HAL-HCO106

Handheld Carbon Monoxide Meter/Monitor

Operational Manual

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Table of Contents

Important Messages

The information in this manual is believed to be accurate to date. However, Hal Technology assumes no responsibility for any inaccuracies that may be contained in this manual. In no event will Hal Technology be liable for direct, indirect, special, incidental, or consequential damages resulting from any defect or omission in this manual, even if advised of the possibility of such damages. In the interest of continued product development, Hal Technology reserves the right to make improvements or changes in this manual and the products it describes at any time, without notice or obligation.

Published in the United States of America

Quality Assurance

- This product has met the product specifications. All the test instruments and standard materials used for calibration are traceable.
- This certification is for new production only and not valid for used one or ones for an exhibition purpose.

Commonly used symbols in this manual

Following symbols are used throughout this manual:

WARNING

The action could lead to harmful damage to the instrument.

NOTICE

Bring you attention about the features of the instrument.

Unpacking and Inspection

- Inspect the receiving package and notify the shipper immediately if there appears to be susceptible damage during shipping.

- Please verify that the enclosed items match with the shipping package list.

WARNING

This Instrument also contains static sensitive components that may be damaged by improper handling. The warranty is void for any unauthorized opening of the instrument.

Environmental Requirements

To avoid any accident or damage to the instrument, please avoid using in the following situations:

- DO NOT expose to combustible, explosive environments.
- DO NOT expose to environments where rust or radioactivity are present.
- DO NOT expose to an environment exceeding the specified limits.

Technical Support and Warrantee

Within a year from the date purchased, the manufacturer will provide free technical support and software upgrade if applicable. For additional help, please contact info@haltechnologies.com

NOTICE

It is strongly recommended that the instrument should be calibrated semi-annually or annually at most. Please contact Hal Technology to schedule your calibration or any services needed. The HAL-HCO106 can only be serviced at Hal Technology or by Hal Technology's authorizing trained professionals.

I. Introduction

Carbon monoxide (CO) results from incomplete combustion of organic carbon-based materials. It is also an after-product of detonated explosives and diesel engines. Carbon monoxide is highly toxic to the body. Carbon monoxide (CO) is a colorless, odorless, tasteless gas that, physiologically, is a chemical asphyxiant. When inhaled, CO quickly bonds with the body's hemoglobin, thus reducing the blood's ability to carry oxygen throughout the body. In other words, breathing carbon monoxide can lead to asphyxiation - unconsciousness and even death. The HAL-HCO106 handheld Carbon Monoxide meter is a compact personal monitor that can provide a rapid indication of hazardous airborne carbon monoxide levels at simple touch of a button.

The HalTech HCO106 Carbon Monoxide Meter makes it easy to take quick measurements of low CO levels. Featuring the newest generation of electrochemical sensors, the HCO106 is a point-to sample instrument and responds very quickly to ambient changes in CO concentration with a built-in pump. The special circuitry design allows for no drift and accurate measurements. The USB port provides downloading of stored data as well as possible continuous, real time monitoring of the environment. The HCO106 is an useful tool for measurement within spaces such as industrial environments, commercial buildings, or residential dwellings where accumulation of

combustionable gas is possible.

1.1 Features

- Easy to use - minimal operator training required
- Wide measuring range
- Rapid response time
- No warm-up time
- Direct real time readings allow immediate response to results
- Reliable electrochemical sensor
- Large data storage capability
- Auto back light (power saving)
- High-speed USB connectivity
- Simple and easy in-field calibration
- External digital temperature and humility sensors to assure accurate measurement
- Excess limit warning (user defined)
- No less than 6 hours of continuous operation.

1.2 Specifications

- Target Gas: Carbon Monoxide (CO) in air
- Sensor Technology: Electrochemical sensor
- Sampling Method: Pump and pointing sampling
- Range: 0 ~ 500ppm
- Response Time: < 30 seconds
- Resolution: 0.01ppm
- Long Term Draft: <10% per year and < 25% over 5 years
- Repeatability: < ± 2%
- Position Sensitivity: None
- Expected Sensor Life: 5 years in non-corrosive environment.
- Display Unit: ppm (4 digit LCD)
- Memory: Up to 500 sets of data

- Interface: USB
- Power: Rechargeable Lithium ion battery (3.7V/900mAh); AC adapter 100~ 240VAC to 5VDC/1A
- Dimension: 80 (W) × 150 (H) × 36 (D) mm
- Weight About 200 grams
- Environmental Condition: Operating: 5~ 40°C, <90%RH; Storage: -20~ 50°C, <90%RH
- Standard accessories: AC adapter, USB cable, CD with data download software and user manual
- Optional accessories: Temperature and humidity sensor probe

II. Basic Operation

Six control keypads are used to operate the instrument: ⏻, **RUN/STOP**, **ENTER**, **BACK**, ▲, ▼.

