



FILTERSCAN®

Reference Guide
Version 2.4

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Introduction

Congratulations on your purchase of the CleanAlert **FILTERSCAN®** Air Filter Clog Detection System. The CleanAlert **FILTERSCAN®** is intended for continuous and automatic monitoring of the clogging of an air filter installed into a household or commercial forced air heating, air conditioning, or heat pump system. Please read all instructions carefully to insure years of trouble-free operation. We're sure you enjoy outstanding performance when the **FILTERSCAN®** is installed by a qualified HVAC technician and properly operated.

In The Box

1. **FILTERSCAN®** Monitor
2. 4 "AA" Batteries ("B" models only)
3. Installation and Operation Guide
4. Template for attaching the **FILTERSCAN®** Monitor to an air duct
5. Mounting Screws
6. Packaging / box
7. External wall adapter power supply – Optional ("B" models only)
8. **FILTERSCAN®** Receiver – Optional ("W" models only)
9. 2 "AAA" Batteries (Receiver only)

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Tools Required

1. Drill
2. 7/64" drill bit
3. 3/8" drill bit
4. Phillips Screwdriver
5. 1/2" drill bit (if Model CA-4DP Differential Pressure kit ordered)

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Safety

WARNING! READ AND UNDERSTAND ALL INSTRUCTIONS. Failure to follow all instructions may result in electrical shock and or serious personal injury.

Application

FILTERSCAN® is an air filter clogging detection system. It has been designed to monitor the amount of dirt building on an air filter and alert the user when the amount of clogging reaches a pre-determined threshold.

The **FILTERSCAN®** Monitor is compatible with most air filters ranging in differential pressure drop from 0.10"wg to 4.0"wg and with single or multi-speed blowers, but not compatible with VAV (Variable Air Volume) systems.

If the wireless option has been installed, the **FILTERSCAN®** Monitor will transmit alarm conditions to a remote Receiver. The Receiver may be located up to 100 feet from the Monitor depending upon line-of-sight and obstacles located between the Monitor and Receiver.

FCC Compliance

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC ID Number: **AUPFS-242**

IC Compliance

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Cet appareil est conforme à Industrie Canada exempts de licence RSS norme. Opération est soumis aux deux conditions suivantes: (1) cet appareil ne peut pas causer de brouillage et (2) cet appareil doit accepter toute interférence, y compris les interférences pouvant causer un fonctionnement intempestif du dispositif.

Model: FS-242-BW Modèle: FS-242-BW

Model: FS-242-CW Modèle: FS-242-CW

IC Certification/Registration Number IC: **10341A-FS242**

Numéro de Certification / d'enregistrement les IC: **10341A-FS242**

Monitor Installation

Although the CleanAlert **FILTERSCAN®** Air Filter Clogging Monitor and Alarm, Model FS-242, may be installed upstream, downstream, or differentially across the air filter (using optional tubing kit Model CA-4DP), the best results will be found when installing downstream of the air filter (that is, between the air filter and the system blower fan, usually located at the return duct of the HVAC system).

WARNING!

Ensure that the HVAC system blower motor/fan is turned OFF until told to otherwise!

1. The **FILTERSCAN®** Monitor is to be attached to the external wall of the air duct, either upstream or downstream from the air filter to be

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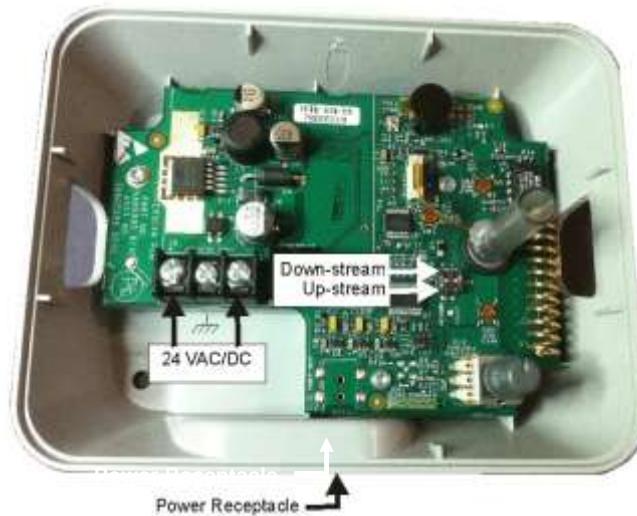
monitored. NOTE: The minimum distance for positioning the **FILTERSCAN®** Monitor from the air filter is six (6) inches.

