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Datasheet

US Embassy London
Fuel Oil Submittal
231113
BL Harbert International
120080

LI	DESCRIPTION	MFTR/PART N0.	QTY	U/M
1	**Aboveground Storage Tanks**			
2	10000 Gallon VERTICAL Storage Tank Application: ABOVEGROUND Type: SINGLE WALL Material: Mild Carbon Steel Diameter: 10'/ Height: 17' 1/4" Shell 1/4" Head Each Tank Includes: * (1) 18"DIA Emergency Vent Manway * (1) 2"FNPT Threaded Opening * (5) 4"FNPT Threaded Openings * (1) 4"FNPT Threaded Opening (Fill) with an internal drop tube extending to 6" of bottom of tank * Striker Plates * Lifting Lugs * Grounding Lug * (1) Set Hold Down Lugs * UL-142 Label		4	ea
3	Epoxy Primer / White Urethane Top Coat. SP-6 Blast Included		4	ea
4	EXTERNAL VERTICAL STRAIGHT LADDER - PAINTED		2	ea
5	EXTERNAL SAFETY CAGE - PAINTED		2	ea
6	PAINTED 24"W x 36"L CATWALK W/HANDRAIL BOTH SIDES F/GLASS GRATING		2	ea
7	TANK TOP PERIMETER SAFETY RAILING - PAINTED		4	ea
8	Special 30-year limited warranty - requries internal seal welding for tanks		4	ea
9	Box of accessoried needed to accommodate ladders, railings, platforms and safety cages		1	ea
10	Internal Seal Welding for each tank		4	ea
11	Delivery - 10,000 gallon vertical tank to Baltimore, MD Offloading and preparation for export by others.	FRT	1	lot
	10" Flanged Emergency Vent - 808,350 CFH @ 2.5 psi, 8 oz/sq in	Morrison 244F--0400AV	4	ea
151	Crating:WPM/1SPM 15 Heat Treated Wooden Crate/18'L x 120"W x 120"H CRATING TANKS FOR SHIPMENT OVERSEAS		4	ea
152	Crating and Freight for ladders, safety cages, platforms and railings		1	ea
12	**Remote Fill**			
13	Custom Remote Grade Fill Assembly with: -14GA SS Secondary Containment, horizontal discharge -3/8"" diamond plate H20 Load rating -5ea spill bucket -5ea hand pump -5ea entry boot (mounted)	Fairfield RFTC-Custom	1	ea
14	Drybreak Adapter, FNPT, Al, 4" NPTFPM VITON SEAL (@remote fill)	TODO 7476-1107	4	ea
15	Drybreak Cap, Al, 4" FPM SEAL (@remote fill)	TODO 5635B-1407	4	ea
16	4" Butterfly Valve - ductile iron body; lug style; for fuel service. 255# DI, SS, BUNA. ADD Lockable handle per drawing (isolate in fuel storage room since single wall)	DixBFVL400	4	ea
17	**Tank Accessories**			
18	4" x 15" Flex connector, male x male, stainless steel (fill)	Flexing FFUL40X15MxM	4	ea
19	4" Updraft Vent	Morrison 354-0400AV	4	ea
20	Ball Valve, 2" Lockable (FOS/FOR)	Morrison 691B 08001V or equal	12	ea

21	Flex Connector, 2"x 18", MxM swivel (FOS/FOR)	FF20X18HMXM346	16	ea
22	2" x 2" Internal Emergency Valve	Morrison 272HO-0100AV or equal	8	ea
23	Misc Tank Fittings and Ports		1	ea
24	**Building Occupied**			
25	Flex Connector, 2"x 18", MxM swivel (Tank FOS/FOR, Polisher and Pump Connections)	FF20X18HMXM346	16	ea
26	Safety Valve at bulding entry, 2" (FOS where it enters the MER's)	Morrison 346DI-0500 AV or equal	3	ea
27	Ball Valve, 2" Lockable (if needed for isolation of sections)	Morrison 691B 08001V or equal	10	ea
28	**Day Tank Fittings**			
29	Vacuum Breaker, 1"MNPT x 3/4"FNPT, SS ball w/viton o-ring for fuel oil (day tank return line)	KJ 24A02580	5	ea
30	2" Flame Arrestor	ProtectoSeal 6672	4	ea
31	**Pneumercator - Main**			
32	TMS 4000 w/ Display & Push Buttons - Includes: * 4 Mag Inventory Probe/8 Leak Sensor Card, (Probes and Sensors Separate) * Two RS-232 Ports * One RS-485 Port	TMS 4000	1	ea
33	Console Adders			
34	At-Factory Programming		1	ea
35	Internal 4 Mag Probe/8 Leak Sensor Interface Card		1	ea
36	Internal 16 Leak Sensor Interface Card		1	ea
37	Internal 8 Relay/8 Non I.S. Input I/O Card		1	ea
38	Internal 4-20 Mili-amp Card - 12 Channels		1	ea
39	Internal Mod Bus Card for BAS		1	ea
40	External Relays			
41	TX 1064-1 - Extrenal Relay Expansion Panel		1	ea
42	Internal 16 Relay Card		1	ea
43	Mag Probes			
44	MP-461-xxx-21-Series Flexible Kynar Inventory Probe for 17' tall AST		4	ea
45	B4Xx-Kx - Extended Buna-N Float Kit - 4" Dia. - Standard Product and Extended Water		4	ea
46	***Probe Installation Kit included in Flex Probe Price***			
47	MP-450S-xxx-11 Rigid Inventory Probes for 1 Boiler Day Tank		1	ea
48	S2K2 - Dual Float Kits- Include: Product and Water Floats for Diesel		1	ea
49	PK 2 DM1 - 3/4" S.S./Teflon Probe Installation Compression Fitting Kit for Direct Mounting		1	ea
50	MP-450S-xxx-11 Rigid Inventory Probes for 3 UTL Gen Sub-base Day Tanks		3	ea
51	S2x - Standard Stainless Steel Float - 2" Dia. - Product Only		3	ea
52	PK 2 DM1 - 3/4" S.S./Teflon Probe Installation Compression Fitting Kit for Direct Mounting *NOTE: 8 of 8 Probe Inputs Used		3	ea
53	Leak Sensors			
54	SK2 - 2" Leak Sensor Installation Cap Kit for Day Tanks		4	ea
55	ES-825-200-F Discriminating, Optic Leak Sensor, Fuels 4 - Remote Fill Sump Sensor 4 - Low Point DW Fill Pipe Sensor 12 - Low Point DW Supply Pipe Sensor (best guess) 4 - Day Tank Leak Sensors (3 gen, 1 boiler)		24	ea

56	LS-600 LD-BN-1F Non-Discriminating, Buna-n Float, Liquid Leak Sensor, Sumps, Disp. Pans, Steel Tanks 1 - Fuel Polisher Cabinet Leak Sensor 1 - Pump Set Skid #1 Leak Sensor 2 - Fuel Tank Room Leak Sensor *NOTE: 28 of 32 Sensor Inputs Used		4	ea
57	Remote Alarms			
58	RA 400 Remote Alarm Panel * Audible Alarm w/ Digital Display, Test & Silence Buttons * Utilizes RS 485 Port for Communications with TMS Console * Switchable Power 115/230 VAC (50/60 Hz) * NEMA 4X Enclosure		4	ea
59	Remote Alarm w/ Digital Level Display			
60	ETD 1000 remote digital level display and level alarm panel Audible alarm w/digital display, test and silence buttons Utilizes RS485 port for communications with TMS console Switchable power 115/230 VAC(50/60HZ) NEMA 4X enclosure		2	ea
61	Other			
62	Auto Cad Wiring Diagrams for Pneumercator		1	ea
63	**Pneumercator - NOB**			
64	TMS 4000 w/ Display & Push Buttons - Includes: * 4 Mag Inventory Probe/8 Leak Sensor Card, (Probes and Sensors Separate) * Two RS-232 Ports * One RS-485 Port * NEMA 12 Case * TMS COMM Remote communication software	TMS 4000	1	ea
65	Console Adders			
66	At-Factory Programming		1	ea
67	Internal 8 Relay/8 Non I.S. Input I/O Card		1	ea
68	Internal 4-20 Mili-amp Card - 6 Channels		1	ea
69	Internal Mod Bus Card for BAS		1	ea
70	Mag Probes			
71	MP-461-xxx-21-Series Flexible Kynar Inventory Probe for 17' tall AST		1	ea
72	B4Xx-Kx - Extended Buna-N Float Kit - 4" Dia. - Standard Product and Extended Water		1	ea
73	***Probe Installation Kit included in Flex Probe Price***			
74	MP-450S-xxx-11 Rigid Inventory Probes for 1 NOB Gen Sub-base Day Tank		1	ea
75	S2x - Standard Stainless Steel Float - 2" Dia. - Product Only		1	ea
76	PK 2 DM1 - 3/4" S.S./Teflon Probe Installation Compression Fitting Kit for Direct Mounting * NOTE: 2 of 4 Probe Inputs Used		1	ea
77	Leak Sensors			
78	SK2 - 2" Leak Sensor Installation Cap Kit for Day Tanks		1	ea
79	ES-825-200-F Discriminating, Optic Leak Sensor, Fuels 1 - NOB Day Tank Leak Sensors		2	ea
80	LS-600 LD-BN-1F Non-Discriminating, Buna-n Float, Liquid Leak Sensor, Sumps, Disp. Pans, Steel Tanks 1 - Pump Set Skid #2 Leak Sensor *NOTE: 6 of 8 Sensor Inputs Used		1	ea
81	Remote Alarm w/ Digital Level Display			

82	ETD 1000 remote digital level display and level alarm panel Audible alarm w/digital display, test and silence buttons Utilizes RS485 port for communications with TMS console Switchable power 115/230 VAC(50/60HZ) NEMA 4X enclosure		2	ea
83	Other			
84	Auto Cad Wiring Diagrams for Pneumercator		1	ea
85	**Fuel Polishing System**			
86	FRS 660-25-MTU-4-UL Recirulating Unit includes: * PLC based, FOUR TANK System * UL 508 Listed * NEMA 4 Locakable Weatherproof Enclosure (48" x 42" x 12") * 25 GPM positive displacement pump @ 100 PSI capacity @ 1800 rpm * RCI Fuel Purifier: Primary Particulate Removal - 98% (to10 microns) Free Water Removal - 99.9% * Water detector with Alarm and ball drain valve * Pre-engineered for Class II or III Combustible liquids * 2.0 hp pump motor * Pump Motor Starter - 20 amp single pole circuit breaker * Pump Control Touch Commands - Auto, Off, Manual * Catch basin leak detector * 6" Weatherproof Operator Touch panel Interface * Alarm conditions: Leak, High Water, Pump Fail * Factory Assembled, pre-plumbed and pre-wired * Isolated compartments for mechanical and electrical devices * External 1.5" dia. Ports (w/ Ball Valves) for connection of field plumbing	FS Choice	1	ea
	ADD: Upgrade to 1.5" Valves and System		1	lot
87	Adders			
88	Up-Grade to 3 Phase Power - 380 VAC 50hz w/ Rotory Disconnect		1	ea
89	MODBUS RTU Communications		1	ea
90	Custom Programming to include: 4 Additional Inputs for signals from Pump Sets Larger PLC		1	ea
91	3 Micron Spin-on Filter w/ Pressure Alarm Sensor (Stage 2) - 1" NPT		1	ea
92	Automatic Water drain into 15 gal container w/high level alarm		1	ea
155	Automatic Chemical Feed (chemicals separate)		1	ea
93	Other			
94	International Crating Charge		1	ea
95	Freight		1	ea
96	**PUMP AND PUMP CONTROLLERS**			
97	FUEL FILL POINT PANEL & TANK FILL MOTORIZED BALL VALVES PER SECTION 2.17			
98	Fill Point remote control panel, with selector switches and alarm lights, NEMA 4 lockable panel with deadfront (Note: Main controls to be located in main panel)	FPC-1-460	1	ea
99	*Note: Panel cannot be located in pit*			
100	*Note: Fill point controller will interface with Pneumacator via 4-20 mA signal for tank level and dry contact for tank leak.*			
101	MAIN CONTROL PANEL FOR MAIN TANKS 1,2, 3 & 4; PUMP SET A; GEN BELLY TANKS 1, 2 & 3, BOILER DAY TANK			

102	Pumping System Control Panel: NEMA 3R enclosure; fused disconnect switch, motor starters /overload, pump HOA, system status display	PC System	1	ea
103	Main tank supply & return valves, 2"carbon steel motorized ball valve,#150 lb flanged with electric actuator & end switches	XX066231-XX066232C2	6	ea
104	Main tank fill valves, 4"carbon steel motorized ball valve,#150 lb flanged with electric actuator & position end switches.	XX070937-XX070938C2	4	ea
105	*Note: Controller will interface with Pneumacator via 4-20 mA signal for tank level and dry contact for tank leak. System will be 400VAC/3PH/50 Hz. Price includes mounting & wiring Pneumacator to control panel.*			
106	DUPLEX PUMP SET A			
107	#20 Duplex oil pump set, 12 GPM @ 150 PSI with (2) 2 HP motors, 400 VAC/3PH/50Hz	D20-4-020-F-X	1	ea
108	Pump discharge flow switch with flow loss alarm indication and automatic lag pump start (factory installed on pump set discharge)	Option 1258G	1	ea
109	*Controls to be located in main control panel. System shall be set with BRPV in lieu of standard relief valves.* *Pump set flow rate per pump schedule and not drawing.*	Exception		
110	GEN DAY TANKS 1, 2 & 3 ACCESSORIES			
111	1" Flow control manifold: (1) solenoid valve with isloation valves; manual bypass tee with shut off valve; strainer & flow restrictor	Option 1082C	3	ea
112	#24 gear pump, cast iron, viton seal, 1 1/2" NPT ports, CW rotation, internal relief valve, 1 1/2 HP, 22/380/440 VAC 50 hertz, TEFC motor, 17 GPM @ 20 PSI	GP24V01543TCW-R-50	3	ea
113	Push Button Station, Day Tank Return	SQ-9001XALD101	3	ea
114	*Note: Manifold flow restrictors field set to be 4 GPM as to not overwhelm the return pumps*			
115	Factory Integration of Pneumercator Panel		1	ea
116	Factory Witness Test		1	ea
117	BOILER DAY TANK & ACCESSORIES			
118	500 Gallon daytank v12, closed top basin per UL 142, visual level gauge, generator supply & return ports with drop tubes	PDWT-500.12	1	ea
119	#24 gear pump, cast iron, viton seal, 1 1/2" NPT ports, CW rotation, internal relief valve, 1 1/2 HP, 22/380/440 VAC 50 hertz, TEFC motor, 17 GPM @ 20 PSI	GP24V01543TCW-R-50	1	ea
120	1" Flow control manifold: (1) solenoid valve with isloation valves; manual bypass tee with shut off valve; strainer & flow restrictor	Option 1082C	1	ea
121	Daytank Hand Pump, piston type rated 20 gallons per 100 strokes with check & manual shut off valve	Option 1015	1	ea
122	Outdoor weather proof vent cap, 2" (shipped loose)	OEM-4025	1	ea
123	4" Emergency Vent (shipped loose)	U48-40	2	ea
124	Push Button Station	Q-9001XALD101	1	ea
125	*Exception: Day tank shall be UL 142 only. Pump, level control, monitoring panel and all accessories shall be per Phillips standard.*			
126	*Exception: Phillips take exception to Section 2.6c. Pump, level control, monitoring panel and all accessories shall be per Phillips standards.*			
127	**NOB GEN SET CONTROLLER & PUMP SET**			
128	NOB daytank level controller: NEMA 12, fused disconnect, motor starter/overload, alarm & status display, reset & test pushbuttons	PTC Special	1	ea
129	1" Flow control manifold: (1) solenoid valve with isloation valves; manual bypass tee with shut off valve; strainer & flow restrictor	Option 1082C	1	ea
130	Main tank supply & return valves, 2"carbon steel motorized ball valve,#150 lb flanged with electric actuator & end switches	XX066231-XX066232C2	2	ea

131	Pump Set B: #8 Duplex oil pump set, 4.6 GPM @ 150 PSI with (2) 1.5 HP TEFC motors, 400 VAC/3PH/50Hz	D8-4-010-F-X	1	ea
132	Pump set discharge flow switch with flow loss alarm indication and automatic lag pump start (factory installed on pump set discharge)	Option 1258G	1	ea
133	#24 gear pump, cast iron, viton seal, 1 1/2" NPT ports, CW rotation, internal relief valve, 1 1/2 HP, 22/380/440 VAC 50 hertz, TEFC motor, 17 GPM @ 20 PSI	GP24V01543TCW-R-50	1	ea
134	1" NPT Back pressure regulating valve, 303 stainless steel body with viton diaphragm, 5 to 75 PSI pressure range (for pressure relief @ pumpsets)	RVI2010T-SS-5/75	2	ea
135	*Note: Controls and motor starters for pump set B shall be located in NOB day tank control panel. Return pump is quote as a single pump unit, not duplex.*			
136	*System will be 400VAC/3PH/50 Hz.*			
137	*System to be as per Phillips standard components and manufacturing practices. Submittals 3 - 4 weeks, current production is 12 weeks.*			
138	Factory Integration of Pneumercator Panel		1	ea
139	Factory Witness Test		1	ea
	FRP-1			
	Manual Fuel Removal Pump as per submittal documents	SP24-130062	1	ea
	# 24 Return Pump & Accessories 17 GPM @ 50 PSI, 11⁄2 HP motors, 400 VAC/ 3Ø/ 50Hz with loose manual controller.			
	Foot Valve	EBW-150-202-01	1	ea

Notes And Exceptions

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200 **NOTES AND EXCEPTIONS**

201 General

206 Fire Pump is not indicated and no controls or manifolds are provided for fire pump connection.

209 Overfill prevention valves are excluded as below grade style valves would be required but the head room for installation and maintenance is too small. Instead the motorized valves for security isolation will also be used for overfill prevention. This is acceptable as per NFPA 30-21.7.1.5

210 Drawing Exceptions

211 Drawing NOBM6.03: Polishing system was scheduled in the IFC set as 50GPM. We believe this is unnecessary and recommend staying with 25GPM and using 1" supply and return lines as per the above proposal.

212 Drawing NOBM6.03: Return Pump flowrate was increased to 17.6GPM and the pressure was reduced to 20PSI.

213 Drawing NOB M9.4.1: Fill Box with removable cover is excluded in this proposal. Fill buckets with secondary containment are offered and remote fill alarms are NEMA 4 and can be mounted on a outside wall or inside a wall box. Remote fill display includes an audio-visual alarm but does not include a level display as per standard OBO specifications.Wall box is not included in this proposal. Tank 4 return valve is excluded. Back pressure valves are excluded as it is assumed day tanks do not need to loop. Pressure relief valve at boiler day tank is excluded as it is not needed and will not work in this location. Fuel Polishing system will require to pull from the each tank individually and cannot pull from the common supply as shown. Mechanical overfill prevention valves are not included since we have motorizes isolation valves.Sump Pump system assembly is excluded.

214 Drawing NOB MP1.000.BA: Fill lines are shown as 50mm. 4" is assumed when sizing accessories.

215 Drawing NOB MC9.3.0 / NOB MC9.3.1: Does not show the correct valves and is therefore excluded. Position indicators only provided on the fill and return valve per standard OBO design. Not on fuel supply manifolds. Sequence will be Philipps standard as submitted. Remote Alarm for fill does not include a tank level display. Service Court motorized valves are not necessary and are excluded.

216 Specification 231113

218 1.4: Phillips control system is offered.

222 2.2: Excluded in this proposal.

223 2.4: Excluded in this proposal as these are shear valves for dispensers

224 2.5: Standard Highland UL construction provided.

225 2.8: Section assumed to be only for 10k tanks. C: Overfill prevention by motorized valve. G: Standard highland catwalk, rails etc. . . are offered. Specialty catwalk as shown in the drawings is by others. I/J: remote fill of this system so fill boxes are not included on the tank. L. Flame arrestors are excluded..

226 2.11: Section is excluded as all leak monitoring is provided within section 2.10.

227

228 Specification 231113-2.15: Polishing system specification is written around a different manufacturer therefore we do not meet all of the requirements. We do meet the polishing requirement but exclude the chemical additives from the base bid as we do nto recommend these.

229 2.16: Based on Phillips Pump.

230 2.17: Custom grade fill provided.

231113-2.5, 2.7, 2.8, 2.9, 2.14 10,000Gallon Vertical Storage Tanks and Accessories

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Highland Vertical Storage Tanks

Highland Tank

UL-142 Vertical Storage Tanks

Highland Vertical Storage Tanks are ideal for the storage of a wide variety of liquids. Available in carbon and stainless steel, Highland Vertical Tanks for the storage of flammable and combustible liquids bear the Underwriters Laboratories UL-142 label. ~~Tanks can also be manufactured to API650, Appendix J for shop built tanks.~~

Highland UL-142 tanks are available in single-wall, ~~double-bottom, or double-wall (sides & bottom) construction.~~ Vertical UL-142 tanks over 64" diameter are provided with a coned top to shed rainwater and snow. UL-142 specifications limit construction to a maximum vertical shell height of 35'0".

Because piping installations vary with each tank, the size and location of fittings can be specified by the end-user. Up to 24" of threaded fittings are generally included with the tank. Normal and emergency venting is required on all UL-142 Aboveground Vertical tanks.

Tanks are provided with a coat of primer. Special surface preparation and primers are available to accomodate your field finish coat specifications. Highland can also provide complete VOC compliant finish systems. Field touch-up will be required due to tank shipping and handling, and piping and accessory installation.

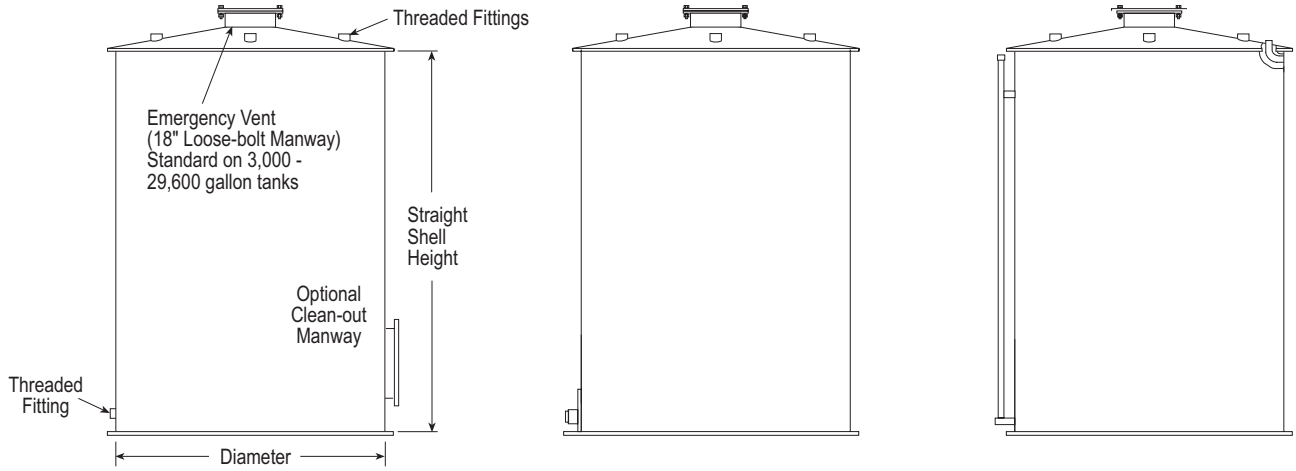
Special linings are available for storage of fertilizers, potable water, chemicals, etc. Other options include: coned bottom, legs, ladders, cages, handrails, gauging systems, heaters, flame arrestors, sumps, sight glasses and flanges.

Our Commitment to Industry

Service, Quality and Delivery at Competitive Prices

Highland is committed to producing high-quality steel tank products. We've been manufacturing tanks for more than 50 years, always striving for excellence. For information on other products, please call one of our offices or contact your local Highland representative.

General Arrangement - Single-wall



Volume Gallons	Dimensions Diameter	Shell Height
185	3'2"	3'4"
240	3'2"	4'0"
300	3'2"	5'0"
500	4'0"	5'5"
1,000	4'0"	10'9"
1,000	5'4"	6'0"
1,500	5'4"	9'0"
2,000	5'4"	12'0"
3,000	8'0"	8'0"
4,000	8'0"	10'6"
5,000	8'0"	13'4"
6,000	8'0"	16'0"
8,000	10'0"	14'0"

Volume Gallons	Dimensions Diameter	Shell Height
10,000	10'0"	17'0"
12,000	10'0"	20'6"
15,000	10'0"	25'6"
20,000	10'0"	34'0"
20,000	10'6"	31'0"
25,000	12'0"	29'8"
30,000	12'0"	35'6"
30,000	12'6"	32'9"
40,000	12'0"	47'6"
40,000	12'6"	43'8"
40,000	13'0"	40'4"
49,500	13'0"	50'0"

Guide Specification

Furnish and install a _____ gallon aboveground vertical, (single wall, double-bottom, double-wall) steel storage tank _____ inches in diameter by _____ high. Tank shall be fabricated from mild carbon steel with a flat bottom head and a coned top(over 64" diameter only). Tank gauge: bottom head and shell gauge _____; Top gauge _____. All items included in tank unit shall be coated with primer. The tank unit shall be manufactured in conformance with Underwriters Laboratories' UL-142 specifications and so labeled.

Provide threaded fittings as per attached drawing. All fittings in coned top shall be full couplings. All UL-142 aboveground single wall tanks shall include fittings for normal and emergency venting.

Tanks shall be fabricated with the following threaded connections : _____ 2 inch, _____ 4 inch, _____ 6 inch as located on attached drawing AND/OR _____ 150# flanged connections with flange protectors. Flange sizes as follows (qty-size): _____, _____, _____, with locations also indicated on drawing. Thread protectors shall be inserted in all threaded openings prior to shipment.

Highland tanks are air tested at the factory but MUST be retested at the jobsite by the installer prior to installation.

SEE ATTACHED DRAWING FOR SPECIFICS

Options & Accessories:

____ Manway _____ inches in diameter with bolted and gasketed lid
____ Loose-bolt manway _____ inches in diameter with bolted and gasketed lid
____ Emergency Vent
____ External Ladder with Cage
____ External Ladder & Platform
____ External Stairway
____ Walkway(s) with handrails
____ 4" x 4" x 1/2" Clip Angle for anchoring
____ Coned bottom with Legs; _____ " clearance.
____ Commercial grit blast (SSPC-6), epoxy primer coat
____ Other exterior coating _____
____ Internal Ladder(s)
____ Internal Coating _____ (Must include interior weld. Minimum size 500 gallon.)
____ Level Sensing System(s)
____ Pump Platform

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FAX 444-8662

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TOUCH UP OF FINISHED PAINT IS REQUIRED BY INSTALLATION CONTRACTOR. TOUCH UP PAINT SHIPPED WITH TANK.

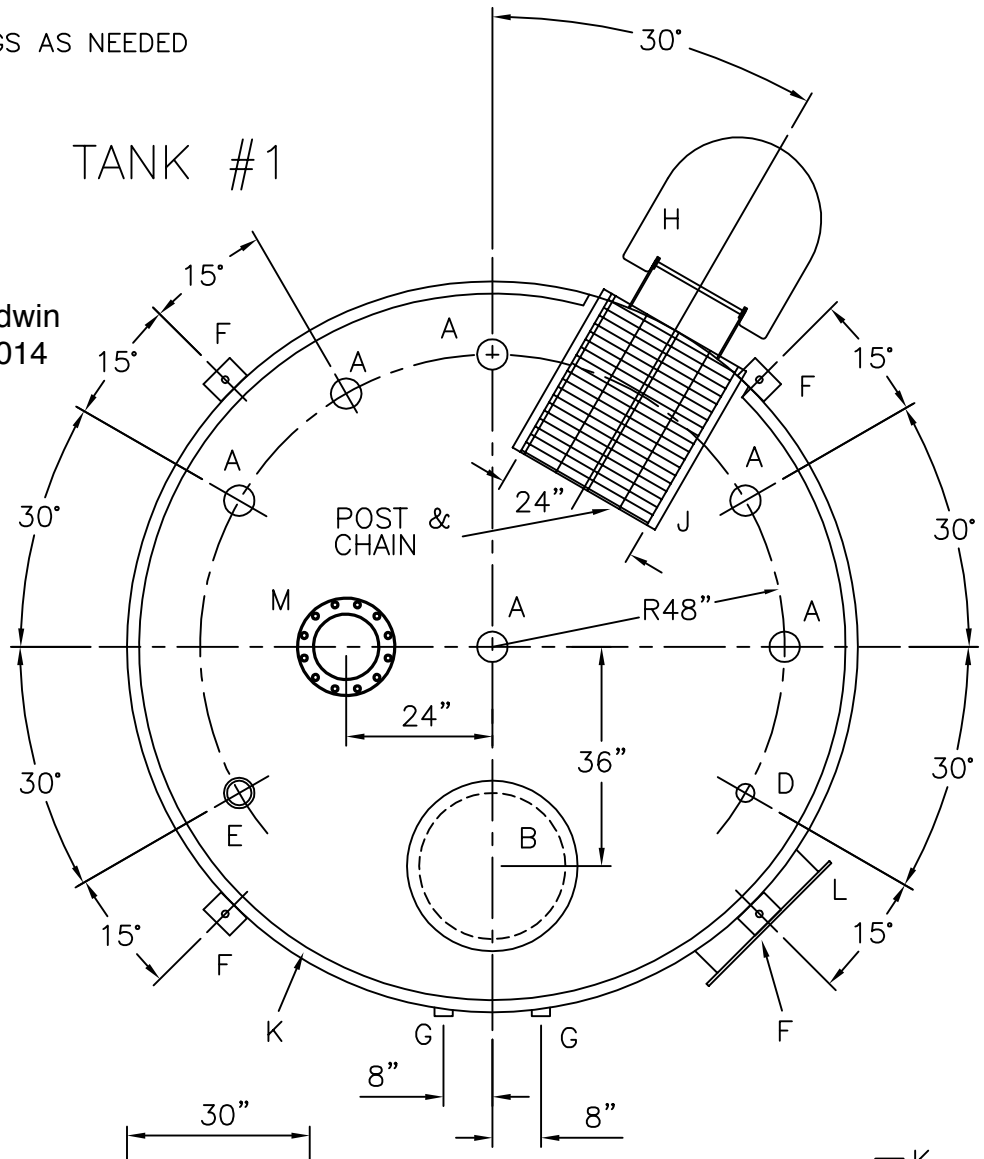
NOTES

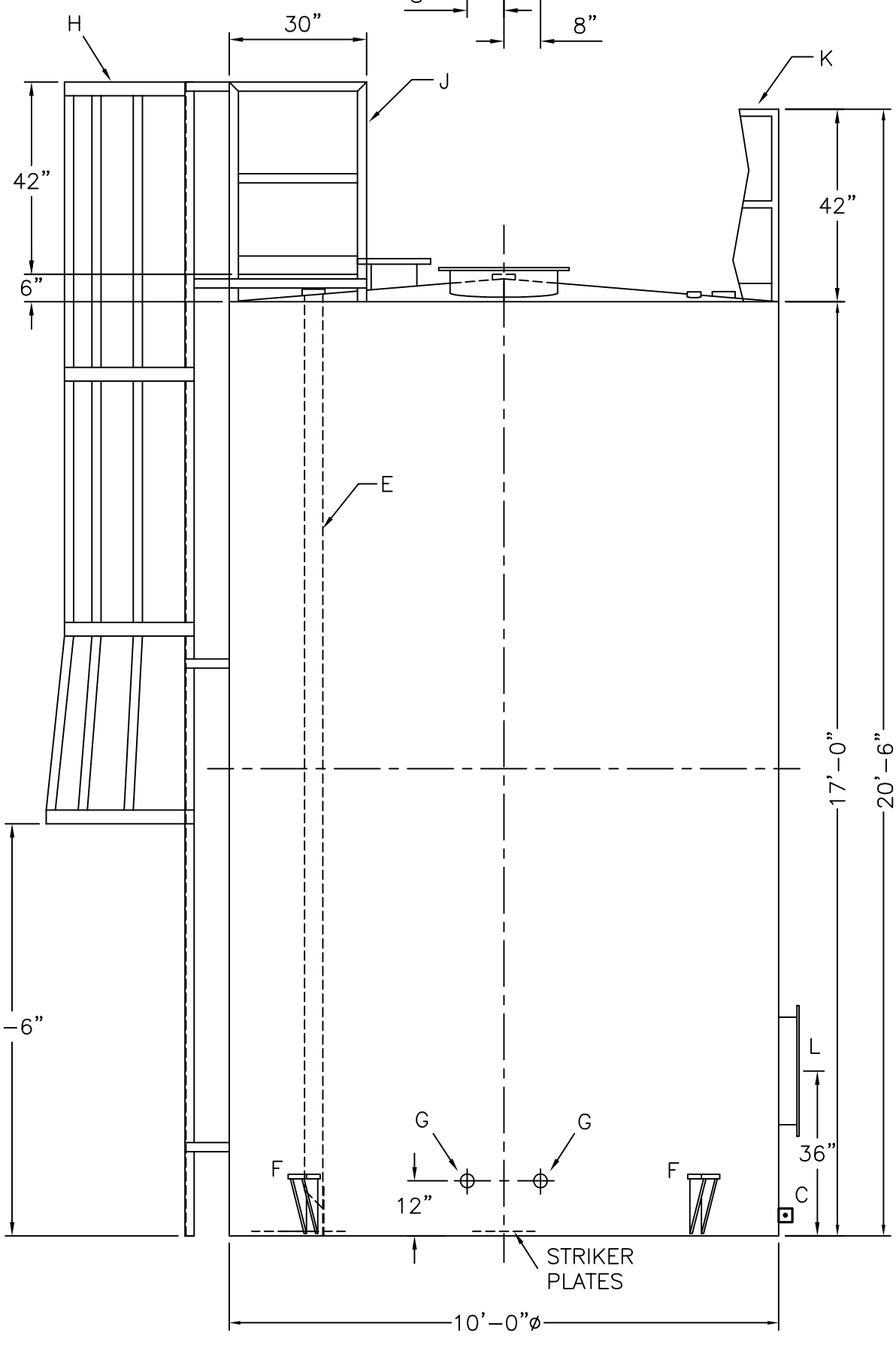
1. SEE PLAN VIEW FOR TRUE ORIENTATION AND LOCATION OF FITTING
2. LIFTING LUGS FOR UNLOADING UNIT & STANDING UNIT UPRIGHT TO BE PLACED AS NEEDED BY FABRICATION SHOP
3. A 3x3x¼" STEEL GROUNDING LUG WITH A ⅝"ø HOLE IN CENTER TO BE PLACED ON SHELL AT BOTTOM OF TANK IN LINE WITH LIFTING LUGS

SHIPPING LUGS AS NEEDED

TANK #1

Thomas Goodwin
28 January 2014



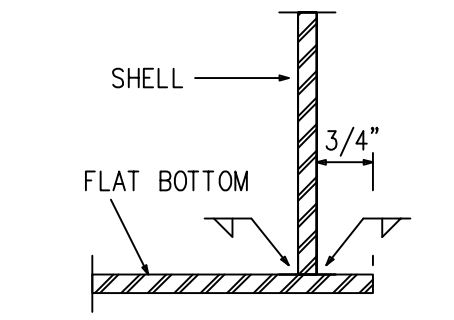


DESIGN DATA

CAPACITY – 10,000 GALLONS
TYPE – SINGLE WALL ABOVEGROUND VERTICAL
NO. REQ. – 1
OPERATING PRESSURE – ATMOSPHERIC
SPECIFIC GRAVITY = 1.0
TANK MATERIAL – MILD CARBON STEEL
THICKNESS – TOP: 7 GAUGE SHALLOW CONED THICKNESS – BOTTOM: 1/4" FLAT PER DETAIL THICKNESS – SHELL: 1/4"
CONSTRUCTION – LAP WELD INSIDE & OUTSIDE
TANK TEST – 2 PSIG
INT. FINISH – NONE
EXT. FINISH – SP6 BLAST, EPOXY PRIMER WHITE URETHANE TOPCOAT
LABEL – UL 142

LEGEND

A	4" FNPT FITTING
B	24" X 1/4" PLATE TIGHT BOLT MANWAY WITH 1/8" THICK NEO–CORK GASKET
C	GROUNDING LUG WITH 5/8" HOLE
D	2" FNPT FITTING
E	4" FNPT FITTING W/4"ø INTERNAL DROP PIPE TO WITHIN 6" OF TANK BOTTOM, MITER END 45°, SHIP TO BRACE AS NEEDED
F	HOLD DOWN LUG PER DWG AVLUGB
G	2" FULL COUPLING
H	HTM STD BOLT TO TANK VERTICAL LADDER WITH SAFETY CAGE, FINISH SAFETY YELLOW EPOXY, SHIP LOOSE, INSTALLATION ON SITE BY OTHERS
J	HTM STD BOLT TO TANK 24" WIDE X 30" LONG PLATFORM WITH 1" THICK FIBERGLASS GRATING, FINISH SAFETY YELLOW EPOXY, SHIP LOOSE, INSTALLATION ON SITE BY OTHERS
K	HTM STD BOLT TO TANK HAND RAILING, FINISH SAFETY YELLOW EPOXY, SHIP LOOSE, INSTALLATION ON SITE BY OTHERS
L	24" CLOSE BOLT MANWAY WITH ⅛" THICK NEO–CORK GASKET THICKNESS NOZZLE– ¼" THICKNESS FLANGE– ¼" THICKNESS COVER– ⅜"
M	10" 150# FFSO FLANGE PRIMARY EMERGENCY VENT



BOTTOM JOINT DETAIL

8	REVISED PER CUSTOMERS MARKUP	1/21/14	006
7	CHANGED QTY TO 1 WAS 2, ROTATED LADDER, NOW (4) VERSIONS (85642, 87369, 87374 & 87375)	1/9/14	006
6	CHANGED QTY TO 2 WAS 4, NOW THERE WILL BE (2) TANKS WITH LADDER,CAGE & STEP–OFF PLATFORM & (2) TANKS WITHOUT (87369)	1/9/14	006

Highland Tank

10,000 GAL 120"ø SW VERTICAL TANK

TANK #1

CUSTOMER: FLUID SOLUTIONS
BIRMINGHAM, AL

PROJECT: U.S. EMBASSY
LONDON, ENGLAND

QUOTE NO: 310050

CHK'D BY:

SCALE:	DATE:	DWG. BY:	DWG. NO.:
3/8" = 12"	8/23/13	006	85642

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TOUCH UP OF FINISHED PAINT IS REQUIRED BY INSTALLATION CONTRACTOR. TOUCH UP PAINT SHIPPED WITH TANK.

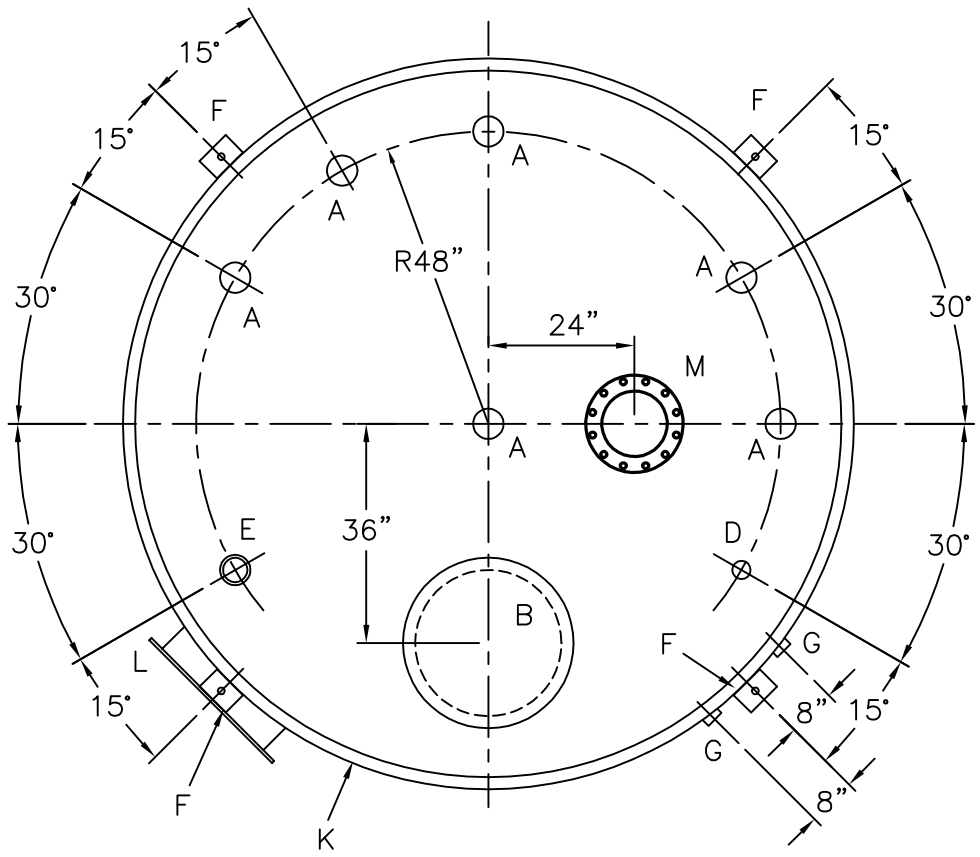
NOTES

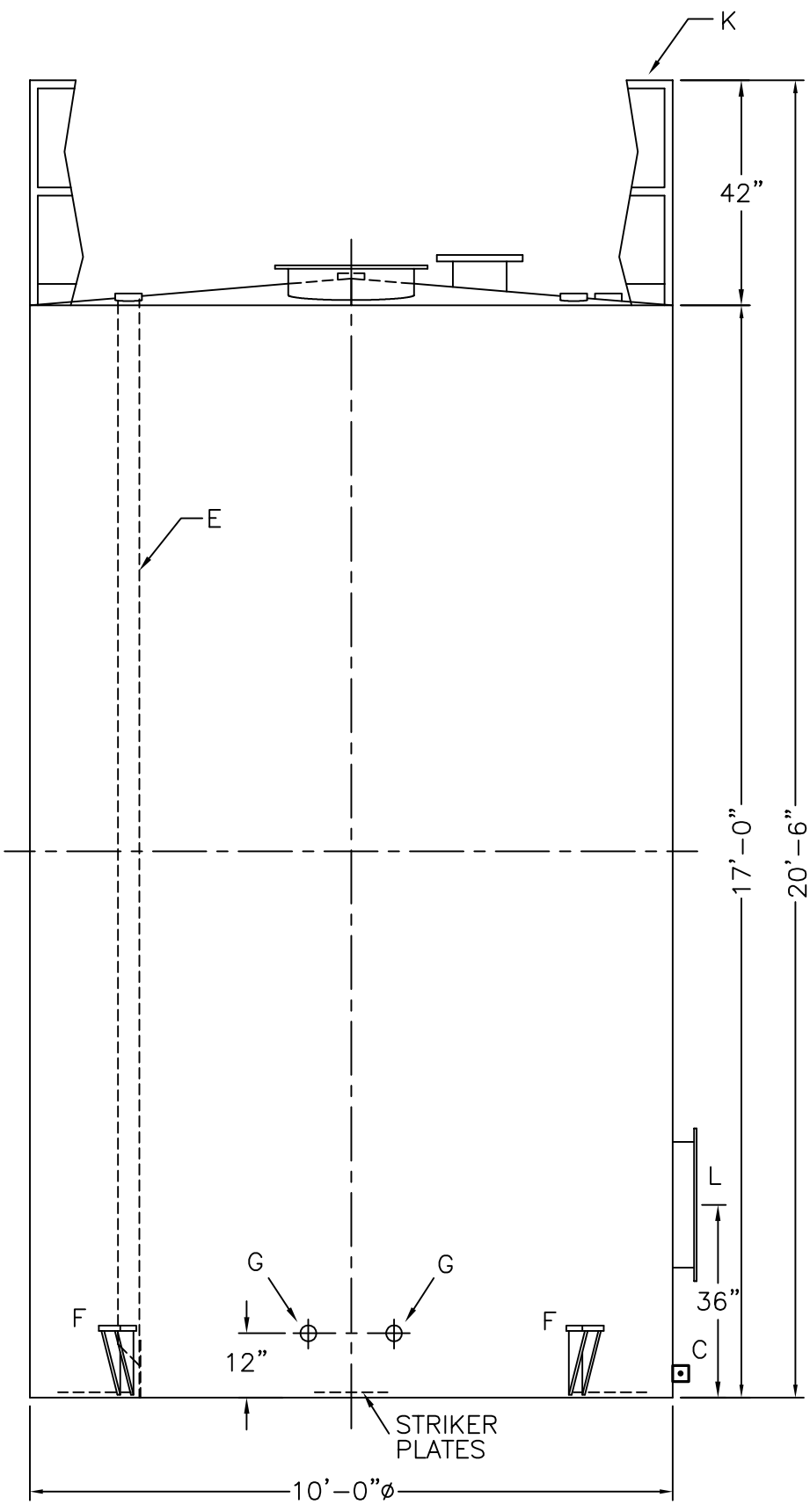
1. SEE PLAN VIEW FOR TRUE ORIENTATION AND LOCATION OF FITTING
2. LIFTING LUGS FOR UNLOADING UNIT & STANDING UNIT UPRIGHT TO BE PLACED AS NEEDED BY FABRICATION SHOP
3. A 3x3x¼" STEEL GROUNDING LUG WITH A ⅝"ø HOLE IN CENTER TO BE PLACED ON SHELL AT BOTTOM OF TANK IN LINE WITH LIFTING LUGS

SHIPPING LUGS AS NEEDED

Thomas Goodwin
28 January 2014

TANK #4



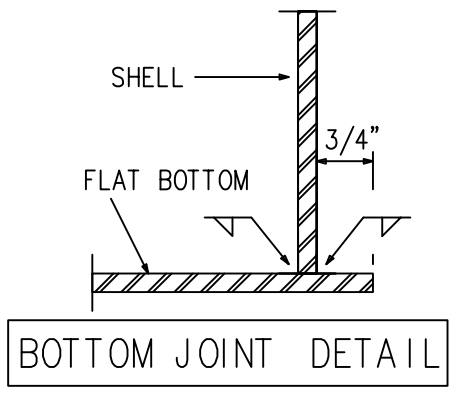


DESIGN DATA

CAPACITY – 10,000 GALLONS
TYPE – SINGLE WALL ABOVEGROUND VERTICAL
NO. REQ. – 1
OPERATING PRESSURE – ATMOSPHERIC
SPECIFIC GRAVITY = 1.0
TANK MATERIAL – MILD CARBON STEEL
THICKNESS – TOP: 7 GAUGE SHALLOW CONED THICKNESS – BOTTOM: 1/4" FLAT PER DETAIL THICKNESS – SHELL: 1/4"
CONSTRUCTION – LAP WELD INSIDE & OUTSIDE
TANK TEST – 2 PSIG
INT. FINISH – NONE
EXT. FINISH – SP6 BLAST, EPOXY PRIMER WHITE URETHANE TOPCOAT
LABEL – UL 142

LEGEND

A	4" FNPT FITTING
B	24" X 1/4" PLATE TIGHT BOLT MANWAY WITH 1/8" THICK NEO–CORK GASKET
C	GROUNDING LUG WITH 5/8" HOLE
D	2" FNPT FITTING
E	4" FNPT FITTING W/4"ø INTERNAL DROP PIPE TO WITHIN 6" OF TANK BOTTOM, MITER END 45°, SHIP TO BRACE AS NEEDED
F	HOLD DOWN LUG PER DWG AVLUGB
G	2" FULL COUPLING
H	–
J	–
K	HTM STD BOLT TO TANK HAND RAILING, FINISH SAFETY YELLOW EPOXY, SHIP LOOSE, INSTALLATION ON SITE BY OTHERS
L	24" CLOSE BOLT MANWAY WITH ⅛" THICK NEO–CORK GASKET THICKNESS NOZZLE– ¼" THICKNESS FLANGE– ¼" THICKNESS COVER– ⅜"
M	10" 150# FFSO FLANGE PRIMARY EMERGENCY VENT



BOTTOM JOINT DETAIL

2	REVISED PER CUSTOMERS MARKUP	1/21/14	006
1	CHANGED QTY TO (1) WAS (2), ROTATED SHELL MANWAY	1/9/14	006

Highland Tank

10,000 GAL 120"ø SW VERTICAL TANK
TANK #4

CUSTOMER: FLUID SOLUTIONS
BIRMINGHAM, AL

PROJECT: U.S. EMBASSY
LONDON, ENGLAND

QUOTE NO: 310050

CHK'D BY:

SCALE:	DATE:	DWG. BY:	DWG. NO.:
3/8" = 12"	1/9/14	006	87369

NOTE: ALL RIGHTS RESERVED. THIS DRAWING MUST NOT BE REPRODUCED IN ANY FORM WITHOUT THE WRITTEN PERMISSION OF HIGHLAND TANK®. HIGHLAND TANK® SHALL BE RESPONSIBLE ONLY FOR ITEMS INDICATED ON THIS FABRICATION DRAWING UNLESS OTHERWISE NOTED. CUSTOMER IS RESPONSIBLE FOR VERIFYING CORRECTNESS OF SIZE AND LOCATION OF FITTINGS, ACCESSORIES, AND COATINGS SHOWN ON THIS DRAWING.

TOUCH UP OF FINISHED PAINT IS REQUIRED BY INSTALLATION CONTRACTOR. TOUCH UP PAINT SHIPPED WITH TANK.

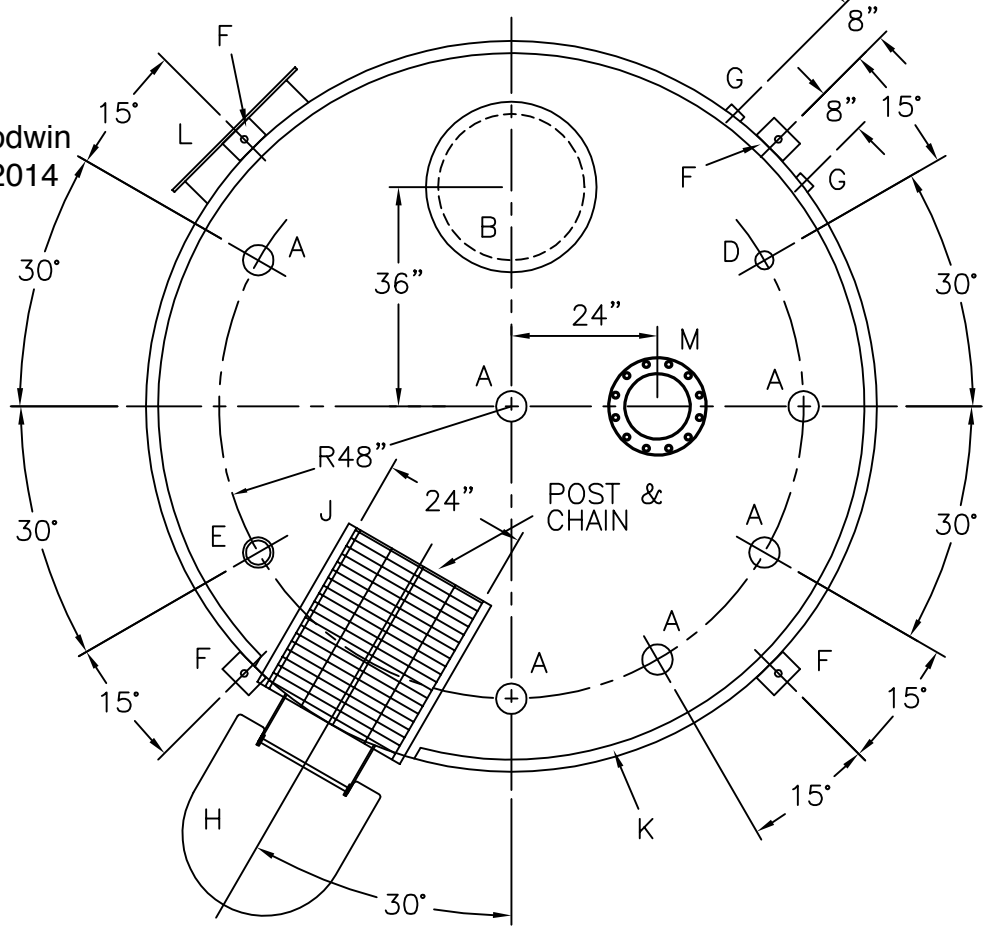
NOTES

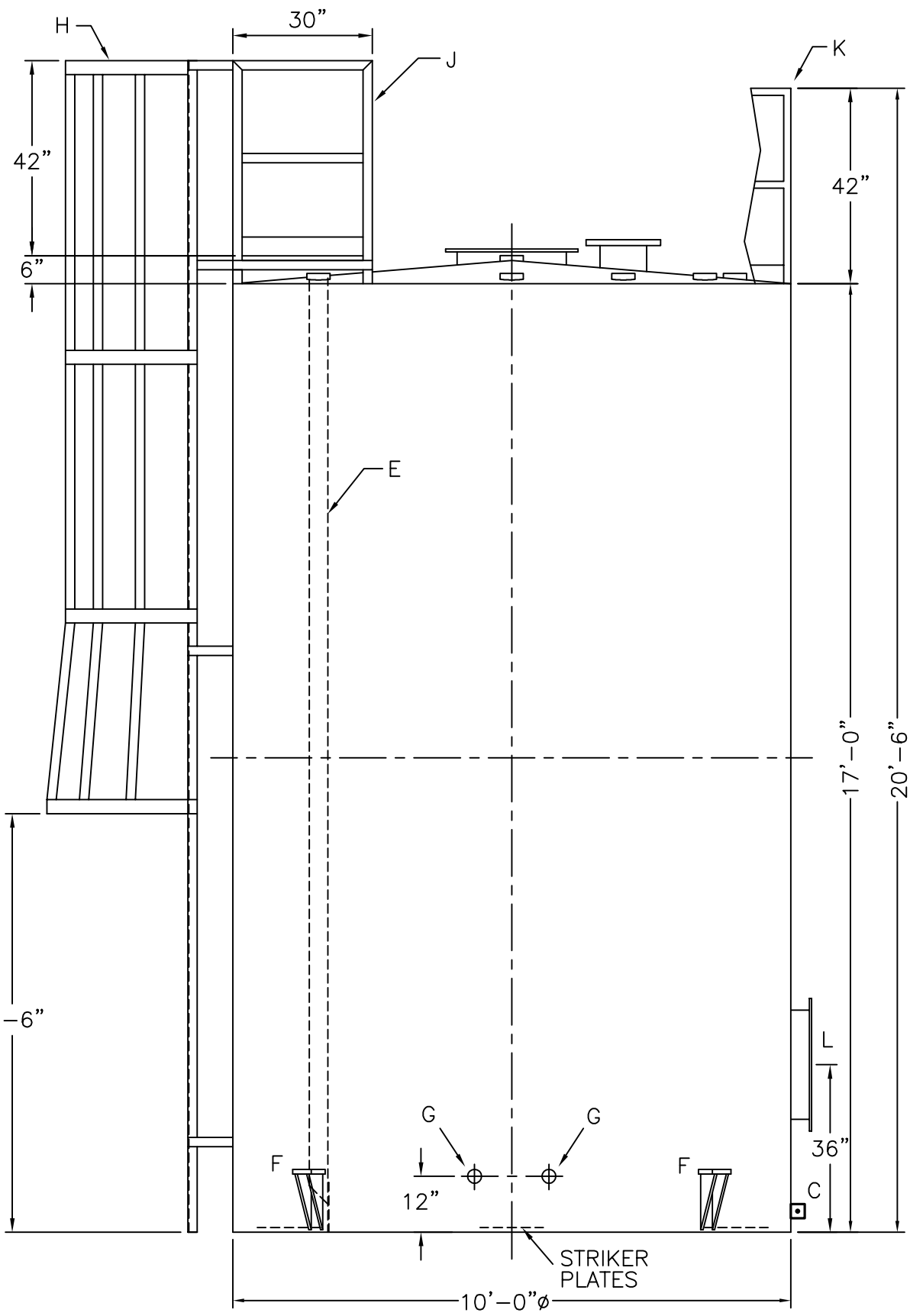
1. SEE PLAN VIEW FOR TRUE ORIENTATION AND LOCATION OF FITTING
2. LIFTING LUGS FOR UNLOADING UNIT & STANDING UNIT UPRIGHT TO BE PLACED AS NEEDED BY FABRICATION SHOP
3. A 3x3x¼" STEEL GROUNDING LUG WITH A ⅝"ø HOLE IN CENTER TO BE PLACED ON SHELL AT BOTTOM OF TANK IN LINE WITH LIFTING LUGS

SHIPPING LUGS AS NEEDED

TANK #3

Thomas Goodwin
28 January 2014



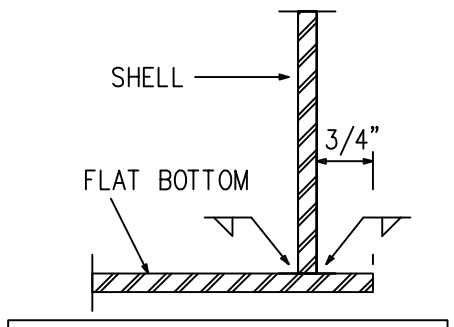


DESIGN DATA

CAPACITY – 10,000 GALLONS
TYPE – SINGLE WALL ABOVEGROUND VERTICAL
NO. REQ. – 1
OPERATING PRESSURE – ATMOSPHERIC
SPECIFIC GRAVITY = 1.0
TANK MATERIAL – MILD CARBON STEEL
THICKNESS – TOP: 7 GAUGE SHALLOW CONED THICKNESS – BOTTOM: 1/4" FLAT PER DETAIL THICKNESS – SHELL: 1/4"
CONSTRUCTION – LAP WELD INSIDE & OUTSIDE
TANK TEST – 2 PSIG
INT. FINISH – NONE
EXT. FINISH – SP6 BLAST, EPOXY PRIMER WHITE URETHANE TOPCOAT
LABEL – UL 142

LEGEND

A	4" FNPT FITTING
B	24" X 1/4" PLATE TIGHT BOLT MANWAY WITH 1/8" THICK NEO–CORK GASKET
C	GROUNDING LUG WITH 5/8" HOLE
D	2" FNPT FITTING
E	4" FNPT FITTING W/4"ø INTERNAL DROP PIPE TO WITHIN 6" OF TANK BOTTOM, MITER END 45°, SHIP TO BRACE AS NEEDED
F	HOLD DOWN LUG PER DWG AVLUGB
G	2" FULL COUPLING
H	HTM STD BOLT TO TANK VERTICAL LADDER WITH SAFETY CAGE, FINISH SAFETY YELLOW EPOXY, SHIP LOOSE, INSTALLATION ON SITE BY OTHERS
J	HTM STD BOLT TO TANK 24" WIDE X 30" LONG PLATFORM WITH 1" THICK FIBERGLASS GRATING, FINISH SAFETY YELLOW EPOXY, SHIP LOOSE, INSTALLATION ON SITE BY OTHERS
K	HTM STD BOLT TO TANK HAND RAILING, FINISH SAFETY YELLOW EPOXY, SHIP LOOSE, INSTALLATION ON SITE BY OTHERS
L	24" CLOSE BOLT MANWAY WITH ⅛" THICK NEO–CORK GASKET THICKNESS NOZZLE– ¼" THICKNESS FLANGE– ¼" THICKNESS COVER– ⅜"
M	10" 150# FFSO FLANGE PRIMARY EMERGENCY VENT



BOTTOM JOINT DETAIL

1	REVISED PER CUSTOMERS MARKUP	1/21/14 | 006

Highland Tank

10,000 GAL 120"ø SW VERTICAL TANK
TANK #3

CUSTOMER: FLUID SOLUTIONS
BIRMINGHAM, AL
PROJECT: U.S. EMBASSY
LONDON, ENGLAND
QUOTE NO: 310050
CHK'D BY:

SCALE:	DATE:	DWG. BY:	DWG. NO.:
3/8" = 12"	1/9/14	006	87374

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TOUCH UP OF FINISHED PAINT IS REQUIRED BY INSTALLATION CONTRACTOR. TOUCH UP PAINT SHIPPED WITH TANK.

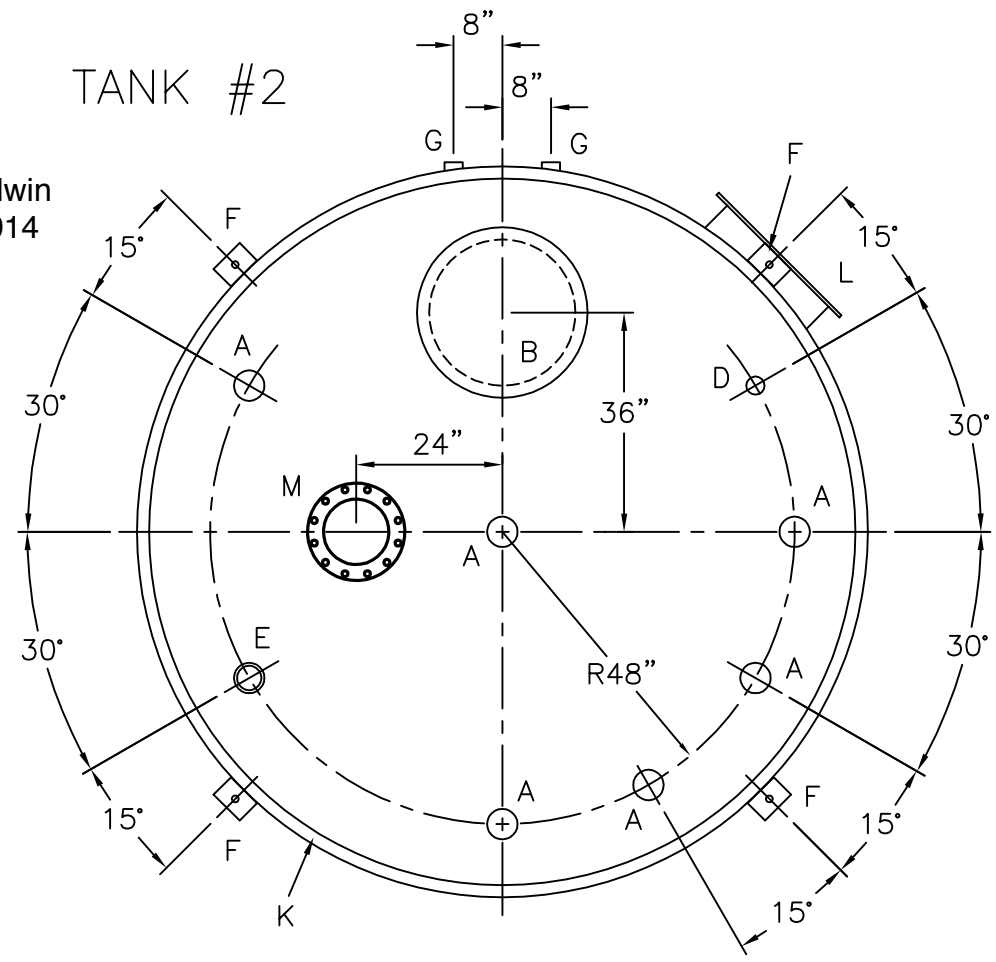
NOTES

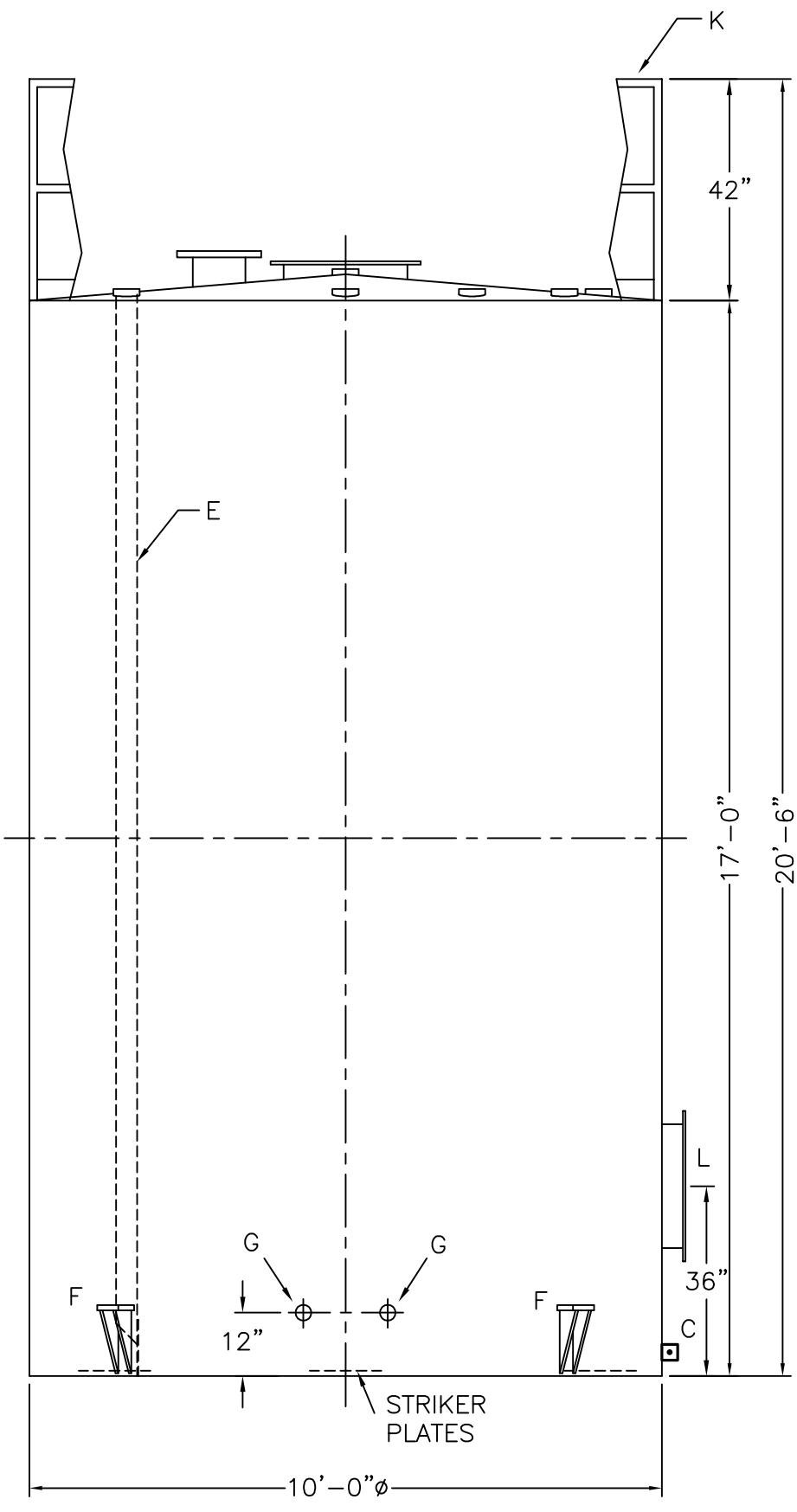
1. SEE PLAN VIEW FOR TRUE ORIENTATION AND LOCATION OF FITTING
2. LIFTING LUGS FOR UNLOADING UNIT & STANDING UNIT UPRIGHT TO BE PLACED AS NEEDED BY FABRICATION SHOP
3. A 3x3x¼" STEEL GROUNDING LUG WITH A ⅝"ø HOLE IN CENTER TO BE PLACED ON SHELL AT BOTTOM OF TANK IN LINE WITH LIFTING LUGS

SHIPPING LUGS AS NEEDED

Thomas Goodwin
28 January 2014

TANK #2



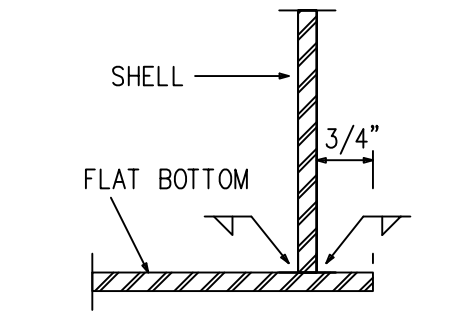


DESIGN DATA

CAPACITY – 10,000 GALLONS
TYPE – SINGLE WALL ABOVEGROUND VERTICAL
NO. REQ. – 1
OPERATING PRESSURE – ATMOSPHERIC
SPECIFIC GRAVITY = 1.0
TANK MATERIAL – MILD CARBON STEEL
THICKNESS – TOP: 7 GAUGE SHALLOW CONED THICKNESS – BOTTOM: 1/4" FLAT PER DETAIL THICKNESS – SHELL: 1/4"
CONSTRUCTION – LAP WELD INSIDE & OUTSIDE
TANK TEST – 2 PSIG
INT. FINISH – NONE
EXT. FINISH – SP6 BLAST, EPOXY PRIMER WHITE URETHANE TOPCOAT
LABEL – UL 142

LEGEND

A	4" FNPT FITTING
B	24" X 1/4" PLATE TIGHT BOLT MANWAY WITH 1/8" THICK NEO–CORK GASKET
C	GROUNDING LUG WITH 5/8" HOLE
D	2" FNPT FITTING
E	4" FNPT FITTING W/4"ø INTERNAL DROP PIPE TO WITHIN 6" OF TANK BOTTOM, MITER END 45°, SHIP TO BRACE AS NEEDED
F	HOLD DOWN LUG PER DWG AVLUGB
G	2" FULL COUPLING
H	–
J	–
K	HTM STD BOLT TO TANK HAND RAILING, FINISH SAFETY YELLOW EPOXY, SHIP LOOSE, INSTALLATION ON SITE BY OTHERS
L	24" CLOSE BOLT MANWAY WITH ⅛" THICK NEO–CORK GASKET THICKNESS NOZZLE– ¼" THICKNESS FLANGE– ¼" THICKNESS COVER– ⅜"
M	10" 150# FFSO FLANGE PRIMARY EMERGENCY VENT



BOTTOM JOINT DETAIL

1	REVISED PER CUSTOMERS MARKUP	1/21/14 | 006

Highland Tank

10,000 GAL 120"ø SW VERTICAL TANK
TANK #2

CUSTOMER: FLUID SOLUTIONS
BIRMINGHAM, AL
PROJECT: U.S. EMBASSY
LONDON, ENGLAND
QUOTE NO: 310050
CHK'D BY:

SCALE:	DATE:	DWG. BY:	DWG. NO.:
3/8" = 12"	1/9/14	006	87375

Morrison Bros. Co.

www.morbros.com

Fig. 2448" & 10" Emergency Vent

Specification Sheet

UL Listed Emergency vent (pressure relief only) used on aboveground storage tanks, as a code requirement, to help prevent the tank from becoming over-pressurized and possibly rupturing if ever exposed to fire. Vent must be used in conjunction with a "normal vent." Correct application of this vent requires proper vent size and selection for the tank system in order to meet the specific venting capacity.

8" & 10" Fig. 244

SPECIFICATION OPTIONS:

I.D. NUMBER	A	B	C	D	E	F	G	H	DIA	HT	WT.
244M--0600 AV	8	453.30	M	8	I	BR	AL	N	10.1	5.9	34
244MI-0600 AV	8	453.30	M	8	I	BR	I	N	10.1	5.9	34.6
244OM-0600 AV	8	453.30	M	8	I	O	AL	N	10.1	5.7	34
244OMI0600 AV	8	453.30	M	8	I	O	I	N	10.1	5.7	34.6
244M--0700 AV	8	453.30	M	16	I	BR	AL	N	10.1	7.5	68
244MI-0700 AV	8	453.30	M	16	I	BR	I	N	10.1	7.5	75.4
244OM-0700 AV	8	453.30	M	16	I	O	AL	N	10.1	7.4	68
244OMI0700 AV	8	453.30	M	16	I	O	I	N	10.1	7.4	75.4
244F--0100 AV	8	509.55	F	8	I	BR	AL	N	10.1	4.6	42
244OF-0100 AV	8	509.55	F	8	I	O	AL	N	10.1	4.5	42
244F--0200 AV	8	509.55	F	16	I	BR	AL	N	10.1	6.1	75
244OF-0200 AV	8	509.55	F	16	I	O	AL	N	10.1	6.1	75
244---0600 AV	8	462.00		8	I	BR	AL	N	10.1	5.5	34.7
244I--0600 AV	8	462.00		8	I	BR	I	N	10.1	5.5	44.3
244O--0600 AV	8	462.00		8	I	O	AL	N	10.1	5.3	34.7
244OI-0600 AV	8	462.00		8	I	O	I	N	10.1	5.3	44.3
244---0700 AV	8	462.00		16	I	BR	AL	N	10.1	7.1	68
244I--0700 AV	8	462.00		16	I	BR	I	N	10.1	7.1	77.6
244O--0700 AV	8	462.00		16	I	O	AL	N	10.1	6.9	68
244OI-0700 AV	8	462.00		16	I	O	I	N	10.1	6.9	77.6
244F--0300 AV	10	808.35	F	2.5	AL	BR	AL	N	16	6.1	32
244OF-0300 AV	10	808.35	F	2.5	AL	O	AL	N	16	5.1	32
244F--0400 AV	10	808.35	F	8	I	BR	AL	N	16	6.9	71
244OF-0400 AV	10	808.35	F	8	I	O	AL	N	16	5.5	71
244F--0500 AV	10	808.35	F	16	I	BR	AL	N	16	8.1	125
244OF-0500 AV	10	808.35	F	16	I	O	AL	N	16	6.8	125
244FI-0400 AV	10	808.35	F	8	I	BR	I	N	16	6.8	104.6
244FI-0500 AV	10	808.35	F	16	I	BR	I	N	16	8.1	151.5
244OFI0400 AV	10	808.35	F	8	I	O	I	N	16	5.6	99.4
244OFI0500 AV	10	808.35	F	16	I	O	I	N	16	6.8	146.3
244MT-0600 AV	8	453.30	M	8	I	BR	AL	N	10.1	8.2	38.5
244MT-0700 AV	8	453.30	M	16	I	BR	AL	N	10.1	9.8	72.5
244OMT0600 AV	8	453.30	M	8	I	BR	AL	N	10.1	8.1	38.5
244OMIT0700 AV	8	453.30	M	16	I	BR	AL	N	10.1	9.7	72.5
244OS-0600 AV	8	462.00		8	I	O	AL	Y	10.1	5.3	34.83
244OS-0700 AV	8	462.00		16	I	O	AL	Y	10.1	5.3	68.13
244S--0600 AV	8	462.00		8	I	BR	AL	Y	10.1	5.5	34.83

CHART KEY:

A—Size: 8" or 10"
B—Venting Capacity/CFH (in 1000's)
C—Mounting Connection: Female N.P.T. (BLANK); Male N.P.T.(M); Flanged (F)
D—Pressure Settings: 2.5, 8, 16 oz/in². Pressure Required to Open Vent.
E—Cover: Cast Iron Painted (I); Aluminum (AL); Optional Iron Powder Coated (Consult Factory for Details); Bolt: Steel-Zinc Plated
F—Seat Material: Brass (BR) or Viton O-Ring (O)
G—Body Material: Aluminum (AL) or Iron (I)
H—Screen: Yes/No (3 Mesh)
Diameter—Dimension Across Vent
Height—Dimension From Base to Top When Closed
Weight—Shipping Weight

Conformance Including: NFPA 30, 30a, UL 142, UL 2244, API 2000 and PEI RP200. Additional References: NFPA 30, UL 142, Morrison Venting Guide

Morrison Bros. Co.
Established 1855

P.O. Box 238 • Dubuque, Iowa 52004-0238
563.583.5701 (tel) • 800.553.4840 • 563.583.5028 (fax)
www.morbros.com

Updraft Vent

FIG 354, 354T

Atmospheric updraft vents are installed on the top of storage tank vent pipes on underground and aboveground fuel storage tanks.

Note: Open vents will allow unrestricted evaporation of product.

WARNING: DO NOT FILL OR UNLOAD FUEL FROM A STORAGE TANK UNLESS IT IS CERTAIN THAT THE TANK VENTS WILL OPERATE PROPERLY. Morrison tank vents are designed only for use on shop fabricated atmospheric tanks which have been built and tested in accordance with UL 142, NFPA 30 & 30A, and API 650 and in accordance with all applicable local, state, and federal laws. In normal operation, dust and debris can accumulate in vent openings and block air passages. Certain atmospheric conditions such as a sudden drop in temperature, below freezing temperatures, and freezing rain can cause moisture to enter the vent and freeze which can restrict internal movement of vent mechnisms and block air passages. All storage tank vent air passages must be completely free of restriction and all vent mechanisms must have free movement in order to insure proper operation. Any restriction of airflow can cause excessive pressure or vacuum to build up in the storage tank, which can result in structural damage to the tank, fuel spillage, property damage, fire, injury, and death. Monthly inspection, and immediate inspection during freezing conditions, by someone familiar with the proper operation of storage tank vents, is required to insure venting devices are functioning properly before filling or unloading a tank.

Features Ordering Instructions Downloads Related Products

Fig	Suffix	Size	Description	Weight
354	0100 AV	1.5"	Updraft Vent	0.75
354	0200 AV	2"	Updraft Vent	0.75
354	0300 AV	3"	Updraft Vent	1.5
354	0400 AV	4"	Updraft Vent	2.25
354T	0200 AV	2"	Updraft Vent, Slip-on, Teflon Coated Aluminum, w/ss Screen	0.75
354T	0300AV	3"	Updraft Vent, Slip-on, Teflon Coated Aluminum, w/ss Screen	1.5

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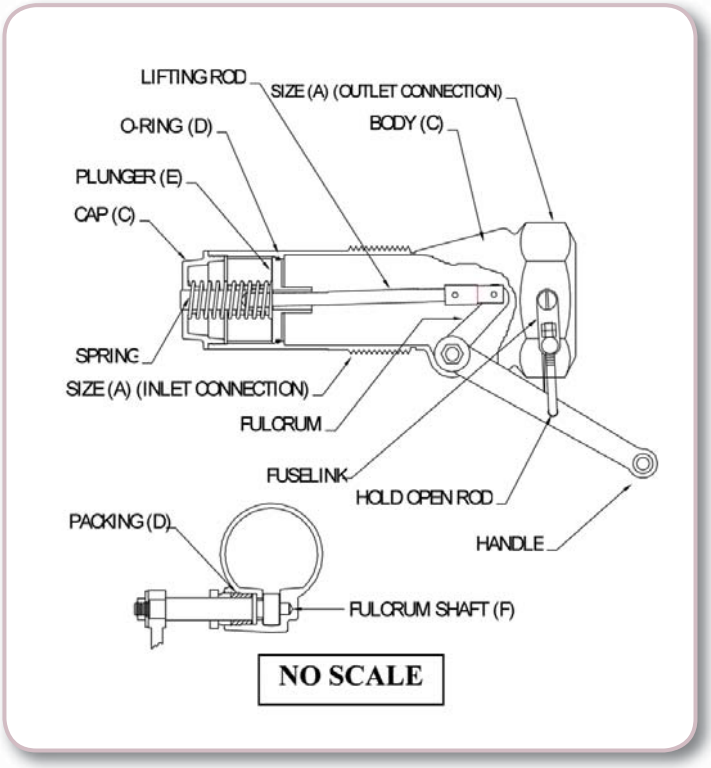
Model 272 Internal Emergency Valves

SPECIFICATION SHEET

The Morrison Fig. 272 Internal Emergency Valve is for installation at the outlet of an A.S.T. where product flow must be stopped at the connection to the tank in the event of a fire. Fig. 272 Flanged Internal Emergency Valves conform to ANSI B16.42 specifications for Class 150 raised face ductile iron flanges. The Fig. 272 is offered with an optional shear section and/or locking mechanism.



Model 272HDI

Model 272HO

Model 272HLS

570 E. 7th Street, P.O. Box 238 | Dubuque, IA 52004-0238
t. 563.583.5701 | 800.553.4840 | f. 563.583.5028
www.morbros.com

Model 272 Internal Emergency Valves *(continued)*

I.D. Number	A	B	C	D	E	F	G	H	I	J	K
272DI-0300 AV	4 X 3	F	DI	TFE	DI	ST	ST	N	N	16.81	34
272DI-0400 AV	6 X 4	F	DI	TFE	DI	ST	ST	N	N	13.5	42
272HDI0100 AV	2 X 2		DI	TFE	DI	ST	ST	N	N	8.75	7
272DLS0100 AV	2 X 2		DI	TFE	DI	ST	ST	Y	Y	8.75	6.5
272HDS0100 AV	2 X 2		DI	TFE	DI	ST	ST	Y	N	8.75	7
272HO-0100 AV	2 X 2		B	GEN	B	B	B	N	N	8.75	6.5
272HOL0100 AV	2 X 2		B	GEN	B	B	B	N	Y	8.75	7
272HLS0100 AV	2 X 2		B	GEN	B	B	B	Y	Y	8.75	7
272HOS0100 AV	2 X 2		B	GEN	B	B	B	Y	N	8.75	6.5
272HDL0100 AV	2 X 2		DI	TFE	DI	ST	ST	N	Y	8.75	7
272HDI0500 AV	3 X 3		DI	TFE	DI	ST	ST	N	N	10.62	10
272DLS0500 AV	3 X 3		DI	TFE	DI	ST	ST	Y	Y	10.62	11.5
272HDS0500 AV	3 X 3		DI	TFE	DI	ST	ST	Y	N	10.62	10
272HO-0500 AV	3 X 3		B	GEN	B	B	B	N	N	10.62	11.5
272HOL0500 AV	3 X 3		B	GEN	B	B	B	N	Y	10.62	13
272HLS0500 AV	3 X 3		B	GEN	B	B	B	Y	Y	10.62	13
272HOS0500 AV	3 X 3		B	GEN	B	B	B	Y	N	10.62	11.5
272HDL0500 AV	3 X 3		DI	TFE	DI	ST	ST	N	Y	10.62	10
272HO-0600 AV	4 X 3		B	GEN	B	B	B	N	N	12.31	17
272HOL0600 AV	4 X 3		B	GEN	B	B	B	N	Y	12.31	18
272HLS0600 AV	4 X 3		B	GEN	B	B	B	Y	Y	12.31	18
272HOS0600 AV	4 X 3		B	GEN	B	B	B	Y	N	12.31	17
272HDI0700 AV	4 X 4		DI	TFE	DI	ST	ST	N	N	12.37	21
272HDS0700 AV	4 X 4		DI	TFE	DI	ST	ST	Y	N	12.37	21
272HO-0700 AV	4 X 4		B	GEN	B	B	B	N	N	12.37	20.25
272HOS0700 AV	4 X 4		B	GEN	B	B	B	Y	N	12.37	20.25

SPECIFICATION OPTIONS:

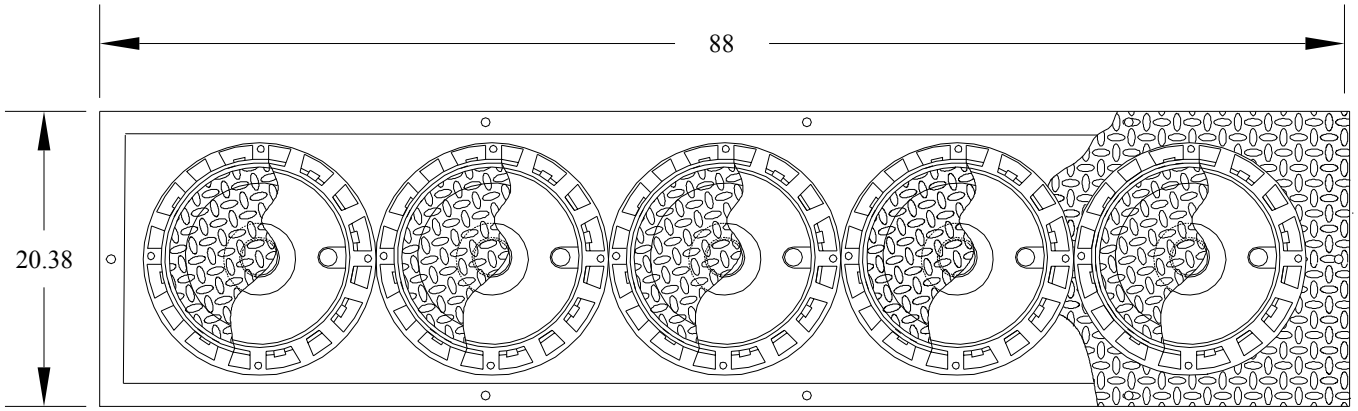
A - Size: In inches - (Inlet) x (Outlet)
B - Tank Connection: Flanged (F) or Male (Blank)
C - Body / Cap Material: Ductile Iron (DI) or Brass (B)
D - O-ring/ Packing: General Packing w/ Flourocarbon
Elastomer O-ring (GEN) PTFE packing w/ TFE
Encapsulated O-ring (TFE) Fig. 272DI-0400 AV-(Packing only)
E - Plunger Material: Ductile Iron (DI) or Brass (B)
F - Shaft Material: Plated Steel (S) or Brass (B)
G - Lifting Rod: Steel (S) or Brass (B)
Handle: Iron
Fulcrum Lever: Iron
Spring: Stainless Steel
Fuselink: 212oF
Hold Open Rod: Steel
H - Shear Section: Yes (Y) / No (N)
I - Locking Mechanism Yes (Y) / No (N)
J - Length of Valve (inches)
K - Shipping Weight (lbs.)

MORRISON BROS. CO.
570 E. 7th Street, P.O. Box 238 | Dubuque, IA 52004-0238
t. 563.583.5701 | 800.553.4840 | f. 563.583.5028
www.morbros.com

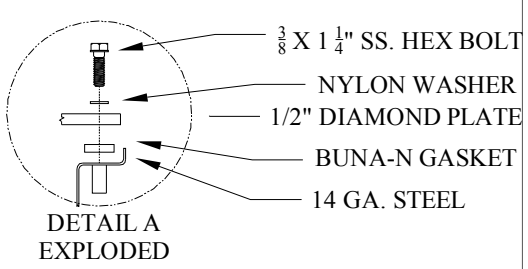
231113-2.17 Remote Fill and Accessories

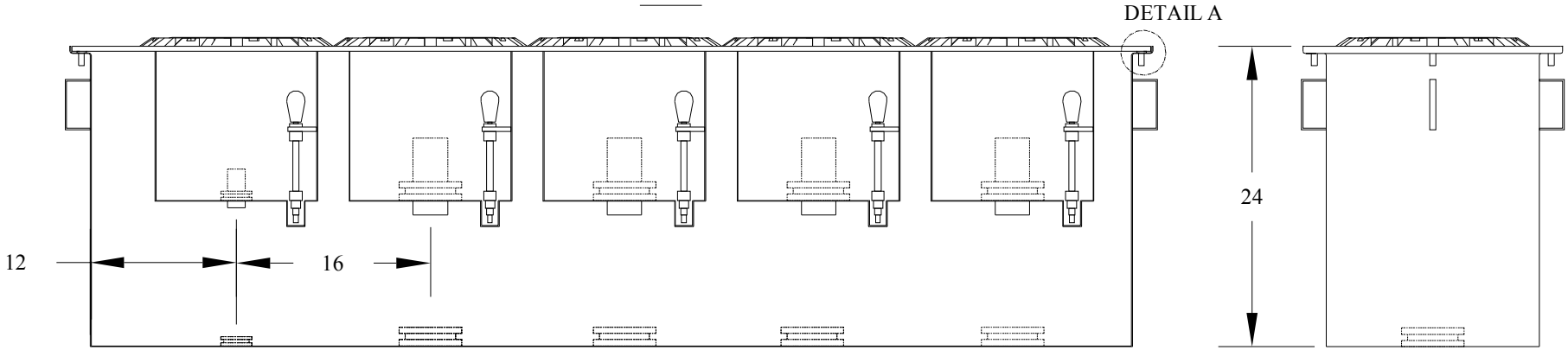
US Embassy London
Fuel Oil Submittal
231113
BL Harbert International
120080

RFTC/CUSTOM



TOP





SIDE

FEATURES:

- REMOVABLE 1/2" THICK DIAMOND PLATE COVER; H-20 TRUCK LOAD RATING; BOLTED AND SEALED WITH GASKET
- 14 GA. STAINLESS STEEL SECONDARY CONTAINMENT/TERMINATION CHAMBER
- FOUR (4) SCM-5 4"
- FOUR (4) FOUR INCH FLANGES
- ONE (1) SCM-5 2"
- ONE (1) TWO INCH FLANGE
- CHANNEL-STYLE CONCRETE ANCHORS
- 1/8" THICK BUNA-N GASKET
- MADE IN USA

FAIRFIELD INDUSTRIES, INC
827 NORTH 6TH STREET, NEWARK, NJ 07107
PHONE: 973-483-0100 FAX: 973-483-5333

RFTC/CUSTOM					
SIZE A	SCALE NTS	DWG NO. RFTC3111		C.REV -	REV -
DRAWN BY A.CONKLIN		DATE 1/2/14		SHEET 1 OF 2	

TODO-MATIC® Tank Unit 4" (DN100, Ø 164 mm) threaded

For industrial process plant, Road and rail tankers, ISO containers, Aviation fuel bunkering, Offshore, Pharmaceutical and Petrochemical industries. Media: Butadiene, Drilling Mud, Barite, Methanol, Potable Water, Waste Water, Base Oil, Oil Based Mud etc.

TODO-MATIC® Tankkupplung (Vaterteilkupplung) Gewinde. Für Anlagen, Tankwagen und Kesselwagen, Container, Flugzeugtreibstoff-Tankläger, Offshore, pharmazeutische und petrochemische Industrie. Medien: Butadien, Bohrschlamm, Barite, Diesel, Methanol, Schmutzwasser, ölhaltiger Schlamm.

TODO-MATIC® tankdel med gänga. För fabriker, tankbilar, tankvagnar (järnväg), container, bunkring flygbränsle, skepp, plattformar. Media: Butadien, borrslam, baryt, diesel, metanol, dricksvatten, avfallsvatten, oljebaserat slam etc.

Dimension *DN*	D.Ø *mm*	Connection	Material Werkstoff *Material*	Seal Dichtung *Tätning*	Weight Gewicht *Vikt*	Fig. Abb. *Bild*	Code no. Bestellnummer *Beställningsnr*
		BSP					
DN 100	164	4" female	SS	FKM	6,9 kg	2	5830A-4407
DN 100	164	4" female	Al	FKM	3,3 kg	1	5631-1107
DN 100	164	4" female	Brass	FKM	7,4 kg	2	5631-2207
		NPT					
--	164	4" female	SS	FKM	7,3 kg	2	7480A-4407
--	164	4" female	Al	FKM	3,3 kg	1	7476-1107
--	164	4" female	Brass	FKM	7,4 kg	2	7476-2207

BSP threads according to ISO 228-G. NPT threads according to ANSI B 2.1. / BSP Gewinde gemäß ISO 228-G. NPT Gewinde gemäß ANSI B 2.1. / *BSP gängor enligt ISO 228-G. NPT gängor enligt ANSI B 2.1.*

Figure
Abbildung
Bild

1.

2.

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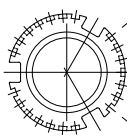
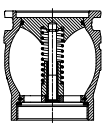


Page 10-12 **Option / Zuwahl / Tillval**
Selectivity to prevent cross contamination of media / Codierung gegen Produktvermischung. / *Selektivitet för att undvika mediablandning.*



Page **Technical information**
4 **Material & sealing. Standard sealing is FKM, others on request.** / Werkstoff & dichtung. Standard-Dichtungswerkstoff ist FKM, andere auf Anfrage. / *Material & tätning. Standardtätning är FKM, andra på förfrågan.*
5 **Dimension, diameter, thread.** / DN, durchmesser, gewinde. / *Dimension, diameter, gänga.*
7 **Thread measurement** / Gewindemasse / *Gängmått*

Dust cap for TODO-MATIC® Tank Unit ¾" - 6"

Kappen für TODO-MATIC® Vaterteil.

Skyddskåpa för TODO-MATIC® tankdel.

Dimension *DN*	D.Ø *mm*	Material Werkstoff *Material*	Seal Dichtung *Tätning*	Weight Gewicht *Vikt*	Fig. Abb. *Bild*	Code no. Bestellnummer *Beställningsnr*
DN 20-40 (¾"-1½")	56	Al	-	0,2 kg	1	4915-1400
DN 20-40 (¾"-1½")	56	Brass	-	0,4 kg	1	4915-2400
DN 20-40 (¾"-1½")	56	SS	-	0,4 kg	1	4915-4400
DN 20-40 (¾"-1½")	56	CR	-	0,1 kg	4	3664-10
DN 20-40 (¾"-1½")	56	Al	FKM	0,4 kg	-	5659-1407
DN 40-50 (1½"-2")	70	Al	FKM	0,3 kg	2	6070B-1407
DN 40-50 (1½"-2")	70	Brass	FKM	0,7 kg	2	6070B-2407
DN 40-50 (1½"-2")	70	SS	FKM	0,6 kg	2	6070B-4407
DN 40-50 (1½"-2")	70	CR	-	0,15 kg	4	3666-10
DN 65 (2½")	105	Al	FKM	0,5 kg	3	5435C-1407
DN 65 (2½")	105	Brass	FKM	1,4 kg	3	5435C-2407
DN 65 (2½")	105	SS	FKM	1,2 kg	3	5435C-4407
DN 80 (3")	119	Al	FKM	0,6 kg	3	5535C-1407
DN 80 (3")	119	Brass	FKM	1,6 kg	3	5535C-2407
DN 80 (3")	119	SS	FKM	1,4 kg	3	5535C-4407
DN 80 (3")	119	Al	FKM	1,3 kg	5	5662-1407
DN 100 (4")	164	Al	FKM	1,6 kg	2	5635B-1407
DN 100 (4")	164	Brass	FKM	3,6 kg	2	5635B-2407
DN 100 (4")	164	SS	FKM	3,1 kg	2	5635B-4407
DN 100 (4")	164	Al	FKM	2,2 kg	5	5663-1407
DN 150 (6")	238	Al	FKM	3,5 kg	6	7219-1407

Figure
Abbildung
Bild

1.

2.

3.

4.

5.

6.

© TODO AB. Design may change without notice - Konstruktive ändringar vorbehalten - Konstruktionsändringar förbehålles.

Ductile Iron Butterfly Valves

SAFETY ALERT *NOT RECOMMENDED FOR STEAM SERVICE*

- for use between two 150 lb. flanges
- will lock "open" or "closed"
- rated to **200 PSI** at ambient temperature (70°F)

- ductile iron body, ASTM A536
- aluminum bronze disc, ASTM B148, ALY.954
- Buna-N seal and stem seals
- PTFE bushing
- stainless steel top and bottom stems
- The number of holes on the valve should match the number of holes for the specific flange size listed in the Pipe and Flange dimensions chart on page 619.

threaded lug style with bronze disc

Size	*with Buna-N liner*		*with EPDM liner*	
	Part #	Price/E	Part #	Price/E
2"	***BFVL200***	**$145.00**	***BFVL200E***	**$145.00**
3"	***BFVL300***	**181.25**	***BFVL300E***	**181.25**
4"	***BFVL400***	**270.00**	***BFVL400E***	**270.00**
6"	***BFVL600***	**475.00**	***BFVL600E***	**475.00**

- ductile iron body, ASTM A536
- aluminum bronze disc, ASTM B148, ALY.954
- Buna-N seal and stem seals
- PTFE bushing
- stainless steel top and bottom stems
- The number of holes on the valve depends on the body size.

wafer style with bronze disc

Size	*with Buna-N liner*		*with EPDM liner*	
	Part #	Price/E	Part #	Price/E
2"	***BBFVW200***	**$133.00**	***BBFVW200E***	**$133.00**
3"	***BBFVW300***	**170.00**	***BBFVW300E***	**170.00**
4"	***BBFVW400***	**240.00**	***BBFVW400E***	**240.00**
6"	***BBFVW600***	**420.00**	***BBFVW600E***	**420.00**

- ductile iron body, ASTM A536
- stainless steel disc, ASTM A351, GR. CF-8M
- Buna-N seal and stem seals
- PTFE bushing
- stainless steel top and bottom stems
- The number of holes on the valve depends on the body size.

wafer style with stainless disc

Size	*with Buna-N liner*	
	Part #	Price/E
2"	***BFVW200***	**$150.00**
3"	***BFVW300***	**185.00**
4"	***BFVW400***	**250.00**
6"	***BFVW600***	**440.00**

231113-2.1.C Flexible Connectors

US Embassy London
Fuel Oil Submittal
231113
BL Harbert International
120080

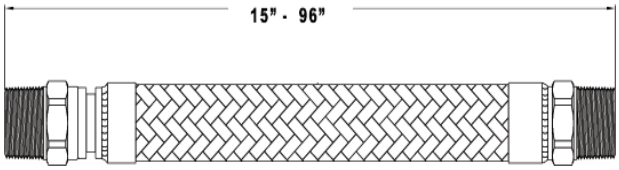
FLEX-ING™
www.flex-ing.com

FIREFLEX
FLEXIBLE CONNECTORS

2828 Fallon Drive
Sherman, Texas 75090
Phone: 1.800.333.3599 / 1.903.892.8983
Fax: 1.800.765.4801 / 1.903.893.9576

Description —

FLEX-ING's premiere above and below ground fire rated flex connector.



Application —

Connects the shear valve with primary piping in a fuel dispenser sump system.

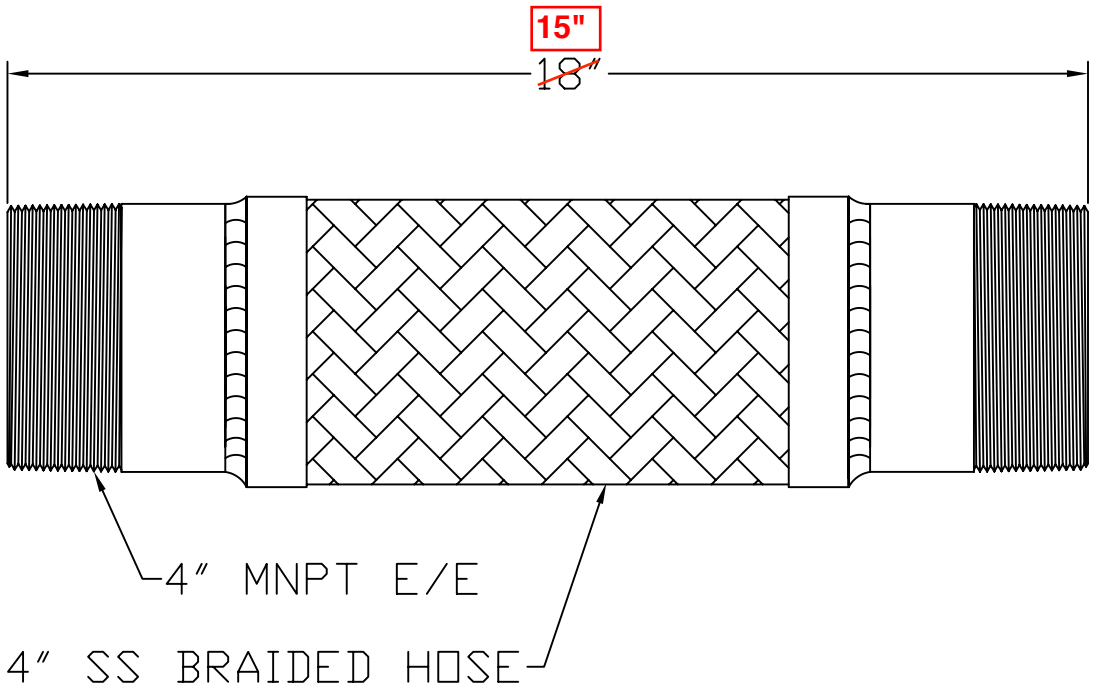
Features —

SB 989 Compliant	Successful Praxair/Tracer Testing
Metal construction	All metal construction means one flex-connector for both above and below ground applications.
Full Vacuum	Testable under full vacuum.
UL Listed	UL Listed for above and below ground installation.
Long service life	An 18-8 alloy with titanium, 321 Stainless Steel inner core provides a long service life.
Greater flexibility	Standard wall thickness with close pitch corrugations gives more flexibility.
Multi-seal design	The 346 Integral Male Swivel* ensures ease of installation with a multi-seal design.
Schedule 80 construction	Thick, schedule 80 hex end fittings protect against deformation of the ends.
Quality tested	100% pressure tested to assure quality.
Superior working pressure	350 psi working pressure assembly exceeds UL 50 psi requirement on 3/4" - 3". 225 psi on 4"
Minimum Bend Radius from Centerline of Hose	6" - Hose up to 2" 9" - Hose up to 3" 13" - Hose up to 4"

NFPA® MEMBER 2009-2010

See Requirements and Installation Instructions on Page 2

REVISIONS		
REV	DESCRIPTION	DATE



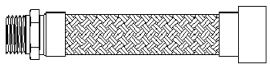
FLEX-ING

2828 FALLON DR
SHERMAN, TX 75090

SIZE	PART #	DRAWING NAME	
A	FFUL40X18MXM	4" MALE X MALE X 18" OAL	
DRAWING BY:		DATE	SHEET
BRANDON THOMPSON		7/11/08	1 OF 1

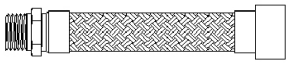
FLEX-CONNECTOR SYSTEM

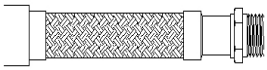
1-1/2” FIREFLEX



1-1/2” HEX MALE X 2” FEMALE	FFUL15X18HMX2F FFUL15X24HMX2F FFUL15X30HMX2F
1-1/2” MALE 346 SWIVEL X 2” FEMALE	FF15X18M346X2F FF15X24M346X2F FF15X30M346X2F

2” FIREFLEX





2” HEX MALE X 2” HEX MALE	FFUL20X18HMXHM FFUL20X24HMXHM FFUL20X30HMXHM
2” HEX MALE X 2” MALE 346 SWIVEL	FF20X18HMXM346 FF20X24HMXM346 FF20X30HMXM346
2” HEX MALE X 2” FEMALE	FFUL20X18HMXF FFUL20X24HMXF FFUL20X30HMXF
2” FEMALE X 2” MALE 346 SWIVEL	FF20X18M346XF FF20X24M346XF FF20X30M346XF

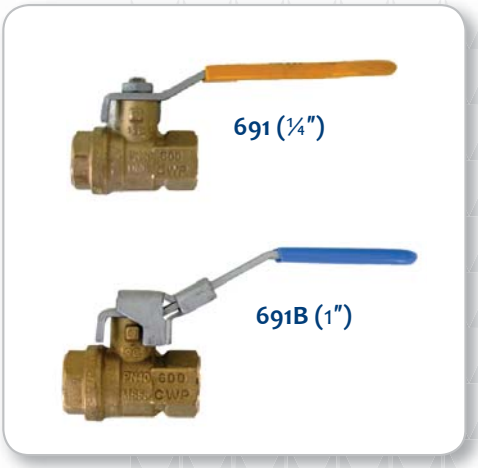
231113-2.3 Valves

US Embassy London
Fuel Oil Submittal
231113
BL Harbert International
120080

Model 691 & 691B Full Port Brass Ball Valve

SPECIFICATION SHEET

Ball valves are used throughout fuel piping systems where a shut-off is required or desired.



Features

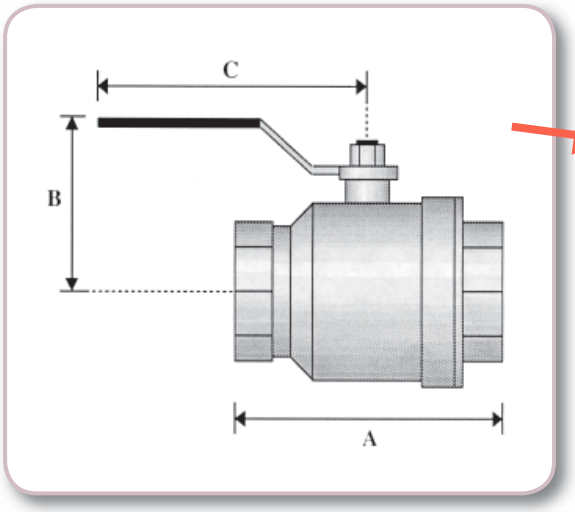
- Quarter turn operation
- Full port for maximum flow and minimum pressure drop
- Can be operated in partial open position for flow control
- Double seal allows the valve to be operated in both directions
- Blowout proof stem
- 600 PSIG non-shock cold working pressure rating for ¼″ to 2″ size
- 450 PSIG non-shock cold working pressure rating for 2½″ to 4″ size
- Can be used for air service
- **691B** is lockable with a padlock

Construction Details

- Forged brass body
- Hard chrome plated ball
- Teflon® seal

Certifications & Listings

UL 842 listed for flammable liquids,
UL 125 listed for LP gas shut-off,
FM approval ¼″ to 2″, CSA approved



I.D. Number	Size	A	B	C	Port Size	Weight (lbs)
691---0100 1V	¼″	1.771	1.496	3.228	0.314	0.30
691---0200 1V	⅜″	1.771	1.496	3.228	0.393	0.30
691---0300 1V	½″	2.32	1.69	3.94	0.59	0.50
691---0400 1V	¾″	2.519	1.968	4.724	0.787	0.80
691---0500 1V	1″	3.188	2.125	4.724	0.984	1.17
691---0600 1V	1¼″	3.661	2.874	6.22	1.259	1.93
691---0700 1V	1½″	4.015	3.11	6.22	1.574	2.40
691---0800 1V	2″	4.763	3.385	6.22	1.968	4.02
691---0900 1V	2½″	6.141	5.196	10.04	2.559	10.0
691---1000 1V	3″	6.968	5.551	10.04	3.149	13.65
691---1100 1V	4″	8.504	6.062	10.04	3.937	22.0
691B--0100 1V	¼″	1.771	1.496	3.228	0.314	0.30
691B--0200 1V	⅜″	1.771	1.496	3.228	0.393	0.30
691B--0300 1V	½″	2.32	1.69	3.94	0.59	0.50
691B--0400 1V	¾″	2.519	1.968	4.724	0.787	0.80
691B--0500 1V	1″	3.188	2.125	4.724	0.984	1.17
691B--0600 1V	1¼″	3.661	2.874	6.22	1.259	1.93
691B--0700 1V	1½″	4.015	3.11	6.22	1.574	2.40
691B--0800 1V	2″	4.763	3.385	6.22	1.968	4.02
691B--0900 1V	2½″	6.141	5.196	10.04	2.559	10.0
691B--1000 1V	3″	6.968	5.551	10.04	3.149	13.65
691B--1100 1V	4″	8.504	6.062	10.04	3.937	22.0

NOTE: All dimensions are in inches.

MORRISON BROS. CO.

570 E. 7th Street, P.O. Box 238 | Dubuque, IA 52004-0238
t. 563.583.5701 | 800.553.4840 | f. 563.583.5028
www.morbros.com

Model 346 External Emergency Valves

SPECIFICATION SHEET

The Morrison Fig. 346 Series External Emergency Valve is designed for installation at the outlet of an AST or in a liquid transfer line where product flow must be stopped in the event of a fire. The flanges on the 346FDI models conform to ANSI B16.42 specifications for class 150 raised face ductile iron flanges. Cold non-shock pressure rating is 200 P.S.I. W.O.G. for sizes ¾" to 3" and 250 P.S.I. W.O.G. for the 4". Ductile iron valves are painted green.

Model 346FDI

Model 346DI

Model 346SS

I.D Number	A	B	C	D	E	F	G	H	I	J	K	L
346FDI0200 AV	2	F	DI	TFE	DI	DI	165	4	6.25	6.5		15.0
346FDI0300 AV	3	F	DI	TFE	DI	DI	165	4	8.53	8.63		29.40
346FDI0400 AV	4	F	DI	TFE	DI	DI	165	8	11.75	11.5		72.0
346DI-1000 AV	¾		DI	TFE	DI	DI	165		5	6.94	I	7.30
346DI-1100 AV	1		DI	TFE	DI	DI	165		5	6.94	I	7.30
346DI-1200 AV	1¼		DI	TFE	DI	DI	165		5	6.94	I	7.0
346DI-0400 AV	1½		DI	TFE	DI	DI	165		5	5.44		6.80
346DI-0500 AV	2		DI	TFE	DI	DI	165		5	5.44		6.20
346DI-0600 AV	3		DI	TFE	DI	DI	165		7	8.32		15.50
346SS-1000 AV	¾		SS	TFE	SS	SS	165		5	6.94	SS	8.60
346SS-1100 AV	1		SS	TFE	SS	SS	165		5	6.94	SS	8.60
346SS-1200 AV	1¼		SS	TFE	SS	SS	165		5	6.94	SS	8.50
346SS-0100 AV	1½		SS	TFE	SS	SS	165		5	5.44		8.0
346SS-0200 AV	2		SS	TFE	SS	SS	165		5	5.44		7.0

SPECIFICATION OPTIONS:

A—Size: In Inches
B—Mounting Connection: Flanged (F) or Female NPT (Blank)
C—Body / Cap Material: Ductile Iron (DI) or 316 Stainless Steel (SS)
D—Gasket Material: Teflon (TFE)
E—Poppet: Ductile Iron (DI) or 316 Stainless Steel (SS)
O-ring: Teflon Encapsulated Flourocarbon Elastomer
Spring: 302 Stainless Steel
Seal Nut/Plug: 303 Stainless Steel
Handle: Brass
Fulcrum Shaft: 303 Stainless Steel
Groove Pin: Steel
Hold Open Hook: Stainless Steel
F—Lever Arm: Ductile Iron (DI) or 316 Stainless Steel (SS)
G—Fuse Link: 165° F STD. (212°F Optional); Fuse Link is UL Listed & Factory Mutual Listed
H—Number of Bolt Holes
I—Height of Valve (Inches)
J—Length of Valve (Inches)
K—Reducing Bushings: Iron (I) or 316SS (SS)
L—Shipping Weight (lbs.)

Companion flanges, flange gaskets, nuts, bolts and washers available.

MORRISON BROS. CO.
570 E. 7th Street, P.O. Box 238 | Dubuque, IA 52004-0238
t. 563.583.5701 | 800.553.4840 | f. 563.583.5028
www.morbros.com

Back Pressure Regulating Valves

Phillip's RVI & BPS series back pressure regulating valves are self-contained units designed to handle the most critical upstream pressure requirements typically found in fuel oil loop applications. Our industrial duty back pressure regulating valve automatically maintains the desired set pressure in the loop system by relieving excess pressure into the lower pressure return side of the loop. With a fast response and available in two separate spring ranges, these adjustable valves are ideally suited for continuous operation.

Features Include:

- Fast Response
- 303 Stainless steel body, viton piston seals
- 300 PSIG Maximum Pressure
- 200 Degrees F Max Temperature
- Adjustable pressure ranges

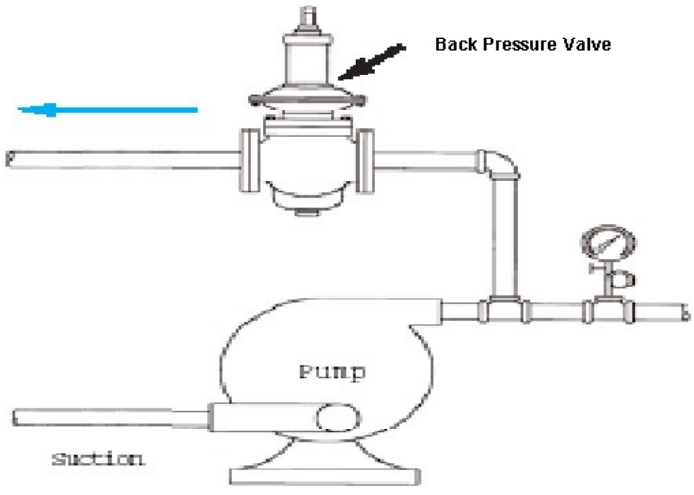
Size	Part Number	Pressure Range
1/2" NPT	RVI2005T-SS-2/25 RVI2005T-SS-5/75	2-25 PSI 5-75 PSI
3/4" NPT	RVI2007T-SS-0/50 RVI2007T-SS-50/150	2-25 PSI 5-75 PSI
1" NPT	RVI2010T-SS-0/50 RVI2010T-SS-50/150	2-25 PSI 5-75 PSI
1 1/4" NPT	BPS0511T-SS-15/60 BPS0511T-SS-25/150	15-60 PSI 25-150 PSI
1 1/4" Flanged	BPS0512A-SS-15/60 BPS0512A-SS-25/150	15-60 PSI 25-150 PSI
1 1/2" NPT	BPS0515T-SS-15/60 ~~BPS0515T-SS-25/150~~	15-60 PSI ~~25-150 PSI~~

Size	Part Number	Pressure Range
1 1/2" NPT	BPS0515T-SS-15/60 BPS0515T-SS-25/150	15-60 PSI 25-150 PSI
1 1/2" Flanged	BPS0515A-SS-15/60 BPS0515A-SS-25/150	15-60 PSI 25-150 PSI
2" NPT	BPS0520T-SS-15/60 BPS0520T-SS-25/150	15-60 PSI 25-150 PSI
2" Flanged	BPS0520A-SS-15/60 BPS0520A-SS-25/150	15-60 PSI 25-150 PSI
3" Flanged	BPS0530A-SS-15/60 BPS0530A-SS-25/150	15-60 PSI 25-150 PSI
4" Flanged	BPS0540A-SS-15/60 BPS0540A-SS-25/150	15-40 PSI 25-195 PSI

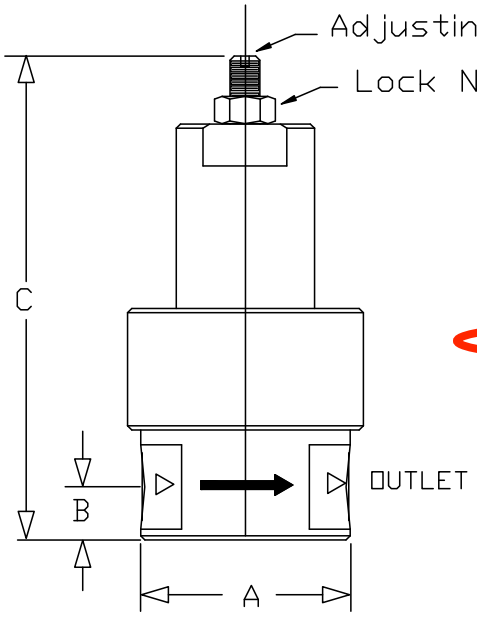
HOW IT WORKS

By sensing the upstream pressure acting on the underside of the diaphragm through a port in the bottom of the diaphragm case, an increase in up-stream pressure pass the set pressure will compress the spring and allow the valve to open. The spring will close as the upstream pressure decreases.

