MACURCO
GAS DETECTION

Macurco™ RD-12
Refrigerant Detector, Controller and Transducer
User Instructions

Important: Keep these User Instructions for reference

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GENERAL SAFETY INFORMATION

Intended Use

The Macurco RD-12 is a line voltage, dual relay Refrigerant (REF) detector, controller and transducer. The RD-12 utilizes an internal switching power supply that is capable of using line voltage between 100 and 240VAC and 50-60Hz. The RD-12 has selectable 4-20 mA output, buzzer and digital display options. It is an electronic detection system used to measure the concentration of refrigerant gas and provide feedback and automatic exhaust fan control to help reduce refrigerant gas concentrations in industrial refrigeration, cold storage, warehouses, hockey rinks or other commercial applications. The RD-12 is a low level meter capable of detecting several refrigerants including R-22, R-134a, R-404a, R-407c and R-410a, and displaying from 0-1,000 ppm of refrigerant gas. The RD-12 is factory calibrated and 100% tested for proper operation.

List of Warnings and Cautions within these User Instructions

⚠ WARNING

- 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 0°F or above 125°F (-18°C or above 52°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 (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 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.
  - 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 free of debris

USE INSTRUCTIONS AND LIMITATIONS

⚠ WARNING

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 RD-12 provides refrigerant gas detection and automatic exhaust fan control for industrial refrigeration, cold storage, warehouses, hockey rinks or other commercial applications. The RD-12 is capable of detecting several refrigerants including R-22, R-134a, R-404a, R-407c and R-410. Refrigerants are colorless and nearly odorless liquids or gases divided into two groups according to toxicity and flammability. See ANSI/ASHRAE Standard 34-2007 - Designation and Safety Classification of Refrigerants for details. Always review the refrigerant MSDS and safety classifications before use. RD-12 can be used stand alone, with the Macurco DVP-120 Detection and Ventilation Control Panel, other fire/security panels or building automation systems.

⚠ WARNING

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 RD-12 is not intended for use in hazardous locations or industrial applications such as refineries, chemical plants, etc. Do not mount the RD-12 where the normal ambient temperature is below 0°F or exceeds 125°F (-18°C or above 52°C). The RD-12 mounts on a type 4S electrical box supplied by the contractor. Do not install the RD-12 inside another box unless it has good air flow through it.

⚠ WARNING

This equipment may not function effectively below 0°F or above 125°F (-18°C or above 52°C). Using the detector outside of this temperature range may adversely affect product performance and **result in sickness or death**.

General Description

The RD-12 is a line voltage, dual relay Refrigerant (REF) detector and automatic ventilation controller. The RD-12 uses a microcomputer controlled, electronic system to measure the concentration of refrigerant gas, actuate relays and provide a 4-20 mA output. The RD-12 has a low maintenance long life (7+ years) solid-state sensor. The RD-12 is a low level meter capable of displaying from 0-1,000 ppm of refrigerant gas.

Features

- ETL Listed to UL 61010-1 and CAN/CSA C22.2 No 61010-1
- Low level meter capable of displaying from 0-1,000 ppm of refrigerant gas
- Selectable fan and alarm relay activation
- 5 A SPDT fan relay controls starters of exhaust fans
- 0.5 A N.O. or N.C. alarm relay connects to warning devices or control panels
- 4-20 mA Current Loop
- RD-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

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: 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 (disable), OFF, 100 (default), 150, 200, 250, 300, 350ppm
- Fan Delay Settings of 0, 1, 3 (default), 5 and 10 minutes
- Fan 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, 100, 125, 150, 200, 300 (default), 400, 500 or 600ppm
- Current Loop, 4-20 mA for 0-1,000 ppm refrigerant gas, selectable to off or on (default)
- Buzzer: 85 dBA at 10cm settable to on (default) or off
- Digital display: 3 digit LED selectable to on (default) or off
- Operating Environment: 0°F to 125°F (-18°C to 52°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 RD-12 Refrigerant gas 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.