2. Locate an area on the return duct, preferably downstream from the air filter (that is, between the air filter and the system blower), large enough to place the Monitor template on a flat surface and where there are NO obstacles inside the duct. There should be sufficient clearance from the surrounding walls and from any components of the air supply system.
3. Place the Monitor template at the location found in the previous step, such that "TOP" is facing upward. NOTE: The **FILTERSCAN®** Monitor front panel must be clearly visible when installed.
4. Using the template, drill one large hole, (3/8") for the sensor and four small holes (7/64") for the mounting screws.
5. Attach the **FILTERSCAN®** Monitor by aligning its sensor tube with the larger hole and secure the Housing using the mounting screws supplied. The sensor tube does not extend into the duct.



6. Set the Upstream/Downstream switch so that it matches the **FILTERSCAN®** Monitor position with respect to the air filter (that is, OFF for upstream mounting or ON for downstream or differential mounting). The switch can be accessed by removing the front cover of the Monitor.

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7. Apply power:
 - a. Models FS-242-B and FS-242-BW - Insert the wall mount power adapter into the **FILTERSCAN®** power receptacle, or install 4 AA batteries and replace the Monitor front cover. See Appendix for battery replacement.
 - b. Models FS-242-C and FS-242-CW – These models should be installed by a qualified electrician, and are powered from the HVAC systems auxiliary 24 VAC/DC power supply. A typical installation will have that power run through rigid conduit to the **FILTERSCAN®**.
 - c. The **STATUS** LED should come on green momentarily then turn and remain red. This indicates that the unit has not yet been calibrated to the air filter and HVAC system upon which it is installed.

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8. Wait for approximately 15 seconds (warm up and stabilization time).
9. Install a clean, new air filter into the HVAC system.
10. Depress the **ZERO/CLEAN** button ONCE. The **STATUS** LED will blink yellow for several seconds while the **FILTERSCAN®** records the system's FAN OFF condition, then turn to blinking green. This indicates proper operation and that you are ready to move to next step. If the unit detects the zero air flow is out of limits, the **STATUS** LED will blink red. In this case, check to see that the HVAC system blower fan is OFF and no conditions exist during this part of the calibration that would cause air to be moving within the HVAC ducts, such as opening and closing of doors or windows. If no such condition exists, contact the company that you purchased the **FILTERSCAN®** from for repair information.
11. Adjust the thermostat temperature adjustment to either increase or decrease the room temperature by at least four degrees, enough to signal the HVAC system to turn on heating or cooling.
12. Once the HVAC system blower fan turns on, wait one minute for the blower fan to stabilize.
13. Depress the **ZERO/CLEAN** button once. The **STATUS** LED should turn from blinking green to blinking yellow for several minutes. This indicates that the unit is calibrating itself to the air filter and HVAC system into which it is installed. Once calibration is completed, the **STATUS** LED will blink green a few times then turn off.
14. Return the thermostat to normal operating temperature. This concludes the installation of the **FILTERSCAN®** Monitor.
15. The **SERVICE FILTER** control is a fine tuning adjustment that has been calibrated to the mid-range, Recommended Setting at the factory. This control allows the user to change the point at which the clog alarm will be triggered. Turning the **SERVICE FILTER** adjustment clockwise will cause the **FILTERSCAN®** to issue an alarm at a lower level of filter clogging. Turning the **SERVICE FILTER** adjustment counter-clockwise will cause the **FILTERSCAN®** to issue an alarm at a higher level of filter clogging.

