Fire Pump Room Basics

CYBERTRONIC CONTROLS

TORNATECH

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Fire pumps

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UNPACKING THE PUMP. The packaging should be opened immediately upon its arrival from the factory, and the contents of each carton inspected for damage and shortage of components. Many Fire Pump accessories are shipped loose for field installation, and these items should be checked using the packing list to assure they will be on hand at the time of assembly.
The following standard accessories are shipped unassembled in a separate carton and are sometimes misplaced or overlooked until they are needed for the installation:

- Discharge pressure gauge (0-300 PSI or 0-600 PSI).
- Compound suction gauge (03”-0-150 PSI or 30”-0-300 PSI).
- Gauge cocks (1/4” – one for each gauge).
- Pipe nipples for connecting the gauges to the pump.
- Float-operated automatic air release valve.
- Casing relief valve (3/4”x3/4” or 1”x3/4”) furnished on electric motor driven pumps only.

Other optional accessories may also be shipped loose, and it is wise to check the packing list for each option ordered well in advance of the actual time of assembly. Some common examples are:

- Eccentric tapered suction reducer.
- Concentric tapered discharge increaser.
- Hose manifold.
- Hose valves with caps and chains.
- Ball drip valve.
- Flow meter.
- Main relief valve (diesel driven pumps).
- Waste cone (diesel driven pumps).

Diesel driven Fire Pumps are furnished with additional standard accessories which are packaged separately. They include:

- Batteries, 12-volt (two for 12-volt engines; four for 24-volt engines).
- Battery rack(s) (one for 12-volt engines; two for 24-volt engines).
- Battery cables (four for 12-volt engines; six for 24-volt engines).
- Muffler (commercial grade is standard; residential grade is optional).
- Flexible exhaust connector.
- Heat Exchanger Drain Plugs
- Additional fittings, clamps, and/or flanges if needed to connect the muffler and flexible connector to the engine.

If a diesel fuel tank is included, the following components are not assembled, but packaged with the previously mentioned accessories:

- Fuel tank legs and floor flanges.
- Fuel level gauge.
- Lockable fuel cap.
- Vent/Flash arrestor.
- Lockable fuel supply valve.
- Fuel fill tube (2” pipe).
- Fuel Vent tube (1/2” pipe).
- Tube fittings (four furnished, 1/2” NPT x 5/8 O.D. tubing).

Two flexible flame resistant fuel hoses are attached to the diesel engine by the manufacturer. Engine air cleaners may be mounted or loose, depending on the model and manufacturer of the engine.

Fire Pump controllers, whether for diesel or electric units, are shipped directly from the manufacturer unless mounted and wired by pump supplier.

PUMP FOUNDATION. The foundation for your pump must be sufficiently rigid to absorb any vibration and stress encountered during operation. A raised foundation of concrete is preferable to assure a satisfactory base and protection against flooding while facilitating drainage and keeping the area clean.

The pump and driver base should be firmly bolted to the foundation using mounting bolts or studs. Foundation bolts should be enclosed by a sleeve that is 2 to 4 diameters larger than the bolt to allow movement for proper alignment with the mounting holes.

PREPARING TO INSTALL YOUR PUMP. Your pump and driver will be mounted on a common base. The unit has been accurately aligned and securely mounted to the base at the factory. However, the alignment cannot be maintained during shipping, so the entire unit must be leveled and realigned at the time of installation.

LEVELING THE PUMP. Leveling the pump will require enough shims to support the unit base at the foundation bolts and at any other point of the base carrying a substantial weight load. The shims should be large enough to allow a gap of ¾" to 1 ½" between the base and the foundation for grouting.

The unit base should be lowered onto the foundation, being careful to avoid damaging the threads of the foundation bolts. The coupling guard should be removed and the flexible coupling halves disconnected. The coupling alignment should be observed during the leveling operation.

Shims should be inserted and the unit base leveled using a spirit level. The shims should be adjusted until the unit is leveled vertically and horizontally. Tighten the foundation bolts finger tight.

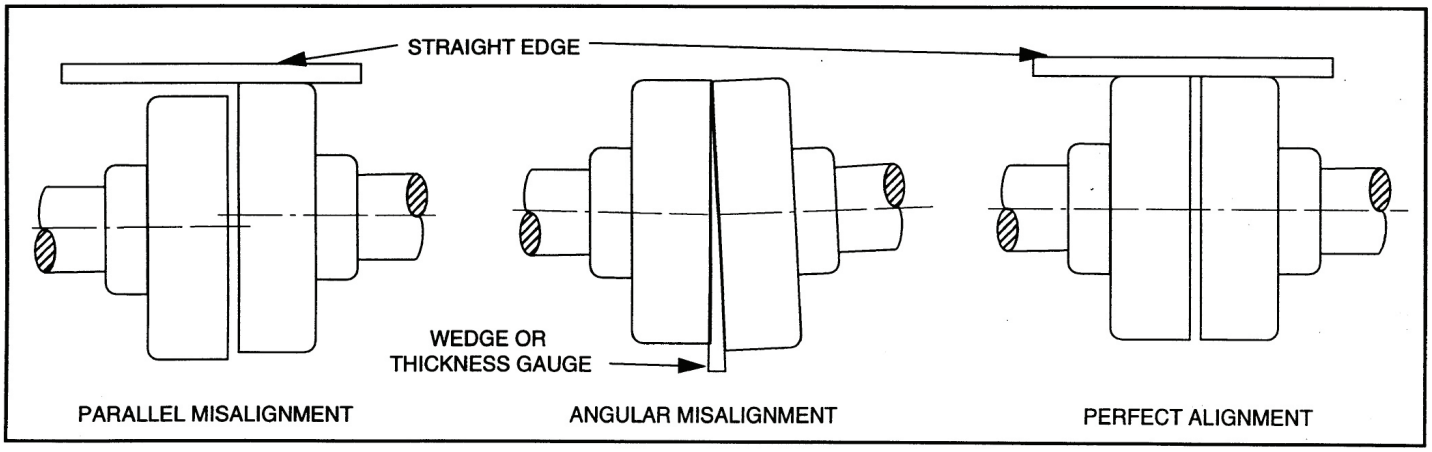
INITIAL ALIGNMENT OF THE FLEXIBLE COUPLING. The pump and driver were accurately aligned at the factory. However, the alignment cannot be maintained during shipping and it will be necessary to realign the entire unit at the time of installation. Flexible couplings are not universal joints. They should not be used to compensate for misalignment of the pump and motor shafts. Their function is to transmit power from the driver to the pump while compensating for thermal expansion and shaft end-movement. The coupling halves should be far enough apart so that they do not make contact when the motor shaft is forced to the limit of the bearing clearance toward the pump shaft.

In order to properly align the coupling, you will need a taper gauge or set of feeler gauges and a straightedge or, if available, a dial indicator.

There are two types of misalignment encountered with flexible couplings: angular misalignment, in which the shafts are not parallel, and parallel misalignment where the shafts are parallel but not on the same axis.

To check angular alignment, insert a feeler gauge or taper gauge at any four places 90 degrees apart around the coupling halves. Insert shims under the driver feet or adjust pump and/or driver position until the same reading is obtained at all four check points. The pump and driver will then be in angular alignment.

To check angular alignment with a dial indicator, clamp the dial indicator to the pump coupling half so that the ball on the indicator just rests on the face of the motor coupling half. A chalk mark should be made at the point where the ball contacts the coupling half. Both the pump shaft and the motor shaft should be rotated an equal amount so that the reading is taken at all check points with the ball on the chalk mark. Insert shims as required.



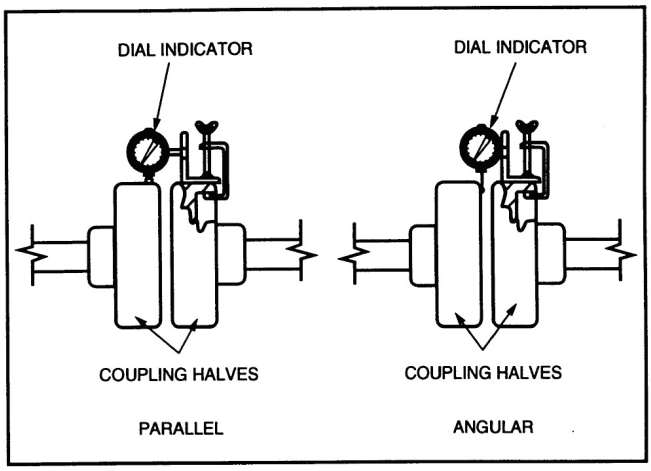


FIGURE 2 CHECKING ALIGNMENT WITH DIAL INDICATOR

To check parallel alignment, a straightedge is held against the edges of the coupling halves 90 degrees apart around the coupling. The straightedge should be parallel to the pump and driver shafts at all times. Insert shims or adjust pump and/or driver position until the straightedge lies flat against both coupling halves at all four check points. The pump and driver will then be in proper parallel alignment.

To check the parallel alignment with a dial indicator, the indicator should be clamped to the pump coupling half with the ball resting on the periphery of the driver coupling half. A chalk mark should be made on the motor coupling half at the point of contact of the indicator ball, and the shafts rotated equally so that the reading is taken on the chalk mark at all check points. Insert shims or adjust the pump and/or driver position to obtain the same reading at all check points.

NOTE

Any adjustment to correct one direction of alignment may affect the other direction. Therefore, it is necessary to recheck both angular and parallel alignment after each adjustment.

When the unit is properly aligned, the foundation bolts can be tightened, but not too firmly. Waste material should be stuffed into the sleeves around the foundation bolts to prevent grout from filling the sleeves during grouting.

PIPING. Suction and discharge piping must be properly installed and attached to pump. Positioning of the unit according to the above recommendations will allow the piping to be connected without straining or twisting the pump casing. Piping must be supported by stands or hangars and not by the pump casing. If an eccentric suction reducer is used, it must be installed with its top horizontal; tapered side should be on the bottom.

Standard Fire Pump fittings are to be properly installed. Gauges, gauge cocks and nipples are furnished for all Fire Pumps, The compound gauge is to be installed in the suction flange tap; the pressure gauge goes in the discharge flange tap. Pipe elbows are provided on vertical Fire Pumps to allow the gauges to be installed in an upright position.

A float-operated automatic air release valve is furnished for all Fire Pumps, and is to be installed in the top (or highest point) of the casing. A ½" pipe nipple is needed to connect it to the casing.

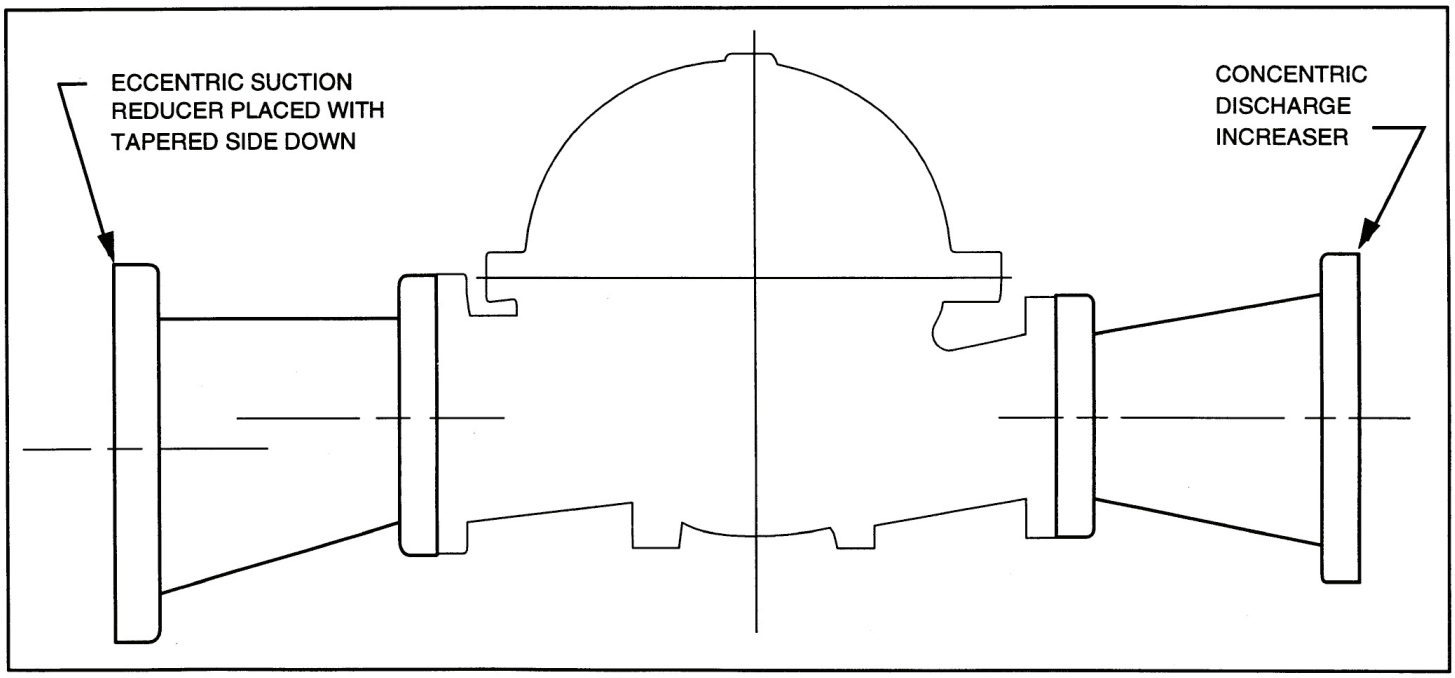


FIGURE 3 PROPER INSTALLATION OF TAPERED REDUCERS

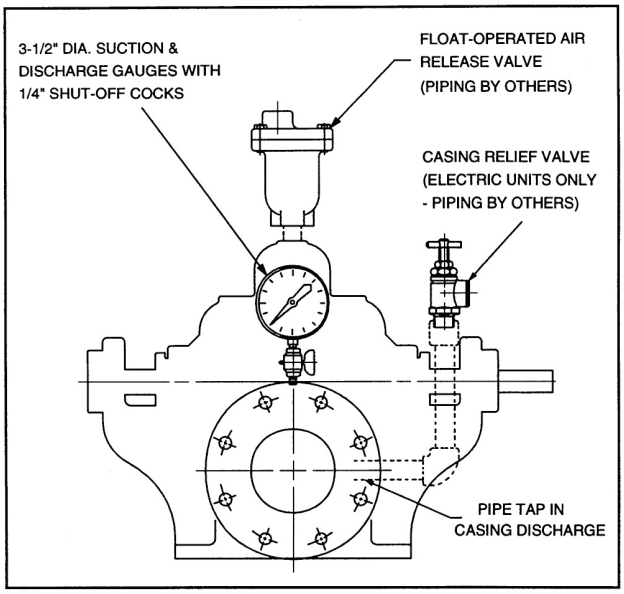


FIGURE 4 STANDARD ACCESSORIES

For best results on two-stage Fire Pumps, the casing taps in booth stages should be piped to the automatic air release valve.

On vertical Fire Pumps, the automatic air release valve is connected to the uppermost tap in the suction branch on the "back" of the lower casing half. A small vacuum check valve is furnished to prevent drawing air into pump if the suction pressure drops.

A ¾" pressure relief valve is provided for all electric motor driven Fire Pumps. It is to be installed in or piped to the tap in the side of the discharge neck on the pump casing. The outlet may be piped to a drain if desired. If bearing arm drain taps are piped to waste, the piping must be separate from that of the relief valve outlet.

PRESSURE SENSING LINE. A ½" (minimum) pressure sensing line must be connected to the pressure switch of each controller (Fire Pump and Jockey Pump) to monitor the system pressure. The connection should be made to the Fire Pump system at a point downstream from the check valve as illustrated in Figure A-7 5.2.1(a) in N.F.P.A. 20.

CONTROLLER WIRING. Wiring of the Fire Pump and Jockey Pump controllers should be made by qualified personnel in accordance with N.E.C. and other applicable local codes. Wiring to the electric motors should be connected as indicated in the specific wiring diagrams furnished with each controller. It should be noted that fuses are not furnished in the Jockey Pump controller unless specifically ordered.