⚠ WARNING

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 RD-12 is normally mounted low in the room on a wall or column one foot above the floor in a central area where air movement is generally good. Use the same spacing as for smoke detectors, 30-foot centers, 900 square feet per detector (84 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. The RD-12 mounts on a 4x4 electrical box supplied by the contractor. Do not install the RD-12 inside another box unless it has good air flow through it. Do NOT mount the RD-12 where the normal ambient temperature is below 0°F or exceeds 125°F (below -18°C or above 52°C).

⚠ WARNING

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 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.

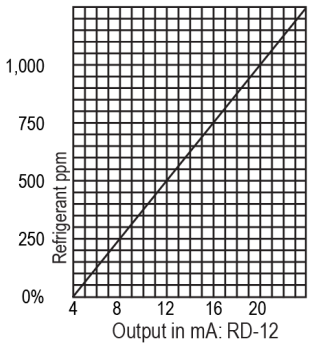
Note: The 4-20mA current loop outputs may be used with the Macurco DVP-120 control panel or other systems. The 4-20mA signal connections to detectors should be size AWG18 (minimum) for short runs. Refer to the table for recommended wire gauges. Do not bundle detector 4-20mA signal connections with AC 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.

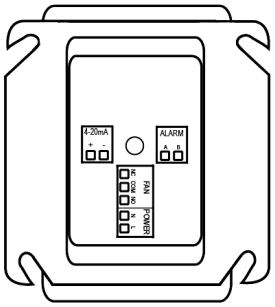
Installation

1. The RD-12 mounts on a 4" square (or 4x4) electrical box supplied by the contractor. Do not mount the RD-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 refrigerant gas 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:
    - Refrigerant gas 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.

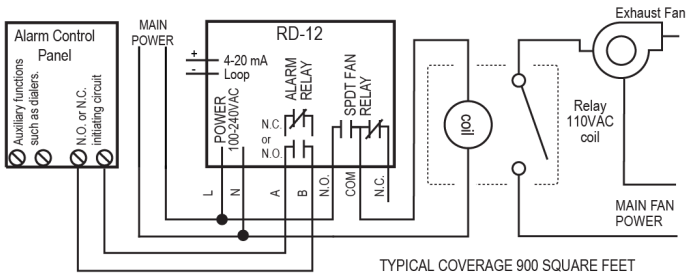
7. The Current Loop is 4 mA in clean air and 4-20 mA for 0-1,000 ppm refrigerant gas





