EQUIPMENT MANUAL

ACCUSHOT™ DILUTION SYSTEMS

MOTOR CITY WASH WORKS®

TABLE OF CONTENTS

Motor City Wash Works, Inc.
48285 Frank Street
Wixom, MI 48393
Toll Free: 866-362-6377
Fax: 248-313-0271

SPECIFICATIONS

POWER REQUIREMENTS			
20 GPM *(75 LPM)* 3 HP Booster Pump	20 GPM *(75 LPM)* 5 HP Grundfos Pump	40 GPM *(150 LPM)* 7.5 HP Grundfos Pump	Air-Actuated Valves
230V/3PH/60Hz/8.9A 460V/3PH/60Hz/4.2A	230V/3PH/60Hz/12.2A 460V/3PH/60Hz/5.6A	230V/3PH/60Hz/18.6A* 460V/3PH/60Hz/8.9A	24 VAC, 24 VDC, or 120VAC, 3.5 Watts/Port

**Recommended for use with 30A breaker.*

SPACE REQUIREMENTS WALL-MOUNTED BOOSTER PUMPS (DEPTH X WIDTH X HEIGHT)		
1-Pump Wall-Mount	2-Pump Wall-Mount	3-Pump Wall-Mount
12″ x 24″ x 48″ *(31 x 61 x 122 cm)*	12″ x 24″ x 48″ *(31 x 61 x 122 cm)*	12″ x 36″ x 48″ *(31 x 91 x 122 cm)*

SPACE REQUIREMENTS FLOOR-MOUNTED BOOSTER PUMPS (DEPTH X WIDTH X HEIGHT)		
1-Pump Floor-Mount	2-Pump Floor-Mount	3-Pump Floor-Mount
12″ x 24″ x 54″ (31 x 61 x 138 cm)	*12″ x 32″ x 54″ (31 x 82 x 138 cm)*	*22″ x 32″ x 54″ (56 x 82 x 138 cm)*

SPACE REQUIREMENTS GRUNDFOS PUMPS (DEPTH X WIDTH X HEIGHT)	
20 GPM Grundfos Pumps	40 GPM Grundfos Pumps
17″ x 14″ x 41″ *(44 x 36 x 104 cm)*	19″ x 15″ x 42″ *(49 x 38 x 107 cm)*

SPACE REQUIREMENTS FOR MCU, VFD, & MD PANELS (DEPTH X WIDTH X HEIGHT)		
Motor Control Unit	VFD	AccuShot Panels
9″ x 14″ x 15″ *(23 x 36 x 38 cm)*	14″ x 21″ x 20″ *(36 x 54 x 51 cm)*	8″ x 27″ x 43″ *(21 x 69 x 110 cm)*

WATER INLET LINES		
20 GPM *(75 LPM)* Booster Pump	20 GPM *(75 LPM)* Grundfos Pump	40 GPM *(150 LPM)* Grundfos Pump
1″ ID	1.25″ ID	2″ ID

SOLUTION OUTLET LINES			
Up to 2.25 GPM *(8.5 LPM)*	3.25 - 4.5 GPM *(13.3 - 17 LPM)*	5.5 GPM *(20.8 LPM)*	10.0 - 15.0 GPM *(37.9 - 56.8 LPM)*
3/8″ ID (1/2″ OD Polyflow*)	1/2″ ID*	5/8″ ID*	3/4″ ID

**Assuming line length is 50' (15 m) or less. Refer to user page 33 for recommended size chart for other lengths.*

OUTLET CONNECTION FROM MANIFOLD	
20 GPM VERTICAL GRUNDFOS PUMP	40 GPM VERTICAL GRUNDFOS PUMP
.5″ FNPT	1″ FNPT

FLANGE TORQUE
20 or 40 GPM VERTICAL GRUNDFOS PUMP
37-44 ft-lbs

MAX. WATER SOURCE TEMP.
Recommended 110°F (43°C) (max water temp) 137°F (58°C) with Booster Pump 140°F (60°C) with Grundfos Pump

OPERATING WATER PRESSURE
200 PSI *(14 bar)* Factory Set (Assumes 40 PSI *(2.8 bar)* City Feed)

WATER FILTRATION (SUGGESTED)
50 Micron

AIR OUTLET LINE
3/8″ OD Polyflow per Application

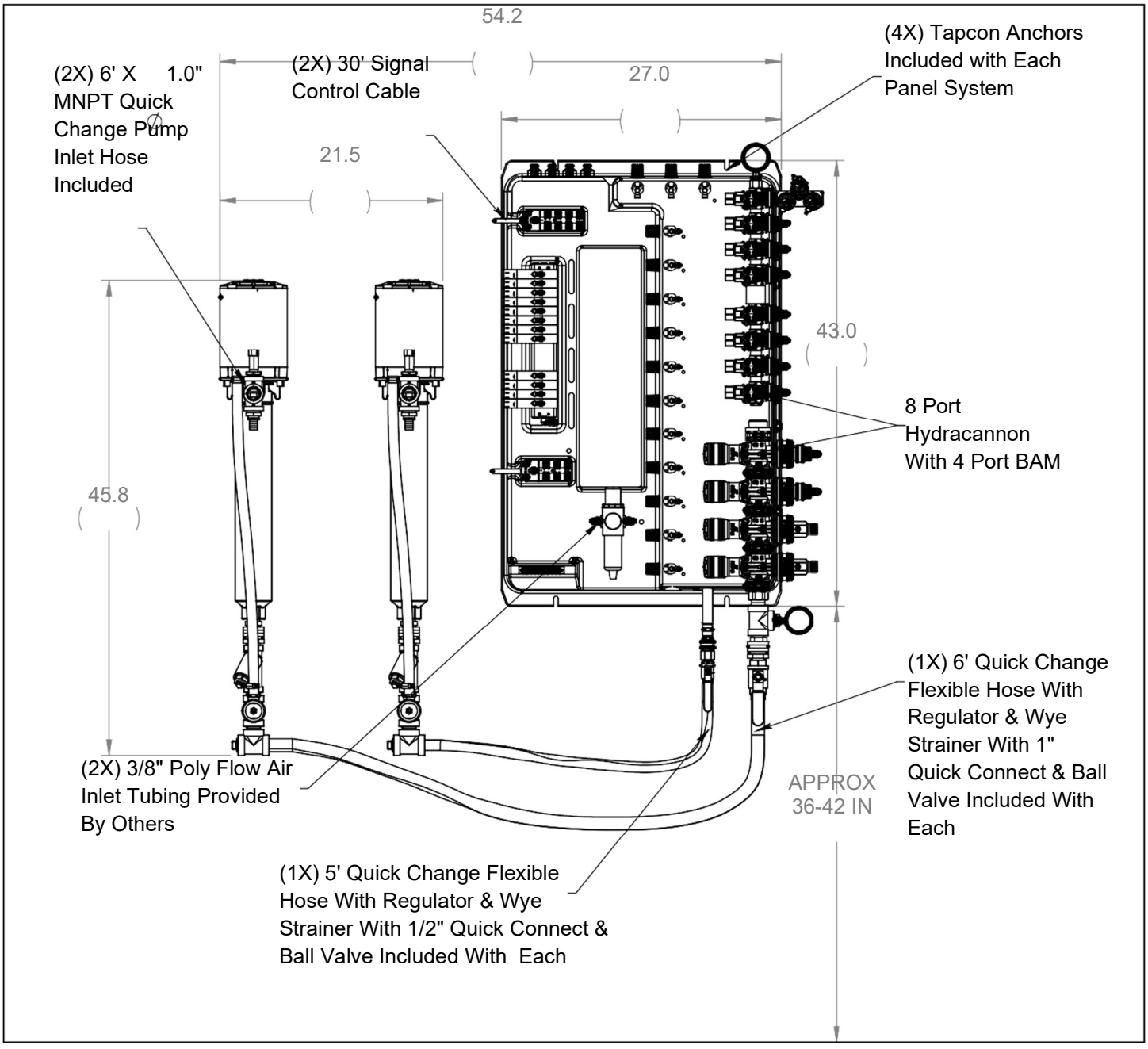
AIR INLET LINE
3/8″ OD Polyflow per MD Panel

AIR INLET PRESSURE
20 CFM @ 80-120 PSI *(5.5-8.3 bar)* Dry Air

PRESSURE TRANSDUCER (VFD)	
Pressure Range	0-300 PSI
Set point	200 PSI
Cord Length	7 Meter

WATER SUPPLY	
Max Flow Per Hydra-Cannon Port	6 GPM
Max Flow Per BAM Port	15 GPM

LAYOUT DRAWING



****Pump configuration will vary depending on specific order options.*

ESTIMATED INSTALLATION TIMELINE

PRE-INSTALLATION

WHO	TASK	EST. TIME
DISTRIBUTOR & CUSTOMER	DETERMINE LOCATION TO INSTALL EQUIPMENT	1 HR
PLUMBER	INSTALL WATER SUPPLY LINE	4 HR
ELECTRICIAN	INSTALL ELECTRICAL SUPPLY LINE	4 HR
TECHNICIAN	LABEL ALL CONTROLLER RELAYS AT CONTROLLER	1 HR
TECHNICIAN	RUN SOLUTION AND AIR LINES (IF NECESSARY)	5 HR
TECHNICIAN	INSTALL AIR SUPPLY LINE	1 HR
	TOTAL LABOR HOURS	**16 HRS**

INSTALLATION

WHO	TASK	EST. TIME
DISTRIBUTOR / TECHNICIAN	HANG EQUIPMENT	1 HR
TECHNICIAN	CONNECT WATER, AIR AND SOLUTION LINES	1 HR
TECHNICIAN	CONNECT CONTROL LEADS TO MAIN CONTROLLER OR JUNCTION BOX	2 HR
DISTRIBUTOR/TECHNICIAN	STARTUP (INJECTOR, METERING TIP AND NOZZLE SELECTION)	3 HR
DISTRIBUTOR/TECHNICIAN	DOCUMENT CONFIGURATION	1 HR
	TOTAL LABOR HOURS	**8 HRS**

POST INSTALLATION

WHO	TASK	EST. TIME
DISTRIBUTOR	MONITOR & RECORD PERFORMANCE	2 HR / WK
DISTRIBUTOR	MAINTENANCE PER SCHEDULE OR AS NEEDED	

TOTAL HOURS SPENT

TOTAL CUSTOMER	**1 HR**
TOTAL DISTRIBUTOR/TECHNICIAN	**15 HR**
TOTAL ELECTRICIAN	**4 HR**
TOTAL PLUMBER	**4 HR**

Installation takes approximately ONE day. An electrician and a plumber are needed for half a day.

INSTALLATION INSTRUCTIONS

General Skill Level

- Mechanical: Basic - mounting equipment
- Electrical: Advanced - three phase power and controls knowledge (local codes knowledge required)
- Plumbing: Moderate - principal supply line required
- Pneumatic: Basic- pneumatic utility connection required
- Chemical Knowledge: Moderate - chemical titrations required

Tools & Equipment Needed:

- Drill with Phillips head
- Concrete drill bit 3/8”
- Concrete drill bit 5/32”
- Hammer
- Tape measure
- Level
- Utility knife
- Wire stripper
- Socket set
- Adjustable wrench
- Screw driver set
- Teflon tape

Useful Tools:

- Amp Meter
- Volt Meter

UNPACKING

When unpacking AccuShot be sure not to discard the manual or any accessories. Inspect the shipment for any damage or missing components. If pumps are included with order, take care moving the pump(s). Utilize proper lifting technique and mechanical assistance if necessary.

LOCATION & MOUNTING

**If location was not identified during the Pre-Installation Process, make sure to consider the proximity to feed water, power supply, and the control cabinet as well as space near the system to store chemical containers.

*****See drawing in reference for general layout**

ACCUSHOT (WALL MOUNT)

1. Drill (4) 5/32” holes on the wall. 16 3/8” wide, 27 5/8” tall.
2. Press AccuShot board tight against the wall.
3. Screw in 3/16” concrete screws with a washer.

SYSTEMS WITH BOOSTER PUMPS & MCU

PUMP ASSEMBLY - NEED TO BE WITHIN 6’ OF FURTHEST AQUA-LAB PANEL

1. Drill 3/8” holes in wall for bottom slots (20” on center pump nose down, 3.5” on center pump nose sideways - dual stand).
2. Insert concrete anchors, set pump on bolts and tighten down.
3. Hold pump stand in place, drill top holes, insert anchors and tighten.

MOTOR STARTER

1. Mount to the wall with 4 appropriate anchors.

SYSTEMS WITH VFD & GRUNDFOS PUMPS

1. *Before bolting components down, ensure the water lines, electrical cables, etc. have enough length to connect.*
2. Remove pump from packaging.
3. Locate pump in desired location.
4. Securely anchor pump to concrete floor.
5. Mount VFD to the wall.

PNEUMATIC CONNECTIONS

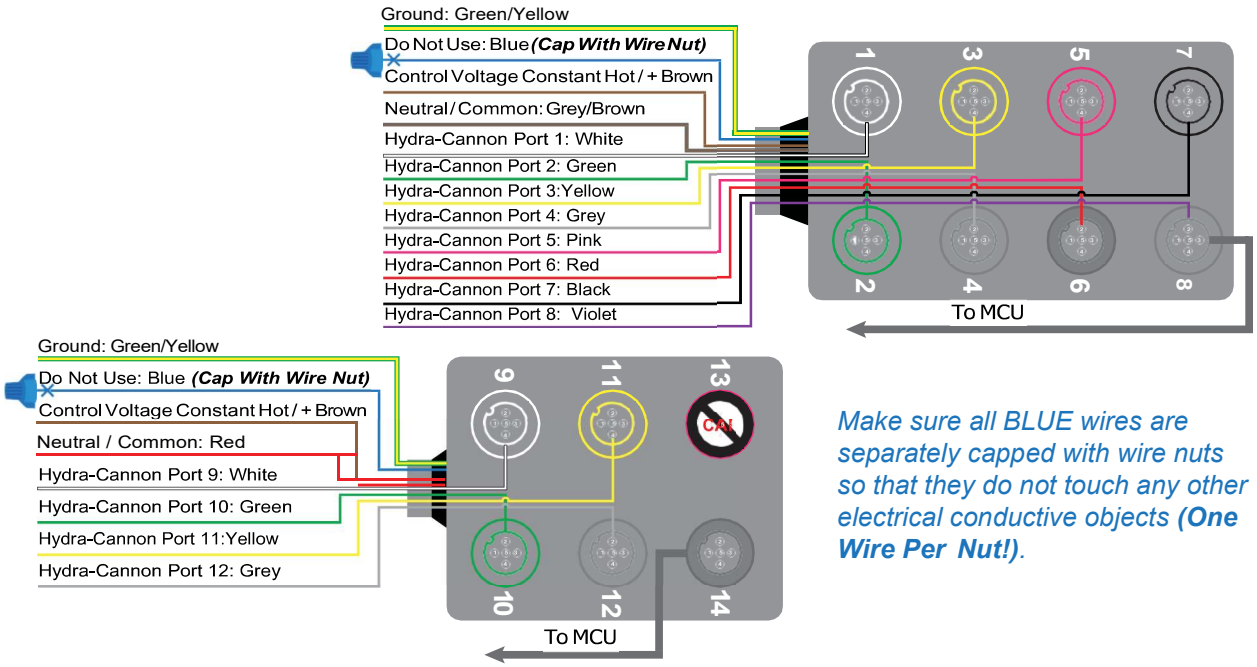
- Connect pre-run 3/8” OD poly feed line to push connect fitting on the side of the primary regulator.
- Connect 3/8” OD poly lines from arch to each port that will be foaming.

***If there are unused air ports, counter-clockwise turn the individual line regulator until air no longer flows.*

1. ELECTRICAL CONNECTIONS (HFI MOTOR CONTROL UNIT)

a. Wire homerun control cables to car wash control panel.
(See diagram on page 15 for wiring schematic)

- *Manifold position below designates which Hydra-Cannon port is associated to what color wire.*
  - *Example: if you want Presoak 1 to be on manifold port 2, connect the green wire to your controller relay for Presoak 1.*



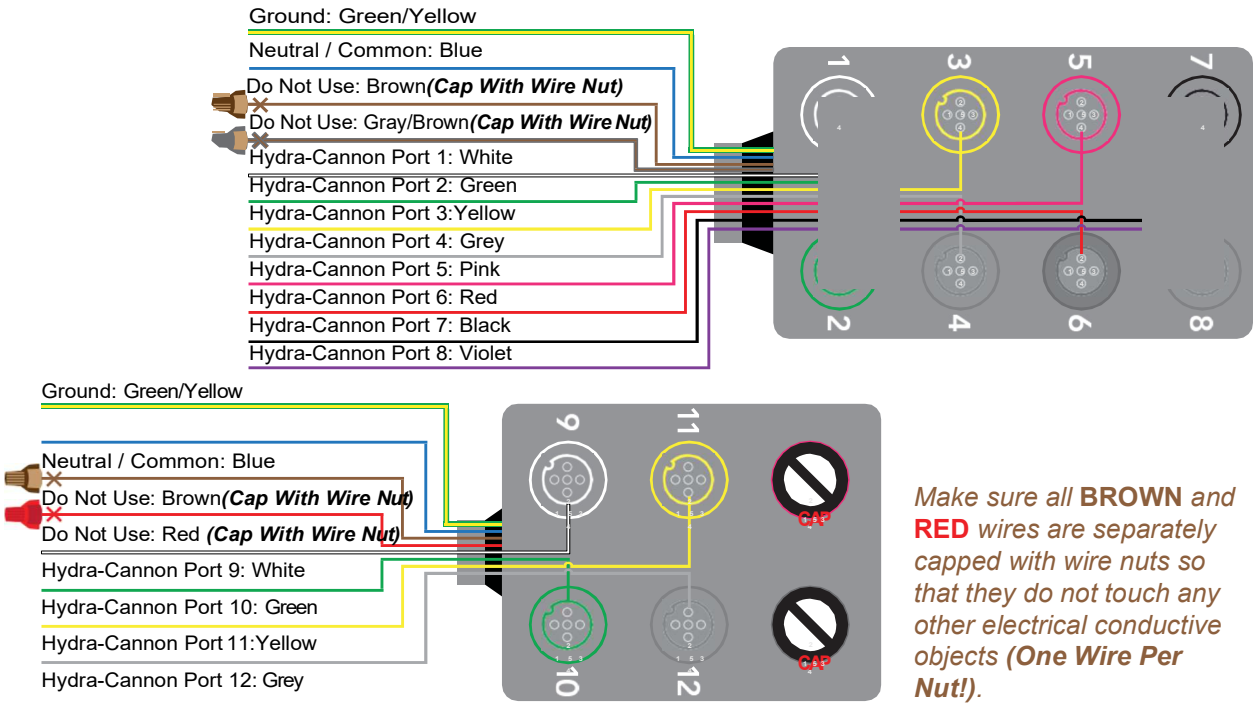
Make sure all BLUE wires are separately capped with wire nuts so that they do not touch any other electrical conductive objects ***(One Wire Per Nut!)***.

