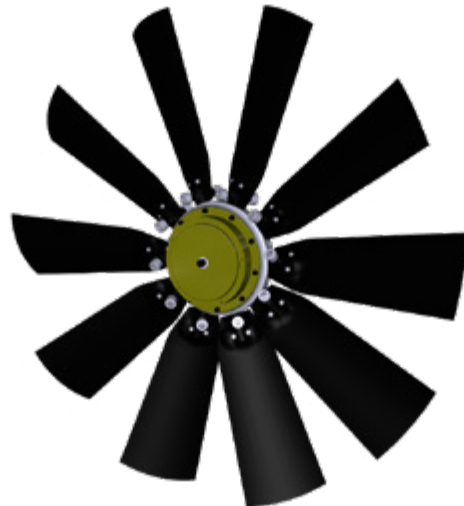
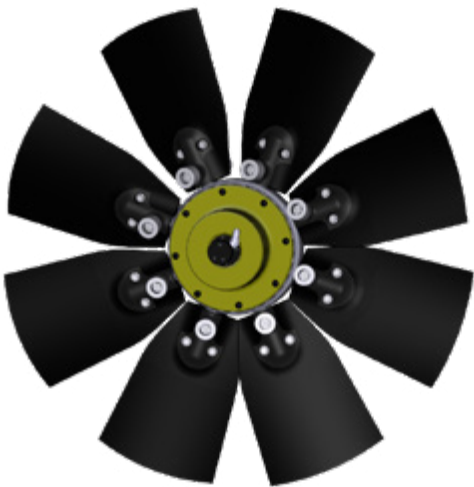




FLEXXAIRE

Installation and Service Document for Gen 2 Pneumatic and Hydraulic Actuated Fans



Publication No. 02090
Revision 3

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1.0 Introduction & Safety Information

1.1 Introduction

Thank you for purchasing a Flexxaire Fan.

Flexxaire takes great pride in designing, manufacturing and assembling our products for many years of use.

This document is produced to assist in the installation, operation and maintenance of the Flexxaire® Fan System.

Flexxaire has made every effort to ensure that the information contained in this document is correct and complete at the time of creation. Flexxaire will assume no responsibility for any errors or omissions. If you have any questions regarding this document, any other document provided with your fan system or any questions not answered by this document, please go to www.flexxaire.com to contact us or by email at support@flexxaire.com

1.2 Important Safety Information

The safety information in this publication is to be used in conjunction with the safety information from the original machine manufacturer. Please refer to all safety information supplied, prior to doing any work on the fan assembly or any other component to assure safety.

Improper operation, maintenance or repair of this product can be dangerous and could result damage to equipment or result in injury or death.

Always use genuine Flexxaire parts and components or Flexxaire approved parts and components. The use of unapproved parts or components will void the factory warranty.

Do not operate or perform any maintenance on this product until you have read and understand the operation and maintenance information. Please contact Flexxaire or an approved dealer for any information that you may require.

The person(s) servicing the product may be unfamiliar with many of the systems or components of the product. It is important to use caution when performing any type of service work. Knowledge of the product and its components is required before the removal or disassembly of any component.

1.2.1 Protective Equipment

Always wear protective glasses, protective shoes and any other protective equipment as required by law and/or your company safety program.

1.2.2 Pressurized Fan Hub

The hub assembly is spring-loaded. If disassembly of the hub is required, take caution that you are well protected from the hub's release which may be sudden and pose an impact-related injury.

Contact Flexxaire at support@flexxaire.com prior to disassembling the fan.

1.2.3 Hot Fluids and Parts

To avoid burns, be alert for hot parts on the assembly or the machine that has just been stopped and have hot fluid in lines, tubes and compartments.

1.3 Crankshaft Mounting

The Flexxaire fan is not designed to be mounted onto a crankshaft or crankshaft pulley. Torsional vibration from crankshafts will damage the fan and could result in machine damage and serious injury. Please contact sales@flexxaire.com for options that may be available for mounting to the crankshaft or crankshaft pulley.

2.0 Specifications and Maintenance

2.1 Grease

Your Flexxaire fan has been filled with the required amount semi fluid grease at the factory. The purpose of the grease is to reduce friction at contact surfaces, lubricate the internal thrust bearings and prevent corrosion of internal components.

2.1.1 Grease Specification

The grease used in your fan is:

[Petro Canada Precision Synthetic EP00](#)

Click on the above hyperlink for the Safety Data Sheet.

Any equivalent grease can be used. If you are not sure, please contact support@Flexxaire.com.

2.1.2 Grease Quantity

The amount of grease required for your fan varies by fan series. The following is the amount added at the factory:

Series 500	50mL	(1.7 US fl/oz)
Series 1000	60mL	(2.0 US fl/oz)
Series 1000P G3	162ml	(5.5 US fl/oz)
Series 1000H G3	116ml	(3.9 US fl/oz)
Series 2X00	240mL	(8.1 US fl/oz)
Series 3X00	720mL	(24.3 US fl/oz)

2.2 Maintenance

The Flexxaire Fan hub is sealed with o-rings, and contains a small amount of grease. As a result, the fan should not require any maintenance.

2.2.1 Visual Inspections

Under normal operating conditions, Flexxaire fans do not require any scheduled maintenance and are built to provide thousands of hours of trouble-free service.

In moderate to extreme operating conditions, a visual inspection of the moving parts is recommended.

2.2.2 Mechanical Review

1. Ensure that the fan fully reverses pitch.
2. Check for leaks in the rotary union.
3. Check that the rotary union bearings rotate smoothly.

Note:

The blades will show streaking marks from oil at the initial start-up of the fan due to oil from the assembly process used during manufacturing. It should stop after 10 hours or less of operation of the fan.

2.3 Service Documents

Flexxaire has various support documents available to its customers upon request or online.

2.3.1 Parts Books

Please go to www.Flexxaire.com to find your fan model and model-specific Parts Book. Contact support@flexxaire.com if you cannot find your model listed.

2.3.2 Service Kit Instructions

Please go to www.Flexxaire.com to find your fan model and model-specific Service Kit Instruction. Contact support@flexxaire.com if you cannot find your model listed.

2.3.3 Fan Rebuild Instructions

Please go to www.Flexxaire.com to find your fan model and model-specific Fan Rebuild Instructions. Contact support@flexxaire.com if you cannot find your model listed.

3.0 Fan Overview

The Flexxaire fan is a pneumatically or hydraulically actuated variable pitch fan. The heavy internal spring holds the fan blades in full pitch. As pneumatic or hydraulic pressure is applied to the control line, the pitch of the blade is reduced and then reversed. When the pressure is released, the fan blades return to their default position.

The Flexxaire fan has the following important features:

1. Fail-Safe Operation

The blades are spring-loaded into their default full pitch position. If the pressure is ever lost, the fan will default to full pitch and continue to work like a fixed pitch fan with maximum cooling.

2. Variable Pitch

On a Variable Pitch Fan, the blades will run at any pitch between neutral and maximum based on the needs of the engine, solving overcooling and saving horsepower and fuel.

3. Reverse Position

The ability to reverse the pitch of the blades allows reverse airflow to clean the radiator or side panels of dust or debris, allowing proper airflow for cooling.

When the fan reverses airflow, the blades move through neutral at full-speed, ensuring there are no horsepower spikes.

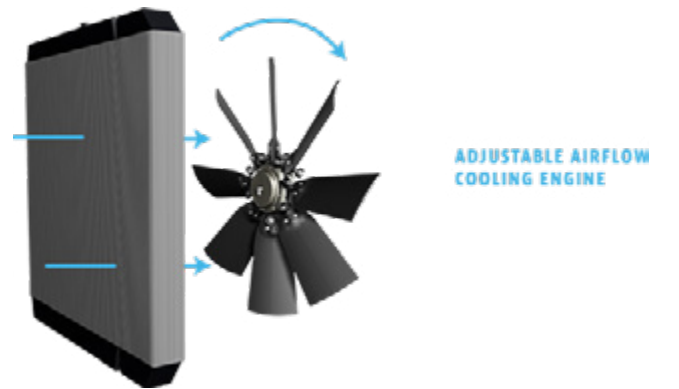


Figure 1

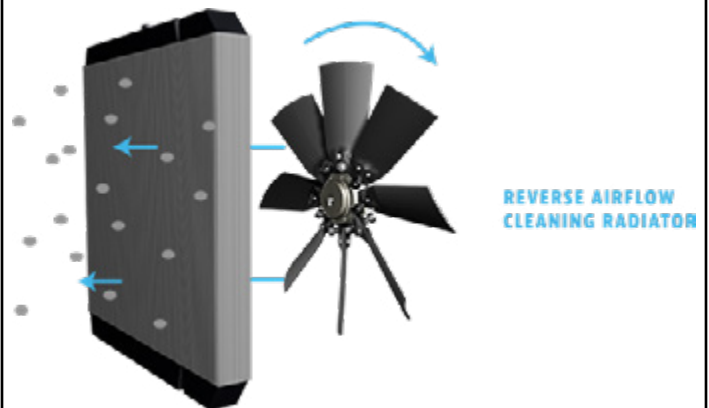


Figure 2

4.0 Fan Installation

4.1 Major Components

The Flexxaire fan assembly can be identified by several external components as shown in Figure 1. Use this diagram for terminology and major component identification.