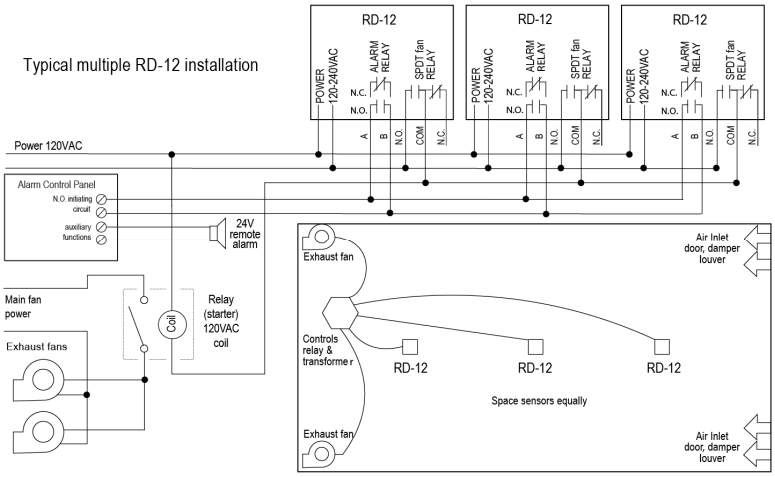
Rear view with connectors

TYPICAL CONNECTION OF RD-12



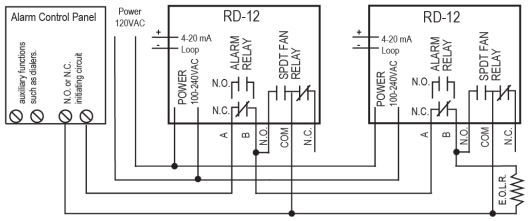
TYPICAL COVERAGE 900 SQUARE FEET

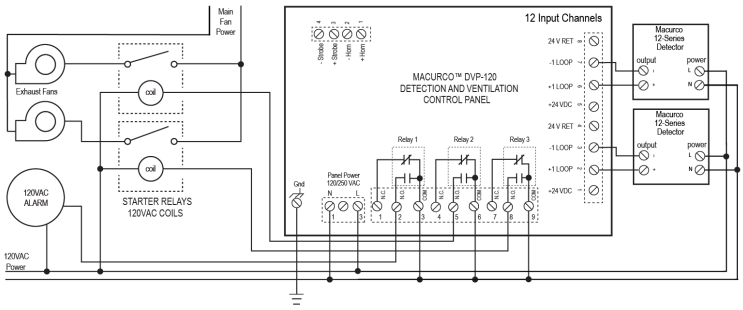
Typical multiple RD-12 installation



Alternate connection to alarm control panel

1. In this application 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.
2. The RD-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.
3. In this error mode the Fan* and Alarm relays will be activated indicating the trouble condition at panel and the RD-6 display will flash the error.
   *See the Trouble Fan Setting Option





Typical connection to the Macurco DVP-120 Detection and Ventilation Control Panel

Power Up

The RD-12 steps 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.

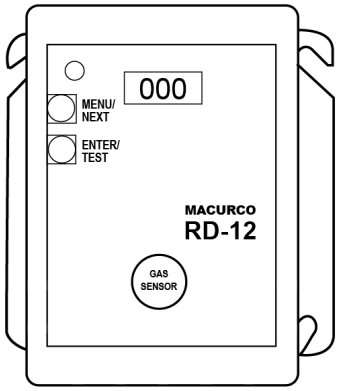
Operation

1. With the display function turned "On", the RD-12 will show the current concentration of refrigerant gas ppm or "0" (zero) in clean air. When the gas concentration reaches the Fan Relay setting (100 ppm, for example) the display will flash back and forth between "FAn" and "100". With the display function turned "OFF", the display does not show the refrigerant gas concentration, but will show "FAn" as long as the fan relay is activated.
2. With the display function turned "On" and the refrigerant gas concentration reaching the Alarm Relay setting, (200 ppm, for example) the display will flash back and forth between "ALr" and "200". The buzzer will sound indicating "Alarm" if the buzzer is turned "On". With the display function turned off the display does not show the refrigerant gas concentration, but will show "ALr" when the Alarm relay is activated.
3. With the 4-20 mA function turned "On" and the refrigerant gas concentration climbing, the 4-20 mA signal will ramp up corresponding to the concentration (0-300 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 **300 ppm**
- The default **Alarm Relay Configuration** setting is **Normally Open**
- The default **Fan Relay Setting** is activation at **100 ppm**
- The default **Fan Relay Delay** setting is **3 minutes**
- The default **Fan Relay 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 RD-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 100, 125, 150, 200, 300 (default), 400, 500 or 600 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 100 (default), 150, 200, 250, 300, 350 ppm (flashing) then push ***Enter*** to confirm the change (solid) and push ***Enter*** again to return to "run" 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" (zero minutes) 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 Runtime – "Frr"

To select the Fan 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" (zero minutes) 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.

On-board Diagnostics

The RD-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 (0-1,000 ppm)
- 24 mA indicates a Trouble condition

Error Codes

- t01 Sensor missing
- t02 Temperature compensation failure
- t04 EEPROM bad checksum
- t10 Bad EEPROM
- t20 Bad calibration
- t40 Factory calibration failure
- t80 Read ADC failure
- t100 Under range
- t200 Sensor warranty expired

Note: For trouble codes over 080 the display will alternate between t_1 and t00 for t100 and between t_2 and t00 for t200.

