BROADCAST tools ® INC

PROBLEM SOLVED

Installation and Operation Manual

GPI 16 + G2
Sixteen Input General Purpose Interface with USB/RS–232 Serial

Manual Revised 10/2/2023
If you need a firmware upgrade, contact Broadcast Tools®

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ALL SPECIFICATIONS AND FEATURES FOR THIS PRODUCT ARE SUBJECT TO
CHANGE WITHOUT NOTICE

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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INTRODUCTION

Thank you for your purchase of a Broadcast Tools® GPI-16 + G2, sixteen input general purpose interface (referred to as the GPI-16 + G2 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.

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
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THANK YOU FOR CHOOSING
BROADCAST TOOLS® BRAND PRODUCTS!

Broadcast Tools is a Veteran Owned Business

Designed, Assembled and Supported in WA State, USA
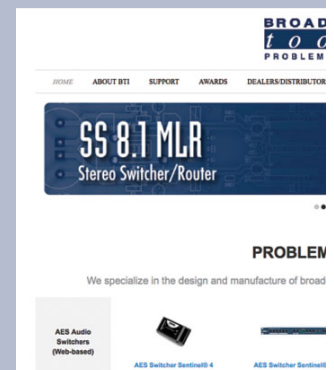
CAUTION!

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 interfaces 16 general purpose logic inputs to users PC COM or USB port. 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 RS-232 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.

Inspection

Please examine your GPI-16 + G2 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, a USB type A/B cable, a reverse modular cable with 9-pin "S9" female D-sub adapter and a 9.0 VDC universal desktop power supply with IEC AC inlet. Manuals may be downloaded from our web site.

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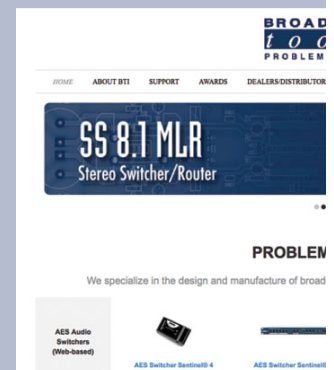
Installation

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 to a UPS standby power system. A UPS, like the BE600M1 from APC helps to minimize the risk to the GPI-16 + G2 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 to a computer's USB port using the included USB A/B cable. When you first plug the GPI-16 + G2 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 on a COM port. If the GPI is being used for RS-232 serial operation this should remain disconnected, and the drivers are not necessary.

NOTE: If the GPI-16 + G2'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

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🟠 **CAUTION!**

Broadcast Tools RFI and surge suppression suggestions: *Installation of the GPI-16 + G2 in high RF environments should be performed with care. It is recommended that all cables connected to the GPI-16 + G2 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.*
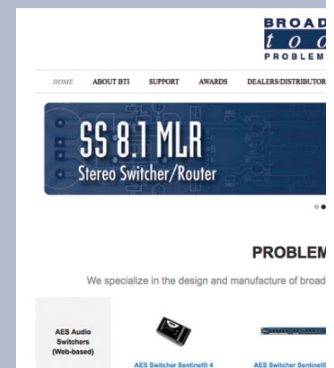
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RS-232 Serial Connector:

This RJ-11 port is used to connect the GPI-16 + G2 to a computer's COM port for RS-232 serial operation using the included reverse modular cable with 9-pin "S9" female D-sub adapter. If the GPI is being used for USB operation this will remain disconnected.

RJ-11 Adapter Pin	DB-9 D-SUB Pin #	Product's point of view Function Name.
4	3	RS-232 Receive
3	2	RS-232 Transmit
2	5	Ground

1 2 3 4
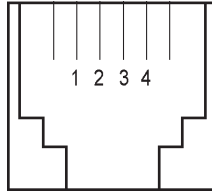
Modular connector's point of view.

INSTALLATION
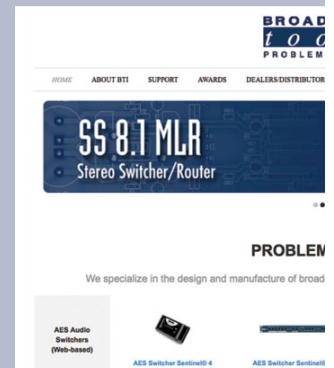
Configuration

The GPI-16 + G2 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 to an available USB port on your PC. When you first plug the GPI-16 + G2 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 on a COM port. Once you've installed the driver, the GPI-16 + G2 will be listed as "USB Serial Port" in device manager.

NOTE: If the GPI-16 + G2'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

2. Start a serial terminal application like Tera Term, PuTTY or HyperTerminal configured for the USB COM port the GPI-16 + G2 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'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 RS-232 Serial Port.

1. Connect the supplied reverse modular cable with 9-pin "S9" female D-sub adapter from the "RS-232" jack on the GPI to a RS-232 serial COM port on your PC.

2. Start a serial terminal application like Tera Term, PuTTY, or HyperTerminal configured for the COM port the GPI-16 + G2 is connected 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'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.

