



AVTECH ELECTROSYSTEMS LTD.

NANOSECOND WAVEFORM ELECTRONICS
SINCE 1975

P.O. BOX 265
OGDENSBURG, NY
U.S.A. 13669-0265

TEL: 888-670-8729 (USA & Canada) or +1-613-686-6675 (Intl)
FAX: 800-561-1970 (USA & Canada) or +1-613-686-6679 (Intl)

info@avtechpulse.com - <http://www.avtechpulse.com/>

BOX 5120, LCD MERIVALE
OTTAWA, ONTARIO
CANADA K2C 3H4

INSTRUCTIONS

MODEL AVR-B-PS-R2

0 TO +28 VOLTS, 5 kHz

COMPLEMENTARY DUAL-CHANNEL

PULSE GENERATOR

SERIAL NUMBER: _____

WARRANTY

Avtech Electrosystems Ltd. warrants products of its manufacture to be free from defects in material and workmanship under conditions of normal use. If, within one year after delivery to the original owner, and after prepaid return by the original owner, this Avtech product is found to be defective, Avtech shall at its option repair or replace said defective item. This warranty does not apply to units which have been disassembled, modified or subjected to conditions exceeding the applicable specifications or ratings. This warranty is the extent of the obligation assumed by Avtech with respect to this product and no other warranty or guarantee is either expressed or implied.

TECHNICAL SUPPORT

Phone: 888-670-8729 (USA & Canada) or +1-613-686-6675 (International)

Fax: 800-561-1970 (USA & Canada) or +1-613-686-6679 (International)

E-mail: info@avtechpulse.com

World Wide Web: <http://www.avtechpulse.com>

TABLE OF CONTENTS

WARRANTY	2
TECHNICAL SUPPORT	2
TABLE OF CONTENTS	3
INTRODUCTION	5
SPECIFICATIONS & ORIGINAL QUOTATION	6
EUROPEAN REGULATORY NOTES	8
EC DECLARATION OF CONFORMITY	8
DIRECTIVE 2002/95/EC (RoHS)	8
DIRECTIVE 2002/96/EC (WEEE)	8
INSTALLATION	10
VISUAL CHECK	10
POWER RATINGS	10
CONNECTION TO THE POWER SUPPLY	10
PROTECTION FROM ELECTRIC SHOCK	11
ENVIRONMENTAL CONDITIONS	11
FUSES	13
AC FUSE REPLACEMENT	13
DC FUSE REPLACEMENT	14
FUSE RATINGS	14
FRONT PANEL CONTROLS	15
REAR PANEL CONTROLS	17
GENERAL INFORMATION	18
BASIC PULSE CONTROL	18
PROTECTING YOUR INSTRUMENT	20
TURN OFF INSTRUMENT WHEN NOT IN USE	20
DO NOT EXCEED 5 kHz	20
USE LOW-INDUCTANCE LOADS	20
MECHANICAL INFORMATION	21
TOP COVER REMOVAL	21
RACK MOUNTING	21
ELECTROMAGNETIC INTERFERENCE	21
MAINTENANCE	22

REGULAR MAINTENANCE.....22
CLEANING.....22
WIRING DIAGRAMS.....23
WIRING OF AC POWER.....23
PCB 158N - LOW VOLTAGE POWER SUPPLY, 1/3.....24
PCB 158N - LOW VOLTAGE POWER SUPPLY, 2/3.....25
PCB 158N - LOW VOLTAGE POWER SUPPLY, 3/3.....26
MAIN WIRING.....27
PERFORMANCE CHECK SHEET.....28

Manual Reference: /fileserver1/officefiles/instructword/avr-b/AVR-B-PS-R2,ed2.odt.
Last modified February 29, 2024.
Copyright © 2024 Avtech Electrosystems Ltd, All Rights Reserved.

INTRODUCTION

The AVR-B-PS-R2 is a customized externally-triggered dual-channel pulse generator

Two output channels ("A" and "B") are triggered by a common TTL-level trigger input. The output pulse width is approximately equal to the input pulse width.

For output A, the baseline (between pulses) is fixed at zero Volts. During the pulse, the voltage rises to V_A , which may be adjusted from 0 to +28V using a ten-turn dial.

For output B, the baseline (between pulses) is fixed at +28V (+/- 0.5V). During the pulse, the voltage falls to V_B , which may be adjusted from +28V to 0V using a ten-turn dial.

The A and B output pulse widths are approximately equal to the input pulse width, and may range from 1 μ s to 150 ms.

The maximum trigger rate is 5 kHz. The output rise and fall times are < 7 ns, on a 20%-80% basis.

This instrument is intended for use in research, development, test and calibration laboratories by qualified personnel.

SPECIFICATIONS & ORIGINAL QUOTATION

Date: Tue, 17 Feb 2009 09:51:18 -0500
From: Avtech Sales
Subject: Re: Quote 3-166947

XXXXX,

I am pleased to quote as follows:

Quote number: 14647

Model number: AVR-B-PS-R2

Description: Customized dual-output pulse generator, intended to replace the older AVR-B-PS-R units.

Basic function: Two output channels ("A" and "B") are triggered by a common TTL-level trigger input. The output pulse width is approximately equal to the input pulse width.

Output A: The baseline (between pulses) is fixed at zero Volts. During the pulse, the voltage rises to VA, which may be adjusted from 0 to +28V using a ten-turn dial.

Output B: The baseline (between pulses) is fixed at +28V (+/- 0.5V). During the pulse, the voltage falls to VB, which may be adjusted from +28V to 0V using a ten-turn dial.

