SL-701 DUCT CARBON MONOXIDE DETECTOR KIT
INSTALLATION AND MAINTENANCE INSTRUCTIONS

PRODUCT OVERVIEW

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- SL-701 Duct Carbon Monoxide Detector
- MSR-50/CO Remote Accessory
- FAST Sample Tube Assembly Kit
- 8" FAST Exhaust Tube
- Mounting Template and Screws

SL-701 SPECIFICATIONS

Input Power	Standby Current	Alarm Current
24VAC	43 mA	246 mA
24VDC	28 mA	187 mA
115VAC	23 mA	50 mA
230VAC	11 mA	28 mA

Relay Contact Ratings:
Alarm contacts: (2) Sets of form "C" rated 10A @ 115VAC resistive (1) form "A" rated at 2A
Trouble contacts: (1) Set of form "C" rated 10A @ 115VAC resistive

Air Velocity:
100 to 4000 feet per minute

To get FPM from CFM:
CFM / (Duct W' x Duct H')

Ambient temperature:
32˚F to 140˚F (0˚C to 60˚C)

Humidity:
10% to 85% RH Non-Condensing/Non-Freezing

Dimensions:
13 ½"L × 4 ½"W × 2 ¼"D

MSR-50/CO SPECIFICATIONS

Current Draw	Standby 0 mA	Alarm 105 mA
Audible	Hi 69 db @ 10'	Lo 54 db @ 10'
Format	ANSI Temporal 4	Continuous
Visual	2 CD on axis	1 HZ (1/S)

PRODUCT APPLICATION

The SL-701 duct carbon monoxide detector kit provides early detection of carbon monoxide in air moving through the HVAC duct supply, return, or both in commercial, industrial, or residential applications. Complete HVAC systems can be shut down in the event of carbon monoxide detection. The included MSR-50CO remote accessory can be used to provide Private Mode (non-public) audible and visual alarm indication in a remote location. Combination CO / Fire alarm control units can, and must, be notified of an alarm or trouble condition to provide Public Mode Notification and Remote Reporting.

NOTE: The SL-701 is intended to be connected to a fire alarm control unit or combination control unit if present. Please refer to NFPA 720 (Standard for the Installation of Carbon Monoxide (CO) Detection and Warning Equipment) and NFPA 72 (National Fire Alarm and Signaling Code).

This is not a duct smoke detector (UL 268A) or "CO alarm" (UL 2034) and is not designed to detect smoke, fire or any gas other than carbon monoxide as caused by fossil fuel fired appliances and / or as introduced from the outside in fresh air intakes in the HVAC system. The SL-701 is a CO system detector (UL 2075).

PRODUCT DESCRIPTION

The SL-701 duct mounted carbon monoxide detector is fitted with an electrochemical sensor that is able to detect four levels of carbon monoxide and has a life of approximately six years in normal environmental conditions.
NOTE: Areas of high or low temperature and low humidity will reduce the life expectancy of the sensor. In all cases, an end of life trouble report will be signaled.
The detector has two sets of form "C" alarm contacts, one set of form "A" alarm contacts, and one set of form "C" trouble contacts. The alarm

contacts can be used to shut down HVAC equipment and signal a fire alarm control unit of an alarm condition. The trouble contact supervises the presence of input power, removal of the detector cover, removal of the sensor, or a sensor end of life.

SAMPLING TUBES

The operating principle of a duct detector is based on the Venturi effect. Two tubes extend into the HVAC duct. Air flowing through the duct is forced through the sampling tube via the opening in the tube pointed toward the airflow. The airflow is passed over the sensor and is drawn out via the exhaust tube back into the duct.

The duct carbon monoxide detector units are designed to operate in duct widths from 6" to 10' wide with an air velocity between 100 to 4000 feet per minute. To verify correct installation, the pressure differential between the sampling (high side) and exhaust (low side) tubes should be measured using a Magnehelic pressure gauge or equivalent. An acceptable reading is between 0.01 and 1.2 inches of water.

