BASIC PUMPING OPERATIONS

1. DEFINITIONS

1.1 Rated Capacity - the maximum quantity of water capable of being discharged at a given pressure. (Example: 1,000 GPM pumper, 2,000 GPM pumper)

1.2 Stages - a pump with one impeller is a one-stage pump and a pump with two impellers is a two-stage pump. A two-stage pump can be thought of as two separate pumps built into a single casing. The FDNY uses 2-stage pumpers and 3-stage pumpers (high-pressure).

1.3 Volume - the amount of water the pump can discharge.

1.4 Pressure - the force or velocity at which water is discharged.

1.5 Transfer Valve - located at the outlet of the first stage. The purpose of this valve is to enable the pumper to operate in either the pressure position or the volume position. All FDNY pumpers are to be maintained in the volume position unless, upon arrival at the scene of an operation, head pressures must be overcome. In this situation, the transfer valve should be immediately changed to the pressure position before lines are charged.

A) Volume Position - (Parallel) The water enters each stage simultaneously from a common intake and leaves through a common pump discharge. The Volume position is to be utilized as a standard operating procedure.

B) Pressure Position - (Series) The first stage pumps its full volume and pressure directly to the second stage, which then pumps this same volume of water to the pump discharge, but at twice the first stage pressure.

Note: Utilize the Pressure position before any operation where head pressures must be overcome, e.g., standpipe operations. This should not be confused with the Pro – Pressure Governors Pressure Mode

1.6 Engine Idle - The lowest RPM that an apparatus is capable of achieving as determined by the manufacturer. (Tachometer gauge)

1.7 Pump Idle Pressure - The pressure the pump pressure gauge will read when the apparatus is at its lowest RPMs. Pump idle pressure always equals the pressure the pumps provide at its lowest RPMs (around 55 psi in volume or around 110 psi in pressure) plus the water intake pressure received from a water source (e.g., hydrant pressure 50 psi plus pump pressure in volume 55 psi will equal a pump idle pressure of 105 psi).
1.8 **Pro – Pressure Governor (PPG)** – A computer that controls the discharge pressure of the pump by controlling engine RPMs. It is used in conjunction with individual discharge gates to regulate pressure. For multiple handline operations, when the PPG is set and working and a handline is shut down at the nozzle, the computer adjusts the engine RPMs to maintain the indicated pump pressure so that other handlines do not receive excess pressure. The PPG can operate either in the pressure mode or the RPM mode.

A) **Pressure Mode** – In the Pressure mode the PPG will automatically maintain the discharge pressure set in the LED display. This should not be confused with the Pumps Pressure Position.

**Note:** A setting in the LED display of the Pro-Pressure Governor that is lower than the pump Idle Pressure will result in the Pro-Governor being inactive to that point. The pressure governor will engage when the ACTUAL engine pressure begins to fall below the pressure indicated in the LED display.

B) **RPM Mode** – In the RPM mode, the PPG will maintain engine RPMs set in the LED display. In this mode, it will not automatically compensate for any changes in discharge pressure (functions as a manual throttle). For this reason the FDNY uses the PPG in the pressure mode only.

**Note:** In emergency situations this mode is used as a back-up in the event the pressure mode malfunctions. If this should occur, any hoselines in operation should not advance and should back out to an area of safe refuge.

1.9 **Priming Pump** - a positive displacement pump used to evacuate air from the pump chamber.

1.10 **Static Pressure** - The pressure indicated on the intake pressure gauge when water is not flowing: e.g., a pumper connects to a hydrant, opens the hydrant and supplies water to the pumps. The intake pressure gauge reads 60 psi with no water being discharged from the pumps. The 60 psi is “Static Pressure.”

1.11 **Residual Pressure** - The remaining pressure indicated on the intake pressure gauge once water has begun flowing. Using the preceding example, the static reading was 60 psi. Once water is discharged from the pumps, the intake pressure will drop on the intake pressure gauge. This new reading is “Residual Pressure” and indicates the remaining capability the hydrant has to supply water.

