AVTECH ELECTROSYSTEMS LTD.

NANOSECOND WAVEFORM ELECTRONICS
SINCE 1975

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

INSTRUCTIONS

MODEL AVP-AV-1S-C-EA-EW-HITA

1 TO 5 VOLTS, 10 kHz

HIGH SPEED PULSE GENERATOR

WITH 40 ps RISE TIME

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 dissembled, 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

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Manual Reference: /fileserver1/officefiles/instructword/avp/AVP-AV-1S-C-EA-EW-HITA,ed1.odt.
Last modified February 29, 2024.

INTRODUCTION

The AVP-AV-1S-C-EA-EW-HITA is a high performance instrument capable of generating up to 5V into 50Ω loads at repetition rates up to 10 kHz. The rise and fall times (20%-80%) are less than 500 ps. The pulse width is variable from 1 to 10 ns.

The output polarity is switchable from pulse to pulse, using an externally-generated TTL-level control signal. The input impedance is 50 Ohms. The input connector is BNC. A TTL-high control signal will correspond to the positive polarity mode, and a TTL-low control signal will correspond to the negative polarity mode. This control signal should not change within 100ns of an input trigger pulse (before, after, or during), or false triggering may occur.

The output is designed to drive 50Ω loads. (A 50Ω load is required for proper operation.) The output is AC-coupled.

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

ORIGINAL QUOTATION

Date: Tue, 08 Feb 2011 13:04:49 -0500
From: Avtech Sales
To: XXXXX
Subject: Re: Avtech bipolar pulser

XXXXX,

I am pleased to quote as follows:

Quote number: 15552

Model number: AVP-AV-1S-C-EA-EW-HITA

Description: Customized Ultra High Speed Pulse Generator

Triggering: Requires an external TTL-level trigger source (50 ns or wider). The input impedance is 50 Ohms. The input connector is BNC.

Polarity: Switchable from pulse to pulse, using an externally-generated TTL-level control signal. The input impedance is 50 Ohms. The input connector is BNC. A TTL-high control signal will correspond to the positive polarity mode, and a TTL-low control signal will correspond to the negative polarity mode. This control signal should not change within 100ns of an input trigger pulse (before, after, or during), or false triggering may occur.

Amplitude: 1V to 5V, adjustable using a one-turn front-panel knob, or by a 0 to +10V control voltage applied to a rear-panel BNC connector (-EA option).

Pulse width (FWHM): 1 to 10 ns, adjustable using a one-turn front-panel knob, or by a 0 to +10V control voltage applied to a rear-panel BNC connector (-EW option).

Maximum PRF: 10 kHz

Rise and fall times (20%-80%): < 500 ps

Output connector: one SMA female connector

AC power requirement: 100-240 V, 50-60 Hz

Dimensions: 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. (Customers who wish to order from an authorized US reseller to avoid international shipping can contact Sales@Testequipmentconnection.com for an alternative quotation.)

Quote valid for: 8 weeks

Terms: Net 30 days.

Note: Orders with Avtech are non-cancelable, non-refundable. Avtech does not offer returns, due to the highly-specialized low-volume nature of our instruments.

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

End Use Statement: An "End Use Statement - Low Speed Models" form must be completed when ordering, to determine if any special export control regulations apply. We can not process your order without this information. The necessary form is attached (in PDF format), and is also available at:
http://www.avtechpulse.com/end-use/EndUseStatement,LowSpeed,v7.pdf

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

Thank you for your interest in our products!

Regards,

Dr. Michael J. Chudobiak
Chief Engineer

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

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www.avtechpulse.com

SPECIFICATIONS

Model:	AVP-AV-1S-C-EA-EW-HITA
Amplitude[1,2]: (50 Ohm load)	1 - 5 Volts
Pulse width (FWHM)[1]:	1 – 10 ns
PRF: external trigger mode:	0 Hz to 10 kHz
internal trigger mode:	1 Hz to 10 kHz
Rise time (20%-80%):	≤ 500 ps
Fall time (80%-20%):	≤ 500 ps
Polarity:	Switchable from pulse to pulse, using an externally-generated TTL-level control signal. The input impedance is 50 Ohms. The input connector is BNC. A TTL-high control signal will correspond to the positive polarity mode, and a TTL-low control signal will correspond to the negative polarity mode. This control signal should not change within 100ns of an input trigger pulse (before, after, or during), or false triggering may occur.
Required load impedance:	50 Ohms[3]
Propagation delay:	≤ 70 ns (Ext trig in to pulse out)
Jitter, Ext trig in to pulse out:	±15 ps
Trigger required:	Ext trig mode: +5 Volt, 50 ns to 500 ns (TTL)
Sync delay:	Variable 0 to 500 ns (sync out to pulse out)
Connectors: OUT: TRIG:	SMA BNC
Power requirement:	100 - 240 Volts, 50 - 60 Hz
Dimensions (H x W x D):	100 mm x 430 mm x 375 mm (3.9” x 17” x 14.8”)
Chassis material:	Anodized aluminum, with blue plastic trim
Temperature range:	+5°C to +40°C

1) For analog electronic control (0 to +10V) of amplitude or pulse width suffix model number with -EA or -EW. Electronic control units also include standard front-panel controls.
2) For operation at amplitudes of less than 20% of full-scale, best results will be obtained by setting the amplitude near full-scale and using external attenuators on the output.
3) A 50 Ohm load is required. Other loads may damage the instrument. Consult Avtech (info@avtechpulse.com) if you need to drive other load impedances.

REGULATORY NOTES

FCC PART 18

This device complies with part 18 of the FCC rules for non-consumer industrial, scientific and medical (ISM) equipment.

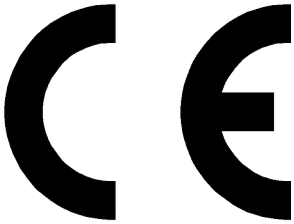
This instrument is enclosed in a rugged metal chassis and uses a filtered power entry module. The main output signal is provided on a shielded connector that is intended to be used with shielded coaxial cabling and a shielded load. Under these conditions, the interference potential of this instrument is low.

If interference is observed, check that appropriate well-shielded cabling is used on the output connectors. Contact Avtech (info@avtechpulse.com) for advice if you are unsure of the most appropriate cabling. Also, check that your load is adequately shielded. It may be necessary to enclose the load in a metal enclosure.

