INSTRUCTIONS

MODEL AVR-3-PW-C-P-TEK2

0 TO +250 VOLTS, 0 TO +5 AMPS
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 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

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Manual Reference: /fileserver1/officefiles/instructword/avr-3/AVR-3-PW-C-P-TEK2ede.doc, created April 30, 2002

INTRODUCTION & SPECIFICATIONS

Model AVR-3-PW-C-P-TEK2 is a special order item which was custom designed for Tektronix, for the testing of current probes (such as the A6303 probe). Specifications are as follows:

Model designation:	AVR-3-PW-C-P-TEK2
Description:	The AVR-3-PW-C-TEK2 generates a 10 ns rise time voltage pulse (0 to +250 Volts, 0.25 to 250 µs), which is accessible at the front panel OUT terminal. A shorting bar is connected between the OUT and IN terminals and the current probe is placed over the shorting bar. The IN terminal connects to ground via a 50 Ohm termination. A variable current of up to 5.0 Amperes is defined by the 250 Volt pulse and the 50-Ohm termination. For other applications, the OUT terminal may be used to pulse a user-supplied 50 Ohm load, if desired. In this case, the shorting bar and the "IN" terminal are not used.
Output Amplitude:	0 to +250 Volts to $R_L \geq 50$ Ohms (ie 5 amperes peak current). Ten-turn locking dial control.
Output pulse width:	250 ns to 250 us. 3-position range switch and ten-turn fine control.
Output connectors:	Two SMA connectors. Output Shorting bar connects between two connectors. Tektronix probe clips over this shorting bar.
Rise, fall time:	$\leq$ 10 ns
Max duty cycle:	0.25 % (eg PRF max 25 Hz for PW=250 us).
Overshoot at max output:	$\leq$ 5%
Droop (at max pulse width):	$\leq$ 2%
Chassis:	3.9" x 17" x 14.8"
Other:	See standard AVR-3-C, pages 43 and 44 Cat. No. 11

Model AVR-3-PW-C-TEK2 is modelled on our standard product model AVR-3-C-P (see Cat 11 pages 43 and 44 or http://www.avtechpulse.com/speed/avr-3).

INSTALLATION

VISUAL CHECK

After unpacking the instrument, examine to ensure that it has not been damaged in shipment. Visually inspect all connectors, knobs, and handles. Confirm that a power cord and the output shorting bar are with the instrument. If the instrument has been damaged, file a claim immediately with the company that transported the instrument.

PLUGGING IN THE INSTRUMENT

Examine the rear of the instrument. There will be a male power receptacle, a fuse holder and the edge of the power selector card visible. Confirm that the power selector card is in the correct orientation.

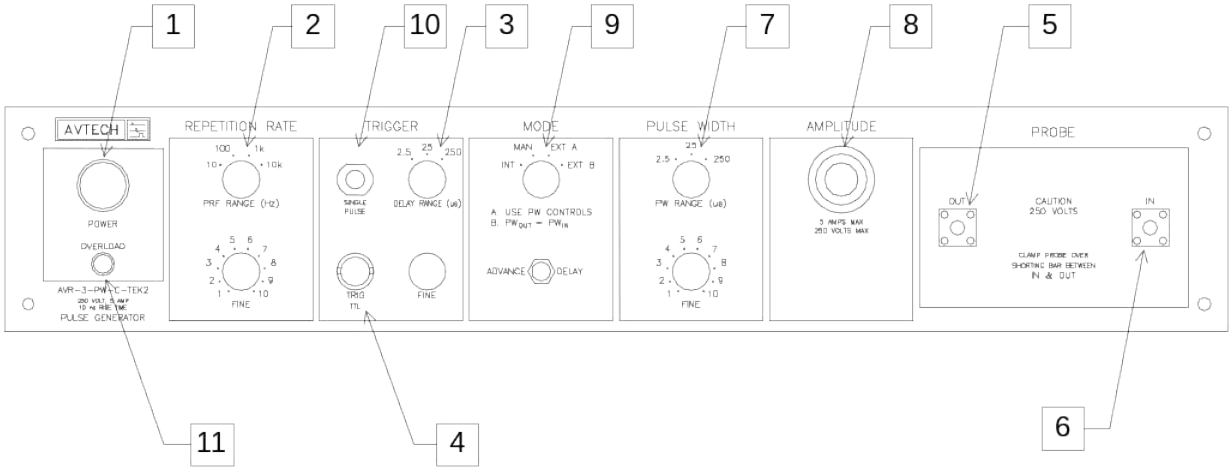
For AC line voltages of 110-120V, the power selector card should be installed so that the “120” marking is visible from the rear of the instrument, as shown below:

