HI-4460 Graphical Readout

User Manual

ETS·LINDGREN™
HOLADAY EMF MEASUREMENT

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Revision Record | HI-4460 USER'S MANUAL | Part #H-600079, Rev. E

Revision	Description	Date
	Initial Release	February, 1998
A	Added upload/download information	January, 2000
B	Added battery operation information	September, 2000
C	Updated percent of standards information	July, 2001
D	Updated upload menu information	November, 2001
E	Updated download information; rebrand	September, 2008

Table of Contents

Notes, Cautions, and Warnings

	**Note:** Denotes helpful information intended to provide tips for better use of the product.
CAUTION	**Caution**: Denotes a hazard. Failure to follow instructions could result in minor personal injury and/or property damage. Included text gives proper procedures.
WARNING	**Warning**: Denotes a hazard. Failure to follow instructions could result in SEVERE personal injury and/or property damage. Included text gives proper procedures.

 See the ETS-Lindgren *Product Information Bulletin* for safety, regulatory, and other product marking information.

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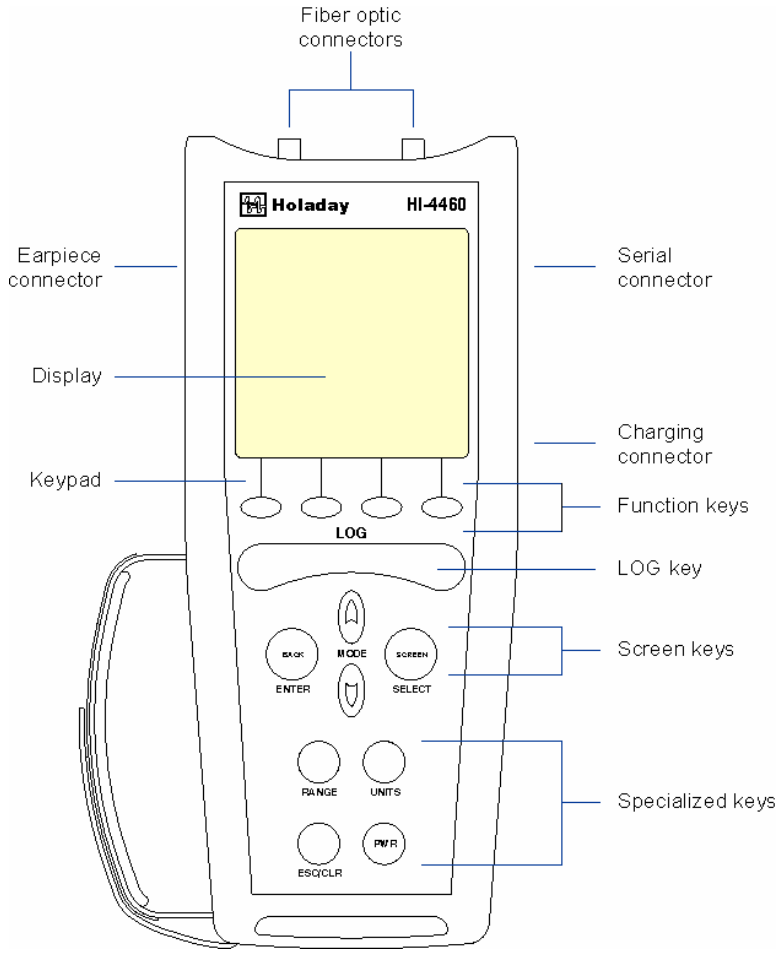
1.0 Introduction

See *Keypad Operation* on page 19 and *Screens* on page 23 for complete information on using the keypad and navigating the screens.



Required Components

The following components are required to install and operate the HI-4460 Graphical Readout:

- HI-4460 Graphical Readout
- Fiber optic cable
- Probe supported by the HI-4460

ETS-Lindgren Product Information Bulletin

See the ETS-Lindgren *Product Information Bulletin* included with your shipment for the following:

- Warranty information
- Safety, regulatory, and other product marking information
- Steps to receive your shipment
- Steps to return a component for service
- ETS-Lindgren calibration service
- ETS-Lindgren contact information

2.0 Maintenance

CAUTION

Before performing any maintenance, follow the safety information in the ETS-Lindgren *Product Information Bulletin* included with your shipment.

Maintenance of the HI-4460 is limited to external components such as cables or connectors.

If you have any questions concerning maintenance, contact ETS-Lindgren Customer Service.

Maintenance of Fiber Optics

Fiber optic connectors and cables can be damaged from airborne particles, humidity and moisture, oils from the human body, and debris from the connectors they plug into. Always handle connectors and cables with care, using the following guidelines.

Before performing any maintenance, disconnect the fiber optic cables from the unit and turn off power.

When disconnecting fiber optic cables, apply the included dust caps to the ends to maintain their integrity.

Before connecting fiber optic cables, clean the connector tips and in-line connectors.

Before attaching in-line connectors, clean them with moisture-free compressed air.

Failure to perform these tasks may result in damage to the fiber optic connectors or cables.

Service Procedures

For the steps to return a system or system component to ETS-Lindgren for service, see the *Product Information Bulletin* included with your shipment.

3.0 Specifications

Electrical Specifications

Fiber Optic Cable:	200µm, graded index, multimode
Fiber Optic Cable Connector:	Standard FSMA (2)
Battery	
Battery:	7.2 VDC, 140 mAh rechargeable Nickel-Cadmium (NiCd)
Battery Life:	15 hours continuous (full charge)
Battery Charger:	115/230 VAC, approximately one hour
Charger Jack:	2.5 mm phone jack
Environmental	
Operating Temperature:	10°C to 40°C (50°F to 104°F)
Humidity:	Humidity: 5% to 95% relative humidity, non-condensing

Physical Specifications

Length:	230 mm (9.05 in)
Width:	94 mm (3.70 in)
Weight:	0.72 kg (1.58 lb)

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4.0 Getting Started

CAUTION

Before connecting any components, follow the safety information in the ETS-Lindgren *Product Information Bulletin* included with your shipment.

Connect Components

1. Connect the fiber optic cable to the fiber optic ports on the probe, matching white to white (transmit) and yellow to yellow (receive) as indicated by the markers on the probe and cable.
2. Connect the other end of the fiber optic cable to the fiber optic ports on the top of the HI-4460 Graphical Readout, matching white to white and yellow to yellow.

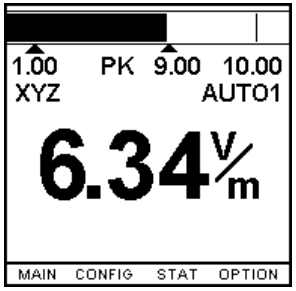
Power Up

1. Press the power button on the HI-4460.

   The initial screen displays **NO PROBE**, indicating a probe is not connected, or the connected probe is turned off.

2. Turn the probe on.

   The screen indicates the composite field level is being sensed.



Default Settings

The HI-4460 is shipped in the default condition, with most settings turned off or not enabled. Following are some of the default settings:

- **Default probe—**The HI-4422 Field Probe is set as the default probe. To set up a different probe, select the desired probe in the MAIN menu.

The HI-4460 may be set up with a probe attached.

- **Axis—**The default setting is XYZ. This allows data for each axis to be displayed on the screen or in a log file.

Only some probes read from the X, Y, and Z axes. See the user manual for your probe to determine if your probe reads three axes.

- **Power management—**The default setting is turned off.
- **Back light—**The default setting is turned off.
- **Screen saver—**The default setting is turned off.
- **Logging—**The default setting is set to **Single** point. When the Log key is pressed, the X, Y, and Z values are logged, as well as the composite.

Overview of Screens

For a description of each screen, see *Screens* on page 23. For a description of the keypad, see *Keypad Operation* on page 19.

The HI-4460 displays monitoring screens and logging screens. Press the up or down MODE keys to toggle between the monitoring and logging screens.

- The monitoring screens display at power up. There are five monitoring screens; the fifth screen displays when a standard is selected in the MAIN menu. To cycle through the monitoring screens, press the BACK/ENTER key or SCREEN/SELECT key.
- At the bottom of the screen are five menu selections. Press one of the four function keys below the display on the HI-4460 to select the indicated menu.
- Press the BACK/ENTER key or SCREEN/SELECT key to cycle through the four logging screens. Eight menu selections are available on the logging screens.

Troubleshooting

HI-4460 Fails to Power On

The battery may be depleted. Connect the battery charger to the charging connector on the HI-4460 and charge the battery.