If any of the connectors on the instrument are unused, they should be covered with shielded metal “dust caps” to reduce the interference potential.

This instrument does not normally require regular maintenance to minimize interference potential. However, if loose hardware or connectors are noted, they should be tightened. Contact Avtech (info@avtechpulse.com) if you require assistance.

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)

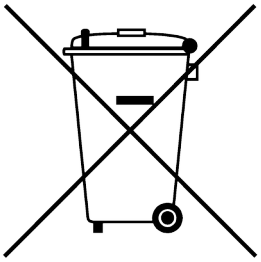
This instrument is exempt from Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the Restriction of the use of certain Hazardous Substances (RoHS) in electrical and electronic equipment. Specifically, Avtech instruments are considered "Monitoring and control instruments" (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 with 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	Option	Manufacturer	Part Number
United Kingdom, Hong Kong, Singapore, Malaysia	BS 1363, 230V, 50 Hz	-AC00	Qualtek	370001-E01
Australia, New Zealand	AS 3112:2000, 230-240V, 50 Hz	-AC01	Qualtek	374003-A01
Continental Europe, Korea, Indonesia, Russia	European CEE 7/7 “Schuko” 230V, 50 Hz	-AC02	Qualtek	364002-D01
North America, Taiwan	NEMA 5-15, 120V, 60 Hz	-AC03	Qualtek	312007-01
Switzerland	SEV 1011, 230V, 50 Hz	-AC06	Qualtek	378001-E01
South Africa, India	SABS 164-1, 220-250V, 50 Hz	-AC17	Volex	2131H 10 C3
Japan	JIS 8303, 100V, 50-60 Hz	-AC18	Qualtek	397002-01
Israel	SI 32, 220V, 50 Hz	-AC19	Qualtek	398001-01
China	GB 1002-1, 220V, 50 Hz	-AC22	Volex	2137H 10 C3

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.

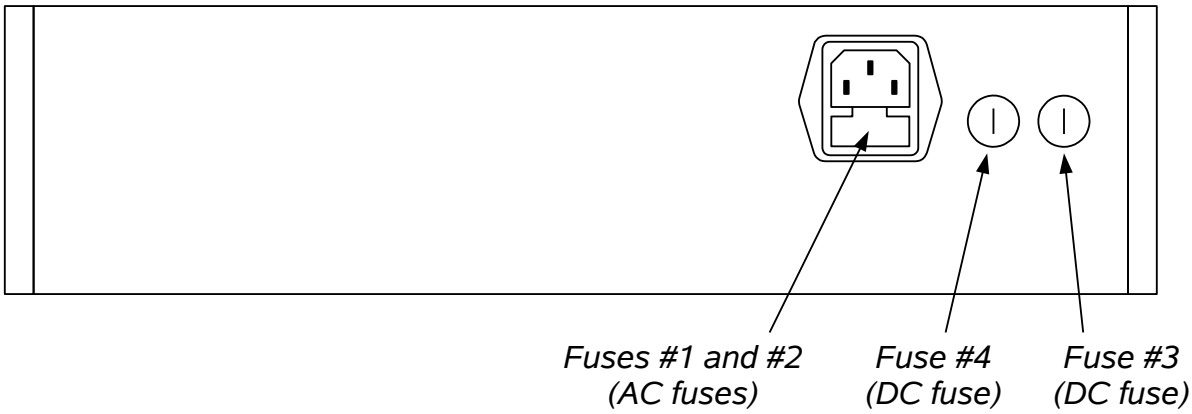
ENVIRONMENTAL CONDITIONS

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.

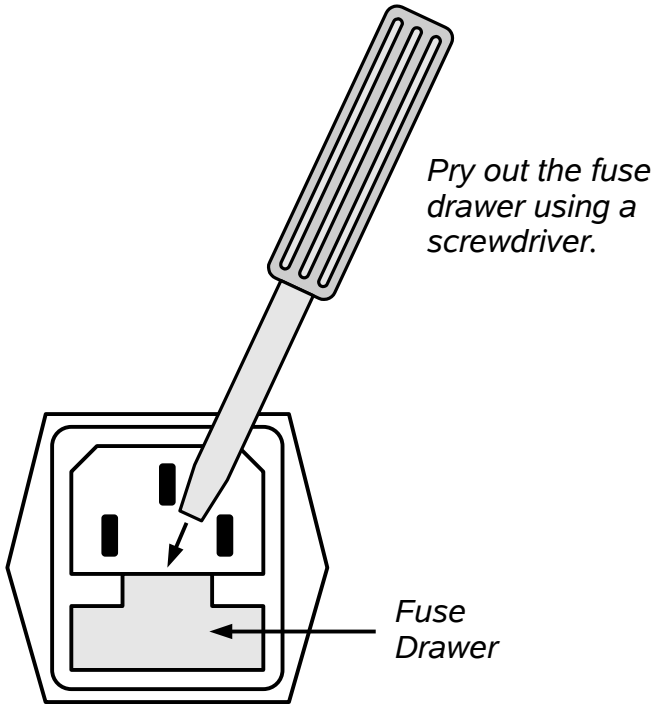
FUSES

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

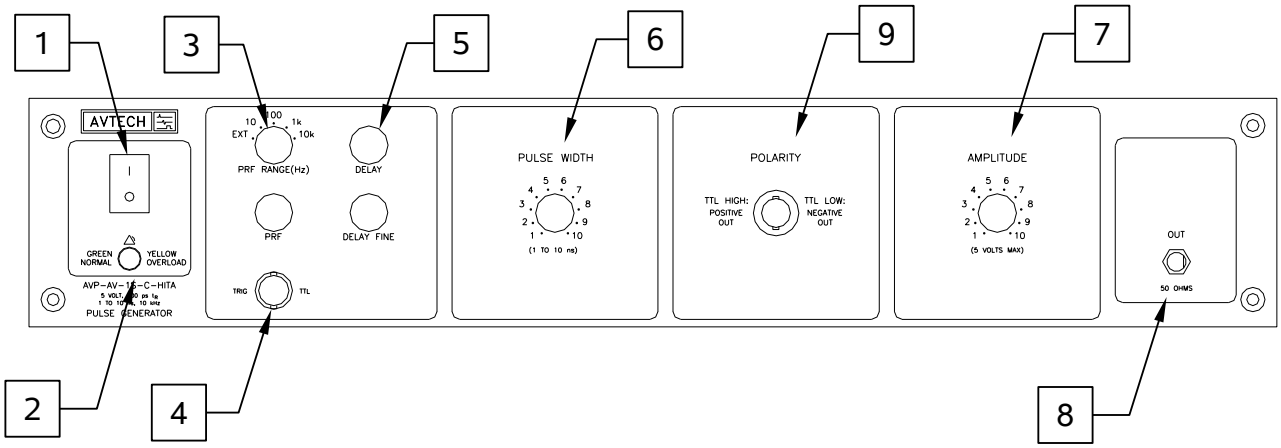
The following table lists the required fuses:

