Who We Are

The SCRTTC is comprised of public transportation agencies and academic members located in Southern California. The Consortium has been granted the 501(C)(3) “not for profit” status under the Internal Revenue Service code.

Board consist of twenty-one (21) members including twelve (12) transit members, five (5) college members, one (1) association, and three (3) private industry partners. The membership of the Board serves two-year terms in accordance with our bylaws. Subsequent membership will be governed by the organizational bylaws.

The SCRTTC currently has five operating committees reporting to the Board: (1) Finance and Budget Committee, (2) Governmental Relations Committee, (3) Administration Committee, (4) Educational Services Committee and (5) Ditch Golf Classic Committee. Sub committees may be formed as needed.

What is our Mission?

Advance the skills of our transit workforce...preparing for the future.

Strategic Goals

- Training Effectiveness
- Leadership Sustainability (Organizational Effectiveness)
- Membership Management (Organizational Effectiveness)
- Partnerships (Organizational Effectiveness)
- Communication and Outreach (Organizational Effectiveness)
- Financial Health (Organizational Effectiveness)
- Expansion Analysis (Organizational Effectiveness)

Providing Solutions for Solving Training Needs

- Improving the quality of training for the entire workforce
- Increasing the efficiency and effectiveness of training while reducing redundancy
- Optimizing educational resources
- Developing funding resources to maximize the use of taxpayers’ dollars
- Providing training needs assessments and analysis
- Maintaining an inventory of available resources and courses
- Delivering state-of-the-art training
- Building training capacity for public transit
- Developing standards for transit vehicle repairs
## Contents

<table>
<thead>
<tr>
<th>Track 1</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1-DVOM/ITS Tech SC-DV-2700-I</td>
<td>5</td>
</tr>
<tr>
<td>E1-Electric I for Transit SC-EL-1600-I</td>
<td>7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Track 2 - General</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1-Brakes I for Transit SC-BR-1300-I</td>
<td>8</td>
</tr>
<tr>
<td>B2-Brakes II for Transit SC-BR-1300-II</td>
<td>9</td>
</tr>
<tr>
<td>E2-Electrical II for Transit SC-EL-1600-II</td>
<td>10</td>
</tr>
<tr>
<td>E3-Electrical III for Transit SC-EL-1600-III</td>
<td>11</td>
</tr>
<tr>
<td>E4-Electrical IV for Transit SC-EL-1600-IV</td>
<td>12</td>
</tr>
<tr>
<td>E5-Electrical V for Transit SC-EL-1600-V</td>
<td>13</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Track 3 - Advanced</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1-HVAC I SC-HV-3000-I</td>
<td>19</td>
</tr>
<tr>
<td>H2-HVAC II SC-HV-3000-II</td>
<td>20</td>
</tr>
<tr>
<td>HY1 Hybrid Safety &amp; Familiarization SC-HY-4000-I</td>
<td>21</td>
</tr>
<tr>
<td>HY2 Hybrid Advanced Familiarization &amp; Operations SC-HY-4010-I</td>
<td>22</td>
</tr>
<tr>
<td>HY3 Hybrid PM SC-HY-4020-I</td>
<td>23</td>
</tr>
<tr>
<td>HY4 Hybrid Advanced Diagnostics SC-HY-4030-I</td>
<td>24</td>
</tr>
<tr>
<td>HY5 Hybrid Ford Engine Operations SC-HY-4040-I</td>
<td>25</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Track 4 - Vehicle/Special</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNG Transit Vehicle Safety SC-CG-4100-I</td>
<td>26</td>
</tr>
<tr>
<td>CNG Transit Vehicle Safety Training - SC-CG-4111-X</td>
<td>27</td>
</tr>
<tr>
<td>Leadership-Transition to Supervisor SC-LD-8800-I</td>
<td>29</td>
</tr>
<tr>
<td>Leadership In-class/Distance Learning SC-eLD-8801-DE-I</td>
<td>31</td>
</tr>
<tr>
<td>OSHA Basic Safety Course SC-OS-9999-I</td>
<td>33</td>
</tr>
<tr>
<td>Introduction and Troubleshooting Zero Emission Propulsion (ZEPS) SC-ZE-4400-1</td>
<td>35</td>
</tr>
<tr>
<td>EV Transit Bus Safety Awareness and Familiarization SC-BEV-5000-I</td>
<td>36</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Track 5 - Distance Based Technical Courses</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>eDigital Volt-Ohm Meter (DVOM) and ITS SC-eDV-2700-DE-I</td>
<td>38</td>
</tr>
<tr>
<td>eCummins INSITE™ Diagnostic Software SC-eEN-1712-DE-I</td>
<td>40</td>
</tr>
<tr>
<td>eElectrical System Diagnosis for Transit SC-eEL-1600-DE-I</td>
<td>42</td>
</tr>
<tr>
<td>eCNG Transit Vehicle Safety SC-eCG-4100-DE-I</td>
<td>44</td>
</tr>
<tr>
<td>Introduction to HVAC for Transit-Blended Course SC-eHV-3000-DE-I</td>
<td>45</td>
</tr>
<tr>
<td>eEV Transit Bus Safety Awareness and Familiarization SC-eBEV-5000-DE-I</td>
<td>46</td>
</tr>
</tbody>
</table>
Rules & Requirements

Thank you for your interest in transit training provided by the SCRTTC. To ensure a safe, positive and collaborative learning environment for all of our students and trainers, please read the following important rules and requirements that apply to each and every SCRTTC training course opportunity. There are NO exceptions.

For all In-Class/On-Site training, proper safety gear, vests, clothing and safety shoes must be worn at all times (NO shorts, tank tops, etc.). Failure to wear the proper safety equipment and/or clothing will result in a non-refundable cancellation and you will be immediately dismissed from the class. Safety is a critical concern in all transit environments, so we cannot make exceptions if someone fails to arrive for class prepared and dressed properly.

Cancellations must be received 48 hours prior to the class start time, otherwise the course fee will be charged in full. Substitutions are allowed.

To register for any SCRTTC course, you are required to create a free SCRTTC.com account. Why? Because we need to track those who access our training in order to provide reports to funding agencies and sources. Your name and/or information will absolutely not be shared beyond the reporting and tracking purposes of the SCRTTC.

If you are employed by an SCRTTC member transit agency or academic organization, your training director (or similar) will register you for your chosen course(s) utilizing an SCRTTC Member Access Code. Without this code, you will be asked to pay for the cost of the course via PayPal to complete your registration. Please contact your training director or facilitator to register properly as an SCRTTC member.

The SCRTTC reserves the right to refuse training to any person if the person is not properly clothed, in possession of all required safety gear and equipment, or is disruptive to the learning environment in any way. Those refused training with cause shall be charged the full course fee.

Should you have any questions regarding the rules and requirements of SCRTTC training, please contact the SCRTTC Training Director.
Track 1

D1-DVOM/ITS Tech SC-DV-2700-I

Digital Volt Ohm Meters for ITS Diagnosis and Repair in Transit

Prerequisites: Personal experience with Volt Ohm Meter Desired

Course Description: The class is designed to improve technicians’ understanding of basic DVOM functions. Students will be working with a Digital Volt Ohm Meter (DVOM) to learn its safe usage. Students are encouraged to bring their own meters for comparison. Course includes both lecture and lab experiences.

Course Benefits: The benefit of this course is designed to expose the students to all capabilities of the DVOM. Students will gain knowledge about the functions of the various DVOM screens using their own meters as an example. Fluke meters are emphasized as a base, with other meters including specialty meters such as the fluke 1587, which is capable of safely testing the High Voltages in the Electric and Hybrid Vehicle System.

What You Will Learn:

- Use of the functions of the DVOM
- Proper hookup of the DVOM for each function
- Interpreting basic DVOM digital displays
- Voltage measurements
- Resistance measurements
- Amperage measurements
- Frequency measurements
- Min/Max, diode and other special functions
- Identifying open and short circuits

Equipment Requirements:

- Classroom with computer/projector
- PowerPoint presentation
- Student workbook for each technician
- Master included with instructor's set includes PowerPoint and lab exercises

Fluke meters are emphasized as a base, with other meters including specialty meters such as the fluke 1587 which is capable of safely testing the High Voltages in the Hybrid Vehicle System (one for every two techs minimum with techs encouraged to bring their own).

Demonstration pieces for each DVOM mode (ie: resistors, TPS, knock sensors or frequency modulator, AC & DC voltage sources rectifier bridge/diodes. Jumper wires and simple circuits to practice voltage drop, amperage and short/open circuit examples—can use vehicle if available).

Multi-meter Course Outline:

- Introductions
- Instructor
- Technicians
- SCRTTC

Intelligent Transportation Systems:

- Introduction to ITS
- ITS uses
- Typical ITS systems
- ITS reliability
- DMM diagnostics
Integration of Intelligent Transportation Systems:

- Communication Systems
- Data systems
- Vehicle operating systems
- Maintenance management systems

History:

- Federal legislation

Implementation of Intelligent Transportation Systems:

- Transit agencies
- Other transportation agencies
- Typical Intelligent Transportation Systems
- Communication systems
- Data systems
- Vehicle operating systems
- Maintenance management systems

Smart Bus:

- Integrated multi-function computer and communication systems
- Computer aided dispatch
- CAD/AVL system
- Computerized vehicle performance data
- Enhanced traffic signal maintenance priority
- Other
- Multi-Meter Functions in General

Specific Meter Functions:

- Auto Ranging
- Test leads
- Analog bar graph
- Touch hold
- Frequency function
- Duty cycle function
- Min/max function
- Diode test function
- Voltage
- Voltage drop
- Ohms test function
- Amperage test function
- Open circuits
- Short circuit
- Temperature testing

Course Times: 7:00am - 3:30pm each day. (SUBJECT TO CHANGE - CHECK REGISTRATION)

Number of Hours/Days: 16 Hours over 2 Days

Continuing Education Units (CEU): 0
E1-Electric I for Transit SC-EL-1600-I

Electrical System Diagnosis for Transit

Prerequisites: DVOM Course (preferred), or thorough understanding of meters or an equivalent experience.

