

ELK-IP232

Ethernet to Serial Bridge

INSTALLATION AND CONFIGURATION MANUAL

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IMPORTANT NOTICE:

The ELK-IP232 Bridge does not support encryption nor secure network connections. If remote (Internet) connections are allowed to it, whatever serial device is connected will be vulnerable. It is recommended that the Bridge be used within a local network only, behind a router and/or firewall.

Features and Specifications

APPLICATION:

The ELK-IP232 is an Ethernet to RS-232 Serial Port Bridge. It may be used to connect any standard serial communications device such as a PC, an audio/video distribution system, or an Elk-M1 Control, to an Ethernet network. It allows bi-directional communication between the two. It operates as both a network server and a client, which means it is able to both initiate and accept network connections. Once a network connection is made, the remote networked device or computer is virtually connected to the serial device on the other side of the Bridge. Both the network device and the serial device can send and receive messages to and from each other. Up to twelve network devices may be connected simultaneously. Data sent from any one of them is bridged to the serial port. Data received on the serial side is transmitted to all connected network devices. The bridge can send and receive both UDP and TCP packets.

It is powered by an ELK-P1216 12 Volts DC, 1.5 Amp plug-in power supply/adaptor (included). A software setup utility for configuring the serial and network setup options can be installed from the included CD ROM or may be downloaded from www.elkproducts.com. The ELK-IP232 is factory defaulted to obtain a dynamic IP address from a DHCP server (i.e. Ethernet switch, cable modem, etc.), however it may also be setup with a static IP address.



Note: The ELK-IP232 is not replacing the ELK-M1XEP. Unlike the ELK-M1XEP the ELK-IP232 does not offer a built-in web server and cannot send email or alarm reporting.

FEATURES:

- Supports both UDP and TCP protocols
- Allows up to twelve (12) simultaneous TCP-IP network connections
- Up to twelve (12) "Rules" may be programmed to make outgoing connections.
- Outgoing connections may be initiated upon power up or when serial activity is detected. They may remain connected indefinitely or for a set time period.
- Selectable baud rate from 300 to 115200 baud
- Supports software handshaking (XON/XOFF) and hardware handshaking (RTS/CTS)
- Multiple Bridges can be used on the same network
- Can be updated in the field with new firmware using the Configuration Utility
- Integrated 802.3 compliant 10/100 Mbit network interface
- RS232, DB9M 9-pin serial port connection
- Connects to the M1 RS-232 Serial port (Port 0).
- RJ45 8-pin Network Jack
- 2.1mm barrel type power connector (center positive)
- LED Indicators for Power, Link, and Data

