H&L instruments
The Fiberoptic Communications Specialists

Model 570 Family of FiberopticTransceivers for FiberopticNetworks

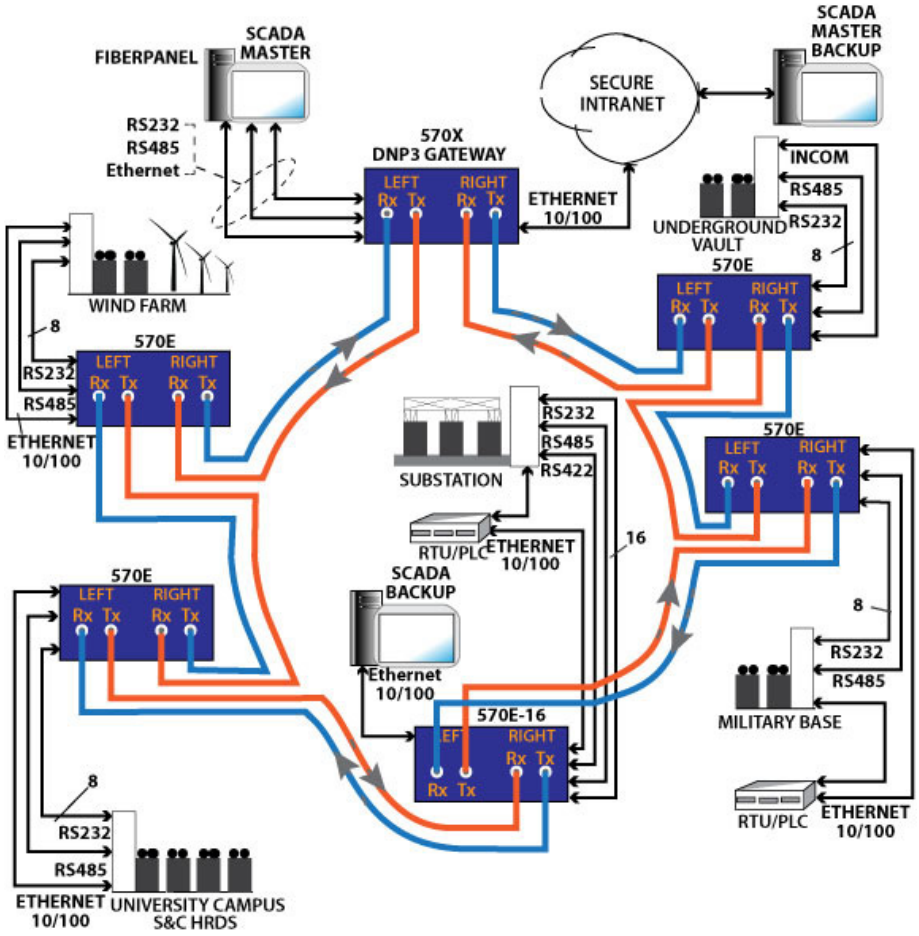
Features

- Fast 6 ms redundant/fault-tolerant self-healing ring or radial operation
- 8 EIA RS-232 compliant serial ports
- RS-485 interface
- 126 serial communication channels
- TCP/IP and UDP protocol support
- All byte protocols are supported including DNP and UCA
- Two Ethernet 10/100 ports
- Top-panel 8-character LED diagnostic display
- SEL Mirrored Bits™ support
- FiberPanel integrated network management software

Options

- Synchronous RS-422 interface
- 16 RS-232 serial ports
- INCOM interface
- SLIC and PBX interfaces
- IntelliTEAM support
- Audio Channels
- WiFi
- MultiTech universal socket support

Model 570 Products



Typical Fiberoptic Network Diagram Shows Flexibility And Versatility Of The Model 570 Family Of Products.

H&L Instruments, LLC P.O. Box 580, 34 Post Road North Hampton, NH 03862-0580
Tel 603-964-1818

9200-5105 11/01/07/2020

Features of the Model 570 Family of Products

The Model 570 is a high-performance family of fiberoptic transceivers that use advanced technology for fast and reliable network communication in the electric power distribution, water, waste water industries. The products' internal circuitry utilize solid state, surface mount technology, which is rated for temperature and other environmental extremes common to the industry.

All products in the Model 570 family offer high-speed serial communication to meet the needs of SCADA networks, secondary networks, distribution automation, corporate LAN, and substation networks and protection relay systems.

Summary of Features

- Support for large networks with up to 200 transceiver nodes
- Highly reliable fault-tolerant, self-healing, redundant ring and radial network configuration support
- 126 high-speed (115.2 bps) serial communication channels
- 8 serial ports with expansion option
- RS-485 interface
- Superior noise immunity and electrical isolation
- Point-to-point communication
- SEL Mirrored Bits™ support
- Two Ethernet 10/100 ports
- Intelligent LED status indicators
- 8-character alphanumeric LED display for diagnostics and port status
- Solid state alarm relay contacts
- Front panel maintenance port connectivity for use with FiberPanel network management software

Model 570 Master/Slave Transceiver

The Model 570 base product combines the capabilities of a transceiver and a controller in a single unit. SCADA master, slave, and point-to-point communication are easily implemented via simple configuration settings.

