Genesis Digital Hydraulic Over-Speed Control System

Permco offers a closed loop digital input/output hydraulic over-speed control and speed sensor that is used in conjunction with Permco's VERSA-PAK series refuse pumps. In refuse applications it is usually required that the vehicle's hydraulic system be able to operate while in motion. This creates a problem in that while the pump delivers the required flow at or near idle RPM's, the operator would have the ability to substantially over-speed the hydraulic system (and in turn the mechanics of the truck) while operating the vehicle at speeds associated with moving (roading) the vehicle. Permco's Genesis system over-speed control eliminates this possibility by shutting the pump inlet flow off (dry valve system) or unloading discharge flow to tank (unloader system) when a predetermined over-speed setting is reached, protecting the hydraulic system, the mechanics of the truck and the pump.

Control of the system when used in a dry valve system setup is accomplished through the use of two (2) on/off solenoid valves and one (1) speed sensor. The closed loop input/output digital controller is used to open and close these valves in response to varying speeds. A microprocessor converts the signal from the speed sensor into RPM's and sends a signal to the two (2) on/off solenoid valves to change their output based on user selected set points. One (1) of the valves is an electric/air, which controls the opening and closing of the dry valve; the second valve is a 2-way normally open hydraulic cartridge valve which controls the opening and closing of the “bleed valve” tank port. The solenoid bleed valve gives the dry valve lubrication flow a direct, unrestricted path to the hydraulic tank. Unlike other manufacturer's bleed valves that provide a similar function, the Permco design is the only one available that is integral to the pump itself and provides a positive closure (shutoff) when the pump is told to do work. This design allows all flow that would have bypassed to tank (as in the case of pressure compensated valves that bleed a given amount of flow continuously throughout the entire work cycle), to now be directed to the work circuit providing full power to the hydraulic system. This can translate to over 3.5 horsepower loss to tank for traditional compensated valves verses Permco's bleed valve.

Control of the system when used in an unloader system setup is accomplished through the use of one (1) on/off solenoid valve and one (1) speed sensor. The closed loop input/output digital controller is used to open and close the solenoid in response to varying speeds. A microprocessor converts the speed sensor output into RPM's and sends a signal to the one (1) on/off solenoid to change its output based on user selected set points. The on/off solenoid is a 2-way normally open hydraulic cartridge valve which controls the opening and closing of the unloader tank port. When activated 100% of the pump flow is diverted back to tank at very little pressure.

Both the dry valve system and the unloader system can incorporate Permco's VERSA-PAK pressure compensated flow control valve, this allows a preset amount of flow to the hydraulic system with the excess flow being returned to the suction side (dry valve system) or returned to tank (unloader system); this function protects the system's main relief valve from being flooded so it can better accomplish its function of controlling system pressure and reduces the possibility of cavitating the pump at high RPM's (dry valve system). Because the system never exceeds the correct flow, it doesn't have the consequential pressure spikes resulting in cylinder and component failure.

The digital controller is a compact IP67 rated package with plug-in connections for remote mounting. Power supply is 12 or 24 VDC with reverse polarity, transient surge and over-current protection provided.
The controller interfaces with a PC using RS232 communications for configuration of the module. Windows HyperTerminal can be used to set or change the RPM ranges from their default settings; unit is shipped with complete wiring harness set.

The speed sensor which threads directly into the gear housing (provided by Permco) is an active Hall Effect type, each time a gear tooth passes in front of the sensor the output changes state generating a steady pulse train of frequency proportional to target speed, this pulse train of frequency is read by the digital controllers microprocessor and converted to RPM's, when the selected set points RPM's are reached a signal is sent to the corresponding solenoids to open or close. This speed sensor has full pressure capabilities unlike other units on the market. This minimizes any problems should it see pressure spikes from the system.

Reliability has been addressed on several levels.

1. First of all, Permco warrants their pumps and motors for two full years. Dependability is a very high priority for Permco. We strive to make it right the first time.
2. 100% of Permco pumps are factory tested to eliminate even the possibility of an occasional problem.
3. Permco uses front outboard bearing seals that eliminate the possibility of contamination getting into the front outboard bearing. This front outboard bearing seal extends the life of the bearing, but, at the same time, we also know that contamination getting to that bearing often shortens the life of the pump. Rather than eliminating the outboard bearing as other suppliers have done, we leave the bearing in to maintain stability but we protect it to eliminate premature failure.
4. Running hot and cavitation are often associated with dry valve systems. We have eliminated these by establishing a positive bleed valve system eliminating the possibility of pressure on the discharge side of the pump in the dry mode. When the electric/air solenoids controlling the air to the dry valves go into the dry mode, the corresponding electric/hydraulic solenoids open, ensuring a direct path for the fluid back to tank.

Efficiency is another aspect about which Permco is concerned. With the hundreds of thousands refuse vehicles operating daily, each vehicle must be running at capacity and at as low of a maintenance cost as possible. With this new Permco Genesis system, we have documentation showing increased productivity and fuel savings over the common unloader systems.
Because we are controlling the hydraulic system, we can give the operator hydraulic flow and pressure at the appropriate time and at the appropriate rate. By closely controlling the hydraulic system, issues such as heat and flow saturation of the system are virtually eliminated.
Gear pumps are an efficient and cost effective means to supply the required gallons per minute/pressure for this industry's hydraulic requirements. Other more expensive pumps are not as tolerant of conditions that exist in the refuse market. Replacement and downtimes are minimized because of reliability, availability, and simplicity of design.

You have a choice. Make it PERMCO.

Permco
1500 Frost Rd.
P. O. Box 2068
Streetsboro, OH 44241

Phone 330-626-2801
Fax 330-626-2805
e-mail info@permco.com
www.permco.com

Genesis Pump System: Low RPM / Fuel $avings

The Genesis Fuel Saving Systems are tandem (two pumping sections) P7600 dry valve pumps. The displacement of the two sections is dependant upon the desired controlled engine speed and the necessary GPM's required for proper cycle times. Generally, for a commercial front loader, for instance, the requirements are in the 45-60 GPM range. With a front or rear loader, it is usually required that the vehicle be able to operate while in motion. This creates a problem in that while delivering the required GPM's at or near idle RPM's, the operator would have the ability to substantially over-speed the hydraulic system (and in turn the mechanics of the truck) while operating the vehicle at RPM's associated with moving (roading) the vehicle. Permco's Genesis system essentially eliminates this possibility by controlling both sections of the pumping group independently.

Genesis Pump System

Both sections of the pump are controlled independently by an electronic speed sensor with different speed settings for each pumping section. At idle speed (600-850 RPM's) both pumping sections are in the wet mode, which means that maximum fluid is available to the hydraulic system. At any time the engine RPM is increased above the 1st speed switch setting (approximately 650 RPM's) the front pumping section of the pump goes into the dry mode (no fluid output). The back section of the pump is still operational (wet mode) until the engine reaches the 2nd speed switch setting (approximately 1200 RPM's) when it then also goes into the dry mode. When the engine then reaches a speed below approximately 1100 RPM's the back pumping section returns to the wet mode. When the engine RPM reaches the setting of the front section it then returns to the wet mode. At this point both pumping sections are back into the wet mode.

Control of the system is accomplished through the use of four (4) on/off solenoids and one (1) speed sensor. A closed loop input/output digital controller is used to open and close the solenoids in response to varying speeds. A microprocessor converts the speed sensor input teeth/seconds into RPM's and sends a signal to the four (4) on/off solenoid valves to vary their output based on user selected set points. Two (2) of the solenoids are electric/air, which control the dry valves. The other two (2) solenoids are used as "bleed valves" and are independently mounted in the bearing carrier and port end cover on the discharge side of the pump. There is a check valve internal to the pump which allows the front pumping section to combine with the rear pumping section when both pumping sections are in the wet mode and/or segregate the front pumping section when that pumping section is in the dry mode.

NFPA
Solutions through motion technology

The Sensible Choice

The digital controller is a compact IP67 rated packaging with plug-in connections for remote mounting. Power supply is 12 or 24 VDC with reverse polarity, transient surge and over-current protection provided.
The controller interfaces with a PC using RS232 communications for configuration of the module. Windows HyperTerminal or Palm OS can be used to set or change the RPM ranges from their default settings.

Although a tandem dry valve system is the standard setup system, we can customize your system for specific needs. A combination dry valve/unloader system which incorporates a flow control can also be used. The system can also be setup so that the pack cycle is completed before a pump or pumping section is kicked out due to speed settings. Also, the system can be designed so that only one (1) pumping section is activated for low flow requirements such as top doors and tailgates.

There are many ways that the Genesis fuel saving system can be tailored to fit you system and at the same time it is reliable, efficient, and one that has been proven to save fuel.

Reliability has been addressed on several levels.

1. Permco warrants all their pumps and motors for a full two years. Dependability is a very high priority for Permco. We strive to make it right the first time.

2. 100% of Permco pumps are factory tested to eliminate even the possibility of an occasional problem.

3. Permco uses a front outboard bearing seal that eliminates the possibility of contamination getting into the front outboard bearing. This front outboard bearing seal extends the life of the pump, but, at the same time, we also know that contamination getting to that bearing often shortens the life of the pump. Rather than eliminating the outboard bearing as other suppliers have done, we leave the bearing in to maintain stability but we protect it to eliminate premature failure.

4. Running hot and cavitation are often associated with dry valve systems. We have eliminated these by establishing a positive bleed valve system eliminating the possibility of pressure on the discharge side of the pump in the dry mode. When the electric/air solenoids controlling the air to the dry valves go into the dry mode, the corresponding electric/hydraulic solenoids open, ensuring a direct path for the fluid back to tank.

Efficiency is another aspect about which Permco is concerned. With the hundreds of thousands refuse vehicles operating daily, each vehicle must be running at capacity and at as low maintenance cost as possible. With this new Permco Genesis system, we have documentation showing increased productivity and fuel savings over the common Unloader systems.
Because we are controlling the hydraulic system, we can give the operator hydraulic operations at the appropriate time and at the appropriate rate. By closely controlling the hydraulic system, issues such as heat and flow saturation of the system are virtually eliminated.
Gear pumps are an efficient and cost effective means to supply the required gallons per minute/pressure for this industry's hydraulic requirements. Other more expensive pumps are not as tolerant of conditions that exist in the refuse market. Replacement and downtimes are minimized because of reliability, availability, and simplicity of design.

Fuel savings, probably the most important consideration, will more easily be accomplished through the use of a dry valve system than other systems. Permco's Genesis units are currently saving several gallons of fuel per day over the supplied unloading systems and other low RPM systems based on more sophisticated hydraulic components.

PERMCO

Permco
1500 Frost Rd.
P. O. Box 2068
Streetsboro, OH 44241

Phone 330-626-2801
Fax 330-626-2805
e-mail info@permco.com
www.permco.com

Over-Speed Kickout Settings

Single Unloader System

In a Permco Single Unloader System only the “D” solenoid lead wire is used;
“D” lead wire is connected to the DC operated 2-way normally open on/off hydraulic cartridge valve that controls the opening and closing of the unloader tank port.

Under normal operating conditions the operator will engage the pump switch at normal engine idle speed (600-700 RPM); “D” solenoid will receive current and close the tank port sending pump flow to the hydraulic circuit; when the engine RPM’s are increased to the 1400 RPM default (D off) setting, “D” solenoid will lose current and open the unloader tank port sending pump flow to tank; when the engine RPM’s decrease to the 1000 RPM default (D on) setting, “D” solenoid will receive current and close the tank port sending pump flow to the hydraulic circuit.

Simple terminology using default settings is “D” on at normal engine idle speed (600-700 RPM); “D” off at 1400 RPM and “D” back on at 1000 RPM

Speed setting ranges for “D” solenoid:

“D” on	800 to 1500 RPM	Default Setting 1000 RPM
“D” off	850 to 2000 RPM	Default Setting 1400 RPM

**Specific speed settings can be programmed before shipping.*

Single Dry Valve System

In a Permco Single Dry Valve System “C” and “D” solenoid lead wires are used;
“C” lead wire is connected to the DC operated normally open on/off electric/air solenoid that controls the opening and closing of the dry valve.
“D” lead wire is connected to the DC operated 2-way normally open on/off hydraulic cartridge valve that controls the opening and closing of the bleed valve tank port.
Both “C” and “D” work in conjunction with each other and have the same speed settings.

Under normal operating conditions the operator will engage the pump switch at normal engine idle speed (600-700 RPM); “C” and “D” solenoids will receive current, the dry valve will open and the bleed tank port will close sending pump flow to the hydraulic circuit; when the engine RPM’s are increased to the 1400 RPM default (C and D off) setting, “C” and “D” solenoids will lose current closing the dry valve and opening the bleed valve tank port restricting pump flow to the hydraulic circuit; when the engine RPM’s decrease to the 1000 RPM default (C and D on) setting, “C” and “D” solenoids will receive current opening the dry valve and closing the bleed valve tank port sending pump flow to the hydraulic circuit.

Simple terminology using default settings is “C” and “D” on at normal engine idle speed (600-700 RPM); “C” and “D” off at 1400 RPM and “C” and “D” back on at 1000 RPM.

Speed setting ranges for “C” and “D” solenoid:

“C” and “D” on	800 to 1500 RPM	Default Setting 1000 RPM
“C” and “D” off	850 to 2000 RPM	Default Setting 1400 RPM

** Specific speed settings can be programmed before shipping.*

Over-Speed Kickout Settings

Tandem Dry Valve System

In a Permco Tandem Dry Valve System “A”, “B”, “C” and “D” solenoid lead wires are used;
“A” lead wire is connected to the DC operated normally open on/off electric/air solenoid that controls the opening and closing of the dry valve for the front pumping section.
“B” lead wire is connected to the DC operated 2-way normally open on/off hydraulic cartridge valve that controls the opening and closing of the bleed valve tank port for the front pumping section.
Both “A” and “B” work in conjunction with each other and will have the same speed settings.
“C” lead wire is connected to the DC operated normally open on/off electric/air solenoid that controls the opening and closing of the dry valve for the rear pumping section.
“D” lead wire is connected to the DC operated 2-way normally open on/off hydraulic cartridge valve that controls the opening and closing of the bleed valve tank port for the rear pumping section.
Both “C” and “D” work in conjunction with each other and will have the same speed settings.

An internal check valve allows combined or segregated flow between the two (2) pumping sections.

Under normal operating conditions the operator will engage the pump switch at normal engine idle speed (600-700 RPM); “A”, “B”, “C” and “D” solenoids will receive current, both dry valves will open and both bleed tank ports will close sending combined pump flow to the hydraulic circuit *(internal check valve open)*; when the engine RPM’s are increased to the 750 RPM default (A and B off Y0) setting, “A” and “B” solenoids will lose current closing the dry valve and opening the bleed valve tank port restricting front pumping section flow to the hydraulic circuit *(internal check valve closed)*; the rear pumping section is still on line at this point; when the engine RPM’s are increased to the 1400 RPM default (C and D off) setting, “C” and “D” solenoids will lose current closing the dry valve and opening the bleed valve tank port restricting rear pumping section flow to the hydraulic circuit; both the front and rear pumping sections are off line at this point; when the engine RPM’s decrease to the 1000 RPM default (C and D on) setting, “C” and “D” solenoids will receive current opening the dry valve and closing the bleed valve tank port sending flow to the hydraulic circuit *(internal check valve closed)*; the rear pumping section is back on line at this point; when the engine RPM’s decrease to the 700 RPM default (A and B on Y1) setting, “A” and “B” solenoids will receive current opening the dry valve and closing the bleed valve tank port sending combined pump flow to the hydraulic circuit *(internal check valve open)*; both the front and rear pumping sections are back on line at this point.

An added pumping section kick-out setting safety feature to prevent engine stall is built into the speed controller where under normal operating conditions (A, B, C and D on) should the engine experience a stall situation where the engine RPM’s fall below the 400 RPM default (A and B off XO) setting, “A” and “B” solenoids will lose current closing the dry valve and opening the bleed valve tank port restricting front pumping section flow to the hydraulic circuit *(internal check valve closed)*; the rear pumping section is still on line at this point; when the engine RPM’s increase to the 600 RPM default (A and B on X1) setting, “A” and “B” solenoids will receive current opening the dry valve and closing the bleed valve tank port sending combined pumping section flow to the hydraulic circuit *(internal check valve open)*; both the front and rear pumping sections are back on line at this point.

Simple terminology using default settings is “A”, “B”, “C” and “D” on at normal engine idle speed (600-700 RPM); “A” and “B” off at 750 RPM; “A” and “B” back on at 700 RPM; “C” and “D” off at 1400 RPM; “C” and “D” back on at 1000 RPM; engine stall setting of “A” and “B” off at 400 RPM and “A” and “B” back on at 600 RPM.

Speed setting ranges for “A”, “B”, “C” and “D” solenoid:

“A” and “B” off X0 (engine stall)	350 to 650 RPM	Default Setting 400 RPM
“A” and “B” on X1 (engine stall)	X0 + 50 to X0 + 200 RPM	Default Setting 600 RPM
“A” and “B” off Y0	Y1 – 200 RPM to Y1 – 50 RPM	Default Setting 750 RPM
“A” and “B” on Y1	750 to 1100 RPM	Default Setting 700 RPM
“C” and ”D” off	850 to 2000 RPM	Default Setting 1400 RPM
“C” and “D” on	800 to 1500 RPM	Default Setting 1000 RPM

** Specific speed settings can be programmed before shipping.*

Over-Speed Kickout Settings

Tandem Dry Valve/Unloader

In a Permco Tandem Dry Valve/Unloader System “A”, “B” and “D” solenoid lead wires are used;
“A” lead wire is connected to the DC operated normally open on/off electric/air solenoid that controls the opening and closing of the dry valve for the front pumping section.
“B” lead wire is connected to the DC operated 2-way normally open on/off hydraulic cartridge valve that controls the opening and closing of the bleed valve tank port for the front pumping section.
Both “A” and “B” work in conjunction with each other and will have the same speed settings.
“D” lead wire is connected to the DC operated 2-way normally open on/off hydraulic cartridge valve that controls the opening and closing of the unloader tank port for the rear pumping section.

An internal check valve allows combined or segregated flow between the two (2) pumping sections.

Under normal operating conditions the operator will engage the pump switch at normal engine idle speed (600-700 RPM); “A”, “B” and “D” solenoids will receive current, the dry valve will open and the bleed tank port will close on the front pumping section and the unloader tank port will close on the rear pumping section sending combined pump flow to the hydraulic circuit (internal check valve open); when the engine RPM’s are increased to the 750 RPM default (A and B off Y0) setting, “A” and “B” solenoids will lose current closing the dry valve and opening the bleed valve tank port restricting front pumping section flow to the hydraulic circuit *(internal check valve closed)*; the rear pumping section is still on line at this point; when the engine RPM’s are increased to the 1400 RPM default (D off) setting, “D” solenoid will lose current opening the unloader tank port sending pump flow to tank; both the front and rear pumping sections are off line at this point; when the engine RPM’s decrease to the 1000 RPM default (D on) setting, “D” solenoid will receive current closing the unloader valve tank port sending pump flow to the hydraulic circuit *(internal check valve closed)*; the rear pumping section is back on line at this point; when the engine RPM’s decrease to the 700 RPM default (A and B on Y1) setting, “A” and “B” solenoids will receive current opening the dry valve and closing the bleed valve tank port sending combined pump flow to the hydraulic circuit *(internal check valve open)*; both the front and rear pumping sections are back on line at this point.