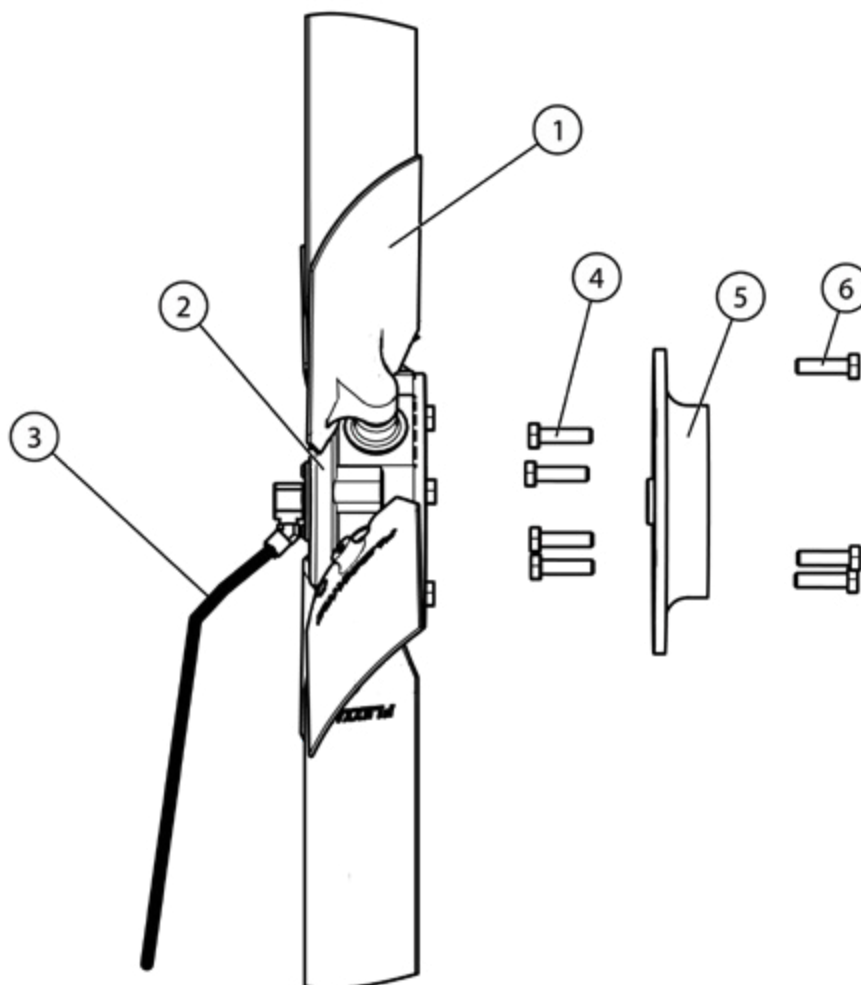


Figure 1

1. Blade Assembly
2. Hub Assembly

3. Pressure Line
4. Mounting Adapter Bolts (Not Supplied)

5. Adapter Plate
6. Mounting Bolts

4.2 Existing Fan Removal

The following is a general description of the removal of an existing fan and the installation of the Flexxaire Fan.

1. Remove fan guards and safety equipment to gain access to the existing fan.
2. Loosen belt(s) and remove existing fan hardware as required.
3. Clean the mounting surface of the fan drive.

4.3 Installation

4.3.1 Fan Mounting Adapter

The Flexxaire fan is supplied with a pre-machined mounting adapter plate. Pre-machined mounting adapters are machined for your pilot and bolt circle.

For some applications, a wider two piece adapter may be used, and may require the customer to supply additional hardware for assembling the two parts together. This two piece adapter may be pre-assembled.

4.3.2 Fan Position

Ideally the fan should be centered in the shroud (30-70% immersion is acceptable). The shroud may require modification and the fan spacer may need to be modified or removed. See Figure 2 and Figure 3.

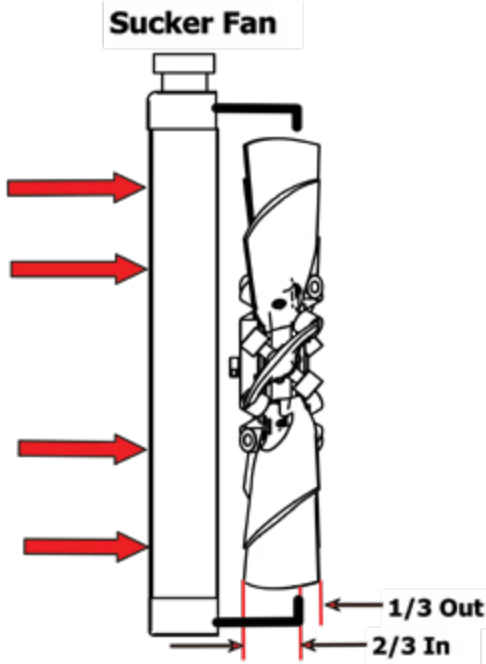


Figure 2

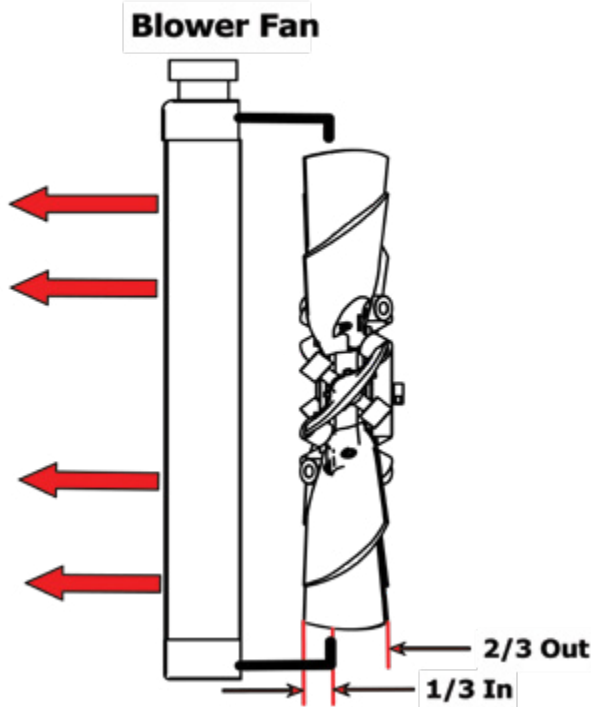


Figure 3

1. Install the supplied mounting adapter using bolts from the original fan. If the bolt length needs to be changed, use an equivalent or better grade of bolt. Follow the original equipment manufacturer's torque and thread locking specifications when installing the mounting adapter to the fan drive. Refer to Figure 4.

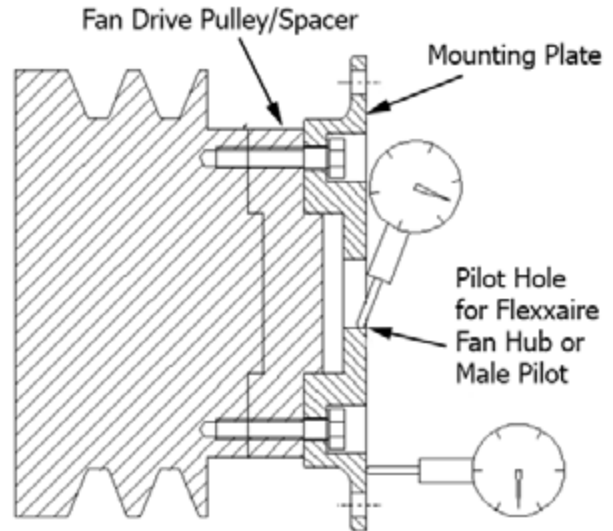


Figure 4

2. Set up the dial gauge to measure axial deviation of the mounting adapter on the fan mounting surface. Deviation should not exceed 0.13mm (0.005"). Refer to Figure 4.
3. Set up the dial gauge to measure radial deviation of the mounting adapter on the pilot hole surface or male pilot surface. Deviation should not exceed 0.13mm (0.005"). Refer to Figure 4.
4. Remove the shipping plug from the rear of the fan. Place the Flexxaire fan onto the mounting adapter (Refer to Figure 5) and torque the bolts as follows:

Bolt Size	Torque Nm	Torque ft/lbs
M8	28	21
M10	57	42
3/8"	47	35

Warning: Do not use thread lock on the fasteners.

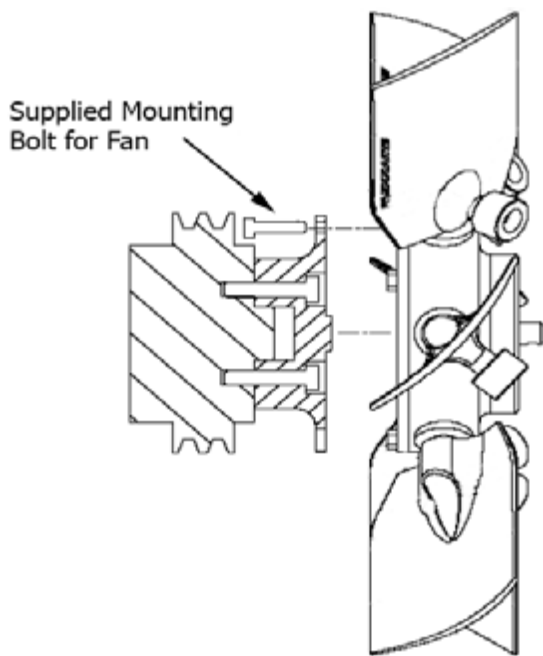


Figure 5

4.3.3 Fan Blade Installation

The Series 500 and 1000 Fan Systems are shipped from the factory with the fan blades installed on the fan.

The Series 2000, 2500, 2600, 3000 and 3500 fans require the installation of the fan blades at the customer location.

4.3.3.1 Series 2X00 and 3X00 Blade Install

These fan series ship with their blades unattached, take care to ensure the blades are attached correctly.