126 Serial Communication Channels

The 570 implements H&L Instruments latest fiberoptic network technology, which supports multiple remote terminal units (RTUs), intelligent electronic devices (IEDs), and programmable logic controllers (PLCs) on a single network. With 126 independent serial communication channels, you can group RTUs with common protocols, segregate different applications, allocate network bandwidth, and configure backup master stations.

The H&L Instruments fiberoptic network uses a concept of *virtual channels* to represent a pseudo-wire per channel, which is available to any transceiver on the fiber network. Any serial port at any transceiver can subscribe to any of the 126 serial channels, and serial ports can be configured as master, slave, DNP-Master, DNP-Slave, point-to-point, or Mirrored Bits™ point-to-point. Redundant backup masters are easily implemented by assigning serial ports on two or more transceivers as masters and subscribing them to the same virtual channel. You can configure the backup transceiver to automatically assume the master role if the master computer or transceiver fails, or you can configure the backup for manual switch over. At switch over, no cables need be moved and no reconfiguration of backup transceivers is required.

SEL Mirrored Bits and S&C Electric HRDS Supported

An important feature of the 570 is its built-in support of SEL's Mirrored Bits technology. Other solutions, such as serial servers, do not support the Mirrored Bits communication between relays such as the SEL 311, 321, and 351. However, the model 570 and the SEL relays are in use at numerous municipal sites, college campuses, industrial parks, and military installations as part of S&C Electric's high reliability distribution system (HRDS). The 570 transceiver support of Mirrored Bits communication, combined with its rapid 6 millisecond self-healing, make it an attractive, full-featured solution for HRDS. S&C Electric has documented and verified the performance of the Model 570 in numerous conference proceedings. See http://www.hlinstruments.com/articles.html.

Protocol Transparency

The 570 is protocol transparent. The transceiver immediately and efficiently transfers each byte received on a serial port to remote devices without using a timeout or special character recognition. Due to its very low overhead for encapsulation of serial data, the model 570 can handle any serial protocol without special software options, configuration, or OS tuning. The transceiver uses a proprietary multi-protocol labeling scheme (MPLS) for fast serial data transmission over Ethernet fiber links.

Fast Self-Healing Supports S&C Electric's HRDS Technology

The 570 heals in 6 milliseconds independent of the number of transceivers in the network. An S&C Electric HRDS implementation requires healing of a node failure or interruption in less than 8 ms (one-half a power cycle). In comparison, the data sheet for a typical managed Ethernet switch product with enhanced RSTP states that a network comprising only 20 nodes would require 100 ms to heal, which is 5 ms per node. In a 20 node network, the Ethernet switch product is unworkable for the HRDS application. The model 570 self-healing time of 6 ms, regardless of the number of transceiver nodes on the network, makes it the right solution for high reliability systems. To read about a high-reliability college campus installation employing the Model 570, see the S&C Electric DistribuTECH presentation *Automation System Provides Reliable Power to University of California, Santa Barbara* at http://www. hlinstruments.com/articles/scadaDA/UCSBDistributechFeb07.pdf.

Built-in 8-Character LED Transceiver Diagnostic/Status Display

A built-in 8-character LED display incorporates a three-button navigation scheme for local checking of transceiver configuration settings, options, and network status. The display provides information about the transceiver that includes its serial number, network address, serial port configurations, options installed, network loop or radial configuration, fiberoptic power levels, Ethernet connection status, and much more. In addition, discrete LED indicators provide intelligence for diagnosing and troubleshooting local communication issues or problems.

Maintenance Port Connectivity Via a DB9-F Connector

All model 570 transceivers include an RS-232 maintenance port on the front panel of the chassis. The maintenance port connects via a DB9-F connector to a Windows PC and uses H&L Instruments FiberPanel software to configure, manage, and report operating conditions for both the local and remote transceivers on the network. The HLFlash software uses the same connection from the PC COM port to the maintenance port for updating both local and remote transceiver firmware.

Ethernet Ports

The Model 570E includes two 10/100Mbps ports compliant with 802.3 Ethernet and 802.3u fast Ethernet standards. The Ethernet ports provide a TCP/IP interface for connecting FiberPanel to the local and remote transceivers. In the event of excessive TCP/IP traffic overloading the network, the Ethernet ports of both local and remote transceivers can be enabled or disabled via FiberPanel.

RS-485 Interface

The RS-485 feature is factory-installed and connected alongside the RS-232 interface on the serial-port 4 connector. Pre- and post-transmit delay-timers can be used in FiberPanel to set the amount of delay before and after the RS-485 data transmission out of the port.

