650 Rostra Cruise Control

(Top) 650 Rostra Cruise Control

DIY INSTALLATION OF THE ROSTRA UNIVERSAL CRUISE CONTROL ON A SUZUKI BURGMAN 650 EXECUTIVE

by Redbeard

The Rostra Cruise Control Module (Part # 250-1223) is an electromechanical self contained Cruise Control Device. The two major components within the Module are, the electronics (aka. the brains), and the electromechanical components (aka. the servo) and are used to accurately control the throttle. The Module itself may be a bit on the 'large' side, but it doesn't require any vacuum lines to be run or any large vacuum tanks or external vacuum pumps to find a home for. This Module doesn't need any vacuum to operate.

This DIY and the information contained within is offered as an installation guideline only. No promises are made here! Your installation may be different and may require different materials and procedures. Please be very careful during this installation to take your time and use lots of common sense. The installation of anything that controls the throttle of a motorized vehicle inherently contains a substantial risk to both the operator and others around them. Installing and using this kit is the sole responsibility of the person doing the installation work and the person operating the scooter. Installing and using this cruise control is purely done at your own risk. Some parts of this installation are critical and not very forgiving, so take your time; this isn't going to go quickly. Be especially careful during the road test portion while the correct functionality of the system has not yet been determined. Lastly, be aware that Rostra does not support installing this Module on a scooter. If you install this and have warranty or other issues later on; you're very possibly going to be on your own!

As one would imagine, this Universal Cruise Control is clearly not designed to fit onto this specific scooter. Please understand that it's not a straightforward plug and play installation. Modification of your scooter will be required to install the Rostra. Basically, as an quick high level overview, the following modifications will need to be made: The removal and or relocation of the lower front storage area Accessory Power Outlet, removing part of the plastic drain guide attached to the left top glove box compartment that resides on the underside of the Front Panel, alteration of the throttle cable pulley assembly on the scooters engine to attach an additional "fabricated" Throttle Extension Arm and modifications of the Rostra supplied mounting brackets and wiring harnesses. You will also need to make various electrical taps, additions and modifications to the scooters wiring harness.

Please read this entire DIY several times along with the instructions that came with the Rostra Module and the control switch you are going to be using with the Rostra before beginning installation. Some of the descriptions below assume you've read through the entire DIY at least once for them to make the most sense. This DIY was written using a 2009 Executive, AN650AK9. It is the same for 2007 to 2009 Executives. There will be slight differences in the installation on standard 650's and scooters from 2003 to 2006. I will try and continue to update this DIY with info for those years and models that are not 2007 and up Executives.

Every attempt has been made throughout this DIY to provide you with as much information as possible to allow you to

customize or adjust this installation to your particular needs or preferences. Unfortunately, doing this makes this DIY at times seem overwhelming with information overload and thus harder to follow. The flow is frequently interrupted with "optional" paths, especially in the electrical and wiring sections. This is another reason to read through this document several times and map out which way your going to go before you begin.

Please use the following thread in the forum for questions, answers, discussions, etc. http://burgmanusa.com/forums/viewtopic.php?f=4&t=50703. That way we can keep everything in one place.

What's in the Box

Picture 1

Note: The top center bag in this picture is a Control Switch which does not come with the Main Unit and must be purchased separately.

Parts Needed:

- Rostra Cruise Control, Part # 250-1223
- Control Switch of your choice or design

Additional Items you Will Need:

For mounting the main Module and mounting a fabricated throttle extension arm

- (1) 6mm X 1 Nut
- (2) 6mm shoulder washers (or similar standard size)
- (1) 6mm X 1 X 24 bolt (a little shorter length should be ok. Don't go longer)
- (2) 7mm X 1 Jam Nuts (thinner than a normal nut, see step 4, picture 36) (2007 and up only)
- (1) #10 Lock Washer
- (1) 10/32 Nyloc Nut (optional)

Needed Specialty Items:

- T30 Anti-Tamper Torx Bit JT30H
- Blue Loctite type liquid thread lock
- Number 18 Drill Bit
- 10/32 Tap
- Possibly 1 or 2 Standard Automotive Relays depending on your particular configuration

Additional Resources

BurgmanUSA.com
The Best Burgman Series Scooter Site and Knowledge Base on the net!

LeDude's Burgman Center
Huge thanks to 'LeDude' for allowing me to link his Burgman Center giving you a reference source for the removal and re-installation of Tupperware as needed. He's done one heck of a job on his site and it's a great resource of Burgman 650 maintenance, maintenance videos, reviews and other vital information on the web.

A Basic Overview of this Installation

There are 9 steps outlined in this DIY for installing the Rostra into a Burgman 650 Executive (AN650A). They can all be combined into the following logical tasks:

Steps 1 through 5	The Mechanical Installation and Adjustment of the Rostra Main Module
Step 6	Control Switch Information and wiring
Step 7	Attaching the Main Module and Control Switch Wiring Harnesses to the Scooter
Steps 8 and 9	Run On Board Self Diagnostics Tests and Road Tests, Perform Final Adjustments, Top Panel Modification and Assembly

Before you start you'll need to remove at least 10 Pieces of Tupperware and the Windshield

Handlebar Covers	Front Panel	Maintenance Lid	Leg Side Cover - Left	Leg Side Cover - Right
Lower Leg Shield	Front Leg Cover	Leg Shield	Front Box	Windshield
Combination Meter Front Lower Panel				

The Combination Meter Front Lower Panel located in the front of the scooter behind the windshield. It is held on by 1 plastic fastener, located just above the piece you're removing, top center, and 2 screws on the side edges about 2/3rds of the way down the panel. This panel covers the motorized windshield cables, and will allow you to gain access to the left and right handle bar electrical cable connectors which you'll need to get to in Step 7.

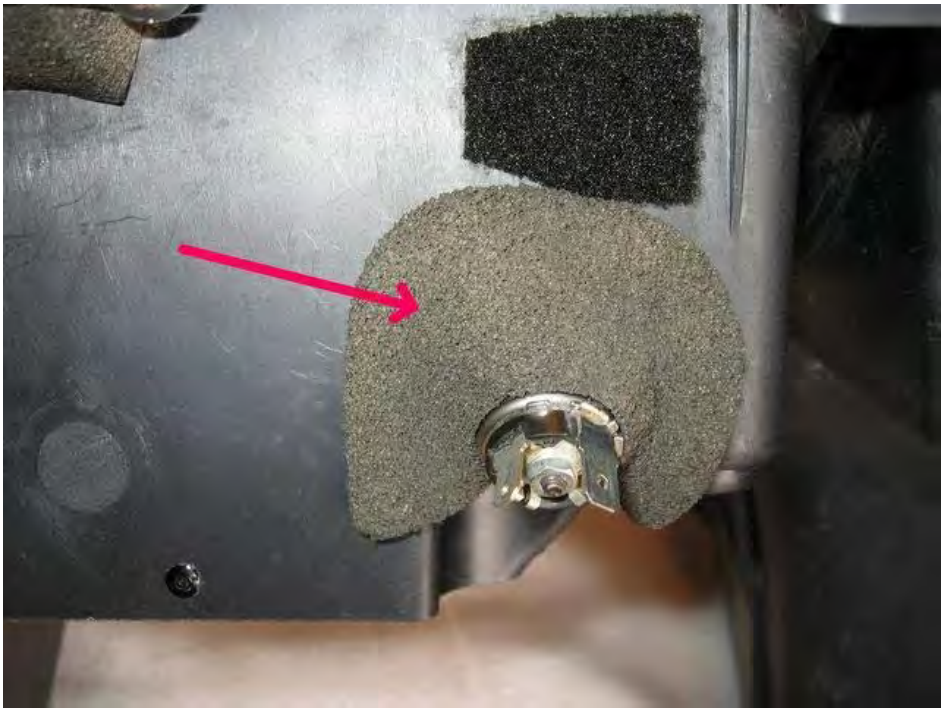
STEP 1: REMOVING THE ACCESSORY POWER OUTLET

In this step you will be removing the Accessory Power Outlet from the lockable storage area of the Front Box to make room for installation of the Rostra Main Module. This is being done to allow the Main Module to be mounted just to the left of the ignition key assembly as you'll see in Step 2. It was the only place I could find to put it and the outlet sticks up in the way of mounting the Main Module in this location. You can always run a wire 'pigtail' through the exposed hole if you don't

want to loose the functionality of the outlet. Just purchase an outlet with a pigtail, cut off power input end of the pigtail to the length you want, and crimp on spade connectors to plug it directly into the existing spade connectors that you unplugged when you removed the Front Panel. Don't forget to seal the hole when you're done.The Power Outlet and Protective Sponge Foam will be removed from the bike as seen in Picture 2. You will need a small straight screwdriver and a pair of channel lock or equivalent pliers.

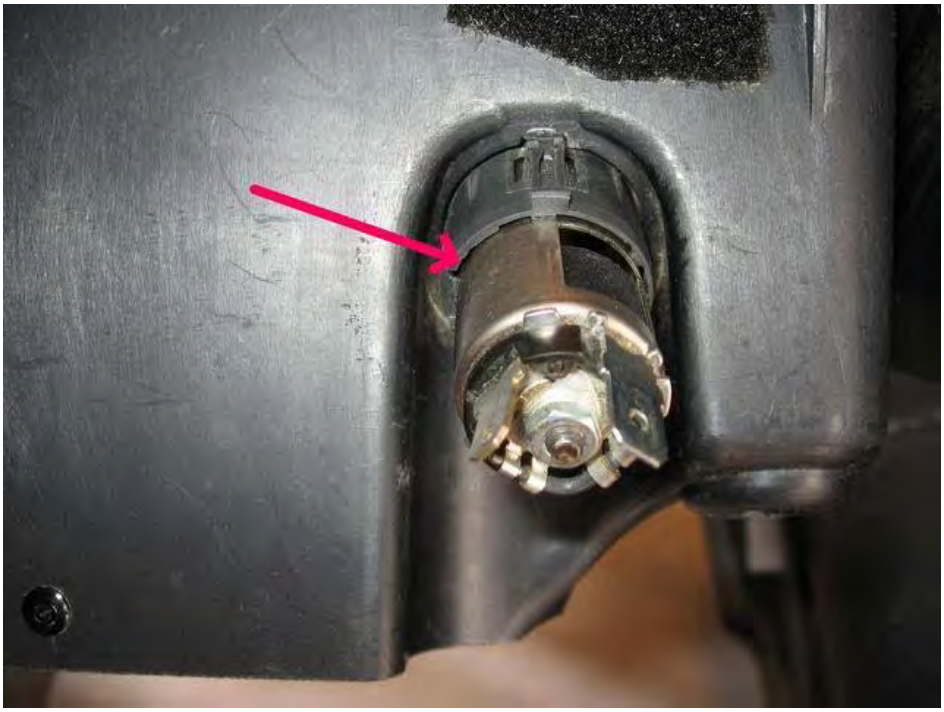
Picture 2

Locate the Front Box and carefully remove the grey protective sponge foam from around it.



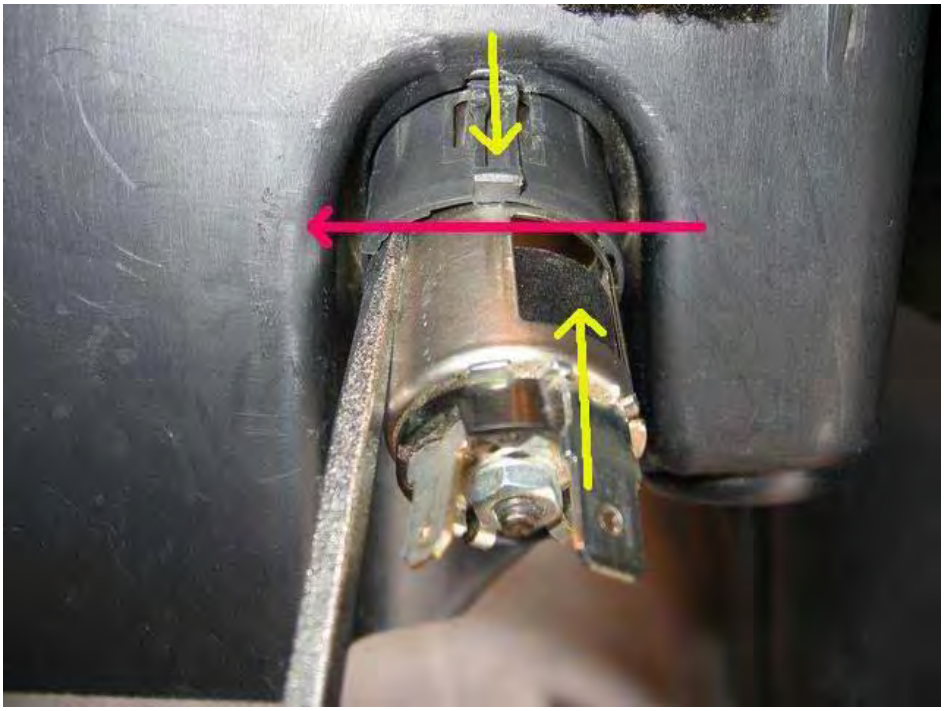
Picture 3

Now push the blade of a small screwdriver into the indicated slot, far enough to raise the little plastic tab to the left of the screw driver blade high enough to clear the metal portion of the outlet so that the metal portion can rotate.



Picture 4

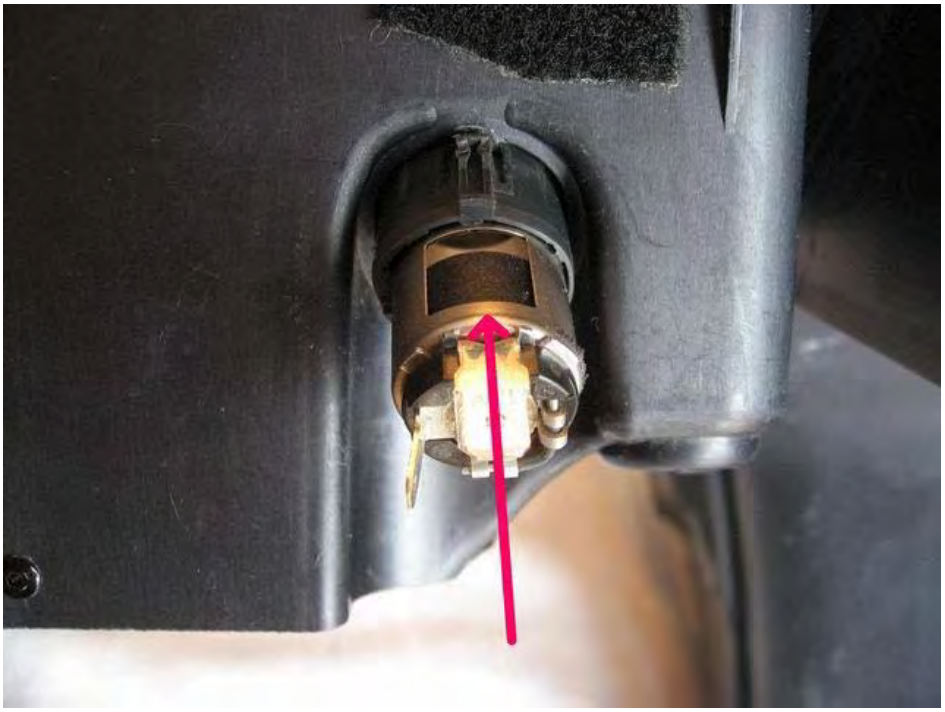
Rotate the metal portion of the outlet counter-clockwise until the large opening in the metal part (bottom yellow arrow) is in-line with the plastic tab at the top. This should align the 2 yellow arrows in the picture. You can remove the small screw drive once the tab has cleared its hole to help make rotating the metal portion easier.



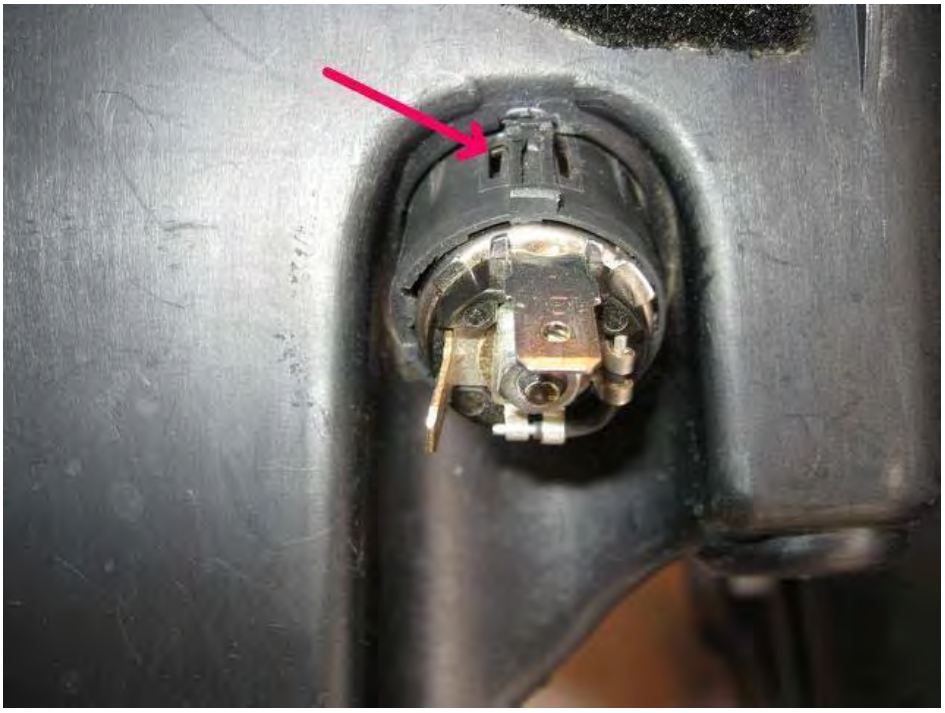
Picture 5

Next, push the metal portion of the Accessory Power Outlet toward the inside of the storage space (direction of the red

arrow in Picture 6) until the large opening in the metal part is directly under the plastic tab as shown in Picture 7. With the hole directly under the plastic tab the metal part should resist going in any further.

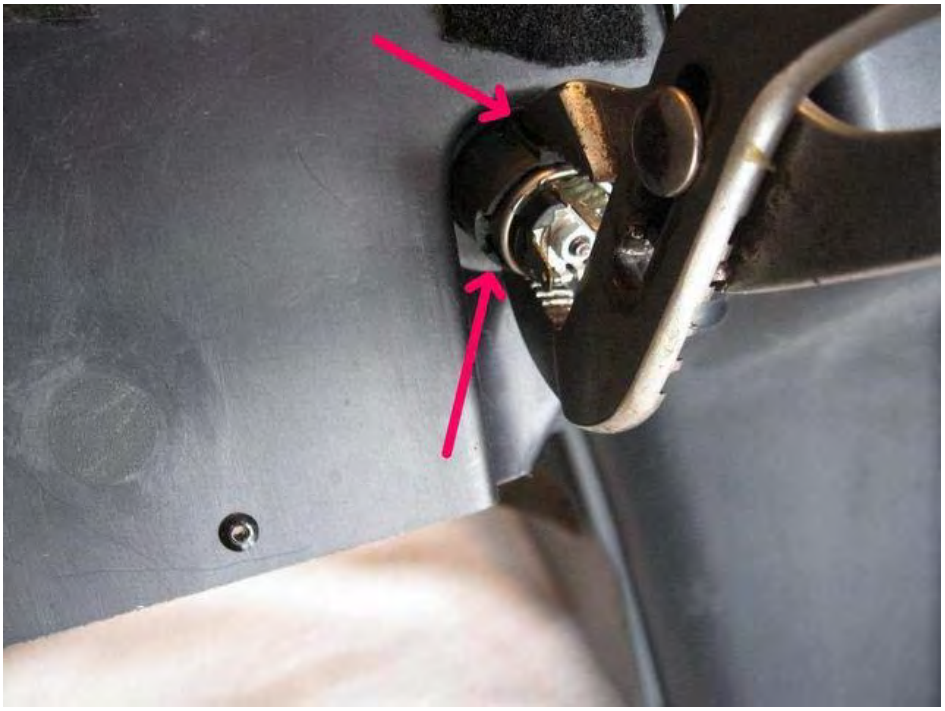


Picture 6



Picture 7

Taking a pair of channel lock pliers or similar, gently compress the 2 plastic tabs inward, toward each other, at the same time while pushing the entire assembly, metal and plastic parts, toward the inside of the storage area as far as possible with the pliers compressing the 2 tabs.



Picture 8

Once the tabs enter the hole, continue pushing the entire Accessory Power Outlet completely out of the hole and retrieve it from the internal storage space area.

Picture 9

Clean off the plastic around the hole and seal it off; or use the hole to run a new Accessory Power Outlet with a ‘pigtail’ wire through the hole if you don't want to loose the ability to plug things in from the inside of the storage area. Either way, at least you won't need to worry about the length of the accessory plug you’re using anymore!

Picture 10

Here's an example of the pigtail outlet I mentioned for reference.

Picture 10a

STEP 2: INSTALLING THE ROSTRA MAIN MODULE

First you'll need to modify the included Main Module Mounting Bracket, Item D, Part# 250-2236 in the Rostra Manual. Place the bracket in a vise and straighten out the stock bend in the bracket indicated by the red arrows in Picture 11. Once complete, change the remaining stock bend to be 90 Degrees.