2. ELECTRICAL CONNECTIONS *(FOR SYSTEMS RUNNING WITH NON HFI MCU)*

a. Connect homerun control cables to car wash control panel.
(See diagram for wiring schematic)

- *Manifold position below designates which port is associated to what color wire.*
  - *Example: if you want Presoak 1 to be on manifold port 2, connect the green wire to your controller relay for Presoak 1.*

b. Wire each leg of power from your starter to each pump.
i. See diagram on pump for wiring schematic or pump manual.



Make sure all **BROWN** *and* **RED** *wires are separately capped with wire nuts so that they do not touch any other electrical conductive objects* ***(One Wire Per Nut!)***.

HFI BOOSTER PUMP & MCU

(SINGLE SOURCE / SINGLE PUMP SHOWN)

Current Switch

3 Phase Disconnect

Contactor

Timer Relay

Thermal Overload

Quick Connect Pump Plug Female

Temperature Shutdown Relay

Grey M12 Cables *(Carry signal from M12 distribution block to motor starter that turns on the pump)*

Quick Connect 9' Cordset For Pump *(Plugs Into Bottom Of Motor Starter)*

Temperature Switch

Back-up Pump

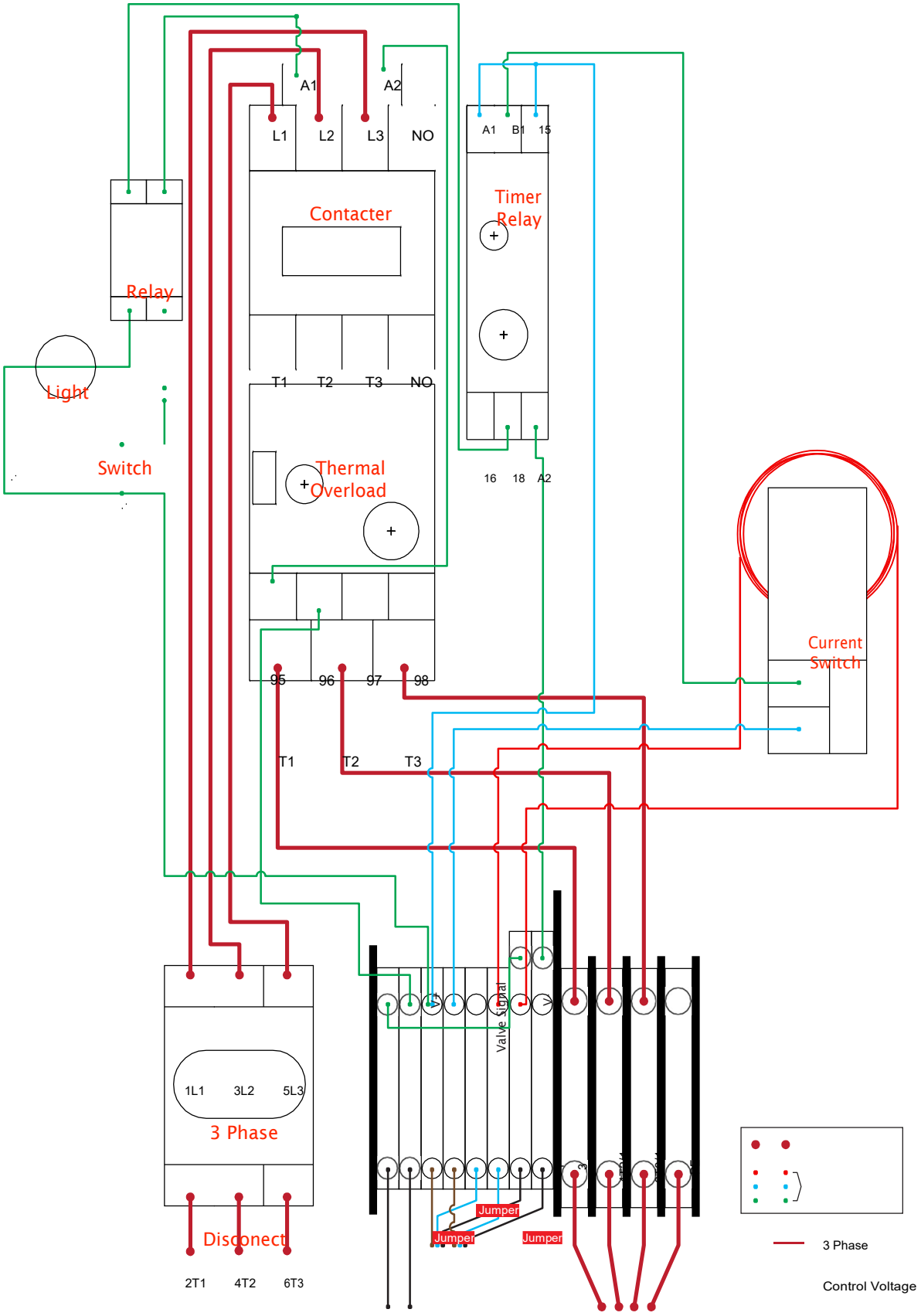
Wye-Strainer

Bypass Pressure Regulator

Pump Outlet Feed Line To MD Panels

MCU WIRING DIAGRAM

(SINGLE SOURCE SINGLE PUMP)



From Breaker

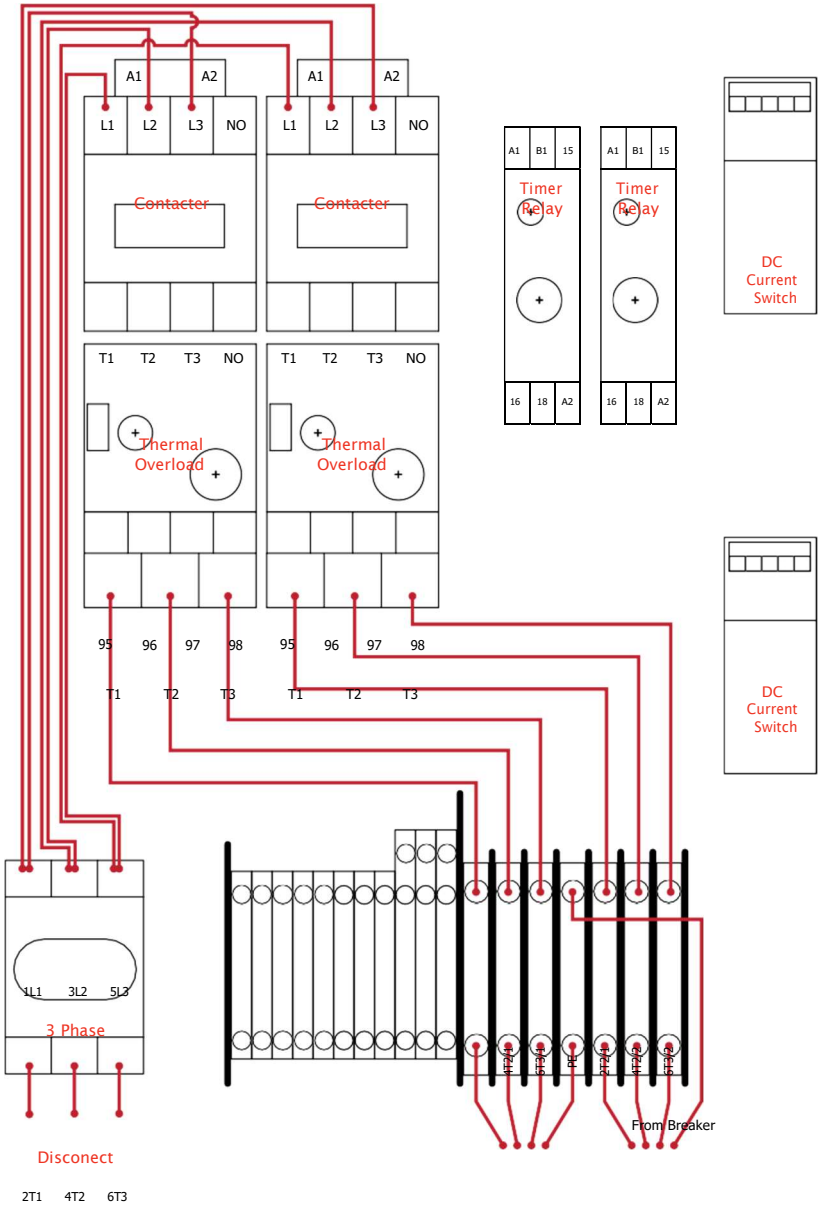
From Grey
M12 Cables
(Port 6 on M12 Block)

To Temp Switch

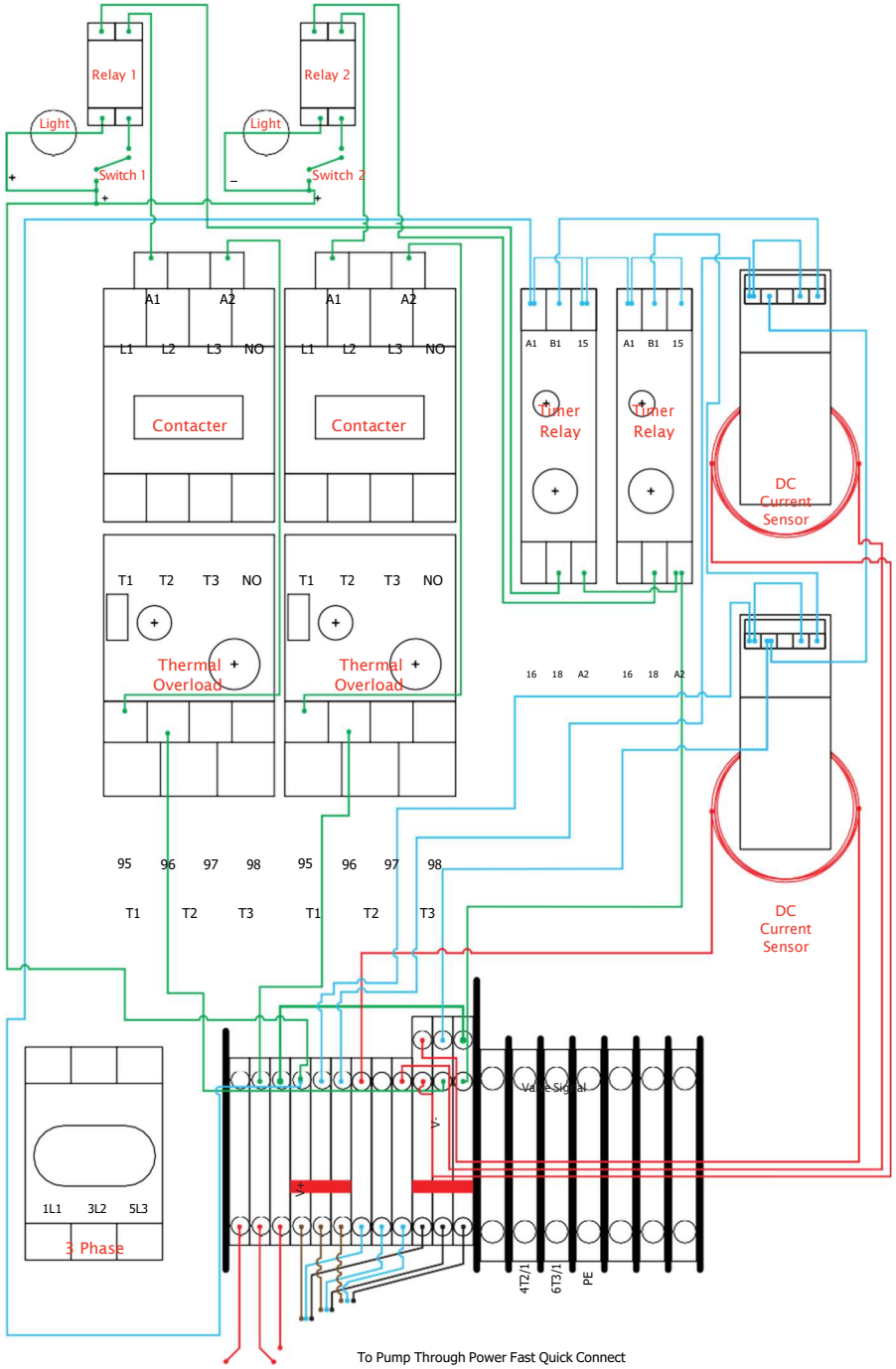
To Pump Through Power Fast Quick Connect

MULTI-SOURCE / DUAL PUMP

3 PHASE



CONTROL VOLTAGE



TEMP1
TEMP2
CB1/BR N
CB2/BR N
CB3/BR N
CB1/BL U
CB2/BL U

Jumper

Disconect

2T1 4T2 6T3

F r o m G r e y M 1 2 C a b l e s T o T e m p T o T e m p

TS1
TS2
TS3
CB1/BRN 1
CB2/BRN 1
CB3/BRN 1
CB1/BLU 3
CB2/BLU 3
CB3/BLU 3
CB1/BLK V- 2
CB2/BLK V- 2
CB3/BLK V- 2

2T1/1

2T2/1

4T2/2

6T3/2

Switch 1 Switch 2

Valve Signal 2

FEED WATER CONNECTION

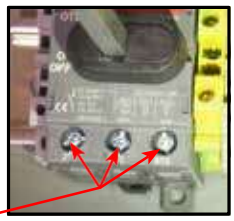
****PRIOR TO CONNECTION, ENSURE THAT THE FEED LINES ARE FREE OF DEBRIS BY FLUSHING OUT THE LINES FOR 15 MINUTES**

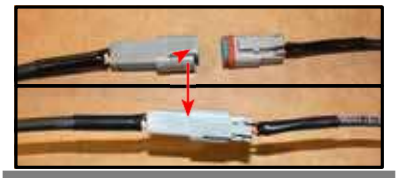
- Connect pre-run main water supply line to pump inlet with hose supplied.
  - Single operating pump: 1" MNPT
  - Dual operating pump: 1-1/2" MNPT

START UP BOOSTER PUMPS

!WARNING!

PUMP MUST BE PRIMED BEFORE OPERATION





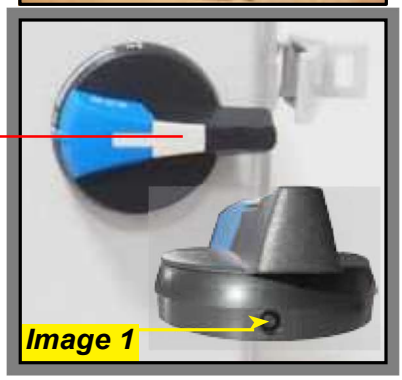


Image 1

1. FLUSH

Make sure water supply to pump is turned on. Open ball valve and direct toward a drain or container to remove the majority of the air from the pump until a steady stream of water is flowing *(approx. 1 min)*. Then close the ball valve.

a. Connect Powerfast Cordset on motor(s) to motor control unit.

b. In the lower left of the enclosure, wire each leg of the incoming power to the terminals labeled 2T1, 4T2, and 6T3.

- *Make sure to follow all applicable electrical codes.*

c. Quick connect high temp shutdown switch.

- *Connect the high temp switch from the pump assembly to MCU.*

2. CHECK ROTATION

Open AccuShot Motor Control Unit (MCU) and ensure 3 phase disconnect is on. *(Note: Door will not open with disconnect on. Use a 1/4" wrench or crescent wrench to turn it back on after opening door.) (MCU with blue and black Eaton disconnect can be opened without shutting off by depressing button under switch handle. Press small button with screw driver to bypass disconnect* ***(Image 1)****.*

!WARNING! - ELECTRIC SHOCK HAZARD. HIGH VOLTAGE PRESENT INSIDE MOTOR CONTROL UNIT - USE CAUTION!

Start the pump momentarily by depressing the center of the contractor ***(image 2)***.

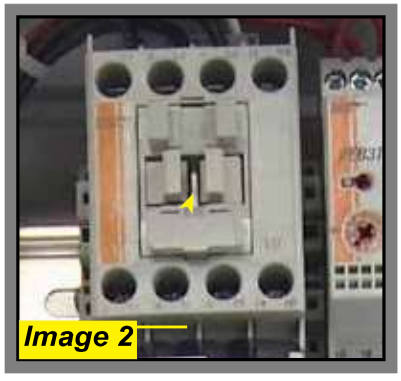


Image 2

!WARNING! RUNNING THE PUMP BACKWARD WILL CAUSE CATASTROPHIC SYSTEM FAILURE! ENSURE THAT PUMP ROTATION IS CORRECT ***(image 3)*** as indicated by the arrow on the casting of the pump and that 200 psi can be reached.