HI-4460 Display Does Not Show Field Level, Displays NO PROBE

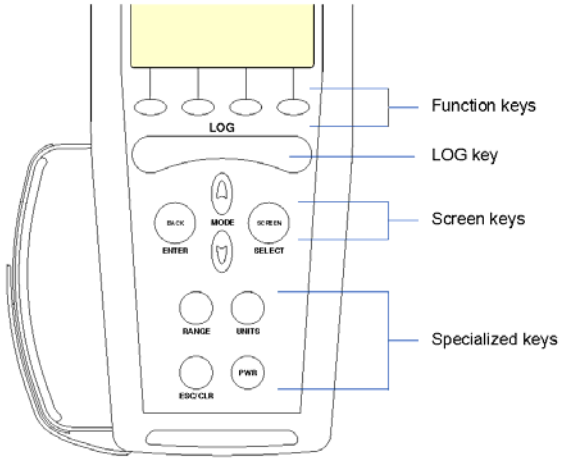
- Make sure the fiber optic cable is connected correctly; see *Connect Components* on page 15. If the connectors and leads are not color-coded, connect XMIT on the probe to RECEIVE on the HI-4460, and RCV on the probe to TRANSMIT on the HI-4460.
- Make sure the probe is turned on.
- Verify that the probe battery is fully charged.

5.0 Keypad Operation

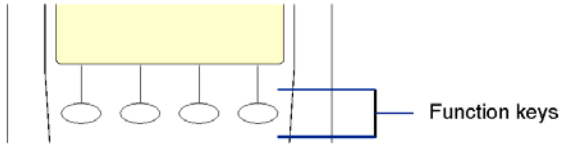
The HI-4460 Graphical Readout is comprised of two basic user areas, the display and the keypad. The display is a backlit LCD, and the keypad consists of four sets of keys. For information on navigating the screens, see *Screens* on page 23.

For additional information, see *Menu Tree* on page 67.

The HI-4460 uses a rubber keypad with 13 keys. These keys can be divided into different groups: function keys, the LOG key, screen keys, and specialized keys.



Function Keys

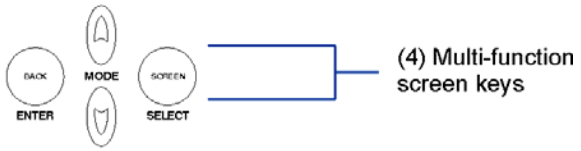


The four function keys are used to select the submenus displayed at the bottom of each screen. They are also used for setting specific numeric levels. For more information on setting specific numeric level, see *Number Picker* on page 22.

LOG Key

Toggles the logging function on and off. The default logging function is single point logging (logging turns off after one reading is taken). Other logging functions are explained in *Logging* on page 39.

Screen Keys



MODE KEYS: UP AND DOWN

The up and down MODE keys perform three functions:

- Toggles between the monitoring screens and logging screens.
- After a menu function key is pressed, the MODE keys are used to move up and down through selections.
- After a selection has been made using the SELECT key, the MODE keys are used to scroll through selections when only a fixed number of selections are available.

For items that require a larger range of values, holding down the up or down MODE key will advance the number by one until it has been raised or lowered to ten. It will then continue to increase or decrease by tens, and then by hundreds.

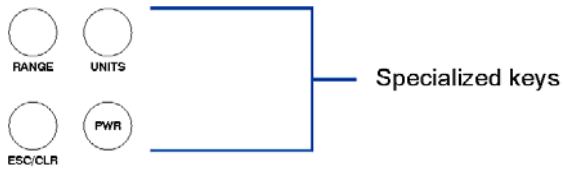
BACK/ENTER KEY AND SCREEN/SELECT KEY

The BACK/ENTER and SCREEN/SELECT keys perform two functions:

- Scrolls through the monitoring screens and logging screens.
- When at a menu screen, the SCREEN/SELECT key is used to select an item. The BACK/ENTER key is used to save and exit the menu screen or item.

  To exit an item without saving, use the specialized ESC/CLR key. This will return to the previous value for only that item. Using the ESC/CLR key to exit the entire menu screen returns to the previous values for all items.

Specialized Keys



RANGE

Scrolls through the measurement ranges offered by the probe, based on the UNITS setting. The RANGE key will scroll through all of the possible manual ranges and the auto range.

UNITS

Scrolls through the units of measurement offered by the probe, based on the RANGE setting.

ESC/CLR

- Clears the PEAK and X, Y, and Z data on the screens, as well as the averaging buffers.
- Backs up one level in the menus without saving changes. On menu screens, pressing the ESC/CLR key moves back one field.

PWR

Turns the unit on and off. The PWR key is also used to turn the back light off (if not set to OFF in the **CONFIG** menu).

- To turn the unit on, quickly press the PWR key.
- To turn the unit off, press and hold the PWR key.
- To turn the backlight off, quickly press the PWR key. Pressing any other key will turn the backlight on again.

Number Picker

The number picker function is available on some menus. When an item associated with the number picker is selected, the value is highlighted, and the bottom bar on the screen displays a row of numbers, 0–9.

1. Press the down MODE key to move the cursor to the bottom of the screen.
2. Press the middle two function keys to scroll through the numbers. When the curser is on the desired number, press the ENTER key to select the number.
3. Continue selecting numbers until the desired value is shown in the field.

Each menu selection that utilizes the number picker function has a predetermined number of decimal places. When the number entered reaches this limit, the curser will move back to the menu item. If the number entered is not valid, it will be set to a minimum or maximum acceptable number. To move the cursor back to the menu item before it reaches the limit, press the up MODE key. When the field contains a decimal point, the place is predetermined and the number must be entered accordingly.

6.0 Screens

When the HI-4460 Graphical Readout is turned on for the first time, a series of initial screens display, and then a user screen displays. After the first power on sequence, the screen that was active when the unit was last turned off will display.

Following is a description of the monitoring screens and logging screens.

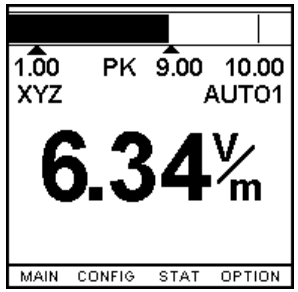
For additional information, see *Menu Tree* on page 67.

Monitoring Screens

The first screen to display is the monitoring screen.

- **Field strength** displays at the top of the screen as a bar graph. **Peak value** displays as a thin vertical line next to the bar graph.

  If the bar graph appears blank, the value is less than the lower range value. If the bar is completely filled in, the value is greater than the upper range value.



Change to a different range to view the reading. Below the bar graph is a line of text that shows selected range limits. The lower limit is on the left, the upper limit is on the right, and the peak value is in the center.

Under the range limits is another line of text that shows the axes that are being recorded, and the selected range. The axes are on the left side and the selected range is on the right

An HI-60XX Series Field Probe has only one range. The scale readings are for the displayed bar graph only. A scheduled log period will display the word LOG in the center of this line. If the unit is logging data, the word LOG will flash.

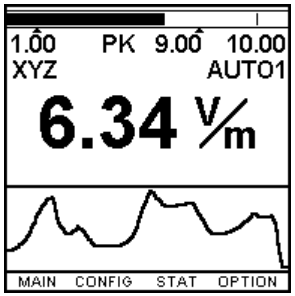
At the bottom of most screens is a list of menus that may be selected using the four Function keys. Alarm messages are also displayed in this area.

The rest of the screen shows the present field reading in large digits, along with the units of measure currently selected. When there is no probe attached or the probe is turned off, this area will display **NO PROBE**.

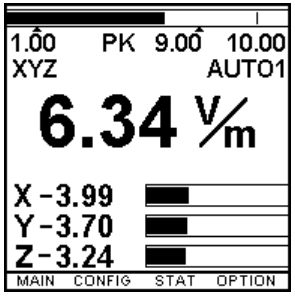
The following screens replace this large digit reading with information If auto range is not selected and the reading does not fall within the selected range, an over or under range condition occurs. When this happens, the area showing the reading reports an over range or an under range reading. The over range or under range value is also shown

Press the BACK/ENTER key or SCREEN/SELECT key to scroll through the monitoring screens, as shown in the following illustrations.

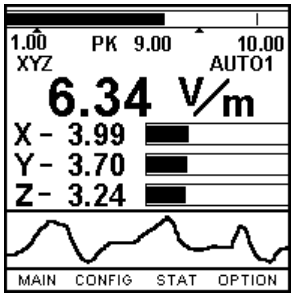
This shows a plot of the composite reading with the two horizontal bars representing the upper and lower limits of the range selected



This shows a bar graph of each of the axes being monitored as well as their values. This screen is not available if axis enable in the MAIN menu is set to **COMP** (composite).

