



**MATHESON**

The Gas Professionals

# COMPRESSED BREATHING AIR ANALYSIS KIT



## Instructions

*READ AND COMPLY WITH THESE INSTRUCTIONS BEFORE  
INSTALLING, OPERATING, OR SERVICING*



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## I. SERVICE

### General Service

A unit which is not functioning in a normal manner should be removed from service until such time that repairs or replacement can be made. Upon completion of repair, full testing should be performed to assure the user that the unit has been returned to its original operating parameters. MATHESON can repair or replace equipment. To arrange for repair or replacement service, call 1-800-828-4313 and ask for the Warranty Administrator. **No product will be received by MATHESON without indication of gas service and without proper return material authorization provided by the warranty administrator. (All repairs must be made by MATHESON or an assigned and approved facility to maintain any warranties or guarantees).**

If the unit is under an applicable warranty, return the unit to MATHESON for repair or replacement. To arrange for warranty service, call 1-800-828-4313 and ask for the Warranty Administrator. **No product will be received by MATHESON without indication of gas service and without proper return material authorization provided by the warranty administrator.**

If advised by the Warranty Administrator to return the product to MATHESON, prepare the product for shipment and write, in large lettering the RMA Number assigned by the Warranty Administrator on the outside of the box. Also, if required by the Warranty Administrator, supply the completed RMA form with the product. Make sure that the product is adequately packaged, in the original shipping container if possible, and shipped prepaid (MATHESON will not accept COD freight) with a description of the observed deficiency to the attention of the:

Warranty Administrator  
MATHESON  
166 Keystone Drive  
Montgomeryville, PA 18936

The user is expected to periodically inspect the product for leaks, loose, or worn parts, broken or non-functioning components and to address those situations immediately. If the user would require verbal assistance in ascertaining the potential of a problem with any MATHESON product, contact the local MATHESON branch for assistance or your MATHESON Sales Representative.

## II. TROUBLE SHOOTING

### Indications of Regulator Malfunction

1. Gauges should always read zero when all gas is drained from the regulator. If they do not read zero they may have to be replaced.
2. No gas should be coming out of the outlet when the regulator is in the closed position. If there is gas flow, this is an indication of regulator seat failure or imminent seat failure.
3. The delivery pressure should not rise with the cylinder valve open, the regulator set at a given delivery pressure and the outlet valve closed for five to ten minutes. If there is a pressure rise, this is an indication of regulator seat failure or imminent seat failure.
4. Gas leakage should never occur from the spring case (end of the regulator with adjusting knob or handle). If there is gas leakage, it is possible that the diaphragm or diaphragm seal is deficient.
5. All joints and connections on a regulator should be periodically checked for leaks. Presence of leaking seals is indicative of deficient performance.
6. There should be no excessive periodic drop in flow from the outlet of the regulator when in service. If this occurs, there is most likely a blockage or occlusion in the flow path.
7. To ensure long life to the user of the regulator, periodically, on a schedule consistent with user experience, regulators should be reconditioned for full service. MATHESON offers this service, and more information can be obtained by contacting the Warranty Administrator at 1-800-828-4313.

**If any of the above noted deficiencies are observed by the user, the unit should immediately be removed from service and arrangements made for repair or replacement of the deficient product.**

### Indications of Kit Malfunction

1. The rubber detector tube connector must provide a snug fit for the detector tube. Otherwise, sample air will escape the system without passing through the detector tube, thereby causing measurement errors. It should be replaced after every 75-100 measurements, or possible earlier. If it appears to provide a loose fit, or appears to be cracked or dried out, order Part Number 8014-002 (pkg. 6)
2. Detector tubes have a limited shelf life. Do not attempt to use any which have exceeded the expiration date stamped on each box.

3. Depending upon the quality of the breathing air being analyzed, the flowmeter may accumulate a particulate buildup, which can result in flow measurement errors. If it appears that the float ball in the flowmeter seems to stick when attempting to adjust flow rates, it most likely requires cleaning and should be returned to MATHESON for such services by contacting the Warranty Administrator at 1-800-828-4313.

