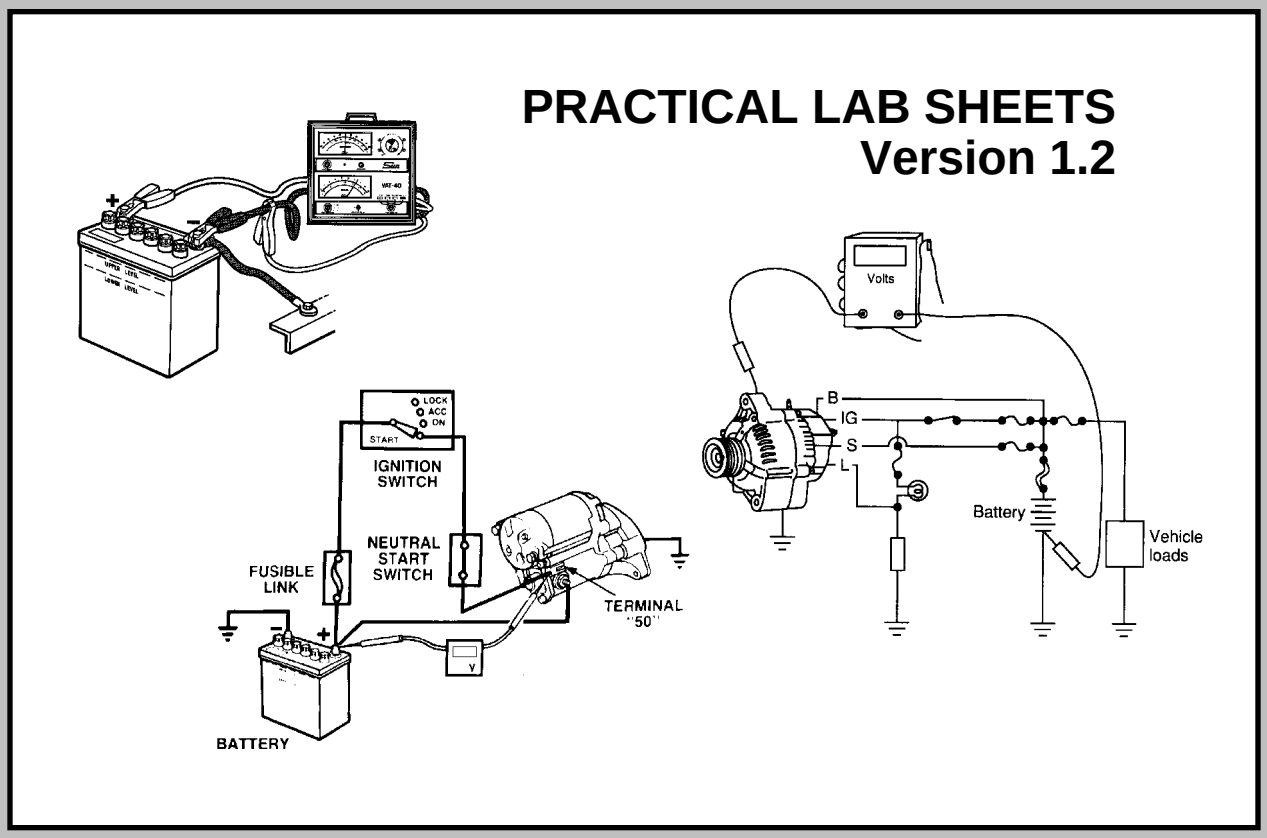
ELECTRICAL



BATTERY, STARTING, & CHARGING ON-CAR LAB SHEETS

http://www.autoshop101.com

Developed by Kevin R. Sullivan

Blank Page

All pages in this booklet
should be double sided

LAB SHEET # B-1 On-Car Testing NAME_____#_____

CAUTION: WEAR SAFETY GLASSES

BATTERY TESTING - PRACTICAL

1. Test batteries on a variety of vehicles.
2. Make all tests necessary to determine the battery charge, capacity, condition, and identify any defects.
3. Record you r results below, you findings must support your conclusions of battery condition and charge.
4. Follow the testing procedures outlined in the battery handout or textbook.