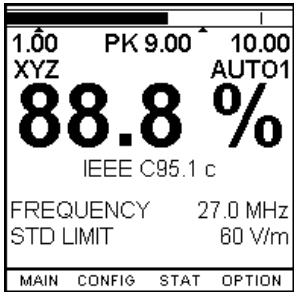


This shows the bar graphs and the plot. This screen is not available if axis enable in the MAIN menu is set to **COMP**.



This shows the percent of standard information. It is displayed only if **Standards** is turned on in the MAIN menu.

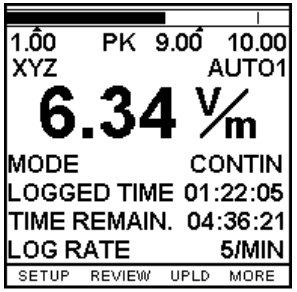
The percentage of the standard is displayed in large numbers, with the specific standard displayed under the percentage. The last two lines show the frequency selected and the standard value associated with it.



Logging Screens

Use the up or down MODE key to select the first of four logging screens. The common information is similar to that of the monitoring screens:

- A bar graph at the top shows the field strength.
- The first line of text shows the lower and upper limits of the present range, as well as the peak value.
- The next line shows the axis being monitored and the selected scale.
- At the bottom is a selection of menus that may be executed using the four function keys.

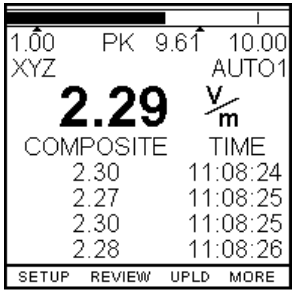


The word LOG will appear when logging is active or scheduled. It appears steady if conditions are not correct for a reading, such as not within the specified levels or time frame, and it will flash on and off when it is recording data. Alarm messages are also displayed in this area.

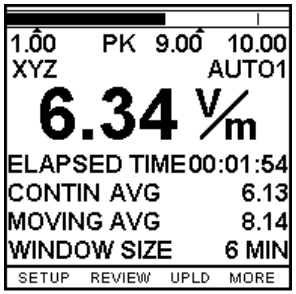
The first logging screen shows the selected log mode along with the logged time, time remaining, and the log rate. The time remaining indicates the amount of time before the memory fills up when in the continuous mode. When in periodic or scheduled mode, it shows the time left for the current period of logging.

Press the BACK/ENTER key or SCREEN/SELECT key to scroll through the logging screens.

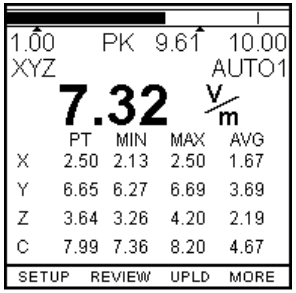
This shows the last four composite readings and the time at which they were recorded.



This shows the elapsed time, continuous average, moving average, and the moving average time length of the current logging operation.



This shows the composite value in large digits as well as a matrix of values for each axis and the composite. Only the values that were selected to be logged in the logging setup menu will appear on the screen.



- The PT values for the X, Y, and Z axes are the log point values taken at the log rate interval selected in the logging setup screen.
- The PT value for C is the composite of the X, Y, and Z values.
- The MIN and MAX values are the minimum and maximum numbers obtained by the sample rate, either 2/sec or 6/sec, during the log rate interval.
- The AVG value is the average of all samples, either 2/sec or 6/sec, divided by the log rate interval.

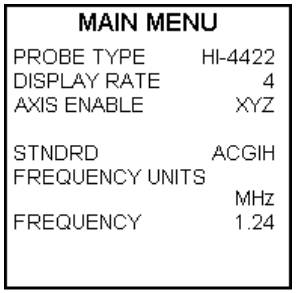
7.0 Menus

Menus allow you to customize the settings for your particular requirements. The menus are listed at the bottom of the screen and can be accessed by pressing the function keys directly below the display.

There are three menus available from both the monitoring and logging screen: MAIN, CONFIG, and STATUS.

MAIN Menu

From the MAIN menu you may view the type of probe attached to the HI-4460 Graphical Readout, select a probe if one is not attached, choose the display rate, and select the axis to monitor.



- To move up or down the list, press the up or down MODE key.
- To select an item, press the SCREEN/SELECT key.
- To change the values, press the up or down MODE key again.
- To save the setting, press the BACK/ENTER key.
- To back out without changing the item, press the ESC/CLR key. The new settings are saved when the menu is exited.
- To exit the menu and save all new settings, press the BACK/ENTER key.
- To exit the menu and cancel all setting changes, press the ESC/CLR key.

PROBE TYPE

Displays the name of the probe attached to the unit. If no probe is attached, you may select one for setup purposes.

When using an HI-4433-GRE Field Probe or HI-4453 Field Probe the unit will display a probe select menu. Select the correct probe attached.

DISPLAY RATE

Selects the screen display rate from 1 to 6 updates per second.

AXIS ENABLE

Selects which information to include on the screen and in the log file. When **XYZ** is selected, instantaneous values for each of the axes is displayed and/or logged. When **COMP** is selected, only the composite of the axes is displayed and/or logged.

STNDRD

Selects which standard to compare the reading to. See *Standards* on page 59 for lists of available standards.

FREQUENCY UNITS

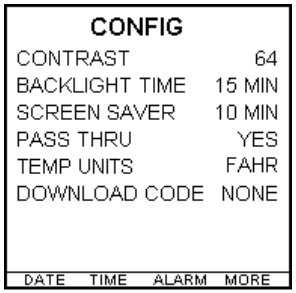
Selects the frequency range to be used, and displays only when a standard comparison is selected. Possible frequency ranges are kHz, MHz, and GHz. Some standards do not have frequencies associated with them, but use other values. Those values, such as **DAILY**, are displayed here.

FREQUENCY

Used to enter the numerical part of the frequency desired. When the standard comparison chosen does not have any frequency information associated with it, this field will not be displayed. If a frequency which is not within the probe specification is entered, the closest acceptable value will be entered upon exiting the number picker function.

CONFIG Menu

The CONFIG menu is used to adjust or set the operating settings for the HI-4460.



CONTRAST

Adjusts the screen contrast.

BACKLIGHT TIME

Sets the amount of time before the backlight turns off. When no key is pressed for the specified time, the backlight will turn off. The backlight will turn on again when any key is pressed.

SCREEN SAVER

Sets the amount of time before the HI-4460 switches to a low power mode. When no activity has taken place for the specified time, the display turns off. The display will turn on again when any key is pressed.

PASS THRU

Used to pass data from the probe, through the HI-4460 serial port, and to a computer using appropriate software, such as ProbeView™ LT.

When a probe is connected, select **YES** for pass thru in the CONFIG menu, and then press the BACK/ENTER key twice to display the PASS THRU screen. It will appear blank until you request information through your software. A number value will be displayed.

This screen monitors the values from the probe as they are transferred to the computer. To stop pass thru, select **EXIT**.

TEMP UNITS

Selects the temperature units of measurement. Valid choices are **FARH** for Fahrenheit and **CELS** for Celsius.

DOWNLOAD CODE

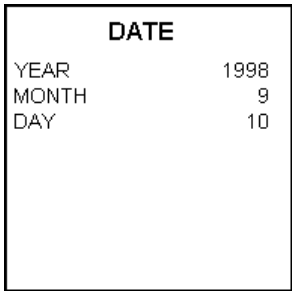
Downloads updated HI-4460 software using a personal computer. You may use either the serial connector or the fiber optic connector on the HI-4460. Select **Yes** when the warning message displays to begin the download. See *Download Utility* on page 57 for more information.

CAUTION

You will lose all data and setup information when downloading updated software.

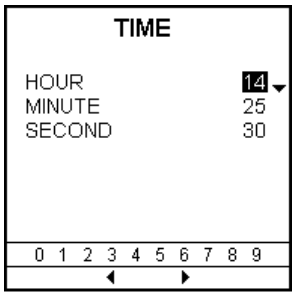
DATE

Enters a date into non-volatile memory.



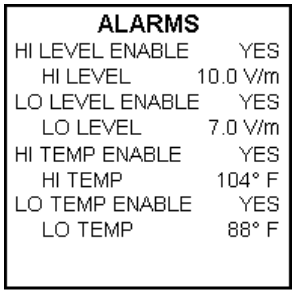
TIME

Enters a time into non-volatile memory. The time displays in military format.



