

Water Degasifying Skid

Project Number: 17740



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1.0 EQUIPMENT DESCRIPTION

FEED WATER REQUIREMENTS

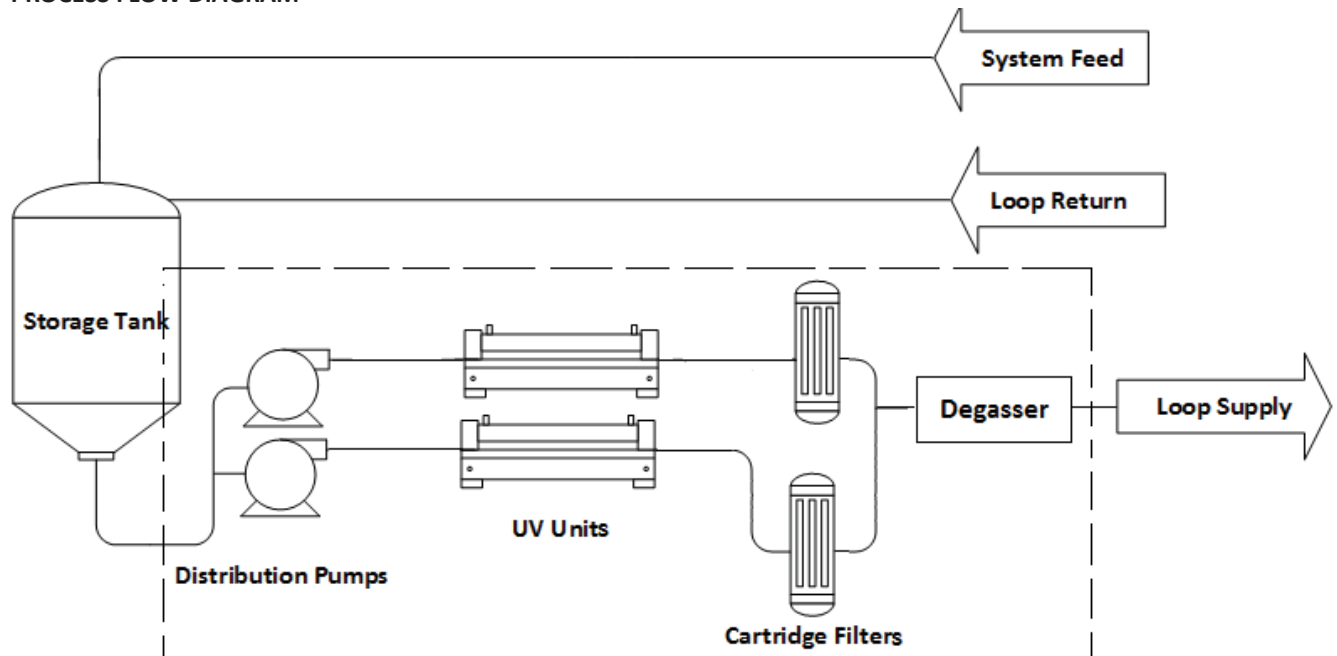
- Source: municipal water
- Flow rate: 6 gpm normal makeup, 23 gpm maximum
- Pressure: 40 psi minimum(dynamic)

PRODUCT WATER SPECIFICATIONS:

- Quantity
 - Make up: 2 gpm (2,880 gpd)
 - Distribution: 51 gpm @ 68 psi
 - Product Storage: 1,000 gallons
- Quality*
 - ASTM Type II Water
 - Appearance: Clear, odorless water
 - Conductivity: <1 uS/cm
 - TOC: ≤ 50 ppb
 - Sodium: < 5 ppb
 - Chloride: < 5 ppb
 - Silica: < 3 ppb

**Note product water specifications are contingent upon proper system operation & maintenance, as well as prerequisite feed water requirements.*

PROCESS FLOW DIAGRAM



UTILITIES

Feed Water

- Source: RO Feed
- Flow Rate: 2 gpm normal
- Temperature: 33°F minimum, 110°F maximum

Electrical

- Single feed, 120 VAC, 1 phase, 60 hz, 30 Amp

Drain

Component	Flow Rate [gpm]	Type [Intermittent/Continuous/Service]
Vacuum Seal Water	1	Intermittent

EQUIPMENT SPECIFICATIONS

(1) Pump/UV/Final Filter Skids (MU-PUFDG-002P05)

- QTY (2) Distribution Pump
 - Polypropylene front/rear housing and impeller, Viton O-ring, and ceramic shaft and thrust washer
 - Capacity: 33 ft TDH (14.3 psi) @ 2 gpm
 - Mounted on a welded and painted steel support frame with UV and Filter
 - Inlet & outlet type diaphragm isolation valves, beta polypropylene
 - Diaphragm valve allows for flow modulation
 - 316 SS outlet pressure gauge
 - Acrylic variable area flow indicator on outlet
 - Beta polypropylene pipe & fittings
 - Locally mounted starter & disconnect
- QTY (2) Disinfection UV Unit
 - Disinfecting UV unit, 254 nm
 - Capacity: 2 gpm
 - Dosage: 40 mJ
 - 316L Stainless steel vessel
 - Electropolished
 - Horizontal mounting
 - Lamp life > 1 year
 - Inlet & outlet diaphragm type isolation valves, polypropylene
 - Beta Polypropylene pipe & fittings
 - Mounted to a welded & painted steel frame with pump and filter
- QTY (2) Final Filter
 - Final polishing filter removes trace contaminants prior to feed to distribution loop
 - Capacity: 2 gpm
 - 0.2 micron absolute pleated type cartridges
 - Beta polypropylene housing
 - Inlet & outlet diaphragm type isolation valves
 - Inlet & outlet pressure gauges
 - Beta polypropylene pipe & fittings
 - Mounted to a welded & painted steel frame with pump and UV
- QTY (1) Degasifier
 - Degasser skid prevents bubble/gas formation
 - Polypropylene/polyethylene membrane/potting material
 - Typical membrane surface area 15 ft²
 - Polypropylene housing
 - Flange connections
 - Flow Sensor on outlet
 - Temperature sensor on outlet
 - Mounted to a welded & painted steel frame

2.0 SEQUENCE OF OPERATION

SYSTEM OVERVIEW

RO/DI water is fed from a tank to dual distribution pumps which provide flow and pressure through the water system. The water is then fed through a UV disinfection unit that will de-activate organisms in the water. After the UV unit, the water goes through a single 10" final filter, that will removes and solids and organisms from the water over .2 microns in length. The water then goes into the degasifier membrane that pulls CO₂ from the water into the vacuum pump and out to the atmosphere. The water then is fed into the loop.

Distribution Pumps (P-101A/101B)

The distribution pump skid has duplex pumps that provides constant pressure and flow through the loop. The duplex system allows for meeting flow and pressure demands with a single pump failure. The flows and pressures are manually controlled and set by skid valves.

CONDITION/FEATURE	RESULT/RESPONSE
FE-101 FLOW BELOW LOW FLOW SET POINT	DISTRIBUTION PUMP P-101A/101B GOES TO STANDBY
FE-101 FLOW ABOVE LOW FLOW SET POINT	DISTRIBUTION PUMP P-101A/101B RUNNING

UV Unit (UV-101A/101B)

The disinfection UV unit (UV-101A/101B) operates based on the status of the distribution pumps (P-101A/101B). During service the disinfection UV unit is ON; during standby, UV is off.

CONDITION/FEATURE	RESULT/RESPONSE
IF P-101A/101B IN STANDBY	UV-101A/101B IN STANDBY
IF P-101A/101B IS IN SERVICE AND UV-101A/101B IS IN AUTO	UV-101A/101B IN SERVICE

Final Filters (F-101A/101B)

The 0.2 Micron Final Filters eliminates any remaining solids, as well as all bacteria that have been deactivated by the disinfection UV. This keeps the final water quality high, and keeps bacteria and biological growth in the loop to a minimum. The Final Filters can be closed by diaphragm valves on either side of the filter housing. One Filter housing can be closed off for maintenance while the other is in service.

Degasifier Membrane (DEGAS-101)

The degasifier membrane uses vacuum suction to remove dissolved CO₂ from the water as it passes through the shell side of the membrane.

Vacuum Pump (P-102)

CONDITION/FEATURE	RESULT/RESPONSE
IF P-101A/101B IN STANDBY	P-102 IN STANDBY
IF P-101A/101B IN SERVICE, LS-101 NOT MET	P-102 IN STANDBY
IF P-101A/101B IS IN SERVICE AND P-102 IS IN AUTO	P-102 IN SERVICE

Alarms & Alarm Setpoints

ALARM DESCRIPTION	SENSOR	ALARM TAG	ACTION	ACTION DELAY [SEC]	SETPOINT TAG	SETPOINT DEFAULT	SETPOINT UNITS
DISTRIBUTION PUMP 101A FAILED	P-101 FEEDBACK	MA101A	ALARM SET	5	N/A	N/A	N/A
DISTRIBUTION PUMP 101B FAILED	P-101	MA101B	ALARM SET	5	N/A	N/A	N/A
LOW DISTRIBUTION FLOW	FE-101	FA101	ALARM SET, UV TO STANDBY, P-102 TO STANDBY	30	FA101_SP	1	Gpm
DISTRIBUTION TEMPERATURE HIGH	TT-101	TA101	ALARM SET	30	TA101_SP	110	F

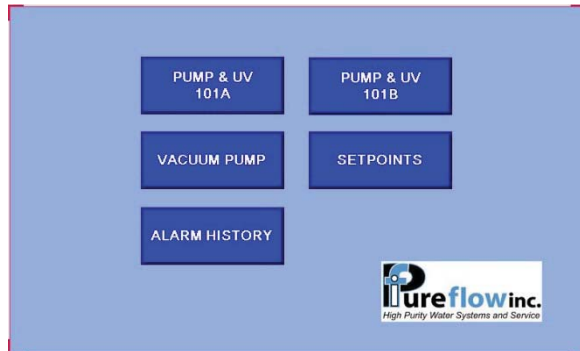
Table 2.4. Digital Input/Output (I/O) list.

DESCRIPTION	PLC ADDRESS	PLC TAG
LOOP FLOW	IO:00	FE101
PUMP ENABLE FROM CUSTUMER	IO:01	ZSCUST
SPARE	IO:02	
PUMP P-101A STATUS	IO:03	ZIP101A
PUMP P-101B STATUS	IO:04	ZIP101B
PUMP P-102 STATUS	IO:05	ZIP102
P-102 RESERVIOR LEVEL SWITCH	IO:06	LS201
ALARM LIGHT	OO:00	AL806
ALARM HORN	OO:01	AH810
UV-101A ENABLE	OO:02	CR814
UV-101B ENABLE	OO:03	CR816
COMMON ALARM RELAY	OO:04	CR818
SPARE	OO:05	
DEGASSIFIER SOLENOID	OO:06	SV101
P-101A ENABLE	OO:07	K828
P-101B ENABLE	OO:08	K830
P-102 ENABLE	OO:09	K832

Table 2.4. Analog Input/Output (I/O) list.

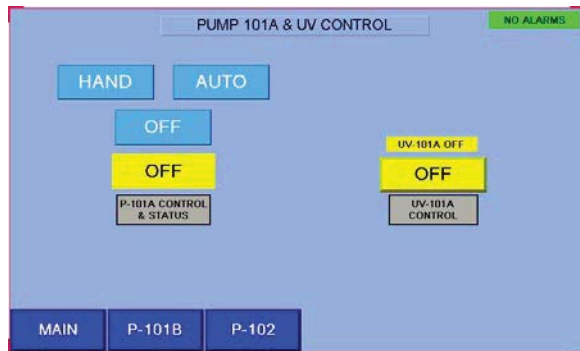
DESCRIPTION	PLC ADDRESS	PLC TAG	UNITS	LOW RANGE	HIGH RANGE
LOOP TEMPERATURE	IO:P1:AI:00	TT101	F	33	120
SPARE	IO:P1:AI:01				
LOOP FLOW (Customer)	IO:P2:AO:00	FI101	GPM	0	10
RECTIFIER CURRENT	IO:P2:AO:01	TI101	F	33	120

Table 2.5. User Interface HMI Screens



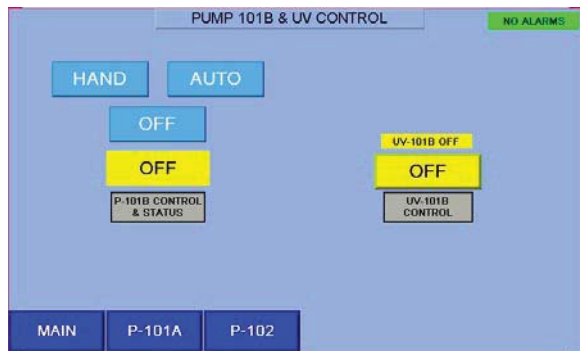
Main Panel

Default Screen, used to navigate to other detail screens via the five touch buttons located on the screen.



