IMPORTANT: Read Manual BEFORE installing, operating or maintaining MARK II.

VACUUM CONTROLLER
PARTS AND MAINTENANCE MANUAL

GENERAL INFORMATION

The SENTINEL MARK II is an updated version of the successful and popular Sentinel Mark I Vacuum Controller. The Mark II represents another significant advancement in vacuum controllers by L. J. Engineering, Inc. in its continuing leadership position since introducing the first diaphragm-operated vacuum controller to the dairy industry almost 40 years ago. The SENTINEL line of vacuum controllers has raised the standard of vacuum controller accuracy in milking, with the attendant operating benefits for dairies of all sizes.

The SENTINEL MARK II is a low-cost, diaphragm-operated vacuum controller designed to provide high performance for milking systems of up to 150 CFM (cubic feet per minute, ASME) at 15" Hg (inches of mercury). (L. J. Engineering, Inc. offers other models of SENTINEL controllers for milking systems with greater air flow.)

The MARK II is designed to provide proper vacuum stability - as well as a more balanced system - for safe and efficient milking at a relatively low cost. With proper installation the Mark II is capable of maintaining a stable vacuum within +-0.2" Hg over an adjustable range of 10" to 15" Hg at the controller under normal milking conditions.

The SENTINEL MARK II VACUUM CONTROLLER provides the following performance features:

1. The MARK II is not load sensitive to normal airflow (CFM) usage changes relating to normal milking conditions. It may be adjusted to a desired vacuum level with or without the milking units on the line. This is particularly valuable to the dairy which milks with a varying number of units. As each unit is removed or added to the system, the MARK II will automatically compensate for the changing load. In areas where testing devices are used, no readjustment is necessary to correct for the increased load of additional units on the pipeline. However, it cannot offset the pressure drop which occurs in the claw due to the weigh device being in series with the milk hose on each unit.