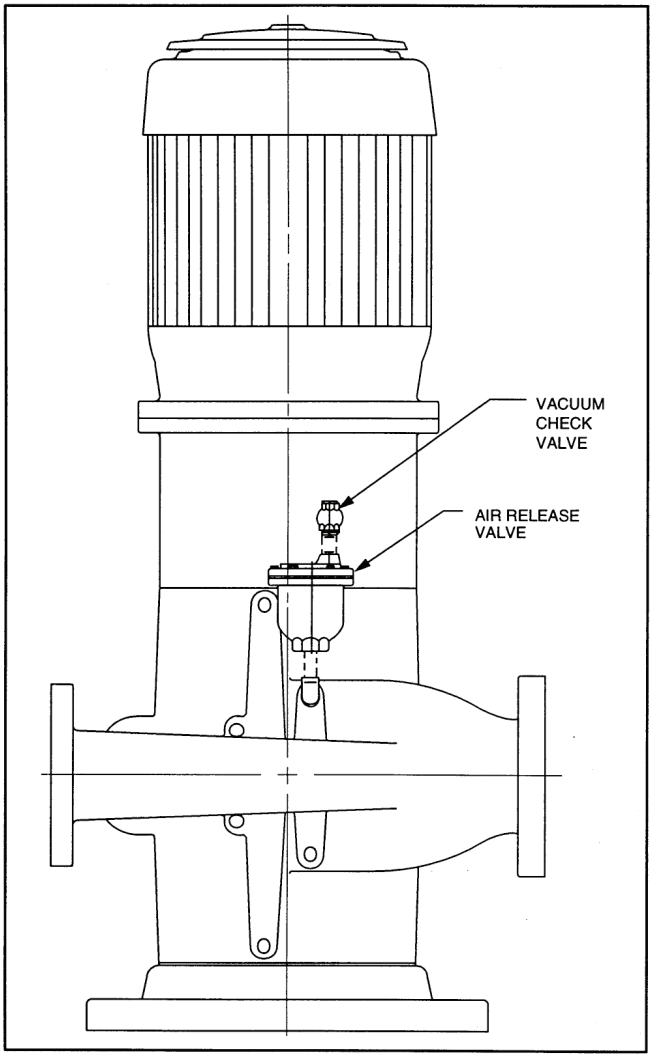


FIGURE 5 AIR RELEASE VALVE INSTALLED ON
MODEL 483 VIRTICAL FIRE PUMP

SPECIAL CONSIDERATIONS FOR DIESEL ENGINES

ENGINE FLUIDS. Many diesel engines are shipped dry and must have lubricating oil and coolant added prior to start-up. It is the installer's responsibility to assure that all fluid levels are correct to avoid damages to the engine.

DIESEL ENGINE WIRING. The Fire Pump controller must be wired to the diesel engine's junction box. This is usually a simple matter of connecting like-numbered terminal of each with the correct wire gauge size. Refer to panel manufacturer's wiring diagram.

The electric solenoid valve in the diesel engine cooling loop piping must be wired to the engine junction box. Either red wire goes to terminal 1; the other red wire goes to terminal 11; the green wire is grounded to the engine block.

Engines may have 12-volt or 24-volt systems, but all batteries furnished are 12-volt. Since dual battery sets are required by N.F.P.A. 20, two batteries are furnished for 12-volt systems, and four batteries are furnished for 24-volt systems.

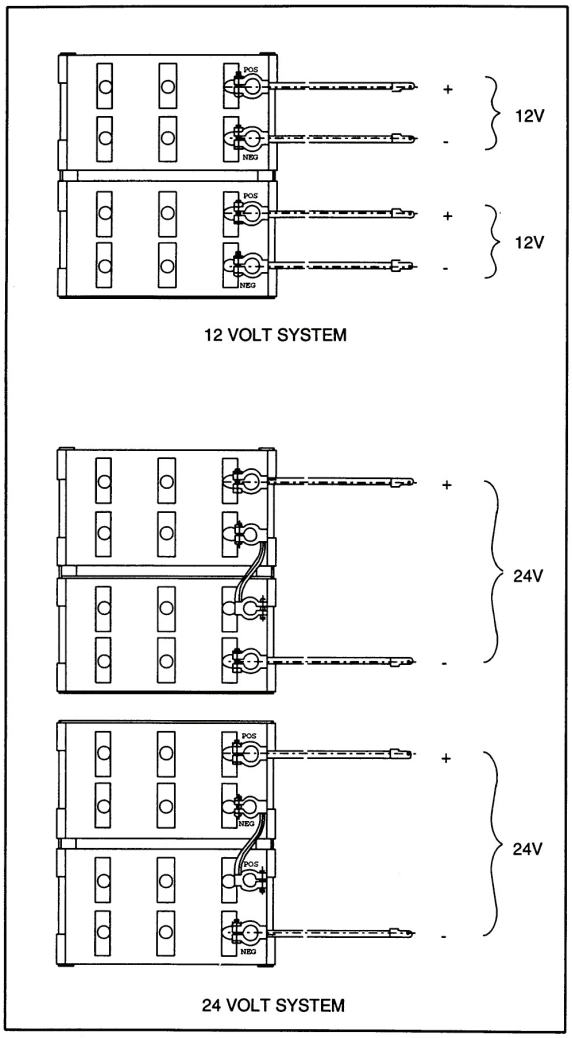


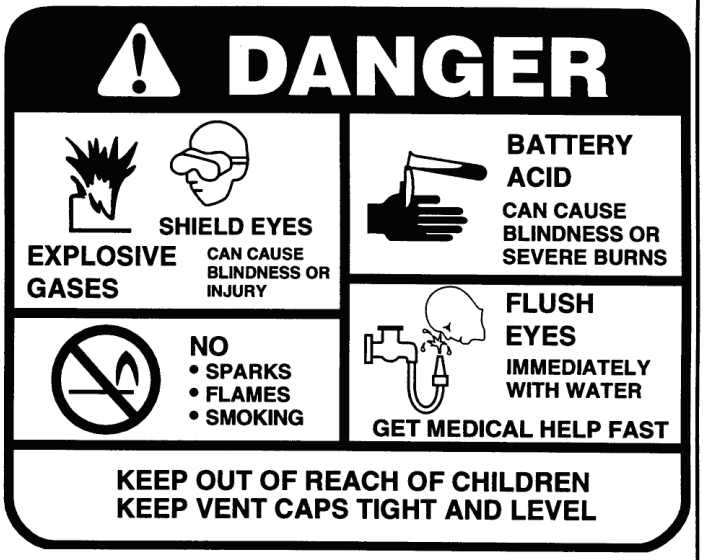
FIGURE 6 BATTERY CABLE ARRANGEMENTS

Standard battery racks are designed to keep the batteries elevated off the floor for housekeeping purposes. They must be placed on a suitable level surface as close to the diesel engine as possible. Each rack holds two batteries; one rack is required for 12-volt systems and two racks for 24-volt systems. If two racks are used, they are to be placed side-by-side and not stacked.

Electrolyte is not furnished; it must be procured locally (approximately 16 quarts per battery).

Electrolyte must be added and the batteries charged at a low rate for at least 24 hours prior to start-up. It is recommended for safety reasons,

That the batteries be filled with electrolyte only after being placed in their permanent positions in the pump room.



Batteries contain sulphuric acid electrolyte. This is a highly **CORROSIVE POISON**. They also produce a mixture of hydrogen and oxygen gasses which will **EXPLODE** if itgnited.

WHEN WORKING ON OR NEAR BATTERIES, MIXING OR POURING ACID SOLUTIONS, ALWAYS WEAR PROTECTIVE CLOTHING AND PROTECT EYES WITH SAFETY GOGGLES. KEEP SPARKS, FLAMES AND CIGARETTES AWAY.

KEEP BATTERIES AND ACID OUT OF THE REACH OF CHILDREN.

If acid contacts skin or eyes, flush affected parts with clean water immediately and repeat for 15 minutes. Then seek prompt medical attention.

If acid is taken internally, call medical help immediately. Drink large quantities of water, milk or milk of magnesia, beaten eggs or vegetable oil.

Acid spilled on clothing, workbench or floor may be neutralized with baking soda or ammonia solutions, in metallic containers.

Use only glass, ceramic or acid resisting plastic vessels. Never discard used containers before they have been rinsed clean, then puncture them to prevent further use.

When charging batteries, keep area well ventilated and bar general access. Connect/disconnect batteries only when charge is switched off. Make sure tools cannot short circuit battery terminals. Keep vent caps on battery during charging.

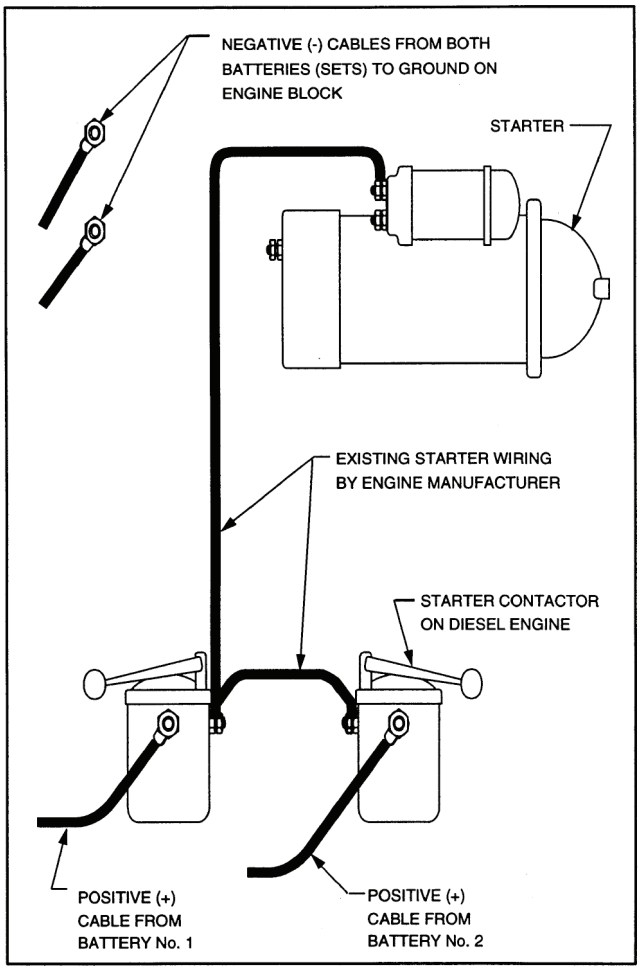


FIGURE 7 STARTER AND CONTACTOR CONNECTIONS

The positive battery terminal of each battery (or pair of batteries for 24-volt systems) is connected to one of the engine's starter contactors. The negative terminals are to be connected to the engine block or other suitable ground.

Battery cable wire gauge sizes are selected for a maximum 10-foot circuit length (5-foot cables). Longer cables will require heavier gauge wire to be used.

Power wiring to the engine's jacket water heater must be completed only after it has been assured that there is sufficient coolant in the engine. Most heaters are continuously energized when wiring is connected and will burn out the heating element if no water is present. This failure is not covered by warranty. Refer to engine manufacturer's data sheet for correct voltage of the heater.

DIESEL ENGINE COOLING LOOP PIPING. The cooling loop system diverts a small amount of water from the pump discharge through the engine's heat exchanger to help control the operating temperature of the engine. Prior to start-up, it is recommended that this piping be checked for damage or displacement that might have occurred during shipment.

During normal operation, the top two valves of the cooling loop (in the by-pass line) are to be closed, and the lower two valves (in the pressure regulated line) are to be open. Failure to observe this may result in over-pressurization of the heat exchanger when the pump is started, causing damage to the engine.

Piping from the engine's heat exchanger to a drain is to be provided by the installer. It is important to use the recommended size piping to reduce back pressure and avoid over pressurizing the heat exchanger.

A length of PVC tubing is provided to be connected to the petcock in the cooling loop piping in order to vent the system and visually verify the flow of water through the heat exchanger.

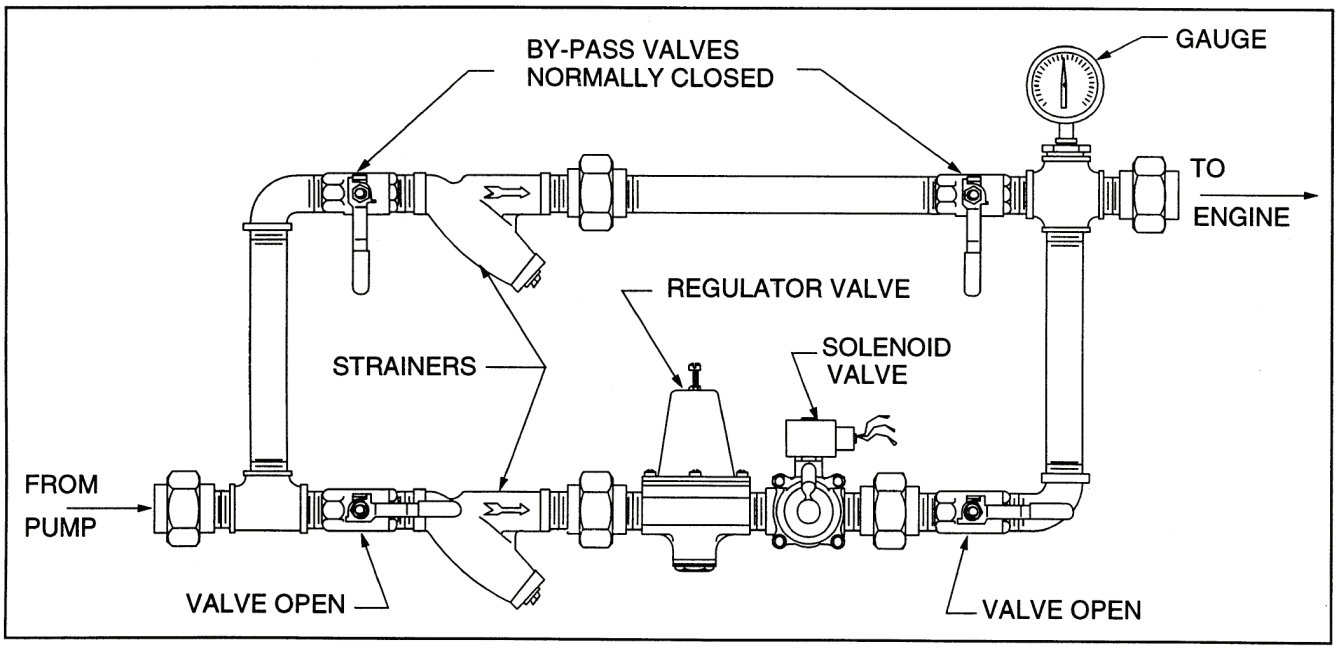


FIGURE 8 COOLING LOOP SHOWING NORMAL POSITION OF VALVES

DIESEL ENGINE FUEL SYSTEM. The fuel tank should be installed so that the supply outlet is at the same elevation as the engine's fuel pump. Since the unit base is usually elevated as described earlier, this may require that the fuel tank is likewise elevated. The means of elevating the tank is the responsibility of the installer. Substituting the legs furnished with the tank with pipes of greater length is not a recommended method of elevating the tank.

All fuel fittings shown are shipped loose for field installation. They are to be assembled as shown in Figure 9 below, to be consistent with Figure A-8-4.6 of N.F.P.A. Pamphlet 20. Installation may vary at the discretion of the installer with the approval of the local authority having jurisdiction. Note that some sections of common piping needed to complete this installation are not furnished and must be procured locally.

Tube fittings are provided to allow the use of 5/8" O.D. tubing for the fuel supply and return lines. If hard piping is used, these tube fittings are simply to be discarded.

Diesel fuel is not furnished and must be procured locally prior to start-up.

