



Vacuum Pumps Technical Manual

EFFICIENCY IN DENTISTRY®

Vacuum Pumps

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Vacuum Pumps

Motor

	<u>CV-101 FS</u>	<u>CV-102 FS</u>
Power Rating:	1 HP	2 HP
Voltage:	115/208/230	208/230
Amps (each motor):	15/7.5/7.5	15/15
Cycle:	60 Hz.	
Phase:	Single	
Running Speed:	3450 RPM	
Ambient Temperature Range:	10-40°C/50-104°F	
Wire Size:	12 GA.	

Vacuum

Mercury Pull (Sealed Sys.): Approx. 20-25" Hg. Adjust.

Usable CFM: 15 30

Use factor (Number of high-volume hoses open simultaneously): 1.5 3

Water Requirements

Gallons Per Minute: 1/2 1

Dimensions

Height: 16" 20"
Width: 12" 14"
Depth: 9" 11"

Shipping Weight: 68 lbs. 78 lbs.



Motor

	<u>MC-201 FS</u>	<u>MC-202 FS</u>
Power Rating:	1 HP	2 HP
Voltage:	208/230	208/230
Amps (each motor):	7.5/7.5	15/15
Cycle:	60 Hz.	
Phase:	Single	
Running Speed:	3450 RPM	
Ambient Temperature Range:	10-40°C/50-104°F	
Max. Oper. Noise Level:	70-75 dB	

Vacuum

Mercury Pull (Sealed Sys.): Approx. 20-25" Hg. Adjust.

One Pump Operation

Usable CFM: 15 30

Use factor (Number of high-volume hoses open simultaneously): 1.5 3

Two Pump Operation

Usable CFM: 30 60

Use factor (Number of high-volume hoses open simultaneously): 3 6

Dimensions

Height: 23"
Width: 24"
Depth: 17-1/2"

Shipping Weight: 175 lbs. 215 lbs.

Water Requirements

Gallons Per Min. (per pump): 1/2 1



Vacuum Pumps

Approvals:

UL/CUL Classified: File E212679



File # 1371



Medical Equipment with
Respect to Electric Shock,
Fire and Mechanical
Hazards
Only in Accordance with
UL60601-1 and
CAN/CSA C22.2 No. 601.1
and IEC60601-1-2



- Type of protection against electric shock: Class 1 Equipment
- Degree of protection against the ingress of water: Ordinary
- Equipment not suitable for use in the presence of a flammable anesthetic mixture with air or with oxygen or nitrous oxide.
- Mode of operation: Continuous
- Environmental conditions for transport and storage
Recommended ranges:
 - Temperature range within - 40° C to + 70° C
 - Relative humidity range within 10% to 100%
 - Atmospheric pressure range within 500 to 1050 hPa

CERTIFICATIONS

CVI01FS / CVI02FS

The following Pre-installation information will assist in making a quick, easy and quality installation. However, if there are any questions, contact a CustomAir technical service representative at **1-866-DTE-INFO**.

Site Requirements

Before the Single Wet Vacuum Pump can be properly installed, the following utilities must be available:

Water

Water line must be installed by a plumber according to local building codes. Requirements: 1/2" gate valve reduced to 1/8" FIP.

Waste

Waste line must be installed by a plumber according to local building and health codes. Requirements: reduce connection to 1" FIP or floor sink. When using floor sink, order a floor sink adapter.

Vacuum Lines

Vacuum lines must be installed by a plumber according to local building and electrical codes. Requirements: 1" IPS, PVC, Schedule 40.

Electrical

All electrical supply lines and control wiring should be supplied and installed by a licensed electrician according to local building codes.

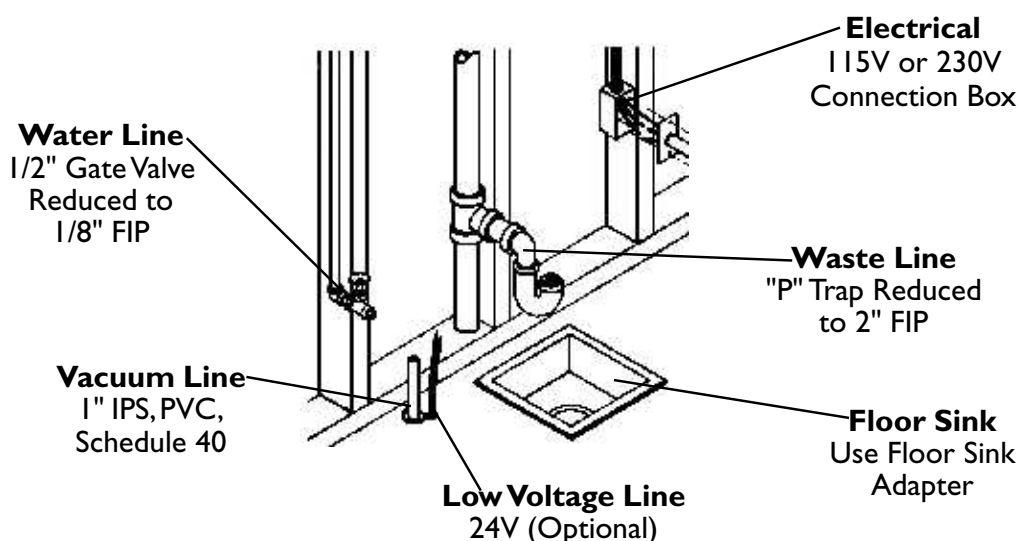
Electrical Requirements

Volts	Model CV-101 FS*	Model CV-102 FS
115V	Wired direct by electrician as per local codes. Separate circuit with 30 amp breaker, single phase.	Cannot be connected to 115V line.
208/230V	Wired direct by electrician as per local codes. Separate circuit with 20 amp breaker, single phase.	Wired direct by electrician. Separate circuit with 30 amp breaker, single phase.

*Model CV-101 FS is manufactured and shipped for 115V operation. This model may be converted to 230V operation by qualified installation technicians only following connection diagrams inside the pump control box.

Low Voltage Control Line (Optional)

If remote low voltage is desired, a licensed electrician should install 18-2 thermostat wire from the pump location to the operatory switches. (Use 18-3 thermostat wire for lighted switch.)



MC20IFS / MC202FS

The following Pre-installation information will assist in making a quick, easy and quality installation. However, if there are any questions, contact a CustomAir technical service representative at **1-866-DTE-INFO**.

Site Requirements

Before the Dual Wet Vacuum Pump can be properly installed, the following utilities must be supplied:

Electrical

All electrical supply lines and control wiring should be supplied and installed by a licensed electrician according to local building codes. **The Dual Wet Vacuum Pump requires two separate circuits** (one for each pump motor) of the correct voltage for the system ordered. In addition to the thermal overload protection built into the motors, each circuit must be provided with a circuit breaker, time delay fuse or standard fuse. See the Motor Protection Chart below for recommended breaker or fuse amperage.

Motor Protection Chart

Protection Type (each motor)	MC-201 FS 230V	MC-202 FS 230V
Circuit Breaker	20 Amps	30 Amps
Time Delay Fuse	12 Amps	20 Amps
Standard Fuse	25 Amps	40 Amps

Low Voltage Control Line (Optional)

If remote low voltage is desired, a licensed electrician should install 18-3 thermostat wire for lighted switch or 18-2 thermostat wire for non-lighted switch from the pump location to the operatory switch located up to 150 feet away. If the operatory switch is over 150 feet away from the pump location, use 16-3 thermostat wire for lighted switch or 16-2 thermostat wire for non-lighted switch.

— IMPORTANT —

All vacuum systems must be installed according to local building and electrical codes.

Water

Water line must be installed by a plumber according to local building codes. Terminate water line in 1/2" FIP gate valve.

Waste

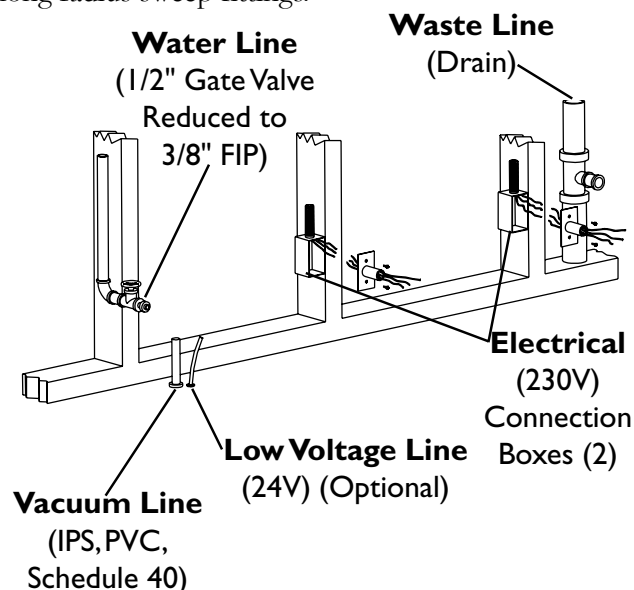
— CAUTION —

A free-flowing discharge system is required for proper operation of the vacuum system. The dual pump may leak at the anti-siphon valve if the discharge system is restricted. Ensure the vacuum system is installed and cleaned in accordance to the instructions in this manual.

Waste line must be installed by a plumber according to local building and health codes. For requirements, see Typical Installation Options, Page 4 and Waste Line, Page 6.

Vacuum Lines

Vacuum lines be installed by a plumber according to local building codes. Vacuum lines and risers to be IPS, PVC, Schedule 40, unless local codes require another material such as copper. Slope all vacuum lines toward the vacuum producer 1 inch for every 20 foot run. Make all vacuum line connections using long radius sweep fittings.



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Wet Vacuum Pumps

Vacuum Pump Water Consumption Chart

Model #	Gal. per hour w/o recirculator	Gal. per hour w/recirculator
CV-101	30	5 - 6
CV--102	60	9 - 10
MC-201 w/one pump running	30	5 - 6
MC-201 w/both pumps running	60	9 - 10
MC-202 w/one pump running	60	9 - 10
MC-202 w/both pumps running	120	18 - 20

Note: Figures are for continuous operation.

CONSUMPTION
WATER

Single Pump Water Recirculator

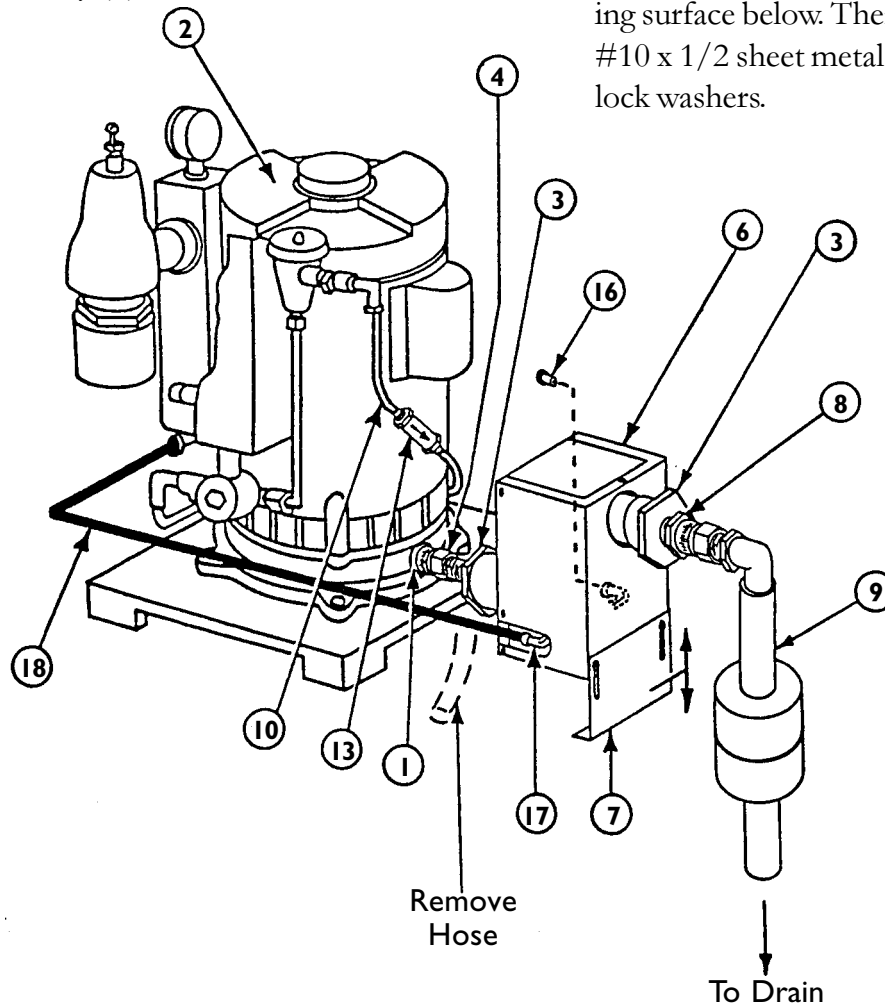
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WARNING: Before doing any work, turn **OFF** the main power.

NOTE: For convenience, refer to the itemized illustration below during installation.

Mounting

1. Disconnect the vacuum pump exhaust hose (9) from the hose connector (1) on the pump (2).
2. Install the reducing bushing (3) in the lower inlet opening of the recirculator assembly (6).
3. Install the swivel connection adapter (4) in the reducing bushing (3) installed in the previous step.
4. Attach the swivel connection adapter (4) to the hose connector (1) on the pump and align the recirculator assembly (6) so that it is vertically in line with the vacuum pump (2). Then securely tighten the swivel connection adapter (4).
5. Align the support bracket (7) with the recirculator enclosure (6) until the foot pads on the support bracket contact the supporting surface below. Then secure using two #10 x 1/2 sheet metal screws and two #10 lock washers.



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Pump Exhaust

1. Install a reducing bushing (3) in the upper exhaust opening of the recirculator assembly (6).
2. Install a brass 3/4 MIP x G.H.T. (8) hose connection adapter in the reducing bushing (3) installed in the previous step.
3. Reconnect the existing 1" exhaust hose (9) and muffler to the hose connection adapter installed in the previous step.

Water Supply

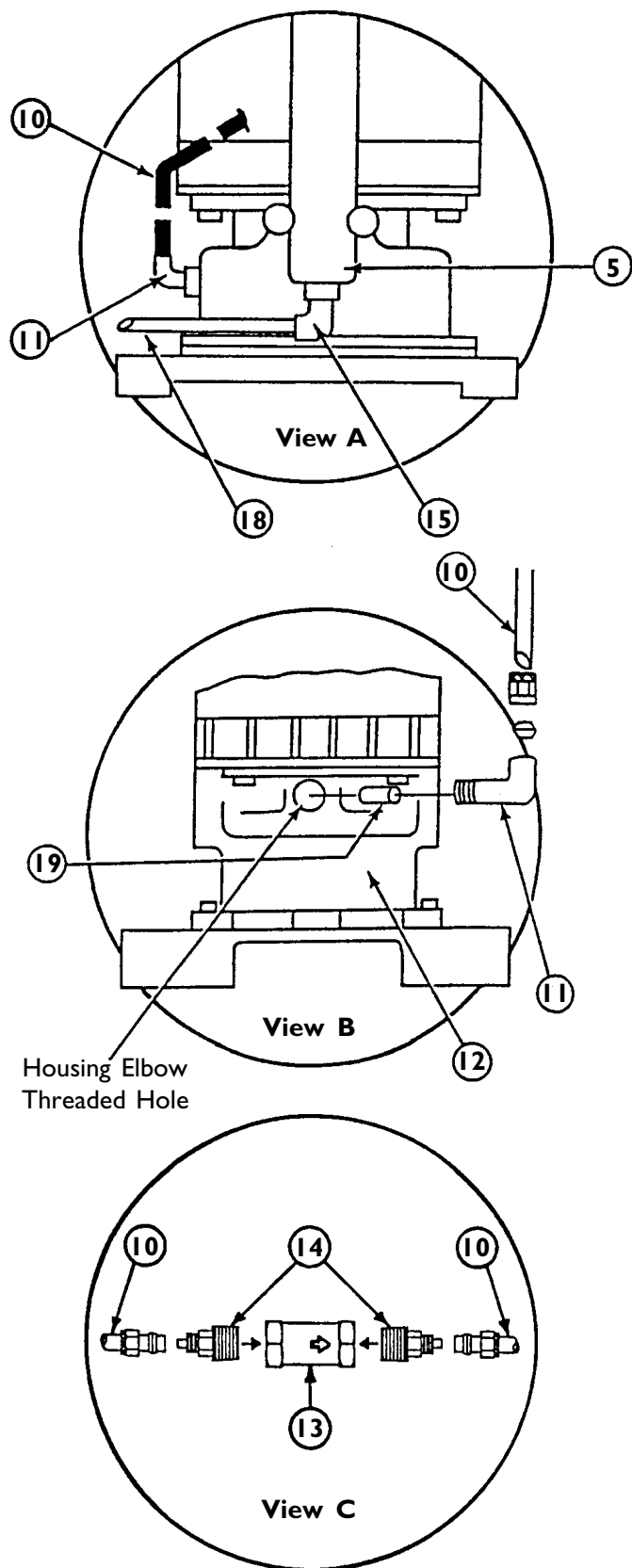
NOTE: For convenience, refer to the illustrations on the next page for water supply installation.

1. Remove the 1/4" poly tubing (10) from the elbow (11). (Views A & B) (On next page)
2. Remove the elbow (11) from the vacuum pump housing (12). (Views A & B)
3. Insert the sleeve (19) into the housing elbow threaded hole. (View B)
4. Reconnect the elbow (11) to its original position.
5. Assemble two poly tube connection adapters (14) to the correct rate flow restrictor valve (13) as follows: (View C)
 - For a 1 H.P. pump, use a .12 G.P.M. valve.
 - For a 2 H.P. pump, use a .25 G.P.M. valve.
6. Cut the 1/4" poly tubing (10) at its midpoint and slip a brass nut and brass sleeve over each cut end of the poly tubing. (View C)
7. With the flow direction arrow on the flow restrictor valve (13) pointing down toward the pump base, secure the cut ends of the 1/4" poly tubing (10) to the connection adapters on the flow restrictor valve.
8. Reconnect the remaining end of the 1/4" poly tubing (10) to the elbow (11). (View B)
9. Remove the pipe plug from the manifold (5) and replace with poly tubing connection elbow (15). (View A)
10. Connect the recirculator outlet (17) to the manifold elbow (15) using 1/4" poly tubing (18). (View A)
11. Fully insert the plug (16) into the unused recirculator outlet (17) on the opposite side of the recirculator assembly (5).

Operation Check

1. After installation is complete, operate the system and check all connections for leaks.
2. Correct leaks as required.

CV-101FS / CV102FS



INSTRUCTIONS
RECYCLATORS

Dual Pump Water Recirculator

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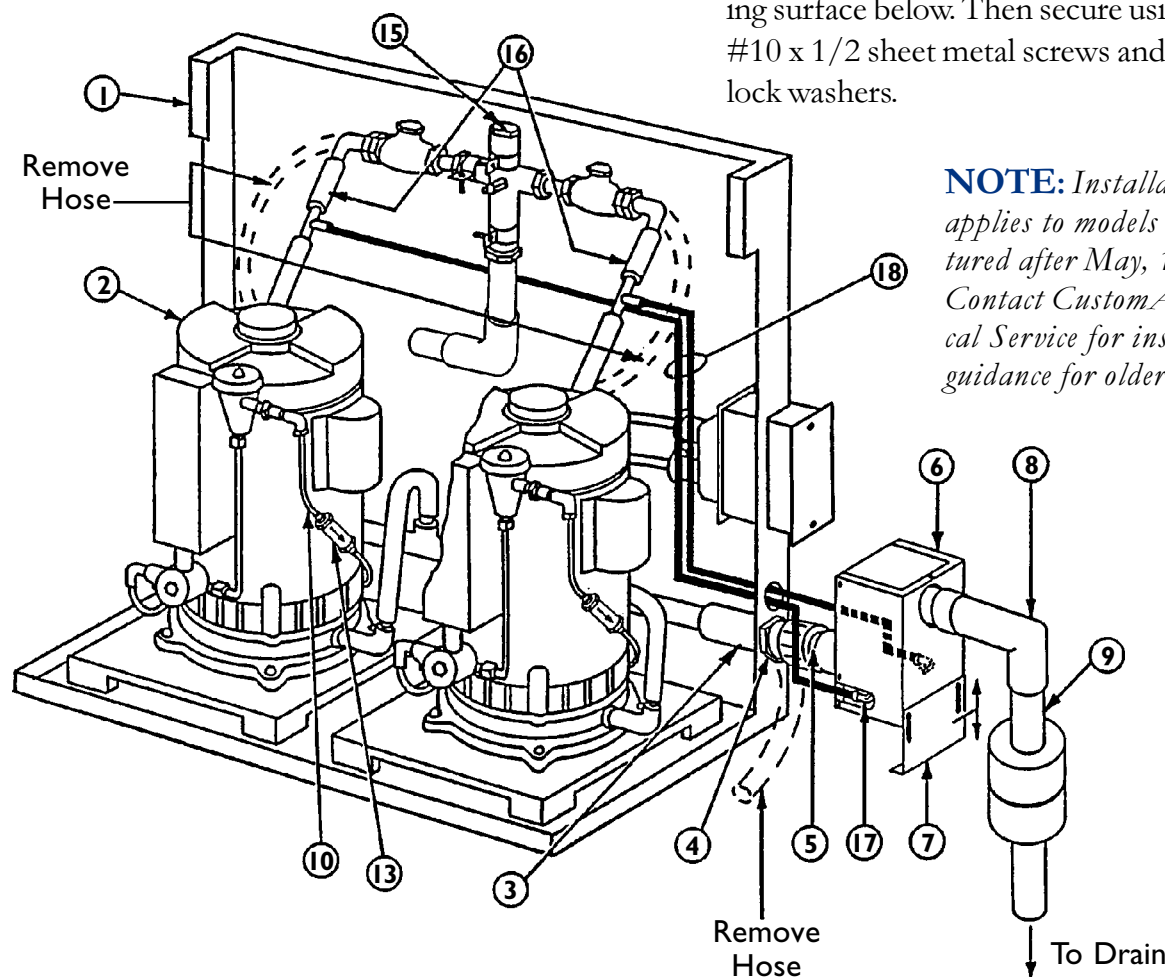
WARNING: Before doing any work, turn **OFF** the main power.

NOTE: For convenience, refer to the itemized illustration below during installation.

Mounting

1. Disconnect the vacuum pump exhaust hose (9) and adapter from the exhaust manifold (3).
2. Install the 1-1/2" male compression adapter (4) in the exhaust manifold (3).
3. Install the threaded end of the 1-1/2" pipe nipple (5) in the lower inlet opening of the recirculator assembly (6).
4. Fully insert the plain end of the 1-1/2" pipe nipple (5) into the 1-1/2" male compression adapter (4) and vertically align the recirculator assembly (6) with the frame (1). Then securely tighten the compression adapter.
5. Align the support bracket (7) with the recirculator enclosure (6) until the foot pads on the support bracket contact the supporting surface below. Then secure using two #10 x 1/2 sheet metal screws and two #10 lock washers.

NOTE: Installation shown applies to models manufactured after May, 1992. Contact CustomAir Technical Service for installation guidance for older models.



Pump Exhaust

1. Install a 1-1/2" elbow (8) or 1-1/2" straight hose connection adapter (*not shown-- depending on location requirements*) in the upper exhaust opening of the recirculator assembly (6).
2. Reconnect the existing 1-1/2" exhaust hose (9) and muffler to the hose connection adapter that is installed in the upper exhaust opening. Then secure using a 1-1/2" clamp.

Water Supply

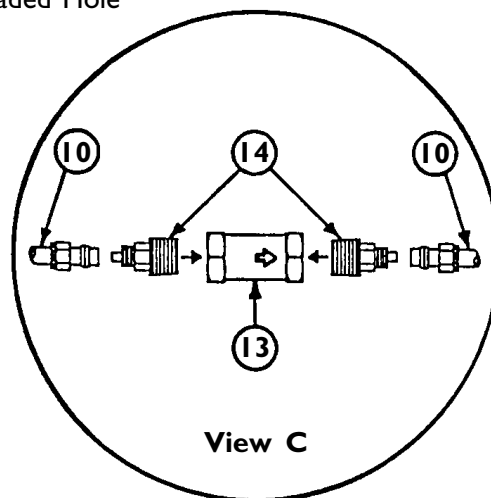
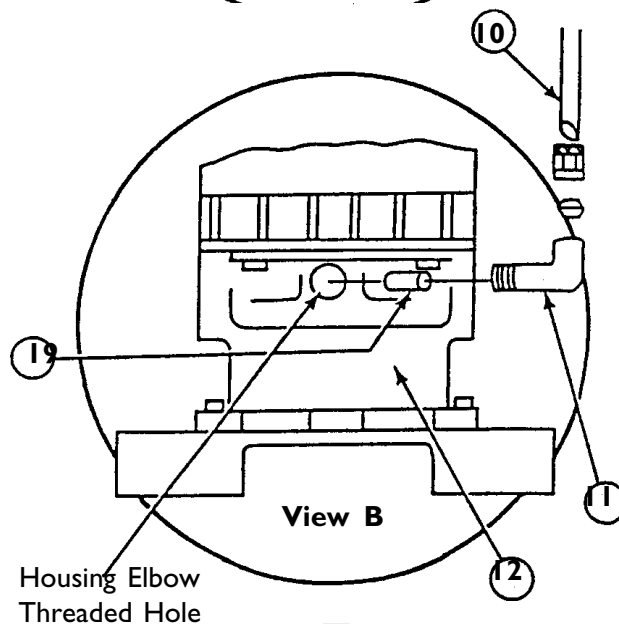
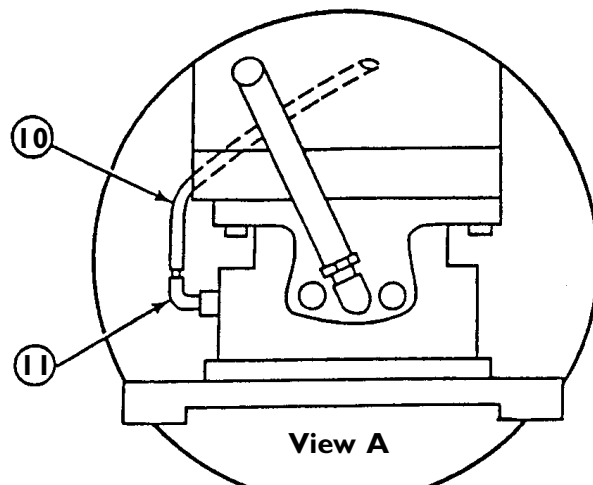
NOTE: For convenience, refer to the illustrations on the next page for water supply installation.