1.12 **Flowmeters** - The flowmeter is designed to measure the rate of flow of water in a confined space as it passes a given point at a given time. Flowmeters will register a reading only when water is flowing. Flowmeter displays are represented in Gallons Per Minute (GPM). Flowmeters can be used by ECCs to determine problems with an operating handline.
**Example:** An ECC supplies the correct pressure to a 1¾” handline operating at a fire. The ECC checks the flowmeter and notes that the correct flow is being achieved (approx. 180 GPM). Suddenly, the Officer is calling for more water/pressure and the ECC notes the reading on the flowmeter has dropped (now reading 110 GPM). This indicates the possibility that there could be kinks in the hose line. Also in the same situation, a handline with a proper flow on the flowmeter is reported to have lost pressure or lost water and the flowmeter reading has increased (now reading 230 GPM). This indicates the possibility that there could be a burst length.

1.13 **Pressure Gauges** - Pressure gauges are of 3 general types:

   A. *Pressure gauges* which indicates positive pressure; or
   
   B. *Vacuum gauges* which indicates negative or vacuum pressure; or
   
   C. *Compound gauges* that indicate both positive and negative pressure.

   Pressure gauges usually indicate pressure above the surrounding atmospheric pressure that is equal to approximately 14.7 pounds per square inch absolute (psi) at sea level. Pressure gauge displays are represented in Pounds Per Square Inch (psi). Vacuum expresses the amount of pressure below atmospheric pressure. Vacuum values are usually expressed as inches of Mercury vacuum.

2. **POSITION OF APPARATUS**

   2.1 Decide which inlet is going to be used, front or side, then position apparatus so that proper connections can be made. Position pumper so that roadway is clear for incoming apparatus.

3. **TESTING HYDRANT**

   3.1 Any hydrant that will be used shall be tested before hooking up.

   3.2 To test hydrant, remove the large cap and tighten the small cap. Open hydrant with proper hydrant wrench.

   3.3 To flush hydrant:

   Do not open the hydrant fully. Debris can be forced upwards into the top of the barrel and remain in the hydrant. Open the hydrant operating nut several turns, and let the gentle flow of water push any debris out of the hydrant nozzle.

   **Note:** See Firefighting Procedures, Engine Company Operations, Chapter 6.
4. **HYDRANT CONNECTIONS**

   Be guided in the use of hydrant and suction connections by the following:

   a) When first to arrive on the first alarm, the 10’ small hydrant connection or the 35’ soft hydrant connection may be used.

   b) When other than first to arrive on the first alarm, the 10’ small hydrant connection, 35’ soft hydrant connection or the 10’ hard suction shall be used.

   c) When arriving at second or greater alarms the 10’ hard suction connection should be used if available.

   d) When drafting operations are indicated, the 10’ hard suction connection must be used.

   e) When hydrants are unlawfully blocked at fires or emergency operations, a length of 3½” hose, where practicable, may be used to connect a pumper to a hydrant if the 35’ soft hydrant connection will not reach.

   f) When in-line pumping operations are implemented, 3½” hose shall be the initial supply line. (Operate as per Evolution 1A).

   Note: See Engine Company Operations, Chapter 6

5. **HOOKING UP TO HYDRANT**

   5.1 Connect to the hydrant first before hooking up to the apparatus, in case repositioning is required.

6. **CHARGING PUMP – FROM A HYDRANT**

   6.1 Insure all drains, discharges and inlets are in the closed position.

   6.2 Open hydrant FULLY.

   6.3 When supplying water into any gated inlet, the inlet **MUST BE OPENED FULLY**. If the inlet is not fully opened the intake is restricted and the pump can run away from the water supply, causing an intermittent supply of water to hoselines.

   Note: If going into a gated inlet, open the drain to the gated inlet to expel air prior to opening the gated inlet.