Pulse width: The A and B output pulse widths are approximately equal to the input pulse width, and may range from 1 us to 150 ms.

Maximum pulse repetition frequency: 5 kHz

Maximum duty cycle: 50%

Rise and fall times (20%-80%): < 7 ns

Load impedance: 10 kilohms or higher

Output impedance: 50 Ohms. This is the resistor in series with the output, internally. It is not related to the load impedance.

Input trigger: TTL levels (0V, and +3 to +5V). The input impedance of the trigger input is 1 kilohm.

Connectors: BNC

Power requirement: 100-240 V, 50-60 Hz.

Dimensions (H x W x D): 100 mm x 430 mm x 375 mm (3.9" x 17" x 14.8").

Price: \$XXXXX US each, DDU (Delivered Duty Unpaid). Includes the cost of shipping and insurance, but excludes customs duties, taxes, and other import fees. Shipments are from Canada, and are normally duty-free.

Quote valid for: 8 weeks

Estimated delivery: 8-10 weeks after receipt of order.

The main differences between this model (the AVR-B-PS-R2) and the earlier existing models (AVR-B-PS-R) are that:

- 1) The rise time is rated at 7 ns. The AVR-B-PS-R was originally specified as 3 ns, but probably did not actually meet this specification. 7 ns is more realistic.
- 2) The output impedance is increased from ~0 to 50 Ohms. This provides transmission line back-matching, and cleaner waveforms.
- 3) The chassis is wider. A rack-mount kit is available.
- 4) The AC power supply is a much more sophisticated auto-sensing switching power supply.
- 5) The circuitry in general should be more rugged and reliable.

Otherwise, the AVR-B-PS-R2 should be a "drop-in" replacement for the AVR-B-PS-R. If you wish to change or modernize the specifications to meet your current actual requirements, let me know what needs to be changed. We can also provide GPIB control of the amplitudes if desired. We can also provide an internal trigger source with GPIB-controllable PRF and pulse width, if that simplifies your application.

Please call or email me if I can be of further assistance.

Thank you for your interest in our products!

Regards,

Mary Budarick
Sales Manager

--- Avtech Electrosystems Ltd. ----- since 1975 ---

PO Box 265	ph: 888-670-8729 or 613-686-6675	Box 5120
Ogdensburg	fax: 800-561-1970 or 613-686-6679	LCD Merivale
New York		Ottawa, Ontario
USA 13669-0265	info@avtechpulse.com	Canada K2C 3H4
	www.avtechpulse.com	

Pulse Generators - Laser Diode Drivers - HV Amplifiers
Monocycle Generators - Impulse Generators - Pulse Amplifiers
Function Generators - Frequency Dividers - Standard & Customized

EUROPEAN REGULATORY NOTES

EC DECLARATION OF CONFORMITY

We Avtech Electrosystems Ltd.
P.O. Box 5120, LCD Merivale
Ottawa, Ontario
Canada K2C 3H4

declare that this pulse generator meets the intent of Directive 89/336/EEC for Electromagnetic Compatibility. Compliance pertains to the following specifications as listed in the official Journal of the European Communities:

EN 50081-1 Emission

EN 50082-1 Immunity

and that this pulse generator meets the intent of the Low Voltage Directive 72/23/EEC as amended by 93/68/EEC. Compliance pertains to the following specifications as listed in the official Journal of the European Communities:

EN 61010-1:2001 Safety requirements for electrical equipment for measurement, control, and laboratory use



DIRECTIVE 2002/95/EC (RoHS)

This instrument is exempt from Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the Restriction of the use of certain Hazardous Substances (RoHS) in electrical and electronic equipment. Specifically, Avtech instruments are considered "Monitoring and control instruments" (Category 9) as defined in Annex 1A of Directive 2002/96/EC. The Directive 2002/95/EC only applies to Directive 2002/96/EC categories 1-7 and 10, as stated in the "Article 2 - Scope" section of Directive 2002/95/EC.

DIRECTIVE 2002/96/EC (WEEE)

European customers who have purchased this equipment directly from Avtech will have completed a "WEEE Responsibility Agreement" form, accepting responsibility for WEEE

compliance (as mandated in Directive 2002/96/EC of the European Union and local laws) on behalf of the customer, as provided for under Article 9 of Directive 2002/96/EC.

Customers who have purchased Avtech equipment through local representatives should consult with the representative to determine who has responsibility for WEEE compliance. Normally, such responsibilities will lie with the representative, unless other arrangements (under Article 9) have been made.

Requirements for WEEE compliance may include registration of products with local governments, reporting of recycling activities to local governments, and financing of recycling activities.



INSTALLATION

VISUAL CHECK

After unpacking the instrument mainframe and the transformer module, examine to ensure that they have not been damaged in shipment. Visually inspect all connectors, knobs, and handles. Confirm that a power cord and an instrumentation manual (this manual), are with the instrument. If the instrument has been damaged, file a claim immediately with the company that transported the instrument.

POWER RATINGS

This instrument is intended to operate from 100 - 240 V, 50 - 60 Hz.

The maximum power consumption is 57 Watts. Please see the “FUSES” section for information about the appropriate AC and DC fuses.

This instrument is an “Installation Category II” instrument, intended for operation from a normal single-phase supply.

