

# **OPERATIONS MANUAL FOR PORTABLE PROFILER – INSTALLING AND USING THE PORTABLE PROFILER**

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## Installing and Using the Portable Profiler



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## INTRODUCTION

This manual is divided into two sections. The first is using the UTA-Profiler Program with the portable profiler for generating surface profilers. The second is installing the portable profiler module on a typical van or truck. The calibration and initialization files used by the UTA-Profiler Program are compatible with the standard TxDOT files used with VAMOS and WinTK. Information on, deriving these files are explained in the TxDOT Profiler Operations Manual. The generated profile obtained when using the the UTA-Profiler Program with the portable profiler is consistent with the TxDOT PF9 VNET data file specifications and as such the generated profile can be directly used with current TxDOT and PROVAL application programs.

The second section, installing the portable profiler module on a typical van or truck, provides a step by step process for mounting the portable profiler sensor module.

## USING THE UTA-Portable Profiler Program

The UTA-Portable Profiler Program is written in C++ and designed to run in the Windows console mode for use on multiple Windows platforms. Using the program requires three files - UTA-Portable.exe, UTA-Profiler.ini, and Header.ini. Typical TxDOT files for these two files are illustrated in Figures 1 and 2.

# Header.ini File

```
Record1,HEAD3;
District,17;
County,21;
HighwaySystem,SH;
HighwayNumber,47;
HighwayDirection,S;
ReferenceStart,0;
ReferenceSuffix,A;
ReferenceOffset,2.2;
LaneMark,K;
LaneNum,6;
Record2,CMET3;

Model,Portable Profiler;
Reserved1,;
Reserved2,;
Reserved3,;
Reserved4,;
CertCode,1FTSW21P76EB82581;
CertDate,09092006;
Manufacturer,KPRF01
ElevationUnits,mil;
Wheelpath,LR;
Comment1,Comment Card;
Comment2,Comment Card;
```

Figure 1 Typical TxDOT Profiler Header.ini File

# UTA-Profiler.ini File

```
AccelLeftAD1,-6117;
AccelLeftAD2,6224;
AccelLeftChannel,3;
AccelLeftD1,0.00;
AccelLeftD2,19600.00;
AccelRightAD1,-6067;
AccelRightAD2,6232;
AccelRightChannel,5;
AccelRightD1,0.00;
AccelRightD2,19600.00;
FilterLength,60.96;
LaserLeftAD1,17668;
LaserLeftAD2,20829;
LaserLeftChannel,2
LaserLeftD1,0.00;
LaserLeftD2,-25.40;
LaserRightAD1,20166;
LaserRightAD2,23782;
LaserRightChannel,4;
LaserRightD1,0.00;
LaserRightD2,-25.40;
NumberOfBuffers,Auto;
SamplingRate,4000.00;
SizeOfBuffers,Auto;
SpeedCount,40876.00;
```

Figure 2 Typical UTA-Profiler.ini File

The following steps are used for running the UTA-Profiler Program:

1. Edit the Header.ini and UTA-Profiler.ini files (Figures 1 and 2) and change the wheel path entry to LR, L, or R so that the output data file will provide the appropriate wheel path. Use either UTA's CalConsole or TxDOT Calibration program for obtaining calibration values. The Portable Profiler Module is wired as follows:
  - a. Channel 0 - DMI sensor signal (See Figure 3-4)
  - b. Channel 1 - Infrared start sensor (See Figure 3-4)
  - c. Channel 2 and 4 – Selcom SLS 5000 Laser
  - d. Channel 3 and 5 - Columbia Research  $\pm 4$  g accelerometer



	<b>Screw</b>	<b>Signal Terminal</b>	<b>Screw</b>	<b>Signal Terminal</b>
	20	USB +5 V Out	40	Ext Trigger
	19	Ground	39	Ext Clock
	18	Counter 0 In	38	Ground
	17	Counter 0 Out	37	Digital Output 7
	16	Counter 0 Gate	36	Digital Output 6
	15	Ground	35	Digital Output 5
	14	Reserved	34	Digital Output 4
	13	Reserved	33	Digital Output 3
	12	Reserved	32	Digital Output 2
	11	Reserved	31	Digital Output 1
	10	2.5 V Reference	30	Digital Output 0
	9	Ground	29	Ground
	8	Reserved	28	Digital Input 7
	7	Reserved	27	Digital Input 6
	6	Analog In 5	26	Digital Input 5
Accelerometer Sensor	5	Analog In 4	25	Digital Input 4
Laser Sensor	4	Analog In 3	24	Digital Input 3
DMI Start Sensor	3	Analog In 2	23	Digital Input 2
DMI sensor signal	2	Analog In 1	22	Digital Input 1
	1	Analog In 0	21	Digital Input 0

Figure 3 DT 9816-A Pin Assignments (See Data Translation <http://www.datx.com/>)



Figure 4 Connect Distance Input to Channel 0, Start Sensor to Channel 1

2. Start the UTA-Profiler by clicking on the UTAProfiler.exe icon.
3. Once the program starts, type “y” and press “ENTER” to accept the header.ini as the default header file or type in the header file name that you will be using (Figure 5).

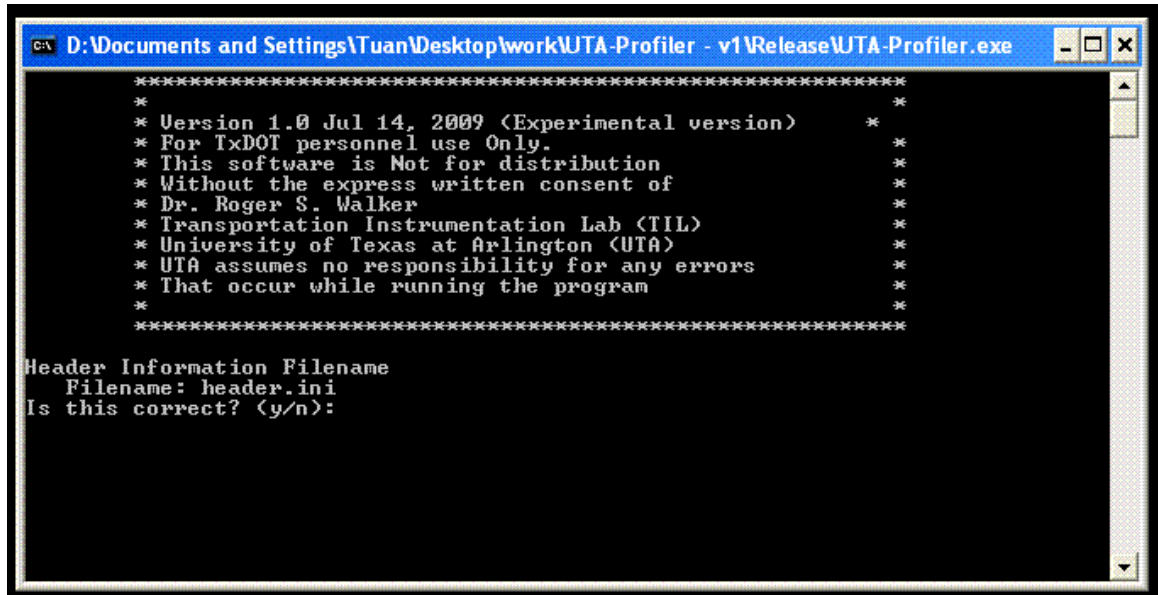


Figure 5 Entering Header.ini File Name/Location

4. Type “y” and press “ENTER” to accept UTA-Profiler.ini as the default configuration file or type in the configuration file name that you will be using (Figure 6).

