Voice Activation for the Bed (v4)

By Bill Weis

Today this is a custom solution that requires development effort. Don't expect a voice activated bed from any manufacturer until late 2018, at least that is what I am being told. Keep in mind that what enables a bed to move is the controller/linear actuator/and hand held remote. In most cases, bed manufacturers do not make their own controllers and use the controller/linear actuator/remote from one of these companies:

Linak

TiMOTION

Leggett and Platt

Okin

(The above list is not complete, but contains what I am told are the largest providers).

What this means in many cases is the bed manufacturer is dependent on one of the companies above to invest in the technology to create voice activated beds. I have been in contact with all of them and they are in various stages of design and test.

In the meantime, enabling a bed to be voice activated requires development work which leaves all of us on our own. The obvious approach might be to capture the codes for the different bed functions and hand them off to Logitech to be included in their Harmony Hub. After all, there are many similarities between asking the Echo or Google Home to have Harmony raise the volume on a TV to raising the head of a bed. Both the bed and the TV can have wireless remotes that send signals to their respective device to perform a task. Unfortunately, it is not that easy, at least not with current implementations of the bed controllers. In the future they seem to be headed towards using Blue Tooth Low Energy as their protocol, but for now many of them are using proprietary forms of radio frequency which would be very difficult to emulate through a third-party device. For Robbie's bed, my initial approach was to try to capture the codes from the remote, but quickly looked to a 'Plan B'. The quickest approach was to leverage the bed remote in a way in which I did not have to deal with trying to capture codes for each of the buttons on the remote. Rather I configured a micro controller to drive some relays that are wired to the buttons on the remote. Not pretty, not scalable, but it was the quickest solution I could come up with. Here is a link to the initial testing of that device.

What are the big considerations when thinking about developing a custom solution for the bed?

One important consideration pertains to how many remotes the bed will support at any one time. Ideally you would want redundancy in the event that the internet goes down. If your voice solution for the bed uses a smart speaker like Amazon Echo or Google Home, you need a working internet. Redundancy allows the caregiver the ability to control the bed during internet outages. A bed with a direct cabled remote cannot be placed on a splitter with an alternate device like a custom voice activation controller, so in this case redundancy means getting on the floor and unplugging one device and plugging in the other. In my current project we are going to try installing a short extension cable so in the event they need to remove the voice-controlled box and re-install the standard hard-wired control, it would not require reaching under the bed to switch cables. Also, some beds allow for manual cranking to allow the caregiver to make adjustments to the bed position in the event of a power outage.

Technology approaches

In a nutshell, these are the technological approaches I know of for voice activating a bed

