

# **Gunson**

**WORKSHOP TIMING LIGHT**

**PART NO G4133**

HANDBOOK

# CONTENTS

## Workshop Timing Light

- 8000 rpm
- 2 volts DC
- Heavy duty
- Xenon/Advance with

**Inductive Pick-Up – This instrument contains a very delicate ferrite material and should not be snapped closed, dropped or mis handled. Keep all contact surfaces clean and store with compartment completely closed**

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# **READ THE FOLLOWING PRECAUTIONS BEFORE PROCEEDING**

## **PRECAUTIONS**

Using this timing light necessarily involves working under the bonnet while the engine is running. This is a potentially hazardous situation, and the user should take every precaution to avoid any possibility of injury. The following guidance should always be followed:

- **Never wear loose clothing, particularly ties, long sleeves etc that can catch in moving engine parts**
- **Ensure that the car is on firm level ground, and is out of gear and the handbrake firmly applied at all times.**
- **If for any reason the car is jacked up or the wheels removed, always ensure that the car is well supported, and never rely on a car jack alone, always use ramps or axle stands.**
- **Do as much of the work as possible without the engine running.**
- **Always route cables well away from hot or moving parts**
- **Always guard against getting the timing light or fingers too close to moving, hot or electrical parts. Remember that thermostatically controlled fans may suddenly start with no warning.**
- **Take care to avoid placing metal tools where they may cause an electrical short, such as near the car battery.**
- **Take care not to place tools etc where they may be dislodged by engine vibration.**
- **Treat High Tension components with respect, remembering that electrical shocks can cause involuntary movement which may result in secondary injury**
- **Keep all sensitive electronic equipment away from HT voltages, and do not make any electrical connection to HT voltages except as expressly advised by the makers of the electronic equipment.**
- **Remember that Low Tension Voltage, present on the LT terminal of the ignition coil and at the contact breakers, can also give quite an electrical shock.**
- **Make all electrical connections with power off, so as to avoid the possibility of electrical sparks, which can ignite fuel vapour or inflammable battery gas emissions.**
- **Take care not to inhale exhaust gas. Never run the engine inside a garage or in a confined space. Ensure that there are no leaks in the exhaust system near where you are working.**
- **Keep children and pets away from the car while work is being carried out.**

# **I. INTRODUCTION**

Gunson is now part of the Tool Connection and sold alongside the Laser Tools and Kamasa brands. Where possible our Service Department can help with any general tool enquiries and other products in the Gunson range can be viewed on [www.gunson.co.uk](http://www.gunson.co.uk).

If you would like to discuss tools in a general forum visit:  
<http://forums.toolconnection.co.uk>

## **2. DESCRIPTION**

The Gunson Workshop Timing Light is of robust construction, and is intended for heavy duty applications where it may be subjected to regular or continuous use.

### **1) BODY**

It has a metal die cast body, with a sturdy handgrip and trigger, and with a soft rubber nose cone which minimises the danger to the timing light or car from inadvertent contact with moving parts such as the fan, fan belt or pulley.

### **2) TRIGGER**

When the trigger is depressed, the timing light starts to flash in time with the cylinder ignition sparks corresponding to the ignition lead to which the pick-up is connected. If the pick-up is not clipped over an HT lead, then the timing light may or may not flash randomly due to received interference.

### **3) OPTICAL COMPONENTS**

A Xenon discharge lamp of high energy output is provided, combined with a lens which gives a wide beam of brilliant white light, enabling the timing marks to be readily seen under daylight conditions.

Should the lamp ever need replacing, spares can be obtained from Gunson

### **4) LEAD/PICKUP SET**

A plug-in lead and pick-up set is provided which is detachable for safe keeping and for ease of replacement should it become damaged

The leads/pickups comprise:

**RED** and **BLACK** clips for connecting to the car battery.

**RED INDUCTIVE PICKUP**, for clipping over the spark plug lead at No 1 cylinder, for detecting the instant of firing of the spark plug. Note that the body of the pickup shows an arrow sign, and the pickup should be attached with this arrow pointing along the HT lead towards the spark plug (connecting it the other way round may result in reduced pickup sensitivity).