REMOTE ACCESSORY

The SL-701 duct CO detector kit includes the MSR-50/CO remote accessory (non-supervised). This device is designed to provide Private Mode visual and audible indicators of detector status. The remote is wired to the SL-701 on the DC voltage terminals as shown on page 4. The remote will show a green LED in normal operation, and will change to a red LED in an alarm or test condition. The LED will be off during any trouble condition. The included sounder will give a temporal code 4 tone and the strobe will flash in an alarm or test condition.

DANGERS OF CARBON MONOXIDE

Carbon Monoxide (CO) is an odorless, tasteless and highly toxic gas that results from the incomplete combustion of fossil fuels. It is often referred to as "the silent killer" because it is virtually impossible to detect without sensing technology. Through the normal living process of respiration and circulation, oxygen molecules enter the lungs and are transported to cells throughout the body by attaching to hemoglobin in the blood. CO molecules, however, attach to hemoglobin far more readily than oxygen. When CO is present in the environment, these molecules interfere with the normal circulation of oxygen throughout the body by attaching to hemoglobin that would normally transport oxygen. This can cause varying levels of injury, sickness and even death, depending on length and level of exposure. CO poisoning can result from prolonged exposure to low levels of CO and / or shorter exposures to higher concentrations as shown in the table below.

CO concentration in parts per million (PPM)	Symptoms
50	No adverse effects with 8 hours of exposure
800	Headache, nausea, and dizziness after 45 minutes of exposure; collapse and unconsciousness after 2 hours of exposure
1000	Loss of consciousness after 1 hour of exposure
6400	Headache and dizziness after 1-2 minutes of exposure; unconsciousness and danger of death after 10-15 minutes of exposure

ALARM LEVELS

The electrochemical sensor in the SL-701 is programmed to monitor four levels of carbon monoxide. The status LED on the sensor will flash a red LED code depending on the level of CO sensed as shown below.

Carbon Monoxide levels (PPM) (Applicable National Standard)	Alarm response time (Time Weighted Average)	Red Status LED code
50-70 parts per million (OSHA IAQ)	For 8 hours	2 Flashes
70-150 parts per million (UL 2075 / 2034)	For 2 hours	3 Flashes
150-400 part per million (UL 2075 / 2034)	For 15 minutes	4 Flashes
400+ parts per million (UL 2075 / 2034)	For 5 minutes	5 Flashes

MECHANICAL INSTALLATION

LOCATION PREREQUISITES

To determine the correct installation position for an SL-701 Series duct carbon monoxide detector, the following factors must be considered.

- A uniform non-turbulent (laminar) airflow between 100 to 4000 ft/min.
- The pressure differential between the sampling and exhaust tubes must be between 0.01 and 1.2 inches of water.
- On supply side duct the detector must be installed after the heat exchanger and before any duct branches.
- The detector can be mounted after fresh air intakes on the return duct to monitor possible CO contamination from outside sources.
- The detector must be installed in an area that is accessible for future testing and maintenance.

SAMPLING TUBE ASSEMBLY

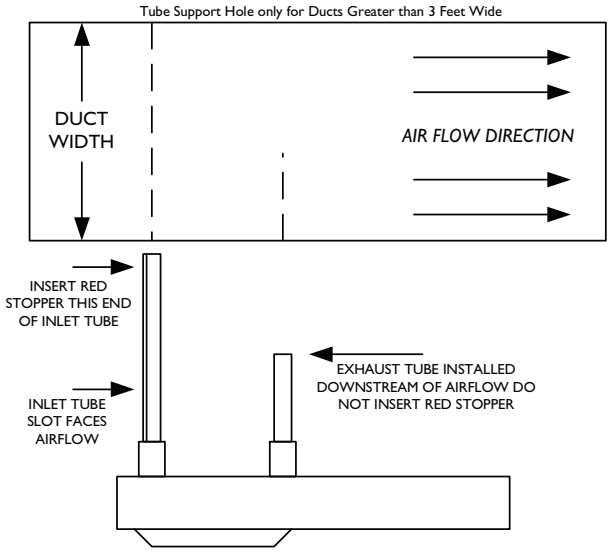
The SL-701 duct carbon monoxide detectors employ a specially notched sampling tube. The kit includes 3- 18" sampling tubes, 1- 8" exhaust tube, a notched sampling tube starter, and a red stopper cap. The sampling tube sections can be combined for a total length of 54 inches. The notched sampling tube starter must be connected to the first length of sampling tube for proper connection to detector housing.

