This instrument puts the four most used ignition meters into one compact package. The bright digital display shows RPM or Degrees Advance while the strobe light is flashing, and Dwell Percent or Volts when the strobe is off. Timing Advance Control Buttons are conveniently located on the handle, allowing easy, one-handed operation. A 2/4 stroke switch scales readings for double ended coil or distributor ignitions.

OPERATING SPECIFICATIONS

DISPLAY	RANGES:	*Resolution*	*Accuracy*
ADVANCE	to 90 degrees, 4 S	0.1 degree	1 degree
	to 45 degrees, 2 S	0.1 degree	± 1 degree
TACHOMETER	400 to 10,000+ rpm	10 rpm	± 1 %
DWELL	0 to 100 percent	0.1 %	± 1 %
VOLTS DC	0 to 19 volts	0.1 volt	± 1 %, .05v

XENON STROBE LIGHT	works beyond 10,000 rpm	
POWER	10 to 16 Volts DC, 1.5 Amp	12 volt battery
TEMPERATURE Operating	0° to 122° F	-18° to 50° C
Storage	-40° to 180° F	-40° to 80° C
LEADS	5 feet	1.5 meter
WEIGHT	1.7 pound	770 gram
SIZE	12 inches tip to tip, 2.8 wide	30 x 7 cm

TECHNICAL HELP & SERVICE

Questions or inquiries about service can be answered by contacting Ferret at: (231) 627-5664, Fax: (231) 627-2727, Toll Free (800) 627-5655. When sending an item to the factory address it to: Ferret Instruments, Inc., 1310 Higgins Dr., Cheboygan, MI 49721-1061

Include a note describing the problem.

FERRET BRAND LIMITED PRODUCT WARRANTY

FERRET INSTRUMENTS, INC. of Cheboygan Michigan, warrants to the original purchaser that FERRET brand products are free from defects in materials and workmanship for a period of three years from date of purchase. Our sole obligation for a product within the above warranties will be to repair or replace, at our option, any defective parts and return the product to the sender within the U.S.A., shipping prepaid, if it is sent to our Repair Department shipping prepaid and accompanied by proof of purchase. The above warranty is extended for the flashtubes in timing lights which are within five years of the date of manufacture.

EXTENDED SERVICE POLICY

A FERRET brand product less than five years old according to the date of manufacture, and which is returned with transportation charges prepaid to: Ferret Instruments, Inc., Repair Department, 1310 Higgins Drive, Cheboygan, MI 49721, will be repaired or replaced, at factory option, for a service charge not to exceed 40% of the latest factory suggested user price; plus return transportation charges and insurance. If the product has been discontinued, the nearest equivalent product may be substituted.

This Warranty and Extended Service Policy do not apply to products which have been altered outside the factory; or repaired by anyone other than the factory or its authorized service centers; or which have been damaged from accidents, negligence, or abuse; or have been used differently than described in the printed instructions. Please note that wear and tear on leads and replacement of consumable items, such as NOx and O2 sensors, is not covered by warranty.
Ferret Instruments, Inc.'s sole liability and buyer's exclusive remedy is limited to repair or replacement of the product as stated in the Limited Product Warranty and the Extended Service Policy. THERE ARE NO OTHER WARRANTIES EXPRESSED OR IMPLIED INCLUDING THOSE OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE AND FERRET INSTRUMENTS, INC. SHALL NOT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING FROM THE SALE OR USE OF THE PRODUCT.

Some states do not allow limitations on the length of implied warranties nor exclusion or limitations of incidental or consequential damages, so that the above limitations and/or exclusion may not apply to you. This warranty gives you specific legal rights and you may also have other rights which may vary from state to state.

SAFETY PRECAUTIONS

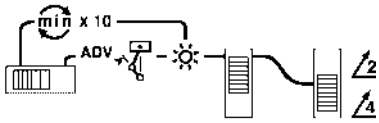
—Read All Instructions Before Using The Meter—

- Always wear eye protection when testing vehicles. Be extra careful near batteries and moving parts. Do not lay tools on a battery.
- Battery gas is highly explosive.
  a. If a battery explodes flush the acid away from persons skin with generous amounts of water. Follow up with a neutralizing solution of baking soda and then more water.
  Treat clothing, vehicle parts, and equipment similarly. Any acid traces inside equipment must be removed by generous rinsing. Dry equipment and place in a warm 50°C (120°F) oven until thoroughly dry.
  b. Never use a wrench on the ungrounded battery terminal until the grounded one has been disconnected. Contact between the vehicle body metal and the hot terminal can cause sparks to ignite gas or even weld tools into a battery short circuit.
  c. Keep the space around a battery well ventilated.
  d. Do not make sparks or allow flames near batteries.
- Before working on a vehicle set the brakes and block the wheels.
  Beware of automatic parking brake releases.
- Keep your work area well ventilated and free of exhaust. **Engine exhaust contains deadly poisons.** Treat Gas Detector exhaust and drain hoses the same as the vehicle tailpipe. Both give off deadly exhaust fumes.
- Avoid electrical shocks caused by getting close to live ignition wires or touching the coil TACH terminal. A person's reaction near a live engine can be more damaging than the shock.
- Keep spark producing devices at least 0.5m (18") above the floor to reduce the hazard of igniting gasoline vapor.
- Do not let test leads fall in a moving fan or pulley. Route leads away.
- Remove finger rings and metal wrist bands. They can short terminals and become very hot from electric current. E086-01

TIMING-ADVANCE TEST PROCEDURE

This light measures advance by delaying the flash so that it appears to align the crank shaft TDC mark to its pointer, and then displaying the degrees delayed. Note that on engines with ignition contact points, dwell affects timing and must be in calibration before timing is adjusted.

