My name is Jim. I was diagnosed with ALS 5 years ago at the age of 45, with symptoms starting 2 years prior. I am paralyzed from the shoulders down. I rely on a nasal mask (bipap) 24/7 for breathing. My speech is slurred but still understandable. My neck muscles are weakened but still function ok with good coordination. I still eat and swallow efficiently. I spend 22 hours a day almost every day in my room, in my recliner. I don't take any medication whatsoever and am quite comfortable most times. I laugh often and am still a useful Dad and enjoy watching my 11 year old daughter grow up. My caregiver, the woman I love, gives me a reason to get up every morning. She happily plays the role of my hands: wiring, mounting, installing, drilling all the various devices I use. All the while she almost exclusively handles my activities of daily living. I often wonder what is more rare, getting ALS, or having such a wonderful woman in my life. What follows is a list of things I have done to keep my brain engaged and allow my body position to be adjusted independently. The things I have put to use have greatly reduced the burden on the people in my life and kept me from losing my mind. I have geared my solutions with the use of eyegaze in mind. When my neck muscles fail me, most things will still be doable with my eye movement, although not as efficiently as my current method allows. I was an average blue collar machinist before ALS so paying someone to set up or figure all this out for me was not an option. With some desire and determination, things have gone better than I have expected.

My goals: control without the use of hands or voice. Voice commands are optional thru text to speech or with a capable speaking person , but not necessary for any of the controls. Items to control or interface with :

- Windows pc
- Android phone
- Lighting
- Fans
- Heater
- Emergency buzzer
- Backup bipap power on/off
- Stereo system
- Cameras to monitor water consumption and backup battery status
- Tv
- intercom/broadcast over household
- Adjustment of power recliner including headrest, backrest, leg rest, and two memory presets. Must retain alternate means of control for caregivers and an easy way to connect the original wired remote in case alternate control fails.

Solutions:

- 5 color smart bulbs, Tp-link Kasa LB130 and KL130, via voice control thru Google home or android app Kasa Smart
- 6 smart plugs, Tp-link Kasa HS105 - switch on/off:: 3 fans, tv led light strip power supply, recliner power, emergency buzzer, via voice control thru Google home or android app Kasa Smart

- Tv color led light strip, Nexlux, via voice control thru Google home or android app Magic Home Pro
- TV, LG 55LF5700-UA (55” hdtv, Roku operating system), via voice control thru Google home, android app Roku, or controlled via ir with Broadlink RM Mini 3
- Broadlink, RM Mini3 - programmable ir universal remote control using the android app e-Control
- NAD - D 3020 v2 integrated stereo amplifier, controlled via ir with Broadlink RM Mini 3
- DeLonghi ceramic space heater, controlled via ir with Broadlink RM Mini 3
- Dreamstation Bipap on/off controlled via Switchbot mechanical switch via bluetooth and android app Switchbot
- 2, 4 channel smart switches, Sonoff 4CH Pro R2, via voice control thru Google home, android app eWelink, or Rf remote for caregiver.
- Golden Technologies power recliner similar to PR-505 MaxiComfort , controlled via Sonoff smart switches wired to chair hand control pendant. Can easily be switched back to the original controller with one plug in the right side chair pocket. System has been extremely reliable thus far 24/7 coming up on a year.
- Microsoft Surface Pro 5 (2017) (i5, 4GB ram) using the surface dock is connected to the LG tv and an Acer SB220Q 21.5” monitor, distance to the recliner is 9ft. Also connected to the dock are 3 harddrives, a Galaxy S7 android phone and a Logitech C920 webcam (placed on top of Lg Tv). The Windows application Enable Viacam (eViacam) in combination with the logitech webcam zoomed in allows complete control of this computer with only a few inches of head movement. (head mouse). The Galaxy S7 android phone and any of the home automation apps can also be accessed from this pc via Samsung's SideSync app which mirrors the S7’s display to the pc. S7’s with worn displays (burn in) can be bought cheap ($60) on ebay.
- A second Microsoft Surface Pro 5 (2017) (i5, 8GB ram) at a distance of about 23” from the recliner is mounted to a pivoting arm attached to a small, easily movable/rolling cart which also contains my Trilogy and Dreamstation bipap with battery backup. The Windows application, Enable Viacam (eViacam) is also used for complete pc control via head movement. I use the built in Surface webcam. An added benefit is the face unlock (windows hello) built into the Surface, which allows handsfree restarts/login. With Cortana (Windows voice assistant) the eViacam program can be started hands free also. Connected thru usb is a Google Pixel 3 android phone. The Vysor application installed on windows allows complete screen mirroring and control of the Pixel 3, even restarts (phone unlocked). I take calls, text and can control any home automation apps for android from the Pixel 3. If the wifi/internet should go out, the hotspot feature can be enabled on the Pixel. Just turn off the home wifi, and set the Pixels wifi network with the same name and password as the home network and all the home automated devices should carry on. Be aware, windows computers will not know that they are using your mobile data, and can use a lot of data just for updates.(can be changed to metered connection in windows settings, just remember to change back)

