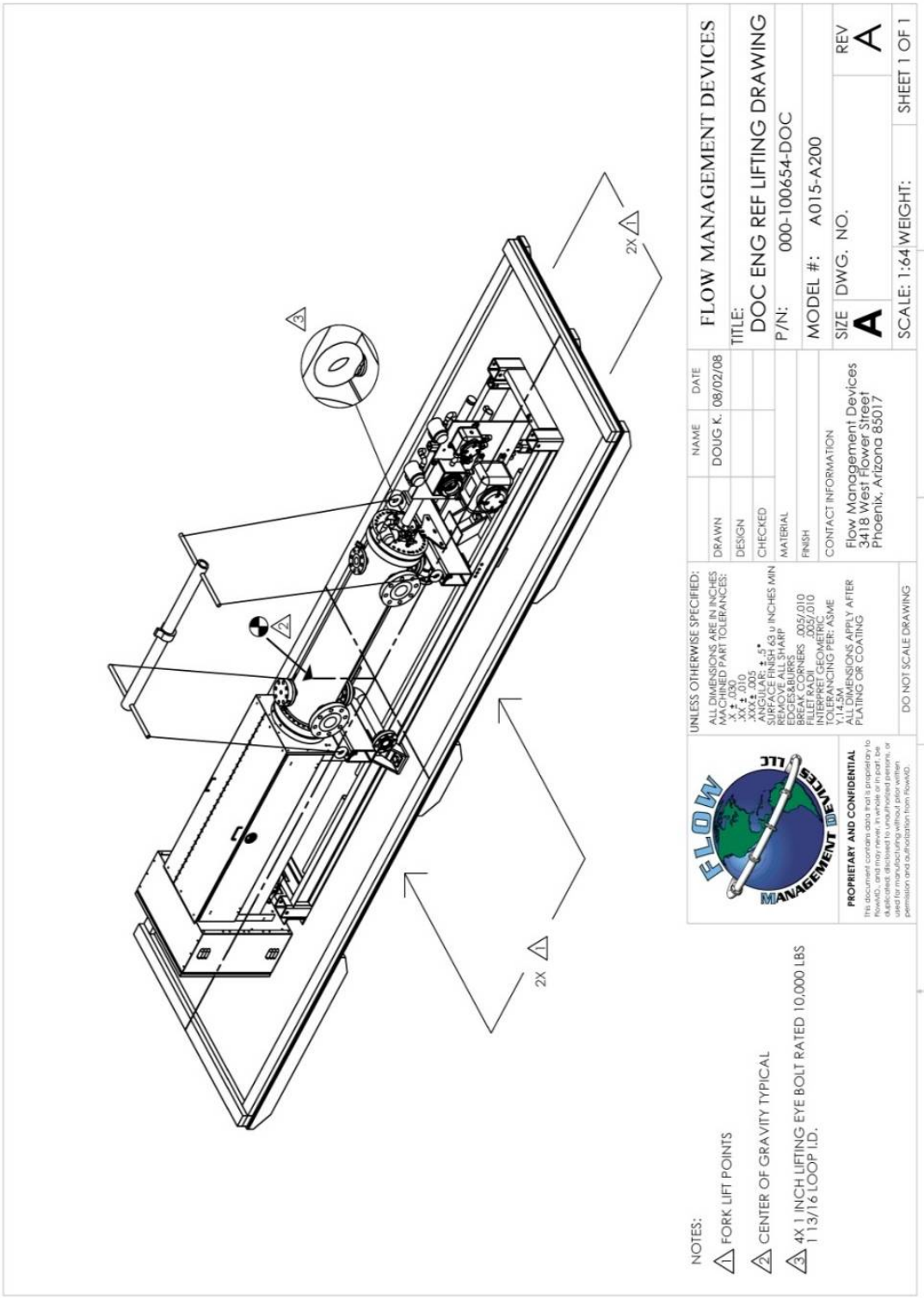
3.1- Unpacking- All FMD-XXX Provers crates are designed per Mod Mil 601 Style Container, 26195 Style Skid packaged for safe storage. The crate is manufactured using certified wood ISPM 601 and it is either nailed or screwed together for ease of disassembly.

Figure 3.1-1 Unpacking



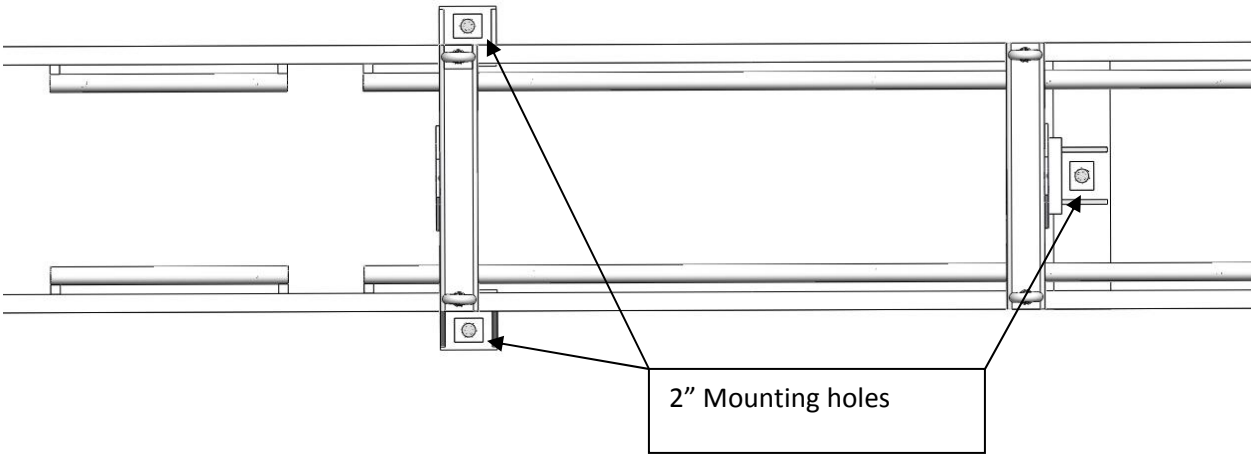
3.1-2- Lifting- The following figure indicates the location for lifting eyes and center of gravity to be used by forklift or crane operators.

Figure 3.1-2 Lifting



3.2- Mounting- The 3 point mounting pads are design to give the user easy access and eliminate any wobbling or stress to the unit. The mounting pads have a 2" hole in the center and we require use of 1" studs. This will allow some tolerance for alignment and adjustment.
Please note - The hardware must be tightened after the pipeline is connected to the FMD Prover in order to reduce the stress to the Prover and frame.

Figure 3.2.1 Installation pad top view



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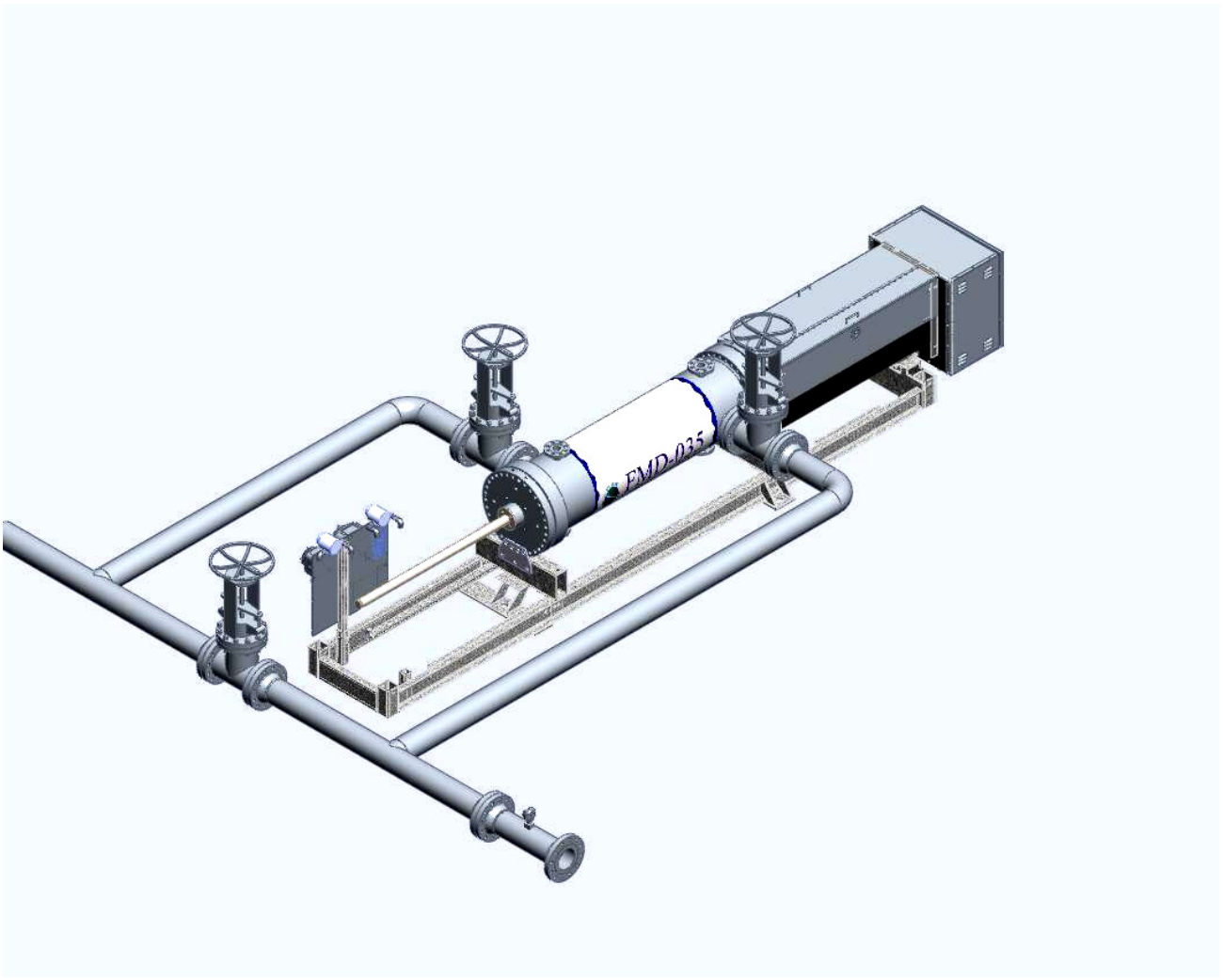
3.2.2 TYPICAL PROVER INSTALATION



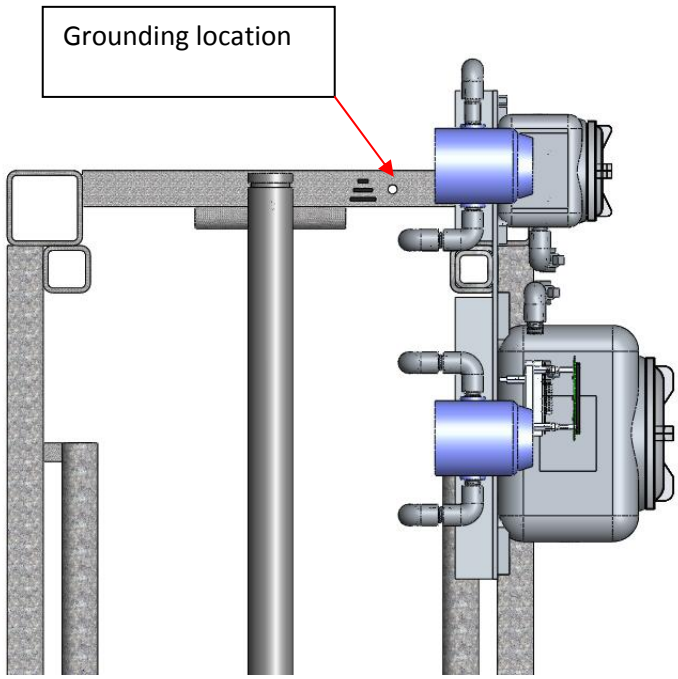
3.3- Electrical-

3.3.1- Proper Ground connection is essential for the following purposes:

1- Safety
2- Reducing damage due to lightening strike
3- Eliminating Static built up
4- Protecting circuit insulation from damage due to excessive voltage

NOTE: Improper Grounding may cause serious injury to the operator and may void the warranty

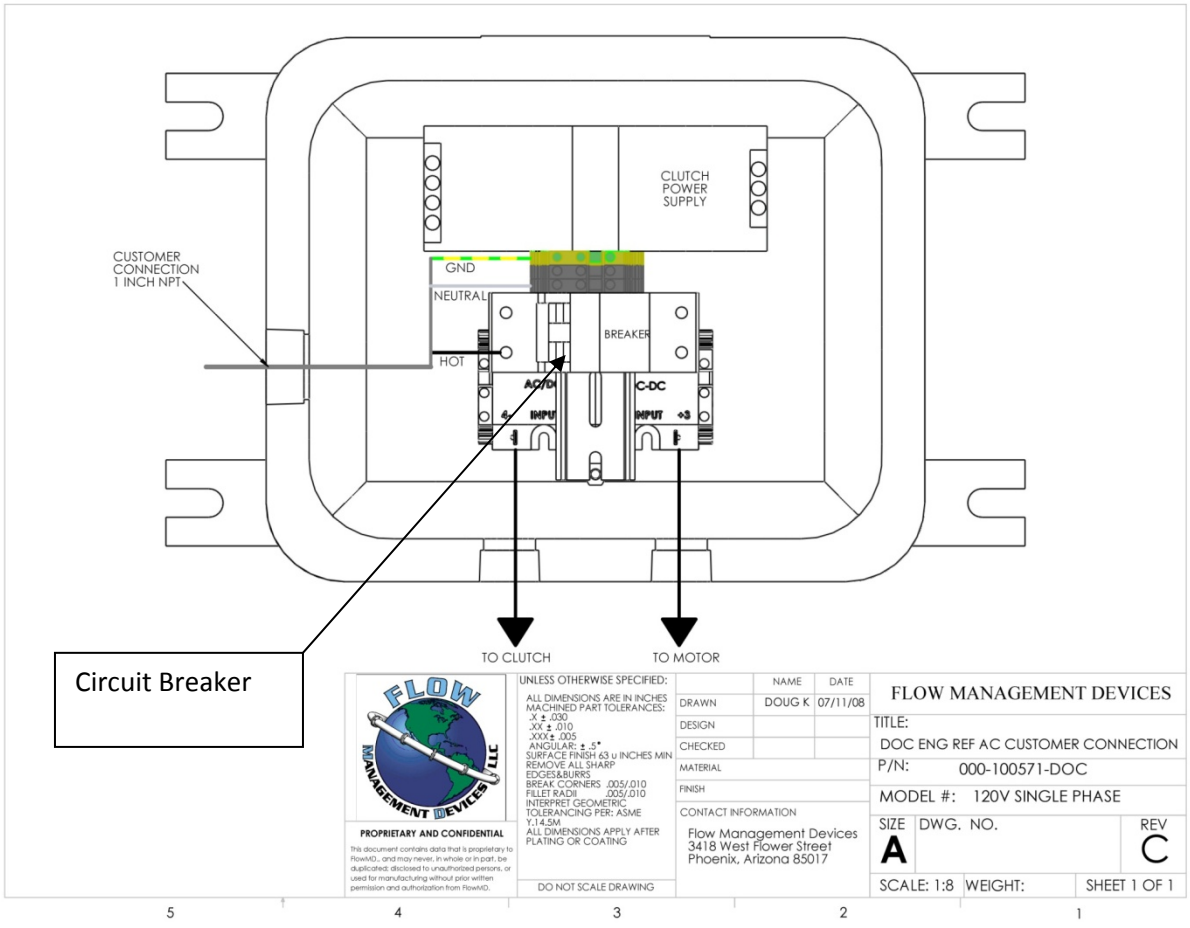
Figure 3.3-1 Grounding



3.3-2- Electrical connection- The customer connection for electrical power is located in an explosion proof enclosure. For ease of connection FMD Provers are equipped with three terminal blocks for connection to Ground, Neutral and power wires. FMD Provers are also equipped with circuit breakers for customer convenience.

