

MACURCO

GAS DETECTION

Macurco™ CD-12 Carbon Dioxide Detector, Controller and Transducer User Instructions



Important: Keep these User Instructions for reference

TABLE OF CONTENTS

GENERAL SAFETY INFORMATION	4
Intended Use	4
List of Warnings and Cautions	4
USE INSTRUCTIONS AND LIMITATIONS	5
Use For	5
Do Not Use For	5
General Description	5
Features	6
Specifications	6
INSTALLATION AND OPERATING INSTRUCTIONS	7
Location	7
Connections	7
Installation	7
4-20 mA Output diagram	8
Garage diagram	8
Multiple Device diagram	9
Alarm Control Panel diagram	9
DVP-120 Control Panel diagram	10
Alternate Alarm Panel	11
Power Up	11
Operation	11
Default - Factory Settings	11
Power-Up Test setting	13
Display setting	13
Buzzer setting	13
Alarm Relay setting	14
Alarm Relay Configuration	14
Fan Relay setting	14
Fan Relay Delay setting	14
Fan Relay Minimum Runtime setting	14
Fan Relay Latching setting	14
Trouble Fan Setting	15
4-20mA Output setting	15
On Board Diagnostics	15
MAINTENANCE	16
End-of-Life Signal	16
Sensor Life Reset	16
Cleaning	17
Testing	17
Operation Test	17
Manual Operation Test	18
Carbon Dioxide Gas Test	19
MACURCO GAS DETECTION PRODUCTS WARRANTY	24

GENERAL SAFETY INFORMATION

Intended Use

The Macurco CD-12 is a line voltage, dual relay Carbon Dioxide (CO₂) detector, controller and transducer. The CD-12 utilizes an internal switching power supply that is capable of using line voltage between 100 and 240VAC and 50-60Hz. The CD-12 has selectable 4-20 mA output, buzzer and digital display options. It is an electronic detection system used to measure the concentration of Carbon Dioxide and provide feedback and automatic ventilation control to help reduce CO₂ concentrations in conference rooms, classrooms, meeting halls or similar applications. The CD-12 is a low level meter capable of displaying from 0-2,000 ppm (parts per million) of Carbon dioxide. The CD-12 is factory calibrated and 100% tested for proper operation. The CD-12 uses an automated background calibration program to set the clean air level on a regular basis.

List of Warnings and Cautions within these User Instructions



- Each person using this equipment must read and understand the information in these User Instructions before use. Use of this equipment by untrained or unqualified persons, or use that is not in accordance with these User Instructions, may adversely affect product performance and **result in sickness or death**.
- Use only for monitoring the gas which the sensor and instrument are designed to monitor. Failure to do so may result in exposures to gases not detectable and **cause sickness or death**. For proper use, see supervisor or User Instructions, or call Technical Service at 1-877-367-7891.
- This equipment may not function effectively below 32°F or above 122°F (0°C or above 50°C). Using the detector outside of this temperature range may adversely affect product performance and **result in sickness or death**.
- This detector helps monitor for the presence and concentration level of a certain specified airborne gas. Misuse may produce an inaccurate reading, which means that higher levels of the gas being monitored may be present and could result in overexposure and **cause sickness or death**. For proper use, see supervisor or User Instructions, or call Technical Service at 1-877-367-7891.
- High voltage terminals (120/240 VAC) are located within this detector, presenting a hazard to service technicians. Only qualified technicians should open the detector case and service the internal circuits. Ensure power is removed from the detector relays prior to servicing the unit. **Failure to do so may result in sickness or death**.
- Do not disassemble unit or attempt to repair or modify any component of this instrument. This instrument contains no user serviceable parts, and substitution of components may impair product performance and **result in sickness or death**.
- Using a certified gas with a concentration other than the one listed for this detector when conducting a calibration or calibration verification test (bump test) will produce inaccurate readings. This means that higher levels of the gas being monitored may be present and could result in overexposure and **cause sickness or death**. For proper use, see supervisor or User Instructions, or call Technical Service at 1-877-367-7891
- The following steps must be performed when conducting a calibration verification test (bump test) to ensure proper performance of the monitor. Failure to do so may adversely affect product performance and **result in sickness or death**.
 - When performing a calibration verification test (bump test) only use certified calibration gas at the required concentration level. Do not test with expired calibration gas.
 - Do not cover or obstruct display or visual alarm cover.
 - Ensure sensor inlets are unobstructed and is free of debris

USE INSTRUCTIONS AND LIMITATIONS



Each person using this equipment must read and understand the information in these *User Instructions* before use. Use of this equipment by untrained or unqualified persons, or use that is not in accordance with these *User Instructions*, may adversely affect product performance and **result in sickness or death**.

Use For

The CD-12 provides CO₂ detection and automatic ventilation control for conference rooms, classrooms, meeting halls or similar applications. Carbon dioxide is a colorless, odorless gas that is produced both by people exhaling CO₂ as well as the burning of gasoline, coal, oil and wood. The outdoor concentration of carbon dioxide can vary from 350-450 parts per million (ppm) or higher in areas with high vehicle traffic or industrial activity. The indoor CO₂ level depends upon the number of people present, how long an area has been occupied, the amount of outdoor fresh air entering the area and other factors. Carbon dioxide concentrations indoors can vary from several hundred parts per million to over 1000 ppm in areas with many people present for an extended period and where fresh air ventilation is limited. Outdoor "fresh" air ventilation is important as it can dilute CO₂ the indoor environment. The amount of fresh air that should be supplied to a room depends on the type of facility and room. Ventilation should keep carbon dioxide concentrations below 1000 ppm and create indoor air quality conditions that are acceptable to most individuals. The CD-12 uses an automated background calibration program to set the clean air level on a regular basis. The CD-12 will maintain accuracy if it is exposed to the "clean air reference value" (this reference value is the lowest concentration to which the sensor is exposed) at least once per week.

