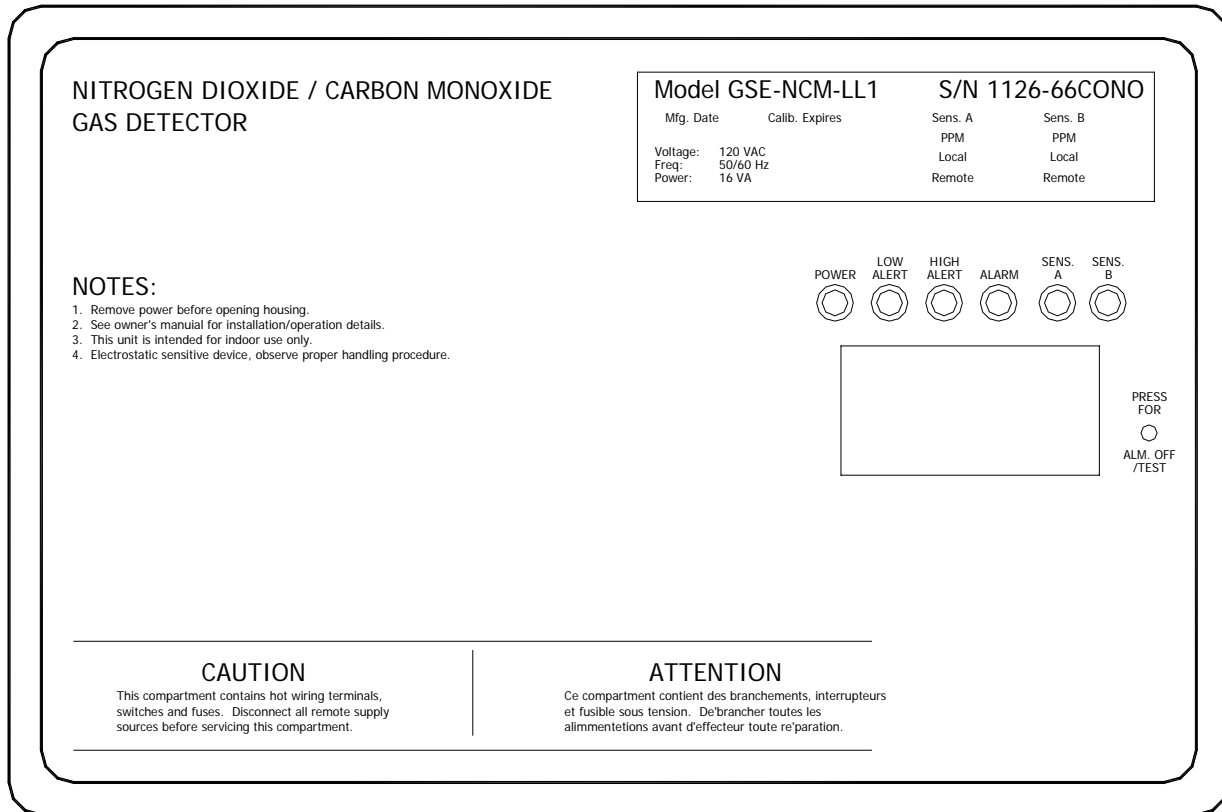


# NSGV SERIES "GSE" DUAL GAS DETECTOR

## I, O & M MANUAL

# NSGV Series "GSE-NCM-LL1" Carbon Monoxide / Nitrogen Dioxide Detector



### GSE-NCM-LL1 Specifications

Power	120VAC Input Voltage
Selectable Fan Settings	2-speed motor fans / 2 individual fans
Internal Alarm	106dB @ 3.7 KHz/ Piezoelectric element / silence key
Alert Levels	7 field selectable choices
Delay Times	0 to 7 minutes in 1 minute increments
Size	9 7/16" x 6 1/4" x 3 1/2"
Weight	3 pounds
Color	Gray

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# NSGV GSE-NCM-LL1 DUAL GAS DETECTOR

## I, O & M MANUAL

### Installation

#### Step 1

**Determine the location for mounting your detector(s).** The location(s) may be indicated on the architectural drawing. Also, the owner or designer of the facility may be consulted. The ability of the detector to sense the target gas and the efficiently control the ventilation system depends greatly upon proper selection of the mounting location. This detector monitors the area around it by sampling the air that passes by the sensor. Since the sensor is mounted inside the housing, air must diffuse through the bottom housing vents and pass by the sensor on its way out the top housing vents. Therefore, the detector should be positioned where it can sample air that contains a target gas concentration representative of the average value in that area.

