

INSTRUCTIONS

MODEL AVX-FD3-PS

0 to 250 MHz
FREQUENCY DIVIDER

WITH DIVISION FACTOR
VARIABLE FROM 2 TO 65535
AND A RESET INPUT

SERIAL NUMBER: _____

WARRANTY

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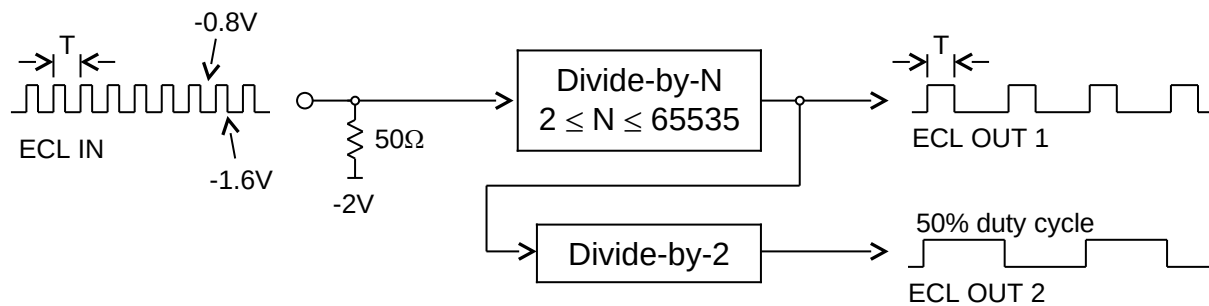
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INTRODUCTION

The AVX-FD3-PS is a high-speed frequency divider that can operate at pulse repetition frequencies up to 250 MHz. The main output can be set to generate a pulse for every N input pulses, where N can vary from 2 to 65535. The output pulse width is equal, approximately, to one input period. A second output is also available, which generates a pulse for every 2N input pulses. This output has 50% duty cycle.

All outputs are ECL-level (i.e. logic high = -0.8V, logic low = -1.6V). The outputs can drive loads of 50Ω to ground or 50Ω to -2V, for maximum flexibility. The standard AVX-FD3-PS accepts an ECL-level input, but small-signal and differential ECL inputs are available as options.

A TTL "RESET" input and an OPERATE/RESET switch are also provided. A logic-high level on the TTL input resets the internal counters to a default state. This input is useful for synchronization purposes. The OPERATE/RESET switch performs a similar function when it is set to the RESET position. After the reset condition is removed, the first output pulse will occur after N input pulses, where N is the divisor setting.



Block Diagram of AVX-FD3-PS

OPTIONAL FEATURES

The following options are available for the AVX-FD3-PS:

- DECL option: Inputs and outputs are differential ECL.
- EP option: Provides complementary output pulses.
- IP option: Accepts pulse or sine wave input from 0.2 to 5.0 Volts peak to peak.

SPECIFICATIONS

Model:	AVX-FD3-PS
Maximum input frequency:	N > 1: 0 - 250 MHz N = 1: 0 - 125 MHz
Division factor (N):	0 to 65535
Input level:	ECL (-0.8 and -1.6V)
Input termination:	50 Ω to -2V
Input pulse width:	≥ 1 ns
Output level:	ECL (-0.8 and -1.6V)
Outputs:	OUT1: $f_{OUT1} = f_{IN}/N$ OUT2: $f_{OUT2} = f_{OUT1}/2$
Output pulse width:	OUT1: one input period, i.e. $PW_{OUT1} = 1/f_{IN}$ OUT2: 50% duty cycle, i.e. $PW_{OUT2} = 1/f_{OUT1}$
Jitter:	≤ 100 ps
Connectors:	BNC
Prime power:	120/240 Volts, 50 - 60 Hz
Dimensions (H x W x D):	100 mm x 215 mm x 375 mm (3.9" x 8.5" x 14.8")
Temperature range:	+ 10° to + 40° C

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 this 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.