CONNECTION TO THE POWER SUPPLY


An IEC-320 three-pronged recessed male socket is provided on the back panel for AC power connection to the instrument. One end of the detachable power cord that is supplied with the instrument plugs into this socket. The other end of the detachable power cord plugs into the local mains supply. Use only the cable supplied with the instrument. The mains supply must be earthed, and the cord used to connect the instrument to the mains supply must provide an earth connection. (The supplied cord does this.)

 Warning: Failure to use a grounded outlet may result in injury or death due to electric shock. This product uses a power cord with a ground connection. It must be connected to a properly grounded outlet. The instrument chassis is connected to the ground wire in the power cord.

The table below describes the power cord that is normally supplied with this instrument, depending on the destination region:

Destination Region	Description	Manufacturer	Part Number
Continental Europe	European CEE 7/7 "Schuko" 230V, 50Hz	Qualtek (http://www.qualtekusa.com)	319004-T01
United Kingdom	BS 1363, 230V, 50Hz	Qualtek (http://www.qualtekusa.com)	370001-E01
Switzerland	SEV 1011, 2 30V, 50Hz	Volex (http://www.volex.com)	2102H-C3-10
Israel	SI 32, 220V, 50Hz	Volex (http://www.volex.com)	2115H-C3-10
North America, and all other areas	NEMA 5-15, 120V, 60 Hz	Qualtek (http://www.qualtekusa.com)	312007-01

PROTECTION FROM ELECTRIC SHOCK

 Operators of this instrument must be protected from electric shock at all times. The owner must ensure that operators are prevented access and/or are insulated from every connection point. In some cases, connections must be exposed to potential human contact. Operators must be trained to protect themselves from the risk of electric shock. This instrument is intended for use by qualified personnel who recognize shock hazards and are familiar with safety precautions required to avoid possibly injury. In particular, operators should:

1. Keep exposed high-voltage wiring to an absolute minimum.
2. Wherever possible, use shielded connectors and cabling.
3. Connect and disconnect loads and cables only when the instrument is turned off.
4. Keep in mind that all cables, connectors, oscilloscope probes, and loads must have an appropriate voltage rating.
5. Do not attempt any repairs on the instrument, beyond the fuse replacement procedures described in this manual. Contact Avtech technical support (see page 2 for contact information) if the instrument requires servicing. Service is to be performed solely by qualified service personnel.

ENVIRONMENTAL CONDITIONS

This instrument is intended for use under the following conditions:

1. indoor use;
2. altitude up to 2 000 m;
3. temperature 5 °C to 40 °C;

4. maximum relative humidity 80 % for temperatures up to 31 °C decreasing linearly to 50 % relative humidity at 40 °C;
5. Mains supply voltage fluctuations up to ± 10 % of the nominal voltage;
6. no pollution or only dry, non-conductive pollution.

FUSES

This instrument contains four fuses. All are accessible from the rear-panel. Two protect the AC prime power input, and two protect the internal DC power supplies. The locations of the fuses on the rear panel are shown in the figure below:



AC FUSE REPLACEMENT

To physically access the AC fuses, the power cord must be detached from the rear panel of the instrument. The fuse drawer may then be extracted using a small flat-head screwdriver, as shown below:



DC FUSE REPLACEMENT

The DC fuses may be replaced by inserting the tip of a flat-head screwdriver into the fuse holder slot, and rotating the slot counter-clockwise. The fuse and its carrier will then pop out.

FUSE RATINGS

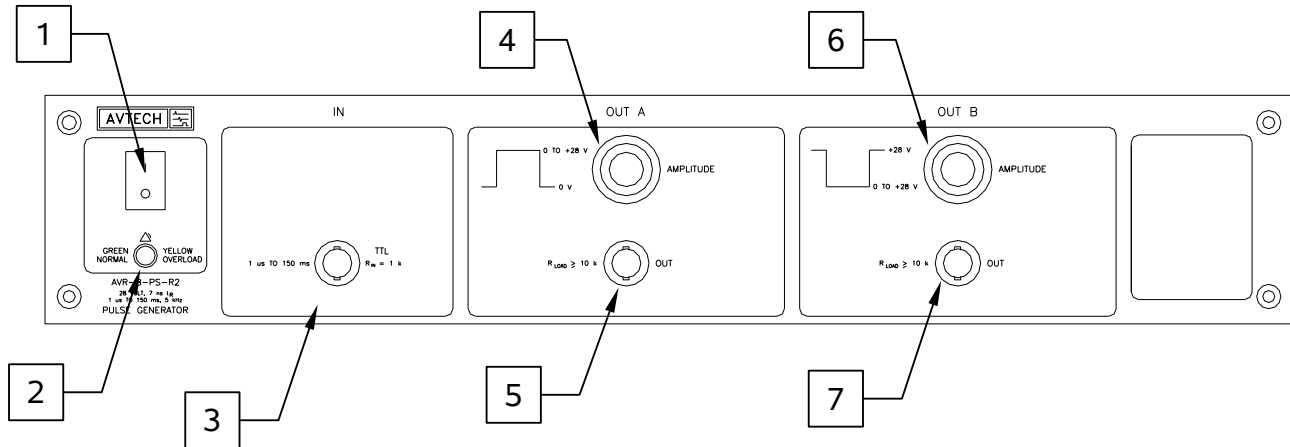
The following table lists the required fuses:

Fuses	Nominal Mains Voltage	Rating	Case Size	Recommended Replacement Part	
				Littelfuse Part Number	Digi-Key Stock Number
#1, #2 (AC)	100-240V	0.5A, 250V, Time-Delay	5×20 mm	0218.500HXP	F2416-ND
#3 (DC)	N/A	0.5A, 250V, Time-Delay	5×20 mm	0218.500HXP	F2416-ND
#4 (DC)	N/A	0.25A, 250V, Time-Delay	5×20 mm	0218.250HXP	F2413-ND

The recommended fuse manufacturer is Littelfuse (<http://www.littelfuse.com>).

