



**Merlin Controls Speed Wizard
For Electronic Speedometer Correction**



**Merlin Speed Wizard
Fits Most Ford Trucks and SUVs 1992-Present**

TABLE OF CONTENTS

TABLE OF CONTENTS	2
OVERVIEW AND PURPOSE:	3
HISTORY OF THE SPEED SIGNAL	3
INTRODUCTION	4
PRE-INSTALLATION NOTES:	4
PARTS INCLUDED PICTURE:	5
INSTALLATION OVERVIEW:	6
1. MAKING CONNECTIONS:	6
2. PRE-INSTALL STEPS:.....	7
3. GENERAL INSTALL INFORMATION:.....	7
4. TESTING SIGNALS (RECOMMENDED FOR ALL VEHICLES).....	7
5. MOUNTING THE SPEED WIZARD AND MAKING ELECTRICAL CONNECTIONS.....	8
NOTES ON CONNECTIONS:.....	8
REFERENCE PICTURES:.....	9
ABS 1	9
FIGURE 1	10
FIGURE 2	11
CORRECTION INFORMATION:	12
1. CORRECTION METHOD (Overview):.....	12
2. RETURNING TO STOCK:	12
3. CORRECTION INSTRUCTIONS (Detailed):.....	12
4. CORRECTION FORMULAS:.....	13
TABLE OF VARIABLES:.....	15
FINAL CHECK	17
VERIFICATION AND TWEAKING THE CORRECTION SPEED	17
IMPORTANT PRODUCT USE INFORMATION.....	18
LIABILITY AGREEMENT	19
CONTACT INFORMATION.....	20
REFERENCE INFORMATION:.....	20

OVERVIEW AND PURPOSE:

A common annoyance experienced by drivers of modified vehicles is incorrect speedometer readings. This problem is especially prevalent when a vehicles tire size has been modified. In some cases the problem may also present itself when modifying gear ratios. When a vehicle speedometer reads incorrectly, it results in incorrect odometer readings. This problem can result in missing scheduled maintenance and even worse, potential traffic violations. The Merlin Speed Wizard solves this problem by modifying the speed signal to reflect actual ground speed.



This device is NOT a substitute for dealer calibration. The Speed Wizard is an adjustment tool that will adjust the speedometer within 2% accuracy in most cases. Accuracy should be verified with a measured distance or GPS.

HISTORY OF THE SPEED SIGNAL

“Vehicle speed sensors” were at one time a geared device with a cable that was attached to the mechanical speedometer. With technology, a newer type has replaced the cable style speed sensor. The newer style speed sensors emit a number of pulses per MPH that is sent to various vehicle systems for processing. Changing tire diameter and in some cases changing gear ratios will cause this signal to read incorrectly; which makes the speedometer, odometer, and other onboard systems read incorrectly.

With the “Speed Wizard” the speed signal is adjustable, and the speed can be corrected. The Speed Wizard installs in series with the speed signal wire, so the signal must now pass through the Speed Wizard module. The result is a speedometer that reads correctly, and an odometer that shows the correct mileage.

It has been researched and based upon our experience; a stock vehicle speedometer may have as much as 10% error. When modifications are made to the vehicle, the speedometer may be off by an even greater percentage. The Speed Wizard has one purpose, and that is to return the speed signal back so that it reads actual speed. The Speed Wizard can be used to adjust the speedometer to better than 10% and has been tested to <1%.



It is the driver’s responsibility to make sure the speedometer is reading correctly.

INTRODUCTION

This document will cover the installation and operation of the Merlin Controls Speed Wizard. We have attempted to insure that no errors are present in this instruction guide. If an error should be found please let us know we will be sure to include the fix in our next revision.

PRE-INSTALLATION NOTES:

Installation of this device requires a professional mechanic, or person familiar with vehicle electronics. Of course, the vehicle's speedometer should be in fully functional condition. The installer should read and understand these instructions before starting the install procedure. If there are any questions regarding the installation of the Speed Wizard please contact our email support at speedwiz@fmdkinc.com.



The **Speed Wizard** is small enough to fit just about anywhere. We recommend that it be located behind the fuse panel in the cab of the vehicle. Be sure to locate wires away from moving parts and high heat sources. Tie wires up using the supplied zip ties. Protect any wires as necessary to avoid short-circuits or wires being chaffed.

REQUIRED TOOLS:

- Soldering Iron & Solder
- Crimping Tool
- Wire Stripper
- Screwdriver Phillips / Flat
- Nut Driver

HELPFUL ITEMS

A vehicle technical service manual on DVD (these are great) or (www.helm.com).

