

# VENTLINE

*DIVISION OF PHILIPS PRODUCTS*

## **Monitor Panel Troubleshooting**

A technical overview and troubleshooting guide for “Two Wire” and “Conventional” monitor panel systems manufactured by Ventline. Ventline furnishes this guide as a service to our customers. It is intended to offer a better understanding of operating theory and practical solutions for real world problems.

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### **Technical Support**

If the following information is inadequate to solve your specific troubleshooting requirement on any Ventline monitor panel system please contact Ventline for technical support. Ventline technical support staff will require the specific model number of the monitor panel in question (marked on the rear of the monitor panel), as well as the make and model of the recreational vehicle in which the monitor is installed. Please be prepared with this information in advance. Failure to furnish this information will result in unavoidable delays and may prevent us from assisting altogether.

Thank you

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## **Two Wire Monitor Panel Systems - An Overview**

The "Two wire" monitor system is commonly used to monitor holding tank levels, battery charge levels, and LP gas levels in recreational vehicles. This technology offers the consumer a convenient method for determining status of the above from a central location. It offers the RV manufacturer improved installation over conventional systems due to the reduced number of wires required. Monitor systems are commonly located in a wall mount panel, or furnished as part of the galley range exhaust hood. Regardless of the location or style of monitor, the basic purpose and function of all two wire monitor systems are the same.

### **Components Of The Two Wire System**

**Monitor Panel** - The monitor panel consists of a metal or plastic chassis to which the printed circuit board, switching, and printed overlay are attached. The panel can be wall mounted with screws or mounted to the range exhaust hood using various methods. Each monitor panel manufactured by Ventline has been designed to provide for specific functions as specified by the RV manufacturer. Holding tank levels are typically displayed in 1/3 tank increments. The monitor panel is generally equipped with a single test switch and individual lighted status displays for each status point being monitored.

**Wiring Harness** - The wiring harness is an engineered assembly of wires and connectors which provides the monitor panel with 12 volt DC power as well as inputs from those items being monitored. Wiring harnesses are typically color-coded. The wiring diagram prepared for each Ventline monitor panel will reflect the color-coding specified by the RV manufacturer.

**Tank Resistor Harness** - The tank resistor harness combines color-coded wiring with encapsulated electronic components. Each tank resistor harness will have a wire dedicated to each tank level being monitored as well as a common wire that provides an input to the circuit board through the wiring harness. **Holding Tank Sensors** - The holding tank sensors are located in the sidewall of the holding tanks at various locations corresponding with the levels being monitored. Sensors may be permanent or removable. The relative location of these stainless steel sensors will vary with the configuration of the holding tank.

**Fresh Water Probe** - The fresh water probe is a specially designed probe for use with potable water. It consists of various lengths of stainless steel wire, which are suspended through a threaded fitting from the top of the fresh water tank.

Please refer to the drawings shown in Appendix "A" for identification of system components, typical wiring configurations, and suggested installation methods. Ventline manufactures a wide variety of monitor panel systems to OEM specifications. The drawings shown in Appendix "A" are intended to show general system configuration only. Your system may contain more or less features based on specific OEM requirements. If you require technical information or repair parts, please contact your RV dealer or RV manufacturer for assistance in identification of your specific system.

### **Installation**

To insure proper operation, each monitor system must be installed in accordance with the appropriate wiring diagram and tank sensor location diagram. The 12VDC power source must be the vehicle battery or originate from the filtered/battery side of the AC/DC power converter. Undesirable line noise present on the unfiltered side of the AC/DC power converter will cause a number of unpredictable malfunctions.

### **Operation Overview - Two Wire Systems.**

**Test Switch** - The two wire system uses a single “test” switch and multiple lighted displays. When the “test” switch is pressed the status of all functions being monitored will be displayed simultaneously.

**Water pump switch** - This switch is used to operate the water pump system. Pressing this switch to the “on” position will energize the water pump and illuminate a red indicator light labeled “pump” or “pump on”. Pressing this switch to the off position will de-energize the water pump and turn off the indicator light.