Picture 11

When you're done, it should look like Picture 12 :

Picture 12

Using your favorite implement of destruction; cut off the excess length of the bracket. It is no longer needed or used. Picture 13 should help you to determine where to cut. Basically you cut off the end just before the larger 4th hole up from the bend. The exact position of the cut is not critical.

SAFETY WARNING:

Don't forget to clean and round off the edges of the cut you just made with a file to help prevent injury from sharp left over remnants of metal from the cut.

Picture 13

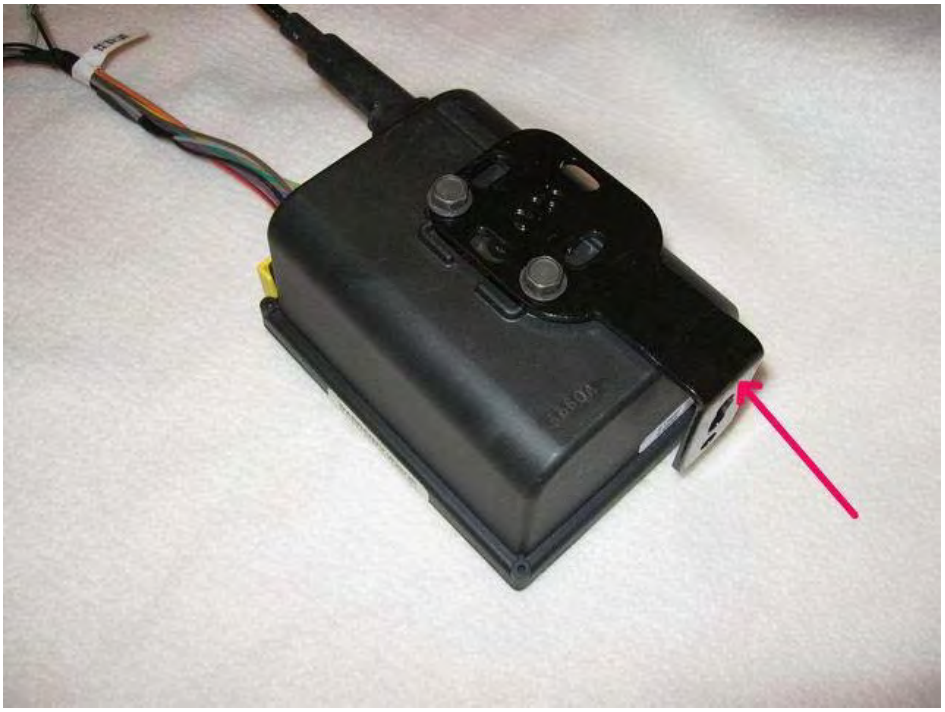
Drill (2) new mounting holes higher up on the bracket and vertically in-line with the existing slotted ones and horizontally aligned with each other. Get as close to the upper left edge (indicated by red arrow), but not so that you break through the outer edge of the bracket. The object here is to lower the bracket on the module so it aligns better with the mounting bolt on the ignition switch assembly. Create both holes the same size as the slots so that the included screws can still be fit through them. Again in this case, the exact placement of the holes is not overly critical. Just make sure the bracket will mount on the Main Unit and is level with it. (see Picture 16 below)

Picture 14

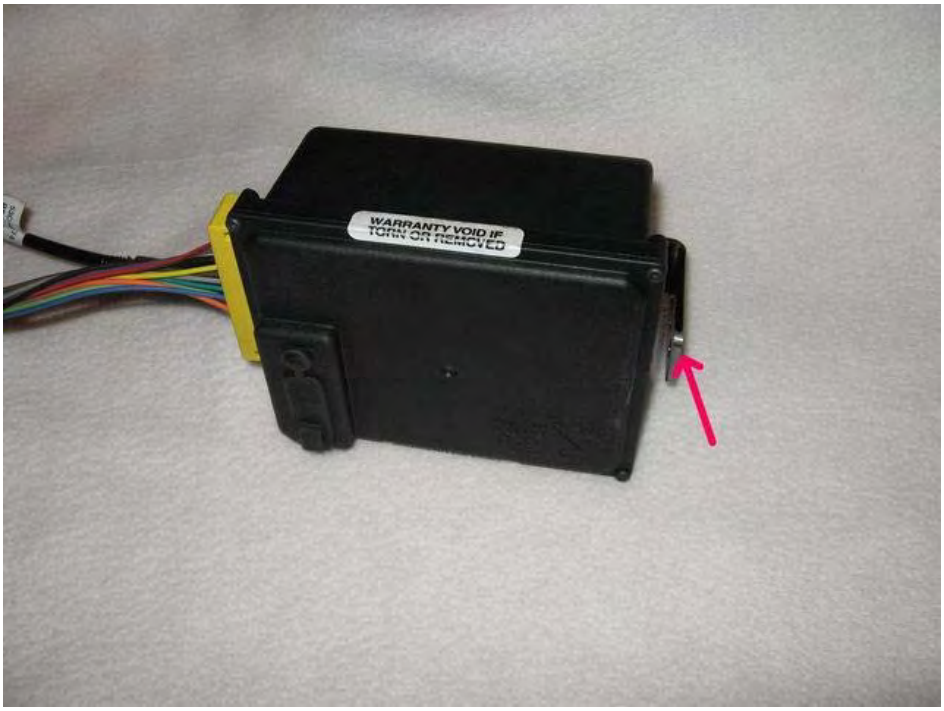
Create an “adjustment” slot between and including the 2 inner side mounting holes as shown. Clean the bracket and paint any exposed metal surfaces to prevent rust. The modified bracket is now complete and ready for installation.

Picture 15

Mount the bracket on the Main Module as shown in the pictures below. Make sure that the bent, over end of the bracket, is opposite the throttle cable. Use the supplied screws to attach it to the Main Module.



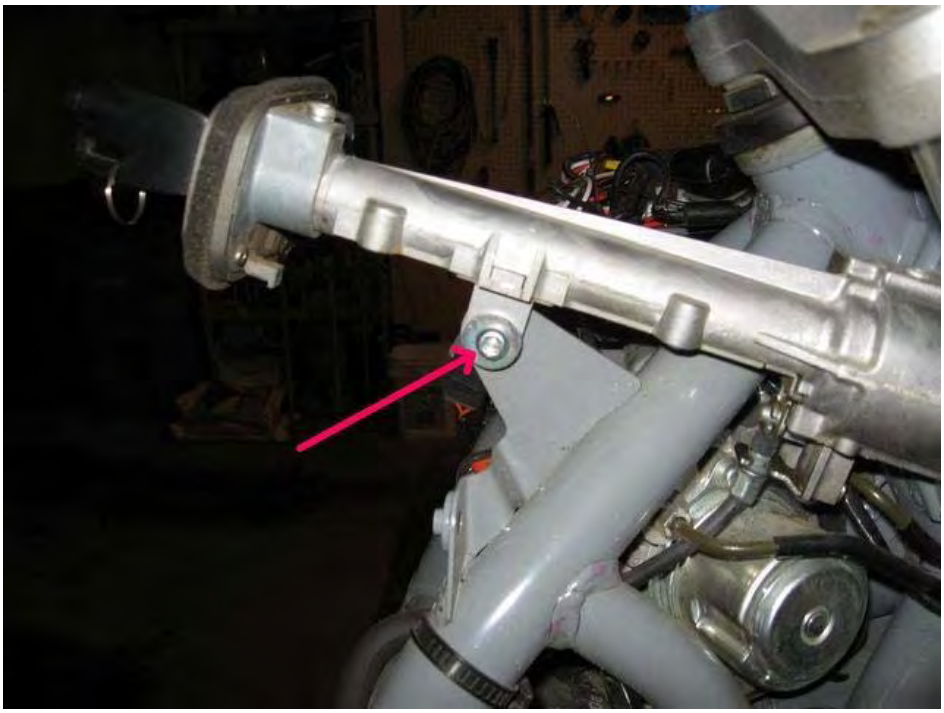
Picture 16



Picture 17

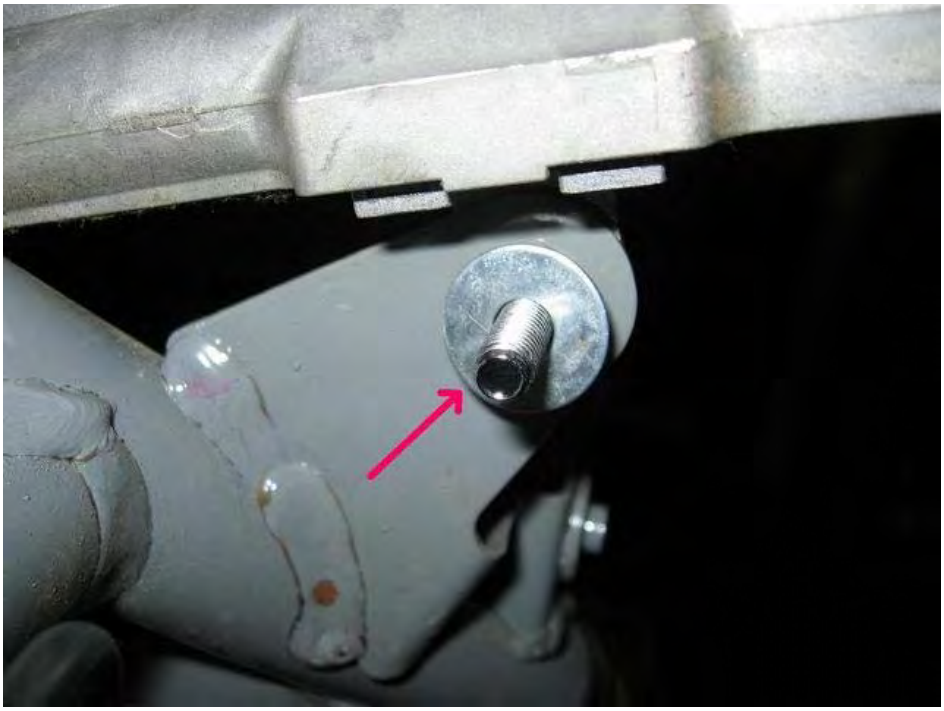
Remove the existing ignition key assembly bolt, indicated by the red arrow, using a T30 Security Bit. Replace it with the new 6mm X 1 X 24 screw.

Note: Do not tighten the replacement screw at this time.



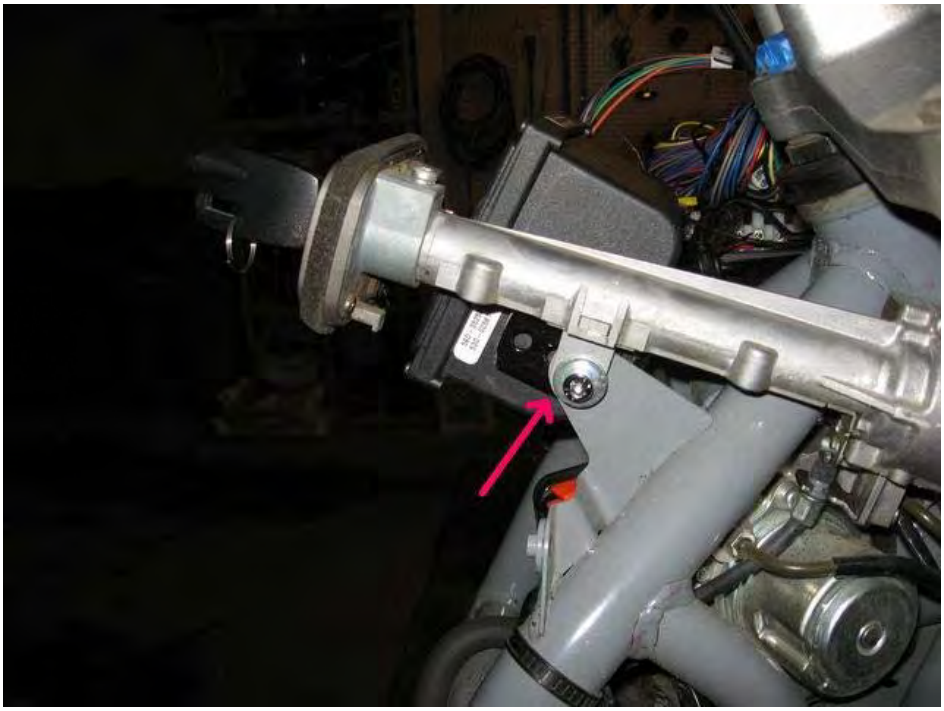
Picture 18

Place a 6mm shoulder washer on the back of the new screw as shown.



Picture 19

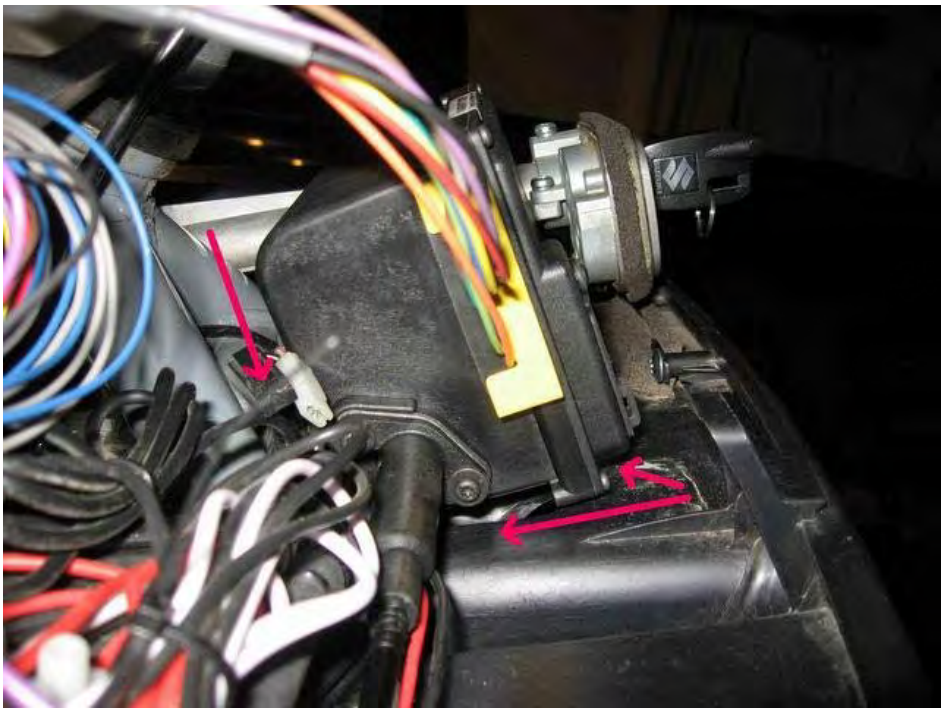
Now slide the Main Module Bracket on to the bolt, the 2nd shoulder washer and finally the 6mm nut. This is where small hands come in really handy! The easiest way I found to do this was to temporally tape both the washer and nut, lined up, on to the Main Module mounting bracket. Then, as you hold the Main Module in position, carefully insert the new longer screw while turning it into the taped on washer and nut. Once you get the nut started you can remove the tape and tighten down the screw completely. Then snug down the nut hand tight. You just tighten the nut enough to keep the Main Module from moving easily, but still allowing it to be movable.



Picture 20

Temporarily place the Lower Leg Shield back in place and adjust the Main Module's position so that it's not touching

anything under or behind it. It is also possible for the forks to hit it when turned fully counter clockwise if it's too far toward the front of the scooter. Make sure you check that also. Once you're satisfied with its location, remove the Lower Leg Shield and finish tightening down the nut securing the Main Module to the scooter.



Picture 21

The Main Module is now in a place where it can easily be accessed by removing just the Front Panel for adjustments.

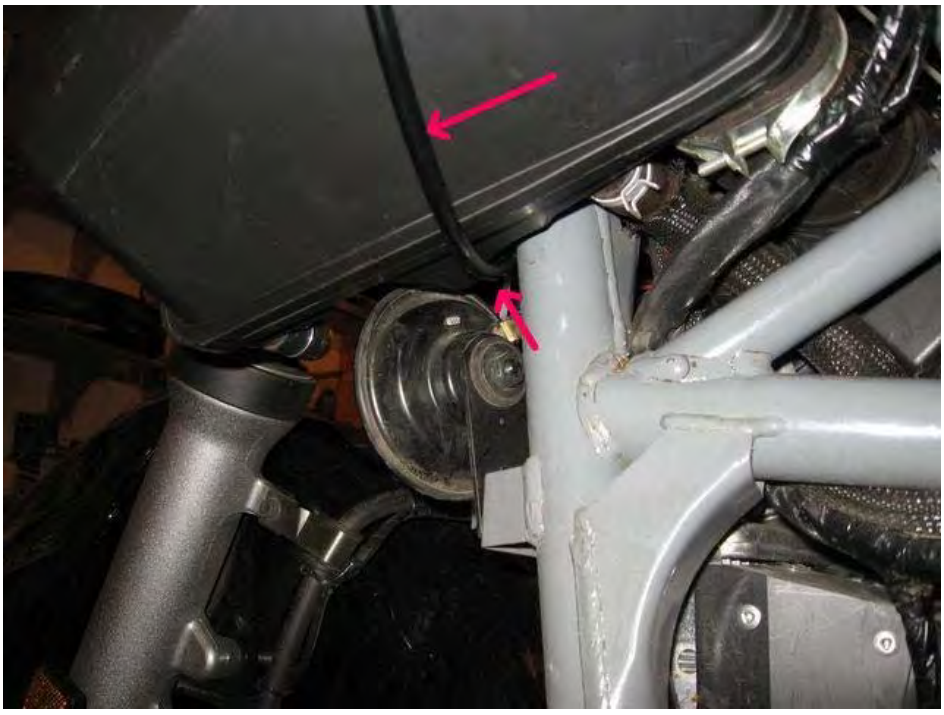
Picture 22

STEP 3: ROUTING THE MAIN UNIT THROTTLE CABLE

Note: This step was done on a 2007 - 2009 throttle body (10G2, 10G3). The 2003 - 2006 (10GO) body is different.

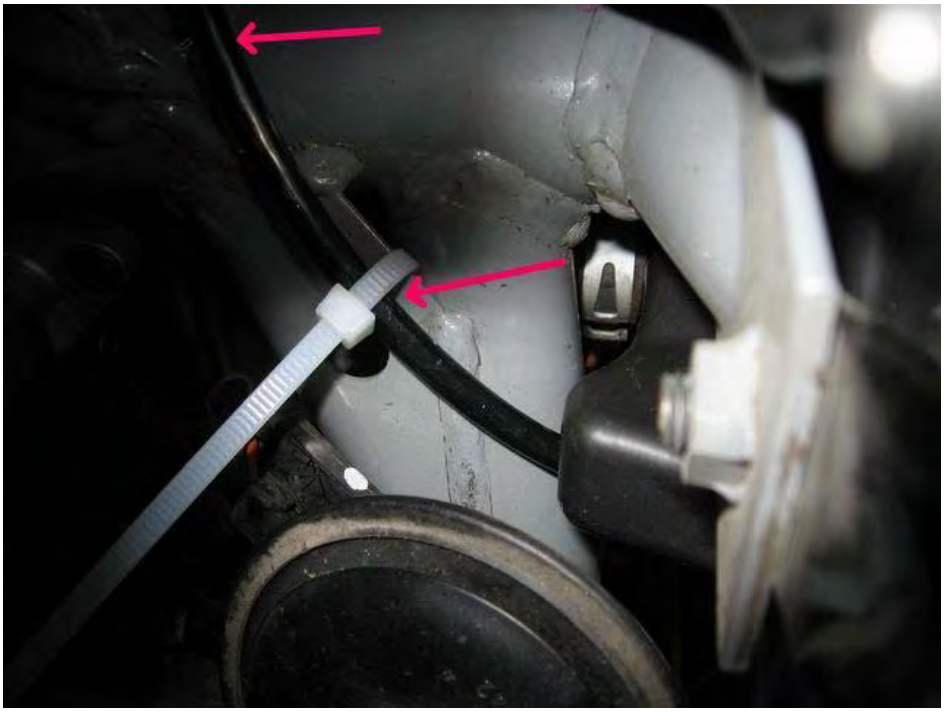
Route the cable down, around and under the Air Box to between the horn and the frame and then start heading back upwards. Gentle curves are your friend. Do not completely tighten the tie wraps installed at this time until later in this DIY.

Picture 23



Picture 24

Right behind the horn attach the cable to the frame as indicated with a tie wrap. Continue to route the cable up and over the frame toward the Main Module routing the cable under itself as it heads toward rear. Attach the cable to the main wire harness with a tie wrap to keep it from interfering with the front forks.