**If any of the above noted deficiencies are observed by the user, the unit should immediately be removed from service and arrangements made for repair or replacement of the deficient product.**

### III. LIMITED WARRANTY

This equipment is sold by MATHESON under the warranties set forth in the following paragraphs. Such warranties are extended only with respect to the purchase of this equipment directly from MATHESON or MATHESON's Authorized Agent as new merchandise and are extended to the first Buyer thereof other than the purpose of resale.

For a period of one year from date of original delivery (ninety days in corrosive service) to Buyer or to Buyer's order, this equipment, is warranted to be free from functional defects in materials and workmanship and to conform to the description of this equipment contained in this manual and any accompanying labels and/or inserts, provided that this equipment is properly operated under the conditions of normal use and that regular and periodic maintenance and service is performed or replacements are made in accordance with the instructions provided. Expendable parts of this equipment are similarly warranted to be free from functional defects in materials and workmanship and to conform to the description of this equipment contained in this manual and any accompanying labels and/or inserts. The foregoing warranties shall not apply if the equipment has been repaired other than by MATHESON or a service facility designated by MATHESON, or if this equipment has not been operated and maintained in accordance with written instructions provided by MATHESON, or has been altered by anyone other than MATHESON, or if the equipment has been subject to abuse, misuse, negligence, or accident.

MATHESON's sole and exclusive obligation and the Buyer's sole and exclusive remedy under the above warranties is limited to repairing or replacing, free of charge, at MATHESON's sole discretion, the equipment or part which is telephonically reported to be a problem to the local MATHESON Branch Location, and which if so advised, is returned with a written statement of the observed deficiency, not later than seven days after the expiration of the applicable warranty, to the MATHESON Gas Equipment Technology Center during normal business hours, transportation charges prepaid, and which, upon examination, is found to comply with the above warranties. The Buyer shall pay for return trip transportation charges for the equipment or part.

**MATHESON shall not be otherwise liable for any damages including but not limited to incidental damages, consequential damages, or special damages, whether such damages result from negligence, breach of warranty or otherwise.**

**There are no express or implied warranties that extend beyond the warranties hereinabove set forth. MATHESON makes no warranty of merchantability or fitness for a particular purpose with respect to the equipment or parts thereof.**

**Acceptance of the equipment by the final buyer indicates the final buyer's acceptance of all warranties and limitations set forth above.**



#### **IV. USER RESPONSIBILITY**

This equipment will perform in conformity with the description thereof contained in this manual and accompanying labels and/or inserts when installed, operated, maintained, and repaired in accordance with the instructions provided. This equipment must be checked periodically, with the frequency of such inspections depending upon the scope of use. Damaged, worn, or contaminated equipment should not be used. Parts that are broken, missing, plainly worn, distorted, or contaminated should be replaced immediately. Should such repair or replacement become necessary, MATHESON recommends that a telephonic or written request for service advice be made to the MATHESON Equipment Engineering Group in Montgomeryville, Pennsylvania or to the nearest MATHESON branch location.

This equipment or any of its parts should not be altered without the prior written approval of MATHESON Equipment Engineering Group. The user of this equipment shall have the sole responsibility for any malfunction, which results from improper use, faulty maintenance, damage, improper repair or alteration by anyone other than MATHESON or a service facility designated by MATHESON. Further, the ultimate user of the equipment is responsible for the training and safe operation of the equipment by personnel in his/her employ.

## V. SAFETY PRECAUTIONS

1. Many Specialty Gases are hazardous in nature. It is important that the user of the equipment carefully review the hazards associated with the gas to be used with the Regulator. **Before installing the Regulator on any cylinder of compressed or liquefied gas, refer to the MSDS that was shipped with the gas or on file in your facility, as to the specific hazards associated with the gas to be used. Also, refer to all applicable inserts contained with the equipment for additional precautions and operating instructions.**
2. Make certain the Compressed Breathing Air Analysis Kit purchased is suitable for the application intended. All regulators supplied by MATHESON have a serial number, a model number, and a pressure limitation label and or stamping. Carefully review this information to establish the regulator fit for service in the desired application

The Model 8014BAK-01 is fitted with a CGA 346 connection and is rated for pressures of 0-3000 psig. This model should only be used for analyzing compressed breathing air in U.S.D.O.T. approved cylinders with a stamped service pressure in the range of 0-3000 psig.

