Hal Technology

HAL-HFX205
Handheld Formaldehyde
Meter/Monitor

Operational Manual

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Version Table

Date	Version	Comment
May 22, 2015	2.0	User Interface Redesigned
February 1, 2014	1.2	Window 7/8 Compatible Upgrade
May 3, 2012	1.1	Final Release
May 18, 2010	1.0	Initial Release

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.

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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.

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

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-HFX205 can only be serviced at Hal Technology or by Hal Technology's authorized and trained professionals.

I. Introduction

Formaldehyde (HCHO) is one of the most common, poisonous substances found in daily life and industry. The HAL-HFX205 handheld Formaldehyde meter is a compact personal monitor that can provide a rapid indication of hazardous airborne formaldehyde levels at the touch of a button.

The HAL-HFX205, based on reliable electrochemical sensing technology, features directly display of the formaldehyde concentration in ppm, and is easy to use.   A short, low-resistance diffusion pathway with a built-in pump enables a rapid reaction time.

Low power design allows long operation time.   Exceptional linearity and stability allow easy and very long intervals between calibration checks. The external digital temperature and humidity sensors or pressure sensor, if applicable, allows compensation or correction for accurate measurement.   A USB port provides capability of downloading stored data and possibly continuous, real-time monitoring of the environment remotely.

The HAL-HFX205 Formaldehyde Monitor is designed for use in a wide variety of applications such as furniture, floor boards, wall papers, paint, gardening, indoor decoration, construction, dye stuffs, paper manufacture, hospitals, pharmaceutical, medical, food, cleaning, synthetic resins, textile treatment, horticulture, and cosmetics.

1.1 Features

- Easy to use - minimal operator training required

- Wide measuring range

- Rapid response time

- No warm-up time for sensor

- Direct real time readings allow immediate response to results

- Reliable electrochemical sensor

- Manual and auto save capability

- Auto back light (power saving)

- High-speed USB connectivity

- Simple and easy in-field calibration

- External digital pressure, temperature and humility sensor probe options.

- Temperature compensated reading option

- Live data streaming and TWA/STEL measurement capabilities through USB

- Excess limit warning (user defined)

- Window XP/7/8 compatible

- No less than 6 hours of continuous operation.

1.2 Specifications

- Target Gas: Formaldehyde (HCHO) in air

- Sensor Technology: Electrochemical sensor

- Sampling Method: Pump and pointing sampling

- Range: 0 ~ 10ppm   (up to 100ppm available for custom order)

- Response Time: < 30 seconds (T90)

- Resolution: 0.01ppm

- Display Unit: ppm or mg/m^3

- Long Term Draft: < ±10% per year (under ideal storage conditions)

- Repeatability: < $\pm$ 2%

- Position Sensitivity: None

- Expected Sensor Life: 5 years in non-corrosive environment.

- Display Unit: ppm (4 digit LCD) or mg/m^3

- Memory: Up to 500 sets of data

- Interface: USB (Window XP/7/8 compatible)

- Power: Rechargeable Lithium ion battery (3.7V/1200mAh); AC charger 100~ 240VAC to 5VDC/1A

- Dimension: 80 (W) $\times$ 157 (H) $\times$ 45 (D) mm

- Weight: Less than 240 grams

- Environmental Condition: Operating: 0 ~ 40°C, 15% ~ 90%RH; Storage: -20 ~ 50°C, <90%RH

- Standard accessories: AC charger, USB cable, CD with data download software and user manual

- Optional accessories: Digital pressure, temperature, and humidity sensor probe

1.3 Sensor cross sensitivity data

Chemicals	Cross Sensitivity
Ethanol (C_2H_6O)	45%
Sulfur Dioxide (SO_2)	12%
Phenol (C_6H_6O)	7%
Carbon Monoxide (CO)	1%
Hydrogen Gas (H_2)	0.1%
Chlorine Gas□Cl_2)	-3%
Acetone (C_3H_6O), Ammonia (NH_3), CO_2, slow H_2O vapor have no response; C_2H_4, H_2S, NO, and NO_2 have no data.	

II. Basic Operation

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

▲ , ▼ . Each button controls the following features:

- **Power button** ⏻ : While the unit is off, press and hold the power button for approximately 2 seconds to turn on the instrument. While the unit is on, press and hold the power button for approximately 2 seconds to turn off the instrument. If the instrument is not taking measurements it will automatically power off after 5 minutes of inactivity.