- Use one detector for each 5000 square feet to be monitored.
- Mount the detector at the average breathing height.
- **Do not mount** near doorways, fans, ventilation inlets/outlets, or areas with high volume of airflow.
- **Do not mount** where direct contact with water may occur.
- **Do not mount** where direct engine exhaust or chemicals are present.
- **Do not mount** where the detector may be hit or airflow is restricted.

#### Step 2

**The detector is attached in the mounting position in one of two ways.**

1. Attach the housing to a four inch conduit box using the conduit fittings supplied with the detector. If you use this method, make sure that the four inch box is securely attached with screws to a solid support base. Firmly tighten the threaded nuts on the conduit fittings inside the four inch box so they will not loosen over time.
2. Attach the housing to a solid support base using screws through the internal housing mounting holes. This method requires removal of the housing cover to gain access to the mounting holes. A mounting hole is located at the top and bottom of each of the housing end walls. Find a flat area at least 8" high by 11" long and place the back of the open housing flat against it. Using a pencil, mark the location of the four mounting holes using the housing as a template. Start the screws without the housing in place to avoid any possibility of damage to the housing or circuit board. Remove the screws, place the housing in position and install the mounting screws. **DO NOT OVER-TIGHTEN THE SCREWS.** Be careful not to damage the printed circuit board. Carefully replace the cover after properly aligning the lamps and "ALM. OFF/TEST" switch in their cover holes. Securely tighten the six cover retaining screws.

#### Step 3

#### Connecting the power Supply

### **WARNING**

**This detector may require the use of voltage levels high enough to cause fatal injuries.**

**Proper procedures must be followed anytime work is performed on this unit.**

- The GSS-NCM-LL1 detector is designed to operate from a 120 VAC power supply. The voltage is listed in the upper, right corner of the front panel label.
- While this detector does not require much power to operate, it is usually located near machines that do require large amounts of power. When these large machines operate, they cause large voltage spikes to appear on the AC wiring. These spikes can interfere with the proper operation of the detector. The easiest way to avoid much of this interference is by providing power to the detector through a dedicated circuit from the service panel. In some very noisy situations, a line filter can be connected in the power supply circuit just ahead of the wiring connections at the detector.

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### NOTE

**Do not operate the detector on the same AC circuit with the ventilation components.**

**Doing this will almost always cause improper detector operation.**

#### Step 3 cont.

- Provide a dedicated circuit, at the required operating voltage, at each detector mounting location. Follow all national and local wiring codes. The wiring should be at least 14 AWG. A conductor, connected to the earth ground, should also be provided. The circuit must include a disconnect switch (provided by others) located within easy reach of the detector.

### CAUTION

**Operating this detector with the incorrect voltage and power requirements can cause internal electrical components to overheat and fail. Operation with the wrong power requirement will void Nationals' warranty, and the installer will be responsible for any damage that occurs.**

- Color coded wires, exiting the detector housing through the top, left conduit connector, are provided for connecting the operating voltage to the detector. Therefore, it should not be necessary to remove the front cover from the detector when connecting the voltage supply. **Connect the hot power conductor to the BLACK wire, connect the neutral conductor to the WHITE wire and connect the ground conductor to the GREEN wire. (See wiring diagram Fig. 1)**

#### Step 4

##### Controlling the Ventilation System

- As an energy saving device, the main function of the detector is to operate the ventilation system only when necessary. To accomplish this, the detector is equipped with two control relays. The contacts of these relays can control various ventilation system configurations. Figures 1, 2, & 3 on page \_\_\_ gives examples of the wiring for the most common systems. Coil control signals on relays for damper and make-up air units can also be connected across the detector's relay contacts so that these components actuate simultaneously with the exhaust fans. However, **DO NOT EXCEED THE MAXIMUM RATINGS OF THE RELAYS, listed below.**  
125 VAC 50/60 HZ.  
5 Amp Resistive  
24 VA Inductive
- Please give special attention to the note on each wiring diagram. Jumper TP3 must be in the proper configuration before power is applied or the ventilation system will not function correctly. The detector is shipped from the factory with the TP3 in the 50/100% position. Therefore, unless you use a two-speed motor starter or a low speed fan is to be off if a high speed fan is on, you can connect the ventilation wiring without removing the detector front panel cover.
- TP3 is located near the bottom edge of the control board approximately 2 1/2" from the right side. To change the setting to two-speed, lift the shunt off TP3 and move it one pin to the left. Then slide it back on the pins.