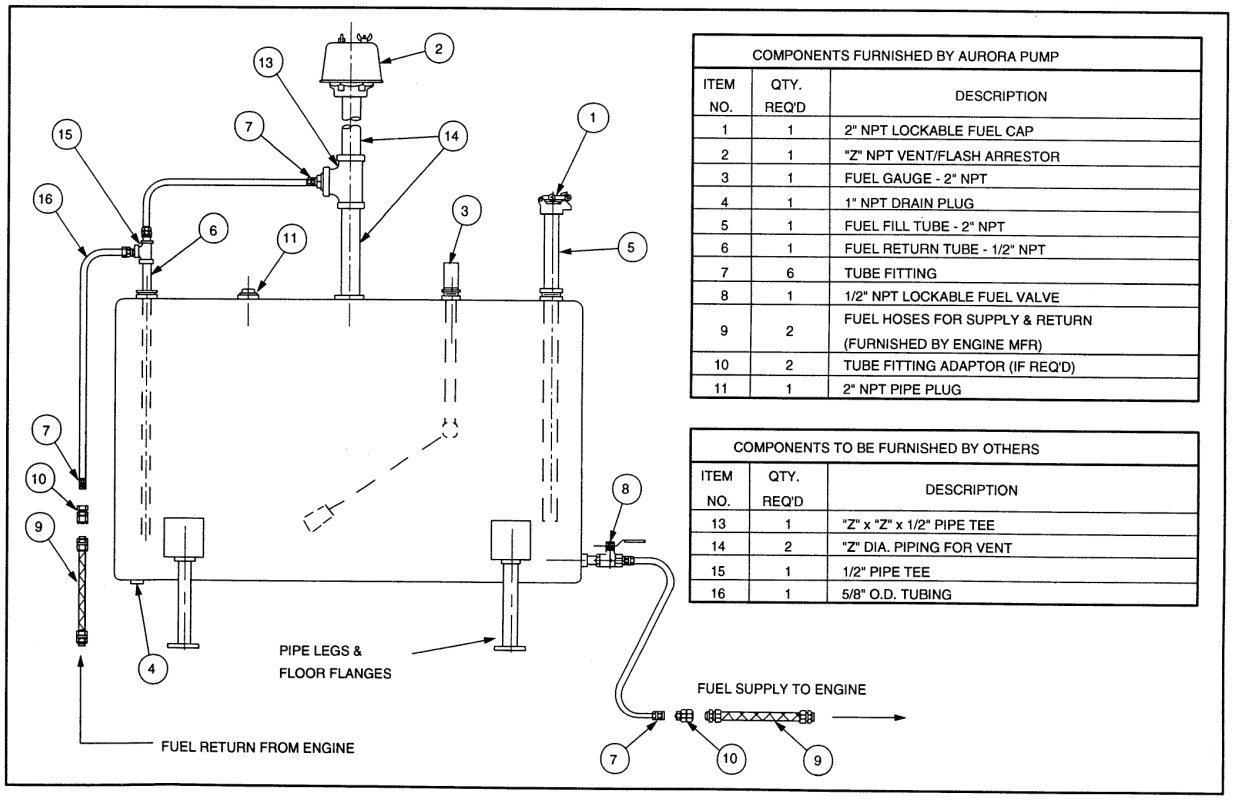
DIESEL MUFFLER AND EXHAUST SYSTEM. A commercial grade muffler and flexible connector are furnished as standard on diesel Fire Pumps. If necessary, additional fittings needed for connecting these to the engine are also provided.

Commercial grade mufflers have NPT connections on 3" & 3 ½" sizes, slip-on (automotive type) connectors for 4", 5", and 6" sizes, and 125# ANSI flanged connections for larger sizes.

Piping, elbows, and other components required to route the exhaust to the outside are not provided. It is suggested that the building contractor or on-site engineers design and install the remainder of the exhaust system.

Mufflers are sized to allow the engine to operate at its rated speed with nominal back pressure. However, if more than 25 feet of additional piping and/or more than 4 90-degree elbow are required to complete the system, it is important to contact the factory for re-evaluation of the system with respect to back pressure. A larger muffler and piping may be required to allow the engine to operate properly.

The flexible connectors furnished are intended for use as a vibration control device and cannot be substituted for elbows in the piping system. It is recommended that the flexible connector be placed as close to the engine's exhaust as possible. The muffler and piping must be supported to prevent strain on any diesel engine component.



COMPONENTS FURNISHED BY AURORA PUMP		
ITEM NO.	QTY. REQ'D	DESCRIPTION
1	1	2" NPT LOCKABLE FUEL CAP
2	1	"Z" NPT VENT/FLASH ARRESTOR
3	1	FUEL GAUGE - 2" NPT
4	1	1" NPT DRAIN PLUG
5	1	FUEL FILL TUBE - 2" NPT
6	1	FUEL RETURN TUBE - 1/2" NPT
7	6	TUBE FITTING
8	1	1/2" NPT LOCKABLE FUEL VALVE
9	2	FUEL HOSES FOR SUPPLY & RETURN (FURNISHED BY ENGINE MFR)
10	2	TUBE FITTING ADAPTOR (IF REQ'D)
11	1	2" NPT PIPE PLUG

COMPONENTS TO BE FURNISHED BY OTHERS		
ITEM NO.	QTY. REQ'D	DESCRIPTION
13	1	"Z" x "Z" x 1/2" PIPE TEE
14	2	"Z" DIA. PIPING FOR VENT
15	1	1/2" PIPE TEE
16	1	5/8" O.D. TUBING

FIGURE 9 DIESEL FUEL TANK AND FITTINGS

START-UP & FIELD ACCEPTANCE TEST

GENERAL. The following is a general outline for starting and field testing Fire Pump systems. It is recognized that requirements and method may vary depending on local customs and practices. Those involved in Fire Pump sales MUST fully understand all local requirements and N.F.P.A Pamphlet 20. A general method to follow is outlined below.

Be specific and complete when ordering Fire Pumps and accessories so that all necessary and correct items are on hand for the start-up. Since trouble cannot be tolerated on the day of field acceptance test…

Visit the jobsite after delivery of the equipment to verify that all components ordered have been received and are correct for the installation.

Visit the jobsite again after installation to assure that the components have been correctly assembled and installed.

After the installation is complete and the Fire Pump system is pressurized and checked by the contractor, the following items must be verified:

A. Coupling has been properly aligned.

B. Motor has been “bumped” to check for proper rotation.

C. Diesel engine (where applicable) has been properly serviced, necessary fluids added.

INITIAL TEST. The following steps are basic for an initial test of the Fire Pump system:

A. Close the valves on all discharge outlets.

B. Open the suction valve.

C. Having read the controller manual and gained an understanding of its operation, set the Fire Pump controller to “manual”. The Jockey pump panel should be set to the “off” position.

D. With the controller door closed, start the Fire Pump.

E. Adjust the packing to allow approximately 60 drops per minute to flow from each packing box. Further adjustment may be required later, so a recheck upon completion of the test is advised.

F. Close the relief valve completely for a brief period to verify that the shut-off pressure agrees with that on the certified factory test curve.

G. Adjust the casing relief valve (electric-driven units only) to allow enough flow to keep the pump cool.

H. Stop the Fire Pump.

I. Set the Fire Pump controller to the “automatic” position.

J. Slowly lower the system pressure with the control valve. The Fire Pump should start. Observe this starting pressure and adjust if necessary. (Adjustment procedure varies with the controller manufacturer.) Stop the Fire Pump.

FIELD ACCEPTANCE TEST. Personnel on hand for the Fire Pump field acceptance test should include the controller representative, diesel engine service technician (if applicable), representatives of the insuring agency and local fire authority, as well as those responsible for building maintenance and supervision.

Equipment needed for the field acceptance test includes:

1) Volt meter

2) Tachometer

3) Pitot Tube & gauge

4) Calibrated suction and discharge gauges with ¼% accuracy. (Gauges furnished with the pump are 2%-3% accurate and could be troublesome for the field acceptance test.

5) 50 feet of 2 ½” hose for each connection on the hose manifold

6) Play pipe with suitable nozzle for each hose

While field acceptance tests vary by location, the following steps are usually taken. Additional operations may be required depending on the special needs in some territories.

1) A hose and play pipe are connected to each valve on the hose manifold.

2) The discharge valve leading to the building’s fire system is closed.

3) The discharge valve leading to the hose manifold (or “test header”) is opened.

4) The suction valve is opened.

5) All relief valves are closed.

6) One hose valve on the hose manifold is opened.

7) With the Fire Pump operating, the hose valve is adjusted for a flow of 500 GPM at the play pipe as indicated by the pitot tube. Refer to the table (left) to determine the pressure vs. flow for the size play pipe used for this test.

NOZZLE PRESSURE	GPM AT VARIOUS NOZZLE SIZES					
	1-1/8	1-1/4	1-3/8	1-1/2	1-5/8	1-3/4
10	100	130	160	195	235	285
20	160	203	245	290	348	410
30	206	254	308	366	430	498
35	222	275	332	395	464	538
40	238	294	355	423	496	575
45	252	311	377	448	525	610
50	266	328	397	473	555	643
55	279	344	417	496	582	675
60	291	360	435	518	608	716
62	296	366	442	526	618	728
64	301	371	449	535	628	732
66	305	377	456	543	637	739
68	310	383	463	551	647	750
70	315	388	470	559	656	761
72	319	394	477	567	666	772
74	323	399	483	575	675	783
76	328	405	490	583	684	793
78	332	410	496	590	693	803
80	336	415	502	598	702	814
85	347	428	518	616	723	839
90	357	440	533	634	744	863
95	355	452	547	651	765	887
100	376	464	562	668	784	910
105	385	476	575	685	804	932
110	394	487	589	701	823	954
115	403	498	602	717	841	976
120	412	509	615	732	859	997

8) By opening additional valves and measuring the flow equal to 500 GPM, readings of 1000 GPM, 1500 GPM, 2000 GPM, etc. can be determined.

9) Open the necessary hose valves to obtain the total rated flow. When this flow is assured, check and record the following data:

a) Suction gauge pressure

b) Discharge gauge pressure

c) RPM with tachometer

d) Voltage

e) Amps (on all legs)

10) Verify that the flow remained constant during the above data readings.

11) Adjust the valves to achieve 150% of rated flow. Proceed as before and record the necessary data.

12) Repeat these steps as required by supervising authorities to obtain the desired number of points on the test curve.

13) Finally, close all valves and record the above readings in Step 9 at shut-off (zero GPM) condition.

If a number of automatic and/or manual starts are to be demonstrated, this series of tests can now be conducted.

The Jockey Pump controller must be set to start the Jockey Pump at a pressure greater than that of the main Fire Pump. The following procedure may be used to accomplish this.

1) The main Fire Pump controller is set to the “off” position.

2) The Jockey Pump controller is set to the “automatic” position.

3) The system pressure is slowly reduced by opening the test valve until the Jockey Pump starts. Observe the pressure at which the Jockey Pump starts.

4) Allow the Jockey Pump to continue running until the system pressure rises enough to stop the pump automatically. Typically, there is a minimum of 10 PSI between the “pump start” and “pump stop” pressure readings.

5) Adjust the set Points in the Jockey Pump controller as necessary to achieve the desired results. As with the main Fire Pump controller, adjustment methods vary with controller manufacturer.

IMPORTANT

Upon successful completion of the field acceptance test, the following points must be verified:

A. The discharge valve leading to the outside hose manifold should be closed.

B. The discharge valve leading to the building fire protection system should be opened.

C. The casing relief valve should be set to a pressure just below the shut-off pressure of the pump.

D. The main relief valve (if applicable) should be set to a pressure just above the maximum system pressure.

E. Both the Fire Pump and Jockey Pump controllers should be set to the “automatic” position.

F. Any alarm systems disabled during the tests should be reactivated.

G. The individual or authority responsible for maintaining the building’s fire protection system must be made aware of all settings and the operational condition of the system before leaving the site.

Fire pump piping

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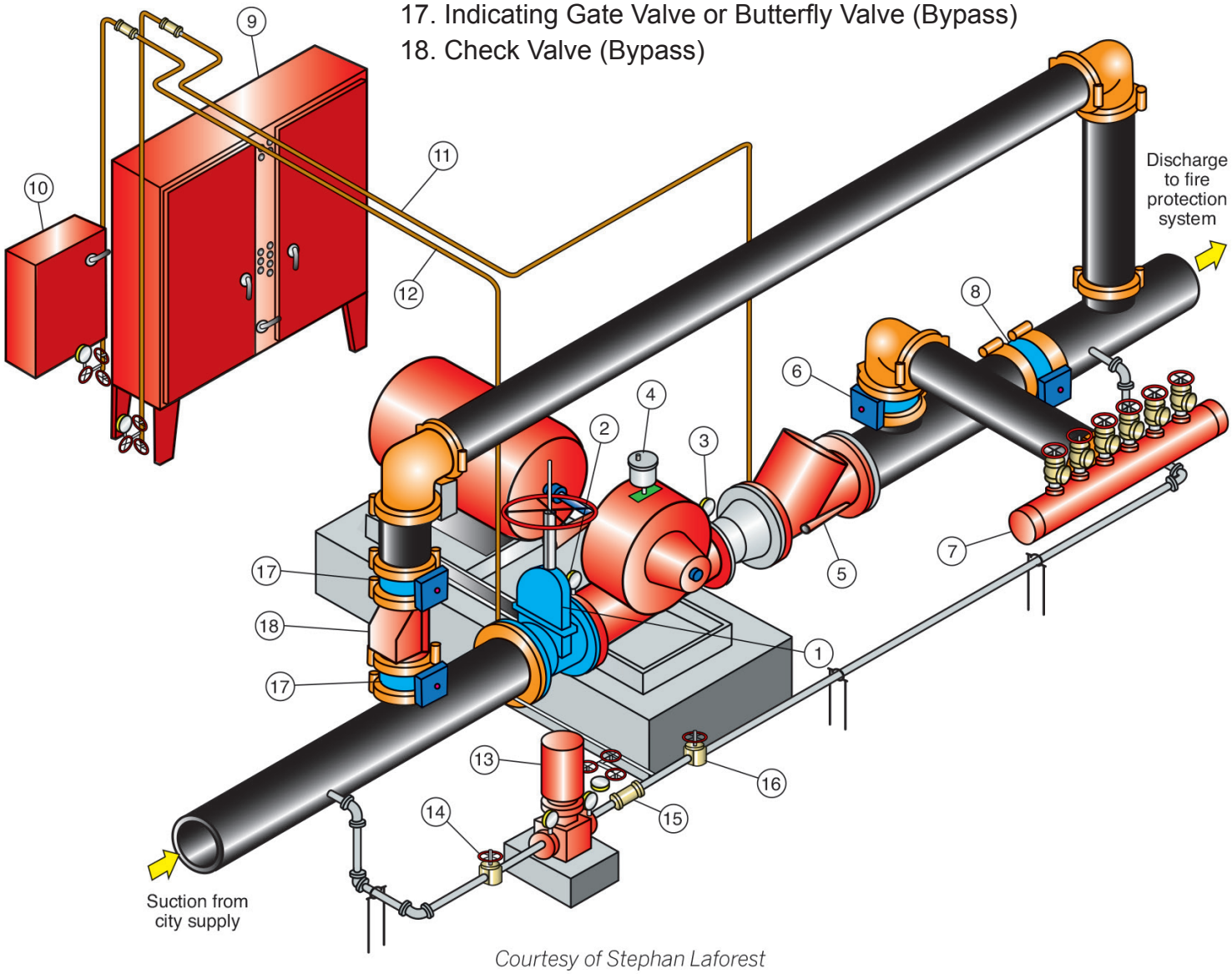
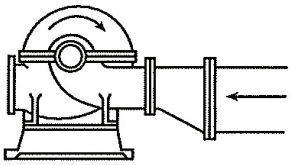
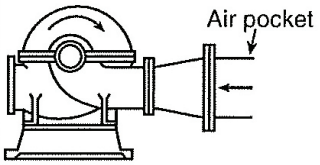
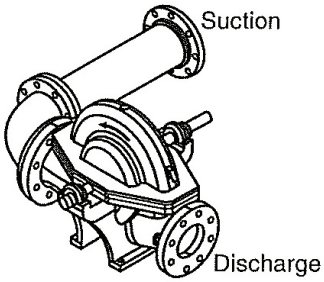
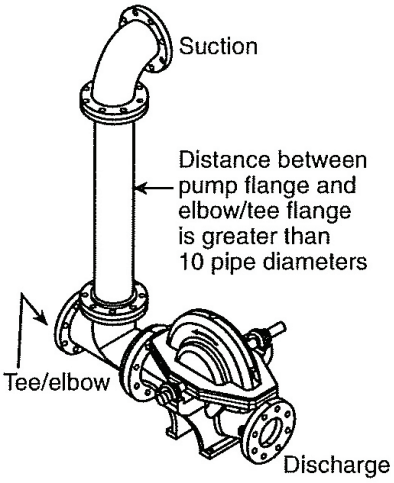
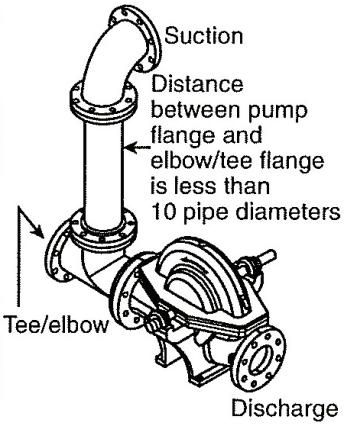
1. OS&Y Gate Valve (Suction Control)
2. Suction Pressure Gauge
3. Discharge Pressure Gauge
4. Automatic Air Release
5. Check Valve (Pump Discharge)
6. Indicating Gate Valve or Butterfly Valve (Test Header)
7. Test Header
8. Indicating Gate Valve or Butterfly Valve (Discharge Control Valve)
9. Fire Pump Controller
10. Pressure Maintenance Pump Controller (Jockey Pump)
11. Pressure-Sensing Line (Fire Pump)
12. Pressure-Sensing Line (Jockey Pump)
13. Pressure Maintenance Pump (Jockey Pump)
14. Isolation Valve (Jockey Pump Suction)
15. Check Valve (Jockey Pump Discharge)
16. Isolation Valve (Jockey Pump Discharge)
17. Indicating Gate Valve or Butterfly Valve (Bypass)
18. Check Valve (Bypass)