- Electrical Tape
- A helper
- Heat Gun

PARTS INCLUDED LIST:

Parts Included with Merlin Controls Speed Wizard		
Item #	Quantity	Description
1	1	Speed Wizard Box W/Wires
2	1	Instruction Sheet (Downloadable)
3	2	22-18Ga butt splice
4	2	Shrink Tube pieces
5	1	Velcro Pad
6	4	Tie Wraps
7	1	Speedometer Notice Sticker

PARTS INCLUDED PICTURE:



INSTALLATION OVERVIEW:

Summary:

- Locate speed signal wire
- Splice in Speed Wizard wires
- Provide power and ground to the Speed Wizard

CONNECTIONS FROM SPEED WIZARD:

WIRE #	COLOR	DESCRIPTION
1	YELLOW	FUSED IGNITION ON +
2	BLACK	GROUND
3	ORANGE	OUTPUT TO SPEEDOMETER / PCM
4	VIOLET	INPUT FROM VEHICLE SPEED SIGNAL



WIRE COLORS: THE WIRE COLORS FROM THE SPEED WIZARD ARE NOT THE SAME COLORS IN THE VEHICLE WIRE HARNESS. IT IS UP TO THE INSTALLER TO VERIFY THE VEHICLE HARNESS WIRE COLORS BEFORE INSTALLING

WIRE #1: The YELLOW wire connects to a fused positive 12-volt source on ignition on. The device should only be powered when the ignition is on, or engine running. We suggest that the speed wizard be tied to the ignition on portion of the fuse box, to a fuse with a current rating of 5A or less. Radio fuses usually have a value of 5A or less, and also work off ignition “on”. Alternatively an inline fuse may be added at the installer’s discretion. The Speed Wizard is internally fused but the wires should be fused as close to the positive connection as possible, to prevent fire if the wires were to short out on a car surface or structure.



CAUTION: ALWAYS SUPPLY POWER FROM A FUSED SOURCE.

WIRE #2: The BLACK wire connects to a ground, the ground is very important. Either tap into another ground wire, or run a separate ground directly to the battery. Just grounding to something metal on the car does not suffice; a poorly connected ground wire may lead to speedometer error. Usually a suitable ground can be found under the steering wheel on the right hand side. To test the ground wire, check continuity using an ohmmeter from the “ground wire” to the negative terminal of the battery, the reading should be < 5 Ω.

Wire #3: The ORANGE wire connects to the speedometer side of the speed signal wire that is cut. The wire harness that comes from towards the cab of the truck contains the signal wire for “vehicle speed”. The wire then goes to the speedometer. The ORANGE wire connects to the wire that comes from the speedometer.

Wire #4: The VIOLET wire connects to the vehicle side of the speed signal wire that is cut. The wire harness located right after the ABS module usually contains the signal wire for “vehicle speed”. Always test the wire to verify it is the correct one. The VIOLET wire connects to the wire that comes from the ABS module, not the side that connects to the speedometer / away from ABS module.

1. MAKING CONNECTIONS:

All of the instructions above are described in detail below. Read through the entire procedure before attempting the installation of this product. If you feel uncomfortable with this installation, it may be best to let somebody else install this product. Contact an expert in automotive systems for help with installation.



SAFETY FIRST: WORK ON A FLAT AREA WITH THE EMERGENCY BRAKE SET TO PREVENT THE VEHICLE FROM ROLLING!

2. PRE-INSTALL STEPS:

- A. The vehicle should be in Park for automatic transmissions or First gear for manual transmissions with the ignition in the “off” position, keys removed, and emergency brake set.

3. GENERAL INSTALL INFORMATION:

- Be sure to route all wires away from sharp edges and high heat sources.
- It is best to route all wires by following a factory wire loom whenever possible.
- Find a suitable location inside the cab to mount the Speed Wizard module.
- The module is water-resistant but not waterproof! We suggest locating the Speed Wizard module behind the fuse box, in the cab. If tire sizes are changed often it may be wise to locate the Speed Wizard in a more accessible location.
- Use the Velcro strip provided to mount the Speed Wizard.
- Trim each wire to length as necessary. It is usually good to leave about an extra foot of wire. Extra wire can always be cut later.

4. TESTING SIGNALS (RECOMMENDED FOR ALL VEHICLES)

We suggest that the installer test the following wires before making permanent connections. When testing wires, it is required that a small area of the insulation be stripped. If the wire tested is not the correct wire, be sure to tape the stripped area of the insulation well to prevent shorting to other connections or ground.

Ignition ON Wire:

- Locate an ignition on source. Refer to Technical Service manual. The wire can be verified by using a DC voltmeter.
- With ignition off the voltage should be $< 0.3V$ with ignition on it should be $> 10V$, with engine running it should be $> 10V$.
- The ignition wire should be “hot” when the ignition switch is in the “run” position.
- Turn the ignition switch to the “run” position. Using a voltmeter, determine that the wire you have selected is hot when ignition on and when engine is running. The wire selected should be off or 0V if ignition off.
- Turn the ignition switch back to the “off” position.
- Strip the ignition on wire that was just tested, **DO NOT CUT THE WIRE**. Wrap the YEL wire from the Speed Wizard around the stripped area, so that a “T” shape is formed. See figure 2.

GND Wire:

- Locate a suitable GND wire. Refer to Technical Service manual. The wire can be verified by using an ohmmeter.
- Ignition off, keys removed.
- Check the resistance from the selected Ground wire to the negative post of the battery.
- The ohmmeter should read $< 5 \Omega$.
- Strip the selected GND wire that was just tested, **DO NOT CUT THE WIRE**. Wrap the BLK wire from the Speed Wizard around the stripped area, so that a “T” shape is formed. See figure 2.
- Another option is to use a ring terminal and attach the ground wire to a ground bolt or ground screw.