The higher the system pressure above the set point, the more flow the valve will pass.



109 Holland Ave • Bridgeport, Connecticut 06605 USA • Phone: 203-908-3323 Fax: 203-908-3325
www.phillipfuelsystems.com

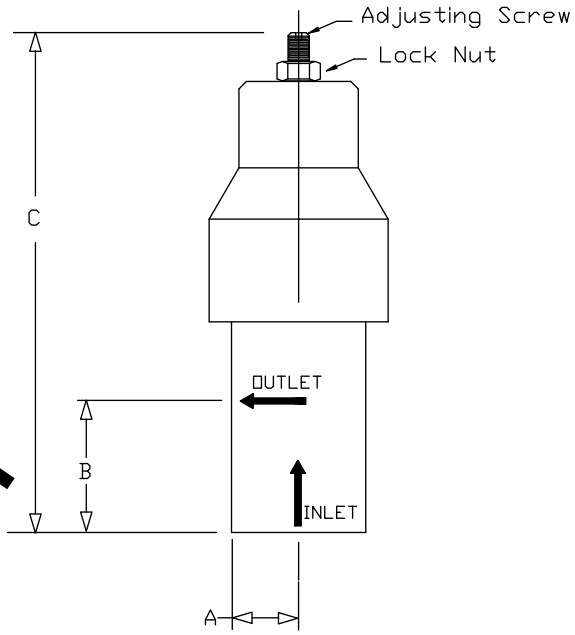


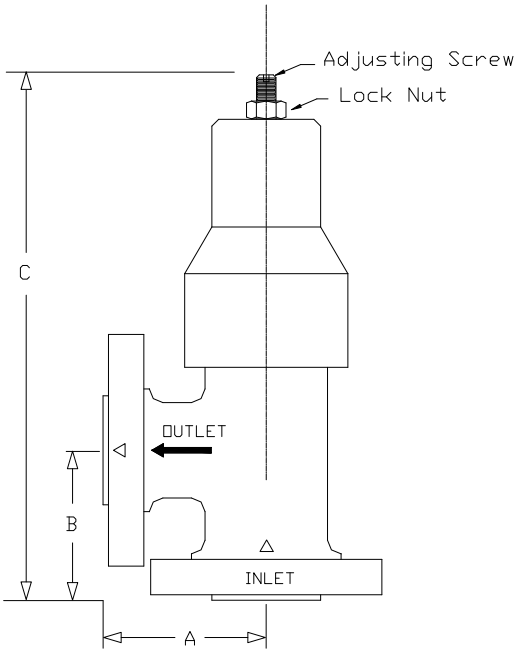
RVI-20 SERIES INLINE VALVE

Size NPT	Dimension (in) A	B	C	Cv	Max GPM
1/2	2.50	0.63	5.62	4.5	15
3/4	3.00	0.75	6.17	6.7	25
1	4.00	1.00	9.25	13.7	40

BPS-05 SERIES- NPT RIGHT ANGLE PORTING

Size NPT	Dimension (in) A	B	C	Flow Cv
1 1/4	2.0	2.5	11.0	15.9
1 1/2	2.0	2.5	12.5	27.7
2	2.4	3.0	12.5	49.5





BPS-05 SERIES- FLANGED RIGHT ANGLE PORTING

Size NPT	Dimension (in) A	B	C	Flow Cv
1 1/4	3.0	3.5	12.3	15.9
1 1/2	3.0	4.0	13.5	27.7
2	3.5	4.5	15.5	49.5
3	5.5	5.5	21.0	79.7
4	6.0	6.0	23.0	124.6

109 Holland Ave • Bridgeport, Connecticut 06605 USA • Phone: 203-908-3323 Fax: 203-908-3325
www.phillipfuelsystems.com

231113-2.6 Boiler Daytank and Generator Daytank Fittings (Gen. Day Tanks by Others)

US Embassy London
Fuel Oil Submittal
231113
BL Harbert International
120080

Phillips Fuel Systems

109 Holland Ave Bridgeport CT, USA 06605
Phone: (203)-908-3323 Fax: (203)-908-3325

PDWT500-130062

500 gallon closed dike daytank, per UL 142

London

All rights Reserved. No portion of this package or any part herein shall not be reproduced in any form without the written permission of Phillips Fuel System Inc

By acceptance of this package, it is understood that Phillips Fuel System Inc shall be responsible for only those items indicated herein and unless otherwise noted. The signatory whose signature appears is duly authorized by all necessary and appropriate action to execute approval and will all abide by Phillips Fuel Systems Inc standard sales terms and conditions and be responsible for verifying correctness of the type, size, location, operation, electrical requirements, piping, accessories or any other requirements for successful operation. It is further understood that by acceptance of this package, Phillips Fuel System Inc will not be held liable for any deviation or omission from any quotation and/or specification. Phillips Fuel System Inc reserves the right, without approval, to rearrange components or substitute, due to lack of availability, quality and/or performance, any component indicated herein with a compatible component, as long as that component is of the same quality and general design.

Approved _____ Date _____

Approved _____ Date _____

Approved _____ Date _____

PHILLIPS FUEL SYSTEMS INC LIMITED WARRANTY FOR NEW PUMPS OR PUMPING SYSTEMS MANUFACTURED BY PHILLIPS FUEL SYSTEMS INC

A. PRODUCTS WARRANTED - Phillips Fuel System Inc, subject to the limitations contained below, will at its option, repair or replace, without charge for parts or labor only, any part or parts of a new pump or system manufactured by PHILLIPS FUEL SYSTEMS which is found, upon examination by PHILLIPS FUEL SYSTEMS INC at it's factory in Bridgeport, Ct. or by its designated affiliate, to be DEFECTIVE IN MATERIAL AND/OR WORKMANSHIP if determined by such examination within twelve months from the date of sale to the original consumer purchaser.

B. PRODUCTS AND ITEMS NOT WARRANTED - The provisions of this warranty shall not apply to any equipment, part or accessory which:
(a) has been improperly specified by buyer;
(b) has been improperly stored or handled prior to placing in service;
(c) has been improperly mounted, installed or connected, altered or modified in any way.
(d) has not been operated within specifications as stated on its nameplate, label, placard, or within its operating manual;
(e) has not been properly maintained;
(f) parts supplied by buyer for inclusion in finished equipment are not covered by this warranty;
(g) components or assemblies specified by buyer with no substitution permissible that are not normally used by Phillips Fuel System Inc are not covered by this warranty;
(h) that interfaces with, controls or is controlled by any device that has not been approved by Phillips Fuel System Inc

Phillips Fuel System Inc reserves the right to reject warranty claims of any kind against assembled equipment, parts or material for which Phillips Fuel System Inc has not received payment in full and for any system which was not authorized for start up and use by Phillips Fuel System Inc or by its designated affiliate. Should buyer, at his own risk, elect to replace failed equipment or parts in the field rather than obtain start up service under this warranty, Phillips will supply and invoice parts at normal prices upon receipt of buyer's bonafide purchase order. Failed equipment or parts returned for in-warranty crediting in exchange for replacement parts must be returned within 45 days from date of shipment of replacement in order to qualify for warranty consideration.

This warranty is extended to the original buyer only and is not transferable to subsequent buyers. This warranty is available for installations in the forty-eight contiguous U.S. states only.

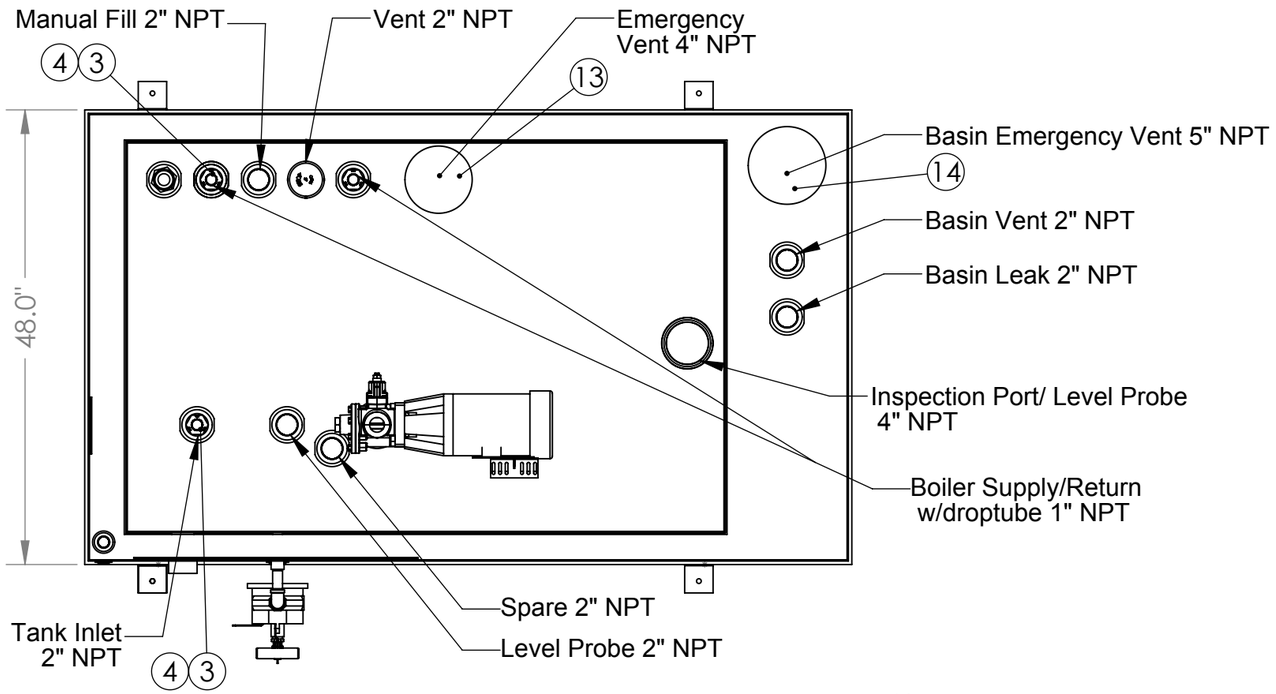
C. SECURING WARRANTY SERVICE - Warranty service can be arranged by contacting PHILLIPS FUEL SYSTEMS INC, c/o Service Manager, 109 Holland Ave, Bridgeport, Ct 06605. Warranty service can only be performed by Phillips Fuel System Inc at its factory in Bridgeport, Ct or by its designated affiliate. At the time of requesting warranty service, evidence must be presented of the date of sale to the original consumer purchaser. The purchaser shall pay any charges for making service calls and/or for transporting the product to and from the place where the inspection and/or warranty work is performed. The purchaser shall be responsible for any damage or loss incurred in connection with the transportation of the system and/or of part or parts of the system, submitted for inspection and/or warranty work.

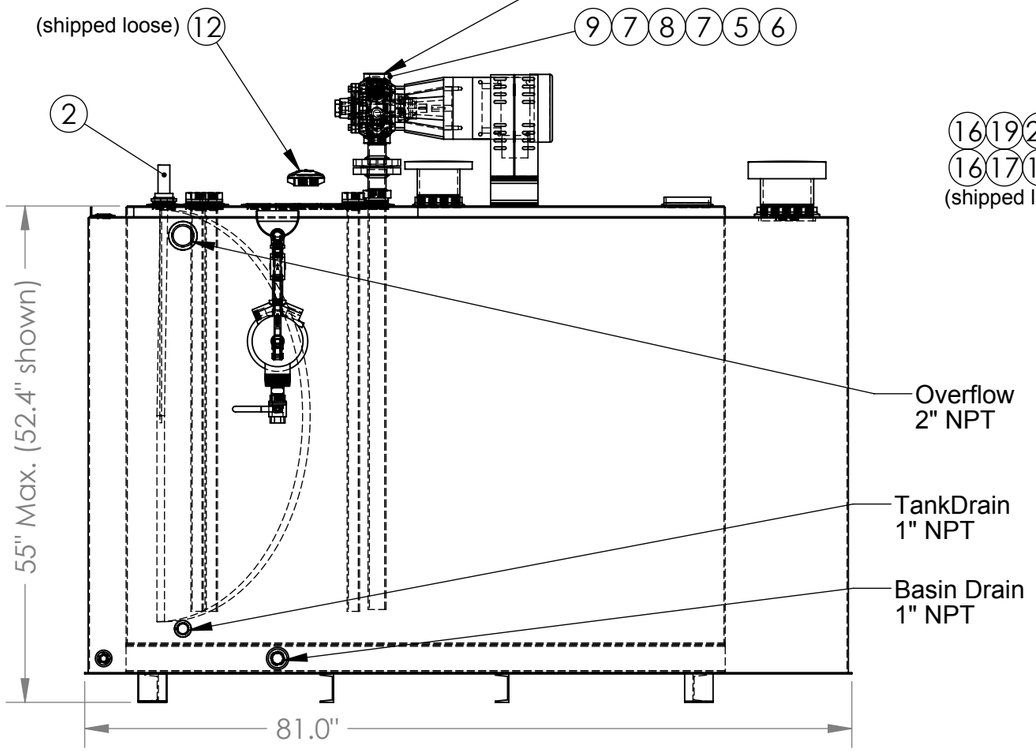
D. NO ADDITIONAL WARRANTIES OR REPRESENTATIONS - The foregoing EXPRESSED WARRANTY IS IN LIEU OF ALL OTHER EXPRESSED WARRANTIES. Neither Phillips Fuel System Inc nor any of its affiliates make any warranties, representations or promises, written or verbal, as to the quality of the system or its parts other than those set forth herein.

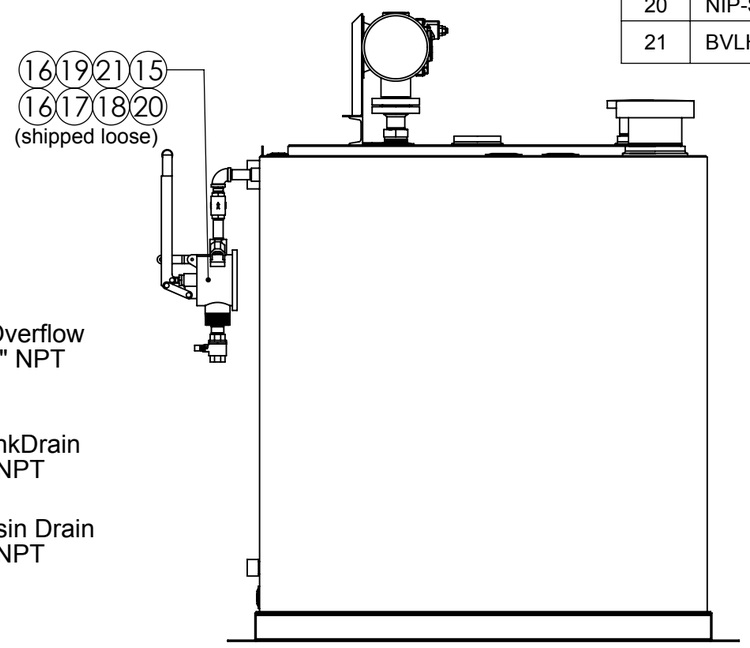
ANY IMPLIED WARRANTIES (INCLUDING, BUT NOT LIMITED TO MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE) TO THE EXTENT EITHER APPLIES TO PART OR PARTS OF A SYSTEM SHALL BE LIMITED IN DURATION TO THE PERIODS OF THE EXPRESSED WARRANTIES AS DEFINED IN PARAGRAPH A. Some states do not allow limitations on how long an implied warranty lasts, so the above limitations may not apply.

E. DAMAGES - IN NO EVENT WILL PHILLIPS PUMPS BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES AND/OR EXPENSES. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation may not apply to you. This warranty gives you specific legal rights and you may have other legal rights which vary from state to state.

F. NO DISTRIBUTOR DEALER WARRANTY - PHILLIPS FUEL SYSTEM INC neither assumes nor authorizes any other person, natural or corporate, to assume any other obligations or liabilities in connection with or with respect to any part or parts of a system. The seller, dealer or distributor of part or parts has no authority to make any representations or promises on behalf or PHILLIPS FUEL SYSTEMS INC or to modify the terms or limitations of this warranty in any way. The seller, dealer or distributor makes no warranty of his own on any item warranted by PHILLIPS FUEL SYSTEMS and makes no warranty on other items, unless such seller or dealer delivers to the purchaser a separate written warranty document in which the seller or the dealer individually and specifically on its own behalf, warrants the terms or items.







ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	DTC500	Daytank per UL 142: 500 gallon, 10 gauge steel plate, externally reinforced and seam welded with 150% integral closed top outer containment rupture basin. Tank is pressure tested to 5 PSI. With internal vegatable oil coat and external enamel finish over chemical resistant primer.	1
2	D-2.0-44	Fuel Level Gauge, 44" Deep Tank	1
3	OEM-4579	Bushing, Double Tap, 2 x ½	3
4	Halfnip-14x43	Halfnip-1" x 43.00" lg	3
5	OEM-4581	Bushing, Double Tap, 2 x ½	1
6	Halfnip-16x43	Halfnip-1¼" x 43.00" lg	1
7	FGNP150-FS-16-16-3	Flanged Nipple, #150, 1½ x 3.00	2
8	FG150-GKT-16	Flange Gasket 1½"	1
9	GP24V01543TCW-R-50	#24 gear pump, cast iron, viton seal, 1 1/2" NPT ports, CW rotation, internal relief valve, 1 1/2 HP, 22/380/440 VAC 50 hertz, TEFC motor, 16 GPM @ 50 PSI	1
10	BRKT-DTPUMP-56.002	Pump mounting bracket	1
11	C3x4.1x5	C3x4.1x5	1
12	OEM-4025	2" Outdoor vent cap	1
13	MB 244OM-0100 AV	Emergency Vent 4", 8 oz/in², MNPT	1
14	MB-244OM-0800 AV	Emergency Vent 5", 8 oz/in², MNPT	1
15	FR-150	Hand Pump, Lever Type, 20 Gallon/100 Strokes	1
16	NIP-BS40-13 X 3	Nipple,Blk Steel, 3/4" X 3.0"	2
17	EL-BS40-13	90 Degree Elbow, Black Steel, 3/4" NPT	1
18	NIP-BS40-13 x CL	Nipple,Blk Steel, 3/4" X CL (1.38)"	1
19	525-13	¾" NPT Bronze In Line Check Valve, 200 psi	1
20	NIP-SS40-14 x 2	Nipple, SS, 1" NPT x 2" LG	1
21	BVLH-BZ-14	1" Ball Valve, Bronze with lockable handle	1

Phillips Fuel Systems
109 Holland Ave., Bridgeport, Ct 06605

TITLE:
500 gallon closed dike daytank, per UL 142

Part Number.
PDWT500-130062

REV

	NAME	DATE
DRAWN		

SCALE: 1:16 | WEIGHT: | SHEET 2 OF 2

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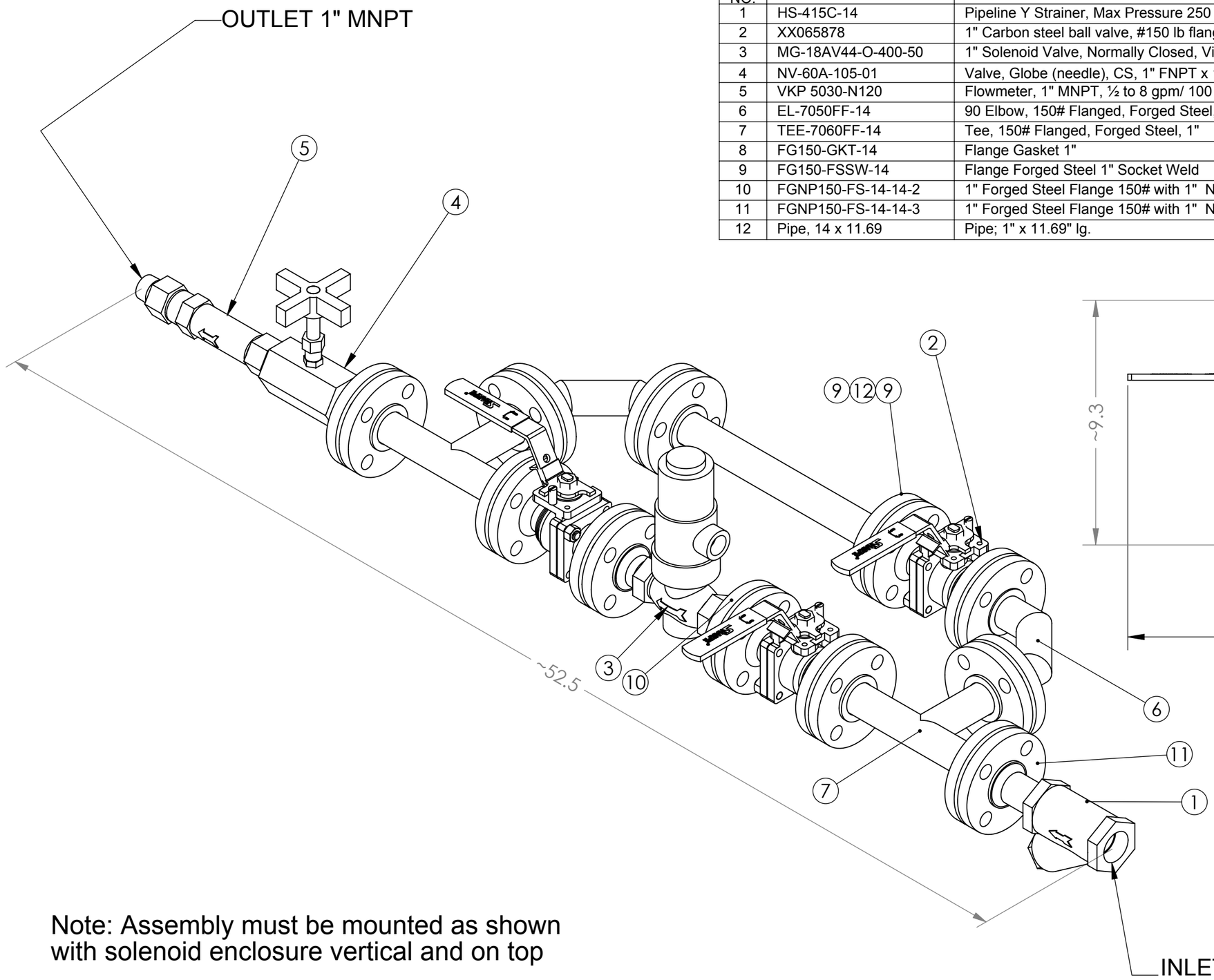
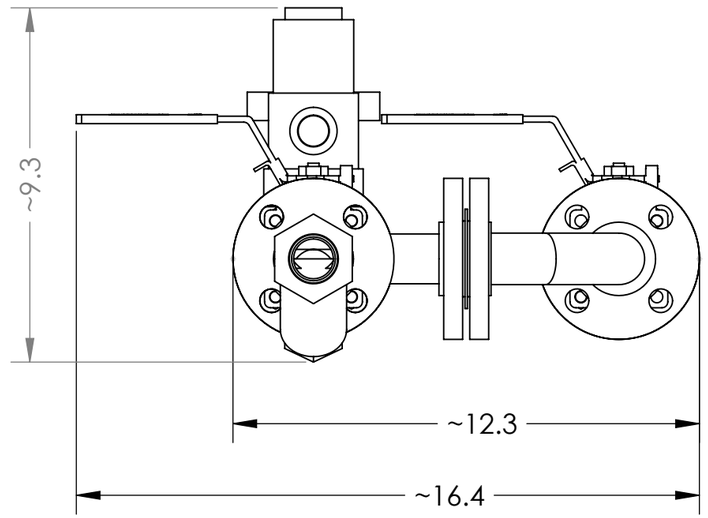
DO NOT SCALE DRAWING

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	HS-415C-14	Pipeline Y Strainer, Max Pressure 250 PSI, 1" NPT, Cast Iron Body	1
2	XX065878	1" Carbon steel ball valve, #150 lb flange with Reinforced TFM seat with locking handle	3
3	MG-18AV44-O-400-50	1" Solenoid Valve, Normally Closed, Viton , 400 VAC, 50 Hertz	1
4	NV-60A-105-01	Valve, Globe (needle), CS, 1" FNPT x 1" FNPT	1
5	VKP 5030-N120	Flowmeter, 1" MNPT, ½ to 8 gpm/ 100 cSt. with 3/4 NPT union ends	1
6	EL-7050FF-14	90 Elbow, 150# Flanged, Forged Steel, 1"	2
7	TEE-7060FF-14	Tee, 150# Flanged, Forged Steel, 1"	2
8	FG150-GKT-14	Flange Gasket 1"	11
9	FG150-FSSW-14	Flange Forged Steel 1" Socket Weld	2
10	FGNP150-FS-14-14-2	1" Forged Steel Flange 150# with 1" NPT nipple end, 2" long	3
11	FGNP150-FS-14-14-3	1" Forged Steel Flange 150# with 1" NPT nipple end, 3" long	1
12	Pipe, 14 x 11.69	Pipe; 1" x 11.69" lg.	1





Note: Assembly must be mounted as shown with solenoid enclosure vertical and on top

Phillips Fuel Systems
109 Holland Ave., Bridgeport, Ct 06605

TITLE:
Flow Control Manifold, Daytanks, 1" London

Part Number.
FCM14-130062-DT

REV

	NAME	DATE
DRAWN		

SCALE: 1:4 | WEIGHT: ~≤140 | #SHEET 1 OF 1

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DO NOT SCALE DRAWING

BRONZE SOLENOID VALVES
Dependable • Packless

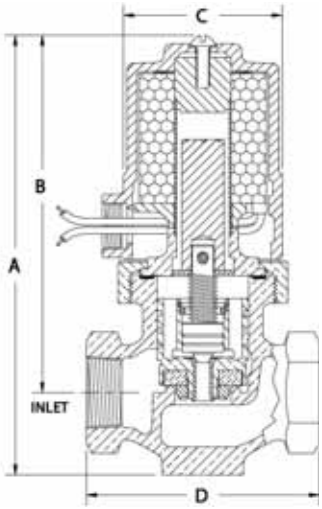
TYPE "A" FULL PORT - NORMALLY CLOSED
1/2" TO 3" PIPE SIZE

NO DIFFERENTIAL PRESSURE REQUIRED TO OPEN

MAX. FLUID TEMP.
212° F
MAX. STATIC PRESSURE
300 PSI
Except valves listed for 500 PSI

OPERATION:
Valve opens when energized and closes when de-energized. When the coil is energized the pilot valve opens, relieving the pressure above the piston, which is then lifted from its seat by the plunger. Upon de-energizing the coil, a spring closes the pilot valve and opens a bleed passageway to permit pressure to build above the piston and seat it.

CONSTRUCTION: (* Wetted parts)
*Valve Body - Cast Bronze, Globe Pattern - NPT ends
*Piston - Bronze
Coil Enclosure - Malleable or Cast Iron, 1/2" NPS conduit conn.
*Plunger - 430 Stainless Steel
*Pilot Valve - 303 Stainless Steel
*Bonnet Tube - 304 Stainless Steel
*Spring - 302 Stainless Steel
*Body Seal - Buna N or Non Asbestos Gasket
*Orifice Seal - Buna N (Viton or Glass Filled Teflon available)
*AC Shading Coil - Copper
*Stem Pin - Inconel
Coil - Encapsulated Class B, 18" leads - (Class H available)



APPLICATION:
To control the flow of Water, Oil, Air, Gas, Solvents, Brine, Vacuum and any other fluids not reactive with construction materials and free of sediment. Valve operates from zero to maximum differential pressure indicated in table. Valve must be mounted in horizontal pipe with solenoid enclosure vertical and on top.

Pipe Size Inches	Max. Diff. PSI	Type No.	Watts AC	Amps Hold 120-60	Amps Inrush 120-60	Watts DC	Ship Wt. Lbs.	Dimensions In Inches			
								A	B	C	D
1/2	110 200 300	18A42 18A32 18A52	25	0.4	1.2	18	8	7	5-7/8	2-3/4	3-1/4
	500	E33A62	45	0.8	2.4	23	16	8	6-7/8	4-1/8	3-1/4
3/4	50 110	18A23 18A43	25	0.4	1.3	18	8	7-1/8	6	2-3/4	3-1/2
	160	118A43	40	0.6	2.0	28					
	200 300	33A33 33A53	45	0.8	2.6	23	12	8-1/8	7	3-1/2	3-1/2
	500	E133A63	65	1.2	3.9	33	17	8-1/8	7	4-1/8	3-1/2
1	50 110	18A24 18A44	25	0.4	1.5	18	10	7-7/8	6-5/8	2-3/4	4-1/8
	160	118A44	40	0.6	2.5	28					
	200 300	33A34 33A54	45	0.8	2.8	23	14	8-7/8	7-1/2	3-1/2	4-1/8
	500	E133A64	65	1.2	4.2	33	19	8-7/8	7-1/2	4-1/8	4-1/8
1-1/4	50 90	18A25 18A45	25	0.4	1.6	18	12	8-3/8	6-3/4	2-3/4	4-1/2
	150	118A45	40	0.6	2.4	28					
	200 300	33A35 33A55	45	0.8	3.0	23	16	9-3/8	7-3/4	3-1/2	4-1/2
	500	†† 40A65	60	1.2	6.2	N/A	20	10-3/8	8-3/4	4-1/2	4-1/2
1-1/2	50 115	35A26 35A46	45	0.8	3.2	23	20	10	8-1/8	4	4-7/8
	160	135A46	65	1.2	4.8	33					
	200 300	41A36 41A56	60	1.2	6.7	35	24	11	9-1/8	4-1/2	4-7/8
	500	141A66	85	2.0	10.0	45					
2	50 100	36A27 36A47	45	0.8	3.5	23	31	11	8-3/4	5-3/8	6
	150	136A47	65	1.2	5.0	33					
	200 300	42A37 42A57	60	1.2	7.4	35	36	12	9-3/4	5-3/8	6
	500	142A67	85	2.0	11.0	45					
2-1/2	50 125 200	43A28 43A48 43A38	60	1.2	8.0	35	43	12-7/8	10-1/8	5-7/8	7-1/4
	300	143A58	85	2.0	12.0	45					
3	50 100 200	44A29 44A49 44A39	60	1.2	8.8	35	56	13-3/4	10-1/2	6-5/8	8-3/8
	300	144A59	85	2.0	13.0	45					

FOR OPTIONS & ACCESSORIES SEE PAGES 24 & 25

Strainers are recommended for use with solenoid valves

(See page 19)

When you order please supply the following:

- Pipe Size
- Valve Type
- Voltage (AC or DC)
- Hertz
- Fluid
- Fluid Temperature
- Max. Diff. Pressure
- Optional Features

(See pages 24 & 25)

†† Not available for DC operation

Y-Strainers

Y Strainers are designed for steam, oil or water lines. Strainers should be installed ahead of temperature regulating and/or pressure reducing valves and steam traps to protect their moving parts from dirt, this is particularly important for new installations.

Screwed NPT End

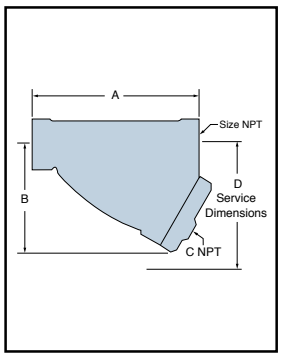
Model 415C

- Cast iron body
- Maximum pressure:
  – 250 psig (17.3 bar) for steam service
  – 400 psig (27.6 bar) for water service
- Available in sizes ½" - 3" NPT

Model 420C

- Cast brass body
- Maximum pressure:
  – 300 psig (20.6 bar) for steam service
  – 400 psig (27.6 bar) for water service
- Available in sizes ½" - 3" NPT

Screwed NPT End Y-Strainer



Ordering Information

Model Number	Part Number	NPT Size in.	Weight Approx. lbs. (kg)
415C	405000	½	2 (0.9)
415C	405003	¾	2½ (1.1)
415C	405006	1	4 (1.8)
415C	405009	1¼	6 (2.7)
415C	405012	1½	7 (3.2)
415C	405015	2	12 (5.4)
415C	405018	2½	19 (8.6)
415C	405022	3	32 (14.5)
420C	405024	½	1 (0.5)
420C	405027	¾	2 (0.9)
420C	405030	1	4 (1.8)
420C	405033	1¼	5 (2.3)
420C	405036	1½	7 (3.2)
420C	405039	2	12 (5.4)
420C	405042	2½	22 (10)
420C	405045	3	35 (16)

Dimensions in. (mm)

Model 415C

Part Number	A	B	NPT C	D
405000	4 1/8 (105)	2 1/2 (64)	1/2	3 1/4 (83)
405003	3 3/4 (95)	2 7/16 (62)	3/8	3 (76)
405006	4 (102)	2 5/8 (67)	3/8	3 1/4 (83)
405009	4 7/8 (124)	3 3/4 (95)	3/4	6 (152)
405012	6 (152)	4 (102)	3/4	6 (152)
405015	7 3/8 (187)	4 1/4 (108)	3/4	6 3/4 (171)
405018	9 1/4 (235)	5 7/8 (149)	1 1/2	7 7/8 (200)
405022	10 (254)	6 (152)	1 1/2	8 (203)

Model 420C

Part Number	A	B	NPT C	D
405024	2 15/16 (75)	2 (51)	1/4	3 (76)
405027	3 5/8 (92)	2 3/8 (60)	1/4	4 (102)
405030	4 1/2 (114)	2 3/4 (70)	3/8	4 1/2 (114)
405033	5 1/8 (130)	3 1/2 (89)	3/8	5 (127)
405036	5 13/16 (148)	4 3/4 (95)	1/2	5 3/4 (146)
405039	7 15/16 (202)	4 1/2 (114)	1/2	6 1/2 (165)
405042	8 1/4 (210)	6 3/4 (171)	1 1/4	—
405045	9 5/8 (244)	6 1/4 (159)	1 1/4	—

Specifications

Model	Body Material	Steam Service			Water Service		
		Pressure psig (bar)	Temperature °F (°C)	Screen Material Mesh SS	Pressure psig (bar)	Temperature °F (°C)	Screen Material Mesh SS
415C	Cast Iron	250 (17.3)	400 (204)	20	400 (28)	100 (38)	20
420C	Cast Brass	300 (20.6)	400 (204)	20	400 (28)	150 (66)	20

SETTING A NEW INDUSTRY STANDARD IN PERFORMANCE EXCELLENCE

Changeable, quick, agile, and incredibly reliable . . . engineered to meet the challenges of industrial users in today's fast-paced environment. With the flexibility of a bolt-on integral relief valve, a broad choice of field-changeable shaft seals and elastomers, and the time-tested "gear within a gear" pumping principal, the new Haight Universal Series of pumps offer unparalleled flexibility and reduced maintenance expenses.

Discover the **HAIGHT ADVANTAGE** and put it to work for you.

HAIGHT® PUMPS
DIVISION OF: BAKER MANUFACTURING COMPANY

133 Enterprise Street
Evansville, WI 53536
Phone: 800-871-9250
Fax: 608-882-3777
Email: haight pump@baker-mfg.com

THE HAIGHT ADVANTAGE

Your local Haight distributor is a pump professional with the products, knowledge, and experience to provide quality solutions to all your pumping needs.

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HAIGHT UNIVERSAL PUMPS

Step up to Quality . . .

Step up to Haight

www.haightpump.com

Pumps that fit . . . Pumps that perform

HAIGHT . . . BETTER BY DESIGN

Haight Pumps are engineered for performance and long life under the most rugged conditions.

TYPICAL COMPETITIVE GEAR DESIGN

The typical cantilevered gear design with the inner idler gear has several pronounced disadvantages that the Haight design eliminates, including:

- Single point of entry liquid feed to gears resulting in a “built-in” inlet restriction. This often requires speed reduction at fluid viscosities above 750 SSU.
- Hydraulic imbalance resulting in shaft deflection and premature wear.
- Increased idler speeds resulting in higher gear tip speeds and accelerated wear.
- Thrust bearing field adjustment needed to keep driver gear properly positioned.

THE HAIGHT ADVANTAGE

Haight pumps feature an inner driving gear coupled to a hydraulically balanced free floating outer gear on a dramatically shortened shaft arrangement.

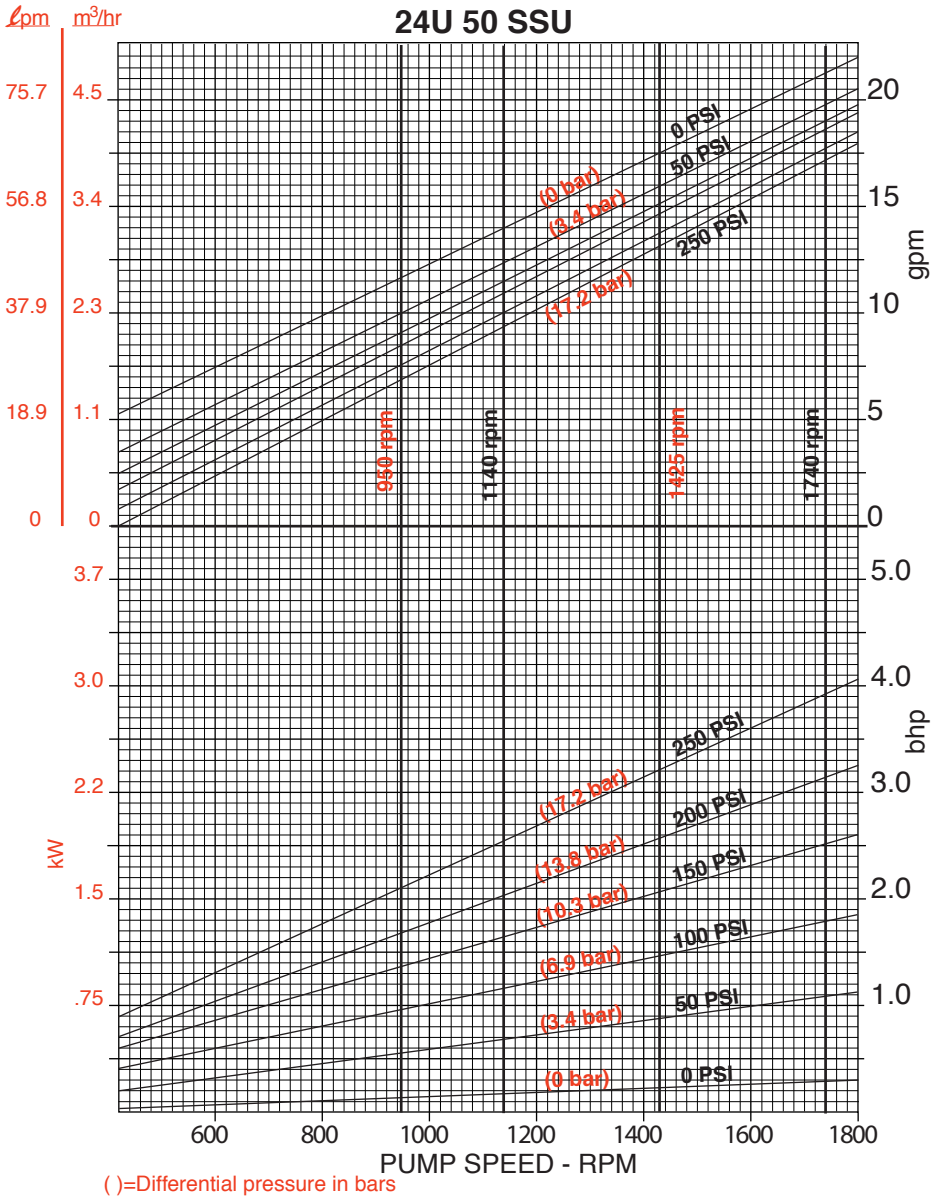
- Thrust bearing adjustment is eliminated since the gears are precisely positioned without the need for field adjustment.
- Gears rotate on a shaft that is fully supported at both ends by lubricated and vented bearings eliminating deflection which causes wear.
- Pinion and rotor gears are hydraulically balanced by the pumped fluid eliminating pistoning into the casing and cover.
- Dual paths of fluid entry to the gears (rather than one) allows Haight pumps to generate full rated displacement while close-coupled at standard motor speeds, without gear reducers at viscosities up to 10,000 SSU. This eliminates misalignment and significantly reduces cost.
- All rotating components are accessible beneath the front cover making routine cleaning and service faster, and simpler.
- Lower rotor tip speeds result in reduced noise levels.

HAIGHT PUMPS LAST LONGER

- **1-8 GPM**
  Typical top gear speed cantilevered design (RPM) 2,333
  Top gear speed Haight Universal (RPM) 1,750 (Motor Speed)
  Difference 583
- **10-20 GPM**
  Typical top gear speed cantilevered design (RPM) 2,846
  Top gear speed haight Universal (RPM) 1,750 (Motor Speed)
  Difference *1,096*
- **30-80 GPM**
  Typical top gear speed cantilevered design (RPM) 2,407
  Top gear speed Haight Universal (RPM) 1,750 (Motor Speed)
  Difference 657

- A typical cantilevered gear design pumps as shown here must increase the top rotating speed of the gear set by an average of 33% in the 1-8 GPM range, 63% in the 10-20 GPM range, and 38% in the 30-80 GPM range for any given volume of displacement.
- A Haight universal pump requires, on average, 46,720 fewer revolutions **per operating hour** for a given volume of displacement.

THE HAIGHT ADVANTAGE


24U 50 SSU
ℓpm
m³/hr
75.7
4.5
56.8
3.4
37.9
2.3
18.9
1.1
0
0
950 rpm
1140 rpm
1425 rpm
1740 rpm
0 PSI
50 PSI
250 PSI
(0 bar)
(3.4 bar)
(17.2 bar)
gpm
20
15
10
5
0
3.7
3.0
2.2
1.5
.75
kW
5.0
4.0
3.0
2.0
1.0
bhp
250 PSI
200 PSI
150 PSI
100 PSI
50 PSI
0 PSI
(17.2 bar)
(13.8 bar)
(10.3 bar)
(6.9 bar)
(3.4 bar)
(0 bar)
600
800
1000
1200
1400
1600
1800
PUMP SPEED - RPM
( )=Differential pressure in bars

The Most Trusted name in Pumps & Meters FILL-RITE

PRODUCT DATA SHEET

Series 5200 Piston Hand Pump

- Description of Included Models
- Available Options
- Safety Listings
- Accessories
- Performance
- Fluid Compatibility
- Dimensions
- Repair
- Maintenance
- Frequently Asked Questions

Series 5200 Piston Hand Pump Shown

FILL-RITE

Description of Included Models

Model Number	Description	The Change in Shipping Weights
FR150-1	**Basic UL Listed pump** with Vacuum Breaker	(8 lbs 3.6 kgs)
[illegible]	**Basic UL Listed pump** with vacuum breaker, bung adapter, 1" inlet & 3/4" outlet, spout and telescoping suction pipe.	(10 lbs 4.5 kgs)
FR151	**Basic UL Listed pump** with bung adapter, 1" inlet & 3/4" outlet, spout and telescoping suction pipe.	(12 lbs 5.4 kgs)
[illegible]	**Basic UL Listed pump** with vacuum breaker, bung adapter, 1" inlet & 3/4" outlet, 8' hose & nozzle and telescoping suction pipe. A kit is available to fit a 807C meter to this model. See kit number 807CMK.	(15 lbs 6.8 kgs)

[back to data sheet index]

Safety Listings

Approval Organization Mark	Organization Description	File Number	Guide Number
UL LISTED	**Underwriters Laboratories Inc.,** a nationally recognized Independent organization for testing of products to ensure public safety.	MH6988	EVRZ

[back to data sheet index]

Available Options

Option	Description	Shipping Weight (lbs.)	Shipping Weight (kgs.)
-X001	Unit supplied less hose	(3.0)	(1.4)
-X002	Unit supplied less telescoping suction tube	(2.0)	(0.9)
-X003	Unit supplied less nozzle	-	-
-X004	Unit supplied less spout	(2.0)	(0.9)
-X005	Unit supplied less hose and nozzle	(3.0)	(1.4)

[back to data sheet index]

Accessories

Part Number	Description
5200F1593	Barrel bung adapter with square headed screws.
5200F1619	Discharge spout
5200F1750	Hose 5/8" X 8' with 3/4" ferrules
5200F1790	Hand pump nozzle.
5200F1839	Telescoping steel suction pipe extends from 22" to 40"
807CMK	Model 807C Meter Kit to fit this meter to the FR152 pump.
7000KTF7183	Particulate filter kit
7000KTF7186	Hydrosorb filter kit

[back to data sheet index]

Performance

Flow Capacity	20 GPM (76 LPM) at 100 Push/Pull Strokes per Minute
Maximum Recommended Viscosity of Pumped Fluid	Diesel Fuel
Maximum ambient operating temperature	150 °F (66 °C)*
Minimum ambient operating temperature	-15 °F (-26 °C)*
Minimum Dry Vacuum	10 Inches of mercury
Minimum Suction Lift**	11 feet for diesel & see below for gasoline***

* Consult factory for extreme temperature applications outside this range.
** The lift in feet is equivalent to the vertical distance from the surface of the fluid in the tank to the inlet of the pump, PLUS the friction losses through the vertical and horizontal runs of pipe. All elbows and other fittings must be included in the calculation of friction loss. The system should be designed to require a minimum amount of suction lift.
*** Lift of gasoline dependent on Reid's vapor pressure of the gasoline and it's temperature. The lower the vapor pressure and temperature, the higher the possible lift.

CAUTION: Only pump clearly carrying the UL Listing Mark should be used with gasoline or any low flashpoint fluid. Look for the Mark.

[back to data sheet index]

Fluid Compatibility

The Series 150 piston hand pumps are designed for petro products of all types. If there is a question for a particular fluid, check the affects of that fluid on the following wetted materials.

Zinc Plated Steel	**Nickel Plated Steel**	**Aluminum**
Acetal	**300S Stainless Steel**	**400S Stainless Steel**

XALD101

XALD111

XALD164

Start or Stop Function (light grey base, RAL 7035; dark grey lid, RAL 7016)

Description	Type of Push	Type of Contact		Legend Marking	Catalog Number
		N/O	N/C		
Marking on Legend Holder					
1 momentary push button	Flush black	1	–	Start	**XALD101**
	Flush red	–	1	Stop	**XALD111**
Marking on Legend Holder					
1 mushroom head push button Ø40 mm, momentary	Red	–	1	Emergency stop (red legend)	**XALD164**

XALK174

XALK184

XALK194

Emergency Stop Function (light grey base, RAL 7035; yellow lid, RAL 1012)

Description	Type	Type of Contact		Catalog Number
		N/O	N/C	
1 Mushroom head push button Ø 40mm, red Turn to release	Standard	–	1	**XALK174**
	Trigger action	–	1	**XALK178**
1 Mushroom head push button Ø 40mm, red Key release (Key No. 455)	Standard	–	1	**XALK184**
	Trigger action	–	1	**XALK188**
1 Mushroom head push button Ø 40mm, red Push-pull	Standard	–	1	**XALK194**

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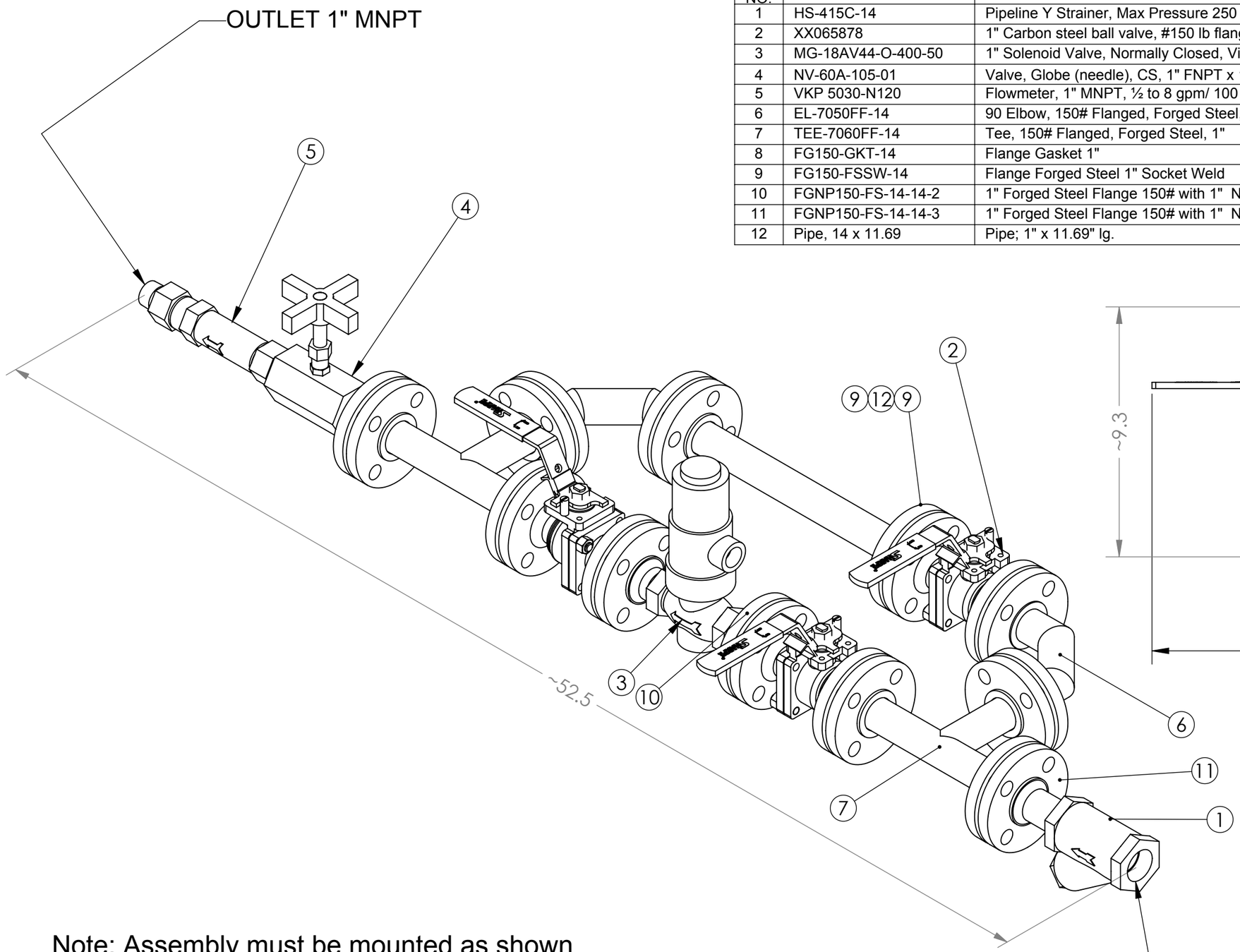
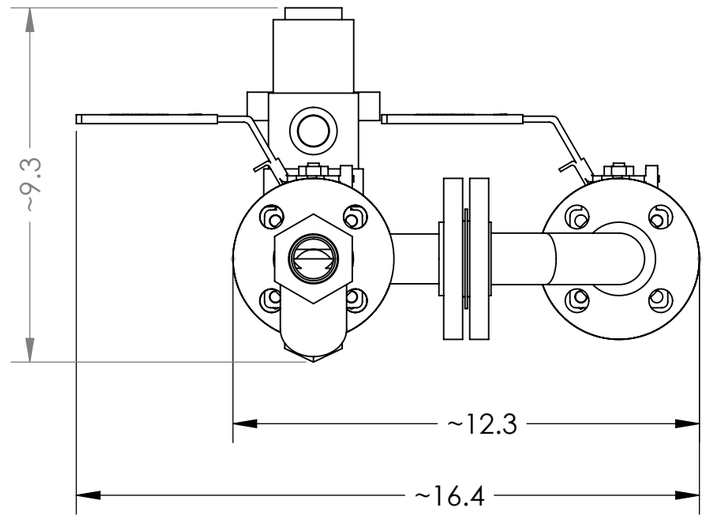
ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	HS-415C-14	Pipeline Y Strainer, Max Pressure 250 PSI, 1" NPT, Cast Iron Body	1
2	XX065878	1" Carbon steel ball valve, #150 lb flange with Reinforced TFM seat with locking handle	3
3	MG-18AV44-O-400-50	1" Solenoid Valve, Normally Closed, Viton , 400 VAC, 50 Hertz	1
4	NV-60A-105-01	Valve, Globe (needle), CS, 1" FNPT x 1" FNPT	1
5	VKP 5030-N120	Flowmeter, 1" MNPT, ½ to 8 gpm/ 100 cSt. with 3/4 NPT union ends	1
6	EL-7050FF-14	90 Elbow, 150# Flanged, Forged Steel, 1"	2
7	TEE-7060FF-14	Tee, 150# Flanged, Forged Steel, 1"	2
8	FG150-GKT-14	Flange Gasket 1"	11
9	FG150-FSSW-14	Flange Forged Steel 1" Socket Weld	2
10	FGNP150-FS-14-14-2	1" Forged Steel Flange 150# with 1" NPT nipple end, 2" long	3
11	FGNP150-FS-14-14-3	1" Forged Steel Flange 150# with 1" NPT nipple end, 3" long	1
12	Pipe, 14 x 11.69	Pipe; 1" x 11.69" lg.	1





Note: Assembly must be mounted as shown with solenoid enclosure vertical and on top

Phillips Fuel Systems
109 Holland Ave., Bridgeport, Ct 06605

TITLE:
Flow Control Manifold, Daytanks, 1" London

Part Number.
FCM14-130062-DT

REV

	NAME	DATE
DRAWN		

SCALE: 1:4 | WEIGHT: ~≤140 | #SHEET 1 OF 1

X:\jobs\2013 Jobs\130062 London\ FCM14-130062-DT 10/18/2013 10:30:38 AM

DO NOT SCALE DRAWING

BRONZE SOLENOID VALVES
Dependable • Packless

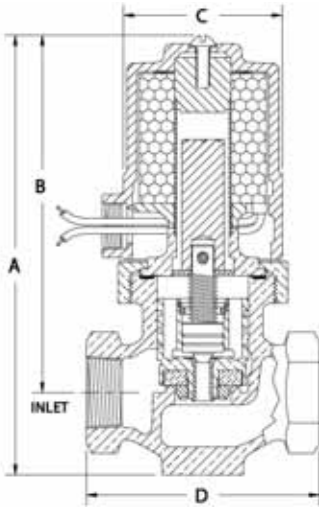
TYPE "A" FULL PORT - NORMALLY CLOSED
1/2" TO 3" PIPE SIZE

NO DIFFERENTIAL PRESSURE REQUIRED TO OPEN

MAX. FLUID TEMP.
212° F
MAX. STATIC PRESSURE
300 PSI
Except valves listed for 500 PSI

OPERATION:
Valve opens when energized and closes when de-energized. When the coil is energized the pilot valve opens, relieving the pressure above the piston, which is then lifted from its seat by the plunger. Upon de-energizing the coil, a spring closes the pilot valve and opens a bleed passageway to permit pressure to build above the piston and seat it.

CONSTRUCTION: (* Wetted parts)
*Valve Body - Cast Bronze, Globe Pattern - NPT ends
*Piston - Bronze
Coil Enclosure - Malleable or Cast Iron, 1/2" NPS conduit conn.
*Plunger - 430 Stainless Steel
*Pilot Valve - 303 Stainless Steel
*Bonnet Tube - 304 Stainless Steel
*Spring - 302 Stainless Steel
*Body Seal - Buna N or Non Asbestos Gasket
*Orifice Seal - Buna N (Viton or Glass Filled Teflon available)
*AC Shading Coil - Copper
*Stem Pin - Inconel
Coil - Encapsulated Class B, 18" leads - (Class H available)



APPLICATION:
To control the flow of Water, Oil, Air, Gas, Solvents, Brine, Vacuum and any other fluids not reactive with construction materials and free of sediment. Valve operates from zero to maximum differential pressure indicated in table. Valve must be mounted in horizontal pipe with solenoid enclosure vertical and on top.

Pipe Size Inches	Max. Diff. PSI	Type No.	Watts AC	Amps Hold 120-60	Amps Inrush 120-60	Watts DC	Ship Wt. Lbs.	Dimensions In Inches			
								A	B	C	D
1/2	110 200 300	18A42 18A32 18A52	25	0.4	1.2	18	8	7	5-7/8	2-3/4	3-1/4
	500	E33A62	45	0.8	2.4	23	16	8	6-7/8	4-1/8	3-1/4
3/4	50 110	18A23 18A43	25	0.4	1.3	18	8	7-1/8	6	2-3/4	3-1/2
	160	118A43	40	0.6	2.0	28					
	200 300	33A33 33A53	45	0.8	2.6	23	12	8-1/8	7	3-1/2	3-1/2
	500	E133A63	65	1.2	3.9	33	17	8-1/8	7	4-1/8	3-1/2
1	50 110	18A24 18A44	25	0.4	1.5	18	10	7-7/8	6-5/8	2-3/4	4-1/8
	160	118A44	40	0.6	2.5	28					
	200 300	33A34 33A54	45	0.8	2.8	23	14	8-7/8	7-1/2	3-1/2	4-1/8
	500	E133A64	65	1.2	4.2	33	19	8-7/8	7-1/2	4-1/8	4-1/8
1-1/4	50 90	18A25 18A45	25	0.4	1.6	18	12	8-3/8	6-3/4	2-3/4	4-1/2
	150	118A45	40	0.6	2.4	28					
	200 300	33A35 33A55	45	0.8	3.0	23	16	9-3/8	7-3/4	3-1/2	4-1/2
	500	†† 40A65	60	1.2	6.2	N/A	20	10-3/8	8-3/4	4-1/2	4-1/2
1-1/2	50 115	35A26 35A46	45	0.8	3.2	23	20	10	8-1/8	4	4-7/8
	160	135A46	65	1.2	4.8	33					
	200 300	41A36 41A56	60	1.2	6.7	35	24	11	9-1/8	4-1/2	4-7/8
	500	141A66	85	2.0	10.0	45					
2	50 100	36A27 36A47	45	0.8	3.5	23	31	11	8-3/4	5-3/8	6
	150	136A47	65	1.2	5.0	33					
	200 300	42A37 42A57	60	1.2	7.4	35	36	12	9-3/4	5-3/8	6
	500	142A67	85	2.0	11.0	45					
2-1/2	50 125 200	43A28 43A48 43A38	60	1.2	8.0	35	43	12-7/8	10-1/8	5-7/8	7-1/4
	300	143A58	85	2.0	12.0	45					
3	50 100 200	44A29 44A49 44A39	60	1.2	8.8	35	56	13-3/4	10-1/2	6-5/8	8-3/8
	300	144A59	85	2.0	13.0	45					

FOR OPTIONS & ACCESSORIES SEE PAGES 24 & 25

Strainers are recommended for use with solenoid valves

(See page 19)

When you order please supply the following:

- Pipe Size
- Valve Type
- Voltage (AC or DC)
- Hertz
- Fluid
- Fluid Temperature
- Max. Diff. Pressure
- Optional Features

(See pages 24 & 25)

†† Not available for DC operation

Y-Strainers

Y Strainers are designed for steam, oil or water lines. Strainers should be installed ahead of temperature regulating and/or pressure reducing valves and steam traps to protect their moving parts from dirt, this is particularly important for new installations.

Screwed NPT End

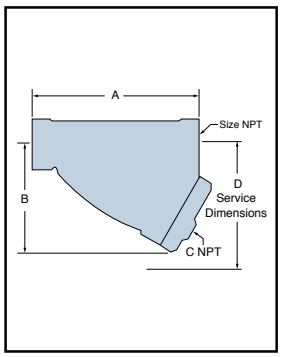
Model 415C

- Cast iron body
- Maximum pressure:
  – 250 psig (17.3 bar) for steam service
  – 400 psig (27.6 bar) for water service
- Available in sizes ½" - 3" NPT

Model 420C

- Cast brass body
- Maximum pressure:
  – 300 psig (20.6 bar) for steam service
  – 400 psig (27.6 bar) for water service
- Available in sizes ½" - 3" NPT

Screwed NPT End Y-Strainer



Ordering Information

Model Number	Part Number	NPT Size in.	Weight Approx. lbs. (kg)
415C	405000	½	2 (0.9)
415C	405003	¾	2½ (1.1)
415C	405006	1	4 (1.8)
415C	405009	1¼	6 (2.7)
415C	405012	1½	7 (3.2)
415C	405015	2	12 (5.4)
415C	405018	2½	19 (8.6)
415C	405022	3	32 (14.5)
420C	405024	½	1 (0.5)
420C	405027	¾	2 (0.9)
420C	405030	1	4 (1.8)
420C	405033	1¼	5 (2.3)
420C	405036	1½	7 (3.2)
420C	405039	2	12 (5.4)
420C	405042	2½	22 (10)
420C	405045	3	35 (16)

Dimensions in. (mm)

Model 415C

Part Number	A	B	NPT C	D
405000	4 1/8 (105)	2 1/2 (64)	1/2	3 1/4 (83)
405003	3 3/4 (95)	2 7/16 (62)	3/8	3 (76)
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405009	4 7/8 (124)	3 3/4 (95)	3/4	6 (152)
405012	6 (152)	4 (102)	3/4	6 (152)
405015	7 3/8 (187)	4 1/4 (108)	3/4	6 3/4 (171)
405018	9 1/4 (235)	5 7/8 (149)	1 1/2	7 7/8 (200)
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Part Number	A	B	NPT C	D
405024	2 15/16 (75)	2 (51)	1/4	3 (76)
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Specifications

Model	Body Material	Steam Service			Water Service		
		Pressure psig (bar)	Temperature °F (°C)	Screen Material Mesh SS	Pressure psig (bar)	Temperature °F (°C)	Screen Material Mesh SS
415C	Cast Iron	250 (17.3)	400 (204)	20	400 (28)	100 (38)	20
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Pumps that fit . . . Pumps that perform

HAIGHT . . . BETTER BY DESIGN

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TYPICAL COMPETITIVE GEAR DESIGN

The typical cantilevered gear design with the inner idler gear has several pronounced disadvantages that the Haight design eliminates, including:

- Single point of entry liquid feed to gears resulting in a “built-in” inlet restriction. This often requires speed reduction at fluid viscosities above 750 SSU.
- Hydraulic imbalance resulting in shaft deflection and premature wear.
- Increased idler speeds resulting in higher gear tip speeds and accelerated wear.
- Thrust bearing field adjustment needed to keep driver gear properly positioned.

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Haight pumps feature an inner driving gear coupled to a hydraulically balanced free floating outer gear on a dramatically shortened shaft arrangement.

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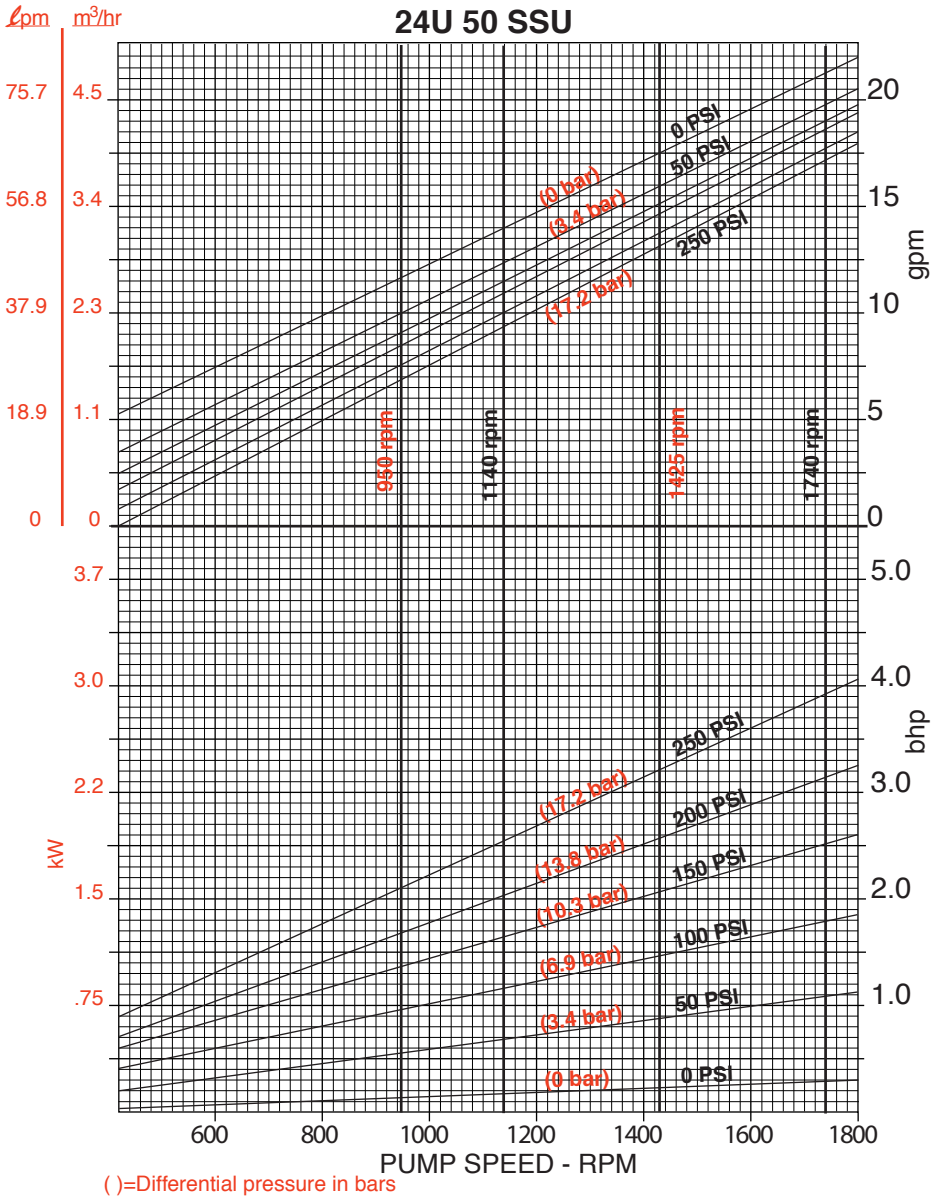
- Gears rotate on a shaft that is fully supported at both ends by lubricated and vented bearings eliminating deflection which causes wear.
- Pinion and rotor gears are hydraulically balanced by the pumped fluid eliminating pistoning into the casing and cover.
- Dual paths of fluid entry to the gears (rather than one) allows Haight pumps to generate full rated displacement while close-coupled at standard motor speeds, without gear reducers at viscosities up to 10,000 SSU. This eliminates misalignment and significantly reduces cost.
- All rotating components are accessible beneath the front cover making routine cleaning and service faster, and simpler.
- Lower rotor tip speeds result in reduced noise levels.

HAIGHT PUMPS LAST LONGER

- **1-8 GPM**
  Typical top gear speed cantilevered design (RPM) 2,333
  Top gear speed Haight Universal (RPM) 1,750 (Motor Speed)
  Difference 583
- **10-20 GPM**
  Typical top gear speed cantilevered design (RPM) 2,846
  Top gear speed haight Universal (RPM) 1,750 (Motor Speed)
  Difference *1,096*
- **30-80 GPM**
  Typical top gear speed cantilevered design (RPM) 2,407
  Top gear speed Haight Universal (RPM) 1,750 (Motor Speed)
  Difference 657

- A typical cantilevered gear design pumps as shown here must increase the top rotating speed of the gear set by an average of 33% in the 1-8 GPM range, 63% in the 10-20 GPM range, and 38% in the 30-80 GPM range for any given volume of displacement.
- A Haight universal pump requires, on average, 46,720 fewer revolutions **per operating hour** for a given volume of displacement.

THE HAIGHT ADVANTAGE


24U 50 SSU
ℓpm
m³/hr
75.7
4.5
56.8
3.4
37.9
2.3
18.9
1.1
0
0
950 rpm
1140 rpm
1425 rpm
1740 rpm
0 PSI
50 PSI
250 PSI
(0 bar)
(3.4 bar)
(17.2 bar)
20
15
10
5
0
gpm
3.7
3.0
2.2
1.5
.75
kW
250 PSI
200 PSI
150 PSI
100 PSI
50 PSI
0 PSI
(17.2 bar)
(13.8 bar)
(10.3 bar)
(6.9 bar)
(3.4 bar)
(0 bar)
5.0
4.0
3.0
2.0
1.0
bhp
600
800
1000
1200
1400
1600
1800
PUMP SPEED - RPM
( )=Differential pressure in bars

XALD101

XALD111

XALD164

Start or Stop Function (light grey base, RAL 7035; dark grey lid, RAL 7016)

Description	Type of Push	Type of Contact		Legend Marking	Catalog Number
		N/O	N/C		
Marking on Legend Holder					
1 momentary push button	Flush black	1	–	Start	**XALD101**
	Flush red	–	1	Stop	**XALD111**
Marking on Legend Holder					
1 mushroom head push button Ø40 mm, momentary	Red	–	1	Emergency stop (red legend)	**XALD164**

XALK174

XALK184

XALK194

Emergency Stop Function (light grey base, RAL 7035; yellow lid, RAL 1012)

Description	Type	Type of Contact		Catalog Number
		N/O	N/C	
1 Mushroom head push button Ø 40mm, red Turn to release	Standard	–	1	**XALK174**
	Trigger action	–	1	**XALK178**
1 Mushroom head push button Ø 40mm, red Key release (Key No. 455)	Standard	–	1	**XALK184**
	Trigger action	–	1	**XALK188**
1 Mushroom head push button Ø 40mm, red Push-pull	Standard	–	1	**XALK194**

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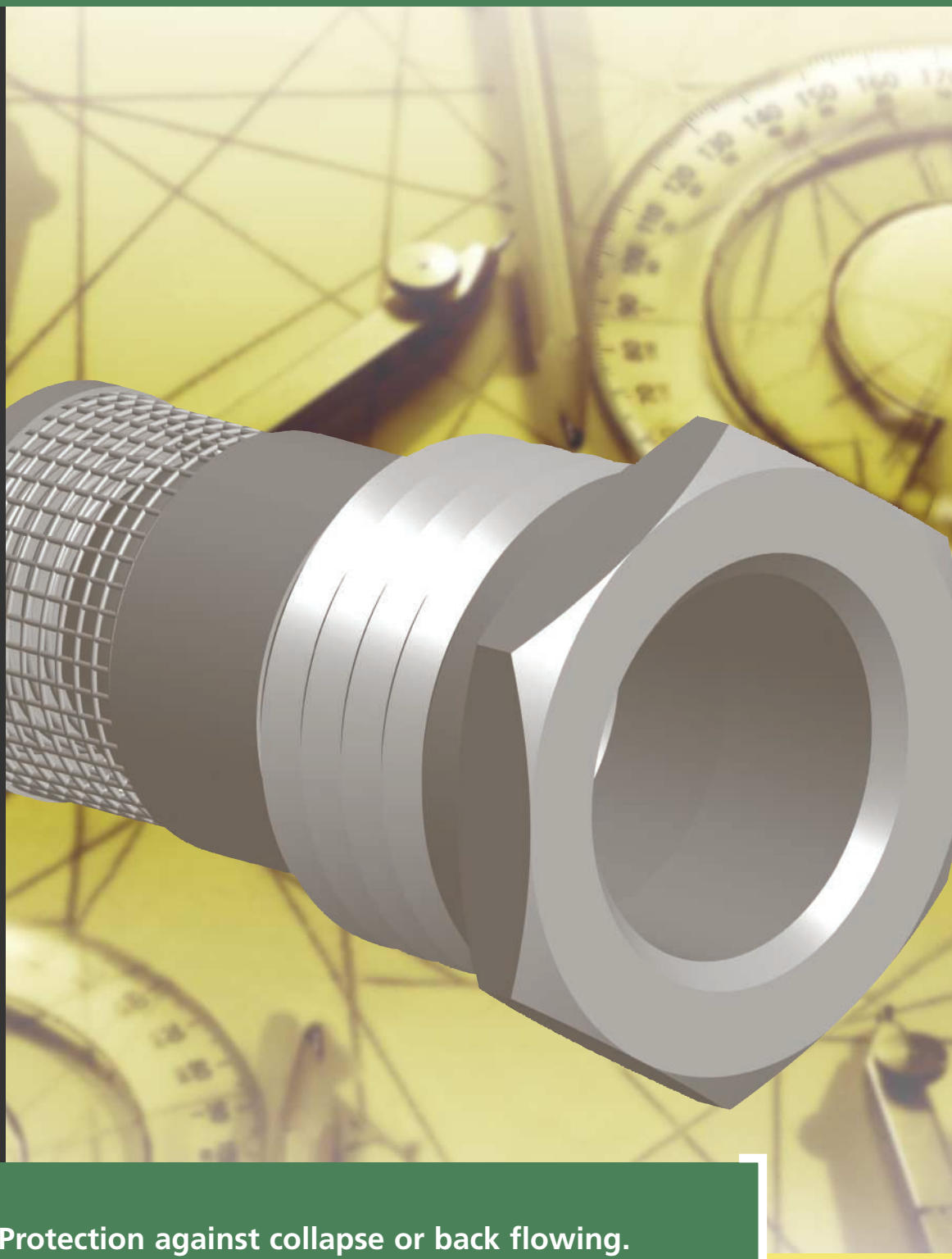
Vacuum Breakers

Anti-siphoning check valves

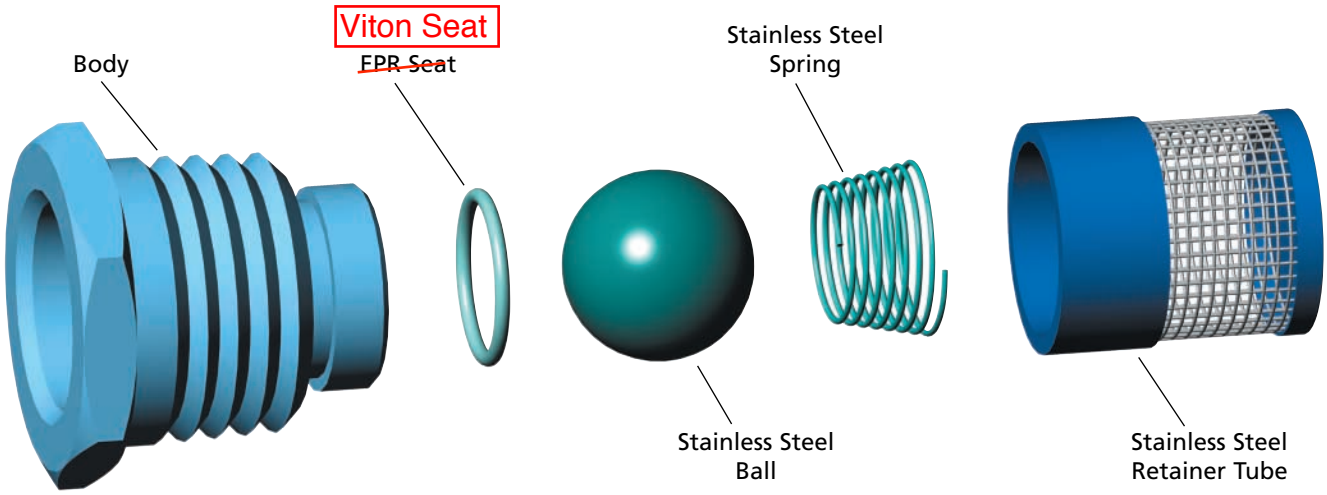
KĀDANT JOHNSON

Vacuum check valves and backflow devices.



Protection against collapse or back flowing.

Series VB8



Fast acting, tight closing, high capacity
Kadant Johnson Vacuum Breakers provide a simple, dependable way to relieve any unwanted vacuum condition that may develop in a closed vessel or pipeline. They can be used to prevent contamination from back flowing in fluid handling systems and to protect equipment against collapse or implosion. They combine tight closing with instant response; provide large air venting capacity; are designed for easy installation and long service life.

Positive closing, low breakaway
The successful combination of the spring action on a round ball and the soft resilient seat assures positive bubble-tight closing, even at very low differential pressures. And, of course, the higher the pressure the tighter the seal.

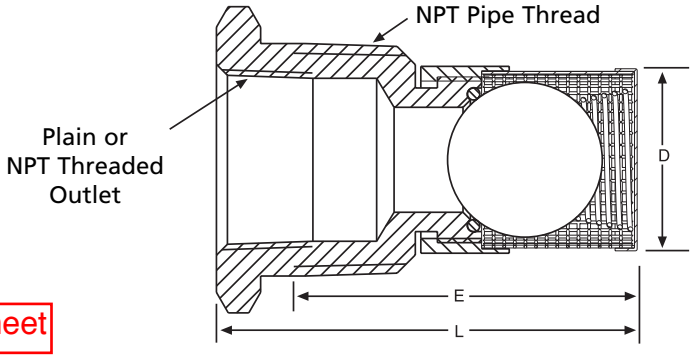
Since only slight spring pressure is needed for seating, the ball comes off the soft seat at a very low vacuum condition, providing almost instantaneous protection. Sealing is accomplished by an EPR o-ring. The supporting seat, however, is designed to assume any pressure in excess of the small amount needed for sealing, thus preventing any excessive compression of the o-ring.

Quiet, trouble-free operation
The soft resilient seat, combined with the gentle spring action, provides quiet opening and closing; chatter is completely eliminated. Corrosion-resistant seating surfaces leave little danger of any sticking or leaking. The simple design assures long and dependable service life, as proven both in the laboratory and in the field.

Easily installed, easily maintained
Kadant Johnson Vacuum Breakers have hex heads and standard NPT pipe threads, and are simply threaded into pipe fittings or available tank openings. Outlets can be threaded if desired.

Rigorously tested
In exhaustive endurance tests Kadant Johnson Vacuum Breakers have been subjected to 120 psig of steam and then vacuum, four times a minute, and still opened freely and closed bubble-tight after a million such test cycles. Every individual vacuum breaker is bubble-tested before it leaves the factory.

High pressure and temperature
Kadant Johnson Vacuum Breakers are rated for use with pressures up to 300 psig and temperatures up to 365°F. Higher operating pressures are possible, depending upon size, seal materials, and temperatures.



Sizes per datasheet

Size	Quick Ship No. (Brass)	Quick Ship No. (Stainless Steel)	Outlet	Outlet Size	Total Length "L"	Engaged Length "E"	O.D. of Tube "D"	Diameter of Orifice
3/8"	–	24A75500	Plain	1/4"	1-1/2"	1-1/8"	9/16"	1/4"
3/8"	24A75200	24A75600	Threaded	1/4"	1-1/2"	1-1/8"	9/16"	1/4"
1/2"	24A75900	24A76300	Plain	3/8"	1-3/4"	1-3/8"	11/16"	9/32"
1/2"	24A76000	24A76400	Threaded	3/8"	1-3/4"	1-3/8"	11/16"	9/32"
3/4"	24A76700	24A77100	Plain	1/2"	2-1/8"	1-5/8"	13/16"	13/32"
3/4"	24A76800	24A77200	Threaded	1/2"	2-1/8"	1-5/8"	13/16"	13/32"
1"	24A77500	24A77900	Plain	3/4"	2-3/8"	1-7/8"	1-1/16"	19/32"
1"	24A77600	24A78000	Threaded	3/4"	2-3/8"	1-7/8"	1-1/16"	19/32"
1-1/4"	24A78300	24A78500	Plain	1"	2-15/16"	2-5/16"	1-5/16"	3/4"
1-1/4"	24A78400	24A78600	Threaded	1"	2-15/16"	2-5/16"	1-5/16"	3/4"
1-1/2"	24A78700	24A78900	Plain	1-1/4"	3-1/16"	2-1/2"	1-9/16"	7/8"
1-1/2"	24A78800	24A79000	Threaded	1-1/4"	3-1/16"	2-1/2"	1-9/16"	7/8"

Simple Installation
The drawings at the right show how the vacuum breaker can be installed in a threaded opening in either a vertical or horizontal position. When installed in a pipeline fitting, use of a reducing bushing is required to make sure the vacuum breaker does not intrude far enough to impede flow in the line or bind against any internal wall.

Figure 1
Horizontal installation in either end or side outlet of tee, showing use of reducing bushing.

Figure 2
Vertical installation in top outlet of tee, showing use of reducing bushing.

Figure 3
Vertical installation in bottom outlet of tee, showing use of reducing bushing.

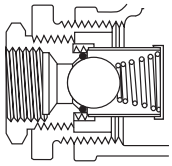


Figure 1

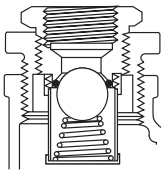


Figure 2

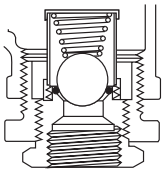


Figure 3

Vacuum Required to Open

		Horizontal	Vertical		
			Top Outlet	Bottom Outlet	No Spring
VB8-38 3/8"	In. H_2O	7.00	4.30	10.5	3.50
	In. Hg	0.51	0.32	0.77	0.26
	PSI	0.25	0.16	0.38	0.13
VB8-51 1/2"	In. H_2O	9.30	10.6	18.0	4.40
	In. Hg	0.68	0.78	1.32	0.32
	PSI	0.34	0.38	0.65	0.16
VB8-76 3/4"	In. H_2O	15.3	15.0	25.0	5.10
	In. Hg	1.13	1.10	1.84	0.37
	PSI	0.55	0.54	0.90	0.18
VB8-101 1"	In. H_2O	10.0	5.90	19.5	6.60
	In. Hg	0.73	0.43	1.43	0.48
	PSI	0.36	0.21	0.70	0.24
VB8-126 1-1/4"	In. H_2O	10.5	7.10	21.0	6.90
	In. Hg	0.77	0.52	1.54	0.51
	PSI	0.38	0.26	0.76	0.25
VB8-151 1-1/2"	In. H_2O	10.0	4.90	20.3	7.90
	In. Hg	0.73	0.36	1.49	0.58
	PSI	0.36	0.18	0.73	0.29

Note: Stainless Steel Ball was used to arrive at all figures.
Values given are averages of test results and may vary slightly.

SAFETY WITHOUT COMPROMISE

SERIES 670 / 6670

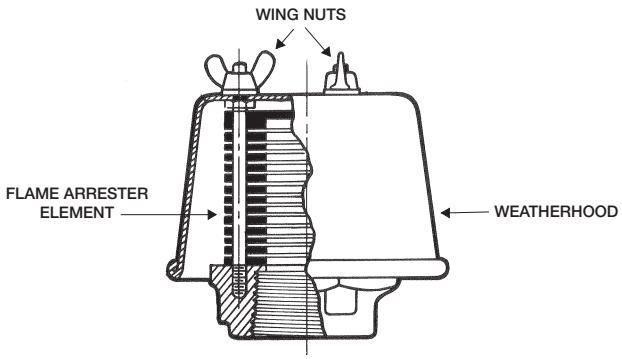
End-of-Line Circular Plate Flame Arrester

- Sizes 1" (DN 25) through 4" (DN 100)
- Listed by Underwriters Laboratories in 1" and 2" sizes
- Suitable for use with vapors equivalent to NEC 500 Group D, IEC Group IIA
- Vertically mounted, parallel plate-type flame arrester
- Protects against fire
- Minimizes pressure drop under normal operating conditions
- Easy inspection and maintenance
- Factory inspected prior to shipment
- Available in Aluminum and Stainless Steel

SERIES 670 6670

OBJECTIVE

The Series 670/6670 Flame Arresters are designed to provide flame stopping protection for a tank's vapor space when mounted to the end of a tank nozzle leading directly to atmosphere. The arresters are intended for use with vapors equivalent to Group D of the National Electric Code (NEC 500). The arresters prevent a flame front generated by an unconfined deflagration occurring outside the tank from propagating into the vapor space.



TECHNIQUE

The arrester is mounted on the end of a vent pipe from the tank. Vapors are allowed to escape into the atmosphere and air can be drawn into the tank through the specially designed flame arrester grid assembly. If an ignition source outside the tank is encountered, the flame arrester provides protection for the tank contents.

SPECIAL FEATURES

Easy Inspection, Installation and Maintenance. Design and light weight of unit permit easy, convenient handling for inspection, installation and maintenance. The weatherhood is readily removable by loosening just a few extra large wing nuts.

Automatic Condensate Drainage. Vertically mounted, circular plate-type flame arrester is employed for self-drainage of condensate. This prevents accumulation of condensate subject to freezing and consequent clogging of the arrester under low temperature conditions.

Positive Flame Arresting. The Series 670/6670 employs a circular-plate, precisely-spaced, type flame arrester to protect tank contents by preventing the propagation of fire into the tank. Precision embossings on alternate plates provide correct air-spacing for flame arresting function. Plates are fabricated from 1/16" to 3/32" heavy gauge metal, depending on material of construction, to resist distortion and bending during cleaning.

Sizes Available. 1", 2", 3" and 4" have standard NPT female threaded connections. Adapter flanges are available in these sizes.

Test Lab Listings. Listed by Underwriters Laboratories (UL) in 1" and 2" sizes.

PRO-FLOW III® Sizing and Selection Software. Use PRO-FLOW III® to select the correct size unit for pressure and vacuum relief calculated in accordance with API 2000, ISO 28300, NFPA 30 and OSHA 1910.106.

Quality Assurance. Each unit is inspected to meet Protectoseal's high standards prior to shipment.

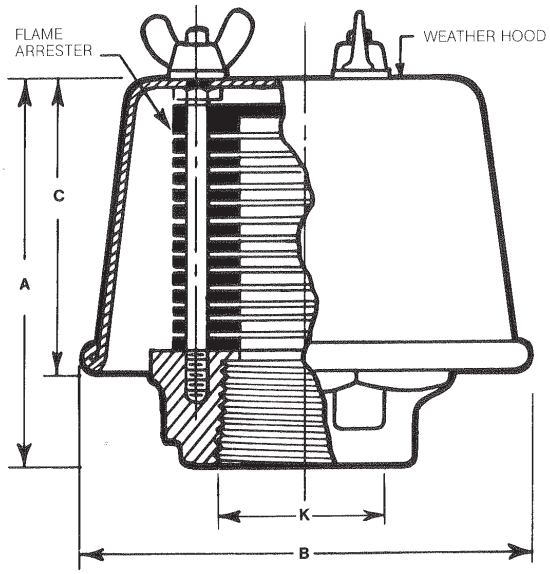
CONSTRUCTION

A comprehensive range of materials is offered as shown in the chart below. Other materials and features can be furnished upon request.

Available Options.

- ➤ Material certifications for castings
- ➤ Flange connections

Series	Weatherhood	Flame Arrester Grid Assembly
670	Aluminum	Aluminum 356
6670	Aluminum	Aluminum 356
F670	316 S.S.	316 S.S.
FF6670	316 S.S.	316 S.S.



DIMENSIONS & ORDERING INFORMATION *(Dimensions shown are for reference only, contact Factory for certified drawings.)*

Cat. No.*	Pipe Size K	Ht. A	Width B	Length C	Test Lab Listing
671	1"	2 7/8"	3 3/8"	2 3/16"	UL
6672	2"	4 5/8"	6 1/8"	4"	UL
673B	3"	7 3/8"	7 1/2"	6 9/16"	-
674	4"	6 3/4"	8 1/2"	5 1/2"	-

** Cat. No. designates all Aluminum construction, please refer to chart on reverse for other materials of construction.*

ADDITIONAL PRODUCTS FROM PROTECTOSEAL

Series 18540

Pipe-Away Pressure Vacuum Relief Vent for applications that require hazardous vapors be processed into manifolded piping and not released into the atmosphere

Series 7800

Emergency Vent protects tanks against rupture or explosion resulting from excessive internal pressure caused by exposure to fires.

Series 4950

Vent Line / In-Line Parallel Plate Flame Arrester is designed for installation in open vent pipe or bleed lines from storage or processing tanks. Suitable for NEC Group D (IEC Group IIA) vapors

Series 830

Combination Pressure / Vacuum Relief Vent & Flame Arrester provides pressure and vacuum relief as well as protection from propagation of externally introduced flames. Suitable for NEC Group D (IEC Group IIA) vapors.

PROTECTOSEAL®
Safety Without Compromise

225 Foster Ave., Bensenville, IL 60106-1690
P 630.595.0800 F 630.595.8059
info@protectoseal.com www.protectoseal.com

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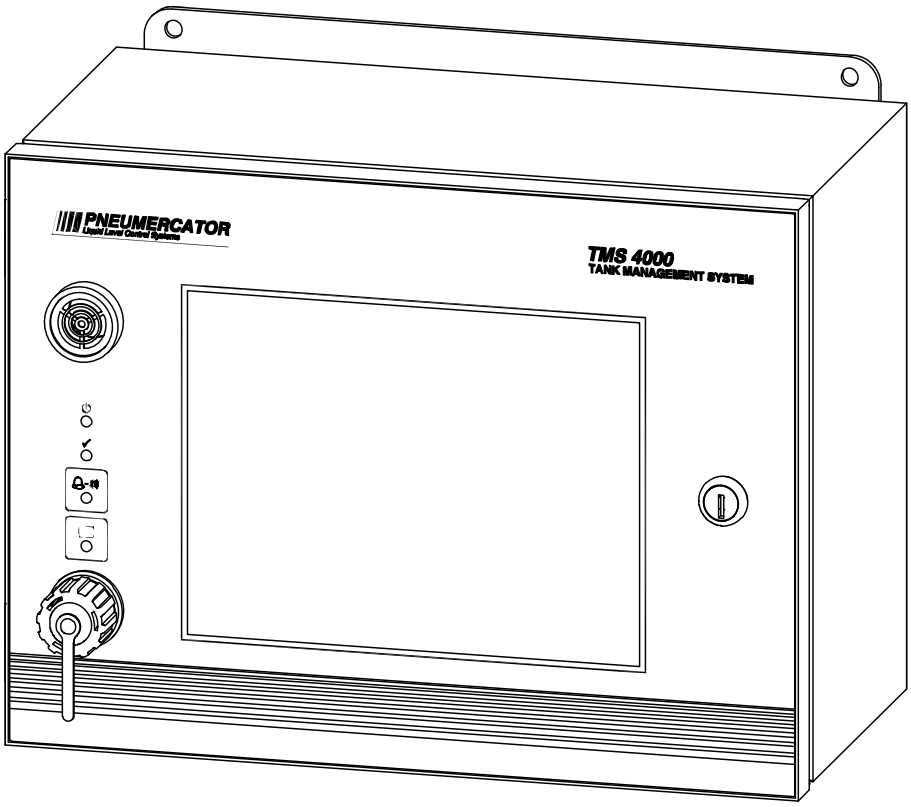
231113-2.10, 2.11 Pneumercator Leak and Level Monitoring System Datasheets

US Embassy London
Fuel Oil Submittal
231113
BL Harbert International
120080

PNEUMERCATOR
Liquid Level Control Systems

MULTI TANK
MONITORING
SYSTEM

OPERATION MANUAL



DRAWING NO. 20208 REV. A

MODEL TMS4000

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HAUPPAUGE, NY 11788

TEL: (631) 293-8450
FAX: (631) 293-8533
http://www.pneumercator.com

Note: A separate INSTALLATION MANUAL is available, but NOT required for TMS4000 operation.

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SECTION 1 – PRODUCT DESCRIPTIONS

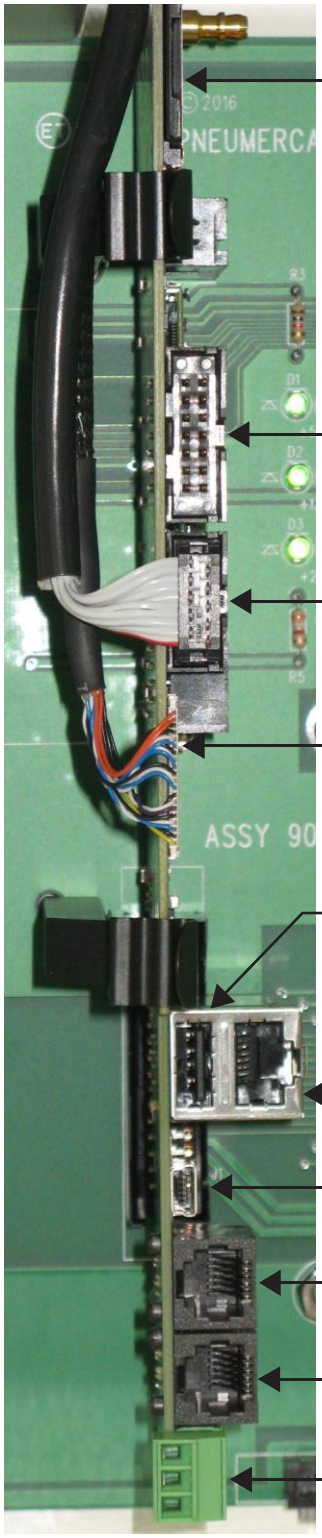
1.1 GENERAL SYSTEM OVERVIEW

This document covers the operation of the TMS4000 using the touch screen interface. A few additional details are visible on the face of the TMS4000 as shown below. Below the integrated horn in the top left corner are three LEDs. From top to bottom, these are the Green Power LED, Green Normal Status LED, and Red Alarm Status LED. The Alarm Status LED will blink for new alarms. Once the TMS alarm has been acknowledged using the Acknowledge button (Bell icon) in the top corner of the touch screen, the Alarm Status LED will not blink and will stay on until the alarm condition is satisfied. Once the alarm condition is satisfied, the Alarm Status LED will be off and the Normal Status LED will be on. Below the LEDs is the Day/Night sensor used to detect the ambient light and automatically adjust the screen brightness, when enabled.

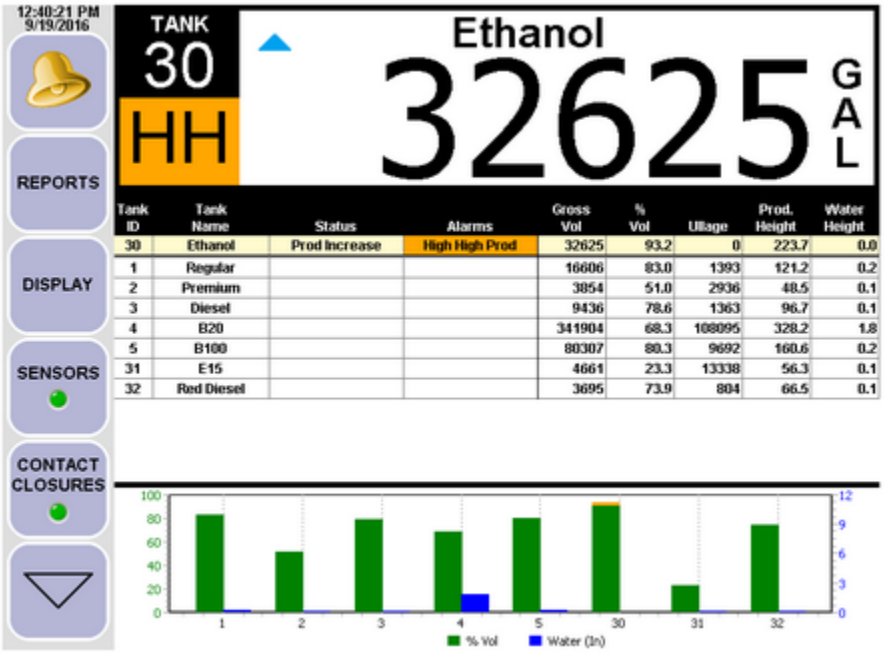
The touch screen is the primary interface for viewing real-time status of tank probes, sensors, and contact closure inputs. Additional access is provided for viewing system reports, changing the system Configuration, and upgrading the TMS firmware.

This manual was written referencing TMS4000 firmware version 10.044. Although some screen shots may vary between firmware versions, the principle of operation remains the same. Contact Pneumercator for any firmware version specific questions.

1.1.1 PROCESSOR CARD CONNECTIONS

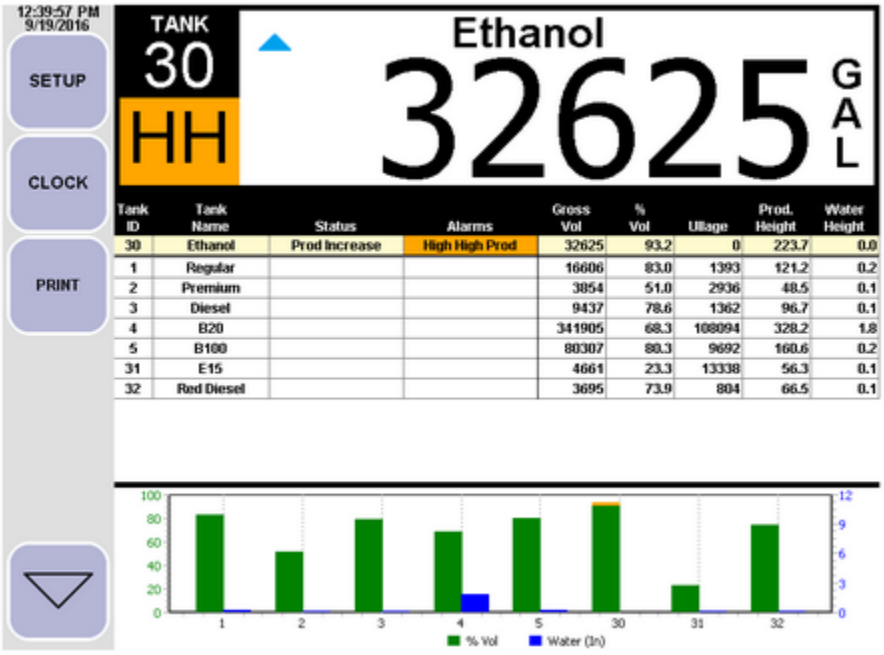


1.2 MAIN SCREEN



Tank ID	Tank Name	Status	Alarms	Gross Vol	% Vol	Ullage	Prod. Height	Water Height
30	Ethanol	Prod Increase	High High Prod	32625	93.2	0	223.7	0.0
1	Regular			16606	83.0	1393	121.2	0.2
2	Premium			3854	51.0	2936	48.5	0.1
3	Diesel			9436	78.6	1363	96.7	0.1
4	B20			341904	68.3	108095	328.2	1.8
5	B100			80307	80.3	9692	160.6	0.2
31	E15			4661	23.3	13338	56.3	0.1
32	Red Diesel			3695	73.9	804	66.5	0.1

Scroll to next set of buttons using down arrow in bottom left corner.



Tank ID	Tank Name	Status	Alarms	Gross Vol	% Vol	Ullage	Prod. Height	Water Height
30	Ethanol	Prod Increase	High High Prod	32625	93.2	0	223.7	0.0
1	Regular			16606	83.0	1393	121.2	0.2
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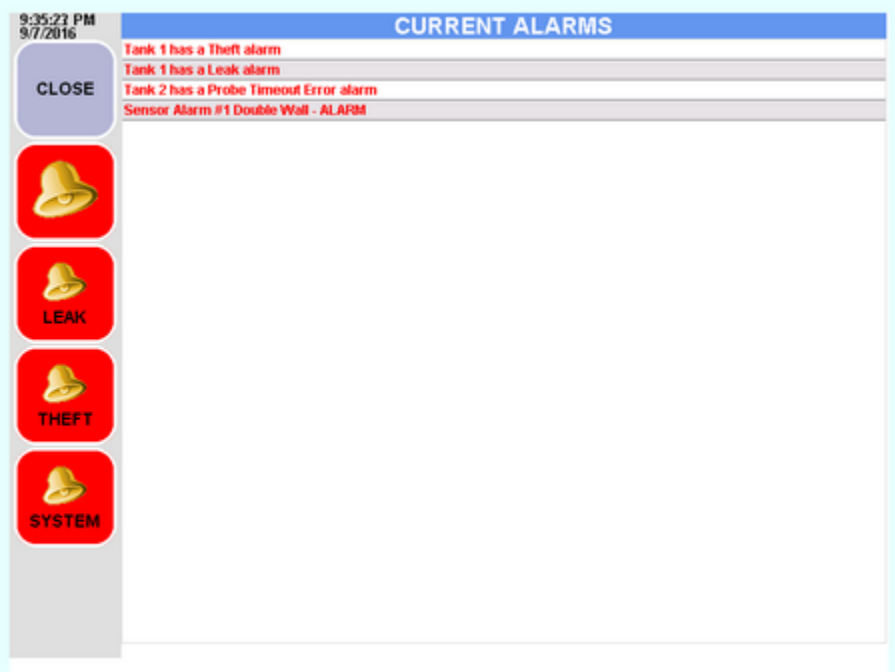
3	Diesel			9437	78.6	1362	96.7	0.1
4	B20			341905	68.3	108094	328.2	1.8
5	B100			80307	80.3	9692	160.6	0.2
31	E15			4661	23.3	13338	56.3	0.1
32	Red Diesel			3695	73.9	804	66.5	0.1

Single Large Meter with Product and Water Bar Graphs shown

The above screens show the Main screen for the TMS4000. The buttons along the left edge provide access to different features that are described on the pages to follow. Above the buttons are shown the current date and time. The display to the right of the buttons show a large meter representing Tank 1, Gross Volume; a tabular display capable of displaying a minimum of 12 rows containing tank information without scrolling vertically; and a bar graph at the bottom showing bars for both percentage of tank volume and water level. The real-time display can be customized to suit your preferences as described in the following section.

1.3 ALARM ACKNOWLEDGMENT

Clicking on the Alarm Acknowledgment button (shown with a Bell icon) in the top left corner of the Main screen will silence the integrated horn and present the screen shown below. This provides the means of viewing the current Alarm/Event status and contains four different buttons on the left edge for acknowledging different categories of Alarm/Event conditions. The conditions that may be acknowledged in each button are listed below the screenshot.



General Acknowledgment: Represented by a bell icon without supporting text. The list of common conditions that may be acknowledged include:

- Tank Product Set Points
- Tank Water Set Points
- Tank Temperature Set Points
- Leak/Point Level Sensor Alarms
- CC Inputs

Leak Acknowledgment: The bell icon shown with LEAK below it is used to acknowledge a Failed In-Tank Leak Test. Once acknowledged, the failure will be removed from the list and will no longer cause the Alarm LED to be lit.

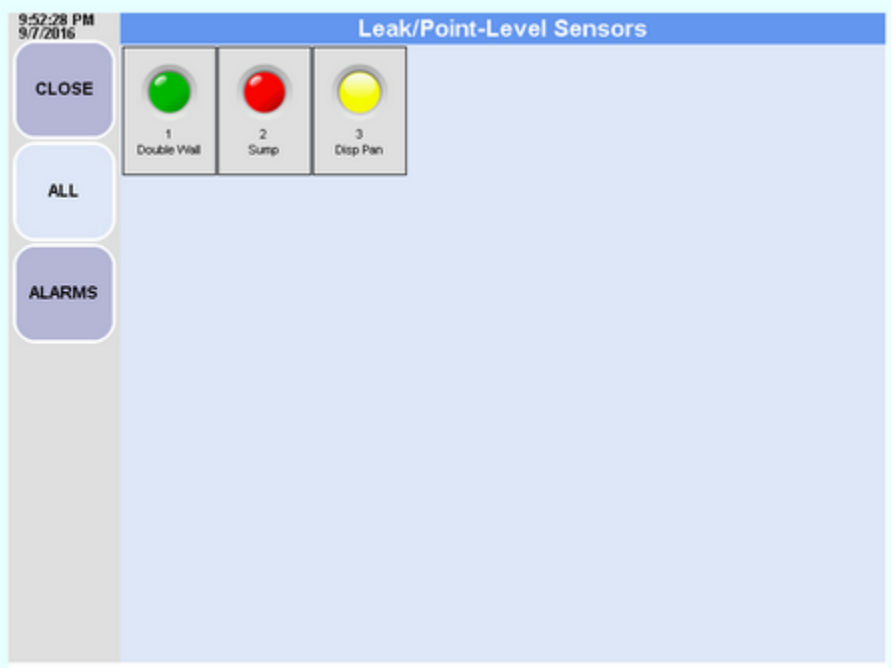
Theft Acknowledgment: The bell icon shown with THEFT below it is used to acknowledge a theft of product from a tank. Theft is an optional feature that must be enabled through the system configuration. Details are provided in a later section.

System Acknowledgment: The bell icon shown with SYSTEM below it is used to acknowledge system Events. These include Probe Timeout, Probe Sync, and Sensor Fault Errors.

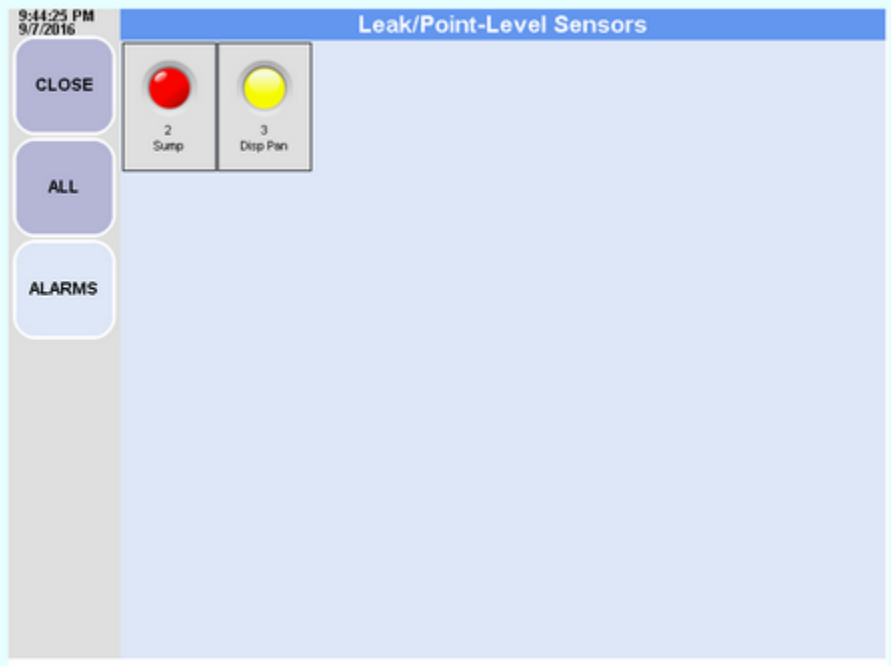
1.4 LEAK/POINT LEVEL SENSOR STATUS

The sensor's alarm or activity status is represented graphically as illustrated below. The colors represent the following:

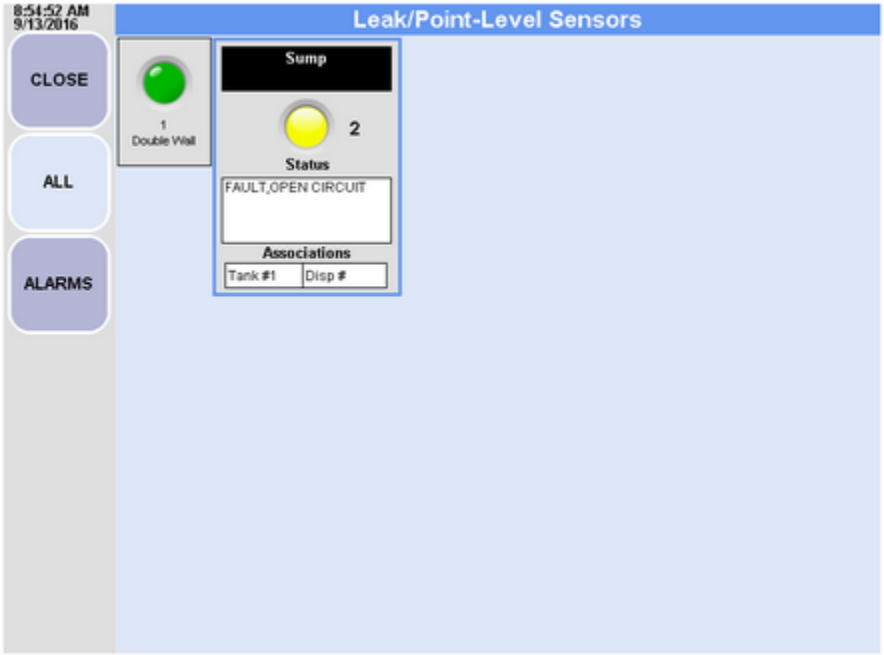
- Green: Normal or inactive sensor
- Red: Sensor alarm or activity. May be a general, product, or water alarm.
- Yellow: Sensor fault error. Either open or short-circuited wiring or a faulty sensor.



All view: shows the status for all enabled sensors



Alarms view: shows only the sensors in an alarm or error state.

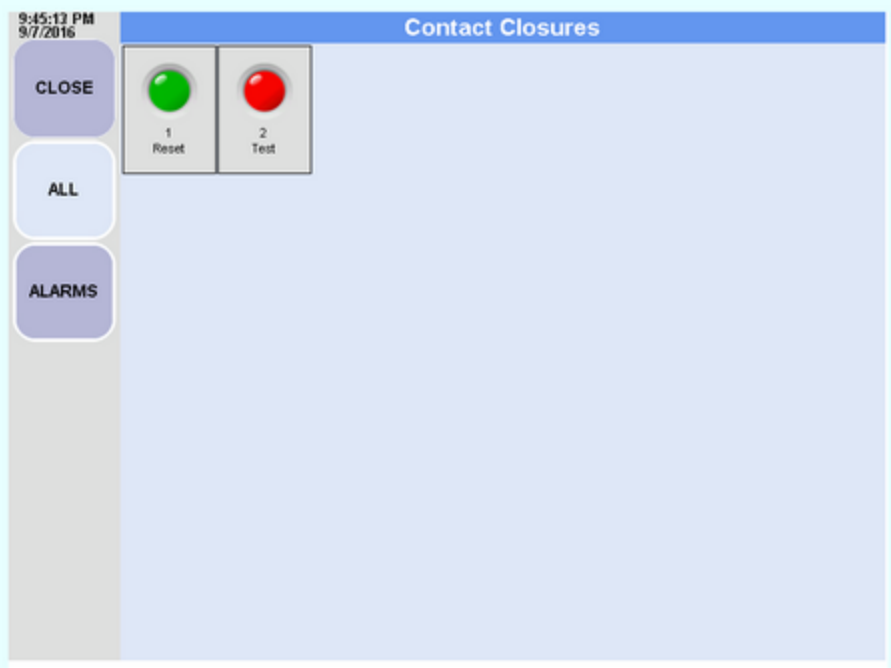


Additional details about the sensor can be obtained by touching the Sensor Status icon. The above screen shot shows a detailed description of the sensor condition in the Status section and additional information about the physical location of the sensor in the Associations section at the bottom.

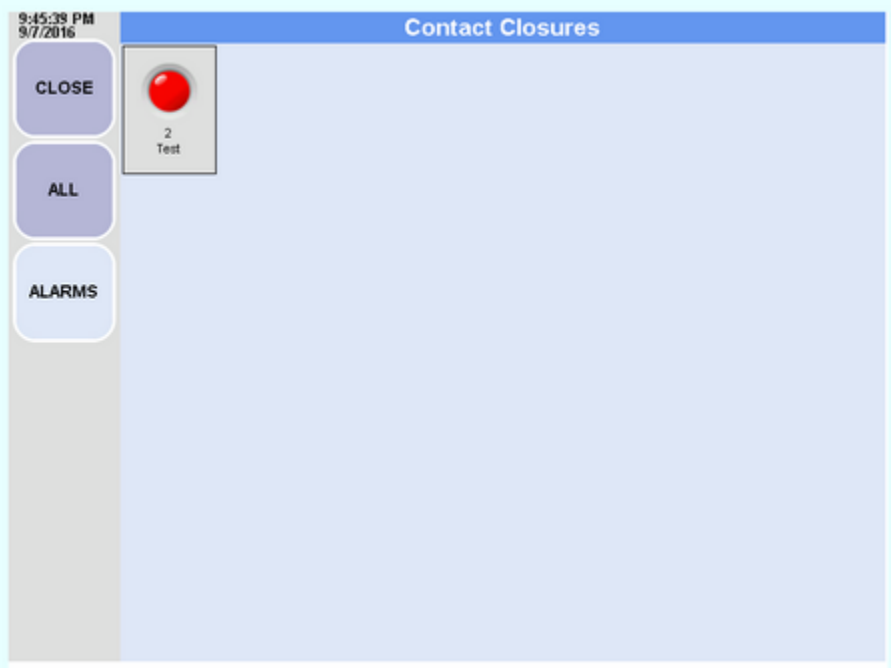
1.5 CC INPUT STATUS

The alarm or activity status of individual CC Inputs are represented graphically as illustrated below. The colors represent the following:

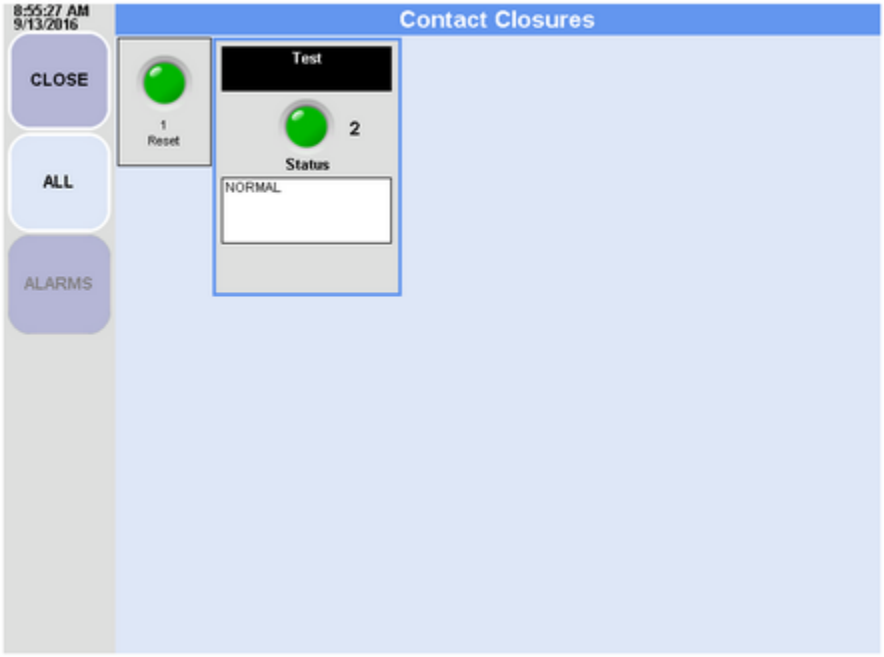
- Green: Normal or inactive sensor
- Red: CC Input in an alarm or active state.



