

THE TOOL COMPANY

# TIMING LIGHT

■ STOCK No.55106  
55107

■ PART No.TL4  
TL5

## • INSTRUCTIONS •

**IMPORTANT:** PLEASE READ THESE INSTRUCTIONS CAREFULLY TO ENSURE THE SAFE AND EFFECTIVE USE OF THIS TOOL.



05/98



THE TOOL COMPANY

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# TIMING LIGHT

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### NOTE

EMI/RFI problems with Digital Timing Lights:

1. If the Digital Timing Light readout becomes inoperative or locks up during use, disconnect and reconnect the timing light's positive battery clamp from the battery to reset the unit.
2. If the rpm reading on Digital Timing Lights is erratic, move and/or reverse the direction of the inductive pickup to get a better signal input.
3. Some aftermarket ignition systems and/or specialty spark plug wires (solid core wires, racing wires, off-road wires) radiate above normal Electro-Magnetic Interference (EMI) and Radio Frequency Interference (RFI) which can cause improper operation of testing equipment. Please contact these manufacturers for instructions on how to use an inductive pickup with their systems.



# ENGINE TIMING

Proper ignition timing is critical in order to achieve peak engine performance and to ensure maximum fuel economy. An ignition system timing check is critical during any tune-up procedure.

## DEFINITIONS OF TERMS

**DIS:** Distributorless Ignition System; vehicles are equipped with multiple coils and a “control module” for controlling spark distribution. Such systems may also be referred to as EDIS, IDI, C3I or EI.

**ECM:** Electronic Control Modules, the vehicle’s on-board computer system. May also be referred to as ECU, Brain or Module.

**Ignition Timing:** Checking when the No. 1 cylinder spark plug “fires” in relationship to a timing mark or other reference point.

**Late Model:** Refers to vehicles manufactured during the current model year to vehicles manufactured approximately four years earlier. For example: 1992 to 1997.

**Tune Up:** With reference to today’s “self-tuning” vehicles, the meaning of the term “tune-up”, has changed significantly. A tune-up consists essentially of checking engine operation with Original Equipment Manufacturer’s (OEM) specifications. Adjustments are made and parts are replaced ONLY if engine performance is not within OEM specifications

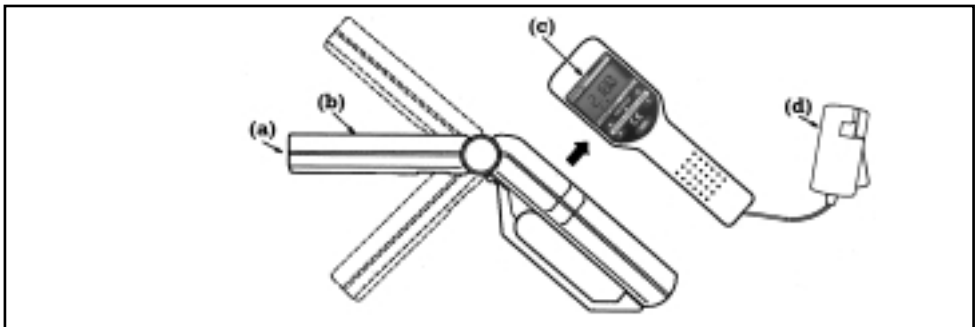


# ABOUT THE TIMING LIGHT

This Timing Light is designed for all 12 volt negative ground vehicles. Some models may also be used on vehicles equipped with DIS (distributorless ignition systems).

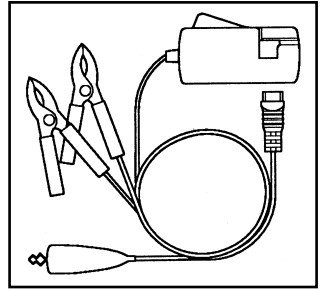
## 1. OPERATING CONTROLS AND INDICATORS - GENERAL

- (a) **Xenon Bulb** – Used to illuminate timing marks for checking timing.
- (b) **Swivelling Head** – Contains the xenon bulb. Rotates over approximately 90° to allow for easy illumination of timing marks in hard to reach locations.
- (c) **Control Panel** – Contains the controls and indicators necessary to operate the timing light. Specific controls and indicators vary between models. Refer to the appropriate paragraph for a description of control panel controls and indicators:
- (d) **Inductive Pickup Lead** – Detachable leads assembly to connect timing light to ignition system:



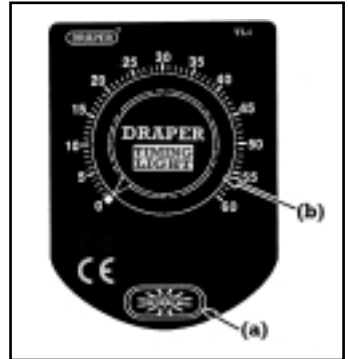
## ABOUT THE TIMING LIGHT cont'd

- **Red Battery Clip** – Connects to battery positive (+) terminal.
- **Black Battery Clip** – Connects to battery negative (-) terminal or bare metal chassis ground.
- **Inductive Pickup Clip** – Clamps around No. 1 spark plug cable.
- **Green DWELL Clip** (only on models with DWELL) – Connects to the tach side of the coil.