2. The MARK II has a fully open to a fully closed span of 0.2" Hg.

3. The MARK II will return to its set-point within 0.1" Hg.

4. The MARK II is easy to adjust, requiring no tools. It may be set within 0.1" Hg of the desired level.

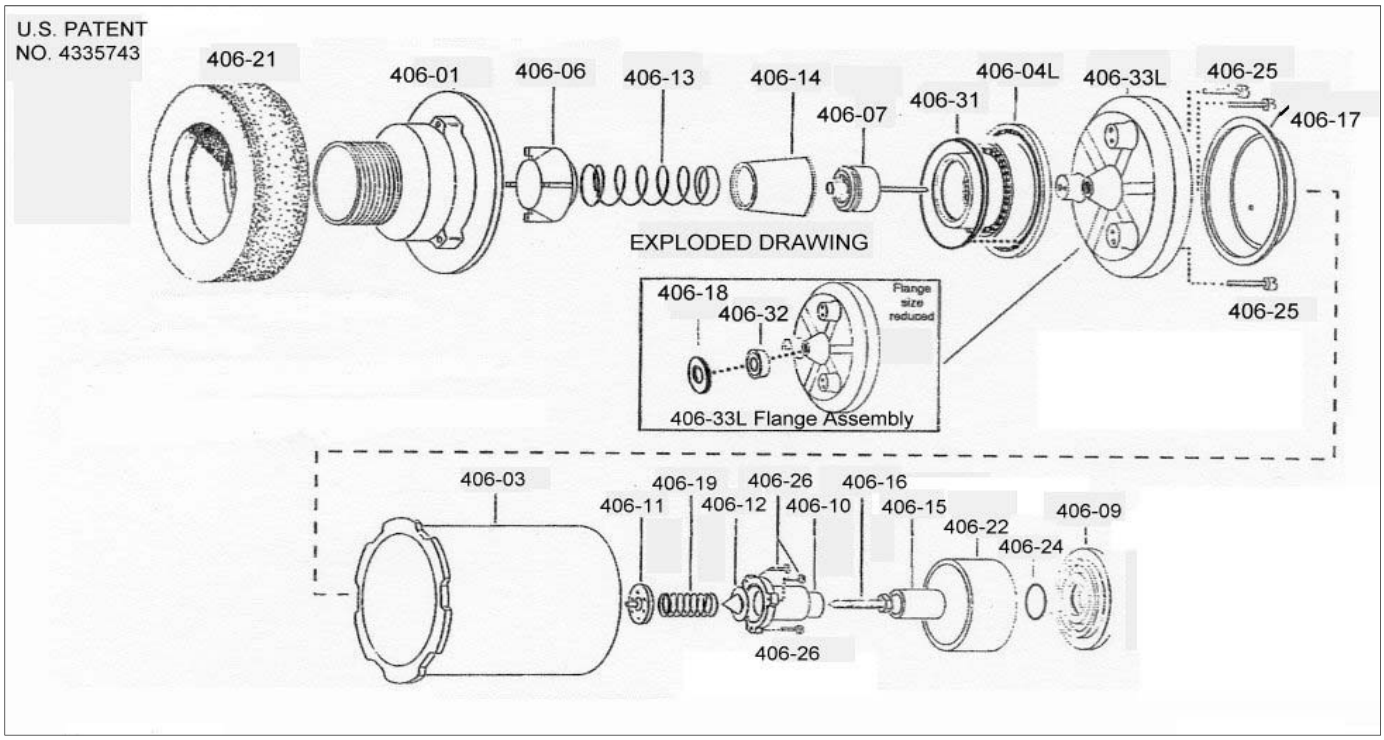
OPERATING PRINCIPLE

The main valve consists of a rolling tube of rubber (406-14-rolling seal) which seals against a series of slots in the flow ring (406-04L). The poppet assembly (406-07) has a hole in it which permits ambient air into the cavity hehind the poppet, which is the side of the poppet assembly opposite the rod. The system vacuum sucks the rolling seal against the slots and seals them. A spring (406-13-closing spring) biases the valve in the closed position. As the system is started up, vacuum is sensed through the sensing ports in the flow ring (406-04L) and flange assembly (406-33L), and pulls the sensing diaphragm (406-17-main diaphragm) down, compressing the closing spring (406-13) and allowing ambient air to flow into the system via the flow ring (406-04L) slots. The vacuum under the main diaphragm (406-17) pulls air out of the dome (406-03) by means of two small holes in the main diaphragm (406-17). Since the dome (406-03) represents the reference vacuum for the controller, system vacuum will increase until the vacuum set-point in inches of mercury is reached. At that point, the vacuum in the adjuster housing (406-10) lifts the dome diaphragm (406-11) against the adjustment spring (406-19) and allows air into the dome. This flow balances the flow through the orifices in the main diaphragm (406-17) and so stabalizes the vacuum in the dome (406-03).

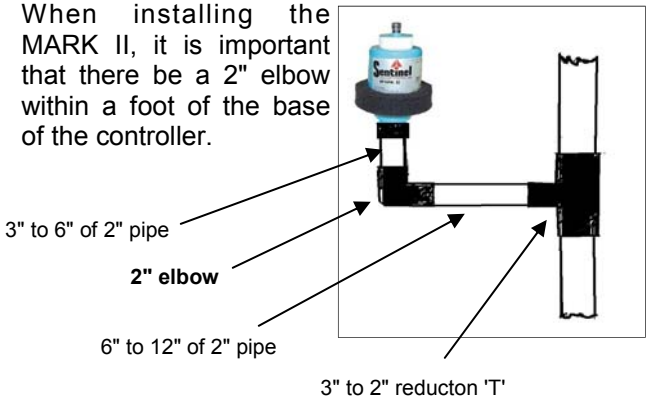
INSTALLATION INSTRUCTIONS

1. The SENTINEL MARK II VACUUM CONTROLLER should be installed at approximately eye level for maximum ease of periodic servicing (changing filters when required, etc.). Avoid installing close to hot water heaters and vacuum pumps, especially in small equipment rooms or confined areas with poor ventilation. The controller should be installed vertically or within 45 degrees of vertical.

2. Install the MARK II as close to the sanitary trap as possible to achieve maximum control. An automatic drain should be provided to assure drainage after wash-up.



