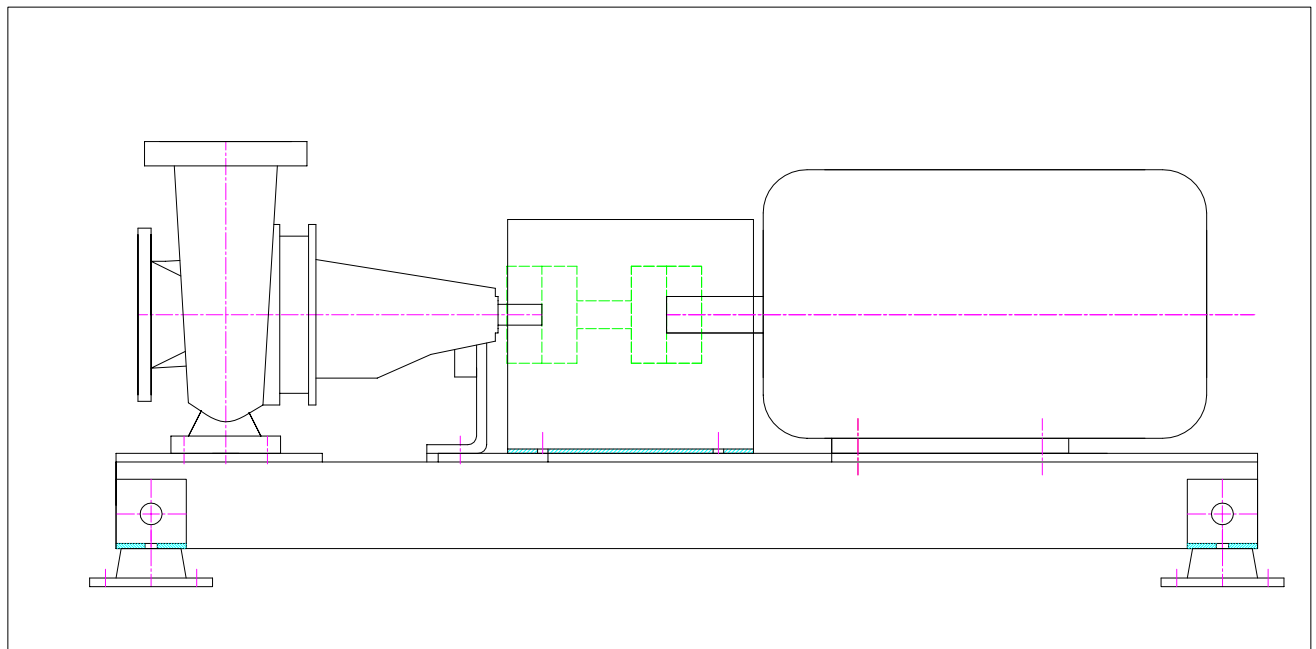
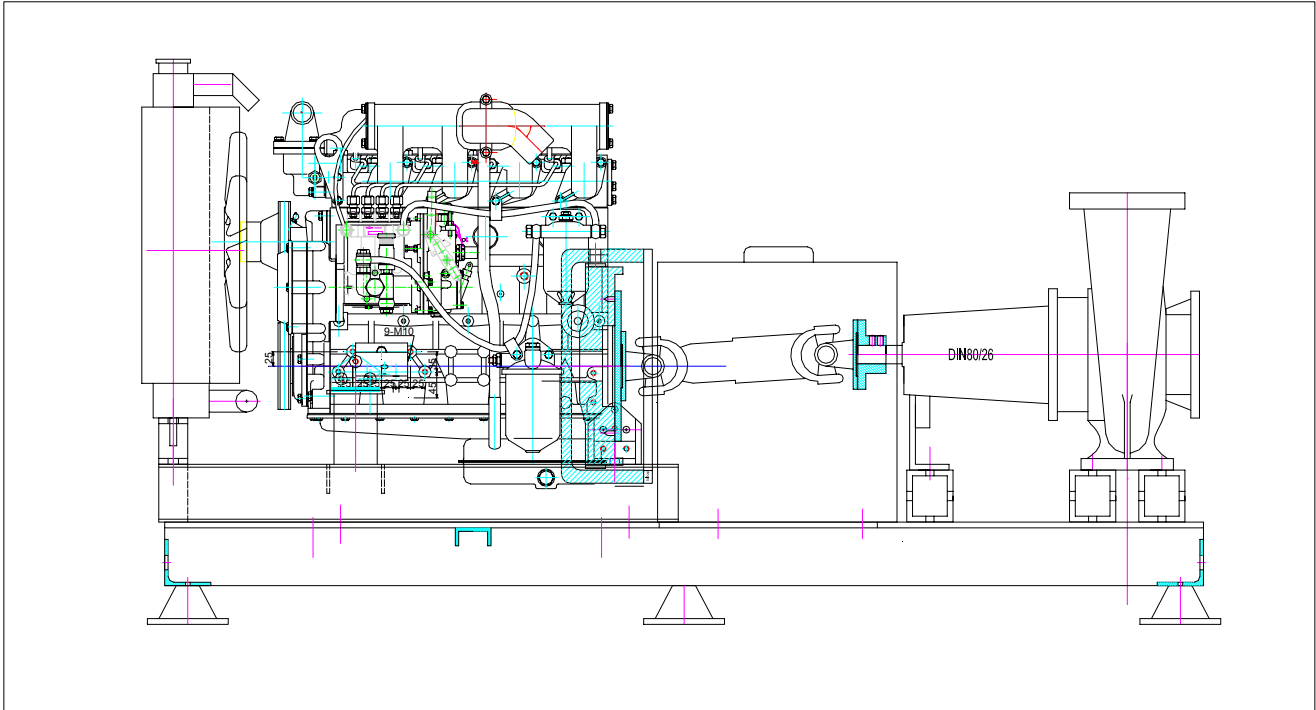


GUIDE TO THE INSTALLATION AND OPERATION OF FIRE PUMPS



Section	Contents	Section	Contents
1	Safety Instructions	5	Commissioning of Diesel Fire Pump
2	Introductions	6	Commissioning of Electric Fire Pump
3	Installations	7	Operations
4	Connection To Services	8	Maintenance

SECTION 1: SAFETY INSTRUCTIONS

The products supplied by Smoothflo Pumps Australia have been designed with safety in mind. Where hazards cannot be eliminated, the risk has been minimized by the use of guards and other design features. Some hazards cannot be guarded against and the instructions below **MUST BE COMPLIED WITH** for safe operation. These instructions cannot cover all circumstances; **YOU** are responsible for using safe working practices at all times.

- Smoothflo pumps products are designed for installation in designated areas, which are to be kept clean and free of obstructions that may restrict safe access to the controls and maintenance access points.
- Access to the equipment should be restricted to the personnel responsible for installation, operation and maintenance and they must be trained, adequately qualified and supplied with the appropriate tools for their respective tasks.
- Smoothflo Pumps requires that all personnel that are responsible for installation, operation or maintenance of the equipment, have access to and study the product instruction manual **BEFORE** any work is done and that they will comply with all local and industry based safety instructions and regulations.
- Ear defenders should be worn where the specified equipment noise level exceeds locally defined safe levels. Safety glasses or goggles should be worn where working with pressurized systems and hazardous substances. Other personal protection equipment must be worn where local rules apply.
- Do NOT wear loose or frayed clothing or jewellery that could catch on the controls or become trapped in the equipment.
- Read the instruction manual before installation, operation or maintenance of the equipment. Check and confirm that the correct instruction manual is used by comparing the serial number on the equipment with the documentation.
- Refer to the data plates on the equipment supplied, operation of the equipment outside these specifications will increase the risk to operators and may lead to premature and hazardous pump failure.
- IMPROPER INSTALLATION, OPERATION OR MAINTENANCE OF THIS SMOOTHFLO PUMPS PRODUCTS COULD RESULT IN INJURY OR DEATH.**
- Within the manual, safety instructions are marked with safety symbols.



