

**BROADCAST**<sup>®</sup>  
**t o o l s** **INC**<sup>®</sup>  
**PROBLEM SOLVED**

***Installation and Operation Manual***



**GPI-16 Plus/RJ**  
***Sixteen Input RJ45 General Purpose Interface with  
USB/RS-232 serial ports.***

Manual update: 04/12/2016 • Firmware version: 1.01 or greater  
If you need a firmware upgrade, contact Broadcast Tools<sup>®</sup>

No part of this document may be reproduced or distributed without permission.  
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.**

Due to the dynamic nature of product design, the information contained in this document is subject to change without notice. Broadcast Tools, Inc., assumes no responsibility for errors and/or omissions contained in this document. Revisions of this information or new editions may be issued to incorporate such changes.

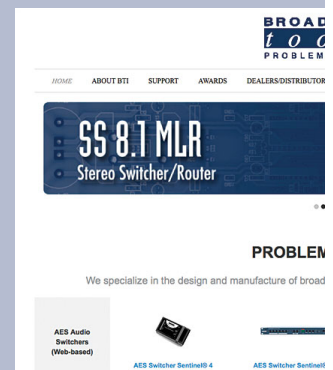
*Broadcast Tools<sup>®</sup> is a registered trademark of Broadcast Tools, Inc.  
All Sentinel<sup>®</sup> labeled products are registered trademarks of Broadcast Tools, Inc.  
Copyright<sup>®</sup> 1989 - 2016 by Broadcast Tools, Inc. All rights reserved.  
No part of this document may be reproduced or distributed without permission.*

Visit [www.broadcasttools.com](http://www.broadcasttools.com) for important product update information.

# Table of Contents

Section Title .....	Page #
Introduction .....	3
Safety Information .....	3
Who to Contact for Help .....	3
Product Overview .....	4
Inspection .....	4
Installation .....	4
RFI and surge suppression suggestions .....	4
RJ45 GPI Input connections .....	5
Power .....	5
USB connector .....	5
RJ11 serial connector .....	6
Configuration .....	6
Serial terminal setup and start-up .....	6
Configuration commands .....	7
Operation .....	8
PIP information retrieval commands .....	8
AT1616 information retrieval commands .....	9
Specifications .....	10
Warranty .....	11
Fractional Schematics .....	Appendix A
Connector, dip-switch and LED layout .....	Appendix B
Top cover label .....	Appendix C
Connection Examples .....	Appendix D

**WEBSITE:**  
*Visit our web site for product updates and additional information.*



## INTRODUCTION

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

## 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](http://www.broadcasttools.com)  
E-mail: [support@broadcasttools.com](mailto: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.

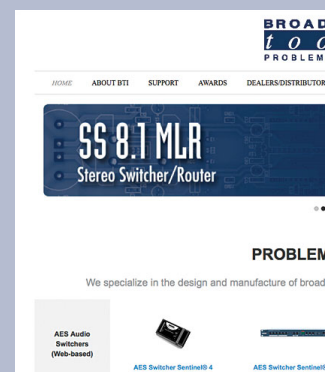


## NOTE:

This manual should be read thoroughly before installation and operation.

## WEBSITE:

Visit our web site for product updates and additional information.



## Product Overview

The GPI-16 Plus/RJ interfaces 16 general purpose logic inputs via four RJ45 jacks to a PC RS-232 serial COM or USB port. The user may select from two pre-programmed serial data formats; the “PIP” GPI format which is used on most of our audio switchers, or the legacy AT-1616 format. The four RJ45 input jacks can connect to the Broadcast Tools COA-37 XDS/RJ adapter using Cat5 cables for easy interfacing with the DB-37 Relay port on a satellite receiver.

## 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 GPI inputs and power.
- GPI connections are on four RJ45 input jacks (four inputs per jack) to simplify wiring and service. May be directly interfaced to the Broadcast Tools COA-37 XDS/RJ adapter.
- Fully RFI proofed.
- Surge protected internal power supply, 9 volt universal switching power adapter with domestic connectors supplied.
- Up to four GPI-16 Plus/RJ's may be rack mounted on one RA-1, 1-RU rack shelf.