The sampling tube is a plastic tube with an opening running the length on one side. These tubes can be cut to fit and must span at least 80% of the duct width. Any tubes over 3' in length must be supported on the side of the duct opposite from the detector. To ensure correct operation of the sampling tube, the red stopper cap that is included with the kit must be installed at the end of the sampling tube.

"NO-TOOLS" TUBE INSTALLATION

The SL-701 Series duct carbon monoxide detector provides a unique, patented mechanism for installation and/or removal of the sampling and exhaust tubes from either the front or rear of the detector housing.

Once airflow direction has been determined, insert the sampling and exhaust tubes into the CO detector. If the cover is in place, the tubes may be inserted into the back of the detector via the key-slots provided. Simply push the tube into place against the spring loaded retainer, and turn into the correct position, allowing the key to "lock" the tube in the desired orientation. For front side installation, simply rotate the tube retainer until the tube may be inserted and oriented properly. Once the tube is installed, rotate the retainer back into place to lock down the tube. Ensure the sampling tube is positioned so that the open slot is directly facing the airflow.



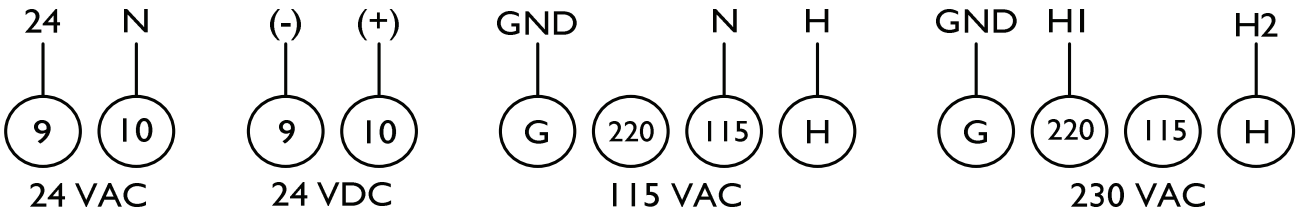
NOTE: Mountings shown are typical. Detector can be mounted on the side, bottom, or top of duct as long as proper tube operation and flow/pressure performance is maintained

DUCT MOUNTING

Apply the mounting template that is included with the installation kit to the ductwork in the desired location. Drill or punch the (2) 1 ¼" holes for the sampling and exhaust tubes using the template as a guide. Install the detector to the duct and secure with the screws provided in the installation kit.

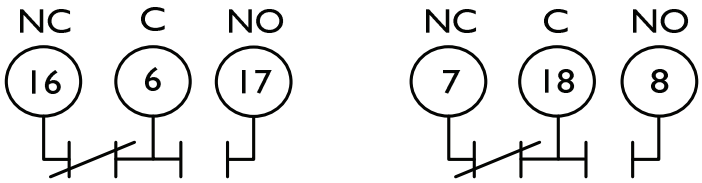
ELECTRICAL INSTALLATION

Choose the input power and connect to the appropriate terminals. **USE ONLY ONE SOURCE OF POWER**.