Course Description: Designed to improve basic electrical skills and circuit diagnosis, students will work with a Digital Volt Ohm Meter (DVOM) in real circuit conditions. The class is a combination of lecture and lab that will prepare students for advanced electrical circuits, schematic reading and circuit troubleshooting.

Course Benefits: This course is specifically designed to prepare students for advanced electrical circuits, schematic reading and circuit troubleshooting. Students will gain knowledge about series and parallel circuit construction, and voltage drop techniques and problem solving skills needed for proper diagnosis and repair of alternatively fueled vehicles.

What you will learn: Each course day is defined by the following relevant learning topics.

Day 1
- Safety
- Refresh activities
- Schematic symbols
- General overview of schematics
- Voltage drop
- Amperage/current
- Resistance/ohms
- Basic circuits

Day 2
- Series circuits
- Parallel circuits
- Series parallel circuits
- Relays
- Resistors
- Solenoids
- Frequency/duty cycle
- Temp sensors/coolant
- Ignition components

Course Times: 7:00am - 3:30pm each day. (SUBJECT TO CHANGE – CHECK REGISTRATION)

Number of Hours/Days: 16 hours over 2 days

Continuing Education Units (CEU): 0
Track 2 - General

B1-Brakes I for Transit SC-BR-1300-I

Basic Transit Brake Systems & Troubleshooting - Foundation Brakes

Prerequisites: None.

Course Description: The course covers primarily Foundation Brake Systems. The course covers at the introductory level theory (physics), inspection and maintenance, trouble shooting and repair as well as guided hands on exercises to reinforce learning outcomes.

Course Benefits: This course is designed such that successful course completers will be capable to apply the principles of repair and basic troubleshooting of Transit Foundation Brake Systems in the workplace. The course focuses on the most commonly performed maintenance and trouble-shooting work on W Series Transit S-cam brakes. Additionally, students will be able to complete an S-cam brake reline in accordance with the APTA foundation brake reline procedures authored by the American Public Transportation Association (APTA) Brake force Committee.

What You Will Learn:

- Braking Theory (Physics)
- How the W-series foundation brake operates
- Foundation Brake system inspection and maintenance including brake adjustment
- Foundation Brake system trouble shooting and repair
- APTA foundation brake reline procedure authored by the American Public Transportation Association (APTA) Brake Committee.

Course Times: 7:00am - 3:30pm each day. (SUBJECT TO CHANGE – CHECK REGISTRATION)

Number of Hours/Days: 16 hours over 2 days

Continuing Education Units (CEU): 0
B2-Brakes II for Transit SC-BR-1300-II

Brake Systems for Transit II - Air System Training

Prerequisites: Brakes for Transit I - SC-BR-1300-I (preferred).

Course Description: This course covers the principles of operation, construction, trouble-shooting and repair of transit bus air brake and accessory systems. Preventive maintenance procedures as well as legal requirements for transit bus brake systems are also covered.

Course Benefits: Transit bus technicians will receive comprehensive operation and repair training of pneumatic brake and accessory systems. The course will cover the supply and control side of transit air systems. Upon completion of this course, the technician will have a solid understanding of how an air system works as well as hands-on experience in trouble-shooting techniques and repair procedures of air brake system.

What You Will Learn:

- Physics
- FMVSS 121, CVSA, CVC, Title 49 FCR, and Title 13 COR requirements
- Air System layout and design
- Air line color codes
- Fitting Identification
- Pneumatic schematics
- Supply system operation
- Supply system components
- Control system operation
- Control system components
- Service, parking brake, and accessory systems
- Component failure diagnosis and repair procedures

Course Times: 7:00am - 3:30pm each day. (SUBJECT TO CHANGE – CHECK REGISTRATION)

Number of Hours/Days: 16 hours over 2 days

Continuing Education Units (CEU): 0
E2-Electrical II for Transit SC-EL-1600-II

Advanced Electrical Systems on Transit

**Prerequisites:** DVOM Course (preferred) or thorough understanding of meters or an equivalent experience. Electrical I course completion or an equivalent experience.

**Course Description:** The class is designed to improve technicians’ electrical skills and circuit diagnosis on Computerized Engine Management Systems for alternate fueled vehicles. Students will be working with a Digital Volt Ohm Meter (DVOM) in real circuit conditions. A modern technician needs a thorough understanding of Advanced Electrical Systems to properly maintain an alternate fueled vehicle. Course includes both lecture and lab experiences.

**Course Benefits:** The benefit of this course is designed to provide real world lab experiences for advanced electrical circuits, symbol understanding, schematic reading and circuit troubleshooting. Students will gain knowledge about circuit construction, voltage drop techniques and problem solving skills needed for computer controlled circuits.

**Who Should Attend:** This course is intended for supervisors and technicians who need intermediate electrical knowledge as well as an introduction to electronics for alternate fueled vehicles.

**What you will learn:** Each course day is defined by the following relevant learning topics.

**Day 1**
- Safety
- Review
- Batteries and charging
- Wiring schematics
- Circuit controls
- Relays
- Transistors
- Pressure sensors

**Day 2**
- Speed sensors
- Temp sensors
- General overview of schematics
- Engine communications
- Bus control systems
- Problem solving with schematics

**Course Times:** 7:00am - 3:30pm each day. (SUBJECT TO CHANGE – CHECK REGISTRATION)

**Number of Hours/Days:** 16 Hours over 2 days

**Continuing Education Units (CEU):** 0
E3-Electrical III for Transit SC-EL-1600-III

Network Communication—Introduction to PLC and Data Networks

Prerequisites: Course prerequisites include proficiency in SC-EL-1600-I and SC-EL-1600-II.

Course Description: This course is the next in the series of SCRTTC electrical courses dealing with the complexity of the harness and computer functions in the modern chassis. Upon completion of this course, the student should have an understanding of the interface wiring harnesses and their relationship to electrical components on the bus.

Course Benefits: This course provides knowledge of the complete integrated operation system of the engine, transmission, body controls, and ABS braking systems. Practice using the instrument panel and other communication operating protocols.

Who Should Attend: This course is intended for the supervisor or technician who needs an overview of the operation of vehicle communication networks and diagnostic procedure.

What You Will Learn: An appreciation for the complexity of harness functions in modern chassis, a complete understanding of the interface wiring harness and diagnostic practice on current multiplex systems.

Day 1
- **Review**
  - Introduction to Network Communication
  - Basic Multiplexing, Computer Function
  - Sensors and Processing
  - Logic Circuits and Gates
  - Output circuits and Drivers
  - SAE J1587, slow speed communication on electronically managed systems
  - SAE J1708, serial communications hardware compatibility used in 6 pin Deutsch connectors
  - SAE J1939, current heavy duty data bus that uses CAN 2 architecture used in the 9 pin Deutsch connector on the backbone network.
  - On the Bus Activities-Deutsch Connector Tests, Network Engine Data
  - OBD I

Day 2
- Introduction to PLC
- Allen Bradley
- DINEX
- Vansco
- On the Bus Activity- Multiplex Diagnosis
- Wiring Repair
- Correct terminal extraction procedures
- Terminal identification
- Terminal replacement
- Micro-Pac, Weather-Pac

Course Times: 7:00am - 3:30pm each day. (SUBJECT TO CHANGE – CHECK REGISTRATION)

Number of Days: 16 Hours over 2 days

Continuing Education Units (CEU): 0
E4-Electrical IV for Transit SC-EL-1600-IV

PLC/IO Systems Diagnostics

Prerequisites: Course prerequisites include proficiency in SC-EL-1600-I, SC-EL-1600-II and SC-EL-1600-III; Technicians attending this course must have experience troubleshooting PLC/IO systems such as: DINEX, Vansco, and Allen-Bradley.

Course Description: This course is designed to give technicians advanced troubleshooting techniques. The course covers: IO Ladder Logic, Using Diagnostic Lights, Module Programming, and Component Replacement. J1939 Communication Protocol, Testing, and Gateways are explained. This course features lab activities, which demonstrate hands-on how to perform diagnosis and repairs of IO systems on an actual transit bus.

Course Benefits: This course is intended for the technician who has an understanding of PLC/IO systems and needs to develop advance diagnostic and repair techniques to troubleshoot these systems.

What You Will Learn: Upon completion of this course, the student will have a complete understanding of the PLC/IO Systems and the correct method of troubleshooting. Course includes both lecture and lab exercises.

Who Should Attend: Supervisors and technicians who need knowledge of advanced troubleshooting.

