Installing the Audiovox CCS-100 Cruise Control on a K75, K100, K1 or K1100

Version 3.0
May, 2011

Introduction: As of May, 2011 I have successfully installed the Audiovox CCS-100 vacuum cruise control in a K1100LT, two K1100RSs, four K75s and a K1. I documented my first install on my K1100LT back in 2005 on the IBMWR K Bike Tech Pages. I did an update on that a little while back which IBMWR never bothered to use so I hosted it myself on my personal Comcrap web space. As I've done subsequent installs I've simplified and streamlined the install. This third write-up reflects my current thoughts on how best to install the CCS-100 on a K bike.

Disclaimer: I am sharing this as an account of how I install the CCS-100 on a K bike in the hope that others will find it useful. If you decide to use this document to help you a install a cruise control unit on your motorcycle then **I assume no responsibility for your actions. If you do this, you do so at your own risk.** Only do this if you feel you have the skill and knowledge required to do it safely. It requires electrical installation skills as well as mechanical skills. Though not really necessary, I strongly recommend that you do some research to understand how cruise controls work before attempting this. To my knowledge, since the unit was designed for installation on automobiles, Audiovox does not condone the use of the CCS-100 on a motorcycle and therefore would not assume any liability should something go wrong. Also note that you're modifying how the throttle is controlled on a motorcycle which also involves an element of risk should something go wrong. Disclaimer aside, it's really pretty straightforward to do and once you have the cruise control installed you'll wonder how you ever got along without it.

Content and updates: The content of this write-up is current. In this Version 3.0 write-up I will be using mostly old pictures. In July I plan to install two more cruise control units on a K1100RS and a K75S. I'll add a few more pictures in June for Version 3.1 and in August will update it to Version 3.2 with new pictures after I've done the K75S and K1100RS installs.

Vacuum reserve canister is not necessary: When I did my first install, everything I found for installing the CCS-100 on a motorcycle said you needed a VRC. This isn't true. I've since removed the VRC from my K1100LT and have not used one on any of my subsequent installs.

Cats, there are lots of ways to skin 'em: But I'm not a Chinese cook so I wouldn't know about that. This is how I do these installs and what works for me. If you want to do it differently then go right ahead.

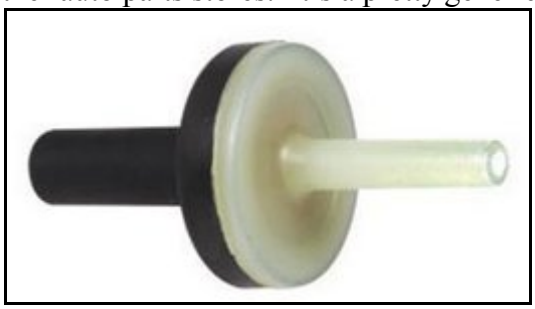
Here we go….

0.) Stuff you'll want to get ahead of time

4 Posi-Taps (Part EX130-RR or PTA2022) – Posi-Taps are light years beyond the old ScotchLok connectors for tapping into wires. SctochLoks are flimsy and often cut through the wire you're tapping into. I had to repair one of the coil leads on my K1100LT because I hadn't heard of Posi-Taps when I did my first CCS-100 install and the ScotchLok cut almost all of the way through the wire. There's a variety of on-line sellers of Posi-Taps and other and there's also a guy on Fleabay who sells them and ships VERY quickly.

