2001-2005 GM ALLISON 5 SPEED
LCT-1000/2000/2400
CO-PILOT PARTS LIST

Co-Pilot Computer (1) 601-800-4248

Solenoid Block (1) 601-109-4248

External Wiring Harness (1) 601-011-4248

Internal Wiring Harness (1) 601-015-4248

Installation Manual
Co-Pilot™ for 2001-2005 GM Allison LCT-1000/2000/2400
Version 4.2

This kit makes it possible to transfer increased power levels over stock developed by a modified engine to the rear wheels without causing the dreaded transmission slip and "Fail Safe" condition that plagues the Allison transmission. The Co-Pilot™ package alone, without any internal transmission modifications, allows the transmission to handle approximately 85 more horsepower and 120 foot pounds of torque over the power level at which the stock Allison will typically enter into "Fail Safe" mode, roughly 425HP/650Tq. The Co-Pilot™ kit allows the transmission's clutch packs to receive full line pressure (clamping force needed to apply clutches) during high power situations. The stock Allison LCT-1000/2000 and 2400 transmission's torque capacity has been reduced by the limited pressure that is available in the clutch packs. The stock Allison transmission only receives approximately 86-PSI oil pressure to the clutch packs when in 5th gear. After the addition of the Co-Pilot™ transmission system the transmission clutch packs receive approximately 230-PSI, more than 2.5 times the stock pressure.

By allowing the available line pressure to the clutch packs, we have designed a system that increases the torque capacity of the stock Allison transmission by over 280 foot pounds of torque with the simple addition of our Co-pilot™ transmission kit. This increased pressure is only applied during high engine torque output, unlike other mechanical kits that do not use electronic controls. This removes the concern of excessive pressure on vital transmission parts such as delivery rings, drums, shafts, etc. during normal operation. Other valve body kits being sold today perform this hydraulically, only after the trim valve has completed the shift. The problems with these hydraulic kits lie in two areas. The first is the lack of ability to sense engine torque and to anticipate a shift. This causes the clutches to endure an excessive amount of slip, causing heat during the shift and eventually glazes the shifting clutch packs. The other problem with these mechanical kits is the valves supply full line pressure to the delivery rings in the transmission at all times. This constant high pressure causes excessive wear in the transmission. We have spent a great amount of time in the engineering and development of this kit to ensure long transmission life, along with great performance. If the Co-Pilot™ kit is installed into a transmission that has been pushed into the fail-safe protection mode (neutral) the effect the Co-Pilot™ will have on the transmission is not as apparent as when installed on a stock transmission that has not been previously damaged. After the C-3 (3rd-5th) clutch pack has been glazed a few times the clutch pack looses about 20% of its holding force, in this case the complete ATS Heavy Duty Transmission package may be necessary to repair the previously damaged components inside the transmission.

Please read all instructions before the installation of the ATS Allison Co-Pilot

Thank you for purchasing the ATS Co-Pilot™ Allison transmission up-grade package. This manual is to assist you with the installation and operation of the unit. If you are installing the unit for a customer, **please pass this manual on to your customer** for future reference.

Features of the ATS Co-Pilot Allison Package

- Increases transmission torque capacity over stock Allison LCT-1000/2000/2400
- Allows full control over transmission shift quality at the touch of a button
- The only system available that will let the driver select shift firmness
- Faceplate on the Co-Pilot module indicates the enhancement level the transmission receives
- Allows shift softness/firmness from mild to wild
- Keeps the engine off of the rev-limiter at wide open throttle, during high torque demand
- Increases transmission life and durability, and reduces transmission fail-safe condition that exists from increased power output of engine
- Automatic command of the torque converter clutch apply under high power conditions
- Allows towing in all gears, including overdrive, with a modified engine
- Works with all add on power modules including propane assist
- Works in conjunction with the factory computer
- Will work with all other transmission shift calibration kits

Understanding the ATS Allison Co-Pilot™ Transmission Package

The ATS Co-Pilot module controls and increases the load capacity of the Allison LCT-1000 automatic transmission based on the amount of increased engine torque. This allows for up to 100% of the power developed by the engine to be transferred through the transmission. The ATS Co-Pilot module provides normal factory operation of the transmission when the engine is operated in the lower power ranges. As the torque of the engine is operated at increased loads the ATS Co-Pilot module will prevent the transmission from slipping; delivering all of the normally unusable power to the ground. In certain high power situations, the converter clutch is turned on eliminating the slippage through the fluid coupling in the torque converter. This feature is best used with the ATS Five Star™ torque converter. The transmission performance is exceptional and oil temperature will remain low because of little to no slippage occurring when the ATS Co-Pilot module is turned on. When the ATS Co-Pilot module is turned on, you can expect exceptional performance and very responsive shifts.

The ATS Co-Pilot module allows the driver to have control over the engagement of the torque converter clutch while eliminating the slip in the transmission clutch packs. The Co-Pilot module also allows the driver to select the shift quality (firmness) desired during heavy acceleration. With the simple push of a button you can select stock type soft shifts to tire burning performance shifts. This feature is the most popular feature of the ATS Allison Co-Pilot Pack. Select a soft shift for every day driving or make a few clicks on the up arrow pad and lay rubber at the racetrack. The glory about this feature is its simplicity.