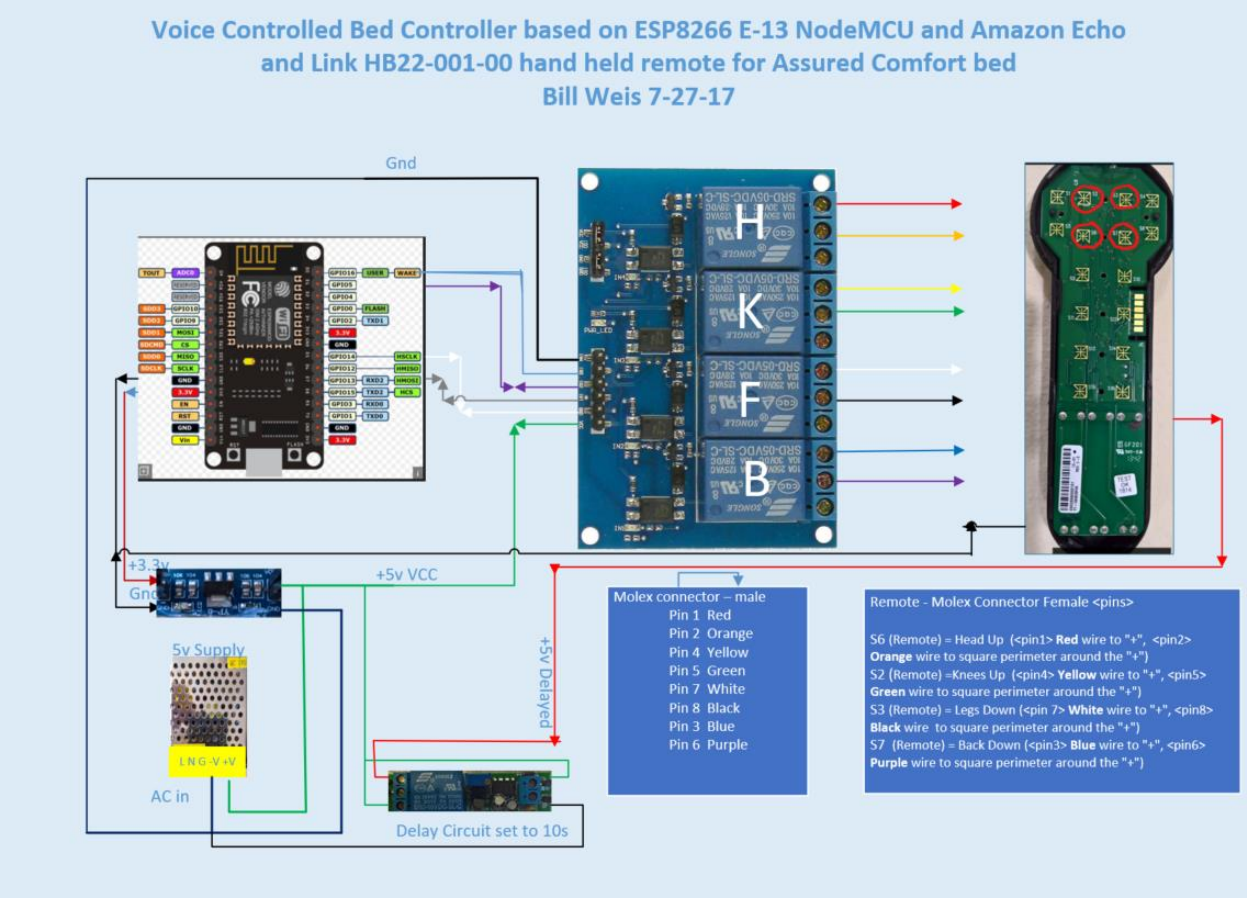
1. Use a microcontroller like an Arduino ESP8266 with some relays that are wired to the wireless remote's PCB. In this case the remote is still responsible for sending the signal to the bed for position changes. The challenge is soldering wires onto the board inside the wireless remote – not an easy feat. This solution works in conjunction with an Amazon Echo or Google Home. Because of internet latency, it is best to use timed commands when moving the bed parts as opposed to separate commands to start moving the bed then stop moving the bed. I have had success with 3 seconds per command, which may mean that it will take 2-3 of the same commands to reach the desired position, but this is still better than issuing a stop command and having the bed overshoot the desired position. (This approach would also apply to #2 and #3 below) See **Appendix A** for functional diagram.
2. Capture the Radio frequency or Bluetooth Low Energy signals from the remote and send them using a micro controller of some kind. This would likely include reproducing the pairing process which in this case the microcontroller would be the paired device.
    a. The downside to this approach is the bed may only allow one device at a time to be paired. If the internet goes down, you would likely

need to switch to the hand held wireless remote which means going through the pairing process.

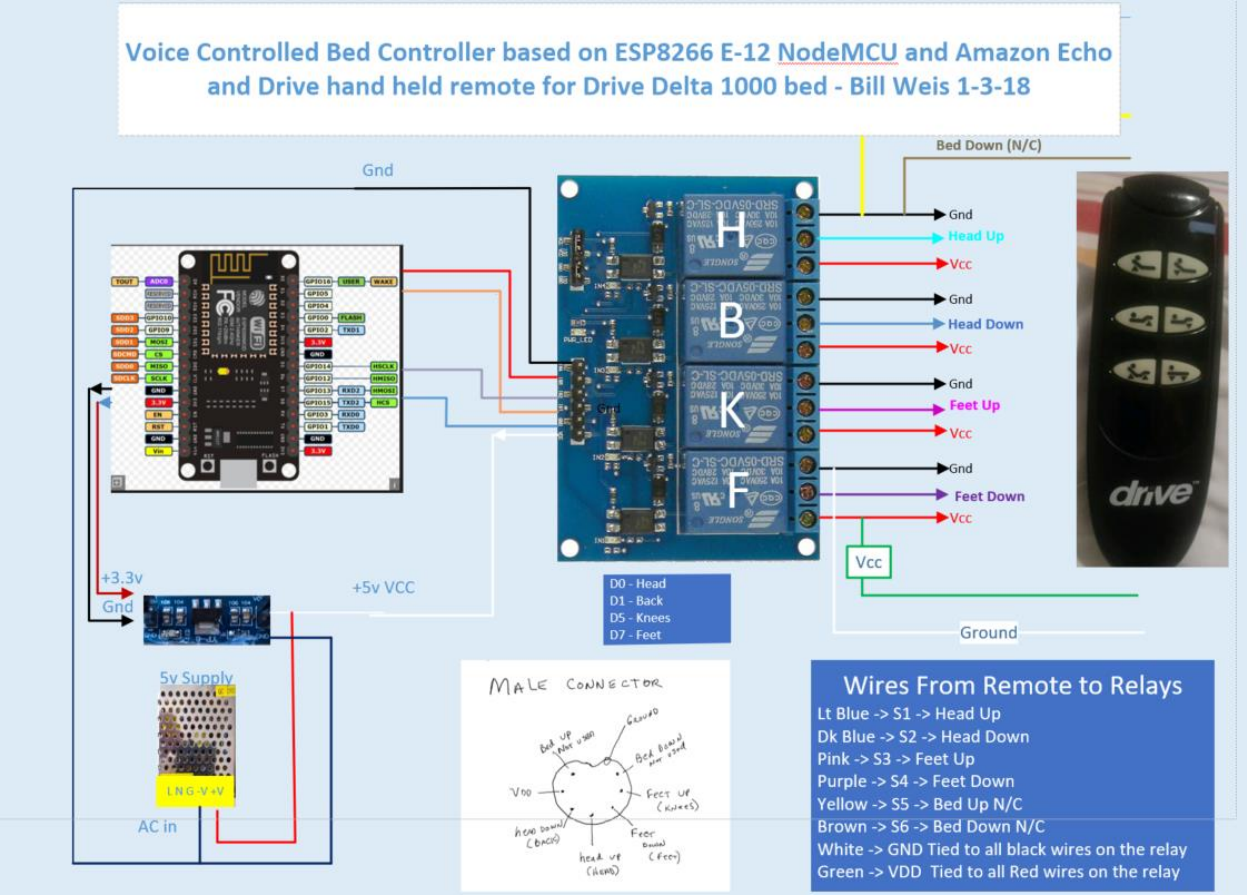
b. Another downside is the fact some modern beds offer the customization of certain settings, like zero gravity. I know of someone who has had limited mobility for many years, and knows exactly where to fine tune the zero gravity button for restful sleep. Such customizing of settings like this would be challenging through micro controller based solutions because of the current handshaking process required on the bed controller.