Day One

- Pre-Test
- DINEX IO
  - Component Review
  - Exercise 1 – MFD
  - Using the Diagnostic Light
  - Exercise 1- DVOM and the Multimeter
  - Exercise 3 – No Start Ladder Logic
  - Communication Network
- Vansco
  - Component Review
  - Using the Diagnostic Lights
  - exercise 4 – module addressing
  - exercise 6 – No Start Ladder Logic
  - Communication Network
  - Exercise 5- Testing J1939

Day Two

- Allen-Bradley
  - Component Review
  - Using the Diagnostic Lights
  - exercise 7 – No Start Ladder Logic
  - Communication Network
- Final Review and Test

Course Times: 7:00am - 3:30pm each day. (SUBJECT TO CHANGE – CHECK REGISTRATION)

Number of Days: 16 Hours over 2 days

Continuing Education Units (CEU): 0
E5-Electrical V for Transit SC-EL-1600-V

Network Systems Electronics Diagnosis and Repair

Prerequisites: Course prerequisites include proficiency in SC-EL-1600-I, SC-EL-1600-II, SC-EL-1600-III and SC-EL-1600-IV. Technicians attending this course must have Allen Bradley / Dinex / Vansco protocol experience.

Course Description: This course integrates the complex system operation of three of the major suppliers of communication systems with various communication operating protocols of transit vehicle's alternatively fueled computerized engine management system. This course features the most intense lab activities due to the complexity of the J1587 / J1708 / J1939 reporting and sensing functions in the modern transit vehicle. This course is intended for the individual who has completed the previous four modules and has experience in the proper wiring harness repair techniques following symbols and manufactures schematics. Upon completion of this course, the student will have a complete understanding of the communication data backbone of alternatively fueled computerized engine management systems. This lab series is designed to help the technician simplify diagnostic processes and procedures in the workplace.

Who Should Attend: This course is intended for the supervisor, technician who needs an overview of alternatively fueled computerized engine management system's basic diagnosis.

What You Will Learn:

Day 1

- Serial data communication and operation of Computerized Engine Management systems
- Networking systems overviews
- Common failures
- SAE J1939, current heavy duty data bus that uses CAN 2 architecture used in network communications.
- High speed switching language
- “FUZZY LOGIC” language
- Ladder Logic language

Day 2

- There are a series of hands on diagnostic labs accompanying this course. Technicians should attend prepared to work on a live chassis.

Course Times: 7:00am - 3:30pm each day.
(SUBJECT TO CHANGE - CHECK REGISTRATION)

Number of Hours/Days: 16 Hours over 2 Days

Continuing Education Units (CEU): 0
EG1-Engines 8.3 C+ Basic SC-EN-1700-I

Cummins 8.3L Basic Computerized Engine Management Systems

Prerequisites: Familiarity with Multi-meters and Electrical I.

Course Description: This course is designed to give technicians the entry level skills needed to diagnose and repair the Cummins 8.3L CNG fuel system. The course covers sensors, actuators, pin-out voltage values and real world diagnostic applications. This course is essential for those seeking to learn more about fuel and timing delivery strategies employed by manufacturers. To gain a thorough understanding, upon completion of this course students should enroll into level II.

Course Benefits: The benefit of this course is designed to prepare the students to understand the electronic and safety aspects of working on Natural Gas fuel systems as used on the Cummins 8.3L engine. This class is a must for new technicians and those who are involved with diagnosis and repair of engine management and fuel delivery systems. Students will learn the proper and safe methods of working with the high pressure CNG fuel systems using the laptop diagnostic software specific to the Cummins controllers.

Who Should Attend: This course is intended for entry level technicians or those seeking to improve their knowledge on computerized engine management systems.

What You Will Learn:

- Unique characteristics of Natural Gas as an Alternative Fuel
- A basic understanding of the Theory of operation
- A basic understanding of the operation and diagnostic procedures of the 8.3 ignition system, fuel system, boost system and their components
- A basic understanding of sensor values
- A basic understanding of pin-out voltages
- A basic understanding of testing techniques
- A basic understanding of 8.3 actuator operational characteristics
- A basic understanding of 8.3 ignition system
- Introduction to Cummins “Insite” software

Course Times: 7:00am - 3:30pm (SUBJECT TO CHANGE - CHECK REGISTRATION).

Number of Hours/Days: 24 Hours over 3 days

Continuing Education Units (CEU): 0
EG2-Engines 8.3 C+ Adv SC-EN-1701-I

Cummins 8.3L Advanced Computerized Engine Management Systems

Prerequisites: Familiarity with Multi-meters and Electrical I and Cummins 8.3L Basic Computerized Engine Management Systems.

Course Description: This course is designed to provide technicians the advanced skills needed to diagnose and repair the Cummins 8.3L CNG fuel system. The course covers sensors, actuators, pin-out voltage values, ignition system, Cummins software “Insite” program and advanced diagnostic routines. This course is essential for those seeking to continue their education in diagnostic process and repair functions. Upon completion of this course, students should be able to successfully diagnose and repair the Cummins 8.3L fuel injection system.

Course Benefits: The benefit of this course is designed to prepare the students to understand the advanced electronic and safety aspects of working on Natural Gas fuel systems as used on the Cummins 8.3L engine. This class is a must for technicians and those who are involved with advanced diagnosis and repair of engine management and fuel delivery systems. Students will learn the proper and safe methods of working with the high pressure CNG fuel systems using the laptop diagnostic software specific to the Cummins controllers.

Who Should Attend: This course is intended for technicians seeking to improve their knowledge on Cummins computerized engine management systems.

What You Will Learn:

- Unique characteristics of Natural Gas as an Alternative Fuel
- An improved knowledge of the operation and diagnostic procedures of the 8.3 ignition system, fuel system, boost system and their components
- Improved knowledge of 8.3L sensor values
- Improved knowledge pin-out voltages
- Improved knowledge diagnostic techniques including actuator and ignition system diagnostics
- Knowledge of waveform analysis
- Lab activities related to the Cummins “Insite” software

Course Times: 7:00am - 3:30pm (SUBJECT TO CHANGE - CHECK REGISTRATION).

Number of Hours/Days: 24 Hours over 3 days

Continuing Education Units (CEU): 0
EG3-Engines 8.9 Basic - Level I - SC-EN-1710-I

Cummins ISL-G Engine Management System Level I

Prerequisites: Familiarity with Multi-meters, Electrical I or 8.3L courses.

Course Description: This course is designed to give technicians the hands-on skills needed to diagnose and repair the 8.9L Cummins ISL-G CNG fuel system. The course covers sensors, actuators, pin-out voltage values and real world diagnostic applications using Cummins Electronic Service Tools.

Course Benefits: Students receive a wealth of experience working on the system and understanding where everything is located and how it works. This class is a must for technicians involved with diagnosis and repair of CNG engine management and fuel delivery systems. Students will learn the proper and safe methods of working with the high pressure CNG fuel systems using DVOMs and the laptop diagnostic software specific to the Cummins controllers. Reference Material installed on technician-provided USB drive upon completion of levels I & II.

What You Will Learn: By the end of this course the student will be able to

- Define Mass Air Flow Fuel Management Systems
- Identify locate and test the following parameters with a DVOM
  - Temperature Sensors
  - Pressure Sensors
  - Position Sensors
  - Voltage Producing Sensors
  - Mass Gas & Air Flow Sensors
- Use INSITE to verify parameters

Course Times: 7:00am - 3:30pm each day. (SUBJECT TO CHANGE – CHECK REGISTRATION)

Number of Days: 16 Hours over 2 days

Continuing Education Units (CEU): 0
EG4 Engines 8.9 Advanced - Level II SC-EN-1711-I

Cummins ISL-G Engine Management System Level II

Prerequisites: Level I & INSITE is our recommended sequence.

Course Description: This is an expansion of the lessons learned in the Level I and INSITE courses to further the technician’s understanding of diagnostic procedures. Technicians are given training in the hands on skills needed to diagnose and repair the 8.9L Cummins ISL-G CNG fuel system. The 105 PID’s for the many sensors & actuators are covered with an emphasis on known values and real world diagnostic applications using Cummins Electronic Service Tools.

Course Benefits: Students will learn the proper and safe methods of working with the high pressure CNG fuel systems using the laptop diagnostic software specific to the Cummins controllers. This class is a must for technicians involved with diagnosis and repair of CNG engine management and fuel delivery systems. The latest in information regarding known good readings, common failures, and technical service bulletins is included. Technicians are encouraged to bring a USB memory drive to obtain the reference materials provided to each tech upon completion of Levels I & II.

What You Will Learn: By the end of this course the student will be able to:

Diagnose faults using INSITE for:

- Ignition Systems
- Temperature Sensors
- Pressure Sensors
- Position Sensors
- Voltage Producing Sensors
- Mass Gas & Air Flow Sensors
- Use INSITE to verify parameters

Course Times: 7:00 am - 3:30 pm (SUBJECT TO CHANGE - CHECK REGISTRATION)

Number of Days: 16 Hours over 2 days

Continuing Education Units (CEU): 0
EG5 Engines Cummins Insite SC-EN-1712-I

Cummins INSITE Diagnostic Software

**Prerequisites:** ISL G or 8.3L course recommended. Recommended Sequence is ISL G level I, INSITE, and ISL G Level II.

**Course Description:** This course is designed to give technicians the hands on skills needed to utilize INSITE, the Cummins Electronic Service Tool. We will be using the 8.9L Cummins ISL-G CNG fuel system for reference and the topics learned will be utilized extensively in the ISL G level II class.

**Course Benefits:** Students receive a wealth of experience working with INSITE and learning the intricacies of this diagnostic software. This class is a must for technicians involved with diagnosis and repair of Cummins engine management and fuel delivery systems regardless of the platform engine. Reference Materials are installed on a technician-provided USB drive upon completion of the course. This material (a PDF version of the program) allows techs to search an index and re-visit topics as needs arise.