**Water heater switch** - This switch is used to operate the water heater. Pressing this switch to the “on” position will begin the water heater ignition sequence. During the ignition sequence, the indicator light labeled “pilot” or “pilot out” will flash on and off. This light will turn off when ignition is complete. As additional hot water is required, the water heater will automatically re-light as evidenced by the flashing indicator light. If water heater ignition is not successful, the light will remain on, indicating a fault condition. If ignition is not successful, place the switch in the off position for 30 seconds before repeating the ignition sequence. If the fault condition continues, consult the RV manufacturer or the water heater manufacturer for assistance in troubleshooting. The water heater switch should remain in the “on” position as long as hot water is desired.

**Hood light switch** - This switch will be present on range hood mounted panels only. Pressing this switch to the “on” position will illuminate the light furnished as part of the range hood. Pressing the switch to the “off” position will turn off the light.

**Hood fan switch** - This switch will be present on range hood mounted panels only. Used for operating the exhaust fan furnished with the range hood, this switch is offered in three different forms based on hood model.

Single speed rocker switch - When pressed to the “on” position, this switch will energize the single speed exhaust fan. On some models this switch will also energize a remote mounted exterior vent, causing it to open during fan operation. Pressing the switch to the “off” position will de-energize the fan (and close the exterior vent if so equipped.)

Dual speed rocker switch - This three position switch will energize the exhaust fan to high or low speed, with the center position being “off”. On some models this switch will also energize a remote mounted exterior vent, causing it to open during fan operation. Pressing the switch to the center “off” position will de-energize the fan (and close the exterior vent if so equipped.)

Dual speed lever switch - This three position switch will energize the exhaust fan to high or low speed, with the far left position being “off”. This switch will also open a remote mounted exterior vent during fan operation. Moving the switch to the left “off” position will de-energize the fan and close the exterior vent.

**Caution: Never operate the range burners without energizing the range hood exhaust fan.**

## **Troubleshooting - All Two Wire Systems**

When troubleshooting a problem with a Ventline monitor system, always remember that there are four basic system components to consider:

- 1) The monitor panel assembly, which includes the circuit board, lights, and switching.
- 2) The wiring harness, which includes the wires and connectors that connect the monitor panel to 12 volt DC power, ground, tank resistor harnesses, LP sensors and switching.
- 3) The tank resistor harness, which includes the wires, connectors, and encapsulated electronic components.
- 4) The holding tank sensors and fresh water probes.

In many cases a malfunction of one of the above components will be reflected in another, which can result in misdiagnosis of the actual problem. Ventline recommends a consistent, methodical approach to troubleshooting in order to diagnose and correct the problem with the minimum investment in time and resources.

### **Prior to troubleshooting any monitor panel problem, verify the following:**

- 1) You are in possession of the correct wiring diagram for the specific system requiring diagnostics
- 2) The 12VDC power source is present and originates from the battery or the filtered side of the power converter.
- 3) The chassis ground is present and has a good connection through the negative side of the battery.
- 4) The monitor panel assembly has been inspected and is free from damage. Check for broken wires, loose components and connectors.
- 5) The wiring harness is connected properly and is free from damage.
- 6) The tank resistor harnesses are connected properly and are free from damage
- 7) The tank level sensors and fresh water probes are properly located and are free from damage.
- 8) All wiring is done in accordance with the wiring diagram.
- 9) All of the above components are accessible during troubleshooting
- 10) After the above is verified, proceed with troubleshooting the system. Common problems are listed starting on the following page, followed by individual troubleshooting sections devoted to each problem.

### **Common Field Problems**

- Inaccurate Holding Tank Level Readings
- Some Or All Holding Tank Level Lights Not Coming On
- Some Or All Holding Tank Level Lights Continuously On
- LP Gas Levels Not Reading Properly
- Range Hood Light Not Functioning (Hood Mounted Panels Only)
- Range Hood Fan Not Functioning (Hood Mounted Panels Only)

## **Inaccurate Holding Tank Level Readings**

The accuracy of two wire holding tank monitoring systems can be adversely affected by dirty tanks, unusual mineral content in the water, or improper holding tank probe location. These conditions can cause the monitoring system to have oversensitive (reads higher than actual level) or undersensitive (reads lower than actual level) readings.

