TRISCO

12V/24V DIESEL & 12V PETROL

DIGITAL

TACH-ADVNACE-DWELL-VOLTS

TIMING TESTER

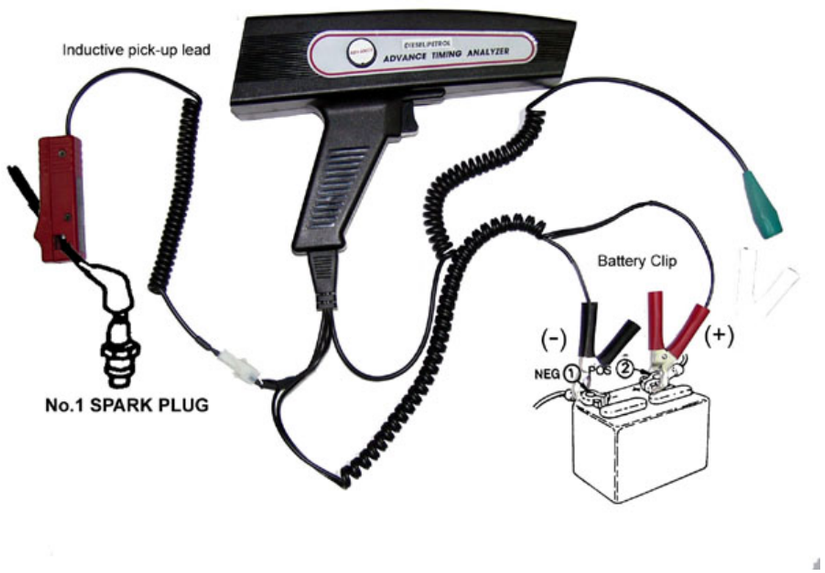
TABLE OF CONTENTS

INTRODUCTION

1. Timing Light
2. Adjustable Nuts: to adjust the tightness of the Piezo Clamp onto the injector pipe
3. Piezo Clamp: The Piezo Clamp equipped with a sensing element enables to detect the fuel pressure pulse in the injector fuel pipe while fuel is injected into the cylinder and the Piezo Clamp is clamped on the #1 Injector fuel pipe.
4. Main Cable :
   a. Battery Clips (red & black): to supply the Timing Light powered from the vehicle battery
   b. Test Clip (green): for RPM, Dwell, Voltage tests
   c. Sensor Connector (white): to connect with Diesel sensor lead or Inductive pickup lead
5. Sensor Lead with converter box: to produce a signal to trigger the timing light
6. Inductive Pick-up Lead: to clamp onto #1 spark plug of ignition engine system

PETROL TIMING LIGHT

This Timing Light works on most 12V petrol engine vehicles.



Connection of the Timing Light with a petrol vehicle:

1. Connect the Inductive pick-up lead with the Main cable.
2. Connect Battery Clips to the vehicle battery, Red to Positive terminal and Black to Negative terminal. The vehicle chassis must be connected to the battery Negative terminal.
3. Connect the Inductive pick-up to No.1 SPARK PLUG

What is Timing?

1. A timing light is used to check the timing on spark ignition engines. Correct timing has a positive influence on the performance and life time of an engine.
2. At the firing point the spark plug ignites the fuel-air mixture forced into the cylinder by the pistion. The flame spreads from the point of ignition throughout the entire combustion chamber. This is the time when the greatest combustion pressure is exerted on the pistion and therefore also the greatest force is acting on the pistion. As a certain time elapses between ignition and the flame spreading over the entire combustion chamber, ignition must occur before reach the top dead centre. The correct firing point is specified by the verhicle manufacturer. Incorrect adjustment of ignition timing can damage the vehicle.

   In the owner's manual, and do-it-yourself reference books and data sheets you will find much helpful information on testing and tuning your vehicle.

   Important: Always switch off the ignition before doing the followings.
   — connecting motor testing instruments
   — replacing ignition sysytem components

   While working on an electronic ignition system, be sure DO NOT touch any live parts once the ignition is on and the engine is running. With an electronic ignition system dangerous voltages can occur throughout the sysytem, not only at an individual unit such as the coil or distributor, but also at the cable harness, on pin-and-socket connectors, or connections to testing instruments etc. When testing and tuning with the timing light, be sure DO NOT touch any leads between the instrument and the vehicle.

