BROADCAST tools ®
PROBLEM SOLVED

Installation and Operation Manual

GPI-16+ G2 Net
Sixteen Input General Purpose Interface with USB/Ethernet

Firmware version: 1.01 or greater
Manual Revised 10/25/2023
If you need a firmware upgrade, contact Broadcast Tools®

NOTE: We recommend the use of Chrome, Firefox or Safari as your browser.

Visit **www.broadcasttools.com** for important product update information.

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e-mail: support@broadcasttools.com   **voice:** 360.854.9559   **fax:** 866.783.1742

INTRODUCTION

Thank you for your purchase of a Broadcast Tools® GPI-16 + G2 NET, sixteen input general purpose interface (referred to as the GPI-16 + G2 NET throughout this manual). We're confident that this product will give you many years of dependable service. This manual is intended to give you all the information needed to install and operate the Broadcast Tools® GPI-16 + G2 NET.

Broadcast Tools, Inc., is unable to support NON-Broadcast Tools hardware/software and/or NON-Broadcast Tools computer hardware/software problems. If you experience these problems, please research your hardware/software instruction manuals or contact the manufacturers technical support department.

SAFETY INFORMATION

Only qualified personnel should install Broadcast Tools® products. Incorrect or inappropriate use and/or installation could result in a hazardous condition.

WHO TO CONTACT FOR HELP

If you have any questions regarding your product or you need assistance, please contact your distributor from whom you purchased this equipment. If you would like more information about BROADCAST TOOLS® products, you may reach us at:

Broadcast Tools, Inc.
131 State Street
Sedro-Woolley, WA 98284-1503 USA
Voice: 360.854.9559
Fax: 866.783.1742

Internet Home Page: www.broadcasttools.com
E-mail:support@broadcasttools.com

THANK YOU FOR CHOOSING
BROADCAST TOOLS® BRAND PRODUCTS!

Broadcast Tools is a Veteran Owned Business

Designed, Assembled and Supported in WA State, USA

CAUTION!

Broadcast Tools® Products, as with any electronic device, can fail without warning. Do not use this product in applications where a life threatening condition could result due to failure.

NOTE:

This manual should be read thoroughly before installation and operation.

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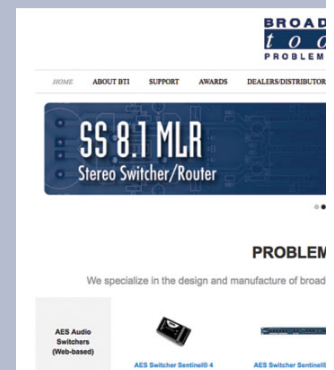
Product Overview

The GPI-16 + G2 NET interfaces 16 general purpose logic inputs to users USB port or Ethernet network. The user may select from two pre-programmed serial formats; the "PIP" GPI trigger format which is used on most Broadcast Tools audio switchers, or the legacy AT-1616 format. Additional features include; Plug-in euroblock screw terminals; 17 LED indicators for power and each input status.

Features/Benefits
• Four user selectable unit ID's: 0 (default), 1,2, and 3.
• Four user selectable baud rates: 9600 (default), 4800, 19200, and 38400.
• PIP or AT1616 data format.
• USB and Ethernet (TCP or UDP) interface for connection to PC.
• LED indicators for all 16 inputs, power.
• GPI connections are on removable euro-block screw terminal connector to simplify
  wiring and service, mating plugs are supplied.
• Fully RFI proofed.
• Surge protected internal power supply, 9 VDC universal desktop power adapter
  with IEC inlet included.
• Up to three units may be mounted on the optional RA-1 rack shelf, using four
  supplied Velcro feet. Desktop and wall mounting are also possible.

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OVERVIEW
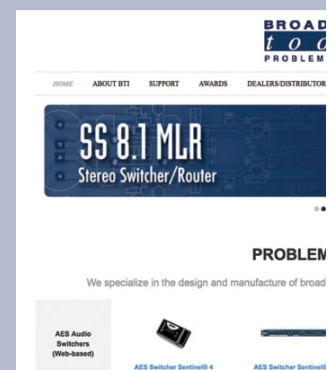
Inspection

Please examine your GPI-16 + G2 NET carefully for any damage that may have been sustained during shipping. If any is noted, please notify the shipper immediately and retain the packaging for inspection by the shipper. The package contains the GPI-16 + G2 NET, a USB type A/B cable, a 7-foot BLUE straight-through CAT 5 cable, a 7-foot GRAY crossover CAT 5 cable, and a 9.0 VDC universal desktop power supply with IEC AC inlet. Manuals may be downloaded from our web site.

Installation

Power
Connect the 2.1mm barrel type center positive power connector into the unit and the 9 VDC power supply with IEC inlet into a 120 Vac 50-60 Hz power source.
NOTE: Never use any type of power supply other than the specified/supplied power supply. Check the power jack on the back of the unit to determine which power supply is required.

UPS Standby Power System
We recommend that you connect your GPI-16 + G2 NET to a UPS standby power system. A UPS, like the BE600M1 from APC helps to minimize the risk to the GPI-16 + G2 NET and provides power during a power outage.

Input connections
The sixteen general purpose inputs may be activated by either pulling the input to ground or releasing the input to a high state. A valid input must be 15ms in duration or greater. External sources can be contact closures, open collectors or 5-to-24-volt logic level sources. The impedance of each input is 22K ohms.

Input connections are via a single 18-position plug-in euroblock screw terminal that is labeled "Inputs" 1 thru 16 with ground connections on terminals 17 and 18. To install, remove the plug from the header, strip 1/8" of insulation from the wire. Insert the wire into the desired terminal and tighten the set screw. When finished, reinsert the plug into the header.