Operating Instructions

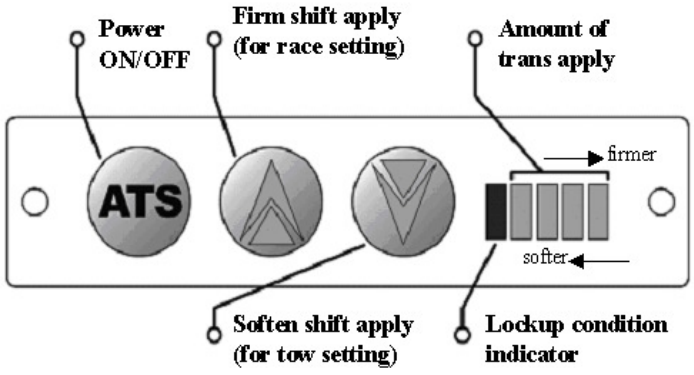
The variable control panel on the face of the ATS Co-Pilot Module allows the driver to select the quality of the transmission shift. The “quality” of the shift is the firmness or softness, this is the duration of time the transmission takes to complete a shift from the time the computer commands a shift tell the

transmission completes a shift. Shift quality is very important, when a shift takes longer than desired the clutches glaze and eventually burn up causing premature transmission failure. A glazed clutch also has far less holding ability than a good clutch. This is the condition that is caused by installing power modules on a vehicle with out taking care of the transmissions first. The control panel face also serves as a boost pressure readout, as engine output torque (boost) rises the lights in the panel will light starting at the left going to the right. The blue boost indicator lights indicate when the transmission is being torque enhanced by the ATS Co-Pilot Module. When the round button on the left side of the Co-Pilot face is depressed and the blue light is turned off, the ATS Co-Pilot Module is disabled. This will allow the factory PCM (Power Train Control Module) to operate the vehicle as it is in near stock form. The OFF position is indicated by none of the lights being lit on the face of the box when boost pressure is reached. To activate the unit, depress the round button on the left side of the Co-Pilot face, one of the blue lights on the face will light up, the light also indicates the level the Co-Pilot was set on before it was last shut OFF. This will tell the ATS Co-Pilot Module to watch for engine load. The torque converter clutch engagement is controlled by two different inputs; vehicle speed and engine load. This feature is adjustable on the control pad; the ATS Co-Pilot Module controls lock-up engagement automatically when the Co-Pilot is adjusted with the Up arrow (Blue L.E.D. lights are to the far right).

The **up** and **down** arrow keys select the amount of additional load capacity the transmission receives from the Co-Pilot module based on engine load. This will cause the Co-Pilot to send a variety of signals to the transmission to enhance the torque capacity of the transmission. This option is only available when the unit is powered on. When the Co-Pilot is powered off the transmission operates in stock form, therefore the transmission will receive no inputs from the Co-Pilot module. Below is a description of how to adjust the shift quality.

Adjusting Shift Firmness

Shift Firmness is adjustable at any time by simply arrowing **up** or **down**. The **up** arrow will **firm** up the shift quality while the **down** arrow will **soften** the shift quality. The Co-Pilot™ has been designed this way so you can customize the quality of your shift during your drive. Note: The buttons must be held down to change the settings. Please see the diagram below.



Allison LCT-1000 Co-Pilot Transmission Management Computer

For racing applications hold the **UP** arrow (increasing shift firmness) for approximately five seconds until all of the blue lights simultaneously illuminate. All of the blue lights coming on at once indicates the Co-Pilot computer has been placed into Race Mode. In some cases Race Mode may cause a check engine light. This light will not cause any performance problems and will reset itself after a few ignition cycles. When the Co-Pilot is placed in the firmest setting (blue L.E.D. all the way to the right) the Co-

Pilot computer will place itself into Race Mode automatically once the transmission reaches operating temperature.. To allow firm shifting without the engagement of the torque converter clutch, place the Co-Pilot computer one setting below the maximum (the right two blue LEDs will be will be on and no check engine light will be set at this point).

In some cases the transmission computer may inhibit reverse if the check engine light is triggered. Do not be alarmed if this condition exists. After an ignition cycle, reverse will be restored.

Installation Instructions

There are three (3) basic installation steps to this kit

A. Valve Body Section
B. Wiring harness installation and the Co-Pilot box
C. Connect wiring harness to sensors

A) Valve Body Section

1) Drain the transmission pan; use a 14 mm socket to remove the drain plug from the bottom of the transmission pan. You will need a pan with a fluid capacity of approximately 6 quarts of fluid. After draining the transmission pan, place the drain plug back into the pan and torque it to 16-foot pounds of torque.

2) Next remove the bolts from the outside of the pan that attach it to the transmission case and remove it from the case, use a 13mm socket. Remove the black plastic filter from the transmission; pull the filter straight down while rotating from side to side to remove it from the case.

3) After the pan and filter has been removed from the transmission allow the valve body to drip for a while to minimize the mess. You are now ready to proceed with the valve body up-grade.