Note: This applies when used in typical indoor ambient air. The CD-12 can be used stand alone, with the Macurco DVP-120 Detection and Ventilation Control Panel, other 12 VAC or 24 VDC fire/security panels or building automation systems.



Use only for monitoring the gas which the sensor and instrument are designed to monitor. Failure to do so may result in exposures to gases not detectable and **cause sickness or death**. For proper use, see supervisor or *User Instructions*, or call Technical Service at 1-877-367-7891.

Do Not Use For

The CD-12 is not intended for use in hazardous locations or industrial applications such as refineries, chemical plants, etc. Do not mount the CD-12 where the normal ambient temperature is below 32°F or exceeds 122°F (0°C or above 50°C). The CD-12 mounts on a type 4S electrical box supplied by the contractor. Do not install the CD-12 inside another box unless it has good air flow through it.



This equipment may not function effectively below 32°F or above 122°F (0°C or above 50°C). Using the detector outside of this temperature range may adversely affect product performance and **result in sickness or death**.

General Description

The CD-12 is a low voltage, dual relay Carbon Dioxide (CO₂) detector and automatic ventilation controller. The CD-12 uses a microcomputer controlled, electronic system to measure the concentration of CO₂, actuate relays and provide a 4-20 mA output. The CD-12 has a low maintenance long life (10+ years) non-dispersive infrared (NDIR) sensor and optional gas test kits. The CD-12 is a low level meter capable of displaying from 0-2000 ppm of carbon dioxide.

Features

- ETL LISTED Certified to CAN/CSA Std. C22.2 No 61010-1 Conforms to UL Std. 61010-1
- Low level meter capable of displaying from 0-2000 ppm of CO₂
- The CD-12 uses an automated background calibration program to set the clean air level on a regular basis
- Selectable fan and alarm relay activation
- 5 A SPDT fan relay controls starters of ventilations
- 0.5 A N.O. or N.C. alarm relay connects to warning devices or control panels
- 4-20 mA Current Loop
- CD-12 mounts on a standard 4x4 electrical box and becomes cover for the box
- Supervised system: any internal detector problem will cause the fan & Alarm relay to activate
- Calibration kit is available. One screw allows access for calibration or gas test

Specifications

- Power: 100-240VAC (50 TO 60 HZ)
- Current: 1.0 A MAX
- Shipping Weight: 1 pound (0.45 kg)
- Size: 4 1/2 x 4 x 2 1/8 in. (11.4 X 11.4 X 5.3 cm)
- Color: White or dark gray
- Connections: plugs/terminals
- Mounting box: (not included) 4x4 electric
- Fan relay: 5 A, 240 VAC, pilot duty, SPDT, latching or non-latching
- Fan relay actuation: selectable at dIS (disabled), 600, 700, 800, 900, 1000 (default), 1100, 1200, 1300, 1400, 1500 ppm
- Fan Delay Settings of 0, 1, 3 (default), 5 and 10 minutes
- Fan Relay Minimum Runtime settings are 0 (default), 3, 5, 10 or 15 minutes
- Fan relay latching or not latching (default) selectable
- Alarm relay: 0.5A 120 V, 60 VA
- Alarm relay actuation: selectable N.O. (default) or N.C.
- Alarm relay settings: "dIS"(disabled), 900, 1000... to 2000 ppm (default)
- Current Loop, 4-20 mA for 0-2000 ppm CO₂, selectable to off or on (default)
- Buzzer: 85 dBA at 10cm settable to off (default) or on
- Digital display: 4 digit LED selectable to off or on(default).
- Operating Environment: 32°F to 122° F (0°C to 50°C), 10 to 90% RH non-condensing
- Operating altitude: Up to 5,000m (16,404ft)

INSTALLATION AND OPERATING INSTRUCTIONS

The following instructions are intended to serve as a guideline for the use of the Macurco CD-12 Carbon Dioxide Detector. It is not to be considered all-inclusive, nor is it intended to replace the policy and procedures for each facility. If you have any doubts about the applicability of the equipment to your situation, consult an industrial hygienist or call Technical Service at 1-877-367-7891.



This detector helps monitor for the presence and concentration level of a certain specified airborne gas. Misuse may produce an inaccurate reading, which means that higher levels of the gas being monitored may be present and could result in overexposure and **cause sickness or death**. For proper use, see supervisor or User Instructions, or call Technical Service at 1-877-367-7891.

Location

A CD-12 is normally mounted at breathing level, about 5 feet (1.5 meters) above the floor on a wall or column in a central area where air movement is generally good. The unit, on average, can cover about 5,000 sq. ft. (465 sq. meters). The coverage depends on air movement within the room or facility. Extra detectors may be needed near any areas where people work or where the air is stagnant. Do NOT mount the CD-12 where the normal ambient temperature is below 32°F or exceeds 122°F (below 0°C or above 50°C).



High voltage terminals (120/240 VAC) are located within this detector, presenting a hazard to service technicians. Only qualified technicians should open the detector case and service the internal circuits. Ensure power is removed from the detector relays prior to servicing the unit. **Failure to do so may result in sickness or death.**

General Wiring Information

With the exception of the safety ground, all field wiring is completed via modular connectors (provided). After wiring, simply plug the modular connectors into the matching connectors on the back side of the detector.

Mains Power Connection

Mains connections should be done in accordance with National and Local Electrical Codes. Only qualified personnel should connect Mains power to any device. Macurco recommends a minimum wire size of AWG18 and the wire insulator must be rated for 140°F (60°C) service. The modular connector will accept wire from 12 to 24 AWG.

The safety ground wire should be secured to the ground screw of the metal electrical box. Tighten the screw and make sure the wire is snug. Ensure that the wire cannot be pulled out from under the screw.

The Line (L) and Neutral (N) wires should be stripped 1/4 in. (6.5 mm), insert the wire into the "L" and "N" wire positions of the modular Fan/Power connector and tighten the screw clamp. Ensure that the wire cannot be easily pulled from the connector. Plug the modular connection into the Fan/Power connection and ensure that it latches into the header properly.