USB Port
This type B USB port is used to connect the GPI-16 + G2 NET to a computer's USB port using the included USB A/B cable. When you first plug the GPI-16 + G2 NET into your PC, it should automatically install the correct FTDI USB Serial "Virtual COM port" driver which will allow you to access the GPI-16 + G2 NET on a COM port. If the GPI is being used for Ethernet operation this should remain disconnected, and the drivers are not necessary.

NOTE: If the GPI-16 + G2 NET's FTDI USB Serial "Virtual COM port" drivers do not automatically install they may be downloaded by clicking on the "setup executable" link found here: http://www.ftdichip.com/Drivers/VCP.htm

CAUTION!

Installation of the GPI-16 + G2 NET in high RF environments should be performed with care. It is recommended that all cables connected to the GPI-16 + G2 NET be looped through ferrite cores to suppress RF. Surge protection with RF filtering is also suggested for the power supply. For lightning protection devices, check out www.polyphaser.com and www.itwlinx.com.

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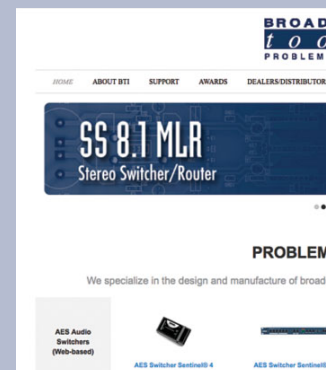
INSTALLATION

LAN/NET Ethernet Port
This 10/100 Ethernet port is used to connect the GPI-16 + G2 NET to a computer for configuration and control via telnet/TCP socket connections. See the "Ethernet" and "Programming" sections of this manual for more information.

Resetting Ethernet Settings to Defaults
Defaults may be restored by depressing the recessed front panel Def. (Defaults) push button, applying power to the unit, and holding down the push button for five seconds after power up.

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INSTALLATION
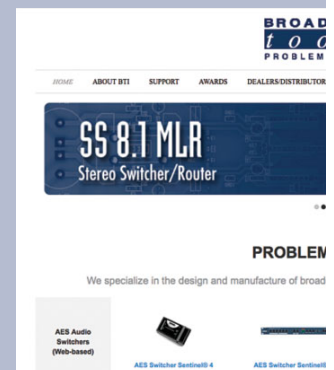
Configuration

The GPI-16 + G2 NET can be connected to your computer by one of two interfaces; USB, or RS-232 serial. Below are connection and configuration instructions for each interface.

NOTE: Step by step "COM" port HyperTerminal setup instructions are available on-line at www.broadcasttools.com under "Downloads".

Configuration via the USB Port.

1. Connect the supplied USB A/B cable from the "USB" jack on the GPI-16 + G2 NET to an available USB port on your PC. When you first plug the GPI-16 + G2 NET into your PC, it should automatically install the correct FTDI USB Serial "Virtual COM port" driver which will allow you to access the GPI-16 + G2 NET on a COM port. Once you've installed the driver, the GPI-16 + G2 NET will be listed as "USB Serial Port" in device manager.

NOTE: If the GPI-16 + G2 NET's FTDI USB Serial "Virtual COM port" drivers do not automatically install they may be downloaded by clicking on the "setup exe-cutable" link found here: http://www.ftdichip.com/Drivers/VCP.htm

2. Start a serial terminal application like Tera Term, PuTTY or HyperTerminal con-figured for the USB COM port the GPI-16 + G2 NET is assigned to at 9600 baud,8,N, 1, flow control to NONE, Emulation set to ANSI, and local character echo enabled.

3. Connect the supplied 9 VDC power supply connector in to the GPI-16 + G2 NET's power jack labeled "9-12VDC", then plug the power supply in to a power source. Verify that the green "PWR/HB" led is blinking. The unit information should be displayed on your monitor if things are setup and/or working properly.

Configuration via the Ethernet Port.
See the "Ethernet Setup and Operation" section of this manual for instructions.

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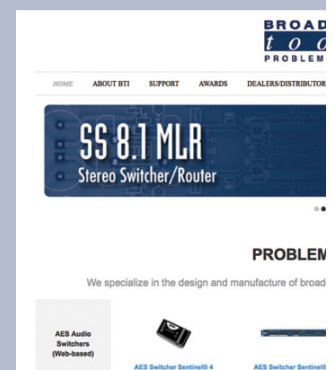
CONFIGURATION

Configuration Commands
If you plan on using the default settings disregard this page of the manual. If you require changes to the default settings, follow the steps below to configure the GPI-16 + G2 NET from your computer.

To modify the default configuration, execute the following command:

*uSUxyz   where "u" is the current unit ID, "x" is configuration item 1, "y" is configuration item 2, and "z" is configuration item 3. No carriage return or line feed is required. NOT case sensitive.

Command example: *0SU030 would set the unit ID to zero, baud rate to 38400 and serial format to PIP.

To query the current configuration, execute the following command:

*ASU? No carriage return or line feed is required. NOT case sensitive.

Command example: *ASU?

Response example: *ASU? where the A would respond to the current configured Unit ID, then the three current configuration characters xyz.

