

THE ART OF TEACHING AUTO/TRUCK ELECTRICAL-ELECTRONICS TROUBLESHOOTING

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Vince Fischelli / Director of Training
Veejer Enterprises Inc. / Garland, Texas
www.veejer.com / sales@veejer.com / 972.276.9642
60 Electronics Lessons ON-LINE <https://training.veejer.com>

Auto-Diesel-Heavy Duty Electrical-Electronics Training Programs by Vince Fischelli, Director of Training, Veejer Enterprises Inc., Garland Texas, USA

The vehicle service industry is in desperate need of technicians who can troubleshoot and repair electrical-electronic systems on today's autos, trucks and heavy-duty equipment.

Auto – truck – heavy duty – tech school students can supply this need if they have essential electrical troubleshooting training. The best way tech schools can provide this essential level of electrical-electronics troubleshooting training is by a curriculum of repetitious hands-on troubleshooting practice with live circuits. There is not enough of this kind of hands-on training in today's classroom. Too much classroom time is spent on electrical theory and building circuits. **Yet there is no skill more needed for students to be able to service today's advanced vehicle electronic systems than *hands-on* electrical-electronic troubleshooting training.**

We offer the solution for teachers to focus the precious limited classroom hours on electrical-electronics training with repetitious hands-on vehicle live circuit troubleshooting. When a technician begins to work on an electrical problem in a vehicle he needs to have a successful step-by-step test procedure he learned in the classroom which he can follow on the job that will lead to the electrical problem. Our training programs will show students the step-by-step electrical troubleshooting procedures to find the electrical problem in the vehicle in the shortest possible time using electrical skills developed with our hands-on electrical training circuit board trainers. Show students how in the classroom and then have them do it exactly the same way on the vehicle. Students will find the problem every time.

Students should not be overloaded with electrical theory just to pass a written test. It will not show them how to fix an electrical-electronic circuit on a vehicle. Our hands-on training programs emphasize a hands-on approach and avoid excessive time in electrical theory that contributes to student confusion. Students study what they need to know about electrical systems and troubleshooting. Available study time a student has to invest in his/her education should always stress *hands-on* electrical-electronics troubleshooting training with just the right amount of electrical theory to bring it all together.

This brochure provides a description of training programs written and developed by Vince Fischelli, Director of Training, Veejer Enterprises Inc. He has over 50 years of experience in vehicle electronics. Much of the hands-on training involves fully constructed live circuit board trainers that require hands-on circuit testing and troubleshooting procedures using a DMM with all its features. Once these electrical troubleshooting procedures are understood with just the right amount of electrical theory, the student is guided through a series of *hands-on* electrical troubleshooting problems with the student workbook to develop electrical circuit troubleshooting skill and build self-confidence.

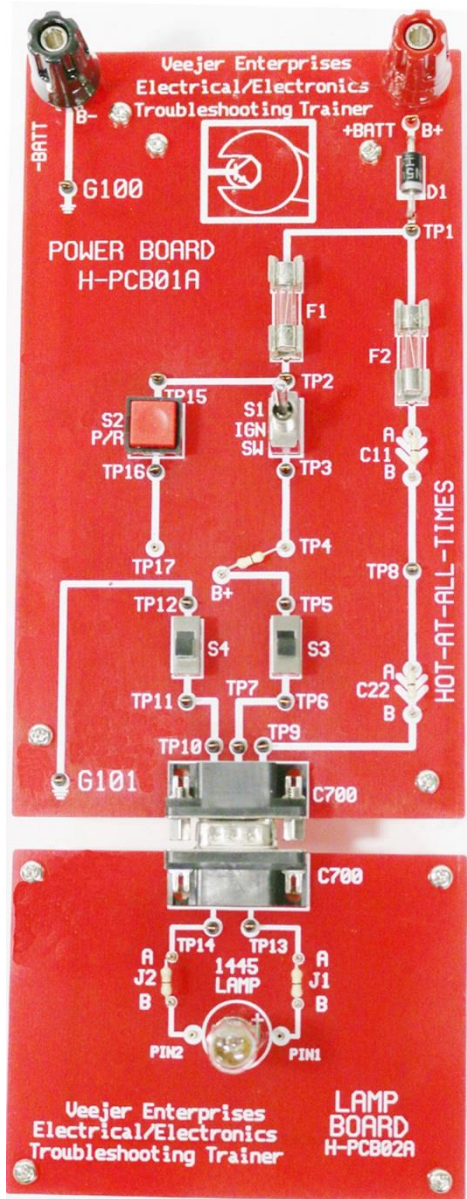
Electrical troubleshooting training is not accomplished by just reading about it, watching someone else do it or watching a video. These have some value, of course, but the point is a student learns how to troubleshoot electrical circuits with hands-on troubleshooting of faulty electrical circuits by himself over and over. Guided hands-on repetition develops electrical troubleshooting and DMM skills that maintains interest to keep the student involved. Read through this brochure for the details and links to go directly to our web site for additional information. We ship upon receiving school purchase orders.