The Model 8014BAK-03 is fitted with a CGA 347 connection and is rated for pressures of 3001-5500 psig. This model should only be used for analyzing compressed breathing air in U.S.D.O.T. approved cylinders with a stamped service pressure in the range of 3001-5500 psig

The Model 8014BAK-02 is fitted with a 1/4" NPT Female connection and is rated for pressures of 0-400 psig. This model should only be used for analyzing compressed breathing air from non-cylinder sources, having pressures no greater than 400 psig.

**CAUTION: Adaptors of any type, specifically which connect a high-pressure source to equipment rated at a lower pressure must not be used. The use of any adaptor is strongly discouraged by all Compressed Gas Industry organizations and companies.**

3. Make certain that the equipment purchased or delivered to the ultimate end user conforms to the specifications of the user. The user is responsible for selecting equipment compatible with gases that are to be used, physical parameters of operation and performance and normal material compatibilities. Selection information can be found in MATHESON Catalogs, MATHESON Tech Briefs and in the MATHESON Gas Data Book. In addition, any MATHESON representative would be pleased to aid in the selection of specific equipment.

4. Before installation of the Breathing Air Kit onto a cylinder of compressed breathing air, make certain that the CGA connection on the cylinder matches the CGA connection of the Breathing Air Kit. CGA connections are fitted to the Breathing Air Kit to limit the services in which the kit can be used. The use of Adaptors or alterations to the kit to change services must not be attempted.
5. Before installation of the regulator onto the source of compressed air, carefully inspect the regulator for visible signs of damage or contamination. Close attention should involve visual inspection of all exposed and connecting threads for visible signs of wear and abuse. Also examine the regulator for any loose parts outside of those that must swivel for connection to the gas cylinder or outlet lines. Also examine the regulator for signs of contamination with dirt, grease, or any other foreign material. Close attention should be given to the external appearance and the view of the regulator from the inlet and the outlet. If any foreign materials are present and cannot be removed from the regulator easily with a cloth, or if the threads on the regulator appear to be abused as indicated above, or any of the components appear to be loose, return the regulator immediately for service.
6. Before installation of the Breathing Air Kit onto the source of compressed breathing air, check the connection from the breathing air source as in step 5 for possible contamination and defective or loose parts.
7. Before installation of the regulator onto the cylinder of compressed air, move the cylinder(s) to the work location and secure the cylinder before removing the cylinder valve cap. Check the cylinder valve as in step 5 for possible contamination and defective or loose parts. If for any reason the cylinder appears to be faulted as noted here, return the cylinder cap to the top of the cylinder, tighten down and remove the cylinder from the work area and call the supplier of the cylinder for immediate pick-up.
8. When using any hazardous gas, the cylinder of the gas should be placed under an exhaust hood or be placed in a suitable safety enclosure.
9. Before installation of the regulator onto the cylinder of compressed air, make certain that the CGA connection on the cylinder matches the CGA connection attached to the regulator. CGA connections are fitted to the regulator to limit the services in which the regulator can be used. **THE USE OF ADAPTORS OR ALTERATIONS TO THE REGULATOR TO CHANGE SERVICES CAN BE EXTREMELY DANGEROUS AND SHOULD NOT BE ATTEMPTED.** If a conversion of a product is required, consult MATHESON before attempting.

## VI. INSTALLATION

Before attaching the Compressed Breathing Air Analysis Kit to the breathing air source to be analyzed, read carefully the "User Responsibility" and "Safety Precaution" sections of this manual.