ALARM

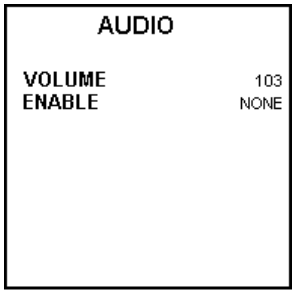
Selects alarms to be monitored. Alarms are displayed in the alarm field in the monitoring or logging screens. All alarms default to **NO**, which means they are disabled. When turned on by selecting **YES**, enter the desired values on the second line.



- **HI LEVEL ENABLE—**Selects an upper alarm level. Any reading above this level will cause a high level alarm. The default settings are: 10.00 (V/m and kV^2/m^2), .0000 (mW/cm^2).
- **LO LEVEL ENABLE—** Selects a lower alarm level. Any reading below this level will cause a low level alarm. The default settings are: 10.00 (V/m and kV^2/m^2), .0000 (mW/cm^2).
- **HI TEMP ENABLE—**Selects an upper temperature alarm level. The default setting is 100°F (38°C).
- **LO TEMP ENABLE—**Selects a lower temperature alarm level. The default setting is 100°F (38°C).

AUDIO

Sets the speaker options.



- **VOLUME—**Use the up and down MODE key to select a volume level. A tone is emitted as the volume is adjusted.
- **ENABLE—**Configures the audio option. The five choices are:

  NONE: No audio options selected.

  INTENSITY: This will emit a continuous beep relative to the field strength. When enabled, the Cadence Enable is unavailable.

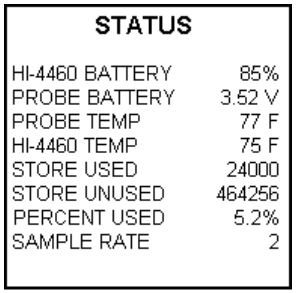
  CADENCE: This will emit periodic beeps while a probe is attached. When enabled, the Intensity Enable is unavailable.

  ALARM: Generates periodic tones when an alarm condition exists.

  LOG: This emits a beep each time the LOG key is pressed while in single point logging, or periodically while logging with any other logging setup.

STATUS Menu

The STATUS menu is used to view battery, temperature, and memory information.



HI-4460 BATTERY

The percentage of charge left in the HI-4460 battery. When the value is highlighted, see the battery charger manual to calibrate the battery.

PROBE BATTERY

The current voltage level of the probe battery. It is blank when there is no probe attached or the probe is turned off.

PROBE TEMP

The current temperature level of the probe. It is blank when there is no probe attached or the probe is turned off.

HI-4460 TEMP

The current temperature value of the HI-4460.

STORE USED

The amount of memory used for data logging.

STORE UNUSED

The amount of memory available for data logging.

PERCENT USED

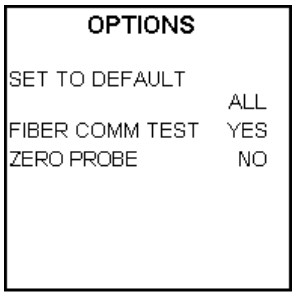
The percentage of memory used.

SAMPLE RATE

The number of samples taken per second. If **XYZ** is selected, 2/sec will be displayed. If **COMP** is selected, 6/sec will be displayed.

OPTIONS Menu

The OPTIONS menu is exclusive to the monitoring screens. It is used to set default values and zero the probe.



SET TO DEFAULT

Returns to the default settings for each type of probe. The choices are **NONE**, **ALL,** or **ONE** (for any of the probes supported by the HI-4460).

FIBER COMM TEST

Tests communication for the HI-4460 fiber optic connectors. Plug the two connectors on one side of the fiber optic cable into the fiber optic connectors on the HI-4460 and choose **YES** for FIBER COMM TEST. Results display near the bottom of the screen.

ZERO PROBE

This is available only when a probe is attached, and is used to zero the probe.

CAUTION **Zero the probe only when the probe is in a zero field.**

8.0 Logging

The logging feature is used to gather readings from the probe and save them for later review. Each set of logged data contains a log file header. This header includes the setup information for a particular set of data. A new log file is created any time the setup is changed. Because a change in the setup is required for each set of scheduled data, a new log file is created each time it is used. For single point and Periodic logging, the data is appended to the end of the log file. When using continuous logging, a new log file is created every time logging is stopped and started again.

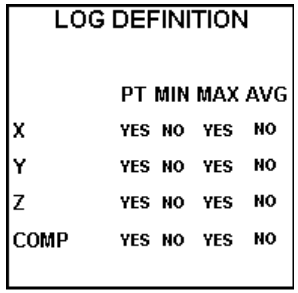
Four menus are available exclusively to the logging screens: SETUP, REVIEW, UPLD, and CLEAR.

SETUP Menu

The SETUP menu is used to select parameters for logging operations. The four possible logging operations are single point, continuous, periodic, and scheduled. The submenu log is available to choose the items to be included in the log file.

- **LOG MODE—**Select single point, continuous, periodic, or scheduled logging.

- **LOG—**The LOG DEFINITION menu is used to select the information to include in the log file. A new log file is created any time one of the log definition parameters is changed.



The PT values for the X, Y, and Z axes are the log point values taken at the log rate interval. The PT value for **COMP** is the composite of the X, Y, and Z value. The MIN and MAX values are the minimum and maximum numbers obtained by the sample rate, either 2/sec or 6/sec, during the log rate interval. The AVG value is the average of all samples, either 2/sec or 6/sec, divided by the log rate interval.

When Axis Enable on the MAIN menu is set to **XYZ**, any of the 16 values shown can be selected to display on the screen, as well as included in the log file. If Axis Enable is set to **COMP**, then only the four values for COMP will be available.

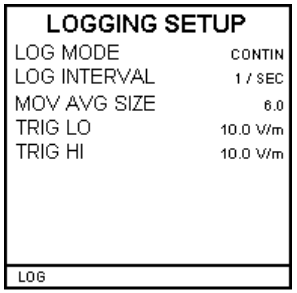
This menu is also available as a read-only screen from the UPLD, REVIEW, and CLEAR menus by selecting the DETAIL menu and then the LOG menu.

SINGLE POINT LOGGING

Logs a single point when the LOG key is pressed. Select the LOG menu to define the items to include in the log file.

CONTINUOUS LOGGING

Logs continuously at the rate selected. Press the LOG key to start logging and press it again to stop.

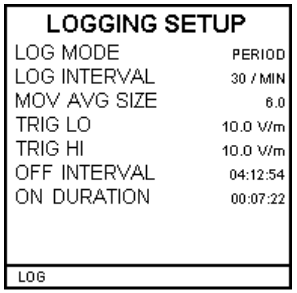


- **LOG INTERVAL—**Sets the interval between logged values. Valid settings include 1/minute to 2/second.
- **MOV AVG SIZE—**Sets the time interval used to calculate the log moving average. Select a value between 0.0 and 99.9 using the number picker function. If **0.0** is displayed or chosen, there is no log moving average, so it will not be displayed or included in the log file.
- **TRIG LO—**Selects the lower data logging value. Logging begins when a field level below this value exists.
- **TRIG HI—**Selects the upper data logging value. Logging begins when a field level above this value exists.

The setup values for LOG INTERVAL, MOV AVG SIZE, TRIG LO, and TRIG HI do not change when the logging function is changed. If new values are desired, they must be changed.

PERIODIC LOGGING

Programs the HI-4460 to log for a fixed amount of time at a predetermined interval. For example, you can log for the first 10 seconds at the start of each minute.

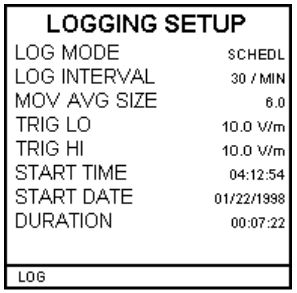


- **LOG INTERVAL—**Sets the interval between logged values. Valid settings include 1/minute to 2/second
- **MOV AVG SIZE—**Sets the time interval used to calculate the log moving average. Select a value between 0.0 and 99.9 using the number picker function. If **0.0** is displayed or chosen, there is no log moving average, so it will not be displayed or included in the log file.
- **TRIG LO—**Selects the lower data logging value. Logging begins when a field level below this value exists.
- **TRIG HI—**Selects the upper data logging value. Logging begins when a field level above this value exists.
- **OFF INTERVAL—**Defines the portion of the period that logging will be off. Enter any value between 00:00:00 and 23:59:59.
- **ON DURATION—**Defines the portion of the period that logging will be on. Enter any value between 00:00:00 and 23:59:59.

