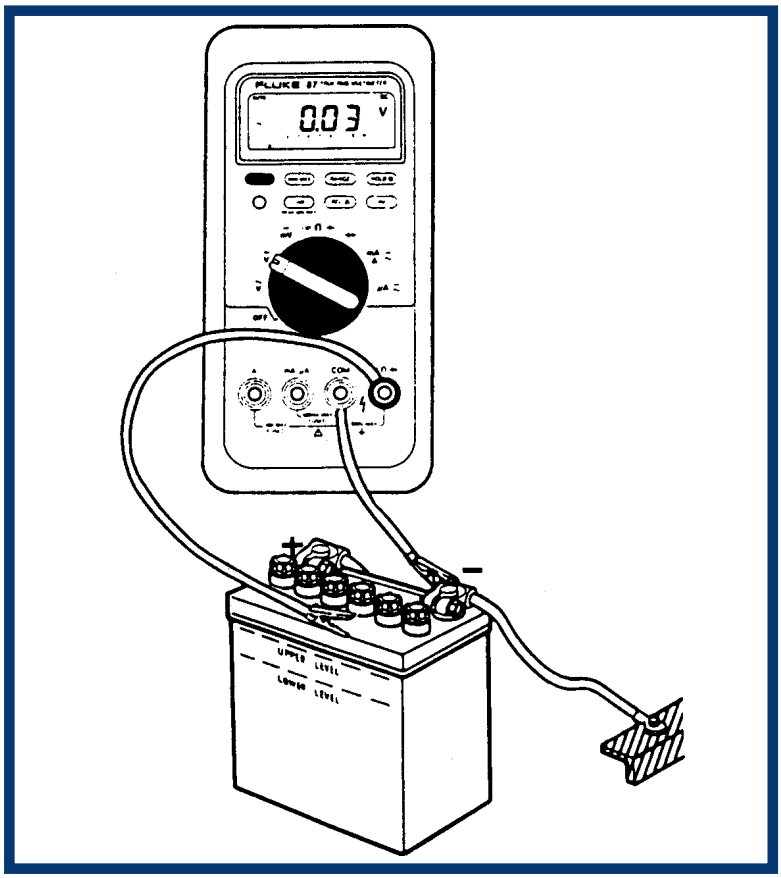
70-1802-W
Student Workbook

AUTOMOTIVE TECHNOLOGY curriculum



Module 2:
Electrical Systems

Student Workbook
2001 Edition

Instructional Materials Laboratory
University of Missouri-Columbia

Automotive Technology

Module 2: Electrical Systems

Student Workbook

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MODULE 2: ELECTRICAL SYSTEMS STUDENT WORKBOOK TRACKING SHEET					
Assignment Sheet	**Title of Assignment Sheet**	**Instructor Guide Page #**	**Student Workbook Page #**	**Date**	**Instructor's Initials**
AS1-L1-UI	Electrons and Electrical Theory	ES 23-26	W 1-2		
AS1-L2-UI	Electrical Measurement and Ohm's Law	ES 39-42	W 3-4		
AS1-L1-UII	Electrical Circuit Components	ES 99-102	W 5-6		
AS1-L2-UIII	Use of Electrical Manuals	ES 135-138	W 7-8		
AS1-L1-UIV	The Basics of the Battery	ES 243-246	W 57-58		
AS1-L1-UV	Starting System Components	ES 333-336	W 87-88		
AS1-L1-UVI	Charging System Components	ES 403-406	W 107-108		
AS1-L1-UVII	Identifying Lighting Systems and Their Components	ES 495-498	W 141-142		
Job Sheet	**Title of Job Sheet**	**Instructor Guide Page #**	**Student Workbook Page #**	**Date**	**Instructor's Initials**
JS1-L3-UIII	Tin the Iron	ES 143-144	W 9-10		
JS2-L3-UIII	Solder Wire Splices	ES 145-146	W 11-12		
JS3-L3-UIII	Replace Terminals	ES 147-154	W 13-20		
JS1-L4-UII	Measure Voltage in a Circuit	ES 175-178	W 21-24		
JS2-L4-UII	Measure Resistance in a Circuit	ES 179-182	W 25-28		
JS3-L4-UII	Measure Current in a Circuit	ES 183-186	W 29-32		
JS4-L4-UII	Determine Circuit Voltage and Continuity Using a Test	ES 187-188	W 33-34		
JS5-L4-UII	Perform a Fault Test	ES 189-192	W 35-38		
JS6-L4-UII	Check Continuity in Automotive Electrical Circuits	ES 193-194	W 39-40		
JS7-L4-UIII	Check for Opens, Shorts, and Grounds in an Automotive Electrical Circuit	ES 195-198	W 41-44		
JS8-L4-UIII	Measure Resistance in an Automotive Electrical Circuit	ES 199-200	W 45-46		
JS9-L4-UIII	Measure Volts in an Automotive Electrical Circuit	ES 201-202	W 47-48		

STUDENT WORKBOOK TRACKING SHEET PAGE 2					
Job Sheet	**Title of Job Sheet**	**Instructor Guide Page #**	**Student Workbook Page #**	**Date**	**Instructor's Initials**
JS10-L4-UIII	Measure Current in an Automotive Electrical Circuit	ES 203-204	W 49-50		
JS11-L4-UIII	Inspect and Service Fusible Links, Circuit Breakers, and Fuses in an Automotive Electrical Circuit	ES 205-210	W 51-56		
JS1-L1-UIV	Inspect, Clean, and Fill a Battery	ES 247-250	W 59-62		
JS2-L1-UIV	Maintain the Electronic Memory Functions	ES 251-252	W 63-64		
JS1-L2-UIV	Check the Battery for Surface Leakage	ES 265-266	W 65-66		
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JS3-L2-UIV	Perform a Load Test	ES 269-272	W 69-72		
JS4-L2-UIV	Perform a Quick Charge Test on a Battery	ES 273-274	W 73-74		
JS5-L2-UIV	Perform a Battery Drain Test	ES 275-278	W 75-78		
JS1-L3-UIV	Remove and Install a Battery	ES 289-290	W 79-80		
JS2-L3-UIV	Charge a Battery	ES 291-294	W 81-84		
JS3-L3-UIV	Jump Start a Vehicle	ES 295-296	W 85-86		
JS1-L2-UV	Inspect the Starting System and Perform a Current Draw Test	ES 343-344	W 89-90		
JS2-L2-UV	Perform Starter Control Circuit Voltage Drop Tests	ES 345-346	W 91-92		
JS3-L2-UV	Test the Starter Control Circuit Components	ES 347-350	W 93-96		
JS1-L3-UV	Remove and Install a Starter	ES 357-358	W 97-98		
JS2-L3-UV	Bench Test a Starter	ES 359-360	W 99-100		
JS3-L3-UV	Service a Starter	ES 361-362	W 101-102		
JS4-L3-UV	Service a Permanent Magnet Starter	ES 363-366	W 103-106		

STUDENT WORKBOOK TRACKING SHEET PAGE 3					
Job Sheet	**Title of Job Sheet**	**Instructor Guide Page #**	**Student Workbook Page #**	**Date**	**Instructor's Initials**
JS1-L2-UVI	Perform a Preliminary Inspection and Test of the Charging System	ES 425-426	W 109-110		
JS2-L2-UVI	Diagnose the Charging System for Undercharge, No-Charge, or Overcharge Conditions	ES 427-428	W 111-112		
JS3-L2-UVI	Perform a Charging System Output Test	ES 429-430	W 113-114		
JS4-L2-UVI	Perform an Alternator Full-Field Test	ES 431-434	W 115-118		
JS5-L2-UVI	Perform a Voltage Regulator Cutout Test	ES 435-436	W 119-120		
JS6-L2-UVI	Perform Circuit Resistance and Voltage Drop Tests	ES 437-442	W 121-126		
JS7-L2-UVI	Determine the Current Requirements for a Charging System	ES 443-446	W 127-130		
JS1-L3-UVI	Remove and Install the Alternator	ES 455-456	W 131-132		
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JS3-L3-UVI	Service the Voltage Regulator	ES 463-464	W 139-140		
JS1-L2-UVII	Test and Diagnose the Lighting System	ES 509-512	W 143-146		
JS1-L3-UVII	Service the Headlights	ES 523-524	W 147-148		
JS2-L3-UVII	Service the Lighting System Components	ES 525-528	W 149-152		
JS1-L1-UVIII	Test and Service Intermittent, High, Low, or No-Gauge Reading	ES 557-560	W 153-156		
JS2-L1-UVIII	Test and Service the Incorrect Operation of an Indicator Light	ES 561-564	W 157-160		
JS3-L1-UVIII	Test and Service the Incorrect Operation of an Audible Warning System Device	ES 565-568	W 161-164		
JS1-L1-UIX	Test and Service Incorrect Horn Operation	ES 591-594	W 165-168		
JS2-L1-UIX	Test and Service Incorrect Windshield Wiper Operation	ES 595-598	W 169-172		
JS3-L1-UIX	Test and Service Incorrect Windshield Washer	ES 599-602	W 173-176		

STUDENT WORKBOOK TRACKING SHEET PAGE 4					
Job Sheet	**Title of Job Sheet**	**Instructor Guide Page #**	**Student Workbook Page #**	**Date**	**Instructor's Initials**
JS1-L2-UIX	Identify Vehicles Equipped with Supplemental Restraint Systems	ES 617-618	W 177-178		
JS2-L2-UIX	Disable the Supplemental Restraint System	ES 619-620	W 179-180		
JS3-L2-UIX	Visually Inspect the Supplemental Restraint System	ES 621-622	W 181-182		
JS4-L2-UIX	Access and Read Supplemental Restraint System Codes	ES 623-626	W 183-186		
JS5-L2-UIX	Replace Supplemental Restraint System Components	ES 627-628	W 187-188		
JS6-L2-UIX	Remove and Replace a Deployed Inflator Module	ES 629-630	W 189-190		
JS7-L2-UIX	Deploy an Air Bag in a Vehicle Ready for Scrap	ES 631-632	W 191-192		
JS1-L3-UIX	Test and Service Heated Glass Systems	ES 639-640	W 193-194		
JS2-L3-UIX	Test and Service the Anti-Theft System	ES 641-642	W 195-196		
JS1-L1-UX	Test and Service the Power Windows	ES 671-674	W 197-200		
JS2-L1-UX	Test and Service the Power Seats	ES 675-678	W 201-204		
JS3-L1-UX	Test and Service the Power Mirrors	ES 679-682	W 205-208		
JS4-L1-UX	Test and Service the Power Door Locks	ES 683-686	W 209-212		
JS5-L1-UX	Test and Service the Remote Keyless Entry System	ES 687-690	W 213-216		
JS6-L1-UX	Test and Service the Cruise Control System	ES 691-694	W 217-220		
JS7-L1-UX	Test and Service the Radio	ES 695-698	W 221-224		

AS1-L1-UI

NAME:

DATE:

ELECTRONS AND ELECTRICAL THEORY

Directions — Answer the following questions by writing all responses on this sheet.

1. Define the following terms.

   Ampere or amp —

   Electrical control —

   Molecules —

   Ohm —

   Resistance —

2. Name three of the six forces that free electrons.

3. If the majority of the atoms in a material are short an electron, what is the result?

4. What must occur before current can flow through a circuit?

5. Name two of the four types of electron force.

The student must obtain a minimum score of ____ on AS1-L1-UI in order to receive an evaluation for All Electrical Systems Competencies.

AS1-L2-UI

NAME:

DATE:

ELECTRICAL MEASUREMENT AND OHM'S LAW

Directions — Answer the following questions by writing all responses on this sheet.

1. How many electrons pass a given point in a circuit during 1 second?

2. What is the unit of measurement for resistance?

3. List all three electrical units of measurement.

4. If any component in the series circuit fails and interrupts current flow, what is the result?

5. Name one of the two major starter circuit components.

The student must obtain a minimum score of ____ on AS1-L2-UI in order to receive an evaluation for All Electrical Systems Competencies.

AS1-L1-UII

NAME:

DATE:

ELECTRICAL CIRCUIT COMPONENTS

1. What five factors influence the resistance of conductors?

2. Name two reasons why carbon is a good conductor.

3. What are the two functions of electrical insulation?

4. What is the function of the capicitor?

5. What is a logic circuit?

What are the six logic gates?

The student must obtain a minimum score of ____ on AS1-L1-UII in order to receive an evaluation for All Electrical Systems Competencies.

AS1-L2-UIII

NAME:

DATE:

USE OF ELECTRICAL MANUALS

Directions — Answer the following questions by writing all responses on this sheet.

1. List two components that are included in electrical manuals.

2. Name both of the major types of wiring diagrams.

3. What are two components that symbols can be used to identify?

4. What is the function of a wiring diagram?

5. Give two examples of electrical symbols used in diagrams.

The student must obtain a minimum score of ____ on AS1-L2-UIII in order to receive an evaluation for All Electrical Systems Competencies.

JS1-L3-UIII

NAME(S):

TIN THE IRON

DATE:

Equipment:

MODEL OF CAR:

File
Protective eyewear
Rosin-core wire solder
Rosin-type soldering flux
Soldering iron stand or protective pad
Soldering iron with tip

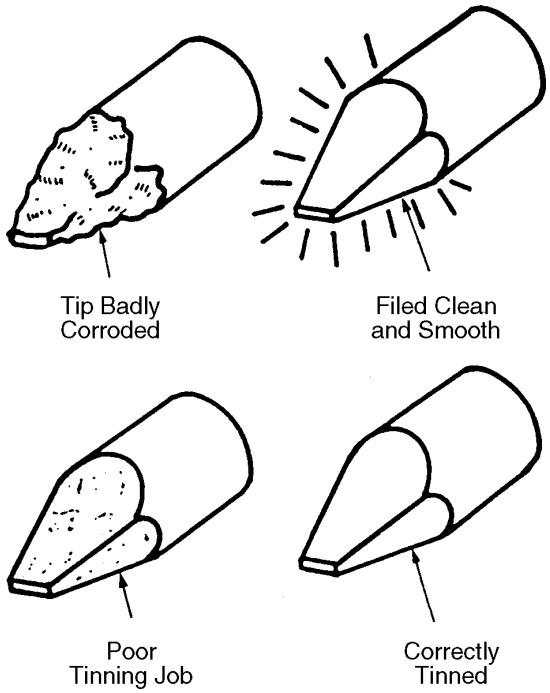
MAKE OF CAR:

YEAR OF CAR:

VIN:

EVALUATION

The soldering iron tip is made of copper. The solvent action of solder and prolonged heating pits and corrodes the iron tip. An oxidized or corroded tip does not satisfactorily transfer heat from the iron to the work.



Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet.

_____

2. Using a file, dress the tip of the soldering iron down to the bare copper. ____

3. File the surfaces of the tip until they are smooth and flat. ____

4. Plug in the soldering iron. ____

5. When the tip color begins to change to brown and light purple, dip the tip in and out of a can of rosin-type soldering flux. ____

6. Apply flux to soldering contacts before soldering. ____

7. Quickly apply rosin-core wire solder to the surfaces. ____

8. Place the hot soldering iron on a soldering stand or protective pad. ____

9. Unplug the soldering iron. ____

NOTE: The soldering iron must be at normal operating temperature to properly tin. Solder then melts quickly and flows freely.

CAUTION: Never try to solder until the iron is properly tinned.

Average of the above evaluations ____

This is a partial evaluation for all electrical system competencies. The final evaluation for all competencies is at the end of JS3-L3-UIII.

JS2-L3-UIII

SOLDER WIRE SPLICES

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

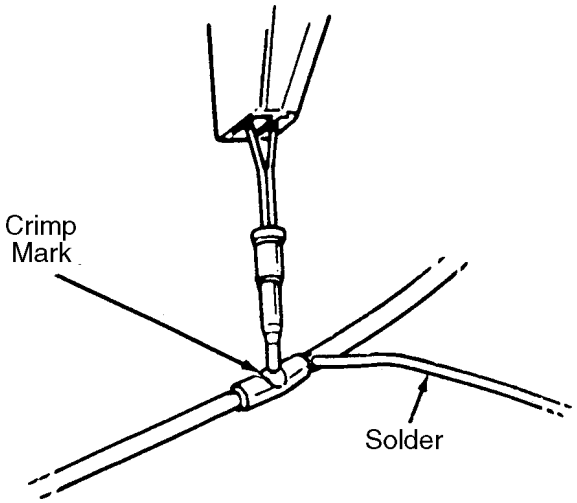
YEAR OF CAR:

VIN:

EVALUATION

Equipment:

Crimped wires with splices
Protective eyewear
Rosin-core wire solder
Rosin-type soldering flux
Soldering iron stand or protective pad
Soldering iron with tinned tip



Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet. _____
2. Clean the wires. _____
3. Crimp the wires together. _____
4. Apply the full surface of a tinned tip of a hot soldering iron against the splice of the wire. _____
5. Apply flux to soldering contacts before soldering. _____
6. Apply the rosin-core wire solder to the flat of the soldering iron where it contacts the splice. As the wire heats, the solder flows through the splice. _____

7. Apply enough solder to form a secure splice. ____

CAUTION: Do not move the splice until the solder sets.

8. Place the hot soldering iron on a soldering stand or protective pad. ____

9. Unplug the soldering iron. ____

Average of the above evaluations ____

This is a partial evaluation for all electrical system competencies. The final evaluation for all competencies is at the end of JS3-L3-UIII.

