

INSTRUCTIONS

MODEL AV-151E-C-R5-ARD-STA

26 V<sub>RMS</sub>, 6.00 kHz  
FUNCTION 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

Fax: 613-226-2802 or 1-800-561-1970

E-mail: [info@avtechpulse.com](mailto:info@avtechpulse.com)

World Wide Web: <http://www.avtechpulse.com>

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## INTRODUCTION

The Model AV-151E-C-R5-ARD function generator can produce square, sine, and triangle wave outputs at a frequency of 6000 Hz  $\pm$  5 Hz, with an amplitude of 26 V<sub>RMS</sub>. (The  $\pm$  5 Hz tolerance includes both initial accuracy and long-term drift errors.) The instrument can drive load impedances of 65 Ohms or larger. The load may be connected to either the front-panel or rear-panel connectors, which are wired to the same points internally.

The amplitude may be adjusted over a narrow range for calibration purposes. The output duty cycle can also be adjusted over a narrow range, to ensure that the lowest possible total harmonic distortion (THD) is obtained. When properly adjusted, the sine-wave THD is less than 1.5%.

ORIGINAL QUOTATIONS & SPECIFICATIONS

April 13, 2000

To: Don Longworth  
Atlantic Research Corp.  
ph. 703-754-5130  
longworth@arceng.com

Don,

Following our telephone conversation on Wednesday, I am pleased to re-quote as follows for a special-purpose function generator:

Quote Number: 9831

Model Number: AV-151E-C-R5-ARD

Amplitude: 74 Volts peak-to-peak (i.e., 26 Volts RMS for a sine wave), adjustable  $\pm 10\%$  with back-panel ten-turn locking dial.

Load Impedance: > 65 Ohms

Frequency: 6000 Hz, adjustable  $\pm 10\%$  with back-panel ten-turn locking dial.

Output Waveform: Sine, Square, Triangle. Selectable via a front-panel switch.

DC offset: none

External Trigger mode: none

Output Connectors: Two sets of OUT and GROUND connectors. One set is on the front panel; the second is on the rear panel. The two sets are wired to the same connections internally.

OUT: female banana post.  
GROUND: female banana post.

The OUT and GROUND posts are separated by 0.75".

Overload: An automatic overload protection feature protects the output against short circuits. The circuit resets automatically.

Dimensions: 3.9" x 17" x 14.8"

Rack mounting: "-R5" rack-mount kit included

Power requirements: 107-124 Volts AC, 50-60 Hz.

Other: See AV-151 series data sheet at  
<http://www.avtechpulse.com/function>

Price: \$5,140.00 US, FOB destination

Delivery: 60 days

Please contact me if you require any further information.

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

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

PO Box 265	ph: 1-800-265-6681 or 613-226-5772	Box 5120 Stn. F
Ogdensburg, NY	fax: 1-800-561-1970 or 613-226-2802	Ottawa, Ontario
USA 13669-0265	email: <a href="mailto:info@avtechpulse.com">info@avtechpulse.com</a>	Canada K2C 3H4
	<a href="http://www.avtechpulse.com/">http://www.avtechpulse.com/</a>	

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!

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To: Don Longworth  
 Atlantic Research Corp.  
 ph. 703-754-5130  
 longworth@arceng.com

Don,

in response to our telephone conversation yesterday, I am pleased to quote on the following upgrade for your AV-151E-C-R5-ARD function generator:

Quote Number: 10136

Part Number: "-STA" option for the AV-151E-C-R5-ARD function generator

Description: upgrades the internal oscillator to a high-stability version

Output Frequency: 6000 Hz, +/- 5 Hz (including drift). Non-adjustable.

Output Total Harmonic Distortion: < 1.5% (sine-wave output)

Price: \$1198 for each unit upgraded, FOB destination.

Delivery: 3 weeks after receipt of order and the instrument for upgrade

As noted above, the output frequency would no longer have the +/- 10% adjustability. It would be fixed at 6000 +/- 5 Hz.

If you wish to proceed with this upgrade, please return the unit(s) via prepaid shipping to the following address:

Avtech Electrosystems Ltd.  
 C/O Strader-Ferris International  
 808 Commerce Park Drive  
 Ogdensburg, NY 13669

Tel: (315)394-0051 (Strader-Ferris Intl)

Please call or 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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## 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 a rack-mount kit 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.

