# INSTRUCTIONS

MODEL AVX-DD-A3-PS-TC

DUAL CHANNEL
DIGITAL DELAY GENERATOR
AND 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 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

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Manual Reference: /fileserver1/officefiles/instructword/avx-dd/AVX-DD-A3-PS-TC,edition1.doc, created November 22, 2001

# INTRODUCTION

The AVX-DD-A3-PS-TC is a highly flexible instrument that can be used as a dual channel digital delay generator, or as a dual channel pulse generator.

Two outputs are provided. Each has independently variable amplitude (0 to ±10V), offset (0 to ±10V), delay (0 to 1 second), and pulse width (0 to 1 second). Both outputs have rise and fall times of 10 ns, and can drive 50Ω loads.

The two outputs share a common trigger source, which can either be an external TTL-level pulse, or the internal oscillator.

# SPECIFICATIONS

| | |
|---|---|
| Model: | AVX-DD-A3-PS-TC |
| Variable delay range: | 0 to 1 second[1] |
| Delay resolution: | varies, < 0.3% of (delay + 20 ns) |
| Jitter (RMS):<br>(trig in to pulse out) | ± 40 ps ± 0.015% of delay. |
| No. of output channels: | 2 |
| Delay control: | Front-panel keypad, GPIB, or RS-232 |
| Insertion delay: | 100 ns |
| Rise time, fall time: | ≤ 10 ns |
| Display: | 4 line by 40 character backlit LCD display |
| Output amplitude: | 0 to ± 10 V (variable) [1], will drive 50 Ω loads |
| Trigger required: | + 5 Volt, PW > 50 ns |
| OUT pulse width: | 50 ns to 1 second[1] (variable) |
| Max duty cycle: | 80% |
| PRF: | 0 to 10 MHz |
| Connectors: | BNC |
| Power requirement: | 120/240 Volts (switchable) 50 - 60 Hz |
| Dimensions: | 100 mm x 430 mm x 375 mm (3.9” x 17” x 14.8”) |

[1] Improved since publication of original datasheet

# INSTALLATION

## VISUAL CHECK

After unpacking the instrument, examine to ensure that it has not been damaged in shipment. Visually inspect all connectors, knobs, liquid crystal displays (LCDs), and the handles. Confirm that a power cord, a GPIB cable, and two instrumentation manuals (this manual and the “OP1B Interface Programming Manual”) 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.

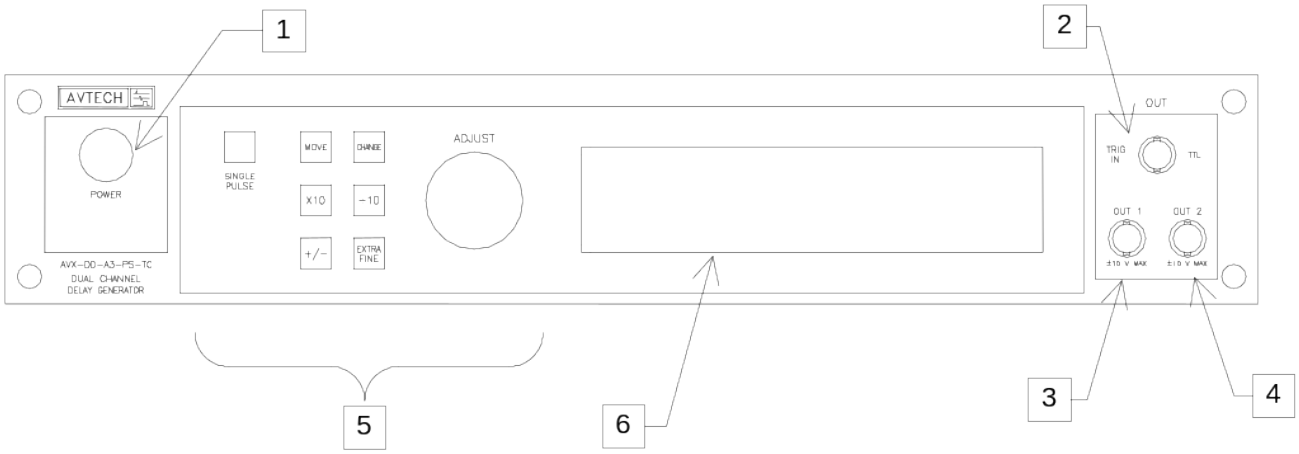
For AC line voltages of 110-120V, the power selector card should be installed so that the “120” marking is visible from the rear of the instrument.

