

EPC-12E Flow Control

Manual Number: MC009

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Cartoners	Packing machines such as carton sealers.
Encoder	An electro/mechanical device that produces an electrical output signal based on shaft rotation.
Glue Pattern	The combination of glue and lack of glue on a product.
Indicator Light	Any light that illuminates to indicate operation.
LED	Light Emitting Diode
Line Shaft Assembly	A method of driving an encoder by means of the shaft of a parent machine using belts and pulleys. Product speed and shaft must be proportional.
Machine-timed Control	Any control that is dependent upon the parent machine for its timing (synchronized).
Millisecond	One-thousandth of one second.
PC Board	Printed Circuit Board
Product	Any package, carton, box, can, etc. processed by the parent machine.
Product Scanner	A switch that senses the presence and absence of a product. Can be either an optical scanner or a mechanical limit switch.
Proximity Switch	An electronic switch that is actuated without physical contact (generally magnetic or pneumatic).
Real-timed Control	Operates independently of the machine that is controlled.
Repeat Dimension	The distance between the leading edge of one product and the leading edge of the following product.
Timed Machine	A machine that controls product movement by means of lugs, flight bars, buckets, or synchronized feed.
Timed Shaft	Any positively-driven shaft in a parent machine. A positively-driven shaft is driven by gears, chains, or other non-slip devices.
Un-timed Machine	A machine that does not control product spacing. Product spacing is a variable.

The EPC-12E is an electronic speed control assembly designed to make a D.C. motor automatically follow the speed variations of a parent machine. Its primary application is the control of hot-melt adhesive systems in order to obtain a uniform adhesive flow over the entire speed range of the parent machine.

The EPC-12E controls the speed of a D.C. motor according to a pulse input received from an optical encoder. The encoder is driven by the parent machine. The EPC-12E converts the speed-related encoder signal into a low-voltage, analog signal that is inputted to a motor control interface (MCI-3) circuit. The MCI-3 circuit converts the low-voltage input into a high-voltage output signal that is sent to the armature of a shunt-wound or permanent-magnet D.C. motor. The MCI-3 board also provides voltage for the field windings in a shunt-wound motor. An EPC-12E control must use an MCI-3 interface circuit. An MCI-3 circuit can accept low-voltage inputs from a control circuit other than the EPC-12E.

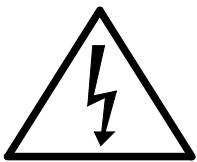
When the auto/manual switch of the MCI-3 assembly is set to automatic, the EPC-12E will govern the hot-melt system. When the switch is set to manual, the EPC-12E is locked out, allowing the operator to control glue flow with a knob that is located on the front panel of the hot-melt unit.

A manually-controlled hot-melt unit can be converted to automatic speed controlled by replacing the original motor control with the MCI-3 and EPC-12E circuits.

Valco Cincinnati has prepared this manual as a general guide for operating and servicing the EPC-12E. Some components are customized for special machines. Others are designed for a customer's special requirements. This does not permit exact definition of some parts within this manual. Additional operation manuals are available for specific cold glue equipment.

Should you need more information, or have problems with the system, please contact your Valco Cincinnati sales representative. If your question is urgent, we encourage you to directly contact our corporate office in Cincinnati, Ohio, U.S.A. at (513) 874-6550, or Valco Europe in the United Kingdom at +44 1952 677911. If the problem cannot be resolved on the telephone, Valco will promptly arrange to have a technical representative visit your facility. Any charges for a service call will be quoted at that time.

The following safety symbols are used throughout this manual to alert the reader to potential safety hazards.



This symbol is used to alert the user to the presence of uninsulated dangerous voltage within the product's enclosure that may be of sufficient magnitude to constitute a risk of fire or electric shock. Failure to observe precaution may result in personnel injury, death and/or equipment damage.



This symbol is used to alert the user to the presence of important operating and/or maintenance information. Failure to observe precaution may result in personnel injury and/or damage to equipment.

Valco Cincinnati, Inc. warrants its equipment worldwide against defects in material and workmanship as follows:

Cold Glue Equipment and Electronic Controls:

One (1) year from the date of shipment by Valco Cincinnati.

Hot Melt Units, Hoses, Valves and Related Equipment:

All components except cast-in heating elements are warranted for a period of six (6) months from the date of shipment by Valco Cincinnati. Cast-in heaters carry an additional, pro-rated warranty not to exceed three (3) years from the date of shipment by Valco Cincinnati.

Liability of the company is limited to repair of the product, or replacement of any part shown to be defective, and does not extend to defects caused by accidents, misuse, abuse, neglect, tampering or deterioration by corrosion. This warranty does not cover those items determined by Valco Cincinnati, Inc. to be normal wear items such as seals, O-rings, diaphragms, springs, etc.

Reconditioned equipment, unless specified otherwise at the time of purchase, will be warranted as described above for a period of ninety (90) days from the date of shipment by Valco Cincinnati.

Components purchased by Valco Cincinnati, Inc. from others for inclusion in its products are warranted only to the extent of the original manufacturer's warranty. In no event shall Valco Cincinnati, Inc. be liable for indirect or consequential damages arising out of the use of Valco Cincinnati products. This warranty is conditioned upon the prepaid return of the equipment claimed to be defective to Valco Cincinnati, Inc. for examination and verification. If claimed de-

fect is verified, repairs or replacements will be made F.O.B. Cincinnati, Ohio, U.S.A. If the inspection of the equipment does not disclose any defect of workmanship or material, repairs, if necessary, will be made at a reasonable charge and return transportation will be charged.

This is the only authorized Valco Cincinnati, Inc. warranty and is in lieu of all other expressed or implied warranties, representations or of any other obligations on the part of Valco Cincinnati, Inc.

Any part which fails during the warranty period shall be returned prepaid to Valco Cincinnati by the customer for disposition. Upon request, Valco Cincinnati personnel are available to repair or replace such parts at the customer's facility. Charges for this service will include travel time and expenses.