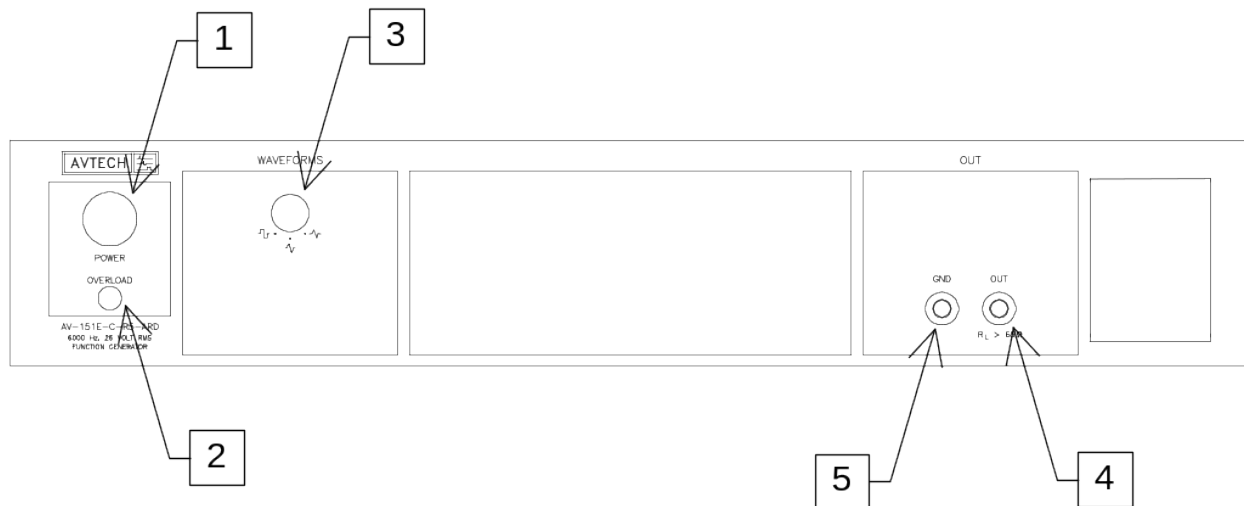
For AC line voltages of 110-120V, the power selector card should be installed so that the "120" marking is visible from the rear of the instrument.

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 1A slow blow fuse is required. In the 240V setting, a 0.5A slow-blow fuse is required.

## FRONT PANEL CONTROLS

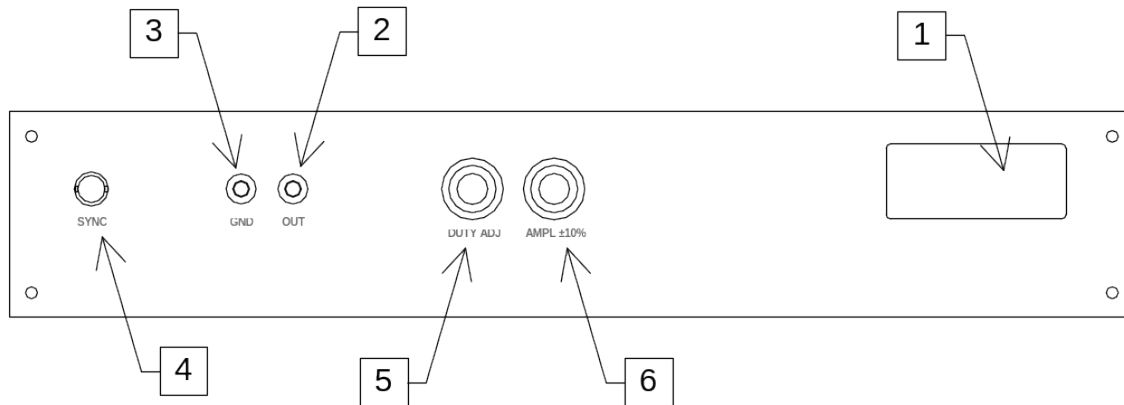


1. **POWER Switch**. The POWER push button switch applies AC prime power to the primaries of the transformer, turning the instrument on. The push button lamp (#382 type) is connected to the +15V DC supply.
2. **OVERLOAD**. An automatic overload circuit protects the output and controls the front panel overload light. If the internal power supply is overloaded due to improper operation, 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.

The overload indicator may come on briefly at startup. This is not a cause for concern.

3. **WAVEFORM Switch**. This 3-position switch selects between square, sine or triangular output at the main output.
4. **OUT Connector**. This red banana post connector provides the main output signal. The rear-panel OUT connector provides the same signal. The two connectors are wired to the same point internally.
5. **GND Connector**. This black banana post connector is connected to ground.

