Engle Dental Systems, LLC
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Hillsboro, OR. 97124

PF-1/PF-2 Dry Vacuum
PF-3/PF-5 Vacuum On Demand

800-547-1906

OWNER'S MANUAL

PF-1/PF-2
208-230 VAC

PF-3/PF-5 Vacuum On Demand
220-240 VAC

Purpose/Definition

Your PF-1 / PF-2 Dry Vacuum / PF-3/PF-5 Vacuum On Demand is designed for use in modern dental practice. A State- Of-The-Art Modular design minimizes user interaction and simplifies installation and service. The PF-1/PF-2 and PF-3 does not require a water supply to create vacuum during regular operation. Vacuum is produced by a regenerative blower motor which draws a vacuum on the separator tank through the top port. The tank, in turn, draws vacuum on the operatory piping. Effluent from the operatory flows through the line and into the separator tank where the liquid waste separates from the air flow. The liquid waste then falls to the bottom of the tank and the dry air continues on to the Exhaust Manifold at the pump(s) which is plumed to the outside. The liquid waste, which has collected in the tank, flows out by means of gravity through the check valve and discharge hose to a sewer connection when the vacuum system is turned off. The Dry Vacuum Systems are shipped with a low voltage control relay installed in the system control box, allowing installation of remote low voltage on/off switching, or optional standard wall switch control if a low voltage control panel has not been installed. From the separator tank to the control box, low voltage wires are run to the control board. It is this control board that allows the vacuum system to be shut down in the event of the separator tank filling up with liquid waste. Should the drain system ever fail, the vacuum pump(s) are protected from drawing in liquid by an additional fail safe float system.PF-1 /PF-2 and PF-3 Vacuum On Demand utilized advanced technology in dry vacuum systems and provide quiet operation while supplying superior vacuum.

PF-1 / PF-2 Warranty 2 years
PF-3/PF-5 Vacuum On Demand Warranty 5 years

Safety Instructions

Use of this *unit* not in conformances with the instructions specified in the manual May result in permanent failure of the unit.

Warning: To prevent fire or electrical shock, do not expose this appliance to rain or moisture.
All user serviceable items are described in the maintenance section.

Attention Users:

Alerts users to important Operating and Maintenance Instructions. Read carefully to avoid any problems.

Warns users that uninsulated voltage within the unit may be of sufficient magnitude to cause electric shock.

Indicates the ON and OFF position for the Equipment power switch.

Indicates protective Earth Ground for the Equipment power switch.

I ON
O OFF

Indicates type B equipment in accordance with IEC 601-1

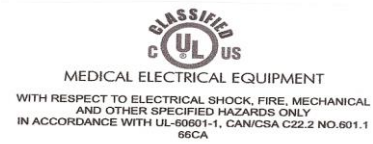
Warns users of hot surfaces. There is a danger of burns. Work near these surfaces only after they have cooled down.

IEC 601-1 CLASSIFICATION

Class 1, Type B, Transportable, Continuous Operation, *IPXO*

Equipment not suitable for use in the presence of flammable anesthetic mixture(s).

Protection against ingress of liquids- Ordinary



Environmental Conditions for Storage G Transport
Recommended Ranges: Temperature Range Within-40 Degrees-C To +70 Degrees- C
Relative Humidity Range Within 10% To 100%
Atmospheric Pressure Range Within 500 To 1060 hPa

NEUTRAL WIRE SHOULD NOT BE FUSED

INSTALLATION

DRY VACUUM LOCATION REQUIREMENTS

Dry Vacuum location should be level, accessible and well ventilated.
Dry Vacuum will be located in a confined space, provide adequate ventilation and install an exhaust fan. THE EXHAUST VENT ON THE VACUUM UNIT MUST BE CONNECTED TO A LOCATION OUTSIDE OF THE EQUIPMENT LOCATION. THE CONNECTION SHOULD BE MADE WITH STEEL OR COPPER PIPE.

Recommended equipment room size 5ft x 5ft or larger with thermostatic controlled fresh air exchange. Fresh air in and exhaust out. (Not a bathroom exhaust vent) Air must exchange in and out of room.

WASTE DISPOSAL **SYSTEM MUST BE INSTALLED SO THAT THE DRAIN ON THE SIDE OF THE UNIT IS HIGHER THAN THE WASTE CONNECTION. THIS WILL ALLOW THE UNIT TO GRAVITY DRAIN WHEN THE SUCTION IS SHUT OFF.** Provide a floor sink or trapped sewer line to connect the 1 ¼ "PVC flex hose included in the hook-up kit. Provide exhaust vent sized according to table 1 below and waste drain that complies with local code.

VACUUM LINE The main vacuum line from the operatories must connect to the piping using the 1 ¼" PVC hose provided in the hook-up kit.

ELECTRICAL

Line voltage must be within the limits of table 2 below. (Install a "buck-boost transformer" if the line voltage is not between these values.) Circuit breaker switches must be **20 amp minimum on single motors and 30 amp on dual motors.**

Local code may require you to provide a quick disconnect (safety switch) for the vacuum unit.

24 volt circuit. For remote switching, provide one 18/3 jacketed cable for the switching on and off each unit. (Dual units need two sets of 18/3 jacketed cable.)

Control Box Fuse: 1/8-amp. 250v

TABLE 1

Pump Size	PF-1 Single	PF-2 Dual	PF-3
Exhaust Vent (dia)	1-1/2"	2"	2"

TABLE 2

Pump Voltage	Amperage Draw	Line Voltage
230 V Single Motor	10 amps	200 - 208
230 V Dual Motor Single	22 amps	200 - 208
230 V PF-3 Motor	20 amps	200 - 240

Motors: Single Phase /AC (built in 15 amp circuit breakers per motor)
Motors: Three Phase/AC (built in 20 amp circuit breakers per motor)
Normal Conditions-Vented Equipment Room (Motor Temperature – 90 to 120 degrees)
Motors include Thermal Protector Device (Motors Turn OFF at Temperature of 130 degrees)

INSTALLATION

2. INSTALLATION STEPS 

This dry vacuum unit should only be installed by qualified personnel.

Place the dry vacuum in a clean, dry, well ventilated area, on a solid level surface. Be sure that adequate ventilation is available and install an exhaust fan. Ambient temperature in the equipment room should be within the temperature range of 40 degrees Fahrenheit minimum to 100 degrees Fahrenheit maximum.

Check the shipping carton for damage. This should detect damage to the unit which might otherwise be overlooked. Remove cardboard shipping carton.

Dry vacuums are shipped bolted to a pallet. This pallet is intended for shipping only and should be discarded.

Inventory your hook-up kit. Check its contents against the inventory sheet included. These items will be used in the remaining steps.

Set the unit in place and be certain it is level and cannot wobble or rock.

Install rubber mounting feet on under side of unit.

Make the necessary exhaust vent connections.

Connect the main vacuum line. Connect flexible 1 ¼" hose to the separator tank.

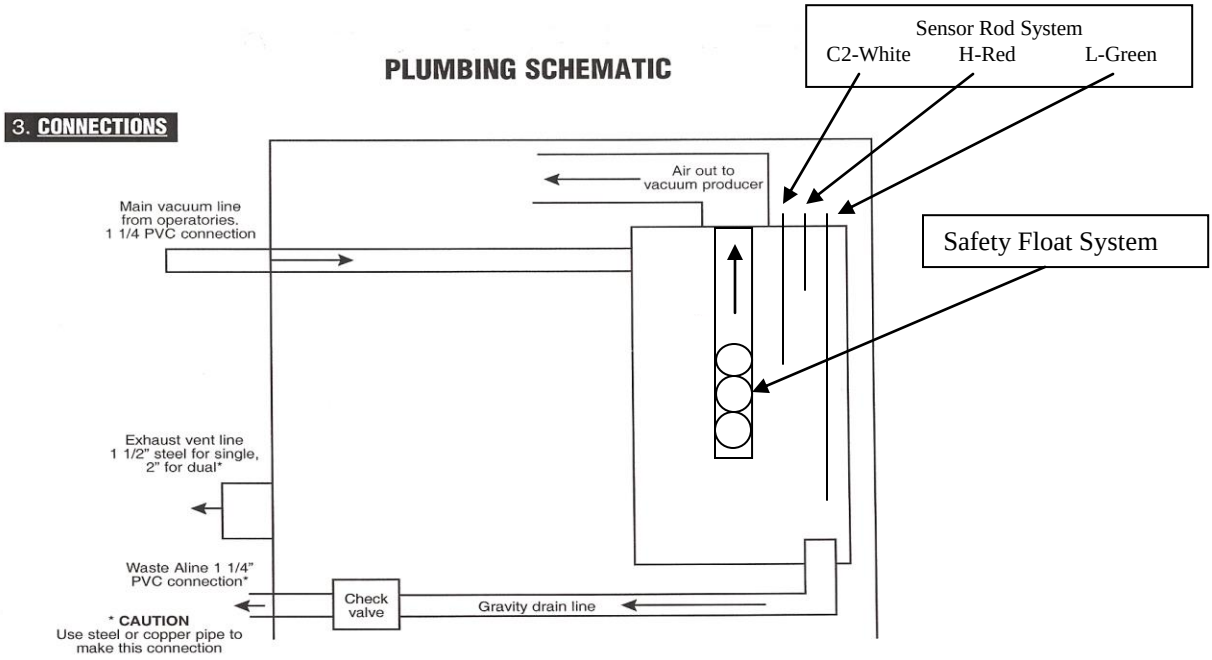
Connect remote control 18/3 jacketed cable to the relay panel. Use wire connectors that provides secure mechanical connections.