- **RUN/STOP**:   Start or stop measuring/sampling.

- ▲ ▼ :   Move the cursor to select desired screen or item.

- **ENTER**:   Confirm the current selection, enter a parameter, or save the current sampling value.

- **BACK**:   Change the concentration unit while the unit is measuring or return from the current selection.

The side of the enclosure includes

- USB Interface: Connect the USB interface to a computer for data downloading or data logging.

- POWER port: An AC adapter plug-in port: 5 VDC @ 1 A.

- Charge Status LED: LED flashes during charge cycle and becomes steady after the charge cycle is finished.

2.1 Measuring Screen

The Measure screen, shown in **Figure 1**, is the main screen of the instrument as it is used for sampling formaldehyde. The Indicator Display in the upper left corner shows immediate information about the sample time, sound options, and alarm settings of the instrument. As

well as these, the measure screen shows the date, time, temperature and humidity (optional), and battery status.

NOTICE

- Push the **RUN/STOP** key to start measuring/sampling. During the sampling process, the backlight will dim if it is set to in the instrument settings.
- Data are logged automatically if the sample interval is set between 1 and 9, or the current sampling value can be saved when the **ENTER** key is pressed. Push the **RUN/STOP** key to stop measuring.
- The instrument will automatically shut off after 5 minutes of inactivity unless the unit is sampling.

2.1.1 Detailed Screen Description
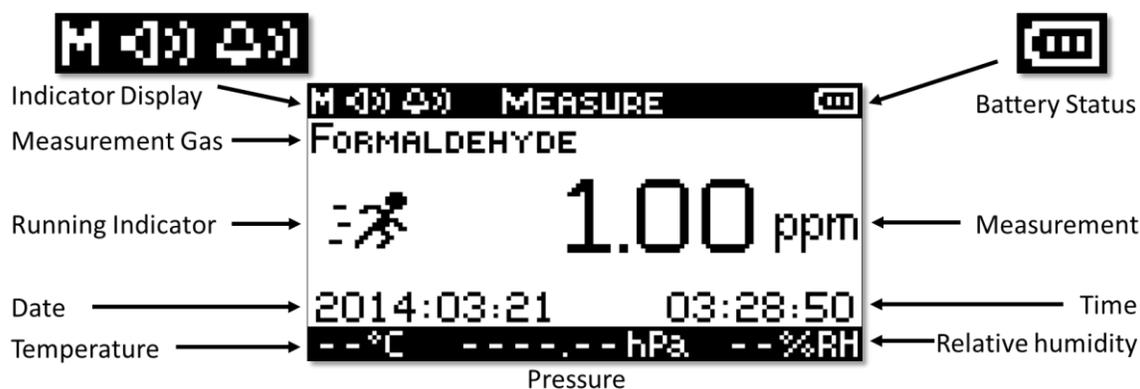
Figure 1: Annotated measure screen of the HFX205

Sample Time Indicator: The first icon in the Indicator Display is the sample time indicator. This indicator will display values of M, or 1 through 9. When set to M, the unit is in manual measurement mode, and samples are taken when the user presses the **ENTER** Button. When set to a number between 1 and 9, automatic samples are taken every 1 through 9 minutes. For example, if the sample time is set to 4, automatic samples are taken

every 4 minutes, and the sample time indicator will display 4. Note, a manual measurement can **always** be made by pressing the **ENTER** button.

Sound Indicator: The second icon in the Indicator Display is the sound ON/OFF icon. Note, this options refers to the sounds made when interface or keypad buttons are pressed. It does not affect the alarm or the startup sounds. In **Figure 1** the instrument has its sound turned on. If the sounds were turned off, an X would appear next to the sound icon.

Alarm Indicator: The third icon in the Indicator Display is the alarm ON/OFF icon. In **Figure 1** the alarm icon shows that the alarm is turned on. To set the alarm, go to the Settings screen and modify the alarm level. To turn the alarm off, set its level to 0 PPM. If the alarm were turned off, an X would appear next to the alarm icon.

Battery Status 🗎 **:**   The battery indicator displays the battery's remaining charge graphically. Three bars represent 100% of charge in the battery; two bars 75%; one bar 50%. No bars signifies 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 audible warnings the instrument will shut off.