- *If pump cannot regulate to 200 psi, remove pump motor cover and look at shaft to confirm correct rotation.*
- *Verify pump inlet pressure remains positive when running.*

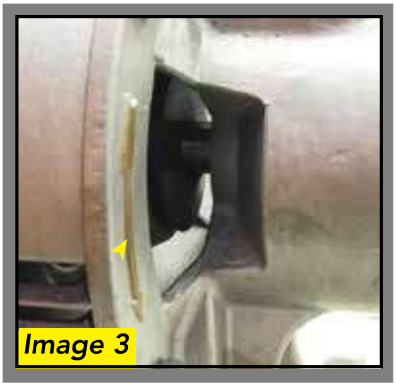


Image 3

3. **CLOSE CABINET**
   Turn on 3 phase disconnect, if high temp switch is present, push to start ***(Image 4).***

4. **PURGE BYPASS**
   Start the pump and slowly open ball valve until it is wide open. Allow to run for 60 seconds to flush lines and then close valve.


Image 4

5. **CONNECT**
   Connect the pump outlet line to the Hydra-Cannon Manifold and open ball valve.

6. **DOUBLE CHECK**
   Confirm that the pump can obtain 200 psi while firing solenoids and that the pump housing *(stainless steel tube)* is cool to the touch after a minute in operation.

- *If housing is hot or noisy, pump did not prime correctly.*
- *If pump does not prime, repeat steps 3-5.*
- *If not at 200 psi and the pump is correctly rotating you may need to adjust the bypass regulator to obtain 200 psi* ***(Image 5)****.*

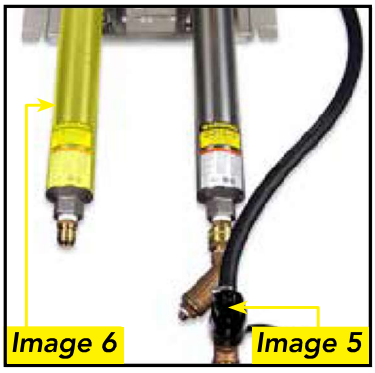


Image 6 Image 5

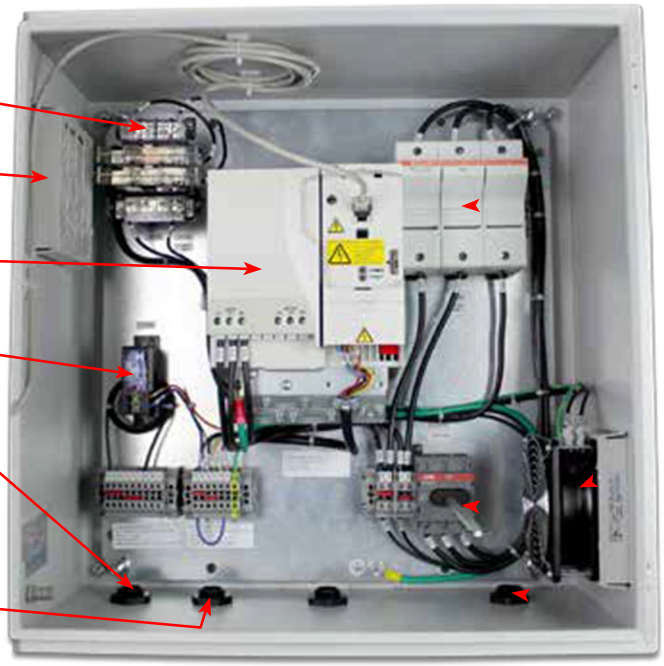
Verify pump prime 24 hours after operation to ensure prime held. Pay close attention to the temperature of the pump shaft, the whole stainless steel area ***(Image 6)*** should be the same temperature. If it starts getting hotter than the supply water or greater than 137°, then it is likely that the pump did not prime correctly which ***WILL CAUSE DAMAGE TO PUMPS***. The motor housing (painted portion) will be hot during operation.

**********(HFI SUPPLIED MCU OR VFD)**********

b. Remove the cap from port 8 then, connect the gray M12 cables hanging out of the MCU to the NEUTRAL/COMMON port 14 of the gray M12 junction boxes.

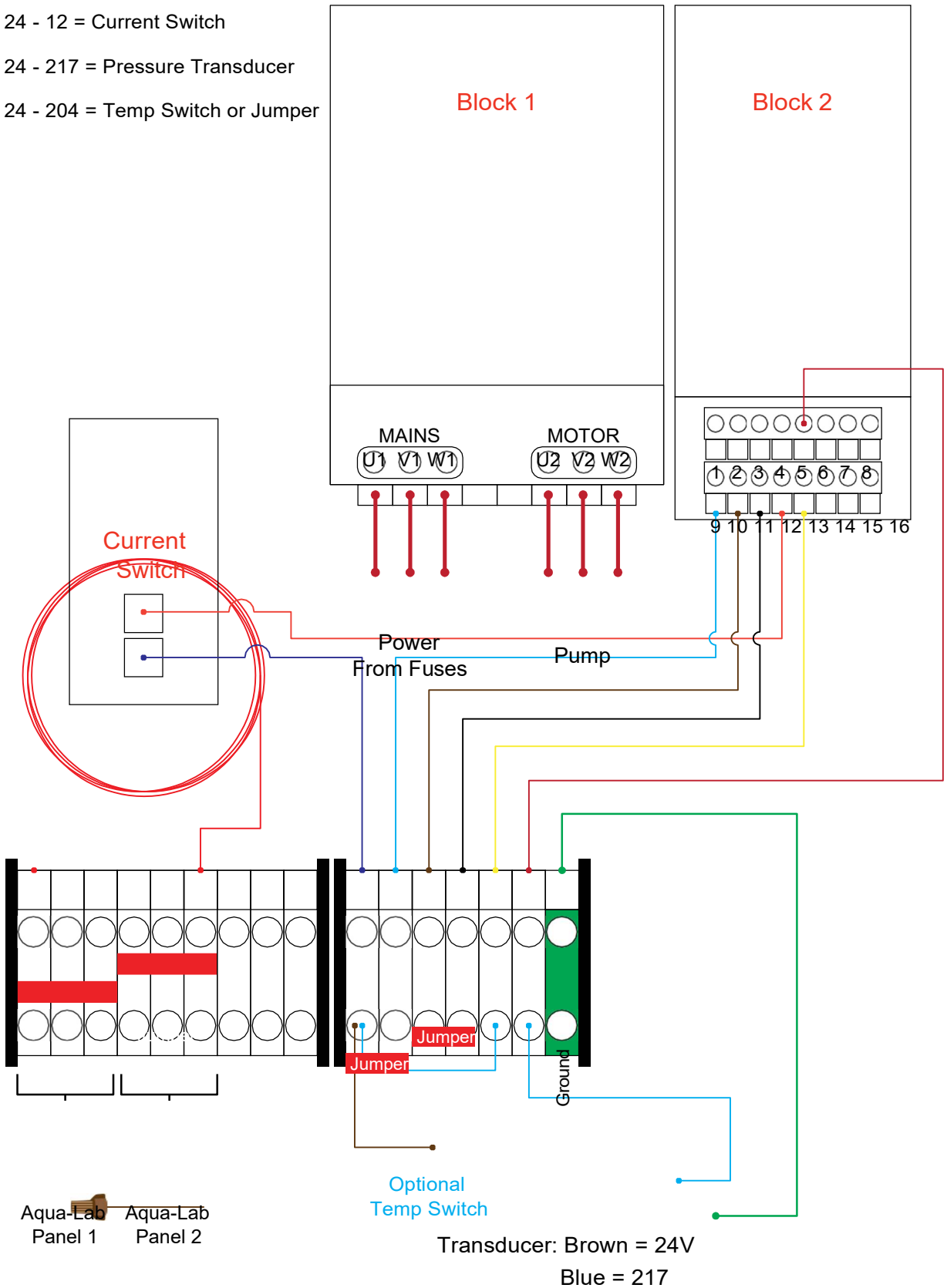
i. If you have more panels than gray wires from the MCU, connect the lose gray wires sent in the shipment into the same jumpers as the pre-wired gray cables. (This step must be completed for unit to function.)

HFI GRUNDFOS PUMP & VARIABLE FREQUENCY DRIVE (VFD)



VFD WIRING DIAGRAM

(FOR FLOOR MOUNTED GRUNDFOS PUMP)

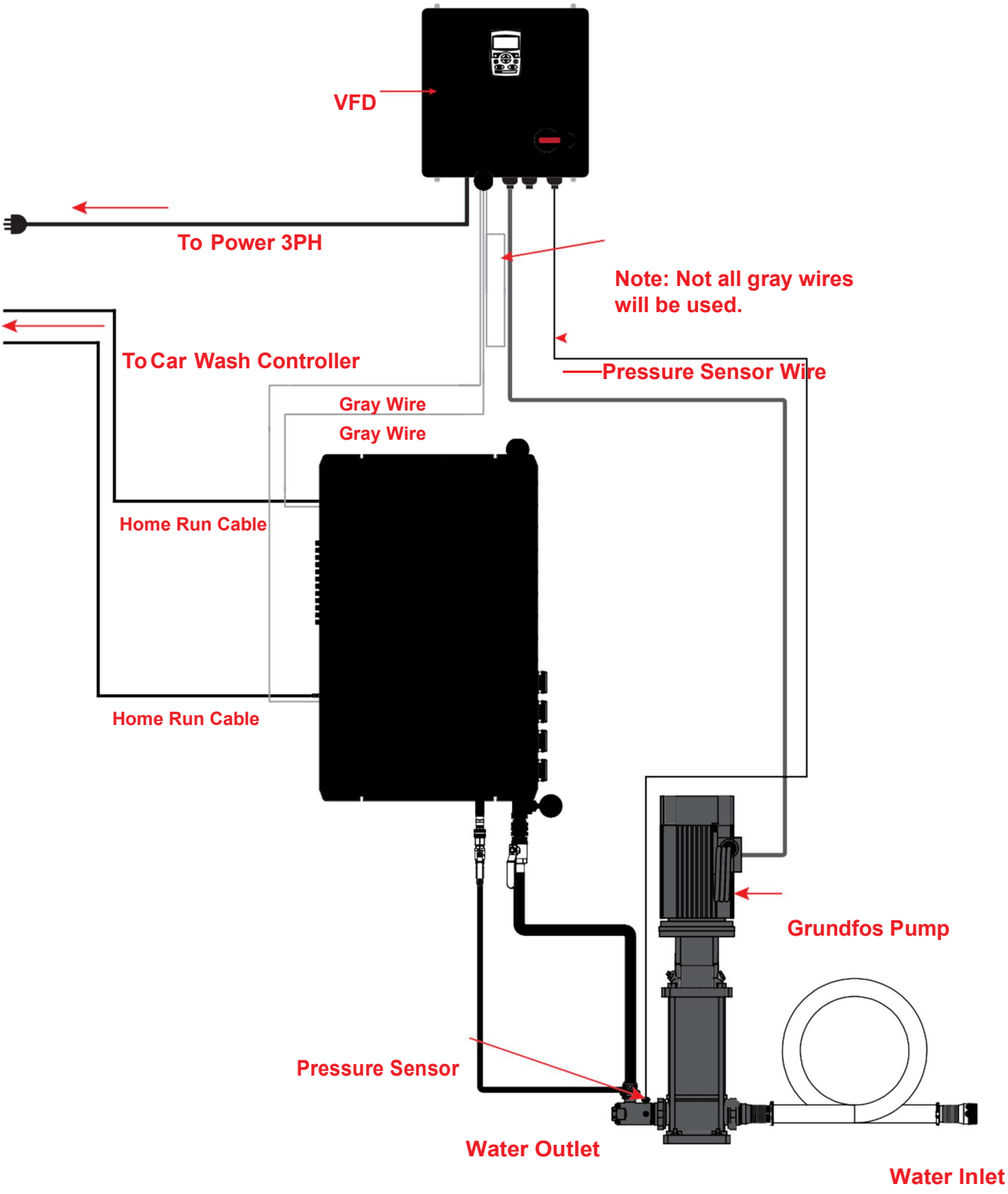


Cap Brown Wire

Shield = Green

S+ S+ S+ S- S- S- NC NC NC 24V 24V DV DV 204 217

GREY M12 CABLE DIAGRAM TWO PANELS
(SINGLE FLOOR MOUNT GRUNDFOS PUMP & VFD)



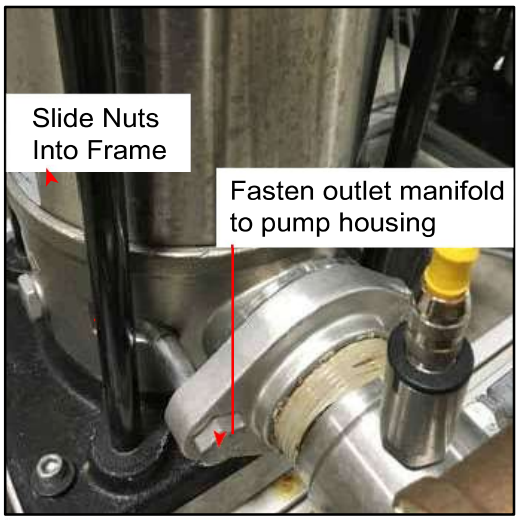
START UP

(SYSTEMS WITH VFD & GRUNDFOS PUMPS):

1. Slide in hex nuts from plumbing outlet manifold into slots on pump housing

2. Fasten outlet manifold to pump housing. Torque bolts to ~40 foot pounds. Ensure gasket is located correctly.

3. Verify that the pump voltage matches the site voltage that will be supplied to power the pump. There is a voltage label on the pump cord indicating which voltage the pump is wired for. Motors are rated for + 10% of the rated voltage on the motor name plate.

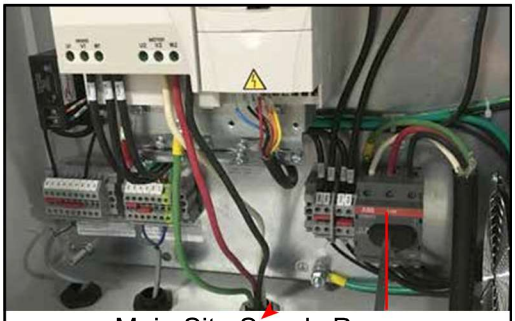


4. Route power from site to VFD box. Make sure that the site power being supplied matches the VFD voltage. **Note: Do not run pump power cord within 6 ft of sensitive electronics. Route in independent conduit to prevent signal interference.**

CAUTION: DO NOT APPLY 480V TO A 230VAC VFD.

5. Route pump power cord to VFD.

Pump Power Cord
White to U2, Red to V2, Black to W2,
Ground to Grounding screw



Main Site Supply Power
White to L1, Red to L2, Black to L3

6. Route water to pump.

   a. Note: for 40 GPM pump, do not plumb any elbows or bends within 20 inches of the pump inlet.
   b. Note: for 20 GPM pumps, do not plumb any elbows or bends within 13 inches of pump inlet.

7. Route pump outlet to AccuShot panel.

8. Prime the pump by loosening the vent plug located at the top of the pump. Air will purge through the vent hole. Pump is primed once water begins to flow out of the vent. Tighten vent cap plug.

   a. FAILURE TO PRIME PUMP PROPERLY WILL VOID WARRANTY! Follow below procedure!

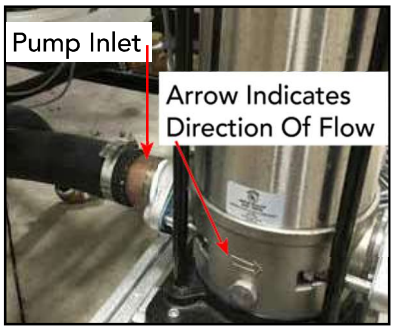
   b. Confirm the inlet water source is turned on and the ball valve to the panel inlet is closed.

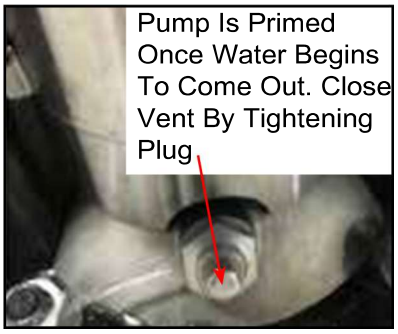
   c. Loosen the vent plug on the pump head to allow any air that may be trapped in the pump to escape.

   d. Turn pump on and run for 2 minutes, then close vent cap (DO NOT OVERTIGHTEN) and turn off pump.

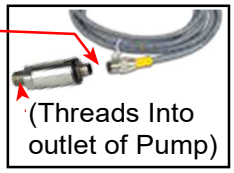
   e. Check for any leaks in the plumbing during this time. NOTE: Some water will spray out of vent cap, so we recommend having a bucket handy.

   f. Open ball valve(s) to manifold inlet.





9. Attach gray pressure transducer cable to pressure transducer.



10. Attach remaining gray signal cords to AccuShot M12 junction blocks positions six and 8B.

    a. *Note: The VFD control box has 3 M12 junction block signal cables attached. If the system does not require all three cords, leave cords coiled up and ensure cable ends are capped.*

11. Ensure VFD is in the REM Mode by using the keypad on the front face of the VFD.

12. **SEE PAGE 14 FOR INSTRUCTIONS ON WIRING YOUR VFD. YOUR VFD MUST BE WIRED IN ORDER FOR YOU TO VERIFY ROTATION.**
Verify Correct Rotation (in REM MODE): Pulse the pump on and off by sending a signal from the car wash controller for a chemical function to turn on. Examine the fan by looking downward onto the pump. Verify that the fan is spinning in the same direction as indicated on the motor casting.

    a. Look downward onto motor to verify fan is rotating in the correct direction.

    b. Turn signal off when complete. If pump is rotating backwards, switch any two lines that connect VFD power to the pump, ie: Switch U2 with V2 as shown in the image above in section 5.