When the primary operation of the fan is to "pull" air towards the engine, mount the blades with the concave surface towards the engine (assuming the fan rotates counter-clockwise, as viewed from the engine towards the fan). Refer to Figure 6.

When the primary operation of the fan is to "push" air away from the engine, mount the blades with the concave surface away from the engine. Refer to Figure 7.

Some fans are shipped from Flexxair with the blades installed by special order. No modification of blade install is required.

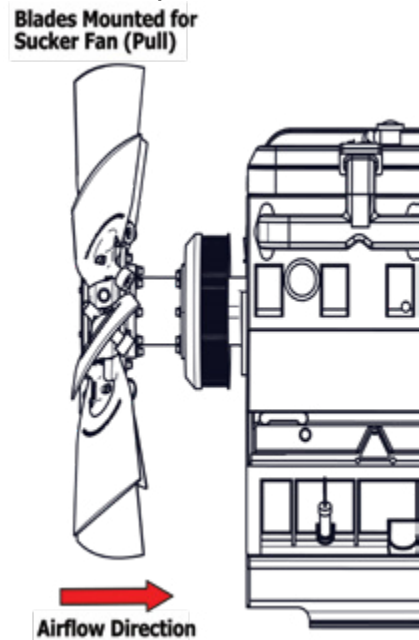


Figure 6

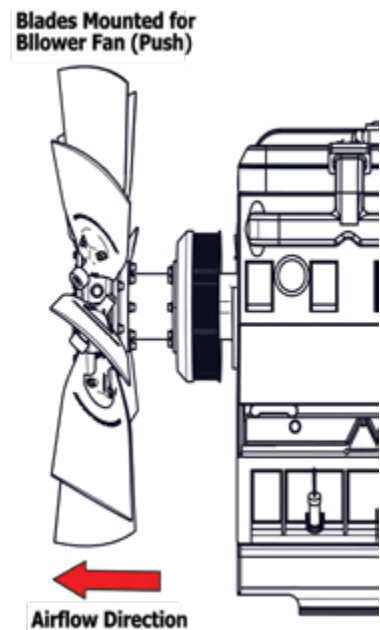


Figure 7

1. Series 2X00/3X00 fans include either one or two counterweights per blade. When there are two counterweights per blade, install one weight on each side. When there is only one counterweight, then install the counterweight on either side, as long as they are all on the same side. Insert the supplied 1/4"NC long hex bolt through the counterweight in the lower hole in the

blade or cap. The head of the bolt should be on the same side of the counterweight when there is only one counterweight. Tighten the assembly with the supplied 1/4"NC lock nut. See Figure 8.

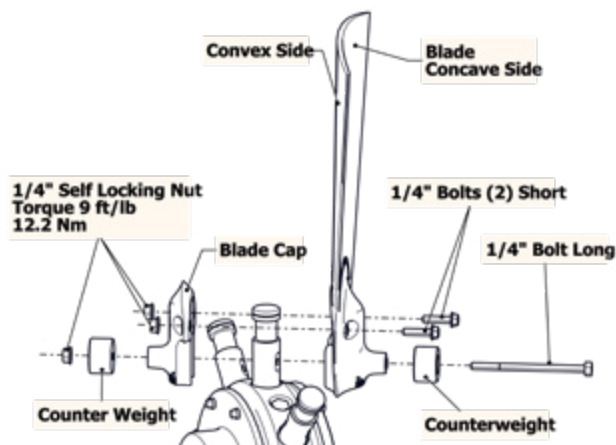


Figure 8

2. Insert the 1/4" NC short bolts through the upper holes in the blade caps and blades. Tighten the assembly to the blade shaft and the blade using the supplied 1/4" lock nuts. Substitute regular hex head bolts with washers for the flange headed bolts if needed.
3. Torque the blade bolts with a torque wrench to the following:

1/4" 20 NC to 12.2 Nm (9 ft/lb)
Warning: Do not over-torque

NOTE: If any of the supplied flanged lock nuts are lost, replace with grade 8 flanged non locking nuts. Apply Loctite 242 or equivalent to the bolt when not using locknuts.

4. Rotate the fan by hand and check for obstructions. Connect the pneumatic or hydraulic hose to the fan the do a final check. Spin the fan by hand with the blade pitch reversed and check for obstructions and proper tip clearance. Flexxaire recommends 1.5% of fan diameter for adequate clearance. Your design may require additional clearance. See figure 9.

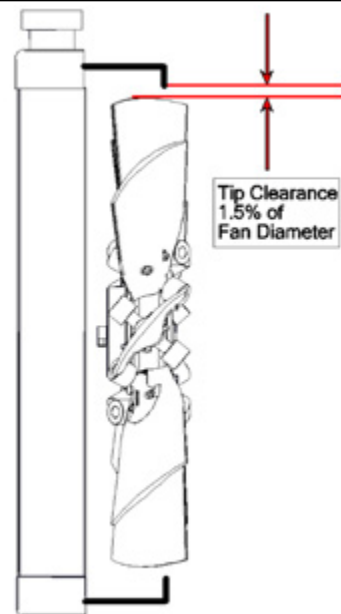


Figure 9

5. Ensure you have the correct blade edge clearance. See Figure 10 on the next page or a list of minimum clearances based on fan diameter.
6. Tighten the fan belts and replace all the fan guards and safety equipment.

WARNING: Failure to have the correct blade clearance could result in blade contact that can cause extensive damage to people and equipment.

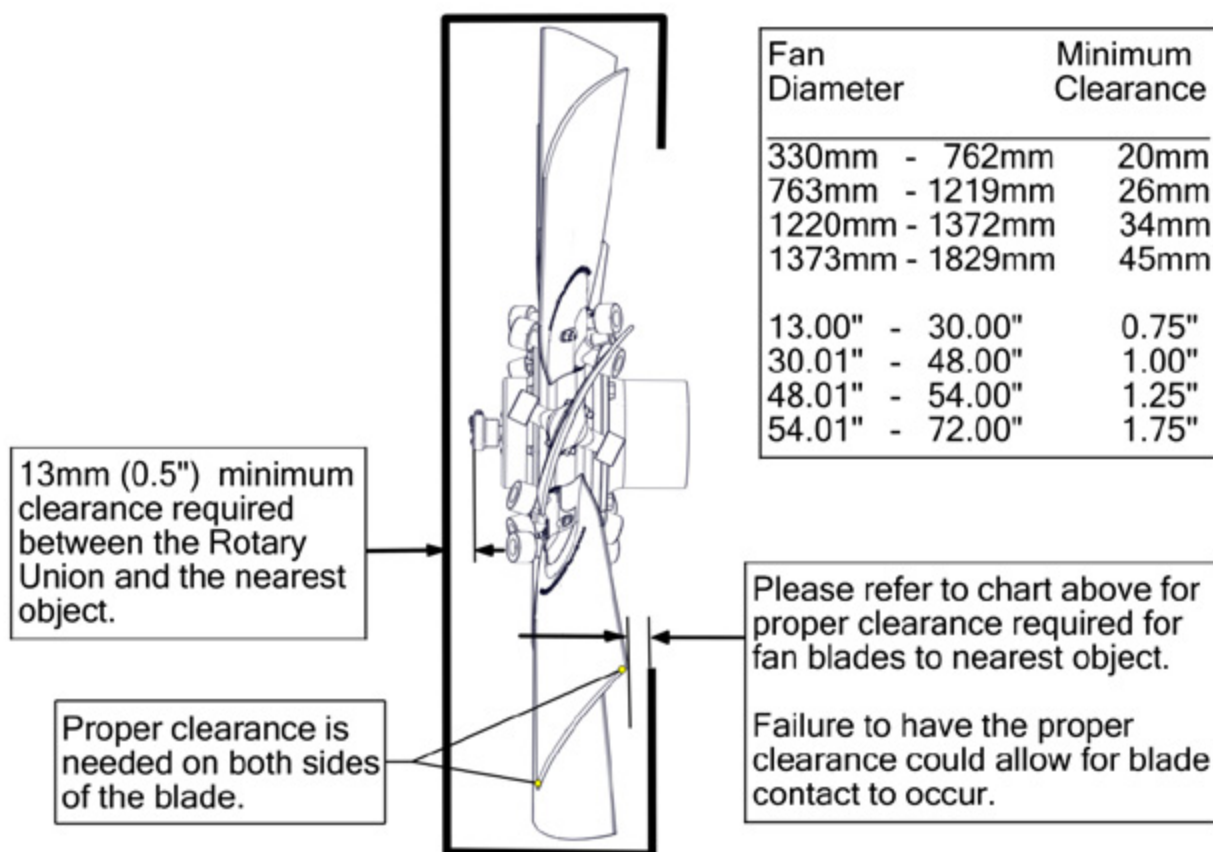


Figure 10

4.3.4 Series 3500 Air Dam

Series 3500 fans above 1373mm (54") in diameter have extended blade shafts and an aluminum air dam/air seal mounted to the front of the hub. This air dam is necessary to prevent reverse air-flow between the bottom of the blades and the hub diameter.

Five bolts mount the air dam on the front shoulder of the Series 3500 hub assembly. See Figure 11 and Figure 12.