SPEED SIGNAL Wire:

- Locate the speed signal wire.
- Strip some insulation off the wire so that a test can be performed.
- Test the speed signal wire, using a DC voltmeter.
- Using the voltmeter, attach the ground lead to ground and the other lead to the speed signal wire.
- Have somebody watch the voltmeter while the vehicle is driven backwards and forwards very slowly ($< 2MPH$) for about 10 feet. **Do not attempt to monitor the voltmeter and drive at the same time, pay attention to driving and let your helper monitor the voltmeter.** The voltmeter should toggle between about 0V and 10V.
- Once the Wire is verified, the driver should park the vehicle, apply the emergency brake, and turn off the engine.

- Pick a spot on the speed signal wire to cut the wire. Leave enough room on both sides to make a crimp and solder the connection.
- Connect the Violet wire to the end of the speed signal wire that leads to the Vehicle Speed Signal, use the crimp tool to make the crimp. See figure 1.
- Connect the Orange wire to the speed signal wire that leads to the speedometer in the dashboard, or towards the cab (On 05 and up models), use the crimp tool to make the crimp. See figure 1.

5. MOUNTING THE SPEED WIZARD AND MAKING ELECTRICAL CONNECTIONS

- Solder each connection well. (Refer to the Soldering diagrams).
- Each connection should be soldered, covered with shrink tube and/or electrical tape.
- Cover speedometer connections with shrink tube, and heat the shrink tube enough to shrink on connection. Be very careful when using a heat source in the vehicle not to melt anything, or cause a fire.
- Make sure no crimp connections or wires are exposed.
- Mount the Speed Wizard in any location using the supplied Velcro strip; be sure wires are kept away from moving components, and high heat sources. Mounting wires in the path of moving parts such as the steering column and / or brake and gas pedals is dangerous and may cause an accident. Keep all wires away from moving parts.

CAUTION: Be sure not to melt any vehicle components, be sure not to melt the carpet. Merlin Controls will not be held responsible for damages caused by heating the shrink tube on this product.

NOTE: Improperly connecting the Power or speed signals wires will result in the Speed Wizard not operating correctly, and may damage the unit. Please verify all connections using a voltmeter before connecting wires.

NOTES ON CONNECTIONS:

We recommend tapping into the speed signal right after the ABS module on most ford trucks.

For most ford trucks the location for the speed signal wire is directly after the ABS module. In most cases this wire is GRY/BLK (With a skinny black stripe). This signal wire is usually located within the thick harness on the driver side fender wall in the engine compartment.

On 1994-1998 Ford Pickup F-series trucks, there will usually be a red/pink wire that is found in the instrument cluster right behind the speedometer. This wire should be tested the same as in the instructions above. **Do not attempt to monitor the voltmeter and drive at the same time. Pay attention to driving and let your helper monitor the voltmeter.** Disconnect the plug from the back of the instrument cluster before making solder connections.

On 1999-2004 Super duty trucks we recommend tapping into the speed signal right after the ABS module. However some customers have found it was easier to tap into the speed signal directly behind the cluster. Please see the website for a detailed install guide for splicing in the speed wizard right after the ABS module.

If your truck is a 2005 or UP Ford Super duty trucks, tapping into the speed signal will require accessing the ABS module plug. The ABS module is on the driver side of the engine compartment against the fender. The plug has a large metal clip. Please see the following pictures (ABS 1). The speed signal wire is gry/blk.

REFERENCE PICTURES:

ABS 1

Picture of 2005 and up super duty ABS plug – Arrow pointing to where gry/blk speed signal wire is.



Note: If the information in the provided document does not match what is found on the vehicle, please contact Merlin Controls email support before proceeding. Speedwiz@fmdkinc.com

FIGURE 1

Soldering a crimp connection.