## Inspection

Please examine your GPI-16 Plus/RJ 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 Plus/RJ, a USB type A/B cable, a modular cable with 9-pin “S9” female D-sub adapter and a 9.0 VDC universal wall power supply with domestic AC power connector. Manuals may be downloaded from our web site.

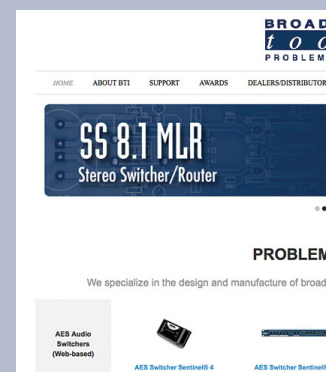
## Installation

### RFI and surge suppression suggestions

**CAUTION!** Installation of the GPI-16 Plus/RJ in high RF environments should be performed with care. It is recommended that all cables connected to the GPI-16 Plus/RJ 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](http://www.polyphaser.com) and [www.itwlinx.com](http://www.itwlinx.com).

## WEBSITE:

*Visit our web site for product updates and additional information.*



## Installation

The GPI-16 Plus/RJ is designed to be used with the Broadcast Tools COA-37 XDS/RJ connector adapter to simplify the wiring between PC based broadcast automation systems and the relay outputs found on broadcast satellite receivers. Interfacing with a satellite receiver is as simple as connecting the COA-37 XDS/RJ to the receiver's DB-37 Relay port and then connecting the COA's RJ45 relay output jacks to the GPI-16 Plus/RJ's RJ45 GPI input jacks using standard straight thru Cat5 Ethernet cables.

### RJ45 GPI Input connections

The GPI-16 Plus/RJ's sixteen general purpose inputs may be triggered by either pulling the input to ground or releasing the input to a high state. A valid input must be 15ms or greater in duration. 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 four RJ45 jacks labeled "RJ45 Inputs": "1-4" "5-8" "9-12" "13-16". These input jacks can be connected to the Broadcast Tools COA-37 XDS/RJ adapter using standard straight thru Cat5 Ethernet cables to facilitate quick installation of satellite receivers with DB-37 relay ports that follow the XDS pinout.

### Input jack 1-4 Pinout:

Inputs:	Wire Pair:	RJ45 Pins:
GPI 1	White/Orange	1
GND	Orange/White	2
GPI 2	White/Green	3
GND	Green/White	6
GND	White/Blue	5
GPI 3	Blue/White	4
GPI 4	White/Brown	7
GND	Brown/White	8

NOTE: Input jacks "5-8" "9-12" and "13-16" follow the same pin pattern, so pin 1 on the "5-8" jack is GPI 5 and pin 7 is GPI 8, etc.

### Power

2.1mm coaxial DC power jack, 9.0 - 12 VDC, center positive.

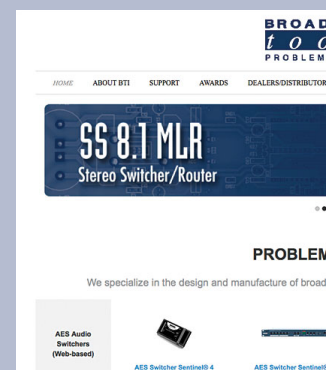
### USB Port

This type B USB port is used to connect the GPI-16 Plus/RJ to a computer's USB port using the supplied USB A/B cable. When you first plug the GPI-16 Plus/RJ 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 Plus/RJ on a COM port. If the GPI is being used for RS-232 serial operation the USB connection will remain disconnected and driver installation is not necessary.

NOTE: If the GPI-16 Plus/RJ'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>

### WEBSITE:

Visit our web site for product updates and additional information.

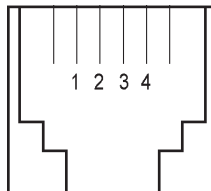


## INSTALLATION

## RS-232 Serial Port:

This RJ-11 jack is used to connect the GPI-16 Plus/RJ 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



Modular Jack  
Pin Numbers

## Configuration

The GPI-16 Plus/RJ 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](http://www.broadcasttools.com) under "Downloads".