Warning- Use Proper lock and tag procedure

Figure 3.3-2 Electrical Connection



3.3-3- Wiring Diagrams-

Figure 3.3-3 Wiring diagram for 110/120 V AC single phase operation

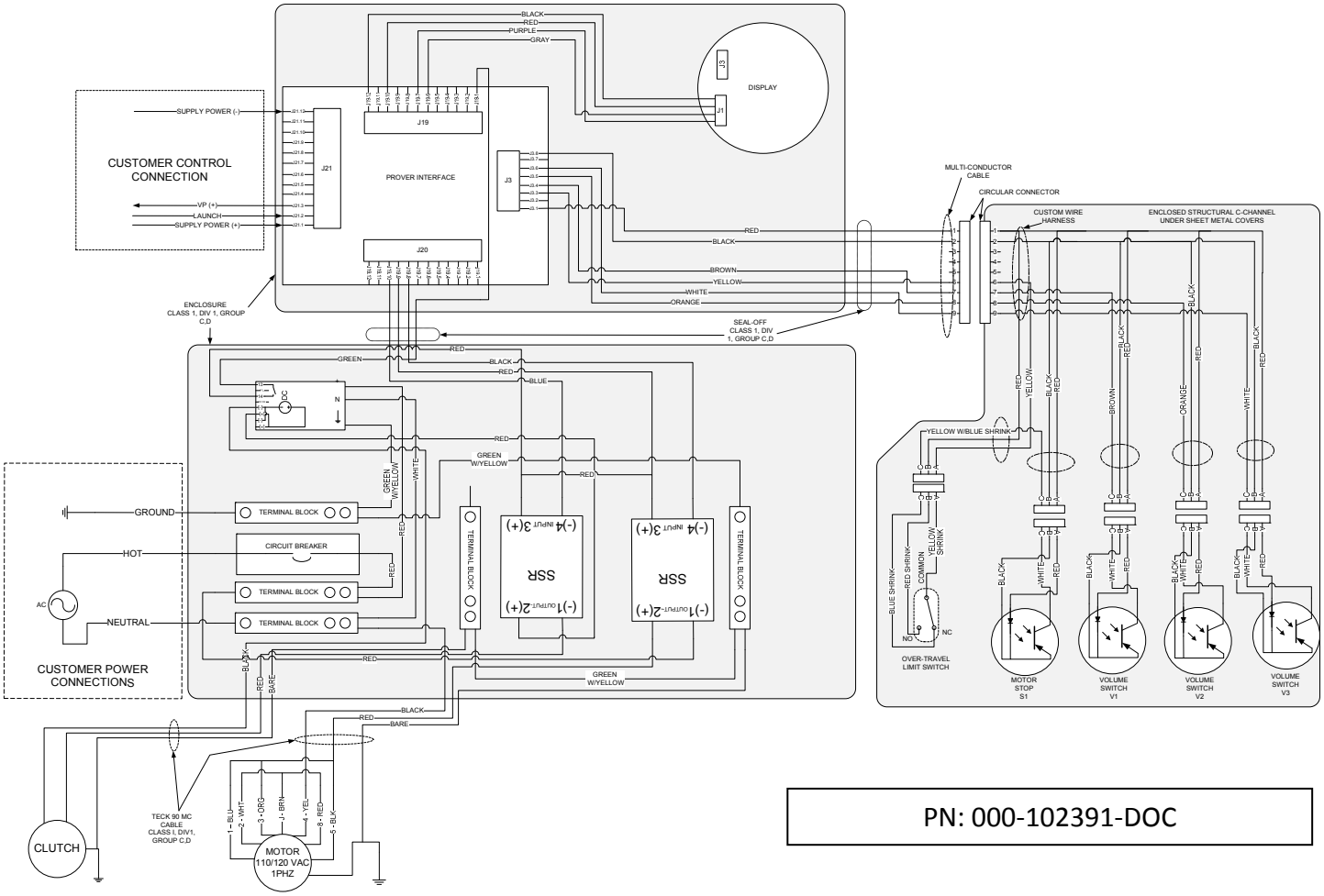


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Figure 3.3-4 Wiring diagram for 220/230 V AC single phase operation

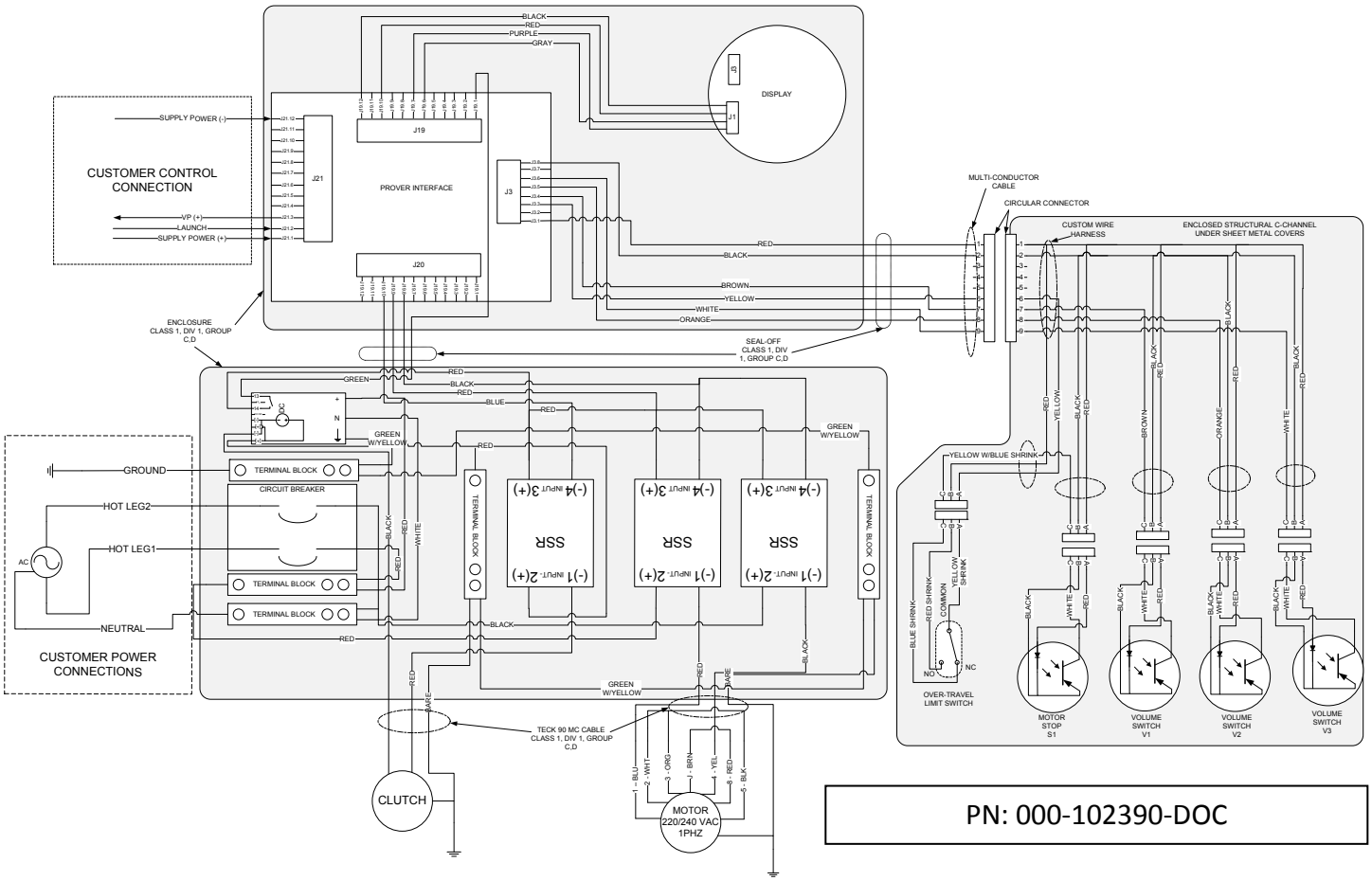

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Figure 3.3-5 Wiring diagram for 208/230 V AC three phase operation

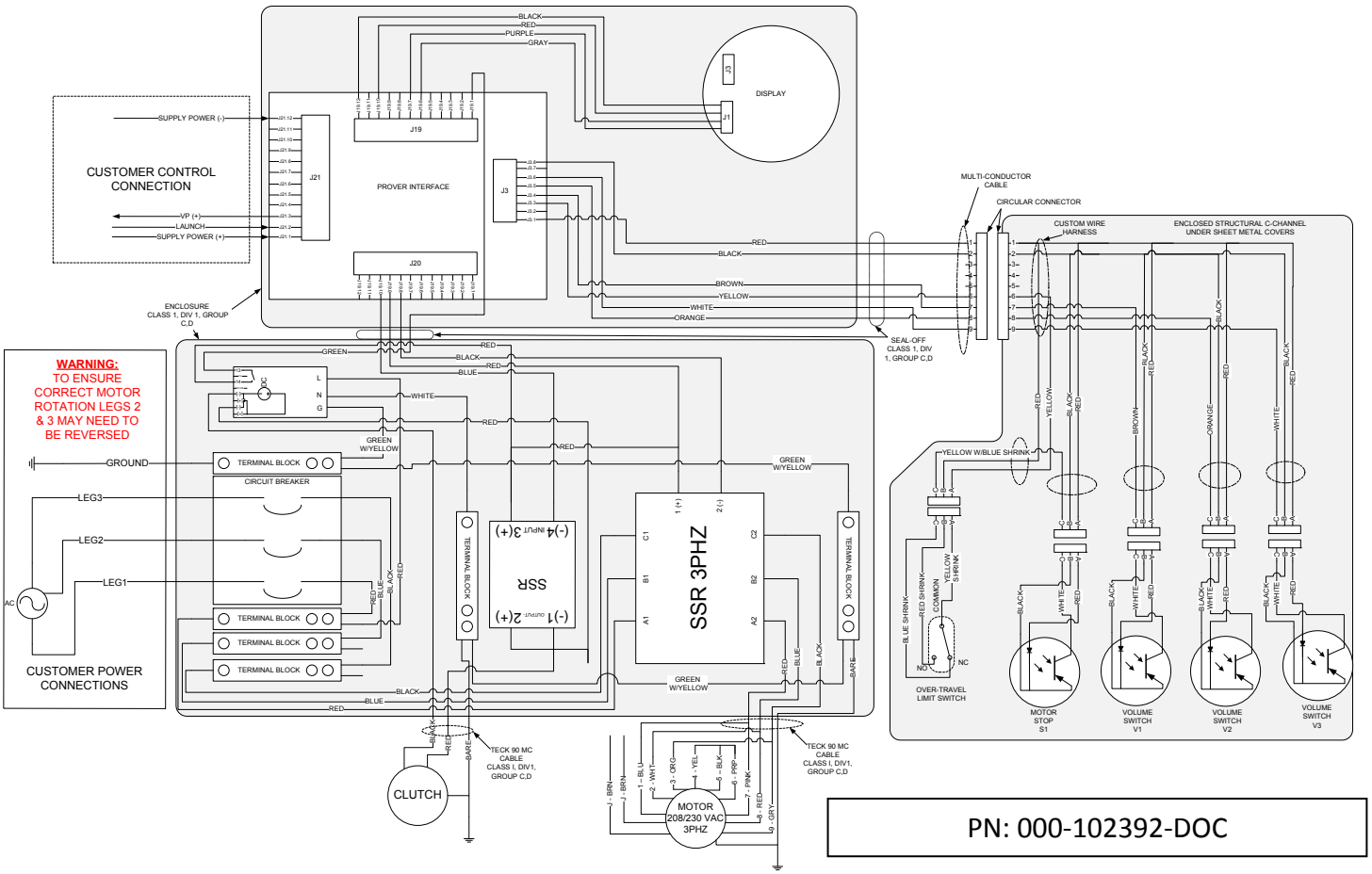

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Figure 3.3-6 Wiring diagram for 380/460 V AC three phase