Configuration Item 1 (unit ID = x): Enter the desired unit ID number:
0 =   (NON-Polling). (default)
1 =   Polling
2 =   Polling
3 =   Polling

Configuration Item 2 (baud rate = y): Enter the desired baud rate number:
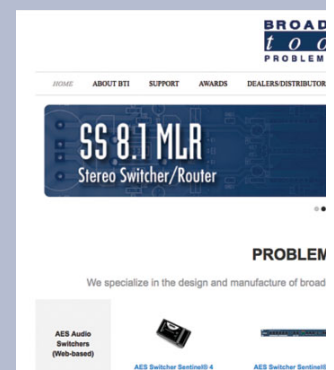0 = 9600 (default)
1 = 19200
2 = 4800
3 = 38400

Configuration Item 3 (serial format mode = z): Enter the desired serial format number:
0 = PIP format (default)
1 = AT1616 format

NOTE: To reset these settings to factory defaults. Pull input 16 low TWO to THREE times within 5 seconds during repowering the unit. The PWR/HB will flash rapidly indicating the defaults have been loaded.

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Command Formats
The GPI-16 + G2 NET may be configured to use either the PIP or AT1616 (input only) serial format. The PIP serial format (default) is listed below and requires the use of the unit ID to request input status (polling) or with a unit ID of zero (non-polling) the GPI-16 + G2 NET will send a serial status string each time an input changes state.

When the unit is restarted (power-up), unit information is issued in either mode.

PIP Information Retrieval Commands
PIP serial format: The (*) asterisk is the beginning of string, next is the unit ID (0-3), then the command. No carriage return or line feed is required. Commands are NOT case sensitive.

*uSPii - Request status for a single input 01 thru 16 where ii is the status input number.
Command Example: Request status of input 01: *0SP01
No carriage return or line feed required. Commands are NOT case sensitive.

Response Example: S0P,01,x <cr><lf> where x is 0 if the corresponding input is high, 1 otherwise.

*uSPA - Request status for ALL inputs
Command Example: *0SPA
No carriage return or line feed required. Commands are NOT case sensitive.

Response Examples: S0P,A,x,x,x,x,x,x,x,x,x,x,x,x,x,x,x,x<cr><lf>
S0P,A,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0<cr><lf> When input 01 is pulled low.
S0P,A,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0<cr><lf> When input 01 is released back high.

Input 01 is the first character, while input 16 is the last character. x is 0 if the corresponding input is high, 1 otherwise.

*uU - Send Unit Information :<product_name>_ver_<n.nn><cr><lf>
Command example: *0U
No carriage return or line feed required. Commands are NOT case sensitive.

Response Example: GPI-16_Plus_ver_1.01<cr><lf>

AT1616 Information Retrieval Commands
In AT1616 format mode the GPI-16 + G2 NET sends a response string in AT1616 format each time an input changes state. In AT1616 format mode the unit ID is setting is ignored and the baud rate is fixed at 9600.
Each string consists of a dash (-) followed by 8 bytes. The first 4 bytes are ASCII hex representations of the 16 outputs which are not included in the GPI-16 + G2 NET, but are issued as all zeros.

The last four bytes represent the 16 inputs in ASCII hex format with four bytes: 16,15,14,13   12,11,10,9   8,7,6,5   4,3,2,1. If inputs 1,4,7,8,9,10,14,16 are all ON (pulled to ground), then these four bytes would appear as: A3C9. In the above example, the complete string would be -0000A3C9

Additional response examples:

Response string example for input 1 pulled low: -00000001
Response string example for input 1 returning high: -00000000

Response string example for input 2 pulled low: -00000002
Response string example for input 2 returning high: -00000000

Response string example for input 3 pulled low: -00000004
Response string example for input 3 returning high: -00000000

Response string example for input 4 pulled low: -00000008
Response string example for input 4 returning high: -00000000

Response string example for input 16 pulled low: -00008000
Response string example for input 16 returning high: -00000000

Response string example for inputs 1 thru 8 pulled low: -00000055
Response string example for input 1 thru 8 returning high: -00000000

Response string example for inputs 9 thru 16 pulled low: -00005500
Response string example for input 9 thru 16 returning high: -00000000
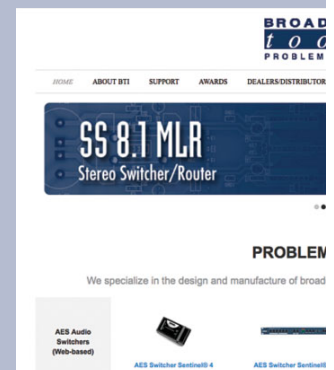
OPERATION

Ethernet Setup and Operation

Ethernet "Quick Start" Guide
CAUTION! NEVER DOWNLOAD FIRMWARE UPDATES OR CHANGES TO THE WEB SERVER UNLESS INSTRUCTED TO DO SO BY BROADCAST TOOLS®. DOING SO DELETES ALL SOFTWARE AND VOIDS ALL WARRANTIES FROM BROADCAST TOOLS, INC.

CAUTION! If you are not familiar with Ethernet enabled equipment, it may be useful to contact your IT department, network administrator or network consultant for assistance. Assigning an IP address already in use by another device may cause problems with your network!

Instructions for changing the IP address of the computer that will be used for the configuration of this product are given here. Note that these instructions are specifically for computers with the Windows 10 operating system but will also work with Windows 7. For setup using other operating systems, refer to the appropriate OS user's manual.