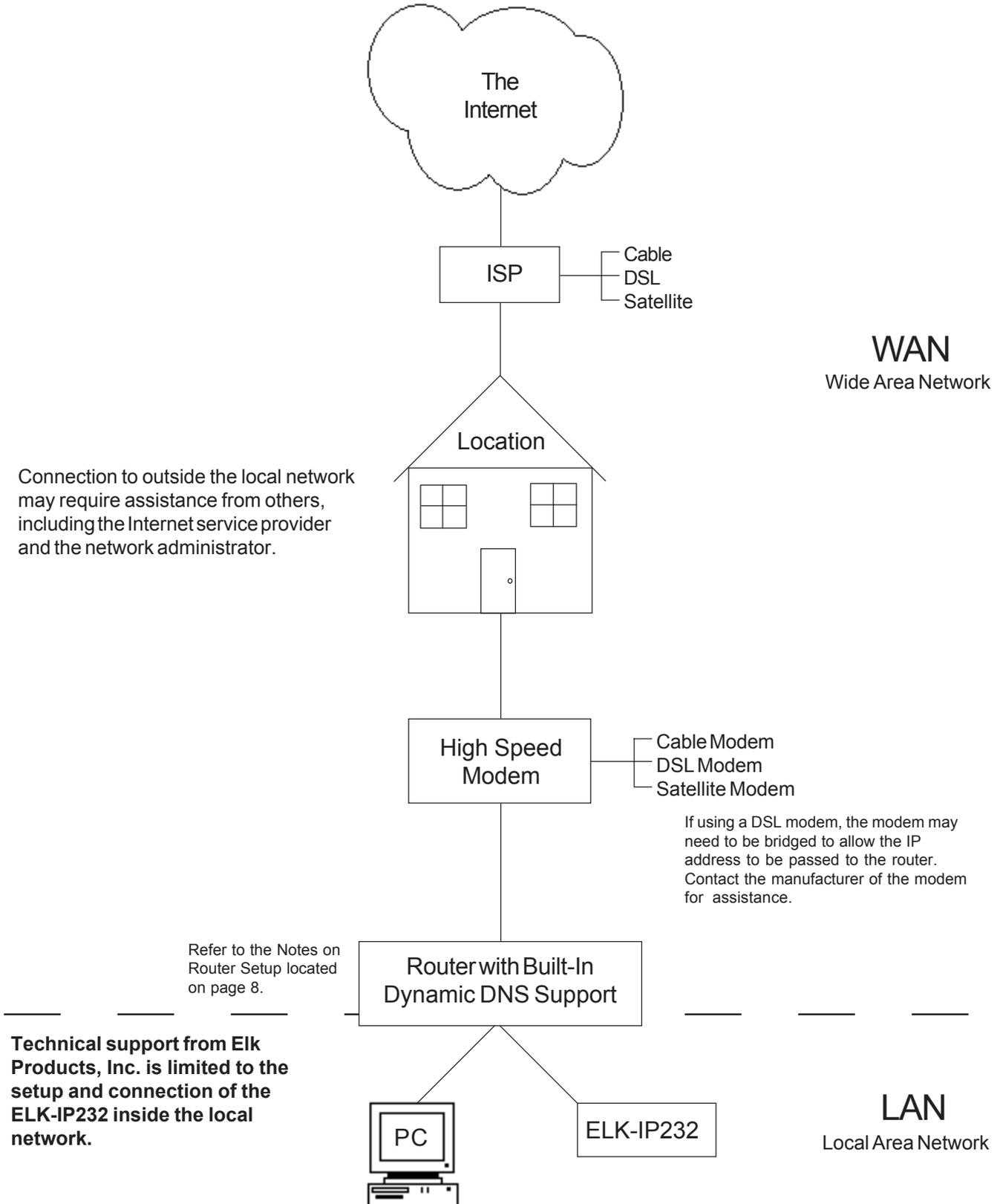
SPECIFICATIONS:

- Operating Voltage: 12 Volts D.C. from ELK-P1216 Plug-in Power Supply **
- Current Draw: approx. 135 mA
- Dimensions: 3.85" L x 1.7" W x 0.93" D

** Any required network equipment, i.e. Ethernet switch, router, cable modem, etc. including the plug-in power supply for the ELK-IP232, *MUST* be backed up with an adequately sized UPS (Uninterruptible Power Supply) in order for the equipment to continue operating during brief power outages.

Basics of Networking

The installer must have a basic understanding of Ethernet setup to install and configure the ELK-IP232. If you do not have this basic knowledge, please seek the assistance of a network professional.



Installation and Hookup

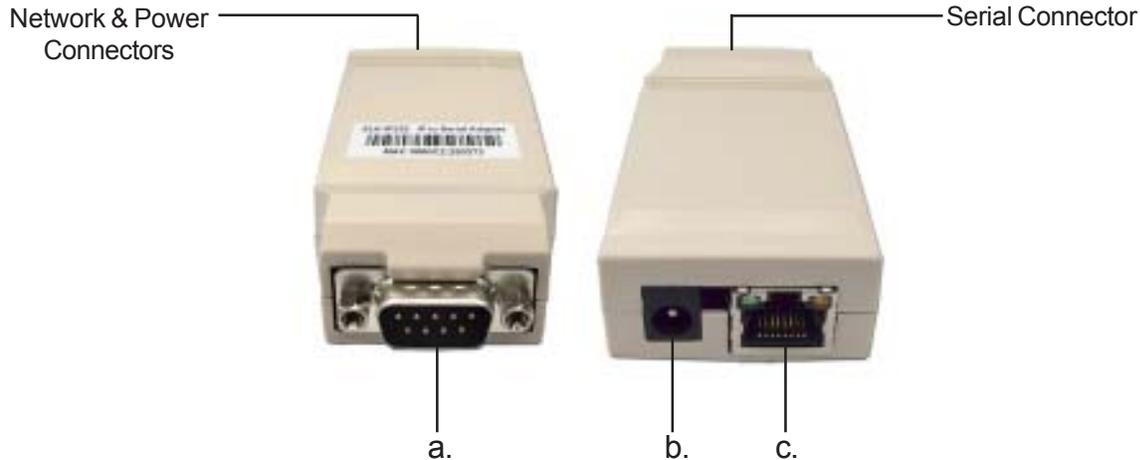
The following connections are required for the ELK-IP232 Bridge.