4) Un-plug the 20-pin connector from the back of the transmission (Figure 1). The connector can be difficult to disconnect from the transmission, squeeze the connector and wiggle it from left to right while exerting pressure to the rear of the vehicle. The connector will disconnect from the transmission with a little effort. **Note: The valve body does not need to be removed from the transmission to install the Co-Pilot.**

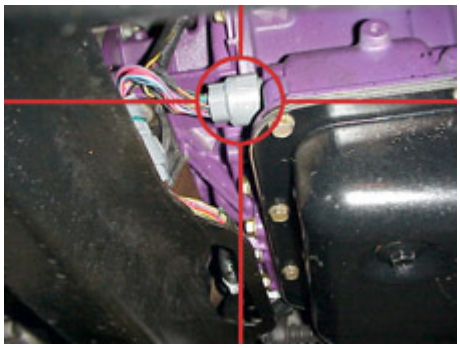


Figure 1: 20-pin connector

5) Remove the (2) two-solenoid retainer clips that attach the internal wiring harness to the valve body, use a flat blade screwdriver to pry the retaining clips out of the valve body, hold your hand over the clips when removing them so that they do not pop out or grab them with a pair of pliers and pull them out (Figure 2). Place the two retaining clips aside for later.

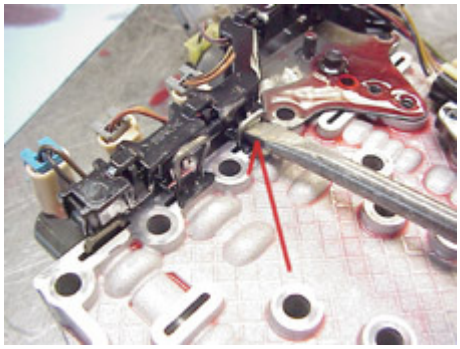


Figure 2: Removal of solenoid retaining clips

6) Next you will need to remove the internal wiring harness connector from the transmission case. The internal connector protrudes through the back of the transmission case. The connector will need to be pushed from the outside of the case to the inside. There are two methods to remove the connector from the case. The preferred method is to use the appropriate tool to compress the locking pins while pushing the connector to the inside of the transmission (Figure 3).

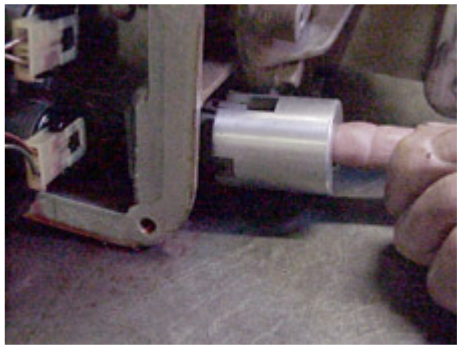


Figure 3: Case connector removal with appropriate tool

The other method of removing the case connector involves possibly damaging the original internal wiring harness. The original wiring harness will be discarded with the instillation of this kit, there is a new internal wiring harness supplied with the Co-Pilot™ kit. If the second method is used to remove the internal wiring harness from the transmission case it can be removed by knocking it through the case using a dead blow hammer. This method will usually damage the internal connecter, it will need to be thrown away, if it is reused later the connector will likely leak transmission fluid through the connector. Now that the connector is released from the case the wiring harness is ready to be removed from the valve body.

7) Remove the wiring harness from the valve body; there are 6 solenoid connectors that need to be disconnected (Figure 4). The wiring harness can be discarded; it will be replaced with the new harness provided.

Figure 4: Disconnecting solenoids

8) Install the new supplied wiring harness. It will fit 2001 to 2005 transmissions. The pigtail wrapped with wire loom is only used on 2004 and later units. For earlier units the wire (marked in Figure 5) can be placed under the filter.

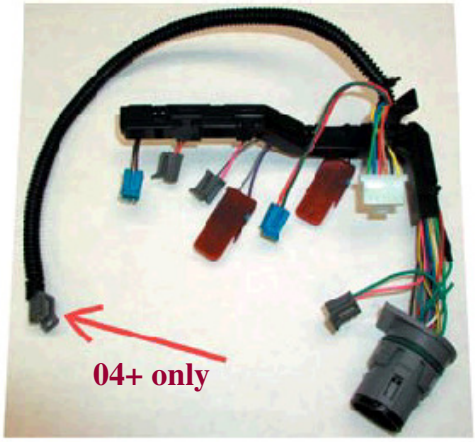


Figure 5: New wiring harness

9) Insert the solenoid retainer clips to secure the wiring harness to the valve body. When installing the clips, it helps to move the solenoids slightly to seat clips (Figure 6).

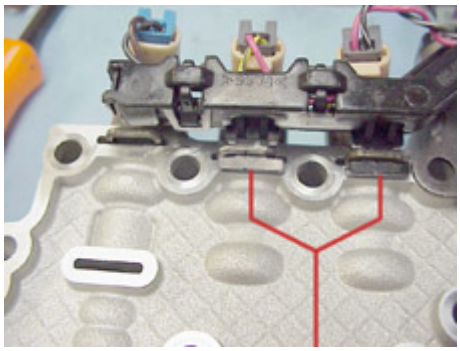


Figure 6: Reinstallation of solenoid retaining clips

10) You will need to modify the original stainless steel tube that was earlier removed from the valve body. Measure the stainless steel tube 1/2-inch from the bracket and cut using a tubing cutter (Figure 7).