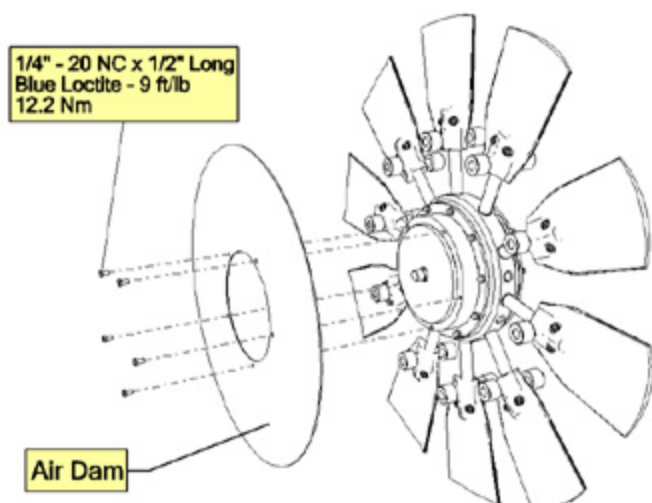


Figure 11

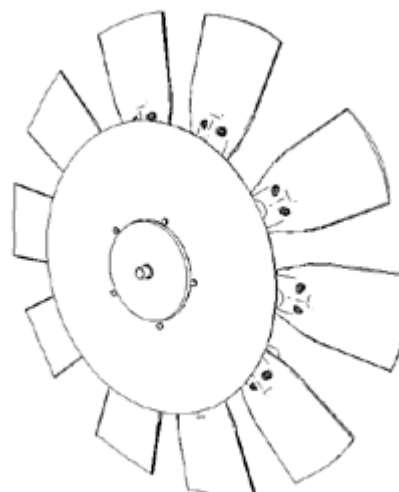


Figure 12

4.3.5 Hydraulic Line Specifications

The connection on the rotary union is a 1/8" NPT female thread. Flexxaire installs a 1/8" NPT to #4 JIC adapter to the rotary union.

The fitting on the ends of the default hose is a #4 JIC. An adapter will mate the hose to the #6 ORB port on the manifold.

We recommend using the smallest hose possible if supplying your own. A large, heavy hose with bulky fittings may create a side load on the rotary union. Side loads can drastically reduce the life of the rotary union.

Refer to the [Hydraulic Control Kit](#) section for additional information on required Hydraulic Pressure for your fan series.

4.3.6 Hydraulic Line Routing

Take care when determining how to route the hydraulic line for hydraulic versions of the fan. Incorrect routing could lead to damage of the fan blades and premature wear and failure of the rotary union.

The fan includes a default hose assembly attached to the hub assembly. If needed, contact support@flexxaire.com for a different hose length or fittings for future orders.

The hose is attached to the fitting on the rotary union at the factory to avoid unnecessary side loads to the bearings of the rotary union.

Using Figures 13 to 17 inclusive, route the hydraulic hose in such a way that eliminates the side loading of the rotary union. Any slack left in the hydraulic line must also be clear of any of the moving components of the fan.

Figures 13, 14 and 15 show acceptable routings of the hydraulic line that should eliminate the side loading of the rotary union of the fan.

Figures 16 and 17 are examples of a routing to avoid since it will create side loading of the rotary union and cause it to fail prematurely or pull out of the fan assembly.

WARNING: Do not secure the hydraulic line so tight as to cause a side load on the rotary union. This could result in the failure of the rotary union causing leaking.

WARNING: Do not secure the hydraulic hose so loose that the hose could contact the blades due to sudden air reversal, vibration, etc.

WARNING: Ensure that you have the minimum clearance between the rotary union and closest obstruction as per [Figure 10](#) on page 4-5.

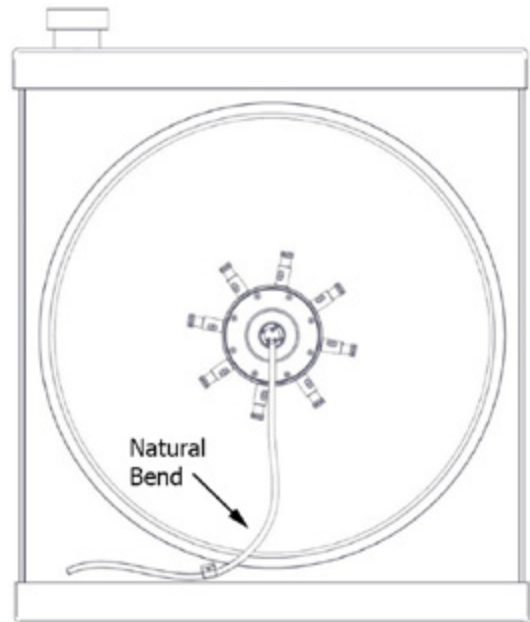


Figure 13

In Figure 13, the routing of the hydraulic line is on the outside of the shroud. Create a natural bend by installing a hose clamp as close to 90 degrees to the running of the hydraulic line to the fan.

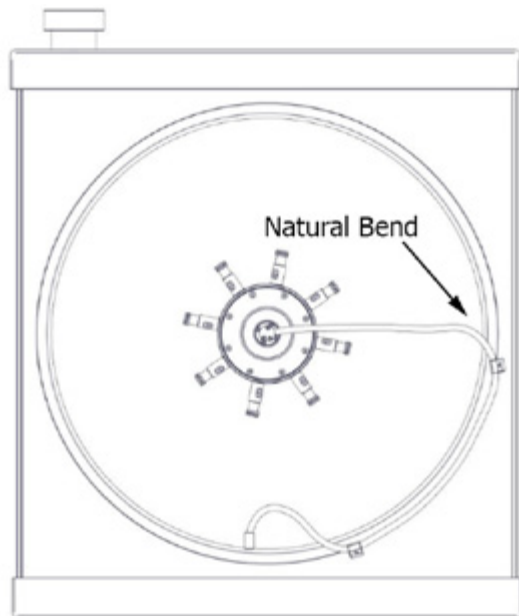


Figure 14

In Figure 14, the routing of the hydraulic line runs through the shroud. Create a natural bend by installing a hose clamp as close to 90 degrees to the running of the hydraulic line to the fan. A second (or additional) clamp can be used as required to assist in the final install of the hydraulic line.

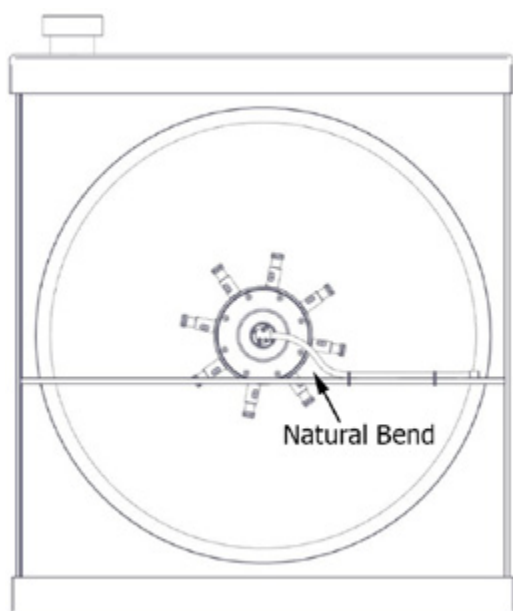


Figure 15

In Figure 15, the routing of the hydraulic line runs along a cross member. Create a natural bend with a small bend in the hose and a clamp on the cross member. Secure the hose to the member with an appropriate clamp that holds the line in place and does not fail due to heat.

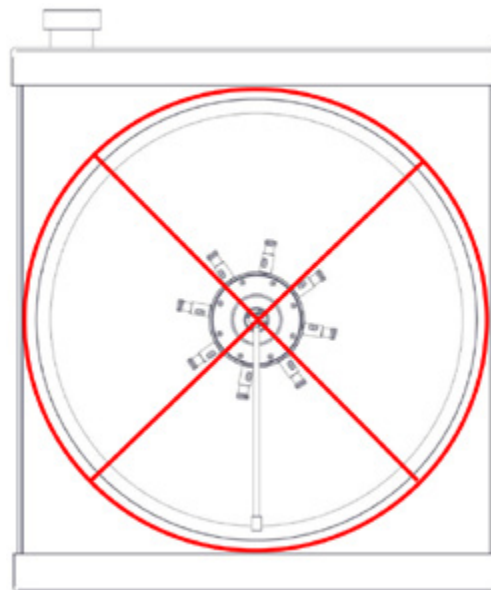


Figure 16

In Figure 16, the hydraulic line routing will create a side load on the rotary union that will lead to premature failure of the rotary union or it could pull out of the fan assembly. Avoid this routing.

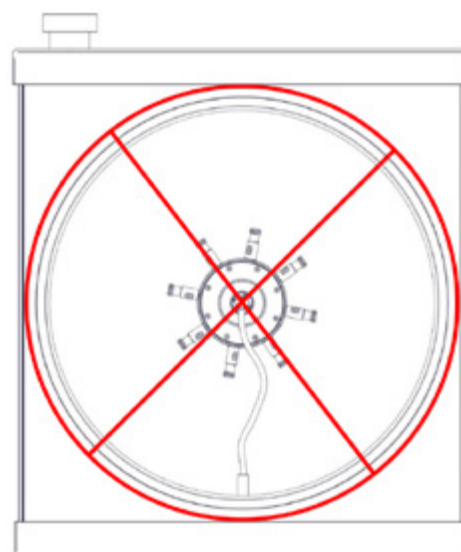


Figure 17

In Figure 17, the hydraulic line routing will create a whipping effect that causes a side load on the rotary union that will lead to premature failure of the rotary union or it could pull out of the fan assembly. The extra slack could make contact with the blades. Avoid this routing.

4.3.7 Pneumatic Air Line Install

Assemble threaded fittings with Teflon thread seal tape or equivalent. Do not use liquid thread sealant as it can interfere with the operation of the solenoid valve.