Fan Relay Connection

All of the SPDT Fan relay terminals are available at the Fan/Power modular connector. Each Fan relay terminal normally open, common and normally closed (NO, COM and NC) can accommodate a wire size 12 to 24 AWG. To install the wiring for the relays,

disconnect the connector from the header. Strip the insulation of each wire back approximately 1/4 in. (6.5 mm), insert the bare wire into the terminal and tighten the screw clamp. Ensure that the wire cannot easily be pulled from the connector. Plug the modular connection into the Fan/Power connection and ensure that it latches into the header properly.

Alarm Relay Connection

The external alarm connections (A and B) are available at the Alarm modular connector. There is no polarity for these connections. To install the wiring for the alarm contacts disconnect the connector from the header on the detector. Strip the insulation of each wire back approximately 1/4 in. (6.5 mm), insert the bare wire into the terminal and tighten the screw clamp. Ensure that the wire cannot easily be pulled from the connector. When the wires are connected seat the modular connector into the header ensuring that the latch engages.

4-20mA Signal Connection

The positive and negative 4-20mA signal connections (+ and -) are available at the 4-20mA modular connector, a 2-position connector. To install the wiring for the 4-20 mA contacts disconnect the connector from the header on the detector. Strip the insulation of each wire back approximately 1/4 in. (6.5 mm), insert the bare wire into the terminal and tighten the screw clamp. Ensure that the wire cannot easily be pulled from the connector. When the wires are connected seat the modular connector into the header ensuring that the latch engages.

NOTE: The 4-20mA current loop outputs may be used with the Macurco DVP-120 control panel or other systems. The 4-20mA signal connections to detectors should be size AWG18 (minimum) for short runs. Refer to the table for recommended wire gauges. Do not bundle detector 4-20mA signal connections with AC power cables to prevent electrical interference. If AC power connections must be bundled with the detector 4-20mA signal cables, the signal connections should be made with twisted pair of the appropriate gauge, with an overall foil and braid shield. All shields should be terminated at the DVP-120 end of the cable only. A ground stud is provided near the bottom left corner of the DVP-120 panel.

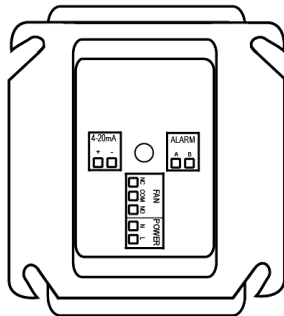
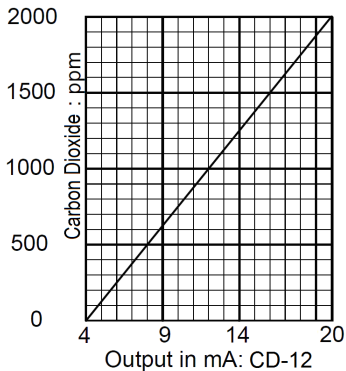
Installation

1. The CD-12 mounts on a 4" square (or 4x4) electrical box supplied by the contractor. Do not mount the CD-12 inside another box, unless it has good air flow through it.
2. There are two terminals for the dry alarm relay contacts, again with no polarity preference. The alarm relay can switch up to 0.5 A 120 V, or 60 VA. The alarm relay is activated if gas reaches or exceeds the alarm settings. See OPERATION section of these User Instructions for details on relay settings.
3. The alarm relay can be configured to normally open (default) (N.O.) or normally closed (N.C.) and will activate if the gas concentration exceeds alarm set point. It will deactivate once the gas concentration drops below the alarm set point. Note that the "disable" setting will cause the alarm relay not to engage at all.
4. The dry contact, SPDT fan relay has three terminals. The common (COM.), normally open (N.O.) and the normally closed (N.C.) contact. The fan relay can switch up to 5.0 A up to 240 VAC. See OPERATION section of these User Instructions for details on relay settings.
5. The Fan Relay can be configured for latching or non-latching (default) when activated (when the gas concentration exceeds fan relay set point). Once latched in, power will need to be interrupted or the "TEST" button pressed to un-latch the relay condition.
6. The Fan Relay will engage if the fan setting Carbon Dioxide concentration is exceeded for longer than the Fan Relay Delay time. Unless it is configured for latching, the fan relay will disengage once both of these conditions have been met:

- Carbon Dioxide concentration has dropped below fan setting
- Fan Relay Run time has been exceeded

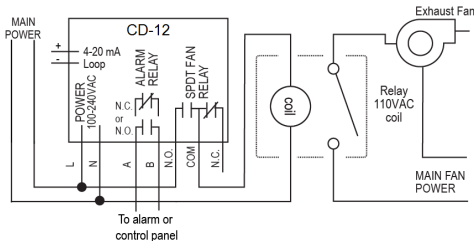
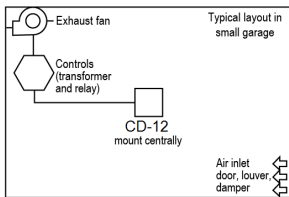
Note that the "disable" fan setting will cause the fan relay to not engage. The fan relay will engage in trouble fault condition (if the Trouble Fan Setting Option is set to "ON") and will disengage once trouble fault condition is cleared.