1. For analyzing breathing air from a cylinder source:
  - 1.1. Secure the cylinder in a manner as to prevent accidental toppling.
  - 1.2. Remove the cylinder cap, if present.
  - 1.3. Make certain that the cylinder valve is tightly closed (clockwise).
  - 1.4. Remove the cylinder plug, if present.
  - 1.5. Inspect the cylinder valve for contamination or abuse, as described under the "Safety Precautions" section.
2. Following the procedures outlined below, make the connection of the regulator to the compressed breathing air source:
  - 2.1. Mount the Breathing Air Kit assembly (without a detector tube attached) so that the flowmeter is in a vertical position, with the flowmeter valve at the top. Any deviation more than 5 degrees from vertical will affect the accuracy of the flowmeter, as well as subsequent measurements made with the kit.
  - 2.2. **DO NOT FORCE** the connection between the regulator and breathing air source. The connection should be made easily. If it cannot be made easily, most likely the user has the wrong regulator connection for the service. See the "Safety Precautions" section above.
  - 2.3. **NEVER USE LUBRICANTS** of any type on the regulator or breathing air source connections.
  - 2.4. **NEVER USE TEFLON TAPE** to aid in the sealing of the regulator connection to the breathing air source connection.
3. Close the regulator by turning its adjusting control knob in a counterclockwise direction.
4. Close the regulator outlet valve (between regulator and flowmeter) by turning it in a clockwise direction.
5. Close the flowmeter valve by turning it in a clockwise direction.

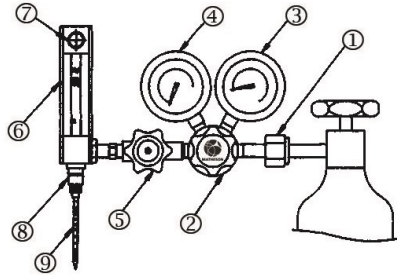
## VII. OPERATION

Before attempting to operate the Compressed Breathing Air Analysis Kit, read carefully the "Safety Precautions" and "Installation" sections of this manual.

### 1. Operation Overview

The following diagram illustrates the components of a Compressed Breathing Air Analysis Kit

- (1) CGA Connection
- (2) Regulator
- (3) Inlet Pressure Gauge
- (4) Delivery Pressure Gauge
- (5) Regulator Outlet Valve
- (6) Flowmeter
- (7) Flowmeter Valve
- (8) Tube Connector
- (9) Detector Tube



(Note that the Model 8014BAK-02 is not fitted with a CGA connection, and the regulator is equipped with a delivery pressure gauge only).

Detector tubes, sold separately, are available for measuring levels of Carbon Monoxide, Carbon Dioxide, Oil Mist, Water Vapor, and Oxygen in the compressed breathing air.

In operation, measurements are made by passing the breathing air through each detector tube at a specified flow rate, pressure, and time interval. Each detector tube is formulated with a high purity reagent which absorbs and reacts with the component being measured. This causes a colorimetric stain whose length is directly proportional to the amount of component in the breathing air. Its concentration is read directly from the measurement scale etched on each detector tube.

## 2. Operation Procedure

- 2.1 The regulator control knob, the regulator outlet valve, and the flowmeter valve should be closed as described in the "Installation" section. Also, a detector tube should not be attached to the system at this time.
- 2.2 The user should be fitted with appropriate safety apparel, such as safety glasses.
- 2.3 The user should then position himself/herself with the cylinder between the user and the breathing air kit. Do not rest hands on, or apply force to, the regulator during the following step.
- 2.4 To avoid damage to the regulator's internal parts, open the cylinder valve, or breathing air source valve, **SLOWLY**. Observe the high inlet pressure gauge (Models 8014BAK-01,03) for a rise in pressure to full cylinder pressure.
- 2.5 Observe all high-pressure connections in the pressurized system for leaks:
  - 2.5.1. An approved soap solution can be used to check connections for leaks.
  - 2.5.2. An approved leak detecting device can be used to check for leaks.
  - 2.5.3. If neither method above can be utilized, re-close the cylinder valve for a minimum of five minutes and observe the high-pressure inlet gauge for a drop in pressure.
  - 2.5.4. If a leak is indicated by any of the methods above, re-check the CGA connection to the cylinder and all other high-pressure connections.
  - 2.5.5. If all the connections indicate no leak and the regulator and outlet valve are still closed, and the pressure continues to fall on the inlet gauge, reduce the pressure in the system as outlined in step 2.15 of this section, and return the Breathing Air Kit to MATHESON for replacement or repair. See "Service" and "Warranty" sections of this manual.
- 2.6 If the system has been leak checked as in step 2.5 and is found to be acceptable, open the cylinder valve or breathing air source valve completely.
- 2.7 While observing the delivery pressure gauge, **SLOWLY** adjust the regulator control knob (clockwise) to raise the delivery pressure to the preset pressure required for the particular detector tube to be used.