JS3-L3-UIII

REPLACE TERMINALS

Equipment:

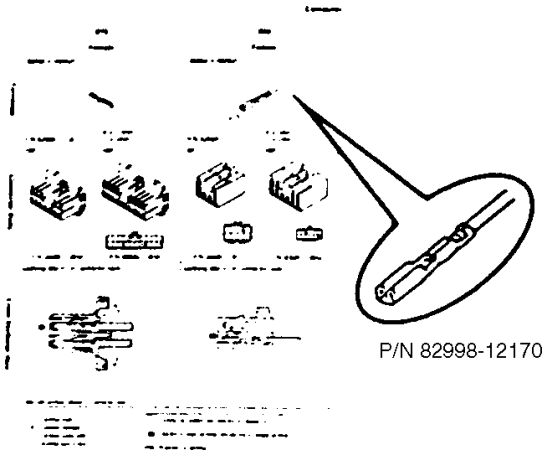
Crimping tool
Heat shrink tubing
Heat source such as a heat gun
Miniature screwdriver or terminal pick
Measuring device such as a micrometer
Protective eyewear
Splice
Standard terminal

NOTE: This job sheet can be performed on an ATech Electrical (300, 700, and 800 series).

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Identify the connector name, locking clips position, unlocking direction, and terminal type. _____



3. Disengage the terminal retainer or secondary locking device. _____

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

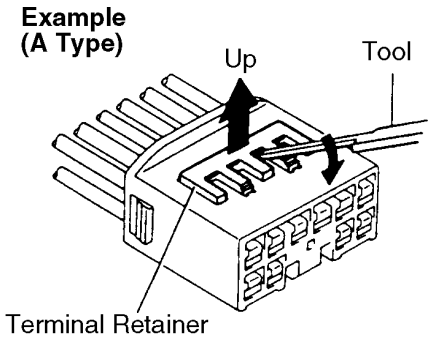
YEAR OF CAR:

VIN:

EVALUATION

4. Disengage the locking device before releasing the terminal locking clip and the terminal removed from the connector. ____

5. Unlock the secondary locking device with a miniature screwdriver or terminal pick. ____



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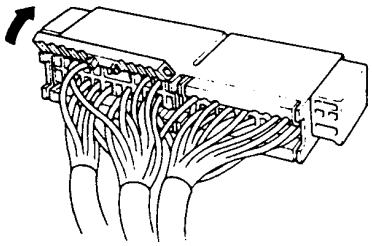
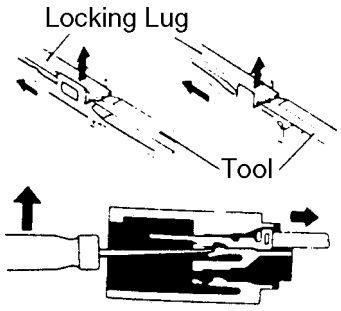


6. Locate the locks on the terminal and connector. ____

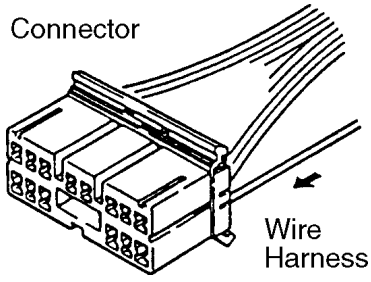
7. Determine and record in the following space the type of tool needed to unlock the terminal. ____

8. Determine and record in the following space the method of entry and operation. _____

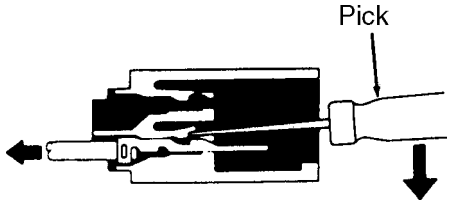


9. Release the locking clip to remove the terminal from the connector. _____

10. Gently push the terminal into the connector and hold in position. _____



11. Insert the miniature screwdriver or terminal pick into the connector in the direction shown in the following illustration. _____

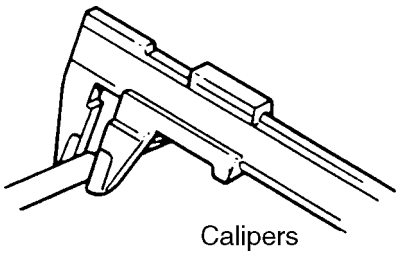


12. Move the locking clip to the unlock position, and hold it there. _____

NOTE: Do not apply excessive force or pry on the terminal.

13. Pull the lead toward the rear of the connector to withdraw the terminal from the connector. ____

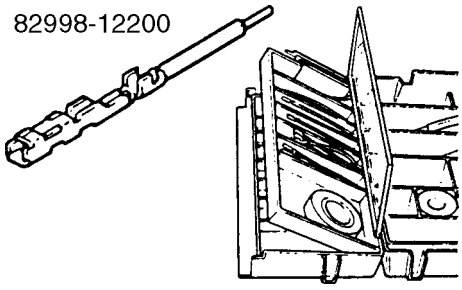
    NOTE: Do not use too much force. If the terminal does not come out easily, repeat 10 through 13.



Calipers

14. To measure the nominal size of the wire lead, place a measuring device such as a micrometer across the diameter of the insulation on the lead. Record the reading in the following space. ____

15. Select the correct replacement terminal with the lead. ____



16. Select the correct size of the splice. The size of the splice is based on the nominal size of the wire. ____

Splice Size	Part Number	Wire Size
Small	00204-34130	16-22 AWG 1.0-0.2 mm
Medium	00204-34137	14-16 AWG 2.0-1.0 mm
Large	00204-34138	10-12 AWG 5.0-3.0 mm

Small: 00204-34130

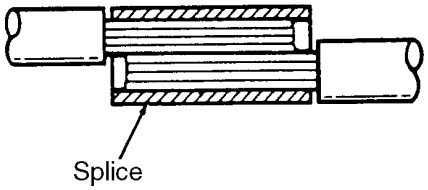
Medium: 00204-34137

Large: 00204-34138

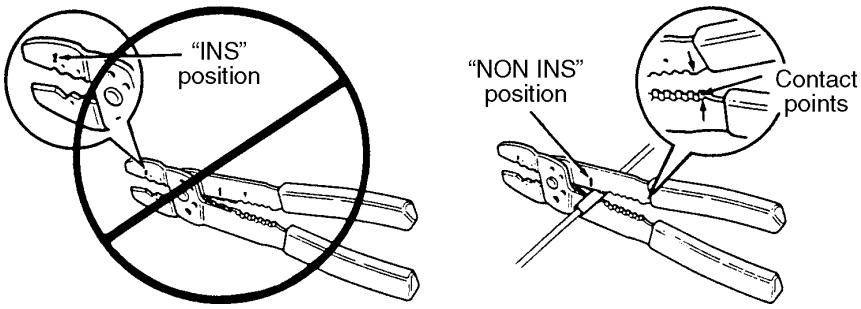
17. Crimp the replacemant terminal lead to the harness lead. ____

18. Insert the stripped ends of both the harness lead and replacement lead into the splice to overlap the wires inside the splice. ____

NOTE: Do not place the insulation in the splice. Only place the stripped wire in the splice.



CAUTION: The crimping tool has positions marked for insulated splices that are marked "INS." These positions should not be used because they do not crimp the splice tightly onto the wires. Only use the position marked "NON INS."

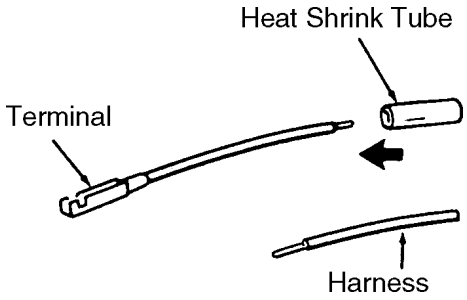


19. Center the splice correctly between the crimping jaws and squeeze the crimping tool together until the contact points of the crimper come together. ____

NOTE: Make sure the wires and the splice are still in the proper position before closing the ends of the crimping tool. Use steady pressure.

20. Make sure that the splice is crimped tightly. ____

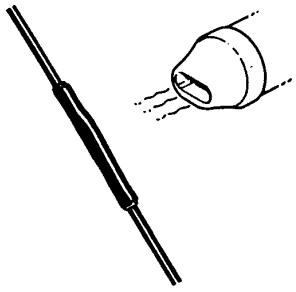
21. Cut a piece of heat shrink tube that is slightly larger in diameter than the splice and slightly longer than the splice. ____



22. Slide the tube over the end of one wire to be spliced. This must be done before joining the wires together. ____

23. Center the tube over the soldered splice. ____

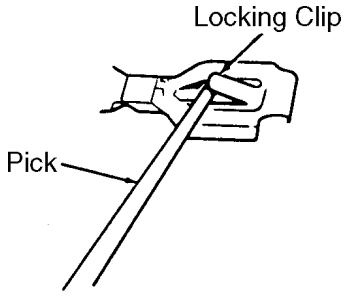
24. With a heat source such as a heat gun, gently heat the tubing until it has shrunk tightly around the splice. ____



NOTE: Do not continue heating the tubing after it has shrunk around the splice because it shrinks a certain amount and then stops. The tubing does not continue to shrink as long as heat is held to it. Be careful not to melt the insulation on the adjoining wires.

25. Install the terminal into the connector. When reusing a terminal, check that the locking clip is still in good condition and in the proper position. ____

26. If the locking clip is on the terminal and not in the proper position, use the miniature screwdriver or terminal pick to gently bend the locking clip back to its original shape. ____



27. Make sure that the other parts of the terminal are in their original shape. ____

Average of the above evaluations ____

This is a partial evaluation for all electrical system competencies. The final evaluation for all competencies follows.

FINAL EVALUATION INSTRUCTIONS

I. Determine the student's evaluation for all Electrical Systems Competencies by averaging the final evaluations from JS1-L3-UIII, JS2-L3-UIII, and JS3-L3-UIII.

JS1-L3-UIII ____

JS2-L3-UIII ____

JS3-L3-UIII ____

Final evaluation for all Electrical Systems Competencies ____

JS1-L4-UIII

MEASURE VOLTAGE IN A CIRCUIT

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

EVALUATION

Equipment:

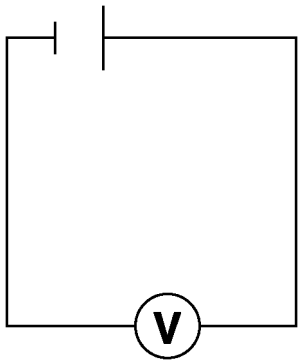
Analog voltmeter
Automotive bulbs and sockets (2)
Digital multimeter
Dry-cell batteries (2)
Jumper leads (2)
Protective eyewear

NOTE: This job sheet can be performed on an ATech 1800 Series or an ATech 18002TR GM Specialized Electronic Trainer.

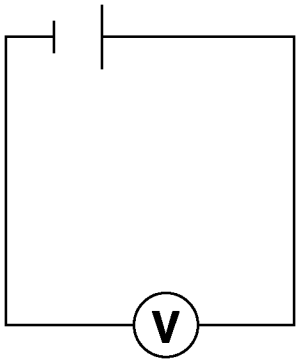
Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet. _____

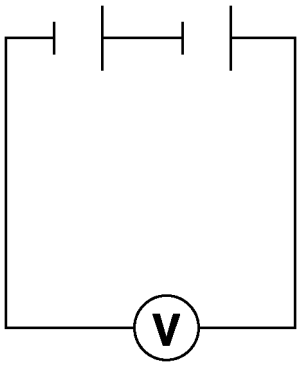
2. Using an analog voltmeter and a digital multimeter, perform a voltage check on a battery selected by the instructor. Use the proper meter procedures and observe the correct polarity. Record observations in the following space. _____



3. Using an analog voltmeter and a digital multimeter, perform a voltage check on a battery selected by the instructor. Use the proper meter procedures and observe the correct polarity. Record observations in the following space. ____

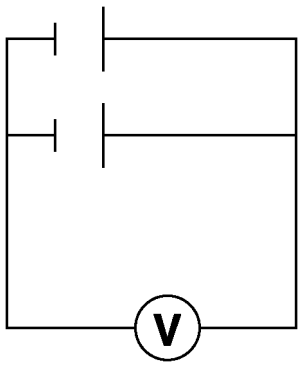


4. Wire 2 batteries selected by the instructor in series. Measure the combined voltage using an analog voltmeter and a digital multimeter. Observe the correct polarity. Record observations in the following space. ____



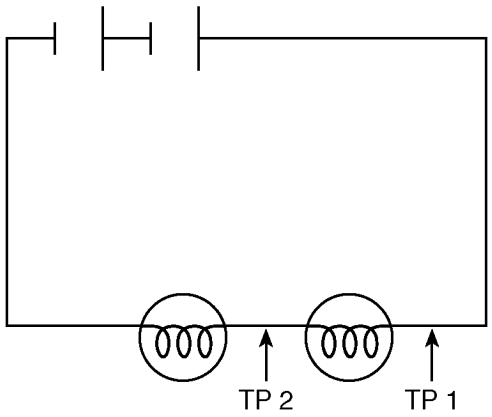
Voltmeter _____ Digital multimeter _____

5. Wire 2 batteries selected by the instructor in parallel. Measure the combined voltage using an analog voltmeter and a digital multimeter. Observe the correct polarity. Record observations in the following space. ____



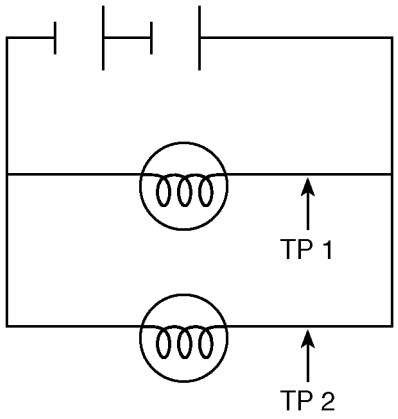
Voltmeter _____ Digital multimeter _____

6. Wire 2 automotive bulbs and sockets or resistors that are wired in series to 2 batteries selected by the instructor that are wired in series. Measure the voltage at test points TP 1 and TP 2. Observe the correct polarity. Record observations in the following space. ____



TP 1 _____ TP 2 _____

7. Wire 2 automotive bulbs and sockets or resistors in parallel to two batteries wired in series. Measure the voltage at test points TP 1 and TP 2. Observe the correct polarity. Record observations in the following space.



TP 1 _____ TP 2 _____

Average of the above evaluations

This is a partial evaluation for Competency D4. The final evaluation for D4 is at the end of JS11-L4-UIII.

JS2-L4-UIII

MEASURE RESISTANCE IN A CIRCUIT

Equipment:

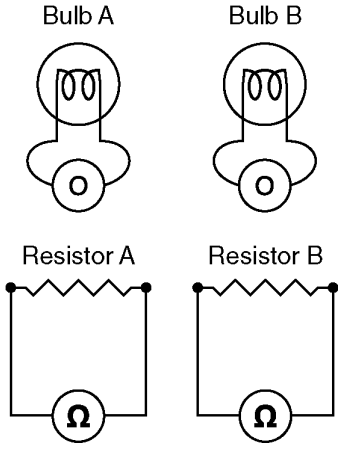
Analog or digital voltmeter
Automotive bulbs and sockets or resistors (2)
Diode
Protective eyewear
Throttle position sensor

NOTE: This job sheet can be performed on an ATech 1800 Series or an ATech 18002TR GM Specialized Electronic Trainer.

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet.

2. Using either an analog or a digital voltmeter, perform a resistance check on resistors or bulbs A and B. Record observations in the following space.



Bulb A _____ Bulb B _____

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

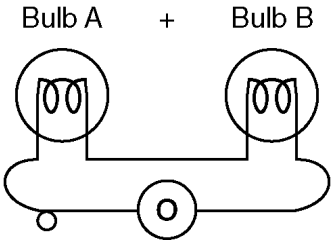
EVALUATION

_____

_____

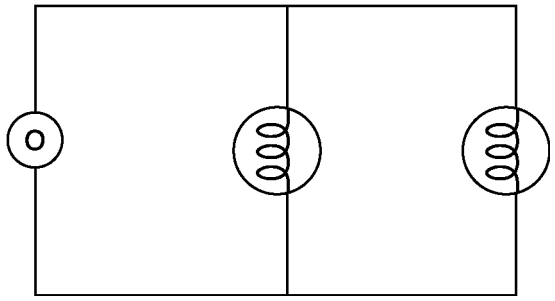
3. Using Ohm's law, calculate the total circuit series resistance with readings from 2. Record observations in the following space.

4. Connect the resistors or bulbs A and B in series. Using an analog or digital voltmeter, measure the total circuit resistance. Record observations in the following space.



5. Using Ohm's law, calculate the total circuit parallel resistance with the readings from 4. Record observations in the following space.

6. Connect the resistors or bulbs A and B in parallel. Using a voltmeter, measure the total circuit resistance. Record observations in the following space.



7. Using a multirange ohmmeter, perform a resistance test across a diode. First, perform the test with the ohmmeter leads in one direction. Then, reverse the leads and perform the test again. Record observations in the following charts.