7. The Current Loop is 4 mA in clean air and 4-20 mA for 0-2000 ppm CO₂

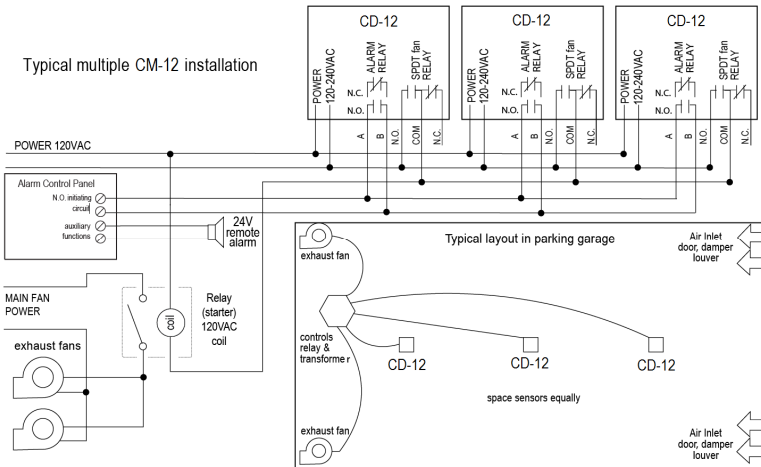


Rear view with connectors

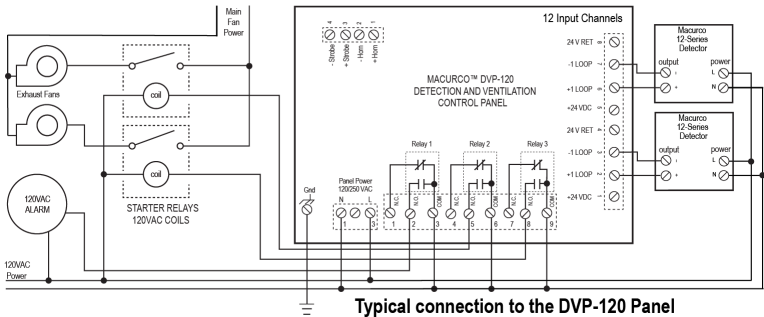
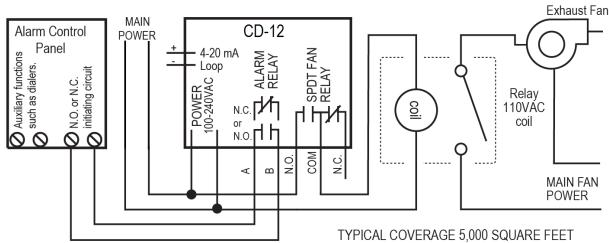
Typical layout in small garage

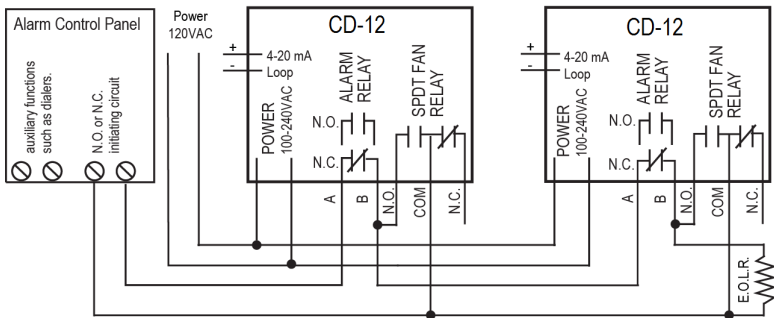


Typical multiple CM-12 installation



TYPICAL CONNECTION OF CD-12





Alternate connection to alarm control panel

In this application (above) the Fan or primary relay is used as a low level alarm relay. The Alarm or secondary relay is used as a supervisory relay when utilized in the normally closed configuration. The CD-12 monitors all critical functions of the unit through software diagnostics that continually test and verify its operations. If a problem is found, the unit will switch to a fail-safe/error mode or trouble condition. In this error mode the Fan* and Alarm relays will be activated indicating the trouble condition at panel and the CD-12 display will flash the error. *See the Trouble Fan Setting Option.

Power Up

The CD-12 cycles through an internal self-test cycle for the first minute that it is powered. The unit will execute the test cycle any time power is dropped and reapplied (i.e. power failure). During the self-test cycle the unit will display the firmware version number, then count down from 60 to 0 (if the display setting is "On") and finally go into normal operation. The alarm relay will be activated for 10 seconds and the fan relay for 60 seconds during the power-up cycle unless the "Power Up Test" (PUT) option is OFF. The indicator light (LED) will flash green during the self-test cycle. At the end of the 1 minute cycle, the unit will take its first sample of the air and the indicator light will turn solid green.

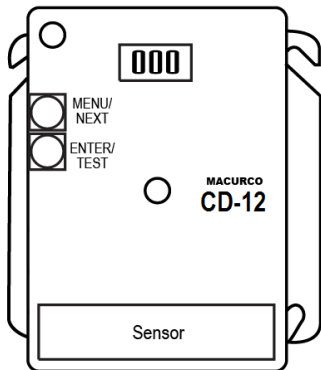
Operation

1. With the display function turned "On", the CD-12 will show the current concentration of CO₂ ppm in the air. Normal outdoor concentration ranges between 350-450 ppm. When the CO₂ concentration reaches the Fan Relay setting (1000ppm, for example) the display will flash back and forth between "FAn" and "1000". With the display function turned "Off", the display does not show the CO₂ concentration, but will show "FAn" as long as the fan relay is activated.
2. With the display function turned "On" and the CO₂ concentration reaching the Alarm Relay setting, (2000 ppm, for example) the display will flash back and forth between "ALr" and "2000". The buzzer will sound indicating "Alarm" if the buzzer is turned "On". With the display function turned off the display does not show the CO₂ concentration, but will show "ALr" when the Alarm relay is activated.
3. With the 4-20 mA function turned "On" and the CO₂ concentration climbing, the 4-20 mA signal will ramp up corresponding to the concentration (0-2000 ppm, for example). The display will show "FAn" and "ALr" and sound as outlined above.