**What You Will Learn:** By the end of this course the student will be able to use INSITE to:

- Select, add and connect proper adapters to a bus
- Access, custom group, and verify parameters
- Access, define, research, and clear fault codes
- Produce snapshots, data logging, and Graphing
- Look up engine derate, enabling criteria and other troubleshooting technique information
- Navigate the Electronic service tools for Cummins

**Course Times:** 7:00 am - 3:30 pm (SUBJECT TO CHANGE - CHECK REGISTRATION)

**Number of Days:** 8 Hours in 1 Day

**Continuing Education Units (CEU):** 0
Track 3 - Advanced

H1-HVAC I SC-HV-3000-I

Introduction to HVAC for Transit

Prerequisites: DVOM (preferred) or thorough understanding of meters and meter testing or equivalent experience.

Course Description: This course is designed to introduce the technician to the air conditioning systems used on transit vehicles. The class will concentrate on building a strong foundation in the theory of operation of air conditioning systems that will enable the technician to successfully deal with changing systems and refrigerants. The student will identify the system components and functions used in air conditioning systems. Integrated into this course are the components used on transit specific applications. The student will be working with the tools of air conditioning service such as, Manifold Gauge Sets, P/T Charts, and Pressure/Temperature Measurement. Safety will be emphasized. Basic compressor clutch circuits and electrical testing will be covered. An introduction into Gauge Diagnosis will also be presented to help prepare the student for the service and diagnostic procedures in course HVAC-II.

Course Benefits: The benefit of this course is for the technician to understand the air conditioning system components and function. Trouble shooting and diagnosis require a thorough understanding of this foundation. The technician would also be able to safely use the basic tools of air conditioning service. Students will gain knowledge about the need for the correct refrigerants and oil for the diverse air conditioning systems.

What You Will Learn: The need for EPA 608, 609, ASE technician certification.

- Safety Concerns on Air Conditioning
- Introduction to A/C Tools: Manifold Gauge Sets, Leak Testing, etc.
- Heat, Temperature, Pressure
- Refrigerants and Oils
- A/C Basic Circuit Flow and Function
- Transit Specific A/C Components
- Basic Clutch Circuit and Electrical Testing
- Transit Systems Overview
- Fundamentals of Gauge Diagnosis

Course Times: 7:00 am - 3:30 pm (SUBJECT TO CHANGE- CHECK REGISTRATION)

Number of Hours/Days: 16 Hours over 2 Days

Continuing Education Units (CEU): 0
H2-HVAC II SC-HV-3000-II

HVAC II – Servicing HVAC Systems for Transit

Prerequisites: HVAC I and a thorough understanding of transit air conditioning components and flow; knowledge of meters and meter testing or equivalent experience.

Course Description: This course is designed to prepare technicians to service the air conditioning systems used on transit vehicles. Instruction will concentrate on safely performing the service procedures needed to maintain these systems. Through the use of demonstration and practice, the course will enable technicians to successfully deal with changing systems and refrigerants. Integrated into the course is a review of components used on transit specific applications. Students will work with the tools and equipment used for transit air conditioning service, such as Micron Gauges, Vacuum Pumps, and Recovery Machines. Safety will be emphasized.

Course Benefits: The benefit of this course is for the technician to be able to safely and correctly perform service and preventative maintenance procedures on transit bus air conditioning systems. Trouble shooting and diagnosis require a thorough understanding of these procedures. Students will gain knowledge about the need for the correct tools and properly functioning equipment for the diverse air conditioning systems. The technician would also be able to safely use the special tools and equipment required for air conditioning service.

What you will learn:

- How to safely maintain transit air conditioning systems
- How to successfully deal with changing systems and refrigerants
- Understanding of components used on transit specific applications
- Use of Micron Gauges, Vacuum Pumps and Recovery Machines

Course Times: 7:00am - 3:30pm each day. (SUBJECT TO CHANGE – CHECK REGISTRATION)

Number of Hours/Days: 16 hours over 2 days

Continuing Education Units (CEU): 0
HY1 Hybrid Safety & Familiation SC-HY-4000-I

Introduction to Safety and Basic Familiarization

**Prerequisites:** This class requires technicians to have previous mechanical shop experience, preferably in a bus facility performing maintenance and repair.

**Course Description:** This class is designed to educate the technicians on necessary safety practices, personal protective equipment, and procedures when working on a high voltage transit vehicle in a shop environment. The program will identify proper steam cleaning procedures, roof access procedures, and gasoline safety procedures. An overview of the Elfa 1 and Elfa 2 ISE hybrid system will be described and shown, while on the bus. The students will perform voltage tests and measurements with a CAT 111 voltmeter on the bus components to confirm the system is safe to work on.

**Course Benefits:** This course is designed to teach safe working conditions and practices, when servicing the ISE Gasoline Electric Hybrid system. The students will understand the basic operation of the ISE hybrid system and its components.

**What You Will Learn:**

**Day 1**

- General Safety
- High Voltage Safety
- Personal Protection Equipment
- Roof Access safety and equipment
- Hybrid Operational Overview
- Elf1 and Elfa 2 Cooling systems
- Ultra Capacitor Overview

**Day 2**

- Taking Voltage Measurements
- Identifying Hybrid Components
- UCAP Fans & Filter Servicing
- Working on the Hybrid bus rooftop
- Bus control systems
- Steam Cleaning Procedures

**Course Times:** 7:00am - 3:30pm each day (SUBJECT TO CHANGE- CHECK REGISTRATION)

**Number of Hours/Days:** 16 Hours over 2 Days

**Continuing Education Units (CEU):** 0
HY2 Hybrid Advanced Familiarization & Operations SC-HY-4010-I

Hybrid Buses Advanced Familiarization & Operations Training

Prerequisites: The students must demonstrate the use of DVOM. The candidates must have completed Introduction to Safety and Basic Familiarization Part 1 (Hybrid Safety Course SC-HY-4000-I) prior to enrolling in this program.

Course Description: This class is designed to reinforce safety and safety practices when working on or around a high voltage transit bus. The technicians will learn about the each Hybrid component in detail and operation. The Elfa 1 and Elfa 2 systems will be detailed and coolant flow diagrams will be introduced and explained. Rooftop system components will be shown and explained in detail. Servicing the UCAP pack and the inspection of the fire apparatus will be performed. The control modules EVCU, DICO, RDU, and the CAN system will be explained. The diagnostic laptop will be connected to the system and test operations performed.

Course Benefits: This course is designed to provide more detail into how the hybrid system components work and interacts with other hybrid components. The Elfa 1 and Elfa 2 cooling systems will be demonstrated and detailed in operation and appearance. The students will be able to connect a laptop computer along with the interfaces for performing service function to various system components.

What You Will Learn:

Day 1
- Safety Overview
- Review Part 1
- Hybrid component detail
- Hybrid Cooling system details
- Hybrid Cooling System Flow Charts
- Can System Layout & Operation
- Software Introduction

Day 2
- Rooftop UCAP Fans & Servicing
- Elfa 1 & Elfa 2 Cooling System Servicing
- Hybrid System Component Identification & Inspection
- Laptop Connection & Operation
- Bus control systems
- Basic Software Operation

Course Times: 7:00am - 3:30pm each day (SUBJECT TO CHANGE - CHECK REGISTRATION)

Number of Hours/Days: 16 Hours over 2 Days

Continuing Education Units (CEU): 0
HY3 Hybrid PM SC-HY-4020-I
Preventative Maintenance Part 3 - ISE Gasoline Hybrid Electric Drive System

Prerequisites: Students must have attended Part 1 & 2 of the SCRTTC Gasoline Hybrid Electric Drive Programs. Students attending these classes must have previous experience working on the ISE Hybrid Electric Drive System.

Course Description: This class is designed to teach the students the correct preventative maintenance practices and procedures in servicing the ISE Gasoline Hybrid Electric Drive System. The students will perform basic servicing procedures, e.g. engine and power train services and procedures; cooling system inspections, servicing, and maintenance; high voltage components inspections, and hybrid component maintenance. Service tips, service time limits, and recommendations will be explained and shown.

Course Benefits: This course is designed to provide real world shop experiences for technicians, and maintenance personnel involved with servicing and performing general maintenance to the ISE Gasoline Hybrid Electric Drive Systems. Specialty tools will be shown and demonstrated.

What You Will Learn:

Day 1
- Safety Overview
- Review of components
- Run in Maintenance
- Daily Preventive Maintenance
- Daily Operational Inspections
- Scheduled Maintenance
- Tools & Procedures

Day 2
- On the bus maintenance procedures
- Using maintenance tools
- Performing engine maintenance
- Performing power train maintenance
- Performing high voltage maintenance
- Performing cooling system maintenance
- Using the laptop computer for maintenance

Course Times: 7:00am - 3:30pm each day (SUBJECT TO CHANGE - CHECK REGISTRATION)

Number of Hours/Days: 16 Hours over 2 Days

Continuing Education Units (CEU): 0
HY4 Hybrid Advanced Diagnostics SC-HY-4030-I

Advanced Diagnostics

Prerequisites: The students must have attended Part 1, 2 & 3 of the SCRTTC ISE Gasoline Hybrid Drive System programs. The students must have basic computer skills, and the ability to use advanced DOS and Windows bases programs. It is recommended to have had previous experience, using the CRT and Siadis computer programs prior to entering this course.

Course Description: This class is designed to improve the technicians’ diagnostic skills, using the laptop computer, the CRT and Siadis software programs. The software will diagnose at a high level the health and condition of the components under test and in question of failure. The class will be introduced to the OBD2 Scan Tool for engine diagnostics.