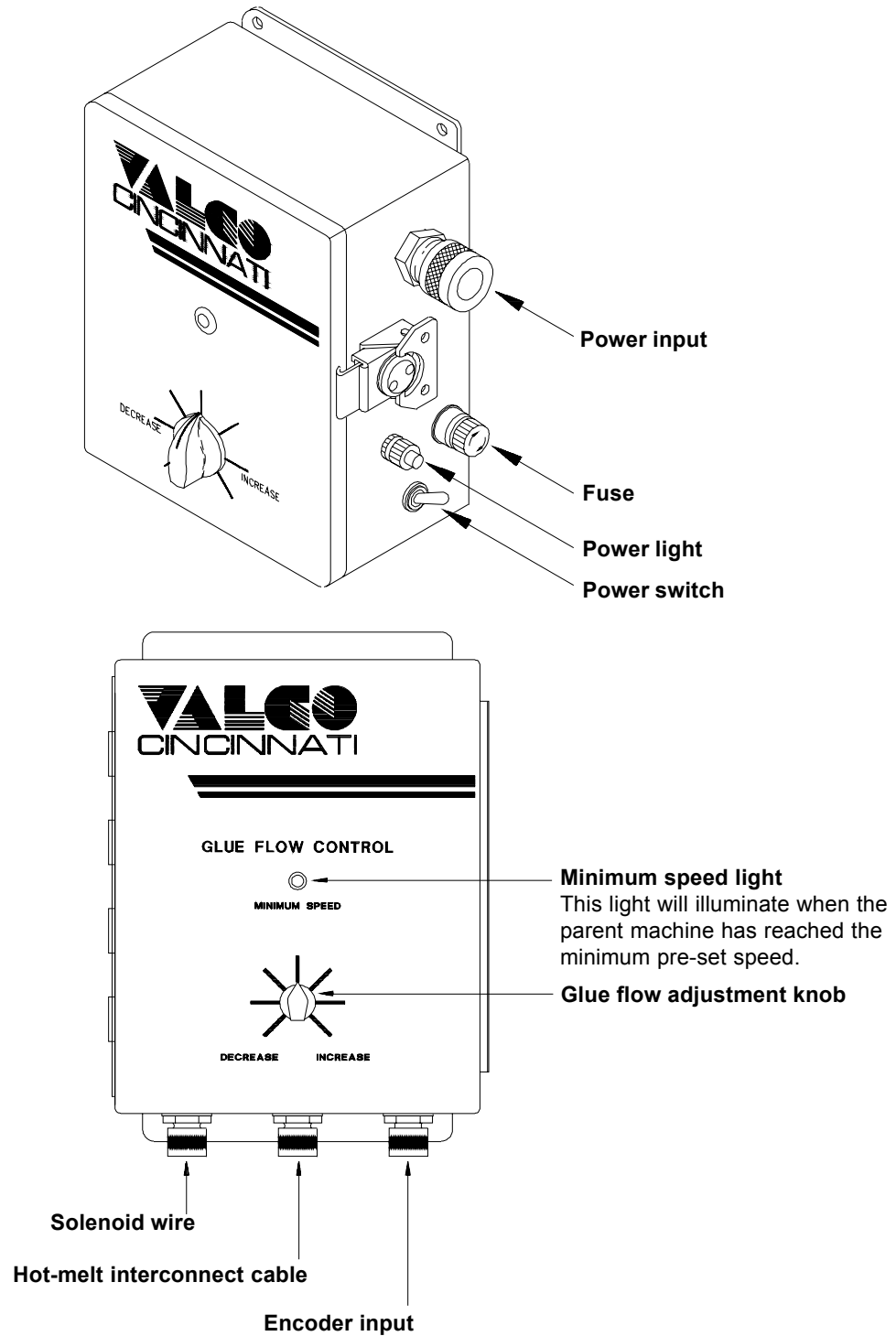
If an equipment problem is the result of customer abuse, improper installation or operation, all travel time, labor, parts, and expenses will be charged to the customer.

If the responsibility for a problem cannot be absolutely determined, the customer will be charged for travel time and expenses only. No charge will be made for parts and labor.

GENERAL PRECAUTIONS

- Properly route all electrical wires away from personnel and moving machine parts.
- Disconnect the power cord and air line before servicing. Depressurize fluid lines if check valves or diaphragms are to be serviced.
- Promptly repair or replace all worn or damaged electrical wiring and mechanical parts.
- Stay clear of moving mechanical parts and do not touch circuit boards or wire connections.
- Keep electrical enclosures closed except during setup, service, and checkout procedures.
- Use proper size fuses.
- A ground fault circuit interrupter can be installed for added safety where standing water may be present.
- Remove pressure from adhesive lines between the regulator and applicator valves when servicing the system.
- The EPC-12E is normally wired for 120VAC and interfaces with a 240VAC hot-melt system. Both of these power levels could be exposed at various points inside the EPC-12E enclosure. These power levels can be lethal. Always disconnect the electrical power before opening the enclosure, adjusting the EPC-12E internal components, or servicing the EPC-12E.

FRONT AND SIDE PANELS

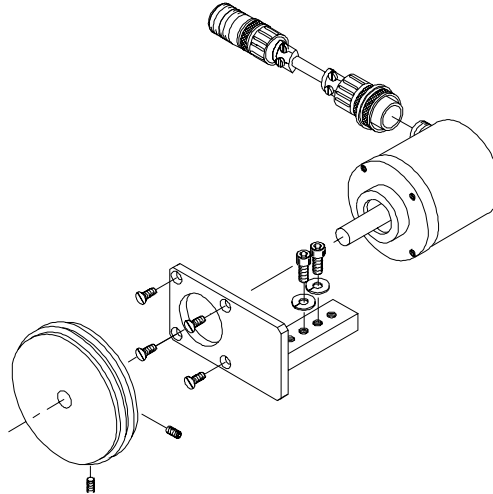


HOT-MELT UNIT INTERFACE



ENCODER ASSEMBLIES

1. Measuring Wheel Encoder Assembly (See "Appendix" section in this manual for encoder selection guide.)



2. Line Shaft Encoder Assembly (See "Appendix" section in this manual for encoder selection guide.)

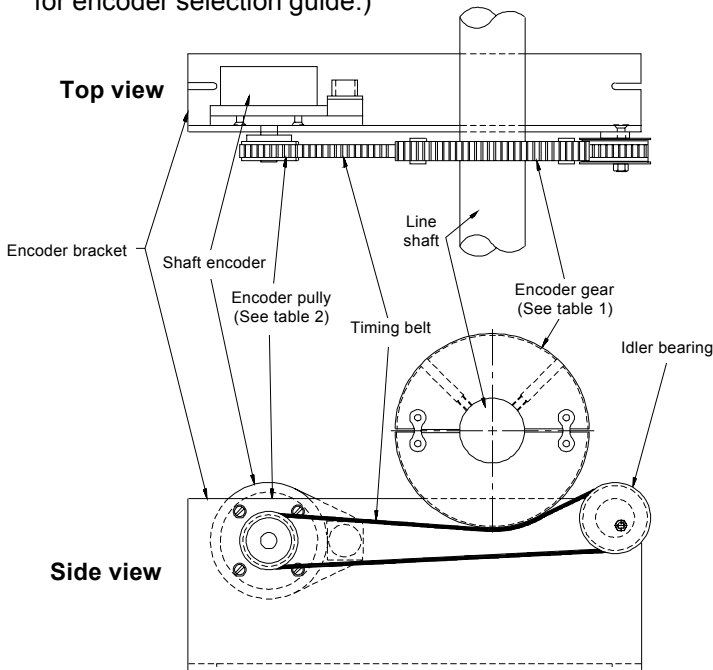


Illustration 999XC155-02

TABLE 1	
PART NUMBER	SHAFT ENCODER GEAR
788XX092	92 teeth - split and linked
788XX072	72 teeth - split and linked
788XX060	60 teeth - split and linked
788XX048	40 teeth - split and linked

TABLE 2	
PART NUMBER	SHAFT ENCODER PULLY
788XX118	18-tooth encoder gear
788XX120	20-tooth encoder gear
788XX121	21-tooth encoder gear
788XX122	22-tooth encoder gear
788XX124	24-tooth encoder gear
788XX128	28-tooth encoder gear
788XX130	30-tooth encoder gear
788XX232	32-tooth encoder gear
788XX236	36-tooth encoder gear
788XX240	40-tooth encoder gear
788XX242	42-tooth encoder gear
788XX244	44-tooth encoder gear
788XX248	48-tooth encoder gear
788XX260	60-tooth encoder gear

OPERATING REQUIREMENTS

Electric

The EPC-12P requires 100VAC, 120VAC, or 240VAC, 50/60 Hz., one ampere maximum, single phase power supply with ground.

Air

80-120 psi (5.5-8.3 bar)

MOUNTING

Mount the EPC-12P unit at or near the operator's station. The unit is supplied with 25 ft. (8 m) of 3/8" O.D. inlet tubing and 25 ft. (8 m) of 1/4" O.D. output tubing.

Refer to the "Specifications" page for mounting hole measurements.