Default Configuration – Factory Settings

- The default **Power Up Test** setting is **On**
- The default **Display** setting is **On**
- The default **Buzzer** setting is **On**
- The default **Alarm Relay Setting** is activation at 2000 **ppm**
- The default **Alarm Relay Configuration** setting is **Normally Open**
- The default **Fan Relay Setting** is activation at 1000 **ppm**
- The default **Fan Relay Delay** setting is **3 minutes**
- The default **Fan Relay Minimum Runtime** setting is **0 minutes**
- The default **Fan Relay Latching** condition is **OFF**
- The default **Trouble Fan Setting** condition is **OFF**
- The default **4-20mA Output** setting is **On**

To change settings, remove the Philips screw on the front of the CD-12. Pull off the front cover of the unit.



Selecting Default Configuration – “dEF”

To select the Default Configuration, in normal mode, push the **Next** button to get to “Con” or the Configuration menu. Then push the **Enter** button to enter the Con menu. The **first** selection is the “dEF” or Default setting. Push **Enter**. If it is already in Default configuration, there will be no action. If it is not already in Default configuration, “nO” will be displayed. Push **Next** to change it to “YES” (flashing) then push **Enter** to confirm the change (solid) and push **Enter** again to return to “dEF” in the con menu. Push **Next** until “End” is displayed then push **Enter** to get back to normal operation.

Selecting Power Up Test Option – “PUt”

To select the **Power Up Test** Configuration, in normal mode, push the **Next** button to get to “Con” or the Configuration menu. Then push the **Enter** button to enter the Con menu. Then push the **Next** button to get to the **second selection** “PUt” or **Power Up Test** setting. Push **Enter**. If the test is “On” push **Next** to turn it “OFF” (flashing) then push **Enter** to confirm the change (solid) and push **Enter** again to return to “PUt” in the Con menu. Push **Next** until “End” is displayed then push **Enter** to get back to normal operation.

Selecting Display Option – “dSP”

To select the Display Configuration, in normal mode, push the **Next** button to get to “Con” or the Configuration menu. Then push the **Enter** button to enter the Con menu. Then push the **Next** button to get to the **third selection** “dSP” or Display setting. Push **Enter**. If the display is “On” push **Next** to turn it “OFF” (flashing) then push **Enter** to confirm the change (solid) and push **Enter** again to return to “dSP” in the Con menu. Push **Next** until “End” is displayed then push **Enter** to get back to normal operation.

Selecting Buzzer Option – “bUZ”

To select the Buzzer Configuration, in normal mode, push the **Next** button to get to “Con” or the Configuration menu. Then push the **Enter** button to enter the Con menu. **The fourth selection** is the “bUZ” or Buzzer setting. Push **Next** twice to get to “bUZ” then **Enter**. If the display is “On” push **Next** to turn it “OFF” (flashing) then push **Enter** to confirm the change (solid) and push **Enter** again to return to “bUZ” in the Con menu. Push **Next** until “End” is displayed then push **Enter** to get back to normal operation.

Selecting Alarm Relay Setting – “ArS”

To select the Alarm Relay Setting, in normal mode, push the **Next** button to get to “Con” or the Configuration menu. Then push the **Enter** button to enter the Con menu. **The fifth selection** is the “ArS” or Alarm Relay Setting. Push **Next** three times to get to “ArS” then **Enter**. If the display is “dIS” (disabled) push **Next** to change it to 900, 1000,....to 2000 (default) ppm (flashing) then push **Enter** to confirm the change (solid) and push **Enter** again to return to “ArS” in the Con menu. Push **Next** until “End” is displayed then push **Enter** to get back to normal operation.

Selecting Alarm Relay Configuration – “Arc”

To select the **Alarm Relay Configuration**, in normal mode, push the **Next** button to get to “Con” or the Configuration menu. Then push the **Enter** button to enter the Con menu. **The sixth selection** is the “Arc” or Alarm Relay Configuration. Push **Next** four times to get to “Arc” then **Enter**. If the relay is “nO” (normally open) push **Next** to turn it to “nC” (flashing) then push **Enter** to confirm the change (solid) and push **Enter** again to return to “Arc” in the Con menu. Push **Next** until “End” is displayed then push **Enter** to get back to normal operation.

Selecting Fan Relay Settings – “FrS”

To select the Fan Relay setting, in normal mode, push the **Next** button to get to “Con” or the Configuration menu. Then push the **Enter** button to enter the Con menu. **The seventh selection** is the “FrS” or Fan Relay setting. Push **Next** five times to get to “FrS” then **Enter**. If the fan relay is “dIS” (disabled) push **Next** to change it to 600, 700, 800, 900, 1000 (default), 1100, 1200, 1300, 1400 or 1500 ppm (flashing) then push **Enter** to confirm the change (solid) and push **Enter** again to return to “FrS” in the Con menu. Push **Next** until “End” is displayed then push **Enter** to get back to normal operation.

Selecting Fan Relay Delay – “Frd”

To select the Fan Relay Delay setting, in normal mode, push the **Next** button to get to “Con” or the Configuration menu. Then push the **Enter** button to enter the Con menu. **The eighth selection** is the “Frd” or Fan Relay Delay. Push **Next** six times to get to “Frd” then **Enter**. If the delay is “0” (disabled) push **Next** to change it to 1, 3, 5, or 10 minutes (flashing) then push **Enter** to confirm the change (solid) and push **Enter** again to return to “Frd” in the Con menu. Push **Next** until “End” is displayed then push **Enter** to get back to normal operation.

Selecting Fan Relay Minimum Runtime – “Frr”

To select the **Fan Relay Minimum Runtime** setting, in normal mode, push the **Next** button to get to “Con” or the Configuration menu. Then push the **Enter** button to enter the Con menu. **The ninth selection** is the “Frr” or Fan Minimum Run Time. Push **Next** seven times to get to “Frr” then **Enter**. If the runtime is “0” (disabled) push **Next** to change it to 3, 5, 10 or 15 minutes (flashing) then push **Enter** to confirm the change (solid) and push **Enter** again to return to “Frr” in the Con menu. Push **Next** until “End” is displayed then push **Enter** to get back to normal operation.

