

INSTRUCTIONS

MODEL AVRH-3-C-LIA PULSE GENERATOR

S.N.:

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

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FIG. 1: PULSE GENERATOR TEST ARRANGEMENT

GENERAL OPERATING INSTRUCTIONS

- 1) CAUTION: EXTREME CAUTION SHOULD BE FOLLOWED WHEN USING THIS INSTRUMENT AS IT GENERATES OUTPUT PULSE AMPLITUDES AS HIGH AS 3,000 VOLTS.
- 2) The bandwidth capability of components and instruments used to display the pulse generator output signal (attenuators, cables, connectors, etc.) should exceed 50 MHz. The load impedance should not be less than 1,000 Ohms as this will result in possible damage to the output stages. Also, the coaxial cable between the SHV output connector and the load should not exceed about 0.5 meters (or the rise time will be degraded).
- 3) The TRIG output channel provides TTL level signals. To avoid overdriving the TRIG input channel of some scopes, a 30 dB attenuator should be placed at the input to the scope trigger channel. The TRIG output precedes the main output when the front panel ADVANCE-DELAY switch is in the ADVANCE position. The TRIG output lags the main output when the switch is in the DELAY position.

The DELAY control controls the relative delay between the reference output pulse provided at the TRIG output and the main output. This delay is variable over the range of 0.1 us to 2.5 us.

- 4) When the Mode AB switch is in the A position, the output pulse width is controlled by means of the front panel one turn PW control.

When the Mode AB switch is in the B position and the INT-EXT-MAN switch is in the EXT position, the output pulse width is controlled by the pulse width of a TTL pulse applied to the TRIG BNC. CAUTION: The applied pulse width must not exceed 2.5 us.

- 5) To obtain a stable output display the PRF control on the front panel should be set mid range. The front panel TRIG toggle switch should be in the INT position. The DELAY controls and the scope triggering controls are then adjusted to obtain a stable output. The scope may then be used to set the desired PRF by rotating the PRF controls.

- 6) The output pulse amplitude is controlled by means of the front panel ten turn AMP control.
 - **CAUTION:** To avoid stressing the output stage it is recommended that the output amplitude control be set fully counter clockwise before applying prime power to the instrument.
- 7) The output pulse polarity is controlled by the front panel two-position polarity switch. **CAUTION:** Before changing polarity, the amplitude should be reduced to zero ($\leq 300V$). If the amplitude is not reduced to near zero, the polarity reversal will not occur.
- 8) An external clock may be used to control the output PRF of the AVR unit by setting the front panel TRIG toggle switch in the EXT position and applying a 50 ns (or wider) TTL level pulse to the TRIG BNC connector input. For operation in this mode, the scope time base must also be triggered by the external clock rather than from the TRIG output.
- 9) For single pulse manual operation, set the front panel INT-EXT-MAN switch in the MAN position and push the SINGLE PULSE button.
- 10) **CAUTION:** The output stage is protected against overload condition by a 2.0 A slow blow fuse on the main frame back panel. However, the output switching elements may fail if the unit is triggered at a PRF exceeding 1 kHz or at duty cycles resulting in an average output power in excess of 25 Watts. Heating and subsequent likely failure of the output stage is reduced if the following action is taken where possible:
 - a) PRF is kept to a minimum, i.e. operate in a low PRF range when possible rather than in a high PRF range.
 - b) Keep the output PW to a minimum.

- 11) OVERLOAD INDICATOR. AVRH units with a serial number higher than 5600 are protected by an automatic overload protective circuit which controls the front panel overload light. If the unit is overloaded (by operating at an exceedingly high duty cycle or by operating into a short circuit), 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:
- 1) Reducing PRF (i.e. switch to a lower range)
 - 2) Reducing pulse width (i.e. switch to a lower range)
 - 3) Removing output load short circuit (if any)
- 12) Note that when the amplitude or PRF or PW are increased, the output stage of the unit will emit an audible hum. This noise is normal and is due to the step up transformer in the output stage.
- 13) CAUTION: DC potentials as high as 800 Volts and pulse potentials as high as 3,000 Volts exist in the interior of the instrument. For this reason it is recommended that the top cover of the unit should not be removed and that the unit should be returned to the factory for servicing (when necessary).
- 14) The unit can be converted from 110 to 220V 50-60 Hz operation by adjusting the voltage selector card in the rear panel fused voltage selector cable connector assembly.
- 15) For further assistance:

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- (1) ON-OFF Switch. Applies basic prime power to all stages.
- (2) PRF Control. Varies PRF from 1 Hz to 1 kHz as follows:
- | | | |
|---------|--------|--------|
| Range 1 | 1 Hz | 10 Hz |
| Range 2 | 10 Hz | 100 Hz |
| Range 3 | 100 Hz | 1 kHz |
- (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 0.1 to about 2.5 us. Delay LEADS or LAGS depending on the position of the ADVANCE-DELAY switch.
- | | MIN | MAX |
|---------|---------|---------|
| Range 1 | 0.1 us | 0.25 us |
| Range 2 | 0.25 us | 2.5 us |
- (4) TRIG Output. This output is used to trigger the scope time base. The output is a TTL level 100 ns (approx.) pulse capable of driving a fifty Ohm load. This output precedes the output at (5) if the two position ADVANCE- DELAY switch is in the ADVANCE position. This output follows the output at (5) if the switch is in the DELAY position. The delay range is variable from 0.1 us to 0.25 us. The external trigger signal is applied at this input when the EXT-INT toggle switch is in the EXT position.
- (5) OUT Connector. SHV connector provides output to a high impedance load ($R_L > 10K$ Ohms). Panel connector will mate to King Model 1705-2 connector (for RG58A cable).
- (6) PW Control. A one turn control which varies the positive output pulse width from 0.25 us to 2.5 us (when Mode AB switch is in the A position).
- (7) AMP Control. A ten turn control which varies the output pulse amplitude from 0 to 3,000 Volts (to $R_L \geq 10K$).
- To avoid stressing the output stage, it is recommended that the AMP control be set fully counter clockwise before applying the prime power to the instrument.
- (8) POLARITY. The output pulse polarity is controlled by this two-position switch. CAUTION: Before changing polarity, the amplitude should be reduced to zero

(≤ 300 Volts). The polarity reversal will not occur if the amplitude is not reduced.

- (9) EXT-INT-MAN Control. With this toggle switch in the INT position, the PRF of the AVRH unit is controlled via an internal clock which in turn is controlled by the PRF control. With the toggle switch in the EXT position, the AVRH unit requires a 50 ns (or wider) TTL level pulse applied at the TRIG input in order to trigger the output stages. In addition, in this mode, the scope time base must be triggered by the external trigger source. With the MODE A-B switch in the A position the output pulse width is controlled by the PW controls. With the MODE A-B switch in the B position, the output pulse width equals the input trigger pulse width. For single pulse operation, set the INT-EXT-MAN switch in the MAN position.
- (10) SINGLE PULSE. For single pulse manual operation, set the front panel INT-EXT-MAN switch in the MAN position and push the SINGLE PULSE button.
- (11) MODE A-B. For output pulse width control via the PW controls, the MODE switch should be in the A position. When triggering via an externally applied TTL level trigger pulse, the output pulse width equals the input trigger pulse width if the MODE switch is in the B position. CAUTION: The applied pulse width must not exceed 2.5 us.
- (12) OVERLOAD INDICATOR. AVRH units with a serial number higher than 5600 are protected by an automatic overload protective circuit which controls the front panel overload light. If the unit is overloaded (by operating at an exceedingly high duty cycle or by operating into a short circuit), 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:
- 1) Reducing PRF (i.e. switch to a lower range)
 - 2) Reducing pulse width (i.e. switch to a lower range)
 - 3) Removing output load short circuit (if any)

- (1) FUSED CONNECTOR, VOLTAGE SELECTOR. The detachable power cord is connected at this point. In addition, the removable cord is adjusted to select the desired input operating voltage. The unit also contains the main power fuse (0.5 A SB).
- (2) 0.5A SB. Fuse which protects the output stage if the output duty cycle rating is exceeded.
- (3) HV ON-OFF. This switch must be in the "ON" position to obtain an output pulse. When prime power is applied to the unit, the output pulse may jump up momentarily to as much as several hundred volts (even with the amplitude pot set fully CCW). This can be prevented by first setting the HV switch in the "OFF" position and then to the "ON" position after the prime power has been applied.

TOP COVER REMOVAL AND RACK MOUNTING

- 1) 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).
- 2) The -R5 rack mount kit may be installed after first removing the one Phillips screw on the side panel adjacent to the front handle.

SYSTEM DESCRIPTION AND REPAIR PROCEDURE

The AVRH-3-C generates a 3,000 Volt pulse by first generating a 750 Volt pulse (of the desired width). This 750 Volt pulse is then supplied to a x4 transformer which increases the output amplitude to 3,000 Volts (to $R_L > 10K$ Ohms). DC potentials as high as 800 Volts are employed in the generation of the 750 Volt pulse so extreme caution must be employed when repairing this instrument. It is therefore highly recommended that the unit be returned to AVTECH for all repairs beyond the replacement of the 1.0 Amp line fuse or the 2.0 Amp SB rear panel fuse.

PERFORMANCE CHECK SHEET