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NANOSECOND WAVEFORM ELECTRONICS
SINCE 1975

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INSTRUCTIONS

MODEL AVR-S3-C-P-QTKA

0 TO +40 VOLTS, 1 MHz

PULSE GENERATOR

WITH 500 ps RISE TIME, 1 ns FALL 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: 613-226-5772 or 1-800-265-6681
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Manual Reference: Q:\office\instructword\Avr-s\AVR-S3-C-P-QTKA.doc, created July 29, 2002

INTRODUCTION

The AVR-S3-C-P-QTKA is a high performance instrument capable of generating up to +40V into 50Ω loads at repetition rates up to 1 MHz. The output pulse width is variable from 1.5 to 10 ns, and the sync delay is variable up to ±500 ns. The rise time is 500 ps, and the fall time is 1 ns.

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

ORIGINAL QUOTATION & SPECIFICATIONS

Jack,

in response to your email, I am pleased to quote as follows:

Quote number: 10973A

Model number: AVR-S3-C-P-QTKA

Amplitude: 0 to +40V, to 50 Ohms

Pulse width: 1.5 to 10 ns

PRF: 0 to 1 MHz

Rise time: 0.5 ns

Fall time: 1 ns

Dimensions: 100 x 430 x 375 mm (3.9" x 17" x 14.8")

Power: 120/240 Volts (switchable) 50 - 60 Hz

Output connector: SMA

Delivery: 60-90 days

Quote number: 10973B

Model number: AVR-S3-B-P-QTKA

Description: as per the AVR-S3-C-P-QTKA, but with the addition of IEEE-488.2 GPIB and RS-232 interfaces.

Delivery: 60-90 days

Please email me if I can be of further assistance.

Regards,
Dr. Michael J. Chudobiak
VP, New Product Development

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

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Nanosecond Waveform Generators
for general purpose, R&D and OEM applications

Pulse Generators - Laser Diode Drivers - Pulse Amplifiers
Impulse Generators - Delay Generators - Comb Generators - Splitters
Function Generators - Monocycle Generators - Frequency Dividers + more!

> -----Original Message-----
> From: Jack Kuo [mailto:jkuo@quatek.com.tw]
> Sent: Wednesday, April 03, 2002 4:25 AM
> To: Dr. Michael J. Chudobiak
> Subject: specical plus generator.
>
>
> Dear Michael,
> One of our customer would like to have a plus generator with
> following specification.
> output voltage: 0-40V.
> plus width: 1-10ns
> PRF : 0 -1MHz.
> rise time: 1ns.
>
> Please advise can you offer above specification instrument to
> customer. If yes, please also advise the price and delivery.
>
> Thanks and Regards
> Jack Kuo
> Quatek Co.,
> Tel: 886-2-27973357~276
> Fax:886-2-27973957
> http://www.quatek.com.tw
> e-mail: jkuo@quatek.com.tw
>

INSTALLATION

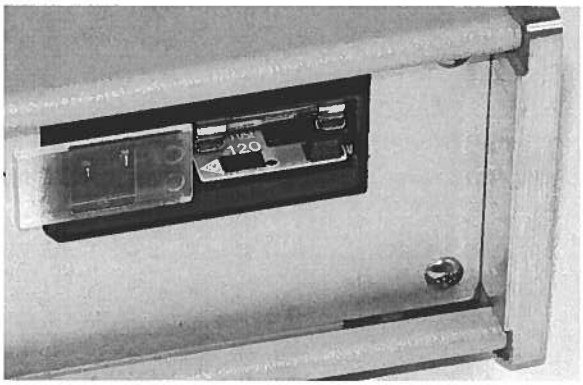
VISUAL CHECK

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 is with the instrument. If the instrument has been damaged, file a claim immediately with the company that transported the instrument.

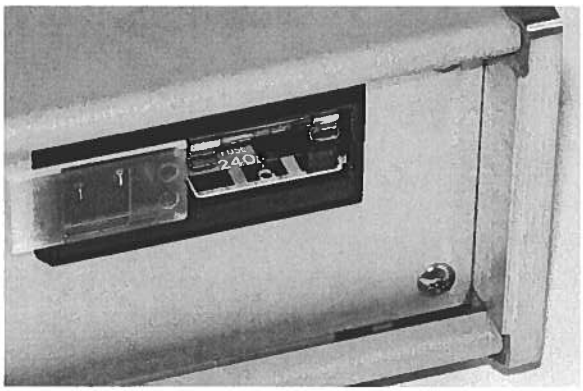
PLUGGING IN THE INSTRUMENT

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:



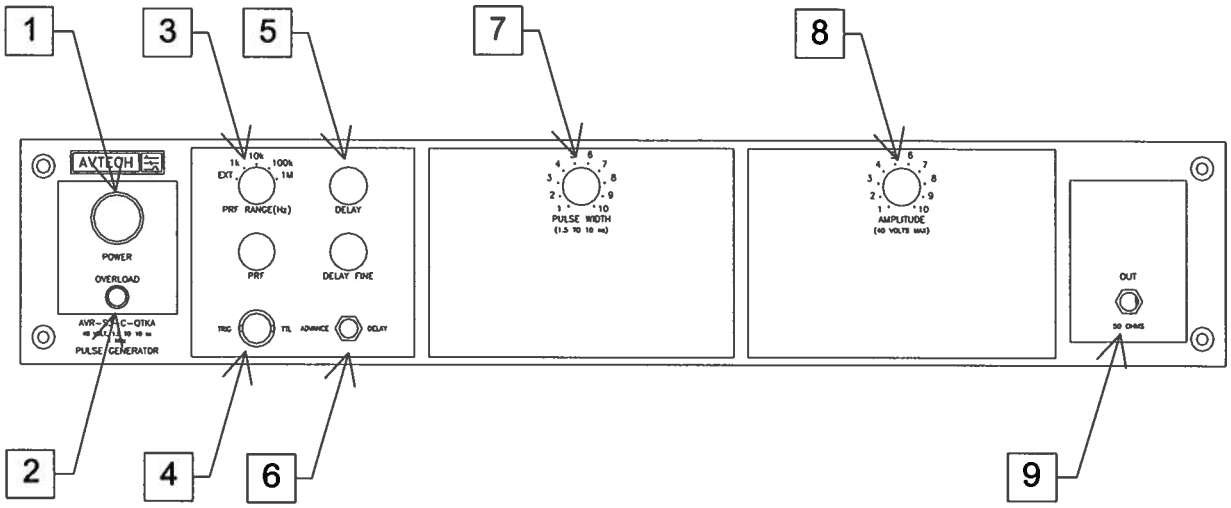
For AC line voltages of 220-240V, the power selector card should be installed so that the "240" marking is visible from the rear of the instrument, as shown below:



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 is connected to the internal +15V DC supply.

2. 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
    - Using the correct load impedance (50 Ohms)
    - Reducing the output amplitude

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.

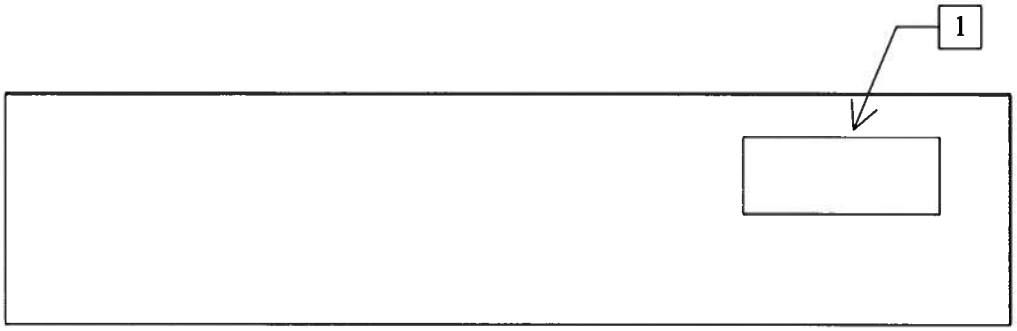
5. Delay Controls. When the PRF Range Switch is set to one of the four internal oscillator ranges, the main output is advanced or delayed relative to the TRIG output pulse (item 3). The delay is variable up to 500 ns, approximately, using the DELAY and DELAY FINE dials.

6. Advance/Delay Switch. When the PRF Range Switch is set to one of the four internal oscillator ranges, this switch determines whether the TRIG output precedes the main output (ADVANCE mode), or whether the TRIG output occur after the main output (DELAY mode).

7. Pulse Width Control. This dial controls the pulse width.

8. Amplitude Control. This dial controls the pulse amplitude.

9. OUT Connector. This is the main output. (This output *requires* a 50Ω load to function properly).



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.