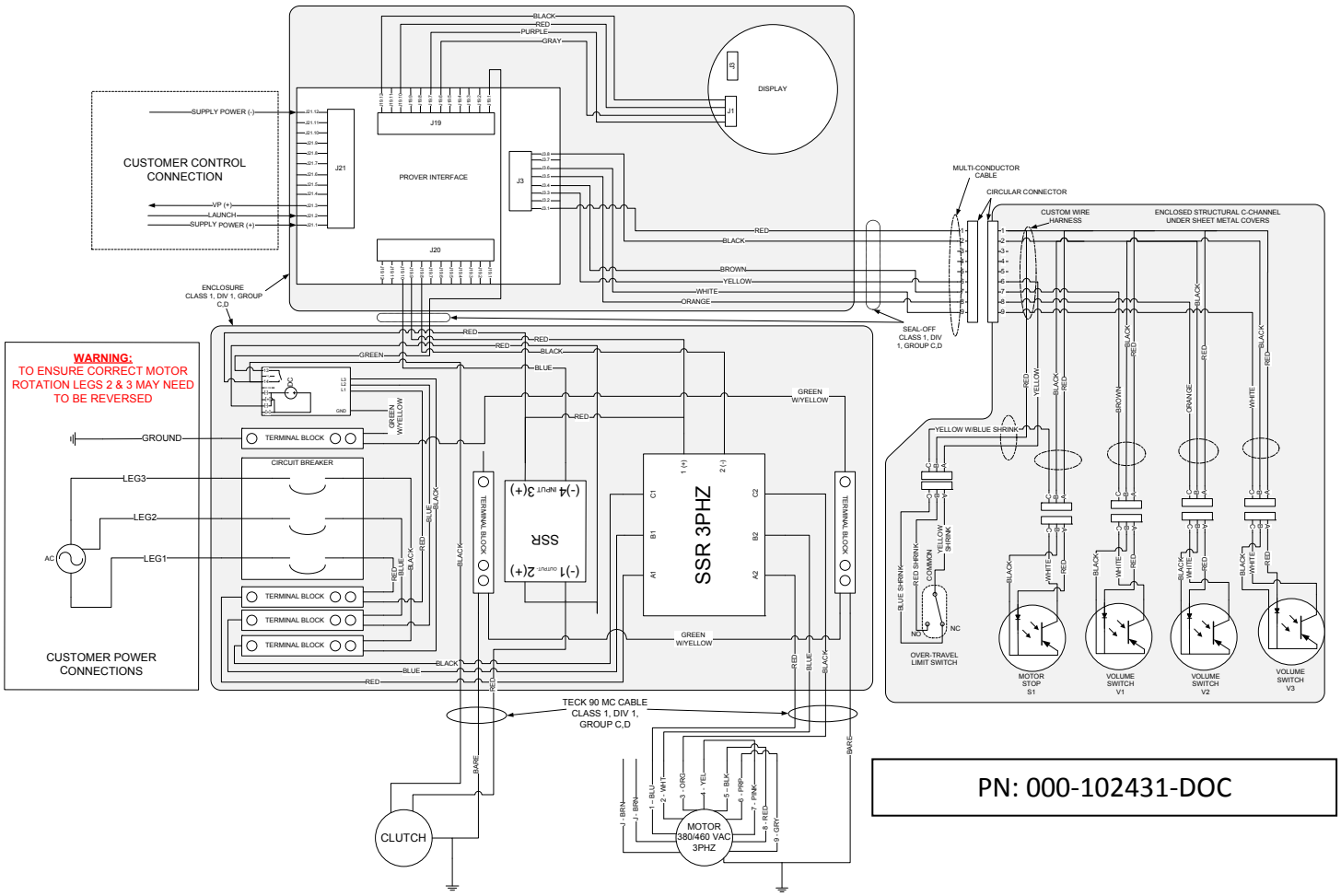

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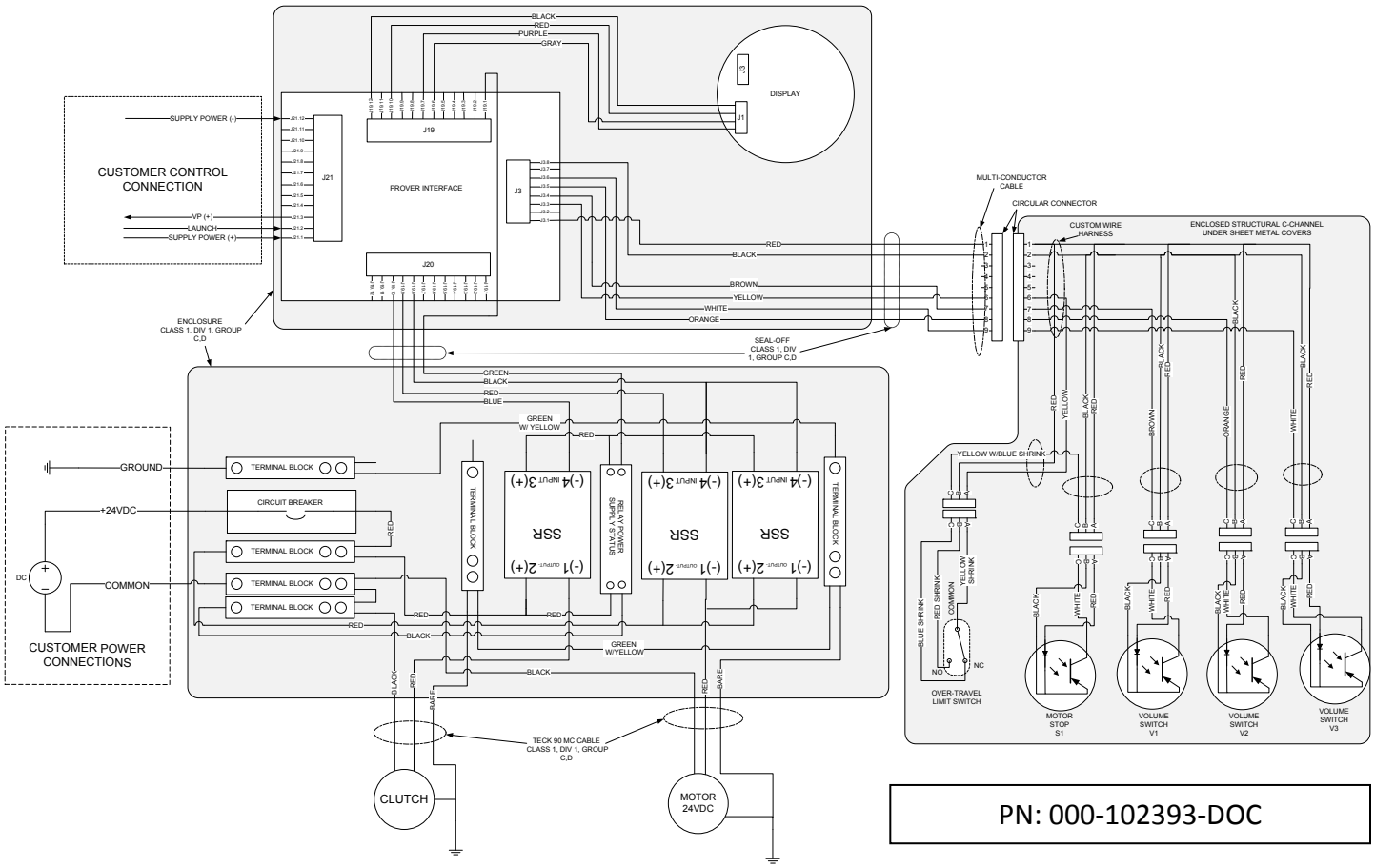
Figure 3.3-7 Wiring diagram for 24V DC operation



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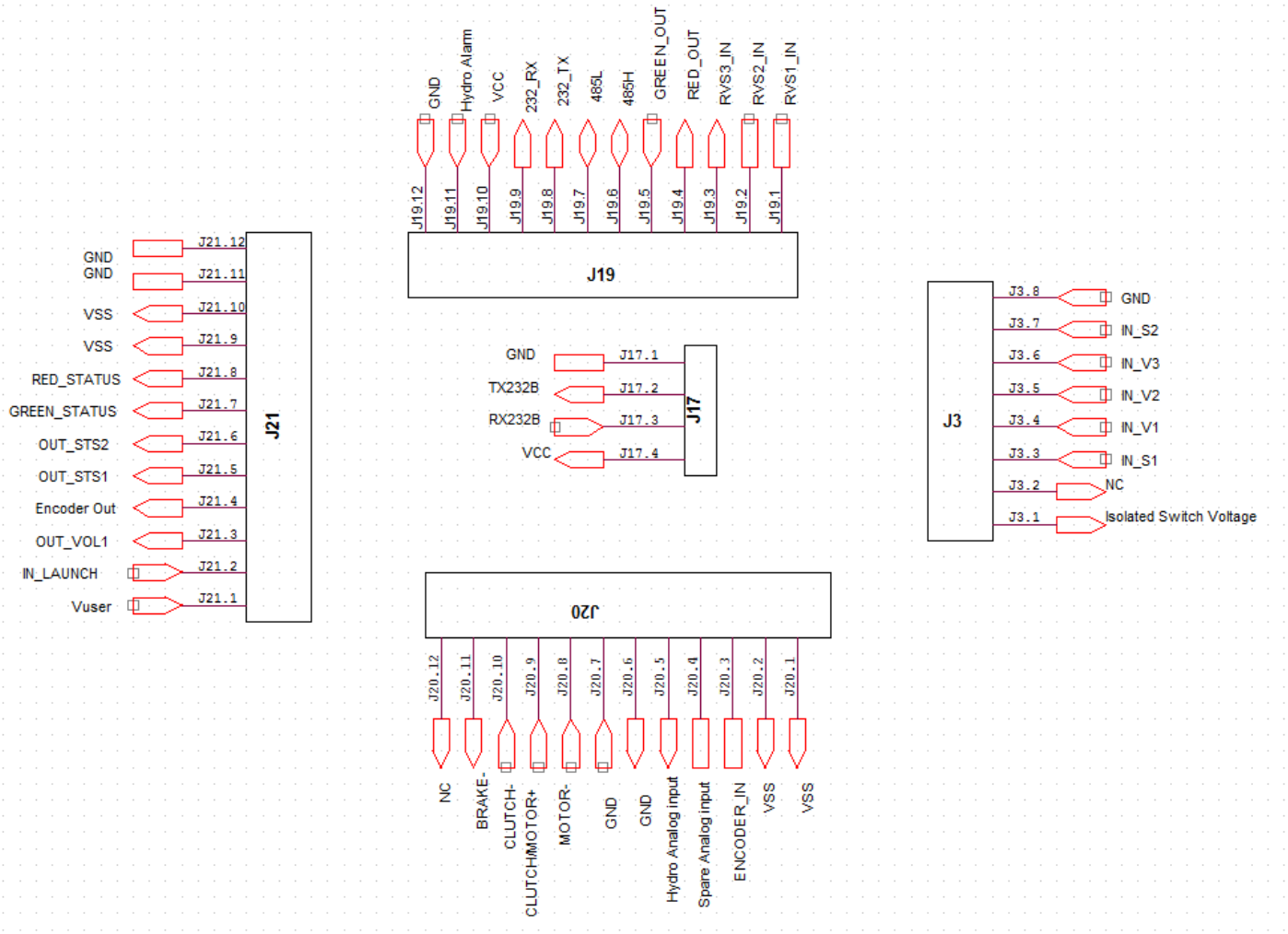
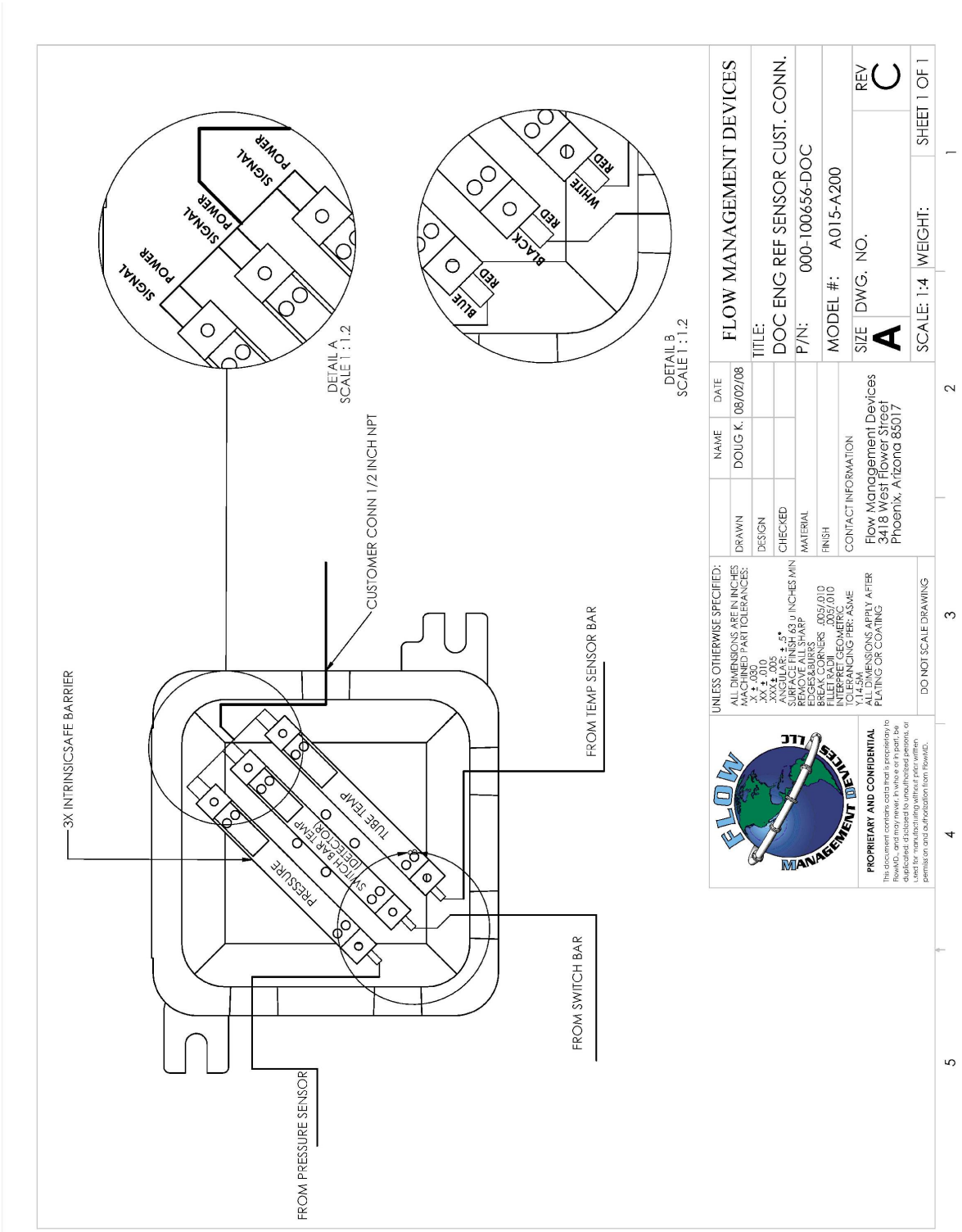
3.3-7- Control Connection- The flow computer must be connected to Prover Interface Module (PIM) J21 connector. Please refer to PIM manual for detailed information on PIM connection.

Figure 3.3-8 Control connection



3.3-8- Pressure and Temperature- The pressure sensor and two temperature sensors are connected to Intrinsic Safe Barriers inside an explosion proof enclosure. The customer connection requires two wires for supplying the voltage and reading (4-20 ma) the signal output for each sensor.