Substance	Detector Tube No.	Preset Pressure
Carbon Monoxide	8014-600SP	8.5 psig
Carbon Dioxide	8014-601SP	14.2 psig
Oil Mist	8014-602SP	14.2 psig
Water Vapor	8014-603SPA	14.2 psig
Oxygen	8014-604SP	3.0 psig

**Note: Should the delivery pressure accidentally be raised higher than the specified valve, close the regulator (turn the control knob counterclockwise all the way), open the flowmeter valve (counterclockwise), and SLOWLY open the regulator valve so as to vent the system. After venting the system (delivery pressure gauge should read zero pressure), close the outlet and flowmeter valves. Then repeat 2.7.**

- 2.8 Open the regulator outlet valve completely. (Note that this valve is intended for temporary shutoff purposes only; it is not designed to throttle or control pressure or flow in any way whatsoever).
- 2.9 Adjust the flowmeter valve so that the float in the flowmeter is approximately one-quarter inch (accuracy not important here) from the bottom of the flowmeter. This allows a slight flow of air through the system.

**Note: Turning the flowmeter valve clockwise decreases flow, while turning it counterclockwise increases flow.**

- 2.10 Re-adjust the regulator delivery pressure to the appropriate preset pressure. See step 2.7 for preset pressures.
- 2.11 Adjust the flowmeter valve so that the center of the float ball in the flowmeter is at the graduated mark for the particular detector tube to be used.
- 2.12 Allow the breathing air to flow through the system for 3 minutes for carbon monoxide, carbon dioxide, and oil mist tubes, 10 minutes for water vapor tubes, so as to purge the system.
- 2.13 Measurement of carbon monoxide, carbon dioxide, oil mist, and water vapor.

**Note: Steps 2.13.1 through 2.13.4 pertain only to the measurement of carbon monoxide, carbon dioxide, oil mist, and water vapor. For the measurement of oxygen, see steps 2.14.1 through 2.14.6.**

- 2.13.1 Set the timer to the appropriate time sampling interval for the detector tube to be used. However, do not start it running yet. (See "Timer Operation" section of the manual for instructions on how to operate the timer).

Substance	Detector Tube No.	Sampling Time
Carbon Monoxide	8014-600SP	2 minutes
Carbon Dioxide	8014-601SP	2 minutes
Oil Mist	8014-602SP	25 minutes
Water Vapor	8014-603SPA	1 minute

- 2.13.2 Break off the ends of the detector tube to be used in the supplied tube tip cutter. Immediately, insert the detector tube into the rubber tube connector of the system, with the arrow on the detector tube pointing down (air flow direction). Simultaneously, start the timer. Note that it is normal for the float in the flowmeter to drop when the detector tube is attached.

- 2.13.3 After the appropriate time interval has elapsed, **PROMPTLY** remove the detector tube from the system. A change in the color of the detector tube reagent (stain) indicates the presence of the component being measured. (See "Specification" section for color changes). The stain end mark indicates the concentration of the component being measured and can be read directly off the measurement scale etched on the detector tube. If the end mark is not even, read the concentration at the center between the longest and shortest points of the discolored stain.
- 2.13.4 If it is desired to run another analysis for a different component (except for oxygen, which is discussed in steps 2.14.1 to 2.14.6), then repeat steps 2.9 through 2.13.3. Note that in this case it is not necessary to purge the system, provided the breathing air is left flowing between analyses. If no other analyses are required, proceed with step 2.15 for system shutdown instructions.