Step 1: Open the control panel by clicking on the Start Menu, click on Settings, then click on Network & Internet.
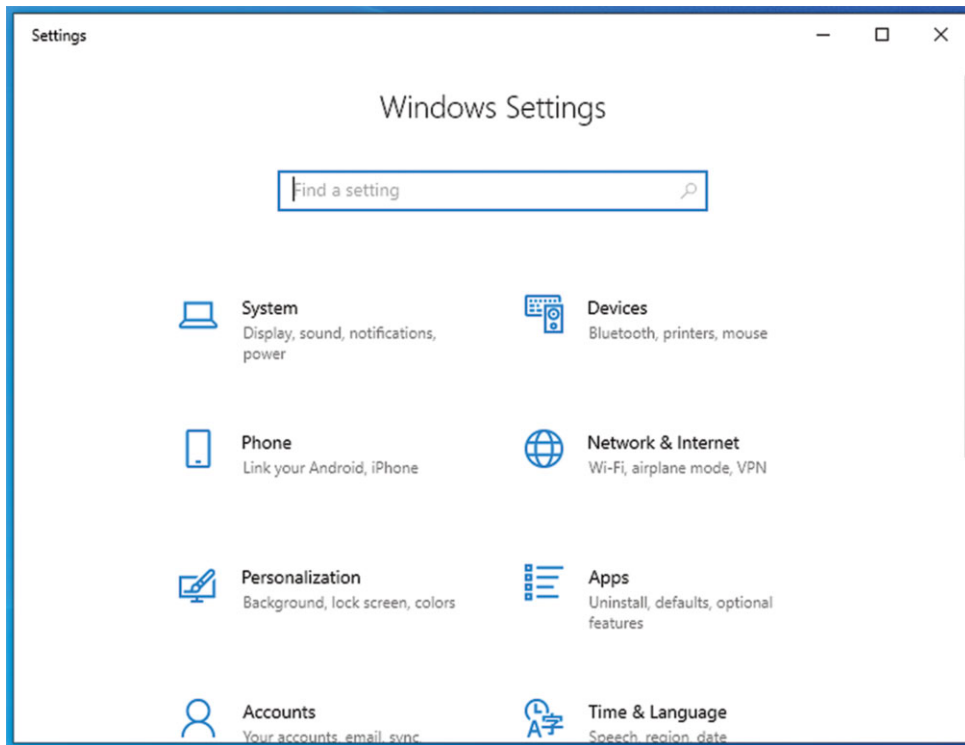
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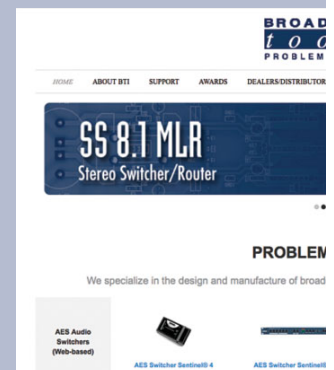
Step 2: Under Advanced Network Settings click Change adapter settings. The Network Connections windows will pop up, as shown below.
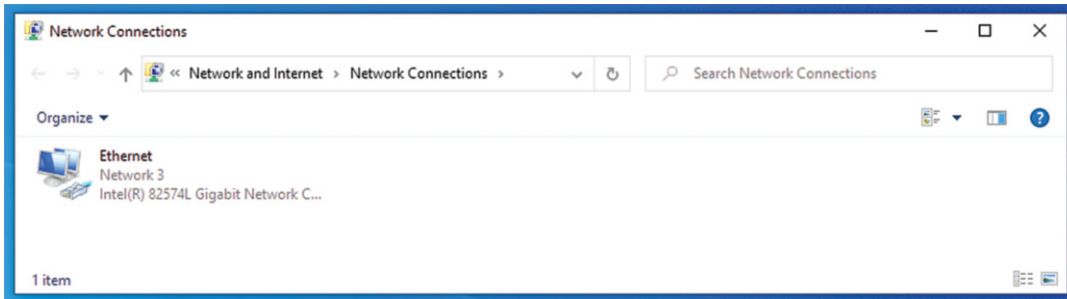
Step 3: Right click on the icon labeled Local Area Connection or Ethernet. A menu will appear. Select the option at the bottom of the menu labeled Properties. The Ethernet Properties window will appear.
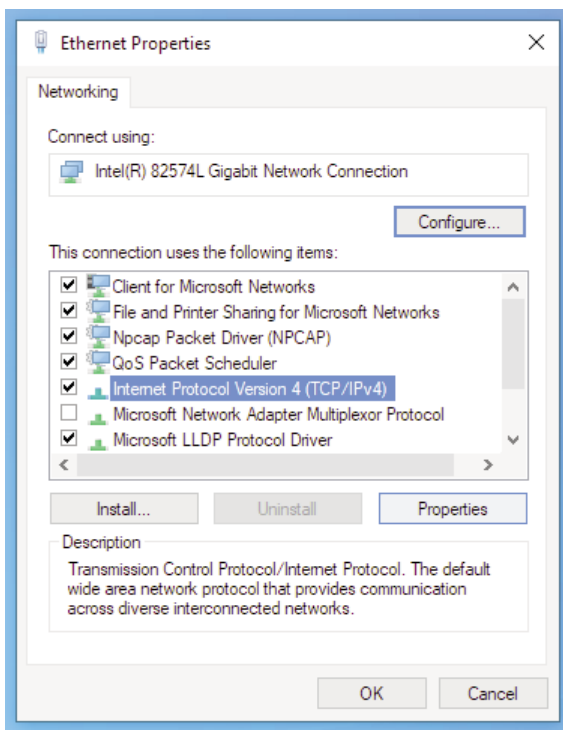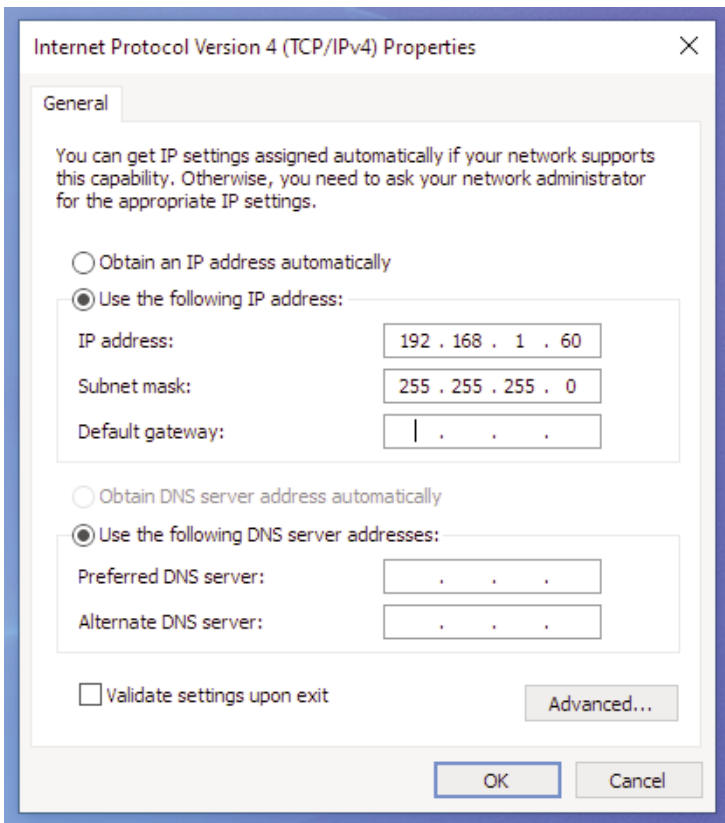