BATTERY #1 CAR #_____

1. Visual Inspection - Battery Case, Hold Down, Cables, and Connections? _____

2. Cell Readings: 1 _____ 2 _____ 3 _____ 4 _____ 5 _____ 6 _____

3. Electrolyte Level and Condition: _____ Is there Excessive Cell Variation: _____

4. Open Circuit Voltage: _____ State of Charge: 0% 25% 50% 75% 100%

5. Parasitic Drain: Specification: _____ Actual Reading: _____

NOTE: Clean Both Battery Terminals, Cable Clamps, and reinstall at this time.

6. Heavy Load Test: Amp Load: _____ Voltage: _____ Time: _____

7. Battery Condition: GOOD / BAD Why?_____

8. Optional - Test battery with MIDTRONICS Capacitance Tester. Are results the same: _____

BATTERY #2 CAR #____

1. Visual Inspection - Battery Case, Hold Down, Cables, and Connections? _____

2. Cell Readings: 1 _____ 2 _____ 3 _____ 4 _____ 5 _____ 6 _____

3. Electrolyte Level and Condition: _____ Is there Excessive Cell Variation: _____

4. Open Circuit Voltage: _____ State of Charge: 0% 25% 50% 75% 100%

5. Parasitic Drain: Specification: _____ Actual Reading: _____

NOTE: Clean Both Battery Terminals, Cable Clamps, and reinstall at this time.

6. Heavy Load Test: Amp Load: _____ Voltage: _____ Time: _____

7. Battery Condition: GOOD / BAD Why?_____

8. Optional - Test battery with MIDTRONICS Capacitance Tester. Are results the same: _____

LAB SHEET CONTINUED ON OTHER SIDE

BATTERY #3 CAR #____

1. Visual Inspection - Battery Case, Hold Down, Cables, and Connections? _____

2. Cell Readings: 1 _____ 2 _____ 3 _____ 4 _____ 5 _____ 6 _____

3. Electrolyte Level and Condition: _____ Is there Excessive Cell Variation: _____

4. Open Circuit Voltage: _____ State of Charge: 0% 25% 50% 75% 100%

5. Parasitic Drain: Specification: _____ Actual Reading: _____

NOTE: Clean Both Battery Terminals, Cable Clamps, and reinstall at this time.

6. Heavy Load Test: Amp Load: _____ Voltage: _____ Time: _____

7. Battery Condition: GOOD / BAD Why?_____

8. Optional - Test battery with MIDTRONICS Capacitance Tester. Are results the same: _____

BATTERY #4 CAR #____

1. Visual Inspection - Battery Case, Hold Down, Cables, and Connections? _____

2. Cell Readings: 1 _____ 2 _____ 3 _____ 4 _____ 5 _____ 6 _____

3. Electrolyte Level and Condition: _____ Is there Excessive Cell Variation: _____

4. Open Circuit Voltage: _____ State of Charge: 0% 25% 50% 75% 100%

5. Parasitic Drain: Specification: _____ Actual Reading: _____

NOTE: Clean Both Battery Terminals, Cable Clamps, and reinstall at this time.

6. Heavy Load Test: Amp Load: _____ Voltage: _____ Time: _____

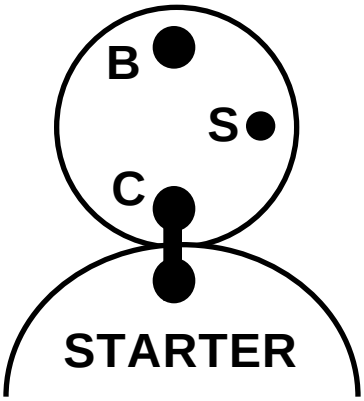
7. Battery Condition: GOOD / BAD Why?_____