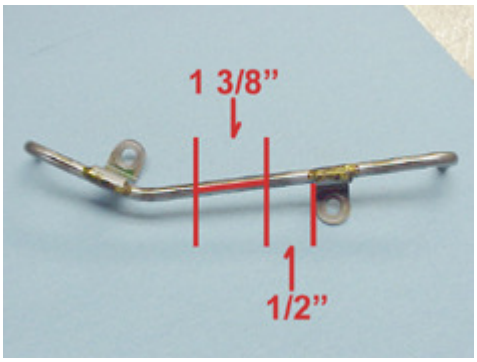


Figure 7: Tube modification

11) After cutting the tube remove **exactly**1-3/8 inch from the other section of the tube (Figure 8).

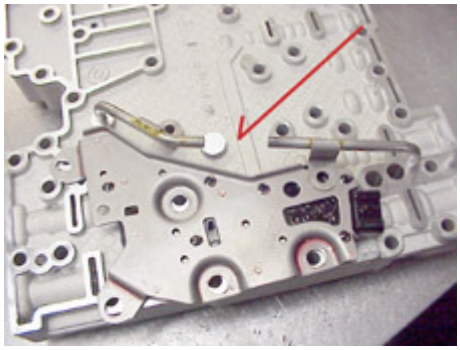


Figure 8: Tube after modification

12) There should be a 1-3/8 gap between the two tubes after the cuts have been made. Place the two modified tubes into the valve body and measure the gap between the sections. **You must have exactly 1-3/8 inch between the two tube halves**, and some modification to the length may be necessary to fit the valve body (Figure 9).

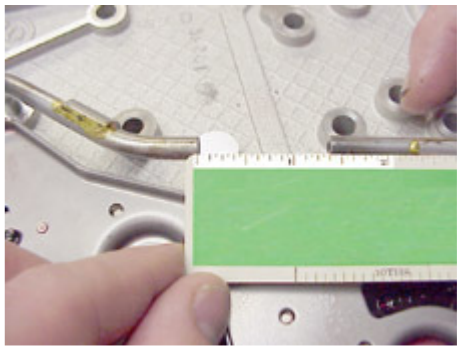


Figure 9: 1-3/8" gap

13) Place the two modified tubes into the new solenoid block provided; use the valve body for assistance when aligning the tubes to the block (Figure 10).

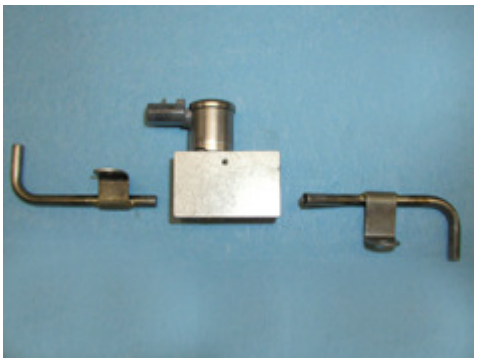


Figure 10: Solenoid block

14) Install the auxiliary valve body assembly and the two tubes into the lower valve body section. Be careful when installing the metal tubes into the lower valve body, gently tap the two tubes in equally where marked in Figure 11; the tubes will drop right in.

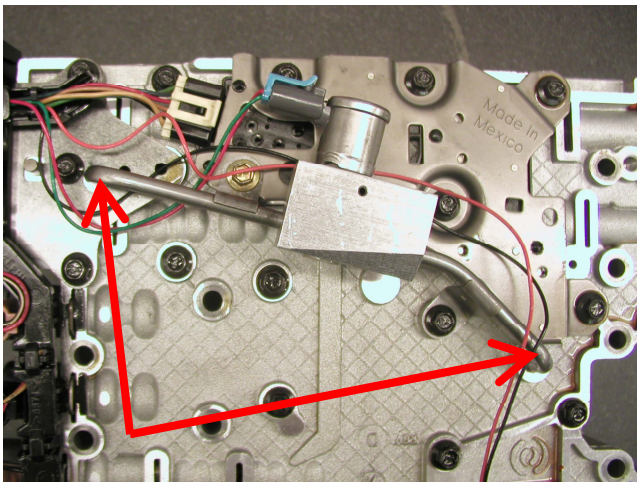


Figure 11: Installing the tubes

15) Install the long gold bolt (Figure 12, Arrow A), and the other bolt that holds the tube and pressure manifold block to the lower valve body (Figure 12, Arrow B).