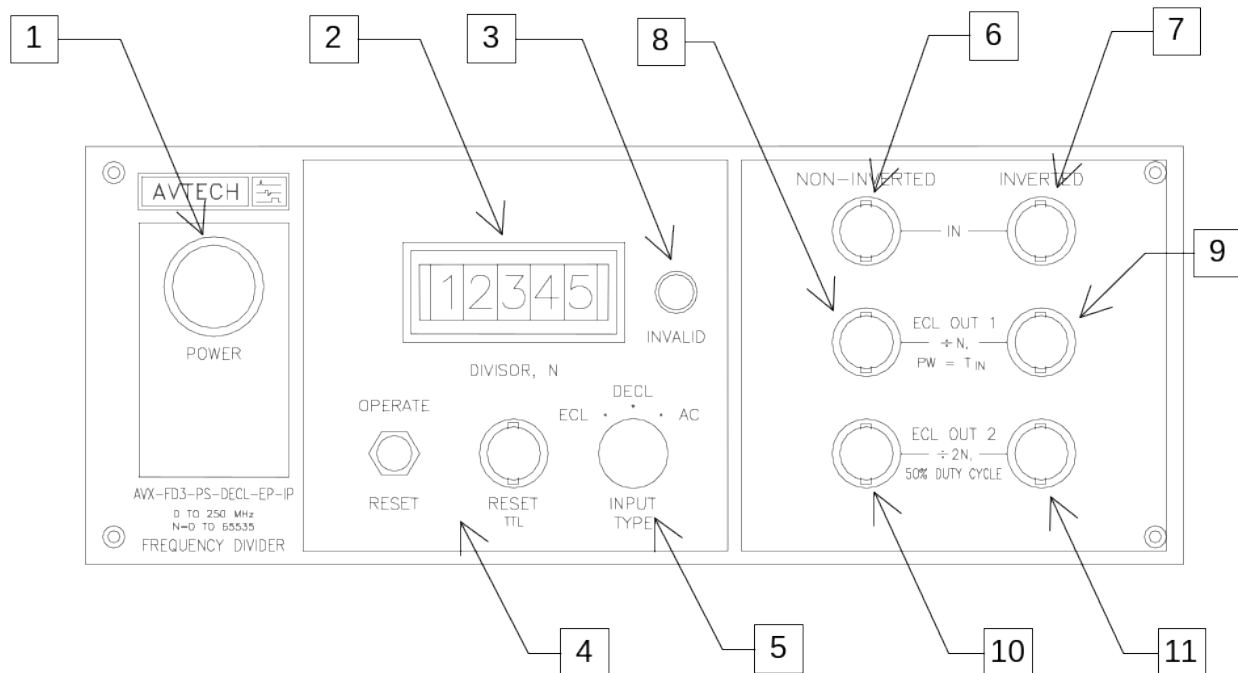
For AC line voltages of 110-120V, the power selector card should be installed so that the "120" marking is visible from the rear of the instrument, as shown below:

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 (#382 type) is connected to the internal +15V DC supply.
- 2) **DIVISOR Thumbwheel Switch.** This switch sets the division factor, N. For normal operation, this value can be set between 2 and 65535. For values above 65535, no output will be generated, and the "Invalid Divisor" light (item 3) will turn on.
- 3) **INVALID DIVISOR Light.** This indicator comes on when the divisor is set to a value greater than 65535.
- 4) **RESET CONNECTOR/SWITCH.** A TTL-level pulse on the RESET connector will reset the internal counters to a default state. This can be used for synchronisation purposes. The connector may be left unconnected without interfering with normal operation.

The OPERATE/RESET switch can be used to achieve this function manually. That is, setting this switch to the "RESET" position will reset the internal counters to a default state.