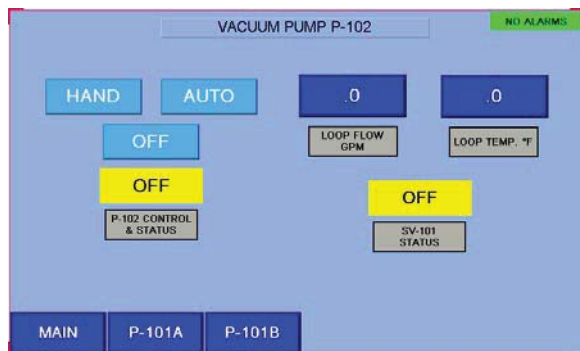
Pump 101A & UV Control

Allows user to view status and control pump P-101A and UV-101A. Pump control will be either in “HAND”, “AUTO”, or “OFF”. UV control will be either in “HAND”, “AUTO”, or “OFF”.



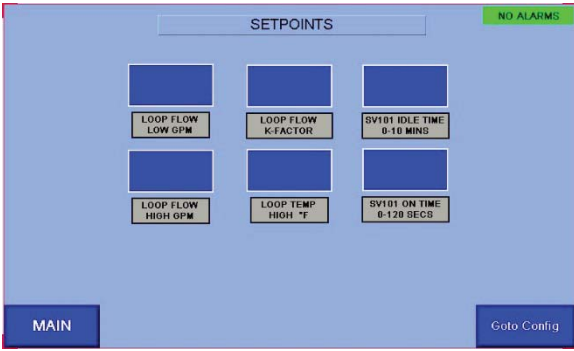
Pump 101B & UV Control

Allows user to view status and control pump P-101B and UV-101B. Pump control will be either in “HAND”, “AUTO”, or “OFF”. UV control will be either in “HAND”, “AUTO”, or “OFF”.



Vacuum Pump P-102 Control

Allows user to control and view status of vacuum pump, as well as shows loop flow rate, loop temperature, and vacuum water inlet solenoid. Pump control will be either in “HAND”, “AUTO”, or “OFF”.



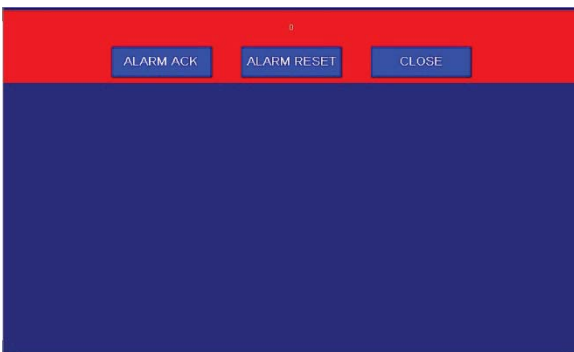
Setpoints

Shows data points of the system, and allows users to view and change setpoints of alarms.



Alarm History

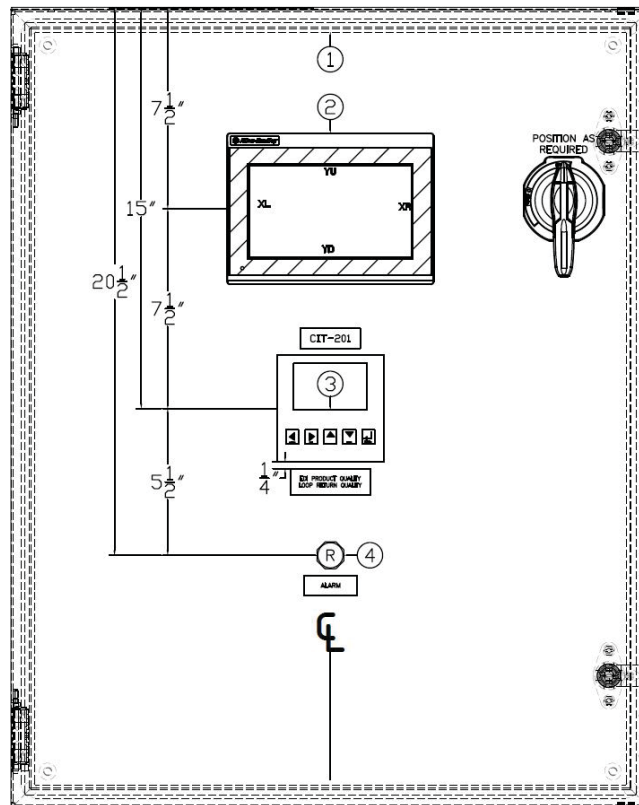
Shows alarm history for all alarms that have been triggered. Allows alarm acknowledge and reset.



Alarm Banner

Shows current alarm and allows alarm acknowledgement and alarm reset.

Table 2.6. Control Panel Interface Components



1. Hoffman Enclosure: Wall mount steel enclosure
2. Allen Bradley PanelView: touch screen HMI that allows control of the PWG system
3. Thorton M200: Ties into conductivity probes, shows conductivity of system
4. Allen Bradley Pilot Light: Flashes when an alarm is triggered

3.0 STANDARD OPERATING PROCEDURES

START-UP:

1. Inspect system components, ensure all pipe & fittings are connected and there are no visible cracks or disconnected components.
2. Confirm all media & expendables have been installed, these include cartridge filters, vent filter, and Degasifier membrane.
3. Open inlet water isolation valves, confirm pressure is available.
4. Ensure all valves are in correct open positions.
5. Confirm system power is connected, turn either "Pump P-101A" or "Pump P-101B" toggle switch on main control panel to "AUTO" or "HAND" position, turn "Pump P-102" toggle switch on main control panel to "AUTO" or "HAND".
6. Turn the UV on for whichever train is in use through the Pump and UV control screens to either "HAND" or "AUTO".
7. Once pump is running, use appropriate diaphragm valves to throttle back until desired flow rate is achieved.
8. While distribution pump is running, check loop return pressure and verify acceptable loop pressure is present. Loop pressure may be adjusted by opening or closing loop supply or loop return valves.
9. Complete system log sheet and save records for start-up data.

SHUT DOWN:

1. Notify any affected users of the intent to shut down the loop and the duration of the shutdown period.
2. On the panel, turn all pumps: "Pump P-101A", "Pump P-101B", and "Pump P-102" switch to "OFF" position. Close related isolation valves from pump inlet.
3. On the panel, turn "UV CONTROL" switch to "OFF" position for both "UV-101A" and "UV-101B".
4. For extended shutdowns (greater than 24 hours), consider draining down the system and/or preserving the loop with a biostat type chemical.

ALARM ACKNOWLEDGE & RESET:

1. If the alarm is activated (audible horn is sounding), press the "ALARM ACKNOWLEDGE" button to disable the audible portion. Alarm indicator lights (red) will remain lit until the alarm condition is cleared (flow is re-established or loop temperature returns to acceptable value).
2. If the system remains in alarm state or interlock state after the operator has cleared the condition, toggle the "PUMP CONTROL" switch on and off to reset the system.
3. If system remains in alarm state confirm a second time that the alarm condition has actually been cleared.

4.0 EQUIPMENT LIST

Below is a list of the major equipment components as identified on the P&ID. Manufacturer provided specification sheets and/or manuals should be consulted for more specific component information or maintenance requirements.

TAG #	MANUFACTURER	PART NO	DESCRIPTION
P-101A	March	335-CP-MD	Pump, Starter, 1.5 GPM at 65 ft of head, 1/3 hp, 3/4" MPT Inlet/Outlet
UV-101A	Glasco	IL-HT-LAB-070	UV, 40 mJ, 254 nm, 100 PSI max, 316LSS vessel, 120/1/60, 2 GPM max
F-101A	Pentair	158214	Filter, Housing, Slim Blue, 1/2" Input/Output, 1R10"
P-101B	March	335-CP-MD	Pump, Starter, 1.5 GPM at 65 ft of head, 1/3 hp, 3/4" MPT Inlet/Outlet
UV-101B	Glasco	IL-HT-LAB-070	UV, 40 mJ, 254 nm, 100 PSI max, 316LSS vessel, 120/1/60, 2 GPM max
F-101B	Pentair	158214	Filter, Housing, Slim Blue, 1/2" Input/Output, 1R10"
F-102	Pentair	158214	Filter, Housing, Slim Blue, 1/2" Input/Output, 1R10"
DG-101	Liqui-Cel	G420	2.5x8 Contactor, Polypro housing, x40 membrane, viton o-ring, 1/4" connections
P-102	Sihi	LEM 40	Pump, Vacuum, 1.5 HP, 18 ACFM, 120/1/60
T-101	Pentair	150238	Filter, Housing, Big Blue, 1" inlet/outlet, seperator

5.0 VALVE LIST

Below is a list of the valves as identified on the P&ID. Manufacturer provided specification sheets and/or manuals should be consulted for more specific component information or maintenance requirements.

TAG #	MANUFACTURER	PART NO	DESCRIPTION
HV-101A	Georg Fischer	167.515.114	Valve, Diaphragm, 32mm, EPDM seal, butt fusion
HV-102A	Georg Fischer	167.515.112	Valve, Diaphragm, 20mm, EPDM seal, butt fusion
HV-103A	Georg Fischer	167.515.112	Valve, Diaphragm, 20mm, EPDM seal, butt fusion
HV-104A	Georg Fischer	167.515.112	Valve, Diaphragm, 20mm, EPDM seal, butt fusion
CKV-101A	Georg Fischer	167.561.082	Valve, Check, 20mm, EPDM seal, butt fusion
HV-101B	Georg Fischer	167.515.114	Valve, Diaphragm, 32mm, EPDM seal, butt fusion
HV-102B	Georg Fischer	167.515.112	Valve, Diaphragm, 20mm, EPDM seal, butt fusion
HV-103B	Georg Fischer	167.515.112	Valve, Diaphragm, 20mm, EPDM seal, butt fusion
HV-104B	Georg Fischer	167.515.112	Valve, Diaphragm, 20mm, EPDM seal, butt fusion
CKV-101B	Georg Fischer	167.561.082	Valve, Check, 20mm, EPDM seal, butt fusion
HV-105	Georg Fischer	167.515.112	Valve, Diaphragm, 20mm, EPDM seal, butt fusion
HV-106	Georg Fischer	167.515.112	Valve, Diaphragm, 20mm, EPDM seal, butt fusion
HV-107	Hylok	P1VF4N	Valve, Plug, ¼", NPT, 316SS
HV-108	Hylok	P1VF4N	Valve, Plug, ¼", NPT, 316SS
HV-109	Hylok	P2VH6T	Valve, Plug, 3/8", NPT, 316SS
HV-110	Hylok	P1VF4N	Valve, Plug, ¼", NPT, 316SS
HV-111	Georg Fischer	167.515.112	Valve, Diaphragm, 20mm, EPDM seal, butt fusion
HV-112	Hylok	NV2MH-4N4T	Valve, Needle, ¼", NPT x Hylok, 316SS
HV-113	Georg Fischer	167.515.112	Valve, Diaphragm, 20mm, EPDM seal, butt fusion

TAG #	MANUFACTURER	PART NO	DESCRIPTION
HV-114	Hylok	P2VH6T	Valve, Plug, 3/8", NPT, 316SS
HV-115	Spears	3629-005	Valve, Ball, 1/2", PVC, Solvent weld
HV-116	Spears	3629-005	Valve, Ball, 1/2", PVC, Solvent weld
CKV-102	Parker	6A-C6L	Valve, Check, 3/8", 316SS, Compression fitting
STR-101	Spears	YS22P8-005	Strainer, Y-Strainer, 1/2" Inlet/Outlet, PVC
SV-101	ASCO	8262H208	Valve, Solenoid, Electric, 1/2", 24V, FC, Brass

6.0 INSTRUMENT LIST

Below is a list of the instruments as identified on the P&ID. Manufacturer provided specification sheets and/or manuals should be consulted for more specific component information or maintenance requirements.

TAG #	MANUFACTURER	PART NO	DESCRIPTION
PI-101A	McDaniel	KD-GF	Indicator, Pressure, 2-1/2", 1/4" NPT,
PI-102A	McDaniel	KD-GF	Indicator, Pressure, 2-1/2", 1/4" NPT,
PI-103A	McDaniel	KD-GF	Indicator, Pressure, 2-1/2", 1/4" NPT,
FI-101A	Blue-White	F-40375LN-8	Indicator, Flow, 1/2" Inlet/Outlet, NPT
PI-101B	McDaniel	KD-GF	Indicator, Pressure, 2-1/2", 1/4" NPT,
PI-102B	McDaniel	KD-GF	Indicator, Pressure, 2-1/2", 1/4" NPT,
PI-103B	McDaniel	KD-GF	Indicator, Pressure, 2-1/2", 1/4" NPT,
FI-101B	Blue-White	F-40375LN-8	Indicator, Flow, 1/2" Inlet/Outlet, NPT
PI-104	McDaniel	KD-GF	Indicator, Pressure, 2-1/2", 1/4" NPT,
PI-105	Grainger	4FMC1	Test Vacuum Gauge, MNPT, 1/4" NPT, Gauge Connection Location: Center Back
PI-106	Grainger	4FMC1	Test Vacuum Gauge, MNPT, 1/4" NPT, Gauge Connection Location: Center Back
PI-107	McDaniel	KD-GF	Indicator, Pressure, 2-1/2", 1/4" NPT,
PI-108	Grainger	4FMC1	Test Vacuum Gauge, MNPT, 1/4" NPT, Gauge Connection Location: Center Back
FI-102	Blue-White	F-40377GN-8	Indicator, Flow, 1/2" Inlet/Outlet, NPT, Air
FE-101	GF Signet	P51530-P0	Flowmeter, Paddlewheel, Standard mount, 515
TE-101	IFM Effector	TA2603	Transmitter, Temp., 1/4" Adapter, 0-302 F, 1"
LS-101	IFM Effector	LMC500	Transmitter, Level Switch, 1/4"w
TI-101	Ashcraft	20-EI-60-R-025-(-20/120)F	Indicator, Temperature, 1/4" NPT, 2" Dial, 2-1/2" Stem, -20-120 F

7.0 CONTROL PANEL COMPONENT LIST

Below is a list of the major control system components as seen in the panel layout drawing and electrical schematics. Manufacturer provided specification sheets and/or manuals are provided for reference.