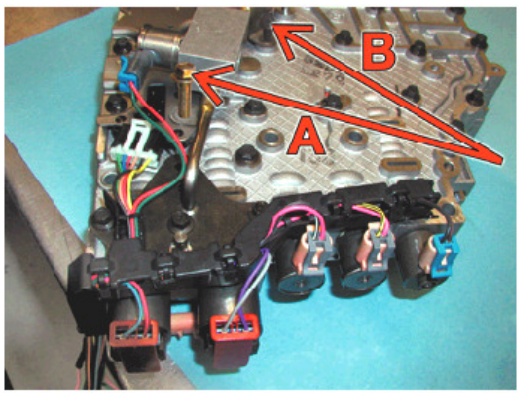


Figure 12: Reassembly

16) Plug the 5 pin wiring harness into the pressure manifold block (Figure 13, Arrow 2)

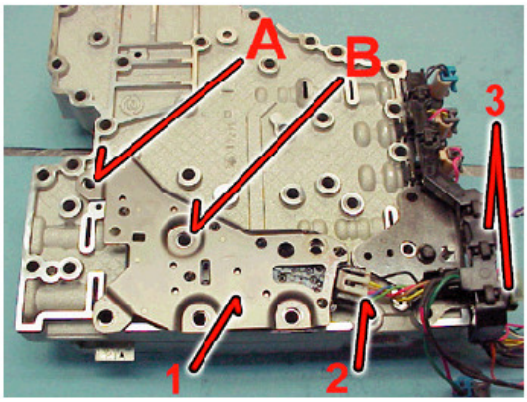


Figure 13: 5 pin harness location (Arrow 2)

17) Take the time to do one last check over the valve body assembly, be sure all of the electrical connectors are plugged in and all of the bolts are tight.

18) Install the internal filter and make one final check to ensure you have not overlooked or forgotten something.

19) Install the pan and gasket; this is also the time to install an aluminum deep pan if you have one.

20) Torque the pan bolts to 18-foot pounds of torque.

21) Add 6 quarts of transmission fluid to the transmission after securing the transmission pan to the case.

22) The transmission internal section is done; after the remaining portion of the ATS Co-Pilot™ kit is completed the transmission fluid needs to be checked immediately after start up. Note: It is common to have a check engine light immediately after start up due to low fluid level, after the transmission is full of fluid and a few ignition cycles the check engine light will reset.

23) **IMPORTANT!** Make sure to recheck the fluid level in the transmission after the vehicle is driven for a short distance, as it is common for the level to drop.

B) Wiring harness installation and Co-Pilot Box

1) Plug the supplied wiring harness into the transmissions round 20-pin connector located on the backside of the transmission. The supplied connector will plug in between the factory wiring harness and the transmission. Connect the factory 20-pin connector into the other end of the harness supplied. Be sure the two 20 pin connectors are securely locked into place, the two tabs on ether side of the connector make a snapping sound when fully engaged.

2) After connecting the male and female ends of the wiring harness route the 10-foot section of the harness over the top of the transmission. The white connector will need to be routed to the inside of the cab.

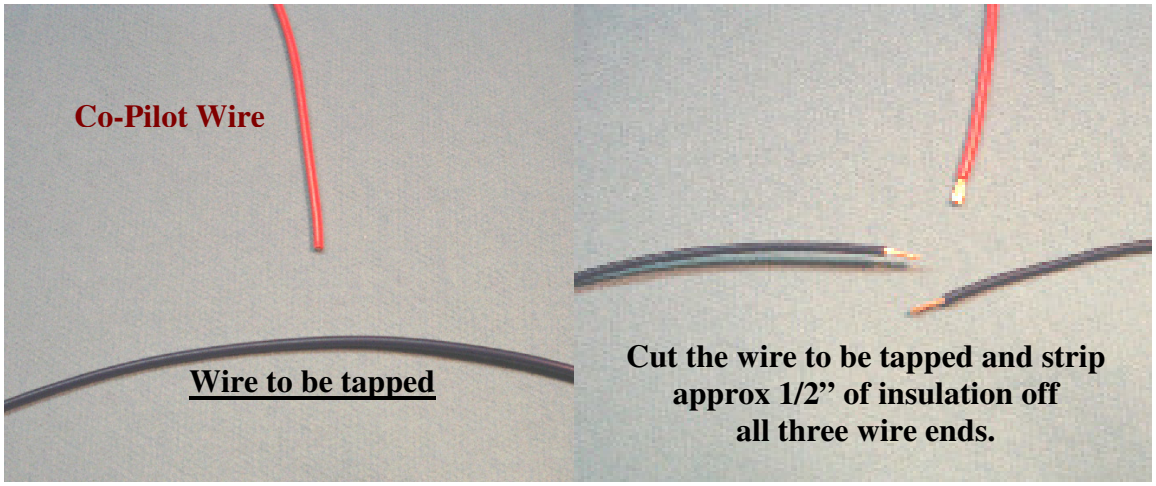
3) Route the small white connector side of the wiring harness into the driver's side compartment through the firewall of the vehicle. There is an access hole in the firewall that can be enlarged to accommodate the harness.