    CAUTION: DO NOT WORK INSIDE VFD BOX UNTIL 10 MINUTES AFTER POWER DOWN.

13. Send signal from carwash controller to AccuShot panel to turn on pump, verify that 180-200 PSI water is supplied to the AccuShot panel. Use the up and down arrows on the keypad to increase/decrease pressure.

VFD MODES

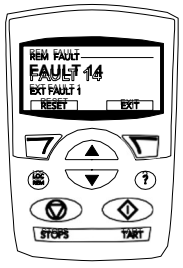
Remote Mode: This takes a signal from a car wash controller to turn on a chemical function which then initiates the VFD to start the pump. To use REM mode, press the loc/rem button on the left of the key pad until REM appears on the top left of the screen. Send a signal from the carwash controller to activate the pump. Use the up and down arrows on the keypad to increase/decrease pressure.

SAFETY

CAUTION: WAIT 10 MINUTES AFTER POWERING DOWN THE VFD BEFORE WORKING INSIDE THE BOX. THE VFD CONTAINS LARGE CAPACITORS AND 10 MINUTES IS NEEDED TO ALLOW THE CAPACITORS TO SAFELY DISCHARGE.

FAULTS

The VFD has the following fault protections to keep the pump and system safe. See table below.

FAULT TYPE	FAULT CAUSE	SCREEN READ OUT
Low Inlet Pressure (FAULT 42)	1. No water supplied to pump inlet. 2. Blown fuse on incoming power supply. 3. Panel flow set up exceeds pump performance curve (reduce injector sizes). 4. Hose rupture. 5. Pump running at low pressure for more than 1 minute.	
High Temperature (FAULT 14)	1. If temperature switch is wired in and the temperature exceeds switch set point, the temperature switch will fault out. 2. If the temperature switch is not installed make sure that there is a solid jumper between terminal block 24V and terminal block 204.	

APPENDIX

INITIAL INJECTOR SETUP

(Based on field experience this is HFI's recommended starting point)

1. Using the recommended starting point (Page 28) or the target flow rate and the chemical dilutions chart (appendix Page 27) install the appropriate injector into each port.
2. Connect pre-run solution lines to each injector with the supplied coupler and push connect fitting.
    a. *Be sure to use Teflon tape when connecting the injector to the coupler and push connect fitting to ensure there are no leaks.*
    b. *Do not over tighten poly fittings or they may crack.*

3. Connect ¼" poly lines from each chemical container to the hose barb on the appropriate injector.
    a. *Ensure a foot valve or similar check valve/filter is installed on each line.*
        i. *These must be present or metering tips may clog.*
4. Metering tips will need to be installed to set dilution ratio (see appendix Page 27 for ratio charts to determine tip.)

TRIPLE FOAM SETUP

Your Accushot panel was design with Tri-Foam capability the below instructions will show you how to setup your triple foam.

- Your triple foam has been setup from the factory to be in port 1.
- Insert your triple foam manifold into position 1 with your selected injectors already inserted.
- On the topside of the panel the 1A, 1B, and 1C regulators will control the air to each of your triple foam colors.
- Insert your air lines to the arch into the bulkhead fittings on the side of the panel. The 1A, 1B, and 1C bulkhead will be the airlines for each color.

Note: Occasionally if all three regulators are pre-set too high, you may need to lower all three regulators to their lowest setting and then turn them up to the desired pressure.

OPTIMIZING THE SYSTEM

CONSISTENTLY ACHIEVE THE DESIRED CLEANING AND PRESENTATION/ PERFORMANCE USING THE LEAST AMOUNT OF CHEMICAL AND WATER

INJECTORS VS. METERING TIPS VS. NOZZLES

THE KEY TO OPTIMIZING THE SYSTEM IS THROUGH TRIAL AND ERROR. DON'T BE AFRAID TO TRY THESE STEPS TO ACHIEVE YOUR IDEAL PERFORMANCE

What do injectors do?

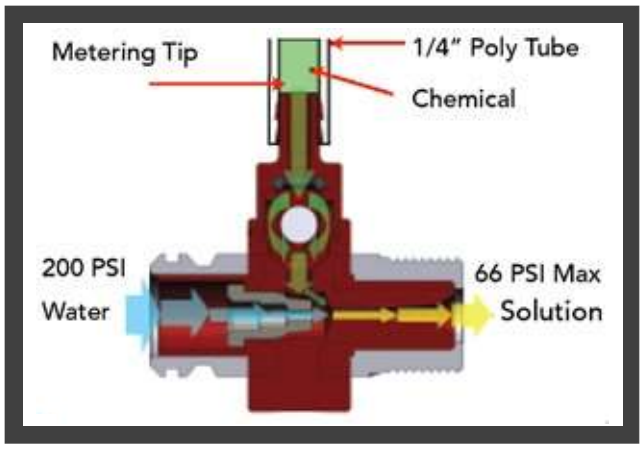
- Increases or decreases the amount of water in the solution.

What do metering tips do?

- Increases or decreases the amount of chemical in the solution.

What do nozzles do?

- Determines the pattern and back pressure of the solution.



APPLICATION OPTIMIZATION

(REPEAT FOR EACH APPLICATION)

- **Application too wet**
  - *Increase foaming air pressure*
  - *Reduce injector size (decreases water)*
  - *Increase metering tip (increases chemical)*
- **Application too dry**
  - *Decrease foaming air pressure*
  - *Increase injector size (increases water)*
  - *Decrease metering tip (decreases chemical)*
- **Nozzle sputters**
  - *Decrease foaming air pressure*
  - *Decrease number of nozzle(s) and/or size used on arch*
  - *Increase injector size (increases water)*
- **Too much chemical used**
  - *Decrease metering tip*
  - *Decrease metering tip and injector size (to maintain desired ratio)*
- **No chemical**
  - *Check vacuum/backpressure of injector for clogging (see page 26 for Injector Vacuum Check Instructions or page 23 for troubleshooting)*
  - *Check foot valve*
  - *Check metering tip*
- **Nozzle fan pattern not filled**
  - *Reduce nozzle size*
  - *Increase injector size (increases water)*
- **Water not present at all nozzles on arch**
  - *Verify check valves are functioning*
  - *Verify nozzles are not plugged*
  - *Reduce number of nozzles*
  - *Reduce nozzle size*
  - *Increase injector size (increases water)*

NOZZLE SETUP

(Optional For Maximized Optimization)

- Using the recommended starting point (appendix page 28) install the recommended nozzles.
  - This may involve removing and plugging some ports.
  - Due to the lower water usage determined by the injector of the Aqua-Lab you will need to match the flow of the application device to the injector.
  - Setup the nozzle spray patterns to "paint" the car - slightly overlapping each other.

MINIMUM NUMBER OF NOZZLES NECESSARY WITHOUT FOAMING AIR *(Assuming <10 PSI line loss and ~ 40 PSI at the nozzle)*									
		SPRAY NOZZLE SIZE								
		# 2.0	# 3.0	# 4.0	# 5.0	# 6.0	# 7.0	# 8.0	# 9.0	# 10.0
INJECTOR FLOW RATE @ 200 PSI (GPM)	0.25	1	1	1	1	1	1	1	1	1
	0.50	2	1	1	1	1	1	1	1	1
	0.75	3	2	1	1	1	1	1	1	1
	1.0	5	3	2	2	1	1	1	1	1
	1.5	7	5	3	3	2	2	1	1	1
	2.0	10	6	5	4	3	2	2	2	2
	2.25	11	7	5	4	3	3	2	2	2
	3.25	16	10	8	6	5	4	4	3	3
	5.5	27	18	13	11	9	7	6	6	5
	8.0	39	26	19	16	13	10	9	9	7
	10.0	49	33	24	20	16	13	11	11	9
	12.0	59	39	28	24	20	15	13	13	11
	15.0	74	49	35	30	25	19	16	16	14

MINIMUM NUMBER OF NOZZLES NECESSARY WITH FOAMING AIR *(Assuming <10 PSI line loss and ~ 40 PSI at the nozzle)*									
		SPRAY NOZZLE SIZE								
		# 2.0	# 3.0	# 4.0	# 5.0	# 6.0	# 7.0	# 8.0	# 9.0	# 10.0
INJECTOR FLOW RATE @ 200 PSI (GPM)	0.25	4	2	2	1	1	1	1	1	1
	0.50	8	5	4	3	2	2	2	1	1
	0.75	13	8	6	5	4	3	3	2	2
	1.0	17	11	8	7	5	5	4	3	3
	1.5	26	17	13	10	8	7	6	5	5
	2.0	35	23	17	14	11	10	8	7	7
	2.25	39	26	19	15	13	11	9	8	7
	3.25	56	37	28	22	18	16	14	12	11
	5.5	96	64	48	38	32	27	24	21	19
	8.0	140	93	70	55	47	39	35	31	28
	10	175	116	87	69	58	49	44	38	35
	12	209	140	105	83	70	59	52	46	41
	15	262	175	131	104	87	74	65	57	52

Elbows/Pipe Fittings

- Elbows and other pipe fittings add back pressure by causing the fluid to change direction and thus changing the fluid's momentum. Try to find simpler ways to route your fluid without elbows.

Line Length

- Longer lines add back pressure due to the inherent resistance caused by friction. See if you can reduce the line length or increase the inside diameter.

CHEMICAL USAGE MEASURING

VERIFY TITRATION OF CHEMICALS BEFORE PROCEEDING

1. Set up lab scale with small bucket of chemical to be measured.
2. Put the suction line into the bucket.
3. Run the application being tested to "prime" the line. (All air bubbles must be removed for accuracy.)
4. Record the **Initial Weight** from the scale. (Tarring the scale with weight on the scale can affect accuracy.)
5. Run the application for 1 vehicle (or manually for the same amount of time it would be on for 1 vehicle).
6. Record the **Final Weight** from the scale.
7. Subtract the Initial Weight from the Final Weight to determine the weight of used product.
8. Divide the **Per Car Weight** in grams by the specific gravity of the chemical to determine the milliliters of chemical used per vehicle.
9. Repeat for each chemical application.

RECOMMENDED MAINTENANCE

THE RECOMMENDED SERVICE AND MAINTENANCE ON THE AQUA-LAB SYSTEM ARE AS FOLLOWS.

Monthly

- Check/drain primary air regulator/filter separator.
- Check water filter and replace as needed (ifinstalled).
- Check and clean wye strainer.

Semi-Annually

- Check and replace injector metering tips.
- Inspect and replace chemical lines asneeded.
- Ensure lines are tightly secured to injector hose barbs, clip 1” off old hose as needed that was stretched by hose barb.

Annually

- Clean water regulator.
- Inspect motor starter for corrosion, if identified order replacement/spare parts.

1-3 Years

- Inspect and replace injectors.
- Replacewatervalves.
- Replace main pressureregulator.

AIROPERATED VALVE REPLACEMENT

1. Shut off the ball valve to Hydra-Cannon manifold.
2. Disconnect air line from front ofvalve.
3. Unscrew quick connect fitting by hand **(DO NOT LOSE BLACK WASHER)**.
4. Unscrew valve assembly from the Hydra-Cannon manifold.
5. Screw new valve into manifold until hand tight and threaded pilot port is facing forward.
6. Remove the cap from pilot port and thread in quick connect fitting to front of valve – **HAND TIGHT ONLY**.
7. Push air line back into fitting.
8. Open the ball valve to the Hydra-Cannon manifold.

BAM MANIFOLD REPLACEMENT

1. Shut offthe water supply ball valve to the BAM manifold.
2. Disconnect air line from front of manifold.
3. Remove spring clips from assembly that are adjacent to manifold being replaced.
4. Unbolt manifold assembly from the panel.
5. Remove manifold from assembly.
6. Install new manifold into assembly ensuring correct orientation.
7. Reinstall spring clips and bolt manifold assembly to panel.
8. Push air line back into fitting.
9. Open the water supply ball valve to the BAM manifold.

TROUBLESHOOTING

PUMP ISSUES

PROBLEM	POTENTIAL CAUSES	SOLUTIONS
Pump Operates, But Only Delivering 100-150 Psi	Incorrect motor rotation	Reverse rotation by interchanging two leads.
Pump Operates, But Delivers Little Or No Water	Pump not primed	See priming instructions.
	Missing 1 of 3 phases	Wire according to diagram/check breaker (turn off on back).
	Inadequate water supply	Check pressure on inlet side of pump to be sure positive pressure is maintained.
	Undersized piping	Replace with larger piping.
	Leak on the inlet side	Make sure connections are tight.
	Worn or defective pump parts	Replace worn parts or entire pump, clean parts if required.
Overheat Light On	Inlet temp to high	Reduce inlet temp to 110°F Max, injector flow to 10 GPM max.
	Injector flow too low	Increase continuous flow to at least 3/4 GPM.
Pump Will Not Start Or Run At Full Speed	Constant hot not connected	Make sure constant control voltage is supplied in car wash controller.
	Blown fuse or circuit breaker	Could be due to blown pump motor. Try to turn breaker back on or replace fuse. If breaker trips after trying to fire motor it is most likely burned out. Replace with new motor and pump.
	Defective motor starter contactor	Replace motor starter contactor.
	Thermal overload set too low/tripped	Adjust setting on thermal overload to match voltage.
	Incorrect motor voltage	Voltage must be within 10% of motor rated voltage. (Check that pump is wired for correct voltage.)
	Defective motor	Replace motor.
	3 phase disconnect turned off	Turn disconnect on.
	Pump components damaged	Replace worn part or entire pump.
	Current Sensor not seeing any current	Turn on one valve and verify red light blinks fast, verify at least 10 wraps of wire around current sensor.

INJECTOR ISSUES

PROBLEM	POTENTIAL CAUSES	SOLUTIONS
Injector Is Not Drawing Chemical - Passes Vacuum Pressure Check	Clogged chemical feed	Check chemical hose, foot valve, metering tip, and hose barb for debris or clogs.
No Flow From Injector	Valve malfunction, valve not opening	Ensure minimum 60 psi on primary air regulator, ensure valve receiving signal.
	Clogged injector	Remove injector and blow out debris with compressed air.
	No water supply	Check that the system has a supply of water.
Injector Is Not Drawing Chemical - Fails Vacuum Pressure Check	Too much back pressure on injector	Clean or replace downstream check valves, increase nozzle size or quantity, use larger tubing, or use smaller flow injectors.
	Clogged injector check valve	Blow compressed air through the chemical hose barb on the injector to remove debris.
	Clogged injector nozzle	Remove injector and blow out any debris with compressed air.
	Defective injector	Replace injector.
	Product specific - Sonny's Rain Bar	Remove elbow at inlet to foam generator and remove nozzle.
	Manifold inlet clogged (rare)	Remove end fittings and retention rod. Clean out inlet holes to allow full flow.
Injector stainless steel disintegrating	Strong hydrofluoric acid	Call Hydra-Flex and order composite version of injectors.

PRESSURE REGULATOR ISSUES

PROBLEM	POTENTIAL CAUSES	SOLUTIONS
System Won't Regulate Up To 200 Psi	Pump not primed	Follow priming instructions.
	Debris in regulator	Remove regulator and clean out debris.
	Motor rotation incorrect	Verify rotation / switch 2 leads.
	Opening too many valves at once	System is limited by size of pump and size of injectors, increase flow by adding secondary pumps or reduce size / number of injectors open.
	Defective check valve (if applicable)	Replace check valve.
	Defective Regulator	Replace regulator.
	Defective Pump	Replace Pump.
	Pressure Transducer is set incorrectly or is broken	Refer to Pump Manual to verify transducer setting or replace transducer.
	Pressure Transducer cable is loose or damaged	Ensure good connections or replace cable.

FLOW / ARCH ISSUES

PROBLEM	POTENTIAL CAUSES	SOLUTIONS
Flow At Arch Is Too Low	Incorrect injector flow rate selection	Replace with larger injector
	System pressure too low	Ensure system pressure is set at 200psi
	Foam generator plugged	Ensure cleaned and clear
	Downstream plumbing restrictive	Increase size of plumbing / tubing, ensure check valves are cleaned or new, reduce elbows in line or other turns that would restrict

VALVE ISSUES

PROBLEM	POTENTIAL CAUSES	SOLUTIONS
Valve Will Not Open	Air pressure too low	Ensure primary air regulator reading at least 60 psi, turn up to 80-90psi if possible and check again.
	Internal valve o-ring jammed / twisted	Remove valve from manifold, Carefully remove top of valve **(caution – under high spring pressure)** push white piston up with small allen wrench from opposite end and check o-ring condition. Replace and lubricate if needed.
Valve Leaks Air Or Water Out Top	Internal o-ring seal damaged / worn	Remove valve from manifold, Carefully remove top of valve **(caution – under high spring pressure)** push white piston up with small screwdriver from opposite end and check o-ring condition. Replace with 018 & 008 Viton O-ring and lubricate with Dow 111 valve lube.
Valve Remains Open After Signal Is Off	Manifold pressure is above 230 psi	Reduce pressure to manifold to 200 psi operating pressure.
	Air exhaust muffler is clogged	Replace exhaust muffler.

VFD ISSUES

PROBLEM	POTENTIAL CAUSES	SOLUTIONS
Low Inlet Pressure (FAULT 42) Valve Leaks Air Or Water Out Top	No water supplied to pump inlet.	Verify water supplied to pump is sufficient.
	Blown fuse on incoming power supply.	Confirm correct electrical supply and connections.
	Panel flow set up exceeds pump performance curve.	Ensure total injector flow is less than pump system can provide. Reduce injector size(s) if needed.
	Water pressure is less than 100 psi for longer than 1 minute.	Check system for leaks or ruptured hoses.
High Temperature (FAULT 14)	If temperature switch is wired in and the temperature exceeds 180° F, the temperature switch will fault out.	Ensure inlet water temperature is less than 140°F.
	If a temperature switch is not installed, false signal to VFD.	Ensure a solid jumper between terminal block 24V and terminal block 204 in the control box.