All view: shows the status for all enabled CC Inputs



Alarms view: shows only the CC Inputs in an alarm or error state.

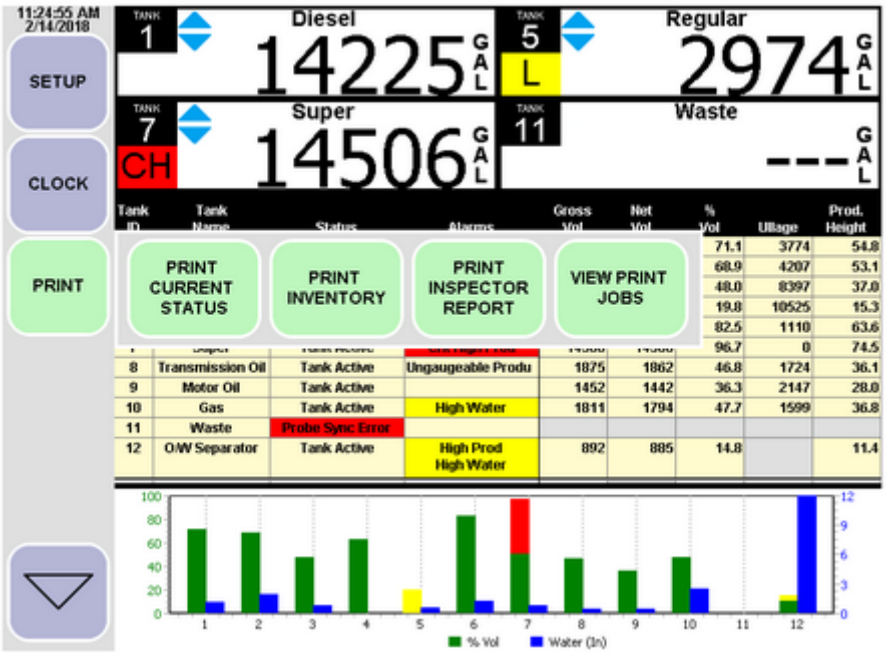


Additional details for the CC Input are show in the Status section after touching the CC Input Status icon.

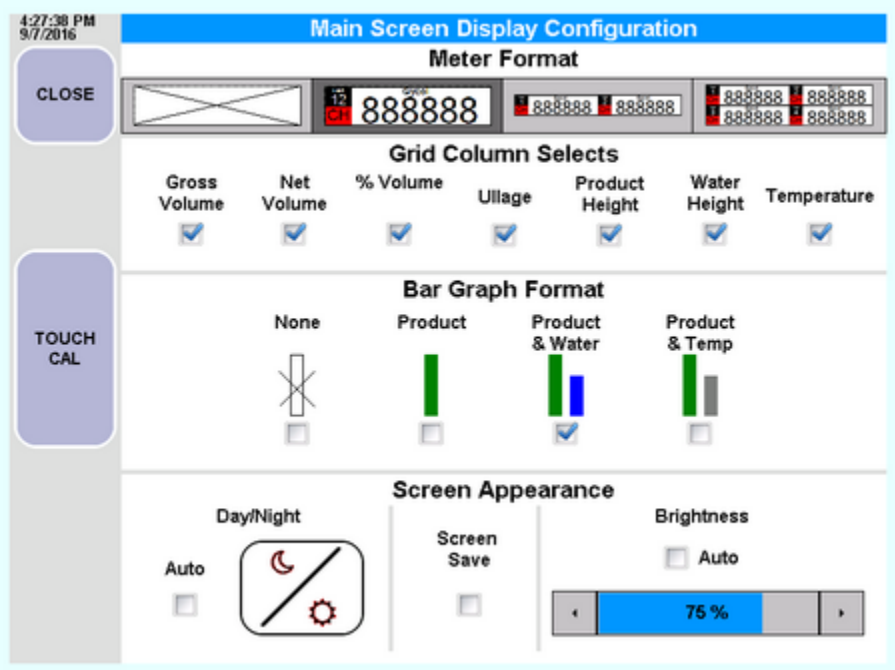
1.6 PRINTING

Many details may be printed from a TMS4000 equipped with a printer. A print button will be visible wherever printing is available. The information that can be printed includes the Reports and System Configuration. The below screen capture displays the options for the Print button accessible on the Main Screen. The reports accessible via this Print button are as follows:

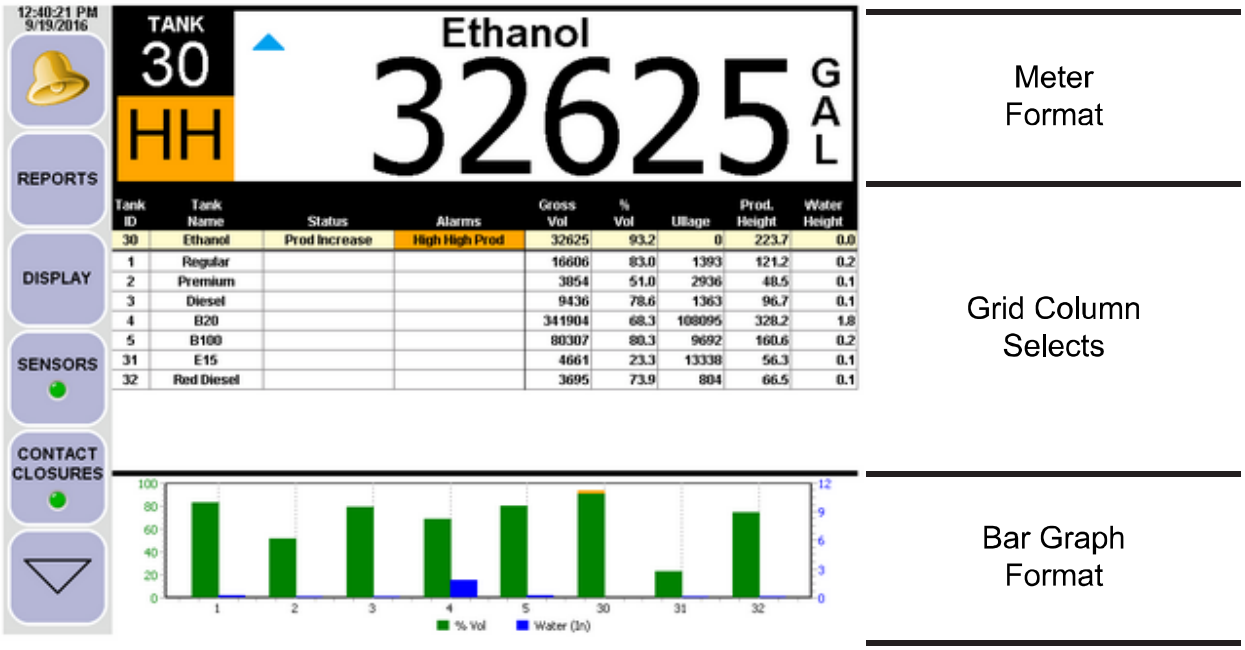
- Print Status: This prints the full system status reports including the states of all enabled tanks/probes and leak/point level sensors
- Print Inventory: The current Inventory displayed on the TMS4000 will be printed. This does not print the contents of the Inventory Report. To print the Inventory Report, simply go to the Reports button and click on the Print button. Other Reports may be printed in a similar fashion.
- Print Inspector Report: Combines the Status and Inventory Printouts into a single Report. This may either be printed or exported as a PDF.
- View Print Jobs: View the printer queue showing pending or active print jobs.



1.7 DISPLAY CUSTOMIZATION



Click on Display from the Main Screen to access the Display Customization screen, shown above. This screen offers settings to customize the real-time data presentation and screen brightness settings. The various settings are described below. Examples of screen configurations are found later in this section. The touch screen may also be recalibrated touching the Touch Cal button (First Generation Resistive LCD Screen Only). Details for recalibrating the screen are outlined in the following section.



Meter Format: The number of meters can be selected in single, dual or four-meter, or the meter window can be disabled altogether. The individual meters may be further customized from the real-time screen as described later in this section.

Grid Column Selects: The specific columns presented on the tabular display may be selected here. If more columns are selected than fit on the width of the display, the user may scroll by dragging their finger left-right across the tabular display. Note that the Tank ID, Tank Name, Status, and Alarms columns cannot be disabled.

- Gross Volume: Temperature Uncompensated volume
- Net Volume: Temperature-Compensated Volume.
- % Volume: Gross Volume/Tank Capacity x 100%.
- Ullage: Maximum delivery amount. See the Header section in Configuration for details on adjusting the maximum fill point.
- Product Height: Total height of liquid. For O/W Separator tanks, this is a measurement of the oil height.
- Water Height: Bottom water height or total water height for O/W Separator Tanks.
- Product Temperature: Volume-weighted average liquid temperature.

Bar Graph Format: Choices for configuring the bar graph are as follows:

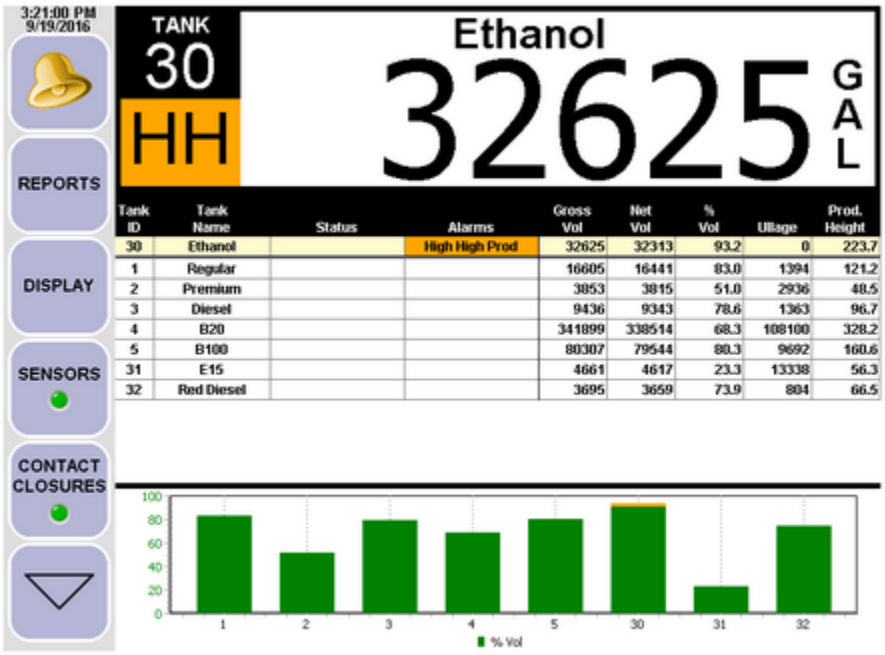
- Disabled
- Product Only
- Product and Water
- Product and Temperature

Screen Appearance: This section offers settings for configuring the Day/Night Mode, Screen Save, and Brightness features as described below:

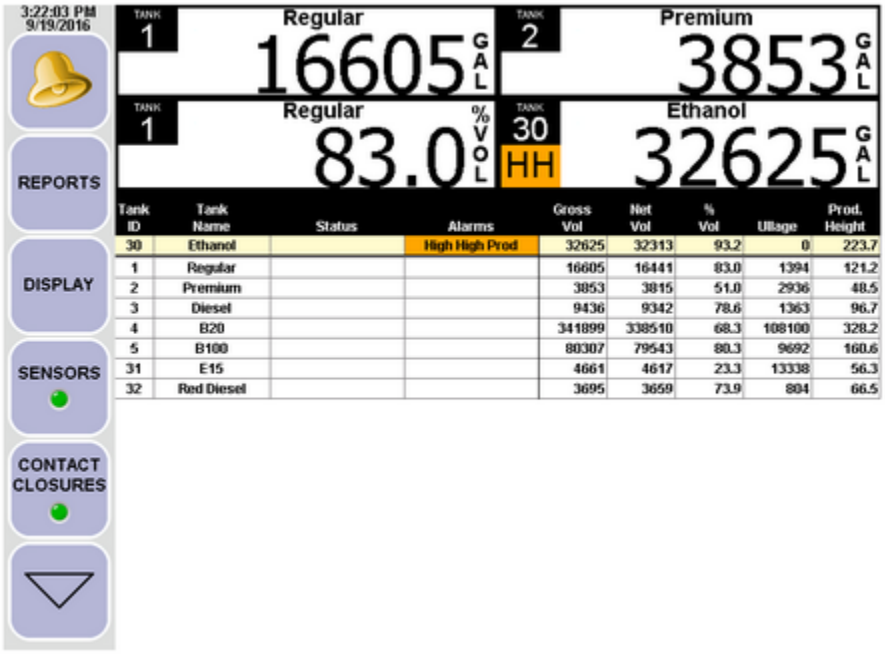
Day/Night: The LCD screen has two different color schemes to improve visibility for both Day and Night conditions. This feature can be set to automatically toggle between these two schemes using the information from the Day/Night sensor on the face of the TMS4000 or may be manually toggled by clicking on the Moon/Sun icon.

Screen Save: Dims the LCD to 3% brightness after a five-minute time delay. The screen is reactivated when the screen is touched or if an alarm or activity occur.

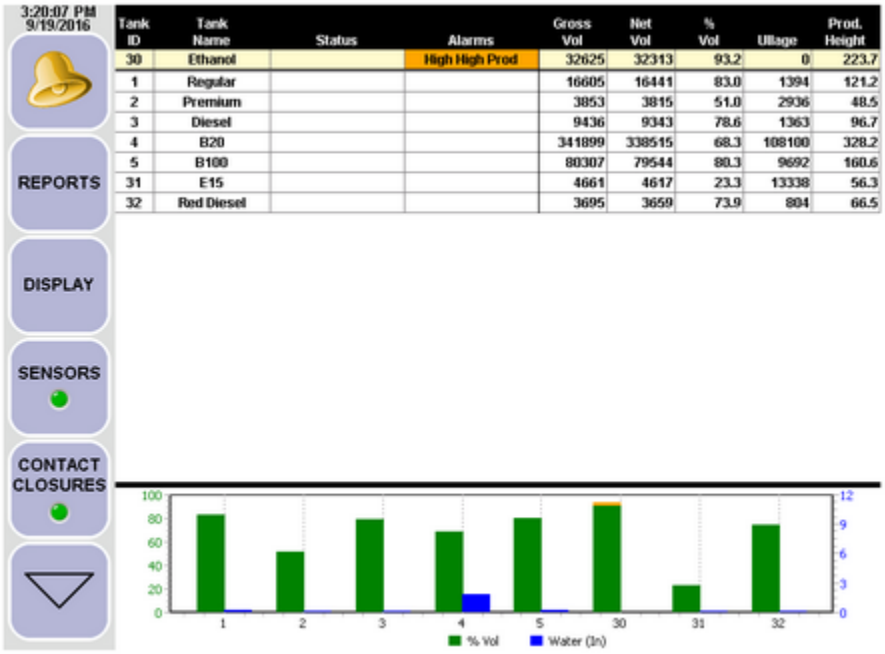
Brightness: The LCD screen brightness may be manually adjusted using the slider (default is 75%) or may be automatically adjusted using the information from the Day/Night sensor on the face of the TMS4000.



Example: One large meter with Product bar graph

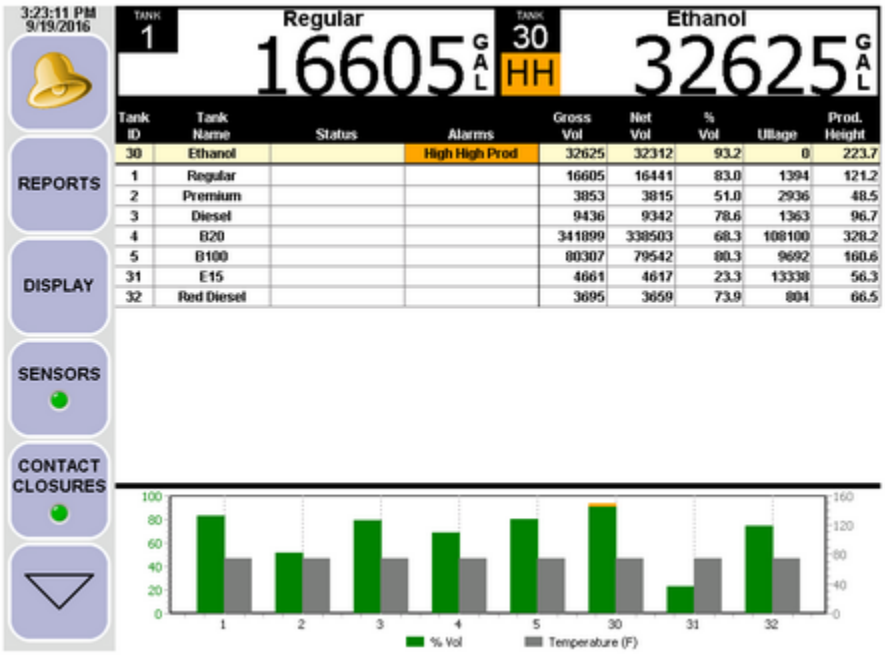


Example: Four small meters with bar graph disabled



Tank ID	Tank Name	Status	Alarms	Gross Vol	Net Vol	% Vol	Ullage	Prod. Height
30	Ethanol		High High Prod	32625	32313	93.2	0	223.7
1	Regular			16605	16441	83.0	1394	121.2
2	Premium			3853	3815	51.0	2936	48.5
3	Diesel			9436	9343	78.6	1363	96.7
4	B20			341899	338515	68.3	108100	328.2
5	B100			80307	79544	80.3	9692	160.6
31	E15			4661	4617	23.3	13338	56.3
32	Red Diesel			3695	3659	73.9	804	66.5

Example: Meters Disabled with Product and Water bar graph

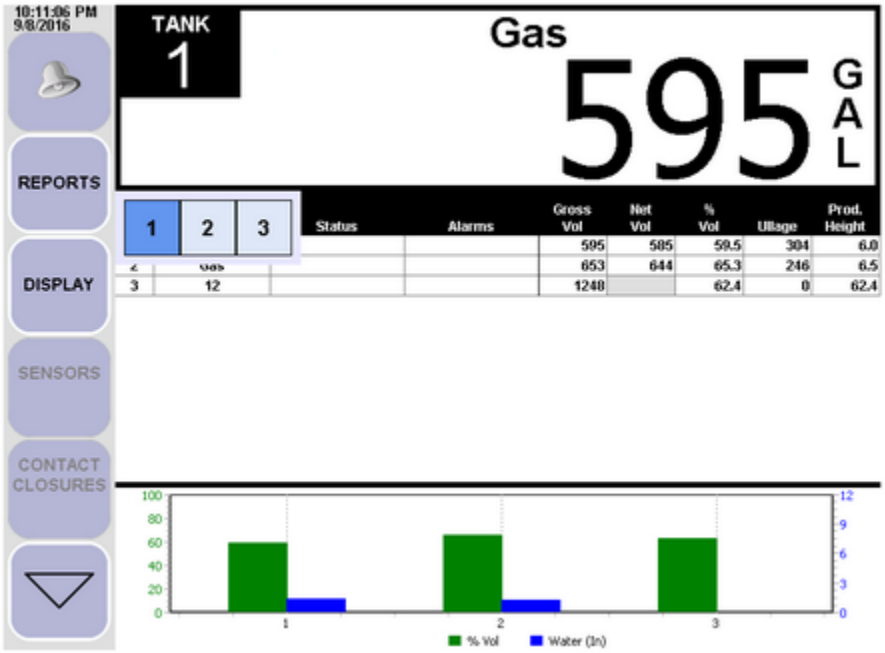


Tank ID	Tank Name	Status	Alarms	Gross Vol	Net Vol	% Vol	Ullage	Prod. Height
30	Ethanol		High High Prod	32625	32312	93.2	0	223.7
1	Regular			16605	16441	83.0	1394	121.2
2	Premium			3853	3815	51.0	2936	48.5
3	Diesel			9436	9342	78.6	1363	96.7
4	B20			341899	338503	68.3	108100	328.2
5	B100			80307	79542	80.3	9692	160.6
31	E15			4661	4617	23.3	13338	56.3
32	Red Diesel			3695	3659	73.9	804	66.5

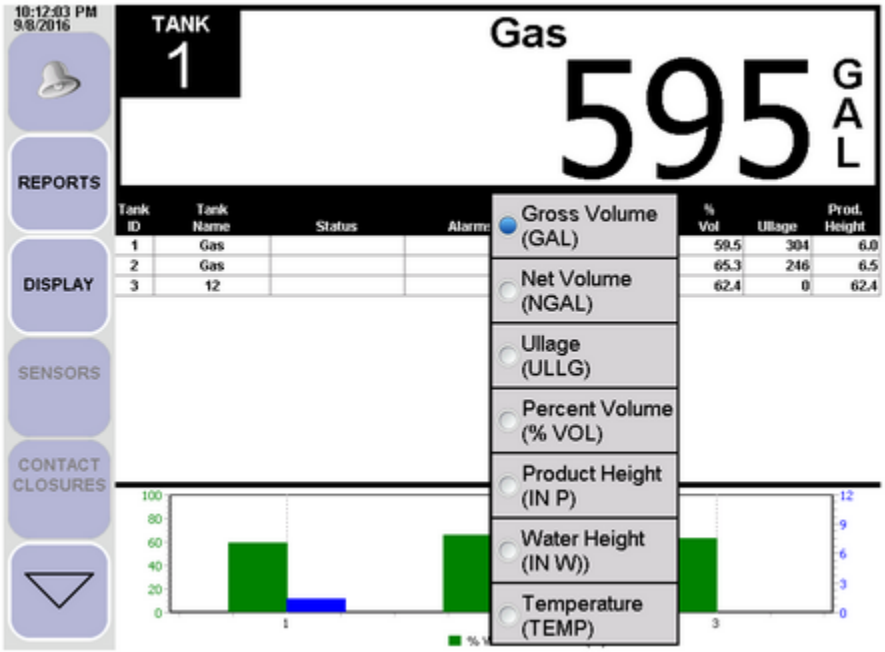
Example: 2 Small Meters with Product and Temperature bar graph

CUSTOMIZING INDIVIDUAL METERS

The below examples illustrate how each individual meter can be configured. The top example is for Tank Channel selection and the bottom example is for Unit selection.



Touch the Tank ID in the back box at the top left corner of the meter to bring up a selection of available Tank Channels that can be selected for the meter. Note that a Tank Channel represents where the probe is physically wired and may differ from the user assigned Tank ID

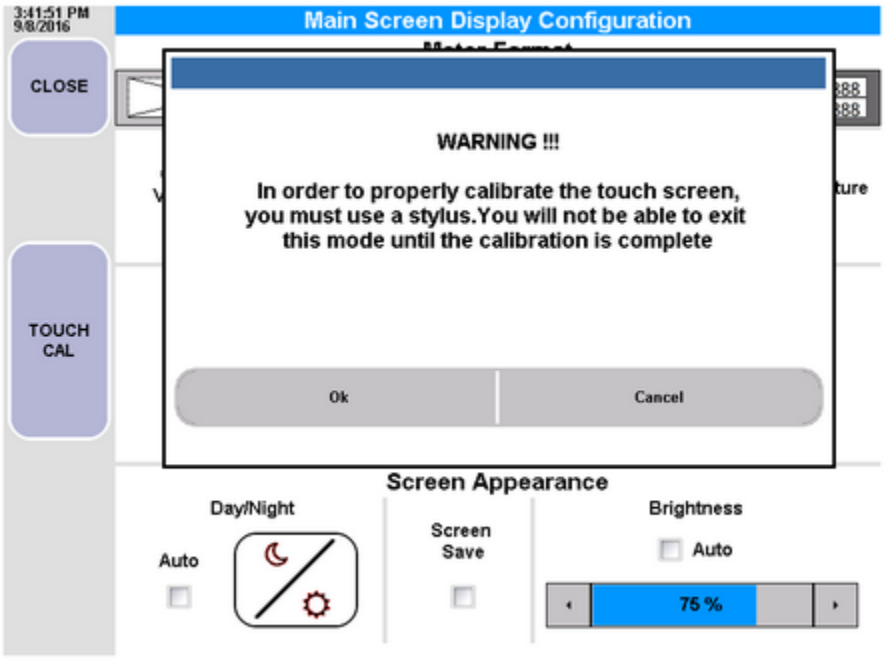


Touch the unit displayed on the far right of the meter (in this case, GAL) to display the drop down menu of choices. Touch the radio button for the desired selection to select that choice.

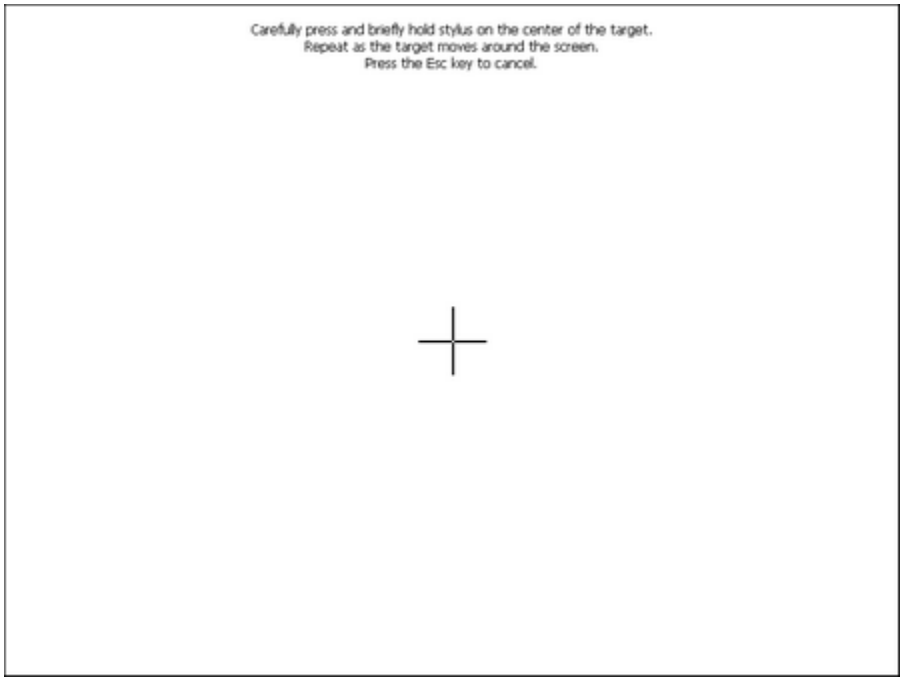
1.8 TOUCH SCREEN CALIBRATION

Note: Only applies to First Generation Resistive LCD Screens ONLY

The ability to recalibrate the touch screen is available in the event the user's touch does not match where the system responds to the touch. It is NOT recommended to perform this without contacting Pneumercator Technical Support. Note that you will need a stylus to properly recalibrate the screen. Failure to follow these instructions may result in the screen being unresponsive and require parts be returned to Pneumercator as directed by Pneumercator Technical Support.



Touching the Touch Cal button will show the above notification screen.



Follow the onscreen instructions above to complete the calibration. The calibration MUST BE COMPLETED to exit this screen.

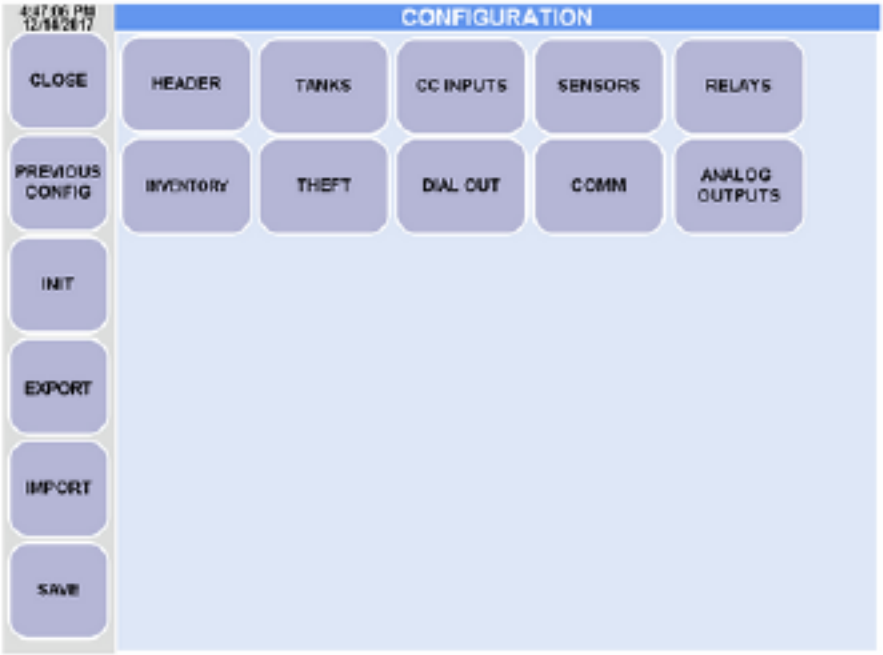
SECTION 2 – SYSTEM CONFIGURATION

2.1 SETUP MENU

The Setup Menu contains options for configuring the TMS and other select administrative functions. A brief description of each section is provided below.

- Config: The configuration of the TMS can be reviewed and/or modified in this section. This includes details for tank geometry, sensor configuration, and Communications and I/O Card configuration. Details are found in the next section.
- Leak Test: This section configures the details for the In-Tank Leak Test including the Test Length and scheduling of the test.
- The System Log contains a list of administrative events like a configuration change or firmware upgrade. Select system problems may also be documented here. This log will be described in Section 3.
- Security: sets the security for accessing select TMS features. Once enabled, a 4-digit PIN number will be needed to access select features.
- Firmware: provides the ability to upgrade the firmware or view what the current firmware level is.
- Localization: the system language and units of measure are configured here.

2.2 SYSTEM CONFIGURATION



The Config menu is divided into categories of configuration options. A brief description of each category is listed below. Additional details immediately follow this section.

- Header: global settings that affect system operation as a whole
- Tanks: all details for configuring a tank including the dimensions and probe details.
- CC Inputs: Contact Closure Inputs typically located on select Relay I/O Cards
- Sensors: Leak/Point Level Sensor
- Relays: Relay output triggers and behavior settings
- Inventory: schedule of inventory snapshot
- Theft: defines hours of operation for the facility
- Dial Out: conditions that can initiate a dial-out
- Comm: Serial, network, and modem settings
- Analog Outputs: tank data assignment to each channel

The buttons along the left edge perform the following functions:

- Close: Closes the Config Window. If changes were made, a prompt will appear questioning whether or not to save the configuration.
- Previous Config: The previously saved version of the configuration is stored in the TMS to allow recovery from accidental configuration changes.
- Init: Initializes the system configuration to the factory default settings.
- Export (Formerly labelled COPY): When a flash drive is inserted, a copy of the current configuration file will be copied to the flash drive. The User is prompted to enter a file name. The file extension used is .CFX. See Section 1.1.1 for location of USB Port.
- Import: When a flash drive is inserted with a valid file with the .CFX extension, the option to import is available. See Section 1.1.1 for location of USB Port.
- Save: The current configuration overwrites the previously saved Previous Configuration and the New Configuration changes become the current configuration.

2.3 HEADER

Site Name: Printed on system generated reports

Unit ID: Used to identify the TMS that generated a report. This is recorded in all Logs and is included on all printouts from the TMS. This is also used, in part, to identify a TMS that is making a phone call to a computer running Autopolling. See Unit ID.

Site ID: Used to identify the TMS that generated a report. This is recorded in all Logs and is included on all printouts from the TMS. This is also used, in part, to identify a TMS that is making a phone call to a computer running Autopolling. See Unit ID.

Horn Delay: Silences the integrated TMS horn after a delay set in minutes. Selecting None disables this feature.

Leak Print Mode: Choice between printing all In-Tank Leak Test Results (Pass-Fail) or only Failing results (Fail Only)

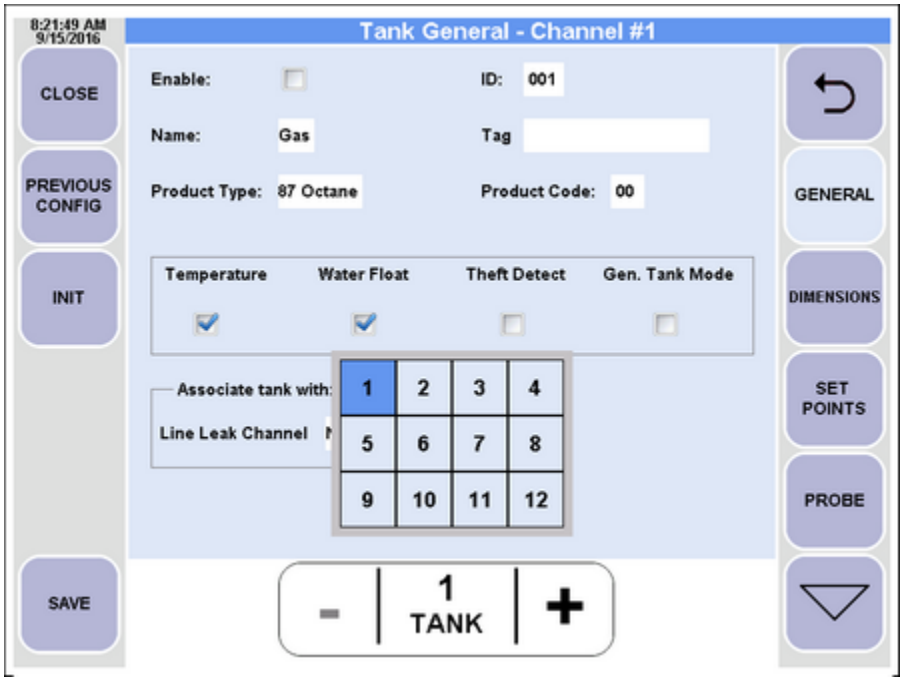
Ullage Limit: ullage is the free space in the tank. Factory default of 90% is used due to the fact that most applications do not permit the filling of a tank above the 90% volume mark. Other options include 85%, 95%, and 100%.

Sales Enable: Enables Bulk Sales Tracking and records data in the Sales Log. Not used for applications where simultaneous transactions can occur.

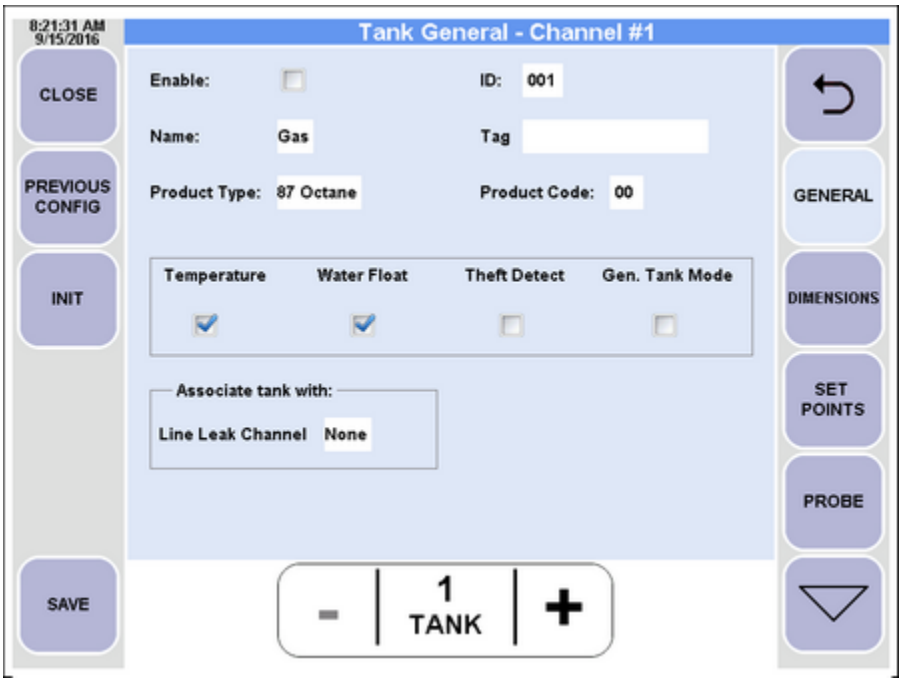
Line Leak Enable: Makes available the assignment of the Line Leak Channel number of the external LS300 Line Leak console to a specific Tank Channel

File Export Prefix: The Prefix is prepended to the file name of the exported report saved to a USB Flash Drive.

2.4 TANKS - GENERAL



Touch the +/- buttons to increment Tank Channel by 1. Touch the Tank Channel number to bring up a list of possible Tank Channels. Touch the Tank Channel number on the table to make a selection.



Enable: Activates the selected Tank Channel. The Tank Channel number is represented by the tabs across the bottom. Use the small arrow buttons on the bottom right corner to access all available tank channels or click on a visible tank tab number.

ID: Used to assign a custom 3 digit numeric tank ID to a tank channel. Default setting has the Tank ID matching the Channel Number.

Tank Name: A name assigned to a tank to identify the stored product. Select from the list or type in a 16 character custom name.

Tank Tag: Printed on system generated reports

Product Type: Defines the coefficient of thermal expansion. Consult factory if product is not listed.

Product Code: Used to support V200 and V300 protocols. Not used in any calculations and is not present on any reports.

Temperature: Selects whether or not the temperature reading is viewed. Shown as a constant zero temperature if disabled. Temperature must be enabled for in-tank leak tests.

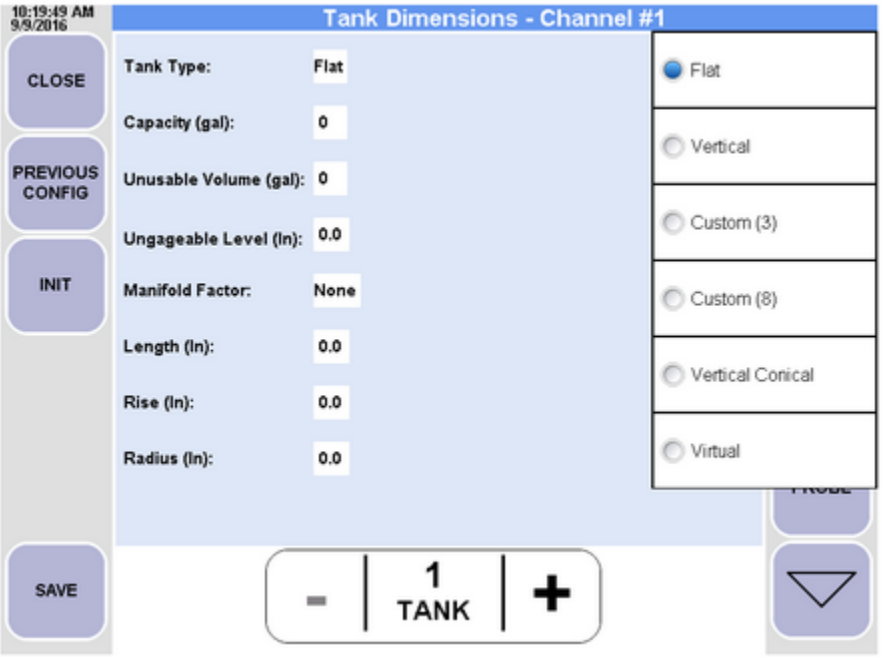
Water Float: Instructs the TMS to display the water level reported by the probe. This setting is intended for use in applications where the water reading is not desired. The TMS displays a blank in the water level field when disabled.

Theft Detect Enable: Enables a per tank setting for theft monitoring. See the Theft tab for more details.

Generator Tank: A special in-tank leak test mode intended for use on above ground generator tanks. Identical to Auto Leak Test Mode without the monthly limitation.

Associate with Line Leak Channel: Used in the Line Leak Report to identify the tank that the tested line supports. Only displayed if Line Leak Enable is checked in Header section.

2.5 TANKS - DIMENSIONS



The TMS support a wide range of tank shapes and sizes. These supported tanks can be configured by selecting the basic tank shape from the list as described below:

Flat: Flat-ended horizontal cylinder.

Vertical: includes vertical cylinders and rectangular tanks. Any tank with a constant volume per unit of level is supported with this type

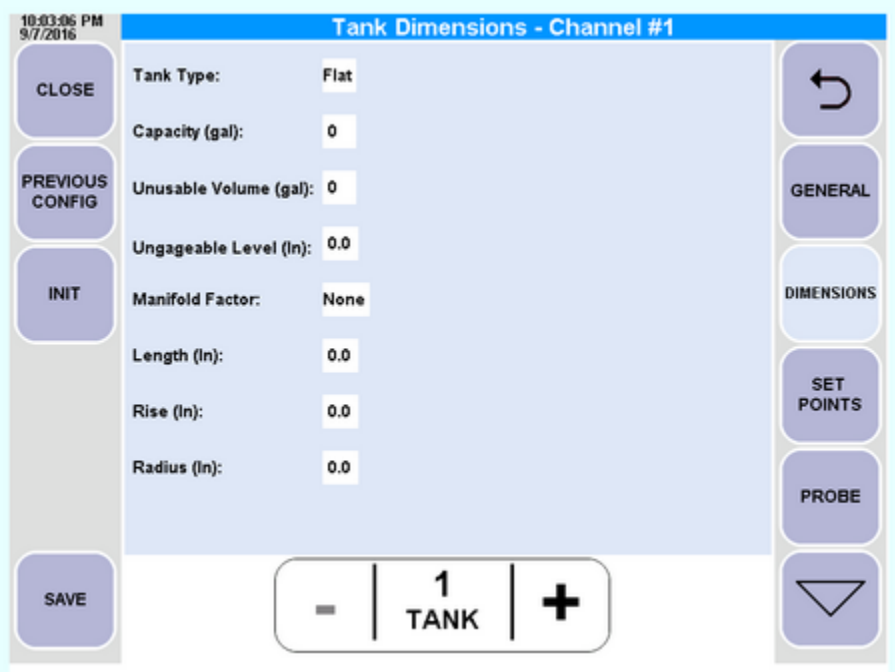
Custom (3): A horizontal cylinder with curved or dished ends.

Custom (8): An asymmetrical tank or other tank with unusual geometry. Contact Pneumercator for assistance.

Vertical Conical: A vertical cylinder with a cone bottom.

Virtual: Combines multiple tank to for a virtual tank for the purpose of defining Product Set Points for the collective volume.

2.5.1 TANKS – DIMENSIONS – FLAT



The following settings pertain to a flat-ended horizontal cylinder:

Capacity: Use actual tank capacity so that an accurate volume calculation can be performed. (i.e. a tank may be referred to as a 10,000 gallon tank for conversation but the actual capacity may actually be 9844.)

Unusable Volume: Affects the calculations performed for the Product Order Report. This volume is excluded from the total volume when calculating the number of days of usable fuel remaining in the tank.

Ungageable Level: Represents the amount of liquid that cannot be measured by the probe. This may be due to the construction of the tank or the fact that the flex probe has a weight on the end of the shaft.

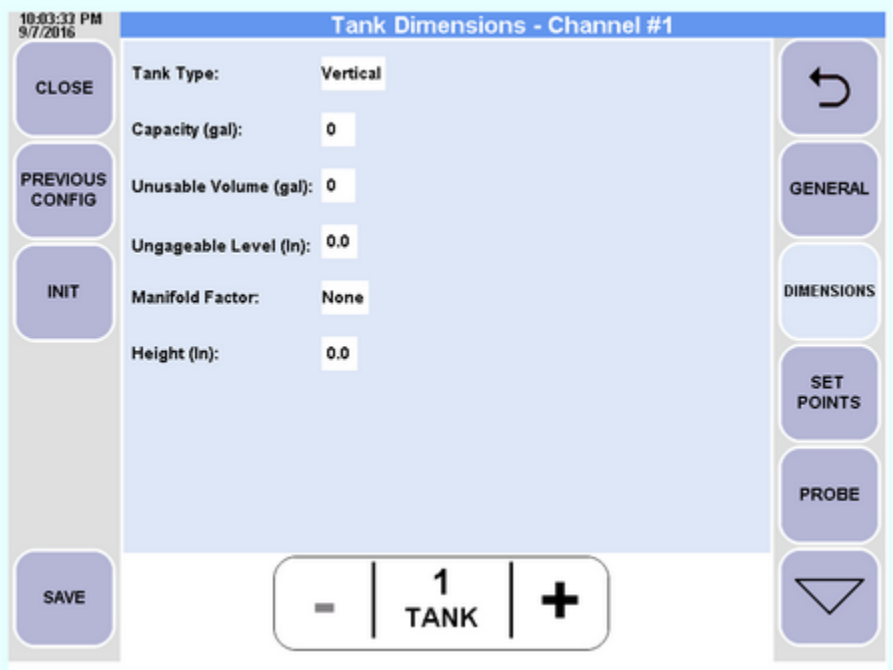
Manifold Factor: The number of Manifolds on a tank set with only one probe. Note that EPA requirements for manifolded tanks are to isolate the tank from the set before performing a leak test. Advanced settings here include the ability to auto select a pump based on the tank with the highest volume. Consult factory for details.

Length: Only used if the tank is tilted. See Tank Rise.

Rise: Amount of tank tilt present on a horizontal tank. Measured in inches and is never negative. See Probe Location Offset.

Radius: 1/2 of the inside diameter. Refer to tank drawing or chart for details.

2.5.2 TANKS – DIMENSIONS – VERTICAL



The following settings pertain to a tank with a constant volume per unit level including vertical cylinders and rectangular tanks:

Capacity: Use actual tank capacity so that an accurate volume calculation can be performed. (i.e. a tank may be referred to as a 10,000 gallon tank for conversation but the actual capacity may actually be 9844.)

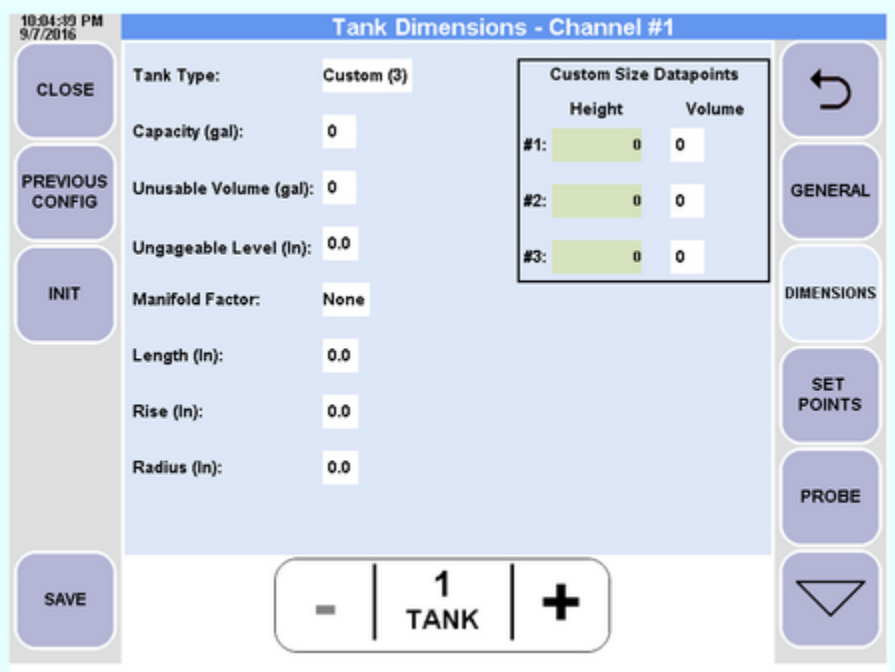
Unusable Volume: Affects the calculations performed for the Product Order Report. This volume is excluded from the total volume when calculating the number of days of usable fuel remaining in the tank.

Ungageable Level: Represents the amount of liquid that cannot be measured by the probe. This may be due to the construction of the tank or the fact that the flex probe has a weight on the end of the shaft.

Manifold Factor: The number of Manifolds on a tank set with only one probe. Note that EPA requirements for manifolded tanks are to isolate the tank from the set before performing a leak test. Advanced settings here include the ability to auto select a pump based on the tank with the highest volume. Consult factory for details.

Height: The inside height of the tank.

2.5.3 TANKS – DIMENSIONS – CUSTOM 3



The following settings pertain to a horizontal tank with curved or dished ends:

Capacity: Use actual tank capacity so that an accurate volume calculation can be performed. (i.e. a tank may be referred to as a 10,000 gallon tank for conversation but the actual capacity may actually be 9844.)

Unusable Volume: Affects the calculations performed for the Product Order Report. This volume is excluded from the total volume when calculating the number of days of usable fuel remaining in the tank.

Ungageable Level: Represents the amount of liquid that cannot be measured by the probe. This may be due to the construction of the tank or the fact that the flex probe has a weight on the end of the shaft.

Manifold Factor: The number of Manifolds on a tank set with only one probe. Note that EPA requirements for manifolded tanks are to isolate the tank from the set before performing a leak test. Advanced settings here include the ability to auto select a pump based on the tank with the highest volume. Consult factory for details.

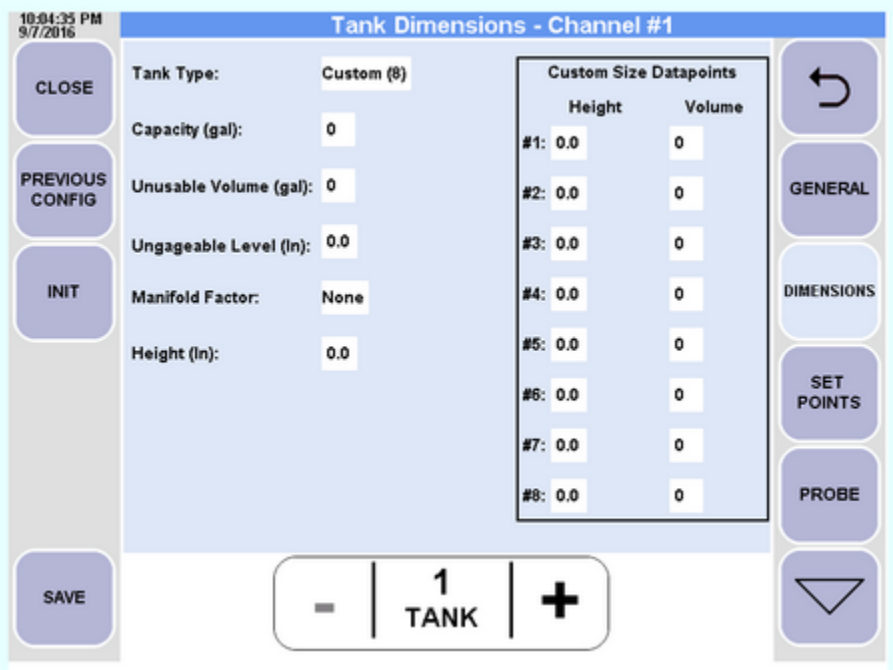
Length: Only used if the tank is tilted. See Tank Rise.

Rise: Amount of tank tilt present on a horizontal tank. Measured in level units and is never negative. See Probe Location Offset.

Radius: 1/2 of the tank diameter. Refer to tank drawing or chart for details.

Custom Size Datapoints: 3 levels are given based on the radius of the tank. Enter the volumes from the manufacturers tank chart for accurate volume calculations.

2.5.4 TANKS – DIMENSIONS – CUSTOM 8



The following settings pertain to tanks with an unusual or asymmetrical geometry:

Capacity: Use actual tank capacity so that an accurate volume calculation can be performed. (i.e. a tank may be referred to as a 10,000 gallon tank for conversation but the actual capacity may actually be 9844.)

Unusable Volume: Affects the calculations performed for the Product Order Report. This volume is excluded from the total volume when calculating the number of days of usable fuel remaining in the tank.

Ungageable Level: Represents the amount of liquid that cannot be measured by the probe. This may be due to the construction of the tank or the fact that the flex probe has a weight on the end of the shaft.

Manifold Factor: The number of Manifolds on a tank set with only one probe. Note that EPA requirements for manifolded tanks are to isolate the tank from the set before performing a leak test. Advanced settings here include the ability to auto select a pump based on the tank with the highest volume. Consult factory for details.

Height: The inside height of the tank.

Custom Size Datapoints: 8 levels and volumes are required. Refer to the manufacturers tank chart for accurate volume calculations. Contact Pneumercator for additional support in selecting specific data points best suited for the specific tank shape.

2.5.5 TANKS – DIMENSIONS – VERTICAL CONICAL

The following settings pertain to vertical tanks with a conical bottom:

Capacity: Use actual tank capacity so that an accurate volume calculation can be performed. (i.e. a tank may be referred to as a 10,000 gallon tank for conversation but the actual capacity may actually be 9844.)

Unusable Volume: Affects the calculations performed for the Product Order Report. This volume is excluded from the total volume when calculating the number of days of usable fuel remaining in the tank.

Ungageable Level: Represents the amount of liquid that cannot be measured by the probe. This may be due to the construction of the tank or the fact that the flex probe has a weight on the end of the shaft.

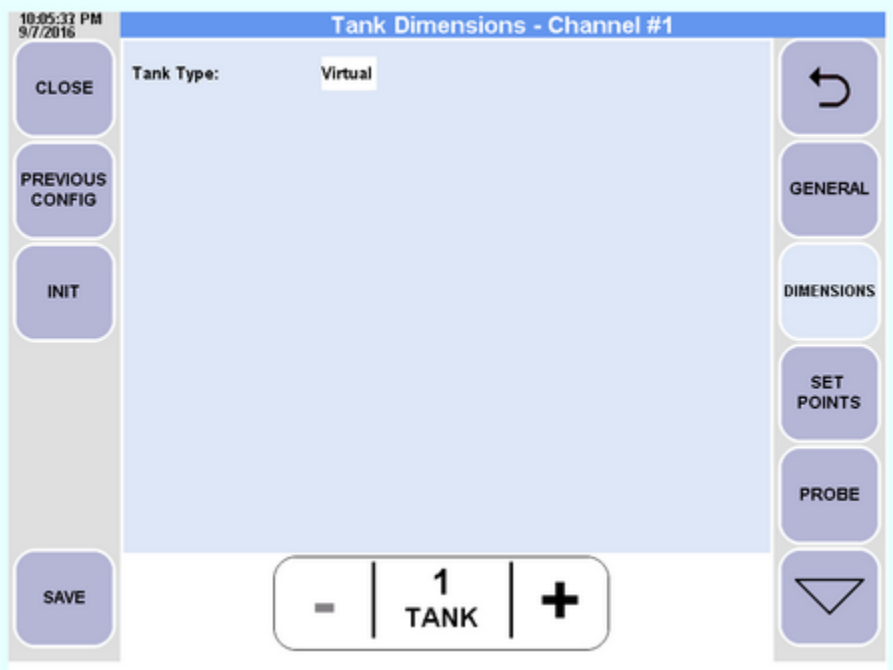
Manifold Factor: The number of Manifolds on a tank set with only one probe. Note that EPA requirements for manifolded tanks are to isolate the tank from the set before performing a leak test. Advanced settings here include the ability to auto select a pump based on the tank with the highest volume. Consult factory for details.

Height: The inside height of the tank.

Cone Height: Height of the cone and radius of the tank are used to determine the pitch of the cone.

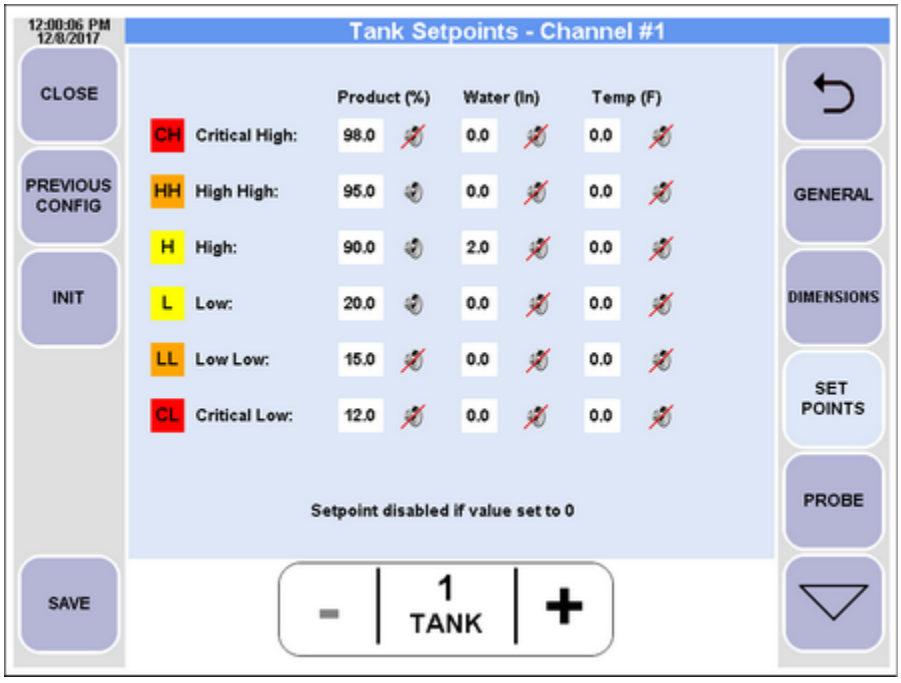
Radius: 1/2 of the diameter of the tank or cone. Refer to tank drawing or chart for details.

2.5.6 TANKS – DIMENSIONS – VIRTUAL



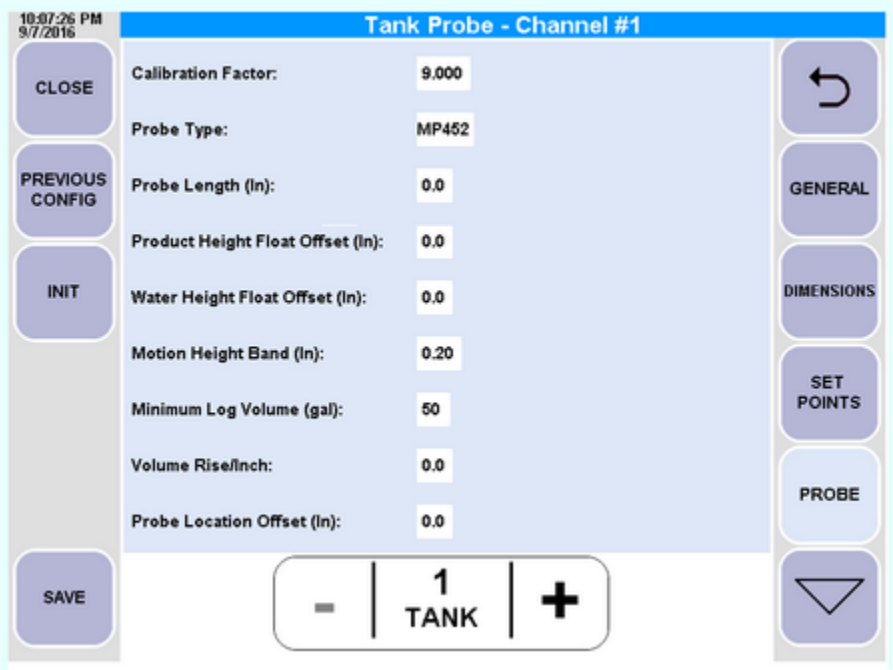
The virtual tank type is a specialized tank that allows the combining of multiple tanks into a single virtual tank for the purpose of defining Product Set Points. The tanks in the set are currently defined by assigning a custom tank name containing the Tank Channel numbers of the tanks to be included in the set.

2.6 TANKS – SET POINTS



The above screenshot shows the default values for the Tank Set Points. The units for the Set Points are displayed above each column. The horn symbol to the right of each value can be touched to toggle whether or not the internal horn activates when the alarm threshold is reached.

2.7 TANKS – PROBE



Calibration Factor: Also known as wire speed. This is a performance value that is measured for each probe and is necessary to generate an accurate level reading.

Probe Type: The model number of the probe. Only the first 5 characters are necessary. (i.e. MP461SC and MP461SA are both programmed as MP461.)

Probe Length: Used to determine the location of the temperature sensors within the probe shaft.

Product Height Float Offset: Compensates for the difference between a manual stick reading of product and the displayed product level. This setting should only be used if the product float is buoyant or floating.

Water Height Float Offset: Compensates for the difference between a manual stick reading of water and the displayed water level. If the manual stick reading shows no water, the water float offset should be set so that the final water reading on the TMS is 0.2 inches for both the MP45Xs and MP461SC. The recommended final reading for the MP46Xs is 1 inch.

Motion Height Band: Sensitivity adjustment used by the TMS to filter out surface action from actual transactions. Set in inches per minute. Defaults to 0.2 inches per minute. When the Motion Band is met or exceeded, the transaction begins. When the Motion Band is not met or exceeded for 3 consecutive minutes, the transaction is ended, categorized, and possibly recorded. See Minimum Log Volume.

Minimum Log Volume: After a transaction is completed, the volume of the transaction is compared to this setting to determine whether to record or discard the transaction. Used to further filter out false transactions.

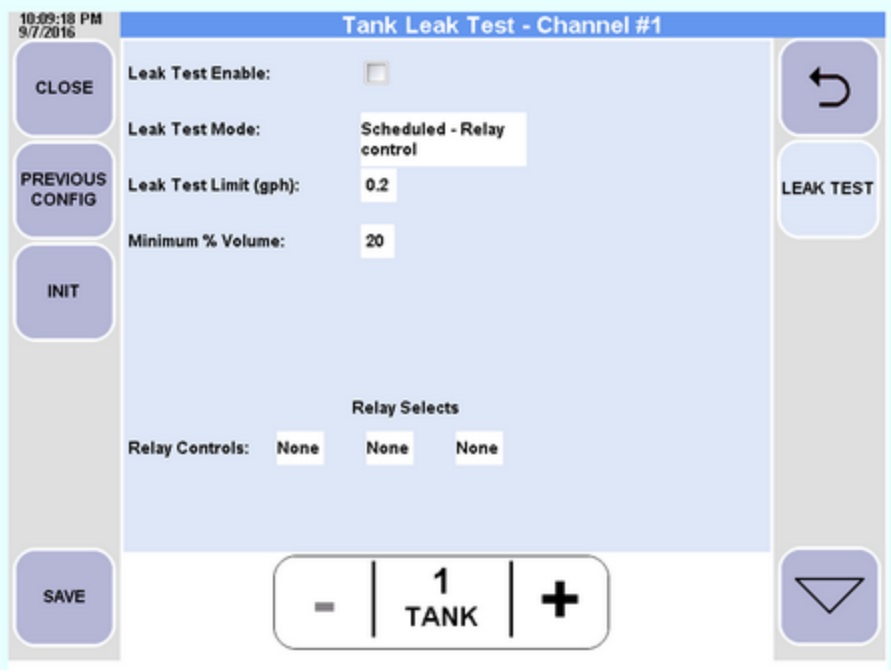
Riser Volume per Inch: MP452 only. Some designs of Oil/Water Separators allow the liquid level in the system to go above the top of the tank in one or more riser pipes. This setting allows the TMS to calculate the volume of product within the riser pipes.

Probe Location Offset: Used to pinpoint the location of the probe in a tilted tank. Represents how many inches away from the high end of the tank the probe is located.

2.8 TANKS – LEAK TEST

The below screenshots show all of the possible configuration settings for in-tank leak testing.

Auto Leak Test Mode settings



Scheduled – Relay Test Mode settings

Leak Test Enable: Test will not run if this box is not checked.

Leak Test Mode: Choose what type of test to run. Choices are as follows:

- Manual: On-demand leak test started when desired
- Timed: Runs on a programmed schedule
- Auto: Runs using information on a CC Input, likely from a current sensor (CS-10) that represents tank activity. Useful for locations where activity is possible 24 hours a day.
- Timed Relay Control: Also runs on a programmed schedule but up to 3 relays will activate at the scheduled time and the test starts 15 minutes later.

Leak Test Limit: Typically set for 0.2 GPH (Gallons Per Hour) for a monthly test. May be set to 0.1 GPH for an annual test.

Minimum % Volume: Defines minimum threshold of product in tank to allow a test to run. Must be used in conjunction with the % Volume Mode leak test schedule.

Auto Mode Pass/Fail: Auto mode completes one test per month. This setting determines what an acceptable completed test result is. A setting of Pass Only would cause the TMS to run the test again during that month if the last test failed.

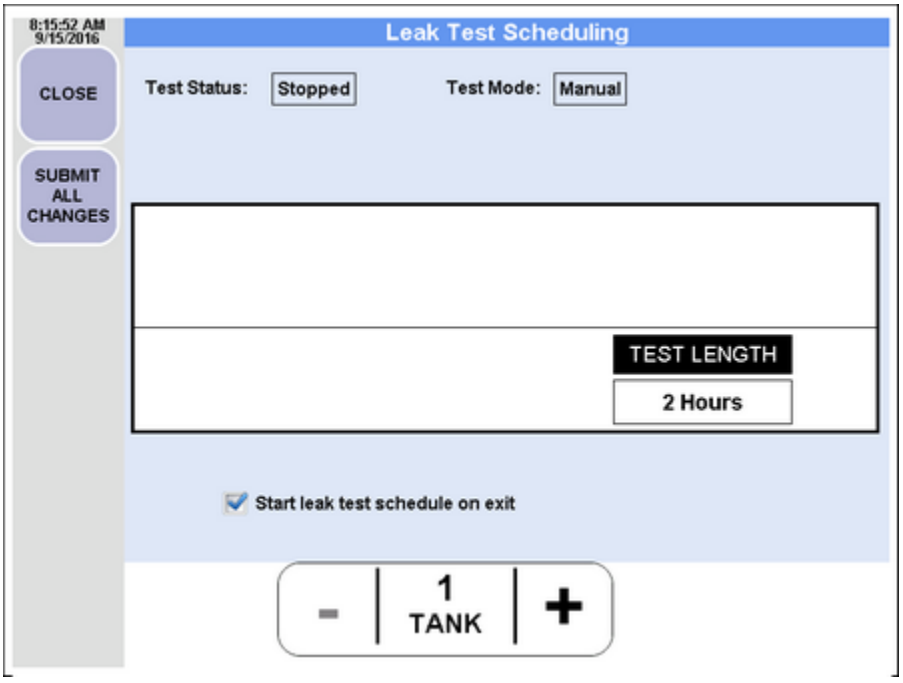
Pump/Generator Run Contact Closure Input (Auto Mode Only): Which input number is the activity signal being received on. Likely wired to a CS-10.

Relay Controls: (Timed Relay Control Mode Only): Select up to 3 relays to activate prior to running a leak test so that a tank in a manifolded set is physically isolated before beginning the leak test.

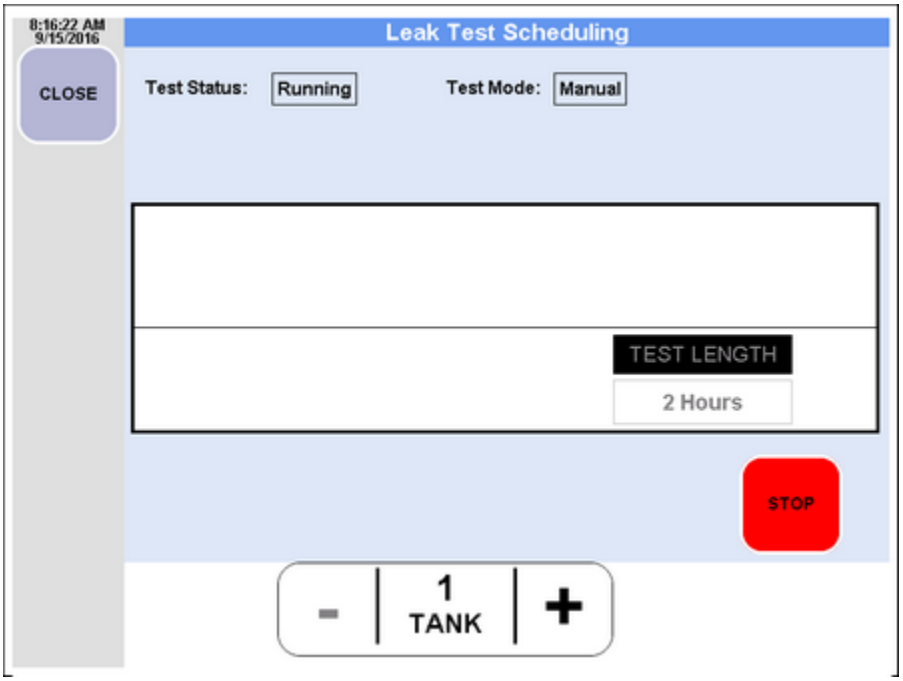
2.9 LEAK TEST SCHEDULING

The In-Tank Leak Test must be enabled as detailed in Section 2.8 above. Failure to do so will result in the below screenshot if any attempt to adjust the schedule is made.

2.9.1 LEAK TEST SCHEDULING - MANUAL

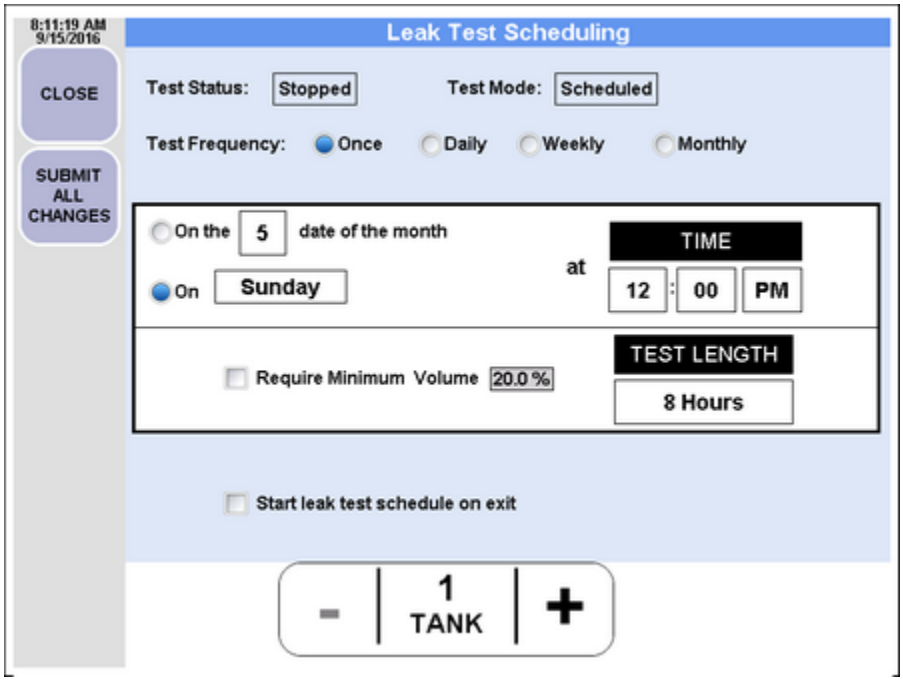


The Manual Leak Test Mode is ideal for applications where the user prefers to manually start the test, usually due to a site having a high throughput. The user would manually shutdown the tank before beginning the test. The test length must be set to comply with local regulations covering the size of tank being tested. Check the box marked “Start Leak Test Schedule On Exit” and touch the Close button to start the test immediately.



2.9.2 LEAK TEST SCHEDULING - SCHEDULED

A leak test may be scheduled to accommodate the needs of the sites and the requirements of the regulatory agencies. Several examples are shown below.



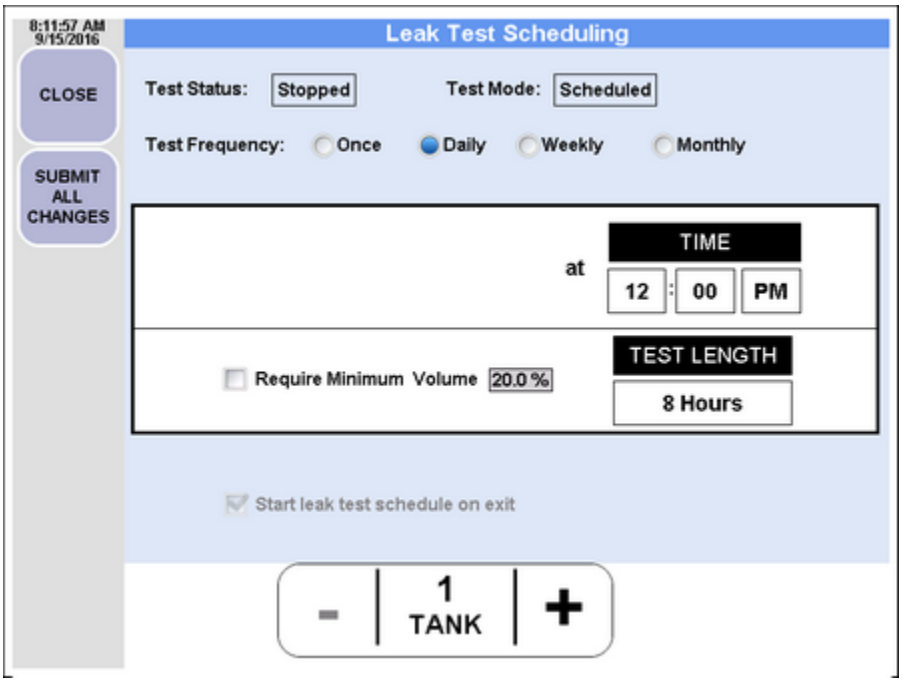
Selecting a Test Frequency of ONCE provides the means of starting a single test at the time and date configured above.

Selecting the radio button for On The nth Date Of The Month allows the user to run the test up to one month in the future. If, for example, today's date is September 15 and the value entered in the box is 14, the test will run on October 14th at the designated time. If the value entered is 15 but that time has already past, then the test will run on October 15th at the designated time.

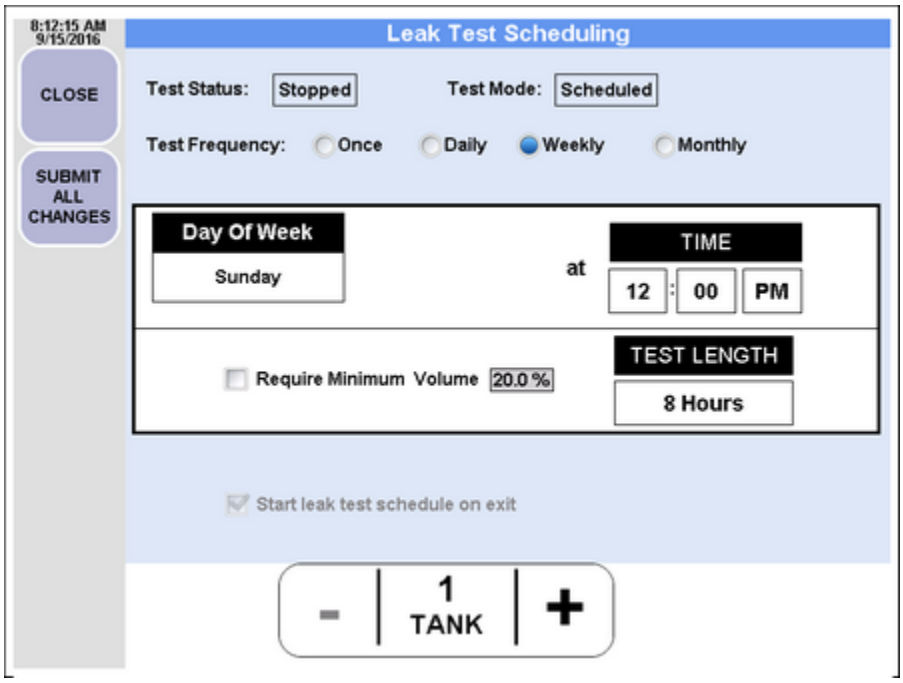
Selecting the radio button On Day of Week allows the test to be run up to one week ahead. The example above show the setting as On Sunday which would cause the TMS to begin the test on Sunday at the designated time.

If the test requires a minimum % Volume, be sure to check the box to establish that requirement. The test will NOT run if the percent volume is below this threshold. The percentage value is configured in the Setup/Config/Tanks/Leak Test menu (See Section 2.8).

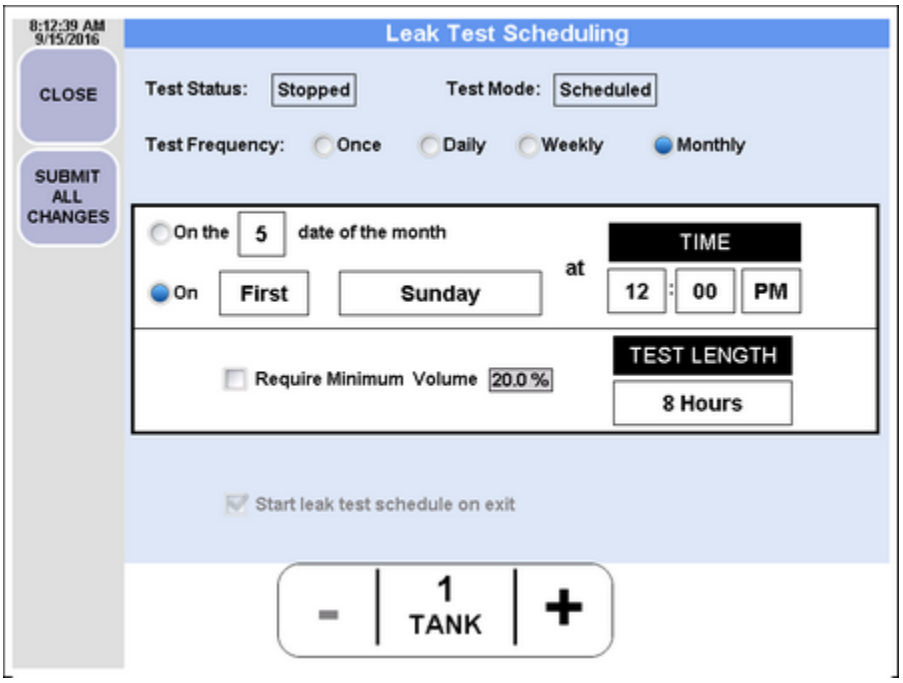
Upon completion, the schedule will be satisfied and no further tests will be run until the TMS schedule is reconfigured. This is generally used either to confirm a tank is not leaking on initial install or to manually run a test after a failure to confirm the results.



Selecting a Test Frequency of DAILY creates a repeating test that will run once a day at the configured start time displayed. Controls are provided for setting the Start Time and Test Length. If the test requires a minimum % Volume, be sure to check the box to establish that requirement. The test will NOT run if the percent volume is below this threshold. The percentage value is configured in the Setup/Config/Tanks/Leak Test menu (See Section 2.8).



Selecting a Test Frequency of WEEKLY creates a repeating test that will run once a week at the configured start time displayed. Controls are provided for selecting which Day of the Week, the Start Time, and Test Length. If the test requires a minimum % Volume, be sure to check the box to establish that requirement. The test will NOT run if the percent volume is below this threshold. The percentage value is configured in the Setup/Config/Tanks/Leak Test menu (See Section 2.8).

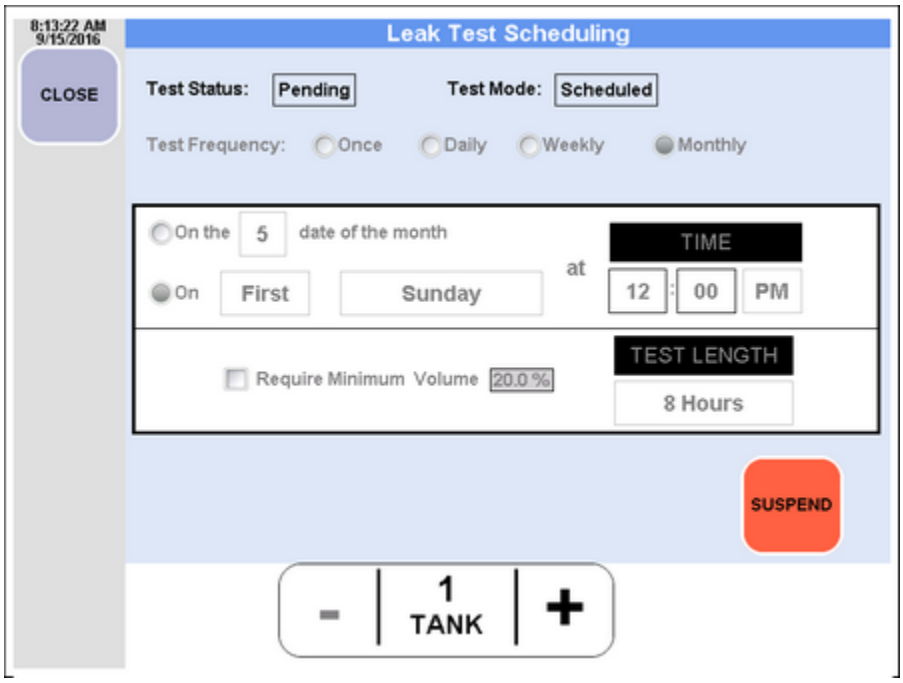


Selecting a Test Frequency of MONTHLY creates a repeating test that will run once a month at the configured start time and date displayed.

Selecting the radio button for On The nth Date Of The Month allows the user to run the test on that data every month. Do not select a date higher than 28 to avoid skipping a test in February.

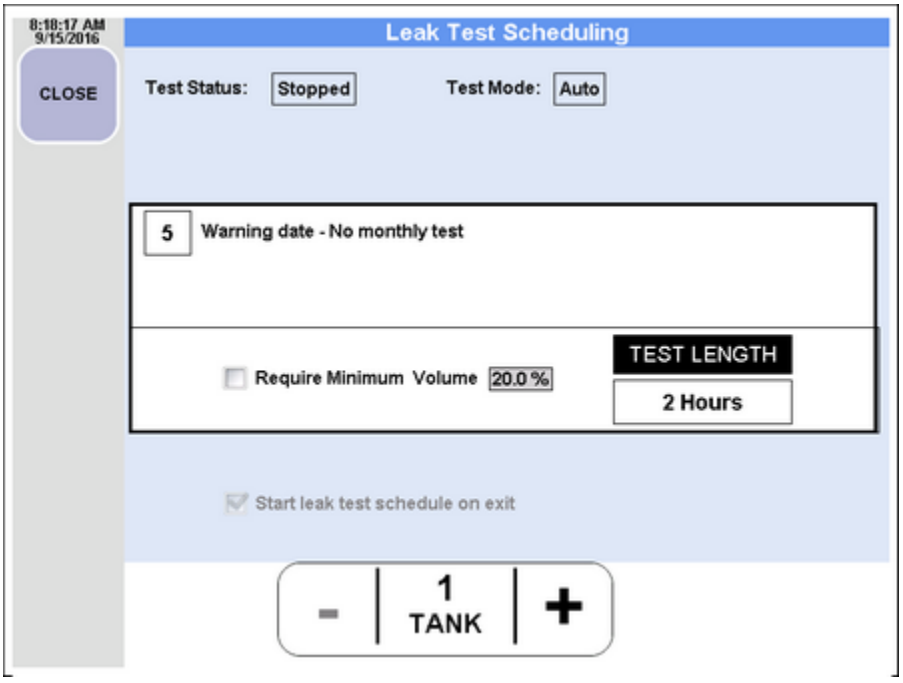
Selecting the radio button On nth Day of Week allows the test to be run once a month on a specific day of the week. The example above show the setting as On First Sunday which would cause the TMS to begin the test on First Sunday of the month at the designated time.

Controls are provided for selecting the Start Time and Test Length. If the test requires a minimum % Volume, be sure to check the box to establish that requirement. The test will NOT run if the percent volume is below this threshold. The percentage value is configured in the Setup/Config/Tanks/Leak Test menu (See Section 2.8).



To stop a test that is running or to stop the scheduler, touch the Suspend button show above.

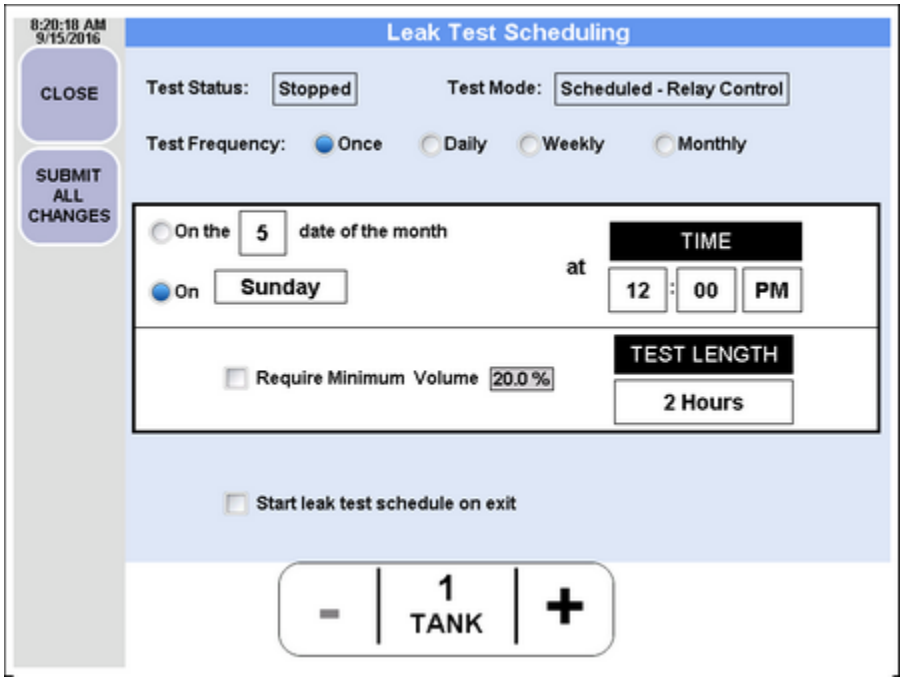
2.9.3 LEAK TEST SCHEDULING - AUTO



Auto Leak Test Mode has the leak test being started by the TMS based on the site activity monitored through a CC Input. The Scheduling window shown above shows a Warning Date – No Monthly Test feature. When configured, the TMS will provide a warning when the tank has not satisfied its monthly test requirements. It is recommended to set this value so there would be enough time to manually shut down the tank and perform a leak test.

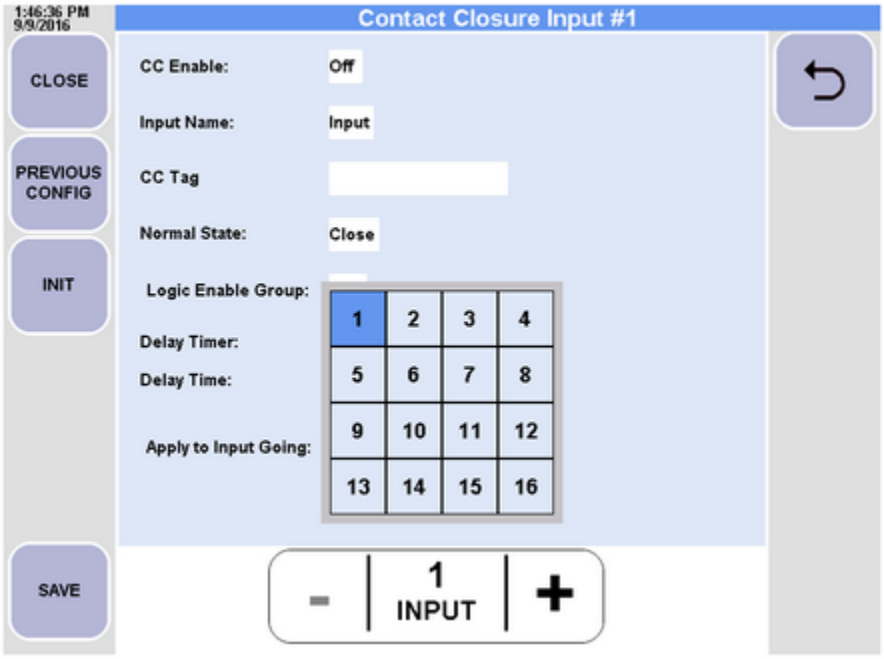
If the test requires a minimum % Volume, be sure to check the box to establish that requirement. The test will NOT run if the percent volume is below this threshold. The percentage value is configured in the Setup/Config/Tanks/Leak Test menu (See Section 2.8).

2.9.4 LEAK TEST SCHEDULING – SCHEDULED – RELAY CONTROL

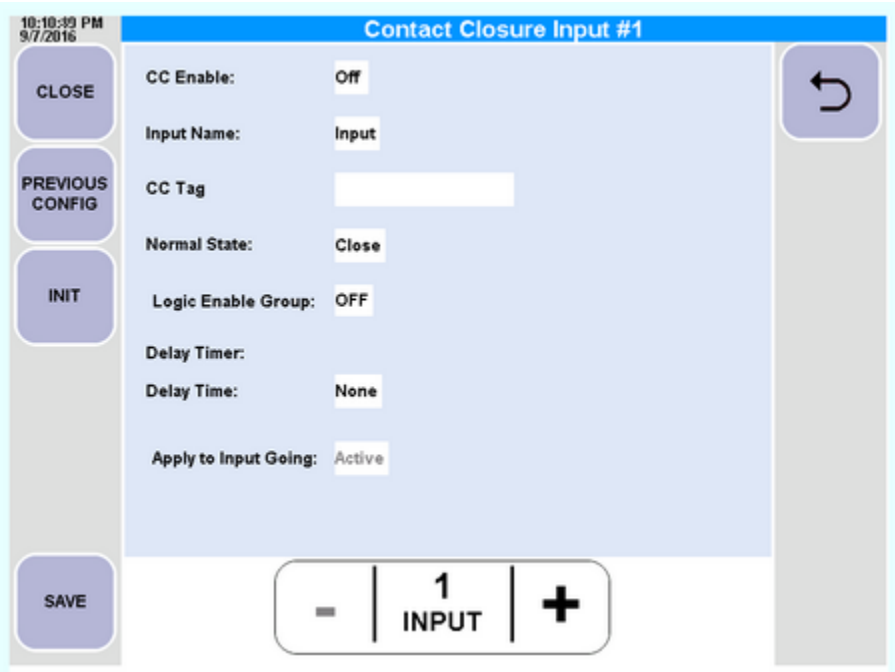


The scheduling options for the Test Mode of Scheduled – Relay Control are identical to those for the Test Mode of Scheduled. See Section 2.9.2 for complete details.

2.10 CC INPUTS



Touch the +/- buttons to increment CC Input by 1. Touch the CC Input number to bring up a list of possible CC Inputs. Touch the CC Input number on the table to make a selection.



CC Input Configuration settings. See next page for a description of each setting.

CC Enable: a CC Input can be enabled in one of several ways:

- Relay: Used to control something whether it is a relay or an auto leak test. (RS2 Test button) (CS-10)
- Gate: Advanced functionality incorporates a logic AND gate into this input. It is paired with other conditions that call out the same relay.
- Alarm: Used to represent an alarm condition from an external device.
- Acknowledge: Used to return a relay to its normal state (RS2 Reset button)
- Line Pass: Specific to specific LS300 Line Leak console configurations. Used to filter out the numerous passing tests and allow only one per month.
- FP Horn Ack: Front Panel Horn Acknowledgement allows an external automation system to send a dry contact signal to the TMS to silence the integrated TMS horn.
- Trigger Group: Part of an advanced auto pump select feature where the pump paired with the highest tank volume is selected. Consult factory for details.

Input Name: Select a name from the list or enter a 16 character custom name. Used to help to identify the input.

CC Tag: Printed on system generated reports

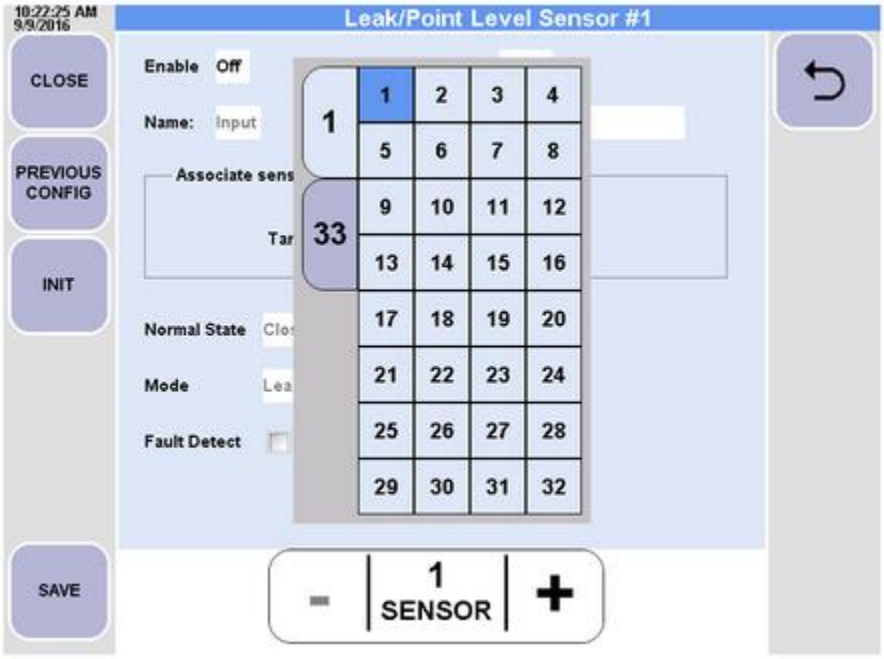
Normal State: Selects the normal contact state of the wired device.

Logic Enable Group: Another form of AND gate where all input in the same logic group are a member of the same gate.

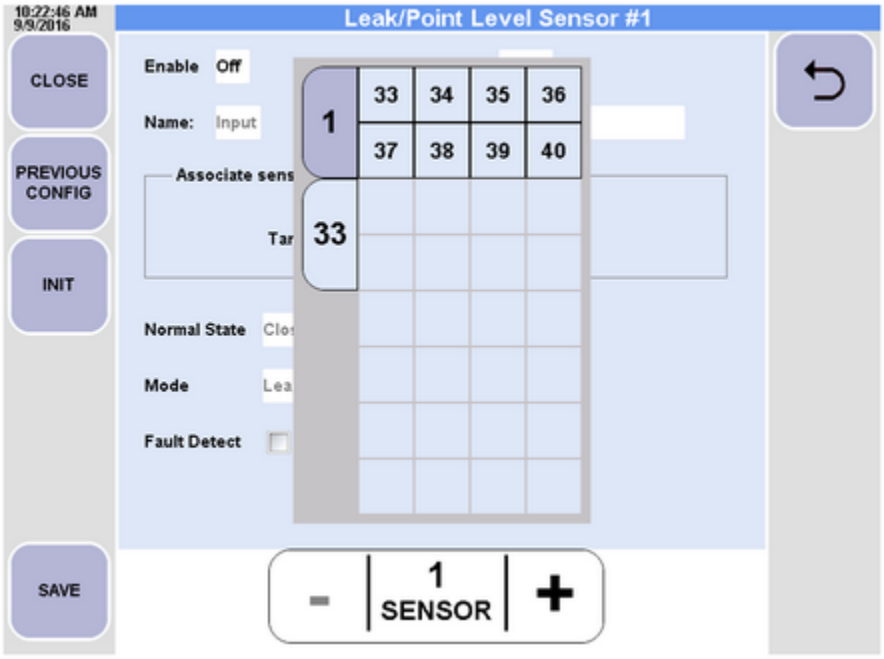
Delay Time: Delay the TMS reaction to the input.

Apply To Input Going: Selects whether the TMS response is delayed with the input going active or inactive.

2.11 SENSOR INPUTS



Touch the +/- buttons to increment Sensor Input by 1. Touch the Sensor Input number to bring up a list of possible Sensor Inputs. The tabs on the left edge show the starting Sensor Input number for the page of choices. Page 1 is shown above and Page 2 is shown below. Touch the Sensor Input number on the table to make a selection.



Sensor Input Configuration settings. See below for a description of each setting.

Enable: Enables the sensor as either Alarm to generate an alarm on the TMS or as Relay to control a relay in the TMS without an alarm. Choosing alarm does not prevent you from also activating a relay on this condition.

Type: Enter the model number of the sensor connected to the TMS.

Name: Choose from the list of predefined names or type in a 16 character name.

Tag: Printed on system generated reports.

Associate Sensor With: Helps to locate a sensor by associating it with a tank or dispenser.

Normal State: Selects the normal contact state of the sensor, open or closed.

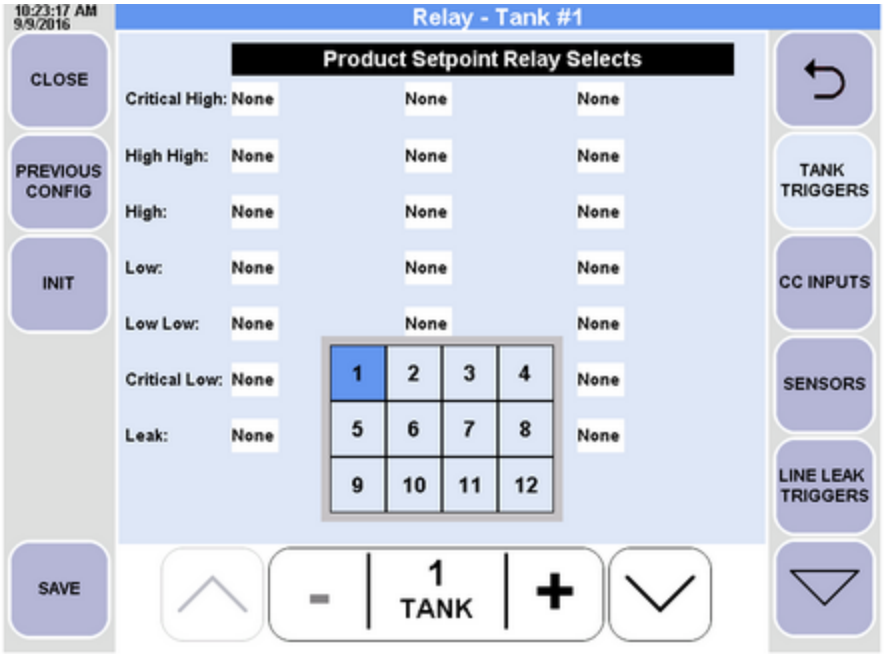
Mode: Select Leak for sensor detecting leaks. Select Other for sensor used for purposes other than leak detection. The integrated horn beeping pattern will differ for sensors defined as Leak sensors versus Other sensors.

Fault Detect: Must be selected for sensors with integrated fault detection circuitry.

2.12 RELAYS

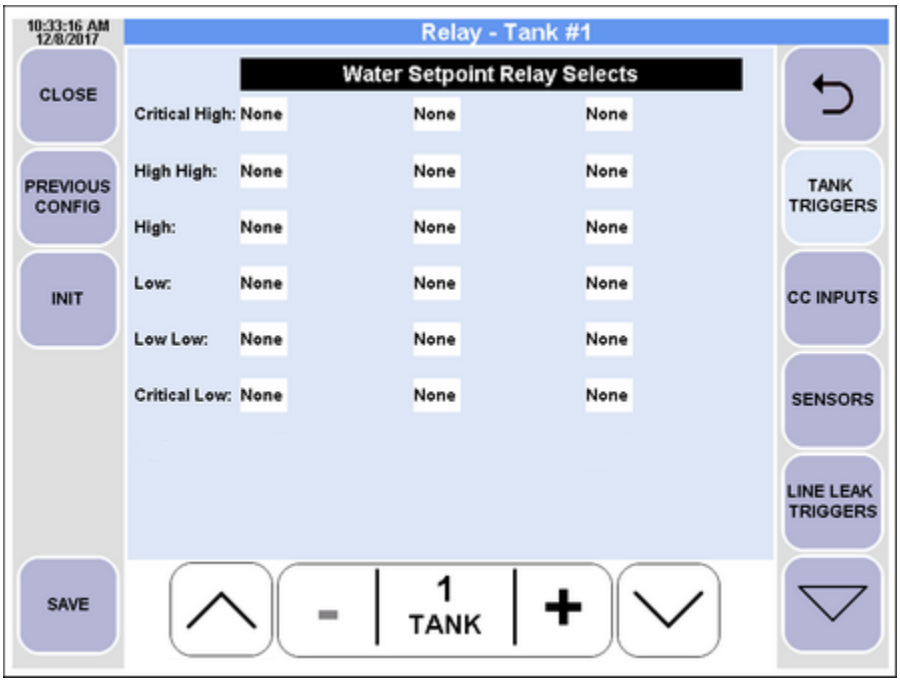
Relay outputs may be configured to trigger from any system alarm or event. The conditions are divided into several categories for easy selection. Any one condition may be assigned to up to three relays. The last category, Relay Mode, contains settings that affect the behavior of the relay.

2.12.1 RELAYS – TANK TRIGGERS

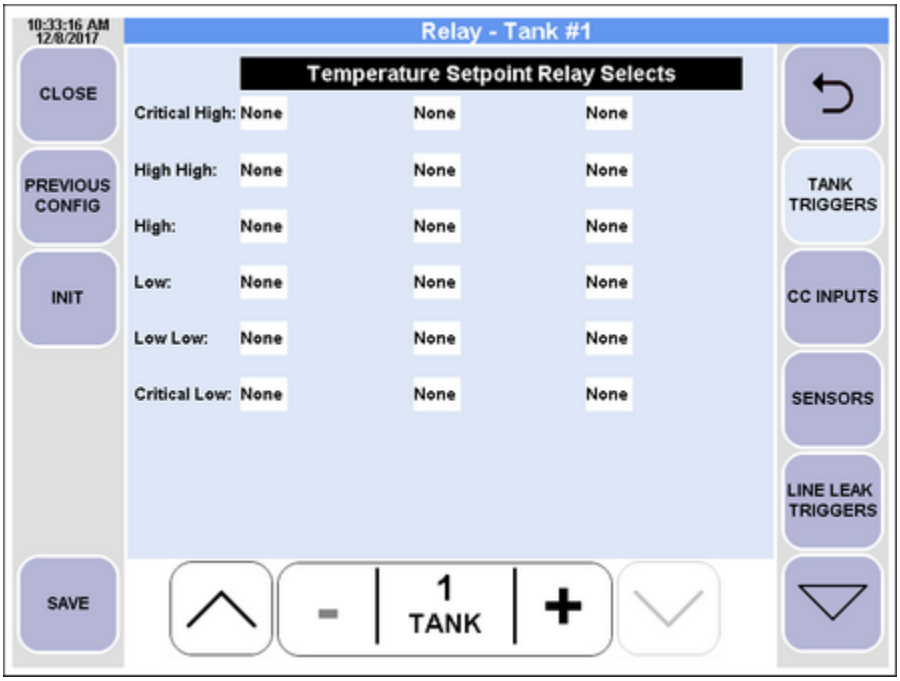


Touch the +/- buttons to increment Tank Channel by 1. Touch the Tank Channel number to bring up a list of possible Tank Channels. Touch the Tank Channel number on the table to make a selection.

Relay assignments for both the Product Set Points and the failure of an In-Tank Leak Test (Leak).

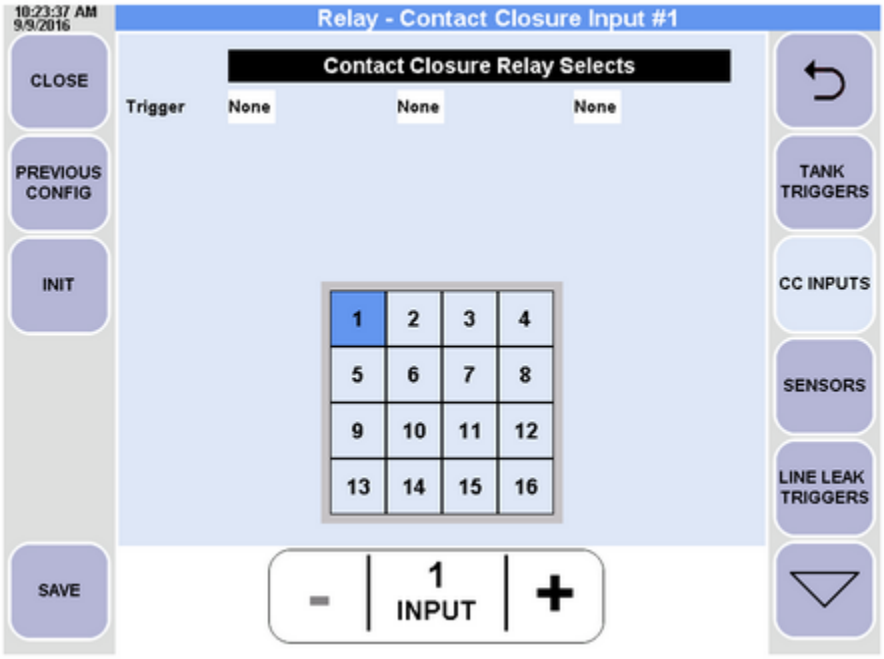


Relay assignments for bottom Water Set Points.

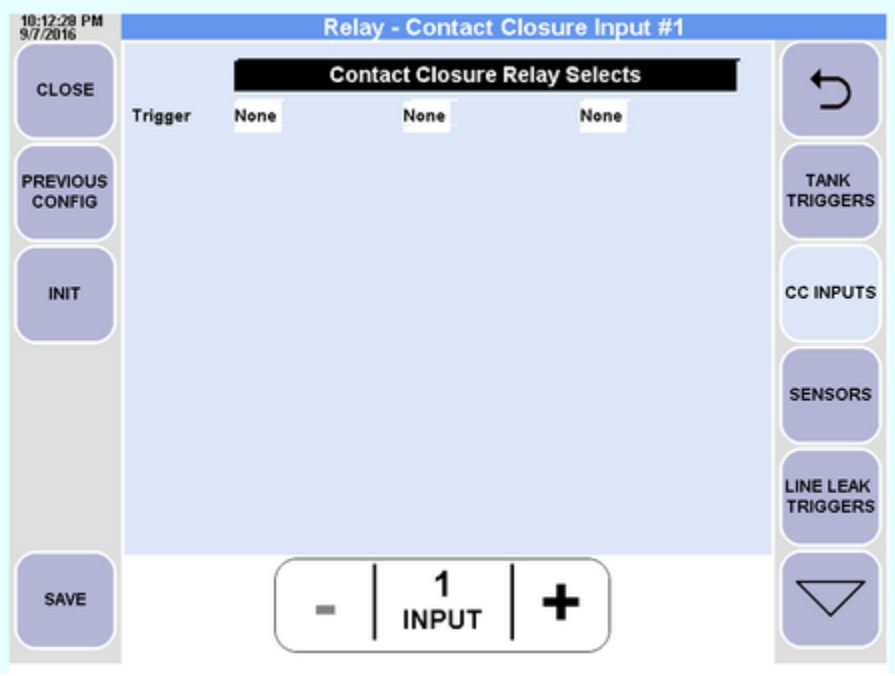


Relay assignments for Temperature Set Points.

2.12.2 RELAYS – CC INPUTS

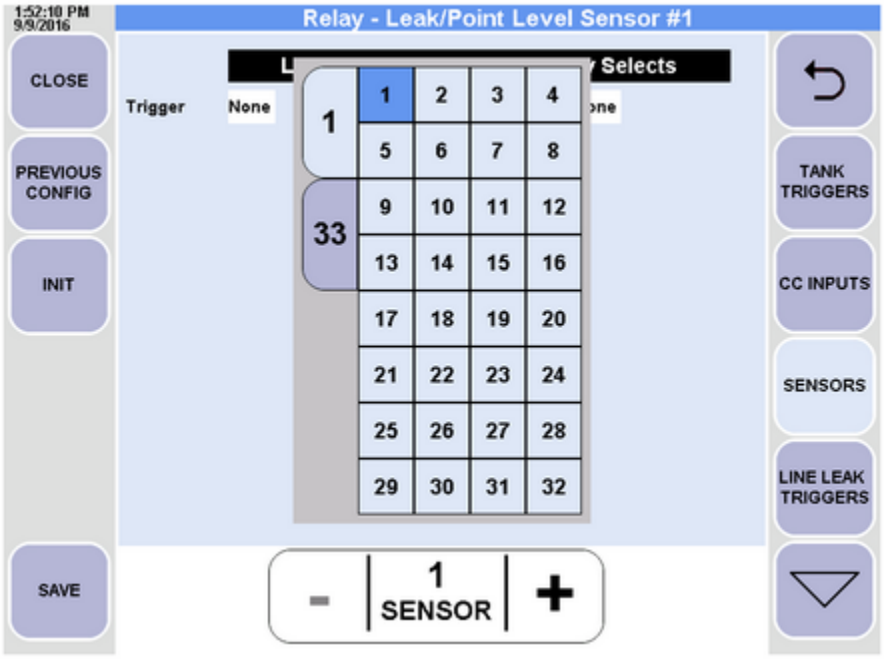


Touch the +/- buttons to increment CC Input by 1. Touch the CC Input number to bring up a list of possible CC Inputs. Touch the CC Input number on the table to make a selection.

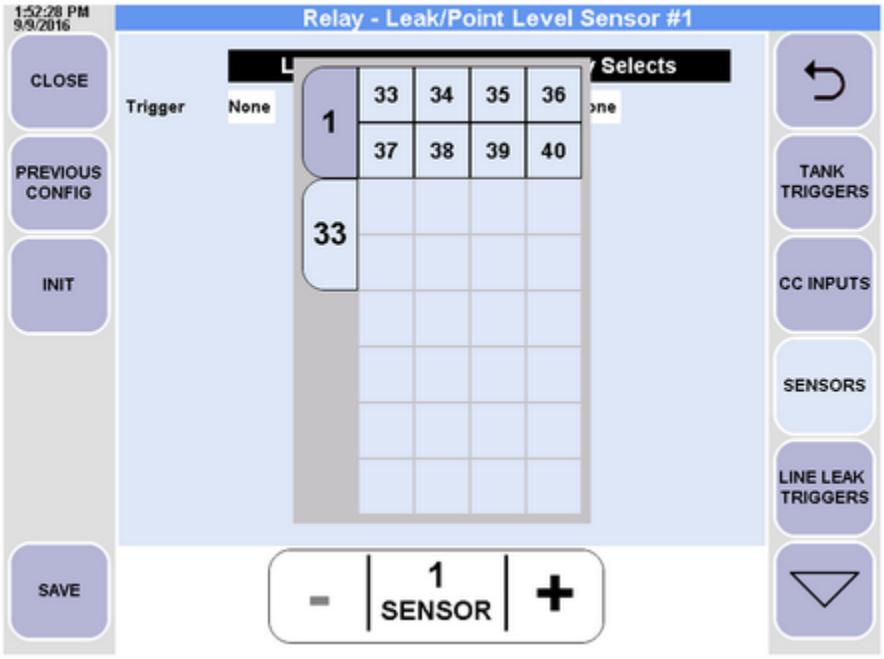


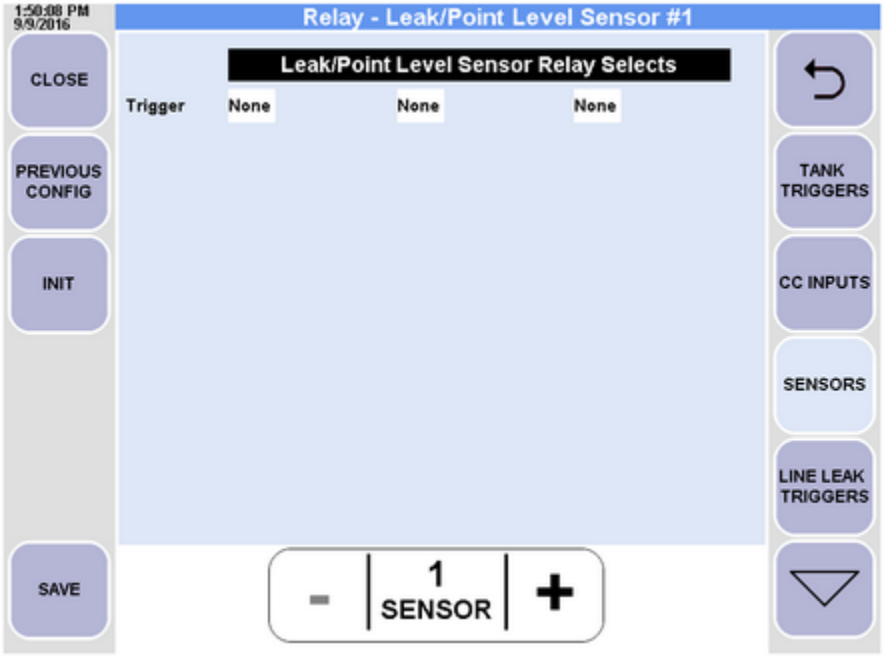
Relay assignments for the CC Inputs.