   6.4 It is important to note hydrant intake pressure at the outset of an operation. The intake pressure gauge on the pump panel will initially indicate static hydrant pressure (water is not flowing).
Because of the many variables affecting a hydrants capacity, the intake pressure gauge should be continually monitored once water is flowing (Residual Pressure) to determine if the hydrants capacity will be able to support additional lines. **When residual pressure drops below 15 psi on the intake pressure gauge, augmentation will be required.**

Note: Hooking up to and opening hydrant is recommended before engaging Pumps.

7. **ENGAGING AND DISENGAGING PUMP**

7.1 Engage pump as per manufacturers instructions.
ECC must insure that the pump is engaged as per the manufacturer's instructions. When the pump is engaged, the drive shaft controls the pump and does not engage the rear axle. The apparatus cannot move. Remember, just because there is pressure in the line does not mean that the pump is engaged. Hydrant pressure in the hoseline can mislead the ECC into believing that the pump is engaged. Ensure that the apparatus is placed into pumps and the transmission selector is in drive.

8. **OPERATING PUMP**

8.1 Priming: After water is introduced into the pump, before increasing pump pressure and opening any discharge outlets, the primer pump must be utilized to expel air from the pump chamber. **This must be done before opening the initial line at any hoseline operation.**

9. **PRO–PRESSURE GOVERNORS APPARATUS ’97 to PRESENT**

9.1 In 1997 the Pro – Pressure Governor (PPG) was introduced into all new engine apparatus ordered by the New York City Fire Department. The PPG is a computer that controls the discharge pressure of the pump. The PPG will maintain the selected pressure setting in the LED display regardless of the number of discharges that are opened or closed as long as the water supply is capable of supplying the amount of water required. It is used in conjunction with individual discharge gates to regulate pressure. For multiple handline operations, when the PPG is set and working and a handline is shut down at the nozzle, the computer adjusts the engine RPMs to maintain the indicated pump pressure so that other handlines do not receive excess pressure.
As of 2004 all engine companies are now equipped with the PPG. The PPG is engineered with ease of operation in mind and eliminates certain mechanical steps (ROSS RELIEF VALVE) that make it easier for the ECC to operate and maintain hoselines at operations. **When the PPG is malfunctioning, the apparatus shall be placed out of service.**

9.2 **Features:** The Pro – Pressure Governor has an LED display and 6 functions –
1) Idle 2) Increase 3) Decrease 4) Rpm 5) Pressure 6) Preset

1) **IDLE** - The IDLE button will bring the engine to idle.

2 & 3) **INCREASE & DECREASE** - The INCREASE and DECREASE buttons allow easy selection of desired pressure from 45 psi to 600 psi. Depress the Increase button to bring the pressure up, and the Decrease button to bring the pressure down. The pressure will ramp up or down at 1 PSI increments when pressed momentarily. It will ramp up or down at 5 PSI and then 10 PSI increments when held down for more than 1 second. Release the button when the desired pressure is reached.

4) **RPM** - The RPM button will change the governor to the RPM mode. In the RPM mode, the PPG will maintain engine RPMs set in the LED display. In this mode it will not automatically compensate for any changes in discharge pressure. (Functions as a manual throttle)

**Note:** In emergency situations, this mode is used as a back-up in the event the pressure mode malfunctions. If this should occur, any hoselines in operation should not advance and should back out to an area of safe refuge.

5) **PRESSURE** - The Pressure button will change the governor operation to the pressure mode. In the Pressure mode the PPG will automatically maintain the discharge pressure set in the LED display.

**Note:** FDNY standard operating procedures requires the PPG be operated in the pressure mode. This is the default mode. This should not be confused with the Pumps Pressure Position.

6) **PRESET** - The Preset button brings the pump pressure quickly to a pre-determined setting. This setting should be a base line from which, if necessary, the ECC can adjust the pump discharge pressure. The Preset should be based and set on typical hydrant pressures in an engine company's response area combined with the pressure the pump typically idles at in volume. This combined number (hydrant psi plus typical volume psi) provides the Pump Idle Pressure.