INJECTOR OPTIMIZATION TOOL

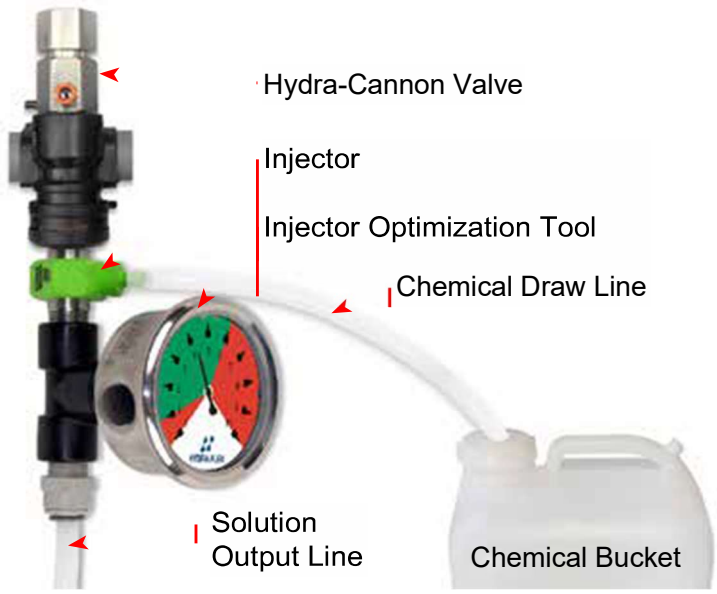
BACKGROUND:

This tool is for initial setup and troubleshooting of Chem-Flex™ Injectors and an AccuShot™ Chemical Dispensing System. In order for the injector to work properly and draw chemical this gauge must be in the ***"GREEN"*** section when installed immediately after an injector that is running. If the gauge is in the red you will either see: intermittent chemical, no chemical draw, or chemical being applied at a very low pressure.

Back pressure refers to the pressure in the solution output line. Excessive back pressure is the main reason that injectors will not draw. If there is ever any concern to why an injector is not drawing chemical, the best and easiest way to diagnose the problem is to check the back pressure. See instructions below:

STEPS:

1. Plug the optimization tool into the outlet line of injector and connect solution output line.
2. Turn on function from car wash controller to actuate Hydra-Cannon valve such that fluid is flowing through both the injector and injector optimization tool and out to the applicator.
3. Read injector optimization tool.
4. If the gauge is in the ***"RED ZONE"*** the back pressure of the outlet line is either too low or too high. See steps below to correct.



BACK PRESSURE TOO HIGH

(UPPER RED SECTION):

(Back Pressure May Be Affected By One Or Several Of These Things)

1. Foam generators are clogged/degraded. Clean or replace media in generator.
2. Injector flow size is too large. Go down an injector size (less GPM).
3. Nozzle size on the arch is too small. Go up in nozzle size.
4. Check valves are dirty and or failing. Clean or replace check valves.
5. There is a kink in the line or excess fittings (elbows and reducers increase the back pressure). Check line and replace any kinked sections. Try to reduce fittings.
6. ID of tubing going out to the tunnel is too small. Go up a size in inside diameter.
7. Check valves have too high of cracking pressure. Replace check valve with lower pressure check valve.
8. Clean foot valve.

BACK PRESSURE TOO LOW

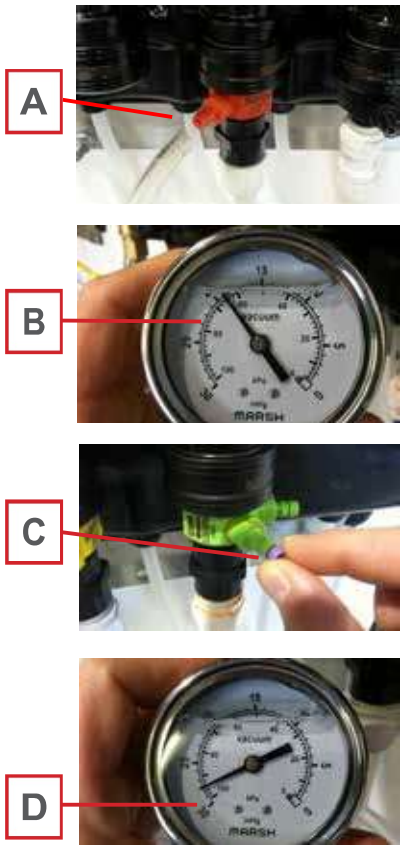
(LOWER RED SECTION):

(Back Pressure May Be Affected By One Or Several Of These Things)

1. Injector flow too low. Increase injector size.
2. Nozzle size too large. Reduce nozzle size.

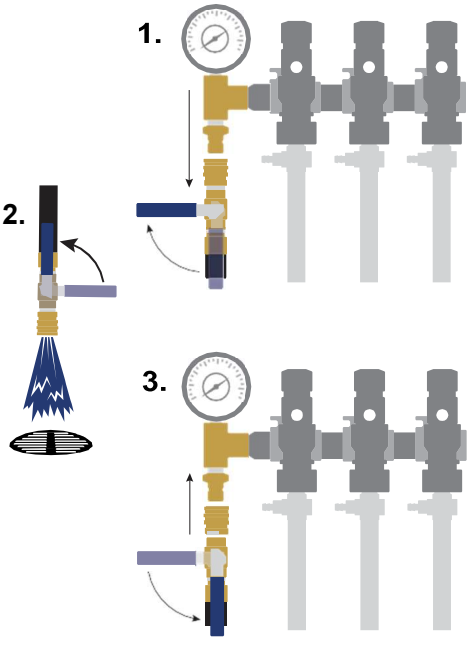
INJECTOR VACUUM CHECK

(FOR TROUBLESHOOTING INJECTORS)



1. At the Chem-Flex injector, remove the chemical feed line from the injector hose barb.
2. Attach the tubing of the vacuum gauge to the Chem-Flex hose barb (Image A).
3. With the pump(s) on, manually activate the chemical that is to be tested at the main car wash control cabinet. An injector that is working properly will have a reading greater than or equal to (≥) 20 in Hg.
4. If vacuum reads <20 in/Hg (image B), remove solution metering tip (image C) and retest.
   a. *If retest vacuum reads >20 in/Hg (image D), The solution metering tip is clogged. Replace the metering tip.*
   b. *If Retest vacuum reads <20 in/Hg, continue to STEP 5*
5. Remove a nozzle on the arch or the chemical feed line from the foam generator and retest vacuum.
   a. *If retest vacuum reads >20 in/Hg, back pressure is being created. Continue to STEP 6.*
   b. *If back pressure is not still not being created try these steps and retest after each:*
      1. *Clean nozzle tips.*
      2. *Loosely replace media in foam generator. Do not over pack.*
      3. *Decrease air pressure for foaming.*
      4. *Try smaller injector (this will produce less flow and thus less back pressure).*
   c. *If retest vacuum reads <20 in/Hg, replace injector and retest. If vacuum continues to read <20 in/Hg, call your service provider.*
6. Repeat steps 2-5 for each chemical lane that a vacuum reading is needed for.
7. Once testing is complete, turn off the AccuShot pump from the main car wash control cabinet.

HFI MCU HIGH TEMP SHUTDOWN RESTART INSTRUCTIONS



1. Close ball valve on panel and quick disconnect high pressure water line.
   *** Purge pressure before disconnecting (pressure gauge to read 0 PSI before disconnecting).
2. Point hose to drain and open ball valve to purge hot water and cool pump for several minutes (USE CAUTION).
3. When pump is sufficiently cooled close ball valve, reconnect hose, open ball valve and press red button on MCU to restart.
4. Determine why system overheated. See manual for troubleshooting (page 24 *Overheat Light On*)

CHEM-FLEX INJECTORS - CHEMICAL DILUTION RATIOS

(Assumes feed pressure of 200 PSI)

NOTE: ***Dilution ratios given above are based on drawing water through the metering tips and are meant as a starting point for system configuration. Results are expected to vary when drawing chemicals due to differences in viscosity and temperature.***

		#8-32 METERING TIPS												
	Flow Rate (GPM) at 200 PSI	0.25	0.50	0.75	1.00	1.50	2.00	2.25	3.25	4.50	5.50	8.0	10.0	12.0	15.0
	Injector Color	White	Yellow	Tan	Red	Orange	Gray	Blue	Light Green	Purple	Dark Green	Black	Black	Black	Black
	Nozzle Size	0.029″ (0.7 mm)	0.040″ (1.0 mm)	0.051″ (1.3 mm)	0.057″ (1.4 mm)	0.070″ (1.8 mm)	0.083″ (2.1 mm)	0.086″ (2.2 mm)	0.098″ (2.5 mm)	0.117″ (2.9 mm)	0.125″ (3.2 mm)	0.161″ (4.1 mm)	0.177″ (4.5 mm)	0.186″ (4.7 mm)	0.207″ (5.3 mm)
Metering Tip	COPPER	1: 57	1: 104	1: 155	1: 195	1: 281	1: 406	1: 468	1: 629	1: 881	1: 1074	1: 2019	1: 2318	1: 3324	1: 4259
	PUMPKIN	1: 43	1: 82	1: 119	1: 126	1: 238	1: 348	1: 398	1: 554	1: 774	1: 946	1: 1465	1: 1832	1: 2310	1: 3042
	BURGUNDY	1: 34	1: 67	1: 97	1: 111	1: 207	1: 304	1: 347	1: 495	1: 690	1: 845	1: 1244	1: 1670	1: 1975	1: 2469
	LIME	1: 28	1: 57	1: 81	1: 100	1: 183	1: 270	1: 307	1: 447	1: 622	1: 764	1: 988	1: 1262	1: 1481	1: 1958
	TAN	1: 28	1: 57	1: 81	1: 100	1: 183	1: 270	1: 307	1: 447	1: 622	1: 764	1: 826	1: 1042	1: 1286	1: 1577
	ORANGE	1: 23	1: 44	1: 64	1: 78	1: 137	1: 196	1: 215	1: 314	1: 437	1: 536	1: 751	1: 874	1: 1136	1: 1262
	TURQUOISE	1: 17	1: 31	1: 45	1: 55	1: 91	1: 126	1: 134	1: 197	1: 274	1: 336	1: 561	1: 752	1: 885	1: 1099
	PINK	1: 14	1: 24	1: 35	1: 42	1: 68	1: 93	1: 98	1: 143	1: 188	1: 224	1: 327	1: 473	1: 570	1: 728
	LIGHT BLUE	1: 11	1: 17	1: 24	1: 31	1: 47	1: 64	1: 66	1: 98	1: 136	1: 166	1: 318	1: 406	1: 483	1: 572
	BROWN	1: 10	1: 15	1: 22	1: 28	1: 43	1: 58	1: 59	1: 88	1: 122	1: 150	1: 270	1: 338	1: 408	1: 507
	RED		1: 12	1: 17	1: 23	1: 34	1: 45	1: 46	1: 69	1: 95	1: 116	1: 202	1: 254	1: 306	1: 375
	WHITE		1: 12	1: 16	1: 22	1: 31	1: 42	1: 43	1: 64	1: 88	1: 108	1: 180	1: 226	1: 272	1: 343
	GREEN		1: 11	1: 14	1: 20	1: 28	1: 37	1: 38	1: 55	1: 76	1: 94	1: 160	1: 201	1: 241	1: 300
	BLUE		1: 10	1: 12	1: 17	1: 23	1: 30	1: 31	1: 46	1: 63	1: 77	1: 222	1: 152	1: 185	1: 224
	YELLOW			1: 9	1: 12	1: 16	1: 20	1: 22	1: 31	1: 42	1: 52	1: 80	1: 100	1: 120	1: 146
	BLACK				1: 10	1: 13	1: 16	1: 17	1: 24	1: 33	1: 40	1: 61	1: 77	1: 92	1: 115
	PURPLE				1: 6.6	1: 8.3	1: 9	1: 10	1: 13	1: 17	1: 21	1: 31	1: 39	1: 46	1: 57
	GRAY				1: 5.3	1: 6.7	1: 6.9	1: 7.6	1: 10	1: 13	1: 16	1: 24	1: 30	1: 35	1: 44
	OPEN				1: 4.9	1: 5.3	1: 5.2	1: 6.0	1: 6.1	1: 8.3	1: 10	1: 12	1: 15	1: 18	1: 23

There may be slight variations of performance in injectors and metering tips that are unavoidable due to manufacture tolerances. Using the same tip color from site to site is a good starting point. However with the potential for variation from part to part it is reasonable to still need to do some adjustments from there.

		SPIRAL METERING PLUGS													
	Flow Rate (GPM) at 200 PSI	0.25	0.50	0.75	1.00	1.50	2.00	2.25	3.25	4.50	5.50	8.0	10.0	12.0	15.0
	Injector Color	White	Yellow	Tan	Red	Orange	Gray	Blue	Light Green	Purple	Dark Green	Black	Black	Black	Black
	Nozzle Size	0.029″ (0.7 mm)	0.040″ (1.0 mm)	0.051″ (1.3 mm)	0.057″ (1.4 mm)	0.070″ (1.8 mm)	0.083″ (2.1 mm)	0.086″ (2.2 mm)	0.098″ (2.5 mm)	0.117″ (2.9 mm)	0.125″ (3.2 mm)	0.161″ (4.1 mm)	0.177″ (4.5 mm)	0.186″ (4.7 mm)	0.207″ (5.3 mm)
Spiral Plug Length	3.00″	1: 251	1: 503	1: 754	1: 1006	1: 1509	1: 2012	1: 2263	1: 3269	1: 4526	1: 5532	1: 8047	1: 10059	1: 12070	1: 15088
	2.00″	1: 181	1: 363	1: 544	1: 726	1: 1089	1: 1451	1: 1633	1: 2359	1: 3266	1: 3991	1: 5806	1: 7257	1: 8708	1: 10885
	1.00“	1: 104	1: 208	1: 311	1: 415	1: 623	1: 831	1: 934	1: 1350	1: 1869	1: 2284	1: 3322	1: 4153	1: 4983	1: 6229
	0.75″	1: 82	1: 165	1: 247	1: 329	1: 494	1: 659	1: 741	1: 1071	1: 1483	1: 1812	1: 2636	1: 3295	1: 3954	1: 4942
	0.50″	1: 59	1: 119	1: 178	1: 238	1: 357	1: 475	1: 535	1: 772	1: 1069	1: 1307	1: 1901	1: 2376	1: 2852	1: 3564
	0.25″	1: 34	1: 68	1: 102	1: 136	1: 204	1: 272	1: 306	1: 442	1: 612	1: 748	1: 1088	1: 1360	1: 1632	1: 2040

******Remove all standard metering tips when using a Metering Plug in an application. 3/8” Polyflow (LLDPE) tubing is required to ensure a seal between the tube wall and the flats on the OD of the Meter Plug.***

RECOMMENDED SETUP STARTING POINTS

APPLICATOR	INJECTORS PART NUMBER/COLOR		
Scent Dispenser	618057 (1 GPM)		
CTA Nozzles (For Showerhead, See Below)	618057 (1 GPM)		
Foam Stick	618070 (1.5 GPM)		
Mitter/Warp Nozzles	618070 (1.5 GPM)		
Undercarriage/Rust Inhibitor	618083 (2.0 GPM)		
V Jet Or Flat Fan Nozzle Arch	618086 (2.25 GPM)		
K12 Nozzle Arch	618086 (2.25 GPM)		
K15 Nozzle Arch	618098 (3.25 GPM)		
Hockey Puck	1 Row Of Holes 618051 (.75 GPM)	2 Rows Of Holes 618057 (1 GPM)	3 Rows Of Holes 618070 (1.5 GPM)
Showerhead	1 Row Of Holes 618057 (1 GPM)	2 Rows Of Holes 618070 (1.5 GPM)	3 Rows Of Holes 618083 (2.0 GPM)
Rain Bar	1 Row Of Holes 618086 (2.25 GPM)	2 Rows Of Holes 618098 (3.25 GPM)	3 Rows Of Holes 618125 (5.5 GPM)
Low Flow Foam Curtain - Choose Foam Accessory Based On # Of Inputs/Foam Generators**	Duo-Foam w/ (2X) 618098 (3.25 GPM)	Triple-Foam w/ (3X) 618086 (2.25 GPM)	
High Flow Foam Curtain - Works with up to 4 Inputs/Foam Generators	818161 (8.0 GPM) With Distribution Manifold HD/XD	818177 (10.0 GPM) With Distribution Manifold HD/XD	818186 (12.0 GPM) With Distribution Manifold HD/XD

Foaming Air: Start at 25 PSI (adjust based on unique application)

CHEM-FLEX INJECTORPART NUMBERS

QUICK CONNECT INJECTORS - PC2 X 3/8" NPT CONNECTIONS
(For exclusive use with Aqua-Lab™ Chemical Dispensing Systems)

COLOR	FLOW ORIFICE	FLOW RATE @ 200 PSI	SINGLE BARB	DUAL BARB	TRIPLE BARB
WHITE	0.029	0.25 GPM	618029	-	-
YELLOW	0.040	0.5 GPM	618040	629040	-
TAN	0.051	0.75 GPM	618051	629051	639051
RED	0.057	1.0 GPM	618057	629057	639057
ORANGE	0.070	1.5 GPM	618070	629070	639070
GRAY	0.083	2.0 GPM	618083	629083	639083
BLUE	0.086	2.25 GPM	618086	629086	639086
LIGHT GREEN	0.098	3.25 GPM	618098	629098	639098
PURPLE	0.117	4.5 GPM	618117	629117	639117
DARK GREEN	0.125	5.5 GPM	618125	629125	639125

QUICK CONNECT INJECTORS - PC3 X 3/x" NPT CONNECTIONS
(For exclusive use with AccuShot™ Chemical Dispensing Systems)

COLOR	FLOW ORIFICE	FLOW RATE @ 200 PSI	SINGLE BARB
BLACK	0.161	8 GPM	818161
BLACK	0.177	10 GPM	818177
BLACK	0.186	12 GPM	818186
BLACK	0.207	15 GPM	818207

SPECIFICATIONS

Pressure Range:	Temperature Range:	Maximum Wrench Torque:
Up to 500 PSI Max. (34 bar) Inlet, 333 PSI (23 bar) Max. Outlet	33°F - 175°F (.5°C - 79°C)	30 ft-lbs (41 N-m)

PRESSURE LOSS IN RUN LENGTH

GREEN = **YELLOW= USE CAUTION** **RED = NOT RECOMMENDED**

All solution line tubing should be selected for 10 PSI or less of pressure loss.