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	0.8A, 250V, Time-Delay	5×20 mm	0218.800HXP	F2418-ND
#4 (DC)	N/A	0.5A, 250V, Time-Delay	5×20 mm	0218.500HXP	F2416-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) PRF Range Switch. This switch sets the pulse repetition frequency (PRF) range of the internal oscillator. The marked value of each position is the upper limit of the 10:1 range, approximately. The vernier dial directly below the switch varies the PRF within the set range.

   If this switched is set to the “EXT” position, the instrument is triggered by a signal applied to the TRIG connector, rather than by the internal oscillator.

4) TRIG Connector. When the PRF Range Switch is set to “EXT”, the instrument is triggered by a TTL pulse applied to this connector. The pulse must be at least 50 ns wide.

   When the PRF Range Switch is set to one of the four internal oscillator ranges, this connector is an output, which supplies a 2V, 200 ns wide pulse for each trigger

event. This output may be used to trigger oscilloscopes or other equipment.

5) Delay Controls. When the PRF Range Switch is set to one of the four internal oscillator ranges, the main output is advanced or delayed relative to the TRIG output pulse (item 3). The delay is variable up to 200 ns, approximately, using the DELAY and DELAY FINE dials.

6) Pulse Width Control. This dial controls the pulse width of Output "A" (item 8).

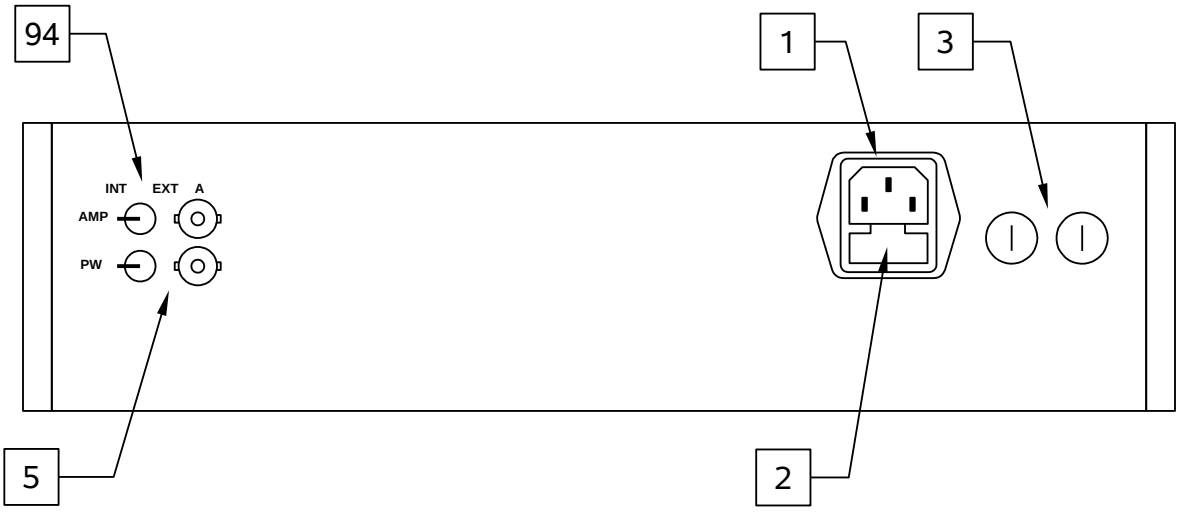
7) Amplitude Control. This dial controls the amplitude of Output "A" (item 8).

8) OUT Connector. This SMA connector provides the main output. This output *requires* a 50Ω load to function properly.

9) Polarity Connector. The output polarity is switchable from pulse to pulse, using an externally-generated TTL-level control signal applied to this connector. The input impedance is 50 Ohms. The input connector is BNC. A TTL-high control signal will correspond to the positive polarity mode, and a TTL-low control signal will correspond to the negative polarity mode. This control signal should not change within 100ns of an input trigger pulse (before, after, or during), or false triggering may occur.

   If no signal is applied to this connector, the output polarity will default to negative.

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.

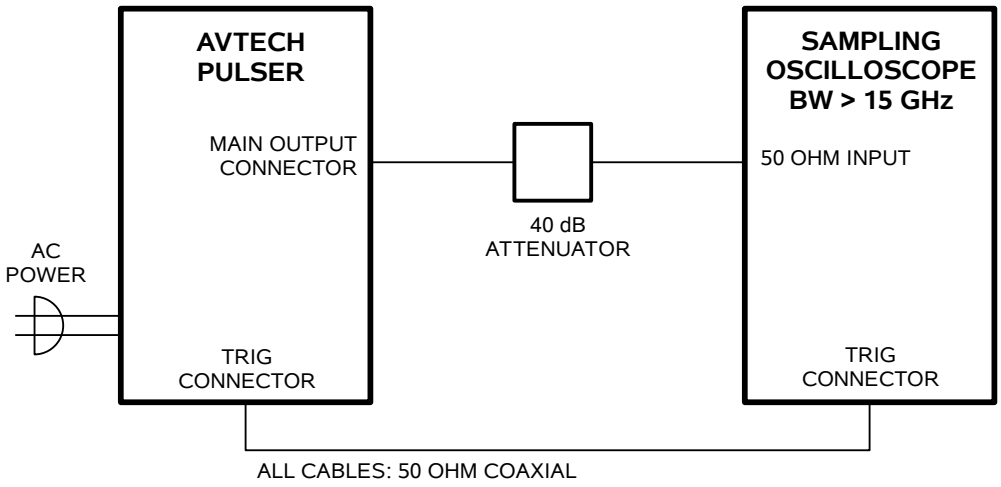
4. AMP SWITCH & INPUT. (Present on units with -EA option only.) To control the output amplitude with an external voltage, set the rear-panel switch to the “EXT” position and apply 0 to +10V to the adjacent connector ($R_{IN} \geq 10k\Omega$).