Hazard

This symbol refers to general mechanical aspects of safety.



Hazard

This symbol refers to electrical safety.

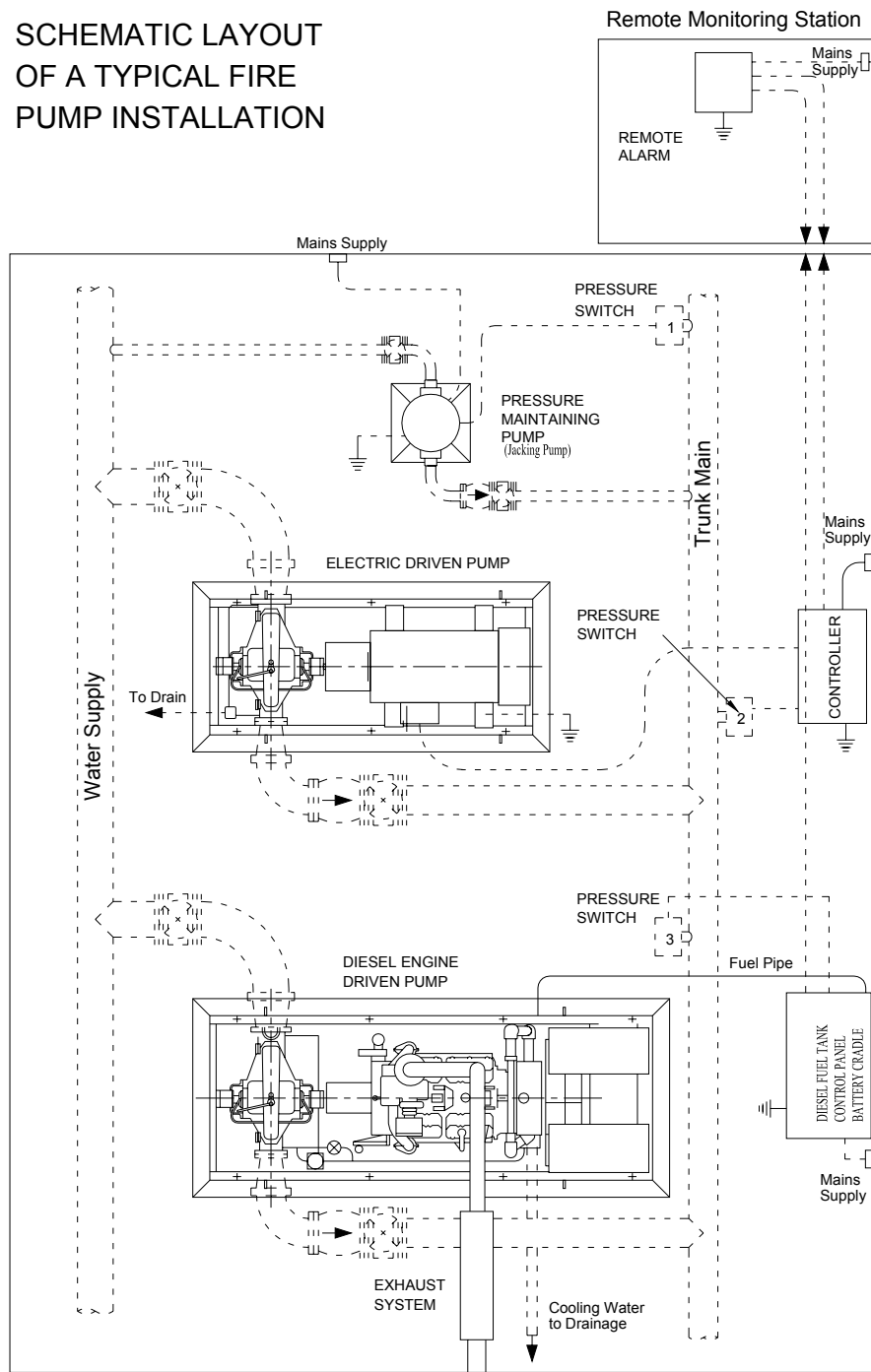
ATTENTION

This symbol gives warning of a hazard to the pump itself, which in turn, could cause a risk to personal safety.

SECTION 2: INTRODUCTIONS

FIRE PUMP ROOM

SCHEMATIC LAYOUT OF A TYPICAL FIRE PUMP INSTALLATION



Smoothflo fire pumps are designed to suit most fire protection applications. Smoothflo Pumps usually supplies pumping and control equipment to specialist fire protection contractors who are responsible for the installation of sprinklers, pipe work, pumps, control panels and alarm systems etc. This manual gives an overview of the requirements for installation, operation and maintenance of fire pump station equipment and therefore will refer to equipment that may not have been manufactured or supplied by Smoothflo Pumps, but is necessary for the successful operation of the system. Before tempting to install the equipment it is important to familiarize yourself with the main items supplied and to ensure that the appropriate cables, pipes and fittings are available to mount and connect the equipment. The equipment supplied by Smoothflo Pumps is shown on the contract documentation. The fire protection contractor is responsible for the provision of all other items required to complete the installation. Fire pump stations will contain a variety of equipment to meet the requirements of the specific fire protection installation but usually will comprise the following main items:

AS2941-2008 Requirements

A fire pump controller must start the fire pump in response to an external starting signal which is normally pressure-setting of a pressure switch plumbed into piping works.

Once started, the engine must continue to run until it is manually stopped or runs out of fuel.

Each automatic or manual starting system shall have the capacity to provide a minimum 3min (15S intermittent cranking with 15S rest) cycle at full rate cranking speed.

- 2.1 **DUTY PUMP: ELECTRIC DRIVEN PUMP SET.** Selected from the Smoothflo Pumps range of fire pumps to suit the required system operating parameters. These pumps may be end suction or split case construction and are driven through a spacer coupling by an electric motor selected to meet the pump power and duty requirements.
- 2.2 **STANDBY PUMP: DIESEL DRIVEN PUMP SET.** This equipment comprises an fire pump matched to an engine which has been specially prepared and approved for fire pump applications, together with a Smoothflo pumps' or other manufacturer's control panel. These items are mounted on a rigid base frame with engine cooling system. The fuel tank assembly and control panel assembly are usually mounted separately and consist of a tank sized to match the power and duty requirements of the pump and fitted with gauges and switches to suit customer requirements.
- 2.3 **CONTROL SYSTEM.** Smoothflo Pumps can supply a full range of control panels for both electric and diesel driven fire pumps, optionally to meet special customer's specifications, proprietary control panels from other manufacturers may be supplied. The fire protection contractors are responsible for the provision and setting of suitable pressure switches. Where required, Smoothflo Pumps can supply a Remote Alarm Panel to provide notification of fire and the status of the system at a remote security monitoring station.
- 2.4 **PRESSURE MAINTENANCE (JACKING) PUMP.** This is usually a small pump that is designed to maintain pressure in the trunk main system at a pre-set level such that the system is primed for operation.
- 2.5 **TYPICAL PUMP HOUSE SCHEMATIC LAYOUT.** This diagram shows the main features of fire pump house installations, these will vary depending upon the number and types of pumps to be installed and they will be placed to suit the position of main pipe runs etc.

SECTION 3: INSTALLATIONS**Please Note:-**

Fire pump sets and control systems should be Installed, and Accepted, in full accordance with AS2941-2008. Failure to Install pumps and other products in pumping system complied with AS2941 will affect equipment warranty.

3.1 Pump Location

The pump should be installed as near to the water source as possible, with the shortest and most direct suction pipe practical. Allow sufficient access for inspection and maintenance with enough headroom for an overhead crane or hoist of sufficient capacity to lift the heaviest item of equipment. The location for a diesel engine driven pump may be dictated by the requirement for an air supply and the need to vent the exhaust.