### **5) ADVANCE ADJUSTMENT KNOB/DIAL**

This knob/dial is situated at the rear of the instrument. It enables the ignition

timing of the engine to be measured anywhere in the range 0° to 60° Before Top Dead Centre (BTDC) over the full speed range of the engine, while using only at Top Dead Centre (TDC) mark. If any other timing mark is being used, then the total ignition timing is the timing shown on the dial PLUS the BTDC timing of the mark being used. (see later for more details on the use of this feature).

**Note** that the area below 0° is dead space and is equal to 0°.

### **3. INSTRUCTIONS FOR USE**

- 1) Ensure that relevant prior service has been carried out on the car. For instance, for contact breaker ignition systems ensure that the points dwell has been correctly set, since adjusting the points can affect ignition timing.
- 2) Obtain the correct technical ignition timing data for the vehicle from the vehicle's workshop manual. In particular, note at what engine RPM the timing should be checked, and check whether vacuum pipe should be left connected or disconnected. Also from the workshop manual, find where to look for the timing marks (usually on the fan belt pulley or on the engine flywheel), and what the timing marks mean, i.e. whether there is a timing mark for Top Dead Centre (TDC), (this is often indicated by a "0" or "V"), and whether there are other marks, and what angles these marks represent.
- 3) Find the timing marks on the engine of the vehicle. Preferably, highlight the marks using white paint (typing correction fluid is ideal).
- 4) Bring the car to its correct operating temperature. Ensure that the car is out of gear, and the handbrake firmly applied.
- 5) If the handbook says that the vacuum pipe between the carburettor and the distributor should be disconnected, then disconnect it at one end, taking care that the loose pipe is not near hot or rotating machinery. If disconnecting the pipe causes the engine to falter, then it may be necessary to block the open end of pipe.
- 6) With the engine of the car switched off, make the connections of Workshop Timing Light to the car, i.e.:
  - Connect the RED lead to the battery positive terminal (+),
  - Connect the BLACK lead to the battery negative terminal (-), Attach the INDUCTIVE PICK-UP to the plug lead of No 1 Cylinder, with the arrow on the pick-up pointing towards the spark plug. Preferably choose a loop of plug lead that is well separated from other leads, so as to minimise possible interference from nearby HT cables. Note that No 1 cylinder is usually specified as the front one of the engine (i.e. at the fan belt end), unless otherwise stated in the workshop manual.

**Note:** Take care to not let any leads or clips come into contact with hot or moving components of the engine, and similarly route all leads well clear of hot or moving parts.

- 7) Start the engine and set the engine speed to the correct RPM as recommended in the workshop manual.
- 8) Direct the timing light at the timing marks of the engine, and press the trigger: the timing light should start to flash, illuminating the timing marks. The actual timing of the ignition spark (measured in degrees Before Top Dead Centre, BTDC), is given by the indication of the timing marks, PLUS whatever is indicated on the dial of the timing light.

#### **4. FURTHER NOTES**

- 1) **6 AND 24 VOLT VEHICLES:** a separate 12 volt battery should be used to power the instrument.
- 2) **MAGNETO IGNITION SYSTEMS:** Operation should be satisfactory, but see below.
- 3) **UNSTEADY READING:** If the illuminated moving mark is not steady, but jumps around, then this indicates that the inductive pick-up is not detecting a clean indication of the ignition spark. Either it is missing sparks, or detecting extra ones. Check that the inductive pick-up is not broken and is correctly attached. Try moving the pick-up to a different position on the HT lead. Ensure that the HT leads are well separated so that one lead is not picking up a signal from an adjacent lead. Check for faults in the vehicle's ignition system. Check the plug gap. This problem is more likely to be encountered on engines in which the electrical polarity of the spark alternates, i.e. a (+) spark followed by a (-) spark, etc. In this case, increase the spark plug gap slightly to cause a stronger signal.
- 4) **TWO-STROKE ENGINES, AND 4-STROKE-WASTED-SPARK.** The dial reading should be halved.
- 5) **RETARDED IGNITION:** One relatively common problem is that an engine has only a mark for static timing, but the user needs to set more retarded timing than this for use with unleaded petrol.

A similar problem is where the user has only a static timing mark, but the data for higher RPM is with reference to TDC, and the user wishes to avoid continual mental arithmetic in making the conversion (i.e. adding the static timing to the measured timing).

The solution to these problems is to paint a TDC mark onto the fan belt pulley or flywheel (using white paint or typing correction fluid), or on the casing of the engine, using a protractor scale as a guide, and use this TDC mark as a reference

in further timing measurement.