Route 1/4 " diameter air line from the push-in fitting that is threaded into the rotary union on the front of the fan (Figure 18) to port #2 on the pneumatic valve bank.

The portion of the air line that is closest to the fan and is within the fan shroud and guard should be secured to the radiator or similar fixed object. This portion of the air line should be attached to the machine in such a way that it cannot touch any rotating part of the fan and will not come loose and touch any part of the fan.

Use the included tie wraps to attach the air line to the radiator or similar object.

Use the included grommet in the kit if the air line must route through a shroud or similar sheet metal part. Drill a 12mm (15/32") hole in the shroud for the grommet and run the air line through the grommet.

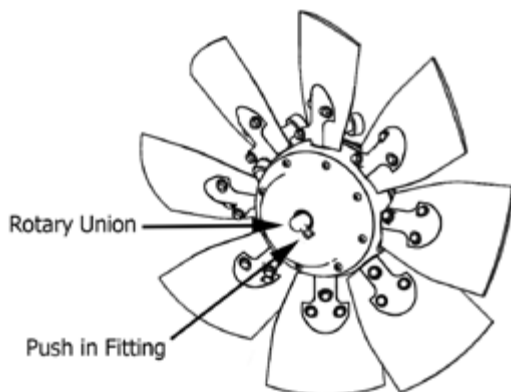


Figure 18

4.4 Install Checklist for Series 500 & 1000

Check	Yes	No
Does fan rotate in default and full reverse pitches without obstruction? See Fig 10, page 4-5 .		
Has the side load on the pressure line been minimized?		
Has the pressure line been constrained to prevent contact with the blades?		
Is the pressure line flexible enough to accommodate relative movement between the radiator and engine?		
Are any of the blades damaged?		
Does the rotary union rotate freely?		
Are there any pressure leaks in the system?		
Are all screens and guards secured?		
Have you recorded the fan S/N for future reference?		

4.5 Install Checklist for Series 2X00 & 3X00

Check	Yes	No
Does fan rotate in default and full reverse pitches without obstruction? See Fig 10, page 4-5.		
Are blade fasteners torqued to 12.2Nm (9 ft-lbs)?		
Are blades installed in the correct orientation (Push/Pull)? See Fig 6 & 7, page 4-3.		
Has the side load on the pressure line been minimized?		
Has the pressure line been constrained to prevent contact with the blades?		
Is the pressure line flexible enough to accommodate relative movement between the radiator and engine?		
Are any of the blades damaged?		
Does the rotary union rotate freely?		
Are there any pressure leaks in the system?		
Are all screens and guards secured?		
Have you recorded the fan S/N for future reference?		

4.6 Decals

The Flexxaire Fan ships with three decals to install on the machine after the fan installation. These Decals are:

1. Serial Number Decal



Figure 19

2. Reversible Fan

Apply the decal in Figure 20 on the machine as an indicator that the machine has a Flexxaire Reversible Fan.



Figure 20

3. Visual Warning

Apply the two supplied decals in Figure 21 on the sides of the machine near the radiator as a warning that the fan will reverse without warning and may blow debris.



Figure 21

5.0 Pneumatic Control

5.1 Pneumatic Specifications

Flexxair supplies numerous pneumatic control options, but all pneumatic versions of the Flexxair fan operate using any air source that meets the general specifications listed below.

If your machine has air on board, then this source will be available. If not, then a compressor kit will be required.

Recommended minimum flow rate:

0.01 m³/min at 4.8 Bar (0.35 ft³/min at 70 psi)

Warning

Extended operation at higher pressure over 130 psi (9.0 Bar) will reduce the life of the rotary union seal.

5.1.1 Series 500

	psi	Bar
Full Pitch Cooling	0	0.0
Reverse Pitch	90	6.2
Max. Continuous Pressure	130	9.0

5.1.2 Series 1000

	psi	Bar
Full Pitch Cooling	0	0.0
Reverse Pitch	60	4.1
Max. Continuous Pressure	130	9.0

5.1.3 Series 1000 G3

	psi	Bar
Full Pitch Cooling	0	0.0
Reverse Pitch	100	6.9
Max. Continuous Pressure	130	9.0

5.1.4 Series 2X00

	psi	Bar
Full Pitch Cooling	0	0.0
Reverse Pitch	100	6.9
Max. Continuous Pressure	130	9.0

5.1.5 Series 3X00

	psi	Bar
Full Pitch Cooling	0	0.0
Reverse Pitch	60	4.1
Max. Continuous Pressure	130	9.0

5.2 2-Position Control

This 2-position pneumatic control solenoid valve will allow two blade pitch positions, providing airflow in the full "PUSH" and full "PULL" directions, and is suitable for applications which require reversing only. A timer kit option is available which will automatically reverse at variable timed intervals.

5.2.1 Compressor Installation

This pneumatic compressor provides an air source for use in applications where air on board is not available.

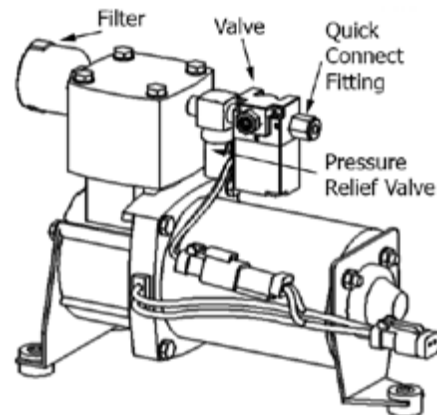


Figure 1

The solenoid valve will come pre-assembled, as shown in Figure 1. For more information on mounting and wiring the optional timer, see [Figure 3](#) on page 5-2 and [Figure 4](#) on page 5-3.

Select a compressor mounting location that is sturdy enough to handle the weight and vibration of the compressor. This location should also be in an area where there is minimal airborne dirt and dust to provide clean air for the compressor intake.

If the optional timer was ordered, make sure that there is a suitable location for the timer enclosure to mount within 305mm (12") of the compressor.

Connect the airline from the fan to the quick connect fitting.

5.2.2 Electrical Installation

For kits that include a Compressor and no Auto Reverse Timer, use Figure 2.

For kits that include a compressor and Auto Reverse Timer, use Figure 3.

For kits that use an Air Source on the machine (No Compressor) and an Auto Reverse Timer, use Figure 4 on the following page.

5.2.3 Auto Reverse Timer

The "T1" knob on the timer controls the length of the reversing cycle; it is adjustable from 5-100 seconds. Please note that the amount of time that the fan pitch reverses is not the same as the length of the reversing cycle.

The "T2" knob on the timer controls the interval time between reversing cycles and is adjustable from 5-100 minutes.

The timer is pre-set at the Flexxaire factory to be "On" for fifteen (15) seconds and "Off" for twenty (20) minutes. These are the recommended initial cycle times. Adjustment of cycle times may be necessary depending on environmental conditions or cooling requirements.