AIR is required for combustion and cooling purposes, with air and radiator cooled engines in particular needing large volumes of air for cooling. Inlet and outlet apertures, suitably sized and positioned to prevent air recirculation, must be provided in the pump house structure. It is recommended that a low level vent matches a high level vent in the opposite wall.

Exhaust runs should be as short as possible. Small bore pipe and/or excessive length will cause backpressure on the engine, reducing engine performance and therefore pump output. The length and diameter of exhaust pipe must comply with the requirements of AS2941-2008.

3.2 Foundations

A foundation plinth should be constructed to support each pump set on a floor area free from expansion joints. These foundation plinths should be sufficiently substantial to absorb vibrations and rigid enough to avoid any twisting or misalignment. As a rough guide, they should be at least 300mm wider than the pump set on all sides and weigh between 1 and 1.5 times the weight of the pump set. Plinths for fire pumps are recommended to have a minimum height of 300mm but height should be sufficient to achieve the necessary weight and to accommodate the pockets for fixing bolts.

3.3 Installing the Pump sets

It is important to install fire pump sets **BEFORE** installing the main suction and delivery pipework. This is to ensure that the pipes are positioned to match the pump location and do not transmit load and induce strain in the pump casing.

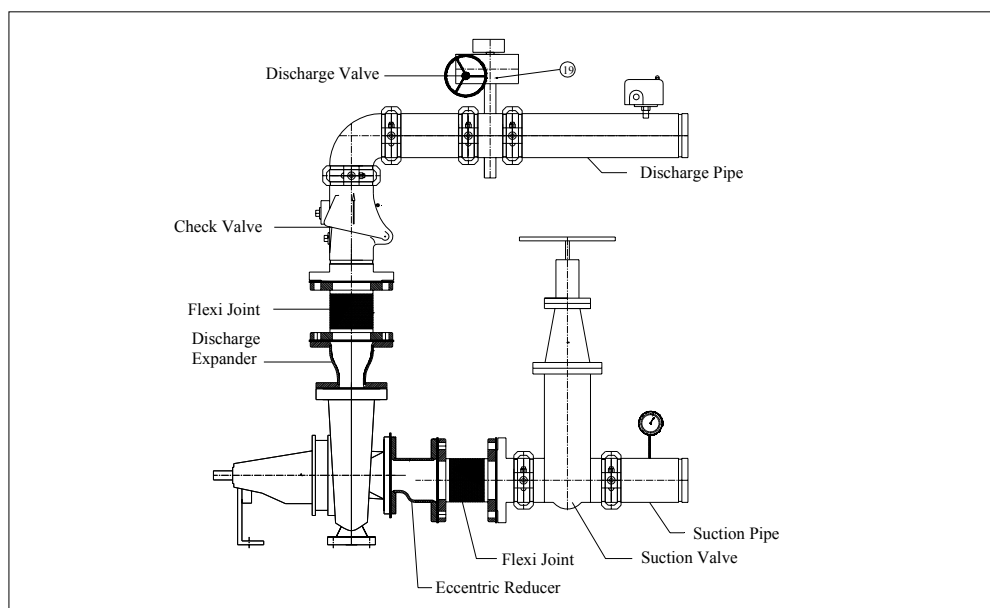
All fire pump sets are supplied with rubber mounts which should be locked on plinth by dynabolts. Adjust the height with shims in each position until the pump suction **flange** is vertical. Do not level from the base plate as this may not be true to the shaft and flanges.

3.4 Suction & Delivery Piping

Both suction and discharge piping should be supported independently and close to the pump so that no strain is transmitted to the pump when the flange bolts are tightened. Use pipe hangers or other supports at intervals necessary to provide support. When expansion joints are used in the piping system, they must be installed beyond the piping supports closest to the pump.

Install piping as straight as possible, avoiding unnecessary bends. Where necessary, use 45° or long sweep 90° bends to decrease friction losses.

Make sure that all piping joints are airtight. Where reducers are used, eccentric or 'flat top' reducers are to be fitted in suction lines and concentric or straight taper reducers in discharge and vertical lines. Undulations in the pipe runs are also to be avoided. Failure to comply with this may cause the formation of air pockets in the pipework and thus prevent the correct operation of the pump.



The suction pipe should be as short and direct as possible, and should be flushed clean before connecting to the pump. For suction lift applications, it is advisable to use a foot valve. Horizontal suction lines must have a gradual rise to the pump. If the pumped fluid is likely to contain foreign matter then a filter or coarse strainer should be fitted to prevent ingress to the pump.

ATTENTION

A non-return valve or check valve and a discharge gate valve usually precede the discharge pipe. The check valve is to protect the pump from excessive backpressure and reverse rotation of the unit and to prevent back flow into the pump in case of stoppage or failure of the driver.
The discharge valve is used when shutting down the pump for maintenance.

Shaft alignment must be checked again after the final positioning of the pump unit and connection to pipework as this may have disturbed the pump or motor mounting positions.

SECTION 4. CONNECTION TO SERVICES

The following section covers the normal service requiring connection, but the actual requirements for each installation will vary depending upon the equipment supplied. Therefore, some of the items covered may not be relevant to specific installations.

Ensure that site electrical power supply characteristics match the data on the equipment data plates. If the control panels were manufactured or supplied by Smoothflo Pumps, the wiring diagrams will be included with the instruction manual. If others have supplied the panels, refer to their literature for electrical details and wiring instructions.

All cables should be installed by a competent electrical contractor.

4.1 Electric Motor Driven Pump Sets

Install the electric motor starter panel in a convenient position for use and wire up to mains supply, to the electric motor and to the trunk main pressure switch. Earth bonding connections are provided on all base frames and must be connected to a suitable earth point.

4.2 Diesel Engine Driven Pump Sets

4.2.1 Control Panels and Fuel Tanks

The freestanding stand is supplied for supporting control panel and fuel tank, which are supplied loosely for the ease of transport and setting up. The whole assembly should be mounted in a convenient position within 4m to start motor of diesel engine for use and wire up to the diesel driven pump set following instructions on the wiring diagrams supplied in the manual.

Connect the control panel to the mains electrical supply as shown in the wiring diagram. Where a pressure switch in the trunk main initiates the start, fit the pressure switch in a convenient position and wire up in accordance with wiring diagram.

The fuel tanks must be big enough for engine run up to 6 hours. And fuel gauge is fitted on the top to display fuel level.

4.2.2 The stand

When a fuel tank stand is supplied it is normally designed to be fixed to a floor having the same level as the pump house. The stand must be high enough for gravity feed to the fuel tanks. If a stand is not supplied or when special conditions apply, reference should be made to the diesel engine manufacturer's instructions for guidance on the correct level to mount the fuel tank. It is important to comply with the requirement for gravity fuel feed to fire pump engines and to provide access for refilling and topping up the fuel.