Course Benefits: This course is designed to provide training at a high level in regards to complicated situations on high voltage components. This program will enable students to save data that can be used to forward to the manufactures or make high level decisions on very expensive components. The OBD2 Scan tool will show how to read the engine DTCs and live data information.

What You Will Learn:

Day 1
- Safety Overview
- Review of computer equipment & interfaces
- Troubleshooting Guides
- Siemens Coding
- CRT Operation & Coding
- Siadis Operation & Coding
- OBD2 Scan Tool & Operation

Day 2
- On the bus using CRT software
- On the bus using Siadis software
- On the bus using the OBD2 Scan Tool
- Using software for testing components
- Reading software error faults
- Interpreting error faults

Course Times: 7:00am - 3:30pm each day (SUBJECT TO CHANGE - CHECK REGISTRATION)

Number of Hours/Days: 16 Hours over 2 Days

Continuing Education Units (CEU): 0
HY5 Hybrid Ford Engine Operations SC-HY-4040-I

Hybrid Buses Ford Engine

Prerequisites: Hybrid Safety Course SC-HY-4000-I, SC-HY-4010-I or equal Course Description.

Course Description: This course will provide students with an advanced understanding of the Gasoline Hybrid Ford Engine Maintenance and Systems. For safety reasons, we strongly discourage any attempt by untrained personnel to operate a bus equipped with the TB42-HG hybrid drive system.

Who Should Attend: This course is designed for all technicians and supervisors responsible for ISE Gasoline Hybrid vehicles who have completed the prerequisite course SC-HY-4000-I Safety and Familiarization.

Course Times: 7:00am - 3:30pm each day. (SUBJECT TO CHANGE - CHECK REGISTRATION)

Number of Hours/Days: 16 Hours over 2 Days

Continuing Education Units (CEU): 0
Track 4 - Vehicle/Special

CNG Transit Vehicle Safety SC-CG-4100-I

CNG Transit Vehicle Safety Training

**Prerequisites:** None. Some familiarity with CNG coaches encouraged.

**Course Description:** The class is designed to familiarize technicians with safe practices when working with CNG fueled vehicles. Fuel, pressure systems, and repair safety practices and regulations are covered.

**Course Benefits:** The benefit of this course is designed to prepare the students to understand the safety aspects of working on a Compressed Natural Gas (CNG) transit coach. This class is a must for new technicians and those who are involved with diagnosis and repair of engine management and fuel delivery systems. Students will learn the proper and safe methods of working with the high pressures involved on these coaches.

**What You Will Learn:**

- Basic fuel characteristics regarding flammability
- Basic fuel characteristics regarding pressure
- Basic pressure system design
- Safety related pressure system components
- Basic cylinder care & damage
- Proper depressurization techniques
- Pressure system component servicing
- High pressure fitting servicing
- Leak detection techniques

**Course Times:** 7:00am - 3:30pm (SUBJECT TO CHANGE - CHECK REGISTRATION)

**Number of Hours/Days:** 8 Hours in 1 Day

**Continuing Education Units (CEU):** 0
CNG Transit Vehicle Safety Training - SC-CG-4111-X

Prerequisites: There is no requirement for formal training to become a certified CNG Fuel System Inspector. Candidates can obtain experience and knowledge to take the exam through:

- Participation in an instructor-led training course consisting of practical performance and academics and/or;
- Knowledge of industry codes and standards, government regulation and industry practices and/or;
- Cylinder manufacturer training specific to the manufacturer’s product and/or;
- On the job training

Course Description: The CNG Fuel System Inspector certification tests each candidate’s knowledge to ensure the candidate possesses the knowledge and skills of the CNG fuel system inspector known as the minimally qualified candidate (MQC) defined as follows and can perform CNG fuel system inspector activities without assistance, including:

- A qualified inspector will inspect for and document damage or other problems and recommend proper action to assure fuel system safety.
- Knowledge of the types of containers used in CNG Vehicle Fuel Systems and damage allowances for each type
- Understanding of inspection requirements, tests and procedures
- The container manufacturer’s current inspection guidelines readily available

Course Benefits: The CNG Fuel System Inspector Certification was developed to meet the needs of fleets of all sizes that use safe, cleaner-burning natural gas to power their vehicles. CNG cylinders and fuel systems must be visually inspected for external damage and deterioration after a motor vehicle fire or accident and at least every 36 months or 36,000 miles, or at the time of any reinstallation.

The inspection is to be performed by a qualified inspector in accordance with the manufacturer’s recommendations and the inspection procedures provided in Compressed Gas Association (CGA) pamphlet C-6.4. A CNG Vehicle Fuel System inspector inspects containers, valves, PRDs and other fuel system components, applying appropriate knowledge and skill to assure the safety of compressed natural gas powered vehicles. CSA Group’s CNG Vehicle Fuel System Inspector program addresses the need to ensure the competency of the persons conducting periodic, visual inspections of CNG fuel systems including cylinders used for on-vehicle fuel storage.
CNG Transit Vehicle Safety Training - SC-CG-4111-X

CSA Group’s CNG Fuel System inspector certification is designed to certify that an individual will have demonstrated proficiency in inspecting compressed natural gas vehicle fuel systems, identifying and documenting defects, and the safe handling and cleaning of fuel system components, enabling them to perform assigned tasks safely, and possesses the body of knowledge recommended by Federal Motor Vehicle Safety Standard (49CFR571.304) and the “NGV2 Standard for CNG Cylinder Containers.” CNG Fuel System Inspector Certification offers consistent assessment of an individual’s proficiency in the area of CNG fuel system inspection and provides formal recognition of an inspector’s knowledge and understanding.

The program helps to reinforce the need for candidates to be adequately trained and then tested to levels of competence set by a committee of acknowledged experts. Procedures are also in place to periodically re-assess certified inspectors to ensure they remain up to date on technical developments and industry changes.

Vehicle owners also benefit because the program develops a pool of certified inspectors from whom they can confidently obtain the recommended system inspections.

Course Times: 7:00am - 3:30pm (SUBJECT TO CHANGE - CHECK REGISTRATION)

Number of Hours/Days: 16 hours over 2 days

Continuing Education Units (CEU): 0
Leadership-Transition to Supervisor SC-LD-8800-I

Leadership Series: Leadership Transition

Prerequisites: None.

Course Description: Management is the process of designing and maintaining a work environment in which employees, working in groups, accomplish the goals of the organization with the least amount of time, resources and personal dissatisfaction. In other words, management is focused on increasing the productivity of an organization.

Productivity is based on creating an organization that is both effective and efficient. Being effective means the organization accomplishes its objectives while being efficient means that the organization achieves the results with the least amount of consumed resources.

There are many different methods to increase productivity but Peter F. Drucker summarized it by stating: “The greatest opportunity for increasing productivity is surely to be found in knowledge, work itself, and especially in management.”

This course focuses on the major functions of management. These functions are considered the management process and include:

- Leading
- Planning
- Organizing
- Controlling
- Staffing

What You Will Learn: This course covers the basic skills required of a manager to effectively execute the various functions. A planning tool is included at the close of the seminar for participants to assess their management skills and to develop a plan for improving these skills. At the conclusion of the course, participants will be able to:

- Demonstrate the basic leadership skills required of a manager
- Coordinate the activities of employees, work groups and committees
- Identify leadership responsibilities
- Plan departmental goals and assist employees in goal planning
- Organize jobs to improve operational performance
- Develop plans for improving their operations
- Properly utilize information for planning and controlling operations
- Utilize proper budgeting as a control device
- Standardize work to improve operational control
- Identify future staffing requirements and develop plans for meeting these requirements
- Develop a plan for improving basic management skills
Leadership—Transition to Supervisor SC-LD-8800-I

Course Outline:

Introduction

- Overview of the seminar
- Learning objectives
- Sequence of the seminar
- Management Foundations

Introduction

- Leading
- Planning
- Organizing
- Controlling
- Staffing
- Skill practice
- Summary and Close

Follow-up planning

- Management skills development plan
- Management skills assessment

Course Times: 7:00am - 3:30pm each day (SUBJECT TO CHANGE - CHECK REGISTRATION)

Number of Hours/Days: 16 Hours over 2 Days

Continuing Education Units (CEU): 0
Leadership In-class/Distance Learning SC-eLD-8801-DE-I

Leadership/Management Training - On-Line Series

Prerequisites: Practical experience in a managerial position for a minimum of two years.

Course Description: Management is the process of designing and maintaining a work environment in which employees, working in groups, accomplish the goals of the organization with the least amount of time, resources and personal dissatisfaction. In other words, management is focused on increasing the productivity of an organization. Productivity is based on creating an organization that is both effective and efficient. Being effective means the organization accomplishes primary objectives, while being efficient means that the organization achieves the results with the least amount of consumed resources.

There are many different methods to increase productivity, but Peter F. Drucker summarized it by stating, “The greatest opportunity for increasing productivity is surely to be found in knowledge, work itself, and especially in management.”

This course focuses on the major functions that make-up the management process, including:

- Leading
- Planning
- Organizing
- Controlling
- Staffing

Course Benefits: Leadership and managerial skills learned in this course will provide a strong foundation for a lifetime of managerial excellence.

What You Will Learn: Upon conclusion of this course, students should be able to:

- Define the fundamental principles of good project management.
- Describe the general management skills and role played by the project manager as they relate to ITS projects.
- Explain the steps taken to plan, design and implement ITS projects.
- Describe the phases of projects (definition, planning, design, & execution) and the project management techniques relevant to each phase.
- Follow leads to additional project management resource information.