Electrician to Hard Wire and Connect line voltage (12 Ga.) 200-208 VAC Per local code/NEC. AWG Earth Ground (12 Ga.) (Via safety switch if required by local code) Refer to the wiring diagram.

Higher or Lower Voltage will require a Buck and Boost Transformer to regulate Voltage (INSTALLED BY AN ELECTRICIAN)

PLUMBING SCHEMATIC

3. CONNECTIONS



3. WEEKLY SERVICING

Weekly Servicing

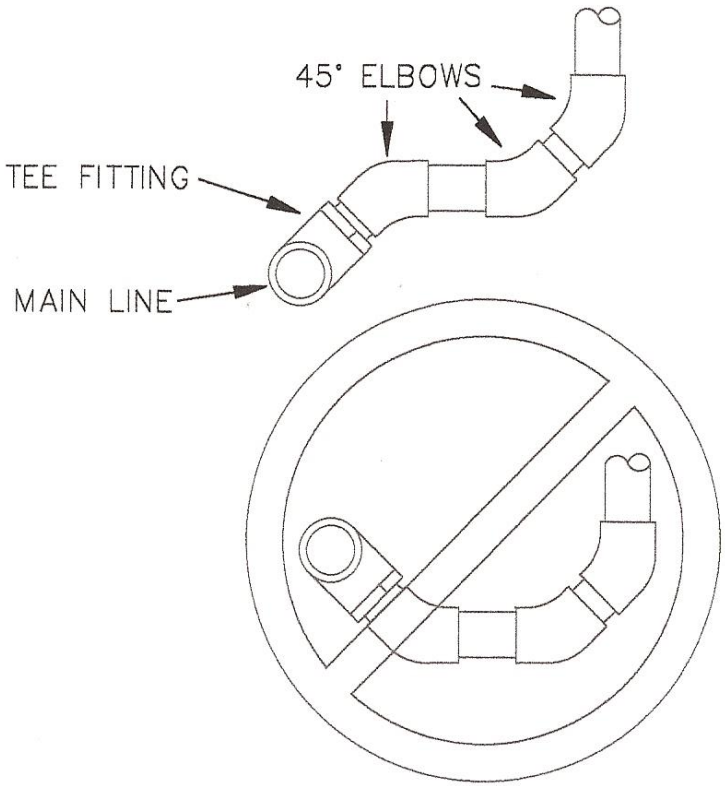
Flush pump(s) and main vacuum lines with a NON-FOAMING dental vacuum cleanser. Follow the cleanser manufacturer's instructions.

Check vacuum gauge level. Vacuum settings are adjusted at the factory. MAXIMUM VACUUM LEVEL SEALED IS 10" OF MERCURY. **WARNING: NEVER SET VACUUM LEVEL HIGHER THAN 12" OF MERCURY.** To check the vacuum level, ensure that the pump is aspiring **AIR ONLY.** If the vacuum level is out of adjustment, turn off the pump and remove the vacuum relief valve. While holding the Phillips head screw in place, turn the tension nut. One complete counter clock-wise turn the tension nut will add 2 inches hg. To the vacuum level; one complete counter clock-wise turn will subtract 2 in. hg. From the vacuum level.

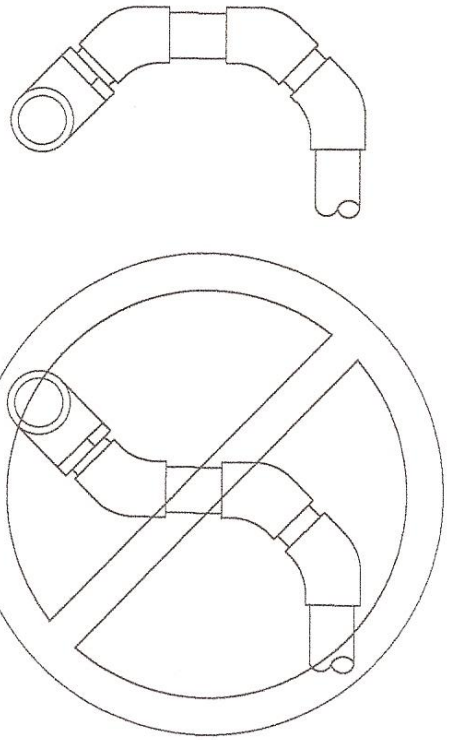
Flush the entire vacuum piping system (all operatories) weekly. Use a NON-FOAMING Cleanser. It is extremely important that the cleaner used cannot and will not foam. Foam will get sucked into the vacuum producer and will cause damage over time.