**WHEN THE VEHICLE MANUFACTURER HAS PROVIDED AN ADE QUATE TIMING MARK.**

For instance, when it is necessary to check the timing at idle, and the manufacturer has provided an "idle" timing mark. In this case the dial of Workshop Timing Light can be set at ZERO (or below zero, since the area below zero is dead space). When the dial is set at ZERO, the timing light behaves as a normal (i.e. non-advance) timing light, and the timing is as indicated by the marks on the fan belt pulley or engine fly wheel. See Fig 1

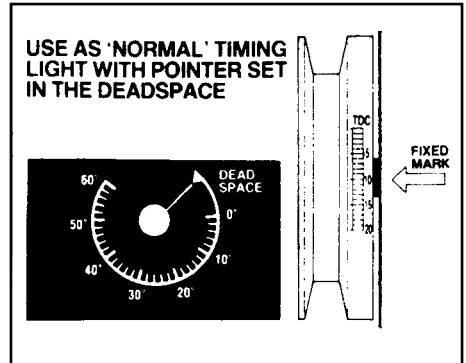


Fig 1

**WHEN THE USER WISHES TO USE THE TOP-DEAD-CENTRE (TDC) MARK.**

Some vehicles have a TDC mark in addition to an idle timing mark. Some vehicles have only a TDC mark. If the timing mark being used is a Top-Dead-Centre (TDC) mark, then the ignition timing of the engine is simply as shown on the dial of the timing light. A TDC mark is very useful if the user wishes to measure ignition advance at high RPM, since the advance angle is simply as indicated on the dial of Workshop Timing Light when the TDC mark is brought to be opposite the stationary mark. See Fig 2

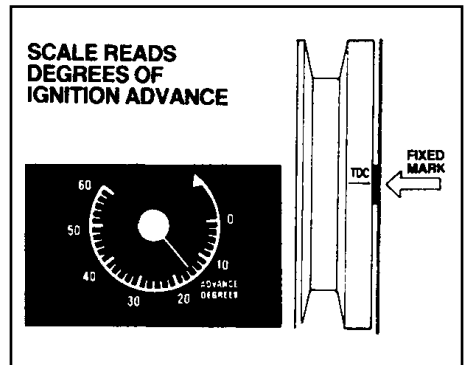


Fig 2

**WHEN THE USER WISHES TO USE THE ADVANCE FEATURE WITH ANY OTHER TIMING MARK.**

Some cars have a timing mark for idle engine speed, but no TDC mark, yet the user may still require to measure the ignition advance at engine speeds greater than idle. In this case, the user can use the idle timing mark. The actual ignition timing of the engine is given by adding the timing indicated by the idle timing mark, to the timing indicated on the dial of Workshop Timing Light. See Fig 3

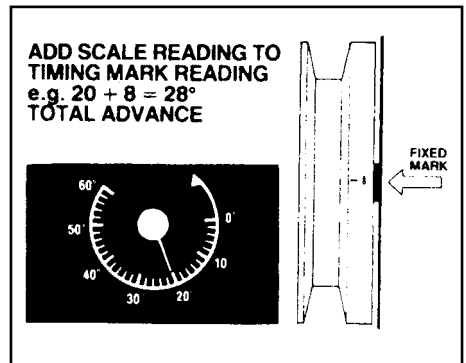


Fig 3

**Note** that Workshop Timing Light can not apply a retardation to timing marks (i.e. it can not be used to set timing After Top Dead Centre (ATDC), where the timing marks are TDC or BTDC), since this would imply causing the timing light to flash before it received the signal from the spark plug, but there are other ways round this problem, as described in Section 4 "Further Notes" (5) above,

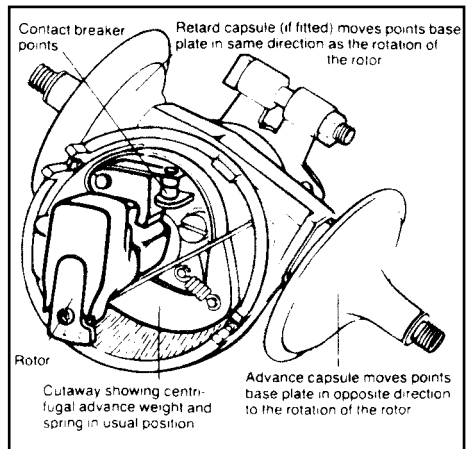
should it ever be needed.