An added pumping section kick-out setting safety feature to prevent engine stall is built into the speed controller where under normal operating conditions (A, B, and D on) should the engine experience a stall situation where the engine RPM’s fall below the 400 RPM default (A and B off X0) setting, “A” and “B” solenoids will lose current closing the dry valve and opening the bleed valve tank port restricting front pumping section flow to the hydraulic circuit *(internal check valve closed)*; the rear pumping section is still on line at this point; when the engine RPM’s increase to the 600 RPM default (A and B on X1) setting, “A” and “B” solenoids will receive current opening the dry valve and closing the bleed valve tank port sending combined pump flow to the hydraulic circuit *(internal check valve open)*; both the front and rear pumping sections are back on line at this point.

Simple terminology using default settings is “A”, “B” and “D” on at normal engine idle speed (600-700 RPM); “A” and “B” off at 750 RPM; “A” and “B” back on at 700 RPM; “D” off at 1400 RPM; “D” back on at 1000 RPM; engine stall setting of “A” and “B” off at 400 RPM and “A” and “B” back on at 600 RPM.

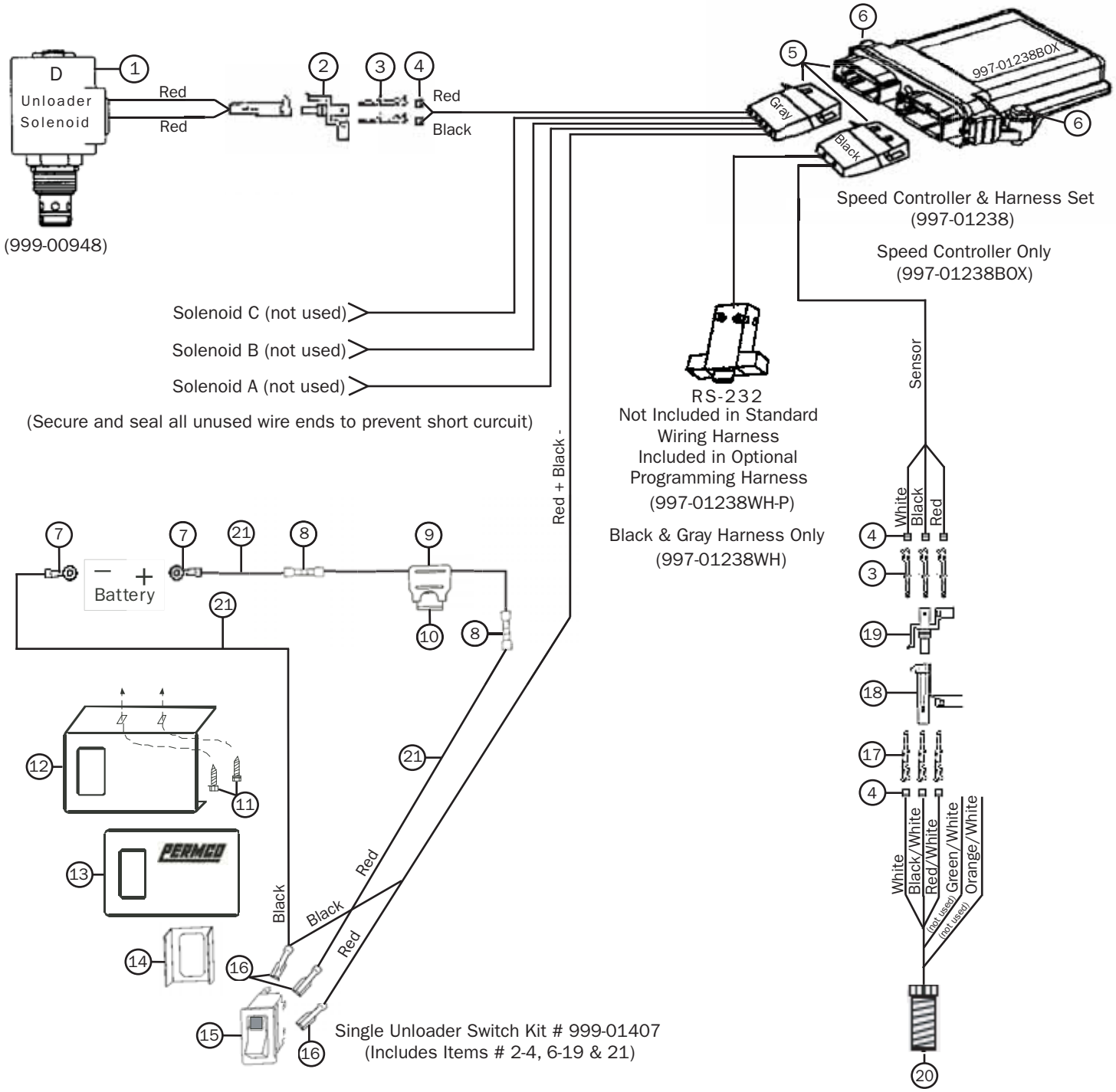
Speed setting ranges for “A”, “B”, “C” and “D” solenoid:

“A” and “B” off X0 (engine stall)	350 to 650 RPM	Default Setting 400 RPM
“A” and “B” on X1 (engine stall)	X0 + 50 to X0 + 200 RPM	Default Setting 600 RPM
“A” and “B” off Y0	Y1 – 200 RPM to Y1 – 50 RPM	Default Setting 750 RPM
“A” and “B” on Y1	750 to 1100 RPM	Default Setting 700 RPM
“D” off	850 to 2000 RPM	Default Setting 1400 RPM
“D” on	800 to 1500 RPM	Default Setting 1000 RPM

** Specific speed settings can be programmed before shipping.*

SINGLE UNLOADER

Refuse Pump System with Speed Sensor
Electrical Installation Diagram (12-24 VDC)



Sensitivity of Electronic Components Require Direct Battery Post Connections
Proper Crimping Tools and/or Soldering Required for Troublefree Connections
Loss of Connection on any Circuit will Shut the System Down

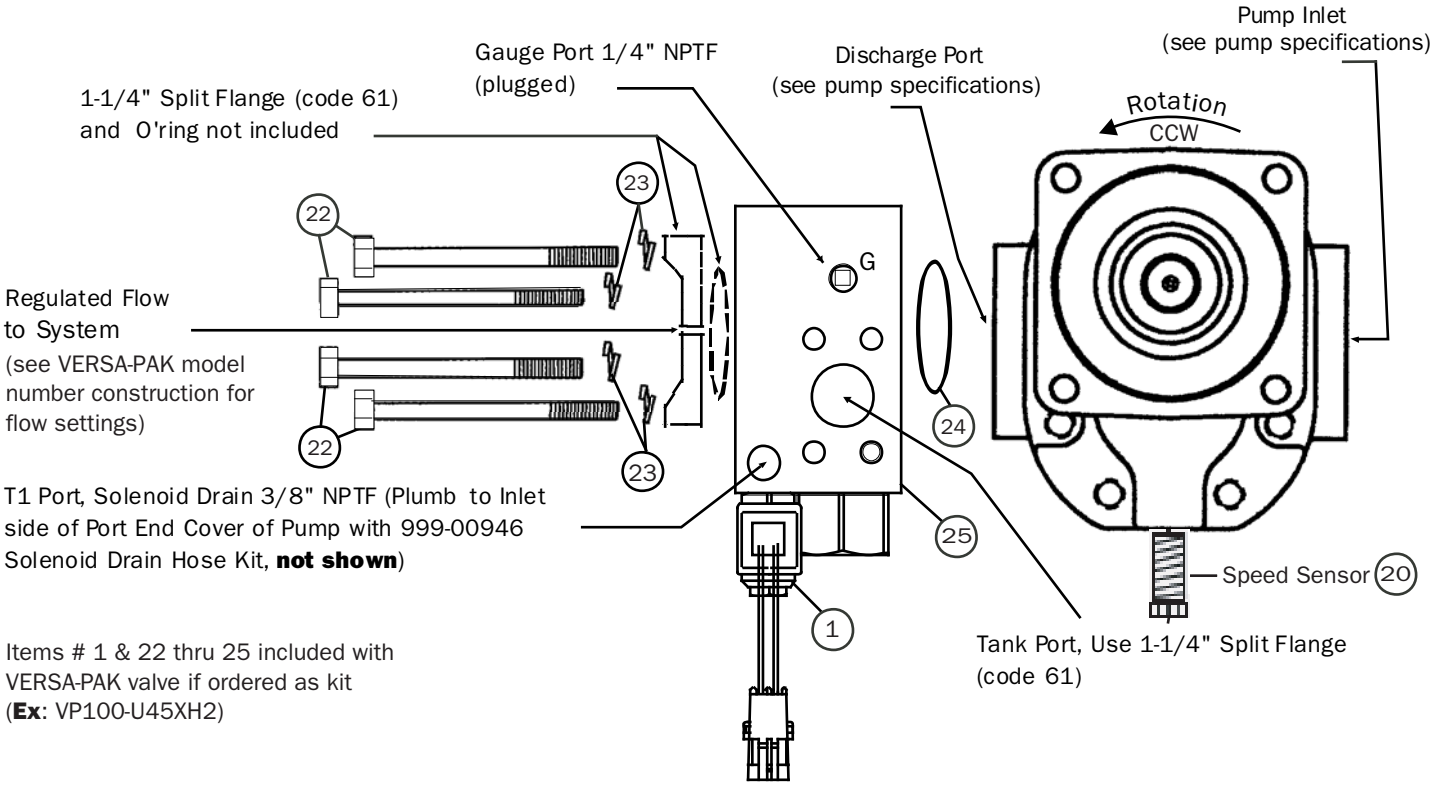
1500 Frost Road
Streetsboro, OH. 44241

Phone: (330) 626-2801
Fax: (330) 626-2805

SINGLE UNLOADER

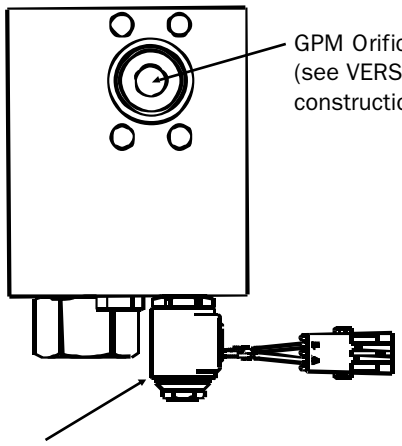
Single Unloader Valve Installation Diagram

Counter-Clockwise Rotation Shown



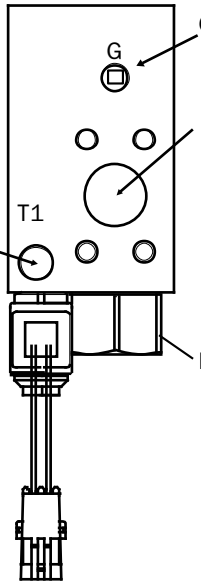
Items # 1 & 22 thru 25 included with VERSA-PAK valve if ordered as kit (**Ex**: VP100-U45XH2)

The Versa-Pak Valve may be installed in this manner with the solenoid and/or logic element pointing down or with the solenoid and/or logic element pointing up. With the solenoid and/or logic element pointing down the return/tank port will be oriented toward the rear of the vehicle. With the solenoid and/or logic element pointing up the return/tank port will be oriented toward the front of the vehicle.



GPM Orifice Plug installed here (see VERSA-PAK model number construction for flow settings)

Versa-Pak Solenoid installed here. Do not overtighten. 5 ft. lb. max Part Number 999-00948.



Gauge Port

Use 1-1/4" Split flange port to return excess and unloaded flow back to tank. Use no smaller than an 1-1/4" hose. Returning flow through the filter is optional.

T1 port (3/8" NPTF) is plumbed to the 3/8" ODT port on suction side of the port end cover on the Versa-Pak pump with Solenoid Drain Hose Assembly number 999-00946.

Logic Element

PERMCO

1500 Frost Road
Streetsboro, OH 44241

Phone: (330) 626-2801
Fax: (330) 626-2805

Versa-Pak Pump Model Number Construction

VP42 - 4C 0 F L UL (SS)

Pump Model (VP+GPM @ 1200 RPM)
- VP28
- VP32
- VP37
- VP42
- VP47

Mounting Flange
- 4B Four Bolt "B"
- 2C Two Bolt "C"
- 4C Four Bolt "C"

Shaft
- 0 1 1/4" C Keyed
- 6 1 1/4" C Spline

Ports
- VP28, VP32: 1 1/2" X 1 1/4" Split Flange
- VP37, VP42, VP47: 2" X 1 1/4" Split Flange

Rotation
- L Left, CCW
- R Right, CW

Function
- UL Unloader

Speed Sensor Machining

Versa-Pak Valve Model Number Construction

VP100 - U 45 X H2

Valve Model
- VP100

Unloader
- U Unloader Installed
- K Kit Only (Non-Functional - Does not include Solenoid, Solenoid Plug, T1 Port Plug, or Regulated Flow Orifice)

Flow Control Setting (GPM)
- BL = No Orifice
- 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80

Switch Kit
- X No Switch Kit Included (order Switch Kit # 999-01407 separately for digital system)

Hose Kit
- H2 Solenoid Drain Hose Kit 3/8" (Use with Unloader)
- X1 No Hose Kit Included

Versa-Pak Pump Specifications

Model Number	Displ. Cu. In.	Max. RPM	Min. RPM	Max. PSI	Inlet Port SAE 4 Bolt	Discharge Port SAE 4 Bolt
VP28	6.066	3000	600	3000	1-1/2"	1 1/4"
VP32	7.077	3000	600	3000	1-1/2"	1 1/4"
VP37	8.088	3000	600	2500	2"	1 1/4"
VP42	9.099	2500	600	2500	2"	1 1/4"
VP47	10.110	2500	600	2250	2"	1 1/4"

PERMCO
1500 Frost Rd
Streetsboro, OH 44241
Phone: (330) 626-2801
Fax: (330) 626-2805

Example of System Component Requirements

System Requirements	Required Components	Description	Qty, Req'd
42 GPM @ 1200 RPM	VP42-4C0FLUL(SS)	Pump 42 GPM @ 1200 RPM (With Speed Sensor Machining) CCW Rotation	1
1400 RPM Over-Speed Setting	997-01238	Speed Controller & Harness Set (1400 RPM Over-Speed Kick-Out Setting) (Item # 5)	1
45 GPM Flow Control	VP100-U45XH2	VERSA-PAK Valve (45 GPM Flow Control + Unloader Solenoid + Drain Hose) (Includes Items # 1 & 22 thru 25)	1
Switch Kit	999-01407	Single Unloader Switch Kit (Includes Items # 2 thru 4, 6 thru 19 & 21)	1
	997-01237	Speed Sensor P7500 Series (Item # 20)	1

42 GPM @ 1200 RPM	VP42-4C0FLUL(SS)	Pump 42 GPM @ 1200 RPM (With Speed Sensor Machining) CCW Rotation	1
1500 RPM Over-Speed Setting	997-01238	Speed Controller & Harness Set (must note 1500 RPM Over-Speed Kick-Out Setting when ordering) (Item # 5)	1
Switch Kit	999-01407	Single Unloader Switch Kit (Includes Items # 2 thru 4, 6 thru 19, & 21)	1
	VP100-UBLXH2	VERSA-PAK Valve (Unloader Solenoid + Drain Hose) (Includes Items # 1 & 22 thru 25)	1
	997-01237	Speed Sensor P7500 Series (Item # 20)	1

* Specific speed settings can be programmed before shipping, please note when ordering

Single Unloader Wiring Instructions

The speed controller black box (5) should be mounted inside the cab in a protected area. Two (2) 3/8-14 x 1" self tapping screws (6) w/washer and seal are supplied for mounting. Insert wiring harness (color coded), run wires to predetermined locations.

The RS-232 connector programming cable is optional; it is utilized to hook to a lap top computer for setting speed control settings and/or troubleshooting. Default settings are preset to D on at engine idle, D off at 1400 RPM, and D back on at 1000 RPM. Specific kick-out speed settings can be programmed before shipping.

D Solenoid (1) is mounted in the Versa-Pak Unloader Valve. Solenoid comes with shroud (male) assembly fully attached. Torque Solenoid to 25 lb. ft., and Solenoid Nut to 5 lb. ft. Run solenoid wires, cut wires to length, allow slack for tie-down. Insert harness cable wires (labeled SOL D) through cable seals (4), crimp male inserts (3) onto each wire end, place into tower assembly (2), (placement of red and black lead wires does not matter, solenoid is not polarity sensitive), push in cable seals (4), snap cover closed, connect shroud and tower together.

The speed sensor (20) is threaded into the pump gear housing. Torque speed sensor to 8 lb. ft. Run sensor wires, cut wires to length, allow slack for tie-down. Insert speed sensor wire colors white, black/white and red/white (green/white and orange/white are not used) through cable seals (4), crimp female inserts (17) onto each wire end (because the speed sensor has 24 gauge wire it is necessary to double fold the wire ends before crimping), place in order into shroud assembly (18), push in cable seals (4), snap cover closed.

Insert sensor wires (labeled Sensor) through cable seals (4), crimp male inserts (3) onto each wire end, place in order into tower assembly (19) (make sure like colors will mate with like colors in shroud assembly (18)), push in cable seals (4), snap cover closed, connect shroud and tower together.

The switch (15) can be mounted in the dashboard via a knock-out or mounted to the base of the dashboard utilizing the dash bracket (12). Mount the dash bracket (12) utilizing the two (2) 10-24 x ½" self tapping screws (11). Peel the backing from the self adhesive nameplate (13) and place onto the face of the dash bracket (12). Put the switch guard (14) over the switch (15) and place inside the opening of the dash bracket (12), support the back of the dash bracket (12) and push the switch assembly in, making sure the plastic tabs are securely locked in place. Run power supply harness wires, cut wires to length, allow slack for tie-down. Crimp ring terminal (7) onto end of ground wire (21), attach to ground post of battery, combine crimp blade terminal (16) onto opposite end of ground wire and black harness wire (labeled -) and connect to top right spade terminal on rocker switch (15). Crimp blade terminal (16) onto end of red harness wire (labeled+) and connect to bottom left spade terminal on rocker switch (15). Crimp blade terminal (16) onto end of 12 VDC supply wire (21) and connect to middle spade terminal on rocker switch (15), butt splice (8) onto end of fuse wire assembly (9), butt splice (8) an extension wire (21) to the opposite end of fuse wire assembly (9), crimp ring terminal (7) onto end of extension wire (21), attach to positive post of battery, insert 10 amp fuse (10).