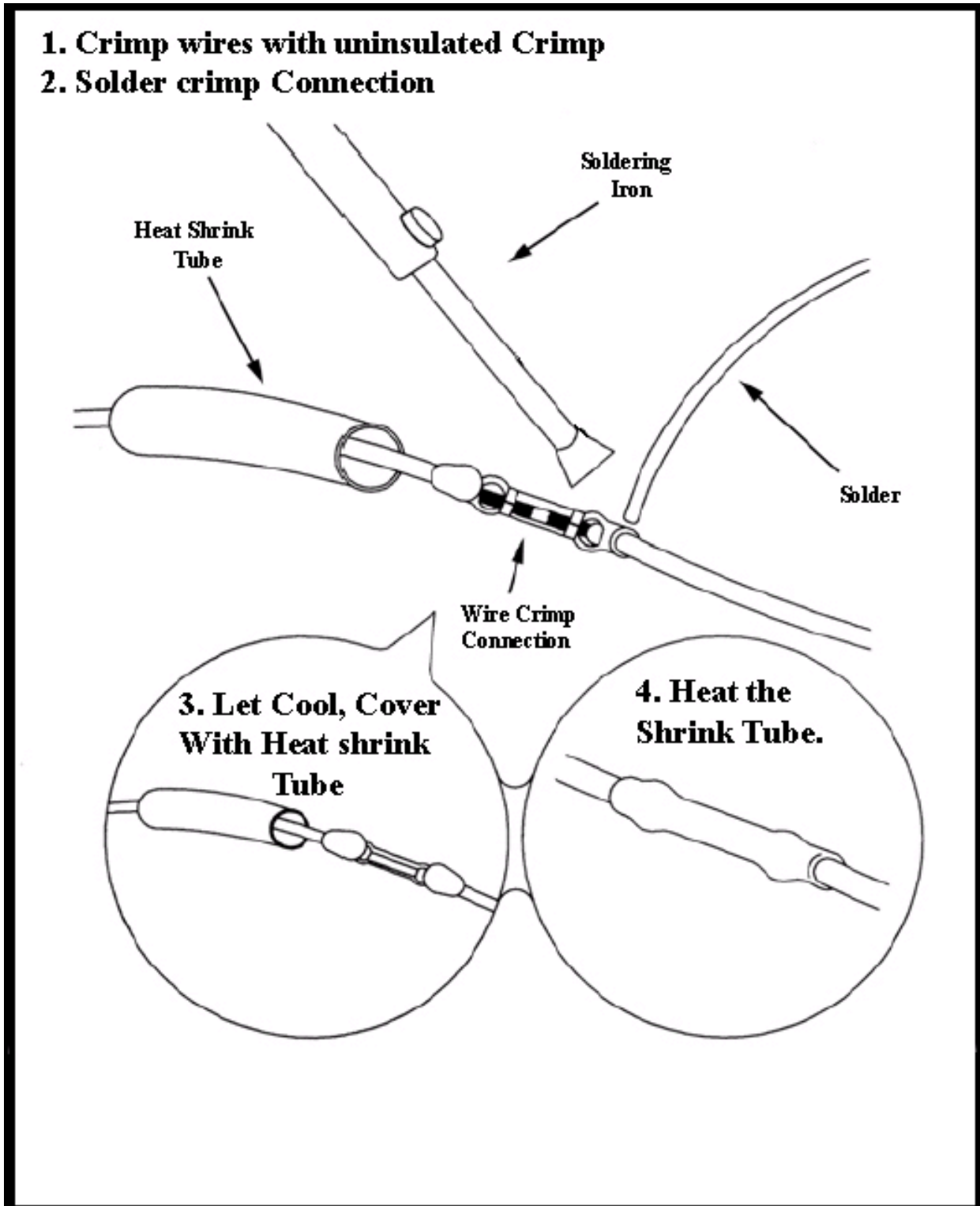
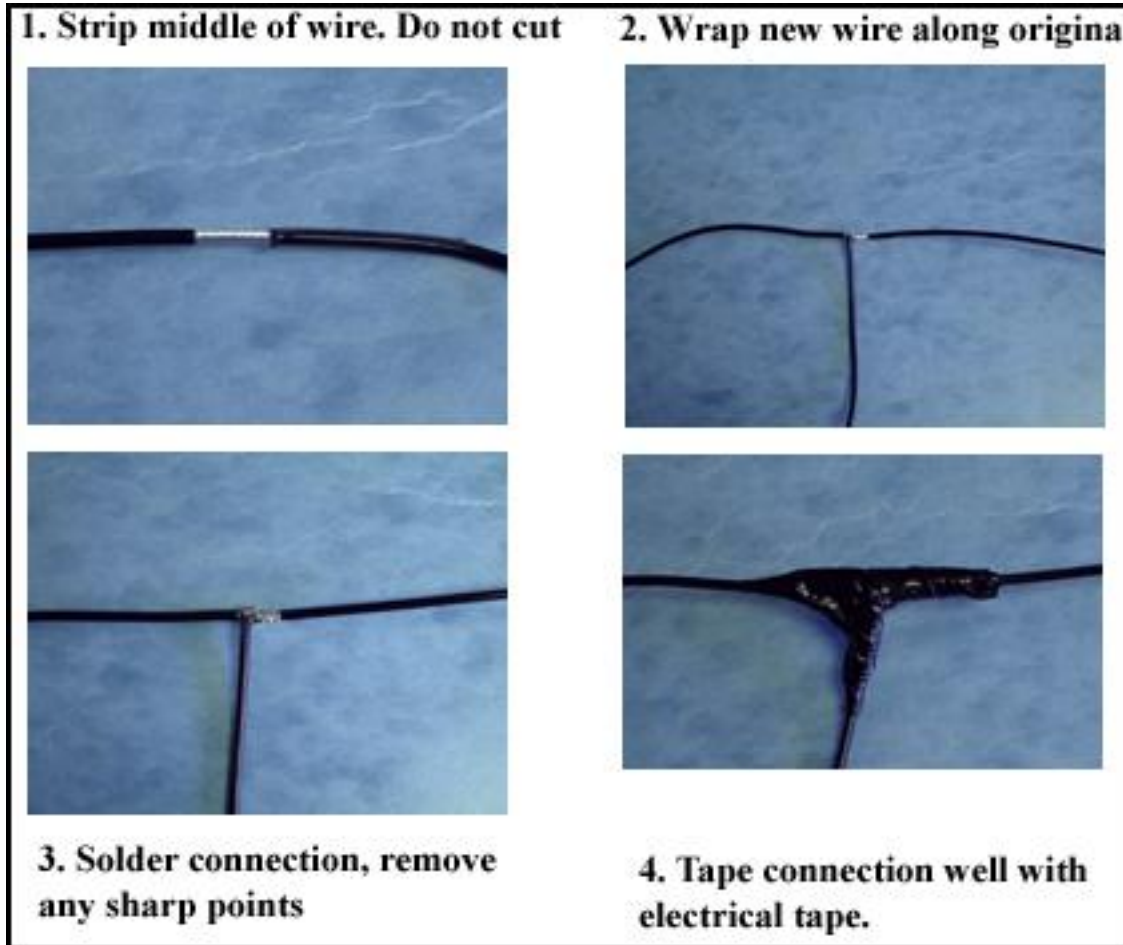