#### Step 5

##### Connecting the External Alarm

- The detector comes standard with an internally mounted alarm. If the target gas concentration exceeds the "HIGH ALERT" level and remains there for more than 15 minutes, the alarm will sound. There are also a set of external alarm contacts that close at the same time. These external contacts, AL1 (gray) and AL2 (purple), can be used to trigger an alarm element mounted at a remote location (by others).
- The internal alarm can be turned off by pressing the "ALM. OFF?TEST" switch for approximately one second. The external alarm will remain activated. Once the gas concentration drops below the "HIGH ALERT" level, the external alarm will deactivate and the internal alarm circuit will reset. Both alarms will activate if another alarm condition occurs. See Fig. 1, 2, & 3 for typical alarm wiring.

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### Step 6

#### Applying Power for the First Time

- Once all the wiring connections are complete, the detector is ready for power to be applied. The first 5 minutes is a warm-up period. Only the Green power lamp will be glowing. The display will be blank except for the decimal point on the right hand side. At the end of this war-up period, the detector will begin to display the target gas concentration and the appropriate sensor lamp will glow. In most cases, the gas concentration will be "0.0". However, if the target gas is present in the monitored area, the display will indicate the actual concentration.
- During this war-up period, the self-test feature can be activated by pressing the "ALM. OFF/TEST" switch for approximately one second. The detector will then enter the test mode. The test mode lasts for 5 minutes. The warm-up period is extended by the amount of time that has expired since power on until the self-test is started.

### Step 7

#### Using the Self-Test Feature

- The self-test feature on this detector provides a convenient way to test the major functions of the complete system. This feature is only active during the first 5 minutes after power is applied. Activate the self-test by pressing the "ALM. OFF/TEST" switch for one second.

#### The self-test performs the following:

- Tests each display digit by displaying "0" through "9".
- Activates the "LOW ALERT" relay and indicator lamp for 30 seconds.
- Waits 30 seconds.
- Activates the "ALARM" relay, indicator lamp and internal alarm for 3 seconds.
- Waits 30 seconds.
- Begins to monitor and display the target gas concentration in the area.
- Before using the self-test feature, National recommends testing the ventilation system for correct connections and operating the ventilation components manually. Make any wiring changes and replace any defective components. Any problem found during the self-test can then be identified much easier. (See Troubleshooting & Maintenance for testing target gas)

### Target Gas Specifications

#### Carbon Monoxide

Full Scale Span:	200PPM							
Low Alert Settings:								
Switch Position	0	1	2	3	4	5	6	7
PPM CO	20	25	30	35	40	45	50	55
High Alert Settings:	100 PPM							

#### Nitrogen Dioxide

Full Scale Span:	10.0 PPM							
Low Alert Settings:								
Switch Position	0	1	2	3	4	5	6	7
PPM NO <sup>2</sup>	0.3	0.5	0.8	1.0	1.5	2.0	3.0	4.0
High Alert Settings:	5.0 PPM							

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# NSGV GSE-NCM-LL1 DUAL GAS DETECTOR

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### Description of Front Panel Indicators

- The front panel indicators convey to the user the operational status of the detector. The following table describes the function of each indicator. Please refer to the detector's front panel label for the indicator's location.

Front Panel Indicators	
Indicator	Description
Power Lamp	Glows Green whenever power is on
Low Alert Lamp	Flashes on short, off long when low alert level is exceeded and delay is activated. Flashes on long, off short when concentration drops below low alert level and delay is active. Glows continuously when low alert relay contacts are closed.
High Alert Lamp	Flashes on short, off long when high alert level is exceeded and delay is active. Flashes on long, off short when concentration drops below high alert level and delay is active. Glows continuously when high alert relay contacts are closed.
Alarm Lamp	Glows continuously when alarm relay contacts are closed. Flashes to indicate that the solid state CO sensor has failed.
SENS A / SENS B Lamps	Active Sensor Indicator. Glows continuously when that sensor's concentration is displayed.
Four Digit Display	Indicates the concentration associated with the active sensor lamp.