Learning Objectives: This course covers the basic skills required of a manager to effectively execute the various functions. A planning tool is included at the close of the seminar for participants to assess their management skills and to develop a plan for improving these skills. Successful course participants will also be able to:

- Demonstrate the basic leadership skills required of a manager
- Coordinate the activities of employees, work groups and committees
- Identify leadership responsibilities
- Plan departmental goals and assist employees in goal planning
- Organize jobs to improve operational performance
- Develop plans for improving their operations
- Properly utilize information for planning and controlling operations
- Utilize proper budgeting as a control device
- Standardize work to improve operational control
- Identify future staffing requirements and develop plans for meeting these requirements
- Develop a plan for improving basic management skills
Leadership In-class/Distance Learning SC-eLD-8801-DE-I

Course Outline:

Introduction
- Overview of the seminar
- Learning objectives
- Sequence of the seminar
- Management Foundations

Introduction
- Leading
- Planning
- Organizing
- Controlling
- Staffing
- Skill practice
- Summary and Close

Follow-up planning
- Management skills development plan
- Management skills assessment
OSHA Basic Safety Course SC-OS-9999-I

Prerequisites: None

Course Description: OSHA recommends workplace safety training for a safe and healthful work environment, specifically for hazard avoidance on the job site. This course includes OSHA 10-hour Construction training and covers specific OSHA regulations and requirements as they apply to the Construction Industry.

Course Benefits: Workers who successfully complete OSHA 10-Hour training will earn their OSHA Education Center 10-Hour Card. The course is intended as an orientation to OSHA safety training standards and covers safety and health hazards workers may face on construction work sites. Specifically, this training places special emphasis on hazard identification, avoidance, control, and prevention.

What You Will Learn: Most workers in the Transportation Industry, Construction, Building Maintenance, and other related fields will need to take hazard recognition training. This will ensure that workers are able to identify, predict, prevent, and stop potential hazards in the workplace. The goal is to make sure that all workers have access to high quality workplace safety training and education. This OSHA course was developed to be convenient, effective, and accommodating for all who take the course.

Day 1
- General Housekeeping Rules
- Overall Topics, Agenda and Objectives
- Intro to OSHA
- Focus Four Hazards
- Fall Hazards
- Electrical Hazards
- Struck-By Hazards
- Caught-In/Between Hazards
- Summary and Final Question

Day 2
- Review of Day One
- Health Hazards
- Personal Protection (PPE)
- Hand & Power Tools
- Stairways and Ladders
- Hazard Communication & GHS
- Summary and Final Questions
- Final Test

Course Times: 8:00am - 4:00pm each day (SUBJECT TO CHANGE - CHECK REGISTRATION)

Number of Hours/Days: 16 Hours over 2 Days

Continuing Education Units (CEU): 0
Clean Energy (Nasdaq: CLNE) is the largest provider of natural gas fuel for transportation in North America and a global leader in the expanding natural gas vehicle fueling market.

We have operations in compressed natural gas (CNG) and liquefied natural gas (LNG) vehicle fueling; construction and operation of natural gas fueling stations; compressor equipment and technology; biomethane production; and vehicle conversion.

Clean Energy fuels over 530 fleet customers and 25,000 vehicles daily at more than 273 strategic locations across the country with a broad customer base in the refuse, transit, trucking, shuttle, taxi, airport and municipal fleet markets.

We are building America’s Natural Gas Highway™, a network of LNG truck fueling stations connecting major freight trucking corridors across the country for coast-to-coast and border-to-border natural gas truck fueling.

Complete Coach Works offers a vast array of solutions for your transportation needs. For over 25 years, Complete Coach Works (CCW) has offered a vast array of solutions for their customer’s transportation needs.

Whether the need is for collision repair, a complete interior rehab, converting a fleet to alternative fuels, or a completely remanufactured vehicle, CCW has the necessary experience to provide the transit industry a one stop shop.

CCW’s team of experts can comply with today’s demanding new standards, from drive train upgrades that meet today’s stringent emission standards to ADA complaint accessibility, GPS systems for Automated Vehicle Location systems to full multiplexing PLC based systems.
Introduction and Troubleshooting Zero Emission Propulsion (ZEPS)  
SC-ZE-4400-1

**Prerequisites:** This class requires technicians to have previous mechanical shop experience, preferably in a bus facility performing maintenance and repair.

**Course Description:** This 16-hour course will orient participants to bus electrical systems and their safe operation. Participants will learn essential aspects of the high-voltage drive system and low-voltage accessories system, including safety protection, and safe operation. It also includes information about the high-voltage and chassis grounds. The course is instructor-led and presented through classroom, on-vehicle activities, and on-the-job training demonstrations and exercises.

**Course Benefits:** This course is designed to teach safe working conditions and practices, when servicing buses equipped with the ZEPS system. The students will understand the basic operation of the ZEPS system, its components and basic troubleshooting.

**Who Should Attend:**

**What You Will Learn:** By the end of this course the student will be able to:

**Day 1**
- Introduction
- Electrical Safety
- Vehicle Systems Overview
- First Responder Training

**Day 2**
- Review and Q&A
- Vehicle Maintenance and Operation
- Vehicle Maintenance

**Course Times:** 7:00am – 3:30pm each day (Subject To Change- Check Registration)

**Number of Hours/Days:** 16 Hours over 2 Days

**Continuing Education Units (CEU):** 0
**EV Transit Bus Safety Awareness and Familiarization SC-BEV-5000-I**

**Prerequisites:** DVOM Course (preferred) or thorough understanding of meters or equivalent experience.

**Course Description:** This course will provide a general understanding of safety do's and don'ts when working around all-electric high voltage (HV) transit vehicles. This course is not intended as a replacement for manufacture specific training and does not qualify the student to diagnose, repair, and work on HV vehicles.

**Course Benefits:** Students will become familiar with all-electric high voltage (HV) transit vehicles to include high voltage electrical systems and their safe operation. Students will learn essential aspects of the high-voltage drive system including safety protection and safe operation.

**Who Should Attend:** Transit agency technicians/mechanics who need to familiarize themselves with all-electric high voltage (HV) transit vehicles.

**What you will learn:** By the end of this course the student will be able to:

- Identify the vehicles high-voltage components
- Explain the required Personal Protective Equipment (PPE)
- Describe the preparations prior to working on or near any high-voltage systems
- Explain the vehicle safety systems
- Identify HV Components and cables in an EV transit bus
- Understand the definitions, terminology, and units of measure, of electrical energy storage and consumption

**Course Times:** In-class 8am to 4pm (SUBJECT TO CHANGE – CHECK REGISTRATION)

**Number of Hours/Days:** 16 hours in-class for 2-day instructor facilitated training.

**Continuing Education Units (CEU):** 0
EV Transit Bus Safety Awareness and Familiarization
Course Outline

1) Similarities & Differences of Transit Bus Equipment
   a) Similar Components in both transit bus systems
      a. Braking Systems
      b. Air Suspension System
      c. Interior and Exterior Lighting, Exterior Mirrors
      d. Cooling System Operation
      e. Door System
      f. Low Voltage
      g. Multiplexer (MUX) & CAN (Controller Area Network)
      h. Grounding
   b) Different Bus Components with HV Systems
      i. Heating unit - electrically powered
      j. A/C compressor
      k. Air Compressor
      l. Power steering unit
      m. Electrical wheel hub drive motor
      n. Regenerative braking

2) High Voltage System Overview
   a) HV Components
   b) HV Power Distribution
   c) Regenerative Braking
   d) HV Defrosters
   e) Contactor Box (High Voltage distribution)
   f) On-Board Chargers (VtoG or Inverters)
   g) HV Battery

3) Safety and Personal Protective Equipment (PPE)
   a) Safety Precautions
   b) Understanding NFPA 70E
   c) Lock out Tag out
   d) HV Power down
   e) HVIL - High Voltage Interlock Loop
   f) Rooftop Access Safety
   g) Appropriate PPE and Tools
   h) High Voltage Safety Equipment

4) Units of Energy – Differences between fuel and electrical energy
   a) Energy Units of Measure
   b) Energy Equivalent

5) Facility Considerations for EV transit vehicles
   a) Fluid change
   b) Oil change
   c) Charging Equipment Systems
      a. J1772 CCS Type 1
      b. Overhead charging (Proterra buses)
Track 5 - Distance Based Technical Courses

eDigital Volt-Ohm Meter (DVOM) and ITS SC-eDV-2700-DE-I

Prerequisites: Personal Experience with Digital Volt-Ohm Meter Desired

Course Description: The Digital Volt-Ohm Meter (DVOM) and ITS self-paced distance learning course is designed to improve technicians’ understanding of basic DVOM functions. Students will be working with a virtual DVOM to learn its safe usage and best practices. Course includes both knowledge topics and knowledge activities. Reference Material will be provided as Resources.

Course Benefits: Students will be exposed to the most commonly used capabilities of the DVOM. Students will gain knowledge about the functions and usage of the DVOM using the virtual meter in a controlled environment.

Who Should Attend: TBD by Supervisor

What You Will Learn: By the end of this course the student will be able to:

- Use the functions of the DVOM
- Properly hookup the DVOM for each function
- Interpret basic DVOM digital displays
- Perform voltage measurements
- Perform current measurements
- Perform resistance measurements
- Identify open circuits and high resistance
- Understand Min/Max, diode and other special functions

Course Times: Self-paced and self-directed (SUBJECT TO CHANGE – CHECK REGISTRATION)
Number of Hours/Days: 16 Hours over 4-week period
Continuing Education Units (CEU): 0
Register Online Today: www.scrttc.com

LMS Access Requirements

How to access your course for the first time? Everyone will be issued an SCRTTC LMS User Account. Instructions on how to log in, access the course and completion requirements will be emailed to each Student.