RS-232 Serial Ports

Eight RS-232 compliant serial ports are standard with an option for16 factory-installed serial ports in a double-wide enclosure. All eight serial ports terminate in a DB9-F connector, and each port can be configured to operate at baud rates from 9600 bps to 115.2 kbps.

Solid State Alarm Relay

The 570 includes a Form 1A (normally open) solid state relay on serial port 4. The normally open contacts are closed when the transceiver is under power and there are no faults on the network. When either a transceiver or network alarm occurs, the contacts close to supply a wetting voltage and current to an external electromechanical interposer relay.

Summary of Standard 570 Features

The 570 family of products incorporates many important features and benefits. These include:

- Single fiberoptic transceiver product supports master, slave, point-to-point, peer-to-peer, and SEL Mirrored Bits communication
- 126 serial communication channels support multiple RTUs, IEDs, and PLCs on a network
- Two 802.3/802.3u compliant Ethernet ports
- S&C Electric's HRDS and SEL Mirrored Bits technologies are fully supported
- 8 RS-232 compliant serial ports
- RS-485 interface
- Fast, efficient serial data transmission due to proprietary H&L Instruments MPLS protocol
- Network self-healing in less 6 ms regardless of the number of transceiver nodes on the network
- Eight-character LED transceiver diagnostic/status display plus intelligent discrete LED indicators
- Solid state alarm relay
- FiberPanel and HLFlash software included for fiberoptic network management

Model 570 Specifications

High Speed Serial Ports: (8) RS-232 via four DB9-F connectors with configurable baud rates from 9600 bps to 115.2 kbps

Ethernet Ports: (2) 10/100 802.3 compliant

Maintenance Port: (1) RS-232 via a DB9-F connector

Alarm Contacts: Solid state Form 1A (N.O.) opto-isolated relay, up to 56Vdc wetting voltage at maximum 50 milliamperes wetting current.

Optical Output Class 1 (eye-safe) devices:

20 km transmission distance:
Laser -8 to -15 dBm @ 1310nm singlemode, Laser -8 to -15dBm @ 1550nm singlemode
80 km transmission distance:
Laser –5 to 0 dBm @ 1550nm singlemode
120 km transmission distance:
Laser –2 to +3 dBm @ 1550nm
singlemode

Optical Receiver Sensitivity: > -28dBm

Optical Budget: 20dB singlemode

Fiberoptic Connector Type: Dual LC (SFP)

Power Options: 9-36Vdc, 18-75Vdc, 125Vdc/120Vac 50/60 Hz, 250Vdc/230Vac 50/60 Hz

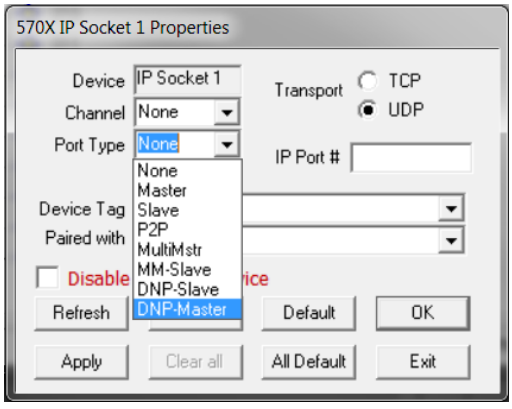
Environmental/Mechanical: Operating Temperature from –40C to +85C, 5% to 95% RH, net weight 3.25 lbs (1.47 kg)

FiberPanel Software Requirements: Microsoft Windows 10, Windows 8, Windows 7, Windows Vista, Windows XP, WIN2k, Windows NT4

Model 570 Options

The model 570 family offers numerous factory-installed options and customization choices. These are:

- Upgrade to16 high speed serial ports
- Synchronous RS-422 interface
- Eaton Cutler-Hammer MPCV INCOM interface
- Subscriber Line Interface (SLIC) for 4-wire, 2-wire, FXO, and FXS service support
- S&C Electric IntelliTEAM II support with 8-36Vdc power and short-case chassis
- Custom interface options via built-in Multitech universal socket



FiberPanel Port Configuraiton Panel

16 Serial Port Option

The model 570 transceiver can be ordered with the standard 8-serial port configuration or with the16-serial port option. The 16-serial port option uses a double-wide enclosure while maintaining the same height and depth dimensions as the standard 8-port transceiver.

Synchronous RS-422 Option

The RS-422 option provides two RS-422 ports via an Extended I/O DB25-F connector. The two ports can function as either RS-422 or be configured for digital orderwire. Each port can be assigned via FiberPanel to a virtual communication channel, which is shared by another RS-422 port on the network. The configuration creates an RS-422 point-to-point communication channel.

If the RS-422 option is configured for digital orderwire, a continuous radial daisy-chain is formed around the fiberoptic network. The digital orderwire operation employs Ardax Systems 705203 PCM encoding and can implement a party-line telephone system or a digital loop-switch (PLT DLS 2) station with features such as selective signaling, and either 2-wire or 4-wire VF operation.