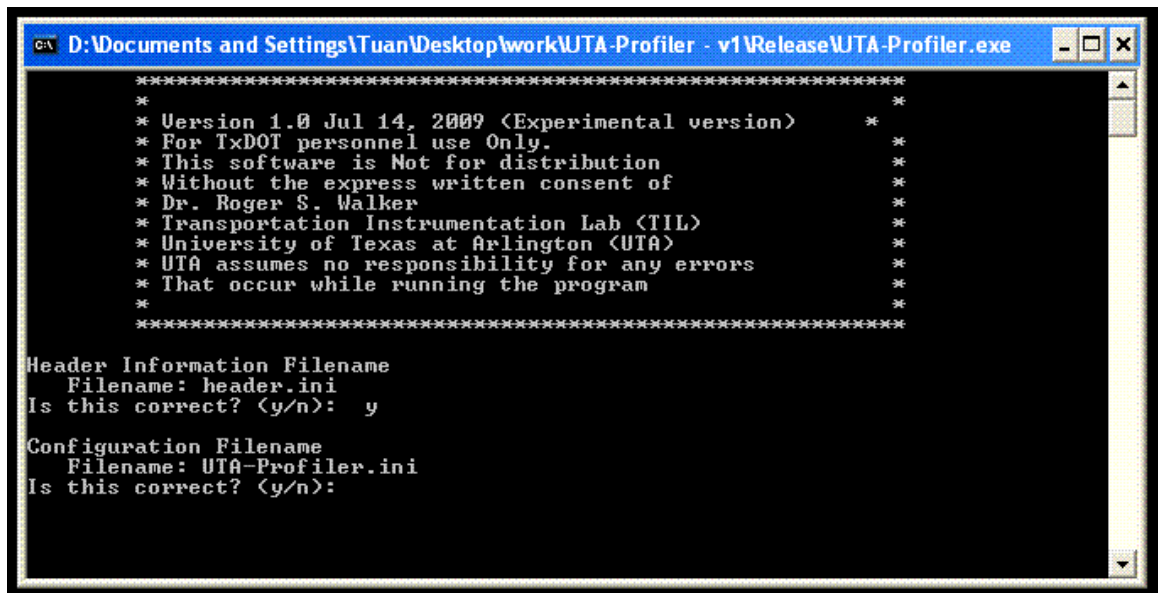
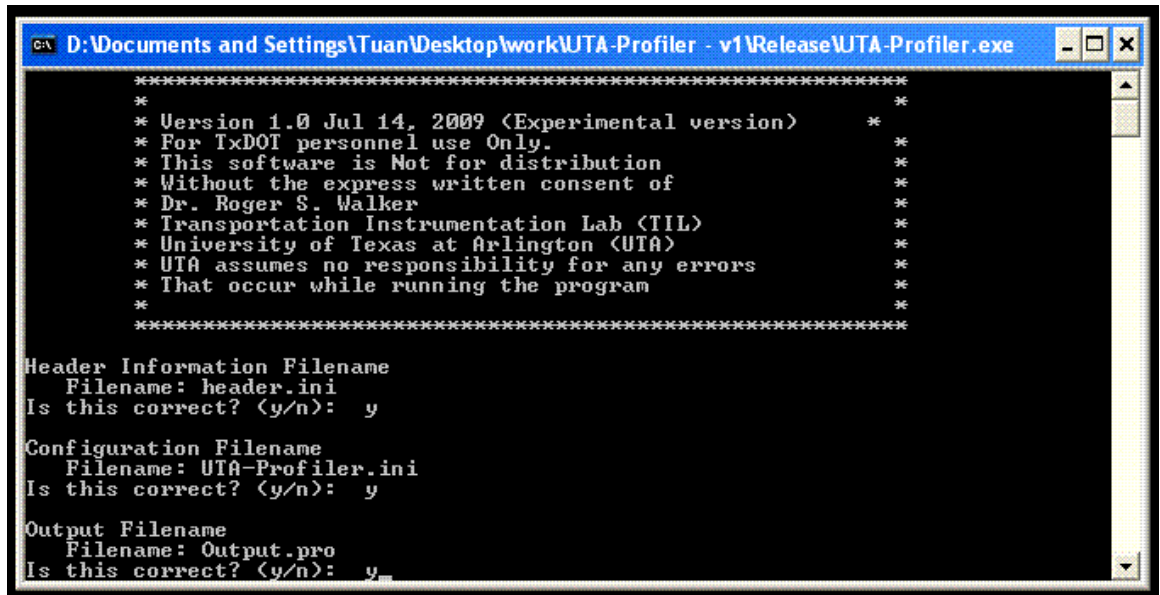


Figure 6 Entering UTA-Profiler.ini File Name/Location

5. Type “y” and press “ENTER” to accept Output.pro as the default output file or type in the output file name that you want to have. (Figure 7)



```
*****
*
* Version 1.0 Jul 14, 2009 (Experimental version) *
* For TxDOT personnel use Only. *
* This software is Not for distribution *
* Without the express written consent of *
* Dr. Roger S. Walker *
* Transportation Instrumentation Lab (TIL) *
* University of Texas at Arlington (UTA) *
* UTA assumes no responsibility for any errors *
* That occur while running the program *
*****

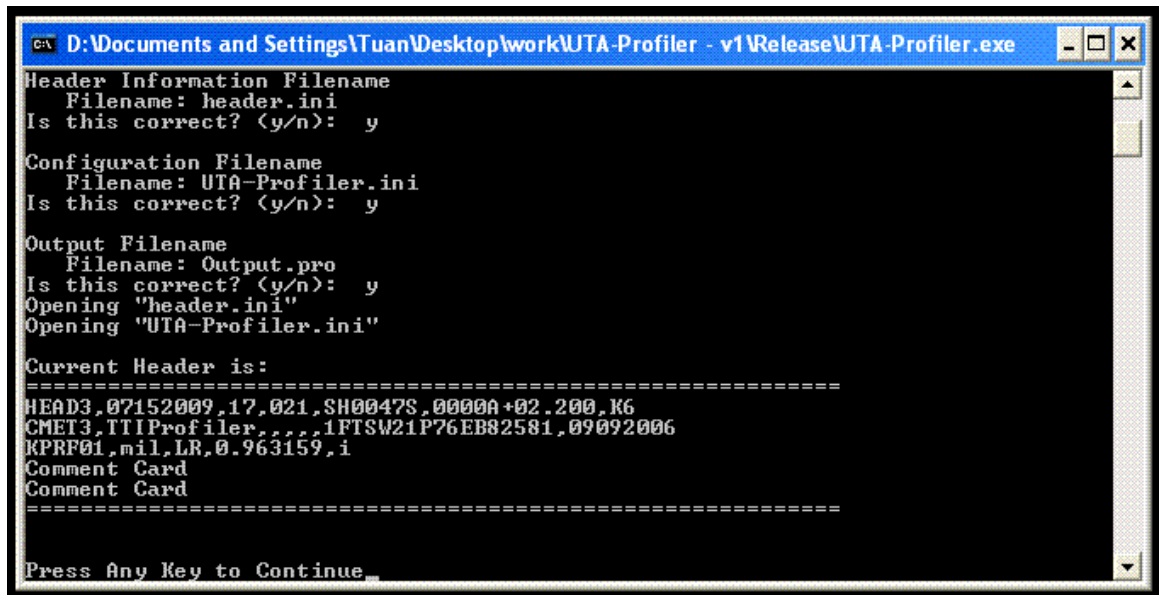
Header Information Filename
  Filename: header.ini
Is this correct? (y/n): y

Configuration Filename
  Filename: UTA-Profiler.ini
Is this correct? (y/n): y

Output Filename
  Filename: Output.pro
Is this correct? (y/n): y
```