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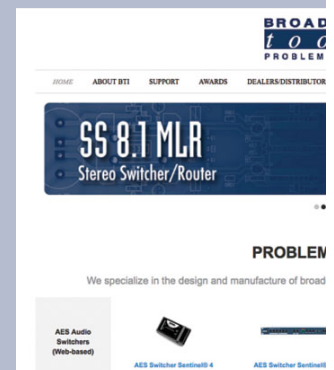
Configuration Commands

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 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 the GPI-16 + G2 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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CONFIGURATION

Operation

Command Formats
The GPI-16 + G2 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 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 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, 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

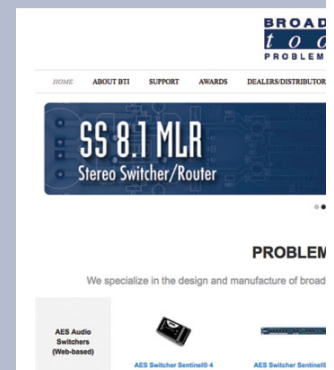Response string example for inputs 1 thru 8 pulled low: -00000055
Response string example for input 1 thru 8 returning high: -00000000

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

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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

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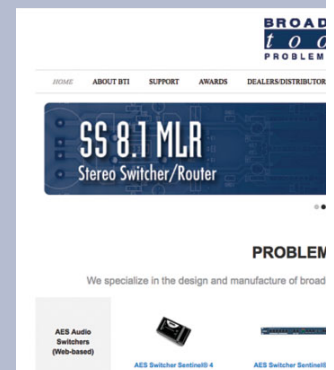
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Broadcast Tools warrants to each Buyer of any item manufactured by Broadcast Tools that the item will be free from defects in materials and workmanship at the time it is shipped by Broadcast Tools if the item is properly installed, used and maintained.