3. When installing the MARK II, it is important that there be a 2" elbow within a foot of the base of the controller.



For example: On a 3" vacuum system use a 3" to 2" reduction 'T', connect to the 'T' approximately 6" to 12" of 2" straight pipe, then a 2" elbow, then another 3" to 6" of 2" straight pipe, then install the Mark II on a 2" coupling. FROM ELBOW TO MARK II DO NOT EXCEED 12 INCHES.

4. Avoid installing on reserve tanks or headers whenever possible in some cases this can result in a pipe-organ effect and cause an oscillation or pulsing problem. If this is encountered, a double elbow or offset may be necessary to break up direct air flow beneath the controller. PLACEMENT IN A DIFFERENT LOCATION IS PREFERABLE.

5. Do not reduce the pipe-size the controller is mounted on to a size less than the diameter of the controller base, (2"), unless the entire system's pipe size is smaller in diameter than the diameter of the controller's base. EXAMPLE: On a 3" vacuum system, do not reduce the pipe size below 2", when installing the Mark II.

6. Do not use a pipe wrench to tighten the Mark II to the line. Hand-tight is sufficient. Teflon tape should be used to provide a seal and prevent galling.

7. AT NO TIME SHUOLD ANY TYPE OF LUBRICANT BE APPLIED TO THE MARK II. Lubrication will only collect foreign particles, restrict movement and eventually damage the diaphragms.

8. At time of installation, your dealer should instruct you in procedures for adjusting the vacuum setting and replacing filters.

9. REGULAR MAINTENANCE IS ESSENTIAL TO THE PROPER FUNCTIONING OF THE MARK II. You are encouraged to participate in a regular service program with your dealer. If not, at time of installation your dealer should instruct you in procedures for cleaning and routine care of the Mark II.

VACUUM ADJUSTMENT PROCEDURE

1. Upon initial starting of the vacuum pump, the controller will open fully and then gradually begin to close until the set-point is reached.

2. Adjust vacuum by turning the adjusting knob (406-15) on the top of the controller. Turn the knob clockwise to increase the vacuum setting. Turn counterclockwise to decrease the vacuum setting.

DISASSEMBLY PROCEDURE

1. Remove the main filter (406-21).

2. Remove the filter cap (406-09) from the top of the dome (406-03) and dome filter (406-22). Remove the "O" ring (406-24) from the filter cap (406-09).

3. Hold the bottom of the controller in one hand and remove the dome (406-03) by rotating it counterclockwise with the other hand.

4. Remove the main diaphragm (406-17) from the flange assembly (406-33L).

5. **WARNING:** WEAR SAFETY GLASSES WHILE PERFORMING STEPS 5 THROUGH 8 OF THIS DISASSEMBLY PROCEDURE. DO NOT POINT THE UNIT TOWARDS ANYONE DURING THESE STEPS SINCE THE SPRING EXERTS CONSIDERABLE FORCE. Remove three flange screws (406-25) and remove the outlet body (406-01) and the outlet seal (406-31). Then remove the flange assembly (406-33L) by sliding it off of the rod of poppet assembly (406-07). **CAUTION:** DO NOT REMOVE RETAINING WASHER (406-18) AND ROD SEAL (406-32) FROM THE FLANGE ASSEMBLY (406-33L) BECAUSE DISASSEMBLY WILL DAMAGE THE ROD SEAL. (SEE STEP 3 OF INSPECTION PROCEDURE AND STEP 14 OF ASSEMBLY PROCEDURE).

6. While holding the poppet/flow ring assembly in one hand with the poppet rod between your fingers so fingers support the poppet, carefully remove the plug (406-06) by twisting it with the other hand and CAREFULLY allow closing spring (406-13) to expand. After removing the plug and spring, remove the poppet assembly (406-07) from the flow ring (406-04) by pushing it out the small end of the flow ring. Then insert your finger under the rolling seal (406-14) and lift the rolling seal out of the groove in the poppet. **DO NO**T use anything sharp which might cut the rubber.

7. Remove the rubber adjusting knob (406-15) and adjusting screw (406-16) from the top of dome (406-03) by turning them counterclockwise. Separate the adjusting knob from adjusting screw.