**20 PSI pressure loss may be acceptable depending upon nozzle sizing, foamers, check valves and other line restrictions present in application.*

All numbers represent pressure loss in PSI for selected solution line tubing.

5/8" ID BRAIDED

		INJECTOR									
	Flow Rate (GPM) at 200 PSI →	0.25	0.50	0.75	1.00	1.50	2.00	2.25	3.25	4.50	5.50
	Injector Color →	White	Yellow	Tan	Red	Orange	Gray	Blue	Light Green	Purple	Dark Green
	Nozzle Size →	0.029" (0.7 mm)	0.040" (1.0 mm)	0.051" (1.3 mm)	0.057" (1.4 mm)	0.070" (1.8 mm)	0.083" (2.1 mm)	0.086" (2.2 mm)	0.098" (2.5 mm)	0.117" (2.9 mm)	0.125" (3.2 mm)
Run Length	150'	1 PSI	1 PSI	1 PSI	1 PSI	2 PSI	3 PSI	4 PSI	7 PSI	13 PSI*	18 PSI*
	125'	1 PSI	1 PSI	1 PSI	1 PSI	2 PSI	3 PSI	4 PSI	6 PSI	11 PSI*	16 PSI*
	100'	1 PSI	1 PSI	1 PSI	1 PSI	2 PSI	2 PSI	3 PSI	5 PSI	9 PSI	13 PSI*
	75'	1 PSI	1 PSI	1 PSI	1 PSI	1 PSI	2 PSI	3 PSI	4 PSI	7 PSI	9 PSI
	50'	1 PSI	1 PSI	1 PSI	1 PSI	1 PSI	1 PSI	2 PSI	3 PSI	5 PSI	6 PSI
	25'	1 PSI	1 PSI	1 PSI	1 PSI	1 PSI	1 PSI	1 PSI	2 PSI	3 PSI	4 PSI

1/2" ID BRAIDED

		INJECTOR									
	Flow Rate (GPM) at 200 PSI →	0.25	0.50	0.75	1.00	1.50	2.00	2.25	3.25	4.50	5.50
	Injector Color →	White	Yellow	Tan	Red	Orange	Gray	Blue	Light Green	Purple	Dark Green
	Nozzle Size →	0.029" (0.7 mm)	0.040" (1.0 mm)	0.051" (1.3 mm)	0.057" (1.4 mm)	0.070" (1.8 mm)	0.083" (2.1 mm)	0.086" (2.2 mm)	0.098" (2.5 mm)	0.117" (2.9 mm)	0.125" (3.2 mm)
Run Length	150'	1 PSI	1 PSI	2 PSI	3 PSI	6 PSI	9 PSI	11 PSI*	21 PSI	36 PSI	56 PSI
	125'	1 PSI	1 PSI	2 PSI	3 PSI	5 PSI	8 PSI	9 PSI	18 PSI*	30 PSI	47 PSI
	100'	1 PSI	1 PSI	2 PSI	2 PSI	4 PSI	7 PSI	8 PSI	14 PSI*	24 PSI	36 PSI
	75'	1 PSI	1 PSI	1 PSI	2 PSI	3 PSI	5 PSI	6 PSI	11 PSI*	18 PSI*	26 PSI
	50'	1 PSI	1 PSI	1 PSI	1 PSI	2 PSI	4 PSI	4 PSI	8 PSI	12 PSI*	18 PSI*
	25'	1 PSI	1 PSI	1 PSI	1 PSI	1 PSI	2 PSI	2 PSI	4 PSI	6 PSI	9 PSI

3/8" ID, 1/2" OD POLY TUBE

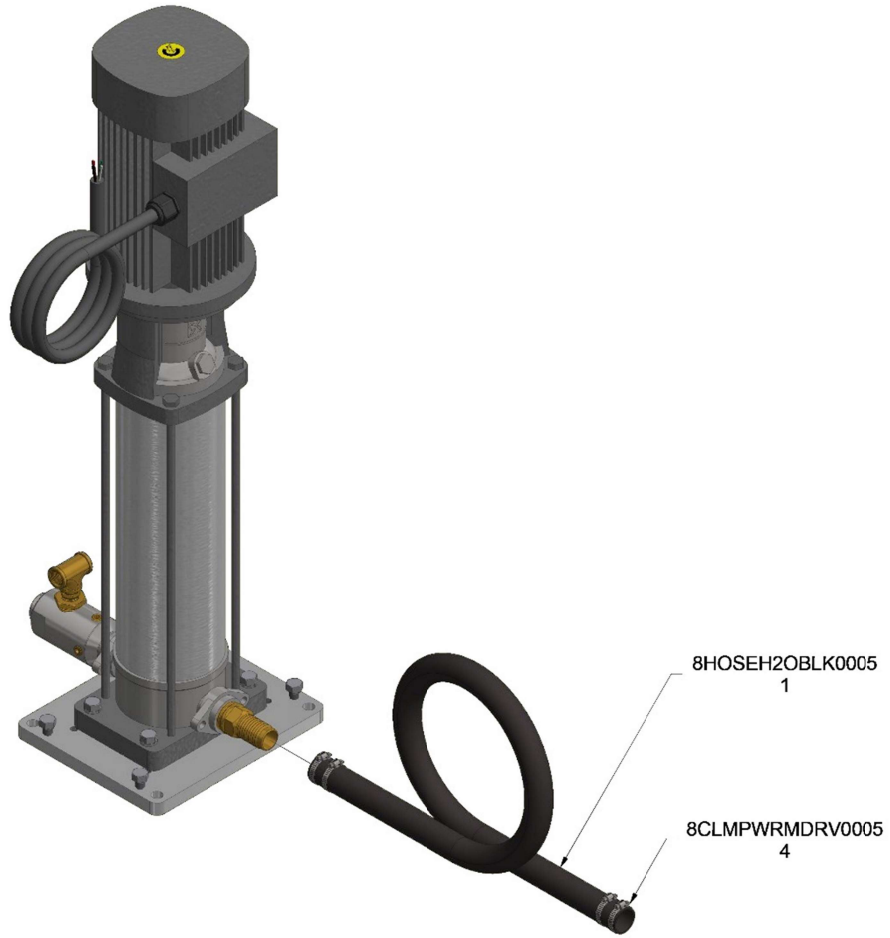
		INJECTOR									
	Flow Rate (GPM) at 200 PSI →	0.25	0.50	0.75	1.00	1.50	2.00	2.25	3.25	4.50	5.50
	Injector Color →	White	Yellow	Tan	Red	Orange	Gray	Blue	Light Green	Purple	Dark Green
	Nozzle Size →	0.029" (0.7 mm)	0.040" (1.0 mm)	0.051" (1.3 mm)	0.057" (1.4 mm)	0.070" (1.8 mm)	0.083" (2.1 mm)	0.086" (2.2 mm)	0.098" (2.5 mm)	0.117" (2.9 mm)	0.125" (3.2 mm)
Run Length	150'	1 PSI	5 PSI	7 PSI	11 PSI*	22 PSI	36 PSI	44 PSI	88 PSI	154 PSI	239 PSI
	125'	1 PSI	4 PSI	6 PSI	9 PSI	18 PSI*	30 PSI	37 PSI	73 PSI	129 PSI	200 PSI
	100'	1 PSI	3 PSI	5 PSI	7 PSI	14 PSI*	23 PSI	28 PSI	54 PSI	103 PSI	142 PSI
	75'	1 PSI	2 PSI	4 PSI	6 PSI	12 PSI*	18 PSI*	22 PSI	42 PSI	77 PSI	106 PSI
	50'	1 PSI	1 PSI	3 PSI	4 PSI	8 PSI	12 PSI*	15 PSI*	28 PSI	52 PSI	73 PSI
	25'	1 PSI	1 PSI	1 PSI	2 PSI	3 PSI	6 PSI	7 PSI	13 PSI*	26 PSI	34 PSI

3/4" ID BRAIDED

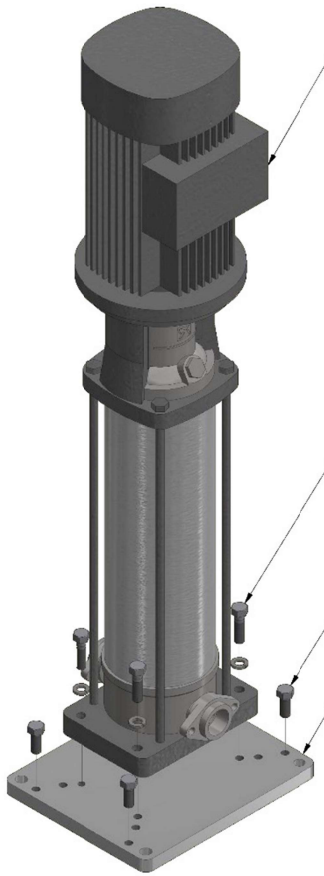
		INJECTOR			
	Flow Rate (GPM) at 200 PSI	8.0	10.0	12.0	15.0
	Injector Color	Black	Black	Black	Black
	Nozzle Size	0.161" (4.09 mm)	0.177" (4.50 mm)	0.186" (4.72 mm)	0.207" (5.26 mm)
Run Length	100'	10 PSI	15 PSI*	21 PSI	32 PSI
	75'	8 PSI	11 PSI*	16 PSI*	24 PSI
	50'	5 PSI	8 PSI	11 PSI*	16 PSI*
	25'	3 PSI	4 PSI	6 PSI	8 PSI

1" ID BRAIDED

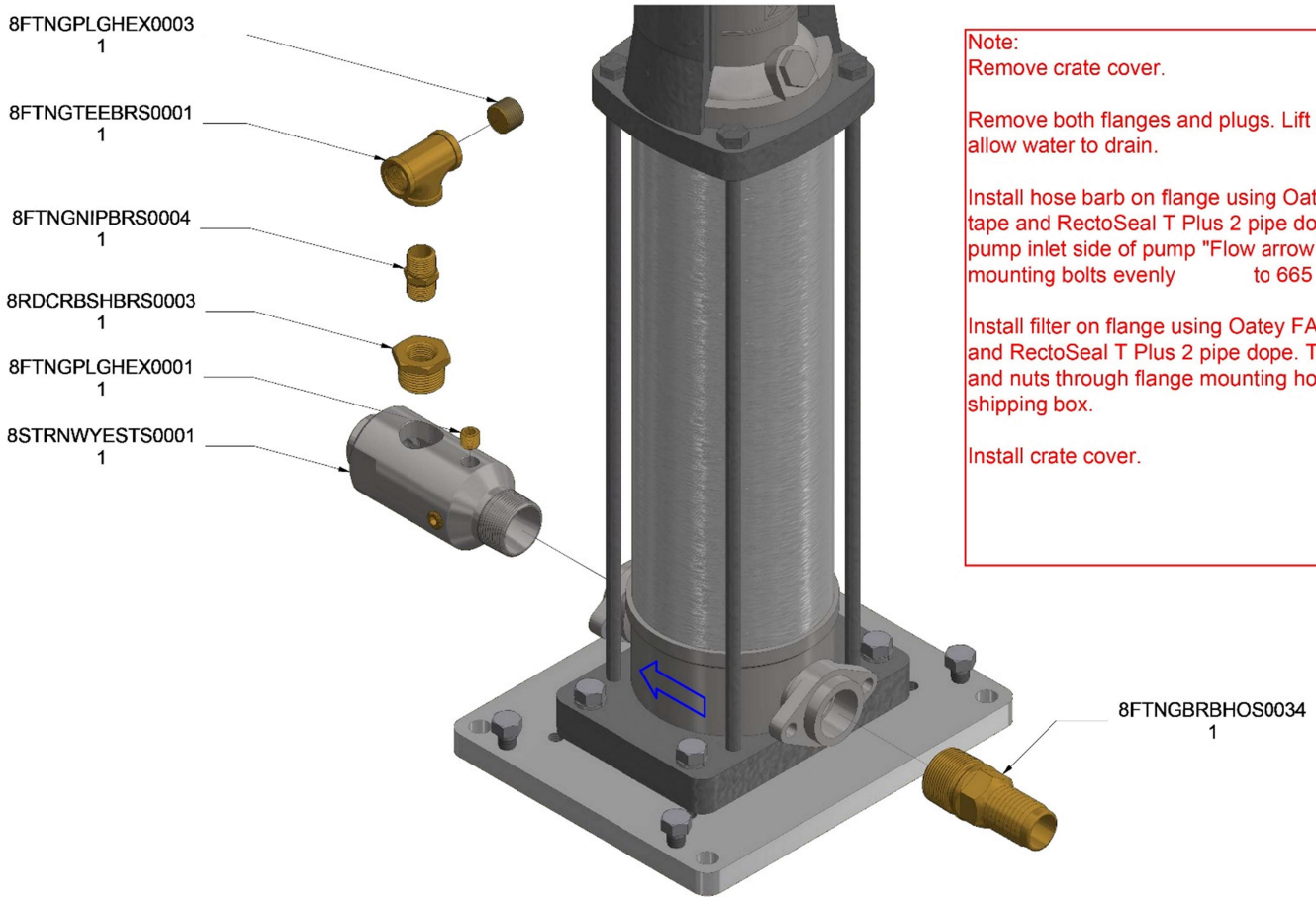
		INJECTOR			
	Flow Rate (GPM) at 200 PSI	8.0	10.0	12.0	15.0
	Injector Color	Black	Black	Black	Black
	Nozzle Size	0.161" (4.09 mm)	0.177" (4.50 mm)	0.186" (4.72 mm)	0.207" (5.26 mm)
Run Length	100'	3 PSI	4 PSI	5 PSI	8 PSI
	75'	2 PSI	3 PSI	4 PSI	6 PSI
	50'	1 PSI	1 PSI	3 PSI	4 PSI
	25'	1 PSI	1 PSI	2 PSI	2 PSI



MOTOR WASH WORKS CITY	NOTES HOSE AND CLAMP; SHIPPED SEPARATELY.	MASTERCAM NUMBER TOOL LIST 1- 2- 3- 4- 5- 6- 7- 8-	TOLERANCE .XX ± .010 .XXX ± .005 .XXXX ± .001 FRACT ± 1/32" UNLESS OTHERWISE SPECIFIED	REVISION	PART NUMBER 7PUMPH2OGF50001 DESCRIPTION GRUNDFOS 5HP20GPM PUMPASY	
				SHEET SIZE B	SCALE NTS	DRAWN BY EIJI ISOMURA DATE 6/20/2017



MOTOR CITY WASH WORKS	NOTES	MASTERCAM NUMBER TOOL LIST 1- 2- 3- 4- 5- 6- 7- 8-	TOLERANCE .XX ± .010 .XXX ± .005 .XXXX ± .001 FRACT ± 1/32" UNLESS OTHERWISE SPECIFIED	REVISION	PART NUMBER 7PUMPH2OGF50001	
				SHEET SIZE B	SCALE NTS	DESCRIPTION GRUNDFOS 5HP20GPM PUMPASY
					DRAWN BY EIJI ISOMURA	DATE 6/20/2017



Note:
Remove crate cover.

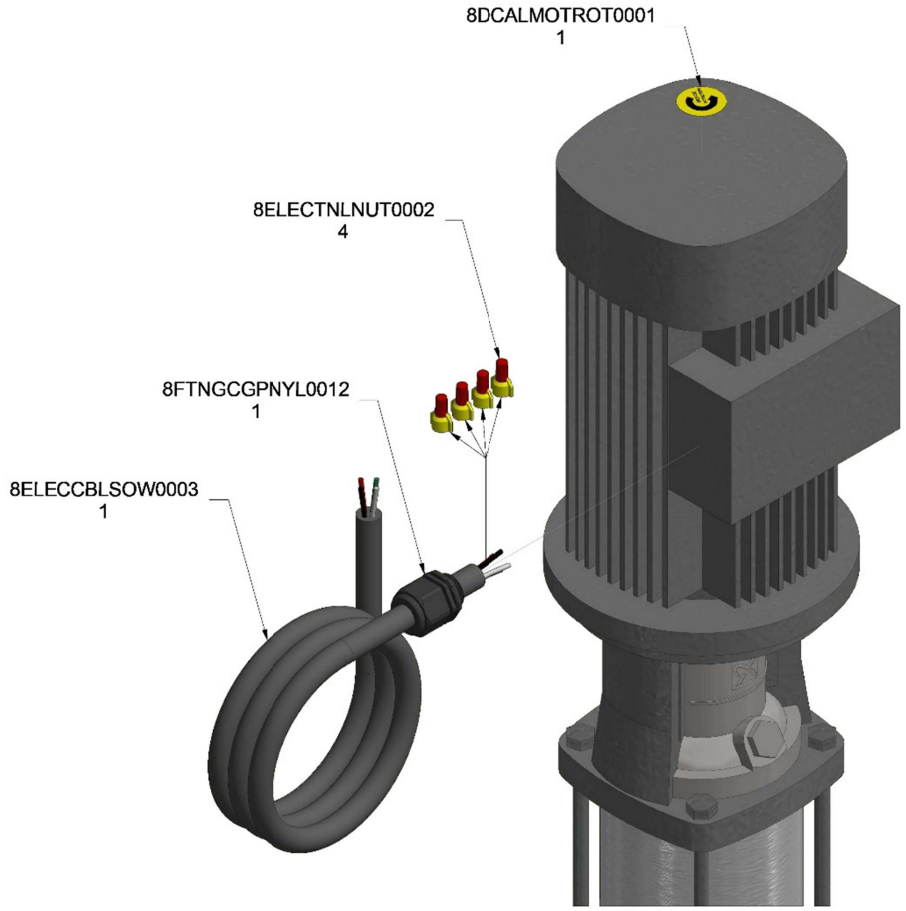
Remove both flanges and plugs. Lift motor end of crate to allow water to drain.