1. Remove the 1/4" poly tubing (10) from the elbow (11). (Views A & B) (*On next page*)
2. Remove the elbow (11) from the vacuum pump housing (12). (Views A & B)
3. Insert the sleeve (19) into the housing elbow threaded hole. (View B)
4. Assemble two poly tube connection adapters (14) to the correct rate flow restrictor valve (13) as follows: (View C)
 - For a 1 H.P. pump, use a .12 G.P.M. valve.
 - For a 2 H.P. pump, use a .25 G.P.M. valve.
5. Cut the 1/4" poly tubing (10) at its midpoint and slip a brass nut and brass sleeve over each cut end of the poly tubing. (View C)
6. With the flow direction arrow on the flow restrictor valve (13) pointing down toward the pump base, secure the cut ends of the 1/4" poly tubing (10) to the connection adapters on the flow restrictor valve.
7. Reconnect the remaining end of the 1/4" poly tubing (10) to the elbow (11). (View B)
8. Repeat the water supply Steps 1. through 7. for the other pump.
9. Remove the 1" hose from the intake manifold (15) to the vacuum pump (2) (two places).
10. Install the water injector assembly (16) between the intake manifold (15) and vacuum pump (2). Then secure using 1" clamps (two places).
11. Connect the recirculator outlets (17) to the water injector assembly (16) using 1/4" poly tubing (18) (two places). Then run the poly tubing through the hole that is provided in the rear side wall of the frame (1).

Operation Check

1. After installation is complete, operate the system and check all connections for leaks.
2. Correct leaks as required.

MC-201 FS / MC-202 FS



— WARNING —

Before starting cleaning procedures, make certain to put on eye protection, a mask and puncture-resistant nitrile gloves.

Weekly Maintenance

Clean In-Line Filter

Turn **OFF** the pump motors.

Carefully unscrew the lower bowl from the filter top and lift out the screen.

Using water, flush the bowl assembly and any contaminated sediment.

Submerge the screen/bowl assembly into a high-level chemical disinfectant solution. *Follow the disinfectant manufacturer's recommendation for time interval required to achieve disinfection.*

Remove the screen/bowl assembly from the disinfectant solution and rinse using tap water.

Properly dispose of the contaminated sediment and disinfectant solution waste.

Replace the screen and make sure the gasket is in place before replacing the bowl.

Check all connecting vacuum, waste and water lines for tightness.

Inspect Operatory Filters

Check and clean all operatory and secondary filters weekly. *Follow the equipment manufacturer's recommendations.*

Inspect Vacuum System

Check the system weekly for water leaks and loose or broken connections.

Monthly Maintenance

Check Vacuum Level

The vacuum level of the CustomAir Single Wet Vacuum Pump is preset at the factory.

Recommended Operating Vacuum Levels:
10" Hg. General Dentistry
19" Hg. Surgery

The pressure gauge will indicate the vacuum level provided by the pump. If it becomes necessary to adjust this setting, the following steps can be taken:

NOTE: *The evacuator should be left **ON** when setting the vacuum level. Also, make sure all hoses in the operatory are closed.*

Turn the lock nut counterclockwise to loosen.

For greater vacuum level, turn the screw clockwise; for less vacuum level, turn screw counterclockwise.

Set to desired vacuum level and tighten locknut.

Clean Surface

Using a damp cloth, remove any surface dust and dirt.

— CAUTION —

A free-flowing discharge system is required for proper operation of the vacuum system. The pump systems may leak at the anti-siphon valve if the discharge system is restricted. Ensure the vacuum system is installed and cleaned in accordance to the instructions in this manual.

— WARNING —

Before starting cleaning procedures, make certain to put on eye protection, a mask and puncture-resistant nitrile gloves.

Weekly Maintenance

Clean In-Line Filter

Turn **OFF** the pump motors.

Carefully unscrew the lower bowl from the filter top and lift out the screen.

Using water, flush the bowl assembly and any contaminated sediment.

Submerge the screen/bowl assembly into a high-level chemical disinfectant solution. *Follow the disinfectant manufacturer's recommendation for time interval required to achieve disinfection.*

Remove the screen/bowl assembly from the disinfectant solution and rinse using tap water.

Properly dispose of the contaminated sediment and disinfectant solution waste.

Replace the screen and make sure the gasket is in place before replacing the bowl.

Check all connecting vacuum, waste and water lines for tightness.

Inspect Operatory Filters

Check and clean all operatory and secondary filters weekly. *Follow the equipment manufacturer's recommendations.*

Inspect Vacuum System

Check the system weekly for water leaks and loose or broken connections.

Monthly Maintenance

Check Vacuum Level

The vacuum level of the CustomAir Dual Wet Vacuum Pump is preset at the factory.

Recommended Operating Vacuum Levels:

10" Hg. General Dentistry

19" Hg. Surgery

The pressure gauge will indicate the vacuum level provided by the pump. If it becomes necessary to adjust this setting, the following steps can be taken:

NOTE: Turn On one pump — vacuum level adjustments are made with only one pump operative.

Turn the lock nut counterclockwise to loosen.

For greater vacuum level, turn the screw clockwise; for less vacuum level, turn screw counterclockwise.

Set to desired vacuum level and tighten locknut.

NOTE: The evacuator should be left **ON** when setting the vacuum level. Also, make sure all hoses in the operatory are closed.

Clean Surface

Using a damp cloth, remove any surface dust and dirt.

AM-200

Model: AM-200

Air/Water or Nitrous Oxide Separator

(PN: 64656200)

Compatible with all single or dual water injected vacuum pumps. Parts provided for unit to be adapted to 3/4", 1" or 1-1/2" exhausts.

A standard 2", no-hub coupling on the air discharge vent eliminates any adaptor and allows direct hookup to a standard vent pipe.

The water trap is inside, which makes plugging virtually impossible.

The entire separator is made of corrosion-proof PVC plastic.

The separator should be mounted near the vacuum pump with the center of the exhausts inlets on the chamber no more than 2 feet above the bottom of the vacuum pump.

NOTE: This product should be installed by a competent technician or plumber. The installation should meet all local health and plumbing codes. This device requires a separate atmospheric vent for maximum safety and effectiveness.



2500 Highway 31 South
Bay Minette, Alabama 36507
1-866-DTE-INFO

PN: 64710078C

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Vacuum Pumps

How is a single pump wired to a remote lighted switch?

— NOTICE —

All wiring between the main control box and equipment should be **Class B, low-voltage**. In most cases, a conduit is **not** required when using this type of wiring.

— WARNING —

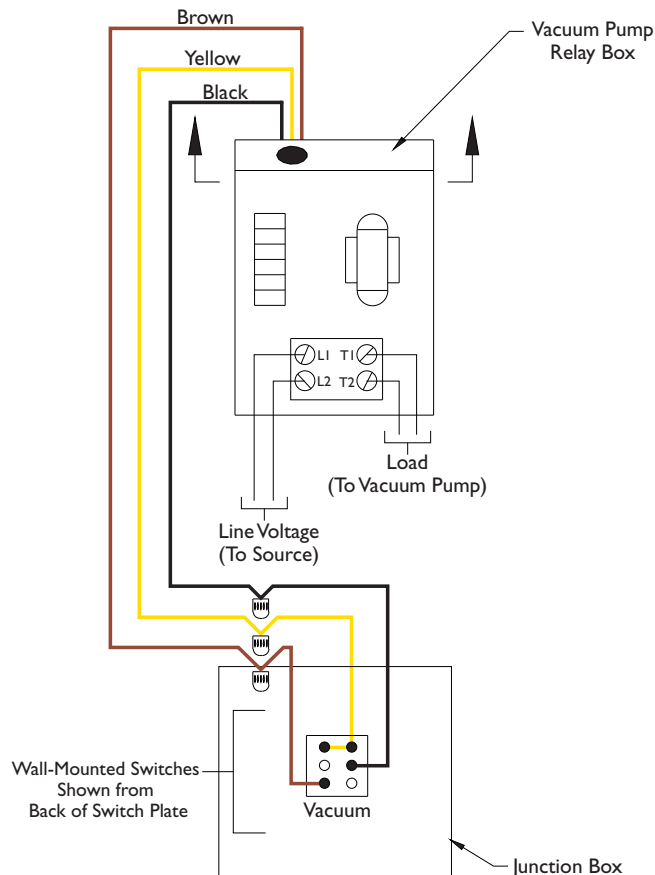
Before proceeding with any electrical installation, comply with and maintain all applicable local electrical code(s) and regulations.

IMPORTANT NOTE:

If not using a DentalEZ Master Control Panel Kit, proceed as follows:

1. Position the master switch in the desired location.
2. Run the appropriate wires to their respective equipment location. (See wiring chart below.)
3. Connect wires according to the wiring diagram on the right.

LEGEND	
Brown	= Light
Yellow	= Return
Black	= Power



WIRING CHART

Model No.	No. of Wires	Wire Under 150 ft.	Wire Over 150 ft.
CV-101	3	18 AWG	16 AWG
CV-102	3	18 AWG	16 AWG

CustomAir

FAQ #1

DentalEZ

Technical Manual

CustomAir

Vacuum Pumps

How are dual pumps wired to a remote lighted switch?

— NOTICE —

All wiring between the main control box and equipment should be **Class B, low-voltage**. In most cases, a conduit is **not** required when using this type of wiring.

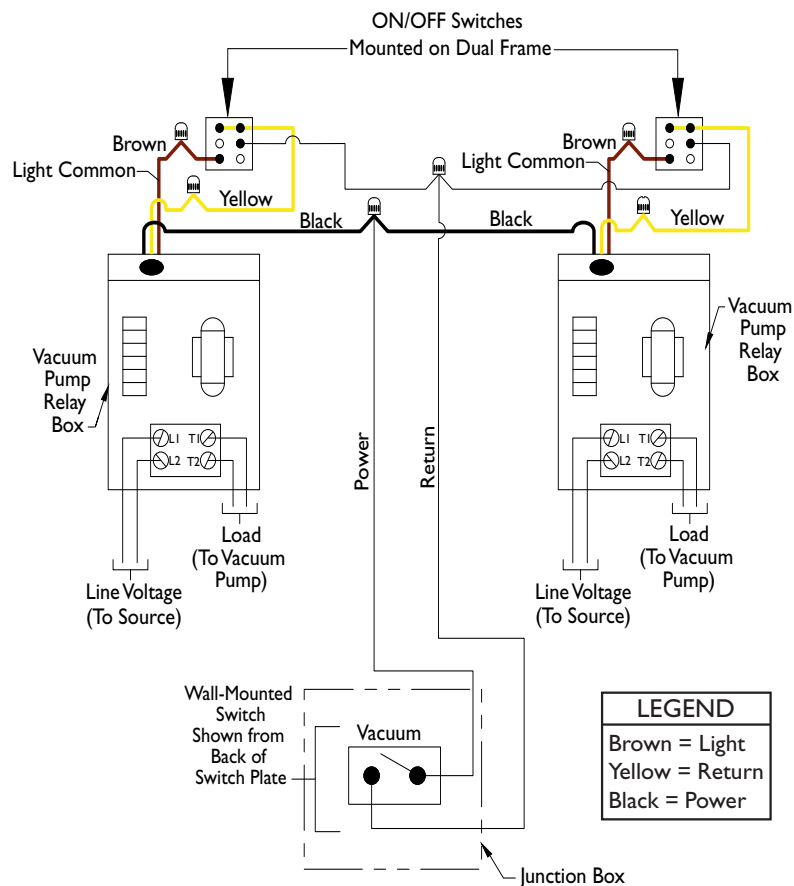
— WARNING —

Before proceeding with any electrical installation, comply with and maintain all applicable local electrical code(s) and regulations.

IMPORTANT

NOTE: If not using a DentalEZ Master Control Panel Kit, proceed as follows:

1. Position the master switch in the desired location.
2. Run the appropriate wires to their respective equipment location. (See wiring chart below.)
3. Connect wires according to the wiring diagram on the right.



WIRING CHART

Model No.	No. of Wires	Wire Under 150 ft.	Wire Over 150 ft.
MC-201	6	18 AWG	16 AWG
MC-202	6	18 AWG	16 AWG

CustomAir

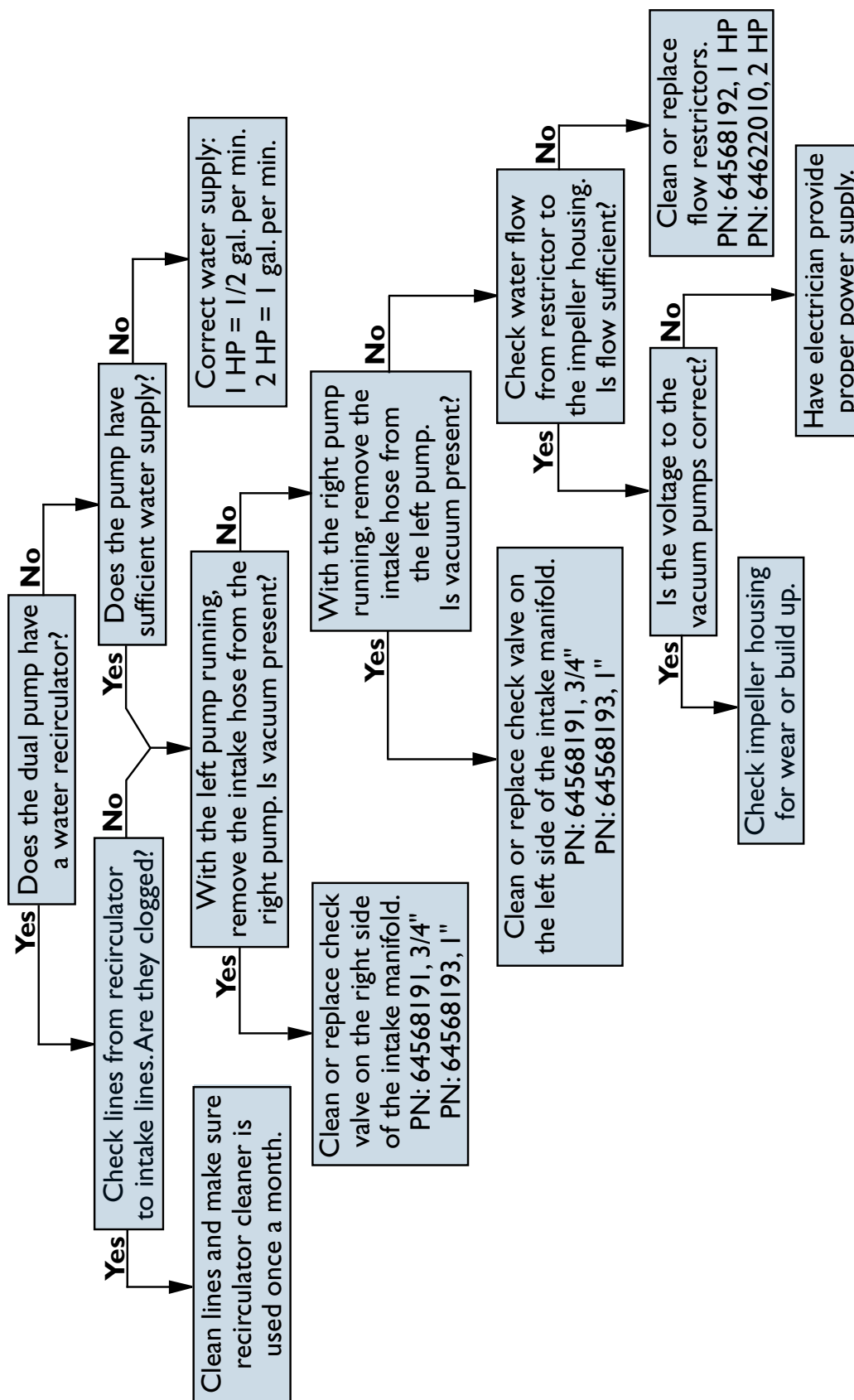
FAQ #9

DentalEZ

Technical Manual

CustomAir

Why is one pump weak?



CustomAir

FAQ #11

APPLICATION AND CONNECTION DATA FOR BUCK-BOOST TRANSFORMERS

DESCRIPTION

Buck-Boost transformers are insulated units rated 120/240 volts high voltage and 12/24 and 16/32 volts low voltage. When connected as autotransformers in single-phase or three-phase circuits, they can be used to change voltage on loads greatly in excess of the rating shown on the nameplate.

Because autotransformers may transmit line disturbances directly to the load, their use in some areas may be prohibited by local codes.

NOTE: BE SURE THAT AUTOTRANSFORMERS ARE PERMISSIBLE IN YOUR LOCALE

APPLICATION

Efficient operation of electrical equipment requires that line voltage be at or near the nameplate rating of the equipment. In order to match available line voltage (whether it be too high or low) with equipment voltage, buck-boost transformers provide the most convenient and least expensive method.

Do not use buck-boost transformers to solve a fluctuating voltage problem. They should be used to compensate for high or low voltage conditions only when the available line voltage is reasonably constant.

5-STEP SELECTION

Buck-boost applications are quick and easy to solve when you follow these easy steps.

FOR BOOSTING UP

AVAILABLE VOLTAGES:

1. Select the table having the same output voltage as the voltage required for the equipment you want to operate. Example: 230 volt, single phase air conditioner — Table 1.
2. Select the available line voltage column located in that table. Example: 208 volts single phase available (Column 2 — Table 1).
3. Select the proper kVA required by your equipment then read down the available line voltage column until you find it. If your kVA is not listed, go on to the next higher kVA. Example: Air conditioner needs 2.4 kVA volts at 230 volts.
4. Select the transformer number. Read directly left across the model number column. Example: T107 will provide the proper voltage correction.
5. Cross-reference the transformer number (T ---) to the descriptions in table A. Example: T107 from the above application is 250 VA 120/240 primary and 12/24 secondary.
6. Select the correct connection diagram for your customer. Read down to the bottom of the available line voltage column you've been working with and the wiring diagram is referenced. Example: Connection diagram "A".

FOR BUCKING DOWN

AVAILABLE VOLTAGES:

Since buck-boost transformers can be used in reverse, so can the quick-selection tables. Simply use the "available line voltage" column for your desired output voltage and select the proper table by your available line voltage (titled "Output" in the tables).

Table A

YR	Transformer Number		
	Primary Yrts (2010)		Primary Yrts (2000)
	Secondary Yrts		
	120V	160V	240V
000	7102	7102	7202
075	7103	7105	7203
100	7104	7104	7204
150	7105	7122	7205
200	7106	7107	7206
300	7108	7108	7208
750	7109	7109	7209
1	7110	7130	7210
1.8	7111	7131	7211
2	7112	7132	7212
5	7213	7143	

SELECTION TABLES

Table 1 – 230 Volts Output, 60 Hertz, Single Phase

[illegible]

Table 2 – 240 Volts Output, 60 Hertz, Single Phase

Transformer Number	Auxiliary Line Voltage							
	200V	210	220	230	240	250	260	270
	Load (kW)							
T102	---	---	800	---	1.0	1.1	---	550
T103	---	380	---	750	---	---	800	---
T104	---	---	---	---	---	---	---	---
T105	---	---	750	---	1.2	1.6	---	800
T106	---	399	---	1.2	---	---	1.2	---
T107	---	---	---	---	---	---	---	---
T108	---	---	---	---	---	---	---	---
T109	---	---	---	---	---	---	---	---
T110	---	---	---	---	---	---	---	---
T111	---	---	---	---	---	---	---	---
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T114	---	---	---	---	---	---	---	---
T115	---	---	---	---	---	---	---	---
T116	---	---	---	---	---	---	---	---
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T268	---	---	---	---	---	---	---	---
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T270	---	---	---	---	---	---	---	---
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T272	---	---	---	---	---	---	---	---
T273	---	---	---	---	---	---	---	---
T274	---	---	---	---	---	---	---	---
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T293	---	---	---	---	---	---	---	---
T294	---	---	---	---	---	---	---	---
T295	---	---	---	---	---	---	---	---
T296	---	---	---	---	---	---	---	---
T297	---	---	---	---	---	---	---	---
T298	---	---	---	---	---	---	---	---
T299	---	---	---	---	---	---	---	---
T300	---	---	---	---	---	---	---	---
T301	---	---	---	---	---	---	---	---
T302	---	---	---	---	---	---	---	---
T303	---	---	---	---	---	---	---	---
T304	---	---	---	---	---	---	---	---
T305	---	---	---	---	---	---	---	---
T306	---	---	---	---	---	---	---	---
T307	---	---	---	---	---	---	---	---
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T312	---	---	---	---	---	---	---	---
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T315	---	---	---	---	---	---	---	---
T316	---	---	---	---	---	---	---	---
T317	---	---	---	---	---	---	---	---
T318	---	---	---	---	---	---	---	---
T319	---	---	---	---	---	---	---	---
T320	---	---	---	---	---	---	---	---
T321	---	---	---	---	---	---	---	---
T322	---	---	---	---	---	---	---	---
T323	---	---	---	---	---	---	---	---
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T326	---	---	---	---	---	---	---	---
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T328	---	---	---	---	---	---	---	---
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T335	---	---	---	---	---	---	---	---
T336	---	---	---	---	---	---	---	---
T337</								

Table 3 – 115 Volts Output, 60 Hertz, Single Phase

Transformer Number	Available Line Voltage							
	B1	B2	B3	B4	B5	B6	B7	B8
	Load (kW)							
T101	180	240	240	180	180	—	240	—
T102	—	240	—	—	200	800	—	200
T103	20	—	240	—	—	—	440	—
T104	280	—	240	200	15	—	—	—
T105	—	240	—	—	15	18	—	840
T106	180	—	—	15	—	—	1.3	800
T107	—	12	—	2.4	2.7	—	—	—
T108	300	—	1.8	—	—	6.1	15	1.2
T109	—	2.4	—	8.3	3.3	—	—	—
T110	1.8	—	2.8	—	—	6.1	—	2.2
T111	2.7	3.8	—	7.2	8.0	—	4.4	3.3
T112	—	—	—	—	—	8.3	—	—
T113	—	—	—	9.5	9.6	—	—	—
T114	3.6	—	7.2	—	—	6.3	3.4	4.8
T115	—	7.2	—	14.4	15.0	—	9.8	—
T116	1.4	—	—	—	27.2	—	12.2	—
T117	—	3.6	—	—	—	—	11.3	—
T118	1.3	—	14.4	—	—	—	18.3	—
T119	—	—	—	—	—	—	—	8.9
T120	10.8	21.6	—	28.8	3.0	—	28.8	—
T121	—	14.4	—	—	—	—	17.2	—
T122	—	—	—	—	—	—	—	17.2
T123	—	—	—	—	15.3	—	—	—
T124	18.0	—	36.0	—	—	—	40.0	22.0

Table 4 – 120 Volts Output, 60 Hertz, Single Phase

Treatment Number	Available Live Insects							
	50	100	150	200	250	300	350	400
Land 80%								
T02	---	250	---	300	180	---	300	---
T03	---	300	---	250	---	---	---	---
T04	---	---	---	---	---	---	---	---
T05	---	---	---	---	---	---	---	---
T06	---	---	---	---	---	---	---	---
T07	---	---	---	---	---	---	---	---
T08	---	---	---	---	---	---	---	---
T09	---	---	---	---	---	---	---	---
T10	---	---	---	---	---	---	---	---
T11	---	---	---	---	---	---	---	---
T12	---	---	---	---	---	---	---	---
T13	---	---	---	---	---	---	---	---
T14	---	---	---	---	---	---	---	---
T15	---	---	---	---	---	---	---	---
T16	---	---	---	---	---	---	---	---
T17	---	---	---	---	---	---	---	---
T18	---	---	---	---	---	---	---	---
T19	---	---	---	---	---	---	---	---
T20	---	---	---	---	---	---	---	---
T21	---	---	---	---	---	---	---	---
T22	---	---	---	---	---	---	---	---
T23	---	---	---	---	---	---	---	---
T24	---	---	---	---	---	---	---	---
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T31	---	---	---	---	---	---	---	---
T32	---	---	---	---	---	---	---	---
T33	---	---	---	---	---	---	---	---
T34	---	---	---	---	---	---	---	---
T35	---	---	---	---	---	---	---	---
T36	---	---	---	---	---	---	---	---
T37	---	---	---	---	---	---	---	---
T38	---	---	---	---	---	---	---	---
T39	---	---	---	---	---	---	---	---
T40	---	---	---	---	---	---	---	---
T41	---	---	---	---	---	---	---	---
T42	---	---	---	---	---	---	---	---
T43	---	---	---	---	---	---	---	---
T44	---	---	---	---	---	---	---	---
T45	---	---	---	---	---	---	---	---
T46	---	---	---	---	---	---	---	---
T47	---	---	---	---	---	---	---	---
T48	---	---	---	---	---	---	---	---
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T50	---	---	---	---	---	---	---	---
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T64	---	---	---	---	---	---	---	---
T65	---	---	---	---	---	---	---	---
T66	---	---	---	---	---	---	---	---
T67	---	---	---	---	---	---	---	---
T68	---	---	---	---	---	---	---	---
T69	---	---	---	---	---	---	---	---
T70	---	---	---	---	---	---	---	---
T71	---	---	---	---	---	---	---	---
T72	---	---	---	---	---	---	---	---
T73	---	---	---	---	---	---	---	---
T74	---	---	---	---	---	---	---	---
T75	---	---	---	---	---	---	---	---
T76	---	---	---	---	---	---	---	---
T77	---	---	---	---	---	---	---	---
T78	---	---	---	---	---	---	---	---
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T80	---	---	---	---	---	---	---	---
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T82	---	---	---	---	---	---	---	---
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T89	---	---	---	---	---	---	---	---
T90	---	---	---	---	---	---	---	---
T91	---	---	---	---	---	---	---	---
T92	---	---	---	---	---	---	---	---
T93	---	---	---	---	---	---	---	---
T94	---	---	---	---	---	---	---	---
T95	---	---	---	---	---	---	---	---
T96	---	---	---	---	---	---	---	---
T97	---	---	---	---	---	---	---	---
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T100	---	---	---	---	---	---	---	---
Control Group 1	C	C	C	C	C	C	C	C

* Load MVA is the maximum load at voltages shown when transformers are connected as autotransformers, according to the diagram referenced and shown on back page.

When 208 is the available line voltage, use the 212 voltage column. This will result in output voltage of 236 volts, which should be sufficient for most applications.