- a. Connect the DB9M 9-pin male connector on the IP232 to any standard RS232 serial port (ie. personal computer, ELK-M1 Control, audio/video distribution system) using the appropriate cable. For connection to a PC, use a null-modem cable. For connection to most other devices, use a standard straight-through cable, such as the W040A RS232 Ribbon Cable provided.
- b. The 2.1mm barrel type connector is used to connect an ELK-P1216 Plug-in Power Adapter (included). The ELK-IP232 operates from 12 Volts DC and draws approximately 135 mA. The center pin of the barrel connector is positive.



Any required network equipment, i.e. Ethernet switch, router, cable modem, etc. including the plug-in power supply for the ELK-IP232, must be backed up with an adequately sized UPS (Uninterruptible Power Supply) in order for the equipment to continue operating during brief power outages.

- c. The RJ45 8-pin network jack is used to connect the ELK-IP232 Bridge to a LAN/WAN Ethernet network switch or router. This requires a standard network 8-pin RJ45 terminated patch cable (not included).



1. Remove power from the ELK-IP232 and serial device before making any connections.
2. Connect the serial port cable from the ELK-IP232 to the serial device. Connect a network patch cable from the ELK-IP232 to the LAN (local area network) switch or router.
3. Connect the power cable from the P1216 plug-in power supply. Plug the P1216 into a 110V power outlet. The ELK-IP232 should power up and attempt to link up with the Ethernet network.
4. Run the Configuration Utility on any PC that is connected to the same network to set up the Bridge (See Configuration and Setup next).

About USB to RS232 serial adapters:

Not all USB to RS232 serial adapters are created equally. Some work well, others do not. Even those that seem to work may not support hardware handshaking if it is needed. Elk Products has tested some adapters and found that some work well in some applications while others do not. For this reason, Elk Products can make no guarantee that the ELK-IP232 will work with your USB to RS232 serial adapter. Elk Products stocks a USB to RS232 serial adapter (part number ELK-USB232) which has been tested and works with the ELK-IP232 in MOST applications. For more information, visit our website <http://www.elkproducts.com>. To order, call 800-797-9355

Configuration and Setup

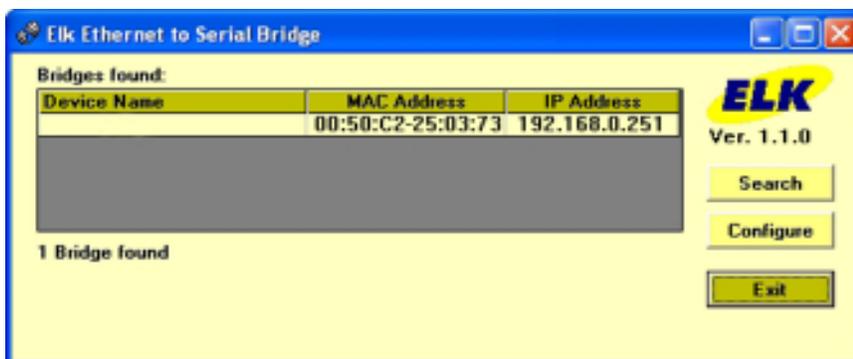
The ELK-IP232 software configuration utility is supplied on the enclosed CD. You can either run it directly from the CD or copy it to any folder on your PC and run it from there. Current updates of the utility can be downloaded from Elk's Website (www.elkproducts.com).