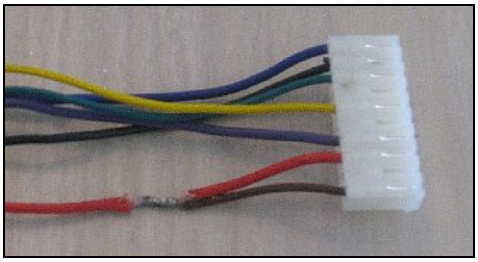
3 Posi-Locks (Part number PL1824) or Posi-Twists (Part number PT2026 or PT1424)

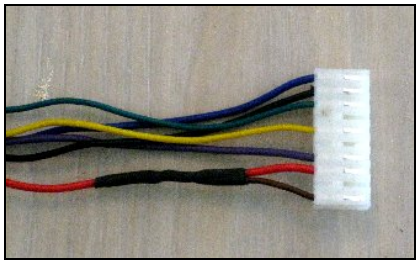
1 "Universal" vacuum check valve – the NAPA part number is 730-1347. You can also find these under the "HELP!" brand at other auto parts stores. It's a pretty generic item that looks like this:



1) Getting the servo ready

Trim the brown wire from the servo wiring harness and solder it to the red wire. Then cover that up with a layer or two of heat shrink tubing. The brown wire is the power wire for the servo unit. The red wire used to go to the hot wire to the rear brake switch. When you wire up the servo this way then the cruise control will turn on automatically when you turn the bike on. The eliminates one wire that you have to connect and eliminates the need to turn the cruise control on every time you want to use it. When I get to the section on control switch options you'll understand why I wire things up this way.

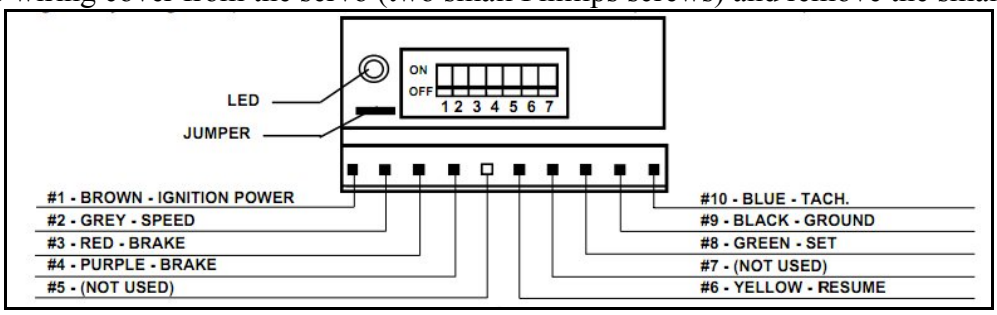




If you're not into soldering then this might also be a good place to use another Posi-Tap to connect the brown wire to the red wire.

There's a pair of gray and black wires that join each other in a black sleeve coming from the servo wiring harness connector. Cut those off at the connector. Those are for speedometer sensor. The CCS-100 will work off of those if you tap them into the K bike speedometer wires (and set DIP switch #3 to ON) but since you have to hook up the coil wire anyhow (to detect surges – it's a safety feature of the CCS-100) and it's just another set of connections to potentially fail my preference is to just run the CCS-100 off of the coil signal.

Remove the wiring cover from the servo (two small Phillips screws) and remove the small jumper:



Now it's time to set the DIP switches using the settings circled in red below. I've left the sensitivity switches uncircled because different K bikes work better on different settings. Low (4 ON, 5 OFF) seems to work best for a K1100RS while medium(4 OFF, 5 OFF) seems to work best for the other K bikes. You can always experiment with the switches later to see what works best for your situation. It comes down to a trade-off between how responsive the servo is to minor speed variations and how jerky it is when the throttle is pulled by the servo. What you're actually adjusting is how hard the servo pulls on the throttle with low being not very much and high being more.

