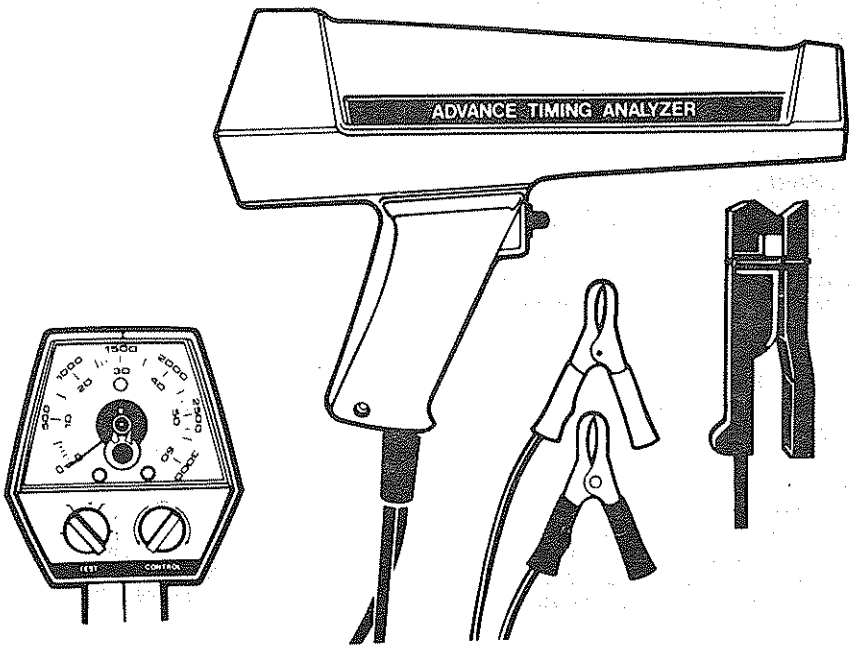


INDUCTIVE ADVANCE TIMING LIGHT

INSTRUCTIONS



SAFETY GUIDELINES

TO PREVENT ACCIDENTS THAT COULD RESULT IN SERIOUS INJURY AND/OR DAMAGE TO YOUR VEHICLE OR TEST EQUIPMENT, CAREFULLY FOLLOW THESE SAFETY RULES AND TEST PROCEDURES.

SAFETY EQUIPMENT

Fire Extinguisher

Never work on your car without having a suitable fire extinguisher handy. A 5-lb. or larger CO₂ or dry chemical unit specified for gasoline/chemical/electrical fires is recommended.

Fireproof Container

Rags and flammable liquids should be stored only in fireproof, closed metal containers. A gasoline soaked rag should be allowed to dry thoroughly outdoors before being discarded.

Safety Goggles

We recommend wearing safety goggles when working on your car to protect your eyes from battery acid, gasoline, and dust and dirt flying off moving engine parts.

NOTE: Never look directly into the carburetor throat while the engine is cranking or running as sudden backfire can cause burns.

LOOSE CLOTHING AND LONG HAIR (MOVING PARTS)

Be very careful not to get your hands, hair, or clothes near any moving parts such as fan blades, belts, and pulleys or throttle and transmission linkages. Never wear neckties or loose clothing when working on your car.

JEWELRY

Never wear wrist watches, rings, or other jewelry when working on your car. You'll avoid the possibility of catching on moving parts or causing an electrical short circuit which could shock or burn you.

VENTILATION

The carbon monoxide in exhaust gas is highly toxic. To avoid asphyxiation, always operate vehicle in a well ventilated area. If vehicle is in an enclosed area, exhaust should be routed directly to the outside via leakproof exhaust hose.

SETTING THE BRAKE

Make sure that your car is in **park** or **neutral** and that the **parking brake is firmly set**.

NOTE: Some vehicles have an automatic release on the parking brake when the gear shift lever is removed from the **PARK** position. This feature must be disabled when it is necessary (for testing) to have the parking brake engaged when in the **DRIVE** position. Refer to your vehicle service manual for more information.

HOT SURFACES

Avoid contact with hot surfaces such as exhaust manifolds and pipes, mufflers (catalysts), the radiator, and hoses. Never remove the radiator cap while the engine is hot as escaping coolant under pressure may seriously burn you.