For AC line voltages of 220-240V, the power selector card should be installed so that the “240” marking is visible from the rear of the instrument, as shown below:

If it is not set for the proper voltage, remove the fuse and then grasp the card with a pair of pliers and remove it. Rotate horizontally through 180 degrees. Reinstall the card and the correct fuse.

In the 120V setting, a 0.5A slow blow fuse is required. In the 240V setting, a 0.25A slow blow fuse is required.

FRONT PANEL CONTROLS



1. POWER Switch. The POWER push button switch applies AC prime power to the primaries of the transformer, turning the instrument on. The push button lamp (#382 type) is connected to the internal +15V DC supply.

2. REPETITION RATE Controls. When triggering internally, the range switch sets the pulse repetition frequency of the internal oscillator to one of four range:

RANGE 1	1 Hz	-	10 Hz
RANGE 2	10 Hz	-	100 Hz
RANGE 3	100 Hz	-	1 kHz
RANGE 4	1 kHz	-	10 kHz

   The “FINE” knob varies the frequency within each range.

3. DELAY Control. Controls the relative delay between the reference output pulse provided at the TRIG output (4) and the main output (5). This delay is variable over the range of 0.25 to 250 us. The TRIG output precedes the main output when the ADVANCE-DELAY switch is in the ADVANCE position and lags when the switch is in the DELAY position.

4. TRIG Connector. When the MODE switch (item 9) is set to the “EXT” position, a TTL-level pulse applied to this connector will trigger the instrument. The instrument triggers on the rising edge of this input. The input impedance of this input is 1 kΩ. (Depending on the length of cable attached to this input, and the source driving it, it may be desirable to add a coaxial 50 Ohm terminator to this input to provide a proper transmission line termination. The Pasternack (www.pasternack.com) PE6008-50 BNC feed-thru 50 Ohm terminator is suggested for this purpose.)

When the MODE switch (item 8) is set to the “INT” position, this connector is used as an output that generates a 200 ns wide TTL-level pulse for each trigger event. This output can be used to trigger an oscilloscope, or other test equipment. The separation between the main output pulse and the TRIG output pulse is controlled by the DELAY controls and the ADVANCE/DELAY switch. For this output to operate correctly, the delay setting must be less than the period.

5. OUT Connector. SMA connector provides 0 to +250 Volt output to a 50-Ohm load. (5) and (6) are normally connected together via the shorting bar, as discussed in later sections of this manual.

6. IN Connector. This SMA input connects to the internal 50-Ohm load. (5) and (6) are normally connected together via the shorting bar, as discussed in later sections of this manual.

7. PW Control. A one-turn knob and three-position range switch vary the output pulse width from 0.25 us to 250 us. The minimum and maximum pulse width (PW) for each range and the corresponding maximum pulse repetition frequency (PRF) are as follows. Note that the unit may fail if operated at duty cycles exceeding 0.25%.

	PW min	PW max
Range 1 (PRF max)	0.25 us (10 kHz)	2.5 us (2.5 kHz)
Range 2 (PRF max)	2.5 us (2.5 kHz)	25 us (250 Hz)
Range 3 (PRF max)	25 us (250 Hz)	250 us (25 Hz)

8. AMP Control. This ten-turn locking dial varies the output pulse amplitude from 0 to +250 Volts (to 50 Ohms).

9. INT/MAN/EXT A/EXT B Mode Switch. With this switch in the INT position, the repetition rate of the unit is controlled by an internal oscillator, which in turn is controlled by the REPETITION RATE controls.

   With the switch in the EXT A position, the unit requires a 50 ns (or wider) TTL level pulse applied at the TRIG input in order to trigger the output stages. The output pulse width is set by the front-panel controls in this mode.