† Warning — 3 phase autotransformers should never be used to obtain 4 wire output with 3 wire input

FAQ #12

Page 1 of 2

FREQUENTLY ASKED QUESTIONS

Vacuum Pumps

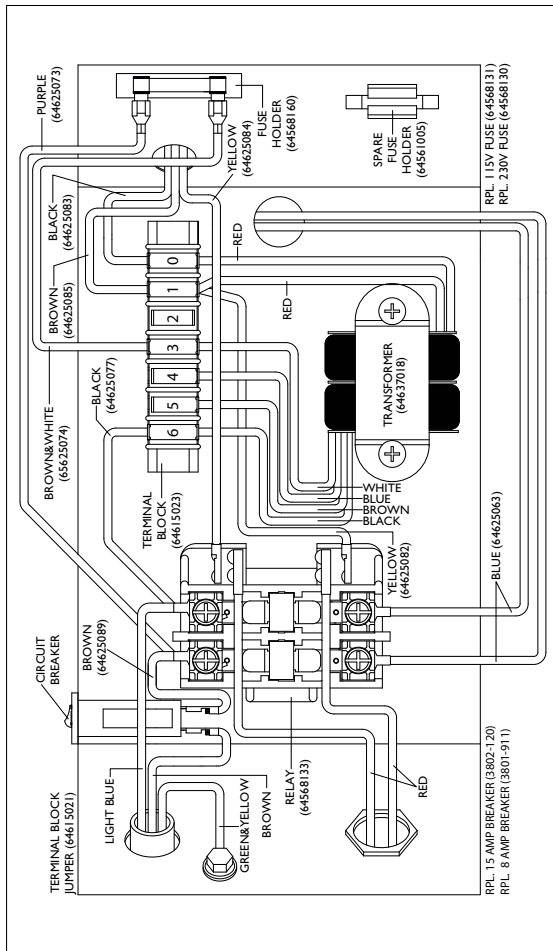
Table 5 – 230 Volts 3 Wire Output, 60 Hertz Single Phase

Quantity Required Per Bank	Transformer Number	Available Line Voltage			
		187V/0	208V/1	230V/2	252V/22
Load kW					
1	T102	420	480	1.3	1.7
2	T103	840	960	2.6	3.4
3	T104	1260	1440	3.9	5.1
4	T105	1680	1920	5.2	6.8
5	T106	2100	2400	6.5	8.5
6	T107	2520	2880	7.8	10.2
7	T108	2940	3360	9.1	11.9
8	T109	3360	3840	10.4	13.6
9	T110	3780	4320	11.7	15.3
10	T111	4200	4800	13.0	17.0
11	T112	4620	5280	14.3	18.7
12	T113	5040	5760	15.6	20.4
13	T114	5460	6240	16.9	22.1
14	T115	5880	6720	18.2	23.8
15	T116	6300	7200	19.5	25.5
16	T117	6720	7680	20.8	27.2
17	T118	7140	8160	22.1	28.9
18	T119	7560	8640	23.4	30.6
19	T120	7980	9120	24.7	32.3
20	T121	8400	9600	26.0	34.0
21	T122	8820	10080	27.3	35.7
22	T123	9240	10560	28.6	37.4
23	T124	9660	11040	29.9	39.1
24	T125	10080	11520	31.2	40.8
25	T126	10500	12000	32.5	42.5
26	T127	10920	12480	33.8	44.2
27	T128	11340	12960	35.1	45.9
28	T129	11760	13440	36.4	47.6
29	T130	12180	13920	37.7	49.3
30	T131	12600	14400	39.0	51.0
31	T132	13020	14880	40.3	52.7
32	T133	13440	15360	41.6	54.4
33	T134	13860	15840	42.9	56.1
34	T135	14280	16320	44.2	57.8
35	T136	14700	16800	45.5	59.5
36	T137	15120	17280	46.8	61.2
37	T138	15540	17760	48.1	62.9
38	T139	15960	18240	49.4	64.6
39	T140	16380	18720	50.7	66.3
40	T141	16800	19200	52.0	68.0
41	T142	17220	19680	53.3	69.7
42	T143	17640	20160	54.6	71.4
43	T144	18060	20640	55.9	73.1
44	T145	18480	21120	57.2	74.8
45	T146	18900	21600	58.5	76.5
46	T147	19320	22080	59.8	78.2
47	T148	19740	22560	61.1	79.9
48	T149	20160	23040	62.4	81.6
49	T150	20580	23520	63.7	83.3
50	T151	21000	24000	65.0	85.0
51	T152	21420	24480	66.3	86.7
52	T153	21840	24960	67.6	88.4
53	T154	22260	25440	68.9	90.1
54	T155	22680	25920	70.2	91.8
55	T156	23100	26400	71.5	93.5
56	T157	23520	26880	72.8	95.2
57	T158	23940	27360	74.1	96.9
58	T159	24360	27840	75.4	98.6
59	T160	24780	28320	76.7	100.3
60	T161	25200	28800	78.0	102.0
61	T162	25620	29280	79.3	103.7
62	T163	26040	29760	80.6	105.4
63	T164	26460	30240	81.9	107.1
64	T165	26880	30720	83.2	108.8
65	T166	27300	31200	84.5	110.5
66	T167	27720	31680	85.8	112.2
67	T168	28140	32160	87.1	113.9
68	T169	28560	32640	88.4	115.6
69	T170	28980	33120	89.7	117.3
70	T171	29400	33600	91.0	119.0
71	T172	29820	34080	92.3	120.7
72	T173	30240	34560	93.6	122.4
73	T174	30660	35040	94.9	124.1
74	T175	31080	35520	96.2	125.8
75	T176	31500	36000	97.5	127.5
76	T177	31920	36480	98.8	129.2
77	T178	32340	36960	100.1	130.9
78	T179	32760	37440	101.4	132.6
79	T180	33180	37920	102.7	134.3
80	T181	33600	38400	104.0	136.0
81	T182	34020	38880	105.3	137.7
82	T183	34440	39360	106.6	139.4
83	T184	34860	39840	107.9	141.1
84	T185	35280	40320	109.2	142.8
85	T186	35700	40800	110.5	144.5
86	T187	36120	41280	111.8	146.2
87	T188	36540	41760	113.1	147.9
88	T189	36960	42240	114.4	149.6
89	T190	37380	42720	115.7	151.3
90	T191	37800	43200	117.0	153.0
91	T192	38220	43680	118.3	154.7
92	T193	38640	44160	119.6	156.4
93	T194	39060	44640	120.9	158.1
94	T195	39480	45120	122.2	159.8
95	T196	39900	45600	123.5	161.5
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117	T218	49140	56160	152.1	198.9
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129	T230	54180	61920	167.7	219.3
130	T231	54600	62400	169.0	221.0
131	T232	55020	62880	170.3	222.7
132	T233	55440	63360	171.6	224.4
133	T234	55860	63840	172.9	226.1
134	T235	56280	64320	174.2	227.8
135	T236	56700	64800	175.5	229.5
136	T237	57120	65280	176.8	231.2
137	T238	57540	65760	178.1	232.9
138	T239	57960	66240	179.4	234.6
139	T240	58380	66720	180.7	236.3
140	T241	58800	67200	182.0	238.0
141	T242	59220	67680	183.3	239.7
142	T243	59640	68160	184.6	241.4
143	T244	60060	68640	185.9	243.1
144	T245	60480	69120	187.2	244.8
145	T246	60900	69600	188.5	246.5
146	T247	61320	70080	189.8	248.2
147	T248	61740	70560	191.1	249.9
148	T249	62160	71040	192.4	251.6
149	T250	62580	71520	193.7	253.3
150	T251	63000	72000	195.0	255.0
151	T252	63420	72480	196.3	256.7
152	T253	63840	72960	197.6	258.4
153	T254	64260	73440	198.9	260.1
154	T255	64680	73920	200.2	261.8
155	T256	65100	74400	201.5	263.5
156	T257	65520	74880	202.8	265.2
157	T258	65940	75360	204.1	266.9
158	T259	66360	75840	205.4	268.6
159	T260	66780	76320	206.7	270.3
160	T261	67200	76800	208.0	272.0
161	T262	67620	77280	209.3	273.7
162	T263	68040	77760	210.6	275.4
163	T264	68460	78240	211.9	277.1
164	T265	68880	78720	213.2	278.8
165	T266	69300	79200	214.5	280.5
166	T267	69720	79680	215.8	282.2
167	T268	70140	80160	217.1	283.9
168	T269	70560	80640	218.4	285.6
169	T270	70980	81120	219.7	287.3
170	T271	71400	81600	221.0	289.0
171	T272	71820	82080	222.3	290.7
172	T273	72240	82560	223.6	292.4
173	T274	72660	83040	224.9	294.1
174	T275	73080	83520	226.2	295.8
175	T276	73500	84000	227.5	297.5
176	T277	73920	84480	228.8	299.2
177	T278	74340	84960	230.1	300.9
178	T279	74760	85440	231.4	302.6
179	T280	75180	85920	232.7	304.3
180	T281	75600	86400	234.0	306.0
181	T282	76020	86880	235.3	307.7
182	T283	76440	87360	236.6	309.4
183	T284	76860	87840	237.9	311.1
184	T285	77280	88320	239.2	312.8
185	T286	77700	88800	240.5	314.5
186	T287	78120	89280	241.8	316.2
187	T288	78540	89760	243.1	317.9
188	T289	78960	90240	244.4	319.6
189	T290	79380	90720	245.7	321.3
190	T291	79800	91200	247.0	323.0
191	T292	80220	91680	248.3	324.7
192	T293	80640	92160	249.6	326.4
193	T294	81060	92640	250.9	328.1
194	T295	81480	93120	252.2	329.8
195	T296	81900	93600	253.5	331.5
196	T297	82320	94080	254.8	333.2
197	T298	82740	94560	256.1	334.9
198	T299	83160	95040	257.4	336.6
199	T300	83580	95520	258.7	338.3

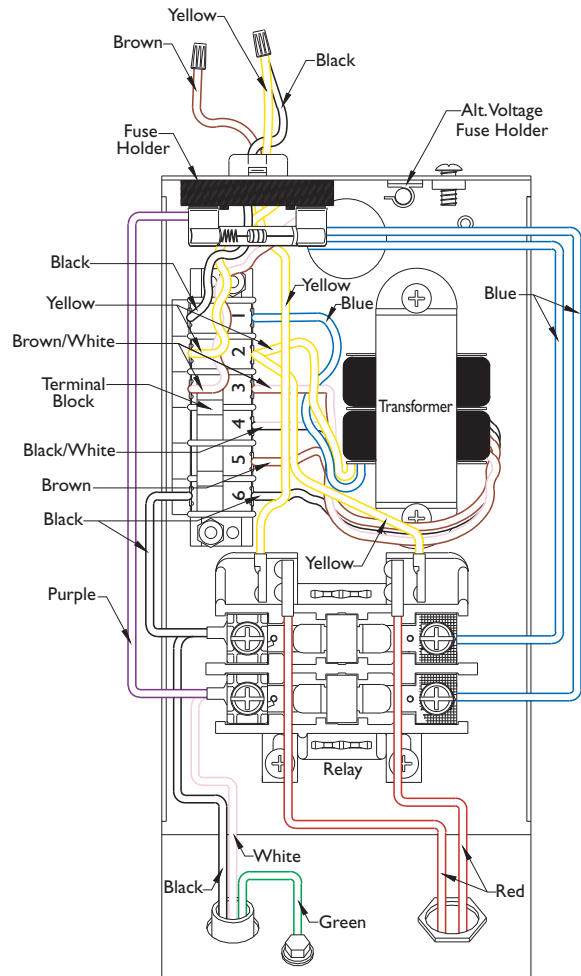
Vacuum Pumps

How is a new transformer wired in an old relay box? (V Series)

New Transformer



Old Relay Box



CustomAir

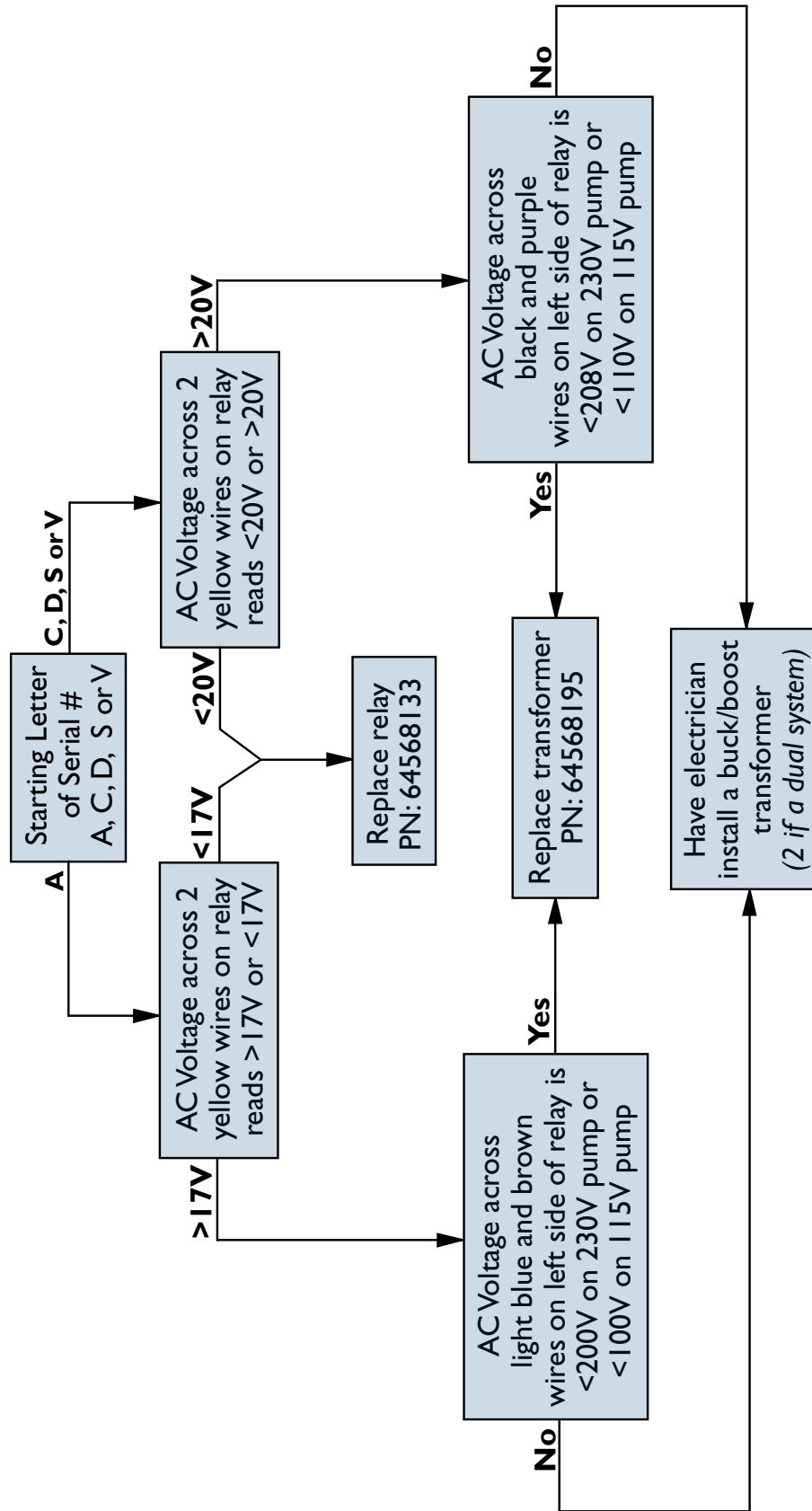
FAQ #13

DentalEZ

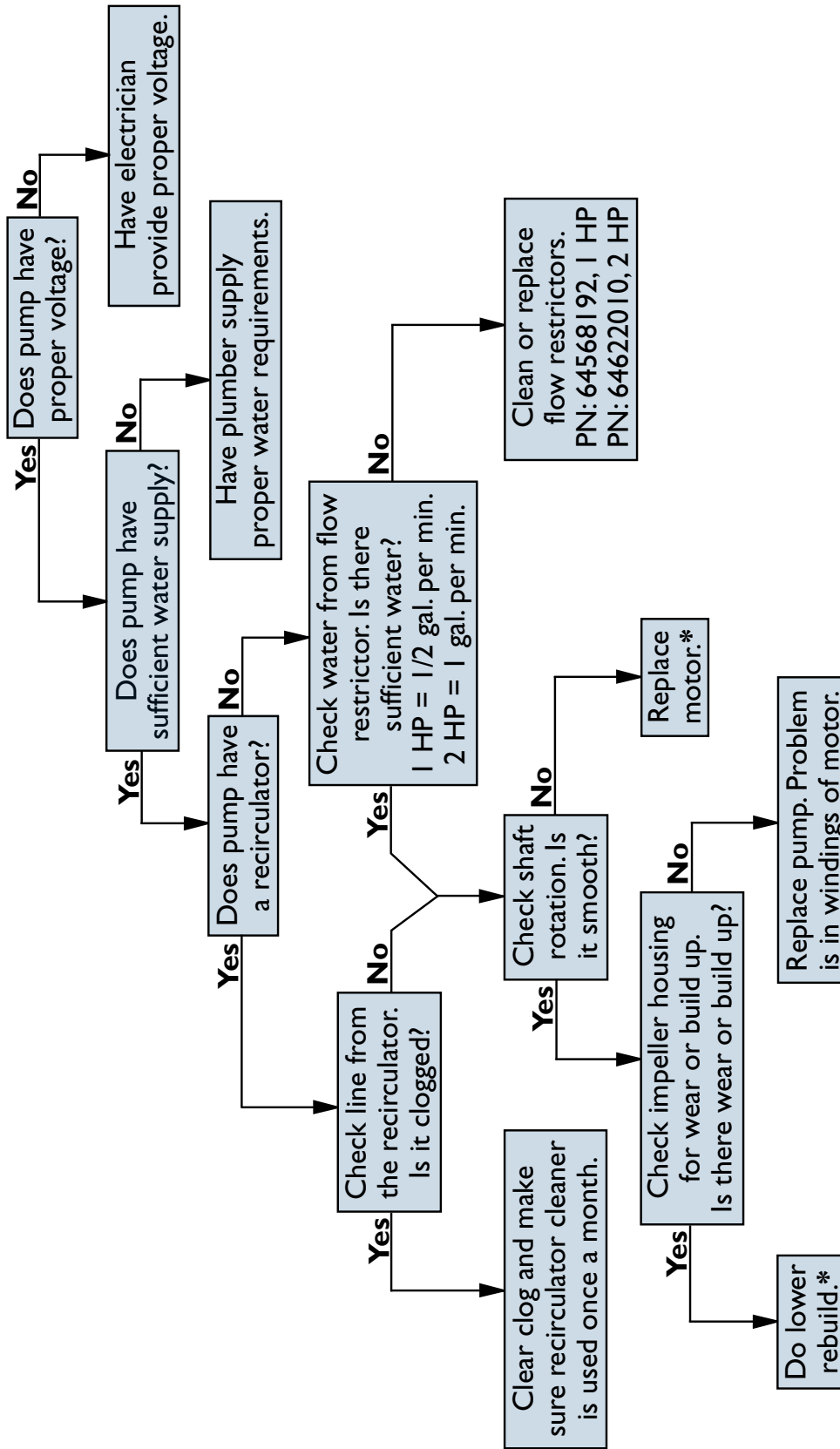
Technical Manual

CustomAir

Why won't the vacuum relay engage and the pump doesn't turn on?



Why does the vacuum pump shut down, cool then restart?



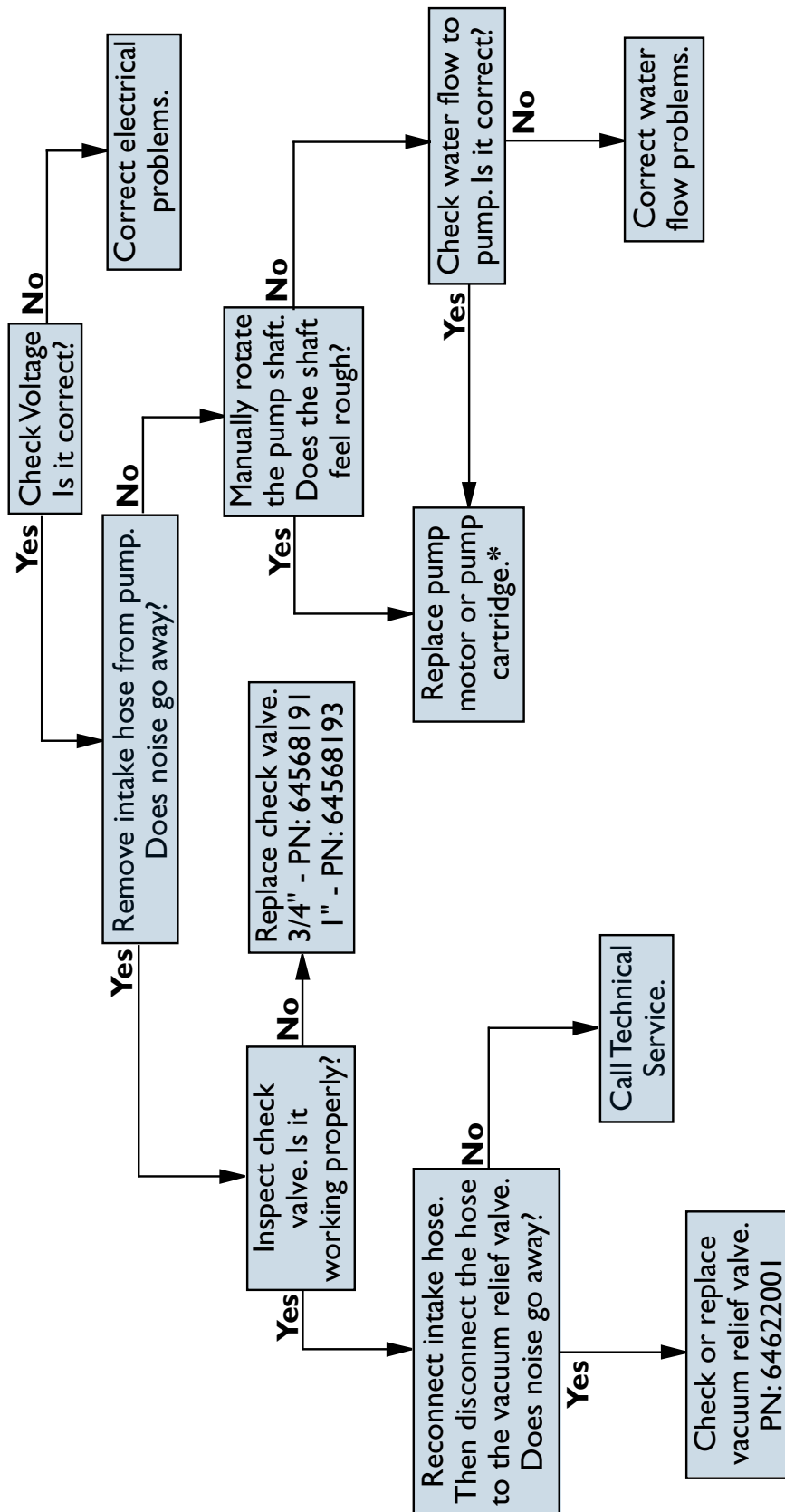
* For part # information contact Tech Service at 1-866-DTE-INFO.

CustomAir

FAQ #29

Vacuum Pumps

Why does pump make squealing/whistling sound?

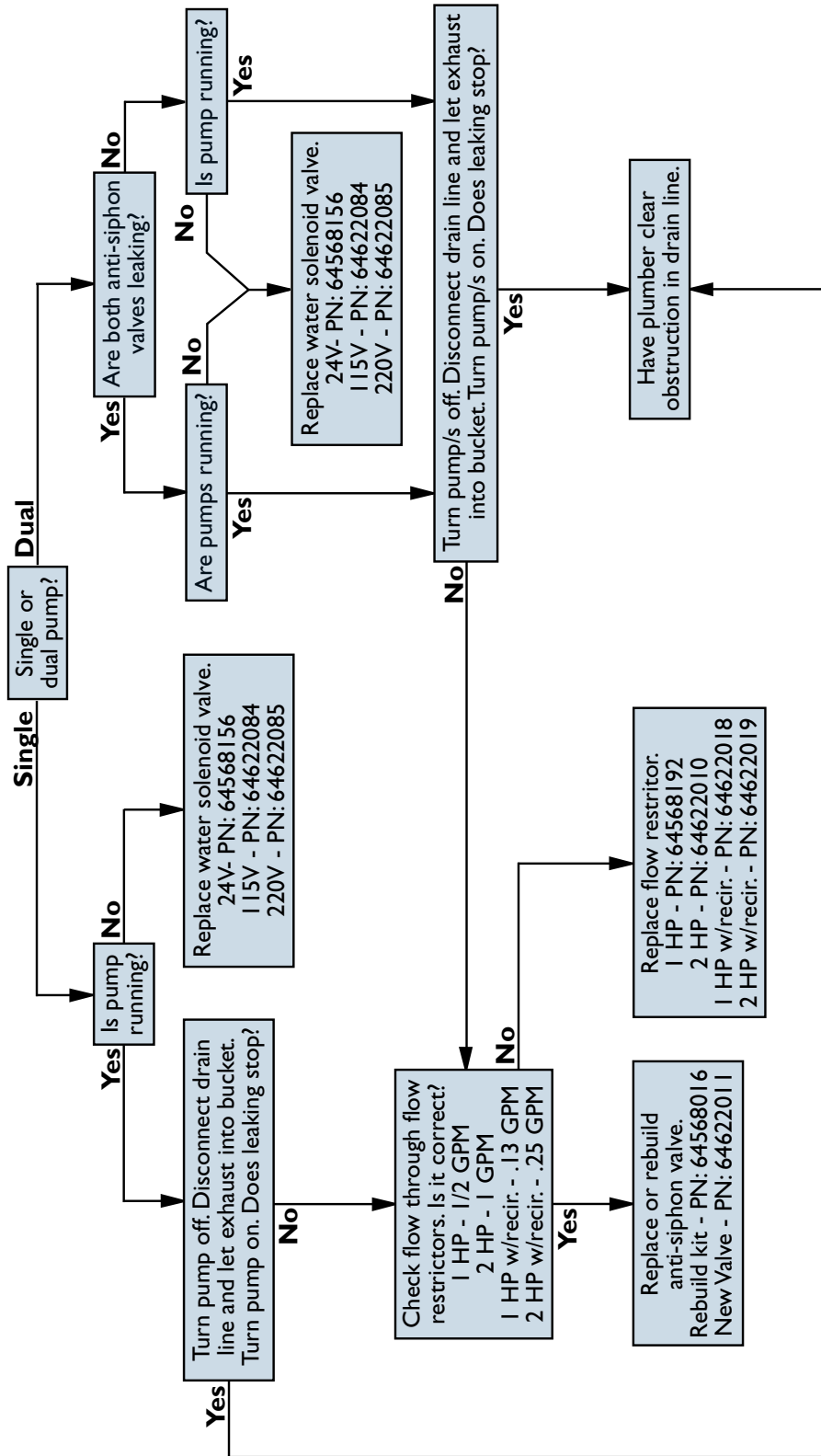


* Contact Tech Service at 1-866-DTE-INFO.