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.

Sensor Poisons

The gas sensor in the detector is designed with extreme sensitivity to the environment. Alcohols, ammonia, cleaning solvents, paint thinner, gasoline vapors, and aerosol propellants may cause nuisance alarms.

In addition, the sensing function may be deteriorated if it is exposed to a direct spray from aerosols such as paints, silicone vapors, etc., or to a high density of corrosive gases (such as hydrogen sulfide or sulfur dioxide) for an extended period of time.

MAINTENANCE

The RD-12 is low maintenance. The unit uses a long life solid-state sensor that has a 7 year life expectancy (in normal conditions). The detector's performance should be tested regularly by using gas as detailed in the Gas Testing section. 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 RD-12.

End-of-Life Signal

The RD-12 has a long life, non-replaceable solid-state sensor. Seven (7) years after the RD-12 is installed the sensor end-of-life signal will be activated indicating that the RD-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 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 RD-12 initiates the initial end-of-life signal. After this 29 day period the RD-12 can no longer be silenced and the sensor life must be reset or the RD-12 detector replaced.

Sensor Life Reset

1. Remove the Philips screw on the front of the RD-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. **Note:** 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.

⚠ WARNING

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.**

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

⚠ WARNING

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.

General

All RD-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 RD-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 RD-12.
2. Remove the front cover.
3. Observe the LED light on the front of the RD-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 RD-12 will step through a cycle test:
   a. The display progresses through the **BUZ** (Buzzer Test) **Art** (alarm relay test), **Frt** (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 2 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 five 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, 5 seconds

Frt - Fan Relay Test, 60 seconds

42t - 420 loop test, 130 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.

Refrigerant Gas Test

⚠ WARNING

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 free of debris

General

The RD-12 calibration can be verified or bump-tested with the RD-FTK with R-134a refrigerant gas, regulator and test hood, available through your local representative or from Macurco.

Contents of the FTK

- RD-FTK: (1) Gas Cylinder, 300 ppm R-134a refrigerant gas in air
- Gas regulator with about two feet of plastic tubing
- Humidifier
- Test hood

FTK Information

Several detectors can be tested with one FTK. The only limitation is the amount of gas in the cylinder and the flow of the regulator. The 34 liter cylinder for example with a 0.2LPM regulator has approximately 170 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.

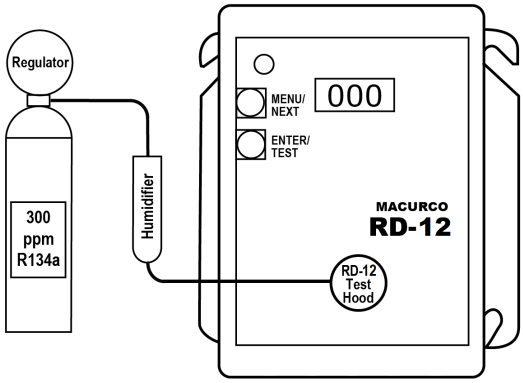
Gas Testing

Preparing the Humidifier

1. Open the two plastic halves of the humidifier by holding one half steady, turning the other one counterclockwise and then pulling them apart.
2. Pull out the orange sponge and wet it.
3. Squeeze the sponge such that there are not any visible drops of water on the sponge (it should only be damp).
4. Put the sponge back into the humidifier housing and close it.

Assembling the Regulator, Hose and Test Hood

1. Open the FTK. Connect the 300 ppm gas cylinder to the regulator.
2. Connect a 6" piece of tubing from the non-sponge end of the humidifier to the test hood.
3. Connect the sponge end of the humidifier to the tubing from the regulator



Testing the Fan Relay

1. Remove the Philips screw on the front of the RD-12. Remove the front cover.
2. Check the pressure gauge on the regulator. If you have 25-psi or less you will need to replace the gas canister.
3. Place the Test Hood over the gas sensor.