For the initial setup, the PC running the Configuration Utility and the ELK-IP232 must be on the same local network. The Utility can not "find" an ELK-IP232 outside of the local area network (refer to step 2 below).

The ELK-IP232 is shipped with DHCP enabled. If a DHCP server exists on your network the ELK-IP232 will obtain a "dynamic" IP address, gateway address, and subnet mask allowing it to work on the local network. If not, the factory programmed (default) IP address is 192.168.0.251. If desired, the ELK-IP232 can be configured with your choice of a "static" (non-changing) IP address. This can be done during the following setup.

Basic Network Setup

1. A router serving DHCP should not need any configuration to allow the ELK-IP232 to connect inside the local network. For communications outside the local network you will need to establish an open port on the router. Please refer to the "Notes on Router Setup" section on page 9 and the documentation for the router for more details.
2. Start the Configuration software. Click the 'Search' button. The utility will search for all ELK-IP232s connected to the local network. If the installation and hookup procedure has been completed correctly, the ELK-IP232 should be listed on this screen. Only one should be found, unless there are multiple units installed. If you are unable to find the ELK-IP232, please refer to the troubleshooting section of this manual on page 12.
 - a. Verify that the MAC address in the second column matches the MAC address of the ELK-IP232. The MAC address is located on the white barcode label located on the outside cover. (see figure below).
 - b. Note the IP address in the third column. This is the address used to connect/communicate with the ELK-IP232. Remember, if a DHCP server is on the network and the ELK-IP232 is still set for DHCP (factory default), this number will most likely be a "dynamic" address. However, in the absence or failure of a DHCP server, the ELK-IP232 will default to a static IP address of 192.168.0.251. To force the DHCP/IP address settings to known values, please refer to the troubleshooting section of this manual on page 13.
3. Highlight the ELK-IP232 to be configured and click the 'Configure' button.



4. Across the top of the screen is displayed the current hardware and software versions. If the ELK-IP232 received a dynamic IP address from a DHCP server, that address will be displayed immediately below the version numbers.
5. As previously discussed, the ELK-IP232 is factory defaulted to DHCP, which means that it expects to be assigned a “dynamic” IP address. Be aware that a “dynamic” IP address can periodically change for many reasons, including a power down/up cycle. You may optionally assign the ELK-IP232 a permanent “static” address, if permitted by the network. This will also involve setting values for subnet mask, and default gateway. These settings can be obtained from your network administrator or Internet service provider. On a local network, the subnet mask is typically 255.255.255.0 and the default gateway is the IP address of the router.



If the ELK-IP232 is programmed to obtain a dynamic IP address from a DHCP server, it will revert back to 192.168.0.251 if it fails to obtain a dynamic IP address.

6. The “Device Network Name” is useful for selecting between more than one ELK-IP232 on the same network. It has no other use and may be left blank if desired.
 7. Select the baud rate of the connected serial device in the “Serial port baud rate” selection box. Make sure the serial device is set to the same baud rate.
 8. If the connected serial device requires handshaking, select the handshaking method in the “Serial port handshaking” selection box. If it does not require handshaking, select “None” (default).
- Note that while baud rate and handshaking are selectable, the ELK-IP232 supports serial communications only with eight (8) data bits, no parity, and one (1) stop bit.**
9. For the ELK-IP232 to function as a TCP server, enter a valid TCP port number (1-65535) in the TCP port box. The factory default is 2401. This port is recommended because it is not widely used. You should stay away from well known and commonly used ports such as 21, 80, and 8080.
 10. The ELK-IP232 can receive UDP packets. Enter the port number (1-65535) to receive them on in the UDP port box. The factory default is 2501. This port is recommended because it is not widely used. You should stay away from well known and commonly used ports such as 21, 80, and 8080.

11. If the ELK-IP232 is to function as a client, create the “Outgoing Connection Rules” to define when connections are to occur and for how long. Click “Add New” to open the Outgoing Connection Wizard dialog. Select an existing rule and click “Modify” or “Remove” to edit or delete it. When creating or editing a rule, you must specify the remote IP address and port to connect to, the protocol (UDP or TCP), when to connect (upon power up or when incoming serial data is detected), and how long to stay connected (indefinitely or up 60 minutes in 1 second increments).
12. Click “Send Settings” to send the settings to the ELK-IP232. They will be stored in memory and the ELK-IP232 will reboot.