ENCODER SELECTION

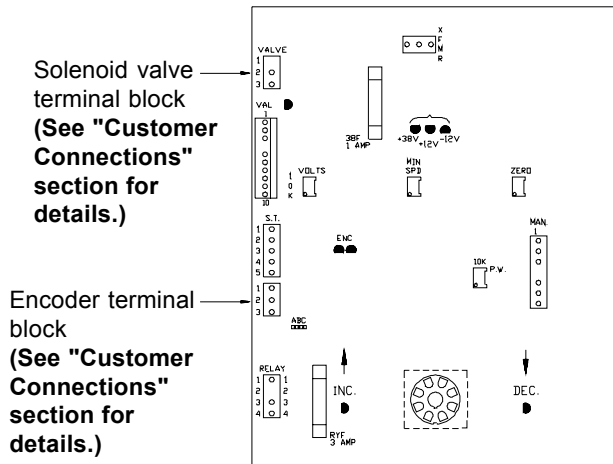
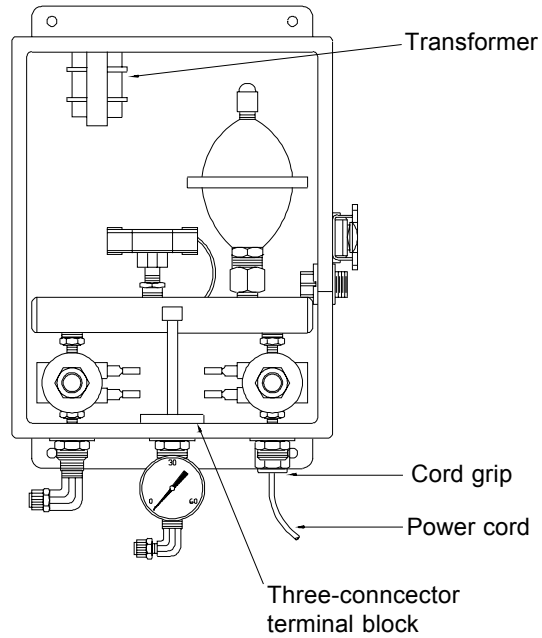
The encoder can be driven with a **measuring wheel** or a **line shaft assembly**. Use the appropriate encoder for the drive method being used. The measuring wheel can be used over the entire speed range of the parent machine. There are low-speed limitations associated with the line shaft assembly method.

In order to determine the proper encoder, see the encoder selection charts in the appendix of this manual.

POWER CONVERSION

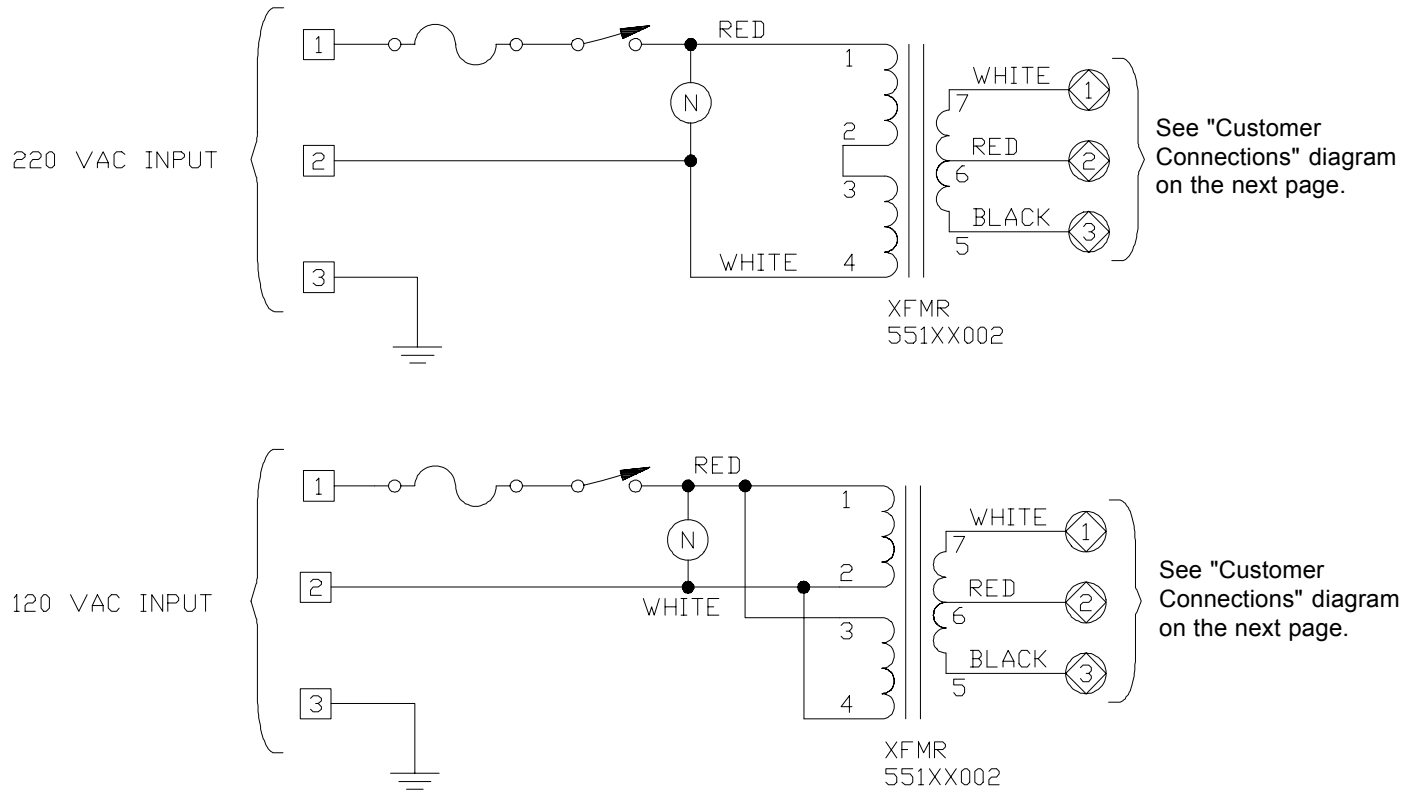
The EPC-12P requires 120 or 240 VAC, single phase power with ground. The transformer may be converted from 120VAC to 240VAC in the field. In the event that the unit needs to be converted from 120 to 240, follow the procedure listed below.

1. Turn off all electrical power to the EPC-12P.
2. Remove the transformer from the cabinet by holding the locknuts with an 11/32" nut holder or pliers, and turning the screws with a screwdriver.
3. Change wiring configuration according to the illustration on the next page.
4. Replace transformer and tighten locknuts. Make sure that the ground wire is connected properly.
5. Bring AC power to the EPC-12P according to plant regulations and local codes. Avoid circuits that operate high amperage equipment.
6. Remove the 120VAC power cord and cord grip and install 240VAC power cord. Connect the power cord to the three-connector terminal block that is mounted inside the door at the bottom center of the EPC-12P cabinet (see diagram).
7. Insert the 7-pin female connector of the encoder cable into the encoder. Insert the exposed wire end of the cable through the bottom left cord grip of the EPC-12P cabinet and connect the three wires of the cable to the encoder terminal block (see diagram).
8. Drill or punch a 7/8" diameter hole in the upper left side of the EPC-12P cabinet for a cord grip. Do not damage door wiring. Insert a solenoid wire (not supplied) through the cord grip and connect it to the top left terminal block (valve) on the circuit board.