8. Optional - Test battery with MIDTRONICS Capacitance Tester. Are results the same: _____

LAB SHEET # B-2 NAME_____#_____

STARTER CURRENT DRAW TEST

1. Insure battery is serviceable (At least 50% charged)
2. Connect the Volt-Amp tester (VAT-40) as instructed or outlined in your textbook.
3. Switch the Volt-Amp switch to Starting Test Position.
4. "Zero" the ammeter and connect amps pickup clamp around the ground cable.
5. Disable the ingnition system or use a remote starter switch.
6. Crank the Engine **(Do not crank engine for more than 15 seconds).**
8. Observe the voltage and amperage. Record the results below and compare to specifications.
9. Perform voltage drop tests using a digital voltmeter or the external leads of the Volt-Amp tester.
10. Record the results below and compare to specifications.



Note: Voltage Drop test on positive side is from the battery B+ post to "C" terminal on the solenoid. Battery Post to "B" terminal + "B" terminal to "C" terminal = Total Positive Voltage Drop.

CAR #1

1. Explain how to diable the ignition system on this car. _____

_____

2. Explain how to install a remote starter switch. _____

_____

3. Visual inspect Starting System? _____

4. Starter Draw Specifications: Amperes _____A Voltage _____V

5. Starter Draw Test: Amperes _____A Voltage _____V

6. Voltage Drop Specs: Positive Side (B+) _____V Ground Side (-) _____V

7. Voltage Drop Tests: Positive Side Total (B+) _____V Ground Side (-) _____V

Positive Side Total = Solenoid Switch (B to C) _____V Battery Cable _____V

Note: Positive Side Total Volage Drop = Solenoid Switch (B to C) + Battery Cable (Batt to B)

Starting System: GOOD / BAD Why?_____

Recommendations: _____

CAR #2

1. Visual inspect Starting System? _____

2. Starter Draw Specifications: Amperes _____A Voltage _____V

3. Starter Draw Test: Amperes _____A Voltage _____V

4. Voltage Drop Specs: Positive Side (B+) _____V Ground Side (-) _____V

5. Voltage Drop Tests: Positive Side Total (B+) _____V Ground Side (-) _____V

Positive V.D. Total = Solenoid Switch (B to C) _____V Battery Cable _____V

Note: Positive Side Total Volage Drop = Solenoid Switch (B to C) + Battery Cable (Batt to B)

Starting System: GOOD / BAD Why?_____

Recommendations: _____

CAR #3

1. Visual inspect Starting System? _____

2. Starter Draw Specifications: Amperes _____A Voltage _____V

3. Starter Draw Test: Amperes _____A Voltage _____V

4. Voltage Drop Specs: Positive Side (B+) _____V Ground Side (-) _____V

5. Voltage Drop Tests: Positive Side Total (B+) _____V Ground Side (-) _____V

Positive V.D. Total = Solenoid Switch (B to C) _____V Battery Cable _____V

Note: Positive Side Total Volage Drop = Solenoid Switch (B to C) + Battery Cable (Batt to B)

Starting System: GOOD / BAD Why?_____

Recommendations: _____

CAR #4

1. Remove and replace starter - Locate and read instructions prior to removing starter. Check with instructor pior to and after removal of the starter.

LAB SHEET # B-3

NAME_____#_____

CHARGING SYSTEM OUTPUT

1. Insure battery is serviceable (At least 50% charged)
2. Connect the Volt-Amp tester (VAT-40) as instructed or outlined in your textbook.
3. Switch the Volt-Amp switch to Charging Test Position.
4. "Zero" the ammeter and connect amps pickup clamp around the ground cable.
5. Connect the Volt-Amp tester to the battery. RED to positive and Black to negative.
6. Raise engine speed to 2000 RPMS.
7. Adjust the Load Control Knob to obtain the highest ammeter reading possible while not letting voltage drop below 12 volts. **(No less than 12V for no more that 10 seconds).**
8. Charging system should produce alternator output current within 10% of the manufacturers rated output.

