

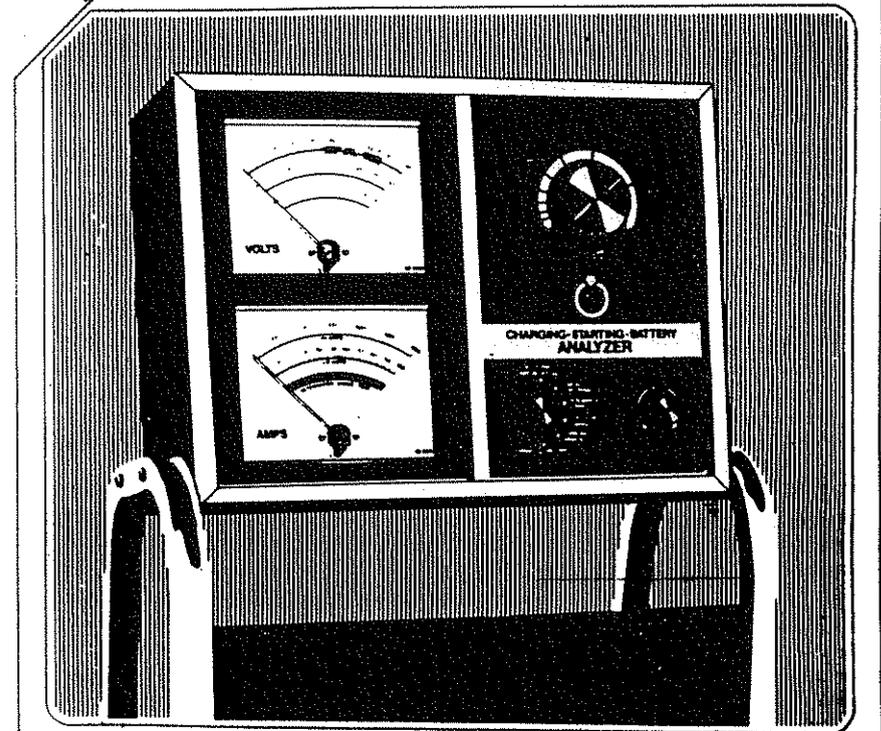
*Your jobber provides a complete line of automotive test tools . . . to help you complete your set*

These professional test tools include hand-held Dwell-Tach-Points, Alternator - Generator - Regulator, Ohmmeters, and Exhaust Gas Testers, D.C. Power Clamp - On and Neon Timing Lights, Compression and Vacuum & Pressure Gauges, Portable Electronic and Two & Four Cycle (magneto-equipped) Engine Analyzers, Charging-Starting, Electronic Ignition Components, Advance Timing and Infrared Emissions Analyzers . . . plus, Console Engine Analyzers.

PRINTED IN U.S.A.

**OPERATING  
MANUAL**

## CHARGING—STARTING—BATTERY ANALYZER



2-213601

**IMPORTANT OPERATING & SAFETY NOTES . . .  
READ BEFORE PROCEEDING WITH TESTS**

1. **Always** work in a well ventilated area . . . **Never** start a vehicle's engine in an enclosed area.
2. **Never** smoke or allow any other open flame to come within 25 feet of the vehicle being tested.
3. **Always** insure that **everyone** within close proximity of the vehicle being tested is **correctly** wearing approved safety/protective glasses before proceeding with any testing or adjustments.
4. **Always** insure that the vehicle's engine is turned **OFF** when connecting or disconnecting any and all test equipment.
5. **Always** insure that the tester's black grounding clip is connected **first** during hook-up, and that it is **disconnected last** when testing is completed.
6. **Always** exercise **extreme** caution to insure that hands, arms, clothing and tester leads are kept well away from **all** moving engine parts.
7. Because the battery may produce highly explosive gases, it is extremely important that you carefully observe the following precautions:
  - A. **DO NOT** smoke or allow any other open flame or spark within 25 feet of the battery.
  - B. **NEVER DIRECTLY CONNECT THE POSITIVE AND NEGATIVE** battery post together with any single conductive material (such as a screwdriver, jumper lead, etc.), as this will cause a short circuit and spark which could result in an explosion.
8. Battery acid and corrosion can be extremely dangerous and **MUST BE DEALT WITH VERY CAREFULLY**.
  - A. **DO NOT** allow battery acid or corrosion to come in direct contact with skin or eyes . . . If it does, thoroughly wash skin with warm, soapy water **IMMEDIATELY** and/or rinse eyes with clear water for 15-20 minutes . . . **CONTACT PHYSICIAN IMMEDIATELY**.
  - B. Extreme caution must be exercised to avoid ingestion of battery acid or corrosion . . . If ingestion does occur, drink large quantities of milk (**DO NOT INDUCE VOMITING**). **CONTACT PHYSICIAN IMMEDIATELY**.
9. Tremendous back pressure can be developed in the radiator, and taking the radiator cap off improperly can result in a sudden release of scalding hot water, and subsequent serious burns. You **MUST** refer to proper vehicle manufacturer's service manual for correct procedure.