(Light is on when switch is engaged indicating power is being supplied to the system)

Single Unloader Switch Kit Components

Switch Kit Part Number 999-01407

Item No.	Part Number	Description	Qty. Req'd
2	999-00937	Weather Pack 2 Pin Tower Assembly (Male)	1
3	999-00939	Weather Pack Pins (Male)	5
4	999-00937CS	16G Weather Pack Cable Seals	8
6	900-01271	1/4-14 x 1 Self Tapping Screw W/Washer	2
7	999-00926	18-14G Ring Terminal	2
8	999-00927	16-14G Butt Splice	2
9	999-00928	16 Guage Fuse Holder	1
10	999-00929	10 Amp Fuse	1
11	900-01270	10-18 x 1/2" Self Tapping Screw W/Washer	2

Item No.	Part Number	Description	Qty. Req'd
12	999-00932	Switch Bracket	1
13	999-00931	Self Adhesive Face Plate	1
14	999-00933	Switch Guard	1
15	999-00934	Rocker Switch W/Light	1
16	999-00935	Female Blade Terminal	3
17	999-00938	Weather Pack Pins (Female)	3
18	999-00940	Weather Pack 3 Pin Shroud Assembly (Female)	1
19	999-00941	Weather Pack 3 Pin Tower Assembly (Male)	1
21	999-00925-30	30' 16 Gauge Wire (cut to required lengths)	1

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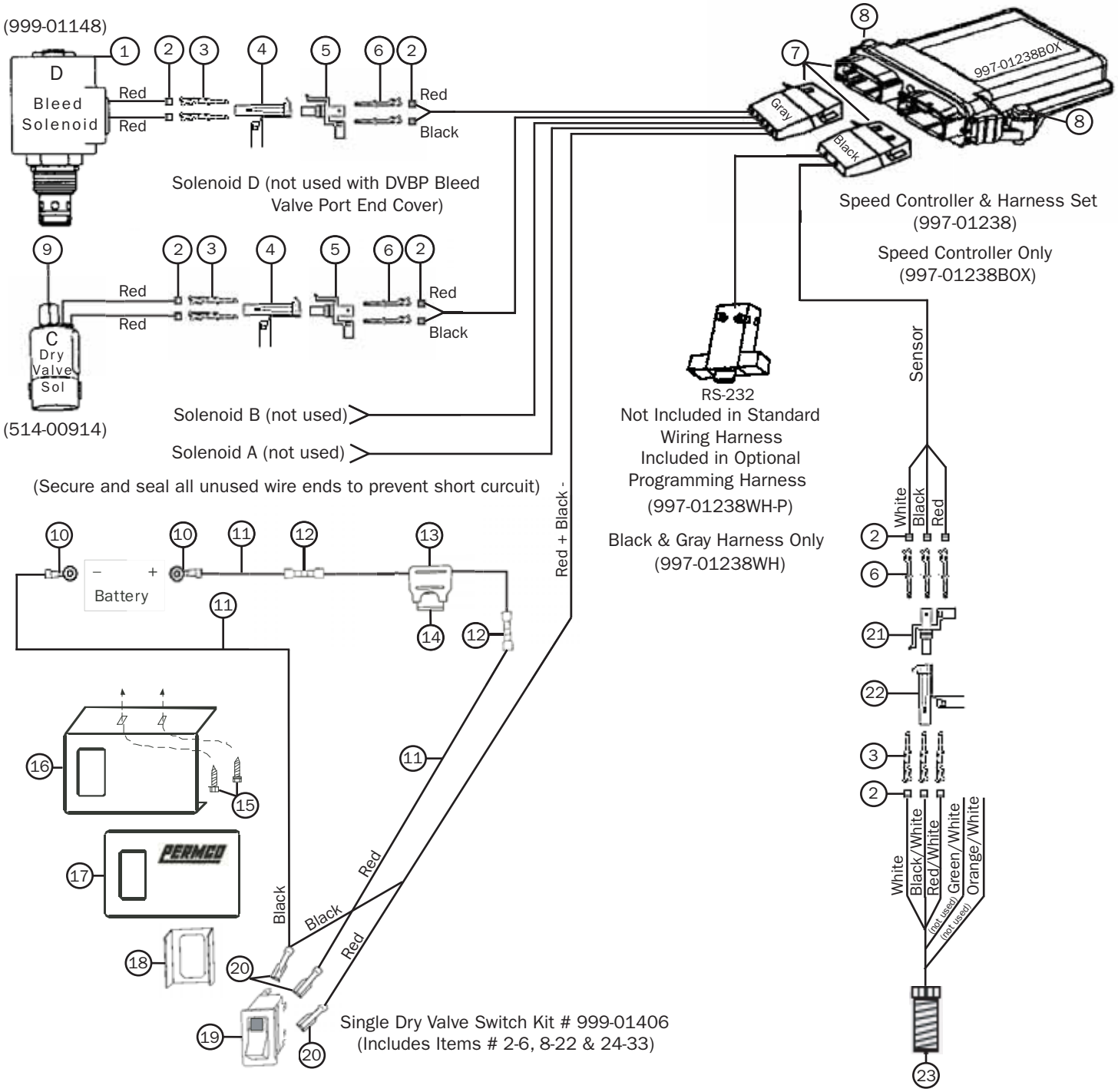
SINGLE DRY VALVE

Refuse Pump System with Speed Sensor
Electrical Installation Diagram (12-24 VDC)



Sensitivity of Electronic Components Require Direct Battery Post Connections
Proper Crimping Tools and/or Soldering Required for Troublefree Connections
Loss of Connection on any Circuit will Shut the System Down

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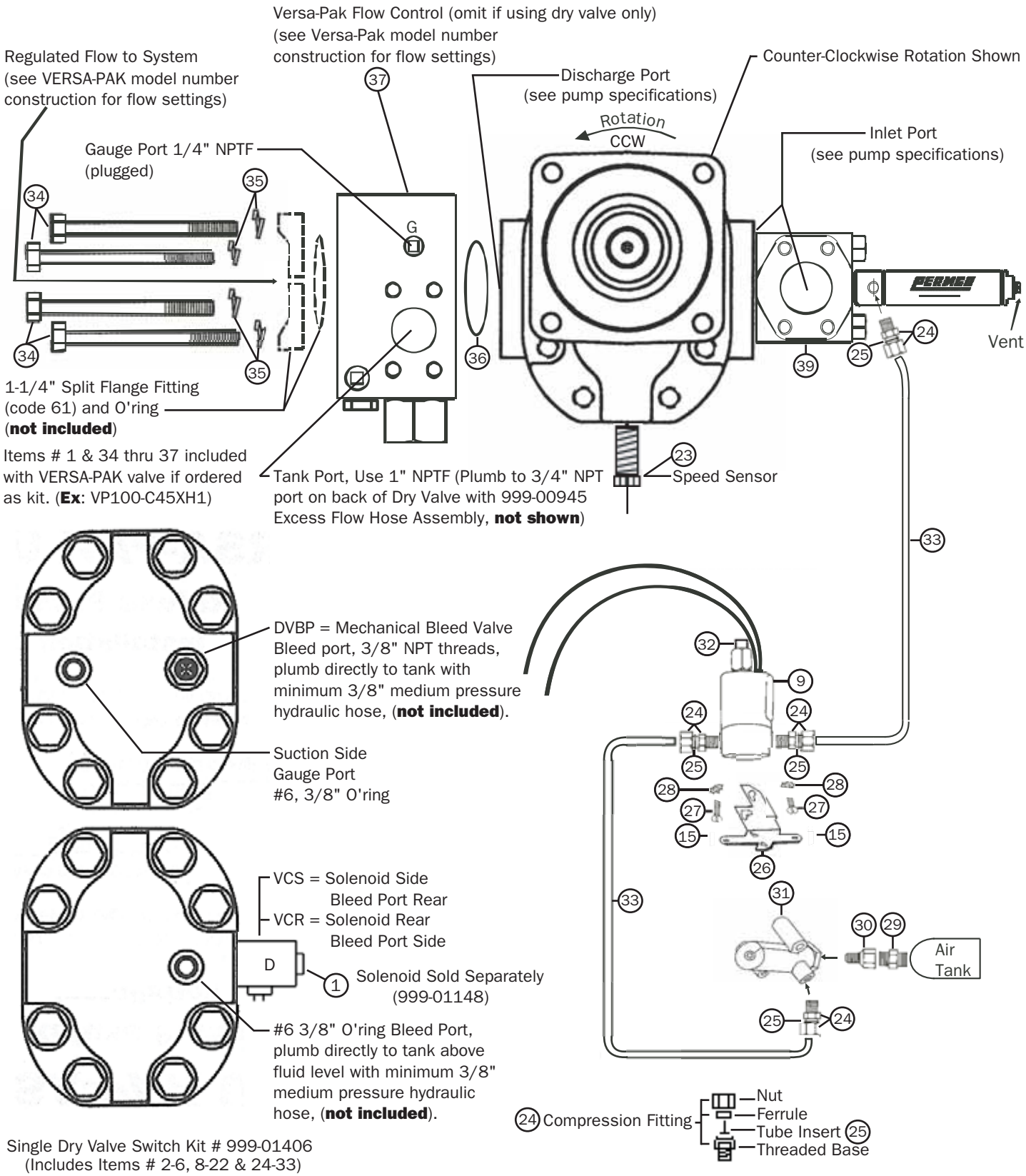
SINGLE DRY VALVE

Single Dry Valve Installation Diagram

W/Optional Versa-Pak Flow Control



Single Dry Valve Switch Kit # 999-01406
(Includes Items # 2-6, 8-22 & 24-33)

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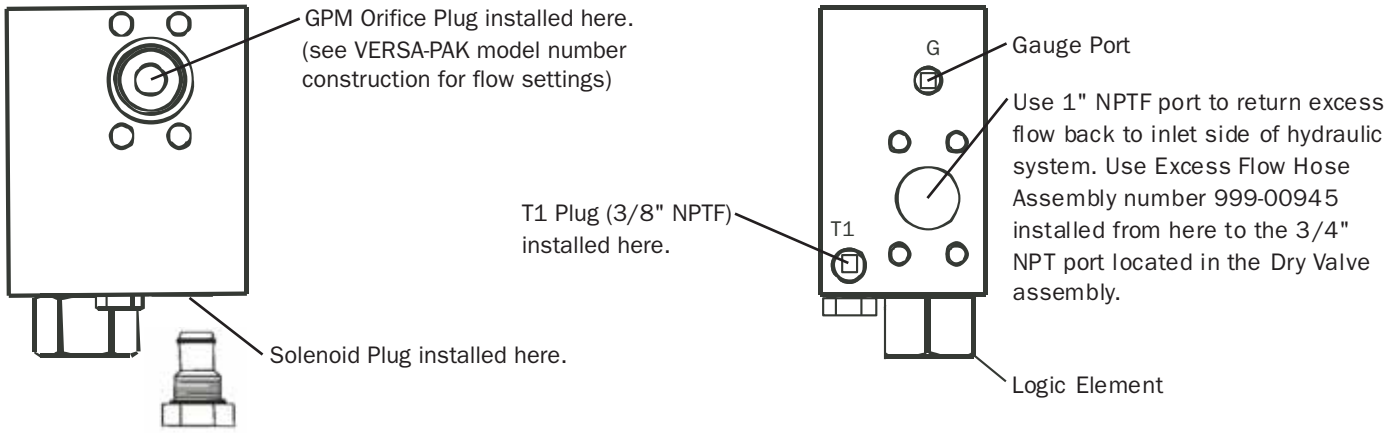
Single Dry Valve Installation Diagram (con't)

The Versa-Pak Valve may be installed in this manner with the logic element pointing down or with the logic element pointing up. With the logic element pointing down the return/tank port will be oriented toward the rear of the vehicle. With the logic element pointing up the return/tank port will be oriented toward the front of the vehicle.



Dry Valve Part Numbers

Item No.	Part Number	Description	Qty. Req'd
39	514-00911-DVA	1-1/2" Dry Valve Assembly (includes mounting bolts)	1

Item No.	Part Number	Description	Qty. Req'd
39	514-00278-DVA	2" Dry Valve Assembly (includes mounting bolts)	1

Example of System Component Requirements

System Requirements	Required Components	Description	Qty, Req'd
42 GPM @ 1200 RPM Solenoid Side	VP42-4C0FLDV(SS)VCS	Pump 42 GPM @ 1200 RPM (With Speed Sensor Machining & Solenoid Location Side)	1
1400 RPM Over-Speed Setting	997-01238	Speed Controller & Harness Set (1400 RPM Over-Speed Kick-Out Setting) (Item # 5)	1
2" Dry Valve	514-00278-DVA	2" Dry Valve (Item 39) (mounting hardware included)	1
Switch Kit	999-01406	Single Dry Valve Switch Kit (Includes Items # 2 thru 6, 8 thru 22, & 24 thru 33)	1
	997-01237	Speed Sensor P7500 Series (Item # 23)	1
	999-01148	Bleed Solenoid (Item # 1)	1
42 GPM @ 1200 RPM Solenoid Rear	VP42-4C0FLDV(SS)VCR	Pump 42 GPM @ 1200 RPM (With Speed Sensor Machining & Solenoid Location Side)	1
1500 RPM Over-Speed Setting	997-01238	Speed Controller & Harness Set (must note 1500 RPM Over-Speed Kick-Out Setting when ordering) (Item # 5)	1
45 GPM Flow Control	VP100-C45XH1	VERSA-PAK Valve (45 GPM Flow Control + Excess Flow Hose Kit) (Includes Items # 34 thru 37)	1
2" Dry Valve	514-00278-DVA	2" Dry Valve (Item 39) (Mounting Hardware Included)	1
Switch Kit	999-01406	Single Dry Valve Switch Kit (Includes Items # 2 thru 6, 8 thru 22, & 24 thru 33)	1
	997-01237	Speed Sensor P7500 Series (Item # 23)	1
	999-01148	Bleed Solenoid (Item # 1)	1
42 GPM @ 1200 RPM DVBP	VP42-4C0FLDV(SS)	Pump 42 GPM @ 1200 RPM (With Speed Sensor Machining & DVBP Mechanical Bleed Valve)	1
1400 RPM Over-Speed Setting	997-01238	Speed Controller & Harness Set (1400 RPM Over-Speed Kick-Out Setting) (Item # 5)	1
2" Dry Valve	514-00278-DVA	2" Dry Valve (Item 39) (mounting hardware included)	1
No Switch Kit	997-01237	Speed Sensor P7500 Series (Item # 23)	1
	514-00914	12 VDC Electric/Air Solenoid (used to open and close dry valve) (Item # 9)	1
	931-00915	Electric/Air Solenoid Bracket (Item # 26)	1
	900-00940	#10-32 x 7/16" Machine Screws (for mounting solenoid bracket to solenoid) (Item # 27)	2
	900-00943	#10 Star Washer (for mounting solenoid bracket to solenoid) (Item # 28)	2
	514-00559-DVBV	Bronze Air Vent (for E/A solenoid vent) (Item # 32)	1

* Specific speed settings can be programmed before shipping, please note when ordering

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Versa-Pak Pump Model Number Construction

VP42 - 4C 0 F L DV (SS) VCS

Pump Model (VP+GPM @ 1200 RPM)
- VP28
- VP32
- VP37
- VP42
- VP47

Mounting Flange
- 4B Four Bolt "B"
- 2C Two Bolt "C"
- 4C Four Bolt "C"

Shaft
- 0 1 1/4" C Keyed
- 6 1 1/4" C Spline

Ports
VP28, VP32
1 1/2" X 1 1/4" Split Flange
VP37, VP42, VP47
2" X 1 1/4" Split Flange

Rotation
- L Left, CCW
- R Right, CW

Function
- DV Dry Valve

Speed Sensor Machining

Solenoid Location
- Blank DVBP Bleed Valve
- VCR Port End Cover Rear
- VCS Port End Cover Side

Versa-Pak Valve Model Number Construction

VP100 - C 45 X H1

Valve Model
- VP100

Unloader
- C Flow Control
- K Kit Only (Non-Functional - Does not include Solenoid, Solenoid Plug, T1 Port Plug, or Regulated Flow Orifice)

Flow Control Setting (GPM)
BL = No Orifice
30, 35, 40, 45, 50,
55, 60, 65, 70, 75, 80

Switch Kit
- X No Switch Kit Included (order Switch Kit # 999-01406 separately for digital system)

Hose Kit
- H1 Excess Flow Hose Kit 3/4" (Use with Dry Valve)
- X1 No Hose Kit Included

Versa-Pak Pump Specifications

Model Number	Displ. Cu. In.	Max. RPM	Min. RPM	Max. PSI	Inlet Port SAE 4 Bolt	Discharge Port SAE 4 Bolt
VP28	6.066	3000	600	3000	1-1/2"	1 1/4"
VP32	7.077	3000	600	3000	1-1/2"	1 1/4"
VP37	8.088	3000	600	2500	2"	1 1/4"
VP42	9.099	2500	600	2500	2"	1 1/4"
VP47	10.110	2500	600	2250	2"	1 1/4"

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Single Dry Valve Wiring Instructions

The speed controller black box (7) should be mounted inside the cab in a protected area. Two (2) 3/8-14 x 1" self tapping screws (8) w/washer and seal are supplied for mounting. Insert wiring harness (color coded) and run wires to predetermined location.

The RS-232 connector programming cable is optional; it is utilized to hook to a lap top computer for setting speed control settings and/or troubleshooting. Default settings are preset to D on at engine idle speed, D off at 1400 RPM, and D back on at 1000 RPM. Specific kick-out speed settings can be programmed before shipping.

D Bleed Solenoid (1) is mounted in the pump port end cover with the VCR and VCB options; it is not used with the DVBP option. A minimum 3/8" medium pressure hydraulic hose (not included) plumbed direct to tank is required for the VCR, VCB and the DVBP options. Torque Solenoid to 25 lb. ft. and Solenoid Nut to 5 lb. ft. Run solenoid wires, cut wires to length, allow slack for tie-down. Insert bleed solenoid (1) wires through cable seals (2), crimp female inserts (3) onto each wire end, place into shroud assembly (4), (placement does not matter), push in cable seals (2), snap cover closed. Insert harness cable wires (labeled SOL D) through cable seals (2), crimp male inserts (6) onto each wire end, place into tower assembly (5), (placement of red and black lead wires does not matter, solenoid is not polarity sensitive), push in cable seals (2), snap cover closed, connect shroud and tower together.

C Electric over Air Solenoid (9) for dry valve should be mounted inside the cab in a protected area. Install the two (2) compression fitting assemblies (24) into electric over air solenoid (9), mount solenoid bracket (26) to electric over air solenoid (9) utilizing the two (2) #10-32 x 7/16" machine screws (27) and the two (2) #10 star lock washers (28), mount the solenoid assembly in a protected area utilizing the two (2) 10-24 x 1/2" self tapping screws w/washer and seal (15). Run electric over air solenoid wires, cut to length, allow slack for tie - down. Insert electric over air solenoid (9) wires through cable seals (2), crimp female inserts (3) onto each wire end, place into shroud assembly (4), (placement does not matter), push in cable seals (2), snap cover closed. Insert harness cable wires (labeled SOL C) through cable seals (2), crimp male inserts (6) onto each wire end, place into tower assembly (5), (placement of red and black lead wires does not matter, solenoid is not polarity sensitive), push in cable seals (2), snap cover closed, connect shroud and tower together.