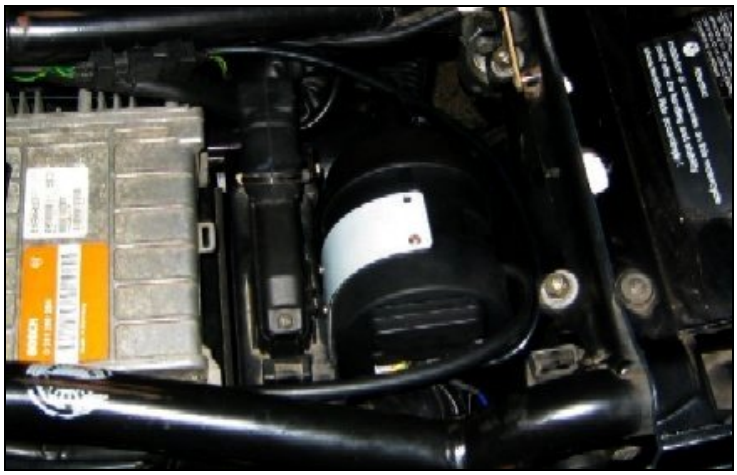
DIP SWITCH PROGRAMMING TABLE: *Follow the chart below to program the servo assembly.*

	SW1	SW2	SW3	SW4	SW5	SW6	SW7
PPM							
2,000	OFF	OFF					
4,000	ON	OFF					
5,000	OFF	ON					
8,000	ON	ON					
SPEED SIGNAL							
TACH ONLY			OFF				
VSS or MAGNETS			ON				
SENSITIVITY							
LOW (LIGHT VEHICLES W/HIGH HORSE POWER)				ON	OFF		
MEDIUM (MOST VEHICLES)				OFF	OFF		
HIGH (LOW POWER VEHICLES/HEAVY VEHICLES)				OFF	ON		
CONTROL SWITCH							
NORM. CLOSED						ON	
NORM. OPEN						OFF	
TACH SOURCE SELECT							
ECM							OFF
COIL							ON

** When changing dip switch setting, make sure the 10-pin connector is unplugged from module.*

2) Mounting the servo

By far the easiest mounting is on the 4 valve ABS I bikes. (K1, K100RS4V, 93 and earlier K1100s) I just point the servo throttle cable to the right and stick the CCS-100 mounting bracket in with the ABS control unit.



On my 94 ABS II K1100RS I just have it loose under the seat. I run a Corbin seat on that bike though. If you have an OEM seat pan then there might not be enough room height-wise.

More on 94+ K1100RS servo mounting – to be added in August, 2011.

On LT/RT K bikes there should be enough room in front of the right storage "bucket." That's where I mounted the servo in my K1100LT. I zip-tied the CCS-100 mounting bracket to the main fairing bracket and made a big loop in the servo cable inside the fairing to take up the slack.

For other models of the 2 valve K bikes (K100, K100RS, K75, K75C, K75S) I mount the CCS-100 in the tail cowl by drilling a hole in the front left corner of the rear storage compartment. In order to do this you'll want to remove the tail cowl in order to drill a hole for the servo throttle cable to pass through. Remove the two nuts from the servo throttle cable before passing it through the hole and you don't need to drill as large of a hole. The servo throttle can then be routed along the top right frame rail. When you eventually put the seat back on make sure that the servo throttle cable is routed outside of the forward seat hinge.

Once I've attached the wiring harness I then bolt the servo mounting bracket on the nut for the right bracket bolt at the bottom inside of the tail cowl.

Picture of tail cowl mounting to be added in June, 2011

3a) Connecting the servo throttle cable to the throttle on a K75 or two valve K100

In the parts that come with the CCS-100 you'll find two throttle attachment parts that look like little hangman's nooses with a ball on the end. I use the shorter one. I wrap it around the throttle bar where the idle adjustment screw is. In order to make sure that it stays in place I put a small zip-tie around it. Adding the zip-tie to keep the noosein the same place is important. Don't skip this step.

There are two little bead connectors and a beaded chain that also come with the kit. These are used to connect the hangman's noose to the servo throttle cable. The connecting beads are pretty sturdy little guys. Dikes (the nickname for diagonal cutters) can be used to open them up so you can insert the beads.

Cut a string of four beads off of the chain. Place one end of the bead on the end of the servo throttle cable and put the end of the four-bead chain in one of the beads. Then close it with firmly with some pliers or gently with some Vice-Grips. Now run the servo throttle cable over the air box with the servo cable towards the front of the bike with respect to the factory throttle cable.

