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SINCE 1975

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INSTRUCTIONS

MODEL AVR-3-C-N-KOPA-EA

0 TO -300 VOLT
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: 613-226-5772 or 1-800-265-6681

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SPECIFICATIONS

Model:	AVR-3-C-N-KOPA-EA ¹
Amplitude ² : (50 Ω load)	0 to -300 Volts
Rise time:	≤ 15 ns
Fall time:	≤ 15 ns
Pulse width:	0.1 to 1.0 μ s
PRF:	0 to 1 kHz
Duty cycle (max):	0.1%
Propagation delay:	≤ 100 ns (Ext trig in to pulse out)
Jitter (Ext trig in to pulse out):	± 100 ps $\pm 0.03\%$ of sync delay
Trigger required: (external trigger mode)	Mode A: + 5 Volts, 50 ns or wider (TTL) Mode B: + 5 Volts, $PW_{IN} = PW_{OUT}$ (TTL)
Sync delay:	Variable 0 to ± 1 μ s
Sync output:	+ 3 Volts, 200 ns, will drive 50 Ohm loads
Connectors:	Out: SMA, Trig, Sync: BNC
Power requirements:	120/240 Volts (switchable) 50 - 60 Hz
Dimensions: (H x W x D)	100 mm x 430 mm x 375 mm (3.9" x 17" x 14.8")

- 1) -C suffix indicates stand-alone lab instrument with internal clock and line powering.
- 2) For analog electronic control (0 to +10V) of amplitude, suffix model number with -EA. Electronic control units also include the standard front-panel controls.

ORIGINAL QUOTATION

To: Hong Choi
Kopin Corp.
508-824-6696
hchoi@kopin.com

Hong,

Following our telephone conversation, I am pleased to quote as follows for a special-purpose manually-controlled instrument:

Quote number: 11312A

Model number: AVRF-3-C-N-KOPA-EA

Description: Dual-Channel High Voltage Pulser

Computer control ports: none

Polarity: negative

Number of output channels: Two. The two outputs have nominally equal amplitude and timing, i.e., they share one set of controls.

-EA option: allows the amplitude to be controlled by an external voltage. A 0V input corresponds to an amplitude of 0V, and a +10V input corresponds to -300V, approximately. The response rate of the amplitude when controlled by this input is > 1 V/ms. The maximum discharge time (i.e., in response to a input step from +10V to 0V, representing an amplitude change from -300V to 0V) is 100 ms.

Connectors: Two output connectors are located on the front panel.

Other: as per the standard AVRF-3-C-N-EA. See <http://www.avtechpulse.com/speed/avrf-3> for details.

Price: \$8956 US each, quantity of 5, FOB destination.

Delivery: One unit by January 17/03, if the order is placed by Nov 29/02. The remaining 4 units would ship 3-4 weeks later.

Terms: To be arranged - your buyer has been in contact with Mary Budarick (mary@avtechpulse.com, ph. 800-265-6681).

We strongly recommend that you evaluate the first unit immediately upon receiving it.

Please note that the AVRF-3-C-N-KOPA-EA has extremely fast rise times (5 ns), and requires a 50 Ohm load. It will not operate correctly into high-impedance loads.

INSTALLATION

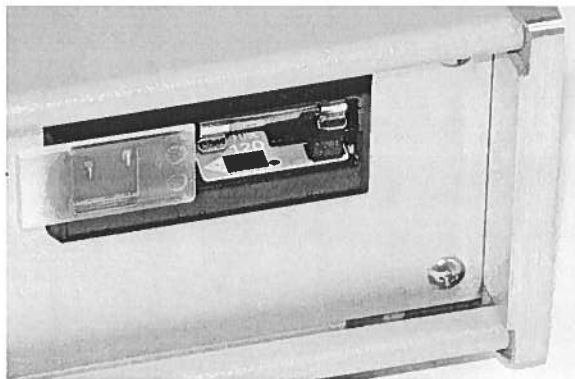
VISUAL CHECK

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.