Our main web site is <http://www.veejer.com>

Our web page for Teachers is <http://www.veejer.com/teachers.html>

Our 60 Lesson web site is <http://training.veejer.com>

Call us at 972.276.9642 if you have any questions.



This is a *Hands-On Troubleshooting Training Program* to teach automotive, H.D. and diesel technology students how to troubleshoot vehicle electrical and electronic circuits. Students learn quickly with *hands-on* live circuit troubleshooting practice.

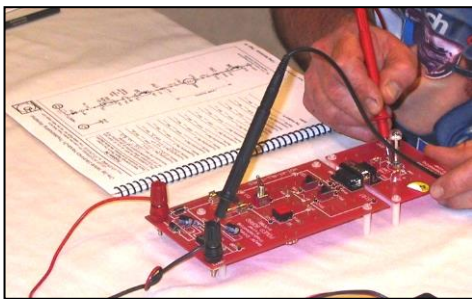
The Starter Kit H-111A(S)

Shown at the left is a fully constructed dual circuit board set-up that simulates a live vehicle circuit. Using the **Student Workbook, H-WB111A**, a student is guided through circuit analysis and a series of circuit voltage tests, voltage drop tests and resistance measurements to learn how to test a live vehicle circuit using a DMM. This focuses electrical training time on actual troubleshooting of circuits rather than using valuable training time building circuits to test. ***Students do not build circuits in the service bay, they troubleshoot complete circuits with faults to find the problem. Teach them troubleshooting procedures in your classroom just as they will do it on a vehicle.***

Instructor Guide, H-IG111A, guides the teacher to insert electrical problems on the under-side (copper side) of the circuit boards. The student troubleshoots from the top of the circuit boards while documenting his troubleshooting steps in his workbook to compare with the teacher's answers provided in the instructor guide.

Problems are inserted in seconds at various points in the voltage side or the ground side of the circuit to keep students busy troubleshooting. By removing a wire jumper on the bottom, an open circuit is created at a point in the circuit. By inserting a fixed carbon resistor, a voltage drop problem is created. Inserting wire jumpers at various points create shorts to ground. Students learn to successfully troubleshoot live electrical-electronic circuits by doing it rather than watching someone else do it or by talking about it. Students troubleshoot electrical problems by themselves, over and over, until they get it right and it becomes second nature.

The Starter Kit, H-111A(S), contains 32 individual electrical troubleshooting problems with open circuits, voltage drops and shorts to ground so students practice hands-on troubleshooting of a live circuit with a fault. This technique develops a student's self-confidence and convinces him he can successfully troubleshoot vehicle electrical circuit problems. **The benefits of this electrical troubleshooting training will last for the rest of their careers.** Students become confident electrical circuit troubleshooters who won't troubleshoot by changing parts. They will troubleshoot by testing a circuit with a DMM to identify a problem and repair it. The student at the left is troubleshooting a problem and recording troubleshooting steps with DMM readings in the workbook to be reviewed later.



Starter Kit, H-111A(S), contains a **Power Board, H-PCB01A** and **Lamp Board, H-PCB02A** that snap together. Includes a DC Power Supply, H-PS01 and a bag of fixed resistors to insert voltage drop problems. Workbook H-WB111A and Instructor Guide H-IG111A makes teaching this electrical program easy. A PowerPoint is available that follows the workbook.