## 6. SOME USEFUL DIAGNOSTIC TESTS

### 1) TESTING CENTRIFUGAL ADVANCE MECHANISM

This mechanism should cause the ignition timing to advance with increase in engine speed. The instructions are as follows:

- Remove vacuum advance/retard connections.
- Observe the timing marks with the engine running at idle.
- Gradually increase the engine speed. The timing mark should remain aligned initially, and then begin to move in the opposite direction to the pulley/flywheel rotation, and then stop. (Centrifugal advance usually begins between 500 & 1500 R.P.M. and ends between 4500 & 5500 RPM).
- If excessive ignition advance with increase in RPM is observed, the cause is usually due to wear or broken advance springs.
- If the ignition advance is too low, the cause is usually sticking or wear at the pivot point of the rotating weights.



### 2) TESTING VACUUM ADVANCE

Re-connect vacuum advance connection only.

Observe the timing marks with the engine running at idle.

Gradually increase the engine speed. Vacuum advance should operate smoothly from around 1000 RPM, reaching a maximum at about 2500 RPM.

This increase in ignition advance will be in addition to that due to the centrifugal advance.

**Note** that if the throttle is opened rapidly the vacuum advance will operate and return quickly as use of the throttle affects the vacuum).

If vacuum advance is operating at idle this may well be due to incorrect

carburettor setting on Solex/Weber carburettors which have both throttle "bypass" and "throttle stop" adjustment; or this may be due to incorrect air balance on twin carburettors.

If the vacuum advance is too low, this is usually due to sticking contact breaker base plate, punctured diaphragm or blocked vacuum pipe. If the vacuum advance is too high, the cause may be due to incorrect carburettor adjustment.

Note that some distributors are adjustable for vacuum advance (examine the area around the vacuum advance or retard operating rod).

### 3) TESTING VACUUM RETARD

This feature may be fitted for emission control, and only operates at idle and during deceleration.

Observe the timing mark with the engine running at idle.

Re-connect the vacuum retard connection.

Observe the difference in timing. The timing mark should move in the same direction as pulley/flywheel rotation.

### 4) DETECTION OF DISTRIBUTOR WEAR OR INACCURACY

Most engines are timed on No 1 cylinder, but other cylinders (No 4 on a 4 cylinder engine) should also fire when the timing marks are aligned. By connecting to the opposite lead to No 1 on the distributor cap the difference can be checked.

Alternatively connection can be made to the king lead (the input HT lead to the distributor) which will give flashes as each cylinder fires. The difference between various cylinders can then be observed.

These methods can also be used to synchronise double points - stop the engine and adjust the position of the moveable points with the engine stationary, until the timing is consistent on appropriate cylinders.

To check other cylinders (2 & 3 on 4 cylinder engines) accurate marking of the pulley at 180° is required.

A regular error (of more than 2-3 degrees) in the ignition timing between separate cylinders indicates distributor cam error or wear, bent or worn distributor shaft or large error in points setting.

Erratic errors in ignition timing on all cylinders indicates wear in distributor drive, shaft or points base plate. A very erratic idle speed or pitted contact breaker points will also cause ignition timing "scatter".

## **5) EFFECTS OF INCORRECT IGNITION TIMING**

**Advance that is too high may cause audible "pinking" or detonation and engine damage. Advance that is too low (i.e. retarded ignition) causes engine overheating, and poor economy and performance. Ignition that is either too advanced or too retarded causes excessive exhaust emissions of Hydrocarbons (HC).**

## **WARRANTY**

**The Tool Connection has made every effort to ensure that this product is of the highest quality and value to the customer. However, The Tool Connection accept no responsibility for any damage arising from the use of this product.**

**All technical enquiries regarding this product made direct to The Tool Connection Please note that The Tool Connection cannot provide technical advice or information on motor vehicles.**

**This warranty does not affect the Statutory Rights of the user.**

**If this product should require service or repair, it should be returned to The Tool Connection, Gunson Service Dept, Kineton Road, Southam, Warwickshire CV47 0DR**

**Please do not return the product for replacement parts.  
Contact us and if we can we will send the missing part to you:**

**The Tool Connection,  
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