### Configuration via the USB Port.

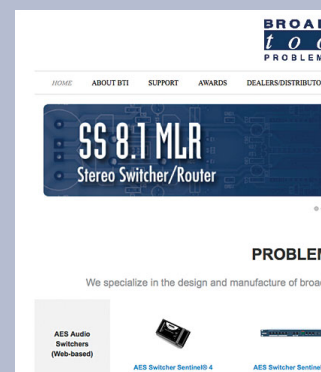
1. Connect the supplied USB A/B cable from the "USB" jack on the GPI-16 Plus/RJ to a USB port on your PC. When you first plug the GPI-16 Plus/RJ into your PC, it should automatically install the correct FTDI USB Serial "Virtual COM port" driver which will allow you to access the GPI-16 Plus/RJ on a COM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

**NOTE:** If the GPI-16 Plus/RJ'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 Plus/RJ 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 Plus/RJ's power jack labeled "9-12VDC", then plug the power supply in to a power source of 120vac 60Hz. Verify that the green "PWR/HB" LED is blinking. The unit information will be displayed on the terminal window.

## WEBSITE:

*Visit our web site for product updates and additional information.*



## INSTALLATION

## 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 Plus/RJ 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 Plus/RJ’s power jack labeled “9-12VDC” and plug the power supply in to a power source of 120vac 60Hz. Verify that the green “PWR/HB” LED is blinking. The unit information will be displayed on the terminal window.

## Configuration Commands

In most cases you will use the GPI-16 Plus/RJ’s default settings and not need to perform any additional configuration of the unit. If you need to check or change settings on the GPI-16 Plus/RJ you can follow the steps below using a terminal application like Tera Term, PuTTY, or HyperTerminal. To query the current configuration, use the following command:

**\*ASU?** - Where the unit would respond to its current configured Unit ID followed by “SU” and then the three current configuration characters item values (xyz). No carriage return or line feed is required. NOT case sensitive.

Command example: \*ASU?

Response example: 0SU000

Unit ID 0, 9600 baud, PIP mode

To modify the unit’s configuration, use 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.

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)

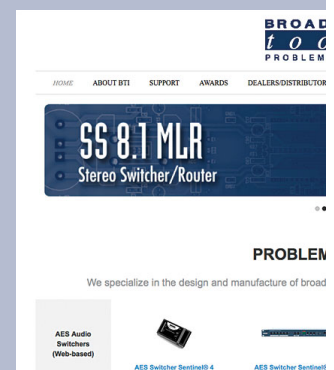
1 = 19200

2 = 4800

3 = 38400

## WEBSITE:

*Visit our web site for product updates and additional information.*



## INSTALLATION





## AT1616 Information Retrieval Commands

When configured for the AT1616 format mode the GPI-16 Plus/RJ 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 16 outputs which are not included in the GPI-16 Plus/RJ, 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

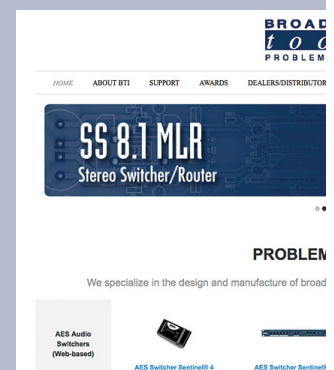
Response string example for input 1 thru 8 returning high: -00000000