Measurement Gas: It shows a gas type that Formaldehyde is being sampled.

Running Indicator: When the unit is measuring, the running icon will be displayed and the pump will be operating. When the unit is idle (not measuring), the running icon will not be displayed and the pump will be off.

Temperature: The current ambient temperature is displayed in units of degrees Celsius. This measurement is not standard and requires the optional temperature sensor probe to function. If no probe is installed, the unit will display: - - ºC.

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Relative Humidity: The current ambient relative humidity is displayed in units of percent. This measurement is not standard and requires the optional relative humidity sensor probe to function. If no probe is installed, the unit will display: - - %.

Pressure: The current absolute ambient pressure is displayed in units of hPa (hectopascals). The unit pf hPa is chosen internationally since 1 hPa = 1 mBar. This measurement is not standard and requires the optional pressure sensor probe to function. If no probe is installed, the unit will display: - - - - - . - - hPa.

Time: Current time set by a user is displayed.

Date: Current date set by a user is displayed.

⚠ WARNING

- By default, the backlight will automatically dim after approximately 60 seconds of keypad inactivity when not actively making measurements.
- The instrument will be automatically shut down if there is no keypad activity for approximately 5 minutes; this does not apply if the instrument is running.

2.2 Browsing Screen

Use the **UP** and **DOWN** keys to navigate to the Browse Screen and press **ENTER** to enter into the screen. This screen will allow the user to browse or delete stored data.
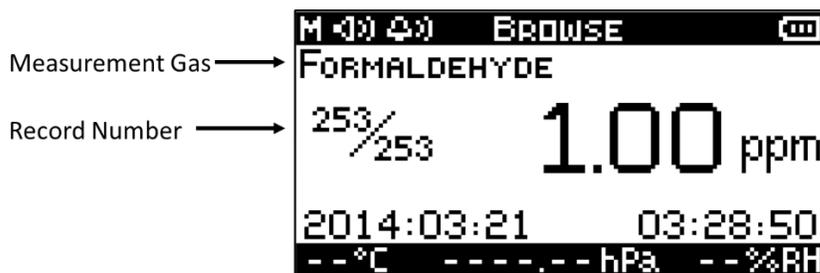
Figure 2: Browsing Screen

In the Browsing screen, use the arrow keys to advance through the stored data.

- Use the ▲ button to move to the next record.

- Use the ▼ button to move to the previous record.

- Use the **BACK** button to exit the Browsing Screen.

Measurement Gas

The Measurement Gas type is displayed as formaldehyde.

Record Number

Record format is current record/total number of records. (e.g., 253/253). In Figure 2, the user is viewing record number 253 of a total 253 records.

Delete a Record

- Press the **UP** or **DOWN** key to select the record to be deleted and press the **ENTER** button.

- Use the **UP** or **DOWN** key to select ONE or ALL. Press the **ENTER** key to delete the current record or all records respectively. In the case of deleting a single record, the total number of records will be reduced by one while the next record number will be moved to replace the deleted record; see Figure 3.

Figure 3: Browse Screen with Delete Screen Shown

2.3 Setting Screen

The Setting Screen allows users to set or change the following items:

- Date

- Time

- Sample Interval

- Alarm Level

- Sound Options

- Backlight Options

- LCD Contrast

- Factory Settings
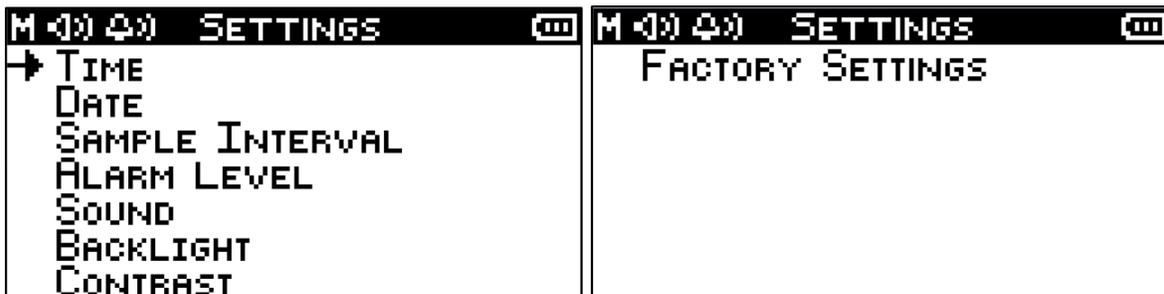
Figure 4: Settings Screens

Press the **ENTER** button to enter into the Settings Screen. An arrow will appear as in Figure 4. Use the **UP** and **DOWN** buttons to scroll through the different settings. Scroll to the desired setting and press the **ENTER** button to select that parameter. A new screen will appear that allows you to edit the selected parameter.