SMOKING AND OPEN FLAMES

Never smoke while working on your car. Gasoline vapor is highly flammable, and the gas formed in a charging battery is explosive.

BATTERY

Do not lay tools or equipment on the battery. Accidentally grounding the "**HOT**" battery terminal can shock or burn you and damage wiring, the battery or your tools and testers. Be careful of contact with battery acid. It can burn holes in your clothing and burn your skin or eyes.

When operating any test instrument from an auxiliary battery, connect a jumper wire between the negative terminal of the auxiliary battery and ground on the vehicle under test. When working in a garage or other enclosed area, auxiliary battery should be located at least 18 inches above the floor to minimize the possibility of igniting gasoline vapors.

HIGH VOLTAGE

High voltage—30,000-50,000 volts is present in the ignition coil, distributor cap, ignition wires, and spark plugs. When handling ignition wires while the engine is running, use insulated pliers to avoid a shock. While not lethal, a shock may cause you to jerk involuntarily and hurt yourself.

JACK

The jack supplied with the vehicle should be used only for changing wheels. Never crawl under car or run engine while vehicle is on a jack.

VEHICLE MANUAL, SOURCES FOR SERVICE INFORMATION.

The following is a list of publishers who have service manuals for your specific vehicle at nominal cost. Write to them for availability and prices, specifying the make, style, and model year of your vehicle.

**American Motors Corporation
and Chrysler Corporation**
Dymont Distribution Service
20770 Westwood Drive
Strongsville, Ohio 44136

Ford Publication Department
Helm Incorporated
Post Office Box 07150
Detroit, Michigan 48207

Buick
Tuar Company
Post Office Box 354
Flint, Michigan 48501

Oldsmobile
Lansing Lithographers
Post Office Box 23188
Lansing, Michigan 48909

Cadillac, Chevrolet, Pontiac
Helm Incorporated
Post Office Box 07130
Detroit, Michigan 48207

OTHER SOURCES—Nonfactory

Domestic and Import Cars
Chilton Book Company
Chilton Way
Radnor, PA 19089

Cordura Publications
Mitchell Manuals, Inc.
Post Office Box 26260
San Diego, CA 92126

Motor's Auto Repair Manual
Hearst Company
250 W. 55th Street
New York, N.Y. 10019

IMPORTANT

CONSULT THE VEHICLE MANUAL FOR SPECIFIC TUNE-UP INFORMATION AND TEST PROCEDURES. ALWAYS FOLLOW THE MANUFACTURER'S SPECIFICATIONS AND TEST PROCEDURES FOR ADJUSTING DWELL ANGLE AND IDLE SPEED, ESPECIALLY ON VEHICLES WITH MODERN ELECTRONIC IGNITION AND EMISSION CONTROLS. DO NOT ATTEMPT TO SERVICE A VEHICLE WITHOUT THE MANUFACTURER'S INSTRUCTIONS AND SPECIFICATIONS.

INTRODUCTION

Precise ignition timing is essential to achieve maximum fuel economy and performance out of any spark ignited engine. Your advance timing analyzer provides a simple method for timing the engines used in today's vehicles, and also provides the additional capability of allowing the user to check timing advance curves of the vacuum, mechanical, or computer controlled types. This timing analyzer incorporates a built-in tachometer which simplifies the timing process as it eliminates the need to hook up a second instrument for checking engine RPM.

Many engines require that advance timing be set or checked with a specific vacuum applied to the vacuum advance diaphragm on the distributor, or on the vehicle's on-board computer. Your supplier offers a number of vacuum pumps for application of vacuum when required. Contact him for further information on these instruments. In the case of engines which are equipped with breaker point ignition systems, it will be necessary to check and, if necessary adjust point dwell **before** adjusting timing.

This timing light is for use on twelve (12) volt negative (-) ground systems only.

CONTROLS AND SPECIFICATIONS

1. **Trigger (Power) Switch** — Depress to apply power to the instrument. This

switch must be depressed to activate all functions of the timing analyzer.

2. **Meter** — 250 degree meter movement displays the following scales:

Low RPM 0 - 3000

High RPM 0 - 6000

(Multiply reading by 2.)