Figure 7 Entering Profile Output File Name/Location

6. Press any key to continue. The UTA-Profiler should display the current header information specified in the header file. Verify that this information is correct.  
(Figure 8)



```
D:\Documents and Settings\Tuan\Desktop\work\UTA-Profiler - v1\Release\UTA-Profiler.exe
Header Information Filename
  Filename: header.ini
Is this correct? (y/n): y

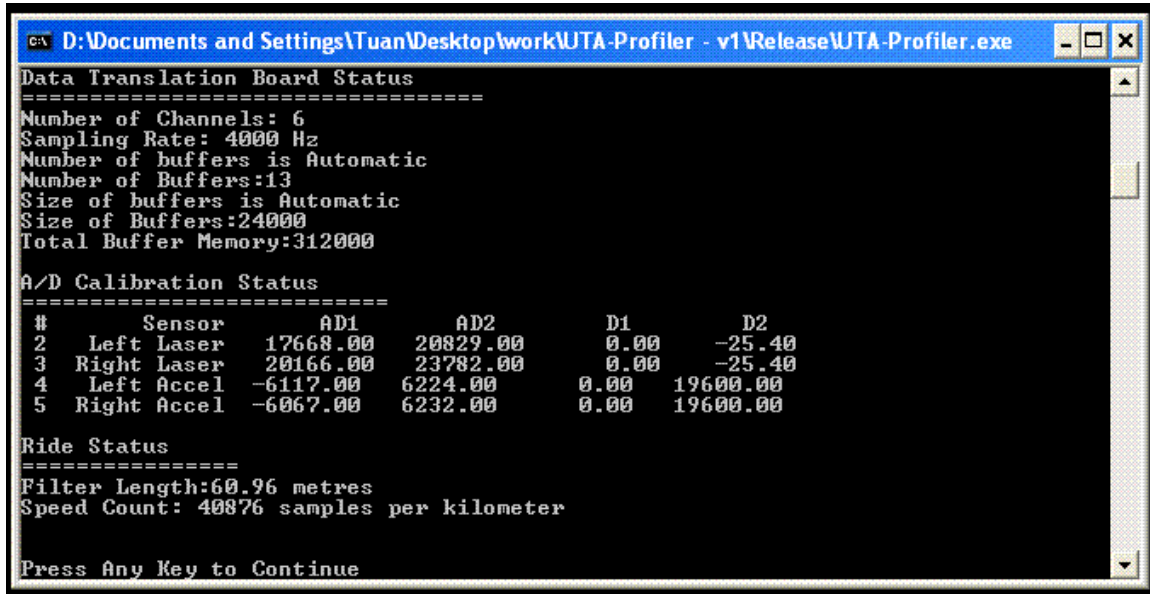
Configuration Filename
  Filename: UTA-Profiler.ini
Is this correct? (y/n): y

Output Filename
  Filename: Output.pro
Is this correct? (y/n): y
Opening "header.ini"
Opening "UTA-Profiler.ini"

Current Header is:
=====
HEAD3,07152009,17,021,SH0047S,0000A+02.200,K6
CMET3,TTIProfiler,,,,1FTSW21P76EB82581,09092006
KPRF01,mil,LR,0.963159,i
Comment Card
Comment Card
=====
Press Any Key to Continue
```

Figure 8 Verifying Initialization and Header File Information

7. Press any key twice to continue after the header information is verified. The UTA-Profiler should display the Data Translation board status. Press any key to continue after you have verified this information (Figure 9).



```

D:\Documents and Settings\Tuan\Desktop\work\UTA-Profiler - v1\Release\UTA-Profiler.exe
Data Translation Board Status
=====
Number of Channels: 6
Sampling Rate: 4000 Hz
Number of buffers is Automatic
Number of Buffers:13
Size of buffers is Automatic
Size of Buffers:24000
Total Buffer Memory:312000

A/D Calibration Status
=====
#      Sensor      AD1      AD2      D1      D2
2  Left Laser  17668.00  20829.00  0.00   -25.40
3  Right Laser 20166.00  23782.00  0.00   -25.40
4  Left Accel  -6117.00  6224.00   0.00  19600.00
5  Right Accel -6067.00  6232.00   0.00  19600.00

Ride Status
=====
Filter Length:60.96 metres
Speed Count: 40876 samples per kilometer

Press Any Key to Continue

```

Figure 9 Verifying Initialization and Header File Information and Prepare for Data Collection

8. At the “Command Menu” (See Figure 10) select one of the following:
  - a. The “S” or Start key to immediately start profile data collection, writing the profile file to the specified profile output file.
  - b. The “P” or Pre-section key to begin computing profile. The computed profile is not stored but used to preload the digital filters and other initialization parameters consistent with the section to be measured. The pre-section should typically be should be at least 300 ft or about 100 feet further than the specified filter length.
  - c. The “O” or Stop key to halt profile data collection

- d. The “R” or Real section key to immediately start profile data collection, writing the profile file to the specified profile output file. This is used to distinguish between the pre-section and the section that profile is to be measured and kept (Real).
- e. The “A” or Arm key to tell the Profiler Program to automatically start the ‘Real’ data collection when a negative going pulse is sensed on the infrared start channel (channel 1).
- f. The “Q” or Quit key to end data collection and close the specified profile output file.

```

D:\Documents and Settings\Tuan\Desktop\work\WTA-Profiler - v1\Release\WTA-Profiler.exe
#      Sensor      AD1      AD2      D1      D2
2  Left Laser  17668.00  20829.00  0.00   -25.40
3  Right Laser 20166.00  23782.00  0.00   -25.40
4  Left Accel  -6117.00  6224.00   0.00  19600.00
5  Right Accel -6067.00  6232.00   0.00  19600.00

Ride Status
=====
Filter Length:60.96 metres
Speed Count: 40876 samples per kilometer

Press Any Key to Continue
A/D Operation Started.

Command Menu
-----
(S)tart Manually
Start (P)resection
St(o)p
(R)eal Section
(A)rm Sensor
(Q)uit