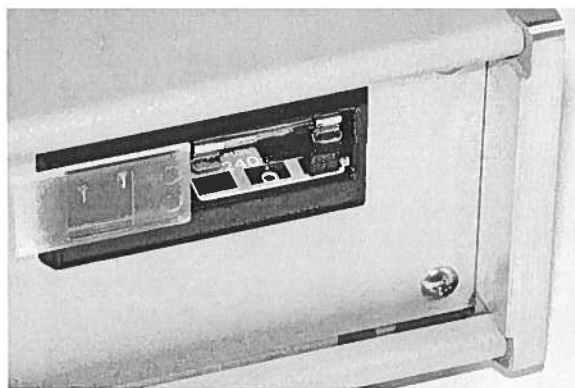
PLUGGING IN THE INSTRUMENT


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:



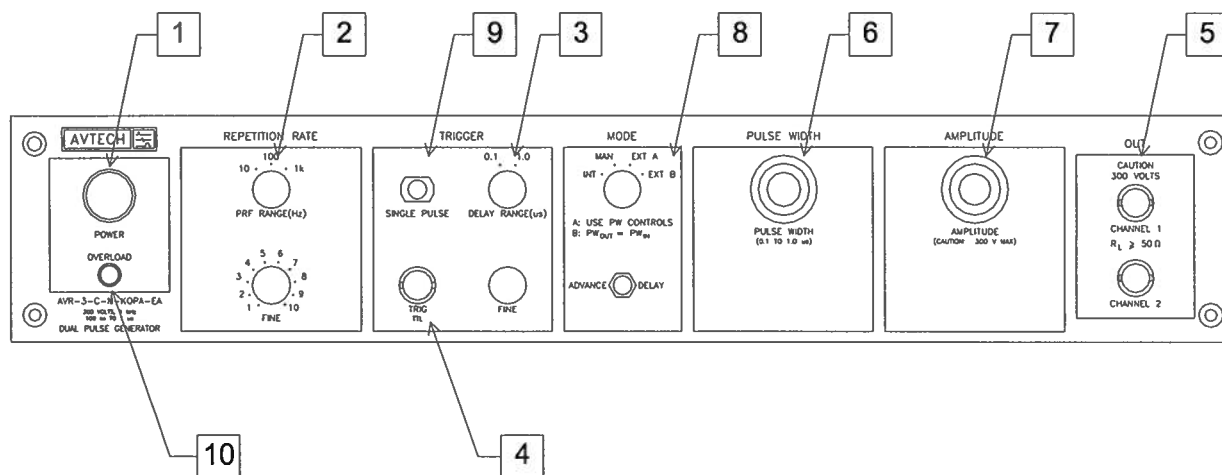


If it is not set for the proper voltage, remove the fuse and then grasp the card with a pair of pliers and remove it. Rotate horizontally through 180 degrees. Reinstall the card and the correct fuse.

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 three range:

RANGE 1	1 Hz - 10 Hz
RANGE 2	10 Hz - 100 Hz
RANGE 3	100 Hz - 1 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 outputs (5). This delay is variable over the range of 0 to 1 us, approximately. 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 8) 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 Connectors. Each of the two BNC connectors provides a 0 to -300 Volt output to a 50 Ohm load. The two outputs are nominally identical in timing and amplitude.
6. PW Control. This ten-turn knob varies the output pulse width from 0.1 to 1 us, approximately.
7. AMP Control. This ten-turn locking dial varies the output pulse amplitude from 0 to -300 Volts (to 50 Ohms), when the rear-panel AMP switch is in the "INT" position.
8. 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 0.1-1 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 (9).

9. 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.
10. 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.

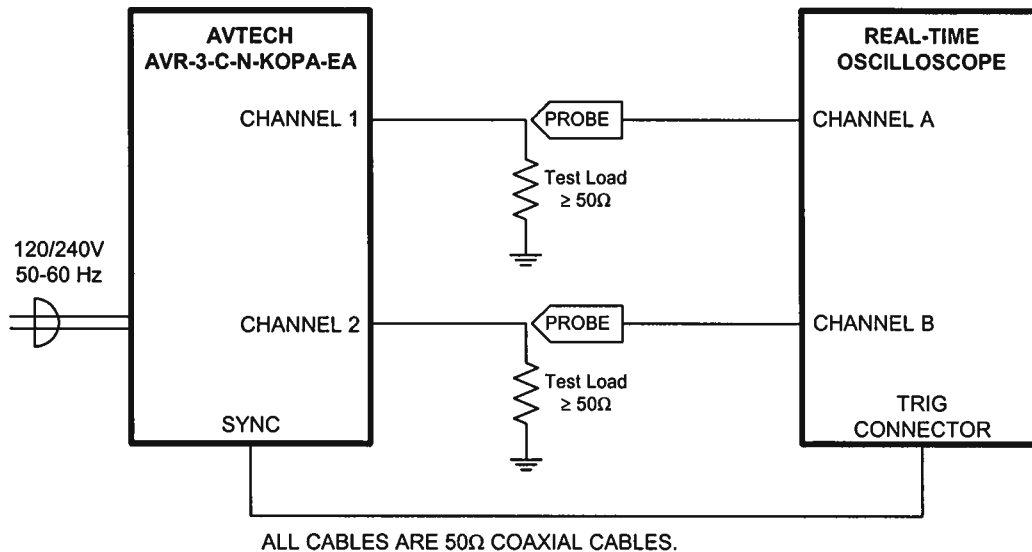
In the 120V setting, a 0.5A slow blow fuse is required. In the 240V setting, a 0.25A slow blow fuse is required. See the "Installation" section for more details.