Due to the inherent dangers associated with even the simplest automotive maintenance procedures, the manufacturer and all parties involved in the distribution and/or sale of this automotive test product will **NOT** be held liable or responsible, wholly OR partially, for ANY injuries, damages or claims resulting from the performance of testing or adjustment procedures included in this instruction guide and/or the use of this automotive test product.

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FOR SERVICE CONTACT:

**KAL EQUIP, 9999 Walford Avenue  
Cleveland, Ohio 44102 (800) 253-9880**

## GENERAL INFORMATION

The Charging Starting Battery Analyzer is a rugged, professional quality tool designed for heavy duty use. The convenient hook up and test sequence allows a complete check out in minutes of the:

Battery	Alternator/Generator
Starter Motor	Voltage Regulator
Starter Solenoid	All Interconnecting Cables

### I. OUTSTANDING FEATURES OF THE CHARGING STARTING BATTERY ANALYZER ARE:

- A. Rugged Construction: Designed for heavy duty use and maximum reliability.
- B. Convenient Hook Up: All connections simply clamp on, no time consuming vehicle disconnections are required on most vehicles.
- C. Built in safety; no current is drawn from the battery until the front panel spring loaded switch is depressed. This eliminates any spark and explosion danger during hook up.
- D. Large easy to read meters:
  1. Voltage Scales 40V, 18V, 4V.
  2. Current Scales 600 Amps, 100 Amps.
  3. Good/Bad Scale for Alternator Diodes.
- E. 5000 Watt Carbon pile for battery load test.
- F. Maneuverability; mounted on 4 swivel rubber wheel casters with front locking casters.

### II. GENERAL INFORMATION (See Figure #1)

#### A. Ammeter

The ammeter is a three-scale meter, 0 to 600 amps, 0 to 100 amps and an ALTERNATOR DIODE TEST SCALE indicating ok or defective alternator diodes.

The zero to 100 amp range is used to measure the ignition and accessory current loads and the charging system output.

The zero to 600 amp range is used to measure the battery current drawn by the starter motor or by the analyzer's carbon pile load and to measure the current output of heavy-duty charging systems (over 100 amp).

## GENERAL INFORMATION

### B. Voltmeter

The volt meter is a three-scale meter with ranges 0 to 18 volts, 0 to 40 volts and 0 to 4 volts.

The 0 to 18 volt range is used to measure the battery voltage on all 6 and 12 volt systems.

The 0 to 40 volt range (on the small external leads) is used to measure voltages above 18 volts.

The 0 to 4 volt range is used to measure voltage drops anywhere in a car's electrical system.

### C. Mechanical Zero Adjust

Both the amp meter and the volt meter have a zero adjusting screw positioned at the bottom center of each meter. Use these screws to zero the meters before connecting the analyzer.

### D. Electrical Zero Adjust

Whenever the clamp amp is to be connected, use this adjustment to zero the amp meter electrically. For maximum accuracy, electrically zero the amp meter with the selector switch in the "Lo Amps" position.

NOTE: The analyzer battery leads must be connected in order to zero the amp meter.

### E. Load Control Knob

The load control knob is used to control the load amps applied to 6, 12 and 24 volt batteries and/or their charging systems. The load amps can be adjusted from 10 to 450 amps with the control knob.

### F. Load On Switch

Battery current can flow through the internal carbon pile load only when the load on switch is depressed. This prevents dangerous sparks from occurring during hookup and disconnect.

To test a battery, the operator must simply hold down the spring loaded switch and tighten the load knob until the desired test current is reached.

### G. Heavy Duty Battery Leads

The heavy battery leads are used to carry the heavy amp loads during the battery, cranking, and charging tests. They are connected inside the analyzer to the 5000 watt carbon pile load.

## GENERAL INFORMATION

### H. Clamp Amp

The clamp amp is used to measure current (amps) without disconnecting any wires or cables. Simply clamp the clamp amp around the analyzer's heavy black lead when load testing the battery or around the battery ground lead (arrow towards battery) when measuring the cranking or charging current. Use the amps zero adjust knob to zero the amp meter before connecting the clamp amp. NOTE: The heavy battery leads must be connected.