Response string example for inputs 9 thru 16 pulled low: -00005500

Response string example for input 9 thru 16 returning high: -00000000

### WEBSITE:

*Visit our web site for product updates and additional information.*

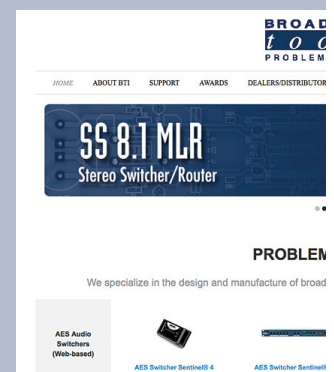


## Specifications:

GPI Inputs	The sixteen general purpose inputs may be 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 green LED's indicating when an input is on or off. When the LED is illuminated, the input is on/triggered.
Input Interfacing	Four RJ45 GPI jacks. Refer to the fractional schematic or page 5 of this manual for wiring information.
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 modular cable with 9-pin "S9" female D-sub adapter is included.
Logic	Flash microprocessor w/non-volatile memory
Power	9 VDC @ 600 ma / 120 Vac 50-60 Hz, domestic power supply supplied. Total product power requirement < 100ma.
Power Indicator	Green LED, indicator will blink indicating proper operation.
Mechanical	6.10" x 3.75" x 1.60" (DWH)
Weight	2 pounds
Options	Broadcast Tools: RA-1, 1-RU rack shelf. Up to four units may be accommodated using adhesive Velcro pads.  Broadcast Tools: COA-37 XDS/RJ adapter.

### WEBSITE:

*Visit our web site for product updates and additional information.*



### SPECIFICATION

## 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.

## NO OTHER WARRANTIES OR REMEDIES

TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, BROADCAST TOOLS AND ITS SUPPLIERS DISCLAIM ALL OTHER WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE; AND THE FOREGOING ALTERNATIVE REMEDIES SHALL BE EXCLUSIVE OF ALL OTHER REMEDIES. THIS LIMITED WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS. YOU MAY HAVE OTHER RIGHTS, WHICH VARY FROM STATE/JURISDICTION TO STATE/JURISDICTION.