## REAR PANEL CONTROLS

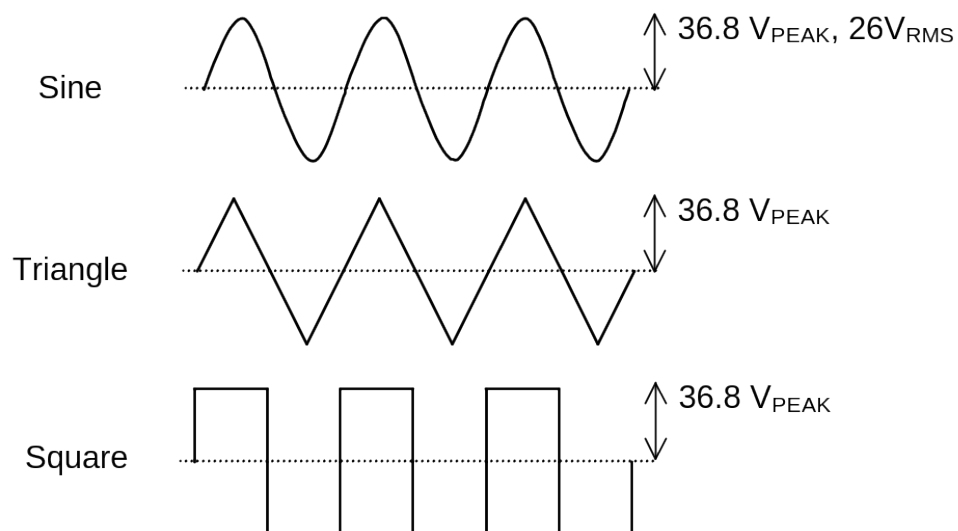


1. AC POWER INPUT. A three-pronged recessed male connector is provided on the back panel for AC power connection to the instrument. Also contained in this assembly is a 1A slow blow fuse and a removable card that can be removed and repositioned to switch between 120V AC in and 240V AC in.
2. OUT Connector. This red banana post connector provides the main output signal. The front-panel OUT connector provides the same signal. The two connectors are wired to the same point internally.
3. GND Connector. This black banana post connector is connected to ground.
4. SYNC Connector. This connector provides a bipolar square wave signal, for triggering oscilloscopes or other test equipment. The output is (approximately)  $\pm 10\text{V}$ , with a  $470\Omega$  output impedance. When driving a  $50\Omega$  load, an amplitude of approximately  $\pm 1\text{V}$  can be expected. This output is short-circuit protected.
5. Duty Cycle Adjust. The output duty cycle is nominally 50%. This control varies the output duty cycle within a  $\pm 1\%$  range, approximately.
6. Amplitude Adjust. The output amplitude is nominally  $26\text{ V}_{\text{RMS}}$ . This ten-turn locking dial can be used to adjust the output amplitude within a  $\pm 10\%$  range, approximately, for calibration purposes.

## GENERAL INFORMATION

### BASIC PULSE CONTROL

Instrument operation is straightforward. The output may be set to be a triangle, sine, or square wave, as illustrated below:



### TOP COVER REMOVAL

The top cover of the instrument may be removed by removing the four Phillips screws on the top panel. With these four screws removed, the top panel may be slid off by pulling it towards the rear.

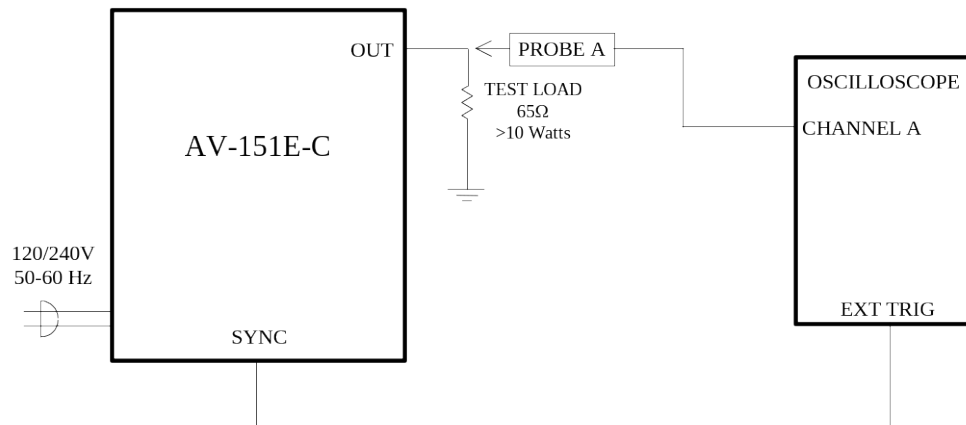
The instrument should not be accessed internally unless it has been turned off for ten minutes, to allow all internal capacitors to discharge. The internal capacitor bank stores a considerable amount of energy.

### 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.

## OPERATIONAL CHECK

This section describes a sequence to confirm the basic operation of the instrument. It should be performed after receiving the instrument. It is a useful learning exercise as well.



*Basic Test Arrangement*

- 1) Connect a 10W or greater, 65Ω test load between the OUT connector and ground.
- 2) Connect a cable from the SYNC OUT connector to the TRIG input of an oscilloscope. Set the oscilloscope to trigger externally.
- 3) Connect one oscilloscope probe (channel A) to the OUT load. On the oscilloscope, set the channel A vertical scale to 20 V/div, and the horizontal scale to 50 μs/div.
- 4) Turn on the AV-151E-C-R5-ARD.
- 5) Set the waveform switch to the sine wave position.
- 6) Observe the oscilloscope. You should see a sine wave with a 166.7 us period, and 73.6V peak-to-peak amplitude.
- 7) Observe the waveform as you switch between the sine, triangle, and square wave modes using the waveform switch.
- 8) This completes the operational check.