Advance 0 - 60 degrees

3. **Meter Zero Adjustment** — Use a slotted screwdriver to adjust the meter to "0" if necessary. Adjust with no leads hooked to the vehicle.

4. **Test Selector** — The test selector switch has four (4) positions which activate the following functions:

A. **Initial** — Disables the RPM and timing advance functions. In this mode of operation, the timing light functions as a typical initial timing light.

B. **Advance** — Enables the timing advance function. In this mode of operation the instrument functions as an advance timing light with a 0 - 60 degree advance scale.

C. **Lo RPM** — Selects the Lo (0 - 3000 RPM) scale on the meter.

D. **Hi x2 RPM** — Changes the meter calibration to Hi (0 - 6000) RPM. Multiply the displayed RPM reading by two (2), or if it is easier, add two (2) zeros to the meter reading as shown by the advance scale.

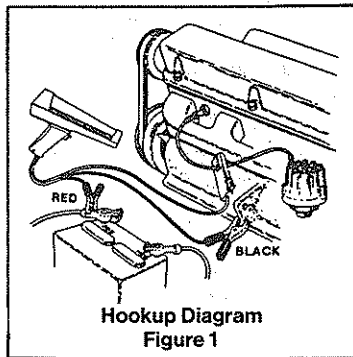
5. **Advance Control** — This control is adjusted to show timing advance on the meter when the advance function is selected on the Test Selector switch.

Engine Preparation For Timing

In order for any engine to be **base (initially) timed correctly**, it is important to carefully follow the instructions as shown on the Vehicle Emission Control Label. This label is located under the hood in the engine compartment. Some typical locations are: the underside of the hood, the fenderwell, a valve cover, or in the area of the hood latch. If the label is missing, consult the vehicle service manual or appropriate service literature for the engine under test. It is important to note that preparation is **specific** to each engine.

Lead Connections

1. Figure 1 shows the typical hookup procedure for most applications. To insure safety, follow the hookup sequence listed below.
2. Make sure the engine is OFF, and the ignition key is OFF.



3. Clamp the inductive pickup around the number one (1) spark plug wire. Do not allow the inductive pickup to touch the exhaust manifold or surrounding parts as these areas become extremely hot and will damage the inductive clamp. Note the arrow on the pickup which indicates hookup polarity.
4. Connect the RED clip to the positive (+) battery terminal.
5. Connect the BLACK clip to a secure engine ground such as the alternator bracket or engine block. For safety reasons, do not use the negative (-) battery terminal or fuel system components as a ground connection point.

Engine Timing Check

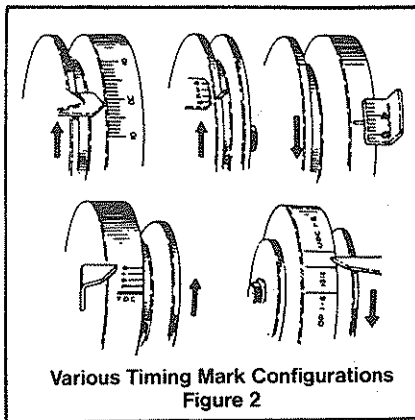
(Breaker Point equipped engines only)

Check, and, if necessary adjust dwell to specification **before** proceeding with timing check.

1. Prepare the engine for timing as indicated above in ENGINE PREPARATION FOR TIMING.
2. Clean, and chalk if necessary, both the rotating and stationary timing marks on the engine. See Figure 2.

NOTE

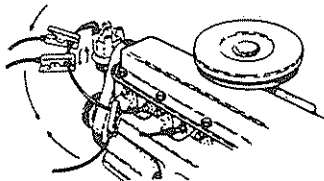
The procedures outlined below instruct the user to clamp the inductive pickup around the number one (1) spark plug wire. This procedure is valid for the majority of engines in use today. There are however, some engines which are timed using the "averaging" method. The most popular user of this method is General Motors where it is recommended for some of their smaller four (4) cylinder engines beginning in 1982. Your timing light has "average timing" capability. The only change in hookup is that instead of clamping the inductive pickup around the number one (1) spark plug wire, it is clamped around the coil tower wire, that is, the wire between the ignition coil and the center of the distributor cap. Consult your vehicle service manual for exact procedures. When using an **advance** timing light, note that average timing is used **only** for initial or base timing with the timing light's advance control set **fully counterclockwise at "0"**. Timing advance measurements must be made with the inductive pickup clamped around the Number One (1) spark plug wire. Timing advance measurements attempted with the inductive pickup clamped around the coil tower wire will not produce valid results.