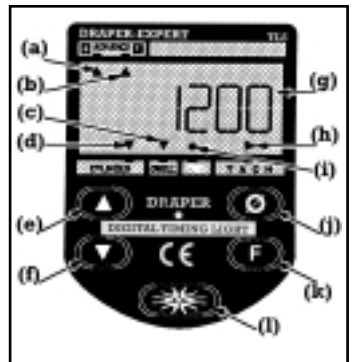
### 2. ADVANCE TIMING LIGHT MODELS— Controls and indicators

- On/Off Switch** – Push to turn timing light on. Push again to turn timing light off.
- Advance Control Knob** – Changes degrees of advance or retard during a vacuum/mechanical advance/retard check (see paragraphs 2 page 8 and 3 page 9).



### 3. DIGITAL ADVANCE TIMING LIGHT MODELS – Controls and indicators

- Advance + indicator**—Displays when advance mode is selected. LCD display shows degrees advance.
- Advance - Indicator** – Displays when advance mode is selected. LCD display shows degrees retard.
- Dwell indicator** – Displays when dwell mode is selected.
- Cylinder indicator** – Displays when dwell mode is selected. Indicates Cylinder/Advance Increment and Decrement switches are enabled.
- Cylinder/advance increment switch**
  - Dwell Mode – Increments through available cylinder settings for dwell check. Enabled when dwell mode is selected.
  - Advance Mode – Increments through degrees of advance/retard during vacuum advance/retard check. Enabled when advance mode is selected.
- Cylinder/advance decrement switch**
  - Dwell mode – Decrements through available cylinder settings for dwell check. Enabled when dwell mode is selected.
  - Advance mode – Decrements through degrees of advance/retard during vacuum advance/retard check. Enabled when advance mode is selected.
- LCD display** – Provides a digital display of engine operating parameters including engine speed (rpm), number of cylinders, vacuum advance or retard (degrees) and dwell (degrees). Displayed information depends on operating mode selected.



- (h) **TACH indicator** – Displays when tachometer mode is selected.
- (i) **ON indicator** – Blinks when timing light is operating.
- (j) **Zeroing Switch** – Returns LCD degrees advance/retard to zero. Enabled when advance mode is selected.
- (k) **Function (F) switch** – Selects timing light operating mode (tachometer or dwell).
- (l) **On/Off switch** – Push to turn timing light on. Push again to turn timing light off.

#### 4. OPERATING SPECIFICATIONS

Operating Temperature: 32 to 135°F (0 to 43°C)

Operating Humidity: 0 to 90% relative humidity



## SAFETY PRECAUTIONS

Always observe safety precautions whenever working on a vehicle.

- (a) Always wear safety eye protection.
- (b) Only work on your vehicle in a well-ventilated area.
- (c) Put transmission in “park” (for automatic) or “neutral” (for manual). Set parking brake.
- (d) Put blocks on drive wheels.
- (e) Avoid moving fan blades or any potentially moving parts.
- (f) Avoid hot engine parts.
- (g) Turn off ignition before connecting (or disconnecting) any testing equipment.
- (h) Please read your vehicle’s service manual and follow its safety procedure.

#### 1. BEFORE YOU BEGIN

Fix any known mechanical problems before performing any test.

Make a thorough check before starting any test procedure. Loose or damaged hoses, wiring, or electrical connectors are often responsible for poor engine performance. Please read your vehicle’s service manual for proper connection of vacuum hoses, electrical wiring, and wiring harness connectors.

Check the following areas:

- (a) All fluid levels
- (b) Air cleaner
- (c) Vacuum hoses
- (d) Belts
- (e) Electrical wiring
- (f) Electrical connectors
- (g) Spark plugs and spark plug wires



## VEHICLE SERVICE MANUALS

Contact your local car dealership, auto parts shop, bookshop or public library for availability of these manuals.

# APPLICATIONS

This timing light is designed for use on most late model import or domestic vehicles equipped with conventional ignition systems. Some models will also operate on vehicles equipped with DIS (distributorless ignition systems).

- Requires a tach/dwell test to read engine rpm.
- Always prepare engine for timing before performing timing check. Refer to the vehicle's Emission Control Label or service manual for timing procedures specific to the vehicle being serviced. As a minimum, make the following preparations before timing:

(a) Locate the timing mark and reference pointer. The timing mark and pointer are usually located on the crankshaft pulley or vibration damper (on the front of the engine) or on the flywheel (between the engine and transmission).