2.12.3 RELAYS - SENSORS



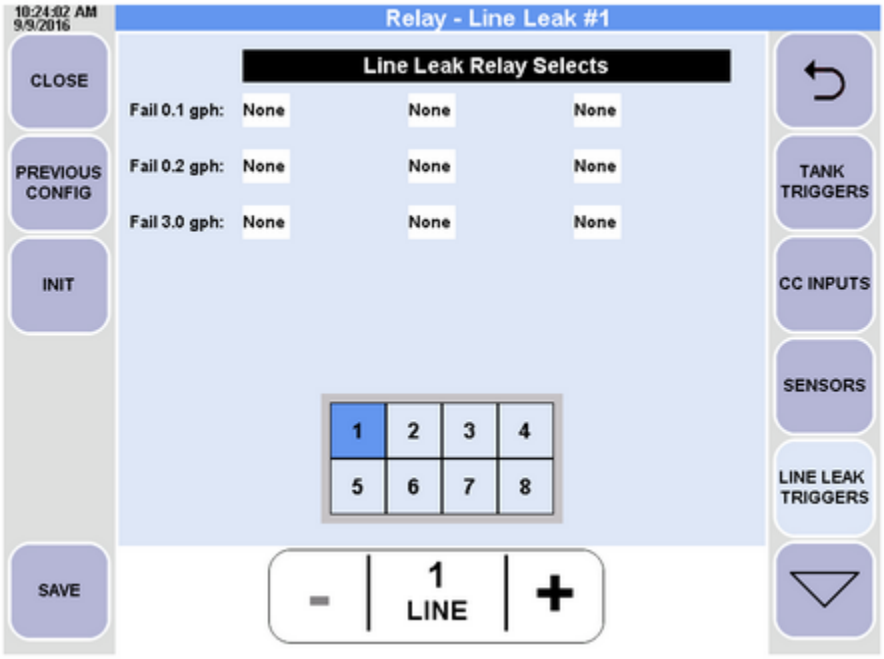
Touch the +/- buttons to increment Sensor Input by 1. Touch the Sensor Input number to bring up a list of possible Sensor Inputs. The tabs on the left edge show the starting Sensor Input number for the page of choices. Page 1 is shown above and Page 2 is shown below. Touch the Sensor Input number on the table to make a selection.



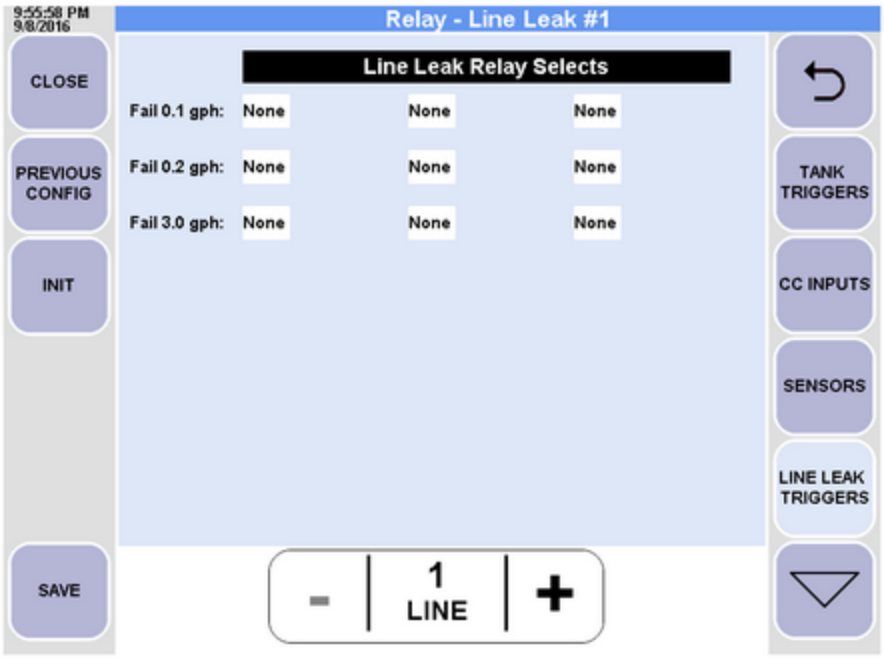


Relay assignments for the Sensor Inputs.

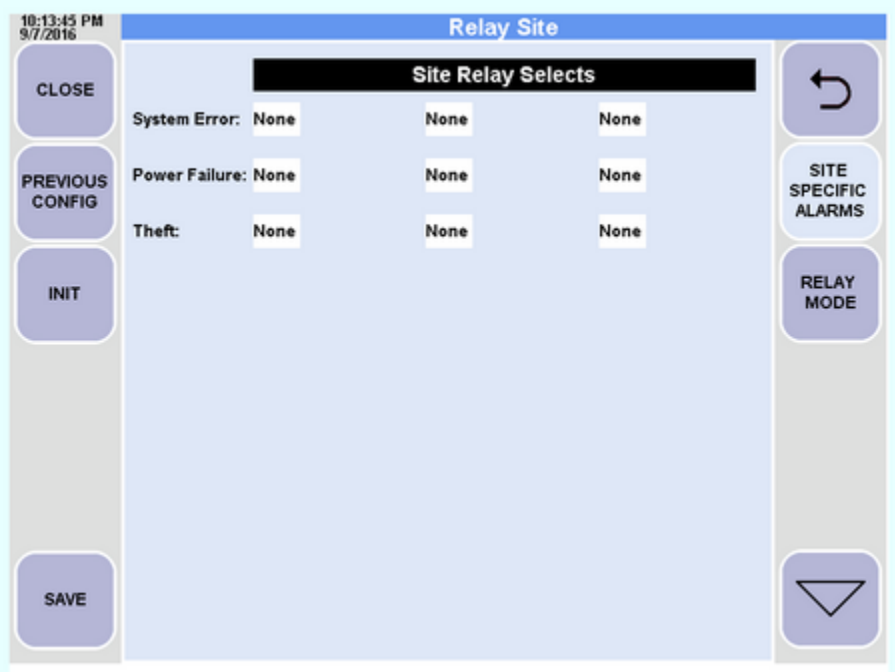
2.12.4 RELAYS – LINE LEAK TRIGGERS



Touch the +/- buttons to increment Line Leak Channel by 1. Touch the Line Leak Channel number to bring up a list of possible Line Leak Channels. Touch the Line Leak Channel number on the table to make a selection.



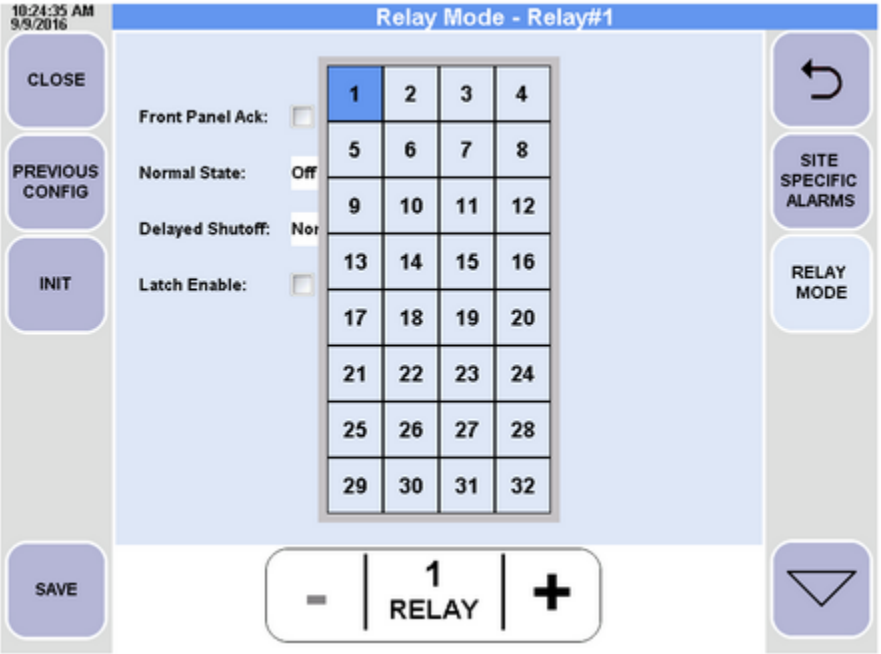
2.12.5 RELAYS – RELAY SITE



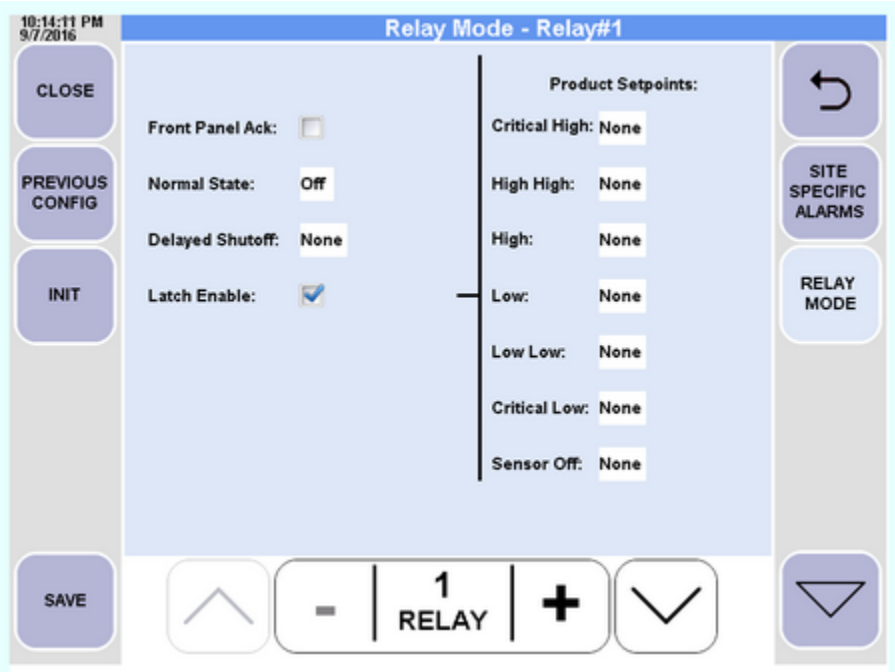
Represents site specific conditions that include System Errors, Power Failure, and Theft. The details are as follows:

- System Error: Includes Probe Timeout, Probe Sync, and Sensor Fault Error conditions.
- Power Failure: A relay will activate once power has been restored to the TMS.
- Theft: A theft condition detected for ANY tank will activate a relay output.

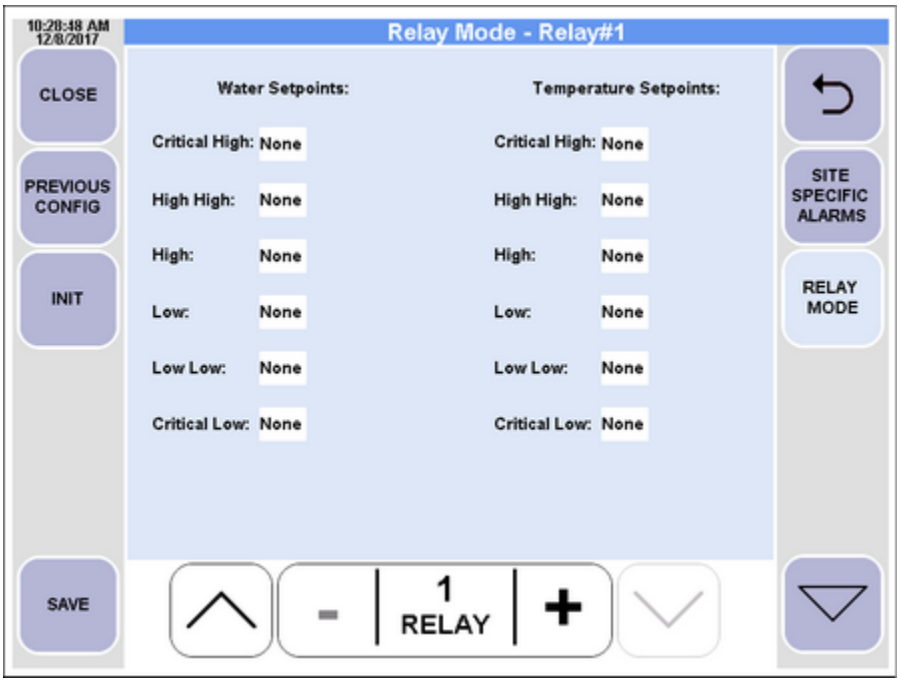
2.12.6 RELAYS – RELAY MODE



Touch the +/- buttons to increment Relay Output Number by 1. Touch the Relay Output Number to bring up a list of possible Relay Output Numbers. Touch the Relay Output Number on the table to make a selection.



The left side of the above screen shows several settings that affect the behavior of the relay. The right side of the screen is visible when enabling the Latch feature and represent the Latch Off conditions. Additional Latch Off conditions are configurable on the second page, accessible by touching the down arrow to the right of the plus sign. Complete details can be found on the following page.



Front Panel Ack: Acknowledges a relay by returning it to the defined normal state after pressing any key on the front panel of the TMS

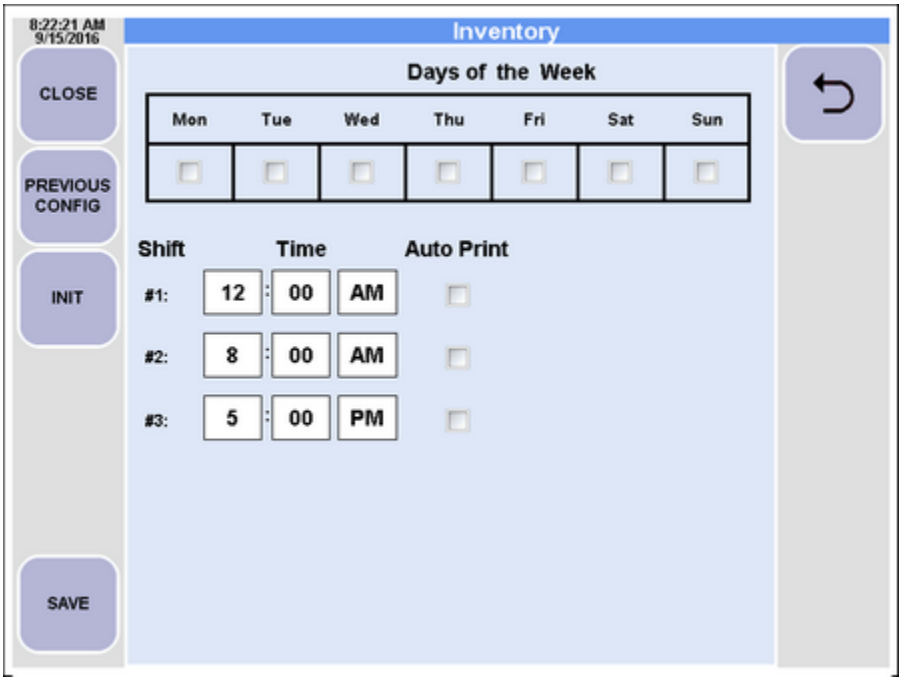
Normal State: A relay is de-energized by default when there is no condition present to activate it. This can be reversed by defining the normal state of the relay as on (energized). A de-energized relay, in that case, would represent the alarm or action state.

Delayed Shutoff: Returns the relay to normal after a delay set in minutes. Selecting None disables this feature.

Latch Enable: Enables a latching feature which separates the conditions that activate a relay from the condition that returns the relay to normal. Ideal for pump/valve control applications. By enabling this feature for a particular relay, all conditions previously assigned to that relay will be the Latch On condition for the relay. Separate conditions would be defined as the latch off conditions as follows:

- Product Set Points: Select the hardware channel of the tank next to the desired Set Point to select the Latch Off condition for the selected relay.
- Sensor Off: Located immediately below the Product Set Points. Select the Sensor number to be used as the Latch Off condition for the selected relay.
- Water Set Points: Select the hardware channel of the tank next to the desired Set Point to select the Latch Off condition for the selected relay.
- Temperature Set Points: Select the hardware channel of the tank next to the desired Set Point to select the Latch Off condition for the selected relay.

2.13 INVENTORY



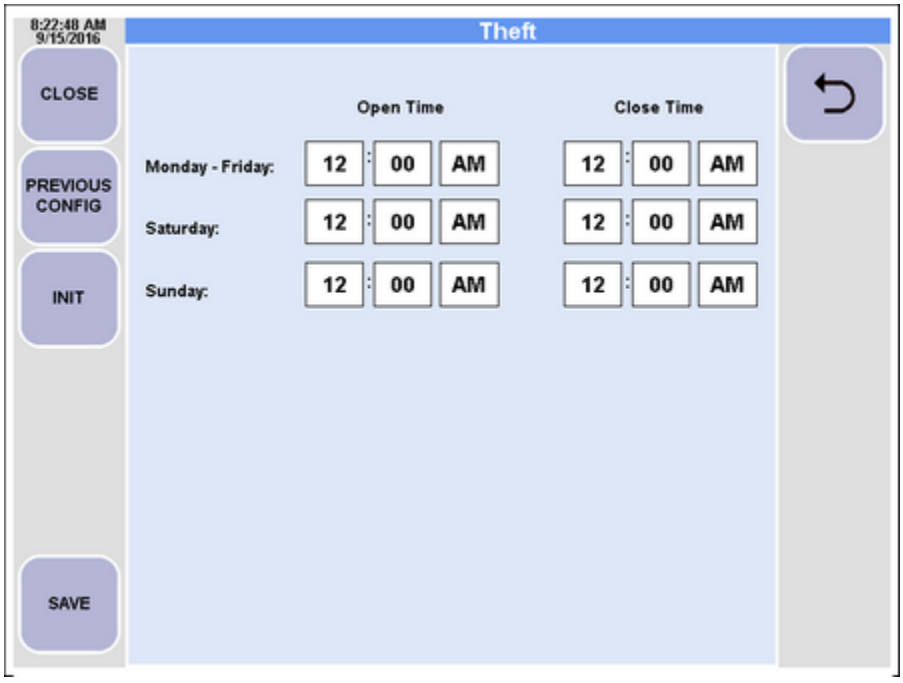
When enabled, the TMS will record inventory snapshots/shift reports to the Inventory Log, as scheduled.

The snapshot can be enabled for any or all of the seven days of the week be checking the appropriate checkboxes. The snapshot is disabled by unchecking all days of the week.

Inventory Log Times: Up to three snapshots can be made daily by setting three different times above. If only one or two snapshots daily are required, make sure that there are only that many different times listed above. For example, if all three Log Times were configured for midnight, one snapshot at midnight would occur if there were any days of the week checked. By changing one of the three times to 12:00PM, you would record two snapshots daily: one at midnight and one at noon. This assumes that at least one day of the week is checked.

Each snapshot can generate a printout on the TMS if desired by checking the appropriate box.

2.14 THEFT



A theft is defined in the TMS as a loss of product during a period when the location is scheduled to be closed. Set the hours of operation above to properly monitor for theft. See Section 2.4 for enabling theft monitoring per tank.

2.15 DIAL OUT

Touch the +/- buttons to increment Dial Out Configuration Number by 1. Touch the Dial Out Configuration Number to bring up a list of possible Dial Out Configuration Numbers. Touch the Dial Out Configuration Number on the table to make a selection.

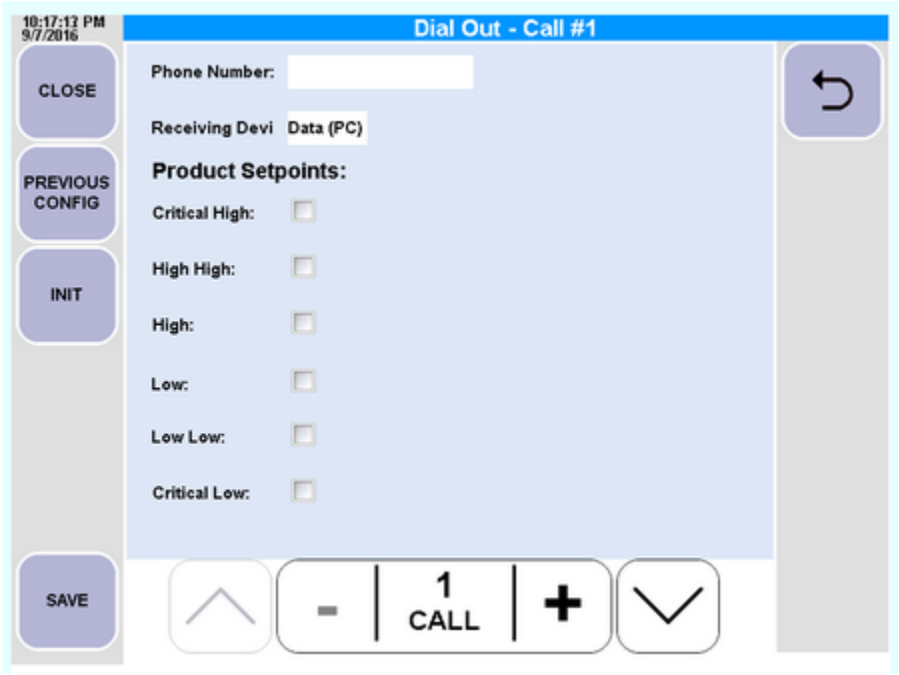
Phone Number: supports a total of 21 digits to make a phone call. A comma represents a pause. See Pause Length in Section 2.16, Modem section for details on setting the length from 1-9 seconds.

Receiving Devi: choice of the following Receiving Devices:

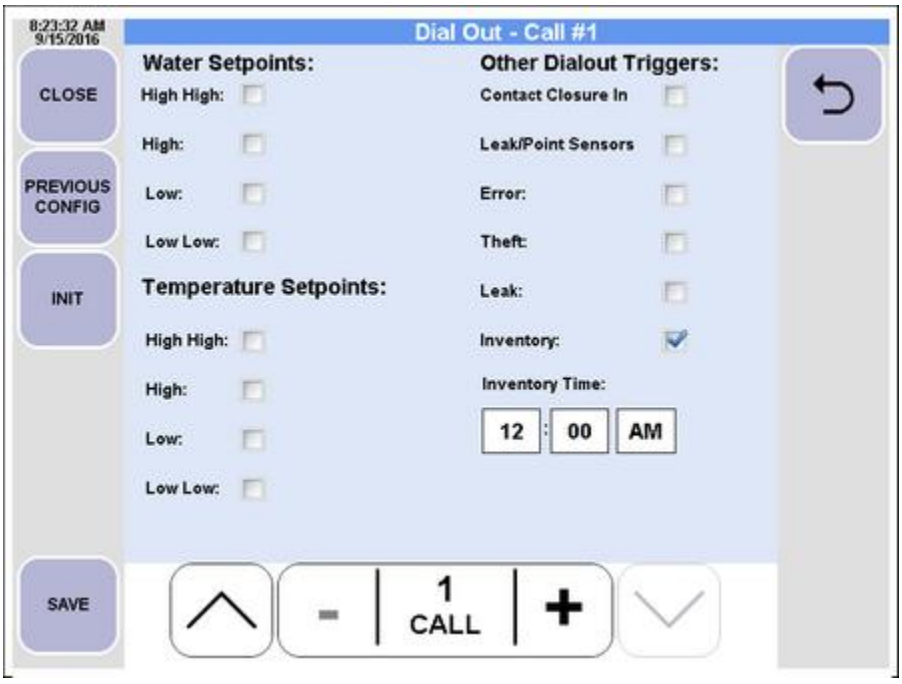
- Data (PC): a computer with TMS Communicator installed and Autopolling running and set to answer the phone upon ringing. The Autopolling configuration controls what data is requested.
- Fax: Any device capable of receiving a fax via phone. Transmits a generic fax report showing inventory with probe and sensor alarm statuses.
- TTY: A text only transmission that can be received by any TTY capable device. HyperTerminal or other terminal emulation program is capable of handling this signal. Transmits a printout comparable to the printout generated by the TMS on its integrated printer.
- Numeric pager: Any numeric pager. Alphanumeric pagers are not supported. Message is limited to what can be incorporated into the 21 digit dial out string

Conditions that will initiate an outbound phone call are as follows:

- Product Set Point: Any Product Set Point for any tank channel
- Water Set Point: Any Water Set Point for any tank channel
- Temperature Set Point: Any Temperature Set Point for any tank channel
- Contact Closure In: Any active CC Input. CC Inputs are found on select relay I/O cards.
- Leak/Point Sensors: Any Sensor alarm.
- Error: Any system error recorded in the Events log
- Theft: Any documented theft recorded in the Thefts Log
- Leak: Any Failed In-Tank Leak Test. Not to be confused with Leak Sensors.
- Inventory: A daily dialout at the time listed below the checkbox if new Inventory Report exists.

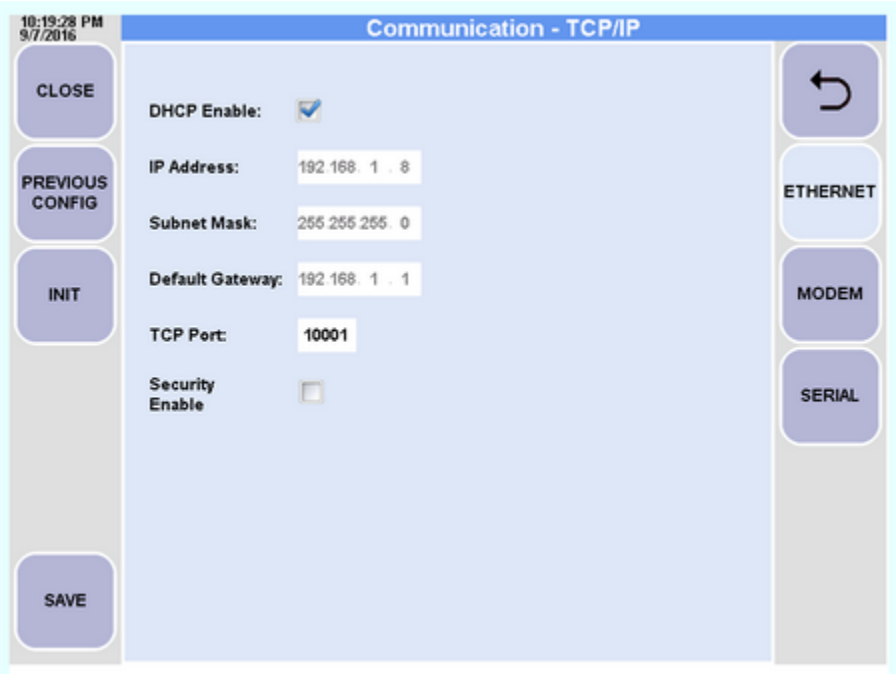


These represent the configuration settings for each set of dial out rules.



2.16 COMMS

The communications section is divided into three categories as illustrated below.



DHCP Enable: Stands for Dynamic Host Control Protocol. Used for automatically assigning an IP Address to a Network Card.

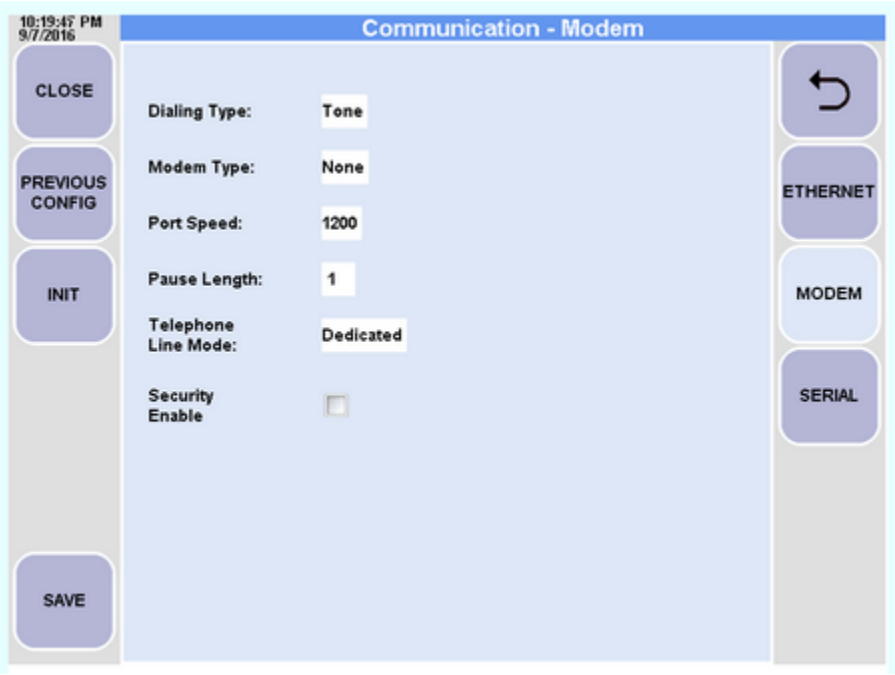
IP Address: A unique address that identifies the TMS on the network. The IP address consists of four octets separated by decimal points that can each range from 0-255. If DHCP is enabled, the currently assigned value is displayed.

Subnet Mask: A mask that defines the subnet of the network supporting the TMS. The Subnet Mask consists of four octets separated by decimal points that can each range from 0-255. If DHCP is enabled, the currently assigned value is displayed.

Default Gateway: A unique address that identifies where responses are sent to when a request is sent from outside of the network. The Default Gateway consists of four octets separated by decimal points that can each range from 0-255. If DHCP is enabled, the currently assigned value is displayed.

TCP Port: The default value of 10001 is recommended unless there are incompatibilities with the current network infrastructure.

Security Enable: Requires a 6-digit numeric Access Code that is prepended to any command issued to the TMS.



Dialing Type: Choice between tone (pushbutton) and pulse (rotary) dialing.

Modem Type: Choices are as follows:

- None: No Modem or Serial C expansion card installed
- Internal: Supports 900433-x Internal Data Modem
- Fax Modem: Supports 900503-1 Internal Fax Modem
- Port Modem: Intended for external modem connected to the RS-232 port. Contact Pneumercator for specific devices supported.
- Serial C: Supports the 900571-x Communications Expansion Cards
- Cell Modem: Intended for a cellular modem. Contact Pneumercator for specific devices supported.

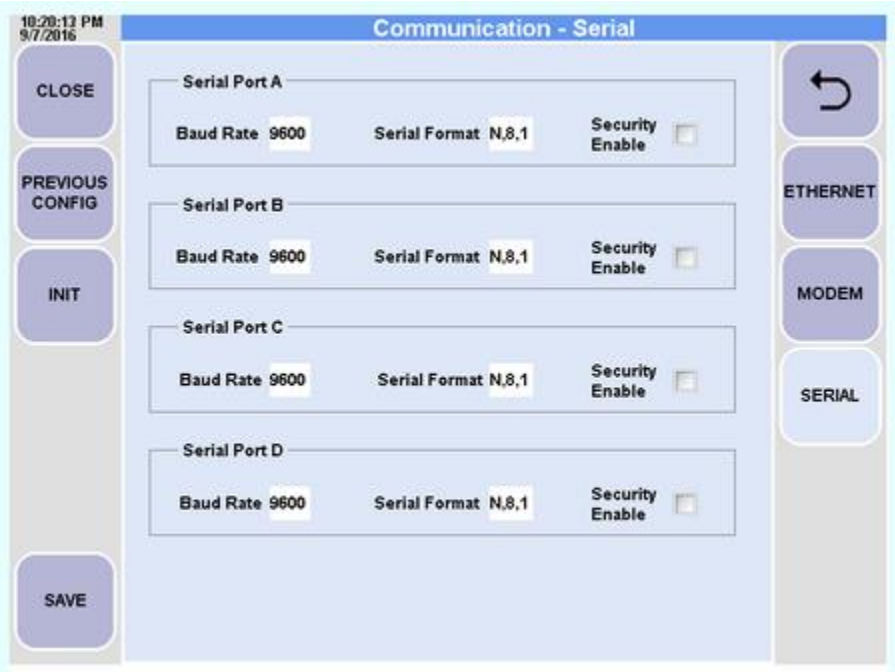
Port Speed: determines the maximum speed the modem is permitted to communicate at.

Pause length: defines the duration of the pause represented by a comma in the dial out string. See Section 2.15 for entering phone number and comma in configuration.

Telephone Line Mode:

- Dedicated: allows the TMS try placing a call without detecting a dial tone. After 5 unsuccessful attempts, the TMS will no longer attempt to place a call for this particular event.
- Shared: the TMS must detect a dial tone before attempting to place a call. After 5 unsuccessful attempts, the TMS will no longer attempt to place a call for this particular event. Failure to detect a dial tone does NOT qualify as a failed attempt.

Security Enable: Requires a 6-digit numeric Access Code that is prepended to any command issued to the TMS.

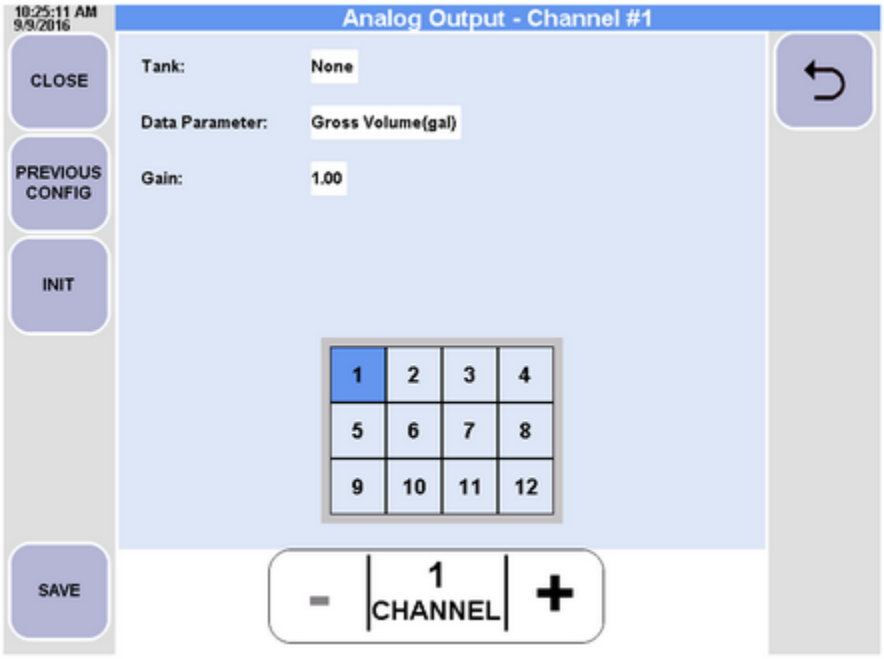


Each individual Serial Port can be configured for the following settings with the defaults shown above:

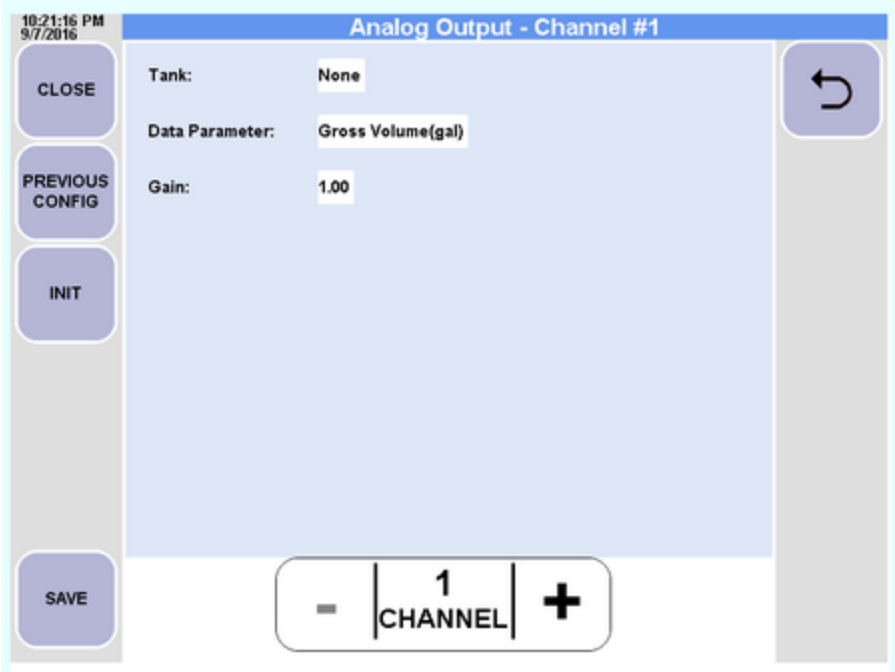
- Baud Rate: the connection speed required to communicate to the attached device
- Serial Format: Presented in the form of Parity, Data Bits, and Stop Bits. Special formats are available to support the external LS300 Line Leak console in both 4 and 8 channel configurations.
- Security Enable: Requires a 6-digit numeric Access Code that is prepended to any command issued to the TMS.

Serial Port A & B are integrated onto the Processor Card of the TMS4000. Serial C & D are optional ports found on select 900571-x communications expansion cards.

2.17 ANALOG OUTPUTS



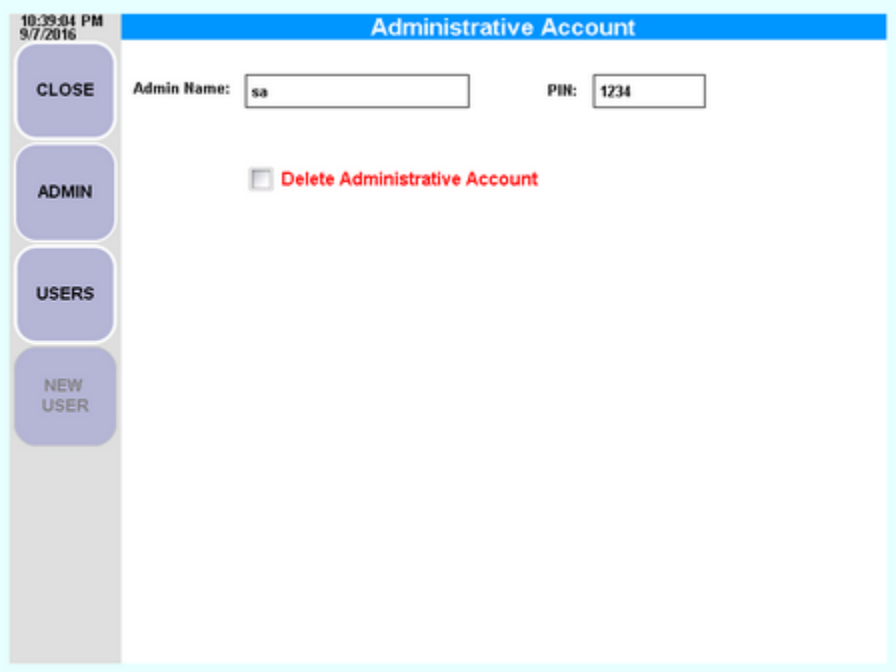
Touch the +/- buttons to increment Analog Output Channel by 1. Touch the Analog Output Channel to bring up a list of possible Analog Output Channels. Touch the Analog Output Channel on the table to make a selection.



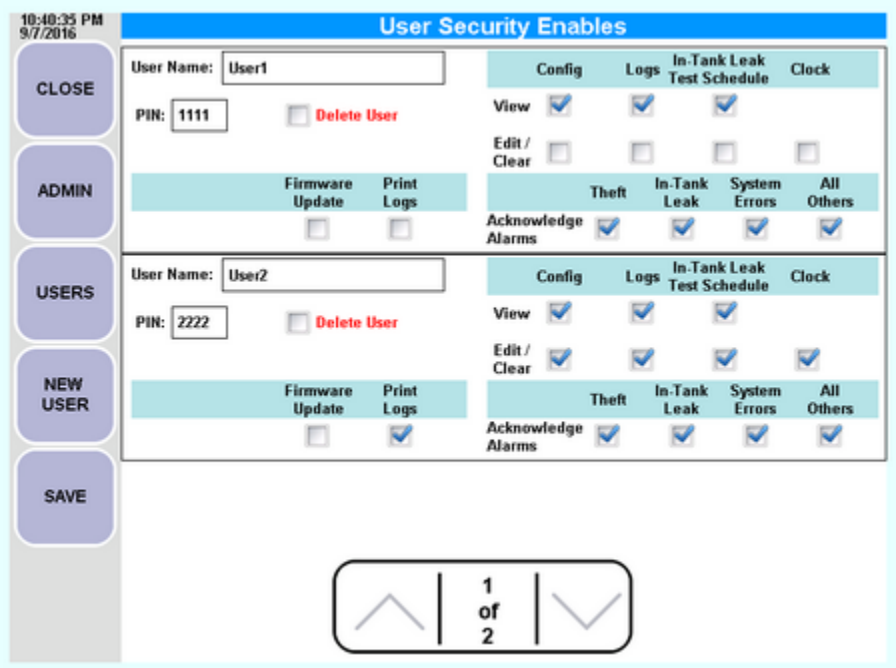
Each desired output must be assigned to a Tank Channel to enable the output. The Data Parameter specifies the information represented by the Analog Output Channel. The Gain should be left configured as 1.00 unless 0-1 mA mode is required. In that case, the Analog Output Card should be configured for 0-20 mA. Consult Bulletin 139 for complete details.

2.18 SECURITY

The TMS4000 can be configured to restrict access to specific information and/or functions. If this is desired, an Administrator account must first be created that has access to everything including the ability to create and modify additional user accounts with varying degrees of permissions.



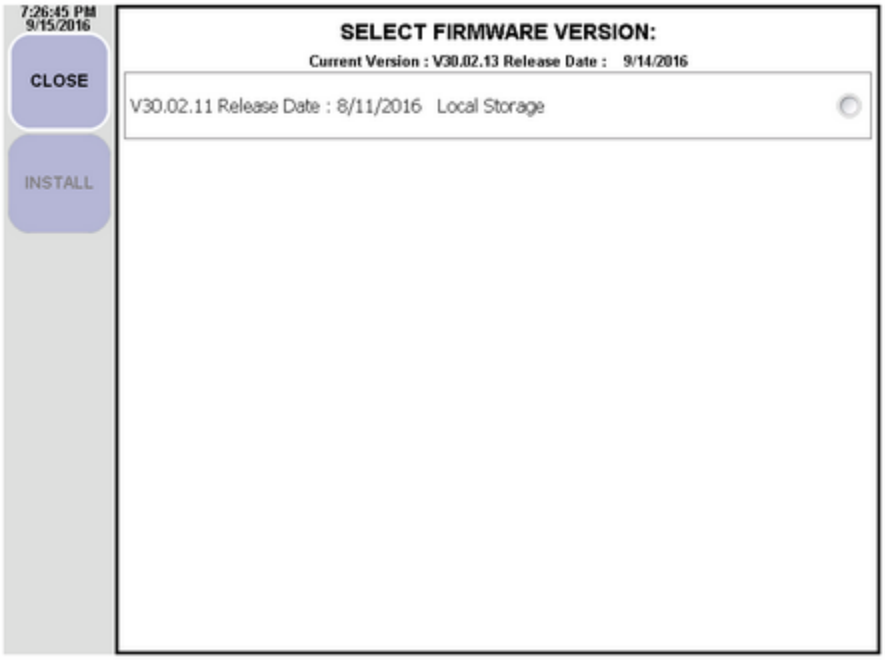
Enter a name for the Administrator and 4-digit numeric PIN. The name is only used in the System Reports to document the user responsible for taking certain actions. Delete the Administrative account to remove all restrictions from accessing TMS4000 functions. See the following page for details on the settings available in the below screenshot showing user accounts.



Each user must have a User Name and 4-digit numeric PIN number assigned. Like the Administrator account, the user name is only used in the System Reports to document the user responsible for taking certain actions. Individual users may be deleted by checking the Delete User checkbox and saving the changes. Access restrictions may currently be placed on the following functions:

- Firmware Update: Firmware Updates may be performed using a USB flash drive. Restrictions may be placed on performing any change to the system firmware
- Logs/Reports: Individual restrictions are as follows:
    - Print: using printer connected to TMS
    - View: on TMS display
    - Clear: Erasing Logs/Reports
- Config: Individual restrictions are as follows:
    - View: on TMS display
    - Edit/Clear: making changes to or erasing the system configuration
- In-Tank Leak Test Schedule: Individual restrictions are as follows:
    - View: on TMS display
    - Edit: making changes to the Leak Test Schedule
- Edit Clock: Changing the Date and Time
- Acknowledge Alarms:
    - Theft: Any detected theft
    - In-Tank Leak: Failed In-Tank Leak Test
    - System Errors: Include Probe Timeout, Probe Sync, and Sensor Fault
    - All Others: Includes Tank Set Points for Product, Water, and Temperature, CC Input and Sensor Alarms.

2.19 FIRMWARE



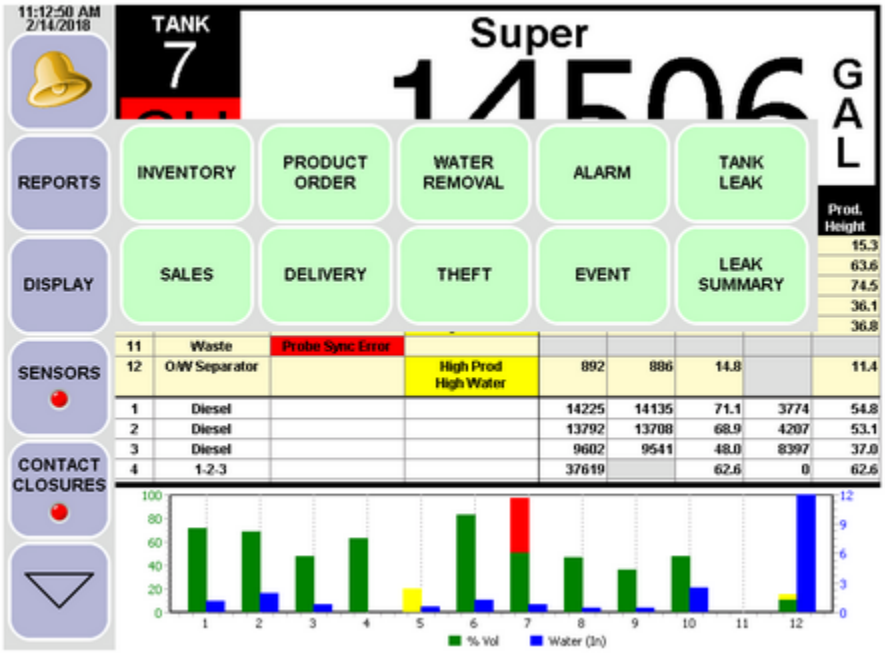
The current version of firmware is displayed across the top. The previous version is available in the event there is technical difficulties with the existing firmware. The Install button will be available once a flash drive is inserted into the internal USB Port with a valid firmware file supplied by Pneumercator. See Section 1.1.1 for location of USB Port.

2.20 LOCALIZATION

The localization screen provides a choice between English and Spanish languages and American versus Metric units of measure.

SECTION 3 SYSTEM REPORTS

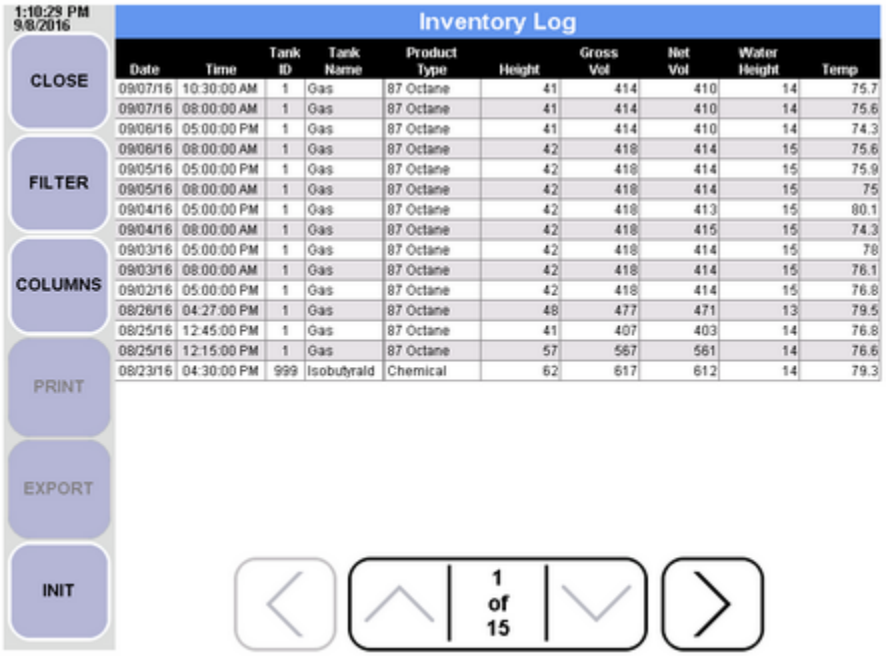
3.1 OVERVIEW



The Reports available in the TMS4000 include the 9 reports displayed above and a System Events Log found in the Setup menu. Any report may be exported to a USB Flash Drive in CSV format by touching the Export button. The CSV (Comma Separated Values) file may be opened using Microsoft Excel or any other comparable software program. See Section 1.1.1 for location of USB Port. The description for each log is as follows:

- Inventory: Contains scheduled Inventory snapshots as defined in the Configuration. Refer to Section 2.13 for additional details
- Sales: Bulk sales representing the sale or withdrawal of fuel from a tank.
- Product Order: An on-demand report indicating the number of days of usable fuel remaining based on the average daily usage since the last delivery
- Delivery: The delivery or addition of fuel to the tank.
- Water Removal: Indicates the water removed from below the fuel surface in the tank.
- Theft: Contains the unauthorized removal of fuel from the tank. Refer to Section 2.14 for additional details.
- Alarm: Alarms for Tank Set Points for Product, Water, and Temperature. Also includes CC Input and Sensor alarms.
- Event: Probe and Sensors errors, Power Fail, and problems regarding Leak Tests, excluding completed failed tests
- Tank Leak: Completed In-Tank Leak Test Results
- Leak Summary: The latest passing test per tank for all previous months. If no test passes for any one month per tank, the latest failure will be listed.
- System Events: Include select Security Events and hardware or software failures of the TMS4000.

3.2 INVENTORY



Date	Time	Tank ID	Tank Name	Product Type	Height	Gross Vol	Net Vol	Water Height	Temp
09/07/16	10:30:00 AM	1	Gas	87 Octane	41	414	410	14	75.7
09/07/16	08:00:00 AM	1	Gas	87 Octane	41	414	410	14	75.6
09/06/16	05:00:00 PM	1	Gas	87 Octane	41	414	410	14	74.3
09/06/16	08:00:00 AM	1	Gas	87 Octane	42	418	414	15	75.6
09/05/16	05:00:00 PM	1	Gas	87 Octane	42	418	414	15	75.9
09/05/16	08:00:00 AM	1	Gas	87 Octane	42	418	414	15	75
09/04/16	05:00:00 PM	1	Gas	87 Octane	42	418	413	15	80.1
09/04/16	08:00:00 AM	1	Gas	87 Octane	42	418	415	15	74.3
09/03/16	05:00:00 PM	1	Gas	87 Octane	42	418	414	15	78
09/03/16	08:00:00 AM	1	Gas	87 Octane	42	418	414	15	76.1
09/02/16	05:00:00 PM	1	Gas	87 Octane	42	418	414	15	76.8
08/26/16	04:27:00 PM	1	Gas	87 Octane	48	477	471	13	79.5
08/25/16	12:45:00 PM	1	Gas	87 Octane	41	407	403	14	76.8
08/25/16	12:15:00 PM	1	Gas	87 Octane	57	567	561	14	76.6
08/23/16	04:30:00 PM	999	Isobutyrald	Chemical	62	617	612	14	79.3

Date: Date the snapshot was taken

Time: Time the snapshot was taken

Tank ID: The Tank ID number, not Tank Hardware Channel number, assigned to the documented tank. See Section 2.4.

Tank Name: The name assigned to the tank. See Section 2.4

Product Type: The Product Type assigned to the tank. See Section 2.4

Height: The total level of liquid in the tank as measured in inches/millimeters

Gross Vol: The total volume of liquid in the tank as measured in gallons/liters

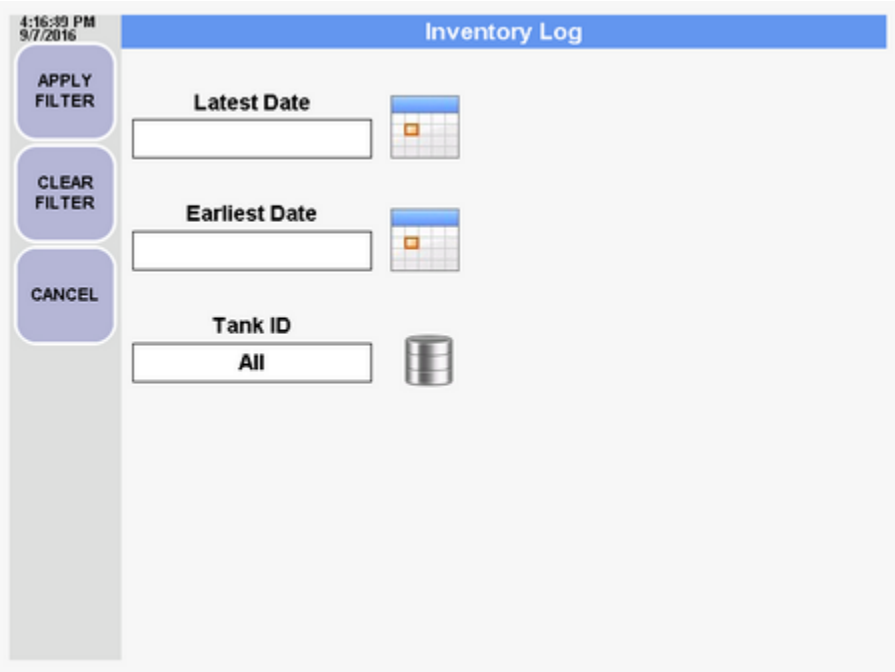
Net Vol: The total temperature-compensated volume of liquid in the tank as measured in gallons/liters. Industry standard compensation for liquid represented as if it was 68°F/20°C.

Water Height: The total level of water below the fuel in the tank as measured in inches/millimeters

Temp: The average liquid temperature in the tank

Ullage: The amount of free space in the tank up to the defined ullage threshold as measured in gallons/liters. See Section 2.3

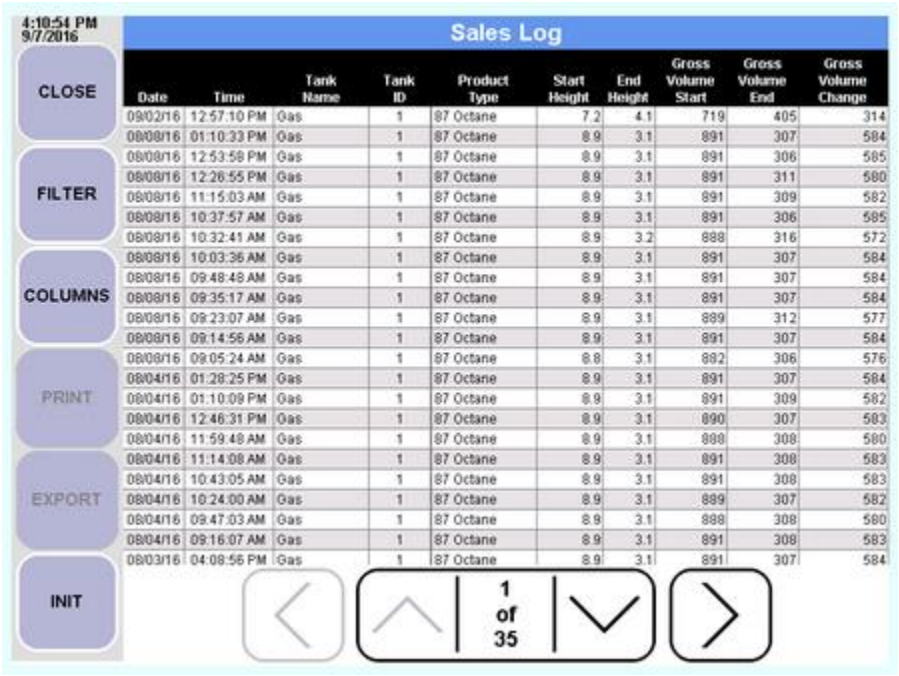
% Vol: The percentage of total tank volume at the time of the snapshot.



Provided filter can select a date range and/or specific Tank IDs.

Individual columns may be disabled by unchecking box. Grayed out values cannot be disabled.

3.3 SALES



Date	Time	Tank Name	Tank ID	Product Type	Start Height	End Height	Gross Volume Start	Gross Volume End	Gross Volume Change
09/02/16	12:57:10 PM	Gas	1	87 Octane	7.2	4.1	719	405	314
08/08/16	01:10:33 PM	Gas	1	87 Octane	8.9	3.1	891	307	584
08/08/16	12:53:58 PM	Gas	1	87 Octane	8.9	3.1	891	306	585
08/08/16	12:26:55 PM	Gas	1	87 Octane	8.9	3.1	891	311	580
08/08/16	11:15:03 AM	Gas	1	87 Octane	8.9	3.1	891	309	582
08/08/16	10:37:57 AM	Gas	1	87 Octane	8.9	3.1	891	306	585
08/08/16	10:32:41 AM	Gas	1	87 Octane	8.9	3.2	888	316	572
08/08/16	10:03:36 AM	Gas	1	87 Octane	8.9	3.1	891	307	584
08/08/16	09:48:48 AM	Gas	1	87 Octane	8.9	3.1	891	307	584
08/08/16	09:35:17 AM	Gas	1	87 Octane	8.9	3.1	891	307	584
08/08/16	09:23:07 AM	Gas	1	87 Octane	8.9	3.1	889	312	577
08/08/16	09:14:56 AM	Gas	1	87 Octane	8.9	3.1	891	307	584
08/08/16	09:05:24 AM	Gas	1	87 Octane	8.8	3.1	882	306	576
08/04/16	01:28:25 PM	Gas	1	87 Octane	8.9	3.1	891	307	584
08/04/16	01:10:09 PM	Gas	1	87 Octane	8.9	3.1	891	309	582
08/04/16	12:46:31 PM	Gas	1	87 Octane	8.9	3.1	890	307	583
08/04/16	11:59:48 AM	Gas	1	87 Octane	8.9	3.1	888	308	580
08/04/16	11:14:08 AM	Gas	1	87 Octane	8.9	3.1	891	308	583
08/04/16	10:43:05 AM	Gas	1	87 Octane	8.9	3.1	891	308	583
08/04/16	10:24:00 AM	Gas	1	87 Octane	8.9	3.1	889	307	582
08/04/16	09:47:03 AM	Gas	1	87 Octane	8.9	3.1	888	308	580
08/04/16	09:16:07 AM	Gas	1	87 Octane	8.9	3.1	891	308	583
08/03/16	04:08:56 PM	Gas	1	87 Octane	8.9	3.1	891	307	584

Date: Date the sale was completed

Time: Time the sale was completed

Tank Name: The name assigned to the tank. See Section 2.4

Tank ID: The Tank ID number, not Tank Hardware Channel number, assigned to the documented tank. See Section 2.4.

Product Type: The Product Type assigned to the tank. See Section 2.4

Start Height: The total liquid level in the tank at the beginning of the sale

End Height: The total liquid level in the tank at the end of the sale

Gross Volume Start: The total volume of liquid in the tank at the beginning of the sale

Gross Volume End: The total volume of liquid in the tank at the end of the sale

Gross Volume Change: The total change in volume liquid as a result of the sale

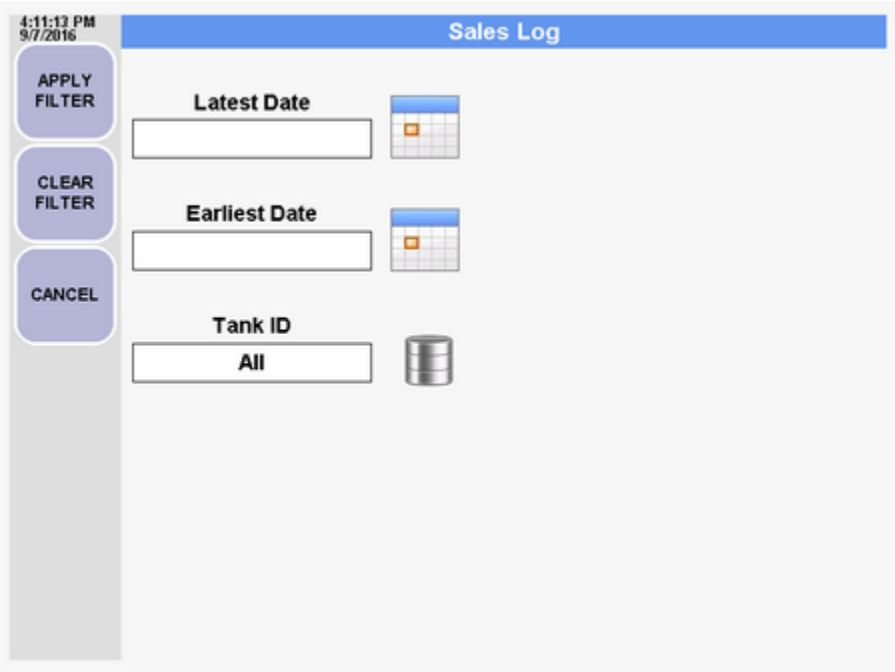
Net Volume Start: The total temperature-compensated of volume of liquid in the tank at the beginning of the sale

Net Volume End: The total temperature-compensated volume of liquid in the tank at the end of the sale

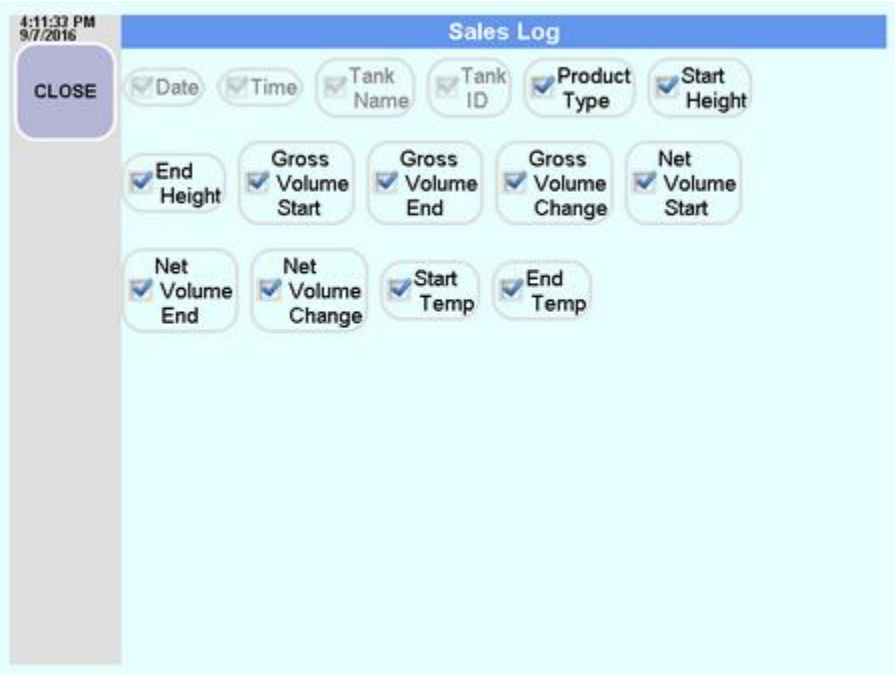
Net Volume Change: The total change in temperature-compensated volume of liquid in the tank at the beginning of the sale

Start Temp: The average liquid temperature at the beginning of the sale

End Temp: The average liquid temperature at the end of the sale



Provided filter can select a date range and/or specific Tank IDs.



Individual columns may be disabled by unchecking box. Grayed out values cannot be disabled.

3.4 PRODUCT ORDER

Date: Date the report was generated

Time: Time the report was generated

Tank ID: The Tank ID number, not Tank Hardware Channel number, assigned to the documented tank. See Section 2.4.

Tank Name: The name assigned to the tank. See Section 2.4

Product Type: The Product Type assigned to the tank. See Section 2.4

Usable Volume: The Total Gross Tank Volume minus the Unusable Volume. See Section 2.5

Gross Vol: The Total Gross Tank Volume

Ullage: The amount of free space in the tank up to the defined ullage threshold as measured in gallons/liters. See Section 2.3

Delivery Date: The date of the most recent delivery for this tank

Delivery Volume: The volume of fuel delivered to the tank at the most recent delivery

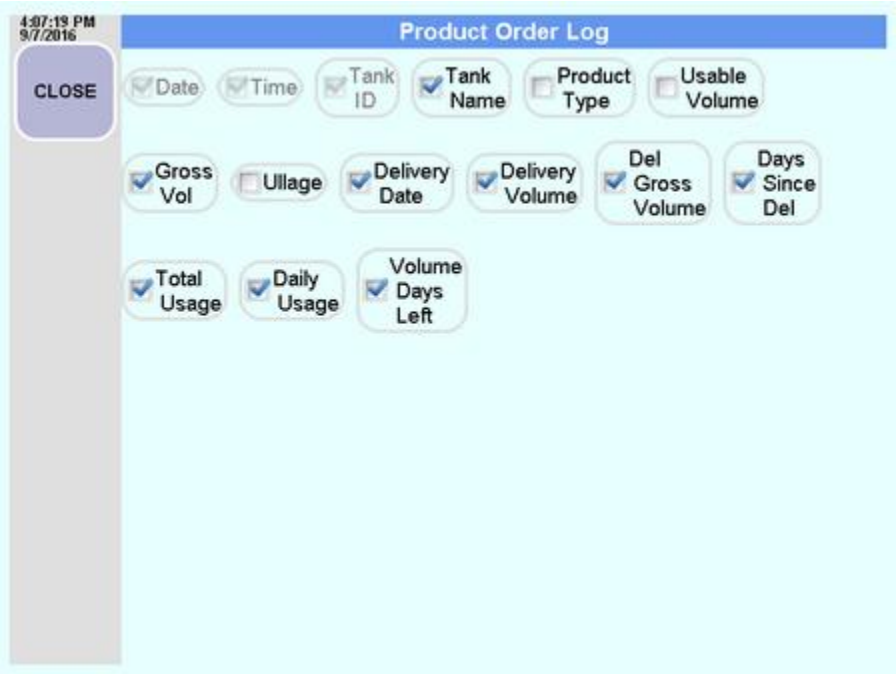
Del Gross Volume: The total volume of fuel in the tank after the latest delivery

Days Since Del: The number of days that passed since the last delivery

Total Usage: The total amount of fuel used since the last delivery

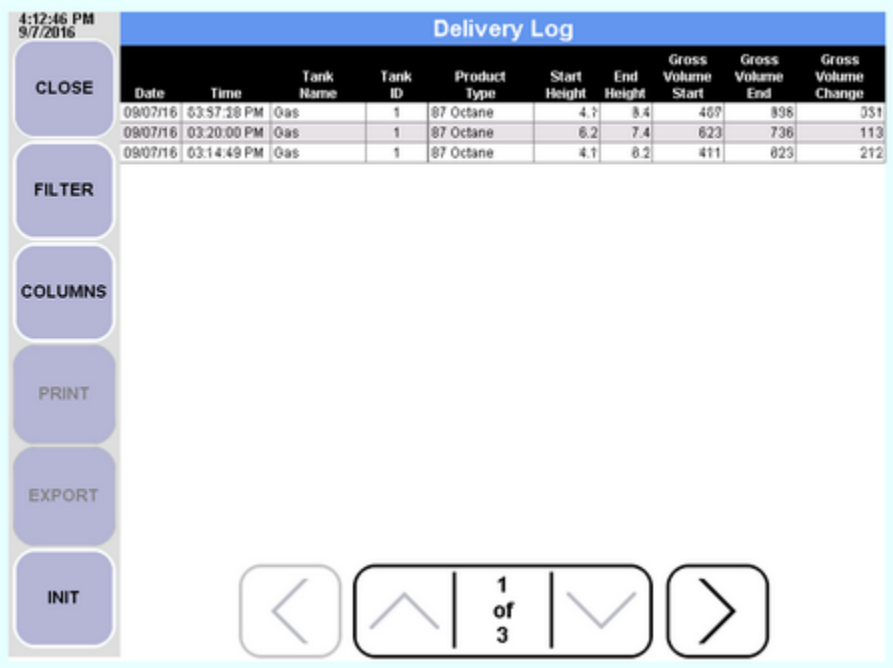
Daily Usage: The average daily usage

Volume Days Left: The estimated number of days of usable fuel remaining based on the Daily Usage.



Individual columns may be disabled by unchecking box. Grayed out values cannot be disabled.

3.5 DELIVERY



Date: Date the delivery was completed

Time: Time the delivery was completed

Tank Name: The name assigned to the tank. See Section 2.4

Tank ID: The Tank ID number, not Tank Hardware Channel number, assigned to the documented tank. See Section 2.4.

Product Type: The Product Type assigned to the tank. See Section 2.4

Start Height: The total liquid level in the tank at the beginning of the delivery

End Height: The total liquid level in the tank at the end of the delivery

Gross Volume Start: The total volume of liquid in the tank at the beginning of the delivery

Gross Volume End: The total volume of liquid in the tank at the end of the delivery

Gross Volume Change: The total change in volume liquid as a result of the delivery

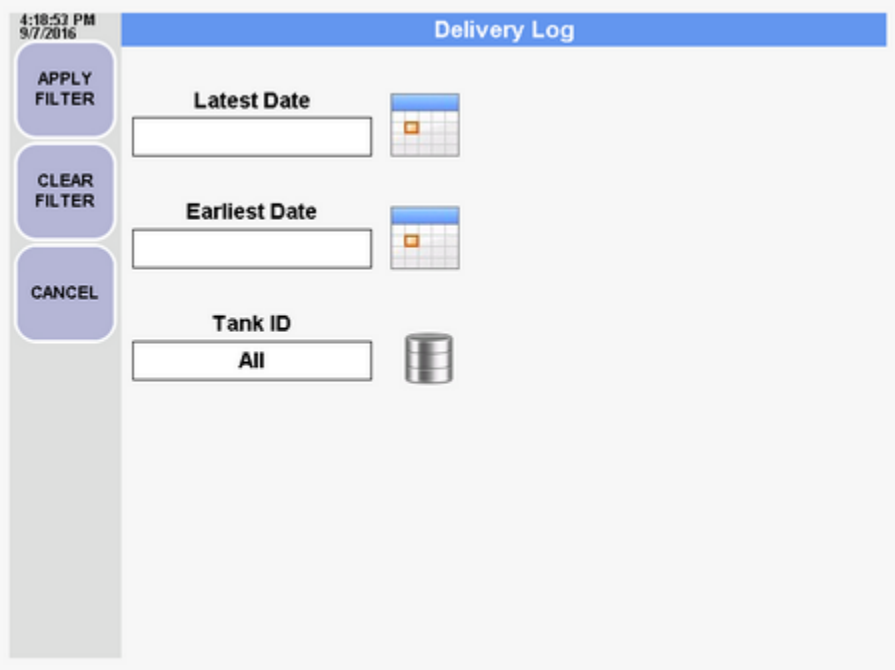
Net Volume Start: The total temperature-compensated of volume of liquid in the tank at the beginning of the delivery

Net Volume End: The total temperature-compensated volume of liquid in the tank at the end of the delivery

Net Volume Change: The total change in temperature-compensated volume of liquid in the tank at the beginning of the delivery

Start Temp: The average liquid temperature at the beginning of the delivery

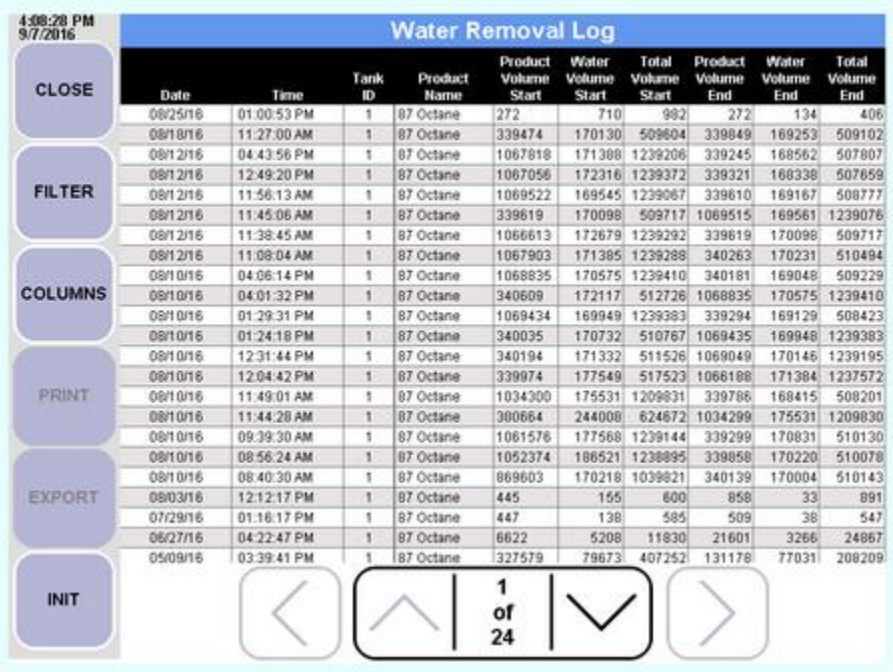
End Temp: The average liquid temperature at the end of the delivery



Provided filter can select a date range and/or specific Tank IDs.

Individual columns may be disabled by unchecking box. Grayed out values cannot be disabled.

3.6 WATER REMOVAL



Date	Time	Tank ID	Product Name	Product Volume Start	Water Volume Start	Total Volume Start	Product Volume End	Water Volume End	Total Volume End
08/25/16	01:00:53 PM	1	87 Octane	272	710	982	272	134	406
08/18/16	11:27:00 AM	1	87 Octane	339474	170130	509604	339849	169253	509102
08/12/16	04:43:56 PM	1	87 Octane	1067818	171388	1239206	339245	168562	507807
08/12/16	12:49:20 PM	1	87 Octane	1067056	172316	1239372	339321	168338	507659
08/12/16	11:56:13 AM	1	87 Octane	1069522	169545	1239067	339610	169167	508777
08/12/16	11:45:06 AM	1	87 Octane	339619	170098	509717	1069515	169561	1239076
08/12/16	11:38:45 AM	1	87 Octane	1066613	172679	1239292	339619	170098	509717
08/12/16	11:08:04 AM	1	87 Octane	1067903	171385	1239288	340263	170231	510494
08/10/16	04:06:14 PM	1	87 Octane	1068835	170575	1239410	340181	169048	509229
08/10/16	04:01:32 PM	1	87 Octane	340609	172117	512726	1068835	170575	1239410
08/10/16	01:29:31 PM	1	87 Octane	1069434	169949	1239383	339294	169129	508423
08/10/16	01:24:18 PM	1	87 Octane	340035	170732	510767	1069435	169948	1239383
08/10/16	12:31:44 PM	1	87 Octane	340194	171332	511526	1069049	170146	1239195
08/10/16	12:04:42 PM	1	87 Octane	339974	177549	517523	1068188	171384	1237572
08/10/16	11:49:01 AM	1	87 Octane	1034300	175531	1209831	339786	168415	508201
08/10/16	11:44:28 AM	1	87 Octane	380664	244008	624672	1034299	175531	1209830
08/10/16	09:39:30 AM	1	87 Octane	1061576	177568	1239144	339299	170831	510130
08/10/16	08:56:24 AM	1	87 Octane	1052374	186521	1238895	339858	170220	510078
08/10/16	08:40:30 AM	1	87 Octane	869603	170218	1039821	340139	170004	510143
08/03/16	12:12:17 PM	1	87 Octane	445	155	600	858	33	891
07/29/16	01:16:17 PM	1	87 Octane	447	138	585	509	38	547
06/27/16	04:22:47 PM	1	87 Octane	6622	5208	11830	21601	3266	24867
05/09/16	03:39:41 PM	1	87 Octane	327579	79673	407252	131178	77031	208209

Date: Date the water removal was completed

Time: Time the water removal was completed

Tank ID: The Tank ID number, not Tank Hardware Channel number, assigned to the documented tank. See Section 2.4.

Product Type: The Product Type assigned to the tank. See Section 2.4

Tank Name: The name assigned to the tank. See Section 2.4

Product Volume Start: The volume of fuel before water was removed

Water Volume Start: The volume of water before water was removed

Total Volume Start: The volume of all liquid, fuel and water combined, before water was removed

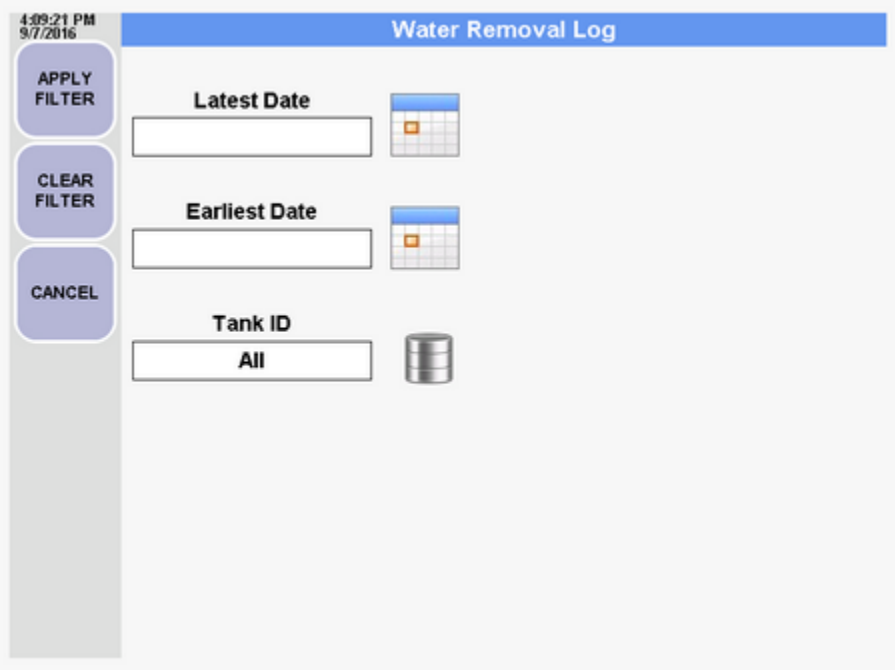
Product Volume End: The volume of fuel after water was removed

Water Volume End: The volume of water after water was removed

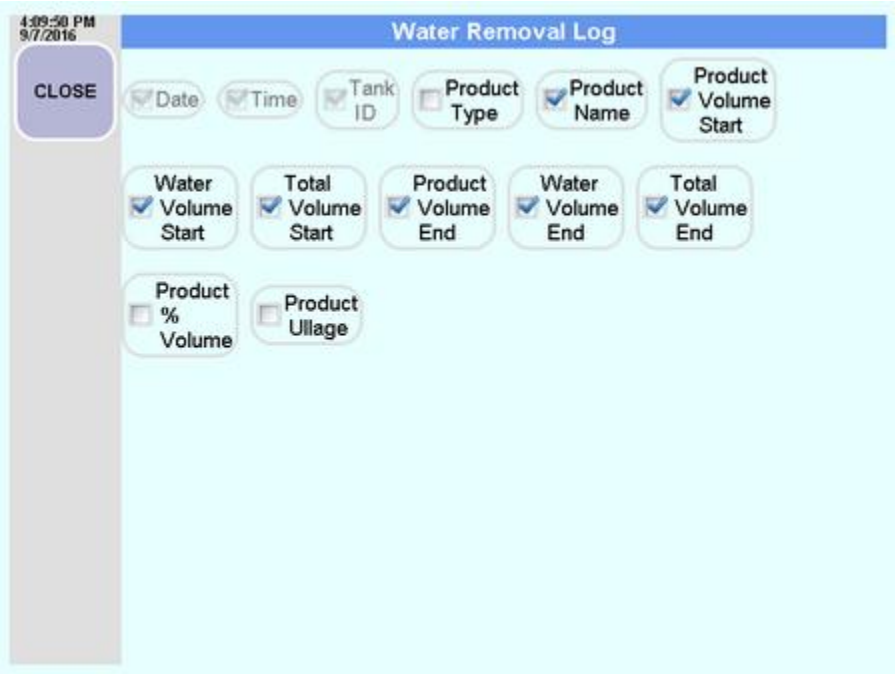
Total Volume End: The volume of all liquid, fuel and water combined, after water was removed

Product % Volume: The percent of total tank volume of all liquid, fuel and water combined, after water was removed

Product Ullage: The amount of free space after water was removed in the tank up to the defined ullage threshold as measured in gallons/liters. See Section 2.3

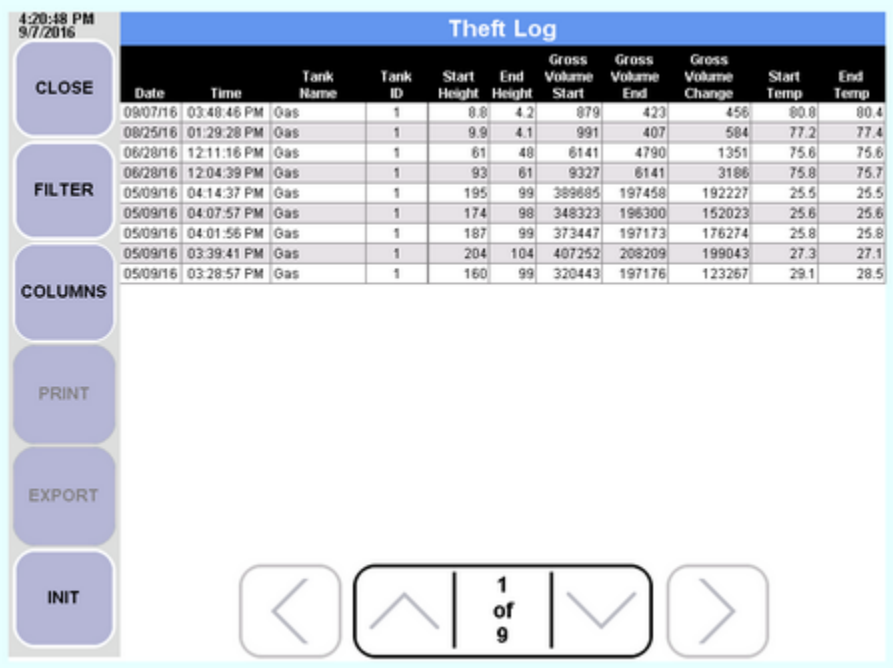


Provided filter can select a date range and/or specific Tank IDs.



Individual columns may be disabled by unchecking box. Grayed out values cannot be disabled.

3.7 THEFT



Date	Time	Tank Name	Tank ID	Start Height	End Height	Gross Volume Start	Gross Volume End	Gross Volume Change	Start Temp	End Temp
09/07/16	03:48:46 PM	Gas	1	8.8	4.2	879	423	456	80.8	80.4
08/25/16	01:29:28 PM	Gas	1	9.9	4.1	991	407	584	77.2	77.4
06/28/16	12:11:16 PM	Gas	1	61	48	6141	4790	1351	75.6	75.6
06/28/16	12:04:39 PM	Gas	1	93	61	9327	6141	3186	75.8	75.7
05/09/16	04:14:37 PM	Gas	1	195	99	389685	197458	192227	25.5	25.5
05/09/16	04:07:57 PM	Gas	1	174	98	348323	196300	152023	25.6	25.6
05/09/16	04:01:56 PM	Gas	1	187	99	373447	197173	176274	25.8	25.8
05/09/16	03:39:41 PM	Gas	1	204	104	407252	208209	199043	27.3	27.1
05/09/16	03:28:57 PM	Gas	1	160	99	320443	197176	123267	29.1	28.5

Date: Date the theft ended

Time: Time the theft ended

Tank Name: The name assigned to the tank. See Section 2.4

Tank ID: The Tank ID number, not Tank Hardware Channel number, assigned to the documented tank. See Section 2.4.

Product Type: The Product Type assigned to the tank. See Section 2.4

Start Height: The total liquid level in the tank at the beginning of the theft

End Height: The total liquid level in the tank at the end of the theft

Gross Volume Start: The total volume of liquid in the tank at the beginning of the theft

Gross Volume End: The total volume of liquid in the tank at the end of the theft

Gross Volume Change: The total change in volume liquid as a result of the theft

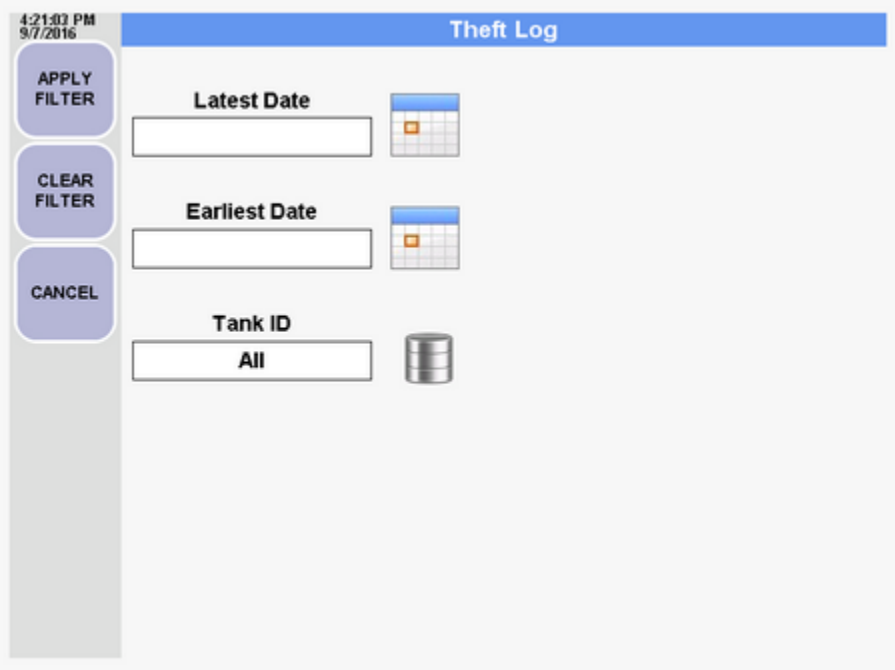
Net Volume Start: The total temperature-compensated of volume of liquid in the tank at the beginning of the theft

Net Volume End: The total temperature-compensated volume of liquid in the tank at the end of the theft

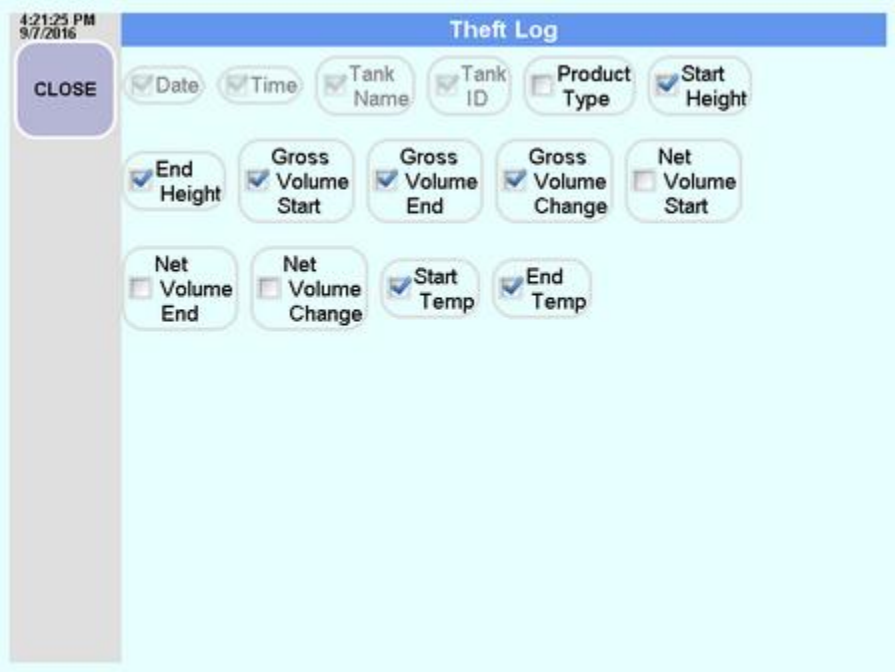
Net Volume Change: The total change in temperature-compensated volume of liquid in the tank at the beginning of the theft

Start Temp: The average liquid temperature at the beginning of the theft

End Temp: The average liquid temperature at the end of the theft

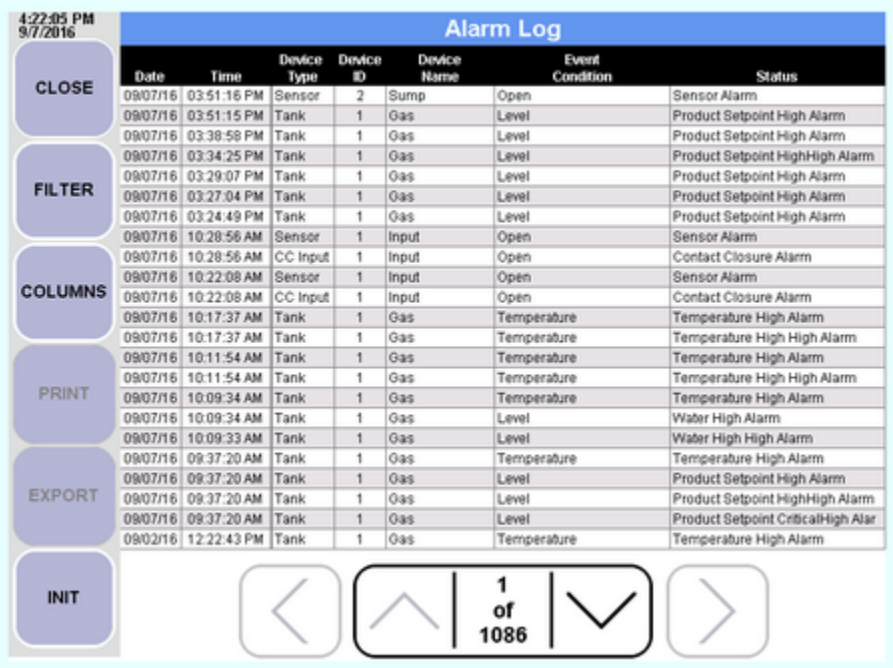


Provided filter can select a date range and/or specific Tank IDs.



Individual columns may be disabled by unchecking box. Grayed out values cannot be disabled.

3.8 ALARM



Date	Time	Device Type	Device ID	Device Name	Event Condition	Status
09/07/16	03:51:16 PM	Sensor	2	Sump	Open	Sensor Alarm
09/07/16	03:51:15 PM	Tank	1	Gas	Level	Product Setpoint High Alarm
09/07/16	03:38:58 PM	Tank	1	Gas	Level	Product Setpoint High Alarm
09/07/16	03:34:25 PM	Tank	1	Gas	Level	Product Setpoint HighHigh Alarm
09/07/16	03:29:07 PM	Tank	1	Gas	Level	Product Setpoint High Alarm
09/07/16	03:27:04 PM	Tank	1	Gas	Level	Product Setpoint High Alarm
09/07/16	03:24:49 PM	Tank	1	Gas	Level	Product Setpoint High Alarm
09/07/16	10:28:56 AM	Sensor	1	Input	Open	Sensor Alarm
09/07/16	10:28:56 AM	CC Input	1	Input	Open	Contact Closure Alarm
09/07/16	10:22:08 AM	Sensor	1	Input	Open	Sensor Alarm
09/07/16	10:22:08 AM	CC Input	1	Input	Open	Contact Closure Alarm
09/07/16	10:17:37 AM	Tank	1	Gas	Temperature	Temperature High Alarm
09/07/16	10:17:37 AM	Tank	1	Gas	Temperature	Temperature High High Alarm
09/07/16	10:11:54 AM	Tank	1	Gas	Temperature	Temperature High Alarm
09/07/16	10:11:54 AM	Tank	1	Gas	Temperature	Temperature High High Alarm
09/07/16	10:09:34 AM	Tank	1	Gas	Temperature	Temperature High Alarm
09/07/16	10:09:34 AM	Tank	1	Gas	Level	Water High Alarm
09/07/16	10:09:33 AM	Tank	1	Gas	Level	Water High High Alarm
09/07/16	09:37:20 AM	Tank	1	Gas	Temperature	Temperature High Alarm
09/07/16	09:37:20 AM	Tank	1	Gas	Level	Product Setpoint High Alarm
09/07/16	09:37:20 AM	Tank	1	Gas	Level	Product Setpoint HighHigh Alarm
09/07/16	09:37:20 AM	Tank	1	Gas	Level	Product Setpoint CriticalHigh Alar
09/02/16	12:22:43 PM	Tank	1	Gas	Temperature	Temperature High Alarm

Date: Date the alarm occurred

Time: Time the alarm occurred

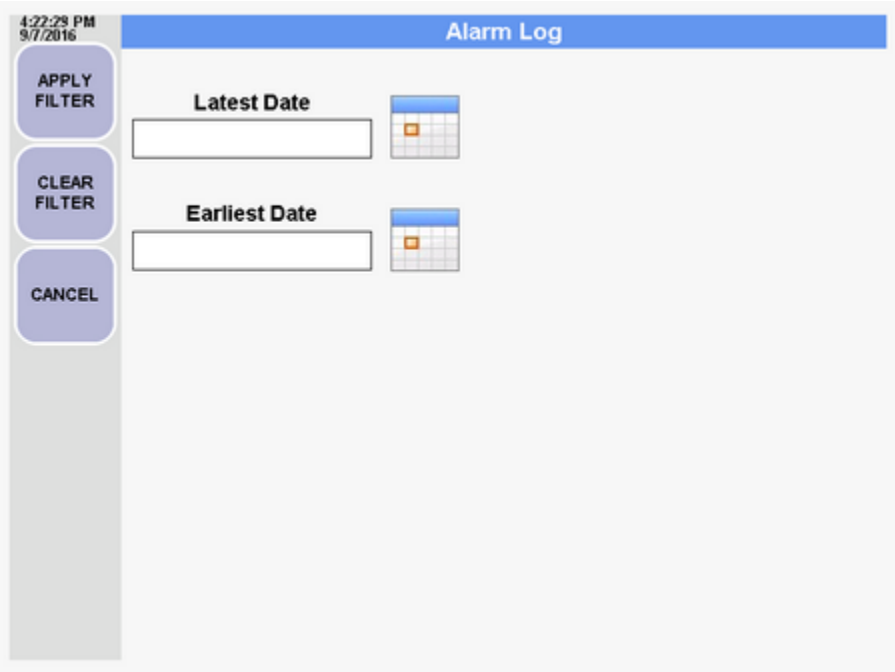
Device Type: Includes, Tank, Sensor, and CC Input

Device ID: The ID number of the Device Type in alarm

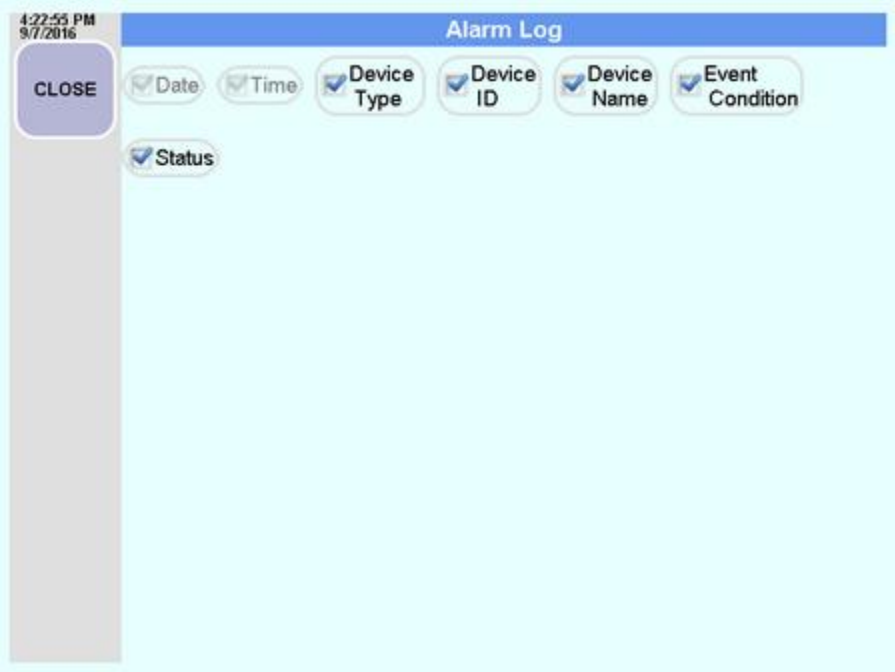
Device Name: The name assigned to the Device Type in alarm

Event Condition: The category of alarm

Status: Detailed description of the alarm



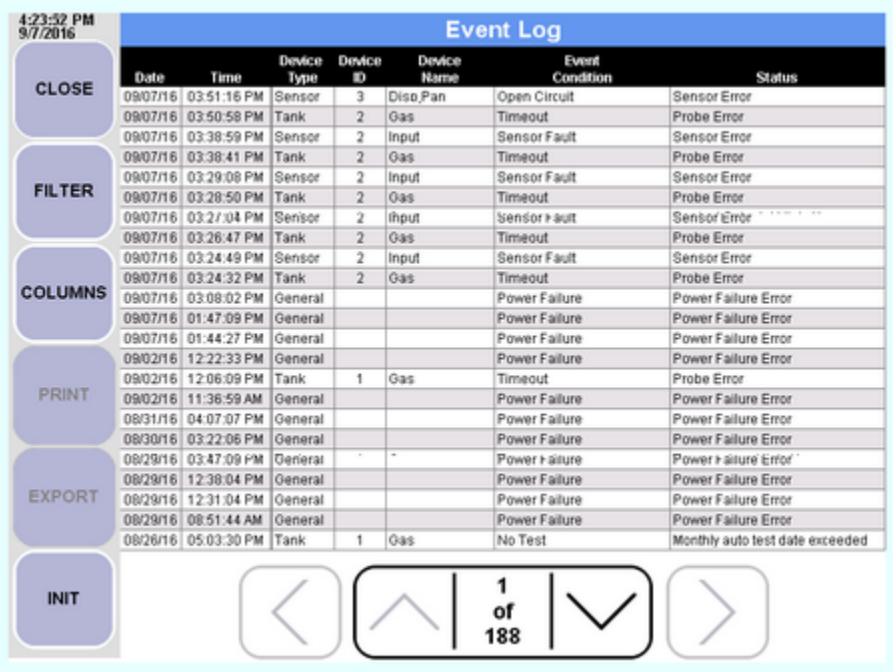
Provided filter can select a date range.



Individual columns may be disabled by unchecking box. Grayed out values cannot be disabled.

3.9 EVENT

The probe map/system setup below should be completed by the electrical installer as each probe,



Date	Time	Device Type	Device ID	Device Name	Event Condition	Status
09/07/16	03:51:16 PM	Sensor	3	Disp,Pan	Open Circuit	Sensor Error
09/07/16	03:50:58 PM	Tank	2	Gas	Timeout	Probe Error
09/07/16	03:38:59 PM	Sensor	2	Input	Sensor Fault	Sensor Error
09/07/16	03:38:41 PM	Tank	2	Gas	Timeout	Probe Error
09/07/16	03:29:08 PM	Sensor	2	Input	Sensor Fault	Sensor Error
09/07/16	03:28:50 PM	Tank	2	Gas	Timeout	Probe Error
09/07/16	03:27:04 PM	Sensor	2	Input	Sensor Fault	Sensor Error
09/07/16	03:26:47 PM	Tank	2	Gas	Timeout	Probe Error
09/07/16	03:24:49 PM	Sensor	2	Input	Sensor Fault	Sensor Error
09/07/16	03:24:32 PM	Tank	2	Gas	Timeout	Probe Error
09/07/16	03:08:02 PM	General			Power Failure	Power Failure Error
09/07/16	01:47:09 PM	General			Power Failure	Power Failure Error
09/07/16	01:44:27 PM	General			Power Failure	Power Failure Error
09/02/16	12:22:33 PM	General			Power Failure	Power Failure Error
09/02/16	12:06:09 PM	Tank	1	Gas	Timeout	Probe Error
09/02/16	11:36:59 AM	General			Power Failure	Power Failure Error
08/31/16	04:07:07 PM	General			Power Failure	Power Failure Error
08/30/16	03:22:06 PM	General			Power Failure	Power Failure Error
08/29/16	03:47:09 PM	General			Power Failure	Power Failure Error
08/29/16	12:38:04 PM	General			Power Failure	Power Failure Error
08/29/16	12:31:04 PM	General			Power Failure	Power Failure Error
08/29/16	08:51:44 AM	General			Power Failure	Power Failure Error
08/26/16	05:03:30 PM	Tank	1	Gas	No Test	Monthly auto test date exceeded

Date: Date the event occurred

Time: Time the event occurred

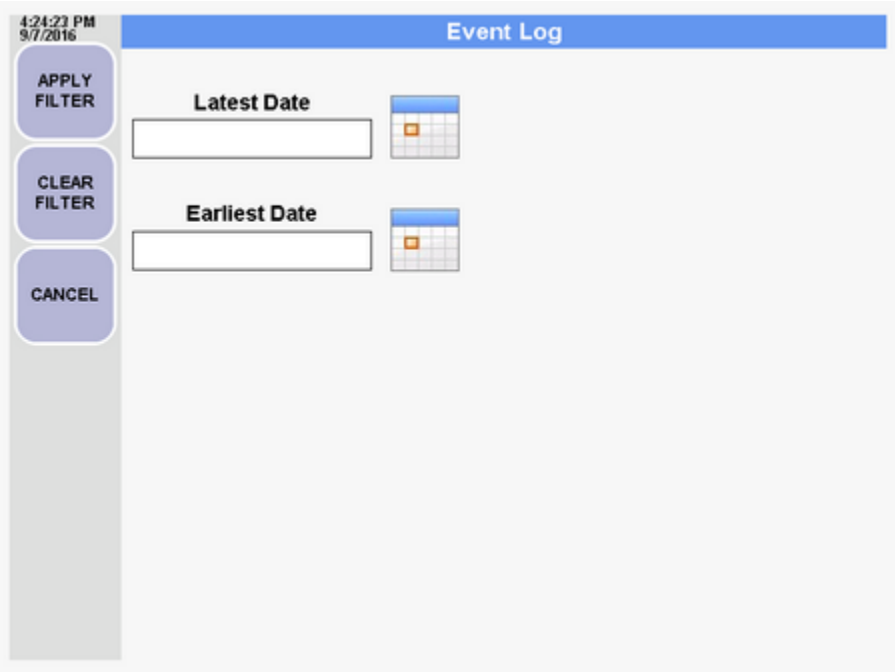
Device Type: Includes, Tank, Sensor, and CC Input

Device ID: The ID number of the Device Type causing the event, if applicable

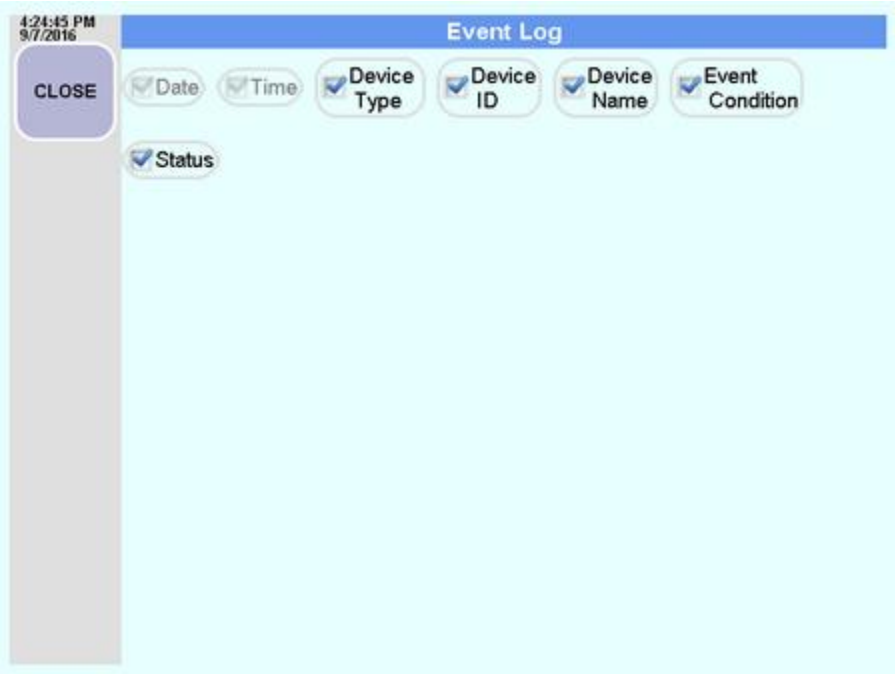
Device Name: The name assigned to the Device Type causing the event, if applicable

Event Condition: The category of event

Status: Detailed description of the event



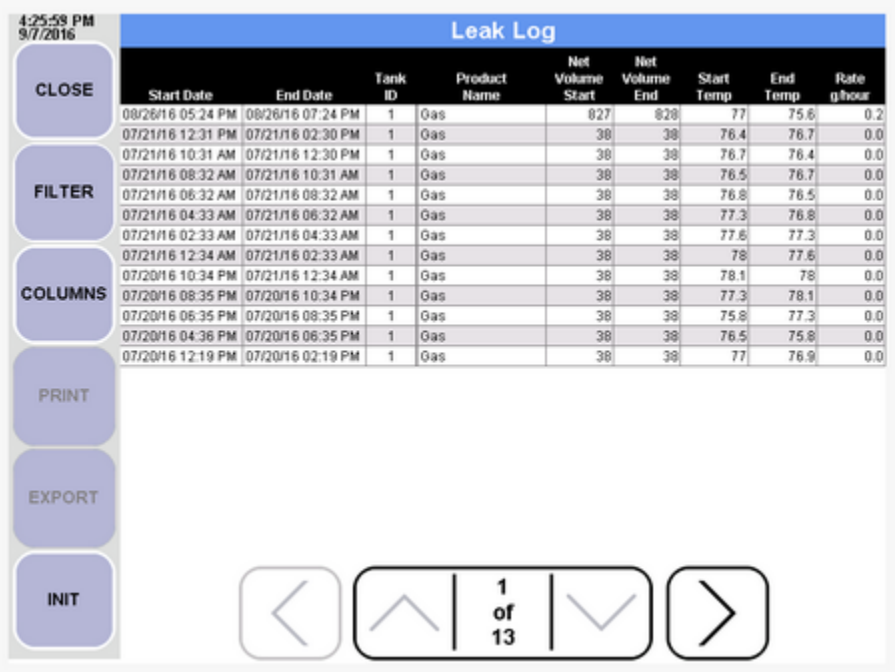
Provided filter can select a date range.



Individual columns may be disabled by unchecking box. Grayed out values cannot be disabled.

3.10 TANK LEAK/LEAK SUMMARY

Note: The Leak Summary Log contains a subset of the Tank Leak Log data including Start and End Date, Tank ID, Product Type, Product Name, Slope, and Result. The latest passing test per tank for all previous months are represented. If no passing test exists for a specific month, the latest fail is recorded. Otherwise both Tank Leak and Leak Summary are functionally equal.



Start Date	End Date	Tank ID	Product Name	Net Volume Start	Net Volume End	Start Temp	End Temp	Rate g/hour
08/26/16 05:24 PM	08/26/16 07:24 PM	1	Gas	827	828	77	75.6	0.2
07/21/16 12:31 PM	07/21/16 02:30 PM	1	Gas	38	38	76.4	76.7	0.0
07/21/16 10:31 AM	07/21/16 12:30 PM	1	Gas	38	38	76.7	76.4	0.0
07/21/16 08:32 AM	07/21/16 10:31 AM	1	Gas	38	38	76.5	76.7	0.0
07/21/16 06:32 AM	07/21/16 08:32 AM	1	Gas	38	38	76.8	76.5	0.0
07/21/16 04:33 AM	07/21/16 06:32 AM	1	Gas	38	38	77.3	76.8	0.0
07/21/16 02:33 AM	07/21/16 04:33 AM	1	Gas	38	38	77.6	77.3	0.0
07/21/16 12:34 AM	07/21/16 02:33 AM	1	Gas	38	38	78	77.6	0.0
07/20/16 10:34 PM	07/21/16 12:34 AM	1	Gas	38	38	78.1	78	0.0
07/20/16 08:35 PM	07/20/16 10:34 PM	1	Gas	38	38	77.3	78.1	0.0
07/20/16 06:35 PM	07/20/16 08:35 PM	1	Gas	38	38	75.8	77.3	0.0
07/20/16 04:36 PM	07/20/16 06:35 PM	1	Gas	38	38	76.5	75.8	0.0
07/20/16 12:19 PM	07/20/16 02:19 PM	1	Gas	38	38	77	76.9	0.0

Start Date: The date and time the test was started

End Date: The date and time the test was completed

Tank ID: The Tank ID number, not Tank Hardware Channel number, assigned to the documented tank. See Section 2.4.

Product Type: The Product Type assigned to the tank. See Section 2.4

Product Name: The name assigned to the tank. See Section 2.4

Net Volume Start: The total temperature-compensated of volume of liquid in the tank at the beginning of the test

Net Volume End: The total temperature-compensated volume of liquid in the tank at the end of the test

Start Temp: The average liquid temperature at the beginning of the test

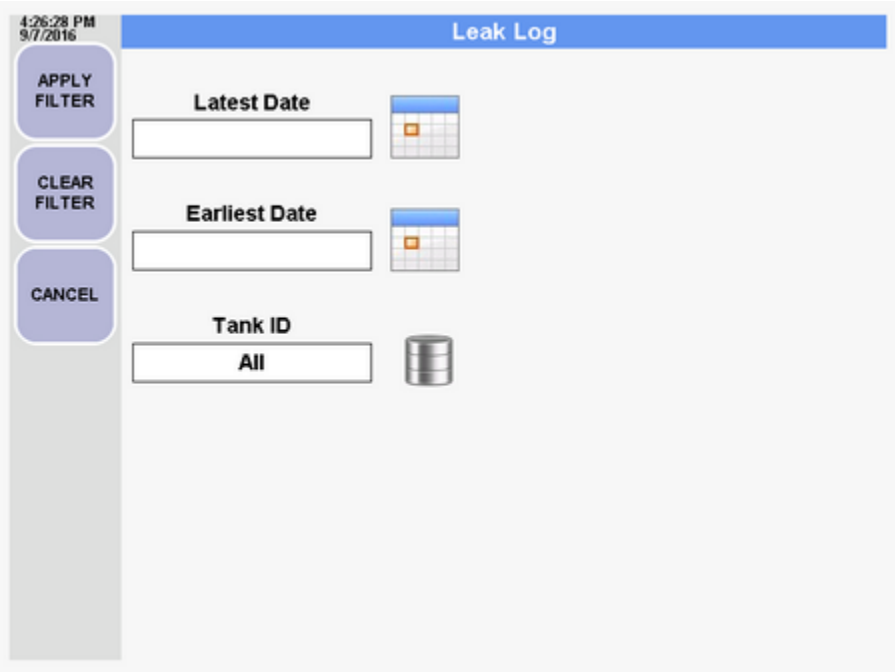
End Temp: The average liquid temperature at the end of the test

Rate g/hour: The minimum detected loss that qualifies as a leak. See section 2.8

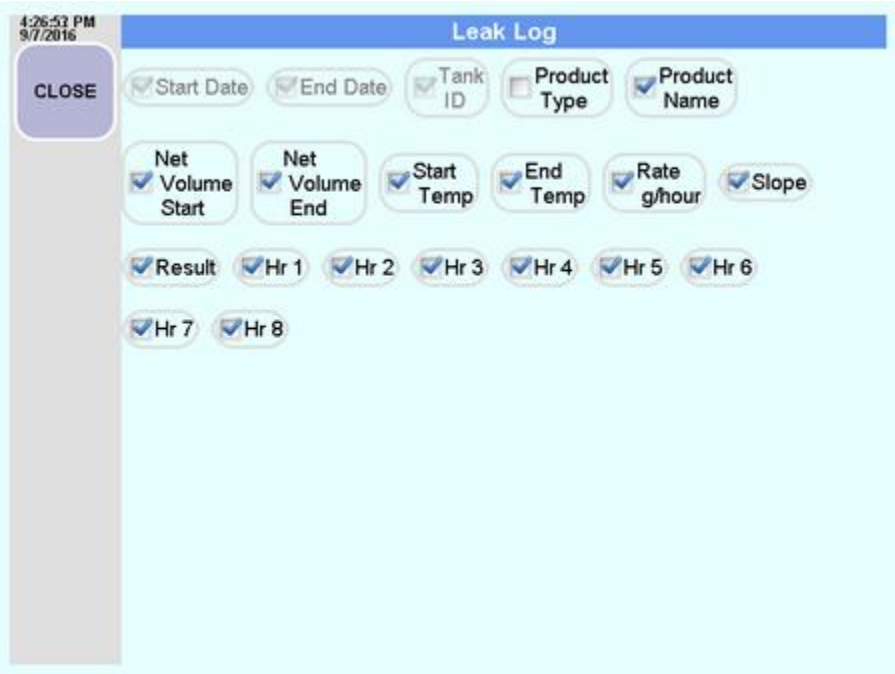
Slope: The actual average change in volume observed at the completion of the test

Result: Pass or Fail

Hr: The average cumulative change in volume at the end of each hour.

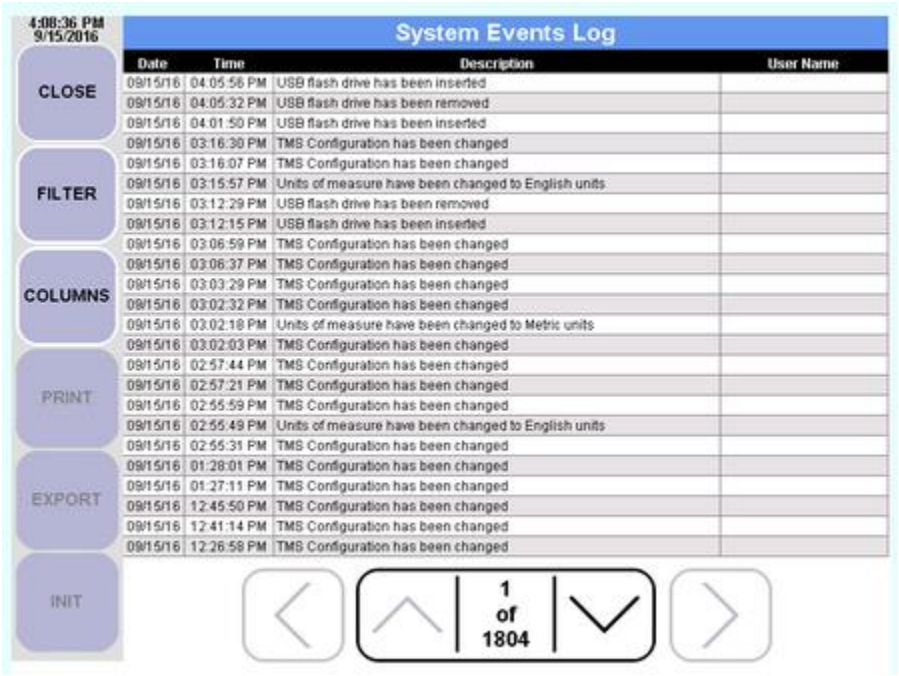


Provided filter can select a date range and/or specific Tank IDs.