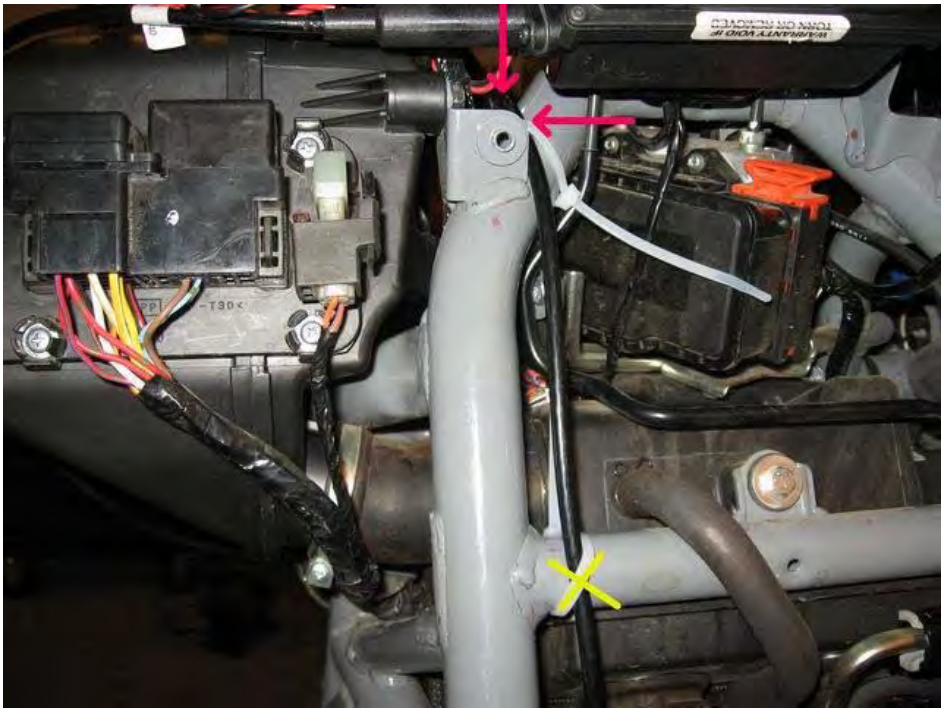


Picture 25

Picture 26

Coming over the top bring the cable back downward. Use a tie wrap to secure it just to the right of the screw hole and welded on plate. The bottom tie wrap is there only for the pictures to demonstrate the location the cable will end up and

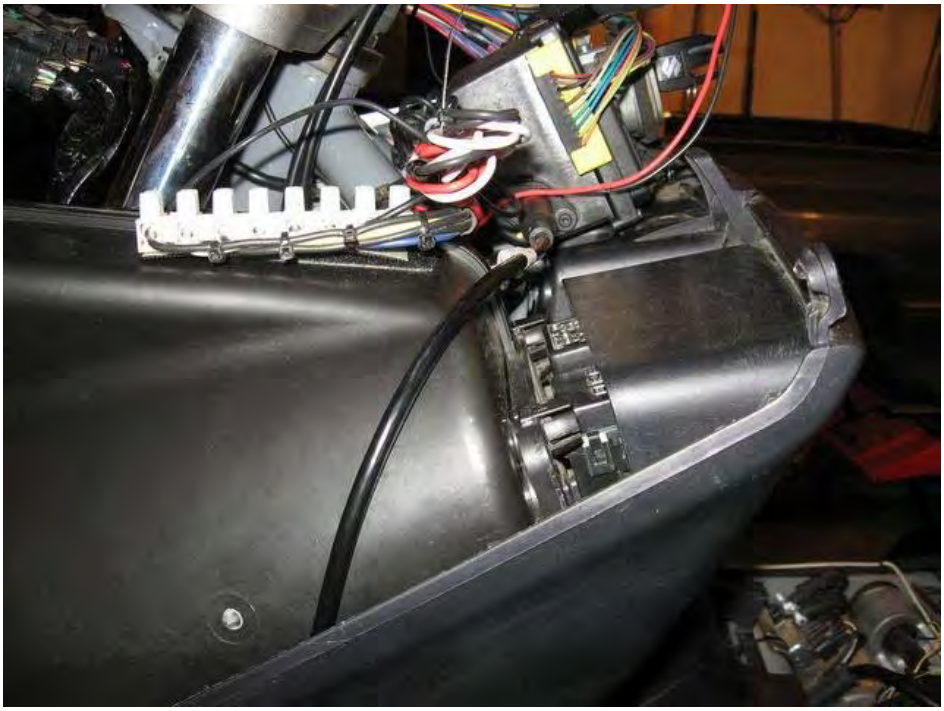
is not used so don't put one there at this time.



Picture 27

Temporarily reposition the Front Box and verify everything fits without issue.

Picture 28



Picture 29

When you're satisfied with the cable position, remove the Front Box and continue on with the installation

Picture 30

STEP 4: FABRICATION AND INSTALLING THE THROTTLE EXTENSION ARM AND CABLE CONNECTION

Let me start off by explaining the reasoning behind going through all the trouble of fabricating a Throttle Extension Arm.

From idle to full throttle, the distance that the scooters throttle cable travels is approximately 7/8". The Main Module cable when operating travels 1-5/8". That's almost double the distance of the scooters cable. In order to be able to use the full 1-5/8" resolution of the Rostra, we'll need to make a separate Throttle Extension Arm. Increasing the arch traveled for the same degrees of throttle movement, the Rostra Cable will now be able to use the full 1-5/8" to control the scooters throttle from fully closed to fully open. The greater resolution achieved with this longer arm, will help smooth out the operation of the Rostra while maintaining speed. This also technically allows the Rostra to make smaller adjustments in speed, as needed, giving you the ability to increase the overall Gain (Sensitivity) of the Rostra and accuracy of holding the set speed.

Looking at 'Chart 1' below it becomes more apparent. 'Offset 1' insures that the scooter throttle will be able to fully close when the cruise control is not active or canceled. 'Offset 2' prevents the Rostra Cable from being able to pull the scooters throttle open further that it can physically go. The red arrow shows the loss of resolution without the Throttle Adjustment Arm. In other words, the Rostra Cable would need to move the distance of the red arrow before it even begins to advance the scooters throttle. This delay can cause the cruise control to take a long time to start maintaining the selected speed. The Rostra also doesn't need beads installed to create slack as it would without the Throttle Adjustment Arm. As the addendum to the manual states, there is no need for beads if the throttle cable travel is >= 1-5/8" (1.625in.) in this current model.

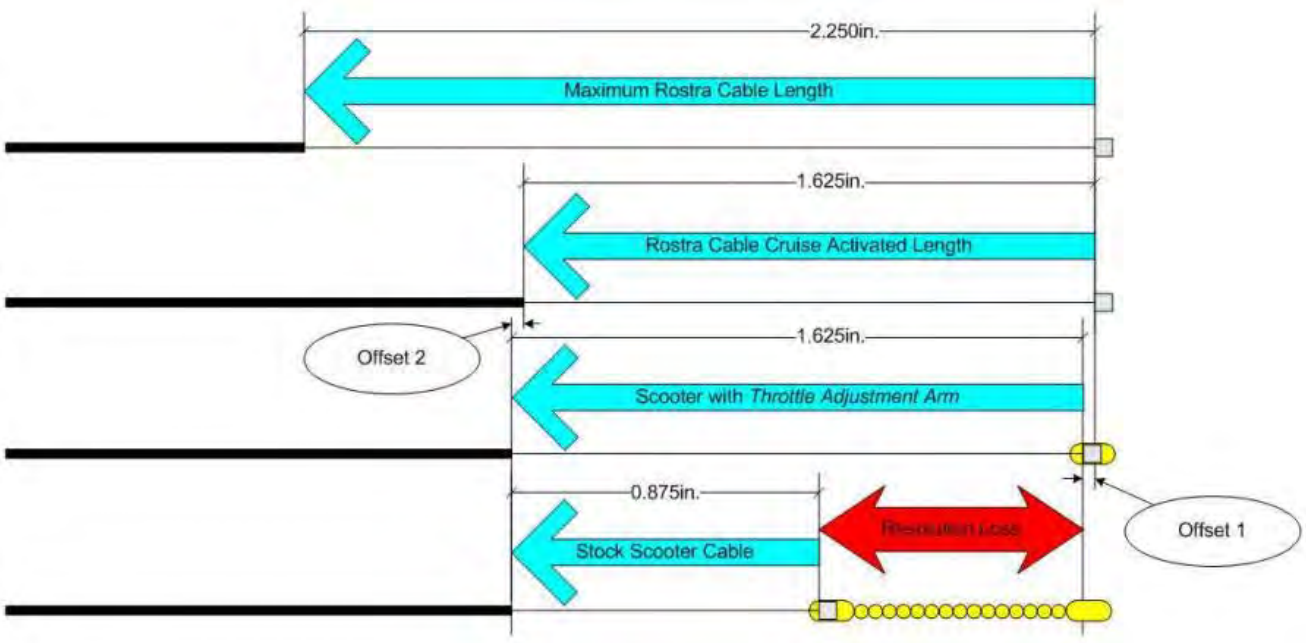


Figure 1 – Cable Travel Overview

For those that want to do this on a different bike, or make your own arm, here's what you need to do to figure it out its length. *Note:* Rough numbers are being used here for this example, all measurements in inches:

Take the travel of the bikes throttle cable [.875] and, divide it by the diameter of the pulley where the cable rests [1.325] times [pi], to get the percentage of the 360 degrees your throttle pulley could theoretically travel in one rotation.

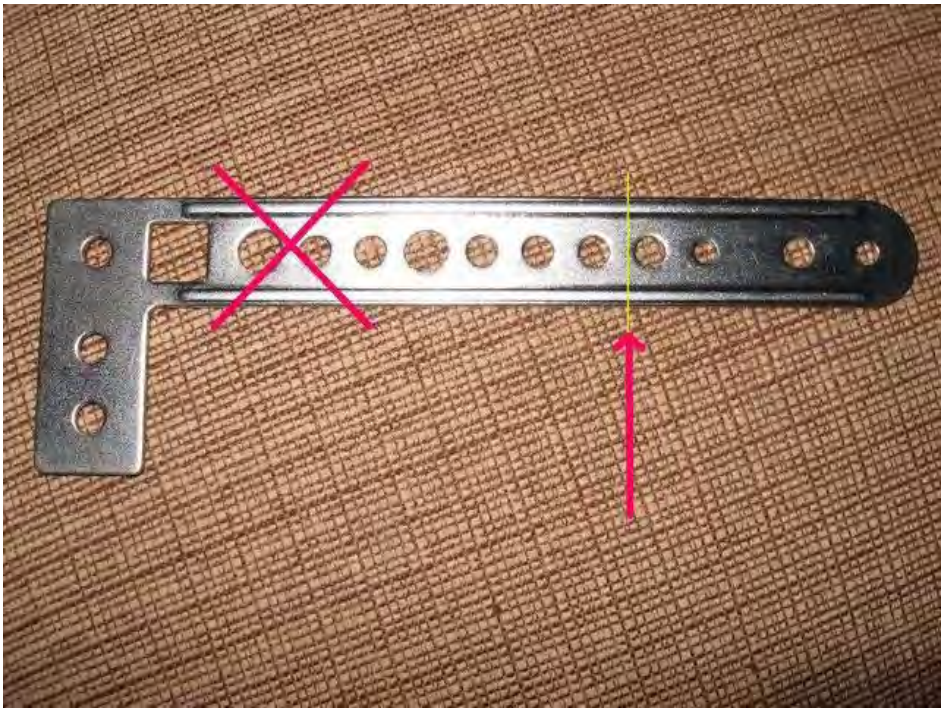
875 / (1.325 * 3.1416) = .21 or 21%

Next take the length of the Cruise Controls Cable travel [1.75] and divide by the percent above [.21] to give you the circumference of the circle the new arm needs to have [8.333]. Then just divide by [pi] for the diameter and [2] for the radius and that's the length between the center of the 2 holes of your arm needs to be, at a minimum.

((1.75 / .21) / 3.1416) / 2 = 1.333"

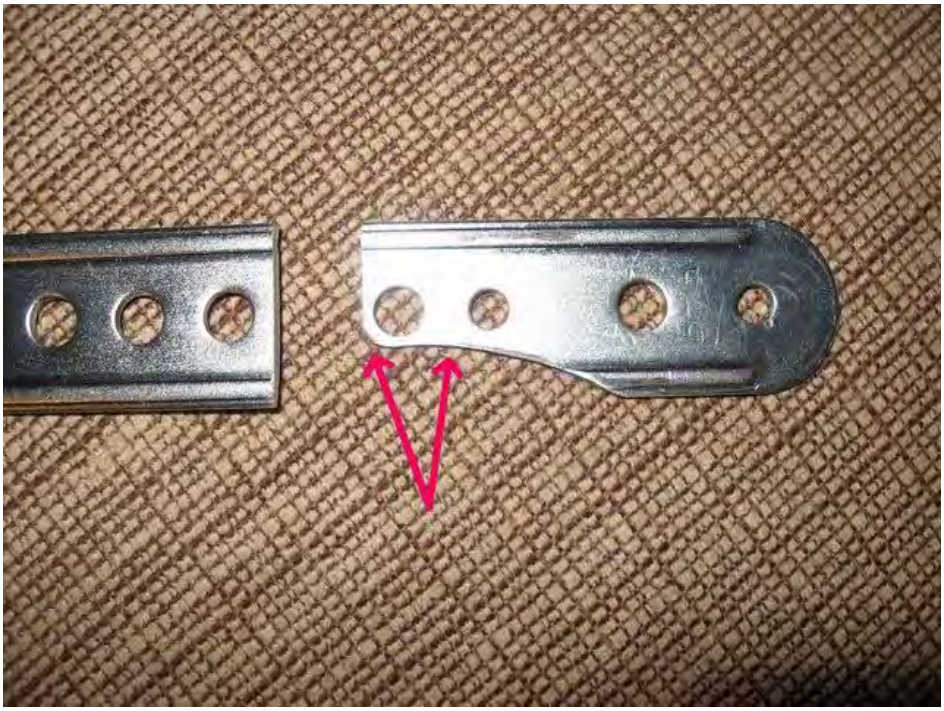
In this example, your arm needs to be at least 1.333" which you could round up to 1 3/8" (1.375") and that should serve you well.

Locate the Cable Bracket, Item E, Part# 250-3700, and cut off the end at the location shown. The rest of the bracket is not used in this step.



Picture 32

Grind off the bottom left portion of the piece as shown. Note the orientation with the raised ridges on top. This is important to make sure the raised area is not between the pulley and the adjustment arm when assembling attaching it. Later when assembling the Eyelet Connector (G8) to the Arm, you may need to fine tune the ground area until the Eyelet Connector moves freely around the corner.



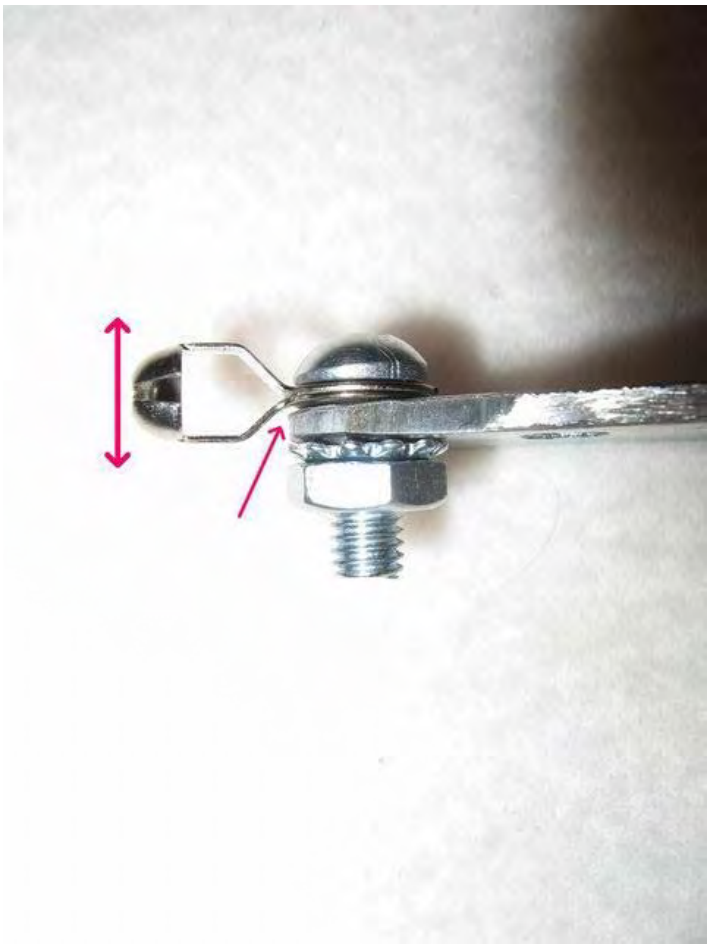
Picture 33

Gather the 10-32 X 1/2 Screw, Round Head (G22), Eyelet Connector (G8), one of the Connector Covers (G5) and a 10/32 Lock Washer Nut (G15). Take the Connector Cover and slice off a piece the thickness of the Throttle Extension Arm. Save the rest for later. This little ring of Connector Cover will help prevent the metal screw thread from cutting into the Throttle Extension Arm, and also make up some of the gap with the screw in this over-sized hole. The fact that it still can move around the hole a little bit is ok, and it will actually work to our advantage later when adjusting things.

Picture 34

Temporarily assemble the pieces on the new Throttle Extension Arm making sure the screw head and Eyelet Connector are on the side of the Arm with the raised areas down its length. You want to tighten the nut enough to minimize any side to side play of the Eyelet, but not enough to prevent the Eyelet from moving smoothly and easily around the corner of the Arm in an arc. Some fine tuning of the 'ground off' area may be necessary to insure the Eyelet doesn't bind on the Throttle Extension Arm anywhere during its arc of travel.

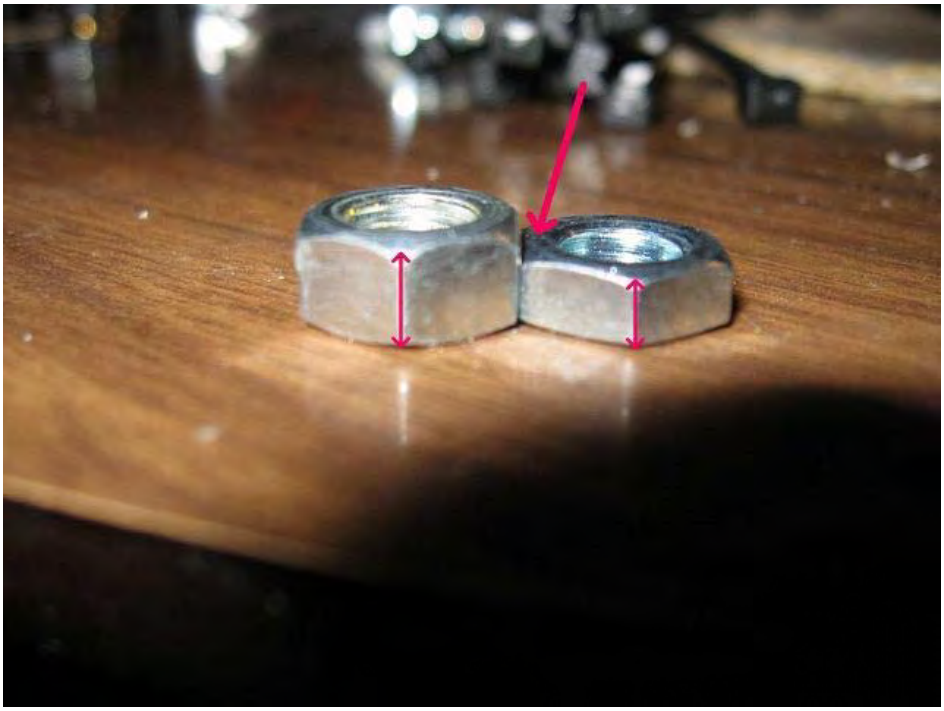
Note: When assembled for the final time, apply a small drop of Blue Loctite to the screw threads in the area the nut will reside. This is to keep it from backing out and falling off. I substituted the supplied Lock Washer Nut with a Nyloc Nut on mine.



Picture 35

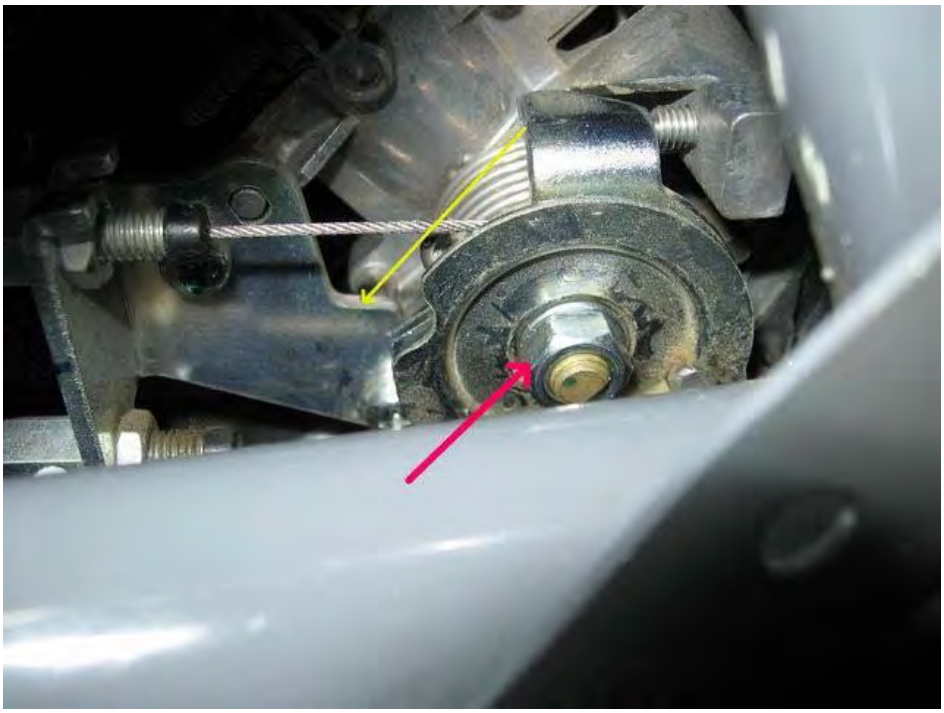
Note: The following double jam nut instructions apply only to 2007 and up scooters. The 2003 to 2006 scooters throttle body shaft is even shorter, therefore there is no room for both nuts. The best solution I've seen so far is to tap a shoulder bushing to 7 mm basically turning it into a long bolt that can be installed through the arm after opening the hole in the arm to it's size. This would also work on the 2007 and up scooters. I will try and write something up on this, once done, I'll add it here.