TAGS	MANUFACTURER	PART NO	DESCRIPTION
	HOFFMAN	CSD24208	ENCLOSURE, WALLMOUNTM STEEL, GRAY, 24X20X8 IN, NEMA13, HINGED, ¼ TURN LATCH, CONCEPT
	AB	2711R-T7T	PANELVIEW 800, 7 IN HMI TERMINAL, TOUCH SCREEN TFT, SERIAL AND ETHERNET PORTS
	C3CONTROLS	DDS2-330-DGMRY	IEC : NON-FUSED; DOOR MOUNT; NON-FUSED DISCONNECT SWITCH; 3 POLES; 30 AMP; PADLOCKABLE LEVER (IP55)
	AB	800FP-P4PN3R	800F PILOT LIGHT – RD. PLAS. (IP66, 4/4X/13), RED, 120VAC
	AB	855P-B30SE22	800F PANEL MOUNT SOUNDER PLAS SINGLE PIEZO, (IP66, 4/4X/13, IP66), BLK
	HOFFMAN	CP2420	PANEL, 22.20X18.20, FITS 24.00X20.00, STEEL, WHITE
	WAYTEK	27023	SLOTTED WALL WIRING DUCT 2" X 3" WHITE
PS601	AB	2080-PS120-240VAC	2080 MICRO800 CONTROLLER, 14-24VAC TO 24VDC POWER SUPPLY FOR CONTROLLER AND EXP I/O
PLC702	AB	2080-LC30-24QWB	2080 MICRO 8330 CONTROLLER, 14-24DC/VAC INPUT, 10-RELAY OUTPUT CONTROLLER
PLC902	AB	2080-IF2	2080 MICRO800 SYSTEM, 2-CH V/I ANALOG INPUT UNIPOLAR 0-10V/0-20MA (NON ISOLATED), ANALOG COMBINATION, 2-CHANNEL VOLTAGE/CURRENT INPUT, 0-10V, 0-20MA, 12BITS
PLC1002	AB	2080-OF2	2080 MICRO SYSTEM, 2-CH V/I ANALOG OUTPUT UNIPOLAR 0-10V/0-20MA (NON ISOLATED) PLUG IN MODULE
	AB	1492-EAJ35	END ANCHOR, USED W/ STANDARD 35MM DIN RAIL
CR814 CR816 CR818	AB	700-HN221	SCREW TERMINAL MINITURE SOCKET PANEL OR DIN RAIL MOUNTING 5-BLADE, FOR USE WITH 1-POLE 700-HK, RATING: 16A
	AB	700-HK36Z24-4	HK TYPE SLIM LINE RELAY WITH SOCKET 700-HN221, 16A, SPDT, 1 POLE WITH PILOT LIGHT 24 VDC, 1 FORM C
CB503 CB507 CB511	AB	1489-M1C150	BULLETIN 1489 MINIATURE CIRCUIT BREAKER, STANDARD CONFIGURATION, AC, 1 POLE CONFIGURATION CURVE C, 15 A
CB513	AB	1489-M1C050	BULLETIN 1489 MINIATURE CIRCUIT BREAKER, STANDARD CONFIGURATION, AC 1 POLE CONFIGURATION CURVE C, 5 A
FU903	AB	1492-WFB424	IEC TERMINAL BLOCK, 24VDC ONE-CIRCUIT FUSE BLOCK (5 X 20 MM FUSES, TYPE W), 4 MM (#22 AWG - #10

			AWG) OR 2.5 MM (#22 AWG – 12 AWG), NEON INDICATOR BLACK
	BUSSMANN	GMD-125MA	CARTRIDGE FUSES 125VAC .25A TIME DELAY
FU605	AB	1492-WFB424	IEC TERMINAL BLOCK, 24VDC ONE-CIRCUIT FUSE BLOCK (5 X 20 MM FUSES, TYPE W), 4 MM (#22 AWG - #10 AWG) OR 2.5 MM (#22 AWG – 12 AWG), NEON INDICATOR BLACK
	BUSSMANN	GMD-2A	CARTRIDGE FUSES 2 AMP 250V TIME DELAY
FU603 FU607 FU609	AB	1492-WFB424	IEC TERMINAL BLOCK, 24VDC ONE-CIRCUIT FUSE BLOCK (5 X 20 MM FUSES, TYPE W), 4 MM (#22 AWG - #10 AWG) OR 2.5 MM (#22 AWG – 12 AWG), NEON INDICATOR BLACK
	BUSSMANN	GMD-1A	CARTRIDGE FUSES 1 AMP 250V TIME DELAY
	AB	199-DRI	ZINC/STEEL DIN RAIL EN 50022 (35MM X 7.5MM) SLOTTED
TS1	AB	1492-W4	TERMINAL BLOCK/STRIP FEED-THROUGH 600V MAX, 30 AMPS MAX, 22-12 AWG WIRE SIZE WIDTH 0.24 IN., COLOR GREY
TS1	AB	1492-WG4	TERMINAL BLOCK/STRIP GROUNDING TERMINAL BLOCK, 750V MAX, 22-12 AWG WIRE SIZE WIDTH 0.24
K828 K830 K832	AB	100-C16D10	100-C CONTRACTOR, 3-POLE, 16AMPS, 110VAC 50HZ, 120VAC 60HZ, LINE SIDE, 1 NO
	AB	100-FSV136	SURGE SUPPRESSOR, VARISTOR MODULE, 56...136VAC/78...180VDC
OL503 OL507 OL511	AB	1935-EERP	100-C IEC CONTACTORS, 9A, 100V 50 HZ/120V 60 HZ
	SQD	PK9GTA	GROUND BAR KIT; QO; TERMINALS; TOP MOUNT; 3.78-IN. LENGTH; W/SCREWS & LABELS

8.0 RECOMMENDED MAINTENANCE & EXPENDABLES LIST

The following maintenance services should be performed with a minimum frequency as indicated to facilitate proper operation of the system. More frequent maintenance activities may be required depending on feed water conditions and required quality restrictions.

QUARTERLY (3 MONTH)

- Chemical Sanitization
- Replace Final Filters (F-101A/F-101B)

ANNUAL (12 MONTH)

- Replace Degas membranes (Degas-101)
- Replace Vent Filter (F-102)
- Calibrate pressure gauges
- Replace UV components (UV-101A/101B)

EXPENDABLES LIST

TAG #	PART #	DESCRIPTION	QUANTITY
F-101A/101B	MMP921CGS	10" .2 micron depth filter, 213 x cap, Silicon	2
UV-101A/101B	IL-HT-LAB-070	Disinfection UV, 254 nm, 1 year lamp life	2
Degas-101	G420	2.5 x 8 membrane, X40, CO ₂ removal	1
F-102	MPM921CGS	10" .2 micron vent filter, 213 x cap, silicon	1

9.0 MAINTENANCE LOG SHEET

The following log sheet should be completed on a daily or weekly basis. Operator should fill in the date & their initials, and then enter values for all parameters listed in a single column. Deviations or observations should be included in the comments section as necessary.

<u>TECHNICIAN INITIALS</u>							
<u>DATE</u>							
DESCRIPTION	TAG	VALUE					UNITS
Loop Pressure	PI-107						PSI
Loop Temperature	TE-101						F
Loop Flow	FE-101						GPM
Vacuum Pressure	PI-105						PSI
Comments/Notes							

10.0 PREVENTATIVE MAINTENANCE PROCEDURES

Note: All maintenance procedures shown below are typically provided & performed by a Pureflow, Inc. service technician, more extensive, component specific maintenance procedures can also be found in the component operation manuals attached at the end of this user manual.

REPLACE CARTRIDGE FILTERS:

1. Note or record system operating parameters (or fill out a system log sheet)
2. Turn off system according to shut-down procedure listed in the standard operating procedures section.
3. Isolate target filter housing by closing the manual isolation valves located before and after the housing. Drain housing using drain valve located on or around base of filter housing.
4. Unscrew filter housing tri-clamp (or wing-nuts).
5. Remove used cartridge[s] and discard.
6. Insert a new cartridge into the housing, making sure that it slips down over the connection and twist locks are engaged.
7. Close the filter housing. Do not over tighten.
8. Open isolation valves located directly around the housing (the valves that were closed during step 3).
9. Return system to service using start-up procedure listed in the standard operating procedures section.
10. Check for leaks, confirm system operating parameters (pressures, flows & quality) return to the same values that they were at prior to system shutdown (check against log sheet completed in step 1).
11. Clean up & dry the wet floor prior to leaving the system after maintenance has been performed.

REPLACE UV LAMP & SLEEVE:

1. Note or record system operating parameters (or fill out a system log sheet)
2. Turn off system according to shut-down procedure listed in the standard operating procedures section.
3. Isolate UV unit by closing the manual isolation valves located before and after the component.
4. Remove the UV unit shroud, allowing access to the lamp connections and internals.
5. Remove UV lamp & sleeve. Install new lamp & sleeve, hand tighten connection, do not overtighten. (**Note: Consult Aquafine UV operation manual in the back of this user manual for details on replacing lamps/sleeves/o-rings or other UV maintenance activities**)
6. Open isolation valves located directly around the UV unit (the valves that were closed during step 3).
7. Return system to service using start-up procedure listed in the standard operating procedures section.
8. Check for leaks, confirm system operating parameters (pressures, flows & quality) return to the same values that they were at prior to system shutdown (check against log sheet completed in step 1).
9. Clean up & dry the wet floor prior to leaving the system after maintenance has been performed.

11.0 DRAWINGS

The following drawing sets are included in this manual:

- Piping and Instrumentation Diagram (P&ID)
- General Arrangements
- Electrical Schematics & Panel Layout

NOTE: IN SOME CASES PUREFLOW I.D. TAGS SHOWN BELOW WILL BE SUPERCEDED BY SCG STANDARD I.D. TAGS

DEVICE	INSTRUMENT IDENTIFICATION TABLE											
	ANALOG	DIGITAL	LOCAL	REMOTE	CONTROL	ALARMS	TEST	STATUS	FUNCTION	OPERATION	INDICATION	CONTROL
MEASURED OR INTRINSICALLY SAFE	AS	AD	AL	AR	AC	AA	AA	AA	AA	AA	AA	AA
CONDUCTIVITY RATIO	CS	CD	CL	CR	CC	CA	CA	CA	CA	CA	CA	CA
VOLTAGE	VS	VD	VL	VR	VC	VA	VA	VA	VA	VA	VA	VA
FLOW RATE	FS	FD	FL	FR	FC	FA	FA	FA	FA	FA	FA	FA
FLOW RATIO	FRS	FRD	FRL	FRR	FRC	FRA	FRA	FRA	FRA	FRA	FRA	FRA
FLOW QUANTITY	FQS	FQD	FQL	FQR	FQC	FQA	FQA	FQA	FQA	FQA	FQA	FQA
HAND SIGNAL	HS	HD	HL	HR	HC	HA	HA	HA	HA	HA	HA	HA
CURRENT	CS	CD	CL	CR	CC	CA	CA	CA	CA	CA	CA	CA
POWER	PS	PD	PL	PR	PC	PA	PA	PA	PA	PA	PA	PA
TIME	TS	TD	TL	TR	TC	TA	TA	TA	TA	TA	TA	TA
TIME TOTALIZER	TT	TD	TL	TR	TC	TA	TA	TA	TA	TA	TA	TA
LEVEL	LS	LD	LL	LR	LC	LA	LA	LA	LA	LA	LA	LA
MOTOR SELECTOR	MS	MD	ML	MR	MC	MA	MA	MA	MA	MA	MA	MA
PRESSURE/HEAD	PS	PD	PL	PR	PC	PA	PA	PA	PA	PA	PA	PA
PRESSURE DIFFERENTIAL	PDS	PDD	PDL	PRD	PDC	PA	PA	PA	PA	PA	PA	PA
SPEED FREQUENCY	FS	FD	FL	FR	FC	FA	FA	FA	FA	FA	FA	FA
TEMPERATURE	TS	TD	TL	TR	TC	TA	TA	TA	TA	TA	TA	TA
WEIGHT FORCE	WS	WD	WL	WR	WC	WA	WA	WA	WA	WA	WA	WA
POSITION	PS	PD	PL	PR	PC	PA	PA	PA	PA	PA	PA	PA

