

INSTRUCTIONS

MODEL AV-1031-C 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 is either expressed or implied.

INTRODUCTION

The Avtech AV-1031-C is a versatile, general-purpose, low-cost, 1ns rise time, 1 MHz laboratory pulse generator, useful everywhere from undergraduate university classrooms to the most advanced research and development laboratories. This pulse generator features variable pulse repetition frequency (PRF), delay, pulse width and amplitude. Additionally, the generator can be triggered either internally or externally, as well as by the manual "Single Pulse" pushbutton. All trigger sources can be gated by a TTL-type pulse. PRF is continuously variable from 1 Hz to 1 MHz, delay to 1ms, pulse width to 1.0ms, and amplitude to $\pm 5V$ (to 50 Ohms). A synchronising trigger output is supplied when operating off of the internal trigger (+2V into 50 Ω , +4V into 1M Ω .)

SPECIFICATIONS

LOAD IMPEDANCE

This unit requires a 50 Ohm load impedance at all times.

PULSE REPETITION FREQUENCY

The PRF is continuously variable from 1 Hz to 1 MHz in 6 ranges, each range providing a ratio of approximately 10 between its highest and lowest frequency.

DELAY

The delay between the SYNC output or the external trigger is variable from 130ns to 1ms in five ranges. Delay is variable over 75% of the pulse.

PULSE WIDTH (AND DUTY CYCLE)

Pulse width is measured at the 50% amplitude point, and is continuously variable from 50ns to 1.0ms. Duty cycle may range up to 10%.

RISE/FALL TIMES

The rise and fall times are measured from the 20% to 80% amplitude levels with the output terminated into 50Ω. The rise and fall times are fixed at less than 1 ns.

AMPLITUDE

The amplitude of the main output is continuously variable between zero and five volts to 50 Ohms, with the polarity controlled by the polarity switch. The amplitude can be varied in three ranges, from, 0 to 0.5V, 0 to 1.5V, and 0 to 5V.

SOURCE IMPEDANCE

The output resistance is 50 Ohms. Note that this unit requires a 50 Ohm load impedance.

SYNC OUT

When triggering off of the internal clock, the SYNC OUT/TRIG IN connector is used as a SYNC output, allowing the user to synchronise other equipment to the instrument (e.g. oscilloscopes). This output provides approximately +2V into a 50Ω load, or +4V into a 1MΩ load. This pulse leads the other outputs by a duration set by the "DELAY" controls, and has a pulse width of approximately 10ns. A sync signal is not provided in the external mode.

EXTERNAL TRIGGER

When the "INT/EXT" switch is in the EXT position, the instrument triggers off of an external signal, which must be supplied by either a TTL type signal (i.e. 0 to +5V) on the "SYNC OUT/TRIG IN" connector or by pressing the "SINGLE PULSE" pushbutton. The external trigger must be at least 4ns wide. This input has a high input impedance (greater than 1kΩ).

SINGLE PULSE

Pressing the "SINGLE PULSE" pushbutton with the "INT/EXT" switch in the "EXT" position will generate a single output pulse on the Main and Logic outputs. Pressing the "SINGLE PULSE" pushbutton with the switch in the "INT" position has no effect.

GATE IN

The "GATE IN" input is a high impedance input that can be used to suppress the triggering of the instrument. Leaving this input unconnected, or applying a TTL high level (e.g. +2.8V to 5V) will permit normal triggering. Taking the input low (to ground, or less than +0.8V) will inhibit any sort of triggering.

JITTER

Repetition rate, delay, and pulse width jitter are less than $\pm 50\text{ps}$ or $\pm 0.05\%$, whichever is greater.

WAVEFORM ABERRATIONS

Overshoot, undershoot, ringing, and top slope aberration are less than $\pm 3\%$ at amplitudes of 300mV and higher with outputs terminated in 50Ω .

OUTPUT PROTECTION

Caution: this unit requires a 50 Ohm load impedance and may be damaged by operating into an open circuit or a short circuit. Also note that the unit may be damaged if operated at duty cycles higher than 10%. The warranty does not apply to cases where damage has resulted from not following the load requirements

OPERATING TEMPERATURE

The instrument is rated for operation in ambient temperatures of $+15^{\circ}\text{C}$ to $+40^{\circ}\text{C}$.

POWER REQUIRED

A maximum of 30W is required. The instrument can operate on 120V AC or 240V AC, selectable on the back panel, at 50 to 60 Hz. (0.5 A SB line fuse).

PHYSICAL CHARACTERISTICS

The instrument is contained in a 4" x 16" x 12" anodised aluminium chassis with handles, with a mass of 10kg. Signal connectors are all BNC type.

ACCESSORIES

One instruction manual and one power cord are supplied with the instrument. An optional 19" rack mounting kit is available (Avtech Part No. -R4)

INSTALLATION

VISUAL CHECK

After unpacking the instrument, examine to ensure that it has not been damaged in shipment. Visually inspect all connectors, knobs, and the handles. Confirm that a power cord and instruction manual is with the instrument. (If the instrument has been damaged in shipment, 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 will be visible. Confirm that the power selector is in the correct orientation - it should be marked either 120 or 240, indicating whether it expects 120V AC or 240V AC. If it is not set for the proper voltage, remove the fuse, 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 1/2A slow blow fuse is required. In the 240V setting, a 1/4A slow blow fuse is required.