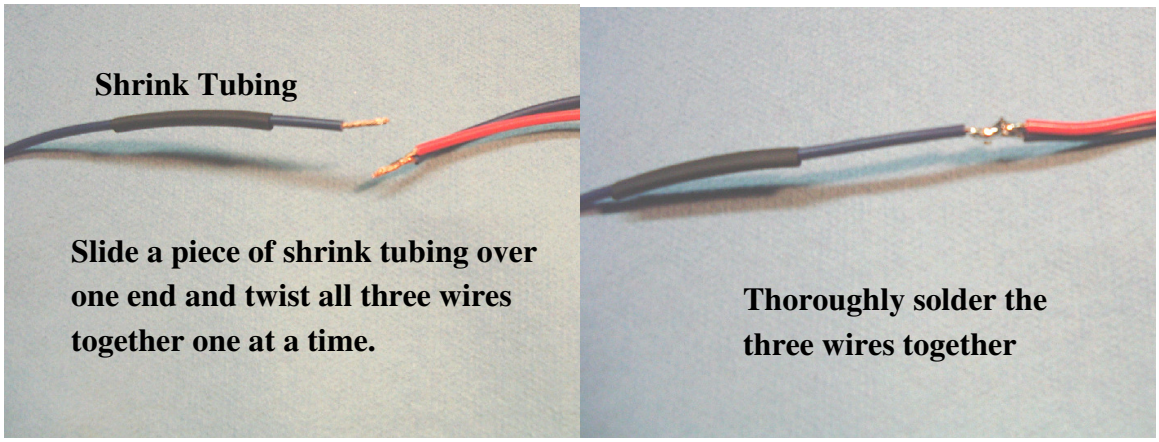
4) Pull the wiring harness through the firewall just enough to connect it to the Co-Pilot module, ideally to the right side of the driver just below instrument cluster.

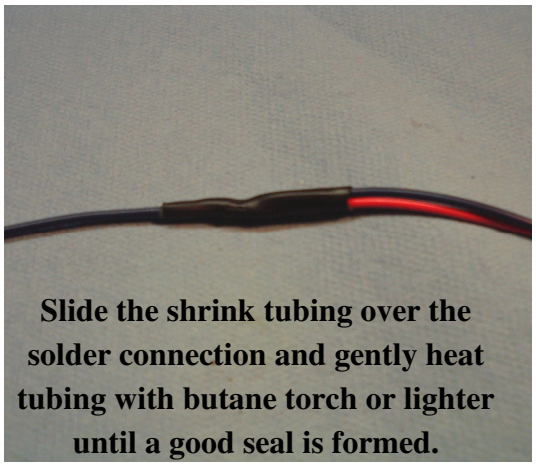
5) Plug the wiring harness into the Co-Pilot module; place it in a good location that can be easily accessed by the driver. Use brake clean or solvent on the dash where the Velcro will be put to insure that it sticks properly. Secure the Velcro and Co-Pilot to the dash.

C) Connecting the wiring harness

We ***strongly*** recommend that you solder all wire connections and protect the soldered connections with shrink-wrap.







Making all of your taps this way will give you reliable and long lasting connections.

-Gray Wire with Black Tracer- GND-Exhaust Brake

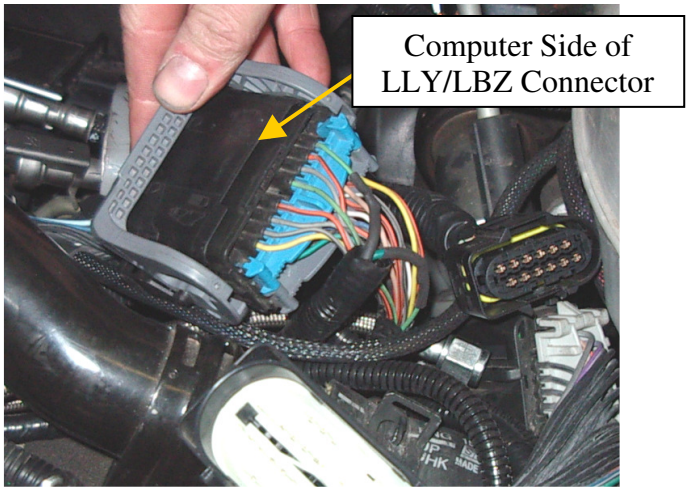
Connect to the ground-side of the exhaust brake solenoid. Cut the existing solenoid ground and butt-connect to the wire end that goes to the solenoid. The Co-Pilot will act as the ground to give optimal braking performance.

-Brown Wire with Green Tracer- MAP Sensor

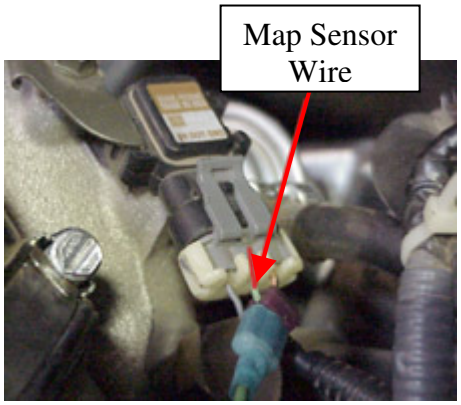
Connect the brown wire with green tracer from the ATS wiring harness to the **Green wire** on the map sensor (Figure 14). Solder or use the T-tap connector supplied to splice into the center connector of the map sensor located on top of the engine.