- 5) **INPUT TYPE SWITCH.** (Present on -IP and -DECL models only.) This switch controls the trigger level of the input. Depending on the options included on the

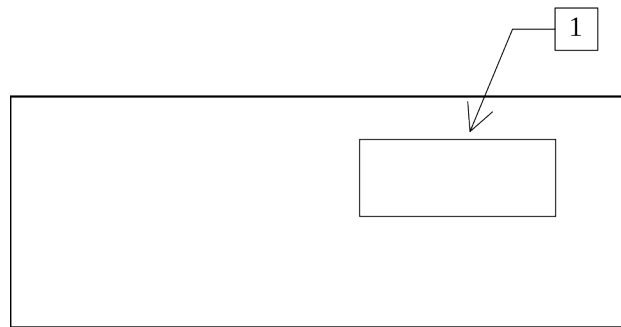
instrument, this switch may be set to the following settings:

- ECL: Standard mode. ECL logic levels (i.e. -0.8V and -1.6V) are required on the main input (item 6) to trigger the instrument. (On models with the -DECL option, the non-inverted input is used for this mode.) The input is terminated internally with a 50Ω shunt resistance to -2V (which is a standard termination for ECL logic circuits).
 - DECL: Different ECL mode. ECL logic levels (i.e. -0.8V and -1.6V) are required on the non-inverted input (item 6) and the inverted input (item 7) to trigger the instrument. The two inputs are terminated internally with a 50Ω shunt resistance to -2V (which is a standard termination for ECL logic circuits). The internal trigger circuit senses the difference between these two inputs.
 - AC: Small-signal mode. A sine wave (or 50% duty cycle square wave) signal with an amplitude of between 0.2 to 5.0 Volts peak-to-peak is required on the main input (item 6) to trigger the instrument. (On models with the -DECL option, the non-inverted input is used for this mode.) The input is terminated internally with a 50Ω shunt resistance to ground. The input is AC-coupled in this mode.
- 6) IN Connector (Non-inverted). An input signal is applied to this BNC connector. For standard models, the IN connector is terminated with a 50Ω shunt resistance to -2V (which is a standard termination for ECL logic circuits), and ECL logic levels (i.e. -0.8V and -1.6V) are required to trigger the instrument. For models with the -IP and/or -DECL models, see the description of the “Input Type Switch” (item 5) for the expected input levels in each mode.
- 7) IN Connector (Inverted). (Present on -DECL models only.) When the “Input Type Switch” (item 5) is set to the “DECL” position, the instrument trigger circuit senses the difference between the signal on the non-inverted input (item 6) and this input. In this mode, this input is terminated with a 50Ω shunt resistance to -2V (which is a standard termination for ECL logic circuits), and ECL logic levels (i.e. -0.8V and -1.6V) are required to trigger the instrument.
- 8) ECL OUT 1 (Non-inverted). This connector supplies the main output. The pulse repetition frequency of this output is 1/N of the input pulse repetition frequency. The output levels are ECL (i.e. -0.8V and -1.6V). This output should be terminated by a 50Ω load to ground or -2V. The pulse width of this output is equal to one period of the input signal (except when N=1, in which case the output pulse width is approximately equal to the input pulse width).
- 9) ECL OUT 1 (Inverted). (Present on -DECL models only.) This output is identical to item 8, except that the logic levels are inverted.

10) ECL OUT 2 (Non-inverted). This connector supplies the secondary output. The pulse repetition frequency of this output is 1/2 of the "ECL OUT 1" output pulse repetition frequency. The duty cycle of this output is 50%.

11) ECL OUT 2 (Inverted). (Present on -DECL models only.) This output is identical to item 10, except that the logic levels are inverted.

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.

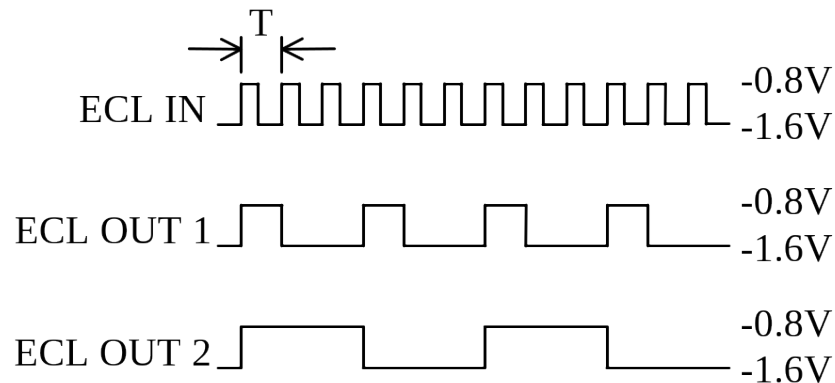
If it is not set for the proper voltage, remove the fuse and then grasp the card with a pair of pliers and remove it. Rotate horizontally through 180 degrees. Reinstall the card and the correct fuse.