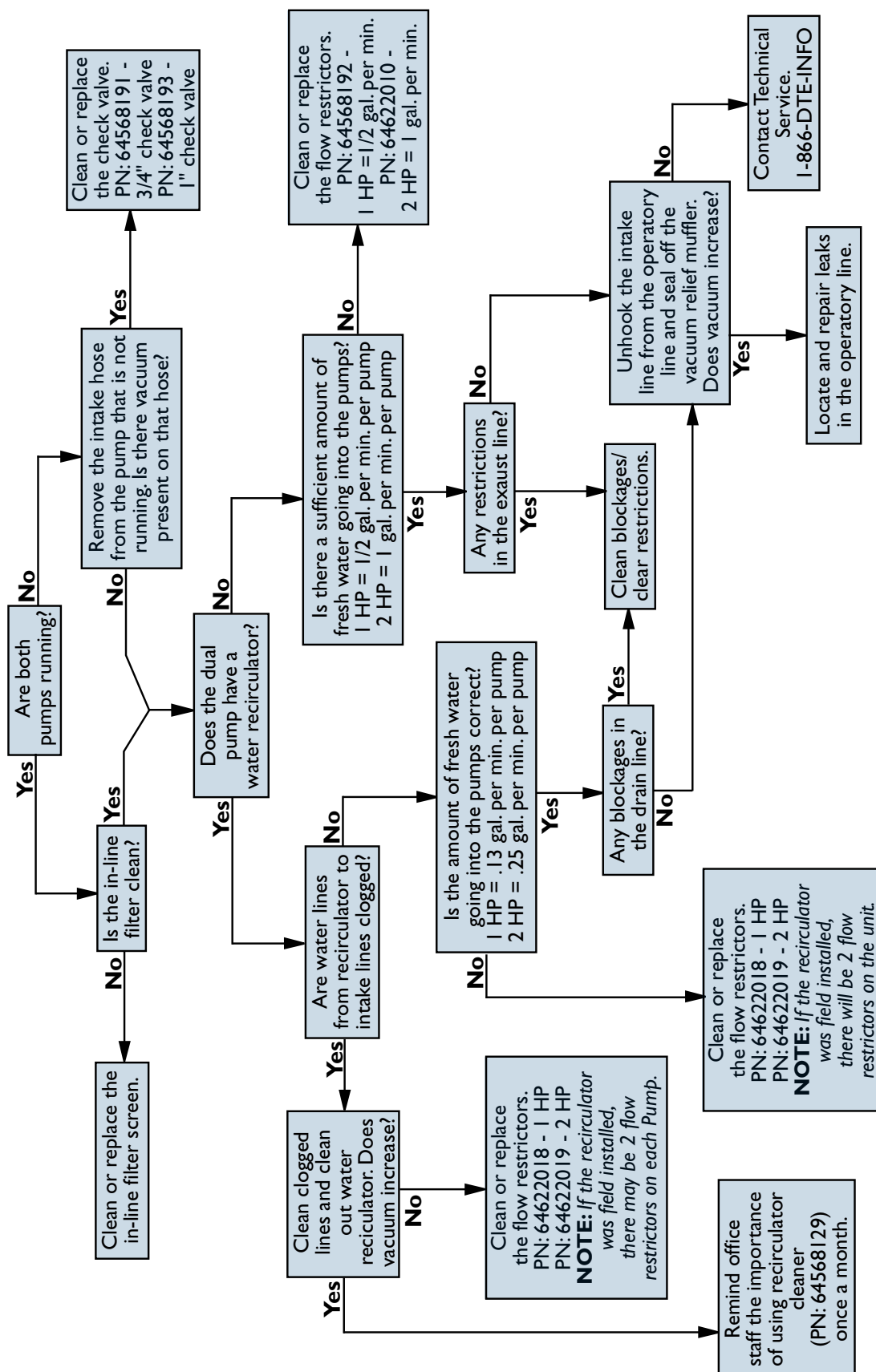
CustomAir

FAQ #32

Why does water leak from the anti-siphon valve?



Why is vacuum from dual pump weak?



Wet Vacuum Pumps

Vacuum Pump		
Symptom	Possible Cause(s)	Solution
Pump will not run	Check all wires for loose or broken connections. Check fuse. Check low voltage leads (<i>yellow and black wires</i>) for 24 volts.	If voltage is not present, replace the transformer or fuse. (<i>Also see Electrical Problems Chart.</i>)(On Page 29)
	Turn power on and off watching to see if relay breaker bar operates properly.	If relay not operating properly, and assuming all other parts are good, replace the relay. (<i>Also see Electrical Problems Chart.</i>)(On Page 29)
	Test solenoid valve by loosening brass nut on right side. If water flows out with power on, turn power off. Water flow should stop. Caution: Do not operate the pump for an extended time, because running the pump without water could cause internal damage.	If water flow does not stop with power off, replace the solenoid valve.
Motor stops or will not start	Circuit breaker, main cut-off and low-voltage operatory switches are in the OFF position.	Place switches in ON position.
	Unit is not plugged in.	Plug in unit.
	Loose or broken wires.	Tighten, repair or replace wires.
	Motor hums indicating a bad capacitor.	Replace capacitor.
	Tight or noisy motor.	Check bearings. Make sure pump is properly shimmed to the motor. Or, remove any debris in the pump.
	Motor is overheating.	Make sure the vacuum relief valve is adjusted properly and the motor has sufficient ventilation and water supply. Check for low line voltage.

Wet Vacuum Pumps

Vacuum Pump (Continued)

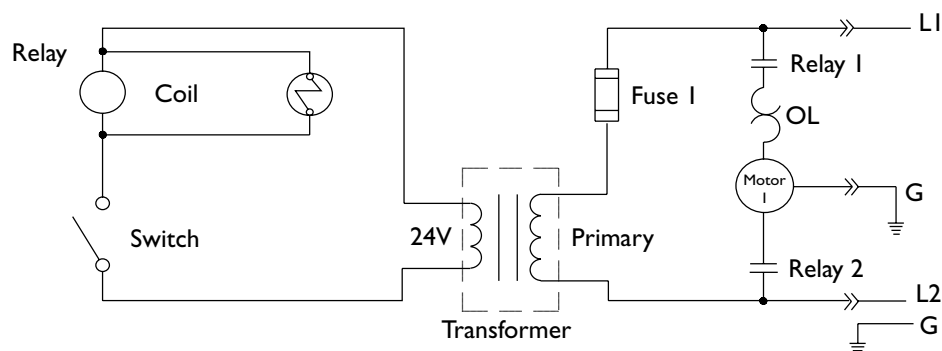
Symptom	Possible Cause(s)	Solution
Low or no vacuum	Dirty filter	Clean operatory and secondary filters if necessary.
	Water control assembly clogged not allowing water to go through pump.	Turn pump OFF immediately to prevent internal damage. Then unclog water control assembly.
	Loose or broken vacuum line connections.	Tighten, repair or replace vacuum line connections.
	Swing check valves clogged allowing pump to suction through the other pump.	Take off the top of the valve and, if possible, remove debris. Otherwise, the valve should be replaced.
	Pump is worn out.	Refer to pump repair section.
	Insufficient water supply.	Check supply where it connects to the cabinet. Then, check the water control valve. The water control solenoid valve opens when the pump is turned on. Check this function by disconnecting the water line that enters the vacuum housing and by holding a container under the valve. Then, turn on the pump. There should be a steady stream of water. CAUTION: DO NOT LEAVE THE PUMP RUNNING WITHOUT WATER! If there is no water flow, replace the water control solenoid valve.

Wet Vacuum Pumps

Electrical System		
Symptom	Possible Cause(s)	Solution
Pump not running because of suspect electrical problem	Main power supply has blown fuse or circuit breaker.	Replace blown fuse or reset circuit breaker.
	Power not reaching pump or incorrect voltage.	Check connection box on the side of the dual cabinet to verify power is reaching the pump and main power supply is the correct voltage.
	Blown fuse in the control box.	Replace the fuse with the same rated capacity as the one from the factory.
	Loose connections inside the control box.	Remove the control box cover and visually inspect for loose connections. <i>(Refer to the schematic inside the control box cover for the components and wiring scheme for that particular box.)</i>
Motor does not start by switch	Defective transformer or coil in the relay.	Using a non-conductive device, push in the tabs on the relay to determine if the motor will start. Then using electrical test equipment, verify the voltage coming out of the secondary side of the transformer. If it is less than 21V, replace the transformer. If it is more than 21V, replace the relay.

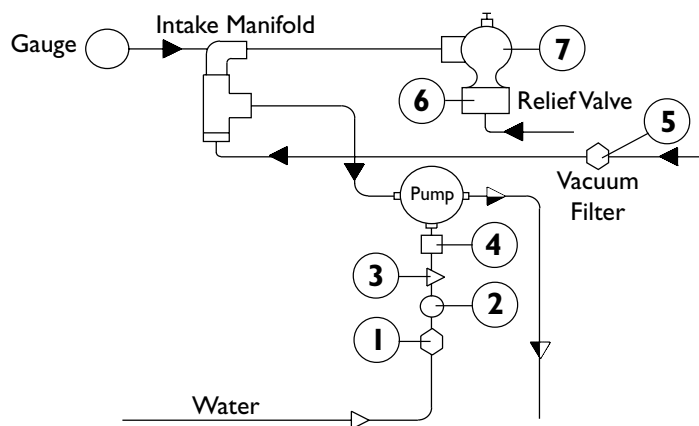
CV-101FS / CV102FS

Wiring Schematic



The Dual Wet Vacuum electrical control system is a low-voltage (24V) circuit. This system also provides automatic control of the water supply system. The wiring schematic shows for electrical rough-in.

Air/Water Flow Circulation Diagram



The circulation diagram shows the relationship of all the major assemblies to the total system. All connecting lines are marked with a symbol to indicate their function: vacuum line, water line or waste line. The assemblies are individually broken down and further explained in other sections of this manual.

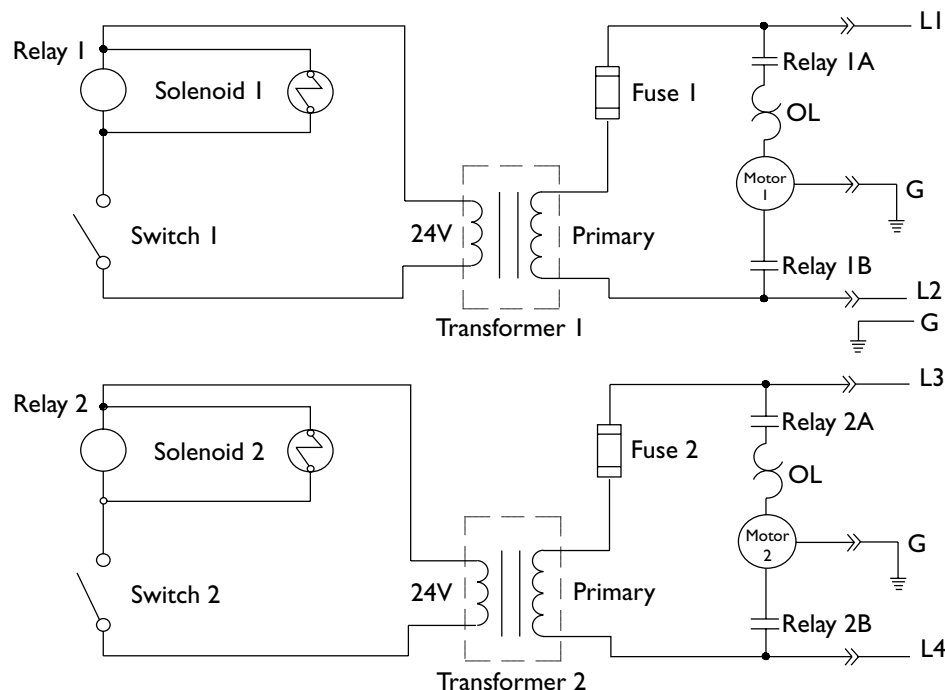
No.	Qty.	Part No.	Description
1	2	64568135	Filter, Water
2	2	64568156	Valve, Solenoid (Only)
3	2	64622011	Valve, Anti-Siphon
4A	2	64568192	Valve, Flow Regulator--1 HP
4B	2	64622010	Valve, Flow Regulator--2 HP

No.	Qty.	Part No.	Description
5	1	64545040	Filter, Vacuum
6	1	64568159	Muffler, Vacuum Relief
7	1	64622001	Valve, Vacuum Relief

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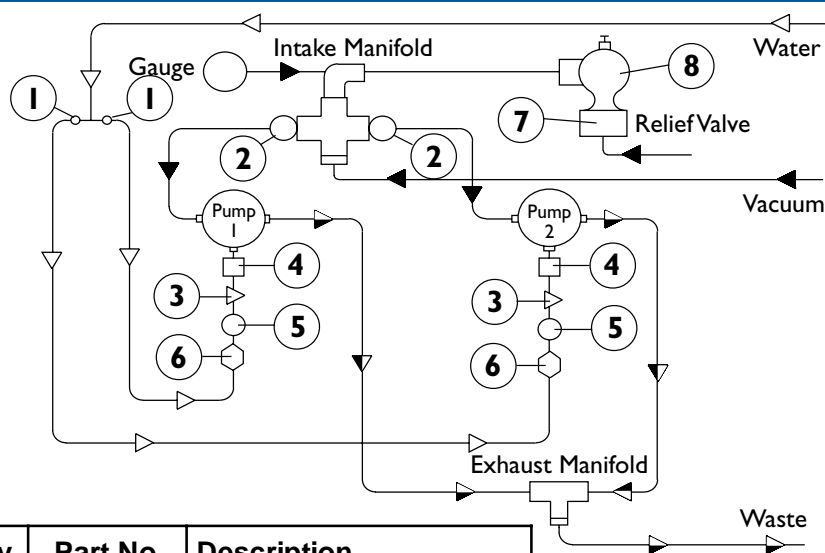
MC-201 FS / MC-202 FS

Wiring Schematic



The Dual Wet Vacuum electrical control system is a low-voltage (24V) circuit, designed to provide two totally independent control systems for each pump unit. This system also provides automatic control of the water supply system for each pump. The wiring schematic shows for electrical rough-in.

Air/Water Flow Circulation Diagram



The circulation diagram shows the relationship of all the major assemblies to the total system. All connecting lines are marked with a symbol to indicate their function: vacuum line, water line or waste line. The assemblies are individually broken down and further explained in other sections of this manual.

No.	Qty.	Part No.	Description
1	2	64622012	Valve, Water Shutoff
2	2	64568191	Valve, Swing Check
3	2	64622011A	Valve, Anti-Siphon
4A	2	64568192	Valve, Flow Regulator--1 HP
4B	2	64622010	Valve, Flow Regulator--2 HP

No.	Qty.	Part No.	Description
5	2	64568156	Valve, Solenoid (Only)
6	2	64568135	Filter, Water
7	1	64568159	Muffler, Vacuum Relief
8	1	64622001	Valve, Vacuum Relief

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Wet Vacuum Pumps

Remote Low-Voltage Switch Control

— NOTICE —

All wiring between the main control box and equipment should be **Class B, low-voltage**. *In most cases, a conduit is **not** required when using this type of wiring.*

— WARNING —

Before proceeding with any electrical installation, comply with and maintain all applicable local electrical code(s) and regulations.

IMPORTANT NOTE: *If not using a DentalEZ Master Control Panel Kit, proceed as follows:*

1. Position the master switch in the desired location.
2. Run the appropriate wires to their respective equipment location. *(See wiring chart below.)*
3. Connect wires according to the wiring diagrams on the next two pages.

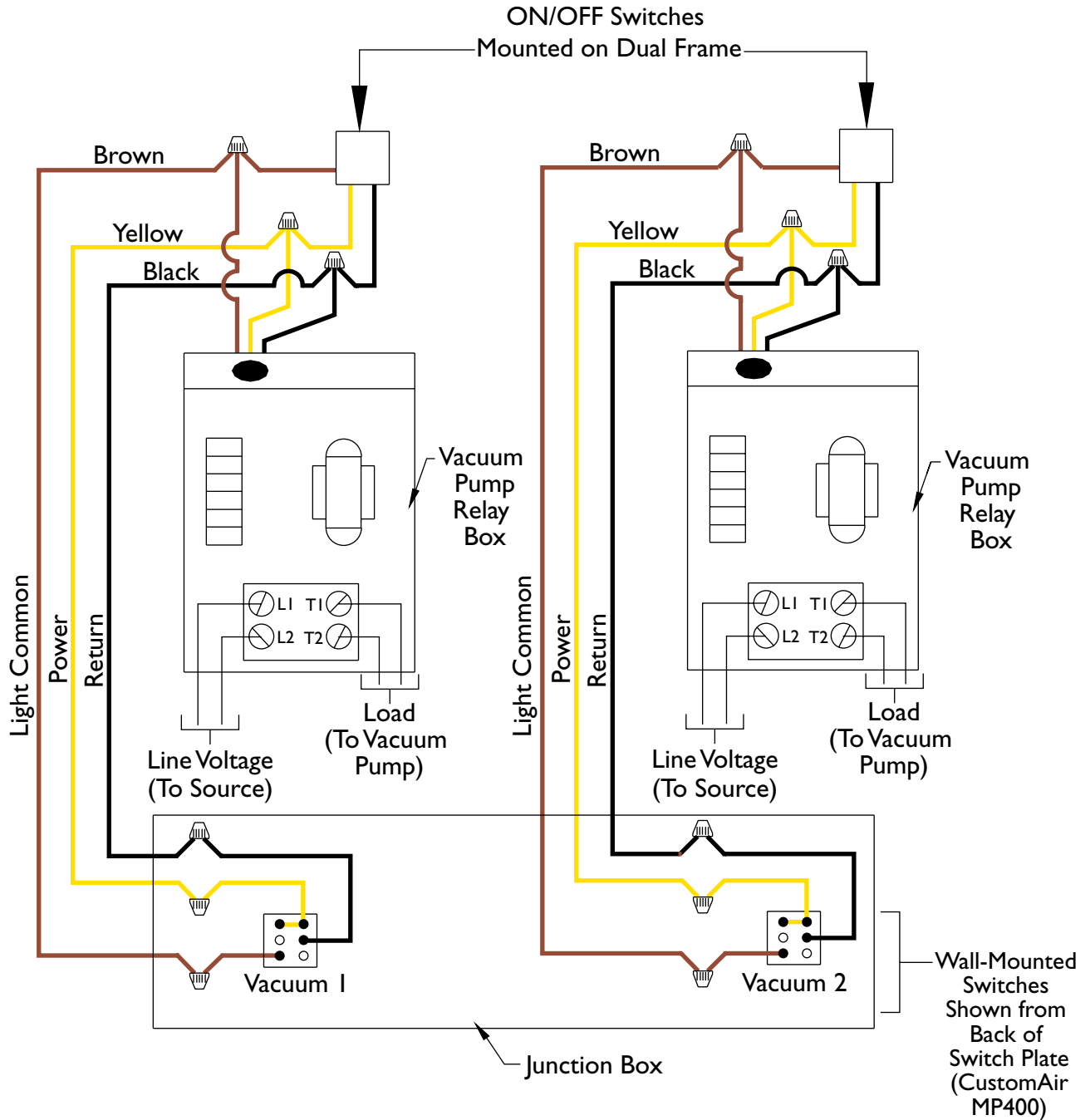
WIRING CHART

Model No.	No. of Wires	Wire Under 150 ft.	Wire Over 150 ft.
CV-101	3	18 AWG	16 AWG
CV-102	3	18 AWG	16 AWG
DV-301	3	18 AWG	16 AWG
DV-302	3	18 AWG	16 AWG
MC-201	6	18 AWG	16 AWG
MC-202	6	18 AWG	16 AWG
Air Compressor	3	18 AWG	16 AWG
MWCV Solenoid Valve	2	18 AWG	16 AWG
MWCV Transformer	2	18 AWG	16 AWG

MC-201 FS / MC-202 FS

Two Switch, Dual Vacuum System

IMPORTANT NOTE: Refer to wiring chart on Page 32 for length and gauge of wire.

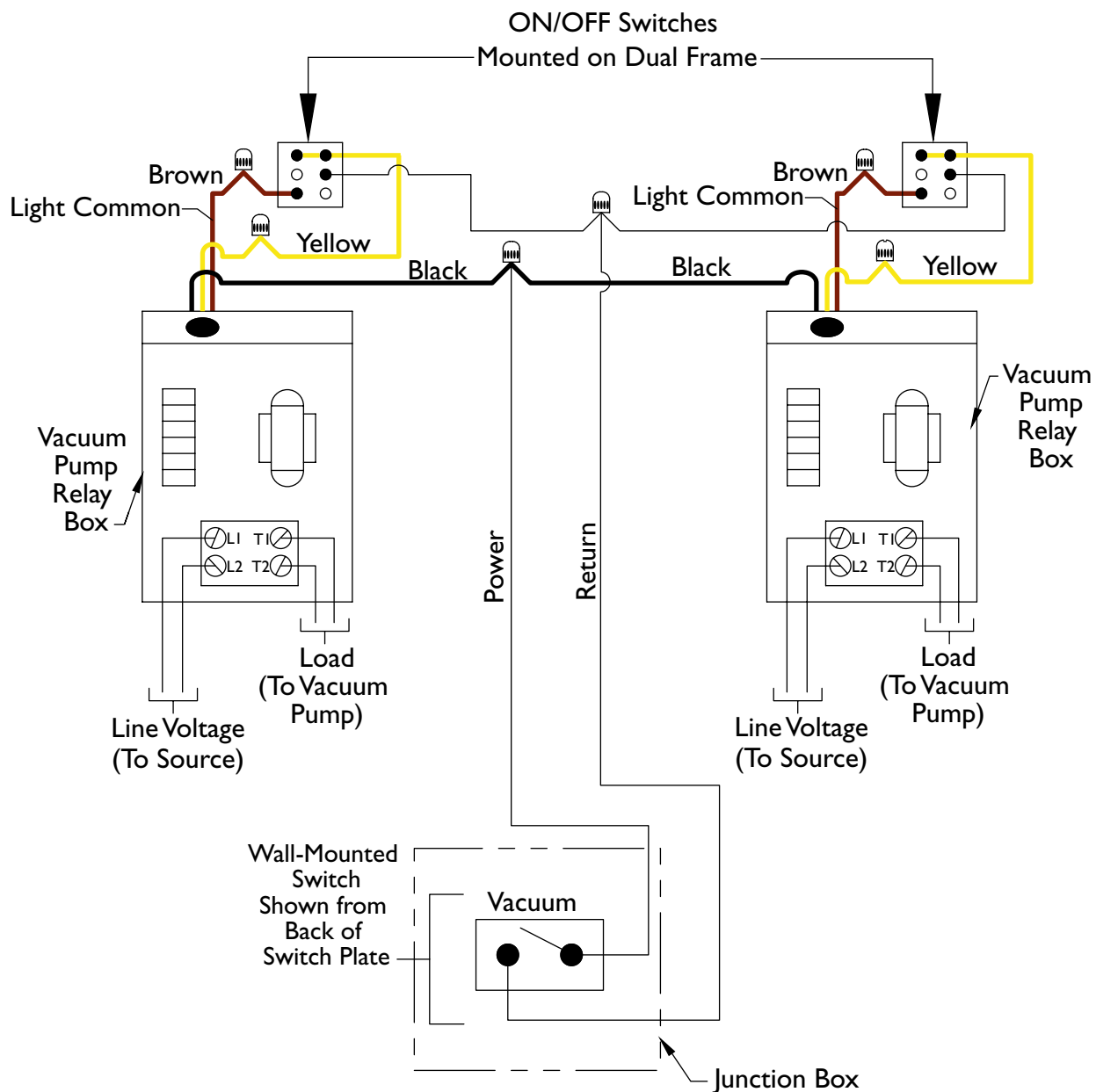


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MC-201 FS / MC-202 FS

One Switch, Dual Vacuum System

IMPORTANT NOTE: Refer to wiring chart on Page 32 for length and gauge of wire.



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Vacuum Pump System Repair Procedure

If the motor does not start after checking through the troubleshooting charts, the motor may be defective. If the pump must be removed for factory repair or replacement, perform the following vacuum pump system repair procedure:

Tools Required:

- Wire Stripper/Crimper
- 1/4", 5/16", 11/32" and 3/8" Nut Driver
- 7/16", 1/2", 9/16" and 15/16" Open-end Wrench
- 1-3/4" Socket and Torque Wrench
- 15/16" Socket with Ratchet
- Hammer
- Flat-blade Screwdriver
- Wire Cutter
- Needle-nose Pliers
- Channel-lock Pliers
- Paint Scraper
- Pump Motor Holding Fixture:
DTE# 64546001
- Pop Riveter
- Bench Vise
- Bearing Seal Lubricant
- Red Loctite/Pipe Sealant:
Item# 57141

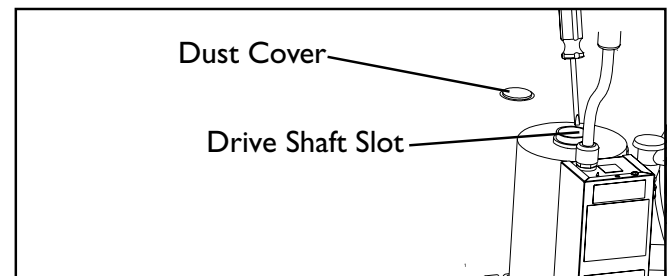
— WARNING —

Do not attempt these repairs in the dental office.

Test Procedure — Diagnostic

Determine if the required repair procedure is electrical or mechanical.

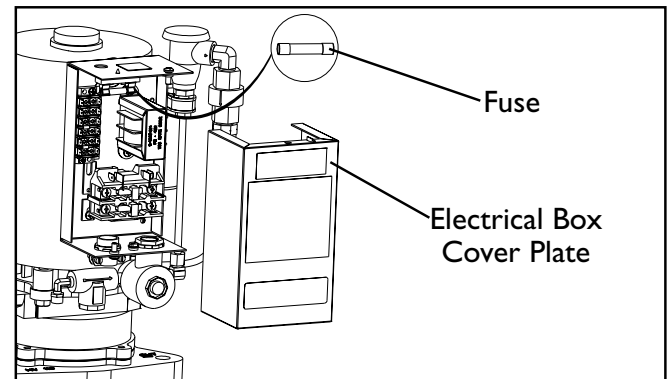
1. Unplug the electrical supply cord.
2. Using the manual valve, turn **OFF** the water supply.
3. Remove the dust cover located at the top center of the motor.



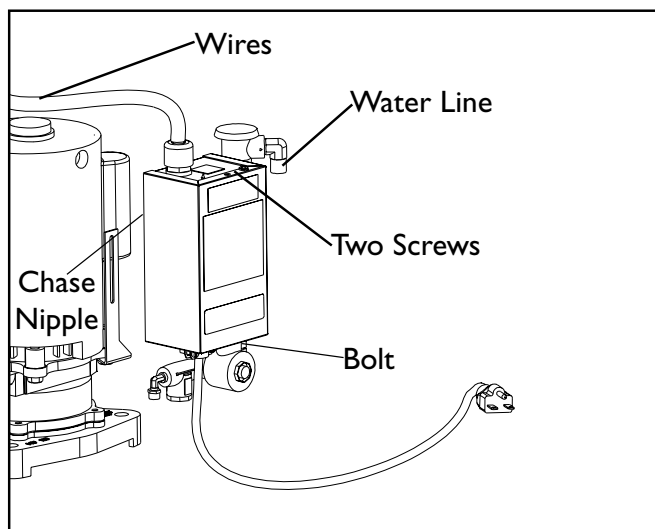
4. Using a flat-blade screwdriver, engage the slot in the drive shaft and rotate the shaft to check for free movement:
 - If the shaft moves smoothly, proceed to **Electrical Box Removal**.
 - If the shaft is difficult to turn or is jammed, proceed to **Pump Removal/Disassembly**.

Electrical Box Removal

1. Remove the electrical box cover plate.



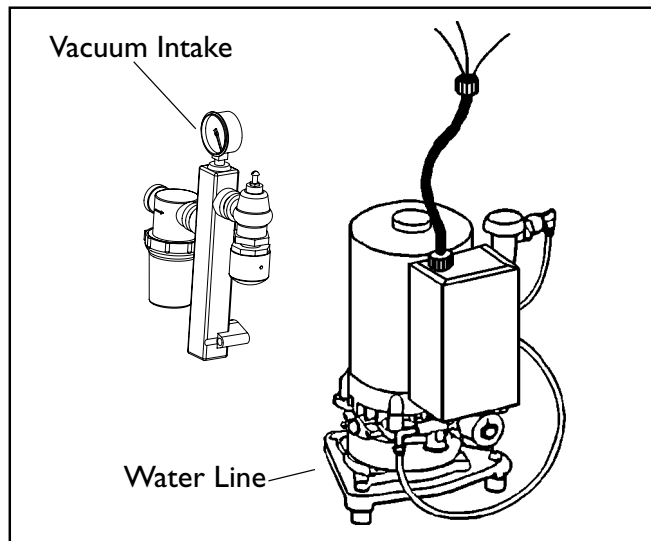
2. Check the wire leads to the motor for breaks or bad connections.
3. Check the fuse and check for loose or broken wires in the electrical box.
4. Disconnect the wires from the top of the motor and pull through the box.