2.3.1 Modifying Parameters (Settings)

Time: **HH:MM:SS**

The time format is **HOURS:MINUTES:SECONDS**. To modify the time go into the time setting screen and use the **UP** and **DOWN** buttons to select either the hours, minutes, or seconds

parameter and press **ENTER**. The selected parameter will now have a blinking underscore beneath it and using the **UP** and **DOWN** buttons will change the parameter. To cancel entering the parameter press the **BACK** button, or to validate the changes you have made press the **ENTER** button. When completed press the **BACK** button to exit the time setting screen.

Date: **DD:MM:YY**

The time format is **DAY:MONTH:YEAR**. To modify the date go into the date setting screen and use the **UP** and **DOWN** buttons to select either the day, month, or year parameter and press the **ENTER** button. The selected parameter will now have a blinking underscore beneath it and using the **UP** and **DOWN** buttons will change the parameter. To cancel entering the parameter press the **BACK** button, or to validate the changes you have made press the **ENTER** button. When completed press the **BACK** button to exit the date setting screen.

Sample Interval

The sample interval parameter can be set to either take a sample every n minutes (where n can be 1 through 9) or to only take manual measurements when the **ENTER** button is pressed (**M** or manual mode). To modify the sample interval press **ENTER** at the sample interval settings screen and the underscore will begin blinking. Use the **UP** and **DOWN** buttons to change the parameter. To cancel entering the parameter press the **BACK** button, or to validate the changes you have made press the **ENTER** button. For example, to set the automatic saving to five minutes, set the sample interval to 5. To turn off automatic saving and only take manual measurements, scroll through the parameters until M appears and press the **ENTER** button. When completed press the **BACK** button to exit the sample interval setting screen.

- • Even with automatic sampling on, the user can still press the **ENTER** button to save

the current measurement.

Alarm level setting

The user may turn on or off the excess exposure limit warning. The user may input any value between 0 and 999.9 ppm. A value of 0 ppm will disable the alarm. The alarm level can be set by entering into the alarm level settings screen from the main Settings Screen. Use the **UP** and **DOWN** keys to choose a digit to modify and press **ENTER**. An underscore below the selected digit will begin blinking. Use the UP and DOWN keys to modify the digit. To cancel entering the digit press the **BACK** button, or to validate the changes you have made press the **ENTER** button. When completed press the **BACK** button to exit the alarm level setting screen.

 NOTICE

- An alarm setting of 0 ppm will disable the alarm.

Sound

This options allows the user to set the keypad sound options. Neither the alarm indicator nor the power up sounds will be affected by this setting. To modify the button sounds option go into the sound setting screen and press the **ENTER** button. The currently selected option will have a blinking underscore beneath it and using the **UP** and **DOWN** buttons will change the option. To cancel selecting **ON** or **OFF** press the **BACK** button, or to validate the changes you have made press the **ENTER** button. When completed press the **BACK** button to exit the sound setting screen

Backlight

This options allows one to set the backlight behaviour while the unit is taking measurements. Regardless of this setting, if the unit is not taking measurements the LCD backlight will turn off after 60 seconds of inactivity to conserve power. To modify the LCD backlight behaviour during measurements go into the backlight setting screen and press the **ENTER** button. The

currently selected option will have a blinking underscore beneath it and using the **UP** and **DOWN** buttons will change the option from **ON** to **OFF** or vice versa. To cancel entering the parameter press the **BACK** button, or to validate the changes you have made press the **ENTER** button. When completed press the **BACK** button to exit the backlight setting screen

Contrast

This options allows the user to set the contrast of the LCD. To modify the LCD contrast go into the contrast setting screen and press the **ENTER** button. The currently selected option will have a blinking underscore beneath it and using the **UP** and **DOWN** buttons will change the option between 1 and 9. To cancel entering the parameter press the **BACK** button, or to validate the changes you have made press the **ENTER** button. When completed press the **BACK** button to exit the contrast setting screen.

