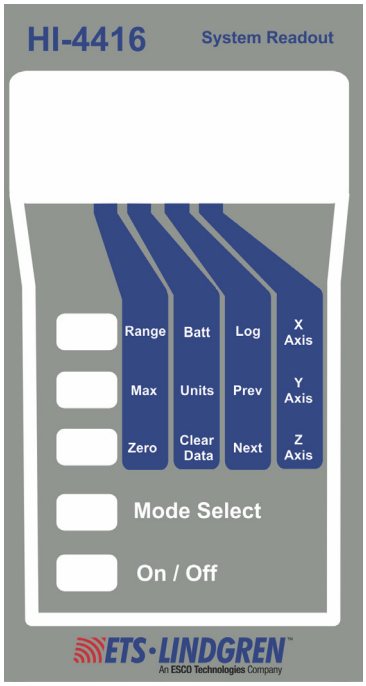
ETS·LINDGREN
An ESCO Technologies Company

HI-4416

System Readout



User Manual

PN: #H-600050

Mar, 2021

Rev K

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Revision Record

MANUAL, HI-4416 | Part # H-600050 Rev K

Revision	Description	Date
	Initial Release	July, 1993
A	Software Updates	March, 1995
B	Update	January, 1996
C	Changed Battery Charger	June, 1997
D	Added CE Label	June, 1997
E	Changed Charger Specs	August, 1999
F	Changed Area Code	February, 2000
G	Updated contact info. And added charger manual as appendix.	February, 2006
H	Revised to current style standards	May, 2013
J	Updated part numbers in Replacement and Optional Parts	September, 2013
K	Rebrand; Update to battery chargers	March, 2021

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.

*All notes, cautions, and warnings will be located on the left column area of the page.

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

SAFETY INFORMATION

	See the ETS-Lindgren *Product Information Bulletin* for safety, regulatory, and other product marking information.
	**Warning:** Do not position the equipment so that it is difficult to connect or disconnect cables into the back of the unit.

INTRODUCTION

The **ETS-Lindgren HI-4000 Hazard Measurement System** introduces fiber optic technology for the acquisition of data from electric and magnetic fields. The use of fiber optic cables for data transfer minimizes perturbation during field measurements.

The heart of this system is the **HI-4416 System Readout.** This fiber optically isolated remote readout/control can be paired with a number of field probes.

Standard features of the HI-4416 System Readout include data logging, a recorder output, and a custom Liquid Crystal Display (LCD) with bar graph. The data log feature captures up to 150 field readings for later review. The recorder output provides a DC voltage proportional to the indicated field value. All selection and control functions are input via the front panel keypad's membrane switches; this keypad is configured in a matrix, allowing access to twelve functions.

The HI-4416 uses an ASCII character string for communication with the probe in both directions. See Appendix B: HI-4416 Operating Protocols for details of the data format.

The HI-4416 may be used in conjunction with many ETS-Lindgren probes. For a current list please contact ETS-Lindgren Customer Service.

Standard Configuration

- Rugged Aluminum Housing
- Custom LCD Readout
- Front Panel Keypad Matrix
- Recorder Output (0 - 5 VDC)
- Nickel-Cadmium (NiCd) Battery
- Standard Quick Charger (115/230 Volt)/ Type 1737570 Battery Charger

ETS-Lindgren Product Information Bulletin

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

- 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

MAINTENANCE

CAUTION

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

WARNING

Maintenance of the HI-4416 is limited to external components such as any cables or connectors.

Warranty may be void if the housing is opened.

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

ETS-Lindgren may substitute a similar part or new part number with the same functionality for another part/part number

Contact ETS-Lindgren for questions about part numbers and ordering parts.

Maintenance Recommendations

Maintenance of the HI-4416 System Readout is limited to external components such as cables or connectors.

Any calibration or maintenance task that requires disassembly of the readout must be performed at the factory. Contact ETS-Lindgren customer service before opening the unit to avoid problems with your readout's warranty.

Replacement and Optional Parts

The following are the part numbers for ordering replacement or optional parts for the HI-4416.