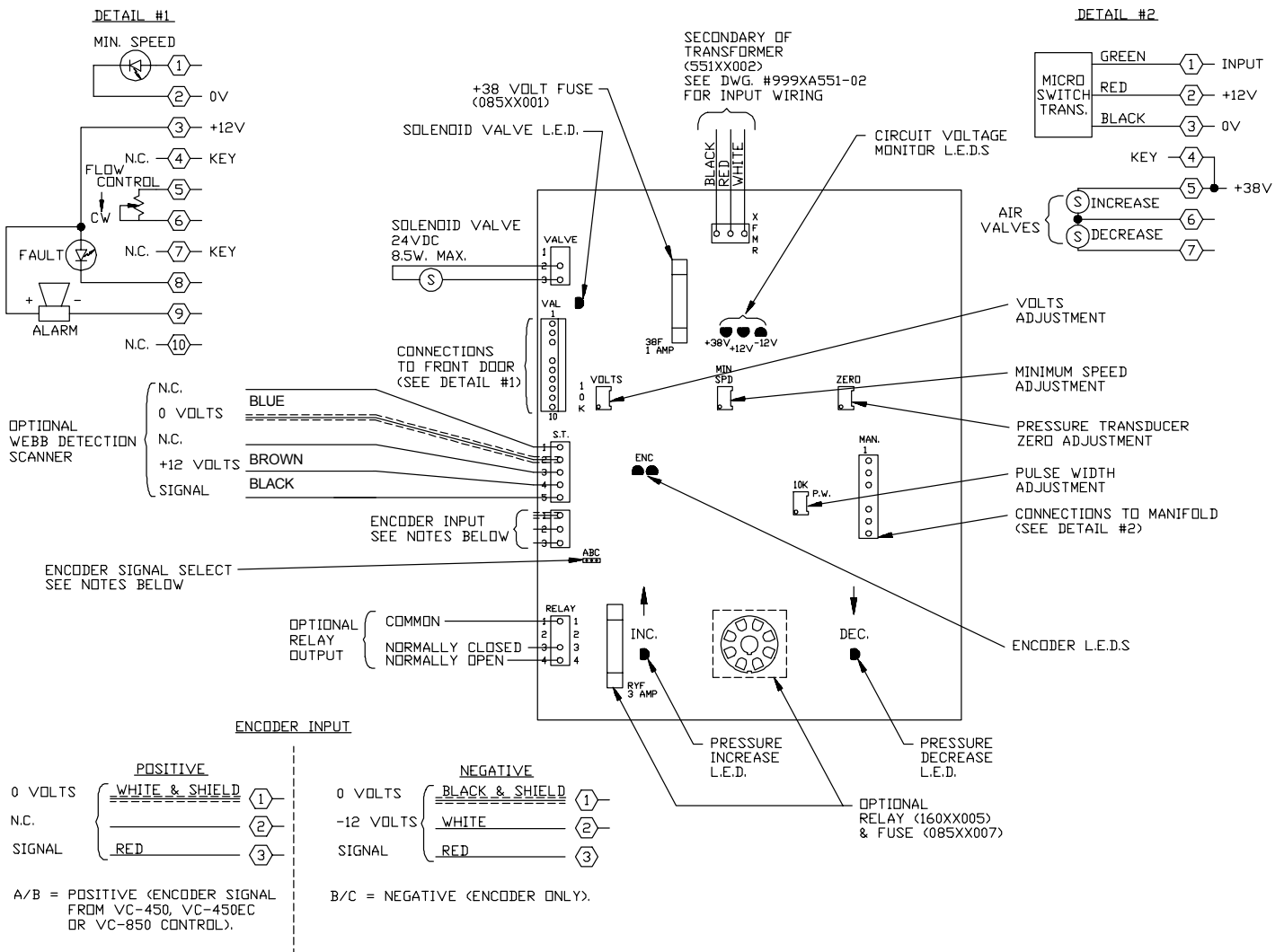


Avoid wiring connections that may allow condensation to enter the cabinet.

TRANSFORMER WIRING DIAGRAM



CUSTOMER CONNECTIONS



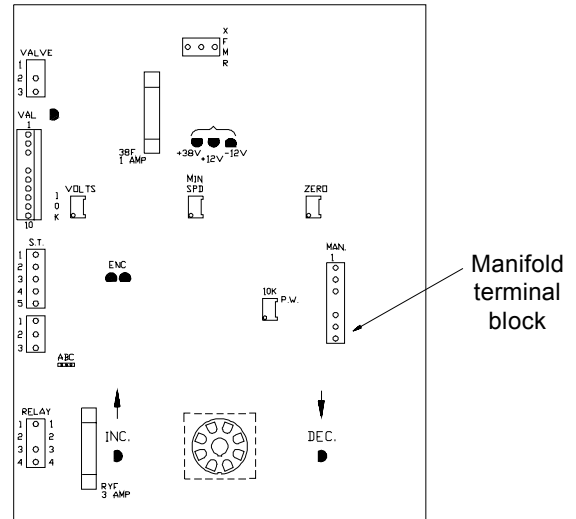
OPTIONAL RELAY WIRING

See "Customer Connections" diagram on the previous page.

OPTIONAL DUMP VALVE WIRING

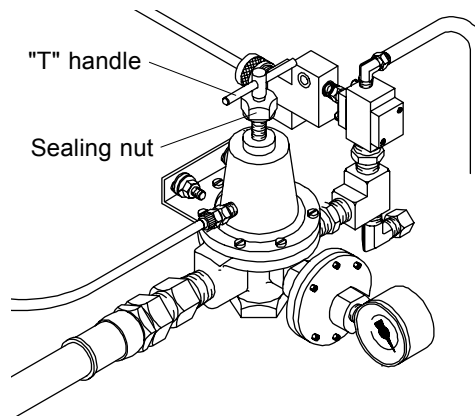
See "Customer Connections" diagram on the previous page.

1. Remove the manifold terminal block plug from the circuit board.
2. Back out locking screws for wires 6 (red) and 7 (white).
3. Each receptacle in the plug will take two (2) wires.
4. Insert the dump valve wires, tighten screws and replace plug.



REGULATOR ADJUSTMENT

1. Disconnect the air output line from the EPC-12P.
2. Turn the sealing nut on the regulator counter-clockwise until it reaches the top of the threaded shank.
3. Run the parent machine at the lowest desired operating speed.
4. Turn the regulator's "T" handle to obtain the desired adhesive flow.
5. Hold the "T" handle in place while turning the sealing nut clockwise until the sealing nut stops.



INTERNAL ADJUSTMENTS

The following adjustments can be made on the circuit board located inside the EPC-12P cabinet:

- Pulse width adjustment
- Volts adjustment
- Minimum speed adjustment
- Pressure transducer zero adjustment

These adjustments are made using a screwdriver to turn thirty-turn clutched potentiometers on the circuit board. A click can be heard when the adjustment has been turned completely left or right.