Figure 3.3-9 Intrinsic Safety Barriers for Pressure and Temperature



4. OPERATIONS-

Safety Check prior to operating FMD-XXX Prover

1-The explosion proof enclosures are covered properly

2-The drive train covers are secured and there is no access to the moving components

The following is the step by step process and procedure for operating the FMD-XXX Small Volume Prover:

i. The power is turned on and the unit is in stand-by mode the piston and shuttle assemblies are at downstream position and stationary, Figure 4.1

ii. The Launch command is generated from Host Flow computer to the PIM (Prover Interface Module)

iii. PIM will send a signal to the motor relay to turn the motor on and a signal to the (clutch) relay to engage the clutch

iv. The clutch will transfer the energy from the motor via pulleys and belt to the Shuttle assembly

v. The shuttle assembly is connected to the upstream shaft and the upstream shaft is connected to the piston therefore the piston will start moving to the upstream position. The poppet is in open condition at this point and no data is being taken or sent to the host.

vi. The shuttle assembly will travel to the upstream position and the flag that is located on the top of the shuttle will trigger the most upstream optical switch (S1)

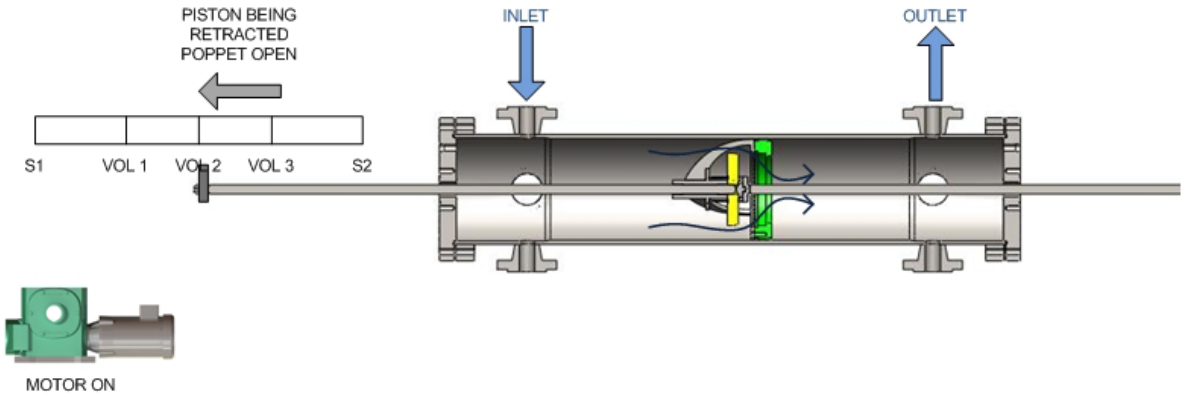
vii. The S1 optical switch will send a signal to the PIM and the PIM will send a signal to the DC relay to turn off the clutch. At this point the motor will continue running depending on programmed time. (please refer to PIM manual to program the motor shut down delay time)

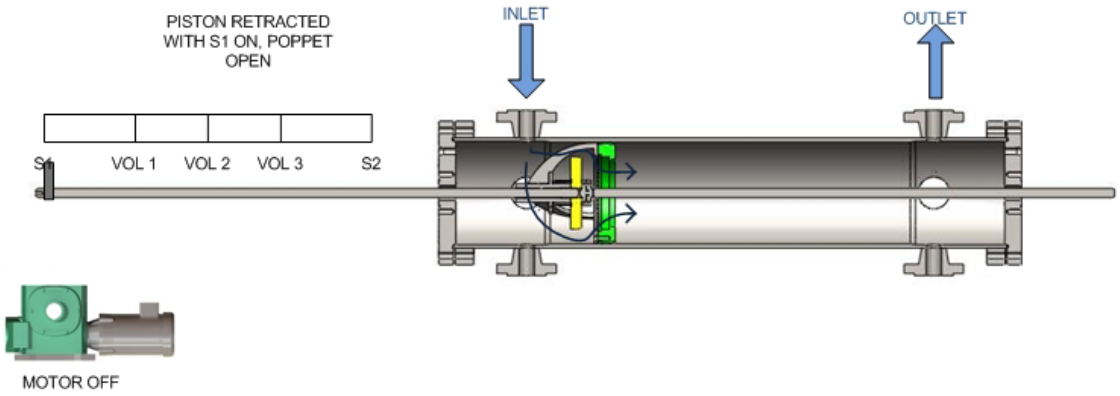
viii. As soon as the clutch is disengaged, the poppet valve will close and the shuttle assembly will start traveling downstream at the rate of the liquid flow in the Prover.
The Flag on top of the shuttle will trigger the VOL 1, VOL 2, and VOL 3 switches in that order sending signal to PIM. (S2 switch is optional and not used at this time)

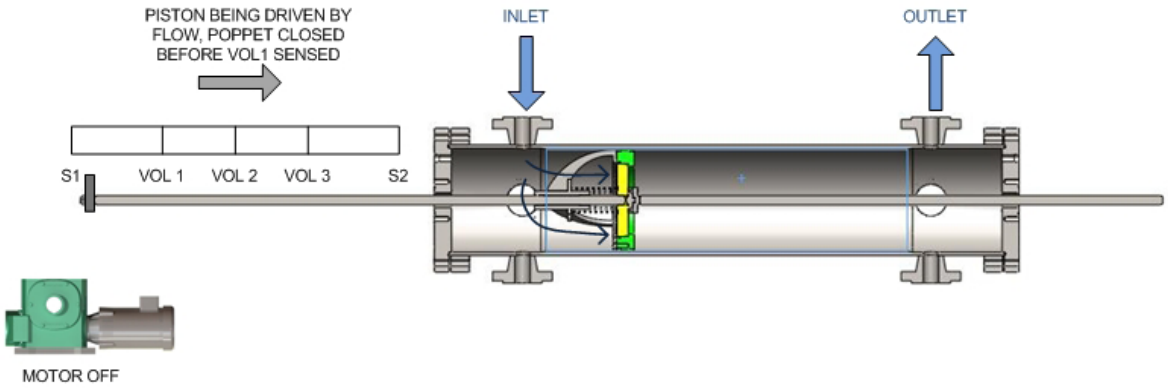
ix. The PIM will relay the signal from VOL switch to the Flow computer. The PIM will then display the time between the optical switches on the display and also record the information in the PIM memory.

x. At this point the piston and shuttle assemblies are in the downstream position with the poppet open and are waiting for another launch command from the host Flow computer to repeat the process.

Figure 4.1 Operation Flow Diagrams





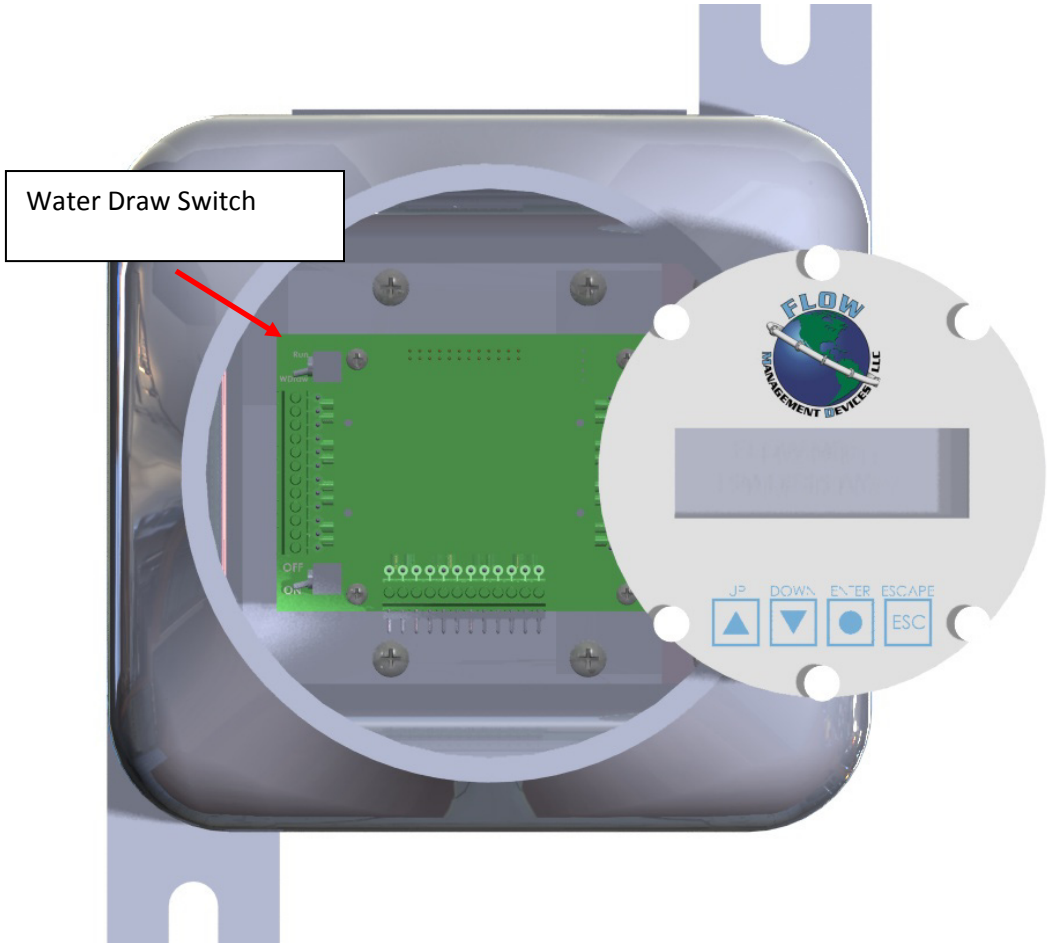


5. Water Draw Calibration-

The Flow MD™ Provers are calibrated at the factory using the Gravimetric method per API MPMS chapters 4.3.7.1, 11.2.3, 12.2.1, 12.2.4, 4.9.2 and 4.9.4.
Recalibration is recommended at 1 year intervals, or as determined by the authorities and parties responsible for the measurement. Recalibration is also required after any maintenance which may affect the base volume, for example; complete switch bar replacement.

The FMD Prover Interface Module has a built in water draw circuit and it can switch between Proving mode and Water Draw mode, parameter settings are made using the keypad or through screwdriver software.

Figure 5.1 Water draw switch on PIM assembly



a. Reference Documents and Equipment:

- API Manual of Petroleum Measurement Standards (MPMS) Chapter 4 – Proving
- Systems sec 4.8, and the MPMS Chapters 4.3.7.1, 11.2.3, 12.2.1, and 12.2.4 – pertaining to the calculation for the volume of Provers using API 4.9.4 for Gravimetric water draw
- De-ionized or distilled water should be utilized for the gravimetric method. API 11.2.3.5, water supply must have steady, non-pulsating pressure
- Precision Scale and weights-NIST traceable
- De-ionized water source with conductivity requirement per API 4.9.4
- Water draw kit-Contact Factory www.flowmd.com
- Certified high resolution pressure gauge: 0-100 psig
- Three traceable thermometers with 0.2 degree graduations
- Seraphin Prover can conforming to API chapter 4 section 7 and NIST traceable

b. Gravimetric Water Draw-

The gravimetric calibration method requires collecting the volume of water displaced by the Prover during a proving run and determining its mass by weighing the displaced water with a precision scale. Corrections are made for the density of the water (Patterson and Morris equation is the API standard) used for the density determination of water and the buoyancy of the air displaced by the volume of water per API 14.6, and applying various other correction factors such as the temperature and pressure effects on the flow tube and the volume switch position.