Go to YouTube and type in "H-111A Vince" in the search bar and watch the video of H-111A.

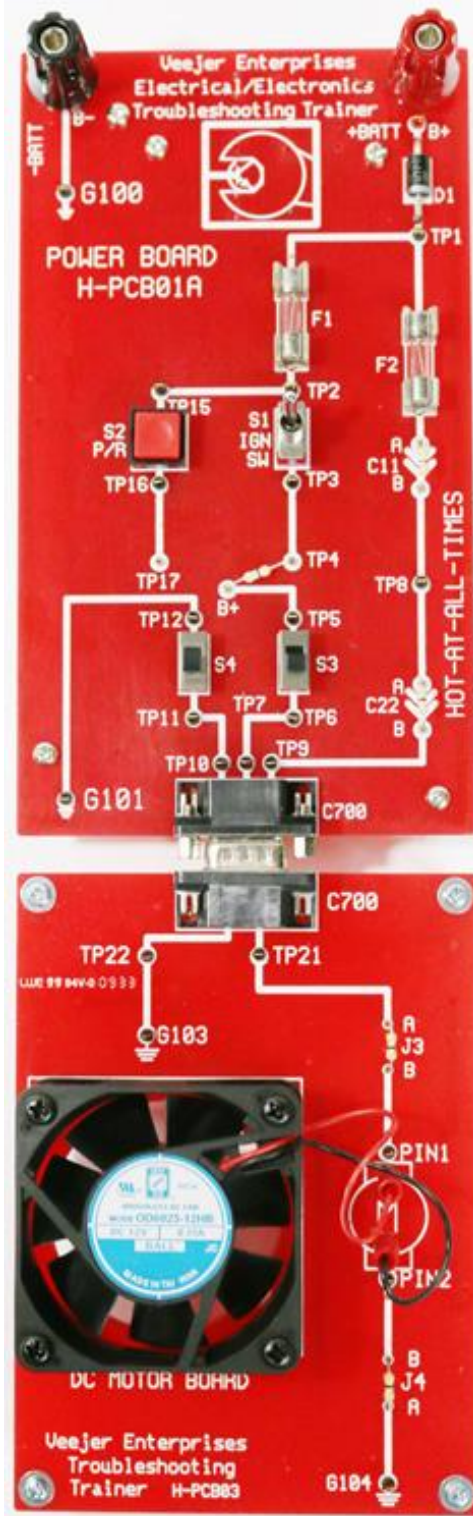
School Pricing at <http://www.veejer.com/hands-onschoolprice.html>

Call 972.276.9642 if you have questions.

Visit our "Teacher's Web Page" at www.veejer.com/teachers.

Special pricing and packaging for tech schools with **H-111A Power Point is available.** Call or email us for a quote. We ship when we receive your purchase order by fax or email.

DC Motor Troubleshooting Trainer, H-113(S) (1st add-on PCB to the Starter Kit)



Add this **H-113(S) Troubleshooting DC Motor Circuits** which connects to the Starter Kit's Power Board to continue developing electrical-electronics troubleshooting skills of DC motor circuits. Students learn to troubleshoot brushless DC Motor circuits and brush-type DC Motor circuits. This module consists of a (brushless) DC Motor Circuit Board Troubleshooting Trainer, Part Number H-PCB03. Once the DC Motor circuit board is connected to the Power Board, as shown at the left, a student is ready to immediately explore hands-on exercises testing and troubleshooting live brushless DC Motor circuits.

The **Student Workbook H-WB113** walks a student through the theory, operation and troubleshooting techniques of brushless DC Motor circuits and reviews testing common brush-type DC Motors used as starter motors, a/c-heater blower motors and window motors. After 30 pages of self-paced step-by-step instruction, a student begins troubleshooting **37 individual electrical problems** in the DC Motor circuit. Circuit problems are inserted by the teacher one at a time in seconds following simple instructions in the Instructor Guide H-IG113.

The DC Motor circuit is described as an **engine cooling fan** circuit to add realism to the troubleshooting problems. Electrical problems inserted are open circuits, voltage drops on the voltage-side or the ground-side of the circuit, short-to-ground and short-to-voltage problems that simulate actual engine cooling fan failures. Students learn how to test a brushless DC Motor with a DMM's Diode Test.