Once you've threaded the servo throttle and beads through the air plenum above the throttle bodies, use the other bead to connect the beaded chain to the ball on the hangman's noose.

Then, above the middle of the air box, use the bracket below to fasten the servo throttle to the factory throttle cable. Adjust the length of the servo throttle cable so there's just a little slack at the beads.

To be honest, this isn't an ideal setup because once in a blue moon the servo throttle will get stuck while riding but all you need to do is pull the clutch in a blip the throttle a time or two. But it makes the install pretty easy. If you want to fashion your own custom bracket or connect the cable vi another route then go for it.

3b) Connecting the servo throttle cable on a K100RS4V or K1100

I use one of the brackets that comes with the CCS-100 and install it at the hole in the plate on the left front corner of the frame. It's best just to let pictures tell the story:

From below:

From above:

On my first install I drilled another hole and used two bolts to secure the bracket to the frame so it wouldn't drop down and let the cable saw through the radiator hose but I don't think that's really necessary.

I then wrap the small hangman's noose connector around the throttle bar and secure it in place with a small zip-tie. If you don't secure it with the zip-tie then it can move around and your throttle could get stuck open. Don't ask me how I know. (I didn't use the zip-tie on Install #2.)

If you've installed the servo under the seat then run the servo throttle cable up the right frame rail, across the top of the radiator and down to the bracket. Then cut a length of four beads from the beaded chain that came with the kit and use the bead connectors to hook it up to the hangman's noose and the end of the servo throttle cable. Then, using the two nuts on the end of the servo throttle cable hose adjust things so there's just a tiny bit of slack in the cable. The threaded part of the cable is made from some very cheesy metal so be careful not to over-tighten those nuts and break that threaded part off. Don't ask me how I know. (Install #1.)

3c) Connecting the servo throttle cable on a K1

Given the weird air hoses above the throttle bodies on the K1 (what isn't weird about that bike?) you can't install the servo throttle cable like you can on the other 4 valve K bikes. What I ended up doing was drilling a hole in the black plastic plate under the tank right above where the factory throttle cable is and using the nuts to mount it in that hole. I'm not a fan of mounting that in plastic but it does work.

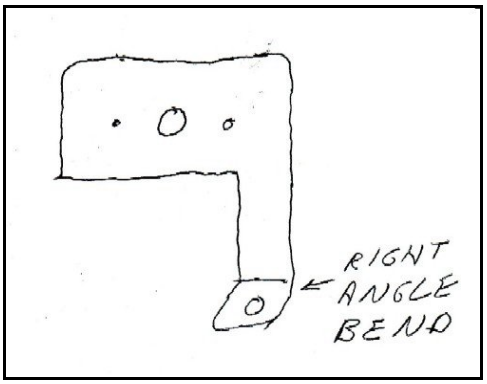
Then use the hangman's noose and the beads to attach the servo throttle cable as described above for the other 4 valve bikes. Remember to zip-tie it in place around the throttle.