(E) BRANCH LINE CONFIGURATIONS

SUB FLOOR

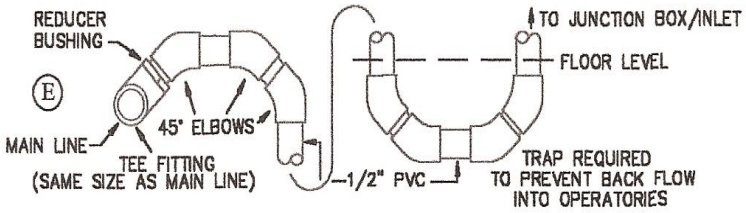


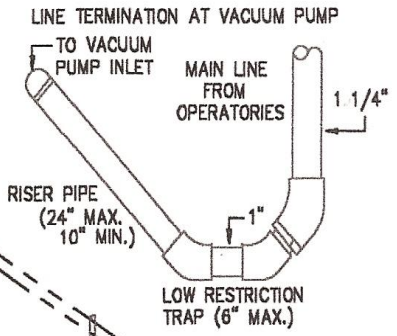
OVERHEAD

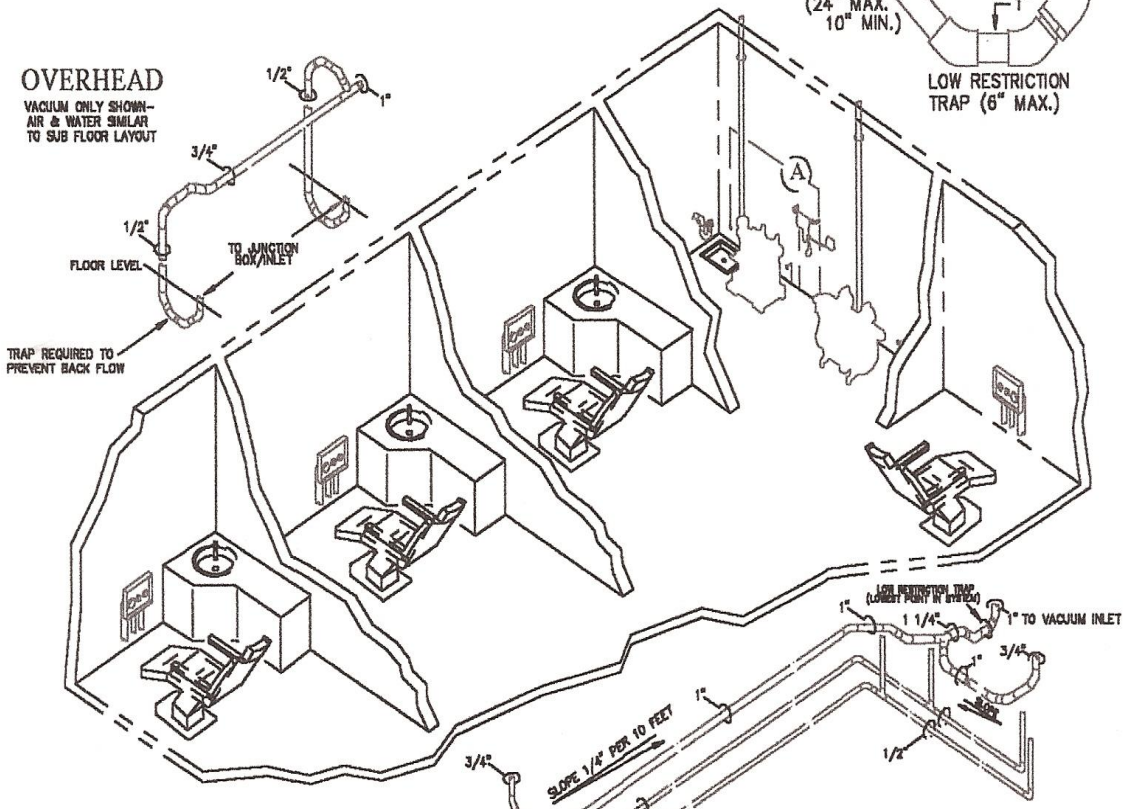


DENTAL OFFICE PLUMBING INSTALLATION

FOUR USER SYSTEM PLUMBING LAYOUT







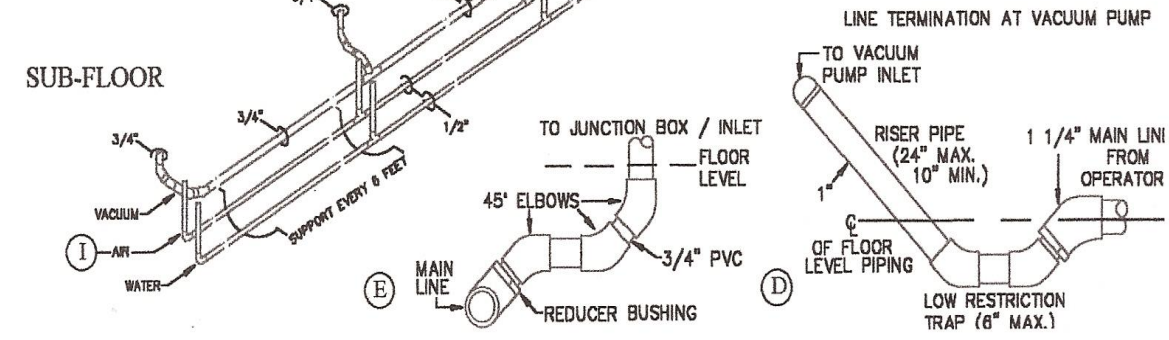


FIG. 9. HOW TO SIZE A VACUUM & AIR SYSTEM

Both the drawing and the size chart are sized to accommodate an air and vacuum system for 100% use. This is done to produce good air and vacuum pressures and flows at all times from all operatories. Normally, you always use this design for a proper system in the event all six operatories are used simultaneously; you would not have any suction loss due to improperly sized main or branch lines.

IMPORTANT: Do not figure or draw any NITROUS or sink evacuation terminations until you have a complete system showing termination to high volume evacuation connections normally found in DENTAL UNIT JUNCTION BOX.

Additional ¾" vacuum lines for NITROUS OXIDE SCAVENGE and EVACUATOR SINKS can be added without affecting main or branch line sizes.

STEP 1. Count the total number of operatories to be plumbed and select the vacuum line size for either PVC or COPPER PIPE. See the line sizing chart in figure 2.

STEP 2. This pipe size you have selected will be the starting line or main and begins at the equipment location. The vacuum line will use a main line riser assembly as shown in figure 1.

STEP 3. After figuring your main line size, you may select the best location to split your piping lines to best accommodate the operatories. Each zone becomes its own system for purposes on sizing the lines properly. If operatories are in a straight line, zone splitting will not be required.

STEP 4. Starting from zone split location, count remaining operatories and look at the sizing chart in fig. 2 to select correct branch line diameter.

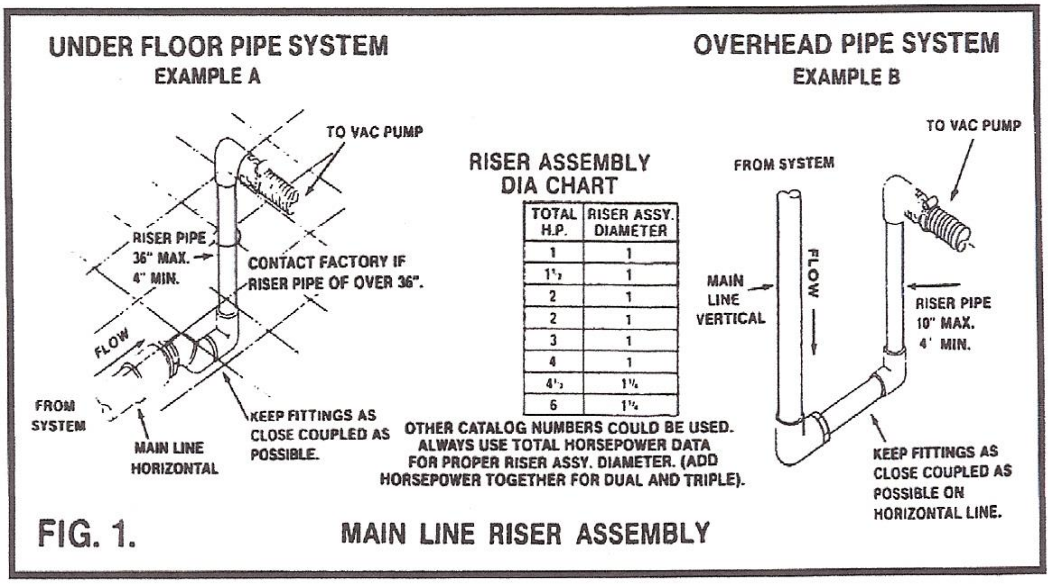


FIG. 1. MAIN LINE RISER ASSEMBLY

FIG. 2. VACUUM LINE SIZING CHART

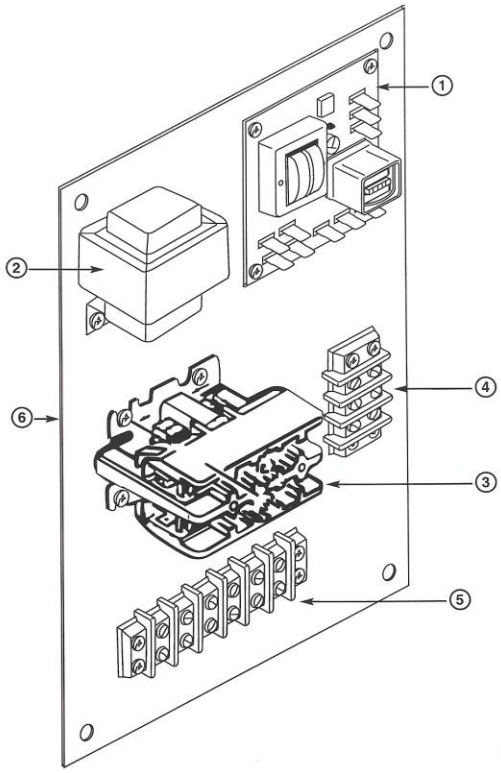
NUMBER OF OPERATORIES SEE NOTE	VACUUM LINE PIPE DIAMETER	
	PVC sch 40	COPPER TYPE "M"
1	1"	1"
2	1"	1"
3	1 1/4"	1 1/4"
4	1 1/2"	1 1/2"
5	1 1/2"	1 1/2"
6	1 1/2"	1 1/2"
7	1 1/2"	1 1/2"
8	1 1/2"	1 1/2"

VACUUM PIPING GUIDELINES

- It is important to MINIMIZE 90 degree ELBOWS in the system. These will not only cause vacuum losses, but will also provide a place for sediment to accumulate. A combination of two 45 degree elbows is preferable to a 90 degree elbow. A "Y" tee fitting should be used when available to branch two lines together.
- Overhead systems require the next larger vacuum pump. They also require ½" branch line, instead of a 3/4" line for sub-floor systems from the operatory. See circle E above for additional provisions of branch line plumbing.
- If the operatory branch line runs more than 40 feet away from the main line or the main line runs more than 50 feet from the vacuum location, use the next larger pipe as shown in the following Vacuum Line Sizing Chart.
- Vacuum lines should be supported every 6 feet to prevent sag and should be sloped ¼" for every 10 feet toward the vacuum pump.
- When determining vacuum line sizes within the system, use the number of operatories being supplied by branch lines, not the number of outlets within the operatories.