- 2) **0.5A SB.** This fuse protects the internal high-voltage DC power supply.
- 3) **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. A 0V input corresponds to an amplitude of 0V, and a +10V input corresponds to -300V, approximately. The response rate of the amplitude when controlled by this input is > 1 V/ms. The maximum discharge time (i.e., in response to a input step from +10V to 0V, representing an amplitude change from -300V to 0V) is 100 ms.

GENERAL INFORMATION

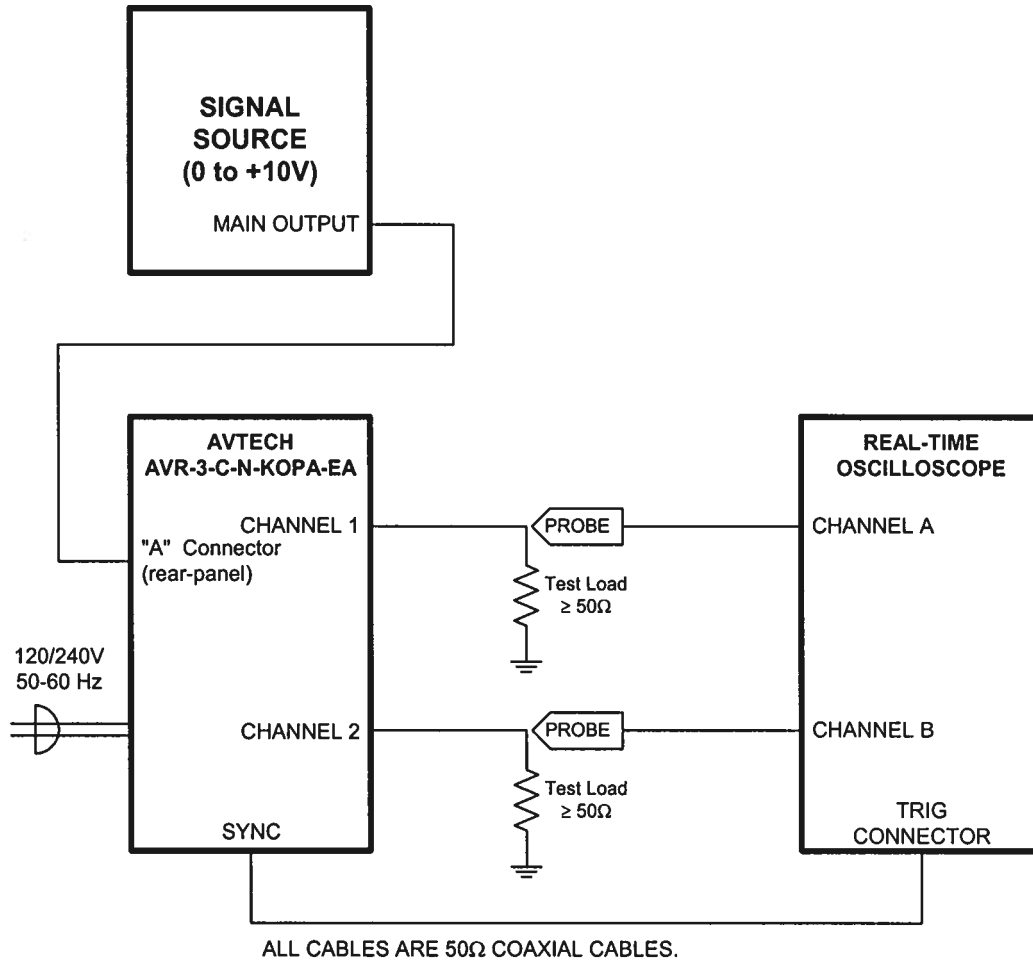
TEST ARRANGEMENT

The basic test arrangement is illustrated below:



In this diagram, it is assumed that the rear-panel "AMP" switch is set to "INT", in which case the amplitude of the two outputs is controlled by the single front-panel amplitude dial.