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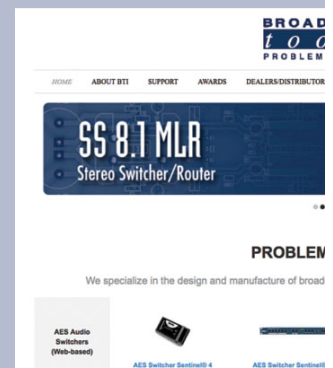
Step 4: On the Local Area Connection Properties page, double click on Internet Protocol (TCP/IPv4) to display properties.

Step 5: Before making any changes to the network settings, write down the current settings (or screen capture the page and print) so that they can be restored once the unit is configured. Next, select the radio button labeled "Use the following IP address" and type in the IP address 192.168.1.60. Type in the subnet mask of 255.255.255.0. Leave the default gateway field blank. Click OK to apply the new settings.

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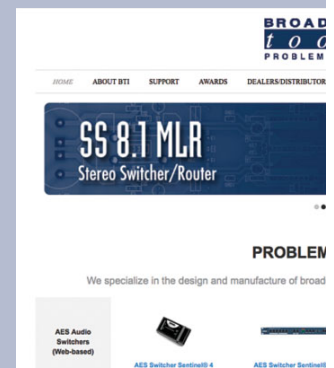
Connecting via the Ethernet "LAN/NET" port:

1. Connect the supplied GRAY colored XOVER cable between the PC's Ethernet port and the products "LAN/NET" network RJ45 jack.

2. Connect the included power supply to the GPI-16+G2 NET. Verify that the green PWR LED is lit and the green "LINK" LED to the left of the "LAN/NET" Network RJ45 jack is illuminated.