Install Diagram for 2-Position with Compressor and No Auto Reverse Timer

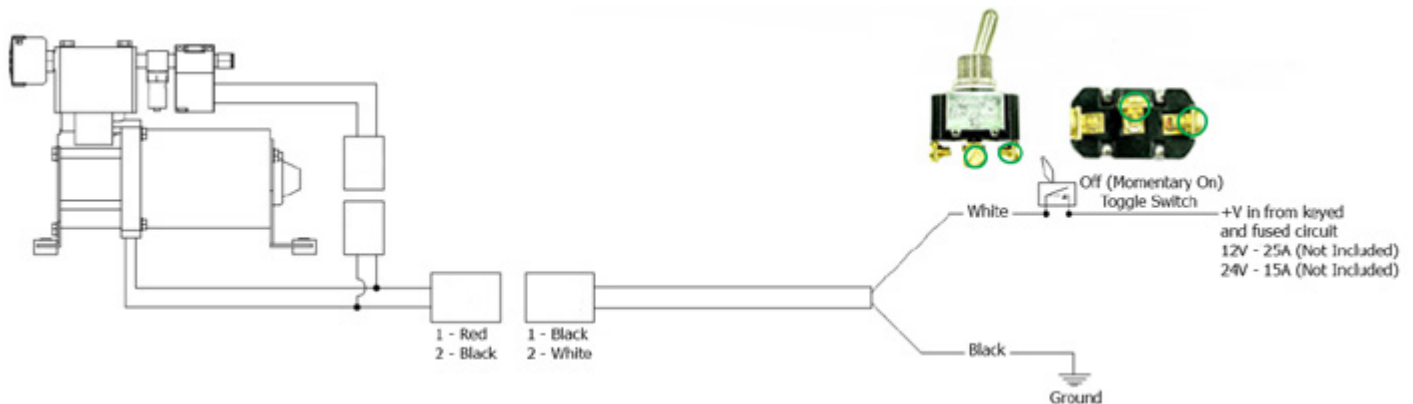


Figure 2

Install Diagram for 2-Position with Compressor and Auto Reverse Timer

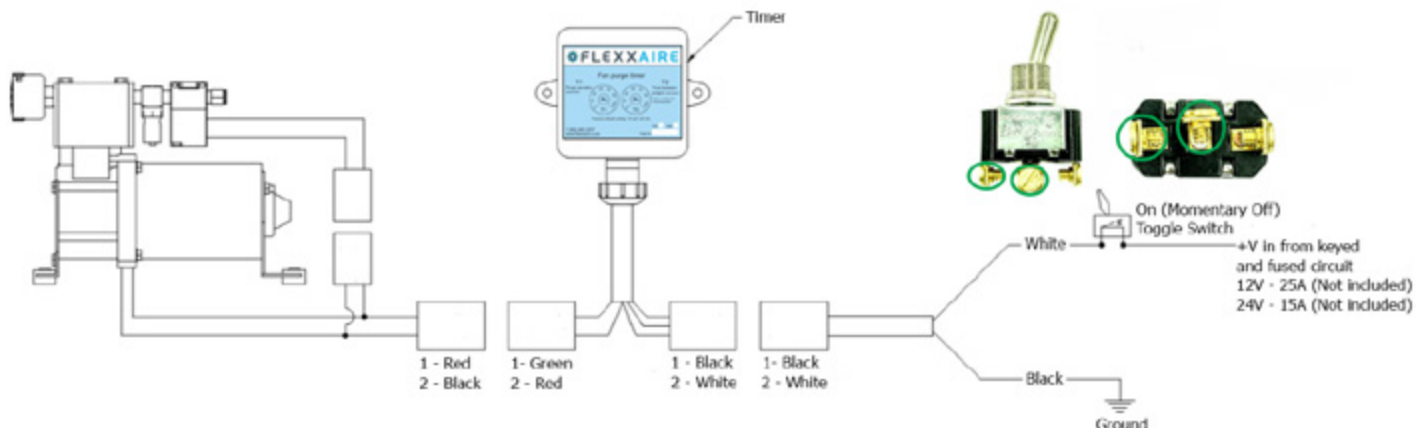


Figure 3

Install Diagram for 2-Position with No Compressor and Auto Reverse Timer

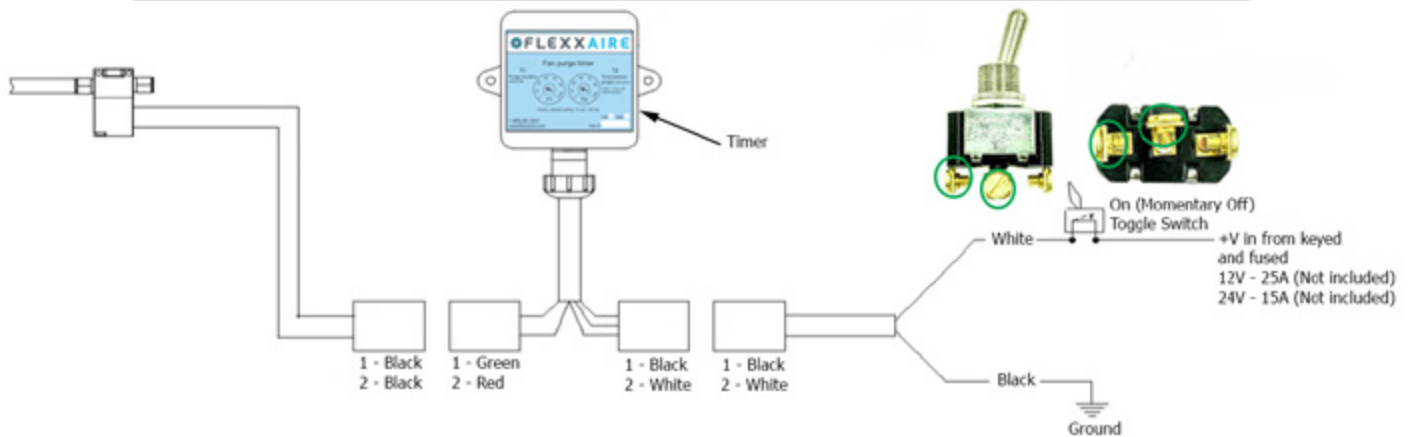


Figure 4

5.3 Operation of 2-Position Control Without Auto Reverse Timer

When the engine turns on, the Flexxaire fan begins in maximum pitch for cooling the engine.

When the Toggle Switch is held, the valve will open and allow air pressure to the Flexxaire fan to fully reverse the airflow of the fan. It will remain in this position until the switch is released.

WARNING!

Holding the switch in the "ON" position for extended time periods (standard reversing durations are 15 – 20 seconds) will cause unnecessary wear on the compressor as the compressor will continuously run and may cause compressor failure.

5.4 Operation of 2-Position Control with Auto Reversing Timer

1. When the engine turns on, the valve will open and allow air pressure to the Flexxaire fan which to fully reverse the airflow of the fan. It will remain in this position for the duration set in the timer (factory default setting is 15 seconds).
2. After this initial reversing, the Flexxaire fan will return to its maximum pitch to cool the engine.

3. The Flexxaire fan will remains at its maximum pitch until the Auto Reverse Timer initiates a Reverse Cycle based on the time interval set in the timer (Factory Default Setting is 20 minutes).

4. If the toggle switch is held down and released any time between auto reverses, the Auto Reverse Timer will reset and start from Step 1.

WARNING!

Although the auto-reverse timer allows for interval times set as low as 1-minute, we do not recommend setting intervals below 5-minutes due to a reduction in cooling capacity and the potential excessive wear of fan components.

5.5 IVP (Infinite Variable Pitch) Control

Flexxaire offers a full variable pitch control system that allows for monitoring of one to four temperatures on the machine to provide the optimum cooling required.

Flexxaire's IVP controller works by receiving feedback through temp sensors installed on the machine or by directly connecting to the machine's Electronic Control Module (ECM) providing temperature data to the Flexxaire IVP Controller.

The IVP control can perform timed auto reversing and manual reversing of the blades similar to the 2-position control.

Each IVP control is designed to the unique machine requirements and supplied with required components, control schematics, program parameters and parts list.

Please refer to the installation information included with your IVP Control Kit or by going to www.flexxaire.com.

5.6 Compressor Filter Maintenance

Maintain the filter for the compressor monthly as follows:

1. Check the filter assembly for physical damage.
2. If the filter or elements are damaged and/or very dirty, replace the filter assembly.
3. When the machine's engine air filter is replaced, replace the compressor filter as well.

The above schedule should be accelerated if operating in very dusty environments. The filter element is not serviceable.

If the filter element becomes plugged, replace the entire filter assembly.

Filter Assembly

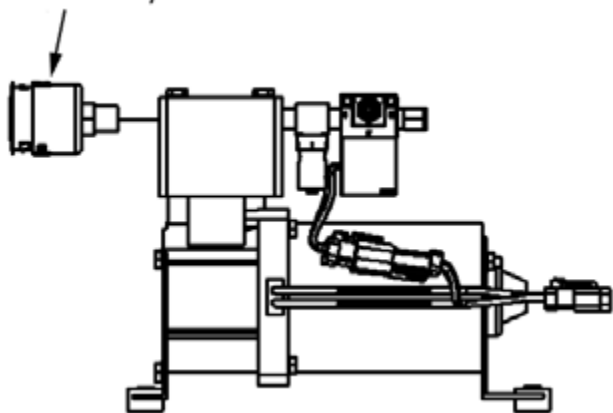


Figure 5

5.7 Valve Maintenance

The brass filter located on the valve can become clogged with debris from normal operation due to the working conditions. This may lead to reduced performance of the valve or eventual plugging.

Every 6 months, the brass filter should be removed and visually inspected. If it requires cleaning, clean with air pressure and reinstall.

The inspection frequency should be increased for dirtier environments.

6.0 Hydraulic Control

6.1 Hydraulic Specifications

Flexxaire supplies numerous hydraulic control options, but all hydraulic versions of the Flexxaire fan operate using any hydraulic source that meets the general specifications listed below.

Flexxaire's hydraulically actuated fans place little demand on a hydraulic system's flow rate. Approximately 32.8cm³ (2 in³) of oil is required for a full purge.

The hydraulic source must maintain the minimum operating pressure to hold the fan blades in pitch unless in full pitch.

NOTE:

The Differential Pressure (Source Pressure - Return Pressure) must meet or exceed the minimum pressure requirement. Avoid hydraulic systems with high-pressure spikes. Flexxaire can provide a pressure relief valve if your system is susceptible to pressure spikes.

The hydraulic seals used in Flexxaire's fans are compatible with most petroleum-based hydraulic and lubricating oils. Do not use high temperature oils, aromatic solvents or industrial phosphate esters; use of these fluids could result in a seal failure.

Potential hydraulic sources for a Flexxaire fan:

1. Pilot / Charge pressure systems.
2. Parking brake system.
3. Power steering system.
4. Final drive system.

Any other hydraulic source that meets the above specifications, but are not listed above may be a good source. Contact support@flexxaire.com for verification.

Flexxaire fans have an acceptable hydraulic pressure range based on the fan series:

6.1.1 Series 500 Low Pressure

	psi	Bar
Full Pitch Cooling	0	0.0
Reverse Pitch	240	16.5
Max. Continuous Pressure	500	34.5

6.1.2 Series 500 High Pressure

	psi	Bar
Full Pitch Cooling	0	0.0
Reverse Pitch	290	20.0
Max. Continuous Pressure	600	41.4

6.1.3 Series 1000

	psi	Bar
Full Pitch Cooling	0	0.0
Reverse Pitch	350	24.1
Max. Continuous Pressure	600	41.4

6.1.4 Series 1000 G3

	psi	Bar
Full Pitch Cooling	0	0.0
Reverse Pitch	280	19.3
Max. Continuous Pressure	600	41.4

6.1.5 Series 2X00 Low Pressure

	psi	Bar
Full Pitch Cooling	0	0.0
Reverse Pitch	200	13.8
Max. Continuous Pressure	500	34.5

6.1.6 Series 2X00 High Pressure

	psi	Bar
Full Pitch Cooling	0	0.0
Reverse Pitch	460	31.7
Max. Continuous Pressure	950	65.5

6.1.7 Series 3X00

	psi	Bar
Full Pitch Cooling	0	0.0
Reverse Pitch	340	23.4
Max. Continuous Pressure	500	34.5

6.2 2-Position Control

This 2-position hydraulic control solenoid valve will allow two blade pitch positions, providing airflow in the full "PUSH" and full "PULL" directions, and is suitable for applications that require Reversing only. An Auto Reverse Timer kit option is available, which will give automatic purges at variable timed intervals.