Refer to paragraph 1 for typical locations of timing marks on late model domestic and import vehicles.

Make sure the timing mark and pointer are clean and clearly visible.

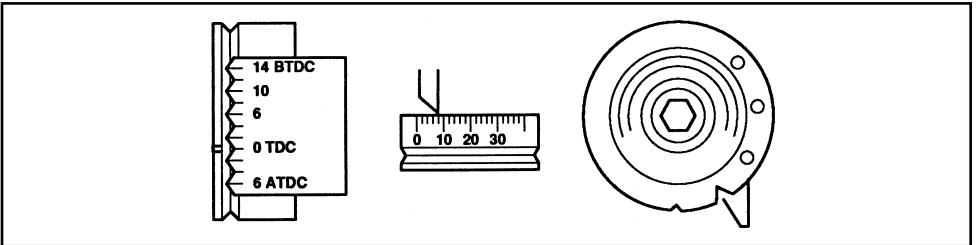
- (b) Make sure all spark plugs are in good condition and properly gapped.
- (c) Start and run the engine until it reaches its normal operating temperature.

**TURN ENGINE OFF BEFORE CONNECTING TIMING LIGHT.**

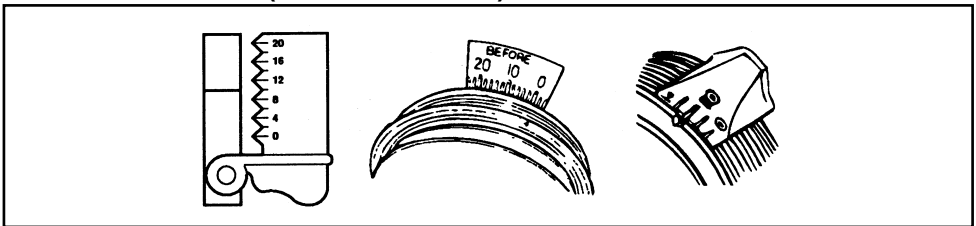
## 1. TYPICAL TIMING MARKS

The following illustrations show typical timing marks for some late model domestic and import vehicles. Refer to your vehicle's service manual for the specific location of timing marks on your vehicle.

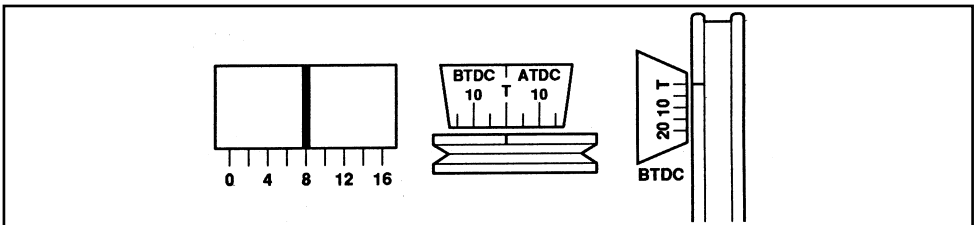
### FORD



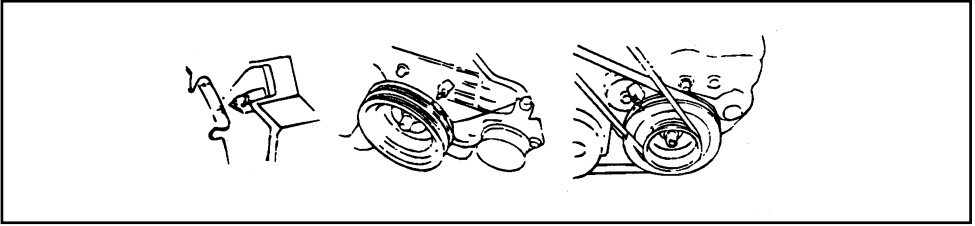
### GENERAL MOTORS (VAUXHALL/OPEL)