NOTE: DO NOT EXCEED 16.5 VOLTS DURING ANY TEST

CAR#1

1. What is the reason for the "arrow" on the inductive amp probe?_____
2. What would the affect be if the "arrow" is ?_____
3. How is RPM going to be measured?_____
4. Is the regulator internal or external?_____
5. Visual Inspection: Belts, Wires, Mounting: _____
6. Belt Tension: Specs _____ mA Actual Reading: _____ mA
7. Parasitic Drain: Specs _____ mA Actual Reading: _____ mA
8. Alternator Output Specs: Amps _____ Voltage _____ RPM _____
9. Alternator Output Reading: Amps _____ Voltage _____ at IDLE
   Amps _____ Voltage _____ at 2000 RPM
10. Voltage Drop Specifications: Positive (B+) _____ V Ground (-) _____ V
11. Voltage Drop Readings: Positive (B+) _____ V Ground (-) _____ V
12. Charging System Condition: GOOD / BAD Why?_____
13. Recommendations: _____

LAB SHEET CONTINUED ON OTHER SIDE

CAR# 2

1. Visual Inspection: Belts, Wires, Mounting: _____

2. Belt Tension: Specs _____ mA Actual Reading: _____ mA

3. Parasitic Drain: Specs _____ mA Actual Reading: _____ mA

4. Alternator Output Specs: Amps _____ Voltage _____ RPM _____

5. Alternator Output Reading: Amps _____ Voltage _____ at IDLE

   Amps _____ Voltage _____ at 2000 RPM

6. Voltage Drop Specifications: Positive (B+) _____ V Ground (-) _____ V

7. Voltage Drop Readings: Positive (B+) _____ V Ground (-) _____ V

8. Charging System Condition: GOOD / BAD Why?_____

CAR# 3

1. Visual Inspection: Belts, Wires, Mounting: _____

2. Belt Tension: Specs _____ mA Actual Reading: _____ mA

3. Parasitic Drain: Specs _____ mA Actual Reading: _____ mA

4. Alternator Output Specs: Amps _____ Voltage _____ RPM _____

5. Alternator Output Reading: Amps _____ Voltage _____ at IDLE

   Amps _____ Voltage _____ at 2000 RPM

6. Voltage Drop Specifications: Positive (B+) _____ V Ground (-) _____ V

7. Voltage Drop Readings: Positive (B+) _____ V Ground (-) _____ V

8. Charging System Condition: GOOD / BAD Why?_____

CAR# 4

1. Visual Inspection: Belts, Wires, Mounting: _____

2. Belt Tension: Specs _____ mA Actual Reading: _____ mA

3. Parasitic Drain: Specs _____ mA Actual Reading: _____ mA

4. Alternator Output Specs: Amps _____ Voltage _____ RPM _____

5. Alternator Output Reading: Amps _____ Voltage _____ at IDLE

   Amps _____ Voltage _____ at 2000 RPM

6. Voltage Drop Specifications: Positive (B+) _____ V Ground (-) _____ V

7. Voltage Drop Readings: Positive (B+) _____ V Ground (-) _____ V

8. Charging System Condition: GOOD / BAD Why?_____

CAR# 5 (Check with instructor prior to starting this section)

1. Remove and replace alternator - Locate and read instructions prior to removing alternator.

LAB SHEET # B-4

NAME_____#_____

DIAGNOSIS & REPAIR OF BATTERIES, STARTING, & CHARGING SYSTEMS

Make of Vehicle_____ Model_____ Year_____

THE BATTERY:

Visual Inspection - Battery Case, Hold Down, Cables, and Connections? _____

Cell Readings: 1 _____ 2 _____ 3 _____ 4 _____ 5 _____ 6 _____

Electrolyte Level and Condition: _____ Is there Excessive Cell Variation: _____

Open Circuit Voltage: _____ State of Charge: 0% 25% 50% 75% 100%

Parasitic Drain: Specification: _____ Actual Reading: _____

NOTE: Clean Both Battery Terminals, Cable Clamps, and at this time.