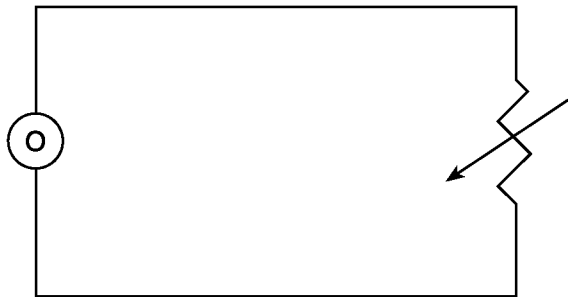
Analog Meter

Test #1		Test #2	
R × 1		R × 1	
R × 100		R × 100	
R × 1K		R × 1K	

Digital Meter

Test #1		Test #2	
R × 1		R × 1	
R × 100		R × 100	
R × 1K		R × 1K	

8. Perform a resistance test across a throttle position sensor. Slowly sweep and watch the voltmeter change. Record observations in the following space. ____



Initial reading _____

½ sweep _____

Full sweep _____

Average of the above evaluations ____

This is a partial evaluation for Competency D3. The final evaluation for D3 is at the end of JS11-L4-UIII.

JS3-L4-UIII

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

EVALUATION

MEASURE CURRENT IN A CIRCUIT

Equipment:

Automotive bulbs and sockets or resistors (2)
Battery
Direct reading ammeter, 0-15 amps minimum
Jumper leads (2)
Protective eyewear
Shunt bar

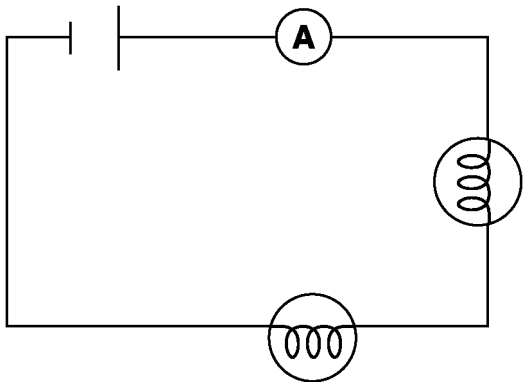
NOTE: This job sheet can be performed on an ATech 1800 Series or an ATech 18002TR GM Specialized Electronic Trainer.

Procedure:

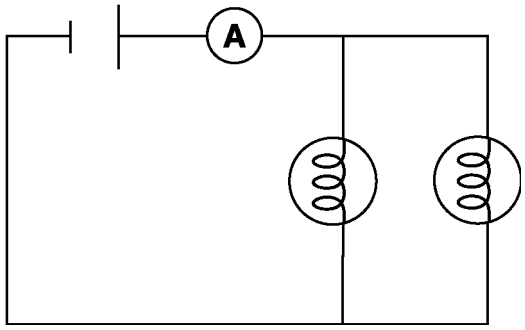
1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Using a direct-reading ammeter, measure the current flow in the following circuits. _____

   a. Wire 2 automotive bulbs and sockets or resistors in series to a battery selected by the instructor. Measure the current in the circuit. Observe the correct polarity. Record observations in the following space.



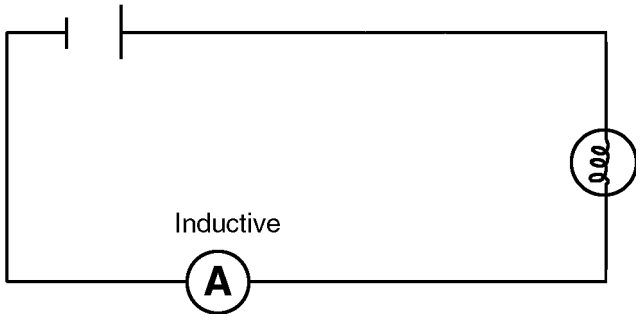
b. Wire 2 automotive bulbs and sockets or resistors in parallel to a battery selected by the instructor. Measure the current flow in the circuit. Observe the correct polarity. Record observations in the following space.



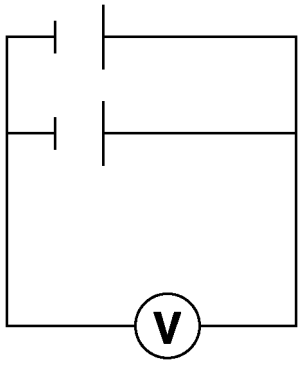
3. Using an inductive ammeter, measure the current flow in the following circuit illustrations.

NOTE: See an instructor for operating instructions for the particular ammeter.

a. Wire 2 automotive bulbs and sockets or resistors in series to a battery selected by the instructor. Measure the current in the circuit. Observe the correct polarity. Record observations in the following space.



b. Wire 2 automotive bulbs and sockets or resistors in parallel to a battery selected by the instructor. Measure the current flow in the circuit. Observe the correct polarity. Record observations in the following space.



Average of the above evaluations ____

This is a partial evaluation for Competency D5. The final evaluation for D5 is at the end of JS11-L4-UIII.

JS4-L4-UIII

DETERMINE CIRCUIT VOLTAGE AND CONTINUITY USING A TEST LIGHT

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

EVALUATION

Equipment:

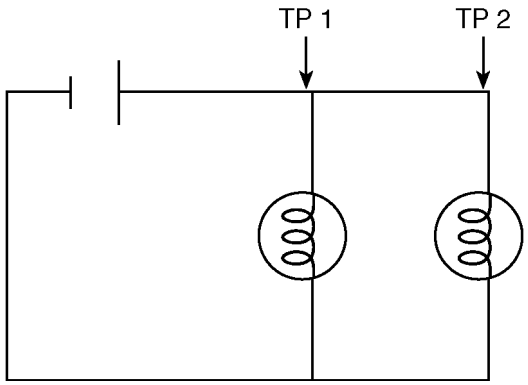
Automotive bulbs and sockets or resistors (2)
Battery
Jumper leads (2)
Protective eyewear
Test light

NOTE: This job sheet can be performed on an ATech 1800 Series or an ATech 18002TR GM Specialized Electronic Trainer.

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet. _____

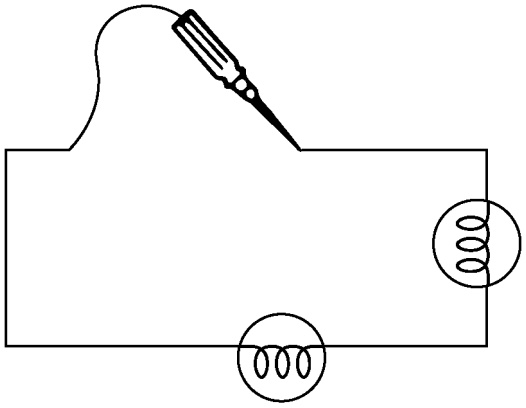
2. Wire 2 automotive bulbs and sockets or resistors in parallel to a battery selected by the instructor. Using a test light, check for voltage at the test points (TP) indicated. Record observations in the following space. _____



Voltage apparent at TP 1 Yes _____ No _____

Voltage apparent at TP 2 Yes _____ No _____

3. Wire 2 automotive bulbs and sockets or resistors in series. Using a test light, check the circuit for continuity. Record observations in the following space.



Is the circuit continuous? Yes _____ No _____

Average of the above evaluations ____

This is a partial evaluation for Competency D1. The final evaluation for D1 is at the end of JS11-L4-UIII.

JS5-L4-UIII

PERFORM A FAULT TEST

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

EVALUATION

Equipment:

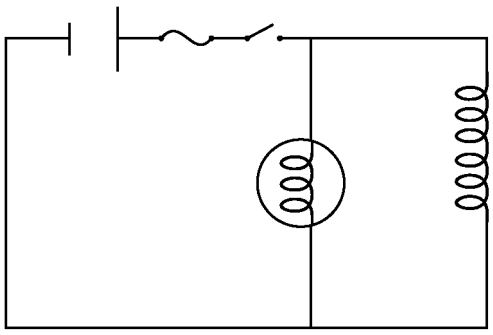
Automotive bulbs and sockets or resistors (2)
Battery
Digital multimeter
Fuse (1 amp)
Jumper wire (2)
Protective eyewear
Single pole single throw switch
Test light
Varnished small-gauge wire (6 feet)

NOTE: This job sheet can be performed on an ATech 1800 Series or an ATech 18002TR GM Specialized Electronic Trainer.

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Set up a circuit according to the following diagram. Have the instructor place a fault in the circuit. Determine the fault and needed repairs. _____



   a. Perform an operational test. Record observations in the following space.

b. Trace the current path. List the relationship of components in the circuit in the following space.

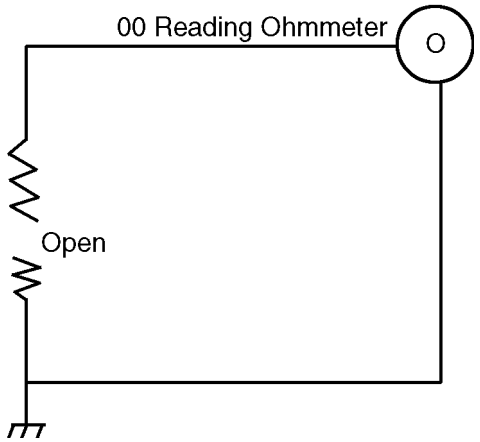
c. Isolate the fault and select the appropriate testing meter.

d. Perform the test procedure.

e. Repair or replace the malfunctioning component.

f. Perform another operational test to determine if the system is functional. Record observations in the following space.

3. Set up a circuit according to the following diagram. Have the instructor place a fault in the circuit. Determine the fault and needed repairs. ____



a. Perform an operational test. Record observations in the following space.

b. Trace the current path. List the relationship of the components in the circuit in the following space.

c. Isolate the fault and select the appropriate testing meter.

d. Perform the test procedure.

e. Repair or replace the malfunctioning component.

f. Perform another operational test to determine if the system is functional. Record observations in the following space.

Average of the above evaluations ____

This is a partial evaluation for Competency D2. The final evaluation for D2 is at the end of JS11-L4-UIII.

JS6-L4-UIII

CHECK CONTINUITY IN AUTOMOTIVE ELECTRICAL CIRCUITS

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

EVALUATION

Equipment:

Digital multimeter
Protective eyewear
Test light

NOTE: This job sheet can be performed on an ATech 1800 Series or an ATech 18002TR GM Specialized Electronic Trainer.

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Select a specific electrical circuit. Locate the appropriate wiring schematic. Using a test light, perform a continuity test on the circuit. _____

   a. Attach a test light to ground.

   b. Energize the circuit.

   c. Probe a wire along the circuit with a test light to confirm the presence of current. Record observations in the following space.

3. Perform a continuity test on the circuit by checking the voltage with a digital or analog meter. _____

   a. Set up the meter for parallel measure.

   b. Energize the circuit.

c. Confirm the presence of voltage by probing the wire along the circuit and taking a battery voltage reading. Record observations in the following space.

4. Perform a continuity test by checking the circuit's resistance with a digital or analog meter. ____

a. Set up the meter for a resistance test.

b. De-energized the circuit.

c. Probe the wire along the circuit to confirm the presence of a low-resistance current path. Record observations in the following space.

Average of the above evaluations ____

This is a partial evaluation for Competency D1. The final evaluation of D1 is at the end of JS11-L4-UIII.

JS7-L4-UIII

CHECK FOR OPENS, SHORTS, AND GROUNDS IN AN AUTOMOTIVE ELECTRICAL CIRCUIT

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

EVALUATION

Equipment:

Ammeter
Digital multimeter
Protective eyewear
Voltmeter

NOTE: This job sheet can be performed on an ATech 1800 Series or an ATech 18002TR GM Specialized Electronic Trainer.

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Test for battery current drain using a digital multimeter. _____

   a. Set up the digital multimeter for a resistance test.

   b. Disconnect the negative/ground terminal from the battery.

   c. Attach the digital multimeter between the negative cable and the positive cable.

   d. Disconnect any nonswitched circuits such as a clock, digital radio, or engine control module.

      NOTE: Remove the fuse to disconnect nonswitched circuits.

   e. Turn off all systems.

   f. Record readings that are below infinite in the following space.

g. Using Ohm's law, calculate the battery current drain. Determine whether it is below .5 amps. Record observations in the following space.

h. Recommend repairs in the following space.

3. Test for the battery current drain using an ammeter. ____

a. Set up the ammeter for a series or inductive ampere measure.

b. Turn off all systems.

c. Record the ampere readings. Determine if the circuit resistance is below 5 amps. Record observations in the following space.

4. Test a fusible link using a voltmeter. ____

a. Set up the voltmeter for resistance.

b. Probe the fusible link to determine its continuity. Record observations in the following space.

5. Test the circuit breaker for opens using a voltmeter. ____

   a. Set up the voltmeter for a resistance test.

   b. Remove the circuit breaker from the panel.

   c. Perform a resistance test across the breaker with a low-scale voltmeter. Record observations in the following space.

6. Test the fuse for opens with a test light. ____

   a. Set up the test light.

   b. Probe both sides of the fuse to check for voltage. Record observations in the following space.

7. Test a load device for shorts using an ohmmeter. ____

   a. Set up the ohmmeter for a resistance test.

   b. Have an instructor select a load device such as a wiper motor or ignition coil.

   c. Perform a resistance test on load.

   d. In the following space, use Ohm's law to calculate the current.

e. Compare the current reading to the proper specification of the load device or to the maximum allowed fuse size. Record observations in the following space.

Average of the above evaluations ____

This is a partial evaluation for Competency D2. The final evaluation for D2 is at the end of JS11-L4-UIII.

JS8-L4-UIII

MEASURE RESISTANCE IN AN AUTOMOTIVE ELECTRICAL CIRCUIT

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

EVALUATION

Equipment:

Ohmmeter
Protective eyewear

NOTE: This job sheet can be performed on an ATech 1800 Series or an ATech 18002TR GM Specialized Electronic Trainer.

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Have the instructor select a circuit or component. Measure the resistance in the circuit using an ohmmeter. _____

   a. Set up the ohmmeter for a resistance check.

   b. Perform a resistance check across the component or circuit.

   c. Record observations and/or recommended repairs in the following space.

Average of the above evaluations _____

This is a partial evaluation for Competency D3. The final evaluation for D3 is at the end of JS11-L4-UIII.

JS9-L4-UIII

NAME(S):

MEASURE VOLTS IN AN AUTOMOTIVE ELECTRICAL CIRCUIT

DATE:

Equipment:

MODEL OF CAR:

Protective eyewear
Voltmeter

MAKE OF CAR:

NOTE: This job sheet can be performed on an ATech 1800 Series or an ATech 18002TR GM Specialized Electronic Trainer.

YEAR OF CAR:

VIN:

EVALUATION

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Have the instructor select a vehicle circuit. Test the voltage in the circuit with a voltmeter. _____

   a. Set up the voltmeter for a parallel voltage test.

   b. Energize the circuit.

   c. Perform a voltage test on the circuit. Record observations in the following space.

Average of the above evaluations _____

This is a partial evaluation for Competency D4. The final evaluation for D4 is at the end of JS11-L4-UIII.

JS10-L4-UIII

MEASURE CURRENT IN AN AUTOMOTIVE ELECTRICAL CIRCUIT

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

Equipment:

Ammeter
Digital multimeter
Protective eyewear

NOTE: This job sheet can be performed on an ATech 1800 Series or an ATech 18002TR GM Specialized Electronic Trainer.

EVALUATION

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Have the instructor select a circuit. Measure the current in the circuit with an ammeter. _____

   a. Set up the ammeter for a series or inductive test.

   b. Hook the ammeter in series, or connect the inductive pickup.

   c. Energize the circuit.

   d. Measure the current draw. Record observations in the following space.

Average of the above evaluations _____

This is a partial evaluation for Competency D5. The final evaluation for D5 is at the end of JS11-L4-UIII.

JS11-L4-UIII

INSPECT AND SERVICE FUSIBLE LINKS, CIRCUIT BREAKERS, AND FUSES IN AN AUTOMOTIVE ELECTRICAL CIRCUIT

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

EVALUATION

Equipment:

Ohmmeter
Protective eyewear
Test light

NOTE: This job sheet can be performed on an ATech 1800 Series or an ATech 18002TR GM Specialized Electronic Trainer.

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Check and replace the fuses. _____

   a. Connect one end of a test light to a suitable ground.

   b. Turn on the appropriate switches to energize the circuits protected by the fuses.

   c. Touch the other end of the test light to both ends of the fuses to verify condition.

d. Verify that the fuses in each circuit are the correct amperage. Use the service manual to determine the amperage specifications. Record observations in the following chart.

Circuit	Fuse #	Amps Spec.	Test Light Ok	Test Light Not Ok	Correct Amps

e. Replace defective fuses. Retest the fuses. Record observations in the following space.

3. Check and replace the fusible links. ____

a. Locate the fusible links in the vehicle and use a service manual to identify the circuits that they are protecting. Record observations in the following space.

b. Conduct a visual inspection of the fusible links in the vehicle and verify condition. Record observations in the following space.

c. Replace the defective fusible links.

4. Check and replace the circuit breakers. ____

a. Locate the circuit breakers.

b. Identify which circuits each of the circuit breakers protect.

c. Verify that each circuit breaker is the appropriate amperage.

NOTE: If necessary, consult a service manual when working on a, b, and c.

d. Connect one end of the test light to a suitable ground.

e. Turn on the appropriate switches to energize the circuits protected by circuit breakers.

f. Verify the condition of the circuit breakers by touching the other end of the test light to both terminals of the circuit breaker. Record observations in the following chart.