## NO LIABILITY FOR CONSEQUENTIAL DAMAGES

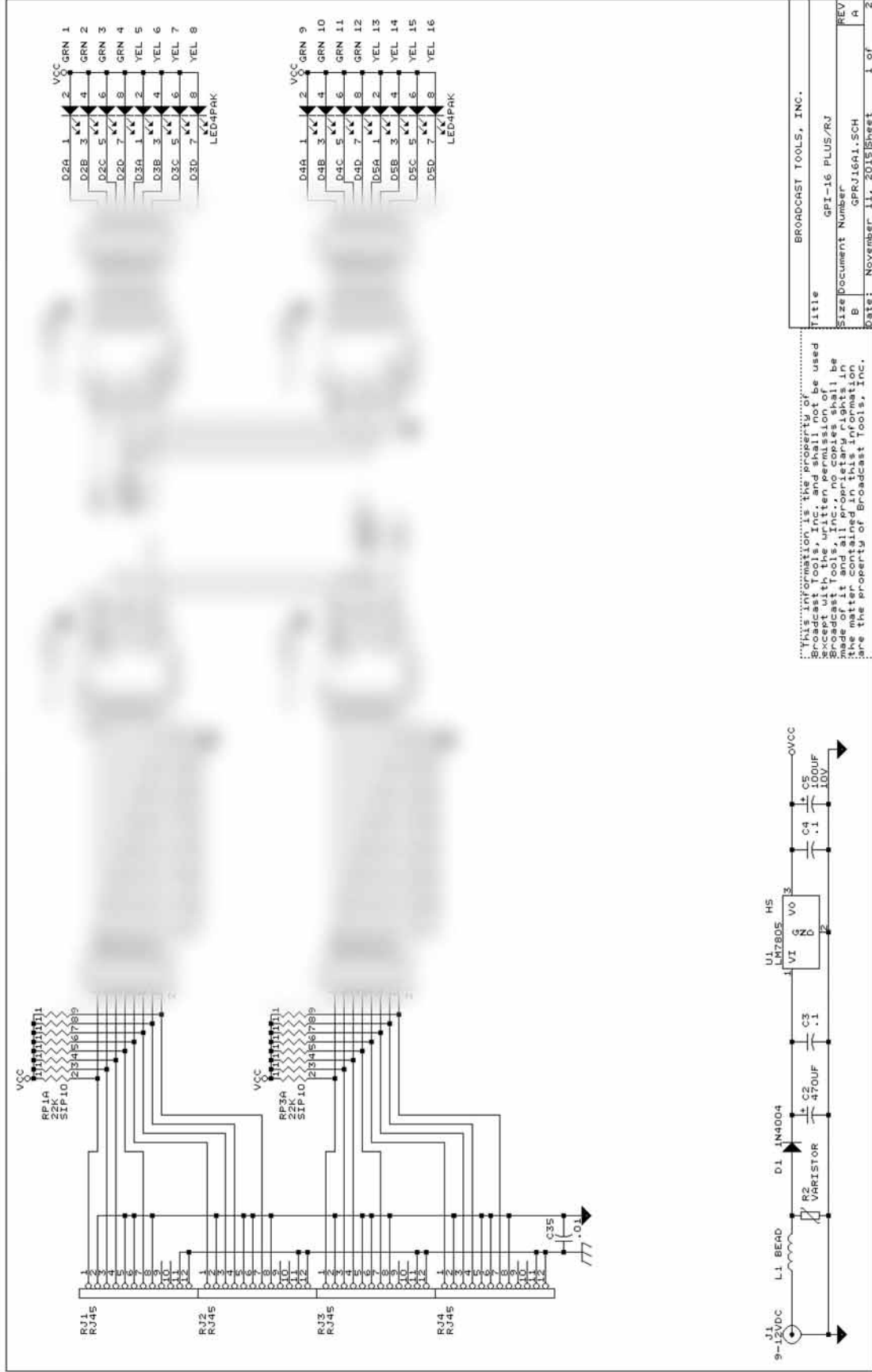
TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, NEITHER BROADCAST TOOLS NOR ANY OF ITS SUPPLIERS SHALL HAVE ANY LIABILITY FOR ANY SPECIAL, INCIDENTAL, INDIRECT, CONSEQUENTIAL OR PUNITIVE DAMAGES WHATSOEVER (INCLUDING, WITHOUT LIMITATION, ANY DAMAGES FOR LOST PROFITS, BUSINESS INTERRUPTION, LOSS OF DATA OR INFORMATION, COST OF CAPITAL, CLAIMS OF CUSTOMERS, OR ANY OTHER PECUNIARY LOSS) ARISING OUT OF THE USE OF OR THE INABILITY TO USE ANY ITEM SUPPLIED BY BROADCAST TOOLS, EVEN IF BROADCAST TOOLS HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES HAVE ANY LIABILITY FOR ANY SPECIAL, INCIDENTAL, CONSEQUENTIAL, EXEMPLARY OR PUNITIVE DAMAGES. THIS LIMITATION OF LIABILITY APPLIES WHETHER A CLAIM IS ONE ALLEGING BREACH OF A CONTRACT OR WARRANTY, NEGLIGENCE OR OTHER TORT, FOR THE VIOLATION OF ANY STATUTORY DUTY, THE FAILURE OF ANY LIMITED OR EXCLUSIVE REMEDY TO ACHIEVE ITS ESSENTIAL PURPOSE, OR ANY OTHER CLAIM OF ANY NATURE. BECAUSE SOME STATES AND JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF LIABILITY FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES, THIS LIMITATION MAY NOT APPLY TO YOU.

### **Broadcast Tools, Inc.**

131 State Street  
Sedro-Woolley, WA 98284 • USA

360.854.9559 **voice** • 866.783.1742 **fax**  
support@broadcasttools.com **e-mail**  
www.broadcasttools.com **website**