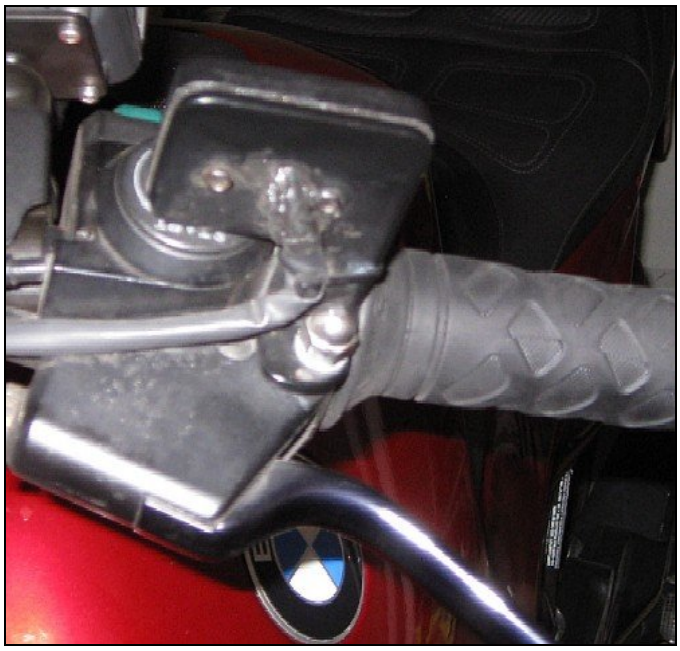
4a) Using the Audiovox switch

On my first few installs I used the switch that came with the CCS-100. In order to "waterproof" it I pried it apart and used some clear silicone sealant to "glue" the rubber button sheet to the front and then when putting it back together I sealed it around the edges.

For mounting it I used some 2" aluminum bar stock from the hardware store and made a little "flag" mount that bolts in the mirror hole in the clutch perch. See pictures below. I don't trust double stick tape so I used some small machine screws to bolt it to the mounting bracket. If you've got longish fingers like I do then you can control the CCS-100 without even taking your hand off of the clutch grip. (I bent the aluminum in a bench vice. Aluminum is a brittle metal so as you're bending it it's a good idea to pound it with a hammer while you're bending it to keep it from breaking.)

I'm no artist but you get the idea:





4b) Using the K1100LT windscreen switch

After upgrading the windscreen switch on my 93 K1100LT from the standard dash switch to the windscreen switch that came on the 96 and later K1100LTs one day the thought occurred to me that it would be really cool if I could use that type of switch to control the cruise control. That would mean no aftermarket crap on the bars and something that's ergonomically perfect for the task as it's right there at your thumb tip. After a little analysis and getting a better understanding of how the Audiovox setup worked it turned out to be quite simple.

Having cruise control is pretty good. Having it controlled by OEM switchgear is even better. On the K75 pictured I also installed a cruise control on/off switch but that ended up being pretty pointless and a waste of a switch and switch slot since I just left it on all of the time. All I really needed was the windscreen switch with the CCS-100 powered by a switched power source so that it came on whenever the bike was turned on.

For the 4 valve K bikes the headlight/horn/left turn/windscreen switch is a plug-n-play deal. For K75s and 2 valve K100s there's a little more work involved because you need to graft the headlight/horn/turn signal wires of the windscreen switch to the older K75/K100 left combination switch connector but that's pretty simple since all of the wires are the same colors.

The three wires (input, up and down) for the windscreen switch go to a separate connector so you can just cut that connector off and hook those wires up for the cruise control.

Pretty cool, huh?

5.1) Wiring the servo

Tip: Heat shrink tubing is a good way to bundle wires so you don't end up with wiring spaghetti all over your bike. If you live near a Fry's Electronics they have a good selection in stock. McMaster-Carr is a good online resource.

Red (and brown) CCS-100 wire: This wire is the power wire to the cruise control. If you remove your tank and look in the relay box you'll find a round four wire white connector that (unless you have the factory alarm) isn't connected to anything. As you might have guessed from the prior sentence it's there for hooking up the BMW alarm kit. The green wire with a brown stripe is switched power for the alarm and comes from fuse 7 which also powers the radiator fan and horn. Since the CCS-100 servo doesn't draw much current I Posi-Tap into that wire and hook up the red(and brown) wire from the servo to that. By tapping into this wire you eliminate the need to have a separate in-line fuse for the CCS-100.

If you're mounting the servo in the tail cowl then you could probably get away with tapping into the power for the tail light however in the very unlikely event that something goes haywire and the CCS-100 causes a short I'd rather have it blow fan the and horn fuse than the brake and tail light fuse.

Black CCS-100 wire: This is the ground wire for the CCS-100 servo. I usually Posi-Tap that into the brown ground wire for the factory alarm connector just to have the two power wires on the same circuit.