### I. External Loads

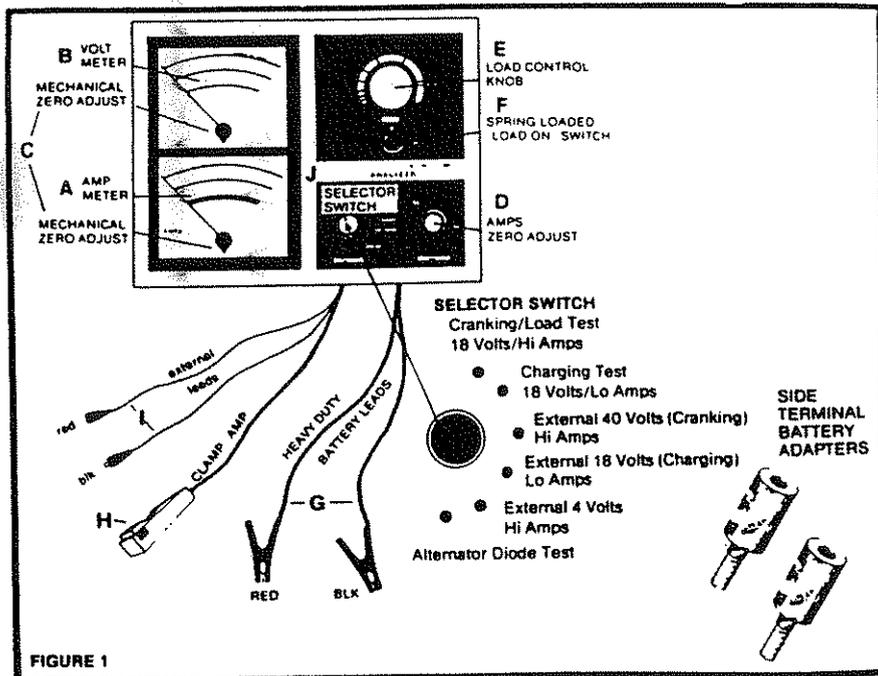
These leads are in use when the test selector switch is placed in one of the external positions. They are used to measure "volts" cranking and charging on 6-12-24 and 36 volt systems.

### J. Test Selector Switch

The test selector switch position determines which meter scales are in use and which set of leads should be used.

### K. Regulator Field Adapters

The adapter set consists of 2 adapters ( the Thexton 304 & 342) which makes it simple to isolate the regulator from the alternator during the alternator output test.



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## OPEN VENT AND MAINTENANCE FREE BATTERIES

### III. OPERATING PROCEDURES:

#### A. Testing Open Vent Batteries:

To determine the ability of any battery to function properly requires testing. The capacity of a battery changes with temperature, specific gravity, age of the battery, etc. Therefore, a complete battery test has several steps

1. Visual Inspection
2. Specific Gravity (open vent type)
3. Load Test

#### CAUTION:

When working with batteries care should be taken to:

1. Wear safety glasses.
2. Do not break live circuits at the battery terminals
3. Avoid accidentally shorting the charger or analyzer clips to the engine frame when connecting and disconnecting the battery leads.
4. Remove the surface charge by connecting the rated amp load (ref. page 8 and 9 #1 A and B) across the battery terminals for 10 seconds or by turning on the head lights for 2 minutes. This stabilizes the battery's state of charge at its normal operating level.

Terminal adapters are available for side terminal batteries. These adapters need not be used on batteries already installed.

#### VISUAL INSPECTION:

Batteries should be clean and free from corrosion at the battery post. Check for

1. Loose Battery Posts.
2. Damaged Battery Cases which would allow the loss of electrolyte
3. The water level must be above the cell plates in all cells, if water is added to the battery before specific gravity readings are taken, the battery must be charged to insure proper mixing of the water and electrolyte.

(Refer to battery manufacturers instructions regarding removal of vent caps while charging battery).

#### SPECIFIC GRAVITY (HYDROMETER) TEST: (OPEN VENT TYPE)

1. The specific gravity readings should not vary more than 50 points between cells. If the variance is more than 50 points, replace the battery.
2. The specific gravity should be at least 1.230 in all cells. If not, charge the battery until 1.230 is obtained. In case the battery is very low, a longer period of time for charging may be required. After charging, remove the surface charge from the battery. If charging the battery will not bring the charge to 1.230 then the battery should be replaced.

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**OPEN VENT AND MAINTENANCE FREE BATTERY**

A battery must be tested with a load to determine its condition. Specific gravity or open circuit voltage tests do not accurately measure a battery's condition.

The generally accepted theory of battery testing is that a good battery should maintain a voltage of 9.6 or more under starter load. This 9.6 minimum voltage is to be used for battery ambient temperatures of 70° and above. For temperatures below 70° use the following:

**TABLE 1  
MINIMUM VOLTAGE**

(21°C) 70°F & Above	(16°C) 60°F	(10°C) 50°F	(4°C) 40°F	(-1°C) 30°F	(-7°C) 20°F	(-12°C) 10°F	(-18°C) 0°F
9.6	9.5	9.4	9.3	9.1	8.9	8.7	8.5

1 There are two methods of rating batteries. For years batteries were rated in "Ampere Hours—20 Hour Rate." A new rating "Cold Cranking Amps at 0°F." is gradually replacing the Ampere Hour rating. While some battery manufacturers are supplying both ratings, many are not. Therefore, the method of determining the load to apply to test a battery depends on which rating is known. (See A or B).

The Cold Cranking Amps rating and/or Ampere Hour rating can be found on the battery, in the car owner's manual or the manufacturers Spec Book.

Sometimes the rating cannot be located, in that case the engine size may be used as a guide to determine the battery's ampere rating. (See Table 2). However, it is recommended, to use the manufacturers recommendations, whenever they can be located.