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 1.0A 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 internal +15V DC supply.

2. TRIG IN Connector. This TTL-level (0 and +5V) logic input can be used to trigger the instrument, if the instrument is set to trigger externally. The instrument triggers on the rising edge of this input. The input impedance is 1 kΩ.

3. OUT 1 Connector. This output is delayed relative to the trigger (which may be from the TRIG IN connector, in the external trigger mode, or the internal oscillator, in the internal trigger mode). The delay, pulse width, amplitude and offset settings of this output are variable, and may be changed using the front panel controls or the computer interfaces. This output will drive loads as low as 50 Ω.

4. OUT 2 Connector. This output is delayed relative to the trigger (which may be from the TRIG IN connector, in the external trigger mode, or the internal oscillator, in the internal trigger mode). The delay, pulse width, amplitude and offset settings of this output are variable, and may be changed using the front panel controls or the computer interfaces. This output will drive loads as low as 50 Ω.

5. KEYPAD.

| Control Name | Function |
|---|---|
| MOVE | This moves the arrow pointer on the display. |
| CHANGE | This is used to enter the submenu, or to select the operating mode, pointed to by the arrow pointer. |
| ×10 | If one of the adjustable numeric parameters is displayed, this increases the setting by a factor of ten. |

| | |
|---|---|
| ÷10 | If one of the adjustable numeric parameters is displayed, this decreases the setting by a factor of ten. |
| +/- | If one of the adjustable numeric parameters is displayed, and this parameter can be both positive or negative, this changes the sign of the parameter. |
| EXTRA FINE | This changes the step size of the ADJUST knob. In the extra-fine mode, the step size is twenty times finer than in the normal mode. This button switches between the two step sizes. |
| ADJUST | This large knob adjusts the value of any displayed numeric adjustable values, such as frequency, pulse width, etc. The adjust step size is set by the "EXTRA FINE" button.<br><br>When the main menu is displayed, this knob can be used to move the arrow pointer. |

6. LIQUID CRYSTAL DISPLAY (LCD). This LCD is used in conjunction with the keypad to change the instrument settings. Normally, the main menu is displayed, which lists the key adjustable parameters and their current values. The “OP1B Interface Programming Manual” describes the menus and submenus in detail.

## 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 1.0A slow blow fuse is required. In the 240V setting, a 0.5A slow blow fuse is required.

2. GATE. This TTL-level (0 and +5V) logic input can be used to gate the triggering of the instrument. This input can be either active high or active low, depending on the front panel settings or programming commands. (The instrument triggers normally when this input is unconnected).