- Power button ⏻: Push and hold it for about 2 seconds to turn on the instrument. After turned on, keep pushing on for about 2 seconds to turn off the instrument. The instrument will shut off automatically to save the power after about 8 minutes standby or no operation,
- **RUN/STOP**: Start or stop a measuring/sampling operation.
- ▲ ▼ : Move the cursor to select desired window page or item.
- **ENTER**: Confirm the current selection or enter parameter or save current sampling value.
- **BACK**: Change the concentration unit or back out of the selection

The bottom of the enclosure includes

- USB Interface: Connect to the USB interface to a computer for data downloading, remote sampling or firmware upgrading. Contact the manufacturer or sale representatives for availability of these functions.
- POWER port: An AC adapter plug-in port.
- Charge Status LED: LED flashes during charge and becomes steady after the charge finished.

2.1 Measuring Screen

The Measuring Screen is the main screen of the instrument for sampling testing. This screen can be run at the default settings. It displays the test result and conditions according to the unit settings. One may wish to change the settings before a measurement run by pressing up or down arrow to enter into the Setup Screen. An example of the Measuring Screen is shown in the Figure 1.

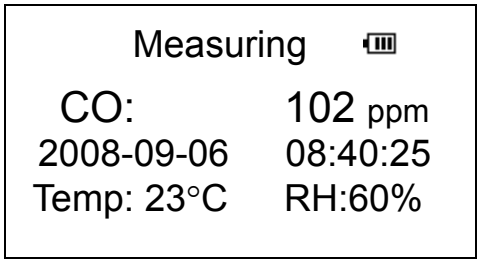

Figure 1 Measuring Screen

Battery Indicator

The battery indicator displays the battery strength graphically. Four bars represent 100% of charge in the battery; three bars 75%; two bars 50%; one bar 25%. No bars signify a low battery status and simultaneously the alarm will buzz as a warning. Charging of the battery is necessary at this level and after a few seconds of the warning sound the instrument shuts itself off automatically.

Time and Date

The current date and time is always displayed in the format of year-month-day and hour: minute: second, respectively. Date and time can be changed in the Setting screen.

Temperature & Relative Humidity (T and R/H)

Temperature and Relative Humidity automatically displays when an external temperature and humidity sensor probe is attached.

NOTICE

- Use **BACK** keypad to toggle the concentration unit between ppm and mg/m^3 if the sampling is not started.
- Push **RUN/STOP** keypad to start continuous measuring/sampling, During the sampling process, the backlight will be off automatically.
- Data are logged or current sampling value will be saved every time when the **ENTER** keypad is pressed. Push **RUN/STOP** keypad to stop measuring and the backlight will be on again.

- The instrument will automatically turn off the power in 8 minutes or so if no keypad action was received. However, the power will not be automatically turned off as long as a sampling (with a running pump) is in process.

Pressure

When it is applicable, the current pressure value will be displayed in Pa when an external pressure sensor is attached. The calibration data is set in the Setting screen.

WARNING

- Auto backlight is on and the instrument will automatically turn off the backlight after about several seconds if there is no keypad action.
- The instrument will be automatically turned off if there is no keypad action after about 8 minutes.

2.2 Browsing Screen

Press the arrow keypad to select the Browsing screen and enter into this page (Figure 2). This screen will allow the user to browse or delete historic data.

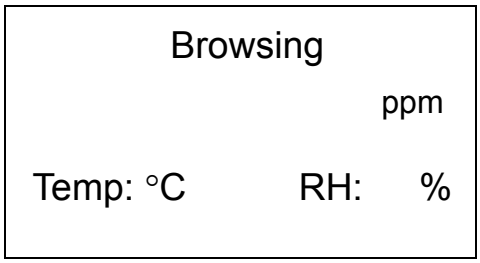

Figure 2 Browsing Screen

In the Browsing screen, press **ENTER** keypad to enter into the last saved data record (Figure 3). Then use the arrow keypad to scroll through the stored data.