**Oversensitive readings:** Oversensitive readings can occur as a result of scum buildup on the tank walls, abnormally high mineral content in the water, or incorrectly located holding tank probes. In these situations, the monitoring system indicates higher levels than are actually present in the holding tank. Certain cleaning products and food by-products can build up on the inside walls of the holding tanks producing a layer of scum that can cause the monitoring system to read higher than the actual level. To correct this problem, the holding tanks should be cleaned periodically (consult dealer or tank manufacturer for cleaning instructions). If the problem persists after cleaning the holding tank, the ground probe can be moved farther away from the other tank probes. The increased distance between the ground probe and the other probes will decrease the sensitivity of the monitoring system.

**Undersensitive readings:** Undersensitive readings can occur if the mineral content of the water is abnormally low or if the holding tank probes are located incorrectly. In this case, the monitoring system indicates lower levels than are actually present in the holding tank. This problem can be corrected by moving the ground probe closer to the other probes. Moving the ground probe closer increases the sensitivity of the monitoring system.

**The Ventline Adjustaboard™:** This adjustable circuit board allows for field adjustments to monitor sensitivity. As tank conditions or water mineral content changes, the monitor circuitry may be made more or less sensitive as required. Please see Appendix A for adjustment instructions.

### **Some or All Holding Tank Level Lights Not Coming On**

Possible Cause	Corrective Action
No power	Verify 12 volt DC power is available from the battery or from the filtered side of the power converter. Verify 12 volt DC power is present at the circuit board.
Poor ground at monitor panel or at holding tank ground probe.	Verify ground at panel and ground probe with a continuity tester.
Wire to tank resistor harness disconnected or damaged.	Verify wire is connected and free of damage. Replace if necessary. With the tank resistor harness correctly installed and free from damage, a jumper wire containing a 47Kohm resistor placed between the holding tank ground probe and any tank level probe should cause the respective tank level lights to illuminate.
Short circuit on circuit board	If the above test fails to illuminate the level lights, repeat the test at the monitor panel. Refer to the wiring diagram for the correct wires to jump together. If lights illuminate, replace the wiring between the panel and the tank resistor harness. If lights do not illuminate, replace the circuit board.

### **Some Or All Holding Tank Level Lights On Continuously**

Possible Cause	Corrective Action
Foreign substances on interior of holding tank causing false readings	See inaccurate holding tank readings above. Clean holding tanks per manufacturers recommendations
Tank sensor wire from panel to tank resistor harness shorted to ground.	Disconnect wire from panel and tank resistor harness. Verify wire is not shorted to ground with a continuity tester. Replace wire if shorted.
Tank resistor harness shorted internally.	Disconnect the tank resistor harness from the tank sensors and from the wire connected to the monitor panel. Check resistance between tank sensor wires with an Ohmmeter. Typical resistance will be 68k ohm between Full and 2/3 levels, 68k ohm between 2/3 and 1/3 levels, and 136k ohm between Full and 1/3 levels. Specific resistance will vary based on resistor harness model, but at no time should you detect a dead short or an open circuit. For resistor values specific to your application, please determine the model number of the resistor harness in question and contact Ventline for assistance. If a short or open is detected, replace the tank resistor harness.
Short circuit on circuit board	If the above steps fail to pinpoint the specific problem, replace circuit board and re-test.

### **LP Gas Levels Not Reading Accurately**

Possible Cause	Corrective Action
Open circuit between panel and LP sensor causes tank to incorrectly read full. Short circuit between panel and LP sensor causes tank to incorrectly read empty	Disconnect the wire running from the monitor panel to the LP sensor. Check the wire for damage and with a continuity tester to verify the wire is OK. If OK, reconnect and check operation. If circuit is open or shorted replace the wire and re-test.
Defective LP sensor provides incorrect signal to monitor panel causing incorrect readings.	Consult the RV manufacturer for information on troubleshooting the LP sensor. Replace the LP sensor and re-test.

### **Range Hood Light Not Functioning**

Possible Cause	Corrective Action
No Power	Verify 12 volt DC power is present. Verify power wiring is intact and free from damage.
Defective light switch	Verify switch function with continuity tester. If test shows switch failure, replace switch.
Burned out light bulb	Replace light bulb

### **Range Hood Exhaust Fan Not Functioning**

Possible Cause	Corrective Action
No Power	Verify 12 volt DC power is present. Verify power wiring is intact and free from damage.
Defective fan switch	Verify switch function with continuity tester. If test shows switch failure, replace switch.
Defective fan motor	Test fan motor with a known 12 volt DC power source. If motor will not function, replace the motor.