```

Figure 10 Verifying Initialization and Header File Information and Prepare for Data Collection

Figures 11 thru 15 depict the screens for each of the above options a. thru f.

```

D:\Documents and Settings\Tuan\Desktop\WTA-Profler - BounceTest\WTA-Profler.exe
3 Right Laser 20166.00 23782.00 0.00 -25.40
4 Left Accel -6117.00 6224.00 0.00 19600.00
5 Right Accel -6067.00 6232.00 0.00 19600.00

Ride Status
=====
Filter Length:60.96 metres
Speed Count: 40876 samples per kilometer

Press Any Key to Continue

A/D Operation Started.

Command Menu
-----
(S)tart Manually
Start (P)resection
  St(o)p
    (R)eal Section
    (A)rm Sensor
    (Q)uit
Start Real Section

(-26720,-26322) Speed: 19.90 mph Real Section Trigger Off 83.88 feet -!!

```

Figure 11 Selecting the Start Manually option

```

D:\WINDOWS\system32\cmd.exe
3 Right Laser 20166.00 23782.00 0.00 -25.40
4 Left Accel -6117.00 6224.00 0.00 19600.00
5 Right Accel -6067.00 6232.00 0.00 19600.00

Ride Status
=====
Filter Length:60.96 metres
Speed Count: 40876 samples per kilometer

Press Any Key to Continue

A/D Operation Started.

Command Menu
-----
(S)tart Manually
Start (P)resection
  St(o)p
    (R)eal Section
    (A)rm Sensor
    (Q)uit
Start Pre-Section

(-14344,-14318) Speed: 19.90 mph Preseccion Trigger Off 87.73 feet //-

```

Figure 12 Selecting the Start (P)reseccion option



```

C:\ D:\WINDOWS\system32\cmd.exe
3 Right Laser 20166.00 23782.00 0.00 -25.40
4 Left Accel -6117.00 6224.00 0.00 19600.00
5 Right Accel -6067.00 6232.00 0.00 19600.00

Ride Status
=====
Filter Length:60.96 metres
Speed Count: 40876 samples per kilometer

Press Any Key to Continue
A/D Operation Started.

Command Menu
-----
      (S)tart Manually
Start (P)resection
      St(o)p
      (R)eal Section
      (A)rm Sensor
      (Q)uit
Arm Trigger

Speed: 19.90 mph No Section Trigger Armed 0.00 feet -

```

Figure 13 Selection the (A)rm sensor option

```

C:\ D:\WINDOWS\system32\cmd.exe
Ride Status
=====
Filter Length:60.96 metres
Speed Count: 40876 samples per kilometer

Press Any Key to Continue
A/D Operation Started.

Command Menu
-----
      (S)tart Manually
Start (P)resection
      St(o)p
      (R)eal Section
      (A)rm Sensor
      (Q)uit
Start Pre-Section

Arm Trigger                                t  i//
Manual Override                            4 feet  \!

(-18985,-18581) Speed: 21.89 mph Real Section Trigger Off 87.73 feet -

```

Figure 14 Selecting the (R)eal Section option

```

D:\WINDOWS\system32\cmd.exe
Ride Status
=====
Filter Length:60.96 metres
Speed Count: 40876 samples per kilometer

Press Any Key to Continue

A/D Operation Started.

Command Menu
-----
  <S>tart Manually
Start <P>resection
  St<o>p
    <R>eal Section
    <A>rm Sensor
    <Q>uit
Arm Trigger

Manual Override

Stop                                     ff   146.24 feet  --\
Speed: 19.90 mph No Section  Trigger Off  146.24 feet  -

```

Figure 15 Selecting the St(o)p option

## Portable Profiler Installation Guide

The following illustrations depict the installation of the Portable Profiler Mounting and Installation procedures.