Periodic logging can be started by pressing the LOG key, and then turning off the HI-4460. The HI-4460 will automatically turn on to perform logging, then turn off when complete.

SCHEDULED LOGGING

Programs the HI-4460 to log data unattended. It can be programmed to start logging at a predetermined date and time and log for a predetermined time.



- **LOG INTERVAL—**Sets the interval between logged values. Valid settings include 1/minute to 2/second
- **MOV AVG SIZE—**Sets the time interval used to calculate the log moving average. Select a value between 0.0 and 99.9 using the number picker function. If **0.0** is displayed or chosen, there is no log moving average, so it will not be displayed or included in the log file.
- **TRIG LO—**Selects the lower data logging value. Logging begins when a field level below this value exists.
- **TRIG HI—**Selects the upper data logging value. Logging begins when a field level above this value exists.
- **OFF INTERVAL—**Defines the portion of the period that logging will be off. Enter any value between 00:00:00 and 23:59:59.
- **ON DURATION—**Defines the portion of the period that logging will be on. Enter any value between 00:00:00 and 23:59:59.
- **START TIME—**Defines the time to start logging. Enter any time between 00:00:00 and 23:59:59.

- **START DATE—**Defines the date to start logging. Enter any valid date format.
- **DURATION—**Defines the length of time to log. Enter any time between 00:00:00 and 23:59:59.

For scheduled logging to begin, the LOG key must be pressed before or during the time of the intended recording. You may turn the HI-4460 off after the LOG key is pressed; it will automatically turn on at the defined start time.

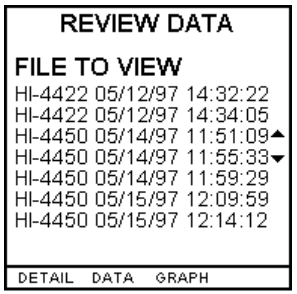
Log Moving Average

The log moving average is computed using the log interval and the moving average size values. A log moving average buffer is dynamically set up to hold the number of logged values that can be taken in the moving average size time.

For example, for a log interval of 1/second and a moving average size of 6 minutes, the moving average is the average of the last 360 logged values, if they exist. If there have not been 360 logged values, then zeros will be inserted as place holders and used to calculate the average. When the 361st value is taken, it will replace the first, and so on.

REVIEW Menu

Views the data in a log file.



- **FILE TO VIEW—**Selects the log file to be viewed. The first seven log files display, if they exist. The first file is selected by default. To view it, select DATA or GRAPH. Use the up and down MODE key to select a different log file.
- **DETAIL—**Views log file information. This is a read-only view of information selected in the SETUP menu. The LOG submenu in the DETAIL submenu is used to view information on what data is being logged.
- **DATA—**Reviews the file in numerical mode. The numerical review shows a screen similar to the log setup screen. Only logged values are shown. Use menu keys corresponding to the arrows at the bottom of the screen to move through the log file data.
- **GRAPH—**Reviews the file in graphical mode. You can review up to three variables graphically. Only values that have been logged are available. Use the up and down MODE key, the BACK/ENTER key, and the SCREEN/SELECT key to choose the item to be viewed for each graph. Use the menu keys corresponding to the arrows at the bottom of the screen to move through the log file data.

Use the arrows in the menu area and the corresponding function keys to move through data. The single arrows move one data point at a time. Double arrows scroll to the opposite end of the data, or to the next full screen of data.

UPLD Menu

Uploads log file information to a computer or other device. See *Upload Utility* on page 53 for more information.

- **START HEADER—**Displays the two newest log files in memory. The newest log file is selected by default.
- **END HEADER—**Displays the two newest log files in memory. The newest log file is selected by default. More than one log file may be sent at once. By default, only the newest log file in memory will be sent. If a block of the files are to be uploaded, they must be selected using the up and down MODE key, the BACK/ENTER key, or the SCREEN/SELECT key. Files must be selected by the block, so all log files between the start header file and end header file selected will be uploaded. To define a block of files, select the end file from the block desired (the file with the oldest date desired). Return to the START HEADER and select the beginning file from the block desired (the file with the newest date desired).
- **UPLOAD PORT—**To send the data selected, choose the method of transfer: **NONE**, **RS-232**, or **FIBER**. After having the Upload Software running on your computer, press the BACK/ENTER key and uploading will begin. If the HI-4460 cannot find the computer you will receive a NO HOST CONNECTED message and a beep. Wait about 5 seconds and the HI-4460 will return to the main logging menu

  NONE: No files sent.

  RS-232: Sends the selected files using the RS-232 connector on the HI-4460.

  FIBER: Sends the selected files using the fiber optic connectors on the HI-4460. An HI-4413P Fiber Optic Modem is required. When connecting the fiber optic cable, you must switch the polarity of one of the ends (white-to-yellow and yellow-to-white).
- **EXIT—** Once uploading has started, you can abort the upload by selecting the EXIT submenu button.

CLEAR Menu

Clears data log files.

- **START HEADER—**Displays the two newest log files in memory. The newest log file is selected by default.
- **END HEADER—**Displays the two newest log files in memory. The newest log file is selected by default. More than one log file may be cleared at once. By default, only the newest log file in memory will be cleared. If a block of the files are to be cleared, they must be selected using the up and down MODE key, the BACK/ENTER key, or the SCREEN/SELECT key. Files must be selected by the block, so all log files between the start header file and end header file selected will be cleared. To define a block of files, select the end file from the block desired (the file with the oldest date desired). Return to the START HEADER and select the beginning file from the block desired (the file with the newest date desired).
- **CLEAR DATA—**Move to CLEAR DATA and press the SCREEN/SELECT key. Use the up MODE key and down MODE key to select **YES**. Press the BACK/ENTER key twice to clear the selected data.

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9.0 Operation

This section contains information about different features of the HI-4460 Graphical Readout.

Startup

When the HI-4460 is turned on, the screen flickers for one to two seconds. If a menu key is pressed before this, the menu will exit and the screen will reappear after the flicker.

Charging

The HI-4460 utilizes a gas gauge microchip to determine battery life. The charger has a discharge button that works with the gas gauge to discharge the battery to a reference level and then charge it to the maximum. This enables the HI-4460 to keep track of the amount of charge that is left.

Battery Operation

Do not disconnect the battery pack from the HI-4460. Disconnecting the battery will interfere with the calibration of the battery charge status indicator and will cause a battery fault indication.

If the battery is disconnected, you must recalibrate the battery charge status indicator.

1. Turn off the HI-4460.
2. With the battery charger connected to the 120/240 VAC mains power supply, connect the battery charger to the HI-4460.

This will discharge and recharge the battery, and will properly initialize the battery charge status indicator.

When fully charged, the battery graphical display may indicate a charge level of 97% to 105%. This is normal; this fully-charged level may begin to drop as the battery ages.

When the battery is being charged (with the HI-4460 turned off), power is still being drawn from the battery to maintain the system monitoring features of the HI-4460. This current being drawn from the battery may cause the battery charger to prematurely indicate a fully charged unit. To continue to charge the battery to full capacity:

1. Disconnect the battery charger from the HI-4460 for approximately 15 seconds.
2. Reconnect the battery charger to the HI_4460. The battery charging sequence will continue to fully charge the battery. Reinitiating the charge sequence in this manner will not adversely affect the ultimate life of the battery.

Follow these steps if the HI-4460 is turned on while charging the battery.

Should the battery become overly discharged (no display, for example), it may be necessary for the charger to trickle charge the battery to a safe level to begin the fast-charge sequence. This may take several hours if the battery is severely over-discharged. During this time, the battery charger will indicate PENDING. When a sufficient charge level is reached, the charger will automatically shift to the fast-charge mode.

Because the HI-4460 is monitoring its operation even when off, there is a load on the battery. This load and the self-discharge characteristic of a nickel-cadmium (NiCd) battery will deplete the charge of the battery even when off. A typical battery life in the off condition is typically 12-13 days. After this time, the battery must be recharged. You may leave the HI-4460 connected to the battery charger indefinitely with no effect on the ultimate life of the battery.

Battery Calibration

- When the HI-4460 battery level is highlighted, the battery must be calibrated; see the battery charger manual for more information.
- If the battery is not calibrated after cycling, cycle it again to calibrate the battery.

Reset

There is a reset button on the HI-4460 circuit board. The reset button can be accessed through a hole on the upper right side of the battery pack cover on the back of the unit. The memory is backed up by battery, so all data and setup information will remain intact.