Part Description	Part Number
Battery Pack, 3.6 VDC, Rechargeable	H-491038
Standard Fast Charger	H-491198-36 (115/230 Volt) 1737570 (12VDC/90-264 VAC)
Cable, Fiber Optic, Glass, 2 meter	H-491106-02
Handle Assembly	H-491073
Carrying Case	H-491083

Upgrade Policies

Periodically, readouts are upgraded to enhance functionality. Contact ETS-Lindgren Customer Service for the upgrade status of your system.

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.

SPECIFICATIONS

Electrical Specifications

Operating Temperature	+10° C to +40° C (+50° F to +104° F)
Humidity	5% to 50% relative humidity, non-condensing

Physical Specifications

Instrument Dimensions (including connectors)	154 mm x 87 mm x 32 mm (6.07 in. x 3.43 in. x 1.25 in.)
Weight	0.42 kg (14.8 oz)

Operational

Battery	3.6 VDC, 1400 mA-h-NiCd
Battery Charger	115/230 VAC approximately 1 hour
Battery Charger Jack	2.5 mm phone jack
Fiber Optic Connectors	Standard FSMA
Recorder Out Level	0 – 5 VDC, 1mA max (all ranges)
Recorder Out Jack	3.5 mm phone jack
Operating Life (battery fully charged)	70 hours (idle) 80 hours (communicating)
Standard Fiber Optic Cable	200µm, graded index, multimode

PRE-INSTALLATION TASKS

CAUTION

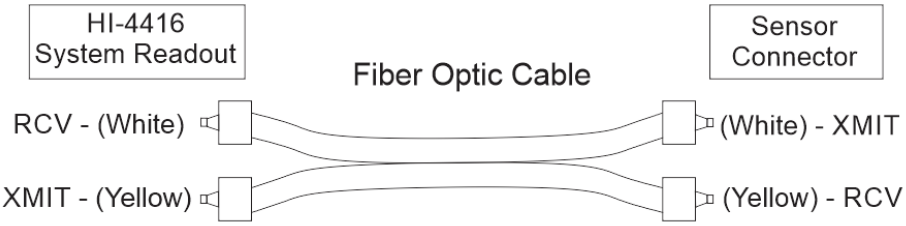
Before connecting any components, follow the safety information in the ETS-Lindgren Product Information Bulletin included with your shipment.

Bench Test

Perform the following procedures to verify system operation.

Readout And Probe Bench Test

1. Remove the plastic caps from the readout's fiber optic connectors. Remove the protective covers from the fiber optic cable assembly. Save all protective caps and covers for future use.



2. Visually inspect the tips of the fiber optic cables to make sure that they are free of dirt and other contaminants. Connect the fiber optic cable to the two connectors on the top of the readout; be sure to match the cable connector colors to those on the readout connectors (yellow to TRANSMIT; white to RECEIVE).
3. Connect the other end of the fiber optic cable to the sensor connectors. Be sure to match the cable connector colors to those on the sensor connectors (white to XMIT; yellow to RCV).
4. Turn the Field Sensor ON.
5. Press the ON/OFF keypad on the front panel of the HI-4416. All segments of the LCD will activate for two seconds, then the version of software installed in the HI-4416 will be displayed followed by the current range of the probe connected to the readout. The HI-4416 will then begin normal operation. Units of measure, current reading (if any), bar graph, etc., will be displayed. If, after several seconds, the readout indicates an error condition, see Appendix: A: Error Codes for additional information.

OPERATION

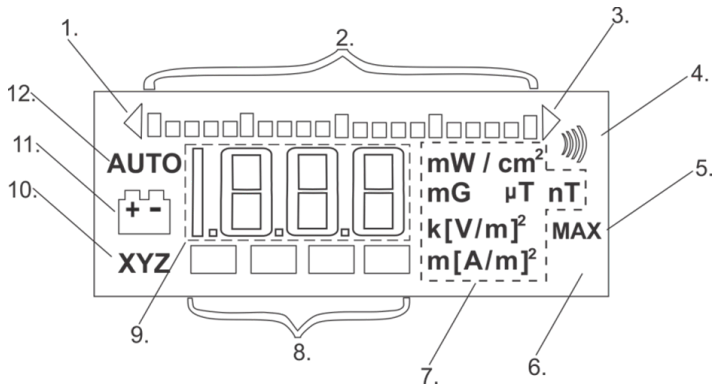
CAUTION

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

The HI-4416 does not shut down automatically. Be sure to turn the instrument off when not in use.