- Google Chromecast 2nd generation is hooked up to the LG tv and can be controlled via Google home, from either android phone or from within the chrome web browser on either Surface pro.
- 4 Google home mini's - voice controlled and can be used to broadcast a voice message over all simultaneously and take voice commands. Especially useful are routines that can be programmed. This allows any home automation products supported by Google home to be used together in one user definable voice command. Routines can also be activated thru the Google home app on android.
- Yi home cameras. One is pointed down beside/behind my recliner to view the charging status/battery level of the bipap backup battery and also my drinking water bag level.The other camera looks out my bedroom window. Cameras can be viewed on either pc thru either android phone via the Yi camera app.
- Moving my recliner at night requires light be left on so the camera can pick up my head movement. It still works well enough with only one light dimly lit and in the color red.

Details on emergency buzzer/siren (approx cost including smart plug $45):

For this I purchased a 2 to 12V DC Piezo Electronic Security Siren 120dB@12VDC, and a Universal AC/DC Multi-Voltage Power adapter for 3V to 12V. Cut off the connectors, stripped the wires and connected them. Voltage can be adjusted for desired volume. Plug into the smart plug and an emergency alarm is born. Can be activated by voice, android app, or via quickly accessible android widget right on the phones home screen.

Details on recliner control (approx parts cost including solder tools: $300):

Each button on the chairs wired control pendant is just two contacts looking to be bridged (have continuity) I'm sure there is a more eloquent way to do this, but I decided to give my Mom a quick course in basic voltmeter use and soldering. I purchased a spare chair remote, some 30 gauge fine stranded copper wire with silicone insulation, .031" rosin core solder, a cheap soldering gun and a magnifying glass. The connection points to be soldered on the pcb are pretty small and right next to the common side! With the voltmeter set to continuity, each button was checked to confirm which contact was the common shared with all the buttons and which was the unique contact. Then each unique contact was connected to a wire via solder and confirmed to have no continuity to the common side. One common wire was soldered to the board. The common would be looped to each common side of the Sonoff switches. I chose to power the Sonoff's with their own power supply, but I think tapping into the chairs power at the pendant would work. I wasn't sure if it would stress the chairs power, so I leaned on the side of caution. Wire color and function were recorded. The Sonoff switches can be set to toggle on/off or in inching mode - active for a preset increment of time. My recliner moves fairly quickly so 1 second increments is appropriate. The two position programmable buttons on the chair pendant (ZG and TV) were not set to inching and when activated, stay on until deactivated. I also got a 4 channel rf keyfob remote and programed the sonoff ZG,TV, backrest up, backrest down. The TV position is set to my average comfortable seating position for computers and tv. The ZG position