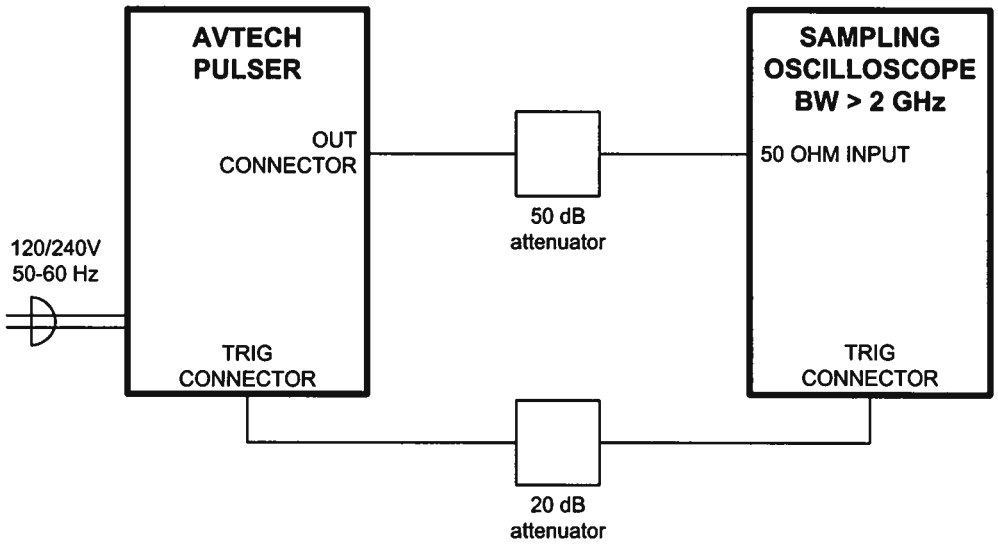
   If it is not set for the proper voltage, remove the fuse and then grasp the card with a pair of pliers and remove it. Rotate horizontally through 180 degrees. Reinstall the card and the correct fuse.

   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.

GENERAL INFORMATION

BASIC TEST ARRANGEMENT

The AVR-S3-C-P-QTKA should be tested with a sampling oscilloscope with a bandwidth of at least 2 GHz to properly observe the high-speed waveform. A typical test arrangement is shown below:



ALL CABLES: 50 OHM COAXIAL

The attenuators are required to prevent damage to the sampling oscilloscope. A 50 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 100V.
- TRIG. The TRIG pulse is a fixed-width TTL-level reference pulse used to trigger oscilloscopes or other measurement systems.

When the ADVANCE/DELAY switch is set to "ADVANCE", the TRIG output precedes the main output. These pulses are illustrated below:

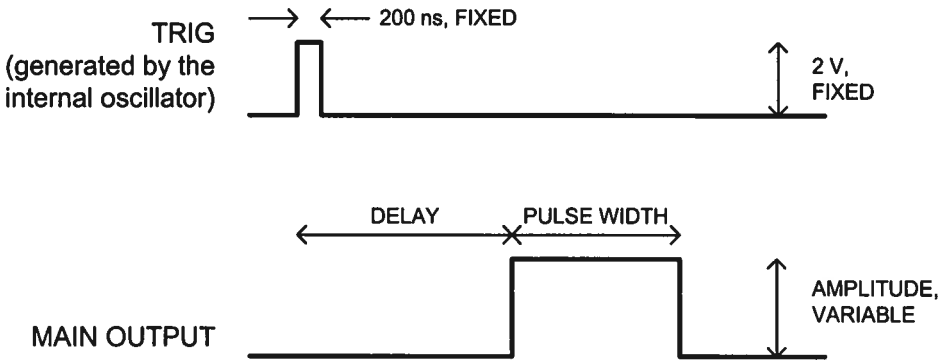
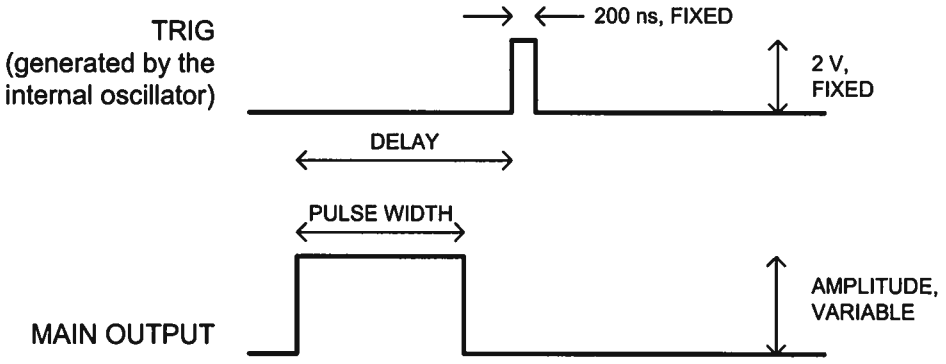
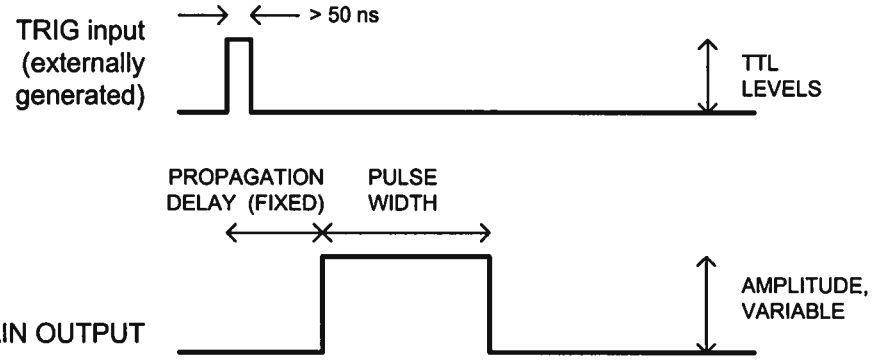