Display

Connect a probe to the HI-4416. Make sure the switch on the probe is in the “ARM” position and then turn the system readout on.



The HI-4416 uses a custom LCD to display the probe settings and field values that are measured.

1. Under Range Indicator
2. Bar Graph
3. Over Range Indicator
4. Alarm Active Indicator
5. Maximum Reaidng Indicator
6. Power On Indicator
7. Units of Measure Indicators
8. Cursor Block
9. Digital Display
10. Axis Indicator
11. Battery Indicator
12. Autorange Indicator

Once the system readout is turned on, all segments of the LCD will activate for two seconds, the version of software installed will appear, followed by the current range of the probe connected to the readout. The HI-4416 then switches to normal operation (measurement). The LCD readout displays the observed value and the units of measure.

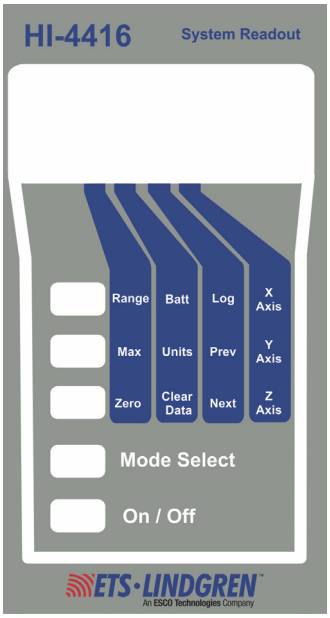
The bar graph along the top of the LCD window presents an analog approximation of the measured field. Each bar graph segment represents five percent of the full-scale reading in the current range. The bar graph is updated 7.6 times per second while the digital display is updated 1.9 times per second.

When the measured field strength is below 5% of full scale for the range in use, the "Under Range" indicator at the left end of the bar graph appears and the display will flash on and off. When possible, switch the range to permit a field strength reading that does not trigger the "Under Range" indicator. If the field strength exceeds full scale, the "Over Range" indicator at the right end of the bar graph will appear and the characters “OL” will appear on the display. Select the next appropriate range.

Keypad Operation

WARNING

The operation of the HI-4416 System Readout is controlled by membrane switches. To activate a switch, press gently on the center of the pad with your fingertip. Do not use hard or pointed objects.



On/Off: This keypad activates the readout.

At power-up, a self-test procedure is automatically performed. As part of this procedure, all segments of the LCD will activate for two seconds, then the version of software installed in the HI-4416 will appear, followed by the current range of the probe connected to the readout. The System Readout then switches to normal (measurement) operation. The HI-4416 does not require any warm-up or settling time prior to use. Pressing On/Off again turns the readout off.

Mode Select: Selects one of the four modes of the keypad matrix.

For maximum operating flexibility, the HI-4416 utilizes a matrix for the upper three keypads on the membrane switch panel. The function that each key controls depends on the location of the cursor block (the dark rectangle located at the bottom edge of the LCD). When the HI-4416 is turned on, the cursor automatically positions itself above the left most of the four function columns on the control panel. In this mode, the functions assigned to the three top keypads are Range, Max and Zero.

Pressing the Mode Select keypad moves the cursor block to the right, allowing access to the three functions in that column. Each successive activation of the pad moves the cursor another position to the right. From the fourth, or right most position, the cursor returns to the first position. This configuration allows a total of twelve different functions to be assigned to the upper three keypads.

Range: Displays the measurement range currently in use, changes the range.

When this keypad is momentarily pressed, the HI-4416 commands the probe to transmit the range currently in use. The system displays this range for two seconds before returning to the measurement mode. Pressing this keypad again (while the current range is still being displayed) signals the probe to switch to the next range; the readout displays the new range.

Continuing in this manner will step through all available ranges. When the highest range is reached, pressing the keypad again returns you to the lowest (most sensitive) range.