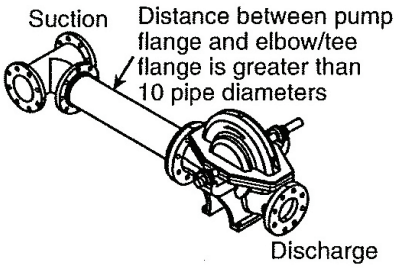
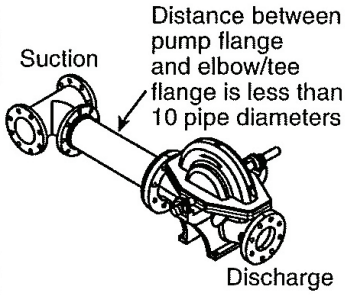


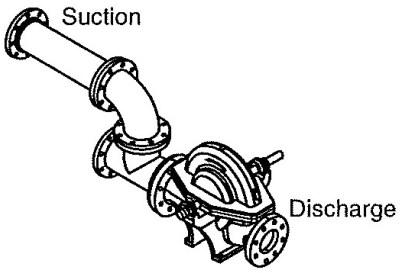
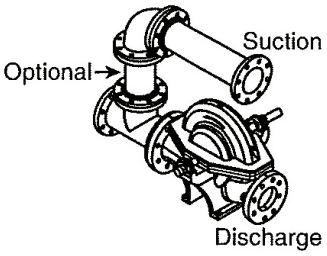
Courtesy of Stephan Laforest

Right	Wrong
	

	Wrong
	

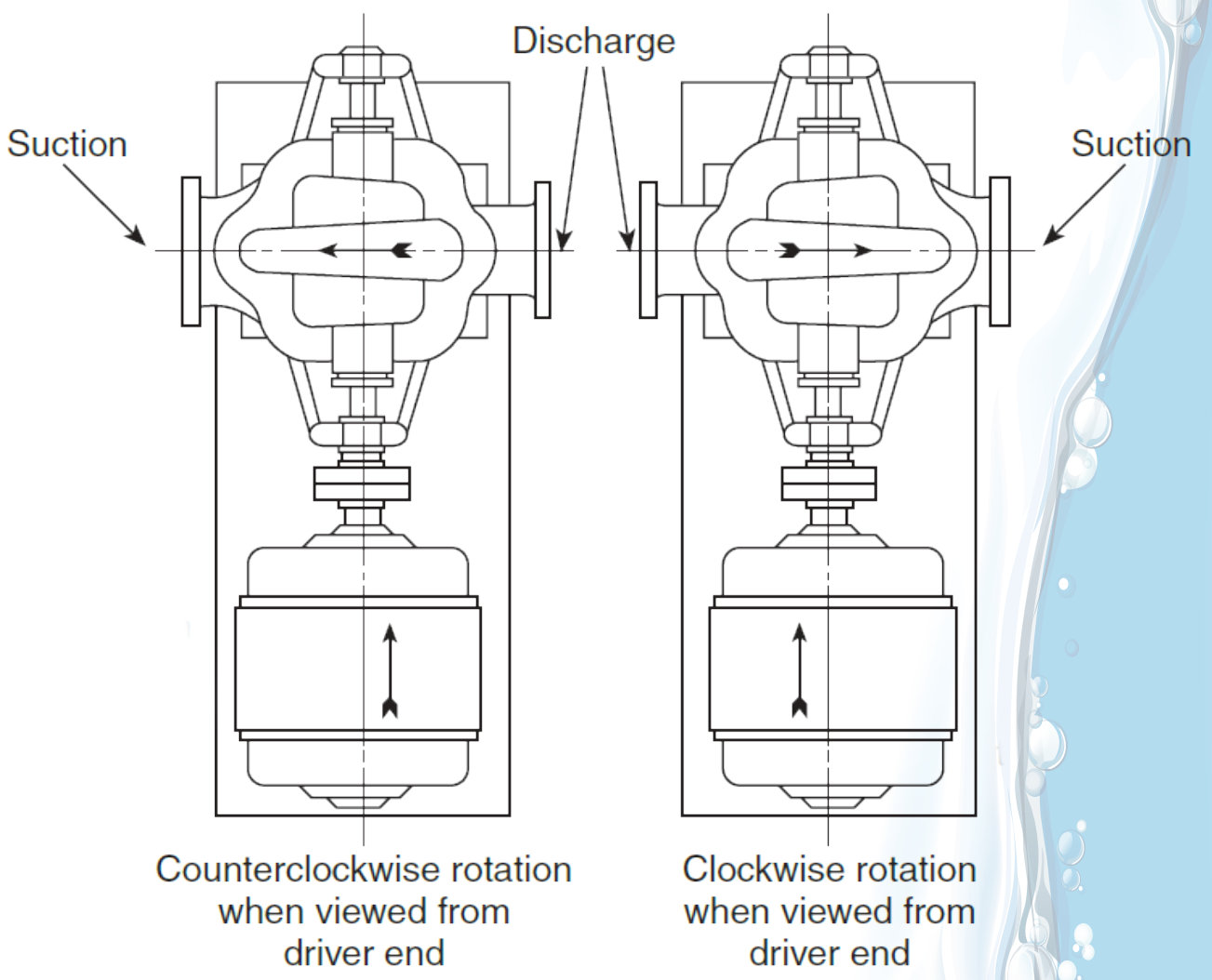
Right	Wrong
	

Right	Wrong
	

Right	Right
	

CYBERTRONIC CONTROLS

Horizontal Pump Shaft Rotation



Sensing Lines

Table 4.26(a) Summary of Centrifugal Fire Pump Data (U.S. Customary)

Pump Rating (gpm)	Minimum Pipe Sizes (Nominal) (in.)						
	Suction[a,b,c]	Discharge[a]	Relief Valve	Relief Valve Discharge	Meter Device	Number and Size of Hose Valves	Hose Header Supply
25	1	1	¾	1	1¼	1 — 1½	1
50	1½	1¼	1¼	1½	2	1 — 1½	1½
100	2	2	1½	2	2½	1 — 2½	2½
150	2½	2½	2	2½	3	1 — 2½	2½
200	3	3	2	2½	3	1 — 2½	2½
250	3½	3	2	2½	3½	1 — 2½	3
300	4	4	2½	3½	3½	1 — 2½	3
400	4	4	3	5	4	2 — 2½	4
450	5	5	3	5	4	2 — 2½	4
500	5	5	3	5	5	2 — 2½	4
750	6	6	4	6	5	3 — 2½	6
1000	8	6	4	8	6	4 — 2½	6
1250	8	8	6	8	6	6 — 2½	8
1500	8	8	6	8	8	6 — 2½	8
2000	10	10	6	10	8	6 — 2½	8
2500	10	10	6	10	8	8 — 2½	10
3000	12	12	8	12	8	12 — 2½	10
3500	12	12	8	12	10	12 — 2½	12
4000	14	12	8	14	10	16 — 2½	12
4500	16	14	8	14	10	16 — 2½	12
5000	16	14	8	14	10	20 — 2½	12

Notes:

(1) The pressure relief valve shall be permitted to be sized in accordance with 4.18.2.1.

(2) The pressure relief valve discharge shall be permitted to be sized in accordance with 4.18.6.2.

(3) The flowmeter device shall be permitted to be sized in accordance with 4.19.2.2.

(4) The hose header supply shall be permitted to be sized in accordance with 4.19.3.4.

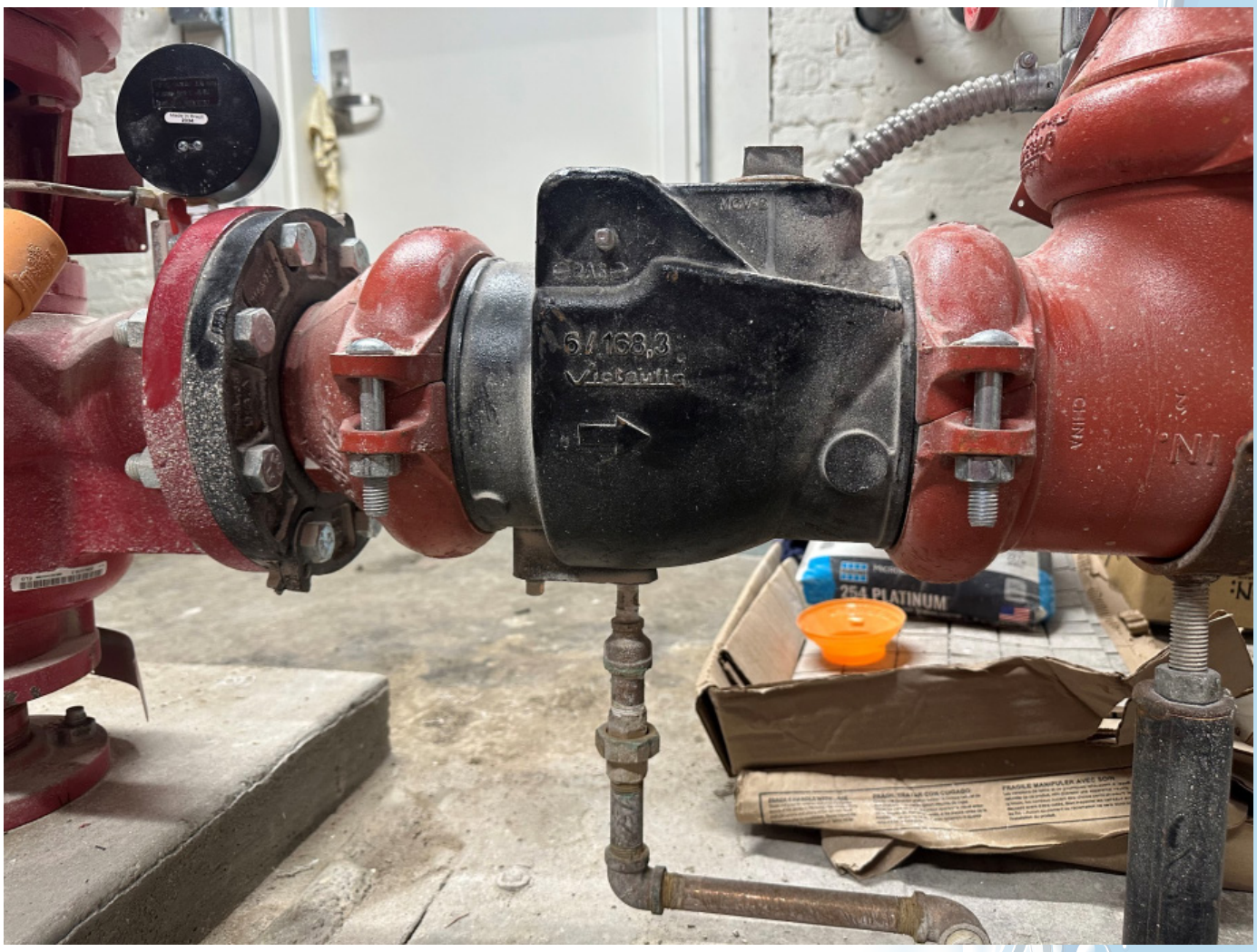
[a]Actual diameter of pump flange is permitted to be different from pipe diameter.

[b]Applies only to that portion of suction pipe specified in 4.14.3.4.

[c]Suction pipe sizes in Table 4.26(a) and Table 4.26(b) are based on a maximum velocity at 150 percent rated capacity to 15 ft/sec (4.6 m/sec) in most cases.

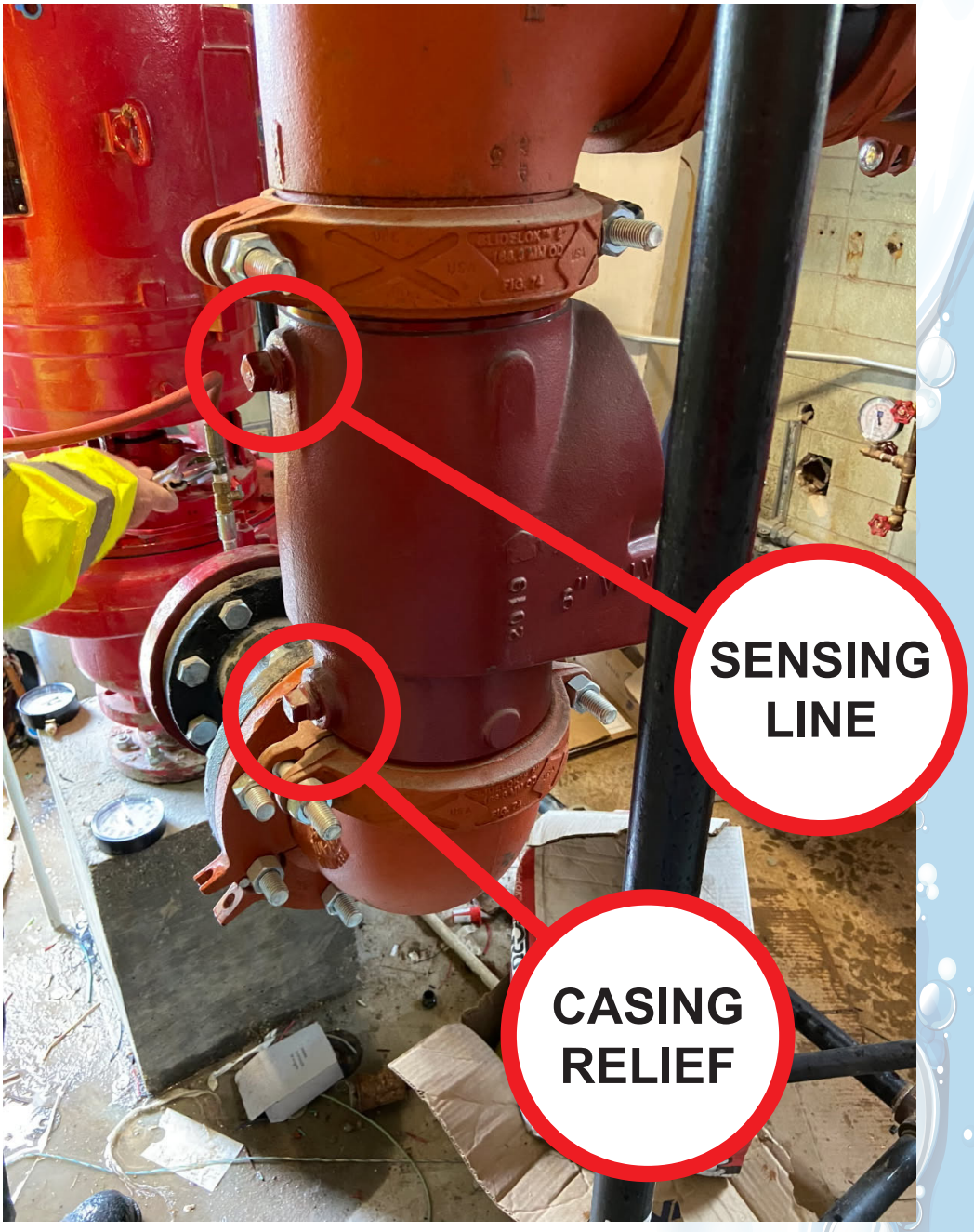
Sensing Lines

CYBERTRONIC CONTROLS



Sensing Lines

CYBERTRONIC CONTROLS



Sensing Lines

CYBERTRONIC CONTROLS

A.4.22.1.5

The hose valves of the fire pump test header should be located on the building exterior. This is because the test discharge needs to be directed to a safe outdoor location, and to protect the fire pumps, controllers, and so forth, from accidental water spray. In instances where damage from theft or vandalism is a concern, the test header hose valves can be located within the building but outside of the fire pump room if, in the judgment of the authority having jurisdiction, the test flow can be safely directed outside the building without undue risk of water spray to the fire pump equipment.