### FRACTIONAL SCHEMATIC

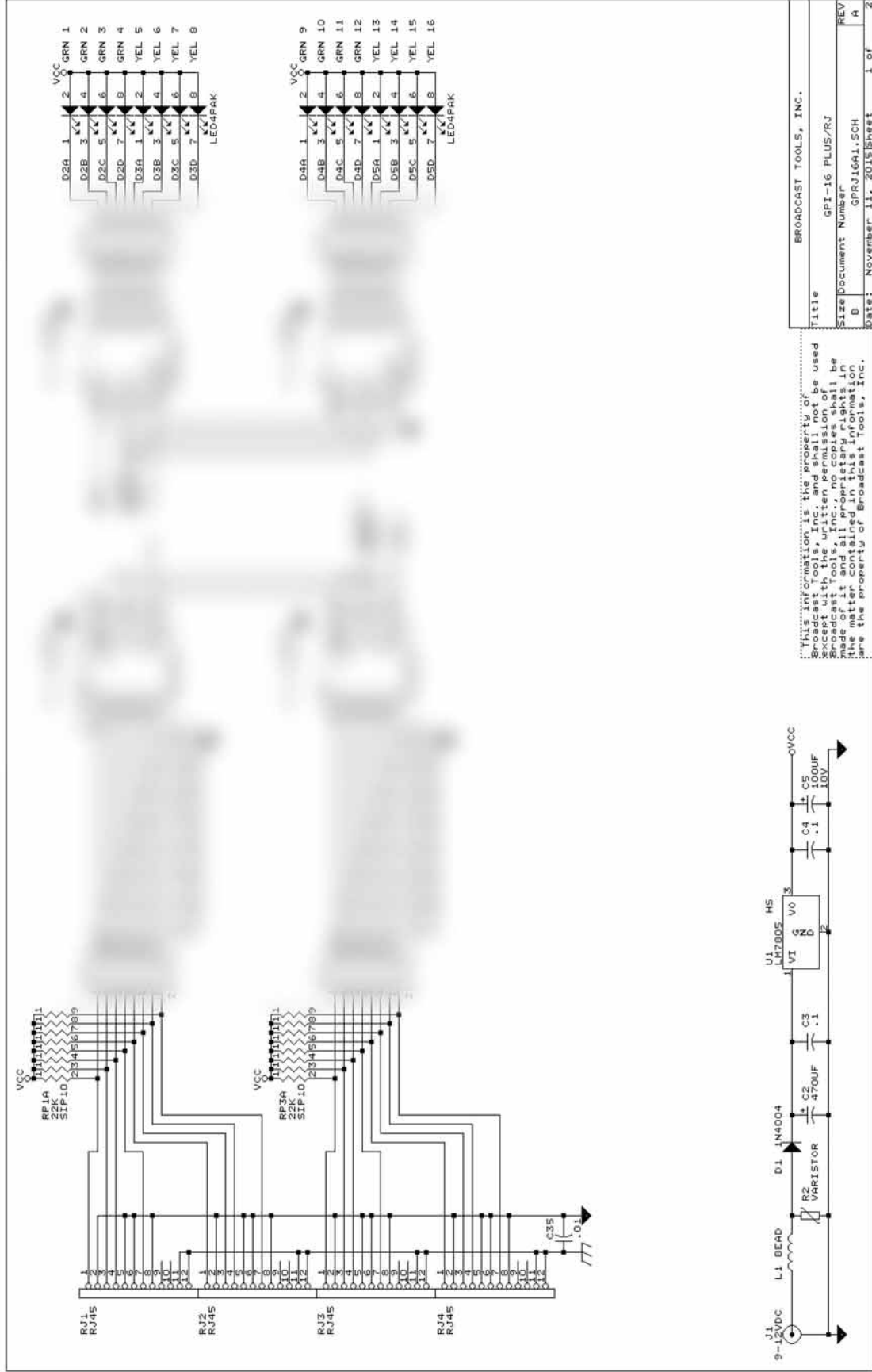


BROADCAST TOOLS, INC.	
Title	gPI-16 Plus/RJ
Size	Document Number
B	GPRJ16A1.SCH
REV	A
Date:	November 11, 2015
Sheet	1 of 2

This information is the property of Broadcast Tools, Inc. and shall not be used without the written consent of Broadcast Tools, Inc. No copies shall be made of it and all proprietary rights in it shall remain the property of Broadcast Tools, Inc.