**Note:** A setting in the LED display of the Pro-Pressure Governor, which is lower than the pump Idle Pressure, will result in the Pro-Governor being inactive to that point. The pressure governor will kick in when the ACTUAL engine pressure begins to fall below the pressure indicated in the LED display.
9.3 Programming the Preset Value

9.3.1 Hook up to a hydrant in your response area, turn the hydrant on fully, place the apparatus into pumps, and proceed to the pump panel and prime the pumps.

9.3.2 Make sure the PPG is at idle when programming the Preset value.

9.3.3 Note the indicated pressure on the pump pressure gauge.

9.3.4 Press and hold the Preset button until the LED display is flashing. While depressing the Preset button, press and HOLD the increase or decrease button until the number in the LED display matches your Indicated Pump Pressure on the pump pressure gauge.

9.3.5 When the pressure indicated in the LED display matches the Indicated Pump Pressure on the pump pressure gauge, release both buttons.

9.3.6 This pressure number is now stored as the Preset pressure.

9.3.7 Whenever the Preset button is depressed, the governor will automatically bring the pumps to that pressure. Should you need more pressure, simply depress the increase button until you reach the desired pressure.

9.4 Changing the Preset psi

9.4.1 Make sure the engine is at idle when changing the setting.

9.4.2 Press the PRESET button and hold it until the LED display is flashing. Use the INCREASE or DECREASE button to program the new PRESET psi.

9.4.3 When the desired PRESET psi is obtained, release the PRESET button and the new preset psi will be stored in the memory.

9.4.4 The LED display will show the Pump pressure that the governor will maintain.

9.4.5 The pressure indicated in the LED display can be changed by depressing the INCREASE or DECREASE button, or by depressing the PRESET button to bring up the PRESET psi into the display. After the PRESET is used, the INCREASE and DECREASE buttons can still be used to change the selected pressure. The IDLE button can bring the Pump to idle, if necessary.
10. **PUMP OPERATION WITH PRO-PRESSURE GOVERNOR**  
*Note*: Pumps equipped with the pressure governor must be primed at the start of every operation, before increasing pump pressure and opening any discharge outlets.

10.1 Single Line Operation with Hydrant Water

10.1.1 Once water is entering the apparatus, engage the pumps. At the Pump Panel note the intake pressure gauge and pump pressure gauge.

10.1.2 Operate the Primer Valve.

10.1.3 Depress the Preset Button. (This is done to activate the PPG)

10.1.4 Determine the pressure required for the handline that will be utilized.

A) Line pressure is determined by the size + number of lengths of hose + nozzle pressure and elevation.

**Notes**: 1¾” hose with a 1 5/16” nozzle = 50 psi @ nozzle + 20 psi per length friction loss. 2½” hose with a 1 1/8” nozzle = 40 psi @ nozzle + 5 psi per length friction loss. 5 psi for each floor above grade must also be calculated.

10.1.5 Slowly open the discharge outlet until the desired line pressure is reached. If the discharge gate is fully opened and more pressure is required, depress the *Increase Button* until the desired pressure is reached.

10.1.6 The Pressure Governor will adjust engine speed to maintain indicated pump pressure as the line’s nozzle is opened or closed.

10.2 Multi-Line Operations with Hydrant Water

10.2.1 Once water is entering the apparatus, engage the pumps. At the Pump Panel note the intake pressure gauge and pump pressure gauge.

10.2.2 Operate Primer Valve.

10.2.3 Depress the Preset Button. (Repeat 10.1.4 above and Notes under A)

A) Line pressure is determined by the size + number of lengths of hose + nozzle pressure and elevation.

10.2.4 Slowly charge the first line until desired pressure is reached. If discharge gate is fully opened and more pressure is needed, depress the “Increase Button” until desired pressure is reached.