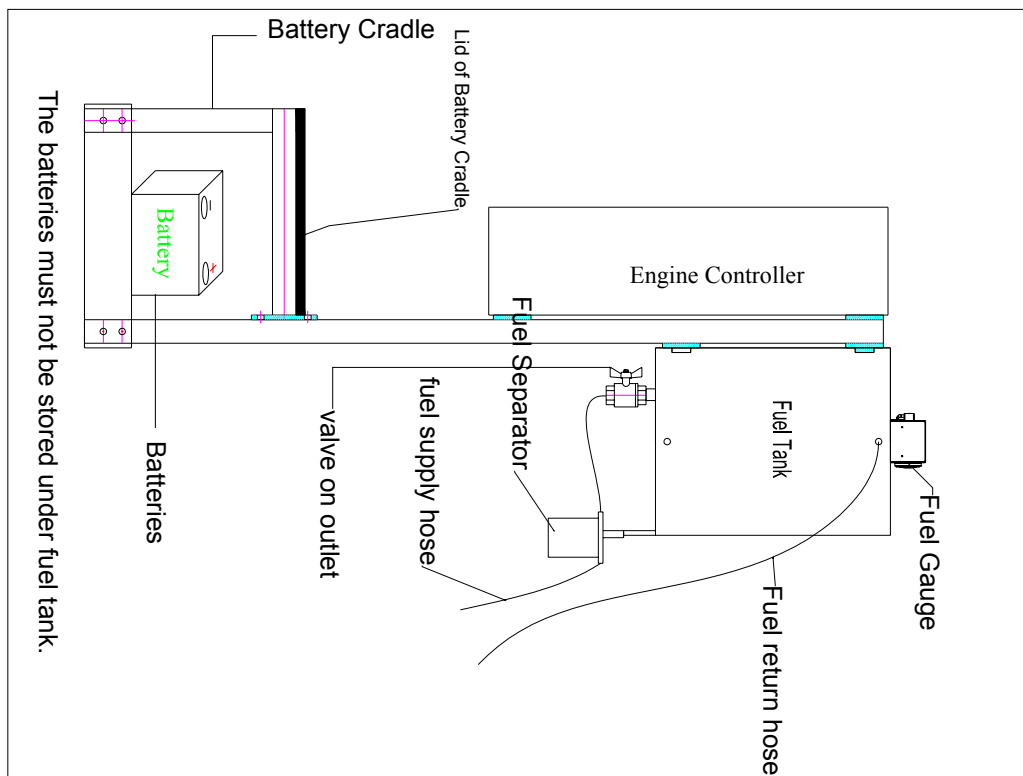
4.2.3 Water Cooling Systems

Most fire pump diesel engine installations use water-cooling systems. These fall into three categories - radiator, heat exchanger and weir tank. RADIATOR cooled engines employ a fan to draw air through the radiator thus directly cooling the closed engine circuit. The pump house must have inlet and outlet vents of suitable size to provide adequate air without re-circulation. HEAT EXCHANGER closed engine circuits, are cooled by a supply of coolant from the pump outlet. A flow control system is fitted to prevent continuous flow of water to waste under standstill conditions. This supply is passed through the heat exchanger and is then piped to waste.

4.2.4 Batteries

Batteries for diesel engine starting may be either lead acid or nickel cadmium type. Lead acid batteries may be dry-charged or conventional; they may be supplied dry or pre-filled and charged. Refer to the battery manufacturer's manual for details on putting new batteries into use. Where nickel cadmium batteries are supplied they are charged and have travel plugs fitted, removal of travel plugs and the commissioning engineer usually does connection.

NOTE that a single-phase electrical power supply (240V) to the control panel is required for the battery chargers.



Typical Arrangement of Control Panel and Fuel Tank and Batteries

4.2.5 Exhaust System

Unless special conditions apply, a set of standard exhaust system components is supplied to suit typical pump house applications. Assemble the engine exhaust system (flexible pipe, solid pipe and silencer) with the flexible section attached to the engine and the discharge passing through the nearest outside wall. Exhaust pipe runs should be as short as possible to minimize back pressure on the engine. If it is required that the exhaust system is extended, refer to Smoothflo Pumps for guidance as the system may need to be increased in diameter to avoid excessive backpressure.

4.3 Ancillary Connections

Electric motor and air or radiator cooled diesel engine driven pumps will have a recirculation system fitted to provide sufficient water circulation to cool the pump when it is running with the discharge valve closed. For these units a feed is taken from the pump outlet, via a pressure differential valve (pressure relief valve), either back into the system water source, or must be piped to waste.

For heat exchanger cooled diesel engines, the cooling water is taken from the pump outlet. This is sufficient to meet the minimum flow requirement. The components of this line are designed to meet the requirements of AS2941-2008.

When installed under positive head conditions pumps should be provided with an air release valve on the top of the pump casing to provide a means of exhausting trapped air.

SECTION 5 ON-SITE COMMISSIONING FOR DIESEL DRIVEN FIRE PUMP

5.1 Pre-commissioning Check

If Smoothflo Pumps is contracted to carry out the commissioning, the following check list shows items to be completed before the commissioning engineer arrives.

Pre-Commissioning Check List

1. Engine checking	Check muffler strainer to find whether or not there is water in muffler. If there is water to be found, report to the Smoothflo office.	
	Inspect exhaust systems for any possibilities for rain water to get into the engine.	
	Check if there are damages on engine, radiator/heat exchanger, rubber hoses,	
	Cooling loop, and pipes (See check list for major components).	
2. Controller checking	Check if there are damages on the controller and its coupling.	
3. Installation:	Mounting plinths comply with instructions for size, construction and location	
	The pump shaft is level. (or if the plinth is level or not)	
	The rubber mounts are bolted on plinth	
	The shaft alignment has been checked.	
	Installation of pressure relief valve and its pipeline to the drain	
	Test rig installation	
4. Drainage	Cooling water from heat exchanger to the drain	
	The drainage for pressure relief valve, heat exchange and test rig.	
5. Pipe works	Suction and delivery pipe work is adequately supported and NEGLIGIBLE forces are transmitted to the pump casing.	
6. Water supply	Sufficient water supply is available.	
7. Exhaust	The diesel engine exhaust has been fitted in line with recommendations.	
8. Fuel tank	The engine fuel tank is filled with sufficient fuel for at least one hour running time.	
9. Cleanness	The area is clear of all builders' material and rubbish to allow access to the pumps.	
10. Witness	A customer's representative is available to witness the pump tests and the setting of pressure switches.	

It is Smoothflo Pumps policy that commissioning engineers will give as much assistance as possible to the customer in solving site problems. However, if due to incomplete installation or failure of equipment not supplied by Smoothflo Pumps further visits are required to complete commissioning, for which additional charge will be made.

5.2 Battery cable connections

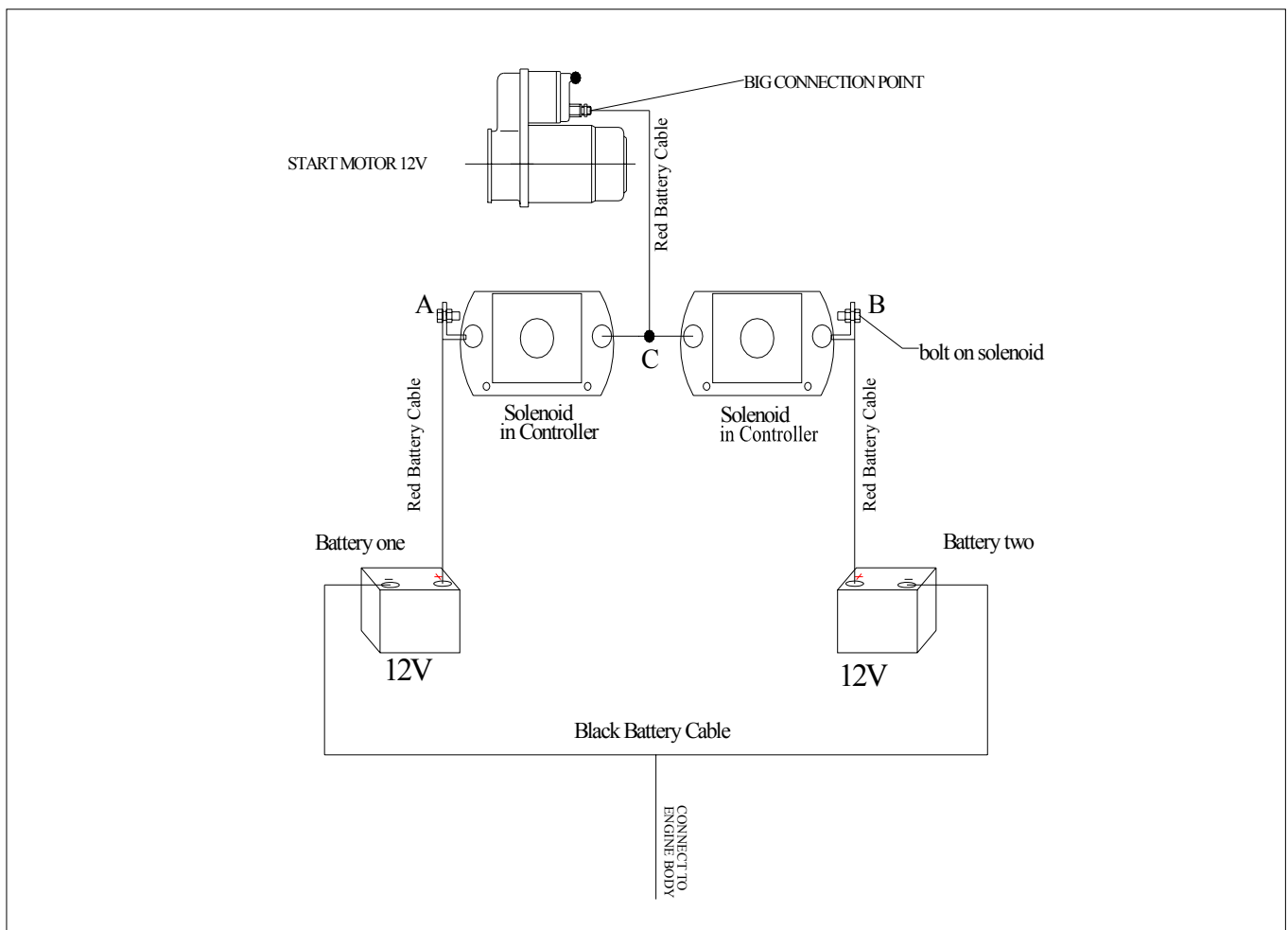
5.2.1 Check out the start motor is 12V or 24V and then select one of following diagrams for connections of battery cables.