INCOM Interface Option

The INCOM option is compatible with the Eaton Cutler-Hammer MPCV devices, which are in common use in underground secondary network systems. The INCOM 2-wire interface is connected via the DB25 Extended I/O connector on the top panel of the 570 enclosure. The H&L Instruments 570-EN implementation of INCOM provides a loop-protected fiberoptic MINT II interface. Because the H&L Instruments network is fiber based, your INCOM 2-wire network distance is limited only by the distance between the fiber nodes, which is miles instead of the 10,000 foot twisted pair copper-wire limit. The INCOM 33-bit data format is converted by the 570-EN INCOM option to a 10-byte ASCII-based data packet, which is transmitted between 570 transceivers using a virtual channel. At each transceiver, the data packets may be routed to a slave port on the virtual channel, where the 10-byte packets are converted back to the INCOM 33-bit communication format and sent out from the 570-EN Extended I/O copper connection onto the INCOM 2-wire interface. A physical RS-232 port is not required for this implementation.

Each Eaton MPCV INCOM device has a unique address, and the 33-bit data packet is converted to and from the 10-byte data packet format by the 570-EN Eaton MPCV INCOM option. The FiberPanel software sets the master and slave virtual channel port assignments, sets the INCOM modulation type, and sets baud rate.

Subscriber Line Interface (SLIC) Option

The factory-installed SLIC option enables 4-wire, 2-wire, FXO, and FXS services. The option adds audio channels between 570 nodes on the network and provides an isolated analog telephony interface. The subscriber line interface option is Bellcore compliant. Using FiberPanel, you can assign the SLIC port type, subscribe the port to a virtual channel, set the Tx direction, select 4-wire, 2-wire, FXO or FXS function, set Tx and Rx VF levels, and more. The SLIC option is used in the electric utility industry to extend a phone system to substations over fiber cable. This option is also used in the railroad industry to transmit radio tower communications over fiber.

IntelliTEAM™ Transceiver Chassis Option

The IntelliTEAM case option is designed to fit with S&C Electric's IntelliTEAM Controller product. With this option, the 570 is packaged using H&L Instruments short-case and a highly efficient 9-36 Vdc power supply. This transceiver case option provides both dimensional and power compatibility with S&C Electric's controller. The IntelliTEAM case option can be combined with the 8-serial port option.

Using FiberPanel, you easily configure the model 570/542 to function as either a model 542 or as a 570 transceiver. In addition, the 570/542 transceiver can implement hybrid networks where some portions of a network are 570-based, and some are 542-based.

Custom Interface Options

The 570 fiberoptic transceiver includes a Multitech Universal Socket for easy customization and interface expansion. If your application requires an interface that is not available as a standard option, the H&L Instruments Product Engineering group is available to understand your requirement and develop custom firmware and hardware for new or unique applications. Incorporation of the Multitech Universal Socket reduces development time and cost, and permits adaptation of additional Multitech interface options that are not already offered by H&L Instruments. Contact H&L Instruments to explore your application requirements, and visit the Multitech website (http://www.multitech.com) to learn about additional existing plugin modules for applications such as cellular GPS, WiFii or BlueTooth.

570X DNP3 Gateway Transceiver

The 570X DNP3 Gateway Transceiver is the newest product innovation in Fiberoptic communication from H&L Instruments. This transceiver embeds a Linux system-on-module (SOM) in the 570 product to deliver a powerful and flexible, all-in-one solution for SCADA network management and control. The model 570X transceiver supports direct serial connection via an IP socket without using a virtual channel. This eliminates the requirement for serial cables and terminals. DNP3 over TCP or UDP are directly supported, and intelligent DNP3 endpoints are supported by a built-in protocol translator. DNP3 streams are carried over the fiberoptic network via 126 independent serial channels. The streams are converted to and from serial DNP3 at each remote 570 transceiver on the network at serial port speeds up to 115.2 kilobaud.

The model 570X transceiver eliminates third-party LAN-to-multiport serial converter hardware, reduces cabling complexities, and improves overall system performance. Using the 570X DNP3 Gateway, your SCADA master or proxy server can use TCP or UDP transport protocols to connect via an Ethernet LAN directly to the 570X transceiver. The transceiver serves as a DNP3-over-IP endpoint for your SCADA master or proxy server by providing up to 16 TCP or UDP ports. Using FiberPanel, an IP port assignment creates an IP socket that bridges between a DNP3 LAN port and a virtual serial communication channel.