3. Open terminal application PuTTY configured for a Telnet connection type to host 192.168.1.55 port 8001.
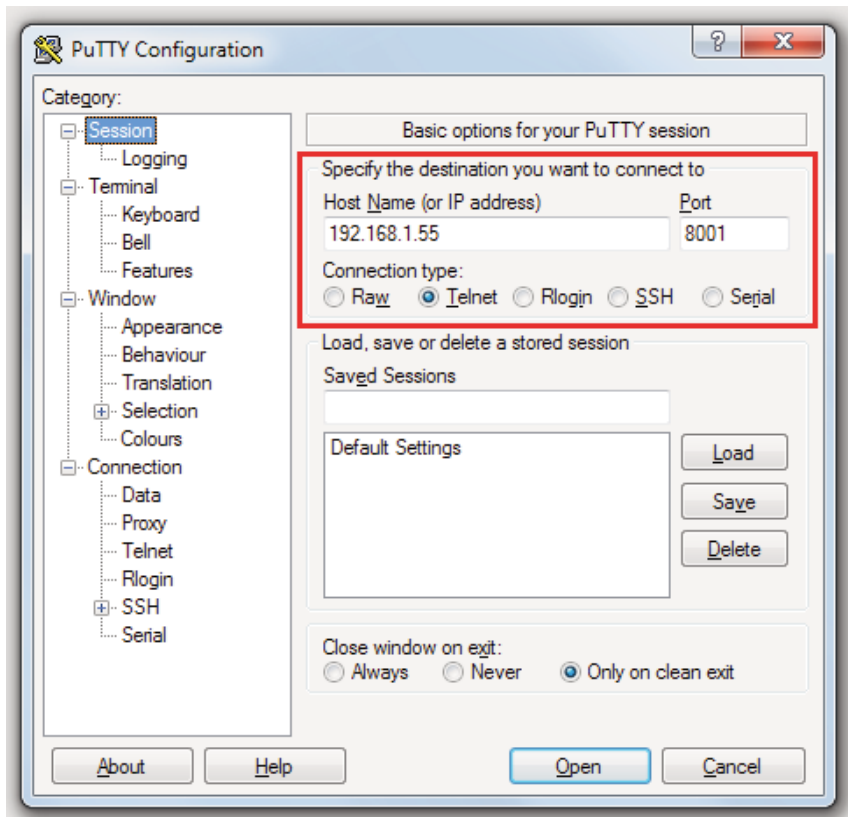
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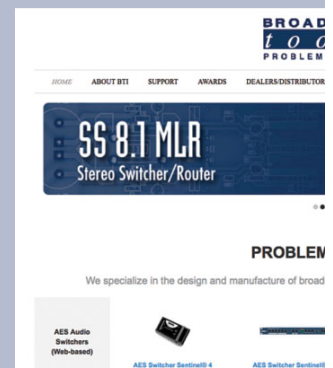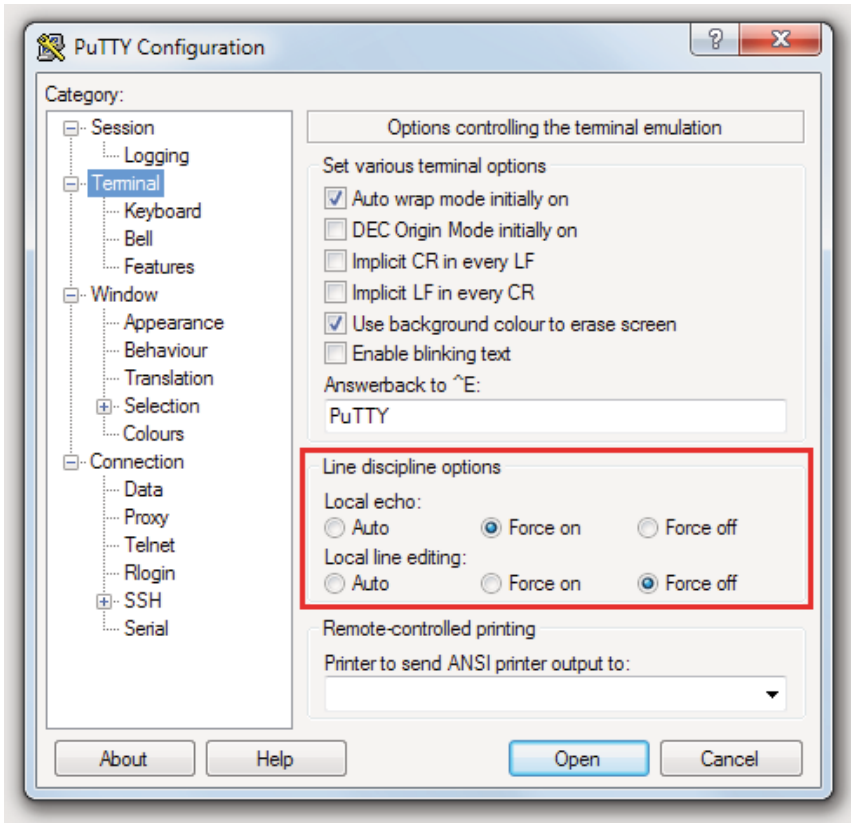
4. In PuTTY configuration > Terminal > Line discipline options set Local echo "Force on" and Local line editing to "Force off".

5. Click okay to connect to the GPI-16+G2 NET and type "p" into the terminal window and press return to enter programming mode. See: "Programming Steps" section of this manual.

Changing network settings on the Ethernet "LAN/NET" port:
NOTE: We recommend the use of Chrome, Firefox, or Safari for as your browser.

1. Connect the supplied GRAY colored XOVER cable between the PC's Ethernet port and the products "LAN/NET" network RJ45 jack.

2. Connect the included power supply to the GPI-16+G2 NET. Verify that the green PWR LED is lit and the green "LINK" LED to the left of the "LAN/NET" Network RJ45 jack is illuminated.

3. Open a web browser window and navigate to the GPI-16 + G2 NET's default IP address: http://192.168.1.55

4. When prompted to login, use the default login and password. Login: admin Password: 1234

5. To change the network settings, choose "Local IP Config" from the side bar:

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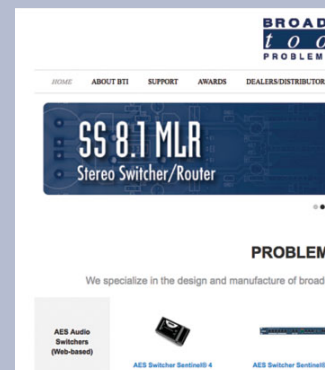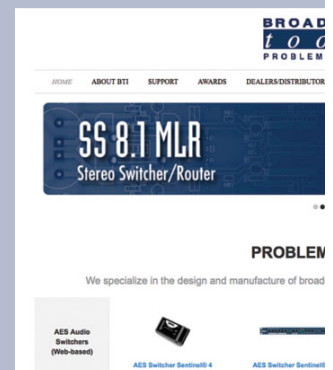

OPERATION

6. The default work mode is TCP Server, TCP Client, UDP Server and UDP Client are also available. To change the TCP port choose "Serial Port" from the side bar and change the "Local Port Number" setting:

7. To save changes click "Save" then when prompted click "Restart Module" and "Ok" to reboot the web server module and allow the changes to take effect.