- On 2001 LB7 Duramax the MAP wire is located on the right intake manifold;
- On 2002-2004 LB7 Duramax the MAP wire is located in the intake tube in the center of the engine.
- On 2004.5-2005 and later LLY Duramax Engines the wire is located in the main (large) wiring harness on top of the engine. Tap the wire on the engine side connector, **NOT** the computer side. 2001 LB7 MAP Sensor Center Wire

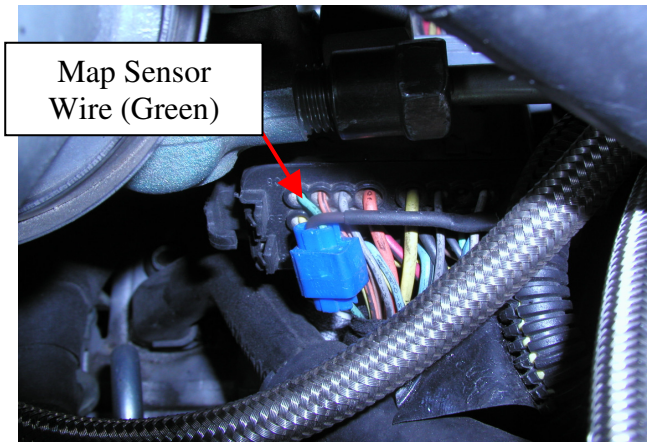
This connection is ***critical*** as it is subjected to harsh conditions. We advise a good solder joint for this connection and shrink-wrap. Some power modules may also plug into this sensor, if there is an additional connector plugged into this sensor, **be sure the Co-Pilot tap is the closest to the sensor**.



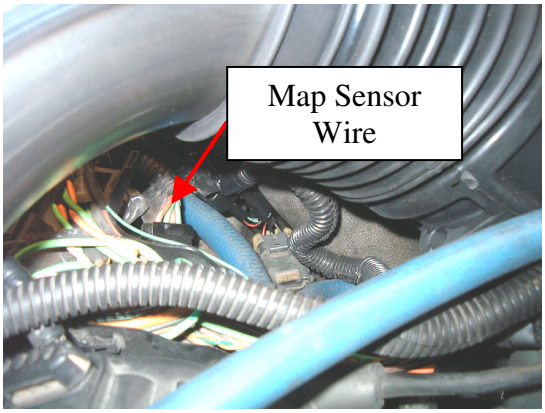
04.5-05 LLY MAP Engine Harness Connector



02-04 LB7 MAP Sensor wire
Center Wire



Engine Side of LLY / LBZ Connector



2001 LB7 Map Sensor (Center) Wire

-Black Wire- Ground

Connect to a bolt or screw under the dash that provides a good ground. For best results, splice this wire into the black wire with white tracer that comes from ECM pin #1 with solder.

-Brown Wire with Black Tracer- VSS

1) Route the Brown with Black tracer wire from the Co-Pilot to the front left (Driver's) side of the vehicle (Fig. 14).

Figure 14: Wire location

2) Remove the transmission control module (TCM) from the radiator support shroud by removing the two 10mm bolts from the cover indicated in Fig. 15.

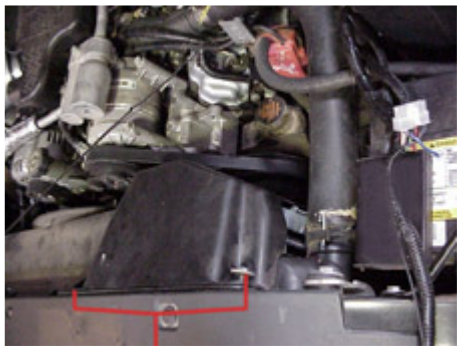


Figure 15: 10mm bolts for removal

3) After removing the bolts lift the computer and cover up, exposing the bottom connector (Fig. 16).

Figure 16: TCM bottom connector

4) Unplug the lower electrical connector from the computer by squeezing the lower connector and pulling outward on the connector. The connector will separate from the TCM (Figure 17).