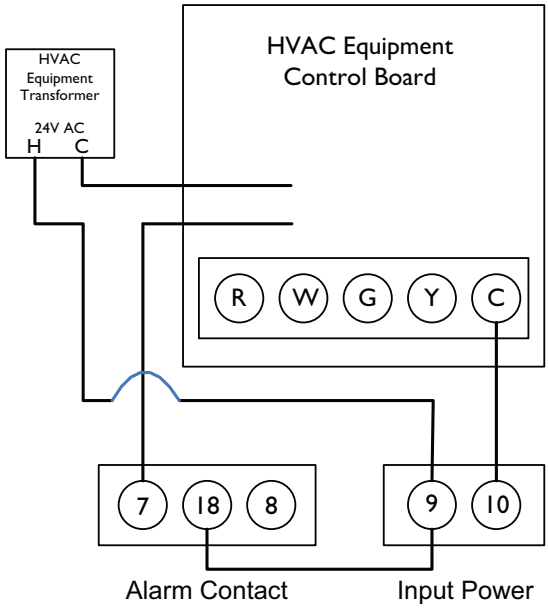
Connect wiring to HVAC equipment. The two 10 amp alarm contacts on the carbon monoxide detector can be used for system shutdown, damper control, or auxiliary fan control. Terminal 6 and 16 are one set of normally closed contacts, with terminals 6 and 17 being the normally open. The other set of 10 amp alarm contacts are terminals 7 and 18 being normally closed, and 8 and 18 being normally open.

Rated at 10A @ 115VAC resistive

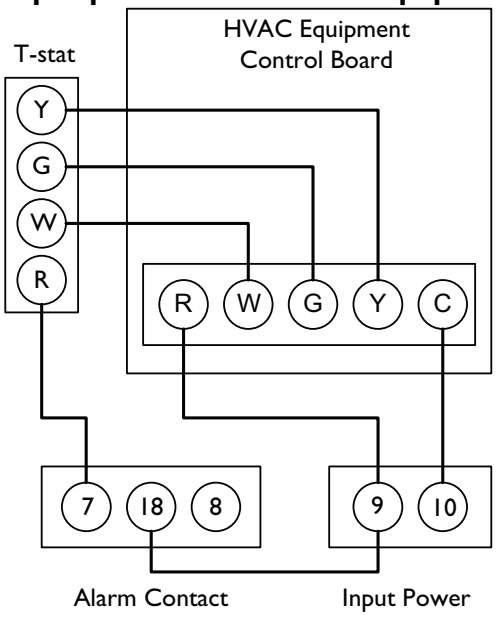


Wiring examples are shown below. Your wiring may be different depending on application.

Breaking Low Voltage Power to the Control Board. Input power from HVAC equipment.

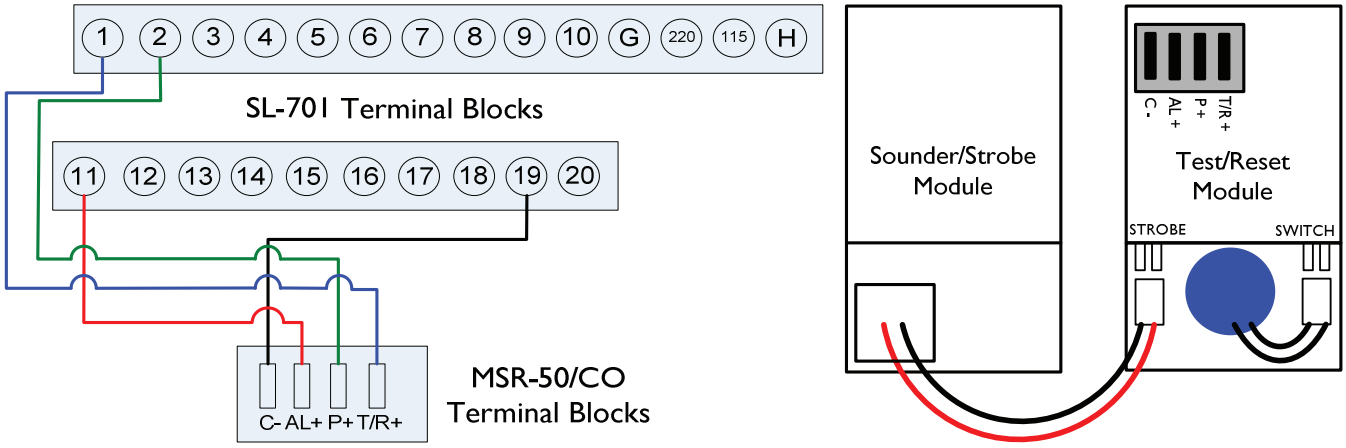


Breaking Power to the Thermostat. Input power from HVAC equipment.