Practice troubleshooting problems are described as "engine running too hot" or "engine gradually overheating" due to a failure of the engine cooling fan circuit. A problem **simulates a battery drain problem** because the cooling-fan runs all the time when the ignition switch (on the Power Board) is switched OFF. Added realism to the electrical troubleshooting problems helps to maintain student interest and relate the troubleshooting problems to real world problems. **Five advanced problems** present additional challenges to a student who is ready for a higher level of electrical troubleshooting. **That's a total of 42 DC Motor Circuit troubleshooting problems.**

DC Motor Circuit Troubleshooting Kit, H-113(S) contains:

(1 ea.) DC Motor Circuit Board-Part Number **H-PCB03** shown at the left connected to the Power Board. Resistor Bag, Part Number H-RB03 is included for voltage drop problems. Workbooks available separately with special school pricing. Part numbers are: Student Workbook, **H-WB113** and Instructor Guide, Part Number **H-IG113**. Power Point **PP-H-113** is available.

Go to YouTube and type in "H-113 Vince" in the search bar and watch the video of H-113.

School Pricing at <http://www.veejer.com/hands-onschoolprice.html>

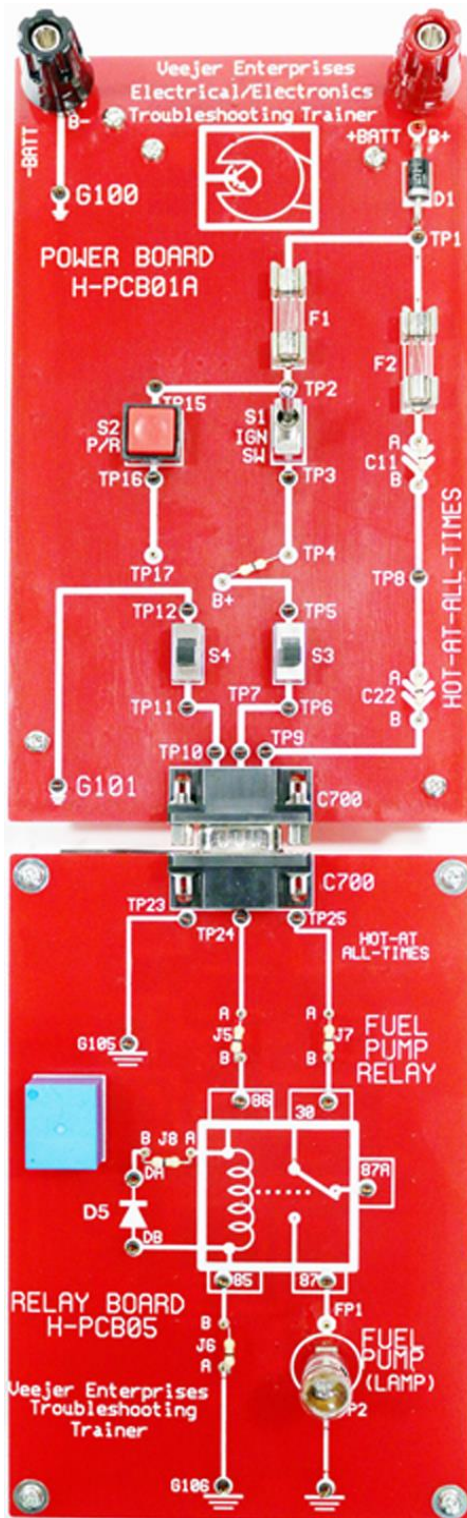
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Visit our "Teacher's Web Page" at www.veejer.com/teachers for details.

Special pricing and packaging for tech schools with **H-113 Power Point is available.**

Call or email us for a quote. We ship when we receive your purchase order by fax or email.

Relay Circuit Troubleshooting Trainer, H-115(S) (2nd add-on PCB to the Starter Kit)



Troubleshooting Relays can be a difficult electrical task given all the possibilities of how a relay circuit can fail. Sometimes replacing a relay does not fix the relay circuit problem. Then what?? It's time to start troubleshooting the relay circuit with a DMM and this training program will show students how it's done.

