



22750 Heslip Drive  
Novi, MI 48375 • USA  
(248) 347-7900  
[www.mcm1.com](http://www.mcm1.com)

Building D, No. 81 Meiyue Road  
Shanghai 200131 • CHINA  
Ph: 011-86-21-58682809

Suite 14 Fairfax House  
Cromwell Business Park  
Chipping Norton Oxon, Ox7 5SR • UK  
Ph: +44-0-1608-695938

### The Problem

In our business, we rely on state-of-the-art components to yield the accurate measurements and control required by our machines. Occasionally, the exact component doesn't exist or is not flexible enough to meet our needs. We have encountered this problem in two specific areas of measurement; Timing and peak detection.

When measuring injector timing, it is necessary to measure the amount of time between firing the injector and fuel coming out of it. This time is usually very short (between 1 and 3 ms) and it is important to measure this event with every shot of the injector. Sure, an oscilloscope can show this relationship, but try to get a value at every shot to external data collection without missing a beat.

When measuring the valve opening pressure of an injector nozzle or the peak injection pressure of a unit injector, it is difficult even with an oscilloscope to detect the subtle change in pressure slope that occurs at VOP, let alone collect it with every shot.

### The Solution

We make it! In response to the two problems addressed here, we reacted by developing a timing module and peak detection module. The products have become stand items that we have developed over the years to be flexible enough to adapt to any system and be flexible enough to apply to different applications. These units are completed designed and built in house by the people that know the application the best.

### Timing Module

This unit can measure injector timing (or any timing event) up to 10 ms. A trigger is needed to start the unit and a terminating event to stop it. Jumper selectable flexibility allows the unit to stop the timing event on a digital signal, or an analog signal crossing a voltage threshold. This threshold can also be internally set or provided externally. A 5-digit display show the timing value in real time and reflects the BCD representation on the rear connector. Provisions for signal polarity and handshaking are also provided. If an event has several timing features that need to be measured, units may be cascaded so that one event will allow the subsequent measurement of another.

#### Machine Features:

- Measurement resolution to 0.1 microseconds
- Snap track mount or panel mount enclosure
- Jumper configuration allows polarity selection
- BCD data output is standard
- Optional analog data output available
- Years of proven use in the field demonstrates reliability
- Accepts a variety of means to determine terminating event
- Unit can handshake if necessary, to accommodate slow data collection
- Unit operates on 15-30 VDC





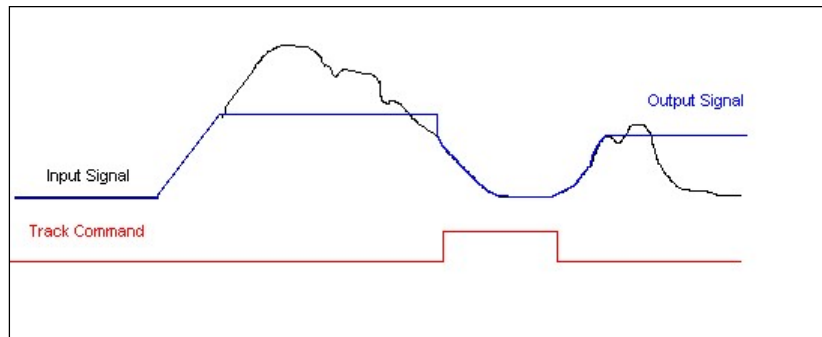
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### Peak Detection Module

This is a two-channel module that detects a slope change on an analog signal and captures this value as a voltage. The unit is jumper configurable to detect positive slopes or negative slopes. External inputs put the unit in to “track” mode which causes the output to follow the input. When a slope change has been detected a “have peak” signal is available as an output. This unit is primarily used to detect the valve opening pressure of an injector nozzle group, but has been used to detect peak injection pressure as well as peak rail pressure in a common rail fuel system. The unit can be mounted on 4” snap trak or it can be panel mounted in a case. Since most injector machines take advantage of the timing module as well, both units can co-exist in the same case.



The above illustration shows an example of how the track command interacts with capturing of a slope change on the input signal.

### Module Features

- Infinite analog resolution
- Snap track mount or panel mount enclosure
- Jumper configuration allows polarity selection for digital signals
- Configurable for sinking or sourcing I/O
- Digital I/O voltage can be configured for any voltage between 5 and 30 VDC.
- Sensitivity adjustment for each channel
- Years of proven use in the field demonstrates reliability
- Multi-colored LEDs indicate the status of the module
- Tracking function can be modified for edge triggering rather than level trigger
- Unit operates on 15-30 VDC