Circuit	Circuit Breaker #	Amps Spec.	Test Light Ok	Test Light Not Ok	Correct Amps

g. Replace the defective circuit breakers. Retest the circuit breakers. Record observations in the following space.

Average of the above evaluations ____

This is a partial evaluation for Competencies D1, D2, D3, D4, and D5. The final evaluations for D1, D2, D3, D4, and D5 follow.

FINAL EVALUATION INSTRUCTIONS

I. Determine the student's evaluation for Competency D1 by averaging the final evaluations from JS4-L4-UIII, JS6-L4-UIII, and JS11-L4-UIII.

JS4-L4-UIII _____

JS6-L4-UIII _____

JS11-L4-UIII _____

Final evaluation for Competency D1 _____

II. Determine the student's evaluation for Competency D2 by averaging the final evaluations from JS5-L4-UIII, JS7-L4-UIII, and JS11-L4-UIII.

JS5-L4-UIII _____

JS7-L4-UIII _____

JS11-L4-UIII _____

Final evaluation for Competency D2 _____

III. Determine the student's evaluation for Competency D3 by averaging the final evaluations from JS2-L4-UIII, JS8-L4-UIII, and JS11-L4-UIII.

JS2-L4-UIII _____

JS8-L4-UIII _____

JS11-L4-UIII _____

Final evaluation for Competency D3 _____

IV. Determine the student's evaluations for Competency D4 by averaging the final evaluations of JS1-L4-UIII, JS9-L4-UIII, and JS11-L4-UIII.

JS1-L4-UIII _____

JS9-L4-UIII _____

JS11-L4-UIII _____

Final evaluation for Competency D4 _____

V. Determine the student's evaluations for Competency D5 by averaging the final evaluations of JS3-L4-UIII, JS10-L4-UIII, and JS11-L4-UIII.

JS3-L4-UIII	____
JS10-L4-UIII	____
JS11-L4-UIII	____
Final evaluation for Competency D5	____

AS1-L1-UIV

NAME:

DATE:

THE BASICS OF THE BATTERY

Directions — Answer the following questions by writing all responses on this sheet.

1. Define the following terms.

   Ampere hour —

   Discharge —

   Electrolyte, or battery acid —

   Hydrogen gas —

   Specific gravity —

2. Name the material that is used to construct a battery case.

3. Name the two types of water that can be added to a battery?

4. What two gases are released while a battery is discharging?

5. Name the type of battery that is designed to last for long periods without losing electrolyte.

The student must obtain a minimum score of ____ on AS1-L1-UIV in order to receive an evaluation for Competencies E1, E2, E3, and E4.

JS1-L1-UIV

INSPECT, CLEAN, AND FILL A BATTERY

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

EVALUATION

Equipment:

Baking soda
Battery cleaning brush
Battery lifting tool
Battery pliers
Battery reamer/spreader
Common hand tools
Distilled water
Protective eyewear
Terminal expander

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Inspect the battery. Complete the following chart. _____

	OK	Not OK
Case		
Cable ends		
Cables		
Terminal eyes		

From the inspection, determine if the battery needs to be replaced. Record observations in the following space.

3. Clean the battery case and terminals. _____

a. Remove the battery cables and use a battery lifting tool to remove the battery. Move the battery to an area designated for battery cleaning.

CAUTION: Always remove the negative battery cable first.

b. Mix a paste of baking soda and water. Brush the paste on the top of the battery.

c. After the acid is neutralized, thoroughly wash the with water.

CAUTION: Do not allow the cleaning solution to come into contact with skin or clothing. Do not allow it to get inside a serviceable battery.

4. Clean the cable ends and posts. ____

a. Using a battery cleaning brush, clean the cable and post surfaces until shiny.

b. Turn any rounded cable or post surfaces with a battery reamer/spreader.

c. To install the terminal, the taper on the terminal needs to match the post. Tighten the bolts to 60 to 90 inches/pounds.

d. The cable end should have a small gap in the clamp. If it is touching, remove the cable and file the gap wider.

e. If desired, apply anticorrosion paste.

5. Fill a serviceable battery. ____

NOTE: Maintenance-free batteries are designed to last for long periods without losing electrolyte. This procedure is for older batteries with vent caps.

a. Determine if the battery is serviceable. Record observations in the following space.

b. Remove the vent caps.

c. Check the electrolyte level. Record observations in the following space.

d. If the electrolyte is low, fill the cells to the proper level with distilled water.

CAUTION: Never use tap water to fill a battery. There are impurities in tap water that can reduce battery life.

Average of the above evaluations _____

This average is a partial evaluation for Competency E1. The final evaluation for E1 is at the end of JS2-L1-UIV.

JS2-L1-UIV

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

EVALUATION

MAINTAIN THE ELECTRONIC MEMORY FUNCTIONS

Equipment:

Memory saver adapter (9-volt)
Protective eyewear

Procedure:

NOTE: Use the recommended manufacturer's procedure to restore lost electronic memory functions.

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Using a service manual or other information source, locate a procedure for maintaing the electronic memory functions. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure. _____

   Be certain that the instructor approves the procedure and checks this box.

   ☐ Instructor Approved

   Using the procedure, maintain the electronic memory functions.

Average of the above evaluations _____

This average is a partial evaluation for Competency E1. The final evaluation for E1 follows.

FINAL EVALUATION INSTRUCTIONS

I. Determine the student's final evaluation for Competency E1 by averaging the final evaluations from JS1-L1-UIV and JS2-L1-UIV.

JS1-L1-UIV ____

JS2-L1-UIV ____

Final evaluation for Competency E1 ____

JS1-L2-UIV

CHECK THE BATTERY FOR SURFACE LEAKAGE

Equipment:

Protective eyewear
Voltmeter

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

EVALUATION

_____

_____

Procedure:

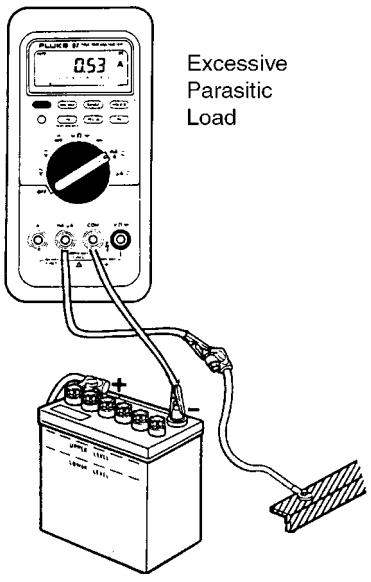
1. Wear protective eyewear while performing the procedures on this job sheet.

2. Measure the amount of current leakage between the battery posts.

   a. Set the voltmeter to the 16-volt scale.

   b. Connect the negative lead of the voltmeter to the negative battery post.

   c. Move the positive lead of the voltmeter between the posts on the battery.



d. If the reading is above 5 volts, the battery should be cleaned. Refer to JS1-L1-UIV. Record observations in the following space.

Next to negative post _____ volts

Halfway between post _____ volts

Next to positive post _____ volts

Average of the above evaluations ___

This average is a partial evaluation for Competency E2. The final evaluation for E2 is the end of JS5-L2-UIV.

JS2-L2-UIV

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

EVALUATION

_____

_____

MEASURE THE BATTERY'S STATE-OF-CHARGE

Equipment:

Carbon pile or volts-amps tester
Cell Probes
Hydrometer
Protective eyewear
Voltmeter

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet.

2. Perform a hydrometer test.

   a. Remove the battery cell vent caps. Make sure the cells contain a sufficient amount of electrolyte.

   b. Draw an electrolyte sample from cell 1. Draw enough electrolyte to make the calibrated scale float but not enough to fill the hydrometer.

   c. Hold the hydrometer vertically and read the number that is level with the electrolyte surface.

   d. Record the reading in the following chart.

      NOTE: Consider the temperature when recording a reading. Remember, the reading is not correct if water has just been added to the battery.

	Cell Number					
	1	2	3	4	5	6
Specific Gravity Reading						
Electrolyte Temperature						
Corrected Gravity Reading						
Gravity Range (Total + Variation)						

e. Return the electrolyte sample to cell 1.

f. Repeat the procedure for the remaining cells.

g. Evaluate the battery's state-of-charge. Is the battery good, fair, or bad? Record the evaluation in the following space.

3. Perform an open-circuit voltage test. ____

a. Using a carbon pile or volts-amps tester, place a 20-amp drain on the battery for 1 minute.

b. Immediately following the drain, measure the voltage. Record observations in the following space.

c. Evaluate the battery's state-of-charge. Is the battery good, fair, or bad? Record the evaluation in the following space.

Average of the above evaluations ____

This average is a partial evaluation for Competency E2. The final evaluation for E2 is at the end of JS5-L2-UIV.

JS3-L2-UIV

PERFORM A LOAD TEST

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

EVALUATION

_____

_____

Equiment:

Ammeter
Carbon pile
Protective eyewear
Voltmeter

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet.

2. Perform a preliminary battery load test.

   a. Establish the battery's state-of-charge. Record observations in the following space.

   NOTE: Do not perform a load test unless the battery is at a 75% charge or greater.

   b. Determine either the amp hours or cold-cranking amps to establish the battery's capacity requirement. Record observations in the following space.

   NOTE: Either the amp hours or cold-cranking amps should be noted on the battery's identification tag.

c. Compare the battery's cold-cranking amps to the cubic-inch displacement of the engine. Record observations in the following space.

NOTE: Vehicles with four- and six-cylinder engines can require more cranking current per cubic inch of displacement.

d. If the cold-cranking amp rating is too small when compared to the cubic inch displacement of the engine, test the battery according to the cold-cranking amps rating found on the battery. If the cold-cranking amps are higher than the cubic inch displacement, test the battery according to the cubic inch displacement. Record observations in the following space.

e. Establish the proper load test specifications. Record observations in the following space.

3. Perform a load test.

a. Attach a carbon pile lead, or volts-amp test leads, to the positive or negative terminals of the battery. The load test knob should be turned off.

b. Clamp the volts-amp tester 40 around the negative cable of the tester. If using individual pieces of test equipment, attach the ammeter leads in series to the carbon pile and the battery. Connect the other leads to the positive or negative terminals of the battery.

c. Attach the voltmeter leads in parallel to the battery.

d. Create a load on the battery by twisting the carbon pile control knob. Record observations in the following space.

Average of the above evaluations _____

This average is a partial evaluation for Competency E2. The final evaluation for E2 is at the end of JS5-L2-UIV.

JS4-L2-UIV

PERFORM A QUICK CHARGE TEST ON A BATTERY

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

EVALUATION

Equipment:

Battery charger
Protective eyewear
Voltmeter

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Perform a quick charge test. _____

   CAUTION: Do not perform a quick charge test on any type of sealed battery.

   a. Connect the voltmeter and battery charger to the battery. Observe battery polarity.

   b. Set the battery charger to the correct voltage.

   c. Charge the battery at a rate of 40 amps. Do not exceed 40 amps.

   d. Observe the voltmeter readings. Record observations in the following space.

   e. Time the process for 3 minutes. Determine the battery's condition with the battery charger still operating.

f. Evaluate the battery's state-of-charge. Is the battery good, fair, or bad? Record the evaluation in the following space.

Average of the above evaluations ____

This average is a partial evaluation for Competency E2. The final evaluation for E2 is at the end of JS5-L2-UIV.

JS5-L2-UIV

PERFORM A BATTERY DRAIN TEST

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

EVALUATION

Equipment:

Low-range ammeter
Protective eyewear
Test light (12 volt)
Volts-amps tester

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Using a 12-volt test light, check for a large current drain on the battery. _____

   a. Set the test light to the lowest range.

   b. Turn off as many of the circuits as possible.

   c. Connect the test light clamp to the negative battery cable.

   d. Connect the test light probe to the negative battery terminal.

   e. Look for a bright light. The parasitic load needs to be repaired if there is a bright light. Record observations in the following space.

   NOTE: If the light is dim, go to 4.

3. Using a low-range ammeter, check for battery drain. _____

   a. Set the ammeter to the lowest range.

   b. Turn off as many of the circuits as possible.

c. Disconnect the negative battery terminal.

d. Connect the negative lead to the negative post of the battery.

e. Connect the positive lead to the negative battery terminal/cable.

f. Measure the current flow. It should be less than .5 amps. If it is greater than .5 amps, locate the source of the drain and recommend repairs. Record observations in the following space.

Average of the above evaluations ___

This average is a partial evaluation for Competency E2. The final evaluation for E2 follows.

FINAL EVALUATION INSTRUCTIONS

I. Determine the student's final evaluation for Competency E2 by averaging the final evaluations from JS1-L2-UIV, JS2-L2-UIV, JS3-L2-UIV, JS4-L2-UIV, and JS5-L2-UIV.

JS1-L2-UIV _____

JS2-L2-UIV _____

JS3-L2-UIV _____

JS4-L2-UIV _____

JS5-L2-UIV _____

Final evaluation for Competency E2 _____

JS1-L3-UIV

REMOVE AND INSTALL A BATTERY

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

Equipment:

Battery strap or tool
Protective eyewear

Procedure:

EVALUATION

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Remove a battery. _____

   a. Disconnect the cables.

      CAUTION: Remove the ground cable first.

   b. Loosen the battery hold-down.

   c. Using a battery strap or tool, lift the battery out of the vehicle.

      NOTE: The Environmental Protection Agency considers discarded batteries to be hazardous waste. Be aware of battery disposal regulations.

3. Install a battery. _____

      NOTE: The replacement battery should have ratings equal to manufacturer recommendations. An undersize battery affects starting motor performance and battery life.

   a. Gently place the battery into the clean tray or box.

   b. Make sure the battery fits properly. The tray edge should not cut or rupture the plastic battery case.

c. Bolt on the battery hold-down.

d. Install the cables.

CAUTION: Connect the ground cable last.

Average of the above evaluations ____

This average is a partial evaluation for Competency E4. The final evaluation for E4 is at the end of JS2-L3-UIV.

JS2-L3-UIV

NAME(S):

CHARGE A BATTERY

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

EVALUATION

Equipment:

Battery charger
Protective eyewear
Voltmeter

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Determine the battery's state-of-charge. Record observations in the following space. _____

3. Calculate the time and amp rate that is required to recharge the battery completely. Use the following chart. _____

Battery Charging Guide for 6-Volt and 12-Volt Batteries
Recommended Rate* and Time for Fully Discharged Condition

Reserve Capacity Rating	Twenty-Hour Rating	5 Amperes	10 Amperes	20 Amperes	30 Amperes	40 Amperes
75 Minutes or Less	50 Ampre-Hours or Less	10 Hours	5 Hours	2½ Hours	2 Hours	
Above 75 to 115 Minutes	Above 50 to 75 Ampre-Hours	15 Hours	7½ Hours	3¼ Hours	2½ Hours	2 Hours
Above 115 to 160 Minutes	Above 75 to 100 Ampre-Hours	20 Hours	10 Hours	5 Hours	3 Hours	2½ Hours
Above 160 to 240 Minutes	Above 100 to 150 Ampre-Hours	20 Hours	15 Hours	7½ Hours	5 Hours	3½ Hours
Above 245 Minutes	Above 150 Ampre-Hours		20 Hours	10 Hours	6½ Hours	5 Hours

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NOTE: On batteries that have a state-of-charge indicator and load test value of less than 200 amps, the green dot should be visible after 50 ampere-hours of charge. On batteries that have a state-of-charge indicator and load test value of greater than 200 amps, the green dot should be visible after 75 ampere-hours of charge. In the event that the green state-of-charge indicator does not appear after the proper amount of time has elapsed, continue to charge the battery for another 50 to 75 ampere-hours. If the green dot still does not appear, replace the battery.

To avoid damage, the charging rate must be reduced or temporarily halted if the electrolyte temperature exceeds 125°F or violent gassing or spewing of electrolyte occurs. Do calculations in the following space.

Amps _____ Time _____

4. Make sure the electrolyte is at the proper level in all cells. ____

5. Recharge the battery. ____

   a. Connect the battery charger and voltmeter to the battery. Observe battery polarity.

   b. Adjust the charging rate on the battery charger to the proper level.

      CAUTION: Do not exceed 15 volts when adjusting the charging level. Do not allow gassing or spewing of the electrolyte.

   c. Charge the battery for the recommended time.

      CAUTION: Do not overcharge the battery.

Average of the above evaluations ____

This average is a partial evaluation for Competency E4. The final evaluation for E4 follows.

FINAL EVALUATION INSTRUCTIONS

I. Determine the student's final evaluation for Competency E4 by averaging the final evaluations from JS1-L3-UIV and JS2-L3-UIV.

JS1-L3-UIV _____

JS2-L3-UIV _____

Final evaluation of Competency E4 _____

JS3-L3-UIV

JUMP START A VEHICLE

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

EVALUATION

Equipment:

Jumper cables
Protective eyewear

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Jump start a vehicle. _____

   a. Inspect the dead battery. Record observations in the following space.

   b. Connect the jumper cables.

   c. Start the engine in the donor vehicle. Allow it to run for 1 to 2 minutes at high idle.

   d. Crank the engine in the dead vehicle for 15 seconds. Let it rest for 30 seconds and then crank again for 15 seconds.

   e. Repeat the procedure until the dead vehicle starts.

   f. Shut the engine in the donor vehicle off.

   g. Disconnect the jumper cables. Remove the negative cable first.

Average of the above evaluations ____

This is the final evaluation for Competency E3. Use this for the student's final evaluation of Competency E3.

