OPTICAL DETECTOR ALIGNMENT AND SETUP CHECKS

The Optical Detector method of projectile detection is by far the most accurate technique and offers many advantages over acoustic and other sensor types. The system enables a measurement accuracy of up to 0.01%, however, care must be taken in the setup of the system in order to achieve these high levels of accuracy.
In the first instance, reference should be made to the setup instructions in the manuals provided with the system. If a problem persists, check through the information given below.

A typical system comprises the following:

- Two Optical Detectors type 858, sometimes known as Sky Screens, (or an earlier version is type 758).
- Velocity Computer (sometimes known as a Chronograph) which will be connected to a PC.
- D.C. lights (for indoor use only)

The Optical Detector type 758/858
The 858 utilises a linear cell placed under a 6/1000" slit. This model may be clearly identified as a bright yellow unit whereas earlier models (pre-1982) were grey. The old units used a single photocell with a fibre-optic fan.
The advantage of the newer units is that they are more sensitive and don't suffer from the 'blind-spots' sometimes observed when projectiles are fired high above the earlier units.
The detection area above the 858 is a 36-degree fan (with the standard lens) which is 0.17 degrees thick. The projectile must occupy approximately 1/500 of the fan width in order to trigger the unit.
e.g. at 1m above the detector, the fan is about 536mm wide, thus a projectile of just over 1mm could be detected.
This sensitivity should be remembered particularly when firing indoors as burnt powder and other fragments can trigger the detector before the real projectile passes overhead.
It is ESSENTIAL that the genuine projectile is detected first. Either the sensitivity must be adjusted using the gain setting in the BallisticsDB control software or the detectors must be placed a sufficient distance from the muzzle to ensure that the projectile is the first detection.
The projectile signal may be observed by connecting an oscilloscope to the BNC connector on the base of the Detector. This connector also provides a D.C. level which may be used to align the detectors under the D.C. lights when the system is set up indoors.

The Velocity Computer is the type 817 (an earlier versions are the 708/808 814/815)
The 817 provides power to the 758/858 and also takes the projectile signal and converts to a TTL (5v) 1µS pulse which is fed to the timing circuitry.
The unit is controlled from the PC using the BallisticsDB software.
Great care must be taken when setting Lockout and False Reading Reject (FRR). If single shots are being fired, lockout should be set to at least 500mS. This should be reduced only in rapid firing modes.
FRR is used to reset the system if, for example, an insect triggers the START but not the STOP. It should be set a time significantly greater than the time taken for a genuine projectile to pass between the two detectors; 1000mS is a typical value.

Solid state lights type 788 (an earlier version was D.C. Lights type 760)
These units are normally suspended from the ceiling or a framework. The optical detectors must be aligned carefully beneath them and this is normally done by connecting a digital voltmeter to the BNC connector on the base of the detector. The D.C. voltage reading should be approximately 8-9v when properly aligned, although very new designs may be 10-11v. Gently slide the detector back and forth under the light to obtain a maximum.
It is important to note that the detection 'fan' of the 758/858 may be wider than the lamp (depending on the height of the lamp above the detector); this means that any extraneous light outside the ends of the D.C. light assembly may be seen. Overhead fluorescent lights are a particular problem as they emit A.C. light which can give rise to a continuous triggering of the detectors. A blackened board above the assembly can remove the problem.

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Typical readings:

If the readings are lower than expected, this suggests that the START detector has received a signal early, i.e. before the real projectile has been seen, and the STOP detector has seen the projectile. The most common reasons for this are as follows:

- Pre-triggering due to burning powder or other debris arriving at the START detector before the bullet. Fire further back or through a piece of card with a small hole to 'strip' debris.
- Pre-triggering due to movement of the D.C. light from the shot blast; this is particularly pronounced when the detectors are aligned badly under the lights. If the detection 'fan' is directed at the edge of the lamp, a small movement in the lamp can cause a large light change.
- Pre-triggering due to movement of the 758. This is normally seen only with larger calibre firings. Place sandbags or similar sound absorbent material between the 758 and the weapon.

If the readings are higher than expected, this suggests that both detectors have received a signal early. The most common reason for this is that the shot blast is triggering both detectors directly. Place sandbags or similar sound absorbent material between the 758 and the weapon.

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