Individual columns may be disabled by unchecking box. Grayed out values cannot be disabled.

3.11 SYSTEM EVENTS

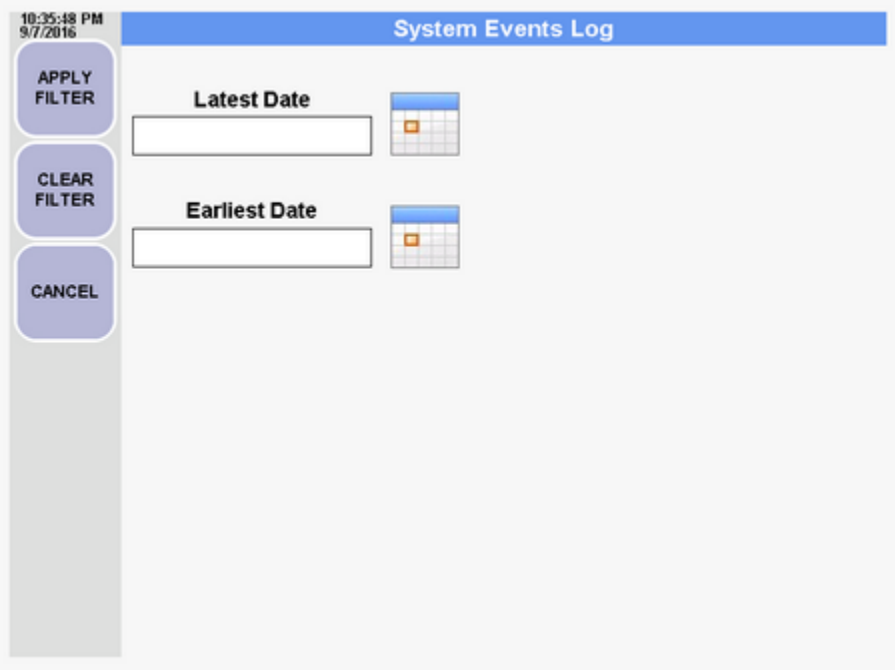


Date: Date the incident occurred

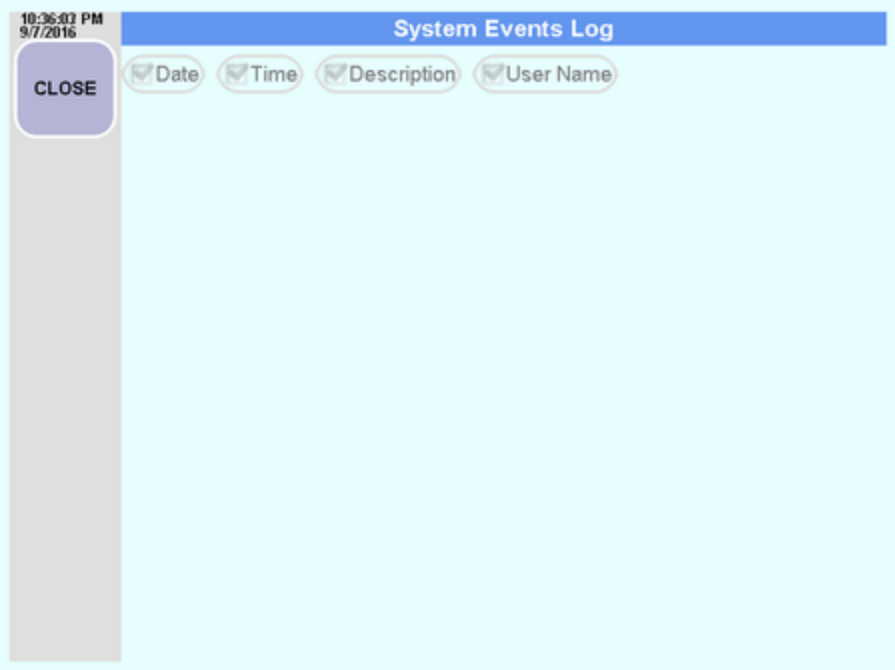
Time: Time the incident occurred

Description: A description of the incident

User Name: The name of the user responsible for the security event.



Provided filter can select a date range.



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PNEUMERCATOR TMS SERIES

LIMITED WARRANTY

TMS Series

Pneumercator, here and after referred to as **PCO**, warrants its **TMS Series** family of products to be free of defects in material and workmanship for a period of **Twelve (12) months** from date of Operation or **Fifteen (15) months** from date of invoice, whichever comes first.

During the warranty period on the **TMS Series**, **PCO,** or factory third party independent representatives will repair or replace the product at the location where it is installed at no additional cost to the customer.

Packages must be inspected upon receipt for damage, missing parts, and/or manuals. **PCO** must be contacted by telephone immediately with a description of damaged or missing parts so replacements can be sent. Written details must be sent within **thirty (30) days.**

Pneumercator will not be responsible for shipping charges incurred by the customer.

Warranty repair coverage invoices will be paid if **all** the following conditions are met:

- PCO has acknowledged and authorized warranty work to be done by issuing a *Warranty Repair Number*.
- Start-up Service technician has been trained by PCO
- Warranty start-up form has been submitted to PCO
- Technician fills out and submits a PCO "Service Report"
- Parts (if any) used are returned to PCO with a proper WRGA (*Warranty Return Goods Authorization)*
- Returned parts are found to be defective.

Repair time will be paid according to PCO document "Standard Warranty Labor Charge Schedule"

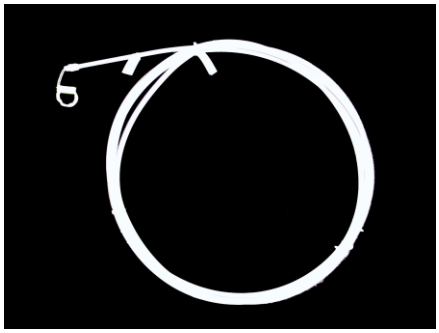
If the Warranty Registration/Start up Check List has been completed and returned on file with the factory and the product is installed in accordance with the specific PCO Operation Product Manual, PCO will activate and meet warranty criteria as described above. Warranty criteria shall be voided if any product has been subjected to misuse, negligence, damage from acts of nature (lightning, wind, rain, etc.) or is in violation of the products design intent, disregard to warnings, installations, modified or repaired by unauthorized personnel or improperly installed. Given that the third party independent contractor has installed the equipment in accordance with the specific product installation manual, and followed all precautions, PCO will fulfill the terms stated in our warranty obligation.

Under no circumstances does the warranty provide a remedy in excess of the equipment. No other expressed or implied warranty is given by PCO. PCO shall not be liable for consequential damages or any expenses incurred by the user.

Distributed by:

PNEUMERCATOR
Liquid Level Control Systems
1785 Expressway Drive North, Hauppauge NY 11788
(631) 293-8450 Fax (631) 293-8533

Flexible Magnetostrictive Probe



Product Description

The MP46xS Series Level Gauging Probe utilizes proven Magnetostrictive technology for accuracy and reliability. Its flexible shaft construction permits easy shipping, handling, and installation of probes up to seventy feet in length. The MP46xS Series Level Gauging Probe is ideally suited for large bulk storage tanks to seventy feet in height.

Applications

- Above and Below Ground Storage Tanks
- Bulk Storage Tanks
- Low ceiling clearance: (Minimum 14" (356 mm))
- All Petroleum Products
- Most Solvents, Acids, and Bases

Specifications

- Technology: Magnetostrictive, Dual Float
- Accuracy (Minimum): Product Level: 0.01" (0.25 mm)
  Water Level: 0.01" (0.25 mm)
  Temperature: 0.001 ºF (0.0006 ºC)
- Materials: Shaft: PVDF
  Floats: 316 SS, Buna-N, Urethane, or PVDF
- Mounting: Minimum 2" (51 mm) opening with bushing or flange mount
- Probe Lengths: 2' – 70' (0.6 m – 21.3 m)
- Temperature Sensing: Available with 1 or 5 Thermistors
- Location Approval: UL Class I, Div 1, Groups C and D; cUL Class I, Zone 0, Group IIB
- Operating Temperature: -40 ºF to 175 ºF (-40 ºC to 80 ºC)
- Operating Pressure: 50 PSIG (345 kPa)
- Field Wiring: 22AWG, 2-Conductor twisted pair w/ shield
  Belden 8441, Belden 8761, Alpha 1736C or equiv., maximum length 3000' to 4600' (914 m to 1402 m)

Installation

Probe is direct-mounted at the tank top via a ¾" NPT compression fitting kit.

Certifications/Approvals

- UL/cUL Approved*, File #E139464
- Model Numbers:

MP461S	24"-216"
MP462S	217"-288"
MP463S	289"-600"
MP464S	601"-840"

* When used in conjunction with the TMS series controllers

Note: Specifications subject to change without notice. 04-01-2013

PNEUMERCATOR Liquid Level Control Systems

Pneumercator Company, Inc.
1785 Expressway Drive North
Hauppauge, New York 11788

Tel: 631-293-8450
Fax: 631-293-8533
http://www.pneumercator.com

Float Kits **for Magnetostrictive Level Probes** Specifications

Product Description

Pneumercator manufactures floats using four different types of materials:
- Urethane
- Stainless Steel
- Buna-Nitrile
- Kynar.

Floats range in diameters from 1.75" to 4".

Dual Float Kits include Product and Water Floats, while Single Float Kits include only a Product Float.

An Extended Float is made for use with our Flexible Kynar Probes.

Urethane

Stainless Steel

Buna-Nitrile

Buna-Nitrile

Kynar

Applications

- Urethane – Gasoline, Diesel, Fuel Oil, Aviation Fuels, Lubricants, other Petroleum Products
- Buna Nitrile - Gasoline Blends, Diesel, Fuel Oil, Aviation Fuels, Lubricants, other Petroleum Products
- Stainless Steel - Petroleum Products and Chemicals (Call Factory for Compatibility)
- Kynar - Chemicals (Call Factory for Compatibility)

Model Number

URETHANE

U4Kx	4" dia Product and Water
U3Kx	3" dia Product and Water
U4x	4" dia Product
U3x	3" dia Product

BUNA NITRILE

B4Kx	4" dia Product and Water
B4x	4" dia Product
B1P75x	1.75" dia Product

NOTE: X = 1 – Gasoline
2 – Diesel, Fuel Oil, etc
3 - #6 Oil
4 - Other

STAINLESS STEEL (316)

S4Kx	4" dia Product and Water
S2Kx	2" dia Product and Water
S2x	2" dia Product
S2XC	2" dia Product, SS end cap (for Chemical application)

KYNAR

K2x	2" dia Product w/ Kynar End Cap (for Chemical application with Flex Probes)

EXTENDED FLOATS (for Flex Probes)

U4Xx-K1	4" dia Standard Product and Extended Water	(for Flex Probes – MP 461, 462, 561 and 562)
U4Xx-K2	4" dia Standard Product and Extended Water	(for Flex Probes – MP 463 and 563 w/ OAL 289" – 432")
U4Xx-K3	4" dia Standard Product and Extended Water	(for Flex Probes – MP 463 and 563 w/ OAL 433" – 600")
U4XO-K1	4" dia Extended Product	(for Flex Probes – MP 461, 462, 561 and 562)
U4XO-K2	4" dia Extended Product	(for Flex Probes – MP 463 and 563 w/ OAL 289" – 432")
U4XO-K3	4" dia Extended Product	(for Flex Probes – MP 463 and 563 w/ OAL 433" – 600")

Note: Specifications subject to change without notice. 3-27-2008

PNEUMERCATOR
Liquid Level Control Systems

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120 Finn Court
Farmingdale, New York 11735

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http://www.pneumercator.com

Rigid Magnetostrictive Probe, EPA Compliant*

Product Description

The MP450S Level Gauging Probe utilizes proven Magnetostrictive technology for accuracy and reliability. When used in conjunction with the TMS2000/3000, it provides the ability to perform EPA compliant in-tank leak tests in underground storage tanks. The probe is available in lengths up to eighteen feet.

Applications

- Above and Below Ground Storage Tanks
- Bulk Storage Tanks
- Generator Sub Base Tanks
- Oil / Water Separators (See MP452S Series spec)
- All Petroleum Products
- Most Chemical Solvents

Specifications

- Technology: Magnetostrictive, Dual Float, w/ reflection resolution doubling
- Accuracy (Minimum): Product Level: 0.0005" (0.013 mm)
  Water Level: 0.001" (0.025 mm)
  Temperature: 0.001 ºF (0.0006 ºC)
- Materials: Shaft: 316 SS
  Floats: Buna-N (Optional 316 SS or Urethane)
- Riser Mount: Minimum 2" (51 mm) dia. riser, 4" (102 mm) dia. riser required for in-tank leak
- Direct Mount: Minimum 2" (51 mm) opening with bushing or flange mount
- Probe Lengths: 1' – 18' (305 mm – 5486 mm)
- Temperature Sensing: 6 Thermistors; 5 in shaft, 1 in probe head
- Location Approval: UL Class I, Div 1, Groups C and D; cUL Class I, Zone 0, Group IIB
- Operating Temperature: -40 ºF to 175 ºF (-40 ºC to 80 ºC)
- Operating Pressure: 150 PSIG (1034 kPa)
- Field Wiring: 22AWG, 2-Conductor twisted pair w/ shield
  Belden 8441, 8761, Alpha 1736C or equiv., maximum length 3000' to 4600' (914 m to 1402 m)

Installation

Probes 15' (4.6 m) or less in length can be installed into a vertical riser pipe with the probe foot contacting the tank bottom, or direct-mounted at the tank top via a ¾" NPT compression fitting kit. Probes greater than 15' (4.6 m) must be direct-mounted.

Certifications/Approvals

- UL/cUL Approved*, File #E139464
- Third-Party Approved, EPA-Compliant for In-Tank Leak Testing:*
  Up to 20,000 Gal. (75,708 Liter) tank capacity, minimum tank inventory for test 20%
  0.2 GPH (0.8 LPH) Leak Test: Pd = 99.9%, Pfa = 0.1%
  0.2 GPH (0.8 LPH) Quick Test: Pd = 95%, Pfa = 5%
  0.1 GPH (0.4 LPH) Precision Test: Pd = 95.3%, Pfa = 4.7%
  Up to 75,000 Gal. (283,906 Liter) tank capacity, minimum tank inventory for test 50%
  0.2 GPH (0.8 LPH) Leak Test: Pd = 97.3%, Pfa = 2.7%

* When used in conjunction with the TMS2000/3000 series controllers

Note: Specifications subject to change without notice. 04-01-2013

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Pneumercator Company, Inc.
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Hauppauge, New York 11788

Tel: 631-293-8450
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http://www.pneumercator.com

Product Description

Pneumercator manufactures floats using four different types of materials:
- Urethane
- Stainless Steel
- Buna-Nitrile
- Kynar.

Floats range in diameters from 1.75" to 4".

Dual Float Kits include Product and Water Floats, while Single Float Kits include only a Product Float.

An Extended Float is made for use with our Flexible Kynar Probes.

Urethane

Stainless Steel

Buna-Nitrile

Buna-Nitrile

Kynar

Applications

- Urethane – Gasoline, Diesel, Fuel Oil, Aviation Fuels, Lubricants, other Petroleum Products
- Buna Nitrile - Gasoline Blends, Diesel, Fuel Oil, Aviation Fuels, Lubricants, other Petroleum Products
- Stainless Steel - Petroleum Products and Chemicals (Call Factory for Compatibility)
- Kynar - Chemicals (Call Factory for Compatibility)

Model Number

URETHANE

U4Kx	4" dia Product and Water
U3Kx	3" dia Product and Water
U4x	4" dia Product
U3x	3" dia Product

BUNA NITRILE

B4Kx	4" dia Product and Water
B4x	4" dia Product
B1P75x	1.75" dia Product

NOTE: X = 1 – Gasoline
2 – Diesel, Fuel Oil, etc
3 - #6 Oil
4 - Other

STAINLESS STEEL (316)

S4Kx	4" dia Product and Water
S2Kx	2" dia Product and Water
S2x	2" dia Product
S2XC	2" dia Product, SS end cap (for Chemical application)

KYNAR

K2x	2" dia Product w/ Kynar End Cap (for Chemical application with Flex Probes)

EXTENDED FLOATS (for Flex Probes)

U4Xx-K1	4" dia Standard Product and Extended Water	(for Flex Probes – MP 461, 462, 561 and 562)
U4Xx-K2	4" dia Standard Product and Extended Water	(for Flex Probes – MP 463 and 563 w/ OAL 289" – 432")
U4Xx-K3	4" dia Standard Product and Extended Water	(for Flex Probes – MP 463 and 563 w/ OAL 433" – 600")
U4XO-K1	4" dia Extended Product	(for Flex Probes – MP 461, 462, 561 and 562)
U4XO-K2	4" dia Extended Product	(for Flex Probes – MP 463 and 563 w/ OAL 289" – 432")
U4XO-K3	4" dia Extended Product	(for Flex Probes – MP 463 and 563 w/ OAL 433" – 600")

Note: Specifications subject to change without notice. 3-27-2008

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120 Finn Court
Farmingdale, New York 11735

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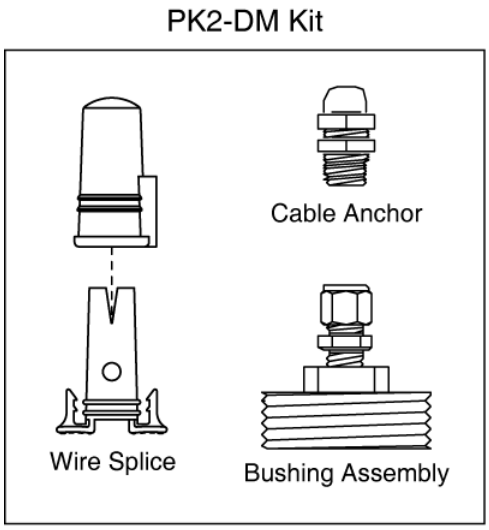
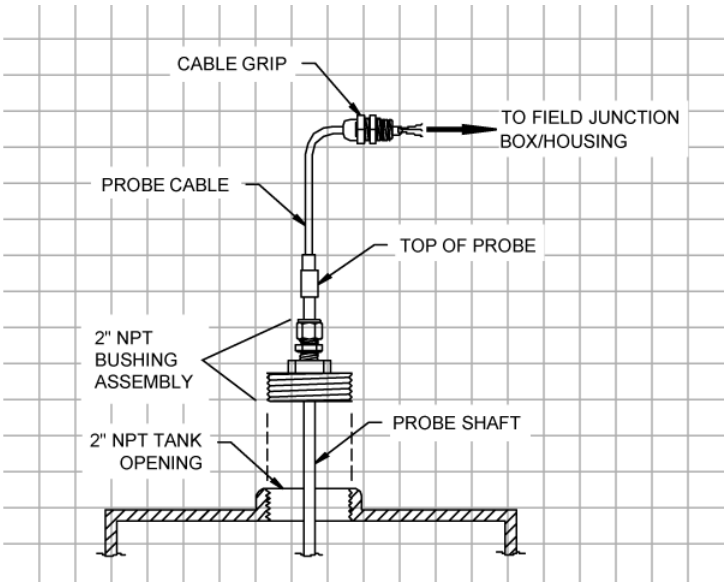
http://www.pneumercator.com

2” (51 mm) Direct Mounting Kit for MP45xS/MP55xS Magnetostrictive Tank Gauging Probes





Product Description

The PK2-DM Direct Mount Probe Kit provides a means for direct or “hard” mounting an MP45xS/MP55xS series tank gauging probe. This direct mount method must be used in applications where the MP45xS/MP55xS series probe length exceeds 15 feet (4.6 m), but may also be required in chemical or high heat applications where isolation of the probe cable and connector from tank vapors is required. The standard kit includes a 2” NPT bushing assembly with integral probe shaft compression fitting, cable compression fitting for field junction box and epoxy seal kit. The standard kit uses Teflon compression rings to secure the probe shaft, allowing for easy re-adjustment of probe height. 316SS compression rings are also available for pressurized applications. The PK2-DM may be used in larger tank openings with the addition of a user-supplied 2” NPT bushing reducer.

Applications

- Vertical Storage Tanks > 15 Feet (4.6 m)
- Chemical Tanks
- Heated #6 Oil Storage Tanks
- Pressurized Tanks

Specifications

- Materials: Bushing: Cast Iron, 316SS, or Polypropylene
  Compression Fitting: 316SS Body, 316SS or Teflon Rings
- Mount: Minimum 2” NPT opening. Larger openings with bushing reducer.
- Stacking Height: 3” Nominal
- Operating Pressure: 316SS Compression Rings: 125 PSIG Cast Iron, 150 PSIG 316SS*
  Teflon Compression Rings: 10 PSIG

  * Rating is limited by probe shaft, not 316SS bushing

Model Numbers

- PK2-DM1(or DM) Cast Iron Bushing, Teflon Compression Rings (Stock, Standard)
- PK2-DM2 Cast Iron Bushing, 316SS Compression Rings (Stock)
- PK2-DM3 316SS Bushing, 316SS Compression Rings (Special Order)
- PK2-DM4 316SS Bushing, Teflon Compression Rings (Special Order)
- PK2-DM5 Polypropylene Bushing, Teflon Compression Rings (Special Order)

Note: Specifications subject to change without notice. 04-01-2013

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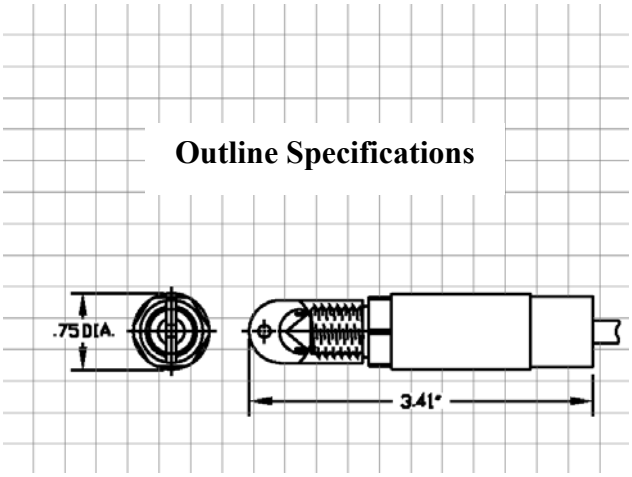
Product-Distinguishing Secondary Containment Leak Sensor with Fault Detection



Product Description

The Model ES825-200 Series is a solid state, electronic, product distinguishing leak sensor utilizing both electro-optical and conductivity technologies to detect and differentiate between hydrocarbon-based liquids and water in secondary containment applications. The sensor contains no moving parts, is unaffected by vapors, and due to its compact size is ideal for interstitial spaces. When connected with a TMS series controller, the ES825-200 Series supports Pneumercator's FAULT-DETECT supervised wiring technology, which automatically detects sensor or field wiring faults.

Applications

- Dry Annular Space in Double-Wall Tanks
- Containment, Manway and Piping Sumps
- Dispenser Pan
- Turbine Enclosures

Specifications

- Technology: Electro-optic and conductivity, no moving parts
- Wetted Materials: Polysulfone, PVC (F), FEP Teflon (XF), Epoxy and 316SS
- Operating Temperature: -5º to +165ºF (-20º to +75º C) (F); -65º to +185ºF (-55º to +85º C) (XF)
- Cable: 22AWG, 3-Conductor, PVC-jacketed, (FEP Teflon-jacketed for XF), 25' Length
- Pass-thru Opening Size: Minimum ¾" NPT
- Location Approval*: UL Class I, Div 1, Groups C and D

Installation

Sensor may be suspended by its cable, placed on the containment or sump floor, or thru-wall mounted via a ¼" FNPT opening. For dry annular applications, sensor may be pulled through using fish tape attached to sensor pull ring, or pushed through with a section of ½" ENT (not included) attached to the back end of the sensor.

Certifications/Approvals

- UL Approved, File #E139464, CSA approval pending
- Third-Party EPA Listed*

Ordering

- ES825-200F — PVC-Jacketed Cable
- ES825-200XF — FEP Teflon-Jacketed Cable, Extended Temperature Range

*When used in conjunction with the TMS series controllers

Note: Specifications subject to change without notice. 06-12-2006

PNEUMERCATOR Liquid Level Control Systems

Pneumercator Company, Inc.
120 Finn Court
Farmingdale, New York 11735

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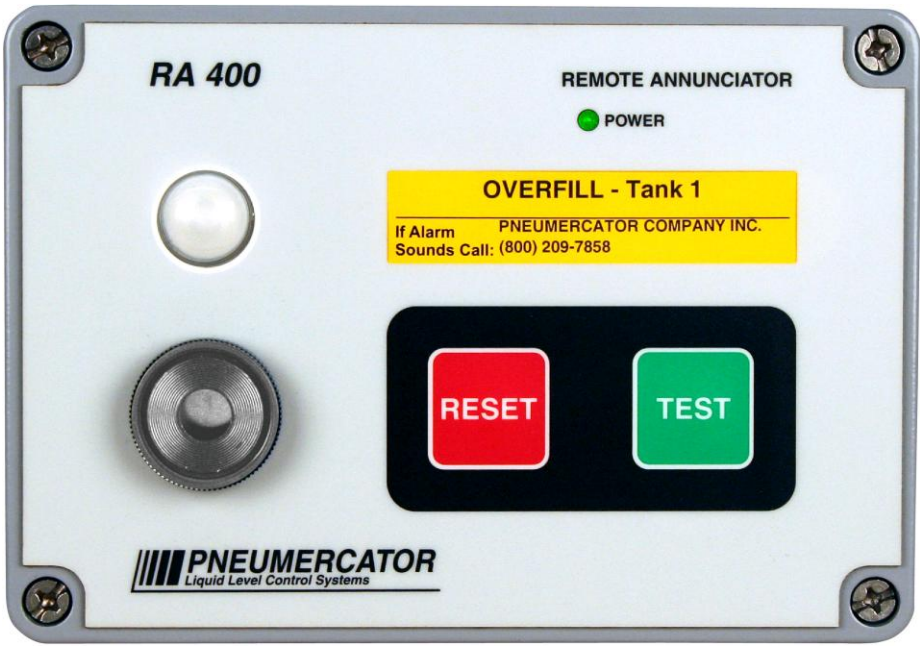
Addressable, Multi-Drop, Remote Audible/Visual Alarm For Use With The TMS2000/3000 Tank Management Systems and LC2000 Alarm Console



Product Description

The RA400 Remote Audible/Visual alarm communicates over the Pneumercator RS-485 Peripheral Expansion Bus supported by select TMS-series Tank Management Systems and the LC2000-series alarm console. The RA400 is used in applications where it is desired to receive system alarms from various on-site locations at distances up to 4000 feet away from the main console. Since the RA400 is a microprocessor-based, addressable device, up to 16 annunciators may be connected to a single system. The visual alarm indicator uses an ultra-bright LED strobe for maximum reliability in extreme temperatures and the audible indication is provided by a loud, 100db piezoelectric alarm designed for outdoor use. A power indicator LED is also provided. The RA400 is housed in a NEMA 4X enclosure for harsh industrial/outdoor environments, with one inch on center membrane overlay pushbuttons for ease of operation with gloved hands. The RA400 front panel includes an internal clear pocket window that accepts an insert displaying alarm description and emergency contact information.

- Dimensions (W x H x D): 7.9” x 5.5” x 3.5” (201 mm x 140 mm x 89 mm)
- Weight: 8 lb (3.6 kg)
- Operating Temperature: -40 ºF to 160 ºF (-40 ºC to 70 ºC)
- Humidity: 95% Non-condensing
- Enclosure Construction: Cast Aluminum, Epoxy Powder Coat Paint Finish, Gasketed Cover w/Captive SS Screws
- Enclosure Rating: NEMA 4X (IP56), Watertight and Corrosion-proof
- Power Requirements: 120 / 240 VAC Switchable, 50-60 Hz, 5 W Max.
- Audible Alarm: 100 db
- Audible Shutoff Delay: 0 to 15 minutes in one minute increments
- Visual Alarm: White LED Strobe, Visible from 300’ (91 m)
- Power Indicator: Green LED, Visible from 75’ (23 m)
- Insert Labels: Pre-Printed or User-Printable/Writeable Polyester Alarm/Emergency Contact Pocket Insert
- Alarm Programming: Selectable for TANK, SENSOR, CONTACT CLOSURE or SYSTEM alarm types
- Communications: Pneumercator RS-485 Peripheral Expansion Bus Included Standard, Plug-in Terminal Blocks
- Field Wiring: 24AWG, single twisted-pair conductors w/ shield
  Belden 9841(PVC), 89841(FEP) or equivalent, maximum length 4000’ (1.2 m) total, all displays

Note: Specifications subject to change without notice.04-01-2013

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Hauppauge, New York 11788
Tel: 631-293-8450
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http://www.pneumercator.com

Addressable, Multi-Drop, Remote Electronic Tank Display Panel For Use With The TMS2000/3000 Tank Management Systems

Product Description

The ETD1000 Electronic Tank Display panel is used in applications where it is desired to view TMS series tank management data from various on-site locations at distances up to 4000 feet away from the main console. Since the ETD1000 is a microprocessor-based, addressable device communicating over the TMS RS485 Peripheral Expansion Bus, up to 16 ETD1000 panels may be connected to a single TMS. Unlike the TD1000 Tandem Remote Display, each ETD1000 may be operated independently. The ETD1000 is housed in a NEMA 4X enclosure for harsh industrial/outdoor environments. The display technology is an ultra-bright, truly sunlight-readable LED display for maximum reliability in extreme temperatures. The membrane overlay pushbuttons are one inch on centers for easy operation with gloved hands.

- Dimensions: 7.9” W x 5.5”H x 3.5”D
- Weight: 8 lbs
- Operating Temperature: -40º to +160º F (-40º to +70º C)
- Humidity: 95% Non-condensing
- Enclosure Construction: Cast Aluminum, Epoxy Powder Coat Paint Finish, Gasketed Cover w/Captive SS Screws
- Enclosure Rating: NEMA 4X, Watertight and Corrosion-proof
- Power Requirements: 120 / 240 VAC Switchable, 50-60Hz, 5W Max.
- Audible Alarm: 100db
- Display: 9-Character, Ultra-Bright Sunlight-Readable LED Display, 0.56” Ht, Readable from 25’
Ultra-Bright Intensity Alarm LEDS, Visible from 75’
- Display Data: Gross/Net Volumes, Percent Volume, Ullage, Product Level, Water Level, Product Temperature, Tank Name, Tank ID, Tank Alarms
- Communications: RS485 TMS Expansion/Peripheral Bus Included Standard, Plug-in Terminal Block,
Used to connect ETD1000 to the TMS
- Field Wiring: 24AWG, single twisted-pair conductors w/ shield
Belden 9841(PVC), 89841(FEP) or equivalent, maximum length 4000’ total, all displays

Note: Specifications subject to change without notice. 12-11-2003

PNEUMERCATOR Liquid Level Control Systems

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http://www.pneumercator.com

231113-2.10, 2.11 Pneumercator Leak and Level Monitoring System Main Drawings

US Embassy London
Fuel Oil Submittal
231113
BL Harbert International
120080

231113-2.10, 2.11 Pneumercator Leak and Level Monitoring System NOB Drawings

US Embassy London
Fuel Oil Submittal
231113
BL Harbert International
120080

231113-2.16 Phillips Fuel Oil Pumps and Control System Main System

US Embassy London
Fuel Oil Submittal
231113
BL Harbert International
120080

Phillips Fuel Systems

109 Holland Ave Bridgeport CT, USA 06605
Phone: (203)-908-3323 Fax: (203)-908-3325

PC6-130062

Tank and Tank Pump Controller

400 VAC / 1Ø/ 50 Hz/ 60A

London

All rights Reserved. No portion of this package or any part herein shall not be reproduced in any form without the written permission of Phillips Fuel System Inc

By acceptance of this package, it is understood that Phillips Fuel System Inc shall be responsible for only those items indicated herein and unless otherwise noted. The signatory whose signature appears is duly authorized by all necessary and appropriate action to execute approval and will all abide by Phillips Fuel Systems Inc standard sales terms and conditions and be responsible for verifying correctness of the type, size, location, operation, electrical requirements, piping, accessories or any other requirements for successful operation. It is further understood that by acceptance of this package, Phillips Fuel System Inc will not be held liable for any deviation or omission from any quotation and/or specification. Phillips Fuel System Inc reserves the right, without approval, to rearrange components or substitute, due to lack of availability, quality and/or performance, any component indicated herein with a compatible component, as long as that component is of the same quality and general design.

Approved _____ Date _____

Approved _____ Date _____

Approved _____ Date _____

PHILLIPS FUEL SYSTEMS INC LIMITED WARRANTY FOR NEW PUMPS OR PUMPING SYSTEMS MANUFACTURED BY PHILLIPS FUEL SYSTEMS INC

A. PRODUCTS WARRANTED - Phillips Fuel System Inc, subject to the limitations contained below, will at its option, repair or replace, without charge for parts or labor only, any part or parts of a new pump or system manufactured by PHILLIPS FUEL SYSTEMS which is found, upon examination by PHILLIPS FUEL SYSTEMS INC at it's factory in Bridgeport, Ct. or by its designated affiliate, to be DEFECTIVE IN MATERIAL AND/OR WORKMANSHIP if determined by such examination within twelve months from the date of sale to the original consumer purchaser.

B. PRODUCTS AND ITEMS NOT WARRANTED - The provisions of this warranty shall not apply to any equipment, part or accessory which:
(a) has been improperly specified by buyer;
(b) has been improperly stored or handled prior to placing in service;
(c) has been improperly mounted, installed or connected, altered or modified in any way.
(d) has not been operated within specifications as stated on its nameplate, label, placard, or within its operating manual;
(e) has not been properly maintained;
(f) parts supplied by buyer for inclusion in finished equipment are not covered by this warranty;
(g) components or assemblies specified by buyer with no substitution permissible that are not normally used by Phillips Fuel System Inc are not covered by this warranty;
(h) that interfaces with, controls or is controlled by any device that has not been approved by Phillips Fuel System Inc

Phillips Fuel System Inc reserves the right to reject warranty claims of any kind against assembled equipment, parts or material for which Phillips Fuel System Inc has not received payment in full and for any system which was not authorized for start up and use by Phillips Fuel System Inc or by its designated affiliate. Should buyer, at his own risk, elect to replace failed equipment or parts in the field rather than obtain start up service under this warranty, Phillips will supply and invoice parts at normal prices upon receipt of buyer's bonafide purchase order. Failed equipment or parts returned for in-warranty crediting in exchange for replacement parts must be returned within 45 days from date of shipment of replacement in order to qualify for warranty consideration.

This warranty is extended to the original buyer only and is not transferable to subsequent buyers. This warranty is available for installations in the forty-eight contiguous U.S. states only.

C. SECURING WARRANTY SERVICE - Warranty service can be arranged by contacting PHILLIPS FUEL SYSTEMS INC, c/o Service Manager, 109 Holland Ave, Bridgeport, Ct 06605. Warranty service can only be performed by Phillips Fuel System Inc at its factory in Bridgeport, Ct or by its designated affiliate. At the time of requesting warranty service, evidence must be presented of the date of sale to the original consumer purchaser. The purchaser shall pay any charges for making service calls and/or for transporting the product to and from the place where the inspection and/or warranty work is performed. The purchaser shall be responsible for any damage or loss incurred in connection with the transportation of the system and/or of part or parts of the system, submitted for inspection and/or warranty work.

D. NO ADDITIONAL WARRANTIES OR REPRESENTATIONS - The foregoing EXPRESSED WARRANTY IS IN LIEU OF ALL OTHER EXPRESSED WARRANTIES. Neither Phillips Fuel System Inc nor any of its affiliates make any warranties, representations or promises, written or verbal, as to the quality of the system or its parts other than those set forth herein.

ANY IMPLIED WARRANTIES (INCLUDING, BUT NOT LIMITED TO MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE) TO THE EXTENT EITHER APPLIES TO PART OR PARTS OF A SYSTEM SHALL BE LIMITED IN DURATION TO THE PERIODS OF THE EXPRESSED WARRANTIES AS DEFINED IN PARAGRAPH A. Some states do not allow limitations on how long an implied warranty lasts, so the above limitations may not apply.

E. DAMAGES - IN NO EVENT WILL PHILLIPS PUMPS BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES AND/OR EXPENSES. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation may not apply to you. This warranty gives you specific legal rights and you may have other legal rights which vary from state to state.

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Basic Operation - This system controls one [1] pair of duplexed pumps (a total of two [2] pumps) drawing from three (3) main tanks, individual daytank loop supply & return motorized valves for each main tank (a total of six [6] motorized valves) and four (4) daytanks with return pumps.

Main Tank Selection - [ST-1, ST-2 & ST-3] The operator will establish the system's tank selection via the three position selector switch located on the front panel. If a Main tank is in operation, its mode selector switch will be lit.

Main Tank Auto - If a Main Tank selected as AUTO, the controller will add that tank to the list of tanks available to be pumped from when the controller determines that a daytank requires filling. When that Main Tank is selected, and if one or both of that tank's pumps are in AUTO, the controller will hold open that tank's fuel oil return valve. When the controller determines that a daytank requires filling, the controller will engage the appropriate pump in that Main Tank. If a Main Tank's fuel level is reduced to a low level condition, the controller will close that Main Tank's fuel oil return valve, remove that Main Tank from the list of available tanks and select the next available tank. If both pumps in a Main Tank are selected as OFF, or are in a Flow failure alarm condition or are in an Overload trip condition or if the Main Tank is in a low level alarm condition, that tank will be skipped and the system will select the next available.

With all Main Tanks selected as AUTO, the system draw from Tank 1 first, then from Tank 2 and Tank 3.

Main Tank Off - If a Main Tank selected as OFF, the system will not engage any pump or return valve in that tank regardless of any alarm, pump on or pump off signals. The system will automatically select the next tank in auto mode.

Main Tank Manual - If a Main Tank selected as MANUAL, the controller will open the fuel oil return valve to that tank, close the other tanks' return valve and engage only those supply pumps in that tank, as long as that tank is selected in manual mode, regardless of any alarm or supply pump on/off signals. Only one Main Tank can be in MANUAL at a time. All of the Main Tanks MUST be in OFF before switching one Main Tank to MANUAL.

Main Tank levels will be received via 4 to 20 mA signals from the Tank Management System (TMS).

Main Tank Pump Operation - [SP-1 & SP-2] The operator will establish each main tank supply pump mode of operation via the three position selector switch located on the front panel. If a main tank pump is in operation, its mode selector switch will be lit. The controller will engage and automatically alternate the pumps in AUTO in that Main Tank. If a Main Tank's fuel level is reduce to a low level condition, the controller will close the fuel oil return valve to that tank, open the return valve to the next available tank and engage those pumps when a day tank calls for fuel.

Main Pump Auto - If both pumps are selected as AUTO, the controller will engage the lead supply pump in the lead main tank when the controller determines that a daytank requires filling. The supply pump will remain engaged until the daytank fuel level reaches the full level (90%, adjustable). If the system receives a critical low level alarm for a Main Tank (via a dry contact from the tank-gauging system), the system controller will close that Main Tank's supply & return valve and select the next available Main Tank. If the Main Tank is in a low level alarm condition, that tank will be skipped and the system will select the next available Main Tank.

Main Pump Off - If the pump is selected as OFF, the system will not engage that supply pump regardless of any daytank demand or alarm signals.

Main Pump Manual - If the supply pump is selected as MANUAL, the system will engage that supply pump continuously, as long as the pump mode is selected as manual, regardless of any alarm, PUMP ON or PUMP OFF signals. (Note: Manual mode is to be used only for short term operation during trouble shooting and maintenance while an operator or technician is present observing operation and in accordance with spill prevention plan. Do not leave switch in manual mode if system is unattended. Care must be taken not to overfill the tank)

Day Tank Operation - The operator will establish each day tank supply mode of operation via the three position selector switch located on the front panel. Note: When a day tank is in operation, that selector switch will be lit.

Day Tank Auto - As fuel is consumed from the day tank an the fuel level drops to fill set point, 50% (adjustable), the controller will engage the lead supply pump in the lead main tank and hold open the supply solenoid valves for the daytank calling for fuel. The supply pump will remain engaged, filling the day tank, until the fuel level reaches the full set point, 90% (adjustable). The controller will then disengage the pump and close the day tank fill solenoid valves.

Day Tank Off - If the day tank is turned off, the system will not engage the remote supply pump or open that day tank's fill solenoid valves regardless of any fuel demand or alarm conditions.

Day Tank Manual - If the day tank is selected as manual, the day tank controller will hold open the fill solenoid valve continuously, as long as the switch in manual mode, regardless of any alarm, pump on or pump off signals. (Note: Manual mode is to be used only for short term operation only during trouble shooting and maintenance while an operator or technician is present observing operation and in accordance with spill prevention plan. Do not leave switch in manual mode if system is unattended. Care must be taken not to overfill the tank).

Note: To fill a day tank manually, that day tank must be selected to MANUAL, all of the Main Tanks selected to OFF, then one Main Tank selected to MANUAL and one of the two pumps in that main tank selected as MANUAL The day tank will be filled regardless of any alarm, pump on or pump off signals. CARE MUST BE TAKEN NOT TO OVERFILL TANK.

Daytank Return Pump Operation - The operator will establish the return pump mode of operation via the three position selector switch located on the front panel. Note: When a pump is in operation, that selector switch will be lit.

Daytank Return Pump Off - If a return pump is selected as OFF, the system will not engage that pump.

Daytank Return Pump Manual - If the return pump is selected as MANUAL, the day tank controller will engage the return pump continuously as long as that return pump is in manual mode regardless of any alarm, pump on or pump off signals.

Daytank Return Pump Auto - If the return pump is selected as AUTO, the controller will engage each pump if the fuel level in the daytank reaches a high level condition of 95%. The return pump will engaged until the fuel level is reduced to the full set point, 90% (adjustable).

Daytank Return Pump Remote (manual) - The system will engage the return pump of a daytank when it receives a normally open switch closure indicating that the pushbutton is being pressed at that daytank to manually reduce the level of that daytank. The pump will remain engaged as long as the pushbutton is pressed. This will function when the three position selector switch is selected as AUTO..

Tank Levels - All tank level will be displayed in percent of volume.

System Alarms

The system controller shall include a LCD display for the Main Tanks and a LCD display for each daytank, for system status, alarm listings, and trouble shooting functions. The LCD displays will include a separate page for viewing the most recent alarms/events with scrolling capability to view the past alarm/event memory. Each event and alarm condition is time and date stamped. This system shall record and annunciate the following alarms and shall also record pump engaged elapsed time.

Flow Failure [Daytanks 1 through 3, Boiler Daytank] - The system will monitor a flow sensor located in the common outlet of the duplex pumpset [Pumpset A] that provides a normally open dry contact closing upon flow. If the sensor does not see flow when the lead pump is engaged within the time as set by the field operator (15 to 99 seconds), the system will switch to the lag pump, sound the alarm panel buzzer and display a flow failure alarm. The system will engage the lag pump upon each subsequent demand call until the alarm is cleared and the system is RESET.. If the sensor does not see flow when the lag pump is engaged within the time set by the field operator, the system will shut down.

Valve Failure - The system will continually monitor each main tank's supply & return valves to insure that the valves are in the correct position. If the system does not see a valve in the correct position during operation, the system will command all pumps OFF, all valves CLOSED, display that main tank's VALVE FAILURE alarm and sound the panel mounted alarm buzzer.

Main Tank Critical Low Level -The system will monitor for main tank low-level condition vis dry contact from the tank-gauging system. If at any time the main tank's fuel level has dropped to a low level condition, the appropriate MAIN TANK LOW LEVEL alarm will be displayed and the alarm buzzer will sound. The system will be locked out from pumping to or from that main tank until the alarm is cleared and the system is RESET.

Main Tank Leak -The system will monitor each main for tank leak conditions via MODBUS from the tank-gauging system. If at any time a main tank is in a leak condition, the appropriate MAIN TANK LEAK alarm will be displayed and the alarm buzzer will sound.

Daytank Leak - The system will monitor each daytank for leak conditions via MODBUS from the tank-gauging system. If at any time a day tank is in a leak condition, the appropriate DAYTANK LEAK alarm will be displayed, the alarm buzzer will sound and pumping to that daytank will stop. The supply solenoid valves will not open until the alarm condition is cleared and the system is RESET.

Daytank Critical Low Level Alarm (25%) - If the fuel level continues to drop in the day tank and the tank level reaches 25%, the alarm will sound, the system will display a CRITICAL low level alarm condition and the system will close a dry contact.

Daytank Low Level Alarm (45%) - If the fuel level continues to drop in the day tank and the tank level reaches 45%, the alarm will sound and the system will display a low level alarm condition.

Daytank High Level Alarm (90% adjustable) - If fuel continues to rise in the day tank and the day tank level reaches 90%, the system will sound the alarm, display a high level alarm and the supply pump will be locked out from pumping to that daytank and that day tank's supply solenoid valves will not open until the alarm condition is cleared and the system is RESET.

Daytank High-High Level Alarm (95%) - If fuel continues to rise in the day tank and the day tank level reaches 95%, the system will sound the alarm, display a high-high level alarm and the the supply pump will be locked out from pumping to that daytank and that day tank's supply solenoid valves will not open until the alarm condition is cleared and the system is RESET.

System Alarms continued on sheet 5

TeSys™
U-Line Motor Starters

Catalog

03

File 8502

CONTENTS

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Telemecanique

LUB•2

The U-Line motor starter consists of one power base (selected from this page) and one control unit (select from page 20 or 21) as a minimum. The power bases connect by one of two control circuit methods:

- With screw clamp terminals
- Without screw clamp terminals

Each power base with control circuit screw clamp terminals includes one N.O. and one N.C. auxiliary contact to indicate the open or closed position of the power contacts.

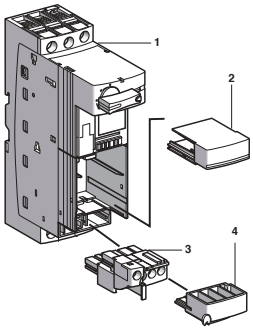
When ordering power bases without control circuit screw clamp terminals (i.e., when building a reversing unit or pre-wiring the low voltage control), the terminal assemblies must be ordered separately.

LUB•20

Full Voltage, Non-Reversing for Standard Applications

Control Connection	Max. Current (Amps)	Three Phase (hp max.)				Single Phase (hp max.)		Self-Protected Starter Base	Starter Base	Weight lb (kg)
		200/208 V	220/240 V	460 V	575/600 V	120 V	240 V	Catalog Number	Catalog Number	
With screw terminations	12	3	3	7.5	10	1.5	2	**LUB12**	**LUS12**	1.98 (0.900)
	32	10	10	20	25	2	5	**LUB32**	**LUS32**	1.98 (0.900)
Without q terminations	12	3	3	7.5	10	1.5	2	**LUB120**	**LUS130**	1.90 (0.865)
	32	10	10	20	25	2	5	**LUB320**	**LUS320**	1.90 (0.865)

Full Voltage, Non-Reversing for Use with High Density PLC Cards (100 mA)



Control Connection	Max. Current (Amps)	Three Phase (hp max.)				Single Phase (hp max.)		Self-Protected Starter Base	Starter Base	Weight lb (kg)
		200/208 V	220/240 V	460 V	575/600 V	120 V	240 V	Catalog Number	Catalog Number	
With screw terminations	12	3	3	7.5	10	1.5	2	**LUB12BH**	**LUS12BH**	1.98 (0.900)
	32	10	10	20	25	2	5	**LUB32BH**	**LUS32BH**	1.98 (0.900)
Without q terminations	12	3	3	7.5	10	1.5	2	**LUB120BH**	**LUS130BH**	1.90 (0.865)
	32	10	10	20	25	2	5	**LUB320BH**	**LUS320BH**	1.90 (0.865)

Terminal Blocks for Non-Reversing Power Bases without Terminations LUB••0, LUS••0

Control Connection	For Use On	Item	Catalog Number	Weight lb (kg)
With screw terminations	LUB120/LUB320 LUS120/LUS320	3 + 4	**LU9BN11**	0.10 (0.45)

q Must order LU9BN11, LU9BN11C, LU9MRC or LU9MR1C.

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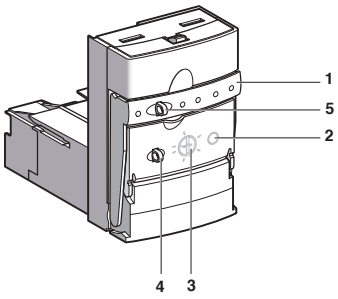
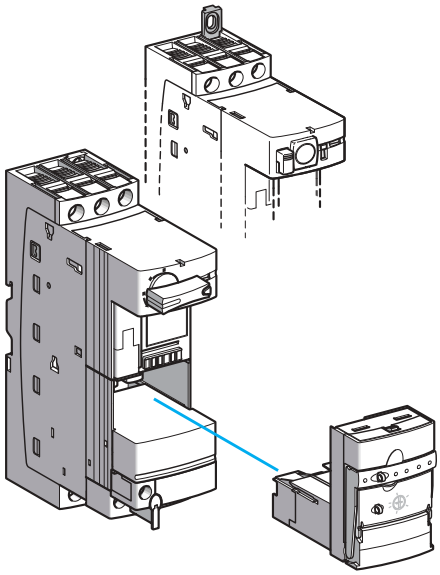
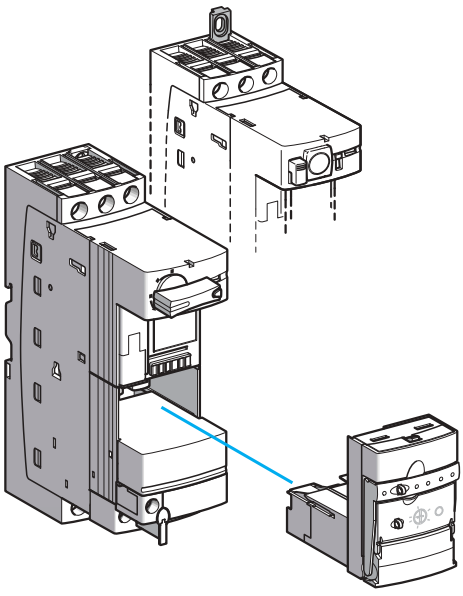




LUCAkkkk



LUCBkkkk

Standard and Advanced Control Units

Description	
1	Extraction and locking handle
2	Test button (on advanced control unit only)
3	Adjustable FLA dial
4	Locking of settings by sealing the transparent cover
5	Sealing of locking handle

Standard, 3-Phase, Class 10 Overload Protection

Setting Range (Amps)	Used with power bases	Catalog Number	Weight lb (kg)
0.15–0.6	LUkB12, LUkB32, LUkS12, LUkS32	**LUCAX6** q	0.30 (0.135)
0.3–1.4	LUkB12, LUkB32, LUkS12, LUkS32	**LUCA1X** q	0.30 (0.135)
1.25–5.0	LUkB12, LUkB32, LUkS12, LUkS32	**LUCA05** q	0.30 (0.135)
3–12	LUkB12, LUkB32, LUkS12, LUkS32	**LUCA12** q	0.30 (0.135)
4.5–18	LUkB32, LUkS32	**LUCA18** q	0.30 (0.135)
8–32	LUkB32, LUkS32	**LUCA32** q	0.30 (0.135)

Advanced, 3-Phase, Class 10 Overload Protection

Setting Range (Amps)	Used with power bases	Catalog Number	Weight lb (kg)
0.15–0.6	LUkB12, LUkB32, LUkS12, LUkS32	**LUCBX6** q	0.31 (0.140)
0.3–1.4	LUkB12, LUkB32, LUkS12, LUkS32	**LUCB1X** q	0.31 (0.140)
1.25–5.0	LUkB12, LUkB32, LUkS12, LUkS32	**LUCB05**	0.31 (0.140)
3–12	LUkB12, LUkB32, LUkS12, LUkS32	**LUCB12** q	0.31 (0.140)
4.5–18	LUkB32, LUkS32	**LUCB18** q	0.31 (0.140)
8–32	LUkB32, LUkS32	**LUCB32** q	0.31 (0.140)

Advanced, Single Phase, Class 10 Overload Protection

Setting Range (Amps)	Used with power bases	Catalog Number	Weight lb (kg)
0.15–0.6	LUkB12, LUkB32, LUkS12, LUkS32	**LUCCX6** q	0.31 (0.140)
0.3–1.4	LUkB12, LUkB32, LUkS12, LUkS32	**LUCC1X** q	0.31 (0.140)
1.25–5.0	LUkB12, LUkB32, LUkS12, LUkS32	**LUCC05** q	0.31 (0.140)
3–12	LUkB12, LUkB32, LUkS12, LUkS32	**LUCC12** q	0.31 (0.140)
4.5–18	LUkB32, LUkS32	**LUCC18** q	0.31 (0.140)
8–32	LUkB32, LUkS32	**LUCC32** q	0.31 (0.140)

Advanced, 3-Phase, Class 20 Overload Protection

Setting Range (Amps)	Used with power bases	Catalog Number	Weight lb (kg)
0.15–0.6	LUkB12, LUkB32, LUkS12, LUkS32	**LUCDX6** q	0.31 (0.140)
0.3–1.4	LUkB12, LUkB32, LUkS12, LUkS32	**LUCD1X** q	0.31 (0.140)
1.25–5.0	LUkB12, LUkB32, LUkS12, LUkS32	**LUCD05** q	0.31 (0.140)
3–12	LUkB12, LUkB32, LUkS12, LUkS32	**LUCD12** q	0.31 (0.140)
4.5–18	LUkB32, LUkS32	**LUCD18** q	0.31 (0.140)
8–32	LUkB32, LUkS32	**LUCD32** q	0.31 (0.140)

q Complete the catalog number by selecting the proper voltage code from the table below.

Voltage Codes

Volts	24	48–72	110–240
DC	BLfa	–	–
AC	B	–	–
DC or AC	–	ES p	FU

f Voltage code to use for a power base with a communication module.
a DC voltage with range of 0.90 to 1.10 of nominal.
p 48–72 Vdc; 48 Vac

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Programmable controller
Twido

Catalog
January
05

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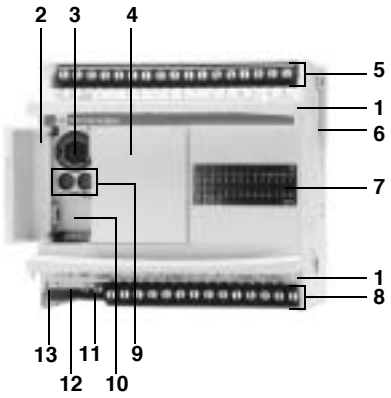
Telemecanique

Twido programmable controller
Compact base controllers



Description

Twido **TWD LC●A ●●DRF** and **TWD LCA● 40DRF** compact programmable base controllers comprise :

1 Two hinged connection terminal block covers for access to the terminals

2 A hinged access door

3 A mini-DIN type RS 485 serial port connector (allowing connection of the programming terminal)

4 A slot (protected by a removable cover) for digital diagnostic/maintenance display module TWD XCP ODC

5 A screw terminal block for ⎓ 24 V supply to the sensors and for connection of the input sensors

6 A connector for I/O expansion modules TWD D●●, TWD A●● and TWD NOI 10M3 (maximum of 4 modules on 24 I/O base controllers and 7 modules on 40 I/O base controllers)

7 A display block showing:
- the status of the controller (PWR, RUN, ERR and STAT)
- the inputs and outputs (IN● and OUT●)

8 A screw terminal block for connection of the output pre-actuators

9 Two analog adjustment points (one point for 10 and 16 I/O models)

10 An extension connector for the addition of a 2nd RS 232C/RS 485 serial port using adapter TWD NAC ●●● (for 16 and 24 I/O models)

11 A screw terminal block for connection of the ∿ 100...240 V mains or ⎓ 19.2...30 V power supply

12 A connector (access through the bottom of the controller) for:
- memory cartridge TWD XCP MFK32 or real-time clock cartridge TWD XCP RTC for base controllers TWD LC●A ●●DRF
- memory cartridge TWD XCP MFK64 and built-in real-time clock TWD XCP RTC for base controllers TWD LCA● 40DRF

13 An RJ45 connector (access through the bottom of the controller) for connection to the Ethernet network, only on base controller TWD LCAE 40DRF

Compact base controllers are mounted on a symmetrical ⊓⎽⊓ rail. Mounting kit TWD XMT5 (supplied in lots of 5) allows plate or panel mounting (2 x Ø 4.3 holes).

Twido programmable controller
Compact base controllers

TWD LC●A 10DRF/16DRF

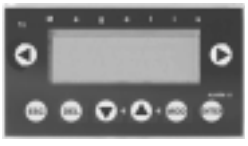
References

Number of I/O	Inputs sink/source	Outputs	Program memory	Reference	Weight kg
Compact base controllers, ∿ supply					
10 I/O	6 ⎓ 24 V inputs	4 relay outputs	700 instructions	**TWDLCAA10DRF**	0.230
16 I/O	9 ⎓ 24 V inputs	7 relay outputs	2000 instructions	**TWDLCAA16DRF**	0.250
24 I/O	14 ⎓ 24 V inputs	10 relay outputs	3000 instructions	**TWDLCAA24DRF**	0.305
40 I/O	24 ⎓ 24 V inputs	14 relay outputs and 2 transistor outputs	3000 instructions *(1)*	**TWDLCAA40DRF**	0.525
				TWDLCAE40DRF *(2)*	0.525
Compact base controllers, ⎓ supply					
10 I/O	6 ⎓ 24 V inputs	4 relay outputs	700 instructions	**TWDLCDA10DRF**	0.230
16 I/O	9 ⎓ 24 V inputs	7 relay outputs	2000 instructions	**TWDLCDA16DRF**	0.250
24 I/O	14 ⎓ 24 V inputs	10 relay outputs	3000 instructions	**TWDLCDA24DRF**	0.305

TWD XCP MFK32/RTC

TWD NAC ●●●●

TWD XCP ODC



XBT N401

ASI ABLM3024

Separate components *(3)*

Description	Application	Type	Reference	Weight kg
32 Kb memory cartridge	For all base controllers Application backup Program transfer	EEPROM	**TWDXCPMFK32**	0.005
64 Kb memory cartridge	For base controllers TWD LCA● 40DRF Memory extension Application backup Program transfer	EEPROM	**TWDXCPMFK64**	0.005
Real-time clock cartridge	Date-stamping RTC based programming	–	**TWDXCPRTC**	0.005
Serial interface adapters	See page 41	–	**TWDNAC●●●●**	–
Digital display	Data display and modification	–	**TWDXCPODC**	0.020
Input simulators	6 inputs	–	**TWDXSM6**	–
	9 inputs	–	**TWDXSM9**	–
	14 inputs	–	**TWDXSM14**	–
External backup batteries	For base controllers TWD LCA● 40DRF	Sold singly	**TSXPLP01**	–
		Sold in lots of 10	**TSXPLP101**	–
Mounting kit (Sold in lots of 5)	For plate or panel mounting of compact base controllers or extensions	–	**TWDXMT5**	–

Magelis compact displays

Description	Protocol	Compatible with PLC types	Supply voltage	Reference	Weight kg
Compact display, 2 lines of 20 characters (alphanumeric display)	Uni-Telway, Modbus	Twido, Nano, TSX Micro, Premium	⎓ 5 V by terminal port on PLC	**XBTN200**	0.360
Compact displays, 4 lines of 20 characters (matrix display)	Uni-Telway, Modbus	Twido, Nano, TSX Micro, Premium	⎓ 5 V by terminal port on PLC	**XBTN400**	0.360
		Twido *(4)* Nano, TSX Micro, Premium, TSX series 7, Momentum, Quantum Other Modbus slave modules	⎓ 24 V external source	**XBTN401**	0.360
Display connection cable	Uni-Telway, Modbus	Twido, Nano, TSX Micro, Premium	–	**XBTZ978**	0.180

Phaseo regulated switch mode power supply

Description	Input voltage 47…63 Hz	Output voltage	Nominal power	Nominal current	Auto-protect reset	Reference	Weight
	V	⎓ V	W	A			kg
Regulated switch mode power supply for AS-Interface cabling system *(5)*	∿ 100…240 single-phase wide range	30 + 24	2 x 72	2.4 + 3	Auto	**ASIABLM3024**	1.300

(1) 6000 instructions with memory extension cartridge TWD XCP MFK64.
(2) Base controller equipped with an integrated Ethernet link (RJ45 port).
(3) Other separate components, see page 46
(4) Connection via built-in port or via optional serial port on Twido programmable controllers.
(5) Without ground fault detection.

The Essential Guide

Magelis™ Human Machine Interfaces

2011

Make the most of your energy℠

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Magelis STO with graphic screen

Type		Specifications		
Display	LCD screen size/resolution	3.4"/monochrome (200 X 80 pixels)		
	Type	Green, orange, red	White, pink, red	Green, orange, red
Functions	Representation of variables	Alphanumeric, bitmap, bar graph, gauge, button, light, clock, flashing light, keypad		
	Curves/alarm logs	Yes, with log/Yes, incorporated		
Communication	Serial link	1 RJ45 (RS 232 – RS 485)		1 Terminal Block RS232
	Networks	—	—	—
Communication protocols		Mitsubishi (Melsec), Omron (Sysmac), Rockwell Automation (Allen Bradley), Siemens (Simatic), Uni-TE, Modbus™, Modbus TCP		Zelio™
Development software		Vijeo Designer VJD•••TG•V••M (on Windows XP, Vista and 7 – 32 bit only) or Vijeo Designer Limited Edition		
Dimensions W x D x H (mm)		116.5 x 38.5 x 77.5		
Compatibility with PLCs		Twido™, Modicon™ TSX Micro™, Modicon Premium™, Modicon Quantum™, Modicon M340™		Zelio
CompactFlash card slot		No		
USB port		1 host type A + 1 Device type miniB		
Built-in Ethernet TCP/IP		No		
Supply voltage		24 VDC		
References		HMISTO511	HMISTO512	HMISTO501

Magelis STU with graphic screen

Type		Specifications	
Display	LCD screen size/resolution	3.5"/QVGA (320 X 240 pixels)	5.7"/QVGA (320 X 240 pixels)
	Type	TFT 65 536 colors	
Functions	Representation of variables	Alphanumeric, bitmap, bar graph, gauge, button, light, clock, flashing light, keypad	
	Curves/alarm logs	Yes, with log/Yes, incorporated	
Communication	Serial link	1 RJ45 (RS 232 – RS 485)	
	Networks	Ethernet, IEEE 802.3, 10/100 BASE-T, RJ45	
Communication protocols		Mitsubishi (Melsec), Omron (Sysmac), Rockwell Automation (Allen Bradley), Siemens (Simatic), Uni-TE, Modbus, Modbus TCP	
Development software		Vijeo Designer VJD•••TG•V••M (on Windows XP, Vista and 7 – 32 bit only) or Vijeo Designer Limited Edition	
Dimensions W x D x H (mm)		Front: 98 x 16 x 81	Front: 163 x 17.5 x 129.5
		Rear: 118 x 30 x 98	
Compatibility with PLCs		Twido, Modicon TSX Micro, Modicon Premium, Modicon Quantum, Modicon M340	
CompactFlash card slot		No	
USB port		1 host type A + 1 Device type miniB	
Built-in Ethernet TCP/IP		Yes	Yes
Supply voltage		24 VDC	
References		HMISTU655	HMISTU855

Tank Supply & Return Valves

DM2500 Series

Flanged Ball Valves

SPECIFICATIONS

Available in stainless steel or carbon steel

- Body and ends are investment cast
- Self-adjusting stem packing
- Blow-out proof stem design
- 100% air tested under water at 100 psi
- Working pressure ANSI 150
- Temperature range: -40°F to +450°F
- ISO 5211 mounting pad
- End cap type: flanged end (ANSI 150)
- Flange dimension: face-to-face ANSI B16.10; flange connection ANSI B16.50
- Silicone free
- Oxygen cleaned option

Size	Breakaway Torque (in-lb)	Cv	Weight
1/2"	50	32	9
3/4"	75	54	10
1"	100	105	12
1-1/2"	185	275	18
2"	300	460	25
2-1/2"	450	780	36
3"	750	1330	50
4"	1100	2420	69
6"	3500	5400	189

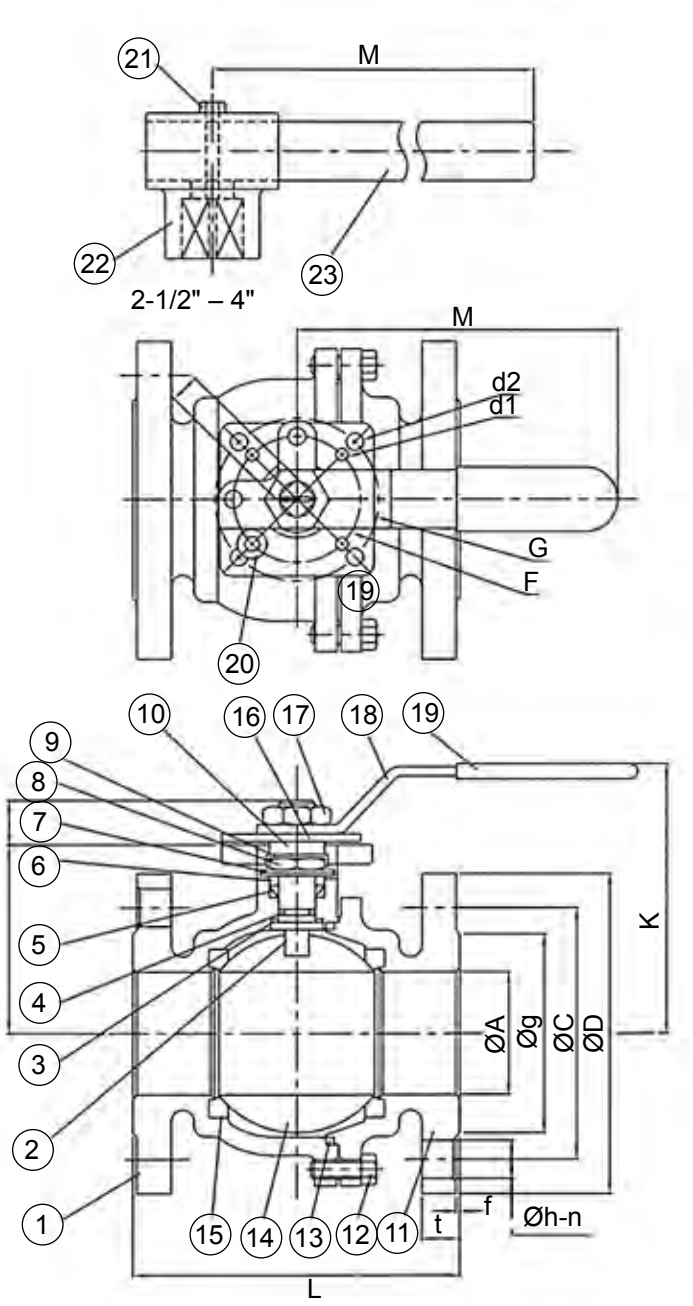
ORDERING SCHEMATIC

Series	Body		Port		Packing		Seat		Ends	
DM25	23	Carbon Steel	F	Full	C	Carbon/Teflon	C	Carbon	F1	Flanged 150
	33	Stainless Steel	R	Reduced	G	Graphite	T	Teflon	F3	Flanged 300
	44	Alloy 20			T	Teflon	TM	Super Teflon		
	77	Hastelloy					TC	Carbon Super Teflon		
	99	Duplex					M	Metal Seated		

J Flow Controls

J Flow Controls, LLC
14 De Camp • Cincinnati, OH 45216
Phone: 513-731-2900 • Fax 513-731-6939
www.jflowcontrols.com

DIMENSIONS (1/2" – 4")



MATERIALS OF CONSTRUCTION

No.	Name of Part	Material Options	
		~~Stainless Steel~~	Carbon Steel
1	Body	~~CF8M/DIN 1.4408~~	WCB/DIN 1.0619
2	Stem	SS316	
3	Thrust Washer	Teflon	
4	O-Ring	Viton	
5	Stem Packing	Graphite	
6	Gland	SS304	
7	Disc Washer	SS01	
8	Stem Nut	SS304	
9	Nut Lock	SS04	
10	Washer	SS304	
11	Flange Cap	~~ASTM A351 Gr. CF8M~~	ASTM A216 Gr. WCB
12	Bolts	~~SS304~~	Carbon Steel
13	Gasket	Graphite	
14	Ball	SS316	
15	Ball Seats	Teflon	
16	Stopper	SS304	
17	Handle Nut	SS304	
18	Handle	SS304	
19	Handle Cover	Vinyl Plastisol	
20	Position Pin	SS304	
21	Set Bolt	SS304	
22	Lever Head	CF8	
23	Lever	Steel Pipe	

Size	A	B	E	L	H	K	M	F	G	d1	d2	D	Flange Dimensions (Class 150)					
													Bolt Hole					
													c	h	n	t	g	f
1/2"	0.59	1.89	0.43	4.25	0.35	3.15	5.12	1.42	1.65	0.24	0.24	3.50	2.38	0.63	0.16	0.45	1.38	0.06
3/4"	0.79	2.09	0.43	4.61	0.35	3.15	5.12	1.42	1.65	0.24	0.24	3.86	2.76	0.63	0.16	0.45	1.69	0.06
1"	0.98	2.32	0.55	5.00	0.43	3.54	6.50	1.65	1.97	0.24	0.28	4.25	3.13	0.63	0.16	0.45	2.01	0.06
1-1/4"	1.26	2.80	0.55	5.51	0.43	4.02	6.50	1.65	1.97	0.24	0.28	4.61	3.50	0.63	0.16	0.50	2.52	0.06
~~1-1/2"~~	~~1.42~~	~~2.99~~	~~0.71~~	~~6.50~~	~~0.55~~	~~4.33~~	~~8.07~~	~~1.97~~	~~2.76~~	~~0.28~~	~~0.36~~	~~5.00~~	~~3.88~~	~~0.63~~	~~0.16~~	~~0.56~~	~~2.87~~	~~0.06~~
2"	1.97	3.35	0.71	7.00	0.55	4.72	8.07	1.97	2.76	0.28	0.36	5.98	4.74	0.75	0.16	0.63	3.62	0.06
2-1/2"	2.56	3.68	0.91	7.48	0.67	5.51	11.8	2.76	4.02	0.36	0.45	7.01	5.50	0.75	0.16	0.70	4.13	0.06
3"	3.15	4.06	0.91	7.99	0.67	5.91	13.4	2.76	4.02	0.36	0.45	7.48	6.00	0.75	0.16	0.75	5.00	0.06
4"	3.94	5.20	0.98	9.02	0.87	7.09	16.5	4.02	4.92	0.45	0.53	9.02	7.50	0.75	0.31	0.94	5.00	0.06

Phillips Fuel Systems

109 Holland Ave Bridgeport CT, USA 06605
Phone: (203)-908-3323 Fax: (203)-908-3325

DP20-130062

20 Duplex Pump Set
12 GPM @ 150 PSI with (2) 2 HP motors,
400 VAC/ 3Ø/ 50Hz

London

All rights Reserved. No portion of this package or any part herein shall not be reproduced in any form without the written permission of Phillips Fuel System Inc

By acceptance of this package, it is understood that Phillips Fuel System Inc shall be responsible for only those items indicated herein and unless otherwise noted. The signatory whose signature appears is duly authorized by all necessary and appropriate action to execute approval and will all abide by Phillips Fuel Systems Inc standard sales terms and conditions and be responsible for verifying correctness of the type, size, location, operation, electrical requirements, piping, accessories or any other requirements for successful operation. It is further understood that by acceptance of this package, Phillips Fuel System Inc will not be held liable for any deviation or omission from any quotation and/or specification. Phillips Fuel System Inc reserves the right, without approval, to rearrange components or substitute, due to lack of availability, quality and/or performance, any component indicated herein with a compatible component, as long as that component is of the same quality and general design.

Approved _____ Date _____

Approved _____ Date _____

Approved _____ Date _____

PHILLIPS FUEL SYSTEMS INC LIMITED WARRANTY FOR NEW PUMPS OR PUMPING SYSTEMS MANUFACTURED BY PHILLIPS FUEL SYSTEMS INC

A. PRODUCTS WARRANTED - Phillips Fuel System Inc, subject to the limitations contained below, will at its option, repair or replace, without charge for parts or labor only, any part or parts of a new pump or system manufactured by PHILLIPS FUEL SYSTEMS which is found, upon examination by PHILLIPS FUEL SYSTEMS INC at it's factory in Bridgeport, Ct. or by its designated affiliate, to be DEFECTIVE IN MATERIAL AND/OR WORKMANSHIP if determined by such examination within twelve months from the date of sale to the original consumer purchaser.

B. PRODUCTS AND ITEMS NOT WARRANTED - The provisions of this warranty shall not apply to any equipment, part or accessory which:
(a) has been improperly specified by buyer;
(b) has been improperly stored or handled prior to placing in service;
(c) has been improperly mounted, installed or connected, altered or modified in any way.
(d) has not been operated within specifications as stated on its nameplate, label, placard, or within its operating manual;
(e) has not been properly maintained;
(f) parts supplied by buyer for inclusion in finished equipment are not covered by this warranty;
(g) components or assemblies specified by buyer with no substitution permissible that are not normally used by Phillips Fuel System Inc are not covered by this warranty;
(h) that interfaces with, controls or is controlled by any device that has not been approved by Phillips Fuel System Inc

Phillips Fuel System Inc reserves the right to reject warranty claims of any kind against assembled equipment, parts or material for which Phillips Fuel System Inc has not received payment in full and for any system which was not authorized for start up and use by Phillips Fuel System Inc or by its designated affiliate. Should buyer, at his own risk, elect to replace failed equipment or parts in the field rather than obtain start up service under this warranty, Phillips will supply and invoice parts at normal prices upon receipt of buyer's bonafide purchase order. Failed equipment or parts returned for in-warranty crediting in exchange for replacement parts must be returned within 45 days from date of shipment of replacement in order to qualify for warranty consideration.

This warranty is extended to the original buyer only and is not transferable to subsequent buyers. This warranty is available for installations in the forty-eight contiguous U.S. states only.

C. SECURING WARRANTY SERVICE - Warranty service can be arranged by contacting PHILLIPS FUEL SYSTEMS INC, c/o Service Manager, 109 Holland Ave, Bridgeport, Ct 06605. Warranty service can only be performed by Phillips Fuel System Inc at its factory in Bridgeport, Ct or by its designated affiliate. At the time of requesting warranty service, evidence must be presented of the date of sale to the original consumer purchaser. The purchaser shall pay any charges for making service calls and/or for transporting the product to and from the place where the inspection and/or warranty work is performed. The purchaser shall be responsible for any damage or loss incurred in connection with the transportation of the system and/or of part or parts of the system, submitted for inspection and/or warranty work.

D. NO ADDITIONAL WARRANTIES OR REPRESENTATIONS - The foregoing EXPRESSED WARRANTY IS IN LIEU OF ALL OTHER EXPRESSED WARRANTIES. Neither Phillips Fuel System Inc nor any of its affiliates make any warranties, representations or promises, written or verbal, as to the quality of the system or its parts other than those set forth herein.

ANY IMPLIED WARRANTIES (INCLUDING, BUT NOT LIMITED TO MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE) TO THE EXTENT EITHER APPLIES TO PART OR PARTS OF A SYSTEM SHALL BE LIMITED IN DURATION TO THE PERIODS OF THE EXPRESSED WARRANTIES AS DEFINED IN PARAGRAPH A. Some states do not allow limitations on how long an implied warranty lasts, so the above limitations may not apply.

E. DAMAGES - IN NO EVENT WILL PHILLIPS PUMPS BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES AND/OR EXPENSES. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation may not apply to you. This warranty gives you specific legal rights and you may have other legal rights which vary from state to state.

F. NO DISTRIBUTOR DEALER WARRANTY - PHILLIPS FUEL SYSTEM INC neither assumes nor authorizes any other person, natural or corporate, to assume any other obligations or liabilities in connection with or with respect to any part or parts of a system. The seller, dealer or distributor of part or parts has no authority to make any representations or promises on behalf or PHILLIPS FUEL SYSTEMS INC or to modify the terms or limitations of this warranty in any way. The seller, dealer or distributor makes no warranty of his own on any item warranted by PHILLIPS FUEL SYSTEMS and makes no warranty on other items, unless such seller or dealer delivers to the purchaser a separate written warranty document in which the seller or the dealer individually and specifically on its own behalf, warrants the terms or items.

SECTION I INTRODUCTION

1-1. This bulletin provides general instructions for the installation and operation of the DP series Pump sets manufactured by Phillips Fuel Systems Inc, Bridgeport, Connecticut

1-2. After carefully uncrating or unpacking, check the equipment against the shipping papers and inspect for damage incurred during shipment. Immediately notify the carrier of any damage or shortage found.

1-3. The type and size of the DP series duplex pump set was selected to meet requirements specified by purchaser. Among the more important are these:

Type of Liquid Pumped (#2 fuel oil or diesel fuel ONLY)
Temperature, Viscosity, Specific Gravity
Flow Rate
Suction Pressure or Lift
Total Head
Type Driver
Motor and its electric power supply characteristics
Engine
Steam turbine and its steam supply and exhaust conditions
Other (as described)

1-4. If any one of these requirements has changed since the order was placed, particularly the suction condition, we strongly recommend that such change be reviewed with a Phillips representative. If the performance curve previously furnished has been lost, the representative will furnish another copy.

WARNING

Do not operate this system at any pressure, flow rate, or liquid temperature other than those for which the system was originally purchased. Do not pump any other liquid than the one for which the pump was originally purchased without the consent of Phillips Pump or its authorized representatives. Disregard of this warning can result in pump failure and serious personal injury or death.

CAUTION

Operation of the pump under conditions differing widely from those for which the pump selection was based may result in reduced parts life.

SECTION II INSTALLATION

2-1. LOCATION. Select a location for the DP series Pump set that will be clean, well ventilated, properly drained and provide accessibility for inspection and maintenance (see out line drawing for dimension). Out door installations may require protection from the elements, particularly freezing. The suction supply line must provide the any pump with fluid equal to or greater than that required by the pump at any capacity on its operating curve.

2-2. FOUNDATION. Concrete (reinforced as necessary or required) is most widely used for the foundation. In sufficient mass, it provides rigid support, which minimizes deflection and vibration. It may be located on soil, structural steel or building floors, provided the combined weight of the purifying unit and foundation does not exceed the allowable bearing load of the support. Allowable bearing loads of structural steel and floors can be obtained from engineering handbooks; building codes of local communities give the recommended allowable bearing loads for different types of soil.

2-3. Before pouring the foundation, locate the foundation bolts by the use of a template frame and provide anchorage. See the outline drawings furnished with each pump for the exact location of the foundation bolts. When pouring, allow for a grout thickness of 3/4 to 1 1/2 inches. Roughen top surface to provide a good bond of the grout. Ordinarily, the proportions used are 1 part cement to 3 parts sand and 4 parts medium aggregate.

CAUTION

Use qualified personnel (riggers) to lift or move unit at any time. Never lift unit using hooks or slings on the pumps. Never place eyebolts in tapped holes except for removal of a part to perform service work.

When the unit is received with it should be placed on the foundation. The unit should be supported on rectangular metal blocks and shims or on metal wedges having a small taper. In each case the supports should be directly under the part of the base plate carrying the greatest weight and spaced closely enough to give uniform support. A gap of about 3/4 inches to 11/2 inches should be allowed between the base and the foundation for grouting.

2-4. PIPING. The suction and discharge piping should be arranged for the simplest, most direct layout, to be of sufficient size and be internally free of foreign material. The piping must never be pulled into position by tightening the suction or discharge ports. It must be independently supported and arranged so that expansion and contraction, due to temperature changes, will not cause misalignment. Flexible braided hose of suitable size and pressure rating should be used to connect the unit's discharge, suction and relief valve (if external relief is present) piping. Failure to connect system to piping with flexible hose will violate the manufacture's warranty. A ball valve should be place on the suction and discharge of the system.

2-5. The suction piping, if not installed properly, is a potential source of faulty operation. To achieve best performance, provide for the following:

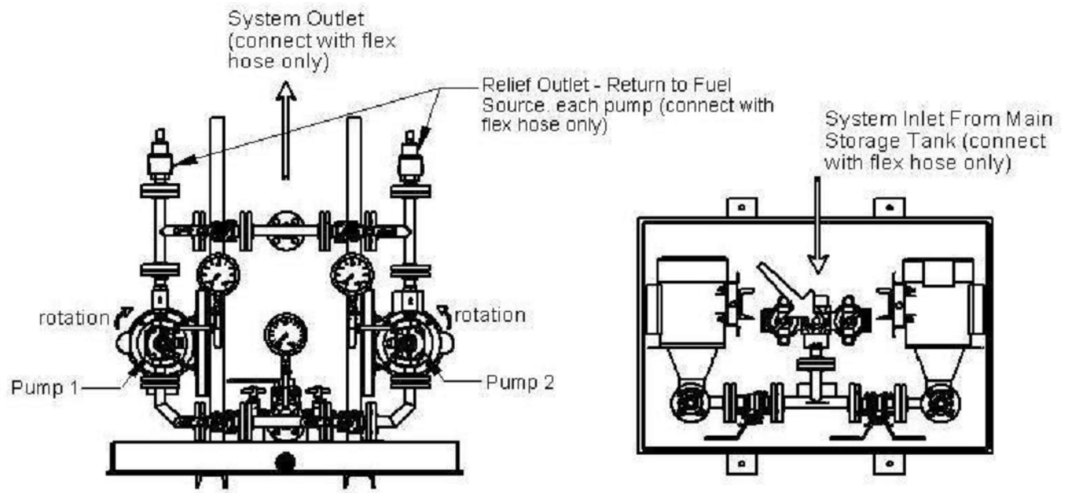
- Suction lines, when operating under suction lift, must be kept absolutely free from air leaks.
- The suction pipe, when operating under suction lift, must be at least the same size as the system's suction inlet. The suction at all points and should not contain loops or high spots in which air can be trapped. If the system level or lower than the fuel source, provide suitable means to prevent the fuel source to be siphoned out thru the pump set.
- The strainer screen must be checked and cleaned periodically. A pump operating under suction lift should never use additional gate or globe valve in the suction line.

2-6. DISCHARGE RELIEF LINE. The Phillips Fuel DP and EDP series duplex pump system may included a pressure safety relief valves that is factory set. Should the system pressure exceed the set pressure, the safety relief valves will open and allow flow through the relief discharge port thus protecting the system. Any relief discharge port should be piped back into the fuel source using the same size or larger pipe to provide pressure relief to the system. DO NOT INSTALL ANY SHUT OFF VALVES IN THE PUMP SET RELIEF VALVE LINES.

Piping should be cleaned mechanically and chemically; and flushed prior to installing the pump. A large number of pump mechanical seal and seizure troubles are due to improperly cleaned systems.

CAUTION

These valves are intended for safety relief only. They are not to be used to regulate system pressure or flow. Do not plug or restrict the discharge relief. Restricting relief port discharge WILL damage the system and result in personal injury.



Flexible braided hose of suitable size and pressure rating should be used to connect the pump set to discharge, suction and relief valve piping.
Failure to connect pump set to piping with flexible hose will violate the manufacture's warranty with regards to any piping leaks.

SECTION III PUMPS

NOTE: Piping must be thoroughly flushed prior to initial start-up to avoid contamination of the pumps.

Gear pumps are positive displacement pumps. Each shaft revolution displaces a definite amount of liquid relatively unaffected by the back pressure in the discharge line. Shaft speed and flow are directly proportional.

These close coupled pumps are mounted directly to single or three phase, totally enclosed fan cooled or explosion proof, 1.15 service factor, electric motors by means of a suitable adapter casting. The pump drive shaft is connected to the motor shaft by a flexible coupling.

3-1. Connect power supply to conform with national and local codes. Line voltage and wire capacity must match the electrical diagram and the nameplate rating on the pump motors. Set motor rotation per instructions on motor nameplate if required.

3-2. Connect switches and other devices to the terminal strips in the control panel as indicated on the electrical wiring diagram further on in the booklet if required.

3-3. PRIMING. The system's pumps should be primed before start up. DO NOT USE PUMPS TO PRIME THE FUEL OIL LINES. The system was fully tested before shipment so the pumps are not completely dry. However, it is best to fill the system with fluid on the suction side before start up. To prime the pump system, open both valves on the suction side of the pump, remove the cap from the strainer and fill as necessary. The fuel oil supply lines leading to the system should be primed via a priming tee at the highest point in the lines.

Trouble Shooting Pump Operation

SUCTION LIFT SHOULD BE NO MORE THAN 15" Hg MAXIMUM - Operating pumps at a greater suction lift will damage pump and gears

Pump will not prime or retain prime after running	1. Air leak in suction line. 2. Gears are worn. 3. Clogged foot valve or strainer. 4. Suction lift to far .	1. Prime pump, repair or replace. 2. Replace. 3. Clean or replace. 4. Move system closer to source or install check valve and or foot valve and prime.
Flow rate to low	1. Incorrect motor speed. 2. Piping is fouled or damaged. 3. Worn gears. 4. Discharge line restricted or undersized.	1. Check motor. 2. Clean or replace. 3. Replace. 4. Flush out line or replace.
Pump runs but no fluid	1. Pump not primed. 2. Faulty suction pipe. 3. Pump located to far from source. 4. Valve closed. 5. Clogged Strainer. 6. Fouled foot valve. 7. Suction height too great or long. 8. Gear loose on shaft.	1. Prime. 2. Replace. 3. Relocate unit. 4. Open all discharge and suction valves. 5. Remove baskets from strainer and clean. 6. Clean or replace. 7. Locate unit closer to source supply. 8. Replace gear and shaft.
Pressure is low	1. Incorrect motor size and speed. 2. Line restrictions. 3. Worn gears.	1. Replace. 2. Clean or replace. 3. Replace.
Pump starts and stops pumping	1. Fouled gears. 2. Leak in suction line. 3. Leak in foot valve. 4. Motor shutdown.	1. Replace. 2. Repair. 3. Repair or replace. 4. Reset motor starter.
Excessive noise	1. Improper Installation. 2. Worn gears. 3. Pumps not secured to base. 4. Piping not supported to relive strain. 5. Restricted suction line.	1. Check system installation. 2. Replace. 3. Secure properly. 4. Secure pipe independently. 5. Clean or correct.

SECTION IV START UP

4-4. MOTOR. Properly selected and installed motors are capable of operating for years with little maintenance. However they must be periodically cleaned around the vent opening, preferably with a vacuum. Periodically check all electrical connections are tight and are not frayed, split or damage. Oil and maintain as recommended by the motor manufacturer

4-5. RELIEF VALVE. The Phillips Pump DP duplex pumping system includes two pressure relief valves that are factory set. This pressure relief valve is designed to protect equipment from overpressure and should be piped back into the fuel source to provide pressure relief to the system. Do not plug any the valve discharge opening. When discharge piping is connected to valve outlet, make sure the valve is not be connected to any discharge pipe that contains pressure before the valve opens or to any pipe where the pressure build-up is greater than 10% of the set pressure when the valve is open and relieving.

Valve discharge piping, other than a short tailpipe, must be supported. A flexible connection between the valve and the pipe should be used to prevent excessive pipe stress, due to thermal expansion, from being imposed on the valve body.

For threaded valves, to prevent sealing compound from entering and damaging the valve, apply a small amount of pipe thread sealing compound to external threads only. Do not put any sealing compound on the first thread or on any internal threads. To do so may cause the sealing compound to enter the valve and cause seat leakage. For flanged valves, use new gaskets and tighten the mounting studs evenly.

The system operating pressure should be at least 5 psig or 10% which ever is greater below the relief valve set pressure. Operating too close to the valve set pressure will cause seat leakage and will shorten the time between valve maintenance.

DO NOT USE THE SAFETY VALVE AS A CONTROL VALVE TO REGULATE SYSTEM OPERATING PRESSURE.

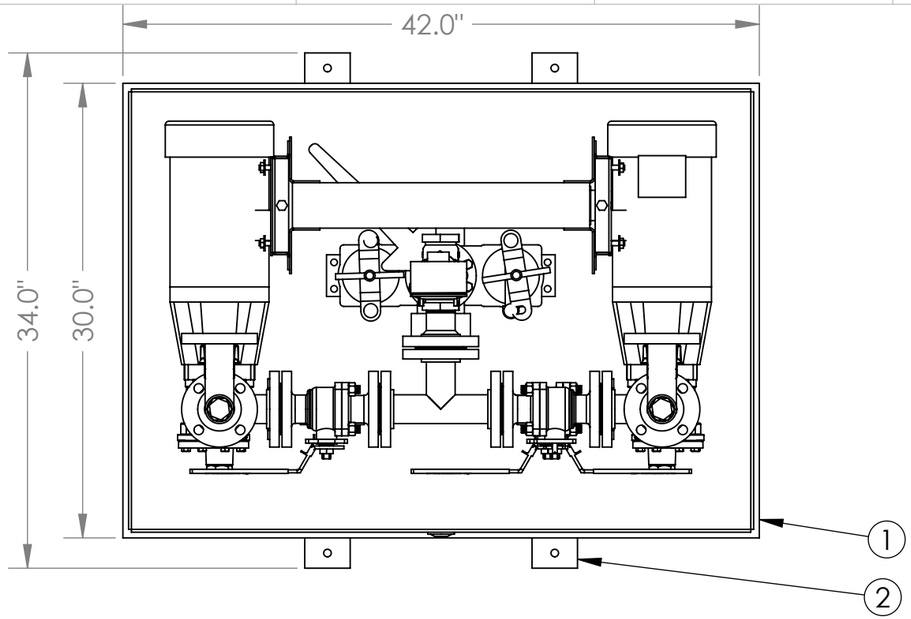
EXCESSIVE OPERATION WILL CAUSE THE SEAT TO LEAK AND WILL REQUIRE MORE FREQUENT VALVE MAINTENANCE.

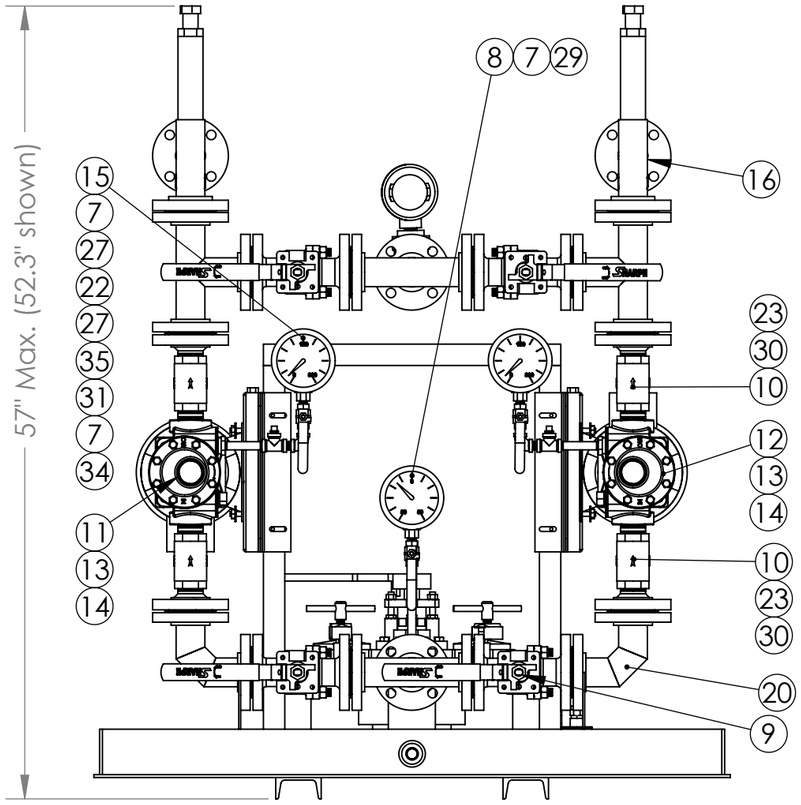
DO NOT INSTALL ANY SHUT OFF VALVES IN ANY RELIEF VALVE LINE

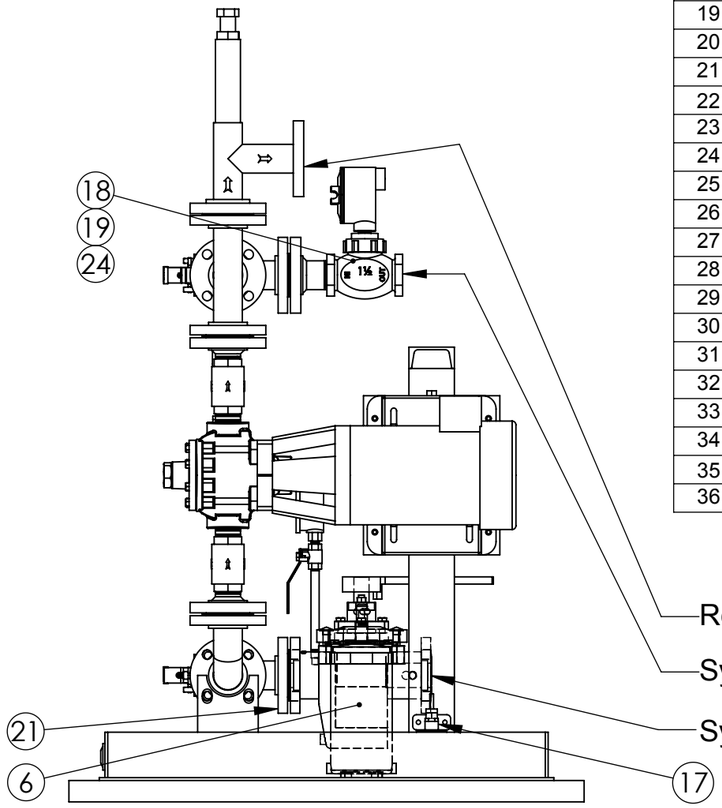
SECTION V STRAINER

5.1. OPERATION - The duplex strainer includes two basket chambers with a built in transfer valve to provide uninterrupted flow during basket change-overs on fluid handling systems. The normal flow of fluid is through the intake port, then through the upper port of the valve, through the inside of the basket where particles are trapped, the bottom port of the valve, and finally through the discharge port of the unit. To direct the flow from one basket chamber to the other, swing the valve handle to either of its extreme positions. The chamber in use is shown by the indicator which is cast into the valve handle and partially covers the chamber in use. The opposite chamber can then be opened and the basket removed for cleaning. It is not necessary to drain the strainer chamber in order to remove the basket, although it can be helpful.

5.2. REMOVING THE BASKET - The basket can be easily removed from the chamber not in use by unscrewing the yoke handle, or on high pressure models, stud nuts, and removing the cover. Care should be taken not to damage the cover gasket. The basket can be easily lifted out of the chamber and cleaned. When replacing the cover of the basket chamber, be sure the cover seat is clean and the cover not cocked to one side. As the handle or cover stud nut is screwed down, tension is placed on the basket handle which holds the basket firmly in place while in use.







ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	Basin-30x42x3x3/16	Basin-42x 30 X 0.1875 HRS.	1
2	Foot-C3 x 4.1 x 34L	Foot, C3x4.1x34"lg.	2
3	C3x4.1X27	C3x4.1X27	2
4	C3x4.1x19.625	C3x4.1x19 5/8	1
5	Ear, Mounting,145	Ear, Riser, 145 Frame	4
6	MOD 72-37F-032BR	1 1/2" Flanged duplex strainer with 1/32" diameter perforated brass basket and lever handle	1
7	BV-BZ-08	Ball Valve, Bronze, ¼" NPT	3
8	CG-9699045	Compound Gauge, 30"Hg/30 PSI, 4"	1
9	XX065879	Valve, Ball, Flanged, 1½", #150	4
10	525-15	1¼" NPT Bronze In Line Check Valve, 200 psi	4
11	20UT-V-CCW-56C	#20 Gear PumpEnd, CCW, for 56C frame	1
12	20UT-V-CW-56C	#20 Gear PumpEnd, CW, for 56C frame	1
13	Lee-121095-175077	Mtr, 2 hp, 1500 rpm, 145T, TEFC: 3Ø, 220/380 VAC,7.0/ 4.1 SFA. with C-face Kit	2
14	AMB-145	145 Frame Adjust Motor Base	2
15	PG-9699142	Press Gauge, 300 PSI, 4"	2
16	BPS0515A-SS-50/250	1 1/2" Flanged Back pressure regulating valve, SS body, 50 to 250 PSI pressure range	2
17	ELS-80500-NO	Enclosed Leak Switch,Normally Open	1
18	FL-16-06	1 1/2" NPT, bronze body flow switch, 6 GPM rated	1
19	GRB-0445	1/2" NPT exproof junction box--2 HUB	1
20	EL-7050FF-16	Elbow, Flanged, 1½", #150	2
21	TEE-7060FF-16	Tee, 150# Flanged, Forged Steel, 1 1/2"	4
22	EL-BS40-08	Elbow,Black Steel 1/4"	2
23	FGNP150-FS-16-15-2	Flanged Nipple, #150, 1½ x 1¼ x 2.00	4
24	FGNP150-FS-16-16-3	Flanged Nipple, #150, 1½ x 3.00	1
25	FG150-FSBL-16	Flange #150, Forged Steel, Blind, 1½"	3
26	FG150-GKT-16	Flange Gasket 1 1/2"	19
27	NIP-BS40-08 X CL	Nipple,Blk Steel, 1/4"x 7/8" lg.	4
28	NIP-BS40-08 X 3	Nipple,Blk Steel, 1/4"x 3" lg.	2
29	NIP-BS40-08 X 6	Nipple,Blk Steel, 1/4"x 6" lg.	1
30	NIP-BS40-15 X CL	Nipple,Blk Steel, 1 1/4"x CL	4
31	PLUG-BS-08	Plug, Black Steel, 1/4 NPT	2
32	PLUG-BS-13	Plug, Blk steel, 3/4" NPT	2
33	PLUG-BS-16	Plug, Black Steel, 1 1/2" NPT	1
34	RB-BS-13-08	Reducing Bushing, 3/4 x 1/4, Black Steel	2
35	TEE-BS40-08	Tee, black steel, 1/4"NPT	2
36	BRKT- FLG-16	Flange Brkt, 1½ x 6.75 CL.	2

Phillips Fuel Systems
109 Holland Ave., Bridgeport, Ct 06605

TITLE:
20 Duplex Pump Set: 12 GPM @ 150 PSI with (2) 2 HP motors, 400 VAC/ 3Ø/ 50Hz: London

Part Number.
DP20-130062

REV

	NAME	DATE
DRAWN		

SCALE: 1:10 | WEIGHT: | SHEET 4 OF 4

DO NOT SCALE DRAWING

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Changeable, quick, agile, and incredibly reliable . . . engineered to meet the challenges of industrial users in today's fast-paced environment. With the flexibility of a bolt-on integral relief valve, a broad choice of field-changeable shaft seals and elastomers, and the time-tested "gear within a gear" pumping principal, the new Haight Universal Series of pumps offer unparalleled flexibility and reduced maintenance expenses.

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Pumps that fit . . . Pumps that perform

HAIGHT . . . BETTER BY DESIGN

Haight Pumps are engineered for performance and long life under the most rugged conditions.

TYPICAL COMPETITIVE GEAR DESIGN

The typical cantilevered gear design with the inner idler gear has several pronounced disadvantages that the Haight design eliminates, including:

- Single point of entry liquid feed to gears resulting in a “built-in” inlet restriction. This often requires speed reduction at fluid viscosities above 750 SSU.
- Hydraulic imbalance resulting in shaft deflection and premature wear.
- Increased idler speeds resulting in higher gear tip speeds and accelerated wear.
- Thrust bearing field adjustment needed to keep driver gear properly positioned.

THE HAIGHT ADVANTAGE

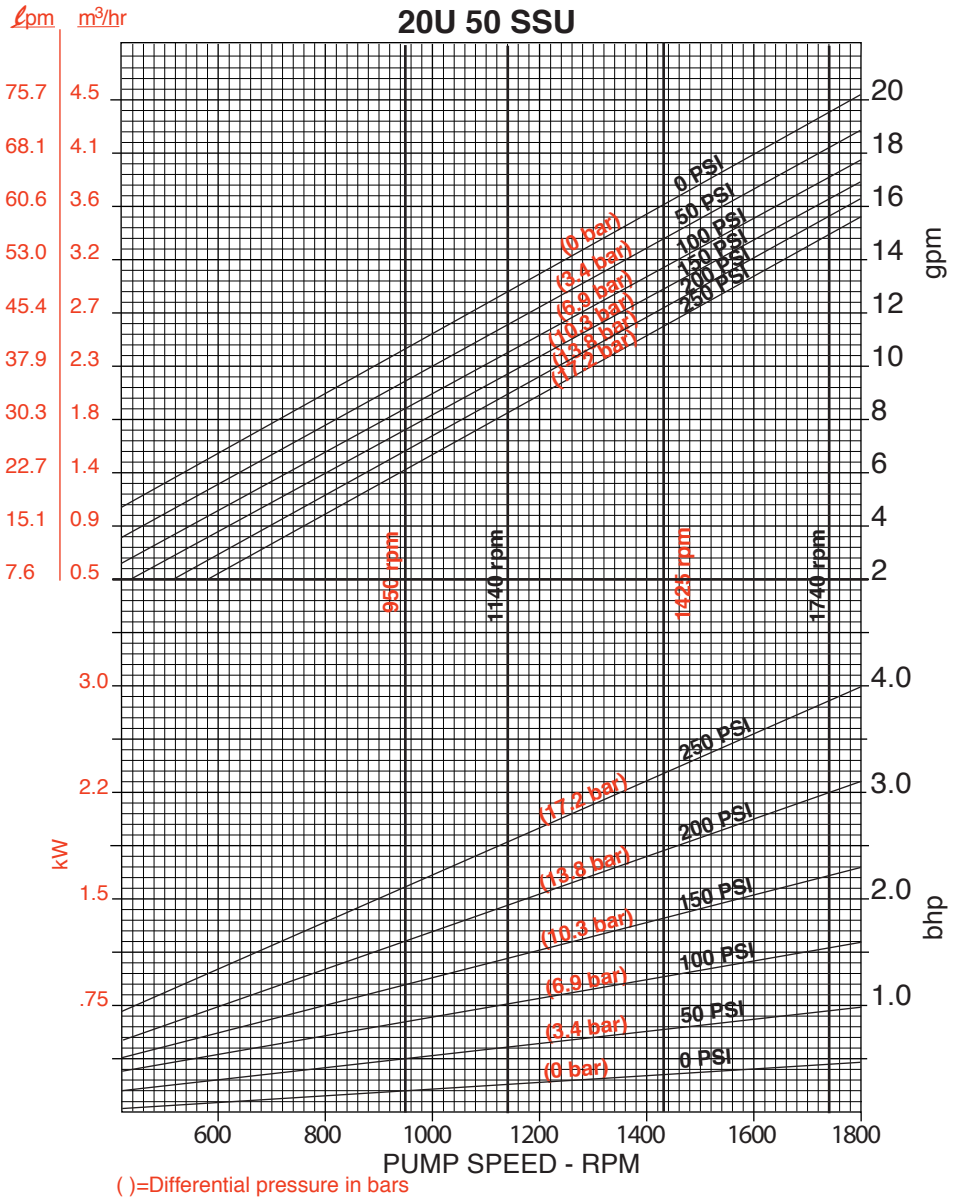
Haight pumps feature an inner driving gear coupled to a hydraulically balanced free floating outer gear on a dramatically shortened shaft arrangement.

- Thrust bearing adjustment is eliminated since the gears are precisely positioned without the need for field adjustment.
- Gears rotate on a shaft that is fully supported at both ends by lubricated and vented bearings eliminating deflection which causes wear.
- Pinion and rotor gears are hydraulically balanced by the pumped fluid eliminating pistoning into the casing and cover.
- Dual paths of fluid entry to the gears (rather than one) allows Haight pumps to generate full rated displacement while close-coupled at standard motor speeds, without gear reducers at viscosities up to 10,000 SSU. This eliminates misalignment and significantly reduces cost.
- All rotating components are accessible beneath the front cover making routine cleaning and service faster, and simpler.
- Lower rotor tip speeds result in reduced noise levels.

HAIGHT PUMPS LAST LONGER

• **1-8 GPM**		
Typical top gear speed cantilevered design (RPM)	2,333	• A typical cantilevered gear design pumps as shown here must increase the top rotating speed of the gear set by an average of 33% in the 1-8 GPM range, 63% in the 10-20 GPM range, and 38% in the 30-80 GPM range for any given volume of displacement.
Top gear speed Haight Universal (RPM)	1,750 (Motor Speed)	
Difference	*583*	
• **10-20 GPM**		
Typical top gear speed cantilevered design (RPM)	2,846	
Top gear speed haight Universal (RPM)	1,750 (Motor Speed)	
Difference	*1,096*	
• **30-80 GPM**		• A Haight universal pump requires, on average, 46,720 fewer revolutions **per operating hour** for a given volume of displacement.
Typical top gear speed cantilevered design (RPM)	2,407	
Top gear speed Haight Universal (RPM)	1,750 (Motor Speed)	
Difference	*657*	

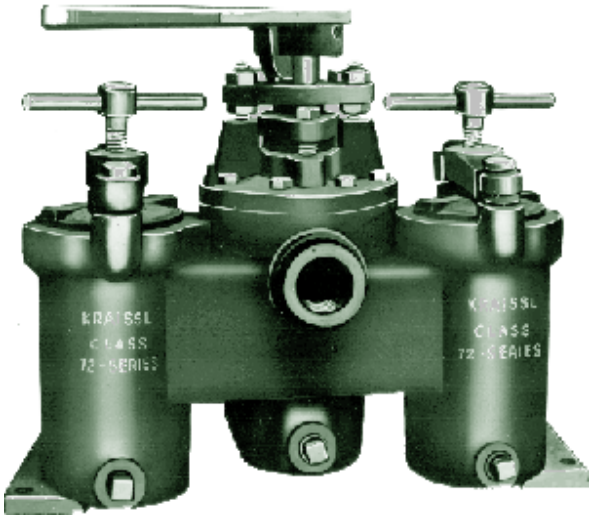
THE HAIGHT ADVANTAGE


20U 50 SSU
ℓpm
m³/hr
75.7
68.1
60.6
53.0
45.4
37.9
30.3
22.7
15.1
7.6
4.5
4.1
3.6
3.2
2.7
2.3
1.8
1.4
0.9
0.5
gpm
20
18
16
14
12
10
8
6
4
2
bhp
4.0
3.0
2.0
1.0
kW
3.0
2.2
1.5
.75
0 PSI
50 PSI
100 PSI
150 PSI
200 PSI
250 PSI
(0 bar)
(3.4 bar)
(6.9 bar)
(10.3 bar)
(13.8 bar)
(17.2 bar)
950 rpm
1140 rpm
1425 rpm
1740 rpm
600
800
1000
1200
1400
1600
1800
PUMP SPEED - RPM
( )=Differential pressure in bars

Duplex Strainers

Duplex strainers are ideal for applications where continuous flow must be maintained, with no flow interruption for basket cleaning. These duplex strainers are listed by Underwriters Laboratories, Inc. (U.L.), and are individually tested to U. L. quality control specifications.

Our Model 72, NPT threaded port and 72F flanged series duplex strainers are furnished with 100% full-flow internal channels and with a quick-opening, hand-clamp closure for easy access and are rugged cast iron bodies, covers, and valve plugs.



A built-in, tapered plug valve that directs flow through either side without shutting off the flow with the valve handle guard shields the side in use and the standard valve handle swings over the inlet port. Drain plugs are provided in each of the valve and basket chambers with an adjustable locking flange holds the valve plug on its seat. A separate, external gland is provided to allow easy access to valve stem packing without complete disassembly, even while in service.

Strainer baskets are fabricated from perforated metal. The standard basket is brass or stainless steel with 1/32” perforation. Each basket is held on its seat by a spring basket handle. Normal flow is through the interior of the basket which then contains the collected debris when the basket is lifted out for cleaning.

Features Include:

- Hand clamps over each basket, requires no special tools.
- Valve handle shields side in use.
- Accessible swing yoke closure for easy basket cleaning.
- Continuous flow without interruption during change over.
- Tapered valve plug for durability.
- Drain connections on each basket chamber.
- Interchangeable strainer, filter and double element baskets.
- Cast iron body pressure tested to U.L. specifications.
- Spring handle holds basket on seat.
- Independent gland for external stem packing access.
- Adjustable locking flange establishes valve clearance.
- Mounting feet provided

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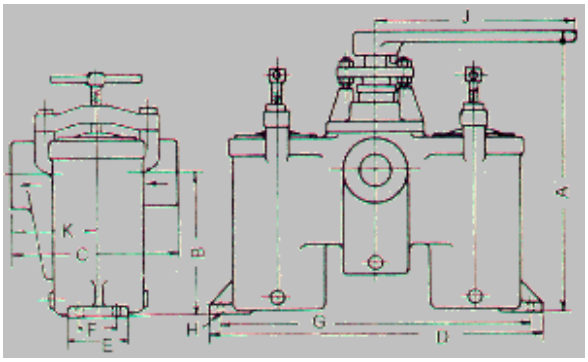
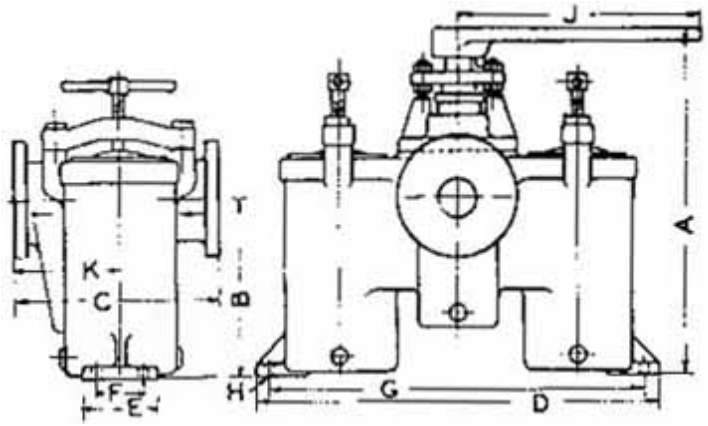


Threaded NPT Ports

Model Series	Size NPT	Dimensions (inches) A	B	C	D	E	F	G	H	J	K
72-31D	3/4	10 1/8	5 1/16	5 1/4	10 7/8	2 1/4	1 1/2	10 1/8	7/16	8 1/8	2 3/4
72-33D	1	10 1/8	5 1/16	5 1/4	10 7/8	2 1/4	1 1/2	10 1/8	7/16	8 1/8	2 3/4
72-35	1 1/4	13 1/4	6 3/4	7 5/8	15 1/4	2 3/4	1 3/4	14 1/4	7/16	12 1/8	3 5/8
72-37	1 1/2	13 1/4	6 3/4	7 5/8	15 1/4	2 3/4	1 3/4	14 1/4	7/16	12 1/8	3 5/8
72-39	2	14 3/4	7 7/8	10 5/8	20 1/2	3	1 7/8	19 1/2	9/16	12 1/8	3 7/8
72-41	2 1/2	14 3/4	7 7/8	10 5/8	20 1/2	3	1 7/8	19 1/2	9/16	12 1/8	3 7/8

Dimensions are subject to casting and production variations.



Flanged Ports

Model	Size FLG	Dimensions (inches) A	B	C	D	E	F	G	H	J	K
72-37F	1 1/2	13 1/4	6 3/4	9 3/8	15 1/4	2 3/4	1 3/4	14 1/4	7/16	12 1/8	4 3/4
72-39F	2	14 3/4	7 7/8	10 3/8	20 3/4	3	1 7/8	19 1/2	9/16	12 1/8	6 7/32
72-41F	2 1/2	14 3/4	7 7/8	10 3/8	20 3/4	3	1 7/8	19 1/2	9/16	12 1/8	6 7/32
72-43F	3	17 5/8	10 3/4	12 1/2	20 3/4	3	1 7/8	19 1/2	9/16	12 1/8	6 7/8
72-47F	4	20 3/4	13 1/32	15 5/8	25 1/4	3 1/4	2	24	5/8	12 1/8	8 15/16
72-49F	5	26 1/8	15 3/8	17 3/4	27 3/4	3 1/4	2	26 1/2	5/8	14	9 7/8
72-51F	6	28 1/2	16 1/4	21	36 3/4	4 1/2	2 3/4	35 1/2	9/16	14	12

Dimensions are subject to casting and production variations.

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LIQUID FILLED GAUGES VACUUM, COMPOUND & PRESSURE

Liquid filled stainless steel case and shatter proof lens designed for industrial environments, Phillips Pump's easy reading gauges provide accurate readings for systems conditions. Having large black numbers and pointer on a white matte aluminum scale plate, each gauge comes complete with a rugged burbon tube mechanism, spring suspend brass movement and a pulsation damping office to resist the effects of shock, pulsation and vibration and insure trouble free life.

As with all Phillips Pump's products are our gauges are designed for use with fuel oils or diesel fuel.