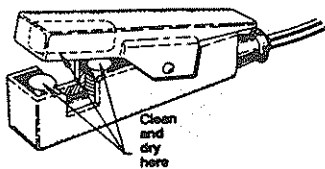
3. Start the engine and allow it to warm to normal operating temperature (upper radiator hose is hot).
4. Check, and, if necessary adjust RPM to specified timing speed.
5. Make certain that the advance control is set fully counterclockwise.
6. Aim the timing light at the crankshaft damper (pulley) or transmission bell housing depending on the location of the timing marks on the engine under test. See Figures 1 and 2.

NOTE

A defective ignition system may cause the timing analyzer to perform erratically (meter and/or light). Low output spark voltage or a defective ignition wire may be responsible. You may be able to improve performance by sliding the inductive pickup along the plug wire to a new location or reversing the inductive pickup as shown in Figure 3. (This may also help with polarity sensitive pickups). Solid copper ignition wires radiate large amounts of radio frequency noise through the air which may interfere with the proper operation of the timing light and other electronic equipment. Replace solid copper ignition wire with resistance type wire if only for the tests described in this manual. Erratic operation of the instrument can also be caused by dirt or grease buildup on the mating surfaces of the inductive clamp. To maintain proper operation of the clamp, clean and dry the inside surfaces of the clamp with a soft cloth when necessary as shown in Figure 4.



Positioning the Inductive Pickup for Reliable Readings
Figure 3



Cleaning the Inductive Pickup
Figure 4

7. Pull the trigger switch on the timing light and observe the location of the rotating mark with respect to the stationary mark. If timing is within the tolerance as specified by the manufacturer (typically plus or minus 2 degrees) no adjustment is necessary and the procedure is finished. If it is **not** within specification, proceed **directly** to the INITIAL TIMING ADJUSTMENT section below. If the timing light multiple flashes or flashes erratically, see the NOTE below.
8. Shut off the engine. Disconnect the timing light leads in the reverse order from which

they were connected.

9. Re-connect any disconnected hoses or electrical connectors which were part of the engine's preparation for timing. Reset the engine's idle speed if necessary.

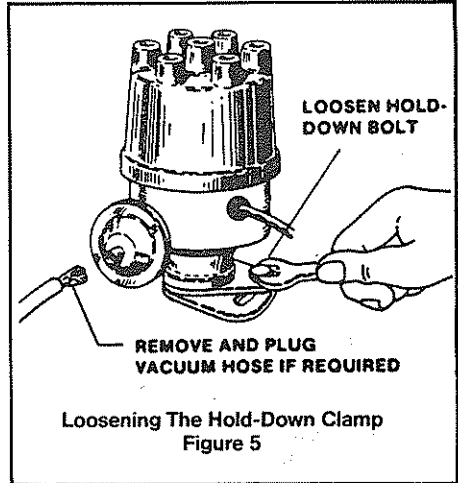
Timing Adjustment

1. Make certain that the engine has been prepared for timing as indicated above in ENGINE PREPARATION FOR TIMING.

NOTE

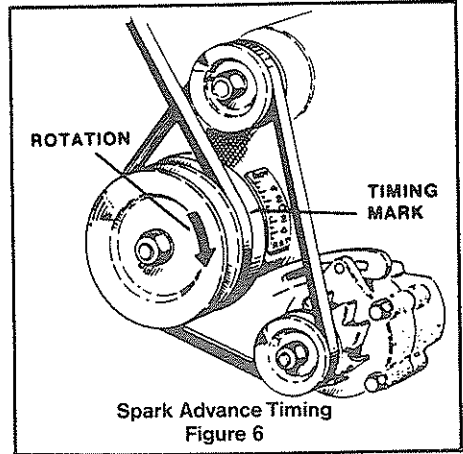
The following timing adjustment procedure can be used on the majority of spark ignited engines in use today. Both General Motors and Ford Motor Company have introduced and used special versions of their common electronic ignition systems which sense ignition directly from the engine's crankshaft via a crankshaft sensor. These systems were introduced in the late 1970's and were typically used only on a few of the "high line" luxury passenger cars. Timing is still checked with a timing light in the standard manner, however, timing adjustment is made at the crankshaft sensor, **not** by turning the distributor as is normally done. See your vehicle service manual for exact adjustment procedures on this type of system.