If additional assistance is required:

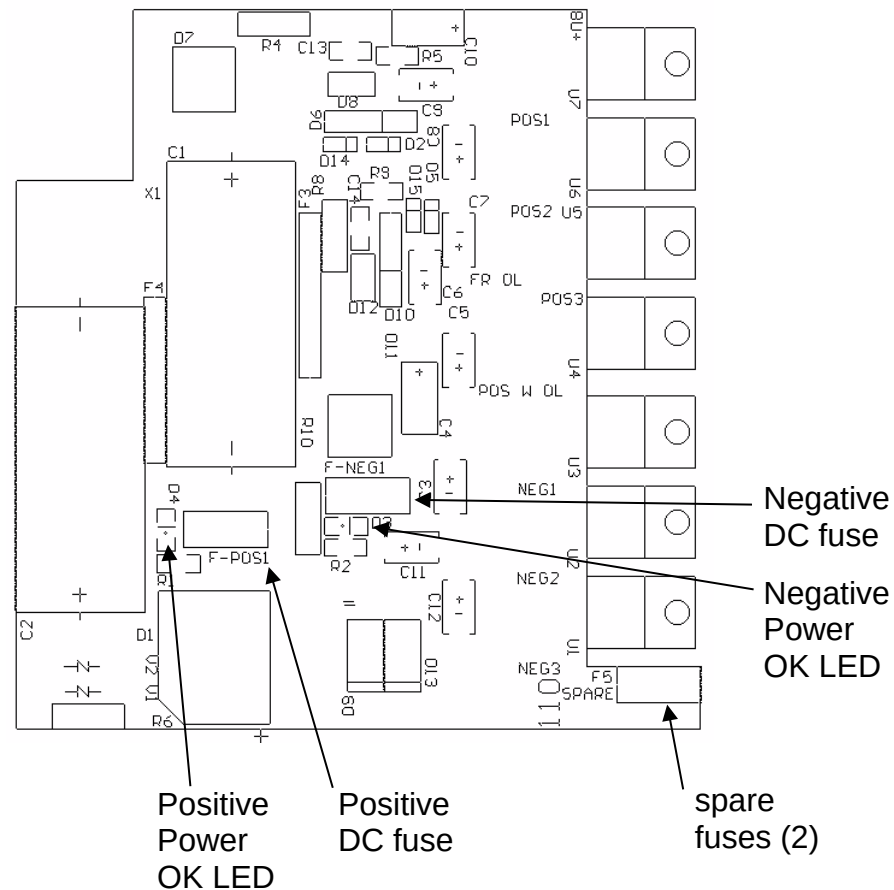
Tel: (613) 226-5772, Fax: (613) 226-2802  
 Email: [info@avtechpulse.com](mailto:info@avtechpulse.com)

## MAINTENANCE

### POWER FAILURE AND FUSE REPLACEMENT

This instrument has three 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 one spare) are located on the internal DC power supply, as shown below:



The spare fuses may be used to replace blown fuses, if required.

The positive power fuse is a 2A slow-blow fuse, Littlefuse part number R452002. (This fuse can be ordered from Digikey, [www.digikey.com](http://www.digikey.com). The Digikey part number is F1345CT-ND).

The negative power fuse is a 0.5A slow-blow fuse, Littlefuse part number R452.500. (This fuse can be ordered from Digikey, [www.digikey.com](http://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.
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.

### CALIBRATION

The output amplitude may be adjusted within a  $\pm 10\%$  range using the “AMPL  $\pm 10\%$ ” locking dial described in the “REAR PANEL CONTROLS” section.

The output duty cycle (nominally 50%) may be adjusted within a  $\pm 1\%$  range using the “DUTY ADJ” locking dial described in the “REAR PANEL CONTROLS” section. To adjust the duty cycle, the recommended procedure is to set the instrument for square wave operation, and observe the output on an oscilloscope with a duty cycle measurement feature. Adjust the dial until the output duty cycle is 50.0%. Then return the waveform setting to its previous value (usually sine wave).

Setting the square wave duty cycle to 50.0% also ensures that the sine wave duty cycle is 50.0%, which in turn reduces the total harmonic distortion (THD) observed on the sine wave output to its minimum possible value.

### OTHER REGULAR MAINTENANCE

The fan grille, located on the bottom of the instrument, should be cleaned once a year so that it does not become blocked. To clean the grille, use a high-power vacuum cleaner.

PERFORMANCE CHECK SHEET