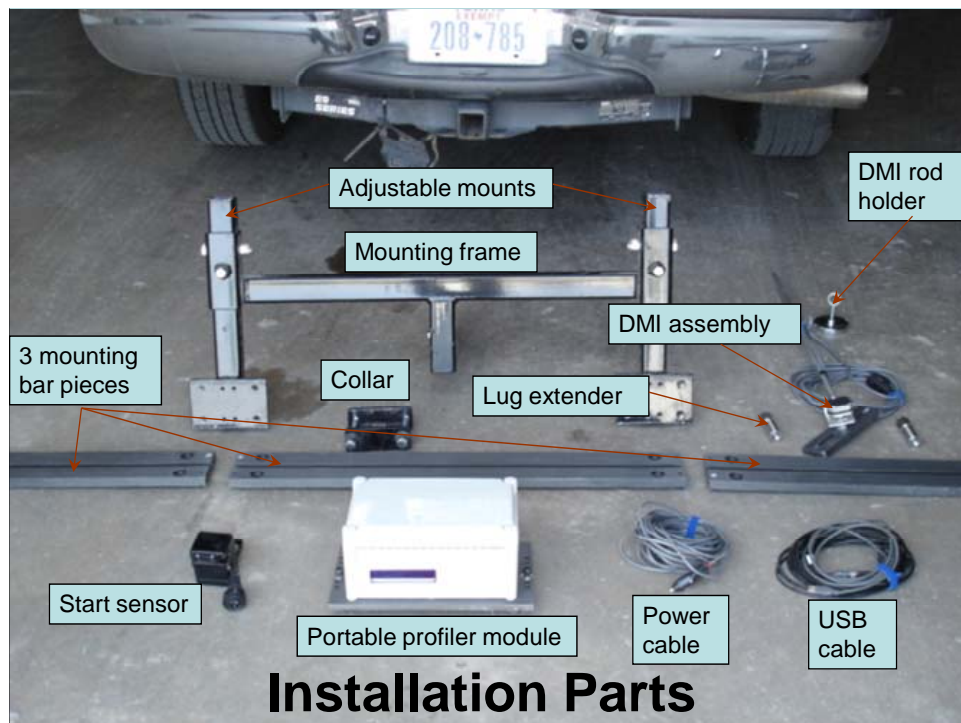


Figure 16 Installation Parts

## ***Mounting the Portable Profiler Module***

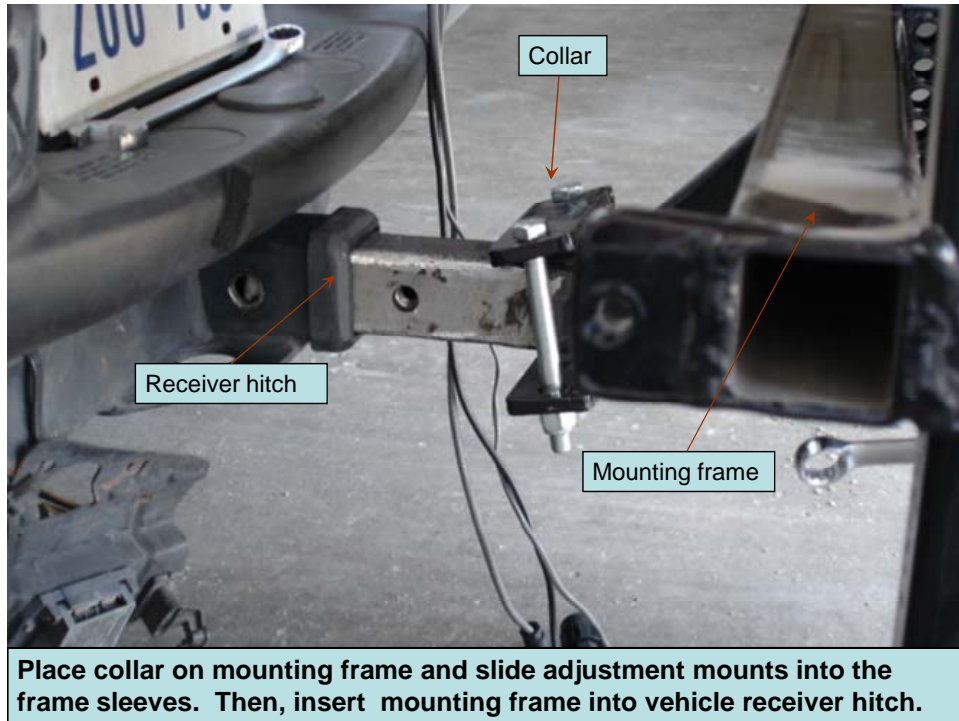


Figure 17 Place Collar on Mounting Frame

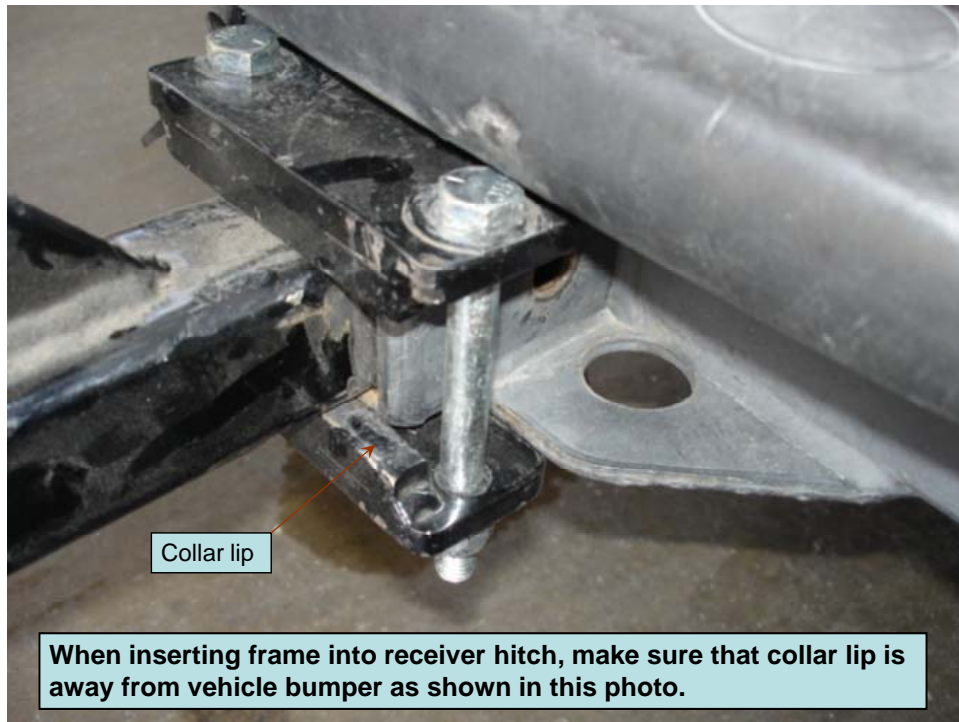


Figure 18 Insert Frame into Receiver Hitch



Figure 19 Secure Mounting Frame



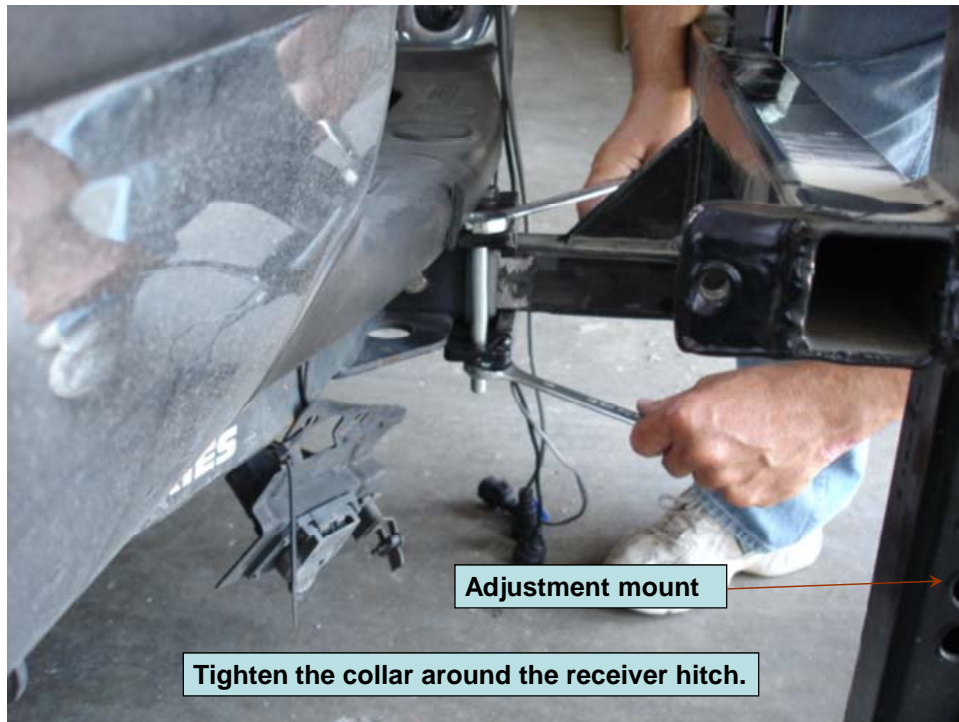


Figure 20 Adjust Mount

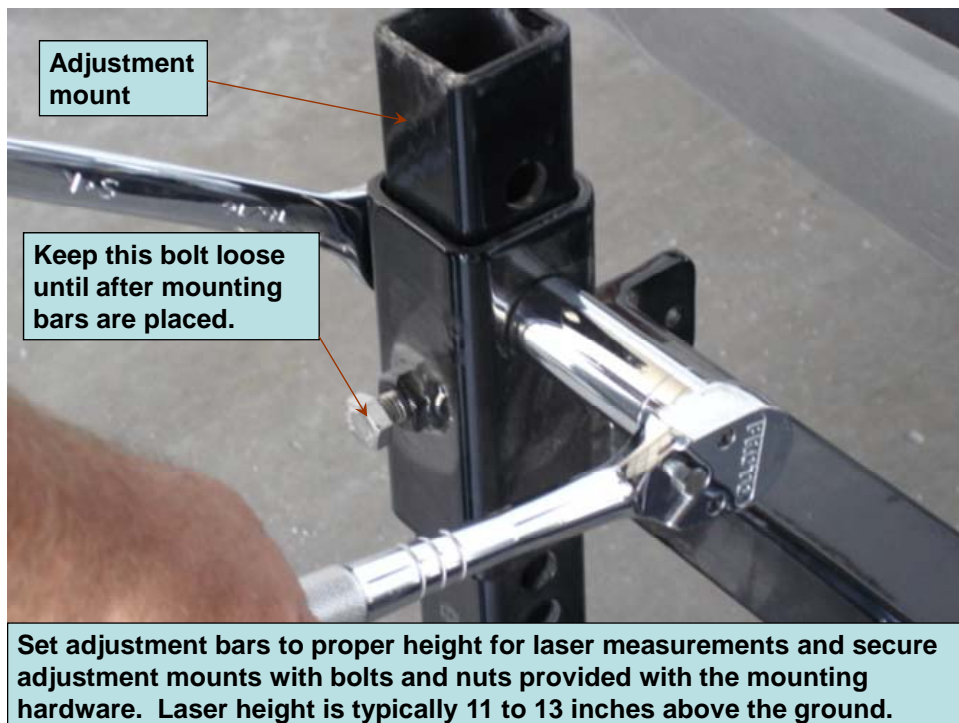


Figure 21 Adjust Height