FIGURE 2

Soldering a “T” Connection.



CORRECTION INFORMATION:

The Speed Wizard speed signal correction device is corrected by following a few simple steps. The correction is saved when completed and will not change unless the correction mode is entered again.



It is extremely important that the Speed Wizard calibration is checked whenever tire and / or gear changes are made. If the speedometer is not reading correctly then the user should readjust the speedometer using the Speed Wizard. Failure to do so will cause inaccurate speedometer / odometer readings. It is the owner's responsibility to ensure that the Speed Wizard is set properly for the vehicle's current tire / gear combination. It is the owner's responsibility to double-check the accuracy of the Speed Wizard periodically using a GPS or similar device.

1. CORRECTION METHOD (Overview):

The Speed Wizard speedometer correction device will correct for Larger tires only, it will not correct speedometer for smaller than stock sized tires.

- The user puts the Speed Wizard in correction mode.
- A default (no correction) reference speed is then shown on the speedometer. This should be written down. See last page for a fill in sheet.
- After a few seconds, 0 MPH will be shown.
- Then the last correction speed will be shown.
- The user will then adjust the Speed Wizard to the calculated correction speed.
- The correction value can be calculated by using the formulas. Note: the speed on the dashboard will go to 0 after about 8 seconds of button inactivity.
- Once the speedometer is set, let go of all buttons, after about 3 - 8 seconds the speedometer will go to 0, this means the correction value has been saved and the vehicle is ready to be driven.



Whenever a calibration mode is executed, mileage will count on the odometer. Mileage will count at a rate of approx. 1.5 Miles per minute.

- If the correction could not be completed before the speedometer went to 0 speed, just turn ignition off for 3 seconds then turn ignition back on and re-enter the correction mode.

2. RETURNING TO STOCK:

NOTE: If the stock tire size is being put back on the vehicle, there is no need to remove the Speed Wizard. Simply follow these steps:

- Enter the correction mode.
- Make the correction speed read the same as the reference speed.
- Wait until the speedometer reads 0 speed.
- Speed Wizard is now set for stock tire size.

3. CORRECTION INSTRUCTIONS (Detailed):

- Press and hold both the “up” and the “down” buttons on the Speed Wizard until a speed is shown on the speedometer (Approx. 5-10 seconds). When this reference speed (REF_SPD) is shown on speedometer, let go of buttons.
- The speed shown on the speedometer should be written down (See Last page for a guide). This is your vehicles' reference speed; this number will never change.
- After ~ 10 seconds, the speed will drop to 0MPH for a short time (~ 2 seconds).

- After ~ 2 seconds the correction speed will be shown (Correction_SPD), and is adjustable at this time. The up and down buttons are used to modify the correction speed. Use only one button at a time to make the adjustment.
- The correction speed should be calculated beforehand by using the reference speed and the formulas in the “Correction formulas” section.
- Once the correct speed is calculated, use the “up” and “down” buttons to adjust the Speed Wizard to the new correction speed.
- When the correction speed is set, release all buttons and in ~ 3 – 8 seconds the speedometer will read 0MPH.
- If the speedometer has dropped to 0 MPH before the correction was completed, it will be necessary to start the correction routine over.
- The correction is only allowed to occur once per power on sequence.
- To re-enter correction, turn ignition off, wait at least 3 seconds then turn ignition on.
- Hold the “up” and “down” buttons together until the reference speed is shown, the correction speed is now shown again, the correction can be completed as written above.
- Correction is complete; the user should now verify the correction by driving the vehicle, a friend can check the correction with a GPS unit.
- At the end of this manual is a fill out sheet. Fill out the sheet so it can be used as a quick reference for correction later. The fill in sheet makes it easy to be able to correct for various size tires. The fill in sheet shows a list of six different sizes, but in actuality, the sheet can have as many designations as you have tire sizes. It will take an experienced user less than one minute to execute the correction for a different tire size, so switching tire size even multiple times a year is not an issue.