5. PW SWITCH & INPUT. (Present on units with -EW option only.) To control the output pulse width with an external voltage, set the rear-panel switch to the “EXT” position and apply 0 to +10V to the adjacent connector ($R_{IN} \geq 10k\Omega$).

GENERAL INFORMATION

BASIC TEST ARRANGEMENT

The AVP-AV-1S-C-EA-EW-HITA should be tested with a sampling oscilloscope with a bandwidth of at least 15 GHz to properly observe the high-speed waveform. (The cables and attenuators must also have a bandwidth of at least 15 GHz.) A typical test arrangement is shown below:



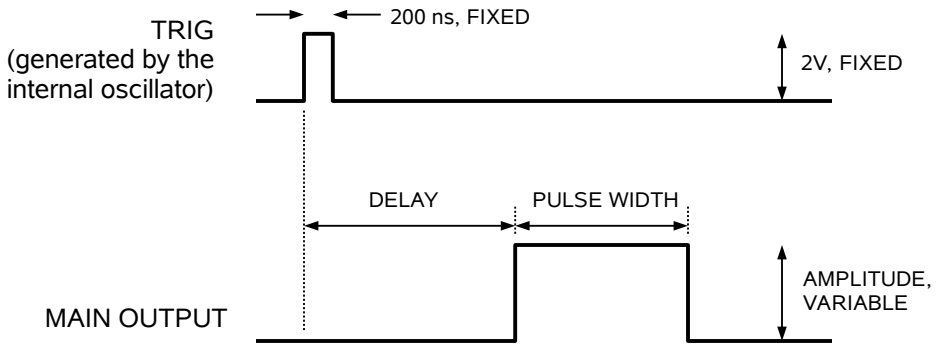
The attenuators are required to prevent damage to the sampling oscilloscope. A 40 dB attenuator with sufficient voltage rating should be used on the main output.

BASIC PULSE CONTROL

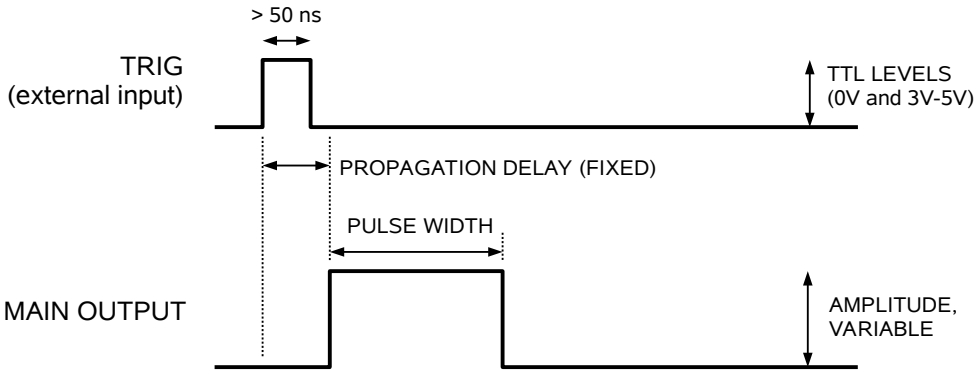
This instrument can be triggered by its own internal clock or by an external TTL trigger signal. When triggered internally, two mainframe output channels respond to the trigger: OUT and SYNC.

- OUT. This is the main output. The maximum output voltage is 5V.
- TRIG. The TRIG pulse is a fixed-width TTL-level reference pulse used to trigger oscilloscopes or other measurement systems.

The TRIG output precedes the main output. These pulses are illustrated below:



When triggered externally, the TRIG connector acts as an input. The delay controls do not function in this mode. This illustrated below:



AMPLITUDE INTERACTION

Some properties of the output pulse may change as a function of the amplitude setting. For some demanding applications, it may be desirable to use a combination of external attenuators and the amplitude pot to achieve the desired output amplitude.

POLARITY CONTROL

The output polarity is switchable from pulse to pulse, using an externally-generated TTL-level control signal applied to the front-panel polarity connector. The input impedance is 50 Ohms. The input connector is BNC. A TTL-high control signal will correspond to the positive polarity mode, and a TTL-low control signal will correspond to the negative polarity mode. This control signal should not change within 100ns of an input trigger pulse (before, after, or during), or false triggering may occur.

MINIMIZING WAVEFORM DISTORTIONS

USE 50Ω TRANSMISSION LINES AND LOADS

Connect the load to the pulse generator with 50Ω transmission lines (e.g. RG-58 or RG-174 cable).

This instrument requires a 50Ω load for proper operation. It will not properly drive a high-impedance load. The output stage will be damaged if it is operated into an open circuit (or any other high impedance). Failures due to improper output loading are not covered by the warranty.

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, $V_{SPIKE} = L \times dI_{LOAD}/dt$, 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.

PREVENTING DAMAGE

The AVP-AV-1S-C-EA-EW-HITA may fail if triggered at a PRF greater than 10 kHz.

This unit is designed to operate into a load impedance of 50 Ohms and the output stage will be damaged if it is operated into an open circuit (or any other high impedance). Failures due to improper output loading are not covered by the warranty.

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.

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 before opening the instrument.

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.

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

ELECTROMAGNETIC INTERFERENCE

To prevent electromagnetic interference with other equipment, all used outputs should be connected to shielded 50Ω loads using shielded 50Ω coaxial cables. Unused outputs should be terminated with shielded 50Ω 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.