Figure 5.1.2 Typical Gravimetric water draw setup

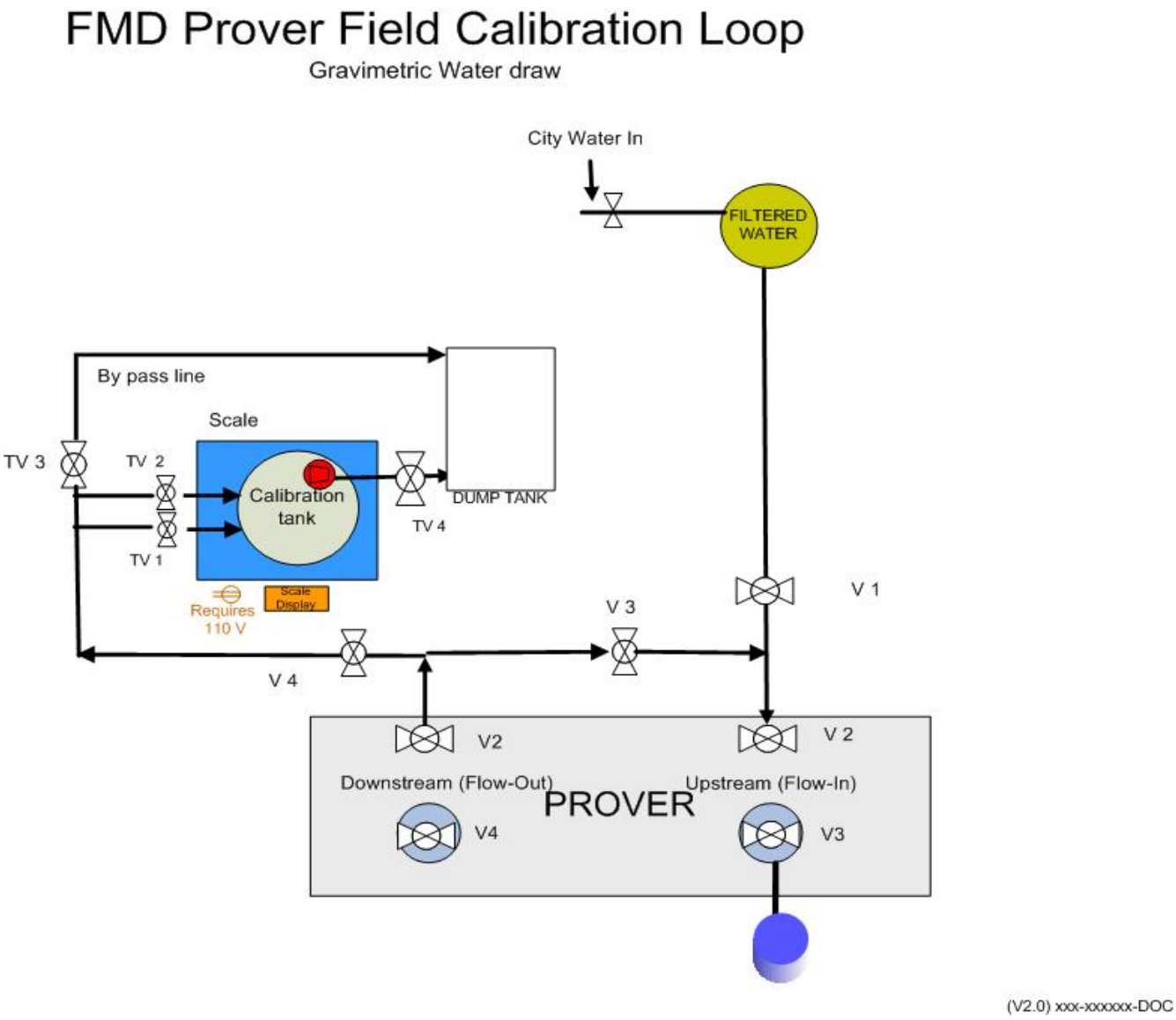
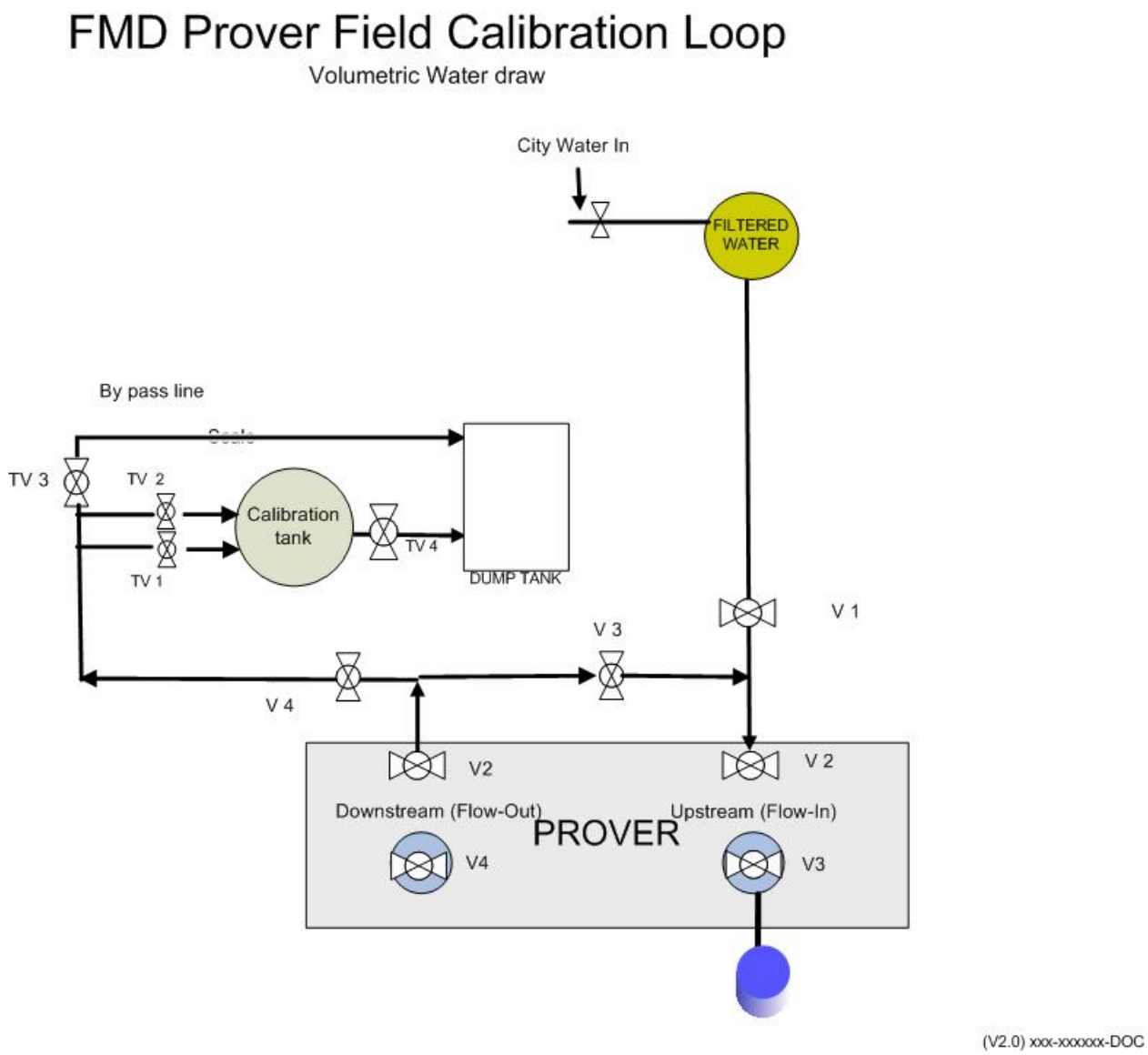


Figure 5.1.3 Typical Volumetric water draw setup



6. MAINTENANCE

Only qualified and trained personal are authorized to perform maintenance on FMD Provers.

1) **Preventive Maintenance**- A schedule of planned maintenance aimed at the prevention of breakdowns and failures. The primary goal of preventive maintenance on an FMD Prover is to help prolong the life of the mechanical parts and to ensure accurate and reliable operation.

The Flow MD™ Prover Interface Module is a powerful tool for maintenance professionals. Multi level password protected cycle counter will keep track of the number of strokes and it can be programmed for a variety of preventive maintenance functions. Please refer to the PIM manual for detailed information.

2) **Differential Pressure Leak Detector-**The purpose of this test is to verify the integrity of piston and poppet seals. The leak detector kit is an option and includes the following:

- Qty 1 each differential pressure gauge
- Qty 2 each braided pressure hose
- Qty 1 each dial indicator
- Qty 1 each indicator extender
- Qty 1 each shaft
- Qty 2 each upstream and downstream attachments
- Qty 1 each leak detector pressure assembly

i. Attach the differential pressure gauge (optional kit) to the upstream and downstream vents via braided pressure hose
ii. Install the leak detector kit on the unit per figure 5.1.1 A, and B
iii. Connect the leak detector to upstream shaft per figure 5.1.1 C
Note: Make sure the temperature is stable and the flow tube is clear of any air bubbles
iv. Using a wrench tighten the pressure bolt until the differential pressure gauge reads about 5 PSI
v. Make sure that the dial indicator is installed properly. Set the dial indicator to Zero (0) in order to determine any movement in the piston assembly
vi. After 10 minutes check the differential pressure gauge and the dial indicator for any changes
vii. If no change, the piston and poppet seal are ok
viii. Change in pressure and or movement may indicate a damaged seal

Note: Verify the temperature is stable and repeat the test if the result is the same then replace the seals.

WARNING- Make sure that the Leak Detector Assembly has been removed or secure prior to start of Prover operation. Failure to do so will cause severe damage to the Prover.

Figure 6.1.1 A Leak Detector setup and test

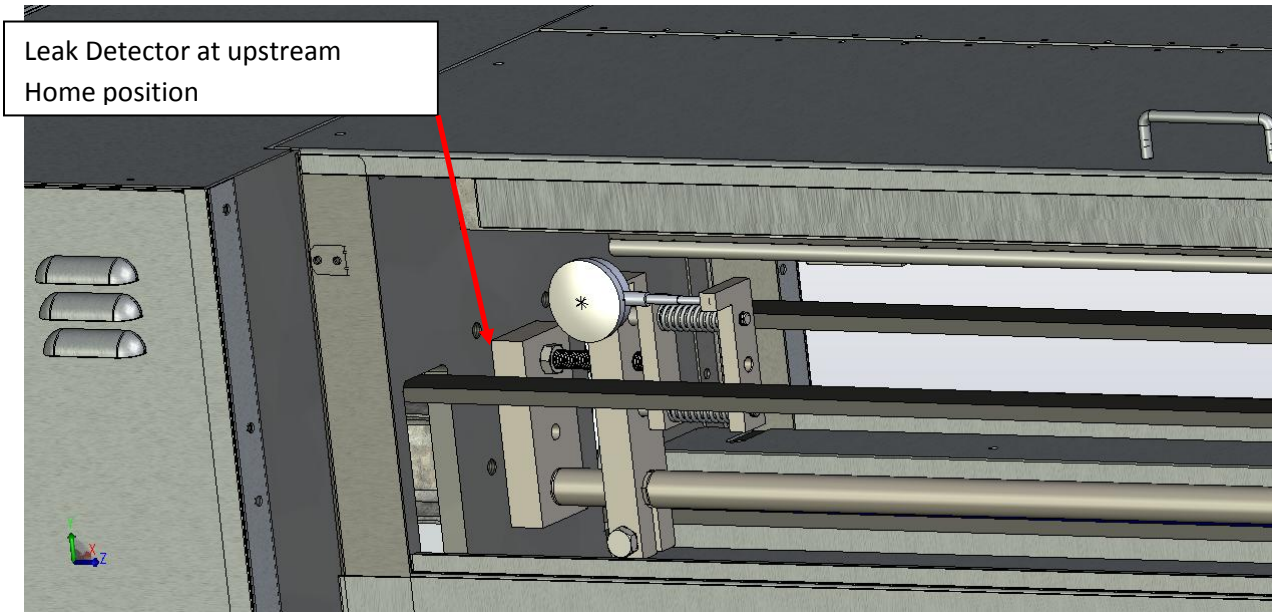


Figure 6.1.1-B

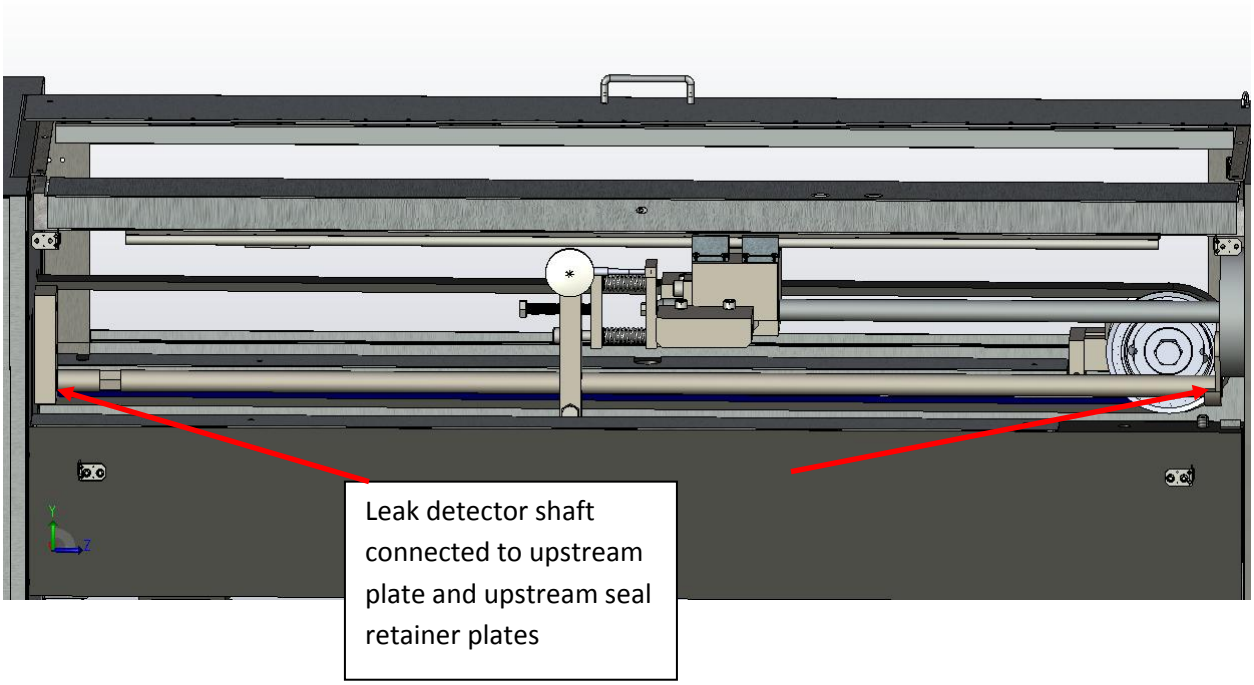
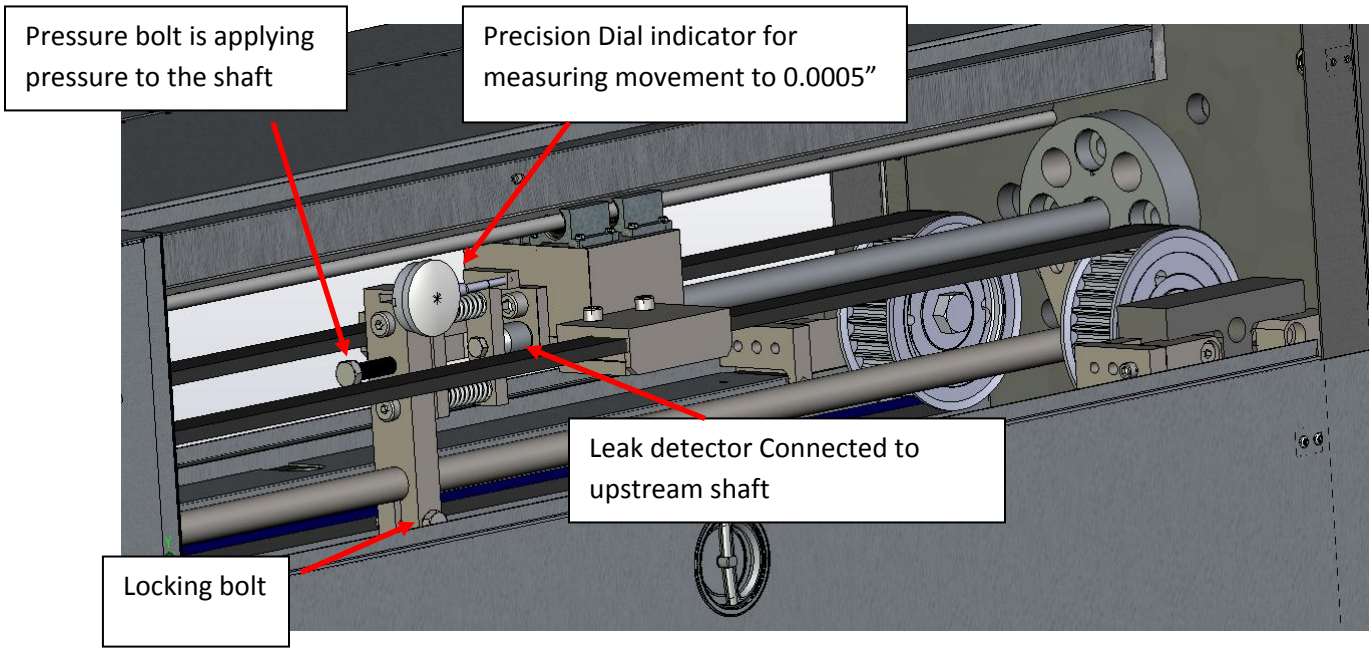


Figure 6.1.1-C



WARNING- PLACE AND SECURE THE LEAK DETECTOR AT UPSTREAM HOME POSITION BEFORE OPERATING THE PROVER

(FIGURE 6.1.1-A)