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OPERATION

Specifications:

GPI Inputs	The sixteen general purpose inputs activated either by pulling the input to ground or releasing the input to a high state. A valid input must be greater than 15ms in duration. External sources can be contact closures, open collectors or 5 to 24 volt logic level sources. Input impedance is 22K ohms (contact current per input 0.250 ma at 5 volts DC).
GPI Indicators	Sixteen LEDs indicating when an input is on or off. When the LED is illuminated, the input is grounded/on.
Input Interfacing	18-position plug-in euroblock screw terminals. Plug supplied.
USB Port:	USB type B connector. FTDI USB-to-serial chipset, 4800, 9600, 19200, 38400 baud, 8 data bits, no parity, 1 stop bit. Handshaking disabled.
RS-232 Serial Port	RJ11 connector. 4800, 9600, 19200, 38400 baud, 8 data bits, no parity, 1 stop bit. Handshaking disabled. A reverse modular cable with 9-pin "S9" female D-sub adapter is included.
Logic	Flash Microprocessor w/non-volatile memory
Power	9-12 VDC, greater than 500 mA. 2.1mm ID x 5.5mm OD coaxial connector, center positive, surge protected. Universal switching power supply with IEC AC inlet supplied.
Power Indicator	Green LED, indicator will blink indicating proper operation.
Dimensions	6 x 5.25 x 1.63 in (W x L x H)
Weight	2 pounds
Operating Environment:	32°F/0°C-122°F/50°C; 0%-95% non-condensing relative humidity; 10,000ft/3048m.
Options	RA-1 Rack Shelf. 1 RU. Accommodates up to 3 units, filler panels supplied. Note: Velcro is provided to secure the product to the RA-1 shelf.
	DBM-1 DIN rail mounting bracket.

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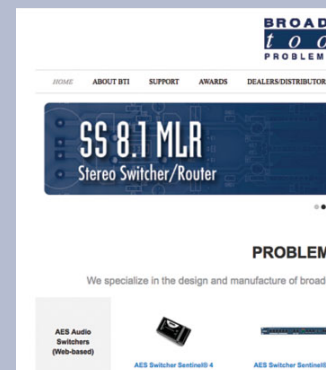
SPECIFICATIONS

LIMITED WARRANTY

The term "Buyer" as used in this document refers to and includes both (but only) (a) any person or entity who acquires such an item for the purpose of resale to others (i.e., a dealer or distributor of an item), and (b) the first person or entity who acquires such an item for such person's or entity's own use.

Broadcast Tools warrants to each Buyer of any item manufactured by Broadcast Tools that the item will be free from defects in materials and workmanship at the time it is shipped by Broadcast Tools if the item is properly installed, used and maintained.

EXCLUSIVE REMEDIES

If Broadcast Tools is notified, in writing, of a failure of any item manufactured by Broadcast Tools to conform to the foregoing Limited Warranty within one (1) year following the date of the Buyer's acquisition of the item, and if the item is returned to Broadcast Tools in accordance with Broadcast Tools' instructions for confirmation by inspection of the defect (which at Broadcast Tools' election may include, without limitation, a requirement that the Buyer first obtain a Return Authorization number from Broadcast Tools, that the Buyer furnish proof of purchase in the form of an invoice and/or receipt, and that the Buyer prepay all freight charges associated with any return of the item to Broadcast Tools using such freight service as Broadcast Tools reasonably may specify), Broadcast Tools will repair or replace the defective item, or will refund the purchase price paid by the Buyer for the item. Broadcast Tools shall have the exclusive right to choose between these alternative remedies.

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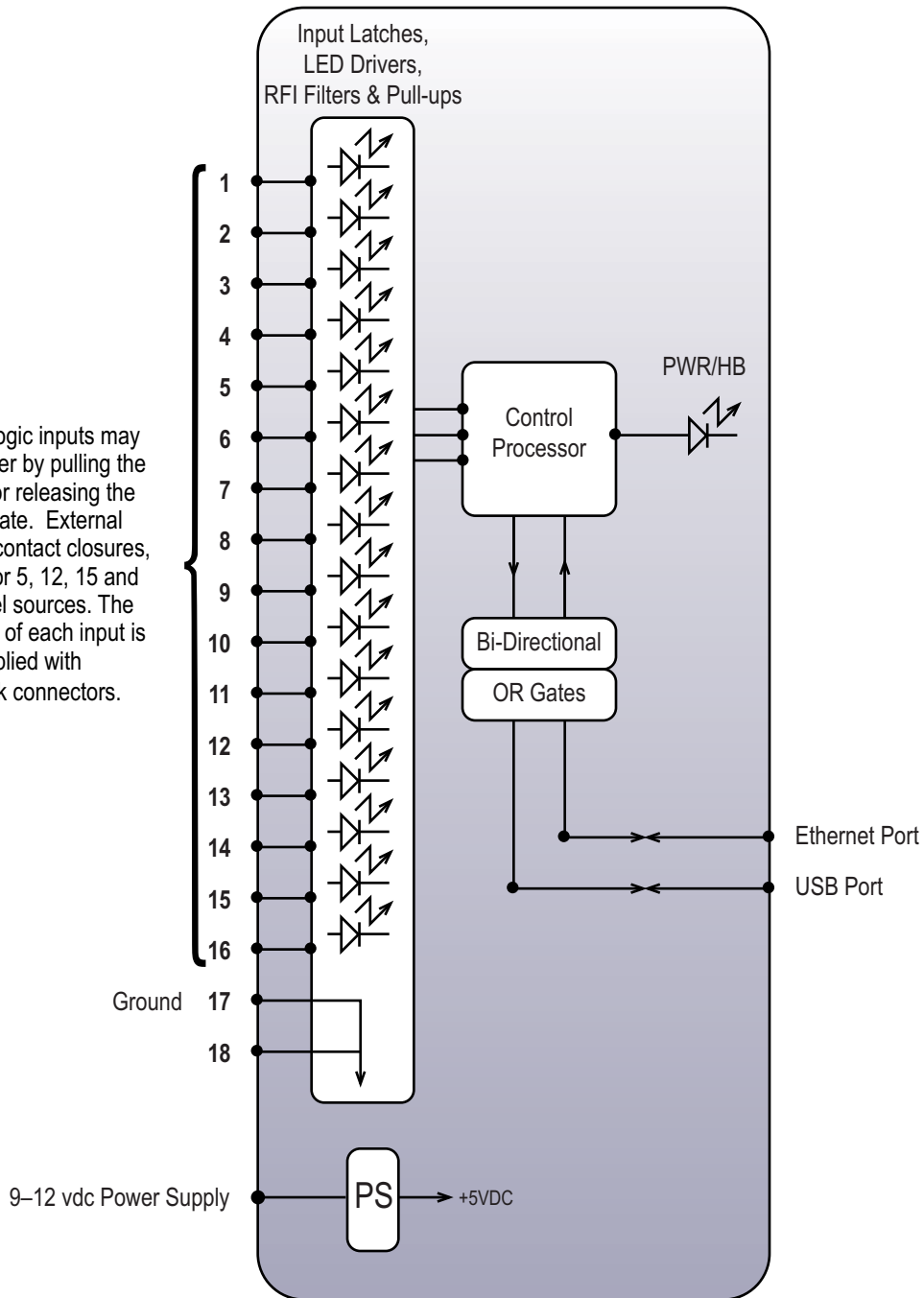
Functional Diagram