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Receiver Installation – Wireless Option Only

1. Remove the front cover of the Receiver by depressing the latch at the top of the Receiver housing, rotating the front cover downward, and lifting the front cover out of the housing.



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2. Install two AAA batteries.



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3. Your FILTERSCAN® Monitor and Receiver have been paired (matched) at the time of manufacturing and should require no further attention.
4. To test the pairing of the Monitor and Receiver:
 - a. Monitor and Receiver should be turned on and in close proximity to each other.
 - b. Test the Receiver by inserting a paperclip through the small hole in the front cover of the Receiver until the click of a switch is felt, then **immediately** pressing the **SEND** button on the Monitor. This transmits a signal to the Receiver, which turns on the Red LED and Beeper.



5. To insure proper operation when Receiver is placed in a desired remote location, retest the Receiver as described above. This remote procedure may require two people.

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NOTE: Although the wireless transmission range is up to 100 feet, it is greatest with no obstructions between the Monitor (transmitter) and Receiver. Any obstructions, such as walls, floors, and ceilings will reduce the range of transmission, and relocation of the Receiver may be required. Retest with each location to ensure proper operation

6. Mount the Receiver vertically by using the screws or adhesive strip supplied.
7. Install the front cover by placing the bottom flanges into the housing and rotating the cover upward until the top latches into the housing.

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Operation

System Monitoring

The **STATUS** LED will blink green approximately once per minute (called a heartbeat) to indicate that the unit is functioning properly. Usually the **FILTERSCAN®** will be in the standby mode, conserving power. It wakes up periodically to monitor air filter condition, battery level, and system operation. If no alarm conditions are detected, the **FILTERSCAN®** goes back to sleep after several minutes of monitoring.

NOTE: Should there be a power failure the **FILTERSCAN®** will save all parameters such as the clean air filter calibration and the current state of the air filter. When power is restored, the **FILTERSCAN®** Monitor will continue operation with no user action required. The same applies when replacing depleted batteries.

Alarm Modes

The **FILTERSCAN®** provides both audible and or visual alarms indicating a clogged air filter, a low battery, or a system malfunction. There is also a wireless option which allows remote monitoring of system conditions.

NOTE: The HVAC system blower fan must be running when the **FILTERSCAN®** Monitor attempts to check air filter condition. Since the **FILTERSCAN®** Monitor checks the air filter condition periodically, it may take several days to detect, trigger, and alarm a clogged filter condition.

Clogged Air Filter

When the **FILTERSCAN®** detects a clogged air filter, an alarm condition is triggered. The red **STATUS** LED will illuminate, blinking five times approximately every ten minutes until the alarm condition is reset. There will also be an audio alert which corresponds to the visual alarm indication. The clogged filter alarm is reset by installing a new, clean air filter, depressing the **CALIBRATE** button, and then following the instructions in the section "Calibrating When Installing a New Air Filter".

NOTE: A new air filter should always be installed whenever the **CALIBRATE** operation is performed.

Low Battery

When the **FILTERSCAN®** detects a low battery condition, an Alarm condition is triggered. The **STATUS** LED will blink yellow approximately once per minute to indicate a low battery in the Monitor. Replacing the Monitor batteries (see the Appendix for instructions) will reset the alarm condition.

Malfunction

When the **FILTERSCAN®** detects an internal malfunction, an alarm condition is triggered. The red **STATUS** LED will illuminate continuously until the malfunction is corrected. In the unlikely event this should occur, remove power from the **FILTERSCAN®** by removing the batteries,

unplugging the optional AC Adapter, or in the case of conduit-powered models ("C") contacting your HVAC system electrician to have the power to the Monitor cut. Wait for a minute and restore power. If your **FILTERSCAN®** unit is operating with both AC Adapter and batteries installed, both will need to be removed in order to reset the malfunction. If this does not reset the malfunction alarm, contact the company that you purchased the **FILTERSCAN®** from for repair information.