Install hose barb on flange using Oatey FASTape PTFE Teflon tape and RectoSeal T Plus 2 pipe dope, reinstall flange on pump inlet side of pump "Flow arrow on base" Torque mounting bolts evenly to 665 in lb/ 102 ft lbs.

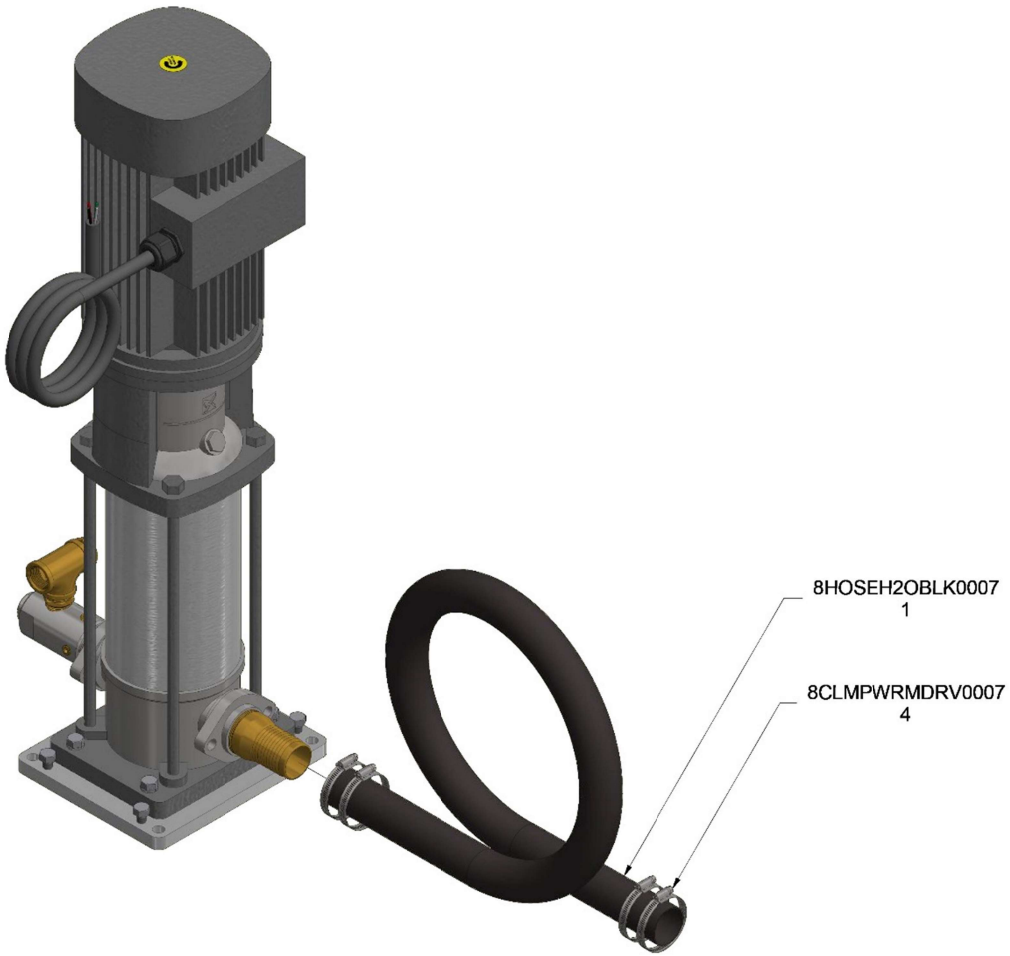
Install filter on flange using Oatey FASTape PTFE Teflon tape and RectoSeal T Plus 2 pipe dope. Temp install bolts, gasket and nuts through flange mounting holes. Place assemble in shipping box.

Install crate cover.

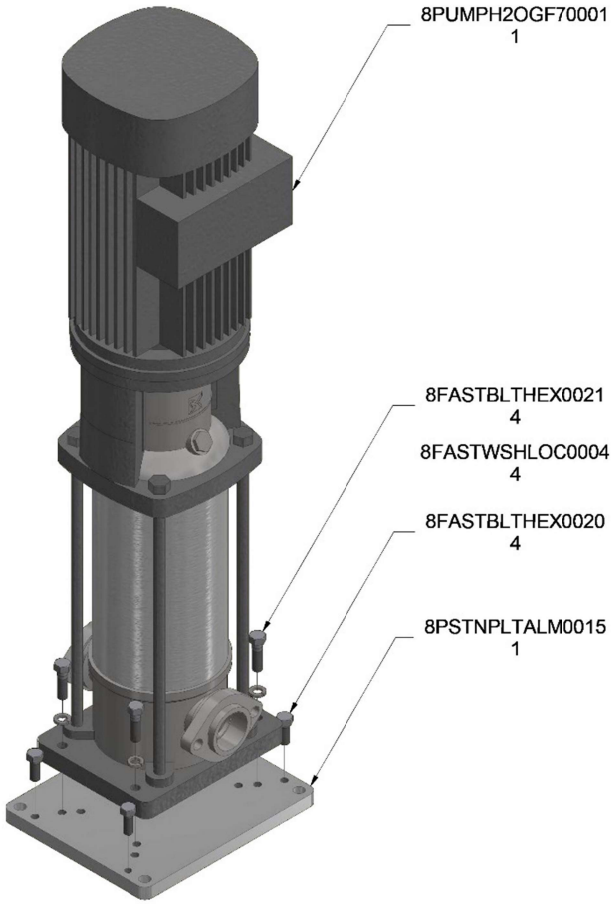
MOTOR WASH WORKS CITY	NOTES APPLY THREAD TAPE OR SEALANT TO NPT THREADS.	MASTERCAM NUMBER TOOL LIST 1- 2- 3- 4- 5- 6- 7- 8-	TOLERANCE .XX ± .010 .XXX ± .005 .XXXX ± .001 FRACT ± 1/32" UNLESS OTHERWISE SPECIFIED	REVISION	PART NUMBER 7PUMPH2OGF50001 DESCRIPTION GRUNDFOS 5HP20GPM PUMPASY SHEET SIZE B / SCALE NTS DRAWN BY EIJI ISOMURA / DATE 6/20/2017



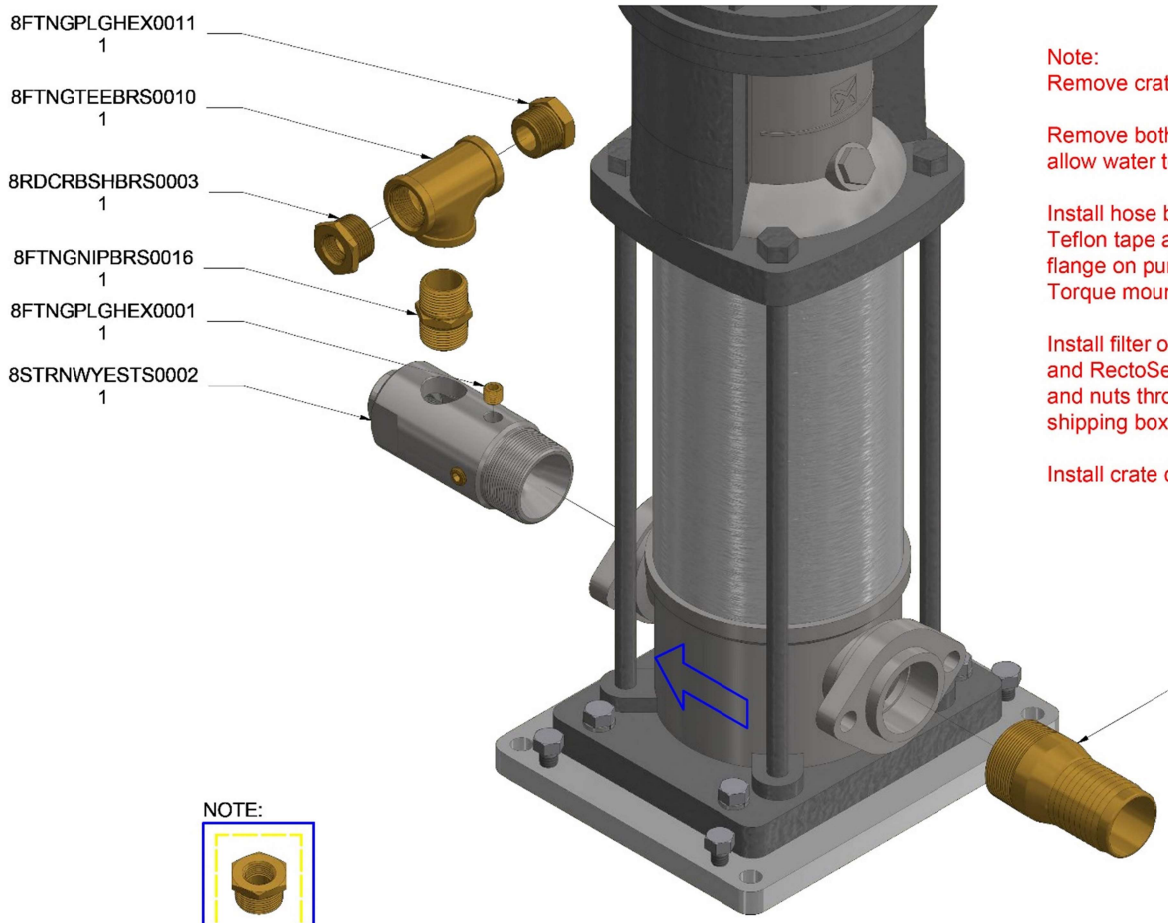
MOTOR WASH WORKS CITY	NOTES WIRE NUTS [QTY (4)] AND MOTOR CABLE WILL SHIP LOOSE. INSTALL CORD GRIP ONTO THE MOTOR JUNCTION BOX. THE MOTOR IS ONLY TO BE WIRED TO SPECIFIC VOLTAGE ON SITE.	MASTERCAM NUMBER TOOL LIST 1- 2- 3- 4- 5- 6- 7- 8-	TOLERANCE .XX ± .010 .XXX ± .005 .XXXX ± .001 FRACT ± 1/32" UNLESS OTHERWISE SPECIFIED	REVISION	PART NUMBER 7PUMPH2OGF50001	
				SHEET SIZE B	SCALE NTS	DESCRIPTION GRUNDFOS 5HP20GPM PUMPASY
					DRAWN BY EIJI ISOMURA	DATE 6/20/2017



MOTOR WASH WORKS CITY	NOTES HOSE AND CLAMP; SHIPPED SEPARATELY.	MASTERCAM NUMBER TOOL LIST 1- 2- 3- 4- 5- 6- 7- 8-	TOLERANCE .XX ± .010 .XXX ± .005 .XXXX ± .001 FRACT ± 1/32" UNLESS OTHERWISE SPECIFIED	REVISION	PART NUMBER 7PUMPH2OGF70001	
				SHEET SIZE B	SCALE NTS	DESCRIPTION GRUNDFOS 7.5HP40GPM ASY
					DRAWN BY EIJI ISOMURA	DATE 6/20/2017



MOTOR WASH WORKS CITY	NOTES	MASTERCAM NUMBER TOOL LIST 1- 2- 3- 4- 5- 6- 7- 8-	TOLERANCE .XX ± .010 .XXX ± .005 .XXXX ± .001 FRACT ± 1/32" UNLESS OTHERWISE SPECIFIED	REVISION	PART NUMBER 7PUMPH2OGF70001	
				SHEET SIZE B	SCALE NTS	DESCRIPTION GRUNDFOS 7.5HP40GPM ASY
					DRAWN BY EIJI ISOMURA	DATE 6/20/2017



Note:
Remove crate cover.

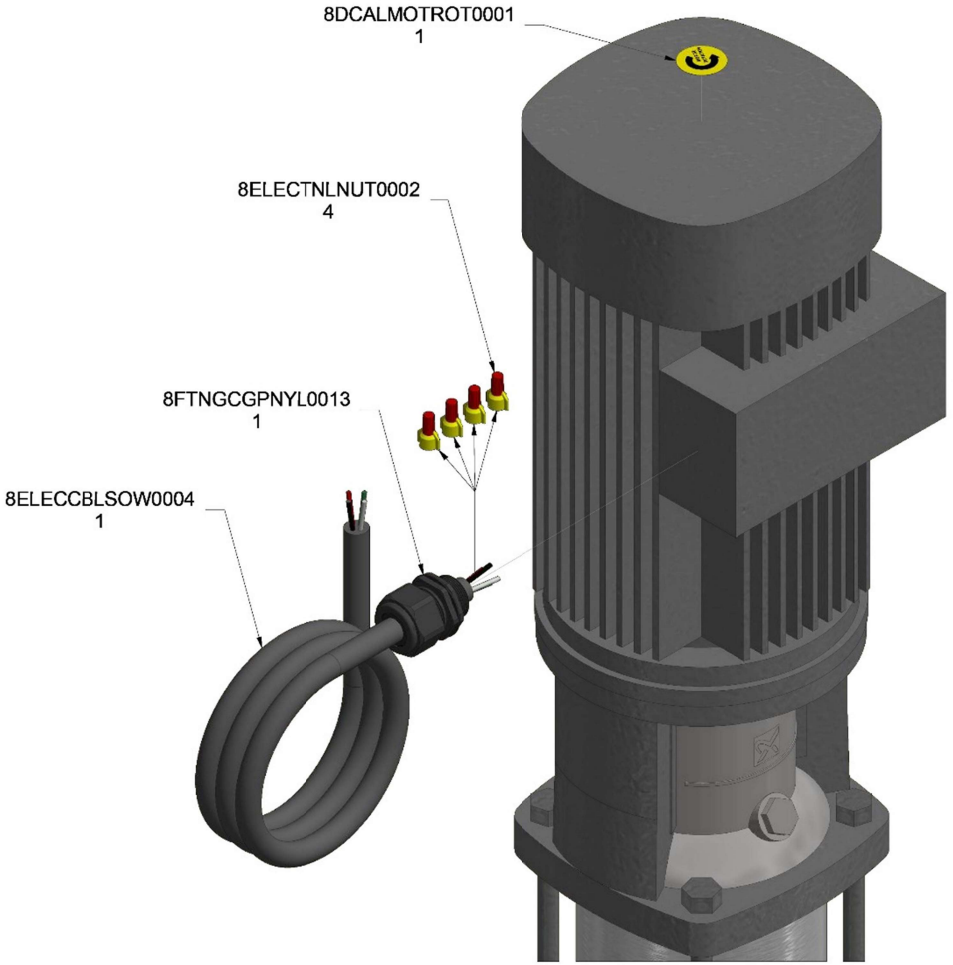
Remove both flanges and plugs. Lift motor end of crate to allow water to drain.

Install hose barb on flange using Oatey FASTape PTFE Teflon tape and RectoSeal T Plus 2 pipe dope, reinstall flange on pump inlet side of pump "Flow arrow on base" Torque mounting bolts evenly to 665 in lb/ 102 ft lbs.

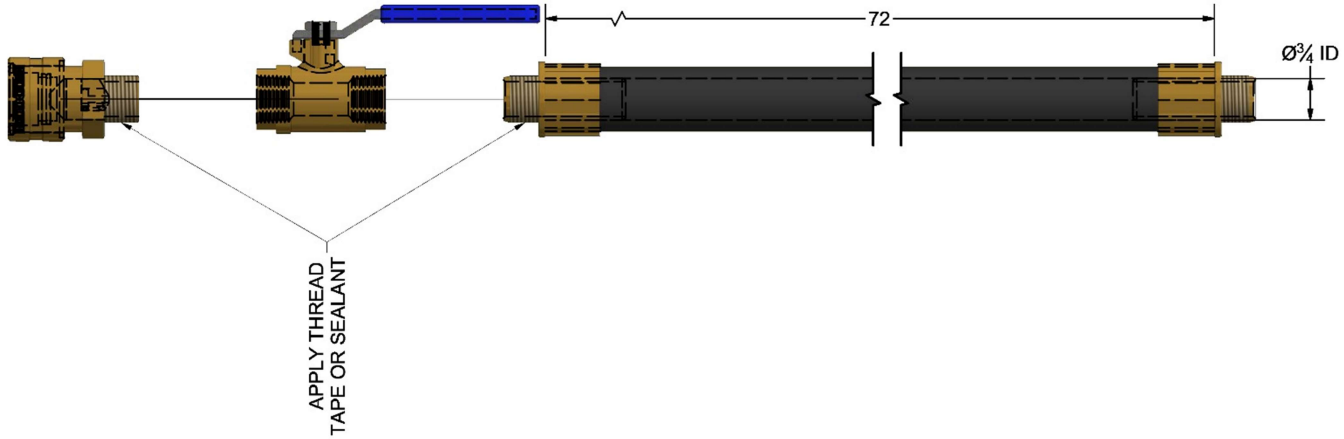
Install filter on flange using Oatey FASTape PTFE Teflon tape and RectoSeal T Plus 2 pipe dope. Temp install bolts, gasket and nuts through flange mounting holes. Place assemble in shipping box.

Install crate cover.