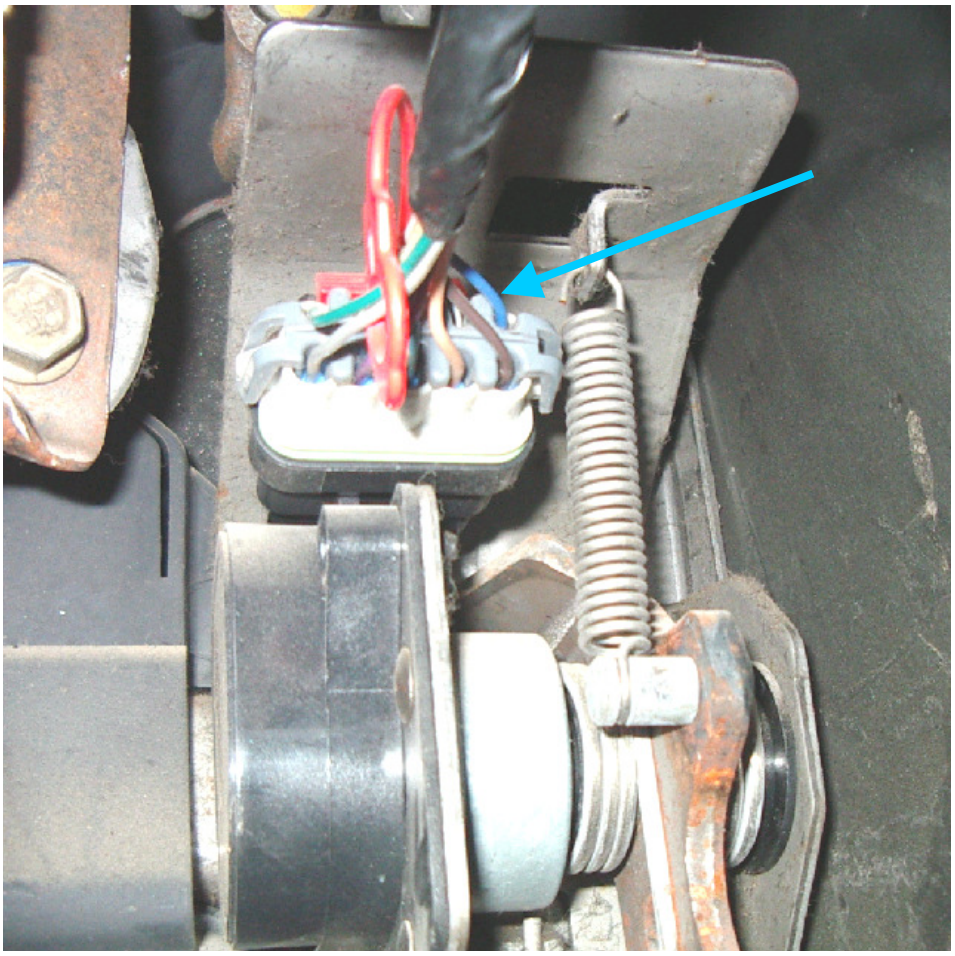
Figure 17: Removing electrical connector

5) You will need to separate the connector at this point; the housing will part exposing the wires in the connector (Figure 18).

Figure 18: Connector with arrow to yellow wire

6) Locate the yellow wire in pin location 27 on the bottom connector. Splice the wire about 2 inches from the connector. Splice the **brown wire with black tracer** from the ATS wiring harness into the yellow wire coming from the connector from the TCM wire that was cut (Figure 19, Arrow 2).

Installing the Throttle Wire



Hook up the **Brown wire with blue tracer from the Co-Pilot harness** to the **throttle position sensor's Blue wire** by tapping with solder. Be sure to tie the wire up out of the way.

Notes about first startup procedure after installation

For the first 50 miles after installation, set your Co-Pilot so that the center LED light is on.

To avoid a 'fail safe' condition and/or check engine light the recommended procedure is to fill the transmission with a minimum of 6 quarts (with stock pan) of fluid before startup. With the high capacity pan you will want to add 11 to 12 quarts before startup. Once the engine is started, allow it to run for 4-5 seconds and then shut off the ignition. Allow the vehicle to sit for 5-10 seconds and then restart the engine. This will purge the air from the system before the OEM computer detects the low pressure (therefore setting the check engine light and trouble code).

Scan Tools
Different scan tools can often be misleading. The only scan tool that ATS has found to be completely effective at clearing trouble colds in the computer is the GM Tech II scanner and the Viewtronics hand-held scanner. Many other scan tools on the market display to the user that they are clearing codes, when in-fact they are not. This condition of not completely clearing the codes has been exhibited repeatedly with the Snap-On scanners. Disconnecting the battery cables from the battery terminals WILL NOT clear the codes or the adaptive strategy that governs shift behavior. Feel free to contact our Technical Support Department with questions or for more details.

Diagnostics
The factory 20 pin connector on the back of the transmission can be plugged directly into the transmission after the Co-Pilot™ internals have been installed. This is one method that can be used to isolate possible electrical issues with the ATS external harness or Co-Pilot™ controller.

Have Any Questions?

Thank you for purchasing the ATS Co-Pilot™. Please check our website at http://www.atsdiesel.com for technical support and other performance products that ATS has developed for the Duramax such as Aurora Turbochargers, Five Star™ torque converters, ATS High Performance Transmissions, Performance Injector Nozzles, CP3 fuel pumps, Torque Pro Propane Systems, Stainless Steel exhaust, and a full line of performance electronics. Please call or e-mail our Sales or Technical Service Department, 8:00am to 5:30pm Mountain Standard Time, Monday through Friday.

Contact Information

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We strive to make our instructions as clear and complete as possible. To achieve this, our instructions are under constant construction. We encourage you to visit our Technical Support Website http://www.atsdiesel.com/ATSWebsite/Technical.asp for the most up-to-date manuals and diagrams as well as other information. If you have any suggestions as to how we can improve this installation manual, let us know at Suggestions@ATSDiesel.com

Bill of Materials

1. Co-Pilot controller 601-800-4248
2. Solenoid block assembly 601-109-4248
3. External wiring harness 601-011-4248
4. Internal wiring harness 601-015-4248
5. Hardware kit (not pictured) 601-001-4248