## **Conventional Monitor Panel Systems - An Overview**

The “Conventional” monitor system is commonly used to monitor holding tank levels, battery charge levels, and LP gas levels in recreational vehicles. This technology offers the consumer a convenient method for determining status of the above from a central location. Monitor systems are commonly located in a wall mount panel, or furnished as part of the galley range exhaust hood. Regardless of the location or style of monitor, the basic purpose and function of all conventional monitor systems are the same.

### **Components Of The Conventional System**

**Monitor Panel** - The monitor panel consists of a metal or plastic chassis to which the printed circuit board, switching, and printed overlay are attached. The panel can be wall mounted with screws or mounted to the range exhaust hood using various methods. Each monitor panel manufactured by Ventline has been designed to provide for specific functions as specified by the RV manufacturer. Holding tank levels are typically displayed in 1/4 increments. The monitor panel is normally equipped with a single lighted status display and individual test switches for each status point monitored.

**Wiring Harness** - The wiring harness is an engineered assembly of wires and connectors which provides the monitor panel with 12 volt DC power as well as inputs from those items being monitored. Wiring harnesses are typically color-coded. The wiring diagram prepared for each Ventline monitor panel will reflect the color-coding specified by the RV manufacturer.

**Holding Tank Sensors** - The holding tank sensors are located in the sidewall of the holding tanks at various locations corresponding with the levels being monitored. Sensors may be permanent or removable. The relative location of these stainless steel sensors will vary with the configuration of the holding tank.

**Fresh Water Probe** - The fresh water probe is a specially designed probe for use with potable water. It consists of various lengths of stainless steel wire that are suspended through a threaded fitting from the top of the fresh water tank.

Please refer to the drawings shown in Appendix B for identification of system components, typical wiring configurations, and suggested installation methods. Ventline manufactures a wide variety of monitor panel systems to OEM specifications. The drawings shown in Appendix B are intended to show general system configuration only. Your system may contain more or less features based on specific OEM requirements. If you require technical information or repair parts, please contact your RV dealer or RV manufacturer for assistance in identification of your specific system.

### **Installation**

To insure proper operation, each monitor system must be installed in accordance with the appropriate wiring diagram and tank sensor location diagram. The 12VDC power source must be the vehicle battery or originate from the filtered/battery side of the AC/DC power converter. Undesirable line noise present on the unfiltered side of the AC/DC power converter will cause a number of unpredictable malfunctions.

### **Operation Overview - Conventional Multi Switch Systems.**

**Fresh water status switch** - (commonly labeled “Fresh Tank”, “Fresh”, and “Water Level”) : Pressing and holding this switch will display the liquid level of the fresh water holding tank on the monitor panel display.

**Holding tank #1 status switch** - (commonly labeled “Black Tank”, “Black”, and “HT1”): Pressing and holding this switch will display the liquid level of the sewage

holding tank on the monitor panel display.

**Holding tank #2 status switch** - (commonly labeled “Gray Tank”, “Gray”, and “HT2”): Pressing and holding this switch will display the liquid level of the wastewater holding tank on the monitor panel display. The source of this wastewater is typically a sink or shower. Some recreational vehicles will be equipped with multiple wastewater holding tanks and the monitor panels will be marked accordingly.

**LP Gas status switch** - (commonly labeled “LP”): Pressing and holding this switch will display the fuel level of the LP gas tank(s) on the monitor panel display.

**Battery condition status switch** - (commonly labeled “Battery” or “Battery Charge”): Pressing and holding this switch will display the charge level of the battery(s) on the monitor panel display. Charge increments are displayed as nominal voltage levels or as “good, fair, low” as specified by the RV manufacturer.

**Water pump switch** - This switch is used to operate the water pump system. Pressing this switch to the “on” position will energize the water pump and illuminate a red indicator light labeled “pump” or “pump on”. Pressing this switch to the off position will de-energize the water pump and turn off the indicator light.

**Water heater switch** - This switch is used to operate the water heater. Pressing this switch to the “on” position will begin the water heater ignition sequence. During the ignition sequence, the indicator light labeled “pilot” or “pilot out” will flash on and off. This light will turn off when ignition is complete. As additional hot water is required, the water heater will automatically re-light as evidenced by the flashing indicator light. If water heater ignition is not successful, the light will remain on, indicating a fault condition. If ignition is not successful, place the switch in the off position for 30 seconds before repeating the ignition sequence. If the fault condition continues, consult the RV manufacturer or the water heater manufacturer for assistance in troubleshooting. The water heater switch should remain in the “on” position as long as hot water is desired.