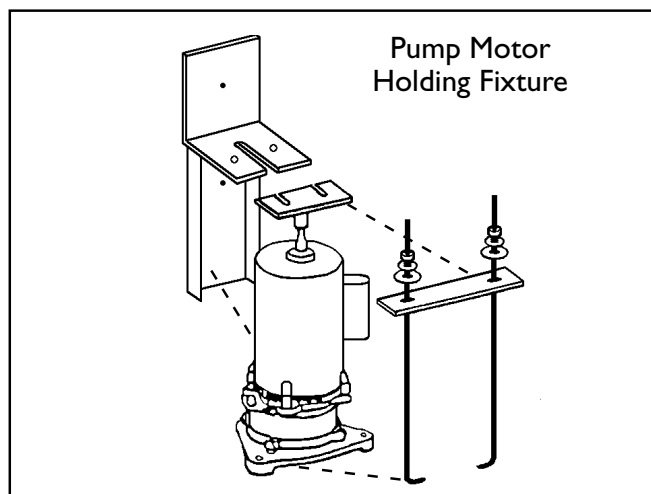
5. Remove the water line from the pump housing.
6. Remove the bolt from the bottom of the electrical box where the bracket is attached.
7. Remove the two screws and nuts from the terminal board located at the top of the electrical box (*old style*).
8. Remove the chase nipple from inside the box where it screws to the motor.

Pump Removal/Disassembly

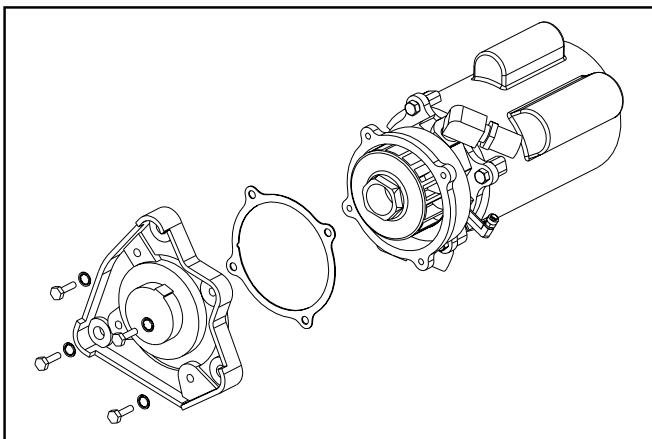
1. Remove the motor cover plate (*top of motor*).
2. Shut **OFF** the valve supplying water to the pump.
3. Disconnect the vacuum and exhaust lines at the pump and install line closure plugs.
4. Disconnect the two motor wire leads from the electrical terminal.



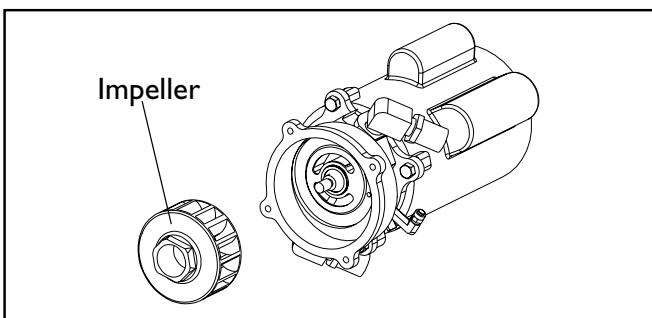
5. Disconnect the waste and input lines from the pump and cap off the lines using the closure plugs provided.
6. Disconnect the vacuum intake manifold.
7. Disconnect the water line at the pump.
8. Disconnect the low voltage wires from the remote switch circuit.
9. Mount the motor in the pump motor holding fixture by aligning the slot in the motor's shaft to the holding blade. Then connect the hold down brackets and tighten so the motor will not rotate in the fixture.



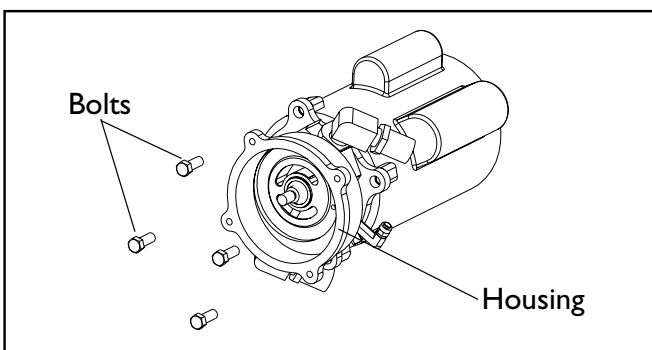
10. Take off the base by removing the bolts that secure it to the housing. Then inspect the base for excessive scoring or side wear.



11. Remove the impeller by unscrewing counterclockwise. Then inspect the impeller for any pitting or scoring.

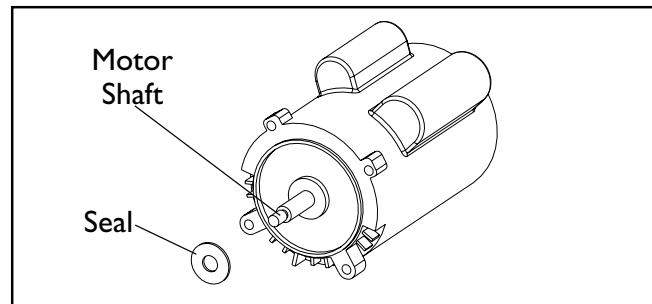


12. Remove the housing bolts and take off the housing by pulling it off the shaft.
13. Remove the water seal spring assembly then inspect the housing for pitting or scoring.

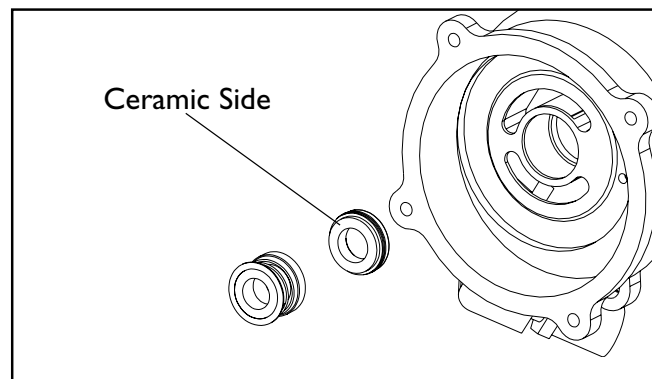


Pump to Motor Assembly

1. Apply lubricating oil to the motor shaft, seal and housing.



2. Press the seal into the housing with the ceramic side facing outward.



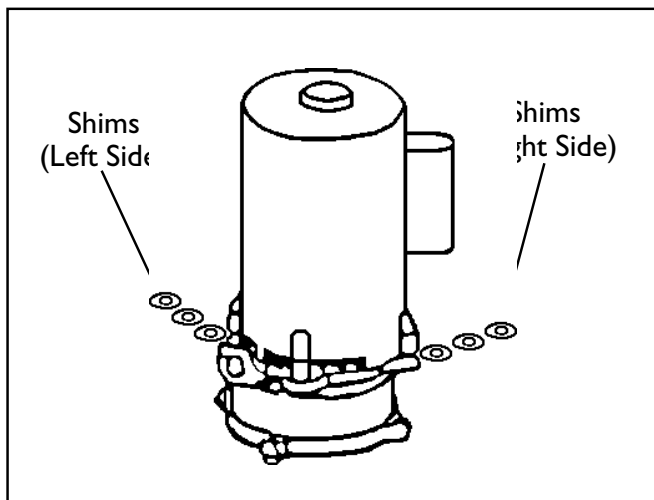
3. Carefully install the housing onto the motor shaft.
4. Install the black spring seal with the nylon side in contact with the ceramic washer.

NOTE: *Lubrication of shaft will ease installation.*

5. Apply locite to the threads of the motor shaft.
6. Screw the impeller onto the shaft with the flat side facing the motor.
7. Torque the impeller to 27 in. lbs.
8. Align the housing so that the electrical box mounting hole is opposite of the small elbow in back of the pump housing.

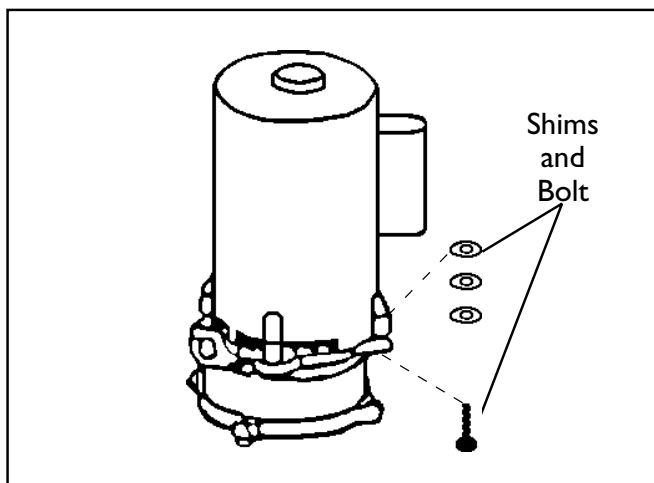
Housing/Impeller Spacing

1. To properly space the impeller to the housing, slide two or three .031" shims between the housing and the motor at one corner.



2. Slide other shims of various sizes diagonally across from the corner in Step 1, until the impeller is snug with the housing.
3. Remove and add up all the sizes of the shims used. EXAMPLE: A total of .100" is used, divide that by 2 to obtain .050". Use this amount minus an additional .005" from 1 HP pumps and .010" from 2 HP for each corner.

NOTE: For further explanation, see *Shimming Procedure*.



SHIMMING PROCEDURE

- A. Insert shims between the motor and the housing at two opposite mounting legs until snug.
- B. Remove and add up the total thickness of the shims from both sides.

EXAMPLE:

Left Side Shims	+	Right Side Shims
.031		.031
+.015		+.031
<u>+.015</u>		<u>+.005</u>
.061		.067

$$.061 + .067 = .128$$

- C. Divide the total by 2 and subtract:
 .005 for 1 HP motor
 .010 for 2 HP motor

EXAMPLE: $.128 \div 2 = .064$
 $.064 - .005 = .059$

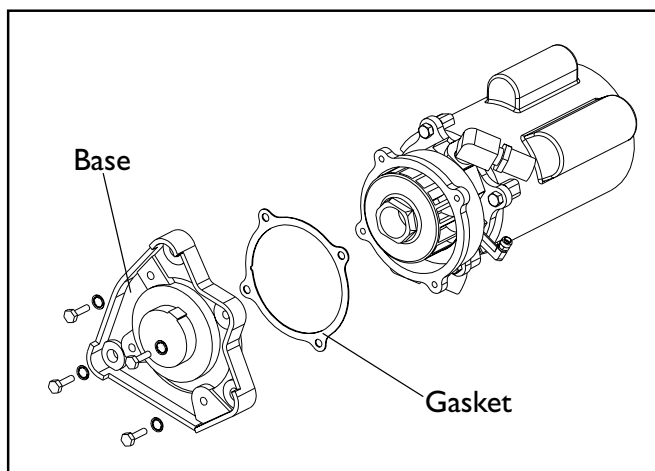
- D. Use the best combination of shims for the required shim dimension.

EXAMPLE:

Required Shim Dimension	Combine Shims
.059	.031
	+.015
	+.010
	<u>+.002</u>
	.058

- E. Install a bolt and equal shim combinations at all four locations.

4. Install the bolts and required shims.
5. Tighten and check for free spin of the impeller by removing the motor from the fixture and rotating the impeller. (For proper fit, shims may need to be added or deleted.)



6. Install the base with the gasket by aligning the intake and discharge ports. Then tighten the bolts (**do not over tighten**).
7. Set the pump upright and insert a screwdriver into the slot on top of the motor and check for free spin and smooth operation of the pump.

Vacuum Pump Operation Testing

1. To check for proper operation of the vacuum pump, connect to an electrical source, water and waste line.
2. Start the pump, then block the suction side of the pump and the vacuum relief valve. *The vacuum level should read between 20-25 in. hg. Shims may need to be added or deleted for proper vacuum reading. (Refer to the Housing/ Impeller Spacing Section.) (On previous page)*
3. Set the vacuum level by unblocking the vacuum relief valve and adjusting the valve to 10-12 in. hg.
4. Operate the pump for approximately one hour continuously.
5. Check for any water leaks, electrical problems and consistent vacuum level.

Pump Removal

If the motor does not start after checking through the troubleshooting charts, the motor may be defective. If the pump must be removed for factory repair or replacement, perform the following steps:

1. Unplug the electrical supply cord.
2. Using the manual valve, turn **OFF** the water supply.
3. Disconnect the water line to the pump being removed.
4. Disconnect the waste and input lines from the pump being removed and cap off the lines using the closure plugs provided.
5. Disconnect the low voltage wires from the remove switch circuit.
6. Remove the wing nuts.

Vacuum Pump System Repair Procedure

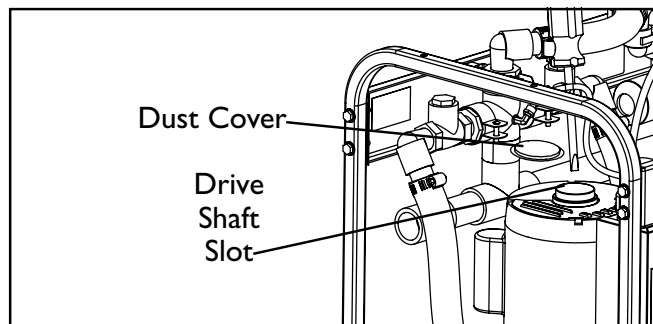
Tools Required:

- Wire Stripper/Crimper
- 1/4", 5/16", 11/32" and 3/8" Nut Driver
- 7/16", 1/2", 9/16" and 15/16" Open-end Wrench
- 1-3/4" Socket and Torque Wrench
- 15/16" Socket with Ratchet
- Hammer
- Flat-blade Screwdriver
- Wire Cutter
- Needle-nose Pliers
- Channel-lock Pliers
- Paint Scraper
- Pump Motor Holding Fixture:
DTE# 64546001
- Pop Riveter
- Bench Vise
- Bearing Seal Lubricant
- Red Loctite/Pipe Sealant:
Item# 57141

Test Procedure — Diagnostic

Determine if the required repair procedure is electrical or mechanical.

1. **Disconnect** the pump electrical cords from the receptacles.
2. At the needle valves, turn **OFF** the main water supply to the cabinet.
3. Remove the dust cover located at the top center of the motor.

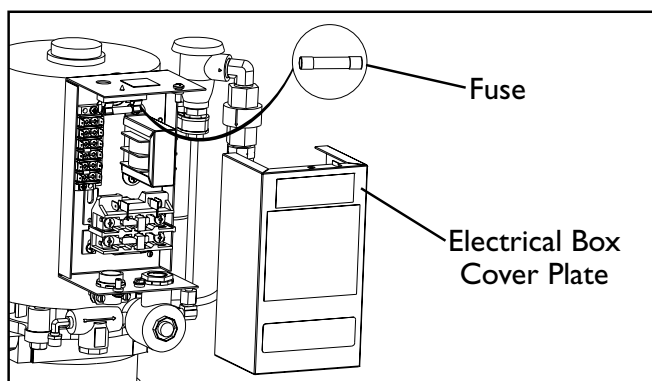


4. Using a flat-blade screwdriver, engage the slot in the drive shaft and rotate the shaft to check for free movement:
 - If the shaft moves smoothly, proceed to **Electrical Box Removal**.
 - If the shaft is difficult to turn or is jammed, proceed to **Pump Disassembly**.

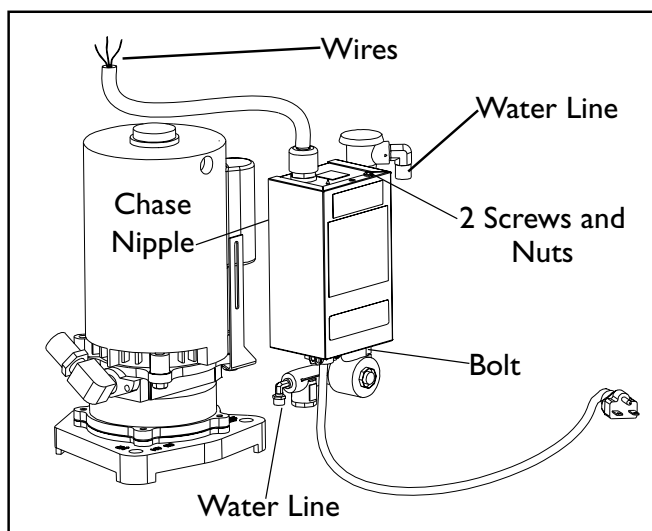
Electrical Box Removal

NOTE: Most electrical repairs can be performed without removing the pump from the cabinet.

1. Remove the electrical box cover plate.
2. Check the wire leads to the motor for breaks or bad connections.



3. Check the fuse and check for loose or broken wires in the electrical box.
4. Disconnect the wires from behind the faceplate of the cabinet and pull through the box.
5. Remove the two water lines from the water manifold.



6. Remove the bolt from the bottom of the box where the bracket is attached.

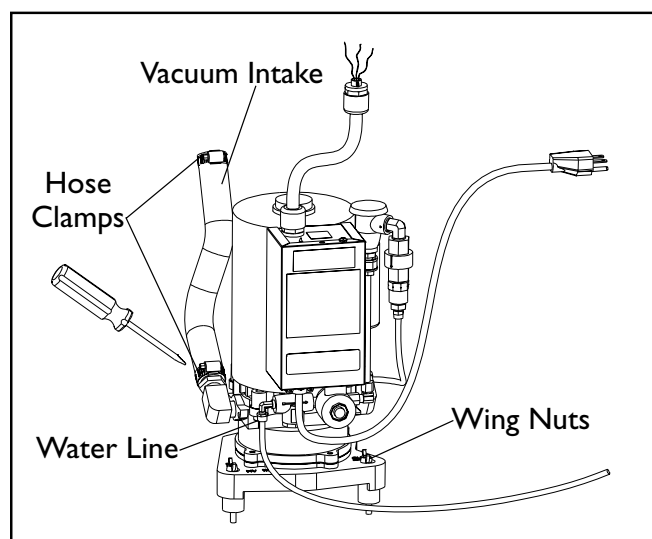
7. Remove the two screws and nuts from the terminal board located at the top of the electrical box.
8. Remove the chase nipple from inside the box where it screws to the motor.

Pump Disassembly

1. Remove the motor cover plate (*top of motor*).
2. Remove the front plate from the cabinet.
3. Remove the nut from the vacuum relief valve.
4. Disconnect the three electrical box wires from the switch located behind the faceplate of the cabinet.

Motor Pump Assembly Removal

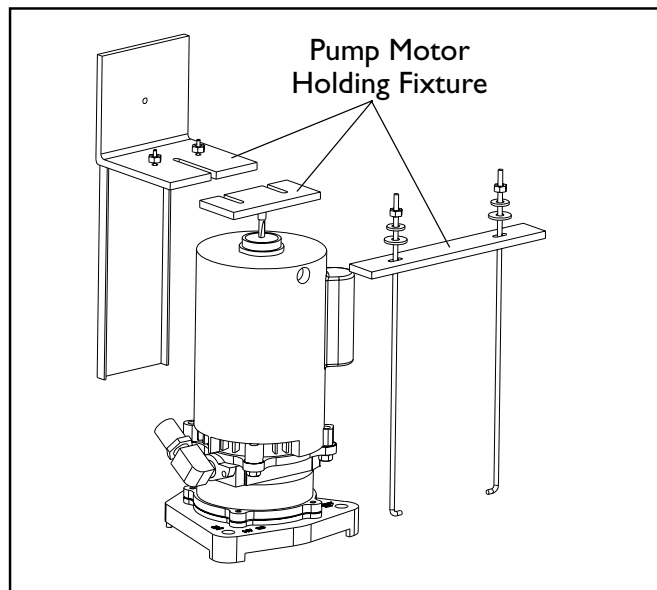
1. Disconnect the pump's vacuum and exhaust lines and install line closure plugs.
2. Disconnect the pump's water line.



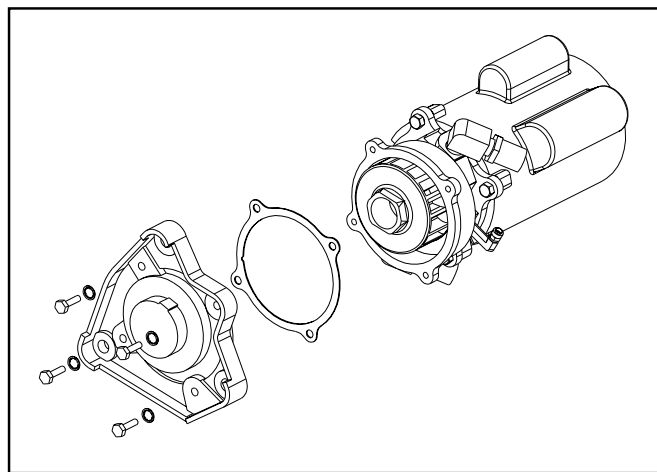
3. Shut **OFF** the valve at the water control manifold.
4. Remove the wing nuts from the pump's base. (*four nuts - 2 HP pump; three nuts - 1 HP pump*)

MC-201 FS / MC-202 FS

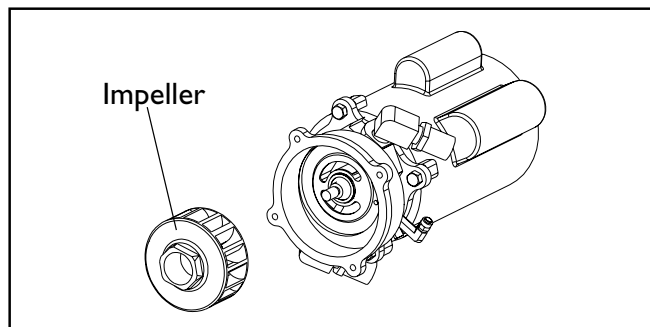
5. Disconnect the two motor wire leads from the electrical terminal.



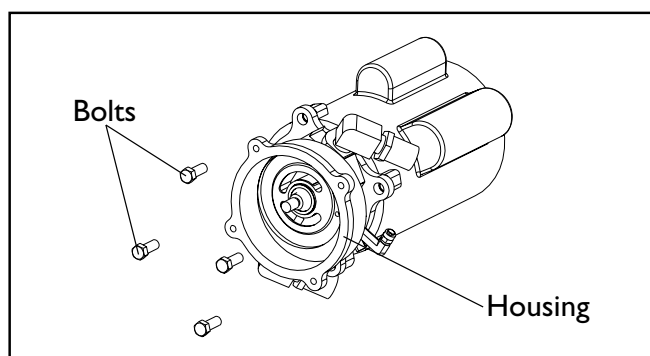
6. Mount the motor in the pump motor holding fixture (DTE# 64546001) by aligning the slot in the motor's shaft to the holding blade. Then connect the hold down brackets and tighten so the motor will not rotate in the fixture.



7. Take off the base by Removing the bolts that secure it to the housing. Then inspect the base for excessive scoring or side wear.



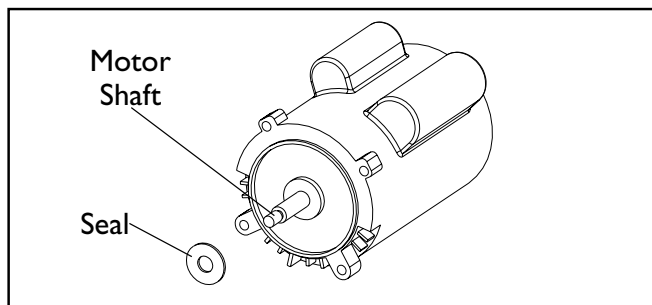
8. Remove the impeller by unscrewing counterclockwise. Then inspect the impeller for any pitting or scoring.



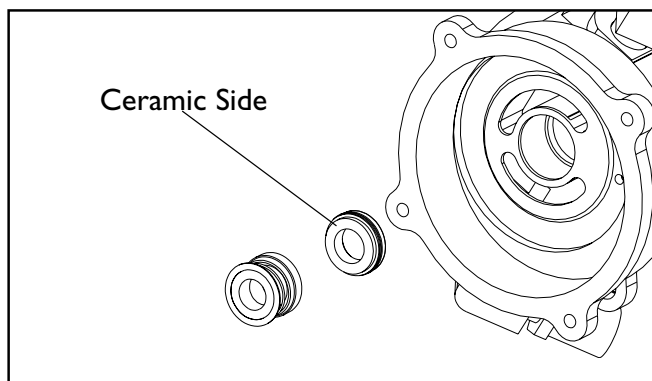
9. Remove the housing bolts and take off the housing by pulling it off the shaft.
10. Remove the water seal spring assembly.
11. Inspect the housing for pitting or scoring.

Pump to Motor Assembly

1. Apply lubricating oil to the motor shaft, seal and housing.



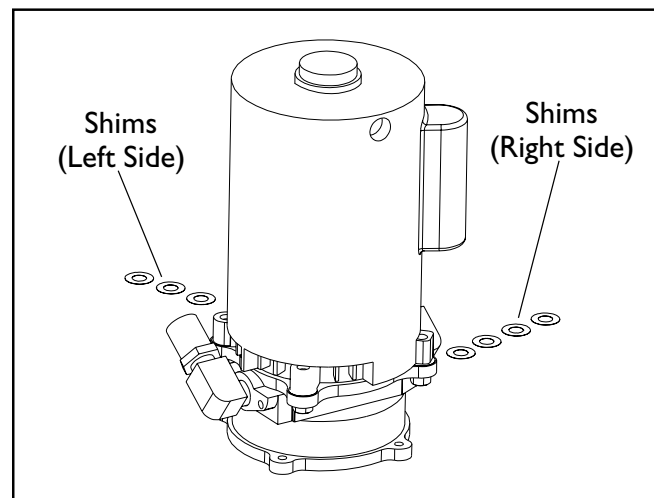
2. Press the seal into the housing with the ceramic side facing outward.



3. Carefully install the housing onto the motor shaft.
 4. Install the black spring seal with the nylon side in contact with the ceramic washer.
- NOTE:** Lubrication of the motor shaft will ease installation.
5. Apply loctite to the threads of the motor shaft.
 6. Screw the impeller onto the shaft with the flat side facing the motor.
 7. Torque the impeller to 27 in. lbs.
 8. Align the housing so that the small elbow is opposite the electrical box mounting hole in the motor.

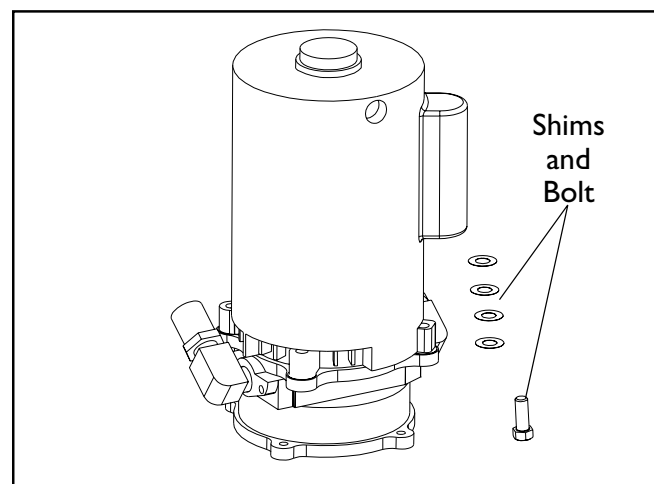
Housing/Impeller Spacing

1. To properly space the impeller to the housing, slide two or three .031" shims between the housing and the motor at one corner.