Verify that the purchased 7mm Jam Nut depth is less than the stock nut. This is critical because of the limited shaft length where the stock nut was removed. The stock nut measures 0.216" in depth, while the Jam Nut is only 0.152" deep. Without this difference in depth you won't be able to get the other Jam Nut on the treads with the Throttle Extension Arm in place. The depth of this first Jam Nut also plays a part in the position of the Throttle Extension Arm against the existing pulley. You want it tight enough to keep it from moving, but not so tight it crushes or distorts the pulley. You could use washers instead of the first jam nut, but this way is less likely to come apart or stress the pulley.



Picture 36

Twist the throttle grip to move the scooters throttle cable pulley to its fully open position. Make sure the pulley stop arm is in contact with the dual cable mounting bracket to help keep the stress off the assembly when you remove the stock nut. Use your Throttle Lock if you have one, or a helper, to keep the throttle in that position. Remove the stock nut and the lock washer behind it that is holding the throttle cable pulley on. The stock nut and lock washer will no longer be used. (Picture show pulleys in 'idle' position)



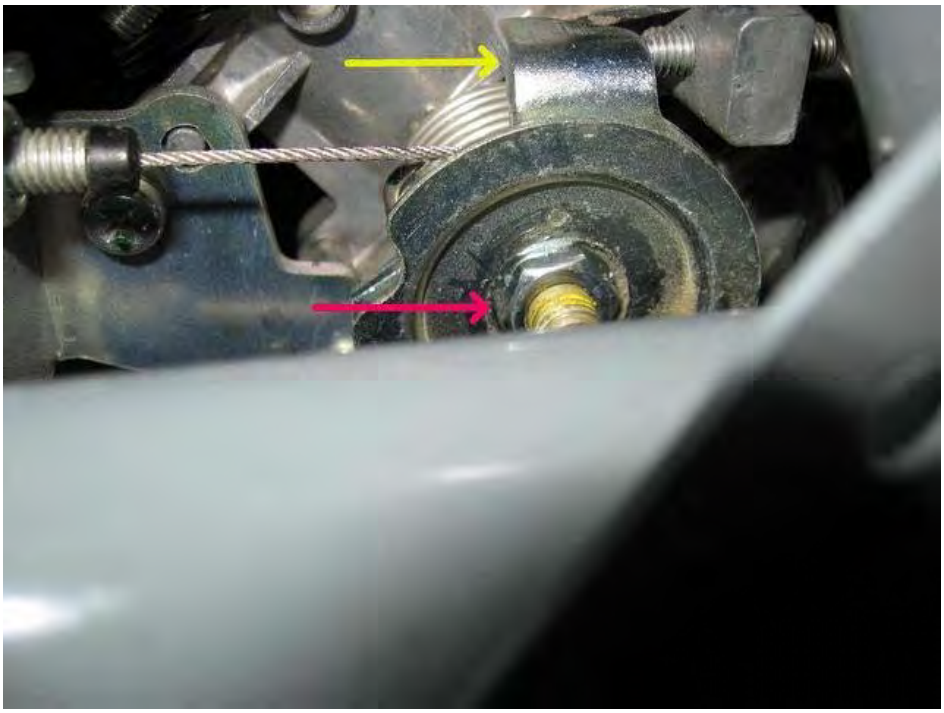
Picture 37

Slowly release the throttle back to an idle position and install one of the 7mm Jam Nuts (purchased separately) against the pulley. Remember, you are not using the original lock washer here, just the Jam Nut.

Note: Use a drop of blue loctite on the threads under the Jam Nut to secure it.

WARNING:

Don't over tighten the Jam Nut or alter the 'factory set' screw adjustment that the stop arm rests on in the idle position. Doing either of these things could lead to permanent damage of the throttle body and the butterfly valves inside it.

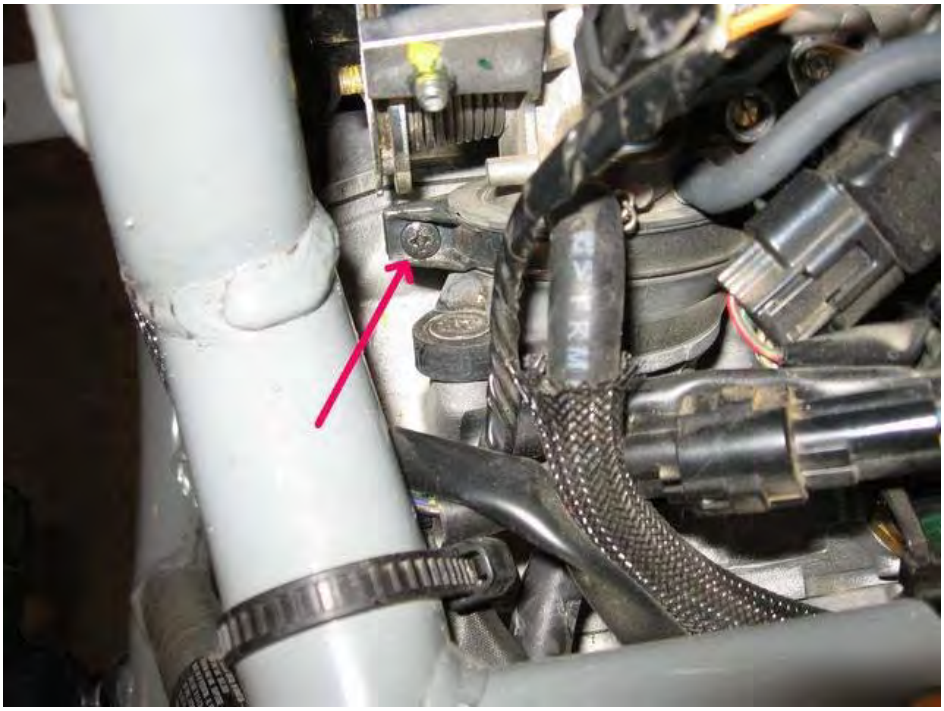


Picture 38

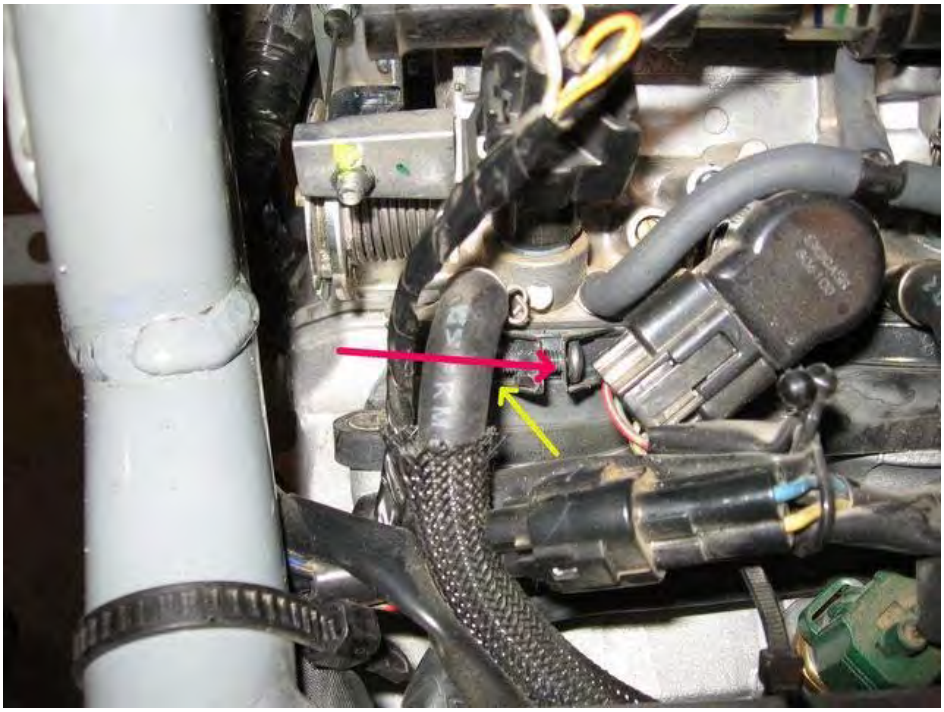
Relocate the lower left throttle body hose clamp to free up some more space for the Throttle Extension Arm to move in. Don't forget to re-tighten the clamp.

SAFETY WARNING:

Make sure the clamp screw in its new location is not in contact with the rubber hose or wiring nearby. Picture 40 is a little deceiving. There's actually plenty of room for the screw under there.



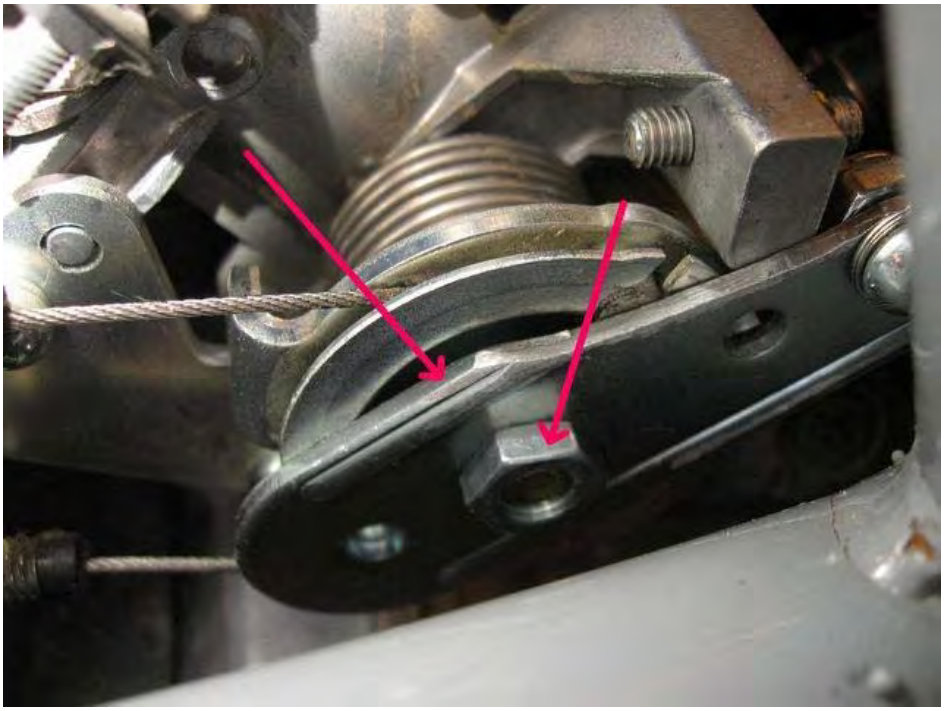
Picture 39



Picture 40

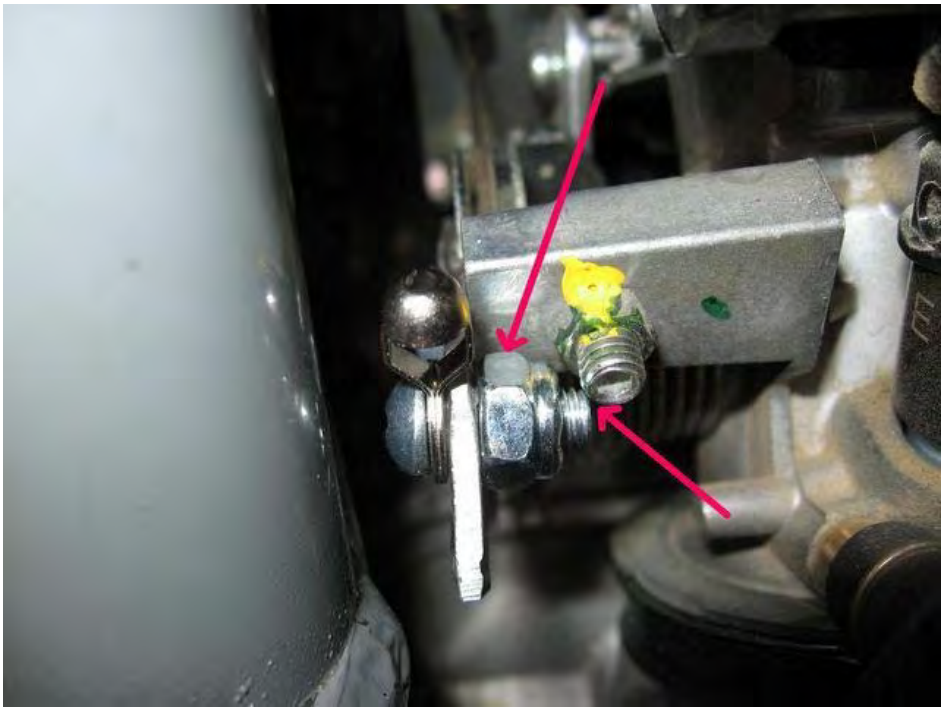
Slide the Throttle Extension Arm on the pulley shaft and install the second Jam Nut. Just tighten it enough to keep it from moving until you adjust its position.

Note: Don't forget to use a drop of blue loctite on the threads under the Jam Nut to secure it.



Picture 41

To adjust the position of the Throttle Extension Arm, twist the throttle grip wide open to move to scooters throttle cable pulley to its full throttle position. Use your Throttle Lock if you have one, or a helper, to keep the throttle in that position. Swing the Throttle Extension Arm up until the threads of the screw or the Nut, which ever comes first, doesn't quite make contact to objects in the surrounding area. Get close, but make sure you've got a definite gap and the throttle arm nut and bolt threads don’t come in contact with any part of the scooters throttle adjustment screw or bracket. After gently releasing the throttle to its idle position, finish tightening down the Jam Nut.



Picture 42

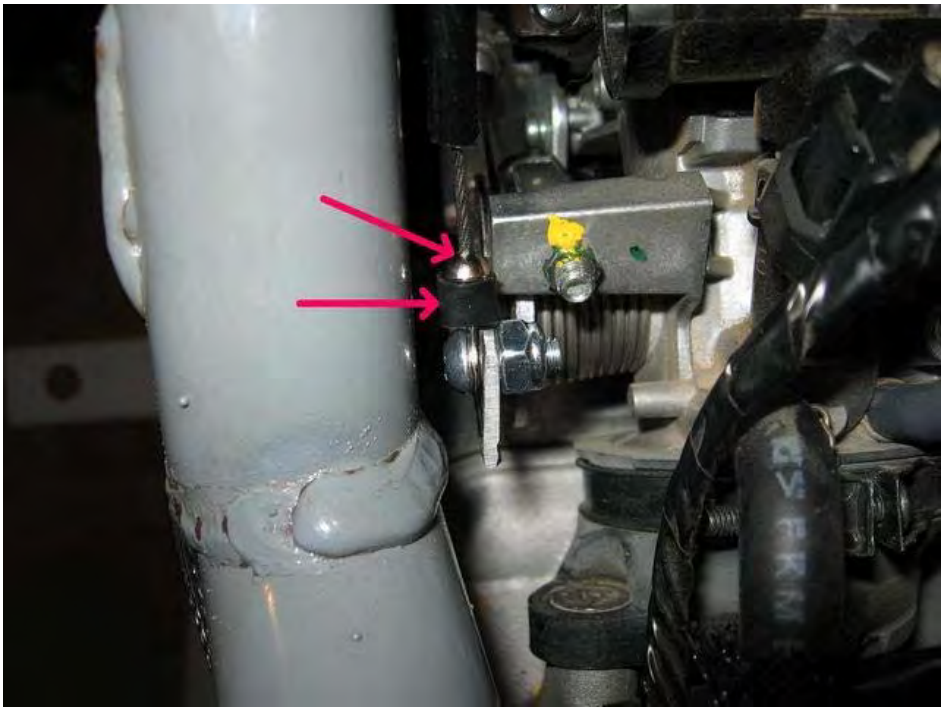
This is how it will look in the idle position. Like before, this picture is a bit misleading and there is plenty of room below

screw and nut.

Note: Double check the Throttle Extension Arm Jam Nut and make sure it's secure. If you don't catch enough threads on the shaft take the time to make adjustments in the thickness of the Arm or the Jam Nuts if necessary. Try the wide open throttle position several times and make sure there is no contact made by the bolt threads or nut to objects in the surrounding area.

Picture 43

Slide the smallest of the 3 Cable Clamps (G11) followed by the remainder of Connector Cover (G5) from the previous step above, over the end of the Main Module cable and then fully connect the cable to the Eyelet so that the cable is trapped in the Eyelet and exits through the top center hole. Next, slide the Connector Cover down over the top of the Eyelet to trap the cable inside the Eyelet. Don't slide it too far down where it interferes with the free movement of the Eyelet on the Throttle Extension Arm. This is why we're using the remainder of the one we cut earlier. The full length one is too big for just the Eyelet.



Picture 44

Slide the Cable Clamp up the cable to the frame cross member. Mark a spot on the frame cross member where the Cable Clamp is to be positioned as shown. Be careful to make sure the cable is lined straight up and down with the Eyelet. The cable should be able to move smoothly up and down straight inside the cables black sleeve.

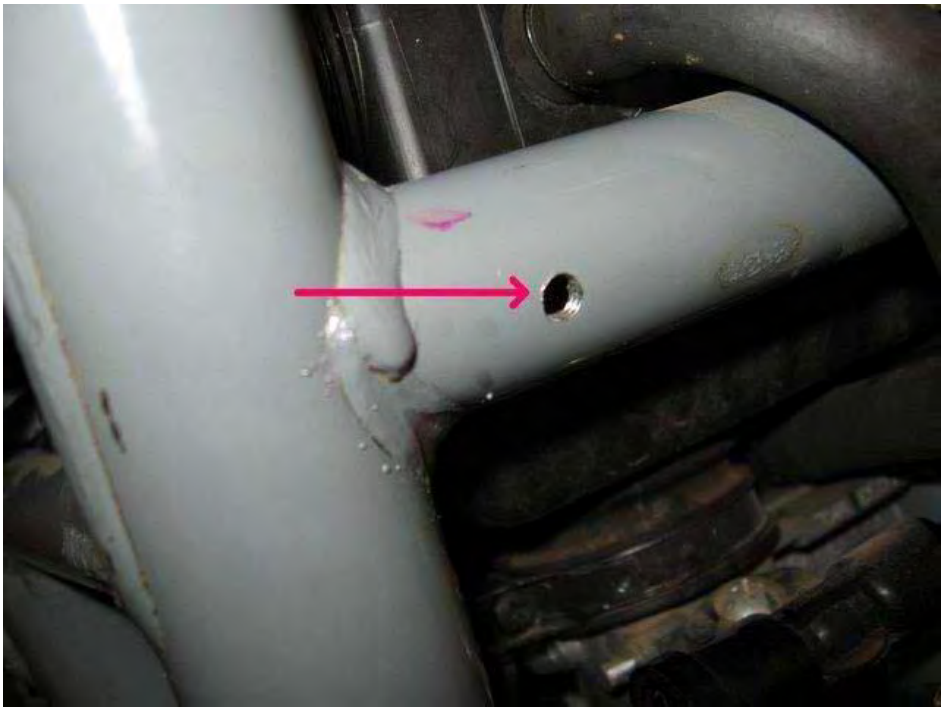
Picture 45

Note: Prior to drilling and tapping a hole at the location of the mark, make sure you protect the scooter from any stray metal chips

Picture 46

Picture 47

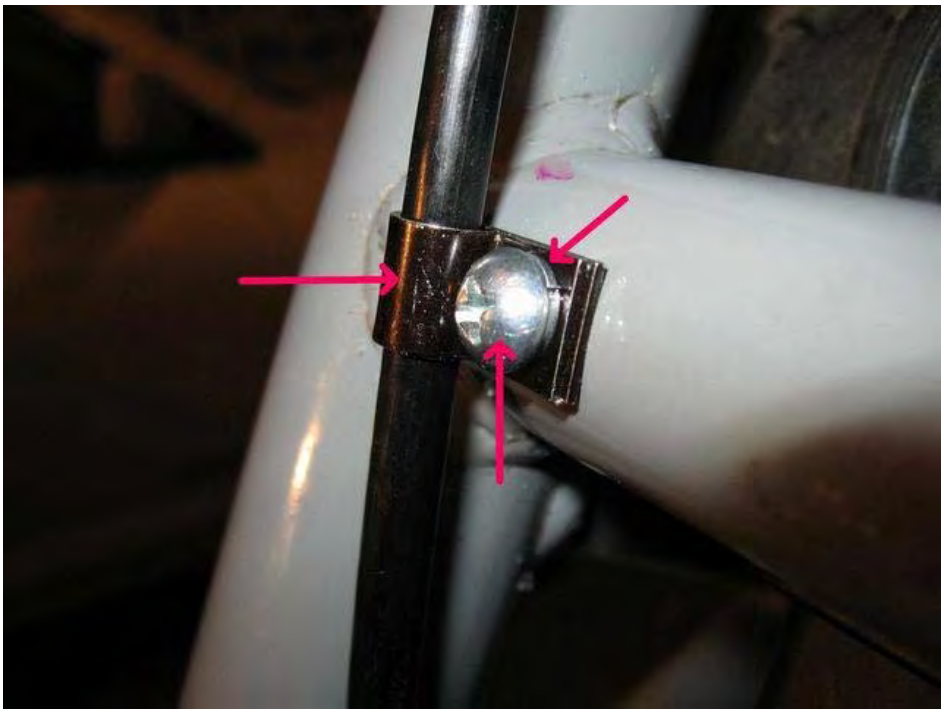
At the location you marked above, drill a hole into the frames cross member using a number 18 (0.1695 in.) drill bit. Then Tap the hole using a 10/32 tap. When you're done it should look like this.