6.2- Replacing the complete seal kit-

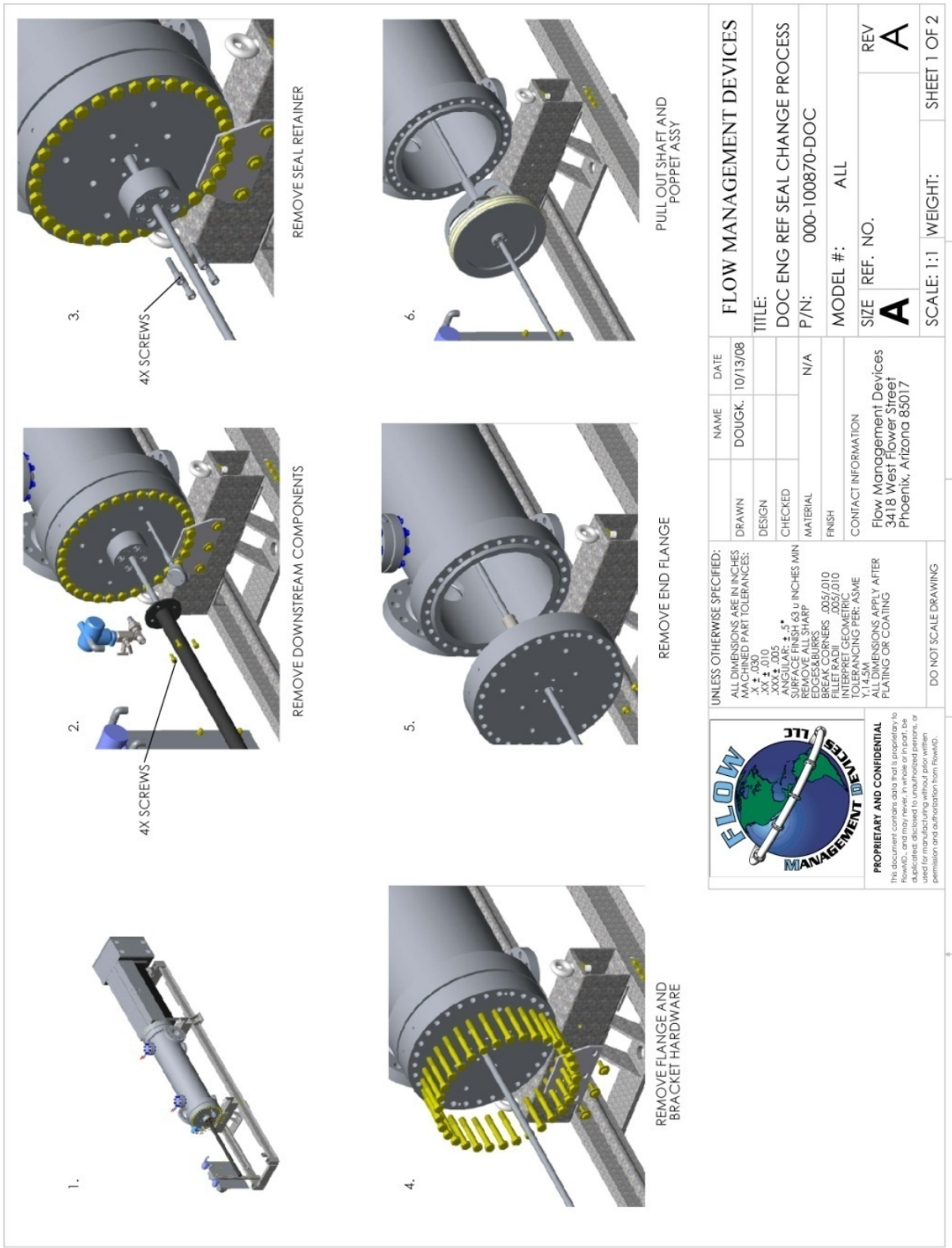
Warning-Make sure the power is turned off and proper lock and tag procedure has been followed

i. Remove the downstream cover (Figure 6.2-A-2)
ii. Remove the pressure transmitter (Figure6.2.A-2)
iii. Remove the seal retainer (Figure 6.2-A-3)
iv. Remove the DOWN STREAM end flange bracket and the end flange (Figure 6.2-A-4 and 5 and figure 6.2-B-1 and 2)
v. Remove the piston assembly (Figure 6.2.B-6)
vi. Remove the piston support from the piston body and remove the seals (Figure 6.2- C 7 thru 11)
vii. Remove and replace the seal retainer components (Figure 6.2-D)
viii. For installation, reverse the process and follow from step 6 back to step one

Note:

a. ANTI-SEIZE lubricant must be applied to following bolts:
    i. Seal retainer Bolts
    ii. End Flange bolts
b. All hardware must be torque per ASTM 307
c. Apply LOCKTITE 242 to all standard hardware (do not apply LOCTITE to note “a”)

Figure 6.2-A Removing the downstream seal retainer and end



flange

Figure 6.2-B Detailed components list on downstream flange and bracket

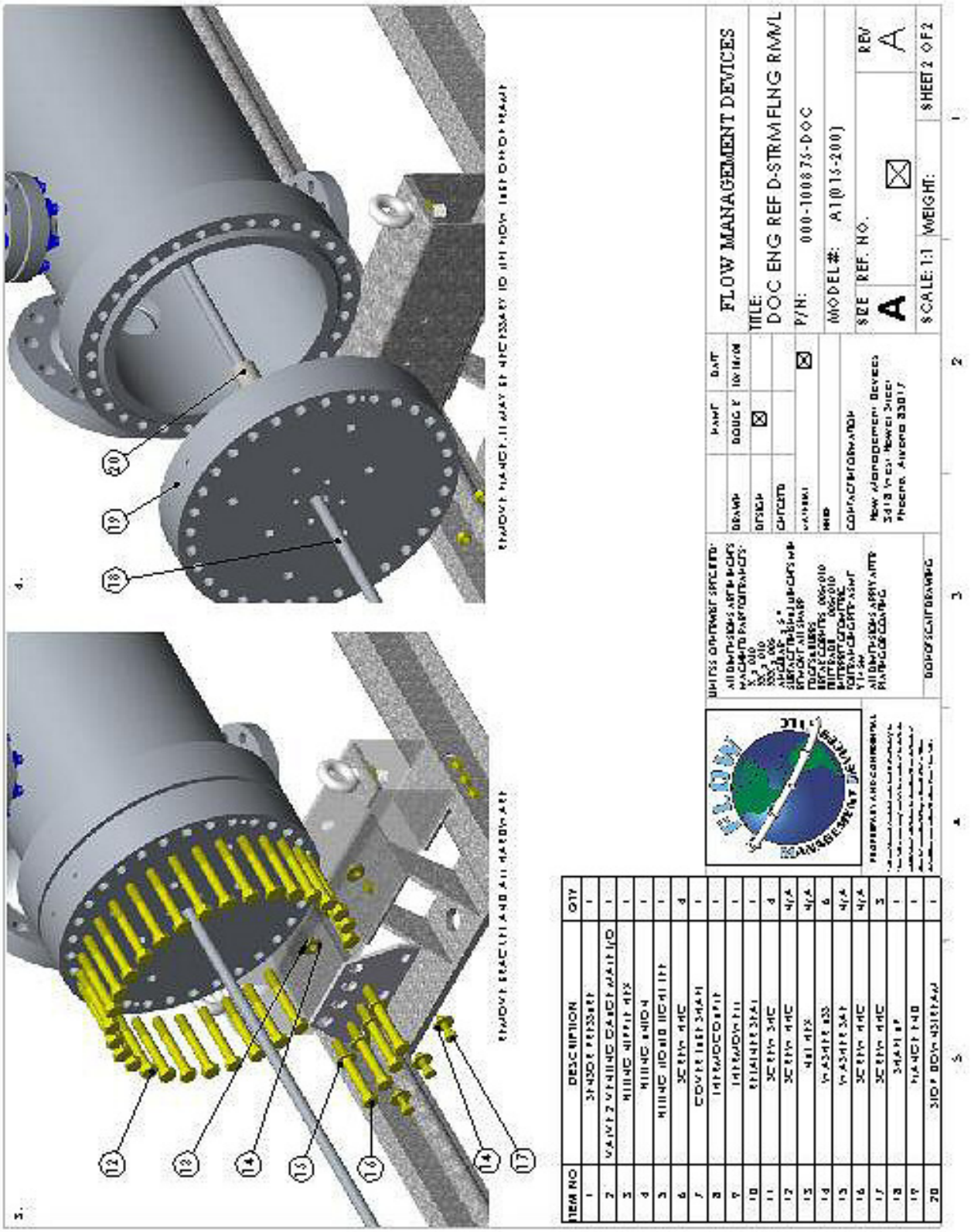


Figure 6.2-C Detailed components list on piston assembly

Figure 6.2.D Detailed components list on downstream and upstream seal retainer

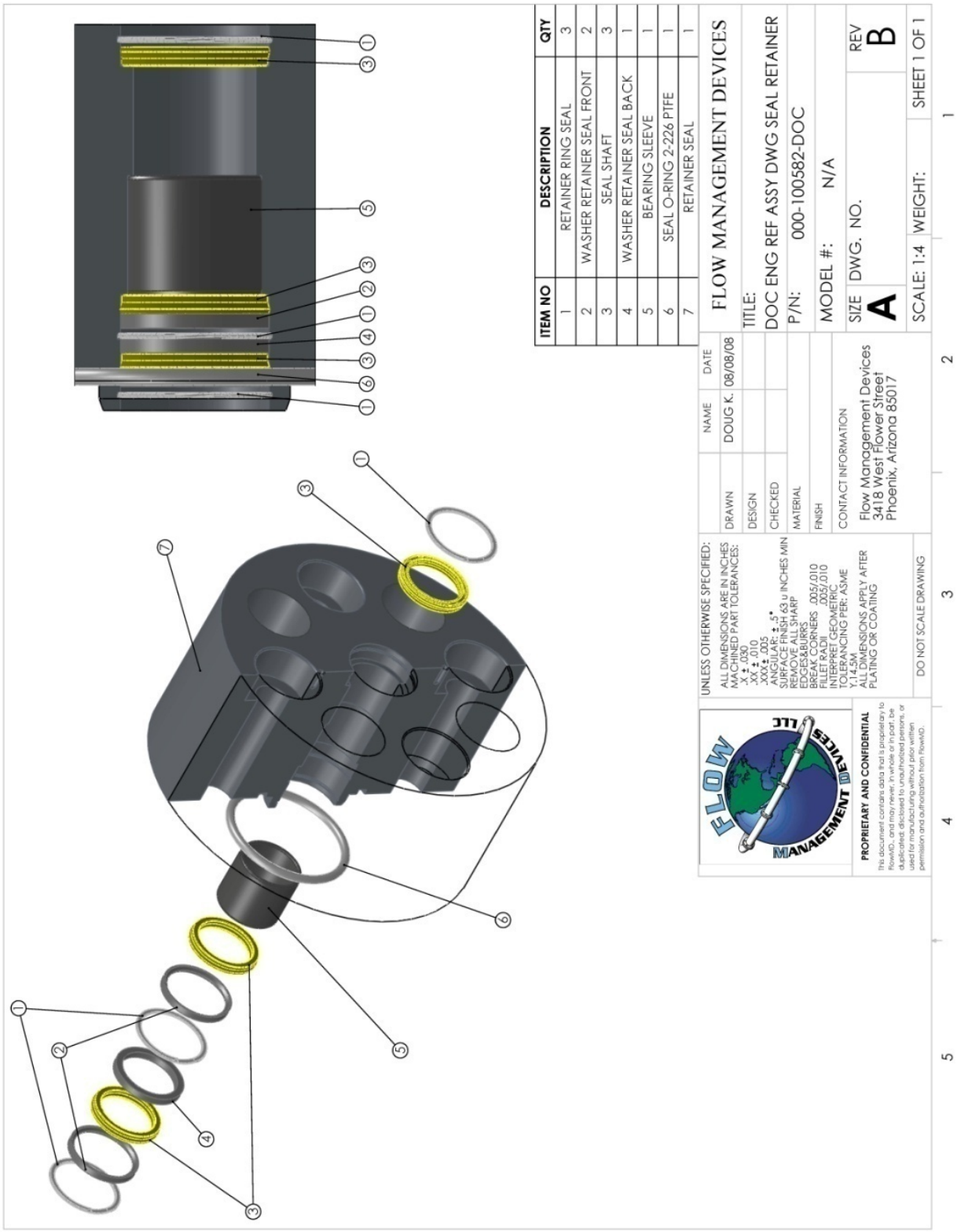
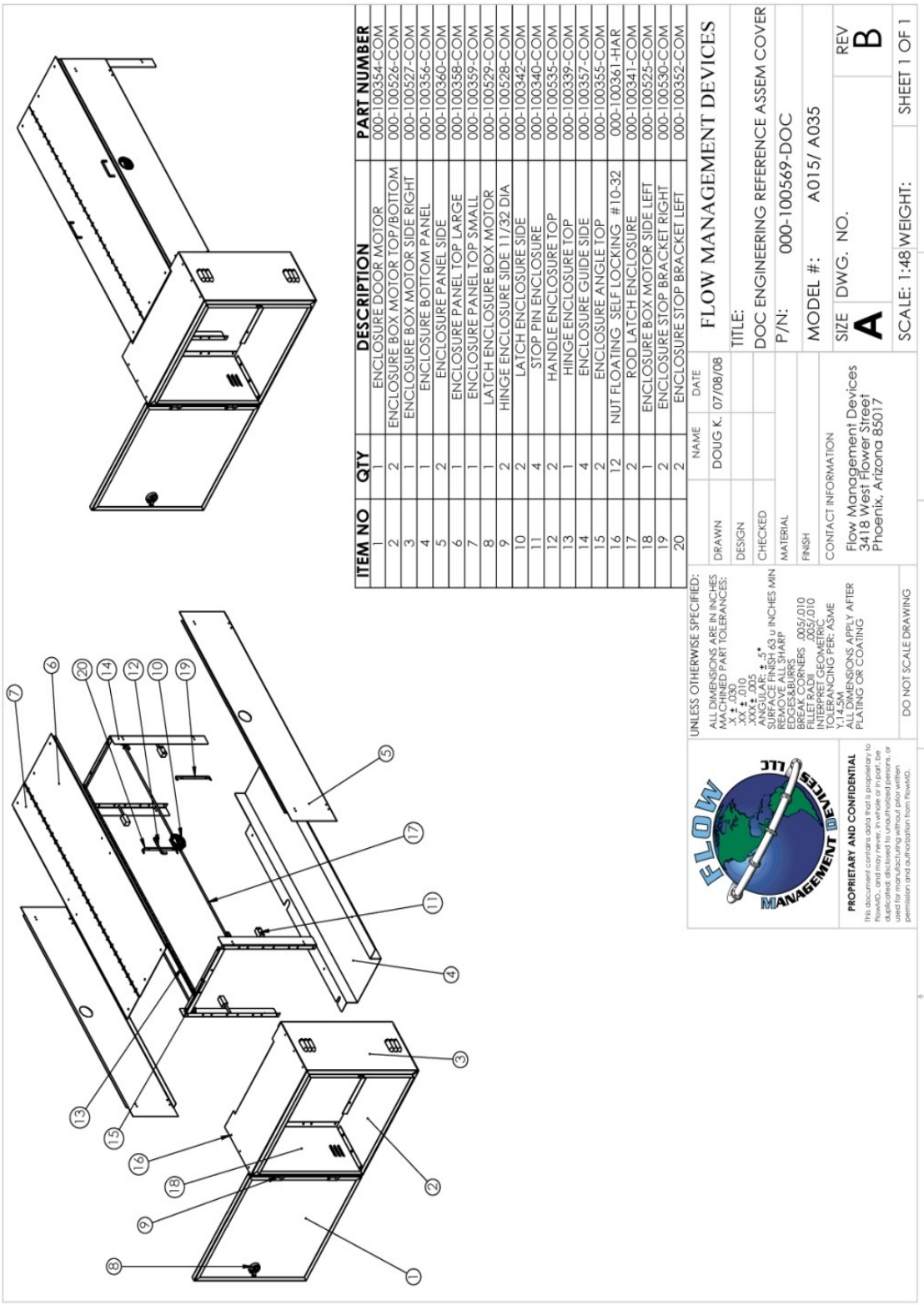