1. Connect the power leads: RED - positive, BLACK - negative. Push the middle switch up for strobe. Select the RPM x 10 display. Set the 2/4 stroke switch. Place the Inductive Pickup around the #1 spark plug wire.



2. Prepare the engine for timing tests, such as: warming-up, disabling electric and vacuum control lines, and cleaning the wheel timing marks. Then run the engine. The light should begin flashing.

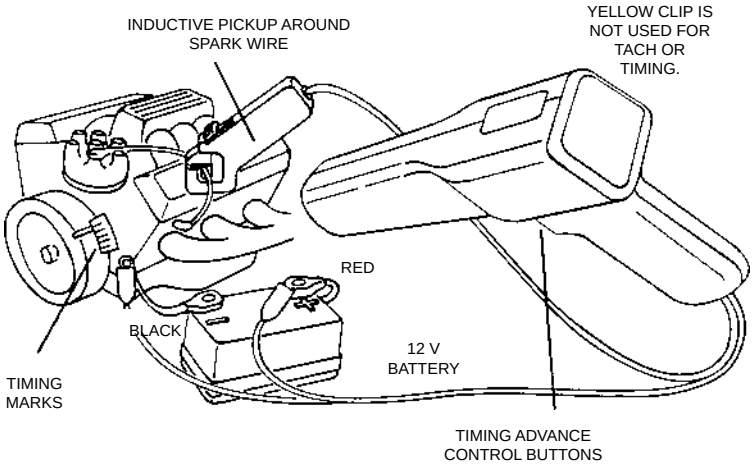
3. Read RPM x 10, and set the engine speed to the test specification. Then slide the display switch toward the crank angle symbol to read degrees of advance. The display will show a decimal point one place from the right.

4. Point the light beam onto the degree marks at the engine damper wheel or flywheel, and move the apparent mark to the TDC position using the Timing Advance Control Buttons. Then read the timing advance on the display.

5. Compare the measurement with the specification. Timing adjustments are made by turning the distributor slightly or by moving the ignition timing sensor.

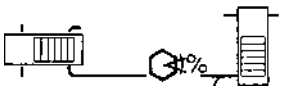
6. Restore all engine parts to their normal arrangement.

NOTE: Align your eye squarely with the timing marks when viewing, to avoid parallax error. The strobe light may be aimed from the side, but marks must be



VOLTS & DWELL MEASUREMENTS

Connect Power Leads to the engine's 12 volt battery. Have the middle switch pushed down. Use the YELLOW clip lead to sense dwell and voltage on ignition coils, control solenoids, and sensors. This clip does not affect RPM or Advance readings.



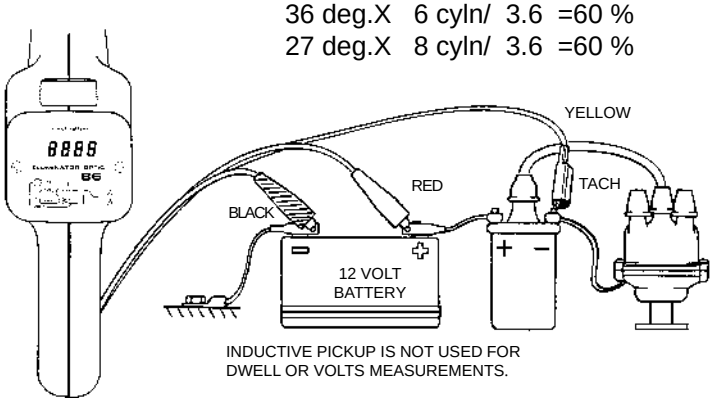
IGNITION DWELL

This reading gives the percent of time that a coil minus terminal is switched to ground. To use, push the left switch toward the right, by the cam angle symbol. The display will show a decimal point one place from the right. With the test clip disconnected or grounded, the display will read 100.0 ±1. It will read 0.00 if connected to battery voltage. Connect the YELLOW clip to the coil minus (TACH) terminal. Then run the engine.

If dwell specification is only provided in degrees, use the following formula:

DEGREES X CYLINDERS / 3.6 = DWELL PERCENT

For example: 54 deg.X 4 cyln/ 3.6 =60 %
36 deg.X 6 cyln/ 3.6 =60 %
27 deg.X 8 cyln/ 3.6 =60 %

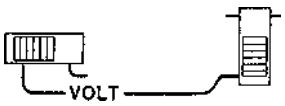


DUTY CYCLE DWELL

Have the left switch toward the cam angle symbol on the right side. Connect YELLOW clip to the signal terminal and run engine. The dwell reading is the percent of time that the signal is switched below this meter's 3 volt input threshold.
Most of these applications read the percent of time that fuel metering solenoids are turned on. This includes Bosch K & KE-Lambda Jetronic and GM mixture control carburetors. Most systems are designed to operate around 50% duty. Follow testing procedures specified for each engine.

VOLTAGE MEASUREMENT

Push the left switch toward the left side. A decimal point will be on the display two places from the right.



Touch the YELLOW clip to a voltage test terminal. The display shows the DC voltage from the YELLOW clip to the battery minus clip. The usable range is from 0.00 through 19 volts DC.

Input impedance is 175 kilohms, so it is generally suitable for circuits under 5 kilohm source impedance. This includes virtually all signals within an automotive harness, with the exception of O2 sensors. O2 lambda sensors usually have a high source impedance (unless good and hot), so connection to them may load the sensor voltage down, and disturb engine operation.