Preparations for Adjusting the Timing

If the position of the injection pump has been modified or if timing is suspected to be incorrect.

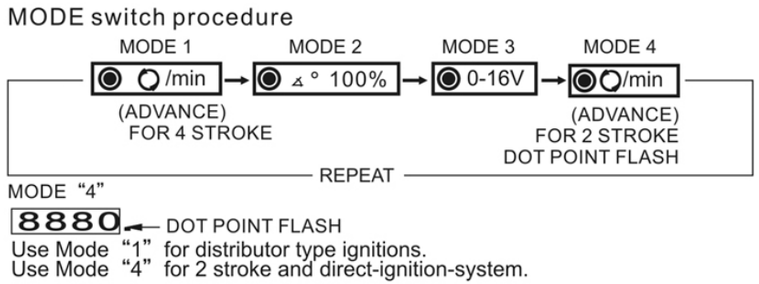
After connect the Timing Light with a petrol engine (as shown in Page 2), run the engine to operating temperature, and make certain that the contact breaker points or the dwell angle are correctly adjusted.

1. Use your owner's manual to determine the pertinent technical data of your vehicle (e.g. rpm, dwell angle).

2. Two marks are needed for adjusting the timing:
   a. A fixed mark on the engine housing, usually a pin, arrow or graduated scale
   b. A rotating mark on the flywheel or on the crankshaft pulley, mostly in the form of a notch, a steel ball or a graduated scale

You will find that these marks are easier to see if they are clean and you can mark them with a chalk or a white marker.

WARNING: The above marks are usually in the vicinity of hot and rotating parts. Be careful of the exhaust manifolds, fan blades, V-belts, etc.



Testing Procedures

1. Connect the timing light with the car battery, red clip to positive (+) terminal and black clip to negative (-) terminal (see Figure 1).
2. The light pulse is usually triggered by the ignition pulse of the first cylinder. This may differ in some vehicles, therefore consult your owner's manual.
3. Clamp the Inductive pickup onto a clean ignition cable and keep the arrow mark shown on pickup points in the direction of the spark plug.
4. Start the engine and run upto an operating temperature and adjustment speed recommended by the manufacturer.
5. Press the switch on the handle of the timing light. The advance indicator will light on. Point the timing light at the timing marks.The two marks should normally be opposite one the other. If not, go to next step.
6. Loosen the clamping of fastening screw on the distributor until the distributor can be turned by hand. Do not loosen too much, otherwise the distributor will turn by itself.
7. Turn the distributor clockwise or anti-clockwise until the rotating mark is in the position recommended by the vehicle manufacturer
8. Re-tighten the lossen screws, to maintain the distributor setting.
9. Re-check the timing again.
10. Turn off engine and disconnect the timing light and the vehicle.

WARNING:
If the vehicle has a positive earth electrical system, the Xenon lamp is possilbe not light up. In this case reverse the inductive pickup so that the arrow points in the direction of the distributor.

Checking the « CENTRIFUGAL ADVANCE» and «VACUUM ADVANCE»

1. Follow the steps 1 to 4 of general procedures on Page 2 except increase the engine speed to 2000 rpm.
2. Trigger the timing light and rotate the knob clockwise slowly and stop until the timing mark moves to « T.D.C» or « o» position.
3. Read the advance angle reading from the LED display
4. Compare the reading with manufacturer's specifications