Replacement fuses may be easily obtained from Digi-Key (<http://www.digikey.com>) and other distributors.

FRONT PANEL CONTROLS

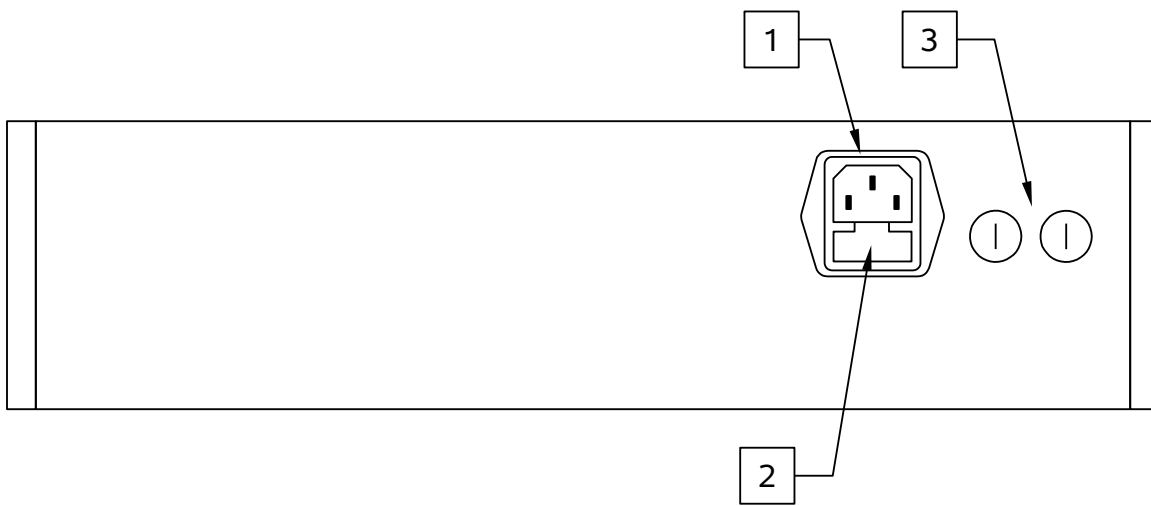


- 1) POWER Switch. This is the main power switch. When turning the instrument on, there may be a delay of several seconds before the instrument appears to respond.
- 2) OVERLOAD Indicator. When the instrument is powered, this indicator is normally green, indicating normal operation. If this indicator is yellow, an internal automatic overload protection circuit has been tripped. If the unit is overloaded (by operating at an exceedingly high duty cycle or by operating into a very low impedance), the protective circuit will disable the output of the instrument and turn the indicator light yellow. The light will stay yellow (i.e. output disabled) for about 5 seconds after which the instrument will attempt to re-enable the output (i.e. light green) for about 1 second. If the overload condition persists, the output will be disabled again (i.e. light yellow) for another 5 seconds. If the overload condition has been removed, the instrument will resume normal operation.

This overload indicator may flash yellow briefly at start-up. This is not a cause for concern.
- 3) IN Connector. The instrument is triggered by a TTL pulse applied to this connector. The pulse width must be in the range of 2 to 200 us, the pulse repetition frequency must be 5 kHz or less, and the duty cycle must be 57.5% or less. The input impedance is 50 Ohms. The output pulse width is approximately equal to the input pulse width.
- 4) OUT A AMPLITUDE Control. For output A, the baseline (between pulses) is fixed at zero Volts. During the pulse, the voltage rises to V_A , which may be adjusted from 0 to +28V using this ten-turn dial.
- 5) OUT A Connector. This connector provides the “A” output signal, into load resistances of 10 k Ω or higher. The output pulse width is approximately equal to the input pulse width.

- 6) OUT B AMPLITUDE Control. For output B, the baseline (between pulses) is fixed at +28V (+/- 0.5V). During the pulse, the voltage falls to V_B , which may be adjusted from +28V to 0V using this ten-turn dial.
- 7) OUT B Connector. This connector provides the “B” output signal, into load resistances of 10 k Ω or higher. The output pulse width is approximately equal to the input pulse width.