- Use ▲ keypad to go to the next saved data record.
- Use ▼ keypad to return to the previous saved data record.

- Use **BACK** keypad to return to the main Browsing window. **BACK** keypad is effective only after entering into the data record.

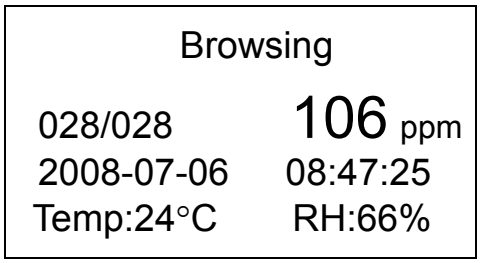

Figure 3 An example of the Browsing Screen

Record

Record format as current number of saved data/total number of stored data. (e.g., 028/028). In the Figure 3, one views the last data in the record with the total 20 of data sets stored.

Delete the record

- Press an arrow keypad to move up or down to select the record to be deleted.
- Use the arrow keypad to select Delete one or Delete all. Then press **ENTER** keypad to delete the current record (in this case, the total number of record will be reduced one while the next record number will be moved to replace the delete one), or delete all the records.

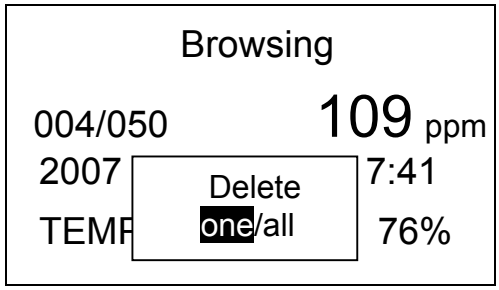

Figure 4 An example of deleting records in the Browsing Screen

2.3 Setting Screen

The Setting screen allows users to set or change Date, Time, and warning limit. Use an arrow and **ENTER** keypads to enter into the Setting screen. Then press the **ENTER** keypad to highlight the parameter that needs to be changed / set. The chosen parameter will be at the bottom of the window. Press **ENTER** keypad again and using the keypads scroll through the parameter options or change the number and then press **ENTER** to confirm the parameter's setting. Press **BACK** keypad to back to the previous screen.

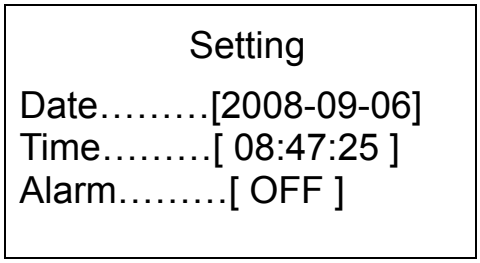

Figure 5 Setting Screen

Alarm level setting

The user may turn on or off the excess exposure limit warning. The user may input any value at the increment of 1ppm between 0 and 999ppm. For your reference, two levels of limit for carbon monoxide are in common: 1) Threshold Limit Value (TLV) of 35 ppm as a "ceiling limit" established by The National Institute for Occupational Safety and Health (NIOSH); 2) Permissible Exposure Limit (PEL) of 50 ppm established by US Occupational Safety & Health Administration (OSHA). All of these concentrations refer to exposures with durations of 8 hr/day, 40 hr/week for a working lifetime and all are attempts to establish a "no effect" level. The Immediately Dangerous to Life and Health (IDLH) limit is 1200ppm. Below are some other exposure levels and effects of carbon monoxide exposure from various sources:

CO Exposure	Effects of Exposure to Carbon Monoxide at this level	Source/comment
0 ppm	No effects, this is the normal level in a properly-operating heating appliance	No carbon monoxide should be detected in residential properties. Possible brief technical exceptions occur.
9 ppm	Maximum allowable short term exposure	ASHRAE
10 - 24 ppm	Investigation needed to find source;	Health effects on humans uncertain.
25 ppm	Maximum allowable TWA exposure limit	OSHA. Used in personal CO alarms.
35 ppm	Maximum allowable workplace exposure limit for an 8-hour work shift	NIOSH (40 hour work week)
50 ppm	Maximum allowable workplace exposure limit for an 8-hour work shift	OSHA (40 hour work week)
125 ppm	Workplace alarm must sound	OSHA
200 ppm	Evacuate the area immediately.	Exposure at 200 ppm of CO causes dizziness, nausea, fatigue.
400 ppm	Evacuate the area.	3 hour exposure may be fatal.
800 ppm	Evacuate the area.	2-3 hour exposure causes convulsions, loss of consciousness, death.
1200 ppm	Evacuate the area..	Revised IDLH

2.4 Calibration

After turning on the instrument, use up or down keypad to go to the Calibration Screen (Figure 6). Users may calibrate the instrument at his/her own wish after using for a certain time of period or suspect degradation of sensor performance.