Heavy Load Test: Amp Load: _____ Voltage: _____ Time: _____

Battery Condition: GOOD / BAD Why?_____

Optional - Test battery with MIDTRONICS Capacitance Tester. Are results the same: _____

Recommendations: _____

THE STARTING SYSTEM:

1. Visual inspect Starting System? _____

2. Starter Draw Specifications: Amperes _____A Voltage _____V

3. Starter Draw Test: Amperes _____A Voltage _____V

4. Voltage Drop Specs: Positive Side (B+) _____V Ground Side (-) _____V

5. Voltage Drop Tests: Positive Side Total (B+) _____V Ground Side (-) _____V

Positive V.D. Total = Solenoid Switch (B to C) _____V Battery Cable _____V

Note: Positive Side Total Volage Drop = Solenoid Switch (B to C) + Battery Cable (Batt to B)

Starting System: GOOD / BAD Why?_____

Recommendations: _____

THE CHARGING SYSTEM:

1. Visual Inspection: Belts, Wires, Mounting: _____

2. Belt Tension: Specs _____ mA Actual Reading: _____ mA

3. Parasitic Drain: Specs _____ mA Actual Reading: _____ mA

4. Alternator Output Specs: Amps _____ Voltage _____ RPM _____

5. Alternator Output Reading: Amps _____ Voltage _____ at IDLE

   Amps _____ Voltage _____ at 2000 RPM

6. Voltage Drop Specifications: Positive (B+) _____ V Ground (-) _____ V

7. Voltage Drop Readings: Positive (B+) _____ V Ground (-) _____ V

8. Charging System Condition: GOOD / BAD Why?_____

Recommendations: _____

LAB SHEET # B-5 NAME_____#_____

SELF ASSESSMENT AND TARGET TRAINING WORKSHEET

BATTERIES	**NEED**	**DONE**
BATTERY MAINTENANCE (CLEAN & INSPECT)	_____	_____
STATE OF CHARGE (OPEN CIRCUIT VOLTAGE)	_____	_____
STATE OF CHARGE (HYDROMETER TESTING)	_____	_____
MEASURING BATTERY CAPACITY (HEAVY LOAD)	_____	_____
REMOVE AND REPLACE A BATTERY	_____	_____
BATTERY CHARGE (SLOW/FAST)	_____	_____
JUMPING A DEAD BATTERY	_____	_____
MIDTRONICS BATTERY TEST	_____	_____
STARTING SYSTEM		
STARTER BENCH-TEST	_____	_____
STARTER DRAW TEST	_____	_____
STARTER CIRCUIT RESISTANCE TEST	_____	_____
REMOVE AND INSTALL A STARTER	_____	_____
INSTALL A REMOTE STARTER	_____	_____
ADJUST AND TEST A NEUTRAL START SWITCH	_____	_____
TEST A CLUTCH START SWITCH	_____	_____
TEST AN IGNITION SWITCH	_____	_____
MIDTRONICS STARTING SYSTEM TEST	_____	_____
DIAGNOSIS CAR #1	_____	_____
CHARGING SYSTEM		
CHARGING SYSTEM VISUAL INSPECTION	_____	_____
CHARGING SYSTEM OUTPUT TEST	_____	_____
ALTERNATOR FULL-FIELDING	_____	_____
CHARGING CIRCUIT RESISTANCE TEST	_____	_____
REMOVE AND INSTALL AN ALTERNATOR	_____	_____
ADJUST ALTERNATOR BELT W/TENSION GAUGE	_____	_____
BASIC DIAGNOSIS & REPAIR OF OVER-CHARGING	_____	_____
BASIC DIAGNOSIS & REPAIR OF NON-CHARGING	_____	_____
MIDTRONICS CHARGING SYSTEM TEST	_____	_____
DIAGNOSIS CAR #2	_____	_____
DIAGNOSIS CAR #3	_____	_____

Blank Page

All pages in this booklet
should be double sided