8. Remove three adjuster housing screws (406-26) and remove the adjuster housing (406-10) from the dome (406-03). Using your fingers, remove the dome diaphragm (406-11) from the adjuster housing. DO NOT use anything sharp which might cut the rubber. Remove the adjustment spring (406-19) and wobble plate (406-12) from the adjuster housing.

CAUTION: BEFORE REASSEMBLING CONTROLLER, BE SURE TO PERFORM CLEANING AND INSPECTION PROCEDURES DETAILED ON THE BACK PAGE OF THIS MANUAL.

ASSEMBLY PROCEDURE

1. Position adjuster housing (406-10) with largest end up.

2. Drop in the wobble plate (406-12) so it will rest flat in the bottom of the adjuster housing (406-10). The cone of the wobble plate should be pointing up as you look down into the adjuster housing.

3. Insert the adjuster spring (406-19) into the adjuster housing (406-10).

4. Place the dome diaphragm (406-11) on the adjustment spring (406-19), positioning the rubber boss of the diaphragm inside the spring so the spring contacts the metal washer in the diaphragm. Compress the diaphragm lightly against the spring while carefully tucking the bead of the diaphragm into the groove of the adjuster housing (406-10). DO NOT use anything sharp which might cut the rubber. Once the bead is in the groove, the diaphragm will stay in place.

5. Place the adjuster housing/diaphragm assembly on the top of the dome (406-03), taking care to avoid crimping the nipple of the dome diaphragm (406-11). Insert the nipple of the diaphragm into the hole in the top of the dome. By looking into the dome, center the nipple of the diaphragm in the hole. Install the three adjuster housing screws (406-26). LIGHTLY AND EVENLY tighten the screws using a screwdriver. **CAUTION:** DO NOT OVER-TIGHTEN THE SCREWS.

6. Install the adjusting screw (406-16) until about 3/4" remains above the adjuster housing (406-10).

7. Slip on adjusting knob (406-15). Set the dome assembly aside.

8. **CAUTION:** ASSURE THAT THE ROLLING SEAL (406-14) IS PROPERLY POSITIONED, I.E., NOT INSIDE OUT. THE BEAD AT THE SMALL END OF THE ROLLING SEAL SHOULD BE ON THE INSIDE DIAMETER OF THE ROLLING SEAL SO THE OUTSIDE DIAMETER AT THE SMALL END OF THE ROLLING SEAL IS SMOOTH AS SHOWN IN THE EXPLODED DRAWING. Insert the blunt end (the end opposite the poppet rod) of the poppet assembly (406-07) into the large end of the rolling seal pointing in the same direction as the poppet rod. Carefully tuck the bead at the small end of the rolling seal into the groove in the poppet, taking care to distribute the rubber material of the rolling seal uniformly around the outside diameter of the poppet. **DO NOT** use anything sharp which might cut the rubber.

9. Invert the rolling seal (406-14) by pulling it back over itself without taking it out of the poppet groove, so the large end of the rolling seal now faces away from the rod end of the poppet assembly (406-07).

10. Insert the rod end of the poppet assembly (406-07) into the small end of the flow ring (406-04L) until the external bead at the large end of the rolling seal (406-14) is seated in its seat at the small end of the flow ring. **CAUTION:** WHEN PROPERLY INSTALLED, THE LARGE END OF THE ROLLING SEAL AND THE END OF THE FLOW RING WILL BE FLUSH, FORMING A COMMON SURFACE.

11. **WARNING:** WEAR SAFETY GLASSES WHILE PERFORMING STEPS 11 THROUGH 16 OF THIS ASSEMBLY PROCEDURE. DO NOT POINT THE UNIT TOWARD ANYONE DURING THESE STEPS SINCE THE SPRING EXERTS CONSIDERABLE FORCE. While holding the poppet/flow ring assembly in one hand with the poppet rod between your fingers so your fingers support the poppet, with the other hand position the closing spring (406-13) in its seat in the poppet and position the cavity of the plug (406-06) on the free end of the spring. Now compress the spring, being sure it remains positioned in its seat in the poppet, and very carefully force the plug into the inside of the rolling seal (406-14) which is inside the flow ring (406-04). **CAUTION:** BE CAREFUL TO NOT CHANGE THE POSITION OF THE ROLLING SEAL IN THE FLOW RING DURING THIS OPERATION. THE END SURFACE OF THE EXTERNAL BEAD AT LARGE END OF THE ROLLING SEAL MUST REMAIN FLUSH WITH THE SMALL END OF THE FLOW RING. (SEE STEP 10.) Once the plug is inserted, rotate it up to 1/4 of a turn to fully seat the plug. CAUTION: DO NOT TURN THE PLUG MORE THAN THIS, OR ROLLING SEAL MAY GET TWISTED. This turning technique plus the friction of the rubber of the rolling seal will hold plug in place.