## 2.14 Measurement of oxygen

**NOTE:** Steps 2.14.1 through 2.14.6 pertain only to the measurement of oxygen. See steps 2.13.1 through 2.13.4 for measurement of other components.

- 2.14.1 The Oxygen detector tube, number 8014-604SP, utilizes a different set of procedures for its use. Note that there are three caution or warning statements which must be observed in the interest of user safety.

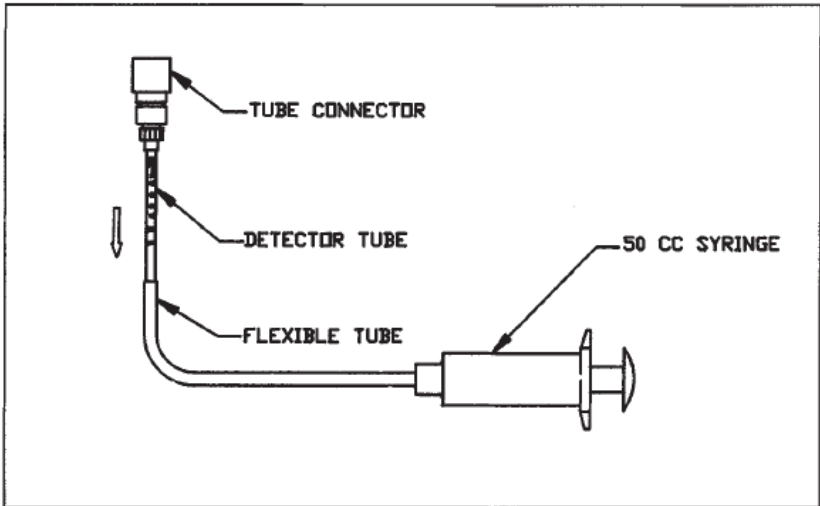
**WARNING:** Step 2.14.2 will cause the detector tube to get HOT. Care should be taken to avoid burning fingers while holding tube. The wearing of gloves is highly recommended. **WARNING:** Step 2.14.2 will require the generation of an open flame. **DO NOT PERFORM THIS PROCEDURE IN AN AREA CONTAINING FLAMMABLE GASES OR IN AN AREA WITH AN ENRICHED (+25%) OXYGEN ATMOSPHERE.**

- 2.14.2 The Oxygen detector tube contains a red colored reagent (about one-half inch long) towards one end of the tube. While holding the tube at the **OPPOSITE** end, heat this red section of the tube with a match or lighter until the color changes to purple.
- 2.14.3 **AFTER** the detector tube has cooled, break off the one end of the tube **OPPOSITE** from the purple reagent, in the supplied tube tip cutter. Attach the supplied flexible tubing and plastic syringe to the end of the detector tube just cut, making sure the plunger on the syringe is pushed all the way in **BEFORE** connecting. See diagram on following page.

**CAUTION:** Step 2.14.4 may cause the plunger to be pushed out of the syringe. Keep your thumb or finger on the plunger to prevent this from happening.

- 2.14.4 Break off the other end of the detector tube in the tube tip cutter, and **QUICKLY** insert the detector tube into the rubber tube connector of the system, with the arrow on the detector tube pointing down (air flow direction). See diagram on following page.





2.14.5 The Oxygen detector tube does not utilize a sampling time interval. Instead, sampling is complete after 50cc of breathing air has passed through the detector tube. This is evidenced when the plunger is pushed out of the syringe to the 50cc mark. Note that the pressure of the system should automatically push the plunger out. However, if it doesn't the user may have to **SLOWLY** withdraw the plunger to the 50cc mark.

2.14.6 As soon as the plunger reaches the 50cc mark, **PROMPTLY** remove the **DETECTOR TUBE** from the rubber tube connector of the system. A change in the color (stain) of the detector tube reagent indicates the presence of oxygen in the sample. (See "Specification" section for color changes). The stain end mark indicates the oxygen concentration and can be read directly off the measurement scale etched on the detector tube. If the end mark is not even, read the concentration at the center between the longest and shortest points of the discolored stain.