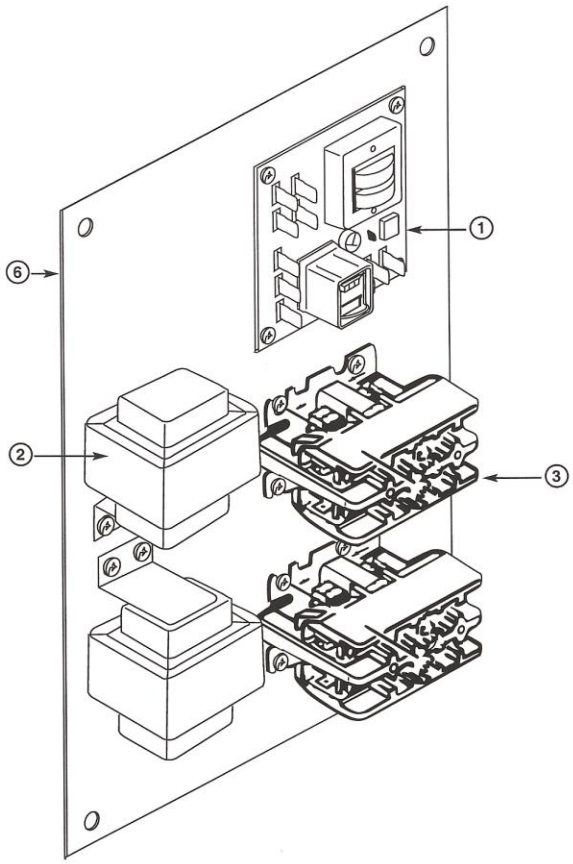
AIR EXHAUST TO OUTSIDE

VENT WITH GALVANIZED PIPE TO OUTSIDE OF BUILDING
(1 ¼" PERFECTION 1-- 2 "PERFECTION 2 & PERFECTION 3)



SINGLE ELECTRICAL PANEL PARTS BREAKDOWN

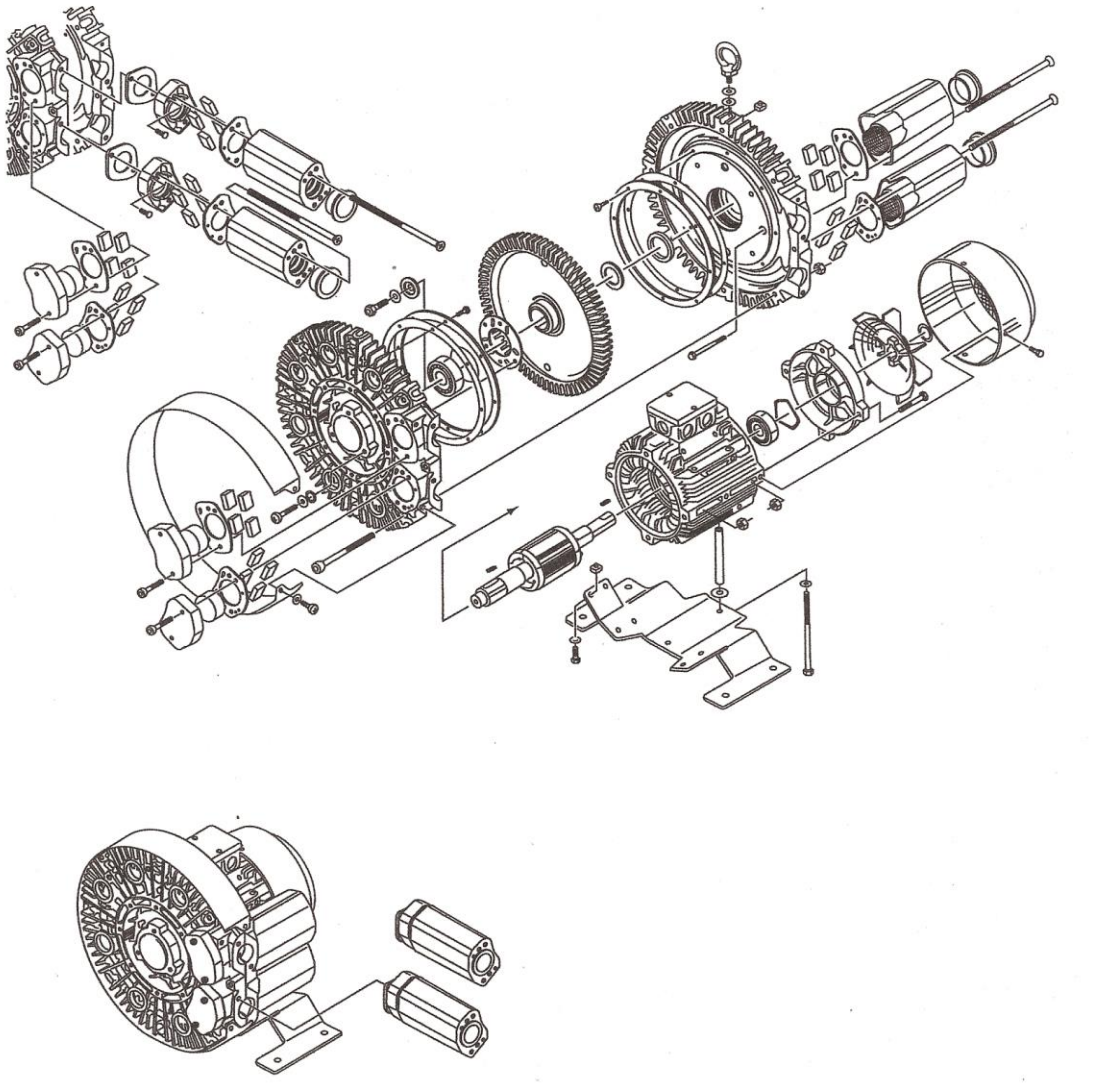
KEY	PART NO.	DESCRIPTION	UNIT
1	ELC-DV	ELECTRONIC LEVEL SENSOR	1
2	PT-100	TRANSFORMER 24V	1
3	PR-100	RELAY/CONTRACTOR	1
4	TS3	THREE POSITION TERMINAL STRIP	1
5	TS6	SIX POSITION TERMINAL STRIP	1
6	PRBI-DV	RELAY PANEL ONLY	1



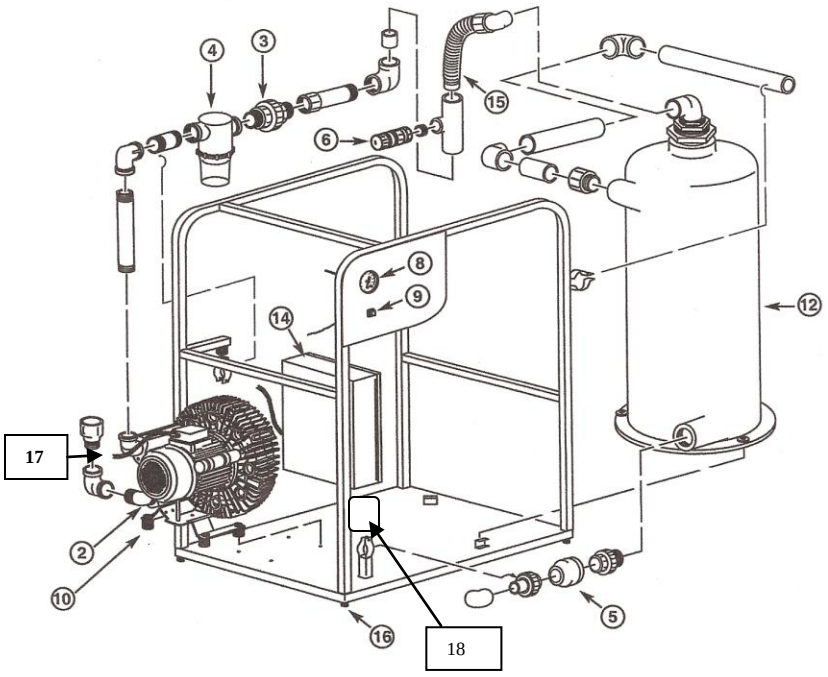
DUAL ELECTRICAL PANEL PARTS BREAKDOWN

KEY	PART NO.	DESCRIPTION	UNIT
1	ELC-DV	ELECTRIC LEVEL SENSOR	1
2	PT-100	TRANSFORMER 24V	1
3	PR-100	RELAY/CONTRACTOR	1
6	PRBI-DV	RELAY PANEL ONLY	1