AS1-L1-UV

NAME:

DATE:

STARTING SYSTEM COMPONENTS

Directions — Answer the following questions by writing all responses on this sheet.

1. Define the following terms.

   Armature —

   Field coils —

   Pole shoe —

   Starter drive —

   Starter motor —

2. In a four-brush starter, how many brushes are grounded and how many are insulated?

3. Name at least three components used in the drive.

4. Name the four types of starters.

5. Name the two types of solenoid-shift starters, and describe their primary difference.

The student must obtain a minimum score of ____ on AS1-L1-UV in order to receive an evaluation for Competencies F1-F3.

JS1-L2-UV

NAME(S):

INSPECT THE STARTING SYSTEM AND PERFORM A CURRENT DRAW TEST

DATE:

Equipment:

MODEL OF CAR:

Ammeter
Protective eyewear
Voltmeter

MAKE OF CAR:

YEAR OF CAR:

NOTE: This job sheet can be performed on an ATech 811/811F Starting System Trainer.

VIN:

Procedure:

EVALUATION

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Inspect the starting system. _____

	OK	Not OK
Battery		
Hold-down		
Terminals		
Cables		
Starter control circuit		
Starter solenoid		

If necessary, repair defective starting system components.

3. Perform a current draw test. _____

   a. Estimate the required cranking amps.

Number of Cylinders	
Cubic Inch Displacement	
Estimated Ampere Draw	

   b. Connect the voltmeter in parallel between the positive and negative battery terminals.

c. Connect the ammeter.

d. Disable the ignition system.

CAUTION: Disconnect the distributor battery lead to avoid high-voltage arcing in the coil secondary lead.

e. Crank the engine for 15 seconds. Observe the reading. Record observations in the following space.

f. Determine if the starting system is using an acceptable amount of current to crank the engine. Record observations in the following space.

g. Recommend necessary repairs in the following space.

Average of the above evaluations ____

This average is a partial evaluation for Competency F1. The final evaluation for F1 is at the end of JS3-L2-UV.

JS2-L2-UV

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

EVALUATION

PERFORM STARTER CONTROL CIRCUIT VOLTAGE DROP TESTS

Equipment:

Protective eyewear
Voltmeter

NOTE: This job sheet can be performed on an ATech 812/812F Charging System Trainer.

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Perform an insulated circuit resistance test using a voltmeter. _____

   a. Set the voltmeter to the lowest scale.

   b. Connect the positive lead to the positive battery post. Connect the negative lead to the starter motor input terminal.

   c. Disable the ignition system.

   d. Crank the engine. Observe the reading. Record observations in the following space.

   e. Enable the ignition system.

3. Perform a starter ground circuit test using a voltmeter. ____

   a. Set the voltmeter to the lowest scale.

   b. Connect the positive lead to the starter end frame. Connect the negative lead to the negative battery post.

   c. Disable the ignition system.

   d. Crank the engine. Observe the reading. Record observations in the following space.

   e. Enable the ignition system.

4. If the voltage drop is unacceptable, recommend the necessary repairs and/or service in the following space. ____

Average of the above evaluations ____

This average is a partial evaluation for Competency F1. The final evaluation for F1 is at the end of JS3-L2-UV.

JS3-L2-UV

TEST THE STARTER CONTROL CIRCUIT COMPONENTS

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

EVALUATION

_____

_____

Equipment:

Hand tools
Protective eyewear
Test light
Test light (12-volt)
Voltmeter

NOTE: This job sheet can be performed on an ATech 811/811F Starting System Trainer.

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet.

2. Perform a starter solenoid test using a voltmeter.

   a. Test the starter solenoid at the lug-to-cable connection.

      1. Connect the positive lead to the wire that connects to the battery.

      2. Connect the negative lead to the lug on the starter solenoid.

      3. Disable the ignition system.

      4. Crank the engine. Observe the reading. Record observations in the following space.

      5. Enable the ignition system.

   b. Test the starter solenoid disc contact and terminal connection.

      1. Connect the positive lead to the lug that has the wire that connects to the battery.

2. Connect the negative lead to the lug that has the wire that connects to the starter.

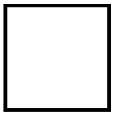
3. Disable the ignition system.

4. Crank the engine. Observe the reading. Record observations in the following space.

5. Enable the ignition system.

3. Using a service manual or other information source, locate a procedure for performing a starter relay test using a test light. Include the wiring diagram. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure. ____

Be certain that the instructor approves the procedure and checks this box.



Instructor Approved

Using the procedure, perform a starter relay test using a test light. Record observations in the following space.

4. Perform an ignition switch test using a test light. ____

a. Touch the test light to the starter solenoid start terminal.

b. Turn the key to the start position. Record observations in the following space.

5. Perform a neutral safety switch test. _____

   a. With the key turned on, move the transmission gear shift lever into different positions. Record observations in the following space.

   b. Touch a 12-volt test light to the neutral safety switch output wire connection while moving the transmission gear shift lever. Record observations in the following space.

6. Determine if any of the starter control circuit components are defective. Record observations in the following space. _____

7. Using a service manual or other information source, locate a procedure for repairing and/or servicing the defective starter control circuit components. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure. _____

   Be certain that the instructor approves the procedure and checks this box.

   ☐ Instructor Approved

   Using the procedure, repair and/or service the defective starter control circuit components.

Average of the above evaluations _____

This average is a partial evaluation for Competency F1. The final evaluation for F1 follows.

FINAL EVALUATION INSTRUCTIONS

I. Determine the student's evaluation for Competency F1 by averaging the evaluations of JS1-L2-UV, JS2-L2-UV, and JS3-L2-UV.

JS1-L2-UV ____

JS2-L2-UV ____

JS3-L2-UV ____

Final evaluation for Competency F1 ____

JS1-L3-UV

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

EVALUATION

REMOVE AND INSTALL A STARTER

Equipment:

Hand tools
Protective eyewear
Safety stands or hoist

NOTE: This job sheet can be performed on an ATech 811/811F Starting System Trainer.

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Disconnect the negative battery cable. _____

3. Place the vehicle securely on safety stands or lift with a hoist. _____

4. Using a service manual or other information source, locate a procedure for removing the starter. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure. _____

   Be certain that the instructor approves the procedure and checks this box.

   ☐ Instructor Approved

   Using the procedure, remove the starter.

5. Complete a bench test and service of the starter. Use JS2-L3-UV and JS3-L3-UV to complete these procedures. _____

6. Using a service manual or other information source, locate a procedure for installing the starter. Include the torque specifications for the mounting bolts. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure. ____

   Be certain that the instructor approves the procedure and checks this box.

   
   Instructor Approved

   Using the procedure, install the starter.

7. Lower the vehicle and connect the negative battery cable. ____

8. Check the operation of the starter. Record observations in the following space. ____

Average of the above evaluations ____

This average is a partial evaluation for Competencies F2 and F3. The final evaluations for F2 and F3 are at the end of JS4-L3-UV.

JS2-L3-UV

BENCH TEST A STARTER

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

EVALUATION

Equipment:

Jumper cables
Protective eyewear
Remote starter switch
Vise
Volts-amp tester

NOTE: This job sheet can be performed on an ATech 811/811F Starting System Trainer.

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Determine the correct free running amp draw for the starter and the minimum voltage that the battery can reach. Record the specifications in the following chart. _____

Free running amp draw	
Minimum voltage	

3. Bench test the starter. _____

   a. Secure the starter so that it will not move.

   b. Using a service manual or other information source, locate the procedures for connecting the jumper cables and remote starter switch. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure.

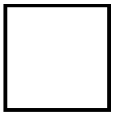
   Be certain that the instructor approves the procedure and checks this box.

   ☐ Instructor Approved

   Using the procedures, connect the jumper cables and remote starter switch.

c. Using a service manual or other information source, locate the procedure for connecting the volts-amp tester. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure.

Be certain that the instructor approves the procedure and checks this box.



Instructor Approved

Using the procedure, connect the volts-amp tester.

NOTE: The volts-amp tester connections are the same for Ford and General Motors systems.

d. Set the ammeter to the correct scale.

e. Crank the starter for 15-20 seconds. Observe the reading. Record observations in the following space.

4. Determine if the starter is in good working condition. Record the determination in the following space. If necessary, recommend repairs. ____

Average of the above evaluations ____

This average is a partial evaluation for Competency F2. The final evaluation for F2 is at the end of JS4-L3-UV.

JS3-L3-UV

SERVICE A STARTER

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

EVALUATION

Equipment:

Clean cloths
Electric motor cleaner
Growler
Hand tools
Protective eyewear
Test light

NOTE: This job sheet can be performed on an ATech 811/811F Starting System Trainer.

NOTE: This job sheet includes disassembling, cleaning, inspecting, testing, and reassembling the starter.

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Using a service manual or other information source, locate a procedure for disassembling the starter. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure. _____

   Be certain that the instructor approves the procedure and checks this box.

   ☐ Instructor Approved

   Using the procedure, disassemble the starter.

3. Clean the components with clean cloths and electric motor cleaner. Check the end frame for solder thrown from the armature connections. _____

4. Inspect the components. Complete the following chart. ____

	OK	Not OK
Bushing		
Brushes		
Drive		
Armature Commutator		

Replace any defective components.

5. Test the components. Record observations in the following chart. ____

Check the armature for shorts.	
Check the armature for ground.	
Check the field coil for opens.	
Check the field coil for ground.	

Repair any problems found during testing.

6. Using a service manual or other information source, locate a procedure for reassembling the starter. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure. ____

Be certain that the instructor approves the procedure and checks this box.

☐ Instructor Approved

Using the procedure, reassemble the starter.

Average of the above evaluations ____

This average is a partial evaluation for Competencies F2 and F3. The final evaluations for F2 and F3 are at the end of JS4-L3-UV.

JS4-L3-UV

NAME(S):

SERVICE A PERMANENT MAGNET STARTER

DATE:

Equipment:

MODEL OF CAR:

Clean cloths
Electric motor cleaner
Growler
Hand tools
Protective eyewear
Test light

MAKE OF CAR:

YEAR OF CAR:

VIN:

NOTE: This job sheet can be performed on an ATech 811/811F Starting System Trainer.

EVALUATION

NOTE: This job sheet includes disassembling, cleaning, inspecting, testing, and reassembling the starter.

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Using a service manual or other information source, locate a procedure for disassembling the starter. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure. _____

   Be certain that the instructor approves the procedure and checks this box.

   ☐ Instructor Approved

   Using the procedure, disassemble the starter.

3. Clean the components with clean cloths and electric motor cleaner. Check the end frame for solder thrown from the armature connections. _____

4. Inspect the components. Complete the following chart. ____

	OK	Not OK
Bushing		
Brushes		
Drive		
Armature Commutator		

Replace any defective components.

5. Test the components. Record observations in the following chart. ____

Check the armature for shorts.	
Check the armature for ground.	
Check the permanent magnets for cracks.	
Check the permanent magnets for secure attachment to the case.	

Repair any problems found during testing.

6. Using a service manual or other information source, locate a procedure for reassembling the starter. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure. ____

Be certain that the instructor approves the procedure and checks this box.

☐ Instructor Approved

Using the procedure, reassemble the starter.

Average of the above evaluations ____

This average is a partial evaluation for Competencies F2 and F3. The final evaluations for F2 and F3 follow.

FINAL EVALUATION INSTRUCTIONS

I. Determine the student's final evaluation for Competency F2 by averaging the evaluations of JS1-L3-UV, JS2-L3-UV, JS3-L3-UV and JS4-L3-UV.

JS1-L3-UV _____

JS2-L3-UV _____

JS3-L3-UV _____

JS4-L3-UV _____

Final evaluation for Competency F2 _____

II. Determine the student's final evaluation for Competency F3 by averaging the evaluations of JS1-L3-UV, JS3-L3-UV and JS4-L3-UV.

JS1-L3-UV _____

JS3-L3-UV _____

JS4-L3-UV _____

Final evaluation for Competency F3 _____

AS1-L1-UVI

NAME:

DATE:

CHARGING SYSTEM COMPONENTS

Directions — Answer the following questions by writing all responses on this sheet.

1. Define the following terms.

   Alternator —

   Alternating current (AC) —

   Diode —

   Fusible link —

   Rotor —

2. What are the two stator winding arrangements?

3. The voltage regulator limits the system voltage to what range?

4. What are the three circuit arrangements that manufacturers use to wire the voltage regulator to the alternator's rotor circuit?

5. What is the purpose of an electronic regulator?

The student must obtain a minimum score of ____ on AS1-L1-UVI in order to receive an evaluation for Competencies G1, G2, G3, and G4.

JS1-L2-UVI

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

EVALUATION

PERFORM A PRELIMINARY INSPECTION AND TEST OF THE CHARGING SYSTEM

Equipment:

Protective eyewear

NOTE: This job sheet can be performed on an ATech 812/812F Charging System Trainer.

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Conduct a visual inspection of the charging system. Record observations in the following chart. _____

	OK	Not OK
Battery		
Battery Terminals		
Alternator Drive Belt		
Alternator Drive Belt Tension		
Alternator Wiring Harness		
Alternator Mounting		
Voltage Regulator Wiring Harness		
Voltage Regulator Ground		

Repair and/or replace and defective components. If necessary, adjust the belt tension.

3. Perform battery tests. ____

   a. Perform a state-of-charge test. See JS2-L2-UIV for the proper procedure. Record observations in the following space.

   b. Perform a load test. See JS3-L2-UIV for the proper procedure. Record observations in the following space.

   c. Replace a bad battery.

Average of the above evaluations ____

This average is a partial evaluation for Competency G1. The final evaluation for G1 is at the end of JS7-L2-UVI.

JS2-L2-UVI

DIAGNOSE THE CHARGING SYSTEM FOR UNDERCHARGE, NO-CHARGE, OR OVERCHARGE CONDITIONS

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

EVALUATION

Equipment:

Protective eyewear
Volts-amp tester

NOTE: This job sheet can be performed on an ATech 812/812F Charging System Trainer.

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Using a service manual or other information source, locate the rated output for the alternator. Record these in the following space. _____

   NOTE: This information is sometimes stamped on the alternator housing.

3. Connect the volts-amp tester leads to the positive and negative battery terminals. _____

4. Connect the exhaust ventilation equipment. _____

   CAUTION: Be sure to use approved exhaust ventilation equipment when operating a vehicle in an enclosed area.

5. Start the engine. _____

6. Check the reading. Record the reading in the following space. ____

7. Shut the engine off. Disconnect the test equipment and the exhaust ventilation equipment. ____

8. Determine if the charging system is producing an undercharge, no-charge, or overcharge condition. Record observations in the following space. If necessary, include the recommended steps to correct any problems found during testing. ____

Average of the above evaluations ____

This average is a partial evaluation for Competency G1. The final evaluation for G1 is at the end of JS7-L2-UVI.

JS3-L2-UVI

PERFORM A CHARGING SYSTEM OUTPUT TEST

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

EVALUATION

Equipment:

Ammeter
Carbon pile
Protective eyewear
Voltmeter

NOTE: This job sheet can be performed on an ATech 812/812F Charging System Trainer.

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Connect the voltmeter in parallel to the battery. Observe battery polarity. _____

3. Connect the ammeter. _____

   a. If using a shunt ammeter, connect the switch in series to the negative battery terminal. Connect the ammeter leads on each end of the switch.

      CAUTION: Shunt ammeters are not recommended for use on vehicles equipped with a computer.

   b. If using an inductive ammeter, attach the inductive clamp to the negative battery cable.

4. Connect the carbon pile in parallel to the battery. _____

5. Connect the exhaust ventilation equipment. _____

   CAUTION: Be sure to use approved exhaust ventilation equipment when operating a vehicle in an enclosed area.

6. Set the tester controls to the proper setting. _____

7. Turn the key to the on position. Check the ammeter reading. Record the reading in the following space. ____

8. Start the engine and allow it to idle at the proper test specification speed. ____

9. Turn the load control knob on the volts-amp tester until the ammeter reads the proper current output. Record the reading in the following space. ____

10. Shut the engine off. Disconnect the test equipment and the exhaust ventilation equipment. ____

11. Determine if the charging system is functioning properly. Record observations in the following space. If necessary, include the recommended steps to correct any problems found during testing. ____

Average of the above evaluations ____

This average is a partial evaluation for Competency G1. The final evaluation for G1 is at the end of JS7-L2-UVI.

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

EVALUATION

JS4-L2-UVI

PERFORM AN ALTERNATOR FULL-FIELD TEST

Equipment:

Allen wrench
Jumper wire (12-gauge)
Protective eyewear
Voltmeter (30-volt range)

NOTE: This job sheet can be performed on an ATech 812/812F Charging System Trainer.

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet. _____

   NOTE: The alternator full-field test can be performed with a VAT. The manufacturers of the VAT will usually provide the appropriate procedure.

2. Using a service manual or other information souce, locate a wiring schematic to determine the type of field circuit used in the alternator. Have the instructor check the following box to indicate approval of the wiring schematic. _____

   Be certain that the instructor approves the procedure and checks this box.

   ☐ Instructor Approved

   Using the wiring schematic, determine the type of field circuit. Record observations in the following space.