Figure 6.3 Drive frame and drive train cover components



ITEM NO	QTY	DESCRIPTION	PART NUMBER
1	1	ENCLOSURE DOOR MOTOR	000-100354-COM
2	2	ENCLOSURE BOX MOTOR TOP/BOTTOM	000-100526-COM
3	1	ENCLOSURE BOX MOTOR SIDE RIGHT	000-100527-COM
4	1	ENCLOSURE BOTTOM PANEL	000-100356-COM
5	2	ENCLOSURE PANEL SIDE	000-100360-COM
6	1	ENCLOSURE PANEL TOP LARGE	000-100358-COM
7	1	ENCLOSURE PANEL TOP SMALL	000-100359-COM
8	1	LATCH ENCLOSURE BOX MOTOR	000-100529-COM
9	2	HINGE ENCLOSURE SIDE 11/32 DIA	000-100528-COM
10	2	LATCH ENCLOSURE SIDE	000-100342-COM
11	4	STOP PIN ENCLOSURE	000-100340-COM
12	2	HANDLE ENCLOSURE TOP	000-100535-COM
13	1	HINGE ENCLOSURE TOP	000-100339-COM
14	4	ENCLOSURE GUIDE SIDE	000-100357-COM
15	2	ENCLOSURE ANGLE TOP	000-100355-COM
16	12	NUT FLOATING SELF LOCKING #10-32	000-100361-HAR
17	2	ROD LATCH ENCLOSURE	000-100341-COM
18	1	ENCLOSURE BOX MOTOR SIDE LEFT	000-100525-COM
19	2	ENCLOSURE STOP BRACKET RIGHT	000-100530-COM
20	2	ENCLOSURE STOP BRACKET LEFT	000-100352-COM

UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS ARE IN INCHES
MACHINED PART TOLERANCES:
X ± .010
XX ± .005
XXX ± .005
ANGULAR: ± .5°
SURFACE FINISH 63 u INCHES MIN
REMOVE ALL SHARP
EDGES & BURRS
BREAK CORNERS .005/.010
FILLET RADII .005/.010
INTERPRET GEOMETRIC
TOLERANCING PER: ASME
Y.14.5M
ALL DIMENSIONS APPLY AFTER
PLATING OR COATING

	NAME	DATE
DRAWN	DOUG K.	07/08/08
DESIGN		
CHECKED		
MATERIAL		
FINISH		

CONTACT INFORMATION
Flow Management Devices
3418 West Flower Street
Phoenix, Arizona 85017

FLOW MANAGEMENT DEVICES

TITLE:
DOC ENGINEERING REFERENCE ASSEM COVER

P/N: 000-100569-DOC

MODEL #: A015/ A035

SIZE A | DWG. NO. | REV B

SCALE: 1:4 | WEIGHT: | SHEET 1 OF 1

DO NOT SCALE DRAWING

PROPRIETARY AND CONFIDENTIAL
This document contains data that is proprietary to FlowMD., and may never, in whole or in part, be duplicated; disclosed to unauthorized persons, or used for manufacturing without prior written permission and authorization from FlowMD.

7.0 - Belt preventive maintenance-

An effective preventive maintenance program consisting of a safe working environment, proper belt drive installation, and inspection and performance evaluations will continue to keep costs down and your FMD Prover operational. The following factors will reduce the life of you belts.

- Improper belt or pulley installation
- Environmental factors
- Improper drive maintenance
- Improper belt storage or handling
- Defective drive components

1) Clutch belt replacement procedure-

Warning-Make sure the power is turned off and proper lock and tag procedure has been followed

i. Relieve the tension by turning the tension bolt counter clockwise Figure 7.1-A-1 and 2
ii. Push the tensioning sprocket down and remove the belt Figure 7.1-B
iii. Place the new belt on the sprockets at the same time
iv. Check the belt location and alignment before tensioning the belt
v. Consult with factory (Flow MD™) for proper belt tension (model dependent) and tension the belt
vi. Tighten the locking nut after proper tension is set Figure 7.1-C

Figure 7.1-A Clutch belt replacement

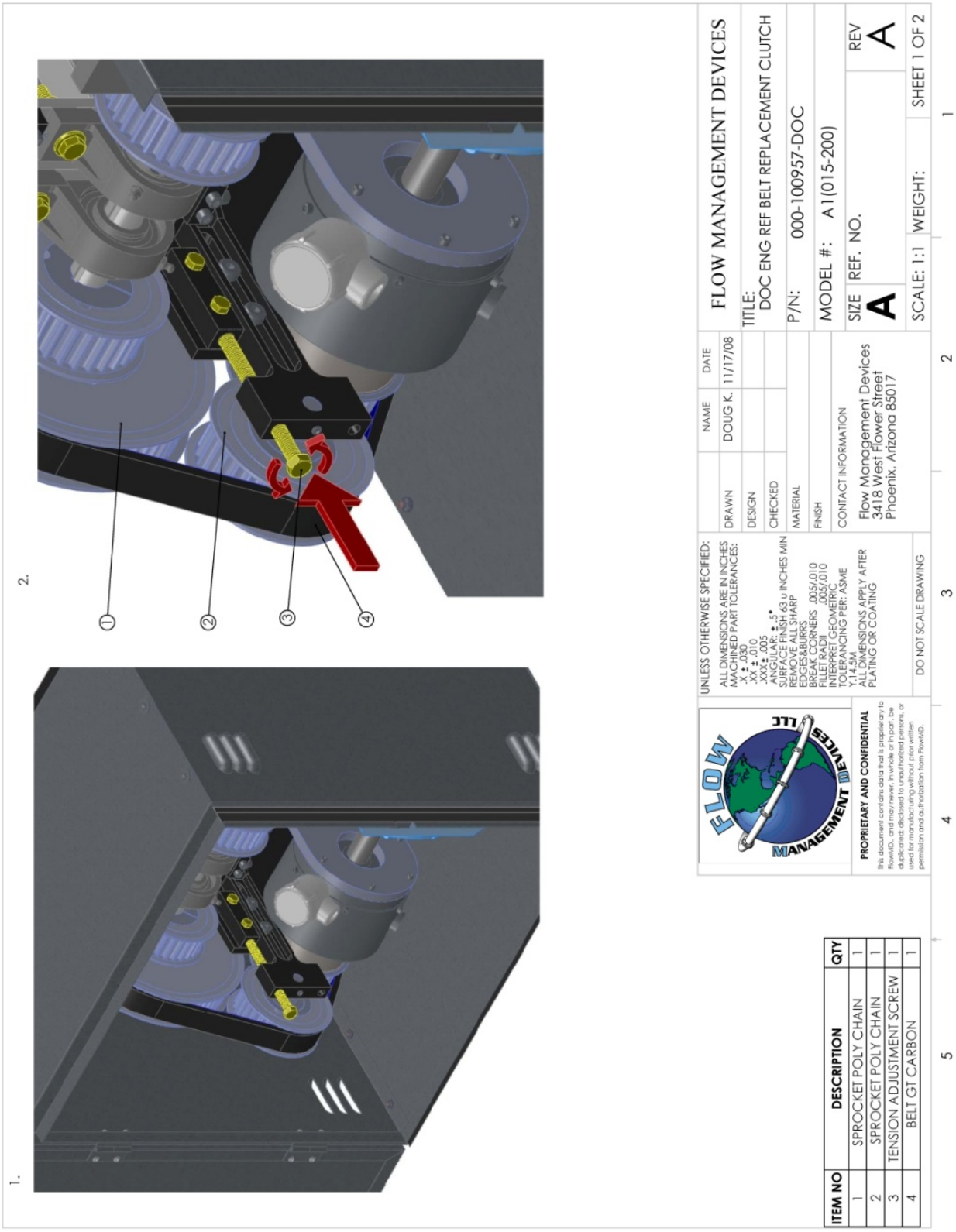
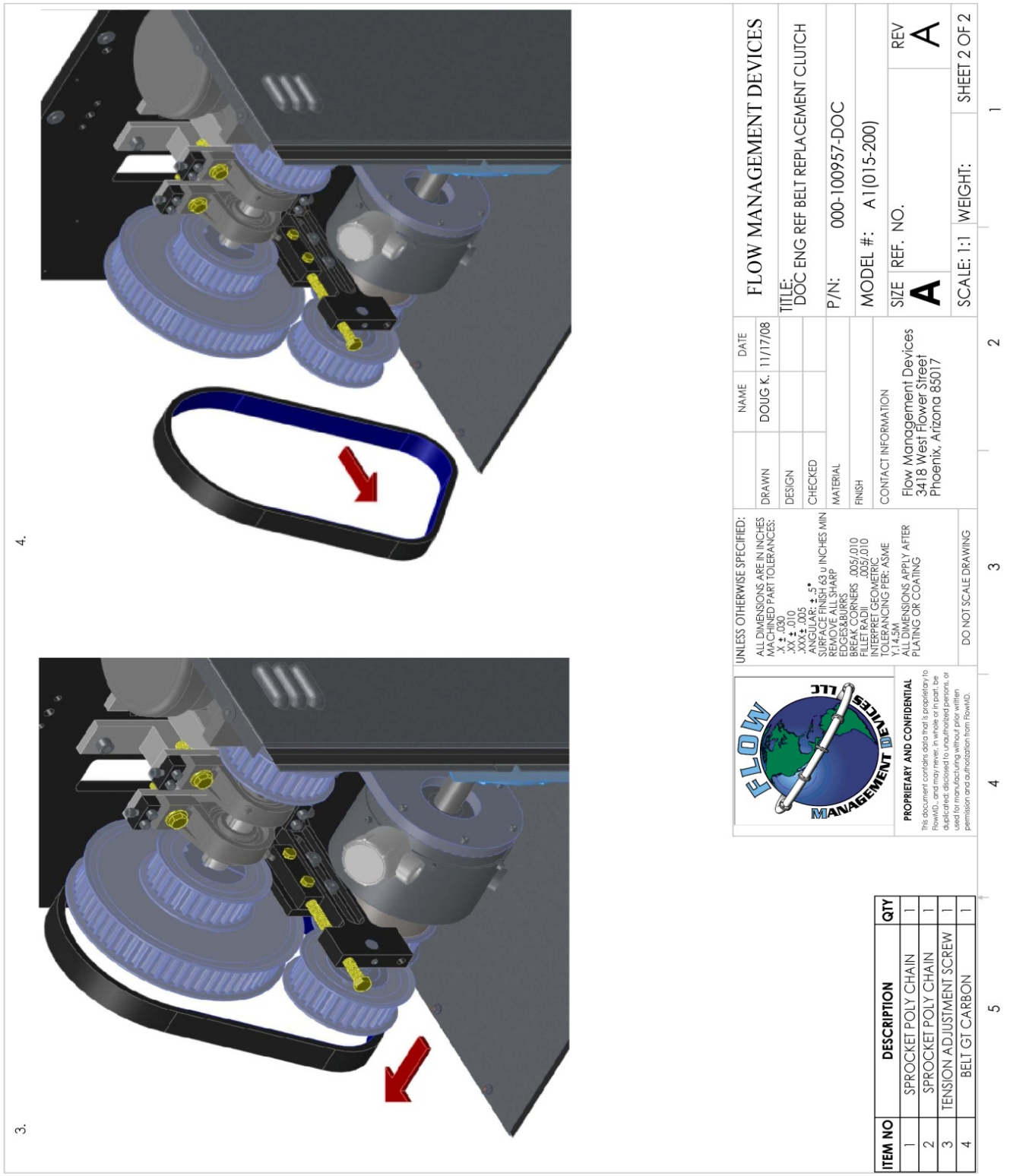


Figure 7.1-B Clutch belt replacement



2) Drive belt replacement –

Warning-Make sure the power is turned off and proper lock and tag procedure has been followed

i. Remove shuttle belt cap from the worn belt Figure 7.2-A-1
ii. Remove the tension by loosening the tensioning bolt. Figure 7.2-A-2
iii. Remove the belt from the sprocket. Figure 7.2-B-3
iv. Remove the first belt from the drive train side. Figure 7.2-B-4
v. Remove the second belt after removing the large sprocket. Figure 7.2-C-5 and 6
vi. Reverse the process for installing the new belts
vii. For proper belt tensioning consult factory