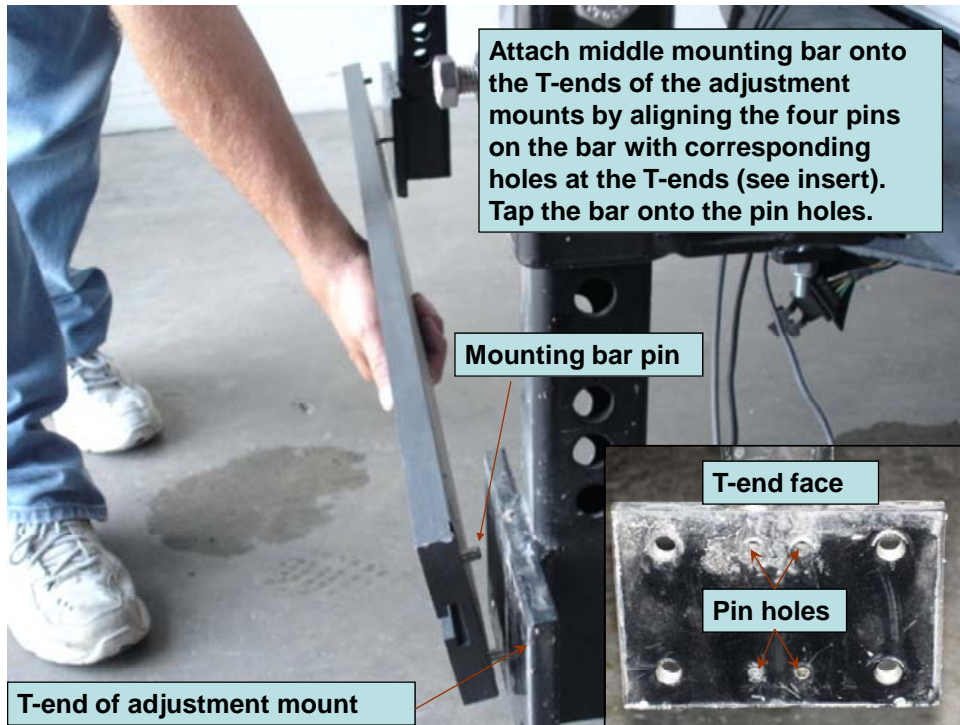


Figure 22 Attach Middle Mount



Figure 23 Attach Side Mount

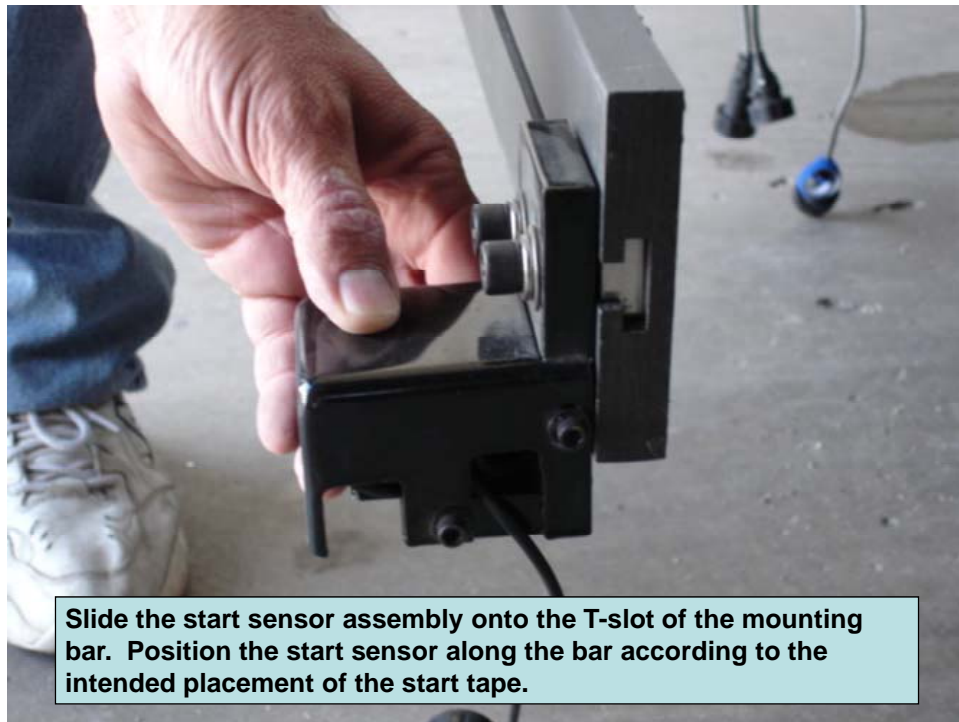


Figure 24 Secure Mounting Bars



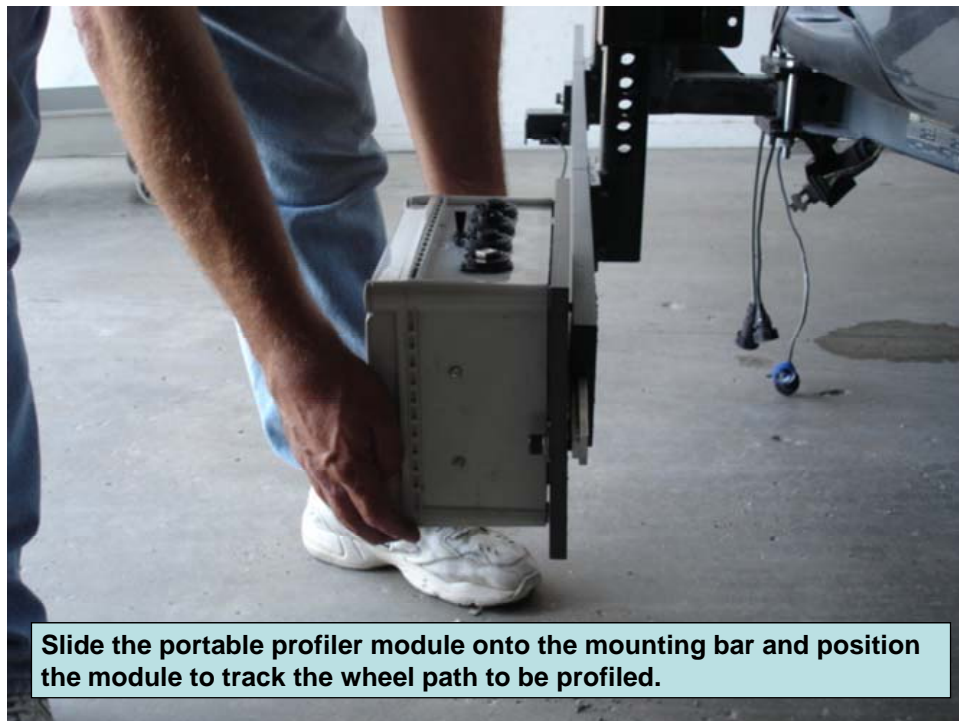
Figure 25 Tighten Mounting Bars





**Slide the start sensor assembly onto the T-slot of the mounting bar. Position the start sensor along the bar according to the intended placement of the start tape.**

Figure 26 Mount Start Sensor