Other Buttons the Configuration Screen

Read Settings: Click to receive and display the settings currently stored in the ELK-IP232.

Load Settings: Load settings from a file on disk

Save Settings: Saves the current settings to a file on disk.

Update Firmware: Used to update the ELK-IP232 when updates are released by Elk Products. Please refer to “Updating the IP232 Firmware” located on page 12.

Restart Device: The ELK-IP232 automatically reboots after saving settings. However, this button provides a simple alternative way to restart the device should the need arise.

Notes on Flow Control (Software/Hardware Handshaking)

When serial devices transfer large amounts of streaming data, sometimes the sending device can get ahead of the receiving device. Without any method to slow or stop the sender, the receiver may lose or drop some of the data. Flow Control is a method for telling the sender to stop until receiver can catch up.

There are two types of flow control, hardware and software. Hardware flow control uses two or more wires between devices as signals to stop and resume sending. Before the receiver becomes overwhelmed it signals the sender using one of the lines. This requires the serial cable to be wired properly to include those lines. They are labeled RTS and CTS. Software flow control on the other hand, does not require extra wires in the cable. The receiver sends a special byte, called "XOFF" to tell the sender to stop. When ready, it sends an "XON" byte to resume. Of course, this means the serial data being transferred cannot contain XON or XOFF bytes in the data stream or else the device receiving those bytes will spuriously stop and resume sending.

You should use flow control only if you understand how it works and if the connected device requires it.

Notes on Router Setup

The table below lists the ports used by the ELK-IP232.

Port	Protocol	Use	Routing
2362	UDP	Discovery (Search)	Do not route outside local network
2401 (default)	TCP	Bridged connections	Not recommended to route outside local network
2501	UDP	Bridged connections	Not recommended to route outside local network

Port Forwarding

The TCP and UDP ports used for accepting connections should not be routed outside the local network for security reasons. However, if you understand the risks and have a need to route the ports outside, it is possible to do so. By default, the ports are 2401 and 2501, although this may be changed using the Configuration Utility. These ports must be opened through the router to allow access to the ELK-IP232 through the Internet. You must access the router's setup in order to open (port forward) these ports. The method for this differs from product to product. Some routers use a software utility to access their setup while others can be accessed via a web browser. Consult the router's documentation for complete instructions on this procedure. Because of the variety of routers available, **Elk Products Technical Support will be unable to assist you with this.**

Connecting to the ELK-IP232 over a Network

Any device or software program capable of initiating a network connection to a known IP address and port can connect to the ELK-IP232. As an example, the instructions below outline how to setup HyperTerminal to connect. HyperTerminal is a communications program that is typically installed on most Windows PCs. Windows Vista, however, does not include it. Some versions of Hilgraeve's HyperTerminal may be downloaded for free from a number of websites.

1. Connect the ELK-IP232 as described in "Installation and Hookup" on page 5. The ELK-IP232 and the PC should both be on the same local network (ie. plugged into the same router).
2. Start HyperTerminal. On most Windows PCs, click "Start" -> "All Programs" -> "Accessories" -> "Communications" -> "HyperTerminal". If you see two "HyperTerminals," select the one without the arrow beside it.
3. Enter a name such as "ELK-IP232 Network Connection" and click "OK."
4. In the "Connect Using" box, select "TCP/IP (Winsock)." Above that, in the "Host address" box, enter the IP address of the ELK-IP232 (as reported or configured by the Configuration Utility – See "Configuration and Setup on page 6). Enter the ELK-IP232's IP Port (default is 2401) in the "Port number" box. Click "OK."
5. In the lower-left corner of HyperTerminal's window, you should see the message "Connected" and a timer counting up. If not, review the previous steps to determine if any settings were entered incorrectly. HyperTerminal should now be connected to the ELK-IP232. If a serial device is already connected to the ELK-IP232's serial port, you should see its serial data out appear in HyperTerminal's window. Likewise, whatever you type in the HyperTerminal window will be sent to the serial device.