10.2.5 Slowly charge the second line. The Pressure Governor will increase pump pressure to maintain the first line. If the Discharge Gate is fully opened and more pressure is required in the second line press “INCREASE” button while adjusting the discharge gate of the first line to maintain its pressure.
10.2.6 When charging a third line, slowly open discharge gate until desired pressure is reached. The pressure governor will increase Pump pressure to maintain the first two lines. If the discharge gate for the third line is fully opened and more pressure is required in that line, depress the INCREASE button while adjusting the gates for the other two lines to maintain their pressure.

10.2.7 When ordered to shut down a handline, slowly close the respective discharge gate. The “Pressure Governor” will maintain any lines continuing to operate. This process is continued until all lines are shut down. When shutting down the last line, depress the idle button to return the pump to IDLE.

10.3 Booster Tank Operation

10.3.1 Place the apparatus into pumps.

10.3.2 Leave cab and note intake gauge and pump pressure gauge. Pull out the Water Tank To Pump handle, and operate primer pump until the pressure reading levels off on the pump pressure gauge. This will indicate all air has been expelled.

10.3.3 Press the Preset Button and slowly open the outlet to be used, until the desired pressure is reached. If the discharge gate is fully opened and more pressure is required, depress the Increase Button until the desired pressure is reached. Notify the company that they are on Booster Tank Water.

10.3.4 With Hydrant Augmentation

A) You must bring hydrant water into the pump through a gated inlet when operating from booster water. Removing the cap of a non-gated inlet will cause a loss of water from the booster tank and an introduction of air into the pump resulting in a loss of prime and the company operating the line to lose water.

Note: It is recommended that the 4½” front-gated inlet be utilized. This will allow the ECC to simultaneously operate the primer pump while opening up the front intake.

B) Once you have hooked up to the hydrant and the pumper, open the hydrant fully, and then open the gated inlet fully. The pressure governor will adjust engine speed to maintain the Pump pressure indicated. Notify the company that they now have hydrant water.

Note: When going into a gated inlet, open the drain to the gated inlet to expel air prior to opening the gated inlet.
11. ROSS RELIEF VALVE APPARATUS Pre ’97

11.1 The Ross Relief Valve is used whenever a line is stretched and in operation, except for booster line operations. The function of the Ross Relief Valve is to give a measure of protection to operating handlines against pressure surges, which can cause injury to members or burst hose lengths.

When the water flow from the pump is stopped or reduced, the pressure produced by the pump may increase sharply. When one line is in operation, the pump's increased pressure will build up. When the line is shut down, the excessive pressure may cause the hose to burst. If two or more lines are in operation and one line is suddenly closed, the pressure build up may be sufficient to affect the remaining hoselines. This could possibly endanger the lives of the members on the nozzle or cause the hoselines to burst.

When it is properly set, the relief valve prevents the pressure in the hoseline from going above the desired setting by bypassing water from the discharge outlet. The pressure will build up and dump out to the street, protecting the handline. The pump operator should set the relief valve as soon as the required handline pressure is obtained.

11.2 SETTING RELIEF VALVE

11.2.1 Setting the relief valve when not in operation:

A) The relief valve is set at a high setting when not in use. Turn relief valve handle IN (clockwise).

11.2.2 When line is stretched and desired engine pressure is reached:

A) Slowly turn valve handle OUT (counter-clockwise) until engine pressure drops as water discharges to ground.
B) Once water discharges to the ground, slowly turn the handle in (clockwise) until the original engine pressure is reached.

11.2.3 The relief valve is now set for the desired engine pressure.

11.2.4 Caution must be used when turning the relief valve handle in (clockwise) so as not to set the relief valve too high. A small flow of water from the relief valve discharge pipe is normal.

11.2.5 When a nozzle is closed, water will discharge from the relief valve discharge pipe to the ground.

11.2.6 Upon completion of the operation, reset the valve handle to the high setting (clockwise).

11.2.7 When a new pump pressure is required during pumping operation and the relief valve is in operation, it will be necessary to reset it for the new pressure.
11.2.8 If the new pressure requirement is higher, the setting must be increased to a point above the new pressure requirement before advancing the throttle. The relief valve should be reset immediately after the new pump pressure is established.

