Building a Custom Cable for Bench Top Downloads of Caterpillar ECM's with a 40-Pin Connector

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Introduction

Extracting and analyzing data from heavy truck electronic control modules (ECM's) is an integral part of a complete accident reconstruction involving commercial vehicles. Obtaining the necessary hardware and software for this data extraction represents a significant monetary investment. There are multiple engine manufacturers each with their own hardware and software requirements. Furthermore, there are multiple hardware options available to connect to the electronic control module, i.e. connecting to the module through the in-cab port, or connecting directly to the module (also called a bench top download), that utilize different cables to connect a computer to the module.

Connecting to the module through the in-cab port is generally the preferred method, and acquiring the necessary hardware is usually available for purchase through a local distributor. However, it is not always possible to connect to the module through the in-cab port. In this situation an additional cable must be purchased. Communicating to the distributor exactly what you need in this situation is a hit or miss proposition. Compared to the hardware needed to communicate to the electronic control module through the in-cab port, the cables needed to connect directly to the module are generally not well known by a salesman in a distributorship. Without knowing the specific part number you need you may or may not be successful in acquiring the proper cable. These cables can cost upwards of several hundred dollars each, and with multiple engine manufacturers producing multiple electronic control modules, a comprehensive set of cables is costly. For these reasons, custom building a cable may be an appropriate option.

This paper presents a step by step procedure for building a cable capable of a bench top download of a Caterpillar electronic control module with a 40 pin connector (when used in conjunction with the "Caterpillar Electronic Technician" software and a reprogramming module). A complete parts list, estimated build time, estimated build cost, and wiring diagram are provided. Future papers will detail how to build additional cables.

Parts Acquisition

A comprehensive parts list has been compiled and is provided in Appendix A. Parts such as connectors and contact pins are manufactured by Deutsch Engineered Connecting Devices, and are available for purchase through their American distributor Ladd Industries, Inc. The URL for their website as well as their parts catalog can also be found in Appendix A. The 40-pin connector will be the connector that eventually plugs into the Caterpillar ECM, and the 9-pin connector will interface with the user's existing "Caterpillar Electronic Technician" software and reprogramming module.

All of the additional parts are common, and can likely be found at any number of electronics or hardware stores. The alligator clips should be large enough to attach to either battery terminals or a "jump pack." There are a total of

eleven parts listed with a total estimated cost of $82.84.

Build Instructions

This cable will be built according to the wiring diagram found in Appendix B. Begin by cutting six equal lengths of 14 AWG wire. Five foot sections are recommended. Use wire strippers to remove approximately one half of an inch of insulation from each end of wire. Crimp the two alligator clips to one end of each of two of the pieces of wire. On the wire and alligator clip designated as the positive power supply, cut the wire about one foot from the alligator clip and strip the insulation off the two ends. Strip the insulation off the ends of the inline fuse holder. Connect one end of the fuse holder to the positive alligator clip using a "butt splice." Connect the other end of the fuse holder to the recently cut wire using a butt splice. You should now have a positive power supply wire with an inline fuse as depicted in the wiring diagram. Set aside the two alligator clips and attached wires.

Crimp the four male contact pins on the ends of the four remaining lengths of wire. Crimp the four female contact pins on the other ends of the wires. Insert the four female contact pins into pins 1, 5, 6, and 7 of the Deutsch 40-pin connector. Use the contact removal tool to remove a pin from its socket if necessary. Insert the four male contact pins into pins A, B, H, and J of the Deutsch 9-pin connector. Refer to the wiring diagram to determine which pins of the connectors should be wired together. Pins 1, 5, 6, and 7 of the Deutsch 40-pin connector should be wired to pins H, B, A, and J of the Deutsch 9-pin connector, respectively.

Locate the wire that joins pin 5 of the 40-pin connector to pin B of the 9-pin connector, and cut it at its midpoint. Strip the insulation off the two new ends. Use a butt splice to connect these two ends and the end of the wire attached to the negative alligator clip.

Locate the wire that joins pin 6 of the 40-pin connector to pin A of the 9-pin connector, and cut it at its midpoint. Strip the insulation off the two new ends. Use a butt splice to connect these two ends and the end of the wire attached to the positive alligator clip. Confirm that the newly built cable is consistent with the wiring diagram of Appendix B. It is recommended that wires be bound together using heat shrink, electrical tape, or zip ties. The wiring of the cable is now complete.

Conclusions

This paper has presented a procedure for building a cable capable of a bench top download of a Caterpillar electronic control module with a 40-pin connector. A complete parts list, as well as a resource for purchasing the parts, has been provided in Appendix A. A wiring diagram is provided in Appendix B. Estimated build cost is $82.84 and the estimated build time is one hour.

A cable has been built using this process and then compared to an existing OEM cable. The two cables were found to be identical.

This document is merely a guide to building a cable capable of a bench top download of a Caterpillar ECM, and does not attempt to address the actual downloading or analysis of the data. Additionally, no mention has been made of any potential problems that could arise as a result of connecting to the ECM (i.e. data corruption, overwriting data, altering programmable ECM parameters, setting fault codes). These issues should be investigated and understood prior to downloading an ECM.

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Appendix A

Parts List

Available from Deutsch distributor Ladd Industries, Inc:

1. Deutsch HD14-9-96P (9 pin connector)
2. Deutsch AEC16-40SU (40 pin connector)
3. Deutsch Male Contact Pins Part # 0460-215-16141
4. Deutsch Female Contact Pins Part # 0462-209-16141
5. Deutsch Contact Removal Tool (optional) Part # 0411-291-1405

Available from electronics store such as Radio Shack:

6. Large Alligator Clips
7. 14 AWG Wire, 50 foot spool
8. 20-Amp Inline Fuse Holder
9. 20 Amp Fuse
10. Butt Splices
11. Wire Strippers/Crimpers

Cost Estimate

Item	Quantity	Unit Price	Total
Deutsch HD14-9-96P	1	7.60	7.60
Deutsch AEC16-40SU	1	23.04	23.04
Male Contact Pins	4	0.44	1.76
Female Contact Pins	4	0.66	2.64
Contact Removal Tool	1	1.80	1.80
Large Alligator Clips	Set of 2	15.00	15.00
14 AWG Wire 50 Foot Spool	1	14.00	14.00
Inline Fuse Holder	1	3.00	3.00
20 Amp Fuse	1	4.00	4.00
Butt Splices	4	0.50	2.00
Wire Strippers/Crimpers	1	8.00	8.00
		TOTAL:	**82.84**

Ladd Industries Website:
www.laddinc.com

Ladd Industries Parts Catalog:
www.laddinc.com/pdf/Connector%20Selector.pdf

Appendix B

Wiring Diagram