In the 120V setting, a 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

OPERATION FOR $2 \leq N \leq 65535$

The figure below shows the basic relationship between the input signal and the two outputs, for $2 \leq N \leq 65535$. The main output, ECL OUT 1, generates a pulse for every N input cycles, and the output pulse width is approximately equal to one input period ("T"). The second output, ECL OUT 2, generates a pulse for every 2N input cycles. It has 50% duty cycle.



Inputs and Outputs For N=3

Models with the "-DECL" output also provided inverted (i.e., logical complement) versions of the ECL OUT 1 and ECL OUT 2 signals.

OPERATION FOR $N > 65535$

If N is set greater than 65535, no output will be generated (i.e. the outputs will remain at ECL logic low, -1.6V), and the "Invalid Divisor" indicator will light.

OPERATION FOR $N = 0$

If N is set to zero, no output will be generated (i.e. the main output will remain at ECL logic low, -1.6V). The "Invalid Divisor" indicator will not light.

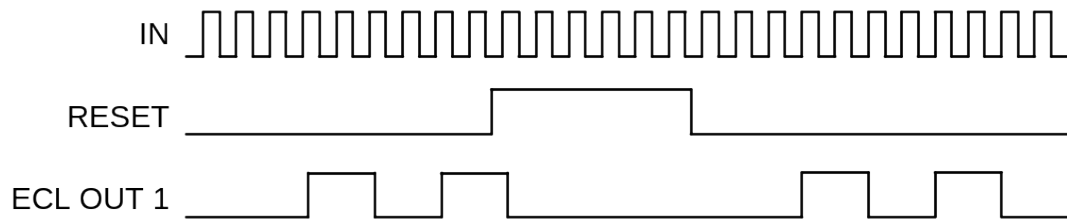
OPERATION FOR $N = 1$

The divider operates slightly differently for $N = 1$. In this case, the internal divider circuitry is bypassed, and the input is routed directly to the ECL OUT 1 output (after passing through a buffer stage). The output pulse width is approximately equal to the

input pulse width. Note that if the input pulse width is very narrow, the buffer circuit may not be able to respond quickly enough. (This mode is an extra feature that is not included in the specifications.)

RESET OPERATION

The front-panel reset input can be used for synchronization, as shown below:



In this example, $N=4$. When the reset input is TTL high, the internal counter are reset to zero and are held at zero until the reset input switches to TTL low. An output pulse is generated on the fourth input pulse after the reset line returns to TTL low.

OUTPUT TERMINATION

All used outputs should be terminated with a 50Ω load, for minimum waveform distortion. The load can be connected to ground or $-2V$, as desired. (The former is a typical termination for pulse generators, and the latter is a common ECL-specific termination.)