12. PUMP OPERATIONS WITH ROSS RELIEF VALVE

12.1 Single Line Operation with Hydrant Water

12.1.1 Once water is entering the apparatus engage the pumps. At the Pump Panel note the hydrant pressure gauge and pump pressure gauge.

12.1.2 Operate the Primer Valve.

A) Line pressure is determined by the size + number of lengths of hose + nozzle pressure and elevation.

Notes: 1¾” hose with a 15/16” nozzle = 50 psi @ nozzle + 20 psi per length friction loss.
2½” hose with a 1 1/8” nozzle = 40 psi @ nozzle + 5 psi per length friction loss.
5 psi for each floor above grade must also be calculated.

12.1.3 Slowly open discharge outlet until the desired line pressure is reached. If discharge gate is fully opened and more pressure is required, advance the throttle until the desired pressure is reached.

12.1.4 Set the Ross Relief Valve as per section 11.2

12.2 Multi-Line Operations with Hydrant Water

12.2.1 Once water is entering the apparatus, engage the pumps. At the Pump Panel, note the hydrant pressure gauge and pump pressure gauge.

12.2.2 Operate the Primer Valve.

A) Line pressure is determined by the size + number of lengths of hose + nozzle pressure and elevation.

Notes: 1¾” hose with a 1 5/16” nozzle = 50 psi @ nozzle + 20 psi per length friction loss. 2½” hose with a 1 1/8” nozzle = 40 psi @ nozzle + 5 psi per length friction loss. 5 psi for each floor above grade must also be calculated.

12.2.3 Slowly charge the first line until the desired pressure is reached. If discharge gate is fully opened and more pressure is needed, advance the throttle until desired pressure is reached.

12.2.4 Set the Ross Relief Valve as per section 11.2
12.2.5 Slowly charge the second line while simultaneously advancing the throttle to maintain the pressure in the first line. If the Discharge Gate is fully opened and more pressure is required in the second line advance the throttle while adjusting the discharge gate of the First Line to maintain its pressure.

12.2.6 Set the Ross Relief Valve as per section 11.2.

12.2.7 When charging third line slowly open discharge gate until desired pressure is reached while simultaneously advancing the throttle to maintain the first two lines. If the discharge gate for the third line is fully opened and more pressure is required in that line, advance the throttle while adjusting the gates for the other two lines to maintain their pressure.

12.2.8 Set the Ross Relief Valve as per section 11.2

12.2.9 As lines shut down, slowly close the respective discharge gate while simultaneously decreasing the throttle to maintain any lines continuing to operate. This process is continued until all lines are shut down. When shutting down the last line, return the pump to IDLE.

12.3 Booster Tank Operation

12.3.1 Place the apparatus into pumps.

12.3.2 Leave cab and note intake gauge and pump pressure gauge. Pull out the Water Tank To Pump handle, operate primer pump until the pressure reading levels off on the pump pressure gauge. This will indicate all air has been expelled.

12.3.3 Increase the throttle and slowly open the outlet to be used, until the desired pressure is reached. If the discharge gate is fully opened and more pressure is required, advance the throttle until the desired pressure is reached. Notify the company that they are on Booster Tank Water.

12.3.4 With Hydrant Augmentation

A) You must bring hydrant water into the pump through a gated inlet when operating from booster water. Removing the cap of a non-gated inlet will cause a loss of water from the booster tank, and an introduction of air into the pump resulting in a loss of prime, and the company operating the line to lose water.

Note: It is recommended that the 4½” front-gated inlet be utilized. This will allow the ECC to simultaneously operate the primer pump while opening up the front intake.
B) Once you have hooked up to the hydrant and the pumper, open the hydrant fully, and then open the gated inlet fully. **The throttle must be decreased and outlet gates adjusted, if necessary, to offset the incoming hydrant pressure.** Notify the company that they now have hydrant water.

Note: When going into a gated inlet, open the drain to the gated inlet to expel air, prior to opening the gated inlet.

