Electronic Cruise Control

I have had problems with my cruise control on the ’94 Breakaway acting up and during trouble shooting, I found a lot that was going wrong. I also didn’t like the existing cruise control used because it is vacuum operated and diesels do not have any vacuum source. A separate vacuum generator that used air pressure was used and that part is no longer available. As a stop-gap measure I found a Volvo vacuum pump and removed the air operated vacuum generator. That worked for a short while and then the system failed again, or so I thought.

I had found many areas where connectors were located in the worst possible locations and corrosion had set in. Cleaning everything got the cruise working again but only for a short time. I was also in the process of changing over to LED tail and clearance lamps so I wasn’t concentrating on the cruise control issues.

While doing a radiator replacement I also decided to remove the old cruise control and get ready to replace it with an electronic unit. I added extra clearance lights LED style) mounted above the bumper because I had always thought that the existing clearance lights could not be seen from the rear. Checking these lights, I found that they did not work--Hmmm- the clearance lights worked before the radiator removal--wait—I took the cruise control unit out—could that have something to do with the lights not working? Sure enough, what I found was that the clearance lights needed a ground path thru the stop light circuit and when I changed to LED lamps, there was no longer a lower resistance path to ground from the brake light circuit. I also found that the cruise control interrupt relay was turning on because the residual voltage on the stop circuit was enough to fire the relay—no wonder the cruise control stopped working!!! Didn’t even think that there could be a relationship between the LED lamps and a non functioning cruise control.

Oh well, I didn’t like the old cruise control system anyway, time to change to a much better system. Checking on the internet, I found several companies that specialize in cruise control systems but were very pricy!!! Nice features but very pricy!!! Would bolt right in and work with diesel engines but were very pricy!!! Did I mention that these units were pricy? Approaching $1000, yes very pricy!

I took a tour thru several salvage yards and found some very interesting units in late model GM cars and trucks. Gm used a separate cruise control module in most of their vehicles until they went to the electronic throttle (throttle by wire) systems about in 1993-1994. I purchased a unit out of a GM K2500 Suburban for $25 and then got the schematic from a friend that owns a repair shop.
This will get technical and I will try to keep it as simple as possible! I found that on most GM cars and trucks, there is a Vehicle Speed Sensor (VSS) located in the transmission which generates pulses, these pulses are sent to the Vehicle Control Module (VCM) which will calibrate the number of pulses per mile. Each vehicle has a different calibration because the tire size may be different or the rear end ratio may be different etc. So no matter what the tire size is, or what the rear end ratio is, the output of the VCM will be very close to 4000 pulses per mile. This is a standard that GM uses to calibrate all of the various modules that require type of vehicle speed information. This pulse train is also sent to the Cruise Control Module. To put this in terms of frequency of the pulse train, if the vehicle is traveling at 60 MPH, each mile will be traveled in 1 minute. If 4000 pulses are generated in 1 mile of travel, then it stands that the pulse frequency will be 4000 pulses per minute or 66 Hz. (66 pulses per second) Most cruise control systems will work from about 30 MPH (33 Hz) to over 90 MPH (99 Hz).

So now that I know what the cruise control is looking for as an input related to speed, 33 Hz to 99 Hz I need to find out what the Barth system generates and make that compatible.

I jacked up the rear wheels and then put wooden blocks under the spring perch area to keep the wheels off the ground and I could safely run the engine and transmission to simulate a driving condition. I then looked (with appropriate test equipment) at the output from the Allison MD3060 transmission electronic control unit. This is the same signal that drives the VDO electronic speedometer. According to my measurements, at 60 MPH the Allison electronics was putting a signal of 682 Hz (40920 pulses per mile). I later verified that this is correct by looking at the VDO speedometer calibration switches that are located on the back of the speedometer.

The frequency output of the Allison electronics was almost exactly 10 times what the GM cruise control needs.

I also confirmed that the output of the Allison electronics was a 0-12 volt signal and the GM electronics wants to see a 0-5 volt signal. OK, some translation needs to be done for both frequency and voltage.

I then designed an electronic buffer that would take the signal from the Allison electronics and translate that to a 0-5 volt pulse, from the buffer the signal is sent to a frequency divider which will divide the frequency by exactly 10. The output of the frequency divider is 0-5 volts so no translation is needed to go directly to the GM cruise control.

The previous schematic is reduced to the following.
Adapting a GM K2500 cruise control to a 1994 Barth Breakaway

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The buffer frequency divider was hand made and put in a small metal box with the appropriate connectors to connect to the Barth wiring harness and to the GM cruise control.

Cruise Control Module from GM K2500 Suburban.

Cruise Control unit installed in the Barth.
Other things that had to be modified were the mechanical connection to the throttle plate, the old cruise control used a slotted piece that was attached to the throttle plate with a cotter pin, the new system has a plastic end piece that requires a “nail head” to snap on to, I located a damaged throttle system at the salvage yard and removed the “nail head” and welded it on to the Barth throttle in the same location where the former cruise control was attached. Turns out that the GM electronic system has the same amount of travel as the vacuum system had, so the actual mechanical movement of the system hasn’t changed. I set the cable length so the cruise control would reach it’s mechanical stop just before the diesel was at full throttle, that way there was no undue strain placed on the system or the cable.

The control switches located on the turn signal arm are not compatible with the new system. I could have made them work by adding a relay or two but decided to relocate the control switches. I am redesigning the left side area by the transmission control and that is where the new cruise control switches will be located.

SO—how does it work? In one word—GREAT! Holds speed much better then the old system, no unnecessary upshifts or down shifts, smooth application upon resume! I had worried that the loop response (engineering words for how the system responds to a change) might no be good going from a relatively light vehicle to a heavy coach but it seems to adapt very well to the coaches needs and road conditions. I will know more as I accumulate more miles later this month.

I will have the entire schematic for the buffer and the divider available to anyone that wants it and will lend assistance if others are interested to make a similar change. Remember Barths can be quite different so this is not a universal fix, this will work with a Cummins 5.9 engine and a Allison MD3060 6 speed transmission.

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