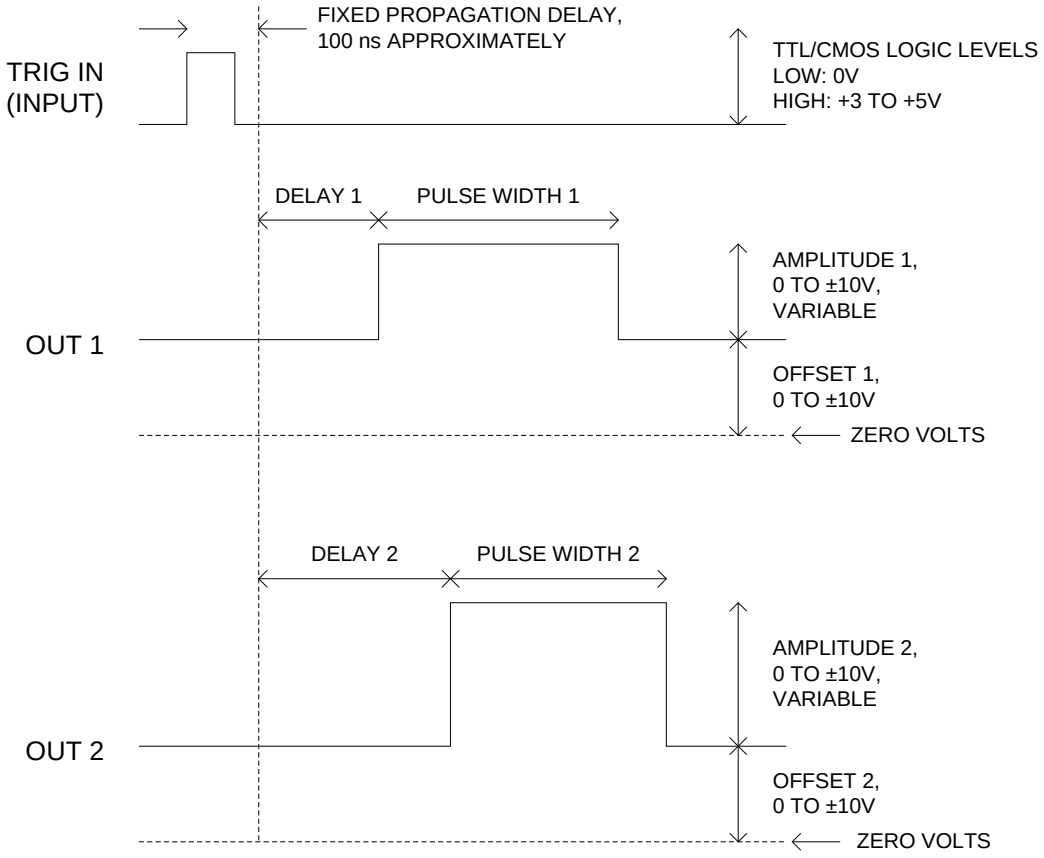
3. GPIB Connector. A standard GPIB cable can be attached to this connector to allow the instrument to be computer-controlled. See the “OP1B Interface Programming Manual” for more details on GPIB control.

4. RS-232 Connector. A standard serial cable with a 25-pin male connector can be attached to this connector to allow the instrument to be computer-controlled. See the “OP1B Interface Programming Manual” for more details on RS-232 control.

## GENERAL INFORMATION

## BASIC OPERATION - DELAY GENERATOR MODE

If the trigger source is set to the external mode (by using the front-panel trigger menu or the “trig:sour ext” command), the instrument acts as a two-channel delay generator. The two output channels are delayed relative to the single input channel, as shown below. The delay is the sum of the insertion delay (approximately 100 ns) and the programmed delay.