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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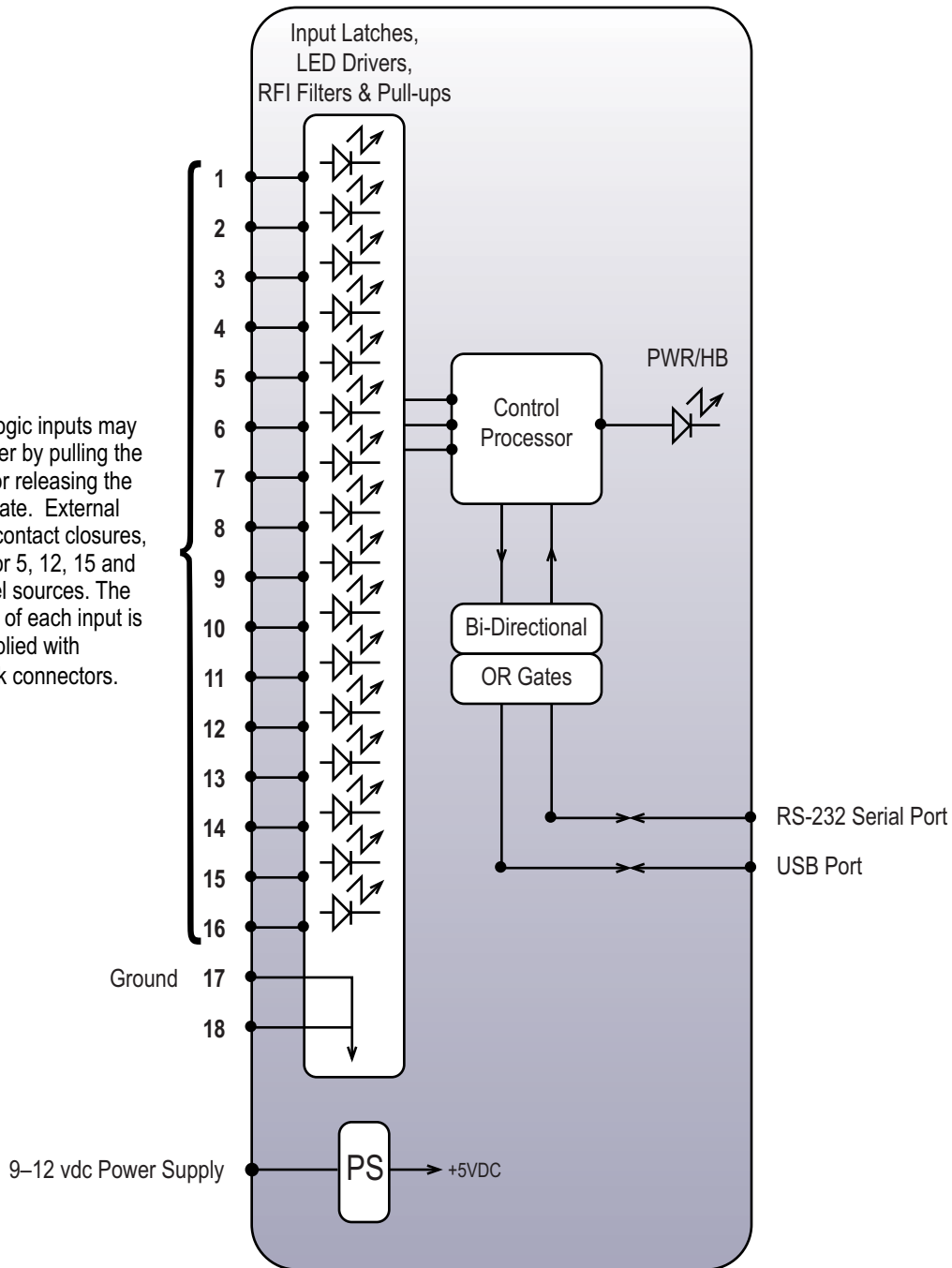
Broadcast Tools, Inc.
131 State Street
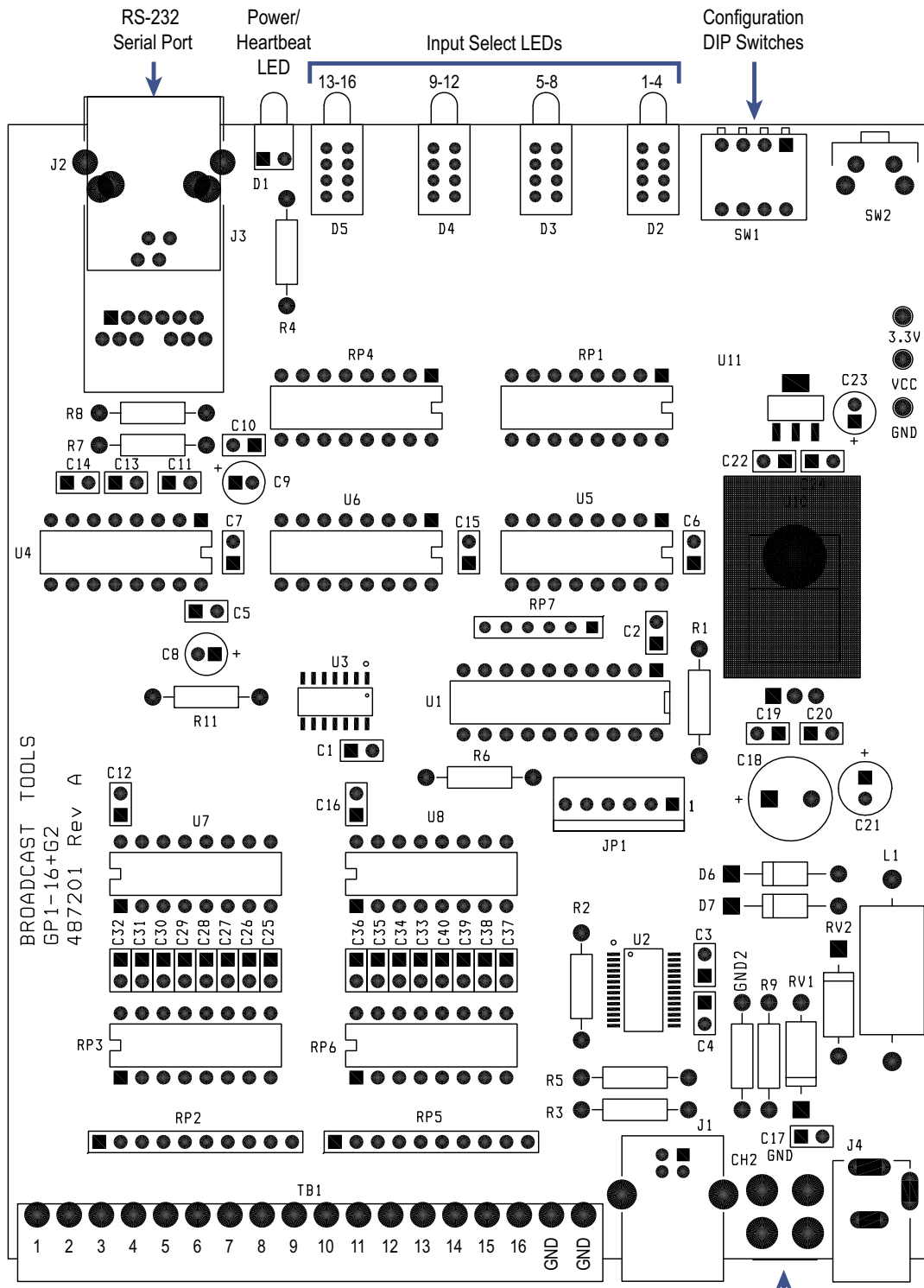Sedro-Woolley, WA 98284 • USA

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support@broadcasttools.com **e-mail**
www.broadcasttools.com **website**

Functional Diagram

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

PWR/HB

Control
Processor

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.

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11
12
13
14
15
16

Bi-Directional

OR Gates

RS-232 Serial Port

USB Port

Ground   17

18

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.

USB Type B Port

Chassis Ground

Power 9-12VDC

APPENDIX

GPI 16 + G2

BROADCAST®
t o o l s

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

Options

INPUTS

Pwr

RS-232

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 GND GND   USB   Chs Gnd PWR 9-12VDC