Max: Displays the maximum reading.

During field measurements, the processor continually monitors and stores the highest measured field value. To recall and display this value, press the Max key. The maximum reading, denoted by the Max indicator near the right edge of the LCD, appears on the display. This reading remains as long as the Max key is pressed. When the Max key is released, the LCD retains the reading for

The LCD presents the range in the form r X, where X is a number. Since all probes do not contain the same number of ranges, the maximum value of X depends upon which probe is connected to the system readout. Consult the probe literature to determine the ranges available for a particular probe.

If the maximum reading is over full scale for the range, 'OL' will appear on the display along with the over range indicator.

approximately two seconds, after which the Max memory location is cleared and a new maximum reading is accumulated.

The maximum value is cleared when the HI-4416 is powered up, when the Max key is released and when the unit of measure is changed. The Clear button does not affect this reading.

Zero: Sends a zero command to the probe.

Selecting this command zeroes all ranges and axes. This mode establishes a baseline for measurements by sampling all axes and ranges and subtracting those values from each subsequent measurement.

Batt: Displays probe battery voltage and temperature. Refer to the manual for your probe to determine if it is capable of communicating battery status.

Pressing this key with the probe connected and armed causes the LCD to display a small battery symbol on the left side of the readout and the battery voltage of the probe. After two seconds, the readout will also display probe temperature in °F. After another two seconds, the readout returns to the measurement mode. Compare the voltage reading you obtain with that stated in the probe manual.

When the probe's battery voltage decreases below a preset limit, the battery symbol will blink; this indicates that the battery needs charging. If the battery voltage is allowed to drop below that required for proper device operation, the display will be blank.

This keypad can also be used to determine the battery status of the HI-4416. When the battery symbol is flashing, toggle the probe's Arm/Off switch to Off, if the symbol still blinks, then the battery needs charging.

Units: Instructs the probe to change the units of measure, and displays the new units.

Continue to press the Units keypad until the desired unit of measure appears on the display. Just as for the Range command, the available units of measure depend upon which probe is connected to the system readout; consult your probe manual.

Clear Data: Clears all readings out of data log memory.

To perform this operation, press and hold the Clear Data keypad. The characters "clr" will flash on the display for approximately two seconds. Continue pressing the keypad until "000" appears on the display (these characters will not flash), data log memory is now cleared. When you release the keypad, the system readout returns to the measurement mode.

If this keypad is released while the "clr" characters are still flashing, data log memory is unaffected. This helps prevent accidental erasing of data.

Log: Saves the current measurement in data log memory.

Pressing the Log keypad saves the reading in memory as this occurs, the readout momentarily displays the three-digit identification number of the reading. The data stored includes values, units of measure, over/under range indication and active axes. Up to 150 measurements may be stored. When data log memory is full, any additional log operations replace the value previously

stored in location 150 with the new value; all other memory locations remain unchanged.

If this keypad is pressed for longer than two seconds, the just-logged data is displayed

Prev: Accesses the last value stored in data log memory.

When the key is pressed the three-digit identification number of the stored value is displayed for approximately one second then the stored value is displayed.

The readout continues to display this value as long as the Prev key remains pressed. Approximately two seconds after releasing the key, the HI-4416 returns to the measurement mode. Successive operations of the Prev key decrement the displayed value toward the beginning of memory (value 001). If the key is pressed while viewing value 001, the readout "wraps around" to the highest stored identification number.

Next: Accesses the next value stored in data log memory.

The operation of this key is similar to that of the Prev key except that successive operations of the Next key increment the displayed value toward the end of data log memory. In addition, if the key is operated while viewing the highest stored value, the readout "wraps around" to identification number 001.

X Axis—Commands the probe to enable/disable X axis measurements. (Probe Dependent)

Y Axis—Commands the probe to enable/disable Y axis measurements. (Probe Dependent)

Z Axos—Commands the probe to enable/disable Z axis measurements. (Probe Dependent)

In some applications, it is advantageous to make field measurements along only one or two axes. These three keypads allow you to enable or disable each axis independently. The status of each axis is denoted by the "XYZ" axis identifier characters in the lower left corner of the LCD. If the axis identifier is visible, field measurement in that axis is enabled; if not visible, the axis is disabled.