Bench-testing the ELK-IP232 using a single PC

To bench-test the ELK-IP232 using a single PC, the PC will need to be connected to a local network and be equipped with a serial port.



A null modem cable is required to connect the ELK-IP232 to the serial port of the computer. If you use a USB to RS232 serial adapter, see the important note on page 5.

1. Establish a network connection as described on page 9.
2. Start a second instance of HyperTerminal.
3. Enter a name such as “ELK-IP232 Serial Connection” and click “OK.”
4. In the “Connect Using” box, select the COM port connected to the ELK-IP232. Click “OK.”
5. Select the baud rate the ELK-IP232 was configured for. Also select 8 data bits, no parity, 1 stop bit and set “Flow control” to however the ELK-IP232 was configured. Click “OK.” Note: until you become familiar with flow control and know your serial port and cable supports it, flow control should be disabled both here and in the ELK-IP232.
6. In the lower-left corner of HyperTerminal’s window, you should see the message “Connected.” If not, review the previous steps to determine if any settings were entered incorrectly. HyperTerminal should now be connected to the serial port of the ELK-IP232.
7. What you type in either HyperTerminal window should appear in the other. If not, review the setup procedure again.

Setting up the ELK-IP232 for use with Russound Audio Distribution Systems and the ELK-TS07 Touchscreen

1. Connect the ELK-IP232 serial port to the Russound serial port using the ELK-W040A serial cable (included). Connect the ELK-IP232 to the local network using an ethernet patch cable. Connect the power supply. For details, see “Installation and Hookup” on page 5.
2. Use the ELK-IP232 Configuration Utility to configure the ELK-IP232 for 19200 baud and no flow control. Enter a Static IP address for the ELK-IP232, subnet mask, and default gateway. See “Configuration and Setup” on page 6. Send these settings to the ELK-IP232 by clicking “Send Settings.”
3. Close the Configuration Utility.

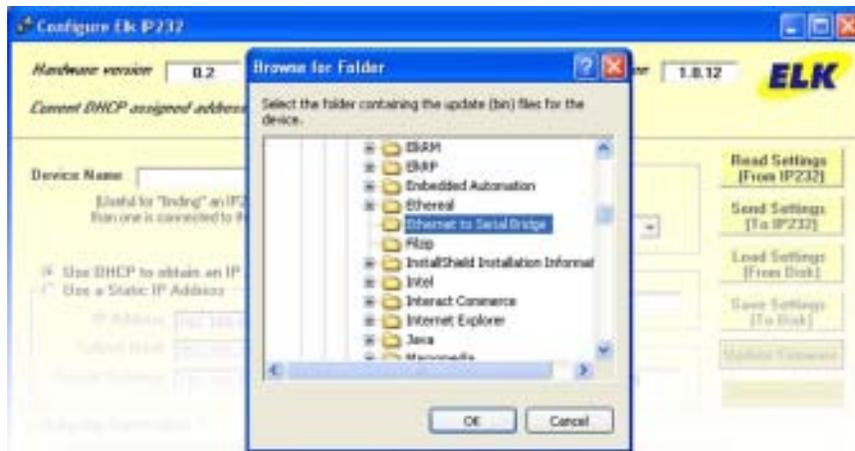
Please refer to the ElkRM Product Manual for software setup instructions.

Updating the ELK-IP232 Firmware

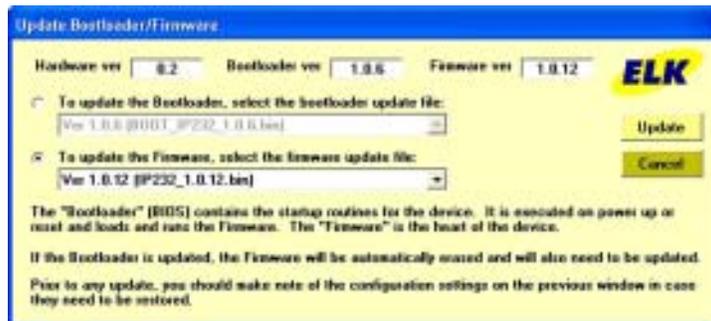
1. Obtain the latest ELK-IP232 firmware version by downloading it from the Elk website (<http://www.elkproducts.com>) and save it to any convenient location on your local disk drive.