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Jockey pumps

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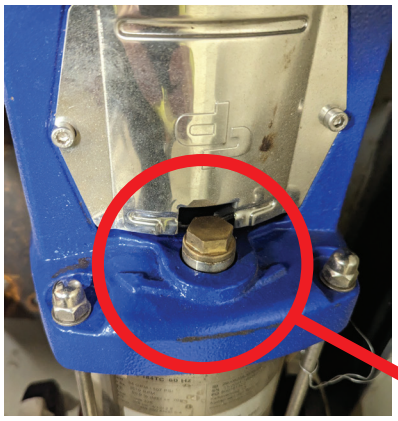
Jockey Pump

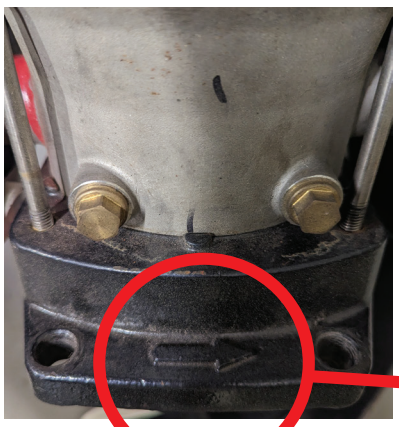
CYBERTRONIC CONTROLS

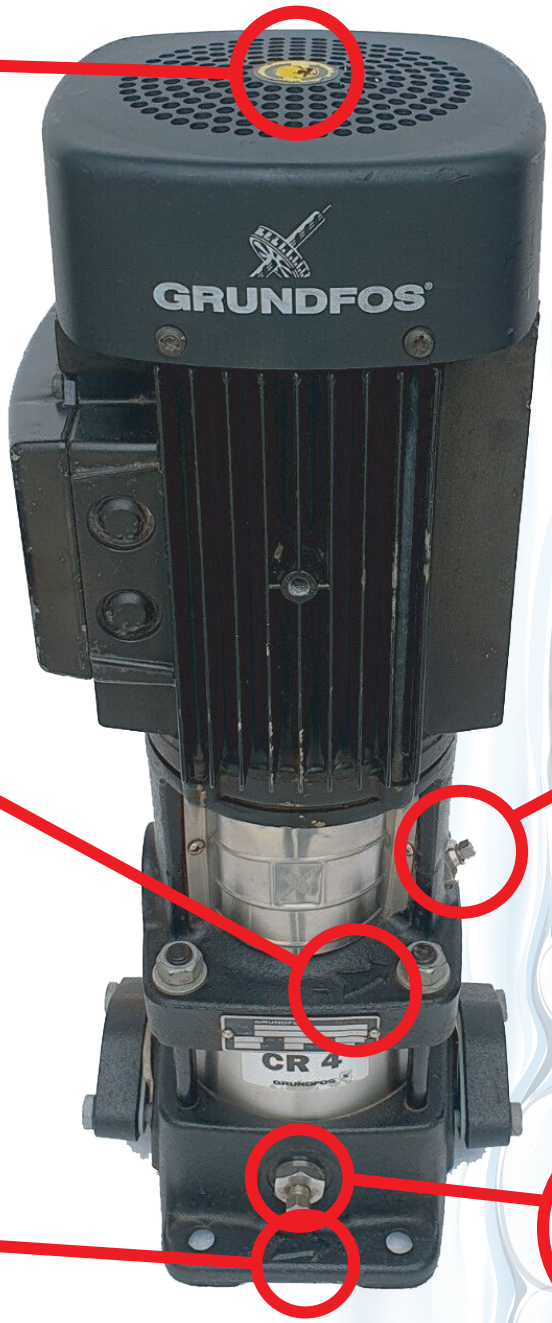
FAN SHROUD
(Motor Rotation)

ROTATION ARROW



FLOW DIRECTION





AIR RELEASE

Drain Plug

NFPA 20
2022 Edition

10.3.4.5 Field Connections.

10.3.4.5.1
A fire pump controller shall not be used as a raceway or as a junction box for any purpose, including the following:

(1) To supply other equipment

(2) To splice incoming or outgoing wires

(3) To connect external surge suppression

10.3.4.5.2
No undervoltage, phase loss, frequency sensitive, or other device(s) shall be field installed that automatically or manually prohibits electrical actuation of the motor contactor.

10.3.4.5.3*
Except as provided in 4.21.2.2(1) and 10.9.4, lockout, remote shutdown, or interlock to prevent normal operation shall not be permitted unless approved by the authority having jurisdiction.

10.3.4.6
Electrical supply conductors for pressure maintenance (jockey or make-up) pump(s) shall not be connected to the fire pump controller.

Electric fire pump controllers

4

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CYBERTRONIC CONTROLS

Electric Fire Pump Controller Types

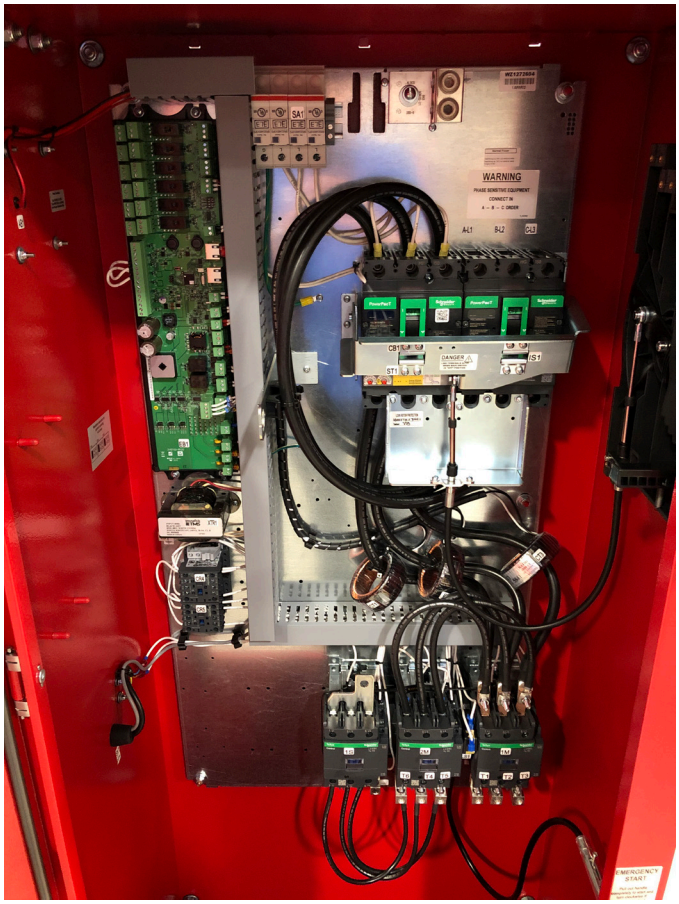
3 LEAD

Tornatech Model Numbers: GPA, GPL, GPR, GPS
Metron Model Numbers: MPT300, MPT400, MPT450, MPT700
Eaton C-H Model Numbers: FD/T20, FD/T30, FD/T60, FD/T90
Master Model Numbers: ECA/T, ECR/T, ECS/T, ECT/T
Firetrol Model Numbers: FTA1000, FTA1500, FTA1800, FTA1930

CYBERTRONIC CONTROLS

Electric Fire Pump Controller Types

6 LEAD



Tornatech Model Numbers: GPP, GPY, GPW

Metron Model Numbers: MPT420, MPT430, MPT435

Eaton C-H Model Numbers: FD/T40, FD/T70, FD/T80

Master Model Numbers: ECP/T, ECO/T, ECY/T

Firetrol Model Numbers: FTA1250, FTA1300, FTA1350

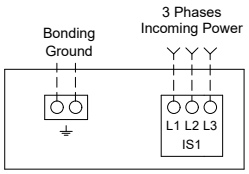
Electric Fire Pump Controller

Model: GPX

Terminal Diagram and Sizing for Isolating Switch

Built to the latest edition of the NFPA 20 standard

Power Terminals



Notes:
1 - For proper wire sizing, refer to NFPA70 and NEC (USA) or CEC (Canada) or local code.
2 - Controller suitable for service entrance in USA.
3 - For more accurate motor connections refer to motor manufacturer or motor nameplate.
4 - Controller is phase sensitive. Incoming lines must be connected in ABC sequence.

COPPER CONDUCTORS for Isolating Switch (IS1).
Field Wiring According to Bending Space (AWG or MCM). Terminals L1 - L2 - L3

Bending Space	5 " (127 mm)							8 " (203 mm)		
HP / Voltage	5	7.5	10	15	20	25	30	40	50	60
208	1x (10 to 1/0)	1x (8 to 1/0)	1x (8 to 1/0)	1x (6 to 1/0)	1x (4 to 1/0)	1x (3 to 1/0)	1x (2 to 1/0)	1x (1/0 to 3/0)	1x (3/0 to 250)	1x (4/0 to 250)
220 to 240	1x (10 to 1/0)	1x (10 to 1/0)	1x (8 to 1/0)	1x (6 to 1/0)	1x (4 to 1/0)	1x (4 to 1/0)	1x (3 to 1/0)	1x (1 to 3/0)	1x (2/0 to 3/0)	1x (3/0 to 250)
380 to 416	1x (10 to 1/0)	1x (10 to 1/0)	1x (10 to 1/0)	1x (8 to 1/0)	1x (8 to 1/0)	1x (6 to 1/0)	1x (6 to 1/0)	1x (4 to 1/0)	1x (3 to 1/0)	1x (3 to 1/0)
440 to 480	1x (10 to 1/0)	1x (10 to 1/0)	1x (10 to 1/0)	1x (10 to 1/0)	1x (8 to 1/0)	1x (8 to 1/0)	1x (6 to 1/0)	1x (6 to 1/0)	1x (4 to 1/0)	1x (3 to 1/0)
600	1x (10 to 1/0)	1x (10 to 1/0)	1x (10 to 1/0)	1x (10 to 1/0)	1x (10 to 1/0)	1x (8 to 1/0)	1x (8 to 1/0)	1x (6 to 1/0)	1x (6 to 1/0)	1x (4 to 1/0)

Bending Space	12 " (305 mm)				16 " (406 mm)						
HP / Voltage	75	100	125	150	200	250	300	350	400	450	500
208	2x (1/0 to 500)	2x (2/0 to 500)	2x (4/0 to 500)	2x (250 to 500)	3x (4/0 to 500)	--------	--------	--------	--------	--------	--------
220 to 240	1x (250)	2x (2/0 to 500)	2x (3/0 to 500)	2x (4/0 to 500)	2x (350 to 500)	3x (250 to 500)	--------	--------	--------	--------	--------
380 to 416	1x (1/0 to 3/0)	1x (3/0 to 250)	1x (250)	2x (1/0 to 500)	2x (3/0 to 500)	2x (4/0 to 500)	2x (300 to 500)	2x (400 to 500)	3x (250 to 500)	3x (300 to 500)	--------
440 to 480	1x (1 to 3/0)	1x (2/0 to 3/0)	1x (3/0 to 250)	1x (4/0 to 250)	2x (1/0 to 500)	2x (3/0 to 500)	2x (4/0 to 500)	2x (300 to 500)	2x (350 to 500)	2x (400 to 500)	3x (250 to 500)
600	1x (3 to 1/0)	1x (1 to 3/0)	1x (2/0 to 3/0)	1x (3/0 to 250)	1x (250)	2x (2/0 to 500)	2x (3/0 to 500)	2x (4/0 to 500)	2x (250 to 500)	2x (300 to 500)	2x (350 to 500)
Bending Space	5 " (127 mm)	8 " (203 mm)				12 " (305 mm)					

ALUMINUM CONDUCTORS for Isolating Switch (IS1).
Field Wiring According to Bending Space (AWG or MCM). Terminals L1 - L2 - L3

Bending Space	5 " (127 mm)							8 " (203 mm)		10 " (254 mm)
HP / Voltage	5	7.5	10	15	20	25	30	40	50	60
208	1x (10 to 1/0)	1x (6 to 1/0)	1x (6 to 1/0)	1x (4 to 1/0)	1x (3 to 1/0)	1x (1 to 1/0)	1x (1/0)	1x (3/0)	1x (4/0 to 250)	1x (300) ** or 1x (250) 90°C *
220 to 240	1x (10 to 1/0)	1x (8 to 1/0)	1x (6 to 1/0)	1x (4 to 1/0)	1x (3 to 1/0)	1x (2 to 1/0)	1x (1 to 1/0)	1x (2/0 to 3/0)	1x (3/0) 90°C *	1x (250)
380 to 416	1x (10 to 1/0)	1x (10 to 1/0)	1x (10 to 1/0)	1x (6 to 1/0)	1x (6 to 1/0)	1x (4 to 1/0)	1x (4 to 1/0)	1x (2 to 1/0)	1x (1 to 1/0)	1x (1/0)
440 to 480	1x (10 to 1/0)	1x (10 to 1/0)	1x (10 to 1/0)	1x (8 to 1/0)	1x (6 to 1/0)	1x (6 to 1/0)	1x (6 to 1/0)	1x (4 to 1/0)	1x (2 to 1/0)	1x (1 to 1/0)
600	1x (10 to 1/0)	1x (10 to 1/0)	1x (10 to 1/0)	1x (10 to 1/0)	1x (8 to 1/0)	1x (6 to 1/0)	1x (6 to 1/0)	1x (4 to 1/0)	1x (4 to 1/0)	1x (2 to 1/0)

Bending Space	12 " (305 mm)				16 " (406 mm)						
HP / Voltage	75	100	125	150	200	250	300	350	400	450	500
208	2x (2/0 to 500)	2x (4/0 to 500)	2x (300 to 500)	2x (350 to 500)	3x (300 to 500)	--------	--------	--------	--------	--------	--------
220 to 240	1x (350) ** N/A	2x (3/0 to 500)	2x (250 to 500)	2x (300 to 500)	2x (500)	3x (400 to 500)	--------	--------	--------	--------	--------
380 to 416	1x (3/0)	1x (250 to 350)	1x (350) ** N/A	2x (3/0 to 500)	2x (4/0 to 500)	2x (300 to 500)	2x (500)	3x (300 to 500)** 2x (500) 90°C *	3x (350 to 500)	3x (400 to 500)	--------
440 to 480	1x (1/0 to 3/0)	1x (3/0)	1x (250)	1x (300 to 350)** 1x (250) 90°C *	2x (3/0 to 500)	2x (250 to 500)	2x (300 to 500)	2x (400 to 500)	2x (500)	2x (500) 90°C *	3x (350 to 500)
600	1x (1 to 1/0)	1x (2/0 to 3/0)	1x (3/0) 90°C *	1x (4/0 to 250)	1x (350 to 500)	2x (3/0 to 500)	2x (4/0 to 250)	2x (300 to 500)	2x (350 to 500)	2x (400 to 500)	2x (500)
Bending Space	5 " (127 mm)	8 " (203 mm)			12 " (305 mm)						

*For standard enclosure, use 90°C aluminium wire. Consult Factory for Use of Conductors Rated Lower than 90°C.
** Consult Factory

Drawing for information only.
Manufacturer reserves the right to modify this drawing without notice.
Contact manufacturer for "As Built" drawing.

NYC Dpt of Building Approved

REV.	DESCRIPTION	DD/MM/YY	Drawing number
1	Removed Seismic logo (optional)	18/05/22	GPX-TD611 1/2 /E
0	First issue	22/12/20	CDL

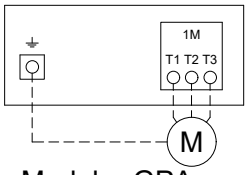
Electric Fire Pump Controller

Model: GPX

Terminal Diagram and Sizing For GPA,GPR & GPS

Built to the latest edition of the NFPA 20 standard

Motor Terminals



Models : GPA,
GPR & GPS

Notes:
1 - For proper wire sizing, refer to NFPA70 and NEC (USA) or CEC (Canada) or local code.
2 - Controller suitable for service entrance in USA.
3 - For more accurate motor connections refer to motor manufacturer or motor nameplate.
4 - Controller is phase sensitive. Incoming lines must be connected in ABC sequence.