Selecting Fan Relay Latching Option – “FrL”

To select the **Fan Relay Latching Option**, in normal mode, push the **Next** button to get to “Con” or the Configuration menu. Then push the **Enter** button to enter the Con menu. **The tenth selection** is the “FrL” or Fan Relay Latching Option. Push **Next** nine times to get to “FrL” then **Enter**. If latching is “OFF” push **Next** to turn it to “ON” (flashing) then push **Enter** to confirm the change (solid) and push **Enter** again to return to “FrL” in the Con menu. Push **Next** until “End” is displayed then push **Enter** to get back to normal operation.

Selecting Trouble Fan Setting Option – “tFS”

To select the **Trouble Fan Setting Option**, in normal mode, push the **Next** button to get to “Con” or the Configuration menu. Then push the **Enter** button to enter the Con menu. **The eleventh selection** is the “tFS” or Trouble Fan Setting Option. Push **Next** ten times to get to “tFS” then **Enter**. If Trouble Fan Setting is “OFF” push **Next** to turn it to “ON” (flashing) then push **Enter** to confirm the change (solid) and push **Enter** again to return to “tFS” in the Con menu. Push **Next** until “End” is displayed then push **Enter** to get back to normal operation.

Selecting 4-20mA Output Option – “420”

To select the **4-20mA Output Option**, in normal mode, push the **Next** button to get to “Con” or the Configuration menu. Then push the **Enter** button to enter the Con menu. **The twelfth selection** is the “420” or 4-20mA Output Option. Push **Next** eleven times to get to “420” then **Enter**. If the 4-20mA is “On” push **Next** to turn it to “OFF” (flashing) then push **Enter** to confirm the change (solid) and push **Enter** again to return to “420” in the Con menu. Push **Next** until “End” is displayed then push **Enter** to get back to normal operation.

Onboard Diagnostics

The CD-12 monitors all critical functions of the unit through software diagnostics that continuously test and verify unit operations. If a problem is found, the unit will switch to a fail-safe/error mode or trouble condition. In this error mode, the Alarm relay will be activated, the 4-20 mA current loop will go to 24 mA, the unit will display the error code, the green status indicator LED light will flash and the buzzer will chirp intermittently. The Fan relay will also engage if the Trouble Fan Setting Option is set to “ON”. This is a safety precaution. To clear this mode, simply turn off power to the unit for a few seconds, or push the ENTER/TEST switch (inside the unit). This will cause the unit to restart the 1 minute self-test cycle.

The 4-20 mA signal can be used for troubleshooting:

- 0 mA is most likely a connection problem
- 4-20 mA is normal gas reading range (0-2000 ppm)
- 24 mA indicates a Trouble condition

Error Codes

- t001 - Trouble with sensor signal
- t002 - Temperature compensation failed
- t004 - EEPROM bad checksum
- t008 - IR lamp trouble
- t010 - Bad EEPROM
- t020 - Bad calibration
- t040 - Factory calibration failure
- t080 - ADC trouble
- t100 - Under range
- t200 - Sensor expired
- t400 - Pressure sensor trouble
- t800 - PCBA not tested

If the error mode repeats frequently, check for continuous power and proper voltage. If power is not the problem and a unit has repeating error conditions, it may need to be returned to Macurco for service, per these User Instructions.

If the error mode indicates "Sensor expired" see the **Sensor Life Reset** section of these User Instructions.

MAINTENANCE

The CD-12 is low maintenance. The unit uses a long life NDIR sensor that has a 10+ year life expectancy (in normal conditions). The CD-12 uses an automated background calibration program to set the clean air level on a regular basis. The CD-12 will maintain accuracy if it is exposed to the "clean air reference value" (this reference value is the lowest concentration to which the sensor is exposed) at least once per week. **Note:** This applies when used in typical indoor ambient air with weekly unoccupied periods. All maintenance and repair of products manufactured by Macurco are to be performed at the appropriate Macurco manufacturing facility. Macurco does not sanction any third-party repair facilities. **Note:** There is no field calibration procedure for the Macurco CD-12.

End-of-life Signal

The CD-12 has a long life, non-replaceable electrochemical sensor. Ten (10) years after the CD-12 is installed the sensor end-of-life signal will be activated indicating that the CD-12 has reached the end of its typical usable life. The end-of-life signal will cause an error code t200 "Sensor expired". See Error Codes section. The end-of-life signal can be silenced for 48 hours by pressing the "ENTER/TEST" button or by temporarily dropping power to the unit. The end-of-life signal provides the user an opportunity to test and/or calibrate the sensor assuring that it is still performing within acceptable parameters though the sensor is nearing the end of its

expected life. The silence function will continue to be available for 29 days after the CD-12 initiates the initial end-of-life signal. After this 29 day period the CD-12 can no longer be silenced and the sensor must be calibrated and the sensor life reset or the CD-12 detector replaced.

Sensor Life Reset

1. Remove the Philips screw on the front of the CD-12. Pull the front cover of the unit off.
2. To reset the sensor life (rSt), from normal or warm-up mode, press the **Next** button four times to get to "SEn" or Sensor Mode.
3. Then press the **Enter** button to get to "rSt" - Reset Sensor Mode.
4. Press the **Enter** button again to see the sensor reset status. If the sensor life has already been reset, done "don" will be displayed. If it has not already been reset, "no" will be displayed. Push **Next** to change it to "YES" (flashing) then push **Enter** to confirm the change (solid) and push **Enter** again to return to "rSt" in the "SEn" menu. Push **Next** until "End" is displayed then push **Enter** to get back to normal operation. The sensor life will be reset for 1 year.

NOTE: If the sensor is reset and the detector not replaced, it is necessary to test the sensor to assure that it is still performing within acceptable specifications though the sensor is nearing the end of its expected life. There will be no other indication of sensor performance.