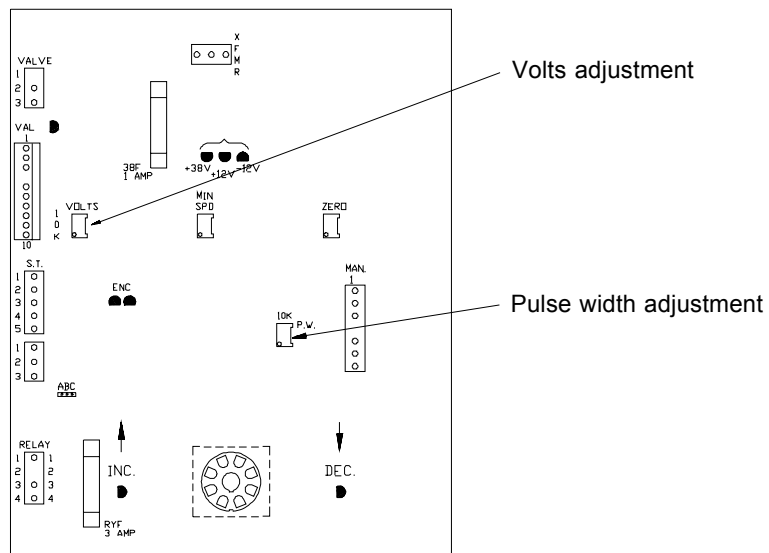
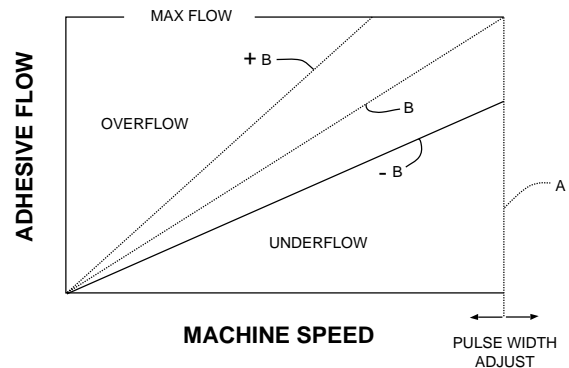
Set the Glue Flow Control knob on the front panel to the 12 o'clock (vertical) position before making adjustments.

Pulse Width Adjustment

This adjustment changes the duration of the pulse that has been received from the encoder in order to produce a strong output signal. It is a coarse adjustment that changes the maximum adhesive flow to correspond with the maximum machine speed (or the machine speed at which adhesive flow is desired to be maximum).

1. Set the Glue Flow Control knob to the 12 o'clock (vertical) position.
2. Turn the **Volts Adjustment** (see illustration below) completely to the left or right (until you hear a click) and then turn the adjustment 15 positions in the opposite direction. The adjustment is now in the center position.
3. Turn the **Pulse Width** adjustment fully counterclockwise until you hear a click. This will set the circuit for high parent machine speed. (This is equal to moving line "A" as far to the right as possible.)
4. Run the parent machine at maximum speed (or the speed at which adhesive flow is desired to be maximum).
5. Turn the **Pulse Width** adjustment clockwise until the adhesive flow appears to be maximum. (This is a coarse adjustment. It is not necessary to adjust this precisely.)

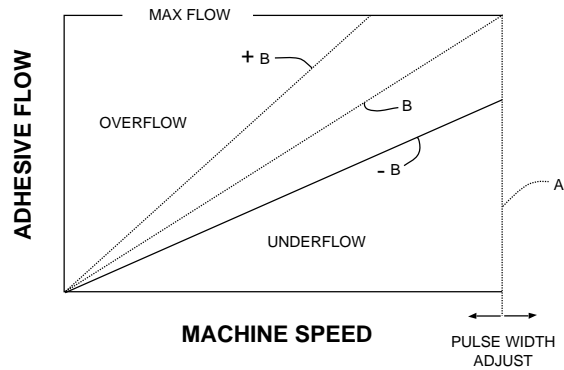
Adjustment of the pulse width is equivalent to shifting line "A" to the right or the left in the illustration below.



Volts Adjustment

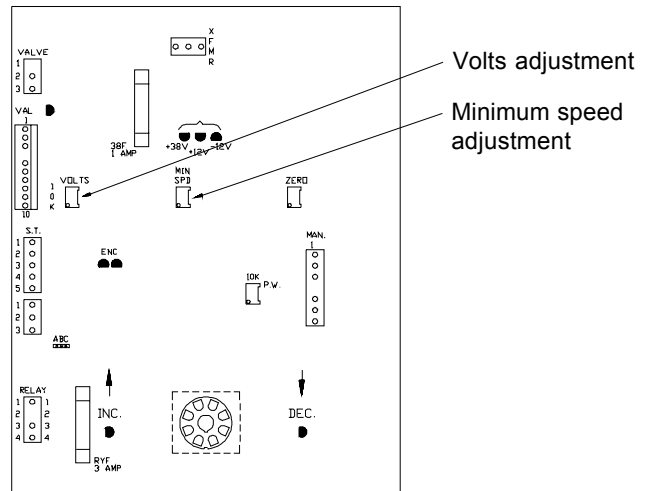
The Volts Adjustment is used to synchronize the maximum adhesive flow with the maximum speed of the machine (shown as line "B" in the illustration to the right). If the adhesive flow reaches maximum before the parent machine reaches its top speed, then adhesive application will not increase with further increases of machine speed (shown as line "+B"). If the parent machine reaches its top speed before the adhesive flow reaches maximum, then the adhesive flow is limited over the entire speed range of the parent machine (shown as line "-B").

A clockwise rotation of the Volts Adjustment will increase the adhesive flow. Turning the adjustment counterclockwise will decrease the adhesive flow. Set the Glue Flow Control Knob on the front of the EPC-12P to the 12 o'clock (vertical) position before turning the Volts Adjustment.



Minimum Speed Adjustment

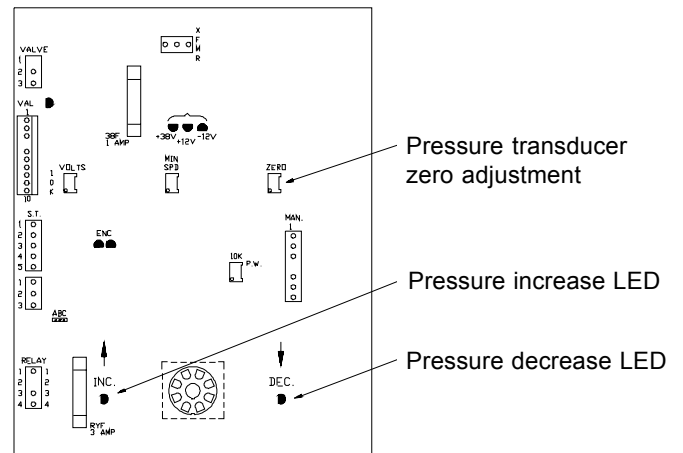
The Minimum Speed Adjustment raises and lowers the threshold speed at which the minimum speed safety circuit is activated. A clockwise rotation increases the threshold speed, and a counterclockwise rotation will decrease the threshold speed. The minimum speed light on the front of the EPC-12P will illuminate when the minimum speed circuit is on.



Pressure Transducer Zero Adjustment

The Pressure Transducer Zero Adjustment is used to synchronize a particular transducer to a particular system. The EPC-12P is sent with this adjustment at zero. If the transducer is replaced outside of the factory, use the following procedure:

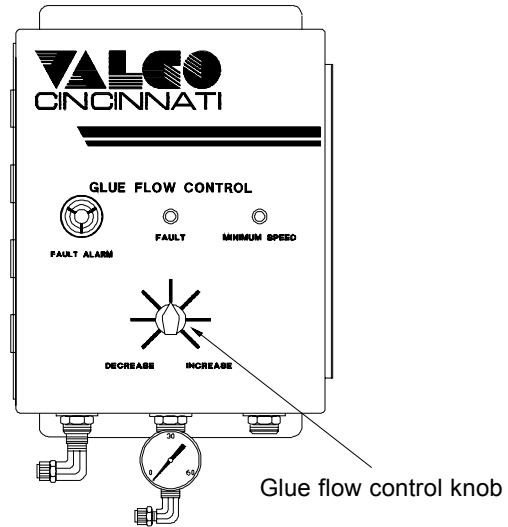
1. Turn the parent machine off.
2. Disconnect the air inlet line so that the manifold cannot receive air.
3. Turn the EPC-12P on. Wait two minutes until the amplifier in the pressure transducer stabilizes.
4. If the Pressure Increase LED is illuminated, turn the Pressure Transducer Zero Adjustment clockwise until the LED goes off. Continue to turn the adjustment clockwise until the Pressure Decrease LED illuminates. Turn the adjustment counterclockwise to the middle position (about one half of a turn).
5. If the Pressure Decrease LED is illuminated, turn the Pressure Transducer Zero Adjustment counterclockwise until the LED goes off. Continue to turn the adjustment counterclockwise until the Pressure Increase LED illuminates. Turn the adjustment clockwise to the middle position (about one half of a turn).