**TABLE 2**

Engine Size	Cubic Inches	Cu. Centimeters	Battery Load or Cranking Amp Rating	Watts
Small	100 to 200	1600 to 2400	100-150 Amps	1200 to 1800
Medium	200 to 350	2400 to 5600	125-200 Amps	1500 to 2400
Large	350 to 500	5600 to 8000	175-300 Amps	2100 to 3600

- a. AMPERE HOUR RATING—When using this rating, multiply it by 3 to obtain the load. For example, a 60 Ampere Hour battery multiplied by 3 requires a 180 ampere load.
- b. COLD CRANKING AMPS—When using this rating, divide it by 2 to obtain the load. For example, a battery with a Cold Cranking Amps rating of 400 divided by 2 requires a 200 ampere load.
- c. BATTERY WATTS—When only the battery rating in watts is known then use Table (2) as a guide to determine what battery load or cranking amps would be normal.  
FOR EXAMPLE: A battery load or cranking amps for a battery rated at 2400 watts would be 125 to 200 amps.

**2. MAINTENANCE FREE AND SEALED BATTERIES**

Sealed batteries can be tested like any other ordinary battery except for the specific gravity test. They have a sealed cover and carry a lifetime supply of electrolyte. One type has the negative and positive terminal on the top and another has them on the side. The side terminal type have threaded terminal connections which are sealed against corrosion where the cables are attached.

Freedom batteries may be charged or tested on-the-vehicle, using the existing terminals. However, when the battery is out-of-the-vehicle, adapters for the side terminal models are required.

Freedom batteries have an indicator built into the battery cover. The color of this indicator verifies the gravity condition of the battery.

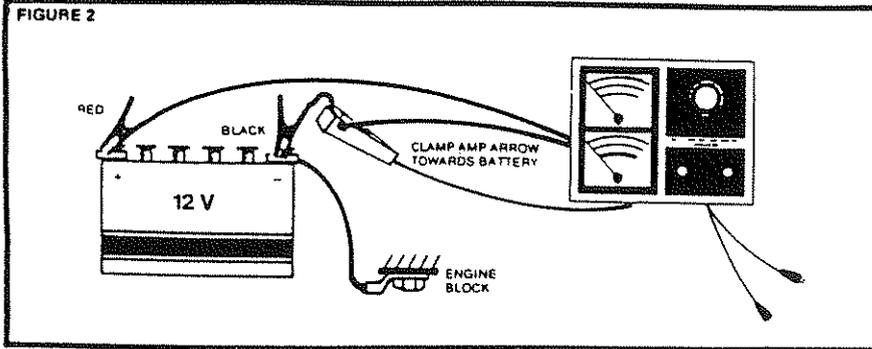
EXAMPLE: Top side of battery:

- If the green ball is visible, the battery is charged.
- If the indicator is dark and the green ball is not visible, the battery is partially discharged.
- If the indicator is light yellow, the battery is low on fluid and near the end of its useful life. **DO NOT ATTEMPT RECHARGING OR TESTING IF THE INDICATOR IS YELLOW.**

OPEN VENT AND MAINTENANCE FREE BATTERY

3. LOAD TEST PROCEDURE

1. The ignition and all accessories should be off.
2. Turn the selector switch to cranking load test 18V/High Amps
3. Turn the large control knob to the full decrease position.
4. Connect the analyzer to the battery as shown in figure (2).<sup>\*</sup>
  - A. Connecting the heavy battery leads first.
  - B. Zero the ammeter, then connect the clamp amp over the analyzer battery negative cable - (arrow towards the battery).



5. Hold the "Load On" switch down.
6. Turn the large control knob clockwise until the desired load current is reached. This load (amps) will be indicated on the amp meter. Limit the load test to 15 seconds. record the battery voltage at the end of this 15 second period (before the load is removed). Then release the "Load On" switch and turn the large control knob counterclockwise.
7. Compare the voltage with the minimum voltage listed in Table (1) on page 6.

EXAMPLE: in Table 3, a battery at 70°-80°F was tested at a load current of 235 amps. At the end of the 15 second test (but before removing the load) the battery should still be 9.6V or greater. If less, the battery has failed the test.

\* NOTE: On vehicles with multiple batteries, only one battery at a time should be tested.

TABLE 3

Battery Type	Volts	Amps for Load Test	Battery Temp.	Minimum Battery Volts After 15 Seconds
1 1200	12	235	70°-80°	9.6
2 85-5	12	170	50°F	9.4
3 49-5	12	210	30°F	9.1
4 89-5	12	230	0°F	8.5

Test the battery under light load. (Green Zone 11.5 to 12.5 volts)

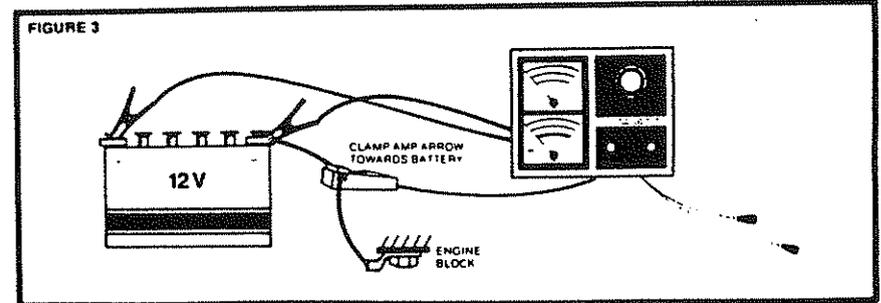
Turn on ignition switch, heater blower, and high beam headlights for 30 seconds.