4. CORRECTION FORMULAS:

Percentage change is the only way the Speed Wizard needs to be corrected. There are two accurate methods for calculating percentage change required to calibrate the speedometer:

1. Stock tire vs. new tire.
2. Speed difference vs. GPS.

NOTE ON DIAMETER: Some of the new tire sizes do not actually measure to their standard size. For example 37x12.5R17 trxus MT's measure 36.5" on a 2003 F250 with 17x10" wheels. The same size tire 37x12.5R17 BFG AT/KO on the same wheel and on the same truck only measure 35.5". The correction will get close but our experience has been that it may be easier for some users to get the actual tire diameter instead of the “said” diameter. Tire squat also has to be taken into account. Referring to the manufactures website will help find the actual diameter of the tires, however we have found another method to work well:

To measure actual tire diameter; first find the circumference of the tire. This can be best achieved by parking the truck on a flat surface. Chalk both the tire and the ground at the lowest part of the tire. Drive the truck forward or backward one full tire revolution until the mark on the tire is at the lowest point again. A friend can help with this. Once the truck is moved one full tire revolution the chalk mark should be at the lowest part of the tire, at this point chalk mark the ground where the chalk mark is on the tire. Move the truck out of the way, and then measure the distance in inches between the two chalk lines on the ground. This is the tire circumference.

From geometry class:

$$\left(\frac{\text{Circumference}}{\text{diameter}} \right) = P \qquad \left(\frac{C}{d} \right) = P$$

Therefore:

$$d = \left(\frac{C}{P} \right)$$

NOTE: The speed difference vs. GPS method will eliminate possible speedometer error, however if the GPS is not reading correctly, or is not accurate then errors will be present when completed.

NOTE: (Does not affect Ford F250 – F550 pickups years 1999 – UP) If gears have been changed, it may be necessary to calculate the percentage difference by using GPS, or contact Merlin controls if the gear change has an effect on the speedometer reading. We can explain how to set up the speed wizard.

1. “Stock” tire vs. “New” tire Diameter, use the concept above to check diameter.
The way the percentage difference is determined is as follows:

$$\left(\frac{New}{Stock} \right) = "Multiplier"$$

When changing from a stock diameter tire to a larger diameter tire, the multiplier will always be a value greater than one (Multiplier > 1). For the Speed wizard device the correction factor must be > 1, the Speed Wizard is not configured for smaller tires (correction factor < 1). The opposite is true: If changing from a “stock” diameter tire to a smaller diameter tire, the multiplier will always be a value less than one (multiplier < 1).

Example: Larger

$$\left(\frac{36.5}{31.7} \right) = 1.151$$

Example: Smaller

$$\left(\frac{28}{31.7} \right) = .883$$

The multiplier is used to figure out the correction speed.

$$Multiplier * REF_SPD = Correction_speed$$

From Page 12 section 3 of the instructions, the Reference speed (REF_SPD) is the number shown on the speedometer after holding both buttons in on the Speed Wizard. The correction speed (Correction_SPD) will be viewed on the speedometer right after the speed goes to 0MPH the first time. The correction speed may be modified by using the “up” and “down” buttons.

2. MPH vs. GPS:
To find the percentage difference when using a GPS:

Before installing the Speed Wizard: Set cruise control to a legal speed maintaining traffic flow. **Do not exceed the speed limit based on the GPS.** Maintain speed for at least 10 sec. After 10 sec, have a friend read the GPS speed and record it. After another 20 seconds (at cruise speed) have your friends write down the GPS reading again. After this test is complete, return home to do some calculations. Use the following averaging formula to help eliminate some GPS variations:

$$\frac{GPS1 + GPS2}{2} = GPS_{AVG}$$

Formula for percentage using GPS is:

$$\left(\frac{GPS_{AVG}}{Speedometer} \right) = "Multiplier"$$

For an example lets say we set the speedometer to 50MPH ($Speedometer = 50$) on the cruise control and the GPS average read 57.5 MPH ($GPS_{AVG}=57.5$), we get the following equation:

$$\left(\frac{57.5}{50} \right) = 1.15$$

FORMULAS 1: SUMMARY OF FORMULAS:

To calculate multiplier knowing tire size difference:

$$\left(\frac{New}{Stock} \right) = "Multiplier"$$

To calculate multiplier knowing speedometer reading vs. GPS reading:

$$\left(\frac{GPS_{AVG}}{Speedometer} \right) = "Multiplier"$$

To calculate multiplier knowing distance driven (using DOT mile markers) use the following equation:

$$\left(\frac{Mile_Mark}{Odometer} \right) = "Multiplier"$$

Where $Mile_Mark$: The distance traveled per the DOT mile markers

$Odometer$: The distance read by the vehicle odometer

**To calculate correction speed knowing the multiplier and the reference speed:
(Reference speed is the first speed shown when entering the correction mode)**

$Multiplier$ (calculated earlier) is used to figure out the correction speed.

$$Multiplier * REF_SPD = Correction_speed$$

Speedometer Notice Sticker:

Install the speedometer notice sticker on the inside of the windshield, or on the dash, within driver's view.



The Speed Wizard is shipped with no set correction value. Upon initial installation, a correction routine should be performed so the speedometer will read correctly.