REAR PANEL CONTROLS

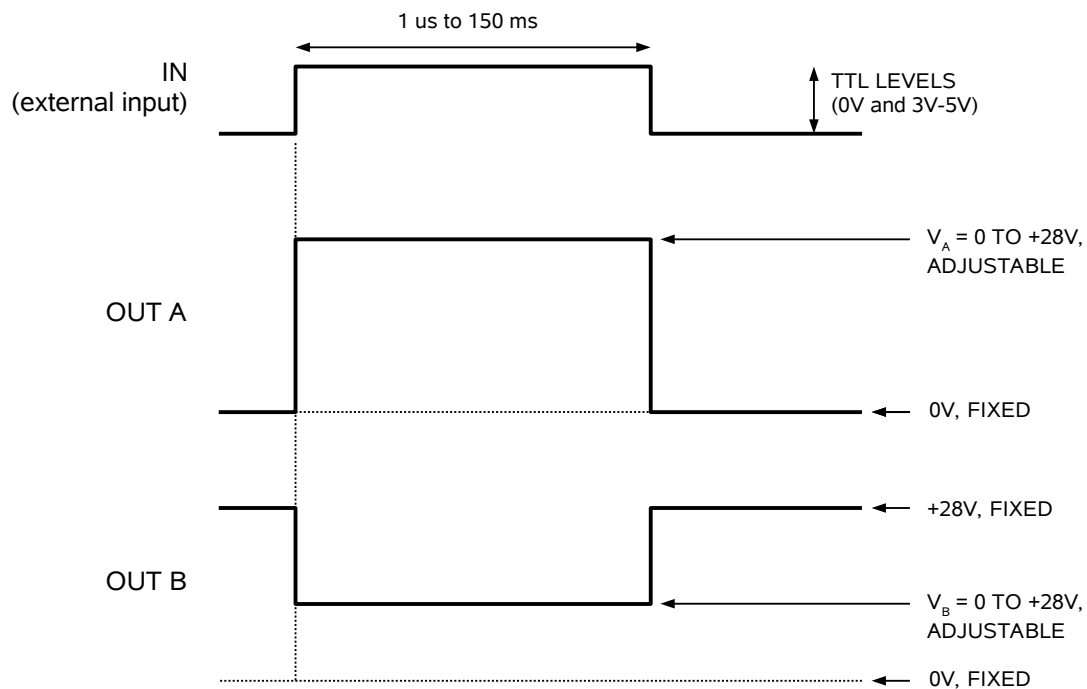


1. AC POWER INPUT. An IEC-320 C14 three-pronged recessed male socket is provided on the back panel for AC power connection to the instrument. One end of the detachable power cord that is supplied with the instrument plugs into this socket.
2. AC FUSE DRAWER. The two fuses that protect the AC input are located in this drawer. Please see the “FUSES” section of this manual for more information.
3. DC FUSES. These two fuses protect the internal DC power supplies. Please see the “FUSES” sections of this manual for more information.

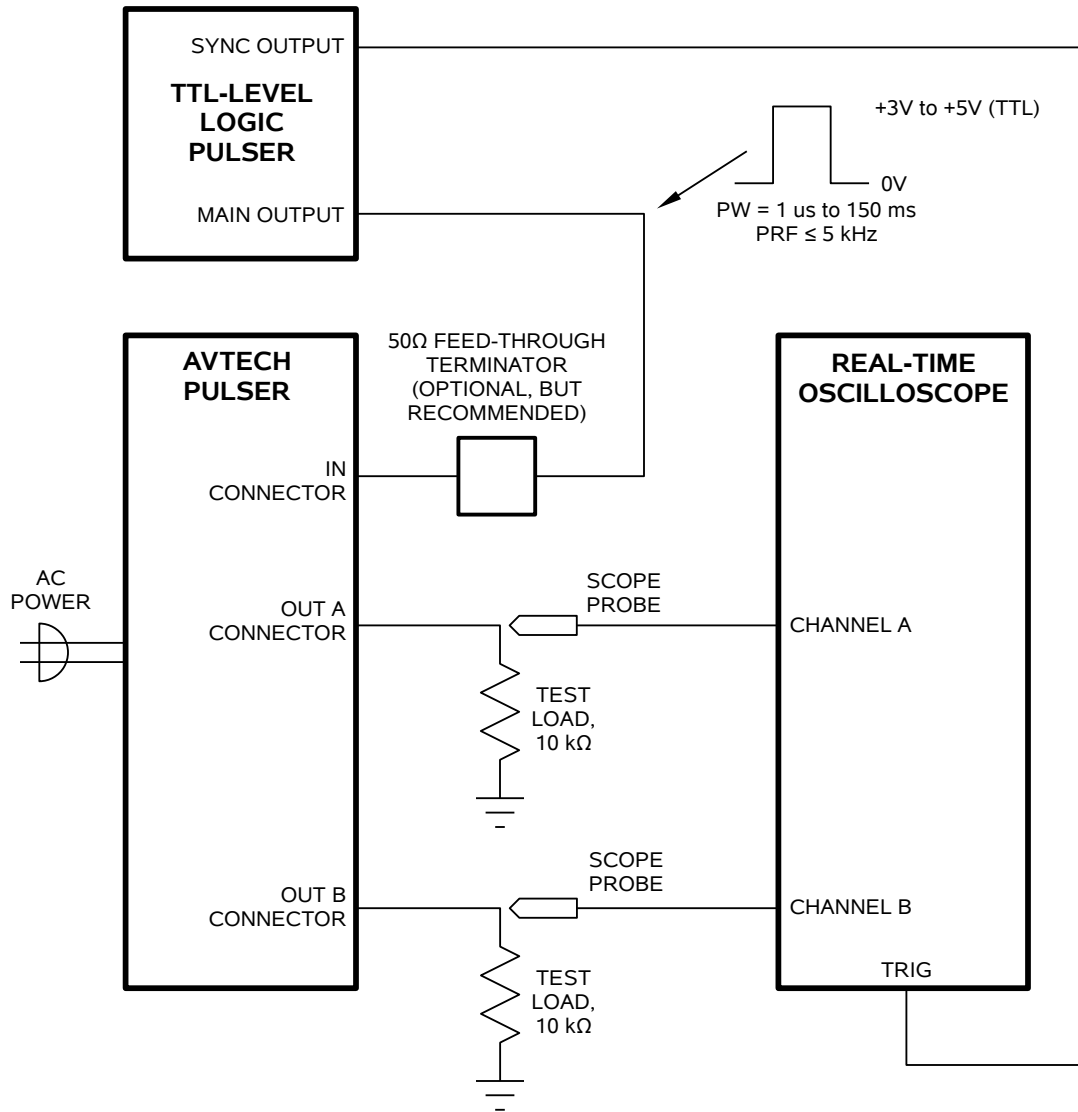
GENERAL INFORMATION

BASIC PULSE CONTROL

This instrument must be triggered by an external TTL trigger signal. Two output channels respond to the trigger: OUT A and OUT B. These signals are shown below:



A typical test arrangement for the AVR-B-PS-R2 is shown below:



PROTECTING YOUR INSTRUMENT

TURN OFF INSTRUMENT WHEN NOT IN USE

The lifetime of the switching elements in the pulse generator module is proportional to the running time of the instrument. For this reason the prime power to the instrument should be turned off when the instrument is not in use. In the case of failure, the switching elements are easily replaced following the procedure described in a following section.

DO NOT EXCEED 5 kHz

The output stage may be damaged if triggered by an external signal at a pulse repetition frequency greater than 5 kHz.

USE LOW-INDUCTANCE LOADS

Lenz's Law predicts that for an inductive voltage spike will be generated when the current through an inductance changes. Specifically, $V_{\text{SPIKE}} = L \times di_{\text{LOAD}}/dt$, where L is the inductance, i_{LOAD} is the load current change, and t is time. For this reason, it is important to keep any parasitic in the load low. This means keeping wiring short, and using low inductance components. In particular, wire-wound resistors should be avoided.


MECHANICAL INFORMATION

TOP COVER REMOVAL

If necessary, the interior of the instrument may be accessed by removing the four Phillips screws on the top panel. With the four screws removed, the top cover may be slid back (and off).

 Always disconnect the power cord and allow the instrument to sit unpowered for 10 minutes before opening the instrument. This will allow any internal stored charge to discharge.

There are no user-adjustable internal circuits. For repairs other than fuse replacement, please contact Avtech (info@avtechpulse.com) to arrange for the instrument to be returned to the factory for repair. Service is to be performed solely by qualified service personnel.

 Caution: High voltages are present inside the instrument during normal operation. Do not operate the instrument with the cover removed.

RACK MOUNTING

A rack mounting kit is available. The -R5 rack mount kit may be installed after first removing the one Phillips screw on the side panel adjacent to the front handle.

ELECTROMAGNETIC INTERFERENCE

To prevent electromagnetic interference with other equipment, all used outputs should be connected to shielded loads using shielded coaxial cables. Unused outputs should be terminated with shielded coaxial terminators or with shielded coaxial dust caps, to prevent unintentional electromagnetic radiation. All cords and cables should be less than 3m in length.

MAINTENANCE

REGULAR MAINTENANCE

This instrument does not require any regular maintenance.

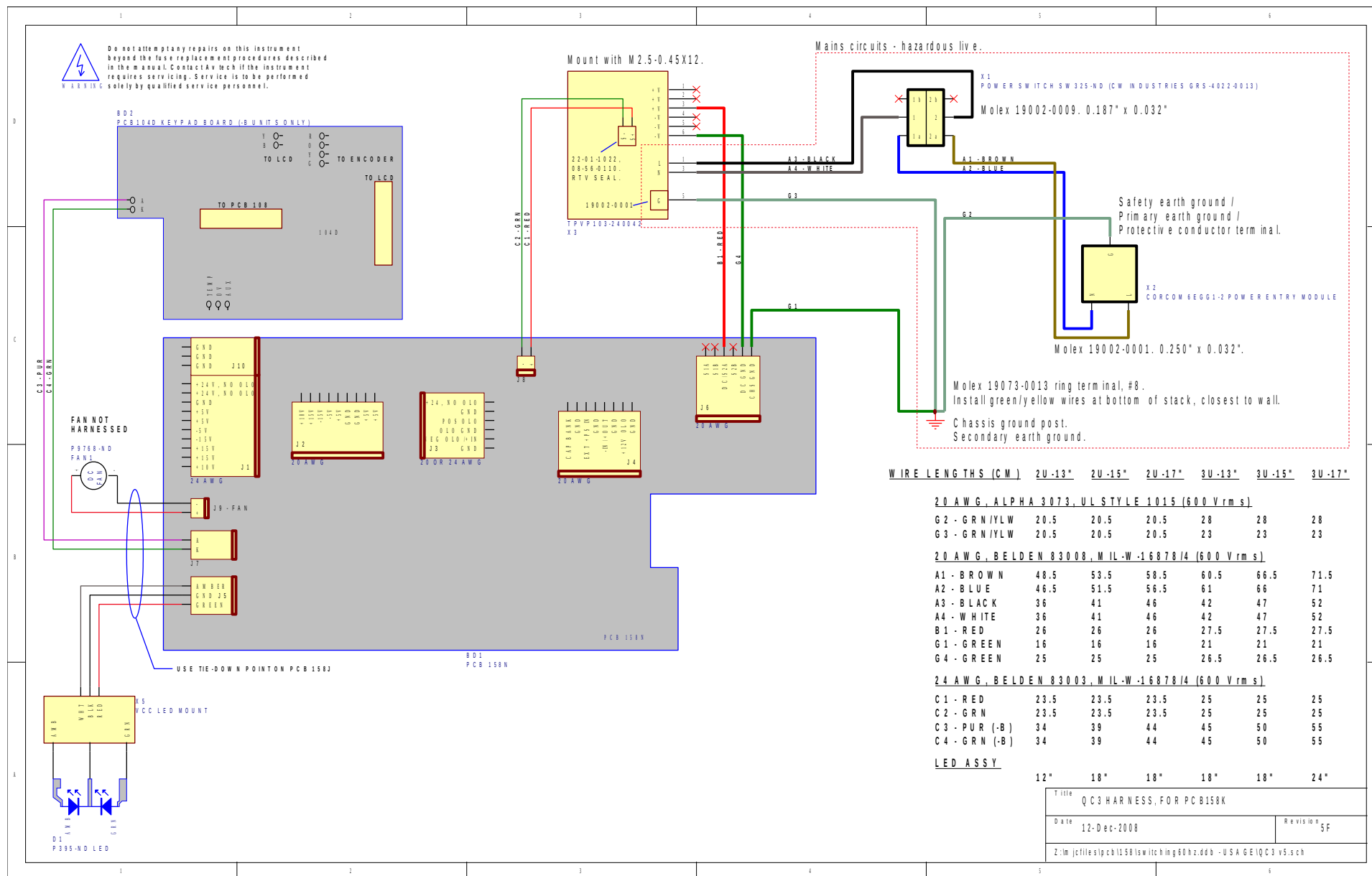
On occasion, one or more of the four rear-panel fuses may require replacement. All fuses can be accessed from the rear panel. See the “FUSES” section for details.