2. With the engine off, loosen the distributor hold down bolt just enough so that the distributor can be turned freely. Do not loosen the bolt beyond this point. See Figure 5.



3. Start the engine and allow it to warm to normal operating temperature (upper radiator hose is hot). Adjust engine RPM to the value specified by the vehicle manufacturer for timing purposes. If no value is given, set the engine to curb idle.
4. Aim the timing light at the timing marks on the engine and pull the trigger switch.

5. With the trigger switch pulled, and while observing the timing marks, rotate the distributor slowly clockwise or counterclockwise as necessary to bring the timing into factory specification. On most engines, a change in timing will change engine RPM. If this happens, reset engine RPM as indicated in Step 3 above and repeat Steps 4 and 5 until timing and RPM are within factory specifications.
 6. Shut off the engine. Tighten the distributor hold down bolt securely.
 7. Start the engine and recheck the timing. If it drifted during the bolt tightening process, readjust it as necessary.
 8. Shut off the engine. Disconnect the timing light leads in the reverse order from which they were connected.
 9. Re-connect any disconnected vacuum hoses or electrical connectors which were disconnected as part of the engine's preparation for timing. Reset the engine's idle speed if necessary.
4. As the engine speed increases, the timing mark should appear to move smoothly in the opposite direction of engine rotation (the "spark advance" direction). See Figure 6. As engine speed is decreased, the timing mark should appear to move smoothly back to the initial timing mark noted in Step 2.



Timing Advance

The following advance system checks are general and may be used on most pre-emission controlled vehicles. Note, however, that many vehicles have ignition and emission control systems which may permit timing advance only under certain operating conditions. It is therefore important on these vehicles to check your vehicle service manual for specific instructions on how to perform advance system checks.

CENTRIFUGAL ADVANCE SYSTEM

Operational Test

1. Turn the advance control on the timing light fully counterclockwise, and turn the test selector to the advance position.
2. With the distributor vacuum line disconnected and plugged (Figure 5) and the engine at curb idle, aim the timing light at the timing marks, press the switch to operate the timing light and note the position of the timing mark as shown in Figures 2, and 7. The timing mark or pointer should appear to be opposite one of the numbers (initial timing) as shown.
3. Gradually increase the engine speed to 2500 RPM while observing the timing mark position.

NOTE

Advance motion should be smooth. An uneven or erratic advance motion may indicate a defective centrifugal advance system which should then be serviced as necessary, according to the vehicle manufacturer's instructions.

Calibration/Accuracy Test

5. Operate the engine at curb idle, direct the timing light at the timing mark and turn the advance control upscale until the timing mark on the engine appears to be at "0" degrees. (See Figure 8.) The meter reading on the timing light indicates the initial advance in degrees, and should correspond to the number obtained in Step 2. (This step does not apply to those engines whose initial timing is **at or after** Top Dead Center, TDC.)

READING
DAMPER WHEEL
ONLY

INITIAL ADVANCE

IDLE RPM

VACUUM HOSE
DISCONNECT

METER
READING = 0
STEP 1 - 2

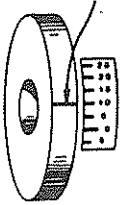


Figure 7

READING
ADVANCE
TIMING LIGHT DIAL

INITIAL ADVANCE

IDLE RPM

VACUUM HOSE
DISCONNECTED

METER READING =
10 DEGREES
STEP 5

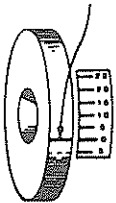


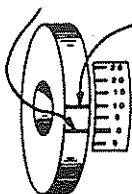
Figure 8

READING
CENTRIFUGAL ADVANCE
AND
INITIAL ADVANCE

CENTRIFUGAL ADVANCE
2500 RPM

VACUUM HOSE
DISCONNECTED

METER READING =
15 DEGREES
STEP 8



METER READING =
5 DEGREES
STEP 7

Figure 9

- Operate the engine at 2500 RPM or as specified by the vehicle manufacturer for the centrifugal advance check. The timing mark may appear to move off scale, and beyond the highest number. This may be normal for the RPM being used and the particular vehicle under test.
- Direct the timing light at the timing mark and turn the advance control until the timing mark on the engine appears to return the **initial timing position** (as noted in Step 2 above). The meter reading on the timing light now indicates the amount of centrifugal advance in **crankshaft or engine** degrees (Figure 9). Repeat the test as required for various speeds as specified in the vehicle service manual.