   With the switch in the EXT B position, the unit requires a 0.25-250 us wide TTL level pulse applied at the TRIG input in order to trigger the output stages. The output pulse width is equal to the input pulse width in this mode.

For a single pulse output, the switch should be in the “MAN” position and then push the SINGLE PULSE pushbutton (10).

10. SINGLE PULSE Pushbutton. When the INT/MAN/EXT A/EXT B switch is in the “MAN” position, the instrument can be triggered by pressing this pushbutton. A single pulse is generated for each button press.

11. OVERLOAD. An automatic overload protective circuit controls the front panel overload light. 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 turn the output of the instrument OFF and turn the indicator light ON. The light will stay ON (i.e. output OFF) for about 5 seconds after which the instrument will attempt to turn ON (i.e. light OFF) for about 1 second. If the overload condition persists, the instrument will turn OFF again (i.e. light ON) for another 5 seconds. If the overload condition has been removed, the instrument will turn on and resume normal operation. Overload conditions may be removed by:

    - Reducing repetition rate
    - Reducing pulse width
    - Increasing the load impedance
    - Reducing the output amplitude

REAR PANEL CONTROLS

1) AC POWER INPUT. A three-pronged recessed male connector is provided on the back panel for AC power connection to the instrument. Also contained in this assembly is a slow blow fuse and a removable card that can be removed and repositioned to switch between 120V AC in and 240V AC in.

   For AC line voltages of 110-120V, the power selector card should be installed so that the “120” marking is visible from the rear of the instrument.

   For AC line voltages of 220-240V, the power selector card should be installed so that the “240” marking is visible from the rear of the instrument.

   If it is not set for the proper voltage, remove the fuse and then grasp the card with a pair of pliers and remove it. Rotate horizontally through 180 degrees. Reinstall the card and the correct fuse.

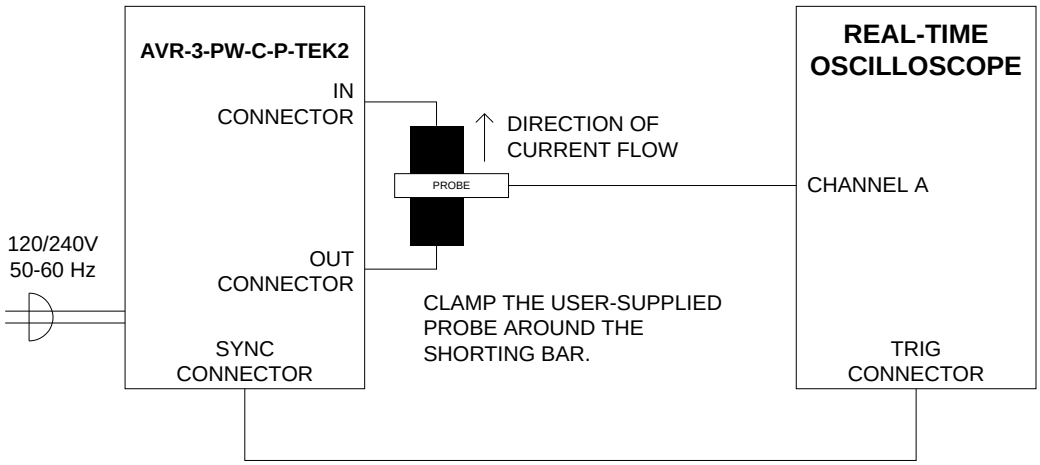
   In the 120V setting, a 0.5A slow blow fuse is required. In the 240V setting, a 0.25A slow blow fuse is required. See the “Installation” section for more details.

2) EA SWITCH AND INPUT. When this switch is set to the “INT” position, the output amplitude is controlled by the front-panel amplitude dial. When this switch is set to the “EXT” position, the output amplitude is controlled by the voltage applied to the “A” BNC connector. 0V in corresponds to zero amplitude, and +10V DC in corresponds to maximum amplitude (+250V). The input impedance of the “A” connector is > 10 kΩ.