The **H-115(S), Relay Circuit Troubleshooting** with **H-PCB05** shown at the left is connected to the Starter Kit's Power Board. A student can now study live relay circuits and practice troubleshooting 75 live relay circuit problems. Multiple hands-on practice exercises are imbedded in the **Student Workbook H-WB115** (over 110 pages) with extensive instructions covering relay operation, relay characteristics, and relay circuit troubleshooting. Learn how relays are used in vehicle circuits but more importantly how relay circuits fail and the troubleshooting technique to find a relay circuit problem residing in the wiring when the relay itself is good.

This electrical troubleshooting training program contains extensive step-by-step instruction and hands-on exercises in relay circuit operation. Students learn to analyze the many ways relay circuits fail, how to measure voltage, voltage drops, resistance and current in relay circuits to identify relay circuit problems. This is followed by hands-on practice in relay circuit troubleshooting technique as techs practice troubleshooting a total of **75 individual live relay circuit problems** to develop their troubleshooting skill and self-confidence. Students troubleshoot from the top-side of the PCB using numbered test points and a DMM to develop troubleshooting skill and record progress. Problems include open circuits, voltage drops, open coil, bad spike suppression diode, shorts to ground and shorts to voltage for comprehensive problem analysis.

The **Relay Instructor Guide, H-IG115**, provides answers to all review exercises and complete instructions for inserting relay circuit problems on the bottom of the Relay Troubleshooting Trainer. Answers to each troubleshooting exercise and problem are included. All the development work is done for you. All you have to do is present the program and watch your students successfully troubleshoot relay circuit problems.

Relay Circuit Troubleshooting, H-115(S), contains:

(1 each) Relay Circuit Board-Part Number **H-PCB05** (shown at the left) connected to the Starter Kit's Power Board. (1 each) Resistor Bag **H-RB05** included. Student Workbook **H-WB115** and Instructor Guide, **H-IG115** are sold separately for schools. **Power Point PP-H-115** helps teachers with talking points as they lead students through the training program.

Go to YouTube and type in "H-115 Vince" in the search bar and watch the video of H-115.

ASK ABOUT SPECIAL PACKAGING FOR SCHOOLS.

School Pricing at <http://www.veejer.com/hands-onschoolprice.html>

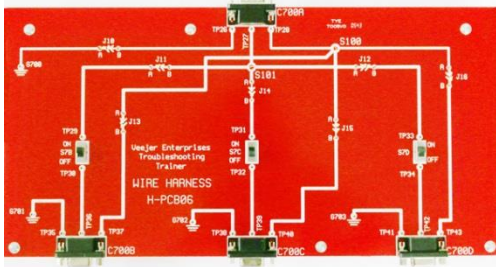
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Special pricing and packaging for tech schools with **H-115 Power Point is available.**

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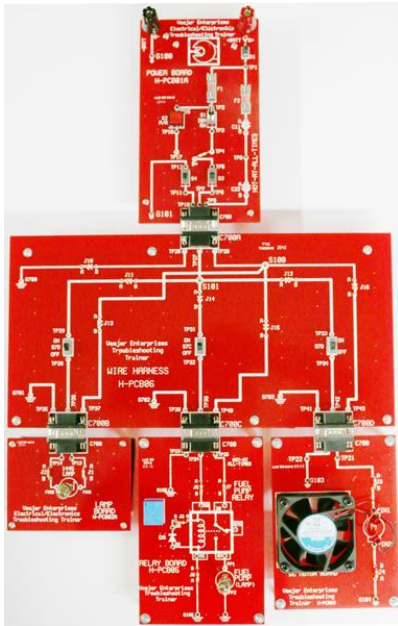
Wire Harness Troubleshooting Trainer, H-116(S) (Mini-Electrical System)



Troubleshooting the wiring harness can be a difficult task given all the possibilities of how a wire harness can fail with broken wires (open circuits), corroded wires & connections (voltage drops), shorts-to-ground and shorts-to-voltage. No need to replace a wire harness with a problem. The **Wire Harness Troubleshooting Trainer H-116** with **H-PCB06** shows students how to troubleshoot and find any type of wire harness problem.