If an under range value is logged and displayed, the measured value along with the under range indicator arrow will appear. If an over range value is logged and displayed, 'OL' and the over range indicator arrow will appear.

Battery Charging

The HI-4416 System Readout contains a rechargeable nickel-cadmium (NiCd) battery. ETS-Lindgren, charges the internal NiCd battery of the HI-4416 at the factory in order to test the HI-4416 System Readout prior to shipment. While every effort is made to make sure that your readout arrives ready to use, we cannot guarantee that this will be the case. Always check the condition of the readout's battery prior to making any measurements.

A fully charged battery (nominal output voltage of 3.6 VDC) provides up to 80 hours of operation. When the batteries have discharged to 3.3 VDC, the readout is still operational, but its battery needs charging. When the voltage drops below 3.18 VDC, the display will be blank.

Charging Procedure

1. Plug the charger into a suitable AC source.
2. Make sure power to the readout is OFF. Insert the plug from the charger cable into the readout's CHARGER jack.
3. The battery pack is now charging. This may take approximately 1 hour, depending on how deeply the batteries are discharged. When charging is complete, the charger automatically goes into a trickle charge and will continue to do so until the probe is disconnected.

Battery Tips

NiCd batteries have several characteristics that can affect both their performance and operating life. The following tips advise you how to take advantage of these characteristics to get the most out of your readout’s battery.

- Although NiCd batteries are rated for operation in temperatures from -20 °C to 65 °C (-4 °F to 140 °F), using the System Readout in extreme temperatures will reduce operating time significantly. The optimum operating temperature range for these batteries is 20 °C to 30 °C (68 °F to 86 °F).
- The battery in the HI-4416 does not require periodic "deep discharges" to reverse the capacity depleting "memory effect" caused by repeated shallow discharges. However, undercharging can reduce battery capacity.
- If the battery in the HI-4416 appears unable to acquire or maintain an appreciable charge, individual cells in the battery may be shorted or damaged and the battery should be replaced. If, for any reason, your battery needs replacement, contact ETS-Lindgren Customer Service for assistance.

APPENDIX A: COMMUNICATION ERROR CODES

When the HI-4416 detects an error condition during communication with a probe, it will display an error message of the form EXX, where XX is a two-digit number. The meaning of each error number is described below. Under certain circumstances, it is possible for the user to correct the conditions causing errors 01 and 02: if not, or if the conditions that generate errors 03 - 12 develop and persist, the probe must be repaired by ETS-Lindgren technicians.

Error	Cause
E01—No Response From Probe	Probe's **ARM/OFF** switch in **OFF** position; faulty probe.
E02—Transmission Error (e.g., Parity)	The HI-4416 is **ON**, no fiber optic cables are connected, and the readout's connectors are aimed toward a light source; faulty probe.
E03—Input Buffer Overflow	Too many characters contained between the Start Character/Carriage Return sequence.
E04—Invalid start character for probe data	Start Character incorrect or not sent.
E05—Probe Data String Length Error	Data string does not conform to one of the two correct string lengths.
E06—Invalid String for Reading Value	Data string does not conform to correct format (four digits plus decimal point).
E07—Invalid Range Value	Incorrect range character.
E08—Invalid Unit Value	Incorrect unit characters.
E09—Invalid Axis Enable Value	Value is other than "E" or "D".
E10—Invalid Battery Status Value	Value is other than "N", "D" or "F".
E11—Over Range Indicator	Value is other than "N" or "O".
E12—Invalid Recorder Out Value	Value is not in the range 0 – 255.

APPENDIX B: HI-4416 OPERATING PROTOCOLS

Communication between the probe and the HI-4416 System Read Out is carried out via an ASCII data string. The probe requires a dual fiber optic cable and only responds when commanded. The HI-4416 continuously (at 7.6 Hz) sends the probe a command for data and waits for a response. If a key that requires information from the probe is pressed, the HI-4416 will send the appropriate command to the probe and wait for a response.