Do not disassemble unit or attempt to repair or modify any component of this instrument. This instrument contains no user serviceable parts, and substitution of components may impair intrinsic safety, which may adversely affect product performance and **result in sickness or death**.

CAUTION

Avoid the use of harsh cleaning materials, abrasives and other organic solvents. Such materials may permanently scratch the surfaces and damage the display window, labels, sensor or instrument housing. High voltage terminals (100-240VAC) are located within this detector, presenting a hazard to service technicians. Only qualified technicians should open the detector case and service the internal circuits. Ensure power is removed from the detector prior to cleaning the unit. Failure to do so may result in sickness or death.

Cleaning

Cleaning of the external surfaces is best carried out using a damp cloth with a mild detergent or soap. Use a vacuum cleaner with soft brush to remove dust or contamination under the cover. Do not blow out the sensor with compressed air.

TESTING



Using a certified gas with a concentration other than the one listed for this detector when conducting a calibration verification test (bump test) will produce inaccurate readings. This means that higher levels of the gas being monitored may be present and could result in overexposure and **cause sickness or death**. For proper use, see supervisor or User Instructions, or call Technical Service at 1-877-367-7891.

General

All CD-12 units are factory calibrated and 100% tested for proper operation. During normal operation the green status indicator LED light will be on steady, the fan & alarm relay will be in standby mode and the 4-20 mA output will be at 4mA (in clean air). The unit also performs a regular automatic self-test during normal operation. If the unit detects an improper voltage or inoperable component, it will default into Error mode. In this error mode, the Alarm relay will be activated, the 4-20 mA current loop will go to 24 mA, the unit will display the error code, the green status indicator LED light will flash and the buzzer will chirp intermittently. The Fan relay will also engage if the Trouble Fan Setting Option is set to "ON".

Operation Test

Check that the green CD-12 status indicator LED light is illuminated continuously. If not, do not proceed with the tests. If the unit is in error mode contact your local representative or Macurco technical service representative for information on resolving the problem.

1. Remove the single screw in the middle of the front cover of the CD-12.
2. Remove the front cover.
3. Observe the LED light on the front of the CD-12.
4. If the light is solid green proceed to step 6.
5. If the green status indicator LED light is off or flashing, refer to the General section above.
6. Locate the switch labeled ENTER/TEST on the left side of the printed circuit board. Press the Test switch once.
7. The CD-12 will step through a cycle test:
 - a. The display progresses through the **BUZ** (Buzzer Test), **Art** (alarm relay test), **Fr**t (fan relay test) then **42t** (4-20 mA output test). Make sure that the settings are "on" or not disabled "diS".
 - b. During the first 10 seconds of the test cycle, the display will show BUZ and set off the audible buzzer
 - c. The alarm relay will be closed, so any devices connected to that relay will be tested.
 - d. The Fan relay will be activated for the next 1 minute of the test, so if the fan circuits are wired in the normal manner, the fan should run.
 - e. The 4-20mA output will then ramp up from 4 to 16 mA over the next 130 seconds of the test, so if the circuit is wired in the normal manner, the control panel or building automation system should respond.
 - f. At the end of the test cycle, the light will turn green and be on steady (Normal Operation), the fan & alarm relay will be in standby mode and the 4-20 mA output will return to 4 mA (in clean air).
8. When testing is completed reassemble the unit or units.

Manual Operation Test

This option gives the user the opportunity to manually initiate an individual test for each relay, the analog output and the sensor response to gas. From normal operation mode press the **Next** button 3 times to get to the Test Mode (tSt). Press the **Enter** button once to get into the Test Menu. Press the **Next** button to scroll through the four test options and press **Enter** to initiate the selected test. Note that if the relay or 4–20 mA output has been disabled, the test selection will not be displayed in the test menu.

bUZ- Buzzer Test, 3 seconds

Art - Alarm Relay Test, 10 seconds

FrT - Fan Relay Test, 60 seconds

42t - 420 loop test, 25 seconds

gtS - Gas Test, 3 minutes (no output to the panel during the gas test)

The display will flash during the test, or in the case of the gas test, the gas level will alternate with gtS. Once the test is complete, the display will return to steady display. To exit the test menu, press the **Next** button until "End" is displayed then, press **Enter** to return to normal mode.

Carbon Dioxide Gas Test



The following steps must be performed when conducting a calibration verification test (bump test) to ensure proper performance of the monitor. Failure to do so may adversely affect product performance and **result in sickness or death**.

- When performing a calibration verification test (bump test) only use certified calibration gas at the required concentration level. Do not test with expired calibration gas.
- If the instrument cannot be tested, do not use until the reason can be determined and corrected.
- Do not cover or obstruct display or visual alarm cover.
- Ensure sensor inlets are unobstructed and is free of debris

General

A Field Test Kit, CD6-FTK, is needed to complete a CO2 gas test. These are available through local distribution or from Macurco.

Contents of the FCK

- CD6-FTK: Gas Cylinder, (1) 17L 2000 ppm carbon dioxide (CO2) in air
- Gas regulator with about two feet of plastic tubing
- CD-6-TH test hood

FCK Information

Several detectors can be calibrated with one FCK. The only limitation is the amount of gas in the cylinder. The 17 liter cylinder has approximately 85 minutes of continuous calibration run time. Replacement cylinders are available. The gas cylinder should be replaced when the pressure gauge on the regulator shows 25-psi or less.

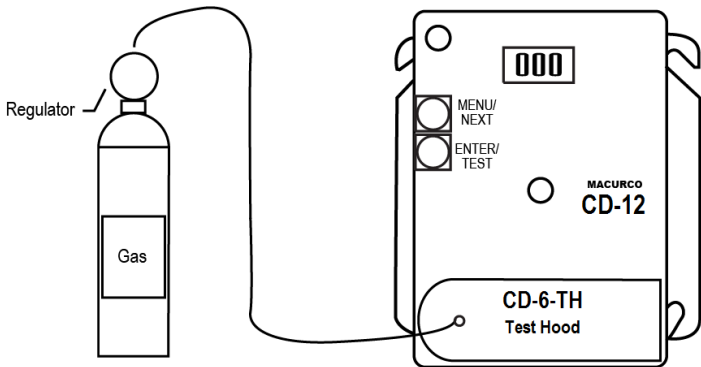
Note: For optimum test results it is suggested that the unit be in clean air, green light on, and be in a low ambient air flow.