CLEANING

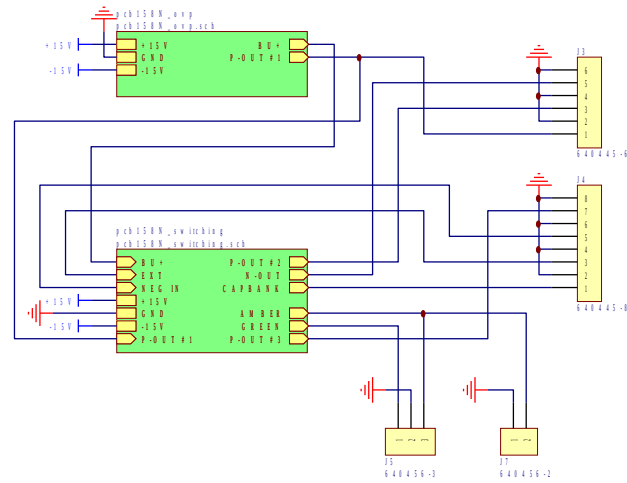
If desired, the interior of the instrument may be cleaned using compressed air to dislodge any accumulated dust. (See the “TOP COVER REMOVAL” section for instructions on accessing the interior.) No other cleaning is recommended.

WIRING DIAGRAMS

WIRING OF AC POWER