**Slide the portable profiler module onto the mounting bar and position the module to track the wheel path to be profiled.**

Figure 27 Mount Profiler Module

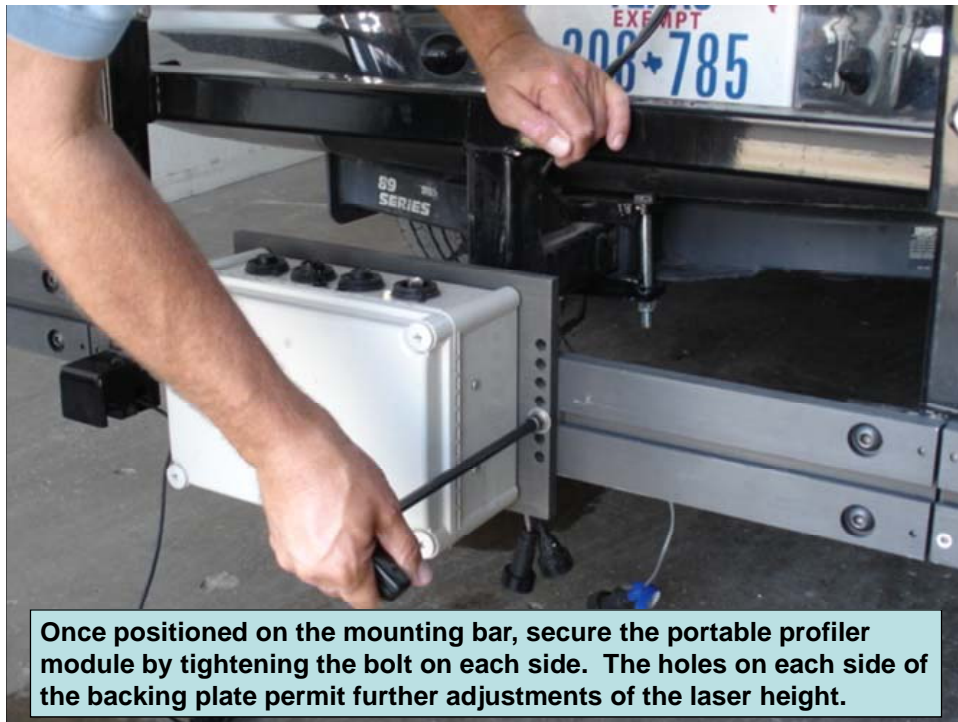


Figure 28 Position Profiler Module to Desired Location

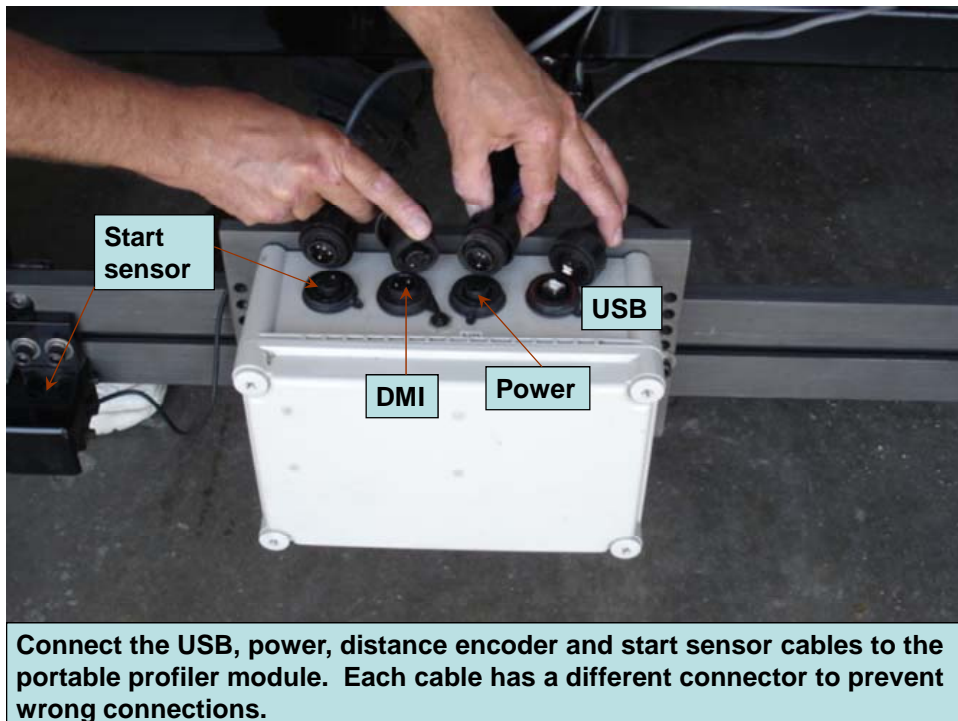


Figure 29 Connect Cables

Route the USB cable to the interior of the vehicle and connect the other end of the cable to a USB port of the profiler's notebook computer.