TACH & ADVANCE

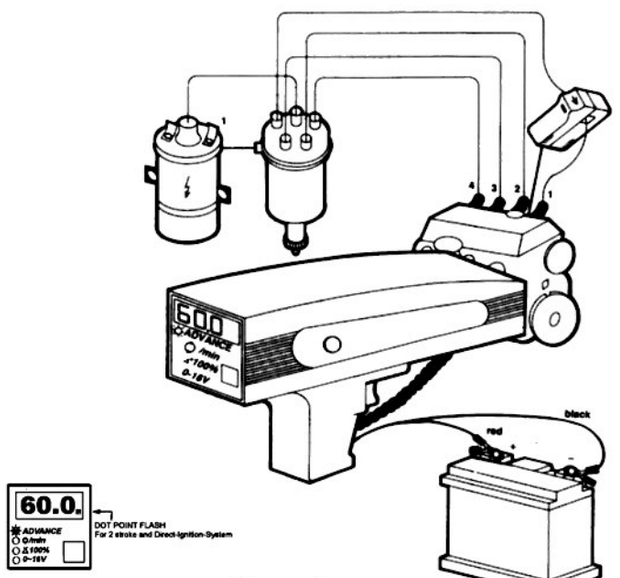


Figure 1

Dwell Angle Measurement

Dwell Angle Measurement is indispensible for exact distributor adjustment. Only when the dwell angle is correctly adjusted, a powerful magnetic field can be built up within the coils, thus provides a high energy ignition spark at all engine speeds.

1. Press the tact switch to light the Dwell indictor. (See figure 2)
2. Connect the black clip to the negative battery terminal (-) and the red clip to the positive battery terminal(+) .
3. Connect the green clip to terminal 1 of the ignition coil. (1, D, RUP, -).
4. Start the engine and let it run at idling speed.
5. Read the Dwell Angle reading in % from the display and compare it with the verhicle manufacturer's recommendations. Refer to the conversion table of Dwell Angle % : ° on page 8. Should you find any deviations, make the appropriate adjustment. If the Dwell angle is too small, it means the point gap is too large; and the Dwell Angle too large the point gap too small.

DWELL

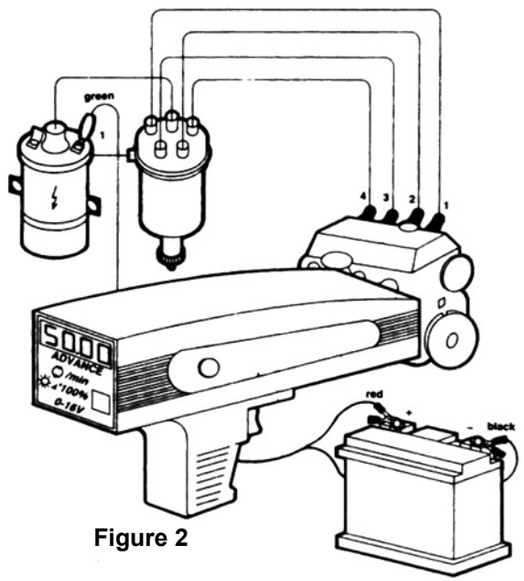


Figure 2

Tachometer

The tachometer is used to measure the engine speed. The engine speed must be known in order to:
- adjust the idling speed
- check the ignition
- adjust the timing
- check the adjustment

1. Press the tact switch to light the RPM indicator.
2. Connect the inductive pick-up to the first cylinder.
3. Connect the red clip to the positive battery terminal (+) and the black clip to the negative battery terminal (-). (See figure 1).
4. Start the engine and read the RPM from the display. Compare the RPM reading with the figure recommeded by the vehicle manufacturer. Should any deviations be found, mark appropriate adjustments.

Voltmeter

The voltmeter can be used to check the battery voltage and the supply voltage to various electronic devices, e.g. lamps,etc.

1. Testing of battery voltage under starting current load.
   a. Disconnect the ignition by pulling the plug off terminal 1 (1,D,RUP,-) on the ignition coil.
   b. Press the tact switch to light the VOLT indicator.
   c. Connect the black clip to the negative battery terminal (-) and the red, green clips to the positve battery terminal (+).
   d. Start the engine by another person.
   e. Read the voltage from the display.

NOTE: If the battery voltage is less than 9V, strongly recommend to ask a professional techican to check the car battery again.

2. Testing of a car battery on loading (e.g. lamps).
   a. Connect the black clip to the negative battery terminal(-) and the red clip to the positive battery terminal (+).
   b. Connect the green clip to the positive terminal of the loading device.
   c. Switch on the device and read the voltage from the LED disply.