70-130 PSI inlet air pressure is required to operate the dry valve. Locate a 1/4" NPT opening on the air tank; install the 1/4" x 1/4" nipple (29) into the opening utilizing a pipe thread sealant, install the 1/4" internal thread x 1/8" external thread adapter (30) into the 1/4" x 1/4" nipple (29) utilizing a pipe thread sealant, install the pressure protection valve (31) onto the 1/4" internal thread x 1/8" external thread adapter (30) utilizing a pipe thread sealant, install the compression fitting assembly (24) into the pressure protection valve (31), install compression fitting assembly (24) into dry valve (39). Run air lines (33), cut to length; allow slack for tie-down. Remove nut and ferrule from compression fitting assembly (24), place nut over air line (33), push ferrule over air line (33), insert tube insert (25) into air line (33), place and push air line into compression fitting (24), gently tighten nut; repeat this process

The speed sensor (23) is threaded into the pump gear housing. Torque speed sensor to 8 lb. ft. Run sensor wires, cut wires to length, allow slack for tie-down. Insert speed sensor wire colors white, black/white and red/white (green/white and orange/white are not used) through cable seals (2), crimp female inserts (3) onto each wire end (because the speed sensor has 24 gauge wire it is necessary to double fold the wire ends before crimping), place in order into shroud assembly (22), push in cable seals (2), snap cover closed.
Insert harness cable wires (labeled Sensor) through cable seals (2), crimp male inserts (6) onto each wire end, place in order into tower assembly (21) (make sure like colors will mate with like colors in shroud assembly (22)), push in cable seals (2),

The switch (19) can be mounted in the dashboard via a knock-out or mounted to the base of the dashboard utilizing the dash bracket (16). Mount the dash bracket (16) utilizing the two (2) 10-24 x ½" self tapping screws (15). Peel the backing from the self adhesive nameplate (17) and place onto the face of the dash bracket (16). Put the switch guard (18) over the switch (19) and place inside the opening of the dash bracket (16), support the back of the dash bracket (16) and push the switch assembly in, making sure the plastic tabs are securely locked in place. Run power supply harness wires, cut wires to length, allow slack for tie-down. Crimp ring terminal (10) onto end of ground wire (11), attach to ground post of battery, combine crimp blade terminal (20) onto opposite end of ground wire and black harness wire (labeled -) and connect to top right spade terminal on rocker switch (19). Crimp blade terminal (20) onto end of red harness wire (labeled+) and connect to bottom left spade terminal on rocker switch (19). Crimp blade terminal (20) onto end of 12 VDC supply wire (11) and connect to middle spade terminal on rocker switch (19), butt splice (12) onto end of fuse wire assembly (13), butt splice (12) an extension wire (11) to the opposite end of fuse wire assembly (13), crimp ring terminal (10) onto end of extension wire (11), attach to positive post of battery, insert 10 amp fuse (14).
(Light is on when switch is engaged, indicating power is being supplied to the system)

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Single Dry Valve Switch Kit Components

Switch Kit Part Number 999-01406

Item No.	Part Number	Description	Qty. Req'd
2	999-00937CS	16G Weather Pack Cable Seals	14
3	999-00938	Weather Pack Pins (Female)	7
4	999-00936	Weather Pack 2 Pin Shroud Assembly (Female)	2
5	999-00937	Weather Pack 2 Pin Tower Assembly (Male)	2
6	999-00939	Weather Pack Pins (Male)	7
8	900-01271	1/4-14 x 1 Self Tapping Screw W/Washer	2
9	514-00914	Electric/Air Solenoid (to operate dry valve)	1
10	999-00926	18-14G Ring Terminal	2
11	999-00925-20	20' 16 Gauge Wire (cut to required lengths)	1
12	999-00927	16-14G Butt Splice	2
13	999-00928	16 Guage Fuse Holder	1
14	999-00929	10 Amp Fuse	1
15	900-01270	10-18 x 1/2" Self Tapping Screw W/Washer	4
16	999-00932	Switch Bracket	1
17	999-00931	Self Adhesive Face Plate	1

Item No.	Part Number	Description	Qty. Req'd
18	999-00933	Switch Guard	1
19	999-00934	Rocker Switch W/Light	1
20	999-00935	Female Blade Terminal	3
21	999-00940	Weather Pack 3 Pin Shroud Assembly (Female)	1
22	999-00941	Weather Pack 3 Pin Tower Assembly (Male)	1
24	514-00306-CF	Compression Fitting, (Base, Nut & Ferrule)	4
25	999-01341	Tube Insert	4
26	931-00915	E/A Solenoid Bracket	1
27	900-00940	#10-32 x 7/16" Machine Screw	2
28	900-00943	#10 Star Washer	2
29	999-00930	1/4" x 1/4" NPT Nipple	1
30	999-00924	1/4" Int. x 1/8" Ext. NPT Adapter	1
31	PP1204	Pressure Protection Valve	1
32	514-00559-DVBV	Bronze Air Vent	1
33	514-00268-PT	Air Line 17.5' (cut to required length)	2

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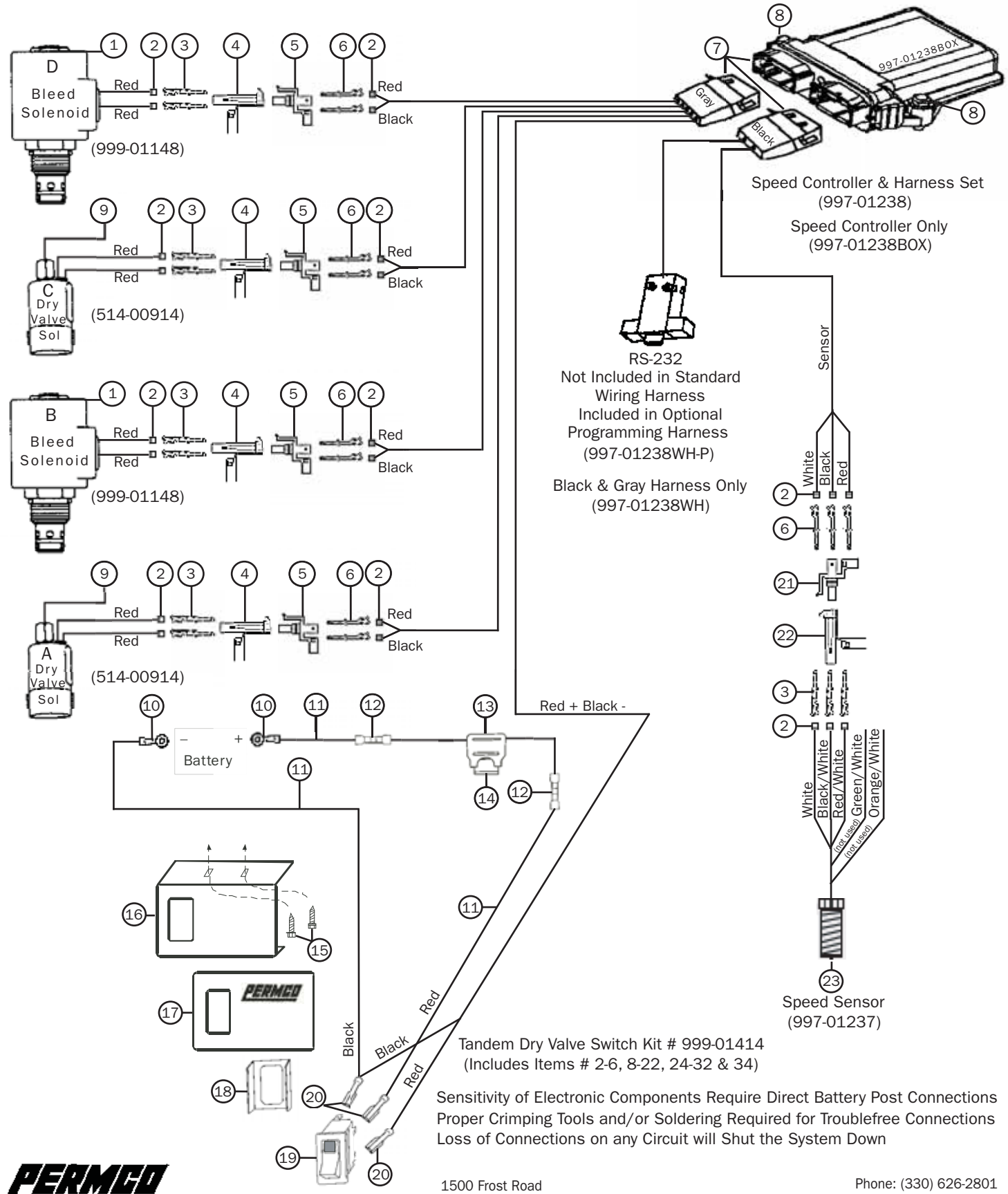
TANDEM DRY VALVE

Refuse Pump System with Speed Sensor
Electrical Installation Diagram (12-24 VDC)



Tandem Dry Valve Switch Kit # 999-01414
(Includes Items # 2-6, 8-22, 24-32 & 34)

Sensitivity of Electronic Components Require Direct Battery Post Connections
Proper Crimping Tools and/or Soldering Required for Troublefree Connections
Loss of Connections on any Circuit will Shut the System Down

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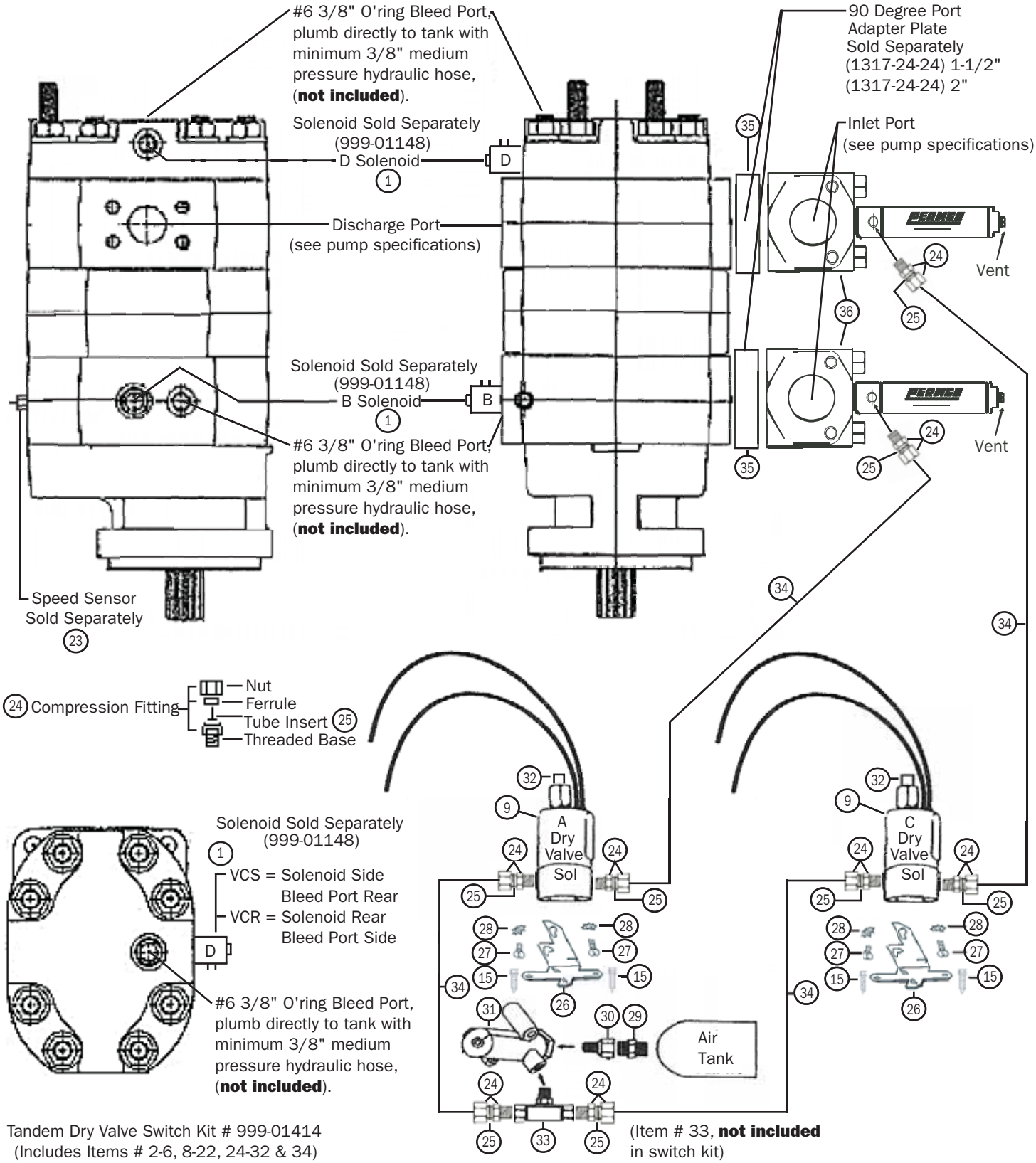
TANDEM DRY VALVE

Tandem Dry Valve Installation Drawing

Counter Clockwise Rotation Shown



Tandem Dry Valve Switch Kit # 999-01414
(Includes Items # 2-6, 8-22, 24-32 & 34)

(Item # 33, **not included** in switch kit)

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Dry Valve Part Numbers

Item No.	Part Number	Description	Qty. Req'd
36	514-00911-DVA	1-1/2" Dry Valve Assembly (includes mounting bolts)	1

Item No.	Part Number	Description	Qty. Req'd
36	514-00278-DVA	2" Dry Valve Assembly (includes mounting bolts)	1

* One (1) Dry Valve required per section

Port Rotation Plate Part Numbers

Item No.	Part Number	Description	Qty. Req'd
35	1317-24-24	Port Rotation Plate Kit for 1-1/2" Dry Valve	1

Item No.	Part Number	Description	Qty. Req'd
35	1317-32-32	Port Rotation Plate Kit for 2" Dry Valve	1

* One (1) Port Rotation Kit required per Dry Valve

Examples of System Component Requirements

System Requirements	Required Components	Description	Qty, Req'd
50 GPM @ 700 RPM Solenoid Side	P7600B467VCSXVCSSTG22-6CVCNM22-1DV	Pump 50 GPM @ 700 RPM (With Speed Sensor Machining & Solenoid Location Side of Port End Cover) CCW	1
750 & 1400 RPM Over-Speed Setting	997-01238	Speed Controller & Harness Set (750 & 1400 RPM Over-Speed Kick-Out Setting) (Item # 7)	1
2" Dry Valve	514-00278-DVA	2" Dry Valve (Item # 36) (mounting hardware included)	2
Switch Kit	999-01414	Tandem Dry Valve Switch Kit (Includes Items # 2 thru 6, 8 thru 22, 24 thru 32 & 34)	1
Port Rotation Plates	1317-32-32	Port Rotation Plate Kit for 2" Dry Valve (Item # 35) (mounting hardware included)	2
	997-01237	Speed Sensor P7500 Series (Item # 23)	1
	999-01148	Bleed Solenoid (Item # 1)	2
45 GPM @ 700 RPM Solenoid Rear	P7600B467VCRXVCSSTG20-6CVCNM20-1DV	Pump 45 GPM @ 700 RPM (With Speed Sensor Machining & Solenoid Location Rear of Port End Cover) CCW	1
750 & 1400 RPM Over-Speed Setting	997-01238	Speed Controller & Harness Set (750 & 1400 RPM Over-Speed Kick-Out Setting) (Item # 7)	1
2" Dry Valve	514-00278-DVA	2" Dry Valve (Item # 36) (mounting hardware included)	2
Switch Kit	999-01414	Tandem Dry Valve Switch Kit (Includes Items # 2 thru 6, 8 thru 22, 24 thru 32 & 34)	1
Port Rotation Plates	1317-32-32	Port Rotation Plate Kit for 2" Dry Valve (Item # 35) (mounting hardware included)	2
	997-01237	Speed Sensor P7500 Series (Item # 23)	1
	999-01148	Bleed Solenoid (Item # 1)	2
45 GPM @ 700 RPM Solenoid Rear	P7600B467VCRXVCSSTG20-6CVCNM20-1DV	Pump 45 GPM @ 700 RPM (With Speed Sensor Machining & Solenoid Location Rear of Port End Cover) CCW	1
750 & 1400 RPM Over-Speed Setting	997-01238	Speed Controller & Harness Set (750 & 1400 RPM Over-Speed Kick-Out Setting) (Item # 7)	1
2" Dry Valve	514-00278-DVA	2" Dry Valve (Item # 36) (mounting hardware included)	2
Port Rotation Plates	1317-32-32	Port Rotation Plate Kit for 2" Dry Valve (Item # 35) (mounting hardware included)	2
No Switch Kit	997-01237	Speed Sensor P7500 Series (Item # 23)	1
	999-01148	Bleed Solenoid (Item # 1)	2
	514-00914	12 VDC Electric/Air Solenoid (used to open and close dry valve) (Item # 9)	2
	931-00915	Electric/Air Solenoid Bracket (Item # 26)	2
	900-00940	#10-32 x 7/16" Machine Screws (for mounting solenoid bracket to solenoid) (Item # 27)	4
	900-00943	#10 Star Washer (for mounting solenoid bracket to solenoid) (Item # 28)	4
	514-00559-DVBV	Bronze Air Vent (for E/A solenoid vent) (Item # 32)	2

* Specific speed settings can be programmed before shipping, please note when ordering

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Tandem Dry Valve Model Number Construction

P	7600	B	4	67	VCR	X	VCSSTG	20	-	6	CVC	NM	20	-	1	DV
A	B	C	D	E	F	G	H	I		J	K	L	M		N	O

A = Pump

B = Series
- 7600

C = Unit Code
- B = Multiple

D = Rotation
- 3 = Right CW
- 4 = Left CCW

E = Mounting Flange
- 67 = Four Bolt "C"

F = Port End Cover Solenoid Location
- VCR = Solenoid Rear-Bleed Port Side
- VCS = Solenoid Side-Bleed Port Rear

G = Studs
- X = Extended Studs

H = Front Gear Housing
- VCSSNT = Solenoid & Speed Sensor Machining CCW Blank x 1-1/2" Split Flange
- VCSSND = Solenoid & Speed Sensor Machining CW 1-1/2" x Blank Split Flange
- VCSSTG = Solenoid & Speed Sensor Machining CCW = Blank x 2" Split Flange
- VCSSTH = Solenoid & Speed Sensor Machining CW 2" x Blank Split Flange

I = Front Gear Housing Size
- 12 = 1-1/4"
- 15 = 1-1/2"
- 17 = 1-3/4"
- 20 = 2"
- 22 = 1-1/4"
- 25 = 2-1/2"

J = Shaft
- 00 = 1-1/4" Keyed (PL Factor 8300)
- 6 = 1-1/4" "C" Spline (PL Factor 12,000)

K = Bearing Carrier
- BVC = CW Rotation
- CVC = CCW Rotation

L = Rear Gear Housing Porting
- NL = CCW 1-1/4" x 1-1/2" Split Flange
- NM = CCW 1-1/4" x 2" Split Flange
- NO = CW 1-1/2" x 1-1/4" Split Flange
- NP = CW 2" x 1-1/4" Split Flange

M = Rear Gear Housing Size
- 12 = 1-1/4"
- 15 = 1-1/2"
- 17 = 1-3/4"
- 20 = 2"
- 22 = 1-1/4"
- 25 = 2-1/2"

N = Connecting Shaft
- 1 = Standard Connecting Shaft

O = Function
- DV = Dry Valve

Genesis Pump Specifications

Gear Housing	Displ. Cu. In.	Max. RPM	Min. RPM	Max. PSI	Inlet Port SAE 4 Bolt	Discharge Port SAE 4 Bolt
1-1/4"	5.055	3000	600	3000	1-1/2"	1-1/4"
1-1/2"	6.066	3000	600	3000	1-1/2"	1 1/4"
1-3/4"	7.077	3000	600	3000	1-1/2"	1 1/4"
2"	8.088	3000	600	2500	2"	1 1/4"
2-1/4"	9.099	2500	600	2500	2"	1 1/4"
2-1/2"	10.110	2500	600	2250	2"	1 1/4"

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1500 Frost Rd
Streetsboro, OH 44241

Phone (330) 626-2801
Fax (330) 626-2805

Tandem Dry Valve Wiring Instructions

The speed controller black box (7) should be mounted inside the cab in a protected area. Two (2) 3/8-14 x 1" self tapping screws (8) w/washer and seal are supplied for mounting. Insert wiring harness (color coded) and run wires to predetermined locations.