Blue CCS-100 wire: This wire monitors the RPMs from one of the ignition coils. Despite what the Audiovox instructions emphatically state, you CAN cut this wire. However, you do need to keep the filter (it's just a resistor) under the red warning tag in the circuit. Posi-Tap this wire into the outer wire on the rear coil.

Purple CCS-100 wire: Posi-Tap this wire into the wiring for the rear brake switch under the right side battery cover. You can tap into the wire on either side of the connector for the gray/green rear brake switch wire. Note that this wire internally connects to the front brake switch wiring as well so using either the front or rear brake will cause the CCS-100 to disengage.

Green and yellow CCS wires: These wires are for the up(resume/accel/tap up) and down (set/coast/tap down) buttons. The yellow wire is for up and the green one is for down. The buttons send 12V+ to the servo "brain" when pressed. The following two subsections describe how to install each type of switch.

5.2a) Wiring the Audiovox switch

The gray wire is for switch backlighting. I don't think that matters so I just cut if off. You can hook it up to a switch power source if you feel like it. If you want to be able to turn the CCS-100 power then you can connect the four wires as described in the CCS-100 installation manual. I prefer just to have the cruise control be on all of the time by having switched power from the bike go straight to the red/brown wire of the CCS-100 servo.

However, you'll still need to feed power to the brown wire of the control pad for the up and down buttons. Connect the brown wire from the control panel to the Posi-Tap you placed on the green wire with a brown stripe near the alarm connector. Connect the yellow and green wires from the control to the corresponding wire for the servo. I usually use Posi-Locks or Posi-Twists for these connections.

5.2b) Wiring the windscreen switch

The BMW windscreen switch has a three wire connector. Cut that off and connect it as follows with either Posi-Locks or Posi-Twists:

Windscreen Switch Wire	**Connects to**
Blue (down)	CCS-100 servo GREEN wire
Green (input)	Connect this to the Posi-Tap you installed in the green/brown wire near the alarm connector
Gray (up)	CCS-100 servo YELLOW wire

6) Install the vacuum hose from the throttle bodies to the servo

The CCS-100 will not operate correctly unless you have a vacuum check installed in the vacuum hose. The black end should be pointed towards the throttle bodies and the white end should be pointed towards the CCS-100 servo. Cut off 3-4" inches of the vacuum hose that comes with the CCS-100 and slide it over the black end of the vacuum check valve. Take the remaining vacuum hose and slide it over the white end of the vacuum check valve. You'll notice that the white tube from the vacuum check valve is a little small for the vacuum hose. There's several ways to get it to seal properly:

1) Being careful not to get any in the hole in the end of it, use some silicone or RTV sealant to glue the vacuum hose onto the vacuum check valve's white tube. This is how I usually do it.
2) Put a layer or two of electrical tape around the white tube.
3) Put a layer or two of heat shrink tubing around d the white tube.

Remove one of the small black rubber caps from one of the throttle bodies (it doesn't matter which one) and attach the short vacuum hose to the little brass tube on the throttle body. Being careful that it is not pinched or kinked, route the vacuum hose to the CCS-100 servo and connect it to the servo.

When I install servo in the tail cowl then I usually run the vacuum hose along the left frame rail and through the hole for the left rear turn signal wires. I attach it with zip-ties that are left slightly loose so as not to pinch the vacuum hose.

If you find that the length of vacuum hose that came with the CCS-100 is inadequate then take a piece of the vacuum hose to the nearest auto parts store and buy another 5 or 6 feet. It's a standard item and only costs about a quarter/foot. Ask at the counter, they usually have it on reels in the back.

7) Testing the CCS-100

Time to button things up and go for a ride. You can't really test this thing standing still because when the cruise control engages the RPMs will surge and the safety feature of the CCS-100 that detects RPMs surges will disengage it.

Tests:

Set – you need to have the RPMs up above 2,500 or so – but you should be riding in that range anyhow. Hitting either the up or down button should set the cruise control and have you traveling at a constant speed.