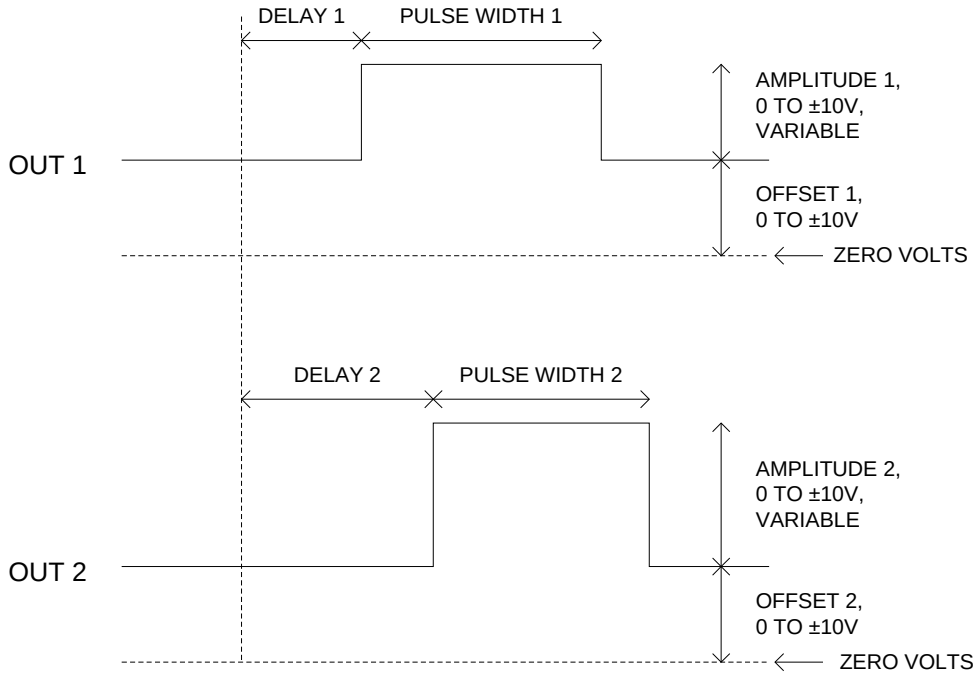

The outputs will drive load impedances as low as 50Ω.

## BASIC OPERATION - PULSE GENERATOR MODE

If the trigger source is set to the internal mode (by using the front-panel trigger menu or the “trig:sour int” command), the instrument acts as a two-channel pulse generator.

In this mode, no external trigger is applied to the instrument. The internal oscillator is used as the trigger instead. The frequency of this oscillator can be varied from 1 Hz to

10 MHz. The two output pulses may be delayed with respect to each other, as shown below:




*The pulse repetition frequency is controlled by the front panel settings (or by programming comands). OUT 1 and OUT 2 trigger at the same frequency.*

## 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 ideally be less than 3m in length.

## 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).

# PROGRAMMING YOUR INSTRUMENT

## KEY PROGRAMMING COMMANDS

The “OP1B Interface Programming Manual” describes in detail how to connect the pulse generator to your computer, and the programming commands themselves. A large number of commands are available; however, normally you will only need a few of these. Several sample sequences of commands that might be sent to the instrument after power-up are given below.

To use the instrument as a delay generator (i.e. to trigger from an external TTL signal applied to the TRIG IN connector), use:

| | |
|---|---|
| *rst | (resets the instrument) |
| trigger:source external | (selects internal triggering) |
| pulse:width1 10 us | (sets the channel 1 pulse width to 10 us) |
| pulse:width2 20 us | (sets the channel 2 pulse width to 20 us) |
| pulse:delay 1 us | (sets the inter-channel delay to 1 us) |
| output:impedance1 2 | (sets the channel 1 output impedance to 2Ω. The only other allowed setting is output:impedance1 50.) |
| output:impedance2 50 | (sets the channel 2 output impedance to 50Ω.) |
| volt:ampl1 5 | (sets the channel 1 amplitude to 5 V) |
| volt:ampl2 -5 | (sets the channel 2 amplitude to -5 V) |
| volt:low1 0 | (sets the DC offset to 0 V) |
| volt:low2 +2 | (sets the DC offset to +2 V) |
| output on | (turns on the output) |

To use the instrument as a pulse generator (i.e. to trigger from the internal oscillator), use:

| | |
|---|---|
| *rst | (resets the instrument) |
| trigger:source internal | (selects internal triggering, i.e., pulse generator mode) |
| frequency 1000 Hz | (sets the frequency to 1000 Hz) |
| pulse:width1 10 us | (sets the channel 1 pulse width to 10 us) |
| pulse:width2 20 us | (sets the channel 2 pulse width to 20 us) |
| pulse:delay 1 us | (sets the inter-channel delay to 1 us) |
| output:impedance1 2 | (sets the channel 1 output impedance to 2Ω. The only other allowed setting is output:impedance1 50.) |
| output:impedance2 50 | (sets the channel 2 output impedance to 50Ω.) |
| volt:ampl1 5 | (sets the channel 1 amplitude to 5 V) |
| volt:ampl2 -5 | (sets the channel 2 amplitude to -5 V) |
| volt:low1 0 | (sets the DC offset to 0 V) |
| volt:low2 +2 | (sets the DC offset to +2 V) |
| output on | (turns on the output) |