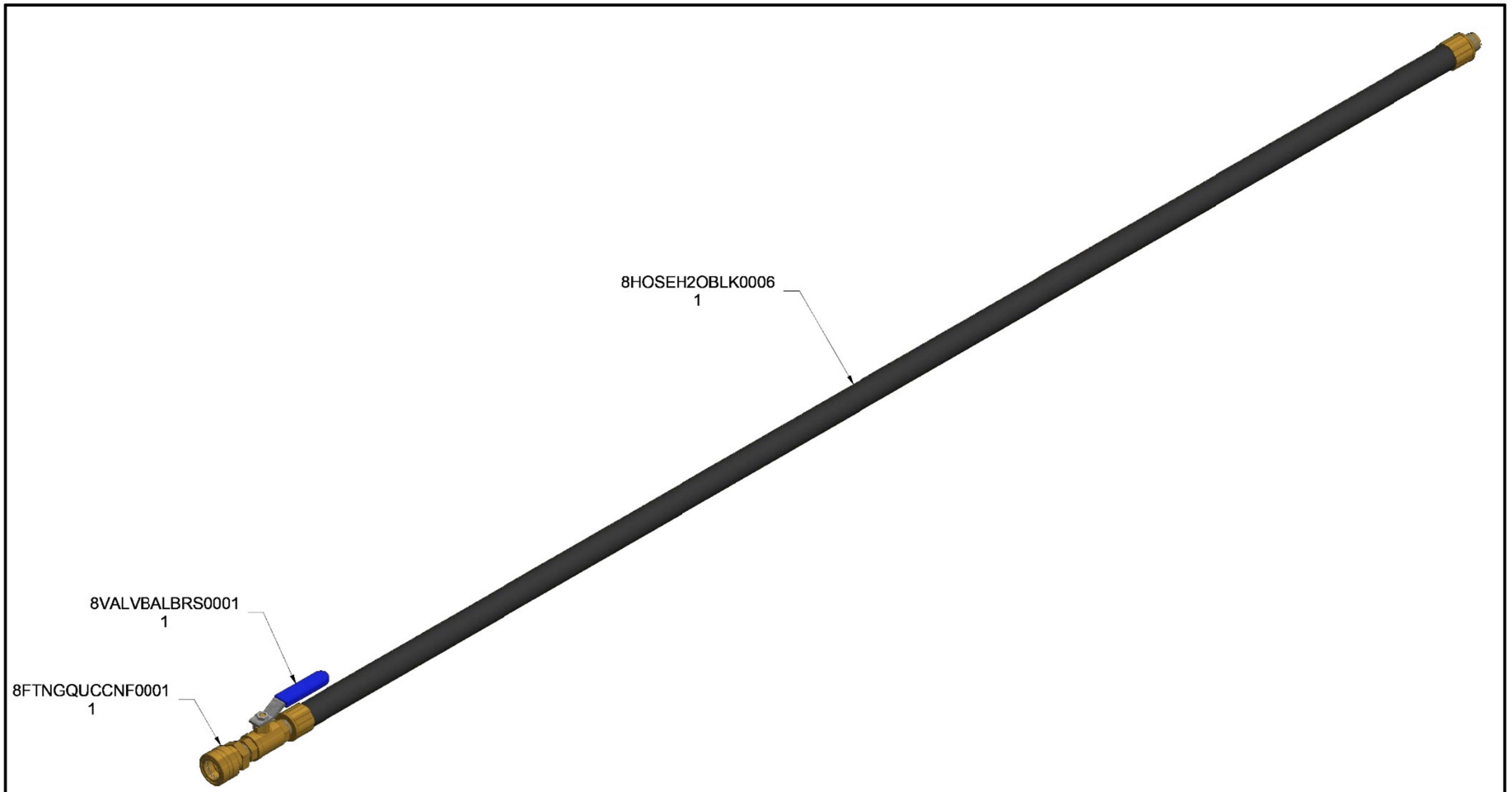
MOTOR WASH WORKS CITY	NOTES 8RDCRBSHBRS0003 SHIPS LOOSE. APPLY THREAD TAPE OR SEALANT TO NPT THREADS.	MASTERCAM NUMBER TOOL LIST 1- 2- 3- 4- 5- 6- 7- 8-	TOLERANCE .XX ± .010 .XXX ± .005 .XXXX ± .001 FRACT ± 1/32" UNLESS OTHERWISE SPECIFIED	REVISION	PART NUMBER 7PUMPH2OGF70001	
				SHEET SIZE B	SCALE NTS	DESCRIPTION GRUNDFOS 7.5HP40GPM ASY
					DRAWN BY EIJI ISOMURA	DATE 6/20/2017



MOTOR WASH WORKS CITY	NOTES WIRE NUTS [QTY (4)] AND MOTOR CABLE WILL SHIP LOOSE. INSTALL CORD GRIP ONTO THE MOTOR JUNCTION BOX. THE MOTOR IS ONLY TO BE WIRED TO SPECIFIC VOLTAGE ON SITE.	MASTERCAM NUMBER TOOL LIST 1- 2- 3- 4- 5- 6- 7- 8-	TOLERANCE .XX ± .010 .XXX ± .005 .XXXX ± .001 FRACT ± 1/32" UNLESS OTHERWISE SPECIFIED	REVISION SHEET SIZE: B SCALE: NTS	PART NUMBER: 7PUMPH2OGF70001 DESCRIPTION: GRUNDFOS 7.5HP40GPM ASY DRAWN BY: EIJI ISOMURA DATE: 6/20/2017	



MOTOR WASH WORKS CITY	NOTES	MASTERCAM NUMBER TOOL LIST 1- 2- 3- 4- 5- 6- 7- 8-	TOLERANCE .XX ± .010 .XXX ± .005 .XXXX ± .001 FRACT ± 1/32" UNLESS OTHERWISE SPECIFIED	REVISION	PART NUMBER 7HOSEASYQUC0001 DESCRIPTION GF5 PUMP OUTLET HOSE ASY	
				SHEET SIZE B	SCALE NTS	DRAWN BY EIJI ISOMURA DATE 11/3/2016



MOTOR CITY WASH WORKS	NOTES APPLY THREAD TAPE OR SEALANT TO NPT THREADS.	MASTERCAM NUMBER TOOL LIST 1- 2- 3- 4- 5- 6- 7- 8-	TOLERANCE .XX ± .010 .XXX ± .005 .XXXX ± .001 FRACT ± 1/32" UNLESS OTHERWISE SPECIFIED	REVISION	PART NUMBER 7HOSEASYQUC0001	
				SHEET SIZE B / SCALE NTS	DESCRIPTION GF5 PUMP OUTLET HOSE ASY	
					DRAWN BY EIJI ISOMURA	DATE 11/3/2016

NOTES

MASTERCAM NUMBER
(TOOL LIST)
1-
2-
3-
4-
5-
6-
7-
8-

TOLERANCE
.XX ± .010
.XXX ± .005
.XXXX ± .001
FRACT ± 1/32"
UNLESS OTHERWISE SPECIFIED

REVISION

SHEET SIZE
B

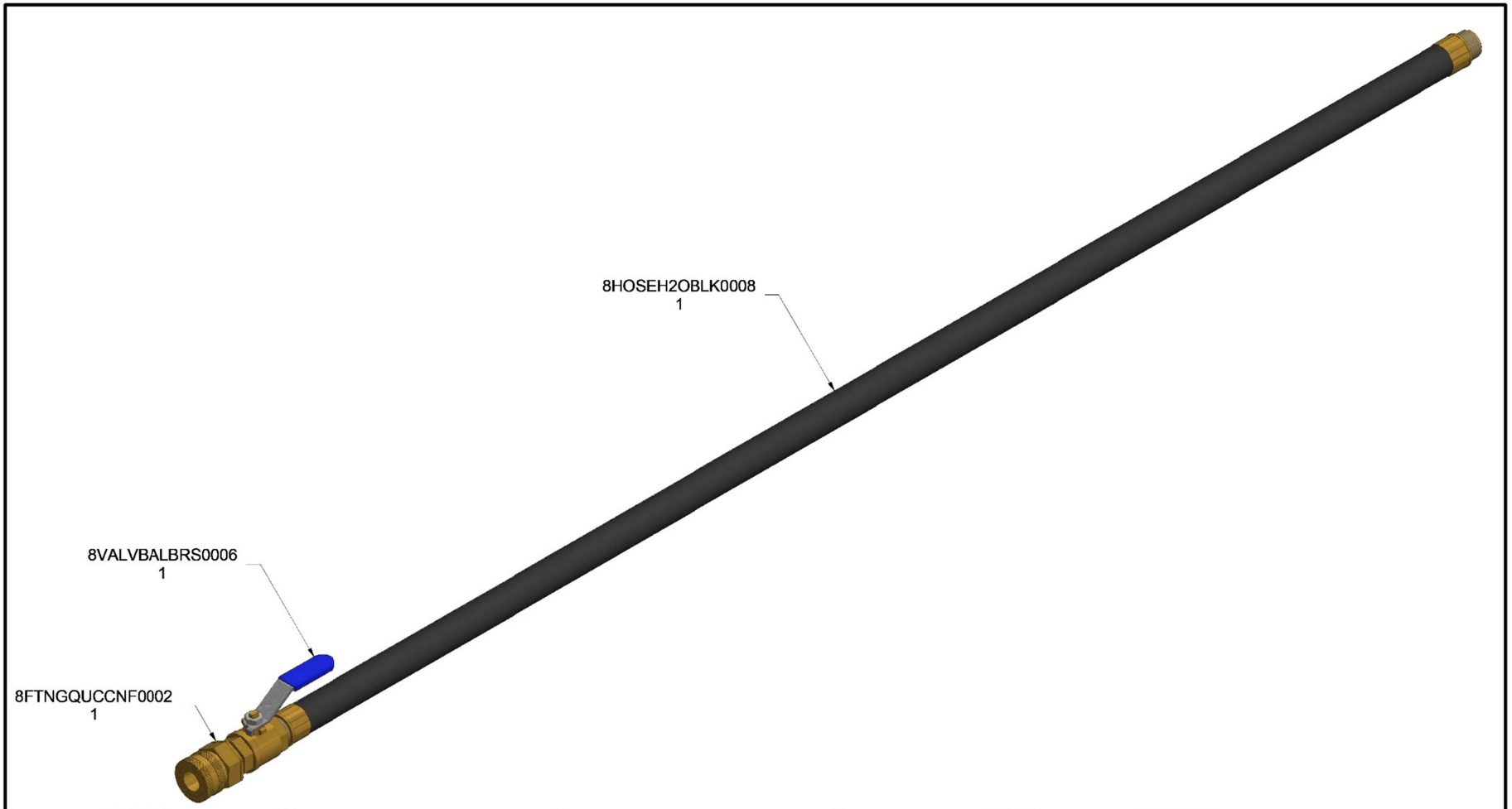
SCALE
NTS

PART NUMBER
7HOSEASYQUC0002

DESCRIPTION
GF10 PUMP OUTLET HOSE ASY

DRAWN BY
EIJI ISOMURA

DATE
11/3/2016



MOTOR WASH WORKS CITY

NOTES
APPLY THREAD TAPE OR SEALANT TO NPT THREADS.

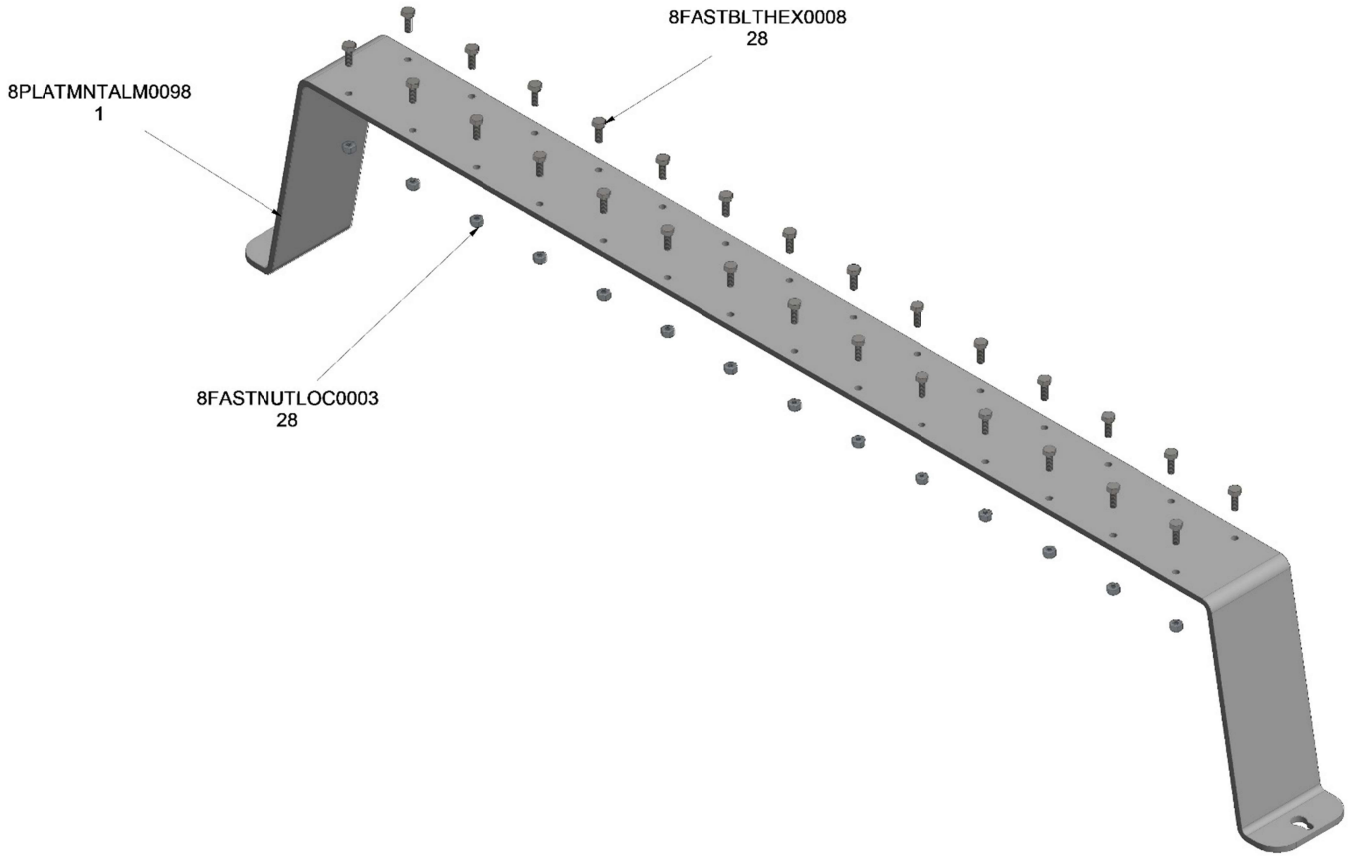
MASTERCAM NUMBER
TOOL LIST
1-
2-
3-
4-
5-
6-
7-
8-

TOLERANCE
.XX ± .010
.XXX ± .005
.XXXX ± .001
FRACT ± 1/32"
UNLESS OTHERWISE SPECIFIED

REVISION

SHEET SIZE: B
SCALE: NTS

PART NUMBER: 7HOSEASYQUC0002
DESCRIPTION: GF10 PUMP OUTLET HOSE ASY
DRAWN BY: EIJI ISOMURA
DATE: 11/3/2016



RAW MATERIAL:

MOTOR WASH WORKS CITY	NOTES	MASTERCAM NUMBER TOOL LIST 1- 2- 3- 4- 5- 6- 7- 8-	TOLERANCE .XX ± .010 .XXX ± .005 .XXXX ± .001 FRACT ± 1/32" UNLESS OTHERWISE SPECIFIED	REVISION	PART NUMBER 7APPLBRKALM0014 DESCRIPTION VERSA DIAL 14 POS MNT PLT	
				SHEET SIZE B	SCALE NTS	DRAWN BY dcalvin
						DATE 7/29/2020

AccuShot™ WARRANTY

FACTORY LIMITED

Motor City Wash Works, Inc warrants its equipment to be free from defect in material or workmanship under proper normal use for a period of one (1) year beginning the date of purchase.

Motor City Wash Works, Inc's liability shall be limited to repair or replacement of parts found to be defective within the warranty period and following Motor City Wash Works, Inc's inspection. Motor City Wash Works, Inc shall have the option requiring the return of defective material to establish the purchaser's claim. In the event of repair or replacement this limited warranty is non-cumulative. Neither labor nor transportation charges are included in this warranty.

This warranty is based upon the proper care and maintenance of the warranted equipment. Warranty

does not apply if the merchandise is altered or modified in any way. Warranty does not apply to any equipment which has been subject to misuse, inappropriate use of tools, including exposure to harsh chemicals, neglect, lack of maintenance, freezing, fluid hammer, accident, third party damage, fluid impurities such as sand or minerals, acts of God or acts of war. Nor does it apply to any equipment which has been repaired or altered by anyone not so authorized by Motor City Wash Works, Inc. All equipment must be properly installed in accordance with specified plumbing, electrical, and mechanical requirements. The warranty does not apply to normal wear and tear or routine maintenance components as described in the equipment manual.

Except as expressly stated herein, Motor City Wash Works, Inc shall not be liable for damages of any kind in connection with the purchase, maintenance, or use of this equipment including loss of profits and all claims for consequential damages. This limited warranty is in lieu of all other warranties expressed or implied. Motor City Wash Works, Inc neither assumes nor authorizes any person to assume for it any other obligation or liability in connection herewith. This warranty is neither assignable nor transferable.

Transportation damage claims are to be submitted to the carrier of the damaged material.

Motor City Wash Works, Inc.
48285 Frank Street
Wixom, MI 48393
Toll Free: 866-362-6377
Fax: 248-313-0271

Motor City Wash Works, Inc.
48285 Frank Street
Wixom, Michigan 48393 USA

p: 866.362.6377 • f: 248.313.0271
e: techsupport@motorcitywashworks.com
w: motorcitywashworks.com

GET MORE
GET MOTOR CITY™