

SentinelTM MARK II

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 Western Dairy Research, Inc. in its continuing leadership position since introducing the first diaphragm-operated vacuum controller to the dairy industry 20 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 standard) at 15" Hg (inches of mercury). (Western Dairy Research, 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:

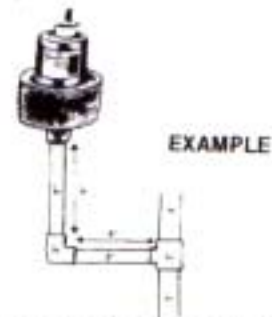
1. The MARK II is not load sensitive to normal airflow (CFM) usage changes relating to normal milking conditions. It may be adjusted to a desired vacuum level with or without the milking units on the line. This is particularly valuable to the dairy which milks with a varying number of units. As each 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 after a drop in vacuum level caused by a typical leak into the system.
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 (406-4). The poppet assembly (406-7) has a hole in it which permits ambient air into the cavity behind 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 (406-4) and flange assembly (406-33), and pulls the sensing diaphragm (406-17 main diaphragm) down, compressing the closing spring and allowing ambient air to flow into the system via the flow ring slots. The vacuum under the main diaphragm pulls air out of the dome by means of two small holes in the main diaphragm. Since the dome 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 and so stabilizes the vacuum in the dome.

INSTALLATION INSTRUCTIONS

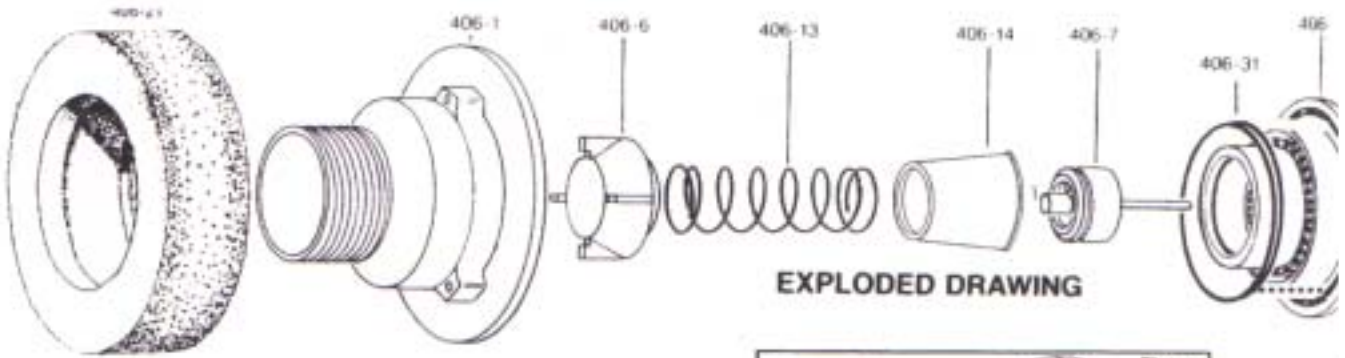
1. The SENTINEL MARK II VACUUM CONTROLLER should be installed at approximately eye level for maximum ease of periodic servicing (changing filters when required). Avoid installing close to hot water heaters and vacuum pumps, especially in small engine rooms or confined areas with poor ventilation. Controller should be installed vertically or within 45 degrees of vertical.
2. Install the MARK II as close to 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 that 'T' approximately 6 inches of 2" straight pipe, then a 2" elbow, then another 6 inches of 2" straight pipe, then install the MARK II. 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 a 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 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.
6. AT NO TIME SHOULD ANY TYPE OF LUBRICANT BE APPLIED TO THE MARK II. Lubrication will only collect foreign particles, restrict movement and eventually damage the diaphragms.
7. At time of installation, your dealer should instruct you in procedures for adjusting the vacuum setting and for replacing filters.
8. **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 set-point is reached.
2. Adjust vacuum by turning adjusting knob (406-15) on top of controller. Turn clockwise to increase vacuum setting. Turn counterclockwise to decrease vacuum setting.