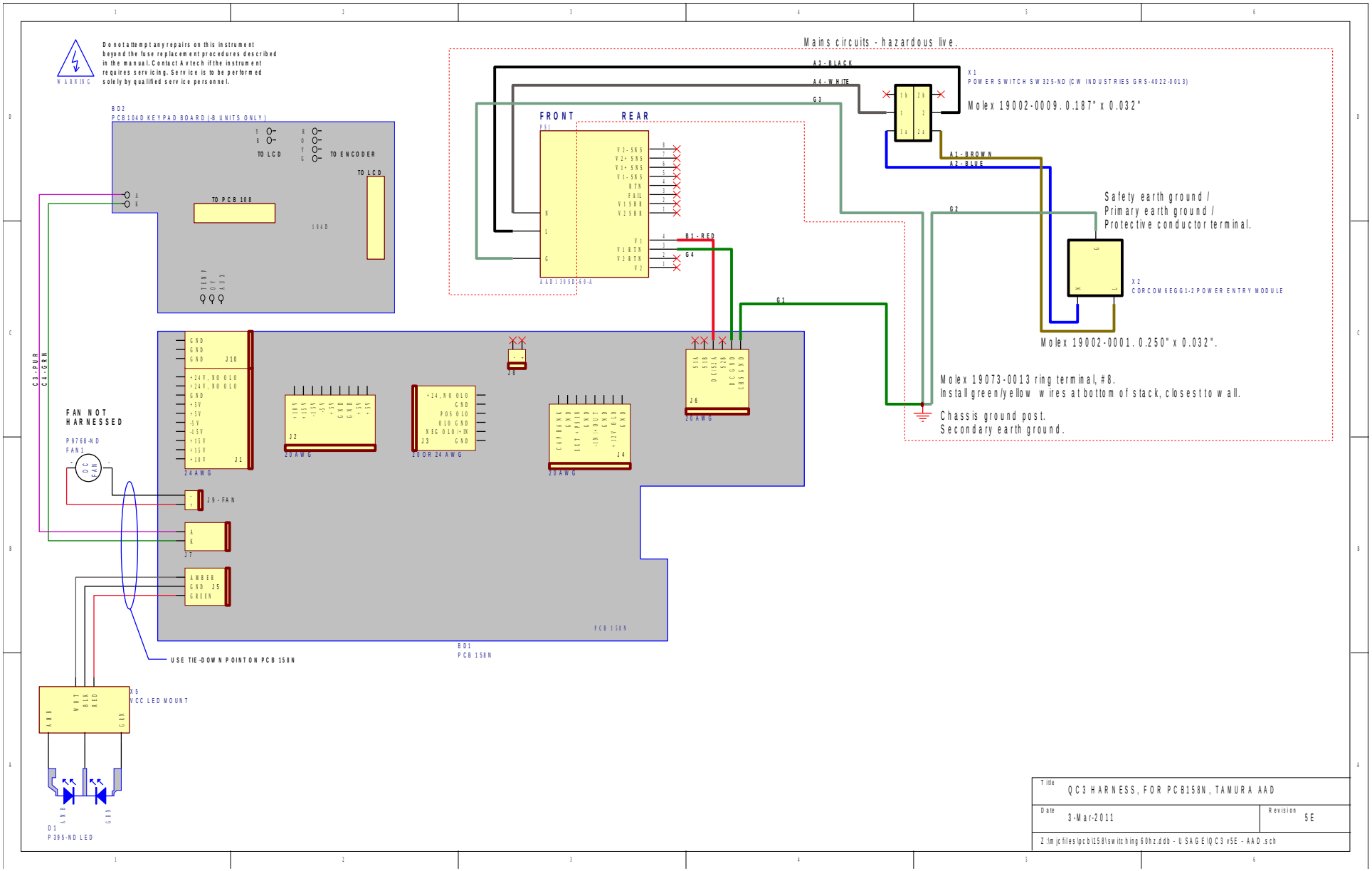
On occasion, one or more of the four rear-panel fuses may require replacement. All fuses can be accessed from the rear panel. See the “FUSES” section for details.

CLEANING

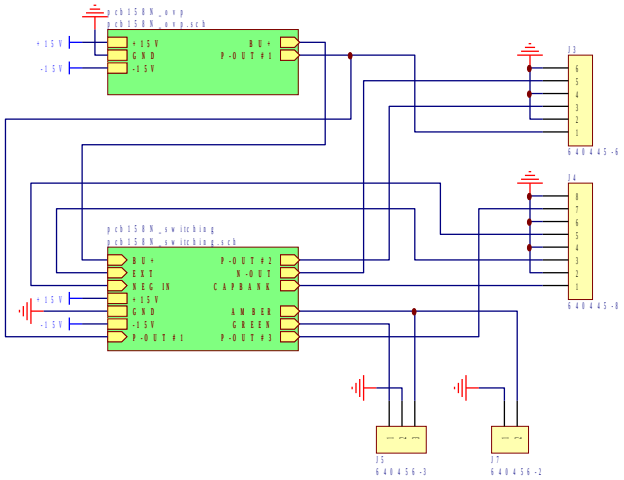
If desired, the interior of the instrument may be cleaned using compressed air to dislodge any accumulated dust. (See the “TOP COVER REMOVAL” section for instructions on accessing the interior.) No other cleaning is recommended.