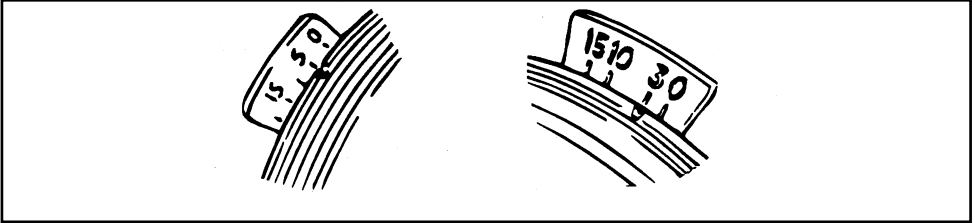
### CHRYSLER



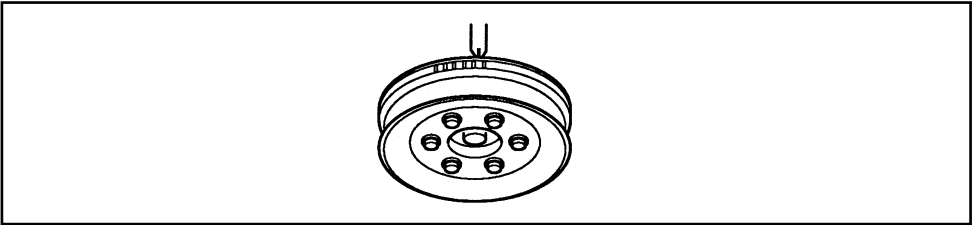
## HONDA



## TOYOTA



## NISSAN



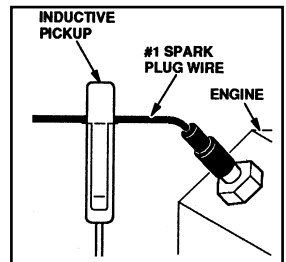
## TIMING LIGHT CONNECTION

**WARNING:** Always keep hands, timing light, lead wires and clips away from moving engine parts and hot surfaces **DO NOT SMOKE.**

- (a) Turn ignition off. **DO NOT CONNECT TIMING LIGHT WITH IGNITION ON OR ENGINE RUNNING.**
- (b) Attach pickup leads into bottom of timing light handle.
- (c) Clamp inductive pickup clip around No. 1 spark plug wire.

**NOTE:** If the rpm reading on digital models is erratic, move and/or reverse direction of the inductive pickup to get a better signal input.

- (d) Connect battery clips to battery:
  - Connect RED clip to battery positive (+) terminal.
  - Connect BLACK clip to battery negative (-) terminal.
- (e) Connect the green DWELL clip to the tach side of the coil (only for models with DWELL).

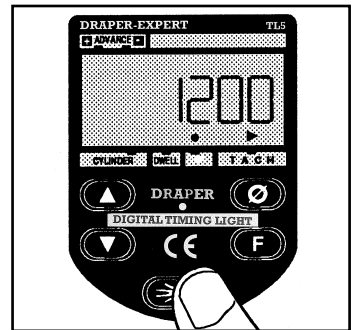
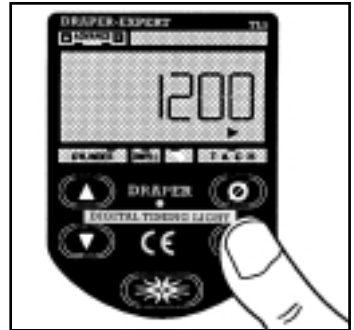


# TIMING CHECK

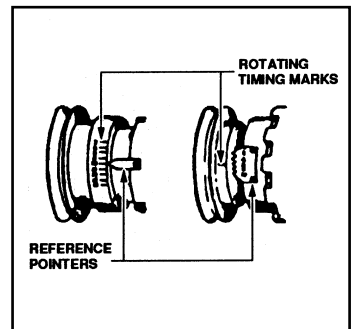
- Make sure engine is prepared for timing check as described in PREPARATION FOR TIMING.
- Make sure timing light is properly connected as described in TIMING LIGHT CONNECTION.

**NOTE: Some models are not equipped with LCD displays.**

- Start engine and adjust engine low rpm speed, if necessary, until proper rpm for timing is reached:
  - **For Digital Advance Timing Light Models ONLY:** Press **F** switch as needed to select tachometer mode. The TACH indicator will display when tachometer mode is selected. The LCD display will show engine speed.
- Adjust the timing light barrel, as needed, to ensure proper illumination of timing marks.
- Press **On/Off** switch. The On indicator (on Digital Models) will blink to indicate the timing light is operating.



- Note position of rotating timing mark in relation to reference pointer.
  - If rotating timing mark is aligned with reference pointer, within tolerance, timing is correct.
  - If rotating timing mark is not aligned with reference pointer, within tolerance, parts replacement or timing adjustment **MAY BE** necessary (refer to TIMING ADJUSTMENT).
  - Disconnect the vacuum line from the distributor if the manufacturer's specification calls for it.
- Press **On/Off** switch. Timing light will stop flashing.
- Turn ignition off and disconnect timing light from engine.
- If disconnected, reconnect vacuum line to distributor.