**Hood light switch** - This switch will be present on range hood mounted panels only. Pressing this switch to the “on” position will illuminate the light furnished as part of the range hood. Pressing the switch to the “off” position will turn off the light.

**Hood fan switch** - This switch will be present on range hood mounted panels only. Used for operating the exhaust fan furnished with the range hood, this switch is offered in three different forms based on hood model.

Single speed rocker switch - When pressed to the “on” position, this switch will energize the single speed exhaust fan. On some models this switch will also energize a remote mounted exterior vent, causing it to open during fan operation. Pressing the switch to the “off” position will de-energize the fan (and close the exterior vent if so equipped.)

Dual speed rocker switch - This three position switch will energize the exhaust fan to high or low speed, with the center position being “off”. On some models this switch will also energize a remote mounted exterior vent, causing it to open during fan operation. Pressing the switch to the center “off” position will de-energize the fan (and close the exterior vent if so equipped.)

Dual speed lever switch - This three position switch will energize the exhaust fan to high or low speed, with the far left position being “off”. This switch will also open a remote mounted exterior vent during fan operation. Moving the switch to the left “off” position will de-energize the fan and close the exterior vent.

**Caution: Never operate the range burners without energizing the range hood exhaust fan.**

## **Troubleshooting - All Conventional Systems**

When troubleshooting a problem with a Ventline conventional monitor system, always remember that there are three basic system components to consider:

- 1) The monitor panel assembly, which includes the circuit board, lights, and switching.
- 2) The wiring harness, which includes the wires and connectors which connect the monitor panel to 12 volt DC power, ground, tank sensors, LP sensors and switching.
- 3) The holding tank sensors, level sensors, and fresh water probes.

In many cases a malfunction of one of the above components will be reflected in another, which can result in misdiagnosis of the actual problem. Ventline recommends a consistent, methodical approach to troubleshooting in order to diagnose and correct the problem with the minimum investment in time and resources.

### **Prior to troubleshooting any monitor panel problem, verify the following:**

- 1) You are in possession of the correct wiring diagram for the specific system requiring diagnostics
- 2) The 12VDC power source is present and originates from the battery or the filtered side of the power converter.
- 3) The chassis ground is present and has a good connection through the negative side of the battery.
- 4) The monitor panel assembly has been inspected and is free from damage. Check for broken wires, loose components and connectors.
- 5) The wiring harness is connected properly and is free from damage.
- 6) The tank sensor and level sensor wires are connected properly and are free from damage
- 7) The tank level sensors and fresh water probes are properly located and are free from damage.
- 8) All wiring is done in accordance with the wiring diagram.
- 9) All of the above components are accessible during troubleshooting

After the above is verified, proceed with troubleshooting the system. Common problems are listed starting on the following page, followed by individual troubleshooting sections devoted to each problem.

## **Common Field Problems**

- 1) Inaccurate Holding Tank Level Readings
- 2) Some Or All Holding Tank Level Lights Not Coming On
- 3) Some Or All Holding Tank Level Lights Continuously On
- 4) LP Gas Levels Not Reading Properly
- 5) Range Hood Light Not Functioning (Hood Mounted Panels Only)
- 6) Range Hood Fan Not Functioning (Hood Mounted Panels Only)

### **Inaccurate Holding Tank Level Readings**

The accuracy of conventional holding tank monitoring systems is rarely affected by dirty tanks, unusual mineral content in the water, or improper holding tank probe location. In extreme cases these conditions can cause the monitoring system to have oversensitive (reads higher than actual level) or undersensitive (reads lower than actual level) readings.

**Oversensitive readings:** Oversensitive readings can occur as a result of extreme scum buildup on the tank walls, or incorrectly located holding tank probes. In these situations, the monitoring system indicates higher levels than are actually present in the holding tank. Certain cleaning products and food by-products can build up on the inside walls of the holding tanks producing a layer of scum that can cause the monitoring system to read higher than the actual level. To correct this problem, the holding tanks should be cleaned periodically (consult dealer or tank manufacturer for cleaning instructions).

