



## **Detonation detection system**

M6 Stud detector

### **Overview**

Detonation is the pre-ignition of fuel in the cylinder and can cause piston damage; a certain level of detonation is good (fuel dependant) to ensure that the engine is running at the optimal level. The detection system allows detonation to be detected and a bright indicator flash indicates a detonation has occurred to warn the rider. The number of detonations on 1 or 2 cylinders can be displayed if the counter is connected.

The detonation detection system allows a plug together system that can be simply expanded from a simple single cylinder system to a full dual cylinder system and to other data recording/logging systems.

### **System variations:**

Single Cylinder : Simple detonation detection  
1 detonation detector  
1 power lead and blue indicator flash

Single Cylinder : Detonation detection and counter  
1 detonation detector  
1 power lead and blue indicator flash  
1 detonation counter

Twin Cylinder : Simple detonation detection  
2 off detonation detector  
2 off power lead and blue indicator flash

Twin Cylinder : Detonation detection and counter  
2 off detonation detector  
1 off power lead and blue indicator flash  
1 off detonation counter

All the above options are built from the basic components of:

- . Detonation detector
- . Power lead
- . Counter unit

The power lead can include either a blue indicator and/or a connector to a data logger.

### **M6 Stud Detector unit**

Amplifier unit

M6 and M8 Stud detectors



The detector system comprises of: a M6 Stud detector sensor and a small amplifier unit. The sensor detects head (or block) deformation and passes this signal to the amplifier. The amplifier produces two output signals:

- A) A standard detonation profiled pulse
- B) An indicator drive for the blue indicator

The (A) output can be coupled to other type of detonation detection systems such as  
Honda detonation counter and logger  
BPS CDi ignition and engine control systems  
Cougar Data Recording motorcycle logging system

The (B) output can be coupled to loggers with standard 5V analogue or digital inputs  
Aim MyChron Extreme system

If connection to one of the above is required then request a power cable with a logger output connection. Note that the BPS/cougar cylinder pressure cannot be measure by this type of sensor

On powering up the unit will generate a detonation signal and/or flash the indicator this is normal and provides a test for the power and indicator

### **Counter unit**



The counter unit (for single or dual cylinder) has two detonation detector inputs labelled (1) and (2) and a power connection. The detector amplifier/s can then be powered via the counter unit.

. The count values are stored in a non-volatile memory and so are unaffected by having the power removed.

. The value normally displayed is the addition of cylinder 1 and cylinder 2 count values

. Pressing the button briefly once will cycle through the count values

The display will show ....

1=  
{Cylinder 1 count value}  
2=  
{Cylinder 2 count value}  
Total  
{Addition of cylinder 1 and 2}                      the normal display

. When cycling through the cylinder counts the counter system will continue to count any detonations

. 20 seconds after a button is pressed the display will fade to reduce power consumption

. To reset the values: press and hold the button for 2 seconds

. The counter unit does not have a compatible detonation output for loggers this signal would be taken from the detector unit/s.

### **Reading the count on generator only powered engines**

The count values on the counter are retained even without power connected to read on a generator only motorcycle then build a small 12 to 14V battery ( 500mAH or above ) with a connector and power the motorcycle for the short period required to read the display.

## **Installation Procedure for the M6 stud detector**

The mounting position should be on the head bolts or as central as possible and in the top half of the engine.

Use an M6 head bolt or stud, the detector has 6mm of internal threads until the head of the internal set screw.

The sensors outside metal surface must make contact to the head or block or steel washer or nut. The contact of the sensor should be of high quality and clean to ensure the resonance coupling. The whole of the sensors metal surface needs to be in level contact.

The sensor should be tightened to the normal head nut tightness

Do not use a copper washer between the head and the detector.

**WARNING:** The detector amplifier unit must be mounted at least 80mm away from the ignition coils. Also route all detector cables away from HT leads or the coil.

### **Honda Power connections**

Wire behind the tachometer:

Red positive power	to	Honda black
Green Chassis	to	Honda green

### **Yamaha Power connections**

Wire behind the tachometer:

Red positive power	to	Yamaha Brown
Green Chassis	to	Yamaha Black

If connecting the unit to an AIM MyChron extreme then the power connection can be via the signal connector

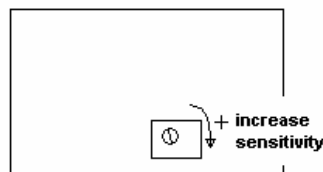
### **NOTE :**

- . Mount the blue indicator in the dash foam pointing towards the rider.
- . Velcro mount the detector amplifier unit to the inside of the chassis: DO NOT MOUNT ON THE SIDE OF THE COIL.
- . Ensure all cables are away from the HT leads, if the HT lead goes right route the detonation lead left.
- . Velcro mount the counter unit in a visible position and ensure that the button cannot be pressed accidentally or pushed by other cables.
- . Use the coloured tie-wraps to indicate which cylinder is which; red=1, blue=2 ensure that the leads are in the correct connectors for cylinders.

### **Sensitivity**

With the surface sensor, the detection level will vary between engine makes and the position mounted used, the sensitivity will need to be initially adjusted to suit.

The Amplifier has adjustable sensitivity using a 15 turn control screw; turning clockwise will increase the sensitivity and anticlockwise will decrease the sensitivity of the detector.



When setting the unit, turn the screw clockwise for more than 15 turns. Use the unit and compare the detonation count to the number expected from the top of the piston. Turn back the screw anti-clockwise to make less sensitive.

If there is no data for your engine on the sensitivity level required, set the sensitivity at the most sensitive. This will no doubt show a continuous blue indication while running the engine in normal conditions. Then with the engine running slightly rich reduce the sensitivity until the light never flashes under slight load with the RPM in the power band.

If the sensitivity is still too high then please contact the office as a suitable washer placed between the cylinder head or block will reduce the detection sensitivity

### **Excessive Detonation count**

- . The effect that the sensor detects can also be caused by mechanical bangs. Worn bearings in the crank or con rod can easily slap against the cylinder head when a higher revs.
- . Interference can also cause the detector amplifier to detect non existent detonation, the cables and amplifier must be mounted away from the HT coil, HT wire or the LT coil drive wiring.
- . Mid throttle (on the Needle / lean needle) detonation can cause actual detonation to occur that is not damaging to the piston but is still a detonation and will still be detected / counted.

### **Options:**

- . 1.5m Extension cable for carts this allow the counter and/or the blue indicator flash to be mounted at the front / steering wheel
- . Connections to loggers ... please contact office for details / options available

### **Specifications:**

#### Detector amplifier

Voltage range	9V to 20V
Input Current	5mA nominal 20mA peak
Sensor temperature range	-10degC to +130degC
Amplifier temperature range	-10degC to +60degC
Weight	Approx 100g
Detonation output	-40V 1mA 16uS
Led / Logger output	+5V 5mA 200mS

#### Counter

Voltage range	9V to 20V
Input Current	50mA nominal 150mA peak
Temperature range	-10degC to +60degC
Weight	Approx 60g
Inputs	2 off -40V 16uS piezo
Led output	+5V 5mA 200mS
Max count	99999

### **Ian E Limited Disclaimer**

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