## 2.15 System shutdown instructions.

Upon completing analyses of the breathing air, the system should be shut down in the following manner:

2.15.1 Shut off the cylinder valve or valve to breathing air source completely.

2.15.2 Allow the contents of the system to vent to atmospheric pressure. Regulator gauges should descend to zero.

- 2.15.3 After venting, close the regulator (by turning knob counterclockwise), close the regulator outlet valve (by turning it clockwise), and close the flowmeter valve (by turning it clockwise).
- 2.15.4 In disassembling the Breathing Air Kit from the breathing air source, **SLOWLY** loosen the connection between them, while listening for gas seepage. If leaking is evident, re-tighten the connection immediately and check that the cylinder valve, or valve to breathing air source, is closed tightly. Also ensure that the pressure gauges read zero.
- 2.15.5 To prevent damage to the Compressed Breathing Air Analysis Kit, it should be stored in its protective case when not in use.

## VIII. TIMER OPERATION

The timer included in this kit can be utilized to measure elapsed times from one second to 100 minutes. There are two digits on the display for minutes (marked “M”) and two digits for seconds (marked “S”).

### Setting the Timer

1. Press the stop/reset button once to zero the timer, if necessary.
2. Press the appropriate keys for the desired time setting. Note the first entry is for minutes times ten, the second entry for minutes, the third entry for seconds times ten, and the fourth and final entry for seconds.
3. If the displayed setting is not the desired setting at the end of step 2 above, reprogram the timer by beginning this sequence again.

### To Stop the Timer

1. To stop the countdown, press the stop/reset button once and the timer will stop.
2. Press the stop/reset button again to reset the timer. The timer will now be ready for programming again.

### Alarm

1. When the programmed time has expired, the alarm signal will sound for a maximum of one minute.
2. The alarm can be disabled by pressing any of the keys on the face of the timer after the alarm commences.

### Replacement of Battery

**NOTE: The timer is battery operated. Over time the batteries of the unit will need to be replaced.**

1. Use a coin to open the cover of the timer on the reverse side from the face in the direction indicated by the arrow.
2. Remove the exhausted battery and replace with a new “G-13” size button cell, positive (+) side of the cell up.
3. Close the cover and snap in place.

## IX. SPECIFICATIONS

<b>Impurity to be Measured</b>	<b>CO</b>	<b>CO<sub>2</sub></b>	<b>Oil</b>	<b>Water</b>	<b>O<sub>2</sub></b>
Tube No.	8014-600SP	8014-601SP	8014-602SP	8014-603SPA	8014-604SP
Range	5-100 ppm	100-3000 ppm	0.3-5 mg/m <sup>3</sup>	20-160 mg/m <sup>3</sup>	2-24 %
Color Change	Yellow to Dark Brown	Purple Blue to Pale Pink	Yellow to Pale Blue	Yellow to Yellow-Green (or Blue**)	White to Brown
Shelf Life (years)	2	2	2	3	2
Tubes per Box	10	10	10	10	10
Preset Pressure (psig)	8.5	14.2	14.2	14.2	3.0
Sampling Time (min)	2	2	25	1	—

\*\*NOTE: For less than approximately 60 mg/m<sup>3</sup>, the changed color becomes yellow-green. For more than 60 mg/m<sup>3</sup>, the color becomes blue.