DRY VACUUM MOTOR

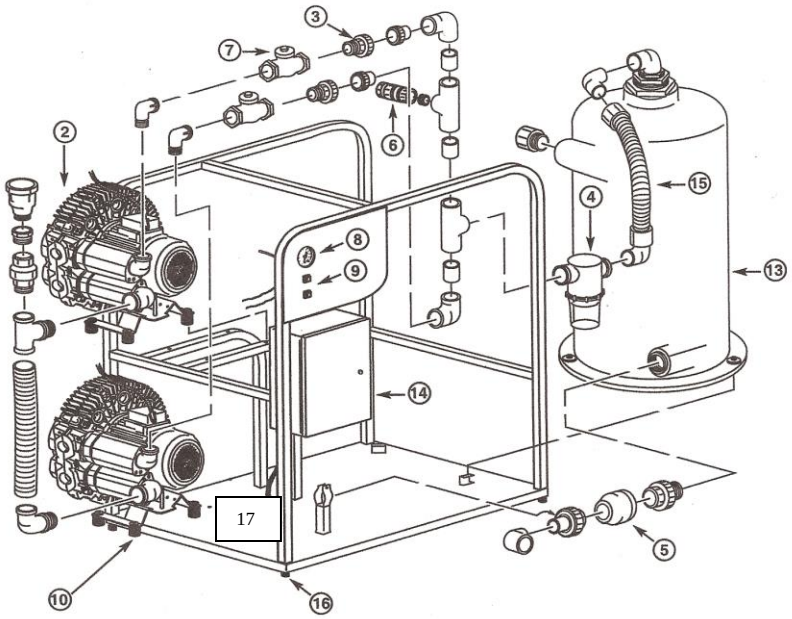


DRY VACUUM MOTOR



SINGLE DRY VACUUM

KEY	PART NO.	DESCRIPTION	UNIT
2	DVM-208	2 HP SIEMENS DRY VAC MOTOR	1
3	PU-125OT	1 ¼ PCV UNION	1
4	VFA-1.25	1 ¼ FILTER ASSEMBLY	1
5	CVF-1.25	1 ¼ PVC CHECK VALVE	1
6	VRV-100	VACUUM RELIEF VALVE	1
8	PMG-VAC	PANEL MOUNT GAUGE	1
9	CPSV-100	CONTROL SWITCH VACUUM	1
10	RIC-DA3	RUBBER MOUNTING FEET	4
12	STDV-100	SEPERATOR TANK WITH FLOAT	1
14	PRBA-DV	REPLAY BOX	1
15	FPH-1.25	PVC 1 ¼ FLEX HOSE	PER FOOT
16	RFV-100	RUBBER MOUNTING FEET	4
17	PWC	12 Ga. 200-208 VAC Power Cord	1
	PF-3	12 Ga. 200-240 VAC Power Cord (Hard Wired)	1
18	VFD	VFD CONTROL BOX (PF-3 ONLY) (PF-3 Vacuum On Demand Only)	1

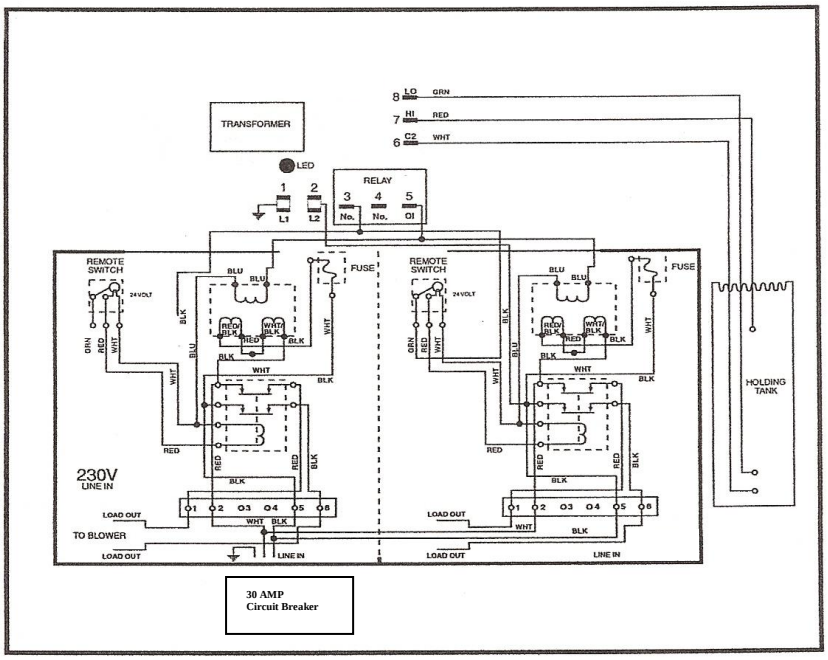


DUAL DRY VACUUM

KEY	PART NO.	DESCRIPTION	UNIT
2	DVM-208	2 HP SIEMENS DRY VAC MOTOR	2
3	PU-1250T	1 ¼ PCV UNION	2
4	VFA-1.25	1 ¼ FILTER ASSEMBLY	1
5	CVF-1.25	1 ¼ PVC CHECK VALVE	1
6	VRV-100	VACUUM RELIEF VALVE	1
7	SCV-1.25	1 ¼ BRASS CHECK VALVE	2
8	PMG-VAC	PANEL MOUNT GAUGE	1
9	CPSV-100	CONTROL SWITCH VACUUM	2
10	RIC-DA3	RUBBER MOUNTING FEET	8
13	STDVD-100	SEPERATOR TANK WITH FLOAT	1
14	PRBA-DV	RELAY BOX	1
15	FPH-1.25	PVC 1 ¼ FLEX HOSE	PER FOOT
16	RFV-100	RUBBER MOUNTING FEET	4
17	PWC	12 Ga. 200-208 VAC POWER CORD (Hard Wired)	1