PIPE MATERIAL ABBREVIATIONS

CPVC - CHLORINATED POLYVINYL CHLORIDE	CS - CARBON STEEL	CU - COPPER	FRP - FIBER REINFORCED PLASTIC	HDPE - HIGH DENSITY POLYETHYLENE	LDPE - LOW DENSITY POLYETHYLENE	PPA - PERFLUOROPOLYIMIDE	PE - POLYETHYLENE	PP - POLYPROPYLENE	PPL - POLYPROPYLENE LINED	PVC - POLYVINYL CHLORIDE	PVDF - POLYVINYLIDENE FLUORIDE	PVFL - PVDF LINED	TEF - TEFZON	TREL - TEFZON LINED	304 - 304 STAINLESS STEEL	316L - 316L STAINLESS STEEL
---------------------------------------	-------------------	-------------	--------------------------------	----------------------------------	---------------------------------	--------------------------	-------------------	--------------------	---------------------------	--------------------------	--------------------------------	-------------------	--------------	---------------------	---------------------------	-----------------------------

MISCELLANEOUS IDENTIFIERS

ACC - ACCUMULATOR	AV - AIR VENT	CP - CLEAN IN PLACE VALVE	CV - CHECK VALVE	DC - DOUBLE CONTAINED	FO - FAIL OPEN	FC - FAIL CLOSED	LS - LOCAL SELECTOR SWITCH	PS - PRESSURE TEST CONNECTION	SP - SAMPLE VALVE	ST - STEAM TRAP	SV - SOLVENED VALVE	SEQ - SEQUENCER	TR - THERMOWELL	TP - TEMPERATURE TEST CONNECTION	TRM - THERMOWELL	TV - THERMAL AIR VENT	XL - EQUIPMENT STATUS LIGHT
-------------------	---------------	---------------------------	------------------	-----------------------	----------------	------------------	----------------------------	-------------------------------	-------------------	-----------------	---------------------	-----------------	-----------------	----------------------------------	------------------	-----------------------	-----------------------------

PIPE CALLOUT

SIZE	MATERIAL	TUBE / PIPE	SCH / WALL THICKNESS	TYPE
1/4"	316L SS	TUBE	SCH 40	WIC - WELDED IMPORTED CODE
1/2"	CS	HOSE	SCH 40	WDC - WELDED DOMESTIC CODE
3/4"	PVC		SCH 120	SDC - SEAMLESS DOMESTIC CODE
1-1/2"	PE		0.049 in.	BW - BUTT WELD
2"	PPA		0.065 in.	SW - SOCKET WELD
3"	PVDF		0.109 in.	BCF - BEAD & CREVICE FREE
4"	CU		BSE	
6"			SR11	
8"			SR17	
10"			PR10	
12"			PR16	

3" 316L PIPE SCH 10 WIC

SELECTOR SWITCHES
MAN - HAND OFF AUTO
OCA - OPEN CLOSE-AUTO
OO - OFF-ON

EXAMPLES

PSUBSCRIPTION/MOMENTARY CONTACT

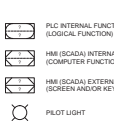
ST - START
SP - STOP

P&ID LEGEND & KEY

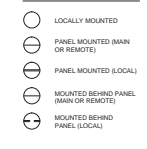
NOTES:

- AN ANALYTICAL VARIABLE FUNCTION DESCRIPTIONS (PH, SO₂, O₂, ETC.) ARE SHOWN OUTSIDE THE INSTRUMENT SYMBOL.
- SUFFIXES ARE FOR: L (LOW), LL (LOW-LOW), H (HIGH), HH (HIGH-HIGH), HL (HIGH-LOW), LH (LOW-HIGH).
- SUFFIX L = CLOSED OR THE SUFFIX H = OPEN ARE USED FOR VALVE POSITION LIGHTS AS NEEDED.
- AUDIBLE/VISIBLE ALARMS HAVE AN 'A' SUFFIX. VISIBLE ONLY ALARMS HAVE A 'V' SUFFIX AND ARE SHOWN LIKE A PILOT LIGHT SYMBOL. THE 'A' OR 'V' ARE FOLLOWED BY THE APPROPRIATE SUFFIX PER NOTE 3.
- POWER/DISCONNECT SWITCH AND MCCB BREAKER.

CONTROL SYMBOLS



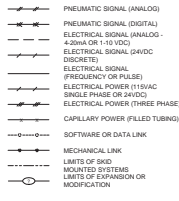
INSTRUMENT SYMBOLS



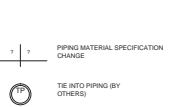
HAND SWITCH FUNCTIONS



LINE SYMBOLS



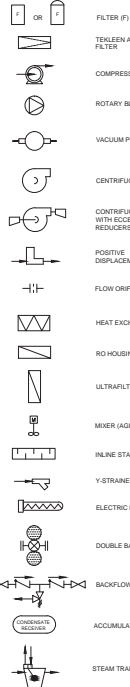
PIPE LEGEND



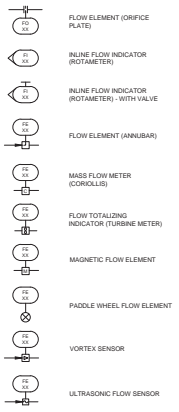
COMPONENT SYMBOLS



EQUIPMENT SYMBOLS



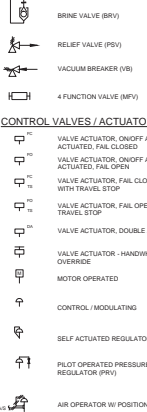
FLOW MEASUREMENT SYMBOLS



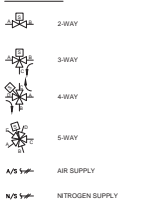
VALVE SYMBOLS



CONTROL VALVES / ACTUATORS



SOLENOIDS



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Graham, NC 27283
336-532-0300**

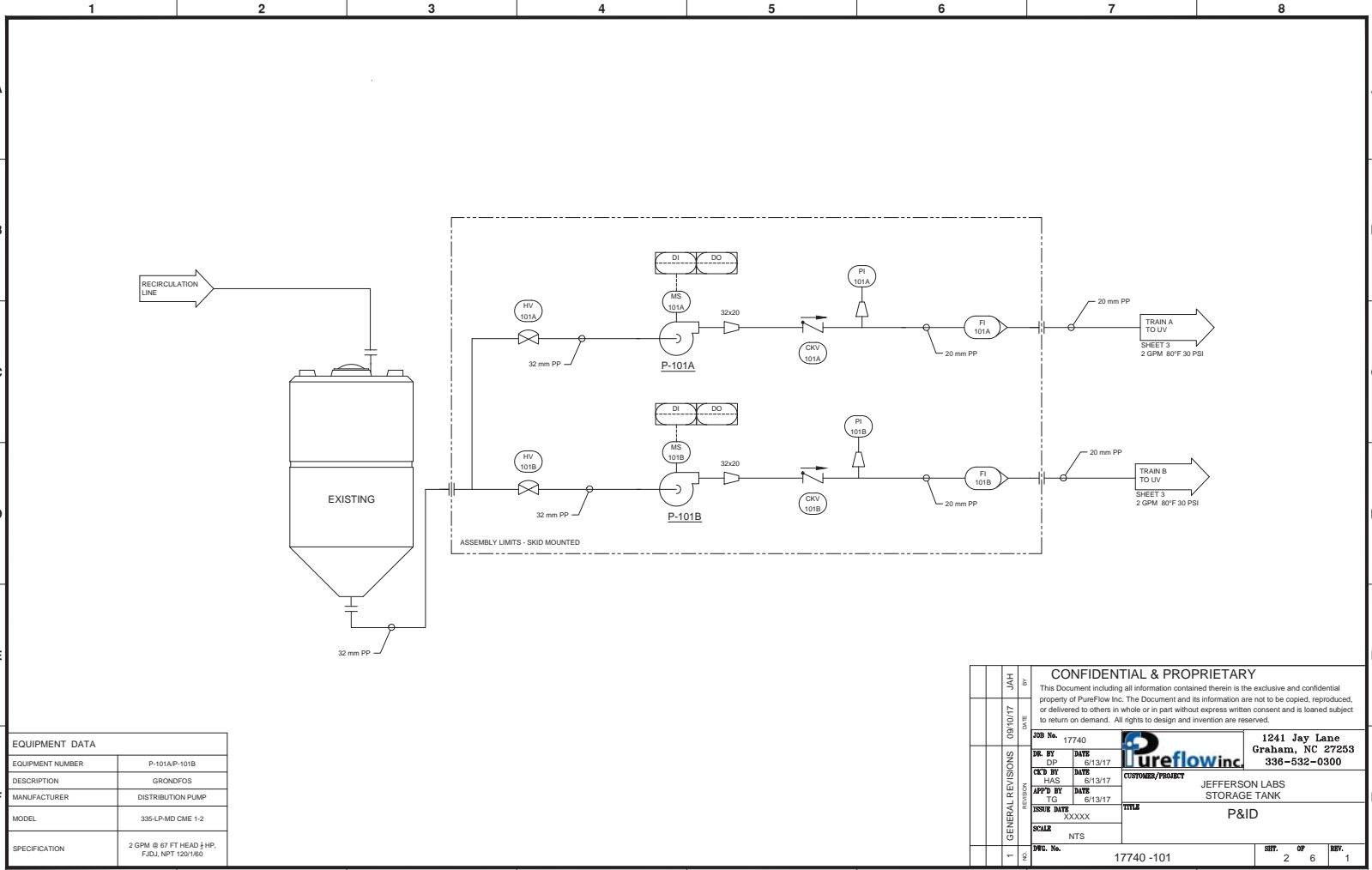
Pureflow inc.

JEFFERSON LABS STORAGE TANK

P&ID


DR. BY DATE
DIP 6/13/17
CHK BY DATE
HAS 6/13/17
APP'D BY DATE
TC 6/13/17
ISSUE DATE XXXXX
SCALE NTS

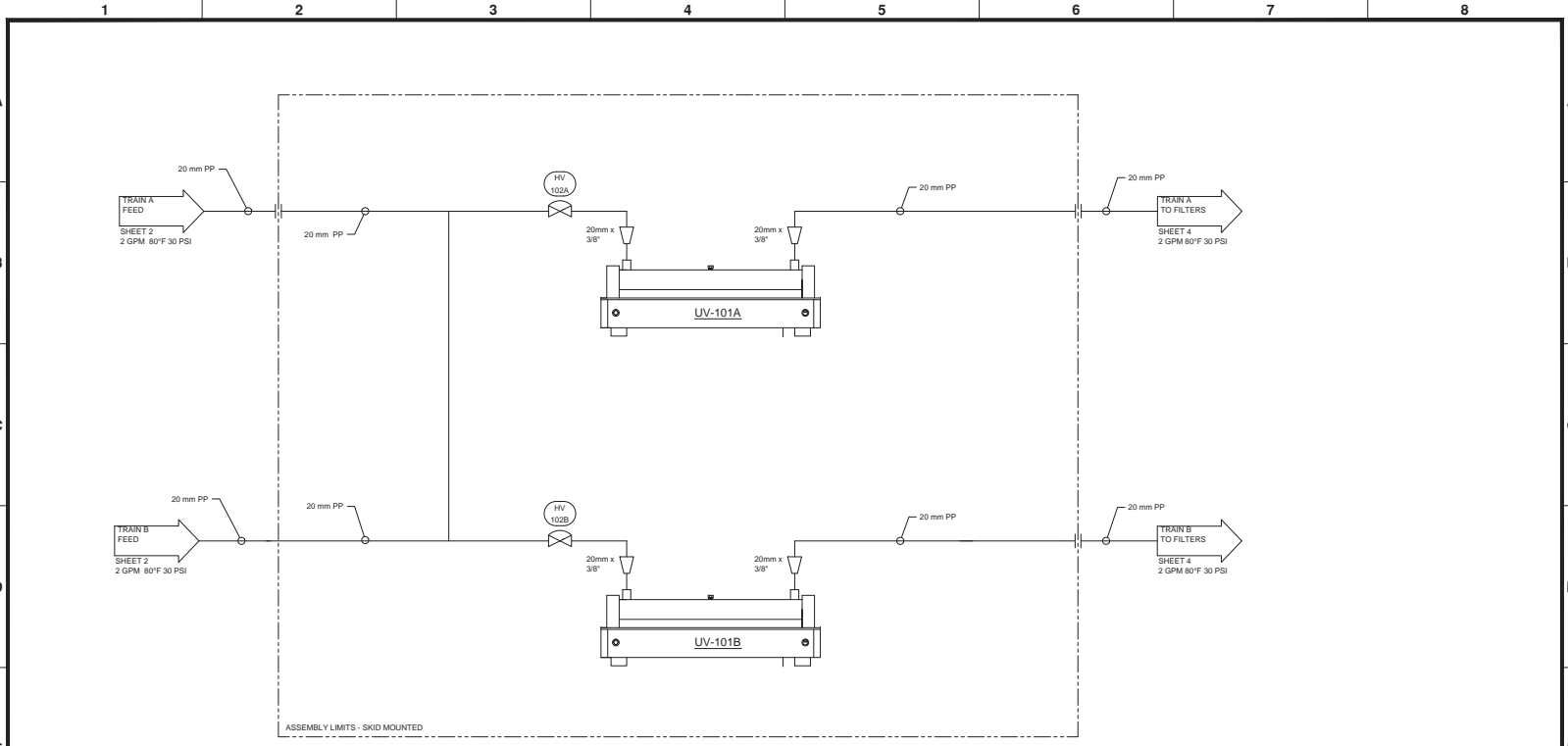
JOB No. 17740
CUSTOMER/PROJECT
TITLE
NO. 17740-101
SHT. 6
OF 1
REV. 1