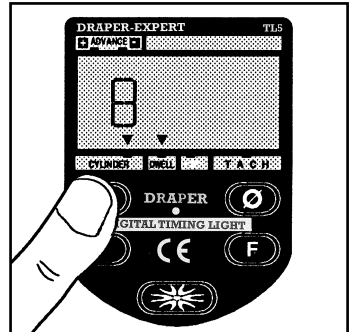
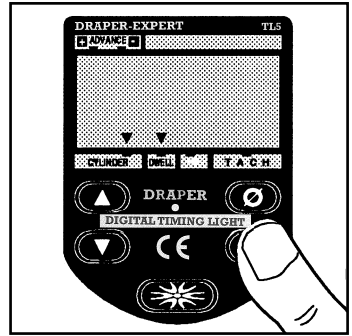
## 1. CHECK DWELL ANGLE (Digital advance timing light models only)

A dwell angle check is performed for vehicles equipped with conventional ignition systems. Dwell angle refers to the degrees (or time) during which the breaker points are closed in every distributor cam rotation. The closed points serve as a path for electric current to flow from the battery into the ignition coil so energy can build up to generate a spark.

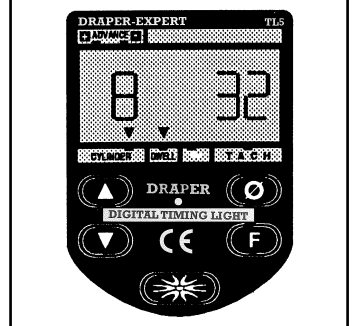
- Start and run engine until it reaches normal operating temperature. **TURN ENGINE OFF BEFORE CONNECTING TIMING LIGHT.**
- Connect timing light as described in TIMING LIGHT CONNECTION (see Page 5).



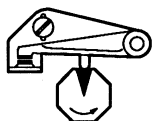
- (c) Press **F** switch as needed to select dwell mode. The **CYLINDER** and **DWELL** indicators will display when dwell mode is selected.
- Press **Cylinder/Advance** increment and decrement switches switch as needed to select appropriate number of cylinders for your vehicle. The LCD display will show the number of cylinders selected.



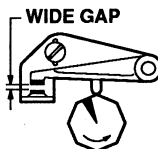
- (d) Remove distributor cap and rotor. Remove high tension cable from centre tower of distributor cap, and ground cable.
- (e) Crank engine and observe LCD display. LCD display will show dwell angle.
- (f) Note: dwell angle and compare to manufacturer's specifications:
- Small dwell angle causes poor high speed performance.
  - Large dwell angle causes points to burn quickly.
  - Refer to your vehicle's service manual for procedures to adjust dwell angle.
- (g) Turn ignition off and disconnect timing light from engine.
- (h) Reinstall rotor and distributor cap. Connect high tension cable to centre tower of distributor cap.



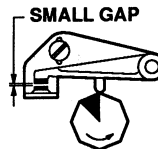
### DWELL ANGLE FOR 8-CYLINDER ENGINES



TYPICAL DWELL



SMALL DWELL ANGLE



LARGE DWELL ANGLE

# TIMING CHECK cont'd

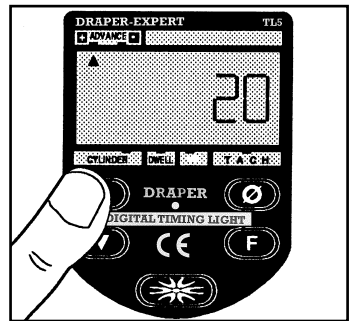
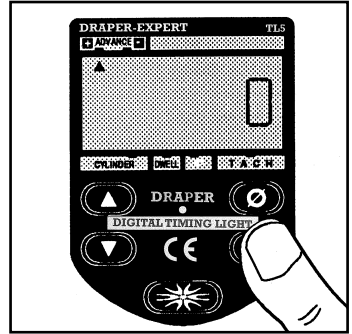
## 2. CHECKING EXACT DEGREES ADVANCE (Advance and digital advance timing light models only)

Generally speaking, a regular timing light can only tell you if the centrifugal (mechanical) and vacuum controlled spark advance mechanisms are working while a timing light with spark advance control can positively let you know if these mechanisms are operating properly.

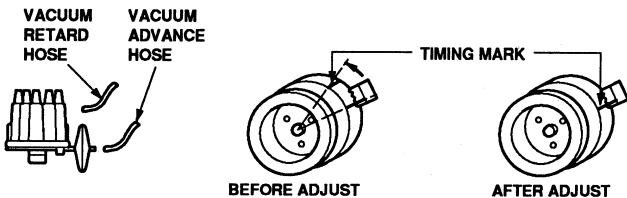
- (a) Perform Timing Check (see Page 6), while increasing engine speed to the specified rpm (as shown on LCD display - Digital model only), and observe for timing mark change.
- (b) Press **F** switch as needed to select advance mode. The ADVANCE indicator will display when advance mode is selected. The LCD display will show "0" degrees advance.

**NOTE:** For advance timing light models - non digital: The tests outlined here are general tests and can be performed using these models. Adjustments to the degrees of Advance/ Retard are made using the Advance Control Knob located on the face of the timing light. Rotating the Advance Control Knob clockwise will raise degrees of Advance in one degree increments.