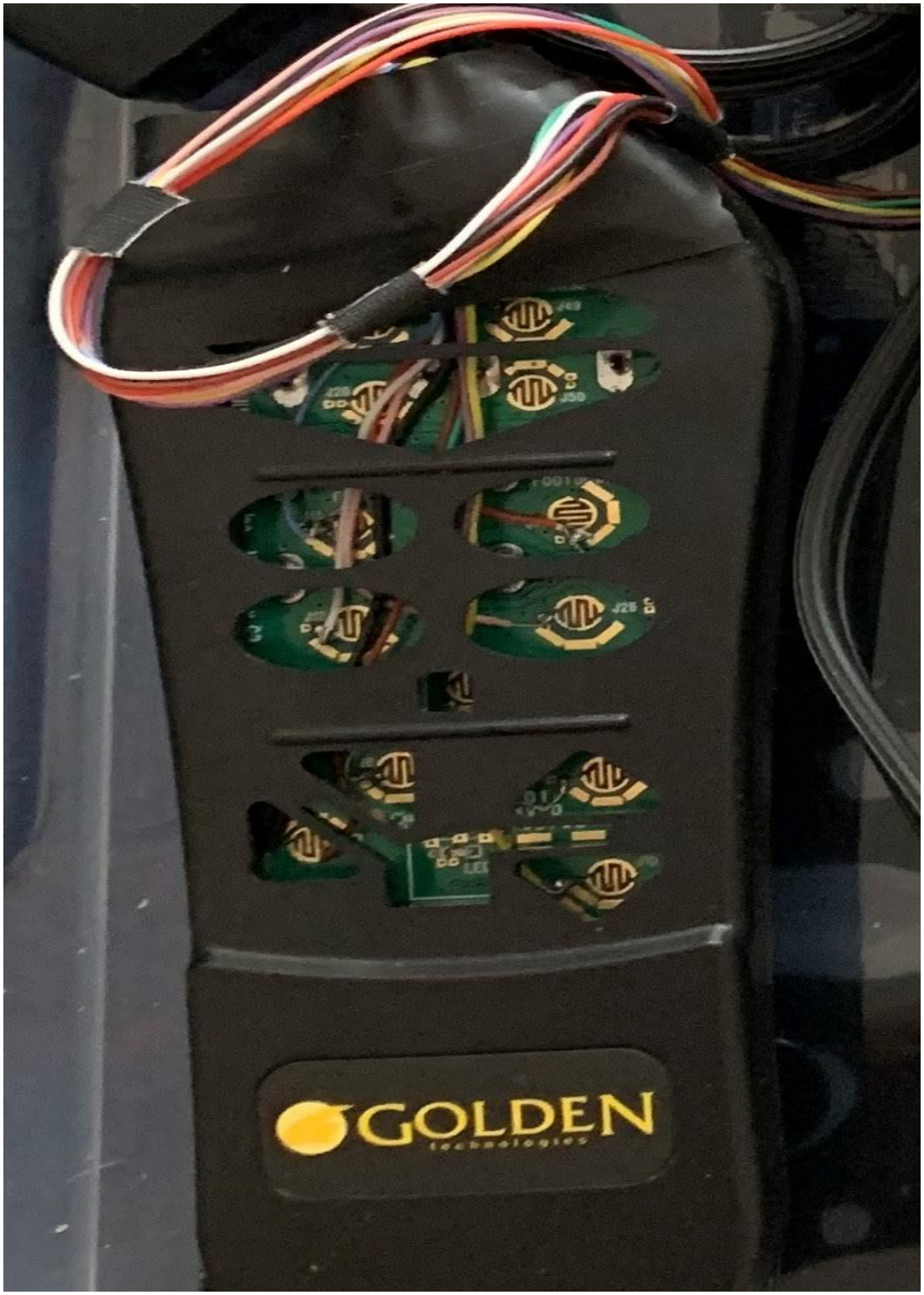
is set to the place where we get the sling set up behind my back. Sorry no fancy wiring diagrams, as this has all been written with only my head movement! Wiring went something like this:

recline/legs
Ch1 - green - backrest up 1 sec/push - C on rf remote
Ch2 - rose - backrest down 1 sec/push - D on rf remote
Ch3 - purple - foot up 1 sec/push
Ch4 - yellow - foot down 1 sec/push
headrest/prog
Ch1 - blue - head forward 1 sec/push
Ch2 - white - head back 1 sec/push
Ch3 - orange - TV (prog) push on/off - A on rf remote
Ch4 - pink - ZG (prog) push on/off - B on rf remote

Black is common/ground

All components for the smart chair were velcroed and or hot glued into a plastic project box 14.18"L x 14.37"W x 3.13"H. A few holes drilled for wires and ventilation and gaffer tape and velcro was used to fasten it to the back of the chair. The chair has the brisa fabric option and the tape holds well and does not damage the fabric. It is hard to see anything different about the chair unless you go behind it.