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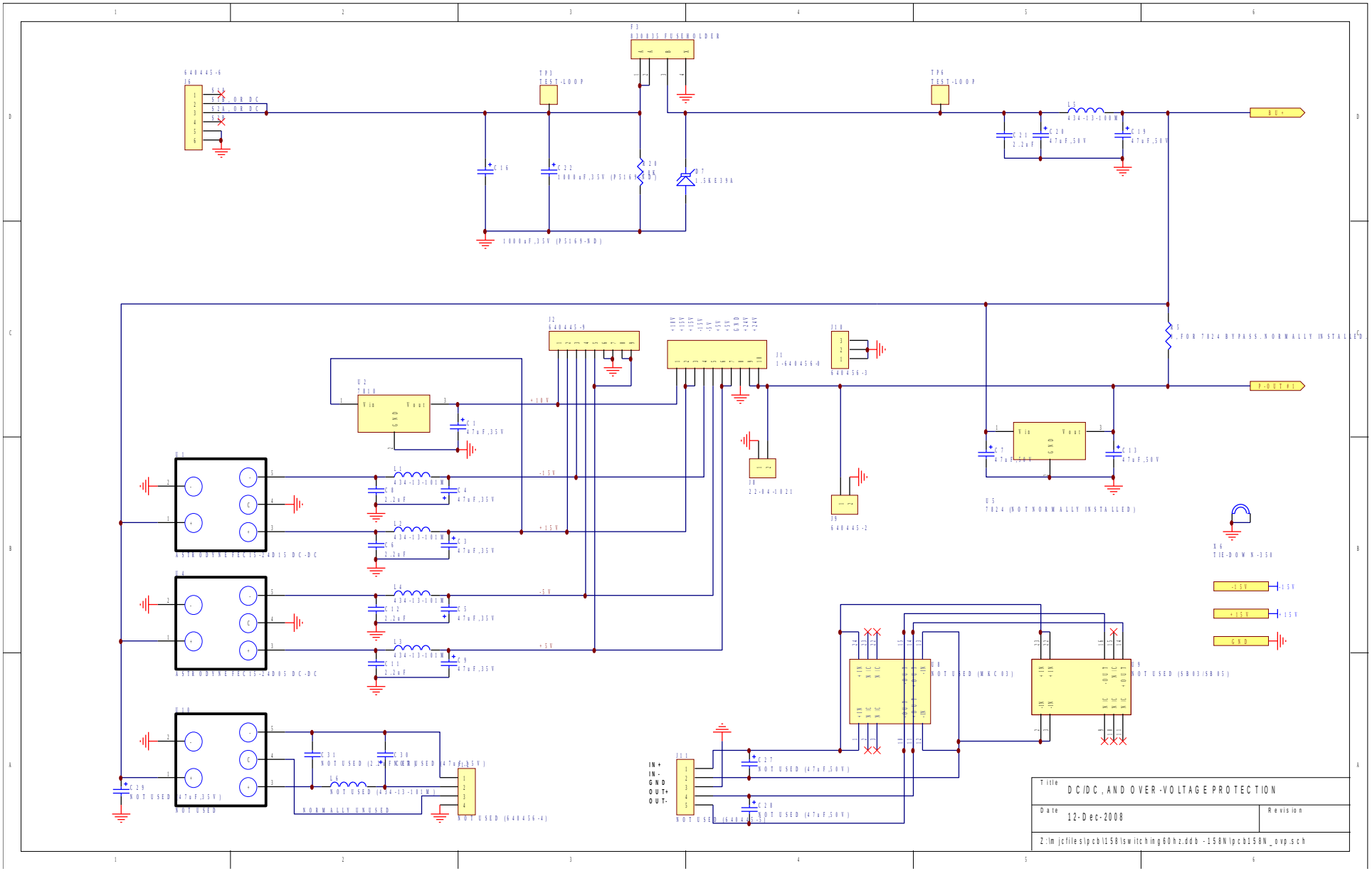
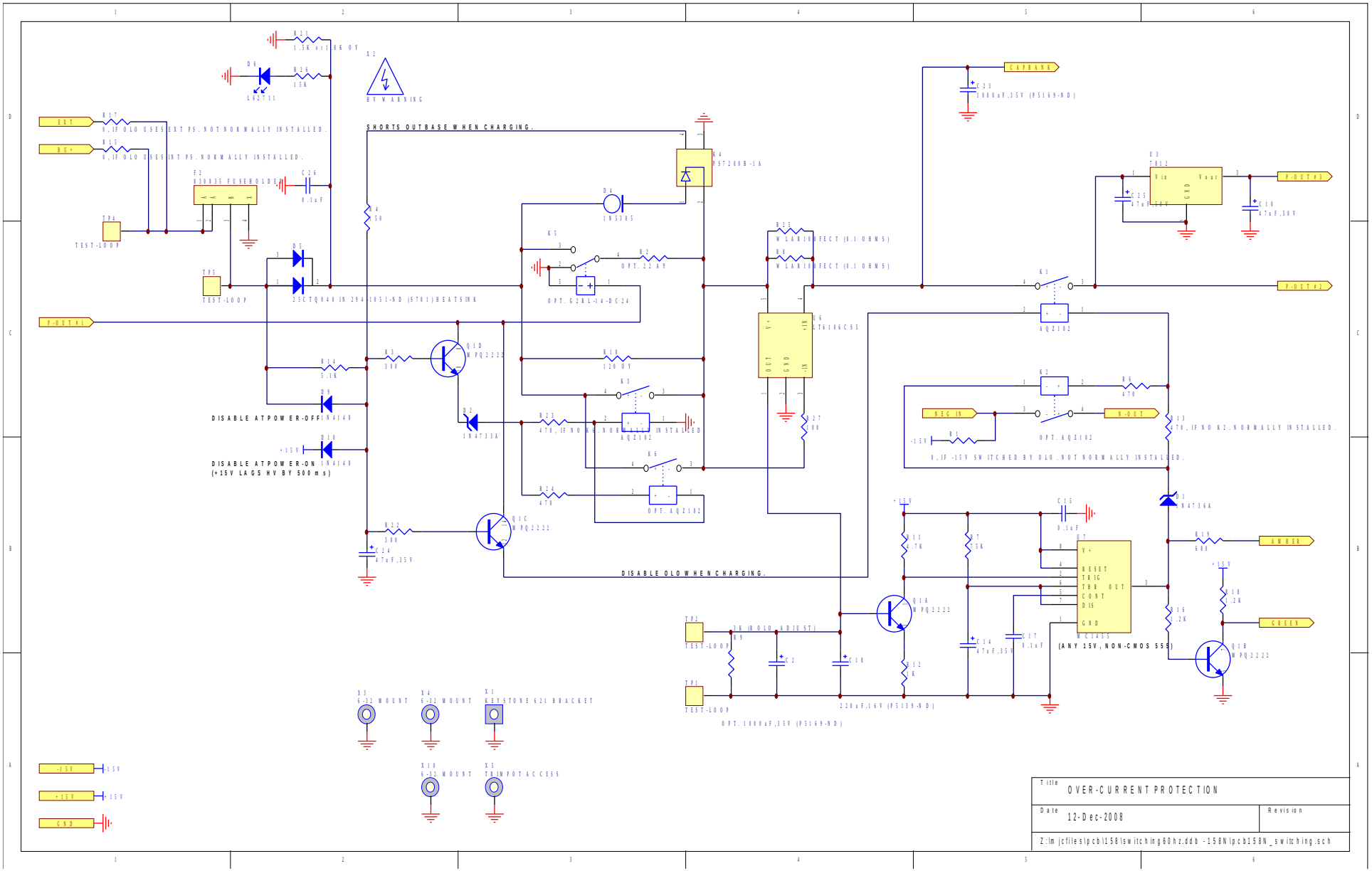
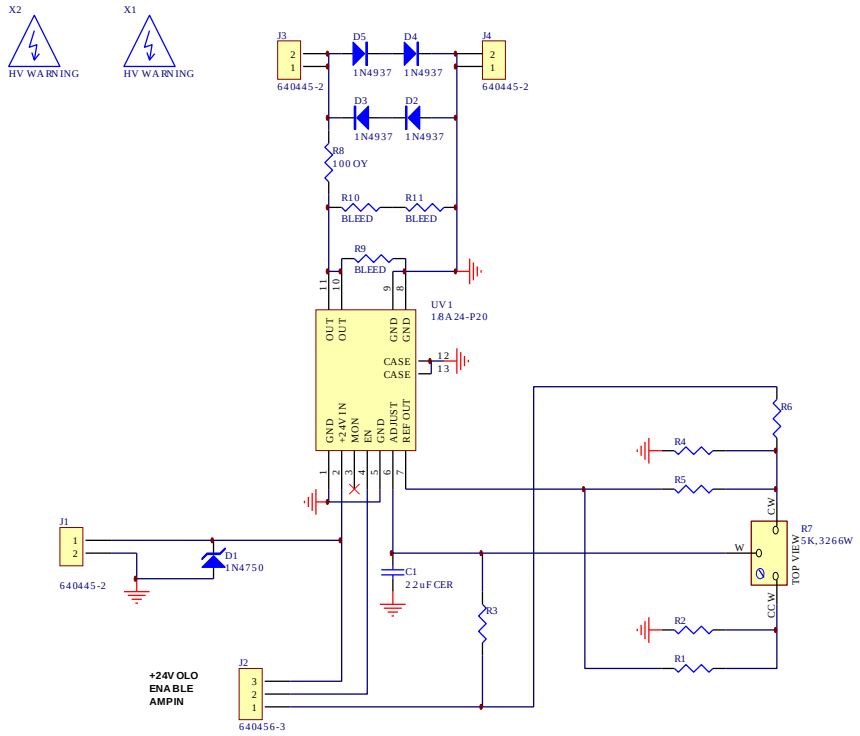
PCB 158N - LOW VOLTAGE POWER SUPPLY, 2/3