Picture 48

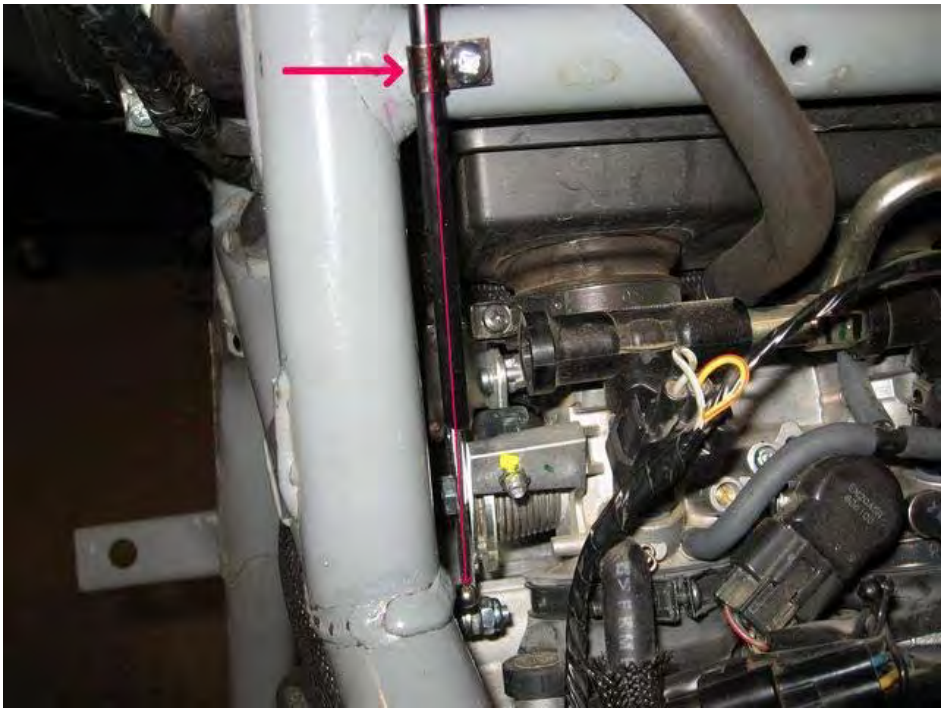
Attach the Cable Clamp to the frame using the last 10-32 X 1/2 Screw, Round Head (G22) from the kit and a #10 lock washer. Don’t tighten it all the way yet. You still need to make cable position adjustments before you clamp it down fully.

Note: Don’t forget to use a drop of blue loctite on the threads of the screw to help secure it. If you're not comfortable with drilling and tapping a hole in the cross member and want to secure the black sleeve differently, just make sure it can be held tightly in place and can't move when done. This is important for the proper operation of the cruise control.



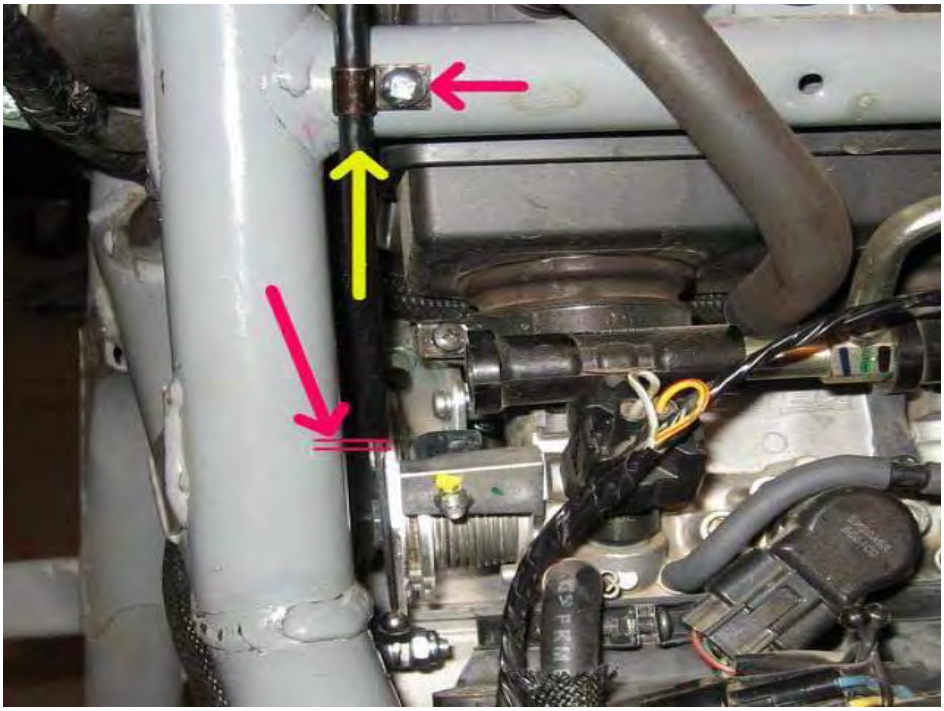
Picture 49

Rotate the Cable Clamp around on the screw to align the cable to be a straight run to the Eyelet.



Picture 50

Gently pull the black sleeve of the cable in the direction of the yellow arrow until it stops, just before starting to lift the Throttle Extension Arm. Next, push the black sleeve back down just a little bit, around 1/16th to 1/8th of an inch as shown in Picture 51. The braided cable should now be able to move ever so slightly upward into the black sleeve before it starts pulling the Throttle Extension Arm upward from its idle resting place. Basically what you're trying to create is Offset 1 as shown in Figure 1 above. Finish tightening the screw on the Cable Clamp to hold the cable black sleeve in this position. Always double check your work and make sure everything runs smoothly. You should feel no difference in the scooter's throttle operation. As you open and close the throttle, the cable should easily and consistently feed up into the black sleeve with no bending or binding.



Picture 51

You can now tighten the cable ties that are holding the Main Module Cable along its path you attached earlier.

STEP 5: CONTROL SWITCH INFORMATION AND WIRING

Preface: Let me start off by saying that the mounting of your switch is more of a personal choice. Therefore, I am not going to tell you how or where you should to mount it. There are so many places to mount it, so many switches, including any custom ones you might come up with or use. After all, this is the one part of this installation that is visible when done.

Important Installation Note: When it comes time to hookup the wires to the scooter, Steps 5 & 6 are really meant to be done at the same time. Laying out both sets of wires at the same time will help in determining each wires length, position and make for the cleanest installation.

Custom Control Switch Electrical Connections Overview:

Here are three examples of the most basic custom switch configurations. This should provide you with enough information to enable you to use any setup you may come up with. These custom examples are intended to be used with the Main Module Switch 12 set to Off (Open Circuit).

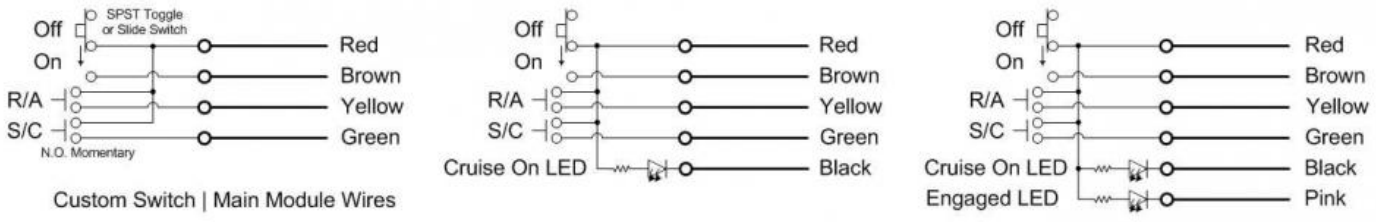


Figure 2 – Custom Switch Wiring Examples

For those that want to use the stock universal switch, and since Control Switch #250-3592 and #250-3593 seem to be the most popular, let's go over #250-3592 version in much more detail. For those who want to use Control Switch #250-3593 it's basically the same switch as #250-3592, just minus the Engaged LED. Figure 3 briefly describes what each wire is does.

Stock Control Switch #250-3592 Functional Overview:

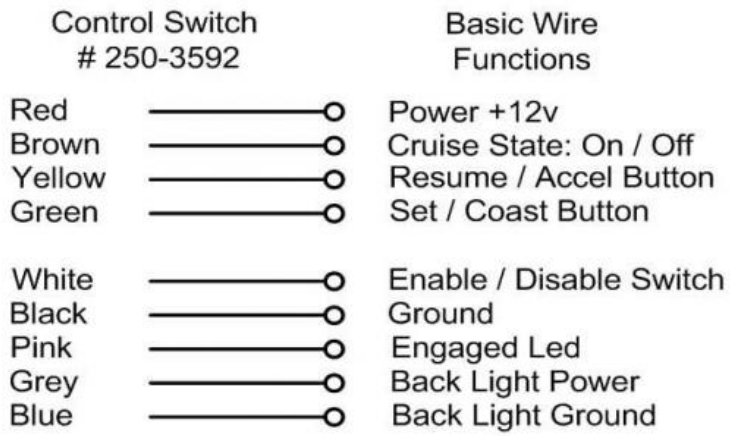


Figure 3 – Basic Wire Functions Reference

The Red and Black wires provide power and ground to the Control Switch from the Scooter. The Brown, Yellow and Green wires change from 0v to +12v to tell the Main Module when any of the 4 buttons are pressed. The Brown wire will stay at +12v whenever the cruise control is On and stay at 0v when it's Off. The Yellow and Green wires will momentarily go to +12v when ever you push the R/A or S/C buttons respectfully. The White wire disables or enables the buttons from working. If the White wire is supplied +12v then the On / Off buttons will work normally. If the White wire is not supplied +12v, the Brown wire will go to 0v and the On / Off buttons won't work. This effectively disables the entire switch because the Main Module will consider the Cruise State as being Off and won't look at the rest. +12v applied to the Pink wire turns the Engaged LED On, 0v turns it Off. The Grey and Blue wires power the button back-lights. +12v to the Grey wire and 0v to the Blue will turn on the button back lighting. The reason for the separate power and ground has to do with the dimming dash light applications in cars and doesn't apply here. Obviously you have the choice to simply not connect them if you don't want back-lit buttons. The Pink, Grey and Blue wires are not required for the Control Switches buttons and thus the Cruise Control to function.

Note: Unlike the examples in Figure 2, the Stock Control Switch won't allow the Cruise Control to turn on when the ignition is turned on. You have to push the On button to turn it On. In other words, you can't accidentally, or on purpose, leave the On / Off switch in the On position with this one like you could with the custom examples in Figure 2.

Stock Control Switch #250-3592 Electrical Connections:

While there are 9 wires running through the switches wiring harness, only 6 are absolutely needed for this application. With the #250-3593 Control Switch you'll only need 5, because there's no Engaged LED. Rostra made switch #250-3592 so that it needs +12v to activate the Engaged LED, but Main Module supplies a ground on the Engaged Orange wire instead. In other words, the Engaged Orange wire is the opposite of what it needs to be. The addition of a Relay is necessary in this stock configuration for switch #250-3592 to invert the signal coming out of the Main Module and properly interface with the Control Switch. This is how the switch will need to be connected if it has not been modified as discussed later on.

Notes: With the #250-3593 Control Switch you don't need the relay because there is no Engaged LED. You can always wire a separate LED to the Main Module if you still want an Engaged LED mounted somewhere else on the scooter.

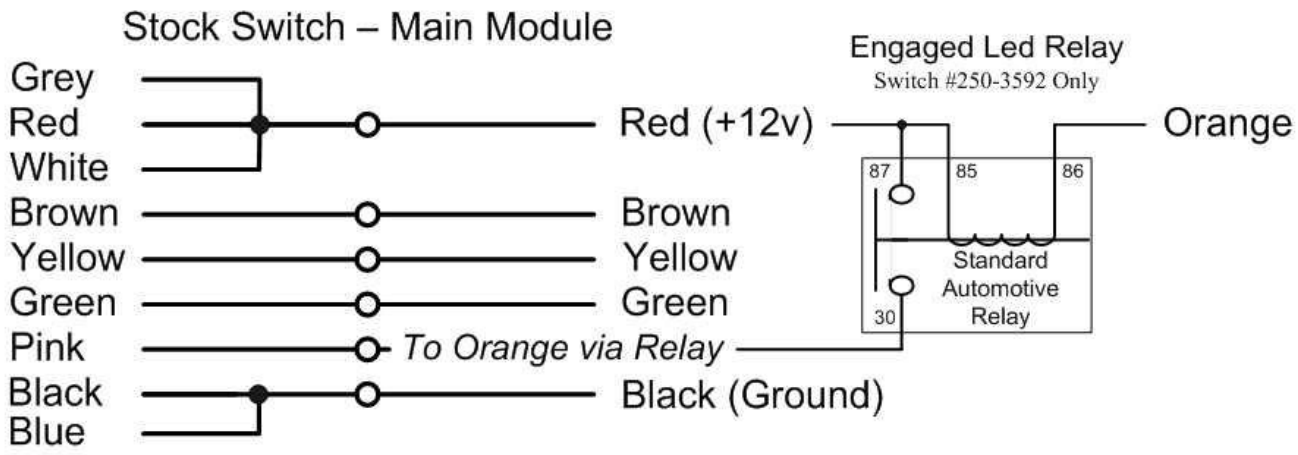


Figure 4 – Unmodified Switch Connections

To hook up this configuration after routing all the systems wires:

- Cut the Red switch wire roughly half way back from the 4 pin connector.
- Take the Grey, the 2, just cut, ends of the Red wires, the White wire, and solder them all together and cover with heat shrink tubing. The connector side of the red wire should come out one end of your splice, the rest out the other end toward the switch.
- Slide the Red wire pin into the supplied 4 pin connector half so that it will mate up with the Red wire on the Main Module connector.
- Insert the Brown, Yellow and Green pins in the rest of the Control Switch side of the 4 pin connector so they also line up with the Main Module connector. Brown goes to the Red with Brown striped wire.
- Connect 4 wires, one to each pin of a standard automotive relay.
- Connect the wires from pins 85 and 87 of the relay to the Red wire on the Main Module 4 pin connector that mates with the switch. I recommend that you cut the Red wire on this side also so that you can slide on heat shrink to cover the connection.
- Connect the Orange wire from the Main Module, you'll probable need to lengthen it, to pin 86 of the relay. (See Main Module Harness Notes and Thoughts in Step 6)
- Connect the Pink wire to pin 30 of the relay.
- Take the Black and the Blue wires and connect both to the black wire going to the 2 pin Switch Power Ground connector from the Main Module. Ideally incorporating a 2 pin connector here with the Pink and Black wires going through it would be advised so that the Control Switch can be completely unplugged and is not hard wired to the Main Module. Unfortunately, the mating 2 pin switch side is not provided. (See Main Module Harness Notes and Thoughts in Step 6 for a solution)

Optional Choices with this Control Switch:

1. If you don't want back-lit buttons, don't connect the Grey and Blue wires.
2. If you're using Control Switch #250-3593, a separate Engaged LED can still be wired to the Main Module if you want an Engaged LED somewhere else on the scooter as shown in right side example in Figure 2.
3. Advanced Option: If for some reason you want the cruise control to shut off, based on something else happening on the scooter, you can. Instead of connecting the White wire to the Red wire as instructed above, connect it to what you want to monitor. For monitoring a +12v signal, just connect it directly, for monitoring a grounded signal connect it along with +12v and ground to an SPDT relay, similar to what we did with the pink wire in Figure 4. The difference between using this wire instead of the Neutral Safety wire is that the Neutral Safety wire disengages saving the current set point so you can resume and this one turns off the Cruise Control erasing it. I can't think of any reason to use either in this application, however you now have the information to do so.

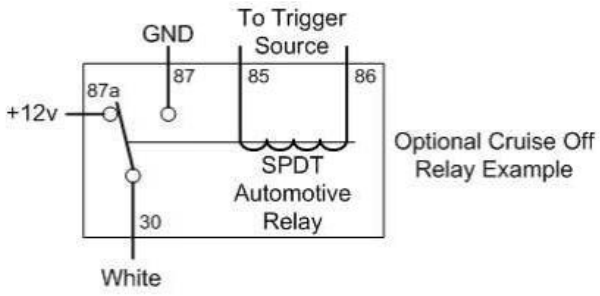


Figure 5

Modifying the Stock Control Switch #250-3592: *(Advanced Option)*

The purpose of this Advanced Option is to show you a way to eliminate unnecessary wires in the Stock Control Switches wiring harness and eliminate the need for the Engaged LED Relay resulting in a cleaner and simpler install.

In this part you will get a little more intense by modifying the Stock Control Switches wiring harness and printed circuit board. Only do this if you are “very” comfortable with these types of modifications. Any modification of the printed circuit board in the switch will of course void all warranties and require a steady hand with experience to do this type of alteration. It’s very easy to permanently ruin the printed circuit board if you’re not careful. On the other side, doing this removes the need for the Engaged LED Relay and eliminates more unneeded wires. As you can see in Figure 6, the wiring becomes a lot cleaner, simpler and straight forward.

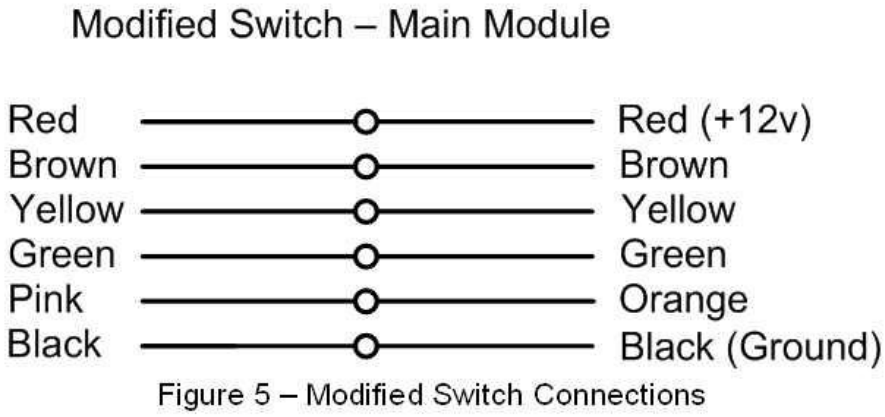


Figure 6

The printed circuit board schematic changes you’ll be making are notated here in Figure 7 for your reference. Basically you’re going to remove the White, Grey and Blue wires from the circuit board and the harness and move the Pink wire to a new location. Connect the Red, White, Pink and Grey wire pads, and separately, the Black and Blue wire pads together on the board directly. You’ll be cutting the trace on the ground side of R6 and attaching the previously removed Pink wire there instead of the pad it was originally attached to. This last step effectively reverses the Engaged LED wiring logic on the circuit board making it compatible with an unmodified Orange wire from the Main Module. The Engaged LED Relay will no longer be needed.

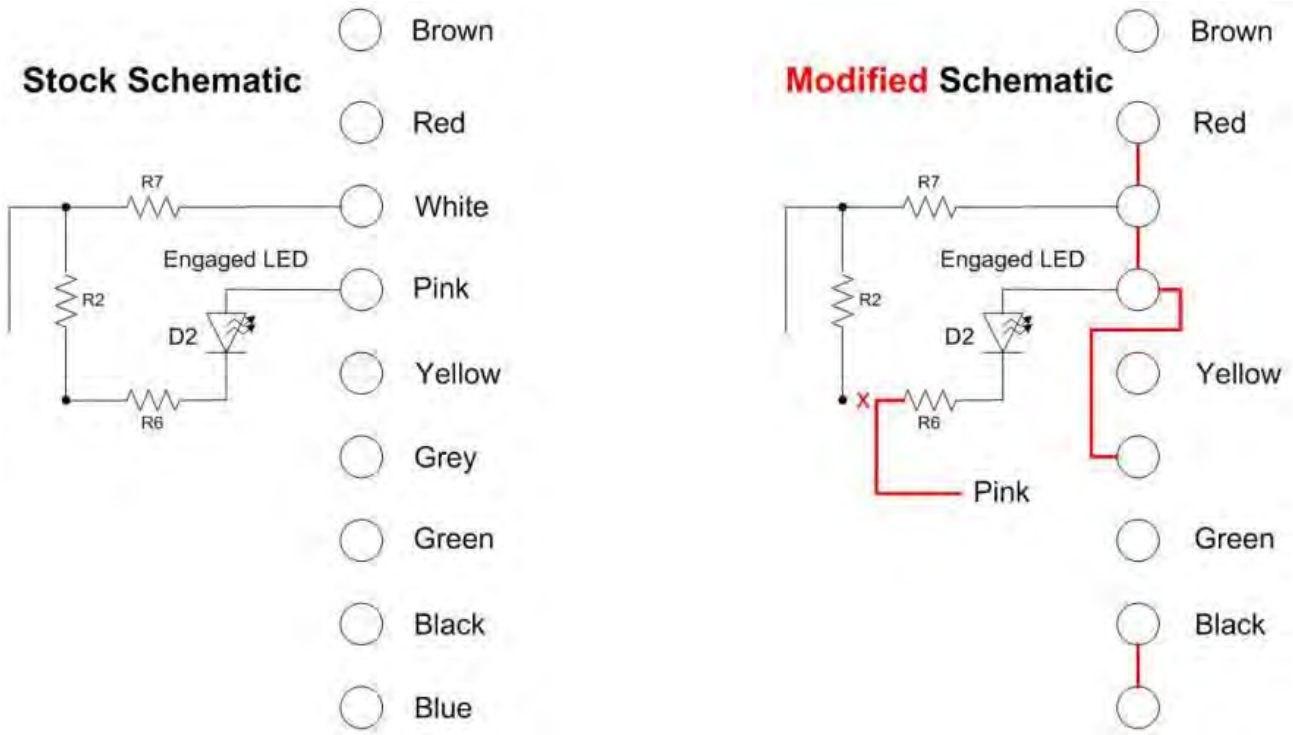


Figure 7

Caution: Again, Please only do this if you are “very” comfortable with these types of modifications. Any modification of the printed circuit board in the switch will void all warranties and does require a steady hand with experience to do this type of alteration. It’s very easy to permanently ruin the printed circuit board if you’re not very careful.