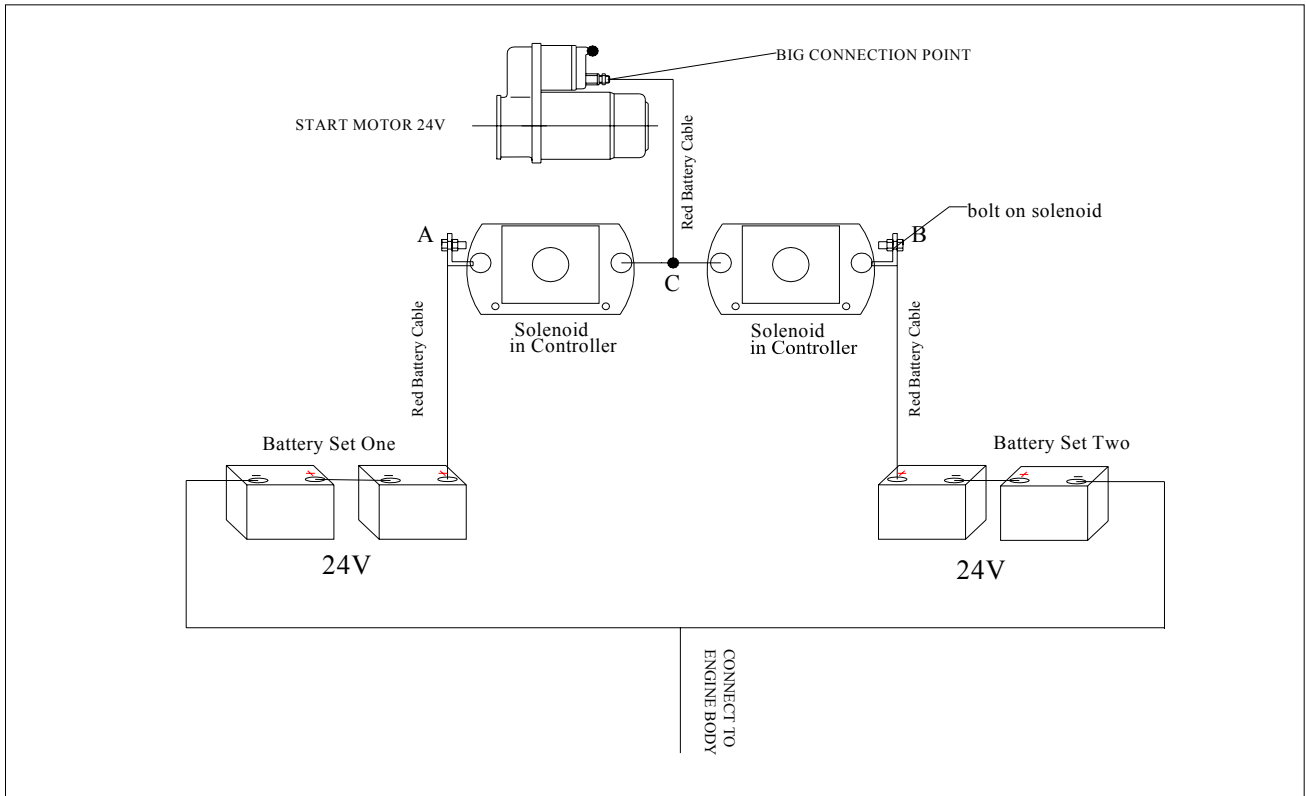
5.2.2 Battery cable connections (for 12V start motor) include:

- There are two 12V batteries and five battery cables supplied with 12V start motor engine.
- Red battery cable 0.8m from point A to the positive of Battery one
- Red battery cable 0.8m from point B to the positive of Battery one
- Red battery cable 2m from point C to start motor of diesel engine (big connection point)
- Black battery cable 0.3m from negative of Battery One to negative of Battery Two
- Black battery cable 2m from negative of Battery One to engine body (this is last connection, otherwise it is easy to cause sparks.)

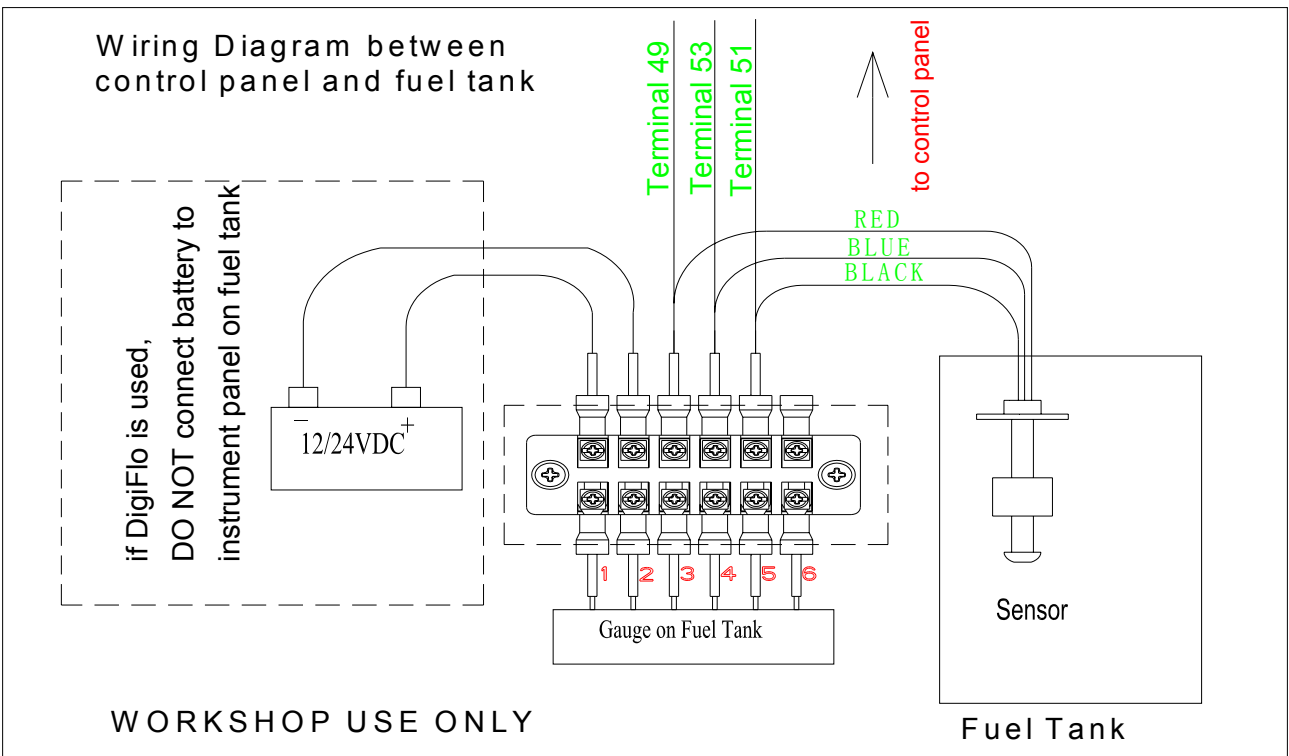
5.2.3 Battery cable connections (for 24V start motor) include:

- There are four of 12V-batteries supplied with 24V-start-motor engine. Four batteries are used to make two sets of 24V batteries for fire pump system. And seven battery cables are supplied.
- Red battery cable 1m from point A to the positive of Battery one.
- Red battery cable 1m from point B to the positive of Battery one.
- Red battery cable 2m from point C to start motor of diesel engine (big connection point).
- **Battery cable 0.4m from positive of one battery to negative of another battery. Repeat for other set of batteries.**
- Black battery cable 0.4m from negative of Battery One to negative of Battery Two.
- Black battery cable 2m from negative of Battery One to engine body (this is last connection. Otherwise it is easy to cause sparks.).



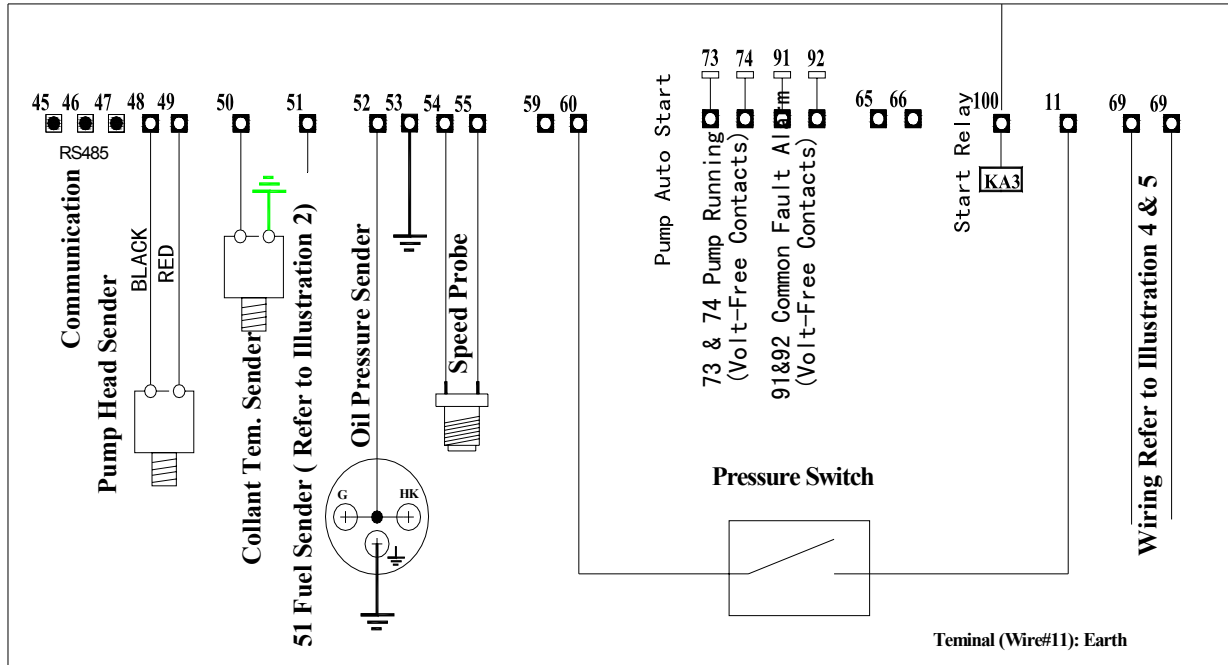


5.2.4 Wirings between Control panel and Fuel Tank



5.2.5 Check the wiring of pressure switch on main pipe work

This part of work should be done by the user's electrician. Wire#60 in **Smoothflo Controller (DIGI-FLO)** is for fire pump automatic start. As long as Wire#60 is earthed, the fire pump will start in a couple of seconds. The Wire#11 is earth line. The wiring diagram is as follows:

5.2.6 Connections between DIGI-FLO controller and Socket on pump base.
The harness is tested and supplied in the package.

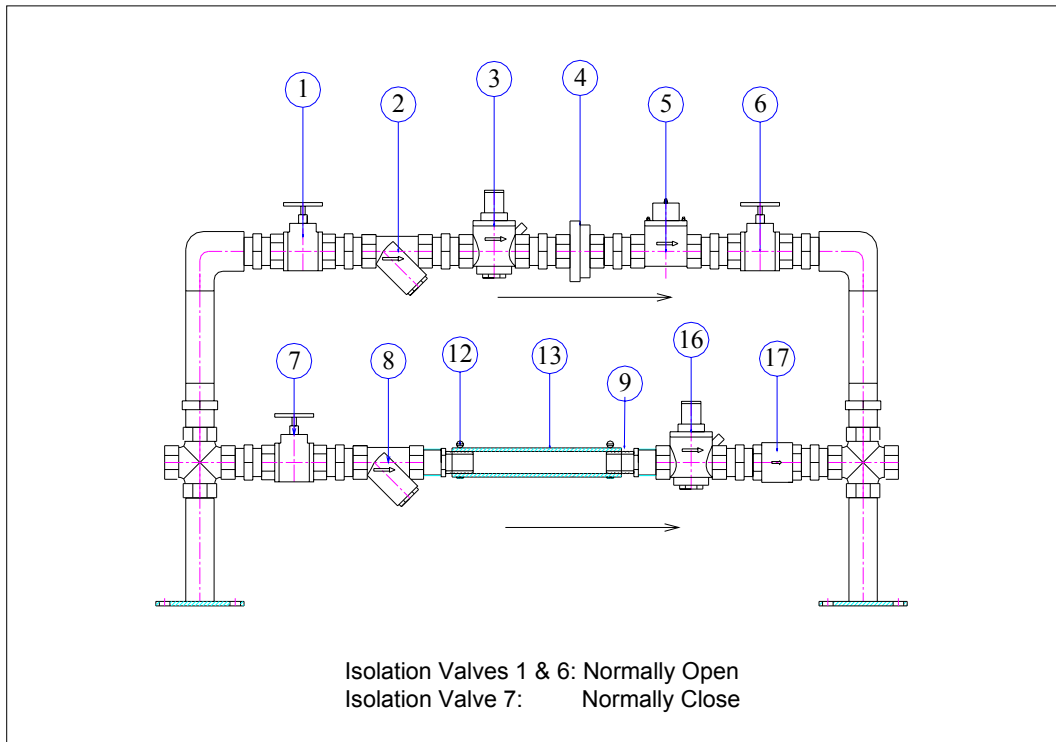
5.2.7 Fuel Hose Connections

- Connect fuel return hose;
- Connect fuel supply hose from tank outlet valve to fuel separator; keep attention on arrows.
- Bleed fuel separator by loosening lock nut on top until air fully discharged and fuel filled up the separator. And then turn off the valve.
- Connect fuel supply hose from fuel separator to fuel pump on the engine. Get fuel first from hose and then connect on the nozzle of fuel pump. Otherwise, the air will be pushed in the fuel system and engine will be very hard to get started.
- Loose the fuel pump bleeding plug and Use the hand primer on fuel pump to prime the fuel pump until fuel is bled out. And then lock the plug. Now the engine is ready to start.