Factory Settings

This screen is reserved for Hal Technology factory and service technicians.

WARNING

Always run the meter under clean environment to clear down to near 0.00 ppm after each exposure before turning off the meter.   The procedure will help to prolong the lifetime or service cycle of the sensor.

2.4 Calibration

After turning on the instrument, use the **UP** or **DOWN** buttons to go to the Calibrate Screen and press **ENTER** (Figure 5). Users may calibrate the instrument at their volition after a period of use or if a drift in sensor accuracy is suspected.
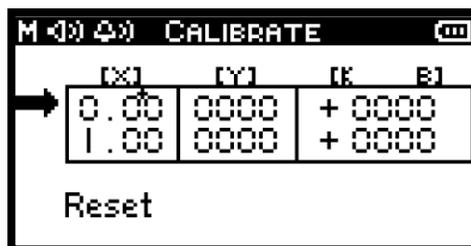
Figure 5: Calibration Screen

The recommended calibration method is the standard Zero-Span technique. The X values in the first column represent the concentration of the calibration 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 the calibration coefficients. An example calibration procedure is described below:

A zero air and a known concentration of formaldehyde gas standard sources are needed for the typical zero and span calibration.

1) Enter into the calibration screen by pressing the **ENTER** button.
2) Connect the inlet of the instrument to a glass container and then introduce the zero air to the glass container.
3) Make sure that the left arrow is pointing at the first row of 0 ppm concentration (refer to Figure 6).

Figure 6: Calibrate Screen with Zero Measurement Complete

4) Press the **RUN/STOP** button to start sampling for the zero measurement. Wait for the Y value for 0 ppm to stabilize and then press the **RUN/STOP** button again.

5) Connect the inlet to a glass container that is connected to a known concentration formaldehyde gas standard (e.g., 1.00 ppm formaldehyde gas standard).

6) Move the cursor to the second row and then press the **ENTER** button. Use **UP** and **DOWN** buttons to select the element to be changed. When the element of the X column becomes highlighted, use the **UP** and **DOWN** buttons to change the number and press **ENTER** to confirm the change. Set the number as the concentration level of the formaldehyde gas concentration to be tested (e.g., 1.00 for 1.00 ppm gas standard used). Press the **BACK** button to return to the calibrate screen as shown in Figure 6.

7) Press the **RUN/STOP** button to start sampling. Wait for Y value to stabilize and then press the **RUN/STOP** button again.

8) After finishing both samplings, move the cursor back to the first row. Press and hold the **ENTER** button for about two seconds. The instrument will automatically calculate and update the calibration coefficients based on the new calibration.

9) After finishing the calibration procedure, press **BACK** to exit.

NOTICE

- To restore the default settings from the factory calibration, move the cursor and highlight **RESET**. Press **ENTER** and **RESET** will begin blinking. Press **ENTER** again and the instrument calibration will be reset back to its factory defaults.

- One can always bypass the zero-air calibration if it is not necessary. In order to do so, move the cursor back to the first row after taking the non-zero gas calibration measurement. Press and hold the **ENTER** button for about two seconds. The instrument will automatically calculate and update the calibration coefficients based on the new non-zero gas calibration (SPAN calibration) only.

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III. Warranty

Hal Technology provides a one-year limited warranty of the Model HFX205 Handheld formaldehyde 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 HFX205 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 replaced and/or repairs completed by an authorized Hal Technology service 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

7970 Cherry Avenue, Suite 303

Fontana, CA 92336 USA

Phone: (855) 438-4258 (toll free)

Fax: (866) 402-9190 (toll free)

services@haltechnologies.com

http://haltechnologies.com

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┌─────────────────────────────────────────────────────┐
│        Information Record                            │
│   Model _____             │
│   Serial No. _____             │
│   Purchase Place _____             │
│   Address _____             │
│          _____             │
│   Phone _____             │
│   Service Place _____             │
│   Address _____             │
│          _____             │
│   Phone _____             │
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Please fill out the Registration form below and send to:

HAL TECHNOLOGY, LLC

7970 Cherry Avenue, Suite 303

Fontana, CA 92336 USA

Phone: (855) 438-4258 (toll free)

Fax: (866) 402-9190 (toll-free)

Or send relevant registration information to the email address below:

services@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