NOTE: If the voltage is too low, this hints there is leakage through the respective leads or connections. This is frequently happened by heating of connecting terminals, switches or parts of the leads.

NOTE: When the voltage drops greater than what specified in your owner's manual, strongly recommend to ask a professional techican to check this again.

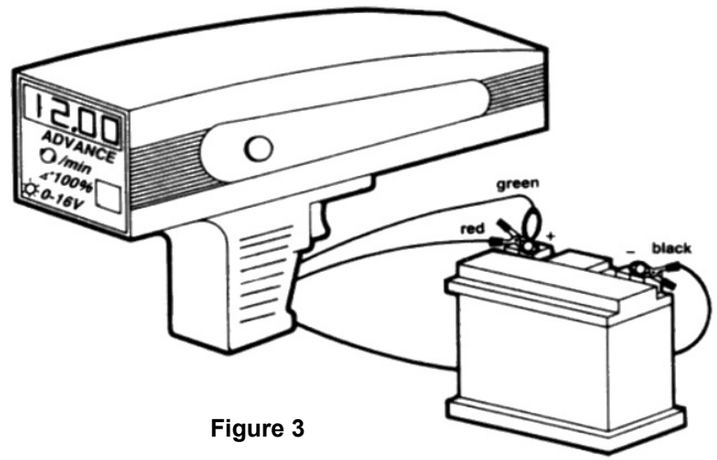
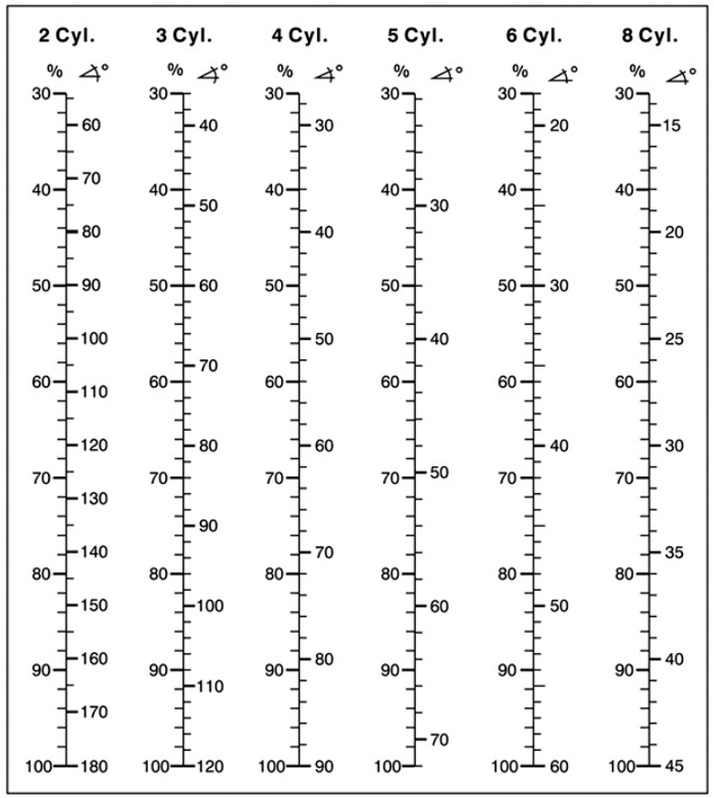


Figure 3

Admissible Voltage Drop

Type of lead	Admissible voltage in Insulated CU lead	Admissible voltage drop in the entire circuit
Lamp leads from light switch Terminal 30 to lights < 15 W or to the trailer socket and from there to the lights	0.1V	0.6V
From light switch terminal 30 to Lights < 15W or to trailer socket	0.5V	0.9V
From light switch terminal 30 to headlights	0.3V	0.06V
From control leads from switch to relay, horn, wiper etc.	0.5V to 12V 2.0V to 24V	1.5V to 12V

Conversion Table of Dwell Angle



SPECIFICATIONS:

Advance : 0 – 60°	± (0.7%RDG + 1%RNG)
TACH : 200-9990 RPM	± (0.7%RDG + 1%RNG)
DWELL : 0-99.9%	± (0.7%RDG + 1%RNG)
VOLTS: 0 – 30 V	± (0.7%RDG + 1%RNG)
Operation Temperature: 0 – 40 °C	± (0.7%RDG + 1%RNG)

DIESEL TIMING LIGHT

This Diesel Timing Light with diesel sensor works on most 12V and 24V diesel engine vehicles.