Setup

The HI-4460 can be setup for a probe even though the probe is not attached.

1. Turn on the HI-4460. NO PROBE will display on the screen.
2. At the Main screen choose the desired probe in the **Probe Type** field.
3. Select any desired settings for the probe; you may also set up logging.

Attach the probe when you are ready to use it. Everything will be set and ready for operation.

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10.0 Upload Utility

Log file data can be uploaded to a personal computer using either the fiber optic connectors or RS-232 connector.

- To use the fiber optic connectors, you need an HI-4413P Fiber Optic Modem. When connecting the fiber optic cable, you must switch the polarity of one of the ends, white-to-yellow and yellow-to-white.
- To use the RS-232 connector, attach the RS-232 cable between the HI-4460 Graphical Readout and the computer.

Before uploading data, you must install Upload Utility onto the computer.

Install Upload Utility

The following installation instructions are intended for use with one of the Microsoft® Windows® operating systems.

1. Download Upload Utility from the ETS-Lindgren website, www.ets-lindgren.com. Point to **Resources**, click **Software/Firmware**, and then click **Upload Utility**. Follow the instructions to download.
2. To begin the installation program, click Setup.exe.

Start Upload Utility

1. Click **Start**, **All Programs**, and then click **HIupload**. The Upload Utility splash screen displays.
2. Select the default communications port you will be connecting to.
3. Upload Utility is now running with the **Incoming Data** tab highlighted. Verify that the proper communication settings are selected.

   Following are the default settings:

Baud:	9600
Parity:	None
Data Bits:	8
Stop Bit:	1

You are now ready to upload log file data to the computer.

Upload Data

Connect the HI-4460 to your computer using either the fiber optic port or the RS-232 port. Start Upload Utility on the computer.

On the HI-4460, go to the Upload menu.

START HEADER

Displays the two newest log files in memory with the newest log file selected.

END HEADER

Displays the two newest log files in memory with the newest log file selected. More than one log file may be sent at once, but by default only the newest log file in memory will be sent.

To upload a block of files, select them using the up MODE key, down MODE key, BACK/ENTER key, and SCREEN/SELECT key. Files must be selected by the block, so all log files between the Start Header file selected and End Header file selected will be uploaded.

To define a block of files, select the end file from the desired block; the file with the oldest date desired. Then return to the Start Header and select the beginning file from the desired block; the file with the newest date desired.

UPLOAD PORT

To send the data selected, choose the method of transfer: **None**, **RS-232**, or **Fiber**. After starting Upload Utility on the computer, press the BACK/ENTER key to begin uploading. The files selected will upload to the computer and the headers for each file will display in the Incoming Data window. If the HI-4460 cannot find the computer you will receive a NO HOST CONNECTED message and a beep. Wait about five seconds and the HI-4460 will return to the main logging menu. Re-check connections and settings.

View Data

To view the data, highlight one of the file headers in the Incoming Data window, and then click **View**. The data will be loaded into the Data window. The data can be viewed in Upload Utility, or can be saved as a Microsoft Office Excel® file by clicking the **File** menu, and then clicking **Save As**. Choose a file name and location and click **Save**.

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11.0 Download Utility

Updated software for the HI-4460 Graphical Readout can be downloaded using Download Utility from a computer to an HI-4460 through the fiber optic connectors or RS-232 connector.

- To use the fiber optic connectors, you need an HI-4413P Fiber Optic Modem. When connecting the fiber optic cable, you must switch the polarity of one of the ends, white-to-yellow and yellow-to-white.
- To use the RS-232 connector, attach the RS-232 cable between the HI-4460 Graphical Readout and the computer.

Before downloading software updates, you must install Download Utility onto the computer.

Install Download Utility

The following installation instructions are intended for use with one of the Microsoft® Windows® operating systems.

1. Obtain Download Utility from the ETS-Lindgren website, www.ets-lindgren.com. Point to **Resources**, click **Software/Firmware**, and then click **Download Utility**. Follow the instructions to download.
2. To begin the installation program, click Setup.exe.

Start Download Utility

1. Click **Start**, **All Programs**, and then click **HIdownload**. The Download Utility splash screen displays.
2. Download Utility is now running. Click **Browse**, navigate to the file to download, and then click **Open**.

Download the File

CAUTION

When downloading new software to the HI-4460, all logged data in the HI-4460 will be erased. Before downloading new software to the HI-4460, make sure to upload all logged data to your computer.

Before downloading new software to the HI-4460, make sure the battery is completely charged.

1. In the HI-4460 Config menu, use the up MODE key, down MODE key, BACK/ENTER key, and SCREEN/SELECT key to select **Download Code**.
2. Select **RS232** or **Fiber**.
3. Move to **Are You Sure** and change it to **YES**.
4. Press the BACK/ENTER key to establish communications with the computer. The message DOWNLOADING appears.

Press the ESC key to cancel the download.

5. In Download Utility, select the correct communications port, **1** or **2**. The Progress area should display the message **Device Found**. You are now ready to download new software.

CAUTION

To stop a download in progress, click Abort or press the ESC key on the HI-4460. Aborting the download process leaves the previous revision of software on the HI-4460 running, but all data is erased.

6. Click **Download** and the software will download to the HI-4460. When the download is complete, the HI-4460 will restart.

12.0 Standards

Listed here are the standards that are programmed into the HI-4460 Graphical Readout, and are selectable in the Main menu. If a value, or formula, is not shown in the table, the value is dependent on frequency and the electric or magnetic field values. For example, there is no value in the first row or the first table for power density. Use the following formulas to calculate them. For any formula in the table containing **Af@** in the tables, use the frequency in MHz, unless noted otherwise.

Formulas

TO CALCULATE POWER DENSITY FOR ELECTRIC FIELDS (PDE)

$$Pde = \frac{E*E}{3770}$$

TO CALCULATE POWER DENSITY FOR MAGNETIC FIELDS (PDH)

$$Pdh = H*H*37.7$$

TO CALCULATE ELECTRIC FIELDS (E)

$$E = \sqrt{Pde*3770}$$

TO CALCULATE MAGNETIC FIELDS (H)

$$H = \sqrt{\frac{Pdh}{37.7}}$$

ACGIH (Controlled)

American Conference of Governmental Industrial Hygienists

	Power Density (mW/cm^2)		E-Field (V/m)	H-Field (A/m)
	E-Field	H-Field		
30kHz-100kHz			614	163
100kHz-3MHz			614	16.3/f
3MHz-30MHz			1842/f	16.3/f
30MHz-100MHz			61.4	16.3/f
100MHz-300MHz	1		61.4	0.163
300MHz-3GHz	f/300			
3GHz-15GHz	10			
15GHz-300GHz	10			

IEEE C95.1 (Controlled)

	Power Density (mW/cm^2)		E-Field (V/m)	H-Field (A/m)
	E-Field	H-Field		
3kHz-100kHz	100	1,000,000	614	163
100kHz-3MHz	100	10,000/f^2	614	16.3/f
3MHz-30MHz	900/f^2	10,000/f^2	1842/f	16.3/f
30MHz-100MHz	1	10,000/f^2	61.4	16.3/f
100MHz-300MHz	1		61.4	0.163
300MHz-3GHz	f/300			
3GHz-15GHz	10			
15GHz-300GHz	10			

IEEE C95 (Uncontrolled)

	Power Density (mW/cm^2)		E-Field (V/m)	H-Field (A/m)
	E-Field	H-Field		
3kHz-100kHz	100	1,000,000	614	163
100kHz-1.34MHz	100	10,000/f^2	614	16.3/f
1.34MHZ-3MHz	180/f^2	10,000/f^2	823.8/f	16.3/f
3MHz-30MHz	180/f^2	10,000/f^2	823.8/f	16.3/f
30MHz-100MHz	0.2	940,000/f^3.336	27.5	158.3/f^1.668
100MHz-300MHz	0.2		27.5	0.0729
300MHZ-3GHz	f/1500			
3GHz-15GHz	f/1500			
15GHz-300GHz	10			

FCC (US) (Controlled)

	Power Density (mW/cm^2)		E-Field (V/m)	H-Field (A/m)
	E-Field	H-Field		
300kHz-3MHz	100		614	1.63
3MHz-30MHz	900/f^2		1842/f	4.89/f
30MHZ-300MHz	1		61.4	0.163
300MHz-1.5GHz	f/300			
1.5GHz-100GHz	5			

FCC (US) (Uncontrolled)

	Power Density (mW/cm^2)		E-Field (V/m)	H-Field (A/m)
	E-Field	H-Field		
300kHz-1.34MHz	100		614	1.63
1.34MHz-30MHz	180/f^2		824/f	2.19/f
30MHZ-300MHz	0.2		27.5	0.073
300MHz-1.5GHz	f/1500			
1.5GHz-100GHz	1			

NRPB (British)

For NRPB, use frequency in GHz for **f**.