TOP COVER REMOVAL

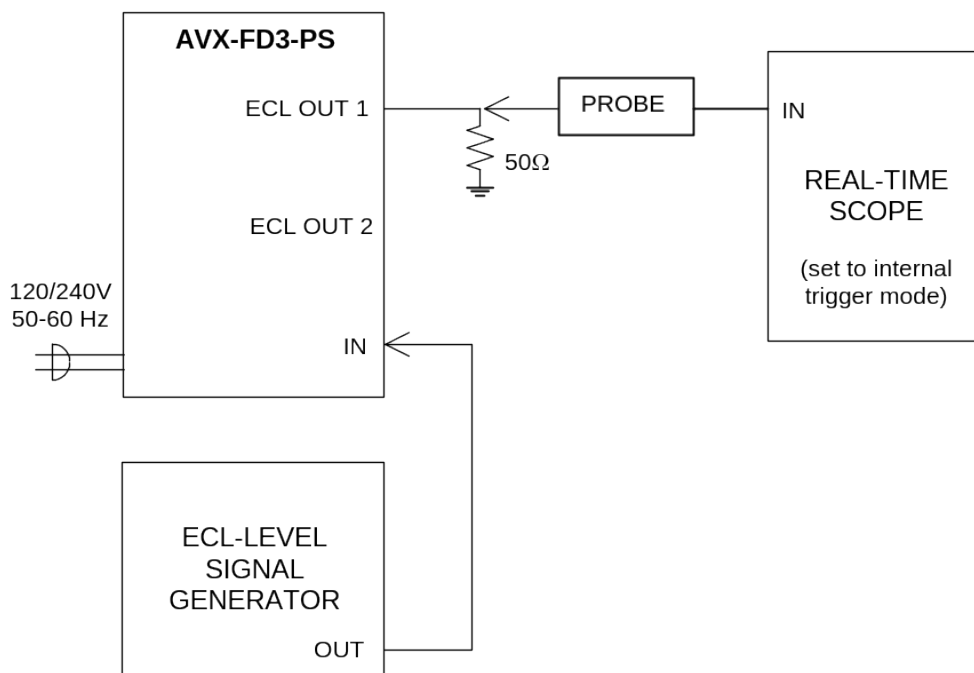
The interior of the instrument may be accessed by removing the four Phillips screws on the top panel. With the four screws removed, the top cover may be slid back (and off).

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.

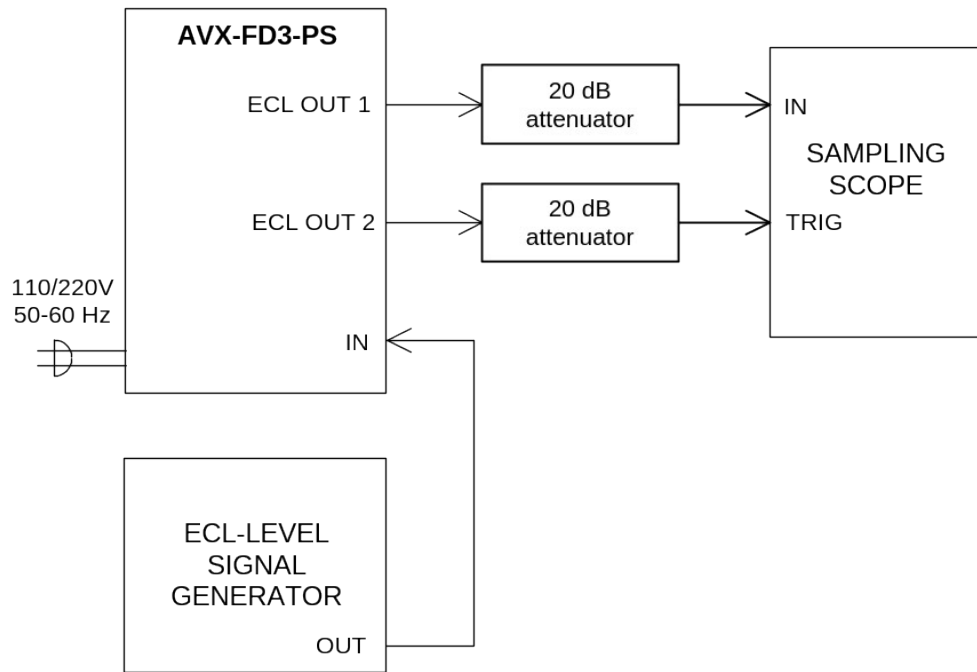
GENERAL TEST ARRANGEMENT

The diagram below illustrates the basic technique for testing the AVX-FD3-PS with a real-time oscilloscope. Use an oscilloscope with sufficient bandwidth to observe your signal.



Test Arrangement for Real-Time Scopes

If you wish to test the divider at its maximum rated pulse repetition frequency (250 MHz), you may need to use a sampling oscilloscope, in which case the arrangement in the following figure suggested. In this arrangement, the main output is terminated by the 50Ω input impedance of the sampling scope, and the scope is triggered by the secondary output.



Test Arrangement for Sampling Scopes

PERFORMANCE CHECKSHEET