If you have any issues, please contact your training facilitator.
eDigital Volt-Ohm Meter (DVOM) and ITS Course Outline

1) Introduction
   a) Course Overview

2) ITS Overview
   a) ITS Introduction
   b) Federal Legislation
   c) ITS Agencies

3) ITS Implementation
   a) ITS Uses
   b) ITS Advantages
   c) Typical ITS
   d) ITS Reliability

4) ITS Subsystems
   a) Subsystems
   b) Communication Systems
   c) Data Systems
   d) Mobile Data Terminals
   e) Vehicle Operating Systems
   f) Maintenance Management Systems

5) Smart Bus
   a) ATMS
   b) Integrated Systems
   c) Automatic Vehicle Locator
   d) AVL Interconnectivity
   e) Computer-Aided Dispatch
   f) Computerized Vehicle Performance Data
   g) Traffic Signal Priority Systems
   h) Passenger Counting Announcement Systems
   i) Surveillance Systems

6) ITS Summary
   a) Summary

7) Introduction
   a) DVOM Introduction

8) DVOM Overview
   a) Multimeters
   b) Advantages
   c) Layout

9) Meter Functions
   a) Input Terminals
   b) Rotary Switch
   c) Pushbuttons
   d) Display
   e) Auto Range
   f) Over-Limit Measurement
   g) Multipliers

10) Safety
    a) DVOM Safety
    b) Current Safety
    c) DVOM Care and Maintenance
    d) Electrostatic Discharge (ESD)

11) Voltage
    a) Meter Settings
    b) Voltage Types
    c) Source Voltage
    d) Available Voltage
    e) Voltage Drops
    f) Converting Voltage Values
    g - i) Knowledge Activity

12) Amps
    a) Meter Settings
    b) Measuring Current
    c) Parasitic Draw
    d) Inductive Current Probe
    e) Converting Amperage Values
    f) Knowledge Activity

13) Ohms
    a) Meter Settings
    b) Resistance Measurements
    c) How to Read Resistors
    d) Converting Resistance Values
    e - h) Knowledge Activity

14) Circuit Diagnosis
    a) Types of Faults
    b) Open Circuits
    c) Short Circuits
    d) High Resistance
    e - f) Knowledge Activity

15) Other DVOM Functions
    a) Introduction
    b) Diodes
    c) Forward and Reverse Bias
    d) Frequency
    e) Duty Cycle
    f) Min/Max
    g) Temperature
    h - i) Knowledge Activity

16) Test Lights and Probes
    a) Test Lights and Probes
    b) How to Connect a Test Light
    c) Piercing Probes

17) Conclusion
Prerequisites: ISL G or 8.3L course recommended. Recommended Sequence is ISL G level I, INSITE™, ISL G Level II

Course Description: This self-paced distance learning course is designed to give technicians the knowledge needed to utilize the Cummins INSITE™ Electronic Service Tool. We will be using Quick Reference Cards and software demonstration videos for reference and the topics learned will be utilized extensively in the ISL G level II class. Reference Material will be provided as Resources.

Course Benefits: Students will receive extensive fundamental knowledge in working with INSITE™ and learning the intricacies of this diagnostic software. This class is a must for technicians involved with diagnosis and repair of Cummins engine management and fuel delivery systems regardless of the platform engine.

Who Should Attend: Those who have previously attended Cummins 8.9 Level I

What You Will Learn: By the end of this course the student will be able to use INSITE™ to:

- Select, add and connect proper adapters to an ECM
- Create custom groups and verify parameters
- Access, define, research, and clear fault codes
- Produce snapshots, data logging, and Graphing
- Look up engine derate, enabling criteria and other troubleshooting technique information
- Navigate the Electronic service tools for Cummins

Course Times: Self-paced and self-directed. (SUBJECT TO CHANGE – CHECK REGISTRATION)

Number of Hours/ Days: 8 Hours over 2-week period
Continuing Education Units (CEU): 0

Register Online Today: www.scrttc.com

LMS Access Requirements

How to access your course for the first time? Everyone will be issued an SCRTTC LMS User Account. Instructions on how to log in, access the course and completion requirements will be emailed to each Student.

If you have any issues, please contact your training facilitator.
eCummins INSITE™ Diagnostic Software Course Outline

1) **Course Introduction**
   a) Course Navigation
   b) Welcome
   c) What is INSITE?
   d) What INSITE Provides
   e) Functionality and Access
   f) Launching INSITE

2) **Navigation**
   a) INSITE Workspace

3) **Connect to ECM**
   a) Introduction
   b) Connections Demonstration

4) **Fault Codes**
   a) Introduction
   b) Fault Code Window
   c) Fault Code Window
   d) Snapshot Demonstration
   e) Clearing Fault Codes Demonstration
   f) Fault Diagnostics Demonstration
   g) Troubleshooting
   h) Troubleshooting Demonstration
   i) QuickServe Online
   j) Knowledge Check
   k) Knowledge Check
   l) Knowledge Check
   m) Knowledge Activity
   n) Knowledge Activity
   o) Knowledge Activity

5) **Data Monitor and Logger**
   a) Introduction
   b) Parameters Demonstration
   c) Creating a Custom Group Demonstration
   d) Tool Bar
   e) Logging Data Demonstration
   f) Graphical Monitoring
   g) Graphical Monitoring Demonstration
   h) Knowledge Check
   i) Knowledge Check
   j) Knowledge Check
   k) Knowledge Activity
   l) Knowledge Activity

6) **ECM Diagnostic Tests**
   a) Diagnostics Wizard
   b) Diagnostics Wizard Demonstration

7) **Advanced ECM Data**
   a) Special Features
   b) Monitoring Maps Demonstration
   c) Knowledge Check
   d) Knowledge Check

8) **Features and Parameters**
   a) Hidden Features
   b) Hidden Features Demonstration
   c) Knowledge Check

9) **Other INSITE Functions**
   a) ECM Calibration
   b) Work Orders
   c) Work Orders Demonstration
   d) Trip Information
   e) Trip Information Demonstration
   f) Audit Trail
   g) Inquire Data Extraction
   h) Knowledge Check
   i) Knowledge Check
   j) Knowledge Check
   k) Knowledge Check
   l) Knowledge Activity
   m) Knowledge Activity
   n) Knowledge Activity
   o) Knowledge Activity

10) **Connections**
    a) Connecting to a Simulator
    b) Connecting to a Simulator
    c) Adding an Adapter Demonstration
    d) Adding a Simulator Demonstration
    e) Locating Adaptors or Simulators
    f) Simulator Mode
    g) Removing an Adapter or Simulator Demonstration
    h) Removing an Adapter or Simulator
    i) Knowledge Check
    j) Knowledge Check

11) **Cummins Adapters and Connectors**
    a) Cummins Adapters
    b) Cummins Adapters
    c) Cummins Adapters
    d) Connectors
    e) Connectors
    f) Knowledge Check

12) **Conclusion**
    a) Course Completion
Prerequisites: DVOM Course (preferred) or thorough understanding of meters or equivalent experience

Course Description: This blended course offering is designed to improve a technician’s basic electrical skills and circuit diagnosis. Students will work with a Digital Volt-Ohm Meter (DVOM) in actual circuit conditions as well as in virtual simulated conditions. Students must bring their DVOM meters to class. The class is a combination of online self-paced instruction and in-class face-to-face instruction. Reference Material will be provided as Resources.

Course Benefits: The benefit of this course is to prepare students for advanced electrical circuits, schematics reading, and circuit troubleshooting. Students will gain knowledge about series and parallel circuit construction, voltage drop techniques, and problem-solving skills needed for proper diagnosis and repair of alternatively fueled vehicles.

Who Should Attend: Those who have taken eDVOM or as determined by Supervisor.

What You Will Learn: By the end of this course the student will be able to:

<table>
<thead>
<tr>
<th>ONLINE</th>
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<tbody>
<tr>
<td>Schematic symbols: Relays: Cooling System</td>
</tr>
<tr>
<td>Wiring Diagrams: Variable Resistors: Temp Sensors</td>
</tr>
<tr>
<td>Overview: Circuit Types: Solenoids: Ignition Systems</td>
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</tbody>
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<table>
<thead>
<tr>
<th>IN-CLASS</th>
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<tbody>
<tr>
<td>Safety: Series Circuit: Activities &amp; Virtual Simulations</td>
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<tr>
<td>Series - Parallel Circuit: Activities &amp; Virtual Simulations</td>
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Course Times: Online Self-paced and self-directed. In-class 8am to 4pm. (SUBJECT TO CHANGE – CHECK REGISTRATION).

Number of Hours/Days: 8 hours online over a 3 week period and 8 hours in-class for 1-day instructor facilitated training.

Continuing Education Units (CEU): 0

LMS Access Requirements

How to access your course for the first time? Everyone will be issued an SCRTTC LMS User Account. Instructions on how to log in, access the course and completion requirements will be emailed to each Student.

If you have any issues, please contact your training facilitator. Register Online at: www.scrttc.com.
eCNG Transit Vehicle Safety
SC-eCG-4100-DE-I

Prerequisites: None. Some familiarity with CNG coaches encouraged.

Course Description: This self-paced distance learning course is designed to familiarize technicians with safe practices while working with CNG fueled vehicles. Fuel, pressure systems, and repair safety practices and regulations are covered. Reference Material will be provided as Resources.