12. Insert the flat side of the outlet seal (406-31) into the groove in the flow ring (406-04L) of the poppet/flow ring assembly. When looking at the installed outlet seal from the small end of the poppet/flow ring assembly, the raised bead on the outlet seal should be visible along the inside edge of the groove.

13. Position the poppet/flow ring assembly into the outlet body (406-01) with the small end inside the cavity of the outlet body, carefully lining up the screw holes. **CAUTION:** DO NOT DISTURB THE POSITIONING OF THE OUTLET SEAL (406-31) IN THE FLOW RING (406-04L).

14. CAUTON: INSPECT THE FLANGE ASSEMBLY (406-33L) FROM THE RIBBED SIDE TO ASSURE THAT THE BRASS-COLORED RETAINING WASHER (406-18) IS INSTALLED IN THE CENTER HOLE AND THAT THE ROD SEAL (406-32), WHICH IS BARELEY VISIBLE, IS IN THE HOLE BELOW THE RETAINING WASHER. **THESE PARTS ARE REQUIRED FOR PROPER FUNCTIONING OF THE CONTROLLER.** DO NOT REMOVE RETAINING WASHER AND ROD SEAL FROM THE FLANGE ASSEMBLY BECAUSE DISASSEMBLY WILL DAMAGE THE ROD SEAL. Flange Assemblies (406-33L) purchased after October 1990 will be supplied with the rod seal (406-32) and the retaining washer installed. The unassembled flange (406-02) will not be available. When the rod seal is worn, you should order a new flange assembly (406-33L) which will contain a properly assembled rod seal. Assembly of the rod seal and the retaining washer into the flange is not recommended to be done in the field; however, with proper tooling and experienced personnel, this operation, while a delicate process, can be performed in the field. A**)** Using an arbor press and a properly sized blunt tool. LIGHTLY press the rod seal (406-32) into the center hole of the flange (406-02) with ribbed side of the flange up and with the small spring in the rod seal up. The spring in the rod seal is visible upon careful examination. **CAUTION:** TOO MUCH PRESSURE WILL DAMAGE THE ROD SEAL. B) Using the arbor press and the same blunt tool, LIGHTLY press the retaining washer (406-18) into the center hole of the flange to retain the rod seal (406-32). **CAUTION:** TOO MUCH PRESSURE WILL DAMAGE THE ROD SEAL.

15. With the ribbed side of the flange assembly (406-33L) facing the poppet rod, carefully place the center hole of the flange assembly over the poppet rod and push the flange assembly over the poppet rod until it touches the poppet assembly (406-07).

16. Install three flange screws (406-25). LIGHTLY AND EVENLY tighten the screws using a screwdriver. **CAUTION:** DO NOT OVER-TIGHTEN THE SCREWS.

17. Position the main diaphragm (406-17) on the flange assembly (406-33L) with metal plate of the diaphragm touching the protruding poppet rod. Carefully tuck the bead of the diaphragm into the groove in the flange assembly. **DO NOT** use anything sharp which might cut the rubber.

18. Wipe the mating surface of the dome (406-03) clean. Insert the dome into the flange assembly (406-33L) and, while holding pressure against the main diaphragm (406-17), rotate the dome clockwise until it is tight against the stops in the flange assembly.

19. Insert “O” ring (406-24) into the groove in the center hole of the filter cap(406-09). Place the dome filter (406-22) over the adjuster housing (406-10) and the mounting ring on the top of the dome (406-03). Then with the flat surface up, place the filter cap over the adjuster housing and push snugly against the dome filter.