Figure A

When the ADVANCE/DELAY switch is set to "DELAY", the TRIG output occurs after the main output. This illustrated below:



When triggered externally, the TRIG connector acts as an input. The delay controls do not function in this mode. Figure C illustrates this mode:



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 AVR-S3-C-P-QTKA may fail if triggered at a PRF greater than 1 MHz.

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

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).

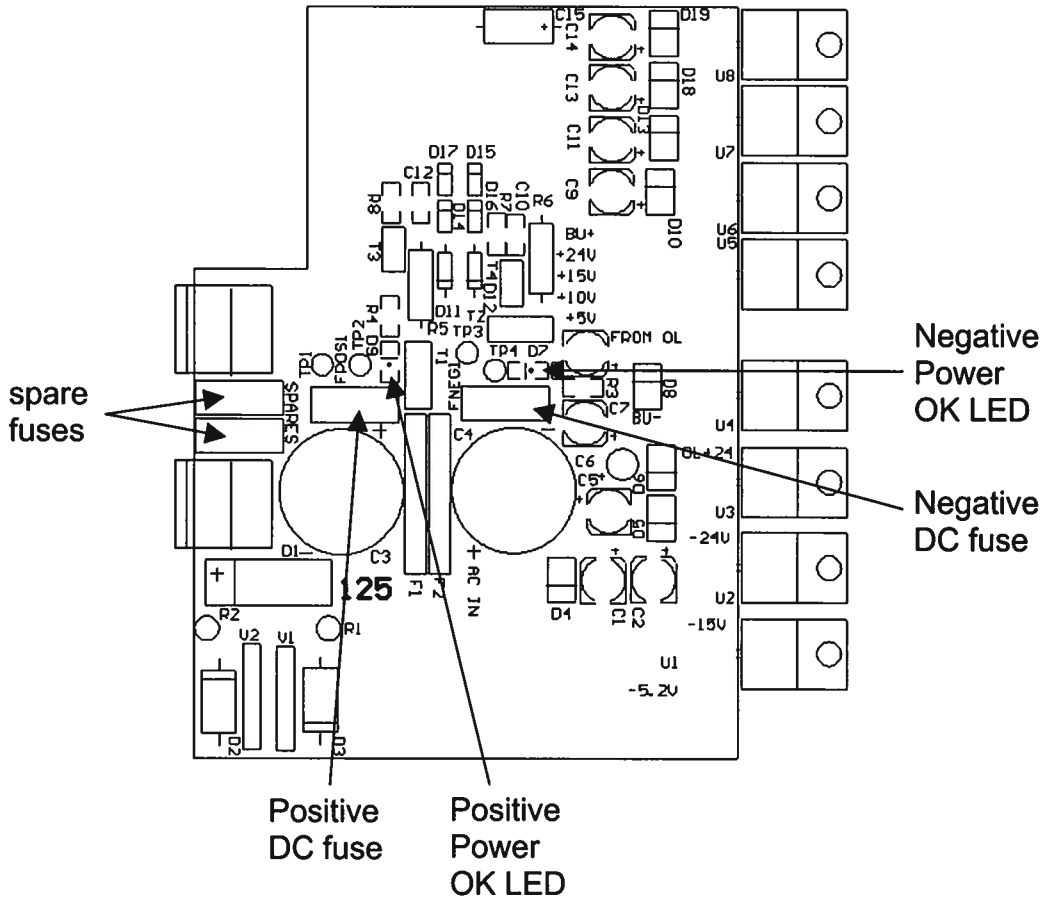
ELECTROMAGNETIC INTERFERENCE

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 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 four fuses on this circuit board are 0.5A slow-blow fuses, Littlefuse part number R452.500. (This fuse can be ordered from Digikey, www.digikey.com. The Digikey part number is 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. (Two spare 0.5 Amp fuses are provided on the circuit board. They may be transferred to the active fuse locations using needle-nose pliers.)

July 30/02