COPPER CONDUCTORS for Motor Connection (1M).
Field Wiring According to Bending Space (AWG or MCM). Terminals T1 - T2 - T3

HP / Voltage	5	7.5	10	15	20	25	30	40	50	60
208	1x (10 to 2)	1x (8 to 2)	1x (8 to 2)	1x (6 to 2)	1x (4 to 2)	1x (3 to 2/0)	1x (2 to 2/0)	1x (1/0 to 3/0)	1x (3/0)	1x (4/0 to 300)
220 to 240	1x (10 to 2)	1x (10 to 2)	1x (8 to 2)	1x (6 to 2)	1x (4 to 2)	1x (4 to 2/0)	1x (3 to 2/0)	1x (1/0 to 3/0)	1x (2/0 to 3/0)	1x (3/0)
380 to 416	1x (10 to 2)	1x (10 to 2)	1x (10 to 2)	1x (8 to 2)	1x (8 to 2)	1x (6 to 2)	1x (6 to 1/0)	1x (4 to 2)	1x (3 to 2/0)	1x (1 to 2/0)
440 to 480	1x (10 to 2)	1x (10 to 2)	1x (10 to 2)	1x (10 to 2)	1x (8 to 2)	1x (8 to 2)	1x (6 to 2)	1x (6 to 2)	1x (4 to 2/0)	1x (3 to 2/0)
600	1x (10 to 2)	1x (10 to 2)	1x (10 to 2)	1x (10 to 2)	1x (10 to 2)	1x (8 to 2)	1x (8 to 2)	1x (6 to 2)	1x (6 to 2)	1x (4 to 2/0)

HP / Voltage	75	100	125	150	200	250	300	350	400	450	500
208	1x (300)	2x (2/0 to 300)	2x (4/0 to 300)	2x (250 to 300)	2x (400 to 600)	--------	--------	--------	--------	--------	--------
220 to 240	1x (250 to 300)	2x (2/0 to 300)	2x (3/0 to 300)	2x (4/0 to 300)	2x (350 to 500)	2x (500 to 600)	--------	--------	--------	--------	--------
380 to 416	1x (1/0 to 3/0)	1x (3/0)	1x (250 to 300)	1x (300)	2x (3/0 to 300)	2x (4/0 to 300)	2x (300)	2x (400 to 500)	2x (500 to 600)	2x (600)	
440 to 480	1x (1 to 1/0)	1x (2/0 to 3/0)	1x (3/0)	1x (4/0 to 300)	2x (1/0 to 300)	2x (3/0 to 300)	2x (4/0 to 300)	2x (300)	2x (350 to 500)	2x (400 to 600)	2x (500 to 600)
600	1x (3 to 1/0)	1x (1 to 1/0)	1x (2/0 to 3/0)	1x (3/0)	1x (250 to 300)	2x (2/0 to 300)	2x (3/0 to 300)	2x (4/0 to 300)	2x (250 to 300)	2x (300)	2x (350 to 500)

ALUMINUM CONDUCTORS for Contactor (1M).
Field Wiring According to Bending Space (AWG or MCM). Terminals T1 - T2 - T3

HP / Voltage	5	7.5	10	15	20	25	30	40	50	60
208	1x (10 to 2/0) **	1x (10 to 2/0) **	1x (6 to 2/0) **	1x (4 to 2/0) **	1x (2 to 2/0) **	1x (1 to 2/0) **	1x (1/0 to 2/0) **	1x (2/0) 90°C *	Consult Factory	1x (300)
220 to 240	1x (10 to 2/0) **	1x (10 to 2/0) **	1x (8 to 2/0) **	1x (4 to 2/0) **	1x (3 to 2/0) **	1x (2 to 2/0) **	1x (1 to 2/0) **	1x (2/0)	1x (3/0) 90°C *	Consult Factory
380 to 416	1x (12 to 2/0) **	1x (12 to 2/0) **	1x (10 to 2/0) **	1x (8 to 2/0) **	1x (6 to 2/0) **	1x (6 to 2/0) **	1x (4 to 2/0) **	1x (2 to 2/0) **	1x (1 to1/0)	1x (1/0)
440 to 480	1x (12 to 2/0) **	1x (12 to 2/0) **	1x (10 to 2/0) **	1x (10 to 2/0) **	1x (8 to 2/0) **	1x (6 to 2/0) **	1x (6 to 2/0) **	1x (4 to 2/0) **	1x (2 to 1/0)	1x (1 to 1/0)
600	1x (12 to 2/0) **	1x (12 to 2/0) **	1x (12 to 2/0) **	1x (10 to 2/0) **	1x (10 to 2/0) **	1x (8 to 2/0) **	1x (8 to 2/0) **	1x (4 to 2/0) **	1x (4 to 2/0) **	1x (2 to 1/0)

HP / Voltage	75	100	125	150	200	250	300	350	400	450	500
208	1x (300) 90°C *	2x (4/0 to 300)	2x (300)	2x (300) 90°C *	2x (600)	--------	--------	--------	--------	--------	--------
220 to 240	1x (300) 90°C *	2x (3/0 to 300)	2x (250 to 300)	2x (300)	2x (500)	2x (600)	--------	--------	--------	--------	--------
380 to 416	1x (3/0)	Consult Factory	1x (300) 90°C *	Consult Factory	2x (4/0 to 300)	2x (300)	Consult Factory	2x (600)	2x (600) 90°C *	2x (600) 90°C *	--------
440 to 480	1x (1/0)	1x (3/0)	Consult Factory	1x (300)	2x (3/0 to 300)	2x (250 to 300)	2x (300)	2x (300) 90°C *	2x (500)	2x (600)	2x (600) 90°C *
600	1x (1 to 1/0)	Consult Factory	1x (3/0) 90°C *	Consult Factory	1x (300) 90°C *	2x (3/0 to 300)	2x (4/0 to 300)	2x (300)	2x (300) 90°C *	2x (300) 90°C *	Consult Factory

*For standard enclosure, use 90°C aluminium wire. Consult Factory for Use of Conductors Rated Lower than 90°C.
**Option V659 required.

Drawing for information only.
Manufacturer reserves the right to modify this drawing without notice.
Contact manufacturer for "As Built" drawing.

TORNATECH

NYC Dpt of Building Approved

REV.	DESCRIPTION	DD/MM/YY	Drawing number
1	Removed Seismic logo (optional)	18/05/22	GPX-TD611 2/2 /E
0	First issue	22/12/20	CDL

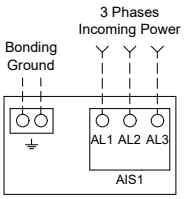
Automatic Transfer Switch
For Electric Fire Pump Controller

Model: GPU

Terminal Diagram and Sizing

Built to the latest edition of the NFPA 20 standard

Power Terminals



Notes:
1 - Controller is phase sensitive. Incoming lines must be connected in ABC sequence.

COPPER CONDUCTORS for Isolating Switch (AIS1).
Field Wiring According to Bending Space (AWG or MCM). Terminals AL1 - AL2 - AL3

Bending Space	5 " (127 mm)							8 " (203 mm)		
HP / Voltage	5	7.5	10	15	20	25	30	40	50	60
208	1x (10 to 1/0)	1x (8 to 1/0)	1x (8 to 1/0)	1x (6 to 1/0)	1x (4 to 1/0)	1x (3 to 1/0)	1x (2 to 1/0)	1x (1/0 to 3/0)	1x (3/0 to 250)	1x (4/0 to 250)
220 to 240	1x (10 to 1/0)	1x (10 to 1/0)	1x (8 to 1/0)	1x (6 to 1/0)	1x (4 to 1/0)	1x (4 to 1/0)	1x (3 to 1/0)	1x (1 to 3/0)	1x (2/0 to 3/0)	1x (3/0 to 250)
380 to 416	1x (10 to 1/0)	1x (10 to 1/0)	1x (10 to 1/0)	1x (8 to 1/0)	1x (8 to 1/0)	1x (6 to 1/0)	1x (6 to 1/0)	1x (4 to 1/0)	1x (3 to 1/0)	1x (3 to 1/0)
440 to 480	1x (10 to 1/0)	1x (10 to 1/0)	1x (10 to 1/0)	1x (10 to 1/0)	1x (8 to 1/0)	1x (8 to 1/0)	1x (6 to 1/0)	1x (6 to 1/0)	1x (4 to 1/0)	1x (3 to 1/0)
600	1x (10 to 1/0)	1x (10 to 1/0)	1x (10 to 1/0)	1x (10 to 1/0)	1x (10 to 1/0)	1x (8 to 1/0)	1x (8 to 1/0)	1x (6 to 1/0)	1x (6 to 1/0)	1x (4 to 1/0)

Bending Space	12 " (305 mm)				16 " (406 mm)						
HP / Voltage	75	100	125	150	200	250	300	350	400	450	500
208	2x (1/0 to 500)	2x (2/0 to 500)	2x (4/0 to 500)	2x (250 to 500)	3x (4/0 to 500)	--------	--------	--------	--------	--------	--------
220 to 240	1x (250)	2x (2/0 to 500)	2x (3/0 to 500)	2x (4/0 to 500)	2x (350 to 500)	3x (250 to 500)	--------	--------	--------	--------	--------
380 to 416	1x (1/0 to 3/0)	1x (3/0 to 250)	1x (250)	2x (1/0 to 500)	2x (3/0 to 500)	2x (4/0 to 500)	2x (300 to 500)	2x (400 to 500)	3x (250 to 500)	3x (300 to 500)	--------
440 to 480	1x (1 to 3/0)	1x (2/0 to 3/0)	1x (3/0 to 250)	1x (4/0 to 250)	2x (1/0 to 500)	2x (3/0 to 500)	2x (4/0 to 500)	2x (300 to 500)	2x (350 to 500)	2x (400 to 500)	3x (250 to 500)
600	1x (3 to 1/0)	1x (1 to 3/0)	1x (2/0 to 3/0)	1x (3/0 to 250)	1x (250)	2x (2/0 to 500)	2x (3/0 to 500)	2x (4/0 to 500)	2x (250 to 500)	2x (300 to 500)	2x (350 to 500)
Bending Space	**5 " (127 mm)**	**8 " (203 mm)**				**12 " (305 mm)**					

ALUMINUM CONDUCTORS for Isolating Switch (AIS1).
Field Wiring According to Bending Space (AWG or MCM). Terminals AL1 - AL2 - AL3

Bending Space	5 " (127 mm)							8 " (203 mm)		10 " (254 mm)
HP / Voltage	5	7.5	10	15	20	25	30	40	50	60
208	1x (10 to 1/0)	1x (6 to 1/0)	1x (6 to 1/0)	1x (4 to 1/0)	1x (3 to 1/0)	1x (1 to 1/0)	1x (1/0)	1x (3/0)	1x (4/0 to 250)	1x (300) ** or 1x (250) 90°C *
220 to 240	1x (10 to 1/0)	1x (8 to 1/0)	1x (6 to 1/0)	1x (4 to 1/0)	1x (3 to 1/0)	1x (2 to 1/0)	1x (1 to 1/0)	1x (2/0 to 3/0)	1x (3/0) 90°C *	1x (250)
380 to 416	1x (10 to 1/0)	1x (10 to 1/0)	1x (10 to 1/0)	1x (6 to 1/0)	1x (6 to 1/0)	1x (4 to 1/0)	1x (4 to 1/0)	1x (2 to 1/0)	1x (1 to 1/0)	1x (1/0)
440 to 480	1x (10 to 1/0)	1x (10 to 1/0)	1x (10 to 1/0)	1x (8 to 1/0)	1x (6 to 1/0)	1x (6 to 1/0)	1x (6 to 1/0)	1x (4 to 1/0)	1x (2 to 1/0)	1x (1 to 1/0)
600	1x (10 to 1/0)	1x (10 to 1/0)	1x (10 to 1/0)	1x (10 to 1/0)	1x (8 to 1/0)	1x (6 to 1/0)	1x (6 to 1/0)	1x (4 to 1/0)	1x (4 to 1/0)	1x (2 to 1/0)

Bending Space	12 " (305 mm)				16 " (406 mm)						
HP / Voltage	75	100	125	150	200	250	300	350	400	450	500
208	2x (2/0 to 500)	2x (4/0 to 500)	2x (300 to 500)	2x (350 to 500)	3x (300 to 500)	--------	--------	--------	--------	--------	--------
220 to 240	1x (350) ** N/A	2x (3/0 to 500)	2x (250 to 500)	2x (300 to 500)	2x (500)	3x (400 to 500)	--------	--------	--------	--------	--------
380 to 416	1x (3/0)	1x (250 to 350)	1x (350) ** N/A	2x (3/0 to 500)	2x (4/0 to 500)	2x (300 to 500)	2x (500)	3x (300 to 500)** 2x (500) 90°C *	3x (350 to 500)	3x (400 to 500)	--------
440 to 480	1x (1/0 to 3/0)	1x (3/0)	1x (250)	1x (300 to 350)** 1x (250) 90°C *	2x (3/0 to 500)	2x (250 to 500)	2x (300 to 500)	2x (400 to 500)	2x (500)	2x (500) 90°C *	3x (350 to 500)
600	1x (1 to 1/0)	1x (2/0 to 3/0)	1x (3/0) 90°C *	1x (4/0 to 250)	1x (350 to 500)	2x (3/0 to 500)	2x (4/0 to 250)	2x (300 to 500)	2x (350 to 500)	2x (400 to 500)	2x (500)
Bending Space	**5 " (127 mm)**	**8 " (203 mm)**			**12 " (305 mm)**						

* For standard enclosure, use 90°C aluminium wire. Consult Factory for Use of Conductors Rated Lower than 90°C.
** Consult Factory

Drawing for information only.
Manufacturer reserves the right to modify this drawing without notice.
Contact manufacturer for "As Built" drawing.

TORNATECH

NYC Dpt of Building Approved

REV.	DESCRIPTION	DD/MM/YY	Drawing number
1	Removed Seismic logo (optional)	18/05/22	GPU-TD613 1/2 /E
0	First Issue	08/01/21	CDL

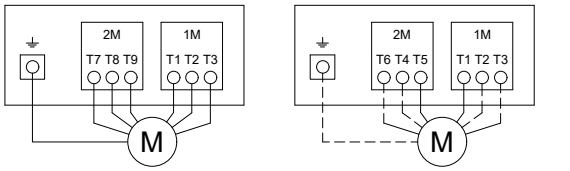
Electric Fire Pump Controller

Model: GPX

Terminal Diagram and Sizing For GPP,GPY & GPW

Built to the latest edition of the NFPA 20 standard

Motor Terminals



Model : GPP Models : GPW & GPY

Notes:
1 - For proper wire sizing, refer to NFPA70 and NEC (USA) or CEC (Canada) or local code.
2 - Controller suitable for service entrance in USA.
3 - For more accurate motor connections refer to motor manufacturer or motor nameplate.
4 - Controller is phase sensitive. Incoming lines must be connected in ABC sequence.

COPPER CONDUCTORS for Motor Connection (1M-2M).
Field Wiring According to Bending Space (AWG or MCM). Terminals T1-T2-T3-T4-T5-T6-T7-T8-T9

HP / Voltage	5	7.5	10	15	20	25	30	40	50	60
208	1x (10 to 4)	1x (10 to 4)	1x (10 to 4)	1x (8 to 4)	1x (8 to 4)	1x (6 to 4)	1x (6 to 4)	1x (4 to 2/0)	1x (2 to 2/0)	1x (1 to 2/0)
220 to 240	1x (10 to 4)	1x (10 to 4)	1x (10 to 4)	1x (8 to 4)	1x (8 to 4)	1x (6 to 4)	1x (6 to 4)	1x (4)	1x (3 to 2/0)	1x (2 to 2/0)
380 to 416	1x (10 to 4)	1x (10 to 4)	1x (10 to 4)	1x (10 to 4)	1x (10 to 4)	1x (10 to 4)	1x (8 to 4)	1x (8 to 4)	1x (6 to 4)	1x (4)
440 to 480	1x (10 to 4)	1x (10 to 4)	1x (10 to 4)	1x (10 to 4)	1x (10 to 4)	1x (10 to 4)	1x (10 to 4)	1x (8 to 4)	1x (8 to 4)	1x (6 to 4)
600	1x (10 to 4)	1x (10 to 4)	1x (10 to 4)	1x (10 to 4)	1x (10 to 4)	1x (10 to 4)	1x (10 to 4)	1x (10 to 4)	1x (8 to 4)	1x (8 to 4)

HP / Voltage	75	100	125	150	200	250	300	350	400	450	500
208	1x (2/0 to 3/0)	1x (3/0 to 300)	1x (250 to 300)	2x (1/0 to 300)	2x (3/0 to 350)	--------	--------	--------	--------	--------	--------
220 to 240	1x (1/0 to 2/0)	1x (3/0)	1x (4/0 to 300)	1x (300)	2x (2/0 to 300)	2x (4/0 to 350)	--------	--------	--------	--------	--------
380 to 416	1x (4 to 2/0)	1x (2 to 2/0)	1x (1/0 to 2/0)	1x (2/0 to 3/0)	1x (4/0 to 300)	1x (300)	2x (2/0 to 300)	2x (3/0 to 300)	2x (4/0 to 350)	2x (4/0 to 350)	--------
440 to 480	1x (4 to 2/0)	1x (3 to 2/0)	1x (2 to 2/0)	1x (1/0 to 3/0)	1x (2/0 to 3/0)	1x (4/0 to 300)	1x (300)	2x (1/0 to 300)	2x (2/0 to 300)	2x (3/0 to 350)	2x (4/0 to 350)
600	1x (6 to 4)	1x (4)	1x (3 to 2/0)	1x (2 to 2/0)	1x (1/0 to 3/0)	1x (2/0 to 3/0)	1x (4/0 to 300)	1x (250 to 300)	1x (300)	2x (1/0 to 300)	2x (2/0 to 300)

ALUMINUM CONDUCTORS for Contactor (1M-2M).
Field Wiring According to Bending Space (AWG or MCM). Terminals T1-T2-T3-T4-T5-T6-T7-T8-T9