NOTE:

This kit does not come with hydraulic lines or fittings as these vary from machine to machine. Determine the additional materials required before starting installation.

6.2.1 Electrical Installation

Please refer to Figure 1 below.

6.2.2 Auto Reverse Timer

1. The "T1" knob on the timer controls the length of the reversing cycle; it is adjustable from 5-100 seconds. Please note that the amount of time that the fan pitch reverses is not the same as the length of the reversing cycle.

2. The "T2" knob on the timer controls the interval time between reverse cycles and adjusts from 5-100 minutes.
3. The timer is pre-set at the Flexxaire factory to be "On" for fifteen (15) seconds and "Off" for twenty (20) minutes. These are the recommended initial cycle times. Adjustment of cycle times may be necessary depending on environmental conditions or cooling requirements.

6.2.3 Hydraulic Valve Installation

1. Mount the solenoid valve in a suitable location on the application. If a spacer plate is included with the control kit, mount the plate between the valve and the mounting surface as required. Ensure the orifice is in Port 3. Refer to Figure 1.
2. Install a "T" fitting and attach a hydraulic line from the pressure line to Port 3 on the valve manifold.
3. Install a "T" fitting and attach a hydraulic line from the return line to tank to Port 1.
4. Attach the hydraulic line from the fan to Port 4 of the valve manifold.

Install Diagram for 2-Position Control with Auto Reverse Timer

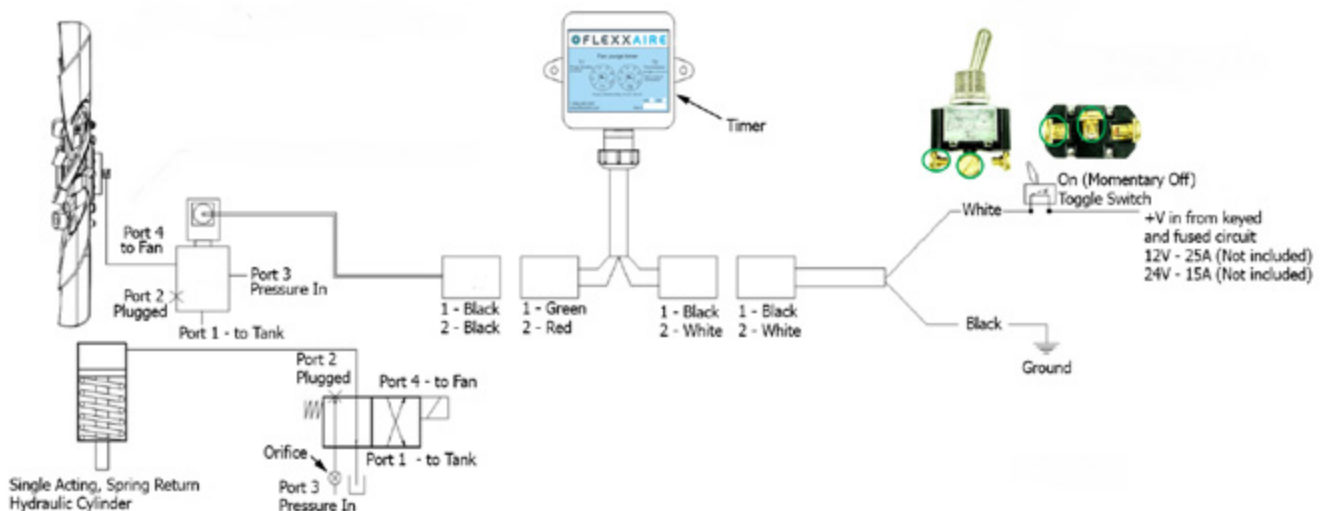


Figure 1

6.3 Hydraulic Fan Control Setup

Control valve bodies from Flexxaire used on 2-Position systems (except FlexxTempo) include an orifice to control the speed at which the blades change pitch. Please see Figure 1 on page 6-2 for information regarding the specific location of the orifice.

Under no circumstances should a Flexxaire fan move from the "PULL" to "PUSH" blade positions in less than 1 second. Please contact support@flexxaire.com if the blade pitch interval is less than 1 second.

1. Start the engine to develop hydraulic pressure.
2. Reverse Flexxaire fan several times with the toggle switch to purge air from newly installed hydraulic lines.

NOTE 1:

If air exists within the hydraulic lines, the fan will take longer to purge. Set the Timer by adjusting the "ON TIME" (Duration) and the "OFF TIME" (Interval) to the desired lengths. Select a duration and interval that meets the application requirements. The default settings for the "ON TIME" is 15-seconds and "OFF TIME" is 20-minutes.

NOTE 2:

"ON TIME" is the length of the reverse cycle duration) and is adjustable between 5-100 seconds. "OFF TIME" is the time between reverse cycles (interval) is adjustable between 5-100 minutes.

NOTE 3:

Although the auto-reverse timer allows for interval times set as low as 1-minute, we do not recommend setting intervals below 5-minutes due to a reduction in cooling capacity and the potential excessive wear of fan components.

6.4 IVP (Infinite Variable Pitch) Control

Flexxaire offers a full variable pitch control system that allows for monitoring of one to four temperatures on the machine to provide the optimum cooling required.

Flexxaire's IVP controller can work by receiving feedback through temp sensors installed on the machine or by directly connecting to the machine's Electronic Control Module (ECM), which would provide temperature data to the Flexxaire IVP Controller.

The IVP control can perform timed auto reversing and manual reversing similar to the 2-position control.

Each IVP control is designed to the unique machine requirements and supplied with required components, control schematics, program parameters and parts list.

Please refer to the installation information included with your IVP Control Kit.

6.5 FlexxTempo Timer 2-Position Control

The FlexxTempo Timer is a Wi-Fi 2 position control that allows a Wi-Fi device such as a mobile phone or laptop to modify the settings.

This 2-position hydraulic control is supplied with a proportional solenoid valve that will allow two blade pitch positions, providing airflow in the full "PUSH" and full "PULL" directions, and is suitable for applications that require reversing only. This valve also serves as a pressure reducing valve. A separate reducing valve is not required for system pressures under 241.3 bar (3500 psi). This valve does not require an orifice to be installed.

NOTE:

This kit does not come with hydraulic lines or fittings as these vary from machine to machine. Determine the additional materials required before starting installation.

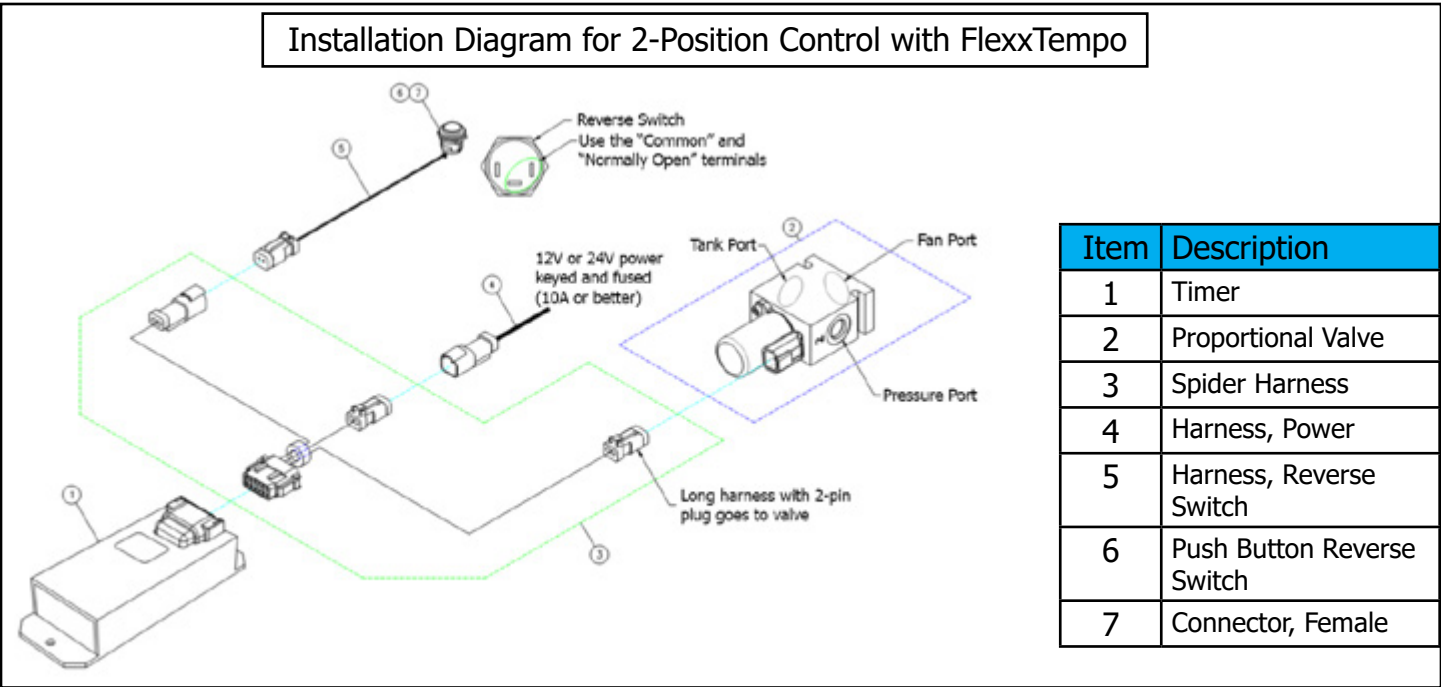


Figure 2

6.5.1 FlexxTempo Electrical Installation

Please refer to Figure 2 for wiring information.