 Some firmware updates may default certain settings in the ELK-IP232. It is good practice to use the Configuration Utility to connect to the ELK-IP232 and note its settings before updating its firmware.

2. Start the ELK-IP232 Configuration Utility and search for the ELK-IP232 you want to update.
3. Select the ELK-IP232 (if more than one is found) and click the “Configure” button.
4. Make note of the current settings or save the settings to disk, then click the “Update Firmware” button.
5. Select the folder where you saved the update files.



6. The utility will list all bootloader and firmware update files found in the folder you selected. Select the latest update file from the Firmware list and click the “Update” button. The update may take a few minutes. Wait for the process to complete. **DO NOT INTERRUPT OR POWER DOWN THE UNIT DURING THIS PROCESS.**



7. When the screen indicates that the update is complete, wait for the device to reboot. **DO NOT INTERRUPT OR POWER DOWN THE UNIT UNTIL THIS PROCESS IS COMPLETE!**

 The ELK-IP232 bootloader may also need to be updated periodically. The bootloader update is done using the steps outlined above. The bootloader update files are downloaded from Elk’s website along with a corresponding firmware update. Update the bootloader first and then update the firmware.

Troubleshooting Guide

<p>The ELK-IP232 Configuration Utility cannot “Find” the ELK-IP232</p>	<p>Verify that the ELK-IP232 is powered up and connected to the network.</p> <p>Wait 1 minute after powering up the ELK-IP232 for the initialization process to complete before the utility can “Find” the ELK-IP232.</p> <p>Verify all cable connections and check to see if the green LED on the RJ45 connector is blinking, indicating network traffic.</p> <p>Use the “DEFAULT” jumper to force the DHCP/IP address setting to known values. For instructions on this process, see page 13.</p> <p>If the network router is not serving IP addresses, or the ELK-IP232 is set to a static address, use a crossover cable to connect directly from the PC to the ELK-IP232. This will require making some changes to the network setup of the PC to allow the PC and the ELK-IP232 to be in the same subnet.</p> <p>If there is a router/firewall between the PC and the ELK-IP232, or if the PC is running a firewall, it must not block port 2362.</p>
<p>Cannot establish a local network connection</p>	<p>Using the ELK-IP232 Configuration Utility, click “Search” to verify the ELK-IP232 is working and to determine its IP address and IP Port to use. If it is not found, refer to the troubleshooting steps above.</p> <p>Click “Configure” and note the IP address and IP port number. Verify the remote connecting device is connecting to that IP address and port number. If there is a router/firewall between the remote device and the ELK-IP232, it must not block the IP port.</p>
<p>Cannot establish an Internet or WAN connection</p>	<p>Follow the same troubleshooting steps for a local network connection above.</p> <p>Verify router settings- the router must port forward the configured IP port.</p> <p>If using a DDNS service, any changes to the “dynamic” name may require time to propagate through the entire internet system. Depending on the service, this could take 1 or 2 days.</p>
<p>Cannot connect to the serial port</p>	<p>Use the ELK-IP232 configuration utility to note the baud rate and flow control settings. Verify the connected serial device is configured accordingly.</p> <p>The connected serial device must be set for 8 data bits, no parity, and 1 stop bit. If flow control is enabled, try temporarily disabling it on both ends.</p> <p>If hardware flow control is required, verify the cable is wired for it. Test the cable by connecting it between two other devices and verifying they communicate correctly.</p> <p>Verify whether a standard straight-through or null modem cable is required. To connect the ELK-IP232 to a PC, a null modem cable is required. To connect the ELK-IP232 to an Elk-M1, to most audio/video systems, and to most other similar devices, a standard straight-through cable is needed.</p>

Forcing the DHCP/IP Address Settings to Known Values:

The ELK-IP232 supports an easy method for forcing it from a static IP address to DHCP mode or vice versa. This is accomplished with the use of the "DEFAULT" Jumper located near the DB9M connector.