2. Slide other shims of various sizes diagonally across from the corner in Step 1, until the impeller is snug with the housing.
3. Remove and add up all the sizes of the shims used. EXAMPLE: A total of .100" is used, divide that by 2 to obtain .050". Use this amount minus an additional .005" from 1 HP pumps and .010" from 2 HP for each corner.

NOTE: For further explanation, see *Shimming Procedure.* (On next page)



SHIMMING PROCEDURE

- A. Insert shims between the motor and the housing at two opposite mounting legs until snug.
- B. Remove and add up the total thickness of the shims from both sides.

EXAMPLE:

Left Side Shims	+	Right Side Shims
.031		.031
+ .015		+ .031
<u>+ .015</u>		<u>+ .005</u>
.061		.067

$$.061 + .067 = .128$$

- C. Divide the total by 2 and subtract:
 .005 for 1 HP motor
 .010 for 2 HP motor

EXAMPLE: $.128 \div 2 = .064$
 $.064 - .005 = .059$

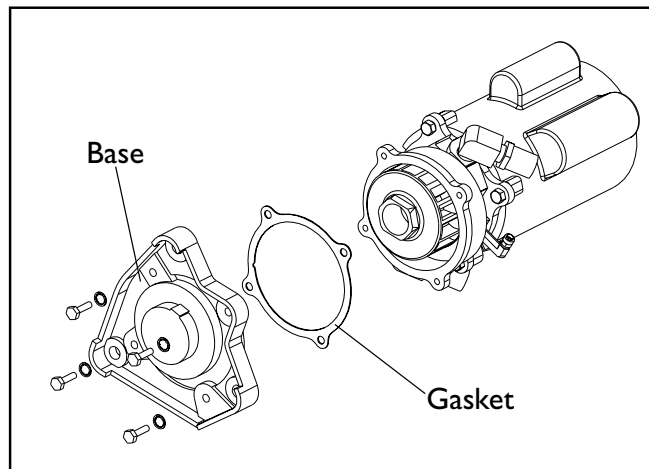
- D. Use the best combination of shims for the required shim dimension.

EXAMPLE:

Required Shim Dimension	Combine Shims
	.031
	+ .015
	+ .010
.059	<u>+ .002</u>
	.058

- E. Install a bolt and equal shim combinations at all four locations.

4. Install the bolts and required shims.
5. Tighten and check for free spin of the impeller by removing the motor from the fixture and rotating the impeller. *(For proper fit, shims may need to be added or deleted.)*



6. Install the base with the gasket by aligning the intake and discharge ports. Then tighten the bolts (**do not over tighten**).
7. Set the pump upright and insert a screwdriver into the slot on top of the motor.
8. Check for free spin and smooth operation of the pump.

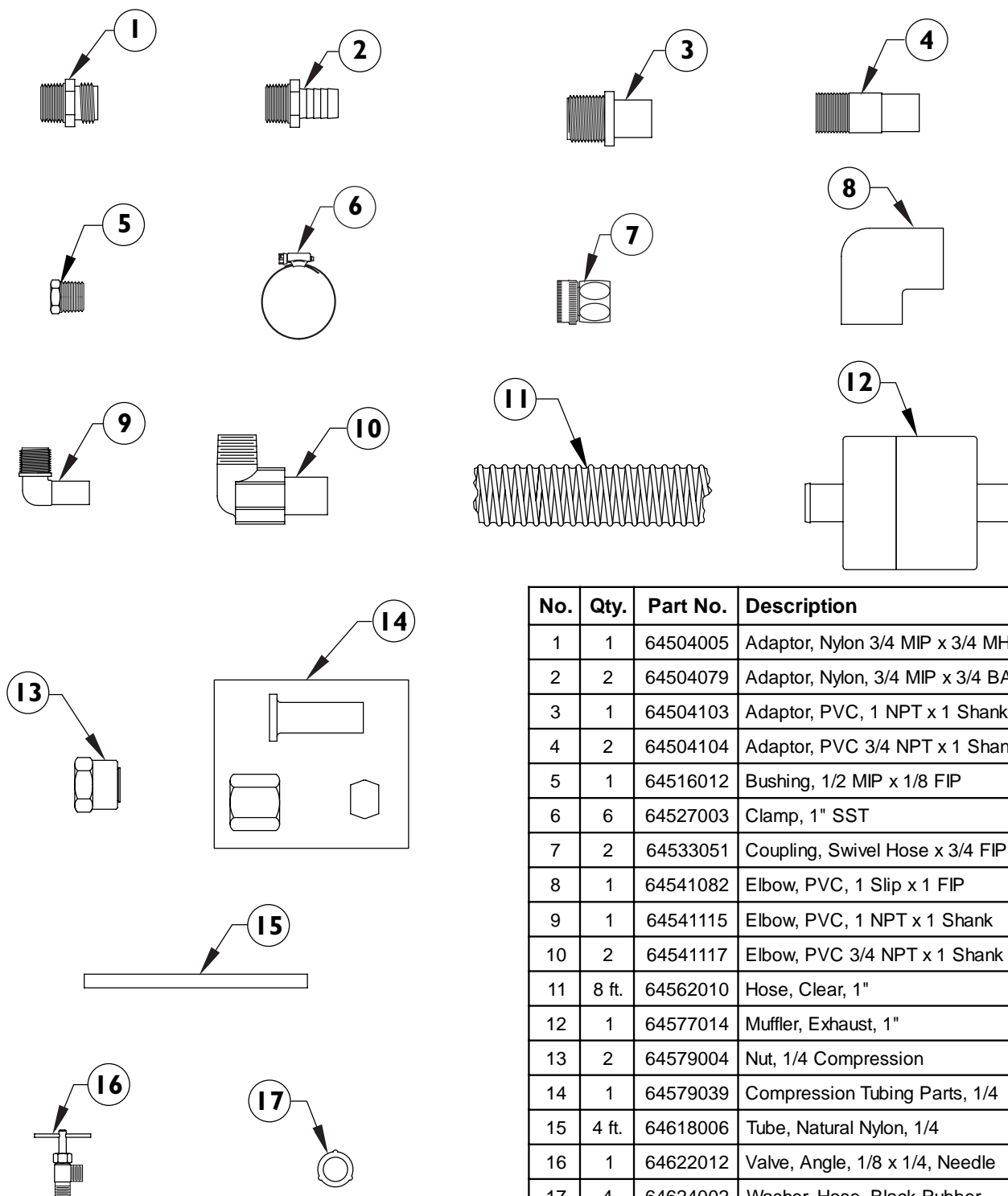
Vacuum Pump Operation Testing

1. To check for proper operation of the vacuum pump, connect to an electrical source, water and waste line.
2. Start the pump, then block the suction side of the pump and the vacuum relief valve. *The vacuum level should read between 20 -25 in hg. Shims may need to be added or deleted for proper vacuum reading. (Refer to the Housing/ Impeller Spacing Section.) (On previous page)*
3. Operate the pump for approximately one hour continuously.
4. Check for any water leaks, electrical problems and consistent vacuum level.

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Installation Kit

Each vacuum pump is supplied with an installation kit (PN: 64568036).



No.	Qty.	Part No.	Description
1	1	64504005	Adaptor, Nylon 3/4 MIP x 3/4 MHT
2	2	64504079	Adaptor, Nylon, 3/4 MIP x 3/4 BARB
3	1	64504103	Adaptor, PVC, 1 NPT x 1 Shank
4	2	64504104	Adaptor, PVC 3/4 NPT x 1 Shank
5	1	64516012	Bushing, 1/2 MIP x 1/8 FIP
6	6	64527003	Clamp, 1" SST
7	2	64533051	Coupling, Swivel Hose x 3/4 FIP
8	1	64541082	Elbow, PVC, 1 Slip x 1 FIP
9	1	64541115	Elbow, PVC, 1 NPT x 1 Shank
10	2	64541117	Elbow, PVC 3/4 NPT x 1 Shank
11	8 ft.	64562010	Hose, Clear, 1"
12	1	64577014	Muffler, Exhaust, 1"
13	2	64579004	Nut, 1/4 Compression
14	1	64579039	Compression Tubing Parts, 1/4
15	4 ft.	64618006	Tube, Natural Nylon, 1/4
16	1	64622012	Valve, Angle, 1/8 x 1/4, Needle
17	4	64624002	Washer, Hose, Black Rubber

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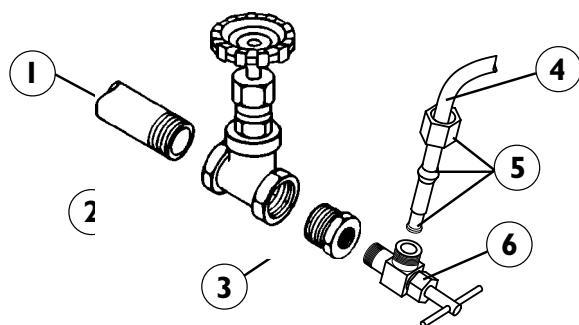
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Water Supply Line

The water going to the unit acts as a pump sealant and cooling agent. When the vacuum pump is in operation, the water supply must be on at all times. There are two methods of installation:

1/8" MIP Angle Valve Installation

The plumber supplies the water line and installs a 1/2" brass gate valve on the water supply line. Connect the 1/4" nylon tubing and slide the nut and brass ferrule over the tubing. Push the tubing in the valve as far as possible. Make sure the tapered end of the ferrule is facing the end of the tubing and tighten the nut.



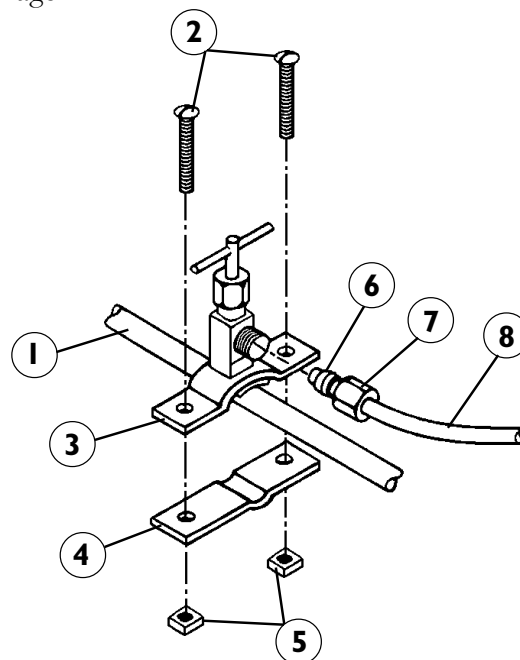
Angle Valve Installation

No.	Qty.	Part No.	Description
1	1	*	Water Line
2	1	*	Valve, Gate, Brass, 1/2"
3	1	64516012	Bushing, Brass, 1/2" MIP x 1/8" FIP
4	4 ft.	64618006	Tube, Nylon, 1/4"
5	1	64579039	Compressions Tubing Parts, 1/4"
6	1	64622012	Valve, Angle, 1/8" x 1/4", needle

* Plumber Supplies

Saddle Valve Installation

A saddle valve may be tapped into an existing cold water line. Follow the instructions on the saddle valve package.



Saddle Valve Installation

No.	Qty.	Part No.	Description
1	1	*	Water Line
2-7	1	*	Saddle Valve, 1/4", Complete Kit
8	4 ft.	64618006	Tube, Nylon, 1/4"

* Plumber Supplies

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Vacuum Line

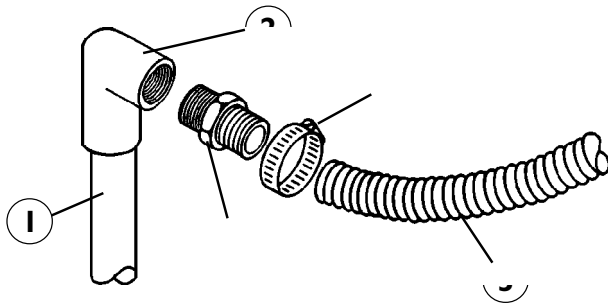
— IMPORTANT —

All vacuum systems must be installed according to local building and electrical codes.

Vacuum lines must be installed by a local plumber according to local building codes. All vacuum lines and risers are recommended to be IPS, PVC, SCH. 40. Type "M" copper should be used if local code does not allow the use of PVC.

Care should be taken to slope the lines 1" for every 20' of run toward the vacuum pump(s). This allows waste and liquids to flow with gravity, contributing to the efficiency of the vacuum system.

Make all connections using long radius sweep fittings. To promote unrestricted flow of air and waste liquids



through the vacuum lines, directional flow connections should be used.

Using 45° elbows for turns or avoiding obstructions is best; however, do not make a trap in the line, doing so will decrease the efficiency of the system.

All elbows and tees should be sized for the main line and sized down with bushing reducers to accommodate smaller lines.

Avoid sagging lines, which cause the formation of traps in the system and prevent good air and waste liquid flow.

Connect the evacuation system to the vacuum line using the hose and fittings supplied in the installation kit.

No.	Qty.	Part No.	Description
1		*	Vacuum Line, IPS, PVC, SCH. 40
2	1	64541115	Elbow, 1" x 1"
3	1	64504103	Adapter, PVC, 1" x 1"
4	1	64527003	Clamp, Stainless Steel, 1"
5	4 ft.	64562010	Hose, Intake, 1"

* Supplied by Plumber

Waste Line

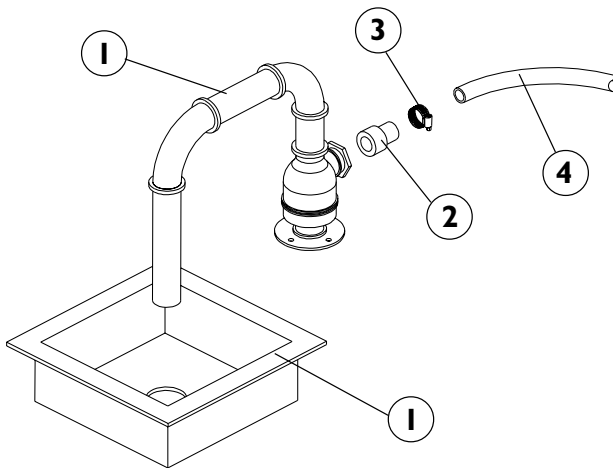
The waste line carries water from the pumps and liquid waste from the operatory to the building's sewer system.

The waste line should follow the most direct path to the sewer connection with a minimum of bends and elevations, and must be installed according to local building and plumbing codes.

The exhaust connection should be made by either of two methods, floor sink connection or direct connection to "P" trap, depending on local code and building facilities.

Floor Sink Connection

Use floor sink adapter SA-100. Install as illustrated.



No.	Qty.	Part No.	Description
1*	1	**	Adapter, PVC, Floor Sink, 1"
2*	1	64504102	Adapter, PVC, 1" INS. x 1"
3	1	64527003	Clamp, Stainless Steel, 1"
4	3 ft.	64562010	Hose, Exhaust, 1"
5	1	Plumber Supplies	Floor Sink

* Floor Sink Adapter Parts

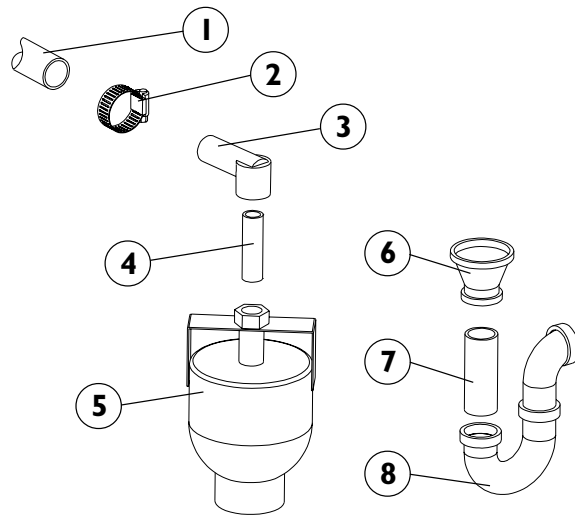
* Supplied by Plumber

— IMPORTANT NOTE —

No part of the waste line should be more than three (3) feet above the level of the waste connection on the vacuum pump.

Direct Connection to "P" Trap

Use "P" trap-air gap, if required by local code. Install as illustrated.



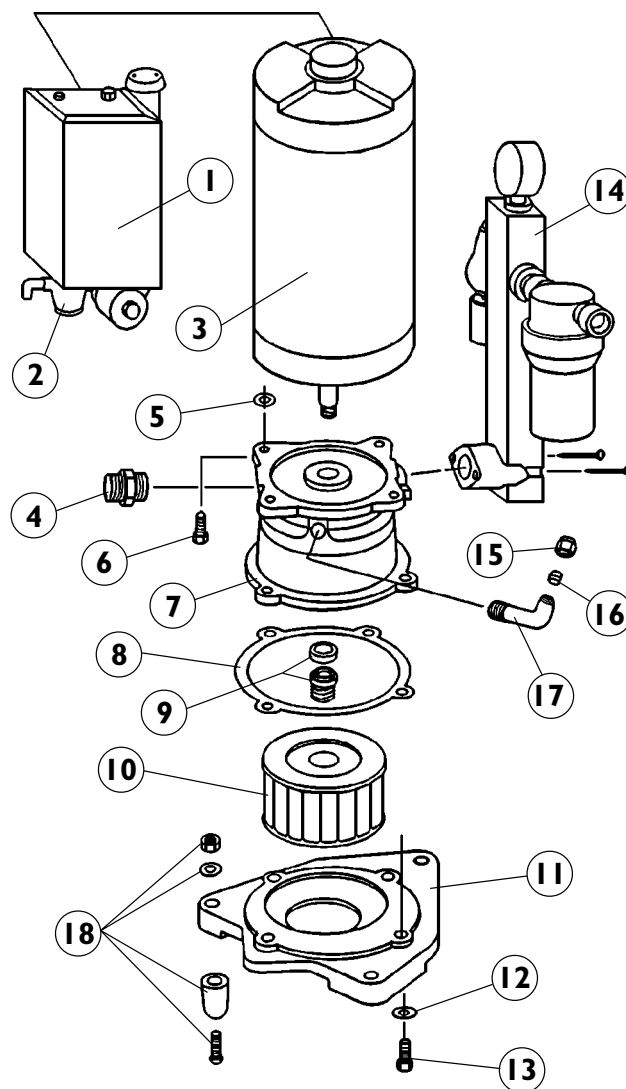
No.	Qty.	Part No.	Description
1	1	64562010	Hose, Exhaust, 1"
2	1	64527003	Clamp, Stainless Steel, 1"
3	1	*	Elbow, Brass, 1" x/Nut
4	1	*	Bushing, PVC, 1" MIP x 1" FIP
5	1	*	Adapter, Air Gap, 2"
6	1	*	Reducer, Bell, 2" x 1-1/2", Galv.
7	1	*	Nipple, 1-1/2" x Close, Galv.
8	1	*	Trap, "P", 1-1/2"

* Supplied by Plumber

CV-101FS / CV102FS

I HP Single Pump Assembly

No.	Qty.	Part No.	Description
	1	64586101	Hi Vac, 1 HP
1	1	64501150R	Relay Unit, 115V, 230V
2	1	64568196	Water Manifold, 1/2 gallon
3	1	64575059	Motor, 1 HP, FS
4	1	64568146	Adaptor, Brass, 3/4" x 1/2"
*5	As Req.	64604001 Shim, Steel .005 Thick 64604002 Shim, Steel .031 Thick 64604003 Shim, Steel .015 Thick 64604004 Shim, Steel .002 Thick 64604005 Shim, Steel .010 Thick	
*6	4	1615-028	Cap Screw, 3/8" --16 x 1"
*7	1	64568199	Housing, Brass, 1 HP
*8	1	64568127	Housing Gasket, Fiber
*9	1	64568123	Housing Seal, Rotary
*10	1	64568198	Impeller, Brass, 1 HP
*11	1	64568168	Base, Brass, 1 HP
*12	4	64624016	Washer, Internal Star, 5/16"
*13	4	64611044	Screw, Cap, 5/16"-18 x 1"
*5-13	1	64568125	Lower Rebuild Kit, 1 HP
14	1	64568164	Manifold, Intake, w/Gauge and Valve
15	2	64579004	Nut, 1/4" Tube, Compression
16	2	64610002	Sleeve, 1/4", Compression
17	1	64568155	Elbow, 1/4" x 1/4"
18	1	64568003	Mounting Feet Kit, 1 HP
	1	64514054	Bracket, Electrical Box to Motor, Stabilizer



NOTE: See the Operation/Maintenance section of this manual for detailed information on hookup and care of the Single Wet Vacuum Pump.

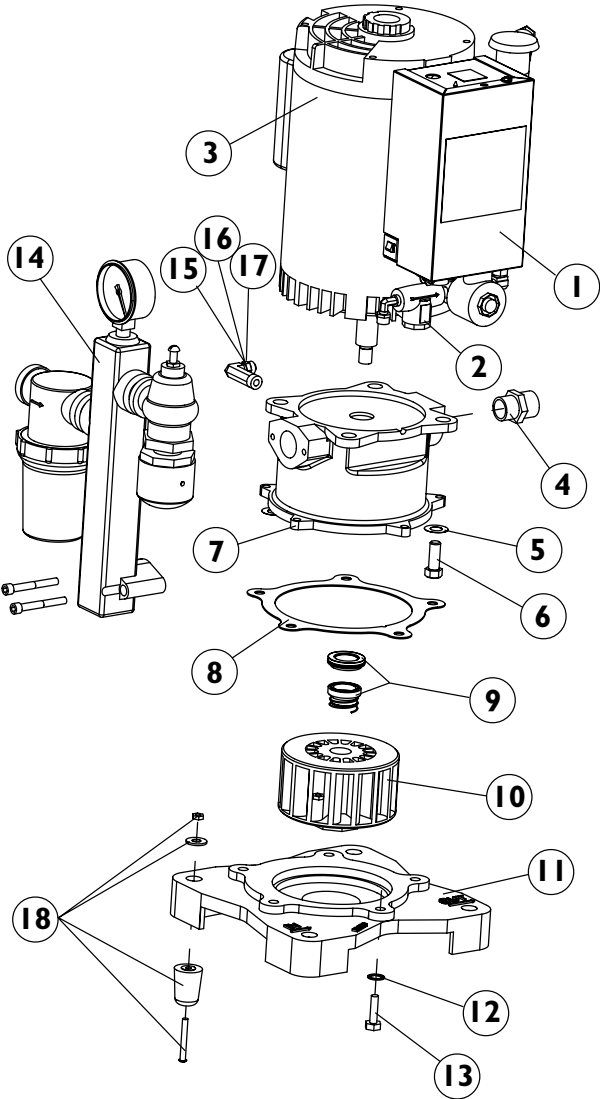
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CV-101FS / CV102FS

2 HP Single Pump Assembly

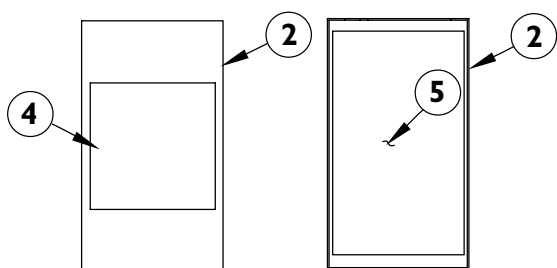
No.	Qty.	Part No.	Description
	1	64586102	Hi Vac, 2 HP
1	1	64501150R	Relay Unit, 230V
2	1	64568197	Water Manifold, 1 gallon
3	1	64575060	Motor, 2 HP, FS
4	1	64568147	Adaptor, Brass, 3/4" x 1/2"
*5	As Req.	64604001 64604002 64604003 64604004 64604005	Shim, Steel .005 Thick Shim, Steel .031 Thick Shim, Steel .015 Thick Shim, Steel .002 Thick Shim, Steel .010 Thick
*6	4	1615-028	Cap Screw, 3/8" - 16 x 1"
*7	1	64568200	Housing, Brass, 2 HP
*8	1	64568128	Housing Gasket, Fiber
*9	1	64568124	Housing Seal, Rotary
*10	1	64568189	Impeller, Brass, 2 HP
*11	1	64568168	Base, Brass, 2 HP
*12	5	64624016	Washer, Internal Star, 5/16"
*13	5	64611044	Screw, Cap, 5/16"-18 x 1"
*5-13	1	64568126	Lower Rebuilt Kit, 2 HP
14	1	64568164	Manifold, Intake, w/Gauge and Valve
15	2	64579004	Nut, 1/4" Tube, Compression
16	2	64610002	Sleeve, 1/4", Compression
17	1	64568155	Elbow, 1/4" x 1/4"
18	1	64568004	Mounting Feet Kit, 2 HP
	1	64514054	Bracket, Electrical Box to Motor, Stabilizer



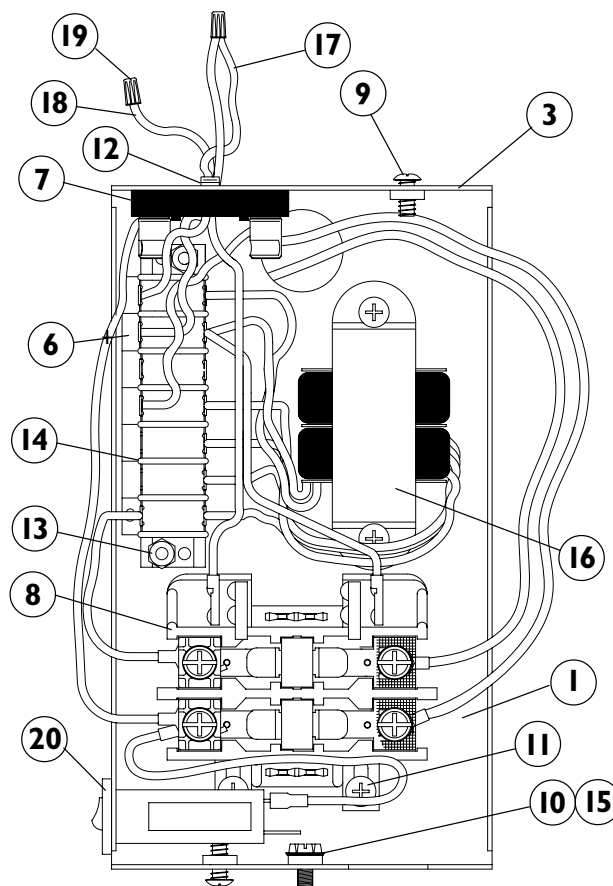
PARTS LIST

CV-10IFS / CV102FS

Electrical Box



No.	Qty.	Part No.	Description
	1	64501150	Electrical Box Assembly, 115V or 230V
1	1	64513011	Control Box Chassis
2	1	64513011B	Control Box Cover
3	1	64529027	Decal, Low, 24V
4	1	64529174	Decal, Fire/Shock Warning
5	1	64529182	Decal, D V Elec. Diagram
6	1	64529185	Decal, D V Terminal Block
7	1	64561004	Fuse Clip Holder
8	1	64568133	Relay, 30 AMP Capacity
9	2	1623-054	Screw, 10-32 x 1/2"
10	1	64611060	Screw, 10-32 Green, Ground
11	4	64611085	Screw, 8 x 1/4" Phillips
12	1	64611119	Screw, 6-32 x 5/16", Fuse Holder
13	2	64611120	Screw, 6-32, Terminal Board
14	1	64615023	Terminal Brd, 7 Qk. Connect
15	1	1636-026	Lock Washer, #10 Int'l star
16	1	64568195	Primary Trans., 115/230V
17	1	64529025	Decal, Caution Low Volts
18	1	64529203	Tag, Wire Usage Warning
19	2	64626003	Wire Nut, Ideal, 71-B Gray
	1	64618068	Conduit, Black
	1	64624058	Washer, 7/8"
	2	64578001	Nipple, Chase, 1/2"
	1	64625073	Wire, 18 Ga., Purple, 6"
*	1	64501151	Electrical Box Assembly Kit, 115/230V (1HP)
*	1	64501157	Electrical Box Assembly Kit, 230V (2 HP)
20	1	3802-120	Circuit Breaker, 15 AMP or
	1	3801-911	Circuit Breaker, 8 AMP



No.	Qty.	Part No.	Description
	1	64532008	Cord, 230V
	1	64529186	Decal, Fuse Replacement 3/10A, 115V or
	1	64529187	Decal, Fuse Replacement 15/100A, 230V
	1	64529125	Decal, 230V, 7.5A, 60 Hz (1 HP Dual) or
	1	64529126	Decal, 230V, 15A, 60 Hz (2 HP)
	1	2679-497	Decal, Ground
	1	64531025	Connector, Snap-in, Black
	1	64579001	Nut, Locking, 1/2"
	1	64568131	Fuse, 3/10 Amp, Slo-Blo, 115V (pkg. of 4) or
	1	64568130	Fuse, 15/100 Amp, Slo-Blo, 230V (pkg. of 4)

***NOTE:** Electrical Box Assembly Kits: Part Nos. 64501151, 115/230V (1 HP) and PN 64501157, 230V (2 HP) are complete with water manifold attached.