GENERAL INFORMATION

TEST ARRANGEMENT

The AVR-3-PW-C-TEK2 generates a 10 ns rise time voltage pulse (0 to +250 Volts, 0.25 to 250 µs), which is accessible at the front panel OUT terminal. A shorting bar is connected between the OUT and IN terminals and the current probe is placed over the shorting bar. The IN terminal connects to ground via a 50 Ohm termination. A variable current of up to 5.0 Amperes is defined by the 250 Volt pulse and the 50-Ohm termination. The basic test arrangement is illustrated below:

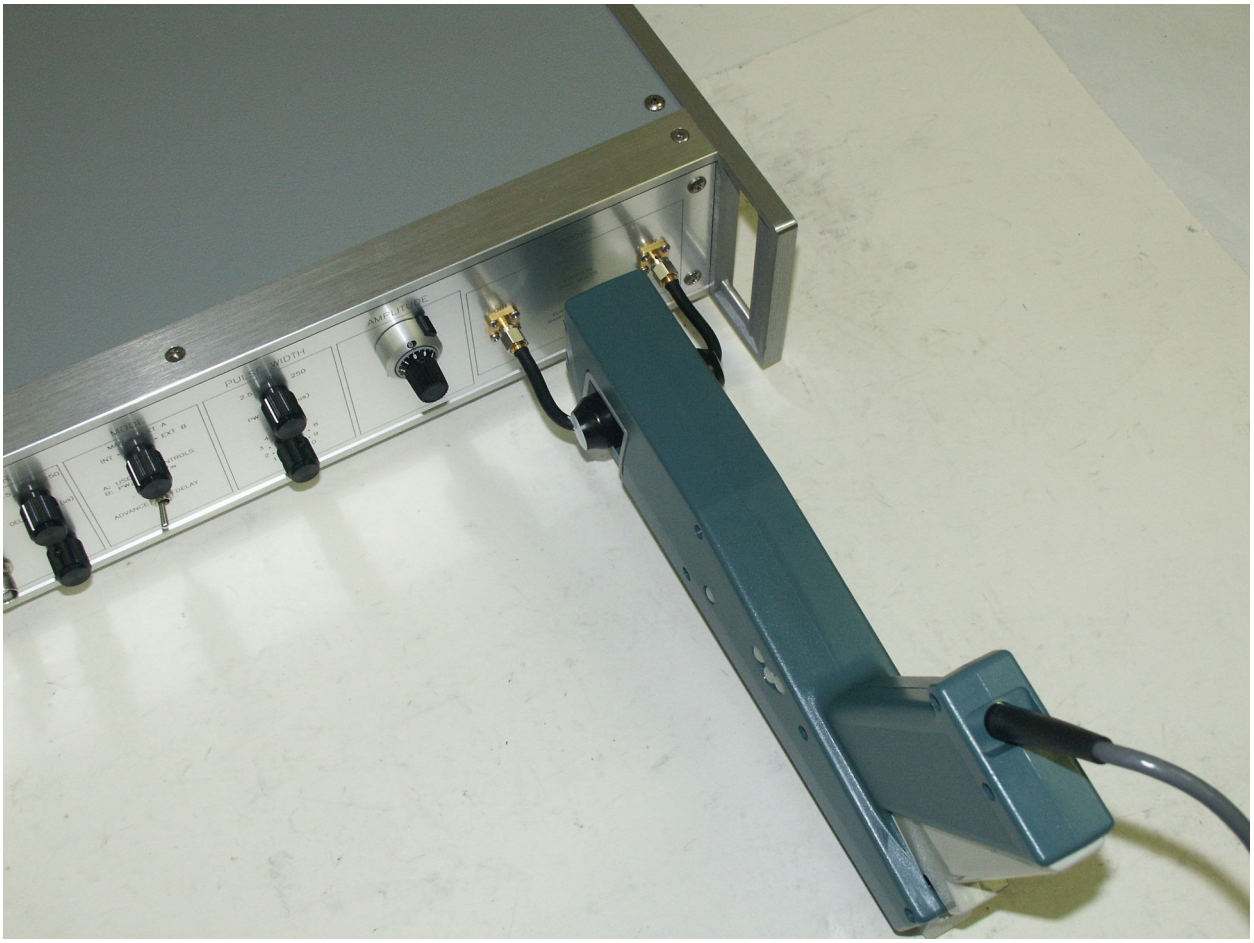


For other applications, the OUT terminal may be used to pulse a user-supplied 50 Ohm load, if desired. In this case, the shorting bar and the “IN” terminal are not used.