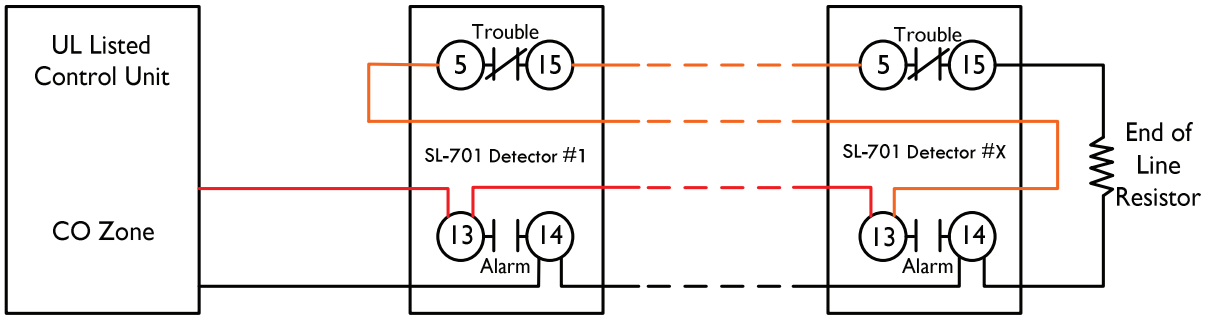
ELECTRICAL INSTALLATION (CONTINUED)

Connect the MSR-50CO remote accessory to the SL-701 with a four wire conductor of at least 18 gauge wires. Plug the 2 wire connector from the sounder/strobe module into the back of the remote accessory at the pin connector marked "STROBE". Secure the modules in a standard 4X4 electrical box with the provided screws, and install the provided cover plate.

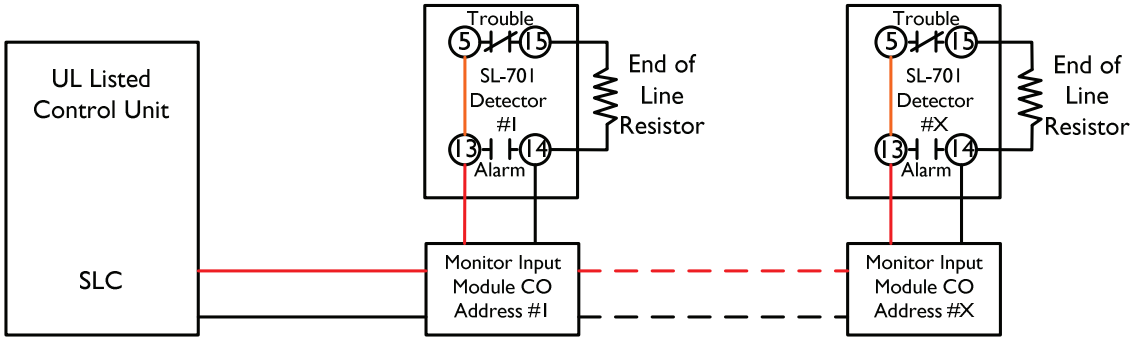


The SL-701 provides a 2 amp form "A" alarm contact and a 10 amp form "C" trouble contact for fire alarm control unit monitoring. The SL-701 will give a trouble report if the unit loses power, if the cover is removed, a sensor "end of life", or improper installation of the sensor.