HP / Voltage	5	7.5	10	15	20	25	30	40	50	60
208	1x (12 to 2/0) **	1x (10 to 2/0) **	1x (10 to 2/0) **	1x (8 to 2/0) **	1x (6 to 2/0) **	1x (4 to 2/0) **	1x (4 to 2/0) **	1x (2 to 2/0)	1x (1/0 to 2/0)	1x (2/0)
220 to 240	1x (12 to 2/0) **	1x (10 to 2/0) **	1x (10 to 2/0) **	1x (8 to 2/0) **	1x (8 to 2/0) **	1x (6 to 2/0) **	1x (4 to 2/0) **	1x (2 to 2/0) **	1x (1 to 2/0)	1x (1/0 to 2/0)
380 to 416	1x (12 to 2/0) **	1x (12 to 2/0) **	1x (12 to 2/0) **	1x (10 to 2/0) **	1x (10 to 2/0) **	1x (8 to 2/0) **	1x (8 to 2/0) **	1x (6 to 2/0) **	1x (4 to 2/0) **	1x (3 to 2/0) **
440 to 480	1x (12 to 2/0) **	1x (12 to 2/0) **	1x (12 to 2/0) **	1x (12 to 2/0) **	1x (10 to 2/0) **	1x (10 to 2/0) **	1x (8 to 2/0) **	1x (8 to 2/0) **	1x (6 to 2/0) **	1x (4 to 2/0) **
600	1x (12 to 2/0) **	1x (12 to 2/0) **	1x (12 to 2/0) **	1x (12 to 2/0) **	1x (10 to 2/0) **	1x (10 to 2/0) **	1x (10 to 2/0) **	1x (8 to 2/0) **	1x (8 to 2/0) **	1x (6 to 2/0) **

HP / Voltage	75	100	125	150	200	250	300	350	400	450	500
208	1x (3/0)	Consult Factory	1x (300) 90°C *	2x (3/0 to 300)	2x (250 to 350)	--------	--------	--------	--------	--------	--------
220 to 240	1x (2/0) 90°C *	Consult Factory	1x (300)	1x (300) 90°C *	2x (4/0 to 300)	2x (300 to 350)	--------	--------	--------	--------	--------
380 to 416	1x (2 to 2/0)	1x (1/0 to 2/0)	1x (1/0 to 2/0)	1x (3/0) 90°C *	1x (300)	1x (300) 90°C *	2x (4/0 to 300)	2x (250 to 300)	2x (300 to 350)	2x (300 to 350)	--------
440 to 480	1x (3 to 2/0) **	1x (2 to 2/0)	1x (2/0) 90°C *	1x (2/0 to 3/0)	1x (3/0) 90°C *	1x (300)	1x (300) 90°C *	2x (3/0 to 300)	2x (4/0 to 300)	2x (250 to 350)	2x (300 to 350)
600	1x (4 to 2/0) **	1x (3 to 2/0) **	1x (2 to 2/0)	1x (1/0 to 3/0)	1x (3/0)	1x (3/0) 90°C *	1x (300)	1x (300) 90°C *	Consult Factory	2x (3/0 to 300)	2x (4/0 to 300)

* For standard enclosure, use 90°C aluminium wire. Consult Factory for Use of Conductors Rated Lower than 90°C.
** Option V659 required.

Drawing for information only.
Manufacturer reserves the right to modify this drawing without notice.
Contact manufacturer for "As Built" drawing.

TORNATECH

NYC Dpt of Building Approved

REV.	DESCRIPTION	DD/MM/YY	Drawing number
1	Removed Seismic logo (optional)	18/05/22	GPX-TD612 2/2 /E
0	First issue	22/12/20	CDL

NFPA 20

9.2.3
For fire pump installations using the arrangement in **9.2.2(1)**, **9.2.2(2)**, **9.2.2(3)**, or **9.2.2(5)** for the normal source of power, a single disconnecting means and associated overcurrent protection device shall be permitted to be installed in the power supply to the fire pump controller.

9.2.3.1
Where the disconnecting means permitted by **9.2.3** is installed, the disconnecting means shall meet all of the following requirements:

- (1) It shall be identified as being suitable for use as service equipment.
- (2) It shall be lockable in both the closed position and the open position.
- **(3)*** It shall be located remote from other building disconnecting means.
- **(4)*** It shall be located remote from other fire pump source disconnecting means.
- (5) It shall be marked “Fire Pump Disconnecting Means” in letters that are no less than 1 in. (25 mm) in height and that can be seen without having to open enclosure doors or covers.

9.2.3.2
Where the disconnecting means permitted by **9.2.3** is installed, a placard shall be placed adjacent to the fire pump controller stating the location of this disconnecting means and the location of any key needed to unlock the disconnect.

9.2.3.3
Where the disconnecting means permitted by **9.2.3** is installed, the disconnect shall be supervised in the closed position by one of the following methods:

- (1) Central station, proprietary, or remote station signal device
- (2) Local signaling service that will cause the sounding of an audible signal at a constantly attended location
- (3) Locking the disconnecting means in the closed position
- (4) Where the disconnecting means is located within fenced enclosures or in buildings under the control of the owner, sealing the disconnecting means and performing approved weekly recorded inspections

NFPA 20
Continued

9.2.3.4

Where the overcurrent protection permitted by **9.2.3** is installed, the overcurrent protection device shall be rated to carry indefinitely the sum of the locked rotor current of the largest pump motor and the full-load current of all of the other pump motors and accessory equipment.

9.2.3.4.1

Alternatively, compliance with **9.2.3.4** shall be based on an assembly listed for fire pump service that complies with all of the following:

- (1) The overcurrent protection device shall not open within 2 minutes at 600 percent full-load current.
- (2) The overcurrent protection device shall not open with a restart transient of 24 times the full-load current.
- (3) The overcurrent protection device shall not open within 10 minutes at 300 percent full-load current.
- (4) The trip point for circuit breakers shall not be field adjustable.
- (5) The overcurrent protection device shall be identified as being "Suitable for Use as Service Equipment."
- (6) Where used as service equipment, the disconnecting means shall be marked "Service Disconnect."

NFPA 20
Continued

10.3.4.5 Field Connections.
10.3.4.5.1
A fire pump controller shall not be used as a raceway or as a junction box for any purpose *(see Section **9.7**)*, including the following:

- (1) To supply other equipment
- (2) To splice incoming or outgoing wires
- (3) To connect external surge suppression

10.3.4.5.2
No undervoltage, phase loss, frequency sensitive, or other device(s) shall be field installed that automatically or manually prohibits electrical actuation of the motor contactor.

10.3.4.5.3*
Except as provided in **4.21.2.2(1)**, **10.5.2.8.4** and **10.9.4**, lockout, remote shutdown, or interlock to prevent normal operation shall not be permitted unless approved by the authority having jurisdiction.

10.3.4.6
Electrical supply conductors for jockey pump(s) shall not be connected to the fire pump controller.

NFPA 70
Article 695

695.6 Power Wiring.

Power circuits and wiring methods shall comply with the requirements in **695.6(A)** through (J), and as permitted in **230.90(A)**, Exception No. 4; **230.94**, Exception No. 4; **240.13**; 230.208; **240.4(A)**; and **430.31**.

(B) Conductor Size.

(1) Fire Pump Motors and Other Equipment.
Conductors supplying a fire pump motor(s), pressure maintenance pumps, and associated fire pump accessory equipment shall have an ampacity of not less than the sum of the following:

- (1)

  125 percent of the sum of the fire pump motor(s) and pressure maintenance motor(s) full-load current(s), as determined by **430.6(A)**

- (2)

  100 percent of the associated fire pump accessory equipment full-load current(s)

Diesel fire pump controllers

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CYBERTRONIC CONTROLS

Diesel Fire Pump Controller Wiring

The wiring between the fire pump controller and the diesel engine have been standardized so that terminal number at the engine is the same terminal number at the controller.
The electrical wiring between the power source and the diesel engine fire pump controller shall meet the NFPA 20, Chapter 12.3.5.1, 12.3.5.2 and 12.2.5.3, NFPA 70 National Electrical Code Article 695 or C22.1 Canadian Electrical Code, Section 32-200, or other local codes.

All wiring between the fire pump controller and the diesel engine must be stranded wire per NFPA 20.

Do not use solid core wire.

Always verify that both the diesel engine and the fire pump controller are the same DC Voltage either 12- or 24-Volts DC.
If installing a new fire pump controller on an older diesel fire pump, verify the engine is **Negative Ground.** Some older diesel fire pump engines are **Positive Ground.** If you have a **Positive Ground** engine, it will need to be converted to **Negative Ground** before replacing the controller.

Diesel engine driven fire pump controllers shall be powered by a dedicated source protected by a fuse or circuit breaker. Verify the label on the cabinet to select the correct protection. Always follow this procedure when connecting or disconnecting the controller: Connect both batteries before connecting the AC power. Disconnect the AC power before disconnecting the batteries. Disconnecting the batteries while the AC is connected may result in severe damage to the controller electronic boards.

Terminal #1 "Energize to Start" is a 12/24 Volt DC positive signal from the controller to the diesel engine. It energizes the fuel rail/solenoid & the cooling water solenoid for the diesel engine heat exchanger. It needs to be **10-GAUGE** wire minimum.

Terminal #2 "Engine Run" is a 12/24 Volt DC positive signal from the diesel engine to the fire pump controller signaling the engine is running. This causes the fire pump controller to disengage the starter during automatic starts. It needs to be **14-GAUGE** wire minimum.

Terminal #3 "Overspeed" is a 12/24 Volt DC positive alarm signal from the diesel engine to the fire pump controller signaling the engine RPM has exceeded 120% of rated RPM. The fire pump controller will shut down the engine when this occurs during an Automatic start. It must be reset at the engine before the fire pump controller can be reset. It needs to be **14-GAUGE** wire minimum.

Terminal #4 "Low Oil Pressure" is a 12/24 Volt DC negative alarm signal from the diesel engine to the fire pump controller signaling the engine has low oil pressure. This alarm will Stop the engine ONLY if triggered during a manual run test or a weekly test. If triggered during an auto start, the engine will continue to run. It needs to be **14-GAUGE** wire minimum.

Terminal #5 "High Engine Temperature" is a 12/24 Volt DC negative signal from the diesel engine to the fire pump controller signaling the engine has high engine temperature. This alarm will Stop the engine ONLY if triggered during a manual run test or a weekly test. If triggered during an auto start, the engine will continue to run It needs to be **14-GAUGE** wire minimum.

CYBERTRONIC CONTROLS

Terminal #6 "Battery 1" is the 12/24 Volt DC positive from battery #1. The fire pump controller is powered via this wire and also charges the battery #1 via this wire. It needs to be **10-GAUGE** wire minimum.

Terminal #7 "Engine Alternator" is a 12/24 Volt DC positive signal from the diesel engine to the fire pump controller to provide battery charging via the diesel engine alternator while the engine is running. This is normally only found on older diesel engines. These engines require Option V001 Alternator output current divider. ***(See Image GPD 1)*** It needs to be **10-GAUGE** wire minimum.

Terminal #8 "Battery 2" is the 12/24 Volt DC positive from battery #2. The fire pump controller is powered via this wire and also charges the battery #2 via this wire. It needs to be **10-GAUGE** wire minimum.

Terminal #9 "Start Contactor 1" is a 12/24 Volt DC positive signal from the controller to the diesel engine to crank the engine on starter/battery 1. It needs to be **10-GAUGE** wire minimum.

Terminal #10 "Start Contactor 2" is a 12/24 Volt DC positive signal from the controller to the diesel engine to crank the engine on starter/battery 2. It needs to be **10-GAUGE** wire minimum.

Terminal #11 "Ground" is the common 12/24 Volt DC negative/chassis ground for both battery banks. It needs to be **10-GAUGE** wire minimum.

Terminal #12 "Energize to Stop" is a 12/24 Volt DC positive signal from the controller to the diesel engine to command the engine to stop. It needs to be **14-GAUGE** wire minimum.
(See Image GPD2 for Terminals #1 thru Terminal #12)

The following terminals are utilized on newer electronic engines equipped with an ECM.

Terminal #301 "ECM selector switch in Alt. Position" is a 12/24 Volt DC negative alarm signal from the diesel engine to the fire pump controller signaling the Electronic Control Module is in the alternate position. This will trigger an "Engine Trouble" alarm. It needs to be **14-GAUGE** wire minimum.

Terminal #302 "Fuel Injection Malfunction" is a 12/24 Volt DC negative alarm signal from the diesel engine to the fire pump controller signaling the Electronic Control Module has a fault. This will trigger an "Engine Trouble" alarm. It needs to be **14-GAUGE** wire minimum.

Terminal #303 "ECM Warning" is a 12/24 Volt DC negative alarm signal from the diesel engine to the fire pump controller signaling the Electronic Control Module has a fault. This will trigger an "Engine Trouble" alarm. It needs to be **14-GAUGE** wire minimum.

Terminal #304 "ECM Fault" is a 12/24 Volt DC negative alarm signal from the diesel engine to the fire pump controller signaling the Electronic Control Module is in fault. This will trigger an "Engine Trouble" alarm. It needs to be **14-GAUGE** wire minimum.

Terminal #305 "PLD Low Suction Pressure" is a 12/24 Volt DC negative alarm signal from the diesel engine to the fire pump controller signaling the Pressure Limiting Driver is in a low suction condition. This will trigger an "Engine Trouble" alarm. It needs to be **14-GAUGE** wire minimum.

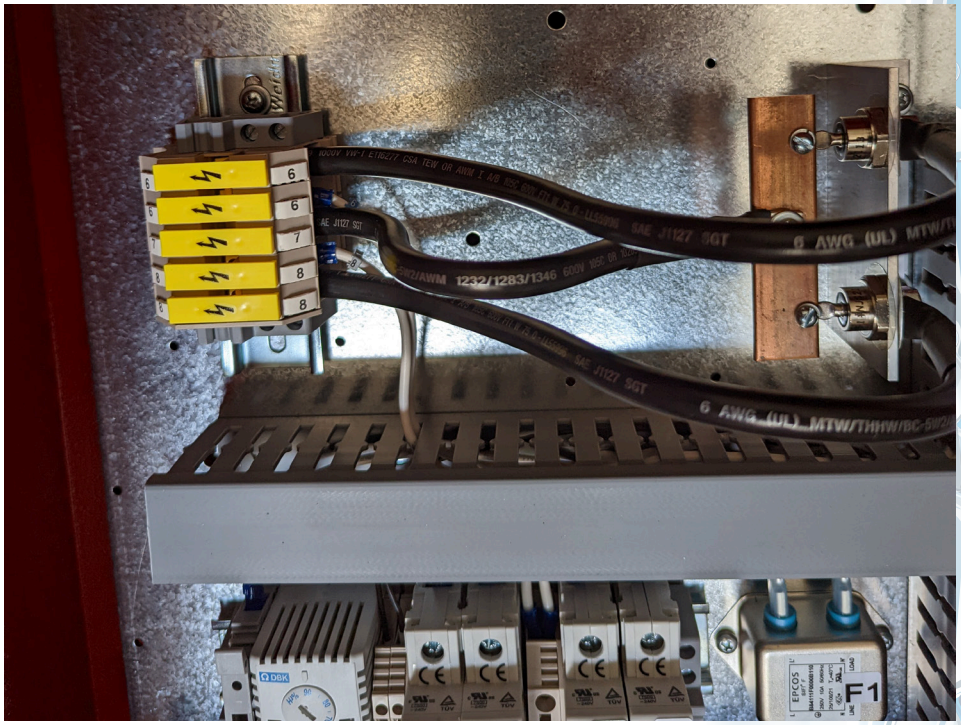
Terminal #310 "High Raw Water Temperature" is a 12/24 Volt DC negative alarm signal from the diesel engine to the fire pump controller signaling the raw water temperature for the heater exchanger is above 105 degrees F. This will trigger an "Engine Trouble" alarm. It needs to be **14-GAUGE** wire minimum.

Terminal #311 "Low Raw Water Flow" is a 12/24 Volt DC negative alarm signal from the diesel engine to the fire pump controller signaling the raw water flow to the heater exchanger is low. This will trigger an "Engine Trouble" alarm. It needs to be **14-GAUGE** wire minimum.

Terminal #312 "Low Engine Temperature" is a 12/24 Volt DC negative alarm signal from the diesel engine to the fire pump controller signaling the engine temperature is below 140 degrees F. It usually means the block heater is off or has failed. This will trigger an "Engine Trouble" alarm. It needs to be **14-GAUGE** wire minimum.