20. Install the main filter (406-21) over the center of the controller so the bottom edge of the filter is below the flange of the outlet body (406-01) and the top edge of the filter is above the upper edge of the flange assembly (406-33L).

Sentinel Mark II Parts List

406-01	Outlet Body
406-02 (*)	Flange (unassembled) NOT AVAILABLE
406-03	Dome
406-04L	Flow Ring
406-06	Plug
406-07	Poppet Assembly
406-09	Filter Cap
406-10	Adjuster Housing
406-11	Dome Diaphragm
406-12	Wobble Plate
406-13	Closing Spring
406-14	Rolling Seal
406-15	Adjusting Knob
406-16	Adjusting Screw
406-17	Main Diaphragm
406-18 (*)	Retaining Washer
406-19	Adjustment Spring
406-21	Main Filter
406-22	Dome Filter
406-24	“O” Ring
406-25	Flange Screw (3 each)
406-26	Adjuster Housing Screw (3 each)
406-31	Outlet Seal
406-32 (*)	Rod Seal
406-33L	Flange Assembly (Includes 406-02, 406-18 and 406-32)

(*) See 406-33L

NOTE: All MARK II parts are interchangeable with Mark I parts.

See Step 4 of Inspection Procedure for parts contained in the Worn Parts Replacement Kit.

FIELD CLEANING PROCEDURE

1. Remove the MARK II from the vacuum line.

2. Remove the main filter (406-21). Immerse the main filter in hot soapy water and, while immersed, squeeze the main filter repeatedly to clean pores of the filter. Then immerse the main filter in clean water and, while immersed, squeeze repeatedly. MULTIPLE RINSES MAY BE REQUIRED TO REMOVE ALL THE SOAP RESIDUE. Then squeeze the main filter repeatedly to remove water and air dry. **CAUTION:** MAIN FILTER SHOULD BE CLEANED AT LEAST MONTHLY FOR OPTIMUM PERFORMANCE OF CONTROLLER.

3. **CAUTION:** DO NOT CLEAN DOME FILTER (406-22). WASHING WILL DAMAGE THE FILTER. REPLACE DOME FILTER WHEN THERE IS A DIFFERENCE OF 0.5" Hg IN THE VACUUM SYSTEM BETWEEN WHEN DOME FILTER IS INSTALLED ON THE CONTROLLER AND WHEN IT IS REMOVED FROM THE CONTROLLER.

4. Hold the bottom of the controller in one had and remove the dome (406-03) by rotating it counterclockwise with the other hand. Set the dome assembly aside.

5. Remove the main diaphragm (406-17) from the flange assembly.

6. Submerge the remaining assembly (lower half of the controller) in hot soapy water and depress the poppet rod protruding from the top of the lower assembly until it is flush with the top surface of the flange assembly (406-33L) Release the poppet rod and allow the assembly to soak for 15 minutes. After soaking, depress the poppet rod while assembly is immersed and swish assembly around in the soapy water to allow dirt to be washed away.

7. TURN THE LOWER ASSEMBLY UPSIDE DOWN SO THE THREADED PORTION POINTS UPWARD. PUMP THE POPPET ROD IN AND OUT UNTIL ALL THE SOAPY WATER IS TRAPPED BEHIND THE POPPET ASSEMBLY (406-07) IS DRAINED.

8. Rinse the lower assembly by repeating Steps 5 and 6 EXCEPT USE CLEAN WATER. REPEATED RINSES MAY BE REQUIRED TO REMOVE ALL THE SOAP RESIDUE. BE SURE TO PUMP OUT ALL THE WATER TRAPPED BEHIND THE POPPET ASSEMBLY.

9. Air dry lower assembly.

10. Position the main diaphragm (406-17) on the flange assembly (406-33L) with the metal plate of the diaphragm touching the protruding poppet rod. Carefully tuck the bead of the diaphragm into the groove in the flange assembly. DO NOT use anything sharp which might cut the rubber.

11. Wipe the mating surface of the dome (406-03) clean. Insert the dome into the flange assembly (406-33L) and, while holding pressure against the main diaphragm (406-17), rotate the dome clockwise until tight against the stops in the flange assembly.