### APPENDIX

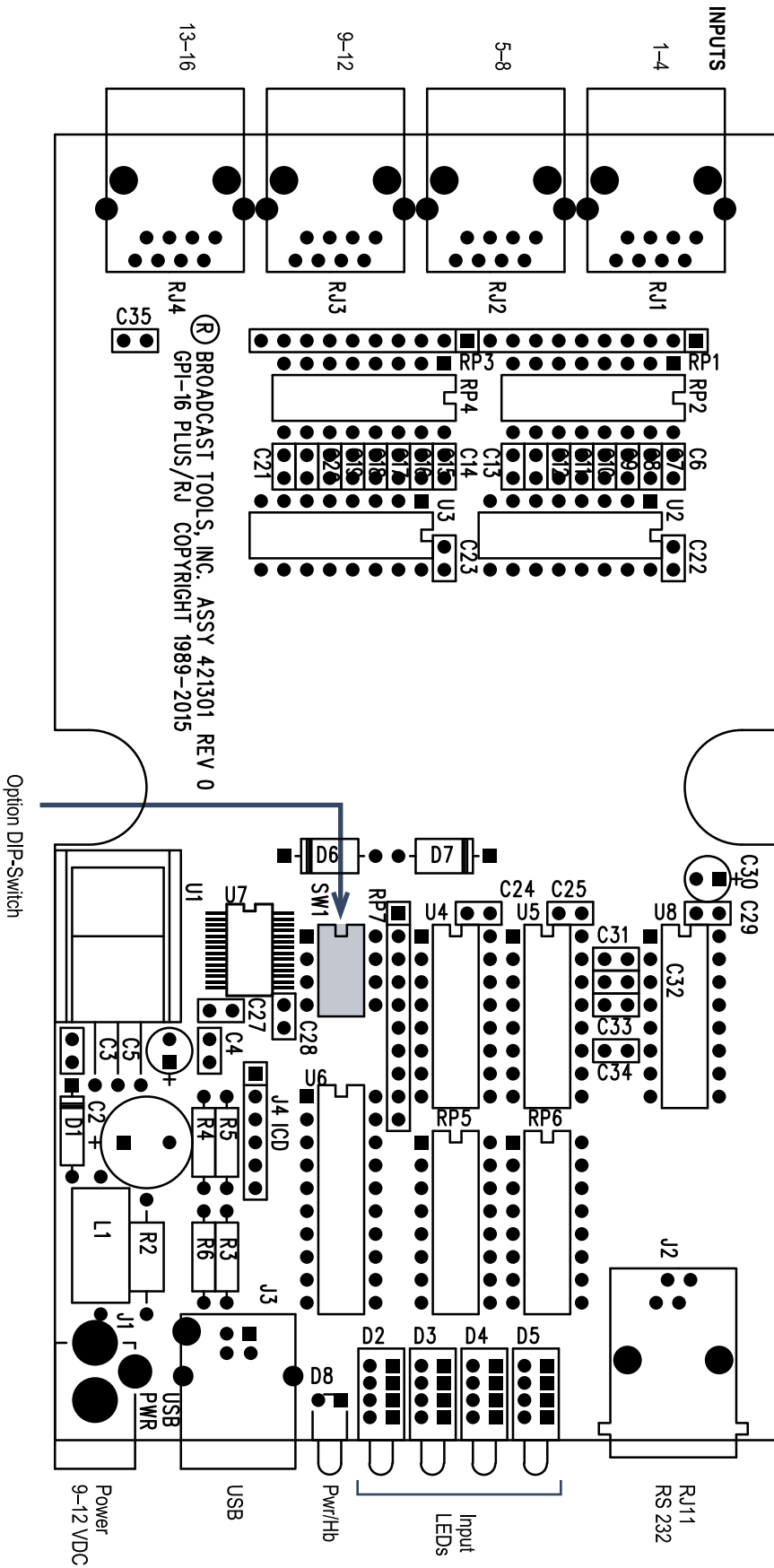
### FRACTIONAL SCHEMATIC



This information is the property of Broadcast Tools, Inc. and shall not be used without the written consent of Broadcast Tools, Inc. All rights reserved. This information is the property of Broadcast Tools, Inc.

# GPI-16 Plus/RJ

## Component Layout

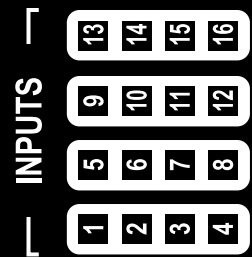


**BROADCAST<sup>®</sup>**  
***t o o l s***

**GPI-16 Plus/RJ**  
16 Input General Purpose Input Interface

RS-232

PROBLEM SOLVED



INPUTS

PWR/HB

USB

9-12 VDC



1-4

5-8

9-12

13-16

RJ45 INPUTS

Connection Examples .....  
Appendix D