Specifications:

Operating Temperature - -40°F to 160°F
Accuracy - + 1.5% of span
Weather Protection - Weather tight (NEMA 4X / IP 65) - liquid-filled case
Working Range -

2½" Steady: 3/4 of full scale value
Fluctuating: 2/3 of full scale value
Short time: full scale value

4" Steady: Full scale value
Fluctuating: 0.9 x full scale value
Short time: 1.3 x full scale value

Material -

Mounting - 1/4" NPT copper alloy
Movement - Copper alloy
Pointer - Black aluminum
O-ring - EPDM
Window - Polycarbonate
Bourdon Tube - copper alloy
Dial - White ABS with stop pin and black lettering
Case - 304 stainless steel with vent plug
Window Gasket - Buna-N
Case Filling - Glycerine

Gauge Range	Type	Part Number 2 1/2" Diameter	Part Number 4" Diameter
30" hg	Vacuum	VG-9767002	VG-9699058
30" hg - 0 - 15 PSI	Compound	-	CG-9699036
30" hg - 0 - 30 PSI		CG-9767010	CG-9699045
30" hg - 0 - 60 PSI		CG-9767029	CG-9699053
30" hg - 0 - 100 PSI		-	CG-9699061
15 PSI	Pressure	PG-9767037	PG-9699095
30 PSI		PG-9767045	PG-9699109
60 PSI		PG-9767053	PG-9699117
100 PSI		PG-9767061	PG-9699125
160 PSI		PG-9767070	PG-9699257
200 PSI		PG-9767088	PG-9699134
300 PSI		PG-9767096	PG-9699142
400 PSI		PG-9767100	PG-9699150
600 PSI		PG-9767118	PG-9699168
800 PSI		-	PG-9699176
1000 PSI		PG-9767126	PG-9699185
1500 PSI		PG-9767134	PG-9699193

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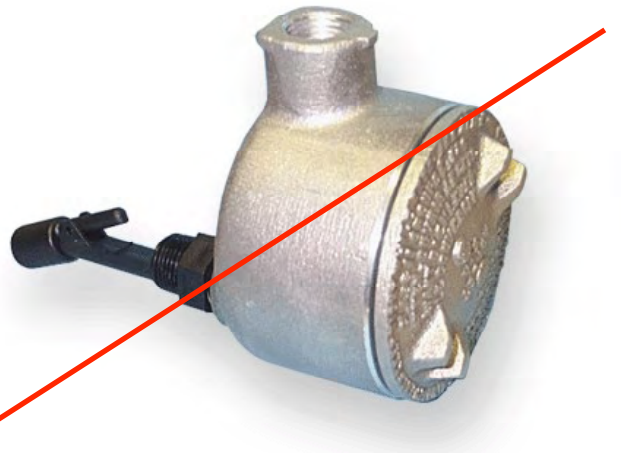
SIDE MOUNT BASIN & PIPING LEAK SENSORS

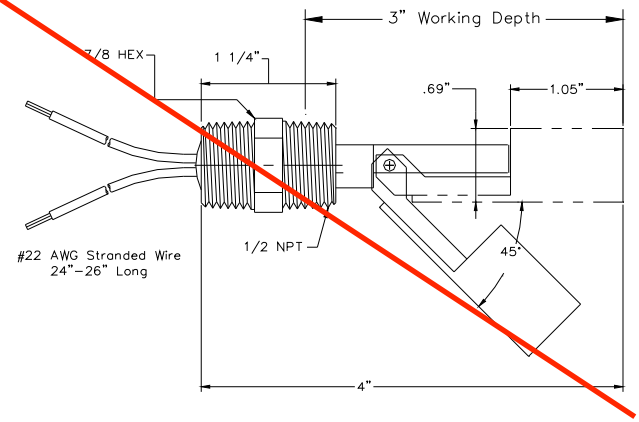


This side-wall mount sealed switch detects diesel or other fuel oil leakage into daytank rupture basin or outer double wall containment piping. They are compact, easy to install into 1/2" NPT threaded opening, the encased magnetic switch is float operated and sealed against vapors. Comes complete with explosion proof wiring enclosure. (Note: for installation in side mounting applications only)

Specifications:

- Normally open, closes on rise
- 30 VA nominal switch rating
- Nylon float & stem for oils, fuels & gasoline
- 100 PSIG Maximum Pressure
- Operating Temperature: -40 to +150 Degrees F

Phillips Part Number: SMLS-1



ENCLOSED BASIN / TANK ROOM FLOAT TYPE LEAK DETECTION SWITCHES

Enclosed single level switches with the addition of a liquid tight cord grip, mounting bracket, and slosh shield. The slosh shield doubles as protection from particulate and debris as well as from accidental tripping. Unlike many other sensors, these are liquid tight inside and out due to the cable cord grip.
Switch consists of all stainless steel housings with polycarbonate shields, and Buna-N floats.

Part Number Number	Switch Configuration
ELS-80500-NC	Normally Closed
ELS-80500-NO	Normally Open

FLOW SWITCH
1/2 to 50 GPM RANGE

Our compact, durable in-line flow detection switches are the perfect answer for flow detection in fuel oil supply lines. The heavy duty cast bronze body and a duable telfon switch shuttle mechanism, this switch provides an ease of installation and many years of trouble free service. Flow rate ranges from 1/2 to 50 GPM. The removeable bonnet assembly provides easy cleaning without removal of the switch from the line.

Features & Specifications:

- In-line mounting, horizontal or vertical
- Low pressure drop
- Single fixed point adjustment
- Temperature Range: -20 to 300° F
- Maximum Pressure: 400 psi
- Switch rating: SPDT 20 & 100 VA

Size (NPT)	Flow Setting	Part Number	A (in)	B (in)	Hex (in)
3/4”	0.5	FL-13-05	3	3	1 13/32
	1	FL-13-10			
	2	FL-13-20			
	3	FL-13-30			
	4	FL-13-40			
	5	FL-13-50			
	6	FL-13-60			
	8	FL-13-80			
1 1/2”	3	FL-16-03	4 1/2	3 1/2	2 1/2
	5	FL-16-05			
	8	FL-16-08			
	10	FL-16-10			
	15	FL-16-15			
	20	FL-16-20			
	25	FL-16-25			
	30	FL-16-30			

Size (NPT)	Flow Setting	Part Number	A (in)	B (in)	Hex (in)
1”	0.5	FL-14-05	3 1/4	3	1 25/32
	1	FL-14-10			
	2	FL-14-20			
	3	FL-14-30			
	4	FL-14-40			
	5	FL-14-50			
	6	FL-14-60			
	8	FL-14-80			
2”	5	FL-17-05	5 3/8	4	3 3/32
	10	FL-17-10			
	15	FL-17-15			
	20	FL-17-20			
	25	FL-17-25			
	30	FL-17-30			
	40	FL-17-40			
	50	FL-17-50			

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231113-2.16 Phillips Fuel Oil Pumps and Control System NOB System

US Embassy London
Fuel Oil Submittal
231113
BL Harbert International
120080

Phillips Fuel System

109 Holland Ave Bridgeport CT, USA 06605
Phone: (203)-908-3323 Fax: (203)-908-3325

PTCSSR-130062

NOB Circuit Daytank Controller
400 VAC/ 3Ø/ 50 hz/ 20 A

London

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By acceptance of this package, it is understood that Phillips Fuel System Inc shall be responsible for only those items indicated herein and unless otherwise noted. The signatory whose signature appears is duly authorized by all necessary and appropriate action to execute approval and will all abide by Phillips Fuel Systems Inc standard sales terms and conditions and be responsible for verifying correctness of the type, size, location, operation, electrical requirements, piping, accessories or any other requirements for successful operation. It is further understood that by acceptance of this package, Phillips Fuel System Inc will not be held liable for any deviation or omission from any quotation and/or specification. Phillips Fuel System Inc reserves the right, without approval, to rearrange components or substitute, due to lack of availability, quality and/or performance, any component indicated herein with a compatible component, as long as that component is of the same quality and general design.

Approved _____ Date _____

Approved _____ Date _____

Approved _____ Date _____

PHILLIPS FUEL SYSTEMS INC LIMITED WARRANTY FOR NEW PUMPS OR PUMPING SYSTEMS MANUFACTURED BY PHILLIPS FUEL SYSTEMS INC

A. PRODUCTS WARRANTED - Phillips Fuel System Inc, subject to the limitations contained below, will at its option, repair or replace, without charge for parts or labor only, any part or parts of a new pump or system manufactured by PHILLIPS FUEL SYSTEMS which is found, upon examination by PHILLIPS FUEL SYSTEMS INC at it's factory in Bridgeport, Ct. or by its designated affiliate, to be DEFECTIVE IN MATERIAL AND/OR WORKMANSHIP if determined by such examination within twelve months from the date of sale to the original consumer purchaser.

B. PRODUCTS AND ITEMS NOT WARRANTED - The provisions of this warranty shall not apply to any equipment, part or accessory which:
(a) has been improperly specified by buyer;
(b) has been improperly stored or handled prior to placing in service;
(c) has been improperly mounted, installed or connected, altered or modified in any way.
(d) has not been operated within specifications as stated on its nameplate, label, placard, or within its operating manual;
(e) has not been properly maintained;
(f) parts supplied by buyer for inclusion in finished equipment are not covered by this warranty;
(g) components or assemblies specified by buyer with no substitution permissible that are not normally used by Phillips Fuel System Inc are not covered by this warranty;
(h) that interfaces with, controls or is controlled by any device that has not been approved by Phillips Fuel System Inc

Phillips Fuel System Inc reserves the right to reject warranty claims of any kind against assembled equipment, parts or material for which Phillips Fuel System Inc has not received payment in full and for any system which was not authorized for start up and use by Phillips Fuel System Inc or by its designated affiliate. Should buyer, at his own risk, elect to replace failed equipment or parts in the field rather than obtain start up service under this warranty, Phillips will supply and invoice parts at normal prices upon receipt of buyer's bonafide purchase order. Failed equipment or parts returned for in-warranty crediting in exchange for replacement parts must be returned within 45 days from date of shipment of replacement in order to qualify for warranty consideration.

This warranty is extended to the original buyer only and is not transferable to subsequent buyers. This warranty is available for installations in the forty-eight contiguous U.S. states only.

C. SECURING WARRANTY SERVICE - Warranty service can be arranged by contacting PHILLIPS FUEL SYSTEMS INC, c/o Service Manager, 109 Holland Ave, Bridgeport, Ct 06605. Warranty service can only be performed by Phillips Fuel System Inc at its factory in Bridgeport, Ct or by its designated affiliate. At the time of requesting warranty service, evidence must be presented of the date of sale to the original consumer purchaser. The purchaser shall pay any charges for making service calls and/or for transporting the product to and from the place where the inspection and/or warranty work is performed. The purchaser shall be responsible for any damage or loss incurred in connection with the transportation of the system and/or of part or parts of the system, submitted for inspection and/or warranty work.

D. NO ADDITIONAL WARRANTIES OR REPRESENTATIONS - The foregoing EXPRESSED WARRANTY IS IN LIEU OF ALL OTHER EXPRESSED WARRANTIES. Neither Phillips Fuel System Inc nor any of its affiliates make any warranties, representations or promises, written or verbal, as to the quality of the system or its parts other than those set forth herein.

ANY IMPLIED WARRANTIES (INCLUDING, BUT NOT LIMITED TO MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE) TO THE EXTENT EITHER APPLIES TO PART OR PARTS OF A SYSTEM SHALL BE LIMITED IN DURATION TO THE PERIODS OF THE EXPRESSED WARRANTIES AS DEFINED IN PARAGRAPH A. Some states do not allow limitations on how long an implied warranty lasts, so the above limitations may not apply.

E. DAMAGES - IN NO EVENT WILL PHILLIPS PUMPS BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES AND/OR EXPENSES. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation may not apply to you. This warranty gives you specific legal rights and you may have other legal rights which vary from state to state.

F. NO DISTRIBUTOR DEALER WARRANTY - PHILLIPS FUEL SYSTEM INC neither assumes nor authorizes any other person, natural or corporate, to assume any other obligations or liabilities in connection with or with respect to any part or parts of a system. The seller, dealer or distributor of part or parts has no authority to make any representations or promises on behalf or PHILLIPS FUEL SYSTEMS INC or to modify the terms or limitations of this warranty in any way. The seller, dealer or distributor makes no warranty of his own on any item warranted by PHILLIPS FUEL SYSTEMS and makes no warranty on other items, unless such seller or dealer delivers to the purchaser a separate written warranty document in which the seller or the dealer individually and specifically on its own behalf, warrants the terms or items.

Basic Operation - This systen controls a duplexed pair of supply pumps (SP-3 & SP-4), a daytank return pump (Daytank 1 RP), a main tank supply valve (ST-4 SUPPLY), a main tank return valve (ST-4 RETURN) and a daytank solenoid valve. The system is intended to be run with all of the selector switches elected as AUTO.

Main Tank Supply and Return Valves - [ST-4 SUPPLY & ST-4 RETURN] The operator will establish the system's tank selection via the three position selector switch located on the front panel. If a valve is in operation, its mode selector switch will be lit.

Supply Auto - If a the SUPPLY valve is selected as AUTO, the system will open that valve when the controller determines that a daytank requires filling.

Return Auto - If a the RETURN valve is selected as AUTO, the system will open that valve when the controller determines that the daytank return pump is required to run.

Supply & Retturn Off - If the SUPPLY or RETURN valve is selected as OFF, the system will not engage that valve regardless of any alarm, pump on or pump off signals.

Supply & Retturn Manual - If the SUPPLY or RETURN valve is selected as MANUAL, the system will open that valve as long as that valve is selected in manual mode, regardless of any alarm or pump on/off signals.

Day Tank Supply Operation (SP-3 and SP-4) - The operator will establish the day tank supply pump mode of operation via FOP the mode selector switches located on the front of the controller.

Supply Pump Off - If the Supply Pump mode is selected as OFF, the system will not engage that pump regardless of any alarm, pump on or pump off signals. However, if its opposite pump is in the auto mode, the system will automatically select the pump that is in auto.

Supply Pump Manual - If the Supply Pump mode is selected as MAN, the system will engage that supply pump continuously and hold open the day tank fill solenoid, as long as the supply pump mode is selected as manual, regardless of any alarm, pump on or pump off signals. **(Note: Manual mode is to be used only for short term operation during trouble shooting and maintenance while an operator or technician is present observing operation and in accordance with spill prevention plan. Do not leave switch in manual mode if system is unattended. Care must be taken not to overfill the tank)**

Supply Pump Auto - If the Supply Pump mode is selected as AUTO, the system will open the main tank supply valve, and when it has received a 'valve open' signal, open the day tank supply solenoid valve and engage the supply pumps in an alternating manner when the day tank controller has received a 50% (Adjustable) tank level indication from the tank level probe. The lead supply pump will engage and the supply solenoid will be held open, until demand is no longer required 85% (Adjustable). The controller will then close the nain tank supply valve, close the day tank supply solenoid valve and disengage the pump.

Return Pump Operation (Daytank 1 RP) - The operator will establish the return pump mode of operation.

Return Pump Off - If a return pump mode is selected as OFF, the system will not engage the return pump.

Return Pump Manual - If the return pump mode is selected as MAN, the system will engage the return pump will continuously as long as the return pump is in manual mode regardless of any alarm, pump on or pump off signals.

Return Pump Auto - If the return pump mode is selected as AUTO, the system will open the main tank return valve, and when it has received a 'valve open' signal, will engage the return pump, if the fuel level in the tank reaches a high level condition of 90% (Adjustable). The return pump will engaged and the return valve will remain open until the fuel level is reduced to the normal tank full level of 85% (Adjutable).

Tank Level - Main Tank level (ST-4) and daytank level will be received via 4 to 20 mA signals from the Tank Management System (TMS).

Tank level will be displayed in percent of volume. NOTE: If the system cannot read or drops the signal from the tank level sensor, a warning icon will be dispalyed. If after 60 seconds there is still no signal, a NO LEVEL DETECTED CHECK LEVEL SENSOR alarm will be displayed and system will shut down. The system is locked out from pumping to that tank until the alarm condition is cleared. The system will pump in manual.

The system controller shall include a LCD display for day tank status, alarm listings, and trouble shooting functions. The LCD display will include a separate page for viewing the most recent alarms/events with scrolling capability to view the past alarm/event memory. Each event and alarm condition is time and date stamped. This system shall record and annunciate the following alarms and shall also record pump engage elapsed time.

System Alarms

Day Tank Leak Detected - The system will monitor for a Daytank Leak condition via a normally open dry contact from the tank-gauging unit. If a leak is indicated, the system will sound the alarm and display a DAY TANK LEAK alarm. The day tank supply pumps will be locked out and the supply solenoid valves will not open until the alarm condition is cleared and the system is reset.

Flow Failure - A flow sensor located in the pumpset common discharge line will monitor flow. If the sensor does not see flow when the lead pump is engaged within 30 seconds, the system will switch to the lag pump, sound the alarm panel buzzer and display a flow failure alarm. The system will then engage the lag pump upon each subsequent demand call until the alarm is cleared and the system is reset. If the system does not see flow within 30 seconds after sequencing to the lag pump, the system will shut down.

Daytank Critical Low Level - The system will monitor for a Daytank Critical Low Level condition via a normally open dry contact from the tank-gauging unit. If there is an indication that a Daytank Critical Low Level has occurred, the system will display the a Daytank Critical Low Level alarm and sound the panel mounted alarm buzzer.

Daytank Low Level Alarm (45% Adjustable) - If the fuel level continues to drop in the day tank and the tank level reaches 45%, the alarm will sound and the system will display a day tank LOW LEVEL alarm.

Daytank High Level Alarm (90% Adjustable) - If fuel continues to rise in the day tank and the fuel oil level reaches 90%, the system will engage (close) the nornally open (NO) day tank over fill solenoid valve and disengage any supply pump, engage the return pump, sound the alarm and display the HIGH LEVEL alarm. The return pump will remain engaged until the fuel level is reduced to 85% (Adjustable). Note: The system will reset itself and will function normally, however the high level alarm will remain until the fuel level is reduced and the system is RESET.

Daytank High - High Level Alarm (95%Adjustable) - If fuel continues to rise in the day tank and the fuel level reaches 95%, the system will close the day tank supply solenoid valve, disengage any supply pump, sound the alarm, display a HIGH-HIGH LEVEL alarm and engage the return pump. The return pump will remain engaged until the fuel level is reduced to 85% however the remote supply pumps will be locked out and the day tank supply solenoid valves will not open until the alarm condition is cleared and the system is RESET.

Main Tank Critical Low Level (ST-4) - The system will monitor for main tank critical low level condition via normally open dry contact from the tank-gauging unit. If at any time the main tank's fuel level has dropped to a critical low level condition, the MAIN TANK CRITICAL LOW LEVEL alarm will be displayed and the alarm buzzer will sound. The day tank supply pumps will be locked out and the supply solenoid valves will not open until the alarm condition is cleared.

Valve Failure - The system will continually monitor the main tank's supply and return valves to insure that the valves are in the correct position. If the system does not see a valve in the correct position during operation, the system will command both valves CLOSED, display that main tank's VALVE FAILURE alarm and sound the panel mounted alarm buzzer.

Pump Overload Trip - The system will monitor each pump's motor starter overload. If the controller receives an overload trip alarm condition the system will sound the alarm panel buzzer and display pump overload trip condition alarm. The system will engage the opposite pump upon each demand call until the alarm is cleared and the system is RESET.

NOT IN AUTO - The system will monitor each selector switch. If a switch should be switched from the auto position, the system will display the appropriate NOT IN AUTO alarm and sound the panel mounted alarm buzzer.

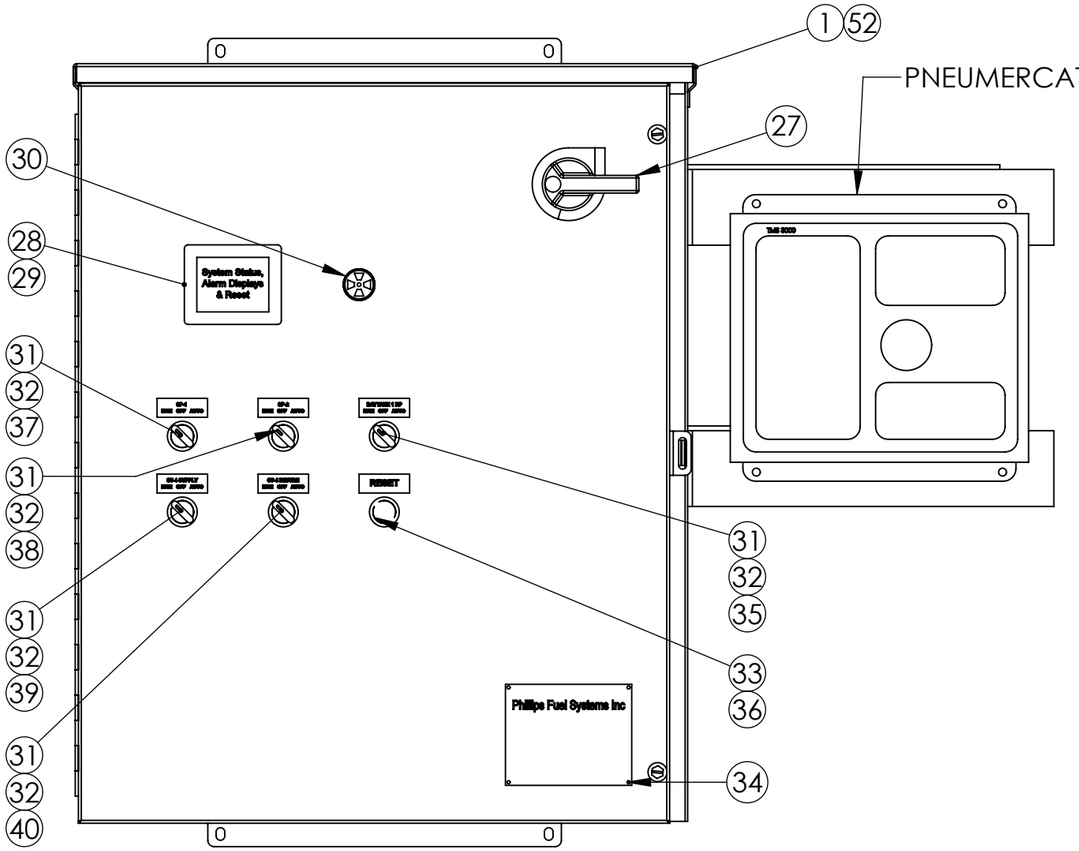
A normally open general alarm dry contact, which will close upon any alarm, is provided for interface with any external alarm. See electrical diagram.

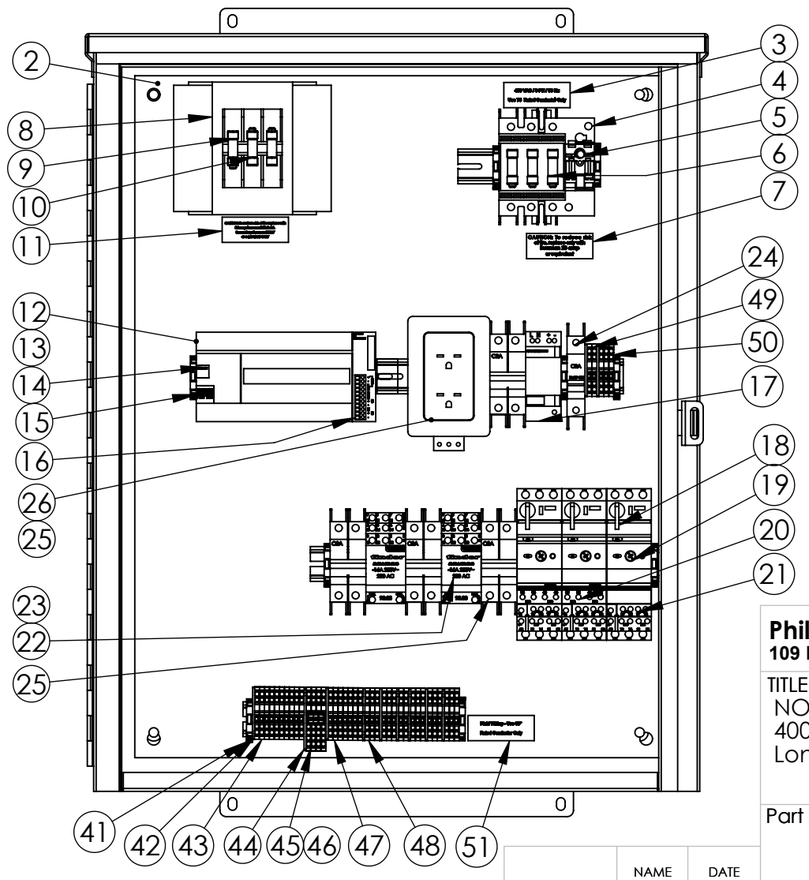
A normally open critical low level alarm dry contact for ST-4 and daytank, which will close upon critical low level alarm in either tank, is provided for interface with an external alarm. See electrical diagram.

Pressing the RESET push button will silence the alarm.

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	HM-A30R2410HCR	NEMA 3R Enclosure, 30 X 24 X 10	1
2	HM-A30P24	Back Panel for 30 " x 24 " enclosure	1
3	Label - 400-3-50	Label - 400 VAC, 3 PH, 50 Hz	1
4	SQ-GS1DDU3	30 AMP Fusible Disconnect Switch	1
5	SQ-GS1AE8	Disconnect shaft, 5mm sq. x 5.50" lg	1
6	LP-CC-20	Fuse 20 A, Reject Type, 600V	3
7	Label - Dis 20 Amp	Disconnect - Label - 20 Amp	1
8	SQ-9070-TF1000D33	1000 Watt Transformer, fused, 380/400/415 VAC to 115/230 VAC	1
9	FNQ-7	Mini Fuse, 7 Amp, Reject Type, 500 Volt	1
10	FNQ-R-4	Mini Fuse, 4 Amp, Reject Type, 600 Volt	2
11	Label - 1000W-400-230	Transformer Label, 400V - 230 V, 1000 W.	1
12	TWDLCAA40DRF	PLC 24 IN / 14 OUT CPU, 100 … 240 VAC	1
13	TSXPLP01	Battery, backup, external, TWDLCA_40	1
14	TWDNAC485T	Modbus Auxiliary Card - R485 Interface	1
15	TWDXCPMFK32	Memory Cartridge, 32 kb	1
16	TWDAMI2HT	2 Input 4...20 mA analog Card	1
17	SQ-ABL8MEM24006	Power Supply, 100-240 VAC IN, 24 VDC, 0.6A OUT	1
18	SQ-LUB12	Intergral motor starter, 12 Amp	3
19	SQ-LUCA12FU	3Ø adj. motor overload 3 to 12 Amp, 110-240 VAC coil	3
20	SQ-LUFN20	Aux Contact block for LU series with 2 NO contact	2
21	SQ-LUA1C20	Overload trip contact block, 2 NO contact	3
22	FI-62.33.8.240.0040	Relay, Plug in style, 3PDT 16 A rated 230 VAC coil	2
23	FI-92.03	Relay Socket	2
24	C60N-60103	2 Amp ,Single Pole, Circuit Breaker	1
25	C60N-60137	2 AMP 2 Pole Circuit Breaker	4
26	PC5602630	Socket, 250 VAC/15A-DIN rail	1

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
27	SQ-GS1AH120	GS1 Disconnect Handle	1
28	SQ-HMISTU655	Control Interface, 56 x 73 mm screen	1
29	SQ-XBTZ9780	Operator Interface Cable, 2.5 m	1
30	MC-09301-Q	Alarm Buzzer, 130-220 VAC	1
31	SQ-ZB4BK1333	Switch, Green Illum, 3 Pos.	5
32	SQ-ZB4BW0M33	3 Position Selector Switch Base, Illuminated, Green, 240VAC	5
33	SQ-XB4BA21	Pushbutton, Black NO	1
34	Nameplate	Product Nameplate	1
35	Nameplate2	Daytank 1 RP MOA	1
36	Nameplate2	Reset	1
37	Nameplate2	SP-1 MOA	1
38	Nameplate2	SP-2 MOA	1
39	Nameplate2	ST-4 SUPPLY MOA	1
40	Nameplate2	ST-4 RETURN MOA	1
41	WAGO-249-116	End Clamp	9
42	WAGO-280-311	Teminal End Cover, 2.5 mm	10
43	WAGO-280-902	Terminal block 2.5mm orange	10
44	WAGO-280-346	End Plate, orange	1
45	WAGO-280-653	Terminal block 2.5mm, 3 conductor, red	4
46	WAGO-280-402	Terminal Block Jumper, 2.5 mm	3
47	WAGO-280-906	Terminal block 2.5mm yellow	7
48	WAGO-280-904	Terminal block 2.5mm blue	17
49	WAGO-280-901	Terminal block 2.5mm grey	2
50	WAGO-280-907	Terminal block 2.5mm green	3
51	Label - Field Wiring	Field Wiring Label	1
52	Label - UL508	UL 508 Label	1





Door, Pneumercator removed

DO NOT SCALE DRAWING

	NAME	DATE
DRAWN		

Phillips Fuel Systems Inc
109 Holland Ave Bridgeport, Ct 06605

TITLE:
NOB Circuit Daytank Controller
400 VAC/ 3Ø/ 60 hz/ 30 A:
London

Part Number. REV

PTCSSR-130062 NOB

SCALE: 1:6 | WEIGHT: | SHEET 3 OF 3

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SYSTEM STATUS, ALARM DISPLAY & RESET

RESET

SP-3 Man Off Auto

SP-4 Man Off Auto

DAYTANK 1 RP Man Off Auto

ST-4 SUPPLY Man Off Auto

ST-4 RETURN Man Off Auto

Inputs

23
22
21
20
19 Power Indicator
18 Return Pump O/L
17 Supply Pump 2 O/L
16 Supply Pump 1 O/L
15 Return MBV Closed
14 Return MBV Open
13 Supply MBV Closed
12 Supply MBV Open
C1 Com
11 Daytank Leak
10 Oil in vent
9 Piping Leak Sensor
8 Fire Valve Sensor
7 Emergency Shut Down
6 Flow Sensor
5 Reset
4 Return MBV Auto
3 Supply MBV Auto
2 Return Pump Auto
1 SP-4 Auto
0 SP-3 Auto
24-
0V
24+

ModBus Interface: SG, B, A

MODBUS INTERFACE

Outputs

General Alarm 15
Com C
Critical Low L 14
Com C
13
12
11
10
Com C
9
8
Return MBV 7
Supply MBV 6
C
Buzzer 5
Retun Pump 4
SP-4 3
SP-3 2
Com C
G
N
L

DRY CONTACTS

Convenience Outlet
230 Volt, 1Ø, 2A, 50 HZ

2 A

CAUTION: To reduce risk of fire, replace only with
Primary: Bussman FRQ-R 4 amp
Secondary: Bussman FNQ 7 amp
or equivalent

1000 VA: 400: 230 VAC

4 A
4 A
7 A

X2

H1
HF
XF

Buzzer
MC-09201-Q

20A 20A 20A

400 Volt, 3Ø, 50 HZ
Use copper 75° rated conductors only

CAUTION: To reduce risk of fire, replace only with Bussman 20 amp or equivalent

10 Ga. 10 Ga. 10 Ga.

Supply Pump 1
1 1/2 hp 400 3Ø
~ 3.3 SFA

Supply Pump 2
1 1/2 hp 400 3Ø
~ 3.3 SFA

Return Pump
1 1/2 hp 400 3Ø
~ 3.3 SFA

1 3 5
33 34
43 44
A1 A2 13 14 17 18
2 4 6

NEC CLASS 2 (24 VDC)

1 2 3 4 5 6 7 8 9 10

FLOW SENSOR
EMERG. SHUTDOWN
FIRE VALVE SENSOR
PIPING LEAK SENSOR
OIL IN VENT
ST-4 SUPPLY VALVE OPEN
ST-4 SUPPLY VALVE CLOSED
ST-4 RETURN VALVE OPEN
ST-4 RETURN VALVE CLOSED
DAYTANK LEAK

NEC CLASS 2 (24 VDC)

ANALOG IN
TWD AMI 2HT

Main Control Level Sensor 4-20mA Signal

Daytank Control Level Sensor 4-20mA Signal

TMS 3000
POWER IN
NO
POWER INDICATOR RELAY (energize/close on power)
NO

2A

L N

G G G

PNEUMERCATOR GROUND

2 A 2 A

finder 62.33.8.230.0040 -16A 250V~ 230 AC

230 VAC 230 VAC

18 19 20
21 22 23

ST-4 SUPPLY MOTORIZED VALVE

ST-4 RETURN MOTORIZED VALVE

2 A

400 VAC

BLUE 24 25

SOLENOID VALVE

400 VAC 3Ø

BLUE 26 27 28

SUPPLY PUMP 1

400 VAC 3Ø

BLUE 29 30 31

SUPPLY PUMP 1

400 VAC 3Ø

BLUE 32 33 34

RETURN PUMP

Field Wiring
Use copper 60°C rated conductors

Dotted line = Wiring by installer

Phillips Fuel Systems Inc.
109 Holland Ave., Bridgeport, CT. 06605

NOB DAYTANK PUMP CONTROLLER,
(2) supply pumps & (1) return pump,
400VAC / 3Ø / 50Hz / 20A, LONDON

SIZE	FSCM NO.	DWG NO.	REV
		PTCSSR-130062	
SCALE		SHEET 1 of 1	

X:\jobs\2013 Jobs\130062 London\PTCSSR-130062 Electrical.dwg, 10/15/2013 1:09:07 PM

Phillips Fuel Systems

109 Holland Ave Bridgeport CT, USA 06605
Phone: (203)-908-3323 Fax: (203)-908-3325

DP8-130062

8 Duplex Pump Set
4.6 GPM @ 150 PSI with (2) 1½ HP motors, 400 VAC/ 3Ø/ 50Hz

London

All rights Reserved. No portion of this package or any part herein shall not be reproduced in any form without the written permission of Phillips Fuel System Inc

By acceptance of this package, it is understood that Phillips Fuel System Inc shall be responsible for only those items indicated herein and unless otherwise noted. The signatory whose signature appears is duly authorized by all necessary and appropriate action to execute approval and will all abide by Phillips Fuel Systems Inc standard sales terms and conditions and be responsible for verifying correctness of the type, size, location, operation, electrical requirements, piping, accessories or any other requirements for successful operation. It is further understood that by acceptance of this package, Phillips Fuel System Inc will not be held liable for any deviation or omission from any quotation and/or specification. Phillips Fuel System Inc reserves the right, without approval, to rearrange components or substitute, due to lack of availability, quality and/or performance, any component indicated herein with a compatible component, as long as that component is of the same quality and general design.

Approved _____ Date _____

Approved _____ Date _____

Approved _____ Date _____

PHILLIPS FUEL SYSTEMS INC LIMITED WARRANTY FOR NEW PUMPS OR PUMPING SYSTEMS MANUFACTURED BY PHILLIPS FUEL SYSTEMS INC

A. PRODUCTS WARRANTED - Phillips Fuel System Inc, subject to the limitations contained below, will at its option, repair or replace, without charge for parts or labor only, any part or parts of a new pump or system manufactured by PHILLIPS FUEL SYSTEMS which is found, upon examination by PHILLIPS FUEL SYSTEMS INC at it's factory in Bridgeport, Ct. or by its designated affiliate, to be DEFECTIVE IN MATERIAL AND/OR WORKMANSHIP if determined by such examination within twelve months from the date of sale to the original consumer purchaser.

B. PRODUCTS AND ITEMS NOT WARRANTED - The provisions of this warranty shall not apply to any equipment, part or accessory which:
(a) has been improperly specified by buyer;
(b) has been improperly stored or handled prior to placing in service;
(c) has been improperly mounted, installed or connected, altered or modified in any way.
(d) has not been operated within specifications as stated on its nameplate, label, placard, or within its operating manual;
(e) has not been properly maintained;
(f) parts supplied by buyer for inclusion in finished equipment are not covered by this warranty;
(g) components or assemblies specified by buyer with no substitution permissible that are not normally used by Phillips Fuel System Inc are not covered by this warranty;
(h) that interfaces with, controls or is controlled by any device that has not been approved by Phillips Fuel System Inc

Phillips Fuel System Inc reserves the right to reject warranty claims of any kind against assembled equipment, parts or material for which Phillips Fuel System Inc has not received payment in full and for any system which was not authorized for start up and use by Phillips Fuel System Inc or by its designated affiliate. Should buyer, at his own risk, elect to replace failed equipment or parts in the field rather than obtain start up service under this warranty, Phillips will supply and invoice parts at normal prices upon receipt of buyer's bonafide purchase order. Failed equipment or parts returned for in-warranty crediting in exchange for replacement parts must be returned within 45 days from date of shipment of replacement in order to qualify for warranty consideration.

This warranty is extended to the original buyer only and is not transferable to subsequent buyers. This warranty is available for installations in the forty-eight contiguous U.S. states only.

C. SECURING WARRANTY SERVICE - Warranty service can be arranged by contacting PHILLIPS FUEL SYSTEMS INC, c/o Service Manager, 109 Holland Ave, Bridgeport, Ct 06605. Warranty service can only be performed by Phillips Fuel System Inc at its factory in Bridgeport, Ct or by its designated affiliate. At the time of requesting warranty service, evidence must be presented of the date of sale to the original consumer purchaser. The purchaser shall pay any charges for making service calls and/or for transporting the product to and from the place where the inspection and/or warranty work is performed. The purchaser shall be responsible for any damage or loss incurred in connection with the transportation of the system and/or of part or parts of the system, submitted for inspection and/or warranty work.

D. NO ADDITIONAL WARRANTIES OR REPRESENTATIONS - The foregoing EXPRESSED WARRANTY IS IN LIEU OF ALL OTHER EXPRESSED WARRANTIES. Neither Phillips Fuel System Inc nor any of its affiliates make any warranties, representations or promises, written or verbal, as to the quality of the system or its parts other than those set forth herein.

ANY IMPLIED WARRANTIES (INCLUDING, BUT NOT LIMITED TO MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE) TO THE EXTENT EITHER APPLIES TO PART OR PARTS OF A SYSTEM SHALL BE LIMITED IN DURATION TO THE PERIODS OF THE EXPRESSED WARRANTIES AS DEFINED IN PARAGRAPH A. Some states do not allow limitations on how long an implied warranty lasts, so the above limitations may not apply.

E. DAMAGES - IN NO EVENT WILL PHILLIPS PUMPS BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES AND/OR EXPENSES. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation may not apply to you. This warranty gives you specific legal rights and you may have other legal rights which vary from state to state.

F. NO DISTRIBUTOR DEALER WARRANTY - PHILLIPS FUEL SYSTEM INC neither assumes nor authorizes any other person, natural or corporate, to assume any other obligations or liabilities in connection with or with respect to any part or parts of a system. The seller, dealer or distributor of part or parts has no authority to make any representations or promises on behalf or PHILLIPS FUEL SYSTEMS INC or to modify the terms or limitations of this warranty in any way. The seller, dealer or distributor makes no warranty of his own on any item warranted by PHILLIPS FUEL SYSTEMS and makes no warranty on other items, unless such seller or dealer delivers to the purchaser a separate written warranty document in which the seller or the dealer individually and specifically on its own behalf, warrants the terms or items.

SECTION I INTRODUCTION

1-1. This bulletin provides general instructions for the installation and operation of the DP series Pump sets manufactured by Phillips Fuel Systems Inc, Bridgeport, Connecticut

1-2. After carefully uncrating or unpacking, check the equipment against the shipping papers and inspect for damage incurred during shipment. Immediately notify the carrier of any damage or shortage found.

1-3. The type and size of the DP series duplex pump set was selected to meet requirements specified by purchaser. Among the more important are these:

Type of Liquid Pumped (#2 fuel oil or diesel fuel ONLY)
Temperature, Viscosity, Specific Gravity
Flow Rate
Suction Pressure or Lift
Total Head
Type Driver
Motor and its electric power supply characteristics
Engine
Steam turbine and its steam supply and exhaust conditions
Other (as described)

1-4. If any one of these requirements has changed since the order was placed, particularly the suction condition, we strongly recommend that such change be reviewed with a Phillips representative. If the performance curve previously furnished has been lost, the representative will furnish another copy.

WARNING

Do not operate this system at any pressure, flow rate, or liquid temperature other than those for which the system was originally purchased. Do not pump any other liquid than the one for which the pump was originally purchased without the consent of Phillips Pump or its authorized representatives. Disregard of this warning can result in pump failure and serious personal injury or death.

CAUTION

Operation of the pump under conditions differing widely from those for which the pump selection was based may result in reduced parts life.

SECTION II INSTALLATION

2-1. LOCATION. Select a location for the DP series Pump set that will be clean, well ventilated, properly drained and provide accessibility for inspection and maintenance (see out line drawing for dimension). Out door installations may require protection from the elements, particularly freezing. The suction supply line must provide the any pump with fluid equal to or greater than that required by the pump at any capacity on its operating curve.

2-2. FOUNDATION. Concrete (reinforced as necessary or required) is most widely used for the foundation. In sufficient mass, it provides rigid support, which minimizes deflection and vibration. It may be located on soil, structural steel or building floors, provided the combined weight of the purifying unit and foundation does not exceed the allowable bearing load of the support. Allowable bearing loads of structural steel and floors can be obtained from engineering handbooks; building codes of local communities give the recommended allowable bearing loads for different types of soil.

2-3. Before pouring the foundation, locate the foundation bolts by the use of a template frame and provide anchorage. See the outline drawings furnished with each pump for the exact location of the foundation bolts. When pouring, allow for a grout thickness of 3/4 to 1 1/2 inches. Roughen top surface to provide a good bond of the grout. Ordinarily, the proportions used are 1 part cement to 3 parts sand and 4 parts medium aggregate.

CAUTION

Use qualified personnel (riggers) to lift or move unit at any time. Never lift unit using hooks or slings on the pumps. Never place eyebolts in tapped holes except for removal of a part to perform service work.

When the unit is received with it should be placed on the foundation. The unit should be supported on rectangular metal blocks and shims or on metal wedges having a small taper. In each case the supports should be directly under the part of the base plate carrying the greatest weight and spaced closely enough to give uniform support. A gap of about 3/4 inches to 11/2 inches should be allowed between the base and the foundation for grouting.

2-4. PIPING. The suction and discharge piping should be arranged for the simplest, most direct layout, to be of sufficient size and be internally free of foreign material. The piping must never be pulled into position by tightening the suction or discharge ports. It must be independently supported and arranged so that expansion and contraction, due to temperature changes, will not cause misalignment. Flexible braided hose of suitable size and pressure rating should be used to connect the unit's discharge, suction and relief valve (if external relief is present) piping. Failure to connect system to piping with flexible hose will violate the manufacture's warranty. A ball valve should be place on the suction and discharge of the system.

2-5. The suction piping, if not installed properly, is a potential source of faulty operation. To achieve best performance, provide for the following:

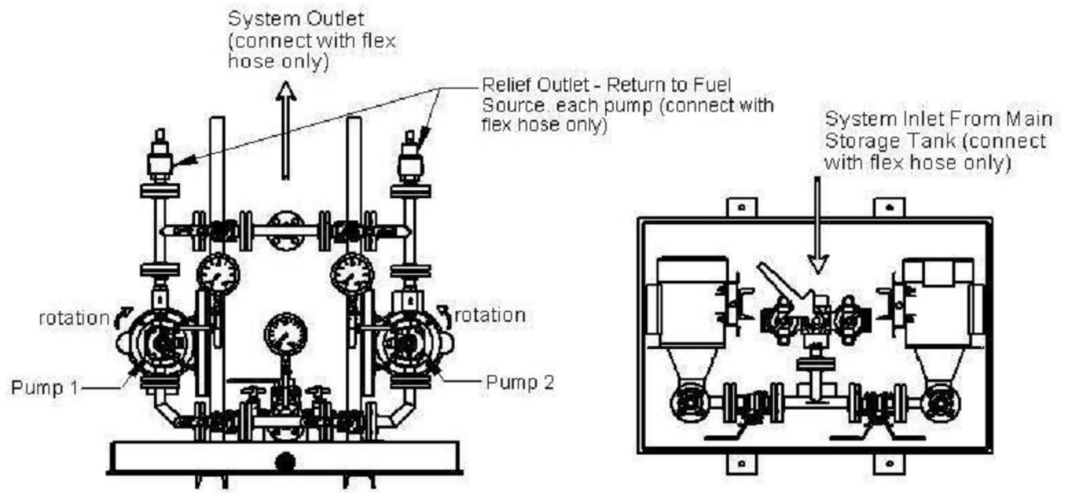
- Suction lines, when operating under suction lift, must be kept absolutely free from air leaks.
- The suction pipe, when operating under suction lift, must be at least the same size as the system's suction inlet. The suction at all points and should not contain loops or high spots in which air can be trapped. If the system level or lower than the fuel source, provide suitable means to prevent the fuel source to be siphoned out thru the pump set.
- The strainer screen must be checked and cleaned periodically. A pump operating under suction lift should never use additional gate or globe valve in the suction line.

2-6. DISCHARGE RELIEF LINE. The Phillips Fuel DP and EDP series duplex pump system may included a pressure safety relief valves that is factory set. Should the system pressure exceed the set pressure, the safety relief valves will open and allow flow through the relief discharge port thus protecting the system. Any relief discharge port should be piped back into the fuel source using the same size or larger pipe to provide pressure relief to the system. DO NOT INSTALL ANY SHUT OFF VALVES IN THE PUMP SET RELIEF VALVE LINES.

Piping should be cleaned mechanically and chemically; and flushed prior to installing the pump. A large number of pump mechanical seal and seizure troubles are due to improperly cleaned systems.

CAUTION

These valves are intended for safety relief only. They are not to be used to regulate system pressure or flow. Do not plug or restrict the discharge relief. Restricting relief port discharge WILL damage the system and result in personal injury.



Flexible braided hose of suitable size and pressure rating should be used to connect the pump set to discharge, suction and relief valve piping.
Failure to connect pump set to piping with flexible hose will violate the manufacture's warranty with regards to any piping leaks.

SECTION III PUMPS

NOTE: Piping must be thoroughly flushed prior to initial start-up to avoid contamination of the pumps.

Gear pumps are positive displacement pumps. Each shaft revolution displaces a definite amount of liquid relatively unaffected by the back pressure in the discharge line. Shaft speed and flow are directly proportional.

These close coupled pumps are mounted directly to single or three phase, totally enclosed fan cooled or explosion proof, 1.15 service factor, electric motors by means of a suitable adapter casting. The pump drive shaft is connected to the motor shaft by a flexible coupling.

3-1. Connect power supply to conform with national and local codes. Line voltage and wire capacity must match the electrical diagram and the nameplate rating on the pump motors. Set motor rotation per instructions on motor nameplate if required.

3-2. Connect switches and other devices to the terminal strips in the control panel as indicated on the electrical wiring diagram further on in the booklet if required.

3-3. PRIMING. The system's pumps should be primed before start up. DO NOT USE PUMPS TO PRIME THE FUEL OIL LINES. The system was fully tested before shipment so the pumps are not completely dry. However, it is best to fill the system with fluid on the suction side before start up. To prime the pump system, open both valves on the suction side of the pump, remove the cap from the strainer and fill as necessary. The fuel oil supply lines leading to the system should be primed via a priming tee at the highest point in the lines.

Trouble Shooting Pump Operation

SUCTION LIFT SHOULD BE NO MORE THAN 15" Hg MAXIMUM - Operating pumps at a greater suction lift will damage pump and gears

Pump will not prime or retain prime after running	1. Air leak in suction line. 2. Gears are worn. 3. Clogged foot valve or strainer. 4. Suction lift to far .	1. Prime pump, repair or replace. 2. Replace. 3. Clean or replace. 4. Move system closer to source or install check valve and or foot valve and prime.
Flow rate to low	1. Incorrect motor speed. 2. Piping is fouled or damaged. 3. Worn gears. 4. Discharge line restricted or undersized.	1. Check motor. 2. Clean or replace. 3. Replace. 4. Flush out line or replace.
Pump runs but no fluid	1. Pump not primed. 2. Faulty suction pipe. 3. Pump located to far from source. 4. Valve closed. 5. Clogged Strainer. 6. Fouled foot valve. 7. Suction height too great or long. 8. Gear loose on shaft.	1. Prime. 2. Replace. 3. Relocate unit. 4. Open all discharge and suction valves. 5. Remove baskets from strainer and clean. 6. Clean or replace. 7. Locate unit closer to source supply. 8. Replace gear and shaft.
Pressure is low	1. Incorrect motor size and speed. 2. Line restrictions. 3. Worn gears.	1. Replace. 2. Clean or replace. 3. Replace.
Pump starts and stops pumping	1. Fouled gears. 2. Leak in suction line. 3. Leak in foot valve. 4. Motor shutdown.	1. Replace. 2. Repair. 3. Repair or replace. 4. Reset motor starter.
Excessive noise	1. Improper Installation. 2. Worn gears. 3. Pumps not secured to base. 4. Piping not supported to relive strain. 5. Restricted suction line.	1. Check system installation. 2. Replace. 3. Secure properly. 4. Secure pipe independently. 5. Clean or correct.

SECTION IV START UP

4-4. MOTOR. Properly selected and installed motors are capable of operating for years with little maintenance. However they must be periodically cleaned around the vent opening, preferably with a vacuum. Periodically check all electrical connections are tight and are not frayed, split or damage. Oil and maintain as recommended by the motor manufacturer

4-5. RELIEF VALVE. The Phillips Pump DP duplex pumping system includes two pressure relief valves that are factory set. This pressure relief valve is designed to protect equipment from overpressure and should be piped back into the fuel source to provide pressure relief to the system. Do not plug any the valve discharge opening. When discharge piping is connected to valve outlet, make sure the valve is not be connected to any discharge pipe that contains pressure before the valve opens or to any pipe where the pressure build-up is greater than 10% of the set pressure when the valve is open and relieving.

Valve discharge piping, other than a short tailpipe, must be supported. A flexible connection between the valve and the pipe should be used to prevent excessive pipe stress, due to thermal expansion, from being imposed on the valve body.

For threaded valves, to prevent sealing compound from entering and damaging the valve, apply a small amount of pipe thread sealing compound to external threads only. Do not put any sealing compound on the first thread or on any internal threads. To do so may cause the sealing compound to enter the valve and cause seat leakage. For flanged valves, use new gaskets and tighten the mounting studs evenly.

The system operating pressure should be at least 5 psig or 10% which ever is greater below the relief valve set pressure. Operating too close to the valve set pressure will cause seat leakage and will shorten the time between valve maintenance.

DO NOT USE THE SAFETY VALVE AS A CONTROL VALVE TO REGULATE SYSTEM OPERATING PRESSURE.

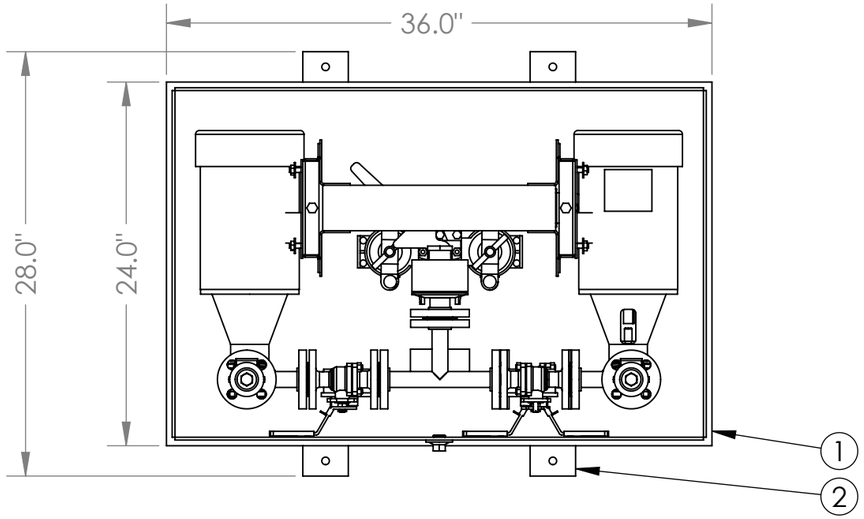
EXCESSIVE OPERATION WILL CAUSE THE SEAT TO LEAK AND WILL REQUIRE MORE FREQUENT VALVE MAINTENANCE.

DO NOT INSTALL ANY SHUT OFF VALVES IN ANY RELIEF VALVE LINE

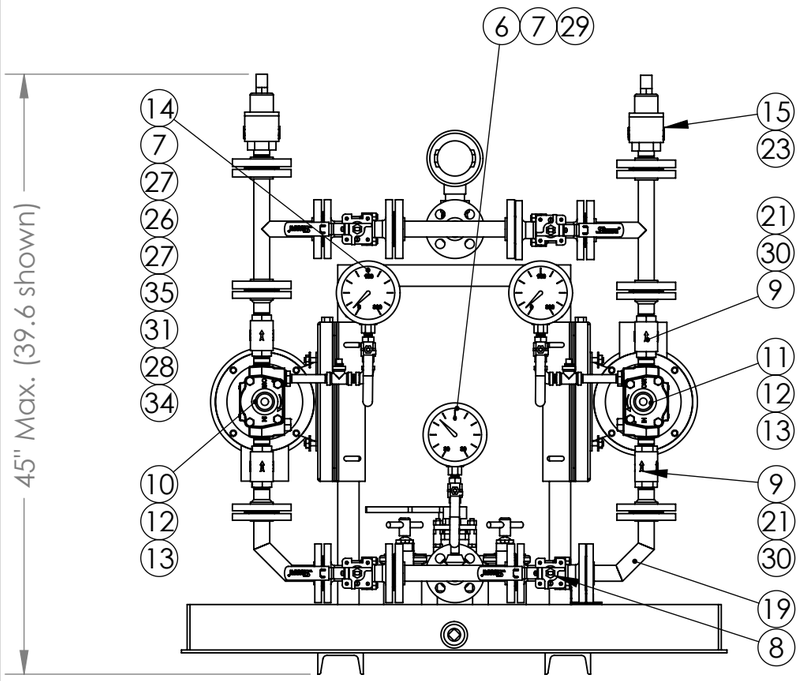
SECTION V STRAINER

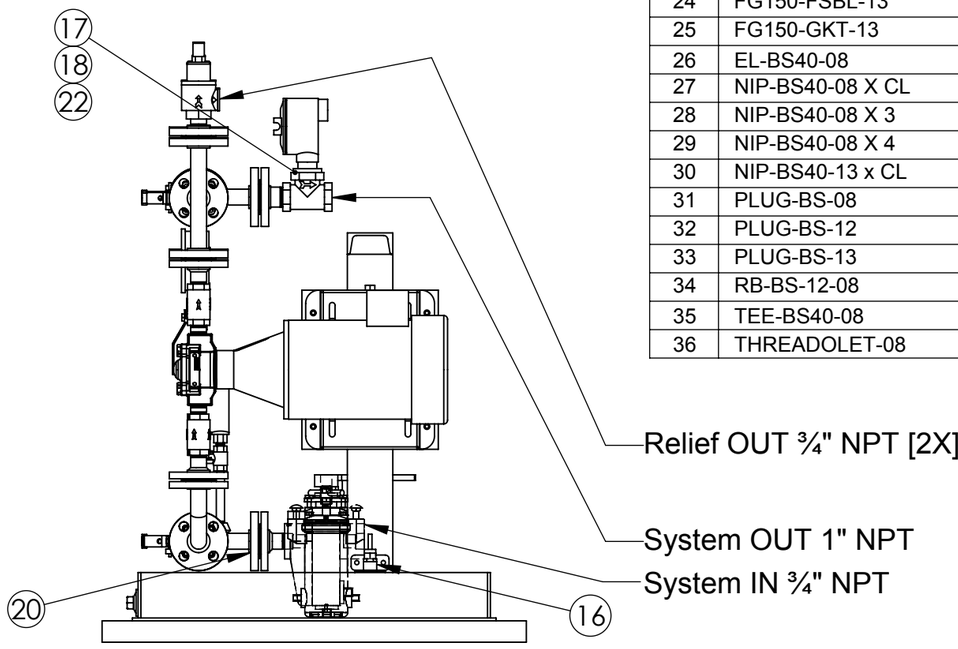
5.1. OPERATION - The duplex strainer includes two basket chambers with a built in transfer valve to provide uninterrupted flow during basket change-overs on fluid handling systems. The normal flow of fluid is through the intake port, then through the upper port of the valve, through the inside of the basket where particles are trapped, the bottom port of the valve, and finally through the discharge port of the unit. To direct the flow from one basket chamber to the other, swing the valve handle to either of its extreme positions. The chamber in use is shown by the indicator which is cast into the valve handle and partially covers the chamber in use. The opposite chamber can then be opened and the basket removed for cleaning. It is not necessary to drain the strainer chamber in order to remove the basket, although it can be helpful.

5.2. REMOVING THE BASKET - The basket can be easily removed from the chamber not in use by unscrewing the yoke handle, or on high pressure models, stud nuts, and removing the cover. Care should be taken not to damage the cover gasket. The basket can be easily lifted out of the chamber and cleaned. When replacing the cover of the basket chamber, be sure the cover seat is clean and the cover not cocked to one side. As the handle or cover stud nut is screwed down, tension is placed on the basket handle which holds the basket firmly in place while in use.



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	Basin-24x36x3x3/16	Basin-36x 24 X 0.1875 HRS.	1
2	Foot-C3 x 4.1 x 28L	Foot, C3x4.1x28"lg	2
3	RiserWldmt-DP-13	¾" Pump Set Riser	1
4	Ear, Mounting,145	Ear, Riser, 145 Frame	4
5	MOD 72-31D-032BR	3/4" duplex strainer with 1/32" diameter perforated brass basket and lever handle	1
6	CG-9699045	Compound Gauge, 30"Hg/30 PSI, 4"	1
7	BVLH-BZ-08	Ball Valve, Bronze, ¼" NPT with locking handle	3
8	XX065877	3/4" Carbon steel ball valve, #150 lb flange with Reinforced TFM seat with locking handle	4
9	525-13	¾" NPT Bronze In Line Check Valve, 200 psi	4
10	8UT-V-CCW-56C	#8 Gear Pump, CCW, 56C frame	1
11	8UT-V-CW-56C	#8 Gear Pump, CW, 56C frame	1
12	Lee-121093-175077	Mtr, 1½ hp, 1500 rpm, 145T, TEFC: 3Ø, 220/380 VAC,6.0/ 3.5 SFA. with C-face Kit	2
13	AMB-145	145 Frame Adjust Motor Base	2
14	PG-9699142	Press Gauge, 300 PSI, 4"	2
15	PRV69-13-165	3/4 MNPT x 3/4 FNPTRelief Valve 165 PSI	2
16	ELS-80500-NC	Enclosed Leak Switch,Normally Closed	1
17	FL-14-20	Flow Switch, 1" NPT, 2 GPM	1
18	GRB-0445	1/2" NPT exproof junction box--2 HUB	1
19	EL-7050FF-13	90 Elbow, 150# Flanged, Forged Steel, 3/4"	2
20	TEE-7060FF-13	Tee, 150# Flanged, Forged Steel, 3/4"	4
21	FGNP150-FS-13-13-2	Flanged Nipple, 3/4" x 2.00" lg	5
22	FGNP150-FS-13-14-2	3/4" Florged Steel Flange 150# with 1" NPT nipple end, 2" long	1
23	FG150-FSTH-13	Flange 150#, Forged Steel, 3/4" Threaded	2
24	FG150-FSBL-13	Flange 150#, Forged Steel, Blind, 3/4"	1
25	FG150-GKT-13	Flange Gasket 3/4"	17
26	EL-BS40-08	Elbow,Black Steel 1/4"	2
27	NIP-BS40-08 X CL	Nipple,Blk Steel, 1/4"x 7/8" lg.	4
28	NIP-BS40-08 X 3	Nipple,Blk Steel, 1/4"x 3" lg.	2
29	NIP-BS40-08 X 4	Nipple,Blk Steel, 1/4"x 4" lg.	1
30	NIP-BS40-13 x CL	Nipple,Blk Steel, 3/4" X CL (1.38)"	4
31	PLUG-BS-08	Plug, Black Steel, 1/4 NPT	2
32	PLUG-BS-12	Plug, Blk steel, 1/2" NPT	3
33	PLUG-BS-13	Plug, Blk steel, 3/4" NPT	3
34	RB-BS-12-08	Reducing bushing, 1/2" to 1/4"	2
35	TEE-BS40-08	Tee, black steel, 1/4"NPT	2
36	THREADOLET-08	Thread-O-Let, 1/4" NPT	1





Phillips Fuel Systems
109 Holland Ave., Bridgeport, Ct 06605

TITLE:
8 Duplex Pump Set: 4.6 GPM @ 150 PSI with (2) 1½ HP motors, 400 VAC/ 3Ø/ 50Hz: London

Part Number. **DP8-130062**

REV

	NAME	DATE
DRAWN		

SCALE: 1:10 WEIGHT: SHEET 4 OF 4

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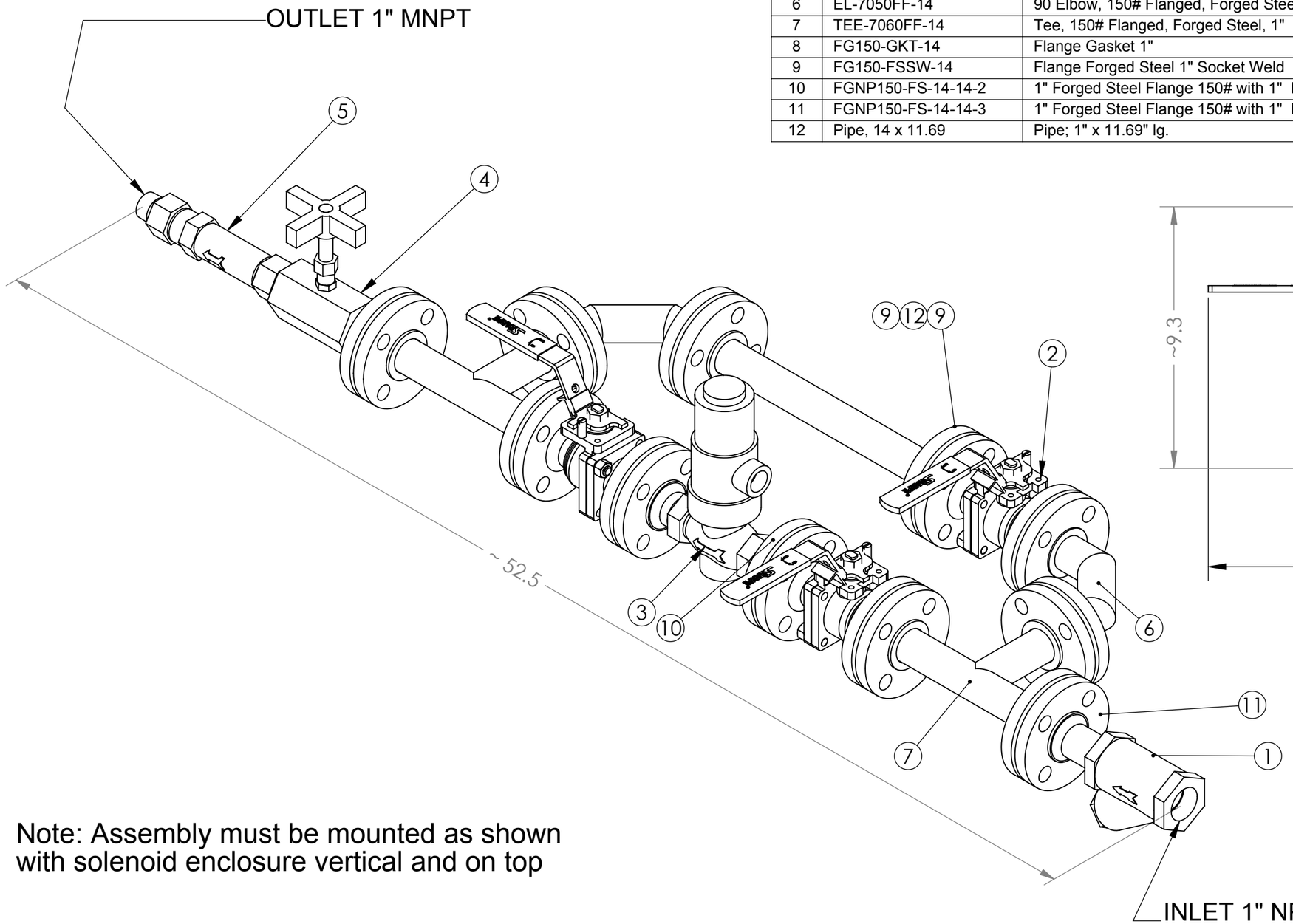
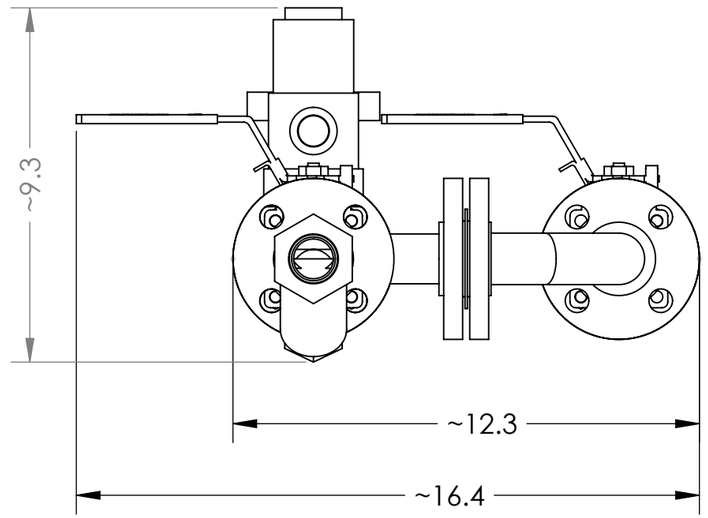
DO NOT SCALE DRAWING

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	HS-415C-14	Pipeline Y Strainer, Max Pressure 250 PSI, 1" NPT, Cast Iron Body	1
2	XX065878	1" Carbon steel ball valve, #150 lb flange with Reinforced TFM seat with locking handle	3
3	MG-18AV44-O-400-50	1" Solenoid Valve, Normally Closed, Viton , 400 VAC, 50 Hertz	1
4	NV-60A-105-01	Valve, Globe (needle), CS, 1" FNPT x 1" FNPT	1
5	VKP 5030-N120	Flowmeter, 1" MNPT, ½ to 8 gpm/ 100 cSt. with 3/4 NPT union ends	1
6	EL-7050FF-14	90 Elbow, 150# Flanged, Forged Steel, 1"	2
7	TEE-7060FF-14	Tee, 150# Flanged, Forged Steel, 1"	2
8	FG150-GKT-14	Flange Gasket 1"	11
9	FG150-FSSW-14	Flange Forged Steel 1" Socket Weld	2
10	FGNP150-FS-14-14-2	1" Forged Steel Flange 150# with 1" NPT nipple end, 2" long	3
11	FGNP150-FS-14-14-3	1" Forged Steel Flange 150# with 1" NPT nipple end, 3" long	1
12	Pipe, 14 x 11.69	Pipe; 1" x 11.69" lg.	1





Note: Assembly must be mounted as shown with solenoid enclosure vertical and on top

Phillips Fuel Systems
109 Holland Ave., Bridgeport, Ct 06605

TITLE:
Flow Control Manifold, NOB, 1" London

Part Number.
FCM14-130062-NOB

REV

	NAME	DATE
DRAWN		

SCALE: 1:4 | WEIGHT: ~≤140 | #SHEET 1 OF 1

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Changeable, quick, agile, and incredibly reliable . . . engineered to meet the challenges of industrial users in today's fast-paced environment. With the flexibility of a bolt-on integral relief valve, a broad choice of field-changeable shaft seals and elastomers, and the time-tested "gear within a gear" pumping principal, the new Haight Universal Series of pumps offer unparalleled flexibility and reduced maintenance expenses.

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Fax: 608-882-3777
Email: haight pump@baker-mfg.com

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Pumps that fit . . . Pumps that perform

HAIGHT . . . BETTER BY DESIGN

Haight Pumps are engineered for performance and long life under the most rugged conditions.

TYPICAL COMPETITIVE GEAR DESIGN

The typical cantilevered gear design with the inner idler gear has several pronounced disadvantages that the Haight design eliminates, including:

- Single point of entry liquid feed to gears resulting in a “built-in” inlet restriction. This often requires speed reduction at fluid viscosities above 750 SSU.
- Hydraulic imbalance resulting in shaft deflection and premature wear.
- Increased idler speeds resulting in higher gear tip speeds and accelerated wear.
- Thrust bearing field adjustment needed to keep driver gear properly positioned.

THE HAIGHT ADVANTAGE

Haight pumps feature an inner driving gear coupled to a hydraulically balanced free floating outer gear on a dramatically shortened shaft arrangement.

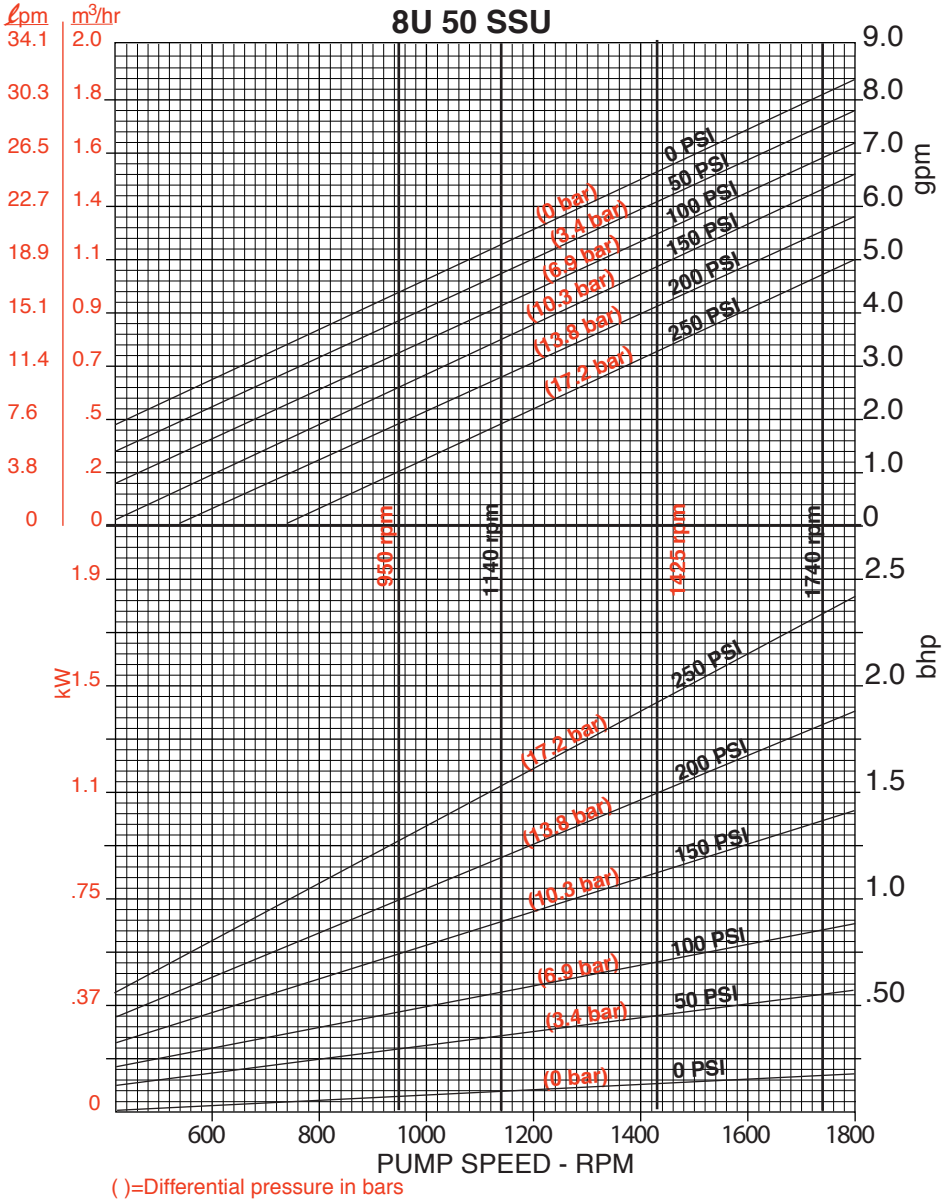
- Thrust bearing adjustment is eliminated since the gears are precisely positioned without the need for field adjustment.
- Gears rotate on a shaft that is fully supported at both ends by lubricated and vented bearings eliminating deflection which causes wear.
- Pinion and rotor gears are hydraulically balanced by the pumped fluid eliminating pistoning into the casing and cover.
- Dual paths of fluid entry to the gears (rather than one) allows Haight pumps to generate full rated displacement while close-coupled at standard motor speeds, without gear reducers at viscosities up to 10,000 SSU. This eliminates misalignment and significantly reduces cost.
- All rotating components are accessible beneath the front cover making routine cleaning and service faster, and simpler.
- Lower rotor tip speeds result in reduced noise levels.

HAIGHT PUMPS LAST LONGER

• **1-8 GPM**		
Typical top gear speed cantilevered design (RPM)	2,333	
Top gear speed Haight Universal (RPM)	1,750 (Motor Speed)	
Difference	*583*	
• **10-20 GPM**		
Typical top gear speed cantilevered design (RPM)	2,846	
Top gear speed haight Universal (RPM)	1,750 (Motor Speed)	
Difference	*1,096*	
• **30-80 GPM**		
Typical top gear speed cantilevered design (RPM)	2,407	
Top gear speed Haight Universal (RPM)	1,750 (Motor Speed)	
Difference	*657*	

- A typical cantilevered gear design pumps as shown here must increase the top rotating speed of the gear set by an average of 33% in the 1-8 GPM range, 63% in the 10-20 GPM range, and 38% in the 30-80 GPM range for any given volume of displacement.
- A Haight universal pump requires, on average, 46,720 fewer revolutions **per operating hour** for a given volume of displacement.

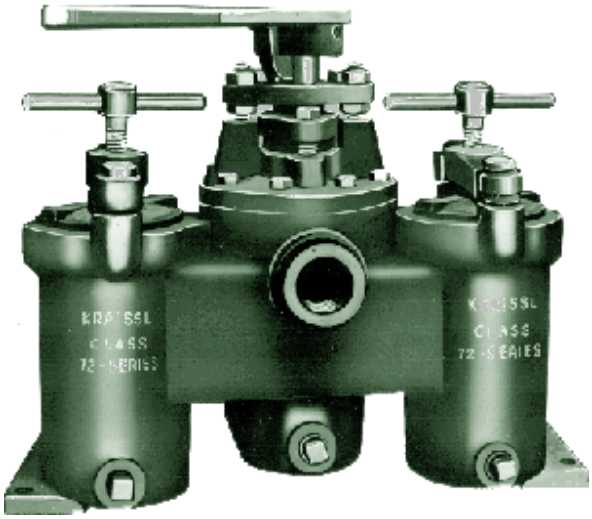
THE HAIGHT ADVANTAGE


8U 50 SSU
ℓpm
m³/hr
34.1
30.3
26.5
22.7
18.9
15.1
11.4
7.6
3.8
0
2.0
1.8
1.6
1.4
1.1
0.9
0.7
.5
.2
0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0
gpm
0 PSI
50 PSI
100 PSI
150 PSI
200 PSI
250 PSI
(0 bar)
(3.4 bar)
(6.9 bar)
(10.3 bar)
(13.8 bar)
(17.2 bar)
950 rpm
1140 rpm
1425 rpm
1740 rpm
kW
1.9
1.5
1.1
.75
.37
0
2.5
2.0
1.5
1.0
.50
bhp
600
800
1000
1200
1400
1600
1800
PUMP SPEED - RPM
( )=Differential pressure in bars

Duplex Strainers

Duplex strainers are ideal for applications where continuous flow must be maintained, with no flow interruption for basket cleaning. These duplex strainers are listed by Underwriters Laboratories, Inc. (U.L.), and are individually tested to U. L. quality control specifications.

Our Model 72, NPT threaded port and 72F flanged series duplex strainers are furnished with 100% full-flow internal channels and with a quick-opening, hand-clamp closure for easy access and are rugged cast iron bodies, covers, and valve plugs.



A built-in, tapered plug valve that directs flow through either side without shutting off the flow with the valve handle guard shields the side in use and the standard valve handle swings over the inlet port. Drain plugs are provided in each of the valve and basket chambers with an adjustable locking flange holds the valve plug on its seat. A separate, external gland is provided to allow easy access to valve stem packing without complete disassembly, even while in service.

Strainer baskets are fabricated from perforated metal. The standard basket is brass or stainless steel with 1/32” perforation. Each basket is held on its seat by a spring basket handle. Normal flow is through the interior of the basket which then contains the collected debris when the basket is lifted out for cleaning.

Features Include:

- Hand clamps over each basket, requires no special tools.
- Valve handle shields side in use.
- Accessible swing yoke closure for easy basket cleaning.
- Continuous flow without interruption during change over.
- Tapered valve plug for durability.
- Drain connections on each basket chamber.
- Interchangeable strainer, filter and double element baskets.
- Cast iron body pressure tested to U.L. specifications.
- Spring handle holds basket on seat.
- Independent gland for external stem packing access.
- Adjustable locking flange establishes valve clearance.
- Mounting feet provided

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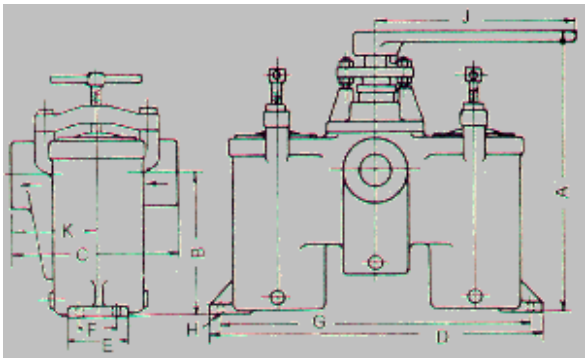
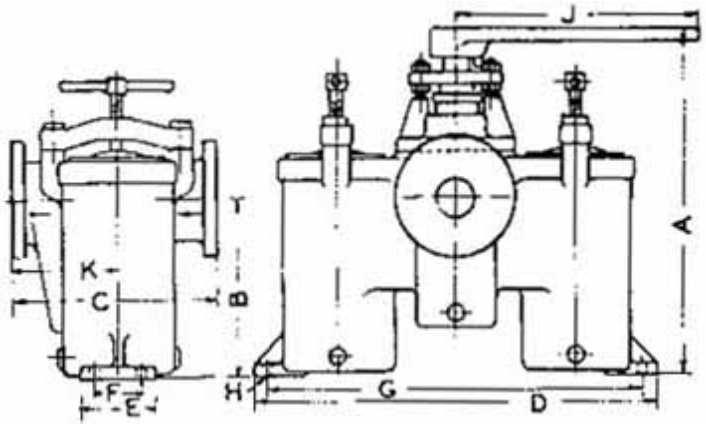


Threaded NPT Ports

Model Series	Size NPT	Dimensions (inches) A	B	C	D	E	F	G	H	J	K
72-31D	3/4	10 1/8	5 1/16	5 1/4	10 7/8	2 1/4	1 1/2	10 1/8	7/16	8 1/8	2 3/4
72-33D	1	10 1/8	5 1/16	5 1/4	10 7/8	2 1/4	1 1/2	10 1/8	7/16	8 1/8	2 3/4
72-35	1 1/4	13 1/4	6 3/4	7 5/8	15 1/4	2 3/4	1 3/4	14 1/4	7/16	12 1/8	3 5/8
72-37	1 1/2	13 1/4	6 3/4	7 5/8	15 1/4	2 3/4	1 3/4	14 1/4	7/16	12 1/8	3 5/8
72-39	2	14 3/4	7 7/8	10 5/8	20 1/2	3	1 7/8	19 1/2	9/16	12 1/8	3 7/8
72-41	2 1/2	14 3/4	7 7/8	10 5/8	20 1/2	3	1 7/8	19 1/2	9/16	12 1/8	3 7/8

Dimensions aresubject to casting and production variations.



Flanged Ports

Model	Size PSC	Dimensions (inches) A	B	C	D	E	F	G	H	J	K
72-37F	1 1/2	13 1/4	6 3/4	9 3/8	15 1/4	2 3/4	1 3/4	14 1/4	7/16	12 1/8	4 3/4
72-39F	2	14 3/4	7 7/8	10 3/8	20 3/4	3	1 7/8	19 1/2	9/16	12 1/8	6 7/32
72-41F	2 1/2	14 3/4	7 7/8	10 3/8	20 3/4	3	1 7/8	19 1/2	9/16	12 1/8	6 7/32
72-43F	3	17 5/8	10 3/4	12 1/2	20 3/4	3	1 7/8	19 1/2	9/16	12 1/8	6 7/8
72-47F	4	20 3/4	13 1/32	15 5/8	25 1/4	3 1/4	2	24	5/8	12 1/8	8 15/16
72-49F	5	26 1/8	15 3/8	17 3/4	27 3/4	3 1/4	2	26 1/2	5/8	14	9 7/8
72-51F	6	28 1/8	16 1/4	21	36 3/4	4 1/2	2 3/4	35 1/2	9/16	14	12

Dimensions are subject to casting and production variations.

LIQUID FILLED GAUGES VACUUM, COMPOUND & PRESSURE

Liquid filled stainless steel case and shatter proof lens designed for industrial environments, Phillips Pump's easy reading gauges provide accurate readings for systems conditions. Having large black numbers and pointer on a white matte aluminum scale plate, each gauge comes complete with a rugged burbon tube mechanism, spring suspend brass movement and a pulsation damping office to resist the effects of shock, pulsation and vibration and insure trouble free life.

As with all Phillips Pump's products are our gauges are designed for use with fuel oils or diesel fuel.

Specifications:

Operating Temperature - -40°F to 160°F
Accuracy - + 1.5% of span
Weather Protection - Weather tight (NEMA 4X / IP 65) - liquid-filled case
Working Range -

2½" Steady: 3/4 of full scale value
Fluctuating: 2/3 of full scale value
Short time: full scale value

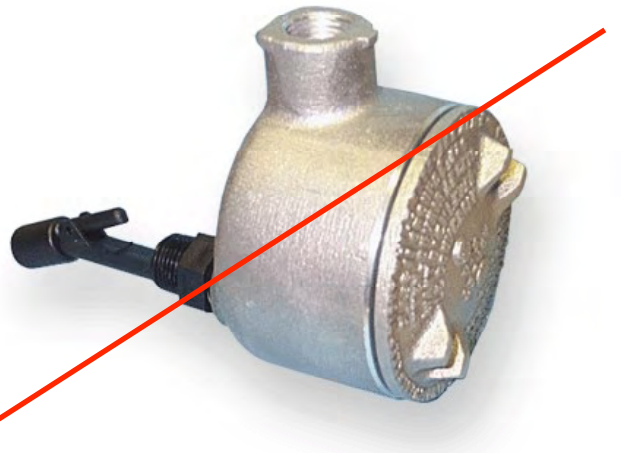
4" Steady: Full scale value
Fluctuating: 0.9 x full scale value
Short time: 1.3 x full scale value

Material -

Mounting - 1/4" NPT copper alloy
Movement - Copper alloy
Pointer - Black aluminum
O-ring - EPDM
Window - Polycarbonate
Bourdon Tube - copper alloy
Dial - White ABS with stop pin and black lettering
Case - 304 stainless steel with vent plug
Window Gasket - Buna-N
Case Filling - Glycerine

Gauge Range	Type	Part Number 2 1/2" Diameter	Part Number 4" Diameter
30" hg	Vacuum	VG-9767002	VG-9699058
30" hg - 0 - 15 PSI	Compound	-	CG-9699036
30" hg - 0 - 30 PSI		CG-9767010	CG-9699045
30" hg - 0 - 60 PSI		CG-9767029	CG-9699053
30" hg - 0 - 100 PSI		-	CG-9699061
15 PSI	Pressure	PG-9767037	PG-9699095
30 PSI		PG-9767045	PG-9699109
60 PSI		PG-9767053	PG-9699117
100 PSI		PG-9767061	PG-9699125
160 PSI		PG-9767070	PG-9699257
200 PSI		PG-9767088	PG-9699134
300 PSI		PG-9767096	PG-9699142
400 PSI		PG-9767100	PG-9699150
600 PSI		PG-9767118	PG-9699168
800 PSI		-	PG-9699176
1000 PSI		PG-9767126	PG-9699185
1500 PSI		PG-9767134	PG-9699193

SIDE MOUNT BASIN & PIPING LEAK SENSORS

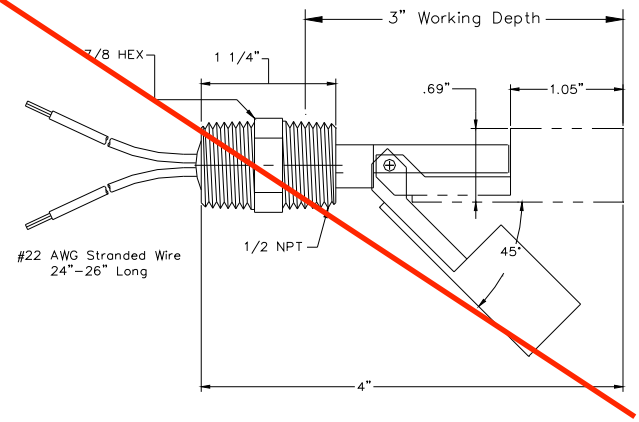


This side-wall mount sealed switch detects diesel or other fuel oil leakage into daytank rupture basin or outer double wall containment piping. They are compact, easy to install into 1/2" NPT threaded opening, the encased magnetic switch is float operated and sealed against vapors. Comes complete with explosion proof wiring enclosure. (Note: for installation in side mounting applications only)

Specifications:

- Normally open, closes on rise
- 30 VA nominal switch rating
- Nylon float & stem for oils, fuels & gasoline
- 100 PSIG Maximum Pressure
- Operating Temperature: -40 to +150 Degrees F

Phillips Part Number: SMLS-1



ENCLOSED BASIN / TANK ROOM FLOAT TYPE LEAK DETECTION SWITCHES

Enclosed single level switches with the addition of a liquid tight cord grip, mounting bracket, and slosh shield. The slosh shield doubles as protection from particulate and debris as well as from accidental tripping. Unlike many other sensors, these are liquid tight inside and out due to the cable cord grip.
Switch consists of all stainless steel housings with polycarbonate shields, and Buna-N floats.

Part Number Number	Switch Configuration
ELS-80500-NC	Normally Closed
ELS-80500-NO	Normally Open

FLOW SWITCH
1/2 to 50 GPM RANGE

Our compact, durable in-line flow detection switches are the perfect answer for flow detection in fuel oil supply lines. The heavy duty cast bronze body and a duable telfon switch shuttle mechanism, this switch provides an ease of installation and many years of trouble free service. Flow rate ranges from 1/2 to 50 GPM. The removeable bonnet assembly provides easy cleaning without removal of the switch from the line.

Features & Specifications:

- In-line mounting, horizontal or vertical
- Low pressure drop
- Single fixed point adjustment
- Temperature Range: -20 to 300° F
- Maximum Pressure: 400 psi
- Switch rating: SPDT 20 & 100 VA

Size (NPT)	Flow Setting	Part Number	A (in)	B (in)	Hex (in)
3/4”	0.5	FL-13-05	3	3	1 13/32
	1	FL-13-10			
	2	FL-13-20			
	3	FL-13-30			
	4	FL-13-40			
	5	FL-13-50			
	6	FL-13-60			
	8	FL-13-80			
1 1/2”	3	FL-16-03	4 1/2	3 1/2	2 1/2
	5	FL-16-05			
	8	FL-16-08			
	10	FL-16-10			
	15	FL-16-15			
	20	FL-16-20			
	25	FL-16-25			
	30	FL-16-30			

Size (NPT)	Flow Setting	Part Number	A (in)	B (in)	Hex (in)
1”	0.5	FL-14-05	3 1/4	3	1 25/32
	1	FL-14-10			
	2	FL-14-20			
	3	FL-14-30			
	4	FL-14-40			
	5	FL-14-50			
	6	FL-14-60			
	8	FL-14-80			
2”	5	FL-17-05	5 3/8	4	3 3/32
	10	FL-17-10			
	15	FL-17-15			
	20	FL-17-20			
	25	FL-17-25			
	30	FL-17-30			
	40	FL-17-40			
	50	FL-17-50			

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BRONZE SOLENOID VALVES
Dependable • Packless

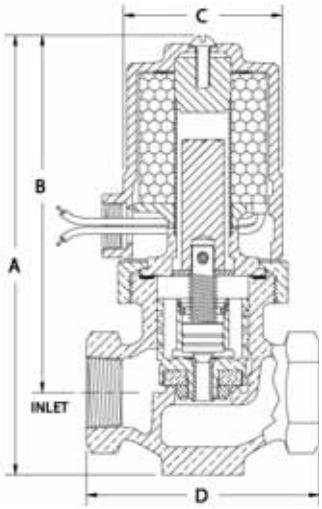
TYPE "A" FULL PORT - NORMALLY CLOSED
1/2" TO 3" PIPE SIZE

NO DIFFERENTIAL PRESSURE REQUIRED TO OPEN

MAX. FLUID TEMP.
212° F
MAX. STATIC PRESSURE
300 PSI
Except valves listed for 500 PSI

OPERATION:
Valve opens when energized and closes when de-energized. When the coil is energized the pilot valve opens, relieving the pressure above the piston, which is then lifted from its seat by the plunger. Upon de-energizing the coil, a spring closes the pilot valve and opens a bleed passageway to permit pressure to build above the piston and seat it.

CONSTRUCTION: (* Wetted parts)
*Valve Body - Cast Bronze, Globe Pattern - NPT ends
*Piston - Bronze
Coil Enclosure - Malleable or Cast Iron, 1/2" NPS conduit conn.
*Plunger - 430 Stainless Steel
*Pilot Valve - 303 Stainless Steel
*Bonnet Tube - 304 Stainless Steel
*Spring - 302 Stainless Steel
*Body Seal - Buna N or Non Asbestos Gasket
*Orifice Seal - Buna N (Viton or Glass Filled Teflon available)
*AC Shading Coil - Copper
*Stem Pin - Inconel
Coil - Encapsulated Class B, 18" leads - (Class H available)



APPLICATION:
To control the flow of Water, Oil, Air, Gas, Solvents, Brine, Vacuum and any other fluids not reactive with construction materials and free of sediment. Valve operates from zero to maximum differential pressure indicated in table. Valve must be mounted in horizontal pipe with solenoid enclosure vertical and on top.

Pipe Size Inches	Max. Diff. PSI	Type No.	Watts AC	Amps Hold 120-60	Amps Inrush 120-60	Watts DC	Ship Wt. Lbs.	Dimensions In Inches			
								A	B	C	D
1/2	110 200 300	18A42 18A32 18A52	25	0.4	1.2	18	8	7	5-7/8	2-3/4	3-1/4
	500	E33A62	45	0.8	2.4	23	16	8	6-7/8	4-1/8	3-1/4
3/4	50 110	18A23 18A43	25	0.4	1.3	18	8	7-1/8	6	2-3/4	3-1/2
	160	118A43	40	0.6	2.0	28					
	200 300	33A33 33A53	45	0.8	2.6	23	12	8-1/8	7	3-1/2	3-1/2
	500	E133A63	65	1.2	3.9	33	17	8-1/8	7	4-1/8	3-1/2
1	50 110	18A24 18A44	25	0.4	1.5	18	10	7-7/8	6-5/8	2-3/4	4-1/8
	160	118A44	40	0.6	2.5	28					
	200 300	33A34 33A54	45	0.8	2.8	23	14	8-7/8	7-1/2	3-1/2	4-1/8
	500	E133A64	65	1.2	4.2	33	19	8-7/8	7-1/2	4-1/8	4-1/8
1-1/4	50 90	18A25 18A45	25	0.4	1.6	18	12	8-3/8	6-3/4	2-3/4	4-1/2
	150	118A45	40	0.6	2.4	28					
	200 300	33A35 33A55	45	0.8	3.0	23	16	9-3/8	7-3/4	3-1/2	4-1/2
	500	†† 40A65	60	1.2	6.2	N/A	20	10-3/8	8-3/4	4-1/2	4-1/2
1-1/2	50 115	35A26 35A46	45	0.8	3.2	23	20	10	8-1/8	4	4-7/8
	160	135A46	65	1.2	4.8	33					
	200 300	41A36 41A56	60	1.2	6.7	35	24	11	9-1/8	4-1/2	4-7/8
	500	141A66	85	2.0	10.0	45					
2	50 100	36A27 36A47	45	0.8	3.5	23	31	11	8-3/4	5-3/8	6
	150	136A47	65	1.2	5.0	33					
	200 300	42A37 42A57	60	1.2	7.4	35	36	12	9-3/4	5-3/8	6
	500	142A67	85	2.0	11.0	45					
2-1/2	50 125 200	43A28 43A48 43A38	60	1.2	8.0	35	43	12-7/8	10-1/8	5-7/8	7-1/4
	300	143A58	85	2.0	12.0	45					
3	50 100 200	44A29 44A49 44A39	60	1.2	8.8	35	56	13-3/4	10-1/2	6-5/8	8-3/8
	300	144A59	85	2.0	13.0	45					

FOR OPTIONS & ACCESSORIES SEE PAGES 24 & 25

Strainers are recommended for use with solenoid valves

(See page 19)

When you order please supply the following:

- Pipe Size
- Valve Type
- Voltage (AC or DC)
- Hertz
- Fluid
- Fluid Temperature
- Max. Diff. Pressure
- Optional Features

(See pages 24 & 25)

†† Not available for DC operation

Y-Strainers

Y Strainers are designed for steam, oil or water lines. Strainers should be installed ahead of temperature regulating and/or pressure reducing valves and steam traps to protect their moving parts from dirt, this is particularly important for new installations.

Screwed NPT End

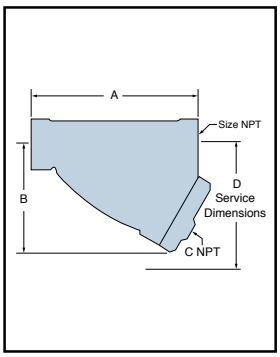
Model 415C

- Cast iron body
- Maximum pressure:
  – 250 psig (17.3 bar) for steam service
  – 400 psig (27.6 bar) for water service
- Available in sizes ½" - 3" NPT

Model 420C

- Cast brass body
- Maximum pressure:
  – 300 psig (20.6 bar) for steam service
  – 400 psig (27.6 bar) for water service
- Available in sizes ½" - 3" NPT

Screwed NPT End Y-Strainer



Ordering Information

Model Number	Part Number	NPT Size in.	Weight Approx. lbs. (kg)
415C	405000	½	2 (0.9)
415C	405003	¾	2½ (1.1)
415C	405006	1	4 (1.8)
415C	405009	1¼	6 (2.7)
415C	405012	1½	7 (3.2)
415C	405015	2	12 (5.4)
415C	405018	2½	19 (8.6)
415C	405022	3	32 (14.5)
420C	405024	½	1 (0.5)
420C	405027	¾	2 (0.9)
420C	405030	1	4 (1.8)
420C	405033	1¼	5 (2.3)
420C	405036	1½	7 (3.2)
420C	405039	2	12 (5.4)
420C	405042	2½	22 (10)
420C	405045	3	35 (16)

Dimensions in. (mm)

Model 415C

Part Number	A	B	NPT C	D
405000	4 1/8 (105)	2 1/2 (64)	1/2	3 1/4 (83)
405003	3 3/4 (95)	2 7/16 (62)	3/8	3 (76)
405006	4 (102)	2 5/8 (67)	3/8	3 1/4 (83)
405009	4 7/8 (124)	3 3/4 (95)	3/4	6 (152)
405012	6 (152)	4 (102)	3/4	6 (152)
405015	7 3/8 (187)	4 1/4 (108)	3/4	6 3/4 (171)
405018	9 1/4 (235)	5 7/8 (149)	1 1/2	7 7/8 (200)
405022	10 (254)	6 (152)	1 1/2	8 (203)

Model 420C

Part Number	A	B	NPT C	D
405024	2 15/16 (75)	2 (51)	1/4	3 (76)
405027	3 5/8 (92)	2 3/8 (60)	1/4	4 (102)
405030	4 1/2 (114)	2 3/4 (70)	3/8	4 1/2 (114)
405033	5 1/8 (130)	3 1/2 (89)	3/8	5 (127)
405036	5 13/16 (148)	4 3/4 (95)	1/2	5 3/4 (146)
405039	7 15/16 (202)	4 1/2 (114)	1/2	6 1/2 (165)
405042	8 1/4 (210)	6 3/4 (171)	1 1/4	—
405045	9 5/8 (244)	6 1/4 (159)	1 1/4	—

Specifications

Model	Body Material	Steam Service			Water Service		
		Pressure psig (bar)	Temperature °F (°C)	Screen Material Mesh SS	Pressure psig (bar)	Temperature °F (°C)	Screen Material Mesh SS
415C	Cast Iron	250 (17.3)	400 (204)	20	400 (28)	100 (38)	20
420C	Cast Brass	300 (20.6)	400 (204)	20	400 (28)	150 (66)	20

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Changeable, quick, agile, and incredibly reliable . . . engineered to meet the challenges of industrial users in today's fast-paced environment. With the flexibility of a bolt-on integral relief valve, a broad choice of field-changeable shaft seals and elastomers, and the time-tested "gear within a gear" pumping principal, the new Haight Universal Series of pumps offer unparalleled flexibility and reduced maintenance expenses.

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Pumps that fit . . . Pumps that perform

HAIGHT . . . BETTER BY DESIGN

Haight Pumps are engineered for performance and long life under the most rugged conditions.

TYPICAL COMPETITIVE GEAR DESIGN

The typical cantilevered gear design with the inner idler gear has several pronounced disadvantages that the Haight design eliminates, including:

- Single point of entry liquid feed to gears resulting in a “built-in” inlet restriction. This often requires speed reduction at fluid viscosities above 750 SSU.
- Hydraulic imbalance resulting in shaft deflection and premature wear.
- Increased idler speeds resulting in higher gear tip speeds and accelerated wear.
- Thrust bearing field adjustment needed to keep driver gear properly positioned.

THE HAIGHT ADVANTAGE

Haight pumps feature an inner driving gear coupled to a hydraulically balanced free floating outer gear on a dramatically shortened shaft arrangement.

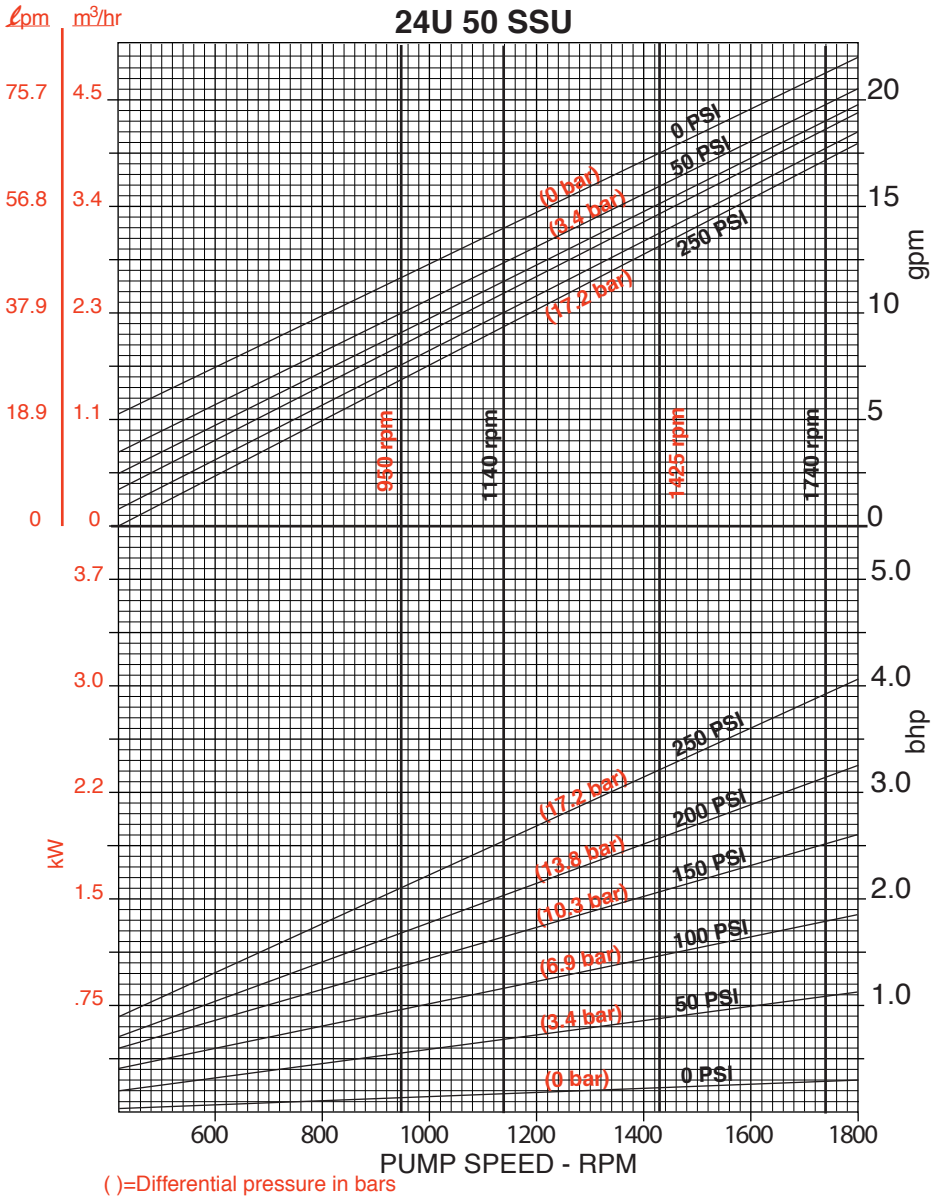
- Thrust bearing adjustment is eliminated since the gears are precisely positioned without the need for field adjustment.
- Gears rotate on a shaft that is fully supported at both ends by lubricated and vented bearings eliminating deflection which causes wear.
- Pinion and rotor gears are hydraulically balanced by the pumped fluid eliminating pistoning into the casing and cover.
- Dual paths of fluid entry to the gears (rather than one) allows Haight pumps to generate full rated displacement while close-coupled at standard motor speeds, without gear reducers at viscosities up to 10,000 SSU. This eliminates misalignment and significantly reduces cost.
- All rotating components are accessible beneath the front cover making routine cleaning and service faster, and simpler.
- Lower rotor tip speeds result in reduced noise levels.

HAIGHT PUMPS LAST LONGER

- **1-8 GPM**
  Typical top gear speed cantilevered design (RPM) 2,333
  Top gear speed Haight Universal (RPM) 1,750 (Motor Speed)
  Difference 583
- **10-20 GPM**
  Typical top gear speed cantilevered design (RPM) 2,846
  Top gear speed haight Universal (RPM) 1,750 (Motor Speed)
  Difference *1,096*
- **30-80 GPM**
  Typical top gear speed cantilevered design (RPM) 2,407
  Top gear speed Haight Universal (RPM) 1,750 (Motor Speed)
  Difference 657

- A typical cantilevered gear design pumps as shown here must increase the top rotating speed of the gear set by an average of 33% in the 1-8 GPM range, 63% in the 10-20 GPM range, and 38% in the 30-80 GPM range for any given volume of displacement.
- A Haight universal pump requires, on average, 46,720 fewer revolutions **per operating hour** for a given volume of displacement.

THE HAIGHT ADVANTAGE


24U 50 SSU
ℓpm
m³/hr
75.7
4.5
56.8
3.4
37.9
2.3
18.9
1.1
0
0
950 rpm
1140 rpm
1425 rpm
1740 rpm
0 PSI
50 PSI
250 PSI
(0 bar)
(3.4 bar)
(17.2 bar)
20
15
10
5
0
gpm
3.7
3.0
2.2
1.5
.75
kW
250 PSI
200 PSI
150 PSI
100 PSI
50 PSI
0 PSI
(17.2 bar)
(13.8 bar)
(10.3 bar)
(6.9 bar)
(3.4 bar)
(0 bar)
5.0
4.0
3.0
2.0
1.0
bhp
600
800
1000
1200
1400
1600
1800
PUMP SPEED - RPM
( )=Differential pressure in bars

TeSys™
U-Line Motor Starters

Catalog

03

File 8502

CONTENTS

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Telemecanique

LUB12

The U-Line motor starter consists of one power base (selected from this page) and one control unit (select from page 20 or 21) as a minimum. The power bases connect by one of two control circuit methods:

- With screw clamp terminals
- Without screw clamp terminals

Each power base with control circuit screw clamp terminals includes one N.O. and one N.C. auxiliary contact to indicate the open or closed position of the power contacts.

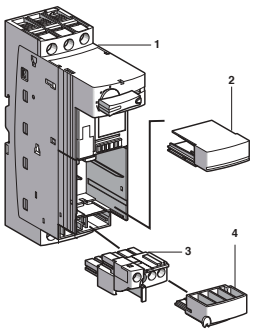
When ordering power bases without control circuit screw clamp terminals (i.e., when building a reversing unit or pre-wiring the low voltage control), the terminal assemblies must be ordered separately.

LUB•20

Full Voltage, Non-Reversing for Standard Applications

Control Connection	Max. Current (Amps)	Three Phase (hp max.)				Single Phase (hp max.)		Self-Protected Starter Base	Starter Base	Weight lb (kg)
		200/208 V	220/240 V	460 V	575/600 V	120 V	240 V	Catalog Number	Catalog Number	
With screw terminations	12	3	3	7.5	10	1.5	2	**LUB12**	**LUS12**	1.98 (0.900)
	32	10	10	20	25	2	5	**LUB32**	**LUS32**	1.98 (0.900)
Without q terminations	12	3	3	7.5	10	1.5	2	**LUB120**	**LUS130**	1.90 (0.865)
	32	10	10	20	25	2	5	**LUB320**	**LUS320**	1.90 (0.865)

Full Voltage, Non-Reversing for Use with High Density PLC Cards (100 mA)



Control Connection	Max. Current (Amps)	Three Phase (hp max.)				Single Phase (hp max.)		Self-Protected Starter Base	Starter Base	Weight lb (kg)
		200/208 V	220/240 V	460 V	575/600 V	120 V	240 V	Catalog Number	Catalog Number	
With screw terminations	12	3	3	7.5	10	1.5	2	**LUB12BH**	**LUS12BH**	1.98 (0.900)
	32	10	10	20	25	2	5	**LUB32BH**	**LUS32BH**	1.98 (0.900)
Without q terminations	12	3	3	7.5	10	1.5	2	**LUB120BH**	**LUS130BH**	1.90 (0.865)
	32	10	10	20	25	2	5	**LUB320BH**	**LUS320BH**	1.90 (0.865)

Terminal Blocks for Non-Reversing Power Bases without Terminations LUB••0, LUS••0

Control Connection	For Use On	Item	Catalog Number	Weight lb (kg)
With screw terminations	LUB120/LUB320 LUS120/LUS320	3 + 4	**LU9BN11**	0.10 (0.45)

q Must order LU9BN11, LU9BN11C, LU9MRC or LU9MR1C.

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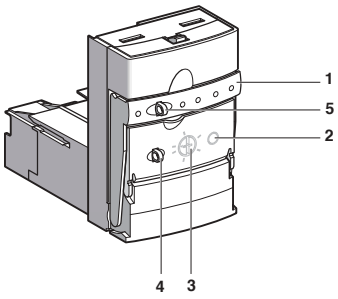
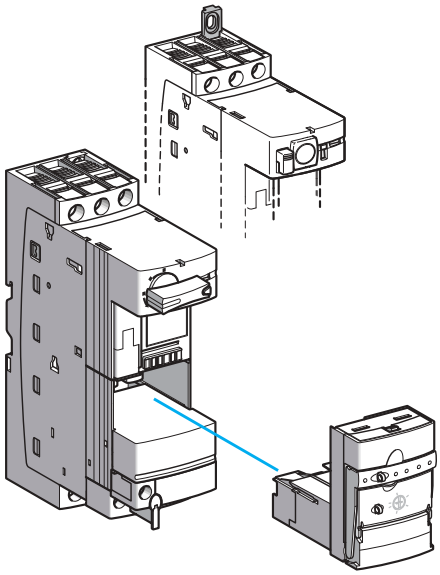
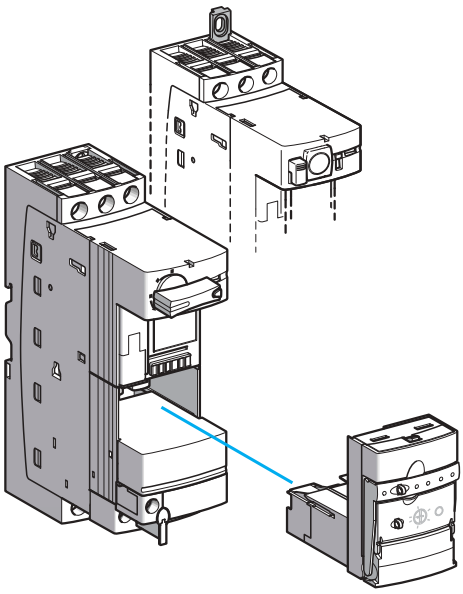




LUCAkkkk



LUCBkkkk

Standard and Advanced Control Units

Description	
1	Extraction and locking handle
2	Test button (on advanced control unit only)
3	Adjustable FLA dial
4	Locking of settings by sealing the transparent cover
5	Sealing of locking handle

Standard, 3-Phase, Class 10 Overload Protection

Setting Range (Amps)	Used with power bases	Catalog Number	Weight lb (kg)
0.15–0.6	LUkB12, LUkB32, LUkS12, LUkS32	**LUCAX6** q	0.30 (0.135)
0.3–1.4	LUkB12, LUkB32, LUkS12, LUkS32	**LUCA1X** q	0.30 (0.135)
1.25–5.0	LUkB12, LUkB32, LUkS12, LUkS32	**LUCA05** q	0.30 (0.135)
3–12	LUkB12, LUkB32, LUkS12, LUkS32	**LUCA12** q	0.30 (0.135)
4.5–18	LUkB32, LUkS32	**LUCA18** q	0.30 (0.135)
8–32	LUkB32, LUkS32	**LUCA32** q	0.30 (0.135)

Advanced, 3-Phase, Class 10 Overload Protection

Setting Range (Amps)	Used with power bases	Catalog Number	Weight lb (kg)
0.15–0.6	LUkB12, LUkB32, LUkS12, LUkS32	**LUCBX6** q	0.31 (0.140)
0.3–1.4	LUkB12, LUkB32, LUkS12, LUkS32	**LUCB1X** q	0.31 (0.140)
1.25–5.0	LUkB12, LUkB32, LUkS12, LUkS32	**LUCB05** q	0.31 (0.140)
3–12	LUkB12, LUkB32, LUkS12, LUkS32	**LUCB12** q	0.31 (0.140)
4.5–18	LUkB32, LUkS32	**LUCB18** q	0.31 (0.140)
8–32	LUkB32, LUkS32	**LUCB32** q	0.31 (0.140)

Advanced, Single Phase, Class 10 Overload Protection

Setting Range (Amps)	Used with power bases	Catalog Number	Weight lb (kg)
0.15–0.6	LUkB12, LUkB32, LUkS12, LUkS32	**LUCCX6** q	0.31 (0.140)
0.3–1.4	LUkB12, LUkB32, LUkS12, LUkS32	**LUCC1X** q	0.31 (0.140)
1.25–5.0	LUkB12, LUkB32, LUkS12, LUkS32	**LUCC05** q	0.31 (0.140)
3–12	LUkB12, LUkB32, LUkS12, LUkS32	**LUCC12** q	0.31 (0.140)
4.5–18	LUkB32, LUkS32	**LUCC18** q	0.31 (0.140)
8–32	LUkB32, LUkS32	**LUCC32** q	0.31 (0.140)

Advanced, 3-Phase, Class 20 Overload Protection

Setting Range (Amps)	Used with power bases	Catalog Number	Weight lb (kg)
0.15–0.6	LUkB12, LUkB32, LUkS12, LUkS32	**LUCDX6** q	0.31 (0.140)
0.3–1.4	LUkB12, LUkB32, LUkS12, LUkS32	**LUCD1X** q	0.31 (0.140)
1.25–5.0	LUkB12, LUkB32, LUkS12, LUkS32	**LUCD05** q	0.31 (0.140)
3–12	LUkB12, LUkB32, LUkS12, LUkS32	**LUCD12** q	0.31 (0.140)
4.5–18	LUkB32, LUkS32	**LUCD18** q	0.31 (0.140)
8–32	LUkB32, LUkS32	**LUCD32** q	0.31 (0.140)

q Complete the catalog number by selecting the proper voltage code from the table below.

Voltage Codes

Volts	24	48–72	110–240
DC	BLfa	–	–
AC	B	–	–
DC or AC	–	ES p	FU

f Voltage code to use for a power base with a communication module.
a DC voltage with range of 0.90 to 1.10 of nominal.
p 48–72 Vdc; 48 Vac

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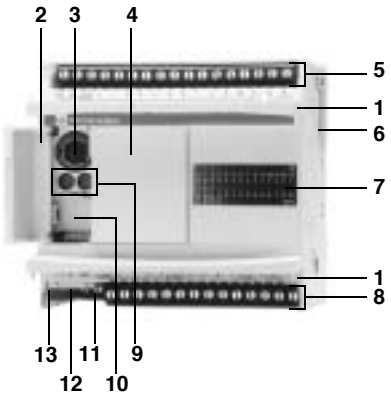
Programmable controller
Twido

Catalog
January
05

a brand of Schneider Electric

Telemecanique

Twido programmable controller
Compact base controllers



Description

Twido **TWD LC●A ●●DRF** and **TWD LCA● 40DRF** compact programmable base controllers comprise :

1 Two hinged connection terminal block covers for access to the terminals

2 A hinged access door

3 A mini-DIN type RS 485 serial port connector (allowing connection of the programming terminal)

4 A slot (protected by a removable cover) for digital diagnostic/maintenance display module TWD XCP ODC

5 A screw terminal block for ⎓ 24 V supply to the sensors and for connection of the input sensors

6 A connector for I/O expansion modules TWD D●●, TWD A●● and TWD NOI 10M3 (maximum of 4 modules on 24 I/O base controllers and 7 modules on 40 I/O base controllers)

7 A display block showing:
- the status of the controller (PWR, RUN, ERR and STAT)
- the inputs and outputs (IN● and OUT●)

8 A screw terminal block for connection of the output pre-actuators

9 Two analog adjustment points (one point for 10 and 16 I/O models)

10 An extension connector for the addition of a 2nd RS 232C/RS 485 serial port using adapter TWD NAC ●●● (for 16 and 24 I/O models)

11 A screw terminal block for connection of the ∿ 100...240 V mains or ⎓ 19.2...30 V power supply

12 A connector (access through the bottom of the controller) for:
- memory cartridge TWD XCP MFK32 or real-time clock cartridge TWD XCP RTC for base controllers TWD LC●A ●●DRF
- memory cartridge TWD XCP MFK64 and built-in real-time clock TWD XCP RTC for base controllers TWD LCA● 40DRF

13 An RJ45 connector (access through the bottom of the controller) for connection to the Ethernet network, only on base controller TWD LCAE 40DRF

Compact base controllers are mounted on a symmetrical ⊓⎽⊓ rail. Mounting kit TWD XMT5 (supplied in lots of 5) allows plate or panel mounting (2 x Ø 4.3 holes).