Start by removing the electrical tape from the stock wiring harness and separate the two halves of the plastic case to expose the circuit board. The two halves of the plastic case are held together with small dimples and can be easily pulled apart. Set the 2 case halves and the rubber button inlay aside from now.

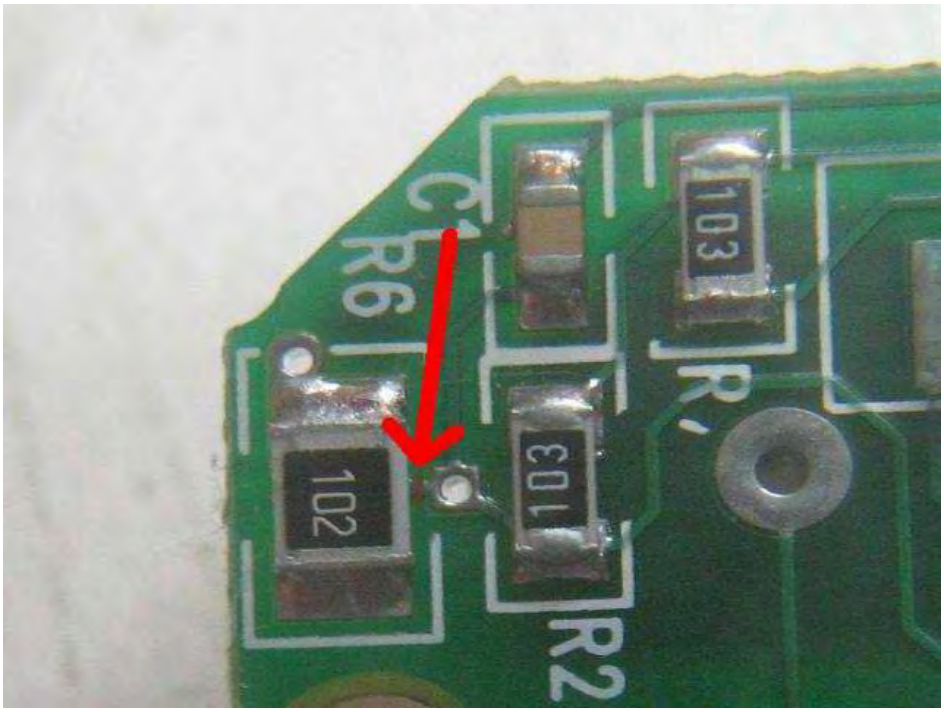
Picture 52

Using a 12v DC source, touch the Pink wire to the positive side and the Black wire to the negative side and verify the Engaged LED lights up.

Danger! Do not proceed if it doesn't light up. Work out why it doesn't. You're doing this to verify that the trace you are about to cut has in fact been cut.

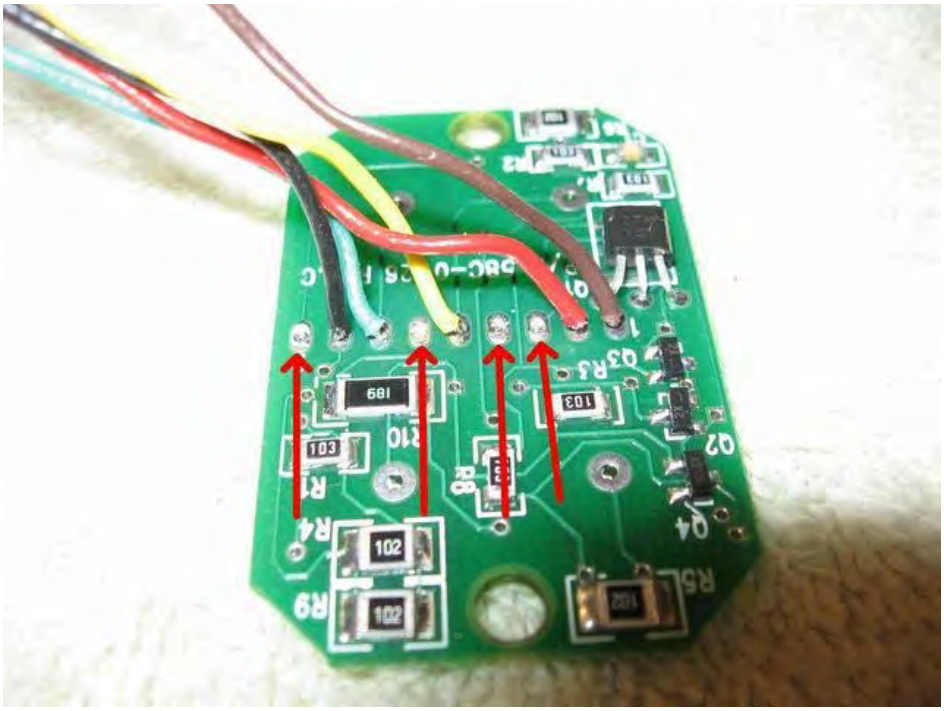
Very carefully cut the trace indicated between R6 and the feed through hole with a sharp “exacto” type knife and verify that the Engaged LED no longer lights up using the above test. This will confirm you actually cut the trace.

Caution: Make sure you cut the trace between the resistor and the feed through hole. The 2 other traces along with the feed through hole need to remain intact or you will not be able to turn on the Cruise Control. They are used in the on/off latching circuit of the board.



Picture 53

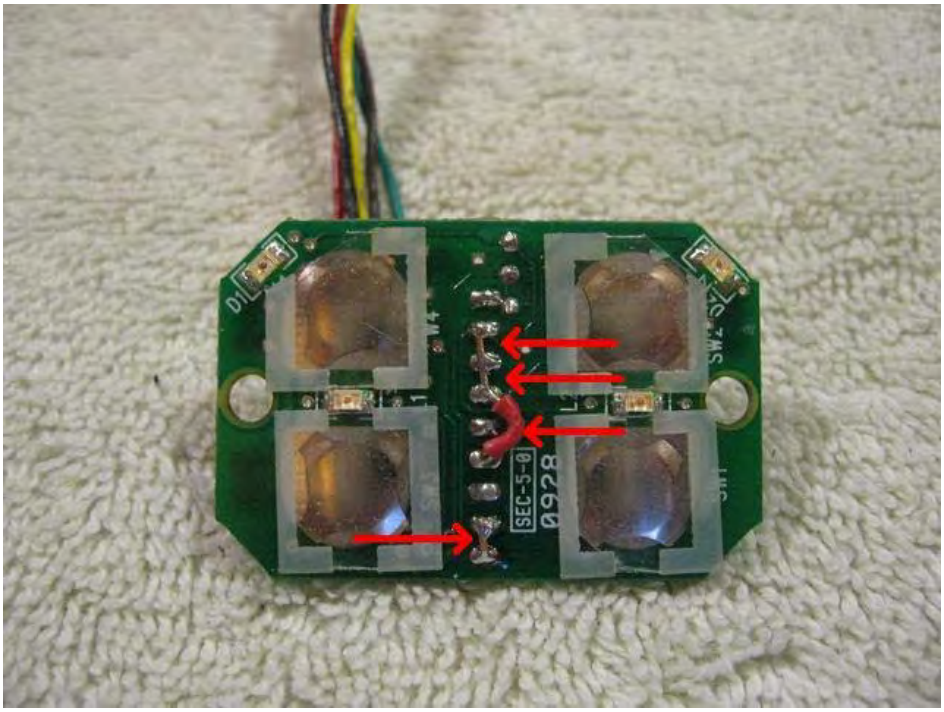
Carefully unsolder the White, Pink, Grey and Blue wires from the circuit board while being careful not to overheat and lift pads or traces off the board.



Picture 54

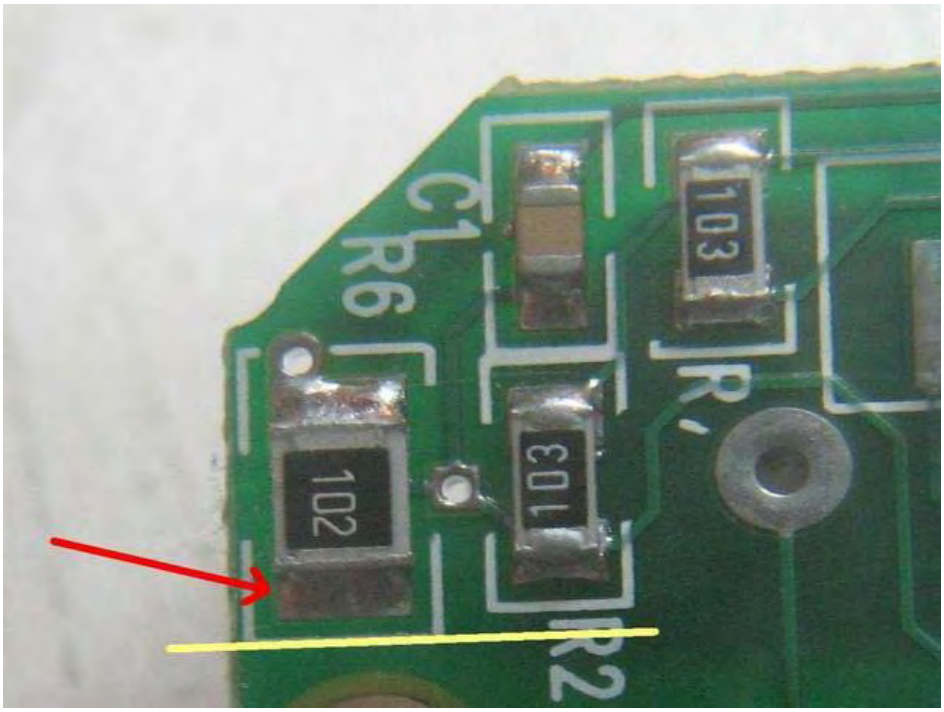
On the top of the board, bridge the pads together as shown. Starting from the top you're bridging the 2nd, 3rd, 4th and 6th pads together. Then you are bridging the 8th and the 9th pads with a separate bridge. Refer to Figure 7 above.

Note: There is not a lot of vertical room here. Keep your work close to the board. The Rubber Button Inlay rests directly on top of this side of the board. You might seriously consider doing this on the back side of the board, it's that close. Whichever side you choose, be careful not to accidentally solder across to adjacent traces running near by. Connect only the wire pads to each other.

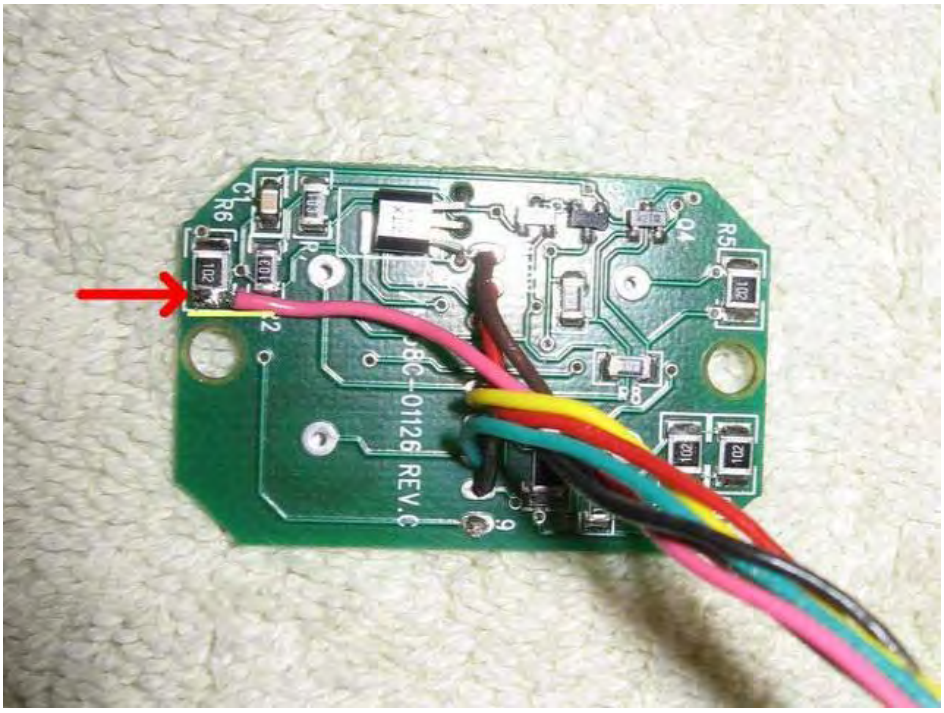


Picture 55

Attach the Pink wire to its new location on the negative side of R6. Keep the Pink wire above the yellow line so as not to interfere with the mounting hole right below it. Run the Pink wire over, up and out with the rest.



Picture 56



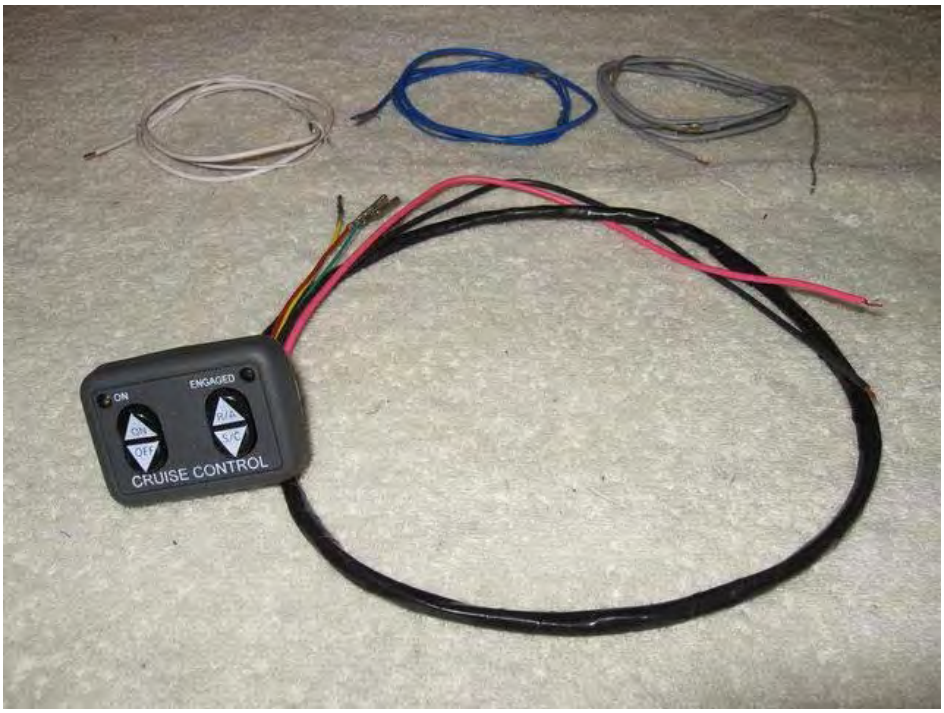
Picture 57

Test the switch for proper operation.

Connect the black wire to the negative side of your 12v source, the red to the positive. Both of the Back-light LED's should light up. Pushing the On button should turn On the Cruise On LED, Pressing OFF should turn the LED off. The Brown Wire

should be at +12v when Cruise On is indicated, 0v when it's not. The Yellow should go to +12v when pressing the R/A Button and the Green wire should do the same thing when the S/C Button is pressed. Last but not least, grounding the Pink wire should turn that pesky Engaged LED On.

Re-tape the harness using fresh electrical tape; re-assemble the switch and you should be good to go. You even have 3 loops of spare wire left over you can use for something else.



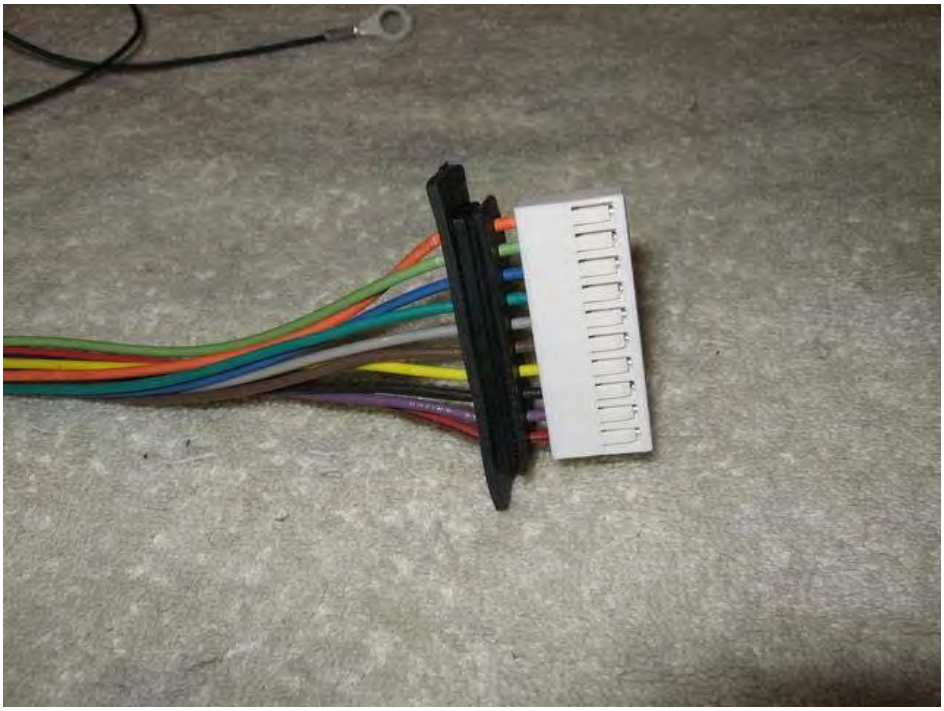
Picture 58

It would not be a bad idea to retest the switch now that it's fully back together.

STEP 6: MAIN MODULE ELECTRICAL HOOKUPS

Main Module Harness Notes and Thoughts:

Consider shortening the harness by cutting the wires before the Bulkhead Connectors. There's enough wire before the Bulkhead Connectors to easily make it as far as the scooter's battery. The Switch Connectors and Fuses can be spliced into the shortened harness and it makes for a cleaner overall install. This also conveniently gives you some extra wire to extend the shorter ones, like the Orange Enable wire. The harness does unplug at the Main Module. Slide the Yellow Locking Cover off the connector area. You will find the wires are routed through a rubber plug and the connector is concealed under that. The wire, rubber plug and connector all come out together as one piece, which means that the Main Module can be removed from the harness at that end if needed.



Picture 59

Since we're not using it, the Optional Speed Sensor connector just happens to be the correct type to plug directly into the 2 pin Switch Connector. Convenient, since that half of the Switch Connector is not provided with the switch.

The Main Module Harness that I received came with two 4 pin Bulkhead Connectors. The schematic on the manual shows a single 4 pin and a single 2 pin Bulkhead Connector. Assuming that the Main Module Wiring Harness has been updated since the manual was written, I've provided an updated schematic reflecting the changes.