With the addition of the 570X DNP3 Gateway at the head-end of your fiber network, 570 transceivers configured as DNP3-Slaves can communicate serially over fiber. A packet transmission technique is used instead of an individual byte method to send DNP3 data via a virtual channel. The technique permits multiplexing multiple slave responses over a single virtual channel without corruption caused by byte-interleaving. This implementation technique improves performance and eliminates transmission errors caused by collisions. Proxy servers can send simultaneous requests to multiple slaves on the same virtual channel, while unsolicited responses from slave devices are transmitted reliably without retries. Legacy 570 transceivers are easily upgraded to support DNP3-Slave operation by a simple, no-cost firmware update available from H&L Instruments.

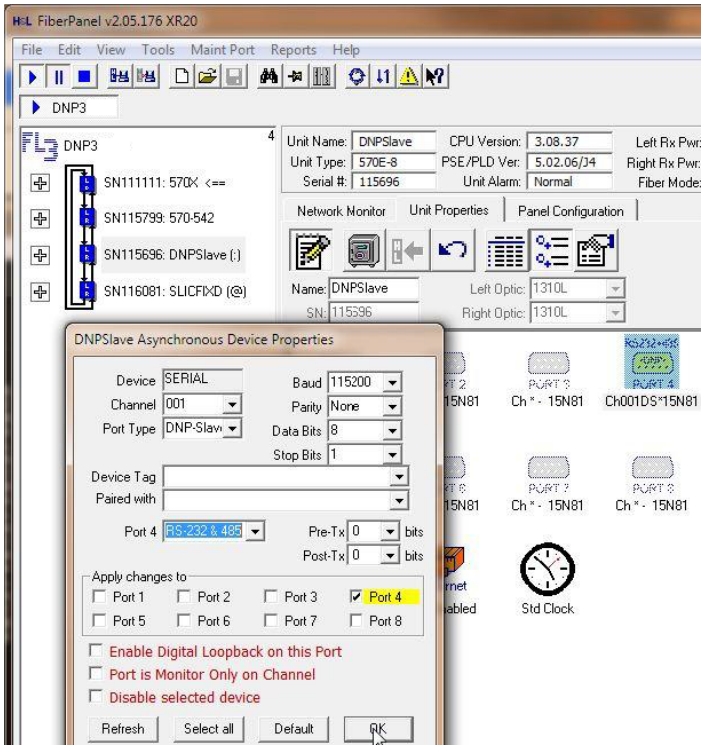
FiberPanel™ Network Management Software

H&L Instruments bundles the FiberPanel network management software with every system. FiberPanel is a Windows®, PC-based application that configures, manages, and monitors your fiberoptic network with an easy to use graphical user interface. The software interoperates with all transceivers in the 570 transceiver family, including the 570X DNP3 Gateway Transceiver. Connection to remote transceivers on the network are fully supported via TCP/IP and UDP connectivity. You can monitor and configure your network via your secure Intranet or by direct connection to the 570 or 570X transceiver at the energy management center.

FiberPanel continually displays graphical maps of the network and real-time status information, records network history and events in log files, and displays alarms if they occur. Unlike other fiber network solutions, FiberPanel detects faults and failures, identifies their location, and prompts with visible and audible alarms. The FiberPanel software is a robust and comprehensive network management solution that ensures proactive control of the fiberoptic network and streamlines network maintenance.

FiberPanel provides:

- Graphical maps of your fiber networks
- Local and remote transceiver identification and status
- Customization and assignment of unit names and tags
- Both local and remote transceiver configuration
- Allocation and assignment of each of the 126 serial communication channels
- Remote serial port configuration for communication with devices such as relay maintenance ports (which do not have SCADA addresses), for downloading event data, or uploading settings
- Continuous monitoring of the network and isolation of faults if they occur
- Remotely disables any port on the network
- System activity reports, diagnostic reports, reports showing unit voltage telemetry/ temperature and malfunctioning transceivers/ nodes



FiberPanel connects to the head-end 570X DNP3 Gateway Transceiver, or to a 570E transceiver, via either the front-panel RS-232 maintenance port or via one of the transceiver's Ethernet ports using the TCP/IP protocol. You can also connect via a standard TELCO-connected modem.

FiberPanel runs continuously to monitor the fiber network. The application can be collapsed to the system tray where it runs silently until a system warning or alarm posts a visible and audible alert.

FiberPanel is a Windows® PC-based application that runs on

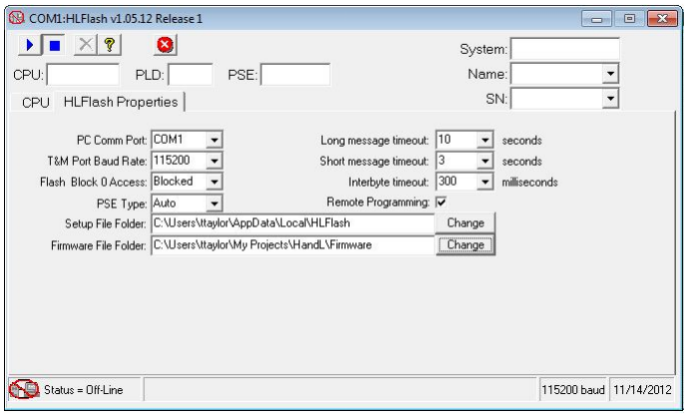
- Microsoft® Windows® 10
- Microsoft® Windows® 8
- Microsoft® Windows® 7
- Microsoft® Windows® XP
- Microsoft® Windows® 2000
- Microsoft® Windows NT®