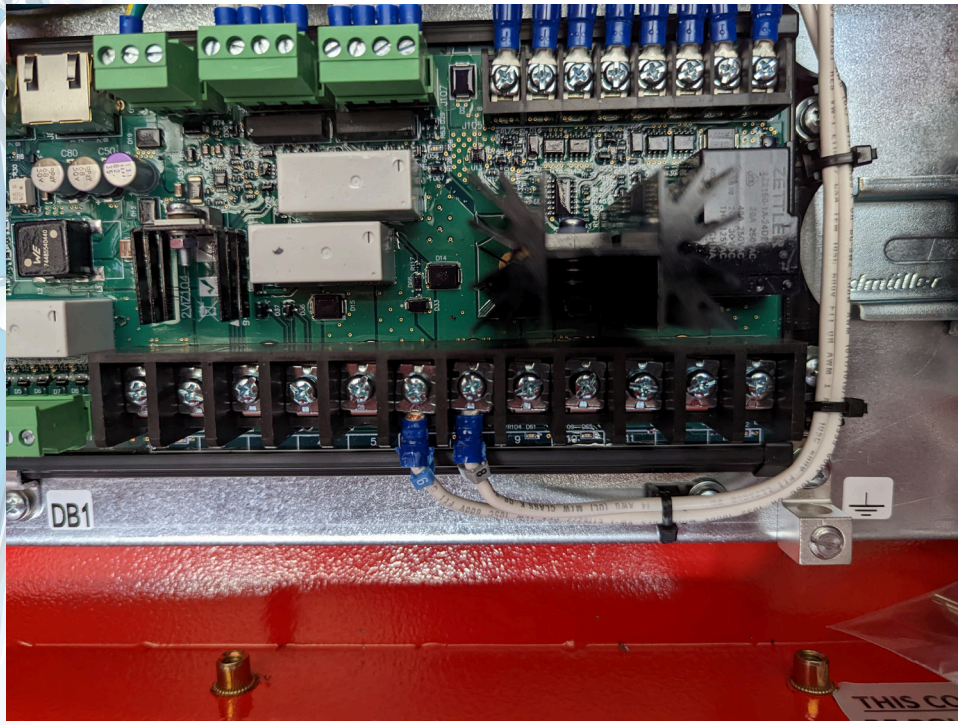
(See Image GPD3 for Terminal #301 thru Terminal #312)

GPD1

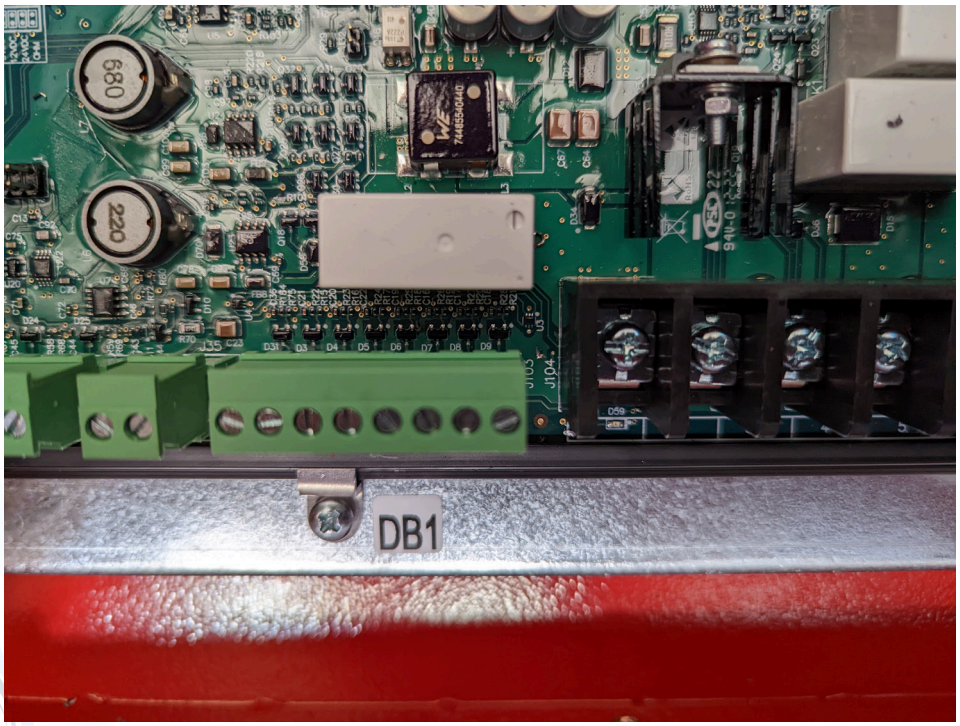


CYBERTRONIC CONTROLS

GPD2



GPD3



Diesel Engine Fire Pump Controller
12VDC or 24VDC Negative Ground

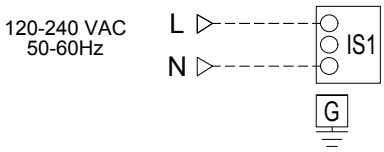
Model: GPD

Terminal Diagram

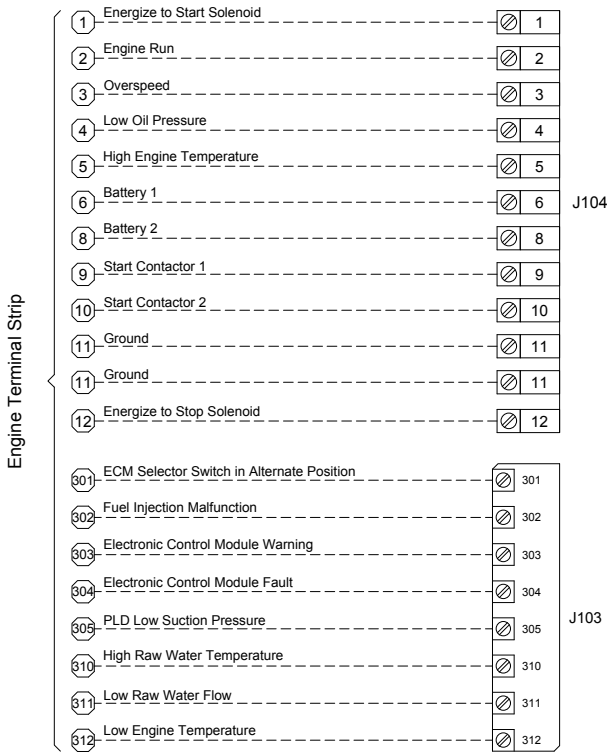
Built to the latest edition of the NFPA 20 standard

Power Supply

Terminals Wire Size:
14 - 6 AWG
3.9 Nm

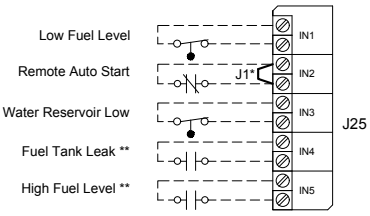


Engine Connections (DB1)



Field Connections (DB1)

Terminals Wire Size:
24 - 12 AWG
0.5 Nm



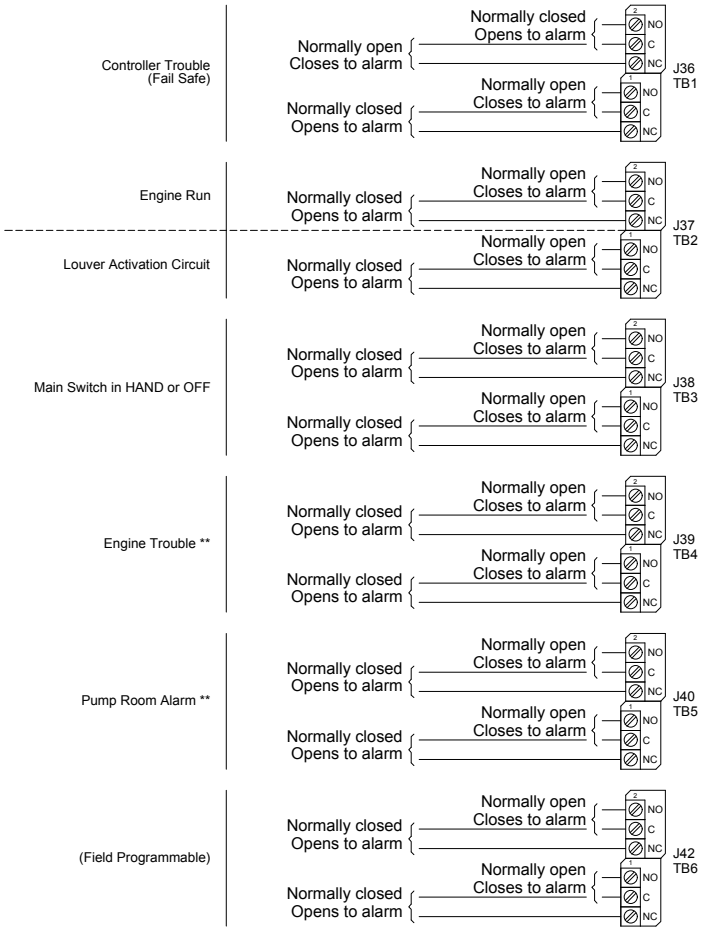
Network Connection (VMB1)

Shielded Female Connector RJ45

* Remove jumper to use this feature
** Re-assignable

Remote Alarm Terminals (DB1)

Terminals Wire Size:
250VAC / 8A Max.
24 - 12 AWG
0.5 Nm



All wiring between the controller and diesel engine shall be stranded (NFPA20)

Wiring between controller and engine (terminals 301, 302, 303, 304, 305, 310, 311, 312, 2 ,3 ,4 ,5) must be #14AWG as minimum.

Wiring between controller and engine (terminals 12 [rated at 10A or 22A for 20 seconds] 1, 9, 10 [rated at 10A]) must be stranded #10AWG as minimum.

Wiring between controller and engine (terminals 6, 8, 11 [rated at 30A]) must be stranded and sized according to distance.

0-5' (0-1.5m) - 12 AWG (4 mm2)
6-10' (1.8-3m) - 10 AWG (6 mm2)
11-15' (3.3-4.5m) - 8 AWG (10 mm2)
16-20' (4.8-6m) - 2x10 AWG (2x6 mm2)
21-32' (6.4-9.75m) - 2x8 AWG (2x10 mm2)

Drawing for information only.
Manufacturer reserves the right to modify this drawing without notice.
Contact manufacturer for "As Built" drawing.

TORNATECH

NYC Dpt of Building Approved

REV.	DESCRIPTION	DD/MM/YY	Drawing number
4	Removed Seismic logo (optional)	18/05/22	GPD-TD700 /E
3	Revised text	22/07/21	
2	Revised IN3	22/05/19	CDL

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Alarms and transfer switch control wiring

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NFPA 20
2022 Edition

10.4.7* Fire Pump Alarm and Signal Devices Remote from Controller.

10.4.7.1
Where the pump room is not constantly attended, audible or visible signals powered by a separate reliable supervised source not exceeding 125 V shall be provided at a point of constant attendance.

10.4.7.2
These fire pump alarms and signals shall indicate the information in **10.4.7.2.1** throughn**10.4.7.2.6.**

10.4.7.2.1 Pump or Motor Running.
The signal shall actuate whenever the controller has operated into a motor-running condition.

10.4.7.2.2 Loss of Phase.

10.4.7.2.2.1
The fire pump alarm shall actuate whenever any phase at the line terminals of the motor contactor is lost.

10.4.7.2.2.2
All phases shall be monitored, which detects loss of phase whether the motor is running or at rest.

10.4.7.2.2.3
When power is supplied from multiple power sources, monitoring of each power source for phase loss shall be permitted at any point electrically upstream of the line terminals of the contactor, provided all sources are monitored.

10.4.7.2.3 Phase Reversal.

10.4.7.2.3.1
The fire pump alarm shall actuate whenever the three-phase power at the line terminals of the motor contactor is reversed.

10.4.7.2.3.2
Where power is supplied from multiple power sources, monitoring for phase reversal shall be permitted at any point electrically upstream of the line terminals of the contactor, provided all sources are monitored.

10.4.7.2.4 Controller Connected to Alternate Source.
Where two sources of power are supplied to meet the requirements of **9.3.2**, this signal shall indicate whenever the alternate source is the source supplying power to the controller.

10.4.7.2.5 Alternate Source Isolating Switch or Circuit Breaker Open.
Where two sources of power are supplied to meet the requirements of **9.3.2,** a signal shall be provided to indicate that the alternate source isolating switch or circuit breaker is open or tripped.

10.4.7.2.6 Controller or System Trouble.
As a minimum, a controller or system trouble alarm shall actuate whenever any of the following alarms occur:

(1)
Ground-fault signal, where provided (see **10.4.5.9**)
(2)
Pressure-sensing device signals (see **10.5.2.1.3.1** and **10.5.2.1.3.2**)
(3)
Variable-speed trouble signals (see **10.10.8.1**, **10.10.8.2**, and **10.10.3**)
(4)
Fail-to-start signal (see **10.5.2.7.5**)

10.4.8 Controller Contacts for Remote Indication.
Controllers shall be equipped with contacts (open or closed) to operate circuits for the conditions in **10.4.7.2.1** through **10.4.7.2.3** and **10.4.7.2.6** and when a controller is equipped with a transfer switch in accordance with **10.4.7.2.4** and **10.4.7.2.5**.

12.4.2 Signal Devices Remote from Controller.

12.4.2.1
Where the pump room is not constantly attended, audible or visible signals powered by a source other than the engine starting batteries and not exceeding 125 V shall be provided at a point of constant attendance.

12.4.2.2 Remote Indication.
Controllers shall be equipped to operate circuits for remote indication of the conditions covered in 12.4.1.3, 12.4.1.4, and 12.4.2.3.

12.4.2.3
The remote panel shall indicate the following:

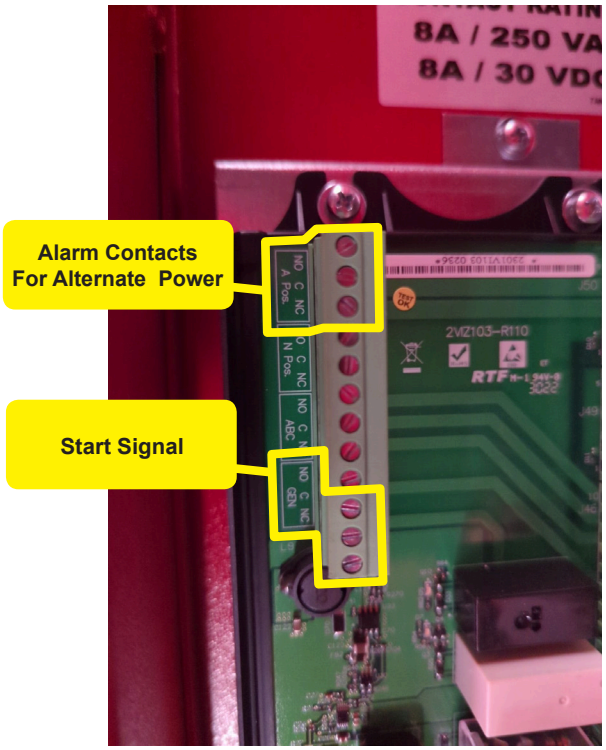
(1)
The engine is running (separate signal).

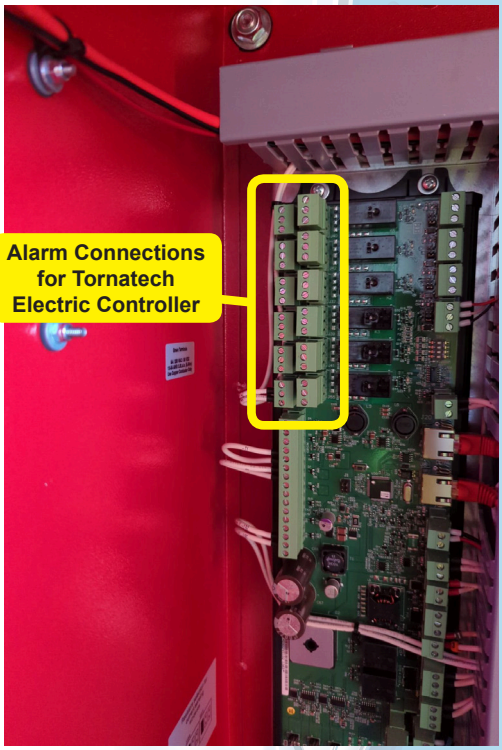
(2)
The controller main switch has been turned to the off or manual position (separate signal).

(3)*
There is trouble on the controller or engine (separate or common signals). (See **12.4.1.4** and **12.4.1.5**)

12.4.3 Controller Contacts for Remote Indication.
Controllers shall be equipped with open or closed contacts to operate circuits for the conditions covered in **12.4.2**.

9.6.4 Transfer of Power.
Transfer of power to the fire pump controller between the normal supply and one alternate supply shall take place within the pump room.





For the latest version of this manual please go to our website.

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