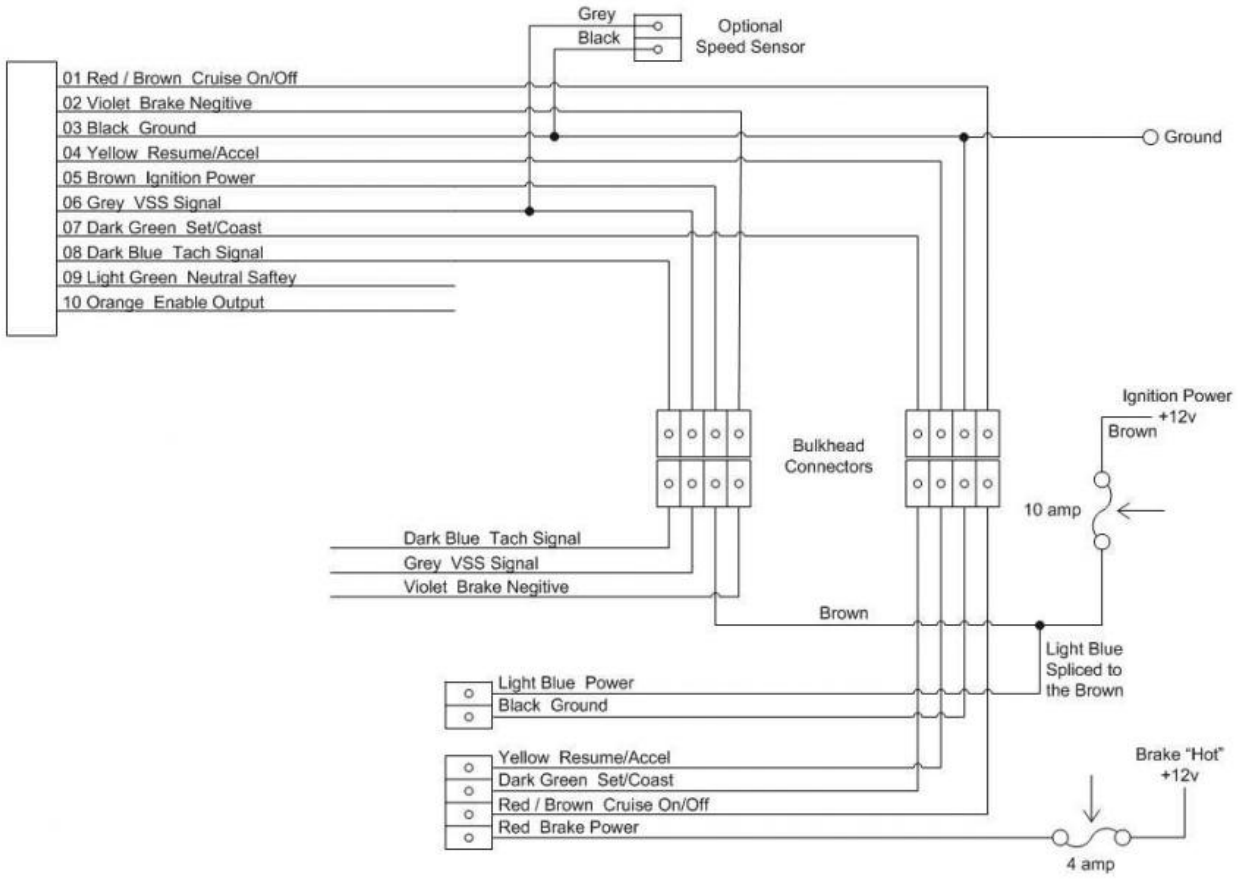


Figure 8 – Updated Stock Main Harness Schematic

Some Important Notes Going Forward:

The Brake Positive 4 amp fuse will be getting its power from the scooters 15 amp Signal Fuse (#5). To be thorough, the 15 amp circuit you're tapping off of on the scooter also supplies power to the radiator cooling fan and your horn, among other things.

If you have LED Brake lights installed you will need to install a ground path for this cruise control system to function properly. A small regular 12v incandescent bulb hooked up to the brakes in addition to the LED bulbs is the best way to supply the needed ground path. The bulb should be installed in the rear of the scooter next to the LED lights for safety. Using a relay as others have will work, but it will also defeat the safety built in to the module and allow the possibility of the brakes to no longer be able to disengage the cruise control under certain brake light circuit failure conditions.

The Stock Control Switch shown in this DIY is 'NOT' waterproof. You should seal it while you're installing it to protect it from water damage.

Rostra states in it's manual on page 18 in the wire description that the Brown Power Wire should be off during the starting (cranking) of the engine. In the Control Switch Trouble Shooting portion on page 23 the reference to this in the switch charts has been removed, based on an older online copy of the manual that had it. I'm not sure why they would want if off when the engine is starting other than to assume that the intention was to make sure the Main Unit started up cleanly on full voltage as opposed to being subjected to a period of possibly low voltage when starting with a weak battery. Therefore I have included some options for those who would prefer to install it that way. The optional wire connections required can be found coming from the scooter's Start Button on the Main Harness side of the right handlebar switch cluster black connector.

SpeedoHealers: If you have one installed and haven't already run the original signal before correction to the front, you

should run the Gray VSS wire back to the SpeedoHealer Connectors on the signal wire and connect to the white wire before the SpeedoHealer's corrected output. This is the recommendation of HealTech Electronics tech support. Even though I have one, I still ran the Grey back to the unaltered signal just to prove the raw signal will work for those who don't have correction. I don't know what effect connecting the Grey wire to the corrected signal, Pink Wire, will have. If you try it, let me know and I'll post the results.

Scooter and Main Unit Harness Basic Connection Overview:

Rostra Harness (number on schematic)	**Scooter Harness**	**Rostra Color**	**Scooter Color (harness side)**	**Throttle Side Handlebar Option Color**
Ground Wire (03)	Battery Ground	Black	Black	n/a
Accessory Power w/ 10 amp fuse (05)	Battery Positive (Multiple Options, see Figure 9)	Brown	Red	Yellow with a White tracer (if not using other switched source)
Brake Positive w/ 4 amp fuse	Rear Brake Switch from the left handlebar switch cluster on the Main Harness side of the connector	Red	Orange with a Green tracer	Black with a Red tracer (Front Brake Switch)
Brake Negative (02)	Rear Brake Switch from the left handlebar switch cluster on the Main Harness side of the connector	Violet	White with a Black tracer	Black with a Blue tracer (Front Brake Switch)
Tachometer (08)	Ground to Rostra Harness Black wire	Dark Blue	Black	n/a
Vehicle Speed Sensor (06)	ECM/PCM (Pin 7) Most will find running this back to the speed sensor connector in the rear an easier option	Gray	Pink (ECM/PCM) - or - White (Speed Sensor connector)	n/a
Neutral Safety (09)	Not used, should be left unconnected - Option Note: Will immediately disengage cruise if grounded	Light Green	n/a	n/a
Enable Output (10)	Control Switch Harness or other custom location (optional, not required)	Orange	Pink	n/a
4 Pin Switch Connector	Connected to Main Module mating connector	Multiple colors	Multiple colors	n/a
2 Pin Switch Connector (Customized)	Connected to Main Module mating connector (Customized)	Multiple colors	Multiple colors	n/a

n/a

Chart 1

Engine Start (Crank) Brown Wire Hookup Options:

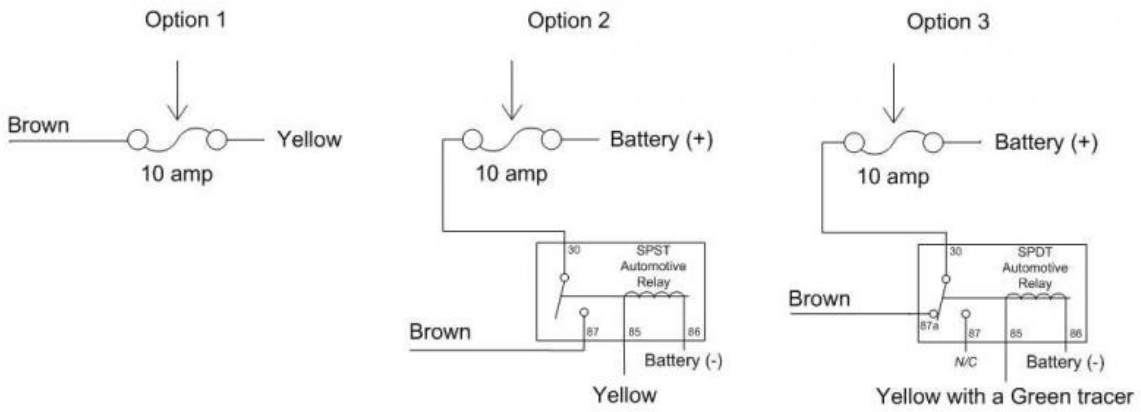


Figure 9

- The Yellow and Yellow with a Green tracer wires are coming from the scooters Start Button on the Main Harness side of the right handlebar switch cluster black connector. (see Picture 65) If wiring to the handlebar harness directly the colors are Yellow with a White tracer and Yellow with a Green tracer respectively.
- For option 3, instead of direct to the battery as shown in Figure 9, it should be direct to a switched power source. I you don't have switched power management installed you can combine options 2 and 3 by connecting pin 30 in option 3 to pin 87 in option 2. It's not the best solution but it will work.

Option	Pros	Cons
Straight To Battery (As shown in Figure 8)	Simplest (what most have done on bikes before us)	No Engine Start Power Disengage
Option 1	Simple Engine Start Power Disengage	Adds additional load to Scooters 40 amp Main Fuse circuit
Option 2	Better Common Relay Engine Start Power Disengage Power Direct from Battery	Relay on all the time Cruise Control is shutdown any time the start button is pressed
Option 3	Best (Recommended optional hookup) Engine Start Power Disengage Accidentally pushing starter button doesn't kill cruise Power Source Direct from Switched Battery Source	Relay only on, drawing power when starting Cruise Control only shutdown when the engine is actually starting

Chart 2

Main Harness after Installation with Modified Switch:

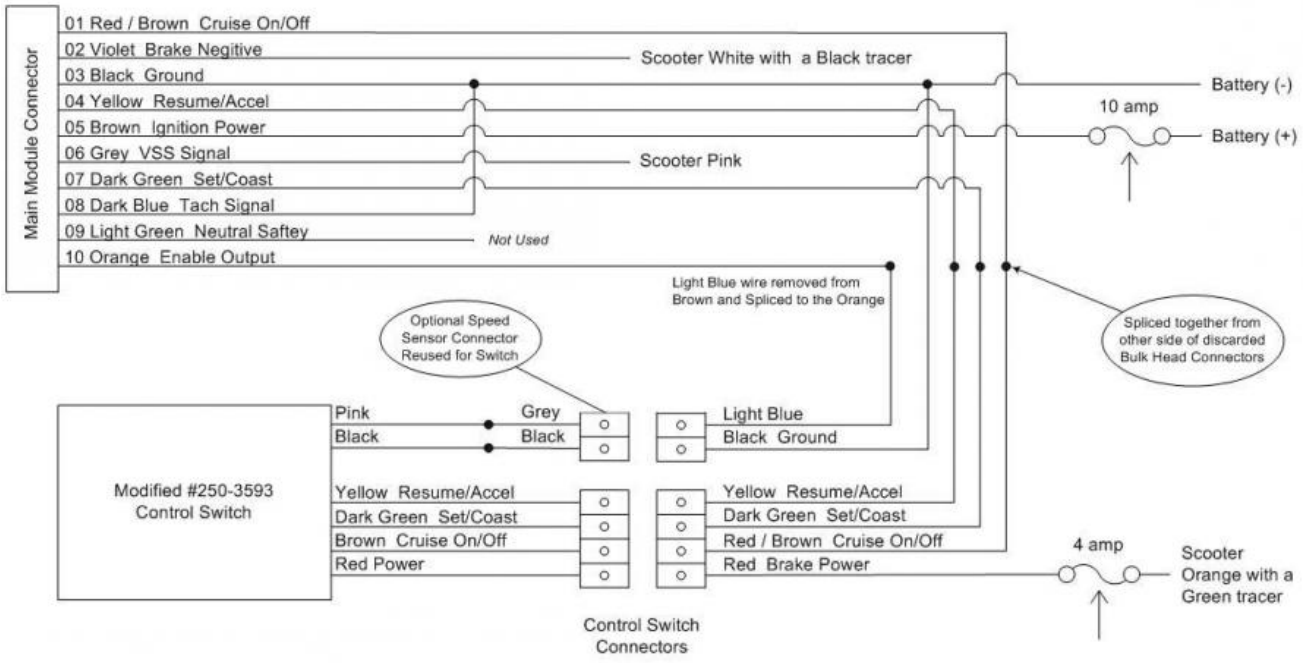
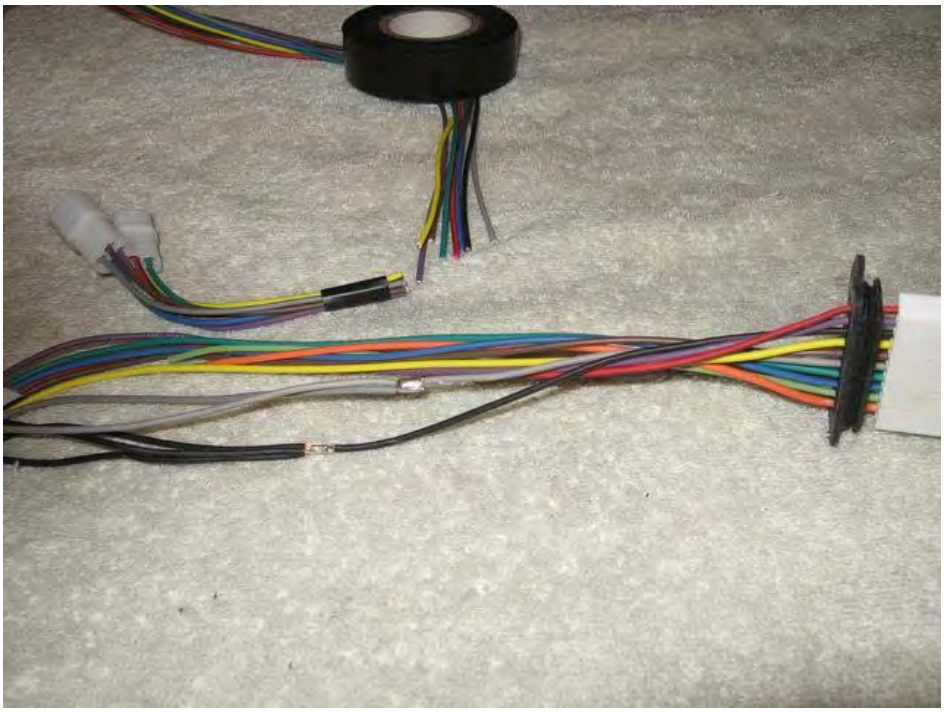


Figure 10 - Combined Scooter / Rostra Main Harness Schematic

Preparing the Main Harness:

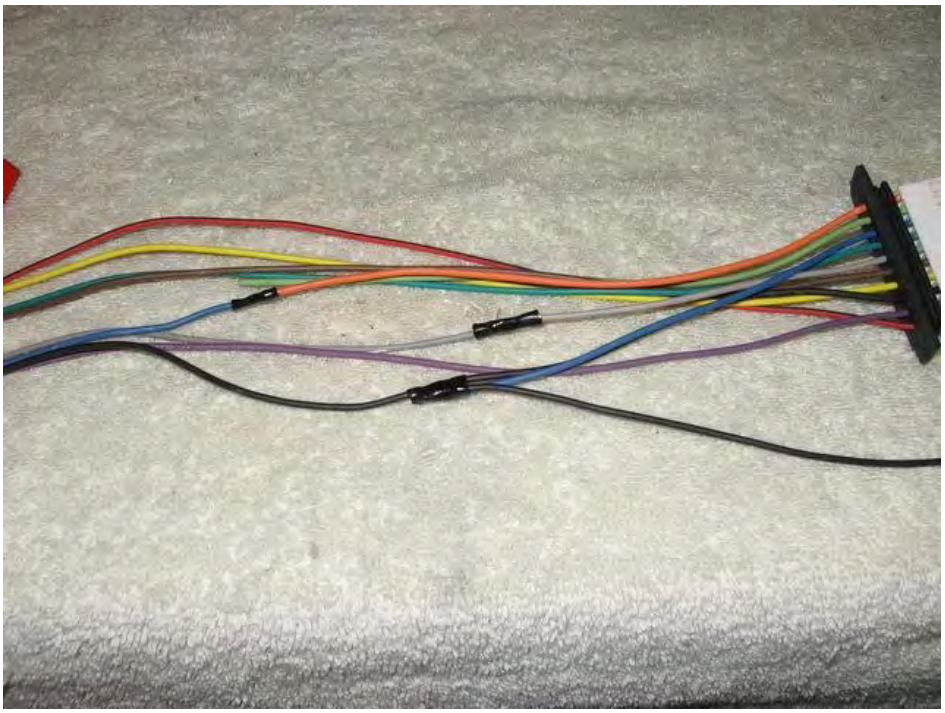
Disclaimer: This is just one way of doing it. Your requirements may be different depending on what options you used along the way. Always work out what your going to need before altering any of the harnesses.

This is for those who are following the full mod route including the Cruise Control Switch as shown in this DIY. Others will need to alter the procedure accordingly. Separate the Bulk Head Connectors and grab the portion of the harness between the Connectors and the Main Module. Cut off the Bulk Head Connectors, Remove any tape and remove the shrink wrap from the splices for VSS (Grey) and Ground (Black).



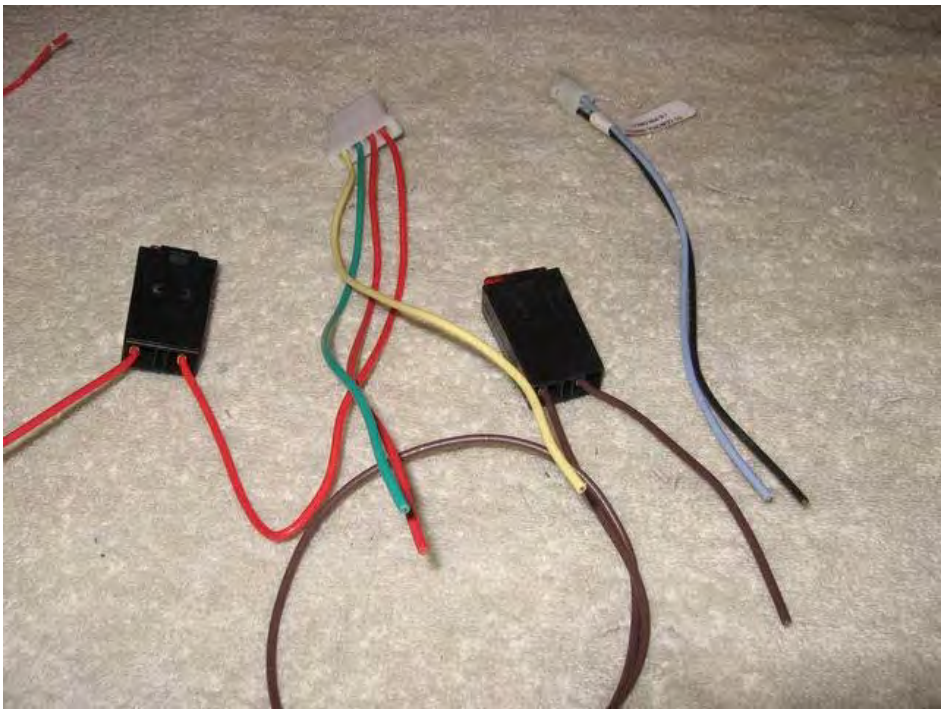
Picture 60

Remove the Optional Speed Sensor Connector by cutting the wire at the splice to use later in the Control Switch harness. Cut the unused Dark Blue Tach wire and solder it to the Black wire splice. Attach the remainder of the Dark Blue wire you just cut to extend the Orange Enable wire. Recover each splice with heat shrink tubing.



Picture 61

Cut the Yellow, Green, Red/Brown, Brown, Light Blue and Black wires off the end of the other end of the original harness as shown. We will re-attach these later.

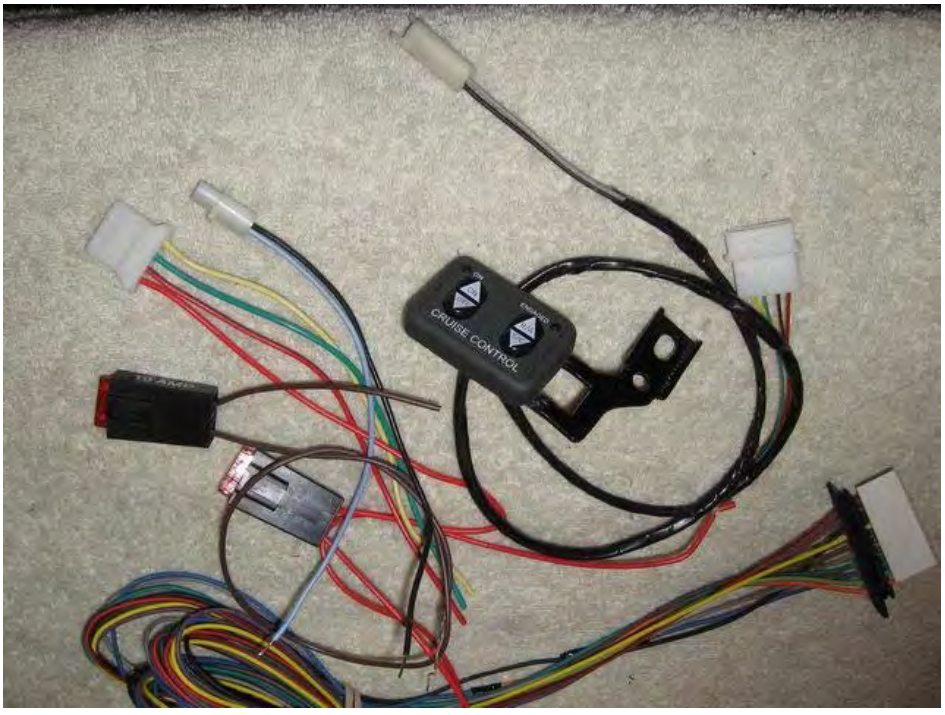


Picture 62

Attach the Optional Speed Sensor Connector removed in picture 61 to the Cruise Control Switch Harness, Black to Black and Light Blue to Pink. Based on how you installed the Switch on your scooter, verify you can run the Switch harness to the left front of the scooter over the ECM/PCM module (see Picture 65). The Main Module harness will be following up the existing scooter harness to the same place. If no problems you can go ahead and attach the connector body to the switch harness as described in the manual.

Picture 63

When you're done you should have an unwrapped main harness, the connectors and fuses you cut off earlier (Picture 62) and a completed Cruise Control Switch harness.