WARNING:
While working around injectors, make certain you should pay extreme attention. When the fuel is injected into the cylinder, the pressure required is enough to inject the fuel under the skin and into the blood stream. At that time if the fuel is injected onto people, this could result in serious injury.

Principle of the Diesel Timing Light:
This Diesel Timing Light is used with an aluminum piezoelectric device and a converter box via pressure pulses detected and converted into electrical signals to trigger this Timing Light. While the aluminum piezo clamp detects a pressure pulse in the diesel fuel injector pipe, will emit an electrical signal to the converter box, and then the converter box will trigger this Timing Light. A technician can use this helpful tool to read a diesel engine's timing and do any necessary adjustment.

For checking:
1.Injection pump timing under operating conditions without removing any components
2.Injection pump advance
3.Fuel pressure problems on distributor-type pumps
4.Engine RPM
5.Battery Voltage

Specifications:

- Input power: 10V-30V DC
- Trigger Point: 15% of the highest pressure in the Injector pipe
- Size of Piezo Clamp: fits for 6mm-10mm (1/4"~3/8") of Injector Pipes
- Maximum 2,000 RPM

Overview of the 4-Stroke Diesel Combustion Cycle

Intake: On early engines, during the intake stroke, the piston travels downward, drawing fuel/air mixture into cylinder. On modern engines, it incorporates an extra cam/lifter arrangement as seen on the exhaust valve which is held shut by a spring. During intake stroke, vehicle's fuel fills up the combustion chamber.

Compression: While the piston rises and passes TDC, cylinder pressure increases and temperature increases up to 500-800℃. The self-ignition temperature of diesel fuel is approx 400℃. Flywheel momentum drives the piston upward, compressing the fuel/air mixture. This is to prepare it for ignition.

Power: After fuel injects into the cylinder, an explosion occurs because of the combination of heat and atomized diesel fuel. This causes the piston to be forced downward which produces torque and the horsepower required from a typical diesel engine.

Exhaust: At the bottom of the power stroke, the exhaust valve is opened by the cam/lifter mechanism. The upward stroke of the piston drives the exhausted fuel out of the cylinder.

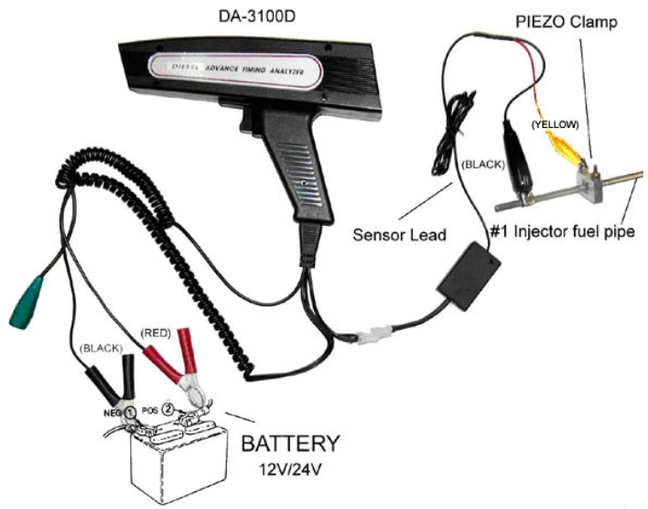
Why Diesel Combustion Timing is important?

Timing is critical to the optimal operation of the diesel engine. The fuel is required to be delivered only after temperature has reached over the self-ignition temperature. The gas expansion should begin only after the piston has passed TDC. If timing is set incorrectly, the engine will not perform efficiently.

Problems could occur if timing is set incorrectly.