Communication Protocol

Data Type:	RS-232 Serial
Data Mode:	Asynchronous
Word Length:	7 bits
Parity:	Odd
Stop Bits:	1
Data Rate:	9600 baud

Probe Data Format

The data sent to the HI-4416 is formatted as **SDxx.xxuuugggobaaat**:

S	Start Character (":")
D	Type Indicator ("D" = Controller, "#" = Listen Only)
xx.xx	Probe Reading (4 digits plus floating decimal)
uuu	Units of Measure (see next page for valid unit indicators)
ggg	Recorder Output/Bar Graph (0 - 255)
o	Over Range Indicator ("N" = Normal, "O" = Over Range)
b	Battery Status ("N" = Normal, "W" = Warning, "F" = Fail)
aaa	X-,Y-,Z-Axis (respectively) enable flag ("E" = Enabled, "D" = Disabled)
t	Terminating Character (Return)

Valid Unit Types

The following table lists the unit codes that can be sent in the data string and the unit indicator displayed on the HI-4416. If an invalid unit code is sent to the HI-4416, no unit indicator is displayed and no error is generated.

An underscore indicates a space character, and is significant.

Unit Code From Probe	HI-4416 Unit Display
_V_	V/m
_V2	$[V/m]^2$
KV_	k[V/m]
KV2	$k[V/m]^2$
_A_	A/m
_A2	$[A/m]^2$
MA_	mA/m
MA2	$m[A/m]^2$
_W2	W/cm^2
MW2	mW/cm^2
UT_	µT
NT_	nT
_G_	G
MG_	mG

APPENDIX C: SERIES H-491198-36 BATTERY CHARGER

Note:

The HI-4416 System Readout contains a Nickel-Cadmium (NiCd) battery and use the Series 4991198-36 Battery Fast Charger.

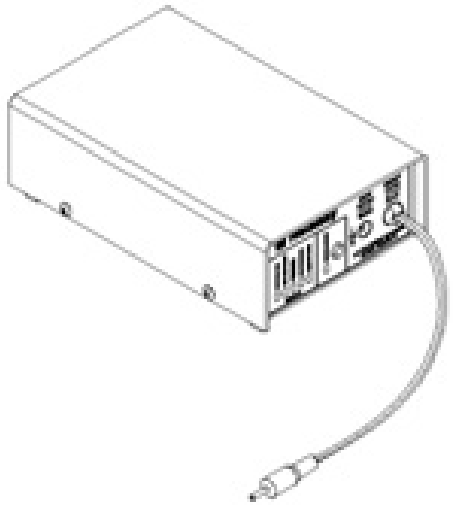
CAUTION

Before operating the Series 491198-36 NiCd Battery Fast Charger, see General Safety Considerations in the ETS-Lindgren Product Information Bulletin included with shipment.

CAUTION

Never attempt to recharge a non-rechargeable battery.

Introduction



The Series H-491198-36 Battery Charger is a dual power source battery charger. It charges 3.6 Volt 1400 mAH NiCd batteries and is powered by 120-240 VAC line power or 12.5 VDC. The H-491198-36 charger uses a -(dV)/(dT) negative delta V technique to determine when the battery is fully charged, which is typically one hour. With this technique, the charge state of the battery has no effect other than shortening the charge time.

Housed in a rugged enclosure, power enters the battery charger through a power entry module, which contains the fuses, or an optional cigarette lighter plug adapter. The front face of the battery charger displays LEDs that provide the operating status. The battery charger connects to the device being charged through a short cord terminated with a power jack.

An integrated circuit within the battery charger monitors the battery voltage and controls the charging functions according to the charge state of the battery.

Charging the Battery

For the steps to charge a battery, see page 15.

Charging Indicators

The following LEDs are located on the front of the battery charger:

- **POWER ON** (green)—Indicates the battery charger is connected to the AC power source.
- **NO BATTERY** (amber)—Indicates the battery charger does not detect a battery.
- **PENDING** (amber)—Indicates the battery charger detects a battery.