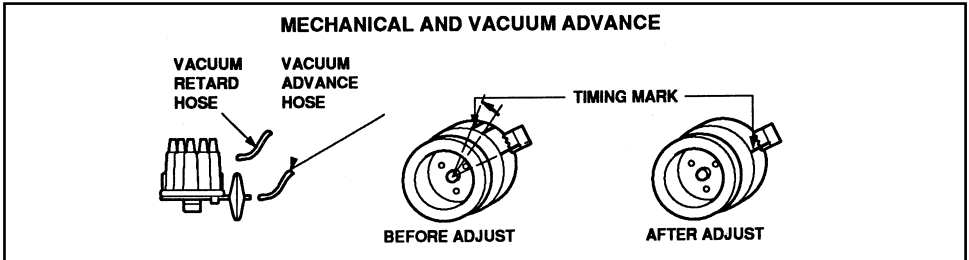
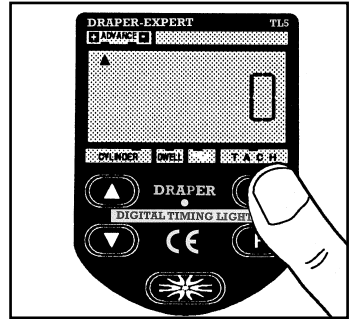
- (c) Press **Cylinder/Advance** increment switch as needed to realign timing marks. Note degrees advance on LCD display and compare with manufacturer's specifications.



### MECHANICAL ADVANCE



- (d) Press **Zeroing** switch to return LCD display to “0” degrees advance. Press **F** switch as needed to select tachometer mode.
- (e) Reconnect vacuum advance hose to distributor while increasing engine speed to the specified rpm as in step a and observe for an additional increase of timing mark change.
- (f) Press **F** switch as needed to select advance mode. Press **Cylinder/Advance** increment switch as needed to realign timing marks. Note degrees advance on LCD display and compare with manufacturer’s specifications.



- (g) Reduce engine speed to idle and reconnect all hoses at end of tests.

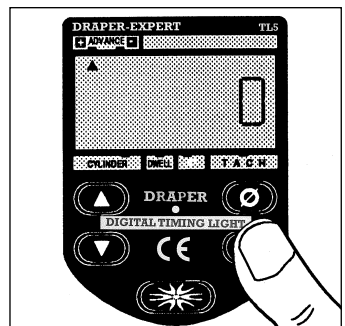
**NOTE:**

- *The above diagram MECHANICAL ADVANCE shows centrifugal (mechanical) spark advance of distributor. No change of timing marks indicates rusted or binding mechanical weights. This prevents free shaft movement and development of maximum power. Clean mechanical advance mechanism with oil or replace.*
- *The above diagram MECHANICAL AND VACUUM ADVANCE shows centrifugal plus vacuum spark advance of distributor. No increase of timing mark change indicates a leaking vacuum advance diaphragm or hose. This prevents free breaker plate movement and development of maximum fuel economy. Repair or replace as needed.*
- *Some recent exhaust emission control systems prevent operation of remote controlled vacuum spark advance unless vehicle is in gear and is travelling above a preset speed. To check these systems, temporarily connect vacuum advance hose of distributor to a direct source of intake manifold vacuum.*
- *All spark advance mechanisms must work properly for an engine to attain maximum performance and acceptable exhaust emissions.*

### 3. CHECKING EXACT DEGREES RETARD (Advance and digital advance timing light models)

Some distributors have a remote vacuum controlled spark retard mechanism, which is intended to reduce the total amount of spark advance under certain engine operation conditions. Check specifications for your engine.

- (a) Perform Timing Check (see Page 6), while increasing engine speed to the specified rpm (as shown on LCD display - Digital model only).
- (b) Temporarily connect vacuum retard hose from distributor to a direct source of intake manifold vacuum and observe for reduction of timing mark change.
- (c) Press **F** switch as needed to select advance mode. The ADVANCE indicator will display when advance mode is selected. The LCD display will show “0” degrees advance.



## TIMING CHECK cont'd

**NOTE:** For advance timing light models - non digital: The tests outlined here are general tests and can be performed using these models. Adjustments to the degrees of Advance/Retard are made using the Advance/Retard Control Knob located on the face of the timing light. Rotating the Advance Control Knob clockwise will raise degrees of Advance in one degree increments.



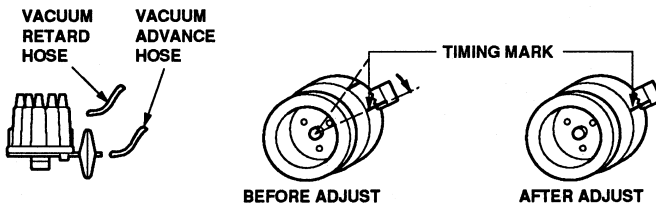
- (d) Press **Cylinder/Advance** decrement switch as needed to realign timing marks. Note degrees retard on LCD display and compare with manufacturer's specifications.