12. Install the main filter (406-21) over the center of the controller so that the bottom edge of the filter is below the flange of the outlet body (406-01) and the top edge of the filter is above the upper edge of the flange assembly (406-33L).

13. Reinstall the MARK II on the vacuum line.

Sentinel™ MARK II

For Technical Support call toll-free in the USA: 800-635-6413
From other locations call (714) 848-8001

GENERAL CLEANING PROCEDURE

1. **CAUTION:** DO NOT CLEAN DOME FILTER (406-22). WASHING WILL DAMAGE THE FILTER. REPLACE DOME FILTER WHEN THERE IS A DIFFERENCE OF 0.5" Hg IN THE VACUUM SYSTEM BETWEEN WHEN DOME FILTER IS INSTALLED ON THE CONTROLLER AND WHEN IT IS REMOVED FROM THE CONTROLLER.

2. Wash all the parts [EXCEPT the dome filter (406-22)] in hot soapy water until all the dirt and foreign material is removed. Squeeze the main filter (406-21) repeatedly while in the soapy water to clean pores of the main filter.

3. Thoroughly rinse all parts [EXCEPT the dome filter (406-22)] in clean water until all the soap residue is removed. Squeeze the main filter (406-21) repeatedly while in the rinse water. MULTIPLE RINSES MAY BE REQUIRED TO REMOVE ALL SOAP RESIDUE.

4. Squeeze the main filter (406-21) repeatedly to remove water. Air dry all the parts.

5. **CAUTION:** THE MAIN FILTER (406-21) SHOULD BE CLEANED AT LEAST MONTHLY FOR OPTIMUM PERFORMANCE OF THE CONTROLLER.

INSPECTION PROCEDURE

1. Visually inspect all the parts for damage or excessive wear.

2. Inspect the following rubber components for damage and wear:

   406-11 Dome Diaphragm
   406-14 Rolling Seal
   406-17 Main Diaphragm
   406-24 “O” Ring
   406-31 Outlet Seal

BOTH DIAPHRAGMS AND THE ROLLING SEAL SHOULD BE CAREFULLY EXAMINED FOR DISTORTION, HOLES, NICKS, TEARS OR CRACKS IN THE RUBBER.

3. **CAUTION:** DO NOT REMOVE THE RETAINING WASHER (406-18) AND ROD SEAL (406-32) FROM THE FLANGE ASSEMBLY 406-33L BECAUSE DISASSEMBLY WILL DAMAGE THE ROD SEAL. Inspect the rod seal (406-32) in the flange assembly (406-33L) for

3. (Continued from previous page) damage or excessive wear. Check the sliding fit of the rod of the poppet assembly (406-07) in the rod seal by inserting the poppet rod into the hole of the rod seal and slowly pushing the poppet rod back and forth. **CAUTION:** FOR PROPER FUNCTIONING OF THE CONTROLLER, THERE MUST BE A SNUG SLIDING FIT AND NO SIDE CLEARANCE BEWEEN THE POPPET ROD AND THE ROD SEAL. If there is not a proper sliding fit, replace with a new flange assembly (406-33L) which will contain a new rod seal (406-32) and retaining washer (406-18). (SEE STEP 14 OF THE ASSEMBLY PROCEDURE.)

4. Replace all parts found to be damaged or to have excessive wear. A standard WORN PARTS REPLACEMENT KIT is available through your dealer. It contains the following parts:

Sentinel Worn Parts Replacement Kit

406-04L	Flow Ring
406-11	Dome Diaphragm
406-14	Rolling Seal
406-15	Adjusting Knob
406-17	Main Diaphragm
406-21	Main Filter
406-22	Dome Filter
406-24	“O” Ring
406-25	Flange Screw (3 each)
406-26	Adjuster Housing Screw (3 each)
406-31	Outlet Seal
406-33L	Flange Assembly (Includes 406-02, 406-18 and 406-32)

Specifications

- Sensitive to 0.1" Hg change
- Adjustment range: 10" to 15" Hg
- Minimum flow while operating: 1 CFM
- Finish: ABS and LEXAN plastics
- 2" male NPT mounting
- Size: 6" diameter, 11-1/4" high
- Filters: (a) Dome Filter (406-22) & (b) Main Filter (406-21)
- Capacity: 150 CFM ASME (less at lower vacuum settings)
- Direct sensing
- Weight: 1-1/4 lbs.