Figure 6.4-A Drive belt replacement

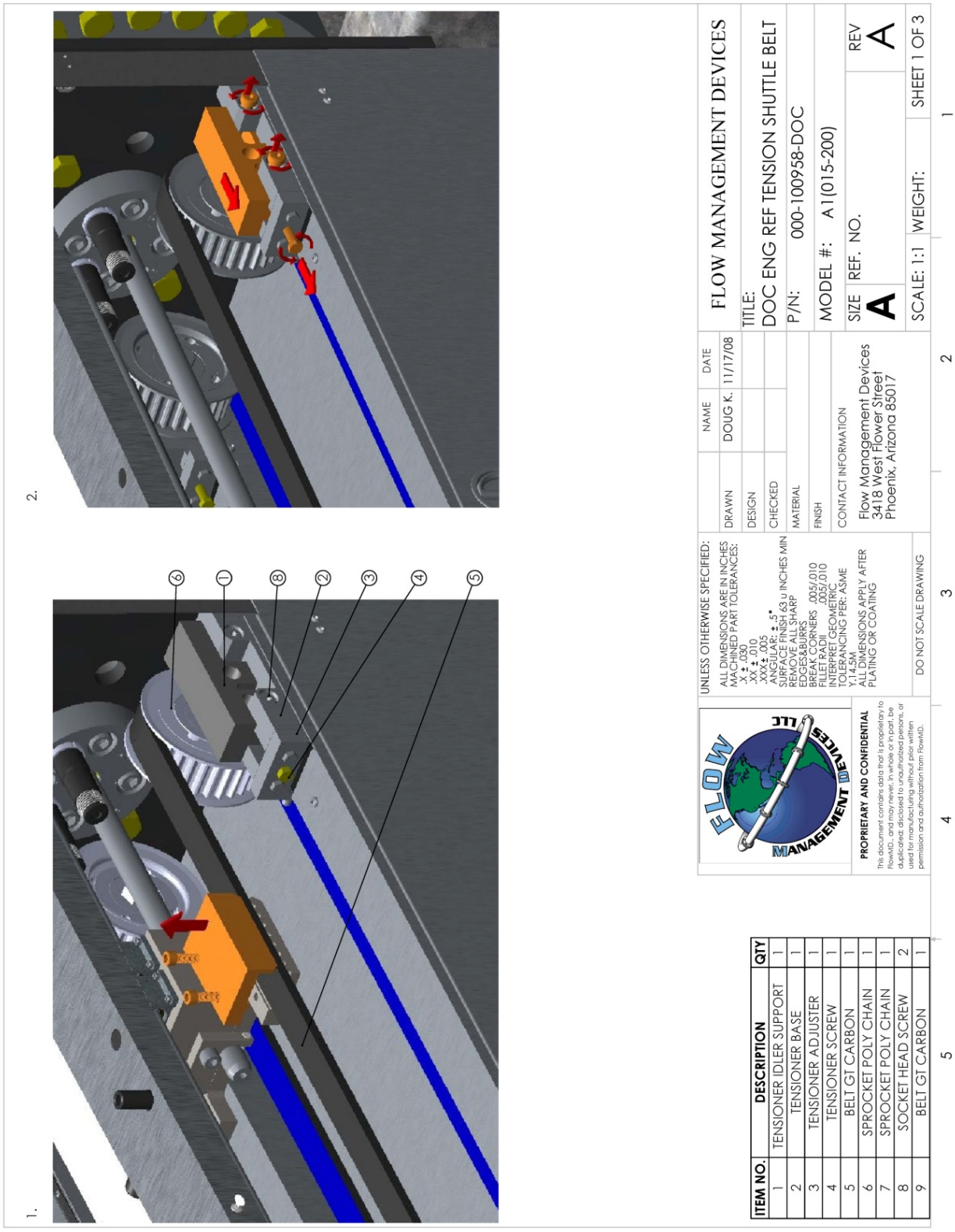


Figure 6.4-B Drive belt replacement

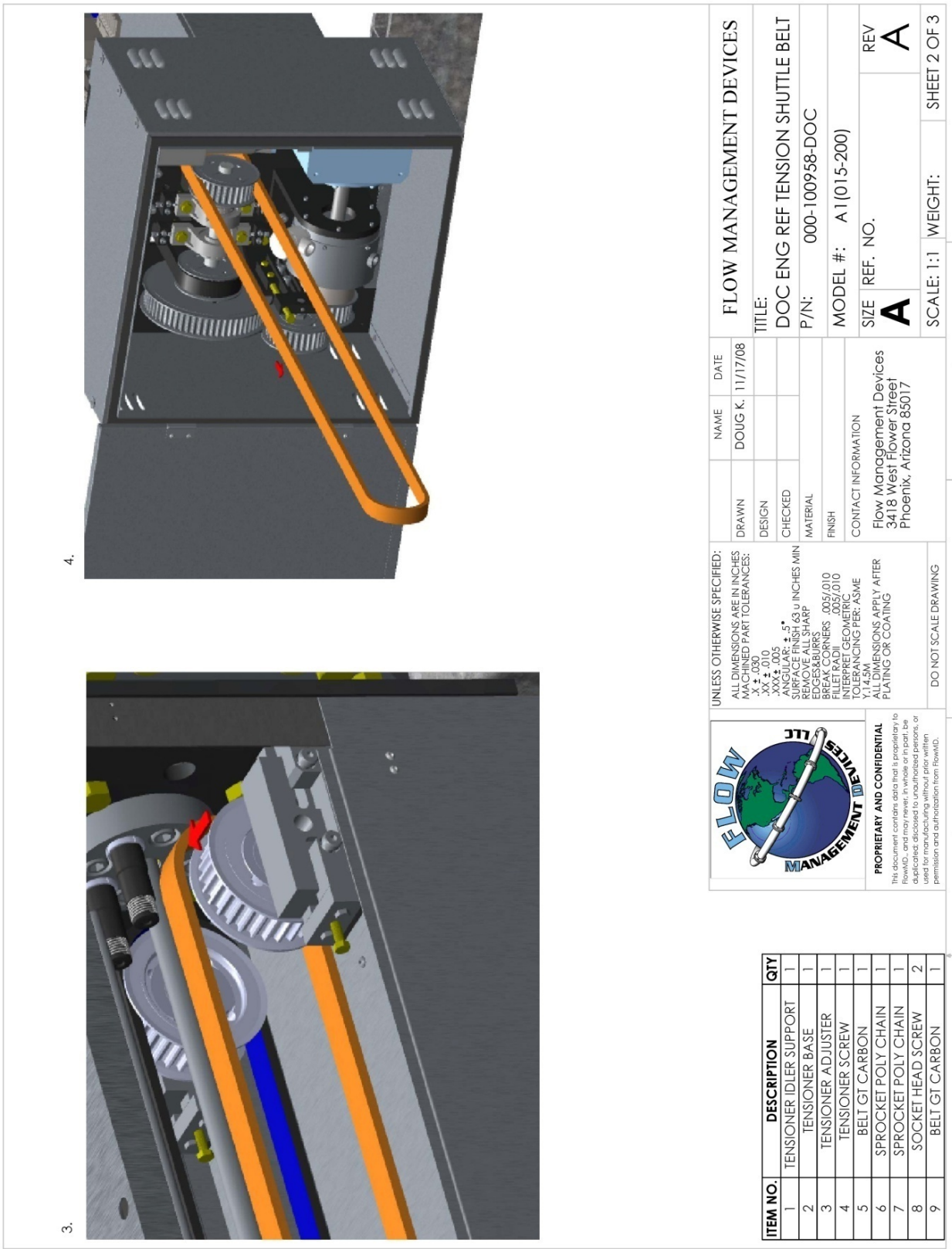
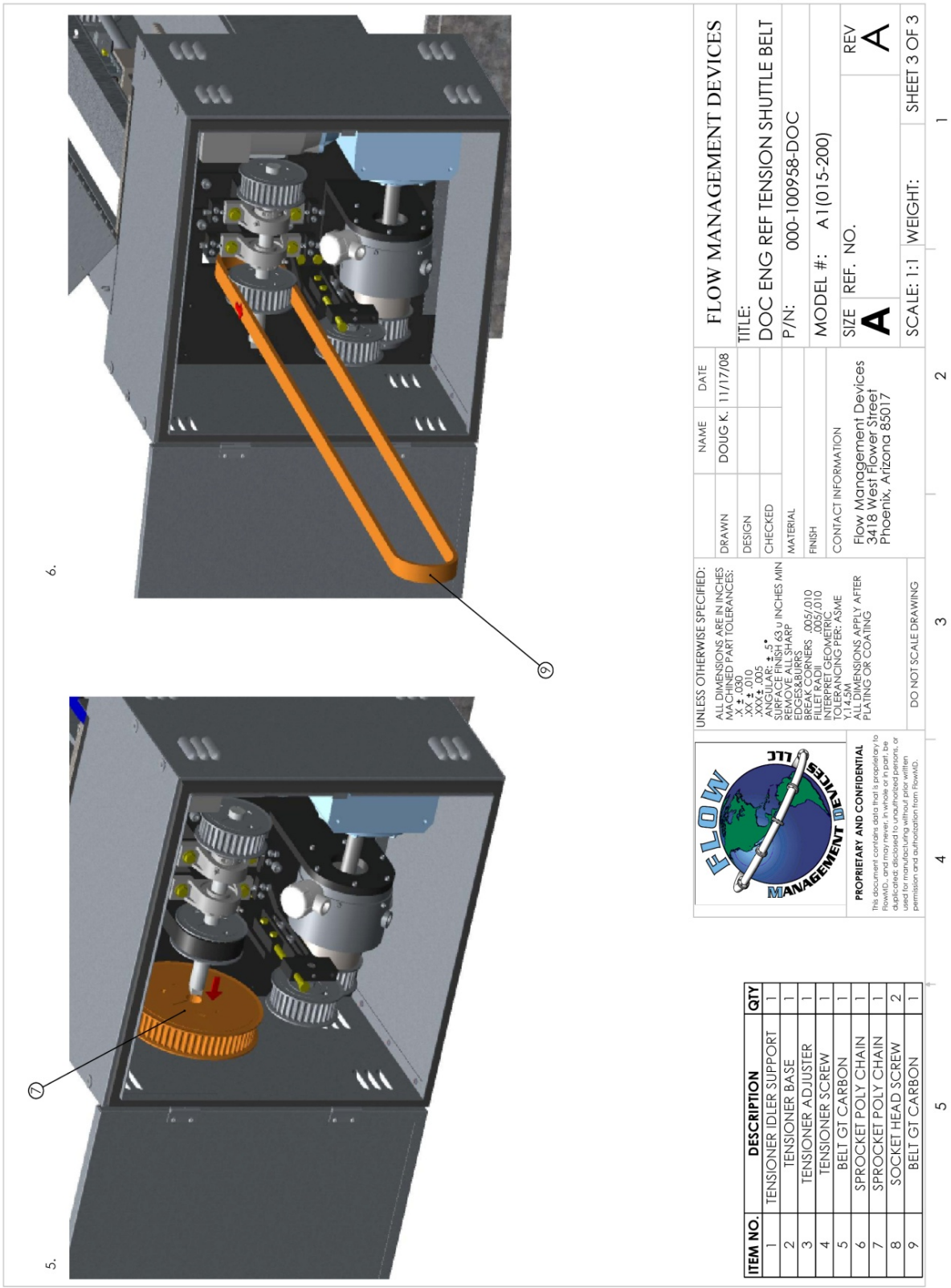


Figure 6.4 C Drive belt replacement



7.0- Preventive Maintenance-

Flow Management Devices highly recommends that each user establish their own preventive maintenance schedule based on usage, products, temperatures, pressure, and etc.
The PIM is programmed for the following preventive maintenance.

Table 7.1 Recommendation for PM

Service number	Number of Cycles	Preventive Action
Service #1	10000	A-Check for leaks B-Check for loose hardware C-Check belt tensions
Service #2	20000	A- Check for leaks B-Check for loose hardware C-Check belt tensions D-Check the shock absorber E-Leak test F-Clean the unit
Service #3	26000	A- Check for leaks B-Check for loose hardware C-Check belt tensions D-Check the shock absorber E-Leak test F-Water Draw G-Clean the unit
Service #4	32000	A- Check for leaks B-Check for loose hardware C-Check belt tensions D-Check the shock absorber E-Leak test F-Clean the unit
Service #5	40000	A- Check for leaks B-Check for loose hardware C-Check belt tensions D-Check the shock absorber E-Leak test F-Water Draw G-Clean the unit

7.2- Clutch Maintenance- The Clutch requires very low maintenance. Please contact the factory for any problems with the clutch.

Warning- Do not add oil to the clutch, overfilling the clutch with oil or incorrect oil will result in Clutch failure.

8.0- Trouble shooting-

8.1 Troubleshooting Chart

Problem	Process	Action	Probability
Prover does not Launch	1-Verify that there is AC voltage at the terminal blocks from customer connection	A-If not, Turn on the circuit breaker or plug in the AC cord. B- Check for loose connection	VERY HIGH
	2-Verify that the circuit breaker located in the explosion proof housing is in the "ON" position	A-If not, turn on the circuit breaker to "ON" position	VERY HIGH
	3-Verify that the LED indicators are illuminated on the motor and (Clutch) relays and power supply	A- Check wiring B- Replace defective relay C- Replace power supply	HIGH
	4-Verify that the power switch is in the "ON" position on the PIM and the power indicator is illuminated	A- Turn on the Power Switch B-Check the power source C-Check the wiring to J21 D-Replace PIM	High
	5- Verify that the motor is running when a Launch command is generated	A-Check the wiring on the motor B- Replace Motor	Low
	6- Verify that the (Clutch)is engaged when the Launch command is generated	A-Check the wiring on S1 and mechanical switch B-Check the wiring in the electrical box C-Check for the proper voltage and signal levels on DC relay D- Check the wiring in the Clutch junction box E-Check for proper oil level High oil level or wrong oil can cause the clutch to slip F- Replace Clutch	Low Low
	7-Verify that all the drive belts are properly tensioned and turning	A- Check the belt B- Check the pulley and tighten the setscrews C-Check for the locking keys in the pulley	
	8- Consult Factory		

Prover will launch and stop at upstream position and after 30 seconds the motor stops (PIM will Display Motor/Clutch error)	1-Verify that the stop switches are properly installed and functioning 2-Verify the power is being supplied to the switches 3-Verify that the Clutch relay is functioning properly 4-Call factory for Service	A-Check the mechanical stop switch B-Check the Optical Stop Switch C-Check the wiring D-Check the connection from optical switch harness to cable E-Check the cable connection to the PIM A-Check the PIM wiring B-Check the voltage level on PIM connector J20 Pin 8 A-Check for loose connection	High High
PIM is displaying "V# Sequence Error"	1-Verify that V# (optical switch for Volume 1,2,or 3) optical switches are installed properly	A-Check for loose connection B-Check the wiring on the PIM C-Replace optical switch	Low

Belt and Sprocket Problems

1-Unusual noise	A- Misaligned drive B-Belt tension too high C-Belt is riding on the sprocket flange D-Liquid or foreign objects on the belt
2-Tension loss	A-Tooth Wear
3-Excessive belt edge wear	A- Misalignment
4-Tensile break	A- Belt tension too high
5- Tooth wear	A-Misaligned Drive B-Tension too high C-Damaged or corroded Sprocket
6- Tooth shear	A- Low belt tension B-Misalignment
7- Land area worn	A-Incorrect sprocket B-Misalignment
8- Flange failure	A-Misalignment
9- Unusual wear	A-Misalignment B-High or low tension

9. Disclaimer notice

The contents of this manual are for informational purposes only and can be modified without notice at any time. Flow Management devices shall not be liable for any subsequent damages including but not limited to: loss of product, profits, etc.

The purchaser and end user are responsible for proper selection, use and maintenance of Flow MD™ products.

Preventive Maintenance Log

Date	Cycle Count	Item Serviced	Problem Found, If any	Action Taken	Performed By

Part Number: 000-100300-DOC Rev C
5225 South 37th St. Suite 4 Phoenix, AZ 85040 Phone (602) 233-9885 Fax (602) 233-9887 Website: www.FlowMD.com