	Power Density (mW/cm^2)		E-Field (V/m)	H-Field (A/m)
	E-Field	H-Field		
< 24Hz			25,000	160,000
24Hz-600Hz			600/f (kHz)	64,000/f (Hz)
600HZ-600kHz			1000	64
600kHz-12MHz			600/f (MHz)	18/f^2 (MHz)
12MHz-200MHz	0.66		50	0.13
200MHz-400MHz	16.5*f^2		250*f	0.66*f
400MHz-800MHz	2.6		100	0.26
800MHz-1.55GHz	4.1*f^2		125*f	0.33*f
1.55GHz-300GHz	10		194	0.52

ICNIRP (Occupational)

Frequency (f) in same units as defined in first column.

	Power Density (mW/cm^2)		E-Field (V/m)	H-Field (A/m)
	E-Field	H-Field		
0-1Hz	C		C	1.63×10^5
1Hz-8Hz	C		20,000	$1.63 \times 10^5/f$
8Hz-25Hz	C		20,000	$2 \times 10^4/f$
0.025kHz-0.82kHz	C		500/f	20/f
0.82kHz-65kHz	C		610	24.4
0.065MHz-1MHz	C		610	1.6/f
1MHz-10MHz	C		610/f	1.6/f
10MHz-400MHz	1		61	0.16
400MHz-2000MHz	f/400		$3f^{1/2}$	$0.008f^{1/2}$
2GHz-300GHz	5		137	0.36

ICNIRP (General Public)

Frequency (f) in same units as defined in first column.

	Power Density (mW/cm^2)		E-Field (V/m)	H-Field (A/m)
	E-Field	H-Field		
0-1Hz	C		C	3.2×10^4
1Hz-8Hz	C		10,000	$3.2 \times 10^4/f$
8Hz-25Hz	C		10,000	4,000/f
0.025kHz-0.8kHz	C		250/f	4/f
0.8kHz-3kHz	C		250/f	5
3kHz-150kHz	C		87	5
0.15MHz-1MHz	C		87	0.73/f
1MHz-10MHz	C		$87/f^{1/2}$	0.73/f
10MHz-400MHz	0.2		28	0.073
400MHz-2000MHz	f/2000		$1.375f^{1/2}$	$0.0037f^{1/2}$
2GHz-300GHz	1		61	0.16

Safety Code 6 (Canada) Exposed Workers

Frequency (f) in MHz.

	Power Density (mW/cm^2)		E-Field (V/m)	H-Field (A/m)
(MHz)	E-Field	H-Field		
0.003-1	C		600	4.9
1-10	C		600/f	4.9/f
10-30	C		60	4.9/f
30-300	1		60	0.163
300-1500	f/300		$3.54f^{1/2}$	$0.0094f^{1/2}$
1500-40,000	5		137	0.364

Safety Code 6 (Canada) General Public

Frequency (f) in MHz.

	Power Density (mW/cm^2)		E-Field (V/m)	H-Field (A/m)
(MHz)	E-Field	H-Field		
0.003-1	C		280	2.19
1-10	C		280/f	2.19/f
10-30	C		28	2.19/f
30-300	0.2		28	0.073
300-1500	f/1500		$1.585f^{1/2}$	$0.0042f^{1/2}$
1500-40,000	1		61.4	0.163

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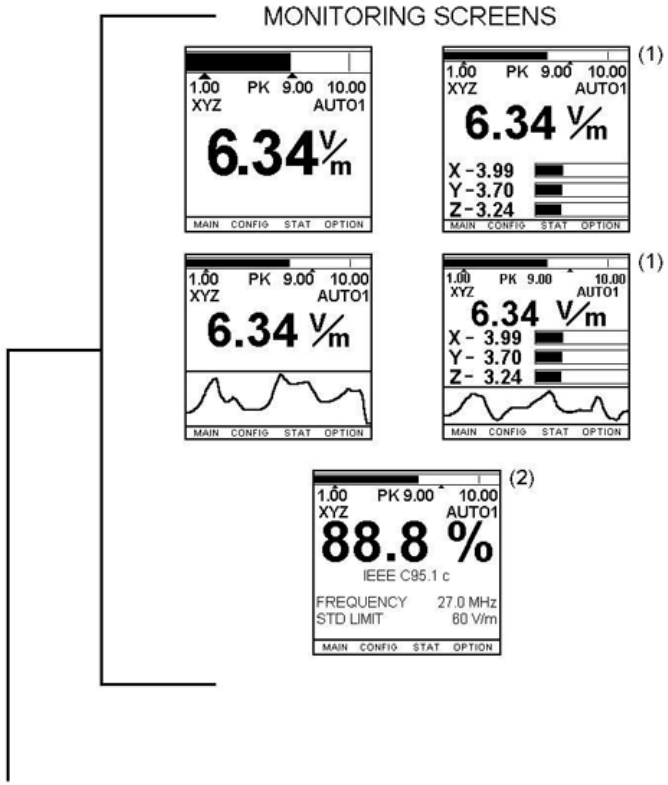
13.0 Menu Tree

These references are used in the following *Monitoring Screens* and *Logging Screens* illustrations:

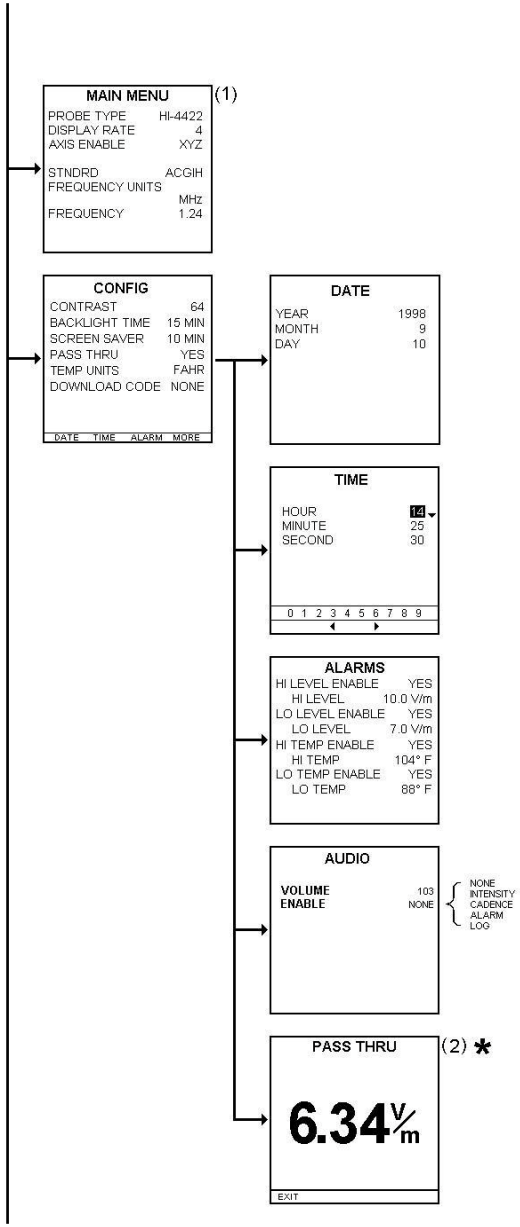
Reference / Description

- ***** Read only screens
- **1** Data screens not displayed if Axis Enable is not set to **Composite**
- **2** Pass Thru screen available only if pass thru value is **Yes** in Config Menu
- **3** Zero Probe displayed only if a probe is attached