## X. GLOSSARY

<b>Symbol</b>	<b>Chemical or Term</b>
CO	Carbon Monoxide
CO <sub>2</sub>	Carbon Dioxide
Oil	Oil Mist
H <sub>2</sub> O	Water Vapor
O <sub>2</sub>	Oxygen
ppm	Parts per Million
mg/m <sup>3</sup>	Milligrams per Cubic Meter
psig	Pounds per Square Inch Gauge
min	Minutes
ml/min	Milliliters per Minute

## XI. PART NUMBERS OF EXPENDABLE PARTS

Part Number	Description
8014BAK-01	Compressed Breathing Air Analysis Kit -- complete with CGA 346 cylinder connection, regulator, regulator outlet valve, flowmeter, tube connector, tube tip cutter, timer, wrench, syringe/tubing, and carrying case. No detector tubes included.
8014BAK-02	Same as above except with 1/4" NPT Female connection
8014BAK-03	Same as above except with CGA 347 connection
8014-600SP	Carbon Monoxide detector tubes*
8014-601SP	Carbon Dioxide detector tubes*
8014-602SP	Oil Mist detector tubes*
8014-603SPA	Water Vapor detector tubes*
8014-604SP	Oxygen detector tubes*
8014-002	Replacement rubber tube connector (pkg 6)
8014-610	Replacement syringe/tubing for Oxygen tube
8014-611	Replacement timer
8014-612	Replacement wrench
8014-613	Replacement tube tip cutter

\*One box containing ten detector tubes

## XII. COMPRESSED AIR QUALITY SPECIFICATIONS

The following table is a partial summary of the maximum allowable component/characteristic levels in various grades of gaseous compressed air. Units are in ppm (mole/mole) unless shown otherwise. A blank indicates no maximum limiting characteristic.

Limiting Characteristics	GRADES								
	A	K	L	D	E	G	J	M	N
Oxygen (percent)	19.5 to 23.5	19.5 to 23.5	19.5 to 23.5	19.5 to 23.5	20 to 22	19.5 to 23.5	19.5 to 23.5	19.5 to 23.5	19.5 to 23.5
Water (ppm, v/v)		200	50				1	3	
Dew Point (°F)		-33	-54				-10.4	-92	
Oil (mg/m <sup>3</sup> at NTP)				5	5				none
Carbon Monoxide				10	10	5	1	1	10
Carbon Dioxide				1000	500	500	0.5	1	500
Total Hydrocarbons (as methane)		25			25	15	0.5	1	
Nitrogen Dioxide						2.5	0.1	0.5	2.5
Nitric Oxide									
Sulfur Dioxide						2.5	0.1		5
Halogenated solvents						10	0.1		
Acetylene							.05		
Nitrous Oxide							0.1		

Source: ANSI/CGA Specification G-7.1 – 1989

For complete Commodity Specification for Air, see Pamphlet G-7.1 (1989) available from the Compressed Gas Association, Inc., New York, New York.

### XIII. WATER VAPOR CONVERSION FACTORS

Water vapor, as measured with the 8014-603SP detector tube, is given in units of milligrams per cubic meter (mg/m<sup>3</sup>). The table below provides the conversion for mg/m<sup>3</sup> water vapor to parts-per-million (ppm) and dew point in degrees Fahrenheit.

mg/m <sup>3</sup>	ppm	Dew Point (°F)	mg/m <sup>3</sup>	ppm	Dew Point (°F)
20	27	-63	95	129	-40
25	34	-60	100	136	-39
30	41	-57	105	143	-38
35	48	-55	110	150	-37
40	54	-53	115	156	-37
45	61	-51	120	163	-36
50	68	-50	125	170	-35.5
55	75	-48	130	177	-35
60	82	-47	135	184	-34
65	88	-46	140	190	-33.5
70	95	-44.5	145	197	-33
75	102	-43.5	150	204	-32.5
80	109	-42.5	155	211	-32
85	116	-41.5	160	218	-31
90	122	-41			

NOTE: The above data is valid only for converting water vapor readings obtained at room temperature (25° C/77° F). To convert a water vapor reading obtained at other than room temperature, use the following formula:

$$\text{ppm} = \frac{\text{mg}}{\text{m}^3} \times \frac{22.4}{M} \times \frac{273 + t}{273} \times \frac{760}{p}$$

where: mg/m<sup>3</sup> = reading from the detector tube  
M = molecular weight (equals 18 for water)  
t = temperature in ° C at time of sampling  
p = pressure (normal atmospheric equals 760)





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