NOTE

Some manufacturers give advance specifications in distributor degrees and distributor RPM. Since the distributor rotates at one half of engine or crankshaft speed, the distributor specifications should be one half of what is indicated on the advance timing light meter. Vehicle test speed must also be doubled if test speed is listed for distributor RPM. It is therefore important to know if the vehicle service manual is presenting specifications in "engine" or "distributor" degrees and RPM.

- Continue to turn the advance control until the timing mark appears at the "0" degree (TDC) mark on the engine. The meter reading on the timing light now indicates the total advance, that is, the initial advance **plus** the centrifugal advance in degrees (Figure 9). If initial timing specification is **after** TDC, this must be added to the meter reading to obtain total advance. (You may also rotate the advance control further, to initial timing, thus eliminating the need for calculation. Total advance will then be shown.) Check the result with manufacturer's specifications. Repeat the test as required for various speeds as specified in the vehicle service manual. If the reading does not meet the manufacturer's specification, it may indicate a problem with the centrifugal advance mechanism which should then be corrected by repair or replacement.

VACUUM ADVANCE SYSTEM CHECKS

Accurately checking the calibration of the vacuum advance system requires not only the advance timing analyzer, but also a vacuum pump with gauge such as described in the INTRODUCTION at the beginning of this manual. Most vehicle service manuals will indicate specific advance in degrees for a given vacuum in inches of mercury. See your vehicle service manual for specific procedures. **As with the centrifugal advance system check, note whether specifications are in distributor or engine degrees.**

9. Perform Steps 1-8 for the centrifugal advance system if not done as yet.
10. Stop the engine and connect your external vacuum pump to the vacuum diaphragm on the distributor or the vehicle's on-board computer.
11. Set the timing light's advance control fully counterclockwise. Make sure the test selector is in the advance position. Restart the engine.
12. Aim the timing light at the timing marks, pull the trigger, and **note engine timing.**
13. Adjust engine RPM if necessary, and apply vacuum levels to the vacuum advance diaphragm as indicated by the vehicle service manual. (If it is necessary to reset engine RPM via vehicle service manual instruction, note engine timing again as indicated in Step 12.)
14. Turn the timing light's advance control clockwise until the timing mark on the engine returns to its starting point as noted in Step 12.
15. Note the timing advance (in degrees) with each application of vacuum and compare the result with service manual values. Failure to obtain the vacuum advance readings may indicate a leaky diaphragm, sticky advance mechanism, or lack of vacuum to drive the vacuum motor diaphragm.
16. After all testing is complete, make sure to reset any idle speeds and reconnect any hoses or electrical connectors which may have been disconnected during the test procedure.

REPLACEMENT PARTS

Note that optional test lead lengths are available as listed.

PART NUMBER	DESCRIPTION
38-1071	Battery Cable, 6-foot rubber insulated wire, Hippo clips
38-1286	Battery Cable, 25-foot rubber insulated wire, Hippo clips
97 5529	Plastic Inductive Pickup, 6-foot, rubber insulated shielded wire, polarity sensitive (arrow molded in clamp) pickup.
38-1391	Plastic Inductive Pickup, 12-foot, rubber insulated shielded wire, polarity sensitive (arrow molded in clamp) pickup.
38-1288	Plastic Inductive Pickup, 25-foot, rubber insulated shielded wire, polarity sensitive (arrow molded in clamp) pickup.
01 5492	Polarity sensitive pickup service kit. Includes all new pickup parts, old test lead (6-, 12-, or 25-foot) must be reused. Delicate soldering required.
60 16701	Test Lead rubber strain relief
60 464	Strain relief clamp
600-258	Xenon Lamp
2-202601	Instruction manual