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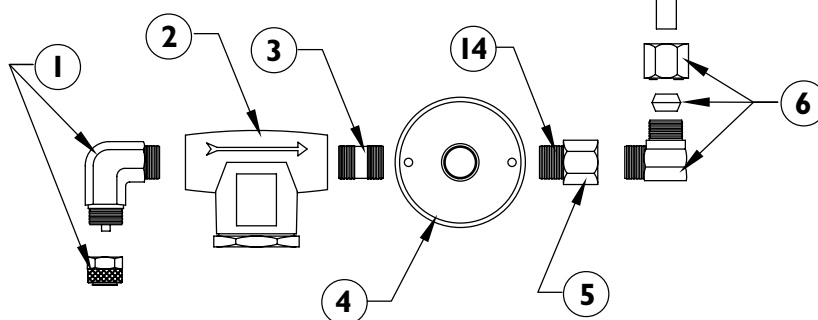
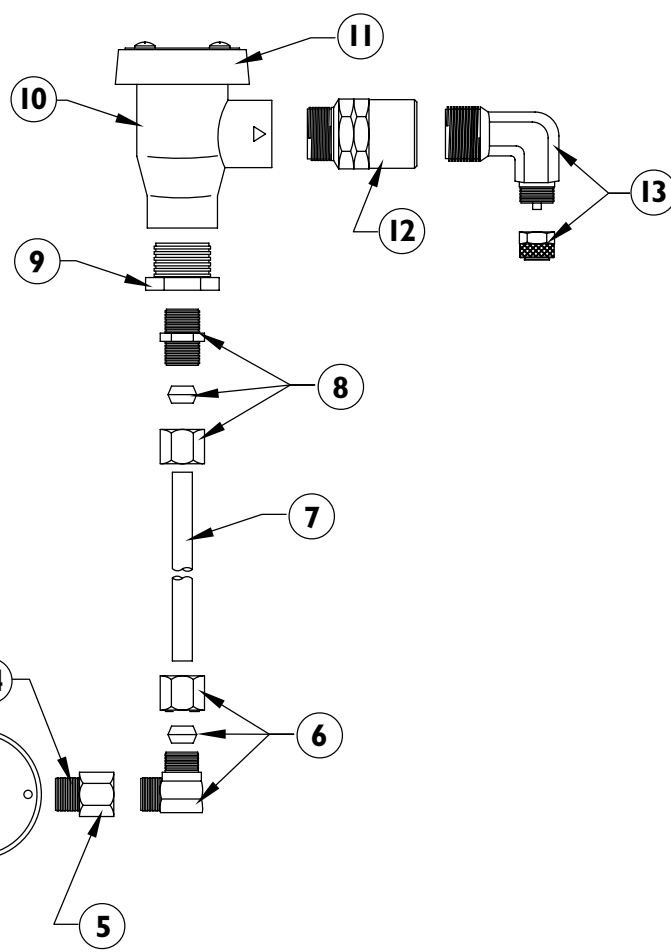
CV-101FS / CV102FS

Water Control Assembly

No.	Qty.	Part No.	Description
	1	64568196	Water Control Assy., 1 HP
	1	64568197	Water Control Assy., 2 HP
1	1	64541004	Elbow, Brass, 1/4" Tube x 1/8" MIP
2	1	64568135	Water Filter, 1/8"
3	1	64578002	Nipple, Brass, 1/8" MIP
4	1	64568156	Solenoid Valve, 24v, 60hz
5	1	64504072	Adapter, Brass, 1/8" MIP x 1/8" FIP
6	1	64541106	Elbow, Brass, 1/4" Comp. x 1/8" MIP
7	1	64568154	Watertube, 6" Straight
8	1	64531013	Connector, 1/4" Tube x 1/8" MIP
9	1	64516005	Bushing, Reducer, Brass, 3/8" MIP x 1/8" FIP
10	1	64622011	Anti-syphon Valve, 3/8"
11	1	64606002	Spring, SST Compression
12	1	64568192 64622010	Flow Control Valve, 1/2 GPM, 1 HP or Flow Control Valve, 1 GPM, 2 HP
13	1	64541084	Elbow, Brass, 1/4" Tube x 3/8" MIP
14*	AR	64660008	Loctite, #571 Sealant

* All Fittings to be sealed with liquid sealant unless fitting is pretreated from manufacturer with sealant.

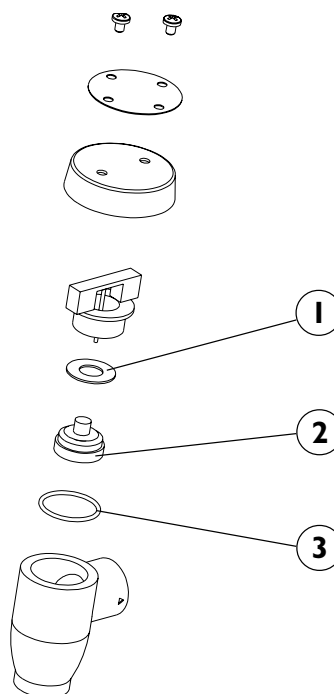
The water control system of the CustomAir Single Wet Vacuum Pump provides the pump with the water flow required for proper suction and supplemental cooling. Automatic and independent water control is provided for the pump. Filters protect the system from damage because of solid materials in the water supply. Flow valves control the amount of water supplied to the pump.



CV-101FS / CV102FS

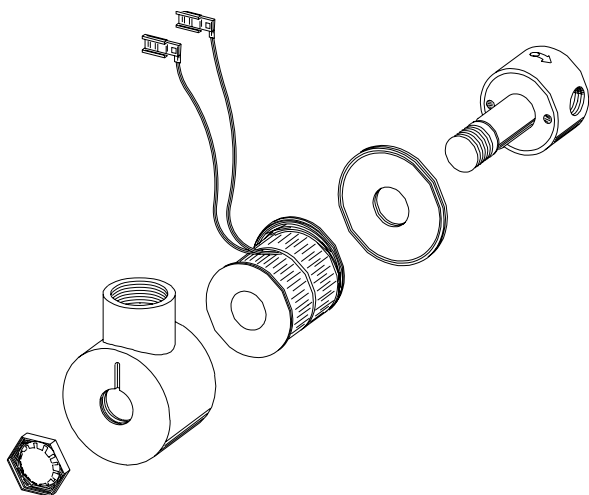
Anti-Siphon Valve Assembly

No.	Qty.	Part No.	Description
	1	64622011	Anti-Siphon Valve Assembly
1,2,3	1	64568016A	Anti-Siphon Repair Kit



Water Solenoid Valve Assembly

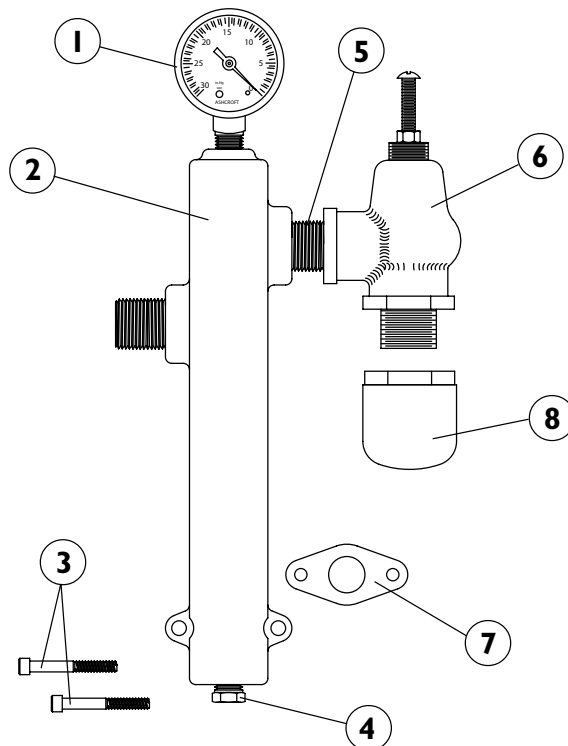
No.	Qty.	Part No.	Description
	1	64568156	Water Solenoid Valve Assembly, 24V



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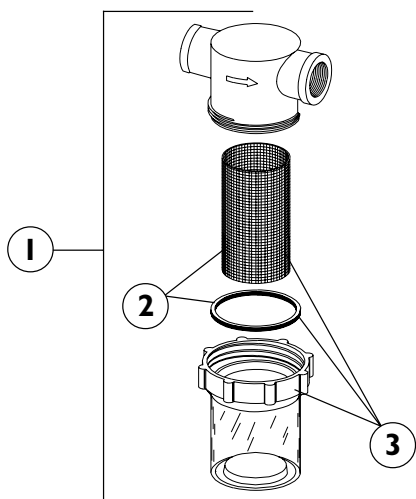
Intake Manifold Assembly

No.	Qty.	Part No.	Description
	1	64568164	Intake Manifold Assy, HiVac
1	1	64568188	Vacuum Gauge, 2"
2	1	64572001	Intake Manifold, Brass
3	2	64611059	Socket Head Cap Screw, 1/4"-20 x 2"
4	1	64584009	Plug, 3/8", Brass
5	2	64578003	Nipple, 3/4" x Close, Brass
6	1	64622001	Vacuum Relief Valve, Brass
7	1	64568137	Manifold Gasket, Fiber
8	1	64568159	Vacuum Relief Muffler



Primary / Secondary Filter

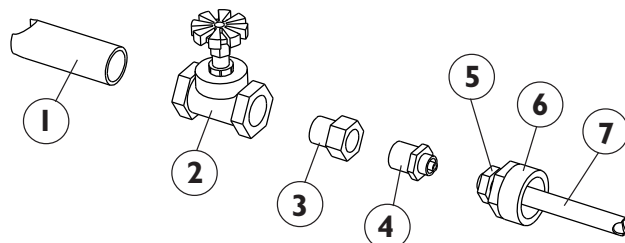
No.	Qty.	Part No.	Description
1	1	64545040	Filter, Primary, 3/4", with clear bowl
2	1	64568119	Screen & Gasket
3	1	64568120	Bowl, Screen & Gasket



MC-201 FS / MC-202 FS

Water Supply Line

The water going to the unit acts as a pump sealant and cooling agent. When the vacuum pump is in operation, the water supply must be on at all times. The plumber supplies and installs a 1/2" gate valve on the water supply line. Connect the 3/8" nylon tubing and fittings, which are supplied with the unit, as illustrated.



No.	Qty.	Part No.	Description
1	1	*	Water Line
2	1	*	Valve, Gate, Brass, 1/2"
3	1	64516041	Bushing, Brass, 1/2" MIP x 3/8" FIP
4	1	64504067	Adapter, Brass, 3/8" MIP x 3/8" Tube
5	1	64610007	Sleeve, Compression, Brass, 3/8"
6	1	64579027	Nut, Brass, 3/8", Nylon Tube
7	4 ft.	64618046	Tube, Nylon, 3/8"

* Plumber Supplies

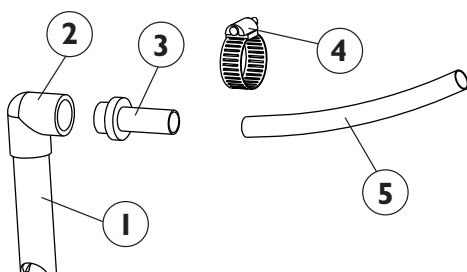
Vacuum Line

Vacuum lines must be installed by a local plumber according to local building codes. All vacuum lines and risers are recommended to be IPS, PVC, SCH. 40. Type "M" copper should be used if local code does not allow the use of PVC.

Care should be taken to slope the lines 1" for every 20' of run toward the vacuum pump(s). This allows waste and liquids to flow with gravity, contributing to the efficiency of the vacuum system.

Make all connections using long radius sweep fittings. To promote unrestricted flow of air and waste liquids through the vacuum lines, directional flow connections should be used.

Using 45° elbows for turns or avoiding obstructions is best; however, do not make a trap in the line, doing so will decrease the efficiency of the system.



All elbows and tees should be sized for the main line and sized down with bushing reducers to accommodate smaller lines.

Avoid sagging lines, which cause the formation of traps in the system and prevent good air and waste liquid flow.

Connect the evacuation system to the vacuum line using the hose and fittings supplied in the installation kit. The vacuum line can be installed from the right or left side of the cabinet.

No.	Qty.	Part No.	Description
1		*	Vacuum Line, IPS, PVC, SCH. 40
2		*	Elbow, IPS, PVC, SCH. 40
3	1	64568153	Adapter, PVC 1" MIP x 1-1/2" Shank
4	1	64527004	Clamp, 1-1/2" Hose
5	6 ft.	64562019	Hose, 1-1/2"

* Plumber Supplies

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Waste Line

The waste line carries water and liquid waste from the operatory to the building's sewer system.

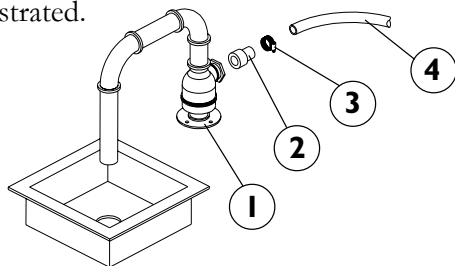
The waste line should follow the most direct path to the sewer connection with a minimum of bends and elevations, and must be installed according to local building and plumbing codes.

The waste line can be installed from the right or left side of the cabinet.

The exhaust connection should be made by either of two methods, floor sink connection or direct connection to "P" trap, depending on local code and building facilities.

FLOOR SINK CONNECTION

Use floor sink adapter SA-200, Part No. 6-4504-013. Install as illustrated.



No.	Qty.	Part No.	Description
1	1	*	Adapter, PVC, Floor Sink, 1" Barbed Insert
2	1	64568153	Adapter, PVC, 1" MIP x 1-1/2" Shank
3	1	64527003	Clamp, Stainless Steel, 1-1/2"
4	6 ft.	64562019	Hose, Exhaust, 1-1/2"

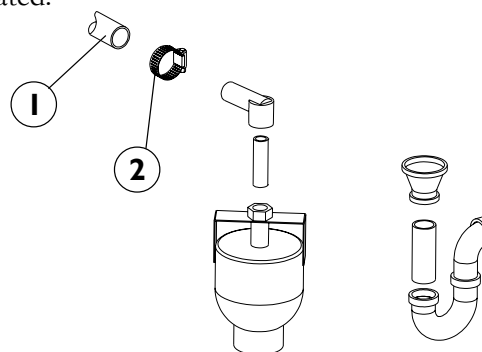
* Plumber Supplies

— IMPORTANT NOTE —

No part of the waste line should be more than three (3) feet above the level of the waste connection on the vacuum pump.

DIRECT CONNECTION TO "P" TRAP

Use "P" trap-air gap, if required by local code. Install as illustrated.

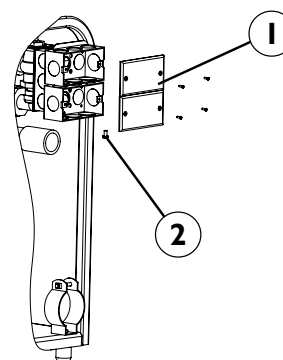


No.	Qty.	Part No.	Description
1	6 ft.	64562019	Hose, Exhaust, 1-1/2"
2	1	64527003	Clamp, Stainless Steel, 1-1/2"
3	1	*	Elbow 1-1/2"
4	1	*	Nipple, 1-1/2"
5	1	*	Adapter, Air Gap, 2"
6	1	*	Reducer, Bell, 2" x 1-1/2"
7	1	*	Nipple, 1-1/2" x Close
8	1	*	Trap, "P", 1-1/2"

Electrical Connection Assembly

Complete the electrical hook-up, as the electrical codes require, through the .375" hole in the box cover.

No.	Qty.	Part No.	Description
1	1	64513021	Cover Plate Screw
2	1	62584484	Cover Plate, J-Box
3	1	64611060	Ground Screw

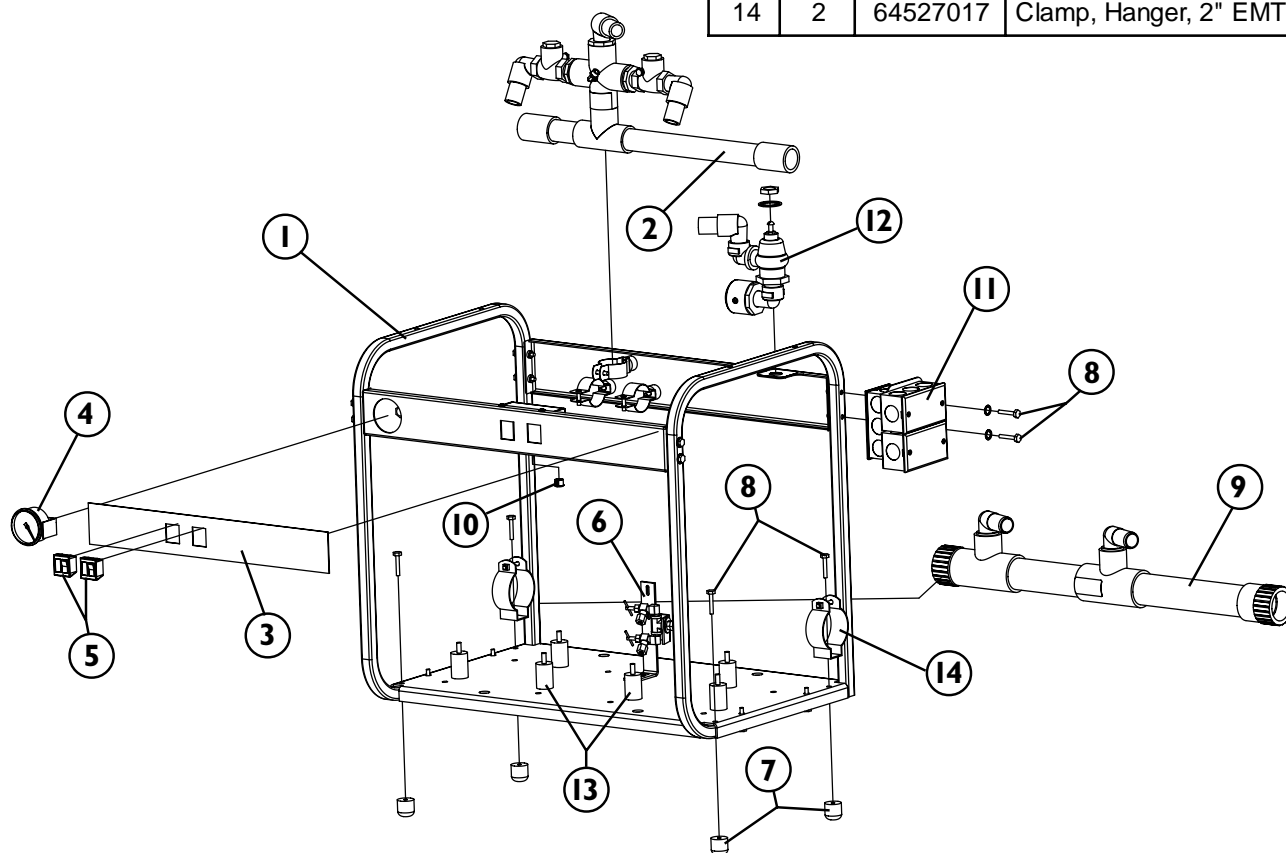


MC-201 FS / MC-202 FS

Frame Assembly

The various parts of the CustomAir Dual Wet Vacuum Pump are attached to the frame assembly. The table identifies each assembly and the drawing indicates its location.

No.	Qty.	Part No.	Description
1	1		Enclosure, complete
2	1	64501451	Intake Manifold Assembly
3	1 1		MC 201 Decal or MC 202 Decal
4	1	64568134	Vacuum Gauge
5	2	64568132	Rocker Switch
6	1	64568163	Water Manifold Assembly
7	4	64568161	Dual PVC Foot
8	6	64611027	Dual Screw, 1-1/4"
9	1	64568162	Waste Manifold Assembly
10	1	64556016	Grommet, 1/2", white
11	1	64513026	Electrical Installation Kit
12	1	64501391	Vacuum Control Assembly
13	1	64568149	Motor Mount (pkg. of 4)
14	2	64527017	Clamp, Hanger, 2" EMT



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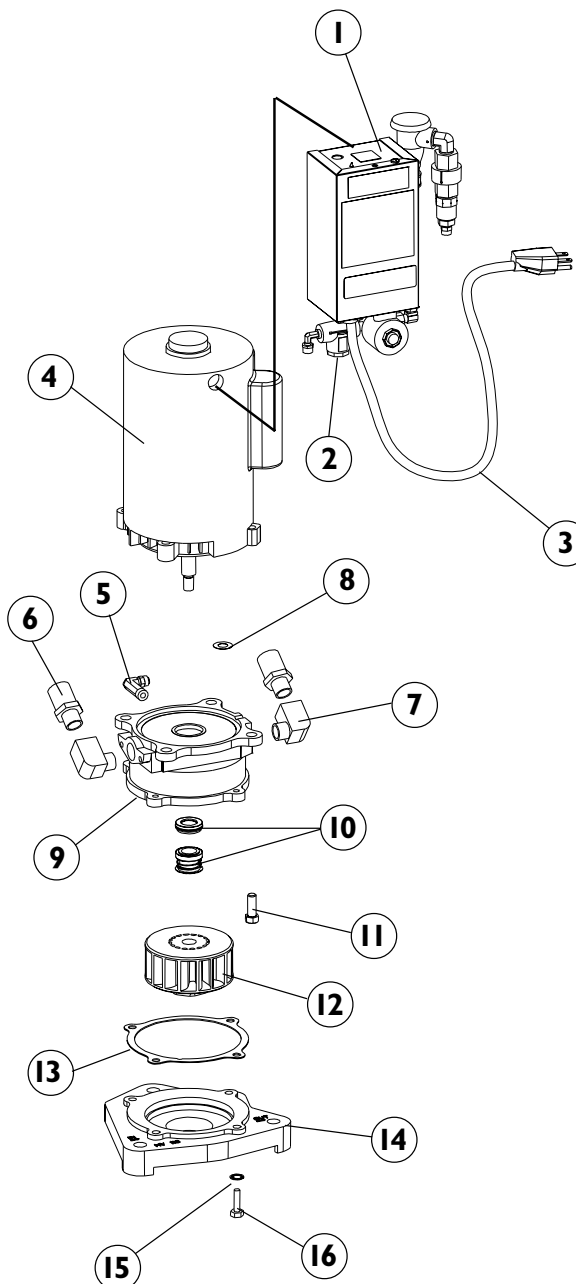
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MC-201 FS

I HP Dual Pump Assembly

The CustomAir Dual Wet Vacuum Pump is powered by two water injected, impeller type vacuum pumps. This type of vacuum producer runs quietly and generates a high mercury pull, which is adjustable from a normal operating range of 10 to 12 inches of mercury to a high range of 18 to 20 inches of mercury for surgical applications. There are two vacuum pump sizes: the 1 HP (model MC-201 FS) and the 2 HP (model MC-202 FS, *illustrated on Page 58*). The dual pump back-up system and the choice of vacuum power ranges, make this a highly reliable and versatile evacuation system.

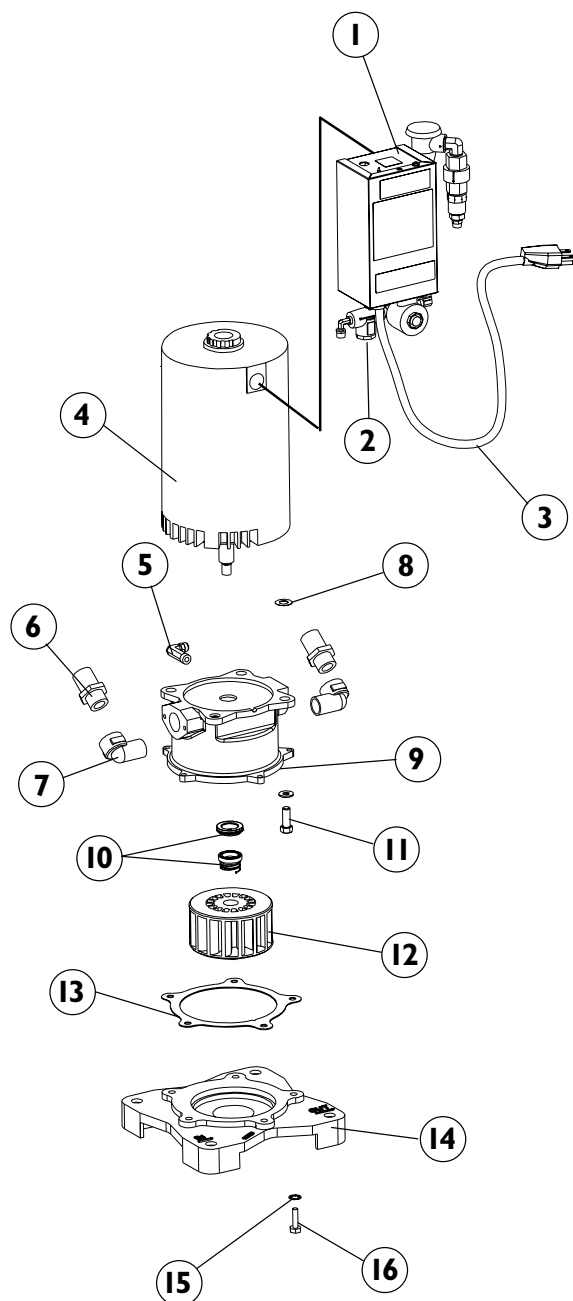
No.	Qty.	Part No.	Description
	1	64586801R	Dual Pump Assembly, 1 HP
1	1	64501153	Relay Unit, 230V
2	1	64568196	Water Manifold, 1/2 gallon
3	1	64532008	Electric Cord Assy., 230V
4	1	64575059	Motor, 1 HP, FS
5	1	64568155	Elbow, Brass, 1/4" x 1/4"
6	2	64568143	Adaptor, Brass, 1" hose x 1/2" MIP
7	2	64568139	Elbow, Brass, 1/2" Street
*8	As Req.	64604001 64604002 64604003 64604004 64604005	Shim, Steel .005 Thick Shim, Steel .031 Thick Shim, Steel .015 Thick Shim, Steel .002 Thick Shim, Steel .010 Thick
*9	1	64568199	Housing, Brass, 1 HP
*10	1	64568123	Rotary Water Seal (gasket included)
*11	4	1615-028	Cap Screw, 3/8" -- 16 x 1"
*12	1	64568198	Impeller, Brass, Balanced, 1 HP
*13	1	64568127	Housing Gasket, Fiber
*14	1	64568167	Base Plate, Brass, 1 HP
*15	4	64624016	Internal Star Washer, 5/16"
*16	4	64611044	Cap Screw, 5/16" -- 18 x 1"
*8-16	1	64568125	Lower Rebuild Kit, 1 HP



NOTE: See the Operation/Maintenance section of this manual for detailed information on hookup and care of the Dual Wet Vacuum Pump.