3. Determine the correct charging system voltage. Record observsations in the following chart. ____

Alternator	
Voltage regulator setting	
A Circuit	
B Circuit	
Charging system output	
The rpms at which the test should be performed	

4. Connect the voltmeter to the battery. Observe battery polarity. Record the battery voltage in the following space. ____

5. Determine the best location for jumping the field circuit, or the external voltage regulator. Record observations in the following space. ____

6. Jump the field circuit. ____

7. Connect the exhaust ventilation equipment. ____

CAUTION: Be sure to use approved exhaust ventilation equipment when operating a vehicle in an enclosed area.

8. Start the engine and allow it to run at the specified rpm. ____

9. Complete the field connection so that the system is bypassing the voltage regulator. ____

CAUTION: Do not allow the voltage to exceed 16.5 volts.

10. Check the voltmeter reading. Record the reading in the following space. _____

11. Shut the engine off. Disconnect the voltmeter and exhaust ventilation equipment. _____

12. Determine if the charging system is functioning properly. Record observations in the following space. If necessary, include the recommended steps to correct any problems found during testing. _____

Average of the above evaluations _____

This average is a partial evaluation for Competency G1. The final evaluation for G1 is at the end of JS7-L2-UVI.

JS5-L2-UVI

NAME(S):

PERFORM A VOLTAGE REGULATOR CUTOUT TEST

DATE:

Equipment:

MODEL OF CAR:

Carbon pile
Protective eyewear
Voltmeter

MAKE OF CAR:

NOTE: Procedures 1 to 3.e. of this job sheet can be performed on an ATech 812/812F Charging System Trainer.

YEAR OF CAR:

VIN:

EVALUATION

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Determine the correct charging system voltage and desired test rpm. Record these in the following space. _____

3. Connect the exhaust ventilation equipment. _____

   CAUTION: Be sure to use approved exhaust ventilation equipment when operating a vehicle in an enclosed area.

4. Connect the voltmeter and carbon pile in parallel to the battery. Observe battery polarity. _____

5. Start the engine and allow it to idle. _____

6. Load the battery until the battery voltage reads less than 10 volts. _____

7. Turn the load knob off. _____

8. Increase the engine speed to the desired test rpm. _____

9. Observe the voltmeter reading. Record the reading in the following space. ____

10. Shut the engine off. Disconnect the test equipment and exhaust ventilation equipment. ____

11. Determine if the charging system is functioning properly. Record observations in the following space. If necessary, include the recommended steps to correct any problems found during testing. ____

Average of the above evaluations ____

This average is a partial evaluation for Competency G1. The final evaluation for G1 is at the end of JS7-L2-UVI.

JS6-L2-UVI

PERFORM CIRCUIT RESISTANCE AND VOLTAGE DROP TESTS

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

EVALUATION

Equipment:

Ammeter
Carbon pile
Protective eyewear
Voltmeter

NOTE: This job sheet can be performed on an ATech 812/812F Charging System Trainer.

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Connect the exhaust ventilation equipment. _____

   CAUTION: Be sure to use approved exhaust ventilation equipment when operating a vehicle in an enclosed area.

3. Perform a complete circuit resistance test. _____

   a. Connect the voltmeter in parallel to the battery. Observe battery polarity.

   b. Connect the carbon pile to the circuit.

   c. Connect the ammeter in series to the battery.

   d. Start the engine and increase to 2,000 rpm.

   e. Increase the load until the charging system reaches the manufacturer's specified output.

   f. Observe the voltmeter reading. Record the reading in the following space.

g. Shut the engine off.

h. Connect the voltmeter in parallel to the alternator.

i. Repeat steps d, e, and f. Record the reading in the following space.

j. Shut the engine off. Disconnect the test equipment.

k. Subtract the second reading from the first reading. Record the voltage drop in the following space.

l. According to this test, is the voltage drop for the complete circuit within specification? Record results in the following space. If necessary, include the recommended steps to correct any problems found during testing.

4. Perform an insulated circuit resistance test. ____

a. Connect the positive voltmeter lead to the positive on the back of the alternator. Connect the negative voltmeter lead to the positive battery terminal.

b. Connect the ammeter in series.

c. Connect the carbon pile in parallel with the battery.

d. Start the engine and increase to 2,000 rpm.

e. Increase the load until the charging system reaches the manufacturer's specified output.

f. Observe the voltmeter reading. Record the reading in the following space.

g. Shut the engine off. Disconnect the test equipment.

h. According to this test, is the voltage drop for the insulated circuit within specification? Record results in the following space. If necessary, include the recommended steps to correct any problems found during testing.

5. Perform a ground circuit resistance test. ____

a. Connect the positive voltmeter lead to the negative battery terminal. Connect the negative voltmeter lead to a good ground on the back of the alternator housing.

b. Connect the ammeter in series.

c. Connect the carbon pile in parallel to the battery.

d. Start the engine and increase to 2,000 rpm.

e. Increase the load until the charging system reaches the manufacturer's specified output.

f. Observe the voltmeter reading. Record the reading in the following space.

g. Shut the engine off. Disconnect the test equipment.

h. According to this test, is the voltage drop for the ground circuit within specification? Record results in the following space. If necessary, include the recommended steps to correct any problems found during testing.

6. Perform a voltage regulator ground circuit resistance test for a charging system with an external voltage regulator. ____

a. Connect the positive voltmeter lead to a good ground on the back of the alternator. Connect the negative voltmeter lead to a good ground on the voltage regulator case.

b. Connect the ammeter in series.

c. Connect the carbon pile in parallel to the battery.

d. Start the engine and increase to 2,000 rpm.

e. Increase the load until the charging system reaches the manufacturer's specified output.

f. Observe the voltmeter reading. Record the reading in the following space.

g. Shut the engine off. Disconnect the test equipment.

h. According to this test, is the voltage drop for the voltage regulator ground circuit within specification? Record results in the following space. If necessary, include the recommended steps to correct any problems found during testing.

7. Perform a voltage drop test. _____

a. Connect one voltmeter lead to the alternator output terminal. Connect the other voltmeter lead to the positive battery terminal.

b. Start the engine.

c. Observe the voltmeter reading. Record the reading in the following space.

d. Shut the engine off. Disconnect the test equipment.

e. According to this test, is the voltage drop within specification? Record results in the following space. If necessary, include the recommended steps to correct any problems found during testing.

8. Disconnect the exhaust ventilation equipment. _____

Average of the above evaluations _____

This average is a partial evaluation for Competency G1. The final evaluation for G1 is at the end of JS7-L2-UVI.

JS7-L2-UVI

NAME(S):

DETERMINE THE CURRENT REQUIREMENTS FOR A CHARGING SYSTEM

DATE:

Equipment:

MODEL OF CAR:

Ammeter
Protective eyewear

MAKE OF CAR:

NOTE: This job sheet can be performed on an ATech 812/812F Charging System Trainer.

YEAR OF CAR:

VIN:

EVALUATION

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Determine the maximum charging system output. Record observations in the following space. _____

3. Connect the ammeter in series. _____

4. Turn on all the accessory equipment including the ignition switch. Do not crank the engine. _____

5. Observe the maximum ammeter reading. Record the reading in the following space. _____

6. According to this test, is the charging system functioning properly? Record observations in the following space. If necessary, include the recommended steps to correct any problems found during testing. ____

Average of the above evaluations ____

This average is a partial evaluation for Competency G1. The final evaluation for G1 follows.

FINAL EVALUATION INSTRUCTIONS

I. Determine the student's final evaluation for Competency G1 by averaging the evaluation of JS1-L2-UVI, JS2-L2-UVI, JS3-L2-UVI, JS4-L2-UVI, JS5-L2-UVI, JS6-L2-UVI, and JS7-L2-UVI.

JS1-L2-UVI	_____
JS2-L2-UVI	_____
JS3-L2-UVI	_____
JS4-L2-UVI	_____
JS5-L2-UVI	_____
JS6-L2-UVI	_____
JS7-L2-UVI	_____
Final evaluation for Competency G1	_____

JS1-L3-UVI

REMOVE AND INSTALL THE ALTERNATOR

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

EVALUATION

Equipment:

Belt tension gauge
Hand tools
Protective eyewear
Torque wrench

NOTE: This job sheet can be performed on an ATech 812/812F Charging System Trainer.

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Using a service manual or other information source, locate a procedure for removing the alternator. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure. _____

   Be certain that the instructor approves the procedure and checks this box.

   ☐ Instructor Approved

   Using the procedure, remove the alternator.

3. Using a service manual or other information source, locate a procedure for installing the alternator. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure. _____

   Be certain that the instructor approves the procedure and checks this box.

   ☐ Instructor Approved

   Using the procedure, install the alternator.

4. Connect the exhaust ventilation equipment. ____

   CAUTION: Be sure to use approved exhaust ventilation equipment when operating a vehicle in an enclosed area.

5. Start the engine. ____

6. Test the alternator operation. Record observations in the following space. ____

7. Shut the engine off and disconnect the exhaust ventilation equipment. ____

Average of the above evaluations ____

This average is a partial evaluation for Competencies G2 and G3. The final evaluations for G2 and G3 are at the end of JS2-L3-UVI.

JS2-L3-UVI

SERVICE THE ALTERNATOR

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

EVALUATION

Equipment:

Electric motor cleaner
Hand tools
Ohmmeter
Protective eyewear
Pulley puller

NOTE: This job sheet can be performed on an ATech 812/812F Charging System Trainer.

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Using a service manual or other information source, locate a procedure for disassembling the alternator. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure. _____

   Be certain that the instructor approves the procedure and checks this box.

   ☐ Instructor Approved

   Using the procedure, disassemble the alternator.

3. Clean the alternator with electric motor cleaner. Wipe or blow the components dry. _____

4. Inspect and test the rotor. _____

   a. Inspect the field slip rings for excessive wear or roughness. Record observations in the following space.

b. Test for continuity from one slip ring to the other using the ohmmeter. Record observations in the following space.

c. Test for continuity from the field coil slip rings to the rotor shaft or core using the ohmmeter. Record observations in the following space.

d. Determine if the rotor is defective. Record observations in the following space.

e. If necessary, replace the rotor.

5. Inspect and test the stator. ____

a. Inspect the stator for signs of damage such as weak or broken leads, distorted frame, or burned windings. Record observations in the following space.

b. Use a scraper to clean a small area of the stator frame to ensure a good electrical contact.

c. Test for continuity from the stator leads to the frame using an ohmmeter. Record observations in the following space.

d. Test continuity from one stator lead to the other leads using an ohmmeter. Record observations in the following space.

e. Determine if the stator is defective. Record observations in the following space.

f. If necessary, replace the stator.

6. Test the rectifier.

a. Separate the positive diode leads from the negative diode leads.

b. Test for continuity from each of the positive diode leads to the positive heat sink using an ohmmeter. Reverse the test probes and repeat. Record observations in the following space.

c. Test for continuity from each of the negative diode leads to the negative heat sink using an ohmmeter. Reverse the test probes and repeat. Record observations in the following space.

d. Determine if the rectifier is defective. Record observations in the following space.

e. If necessary, replace the rectifier.

7. Using a service manual or other information source, locate a procedure for reassembling the alternator. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure. ____

Be certain that the instructor approves the procedure and checks this box.

Instructor Approved

Using the procedure, reassemble the alternator.

Average of the above evaluations ____

This average is a partial evaluation for Competencies G2 and G3. The final evaluations for G2 and G3 follow.

FINAL EVALUATION INSTRUCTIONS

I. Determine the student's final evaluation for Competency G2 by averaging the evaluations of JS1-L3-UVI and JS2-L3-UVI.

JS1-L3-UVI _____

JS2-L3-UVI _____

Final evaluation for Competency G2 _____

II. Determine the student's final evaluation for Competency G3 by averaging the evaluations of JS1-L3-UVI and JS2-L3-UVI.

JS1-L3-UVI ____

JS2-L3-UVI ____

Final evaluation for Competency G3 ____

JS3-L3-UVI

SERVICE THE VOLTAGE REGULATOR

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

Equipment:

Hand tools
Protective eyewear

Procedure:

EVALUATION

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Using a service manual or other information source, locate a procedure for removing the voltage regulator. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure. _____

   Be certain that the instructor approves the procedure and checks this box.

   ☐ Instructor Approved

   Using the procedure, remove the voltage regulator.

3. Inspect the voltage regulator. _____

   a. Check the terminal ends for dirt and corrosion. Record observations in the following space.

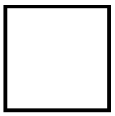
   b. If necessary, use the special terminal cleaning brushes to remove the dirt and corrosion from the terminals.

c. Check the voltage regulator for physical damage. Record observations in the following space.

d. If necessary, replace a damaged voltage regulator.

4. Using a service manual or other information source, locate a procedure for installing the voltage regulator. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure. ____

Be certain that the instructor approves the procedure and checks this box.



Instructor Approved

Using the procedure, install the voltage regulator.

5. Test the voltage regulator operation. Record observations in the following space. ____

Average of the above evaluations ____

This job sheet is the final evaluation for Competency G4.

AS1-L1-UVII

NAME:

DATE:

IDENTIFYING LIGHTING SYSTEMS AND THEIR COMPONENTS

Directions — Answer the following questions by writing all responses on this sheet.

1. Define the following terms.

   Actuator motor —

   Concealed headlight —

   Control device —

   Filament —

   Headlight —

2. Name three types of headlights.

3. What are the two countries that have issued a law requiring all new vehichles to have daylight running lights (DRL) installed?

4. In a concealed headlight system, what happens if the vacuum system fails?

5. Name the two compartments that are illuminated by courtesy lighting systems.

The student must obtain a minimum score of ____ on AS1-L1-UVII in order to receive an evaluation for Competencies H1 and H2.

JS1-L2-UVII

TEST AND DIAGNOSE THE LIGHTING SYSTEM

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

EVALUATION

_____

_____

Equipment:

Hand tools
Jumper wires
Volts-amp tester
Protective eyewear

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet.

2. Using a service manual or other information source, locate a wiring schematic for the lighting system. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the wiring schematic.

   Be certain that the instructor approves the procedure and checks this box.

   ☐ Instructor Approved

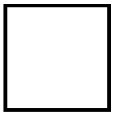
3. Activate each of the bulbs and observe operation. Record the results in the following chart. Identify each bulb on the wiring schematic.

	OK	Not OK		OK	Not OK
Right low beam headlight			Right front turn signal		
Right high beam headlight			Left front turn signal		
Left low beam headlight			Right rear turn signal		
Left high beam headlight			Left rear turn signal		
Right taillight			Front emergency lights		
Left taillight			Rear emergency lights		
Right brake light			Right turn dash light		
Left brake light			Left turn dash light		
Right rear side-marker light			Water temperature warning light		
Left rear side-marker light			Glove box light		
Right front side-marker light			Oil pressure warning light		
Left front side-marker light			Dash lights		
Right reverse light			Charging system warning light		
Left reverse light			Radio light		
License plate light			Seat belt warning light		
Trunk compartment light			Dome light(s)		
Right front parking light			Door ajar warning light		
Left front parking light					

4. Identify brighter than normal, intermittent, dim, or no-light operation. Record observations in the following space.

5. Using a service manual or other information source, locate a procedure for testing for brighter than normal, intermittent, dim, or no-light operation. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure. _____

Be certain that the instructor approves the procedure and checks this box.



Instructor Approved

Using the procedure, test for brighter than normal, intermittent, dim, or no-light operation. Record observations in the following space. Include the recommended steps to correct any problems found during testing.

Average of the above evaluations _____

This average is the final evaluation for Competency H1.

JS1-L3-UVII

NAME(S):

SERVICE THE HEADLIGHTS

DATE:

Equipment:

MODEL OF CAR:

Hand tools
Headlight aimer
Protective eyewear

MAKE OF CAR:

NOTE: This job sheet can be performed on both the ATech 821/821F Lighting System Trainer and the ATech 822/822F Instrument Pannel Trainer.

YEAR OF CAR:

VIN:

EVALUATION

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Inspect the headlights for cracks, water, or other damage. Check operation of the bulbs. Record observations in the following space. _____

3. Using a service manual or other information source, locate a procedure for removing and installing the headlights. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure. _____

   Be certain that the instructor approves the procedure and checks this box.

   ☐ Instructor Approved

   Using the procedure, remove and install the headlights.

4. Using a service manual or other information source, locate a procedure for aiming the headlights. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure. ____

Be certain that the instructor approves the procedure and checks this box.

Instructor Approved

Using the procedure, aim the headlights.

Average of the above evaluations ____

This average is a partial evaluation for Competency H2. The final evaluation for H2 is at the end of JS2-L3-UVII.

JS2-L3-UVII

NAME(S):

SERVICE THE LIGHTING SYSTEM COMPONENTS

DATE:

Equipment:

MODEL OF CAR:

Hand tools
Jumper cables
Ohmmeter
Protective eyewear
Test light
Voltmeter

MAKE OF CAR:

YEAR OF CAR:

VIN:

NOTE: This job sheet can be performed on both the ATech 821/821F Lighting System Trainer and the ATech 822/822F Instrument Pannel Trainer.

EVALUATION

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Inspect the vehicle for malfunctioning lighting. Check the operation of bulbs and fuses. Record observations in the following space. _____

3. Using a service manual or other information source, locate a procedure for servicing the malfunctioning lights. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure. _____

   Be certain that the instructor approves the procedure and checks this box.

   ☐ Instructor Approved

   Using the procedure, service the malfunctioning lighting.

4. Test the operation of the newly serviced lighting. Record observations in the following space. ____

Average of the above evaluations ____

This average is a partial evaluation for Competency H2. The final evaluation for H2 follows.