SHORTING BAR

The shorting bar allows a Tektronix current probe to be clamped around it. The current bar is reversible; it may be installed in either orientation. A photo of the shorting bar is shown below:

The next photo shows the shorting bar installed, with a Tektronix A6303 current probe clamped to it. Note that the probe is upside-down, in order for the probe to sense a positive current.



OTHER MECHANICAL INFORMATION

TOP COVER REMOVAL

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).

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 50Ω loads using shielded 50Ω coaxial cables. Unused outputs should be terminated with shielded 50Ω BNC terminators or with shielded BNC dust caps, to prevent unintentional electromagnetic radiation. All cords and cables should be less than 3m in length.

INTERNAL CONTROLS

Other than certain fuses described later in this manual, there are no controls inside the instrument affecting the normal operation of the instrument. (Earlier versions of this instrument had a “HIGH-LOW capacitor switch”. Design improvements have allowed removal of this switch.)

SYSTEM DESCRIPTION AND REPAIR PROCEDURE

The AVR-3-PW-C-P-TEK2 consists of the following basic modules:

1) “PCBM - PCB 152” timing circuit board
2) “AVR-3-PW-P-TEK2-PG” pulse generator module
3) “AVR-3-TEK2-50” internal load
4) “1/4A24-P20” high voltage power supply
5) “PS 125” 60 Hz power supply
6) “OLO 132” overload module
7) “AVR-3 Active Discharge Daughterboard”

These circuits are interconnected as shown in the following wiring diagram. The “PCBM - PCB 152” timing circuit board generates the TTL-level trigger pulse that drives the “AVR-3-PW-P-TEK2-PG” pulse generator module. The pulse width of this TTL-level trigger pulse controls the pulse width of the output pulse.

The “AVR-3-PW-P-TEK2-PG” pulse generator module generates the main output pulse. The amplitude of this pulse is controlled by the “1/4A24-P20” high voltage power supply. The DC output voltage of the “1/4A24-P20” high voltage power supply is approximately equal to the output pulse amplitude.