The Wire Harness Troubleshooting Trainer, H-PCB06 is shown at the left. Learn to troubleshoot wire harness problems when one circuit in an **electrical system** is not functioning correctly. ***Is it a problem in the wiring on the voltage side? Is it a problem in the wiring on the common ground side? Is it a problem isolated to only one circuit? Are several circuits affected by the same problem? Could it be a problem in a part of the wire harness circuit common***

to more than one circuit? Answers to these questions and how to troubleshoot these types of wire harness problems are covered in this Troubleshooting Trainer. **See how one circuit's problem can affect other perfectly good circuits that share portions of the same electrical wiring. It's as realistic as real-world troubleshooting can get!**



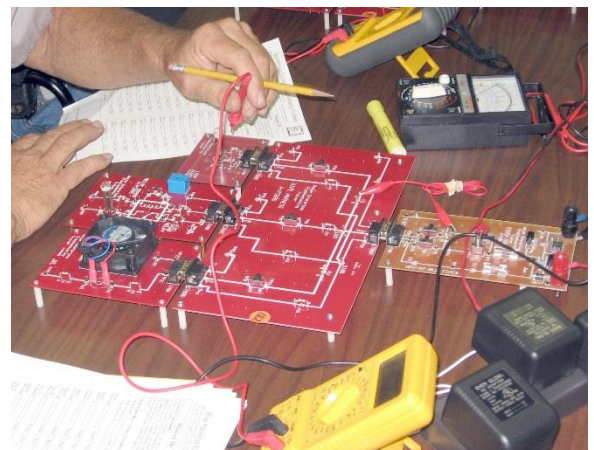
All troubleshooting trainers are connected together through the Wire Harness Troubleshooting Trainer to create a **Mini-Electrical System** called The "**M.E.S.**" shown at the left. Study advanced troubleshooting training in tracing Opens, Voltage Drops, Shorts-to-Ground and Shorts-to-Voltage problems throughout the "M.E.S." circuits.

Techs learn to analyze the ways a wire harness fails by measuring voltage, voltage drops, resistance and current in circuits to identify wire harness problems. This is followed by hands-on practice in wire harness troubleshooting technique as students practice troubleshooting up to **114 individual live wire harness problems** to develop troubleshooting skill and confidence. After completing all 114 wire harness electrical problems your student (future electrical technician specialist) will never be stumped by a wire harness problem. Multiple hands-on practice exercises are

imbedded in the **Student Workbook H-WB116** text of 100+ pages with extensive instructions and hands-on exercises. The **Wire Harness Instructor Guide, H-IG116** provides answers to all review exercises, instructions for inserting wire harness problems on the bottom of the trainer and answers to wire harness troubleshooting problems. Students troubleshoot from the top-side of the PCB using designated test points and their own DMM. Students evaluate troubleshooting progress by comparing their troubleshooting notes with the Instructor explaining answers from the Instructor Guide.

Wire Harness Troubleshooting H-116(S), contains these items: (1 each) Wire Harness Circuit Board Troubleshooting Trainer, **H-PCB06** and (1 each) Resistor Bag **H-RB06**. Student Workbooks are available separately, Part Number **H-WB116** or **S-SM06**; Instructor Guide, Part Number is **H-IG116** or **H-IG06**

Go to YouTube and type in "H-116 Vince" in the search bar and watch the video of H-116.