**Undersensitive readings:** Undersensitive readings can occur if the mineral content of the water is abnormally low or if the holding tank probes are located incorrectly. In this case, the monitoring system indicates lower levels than are actually present in the holding tank. This problem can be corrected by moving the sensor probes closer to the level probes. The decreased distance between the sensor probes and the level probes will increase the sensitivity of the monitoring system.

### **Some or All Holding Tank Level Lights Not Coming On**

Possible Cause	Corrective Action
No power	Verify 12 volt DC power is available from the battery or from the filtered side of the power converter. Verify 12 volt DC power is present at the circuit board.
Poor ground at monitor panel	Verify ground integrity at panel with a continuity tester.
Wires to tank sensors or level sensors disconnected or damaged.	Verify wires are connected and free of damage. Replace if necessary. With the tank sensor wires correctly installed and free from damage, a jumper wire placed between the holding tank sensor probe and any tank level probe should cause the respective tank level lights to illuminate.
Short circuit on circuit board	If the above test fails to illuminate the level lights, repeat the test at the monitor panel. Refer to the wiring diagram for the correct wires to jump together. If lights illuminate, replace the wiring between the panel and the tank sensors. If lights do not illuminate, replace the circuit board.

### **Some Or All Holding Tank Level Lights On Continuously**

Possible Cause	Corrective Action
Foreign substances on interior of holding tank causing false readings	See inaccurate holding tank readings above. Clean holding tanks per manufacturers recommendations
Tank sensor wire from panel to tank sensor probe shorted to wire for tank level probe.	Disconnect wires from panel and tank sensor probes. Verify wires are not shorted with a continuity tester. Replace wire if shorted.
Short circuit on circuit board	If the above steps fail to pinpoint the specific problem, replace circuit board and re-test.

### **LP Gas Levels Not Reading Accurately**

Possible Cause	Corrective Action
Open circuit between panel and LP sensor causes tank to incorrectly read full. Short circuit between panel and LP sensor causes tank to incorrectly read empty	Disconnect the wire running from the monitor panel to the LP sensor. Check the wire for damage and with a continuity tester to verify the wire is OK. If OK, reconnect the wire and check operation. If circuit is open or shorted replace the wire and re-test.
Defective LP sensor provides incorrect signal to monitor panel causing incorrect readings.	Consult the RV manufacturer for information on troubleshooting the LP sensor. Replace the LP sensor and re-test.

### **Range Hood Light Not Functioning**

Possible Cause

Corrective Action

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No Power	Verify 12 volt DC power is present. Verify power wiring is intact and free from damage.
Defective light switch	Verify switch function with continuity tester. If test shows switch failure, replace switch.
Burned out light bulb	Replace light bulb

**Range Hood Exhaust Fan Not Functioning**

Possible Cause

Corrective Action

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No Power	Verify 12 volt DC power is present. Verify power wiring is intact and free from damage.
Defective fan switch	Verify switch function with continuity tester. If test shows switch failure, replace switch.
Defective fan motor	Test fan motor with a known 12 volt DC power source. If motor will not function, replace the motor.

## **Appendix A - 2 Wire systems - Table of contents**

- Page 1 Typical wiring and component identification for a hood mounted, multi light, 2 wire monitor panel.
- Page 2 Typical wiring and component identification for a wall mounted multi switch, 2 wire monitor panel.
- Page 3 Adjustaboard™ adjustment instructions.
- Page 4 Holding tank probe locations for 2 wire monitor systems.

## **Appendix B - Conventional Systems - Table of contents**

- Page 1 Typical wiring and component identification for a hood mounted, multi-light, conventional monitor panel.
- Page 2 Typical wiring and component identification for a wall mounted multi switch, conventional monitor panel.
- Page 3 Holding tank probe locations for conventional monitor panel systems.

## **Technical Support**

If the preceding information was inadequate to solve your specific troubleshooting requirements on any Ventline monitor panel system please contact Ventline for technical support. Ventline technical support staff will require the specific model number of the monitor panel in question (marked on the rear of the monitor panel), as well as the make and model of the recreational vehicle in which the monitor is installed. Please be prepared with this information in advance. Failure to furnish this information will result in unavoidable delays and may prevent us from assisting altogether.

Thank you

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