EXPLODED DRAWING

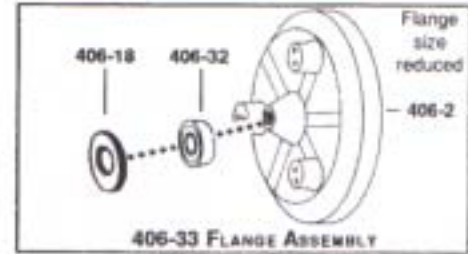
DISASSEMBLY PROCEDURE

1. Remove main filter (406-21).
2. Remove filter cap (406-9) from top of dome (406-3) and dome filter (406-22). Remove "O" ring (406-24) from filter cap.
3. Hold bottom of controller in one hand and remove dome (406-3) by rotating it counterclockwise with other hand.
4. Remove main diaphragm (406-17) from flange assembly (406-33).
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 outlet body (406-1) and outlet seal (406-31). Then remove flange assembly (406-33) by sliding it off of rod of poppet assembly (406-7). **CAUTION: DO NOT REMOVE RETAINING WASHER (406-18) AND ROD SEAL (406-32) FROM FLANGE ASSEMBLY (406-33) BECAUSE DISASSEMBLY WILL DAMAGE ROD SEAL. (SEE STEP 3 OF INSPECTION PROCEDURE AND STEP 14 OF ASSEMBLY PROCEDURE.)**
6. While holding poppet/flow ring assembly in one hand with poppet rod between fingers so fingers support poppet, carefully remove plug (406-6) by twisting it with other hand and **CAREFULLY** allow closing spring (406-13) to expand. After removing plug and spring, remove poppet assembly (406-7) from flow ring (406-4) by pushing it out the small end of flow ring. Then insert your finger under the rolling seal (406-14) and lift rolling seal out of the groove in poppet. **DO NOT** use anything sharp which might cut the rubber.
7. Remove rubber adjusting knob (406-15) and adjusting screw (406-16) from top of dome (406-3) by turning them counterclockwise. Separate the adjusting knob from adjusting screw.
8. Remove three adjuster housing screws (406-26) and remove adjuster housing (406-10) from dome (406-3). Using fingers, remove dome diaphragm (406-11) from adjuster housing. **DO NOT** use anything sharp which might cut the rubber. Remove adjustment spring (406-19) and wobble plate (406-12) from adjuster housing.

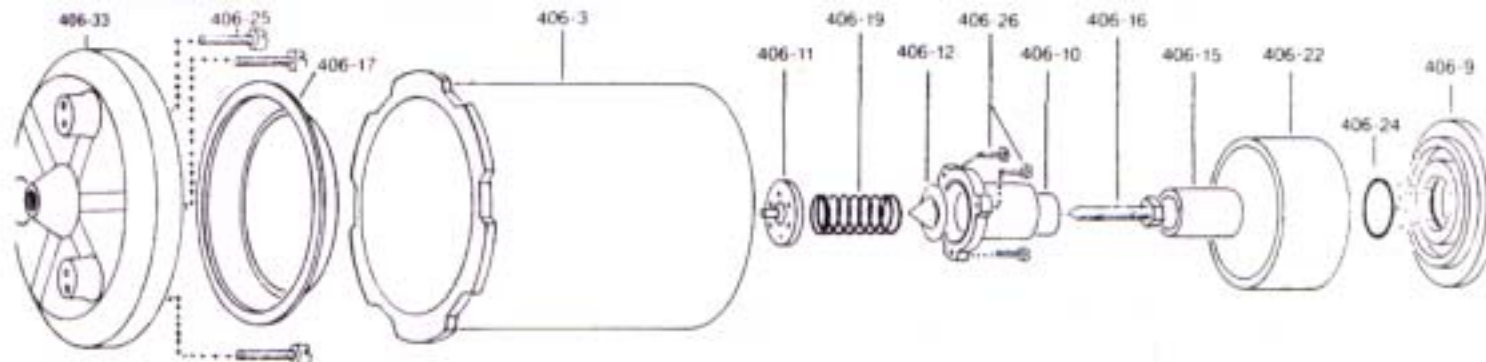
CAUTION: BEFORE REASSEMBLING CONTROLLER, BE SURE TO PERFORM CLEANING AND INSPECTION PROCEDURES DETAILED ON BACK PAGE OF THIS MANUAL.

ASSEMBLY PROCEDURE

1. Position adjuster housing (406-10) with largest end up.
2. Drop in wobble plate (406-12) so it will rest flat in bottom of adjuster housing (406-10). The cone of wobble plate should be pointing up as you look down into adjuster housing.
3. Insert adjustment spring (406-19) into adjuster housing (406-10).
4. Place dome diaphragm (406-11) on adjustment spring (406-19), positioning rubber boss of diaphragm inside spring so spring contacts metal washer in diaphragm. Compress diaphragm lightly against spring while carefully tucking bead of diaphragm into groove of adjuster housing (406-10). **DO NOT** use anything sharp which might cut the rubber. Once bead is in groove, the diaphragm will stay in place.