Twido programmable controller
Compact base controllers

TWD LC●A 10DRF/16DRF

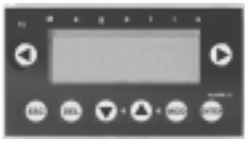
References

Number of I/O	Inputs sink/source	Outputs	Program memory	Reference	Weight kg
Compact base controllers, ∿ supply					
10 I/O	6 ⎓ 24 V inputs	4 relay outputs	700 instructions	**TWDLCAA10DRF**	0.230
16 I/O	9 ⎓ 24 V inputs	7 relay outputs	2000 instructions	**TWDLCAA16DRF**	0.250
24 I/O	14 ⎓ 24 V inputs	10 relay outputs	3000 instructions	**TWDLCAA24DRF**	0.305
40 I/O	24 ⎓ 24 V inputs	14 relay outputs and 2 transistor outputs	3000 instructions *(1)*	**TWDLCAA40DRF**	0.525
				TWDLCAE40DRF *(2)*	0.525
Compact base controllers, ⎓ supply					
10 I/O	6 ⎓ 24 V inputs	4 relay outputs	700 instructions	**TWDLCDA10DRF**	0.230
16 I/O	9 ⎓ 24 V inputs	7 relay outputs	2000 instructions	**TWDLCDA16DRF**	0.250
24 I/O	14 ⎓ 24 V inputs	10 relay outputs	3000 instructions	**TWDLCDA24DRF**	0.305

TWD XCP MFK32/RTC

TWD NAC ●●●●

TWD XCP ODC



XBT N401

ASI ABLM3024

Separate components *(3)*

Description	Application	Type	Reference	Weight kg
32 Kb memory cartridge	For all base controllers Application backup Program transfer	EEPROM	**TWDXCPMFK32**	0.005
64 Kb memory cartridge	For base controllers TWD LCA● 40DRF Memory extension Application backup Program transfer	EEPROM	**TWDXCPMFK64**	0.005
Real-time clock cartridge	Date-stamping RTC based programming	–	**TWDXCPRTC**	0.005
Serial interface adapters	See page 41	–	**TWDNAC●●●●**	–
Digital display	Data display and modification	–	**TWDXCPODC**	0.020
Input simulators	6 inputs	–	**TWDXSM6**	–
	9 inputs	–	**TWDXSM9**	–
	14 inputs	–	**TWDXSM14**	–
External backup batteries	For base controllers TWD LCA● 40DRF	Sold singly	**TSXPLP01**	–
		Sold in lots of 10	**TSXPLP101**	–
Mounting kit (Sold in lots of 5)	For plate or panel mounting of compact base controllers or extensions	–	**TWDXMT5**	–

Magelis compact displays

Description	Protocol	Compatible with PLC types	Supply voltage	Reference	Weight kg
Compact display, 2 lines of 20 characters (alphanumeric display)	Uni-Telway, Modbus	Twido, Nano, TSX Micro, Premium	⎓ 5 V by terminal port on PLC	**XBTN200**	0.360
Compact displays, 4 lines of 20 characters (matrix display)	Uni-Telway, Modbus	Twido, Nano, TSX Micro, Premium	⎓ 5 V by terminal port on PLC	**XBTN400**	0.360
		Twido *(4)* Nano, TSX Micro, Premium, TSX series 7, Momentum, Quantum Other Modbus slave modules	⎓ 24 V external source	**XBTN401**	0.360
Display connection cable	Uni-Telway, Modbus	Twido, Nano, TSX Micro, Premium	–	**XBTZ978**	0.180

Phaseo regulated switch mode power supply

Description	Input voltage 47…63 Hz	Output voltage	Nominal power	Nominal current	Auto-protect reset	Reference	Weight
	V	⎓ V	W	A			kg
Regulated switch mode power supply for AS-Interface cabling system *(5)*	∿ 100…240 single-phase wide range	30 + 24	2 x 72	2.4 + 3	Auto	**ASIABLM3024**	1.300

(1) 6000 instructions with memory extension cartridge TWD XCP MFK64.
(2) Base controller equipped with an integrated Ethernet link (RJ45 port).
(3) Other separate components, see page 46
(4) Connection via built-in port or via optional serial port on Twido programmable controllers.
(5) Without ground fault detection.

The Essential Guide

Magelis™ Human Machine Interfaces

2011

Make the most of your energy℠

Schneider Electric™

Magelis STO with graphic screen

Type		Specifications		
Display	LCD screen size/resolution	3.4"/monochrome (200 X 80 pixels)		
	Type	Green, orange, red	White, pink, red	Green, orange, red
Functions	Representation of variables	Alphanumeric, bitmap, bar graph, gauge, button, light, clock, flashing light, keypad		
	Curves/alarm logs	Yes, with log/Yes, incorporated		
Communication	Serial link	1 RJ45 (RS 232 – RS 485)		1 Terminal Block RS232
	Networks	—	—	—
Communication protocols		Mitsubishi (Melsec), Omron (Sysmac), Rockwell Automation (Allen Bradley), Siemens (Simatic), Uni-TE, Modbus™, Modbus TCP		Zelio™
Development software		Vijeo Designer VJD•••TG•V••M (on Windows XP, Vista and 7 – 32 bit only) or Vijeo Designer Limited Edition		
Dimensions W x D x H (mm)		116.5 x 38.5 x 77.5		
Compatibility with PLCs		Twido™, Modicon™ TSX Micro™, Modicon Premium™, Modicon Quantum™, Modicon M340™		Zelio
CompactFlash card slot		No		
USB port		1 host type A + 1 Device type miniB		
Built-in Ethernet TCP/IP		No		
Supply voltage		24 VDC		
References		HMISTO511	HMISTO512	HMISTO501

Magelis STU with graphic screen

Type		Specifications	
Display	LCD screen size/resolution	3.5"/QVGA (320 X 240 pixels)	5.7"/QVGA (320 X 240 pixels)
	Type	TFT 65 536 colors	
Functions	Representation of variables	Alphanumeric, bitmap, bar graph, gauge, button, light, clock, flashing light, keypad	
	Curves/alarm logs	Yes, with log/Yes, incorporated	
Communication	Serial link	1 RJ45 (RS 232 – RS 485)	
	Networks	Ethernet, IEEE 802.3, 10/100 BASE-T, RJ45	
Communication protocols		Mitsubishi (Melsec), Omron (Sysmac), Rockwell Automation (Allen Bradley), Siemens (Simatic), Uni-TE, Modbus, Modbus TCP	
Development software		Vijeo Designer VJD•••TG•V••M (on Windows XP, Vista and 7 – 32 bit only) or Vijeo Designer Limited Edition	
Dimensions W x D x H (mm)		Front: 98 x 16 x 81	Front: 163 x 17.5 x 129.5
		Rear: 118 x 30 x 98	
Compatibility with PLCs		Twido, Modicon TSX Micro, Modicon Premium, Modicon Quantum, Modicon M340	
CompactFlash card slot		No	
USB port		1 host type A + 1 Device type miniB	
Built-in Ethernet TCP/IP		Yes	Yes
Supply voltage		24 VDC	
References		HMISTU655	HMISTU855

Tank Supply & Return Valves

DM2500 Series

Flanged Ball Valves

SPECIFICATIONS

Available in stainless steel or carbon steel

- Body and ends are investment cast
- Self-adjusting stem packing
- Blow-out proof stem design
- 100% air tested under water at 100 psi
- Working pressure ANSI 150
- Temperature range: -40°F to +450°F
- ISO 5211 mounting pad
- End cap type: flanged end (ANSI 150)
- Flange dimension: face-to-face ANSI B16.10; flange connection ANSI B16.50
- Silicone free
- Oxygen cleaned option

Size	Breakaway Torque (in-lb)	Cv	Weight
1/2"	50	32	9
3/4"	75	54	10
1"	100	105	12
1-1/2"	185	275	18
2"	300	460	25
2-1/2"	450	780	36
3"	750	1330	50
4"	1100	2420	69
6"	3500	5400	189

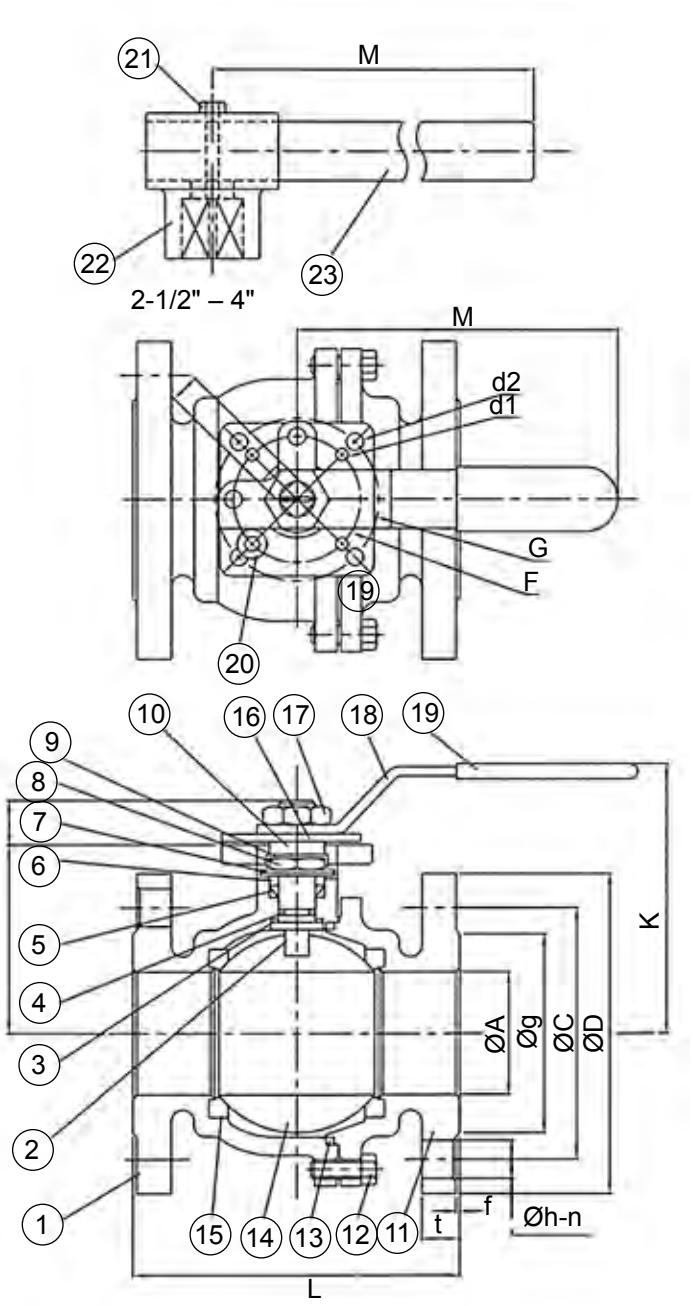
ORDERING SCHEMATIC

Series	Body		Port		Packing		Seat		Ends	
DM25	23	Carbon Steel	F	Full	C	Carbon/Teflon	C	Carbon	F1	Flanged 150
	33	Stainless Steel	R	Reduced	G	Graphite	T	Teflon	F3	Flanged 300
	44	Alloy 20			T	Teflon	TM	Super Teflon		
	77	Hastelloy					TC	Carbon Super Teflon		
	99	Duplex					M	Metal Seated		

J Flow Controls

J Flow Controls, LLC
14 De Camp • Cincinnati, OH 45216
Phone: 513-731-2900 • Fax 513-731-6939
www.jflowcontrols.com

DIMENSIONS (1/2" – 4")



MATERIALS OF CONSTRUCTION

No.	Name of Part	Material Options	
		~~Stainless Steel~~	Carbon Steel
1	Body	~~CF8M/DIN 1.4408~~	WCB/DIN 1.0619
2	Stem	SS316	
3	Thrust Washer	Teflon	
4	O-Ring	Viton	
5	Stem Packing	Graphite	
6	Gland	SS304	
7	Disc Washer	SS01	
8	Stem Nut	SS304	
9	Nut Lock	SS04	
10	Washer	SS304	
11	Flange Cap	~~ASTM A351 Gr. CF8M~~	ASTM A216 Gr. WCB
12	Bolts	~~SS304~~	Carbon Steel
13	Gasket	Graphite	
14	Ball	SS316	
15	Ball Seats	Teflon	
16	Stopper	SS304	
17	Handle Nut	SS304	
18	Handle	SS304	
19	Handle Cover	Vinyl Plastisol	
20	Position Pin	SS304	
21	Set Bolt	SS304	
22	Lever Head	CF8	
23	Lever	Steel Pipe	

Size	A	B	E	L	H	K	M	F	G	d1	d2	D	Flange Dimensions (Class 150)					
													Bolt Hole					
													c	h	n	t	g	f
1/2"	0.59	1.89	0.43	4.25	0.35	3.15	5.12	1.42	1.65	0.24	0.24	3.50	2.38	0.63	0.16	0.45	1.38	0.06
3/4"	0.79	2.09	0.43	4.61	0.35	3.15	5.12	1.42	1.65	0.24	0.24	3.86	2.76	0.63	0.16	0.45	1.69	0.06
1"	0.98	2.32	0.55	5.00	0.43	3.54	6.50	1.65	1.97	0.24	0.28	4.25	3.13	0.63	0.16	0.45	2.01	0.06
1-1/4"	1.26	2.80	0.55	5.51	0.43	4.02	6.50	1.65	1.97	0.24	0.28	4.61	3.50	0.63	0.16	0.50	2.52	0.06
~~1-1/2"~~	~~1.42~~	~~2.99~~	~~0.71~~	~~6.50~~	~~0.55~~	~~4.33~~	~~8.07~~	~~1.97~~	~~2.76~~	~~0.28~~	~~0.36~~	~~5.00~~	~~3.88~~	~~0.63~~	~~0.16~~	~~0.56~~	~~2.87~~	~~0.06~~
2"	1.97	3.35	0.71	7.00	0.55	4.72	8.07	1.97	2.76	0.28	0.36	5.98	4.74	0.75	0.16	0.63	3.62	0.06
2-1/2"	2.56	3.68	0.91	7.48	0.67	5.51	11.8	2.76	4.02	0.36	0.45	7.01	5.50	0.75	0.16	0.70	4.13	0.06
3"	3.15	4.06	0.91	7.99	0.67	5.91	13.4	2.76	4.02	0.36	0.45	7.48	6.00	0.75	0.16	0.75	5.00	0.06
4"	3.94	5.20	0.98	9.02	0.87	7.09	16.5	4.02	4.92	0.45	0.53	9.02	7.50	0.75	0.31	0.94	5.00	0.06

231113 Phillips Fill System and Diversion Controller

US Embassy London
Fuel Oil Submittal
231113
BL Harbert International
120080

Phillips Fuel Systems

109 Holland Ave Bridgeport CT, USA 06605
Phone: (203)-908-3323 Fax: (203)-908-3325

FPC4-130062

Fuel off-loading station controller, four (4) tanks, 230V/ 1Ø/ 50Hz/ 15A

London

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By acceptance of this package, it is understood that Phillips Fuel System Inc shall be responsible for only those items indicated herein and unless otherwise noted. The signatory whose signature appears is duly authorized by all necessary and appropriate action to execute approval and will all abide by Phillips Fuel Systems Inc standard sales terms and conditions and be responsible for verifying correctness of the type, size, location, operation, electrical requirements, piping, accessories or any other requirements for successful operation. It is further understood that by acceptance of this package, Phillips Fuel System Inc will not be held liable for any deviation or omission from any quotation and/or specification. Phillips Fuel System Inc reserves the right, without approval, to rearrange components or substitute, due to lack of availability, quality and/or performance, any component indicated herein with a compatible component, as long as that component is of the same quality and general design.

Approved _____ Date _____

Approved _____ Date _____

Approved _____ Date _____

PHILLIPS FUEL SYSTEMS INC LIMITED WARRANTY FOR NEW PUMPS OR PUMPING SYSTEMS MANUFACTURED BY PHILLIPS FUEL SYSTEMS INC

A. PRODUCTS WARRANTED - Phillips Fuel System Inc, subject to the limitations contained below, will at its option, repair or replace, without charge for parts or labor only, any part or parts of a new pump or system manufactured by PHILLIPS FUEL SYSTEMS which is found, upon examination by PHILLIPS FUEL SYSTEMS INC at it's factory in Bridgeport, Ct. or by its designated affiliate, to be DEFECTIVE IN MATERIAL AND/OR WORKMANSHIP if determined by such examination within twelve months from the date of sale to the original consumer purchaser.

B. PRODUCTS AND ITEMS NOT WARRANTED - The provisions of this warranty shall not apply to any equipment, part or accessory which:
(a) has been improperly specified by buyer;
(b) has been improperly stored or handled prior to placing in service;
(c) has been improperly mounted, installed or connected, altered or modified in any way.
(d) has not been operated within specifications as stated on its nameplate, label, placard, or within its operating manual;
(e) has not been properly maintained;
(f) parts supplied by buyer for inclusion in finished equipment are not covered by this warranty;
(g) components or assemblies specified by buyer with no substitution permissible that are not normally used by Phillips Fuel System Inc are not covered by this warranty;
(h) that interfaces with, controls or is controlled by any device that has not been approved by Phillips Fuel System Inc

Phillips Fuel System Inc reserves the right to reject warranty claims of any kind against assembled equipment, parts or material for which Phillips Fuel System Inc has not received payment in full and for any system which was not authorized for start up and use by Phillips Fuel System Inc or by its designated affiliate. Should buyer, at his own risk, elect to replace failed equipment or parts in the field rather than obtain start up service under this warranty, Phillips will supply and invoice parts at normal prices upon receipt of buyer's bonafide purchase order. Failed equipment or parts returned for in-warranty crediting in exchange for replacement parts must be returned within 45 days from date of shipment of replacement in order to qualify for warranty consideration.

This warranty is extended to the original buyer only and is not transferable to subsequent buyers. This warranty is available for installations in the forty-eight contiguous U.S. states only.

C. SECURING WARRANTY SERVICE - Warranty service can be arranged by contacting PHILLIPS FUEL SYSTEMS INC, c/o Service Manager, 109 Holland Ave, Bridgeport, Ct 06605. Warranty service can only be performed by Phillips Fuel System Inc at its factory in Bridgeport, Ct or by its designated affiliate. At the time of requesting warranty service, evidence must be presented of the date of sale to the original consumer purchaser. The purchaser shall pay any charges for making service calls and/or for transporting the product to and from the place where the inspection and/or warranty work is performed. The purchaser shall be responsible for any damage or loss incurred in connection with the transportation of the system and/or of part or parts of the system, submitted for inspection and/or warranty work.

D. NO ADDITIONAL WARRANTIES OR REPRESENTATIONS - The foregoing EXPRESSED WARRANTY IS IN LIEU OF ALL OTHER EXPRESSED WARRANTIES. Neither Phillips Fuel System Inc nor any of its affiliates make any warranties, representations or promises, written or verbal, as to the quality of the system or its parts other than those set forth herein.

ANY IMPLIED WARRANTIES (INCLUDING, BUT NOT LIMITED TO MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE) TO THE EXTENT EITHER APPLIES TO PART OR PARTS OF A SYSTEM SHALL BE LIMITED IN DURATION TO THE PERIODS OF THE EXPRESSED WARRANTIES AS DEFINED IN PARAGRAPH A. Some states do not allow limitations on how long an implied warranty lasts, so the above limitations may not apply.

E. DAMAGES - IN NO EVENT WILL PHILLIPS PUMPS BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES AND/OR EXPENSES. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation may not apply to you. This warranty gives you specific legal rights and you may have other legal rights which vary from state to state.

F. NO DISTRIBUTOR DEALER WARRANTY - PHILLIPS FUEL SYSTEM INC neither assumes nor authorizes any other person, natural or corporate, to assume any other obligations or liabilities in connection with or with respect to any part or parts of a system. The seller, dealer or distributor of part or parts has no authority to make any representations or promises on behalf or PHILLIPS FUEL SYSTEMS INC or to modify the terms or limitations of this warranty in any way. The seller, dealer or distributor makes no warranty of his own on any item warranted by PHILLIPS FUEL SYSTEMS and makes no warranty on other items, unless such seller or dealer delivers to the purchaser a separate written warranty document in which the seller or the dealer individually and specifically on its own behalf, warrants the terms or items.

SECTION I INTRODUCTION

1-1. This bulletin provides general instructions for the installation, start up and operation of the IP series off-loading system manufactured by Phillips Fuel Systems, Bridgeport, Connecticut. This Phillip's off-loading system is designed to transfer fuel from gravity trucks to an above ground fuel storage tank, to control the filling operation to prevent overfilling of the tank, and allow for full draining of the truck delivery hose.

1-2. After carefully uncrating or unpacking, check the equipment against the shipping papers and inspect for damage incurred during shipment. Immediately notify the carrier of any damage or shortage found. Upon receipt of the system, inspect the package for any signs of damage before signing the bill of lading. If there is any visible damage, immediately notify the shipping company. Remove the top cover and inspect for possible damage that might have occurred during shipment. All products are inspected at the point of shipment to ensure they are free from any defects and are in good working condition. Dropping and other rough handling in transit could place stress or break welds and plumbing joints that will result in failure. Electrical components or hardware may become loose during shipping. Check to ensure that the units arrive in good condition.

1-3. The type and size of the IP series off-loading system was selected to meet requirements specified by purchaser. Among the more important are these:

Type of Liquid	Temperature, Viscosity, Specific Gravity
Flow Rate	Suction Pressure or Lift
Total Head	Type Driver
Motor and its electric power supply	

If any one of these requirements has changed since the order was placed, particularly the suction condition, we strongly recommend that such change be reviewed with a Phillips representative. If the performance curve previously furnished has been lost, the representative will furnish another copy.

WARNING

Do not operate this system at any pressure or flow rate other than those for which the system was originally purchased. Do not pump any other liquid than the one for which the system was originally purchased without the consent of Phillips Fuel System or its authorized representatives. Disregarding this warning can result in system failure and serious personal injury or death.

CAUTION

Operation of the off-loading under conditions differing widely from those for which the system selection was based may result in reduced parts life.

SECTION II INSTALLATION

2-1. LOCATION. Select a location for the transfer unit which will:

(A) Be clean, well ventilated, properly drained and provide accessibility for inspection and maintenance (see out line drawing for dimension). Outdoor installations may require protection from the elements, particularly freezing.

(B) The suction supply system must provide the unit with fluid equal to or greater than that required by the unit.

2-2. FOUNDATION. Concrete (reinforced as necessary or required) is most widely used for the foundation. In sufficient mass, it provides rigid support, which minimizes deflection and vibration. It may be located on soil, structural steel or building floors, provided the combined weight of the system and foundation does not exceed the allowable bearing load of the support. Allowable bearing loads of structural steel and floors can be obtained from engineering handbooks; building codes of local communities give the recommended allowable bearing loads for different types of soil.

2-3. Before pouring the foundation, locate the foundation bolts by the use of a template frame and provide anchorage as shown in Figure 1. See the outline drawings furnished with each system for the exact location of the foundation bolts. When pouring, allow for a grout thickness of 3/4 to 1 1/2 inches. Roughen top surface to provide a good bond of the grout. Ordinarily, the proportions used as 1 part cement to 3 parts sand and 4 parts medium aggregate.

CAUTION

Use qualified personnel (riggers) to lift or move unit at any time. Never lift unit using hooks or slings on the units. Never place eyebolts in tapped holes except for removal of a part to perform service work.

When the unit is received, it should be placed on the foundation. The unit should be supported on rectangular metal blocks and shims or on metal wedges having a small taper. In each case the supports should be directly under the part of the support legs carrying the greatest weight and spaced closely enough to give uniform support. Adjust the metal supports or wedges until the system is at a slight angle to prevent water from collecting anywhere. The system should be bolted down before any piping is installed. Flexible braided hose of suitable size and pressure rating should be used to connect the system to the fuel piping. Failure to connect to piping with flexible hose will violate the manufacture's warranty with regards to leaks.This should eliminate any piping stresses due to misalignment.

The system should be placed so that the various fuel connections can be easily connected and inspected. Remove the shipping plugs from all connection fittings.

CAUTION

REMOVE ANY PLASTIC PLUGS AND CAPS. Phillips systems may be shipped with plastic plugs, caps or other type of fittings to protect the ports and piping from damage. These need to be removed. The ports and drains not in use should plugged or capped with fitting made of a material compatible with the liquid being stored.

2-4. PIPING. All fuel piping should be of black iron pipe. Flexible braided hose of suitable size and pressure rating should be used to connect the system to the fuel piping. Failure to connect to piping with flexible hose will violate the manufacture's warranty with regards to leaks. Brass, copper, or galvanized pipe can cause decomposition of fuel over extended periods of time. Pipe sizes should follow standard recommendations based on ratings plus distance and elevation between the system and the main tank. All should be arranged for the simplest, most direct layout, to be of sufficient size and be internally free of foreign material. The piping must never be pulled into position by tightening it to the system's discharge port. It must be independently supported and arranged so that expansion and contraction, due to temperature changes, will not cause misalignment. The piping, if not installed properly, is a potential source of faulty operation. To achieve best performance, provide for the following:

(A) Suction and discharge lines must be kept absolutely free from air leaks.

(B) Piping must be at least the same size as the pumping systems suction inlet and discharge. The piping layout at all points should not contain loops or high spots in which air can be trapped.

(C) Any strainer screen must be checked and cleaned periodically.

(D) Piping should be cleaned mechanically and chemically, and flushed prior to installing the system. A large number of pump mechanical seal and seizure troubles are due to improperly cleaned systems.

2-5. ELECTRICAL - Connect switches and other devices to the terminal strips in the control panel as indicated on the electrical wiring diagram further on in the booklet. These points are located on easily accessible terminal strips inside the system's controller. Power requirements and connections depend upon the number and types of options included with the system. Please refer to the job specific wiring schematic and the component wiring diagram included within. Using #18 AWG or larger to connect any float switches or float switch assemblies as shown. Using #18 AWG or greater shielded wire to connect level transducers or to connect with third party tank gauging.

2.6. GROUNDING - Connect to an earth ground using the threaded ground stud in the system's control panel and connect ground wires from IP system to the above ground storage tank by suitable means.

2-7. VALVES - Install all valves per manufacturers recommendation. *All solenoid valves and/or motorized ball valves must be installed with the coils in the horizontal position.* When discharge piping is connected to valve outlet, make sure the valve is not connected to any discharge pipe that contains pressure before the valve opens or to any pipe where there is pressure build-up. Valve discharge piping, other than a short tailpipe, must be supported. Isolation ball valves should be placed on each side of the fill valve between the valve and the pipe so a damaged valve can be removed from service.

2.8 . MOTOR - Properly selected and installed motors are capable of operating for years with little maintenance. However they must be periodically cleaned around the vent opening, preferably with a vacuum. Periodically check all electrical connections are tight and are not frayed, split or damage. Oil and maintain as recommended by the motor manufacturer.

The rotation for single phase motors is factory set. The rotation for three phase motors however must be set in the field during installation. Check and set the motor rotation by observing the pump's shaft rotation. Rotation should be counterclockwise as viewed from the pump suction end (clockwise from the motor fan cover end). There is an arrow on the front cover of the pump indicating the rotation direction.To view the rotation press the pump on then the pump off pushbutton located on the control panel to bump the pump. To change rotation, be sure that any customer supplied control power is OFF. Open the system's control panel inner door to access the control compartment and place the internal circuit breaker to OFF. Locate the motor starter labeled PUMP. On the bottom side the motor starter interchange the wires on #2 and #6. Be sure to retighten the terminals so that the wire is secure. (Note: The pump motor should only be bumped to check rotataion. If the pump is run for a long peroid of time without fuel, pump damage may occur)

Note - Some Phillips systems comes with a password code. This code is required in order for the system to operate after the trail period has expired. Please consult your Phillips representative.

Phillips Fuel Systems 109 Holland Ave., Bridgeport, Ct 06605		
TITLE: Fuel off-loading station controller, four tank, 230V/ 1Ø/ 50Hz/ 15A: London		
Part Number. **FPC4-130062**		REV
	NAME / DATE	
DRAWN		
SCALE: 1:8	WEIGHT:	SHEET 2 OF 4

X:\jobs\2013 Jobs\130062 London\ FPC4-130062 1/29/2014 11:04:22 AM

DO NOT SCALE DRAWING

Basic Operation

The system will allow the transfer of fuel when a Tank selector switch in in AUTO and will close that tanks motorized ball valve at 95% tank level.

NOTE: If the system cannot read or drops the signal from the tank level sensor, a NO LEVEL DETECTED - CHECK LEVEL SENSOR alarm will be displayed and system will not open the valve. The system is locked out from filling that tank until the alarm condition is cleared and the system is reset.

Tank Selection - [Tank 1, Tank 2, Tank 3 & Tank 4] The operator will establish the system's tank selection via the three position selector switch located on the front panel. If a Tank is in operation, its mode selector switch will be lit.

Tank AUTO - If a Main Tank selected as AUTO, the controller will open and hold open that tank's motorized ball valve as long as that tank's level is below 95%. If the tank level exceeds 95%, the motorized ball valve shall close, the panel mounted buzzer will sound and a TANK HIGH LEVEL alarm shall be displayed. The motorized ball valve shall not open until the level has been reduced to below 93% and the system has been RESET.

Tank OFF - If a Main Tank selected as OFF, the system will not open the motorized ball valve in that tank regardless of any alarm or signals.

Tank Manual - If a Main Tank selected as MANUAL, the system will open the motorized ball valve to that tank as long as that tank is selected in manual mode, regardless of any alarm or signals.

Storm Valve - The operator will establish the Storm valve's mode of operation selection via the three position selector switch located on the front panel. If the storm valve is open, its red indiactor light will be lit. If the storm valve is in closed, its green mode selector switch will be lit.

Storm Valve AUTO - If the Storm Valve is selected as AUTO, the controller will CLOSE the Storm Valve whenever any one of the tanks is switched to AUTO.

Storm Valve CLD - If the Storm Valve is selected as CLD (closed), the controller will not open the Storm Valve regardless of any alarm or signals.

Storm Valve OPN - If the Storm Valve is selected as OPN (open), the controller will not close the Storm Valve regardless of any alarm or signals.

By-Pass Valve - The operator will establish the By-Pass valve's mode of operation selection via the three position selector switch located on the front panel. If the By-Pass valve is closed, its red indiactor light will be lit. If the By-Pass valve is in open, its green mode selector switch will be lit.

By-Pass Valve AUTO - If the By-Pass Valve is selected as AUTO, the controller will OPEN the By-Pass Valve whenever any one of the tanks is switched to AUTO.

By-Pass Valve OPN - If the By-Pass Valve is selected as OPN (open), the controller will not close the By-Pass Valve regardless of any alarm or signals.

By-Pass Valve CLD - If the By-Pass Valve is selected as CLD (closed), the controller will not open the By-Pass Valve regardless of any alarm or signals.

Main Tank levels will be received via 4 to 20 mA signals from the Tank Management System (TMS). Tank level will be displayed in percent volume.

System Alarms

Tank High Level (95%) - If at any time during the transfer process, the tank has reached the high level limit, the system will lock close that tank's fill solenoid valve. The TANK HIGH LEVEL alarm will be displayed and system is locked out from opening to that tank until that tank's level is reduced and the system is RESET.

Tank Leak - The controller will monitor the tank gauging / leak detection system for a Tank summary leak alarm. If the controller should receive a normally open dry contact switch closure indicating that a leak in any of the main tanks has occurred, the system will not allow any tank's motorized ball valve to open until the alarm condition is cleared and the system is RESET.

Tank Level - Tank level of the selected tank is displayed in percent of volume. NOTE: If the system cannot read or drops the signal from the tank level sensor, a REESTABLISHING COMMUNICATIONS alarm will be displayed. If the system cannot read the signal in the next 60 seconds, a NO LEVEL DETECTED CHECK LEVEL SENSOR alarm will be displayed. The system is locked out from pumping to that tank until the alarm condition is cleared.

Valve Failure - The system will continually monitor the motorized ball valves to insure that all valves are in the correct position. If the system does not see a valve in the correct position (either open or closed) during operation within the predetermined time (25 seconds), the system will sound the alarm buzzer, display that main tank's VALVE FAILURE alarm. The system will not open that tank's motorized ball valve in the AUTO mode until the alarm is cleared (the valve position fault is fixed) and the system is RESET.

INITIAL SYSTEM START UP

NOTE: Flush the piping before connecting to the system set to avoid contaminating the valves with weld slag, threading chips and other construction debris.

CONFIRM CORRECT INSTALLATION -

1) Unit has be pad mounted on suitable pad that provides rigid support
2) Unit is locate is an area where it can be cleanned, is well ventilated, can be properly drained and has accessibility for inspection and maintenance

CONNECT EXTERNAL SWITCHES AND CHECK CONTROLS -

1) Connect switches and other external devices per the electrical diagram further in the booklet.

CHECK SYSTEM OPERATION -

1) Power up the system. Open the system's control panel inner door to access the control compartment and place the internal circuit breaker to ON. Close inner access door.

The system's display should light up and each tank's level should be displayed. Note: If a tank is empty and its level is zero, the system will display a NO LEVEL DETECTED ALARM and the panle mounted alarm will sound. This is normal until there is fuel inside a tank for the level sensor's to read. Pressing the RESET pushbutton will silence the alarm.

2) Receiveing the first delivery -

a. Unlock the fill box and connect the delivery hose to the selected hose coupling.

b. All the tanks should be selected as OFF when not being filled.

c. Select the STORM VALVE and BY-PASS VALVE as AUTO.

d. Select the selector switch of the tank to be filled to AUTO. The fill valve to that tank will open. The STORM VALVE will close. The BY-PASS VALVE will open. The system will auomatically confirm that the correct fill valve is open, and that the STORM and BY-PASS valves are in the correct position via position end switches located on each valve.

e. Open any valves on the transport.

f. On an initial start up, if there is no fuel in the tank(s), the system will display either a REESTABLISHING COMMUNICATIONS or a NO LEVEL DETECTED CHECK LEVEL SENSOR alarm. This is normal with empty tanks. Press the RESET pushbutton to start the fuel transfer. The selected tank's fill valve should open and fuel will start being transferred to the tank for 30 seconds. The NO LEVEL DETECTED CHECK LEVEL SENSOR alarm may occur numerous times until the system can register fuel level. Press the RESET pushbutton each time until the selected tank level is registered on the system's display and the alarm for that tank has cleared. On multi-tank systems it is advisable that all tanks be filled with some fuel to insure proper operation.

g. Delivery may be stopped at any time by selecteing that tank as OFF to close the selected tank's fill valve.

h. If the tank level exceeds 95%, the motorized ball valve shall close, the panel mounted buzzer will sound and a TANK HIGH LEVEL alarm shall be displayed. The motorized ball valve shall not open until the level has been reduced to below 93% and the system has been RESET.

Phillips Fuel Systems
109 Holland Ave., Bridgeport, Ct 06605

TITLE:
Fuel off-loading station controller, four tank, 230V/ 1Ø/ 50Hz/ 15A: London

Part Number.
FPC4-130062

REV

	NAME	DATE
DRAWN		

SCALE: 1:8 | WEIGHT: | SHEET 3 OF 4

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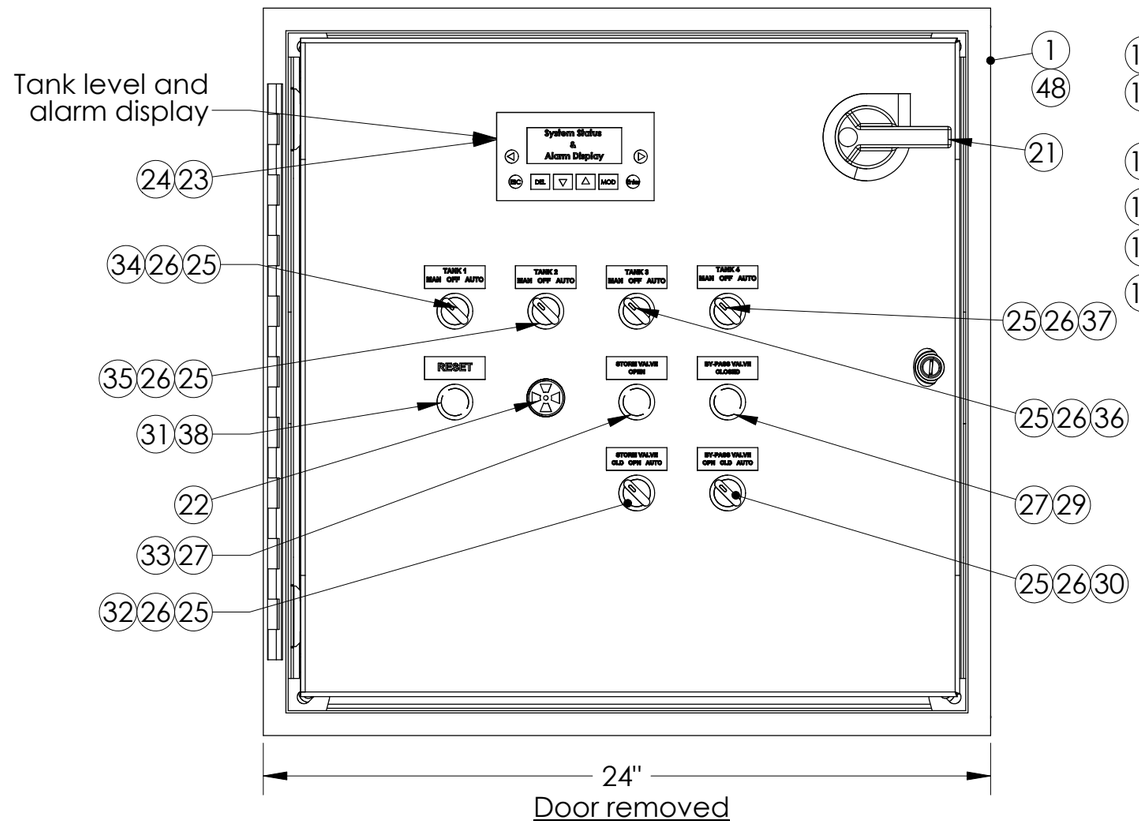
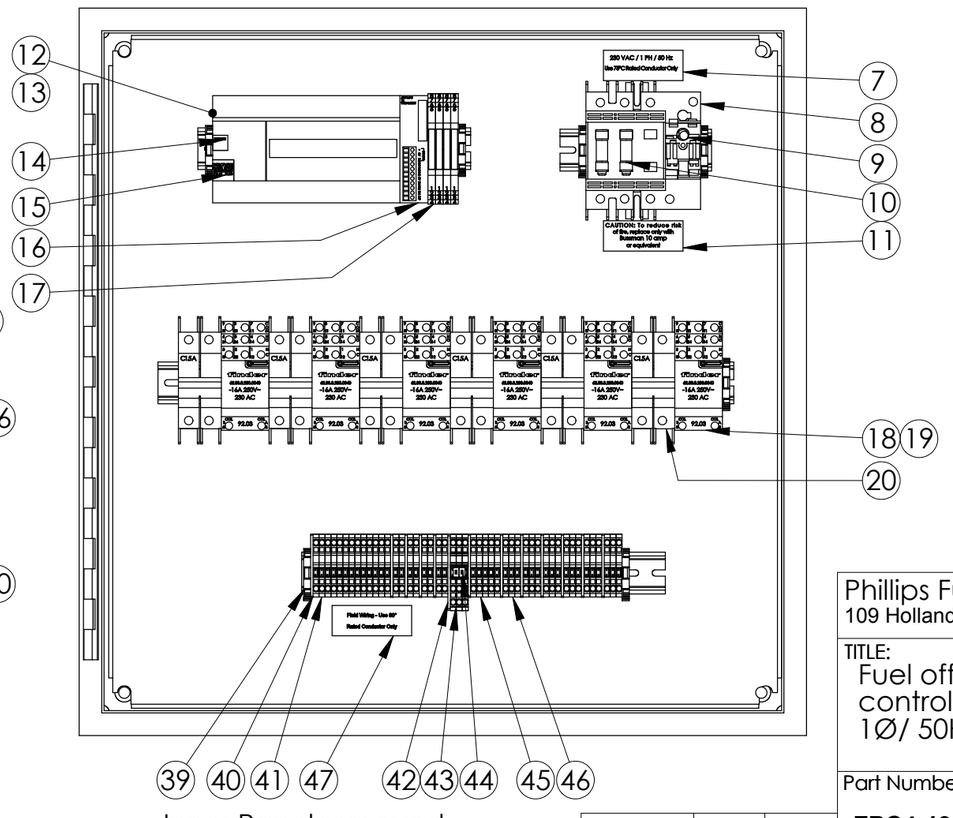
DO NOT SCALE DRAWING

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	HM-CSD242410	Enclosure, 24x24x12, NEMA 4,12	1
2	HM-CP2424	Back Plate, 24 x 24, CSD Series.	1
3	HM-CSPB2424	NEMA 12 Swing Panel 24" x 20", variable depth	1
4	HM-CAM104	Inner panel Mount Kit, 10"dp	1
5	HM-CSPBADB	Adjustable Bracket, Swing-Panel	1
6	HM-CWHK	NEMA 12 Encl Locking Handle	1
7	Label - 230-1-50	Label - 230 VAC, 1 PH, 50 Hz	1
8	SQ-GS1DDU3	30 AMP Fusible Disconnect Switch	1
9	SQ-GS1AE8	Disconnect shaft, 5mm sq. x 6.50" lg	1
10	LP-CC-10	Fuse 10 A, Reject Type, 600V	2
11	Label - Dis 10 Amp	Disconnect - Label - 10 Amp	1
12	TWDLCAA40DRF	PLC 24 IN / 14 OUT CPU, 100 240 VAC	1
13	TSXPLP01	Battery, backup, external, TWDLCA_40	1
14	TWDNAC485T	Modbus Auxiliary Card - R485 Interface	1
15	TWDXCPMFK32	Memory Cartridge, 32 kb	1
16	TWDAMI8HT	8 Input 0 20 mA analog Card	1
17	PX-2864406	4 ... 20 mA to 4 .. 20 mA isolator	4
18	FI-92.03	Relay Socket	6
19	FI-62.33.8.240.0040	Relay, Plug in style, 3PDT 16 A rated 230 VAC coil	6
20	C60N-60136	1.5 AMP 2 Pole Circuit Breaker	6
21	SQ-GS1AH120	GS1 Disconnect Handle	1
22	MC-09301-Q	Alarm Buzzer, 130-220 VAC	1
23	SQ-XBTN400	Operator interface & system status display	1
24	SQ-XBTZ978	Operator Interface Cable	1

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
25	SQ-ZB4BK1333	Switch, Green Illum, 3 Pos.	6
26	SQ-ZB4BW0M33	3 Position Selector Switch Base, Illuminated, Green, 240VAC	6
27	SQ-XB4-BVM4	Indicating LED, 240 VAC, Red	2
28	Nameplate	Product Nameplate	1
29	Nameplate2	By-Pass Valve- CLOSED	1
30	Nameplate2	By-Pass Valve- OPN-CLD-AUTO	1
31	Nameplate2	Reset	1
32	Nameplate2	Storm Valve- CLD-OPN-AUTO	1
33	Nameplate2	Storm Valve-OPEN	1
34	Nameplate2	TANK 1 (Man Off Auto)	1
35	Nameplate2	TANK 2 (Man Off Auto)	1
36	Nameplate2	TANK 3 (Man Off Auto)	1
37	Nameplate2	TANK 4 (Man Off Auto)	1
38	SQ-XB4BA21	Pushbutton, Black NO	1
39	WAGO-249-116	End Clamp	8
40	WAGO-280-311	Teminal End Cover, 2.5 mm	12
41	WAGO-280-902	Terminal block 2.5mm orange	21
42	WAGO-280-346	End Plate, orange	1
43	WAGO-280-653	Terminal block 2.5mm, 3 conductor, red	3
44	WAGO-280-402	Terminal Block Jumper, 2.5 mm	2
45	WAGO-280-906	Terminal block 2.5mm yellow	5
46	WAGO-280-904	Terminal block 2.5mm blue	18
47	Label - Field Wiring	Field Wiring Label	1
48	Label - UL508	UL 508 Label	1





Phillips Fuel Systems
109 Holland Ave., Bridgeport, Ct 06605

TITLE:
Fuel off-loading station controller, four tank, 230V/ 1Ø/ 50Hz/ 15A: London

Part Number. **FPC4-130062**

REV A

	NAME	DATE
DRAWN		

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DO NOT SCALE DRAWING

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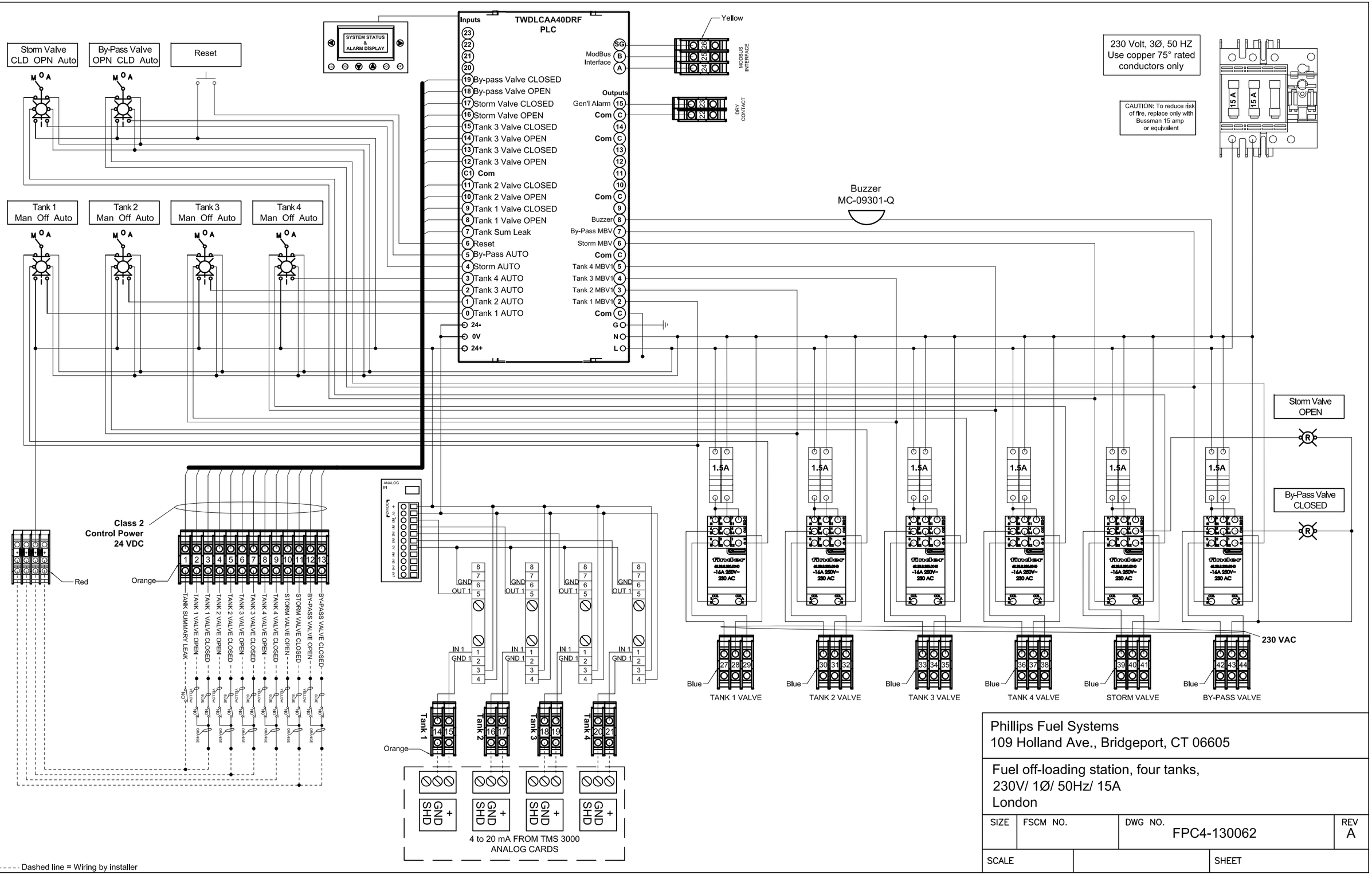

Phillips Fuel Systems
109 Holland Ave., Bridgeport, CT 06605

Fuel off-loading station, four tanks,
230V/ 1Ø/ 50Hz/ 15A
London

SIZE	FSCM NO.	DWG NO.	REV
		FPC4-130062	A
SCALE		SHEET	

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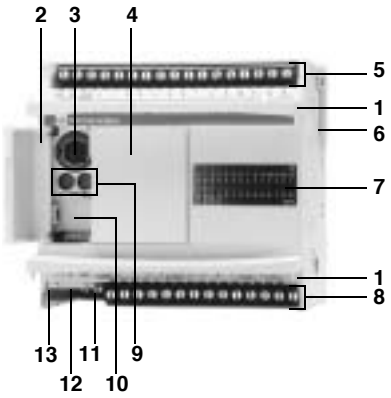
Programmable controller
Twido

Catalog
January
05

a brand of Schneider Electric

Telemecanique

Twido programmable controller
Compact base controllers



Description

Twido **TWD LC●A ●●DRF** and **TWD LCA● 40DRF** compact programmable base controllers comprise :

1 Two hinged connection terminal block covers for access to the terminals

2 A hinged access door

3 A mini-DIN type RS 485 serial port connector (allowing connection of the programming terminal)

4 A slot (protected by a removable cover) for digital diagnostic/maintenance display module TWD XCP ODC

5 A screw terminal block for ⎓ 24 V supply to the sensors and for connection of the input sensors

6 A connector for I/O expansion modules TWD D●●, TWD A●● and TWD NOI 10M3 (maximum of 4 modules on 24 I/O base controllers and 7 modules on 40 I/O base controllers)

7 A display block showing:
- the status of the controller (PWR, RUN, ERR and STAT)
- the inputs and outputs (IN● and OUT●)

8 A screw terminal block for connection of the output pre-actuators

9 Two analog adjustment points (one point for 10 and 16 I/O models)

10 An extension connector for the addition of a 2nd RS 232C/RS 485 serial port using adapter TWD NAC ●●● (for 16 and 24 I/O models)

11 A screw terminal block for connection of the ∿ 100...240 V mains or ⎓ 19.2...30 V power supply

12 A connector (access through the bottom of the controller) for:
- memory cartridge TWD XCP MFK32 or real-time clock cartridge TWD XCP RTC for base controllers TWD LC●A ●●DRF
- memory cartridge TWD XCP MFK64 and built-in real-time clock TWD XCP RTC for base controllers TWD LCA● 40DRF

13 An RJ45 connector (access through the bottom of the controller) for connection to the Ethernet network, only on base controller TWD LCAE 40DRF

Compact base controllers are mounted on a symmetrical ⊓⎽⊓ rail. Mounting kit TWD XMT5 (supplied in lots of 5) allows plate or panel mounting (2 x Ø 4.3 holes).

Twido programmable controller
Compact base controllers

TWD LC●A 10DRF/16DRF

References

Number of I/O	Inputs sink/source	Outputs	Program memory	Reference	Weight kg
Compact base controllers, ∿ supply					
10 I/O	6 ⎓ 24 V inputs	4 relay outputs	700 instructions	**TWDLCAA10DRF**	0.230
16 I/O	9 ⎓ 24 V inputs	7 relay outputs	2000 instructions	**TWDLCAA16DRF**	0.250
24 I/O	14 ⎓ 24 V inputs	10 relay outputs	3000 instructions	**TWDLCAA24DRF**	0.305
40 I/O	24 ⎓ 24 V inputs	14 relay outputs and 2 transistor outputs	3000 instructions *(1)*	**TWDLCAA40DRF**	0.525
				TWDLCAE40DRF *(2)*	0.525
Compact base controllers, ⎓ supply					
10 I/O	6 ⎓ 24 V inputs	4 relay outputs	700 instructions	**TWDLCDA10DRF**	0.230
16 I/O	9 ⎓ 24 V inputs	7 relay outputs	2000 instructions	**TWDLCDA16DRF**	0.250
24 I/O	14 ⎓ 24 V inputs	10 relay outputs	3000 instructions	**TWDLCDA24DRF**	0.305

TWD XCP MFK32/RTC

TWD NAC ●●●●

TWD XCP ODC

XBT N401

ASI ABLM3024

Separate components *(3)*

Description	Application	Type	Reference	Weight kg
32 Kb memory cartridge	For all base controllers Application backup Program transfer	EEPROM	**TWDXCPMFK32**	0.005
64 Kb memory cartridge	For base controllers TWD LCA● 40DRF Memory extension Application backup Program transfer	EEPROM	**TWDXCPMFK64**	0.005
Real-time clock cartridge	Date-stamping RTC based programming	–	**TWDXCPRTC**	0.005
Serial interface adapters	See page 41	–	**TWDNAC●●●●**	–
Digital display	Data display and modification	–	**TWDXCPODC**	0.020
Input simulators	6 inputs	–	**TWDXSM6**	–
	9 inputs	–	**TWDXSM9**	–
	14 inputs	–	**TWDXSM14**	–
External backup batteries	For base controllers TWD LCA● 40DRF	Sold singly	**TSXPLP01**	–
		Sold in lots of 10	**TSXPLP101**	–
Mounting kit (Sold in lots of 5)	For plate or panel mounting of compact base controllers or extensions	–	**TWDXMT5**	–

Magelis compact displays

Description	Protocol	Compatible with PLC types	Supply voltage	Reference	Weight kg
Compact display, 2 lines of 20 characters (alphanumeric display)	Uni-Telway, Modbus	Twido, Nano, TSX Micro, Premium	⎓ 5 V by terminal port on PLC	**XBTN200**	0.360
Compact displays, 4 lines of 20 characters (matrix display)	Uni-Telway, Modbus	Twido, Nano, TSX Micro, Premium	⎓ 5 V by terminal port on PLC	**XBTN400**	0.360
		Twido *(4)* Nano, TSX Micro, Premium, TSX series 7, Momentum, Quantum Other Modbus slave modules	⎓ 24 V external source	**XBTN401**	0.360
Display connection cable	Uni-Telway, Modbus	Twido, Nano, TSX Micro, Premium	–	**XBTZ978**	0.180

Phaseo regulated switch mode power supply

Description	Input voltage 47…63 Hz	Output voltage	Nominal power	Nominal current	Auto-protect reset	Reference	Weight
	V	⎓ V	W	A			kg
Regulated switch mode power supply for AS-Interface cabling system *(5)*	∿ 100…240 single-phase wide range	30 + 24	2 x 72	2.4 + 3	Auto	**ASIABLM3024**	1.300

(1) 6000 instructions with memory extension cartridge TWD XCP MFK64.
(2) Base controller equipped with an integrated Ethernet link (RJ45 port).
(3) Other separate components, see page 46
(4) Connection via built-in port or via optional serial port on Twido programmable controllers.
(5) Without ground fault detection.

DM2500 Series

Flanged Ball Valves

SPECIFICATIONS

Available in stainless steel or carbon steel

- Body and ends are investment cast
- Self-adjusting stem packing
- Blow-out proof stem design
- 100% air tested under water at 100 psi
- Working pressure ANSI 150
- Temperature range: -250°F to +700°F
- ISO 5211 mounting pad
- End cap type: flanged end (ANSI 150)
- Flange dimension: face-to-face ANSI B16.10; flange connection ANSI B16.50
- Silicone free
- Oxygen cleaned option

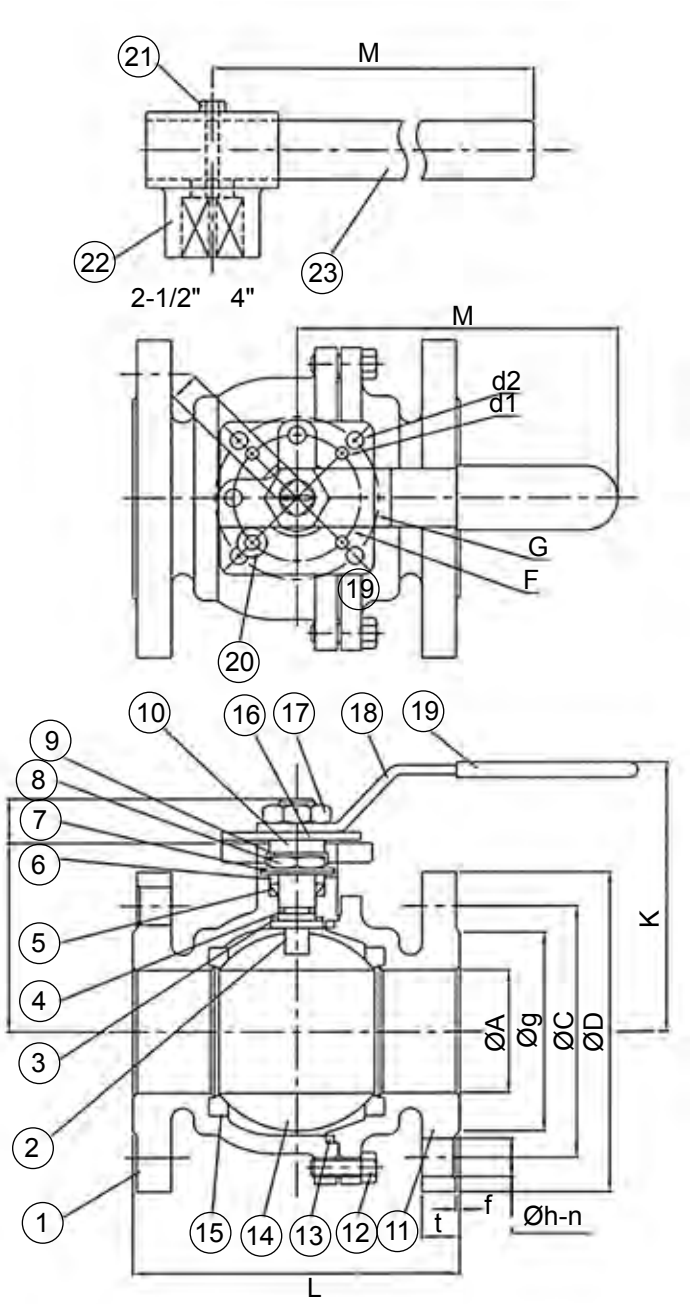
Size	Breakaway Torque (in-lb)	Cv	Weight
1/2"	50	32	9
3/4"	75	54	10
1"	100	105	12
1-1/2"	185	275	18
2"	300	460	25
2-1/2"	450	780	36
3"	750	1330	50
4"	1100	2420	69
6"	3500	5400	189

ORDERING SCHEMATIC

Option		Series	Body		Port		Packing		Seat		Ends	
EB	Ext. Bonnet	DM25	23	Carbon Steel	F	Full	C	Carbon/Teflon	U	UHMWPE	F1	Flanged 150
			33	Stainless Steel	R	Reduced	G	Graphite	P	PEEK	F3	Flanged 300
			44	Alloy 20			T	Teflon	TM	Super Teflon		
			77	Hastelloy					TC	Carbon Super Teflon		
			99	Duplex					M	Metal Seated		

J Flow Controls, LLC
14 De Camp • Cincinnati, OH 45216
Phone: 513-731-2900 • Fax 513-731-6939
www.jflowcontrols.com

DIMENSIONS (1/2" 4")



MATERIALS OF CONSTRUCTION

No.	Name of Part	Material Options	
		Stainless Steel	Carbon Steel
1	Body	CF8M/DIN 1.4408	WCB/DIN 1.0619
2	Stem	SS316	
3	Thrust Washer	Teflon	
4	O-Ring	Viton	
5	Stem Packing	Graphite	
6	Gland	SS304	
7	Disc Washer	SS01	
8	Stem Nut	SS304	
9	Nut Lock	SS04	
10	Washer	SS304	
11	Flange Cap	ASTM A351 Gr. CF8M	ASTM A216 Gr. WCB
12	Bolts	SS304	Carbon Steel
13	Gasket	Graphite	
14	Ball	SS316	
15	Ball Seats	Teflon	
16	Stopper	SS304	
17	Handle Nut	SS304	
18	Handle	SS304	
19	Handle Cover	Vinyl Plastisol	
20	Position Pin	SS304	
21	Set Bolt	SS304	
22	Lever Head	CF8	
23	Lever	Steel Pipe	

Size	A	B	E	L	H	K	M	F	G	d1	d2	D	Flange Dimensions (Class 150)					
													Bolt Hole					
													c	h	n	t	g	f
1/2"	0.59	1.89	0.43	4.25	0.35	3.15	5.12	1.42	1.65	0.24	0.24	3.50	2.38	0.63	0.16	0.45	1.38	0.06
3/4"	0.79	2.09	0.43	4.61	0.35	3.15	5.12	1.42	1.65	0.24	0.24	3.86	2.76	0.63	0.16	0.45	1.69	0.06
1"	0.98	2.32	0.55	5.00	0.43	3.54	6.50	1.65	1.97	0.24	0.28	4.25	3.13	0.63	0.16	0.45	2.01	0.06
1-1/4"	1.26	2.80	0.55	5.51	0.43	4.02	6.50	1.65	1.97	0.24	0.28	4.61	3.50	0.63	0.16	0.50	2.52	0.06
1-1/2"	1.42	2.99	0.71	6.50	0.55	4.33	8.07	1.97	2.76	0.28	0.36	5.00	3.88	0.63	0.16	0.56	2.87	0.06
2"	1.97	3.35	0.71	7.00	0.55	4.72	8.07	1.97	2.76	0.28	0.36	5.98	4.74	0.75	0.16	0.63	3.62	0.06
2-1/2"	2.56	3.68	0.91	7.48	0.67	5.51	11.8	2.76	4.02	0.36	0.45	7.01	5.50	0.75	0.16	0.70	4.13	0.06
3"	3.15	4.06	0.91	7.99	0.67	5.91	13.4	2.76	4.02	0.36	0.45	7.48	6.00	0.75	0.16	0.75	5.00	0.06
4"	3.94	5.20	0.98	9.02	0.87	7.09	16.5	4.02	4.92	0.45	0.53	9.02	7.50	0.75	0.31	0.94	5.00	0.06

Compact Valve Automation

Valvsys™ LLC
ELECTRIC ACTUATORS

421 BREADEN DR. #15 MONROE, OH 45050-1575 PH 513.539.1234 FX 513.539.2176

NL Series

Worm Gear Drive

NPT Conduit Entry
with cable gland protector.

Heavy Duty PSC Motor

Visual Position Indicator

Ball Bearing Reliability
Ball bearings on both the inner and outer rotor shaft provide greater reliability.

Travel Switches
10amp SPDT with position feedback.

High Strength Heat Treated Gears
One piece worm and output shaft for strength.

Optional Heater & Thermostat
Other options available.

Optional Handwheel Override
Manual Operation is accomplished by pushing to engage gearing. Automatic spring dis-engage. Standard units are supplied with a hex wrench.

Motor Thermal Protector Switch
Automatically re-setting

Terminal Cover
Seperate cover for access to terminal strip wiring.

IP56 Design Housing Protection
Similar to NEMA 4X for protection against dust and hose directed water jet spray.

Standard Features:

Compact - Reliable:

Ideal for butterfly valve automation.
Because of the worm drive gear, the NL unit is ideally suited for rubberlined butterfly valves. Worm gears are typically used on applications to prevent back driving which causes excessive valve oscillations.

Modulating Control with Digital Calibration
4-20mA input allows complete control over valve position. Push button setup is digitally stored. Comes standard with 4-20mA output.

*Requires longer side cover on NL1 and NL4 models. Controller fits into same housing on all other models.

Optional Motor Voltages
115Vac, 230Vac
380Vac
12, 24Vdc
consult factory for other voltages

Relays, feedback sensors,...
Consult factory for custom electrical requirements.

Options:

B00033-06

Superior Valve Automation

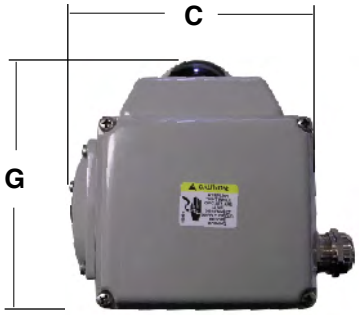
Valvsys™ LLC
ELECTRIC ACTUATORS

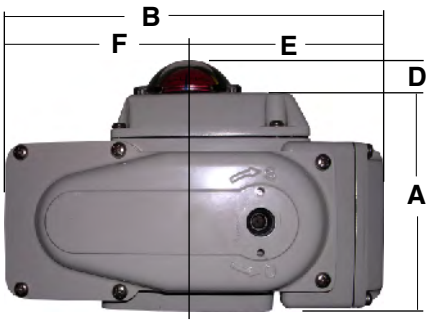
421 BREADEN DR. #15 MONROE, OH 45050-1575 PH 513.539.1234 FX 513.539.2176

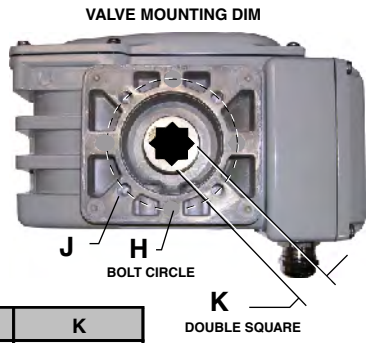
Performance:

Model	Output Torque in-lbs	Output Torque N-m	Current amperes	Speed Sec/90	Optional Sec/90	Weight Lbs	Weight Kg
NL1	177	20	0.5	10	-	4	2
NL4	440	50	0.5	20	-	4	2
NL8	880	100	0.9	30	60	9	4.3
NL1.4K	1,440	160	0.9	30	60	9	4.3
NL1.7K	1,760	200	1	30	60	17	7.8
NL2.2K	2,200	250	1	30	60	17	7.8
NL3.5K	3,520	400	2	30	60	18	8
NL4.4K	4,400	500	2	30	60	18	8
NL8.8K	8,800	1,000	2	30	60	26	12
NL17.6K	17,600	2,000	2	60	100	26	12

Dimensional:







Model	A	B	C	D	E	F	G	H		J	K
NL1	4.6	6.1	4.0	1.1	2.7	3.4	5.7	1.97 (50)	F05	M6x4	.551 (14)
NL4	4.6	6.1	4.0	1.1	2.7	3.4	5.7	1.97 (50)	F05	M6x4	.551 (14)
NL8	4.8	8.2	4.7	1.1	4.3	3.9	5.9	2.76 (70)	F07	M6x4	.669 (17)
NL1.4K	4.8	8.2	4.7	1.1	4.3	3.9	5.9	2.76 (70)	F07	M6x4	.669 (17)
NL1.7K	5.7	10.1	6.1	1.1	5.2	4.8	6.9	4.02 (102)	F10	M10x4	.866 (22)
NL2.2K	5.7	10.1	6.1	1.1	5.2	4.8	6.9	4.02 (102)	F10	M10x4	.866 (22)
NL3.5K	5.7	10.1	6.1	1.1	5.2	4.8	6.9	4.92 (125)	F12	M10x4	1.063 (27)
NL4.4K	5.7	10.1	6.1	1.1	5.2	4.8	6.9	4.92 (125)	F12	M10x4	1.063 (27)
NL8.8K	6.2	11.0	6.1	1.1	6.0	5.0	7.3	5.51 (140)	F14	M12x4	1.260 (32)
NL17.6K	6.2	11.0	6.1	1.1	6.0	5.0	7.3	5.51 (140)	F14	M12x4	1.260 (32)

Options:

EV and NV Series

See Bulletins B00010 and B00020 for smaller sized electric actuators from Valvsys. Torques from 125 inlbs to 1,000 inlbs.

Control Boxes

NEM4, NEMA 7, and non-metallic control boxes for on/off, remote control, "jogging", and other specific and custom wired functions. Consult Factory.

While the information contained in this literature is belived to be accurate it is supplied for informative purposes only and should not be considered certified or as a guarantee of satisfactory results by reliance theron. Nothing contained herein is to be construed as a warranty or guarantee, express or implied, regarding any matter with respect to this product. Products may differ as the result of Valvsys, LLC policy of continuous product improvement.

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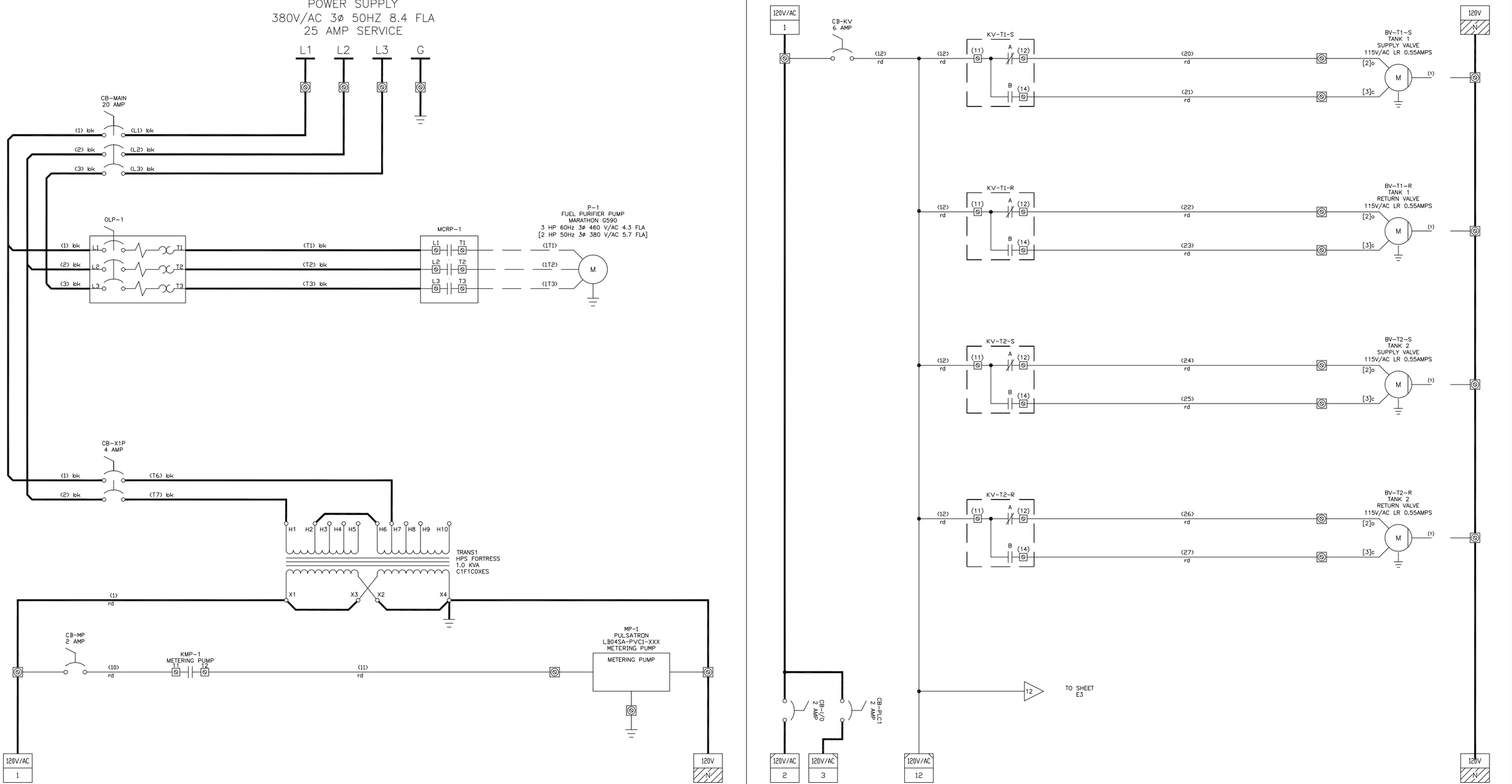
www.valvsys.com
sales@valvsys.com

Valvsys, LLC
421 Breaden Dr., #15
Monroe, OH 45050
ph 513.539.1234
fx 513.539.2176

B00033-06

231113-2.15 RCI Fuel Maintenance System

US Embassy London
Fuel Oil Submittal
231113
BL Harbert International
120080



NO.	REVISION DESCRIPTION	REV BY	CHK BY	APP. BY	DATE

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SOUTH COAST CONTROLS
(714) 998-5656
UL FILE #E122361

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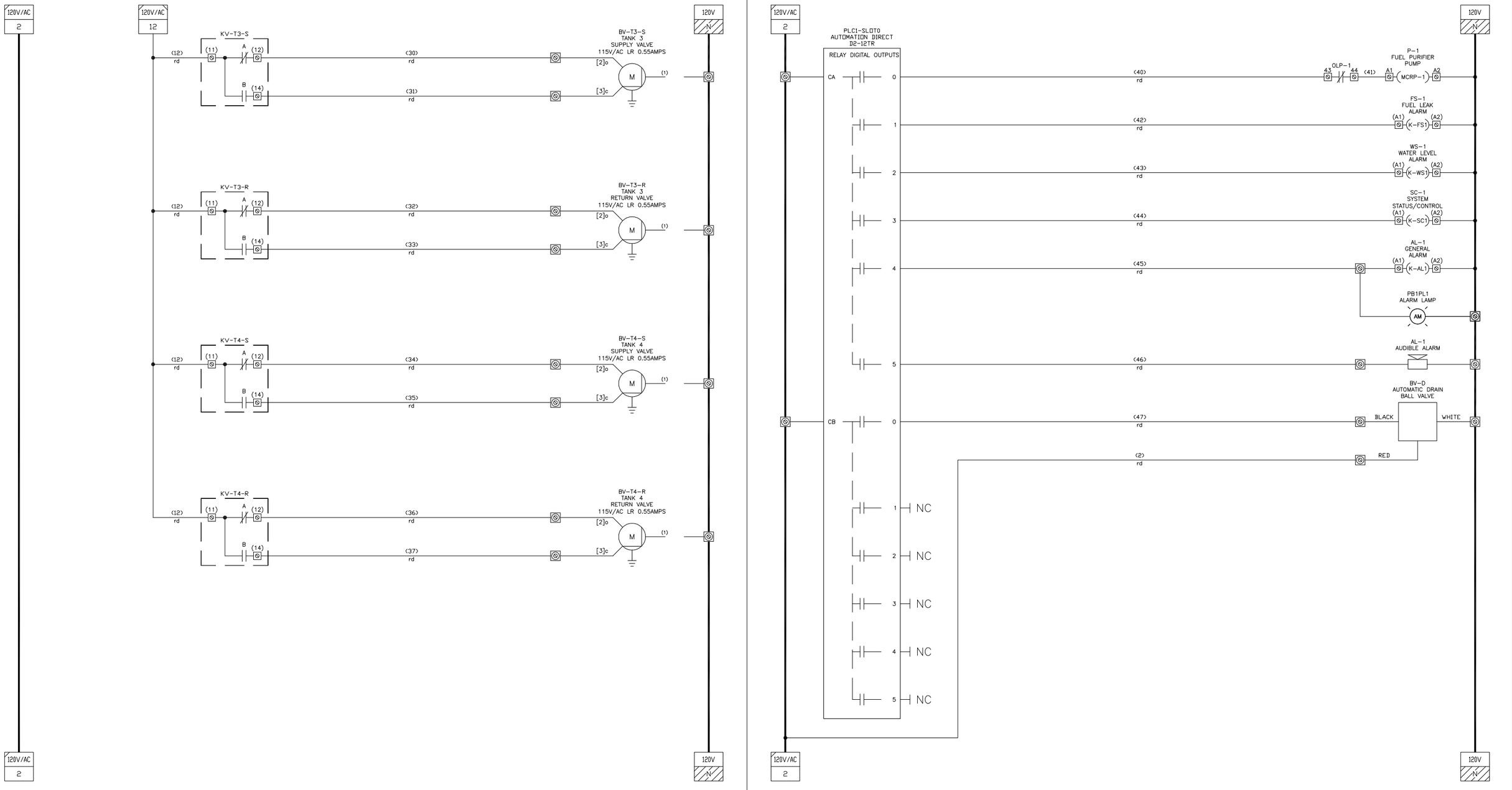
DR.		I.D. NO.:	
DSGN.		PROJECT NO.	
CK.		DWG. SCALE	
AP.		PLOT SCALE	
DATE	10/29/13		
SCC Ser.	RCI13AG053	SHEET	1 OF 14

CUSTOMER: RCI TECHNOLOGIES

TITLE: FRS-660-25-MTU4 (6062)
UL# CB-782759
FILTER UNIT 380V/AC, 50Hz, 3ø, 8.4 FLA, 25 AMP SERVICE

DWG. No. RCI13AG053-E1 | REV. No. A



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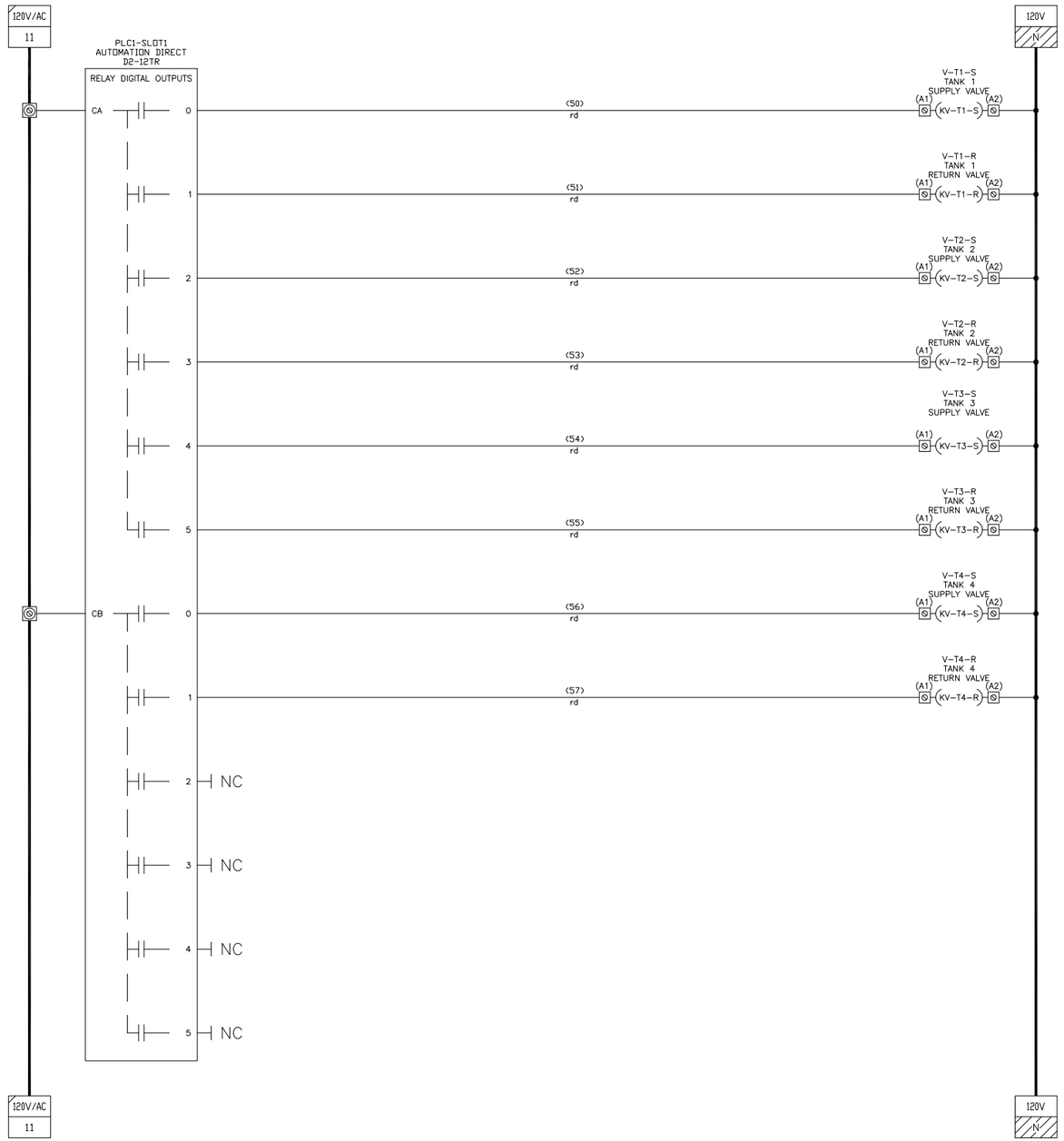
DSGN.		PROJECT NO.	
CK.		DWG. SCALE	
AP.		PLOT SCALE	
DATE	10/29/13		
SCC Ser.	RCI13AG053	SHEET	2 OF 14

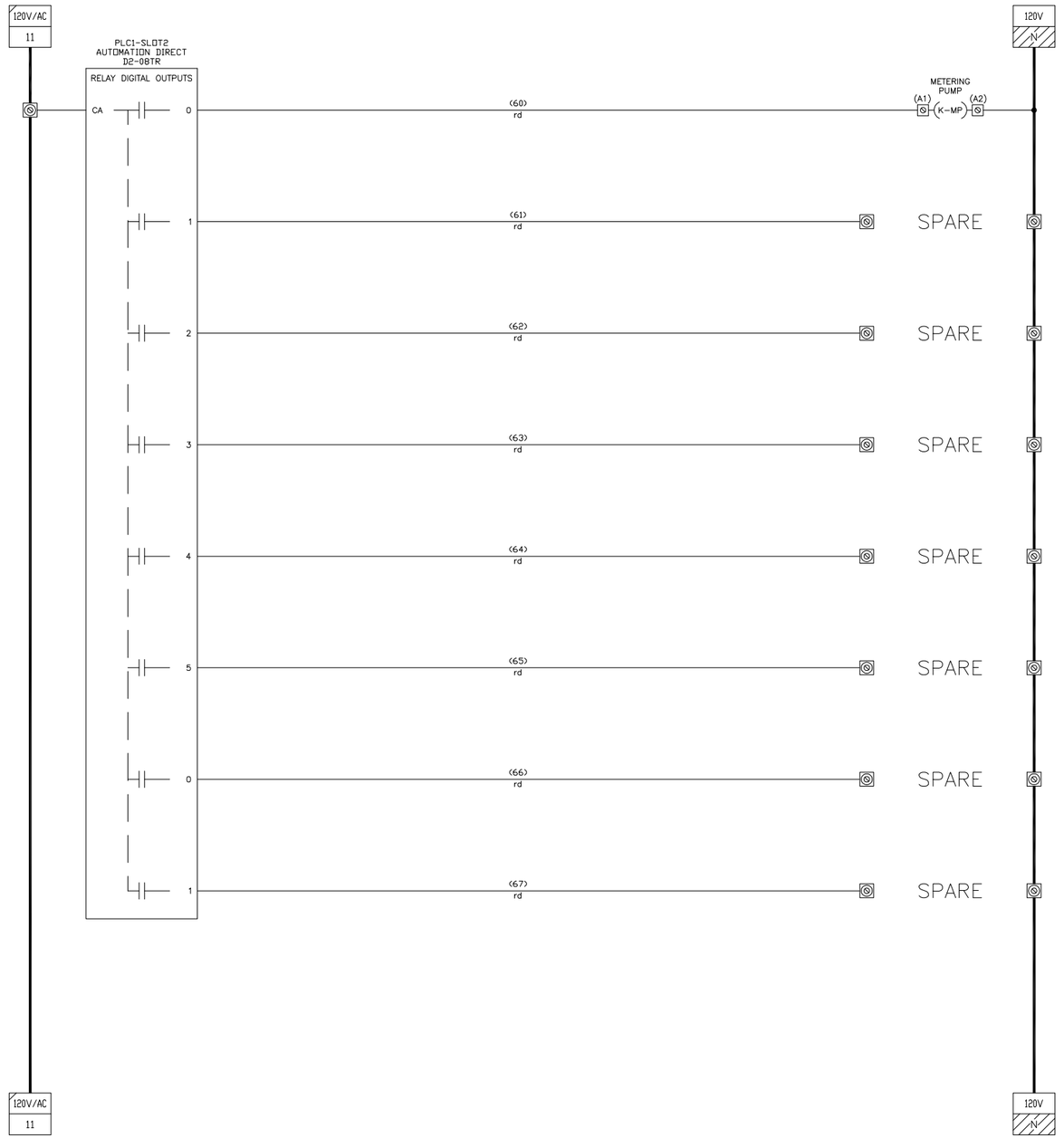
CUSTOMER: RCI TECHNOLOGIES

TITLE: FRS-660-25-MTU4 (6062)
UL# CB-782759
FILTER UNIT 380V/AC, 50Hz, 3ø, 8.4 FLA, 25 AMP SERVICE

DWG. No. RCI13AG053-E2

REV. No. A





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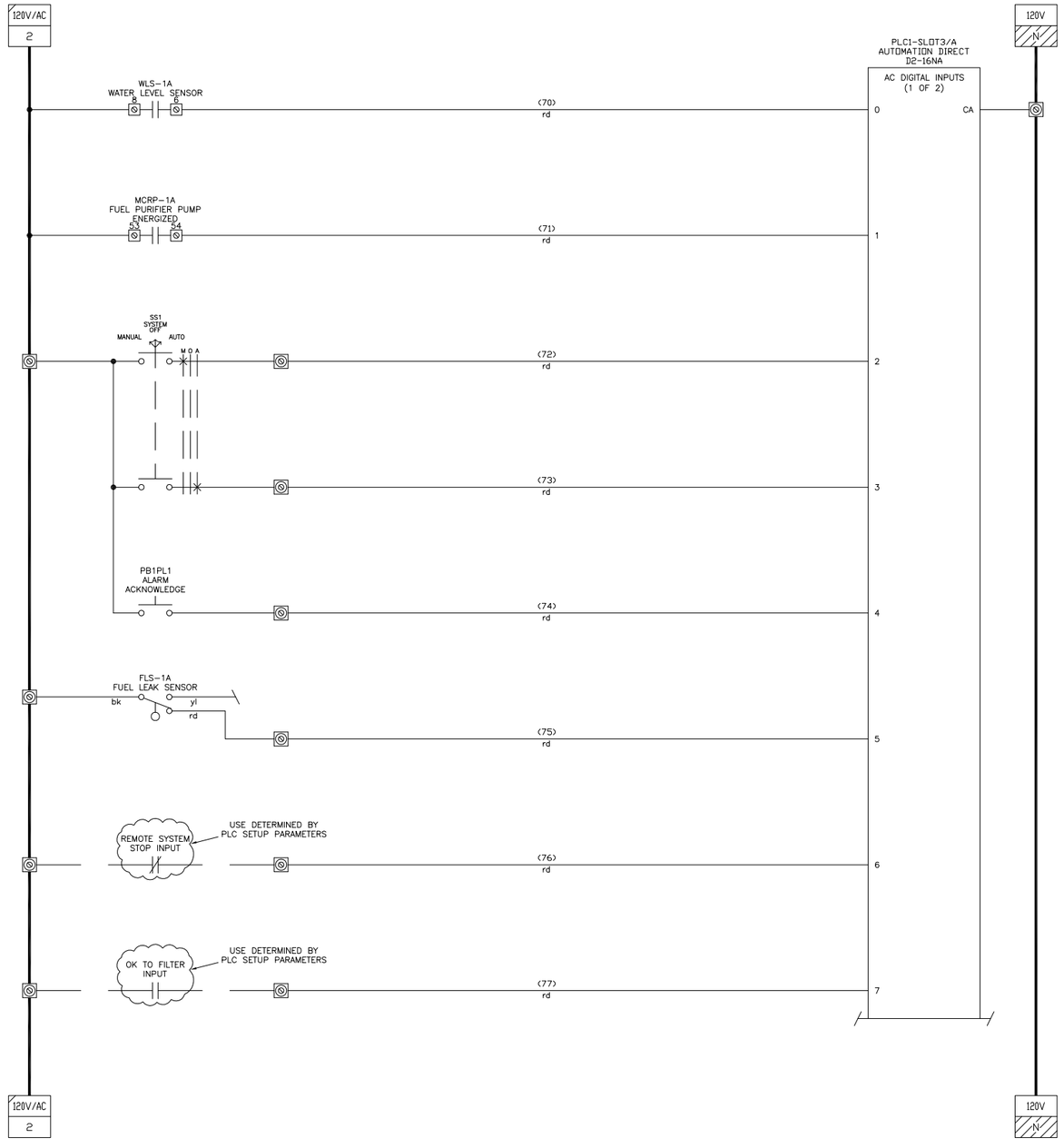
DR.	I.D. NO.:
DSGN.	PROJECT NO.
CK.	DWG. SCALE
AP.	PLOT SCALE
DATE 10/29/13	
SCC Ser. RCI13AG053	SHEET 3 OF 14

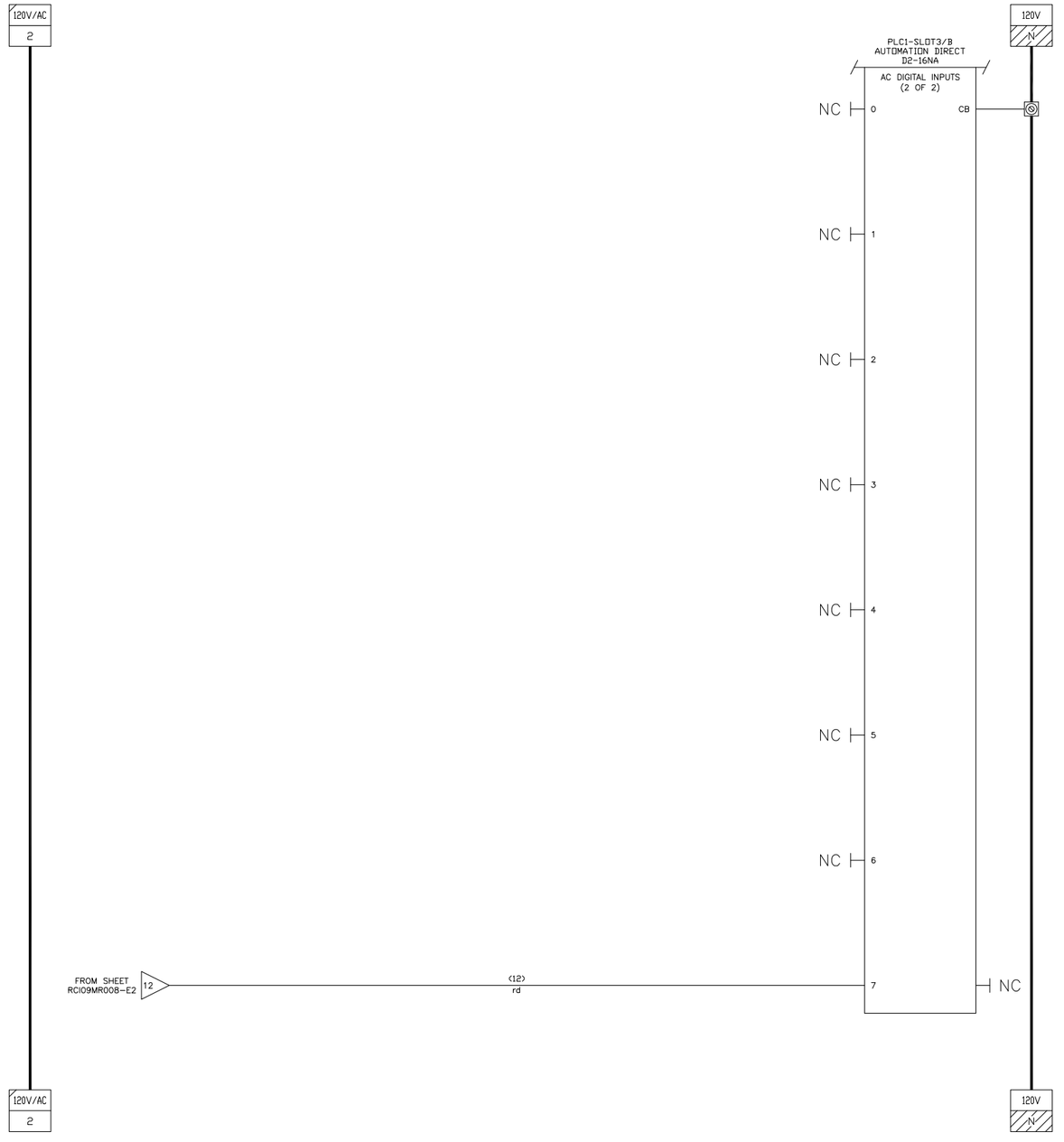
CUSTOMER: RCI TECHNOLOGIES

TITLE: FRS-660-25-MTU4 (6062)
UL# CB-782759
FILTER UNIT 380V/AC, 50Hz, 3ø, 8.4 FLA, 25 AMP SERVICE

DWG. No. RCI13AG053-E3

REV. No. A





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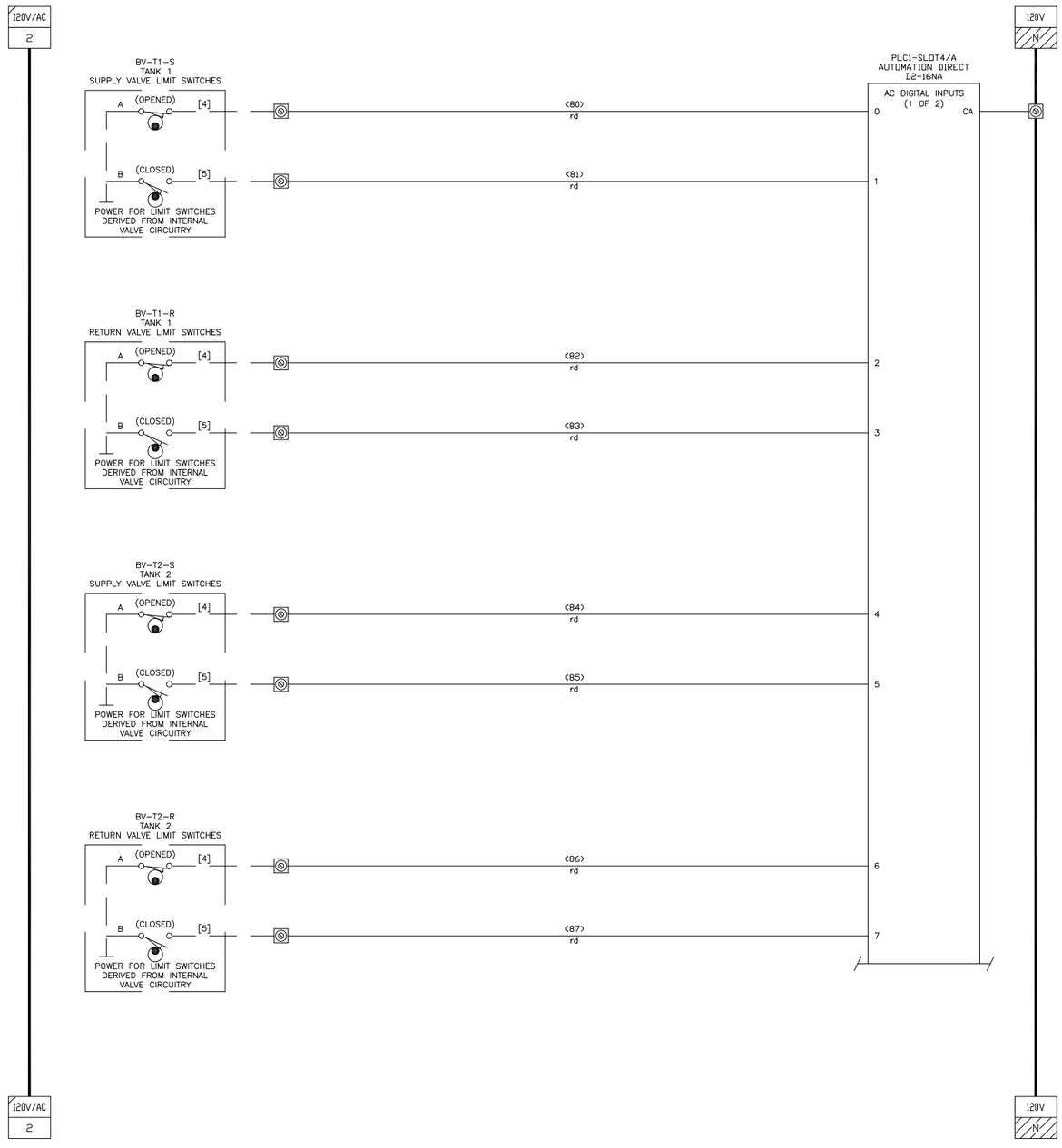
DSGN.		PROJECT NO.	
CK.		DWG. SCALE	
AP.		PLOT SCALE	
DATE	10/29/13		
SCC Ser.	RCI13AG053	SHEET	4 OF 14

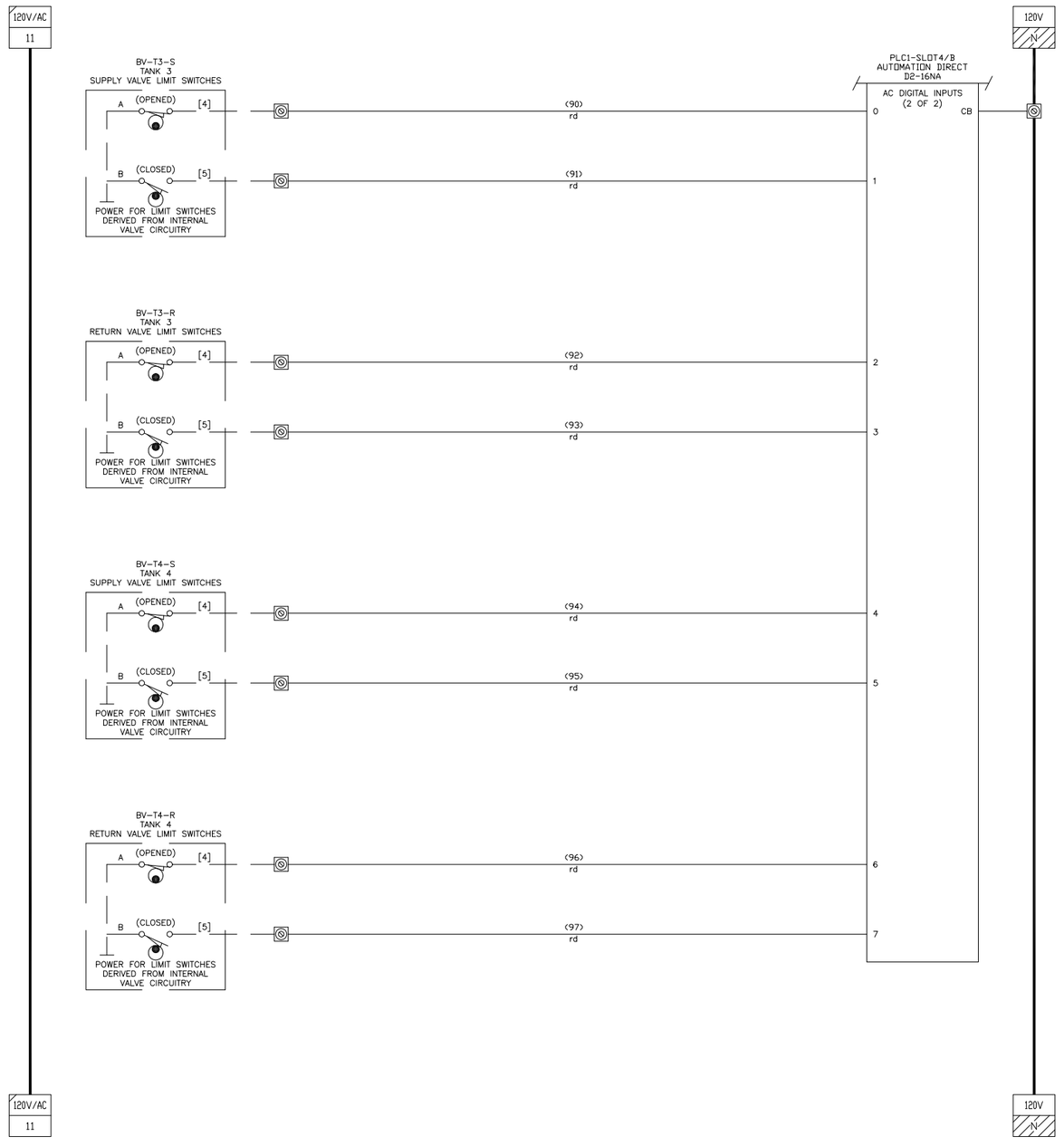
CUSTOMER: RCI TECHNOLOGIES

TITLE: FRS-660-25-MTU4 (6062)
UL# CB-782759
FILTER UNIT 380V/AC, 50Hz, 3ø, 8.4 FLA, 25 AMP SERVICE

DWG. No. RCI13AG053-E4

REV. No. A





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DSGN.	PROJECT NO.
CK.	DWG. SCALE
AP.	PLOT SCALE
DATE 10/29/13	
SCC Ser. RCI13AG053	SHEET 5 OF 14

CUSTOMER: RCI TECHNOLOGIES

TITLE: FRS-660-25-MTU4 (6062)
UL# CB-782759
FILTER UNIT 380V/AC, 50Hz, 3ø, 8.4 FLA, 25 AMP SERVICE

DWG. No. RCI13AG053-E5

REV. No. A

120V/AC
2

K-T1FS
TANK 1
FILTRATION STOP

K-T2FS
TANK 2
FILTRATION STOP

K-T3FS
TANK 3
FILTRATION STOP

K-T4FS
TANK 4
FILTRATION STOP

SPARE

SPARE

SPARE

SPARE

PLC1-SLOT5
AUTOMATION DIRECT
D2-08NA-1
AC DIGITAL INPUTS
(1 OF 1)

0 (100) rd
1 (101) rd
2 (102) rd
3 (103) rd
4 (104) rd
5 (105) rd
6 (106) rd
7 (107) rd
CB

120V
N

120V/AC
2

120V/AC
3

120V
N

PLC1
AUTOMATION DIRECT
D0-06AR
BASE POWER SUPPLY
AC(L) AC(N)
G

(3) rd

PS1
AUTOMATION DIRECT
PSP24-024S
POWER SUPPLY
24V/DC 1.0A
L1 N
G
+24V 0V

(110) bn
(111) bu

ES1
MOXA
EDS-205
ETHERNET SWITCH
V+ — 24V/DC INPUT — V-
G

MMI1
AUTOMATION DIRECT
EA7-S6M-R
TOUCH SCREEN
+24V 0V
G

WLS1
PRO SENSE PSFR-1C-120A
WATER LEVEL SENSOR AMPLIFIER
L1 2 ▼ L2 7 ▼
SET SENSITIVITY
DIAL TO 47K
PROBE 6 ▼ COM 5 ▼

(15) bn

WS1
WATER SENSOR
IN FUEL PURIFIER CANISTER

NO.	REVISION DESCRIPTION	REV BY	CHK BY	APP. BY	DATE

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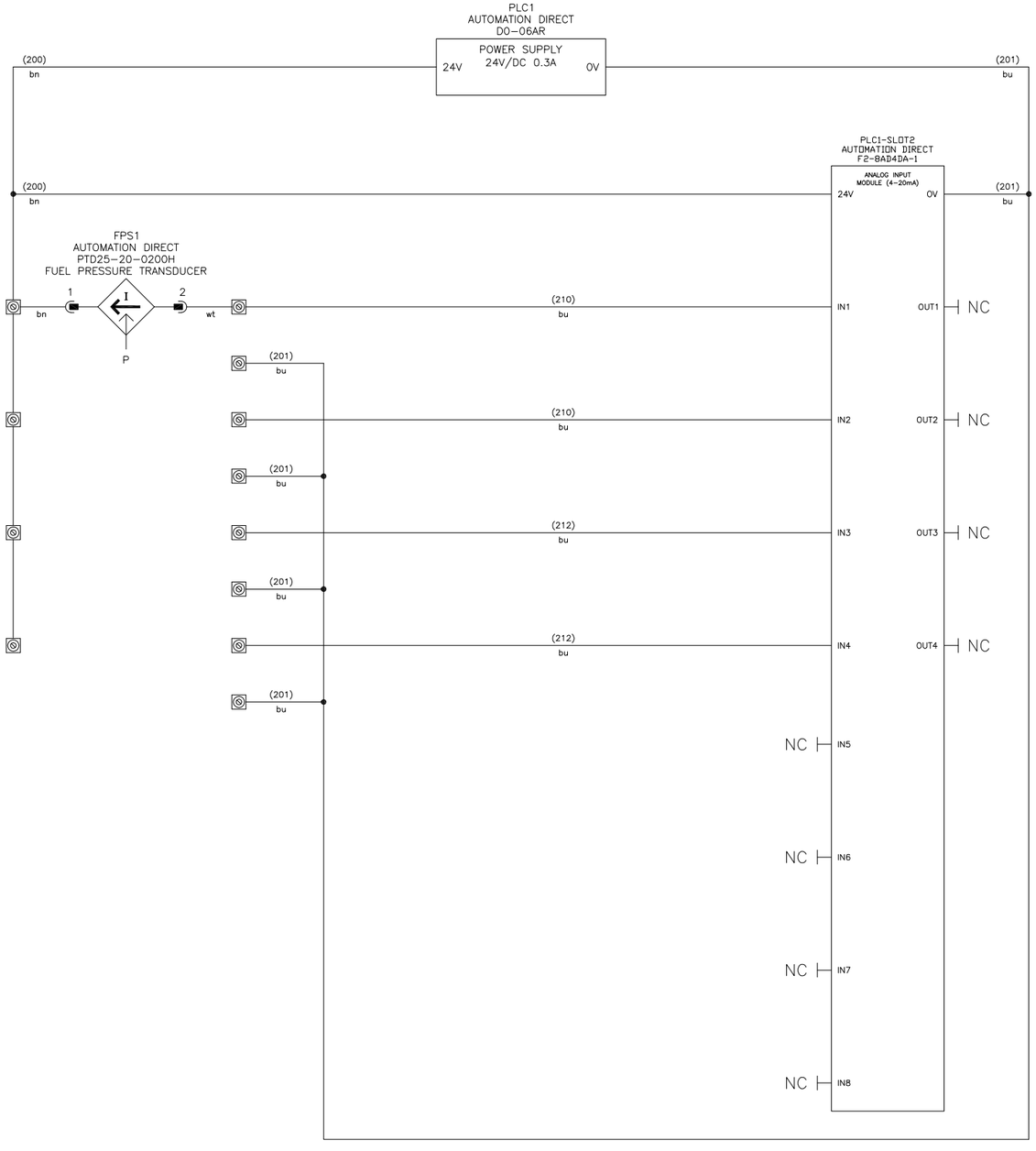
DSGN.	PROJECT NO.
CK.	DWG. SCALE
AP.	PLOT SCALE
DATE 10/29/13	
SCC Ser. RCI13AG053	SHEET 6 OF 14

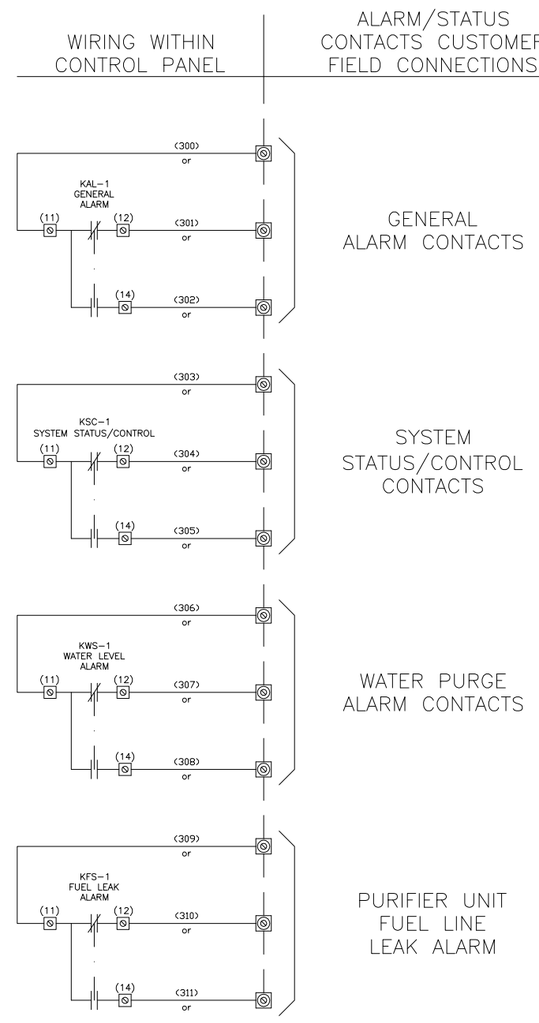
CUSTOMER: RCI TECHNOLOGIES

TITLE: FRS-660-25-MTU4 (6062)
UL# CB-782759
FILTER UNIT 380V/AC, 50Hz, 3ø, 8.4 FLA, 25 AMP SERVICE

DWG. No. RCI13AG053-E6

REV. No. A





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CK.	DWG. SCALE
AP.	PLOT SCALE
DATE 10/29/13	
SCC Ser. RCI13AG053	SHEET 7 OF 14

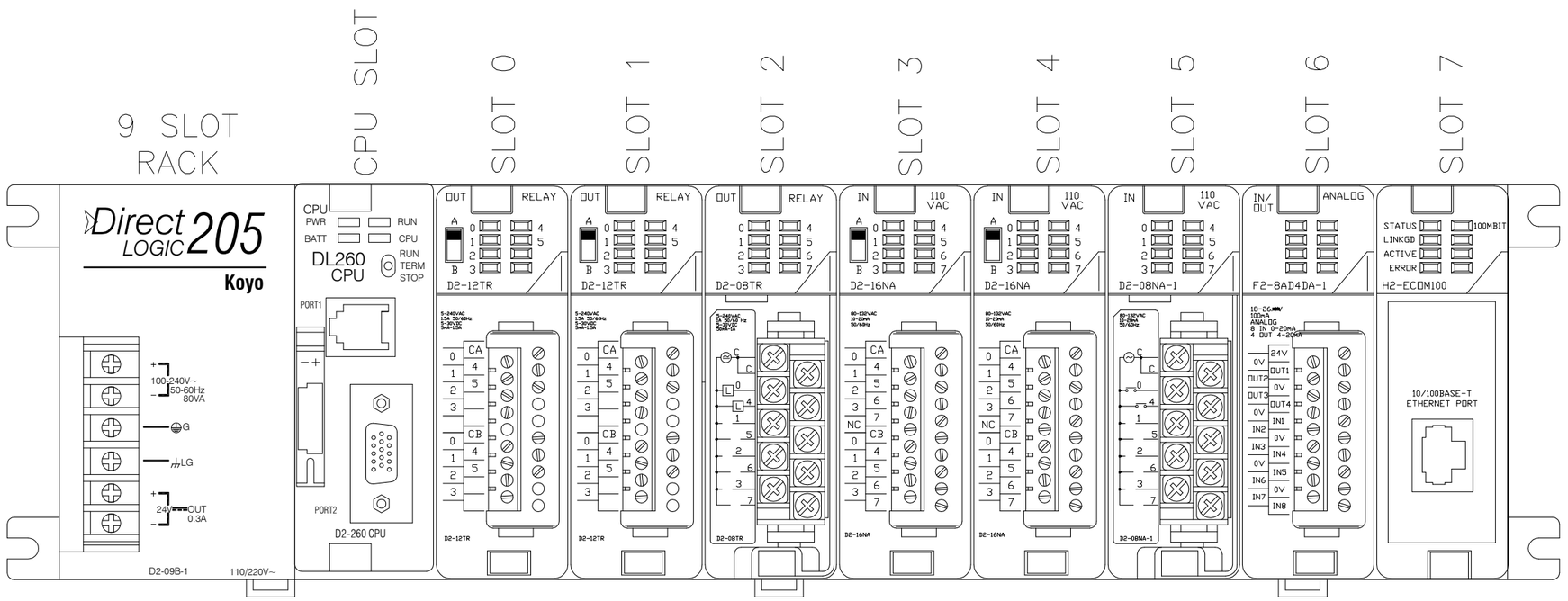
CUSTOMER: RCI TECHNOLOGIES

TITLE: FRS-660-25-MTU4 (6062)
UL# CB-782759
FILTER UNIT 380V/AC, 50Hz, 3ø, 8.4 FLA, 25 AMP SERVICE

DWG. No. RCI13AG053-E7

REV. No. A

9 SLOT
RACK



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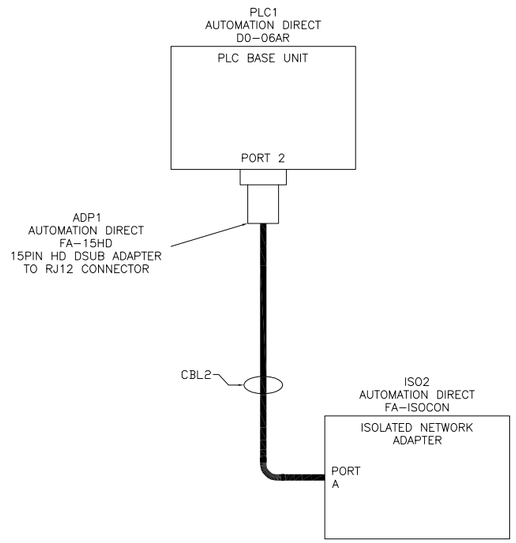
CK.		DWG. SCALE	
AP.		PLOT SCALE	
DATE	10/29/13		
SCC Ser.	RCI13AG053	SHEET	8 OF 14

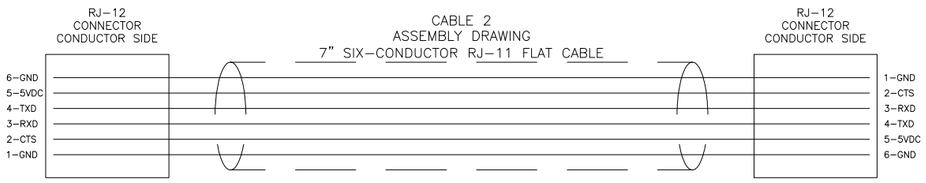
CUSTOMER: RCI TECHNOLOGIES

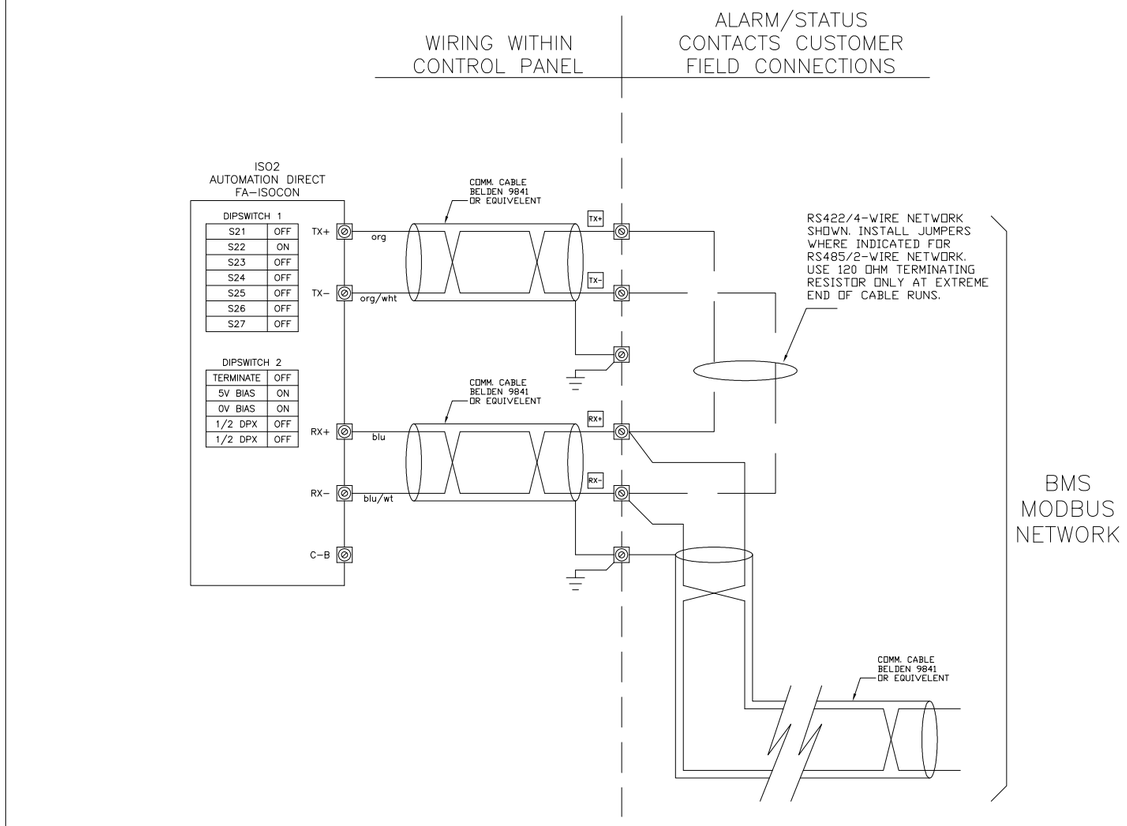
TITLE: FRS-660-25-MTU4 (6062)
UL# CB-782759
FILTER UNIT 380V/AC, 50Hz, 3ø, 8.4 FLA, 25 AMP SERVICE

DWG. No. RCI13AG053-E8

REV. No. A







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AP.		PLOT SCALE	
DATE	10/29/13		
SCC Ser.	RCI13AG053	SHEET	9 OF 14

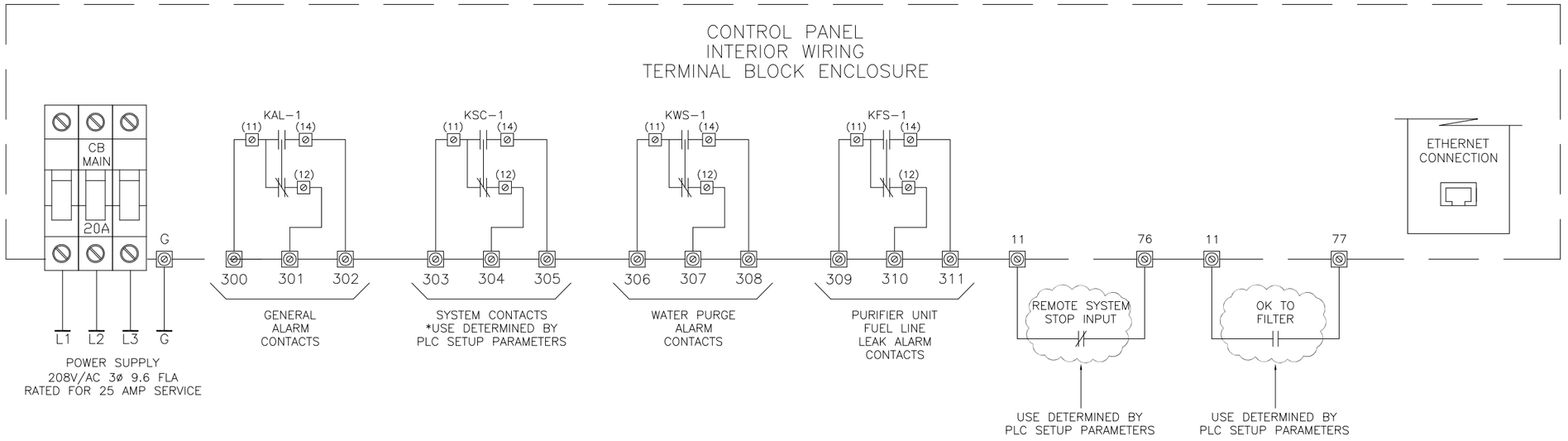
CUSTOMER: RCI TECHNOLOGIES

TITLE: FRS-660-25-MTU4 (6062)
UL# CB-782759
FILTER UNIT 380V/AC, 50Hz, 3ø, 8.4 FLA, 25 AMP SERVICE

DWG. No. RCI13AG053-E9

REV. No. A

FIELD CONNECTION DIAGRAM



FIELD CONNECTIONS

INDICATES TERMINATION AT TERMINAL BLOCK.