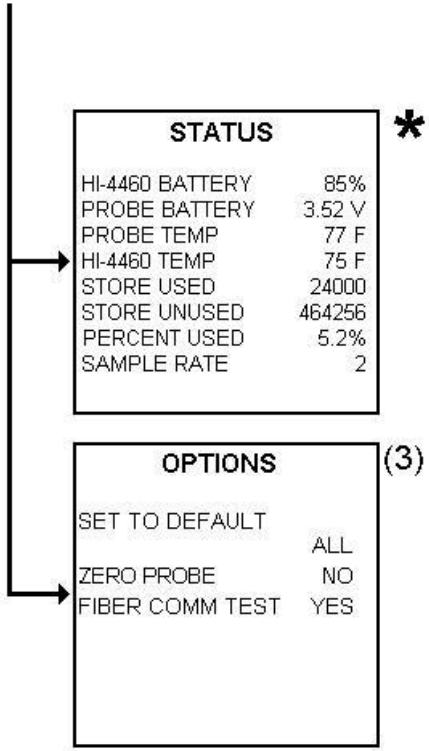
Monitoring Screens



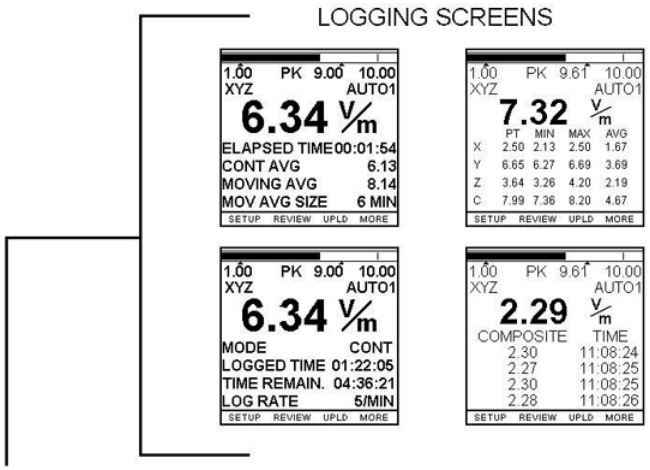
MONITORING SCREENS, CONTINUED



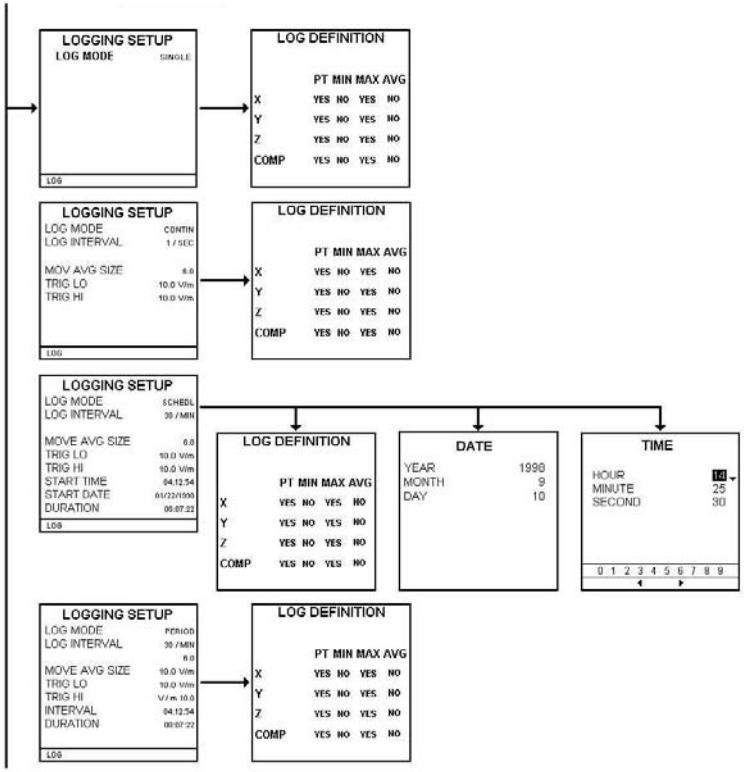
MONITORING SCREENS, CONTINUED



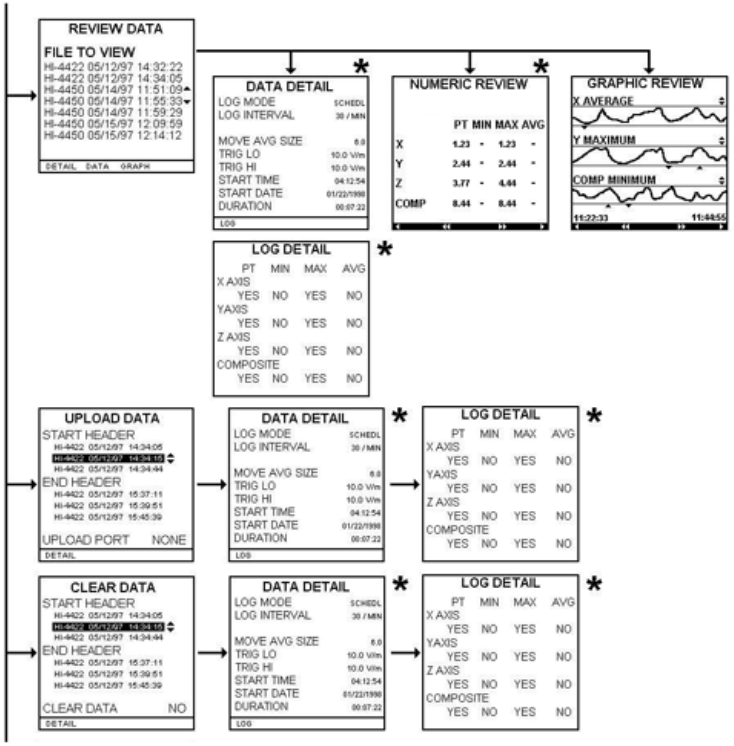
Logging Screens



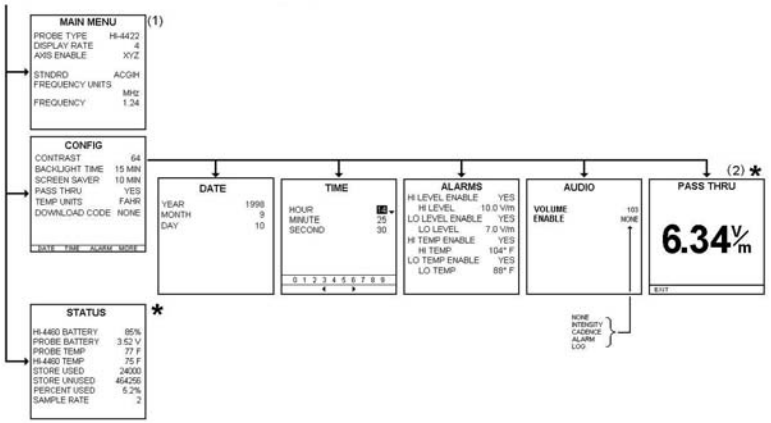
LOGGING SCREENS, CONTINUED



LOGGING SCREENS, CONTINUED



LOGGING SCREENS, CONTINUED



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Appendix A: Warranty

See the *Product Information Bulletin* included with your shipment for the complete ETS-Lindgren warranty for your HI-4460 Graphical Readout.

DURATION OF WARRANTIES FOR HI-4460

All product warranties, except the warranty of title, and all remedies for warranty failures are limited to one year.

Product Warranted	Duration of Warranty Period
HI-4460 Graphical Readout	1 Year

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Appendix B: EC Declaration of Conformity

ETS-LINDGREN
An ESCO Technologies Company

CE 98

We, ETS-Lindgren, L.P., 1301 Arrow Point Drive, Cedar Park, TX, 78613, USA, declare under sole responsibility that the:

Model/Part Number: HI-4460/ FM5501

Model/Part Name: Graphical Readout

Date of Declaration: 28 April, 1998

to which this declaration relates, meets the requirements and is in conformity with the relevant EC Directives listed below using the relevant section(s) of the following EC harmonized standards and other normative documents;

Applicable Directive(s):

Electomagnetic Compatibility Directive (EMC), 89/336/EEC and its amending directives

Applicable harmonized standard(s) and/or normative document(s):

EN 50082-1:1992 Electromagnetic compatibility - Generic immunity standard Part 1: Residential, commercial and light industry

EN 55022:1994 Limits and methods of measurement of radio disturbance characteristics of information technology equipment

FCC Part 15: Radio Frequency Devices, Subpart B - Unintentional Radiators

Authorized Signatories:

ETS-Lindgren L.P.
Bryan Sayler, General Manager

ETS-Lindgren L.P.
James C. Psencik, Vice President of Engineering

The authorizing signatures on this Declaration of Conformity document authorizes ETS-Lindgren, L.P. to affix the CE mark to the indicated product. CE marks placed on these products will be distinct and visible. Other marks or inscriptions liable to be mistaken with the CE mark will not be affixed to these products.

ETS-Lindgren, L.P. has ensured that technical documentation shall remain available on premises for inspection and validation purposes for a period ending at least 10 years after the last product has been manufactured.