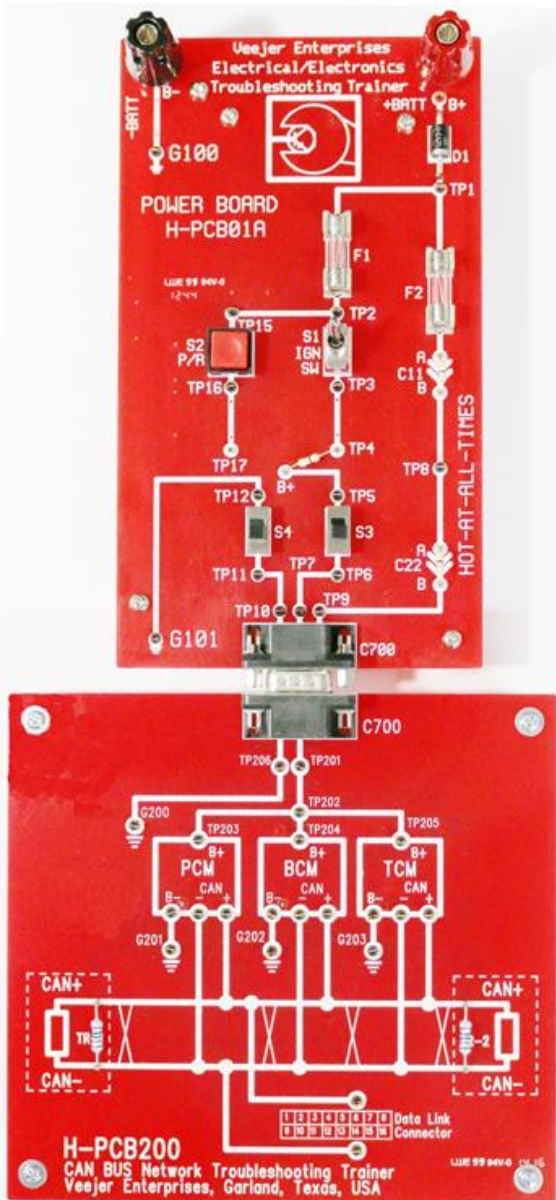
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Special pricing and packaging for tech schools with **H-116 Power Point is available.**
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CAN Bus Troubleshooting Trainer H-200(S) for Tech Schools



Students repairing CAN Bus failures must have specific electrical troubleshooting skills to repair CAN Bus wiring network problems as well as troubleshoot the voltage (B+) and ground circuits (B-) to any Node. This training program provides specific CAN Bus electrical troubleshooting scenarios.

Dimensions for the **CAN Bus Trainer, H-PCB200**, shown here are 5.9" wide x 5.5" long. It is shown connected to the Power Board from the Starter Kit, H-111A.

Many of these CAN Bus failures would be impossible to duplicate on an actual vehicle due to time required and the effort and time wasted gaining access to vehicle circuits. Teach the concepts in minutes!

The CAN Bus Trainer allows a student to experience 48 CAN Bus problems in about 8 hours of training with hands-on practice troubleshooting. The Student Workbook **H-WB200** breaks down the troubleshooting training into two parts.

Part One, Network Failures:

There are 20 common CAN Bus failures inside the 60 ohm network. If network resistance measured at DLC Pins 6 and 14 is 60 ohms, or 120 ohms, what does that indicate? What else could be wrong if 60 ohms is present at the DLC? Several possible network wiring failures could occur when the network resistance is 60 ohms at the DLC. The Student Workbook explains troubleshooting techniques needed to identify any network wiring problem and does not require connection to the Power Board to troubleshoot these 20 network wiring failures.

Part Two, Node Electrical Failures:

After CAN Bus network wiring is repaired and fully functional, instruction is provided with hands-on testing for Node voltage (B+) and ground (B-) circuit problems when the H-PCB200 is connected to the Power Board. There are 28 electrical problems relating to voltage and ground circuit problems to Nodes. When a trouble code indicates a problem with a

Node, what should be tested first is demonstrated to insure the Node has what it needs to function before the Node is condemned. The CAN Bus Trainer, H-PCB200, provides hands-on troubleshooting training for these issues but the Trainer must be connected to the Power Board from H-111A(S) for Part Two exercises. The CAN Bus Trainer, **H-200(S)** contains a circuit board **H-PCB200** and a Resistor Bag. Also available are Student Workbooks **H-WB200**, and an Instructor Guide **H-IG200**. Power Point PP200 follows the workbook.

Go to YouTube and type in "H-200 Vince" in the search bar and watch the video of H-200.