The RS-232 connector programming cable is optional; it is utilized to hook to a lap top computer for setting speed control settings and/or troubleshooting. Default settings are preset to A, B, C, & D on at engine idle speed (600-700 RPM), A & B off at 750 RPM, A & B back on at 700 RPM with an engine stall setting for A & B off at 400 RPM, C & D off at 1400 RPM, and C & D back on at 1000 RPM. Specific kick-out speed settings can be programmed before shipping.

D Bleed Solenoid (1) is mounted in the pump port end cover with the VCR and VCB options. A minimum 3/8" medium pressure hydraulic hose (not included) plumbed direct to tank is required for the VCR, VCB and the DVBP options. Torque Solenoid to 25 lb. ft., and Solenoid Nut to 5 lb. ft. Run solenoid wires, cut wires to length, allow slack for tie-down. Insert bleed solenoid (1) wires through cable seals (2), crimp female inserts (3) onto each wire end, place into shroud assembly (4), (placement does not matter), push in cable seals (2), snap cover closed. Insert harness cable wires (labeled SOL D) through cable seals (2), crimp male inserts (6) onto each wire end, place into tower assembly (5), (placement of red and black lead wires does not matter, solenoid is not polarity sensitive), push in cable seals (2), snap cover closed, connect shroud and tower together.

C Electric over Air Solenoid (9) for rear pump section dry valve should be mounted inside the cab in a protected area. Install the two (2) compression fitting assemblies (24) into electric over air solenoid (9), mount solenoid bracket (26) to electric over air solenoid (9) utilizing the two (2) #10-32 x 7/16" machine screws (27) and the two (2) #10 star lock washers (28), mount the solenoid assembly in a protected area utilizing the two (2) 10-24 x 1/2" self tapping screws w/washer and seal (15). Run electric over air solenoid wires, cut to length, allow slack for tie-down. Insert electric over air solenoid (9) wires through cable seals (2), crimp female inserts (3) onto each wire end, place into shroud assembly (4), (placement does not matter), push in cable seals (2), snap cover closed. Insert harness cable wires (labeled SOL C) through cable seals (2), crimp male inserts (6) onto each wire end, place into tower assembly (5), (placement of red and black lead wires does not matter, solenoid is not polarity sensitive), push in cable seals (2), snap cover closed, connect shroud and tower together.

B Bleed Solenoid (1) is mounted in the pump bearing carrier, a minimum 3/8" medium pressure hydraulic hose (not included) plumbed direct to tank is required for this bleed solenoid. Torque Solenoid to 25 lb. ft., and Solenoid Nut to 5 lb. ft. Run solenoid wires, cut wires to length, allow slack for tie-down. Insert bleed solenoid (1) wires through cable seals (2), crimp female inserts (3) onto each wire end, place into shroud assembly (4), (placement does not matter), push in cable seals (2), snap cover closed. Insert harness cable wires (labeled SOL B) through cable seals (2), crimp male inserts (6) onto each wire end, place into tower assembly (5), (placement of red and black lead wires does not matter, solenoid is not polarity sensitive), push in cable seals (2), snap cover closed, connect shroud and tower together.

A Electric over Air Solenoid (9) for front pump section dry valve should be mounted inside the cab in a protected area. Install the two (2) compression fitting assemblies (24) into electric over air solenoid (9), mount solenoid bracket (26) to electric over air solenoid (9) utilizing the two (2) #10-32 x 7/16" machine screws (27) and the two (2) #10 star lock washers (28), mount the solenoid assembly in a protected area utilizing the two (2) 10-24 x 1/2" self tapping screws w/washer and seal (15). Run electric over air solenoid wires, cut to length, allow slack for tie-down. Insert electric over air solenoid (9) wires through cable seals (2), crimp female inserts (3) onto each wire end, place into shroud assembly (4), (placement does not matter), push in cable seals (2), snap cover closed. Insert harness cable wires (labeled SOL A) through cable seals (2), crimp male inserts (6) onto each wire end, place into tower assembly (5), (placement of red and black lead wires does not matter, solenoid is not polarity sensitive), push in cable seals (2), snap cover closed, connect shroud and tower together.

The speed sensor (23) is threaded into the pump gear housing. Torque speed sensor to 8 lb. ft. Run sensor wires, cut wires to length, allow slack for tie-down. Insert speed sensor wire colors white, black/white and red/white (green/white and orange/white are not used) through cable seals (2), crimp female inserts (3) onto each wire end (because the speed sensor has 24 gauge wire it is necessary to double fold the wire ends before crimping), place in order into shroud assembly (22), push in cable seals (2), snap cover closed. Insert harness cable wires (labeled Sensor) through cable seals (2), crimp male inserts (6) onto each wire end, place in order into tower assembly (21) (make sure like colors will mate with like colors in shroud assembly (22)), push in cable seals (2), snap cover closed, connect shroud and tower together.

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1500 Frost Rd
Streetsboro, OH 44241

Phone (330) 626-2801
Fax (330) 626-2805

Tandem Dry Valve Wiring Instructions

continued

70-130 PSI inlet air pressure is required to operate the dry valves. Locate a 1/4" NPT opening on the air tank; install the 1/4" x 1/4" nipple (29) into the opening utilizing a pipe thread sealant, install the 1/4" internal thread x 1/8" external thread adapter (30) into the 1/4" x 1/4" nipple (29) utilizing a pipe thread sealant, install the pressure protection valve (31) onto the 1/4" internal thread x 1/8" external thread adapter (30) utilizing a pipe thread sealant, install the “Tee” fitting (33) not supplied into the pressure protection valve outlet utilizing a pipe thread sealant, install the compression fitting assemblies (24) into the “Tee” fitting (33), install compression fitting assembly (24) into each dry valve (39). Run air lines (34), cut to length; allow slack for tie-down. Remove nut and ferrule from compression fitting assembly (24), place nut over air line (34), push ferrule over air line (34), insert tube insert (25) into air line (34), place and push air line into compression fitting (24), gently tighten nut; repeat this process for all compression fitting assemblies.

The switch (19) can be mounted in the dashboard via a knock-out or mounted to the base of the dashboard utilizing the dash bracket (16). Mount the dash bracket (16) utilizing the two (2) 10-24 x ½" self tapping screws (15). Peel the backing from the self adhesive nameplate (17) and place onto the face of the dash bracket (16). Put the switch guard (18) over the switch (19) and place inside the opening of the dash bracket (16), support the back of the dash bracket (16) and push the switch assembly in, making sure the plastic tabs are securely locked in place. Run power supply harness wires, cut wires to length, allow slack for tie-down. Crimp ring terminal (10) onto end of ground wire (11), attach to ground post of battery, combine crimp blade terminal (20) onto opposite end of ground wire and black harness wire (labeled -) and connect to top right spade terminal on rocker switch (19). Crimp blade terminal (20) onto end of red harness wire (labeled+) and connect to bottom left spade terminal on rocker switch (19). Crimp blade terminal (20) onto end of 12 VDC supply wire (11) and connect to middle spade terminal on rocker switch (19), butt splice (12) onto end of fuse wire assembly (13), butt splice (12) an extension wire (11) to the opposite end of fuse wire assembly (13), crimp ring terminal (10) onto end of extension wire (11), attach to positive post of battery, insert 10 amp fuse (14).
(Light is on when switch is engaged, indicating power is being supplied to the system)

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Fax (330) 626-2805

Tandem Dry Valve Switch Kit Components

Switch Kit Part Number 999-01414

Item No.	Part Number	Description	Qty. Req'd
2	999-00937CS	16G Weather Pack Cable Seals	22
3	999-00938	Weather Pack Pins (Female)	11
4	999-00936	Weather Pack 2 Pin Shroud Assembly (Female)	4
5	999-00937	Weather Pack 2 Pin Tower Assembly (Male)	4
6	999-00939	Weather Pack Pins (Male)	11
8	900-01271	1/4-14 x 1 Self Tapping Screw W/Washer	2
9	514-00914	Electric/Air Solenoid (to operate dry valve)	2
10	999-00926	18-14G Ring Terminal	2
11	999-00925-20	20' 16 Gauge Wire (cut to required lengths)	1
12	999-00927	16-14G Butt Splice	2
13	999-00928	16 Guage Fuse Holder	1
14	999-00929	10 Amp Fuse	1
15	900-01270	10-18 x 1/2" Self Tapping Screw W/Washer	6
16	999-00932	Switch Bracket	1
17	999-00931	Self Adhesive Face Plate	1

Item No.	Part Number	Description	Qty. Req'd
18	999-00933	Switch Guard	1
19	999-00934	Rocker Switch W/Light	1
20	999-00935	Female Blade Terminal	3
21	999-00940	Weather Pack 3 Pin Shroud Assembly (Female)	1
22	999-00941	Weather Pack 3 Pin Tower Assembly (Male)	1
24	514-00306-CF	Compression Fitting, (Base, Nut & Ferrule)	8
25	999-01341	Tube Insert	8
26	931-00915	E/A Solenoid Bracket	2
27	900-00940	#10-32 x 7/16" Machine Screw	4
28	900-00943	#10 Star Washer	4
29	999-00930	1/4" x 1/4" NPT Nipple	1
30	999-00924	1/4" Int. x 1/8" Ext. NPT Adapter	1
31	PP1204	Pressure Protection Valve	1
32	514-00559-DVBV	Bronze Air Vent	2
34	514-00268-PT	Air Line 17.5' (cut to required length)	2

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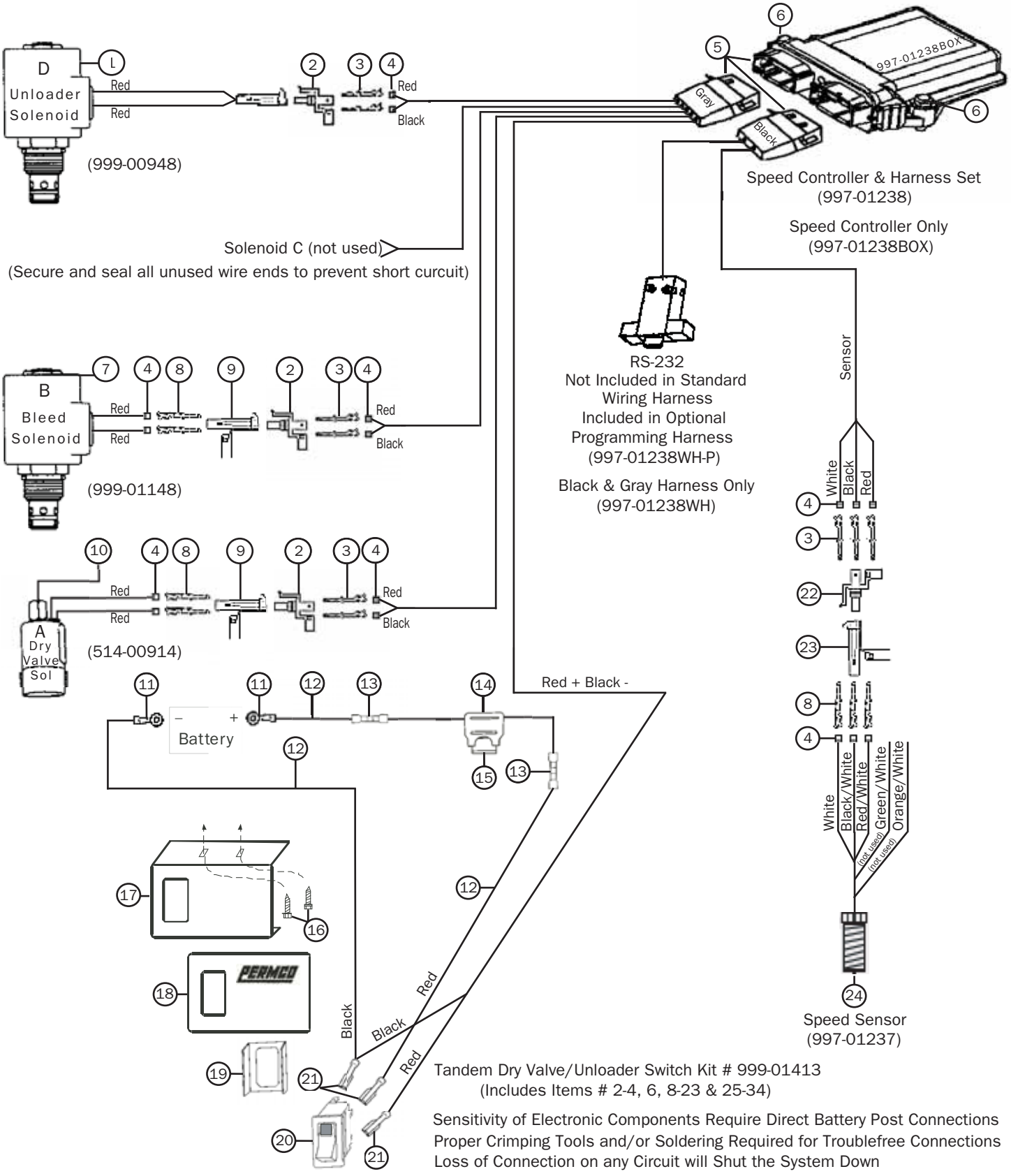
Fax: (330) 626-2805

TANDEM DRY VALVE/UNLOADER

Refuse Pump System with Speed Sensor
Electrical Installation Diagram (12-24 VDC)



Tandem Dry Valve/Unloader Switch Kit # 999-01413
(Includes Items # 2-4, 6, 8-23 & 25-34)

Sensitivity of Electronic Components Require Direct Battery Post Connections
Proper Crimping Tools and/or Soldering Required for Troublefree Connections
Loss of Connection on any Circuit will Shut the System Down

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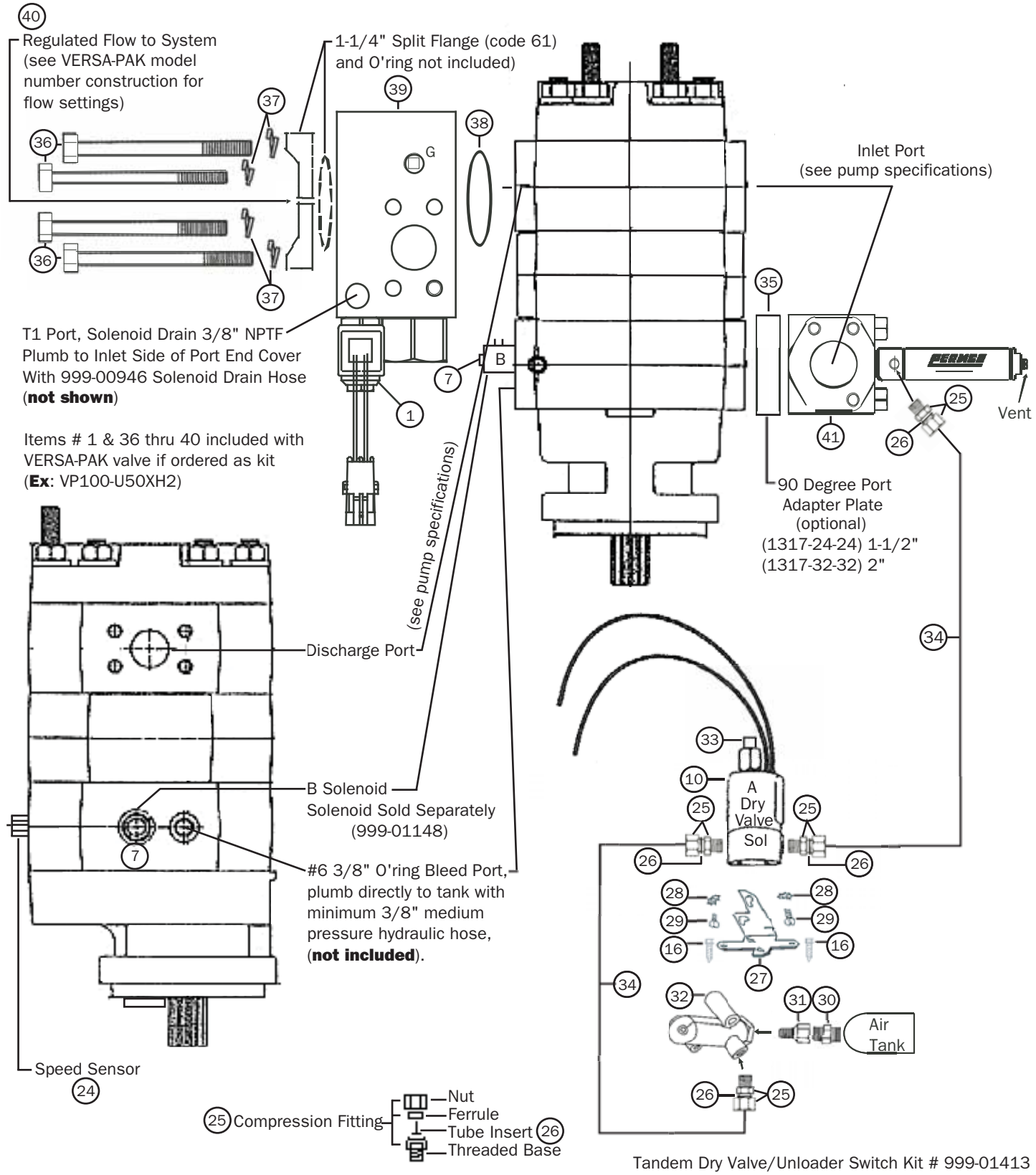
Fax: (330) 626-2805

TANDEM DRY VALVE/UNLOADER

Tandem Dry Valve/Unloader Installation Diagram

Counter-Clockwise Rotation Shown



Tandem Dry Valve/Unloader Switch Kit # 999-01413
(Includes Items # 2-4, 6, 8-23 & 25-34)

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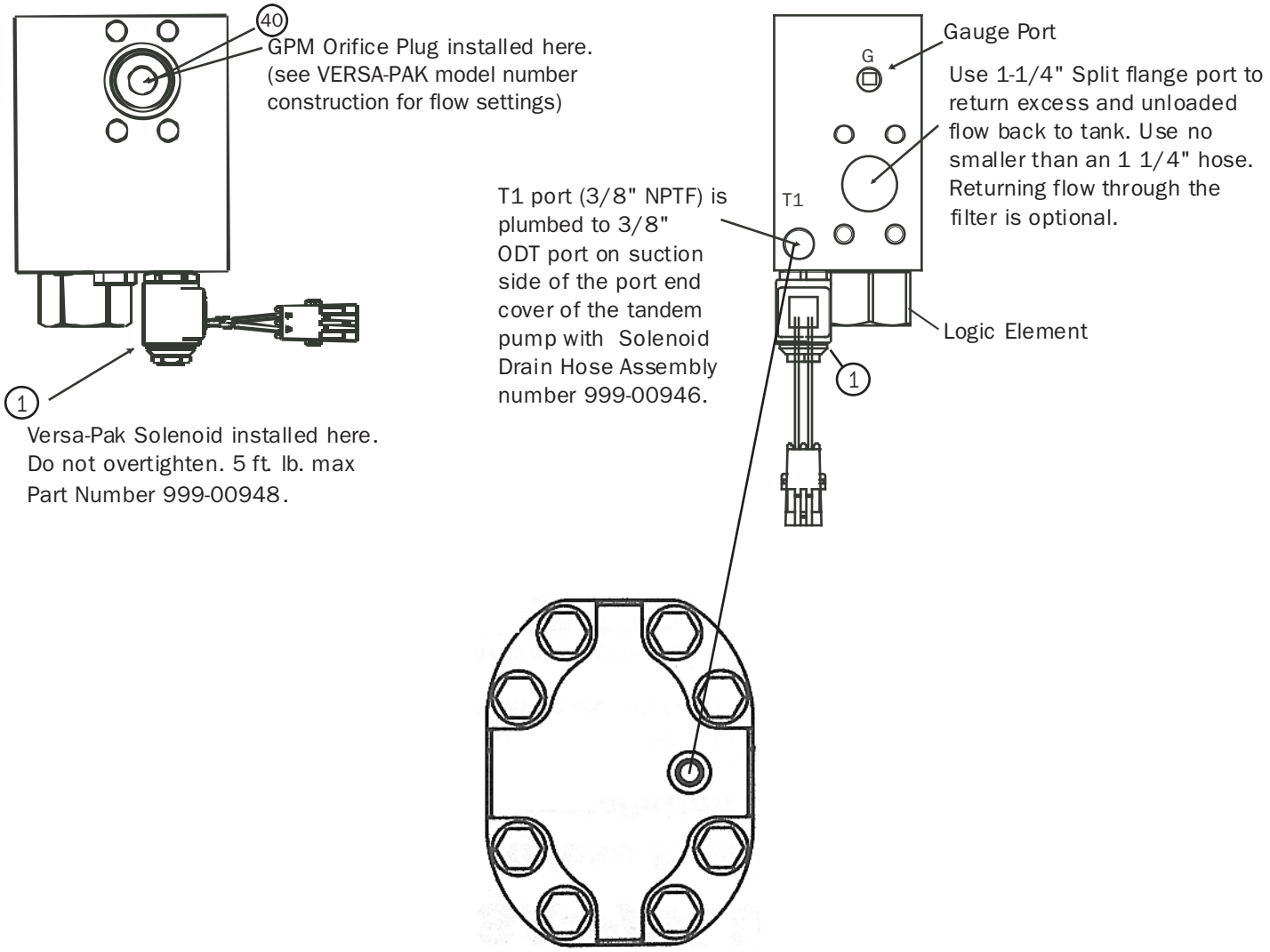
TANDEM DRY VALVE/UNLOADER

Tandem Dry Valve/Unloader Installation Diagram

The Versa-Pak Valve may be installed in this manner with the solenoid and/or logic element pointing down or with the solenoid and/or logic element pointing up. With the solenoid and/or logic element pointing down the return/tank port will be oriented toward the rear of the vehicle. With the solenoid and/or logic element pointing up the return/tank port will be oriented toward the front of the vehicle.