### Obtaining the Best Operation

#### Carbon Monoxide and Nitrogen Dioxide Detector

- The detector has two variables that can be adjusted to obtain the best performance under the conditions it is operating. The target gas concentration at which fans begin to operate is adjustable in 8 steps. Also, there is an adjustable time setting that delays the activation of the fans. This delay assures that the transient levels of gas do not cause fans to operate for short periods of time. This delay is adjustable from 0 to 7 minutes in 8 steps of one minute each. The delay period occurs between the time the "LOW ALERT" level is exceeded and the fans activate, and between the time the target gas concentration drops below the "LOW ALERT" level and the fans turn off. While the delay is in progress, the appropriate alert indicator will flash as the time proceeds toward zero.
- The detector is shipped from the factory with the "LOW ALERT" concentration set at position 3, (see page 3), and the delay set at 3 minutes. These settings provide a good starting point. If the target gas concentration appears to continue rising after the fans activate, fine tune the settings by reducing the "LOW ALERT" setting or the activation delay. If the fans operate too often and/or for short periods, increase the activation delay.
- In some cases, you may find that a target gas source is too close to the detector. Consider other mounting locations for the detector, or move the gas source farther away.

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# NSGV GSE-NCM-LL1 DUAL GAS DETECTOR

## I, O & M MANUAL

### TROUBLESHOOTING & MAINTENACE

#### Testing the Response to the Target Gas

##### Carbon Monoxide and Nitrogen Dioxide Detectors

#### CAUTION

Allowing the detector to come in direct contact with undiluted exhaust gases will decrease the expected useful lifetime of the sensor.

- Testing the detector requires that the target gas be applied to the sensor using one of two methods. Gas can be applied from a tank of air containing a known concentration of the target gas, or a level or target gas sufficient to activate the detector can be produced from the exhaust of an operating engine. Use a gasoline engine to produce CO and a diesel engine to produce NO<sup>2</sup>. Make sure if this method is used, the exhaust source is placed about 10 feet away from the detector so that exhaust gases will not contact the detector directly.
- The engine should be allowed to run until a level of the target gas is displayed on the detector that is sufficient to activate the ventilation system. Depending on detector settings this may take from 10 to 30 minutes.

#### COMMON INSTALLATION/OPERATION MISTAKES

##### Ventilation Components Connected to the Wrong Relays

- A common mistake is to control a single fan ventilation system using the HI1 and HI2 relay contacts. If connected this way, the fan will not activate until the gas concentration exceeds "HIGH ALERT" level. Unless you intend that the ventilation system activate only above the "HIGH ALERT" level, operate this type of system using the LA1 and LA2 relay contacts. Place jumper TP3 in the "50/100%" position so that the fan will continue to operate if the gas concentration exceeds the "HIGH ALERT" level.

##### Configuration Jumper Set in Wrong Position

- On a single fan ventilation system, the fan is controlled from the LA1 and LA2 relay contacts. The fan will activate whenever the gas concentration exceeds the adjustable "LOW ALERT" setting. However, if the jumper on TP3 is positioned in the "2-speed" setting, the fan will turn off if the gas concentration exceeds the "HIGH ALERT" level. Therefore, when controlling a single fan system, place the jumper on TP3 in the "50/100%" position.
- The "2-speed" position on TP3 is used for two-speed fan motors, or on two fan systems in which the low speed fan is to turn off the high speed fan turns on.

##### Low Alert Level Set at Wrong Concentration

- A common tendency is to set the "LOW ALERT" concentration at the lowest setting. A low alert setting that is too low can cause frequent cycling of the ventilation system. Always follow regulatory requirements, but set the low alert concentration to a level which produces the most efficient ventilation system while protecting the workers in the monitored area. The opposite will happen when the "LOW ALERT" concentration is set too high.

##### Delay Period Set Incorrectly

- Using a long delay period can produce a situation in which a rapidly increasing gas level may rise to dangerous concentrations before the ventilation system activates. Choose a delay setting that activates the fans and clears the area before concentration levels get to high. Setting the delay too short will turn the fans on too frequently.