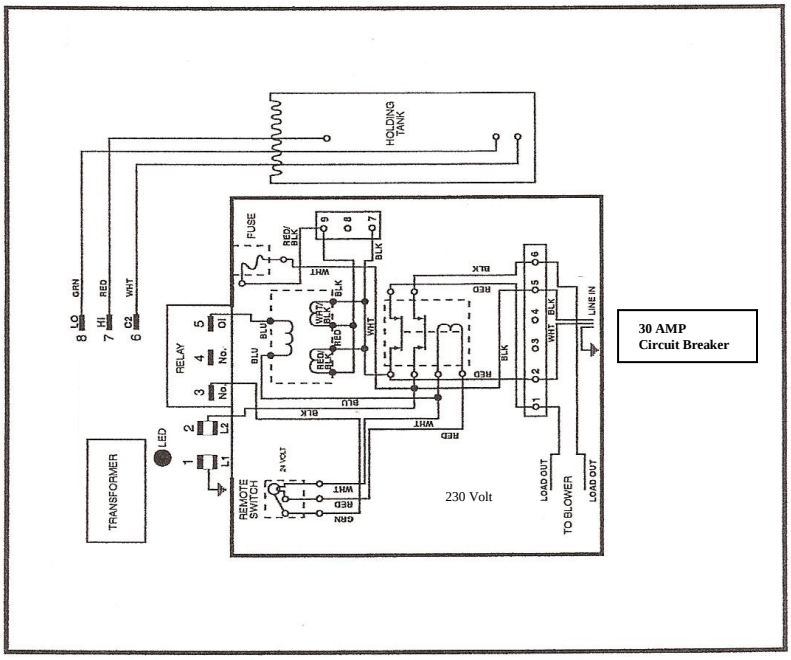
Wiring Diagram

PF-2 Dual



30 AMP
Circuit Breaker

PF-1 Single



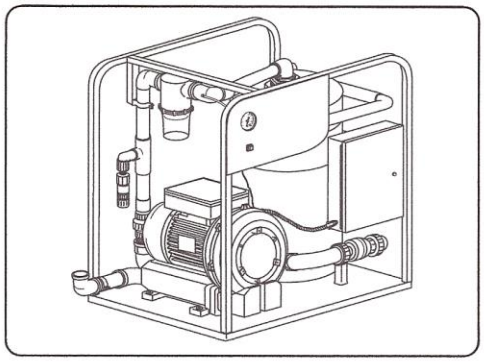
30 AMP
Circuit Breaker

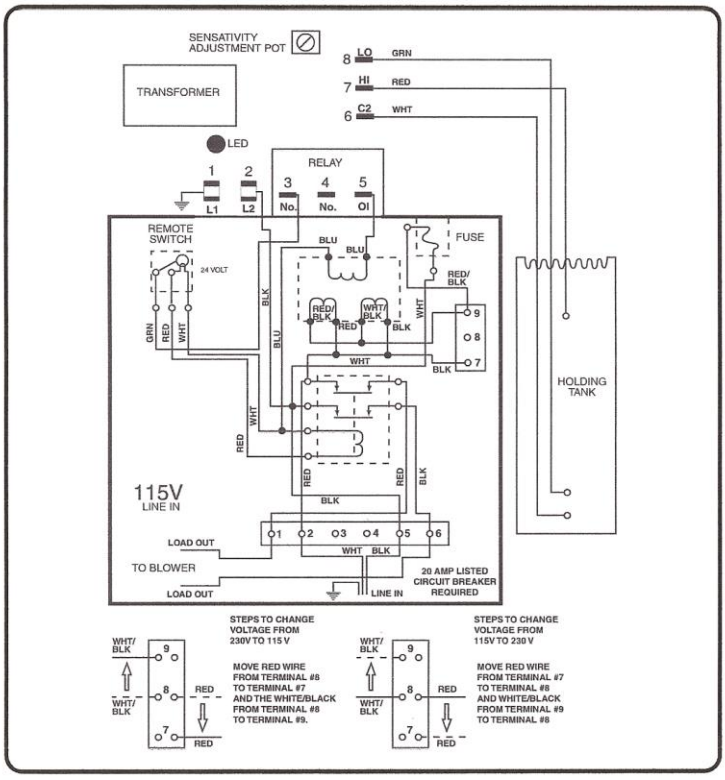
WIRING DIAGRAM

SINGLE PF-1

Wiring Diagram

Single



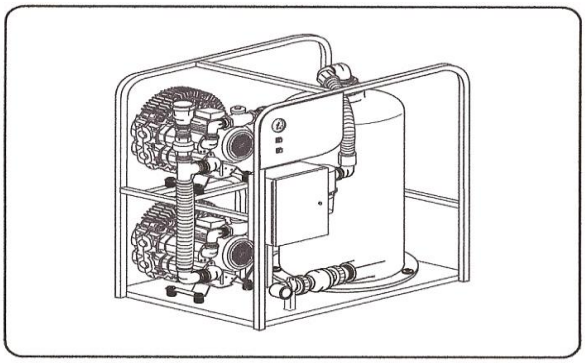


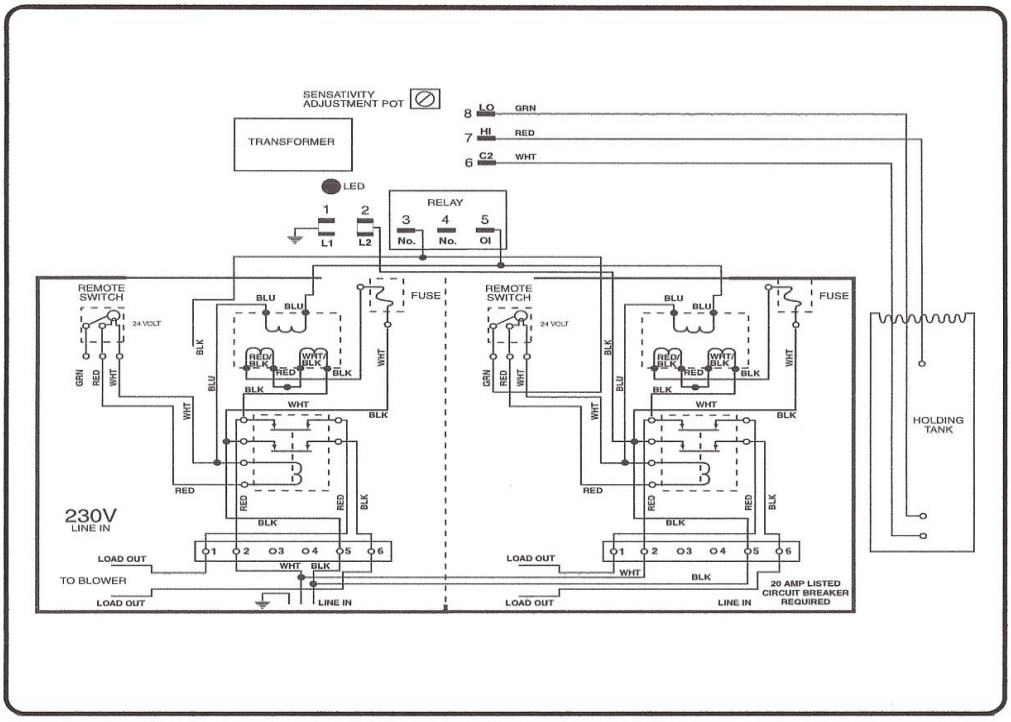
WIRING DIAGRAM

DUAL PF-2

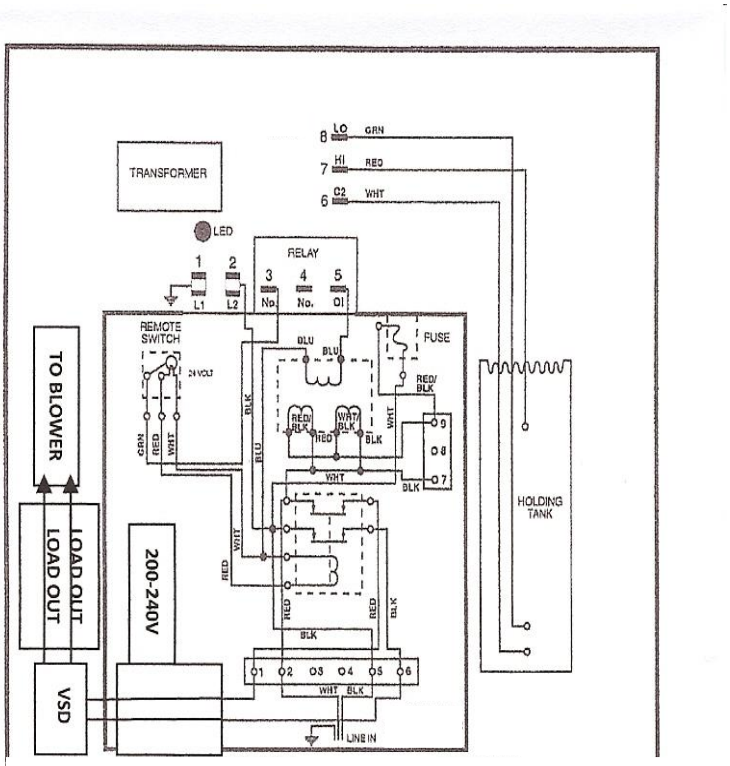
Wiring Diagram

Dual

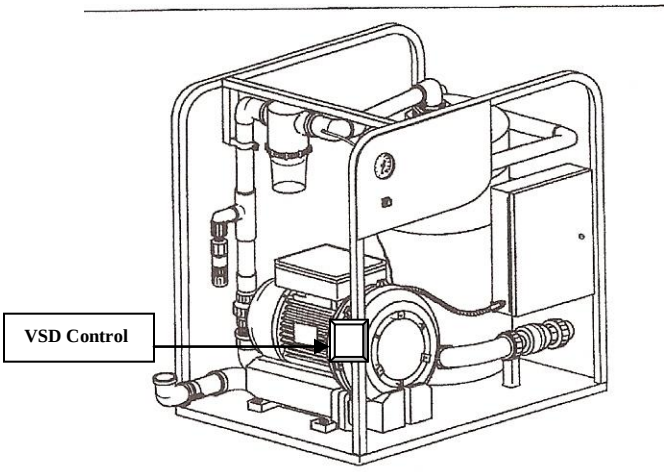


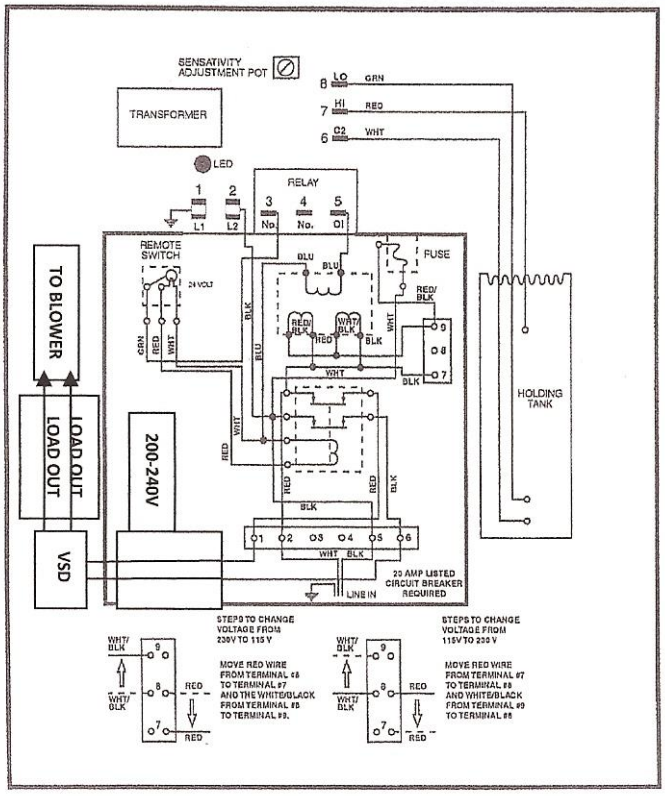


Wiring Diagram
PF-3/PF-5 Vacuum On Demand



Wiring Diagram
PF-3/PF-5 Vacuum On Demand

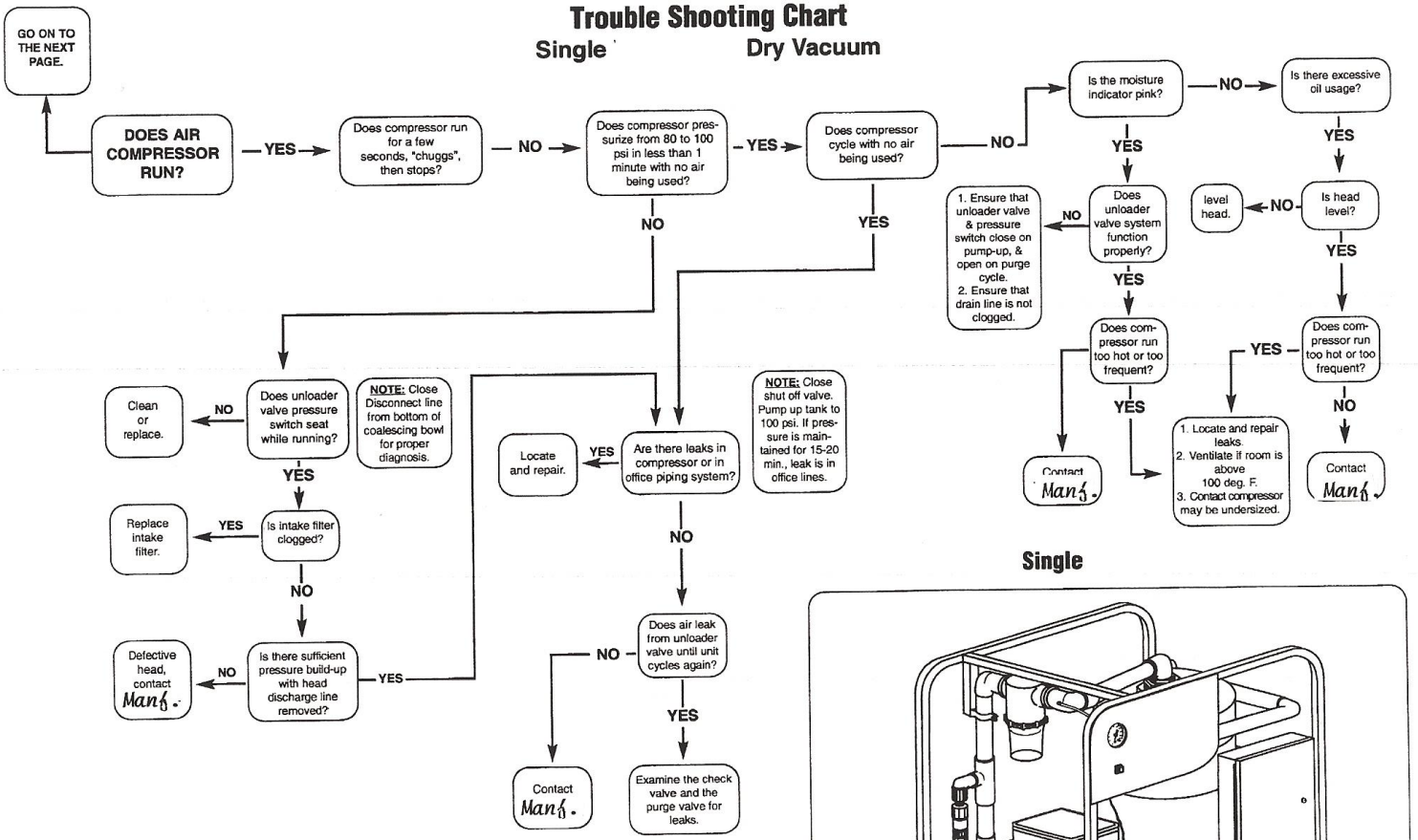




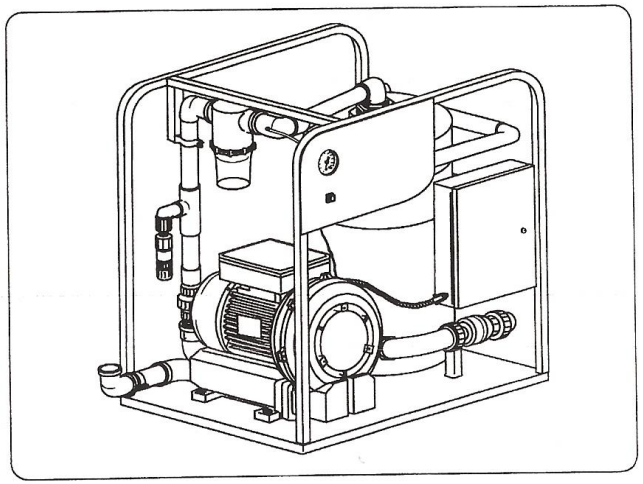
PF-1 Vacuum
PF-3/PF-5
Vacuum
On Demand

Trouble Shooting Chart

Single **Dry Vacuum**



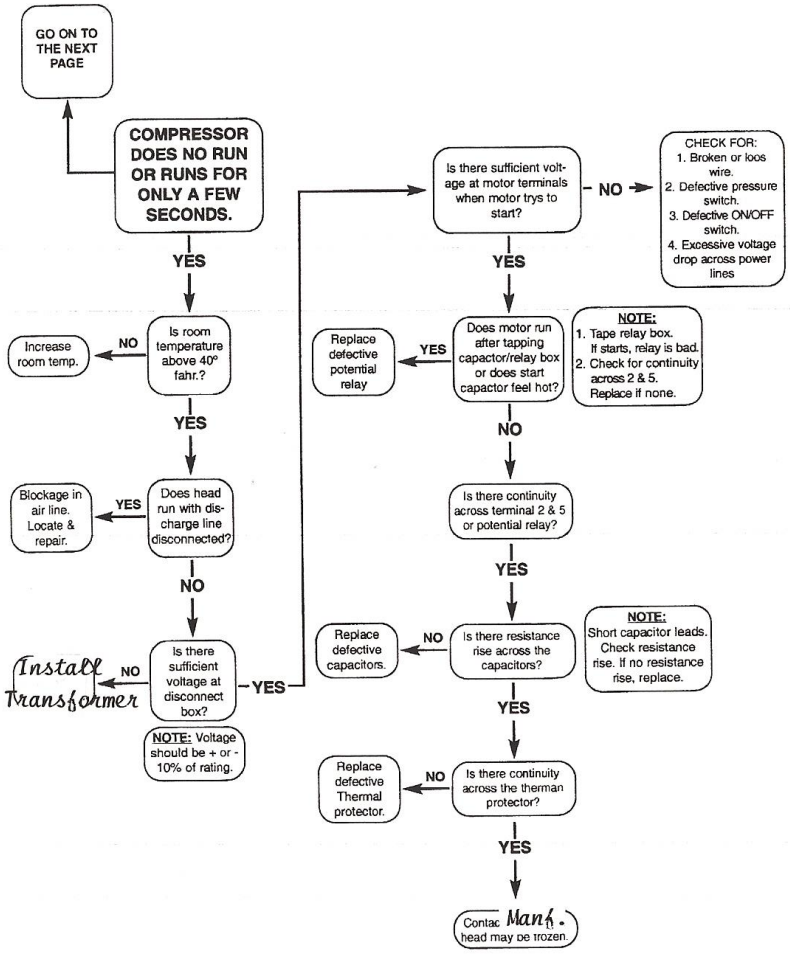
Single

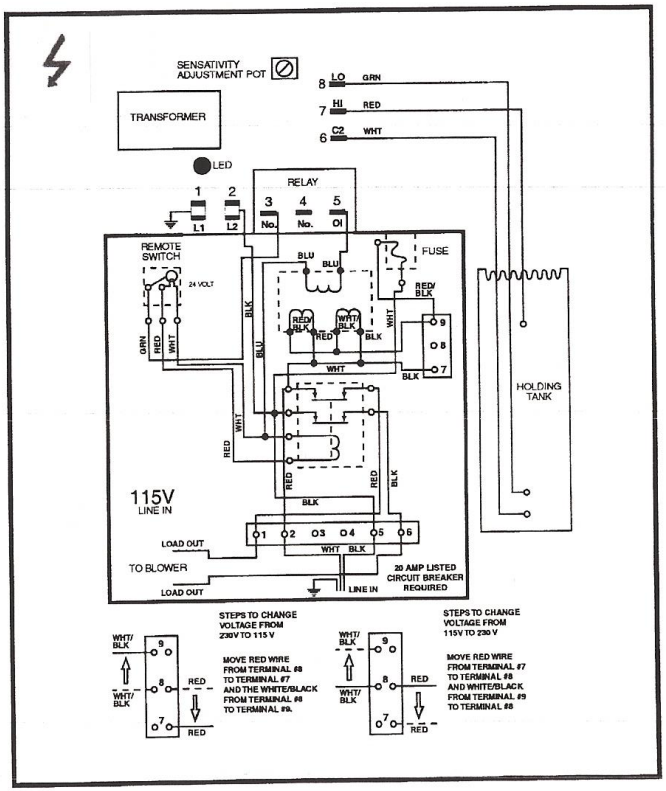


PF-1 Vacuum
PF-3/PF-5
Vacuum
On Demand

Wiring Diagram

Single Dry Vacuum





Trouble Shooting Chart

Dual Dry Vacuum

GO ON TO THE NEXT PAGE.

DOES AIR COMPRESSOR RUN?