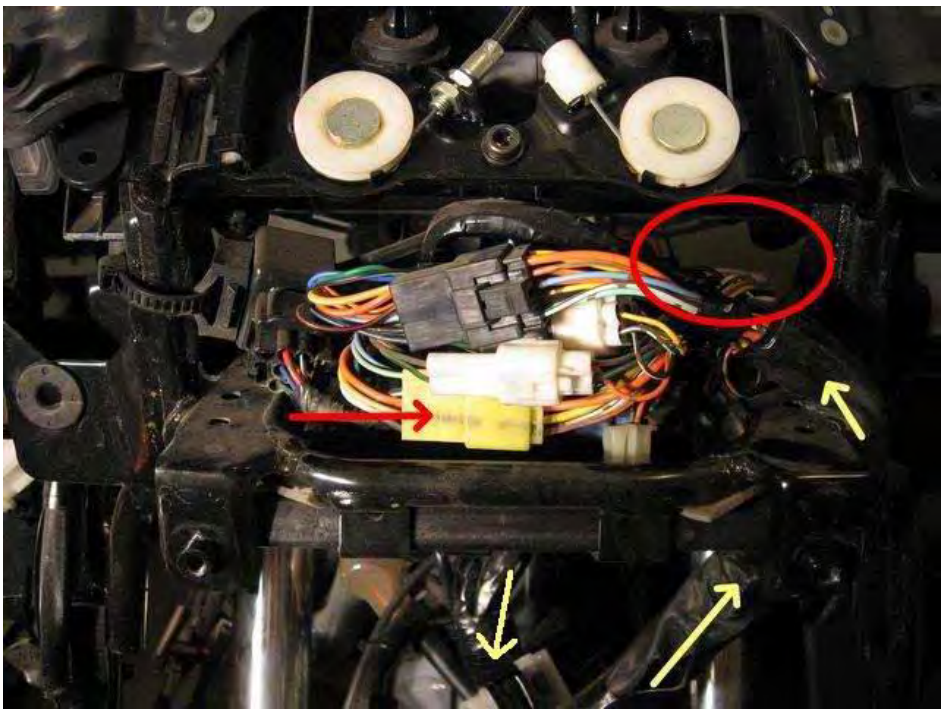


Picture 64

Running and Connecting all the wires:

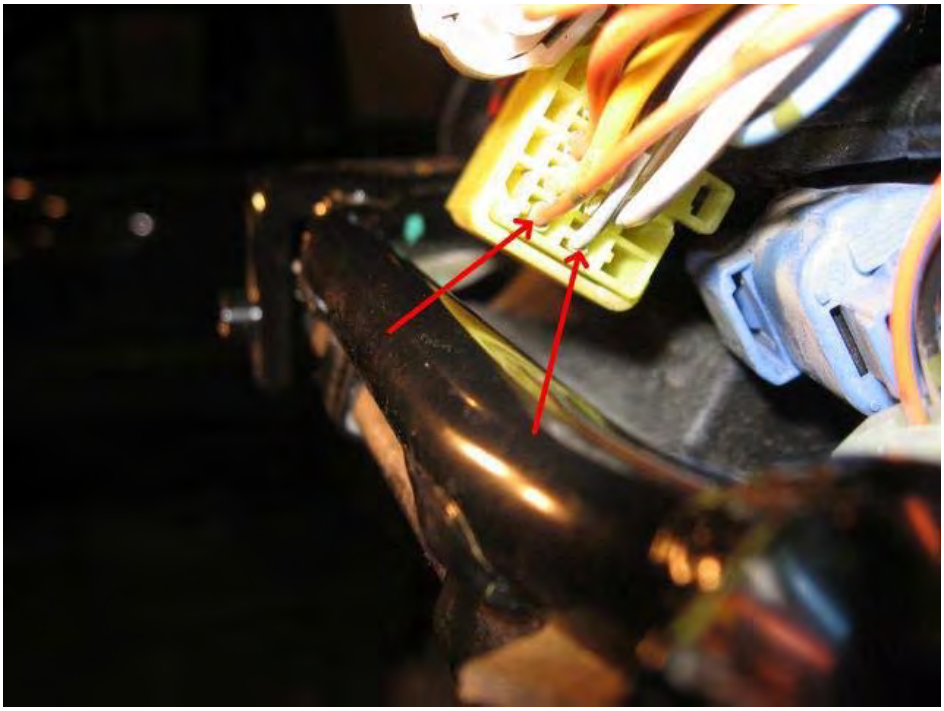
Note: The following procedure is for the Executive model. For the Standard scooters some of these connections are better found on the handlebars themselves. (See Chart 1)

You're almost there! Once done you will have connected only 3 wires to the scooter's harness + Power and Ground to the battery. You will be running the bulk of the Rostra harness down from the Main Module and then up following the scooter's harness as indicated by the yellow arrows. The Switch harness will be coming from the area marked by the red circle and you'll be attaching 2 wires to the scooter harness coming off the yellow connector.



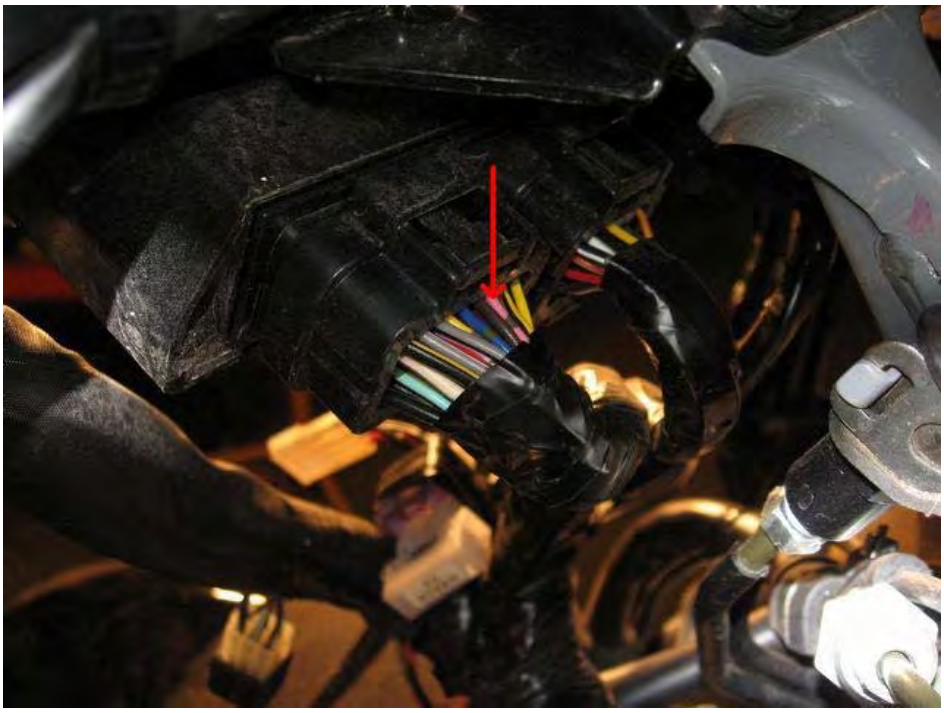
Picture 65

The Red 4 amp Brake Hot wire from the Rostra harness will go to the Orange/Green wire on the left and the Violet Brake Negative wire from the Rostra harness will go to the White/Black wire on the right. Note the orientation of the connector in the picture and the unused spot to the right of the wires you'll be attaching to for reference.



Picture 66

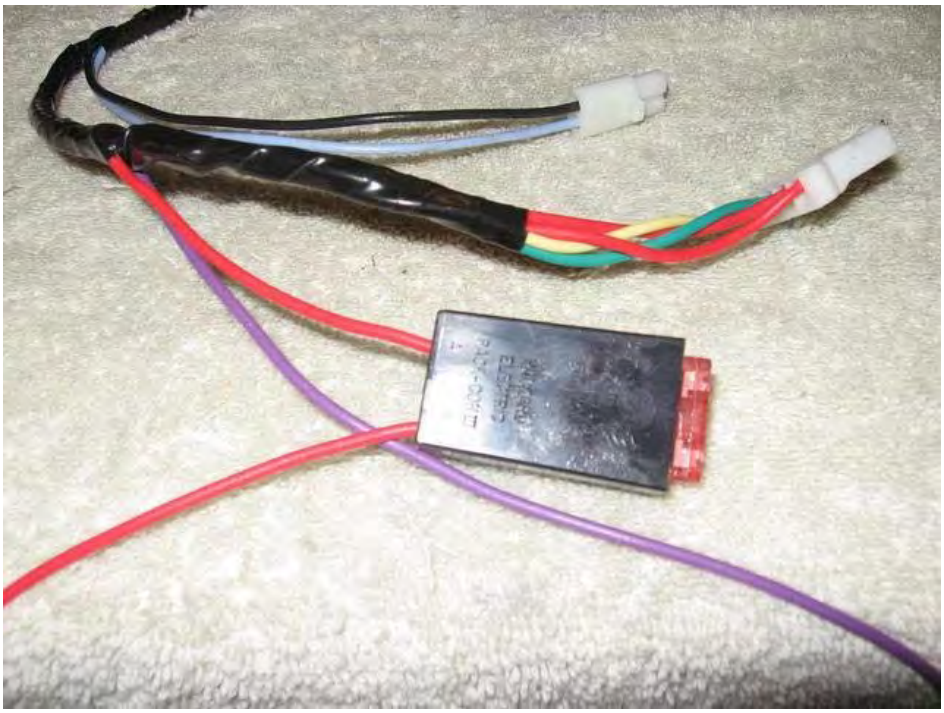
The grey VSS wire can go to the pink wire on the back of the ECM/PCM or to the white wire on speed sensor connector near the main fuses, depending on how you want to do it. If you have a SpeedoHealer, connect it to the white wire on the SpeedoHealers harness to get the uncorrected VSS signal.



Picture 67

To start finishing the rest of the Rostra harness temporarily reconnect it to the Main Module harness connector. Separate out the Brown wire and the shorter Black wire with the round lug. The shorter Black wire with the round lug on it will need to be extended to make it to the battery unless you have a power distribution system in the front. If you have a SpeedoHealer, or are opting to connect the VSS wire to the speed sensor connector you will need to separate out the Grey

wire also, so that it can be run to the rear of the scooter to pickup the signal there. Take the rest of the wires and run them over and down the Main Module's throttle cable as it's coming up from the main harness on its final turn down to the Throttle Extension Arm and then follow the main harness out and up to the handlebar switch connectors. Don't forget to split out the Grey wire if you connecting it to the Pink ECM/PCM wire to follow that wire harness branch up there. Using the items removed in Picture 62, measure and cut the extra wire off the Rostra Harness, remove the harness and reconnect the missing pieces. For example, once the splices are sealed and the harness is taped, it should look similar to this at the Handle Bar Connector end.



Picture 68

All that's left is to disconnect the battery from the scooter, re-install the finished Rostra harness to the scooter and attach the 3 wires to the harness as described above along with the Brown to a switched source and Black to the battery (-). Re-attach the all the battery wires to the Scooter and you are done with the electrical installation.

STEP 7: SWITCH SETTING SUGGESTIONS AND DESCRIPTIONS

Figure 11 shows my initial suggested settings for the switches inside the Main Module for this application. Switch 1 and 2 Off, Switches 3, 4, 5 and 6 On, Switches 7, 8 and 9 Off, Switches 10 and 11 On, and lastly Switch 12 Off.

See the descriptions below to make sure these initial settings coincide with your particular installation. Especially if you've deviated from what was shown in this DIY. For example, if you choose to use one of the available Normally Closed Stock Control Switches then Switch 12 needs to be On.

Length of the Throttle Arm, along with the setting of the VSS (PPM), the Engine / Setup and Gain switches all affect each other. So if you change one, don’t be surprised when you find that another adjustment now works better if set differently.

Be aware that the Amber Diagnostic LED is slightly hidden under the upper edge of the opening, not in plain site as shown here.

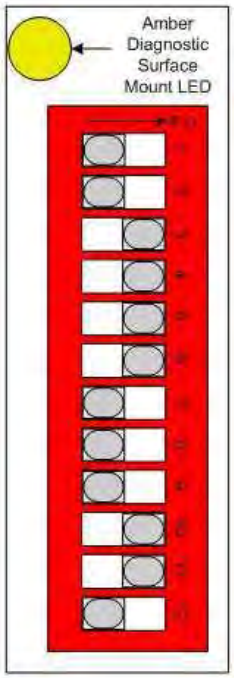


Figure 11

Switches 1 and 2 - Gain (Sensitivity)

The best way to look at these settings is how quickly the throttle responds to changes in scooter speed when subjected, for example, to wind or hills. This adjustment also affects the Module's speed holding accuracy. The higher the gain, the better it will hold its speed. For Safety start at the Extra Low setting and work your way up. Too much gain and the throttle could start violently hunting. Too little it just won't hold speed very well.

Setting	1	2
Extra Low	OFF	OFF
Low	ON	OFF
Mid	OFF	ON
High	ON	ON

Switches 3, 4, 5 and 6 - Pulses/Mile (Pulses/Kilometer)

How many pulses from your particular speed sensor occur when the vehicle travels 1 mile (Kilometer). This setting is used to help the Main Module determine how fast you're going. Technically it should be set as close to reality for your vehicle as possible. This setting affects the dynamic performance of the module. In this application set this to the max 38,600 Pulses/Mile (PPM). The scooter's Pulses/Mile (PPM) are more around the 45,000 PPM mark. The Main Module will think you're going slightly faster than you really are. This has a side effect of lowering the minimum cruise speed from the stock 33 mph to 25 mph. Use extreme caution at those low speeds with the cruise set. It doesn't hold those speeds near as well as the 45 to 75 mph range.

Setting	3	4	5	6
38600 (24000)	ON	ON	ON	ON

With the high pulse count of the scooter this is really your only choice. See Page 8 of the Rostra Manual for other settings if you've chosen a different VSS Source.

Switches 7, 8 and 9 - Engine/Setup Timer

This setting is best described as an indication to the Main Module of the power to weight ratio of the vehicle. It affects the aggressiveness at which the cruise cable moves and you accelerate when you resume from a lower speed or press the Accel Button. Tweak this setting for the amount of acceleration you want while making sure the scooter still adjusts smoothly to deviations of the set speed. It really doesn't have anything to do with the number of cylinders of your engine. As with the gain adjustment, start out low, for safety. The 8 Cylinder Low setting is the least aggressive with acceleration.

Setting	7	8	9
8 Cylinder Low	OFF	OFF	OFF
4 Cylinder Low	ON	OFF	OFF
6 Cylinder Low	OFF	ON	OFF
6 Cylinder Extra High *	ON	ON	OFF
8 Cylinder High	OFF	OFF	ON
4 Cylinder High	ON	OFF	ON
6 Cylinder High	OFF	ON	ON
4 Cylinder Extra High	ON	ON	ON

*** Possible Warning:** It has been noted elsewhere on the web that the 6 Cylinder Extra High setting should really be at the bottom of the list as it is the most aggressive. I mention this as a precaution. I have no first hand knowledge.

Switch 10 - VSS Source (Speed Sensor)

The type of signal you've attached to the wire, Square Wave or Sine Wave. The scooter's speed sensor puts out a square wave.

Setting	10
Sine Wave Input	OFF
Square Wave Input	ON

Switch 11 - Transmission Type

In Automatic, it doesn't check the tach wire and as a result it should be grounded to keep and electrical noise from getting into the module. It relies on the Neutral Safety Switch wire for over rev protection. If you want to use the tach wire for over rev protection this switch needs to be set to Manual. The Neutral Safety Switch wire will disengage the module either way. Since the scooter has no neutral you don’t need either.

Setting	11
Manual	OFF
Automatic	ON

Switch 12 - Control Switch Type

Set for Normally Open or Normally Closed control switch. This setting depends on your Control Switch of choice.

Setting	12

Open Circuit	OFF
Closed Circuit	ON

STEP 8: ON-BOARD DIAGNOSTIC AND ROAD TESTS

Self Diagnostic Testing Procedure:

The Main Module is equipped with an Amber Self Diagnostic LED located underneath the rubber grommet on front bottom left hand side of the Main Module (See Figure 11). Utilize the following Self Diagnostic Procedures to test the basic functions of your cruise control before putting all the Tupperware back on the scooter.

Follow the procedures below to enter the Main Module into Self Diagnostic Mode.

- Turn the cruise control switch Off.
- Turn on the cruise control, while holding the R/A button down. The Diagnostic LED should be Off at this time and the Control Switches Cruise On LED should be lit.

You are now in Self Diagnostic Mode. Continue to follow the procedures below to test your cruise Control Switch, Brake connections and Vehicle Speed Sensor signal.

1. Press and Release the SET/COAST button. The LED should light each time the button is pressed and go out when it is released.
2. Press and release the RESUME/ACCEL button. The LED should light each time the button is pressed and go out when it is released.
3. Press and release both Brake Handles. The LED should light each time either the front or back brakes are applied.
4. Rotate the rear wheel and the LED should flash and continue to flash at the same rate.

Tach Signal Testing Procedure: *(In case you opted to use a Tach Signal)*

1. Put the scooter on its center stand.
2. With the engine running, Turn On the cruise Control while holding the R/A button down to re-enter the Self Diagnostic Mode with the engine running.
3. The Diagnostic LED should be flashing. Rev the engine; the LED should flash faster at higher engine rpm's. If so, your TACH signal is good.

Optional Dynamic Test

DANGER: Do this solely at your own risk. Serious damage to the scooter, yourself and anyone around you at the time could easily occur!

I am only explaining how to do this because of the large amount of time and effort required to install and uninstall the tupperware on this scooter. The problem is you really should re-install the bulk of the tupperware, especially the Windshield, so the your Road Test adjustments will reflect normal riding conditions including the drag on the scooter while moving through the air. There is a way to do one further test for peace of mind that everything is going to work before venturing out on the Road Test. While this is an extremely unsafe test, if done carefully with proper precautions, it will allow you to confirm the "last item" of engaging the cruise control will indeed function once you get out there on the Road Test. In order to do this you'll need to either jack up the rear wheel of the scooter until it can spin freely, or put the scooter on its center stand and disable the center stand safety switch. It's way too dangerous to try and accomplish this with the scooter stuck in 1st gear. Make sure the bike is strapped down and stable before even thinking of doing this test.

Once you're prepared, as best as you possibly can be, what your going to do is turn On the cruise control, accelerate the scooter up to around 30 - 35 mph with the back wheel up in the air and engage the cruise control. If successful, the Rostra will take over and cause the throttle to bounce up and down continuously because the load on the drive-train that it's expecting is not there at this time. Once you see this happening, hit the brake and shut her down. All you want to do was verify that the Rostra will engage.

The Road Test:

Double check everything!

- You should re-install all the Tupperware and the windshield, except for the Top Box before Road Testing.
- Bring a small object to change the switch settings with.
- Fine adjustments can only be made using the Gain (Sensitivity) and Engine Setup Timer (Throttle Aggression) switches.
- No other switches should be touched while performing Road Tests, so be careful not to accidentally alter one of them.
- Make small changes; don’t set the switches to the entire other end of the spectrum in one shot. Work your way there for your safety.
- Expect the unexpected! The change of a setting could result in a bucking bronco effect so be prepared to disengage at all times.
- Test all the functions like engaging, resuming, coasting, tap up, tap down, disengaging with the brakes and the Control Switch.
- Test at different speeds. It won’t necessarily act the same at all speeds.
- Take it slow until you’re sure that the settings and the cruise control are working properly for you before you rely upon it.
- If you can’t get the cruise control to operate the way you want, possibly changing the length of the Throttle Arm or the PPM settings might help.

What to expect with each change:

Too little gain is indicated by sluggishness in the cruise control to respond to changes in conditions and failure to maintain set speed.
Too much gain will cause hunting where the throttle is adjusting up and down trying to stay on the set speed.

Too little Engine Setup Timer will cause the cruise control to be slow to respond to conditions.
Too much Engine Setup Timer will cause the cruise control to accelerate too fast and overshoot the set speed. This can cause violent hunting as it keeps missing the mark. The bucking bronco effect.

What you want:

As much gain as possible with a comfortable acceleration and everything running smoothly through all aspects from engagement to disengagement and everywhere in between at all speeds.

What my settings are:

Switches 1 and 2 - Gain (Sensitivity)

For the Gain Setting, I ended up with Low, S1 On, S2 Off.

Setting	1	2
Extra Low	OFF	OFF

Low	**ON**	**OFF**
Mid	OFF	ON
High	ON	ON

Switches 7, 8 and 9 - Engine/Setup Timer

For this one I went with 4 Cylinder Low, S7 On, S8 Off, S9 Off. The 8 Cylinder Low setting worked well with Low Gain as well.

Setting	7	8	9
8 Cylinder Low	OFF	OFF	OFF
4 Cylinder Low	**ON**	**OFF**	**OFF**
6 Cylinder Low	OFF	ON	OFF
6 Cylinder Extra High *	ON	ON	OFF
8 Cylinder High	OFF	OFF	ON
4 Cylinder High	ON	OFF	ON
6 Cylinder High	OFF	ON	ON
4 Cylinder Extra High	ON	ON	ON

Remember, these setting are not set in stone and each scooter and driver will want there own. See what works best for you. Just remember to be careful.

STEP 9: MODIFYING THE LEFT UPPER GLOVE BOX

I saved this to last because you'll need to cut some Tupperware and before you did; I wanted to make sure you had a working cruise control to justify cutting it. You will need to remove part of the plastic drain guide attached to the left top glove box underneath the Front Panel. This in no way affects the integrity of the glove box. Start by removing the 3 screws and the left glove box.

Picture 69

Next, mark a line 2 inches in from the right side of the drain guide.

Picture 70

Cut at the line, clean the edges and re-attach the glove box to the Front Panel. You may want to work out something else to do in the area that was removed, but I'm leaving that up to you.

Picture 71

GO ENJOY YOUR NEW CRUISE CONTROL!

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