This 30 second preliminary test checks the battery's general condition. If the meter reads below the Green Battery Zone (under 11.5 volts) the battery will more than likely fail under heavy load test to be performed later. If low, recharge the battery (or refer to the battery test procedure) before proceeding.

V. CRANKING TEST PROCEDURE:

The cranking test is made to determine if the cranking circuit is being supplied with the proper voltage to perform efficiently. It is also used to determine and isolate cranking component problems.

1. The ignition and all accessories should be off.
2. Turn the selector switch to cranking load test 18V/High Amps.
3. Turn the large control knob to the full decrease position.
4. Connect the analyzer to the battery as shown in Figure (3).
  - A. Connecting the heavy battery leads first.
  - B. Zero the ammeter, then connect the clamp amp over the battery negative cable - (arrow towards the battery).



5. Disable the engine to prevent it from starting. This may be done by:
  - A. Removing the coil high tension wire from the distributor center tower and connecting it to the engine ground, or
  - b. By disconnecting the ignition switch lead from the distributor. Do not allow it to be grounded.
6. Crank the engine for 15 seconds. Observe the volt and amp meters. The voltage should not drop below 9.6 volts.

Cranking amps Small Engines will draw 100-150 amps  
 Medium Engines will draw 125-200 amps  
 Large Engines will draw 175-300 amps

Examples of the Cranking test and problem areas of a large engine:

## CHARGING CIRCUIT

ENGINE SIZE	BATTERY VOLTS	CRANKING VOLTS	CRANKING AMPS	PROBLEM AREA
1. Large	12.6	9.6 or more	210	Good
2.	12.6	9.6 or more	25	Bad Connection, Bad Cable, Starting Solenoid, Starter Motor
3.	12.6	8.8	350	Starter Motor Short Circuit
4.	12.6	5.2	75	Battery
5.	12.6	12.6	0	Wire Connection or Open Circuit

NOTE: On side terminal batteries, use adapters furnished.

## VI. CHARGING CIRCUIT

The charging system provides the electrical energy needed to operate the ignition system, lights, radio, air conditioner and any other equipment that requires power while the engine is running. This system consists of the alternator (or generator), regulator, battery and all the wires and cables that connect these components to the rest of the engine's systems.

If all the components in the charging system are operating properly, the voltage and current required to operate the engine and all its accessories is precisely maintained at all times . . . not too little, not too much. The alternator (or generator) generates the engine's direct energy needs and also maintains the battery at full capacity; the battery acts as a power reserve so that even when the alternator can't provide all the energy required (a high power requirement when the engine is idling, for example), adequate power is still available. It also insures that adequate electrical power will be available to start the engine later. The regulator acts as the "brains" of the system by controlling the amount of electrical power generated by the alternator, so that the ignition, accessory, and battery requirements are met, and at the same time insures that components aren't burned up and battery water isn't boiled away by overcharging the battery.

Each of the charging system's individual components play an equally important role in the engine's efficient operation, but their combined function is essential . . . and if any one of these components is not performing satisfactorily, you've got a problem that's guaranteed to provide you with aggravation and frustration until the necessary corrections are made. The tests in this section will help you to quickly and easily determine whether or not the charging system is operating properly, and they'll also help you to pinpoint any problems that may exist.

### BATTERY VOLTAGE UNDER LIGHT LOAD (Green Zone 11.5 to 12.5 volts)

Turn on ignition switch, heater blower, and high beam headlights for 30 seconds.

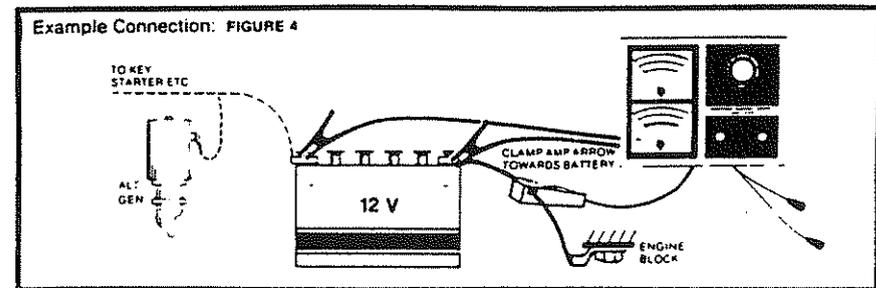
This 30 second preliminary test checks the battery's general condition. If the meter reads below the Green Battery Zone (under 11.5 volts) the battery will more than likely fail under heavy load test to be performed later. If low, recharge the battery (or refer to the battery test procedure) before proceeding.