FINAL EVALUATION INSTRUCTIONS

I. Determine the student's final evaluation for Competency H2 by averaging the evaluations of JS1-L3-UVII and JS2-L3-UVII.

JS1-L3-UVII _____

JS2-L3-UVII _____

Final evaluation for Competency H2 _____

JS1-L1-UVIII

NAME(S):

TEST AND SERVICE INTERMITTENT, HIGH, LOW, OR NO-GAUGE READING

DATE:

Equipment:

MODEL OF CAR:

Hand tools
Ohmmeter
Protective eyewear
Test light
Voltmeter

MAKE OF CAR:

YEAR OF CAR:

NOTE: This job sheet can be performed on an ATech 822/822F Instrument Pannel Trainer.

VIN:

EVALUATION

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Test for voltage in the circuit(s) that supplies current to the gauges using a test light. Use the proper service manual to locate the fuses. Record observations in the following space. If necessary, include the recommended steps to reinstate the current flow. _____

3. Using a service manual or other information source, locate a procedure for testing the sending units. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure. ____

Be certain that the instructor approves the procedure and checks this box.

☐ Instructor Approved

NOTE: If the problem occurs in all gauges, skip this step.

Using the procedure, test the sending units. Record observations in the following space. If necessary, include the recommended steps to service the sending units.

4. Check the gauge circuit voltage limiter. ____

a. Using a service manual or other information source, locate a procedure for exposing the gauge circuit voltage limiter. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure.

Be certain that the instructor approves the procedure and checks this box.

☐ Instructor Approved

Using the procedure, expose the gauge circuit voltage limiter.

b. Using a service manual or other information source, locate a procedure for testing the gauge circuit voltage limiter. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure.

Be certain that the instructor approves the procedure and checks this box.

☐ Instructor Approved

Using the procedure, test the gauge circuit voltage limiter. Record observations in the following space. If necessary, include the recommended steps to service the gauge circuit voltage limiter.

5. Check the printed circuit board on the back of the dashboard. ____

a. Using a service manual or other information source, locate a procedure for exposing the printed circuit board on the back of the dashboard. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure.

Be certain that the instructor approves the procedure and checks this box.

☐ Instructor Approved

Using the procedure, expose the printed circuit board on the back of the dashboard.

b. Using a service manual or other information source, locate a procedure for testing the printed circuit board. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure.

Be certain that the instructor approves the procedure and checks this box.

☐ Instructor Approved

Using the procedure, test the printed circuit board. Record observations in the following space. If necessary, include the recommended steps to service the printed circuit board.

Average of the above evaluations ____

This average is a partial evaluation for Competency I1. The final evaluation for I1 is at the end of JS3-L1-UVIII.

JS2-L1-UVIII

NAME(S):

TEST AND SERVICE THE INCORRECT OPERATION OF AN INDICATOR LIGHT

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

EVALUATION

Equipment:

Hand tools
Ohmmeter
Protective eyewear
Test light
Voltmeter

NOTE: This job sheet can be performed on an ATech 822/822F Instrument Pannel Trainer.

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Test for voltage in the circuit(s) that supplies current to the indicator lights using a test light. Use the proper service manual to locate the fuses. If necessary, include the recommended steps to reinstate the current flow. _____

3. Using a service manual or other information source, locate a procedure for testing the sending units. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure. ____

Be certain that the instructor approves the procedure and checks this box.

Using the procedure, test the sending units. Record observations in the following space. If necessary, include the recommended steps to service the sending units.

4. Test the printed circuit board on a vehicle equipped with indicator lights. ____

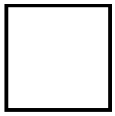
a. Using a service manual or other information source, locate a procedure for exposing the printed circuit board on the back of the dashboard. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure.

Be certain that the instructor approves the procedure and checks this box.

Using the procedure, expose the printed circuit board on the back of the dashboard.

b. Using a service manual or other information source, locate a procedure for inspecting and testing the printed circuit board. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure.

Be certain that the instructor approves the procedure and checks this box.



Instructor Approved

Using the procedure, inspect and test the printed circuit board. Record observations in the following space. If necessary, include the recommended steps to service the printed circuit board.

Average of the above evaluations _____

This average is a partial evaluation for Competency I1. The final evaluation for I1 is at the end of JS3-L1-UVIII.

JS3-L1-UVIII

NAME(S):

TEST AND SERVICE THE INCORRECT OPERATION OF AN AUDIBLE WARNING SYSTEM DEVICE

DATE:

Equipment:

MODEL OF CAR:

Hand tools
Ohmmeter
Protective eyewear
Test light
Voltmeter

MAKE OF CAR:

YEAR OF CAR:

NOTE: This job sheet can be performed on an ATech 832/832F Horn/Alarm Trainer.

VIN:

EVALUATION

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Test for voltage in the circuit(s) that supplies current to the audible warning system device using a test light. Use the proper service manual to locate the fuses. Record observations in the following space. If necessary, include the recommended steps to reinstate current flow. _____

3. Using a service manual or other information source, locate a procedure for testing the sending units. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure.

   Be certain that the instructor approves the procedure and checks this box.

   
   Instructor Approved

   Using the procedure, test the sending units. Record observations in the following space. If necessary, include the recommended steps to service the sending units.

Average of the above evaluations ____

This average is a partial evaluation for Competency I1. The final evaluation for I1 follows.

FINAL EVALUATION INSTRUCTIONS

I. Determine the student's final evaluation for Competency I1 by averaging the evaluations of JS1-L1-UVIII, JS2-L1-UVIII, and JS3-L1-UVIII.

JS1-L1-UVIII _____

JS2-L1-UVIII _____

JS3-L1-UVIII _____

Final evaluation for Competency I1 _____

JS1-L1-UIX

TEST AND SERVICE INCORRECT HORN OPERATION

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

EVALUATION

Equipment:

Hand tools
Ohmmeter
Protective eyewear
Test light

NOTE: This job sheet can be performed on an ATech 831 Horn Circuit Trainer and an ATech 832/832F Horn/Alarm Trainer.

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Test for voltage in the circuit(s) that supplies current to the horn using a test light. Use the proper service manual to locate the fuses. Record observations in the following space. If necessary, include the recommended steps to reinstate current flow. _____

3. Disconnect the horn from the circuit. _____

4. Perform a horn circuit resistance test using an ohmmeter. _____

   a. Remove the negative battery cable.

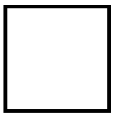
   b. Disconnect the switch wire from the terminal.

   c. Connect one lead of the ohmmeter to the disconnected switch wire. Connect the second lead to a good ground.

d. Push the horn button. Record observations in the following space. If necessary, include the recommended steps to service the horn circuit.

5. Using a service manual or other information source, locate a procedure for testing the horn relay. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure. ____

Be certain that the instructor approves the procedure and checks this box.



Instructor Approved

Using the procedure, test the horn relay. Record observations in the following space. If necessary, include the recommended steps to service the horn relay.

6. Push the horn button on the steering column. Record observations in the following space. If necessary, include the recommended steps to service the horn. ____

7. Using a service manual or other information source, locate a procedure(s) for servicing the defective horn components. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure. _____

Be certain that the instructor approves the procedure and checks this box.

☐ Instructor Approved

Using the procedure(s), service the defective horn components.

Average of the above evaluations _____

This average is a partial evaluation for Competency I2. The final evaluation for I2 is at the end of JS7-L1-UX.

JS2-L1-UIX

TEST AND SERVICE INCORRECT WINDSHIELD WIPER OPERATION

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

EVALUATION

_____

_____

Equipment:

Hand tools
Ohmmeter
Protective eyewear
Test light
Voltmeter

NOTE: This job sheet can be performed on an ATech 830/830F Interval Wiper/Washer Trainer.

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet.

2. Test for voltage in the circuit(s) that supplies current to the wipers using a test light. Use the proper service manual to locate the fuses, circuit breakers, or fusible links. Record observations in the following space. If necessary, include the recommend steps to reinstate current flow.

   NOTE: This procedure is appropriate for front and rear wipers.

3. Test the operation of the wiper motor. Complete the following chart and answer the following questions.

Do the wipers operate in:	OK	Not OK
Slow Mode		
Medium Mode		
High Mode		
Intermittent Mode		
Mist Mode		

a. Do the wiper blades retract into the park position when the motor is shut off?

b. Is the linkage tight yet able to move freely? If necessary, service the linkage.

c. Inspect the wiper blades and arms. Record observations in the following space. If necessary, recommend steps to service the wiper blades and arms.

4. Test the windshield wiper switch. _____

   a. Using a service manual or other information source, locate a procedure for exposing the windshield wiper switch. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure.

   Be certain that the instructor approves the procedure and checks this box.

   ☐ Instructor Approved

   Using the procedure, expose the windshield wiper switch.

   b. Using a service manual or other information source, locate a procedure for testing the operation of the windshield wiper switch. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure.

   Be certain that the instructor approves the procedure and checks this box.

   ☐ Instructor Approved

   Using the procedure, test the operation of the windshield wiper switch. Record observations in the following space. If necessary, include the recommended steps to service the windshield wiper switch.

5. Using a service manual or other information source, locate a procedure for testing the operation of the windshield wiper motor. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure. _____

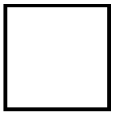
   Be certain that the instructor approves the procedure and checks this box.

   ☐ Instructor Approved

Using the procedure, test the operation of the windshield wiper motor. Record observations in the following space. If necessary, include the recommended steps to service the windshield wiper motor.

6. Using a service manual or other information source, locate a procedure(s) for servicing the problems found during testing of the windshield wiper system. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure. ____

Be certain that the instructor approves the procedure and checks this box.



Instructor Approved

Using the procedure, service the problems found during testing of the windshield wiper system.

Average of the above evaluations ____

This average is a partial evaluation for Competency I2. The final evaluation for I2 is at the end of JS7-L1-UX.

JS3-L1-UIX

NAME(S):

TEST AND SERVICE INCORRECT WINDSHIELD WASHER OPERATION

DATE:

Equipment:

MODEL OF CAR:

Hand tools
Ohmmeter
Protective eyewear
Test light
Voltmeter

MAKE OF CAR:

YEAR OF CAR:

NOTE: This job sheet can be performed on an ATech 830/830F Interval Wiper/Washer Trainer.

VIN:

EVALUATION

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Test for voltage in the circuit(s) that supplies current to the windshield washer circuits. Use the proper service manual to locate the fuses, circuit breakers, or fusible links. Record observations in the following space. If necessary include the recommended steps to reinstate the current flow. _____

3. Inspect the solvent level of the windshield washer. Record observations in the following space. If necessary, add solvent. _____

4. Inspect the windshield washer hose system. Complete the following chart. ____

	OK	Not OK
Hoses		
Spray Nozzles		

If necessary, recommend steps in the following space to service the hoses and spray nozzles.

5. Test the windshield wiper switch. ____

a. Using a service manual or other information source, locate a procedure for exposing the windshield washer switch. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure.

Be certain that the instructor approves the procedure and checks this box.

☐ Instructor Approved

Using the procedure, expose the windshield washer switch.

b. Using a service manual or other information source, locate a procedure for testing the operation of the windshield washer switch. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure.

Be certain that the instructor approves the procedure and checks this box.

☐ Instructor Approved

Using the procedure, test the operation of the windshield washer switch. Record observations in the following space. If necessary, include the recommended steps to service the windshield washer switch.

6. Using a service manual or other information source, locate a procedure for testing the operation of the windshield washer motor. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure. _____

Be certain that the instructor approves the procedure and checks this box.

☐ Instructor Approved

Using the procedure, test the operation of the windshield washer motor. Record observations in the following space. If necessary, include the recommended steps to service the windshield washer motor.

NOTE: If this procedure was completed in JS2-L1-UIX, record observations in the following space.

7. Using a service manual or other information source, locate a procedure(s) for servicing the problems found during testing of the windshield washer system. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure. ____

Be certain that the instructor approves the procedure and checks this box.

☐ Instructor Approved

Using the procedure, service the problems found during testing of the windshield washer system.

Average of the above evaluations ____

This average is a partial evaluation for Competency I2. The final evaluation for I2 is at the end of JS7-L1-UX.

JS1-L2-UIX

NAME(S):

IDENTIFY VEHICLES EQUIPPED WITH SUPPLEMENTAL RESTRAINT SYSTEMS

DATE:

Equipment:

MODEL OF CAR:

Protective eyewear
Service manual or other manufacturer information

MAKE OF CAR:

YEAR OF CAR:

NOTE: This job sheet can be performed on an ATech 1531/40 SRS/SIR "Air Bag" System Trainer.

VIN:

Procedure:

EVALUATION

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Record in the following space the digits in the vehicle identification number that indicate if the vehicle is equipped with SRS. _____

3. Record in the following space any other indicators such as symbols on the vehicle or warning schematics that indicate if the vehicle is equipped with SRS. _____

NOTE: An oversized steering wheel hub is not sufficient evidence that the vehicle is equipped with SRS.

Average of the above evaluations _____

This is a partial evaluation of Competency I2. The final evaluation for I2 is at the end of JS7-L1-UX.

JS2-L2-UIX

NAME(S):

DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM

DATE:

Equipment:

MODEL OF CAR:

Hand tools
Protective eyewear
Specialty tools

MAKE OF CAR:

YEAR OF CAR:

VIN:

NOTE: This job sheet can be performed on an ATech 1531/40 SRS/SIR "Air Bag" System Trainer.

EVALUATION

Procedure:

1. Wear protective eyewear while performing the procedure on this job sheet. _____

2. Using a service manual or other information source, locate a schematic for disabling the supplemental restraint system (SRS). _____

   Be certain that the instructor approves the procedure and checks this box.

   ☐ Instructor Approved

3. Using a service manual or other information source, locate a procedure for disabling the SRS. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure. _____

   Be certain that the instructor approves the procedure and checks this box.

   ☐ Instructor Approved

   Using the procedure, disable the SRS.

   CAUTION: The diagnostic module keeps the air bag activated for some time after the negative battery cable has been disconnected. Wait for the diagnostic module to deplete the reserve power before working on or around the SRS. Depletion time can vary from a few seconds to over 30 minutes.

Average of the above evaluations ____

This average is a partial evaluation of Competency I2. The final evaluation for I2 is at the end of JS7-L1-UX.

JS3-L2-UIX

VISUALLY INSPECT THE SUPPLEMENTAL RESTRAINT SYSTEM

Equipment:

Protective eyewear

NOTE: This job sheet can be performed on an ATech 1531/40 SRS/SIR "Air Bag" System Trainer.

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet.

2. List the major components being inspected. Indicate if problems are detected. Complete the following chart. Use the manufacturer-specific terminology.

Component Name	OK	Not OK (List problems)

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

EVALUATION

_____

_____

3. Record in the following space any other problems found during the visual inspection. ____

Average of the above evaluations ____

This average is a partial evaluation of Competency I2. The final evaluation for I2 is at the end of JS7-L1-UX.

JS4-L2-UIX

ACCESS AND READ SUPPLEMENTAL RESTRAINT SYSTEM CODES

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

EVALUATION

Equipment:

Bi-directional scan tool
Pliers
Protective eyewear
Screwdriver

NOTE: This job sheet can be performed on an ATech 1531/40 SRS/SIR "Air Bag" System Trainer.

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Using a service manual or other information source, locate a procedure for accessing and reading the fault codes. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure. _____

   Be certain that the instructor approves the procedure and checks this box.

   ☐ Instructor Approved

Using the procedure, access and read the fault codes. Complete the following chart.

Code	Meaning of Code

Recommend in the following space the service procedures to service the supplemental restraint system based on the fault codes.

3. Using a service manual or other information source, locate a procedure for accessing and reading the memory codes. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure.

Be certain that the instructor approves the procedure and checks this box.

☐ Instructor Approved

Using the procedure, access and read the memory codes. Complete the following chart.

Code	Meaning of Code

Recommend in the following space the service procedures to service the supplemental restraint system based on the memory codes.

Average of the above evaluations ____

This average is a partial evaluation of Competency I2. The final evaluation for I2 is at the end of JS7-L1-UX.

JS5-L2-UIX

REPLACE SUPPLEMENTAL RESTRAINT SYSTEM COMPONENTS

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

EVALUATION

Equipment:

Protective eyewear
Service kit

NOTE: This job sheet can be performed on an ATech 1531/40 SRS/SIR "Air Bag" System Trainer.

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Using a service manual or other information source, locate a procedure(s) for replacing the defective supplemental restraint system components. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure. _____

   Be certain that the instructor approves the procedure and checks this box.

   ☐ Instructor Approved

   Using the procedure(s), replace the defective supplemental restraint system components.

Average of the above evaluations _____

This average is a partial evaluation of Competency I2. The final evaluation for I2 is at the end of JS7-L1-UX.

JS6-L2-UIX

NAME(S):

REMOVE AND REPLACE A DEPLOYED INFLATOR MODULE

DATE:

Equipment:

MODEL OF CAR:

Protective eyewear

MAKE OF CAR:

YEAR OF CAR:

VIN:

NOTE: This job sheet can be performed on an ATech 1531/40 SRS/SIR "Air Bag" System Trainer.

EVALUATION

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Using a service manual or other information source, locate a schematic for removing and replacing the deployed inflator module. _____

   Be certain that the instructor approves the procedure and checks this box.