EQUIPMENT DATA	
EQUIPMENT NUMBER	P-101A/P-101B
DESCRIPTION	GRONDPOPS
MANUFACTURER	DISTRIBUTION PUMP
MODEL	335-LP-MD CME 1-2
SPECIFICATION	2 GPM @ 67 FT HEAD ± HP; F.D.U. NPT 1201160

GENERAL REVISIONS		DATE		BY	
1	GENERAL REVISIONS	08/10/17		JAH	BT

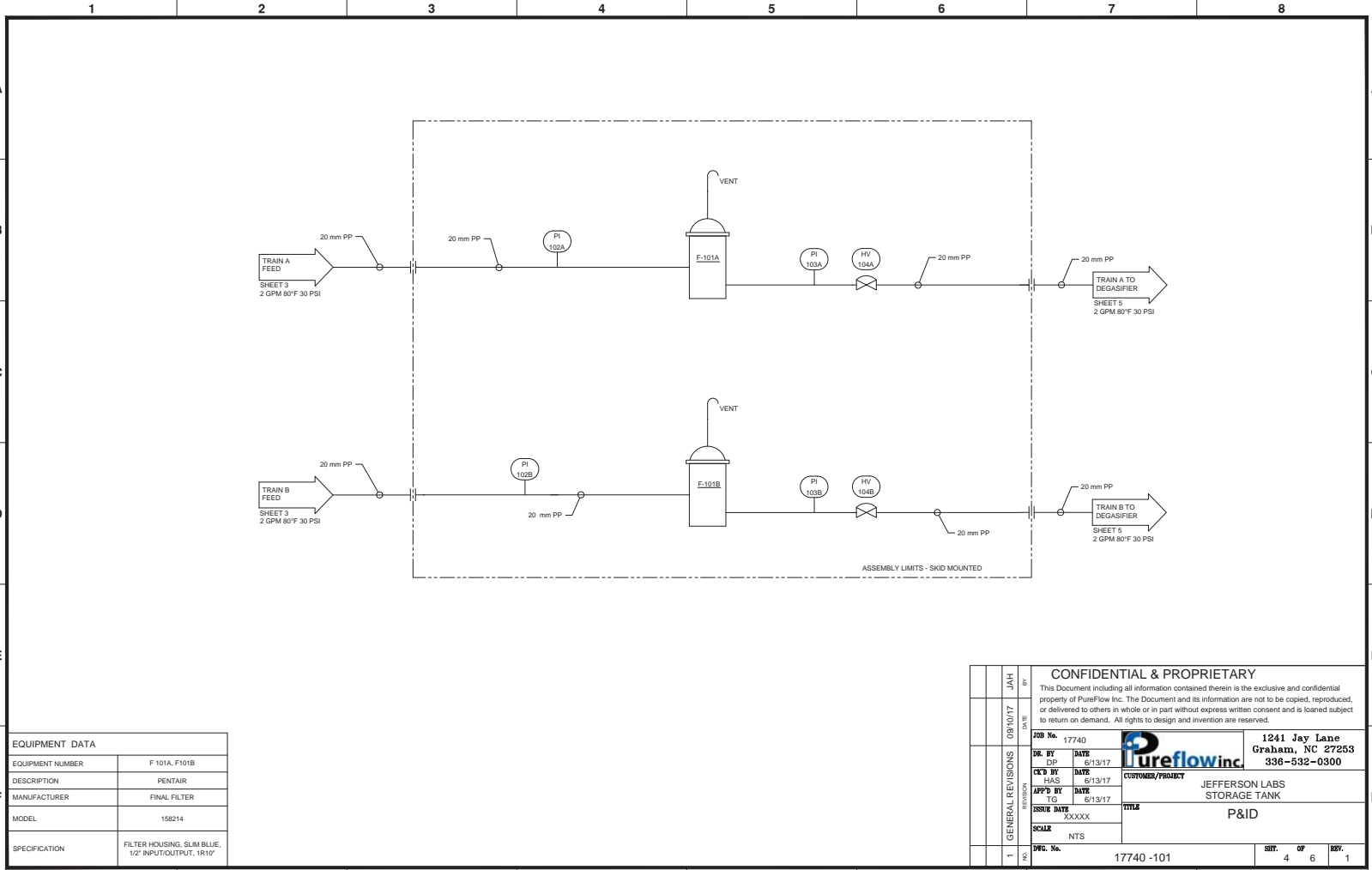
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JOB No.	17740			1241 Jay Lane Graham, NC 27253 336-532-0300	
DR. BY	DJP	DATE	6/13/17	CUSTOMER/PROJECT	
CK'D BY	HAS	DATE	6/13/17	JEFFERSON LABS	
APP'D BY	TC	DATE	6/13/17	STORAGE TANK	
ISSUE DATE	XXXXX	TITLE			
SCALE	NTS	P&ID			
DRG. No.	17740-101	SHT.	2	OF	6
		REV.			1



EQUIPMENT DATA	
EQUIPMENT NUMBER	UV-101A, UV-101B
DESCRIPTION	GLASCO
MANUFACTURER	DISINFECTION UV
MODEL	IL-70
SPECIFICATION	254 NM, 316L SS 100 PSI, ± FNPT, 40 NUM2

GENERAL REVISIONS		DATE		BY	
1	17740-101	08/10/17		JAH	


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DR. BY	DJP	DATE	6/13/17	CUSTOMER/PROJECT	
CHK'D BY	HAS	DATE	6/13/17	JEFFERSON LABS STORAGE TANK	
APP'D BY	TC	DATE	6/13/17	TITLE	
ISSUE DATE	XXXXXX	P&ID			
SCALE	NTS				
DWG. No.	17740-101	SHT.	3	OF	6
		REV.			1

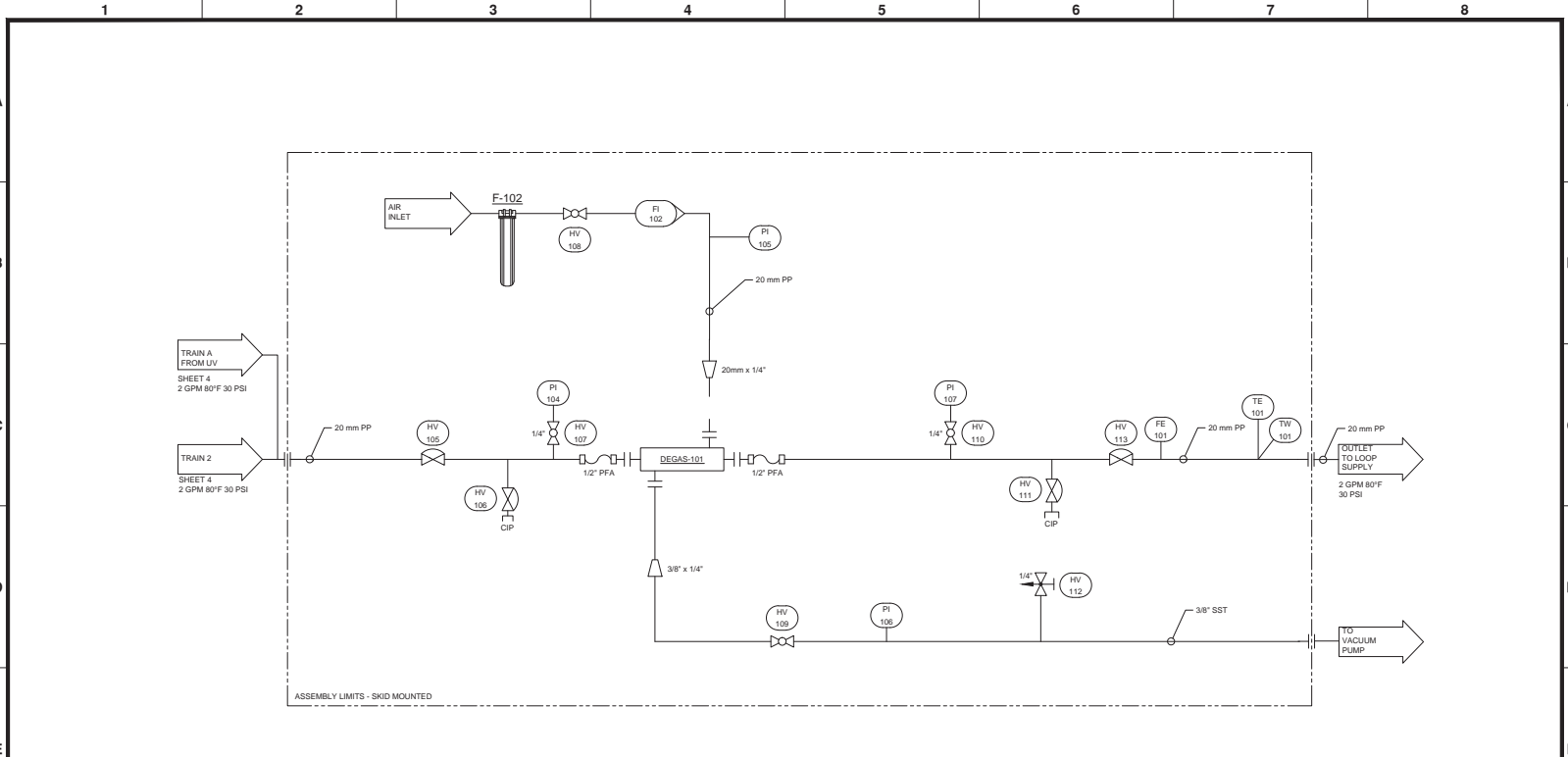


EQUIPMENT DATA	
EQUIPMENT NUMBER	F 101A, F101B
DESCRIPTION	PENTAIR
MANUFACTURER	FINAL FILTER
MODEL	158214
SPECIFICATION	FILTER HOUSING, SLIM BLUE, 1/2" INPUT/OUTPUT, 1R10"

GENERAL REVISIONS		DATE	BY
1	GENERAL REVISIONS	08/10/17	JAH

JOB No.		17740	
DR. BY	DATE	6/13/17	
CK'D BY	DATE	6/13/17	
APP'D BY	DATE	6/13/17	
ISSUE DATE	XXXXX		
SCALE	NTS		

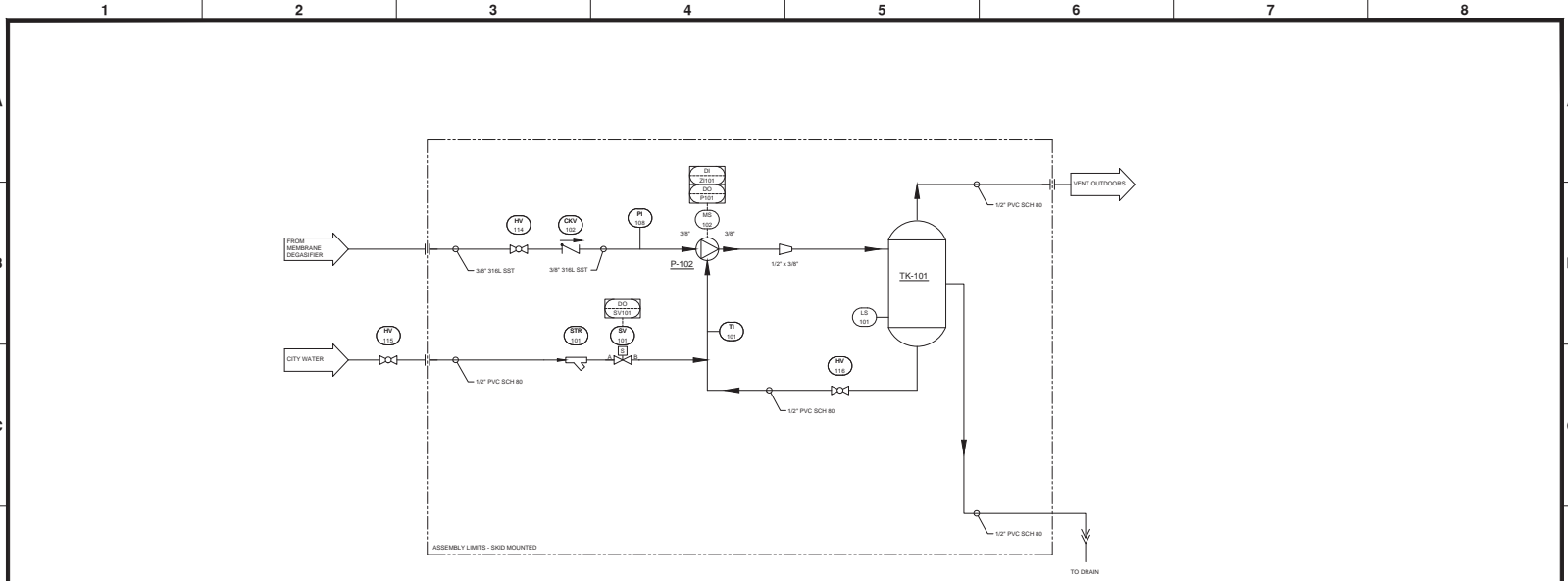
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CUSTOMER/PROJECT		JEFFERSON LABS STORAGE TANK	
TITLE		P&ID	
DWG. No.	17740-101	SHT.	4 OF 6 REV. 1