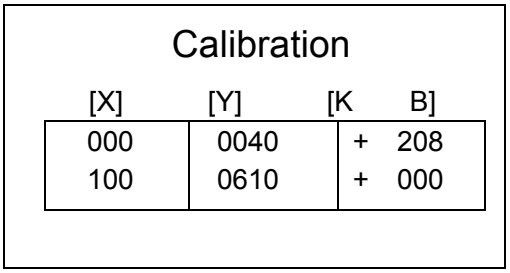

Figure 6 Calibration Screen - 1

Recommended calibration method is standard Zero-Span technique. The X values in the first column represent the concentration of calibrating gas in ppm. The Y values in the second column represent the response of the sensor to be calibrated. The values in the third column are calibration coefficients. The example of calibration procedures is described below:

Here we use a zero air and the vapor concentrations of 100 ppm of carbon monoxide standard gas cylinder as an example for calibration:

1) Connect the inlet of the instrument to a glass container and then introduce the zero air to the glass container
2) Enter into the calibration screen by pressing the **ENTER** keypad and make sure that the left arrow pointed at the first row of 0ppm concentration. Use up or down key to move the cursor. (refer to Figure 7)

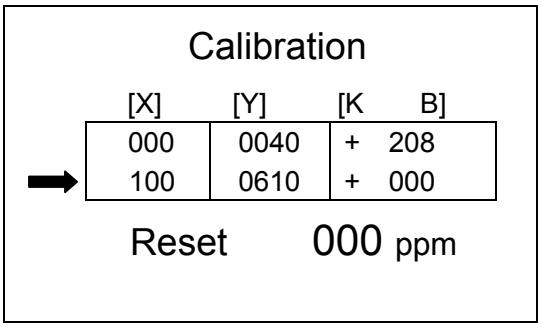

Figure 7 Calibration Screen -2

3) Press **RUN/STOP** keypad to start a sampling. Wait for right bottom number stable and then press **STOP** key.
4) Connect the inlet to a glass container that is connected a standard CO gas cylinder (e.g., 100ppm standard carbon monoxide gas cylinder).
5) Move the cursor to the second row (Refer to Figure 8) and then press the **ENTER** keypad. Use ▲ or ▼ to select the element to be changed. When the element of the X column becomes highlighted, use ▲ or ▼ to change the number and press **ENTER** to confirm the change. Set the number as the concentration level of the standard gas concentration to be tested (e.g., 100ppm). Then use **BACK** keypad to return to the main Calibration screen.

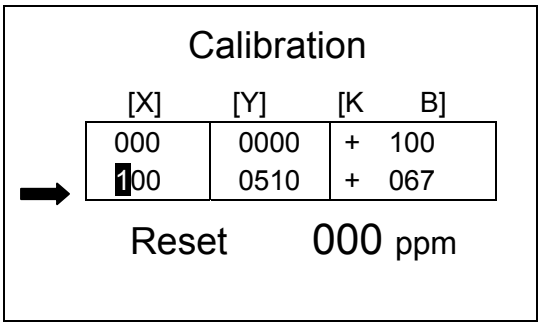

Figure 8 Calibration screen- 3

6) ScreenPress **RUN/STOP** keypad to sample, the correspondence value in the Y column will display the response of the concentration for current liquid standard. Press **RUN/STOP** keypad again to stop the sampling after the reading is stabilized.
7) After finished both samplings on standard gases, move the cursor back to the first row, press and hold the **ENTER** key for about two seconds. The instruments will automatically calculate and update the calibration coefficients based on new calibrations. Press **ENTER** to save values.
8) After finishing calibration procedures, press **BACK** to exit.

NOTICE

To restore the default settings of factory calibration, move cursor to highlight **RESET** and then press **ENTER** to restore factory calibration for coefficients of K and B. press **BACK** key to exit.

III. Warrantee

Hal Technology provides a one-year limited warranty of the Model HCO106 Handheld Carbon Monoxide meter, but not including necessary calibration service.