5. Place adjuster housing/diaphragm assembly on top of dome (406-3), taking care to avoid crimping nipple of dome diaphragm (406-11). Insert nipple of diaphragm into hole in top of dome. By looking into dome, center nipple of diaphragm in the hole. Install three adjuster housing screws (406-26). **LIGHTLY AND EVENLY** tighten screws using screwdriver. **CAUTION: DO NOT OVER-TIGHTEN SCREWS**
6. Install adjusting screw (406-16) until about 3/4" remains above adjuster housing (406-10).
7. Slip on adjusting knob (406-15). Set dome assembly aside.
8. **CAUTION: ASSURE THAT ROLLING SEAL (406-14) IS PROPERLY POSITIONED, I.E., NOT INSIDE OUT. BEAD AT SMALL END OF ROLLING SEAL SHOULD BE ON THE INSIDE DIAMETER OF THE ROLLING SEAL, SO OUTSIDE DIAMETER AT SMALL END OF ROLLING SEAL IS SMOOTH AS SHOWN IN EXPLODED DRAWING.** Insert blunt end (end opposite poppet rod) of poppet assembly (406-7) into large end of rolling seal (406-14). Slip rolling seal (406-14) over poppet assembly (406-7) with large end of rolling seal pointing in same direction as poppet rod. Carefully tuck the bead at small end of rolling seal into groove in poppet, taking care to distribute the rubber material of rolling seal uniformly around outside diameter of poppet. **DO NOT** use anything sharp which might cut the rubber.
9. Invert rolling seal (406-14) by pulling it back over itself without taking it out of poppet groove, so large end of rolling seal now faces away from rod end of poppet assembly (406-7).
10. Insert rod end of poppet assembly (406-7) into small end of flow ring (406-4) until the external bead at large end of rolling seal (406-14) is seated in its seat at small end of flow ring. **CAUTION: WHEN PROPERLY INSTALLED, THE LARGE END OF ROLLING SEAL AND END OF 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 poppet/flow ring assembly in one hand with the poppet rod between fingers so fingers support poppet, with other hand position closing spring (406-13) in its seat in poppet and position cavity of plug (406-6) on free end of spring. Now compress the spring, being sure it remains positioned in its seat in poppet, and very carefully force plug into inside of rolling seal (406-14) which is inside flow ring (406-4). **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 ROLLING SEAL MUST REMAIN FLUSH WITH THE SMALL END OF THE FLOW RING. (SEE STEP 10.)** Once plug is inserted, rotate it up to 1/4 of a turn to fully seat plug. **CAUTION: DO NOT TURN PLUG MORE THAN THIS. OR ROLLING SEAL MAY GET TWISTED.** This turning technique plus the friction of the rubber of rolling seal will hold plug in place.



12. Insert flat side of outlet seal (406-31) into groove in flow ring (406-4) of poppet/flow ring assembly. When looking at installed outlet seal from small end of poppet/flow ring assembly, raised bead on outlet seal should be visible along inside edge of groove.

13. Position poppet/flow ring assembly into outlet body (406-1) with small end inside cavity of outlet body, carefully lining up screw holes. **CAUTION: DO NOT DISTURB POSITIONING OF OUTLET SEAL (406-31) IN FLOW RING (406-4).**

14. **CAUTION: INSPECT FLANGE ASSEMBLY (406-33) FROM RIBBED SIDE TO ASSURE THAT BRASS-COLORED RETAINING WASHER (406-18) IS INSTALLED IN CENTER HOLE AND THAT ROD SEAL (406-32), WHICH IS BARELY VISIBLE, IS IN HOLE BELOW RETAINING WASHER. THESE PARTS ARE REQUIRED FOR PROPER FUNCTIONING OF CONTROLLER. DO NOT REMOVE RETAINING WASHER AND ROD SEAL FROM FLANGE ASSEMBLY BECAUSE DISASSEMBLY WILL DAMAGE ROD SEAL.** Flange Assemblies (406-33) purchased after October 1990 will be supplied with rod seal (406-32) and retaining washer (406-18) installed. When rod seal is worn, you should order a flange assembly which will contain a properly assembled rod seal. Assembly of rod seal and retaining washer into 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. The following steps should be followed if the rod seal and retaining washer are assembled in the field:

a) Using an arbor press and a properly sized blunt tool, LIGHTLY press rod seal (406-32) into center hole of flange (406-2) with ribbed side of flange up and with small spring in rod seal up. Spring in rod seal is visible upon careful examination. **CAUTION: TOO MUCH PRESSURE WILL DAMAGE ROD SEAL.**

b) Using arbor press and the same blunt tool, LIGHTLY press retaining washer (406-18) into center hole of flange to retain rod seal (406-32). **CAUTION: TOO MUCH PRESSURE WILL DAMAGE ROD SEAL.**

15. With ribbed side of flange assembly (406-33) facing poppet rod, carefully place center hole of flange assembly over poppet rod and push flange assembly over poppet rod until it touches poppet assembly (406-7).