HLFlash Firmware Update Software

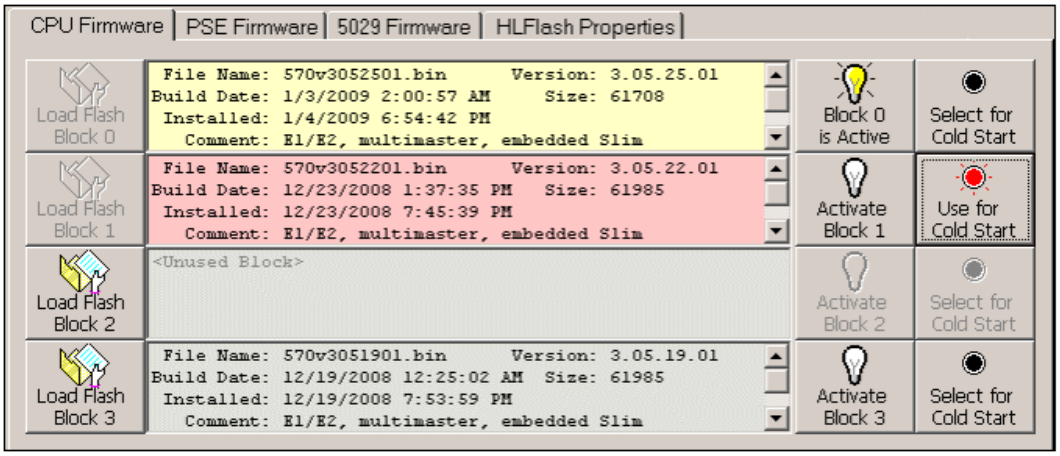
When new product features are added to the H&L Instruments family of products, you want to take advantage of them and have the added benefits without losing your investment in existing fiberoptic transceivers. HLFlash is included in the product family for just that reason. For example, when the model 570X DNP3 Gateway Transceiver was introduced in early 2014, customers wanted to use the DNP3 gateway with their existing 570 transceivers. Through a simple procedure, those customers downloaded new firmware from the H&L Instruments website and used HLFlash to update their existing transceivers. By updating the 570 firmware, you can immediately add the DNP3-Slave configuration option to your existing transceivers. After adding a single 570X transceiver at the network head-end, the entire fiberoptic network can be upgraded to support the DNP3 protocol via TCP or UDP.

Like other H&L Instruments products, HLFlash is designed to be fast, efficient, and easy to use. Upgrading transceivers takes only minutes to download the firmware and upload to the device. The upgrade of remote transceivers located in vaults or at substations is performed from the gateway transceiver at the head-end, so it is not necessary to send a crew to remote locations to perform these updates. In addition, transceivers remain in service during the upgrade, and previous versions of firmware are retained in the transceiver's non-volatile memory in the event the operator wants to restore to a previous operating version.

HLFlash provides a seamless utility for adding new features and maintaining your H&L Instruments transceivers with the most up-to-date firmware. This software utility is included with each H&L system at no additional charge. The HLFlash graphical user interface is straightforward to use. HLFlash sets communication parameters such as COM port and baud rate, and you can choose whether to update CPU, PLD, and PSE firmware all at once or whether to update each separately. The accompanying image shows a typical display of the HLFlash configuration options.



HLFlash includes a tab for each firmware category, which provides detailed information about version, build date, and installation date for the versions stored in the transceiver's flash memory blocks. Update options permit storing multiple firmware versions in separate memory blocks, and choosing or restoring which operating version to use. Another HLFlash option permits restoring the original factory-installed firmware versions. The image below shows an example of the HLFlash update panel for the different firmware categories.



HLFlash is another example of the exceptional support built-in and always included with the H&L Instruments family of products.