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## I, O, & M MANUAL

### SPECIFICATIONS

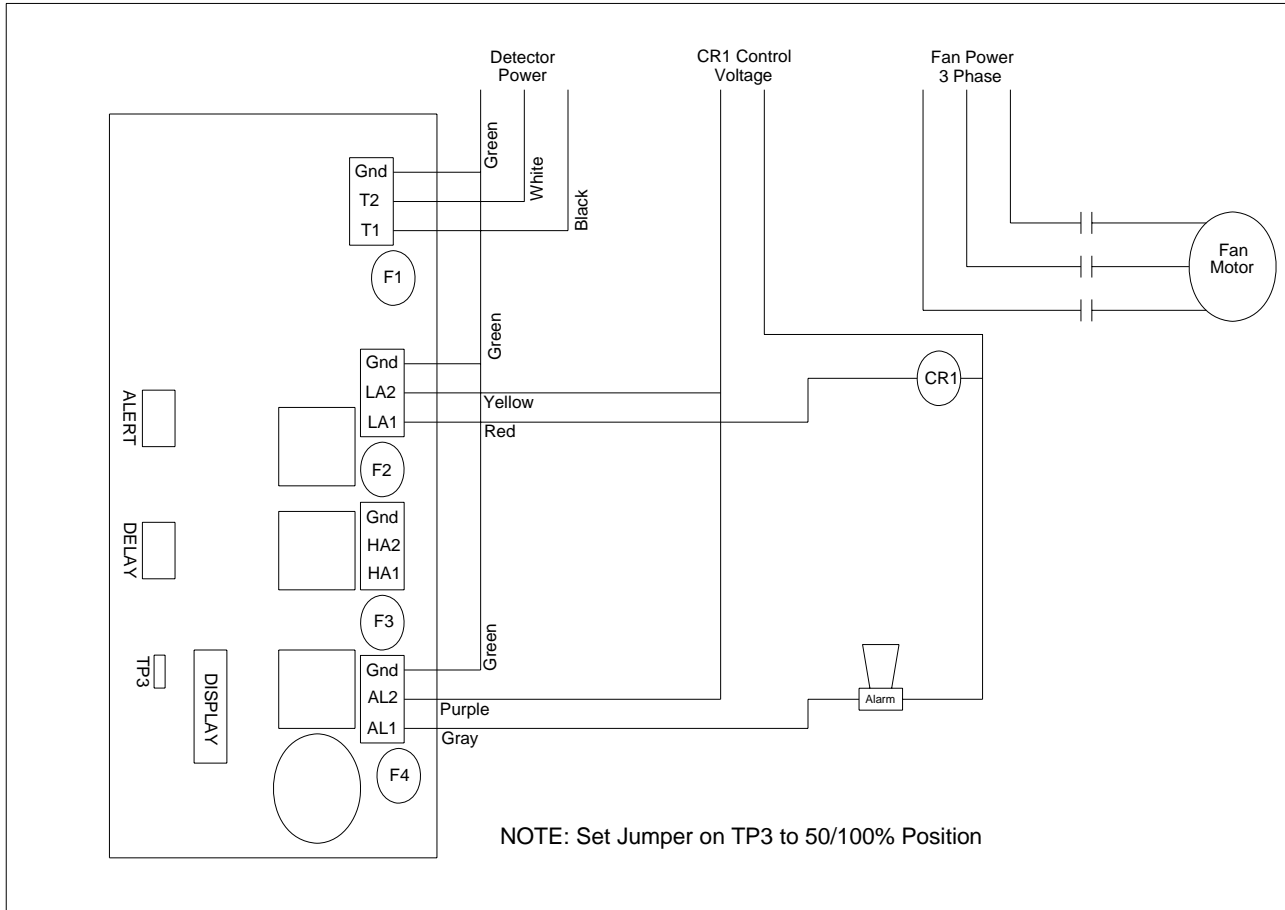
Power:	120 VAC Input Voltage 50/60 Hz. / 0.125 Amps
Installation Category:	II
Operating Temperature:	Storage: -58° F to +248° F (-50° C to 120° C) Operating: +5° F to +104° F (+15° C to +40° C)
Humidity:	10% to 90% (non-condensing)
Coverage:	5000 Square Feet
Ventilation Control Relays:	125 VAC, 50/60 Hz. 5 Amp Resistive 24 VA Inductive
Internal Alarm:	106 dB @ 3.7 KHz. Piezoelectric element / silence key
Front Panel Indicators:	Power On: Green LED Low Alert Relay: Red LED High Alert Relay: Red LED Alarm: Red LED Sensor Active: Yellow LED Concentration: 4 Digit LCD
Selectable Fan Settings:	2-speed motor fans / 2 individual fans
Alert Levels:	7 field selectable choices
Delay Times:	0 to 7 minutes in 1 minute increments
Size:	9 7/16" x 6 1/4" x 3 1/2"
Shipping Weight:	3 pounds
Housing:	Gray, NEMA 1, polycarbonate plastic
Agency Acceptance:	ETL listed to UL 3111-1