**NOTE:** If the manufacturer's specifications are given at less than full manifold vacuum (18" - 22"), use a vacuum pump to apply the specified vacuum to the retard hose or with the aid of a vacuum gauge in parallel adjust engine rpm to the specified vacuum.

- (e) Reduce engine speed to idle and reconnect all hoses at end of tests.

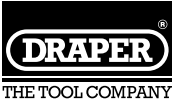


### VACUUM ADVANCE



**NOTE:**

- The above diagram **VACUUM ADVANCE** shows centrifugal (mechanical) spark advance minus vacuum spark of distributor. No reduction of timing mark change indicates a leaking vacuum retard diaphragm or hose. This prevents free breaker plate movement and allow engine damaging pre-ignition or detonation.
- Specifications usually state "crankshaft degrees and rpm" for which the timing light is calibrated. If specifications state "distributor degrees and ", double these values to convert to proper use.



## TIMING ADJUSTMENT

Refer to the vehicle's service manual for procedures to adjust timing. DO NOT ATTEMPT TO ADJUST TIMING WITHOUT MANUFACTURER'S SPECIFICATIONS.



## TROUBLESHOOTING

**NOTE:** If the Digital Timing Light readout becomes inoperative or locks up during use, disconnect and reconnect the timing light's positive battery clamp from the battery to reset the unit.

If the timing light fails to operate, make the following checks:

- (a) Make sure the battery clips are firmly connected to the battery terminals.
- (b) Make sure the battery clip polarity is correct (red clip to positive terminal, black clip to negative terminal).
- (c) Make sure the upper and lower ferrite cores of the inductive pickup clip are clean. Clean the inductive pickup clip if necessary (refer to Chapter 3).
- (d) Make sure the inductive pickup clip is properly connected to the No. 1 spark plug cable.
- (e) Make sure the No. 1 spark plug is working properly:
  - Connect the inductive pickup clip to another spark plug cable, and press the On/Off switch.
  - If the timing light flashes, service the No. 1 spark plug before continuing.



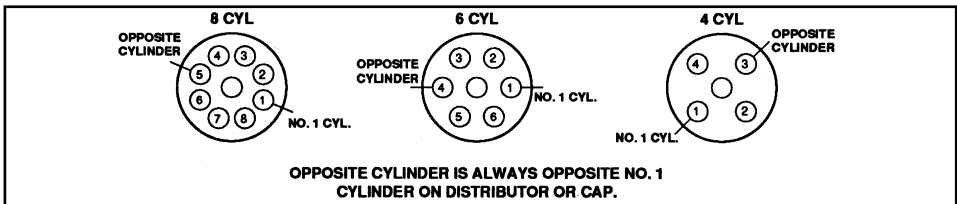
## ADDITIONS TESTS AND TECH TIPS

When using Draper timing lights equipped with tach and dwell functions, it is not necessary to use a separate dwell meter and/or tachometer since these functions are already built in to the timing light.

### 1. CHECKING DISTRIBUTOR CAM WEAR

This check is performed after timing has been set and the timing mark lines up with the reference pointer for the No. 1 cylinder.

- (a) Connect timing light to spark plug wire directly opposite (180°) No. 1 cylinder on distributor cap.



- (b) Start engine and aim timing light towards timing mark. Reading should be the same as when timing light is connected to No. 1 cylinder (timing mark should line up with reference pointer).
- (c) If reading IS NOT the same, probable cause is worn distributor cam or bushing, or bent distributor shaft. Repair as necessary.

## 2. CHECKING FOR SPARK DURING A NO-START CONDITION.

**NOTE:** *Ensure proper operation of fuel system. Take care to avoid fuel and spark coming in contact with each other to avoid fire.*

### CONVENTIONAL IGNITION

This test can pinpoint problems with the coil, cap rotor, plug wires, points, ignition module and related components.

- (a) Clamp inductive pickup around any plug wire. With timing light on, crank engine. If timing light does not flash, no spark is present.
- (b) Reconnect inductive pickup to other plug wires, and repeat step a. If timing light does not flash when connected to ANY other plug wire, connect inductive pickup to coil wire to check coil spark delivery to distributor.
- (c) If timing light does not flash when connected to coil wire, further troubleshooting may be necessary.

### DIS IGNITION SYSTEMS

This test can pinpoint problems with the singular coil packs, camshaft/crankshaft sensors and the signals generated by these sensors, the DIS module, the ECM and related components.