  Before fast charging can begin, the battery voltage must fall within predetermined acceptable limits. A pulse-trickle charge is provided to bring a depleted battery to a valid charge prior to fast charge.
- **CHARGING** (amber)—Indicates the voltage pre-qualification condition has been met, and fast charge has started.
- **COMPLETE** (green)—Indicates a fast charging peak voltage is detected. The Field Probe can remain connected to the battery charger indefinitely while in this maintenance mode.

Specifications

Power	
Main:	IEC filtered AC power input module ; 110-240 VAC, 500 mA max, 50-100 Hz
Alternate:	Automobile cigarette lighter to 2 mm power plug adapter cord, 12.5 Vdc, 100 mA
Fuses:	250 Volt, 1.0 Amp, Type T (5 mm x 20 mm)
Output	
Open Circuit Voltage:	15 Vdc
Fast Charge Pending Current:	60 mA
Fast Charge Current:	1400 mA
Pulsed Trickle Charge Current:	50 mA
Output Voltage (During Fast Charge):	3–6 Vdc
Battery	
NiCd Battery:	3.6 Volt 3 Cell NiCd Battery, 1400 mAH (rapid charge cells, 1.2 Volts/cell) ETS-Lindgren Part #491038
Environmental	
Operating Temperature:	10°C–40°C (50°F–104°F)
Humidity:	5% to 95% relative humidity, non-condensing

Maintenance Recommendations

- Operate the battery charger with care.
- There are no user serviceable parts inside the battery charger. Opening the battery charger housing may void your warranty.

Replacing the Fuse

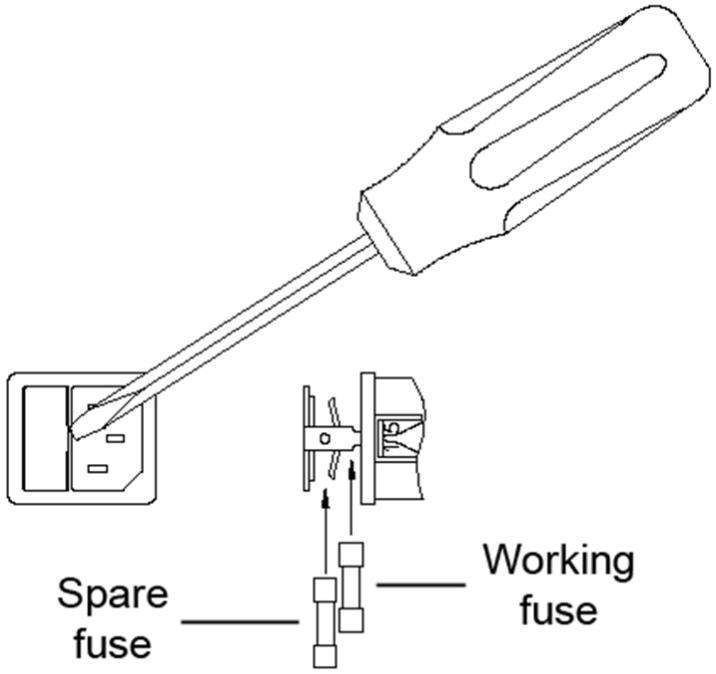
CAUTION

Disconnect the battery charger from power before replacing a fuse.

If the battery charger fails to operate, check for a blown fuse inside the power entry module. A blown fuse must be replaced with the same value and type of fuse, or an unsafe condition may result. Use only 250 Volt, 1.0 Amp, Type T (5 mm x 20 mm) fuses.

To replace a fuse:

1. Two fuses are located in the fuse drawer in the power input module. Use a screwdriver to open the drawer.
2. The fuse towards the outside of the drawer is the spare. Remove the spare fuse from the module.



1. Replace the blown fuse with the spare fuse.
2. Slide the fuse drawer back into the module. Make sure that the drawer snaps securely into its locked position.

APPENDIX D: TYPE 1737570 BATTERY CHARGER

Note:

The HI-4416 System Readout contains a nickel-cadmium (NiCd) battery, and uses the Type 1737570 Battery Charger.

CAUTION

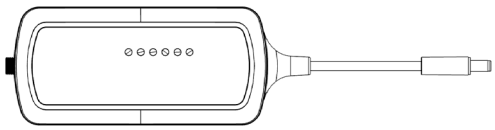
Before operating the Series 1737570 Battery Charger, see Safety Information on page 6.