OPERATIONAL CHECK

This check is to confirm that the instrument is fully functional. In all tests, use a 50 Ω cable and note that the "out" port requires a 50 Ohm load at all times. Set the controls to the following values:

INT/EXT Switch: INT position

REPETITION RATE RANGE Switch: 100 kHz

REPETITION RATE Vernier: MAX

DELAY RANGE Switch: 100ns

DELAY Vernier: MIN

PULSE WIDTH RANGE Switch: 100ns

PULSE WIDTH Vernier: MAX

POLARITY Switch: +

AMPLITUDE RANGE Switch: 5V

AMPLITUDE Vernier: MAX

Connect a cable from the SYNC OUT/TRIG IN connector to the TRIG input of an oscilloscope. A second cable from the main output should be connected to a 20 to 40 dB attenuator connected to the 50 Ohm input of a fast scope ($BW \geq 500$ MHz).
Caution: the “out” port requires a 50 Ohm termination.

Set the oscilloscope to trigger externally. Then follow the instructions on the next page, and compare what is seen on the oscilloscope to what is described. Only approximate values are needed to confirm operation.

<u>STEP</u>	<u>CONTROL</u>	<u>OPERATION</u>	<u>RESULTS</u>
1	POWER	Push in (ON)	+5V pulses at the main output, with period 10 μ s, pulse width 100ns, <1 ns rise and fall times.
2	REPETITION RATE VERNIER	Rotate to MIN, then to MAX	Period rises to about 30 μ s, then falls to about 10 μ s.
3	DELAY VERNIER	Rotate to MAX, then to MIN	Pulses shift to the right on the oscilloscope by 100ns, then back.
4	PULSE WIDTH VERNIER	Rotate to MIN, then to MAX	Pulses become very narrow (about 10ns wide), then return to 100ns pulse width.
5	POLARITY SWITCH	Switch to -, then to +	Pulses swing between 0 and -5V, then swing between 0 and +5V.
6	AMPLITUDE RANGE	Switch to 1.5V, then 0.5V, then back to 5V	Amplitude falls to +1.5V, then +0.5V, then rises back up to +5V.

OPERATING INSTRUCTIONS

POWER Switch

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

INT/EXT Switch

In the "INT" position the instrument is internally triggered and the "SYNC OUT/TRIG IN" connector provides a SYNC output, which allows one to trigger other instruments, such as oscilloscopes. In the "EXT" position the instrument is triggered by a TTL level input pulse on the "SYNC OUT/TRIG IN" connector, or by pressing the "SINGLE PULSE" pushbutton.

SINGLE PULSE Pushbutton

The "SINGLE PULSE" pushbutton will trigger the instrument manually for one cycle of output, when the "INT/EXT" switch is in the "EXT" position. Otherwise, the pushbutton has no effect.

SYNC OUT/TRIG IN Connector

When in the "INT/EXT" switch is in the "INT" position, this connector supplies a SYNC output, that can be used to trigger other equipment, particularly oscilloscopes. This signal leads the main output by a duration set by the "DELAY" controls, and has an approximate amplitude of +2V in 50 Ω , or +4V into 1M Ω , with a pulse width of about 10ns. When the switch is in the "EXT" position, the external trigger is applied to this connector. This input presents a high impedance (greater than 1k Ω). Should an input impedance of 50 Ω be required, it must be added manually at the input.

GATE Input

The GATE input will suppress the triggering of the instrument if grounded, or taken to a TTL LOW level (i.e. 0 to 0.8V). If it is left open, or taken to a TTL HIGH level (i.e. +2.4V to 5.0V), normal triggering will occur. This connector has a high input impedance (greater than 1k Ω .)

REPETITION RATE Controls

The rotary switch marked "RANGE" selects the pulse repetition rate for the internally triggered mode.

The vernier (labelled "MIN - MAX" provides continuously variable control of each range. There are ten ranges and the instrument is set to the rate indicated on the front panel when the vernier is in the "MAX" position.

DELAY Controls

The rotary switch selects one of five ranges and the vernier provides continuously variable control of each range. The instrument is set to the delay indicated on the front panel when the vernier is in the "MAX" position.

PULSE WIDTH Controls

The rotary switch selects one of five ranges and the vernier provides continuously variable control of each range. The instrument is set to the pulse width indicated on the front panel when the vernier is in the "MAX" position.

POLARITY Switch

If the polarity switch is in the "+" position, the main output pulse will pulse upwards (i.e. to a more positive level.) If it is in the "-" position, the output will pulse downwards, to a more negative level.

AMPLITUDE RANGE Switch

When in the 0.5V range, the main output is between variable in amplitude from 0 to ± 0.5 V, peak to peak. Similarly, in the 1.5V and 5V ranges, the amplitude is variable from 0 to ± 1.5 V and ± 5 V respectively. All ranges have 50 Ω backmatching.

AMPLITUDE Controls

The amplitude vernier provide continuously variable control of the peak to peak amplitude of the main output, from zero Volts to the maximum set by the range switch.

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 1/2A slow-blow fuse, and a removable card, that can be removed and repositioned to switch between 120V AC in and 240V AC in.

TOP AND BOTTOM COVER REMOVAL

The interior of the instrument may be accessed by removing the four Phillips screws on the rear panel. With the four screws removed, the top cover may be slid back (and off). In addition, the bottom cover may also be slid back (and off).