GLUE FLOW CONTROL KNOB

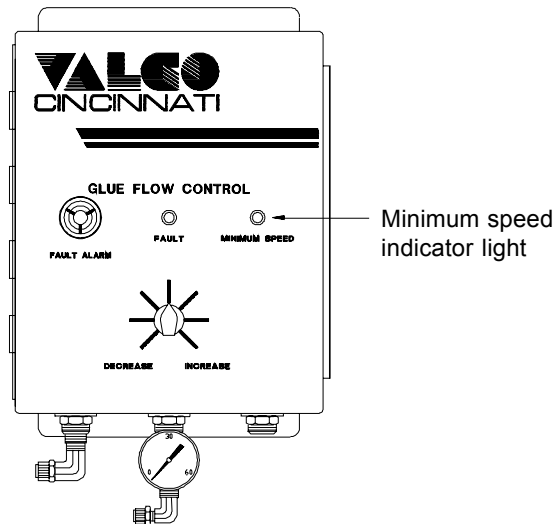
- Turn the Glue Flow Control knob clockwise to increase the adhesive flow.
- Turn the Glue Flow Control knob counter-clockwise to decrease the adhesive flow.

If glue flow is not sufficient, refer to the "Setup" section of this manual.



MINIMUM SPEED INDICATOR LIGHT

The Minimum Speed Indicator Light will illuminate when the parent machine has reached a preset minimum speed. (See "Setup" section of this manual for minimum speed adjustment procedure).

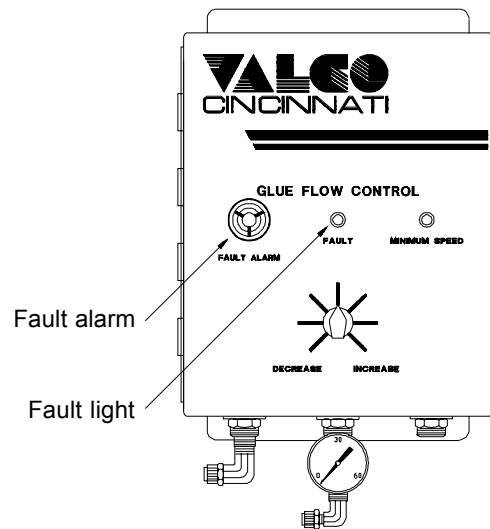


FAULT LIGHT AND ALARM

The front panel fault light will illuminate if the EPC-12P is not registering air pressure. The fault alarm will sound after 30 seconds.

If the fault light illuminates:

- Check the air output gauge of the air regulator.
- If the air regulator gauge is registering the correct air output pressure, the air line from the air regulator to the EPC may be obstructed. Check the needle valve inside the cabinet of the EPC.



START-UP PROCEDURE

1. Prepare the parent machine for operation.
2. Turn on shop air supply.
3. Turn on the EPC-12P and check the Power Indicator Light on the side on the cabinet.
4. Run parent machine. When the parent machine reaches desired operating speed, check that the Minimum Speed Light on the EPC's front panel is illuminated.
5. Observe glue application. Adjust the Glue Flow Control Knob if necessary.

GLUE PRESSURE AT START-UP AND SHUT-DOWN

If the adhesive valves are closed before the parent machine speed is decreased, pressurized adhesive will be stored in the line between the regulator and the adhesive valve(s). If the application of adhesive is resumed at a lower operating speed, there will be a temporary overflow of adhesive. To prevent this, manually depressurize the adhesive line before resuming adhesive application. This can be accomplished after shut-down or before start-up.

Automatic depressurization can be provided with a relief valve at the output of the pressure regulator. The relief valve is wired parallel to the exhaust valve in the EPC-12P. Depressurization occurs according to parent machine speed and excess adhesive is dumped from the system.

GENERAL

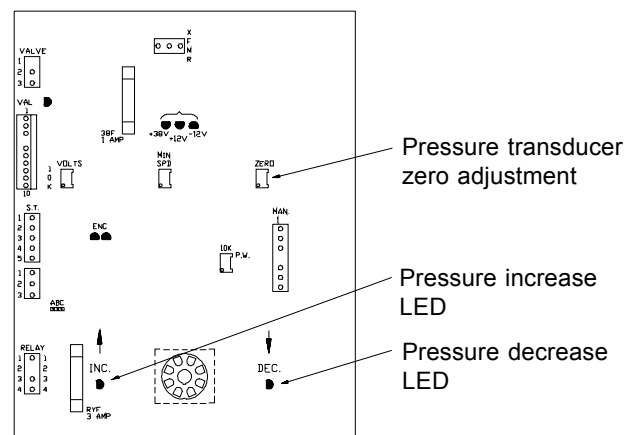
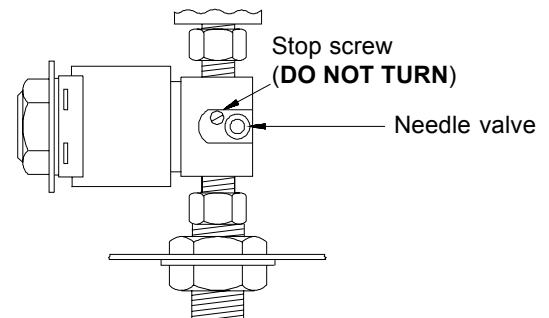
- Inspect wiring for damage or wear.
- Inspect air lines for damage or leakage.

MANIFOLD AIR VALVES

In most cases the manifold air valves may be cleaned with air using the following procedure:

1. Turn off the parent machine.
2. Turn on the EPC-12P.
3. Turn on air supply to the EPC-12P.
4. Turn the needle valve on the inlet and exhaust valve four to five turns counterclockwise. **(DO NOT TURN THE STOP SCREW.)**
5. Turn the Pressure Transducer Zero Adjustment counterclockwise until the Pressure Increase LED comes on. Then turn the Pressure Transducer Zero Adjustment clockwise until the Pressure Decrease LED comes on. Repeat this step several times.
6. Turn the needle valve clockwise until it seats. Then turn counterclockwise 1/8 of a turn.
7. Disconnect the inlet air line so that the manifold cannot receive air.