CAUTION

Never attempt to recharge a non-rechargeable battery.

Introduction

The Series 1737570 Battery Charger charges 3.6 Volt 1400 mAH NiCd batteries and is powered by 1719573 a 90-240 VAC wall mount power supply. The 1719570 charger uses a - (dV)/(dT) negative delta V technique to determine when the battery is fully charged, which is typically one hour. With this technique, the charge state of the battery has no effect other than shortening the charge time.



Housed in a rugged enclosure, power enters the battery charger through a rear entry jack. The top face of the battery charger displays LEDs that provide the operating status. The battery charger connects to the device being charged through a short cord terminated with a power plug.

An integrated circuit within the battery charger monitors the battery voltage and controls the charging functions according to the charge state of the battery.

Charging the Battery

For the steps to charge a battery, see page 15..

Charging Indicators

The following LEDs are located on the top of the battery charger:

- **POWER ON** (green)—Indicates the battery charger is connected to the AC power source.
- **NO BATTERY** (amber)—Indicates the battery charger does not detect a battery.
- **PENDING** (amber)—Indicates the battery charger detects a battery.

  Before fast charging can begin, the battery voltage must fall within predetermined acceptable limits. A pulse-trickle charge is provided to bring a depleted battery to a valid charge prior to fast charge.
- **CHARGING** (amber)—Indicates the voltage pre-qualification condition has been met, and fast charge has started.
- **COMPLETE** (green)—Indicates a fast charging peak voltage is detected. The Field Probe can remain connected to the battery charger indefinitely while in this maintenance mode.

Specifications

Power	
Main:	12VDC 100mA
Output	
Open Circuit Voltage:	15 Vdc
Fast Charge Pending Current:	60 mA
Fast Charge Current:	1400 mA
Pulsed Trickle Charge Current:	50 mA
Output Voltage (During Fast Charge):	3–6 Vdc
Battery	
NiCd Battery:	3.6 Volt 3 Cell NiCd Battery, 1400 mAH (rapid charge cells, 1.2 Volts/cell) ETS-Lindgren Part #491038
Environmental	
Operating Temperature:	10°C–40°C (50°F–104°F)
Humidity:	5% to 95% relative humidity, non-condensing

Maintenance Recommendations

- Operate the battery charger with care.
- There are no user serviceable parts inside the battery charger. Opening the battery charger housing may void your warranty.

APPENDIX E: EC DECLARATION OF CONFORMITY

The EC Declaration of Conformity is the method by which ETS-Lindgren, Inc. declares that the equipment listed on this document complies with the EMC Directive and Low Voltage Directive.

Factory	Issued by
ETS-Lindgren, Inc. 1301 Arrow Point Drive, Cedar Park, TX, USA 78613	ETS-Lindgren, Inc. 1301 Arrow Point Drive, Cedar Park, TX, USA 78613

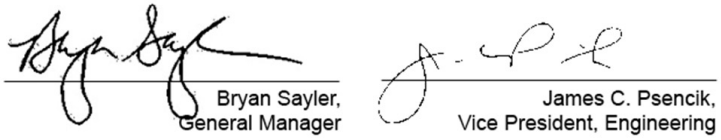
The products listed below are eligible to bear the CE mark:

- HI-4416 System Readout
- Series H-491198-36 NiCd Battery Fast Charger

Applicable Requirements

Standard	Criteria
EN 50082-1	• Electromagnetic compatibility • General immunity standard • Part 1: Domestic commercial and light-industrial environment
EN 55011	• CISPR 11 (1990) ed.2 • Threshold values and measuring methods for radio interference by HF equipment for industrial scientific and medical purposes
86/336/EEC	

Authorized Signatories



The authorizing signatures on the EC Declaration of Conformity document authorize ETS-Lindgren Inc. 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 confused with the CE mark will not be affixed to these products. ETS-Lindgren Inc. has ensured that appropriate documentation shall remain available on premises for inspection and validation purposes for a period of no less than 10 years.