Course Benefits: Technicians will benefit from the material in this course by gaining a better understanding of the characteristics and safety aspects when working with Compressed Natural Gas (CNG) fuel systems along with basic CNG safety practices and facility concerns.

Who Should Attend: New technicians needing a basic understanding and familiarization of CNG Systems and fuel delivery systems.

What you will learn: By the end of this course the student will better understand:

- Fuel characteristics regarding pressure and flammability
- Fueling procedures and requirements
- CNG Pressure system design
- Safety related pressure system components
- Proper depressurization techniques
- Leak detection techniques
- Basic cylinder care & damage identification
- CNG maintenance facility basic safety concerns

Course Times: Self-paced and self-directed. (SUBJECT TO CHANGE – CHECK REGISTRATION)

Number of Hours/Days: 8 Hours over 4-week period.

Continuing Education Units (CEU): 0

LMS Access Requirements

How to access your course for the first time? Everyone will be issued an SCRTTC LMS User Account. Instructions on how to log in, access the course and completion requirements will be emailed to each Student.

If you have any issues, please contact your training facilitator. Register Online at: www.scrttc.com.
CNG Transit Vehicle Safety Course Outline
1) Course Introduction
   a) Course Navigation
   b) Description
   c) Objectives
   d) Disclaimer
   e) Warnings and Cautions
   f) Notes

2) Fuel Characteristics
   a) CNG / LNG vs. LPG
   b) Characteristics of Natural Gas
   c) Operating Pressures and Safety
   d) Energy Content of Alternative Fuels
   e) Composition of Natural Gas
   f) System and Ignition Temperature
   g) Temperature vs. Pressure
   h) Knowledge Review
   i) Knowledge Review
   j) Knowledge Review

3) Facility Considerations
   a) CNG Facility Considerations
   b) Knowledge Review

4) Operational Theory
   a) Naturally Aspirated Carbureted CNG Systems
   b) Fumigated Pilot Ignition LNG/CNG Systems (Westport)
   c) CNG Injection Systems ISL-G
   d) Cummins Mass Gas/Airflow System
   e) CNG Injection Systems
   f) Knowledge Review
   g) Knowledge Review

5) Major Components
   a) CNG Delivery Systems
   b) Fill Valve
   c) Coalescent Filter
   d) One-Way Check Valve
   e) Fuel Storage Cylinders
   f) Cylinder Types
   g) Cylinder Type 1
   h) Cylinder Type 2
   i) Cylinder Type 3
   j) Cylinder Type 4
   k) CNG High Pressure Cylinders
   l) CNG Temperature Compensation
   m) Physical Properties of Cylinder
   n) Cylinder Shut-Off Valve
   o) CNG Excessive Flow Valve
   p) Pressure Relief Device (PRD)
   q) Manual Shut-Off Valve (Quarter Turn)
   r) Stainless Steel Fuel Lines
   s) Pressure Regulators
   t) Shut-Off Valves (Lock-Offs)
   u) Fuel Introduced into Intake Air Stream
   v) Cylinder Mounting Brackets
   w) Isolators
   x) Knowledge Activity
   y) Knowledge Activity
   z) Knowledge Activity
   aa) Knowledge Review

6) Cylinder Care & Damage Prevention
   a) CNG Cylinders & Installation
   b) Cylinder Mounting
   c) CNG Cylinder Handling
   d) Cylinder Damage Prevention
   e) Classification of Damage Levels
   f) Classification of Damage Levels (Level 1)
   g) Classification of Damage Levels (Level 2)
   h) Classification of Damage Levels (Level 3)
   i) Cylinder Damage Prevention
   j) Conditions Requiring Inspections
   k) Inspection Outcomes
   l) Knowledge Review
   m) Knowledge Review
   n) Knowledge Review

7) Depressurization Techniques
   a) CNG Cylinder Defueling: Four Methods
   b) CNG Cylinder Defueling
   c) Defueling Vent Stack
   d) Knowledge Review

8) System Component Servicing
   a) System Component Servicing
   b) Leak Detection Fluid
   c) Electronic Leak Detectors
   d) Knowledge Review
   e) Knowledge Review
   f) Knowledge Review

9) High-Pressure Fitting Servicing
   a) High-Pressure Fitting Servicing
   b) Knowledge Review

10) Conclusion
    a) Course Completion
Introduction to HVAC for Transit-Blended Course SC-eHV-3000-DE-I

Prerequisites: DVOM Course (preferred) or thorough understanding of meters or equivalent experience

Course Description: This blended course offering is designed to introduce the technician to the air conditioning systems used on transit vehicles. The online course will concentrate on building a strong foundation in the theory of operation of air conditioning systems. This foundation will enable the technician to successfully deal with changing systems and refrigerants. The student will identify the system components and functions used in air conditioning systems. Integrated into this course are the components used on transit specific applications. In class, the student will be working with the tools of air conditioning service such as, Manifold Gauge Sets, P/T Charts, and Pressure/Temperature Measurement. Safety will be emphasized. Basic compressor clutch circuits and electrical testing will be covered. An introduction into Gauge Diagnosis will also be presented to help prepare the student for the service and diagnostic procedures in course HVAC-II.

Course Benefits: The benefit of this course is for the technician to understand the air conditioning system components and function. Troubleshooting and diagnosis require a thorough understanding of this foundation. The technician would also be able to safely use the basic tools of air conditioning service. Students will gain knowledge about the need for the correct refrigerants and oil for the diverse air conditioning systems.

Who Should Attend: Those who have taken DVOM/eDVOM or as determined by Supervisor.

What You Will Learn: By the end of this course the student will be able to:
- Understand the requirements of EPA Certification.
- Describe safe Air Conditioning (A/C) service practices.
- Understand how heat moves and the relationship between heat and pressure.
- Select the correct oil for various refrigerants.
- Identify basic A/C components.
- Describe basic A/C functions.
- Demonstrate how to use and operate basic A/C tools.
- Identify common Transit A/C systems in use today.
- Analyze various manifold gauge results and select the correct diagnosis.

Course Times: Online Self-paced and self-directed. In-class 8am to 4pm (SUBJECT TO CHANGE – CHECK REGISTRATION)

Number of Hours/Days: 4 hours online over a 3-week period and 8-hours in-class for 1-day instructor facilitated training.

Continuing Education Units (CEU): 0
eEV Transit Bus Safety Awareness and Familiarization SC-eBEV-5000-DE-I

Prerequisites: DVOM Course (preferred) or thorough understanding of meters or equivalent experience.

Course Description: This course will provide a general understanding of safety do’s and don'ts when working around all-electric high voltage (HV) transit vehicles. This course is not intended as a replacement for manufacture specific training and does not qualify the student to diagnose, repair, and work on HV vehicles.

Course Benefits: Students will become familiar with all-electric high voltage (HV) transit vehicles to include high voltage electrical systems and their safe operation. Students will learn essential aspects of the high-voltage drive system including safety protection and safe operation.

Who Should Attend: Transit agency technicians/mechanics who need to familiarize themselves with all-electric high voltage (HV) transit vehicles.

What you will learn: By the end of this course the student will be able to:

- Identify the vehicles high-voltage components
- Explain the required Personal Protective Equipment (PPE)
- Describe the preparations prior to working on or near any high-voltage systems
- Explain the vehicle safety systems
- Identify HV Components and cables in an EV transit bus
- Understand the definitions, terminology, and units of measure, of electrical energy storage and consumption

Course Times: Self-paced and self-directed.(SUBJECT TO CHANGE – CHECK REGISTRATION)

Number of Hours/Days: 8 hours online over a 3 week period.

Continuing Education Units (CEU): 0

LMS Access Requirements

How to access your course for the first time? Everyone will be issued an SCRTTC LMS User Account. Instructions on how to log in, access the course and completion requirements will be emailed to each Student.

If you have any issues, please contact your training facilitator. Register Online at: www.scrttc.com.
eEV Transit Bus Safety Awareness and Familiarization Course Outline

1) Similarities & Differences of Transit Bus Equipment
   a) Similar Components in both transit bus systems
      a. Braking Systems
      b. Air Suspension System
      c. Interior and Exterior Lighting, Exterior Mirrors
      d. Cooling System Operation
      e. Door System
      f. Low Voltage
      g. Multiplexer (MUX) & CAN (Controller Area Network)
      h. Grounding
   b) Different Bus Components with HV Systems
      i. Heating unit - electrically powered
      j. A/C compressor
      k. Air Compressor
      l. Power steering unit
      m. Electrical wheel hub drive motor
      n. Regenerative braking

2) High Voltage System Overview
   a) HV Components
   b) HV Power Distribution
   c) Regenerative Braking
   d) HV Defrosters
   e) Contactor Box (High Voltage distribution)
   f) On-Board Chargers (VtoG or Inverters)
   g) HV Battery

3) Safety and Personal Protective Equipment (PPE)
   a) Safety Precautions
   b) Understanding NFPA 70E
   c) Lock out Tag out
   d) HV Power down
   e) HVIL - High Voltage Interlock Loop
   f) Rooftop Access Safety
   g) Appropriate PPE and Tools
   h) High Voltage Safety Equipment

4) Units of Energy – Differences between fuel and electrical energy
   a) Energy Units of Measure
   b) Energy Equivalent

5) Facility Considerations for EV transit vehicles
   a) Fluid change
   b) Oil change
   c) Charging Equipment Systems
      a. J1772 CCS Type 1
      b. Overhead charging (Proterra buses)