5.2.8 Final Checks Before Starting Fire Pump:

- If there are loose connections on Battery cables;
- Fuel tank wirings to DIGI-FLO Controller;
- Jacking pump connections;
- Fuel hose connections;
- Open valves on suction and discharge of jacking pump;
- Open valves on suction and discharge of diesel fire pump;
- Wirings of fire pump automatic pressure switch;
- Check harness between engine and DIGI-FLO controller;
- Check if waste water is piped to drainage from heat exchanger (for heat exchanger cool engine only);
- Check if isolation valve A on cooling loop of heat exchanger is open and isolation valve B is close. Refer to the diagram below.
- Final check engine oil level and coolant level of radiator/heat exchanger.
- Final check if there are broken wires or loose wires on diesel engine;

- Final check if there is any damage or loose connection on speed probe.
- Final check if there is any damage or loose connections on head sensor.



5.2.9 Setup Jacking pump

- Check wiring, power supply and valves. Make sure the valves on suction and discharge lines are open.
- The pre-set pressures in workshop for cut-in and cut-out are 1000KPA and 1100KPA.
- If the power supply for jacking pump is independent, perform the next step to setup the cut-in and cut-out pressures for jacking pump to maintain the system pressure.
- If the power supply for jacking pump is from Smoothflo Controller (DIGI-FLO), disconnect automatic start for diesel engine temporarily (Wire#60) first. And then turn on power for the controller to perform the next step to setup the cut-in and cut-out pressures for jacking pump to maintain the system pressure. In case of having alarm after switching on DIGI-FLO main isolator, refer to 5.2.11 for the solutions.

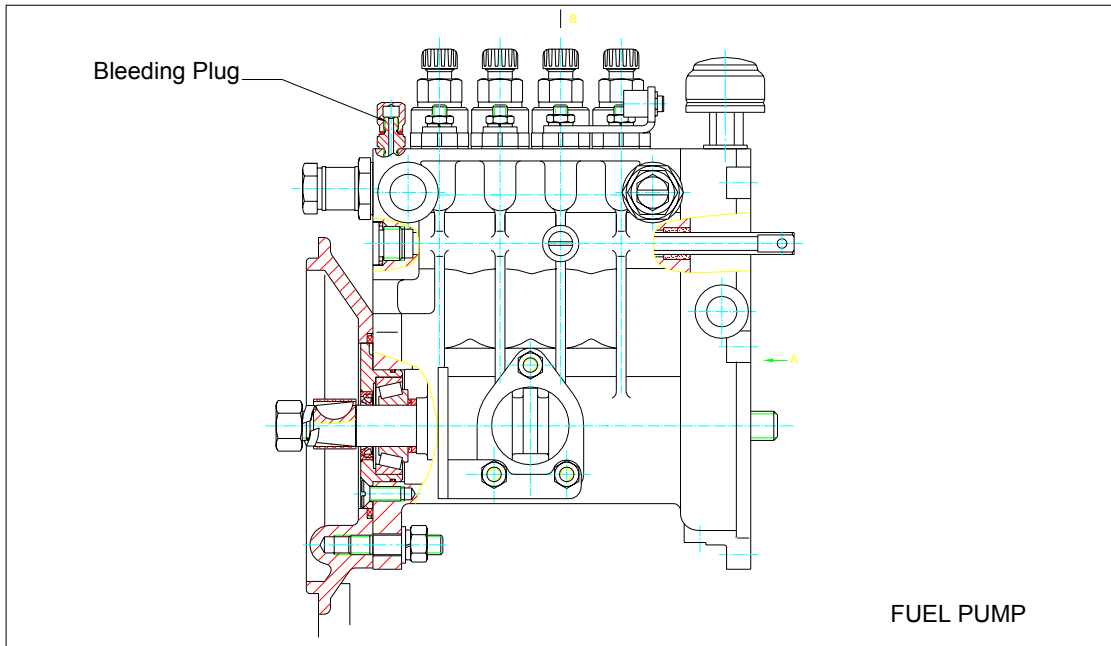
5.2.10 Case study:

- DUTY: If a system need fire pump with duty 10L/S@1100KPA.
- WATER SUPPLY: Mains pressure: 400kpa. The pressure settings are as follows:
- PRESSURE SETTING FOR JACKING PUMP: Jacking pump is used for maintaining the system pressure on a pre-set level. For study case, the pre-set level should be 1100KPa. CUT-IN PRESSURE: 1000KPa; CUT-OUT PRESSURE: 1100KPa.
- Electric Driven Fire pump cut-in pressure: 800KPa. When the system pressure drops to 800KPa, the fire pump will automatically start.
- Diesel Driven Fire pump cut-in pressure: 600KPa. When the system pressure drops to 600KPa, the fire pump will automatically start.
- Fire pump cut-in pressure must be higher than mains pressure.

5.2.11 Setup cut-in pressure for fire pump by using jacking pump manually.

5.2.12 Commissioning of diesel fire pump.

- Make sure the system pressure on pre-set level.
- Prime the fuel pump again by using hand primer again. And bleed the fuel pump from the bleeding plug. Refer to the diagram below.



- Start engine by EMERGENCY START SWITCHES. Please note EMERGENCY START SWITCHES must be turned to “OFF” position after use.
 - First time starting is always harder, especially there is air remained in fuel lines.
 - Hold one of emergency start switches for a couple of second on “start” position. If the pump can’t be started, use another one to repeat.
 - While starting, check the temperature of start motor. If the start motor is very hot, stop and await start motor cool down.
 - In extreme case of hard start, make sure there is fuel supply to injectors. Or call the supplier or diesel mechanics.
- 5.2.13 automatic start testing
- Once finished above steps, make sure the system pressure is higher than fire pump cut-in pressure. If not, use jacking pump to boost system pressure.
 - Connect automatic start pressure switch back to control panel. For DIGI-FLO controller, refer to above diagrams for wire#60 and wire#11.
 - Use test rig to reduce system pressure to fire pump cut-in pressure. The fire pump will start in a couple of sections.
- 5.2.14 Troubleshooting for Smoothflo DIGI-FLO controller:
- In normal condition, the controller will display “ READY” in screen after turning “MAIN ISOLATOR” for 240V, And only green inductor light of Mains Power is on.
 - In case of having alarm sound, the alarm code will be displayed on screen. The following table shows the meaning of alarm code.

ALARM CODES	MEANINGS
11	Over-speed, will shut down the engine
12	Under-speed, DISABLED by 0 setting
20	Oil sender circuit break
22	Oil pressure lower than setting
32 (9998)	Temperature sender short circuit
32 (9999)	Temperature sender circuit break or poor connection

32	Temperature lower than setting
33	Ambient temperature lower than 4°C
40	Engine Start failure
41	Engine Stop failure
50	Battery volt lower than setting
51	Battery volt higher than setting
52	Fuel level lower than setting
53	Water level too low
60	Flow rate too high
61	Head sender circuit break or poor connection
80	Power system failure
Special Code	
P09-50	Low oil pressure and low battery volts
P0A-51	Low oil pressure and too high battery volts

5.2.15 Flow test

- The flow test is normally carried by the user. While testing flow, the operator can increase speed or decrease the speed to get the flow and head for the system.

5.2.16 Remote Monitoring Station

- According to AS2941-2008, DIGI-FLO fire pump controller provides three sets of volts-free contacts: Mains Power Supply, Common Faults and Pump Running;
- The users can connect remoter indicator light and alarm to monitor the status of fire pumps.