NO.	REVISION DESCRIPTION	REV BY	CHK BY	APP. BY	DATE

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DSGN.	PROJECT NO.
CK.	DWG. SCALE
AP.	PLOT SCALE
DATE 10/29/13	
SCC Ser. RCI13AG053	SHEET 10 OF 14

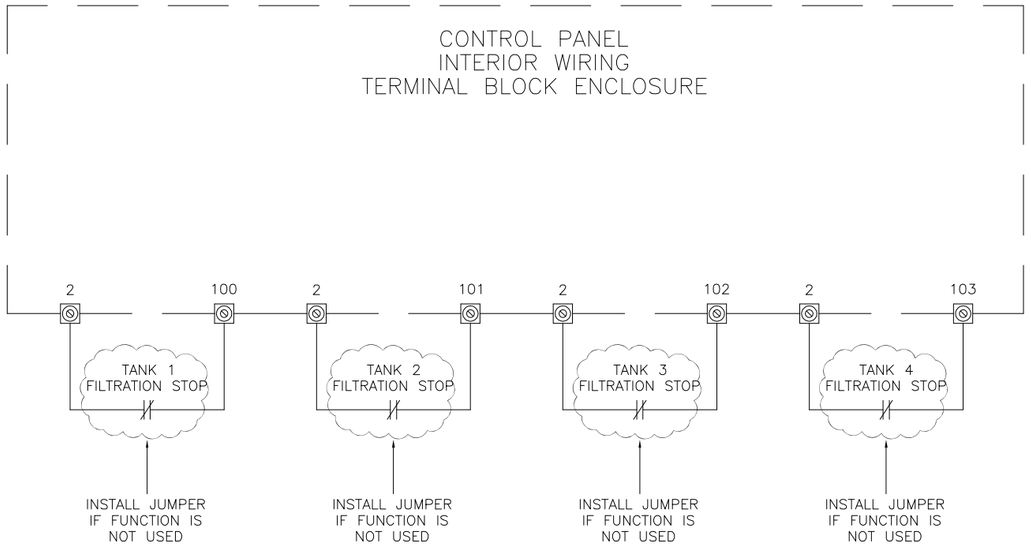
CUSTOMER: RCI TECHNOLOGIES

TITLE: FRS-660-25-MTU4 (6062)
UL# CB-782759
FILTER UNIT 380V/AC, 50Hz, 3ø, 8.4 FLA, 25 AMP SERVICE

DWG. No. RCI13AG053-E10

REV. No. A

FIELD CONNECTION DIAGRAM



FIELD CONNECTIONS

INDICATES TERMINATION AT TERMINAL BLOCK.

NO.	REVISION DESCRIPTION	REV BY	CHK BY	APP. BY	DATE

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DSGN.	PROJECT NO.
CK.	DWG. SCALE
AP.	PLOT SCALE
DATE 10/29/13	
SCC Ser. RCI13AG053	SHEET 11 OF 14

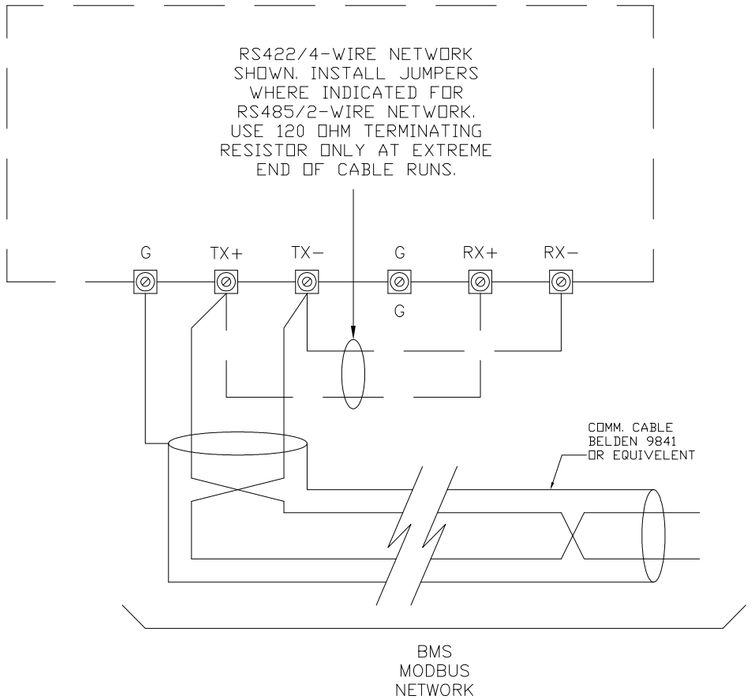
CUSTOMER: RCI TECHNOLOGIES

TITLE: FRS-660-25-MTU4 (6062)
UL# CB-782759
FILTER UNIT 380V/AC, 50Hz, 3ø, 8.4 FLA, 25 AMP SERVICE

DWG. No. RCI13AG053-E11

REV. No. A

FIELD CONNECTION DIAGRAM



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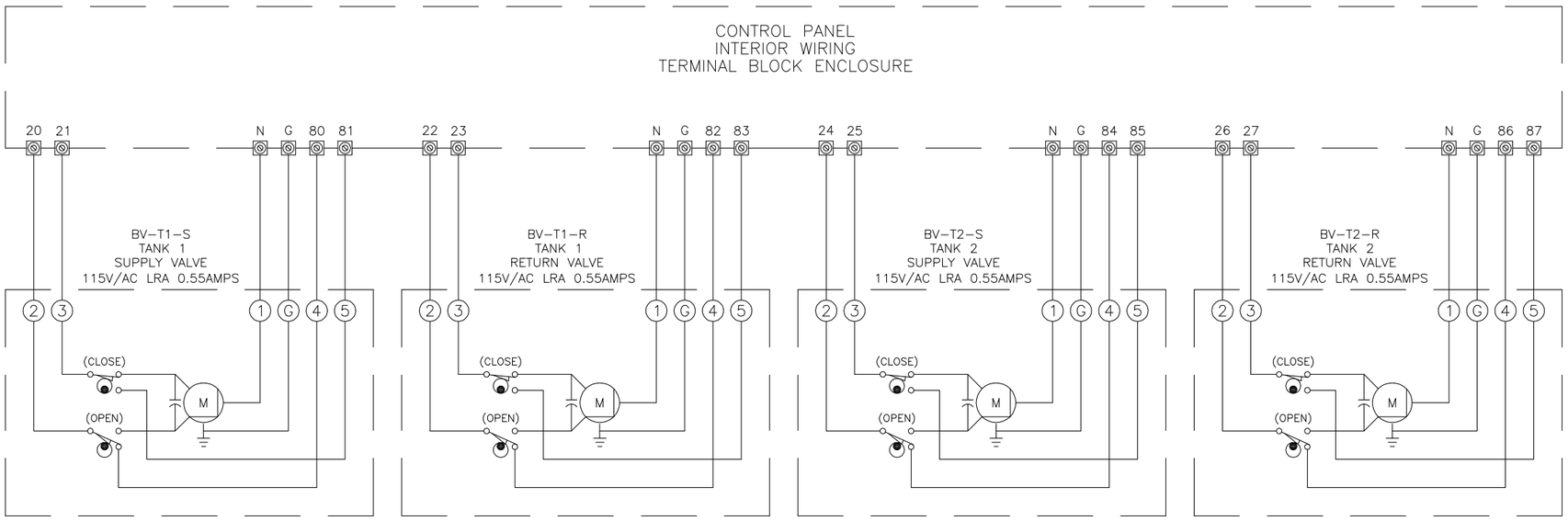
DSGN.	PROJECT NO.
CK.	DWG. SCALE
AP.	PLOT SCALE
DATE 10/29/13	
SCC Ser. RCI13AG053	SHEET 12 OF 14

CUSTOMER: RCI TECHNOLOGIES

TITLE: FRS-660-25-MTU4 (6062)
UL# CB-782759
FILTER UNIT 380V/AC, 50Hz, 3ø, 8.4 FLA, 25 AMP SERVICE

DWG. No. RCI13AG053-E12 REV. No. A

FIELD CONNECTION DIAGRAM



FIELD CONNECTIONS

INDICATES TERMINATION AT TERMINAL BLOCK.

NO.	REVISION DESCRIPTION	REV BY	CHK BY	APP. BY	DATE

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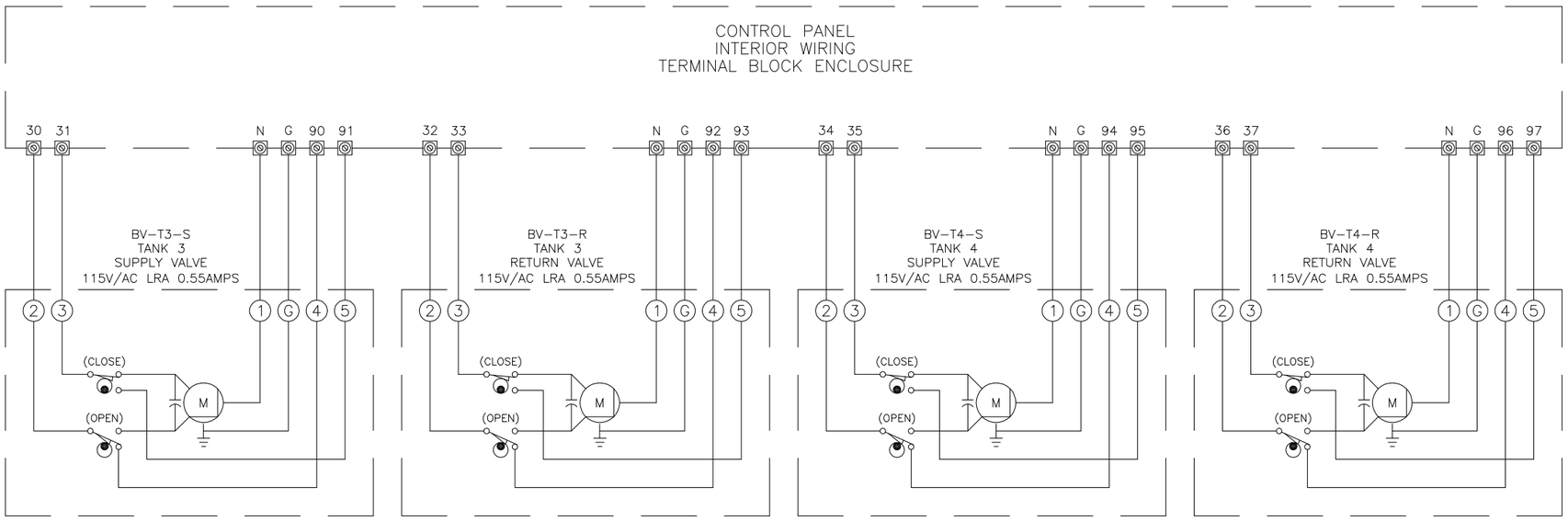
DR.	I.D. NO.:	CUSTOMER:	RCI TECHNOLOGIES
DSGN.	PROJECT NO.	TITLE:	FRS–660–25–MTU4 (6062) UL# CB–782759 FILTER UNIT 380V/AC, 50Hz, 3ø, 8.4 FLA, 25 AMP SERVICE
CK.	DWG. SCALE		
AP.	PLOT SCALE		
DATE 10/29/13		DWG. No.	RCI13AG053–E13
SCC Ser. RCI13AG053	SHEET 13 OF 14	REV. No.	A

FIELD CONNECTION DIAGRAM



FIELD CONNECTIONS

INDICATES TERMINATION AT TERMINAL BLOCK.

NO.	REVISION DESCRIPTION	REV BY	CHK BY	APP. BY	DATE

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UL LISTED CONTROL PANELS
FABRICATED BY
SOUTH COAST CONTROLS
(714) 998–5656
UL FILE #E122361

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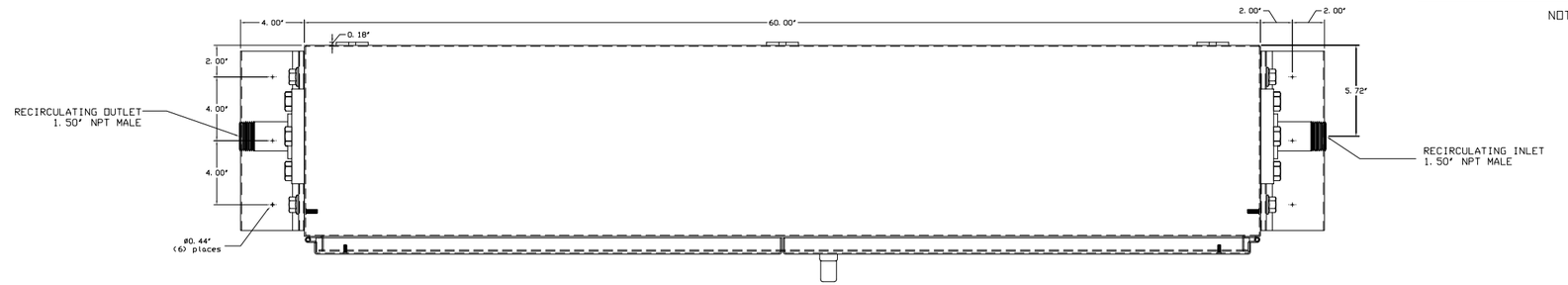
EXCEPT AS AUTHORIZED IN WRITING BY SOUTH COAST CONTROLS

DR.	I.D. NO.:	CUSTOMER:	RCI TECHNOLOGIES
DSGN.	PROJECT NO.	TITLE:	FRS–660–25–MTU4 (6062) UL# CB–782759 FILTER UNIT 380V/AC, 50Hz, 3ø, 8.4 FLA, 25 AMP SERVICE
CK.	DWG. SCALE		
AP.	PLOT SCALE		
DATE 10/29/13		DWG. No.	RCI13AG053–E14
SCC Ser. RCI13AG053	SHEET 14 OF 14	REV. No.	A

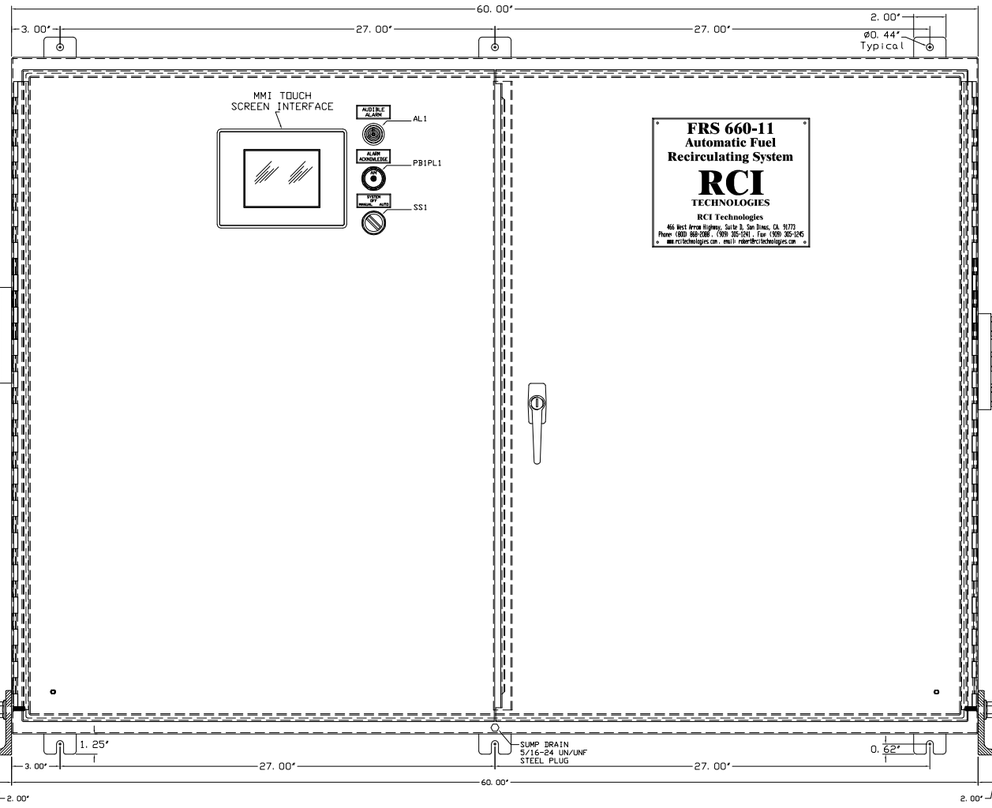
REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED

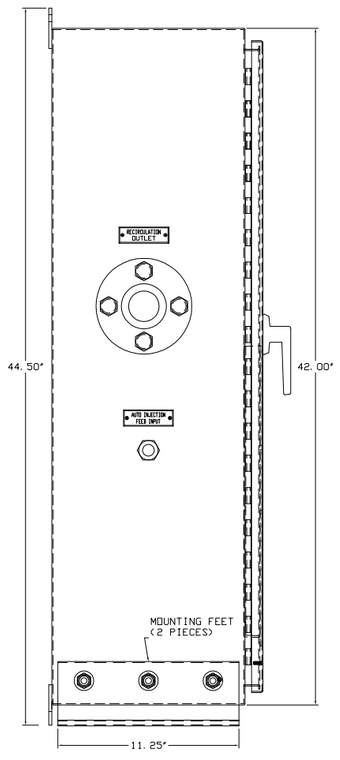
NOTES: UNLESS OTHERWISE SPECIFIED.
1) MAIN ENCLOSURE IS HOFFMAN UL LISTED OR EQUIVELENT. MAIN ENCLOSURE MANUFACTURED FROM 14AWG PHOSPHATIZED STEEL PRIMED AND POWDER COAT PAINTED WHITE. INTERNAL COMPONENTS/ENCLOSURES AND FITTINGS TO MEET UL-3R INTEGRITY OR GREATER.
3) ALL PARTS SHOWN TYPICAL.
4) FLOOR ANGLES ARE SHIPPED ATTACHED AS STABILIZING FEET. THE FLOOR ANGLES CAN BE REPOSITIONED 180° TO ACCOMMODATE RIGID FLOOR FASTENING REQUIREMENTS.



ENCLOSURE SIZE IS ESTIMATED AND SUBJECT TO CHANGE

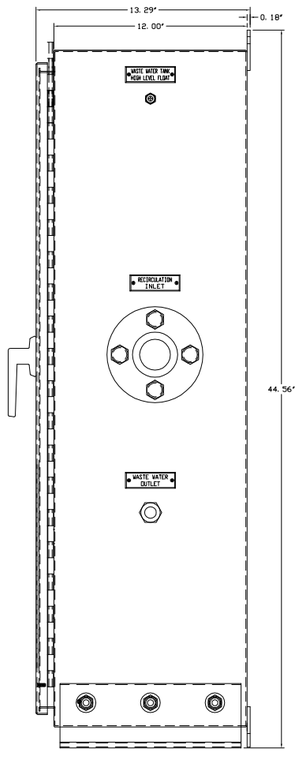
TOP VIEW





LEFT VIEW

FRONT VIEW



25 GPM
1-1/2" NPT

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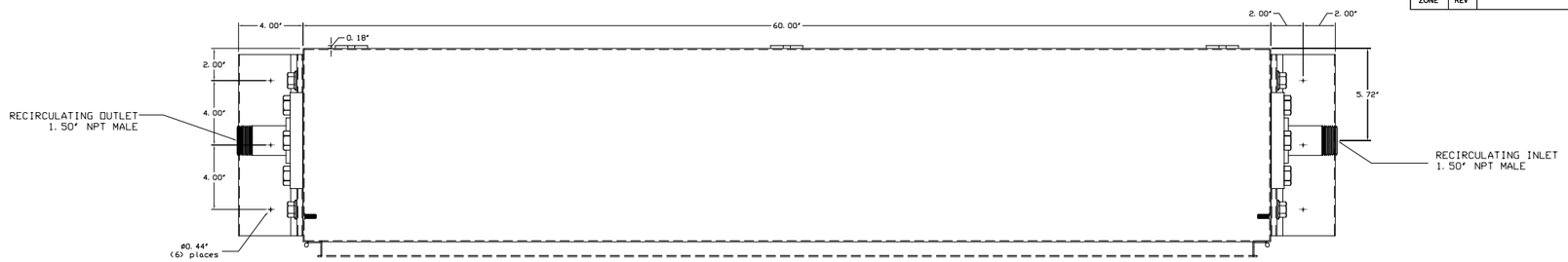
SCALE: –	APPROVED BY: –	DRAWN BY: SDM
DATE: 08/29/13		REVISED: –

FILTER UNIT
380V/AC, 50Hz, 3ø, 8.4FLA
25 AMP SERVICE

FRS660-25-STU (6062)
UL# CB-782759

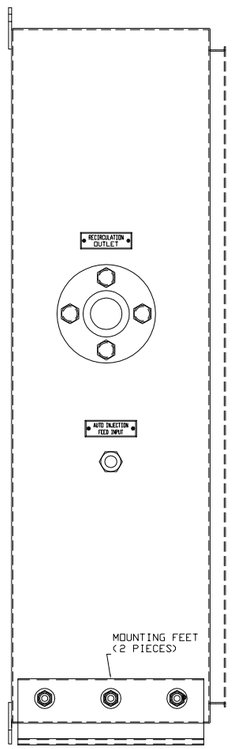
DRAWING DESCRIPTION	SHEET	DRAWING NUMBER
CUSTOMER CLOSED	1 OF 3	RCI13AG053-C1

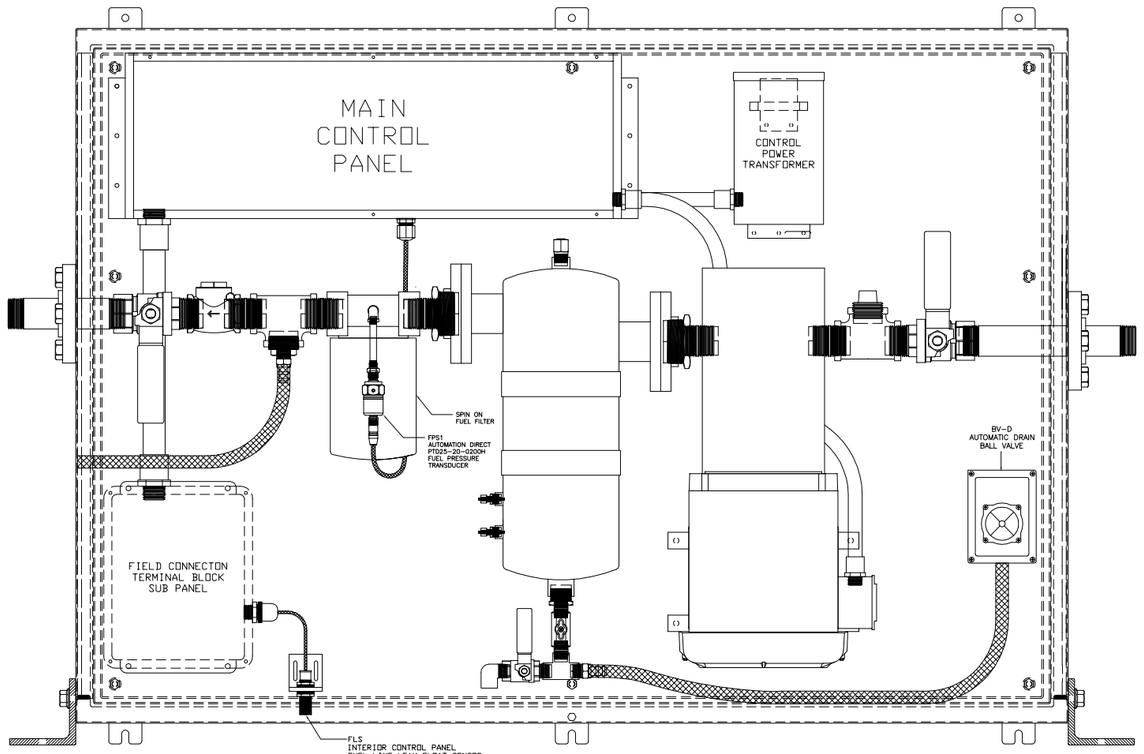
REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED

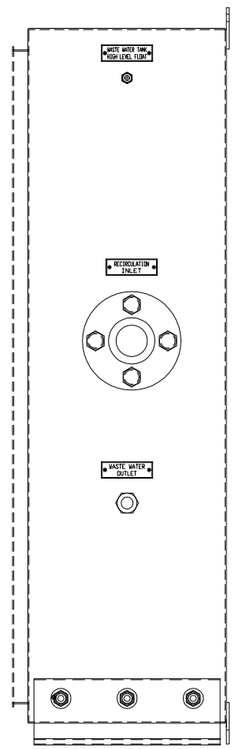


TOP VIEW

ENCLOSURE SIZE IS ESTIMATED
AND SUBJECT TO CHANGE







LEFT VIEW

FRONT VIEW
DOORS SHOWN REMOVED
ALL VIEWS
25 GPM
1-1/2" NPT

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SCALE: –	APPROVED BY: –	DRAWN BY: SDM
DATE: 08/29/13		REVISED: B

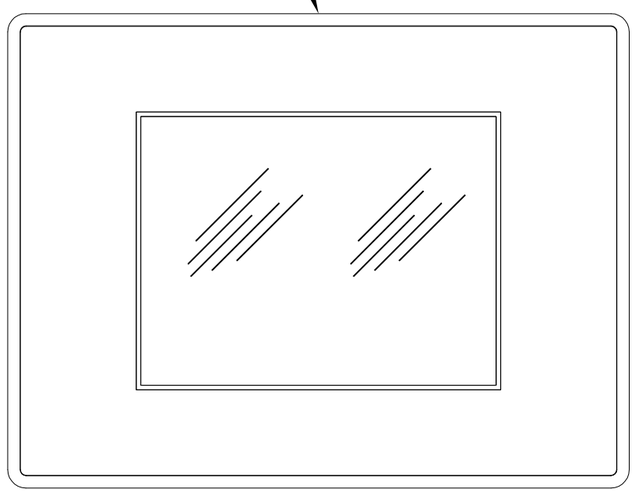
FILTER UNIT
380V/AC, 50Hz, 3ø, 8.4FLA
25 AMP SERVICE

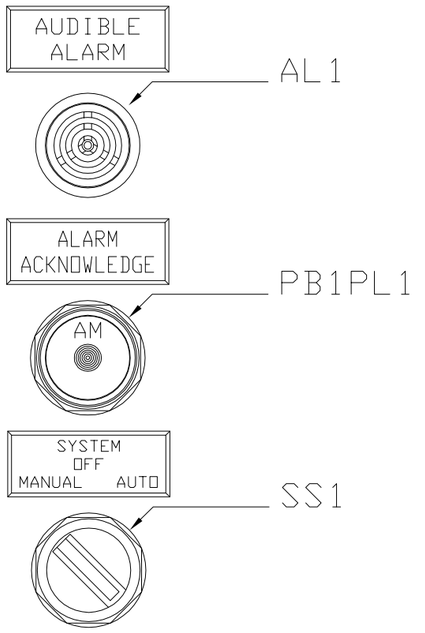
FRS660-25-STU (6062)
UL# CB-782759

DRAWING DESCRIPTION	SHEET	DRAWING NUMBER
CUSTOMER OPEN	2 OF 3	RCI13AG053-C2

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED

MMI TOUCH
SCREEN INTERFACE





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SCALE: –	APPROVED BY: –	DRAWN BY: SDM
DATE: 08/29/13		REVISED: –

FILTER UNIT
380V/AC, 50Hz, 3ø, 8.4FLA
25 AMP SERVICE

FRS660-25-STU (6062)
UL# CB-782759

DRAWING DESCRIPTION	SHEET	DRAWING NUMBER
OPERATOR BLOWUP	3 of 3	RCI13AG053-C3

RCI Technologies

FRS 660

Complete NEMA 4 UL 508A

Automatic Fuel Recirculating Systems

FRS 660-25-MTU-4
(Four Tanks)

SUBMITTAL
DOCUMENTS

SUBMITTAL PACKAGE INDEX

How the FRS 660 System works.

Product Sheets:

- FRS 660-25-MTU-4
- Motorized Ball Valves
- ModBus RTU
- Spin On Filter for 25 GPM System
- Automatic Water Drain
- Automatic Chemical Injection

Single Line Piping Diagram – Multi Tank Systems

Operator Interface Flowchart

Mechanical Drawings and Field Wiring Connections: - See attached Drawing Package

- Power and Alarm Relays
- Motorized Ball Vales for Tanks 1 and 2
- Motorized Ball Vales for Tanks 3 and 4
- ModBus RTU

NOTE: “As-Built” Documents providing detailed “Internal” Wiring Diagrams are provided with each System when it ships.

How RCI's Automatic Fuel Recirculation System works

All RCI single and multi-tank Fuel Recirculation Systems (FRS 660) are **UL 508A Listed**. They are designed to automatically circulate and clean fuel at a predetermined time and rate without the use of costly filter elements.

FRS 660 Systems utilize RCI's patented fuel purification technology which contains no filters or moving parts. The FP Purifiers are used as the Primary fuel purification. They remove 100% of all free water, including emulsified water and up to 98% of normal solid or particulate contaminates found in fuel, including sludge and algae to approximately 10 microns.

FRS 660 Systems are pre-wired and plumbed, housed in **NEMA 4** enclosures and utilize PLC controllers to provide long term reliable operations. All operator interfaces are conveniently located on the front door for easy viewing. Multiple levels of security are built-in to each unit to prevent unauthorized access to critical system operating programs.

FRS 660 - UL 508A

FRS 660 Systems include many standard features such as a continuous duty positive displacement pump with pressure relief valve, TEFC motor with over-load protection, high water sensor, fully seal welded enclosure providing a containment basin with leak sensor, industrial grade powder coating on the interior and exterior of the enclosure, keyed door lock, touch screen system status and programming display, audible alarm with integrated reset button and visual alarm light, keyed HOA switch, biological decontamination unit, brass inlet and outlet ball and check valves and four external alarm relay contacts for interface to other devices.

In addition to standard 120 or 220 VAC power requirements, FRS 660 systems are available with optional 208/230/ 460 VAC. Other key system options include Ethernet or Modbus communication capabilities, thermostatically controlled enclosure heater and Modbus operated solenoid valves for multiple tank systems. This option is unique to RCI and significantly reduces installation costs

FP 400

RCI's FP purifiers provide a **THREE** stage purification process utilizing two well known separation principles, centrifugal and coalescence.

By using these principles, water and other contaminants are separated from the fuel. This eliminates fuel filter clogging, related breakdowns, down time and frequent filter replacement.

As the fuel enters the purifier, it flows downward in a circular movement through an internal baffle system into the lower chamber of the purifier.

In the **FIRST** stage of purification, the velocity of the fuel slows down considerably, allowing any free water droplets and other contaminates to maintain their mass and not emulsify with the fuel. These impurities accumulate and remain at the bottom of the purifier until purged.

In the **SECOND** stage of purification, the fuel migrates through a series of perforated baffle plates to stop any particulates and attract, by way of coalescence, any water droplets still remaining.

In the **FINAL** stage of purification, the fuel passes through the patented coalescence medium to assure that any small water droplets or particulates will be removed from the fuel stream. Only clean fuel risers to the top and exists the purifier.

RCI Technologies' FRS 660 Systems provide consistent, clean burning fuel for quicker ignition and better combustion which leads to increased engine power and efficiency.

FRS 660-25-MTU-4-UL Fuel Recirculating System Specification

Product Description:

The FRS 660-25-UL Fuel Recirculating System is **UL 508A Listed and Green Clean Certified.** It is designed to automatically circulate and clean fuel at 25 GPM for four (4) storage tanks on a preprogrammed schedule without the use of filter elements.

The FRS 660-25 UL utilizes **RCI Technologies patented** fuel purification technology, which contains no filters or moving parts. It is used as primary fuel purification and removes 100% of all free water, including emulsified water and up to 98% of the normal solid or particulate contaminates found in fuel, including sludge and algae to approximately 10 microns.

The control system is housed in a **NEMA 4**, key lockable enclosure. The system consists of an RCI Universal Fuel Purifier, a continuous duty motor and 25 GPM fuel pump. The system is PLC controlled, with an Operator Interface Touch Panel that allows for system programming and alarm monitoring. Automatic controls are governed by a programmable 7 days, 24-hour real time clock with user definable start and run times. Four (4) relay alarm outputs include: pump failure, purifier high water level, system high pressure and fuel catch basin leak. Standard internal relays allow alarm status to be remotely monitored.

FRS Systems are designed for use with all Class II or III combustible fuels having a flash point of 100° F or higher. While not necessary, an additional 3 -micron fuel filter is included to meet the specifications.

All RCI Systems are cycle and leak tested for a minimum of 2 hours prior to shipment.

Standard Features:

System:

- Listing: **UL 508A and Green Clean Institute**
- Approx. shipping weight: 425 lbs.
- Power Requirements: 400 VAC, 50hZ, 3P

Cabinet:

- Dimensions: 60" W x 42" H x 12" D
- Rating: **NEMA 4**
- Construction: Dual Door, Heavy Duty Powder Coated Steel (*white*)
- Mounting: Suitable for floor or wall mounting *(Wall and Floor Mounting Tabs Included)*
- Security: Individually Keyed Lock
- Fuel Leak Basin w/ Drain: Integral
- Leak Float Switch: 1/8" Liquid Detection
- Pressure Switch: Factory Set at 75 psi
- Plumbing and Wiring: Factory assembled and tested

Controls:

- System Controller: **UL 508A** Standard PLC
- Operator Interface: 6" Monochrome Touch Screen
- System Data Display: Same Touch Screen
- Location of:

PLC Controller	In **NEMA 4X** Poly Pro Enclosure
Touch / Data Screen	Exterior of Front Door
OHA Switch	Exterior of Front Door
Summary Alarm Light	Exterior of Front Door
Audible Horn	Exterior of Front Door
Test Reset Alarm Button	Exterior of Front Door
ModBus RTU	Included with PLC

Controls:

- 1.5" Automatic Ball Valves: 8 for four tanks

Fuel Purifier:

- Model Number: FP 1000F Fuel Purifier - Flanged
- Normal Flow: 40 GPM
- Water Removal: 100%
- Bio Decontamination Unit: BM-C1500
- Water Drain Valve: 1" Brass
- Particulate Removal:
  - Primary: 98% to approx. *(10 micron)*
  - Secondary: Provided by Engine Mfg. *(5 micron)*
  - Final Removal Provided by Engine Mfg. *(2 micron)*

Automatic Water Drain Kit
Automatic Chemical Injection Kit
3 Micron Spin-on Filter

Pump:

- Type: Positive Displacement Pump
- Product to pump: Diesel Fuel
- Pump Rate: 25 GPM
- Pump Housing: Aluminum
- Pump Gears: Steel

Pump Motor:

- Horse Power: 2 H.P.
- Enclosure: TEFC
- Frame: 56C
- Duty: Continuous
- Type: Capacitor Start

Plumbing:

- 2 pcs. Brass 1.5" Manual Ball Valves *(Fuel Line Input/Output)*
- 1 pc. Brass 1.5" Priming Tee

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115VAC ACTUATOR AND BALL VALVE

(FRS Option)

PRODUCT NUMBER:

1001

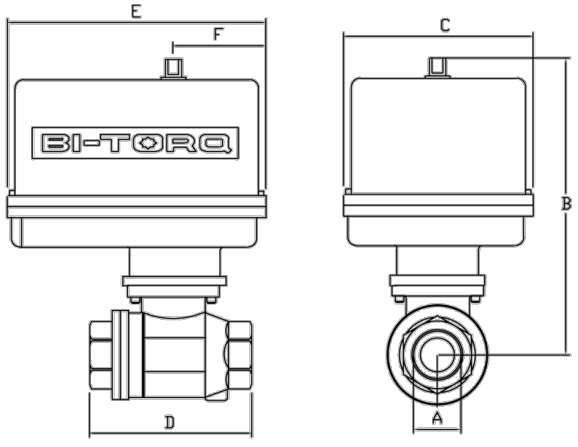
PRODUCT DESCRIPTION:

The 115V Actuator is used on brass motorized ball valves rated at 600 WOG (1/2" for the 5GPM and 11GPM systems, 1" on the 25GPM systems). It is constructed with a NEMA 4 protective cover.

PRODUCT FEATURES:

Product Number	1001
Product Name	115VAC ACTUATOR AND BALL VALVE
Output Torque	100 inch pounds
Cycle Time	2.5 sec/90°
Duty Cycle	75%
Standard Motor	115VAC/60Hz/1ph
Standard Enclosure	NEMA 4
Enclosure Material	Aluminum
Enclosure Coating	Thermal bonding polyester powder
Temperature Rating**	-40°F to +150°F
Thermal Overload Protection	Standard
Manual Override	Standard (omit on NEMA 7)
Lock Rotor Current	0.55 amps
Switches	15A, 1/2 HP 125 250VAC/0.5A/125VDC
Weight	5 pounds

**heater required below 0°F



Section	Ball Valve Size		
A	**1/2"**	**1"**	**1 ½"**
B	**6.13**	**6.57**	**8.29**
C	**4.00**	**4.00**	**4.22**
D	**2.64**	**3.35**	**4.13**
E	**5.63**	**5.63**	**5.63**
F	**2.31**	**2.31**	**2.43**
ACT.	**100E**	**100E**	**200E**
WT.	**5.82**	**6.35**	**10.17**

IP-Series 2-Piece Brass Ball Valves

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PART #	NAME	MATERIAL	OPTIONAL MATERIAL	QTY
1	BODY	BRASS UNI 5705-65	N/A	1
2	ENDS	BRASS UNI 5705-65	N/A	2
3	BALL	BRASS UNI 5705-65 CHROME PLATED	316SS	1
4	SEAT	TFE	N/A	2
5	BODY SEAL	VITON	N/A	2
6	STEM SEAL	TFE	N/A	1
7	BODY O-RING	VITON	N/A	2
8	STEM O-RING	VITON	N/A	1
9	STEM NUT	BRASS UNI 5705-65	316SS	1
10	STEM	BRASS UNI 5705-65	316SS	1

VALVE FEATURES

- Full port brass valve 1/4” through 4”
- Optional stainless Steel ball & stem 1/4” through 2”
- TFE® seats and seals
- Viton® body o-rings
- ISO mounting pad
- Blowout proof stem
- CE rated

PRESSURE RATING

600 WOG

TEMPERATURE RATING

+297°F Maximum

ACTUATOR FEATURES

PNEUMATIC ACTUATORS

- Rack and pinion design
- Spring return or double acting
- Open and closed adjustment stops
- True NAMUR accessory mounting
- Visual indicator

ELECTRIC ACTUATORS

- 120VAC, 220VAC, 24VAC, 12VDC, 24VDC
- NEMA 4 and NEMA 7
- Manual override
- Visual indicator

NOTE: Maximum temperature rating for standard actuators is 150°F (electric) and 180° (pneumatic). Special seals or heat extensions are available for high temperature service

ALL VALVES ARE 100% ELECTRONICALLY TESTED AT 80 PSI IN BOTH THE OPEN AND CLOSED POSITIONS

MODBUS Interface

(FRS Option)

PRODUCT:

1026 – MODBUS Interface Option

PRODUCT DESCRIPTION:

This option allows the operator to connect to a MODBUS network and monitor the system. RCI Technologies will provide the user with all the information and MODBUS mappings for system use*.

*** - Available upon request**

PRODUCT FEATURES:

Product Number	1026
Product Name	MODBUS – PLC Module, Operator Interface & 5 Port Connection
Max. Network Distance	4000 feet
Max. Number of Devices	32 per network
Max. Baud Rate	115.2 Kbaud
Supply Voltage	5 VDC @ 100 mA max (from CPU) or 24 VDC @ 70 mA (external source)
Max. Driver Load	62 ohms
Driver Voltage	±1.5V minimum
No Load Current	80 mA
Max. Current	100 mA (62 _)
Isolation Resistance	>1014 _/7pF
Voltage Withstand	1.2 KVrms/1s or 1.0 KVrms/1 minute
Operating Temp	0 to 60°C (32 to 140°F)

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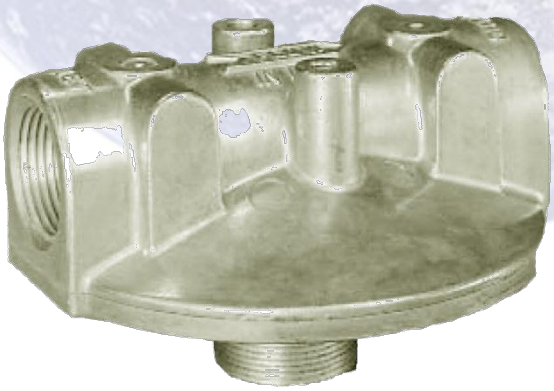
Spin-On Filter– 25 GPM Option

(FRS Option)

PRODUCT:

1018-1 – Spin-On Filter - 25 GPM Option



PRODUCT DESCRIPTION:

This filter and head are plumbed into the system to provide further filtration down to 3 microns. The 1" filter head is used on the 25 GPM FRS systems. The filter option also includes the additional installation of a pressure transducer to alert the system of drops in flow rate or increase in system pressure. The system is designed to trigger an alarm and shut off if there is a drop in pressure below 2 PSI (lack of flow) or above 75 PSI. The system will also trigger an alarm with an increase in pressure above 35 PSI to change the filter element.

PRODUCT FEATURES:

Product Number	1018-1
Product Name	Spin-On Filter - 25 GPM Option
Filter Head	
Flow Rate	40 GPM
Max Pressure	200 PSI
Max Temperature	250° F
Port Size	1" NPTF
FILTER	
Product Number	1018-1-A
Beta Rating	2/3/4
Color/Imprint	White/Green
Diameter	5.1 IN.
Filter Area	680 SQ IN.
Filter Type	Synthetic
Length	6.7 IN.
Max Pressure	80 PSI
Max Temperature	250° F
Micron Rating	3 Micron
Mounting Thread	1.5 IN. – 16 UN

Automatic Water Drain

(FRS Option)

PRODUCT NUMBER:

1011 – AWD (Automatic Water Drain Option)

PRODUCT DESCRIPTION:

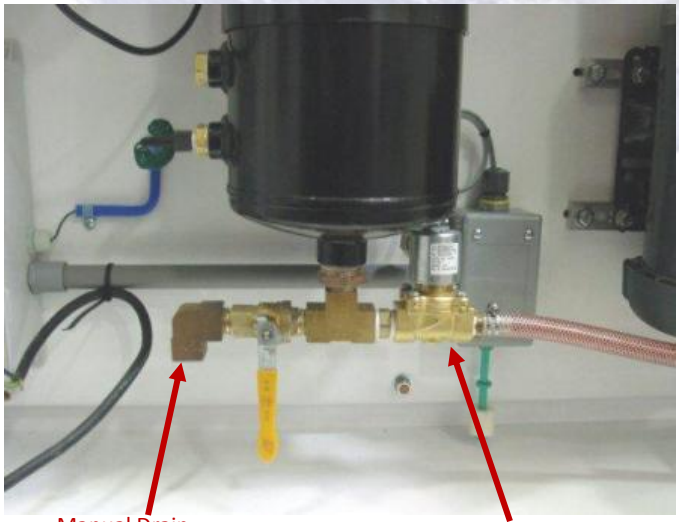
The Automatic Water Drain option gives the operator the ability of automatically purging the water and contaminants removed from the stored fuel during routine circulation. The system is designed to open a solenoid valve for a short period of time, purging a small amount of water and contaminant contained in the sump into an attached container.

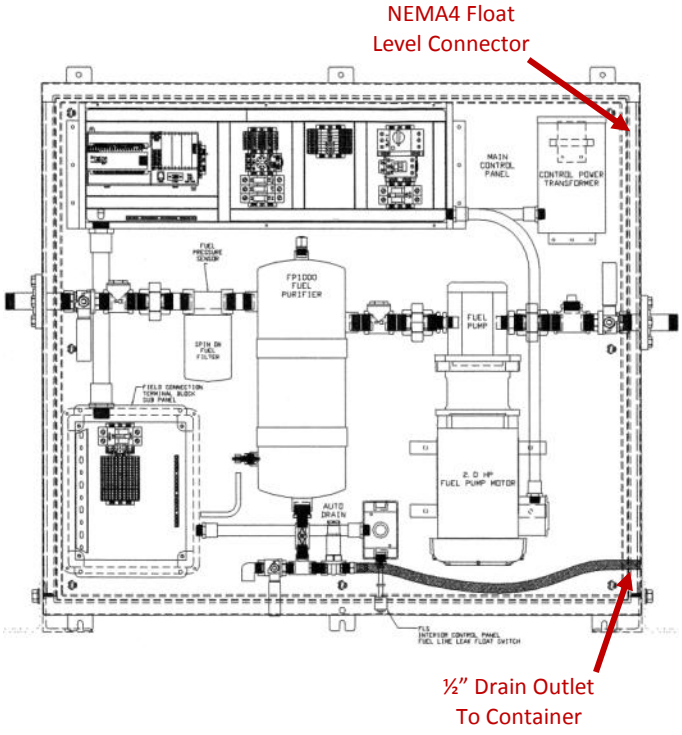
PRODUCT PROCESS:

Once the water level in the RCI Purifier reaches the RCI Water Sensor, it sends a dual function signal to the control, activating a week-long passive alarm and signaling the solenoid valve. The signal momentarily opens the solenoid valve next to the manual purge valve and discharges the water and contaminants into the attached container.

PRODUCT FEATURES:

Product Number	1011
Product Name	Automatic Water Drain Option
Capacity	15 gallon container (included)
Manual Valve	½" Manual Drain Valve
Automatic Valve	½" Solenoid Valve
Drain Outlet	½" Drain outlet
Safety Feature	12mm Panel-Mount NEMA 4 Connector to a High Level Float Switch located on the container.





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AUTOMATIC CHEMICAL FEED

FUEL PURIFIERS • MARINE FUEL PURIFIERS • FUEL RECIRCULATING SYSTEMS • PORTABLE TANK CLEANING

The Automatic Chemical Feed System delivers chemicals into the fuel return line during the fuel polishing cycle via a reliable diaphragm pump. Injection rates are field adjustable.

Manual control pumps feature adjustable stroke rate and length, reliable timing circuits, and circuit protection from voltage and current upsets. Leak-free bleed valves provide safe and easy priming.

The System includes an Injection/back pressure valve assembly, foot valve/strainer assembly, three-function valve, 4-ft clear PVC tubing, 8-ft rigid polyethylene discharge tubing and 5 gallon polyethylene chemical storage container. (Chemicals are not included.)

Pump Specifications	
Product Type	Diaphragm Metering Pumps
Wetted parts	PVC, PTFE, ceramic
Max pressure	100 psi
Max flow rate (LPH)	14.82
Max flow rate (GPH)	3.92
Max viscosity (cp)	1000
Max flow rate (mL/min)	247
Dimensions	5-"W x 10-"H x 11"D
Pump type	Diaphragm
Power (VAC)	115

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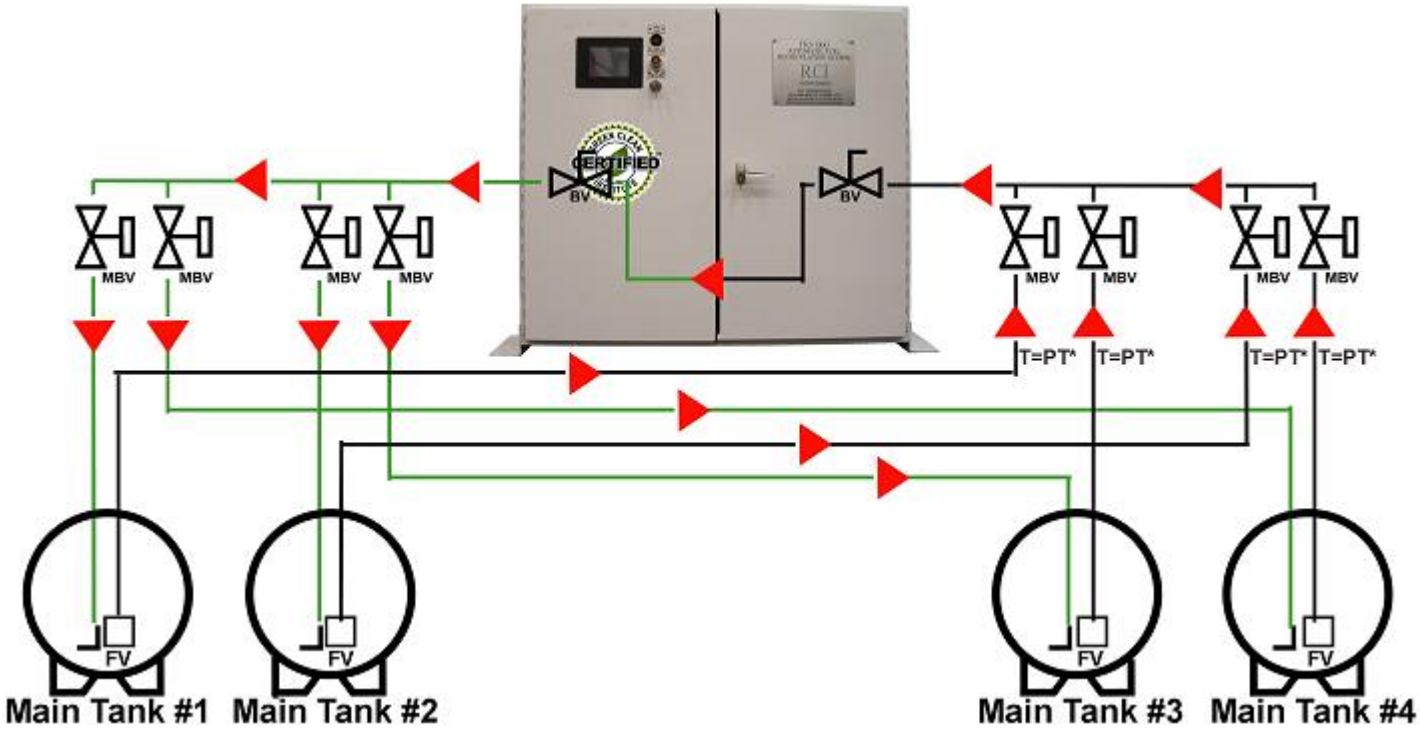
Multiple Tank Diagram



Supplied by RCI Technologies

= Manual Ball Valve

= Motorized Ball Valve

Supplied by Contractor

T=PT = Priming T

* = Install at Highest Point

= Foot Valve

= 90° Elbow

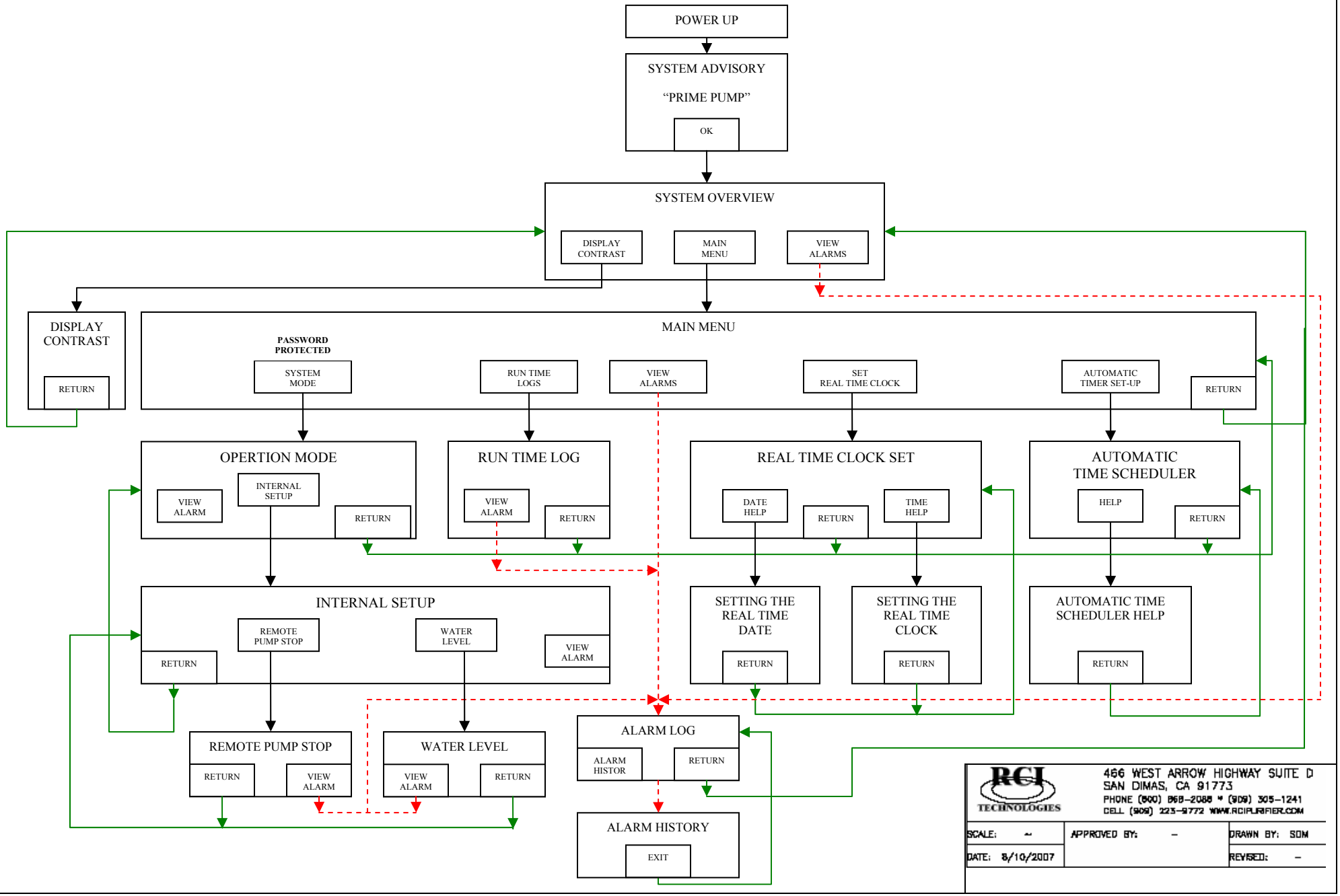
NOTE: *Foot Valve Placement - Depending on the tank type and other installation parameters, the distance of the foot valve off the tank bottom is to be determined by installing contractor.*

Supply and Return lines should be installed a in opposite ends of the tank for effective cleaning.

****All solenoid valves programed normally open.**

OPERATOR INTERFACE FLOWCHART

ALL FRS 660 SINGLE and MTU SYSTEMS



RCI TECHNOLOGIES
466 WEST ARROW HIGHWAY SUITE D
SAN DIMAS, CA 91773
PHONE (800) 868-2088 * (909) 305-1241
CELL (909) 223-9772 WWW.RCIPURIFIER.COM

SCALE: ~	APPROVED BY: –	DRAWN BY: SDM
DATE: 8/10/2007		REVISED: –

231113 FRP-1 Phillips Manual Fuel Removal Pump

US Embassy London
Fuel Oil Submittal
231113
BL Harbert International
120080

Phillips Fuel Systems

109 Holland Ave Bridgeport CT, USA 06605
Phone: (203)-908-3323 Fax: (203)-908-3325

SP24-130062

24 Return Pump & Accessories
17 GPM @ 50 PSI, 1½ HP motors,
400 VAC/ 3Ø/ 50Hz

London

All rights Reserved. No portion of this package or any part herein shall not be reproduced in any form without the written permission of Phillips Fuel System Inc

By acceptance of this package, it is understood that Phillips Fuel System Inc shall be responsible for only those items indicated herein and unless otherwise noted. The signatory whose signature appears is duly authorized by all necessary and appropriate action to execute approval and will all abide by Phillips Fuel Systems Inc standard sales terms and conditions and be responsible for verifying correctness of the type, size, location, operation, electrical requirements, piping, accessories or any other requirements for successful operation. It is further understood that by acceptance of this package, Phillips Fuel System Inc will not be held liable for any deviation or omission from any quotation and/or specification. Phillips Fuel System Inc reserves the right, without approval, to rearrange components or substitute, due to lack of availability, quality and/or performance, any component indicated herein with a compatible component, as long as that component is of the same quality and general design.

Approved _____ Date _____

Approved _____ Date _____

Approved _____ Date _____

PHILLIPS FUEL SYSTEMS INC LIMITED WARRANTY FOR NEW PUMPS OR PUMPING SYSTEMS MANUFACTURED BY PHILLIPS FUEL SYSTEMS INC

A. PRODUCTS WARRANTED - Phillips Fuel System Inc, subject to the limitations contained below, will at its option, repair or replace, without charge for parts or labor only, any part or parts of a new pump or system manufactured by PHILLIPS FUEL SYSTEMS which is found, upon examination by PHILLIPS FUEL SYSTEMS INC at it's factory in Bridgeport, Ct. or by its designated affiliate, to be DEFECTIVE IN MATERIAL AND/OR WORKMANSHIP if determined by such examination within twelve months from the date of sale to the original consumer purchaser.

B. PRODUCTS AND ITEMS NOT WARRANTED - The provisions of this warranty shall not apply to any equipment, part or accessory which:
(a) has been improperly specified by buyer;
(b) has been improperly stored or handled prior to placing in service;
(c) has been improperly mounted, installed or connected, altered or modified in any way.
(d) has not been operated within specifications as stated on its nameplate, label, placard, or within its operating manual;
(e) has not been properly maintained;
(f) parts supplied by buyer for inclusion in finished equipment are not covered by this warranty;
(g) components or assemblies specified by buyer with no substitution permissible that are not normally used by Phillips Fuel System Inc are not covered by this warranty;
(h) that interfaces with, controls or is controlled by any device that has not been approved by Phillips Fuel System Inc

Phillips Fuel System Inc reserves the right to reject warranty claims of any kind against assembled equipment, parts or material for which Phillips Fuel System Inc has not received payment in full and for any system which was not authorized for start up and use by Phillips Fuel System Inc or by its designated affiliate. Should buyer, at his own risk, elect to replace failed equipment or parts in the field rather than obtain start up service under this warranty, Phillips will supply and invoice parts at normal prices upon receipt of buyer's bonafide purchase order. Failed equipment or parts returned for in-warranty crediting in exchange for replacement parts must be returned within 45 days from date of shipment of replacement in order to qualify for warranty consideration.

This warranty is extended to the original buyer only and is not transferable to subsequent buyers. This warranty is available for installations in the forty-eight contiguous U.S. states only.

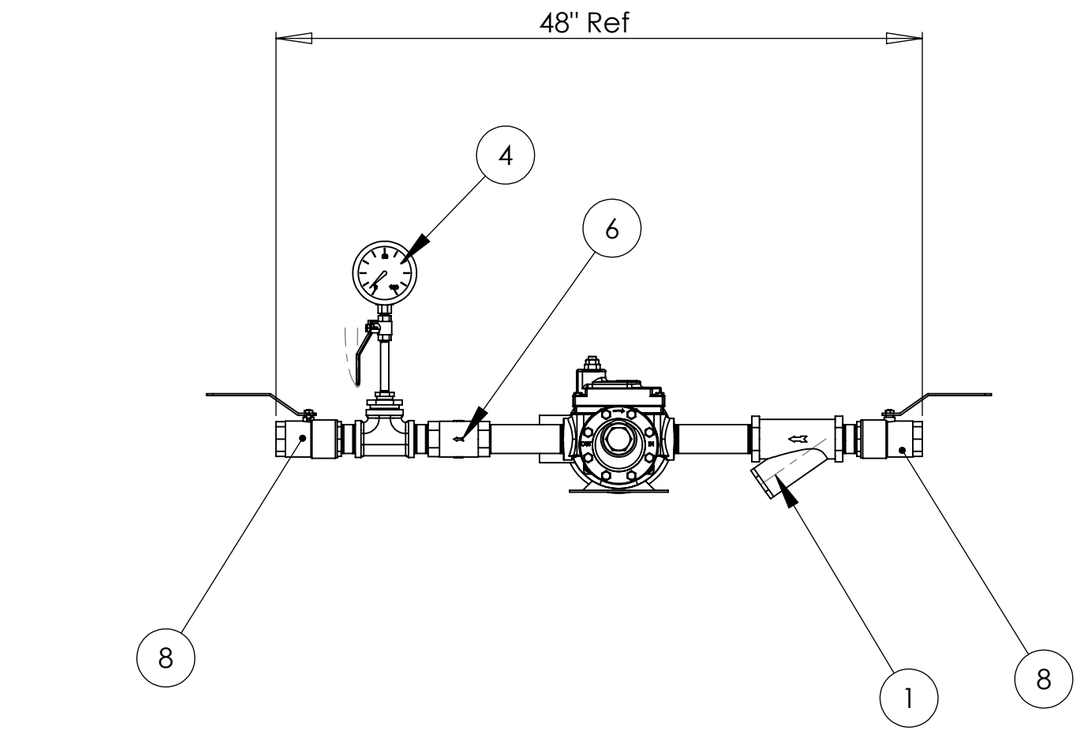
C. SECURING WARRANTY SERVICE - Warranty service can be arranged by contacting PHILLIPS FUEL SYSTEMS INC, c/o Service Manager, 109 Holland Ave, Bridgeport, Ct 06605. Warranty service can only be performed by Phillips Fuel System Inc at its factory in Bridgeport, Ct or by its designated affiliate. At the time of requesting warranty service, evidence must be presented of the date of sale to the original consumer purchaser. The purchaser shall pay any charges for making service calls and/or for transporting the product to and from the place where the inspection and/or warranty work is performed. The purchaser shall be responsible for any damage or loss incurred in connection with the transportation of the system and/or of part or parts of the system, submitted for inspection and/or warranty work.

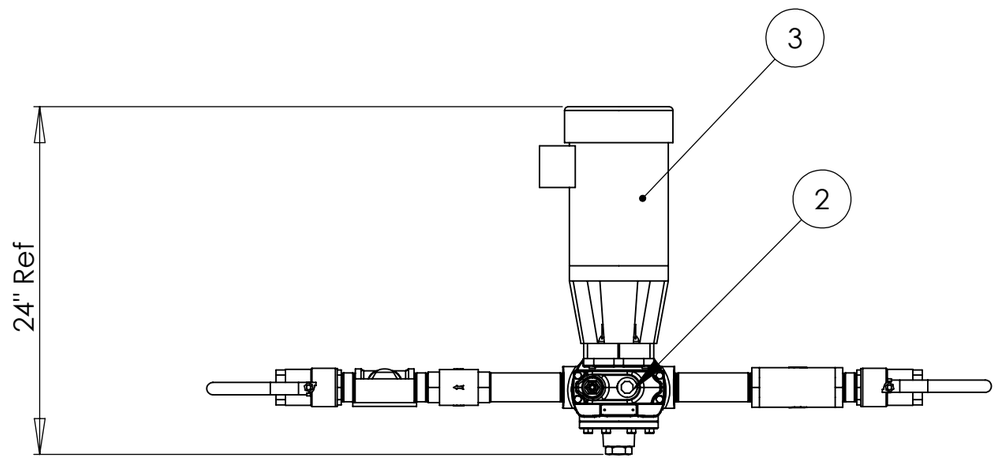
D. NO ADDITIONAL WARRANTIES OR REPRESENTATIONS - The foregoing EXPRESSED WARRANTY IS IN LIEU OF ALL OTHER EXPRESSED WARRANTIES. Neither Phillips Fuel System Inc nor any of its affiliates make any warranties, representations or promises, written or verbal, as to the quality of the system or its parts other than those set forth herein.

ANY IMPLIED WARRANTIES (INCLUDING, BUT NOT LIMITED TO MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE) TO THE EXTENT EITHER APPLIES TO PART OR PARTS OF A SYSTEM SHALL BE LIMITED IN DURATION TO THE PERIODS OF THE EXPRESSED WARRANTIES AS DEFINED IN PARAGRAPH A. Some states do not allow limitations on how long an implied warranty lasts, so the above limitations may not apply.

E. DAMAGES - IN NO EVENT WILL PHILLIPS PUMPS BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES AND/OR EXPENSES. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation may not apply to you. This warranty gives you specific legal rights and you may have other legal rights which vary from state to state.

F. NO DISTRIBUTOR DEALER WARRANTY - PHILLIPS FUEL SYSTEM INC neither assumes nor authorizes any other person, natural or corporate, to assume any other obligations or liabilities in connection with or with respect to any part or parts of a system. The seller, dealer or distributor of part or parts has no authority to make any representations or promises on behalf or PHILLIPS FUEL SYSTEMS INC or to modify the terms or limitations of this warranty in any way. The seller, dealer or distributor makes no warranty of his own on any item warranted by PHILLIPS FUEL SYSTEMS and makes no warranty on other items, unless such seller or dealer delivers to the purchaser a separate written warranty document in which the seller or the dealer individually and specifically on its own behalf, warrants the terms or items.





ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	HS-415C-16	Pipeline Y Strainer, Max Pressure 250 PSI, 1½" NPT, Cast Iron Body	1
2	24UT-Y-V-CW-145TC-R	#24 Gear pump, 1 1/2" NPT side ports, viton seal, counterclockwise rotation, 145TC motor bracket, with internal relief valve	1
3	Lee-121275	Motor, 1½ hp, 1450 rpm, 145T, TEFC: 3Ø, 220/380 VAC,6.0/ 3.5 SFA, 50 Hz	1
4	PG-9699257	Press Gauge, 160 PSI, 4"	1
5	BV-BZ-08	Ball Valve, Bronze, ¼" NPT	1
6	525-16	1½" NPT Bronze In Line Check Valve, 200 psi	1
7	TEE-BS40-16	Tee, Black Steel, 1½" NPT	1
8	BVLH-BZ-16	Ball Valve, Bronze, 1½" NPT	2
9	RB-BS-13-08	Reducing Bushing, 3/4 x 1/4, Black Steel	1
10	RB-BS-16-13	Reducing Bushing, 1½ x ¾	1
11	NIP-BS40-08 X 4	Nipple, Schedule 40, Black Steel, 1/4" x 4 " Long	1
12	NIP-BS40-16 x 2	Nipple, blk stl-1 1/2" NPT x 2.00" lg	3
13	NIP-BS40-16 x 6	Nipple, blk stl-1 1/2" NPT x 6.00" lg	2

Phillips Fuel Systems
109 Holland Ave., Bridgeport, Ct 06605

TITLE:
24 Return Pump & Accessories
17 GPM @ 50 PSI, 1½ HP motors,
400 VAC/ 3Ø/ 50Hz
London

Part Number.
SP24-130062

REV

	NAME	DATE
DRAWN		

SCALE: 1:10 WEIGHT: SHEET 2 OF 3

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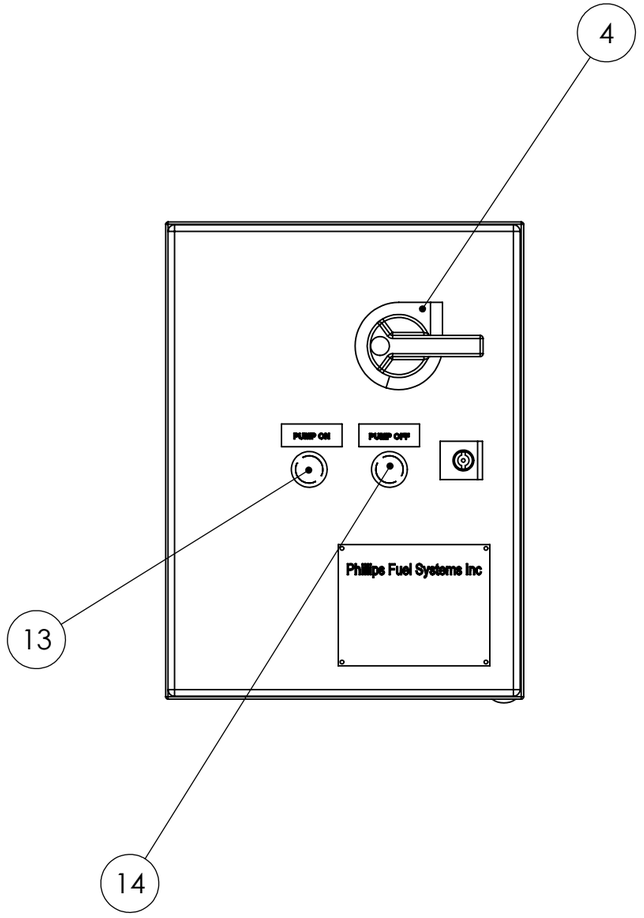
DO NOT SCALE DRAWING

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	Rittall AE1034.500	Enclosure with back panel; 400mm [15.75in] H x 300mm [11.81in] W x 210mm [8.27in] D; NEMA Type 4	1
2	SQ-GS1DDU3	30 AMP Fusible Disconnect Switch	1
3	SQ-GS1AE8	Disconnect shaft, 5mm sq. x 6.50" lg	1
4	SQ-GS1AH120	GS1 Disconnect Handle (5 mm sq shaft)	1
5	FNQ-R-5	Fuse 05 A, Reject Type, 600V	3
6	SQ-9070-TF50D33	50 Watt Transformer, fused, 380/400/415 VAC to 115/230 VAC	1
7	FNQ-R-.3	Mini Fuse, 3/10 Amp, Reject Type, 600 Volt	2
8	FNQ-.6	Fuse, Reject Type 600V	1
9	SQ-LUB12	Intergral motor starter, 12 Amp	1
10	SQ-LUCA12FU	3Ø adj. motor overload 3 to 12 Amp, 110-240 VAC coil	1
11	SQ-LUFN20	Aux Contact block for LU series with 2 NO contact	1
12	SQ-LUA1C20	Overload trip contact block, 2 NO contact	1
13	SQ-XB4BA21	Pushbutton, Black NO	1
14	SQ-XB4BA22	Pushbutton, Black NC	1
15	WAGO-249-116	End Clamp	2
16	WAGO-280-311	Teminal End Cover, 2.5 mm	5
17	WAGO-280-901	Terminal block 2.5mm grey	3
18	WAGO-280-902	Terminal block 2.5mm orange	8
19	NP-PUMP ON	Nameplate - PUMP ON	1
20	NP-PUMP OFF	Nameplate - PUMP OFF	1
21	Label - Dis 5 Amp	Disconnect - Label - 5 Amp	1
22	Label - 400-3-50	Label - 400 VAC, 3 PH, 50 Hz	1
23	Label - Field Wiring	Field Wiring Label	1
24	Label - UL508	UL 508 Label	1
25	Nameplate	Product Nameplate	1



Pump on to engage pump
Pump off to disengage pump

Phillips Fuel Systems
109 Holland Ave., Bridgeport, Ct 06605

TITLE:
24 Return Pump & Accessories
17 GPM @ 50 PSI, 1½ HP motors,
400 VAC/ 3Ø/ 50Hz
London

Part Number.
SP24-130062

REV

	NAME	DATE
DRAWN		

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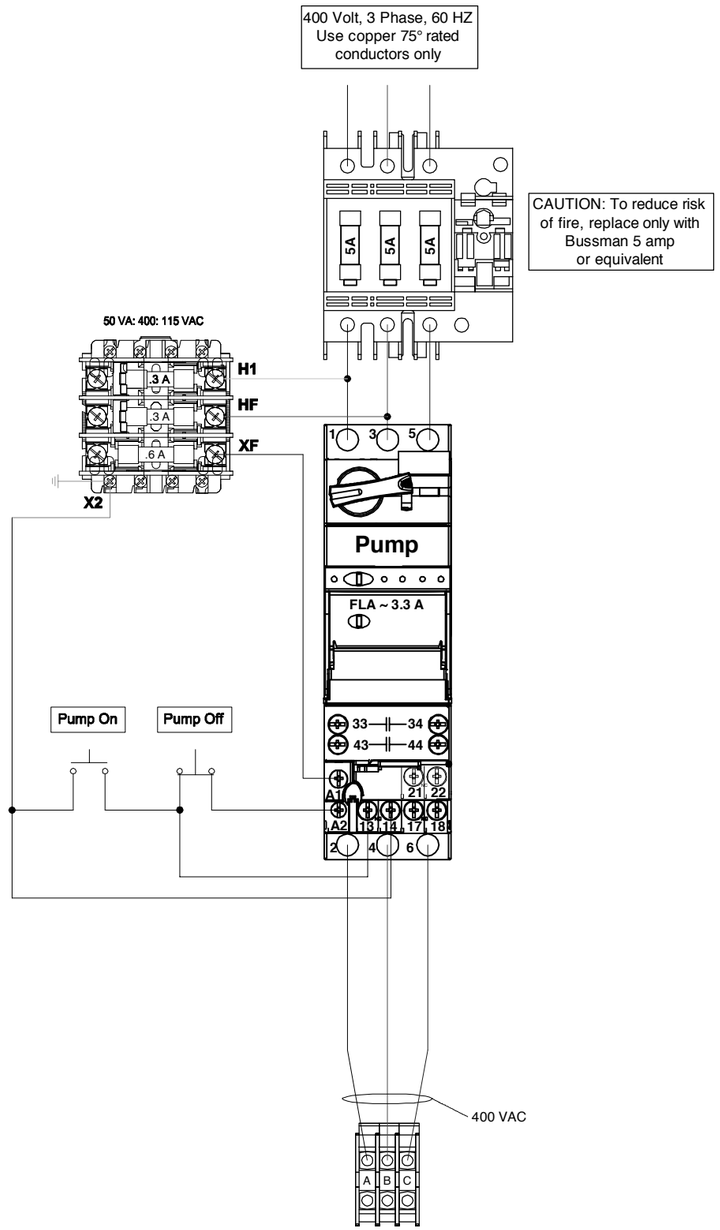

Phillips Fuel Systems
109 Holland Ave., Bridgeport, CT 06605

Single Pump Motor Disconnect Panel
400 VAC / 3Ø / 50 Hz
London - GP24R Series

SIZE	FSCM NO.	DWG NO.	REV
		PC1-130062	
SCALE		SHEET	

SETTING A NEW INDUSTRY STANDARD IN PERFORMANCE EXCELLENCE

Changeable, quick, agile, and incredibly reliable . . . engineered to meet the challenges of industrial users in today's fast-paced environment. With the flexibility of a bolt-on integral relief valve, a broad choice of field-changeable shaft seals and elastomers, and the time-tested "gear within a gear" pumping principal, the new Haight Universal Series of pumps offer unparalleled flexibility and reduced maintenance expenses.

Discover the **HAIGHT ADVANTAGE** and put it to work for you.

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DIVISION OF: BAKER MANUFACTURING COMPANY

133 Enterprise Street
Evansville, WI 53536
Phone: 800-871-9250
Fax: 608-882-3777
Email: haight pump@baker-mfg.com

THE HAIGHT ADVANTAGE

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DIVISION OF: BAKER MANUFACTURING COMPANY

HAIGHT UNIVERSAL PUMPS

Step up to Quality . . .

Step up to Haight

www.haightpump.com

Pumps that fit . . . Pumps that perform

HAIGHT . . . BETTER BY DESIGN

Haight Pumps are engineered for performance and long life under the most rugged conditions.

TYPICAL COMPETITIVE GEAR DESIGN

The typical cantilevered gear design with the inner idler gear has several pronounced disadvantages that the Haight design eliminates, including:

- Single point of entry liquid feed to gears resulting in a “built-in” inlet restriction. This often requires speed reduction at fluid viscosities above 750 SSU.
- Hydraulic imbalance resulting in shaft deflection and premature wear.
- Increased idler speeds resulting in higher gear tip speeds and accelerated wear.
- Thrust bearing field adjustment needed to keep driver gear properly positioned.

THE HAIGHT ADVANTAGE

Haight pumps feature an inner driving gear coupled to a hydraulically balanced free floating outer gear on a dramatically shortened shaft arrangement.

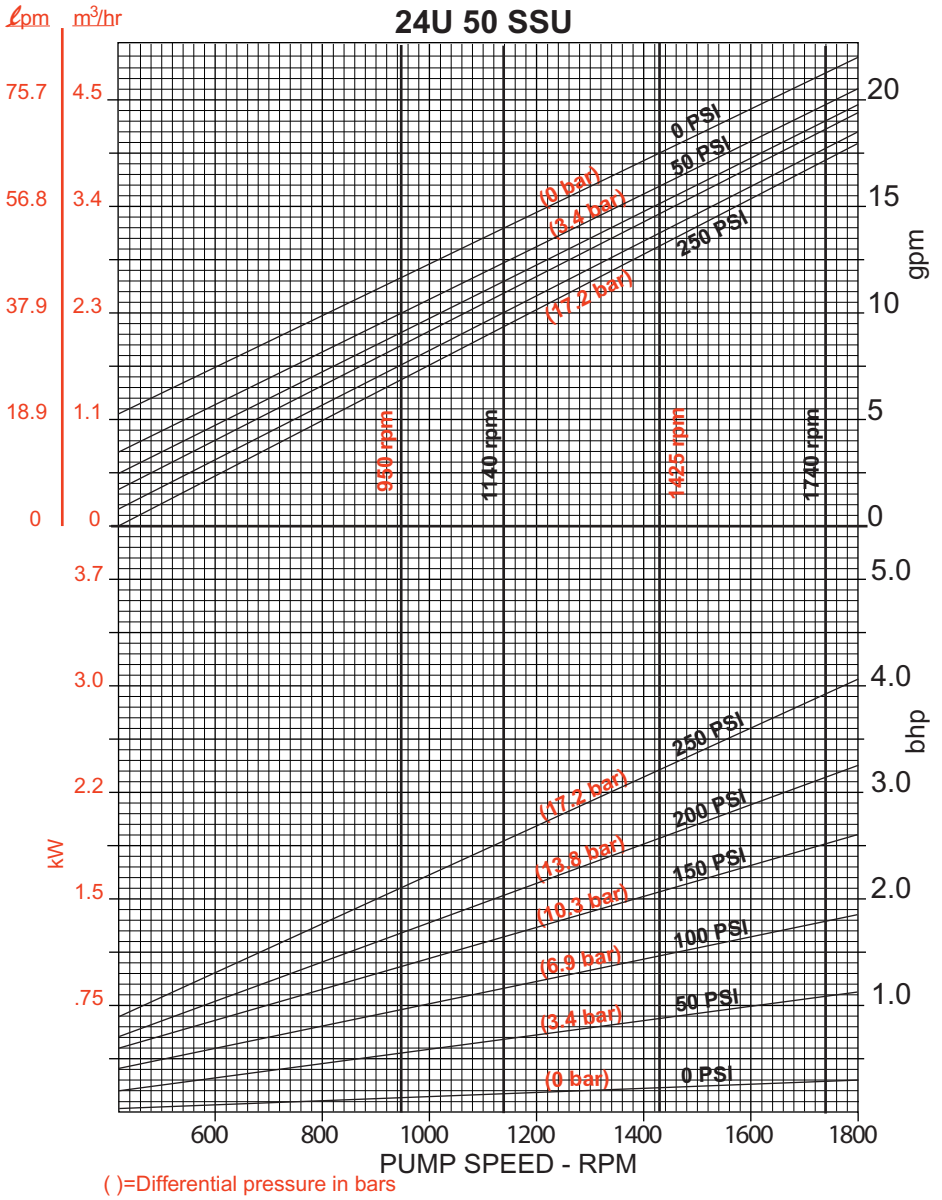
- Thrust bearing adjustment is eliminated since the gears are precisely positioned without the need for field adjustment.
- Gears rotate on a shaft that is fully supported at both ends by lubricated and vented bearings eliminating deflection which causes wear.
- Pinion and rotor gears are hydraulically balanced by the pumped fluid eliminating pistoning into the casing and cover.
- Dual paths of fluid entry to the gears (rather than one) allows Haight pumps to generate full rated displacement while close-coupled at standard motor speeds, without gear reducers at viscosities up to 10,000 SSU. This eliminates misalignment and significantly reduces cost.
- All rotating components are accessible beneath the front cover making routine cleaning and service faster, and simpler.
- Lower rotor tip speeds result in reduced noise levels.

HAIGHT PUMPS LAST LONGER

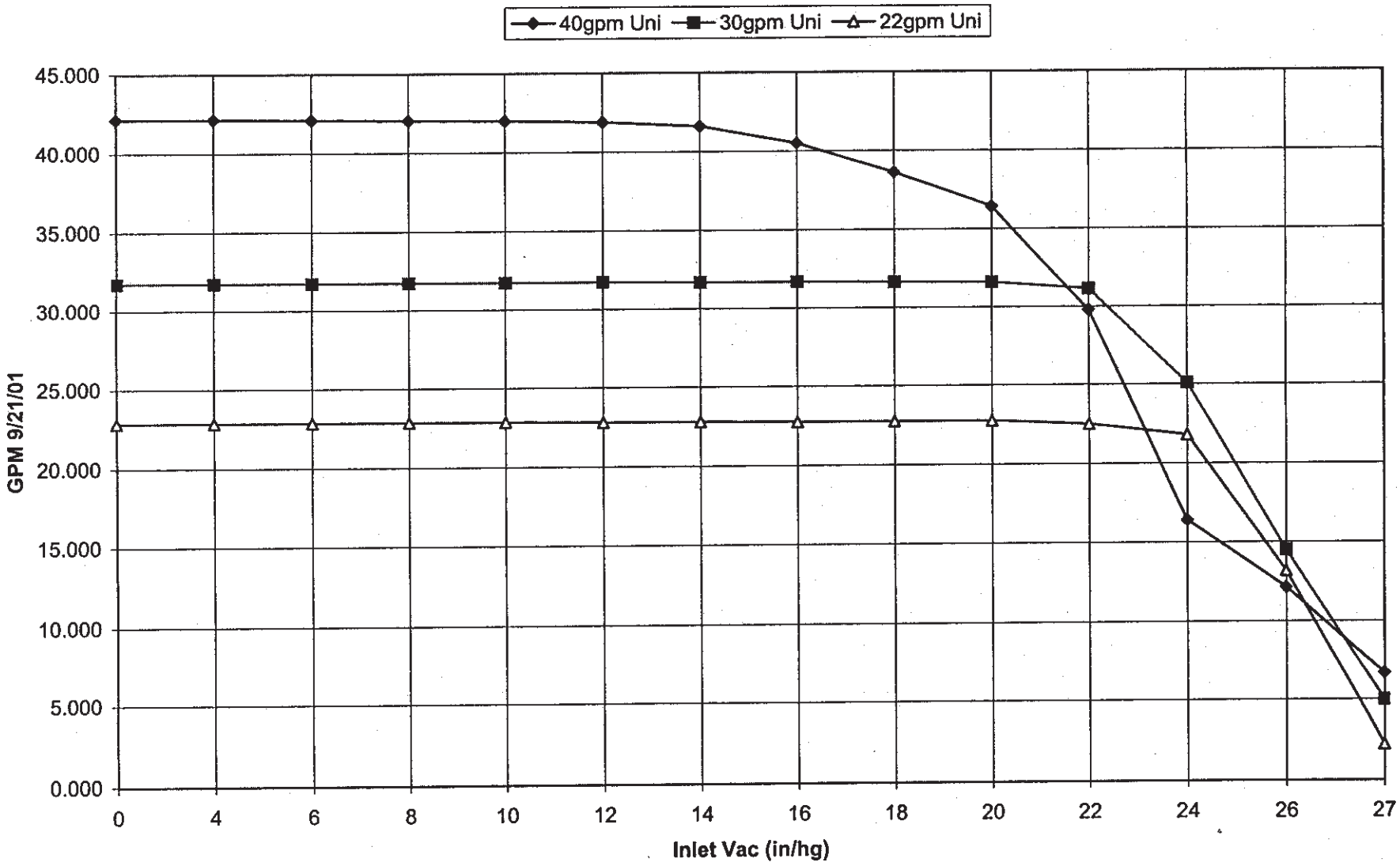
- **1-8 GPM**
  Typical top gear speed cantilevered design (RPM) 2,333
  Top gear speed Haight Universal (RPM) 1,750 (Motor Speed)
  Difference 583
- **10-20 GPM**
  Typical top gear speed cantilevered design (RPM) 2,846
  Top gear speed haight Universal (RPM) 1,750 (Motor Speed)
  Difference *1,096*
- **30-80 GPM**
  Typical top gear speed cantilevered design (RPM) 2,407
  Top gear speed Haight Universal (RPM) 1,750 (Motor Speed)
  Difference 657

- A typical cantilevered gear design pumps as shown here must increase the top rotating speed of the gear set by an average of 33% in the 1-8 GPM range, 63% in the 10-20 GPM range, and 38% in the 30-80 GPM range for any given volume of displacement.
- A Haight universal pump requires, on average, 46,720 fewer revolutions **per operating hour** for a given volume of displacement.

THE HAIGHT ADVANTAGE


24U 50 SSU
ℓpm
m³/hr
75.7
4.5
56.8
3.4
37.9
2.3
18.9
1.1
0
0
950 rpm
1140 rpm
1425 rpm
1740 rpm
0 PSI
50 PSI
250 PSI
(0 bar)
(3.4 bar)
(17.2 bar)
gpm
20
15
10
5
0
3.7
3.0
2.2
1.5
.75
kW
250 PSI
200 PSI
150 PSI
100 PSI
50 PSI
0 PSI
(17.2 bar)
(13.8 bar)
(10.3 bar)
(6.9 bar)
(3.4 bar)
(0 bar)
bhp
5.0
4.0
3.0
2.0
1.0
600
800
1000
1200
1400
1600
1800
PUMP SPEED - RPM
( )=Differential pressure in bars

24,30,40gpm Universal Relief Valve Pumps NPSH Test



Y-Strainers

Y Strainers are designed for steam, oil or water lines. Strainers should be installed ahead of temperature regulating and/or pressure reducing valves and steam traps to protect their moving parts from dirt, this is particularly important for new installations.

Screwed NPT End

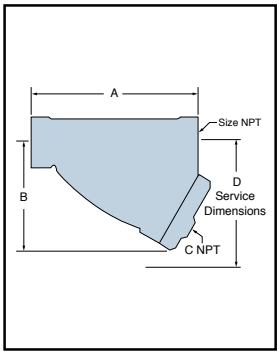
Model 415C

- Cast iron body
- Maximum pressure:
  – 250 psig (17.3 bar) for steam service
  – 400 psig (27.6 bar) for water service
- Available in sizes ½" - 3" NPT

Model 420C

- Cast brass body
- Maximum pressure:
  – 300 psig (20.6 bar) for steam service
  – 400 psig (27.6 bar) for water service
- Available in sizes ½" - 3" NPT

Screwed NPT End Y-Strainer



Ordering Information

Model Number	Part Number	NPT Size in.	Weight Approx. lbs. (kg)
415C	405000	½	2 (0.9)
415C	405003	¾	2½ (1.1)
415C	405006	1	4 (1.8)
415C	405009	1¼	6 (2.7)
415C	405012	1½	7 (3.2)
415C	405015	2	12 (5.4)
415C	405018	2½	19 (8.6)
415C	405022	3	32 (14.5)
420C	405024	½	1 (0.5)
420C	405027	¾	2 (0.9)
420C	405030	1	4 (1.8)
420C	405033	1¼	5 (2.3)
420C	405036	1½	7 (3.2)
420C	405039	2	12 (5.4)
420C	405042	2½	22 (10)
420C	405045	3	35 (16)

Dimensions in. (mm)

Model 415C

Part Number	A	B	NPT C	D
405000	4 1/8 (105)	2 1/2 (64)	1/2	3 1/4 (83)
405003	3 3/4 (95)	2 7/16 (62)	3/8	3 (76)
405006	4 (102)	2 5/8 (67)	3/8	3 1/4 (83)
405009	4 7/8 (124)	3 3/4 (95)	3/4	6 (152)
405012	6 (152)	4 (102)	3/4	6 (152)
405015	7 3/8 (187)	4 1/4 (108)	3/4	6 3/4 (171)
405018	9 1/4 (235)	5 7/8 (149)	1 1/2	7 7/8 (200)
405022	10 (254)	6 (152)	1 1/2	8 (203)

Model 420C

Part Number	A	B	NPT C	D
405024	2 15/16 (75)	2 (51)	1/4	3 (76)
405027	3 5/8 (92)	2 3/8 (60)	1/4	4 (102)
405030	4 1/2 (114)	2 3/4 (70)	3/8	4 1/2 (114)
405033	5 1/8 (130)	3 1/2 (89)	3/8	5 (127)
405036	5 13/16 (148)	4 3/4 (95)	1/2	5 3/4 (146)
405039	7 15/16 (202)	4 1/2 (114)	1/2	6 1/2 (165)
405042	8 1/4 (210)	6 3/4 (171)	1 1/4	—
405045	9 5/8 (244)	6 1/4 (159)	1 1/4	—

Specifications

Model	Body Material	Steam Service			Water Service		
		Pressure psig (bar)	Temperature °F (°C)	Screen Material Mesh SS	Pressure psig (bar)	Temperature °F (°C)	Screen Material Mesh SS
415C	Cast Iron	250 (17.3)	400 (204)	20	400 (28)	100 (38)	20
420C	Cast Brass	300 (20.6)	400 (204)	20	400 (28)	150 (66)	20

525 Bronze In-Line Check Valve

MATCO-NORCA™

- Bronze Body 85/5/5/5
- BUNA-N Seat
- Spring Loaded
- .516 Crack Pressure

200 WOG

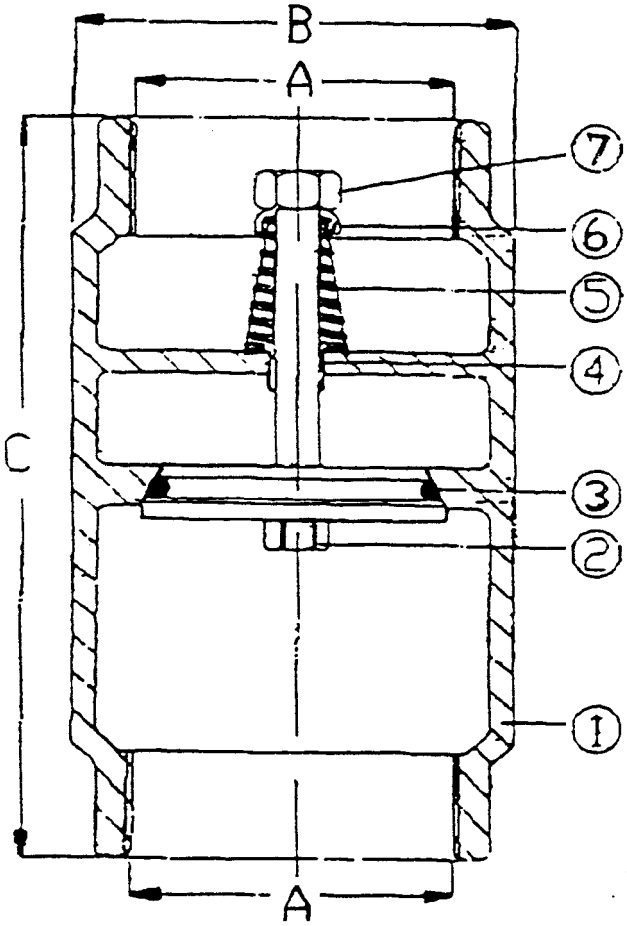
Threaded Ends Comply With ANSI B2.1

Product Spec Sheet

Designed By JCM Advertising

ISO-9002

DIMENSIONS			
Size	A NPT	B	C
1/2"	1/2"	1.26	2.43
3/4"	3/4"	1.50	2.72
1"	1"	1.77	3.23
1-1/4"	1-1/4"	2.13	3.62
1-1/2"	1-1/2"	2.36	4.05
2"	2"	3.03	5.04
3"	3"	4.22	7.29
4"	4"	5.52	10.40



MATERIAL SPECIFICATIONS		
No.	Part	Material
1	Body	Bronze
2	Slopper	Brass
3	O-Ring	BUNA-N
4	Washer	PE
5	Spring	Stainless Steel
6	Cap	Stainless Steel
7	Nut	Stainless Steel

MATCO-NORCA™

Brewster, NY
TEL: 800-431-2082
FAX: 800-640-2252

Houston, TX
TEL: 800-935-5456
FAX: 800-683-4247

La Palma, CA
TEL: 866-532-8306
FAX: 866-532-8307

Americus, GA
TEL: 800-433-7526
FAX: 800-533-5134

e-mail: mail@matco-norca.com www.matco-norca.com

PHILLIPS PUMP

LIQUID FILLED GAUGES VACUUM, COMPOUND & PRESSURE

Liquid filled stainless steel case and shatter proof lens designed for industrial environments, Phillips Pump's easy reading gauges provide accurate readings for systems conditions. Having large black numbers and pointer on a white matte aluminum scale plate, each gauge comes complete with a rugged burbon tube mechanism, spring suspend brass movement and a pulsation damping office to resist the effects of shock, pulsation and vibration and insure trouble free life.

As with all Phillips Pump's products are our gauges are designed for use with fuel oils or diesel fuel.

Specifications:

Operating Temperature - -40°F to 160°F
Accuracy - + 1.5% of span
Weather Protection - Weather tight (NEMA 4X / IP 65) - liquid-filled case
Working Range -

2½" Steady: 3/4 of full scale value
Fluctuating: 2/3 of full scale value
Short time: full scale value

4" Steady: Full scale value
Fluctuating: 0.9 x full scale value
Short time: 1.3 x full scale value

Material -

Mounting - 1/4" NPT copper alloy
Movement - Copper alloy
Pointer - Black aluminum
O-ring - EPDM
Window - Polycarbonate
Bourdon Tube - copper alloy
Dial - White ABS with stop pin and black lettering
Case - 304 stainless steel with vent plug
Window Gasket - Buna-N
Case Filling - Glycerine

Gauge Range	Type	Part Number 2 1/2" Diameter	Part Number 4" Diameter
30" hg	Vacuum	VG-9767002	VG-9699058
30" hg - 0 - 15 PSI	Compound	-	CG-9699036
30" hg - 0 - 30 PSI		CG-9767010	CG-9699045
30" hg - 0 - 60 PSI		CG-9767029	CG-9699053
30" hg - 0 - 100 PSI		-	CG-9699061
15 PSI	Pressure	PG-9767037	PG-9699095
30 PSI		PG-9767045	PG-9699109
60 PSI		PG-9767053	PG-9699117
100 PSI		PG-9767061	PG-9699125
160 PSI		PG-9767070	PG-9699257
200 PSI		PG-9767088	PG-9699134
300 PSI		PG-9767096	PG-9699142
400 PSI		PG-9767100	PG-9699150
600 PSI		PG-9767118	PG-9699168
800 PSI		-	PG-9699176
1000 PSI		PG-9767126	PG-9699185
1500 PSI		PG-9767134	PG-9699193

TeSys™
U-Line Motor Starters

Catalog

03

File 8502

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Telemecanique

LUB•2

The U-Line motor starter consists of one power base (selected from this page) and one control unit (select from page 20 or 21) as a minimum. The power bases connect by one of two control circuit methods:

- With screw clamp terminals
- Without screw clamp terminals

Each power base with control circuit screw clamp terminals includes one N.O. and one N.C. auxiliary contact to indicate the open or closed position of the power contacts.

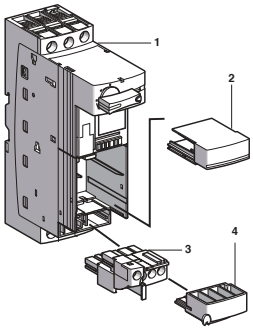
When ordering power bases without control circuit screw clamp terminals (i.e., when building a reversing unit or pre-wiring the low voltage control), the terminal assemblies must be ordered separately.

LUB•20

Full Voltage, Non-Reversing for Standard Applications

Control Connection	Max. Current (Amps)	Three Phase (hp max.)				Single Phase (hp max.)		Self-Protected Starter Base	Starter Base	Weight lb (kg)
		200/208 V	220/240 V	460 V	575/600 V	120 V	240 V	Catalog Number	Catalog Number	
With screw terminations	12	3	3	7.5	10	1.5	2	**LUB12**	**LUS12**	1.98 (0.900)
	32	10	10	20	25	2	5	**LUB32**	**LUS32**	1.98 (0.900)
Without q terminations	12	3	3	7.5	10	1.5	2	**LUB120**	**LUS130**	1.90 (0.865)
	32	10	10	20	25	2	5	**LUB320**	**LUS320**	1.90 (0.865)

Full Voltage, Non-Reversing for Use with High Density PLC Cards (100 mA)



Control Connection	Max. Current (Amps)	Three Phase (hp max.)				Single Phase (hp max.)		Self-Protected Starter Base	Starter Base	Weight lb (kg)
		200/208 V	220/240 V	460 V	575/600 V	120 V	240 V	Catalog Number	Catalog Number	
With screw terminations	12	3	3	7.5	10	1.5	2	**LUB12BH**	**LUS12BH**	1.98 (0.900)
	32	10	10	20	25	2	5	**LUB32BH**	**LUS32BH**	1.98 (0.900)
Without q terminations	12	3	3	7.5	10	1.5	2	**LUB120BH**	**LUS130BH**	1.90 (0.865)
	32	10	10	20	25	2	5	**LUB320BH**	**LUS320BH**	1.90 (0.865)

Terminal Blocks for Non-Reversing Power Bases without Terminations LUB••0, LUS••0

Control Connection	For Use On	Item	Catalog Number	Weight lb (kg)
With screw terminations	LUB120/LUB320 LUS120/LUS320	3 + 4	**LU9BN11**	0.10 (0.45)

q Must order LU9BN11, LU9BN11C, LU9MRC or LU9MR1C.

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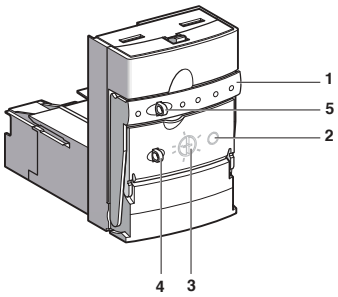
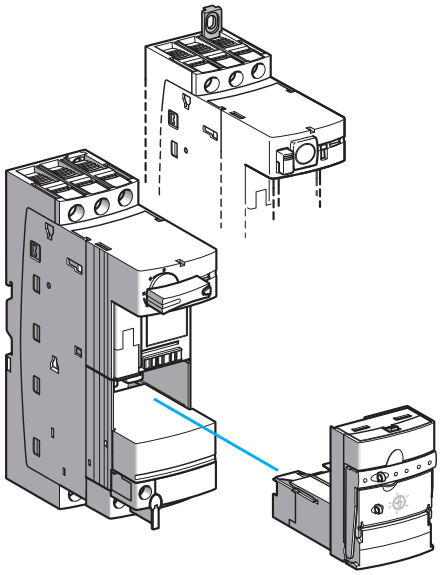
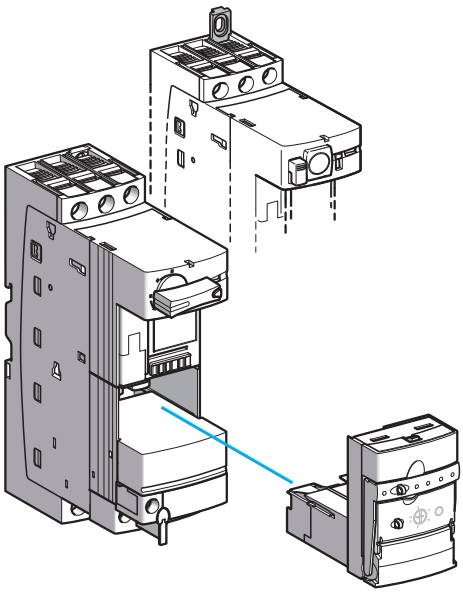




LUCAkkkk



LUCBkkkk

Standard and Advanced Control Units

Description	
1	Extraction and locking handle
2	Test button (on advanced control unit only)
3	Adjustable FLA dial
4	Locking of settings by sealing the transparent cover
5	Sealing of locking handle

Standard, 3-Phase, Class 10 Overload Protection

Setting Range (Amps)	Used with power bases	Catalog Number	Weight lb (kg)
0.15–0.6	LUkB12, LUkB32, LUkS12, LUkS32	**LUCAX6** q	0.30 (0.135)
0.3–1.4	LUkB12, LUkB32, LUkS12, LUkS32	**LUCA1X** q	0.30 (0.135)
1.25–5.0	LUkB12, LUkB32, LUkS12, LUkS32	**LUCA05** q	0.30 (0.135)
3–12	LUkB12, LUkB32, LUkS12, LUkS32	**LUCA12** q	0.30 (0.135)
4.5–18	LUkB32, LUkS32	**LUCA18** q	0.30 (0.135)
8–32	LUkB32, LUkS32	**LUCA32** q	0.30 (0.135)

Advanced, 3-Phase, Class 10 Overload Protection

Setting Range (Amps)	Used with power bases	Catalog Number	Weight lb (kg)
0.15–0.6	LUkB12, LUkB32, LUkS12, LUkS32	**LUCBX6** q	0.31 (0.140)
0.3–1.4	LUkB12, LUkB32, LUkS12, LUkS32	**LUCB1X** q	0.31 (0.140)
1.25–5.0	LUkB12, LUkB32, LUkS12, LUkS32	**LUCB05** q	0.31 (0.140)
3–12	LUkB12, LUkB32, LUkS12, LUkS32	**LUCB12** q	0.31 (0.140)
4.5–18	LUkB32, LUkS32	**LUCB18** q	0.31 (0.140)
8–32	LUkB32, LUkS32	**LUCB32** q	0.31 (0.140)

Advanced, Single Phase, Class 10 Overload Protection

Setting Range (Amps)	Used with power bases	Catalog Number	Weight lb (kg)
0.15–0.6	LUkB12, LUkB32, LUkS12, LUkS32	**LUCCX6** q	0.31 (0.140)
0.3–1.4	LUkB12, LUkB32, LUkS12, LUkS32	**LUCC1X** q	0.31 (0.140)
1.25–5.0	LUkB12, LUkB32, LUkS12, LUkS32	**LUCC05** q	0.31 (0.140)
3–12	LUkB12, LUkB32, LUkS12, LUkS32	**LUCC12** q	0.31 (0.140)
4.5–18	LUkB32, LUkS32	**LUCC18** q	0.31 (0.140)
8–32	LUkB32, LUkS32	**LUCC32** q	0.31 (0.140)

Advanced, 3-Phase, Class 20 Overload Protection

Setting Range (Amps)	Used with power bases	Catalog Number	Weight lb (kg)
0.15–0.6	LUkB12, LUkB32, LUkS12, LUkS32	**LUCDX6** q	0.31 (0.140)
0.3–1.4	LUkB12, LUkB32, LUkS12, LUkS32	**LUCD1X** q	0.31 (0.140)
1.25–5.0	LUkB12, LUkB32, LUkS12, LUkS32	**LUCD05** q	0.31 (0.140)
3–12	LUkB12, LUkB32, LUkS12, LUkS32	**LUCD12** q	0.31 (0.140)
4.5–18	LUkB32, LUkS32	**LUCD18** q	0.31 (0.140)
8–32	LUkB32, LUkS32	**LUCD32** q	0.31 (0.140)

q Complete the catalog number by selecting the proper voltage code from the table below.

Voltage Codes

Volts	24	48–72	110–240
DC	BLfa	–	–
AC	B	–	–
DC or AC	–	ES p	FU

f Voltage code to use for a power base with a communication module.
a DC voltage with range of 0.90 to 1.10 of nominal.
p 48–72 Vdc; 48 Vac

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Foot Valves

Model 50-201 Brass Foot Valves

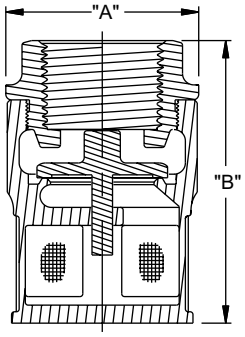
EBW's foot valves are used to maintain the prime in suction system fuel lines. The Foot valves are installed at the bottom of the suction pipe at the bottom of an underground storage tank.

EBW's single poppet foot valves are typically used where easy access to the valve is available. Double poppet models offer twice as much protection for maintaining the prime. Both 1 1/2 inch models can be used with EBW's model 320 extractor fittings.

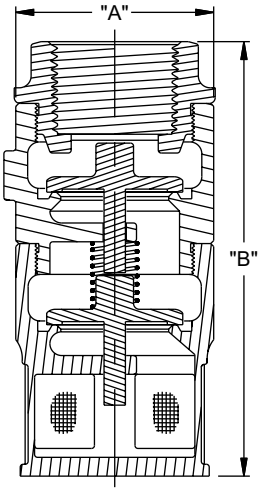
Features

- Metal to metal poppet seating
- 24 mesh screen protects the valve from debris
- All valves are pressure tested to ensure accuracy

Single Poppet



Double Poppet



Part no.	Thread Size	Poppet Type	Weight Lbs.	Weight Kg.	Dim A in.	Dim A mm.	Dim B in.	Dim B mm.
50-105-01	1/2"	Single	.75	.34	1.44	37	2.75	70
51-100-01	1/2"	Double	1.18	.54	1.44	37	4	102
75-105-01	3/4"	Single	.94	.43	1.69	43	2.75	70
76-100-01	3/4"	Double	1.31	.60	1.69	43	4	102
100-105-01	1"	Single	1.12	.51	2	51	3	76
101-100-01	1"	Double	1.56	.71	2	51	4.25	108
150-202-01	1 1/2"	Single	3.12	1.42	2.75	70	4.25	108
151-200-01	1 1/2"	Double	4.38	1.99	2.75	70	5.38	137
200-200-01	2"	Single	4.38	1.99	3.44	87	4.88	124
201-200-01	2"	Double	6.44	2.92	3.44	87	6.75	172

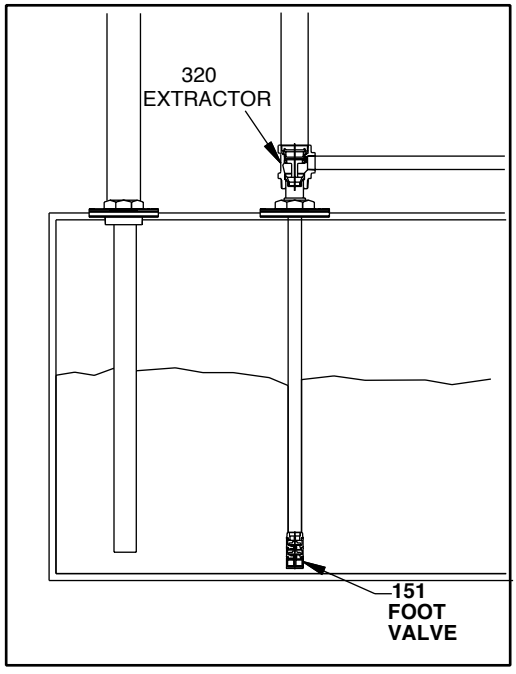
**** BSPT thread available-consult factory***

Materials

Body: Brass

Poppet: Brass

Screen: 24 Mesh Brass



EBW Inc., 2814 McCracken Ave, Muskegon MI 49441 - Sales Desk 1-800-475-3291, Sales Fax 1-800-475-4329