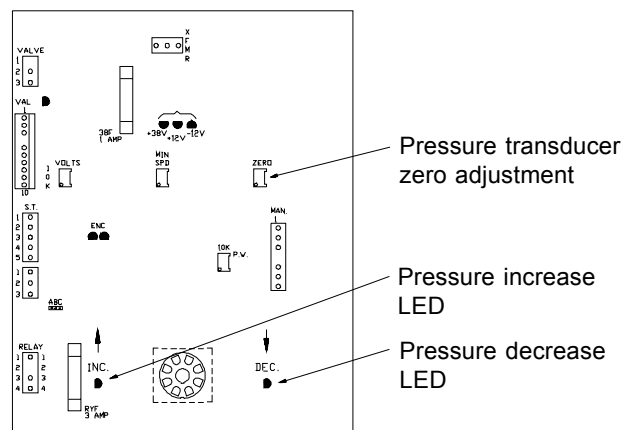
(Continued)



Manifold Air Valve (continued)

8. If the Pressure Increase LED is illuminated, turn the Pressure Transducer Zero Adjustment clockwise until the LED goes off. Continue to turn the adjustment clockwise until the Pressure Decrease LED comes on. Turn the adjustment counterclockwise to the middle position (about one half of a turn).
9. If the Pressure Decrease LED is illuminated, turn the Pressure Transducer Zero Adjustment counterclockwise until the LED goes off. Continue to turn the adjustment counterclockwise until the Pressure Increase LED comes on. Turn the adjustment clockwise to the middle position (about one half of a turn).

If the needle valves are excessively dirty or plugged with adhesive, the procedure listed above may not be successful. A valve overhaul or replacement may be required.



Pressure transducer zero adjustment

Pressure increase LED

Pressure decrease LED

CABINET

The EPC-12P cabinet should be closed unless adjustments, maintenance or service is required.

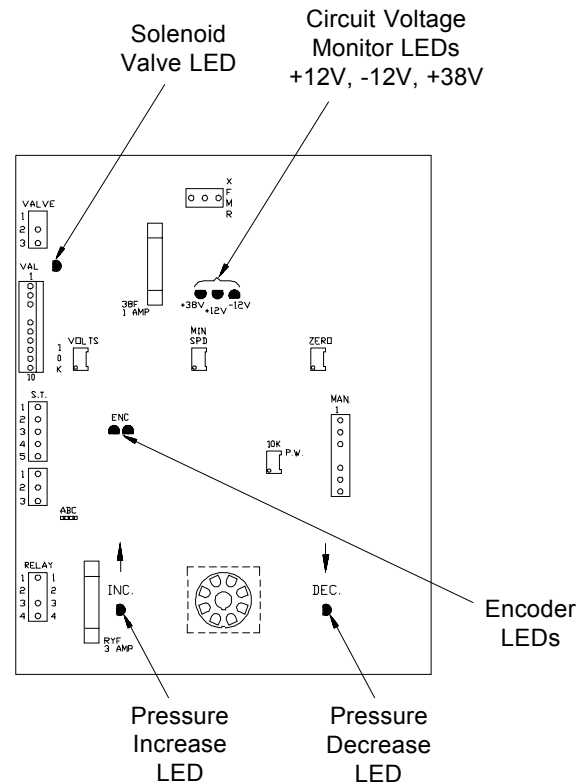
The exterior may be cleaned with a soft cloth and a mild soap and water solution. Automotive wax may be applied to protect the finish.

Do not use a water hose or steam to clean the exterior of the cabinet. If the parent machine is cleaned in this manner, cover the EPC-12P with plastic or other waterproof material.

EPC-12E

The circuit board located inside the EPC-12P has eight indicator lights (LEDs) to assist in troubleshooting.

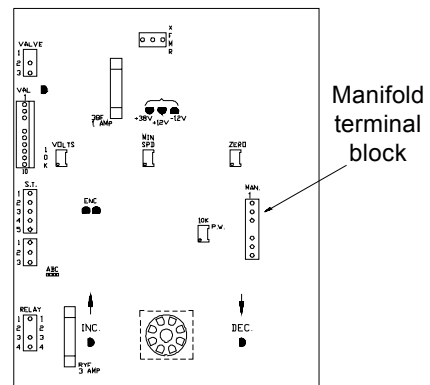
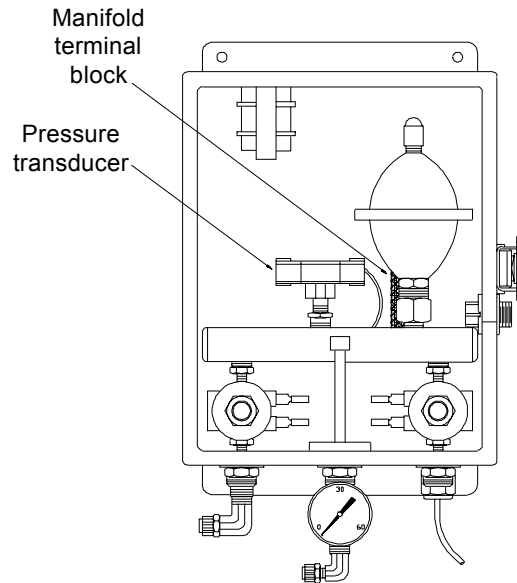
- **+12V LED**
Indicates power supply to the internal circuit board.
- **-12V LED**
Indicates power supply to the encoder circuit.
- **+38V LED**
Indicates power supply to the valve circuit.
- **SOLENOID VALVE LED**
Indicates power output from the minimum speed valve circuit. During proper operation, this LED operates in unison with the Minimum Speed Light on the front panel of the EPC-12P.
- **ENCODER LEDs (2)**
The LED on the left side is illuminated when the encoder output is 12 volts. The LED on the right side is illuminated when the encoder output is zero volts. The square wave output of the encoder is 12 volts (average 6 volts). During normal operation, both LEDs will appear illuminated at the same time with equal brightness. The brightness of the LEDs will be proportional to machine speed.
- **PRESSURE INCREASE LED**
Indicates that the inlet solenoid is activated (open).
- **PRESSURE DECREASE LED**
Indicates that the exhaust solenoid is activated (open).



PROBLEM	POSSIBLE CAUSE	SOLUTION
Power indicator light not illuminated	<ul style="list-style-type: none"> • Line fuse is out • Faulty service cable connections • Damaged service cable • No electrical service 	<p>Replace fuse with 1 amp, 250V slow-blow.</p> <p>Repair.</p> <p>Repair or replace.</p> <p>Check plant's power supply.</p>
+12V, -12V, and +38V LEDs are not illuminated	<ul style="list-style-type: none"> • Faulty transformer connections • Faulty transformer • Faulty circuit board 	<p>Repair.</p> <p>Replace.</p> <p>Replace circuit board.</p>
Only -12V LED is not illuminated	<ul style="list-style-type: none"> • Thermal overload of circuit 	<p>Repair or replace encoder cable.</p>
Only +38V LED is not illuminated	<ul style="list-style-type: none"> • +38V fuse is out • Faulty circuit board 	<p>Replace fuse.</p> <p>Replace circuit board.</p>
Solenoid valve LED is illuminated, but the minimum speed light is not illuminated	<ul style="list-style-type: none"> • Minimum speed light is out 	<p>Replace light.</p>
Solenoid valve LED is not illuminated, but the minimum speed light is illuminated	<ul style="list-style-type: none"> • Faulty circuit board 	<p>Replace circuit board.</p>
One encoder LED is illuminated, the other encoder LED is not illuminated	<ul style="list-style-type: none"> • Encoder is not rotating • Encoder cable is damaged 	<p>Check encoder assembly.</p> <p>Replace cable.</p>
One encoder LED is much brighter than the other encoder LED	<ul style="list-style-type: none"> • Faulty encoder operation 	<p>Replace encoder.</p>

PROBLEM	POSSIBLE CAUSE	SOLUTION
<p>Fault light illuminated and aural alarm has been activated</p>	<ul style="list-style-type: none"> • EPC-12P power is ON but the air supply is OFF. • Leak in output hose or fitting • Inlet or exhaust valve is dirty • Adhesive visible in the clear portion of the manifold output tubing • Solenoid coil malfunction • Transducer malfunction 	<p>Turn EPC-12P OFF.</p> <p>Repair.</p> <p>See "Manifold Air Valves" in the "Maintenance" section of this manual.</p> <p>Replace ruptured diaphragm in the pressure regulator and clean the system. See "Manifold Air Valves" in the "Maintenance" section of this manual.</p> <p>Replace.</p> <p>Replace.</p>
<p>All LEDs are operating properly but adhesive flow does not follow machine speed</p>	<ul style="list-style-type: none"> • Output air line plugged 	<p>Check pressure regulator for ruptured diaphragm and clean output air line.</p>

1. Remove the manifold terminal block (located behind the surge tank) from the circuit board.
2. Loosen locking screws on the manifold terminal block for transducer wires 1, 2, and 3.
3. Turn the transducer counterclockwise to remove.
4. Reverse the procedure listed above to install a new transducer.