- Warranty begins from shipping date.
- The user is responsible for the cost of shipping in the case of any service or repair needed.
- The warrantee only limits to the HCO106 and HAL TECHNOLOGY does not extend this liability to accessories and any other equipment damage, body injury and loss of properties due to abnormal use.

The following are not included in the warranty:

- Improper connection to a power source, resulting in damage of the instrument.
- Any physical damage due to mechanical forces (e.g., collision or dropping) that may cause any damage of the front panel, LCD screen, switch and internal components, etc.
- Unauthorized opening of the instrument.
- Damage due to operation in an un-specified environmental condition.
- Abnormal operation due to instrument needing calibration.

Limitation of Warranty

A. Hal Technology warrants that all equipment shall be free from defects in material and workmanship under normal use for a period of one year from date of shipment to Buyer except that Hal Technology does not warrant that operation of the software will be completely uninterrupted or error free or that all program errors will be corrected. Buyer shall be responsible for determining that the equipment is suitable for Buyer's use and that such use complies with any applicable local, state, or federal law. Provided that Buyer notifies Hal Technology in writing of any claimed defect in the equipment immediately upon discovery and any such equipment is returned to the original shipping point, transportation charges prepaid, within one year from date of shipment to Buyer and upon examination Hal Technology determines to its satisfaction that such equipment is defective in material or workmanship, i.e. contains a defect arising out of the manufacture of the equipment and not a defect caused by other circumstances,

including, but not limited to accident, misuse, unforeseeable use, neglect, alteration, improper installation, improper adjustment, improper repair, or improper testing, Hal Technology shall, at its option, repair or replace the equipment, shipment to Buyer prepaid. Hal Technology shall have reasonable time to make such repairs or to replace such equipment. Any repair or replacement of equipment shall not extend the period of warranty. If the Instrument is modified or in any way altered without the explicit written consent of Hal Technology then the warranty is null and void. This warranty is limited to a period of one year, except as noted below, without regard to whether any claimed defects were discoverable or latent on the date of shipment.

B. If Buyer shall fail to pay when due any portion of the purchase price or any other payment required from Buyer to Hal Technology under this contract or otherwise, all warranties and remedies granted under this Section may, at Hal Technology's option, be terminated.

C. Warranty repairs shall be completed at a Hal Technology authorized service location, by an authorized service technician, or on site at buyer's facility by a Hal Technology authorized employee. Buyer pays shipping costs to factory; seller will pay standard return shipping costs during the warranty period. Buyer may select a faster method of shipment at their own expense.

Warranty of Repairs after Initial One (1) Year Warranty

A. Upon expiration of the initial one-year warranty, all parts and repairs completed by an authorized Hal Technology repair technician are subject to a six (6) month warranty.

B. Other than the above, Hal Technology makes no warranty of any kind, expressed or implied, except that the products manufactured and sold by Hal Technology shall be free from defects in materials and workmanship and shall conform to Hal Technology's specifications; Buyer assumes all risk and liability resulting from use of the products whether used singly or in combination with other products. If instrument is modified or in any way altered without the explicit written consent of Hal Technology, then the warranty is null and void.

C. Warranty repairs shall be completed at a Hal Technology authorized service location, by an authorized service technician, or on site at buyer's facility by a Hal Technology authorized employee. Buyer pays shipping costs to factory; seller will pay standard

return shipping costs during the warranty period. Buyers may select a faster method of shipment at their own expense.

Contact

HAL TECHNOLOGY, LLC

625 E Carroll Avenue

Glendora, CA 91741 USA

Phone: (510) 579-8540

Fax: (626) 963-7302

Info@haltechnologies.com

http://haltechnologies.com

Information Record

Model _____

Serial No. _____

Purchase Place _____

Address _____

_____

Phone _____

Service Place _____

Address _____

_____

Phone _____

Preferred Contact Method

□ E-mail □ Mail □ Phone

Please fill out the Registration form below and send to:

HAL TECHNOLOGY, LLC

625 E Carroll Avenue

Glendora, CA 91741 USA

Phone: (510) 579-8540

Or send relevant registration information to the email address below:

info@haltechnologies.com

User Registration Form

Company _____

Contact Person _____

Address _____

_____

City _____State/Province_____Country _____

Postal Code_____

Phone _____

Fax _____

E-mail _____

Product Model _____

Serial No. _____

Purchase Date_____

Purchase Place _____

Preferred Contact Method

□ E-mail □ Mail □ Phone