— YES → Does compressor run for a few seconds, "chuggs", then stops?

— NO → Does compressor pressurize from 80 to 100 psi in less than 1 minute with no air being used?

— YES → Does compressor cycle with no air being used?

— NO → Is the moisture indicator pink?

— NO → Is there excessive oil usage?

YES → Does compressor run too hot or too frequent?

YES → 1. Locate and repair leaks. 2. Ventilate if room is above 100 deg. F. 3. Contact compressor may be undersized.

NO → Contact Manf.

YES → Run unit in manual purge mode for one week. If indicator still wet, replace desiccant.

YES → Does unloader valve system function properly?

NO → 1. Ensure that unloader valve & pressure switch close on pump-up, & open on purge cycle. 2. Ensure that drain line is not clogged.

YES → Is head level?

NO → level head.

YES → Does compressor run too hot or too frequent?

YES → 1. Locate and repair leaks. 2. Ventilate if room is above 100 deg. F. 3. Contact compressor may be undersized.

NO → Contact Manf.

YES → Run unit in manual purge mode for one week. If indicator still wet, replace desiccant.

NO → Does unloader valve pressure switch seat while running?

NOTE: Close Disconnect line from bottom of coalescing bowl for proper diagnosis

NO → Clean or replace.

YES → Is intake filter clogged?

YES → Replace intake filter.

NO → Is there sufficient pressure build-up with head discharge line removed?

NO → Defective head, contact Manf.

YES → Is there a blockage in the air lines?

YES → Locate and repair.

NO → Are there leaks in compressor or in office piping system?

Note: Close shut off valve. Pump up tank to 100 psi. If pressure is maintained for 15-20 min., leak is in office lines.

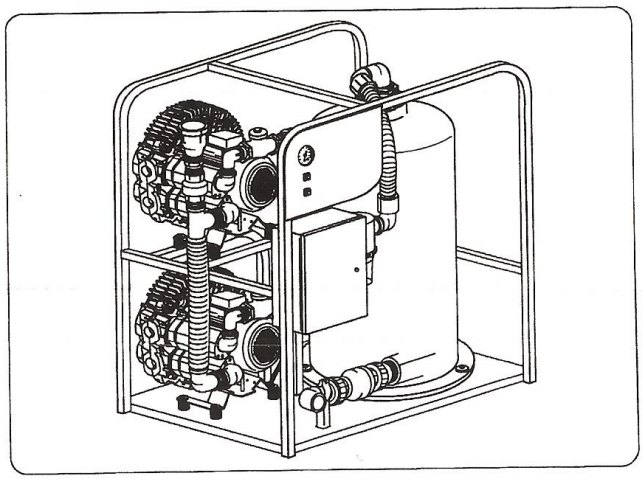
YES → Locate and repair.

NO → Does air leak from unloader valve until unit cycles again?

NO → Contact Manf.

YES → Examine the check valve and the purge valve for leaks.

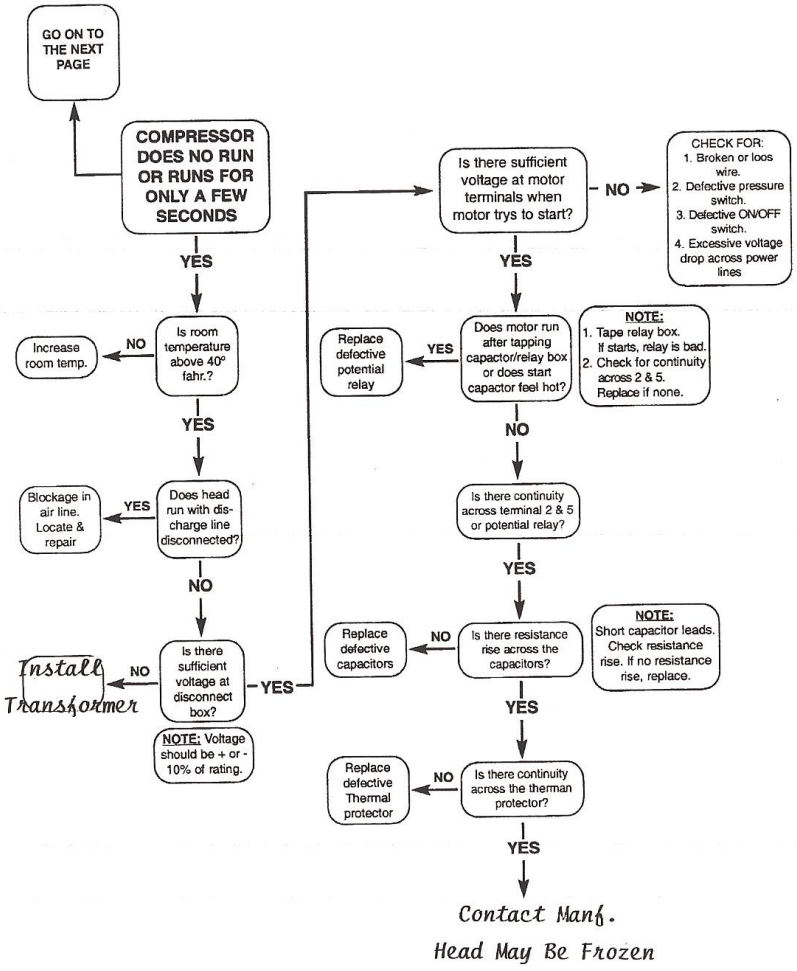
Dual

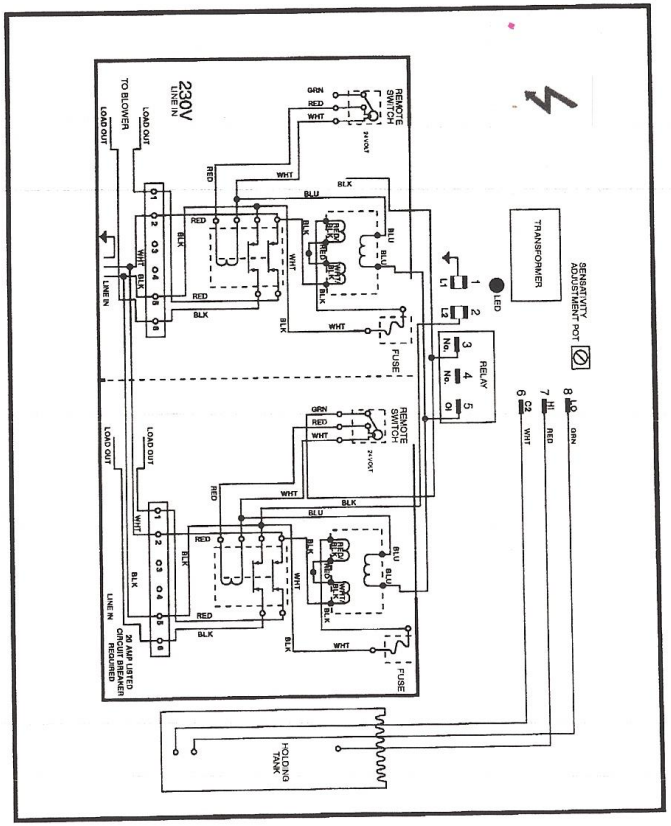


PF-2

Wiring Diagram

Dual Dry Vacuum





Maintenance & Service / Notes