Gas Testing

Testing the Fan Relay

1. Remove the Philips screw on the front of the CD-12. Remove the front cover.
2. Open the FCK. Connect the 2000 ppm gas cylinder to the regulator.
3. Check the pressure gauge on the regulator. If you have 25-psi or less you will need to replace the gas canister.
4. Assemble regulator, hose and Test Hood and place the Test Hood over the CO2 sensor.

Note: The time to activate the Fan relay depends on the delay setting.



5. Turn on the regulator to start the gas flow and wait with the gas applied continuously.
6. With the display function turned "On", the CD-12 will show the current concentration of CO₂ in the air. When the CO₂ concentration reaches the Fan Relay setting (1000 ppm, for example) the display will flash back and forth between "FAn" and "1000". With the display function turned "Off", the display does not show the CO₂ concentration, but will show "FAn" as long as the fan relay is activated.

Note: If the Fan relay does not close within 2 minutes, there are five possibilities:

- a. Gas cylinder is empty, check the pressure gauge. Replace the gas cylinder if 25psi or less.
 - b. Unit needs to be re-calibrated (automated background calibration) then re-test.
 - c. Detector is in need of servicing (return unit to factory for servicing).
 - d. Detector has fan relay set to disable (diS). Set fan relay to 1000 ppm and repeat the test.
 - e. Detector has fan relay delay set to 3 minutes. Set fan relay delay to 0 and repeat the test.
7. Remove the gas from the sensor. Proceed to Test the Alarm relay or replace the top cover.

Testing the Alarm Relay

Note: The CO₂ concentration to activate the Alarm relay depends on the setting.

1. Connect the 2000 ppm cylinder of carbon dioxide to the regulator.
2. Check the pressure gauge. If there is 25psi or less the cylinder should be replaced.
3. Place the Test Hood over the CO₂ sensor. Turn on the regulator to start the gas flow.
4. The Fan relay should activate according to the settings.
5. With the display function turned "On" and the CO₂ concentration reaching the Alarm Relay setting, (1500 ppm, for example) the display will flash back and forth between "ALr" and "1500". The buzzer will sound indicating "Alarm" if the buzzer is turned "On". With the display function turned off the display does not show the CO₂ concentration, but will show "ALr" when the Alarm relay is activated.

Note: If the Alarm relay fails to operate within 2 minutes, there are four possibilities:

- a. Gas cylinder is empty, check the pressure gauge. Replace the gas cylinder if 25-psi or less.
 - b. Unit needs to be re-calibrated (automated background calibration and re-test).
 - c. Detector is in need of servicing (return unit to factory for servicing).
 - d. Detector has Alarm relay set to disable (diS). Set Alarm relay to 1500 ppm and repeat the test.
6. Remove the gas from the sensor after Test. Proceed to Test the 4-20mA output or replace the top cover.

Testing the 4-20mA current loop

1. Connect the 2000 ppm cylinder of carbon dioxide to the regulator.
2. Check the pressure gauge. If there is 25-psi or less the cylinder should be replaced.
3. Place the cap from the regulator over the CO2 sensor. Turn on the regulator to start the gas flow.
4. The Fan relay should activate according to the settings.
5. The Alarm relay should activate according to the settings.
6. The 4-20 mA output should ramp up from 4mA in clean air to 20mA at 2000 ppm. See 4-20 mA diagram on page 8.

Note: If the 4-20mA output does not ramp up within 2 minutes, there are four possibilities:

- a. Gas cylinder is empty, check the pressure gauge. Replace the gas cylinder if 25-psi or less.
 - b. Unit needs to be re-calibrated (automated background calibration and re-test).
 - c. Detector is in need of servicing (return unit to factory for servicing).
 - d. Detector has 4-20 mA option set to "OFF". Set 4-20mA option to "On" and repeat the test.
7. Remove the gas from the sensor. Re-assemble the CD-12 (make sure the LED is aligned with the front case hole). You are done.

MACURCO FIXED GAS DETECTION PRODUCTS LIMITED WARRANTY

Macurco warrants the CD-12 gas detector will be free from defective materials and workmanship for a period of two (2) years from date of manufacture (indicated on the inside cover of the CD-12), provided it is maintained and used in accordance with Macurco instructions and/or recommendations. If any component becomes defective during the warranty period, it will be replaced or repaired free of charge, if the unit is returned in accordance with the instructions below. This warranty does not apply to units that have been altered or had repair attempted, or that have been subjected to abuse, accidental or otherwise. The above warranty is in lieu of all other express warranties, obligations or liabilities. **THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSE ARE LIMITED TO A PERIOD OF TWO (2) YEARS FROM THE PURCHASE DATE.** Macurco shall not be liable for any incidental or consequential damages for breach of this or any other warranty, express or implied, arising out of or related to the use of said gas detector. Manufacturer or its agent's liability shall be limited to replacement or repair as set forth above. Buyer's sole and exclusive remedies are return of the goods and repayment of the price, or repair and replacement of non-conforming goods or parts.

Manufactured by Aerionics, Inc.

Sioux Falls, SD

Email: info@aerionicsinc.com

Phone: 1-877-367-7891

Rev 10.20.2015

© Aerionics 2015. All rights reserved.

Macurco is a trademark of Aerionics, Inc.

The logo features the words "GAS DETECTION" in a bold, sans-serif font, centered within a thick, black horizontal bar. Below this bar, the word "Macurco" is written in a large, stylized, cursive script font.