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Streetsboro, OH 44241

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Dry Valve Part Numbers

Item No.	Part Number	Description	Qty. Req'd
41	514-00911-DVA	1-1/2" Dry Valve Assembly (includes mounting bolts)	1

Item No.	Part Number	Description	Qty. Req'd
41	514-00278-DVA	2" Dry Valve Assembly (includes mounting bolts)	1

* One (1) Dry Valve required per section

Port Rotation Plate Part Numbers

Item No.	Part Number	Description	Qty. Req'd
35	1317-24-24	Port Rotation Plate Kit for 1-1/2" Dry Valve	1

Item No.	Part Number	Description	Qty. Req'd
35	1317-32-32	Port Rotation Plate Kit for 2" Dry Valve	1

* One (1) Port Rotation Kit required per Dry Valve

Examples of System Component Requirements

System Requirements	Required Components	Description	Qty, Req'd
50 GPM @ 700 RPM	P7600B467ZUXVCSSTG22-6CVCNM22-1DVUL	Pump 50 GPM @ 700 RPM (With Speed Sensor Machining) CCW Rotation	1
750 & 1400 RPM Over-Speed Setting	997-01238	Speed Controller & Harness Set (750 & 1400 RPM Over-Speed Kick-Out Setting) (Item # 5)	1
50 GPM Flow Control	VP100-U50XH2	VERSA-PAK Valve (50 GPM Flow Control + Unloader Solenoid + Drain Hose Kit) (Includes Items # 1 & 36 thru 40)	1
2" Dry Valve	514-00278-DVA	2" Dry Valve (Item # 41) (mounting hardware included)	1
Switch Kit	999-01413	Tandem Dry Valve/Unloader Switch Kit (Includes Items # 2 thru 4, 6, 8 thru 23, & 25 thru 34)	1
Port Rotation Plates	1317-32-32	Port Rotation Plate Kit for 2" Dry Valve (Item # 35) (mounting hardware included)	1
	997-01237	Speed Sensor P7500 Series (Item # 24)	1
	999-01148	Bleed Solenoid (Item # 7)	1
45 GPM @ 700 RPM	P7600B467ZUXVCSSTG20-6CVCNM20-1DVUL	Pump 45 GPM @ 700 RPM (With Speed Sensor Machining) CCW Rotation	1
750 & 1400 RPM Over-Speed Setting	997-01238	Speed Controller & Harness Set (750 & 1400 RPM Over-Speed Kick-Out Setting) (Item # 5)	1
2" Dry Valve	514-00278-DVA	2" Dry Valve (Item # 41) (mounting hardware included)	1
Switch Kit	999-01413	Tandem Dry Valve/Unloader Switch Kit (Includes Items # 2 thru 4, 6, 8 thru 23, & 25 thru 34)	1
Port Rotation Plate	1317-32-32	Port Rotation Plate Kit for 2" Dry Valve (Item # 35) (mounting hardware included)	1
	VP100-UBLXH2	VERSA-PAK Valve (Unloader Solenoid + Drain Hose Kit) (Includes Items # 1 & 36 thru 40)	1
	997-01237	Speed Sensor P7500 Series (Item # 24)	1
	999-01148	Bleed Solenoid (Item # 7)	1
45 GPM @ 700 RPM	P7600B467ZUXVCSSTG20-6CVCNM20-1DVUL	Pump 45 GPM @ 700 RPM (With Speed Sensor Machining) CCW Rotation	1
750 & 1400 RPM Over-Speed Setting	997-01238	Speed Controller & Harness Set (750 & 1400 RPM Over-Speed Kick-Out Setting) (Item # 5)	1
2" Dry Valve	514-00278-DVA	2" Dry Valve (Item # 41) (mounting hardware included)	1
Port Rotation Plate	1317-32-32	Port Rotation Plate Kit for 2" Dry Valve (Item # 35) (mounting hardware included)	1
No Switch Kit	VP100-UBLXH2	VERSA-PAK Valve (Unloader Solenoid + Drain Hose Kit) (Includes Items # 1 & 36 thru 40)	1
	997-01237	Speed Sensor P7500 Series (Item # 24)	1
	999-01148	Bleed Solenoid (Item # 7)	1
	514-00914	12 VDC Electric/Air Solenoid (used to open and close dry valve) (Item # 10)	1
	931-00915	Electric/Air Solenoid Bracket (Item # 27)	1
	900-00940	#10-32 x 7/16" Machine Screws (for mounting solenoid bracket to solenoid) (Item # 29)	2
	900-00943	#10 Star Washer (for mounting solenoid bracket to solenoid) (Item # 28)	2
	514-00559-DVBV	Bronze Air Vent (for E/A solenoid vent) (Item # 33)	1

* Specific speed settings can be programmed before shipping, please note when ordering

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1500 Frost Rd
Streetsboro, OH 44241

Phone (330) 626-2801
Fax (330) 626-2805

Tandem Dry Valve/Unloader Model Number Construction

P	7600	B	4	67	ZU	X	VCSSTG	20	-	6	CVC	NM	20	-	1	DV	UL
A	B	C	D	E	F	G	H	I		J	K	L	M		N	O	P

A = Pump

B = Series

7600

C = Unit Code

B = Multiple

D = Rotation

3 = Right CW
4 = Left CCW

E = Mounting Flange

67 = Four Bolt "C"

F = Port End Cover

UZ = Bleed Port CW
ZU = Bleed Port CCW

G = Studs

X = Extended Studs

H = Front Gear Housing

VCSSNT = Solenoid & Speed Sensor Machining
CCW Blank x 1-1/2" Split Flange
VCSSND = Solenoid & Speed Sensor Machining
CW 1-1/2" x Blank Split Flange
VCSSTG = Solenoid & Speed Sensor Machining
CCW = Blank x 2" Split Flange
VCSSTH = Solenoid & Speed Sensor Machining
CW 2" x Blank Split Flange

I = Front Gear Housing Size

12 = 1-1/4"
15 = 1-1/2"
17 = 1-3/4"
20 = 2"
22 = 1-1/4"
25 = 2-1/2"

J = Shaft

00 = 1-1/4" Keyed (PL Factor 8300)
6 = 1-1/4" "C" Spline (PL Factor 12,000)

K = Bearing Carrier

BVC = CW Rotation
CVC = CCW Rotation

L = Rear Gear Housing Porting

NL = CCW 1-1/4" x 1-1/2" Split Flange
NM = CCW 1-1/4" x 2" Split Flange
NO = CW 1-1/2" x 1-1/4" Split Flange
NP = CW 2" x 1-1/4" Split Flange

M = Rear Gear Housing Size

12 = 1-1/4"
15 = 1-1/2"
17 = 1-3/4"
20 = 2"
22 = 1-1/4"
25 = 2-1/2"

N = Connecting Shaft

1 = Standard Connecting Shaft

O = Function Front Section

DV = Dry Valve

P = Function Rear Section

UL = Unloader

Genesis Pump Specifications

Gear Housing	Displ. Cu. In.	Max. RPM	Min. RPM	Max. PSI	Inlet Port SAE 4 Bolt	Discharge Port SAE 4 Bolt
1-1/4"	5.055	3000	600	3000	1-1/2"	1-1/4"
1-1/2"	6.066	3000	600	3000	1-1/2"	1 1/4"
1-3/4"	7.077	3000	600	3000	1-1/2"	1 1/4"
2"	8.088	3000	600	2500	2"	1 1/4"
2-1/4"	9.099	2500	600	2500	2"	1 1/4"
2-1/2"	10.110	2500	600	2250	2"	1 1/4"

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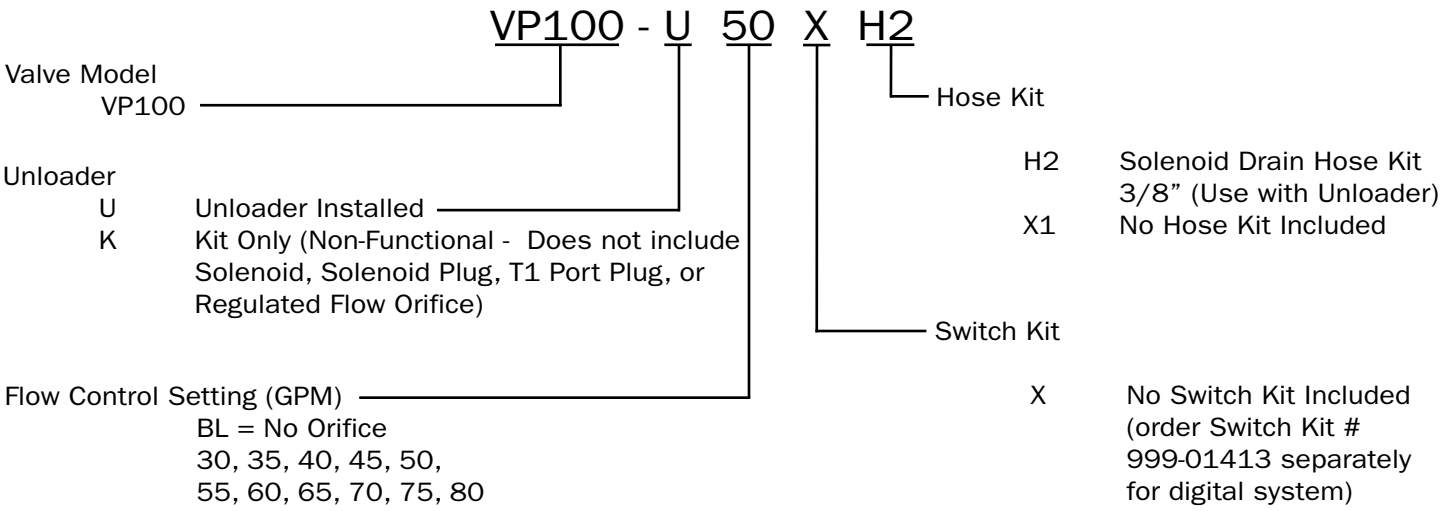
Fax (330) 626-2805

Versa-Pak Valve Model Number Construction



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1500 Frost Rd
Streetsboro, OH 44241
Phone (330) 626-2801
Fax (330) 626-2805

Tandem Dry Valve/Unloader Wiring Instructions

The speed controller black box (5) should be mounted inside the cab in a protected area. Two (2) 3/8-14 x 1" self tapping screws (6) w/washer and seal are supplied for mounting. Insert wiring harness (color coded) and run wires to predetermined locations.

The RS-232 connector programming cable is optional; it is utilized to hook to a lap top computer for setting speed control settings and/or troubleshooting. Default settings are preset to A, B & D on at engine idle speed (600-700 RPM), A & B off at 750 RPM; A & B back on at 700 RPM with an engine stall setting for A & B off at 400 RPM, D off at 1400 RPM, and D back on at 1000 RPM. Specific kick-out speed settings can be programmed before shipping.

D Solenoid (1) is mounted in the Versa-Pak Unloader Block. Solenoid comes with shroud (male) assembly fully attached. Torque Solenoid to 25 lb. ft., and Solenoid Nut to 5 lb. ft. Run solenoid wires, cut wires to length, allow slack for tie-down. Insert harness cable wires (labeled SOL D) through cable seals (4), crimp male inserts (3) onto each wire end, place into tower assembly (2), (placement of red and black lead wires does not matter, solenoid is not polarity sensitive), push in cable seals (4), snap cover closed, connect shroud and tower together.

B Bleed Solenoid (7) is mounted in the pump bearing carrier, a minimum 3/8" medium pressure hydraulic hose (not included) plumbed direct to tank is required for this bleed solenoid. Torque Solenoid to 25 lb. ft., and Solenoid Nut to 5 lb. ft. Run solenoid wires, cut wires to length, allow slack for tie-down. Insert bleed solenoid (7) wires through cable seals (4), crimp female inserts (8) onto each wire end, place into shroud assembly (9), (placement does not matter), push in cable seals (4), snap cover closed. Insert harness cable wires (labeled SOL B) through cable seals (4), crimp male inserts (3) onto each wire end, place into tower assembly (2), (placement of red and black lead wires does not matter, solenoid is not polarity sensitive), push in cable seals (4), snap cover closed, connect shroud and tower together.

A Electric over Air Solenoid (10) for front pump section dry valve should be mounted inside the cab in a protected area. Install the two (2) compression fitting assemblies (25) into electric over air solenoid (10), mount solenoid bracket (27) to electric over air solenoid (10) utilizing the two (2) #10-32 x 7/16" machine screws (29) and the two (2) #10 star lock washers (28), mount the solenoid assembly in a protected area utilizing the two (2) 10-24 x 1/2" self tapping screws w/washer and seal (16). Run electric over air solenoid wires, cut to length, allow slack for tie-down. Insert electric over air solenoid (10) wires through cable seals (4), crimp female inserts (8) onto each wire end, place into shroud assembly (9), (placement does not matter), push in cable seals (4), snap cover closed. Insert harness cable wires (labeled SOL A) through cable seals (4), crimp male inserts (3) onto each wire end, place into tower assembly (2), (placement of red and black lead wires does not matter, solenoid is not polarity sensitive), push in cable seals (4), snap cover closed, connect shroud and tower together.

70-130 PSI inlet air pressure is required to operate the dry valves. Locate a 1/4" NPT opening on the air tank; install the 1/4" x 1/4" nipple (30) into the opening utilizing a pipe thread sealant, install the 1/4" internal thread x 1/8" external thread adapter (31) into the 1/4" x 1/4" nipple (30) utilizing a pipe thread sealant, install the pressure protection valve (32) onto the 1/4" internal thread x 1/8" external thread adapter (31) utilizing a pipe thread sealant, install the compression fitting assemblies (25) into the pressure protection valve (32), install compression fitting assembly (25) into dry valve (41). Run air lines (34), cut to length; allow slack for tie-down. Remove nut and ferrule from compression fitting assembly (25), place nut over air line (34), push ferrule over air line (34), insert tube insert (26) into air line (34), place and push air line into compression fitting (25), gently tighten nut; repeat this process for all compression fitting assemblies.

The speed sensor (24) is threaded into the pump gear housing. Torque speed sensor to 8 lb. ft. Run sensor wires, cut wires to length, allow slack for tie-down. Insert speed sensor wire colors white, black/white and red/white (green/white and orange/white are not used) through cable seals (4), crimp female inserts (8) onto each wire end (because the speed sensor has 24 gauge wire it is necessary to double fold the wire ends before crimping), place in order into shroud assembly (23), push in cable seals (4), snap cover closed. Insert harness cable wires (labeled Sensor) through cable seals (4), crimp male inserts (3) onto each wire end, place in order into tower assembly (22) (make sure like colors will mate with like colors in shroud assembly (23)), push in cable seals (4), snap cover closed, connect shroud and tower together.

The switch (20) can be mounted in the dashboard via a knock-out or mounted to the base of the dashboard utilizing the dash bracket (17). Mount the dash bracket (17) utilizing the two (2) 10-24 x ½" self tapping screws (16). Peel the backing from the self adhesive nameplate (18) and place onto the face of the dash bracket (17). Put the switch guard (19) over the switch (20) and place inside the opening of the dash bracket (17), support the back of the dash bracket (17) and push the switch assembly in, making sure the plastic tabs are securely locked in place. Run power supply harness wires, cut wires to length, allow slack for tie-down. Crimp ring terminal (11) onto end of ground wire (21), attach to ground post of battery, combine crimp blade terminal (21) onto opposite end of ground wire and black harness wire (labeled -) and connect to top right spade terminal on rocker switch (20). Crimp blade terminal (21) onto end of red harness wire (labeled+) and connect to bottom left spade terminal on rocker switch (20). Crimp blade terminal (21) onto end of 12 VDC supply wire (12) and connect to middle spade terminal on rocker switch (20), butt splice (13) onto end of fuse wire assembly (14), butt splice (13) an extension wire (12) to the opposite end of fuse wire assembly (14), crimp ring terminal (11) onto end of extension wire (12), attach to positive post of battery, insert 10 amp fuse (15).

(Light is on when switch is engaged, indicating power is being supplied to the system).