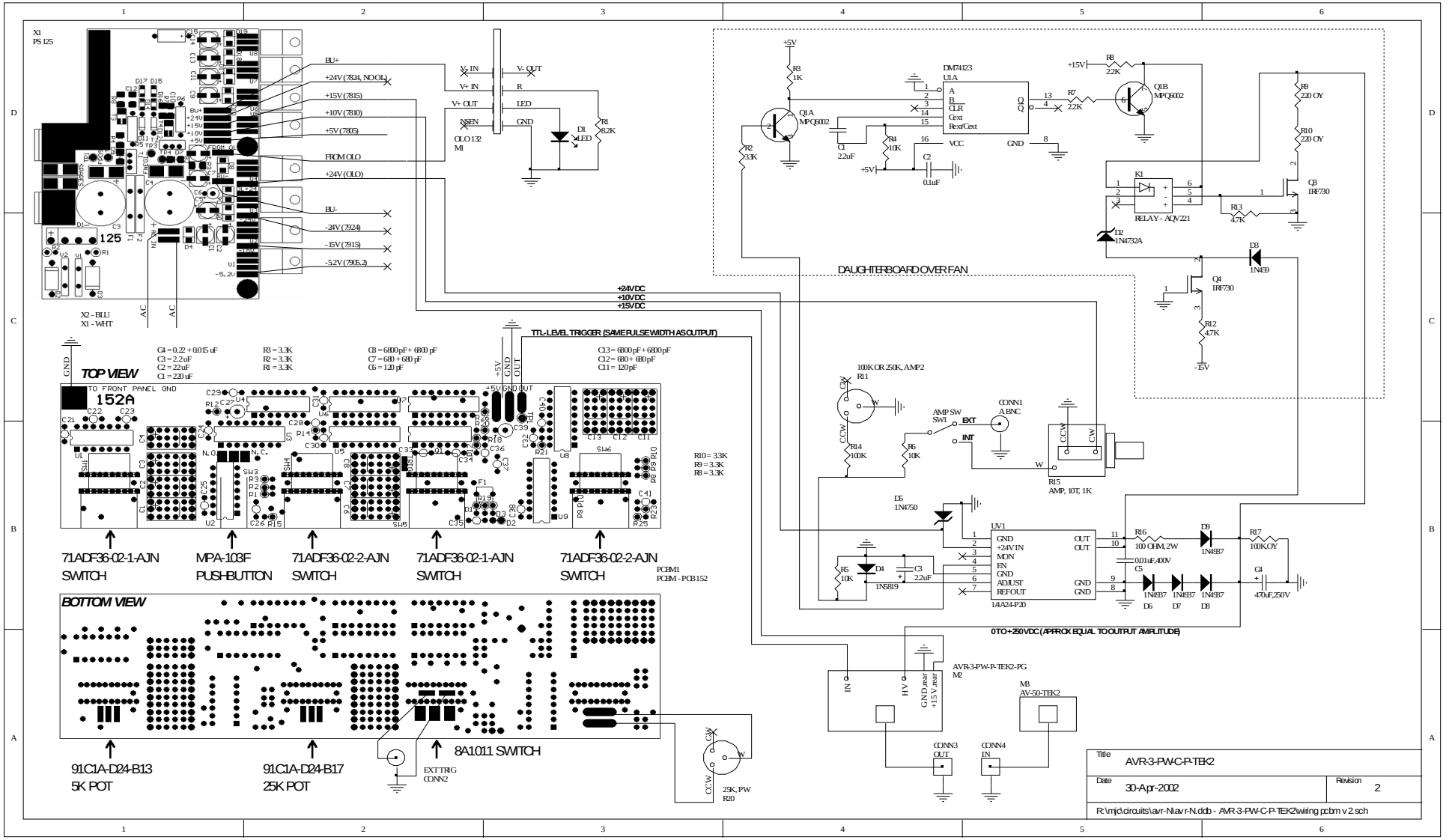
The “1/4A24-P20” high voltage power supply is powered from a +24V DC voltage. The current on this +24V supply is monitored by the “OLO 132” overload module. If the average current exceeds a set limit, the “OLO 132” overload module will remove the +24V DC supply from the “1/4A24-P20” high voltage power supply.

A large energy storage capacitor (470uF, 250V) is connected to the output of the “1/4A24-P20” high voltage power supply. The “AVR-3 Active Discharge Daughterboard” ensures that the voltage on this capacitor is discharged rapidly when the user lowers the set amplitude.

The +24V supply, as well as the other main DC power supply voltages, is generated by the “PS 125” 60 Hz power supply. Several replacable fuses are mounted on this board, as described in a following section.

The “AVR-3-TEK2-50” internal load is a precision 50 Ohm power resistor.