**NOTES**

A) Follow these rules when using the Transfer valve.
   1) Operate in the Volume position as a standard operating procedure.
   2) Transfer to the Pressure position before any operation where head pressures must be overcome, e.g., standpipe operations.

B) After notifying the Officer, throttle the engine down before changing the position of the transfer valve. The pump pressure gauge should read no more than 50psi above the intake pressure gauge. The flap valves will be damaged if it is more than 50 psi above.

C) Remain close to the pumper and observe all gauges frequently.

D) After turning the hydrant on, return wrench to pumper to prevent losing it.

E) Open and close discharge gates slowly. When you have only one line in operation and are told to shut down, return to idle and then close discharge gate.

F) Set relief valve in all operations except booster line operation. (Apparatus pre ’97)

G) If the position of the transfer valve is changed, the relief valve may have to be reset. (Apparatus pre ’97)

H) Use hose tags. Closing the wrong discharge gate is a serious matter. Further identification by marking the discharge gauge with a grease pencil, or marking the hose with chalk.

I) Know your line assignments (who is operating and what is their location). Continually monitor individual discharge outlet gauges.

J) Observe intake pressure gauge and notify the Incident Commander if the intake pressure drops below 15 psi.

K) Make up hydrant and suction connections tightly to prevent air from getting into the pumps. Air leaks will cause poor streams and high motor speed in relation to pressure.

L) In all cases, run the engine at the lowest speed at which the required pressure can be maintained.
M) A high tachometer reading without a corresponding increase in pump pressure could mean the pumps are not engaged. (Apparatus Pre ’97)

N) The water in a centrifugal pump will heat up rapidly if the pump is operated with all discharge gates closed. A prolonged operation will cause damage from overheating. To prevent possible damage, keep water flowing through a drain on one of the discharge gates and/or operate the by-pass cooler.

O) 3½" hose shall be used when connecting to standpipe or sprinkler Siamese inlets, or to the Siamese of Multiversals, Ladder pipes and Tower Ladders.

P) Line pressure must be determined by the size + number of lengths of hose + nozzle pressure and elevation.

Q) Use the Volume position when drafting water. After the pump is primed, follow the rules in note A.
### Pump Panel Reference Chart

1. Intake Pressure Gauge (a.k.a. Hydrant Pressure Gauge)
2. Pump Pressure Gauge
3. Tachometer
4. Pro Pressure Governor (Throttle)
5. Primer
6. Discharge Pressure Gauges
7. Flow Meters
8. Auxiliary Cooler
9. Deluge Gun Pressure Gauge
10. Deluge Gun Gate
11. Suction Relief Valve Shut-Off (M)
12. Auxiliary Tank Fill Gate
13. Booster Tank Fill Gate
14. Bypass Cooler
15. Discharge Drains
16. Air Cock Valve
17. 4½" Front Suction Gate
18. 2½" Discharge
19. Pump Indicator Light
20. 3" Gated Inlet
22. Tank to Pump Gate
23. 4½" Suction Inlet (not gated)
24. Manual Pump Shift Override
25. Ross Relief Valve (M)
26. Pump Drain
27. Transfer Valve
28. 2½" Discharge Gates
29. Master Pressure Gauge Valve
30. Auxiliary Cooler Discharge (M)
31. Front Discharge Gauge (M)
32. Crosslay Outlet Gauge (M)
33. Deck Gun Outlet Gauge (M)
34. Auxiliary Tank Fill Inlet
35. Discharge Relief Valve Shut-Off (M)
36. Akron Deck Gun Gate (M)
37. Crosslay Discharge Gate (M)
38. Front Discharge Gate (M)
39. Engine Coolant Temp. Gauge
40. Auxiliary Cooler Suction (M)
41. Engine Oil Pressure Gauge
42. Pump Transmission Oil Temp. Gauge
43. Pump Hourmeter
44. Audio Warning Buzzer
45. Night Fighter Switch
46. Panel Light Switch
47–50 Warning Lights (Check Engine, Stop Engine, Low Voltage, Low Coolant)