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Streetsboro, OH 44241

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Fax (330) 626-2805

Tandem Dry Valve/Unloader Switch Kit Components

Switch Kit Part Number 999-01413

Item No.	Part Number	Description	Qty. Req'd
2	999-00937	Weather Pack 2 Pin Tower Assembly (Male)	3
3	999-00939	Weather Pack Pins (Male)	9
4	999-00937CS	16G Weather Pack Cable Seals	16
6	900-01271	1/4-14 x 1 Self Tapping Screw W/Washer	2
8	999-00938	Weather Pack Pins (Female)	7
9	999-00936	Weather Pack 2 Pin Shroud Assembly (Female)	2
10	514-00914	Electric/Air Solenoid (to operate dry valve)	1
11	999-00926	18-14G Ring Terminal	2
12	999-00925-20	20' 16 Gauge Wire (cut to required lengths)	1
13	999-00927	16-14G Butt Splice	2
14	999-00928	16 Guage Fuse Holder	1
15	999-00929	10 Amp Fuse	1
16	900-01270	10-18 x 1/2" Self Tapping Screw W/Washer	4
17	999-00932	Switch Bracket	1
18	999-00931	Self Adhesive Face Plate	1

Item No.	Part Number	Description	Qty. Req'd
19	999-00933	Switch Guard	1
20	999-00934	Rocker Switch W/Light	1
21	999-00935	Female Blade Terminal	3
22	999-00941	Weather Pack 3 Pin Tower Assembly (Male)	1
23	999-00940	Weather Pack 3 Pin Shroud Assembly (Female)	1
25	514-00306-CF	Compression Fitting, (Base, Nut & Ferrule)	4
26	999-01341	Tube Insert	4
27	931-00915	E/A Solenoid Bracket	1
28	900-00943	#10 Star Washer	2
29	900-00940	#10-32 x 7/16" Machine Screw	2
30	999-00930	1/4" x 1/4" NPT Nipple	1
31	999-00924	1/4" Int. x 1/8" Ext. NPT Adapter	1
32	PP1204	Pressure Protection Valve	1
33	514-00559-DVBV	Bronze Air Vent	1
34	514-00268-PT	Air Line 17.5' (cut to required length)	1

PERMCO

1500 Frost Rd
Streetsboro, OH 44241

Phone: (330) 626-2801
Fax: (330) 626-2805

Basic Function of Black Box

The Permco "Black Box" is a micro-processor controlled electronic switching system that determines when to switch power on or off based on RPM's. These RPM's come from an electronic signal or pulse generated by the rotating gears of the pump/motor. A sensor threaded into the pump or motor and connected to the black box sends these pulses to the micro-processor of the black box indicating the rotating speed of the pump or motor.

The system is simple in theory. It only knows two things. How fast the pump/motor is going and when to turn power on or off based on the data you enter into it along with the pulses coming from the pump/motor sensor. As long as power is applied and a rotation is sensed, then nothing else can go wrong. If you follow the instructions for programming and connecting the Black Box to the system properly, you should not have any problems.

The Black Box retains all settings even when power is removed. Once the system senses rotation the Black Box will cycle the circuits on an off until power is removed from the system. Should you need the Black Box to shut down the system completely upon the sense of a particular RPM and stay off until power is cycled off and on again, the Black Box can be factory programmed to do so.

Following the preparation section below are some items to check for and some troubleshooting tips in the event the system is not operating correctly.

Preparing the Black Box for Speed Setting Values

The black box comes preprogrammed from the factory with default speed settings. If specific speed settings are required it is recommended they be factory programmed before shipment. The following items are needed to reprogram the speed settings on the black box to enable it to work with your vehicle or system.

Reprogramming the black box without factory approval will void the warranty.

1. A Personal Computer (PC), or Laptop Computer with a terminal emulation software installed such as Windows Hyper Terminal or Pro-Com will be needed. The instructions below explain how to set up the Black Box using Windows Hyper Terminal. If you use any other computer, Mac… with terminal emulation software, or a dumb terminal using ASCII, or ADDS emulation, you simply must be able to make the appropriate communications software settings.

2. Programming/troubleshooting cable, 6 foot in length; Permco part number, 997-01238WH-P

   - ***Although it is assumed that you will program the Black Box before it is installed in the vehicle, you can program the Black Box once installed in the vehicle. You will need to remove the sensor connector and connect the programming cable, part number 997-01238WH-P. (The Black Box comes preprogrammed from the factory with industry standard speed kick out settings; specific settings can be programmed before shipping).***

   - ***Once power is removed from the Black Box, the settings will remain until changed again.***

- ***The following steps are common for Windows Hyper Terminal and necessary to establish communications between your computer and the Black Box.***

- 1.) Connect the programming cable (997-01238WH-P) to your laptop or PC 9 or 25 pin Com port, normally located at the back of your laptop or PC to the Black Box 9 pin connector.

- 2.) Open Hyper Terminal
  (Usually located under Programs, Accessories\Communications.)

- **Connection Description:** New Connection
  Name: *Permco Black Box (Whatever you want)*
  Icon: (doesn't matter)
  Click Ok

- **Phone Number, or Connect to:** Permco
  Connection Using: *Select the Com port you connected the serial cable to in step 1.*
  Click Ok

- **COM# Properties:** Port Settings
  Bits per Second: *9600*
  Data Bits: *8*
  Parity: *None*
  Stop Bits: *1*
  Flow Control: *None*

- **Optimal Advanced Port Settings:**
  Use FIFO buffers: *Selected*
  Receive buffer: *75%*
  Transmit buffer: *75%*
  Click Ok

Advanced Port Settings Instructions

Windows 95/98/2000/XP

1. Right Click on My Computer (From Desktop)
2. Click on properties
3. WIN98/95 – Click on device Manager
   Go to step 4
3. WIN2000/XP – Click on Hardware
   Click on Device Manager
4. Click on "+" next to Ports (COM & LPT)
5. Dbl Click on the port you are adjusting
6. Click on Port Settings
7. Click on Advanced
8. Move the sliders to 75%
9. Click on OK until you close everything

- 3.) Applying power to the black box will begin the speed sense function using the pre-set trip points. To modify these trip points, you will need to press any key on the computer within a few seconds of applying power to the Black Box. If you need to reset the Black Box or start again, simply remove power to the Black Box and re-apply it.

Programming the Black Box

The following are the Black Box Menu Options

M – Main Menu
From anywhere in the system, pressing "M" will bring you to this menu.
A – Information about the Black Box
Short description about the Black Box.
H – Help definitions
A short example of how the Black Box works.
R – Read the present trip point settings
This displays the current Trip Point settings.

D – Set all trip point back to default settings
Resets all previously set trip points to the default settings.
(Aoff =400, Aon = 600, Boff = 750, Bon = 700, Coff = 1400, Con = 1000)

T – Change the trip point settings
Allows you to modify the default settings for Aoff, Aon, Boff, Bon, Coff, Con. To bypass or leave a setting unchanged, you would press the"1" key to move on to the next setting.

S – Change the Startup Timer
This allows you to modify the timers start up time. This is the time the Black Box waits once powered up before it activates the system.

X – Exit setup
This exits the setup process and resumes the countdown to activate the system.

Last minute Checks for Connecting the Black Box to Your Vehicle

* Always consult the appropriate wiring diagram for your application. These diagrams can be obtained by contacting the factory.

1. **Leave some slack in the wires to ensure that the wires do not become disconnected at either end, making sure the wires are properly tied down to avoid snagging and disconnection.**
2. **If available, use only Weather Pack® connectors, pins, and crimping tools to connect each cable to the appropriate mating end. You will find all the appropriate connectors and pins in your Permco switch kit, which can be purchased separately. Soldering is recommended for trouble free connections.**
3. **When installing the sensor (997-01237, 7500/7600 series, or 997-01316, 5000/5100/257 series) in the pump, take care in making sure that you only use 7-1/2 to 8 lb. ft. of torque when tightening.**
4. **When installing the Solenoid in the pump, take care in making sure that you only use 25 lb. ft. of torque maximum when tightening.**
5. **When tightening the solenoid coil nut, take care in making sure that you only use 4 – 5 lb. ft. of torque maximum when tightening.**
6. **Sensitivity of the electronic components requires direct battery post connections for (+) positive and (-) ground. It is not recommended to utilize the fuse panel for (+) positive and (-) ground connections, a millisecond of interrupted power on these circuits will shut the system down and will be problematic for the system.**
7. **On all systems the speed sensor should be mounted on the "belly" side or the bottom of the pump. Should the sensor be located on top, take extra precautions to protect the wire leads coming from the sensor. Tie them down and protect them from becoming stepped on or tangled.**

Failure to observe the previous steps or properly install the electrical circuitry will result in improper functioning of the system. Improperly crimped wires, unprotected (bare) wires and connections could lead to failure and damage to the system. Using incorrect torque (over tightening) of the solenoids, solenoid coils and speed sensors can adversely affect the current draw, this can trip the circuit and will lead to damaged coils and solenoids, although the system will seem to function properly, the coils will eventually burn out and fail. This will not only result in damage to the system, but will also void the warranty.

Troubleshooting:

Should the system fail to function properly, please check the following items before calling the plant for assistance.

1. **Connect a laptop to the Black Box and speed sensor using the programming/troubleshooting cable, Permco part number 997-01238WH-P (sold separately). Verify that the RPM's match that of the tachometer of the vehicle, and check for any error messages that appear when the system is running. *See the above steps to connect your laptop to the black box*. Over-current or a short in the circuit of the system will result in the system shutting down. The system will display such messages should this situation occur.**

2. **Check for loose or open connections. If you purchased the system with the switch kit, make sure that you utilize the Weather Pack® connectors that came with the kit. This is very important. Also, it is very important to use Weather Pack® brand crimpers for crimping the wires to the Weather Pack® connectors. Failure to do so will result in loose and improper connections. Soldering is recommended for trouble free connections.**

3. **If during installation, you did not connect the power and ground leads directly to the battery post, attempt this. Utilizing the fuse panel for connections is not recommended; a millisecond of interrupted power on these connections will shut the system down. It is very important that the power and ground source for the Black Box not be interrupted or dirty.**

4. **Check your current draw to the solenoid leads (1.75 amps maximum per circuit). The internal digital over-current protection (7 amps system total) reacts much quicker than fuses. Current spikes, which may not blow a fuse, will trip the internal over-current protection resulting in the black box temporarily shutting down until the over-current situation is resolved.**

5. **If using Permco's switch kit, verify that the 12 volt power source is connected to the center tab on the system switch and that the ground lead is connected to the tab directly behind the light on the switch. The switched power is connected to the third tab or the tab located opposite the ground tab. The switch may be functioning properly even though the light is not on. The Black Box does not require that the ground source be connected to the switch. Connecting ground to the switch only provides the ground source for the switch light.**

6. **Recheck torque values on all solenoids, solenoid coils and speed sensors; over tightening distorts the solenoid tubes and increases current draw; over tightening of the speed sensor will crack the diaphragm and damage the circuit board. If utilizing "Mac" valves or other types of solenoids not supplied by Permco an over-current draw situation can occur; this will result in the system shutting down and cause damage to the electronic components.**

7. **If your system incorporates a dry valve make sure you have a sufficient clean air supply to the electric over air solenoids and dry valves; 70-130 PSI required.**

997-01238BOX Troubleshooting…

Basic Function of the Black Box

The Permco "Black-Box" is a micro-processor controlled electronic switching system that determines when to switch power on or off based on RPM's. These RPM's come from an electronic signal or pulse generated by the rotating gears of the pump/motor. A sensor attached to the pump or motor and connected to the Black-Box sends these pulses to the micro-processor of the Black-Box indicating the rotating speed of the pump or motor.

The system is simple in theory. It only knows two things. How fast the pump/motor is turning using the pulses from the sensor, and when to turn power on or off based on the pulses and the data you enter into it when initially setting it up. As long as power is applied and a rotation is sensed, then nothing else can go wrong.

The Black-Box retains all settings even when power is removed. Once the system senses rotation the Black-Box will cycle the circuits on and off until power is removed from the system. Should you need the Black-Box to shut down the system completely upon the sensing of a particular RPM and stay off until power is cycled off and on again, the Black-Box can be factory programmed to do so. (See Latching Software)

Basic logic of the circuit…

Power is directed to the 4 electrical circuits through programmable logic stored in Random Access Memory (RAM) located on the circuit board based on settings input during initial setup. There are several conditions that must be met for these circuits to act properly…

1. The speed sensor connected to the black connector on the Black-Box, "MUST" sense the rotation of the internal gears of the pump. If there is no

rotation, then power will be removed from all 4 circuits (A/B & C/D). If rotation falls below the preset value, then power will be removed from the circuit related to that value.

2. Should the internal overload protection circuit sense a **short** on any one of the four circuits (A/B & C/D), or an **over-current** of 1.75 amps per circuit, or 7 amps total, power will be removed from all four of the circuits. The Black-Box will continue to operate, checking for a corrected state. Once the problem has been eliminated through fixing the **short**, or resolving the **over-current**, and a corrected state is detected, the system will resume normal operation.***

Special Note: Normal fuses react to an **over-current** condition much more slowly than an electronic circuit breaker, which is built into the Black-Box. An **over-current** condition of just ¼ amp or less for a split second will trip the **over-current** protection circuitry where a fuse may take several seconds to blow. Circuits containing solenoids should be protected with an "fly-back" diode, which will stop the back-rush of high voltage created by the coil of solenoids when power is removed from the solenoid. The Black-Box has this "fly-back" diode built into the circuitry. ***See attached diagram***.

**** This circuitry can be bypassed by shorting the grey, color banded resister located to the right of LED's 3&4, which is labeled R9. Should it be determined to do this, it is highly recommended that you replace the supplied 10 amp fuse with a 7 amp fuse to make sure you don't burn up the Black-Box if there is a failed electrical system.* ***Doing so will void the warranty.***

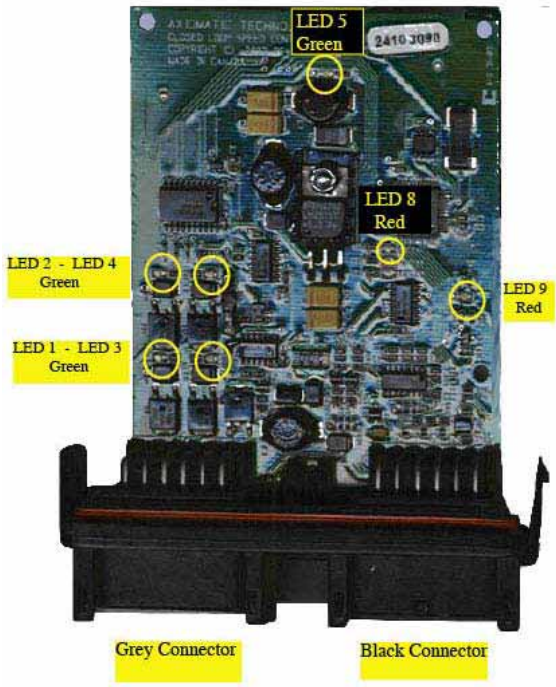
When measuring voltage from any of the four circuits (A/B & C/D), you should see at least 12 volts (with power applied and rotation sensed). You will notice that the polarity on these circuits appears backwards. Positive voltage comes through the black lead and negative through the red. This is only a concern should you have a solenoid that is sensitive to polarity. If this is the case, be sure to properly wire the solenoids. Some solenoids may not be polarity sensitive, but one lead may be tied into chassis ground and this could cause problems. The Solenoids in the valves Permco uses were selected because they are not polarity sensitive, nor does either of the leads tie into chassis ground.

Considering the above, solenoids or other devices connected to the Black-Box must be connected to both leads of the circuit. "DO NOT" connect one lead from the solenoid to the Black-Box, and the other to the chassis or ground. This will cause a failed circuit and could cause permanent damage to the Black-Box.

The electronic components internal to the Black-Box require that the applied voltage and grounding connections be wired directly to the battery posts. Taking the applied voltage and grounding from a fuse panel, or from the chassis will not guarantee proper operation of the hydraulic system.

It is "Highly" recommended that all bleed valves and air valves used in your system, are ones designed for the system by Permco.

Light Emitting Diodes (LED) located on circuit board



LED 1 through 4 - These "green" LED's when lit, are indicating that power is being supplied to the solenoid circuits. Once an over-speed condition is met, or voltage to the system is removed, power will be removed from the solenoid circuits and the LED's will go out.

LED 5 - This "green" LED is a power indicator telling you that the power to the Black-Box is turned on.

LED 6&7 - These are not used for troubleshooting…

LED 8 - This LED blinks bright red when the microprocessor is functioning properly.

LED 9 - This "red" LED blinks with the pulse of the signal coming from the RPM sensor. At normal engine idle, LED's 1 through 4 will come on within 1 –2 seconds, once the RPM sensor senses movement of the internal pump gears. If LED 9 does not come on, then you can assume that there is a problem with the sensor, or the depth position of the sensor in the pump. To operate normally, there must be a minimum air gap of .030 and a maximum air gap of .100 between the face of the gear tooth and the face of the sensor. Permco's manufacturing standard allows for an air gap of .040 - .050.

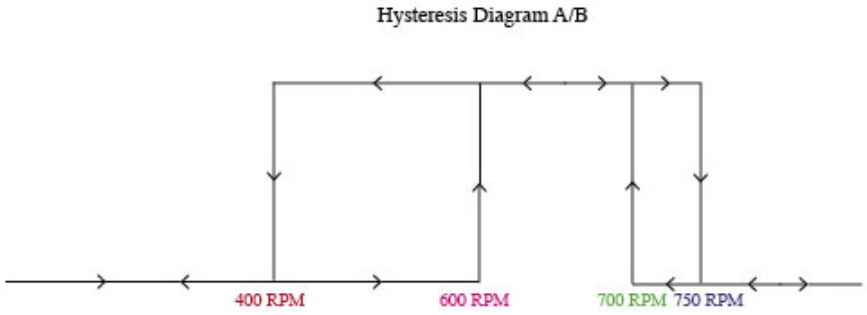
As the pump is rotating, LED 9 may appear to be glowing continuously because the pulse is faster than the human eye can detect.

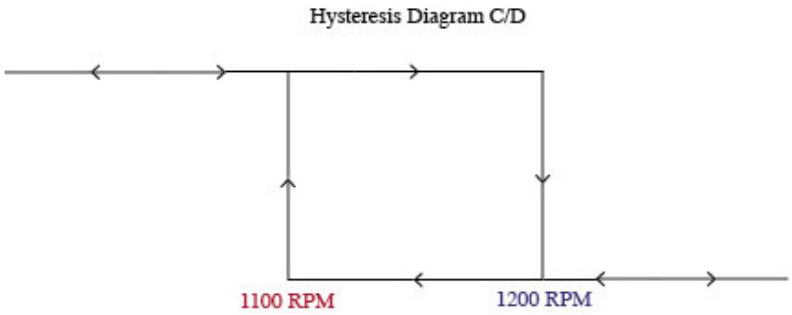
Line Output Specifications

Although there are four lines, both A and B work together, and C and D work together.

Line	Default	Range
Aoff/Boff (X0)	400 RPM	350 – 650 RPM
Aon/Bon (X1)	600 RPM	X0 + 50 to X0 +200 RPM
Aoff/Boff (Y0)	750 RPM	Y1 -200 to Y1 -50RPM
Aon/Bon (Y1)	700 RPM	750 – 1100 RPM
Con/Don	1000 RPM	800 RPM – 1100 RPM
Coff/Doff	1400 RPM	850 RPM – 2000 RPM (Coff > Con)

The above chart reflects Hysteresis logic (example below). This logic says that once the RPM reaches a predetermined level, the system will power off until the RPM decreases beyond the lower setting.





Sensors: There are two types of sensors. One is for the 7500/7600 series, and the other is for the 197/257/2100/2500/3000/3100/3700/5000/5100/5151/ series. The only difference is size. The operational characteristics of both are the same.

Both have 5 leads and a metal braded shield. (Used only for strength and rigidity.)