## CHARGING CIRCUIT

### A. Connecting the analyzer to check the charging circuit:

1. The ignition and all accessories should be off.
2. Turn the selector switch to charging load test 18V/Lo Amps\*
3. Turn the large control knob to the full decrease position.
4. Connect the analyzer to the battery as shown in Figure (4).
- 4A. Connecting the heavy battery leads first.
- 4B. \*Zero the ammeter, then connect the clamp amp over the battery negative cable – (arrow towards the battery).\*

\*For charging circuits over 100 amps, change the selector switch to one of the high amp positions. Turn the clamp amp around so the clamp amp pointer points away from the battery negative. Read the top scale (0 to 600 Amps)



In order to avoid overloading the charging circuit, check the Alt/Gen output capacity before any load is applied. The applied load should not exceed the Alt/Gen capacity (Usually this information is listed on the Alt/Gen case).

### B. Testing the charging circuit.

With the analyzer connected as shown in Figure 4, start the engine and gradually increase the engine speed to about 1800 RPM, noting the volt meter reading.

- If the volt meter pointer climbs steadily and comes to a halt within a range from 13.1 to 15.5 volts for 12 volt systems, proceed to page 18 and perform the Alternator Diode Test. If the diodes test good and no specific complaint or symptom is indicated, the charging system can be presumed to be ok and further testing would be unnecessary.

#### NOTE:

The diode test is important because an alternator can still produce charging current with a bad diode and not be able to produce at its full capacity

- If the voltage does not climb to 13.1 volts (12 volt systems) check and see if there is adequate charging current at 1800 RPM. When both the volts and the charging current remain low, this is an indication of battery trouble.

If the battery is good and voltage doesn't rise to 13.1 volts (12 volt systems) and the charging current remains low as the RPM is increased to 1800 RPM, this is an indication of alternator trouble.

## CHARGING CIRCUIT

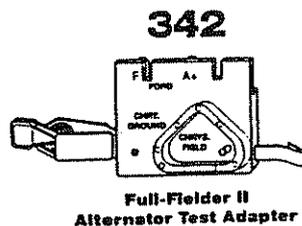
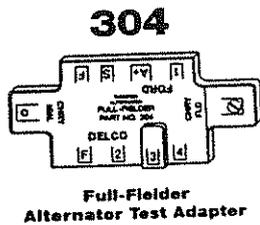
- If the meter pointer climbs but stops either below the correct range or above the correct range, or if the meter pointer fluctuates and will not stop, the regulator is probably at fault. Check the battery and tension on all drive belts, look for loose, corroded or damaged battery posts. Look for poor connections at the battery, voltage regulator and alternator/generator. If they are ok, proceed, with the alternator or generator test.

### C. Alternator/Generator Output Test

To isolate any problem, it is necessary to separate the regulator from the alternator or generator. Use the following method to disable the regulator and make the alt/gen produce its full rated current.

Turn on high beam headlights, heater blower, etc. for about 2 minutes. After 2 minutes, insure that all accessories (radio, lights, heater blower, etc.) are turned off.

The regulator must now be "taken out" of the system by using the Thexton 304 or 342 Full Fielder Alternator adapter.



## CHARGING CIRCUIT

Start the engine and slowly increase RPM to reach rated output. Do not exceed the rating of the alternator or generator. Do not run this test for more than 20 seconds. Typical 12 volt system output ratings are 30 to 42 amps for non-air conditioned cars and 50 to 60 amps for air conditioned cars. Insufficient output rate indicates defective alternator or generator. If amps output is ok, regulator needs replacing or repair or there is a broken connection to or from the regulator.

**NOTE:** Certain late model cars have heater/air-conditioner blower motors that have no on-off switch and operate at all times when engine is running. These motors draw up to 10 amps on "low blower". When checking alternator output on these vehicles either:

1. Add 10 amps to the charging rate shown on the meter or
2. Disconnect the heater/air-conditioning motor blower lead and read the actual alternator output on the meter.

When the test is complete, stop the engine. Disconnect the full fielder alternator adapter and re-connect voltage regulator.

The following are some example test results.