- (a) Clamp inductive pickup around any plug wire. With timing light on, crank engine. If timing light does not flash, no spark is present.
- (b) For vehicles with multiple coils, check each wire on each coil to pinpoint a defective coil or trigger signal for the coil.
- (c) If timing light does not flash when connected to coil wires, further troubleshooting may be necessary.

## 3. MIXTURE CONTROL SOLENOID ADJUSTMENTS (GENERAL MOTORS AND OTHERS)

General Motors, as well as other manufacturers, use mixture control solenoids on many of their vehicles. When adjustments are necessary, solenoid output readings are typically read using a duty cycle meter. When using Draper timing lights equipped with dwell function, duty cycle readings may be taken by utilising the timing light's green DWELL clip.

Many vehicle manufacturers require the use of a duty cycle meter to make adjustments or monitor systems (such as Volkswagen oxygen sensor output, Mercedes flash codes, etc.). Draper timing lights equipped with dwell function may be used to take duty cycle readings (in addition to dwell) by setting the dwell adjust to the six-cylinder mode (see Page 6).

## 4. THROTTLE BODY INJECTION/PULSATING SPRAY PATTERNS

By shining the timing light inside the throttle body cavity while the engine is running, and adjusting the advance accordingly, the pulsing of the timing light can be synchronised with the injector's pulsing to the point where the spray pattern is visible. By inspecting the spray pattern it is possible to identify clog ups, improper spray area, injector leakage, intermittent spraying or other related problems. Dirty injectors can cause poor performance, poor fuel economy, and emission problems.

## 5. SIMPLE RPM CHECKS (ON CONVENTIONAL IGNITION/ELECTRONIC IGNITION VEHICLES)

Timing lights equipped with the Tachometer function incorporate an inductive pickup to read plug firing and rpm; there is no need to touch any 'live' connections at the coil. Simply attach the inductive pickup to the proper plug wire to read the engine's rpm (like a tachometer).

## 6. SIMPLE RPM CHECKS (ON DIS EQUIPPED VEHICLES)

On timing lights equipped with DIS capabilities, rpm is easily read on DIS equipped vehicles by simply attaching the inductive pickup to the proper plug wire (as described in paragraph 5). This function is especially helpful since many DIS systems do not provide an easy connection for a tachometer signal.

## 7. CHECKING KNOCK SENSOR OPERATION (ON EQUIPPED VEHICLES)

The knock sensor causes spark timing to retard when engine knocking occurs. Knock sensor operation can be checked easily while monitoring engine timing. Locate the vehicle's knock sensor, and use a metal rod or other suitable tool to LIGHTLY tap the engine block near the sensor. The timing should retard MOMENTARILY, then return to original value.

## 8. ERRATIC READING/TIMING MARKS NOT STABLE

If readings are erratic or unstable while checking timing, reverse the orientation of the inductive pickup on the spark plug wire. If readings remain erratic, this may indicate a worn or loose timing belt or timing chain, worn distributor bushings, worn distributor drive components (distributor gear, cam gear, etc) or other related components.



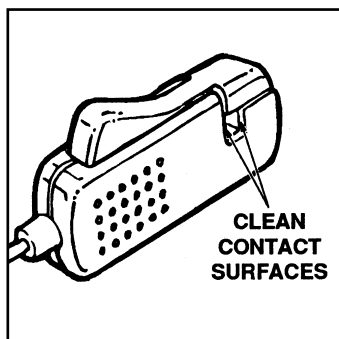
# MAINTENANCE

### 1. CLEANING THE INDUCTIVE PICKUP CLIP

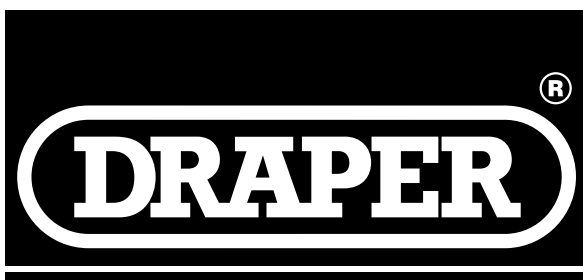
Dirt or grease on the inside surfaces of the inductive pickup clip can result in erratic flashing or poor operation of the timing light. Periodically clean the contact surfaces inside the inductive pickup clip by wiping with a soft cloth.

### 2. REPLACING THE INDUCTIVE PICKUP LEADS

The timing light is equipped with detachable leads which can be disconnected from the timing light for easy storage after use. If the test leads or clips become damaged, a replacement set can be obtained from your Draper stockist.



STOCK No.	PART No.	DESCRIPTION
55603	YTL4	SPARE LEAD SET FOR TL4 TIMING LIGHT
55604	TTL5	SPARE LEAD SET FOR TL5 TIMING LIGHT



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YOUR DRAPER STOCKIST

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