1. White – Signal from sensor to Black-Box
   This lead connects to the white lead of the sensor lead on the Black-Box.
2. White with red stripe – Positive voltage
   This lead connects to the red lead of the sensor lead on the Black-Box.
3. White with black stripe – Negative voltage
   This lead connects to the black lead of the sensor lead on the Black-Box.
4. White with green stripe – Future temperature sensor
   Presently no connection
5. White with orange strip – Future temperature sensor
   Presently no connection

- The port in the gear housing or the pump/motor is machined using the wall of the gear bore as a reference point. This assures that the air gap between the face of the sensor and the tips of the gear is accurate.
- The sensor is sensitive to excessive heat. Temperatures upwards to 300° Fahrenheit, will cause damage to the sensor.
- The sensor was designed specifically for the gears that Permco uses and not meant for use in other applications.
- Pressures above 4250 psi will damage the sensor.

Software

There are two versions of software available.

- **Standard** – Which provides the on/off/on switching as determined by the settings input during the initial set up. (Specifically designed for typical refuse systems.)

- **Latching** – This reacts the same as the standard version, except that solenoids C/D will force complete shutdown of the system requiring a power cycle off/on should the upper RPM setting be reached as determined during initial setup.

What if….

Rpm's are in the acceptable range but the solenoids will not open/close.

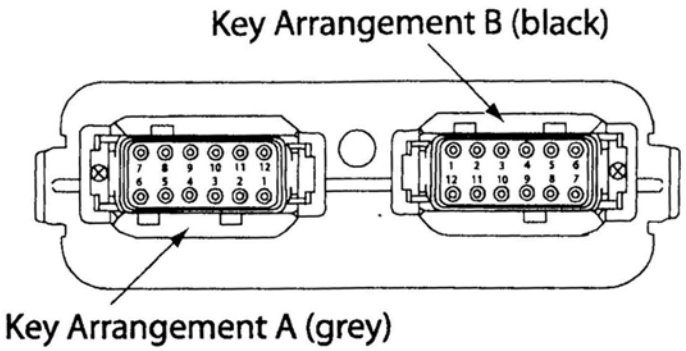
- Poor electrical connection to the Black-Box.
- Short in system
- Failed sensor.

1. Make sure your applied voltage and grounding is wired directly to the battery. Verify that you have 12 volts to the switch. Verify that all connections are tight.
2. With the engine running, connect the laptop to the system using the programming/test cable, checking for error messages due to an over-current situation, or a possible short.
3. Verify that you are getting a signal from the sensor by either using a laptop to check RPM's, or remove the cover from the Black-Box and check to see that LED 9 is either blinking quickly or solid red.
4. Using the sensor test tool described later, determine that the sensor is actually functioning.

System continually cycles on and off during normal operation.

- Short in one or more of the solenoid circuits
- Poor electrical connection to the Black-Box.
- Failing sensor

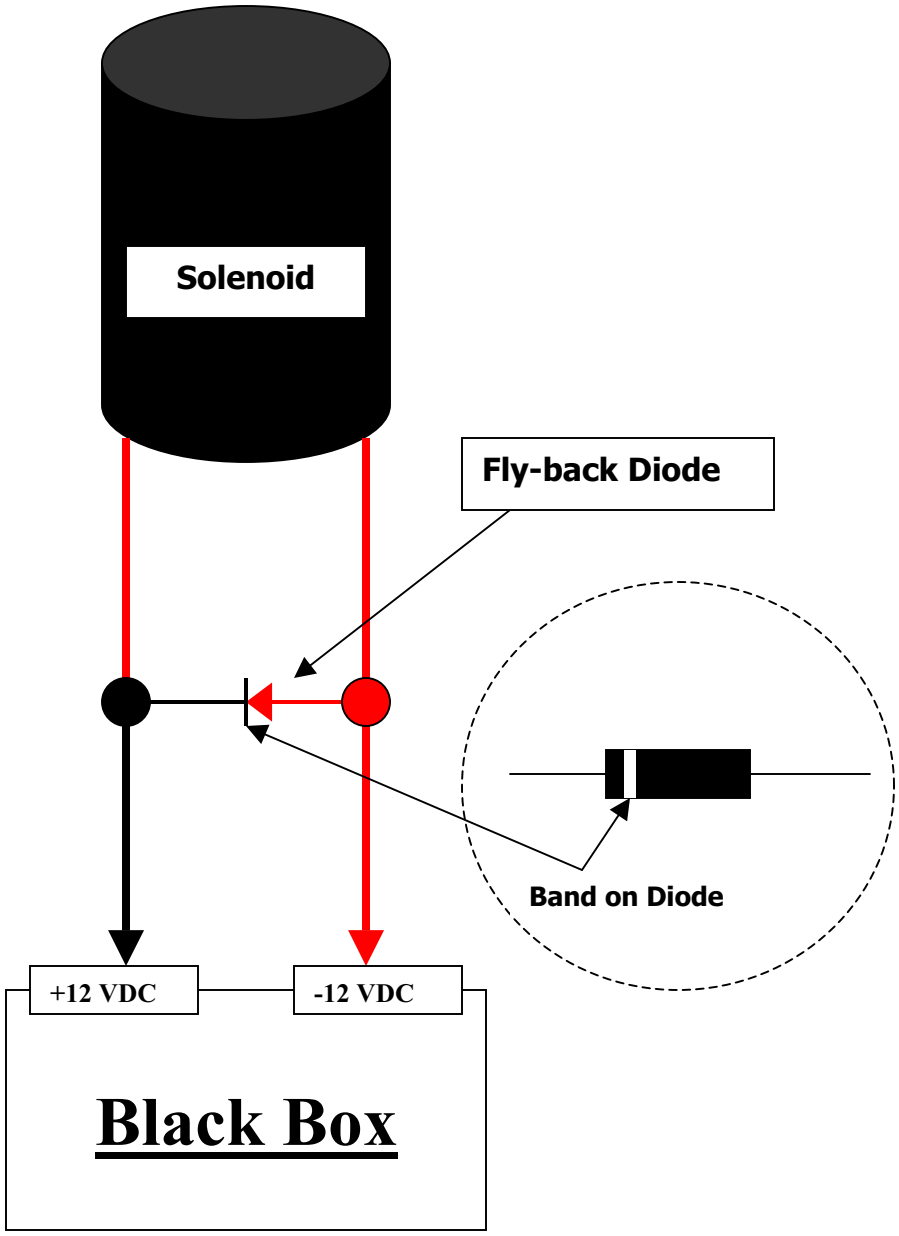
1. With the engine running, connect the laptop to the system using the programming/test harness checking for error messages due to an over-current situation, or a possible short.
2. Make sure your applied voltage and grounding is wired directly to the battery. Verify that you have 12 volts to the switch. Verify that all connections are tight.
3. Verify signal pulse from the sensor by checking RPM's using a laptop or by checking the status of LED 9 on the circuit board.
4. Using the sensor test tool described later, determine that the sensor is actually functioning.



FRONT VIEW 24 PIN RECEPTACLE

Grey Receptacle PIN #	Function	Grey Plug PIN #	Wire Harness Assembly Colors
1	Battery +	1	Red
2	NO CONNECTION	2	Not applicable
3	Output A	3	Red
4	Output B	4	Red
5	Output C	5	Red
6	Output D	6	Red
7	Output Power	7	Black
8	Output Power	8	Black
9	Output Power	9	Black
10	Output Power	10	Black
11	NO CONNECTION	11	Not applicable
12	Battery -	12	Black

Black Receptacle PIN #	Function	Black Plug PIN #	Wire Harness Assembly Colors
1	NO CONNECTION	1	Not applicable
2	NO CONNECTION	2	Not applicable
3	NO CONNECTION	3	Not applicable
4	NO CONNECTION	4	Not applicable
5	NO CONNECTION	5	Not applicable
6	NO CONNECTION	6	Not applicable
7	Sensor Power	7	Red
8	Sensor Input	8	White
9	Sensor GND	9	Black
10	RS-232 GND	10	Black
11	RS-232 TXD	11	White
12	RS-232 RXD	12	Red



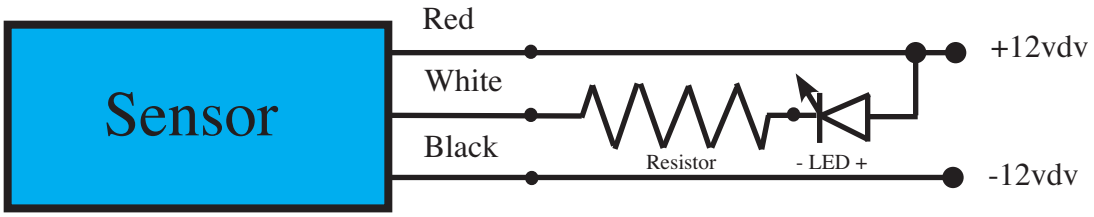
Devices containing solid state components can be damaged or caused to malfunction when used in systems which incorporate inductive leads (e.g. relays, solenoids, etc.) that can generate reverse voltage spikes.

To reduce the potential for this type of damage, install a properly sized fly-back or clamping diode across all inductive loads such as in the above example.

A typical diode is 1N4005 which is readily available from retail sources such as Radio Shack.

Sensor Test Tool

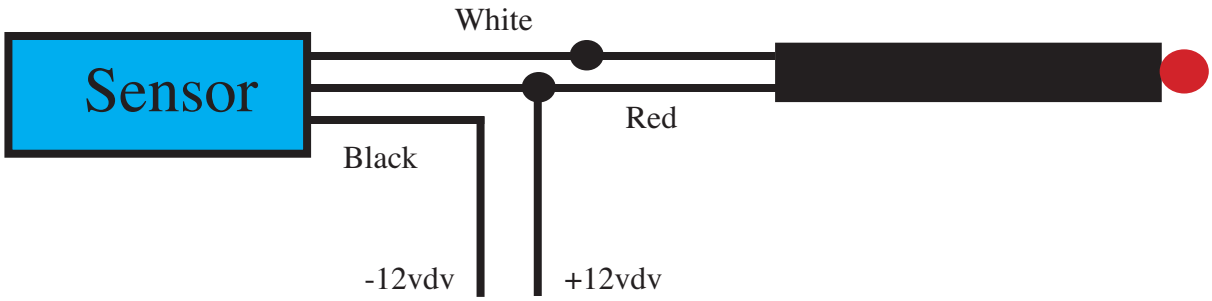
Schematic Diagram



Using a 1000 ohm resistor, connect either end to the white wire of the sensor, connect the negative lead of a 12v LED to the other end of the resistor. Connect the other lead of the LED to the Red on White wire.

Connect a 12 volt power supply to the appropriate leads and pass the tip of a screw driver or other metal object past the face of the sensor. If the LED lights as the metal object passes the face of the sensor, then the sensor is ok.

Connection Diagram



7500/7600 Series Speed Sensor

TOLERANCES UNLESS OTHERWISE SPECIFIED:
FRACTIONS DEC. ANGLES
+/-.031 +/-.010 +/-1 DEG.

REVISIONS					
REV.	DESCRIPTION	ECN #	DATE	INCORP'D	APP'VD

MODEL Z261006 SPECIFICATION DATA

PARAMETER	SPECIFICATION	REF.	TEST PROC.	% TEST
SUPPLY VOLTAGE	10 TO 24			100
TEMP. SPEC.	-40 TO 250°F			
SENSING FREQ.	0 TO 15 K Hz			
OUTPUT CURRENT	20mA MAX.			
PIN CONFIG.	SEE NOTE A			
LOGIC 0	+300 mV MAX.			
LOGIC 1	APPROX. SUP. VOLT. -2.3V			
CURRENT DRAW	APPROX. 9 mA @ +Vdc=12V			

A) RED = +12 VDC
WHITE = SIGNAL (OPEN COLLECTOR)
BLACK = COMMON
GREEN = TEMPERATURE SENSOR
ORANGE = TEMPERATURE SENSOR
SHIELD = NO CONNECTION (AT SENSOR END)

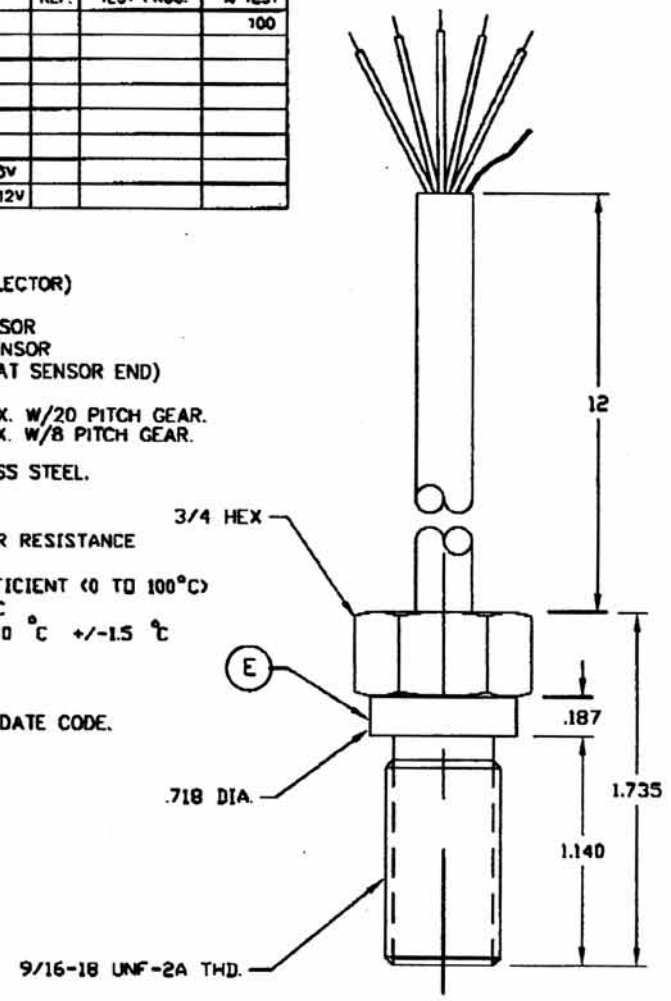
B) AIR GAP: 0.005 TO .030 MAX. W/20 PITCH GEAR.
0.005 TO .100 MAX. W/8 PITCH GEAR.

C) HOUSING MATERIAL: STAINLESS STEEL.

D) TEMPERATURE SENSOR:
RTD TEMPERATURE SENSOR RESISTANCE
IN AIR AT 0°C = 100 Ω
AVE. TEMPERATURE COEFFICIENT (0 TO 100°C)
= +0.00385 Ω/Ω/°C
T = (R /100 - 1)x259.740 °C +/-1.5 °C
VOLTAGE (MAX) 1 VDC
CURRENT (MAX) 1 MA

E) MARKING: SSI Z261006 AND DATE CODE.

F) SENSING END SEALED



Permco Part Number 997-01237

APPROVALS	DATE		TITLE : SPEED/TEMPERATURE SENSOR	
DRN.			SCALE: NONE	REV.-
CHK.			SIZE B	DWG.# Z261006
ENG.				
Q.C.				
MFG.		WAS:		
MATERIAL:				

PERMCO
1500 Frost Road
Streetsboro, OH 44241
Phone (330) 626-2801
Fax (330) 626-2805

197/257/2100/3000/5000 Series Speed Sensor

TOLERANCES UNLESS OTHERWISE SPECIFIED:
FRACTIONS DEC. ANGLES
+/-.031 +/-.010 +/-1 DEG.

REVISIONS					
REV.	DESCRIPTION	ECN #	DATE	DR'WN	APP'VD

MODEL Z261076 SPECIFICATION DATA

PARAMETER	SPECIFICATION	REF.	TEST PROC.	% TEST
SUPPLY VOLTAGE	10 TO 24			100
TEMP. SPEC.	-40 TO 250°F			
SENSING FREQ.	0 TO 15 K Hz			
OUTPUT CURRENT	20mA MAX.			
PIN CONFIG.	SEE NOTE A			
LOGIC 0	+300 mV MAX.			
LOGIC 1	APPROX. SUP. VOLT.			
CURRENT DRAW	APPROX. 9 mA @ +Vdc=12V			
DIELECTRIC	500 VAC			

A) RED = +12 VDC
WHITE = SIGNAL (OPEN COLLECTOR)
BLACK = COMMON
GREEN = TEMPERATURE SENSOR
ORANGE = TEMPERATURE SENSOR
SHIELD = NO CONNECTION (AT SENSOR END)

B) AIR GAP: 0.005 TO .030 MAX. W/20 PITCH GEAR.
0.005 TO .100 MAX. W/8 PITCH GEAR.

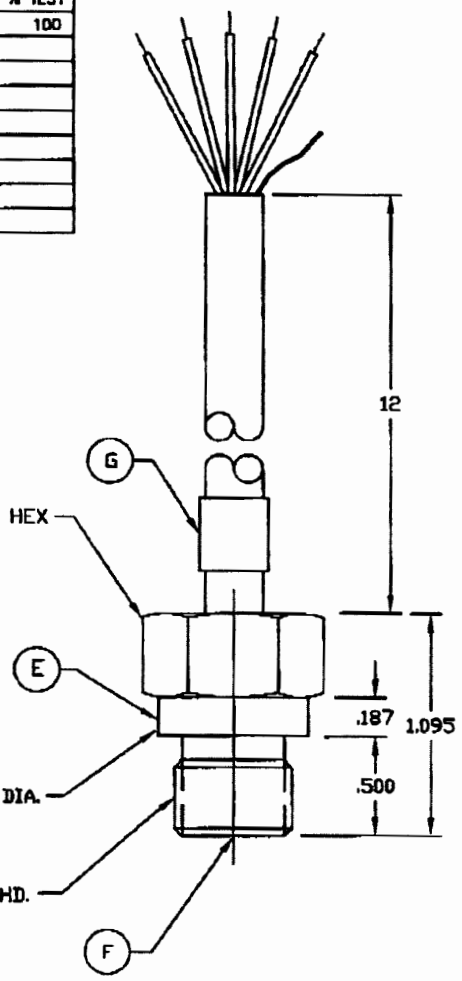
C) HOUSING MATERIAL: STAINLESS STEEL.

D) TEMPERATURE SENSOR:
RTD TEMPERATURE SENSOR RESISTANCE
IN AIR AT 0°C = 100 Ω
AVE. TEMPERATURE COEFFICIENT (0 TO 100°C)
= +0.00385 Ω/Ω/°C
T = (R /100 - 1)x259.740 °C +/-1.5 °C
VOLTAGE (MAX) 1 VDC
CURRENT (MAX) 1 MA

E) MARKING: SSI Z261076 AND DATE CODE.

F) SENSING END SEALED

G) LABEL:
RED: +VDC BLK: COM WHT:SIG
ORG: RTD GRN: RTD SHLD: N/C



Permco Part Number 997-01316

APPROVALS	DATE
DRN. OEH	5-2-07
CHK.	
ENG.	
Q.C.	
MFG.	
MATERIAL:	

WAS:

TITLE : SPEED/TEMPERATURE SENSOR

SCALE: NONE REV.-

SIZE B DWG.# Z261076

PERMCO
1500 Frost Road
Streetsboro, OH 44241
Phone (330) 626-2801
Fax (330) 626-2805

Below is a 7500/7600 housing pictured with a SPECIAL 3/8” JIC port on the top. While this port is a standard JIC port, IT REQUIRES EXACT PLACEMENT IN THE HOUSING and must be done according to the drawing. The port is designed to accommodate our new speed sensor part number 997-01237 which is used with our new speed control box part number 997-01238. You would also need a wiring harness part number 997-01238WH. For more information please refer to the Genesis brochure which is available as a PDF or in hard copy.The code for this new housing is “SS”. Example, P7600A467ZD(SS)NM17-00DVBP.