- Difficult starting hot or cold
- Engine will not rev or is slow to rev up
- Hesitation/stalling/ will not rev in very cold conditions
- Shaky idle
- Excessive fuel consumption
- Black exhaust smoke
- Gray/white exhaust smoke
- Misfiring
- Abnormal knocking from engine
- Engine overheating
- Insufficient power

Testing Procedures



1. Connect Sensor Lead with Main Cable and Timing Light. (See above pic)

2. Keep the vehicle engine off. Locate the #1 Injector fuel pipe. If the #1 Injector fuel pipe is not accessible, its companion injector's fuel pipe can be used for testing.

3. Clamp the Piezo Clamp on a straight section of #1 Injector fuel pipe as close to the pump as possible (there is less noise on the pump side to interference with the pulse), and away from engine for not acquiring incorrect signal. Piezo Clamp and fuel pipe should be clean and dry. Make sure the fuel pipe is straight and is in contact with the Piezo Clamp but **do not overtighten**. Overtightening may cause damage on sensor element.

4. Connect Sensor Lead clips YELLOW to one Adjustable Nut and BLACK to #1 Injector fuel pipe.
   Warning: Black Sensor clip DOES NOT touch Glow Plug Plate; it may cause circuit shorten, or even worse to damage a complete circuit and disable engine operation and the connected timing tester.

5. Connect the Power Lead clips RED to positive and BLACK to negative of the vehicle battery.

6. Start the engine and warm up to operating temperature, then read the results from the timing light.

SAFETY PRECAUTIONS

To prevent accidents that could possibly result in serious injury and/or damage to vehicles and/or test equipment, carefully observe all safety rules and test procedures when working on vehicles

Do not wear loose clothing or jewelry while working on engine. Loose clothing can get caught in fan, pulleys, belts, etc. Jewelry can conduct current and can cause severe burns if comes in contact between power source and ground.

Before working on a vehicle, set the brakes and block the wheels. Beware of automatic parking brake releases.

When the engine is running, it produces carbon monoxide, a toxic and poisonous gas. Always operate the vehicle in a well ventilated area. Do not breathe exhaust gases – they are hazardous that can lead to death.

Fuel and battery vapors are highly flammable.
DO NOT SMOKE NEAR THE VEHICLE DURING TESTING.

When engine is running, many parts (such as pulleys, coolant fan, belts, etc) turn at high speed. To avoid serious injury, always be alert and keep a safe distance from these parts.

Engine parts become very hot when engine is running. To prevent severe burns, avoid contact with hot engine parts.

Never lay tools on vehicle battery. You may short the terminals together causing harm to yourself, the tools or the battery.

LIMITED WARRANTY

This limited warranty covers defects in materials and workmanship for a period of twelve (12) months from the date the product is initially purchased, including only those defects that arises as a result of normal use and does not cover those that arises as a result of unauthorized modifications and repair, improper operation (i.e. overtighten on Piezo Clamp) or misuse, accident or neglect such as dropping the unit onto hard surfaces, contact with water, rain or extreme humidity or extreme heat, Leads that have broken, physical damage to the product surface including scratches, cracks or other externally exposed parts.

TIP : The best way to connect the clamp is to tighten the clamp wheel until the contact is made with the injector pipe, then turn the wheel 1/4 of a revolution more.

The injector pipe is used as a ground connection for the PIEZO clamp. The injector pipe must be clean to insure a good electrical contact, and if necessary can use an abrasive paper on the pipe.

Make certain the clamp DOES NOT touch any other part of the engine except the injector pipe. Otherwise, the sensing element may send false signals due to the engine's vibration.

***TIP*:** If the LED on the Diesel converter box is not flashing, check cable connections as well as the clamp if it has a contact with the injector pipe. The timing light cannot be triggered while the LED on the Diesel converter box is not flashing.

Refer to the instructions of petrol engine timing light shown on P2-P9 in this manual while operating a diesel engine timing light to take measurements and read the values on display.

TIP: When the timing light captures a RPM readout, the timing light will emit a flash signal and display RPM value on display. However, prior to do the test, the engine should be warmed up to an operating temperature.

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