SAMPLE CONTROL PANEL WIRING – STYLE "B"/CLASS "B" IDC (Supervised – A fault condition will not inhibit an alarm response)

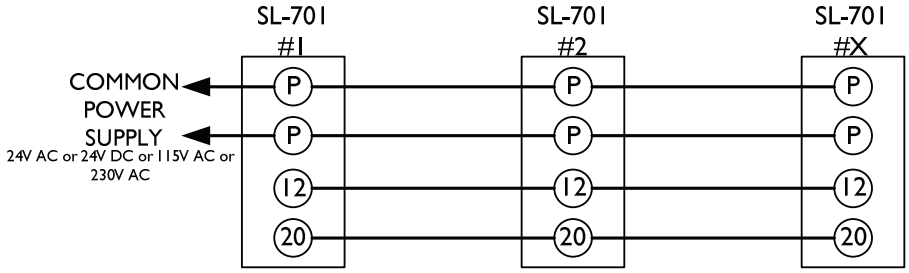


SAMPLE ADDRESSABLE PANEL WIRING – STYLE "6"/CLASS "B" SLC (Supervised – A fault condition will not inhibit an alarm response)



ELECTRICAL INSTALLATION (CONTINUED)

In applications where multiple HVAC shutdowns are required on any carbon monoxide alarm, the SL-701 Series duct carbon monoxide detectors can be interconnected for common shutdown. A common power supply is required for all interconnected detectors. When the detectors are wired as shown below, all of the 10 amp alarm contacts will transfer if any detector alarms. Only the initiating detector will have visual and audible indicators at the detector and the associated MSR-50CO remote accessory. Up to 30 SL-701 detectors can be connected for common shutdown.



TESTING AND MAINTENANCE

OPERATIONAL TESTING

After all wiring is complete and the cover is properly installed, apply power to the detector. The sensor will have an initial warm up time of 2 to 3 minutes. During this time the status LED and fault LED on the sensor will alternately flash between red, green, and yellow. Also the green pilot LED on the control board and green LED on the MSR-50CO remote will be illuminated. The trouble contact will be energized and terminals 5 and 15 will be closed.

After 2 to 3 minutes the green status LED on the sensor will illuminate solid and the yellow fault LED on the sensor will stay off. The green LED on the circuit board and remote will continue to stay on.

If there are problems during the warm up, the LED's will continue to alternately flash for up to 10 minutes. Any failure during warm up will result in the status LED on the sensor going off, and the yellow fault LED on solid. The green LED's on the control board and MSR-50CO remote will also go off and the trouble contact will de-energize and terminals 5 and 15 will open.

The sensor will perform a self test once every day after installation. This is a hidden test that will not affect normal operation in any way. Any failure in the self test will result in a fault condition that will show the fault LED on the sensor solid yellow.

NOTE: If the yellow fault LED on the sensor is the only indicator that is on, the sensor is either defective or has reached its end of life and needs to be replaced.



SENSOR "END OF LIFE"

Because of the nature of the electrochemical sensor used in the SL-701 duct carbon monoxide detector, it does have a limited life expectancy. Under optimal environmental conditions with temperatures at the sensor between 59˚F to 86˚F (15˚C to 30˚C) and the humidity range between 30% and 60% RH, the sensor life will be approximately six years. Environmental conditions are monitored at the sensor and the life expectancy will be dynamically

TESTING AND MAINTENANCE (CONTINUED)

calculated based on the operating environment conditions. When the sensor reaches its end of life the status LED will go off and the yellow fault LED will be illuminated. The green LED on the control board and MSR-50CO remote will be off and terminals 5 and 15 will open.

FUNCTIONAL TESTING

To ensure proper installation and operation of the SL-701 carbon monoxide duct detector, there are three tests that need to be completed.

- Measure pressure differential between sampling and exhaust tubes.

To check for proper pressure differential use a Magnehelic pressure gauge or equivalent. With the HVAC system fan on, remove the cover of the SL-701. Place the high side (+) tube of the gauge into the sampling tube opening where it connects with the duct detector housing. The low side (-) tube should go into the exhaust tube opening.
Seal any openings between the sampling and exhaust tube holes and the tubes from the pressure gauge.
The pressure differential reading on the meter should read between .01 and 1.2 inches of water.

- Test for proper HVAC shutdown.