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

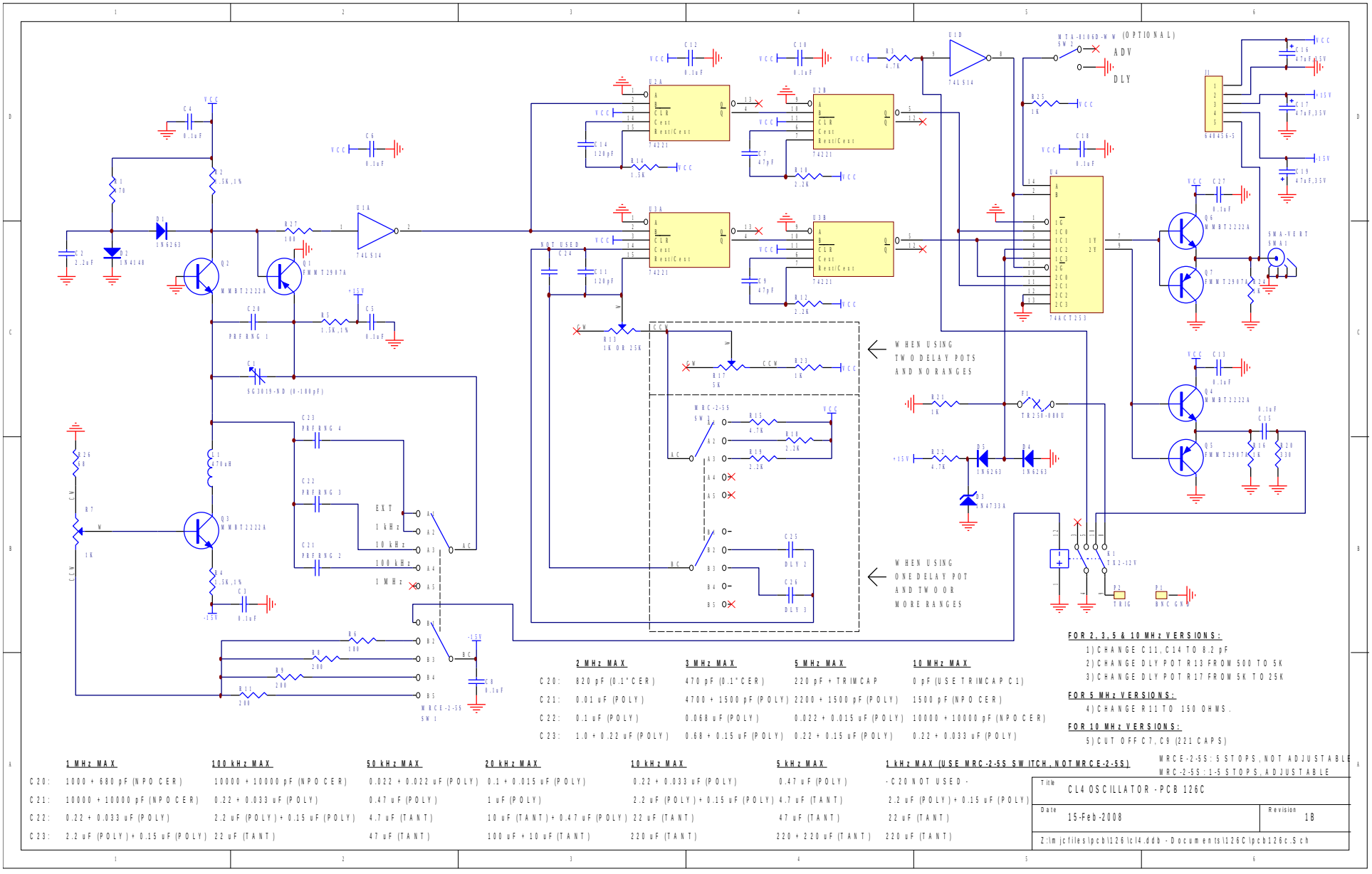


PCB 168B - HIGH VOLTAGE DC POWER SUPPLY



Title	UV-A CONTROL PCB
Date	3-Nov-2005
Revision	1
Z:\mjcfiles\pcb\168\UV-A control\UV-A control.ddb - 168B\PCB168B.sch	

PCB 126C - OSCILLATOR AND TRIGGER CIRCUIT



	2 MHz MAX	3 MHz MAX	5 MHz MAX	10 MHz MAX
C20:	820 pF (0.1" CER)	470 pF (0.1" CER)	220 pF + TRIMCAP	0 pF (USE TRIMCAP C1)
C21:	0.01 uF (POLY)	4700 + 1500 pF (POLY)	2200 + 1500 pF (POLY)	1500 pF (NPO CER)
C22:	0.1 uF (POLY)	0.068 uF (POLY)	0.022 + 0.015 uF (POLY)	10000 + 10000 pF (NPO CER)
C23:	1.0 + 0.22 uF (POLY)	0.68 + 0.15 uF (POLY)	0.22 + 0.15 uF (POLY)	0.22 + 0.033 uF (POLY)

FOR 2, 3, 5 & 10 MHz VERSIONS:

1) CHANGE C11, C14 TO 8.2 pF
2) CHANGE DLY POT R13 FROM 500 TO 5K
3) CHANGE DLY POT R17 FROM 5K TO 25K

FOR 5 MHz VERSIONS:

4) CHANGE R11 TO 150 OHMS.