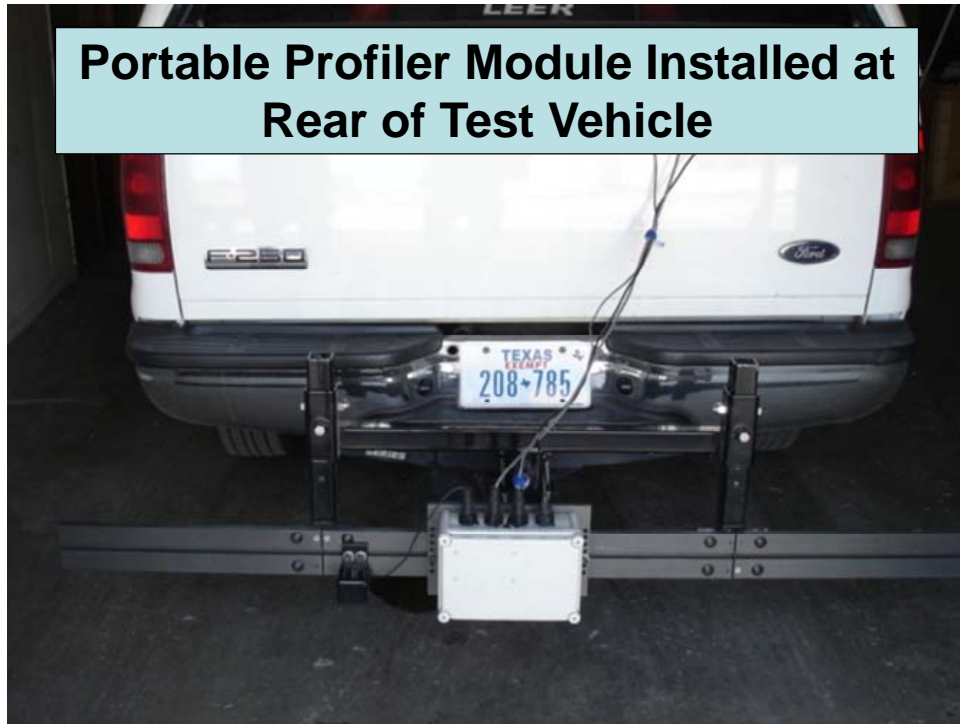


Figure 30 Route USB Cable to PC

Route the power cable to the interior of the vehicle and plug the other end to a power port or a cigarette lighter.



Figure 31 Connect Power Cable



**Portable Profiler Module Installed at  
Rear of Test Vehicle**

Figure 32 Completing Profiler Module Installation

### *Distance Encoder Installation*



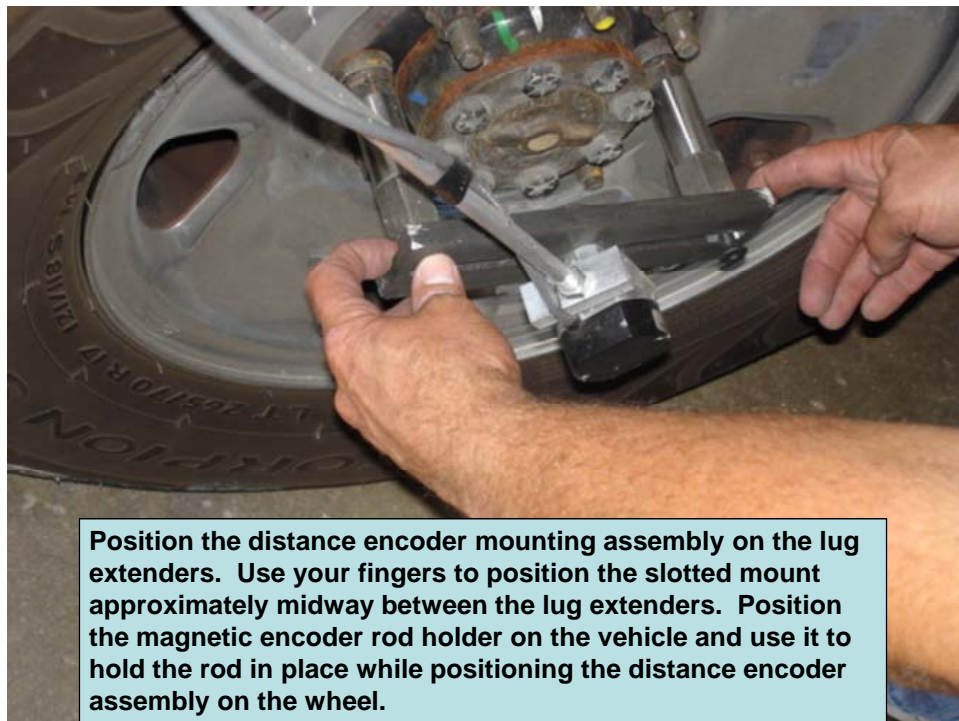
Figure 33 Mounting Lug Extenders





**Join the two pieces of the distance encoder rod by screwing one piece to the other.**

Figure 34 Encoder Holder Rod



**Position the distance encoder mounting assembly on the lug extenders. Use your fingers to position the slotted mount approximately midway between the lug extenders. Position the magnetic encoder rod holder on the vehicle and use it to hold the rod in place while positioning the distance encoder assembly on the wheel.**

Figure 35 Position Encoder into Mounting Assembly



Figure 36 Secure Distance Encoder

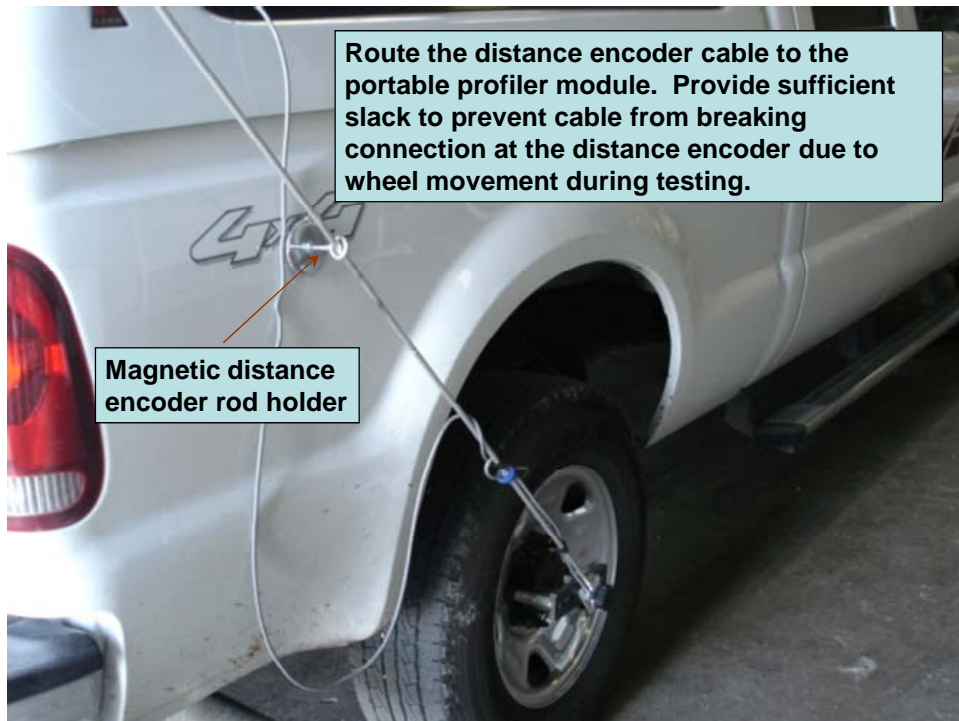


Figure 37 Complete Encoder Installation