SECTION 6: ON-SITE COMMISSIONING OF ELECTRIC DRIVEN FIRE PUMP6.1 Pre-commissioning Check

- If Smoothflo Pumps is contracted to carry out the commissioning, the following check list shows items to be completed before the commissioning engineer arrives.

Pre-Commissioning Check List

1. Controller checking	Check if there are damages on the controller and its coupling.	
2. Wiring	The wiring From switchboard to controller should be done by user's electrician.	
3. Installation:	Mounting plinths comply with instructions for size, construction and location	
	The pump shaft is level. (or if the plinth is level or not)	
	The rubber mounts are bolted on plinth	
	The shaft alignment has been checked.	

	Installation of pressure relief valve and its pipeline to the drain	
	Test rig installation	
4. Drainage	The drainage for pressure relief valve, heat exchange and test rig.	
5. Pipe works	Suction and delivery pipe work is adequately supported and NEGLIGIBLE forces are transmitted to the pump casing.	
6. Water supply	Sufficient water supply is available.	
7. Cleanness	The area is clear of all builders' material and rubbish to allow access to the pumps.	
8. Witness	A customer's representative is available to witness the pump tests and the setting of pressure switches.	

6.2 On-site Alignment Check

- All Smoothflo Electric Driven Fire Pump adopts spacer coupling which results in the reaction load on pump and motor bearings to be minimized. Before starting the fire pump, the alignment should be checked.

6.3 Connection on battery

- The indicator lights on the controller are operated by 12V battery. The battery connection should be done first. Otherwise there are no displays on controller except alarm sound.

6.4 Pressure Settings

- Pressure settings for Jacking pump and electric fire pump are similar to diesel fire pump. Refer to related sections.

6.5 Final Checks Before Starting Fire Pump:

- If there are loose connections on Battery cables;
- Jacking pump connections;
- Open valves on suction and discharge of jacking pump;
- Open valves on suction and discharge of diesel fire pump;
- Wirings of fire pump automatic pressure switch;
- Check if waste water is piped to drainage from pressure relief valve;
- Final check if there are broken wires or loose wires on diesel engine;

6.6 Switch-on controller and start the pump

- After performing above steps, switch on the controller. In normal condition, the GREEN light for mains power is on without alarm.
- If there is alarm, refer to controller's instruction manual.

6.7 TROUBLESHOOTING FOR POWER FAIL

- Check the followings if the indicator light for Power Fail is on after turn-on 415v ac power:
- Check whether or not the indicator light on RELAY OF PHASE PROTECTOR is on.
- Check out if there is power supply from switchboard;
- Check out if there is a lack of phases from switchboard. The motor can be burnt if running motor under the lack of phases.
- The sequence of phases is not matched. Refer to the following troubleshooting.

6.8 TROUBLESHOOTING FOR WRONG MATCHING ON THE SEQUENCE OF THE PHASES

If the sequence of phases on the power supply does not match the sequence of phases in the controller, the indicator light on relay of phase protector will extinguish. And also the GREEN indicator light of AC POWE-ON will extinguish and RED indicator lights of AC POWER-FAIL will be on and simultaneously generate the alarm.

Normal Rotating Direction: the rotating direction of DIN/ISO end-suction pumps is anti-clockwise viewing from pump end. The sequence of phases in controller has set up to suit above rotating direction. After connecting the controller to switchboard, if the

sequences of phases can't be matched, the electrician should immediately swap the positions of two wires in the cable from switchboard to match the controller.

If the sequence of phases is not matched each other, the motor can still start but will rotate in opposite direction. And the battery charger still has power supply and charge the battery.

Rectify The Sequence Of Phases In Controller: **IN CASE** of wrong sequence of phases in controller, it is simple to rectify the sequence. There are 3 wires connected on the relay of phase protector. Swapping any 2 wires will fix the problem. **STEPS:** 1/ release two locking latches on the sides of the RELAY OF PHASE PROTECTOR; 2/ pull out the relay of phase protector from the base; 3/ after swapping any two wires, the sequence of phases in the controller will be changed.

SECTION 7: OPERATIONS

This section outlines a 'typical' fire pump installation comprising one electric motor driven pump set, one diesel engine driven pump set and one pressure maintenance pump often referred to as a Jockey Pump (Jacking Pump).

This pressure maintenance pump is electric motor driven. Installation of this pump set follows an identical procedure to the main pump sets but reference should be made to the manufacturer's manual for further detail.

The equipment supplied may vary in quantity and type to suit the operational requirements of the installation, but the principles outlined are common.

The pressure maintenance (jacking) pump is controlled with a pressure switch in the trunk main. It will switch the pump on and off periodically to maintain trunk main pressure at a high level, ready for initial operation.

The operation of fire pumps is also controlled with pressure switches in the main trunk main, set to start the pumps at predetermined pressure levels.

In the event of a fire, water is released into the region of the fire. The pressure in the trunk main then falls and at a pre-set level the pressure switch signals the duty pump to start.

If due to electrical or mechanical failure the duty pump fails to function or the sprinkler/hydrant demand exceeds the capacity of the duty pump, the pressure will continue to fall until another pressure switch set at a lower level signals the standby diesel engine driven pump to start.

On receipt of a start signal, the diesel engine control panel commences a predefined starting sequence. This will give the required number of rotations using battery sets alternately for the pre-set number of start attempts or until the engine starts.

NOTE - Fire pumps continue running until switched off manually.

Routine System Testing:

Periodic testing of fire pumps is required to meet insurance requirements to ensure that adequate fire protection is available at all times.

After testing it is important to ensure that all power and control panel switches are correctly set and that the fire pumps are ready for operation.

It is also important to ensure that sufficient fuel is provided for diesel driven pumps to give the required number of hours of running.

SECTION 8: MAINTENANCE

8.1 Safety



Electric Shock & Accidental Starting Hazard -

ISOLATE the equipment before any maintenance work is done. Switch off the mains supply, remove fuses, apply lock-outs where applicable and affix suitable isolation warning signs to prevent inadvertent re-connection.

In addition, on diesel engine driven pumps, disconnect the battery supply leads. Using insulated tools remove the negative connection first and isolate the fuel supply.

It is recommended that a conspicuous notice is displayed stating:

PUMP UNDERGOING REPAIRS



Hazardous Materials

Wear a suitable mask or respirator when working with packing or gasket components that contain fibrous materials as these can be hazardous when the fibrous dust is inhaled. Be cautious, if other supplier's components have been substituted for Smoothflo Pumps parts, these may then contain hazardous material.

ATTENTION

Do NOT use 'MEGGER' type testing equipment without first disconnecting any electronic speed sensors, alternators and control panels, as damage can occur to internal components which will prevent operation of the equipment.

ATTENTION

Do NOT connect welding earth lines to the base frame or to diesel engines without first disconnecting any electronic speed sensors and alternators fitted to diesel engine driven pumpsets as damage can occur to internal components which will prevent operation of the equipment.

8.2 Maintenance

Fire water pump sets and control systems should be operated and maintained in full accordance with AS2941-2008. Failure to operate or maintain Smoothflo Pumps supplied equipment in full accordance with AS2941-2008 may affect equipment warranty.

Maintenance visits by Smoothflo Pumps engineers can normally be arranged on dates suitable for the site occupier, assuming the work can be carried out during normal working hours.

The following services are offered:

- Inspect pumps to ensure that bearings are correctly lubricated and the pump gland is functioning correctly.
- Check pump/driver alignment and inspect coupling.
- General inspection to identify any damage or wear to equipment supplied by Smoothflo Pumps. And Issue a report indicating the extent of repairs and/or replacements required.
- Inspect electrical apparatus, including electric motor, starter motor, control panel and remote alarm panel.
- General examination of diesel engine to ensure correct operation of rev counter, oil pressure and water temperature gauges.
- Final check of entire pump installation to ascertain generated pressure, speed, cooling-water output, etc. Engine speed would be reset as necessary.