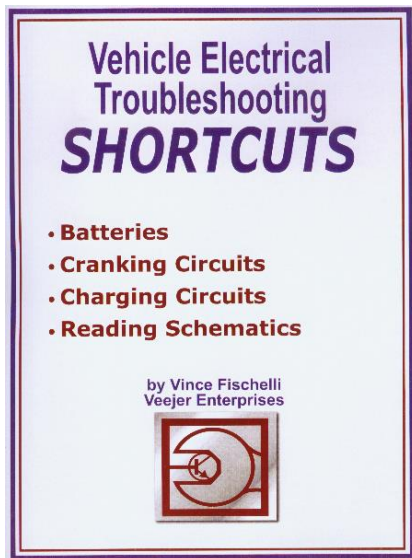
School Pricing at <http://www.veejer.com/hands-onschoolprice.html>

Contact: Veejer Enterprises Inc, Garland, Texas at 972.276.9642 if you have questions.

Visit web site page at http://www.veejer.com/CAN_Bus_Training_Options.html

Visit our Teacher's Page: <http://www.veejer.com/teachers.html>

Special pricing and packaging for tech schools with **H200 Power Point is available**. Call or email us for a quote. We ship when we receive your purchase order by fax or email.



The Electrical "How-To-Book"

"Vehicle Electrical Troubleshooting SHORTCUTS"

<http://www.veejer.com/shortcuts.html>

Teach students to troubleshoot vehicle electrical systems **On-The-Vehicle** using just a DMM & DC Current Clamp! Total of 250 pages in 7 Sections, **Review Tests w/Answers in back of book.**

Topics Covered: Section 1: **Essential Electrical Principles** / Section 2: **Working with Digital Multimeters** / Section 3: **Understanding How Circuits Work** / Section 4: **Quick Troubleshooting Battery Circuits** / Section 5: **Quick Troubleshooting Cranking Circuits** / Section 6: **Quick Troubleshooting Charging Circuits** / Section 7: **Reading Schematic Diagrams.** "SHORTCUTS" is Spiral Bound, 250 pages

Great News for Secondary and Post-Secondary Teachers:

Detailed Power Point presentation available / follows the text with talking points.

Each section of "Electrical **SHORTCUTS**" has review questions.

FIRST THINGS FIRST (Flip-Charts)

An automotive electrical system troubleshooting flipchart called **FIRST THINGS FIRST** was first introduced to the automotive service industry in 1991. Since then students in the auto and truck industry have been using **FIRST THINGS FIRST** with great success finding electrical problems that previously had been overlooked. Helps students identify and find electrical problems with battery problems, weak batteries while cranking, corroded engine and accessory grounds. Students learn to identify problems with the charging system either undercharging or overcharging using a step-by-step series of 15-18 voltage measurements with their DMM.

FIRST THINGS FIRST Pro (Covers single battery 12V-14V electrical system)

The "Pro" flipchart guides a student through testing the primary electrical system consisting of a single battery, engine and accessory grounds and the complete charging system. There are 14 test steps that can be performed in less than 5 minutes. Includes testing the new "Smart Charging Systems." The step-by-step the test procedure in less than 5 minutes and certify the primary electrical system (battery, major grounds and charging system) are functioning properly.

FIRST THINGS FIRST-2 (Covers dual battery 12V-14V electrical system)

The "**FIRST THINGS FIRST-2**" flip-chart guides a student through testing the primary electrical system consisting of two batteries connected in parallel, engine and accessory grounds and the charging system. There are 18 test steps that can be performed in less than 5 minutes. Includes testing the new "Smart Charging Systems." With a little practice, students can perform the entire test procedure in less than 5 minutes and verify both batteries are good, the engine and accessory grounds are good and the charging system is performing properly. Any electrical problem in this area of the vehicle will affect every electrical circuit on the vehicle. The problem is not resolved by troubleshooting an individual vehicle circuit that isn't working correctly if the problem is in the primary electrical system consisting of dual batteries, two major grounds and the charging system and it is over looked.



Flip-Charts and student workbooks available separately. Visit our web page for all the details about this training program.

<http://www.veejer.com/first.html>

**A "School Presentation Package" is available containing-
6 laminated copies of FIRST THINGS FIRST-Pro
6 copies of the Student Workbook
Extensive PowerPoint Presentation with Instructor Guide**

Call Veejer Enterprises Inc. at (972) 276-9642. We accept credit cards and ship orders 1-2 days after a purchase order is received. Call us for a free quote.