3. For beds like those manufactured by DRIVE (Delta 1000) where the remote is direct wired, you have a fairly easy interface to deal with as you can purchase a spare remote and pull the cable off the hand held remote PCB and wire directly to the relays. See **Appendix B** for functional diagram)
    a. The downside is you are limited to one 'remote' at a time. Should the internet go down, you would have to unplug the micro controller based solution and plug in the original hand held remote.
    b. Because of the way the direct cabled remotes are wired, you cannot simply make a pigtail and have both the micro controller-based solution and the hand held remote installed at the same time. The circuit for the hand held controller utilize both sides of the switch (normally open and normally closed) where one side is tied to ground and one side to Vcc, so putting the hand held and the microcontroller on some sort of splitter would simply not work.
    c. Unfortunately, the connection point for the remote is not always easy to get to, so switching back and forth between the micro controller and the hand held could be challenging. It would be possible to install a short extension cable so switching back and forth would be easier, but keep in mind to provide some sort of cable restraint where the hand-held and extension cable come together to avoid them from unplugging from each other.
4. Although I have not looked into this yet, but there are devices that support speech recognition would could preclude the need to depend on Amazon Echo or Google Home. Here are some benefits to this approach:
    a. No dependency on the internet.
    b. Commands should execute real time. In solutions where the Amazon Echo or Google home are used, it is best to use timed commands when moving the bed parts as opposed to separate commands for starting bed movement and then stopping bed movement.

Appendix A


Voice Controlled Bed Controller based on ESP8266 E-13 NodeMCU and Amazon Echo
and Link HB22-001-00 hand held remote for Assured Comfort bed
Bill Weis 7-27-17
Gnd
H
K
F
B
+3.3v
Gnd
+5v VCC
5v Supply
AC in
+5v Delayed
Delay Circuit set to 10s
Molex connector – male
Pin 1 Red
Pin 2 Orange
Pin 4 Yellow
Pin 5 Green
Pin 7 White
Pin 8 Black
Pin 3 Blue
Pin 6 Purple
Remote - Molex Connector Female <pins>
S6 (Remote) = Head Up (<pin1> Red wire to "+", <pin2> Orange wire to square perimeter around the "+")
S2 (Remote) =Knees Up (<pin4> Yellow wire to "+", <pin5> Green wire to square perimeter around the "+")
S3 (Remote) = Legs Down (<pin 7> White wire to "+", <pin8> Black wire to square perimeter around the "+")
S7 (Remote) = Back Down (<pin3> Blue wire to "+", <pin6> Purple wire to square perimeter around the "+")

Appendix B



Resources

Amazon Echo
Alexa Support (Contact Support via the Amazon Alexa app - have them call your number)
Google Home getting started
Google Home Help Forum
Google Home Support Phone number for Google Home hardware support = 855-971-9121 (24/7 days a week)
Logitech Harmony Knowledge Base
Logitech Harmony Support Phone # for Support = 866-601-5644 (M-F 8am to 6pm PST)
Lifx
Wemo Support Phone number for Support = 1-844-745-wemo (9366)