   ☐ Instructor Approved

3. Using a service manual or other information source, locate a procedure for removing and replacing the deployed inflator module. Include the procedures for cleaning the interior of the vehicle. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure. _____

   Be certain that the instructor approves the procedure and checks this box.

   ☐ Instructor Approved

   Using the procedure, remove and replace the deployed inflator module.

Average of the above evaluations _____

This average is a partial evaluation of Competency I2. The final evaluation for I2 is at the end of JS7-L1-UX.

JS7-L2-UIX

DEPLOY AN AIR BAG IN A VEHICLE READY FOR SCRAP

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

Equipment:

Protective eyewear

Procedure:

EVALUATION

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Using a service manual or other information source, locate a schematic for deploying the air bag in a vehicle ready for scrap. _____

   Be certain that the instructor approves the procedure and checks this box.

   ☐ Instructor Approved

3. Using a service manual or other information source, locate a procedure for deploying the air bag in a vehicle ready for scrap. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure. _____

   Be certain that the instructor approves the procedure and checks this box.

   ☐ Instructor Approved

   Using the procedure, deploy the air bag in a vehicle ready for scrap.

Average of the above evaluations _____

This average is a partial evaluation of Competency I2. The final evaluation for I2 is at the end of JS7-L1-UX.

JS1-L3-UIX

TEST AND SERVICE HEATED GLASS SYSTEMS

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

Equipment:

Protective eyewear
Test light

Procedure:

EVALUATION

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Identify the type of heated glass system on the vehicle. _____

3. Using a service manual or other information source, locate a procedure for testing the heated glass system. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure. _____

Be certain that the instructor approves the procedure and checks this box.

☐ Instructor Approved

Using the procedure, test the heated glass system. Record observations in the following space. If necessary, include the recommended steps to service the problems found during testing of the heated glass system.

4. Using a service manual or other information source, locate a procedure for servicing problems found during testing of the heated glass system. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure. ____

Be certain that the instructor approves the procedure and checks this box.

Instructor Approved

Using the procedure(s), service problems found during testing of the heated glass system.

Average of the above evaluations ____

This average is a partial evaluation for Competency I2. The final evaluation for I2 is at the end of JS7-L1-UX.

JS2-L3-UIX

TEST AND SERVICE THE ANTI-THEFT SYSTEM

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

Equipment:

Protective eyewear
Test tools

Procedure:

EVALUATION

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Identify the type of anti-theft system on the vehicle. _____

3. Using a service manual or other information source, locate a procedure for testing the anti-theft system. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure. _____

Be certain that the instructor approves the procedure and checks this box.

☐ Instructor Approved

Using the procedure, test the anti-theft system. Record observations in the following space. If necessary, include the recommended steps to service the problems found during testing of the anti-theft system.

4. Using a service manual or other information source, locate a procedure for servicing problems found during testing of the anti-theft system. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure. ____

Be certain that the instructor approves the procedure and checks this box.

Instructor Approved

Using the procedure, service problems found during testing of the anti-theft system.

Average of the above evaluations ____

This average is a partial evaluation for Competency I2. The final evaluation for I2 is at the end of JS7-L1-UX.

JS1-L1-UX

TEST AND SERVICE THE POWER WINDOWS

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

EVALUATION

Equipment:

Hand tools
Ohmmeter
Protective eyewear
Test light
Voltmeter

NOTE: This job sheet can be performed on an ATech 840/840F Power Windows Trainer.

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Identify malfunctioning power window circuits. Check the switches in the circuits. Record observations in the following space. _____

3. Test the operation of the components in the circuits that have malfunctioning power window switches. _____

   a. Using a service manual or other information source, locate a schematic for testing the operation of the components in the circuits that have malfunctioning power window switches.

   Be certain that the instructor approves the procedure and checks this box.

   ☐ Instructor Approved

b. Using a service manual or other information source, locate a procedure for testing the operation of the components in the circuits that have malfunctioning power window switches. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure.

Be certain that the instructor approves the procedure and checks this box.

☐ Instructor Approved

Using the procedure, test the operation of the components in the circuits that have malfunctioning power window switches. Record observations in the following space. If necessary, include the recommended steps to service any problems.

4. Service faulty circuits that have malfunctioning power window switches. ____

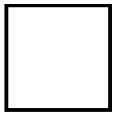
a. Using a service manual or other information source, locate a schematic for servicing faulty circuits that have malfunctioning power window switches.

Be certain that the instructor approves the procedure and checks this box.

☐ Instructor Approved

b. Using a service manual or other information source, locate a procedure for servicing faulty circuits that have malfunctioning power window switches. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure.

Be certain that the instructor approves the procedure and checks this box.



Instructor Approved

Using the procedure, service faulty circuits that have malfunctioning power window switches.

5. Test the circuits for proper operation. Record observations in the following space. _____

Average of the above evaluations _____

This average is a partial evaluation for Competency I2. The final evaluation for I2 is at the end of JS7-L1-UX.

JS2-L1-UX

TEST AND SERVICE THE POWER SEATS

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

EVALUATION

Equipment:

Hand tools
Ohmmeter
Protective eyewear
Test light
Voltmeter

NOTE: This job sheet can be performed on an ATech 860/860F Power Seat Trainer.

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Identify malfunctioning power seat circuits. Check the switches in the circuits. Record observations in the following space. _____

3. Test the operation of the components in the circuits that have malfunctioning power seat switches. _____

   a. Using a service manual or other information source, locate a schematic for testing the operation of the components in the circuits that have malfunctioning power seat switches.

   Be certain that the instructor approves the procedure and checks this box.

   ☐ Instructor Approved

b. Using a service manual or other information source, locate a procedure for testing the operation of the components in the circuits that have malfunctioning power seat switches. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure.

Be certain that the instructor approves the procedure and checks this box.

☐ Instructor Approved

Using the procedure, test the operation of the components in the circuits that have malfunctioning power seat switches. Record observations in the following space. If necessary, include the recommended steps to service any problems.

4. Service faulty circuits that have malfunctioning power seat switches. ____

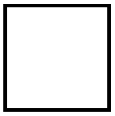
a. Using a service manual or other information source, locate a schematic for servicing faulty circuits that have malfunctioning power seat switches.

Be certain that the instructor approves the procedure and checks this box.

☐ Instructor Approved

b. Using a service manual or other information source, locate a procedure for servicing faulty circuits that have malfunctioning power seat switches. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure.

Be certain that the instructor approves the procedure and checks this box.



Instructor Approved

Using the procedure, service faulty circuits that have malfunctioning power seat switches.

5. Test the circuits for proper operation. Record observations in the following space. _____

Average of above evaluations _____

This average is a partial evaluation for Competency I2. The final evaluation for I2 is at the end of JS7-L1-UX.

JS3-L1-UX

TEST AND SERVICE THE POWER MIRRORS

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

EVALUATION

Equipment:

Hand tools
Ohmmeter
Protective eyewear
Test light
Voltmeter

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Identify malfunctioning power mirror circuits. Check the switches in the circuits. Record observations in the following space. _____

3. Test the operation of the components in the circuits that have malfunctioning power mirror switches. _____

   a. Using a service manual or other information source, locate a schematic for testing the operation of the components in the circuits that have malfunctioning power mirror switches.

   Be certain that the instructor approves the procedure and checks this box.

   ☐ Instructor Approved

b. Using a service manual or other information source, locate a procedure for testing the operation of the components in the circuits that have malfunctioning power mirror switches. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure.

Be certain that the instructor approves the procedure and checks this box.

☐ Instructor Approved

Using the procedure, test the operation of the components in the circuits that have malfunctioning power mirror switches. Record observations in the following space. If necessary, include the recommended steps to service any problems.

4. Service faulty circuits that have malfunctioning power mirror switches. ____

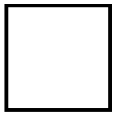
a. Using a service manual or other information source, locate a schematic for servicing faulty circuits that have malfunctioning power mirror switches.

Be certain that the instructor approves the procedure and checks this box.

☐ Instructor Approved

b. Using a service manual or other information source, locate a procedure for servicing faulty circuits that have malfunctioning power mirror switches. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure.

Be certain that the instructor approves the procedure and checks this box.



Instructor Approved

Using the procedure, service faulty circuits that have malfunctioning power mirror switches.

5. Test the circuits for proper operaton. Record observations in the following space. _____

Average of the above evaluations _____

This average is a partial evaluation for Competency I2. The final evaluation for I2 is at the end of JS7-L1-UX.

JS4-L1-UX

TEST AND SERVICE THE POWER DOOR LOCKS

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

EVALUATION

Equipment:

Hand tools
Ohmmeter
Protective eyewear
Test light
Voltmeter

NOTE: This job sheet can be performed on an ATech 850/850F Power Door Locks Trainer.

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Identify malfunctioning power door lock circuits. Check the switches in the circuits. Record observations in the following space. _____

3. Test the operation of the components in the circuits that have malfunctioning power door lock switches. _____

   a. Using a service manual or other information source, locate a schematic for testing the operation of the components in the circuits that have malfunctioning power door lock switches.

   Be certain that the instructor approves the procedure and checks this box.

   ☐ Instructor Approved

b. Using a service manual or other information source, locate a procedure for testing the operation of the components in the circuits that have malfunctioning power door lock switches. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure.

Be certain that the instructor approves the procedure and checks this box.

☐ Instructor Approved

Using the procedure, test the operation of the components in the circuits that have malfunctioning power door lock switches. Record observations in the following space. If necessary, include the recommended steps to service any problems.

4. Service faulty circuits that have malfunctioning power door lock switches. ____

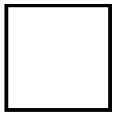
a. Using a service manual or other information source, locate a schematic for servicing faulty circuits that have malfunctioning power door lock switches.

Be certain that the instructor approves the procedure and checks this box.

☐ Instructor Approved

b. Using a service manual or other information source, locate a procedure for servicing faulty circuits that have malfunctioning power door lock switches. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure.

Be certain that the instructor approves the procedure and checks this box.



Instructor Approved

Using the procedure, service faulty circuits that have malfunctioning power door lock switches.

5. Test the circuits for proper operation. Record observations in the following space. _____

Average of the above evaluations _____

This average is a partial evaluation for Competency I2. The final evaluation for I2 is at the end of JS7-L1-UX.

JS5-L1-UX

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

EVALUATION

TEST AND SERVICE THE REMOTE KEYLESS ENTRY SYSTEM

Equipment:

Hand tools
Ohmmeter
Protective eyewear
Test light
Voltmeter

NOTE: This job sheet can be performed on an ATech 832/832F Horn/Alarm Trainer.

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Identify malfunctioning remote keyless entry system circuits. Check the switches and relays in the circuits. Record observations in the following space. _____

3. Test the operation of the components in the circuits that have malfunctioning remote keyless entry system switches or relays. _____

   a. Using a service manual or other information source, locate a schematic for testing the operation of the components in the circuits that have malfunctioning remote keyless entry system switches or relays.

   Be certain that the instructor approves the procedure and checks this box.

   ☐ Instructor Approved

b. Using a service manual or other information source, locate a procedure for testing the operation of the components in the circuits that have malfunctioning remote keyless entry system switches or relays. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure.

Be certain that the instructor approves the procedure and checks this box.

☐ Instructor Approved

Using the procedure, test the operation of the components in the circuits that have malfunctioning remote keyless entry system switches or relays. Record observations in the following space. If necessary, include the recommended steps to service any problems.

4. Service faulty circuits that have malfunctioning remote keyless entry system switches or relays. ____

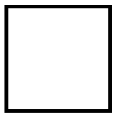
a. Using a service manual or other information source, locate a schematic for servicing faulty circuits that have malfunctioning remote keyless entry system switches or relays.

Be certain that the instructor approves the procedure and checks this box.

☐ Instructor Approved

b. Using a service manual or other information source, locate a procedure for servicing faulty circuits that have malfunctioning remote keyless entry system switches or relays. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure.

Be certain that the instructor approves the procedure and checks this box.



Instructor Approved

Using the procedure, service faulty circuits that have malfunctioning remote keyless entry system switches or relays.

5. Test the circuits for proper operation. Record observations in the following space. _____

Average of the above evaluations _____

This average is a partial evaluation for Competency I2. The final evaluation for I2 is at the end of JS7-L1-UX.

JS6-L1-UX

TEST AND SERVICE THE CRUISE CONTROL SYSTEM

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

EVALUATION

Equipment:

Hand tools
Ohmmeter
Protective eyewear
Test light
Voltmeter

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Identify malfunctioning cruise control system circuits. Check the switches and relays in the circuits. Record observations in the following space. _____

3. Test the operation of the components in the circuits that have malfunctioning cruise control system switches or relays. _____

   a. Using a service manual or other information source, locate a schematic for testing the operation of the components in the circuits that have malfunctioning cruise control system switches or relays.

   Be certain that the instructor approves the procedure and checks this box.

   ☐ Instructor Approved

b. Using a service manual or other information source, locate a procedure for testing the operation of the components in the circuits that have malfunctioning cruise control system switches or relays. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure.

Be certain that the instructor approves the procedure and checks this box.

☐ Instructor Approved

Using the procedure, test the operation of the components in the circuits that have malfunctioning cruise control system switches or relays. Record observations in the following space. If necessary, include the recommended steps to service any problems.

4. Service faulty circuits that have malfunctioning cruise control system switches or relays. ____

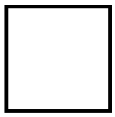
a. Using a service manual or other information source, locate a schematic for servicing faulty circuits that have malfunctioning cruise control system switches or relays.

Be certain that the instructor approves the procedure and checks this box.

☐ Instructor Approved

b. Using a service manual or other information source, locate a procedure for servicing faulty circuits that have malfunctioning cruise control system switches or relays. Make sure the procedure is appropriate for the make and model of the vehicle. Have the instructor check the following box to indicate approval of the procedure.

Be certain that the instructor approves the procedure and checks this box.



Instructor Approved

Using the procedure, service faulty circuits that have malfunctioning cruise control system switches or relays.

5. Test the circuits for proper operation. Record observations in the following space. _____

Average of the above evaluations _____

This average is a partial evaluation for Competency I2. The final evaluation for I2 is at the end of JS7-L1-UX.

JS7-L1-UX

TEST AND SERVICE THE RADIO

NAME(S):

DATE:

MODEL OF CAR:

MAKE OF CAR:

YEAR OF CAR:

VIN:

EVALUATION

Equipment:

Hand tools
Ohmmeter
Protective eyewear
Test light
Voltmeter

NOTE: This job sheet can be performed on an ATech 870/870F Audio System.

Procedure:

1. Wear protective eyewear while performing the procedures on this job sheet. _____

2. Test for voltage in the circuit that supplies current to the radio using a test light. Use the proper service manual to locate the fuse. Record observations in the following space. If necessary, include the recommended steps to reinstate current flow. _____

3. Test the speakers for defects. _____

   a. Connect an ohmmeter to the speaker. Observe the reading. Compare the reading to the proper specification. Record observations in the following space.

b. Connect one lead of the ohmmeter to one speaker terminal and the other to the case. Record observations in the following space.

c. Touch a 9-volt battery to both ends of the speaker to perform a sound check. The speaker should make a crackling sound. Record observations in the following space.

d. Recommend steps to correct any problems with the speakers.

4. Check the radio antenna. ____

a. Unplug the antenna from the back of the radio.

b. Use an ohmmeter to test the items on the following chart. Complete one of the following charts.

NOTE: Test only one design.

Design: Fender Mount			
Circuits	**Specification**	**OK**	**Not OK**
Masting to Center Casing	Low		
Center Terminal to Casing	High		
Casing to Mast	High		
Mast to Ground	High		
Center Terminal to Ground	High		
Casing to Ground	Low		

Design: Built into Windshield			
Circuits	**Specification**	**OK**	**Not OK**
Casing to Center Terminal	High		
Casing to Ground	High		
Center Terminal to Ground	High		

If necessary, recommend steps to service any problems with the radio antenna.

Average of the above evaluations _____

This average is a partial evaluation for Competency I2. The final evaluation for I2 follows.

FINAL EVALUATION INSTRUCTIONS

I. Determine the student's final evaluation for Competency I2 by averaging the evaluations of JS1-L1-UIX, JS2-L1-UIX, JS3-L1-UIX, JS1-L2-UIX, JS2-L2-UIX, JS3-L2-UIX, JS4-L2-UIX, JS5-L2-UIX, JS6-L2-UIX, JS7-L2-UIX, JS1-L3-UIX, JS2-L3-UIX, JS1-L1-UX, JS2-L1-UX, JS3-L1-UX, JS4-L1-UX, JS5-L1-UX, JS6-L1-UX, and JS7-L1-UX.

JS1-L1-UIX	____
JS2-L1-UIX	____
JS3-L1-UIX	____
JS1-L2-UIX	____
JS2-L2-UIX	____
JS3-L2-UIX	____
JS4-L2-UIX	____
JS5-L2-UIX	____
JS6-L2-UIX	____
JS7-L2-UIX	____
JS1-L3-UIX	____
JS2-L3-UIX	____
JS1-L1-UX	____
JS2-L1-UX	____
JS3-L1-UX	____
JS4-L1-UX	____
JS5-L1-UX	____
JS6-L1-UX	____
JS7-L1-UX	____
Final evaluation for Competency I2	____