1. Power down the ELK-IP232. Carefully remove the plastic housing. Place a shorting jumper across the two pins of the "DEFAULT" Jumper. Power the ELK-IP232 back up.
2. After a few seconds, the green LED will blink and repeat in a "coded" fashion, indicating either DHCP or STATIC modes. If set for DHCP mode there will be 1 quick blink. If set for STATIC mode there will be 2 quick blinks. When the ELK-IP232 is forced to STATIC mode its address will become 192.168.0.251.
3. If the blink indicates the wrong mode, power the unit down and back up to force it to the opposite setting.
4. When the green LED indicates that the ELK-IP232 is at the desired setting, remove the shorting jumper and allow the ELK-IP232 to continue booting up. This may take a few seconds.

WARRANTY AND LIMITATIONS

This product is warranted by Elk Products, Inc. ("Manufacturer") against defects in material and workmanship for a period of two (2) years from the date of manufacture. If product is found to be defective during the first 180 days, manufacturer may allow an over the counter exchange, subject to inspection and approval by one of it's representatives. Manufacturer's obligations under this Limited Warranty shall be limited to repairing or replacing, at its option, free of charge, during this warranty period, any product returned to Manufacturer freight prepaid. After the expiration of the warranty period, product will be repaired based on a fixed charge per device.

OBLIGATION

Manufacturer shall have no obligation under the stated Warranties or otherwise if (1) the Product has been damaged by negligence, accident, mishandling, lightning or flood, or other Acts of God, (2) the Product has not been operated in accordance with its operating instructions, (3) the Product has been altered or repaired by anyone outside Manufacturer's authorized facilities (4) adaptations or accessories have been made or attached to the Product which, in Manufacturer's sole determination, have adversely affected its performance, safety or reliability.

OBTAINING WARRANTY

If a Product should malfunction or fail during it's warranty period, contact Manufacturer or one of its authorized distributors for a Return Authorization (RA) number. Returned Products must include a complete description of the problem, along with the RA number clearly marked on outside of the package. Manufacturer will not be responsible for any unnecessary items included with any returned Product.

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Glossary of Terms

Router- A communications device between networks that determines the best path between them for optimal performance. Routers are used in complex networks such as enterprise-wide networks and the Internet.

Port - The identifier used by Internet transport protocols to distinguish among multiple simultaneous connections to a single destination host.

MAC Address - unique number assigned by the manufacturer to identify each network interface on all network devices. The first few digits of a MAC address typically identify the manufacturer. The remaining digits uniquely identify the specific interface on that individual device. Also known as a “physical” address. (Example: 00409D:256EC0)

LAN (Local Area Network) - a computer network covering a local area, like a home, office or small group of buildings such as a college.

WAN (Wide Area Network) - a computer network covering a wide geographical area, involving vast array of computers. The best example of a WAN is the Internet.

ISP (Internet Service Provider) - provides access to the Internet for others via some connectivity service(s). This might be in the form of dial up services, web hosting services or the combination of both.

DSL (Digital subscriber line) - type of broadband connection that brings information to homes and businesses over ordinary copper telephone lines.

URL (Uniform Resource Locator) - A string of characters that represents the location or address of a resource on the Internet and how that resource should be accessed. World Wide Web pages are assigned a unique URL. Also known as an Internet address or web address. (Example: <http://www.elkproducts.com/>)

TCP/IP (Transmission Control Protocol/ Internet Protocol) - the basic communication protocol of the Internet. This is a standard for routing and data transfer around the world. The Internet Protocol is a connectionless protocol which provides packet routing. TCP is connection-oriented and provides reliable communication and multiplexing.

IP Address (Internet Protocol Address) - the address of a computer attached to a TCP/IP network. Every client and server station must have a unique IP address. (Example: 192.168.0.1)

“Static” IP Address - a permanent or non-changing IP address that is assigned to a node in a TCP/IP network. Static IP addresses are generally used for servers, routers, etc.

“Dynamic” IP Address - an IP address that is automatically assigned to a client station in a TCP/IP network, typically by a DHCP server.

DHCP (Dynamic Host Configuration Protocol) - a standard method for assigning IP addresses automatically to the devices on a TCP/IP network. As a new device connects, the DHCP server assigns an IP address from a list of available addresses. The device retains this IP address for the duration of the session. Once the device disconnects the IP address becomes available for use again.

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