Alternator Capacity	Charging Volts	Charging Amps	Charging Amps-Output Test	Problem Area
37A	13.8-14.5	1-8	32	Good
37A	11.8-13.0	27	32	Low Battery
37A	16.1	28-32	32	Regulator not controlling Alt/output
37A	11.5	5	5	Alt. bad
37A	11.5	5	32	Regulator bad

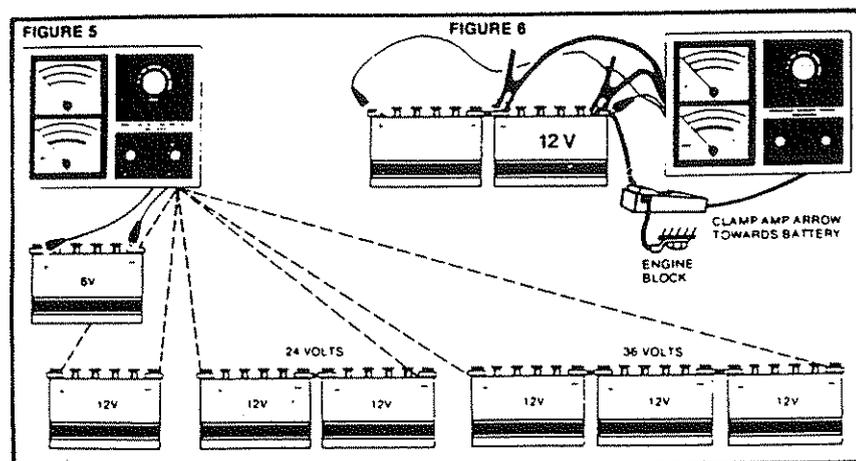
## EXTERNAL TESTING

## VII. EXTERNAL TESTING

The external leads can be used to make both battery voltage and voltage drop tests. The external leads are functional whenever the selector switch is in the Ext. 40V, Ext. 18V position or Ext. 4V position. The clamp amp is functional in these positions only if the heavy battery leads are hooked up to a battery.

Below are examples of tests using the external test leads:

## Example 1 Battery Voltage Test



## PROCEDURE:

1. Turn the selector switch to the proper volt position.
2. Connect the external leads to the battery and the volt meter will show the battery voltage.

## EXTERNAL CRANKING

## Example (2) External Cranking Volts/Amps Test

1. Ignition Switch off.
2. Turn the selector switch to "External 40 volt/Hi Amps"
3. Connect the analyzer as shown in figure (6).

## EXTERNAL TESTING

## NOTE:

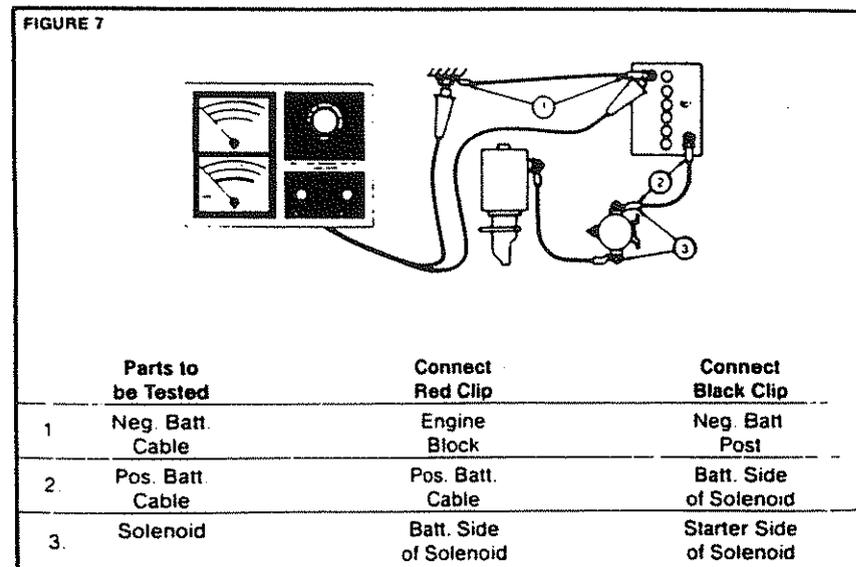
- A. Connect all leads except clamp amp.
  - B. Adjust the amp meter to zero then connect the clamp amp over the battery negative lead (arrow towards battery).
4. Crank the engine and read both the cranking volts and amps.  
Cranking volt range 0-40 volts  
Cranking amp range 0 to 600 amps

## Example (3) Voltage Drop Test

(Battery cables, starter solenoid, starter motor brushes)

Make this test if the cranking volts/hi amps test indicated voltage above 9 volts with low starter current.

1. Connect the analyzer as shown in Figure 7.



2. Move the Test Selector to "Ext. 4 volts" position.
3. Connect the red clip to the positive side and black clip to the negative side of the parts to be checked.
4. With the Analyzer leads connected as described, crank the engine and read the meter. Readings should not exceed .2 volt (.5 volt on solenoid). If readings are high the part is bad or the connection is poor.

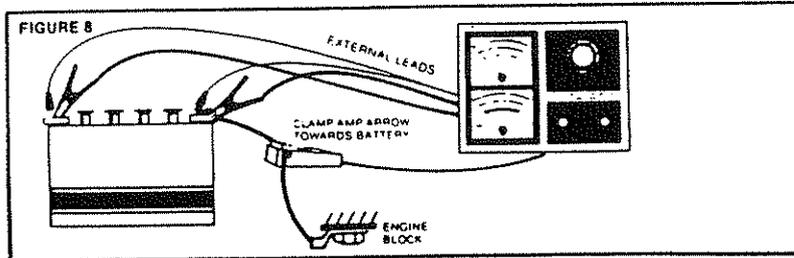
## EXTERNAL TESTING

NOTE: The Voltage Drop Test will also work on an engine that *will not* crank as long as the battery is fully charged and the ignition switch is allowing voltage to the solenoid.

