

## 2-Channel, USB-Controlled Constant Fraction Discriminator

The SensL HRM-CFD provides a solution for picosecond timing with ultra-fast detectors. This compact, rugged and low-power instrument features two independent channels each with their own 0.75GHz amplifier. All settings and adjustments are programmed via USB using the SensL GUI provided, which also allows automatic optimization and easy storing of parameters in non-volatile memory (stored during power-off state). The HRM-CFD is fully compatible with the SensL HRM-TDC High Resolution Timing Module.



### GENERAL PARAMETERS

No. channels	2
Input and output connectors	SMA
Output level	LVTTL
Input impedance	50Ω
Input polarity	Positive OR Negative
Input protection	Over-current protected
Power consumption	<6W
Power supply	Mains (cable provided)
Weight	930g
Dimensions	179 x 118 x 36 mm <sup>3</sup>
Temperature range	Operating: 0°C to +50°C Storage: -20°C to +70°C

### PERFORMANCE PARAMETERS

Delay line value selection	1ns, 1.1ns, 1.5ns, 1.6ns
Fraction selection	15%, 25%, 35%, 60%
Internal bandwidth	750MHz
Internal amplifier gain range	0.6x – 500x (8-bit resolution)
Time walk	<±50ps over 10:1 (typical)
Time jitter	<20ps FWHM (typical)
Threshold adjustment range	0 – 2.5V (12-bit resolution)
Threshold LSB	0.61mV
Output pulse duration selection	8ns OR 270ns
DC offset range	0 – 2.5V (12-bit resolution)

### CFD OPERATION

Simple thresholding discriminators will result in timing inaccuracies when the incoming signals have a range of amplitudes. This 'time walk' is illustrated in Figure 1. If accurate timing is required from fast detector signals, such as those from PMTs and SPMs, then a constant fraction discriminator (CFD) can be used to eliminate this time walk. The signals from a given detector will typically have identical pulse shapes and a CFD utilizes this fact in order to provide a constant trigger point regardless of the signal amplitude. Figure 2 illustrates the process used to produce this trigger at a constant fraction of the pulse height.

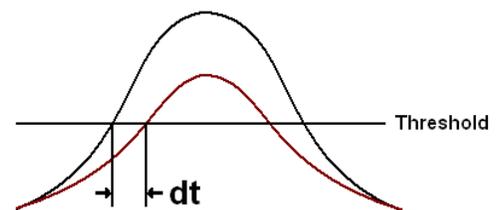


Figure 1, The timing discrepancy resulting from pulses of different amplitude when a simple 'leading edge' discriminator is used.

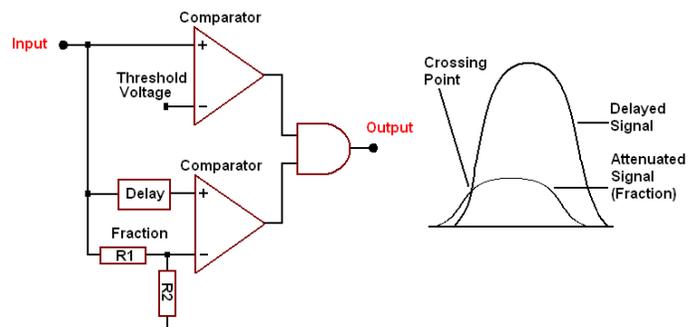
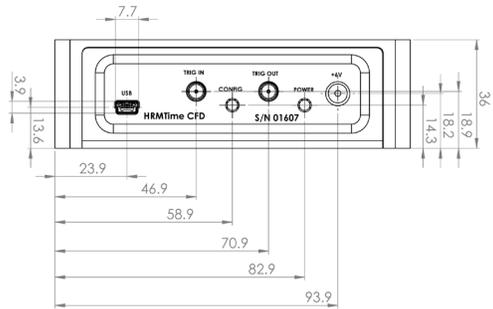
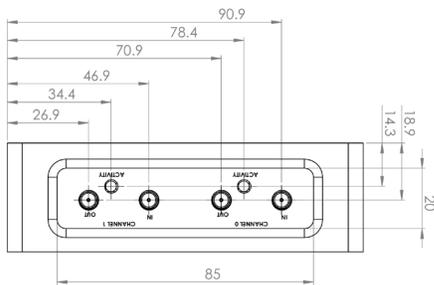
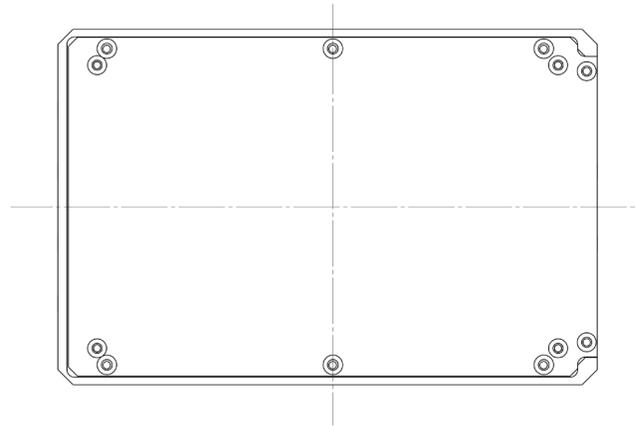
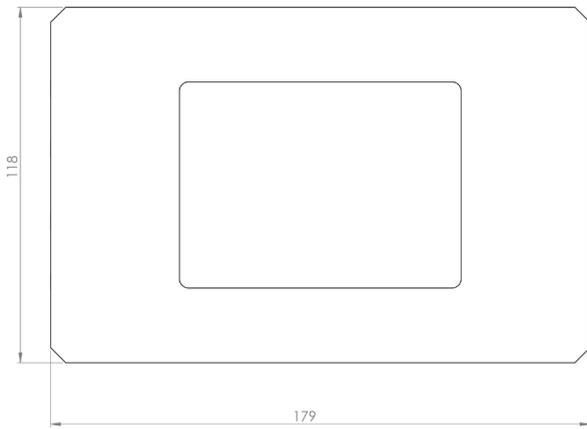


Figure 2, a) A simplified diagram of the CFD principle, where the input signal is split into two parts, b) With the correct settings, the crossing point will be common for signals for all amplitudes.



**SCHEMATICS (All dimensions in mm)**



**ORDERING INFORMATION**

Product Code	Description
HRM-CFD	2-Channel, USB Constant Fraction Discriminator (CFD)