EQUIPMENT DATA		
EQUIPMENT NUMBER	DEGAS-101	F-102
DESCRIPTION	LIQUI-CEL	FILTER HOUSING
MANUFACTURER	DEGASIFIER MEMBRANE	PENTAIR
MODEL	2.5 X 8 EXTRA FLOW/ X50 FIBER	158214
SPECIFICATION	1.4 MP2 MEMBRANE SURFACE LO2 REMOVAL 5-3 GPM	FILTER HOUSING, SLIM BLUE, 1/2" INPUT/OUTPUT, 1R10'


REVISIONS		DATE		BY	
1	GENERAL REVISIONS	08/10/17		JAH	

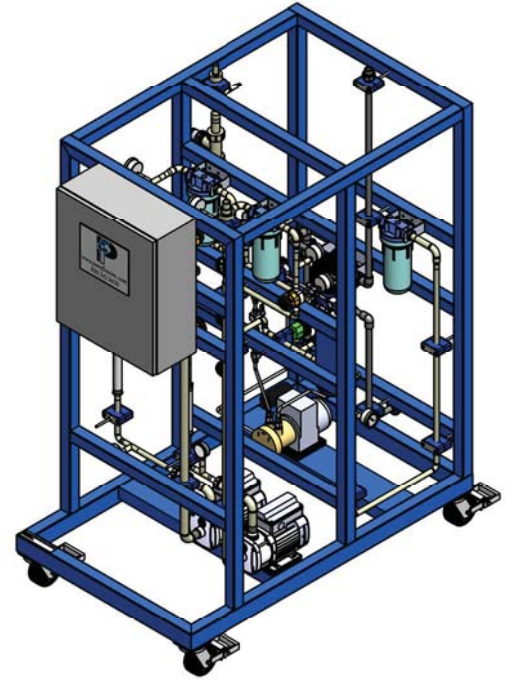
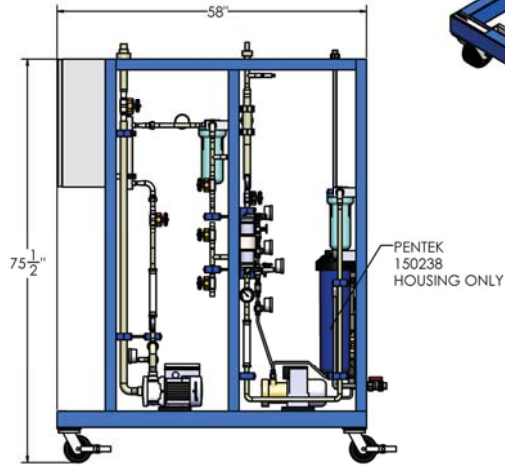
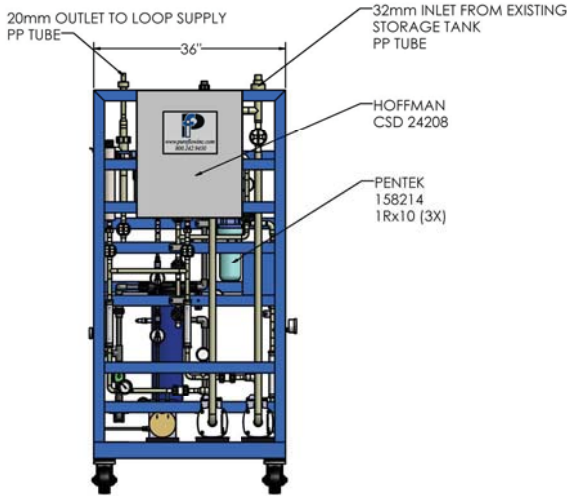
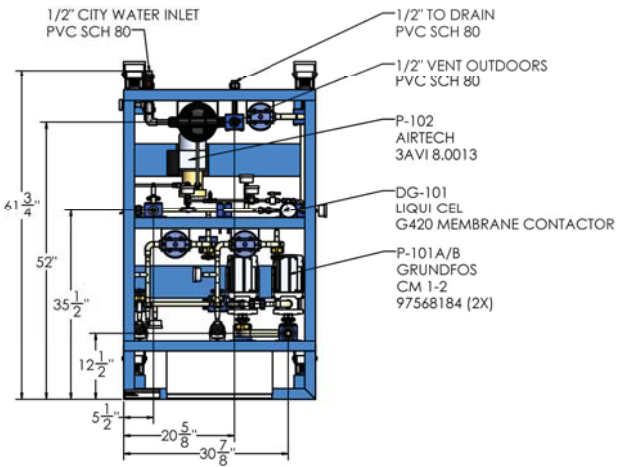
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DR. BY	DJP	DATE	6/13/17	CUSTOMER/PROJECT	
CK'D BY	HAS	DATE	6/13/17	JEFFERSON LABS STORAGE TANK	
APP'D BY	TC	DATE	6/13/17	TITLE	
ISSUE DATE	XXXXX	P&ID			
SCALE	NTS				
DWG. No.	17740-101	SHT.	5	OF	6
		REV.	6	1	




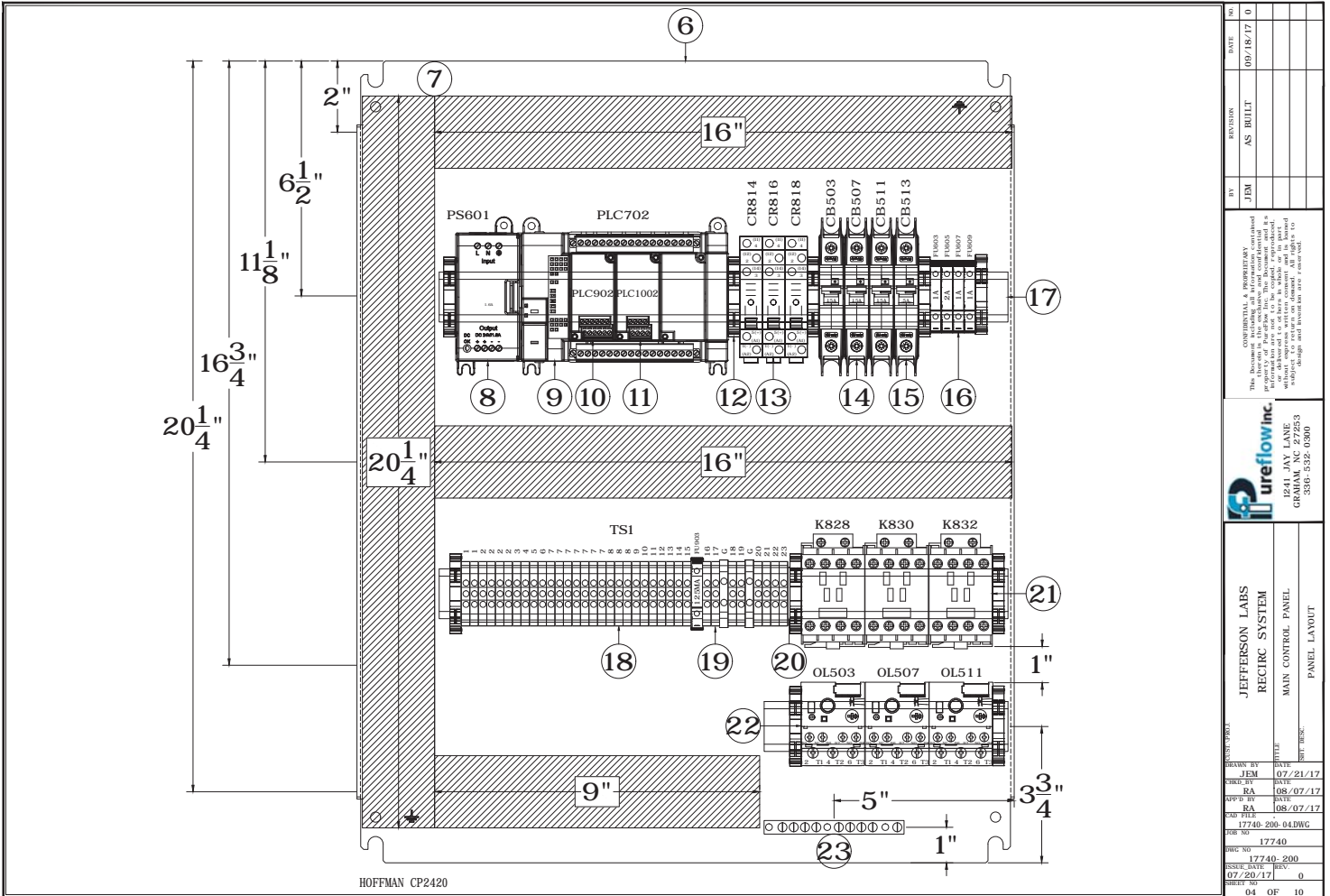
EQUIPMENT DATA		
EQUIPMENT NUMBER	P-102	TK-101
DESCRIPTION	VACUUM PUMP	SEPARATOR TANK
MANUFACTURER	SIHI	PENTAIR
MODEL	LEM 40	150489
SPECIFICATION	18 ACFM AT 300MM Hg 1.5HP, 120V/180	BIG BLUE 3/4" INLET/OUTLET 10"

GENERAL REVISIONS		DATE		BY	
1	GENERAL REVISIONS	08/10/17		JAH	

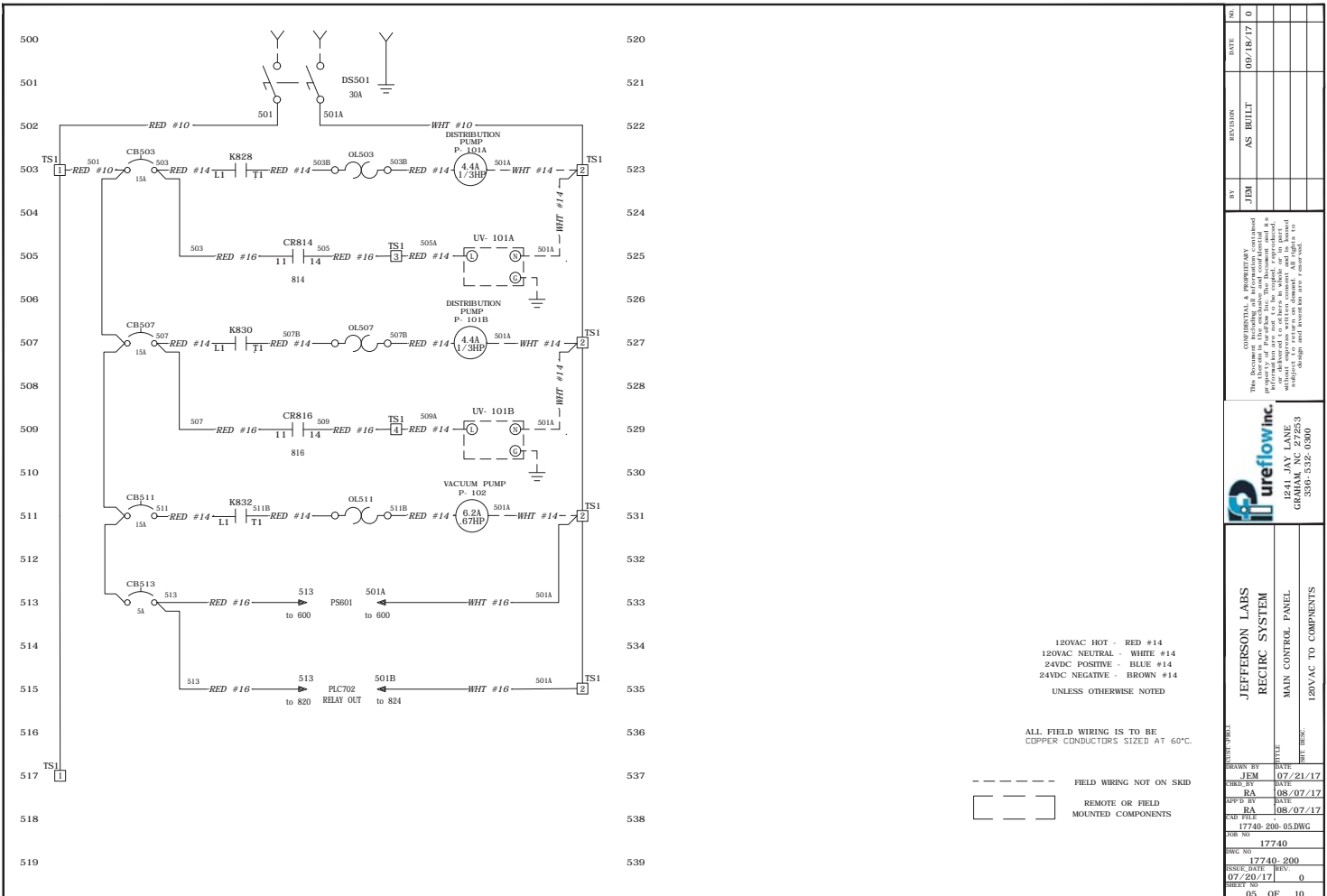
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JOB No.	17740			1241 Jay Lane Graham, NC 27253 336-532-0300	
DR. BY	DJP	DATE	6/13/17	CUSTOMER/PROJECT	
CK'D BY	HAS	DATE	6/13/17	JEFFERSON LABS STORAGE TANK	
APP'D BY	TC	DATE	6/13/17	TITLE	
ISSUE DATE	XXXXXX				
SCALE	NTS				
DWG. No.	17740-101			SHT.	6 OF 6
REV.					1