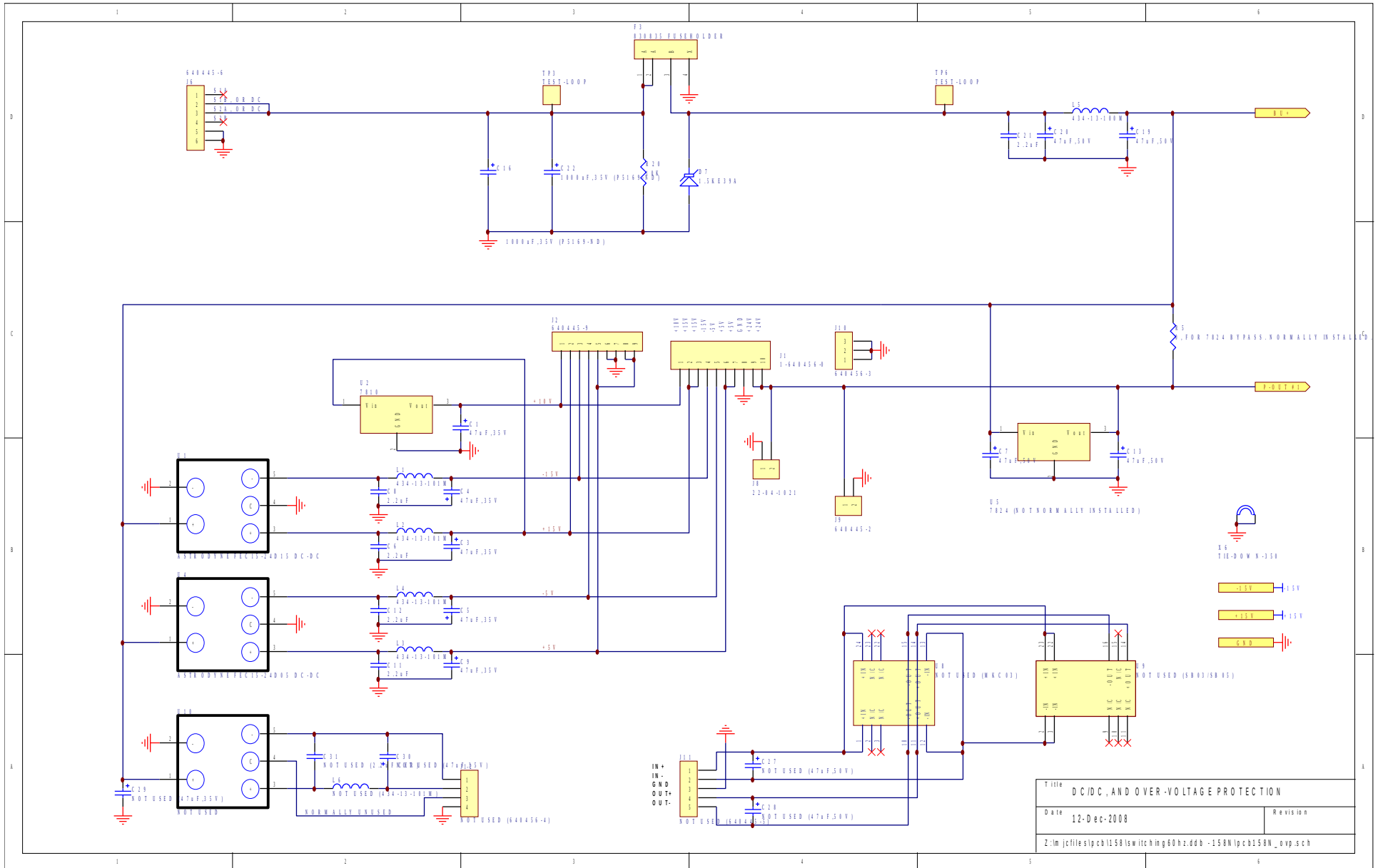


PCB 158N - LOW VOLTAGE POWER SUPPLY, 1/3

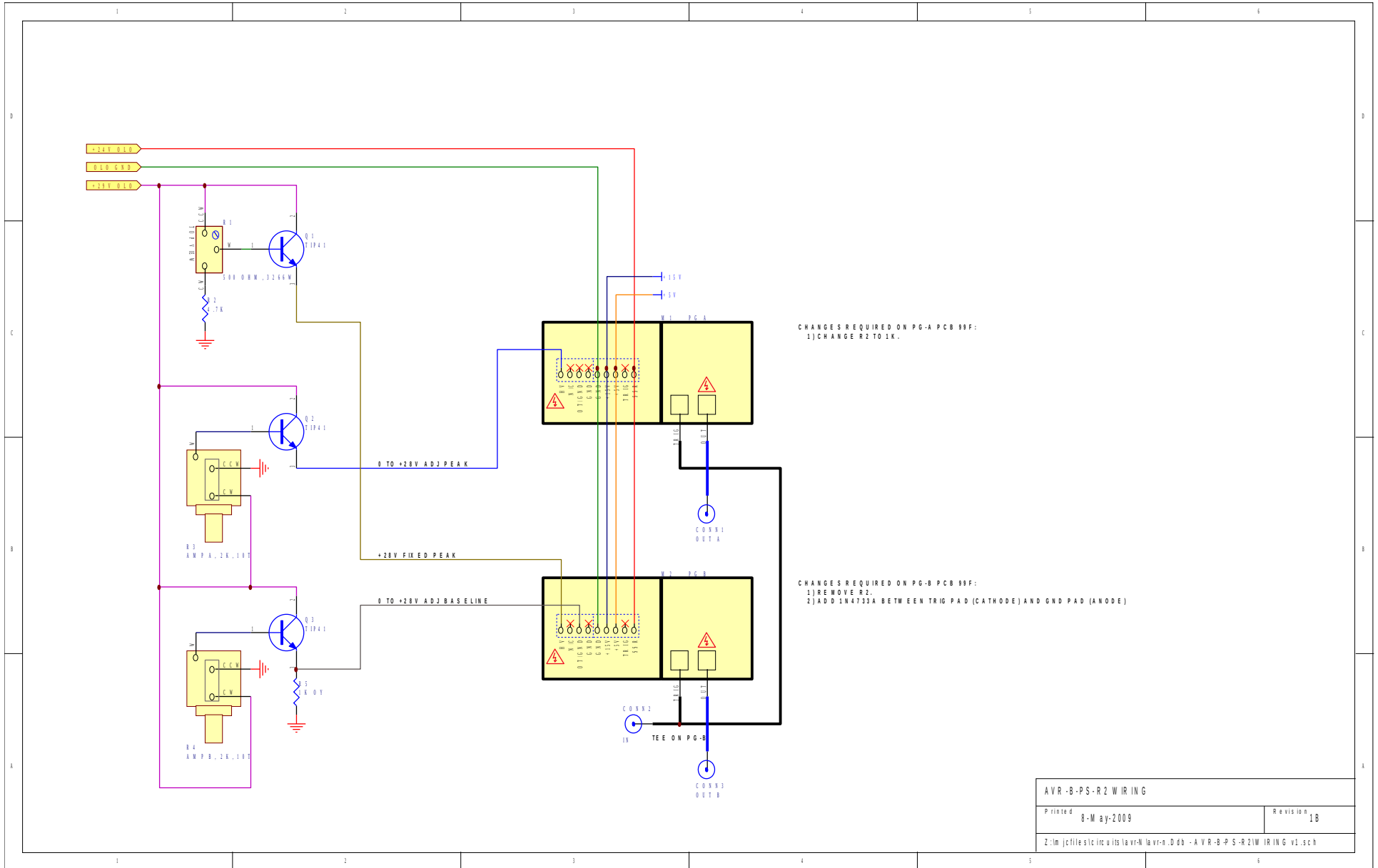


Title		LOW VOLTAGE DC/DC POWER SUPPLY
Date	12-Dec-2008	Revision
Z:\lm\jcr\files\pcb158\switching\60hz.ddb - 158N\pcb158N.sch		

PCB 158N - LOW VOLTAGE POWER SUPPLY, 2/3



MAIN WIRING



PERFORMANCE CHECK SHEET