   Note: The time to activate the Fan relay depends on the delay setting.
4. Turn on the regulator to start the gas flow and wait with the gas applied continuously.
5. With the display function turned "On", the RD-12 will show the current concentration of gas or "0" (zero) in clean air. When the gas concentration reaches the Fan Relay setting (100 ppm, for example) the display will flash back and forth between "FAn" and "100". With the display function turned "OFF", the display does not show the gas concentration, but will show "FAn" as long as the fan relay is activated.

   Note: If the Fan relay does not change state within 2 minutes, there are four possibilities:

   a. Gas cylinder is empty, check the pressure gauge. Replace the gas cylinder if 25psi or less.

b. Detector has fan relay set to disable (diS) or higher than 300 ppm. Set fan relay to 100 ppm and repeat the test.
c. Detector has fan relay delay set to 3 or more minutes. Set fan relay to 0 minutes and repeat the test.
d. Detector is in need of servicing (return unit to factory for servicing).

6. Remove the gas from the sensor. Proceed to Test the Alarm relay or replace the top cover. Fan relay test is complete.

Testing the Alarm Relay

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

1. Connect the 300 ppm cylinder of Refrigerant 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 gas 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 gas concentration reaching the Alarm Relay setting, (150 ppm, for example) the display will flash back and forth between "ALr" and "150". The buzzer will sound indicating "Alarm" if the buzzer is turned "On". With the display function turned off the display does not show the gas concentration, but will show "ALr" when the Alarm relay is activated.

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

a. Gas cylinder is empty, check the pressure gauge. Replace the gas cylinder if 25-psi or less.
b. Detector has Alarm relay set to disable (diS) or higher than 300 ppm. Set Alarm relay to 150 ppm and repeat the test.
c. Detector is in need of servicing (return unit to factory for servicing).

6. Remove the gas from the sensor after Test. Proceed to Test the 4-20mA output or replace the top cover. Alarm relay test is complete.

Testing the 4-20mA current loop

1. Connect the 300 ppm cylinder of Refrigerant to the regulator.
2. Check the pressure gauge. If there is 25-psi or less the cylinder should be replaced.
3. Place the test hood from the regulator over the gas 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 9 mA at 300 ppm. See 4-20 mA diagram on page 7.

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

   a. Gas cylinder is empty, check the pressure gauge. Replace the gas cylinder if 25-psi or less.
   b. Detector has 4-20 mA option set to "OFF". Set 4-20mA option to "On" and repeat the test.
   c. Detector is in need of servicing (return unit to factory for servicing).

7. Remove the gas from the sensor. Re-assemble the RD-12 (make sure the LED is aligned with the front case hole). 4-20 current loop test is complete.

Quick Gas Test

A butane cigarette lighter can be used to perform a functionality test of the RD-12. This test allows installers to do a quick functionality test of the gas sensor.

1. Units to be tested must be powered continuously for a minimum of 3 minutes before proceeding.
2. For optimum test results, the unit should be in clean air and be in a low ambient air flow.
3. Check that the RD-12 status indicator light is illuminated, green continuously. If not, do not proceed with tests. See RD-12 Trouble Indicator section in these User Instructions.
4. The display option should be set to "On" and reading 0 ppm in clean air.
5. With the RD-12 cover on, aim the lighter into the sensor grate area (under "DO NOT PAINT") on the front cover and release the gas (without igniting the flame) for 1 second or less
6. Wait for a few seconds. The digital display should climb indicating the increased gas concentration at the sensor confirming a pass of the quick test.

   Note: If the Display does not change within 10 seconds, consider these possibilities:

   a. Lighter is empty.

   b. Detector is in need of servicing (return unit to factory for servicing).
7. Wait for the display to return to 0 ppm and configure options to desired settings.

MACURCO FIXED GAS DETECTION PRODUCTS LIMITED WARRANTY

Macurco warrants the RD-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 RD-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.

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