SKID NO:	1	ESTIMATED WEIGHT - DRY: 850 LBS	ESTIMATED WEIGHT - OPERATING: 900 LBS
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES.		CONFIDENTIAL & PROPRIETARY	
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DATE	07/24/17	17740	1241 Jay Lane Graham, NC 27253 336-532-0300
DESIGNED BY	JBH	07/24/17	 JEFFERSON LABS ADDRESS DEGAS/REGULIC SYSTEM MU-PUFDG-003P05 LAB SYSTEM GENERAL ARRANGEMENT
CHECKED BY	SB	07/27/17	
APP'D BY	SB	07/27/17	
DATE	07/27/17		
SCALE	NTS		
PIC. No.		17740-501	1 1 0



DATE	06/18/17	0
REVISION	AS BUILT	
BY	JEM	
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<p>Pureflow Inc. 10100 S. BAYVIEW GRANVILLE, OH 43025 330-532-0360</p>		
<p>JEFFERSON LABS RECIRC SYSTEM MAIN CONTROL PANEL PANEL LAYOUT</p>		
DESIGN/PLOT		
REVIEW BY	JEM	07/21/17
DRAWN BY	RA	08/07/17
APP'D BY	RA	08/07/17
DATE FILED		08/07/17
PROJ NO	17740-200-04DWG	
DWG NO	17740	
ISSUE DATE	07/20/17	
SHEET NO	04	OF 10

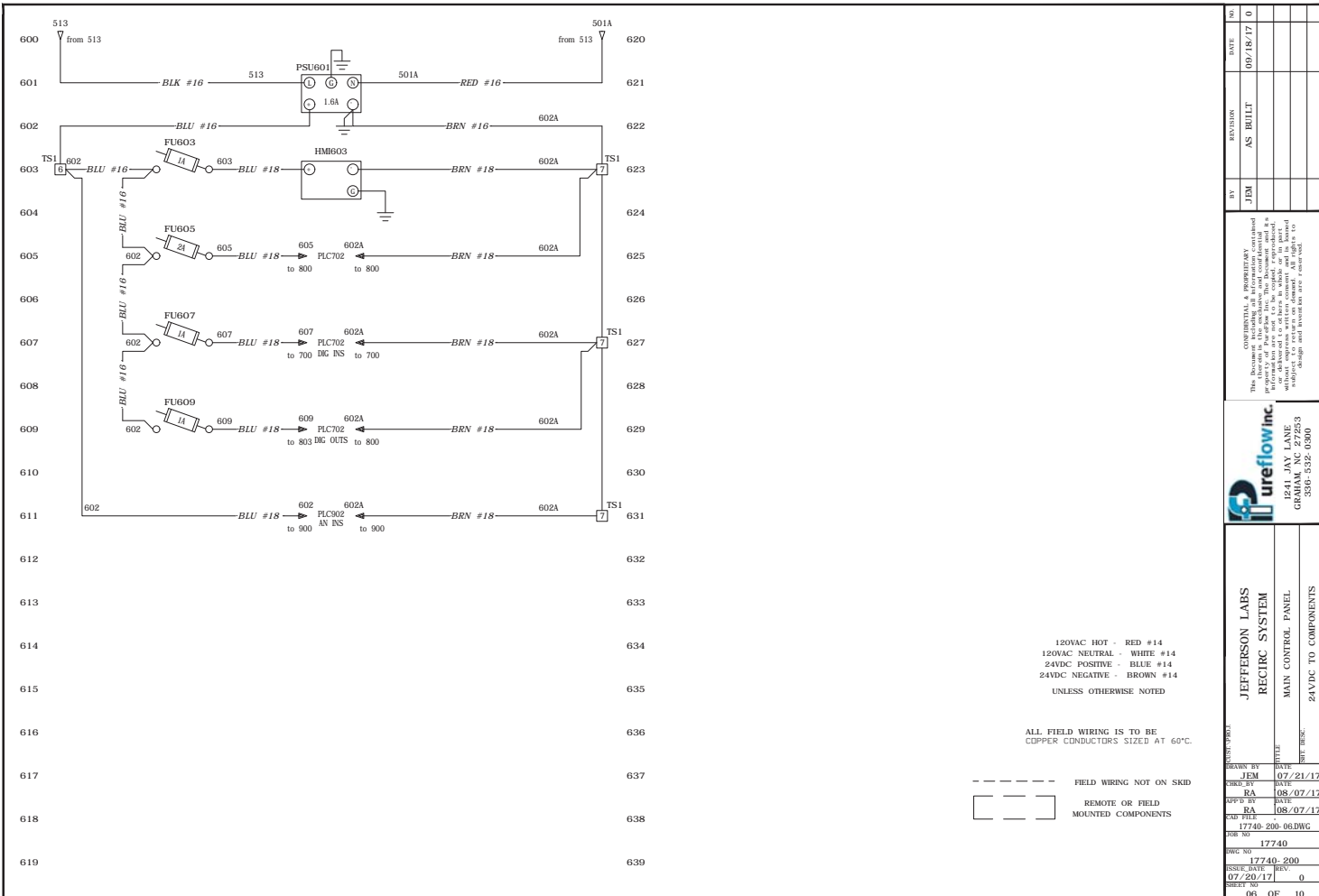


120VAC HOT - RED #14
 120VAC NEUTRAL - WHITE #14
 24VDC POSITIVE - BLUE #14
 24VDC NEGATIVE - BROWN #14
 UNLESS OTHERWISE NOTED

ALL FIELD WIRING IS TO BE
 COPPER CONDUCTORS SIZED AT 60°C.

--- FIELD WIRING NOT ON SKID
 [] REMOTE OR FIELD
 [] MOUNTED COMPONENTS

NO.	DATE	REV.
0	09/18/17	0
REVISION	AS BUILT	
BY	JEM	
<p>The drawings are preliminary and are not to be used for construction without the approval of the manufacturer. The manufacturer is responsible for the accuracy of the drawings and for the design and construction of the equipment.</p>		
<p>Pureflow Inc. 1000 N. 27th St. GRAMM, NC 27623 336-532-0300</p>		
<p>JEFFERSON LABS RECIRC SYSTEM MAIN CONTROL PANEL 120VAC TO COMPONENTS</p>		
DESIGN/PROJECT	DATE	REV.
DESIGNED BY JEM	07/21/17	
CHECKED BY RA	08/07/17	
APP'D BY RA	08/07/17	
DWG FILE	17740-200-05.DWG	
FOR NO.	17740	
DWG NO.	17740-200	
ISSUE DATE	REV.	
07/20/17	0	
SHEET NO.	05	OF 10

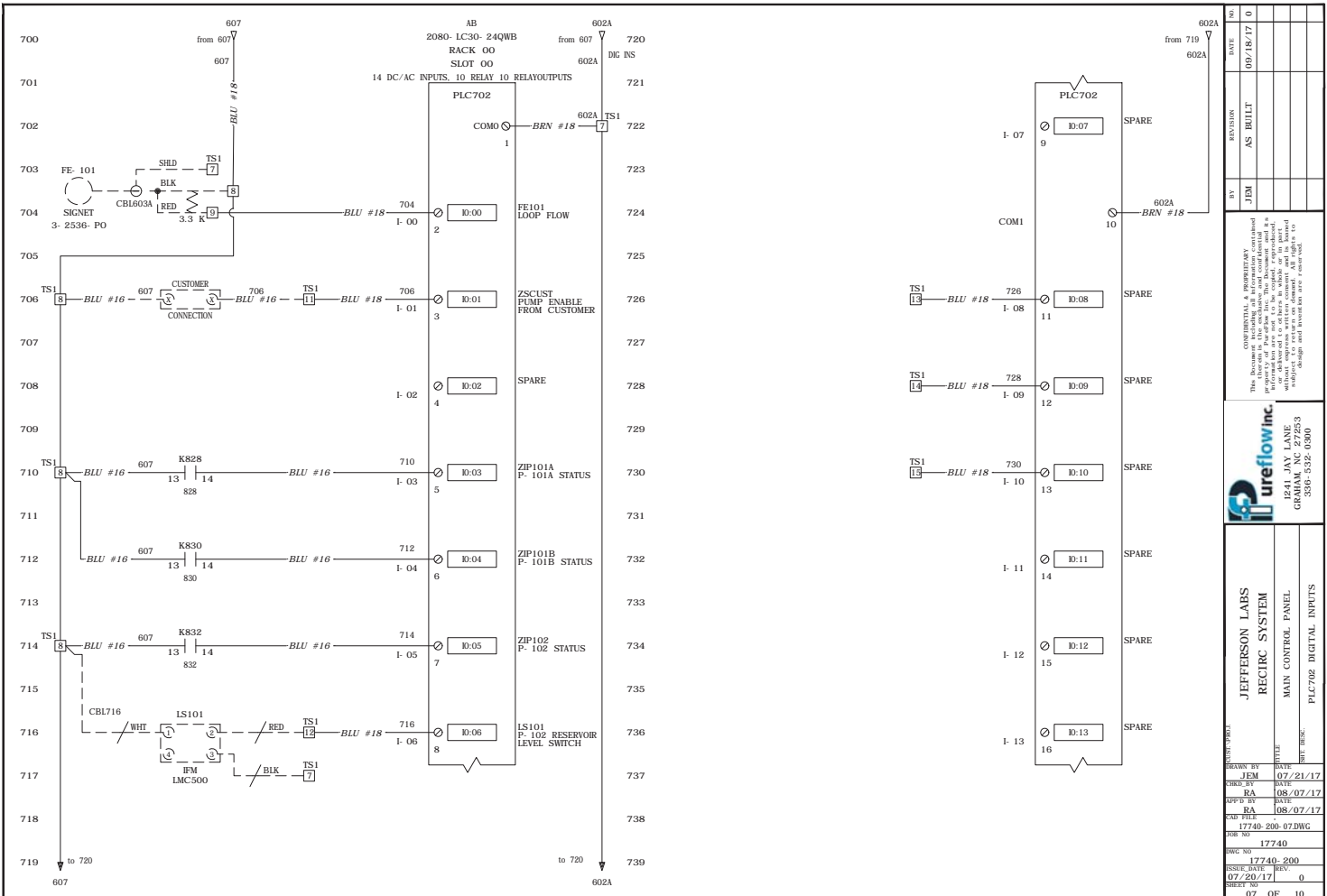


120VAC HOT - RED #14
 120VAC NEUTRAL - WHITE #14
 24VDC POSITIVE - BLUE #14
 24VDC NEGATIVE - BROWN #14
 UNLESS OTHERWISE NOTED