Calibrating When Installing a New Air Filter

Whenever a new air filter is installed, the **FILTERSCAN®** clog detector system must be calibrated. Calibration establishes the clogged air filter detection threshold based upon the condition recorded for a new air filter. When a new air filter is installed, its condition is recorded and saved in nonvolatile memory.

1. Insure that the HVAC system is **OFF** at the thermostat.
2. Remove the dirty air filter from the HVAC system.
3. Install a new, clean air filter into the HVAC system.
4. Make sure the **FILTERSCAN®** Monitor power is **ON** via either AC Adapter or Battery installation, making sure the low battery indication is not being displayed.
5. Depress the **ZERO/CLEAN** button on the **FILTERSCAN®** Monitor.
6. Wait for the red **STATUS** LED to illuminate.
7. Depress the **ZERO/CLEAN** button again.
8. Wait several seconds for the **STATUS** LED to change from blinking yellow to blinking green.
9. Turn the HVAC system **ON** at the system thermostat.
10. Set the thermostat temperature adjustment to either increase or decrease the room temperature by four degrees, which should be enough to signal the HVAC system to turn heating or cooling on.
11. Wait one minute for the HVAC system blower fan to turn on and stabilize.
12. Depress the **ZERO/CLEAN** button again.
13. Wait several minutes for the **STATUS** LED to turn from blinking yellow to blinking green. During this time, the unit is recording the condition of a clean air filter.
14. Wait several seconds for the blinking green **STATUS** LED to turn **OFF**.
15. Return the thermostat to normal operating temperature.

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Your **FILTERSCAN®** Monitor is now calibrated to the type of air filter you have installed. Depending on the air filter type and manufacturing tolerances, you may need to calibrate the **FILTERSCAN®** air filter clogging detector each time a new air filter is installed.

Automatic Adjustment

ATTENTION - HVAC systems with two-speed blowers! Typical HVAC systems will have different blower speeds for Heat and A/C. The **FILTERSCAN®** Monitor automatically adapts to the changes in HVAC blower speeds.

Specifications

Pressure Differential Range	0.1 to 4.0 in H ₂ O
Clog Filter Trigger Point	1.5 to 2 times initial differential pressure (at the recommended setting on the SERVICE FILTER control)
Temperature Range	32° to +122° F (0° to +50° C) Operating

Humidity	-40° to +257° F (-40° to + 125° C) Storage 80% RH, non-condensing
Power Requirements (-B & -BW)	5.5 VDC at 25 mA Status LED on, 3 mA Transmitting, 60 uA Standby
Batteries, Monitor (-B & -BW)	(4) AA 2400 mAH
Batteries, Receiver	(2) AAA 1100 mAH
Battery Life	Approximately 1 year
Power Requirements (-C & -CW)	24 VAC/DC at 25 mA Status LED on, 3 mA Transmitting, 60 uA Standby
Insertion Depth into Duct	Does not extend into duct
Clogged Air Filter Alarm	Red STATUS LED & 2 KHz Beeper alternating ON & OFF five times
Low Battery Alarm	Yellow STATUS LED blinking approximately once per minute
Malfunction Alarm	Red STATUS LED continuously illuminated
Mounting	5 holes, 4 @ 7/64" and 1 @ 3/8"
Monitor Dimensions	6" x 4.625" x 1.5"
Receiver Dimensions	2.75" x 3.75" x 1.0"
Wireless Frequency	418 MHz
Transmission Range	Up to 100 feet, depending upon line-of-sight and obstacles
FCC Identification #	AUPFS-242
Industry Canada #	10341A-FS242

Warranty

One (1) year limited warranty Please refer to <http://www.cleanalert.com/termsofsale.html> for full warranty text.