MC-202 FS

2 HP Dual Pump Assembly



No.	Qty.	Part No.	Description
	1	64586802R	Dual Pump Assembly, 2 HP
1	1	64501158	Relay Unit, 230V
2	1	64568197	Water Manifold, 1 Gallon
3	1	64532008	Electric Cord Assy., 230V
4	1	64575060	Motor, 2 HP, FS
5	1	64568155	Elbow, Brass, 1/4" x 1/4"
6	2	64504087	Adaptor, Brass, 1" hose x 3/4" MIP
7	2	64568144	Elbow, Brass, 3/4" Street
*8	As Req.	64604001 64604002 64604003 64604004 64604005	Shim, Steel .005 Thick Shim, Steel .031 Thick Shim, Steel .015 Thick Shim, Steel .002 Thick Shim, Steel .010 Thick
*9	1	64568200	Housing, Brass, 2 HP
*10	1	64568124	Rotary Water Seal (gasket included)
*11	4	1615-028	Cap Screw, 3/8" -- 16 x 1"
*12	1	64568189	Impeller, Brass, Balanced, 2 HP
*13	1	64568128	Housing Gasket, Fiber
*14	1	64568168	Base Plate Brass, 2 HP
*15	5	64624016	Internal Star Washer, 5/16"
*16	5	64611044	Cap Screw, 5/16" -- 18 x 1"
*8-16	1	64568126	Lower Rebuild Kit, 2 HP

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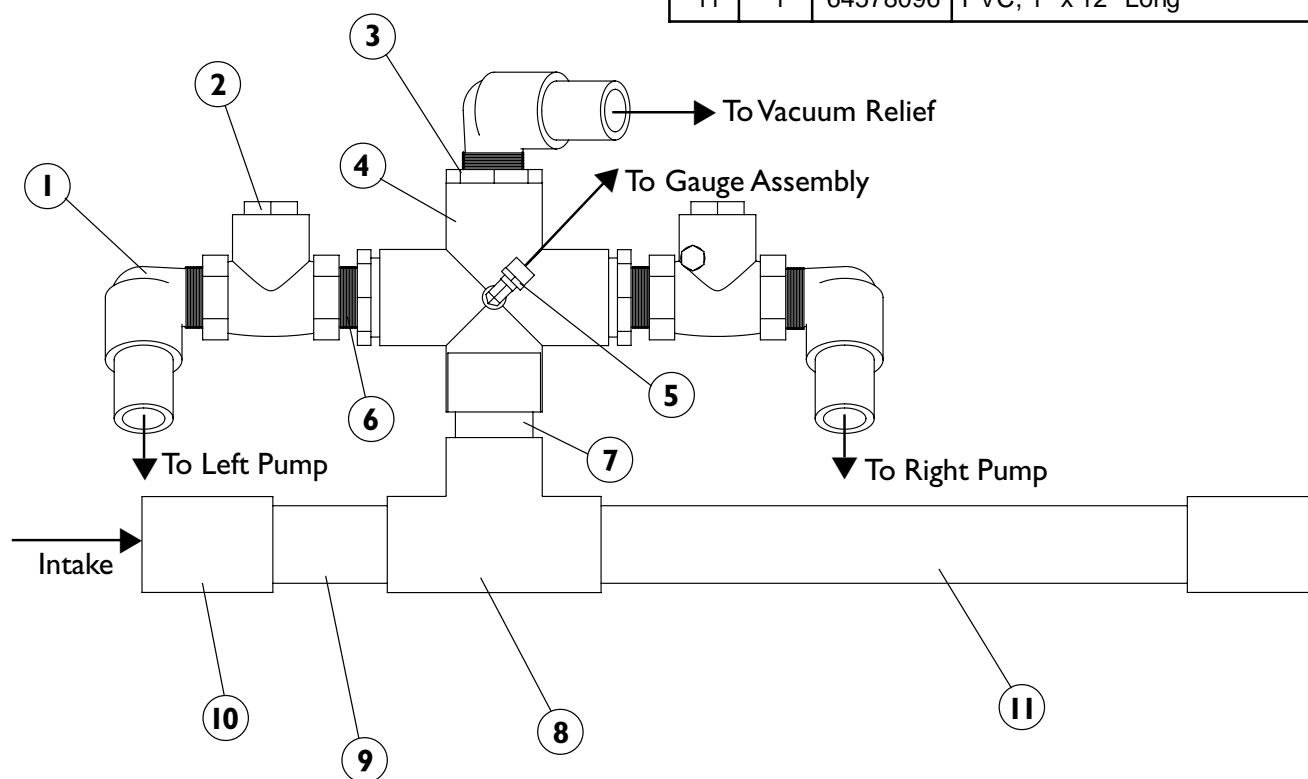
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MC-201 FS / MC-202 FS

Intake Manifold Assembly, Dual

The intake manifold swing-check valves provide automatic isolation for the back-up pump when it is not operating. This prevents vacuum loss through the exhaust of the standby pump. When both pumps are operating, the swing-check valves open to allow maximum air flow. The manifold is constructed of PVC and the valves are brass. Both materials are not affected by chemical disinfectants.

No.	Qty.	Part No.	Description
	1	64501451	Intake Manifold Assembly
1	3	64541117	Elbow, 3/4" NPT x 1" Shank
2	2	64568191 64568193	Swing Check Valve, 3/4" Swing Check Valve, 1"
3	3	64516006	Bushing, Reducer 1" Slip x 3/4" FIP
4	1	64537006	Cross, PVC 1" Slip
5	1	64541004	Elbow, Brass, 1/4" Tube x 1/8" MIP
6	3	64568142	Nipple, Brass, 3/4" Close
7	1	64578098	PVC, 1" x 2" Long
8	1	64616008	Tee, 1" Slip
9	1	64578097	PVC, 1" x 4" Long
10	2	64504029	Adaptor, PVC, 1" FIP x 1" Slip
11	1	64578096	PVC, 1" x 12" Long

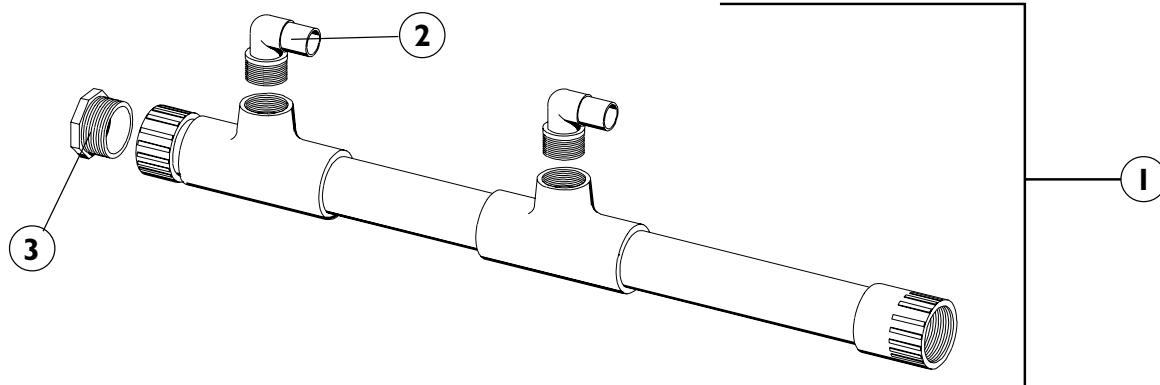


MC-201 FS / MC-202 FS

Exhaust Manifold Assembly, Dual

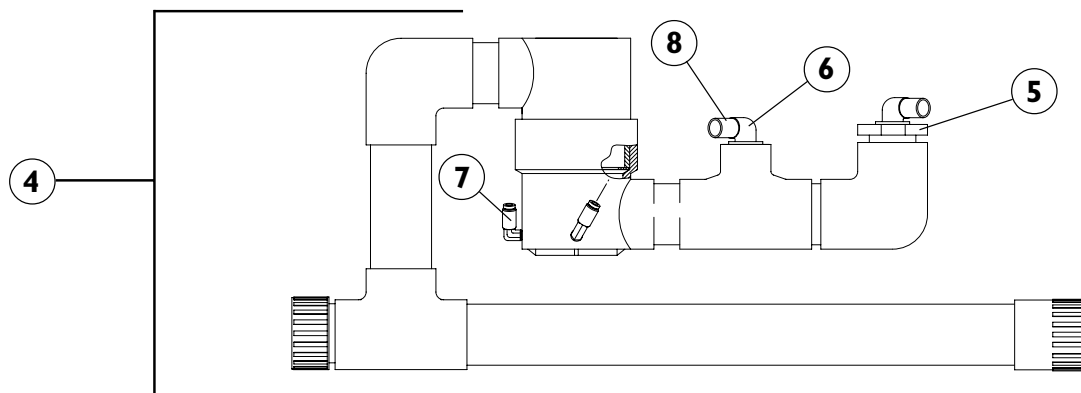
The exhaust manifold delivers liquid waste materials from both pumps to the drain line. The manifold is constructed of PVC to prevent chemical corrosion and buildup of organic and mineral wastes. The exhaust muffler connected to the drain line outside the cabinet assures quiet operation.

No.	Qty.	Part No.	Description
1	1	64568162	Std. Exhaust Manifold Assy.
2	2	64541134	Elbow, Brass, 1" MIP x 1" Shank
3	1	64584024	Plug, PVC, 1-1/2" MIP



Water Recirculator Exhaust Manifold Assembly (Optional)

No.	Qty.	Part No.	Description
4	1	64501122	Water Recirculator Exhaust Manifold Assembly (Optional)
5	1	64516031	Bushing Reducer, 1-1/2" SLIP x 1" FIP
6	2	64541134	Elbow, Brass, 1" NPT
7	2	64541121	Elbow, 1/4" Poly x 1/8" MIP
8	2	64504121	Adaptor, 1" Hose

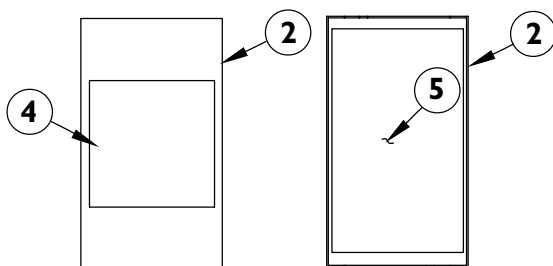


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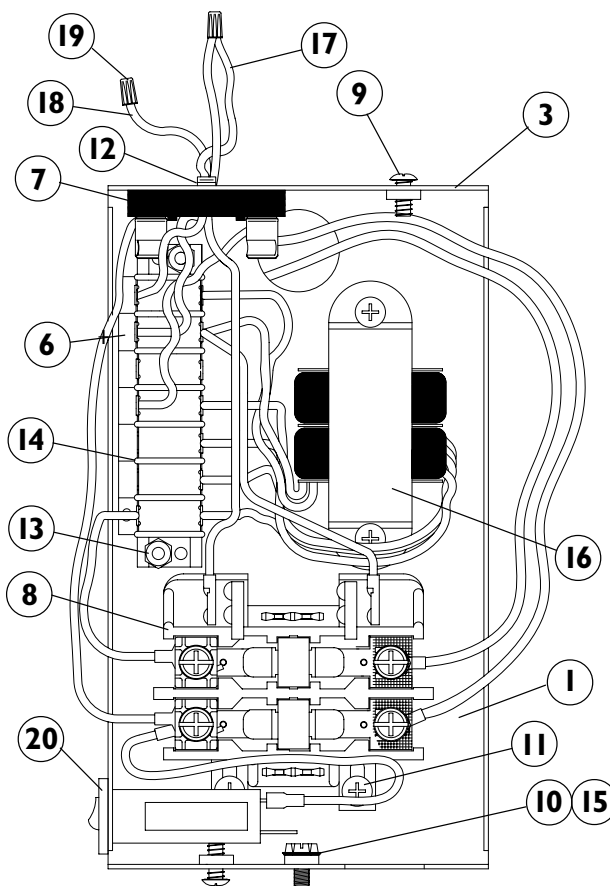
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Electrical Box



No.	Qty.	Part No.	Description
	1	64501150	Electrical Box Assembly, 115V or 230V
1	1	64513011	Control Box Chassis
2	1	64513011B	Control Box Cover
3	1	64529027	Decal, Low, 24V
4	1	64529174	Decal, Fire/Shock Warning
5	1	64529182	Decal, D V Elec. Diagram
6	1	64529185	Decal, D V Terminal Block
7	1	64561004	Fuse Clip Holder
8	1	64568133	Relay, 30 AMP Capacity
9	2	1623-054	Screw, 10-32 x 1/2"
10	1	64611060	Screw, 10-32 Green, Ground
11	4	64611085	Screw, 8 x 1/4" Phillips
12	1	64611119	Screw, 6-32 x 5/16", Fuse Holder
13	2	64611120	Screw, 6-32, Terminal Board
14	1	64615023	Terminal Board, 7 Quik Connect
15	1	1636-026	Lock Washer, #10 Int'l star
16	1	64568195	Primary Transformer, 115/230V
17	1	64529025	Decal, Caution Low Volts
18	1	64529203	Tag, Wire Usage Warning
19	2	64626003	Wire Nut, Ideal, 71-B Gray
	1	64618068	Conduit, Black
	1	64624058	Washer, 7/8"
	2	64578001	Nipple, Chase, 1/2"
*	1	64501153	Electrical Box Assembly Kit, 115/230V (1HP)
*	1	64501158	Electrical Box Assembly Kit, 230V (2 HP)
20	1	3802-120	Circuit Breaker 15 Amp
20	1	3801-911	Circuit Breaker, 8 Amp



No.	Qty.	Part No.	Description
	1	64532008	Cord, 230V
	1	64529186	Decal, Fuse Replacement 3/10A, 115V or
	1	64529187	Decal, Fuse Replacement 15/100A, 230V
	1	2679-497	Decal, Ground
	1	64529125	Decal, 230V, 7.5A, 60 Hz (1 HP Dual) or
	1	64529126	Decal, 230V, 15A, 60 Hz (2 HP)
	1	64531025	Connector, Snap-in, Black
	1	64579001	Nut, Locking, 1/2"
	1	64568131	Fuse, 3/10 Amp, Slo-Blo, 115V (pkg. of 4) or
	1	64568130	Fuse, 15/100 Amp, Slo-Blo, 230V (pkg. of 4)

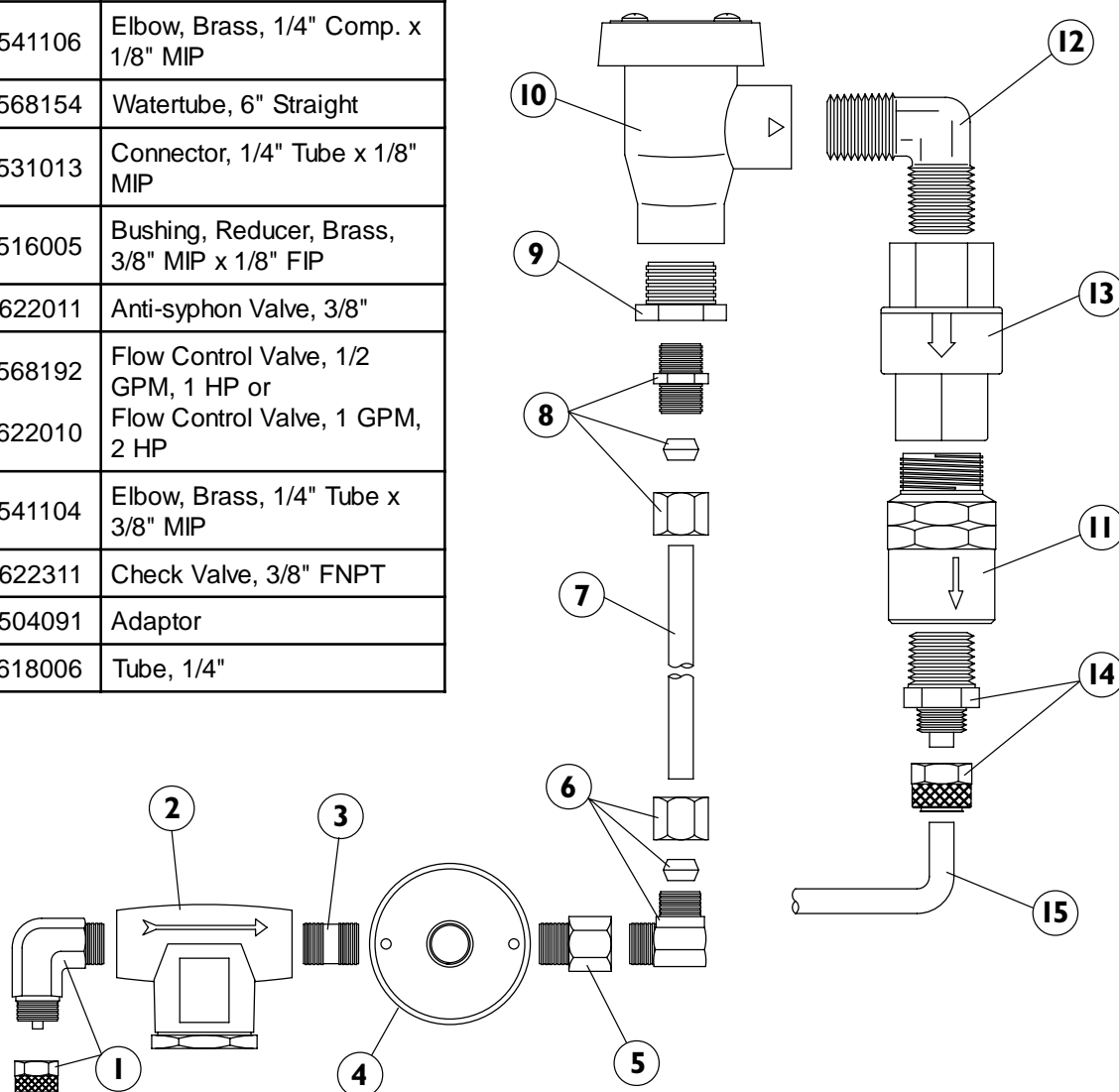
***NOTE:** Electrical Box Assembly Kits: PN 64501153, 230V (1 HP) and PN 64501158, 230V (2 HP) are complete with water manifold attached.

MC-201 FS / MC-202 FS

Water Control Assembly

No.	Qty.	Part No.	Description
	1	64568196	Water Control Assy., 1 HP
	1	64568197	Water Control Assy., 2 HP
1	1	64541004	Elbow, Brass, 1/4" Tube x 1/8" MIP
2	1	64568135	Water Filter, 1/8"
3	1	64578002	Nipple, Brass, 1/8" MIP
4	1	64568156	Solenoid Valve
5	1	64504072	Adapter, Brass, 1/8" MIP x 1/8" FIP
6	1	64541106	Elbow, Brass, 1/4" Comp. x 1/8" MIP
7	1	64568154	Watertube, 6" Straight
8	1	64531013	Connector, 1/4" Tube x 1/8" MIP
9	1	64516005	Bushing, Reducer, Brass, 3/8" MIP x 1/8" FIP
10	1	64622011	Anti-syphon Valve, 3/8"
11	1	64568192 64622010	Flow Control Valve, 1/2 GPM, 1 HP or Flow Control Valve, 1 GPM, 2 HP
12	1	64541104	Elbow, Brass, 1/4" Tube x 3/8" MIP
13	2	64622311	Check Valve, 3/8" FNPT
14	1	64504091	Adaptor
15	1	64618006	Tube, 1/4"

The water control system of the CustomAir Dual Wet Vacuum Pump provides the pumps with the water flow required for proper suction and supplemental cooling. Automatic and independent water control is provided for each pump. Filters protect the system from damage due to solid materials in the water supply. Flow valves control the amount of water supplied to each pump.



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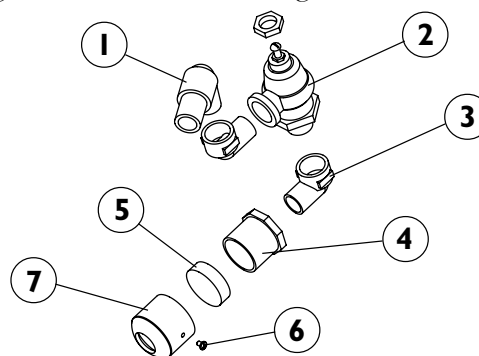
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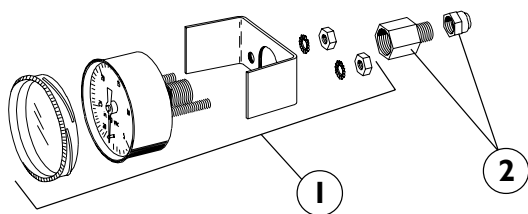
Vacuum Control Assembly

No.	Qty.	Part No.	Description
	1	64501391	Vacuum Control Assembly
1	1	64541117	Elbow, PVC, 3/4" MIP x 1" Shank
2	1	64622001	Vacuum Relief Valve
3	2	64541016	Elbow, Brass, Street 3/4"
4	1	64516008	Bushing, PVC, 1-1/4" Slip x 3/4" FIP
5	1	64568145	Filter Element, Vacuum Relief Valve
6	1	64611085	Screw, 8 x 1/4" Phillips
7	1	64521009	Cap, PVC, 1-1/4"

The vacuum control assembly is attached to the central section of the front control panel. The valve in this assembly provides automatic regulation of the vacuum flow in the system. The vacuum level can be adjusted for different system requirements. The vacuum gauge is connected to a fitting on this assembly.



Vacuum Gauge and Adapter

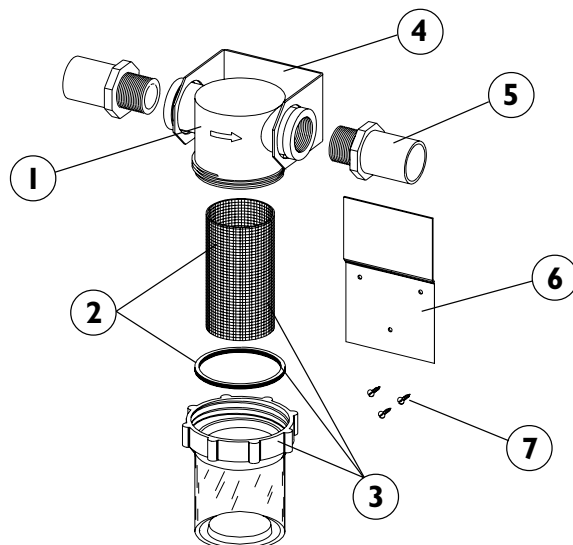


No.	Qty.	Part No.	Description
1	1	64568134	Vacuum Gauge Assembly
2*	1	64531008	Adapter, 1/4" FIP x 1/4" Poly

NOTE: *Not included in assembly.

In-Line Filter Assembly, 1"

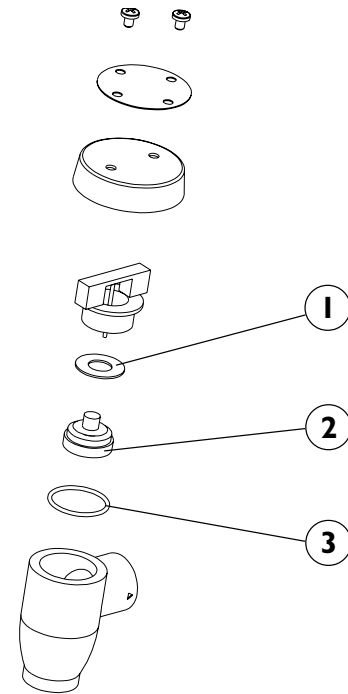
No.	Qty.	Part No.	Description
	1	64501940	In-Line Filter Assembly, 1"
1	1	64509017	In-Line Filter Body, 1"
2	1	64568121	Screen, 1", 20 Mesh, 2-1/4" D x 4-1/4" L, & Gasket
3	1	64568122	Screen, 1", 20 Mesh, 2-1/4" D x 4-1/4" L, Gasket & Bowl, 1" In-Line Filter, Clear
4	1	64514041	Bracket, 1" In-Line Filter, older
5	2	64568153	Adapter, PVC 1" MIP x 1-1/2" Shank or
	2	64504103	Adapter, PVC 1" MIP x 1" Shank
6	1	64514042	Bracket, In-Line Filter Wall Mount
7	3	64611007	Screw, 10 x 1/2" Pan Slot



MC-201 FS / MC-202 FS

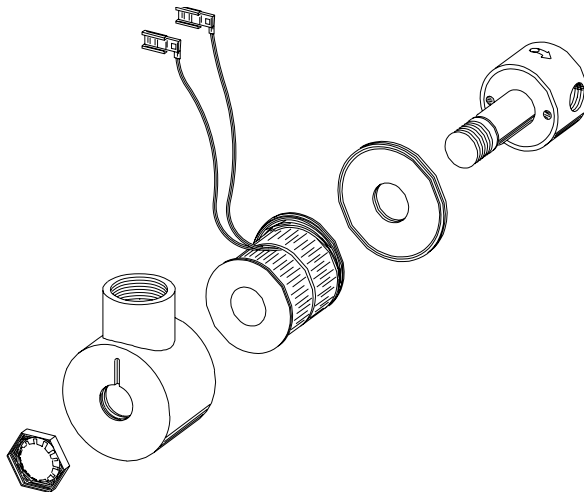
Anti-Siphon Valve Assembly

No.	Qty.	Part No.	Description
	1	64622011	Anti-Siphon Valve Assembly
1,2,3	1	64568016A	Anti-Siphon Repair Kit



Water Solenoid Valve Assembly

No.	Qty.	Part No.	Description
	1	64568156	Water Solenoid Valve Assembly





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