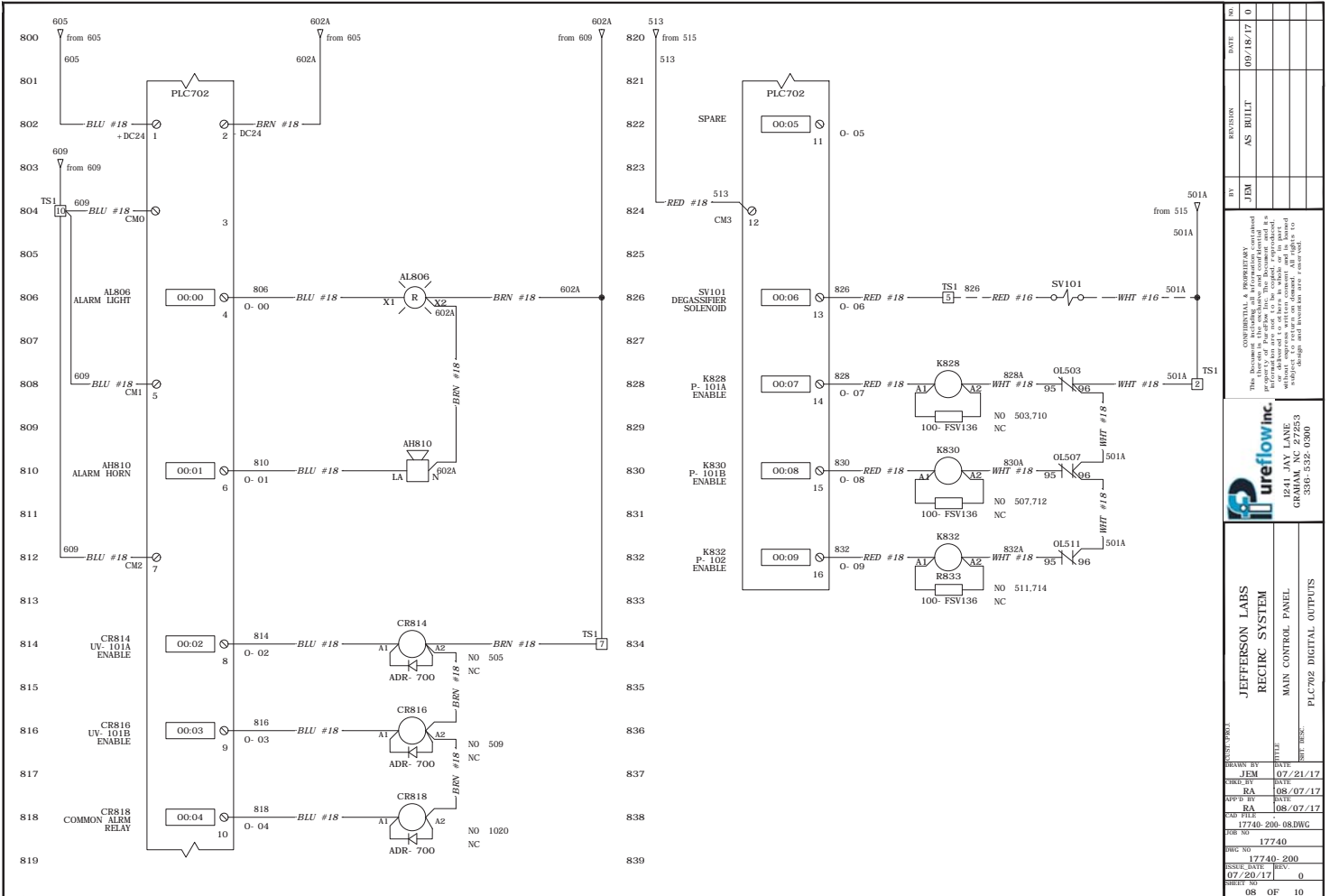
ALL FIELD WIRING IS TO BE
 COPPER CONDUCTORS SIZED AT 60°C.

--- FIELD WIRING NOT ON SKID
 [] REMOTE OR FIELD
 [] MOUNTED COMPONENTS

NO.	0
DATE	09/18/17
REVISION	AS BUILT
BY	JEM
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<p>Pureflow Inc. 1000 S. 27th St. GRAMMA, NC 27623 336-532-0360</p>	
<p>JEFFERSON LABS RECIRC SYSTEM MAIN CONTROL PANEL 24VDC TO COMPONENTS</p>	
DESIGN BY	JEM 07/21/17
CHECK BY	RA 08/07/17
APP'D BY	RA 08/07/17
DATE FILED	08/07/17
FOR NO.	17740-200-06DWG
DWG NO.	17740
ISSUE DATE	07/20/17
REV.	0
SHEET NO.	06
OF	10



NO.	DATE	REV.
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REVISION AS BUILT		
BY JEM		
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JEFFERSON LABS RECIRC SYSTEM MAIN CONTROL PANEL PLC702 DIGITAL INPUTS		
DESIGNED BY JEM	DATE 07/21/17	
CHECKED BY RA	DATE 08/07/17	
APP'D BY RA	DATE 08/07/17	
Dwg No 17740-200-07.DWG	FOR NO 17740	
ISSUED DATE 07/20/17	REV. 0	
SHEET NO 07	OF 10	



NO.	DATE	REV.
009/18/17	0	
REVISION	BY	DATE
AS BUILT	JEM	08/07/17

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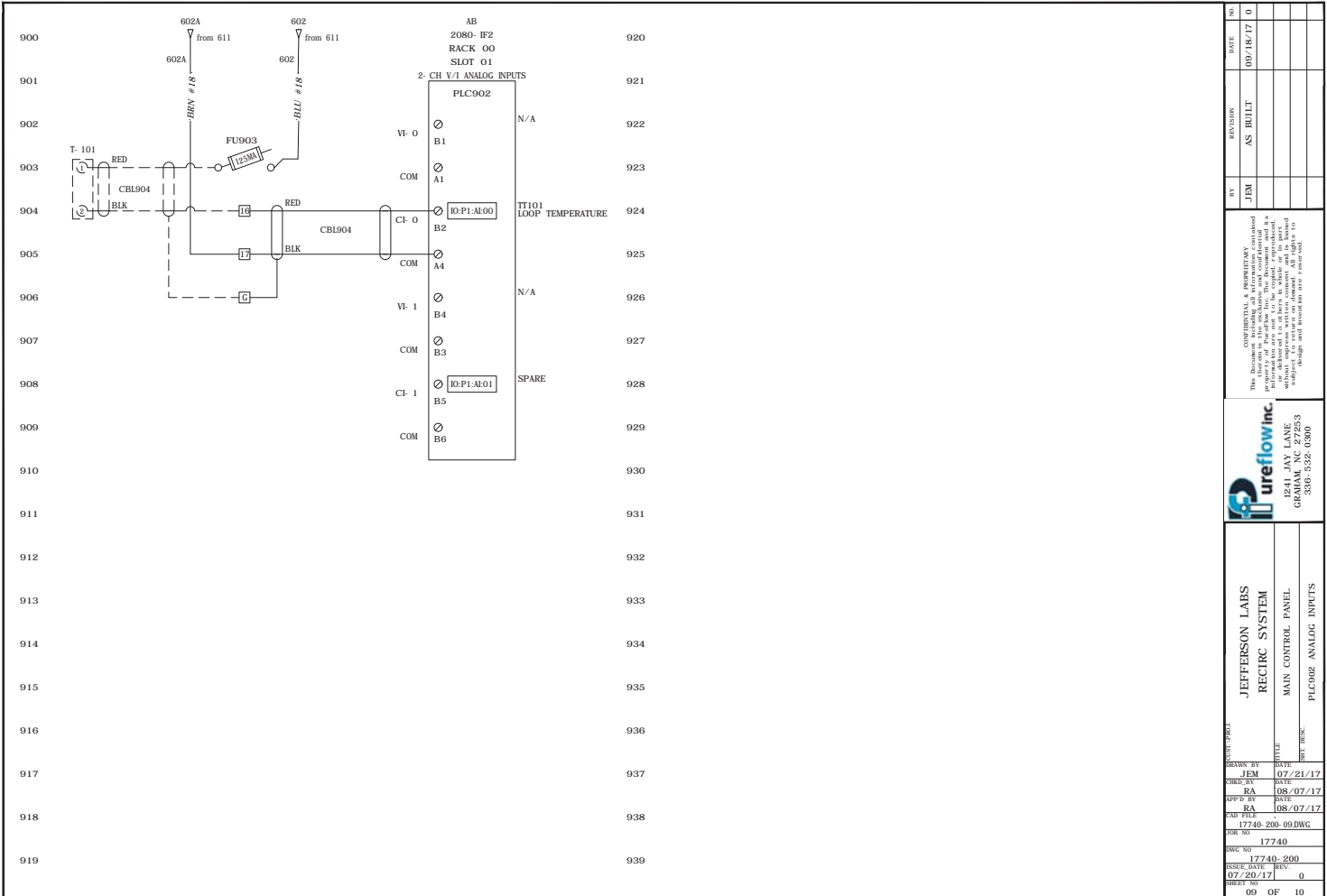
Jefferson Labs
 10000 GARDNER ROAD
 GRANVILLE, OH 43023
 330-532-0300

REVISION	DATE
07/21/17	
08/07/17	
08/07/17	

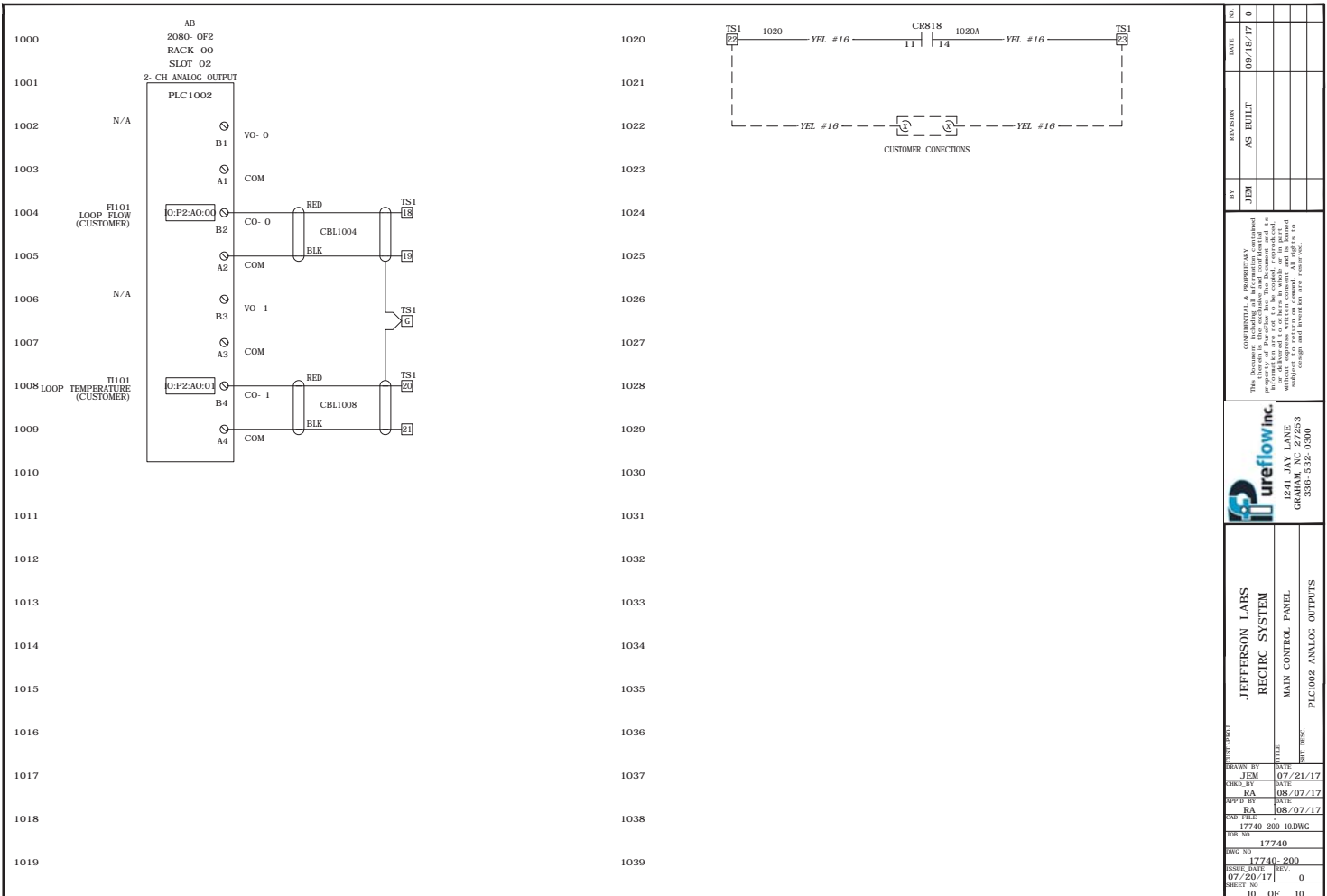
JEFFERSON LABS
RECIRC SYSTEM
 MAIN CONTROL PANEL
 PLC702 DIGITAL OUTPUTS

REV. NO.	ISSUE DATE	REV.
17740-200	07/20/17	0

FIG. NO. 17740-200-08DWG
 SHEET NO. 08 OF 10



NO.	DATE	REV.
	09/18/17	0
REVISION	AS BUILT	
BY	JEM	
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<p>Pureflow Inc. 1000 S. 10th Street Graham, NC 27243 336-532-0360</p>		
<p>JEFFERSON LABS RECIRC SYSTEM MAIN CONTROL PANEL PLC902 ANALOG INPUTS</p>		
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<p>Pureflow Inc. 1000 S. W. 10th St. Graham, NC 27623 336-532-0360</p>			
<p>JEFFERSON LABS RECIRC SYSTEM MAIN CONTROL PANEL PLC002 ANALOG OUTPUTS</p>			
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12.0 EQUIPMENT DATA SHEETS & MANUALS

The following section contains manufacturer provided data sheets, installation instructions and/or operating manuals for the major pieces of component equipment as detailed in the equipment list. Data sheets and manuals are listed alphabetically by manufacturer.

- Glasco UV
- Pentair
- March Pumps
- Sihi