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

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

18. Wipe mating surface of dome (406-3) clean. Insert dome into flange assembly (406-33) and, while holding pressure against main diaphragm (406-17), rotate dome clockwise until tight against stops in flange assembly.

19. Insert "O" ring (406-24) into groove in center hole of filter cap (406-9). Place dome filter (406-22) over adjuster housing (406-10) and mounting ring on top of dome (406-3). Then with flat surface up, place filter cap over adjuster housing and push snugly against dome filter.

20. Install main filter (406-21) over center of controller so bottom edge of filter is below flange of outlet body (406-1) and top edge of filter is above upper edge of flange assembly (406-33).

SENTINEL MARK II PARTS LIST

406-1	Outlet Body
• 406-2	Flange (unassembled)
406-3	Dome
406-4	Flow Ring
406-6	Plug
406-7	Poppet Assembly
406-9	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
406-33	Flange Assembly (Includes 406-2, 406-18, 406-32)

• See 406-33.

NOTE: ALL MARK I parts are interchangeable with MARK II parts.

Part number 406-4 has been changed to 406-04L.

Part number 406-33 has been changed to 406-33L.

See Step 4 of Inspection Procedure on back page of this manual for parts contained in WORN PARTS REPLACEMENT KIT.



CLEANING PROCEDURE

1. **CAUTION: DO NOT CLEAN DOME FILTER (406-22). WASHING WILL DAMAGE FILTER. REPLACE DOME FILTER WHEN THERE IS A DIFFERENCE OF 0.5" HG IN THE VACUUM SYSTEM BETWEEN WHEN DOME FILTER IS INSTALLED ON CONTROLLER AND WHEN IT IS REMOVED FROM CONTROLLER.**
2. Wash all parts [EXCEPT dome filter (406-22)] in hot soapy water until all dirt and foreign material is removed. Squeeze main filter (406-21) repeatedly while in the soapy water to clean pores of main filter.
3. Thoroughly rinse all parts [EXCEPT dome filter (406-22)] in clean water until all soap residue is removed. Squeeze main filter (406-21) repeatedly while in the rinse water. MULTIPLE RINSES MAY BE REQUIRED TO REMOVE ALL SOAP RESIDUE.
4. Squeeze main filter (406-21) repeatedly to remove water. Air dry all parts.
5. **CAUTION: MAIN FILTER (406-21) SHOULD BE CLEANED AT LEAST MONTHLY FOR OPTIMUM PERFORMANCE OF CONTROLLER.**

WARRANTY

Western Dairy Research, Inc. hereby warrants that it will repair or replace for the original purchaser any or all parts for each vacuum controller which within one year from the date of original installation is proved to the satisfaction of Western Dairy Research, Inc. to be defective in performance or quality, provided the aforesaid controller is installed for dairy barn use and in accordance with the installation instructions provided with the equipment. It is recommended by our organization that the measurement of vacuum stability be recorded at the time of installation and at repeated intervals of three to six months to insure precise performance. This measurement must be recorded by equipment capable of monitoring 0.1 inch of mercury fluctuation with a response of at least 50 milliseconds.

This warranty shall be the only obligation of Western Dairy Research, Inc. with respect to said controller, and is in lieu of all other warranties or representations, expressed or implied, and the said firm shall have no liability hereunder, either direct or contingent, for damages to persons or property, nor shall Western Dairy Research, Inc. be bound by any representation or undertakings made by other persons whether or not purporting to be authorized to act on its behalf.

This warranty is not transferable unless the firm's prior consent is endorsed hereon by the duly authorized representative.

By acceptance of this certificate, the original purchaser and any authorized transferee agrees to the conditions and provisions herein above set forth.

All warranties are void if parts within the controller are tampered with or modified.

INSPECTION PROCEDURE

1. Visually inspect all 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 ROLLING SEAL SHOULD BE CAREFULLY EXAMINED FOR DISTORTION, HOLES, NICKS, TEARS OR CRACKS IN THE RUBBER.