TABLE OF VARIABLES:

<i>Variable Name (used in formulas)</i>	Description
<i>New</i>	Diameter of the new aftermarket Tire
<i>Stock</i>	Diameter of the stock tire
<i>Multiplier</i>	The multiply factor to determine correction speed
<i>REF_SPD</i>	The reference speed (shows up on speedometer after holding both buttons in)
<i>Correction_SPD</i>	The speed at which the speedometer should be set to by using the “up” and “down” buttons of the speed wizard.
<i>GPS1</i>	First reading of GPS when conducting a speed check
<i>GPS2</i>	Second reading of GPS when conducting a speed check
<i>GPS_{AVG}</i>	Average GPS reading found by averaging GPS1 and GPS2 together.
<i>Speedometer</i>	Speedometer reading from the instrument cluster when conducting a speed check.
<i>Mile_Mark</i>	Distance traveled using the mile markers on the side of the highway as a reference.
<i>Odometer</i>	Distance traveled using the instrument cluster odometer as a reference.

FINAL CHECK

Check all connections made for proper solder connection and strength. “Cold” solder connections are prone to failure; make sure no “cold” solder joints are made. Verify all wires are routed away from sharp edges, and moving parts. Make sure the shrink tube covered the solder connection well. The connections should not be exposed; exposed wires can short to the chassis and possibly damage the board, or the vehicle. Additional measures may be taken to protect the wires if the installer would like; wire loom may be used to wrap the wires to protect the wires from abrasion.



It is important to verify that after the Speed Wizard is adjusted, the speedometer reading is accurate. The best way to verify the speedometer is to use a GPS. If a GPS is not readily available then an alternative way to check is to use mile markers on a highway. To check the speed by using mile markers: Reset the trip odometer at the start of a mile marker; drive 10 miles based on mile markers. After 10 miles driven on mile markers, check the odometer. The odometer should read 10.0 miles +/- .2. Note 1 mile out of 10 represents a 10% error. 0.2 would represent a 2% error. If the reading is < 10 miles on the odometer after 10 miles on mile markers, beware because when you are driving faster then the speedometer indicates.



Contact GPS manufacturer if GPS accuracy is in doubt.

VERIFICATION AND TWEAKING THE CORRECTION SPEED

You have installed your Speed Wizard; everything is working fine, but you want it to be as accurate as possible:

First figure out how much the speed is still incorrect by:

- Set the cruise control to 50MPH on a highway where that speed is legal. Maintain 50MPH for at least 10 sec.
- After 10 sec, have a friend read the GPS speed and record it, call this GPS1
- After another 20 seconds (at 50MPH) have your friend take down the GPS reading again, call this GPS2.
- After this test is complete, return home to do some calculations. Use the following averaging formula to help eliminate some GPS variations:

$$\frac{GPS1 + GPS2}{2} = GPS_{AVG}$$

Once the GPS speed is found, the formula for finding the multiplier using GPS should be calculated. If a GPS is not readily available then an alternative way to check is to use mile markers on a highway. To check the speed by using mile markers: Reset the trip odometer at the start of a mile marker; drive 10 miles based on mile markers. After 10 miles driven on mile markers, check the odometer. The odometer should read 10.0 miles +/- .2. Note 1 mile out of 10 represents a 10% error. 0.2 would represent a 2% error. In our experience a stock vehicle can be off by as much as 10 percent.

$$\left(\frac{GPS_{AVG}}{Speedometer} \right) = \text{"Multiplier"}$$

Once the new percentage difference is found it should be multiplied by the correction value that was saved before (*Correction_SPD*). Multiply this value by the new multiplier value. The new result should be slightly different then

the old “Correction_SPD ” result. Enter the correction like before, and adjust the value to the new number. This can then be checked again on the road and adjusted if necessary.

Once in the correction mode, small adjustments can be made by tapping the up or down buttons quickly, instead of holding those buttons in.

IMPORTANT PRODUCT USE INFORMATION

- Many vehicle owners will change tires for various reasons; therefore it is important to always verify that the Speed Wizard is properly set for the tire size and gear ratio on the vehicle.
- Do not open the Speed Wizard box. There are no user serviceable parts inside. If there is a problem please contact Merlin Controls Email Support.

We will be happy to assist users with questions about the Speed Wizard products.

LIABILITY AGREEMENT

Merlin Controls

GENERAL TERMS AND CONDITIONS OF SALE FOR SPEED WIZARD

By using this product the customer and/or consumer assents to our conditions of sale below, and we agree to furnish the product only upon these conditions.