PO Box 580
34 Post Road
North Hampton,
New Hampshire 03862
USA
Tel: 603.964.1818

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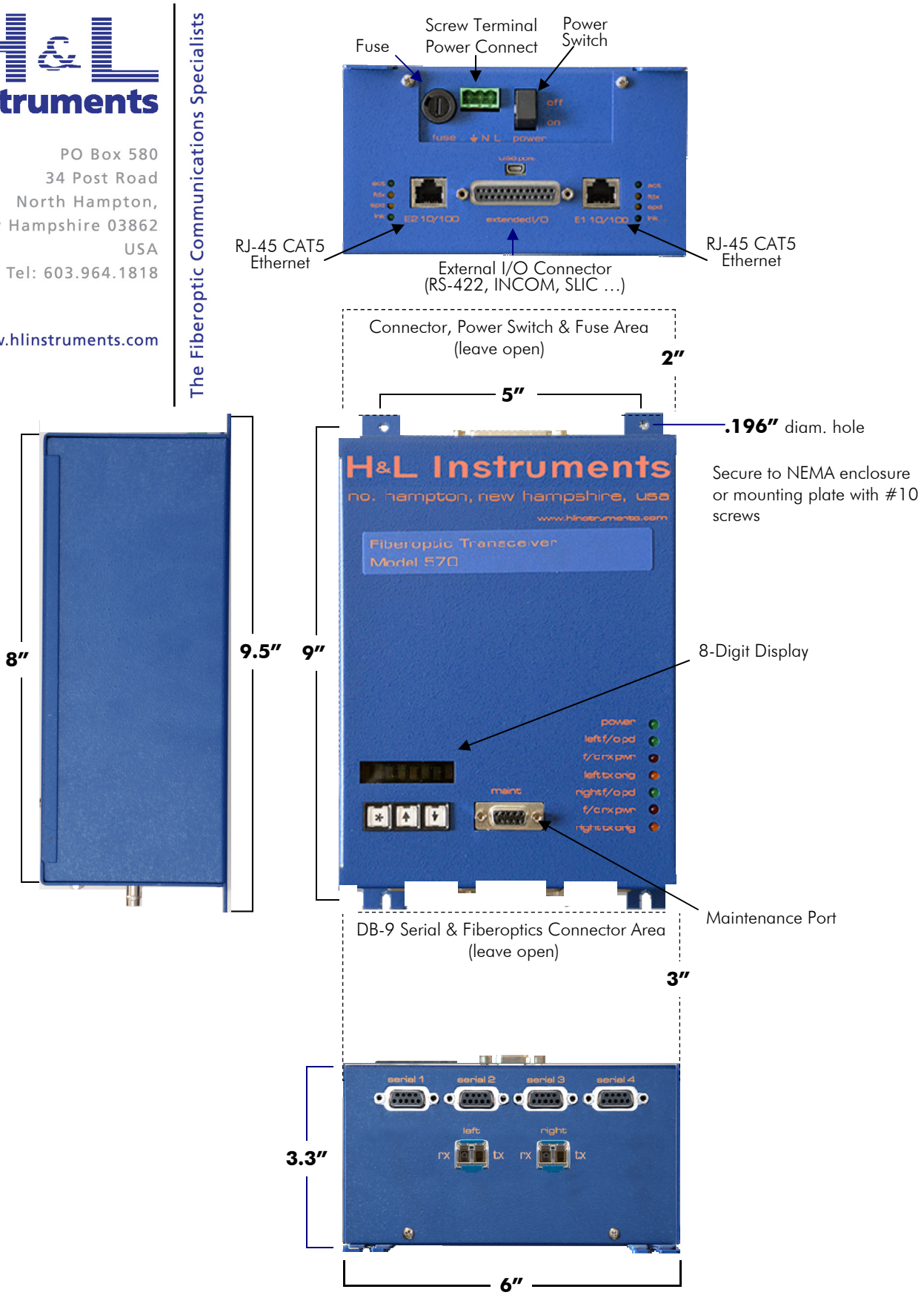
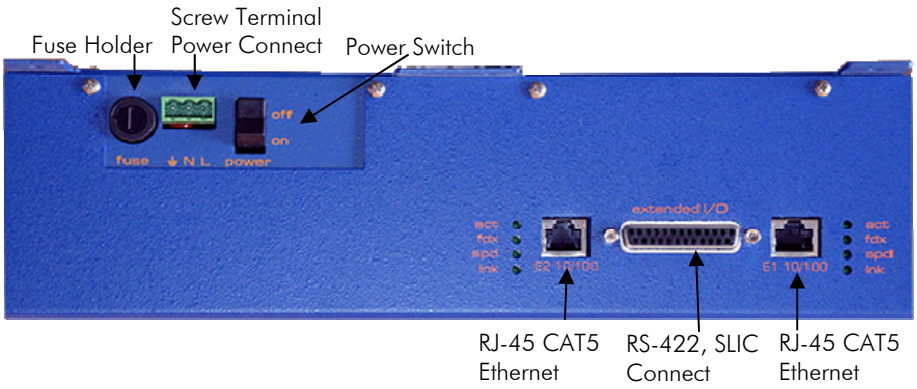
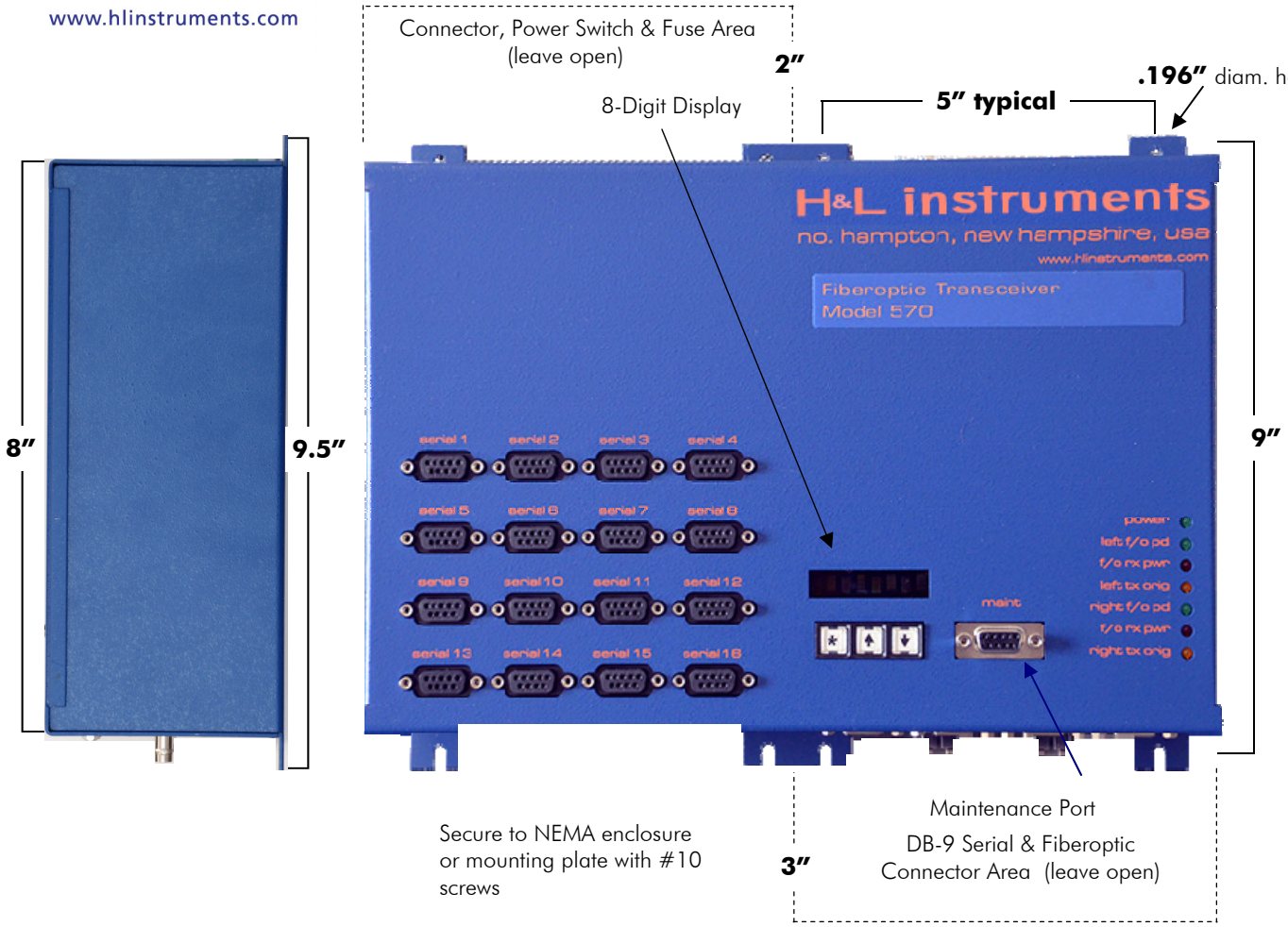