3. **CAUTION: DO NOT REMOVE RETAINING WASHER (406-18) AND ROD SEAL (406-32) FROM FLANGE ASSEMBLY (406-33) BECAUSE DISASSEMBLY WILL DAMAGE ROD SEAL.** Inspect rod seal (406-32) in flange assembly (406-33) for damage or excessive wear. Check sliding fit of rod of poppet assembly (406-7) in rod seal by inserting poppet rod into hole of rod seal and slowly pushing poppet rod back and forth. **CAUTION: FOR PROPER FUNCTIONING OF CONTROLLER, THERE MUST BE A SNUG SLIDING FIT AND NO SIDE CLEARANCE BETWEEN POPPET ROD AND ROD SEAL.** If there is not a proper sliding fit, replace with a new flange assembly (406-33) which will contain a new rod seal (406-32) and retaining washer (406-18). (SEE STEP 14 OF 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:

Worn Parts Replacement Kit

406-11 Dome Diaphragm	406-24 "O" Ring
406-14 Rolling Seal	406-25 Flange Screw (3 ea.)
406-15 Adjusting Knob	406-26 Adjuster Housing (3 ea.)
406-17 Main Diaphragm	406-31 Outlet Seal
406-21 Main Filter	406-33 Flange Assembly
406-22 Dome Filter	
406-04L Flow Ring	

SPECIFICATIONS

- Sensitive to 0.1" Hg change
- Adjustment range: 10" to 15" Hg
- Minimum flow while operating: 1 CFM
- Finish: ABS plastic
- 2" male N.P.T. 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.



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From other locations call (949) 598-9700

FIELD CLEANING PROCEDURE

1. Remove MARK II from vacuum line.
2. Remove main filter (406-21). Immerse main filter in hot soapy water and, while immersed, squeeze main filter repeatedly to clean pores of filter. Then immerse main filter in clean water and, while immersed, squeeze repeatedly. MULTIPLE RINSES MAY BE REQUIRED TO REMOVE ALL SOAP RESIDUE. Then squeeze 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 CONTROLLER AND WHEN IT IS REMOVED FROM CONTROLLER.**
4. Hold bottom of controller in one hand and remove dome (406-3) by rotating it counterclockwise with other hand. Set dome assembly aside.
5. Remove main diaphragm (406-17) from flange assembly.
6. Submerge remaining assembly (lower half of controller) in hot soapy water and depress poppet rod protruding from top of lower assembly until it is flush with top surface of flange assembly (406-33). Release poppet rod and allow assembly to soak for 15 minutes. After soaking, depress poppet rod while assembly is immersed and swish assembly around in soapy water to allow dirt to be washed away.
7. TURN LOWER ASSEMBLY UPSIDE DOWN SO THREADED PORTION POINTS UPWARD. PUMP POPPET ROD IN AND OUT UNTIL ALL SOAPY WATER TRAPPED BEHIND POPPET ASSEMBLY (406-7) IS DRAINED.
8. Rinse lower assembly by repeating Steps 5 and 6 EXCEPT USE CLEAN WATER. REPEATED RINSES MAY BE REQUIRED TO REMOVE ALL SOAP RESIDUE. BE SURE TO PUMP OUT ALL WATER TRAPPED BEHIND POPPET ASSEMBLY.
9. Air dry lower assembly.
10. Position main diaphragm (406-17) on flange assembly (406-33) with the metal plate of diaphragm touching protruding poppet rod. Carefully tuck bead of diaphragm into groove in flange assembly. **DO NOT** use anything sharp which might cut the rubber.
11. Wipe mating surface of dome (406-3) clean. Insert dome into flange assembly (406-33) and, while holding pressure against main diaphragm (406-17), rotate dome clockwise until tight against stops in flange assembly.
12. Install main filter (406-21) over center of controller so bottom edge of filter is below flange of outlet body (406-1) and top edge of filter is above upper edge of flange assembly (406-33).
13. Reinstall MARK II on vacuum line.

SENTINEL MARK II PARTS LIST

406-1	Outlet Body
* 406-2	Flange (unassembled)
406-3	Dome
406-4	Flow Ring
406-6	Plug
406-7	Poppet Assembly
406-9	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
406-33	Flange Assembly (Includes 406-2, 406-18, 406-32)

*See 406-33.

Worn Parts Replacement Kit

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
406-33	Flange Assembly
406-04L	Flow Ring

NOTE: Part number 406-4 has been changed to 406-04L.
Part number 406-33 has been changed to 406-33L.

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 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 of 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 seal rod or seal rod missing	Replace with flange assembly *

* Replacement flange assembly (406-33) must include rod seal (406-32) and retaining washer (406-18).