1. **PAYMENTS**
Unless otherwise agreed to by Merlin Controls, payment will be in full payable in U.S. Dollars and drawn upon a U.S. Bank. The product will be shipped after payment has cleared our financial institution.
2. **DELIVERY AND SHIPPING**
Speed Wizard products are normally shipped via USPS and/or UPS with costs included in the purchase price. Other shipping methods are available upon request and are in addition to the purchase price.
3. **TAXES**
Speed Wizard product prices do not include any applicable sales, use, excise, or similar taxes and will be the sole responsibility of the Customer and/or Consumer. Except for NJ where sales tax will be added.
4. **GENERAL**
 - (i) Any order resulting herein will in all respects be construed and be given legal affect in conformity with the laws of the State of New Jersey, U.S.A.
 - (ii) Any provisions or conditions of the Customer and/or Consumer's order, statement of terms or otherwise, which are in any way inconsistent with or in addition to these General Conditions of Sale (except additional provisions in shipping instructions specifying quantity and character of the items ordered) shall not be binding on Merlin Controls and shall not be considered applicable to this sale. These General Terms and Conditions of Sale supersede all prior discussions and writings and constitute the entire agreement between Customer and/or Consumer and Merlin Controls with respect to the terms and conditions governing all orders.
5. **WARRANTY**
Merlin Controls warrants to the original Customer and/or Consumer that each Speed Wizard product to be delivered hereunder will be free from defects in material or workmanship when used within the service, range and purpose for which they are manufactured. THIS WARRANTY IS EXCLUSIVE AND NO OTHER WARRANTY, EXPRESS, IMPLIED OR STATUTORY (EXCEPT OF TITLE), SHALL BE IMPLIED. NO WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR PURPOSE OR ARISING FROM COURSE OF DEALING OR USAGE OF TRADE SHALL APPLY. Unless otherwise specified by Merlin Controls, if any Speed Wizard product manufactured by Merlin Controls shall prove defective in material and/or workmanship within ninety (90) days from installation, or one hundred twenty (120) days from delivery, whichever occurs first (hereinafter referred to as the "Liability Period"), the Customer and/or Consumer shall notify Merlin Controls within thirty (30) days of discovery of such defect. Merlin Controls shall, at its option, repair or replace Speed Wizard components found by Merlin Controls to be defective in material or workmanship on receipt of same F.O.B. place of manufacture, shipping prepaid. Instruments, equipment or components purchased from other manufacturers included in or with the product will be covered only as provided for by such other manufacturer's warranty.

Without limitation of the foregoing, this warranty shall not apply (i) to the performance of any system of which Merlin Controls' Speed Wizard products are a component part, (ii) to deterioration by corrosion or any cause of failure other than defects of material or workmanship, or (iii) to any of Merlin Controls' Speed Wizard products or parts thereof which have been tampered with, altered, or repaired by anyone except Merlin Controls, or subjected to misuse, neglect, abuse, or improper use or misapplication such as breakage by negligence, accident, vandalism, the elements, shock, vibration, or exposure to any other service, range or environment of greater severity than that for which the Speed Wizard products were designed.

Note: Merlin Controls' Speed Wizard Warranty is conditioned upon the following:

- (a) That the Customer and/or Consumer installs Speed Wizard products in accordance with Merlin Controls' Installation Instructions.
- (b) It is understood that the wire colors provided are for most vehicles and that some vehicles may have differing coloration. It is the Customer and/or Consumer's sole responsibility to test the wiring, as indicated in the Installation Instructions, prior to installation of the Speed Wizard Products. Merlin Controls will not be responsible for improper installation, Speed Wizard failures or vehicle component failures. Failure to meet these requirements will void Merlin Controls' Warranty in its entirety.

The liability of Merlin Controls Speed Wizard products arising out of the supplying of said product, or its use, whether in contract (or warranty) or tort (including claims of negligence), or otherwise, shall not in any case exceed the original purchase price of the Speed Wizard products or part thereof which gives rise to the claim as herein provided. Upon the expiration of the Liability Period herein specified, all such liability shall terminate. The foregoing shall be Merlin Controls' sole and exclusive liability and Customer and/or Consumer's sole and exclusive remedy for any action, whether based in breach of contract or in tort, including negligence or strict liability. **IN NO EVENT SHALL MERLIN CONTROLS BE LIABLE FOR LOST PROFITS, INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES, LOSS OR EXPENSE.**

CONTACT INFORMATION

For questions, support or comments please email us:

Speedwiz@fmdkinc.com

<http://www.merlincontrols.com>

<http://www.fmdkinc.com/wiz.htm>

REFERENCE INFORMATION:

The following area is for reference. This is an area where the user can write down the reference speed, the correction speed and the tire size the correction corresponds to. For each tire size there will be a different correction speed.

Reference Speed: _____ (The first speed that shows when user enters the correction mode).

Tire size Stock: _____ (The stock tire size on the vehicle).

CORRECTION NUMBER	NEW TIRE SIZE	CORRECTION SPEED
1		
2		
3		
4		
5		
6		

REVISION TABLE:

REVISION #	DATE	DESCRIPTION
13	2/06 – 7/30/06	Original document, reviewed by others
14	7/31/06	Removed “Calibration” replaced with correction. Modified wording
15	8/3/06	Added ign on- installer should use fused wire for this connection.
16	8/24/06	Modified Parts list, added caution note for fused source
17	10/3/06	No longer preliminary. Added Information on 05 and up SD trucks, modified some wording. Added picture for 05 and up SD ABS module.
18	7/18/07	Modified per customer comments, modified wording, modified formulas to make more understandable.
19	3/5/08	Added New method to calculate tire diameter, cleaned up wording, changed recommended install location 1999-2004
20	5/17/10	Added notes - will not work for smaller than stock sized tires. Speed Wizard for larger than stock sized tires ONLY.