For triggering a single event, this sequence would be more appropriate:

| | |
|---|---|
| *rst | (resets the instrument) |
| trigger:source hold | (turns off all triggering) |
| pulse:width1 10 us | (sets the channel 1 pulse width to 10 us) |
| pulse:width2 20 us | (sets the channel 2 pulse width to 20 us) |
| pulse:delay 1 us | (sets the inter-channel delay to 1 us) |
| output:impedance1 2 | (sets the channel 1 output impedance to 2Ω. The only other allowed setting is output:impedance1 50.) |
| output:impedance2 50 | (sets the channel 2 output impedance to 50Ω.) |
| output on | (turns on the output) |
| volt:ampl1 5 | (sets the channel 1 amplitude to 5 V) |
| volt:ampl2 -5 | (sets the channel 2 amplitude to -5 V) |
| volt:low1 0 | (sets the DC offset to 0 V) |
| volt:low2 +2 | (sets the DC offset to +2 V) |
| trigger:source immediate | (generates a single non-repetitive trigger event) |
| trigger:source hold | (turns off all triggering) |
| output off | (turns off the output) |

These commands will satisfy 90% of your programming needs.

## ALL PROGRAMMING COMMANDS

For more advanced programmers, a complete list of the available commands is given below. These commands are described in detail in the “OP1B Interface Programming Manual”. (Note: this manual also includes some commands that are not implemented in this instrument. They can be ignored.)

| Keyword | Parameter | Notes |
|---|---|---|
| LOCAL | | |
| OUTPut: | | |
| :[STATe] | <boolean value> | |
| :IMPedance | <numeric value> | |
| :PROTection | | |
| :TRIPped? | | [query only] |
| REMOTE | | |
| [SOURce]: | | |
| :FREQuency | | |
| [:CW \| FIXed] | <numeric value> | |
| [SOURce]: | | |
| :PULSe | | |
| :PERiod | <numeric value> | |
| :WIDTh | <numeric value> \| EXT | [EXT for CH1 only] |
| :DCYCle | <numeric value> | |

```
        :HOLD               WIDTh | DCYCle
        :DELay              <numeric value>
        :GATE
            :LEVel          HIgh | LOw
[SOURce]:
    :VOLTage
        [:LEVel]
            [:IMMediate]
                [:AMPLitude]    <numeric value>
                :LOW            <numeric value>
        :PROTection
            :TRIPped?                               [query only]
STATUS:
    :OPERation
        :[EVENt]?                                   [query only, always returns "0"]
        :CONDition?                                 [query only, always returns "0"]
        :ENABle             <numeric value>         [implemented but not useful]
    :QUEStionable
        :[EVENt]?                                   [query only, always returns "0"]
        :CONDition?                                 [query only, always returns "0"]
        :ENABle             <numeric value>         [implemented but not useful]
SYSTem:
    :COMMunicate
        :GPIB
            :ADDRess        <numeric value>
        :SERial
            :CONTrol
                :RTS        ON | IBFull | RFR
            :[RECeive]
                :BAUD       1200 | 2400 | 4800 | 9600
                :BITS       7 | 8
                :ECHO       <boolean value>
                :PARity
                    :[TYPE] EVEN | ODD | NONE
                :SBITS      1 | 2
    :ERRor
        :[NEXT]?                                    [query only]
        :COUNT?                                     [query only]
    :VERSion?                                       [query only]
TRIGger:
    :SOURce                 INTernal | EXTernal | MANual | HOLD | IMMediate
*CLS                                                [no query form]
*ESE                        <numeric value>
*ESR?                                               [query only]
*IDN?                                               [query only]
*OPC
*SAV                        0 | 1 | 2 | 3           [no query form]
*RCL                        0 | 1 | 2 | 3           [no query form]
*RST                                                [no query form]
*SRE                        <numeric value>
*STB?                                               [query only]
*TST?                                               [query only]
*WAI                                                [no query form]
```

PERFORMANCE CHECK SHEET