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# NSGV GSE-NCM-LL1 DUAL GAS DETECTOR

## I, O, & M MANUAL

### TYPICAL WIRING FOR SINGLE FAN VENTILATION SYSTEM



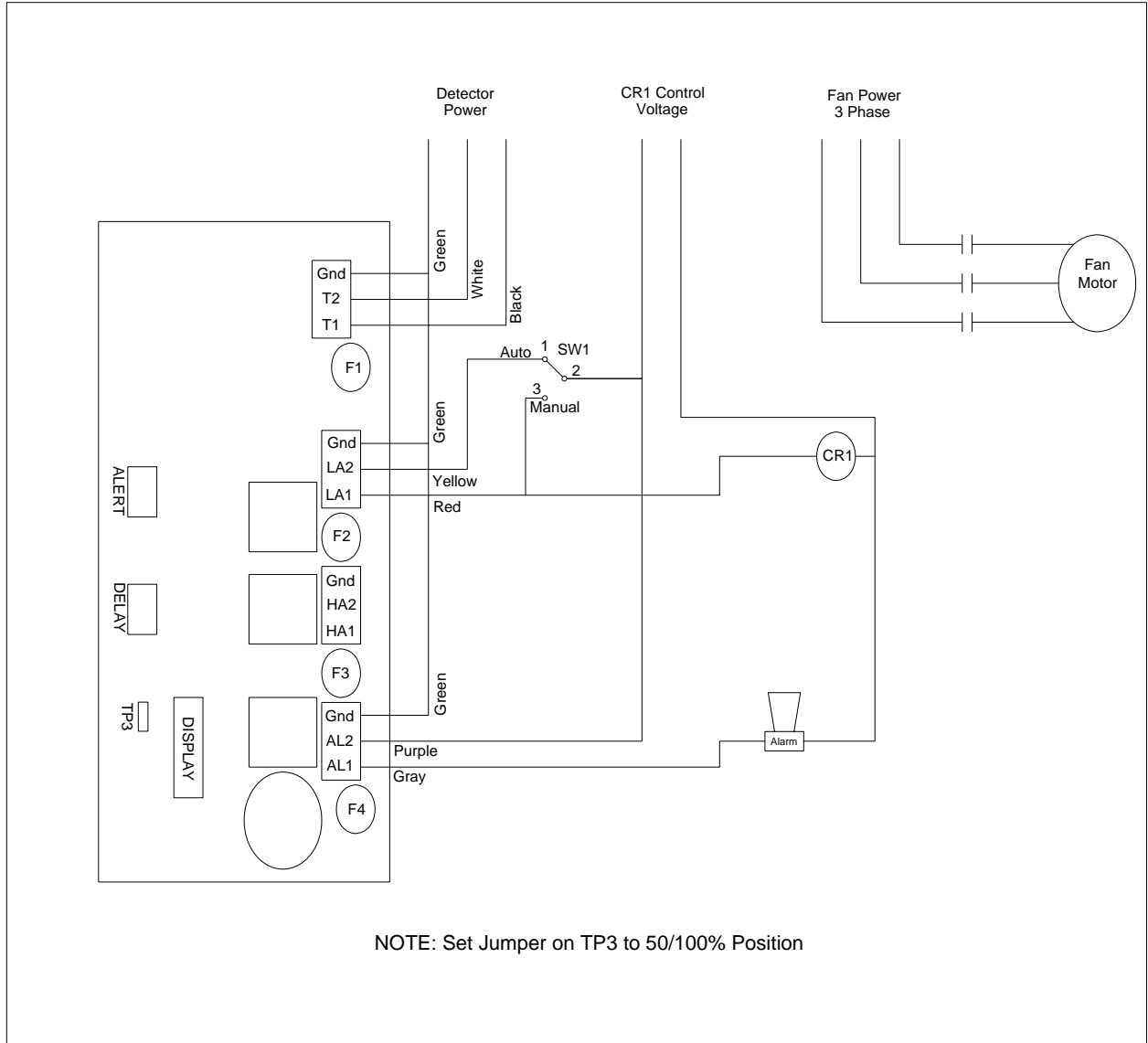
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# NSGV GSE-NCM-LL1 DUAL GAS DETECTOR