Wireless Option

Transmitter

In a wireless system, the **FILTERSCAN®** Monitor contains a wireless transmitter, operating at a frequency of 418 MHz, which is activated whenever there is an alarm condition. Transmissions are very short in duration and intermittent until the alarm condition is reset.

Each **FILTERSCAN®** Monitor is randomly assigned one of over 16 million identification addresses at the time of manufacture. This is important in systems where neighbors have installed similar wireless systems.

Receiver

The **FILTERSCAN®** Receiver contains a wireless receiver, also operating at a frequency of 418 MHz, which is activated intermittently, listening for an alarm condition. The Receiver listens for the **FILTERSCAN®** transmitter's identification address and responds only to transmissions originating from your system's Monitor. This prevents inadvertent activation when neighboring buildings also have **FILTERSCAN®** systems in operation.

Learn Mode

Each **FILTERSCAN®** Receiver has the ability to learn and store a **FILTERSCAN®** Monitor's identification address. Your **FILTERSCAN®** system, consisting of a Monitor and a Receiver, has had both components identification addresses matched at the factory. In the event that a replacement Receiver is introduced into your system, that Receiver must learn the system Monitor's identification address. In order to accomplish

this, both the Receiver and Monitor must be located close to each other. The steps are:

1. Remove the Receiver front cover.
2. Depress the **LEARN** button located next to the batteries.
3. Within 5 seconds, depress the **SEND** button at the Monitor. After several seconds, the Monitor will beep once. Then, after another several seconds, the monitor will beep twice.
4. To confirm proper pairing of the Receiver to the Monitor,
 - a. After mounting the Monitor and Receiver, depress the **LISTEN** pushbutton and insert a straightened paper clip through the small hole located near the bottom of the Receiver cover.
 - b. Within 5 seconds, depress the **SEND** pushbutton on the Monitor. This may require a second person.
 - c. The Red indicator should illuminate and the Beeper should sound for approximately five seconds, indicating that the Receiver is mounted within range of the Monitor.

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NOTE: The best transmission range is obtained when a direct line-of-sight between the Monitor and Receiver exists. Any obstructions, such as floors and walls, will decrease the operating range of the system, and relocation of the Receiver may be required.

Low Battery Indicator

Receiver: When the **FILTERSCAN®** Receiver detects a low battery condition, the Receiver's yellow **STATUS** LED will blink approximately once per minute.

Monitor: When the **FILTERSCAN®** Receiver detects a low battery condition at the Monitor, the Receiver's yellow **STATUS** LED will blink three times every minute.

Identification Address

Creating an identification address is performed by manually depressing the **SEND** button on the Monitor. Wait about ten seconds until the first beep. Depress the **Create Address** button on the Monitor. The green LED will start flashing. After about one second, depress the Create Address button again. The green LED will turn off. All of these steps must be completed before the second set of two beeps. **NOTE:** The **Create Address** button is accessible internally in the Monitor and intended only to be used by factory technicians.

Revision History

Rev. #	Effective	Summary:
DRAFT		Initial draft for review and validation.
Version 1.1	2/2/12	Initial release for review.
Version 2.0	5/25/12	Initial printing release.
Version 2.1	6/4/12	Added Wireless Installation Section and Power failure statement in the System Monitoring section. Revised the Indicator section.
Version 2.2	6/6/12	Added Copyright notice. Revised Figures & battery specification.
Version 2.3	6/12/12	Updated per comments, mostly grammar.
Version 2.4	6/13/12	Added Differential Pressure Mounting kit and Tools Required section.