Testing for HVAC shutdown can be accomplished by pressing the test/reset button on the SL-701 or by turning the key on the MSR-50CO remote accessory to the test/reset position.
Have the HVAC system in heating mode (preferably) or with the system fan turned on. Press and hold the test/reset button on the SL-701 or turn the key on the MSR-50CO remote to the test/reset position. The red alarm LED on the control board will come on, the LED on the MSR-50CO will change to red, and the sounder/strobe will be energized. The alarm contacts will transfer and the HVAC system will shut down. The status and fault LED on the sensor will both be off. Release the test/reset button or turn the key on the remote to the normal position to end the test.
NOTE: If this test lasts longer than 15 seconds the sensor will enter an initial warm up condition after the test has ended.

- Carbon monoxide spray test for the sensor.

In order to use the TG-701 CO test gas (sold separately), the detector must be put into user test mode. Press and hold the test/reset button on the SL-701 for at least five seconds. After releasing the button the status LED on the sensor should be flashing green. The sensor is now ready for the spray test.
NOTE: Pressing the test/reset button will cause the alarm contacts to energize, the red alarm LED on the control board and remote to light up, and the status LED on the sensor to go off.
The TG-701 CO test gas has a special nozzle tip that is designed to work with the red test port on the cover of the SL-701. This allows a simple functional gas test without removing the cover. With the HVAC system fan off, simply press the test gas tip into the red test port on the cover of the detector to spray the test gas directly at the sensor. Only a one second spray is needed to provide adequate test gas into the sensing chamber.
After approximately 20 seconds the status LED on the sensor will illuminate solid red, the red alarm LED on the control board will come on, the alarm contacts will transfer, and the MSR-50CO remote will show a red LED along with the sounder and strobe energized.
Press the test/reset button on the SL-701 to clear the alarm condition and return to normal.
The user test mode can be exited at any time by pressing the test/reset button on the SL-701. Also the user test mode will time out and the detector will return to normal (standby) condition if the test gas is not sprayed in 15 minutes.

MAINTENANCE

As a guideline the sensor and tubes of the SL-701 should be cleaned every six months or as required. The best methods of cleaning are to vacuum the sensor thoroughly or to blow out the sensor and tubes using clean, dry compressed air.
Do not use chemicals or non-conforming air to clean the sensor or tubes as this could contaminate the sensor, tubes, or detector housing.
If the protected area is of a very dirty nature then the SL-701 Duct unit(s) will have to be checked and cleaned on a quarterly basis or more frequently if so required.

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LED INDICATOR CHART

Sensor Indicators		Control Board Indicators		MSR-50/CO Indicators		Detector Condition
Status LED	Fault LED	Alarm LED	Pilot LED	Test/Reset LED	Sounder/Strobe	
Off	Off	Off	Off	Off	Off	No power is present or sensor is not installed properly
Green (Alt) Red (Alt)	Yellow (Alt)	Off	On (Green)	Green	Off	Initial warm up
Green	Off	Off	On (Green)	Green	Off	Normal (Standby) condition
Off	Off	On (Red)	On (Green)	Red	On	Pushing test/reset on detector or turning the key on remote
Green 0.5 second flash	Off	Off	On (Green)	Green	Off	User test mode is in progress
Red Solid On	Off	On (Red)	On (Green)	Red	On	Successful user canned CO spray test
Off	Yellow	Off	Off	Off	Off	Trouble condition; End of sensor life or failed self test
Red 2 Flashes	Off	On (Red)	On (Green)	Red	On	Carbon Monoxide alarm 50PPM for 8 hours
Red 3 Flashes	Off	On (Red)	On (Green)	Red	On	Carbon Monoxide alarm 70PPM for 2 hours
Red 4 Flashes	Off	On (Red)	On (Green)	Red	On	Carbon Monoxide alarm 150PPM for 15 minutes
Red 5 Flashes	Off	On (Red)	On (Green)	Red	On	Carbon Monoxide alarm 400PPM for 5 minutes
Green	Off	Off	Off	Off	Off	Detector cover is not installed properly.