The 16 status / logic inputs may be activated either by pulling the input to ground or releasing the input to a high state. External sources can be contact closures, open collectors or 5, 12, 15 and 24-volt logic-level sources. The input impedance of each input is 22 K ohms. Supplied with Plug-in euroblock connectors.

Input Latches,
LED Drivers,
RFI Filters & Pull-ups

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16

Ground 17
18

PWR/HB

Control Processor

Bi-Directional
OR Gates

Ethernet Port
USB Port

9–12 vdc Power Supply

PS → +5VDC

Component Layout
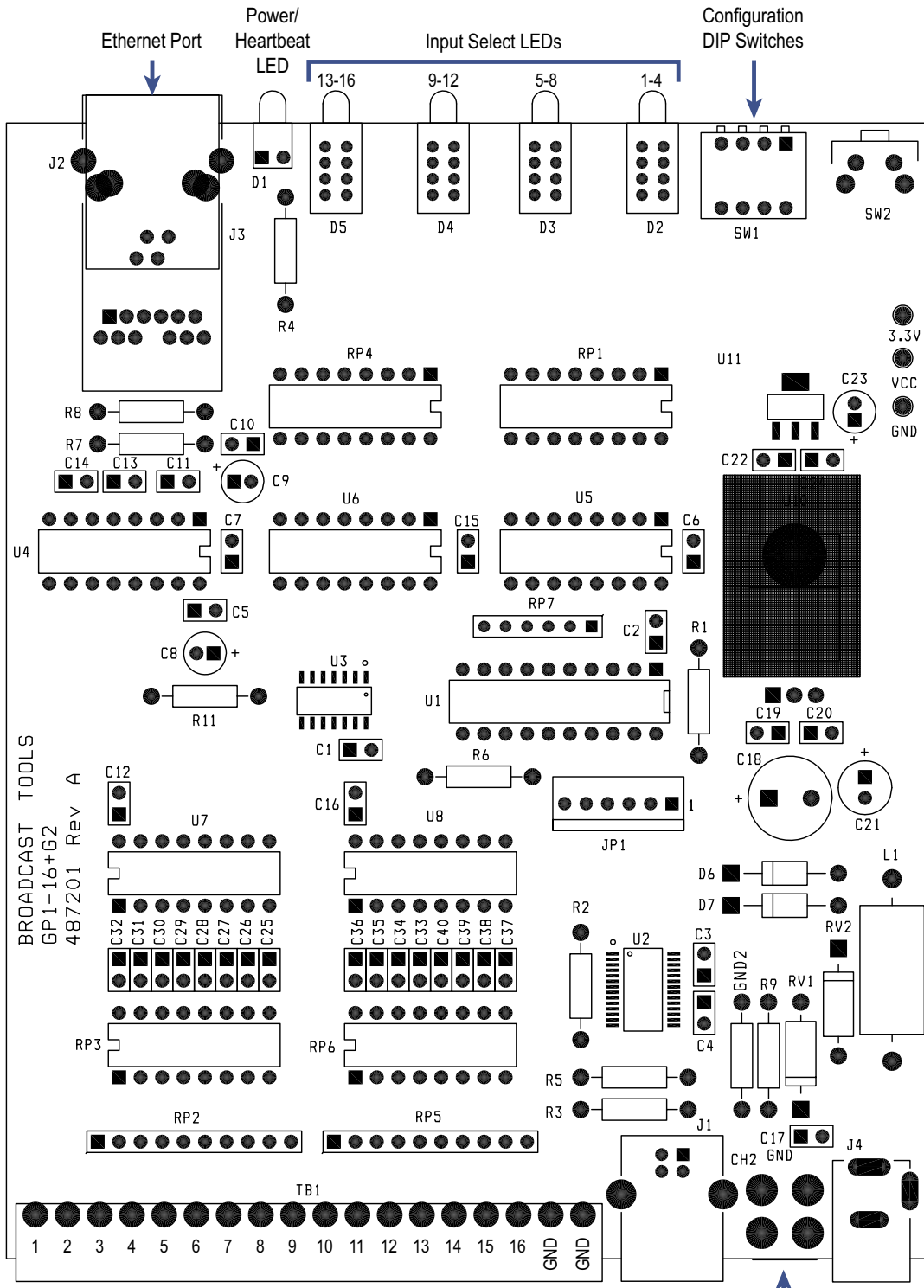
The 16 status/logic inputs may be activated either by putting the input to ground or releasing the input to a higher state. External sources can be contact closures, open connectors or 5, 12, 15 and 24-volt logic-level sources. The input impedance of each input is 22 K ohms. Supplied with plug-in Euroblock connectors.

APPENDIX