## I, O, & M MANUAL

### TYPICAL WIRING FOR SINGLE FAN VENTILATION SYSTEM WITH AUTO/MANUAL SWITCH

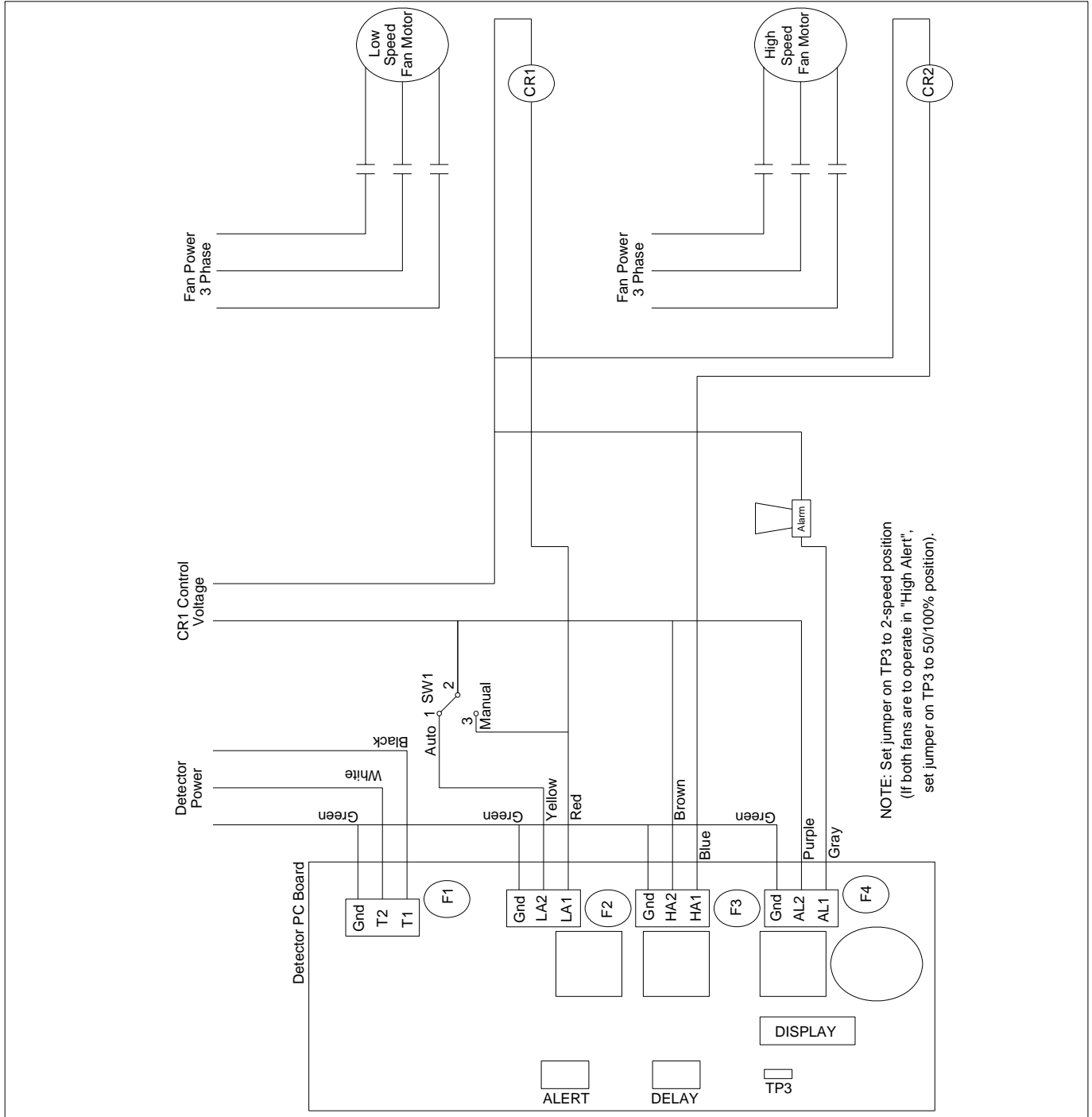


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# NSGV GSE-NCM-LL1 DUAL GAS DETECTOR

## I, O, & M MANUAL

### TYPICAL WIRING FOR TWO FAN VENTILATION SYSTEM WITH AUTOMATIC SWITCH



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