6.5.2 FlexxTempo Timer Setup

The FlexxTempo timer ships with the following settings:

1. The interval time between reverse cycles is 20 minutes.
2. The reverse time is 15 seconds.
3. Timed (automatic) reversals are enabled.
4. The Wi-Fi network will be active for 2 minutes unless it is connected to.
5. The timer can be connected to over Wi-Fi using a web browser in order to change settings:
 - a. Wi-Fi network name: Flexxaire#### (where #### is the serial number of the timer)
 - b. Wi-Fi password (ten zeroes): 0000000000
 - c. Main internet page: 10.10.10.10

Example shown in Figure 3.

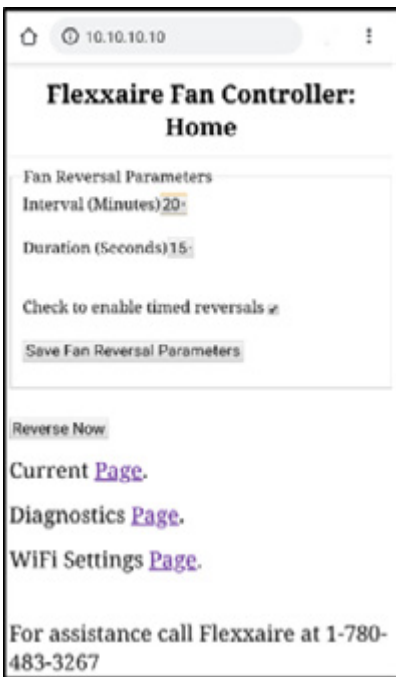


Figure 3

The timer is pre-set to be "On" for fifteen (15) seconds and "Off" for twenty (20) minutes. These are the recommended initial cycle times. Adjustment of cycle times may be necessary depending on environmental conditions or cooling requirements.

Under "Fan Reversal Parameters" in Figure 3, touching the highlighted number for "Interval" (Minutes) or "Duration" (Seconds) will open a

drop-down menu to select different times available. Select the best parameters suited to your environmental conditions or cooling requirements.

Options available for each setting are:

Interval (Minutes)

5 Min
10 Min
15 Min
20 Min
30 Min
60 Min

Duration (Seconds)

5 Sec
10 Sec
15 Sec
20 Sec
30 Sec

6.5.3 FlexxTempo Hydraulic Valve Installation

1. Mount the solenoid valve in a suitable location on the application.
2. Install a "T" fitting and attach a hydraulic line from the pressure line to "Pressure" on the valve manifold. Figure 2.
3. Install a "T" fitting and attach a hydraulic line from the return line to the tank to "Tank" on the valve manifold. Figure 2.
4. Attach the hydraulic line from the fan to "Fan" on the valve manifold. Figure 2.

NOTE:

The valve used with the FlexxTempo timer is a proportional reducing/relieving valve. A separate reducing valve is not required for system pressures under 241.3 bar (3500 psi). This valve does not require an orifice.

6.6 FlexxTempo Hydraulic Fan Control Setup

1. Start the engine to develop hydraulic pressure.
2. Reverse Flexxaire fan several times with the toggle switch to purge air from newly installed hydraulic lines.

NOTE:

If air exists within the hydraulic lines, the fan will take longer to purge.

7.0 Viscous Clutch Simulator (VCS)

7.1 Viscous Clutch Simulator (VCS)

The Flexxaire Viscous Clutch Simulator will eliminate two of the fault codes that can be registered by the ECM:

1. The ECM expects a fan speed signal.
2. The ECM detects a fan clutch engagement solenoid.

7.2 Main Components

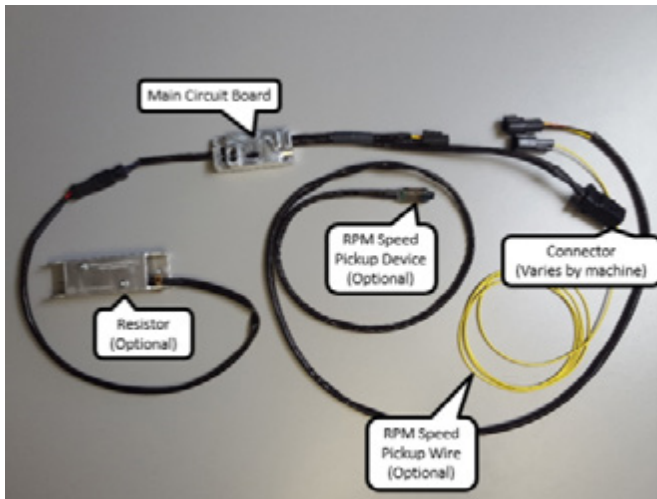


Figure 1

1. Main Circuit Board with LED's
2. Connector that connects to the machine's Viscous Clutch plug. (Varies by machine)
3. RPM Speed Pickup
 - a. Single wire that connects to alternator terminal. ("R" or "W" or other)
 - b. RPM Speed Pickup device that is connected to the alternator.
 - c. Optional resistor mounted on aluminum tubing.

7.3 Installation of Viscous Clutch Simulator

1. Connect the Viscous Clutch Simulator. Figure 2.

Caution:
Keep away from rotating parts and belts.

Caution:

The key must be "OFF" when disconnecting the clutch and when connecting the Viscous Clutch Simulator or a fault code may appear.

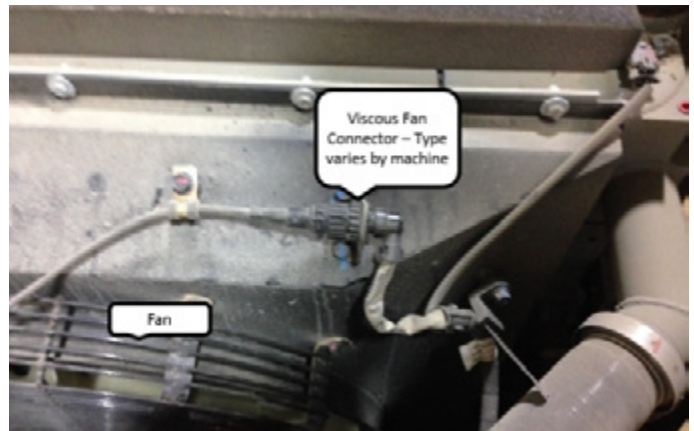


Figure 2

2. Install the RPM Speed Pickup device. Either:
 - a. Use a single wire that connects to an alternator terminal. (Normally "R" or "W" or other)
 - b. Use a RPM Speed Pickup device. Run the engine. Move the RPM Speed Pickup along the alternator housing starting near the pulley until the "Red" LED blinks steadily. The ideal mount location is halfway between the pulley and the location where "Red" LED starts blinking. Shut off the Engine. Secure the RPM Speed Pickup device to the alternator using tie wraps. Figure 3.



Figure 3

Caution:

Keep Away from rotating parts and belts.

7.4 Calibration Process

Calibration of the Viscous Clutch Simulator sends the correct frequency of pulses to the engine ECM.

1. Set the engine RPM's so that the fan is spinning at 1000 RPM. Confirm the speed by:

- a. Tachometer to measure fan speed.
- b. Calculate:

$$\text{Calibration Engine RPM} = \frac{\text{Fan Pulley Diameter}}{\text{Crank Pulley Diameter}} \times 1000$$

2. Connect the calibration terminals on the Viscous Clutch Simulator using a short wire (not supplied) to connect the two calibration pins. Remove wire after 10 seconds. Figure 4.

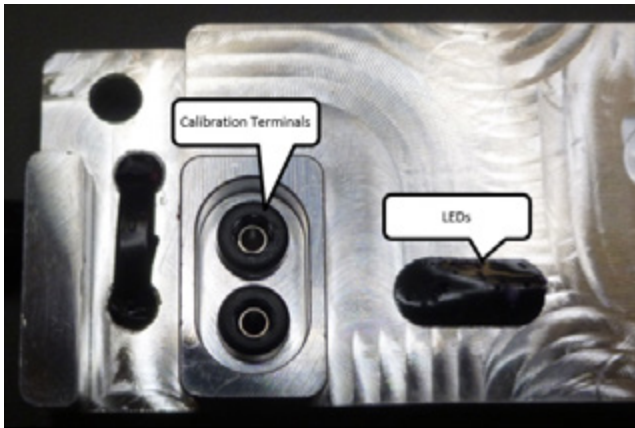


Figure 4

3. The "Green" LED will flash several times as the Viscous Clutch Simulator saves the calibration to memory. The "Red" LED will continue to flash as it receives the signal from the alternator terminal.
- a. If the engine speed is too low or the connection signal from the alternator is not correct, the "Green" LED will not come on.

- b. If this occurs:

- i. First, check that the RPM Speed Pickup wire/device is connected correctly and mounted to the alternator then perform the calibration again.
 - ii. If this does not work, increase the engine RPM by 100– 200 RPM and perform calibration again.
4. Once the installation and calibration steps are complete, turn off the engine. Leave the key off for 30-seconds to clear any faults.
 5. Restart the engine at idle and at various RPM's to see if any fault codes are registered.
 6. If any faults are found, please refer to the Viscous Clutch Simulator Trouble Shooting Section on page 7-3.

7.3 VCS Trouble Shooting