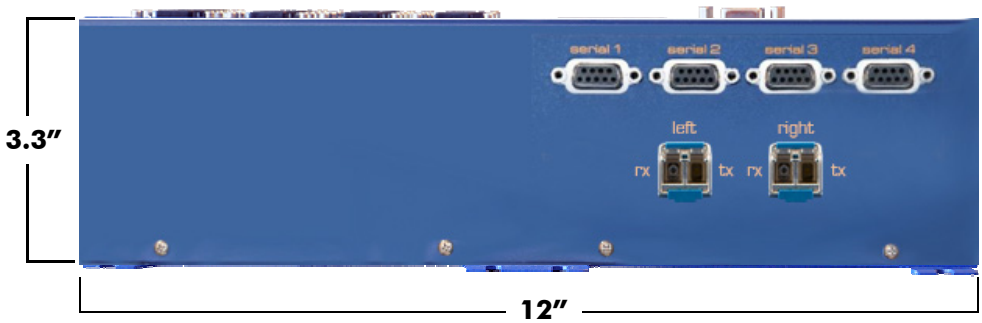
Model 570X/570E/570E-8 Fiberoptic Transceiver Dimensions—Standard Case

PO Box 580
34 Post Road
North Hampton,
New Hampshire 03862
USA
Tel: 603.964.1818

www.hlinstruments.com







Model 570E-16 Fiberoptic Transceiver Dimensions