FOR 10 MHz VERSIONS:

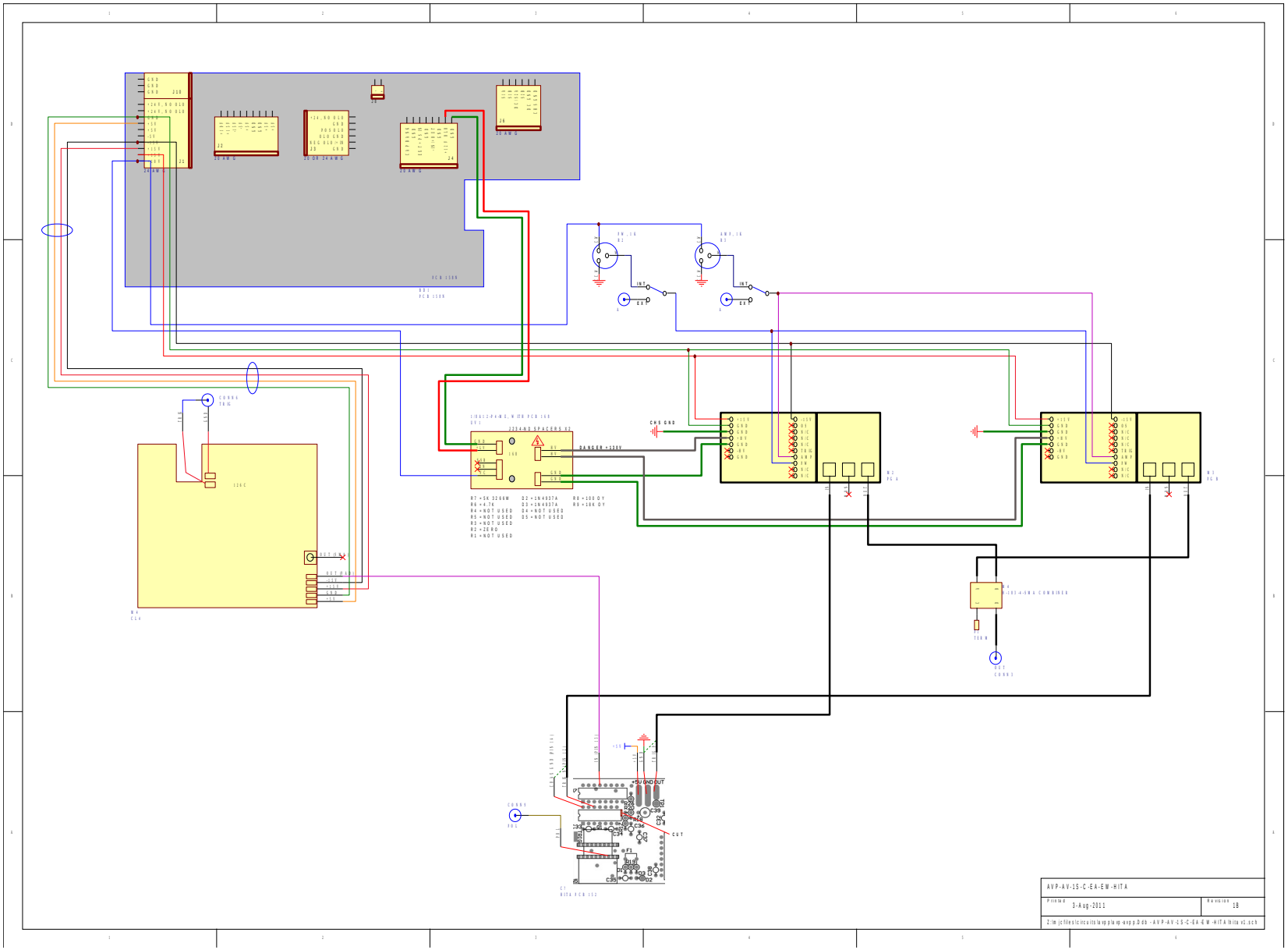
5) CUT OFF C7, C9 (221 CAPS)

	1 MHz MAX	100 kHz MAX	50 kHz MAX	20 kHz MAX	10 kHz MAX	5 kHz MAX	1 kHz MAX (USE MRC-2-5S SWITCH. NOT MRCE-2-5S)
C20:	1000 + 680 pF (NPO CER)	10000 + 10000 pF (NPO CER)	0.022 + 0.022 uF (POLY)	0.1 + 0.015 uF (POLY)	0.22 + 0.033 uF (POLY)	0.47 uF (POLY)	- C20 NOT USED -
C21:	10000 + 10000 pF (NPO CER)	0.22 + 0.033 uF (POLY)	0.47 uF (POLY)	1 uF (POLY)	2.2 uF (POLY) + 0.15 uF (POLY)	4.7 uF (TANT)	2.2 uF (POLY) + 0.15 uF (POLY)
C22:	0.22 + 0.033 uF (POLY)	2.2 uF (POLY) + 0.15 uF (POLY)	4.7 uF (TANT)	10 uF (TANT) + 0.47 uF (POLY)	22 uF (TANT)	47 uF (TANT)	22 uF (TANT)
C23:	2.2 uF (POLY) + 0.15 uF (POLY)	22 uF (TANT)	47 uF (TANT)	100 uF + 10 uF (TANT)	220 uF (TANT)	220 + 220 uF (TANT)	220 uF (TANT)

MRCE-2-5S: 5 STOPS, NOT ADJUSTABLE
MRC-2-5S: 1-5 STOPS, ADJUSTABLE

Title	CL4 OSCILLATOR - PCB 126C
Date	15-Feb-2008
Revision	18
	Z:\mjcfiles\pcb\126\cl4.ddb - Documents\126C\pcb126c.Sch

MAIN WIRING



PERFORMANCE CHECK SHEET