If an external voltage is used to control the output amplitude, the rear-panel "AMP" switch should be set to "EXT", and the instrument should be connected as shown below:



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

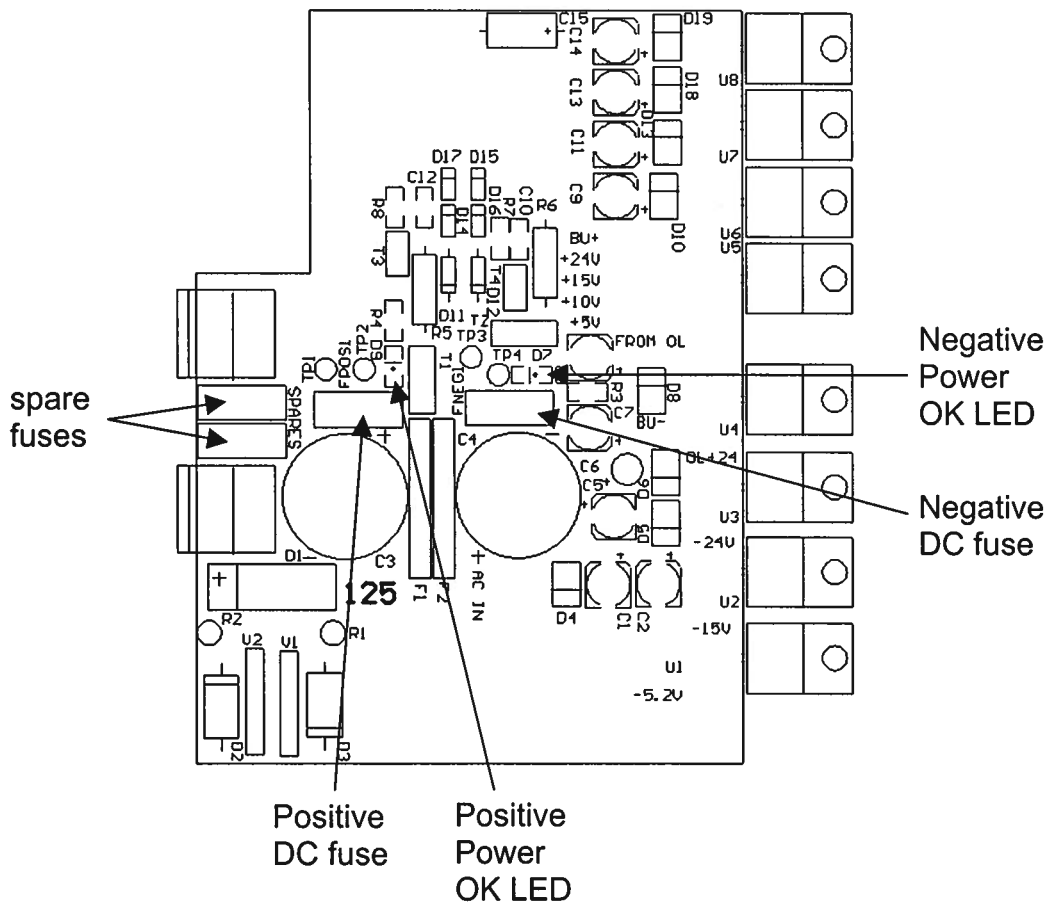


caps, to prevent unintentional electromagnetic radiation. All cords and cables should be less than 3m in length.

POWER SUPPLY AND FUSE REPLACEMENT

This instrument has four 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 second is also located on the rear panel, and protects the internal high-voltage power supply.

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 1.5A slow-blow fuses, Littlefuse part number R45201.5. (This fuse can be ordered from Digikey, www.digikey.com. The Digikey part number is F1344CT-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 1.5 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.)

Jan 14/03