WIRING DIAGRAM

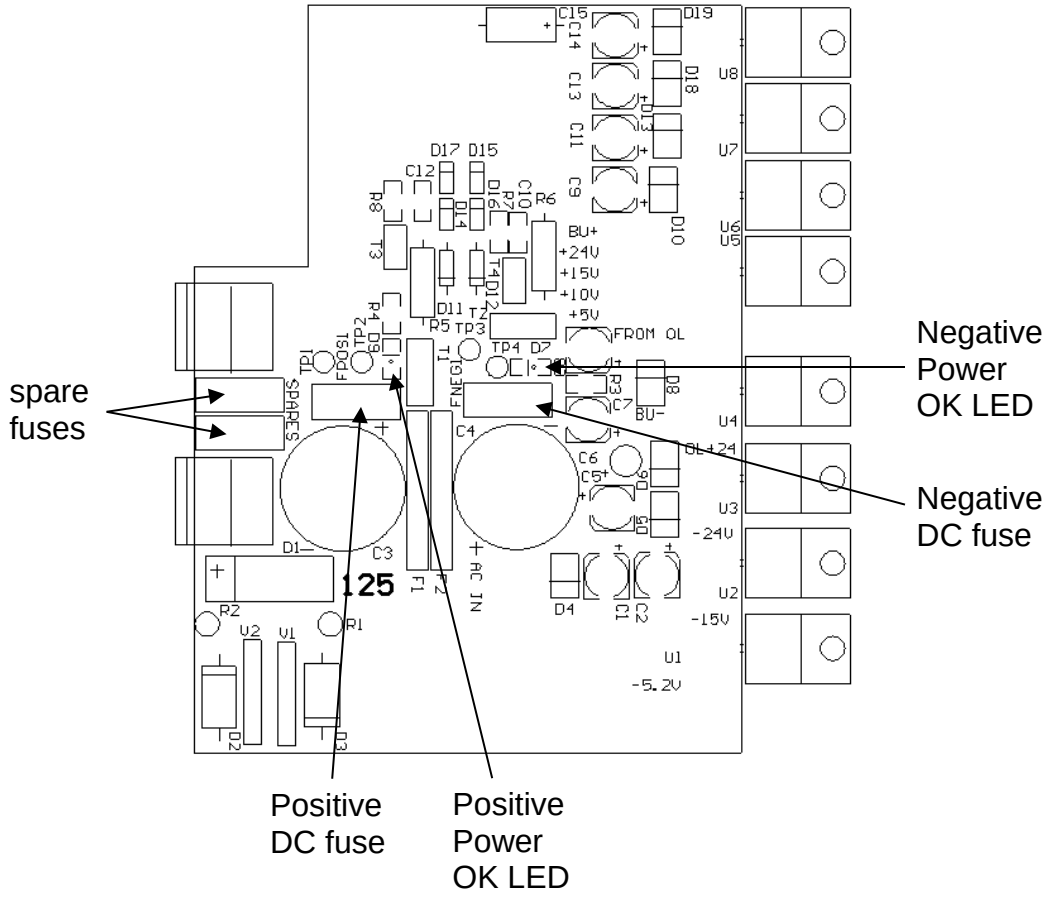


REPAIR PROCEDURE - FUSES

In the event of an instrument malfunction, it is most likely that one of the fuses or some of the output switching elements (SL4T) may have failed, possibly due to an output short circuit condition or to a high duty cycle condition.

This instrument has three main fuses, plus two spares. One, which protects the AC input, is located in the rear-panel power entry module, as described in the “Rear Panel Controls” section of this manual. If the power appears to have failed, check the AC fuse first.

The other two fuses (plus two spares) are located on the internal DC power supply, as shown below:



The positive fuse and one of the spare fuses on this circuit board are 1A slow-blow fuses, Littlefuse part number R452001. (This fuse can be ordered from Digikey, www.digikey.com. The Digikey part number is F1343CT-ND). The negative fuse and the second spare fuse are 0.5A slow-blow fuses (Littlefuse R452.500, Digikey part number F1341CT-ND).

If you suspect that the DC fuses are blown, follow this procedure:

1. Remove the top cover, by removing the four Phillips screws on the top cover and then sliding the cover back and off.

2. Locate the two “Power OK” LEDs on the power supply circuit board, as illustrated above.

3. Turn on the instrument.

4. Observe the “Power OK” LEDs. If the fuses are not blown, the two LEDs will be lit (bright red). If one of the LEDs is not lit, the fuse next to it has blown.

5. Turn off the instrument.

6. If a fuse is blown, use needle-nose pliers to remove the blown fuse from its surface-mount holder.

7. Replace the fuse. (Spare 1 Amp and 0.5 Amp fuses are provided on the circuit board. They may be transferred to the active fuse locations using needle-nose pliers.)

REPAIR PROCEDURE - SWITCHING ELEMENTS

The switching elements may be accessed by removing the cover plate on the bottom side of the instrument. NOTE: First turn off the prime power. The elements may be removed from their sockets by means of a needle nosed pliers. The SL4T is a selected VMOS power transistor in a TO 220 packages and may be checked on a curve tracer. If defective, replacement units should be ordered directly from Avtech. When replacing the SL4T switching elements, take care to insure that the short lead (of the three leads) is adjacent to the black dot on the chassis.

PERFORMANCE CHECK SHEET