Appendix

Glossary

Dirty Air Filter	An air filter which has been in use and has collected some amount of dirt or dust particles that discolor the filter fibers or element but do not substantially affect the air flow through it.
Clogged Air Filter	An air filter which has collected a sufficient amount of dirt or dust particles to not only discolor the filter fibers or element but decrease the air flow through the filter as well. The FILTERSCAN® typically identifies a filter as clogged when the differential pressure within an HVAC system increases to 1.5 to 2 times the initial differential pressure identified when the unit was calibrated with a clean filter.
Monitor	The sensor voltage detection and signal processing portion of the system, which may contain an optional wireless transmitter.
Receiver	The optional portion of the system containing a wireless receiver of data and indicates various alarm conditions.
Address	One of 16 million randomly assigned identification numbers of each monitor.

Indicators

Green STATUS LED.....	The blinking Green STATUS LED at the FILTERSCAN® Monitor or Receiver indicates normal operation.
Yellow STATUS LED.....	The blinking Yellow STATUS LED at the FILTERSCAN® Monitor indicates a process is occurring and can also indicate a low battery condition at the Monitor or Receiver.
Red STATUS LED.....	The Red STATUS LED at the FILTERSCAN® Monitor and Receiver is an alarm indicator which blinks whenever an alarm condition occurs.
Beeper	The audible beeper at the FILTERSCAN® Monitor and Receiver is an alarm indicator which beeps whenever certain alarm conditions occurs.

Battery Replacement

Access	Remove the front cover from the FILTERSCAN® Monitor or Receiver housing. Remove the batteries.
Installation	Insert four (4) AA batteries in the battery holder of the FILTERSCAN® Monitor, or insert two (2) AAA batteries in the battery holder of the FILTERSCAN® Receiver, and replace the front cover. CleanAlert recommends using DURACELL® COPPERTOP batteries.

Alarm Indications

Monitor/Transmitter Alarm Indications

Alarm Condition	Alarm Indication	Clear Alarm Procedure
Normal Operation	STATUS LED flashes green every minute.	None
Clogged Filter	STATUS LED flashes red five times every ten minutes. Beeper sounds with LED flash.	Replace Filter and Recalibrate
Low Battery	STATUS LED flashes yellow every minute.	Replace Batteries
Sensor Failure	STATUS LED continuously on red.	Contact the company that you purchased the FILTERSCAN® from for repair information

Receiver Alarm Indications

Alarm Condition	Alarm Indication	Clear Alarm Procedure
Normal Operation	STATUS LED flashes green every minute.	None
Clogged Filter	STATUS LED flashes red five times every ten minutes. Beeper sounds with LED flash. Supersedes the Heartbeat indication.	Replace Filter and Recalibrate
Receiver Low Battery	STATUS LED flashes yellow every minute.	Replace Receiver Batteries
Transmitter Low Battery	STATUS LED flashes yellow three times every minute. Supersedes the Heartbeat indication.	Replace Transmitter Batteries
Sensor Failure	STATUS LED continuously on red.	Contact the company that you purchased the FILTERSCAN® from for repair information

Disclaimer

The data contained herein are furnished for information only and are believed to be reliable. We cannot assume responsibility for the results obtained by others over whose methods we have no control. It is the user's responsibility to determine suitability for the user's purpose and to adopt such precautions as may be advisable for the protection of property and of persons. In light of the foregoing, the warranty of CleanAlert, LLC on this product shall be exclusive and in lieu of any other warranties, including, without limitation, any warranty of fitness for a particular purpose or warranty of merchantability or any other warranties which may be claimed to arise by operation of law, custom, trade usage, or course of dealing between CleanAlert, LLC and the customer. In no event shall CleanAlert, LLC be liable, whether in contract or tort (including negligence) for damages in excess of the purchase price of the product(s), or for any indirect, incidental, special or consequential damages of any kind, or loss of revenue or profits, or other financial loss arising out of or in connection with the ability or inability to use the product(s), to the full extent these damages may be disclaimed by law. The discussion herein of various applications is not to be interpreted as representation that they are free from domination of patents owned by others or as a license under any CleanAlert, LLC patents that may cover such applications. We recommend that each prospective user test his proposed application before use, using this data as a guide.

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