Surge safety feature – Pull in the clutch while the cruise control is engaged. Almost instantaneously the cruise should disengage when it senses a sudden surge in RPMs. Not that you'll crash but this will also disengage the cruise control it the event that you have a getoff.

Front brake – The cruise should disengage when the front brake switch is activated.

Rear brake – The cruise should disengage when the rear brake switch is activated.

Tap Up – Set it again. Holding the up button for a second or so should yield about a 1mph speed increase.

Tap Down – Holding the bottom button down for a second or so should yield about a 1mph speed decrease. Tap up and tap down can be used to fine tune your cruising speed.

Coast – Tap the down button once quickly and the cruise should disengage. I usually just use one of the brakes for that though.

Accelerate – Holding the up button down and keeping it depressed should slowly increase your speed until you let it go.

Decelerate – Holding the down button down and keeping it depressed should slowly decrease your speed.

It's never happened to me but if something goes wrong then just pull in the clutch, hit the kill switch and pull over. One thing to note is that when you hit the kill switch on a K bike that also kills the

brake light circuit so any cars behind you won't know you're slowing down unless you use a hand signal. (Left arm pointing down.)

Appendix: LED brake lights and the CCS-100

I run LED brake and tail lights in my K bikes. It's easy to do by eliminating the BMU (black bulb monitor unit on the left side of the relay box.) All you have to do is short the wiring as follows:

- Short the front brake switch wire(Gray/Red) and the rear brake switch wire(Gray/Green) to the brake light(Gray/Yellow.)

- Short the tail light/parking light power(Gray/White) to the tail light wire(Gray/Black))

However, the CCS-100 won't work with an LED brake light bulb. It's easy to make it work with an LED bulb though. All you need to do is hook the purple wire up to a normally closed relay so that the purple wire is grounded until you hit the brakes.

If you're using an automotive standard Bosch type relay (a.k.a. 5-pin relay) then wire the relay up as follows:

- Pin 85 - Ground
- Pin 86 – Tapped into Gray/Green rear brake switch wire
- Pin 30 - Ground
- Pin 87a – Purple wire to the CCS-100 servo

Conclusion:

If you have any questions or comments regarding this write-up then please post them here.

AUDIOVOX CCS-100 K BIKE INSTALLATION CHEAT SHEET

If you've read through these instructions then you can probably get by by printing out just this one page instead of the entire write-up.

Servo prep:

1) Remove the jumper from the servo
2) Set the DIP switches:

DIP Switch	Setting
#1 & #2 (RPM)	ON and OFF (4,000)
#3 (VSS or tach signal)	OFF (Tach)
#4 & #5 (Sensitivity)	K1100RS: ON and OFF (Low) Other bikes: OFF and OFF (Medium)
#6 (Switch type)	OFF (Normally open switch)
#7 (Tach source)	ON (Coil)

3) Solder brown servo wire to red servo wire

Servo Wiring:

Wire color	Connects to
Red/Brown (Power)	Posi-Tap to green/brown wire for white four wire alarm connector in relay box
Black (Ground)	Posi-Tap to the brown wire of the alarm connector
Blue (Coil signal)	Outer coil wire for rear coil
Purple (Brake sensor)	Posi-Tap into gray/green rear brake switch wire
Black & Gray Pair (Speedo sensor)	Cut off
Yellow & Green (Up/Down)	See switch instructions

Audiovox switch wiring:

Wire color	Connects to
Gray (LED backlighting)	Cut off
Red (Power)	Cut off
Brown (Power to switches)	Add to Posi-Tap into green/brown wire for alarm connector
Yellow (Up)	Yellow wire to servo
Green (Down	Green wire to servo

BMW windscreen switch wiring:

Windscreen switch wire color	Connects to
Gray (Up)	Yellow wire to servo
Green (Input)	Add to Posi-Tap into green/brown wire for alarm connector
Blue (Down)	Green wire to servo

Vacuum check valve: Black end to throttle body, white end to servo