ENCODER SELECTION

The encoder can be driven with a **measuring wheel** or a **line shaft assembly**. Use the appropriate encoder for the drive method being used. The measuring wheel can be used over the entire speed range of the parent machine. There are low-speed limitations associated with the line shaft assembly method.

Use the following chart to record data for the encoder selection.

1. Choose a shaft on the parent machine. This shaft will drive the encoder.
2. Measure the diameter of the shaft and record the value in the space provided below. (Measure to within + .001" or + .02 mm.)
3. Determine the amount of product travel per revolution of the shaft (inches or millimeters per revolution). Record the value in the space provided below.
4. Determine the maximum parent machine speed in feet or meters per minute. Record the value in the space provided below.

Diameter of shaft (inches or millimeters)	
Amount of product travel per shaft revolution (inches or millimeters per revolution)	
Maximum parent machine speed (feet or meters per minute)	

**ENCODER SELECTION CHART FOR
LINE SHAFT APPLICATION -
IMPERIAL MEASUREMENT**

**Amount of product travel per shaft revolution
(inches per revolution)**

		5	10	15	20	25	30	35					
Product speed (feet per minute)	1800	Use VCE-250 with measuring wheel	0.68	0.95	1.22	1.49	1.76	2.03	Pulley ratios for VCE-250 encoder				
	1700		0.71	1.00	1.29	1.57	1.86	2.14					
	1600		0.76	1.06	1.36	1.67	1.97	2.27					
	1500		0.81	1.13	1.45	1.77	2.10	2.42					
	1400		0.86	1.21	1.55	1.90	2.24	2.59					
	1300		0.93	1.30	1.67	2.04	2.41	2.78					
	1200		1.00	1.40	1.80	2.20	2.60	3.00					
	1100		1.09	1.52	1.96	2.39	2.83	3.26					
	1000		0.71	1.19	1.67	2.14	2.62	3.10			3.57		
	900		0.79	1.32	1.84	2.37	2.89	3.42			3.95		
	800		0.88	1.47	2.06	2.65	3.24	3.82			4.41		
	700		1.00	1.67	2.33	3.00	3.67	4.33			2.50	Pulley ratios for VCE-500 encoder	
	600		1.15	1.92	2.69	3.46	4.23	2.50			2.88		
	500		1.36	2.27	3.18	4.09	2.50	2.96			3.40		
400	1.67	2.78	3.89	2.50	3.06	3.62	4.16						
300	2.14	3.57	2.50	3.22	3.92	4.64	5.36						
200	3.00	2.50	3.50	4.50	5.50	6.50	7.50						
100	1.25	2.08	2.92	3.75	4.58	For VCE-1000							

**ENCODER SELECTION CHART FOR
LINE SHAFT APPLICATION -
METRIC MEASUREMENT**

**Amount of product travel per shaft revolution
(millimeters of product travel per shaft revolution)**

		200	250	300	350	400	450	500	550	600	
Product speed (meters per minute)	550				0.76	0.87	0.98	1.09	1.20	1.31	Pulley ratios for VCE-250 encoder
	500	Use VCE-250 with measuring wheel		0.72	0.84	0.96	1.08	1.20	1.32	1.44	
	450			0.80	0.93	1.07	1.20	1.33	1.47	1.60	
	400		0.75	0.90	1.05	1.20	1.35	1.50	1.65	1.80	
	350		0.86	1.03	1.20	1.37	1.54	1.74	1.89	2.06	
	300	0.80	1.00	1.20	1.40	1.60	1.80	2.00	2.20	2.40	
	250	0.96	1.20	1.44	1.68	1.92	2.16	2.40	2.64	2.88	
	200	1.20	1.50	1.80	2.10	2.40	2.70	3.00	3.30	3.60	
	150	1.60	2.00	2.40	2.80	3.20	3.60	4.00	4.40	4.80	
	100	2.40	3.00	3.60	4.20	4.80	2.70	3.00	3.30	3.60	
50	4.80	3.00	3.60	4.20	4.80	5.40	6.00	6.60	7.20		
25	1.20	1.50	1.80	2.10	2.40	2.70	3.00	3.30	3.60	For VCE-1000	

**DRIVE PULLEY AND ENCODER
PULLY COMBINATIONS**

Drive pulleys

Teeth	48	60	72	92
Maximum bore, inches	1.75	2.50	3.25	4.50
Maximum bore, millimeters	444	635	825	1143

Number of encoder pulley teeth

18	2.67	3.33	4.00	5.11
20	2.40	3.00	3.60	4.60
21	2.29	2.86	3.43	4.38
22	2.18	2.73	3.27	4.18
24	2.00	2.50	3.00	3.83
28	1.71	2.14	2.57	3.29
30	1.60	2.00	2.40	3.06
32	1.50	1.88	2.25	2.88
36	1.33	1.67	2.00	2.56
40	1.20	1.50	1.80	2.30
42	1.14	1.43	1.71	2.19
44	1.09	1.36	1.64	2.09
48	1.00	1.25	1.50	1.92
60	0.80	1.00	1.20	1.53

ENCODER SELECTION FOR MEASURING WHEEL APPLICATION

Imperial		Metric	
Maximum machine speed (feet per minute)	Encoder	Maximum machine speed (meters per minute)	Encoder
0 - 250	VCE-1000	0 - 75	VCE-1000
300 - 1800	VCE-250	100 - 550	VCE-250

Description	Part Number
EPC-12E automatic motor speed control, 120VAC	080xx085
EPC-12E automatic motor speed control, 240VAC	080xx087
Motor control interface/speed tracking assembly	080xx123
Interconnect cable, hot-melt unit to EPC-12E, 33 ft (10 m)	030xx032
Optional relay	160xx005
Relay fuse, 240V, 3-amp, slo-blo	085xx007
Motherboard	151xx069
Transformer	550xx002
Fuse, 1-amp, slo-blo, package of 5	085xx005
Encoder, VCE-250	155xx027
Encoder, VCE-500	155xx029
Encoder, VCE-1000	155xx031
Encoder cable, 33 ft. (10 m)	030xx003
Encoder cable, 66 ft. (22 m)	030xx008

Enclosure	NEMA-12 type
Dimensions	Height: 10" (254 mm) Width: 8" (203 mm) Depth: 3.5" (89 mm)
Power supply	120VAC, or 240VAC, 50/60 Hz., single phase. 250V, 1A, line fuse
Valve circuit	24VDC, 8.5 watt maximum, turn on (off) point adjusted by minimum speed setting
Inputs	Single encoder
Outputs	<ul style="list-style-type: none"> • Motor control signal with minimum speed cutoff • Solid state valve circuit. 24VDC, 17 watt maximum Can be used for on/off control of other solenoid-operated device(s). • Optional: 3 A, 240V maximum mechanical relay.