TROUBLE SHOOTING

SYMPTOM	CAUSE	CURE
Sudden rise in vacuum	Ruptured main diaphragm	Replace main diaphragm
"	Wet dome filter	Replace dome filter
Slow rise in vacuum	Dome filter plugged or dirty	Replace dome filter
"	Foreign particles in adjuster housing	Remove and clean adjuster housing and all other parts in the dome
"	Worn dome diaphragm	Replace dome diaphragm
Vacuum too low	Damaged seat in dome diaphragm	Replace dome diaphragm
"	Damaged dome diaphragm seating surface in dome	Replace dome
Vacuum unstable	Unsuitable location for mounting	Move to another location
"	Pulsator line tied too close to controller	Move to another location
"	Dirty poppet rod	Clean controller
"	Inadequate controller capacity	Use proper size controller
"	Hole in rod seal worn	Replace flange assembly
"	Rod seal missing	Replace flange assembly
Controller leaking air constantly	Rolling seal in backwards	Reassemble properly
Shaft hole in flange worn	Excessive wear of rod seal or rod seal missing	Replace with flange assembly

1. LIMITED WARRANTY: Seller warrants that the goods delivered shall be free from defects in material and workmanship for a period of one (1) year from the date of Seller's shipment. Seller's sole obligation and Buyer's exclusive remedy for defects in the goods shall be limited, at Seller's option, to either repair or replacement of goods determined to be defective. Transportation and any other delivery costs to return defective goods to Seller for repair or replacement shall be the responsibility of Buyer. Any claim by Buyer must be made by Buyer to Seller in writing within five (5) days of the discovery of the claimed defect but in no event after the expiration of one (1) year from the date of Sellers's shipment, whichever is less. Buyer's failure to so notify Seller of such defects within the above time periods shall bar Buyer from any remedy under this Warranty, or for recovery of damages or losses due to defects in the goods. Any return of goods shall be subject to the prior written approval of Seller.

THIS WARRANTY IS THE SOLE WARRANTY COVERING THE GOODS AND SELLER MAKES NO OTHER WARRANTY OF ANY KIND, WHETHER EXPRESS, IMPLIED OR STATUTORY, AND ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED BY SELLER AND EXCLUDED FROM THIS WARRANTY. IN NO EVENT SHALL SELLER BE LIABLE FOR CONSEQUENTIAL, COMPENSATORY, PUNITIVE OR INCIDENTAL DAMAGES HOWSOEVER ARISING FROM SELLER'S PERFORMANCE OF THIS CONTRACT OR THE PERFORMANCE OF THE GOODS.

This Warranty shall not apply to goods which have been repaired or altered by other than authorized representatives of Seller or to damage or defects caused by accident, vandalism, Acts of God, erosion, normal wear and tear, improper selection by Buyer or others, and other causes beyond Seller's control. This Warranty shall not apply to the misapplication, improper installation, or misuse of the goods caused by variations in environment, the inappropriate extrapolation of data provided, the failure of Buyer or others to adhere to pertinent specifications or industry practices, or otherwise.

2. LIMITATION OF SELLER'S LIABILITY: Seller's liability on any claim of any kind, including claims based upon Seller's negligence, breach of contract, or strict liability in tort, for any loss or damage arising out of, connected with, or resulting from the use of the goods furnished hereunder or Seller's performance of this contract, shall in no case exceed the purchase price allocable to the goods or part thereof which give rise to the claim. **IN NO EVENT SHALL SELLER BE LIABLE FOR SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES HOWSOEVER ARISING OUT OF SELLER'S PERFORMANCE OF THIS CONTRACT AND NOTWITHSTANDING WHETHER SELLER MAY HAVE BEEN ADVISED OR IS ADVISED OF THE POSSIBILITY OF SPECIAL (OR LIQUIDATED) DAMAGES.**

Sentinel™
VACUUM CONTROLLER

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