### Example (4) External Charging volts/amps test.

1. Ignition switch off.
2. Turn the selector switch to "External 18 volts[Lo Amps]" position.
3. Connect the analyzer as shown in figure (8), adjust the amp meter to zero before connecting the clamp amp over the battery negative lead.
4. Start the engine and run between 700 to 1500 RPM.
5. Observe the charging volts and charging amps.

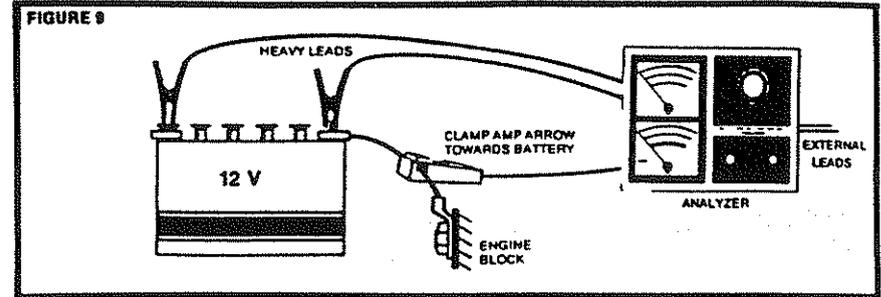
\*NOTE: for charging circuits over 100 amps, change the selector switch to "External 40 volt/Hi amps" Change the clamp amp so the arrow points away from the Battery negative post. Read the top scale (0 to 600 amps).



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## ALT/DIODE TEST VIII. ALT/DIODE TEST

Connect the analyzer leads as shown:



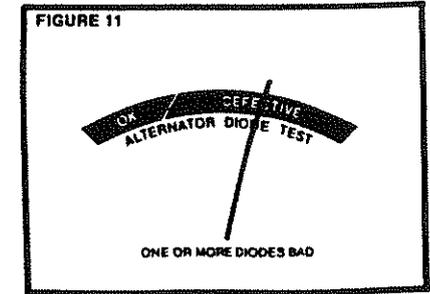
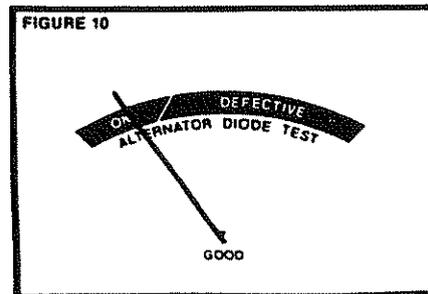
1. Move the selector switch to the charging test (18V/Lo Amps) position. Zero the amp meter without the clamp amp connected. Then reconnect it around the battery ground lead.
2. Run the engine at 1800 RPM. Adjust the load control knob, if necessary, to obtain at least 10 amps of charging current.
3. Place the selector switch in the alternator diode test position.

The meter pointer will point to the ok area if the diodes are good.

If one or more of the diodes are defective, the meter pointer will point to the defective zone.

NOTE: Late style Delco alternators include a diode trio in addition to the regular diodes. To determine which is failing, diode trio or diode(s), the use of an ohmmeter or diode tester is needed. Disconnect the stator wire and test the diode trio and each diode individually.

If diode test is marginal (if in doubt) Full-field alternator,  
If you have a diode out your Amps reading will be considerably less than rated output.



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## SHIPPING

- IX. SHIPPING:**  
To avoid shipping damage to the Carbon Pile Load during shipment, it is important that the Large Control Knob Be Turned Full Increase (Clockwise) Before Shipping.

Remove the four (4) screws from the legs and package only the head section and leads. Shipping the entire unit (with legs and casters) would only add to your shipping cost. All shipments are to be made on a prepaid basis.

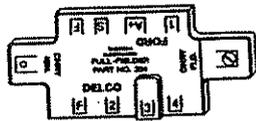
It is imperative that your analyzer is properly packaged for shipment . . . A shipping carton is available . . . Just call our toll free number and we'll send you the correct carton immediately.

### NOTICE:

The information in this manual is true and complete to the best of our knowledge. Because design matters, Engineering changes and methods of application are beyond our control, the authors and publisher disclaim any liability incurred in connection with the use of this data or specific details.

### ADAPTER REPLACEMENT PARTS

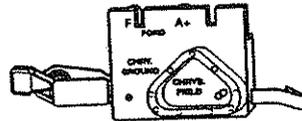
**304**



**Full-Fielder  
Alternator Test Adapter**

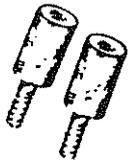
600-512

**342**



**Full-Fielder II  
Alternator Test Adapter**

600-513



**60-9605  
Battery  
Side  
Terminal  
Adapters**



**60-2089 Heavy-Duty  
Battery Adapter**