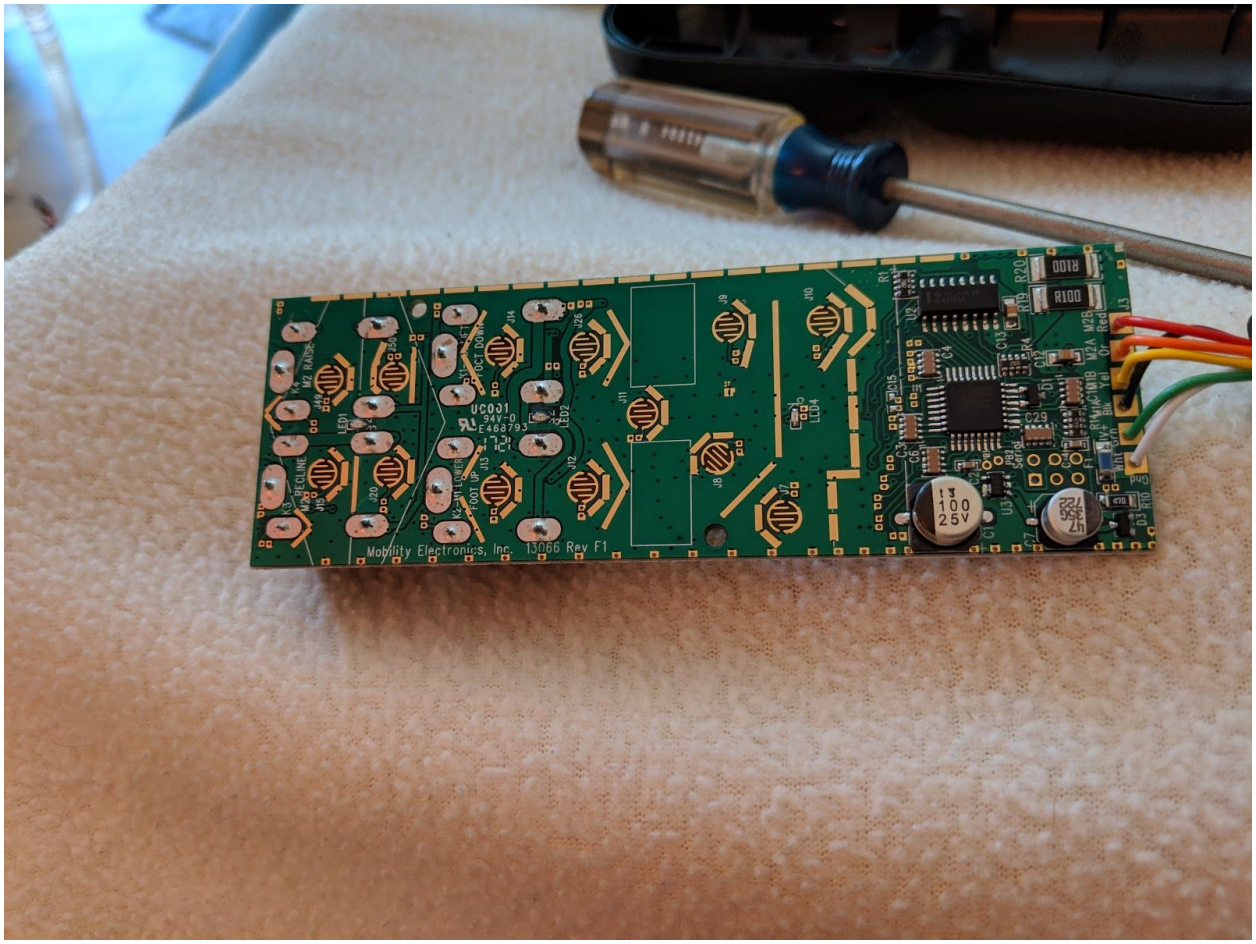
Chair/control side



Control Pendant with push buttons removed and wires soldered to contacts. Original connection and strain relief of control pendant was retained for reliability and easy swap to original control pendant.

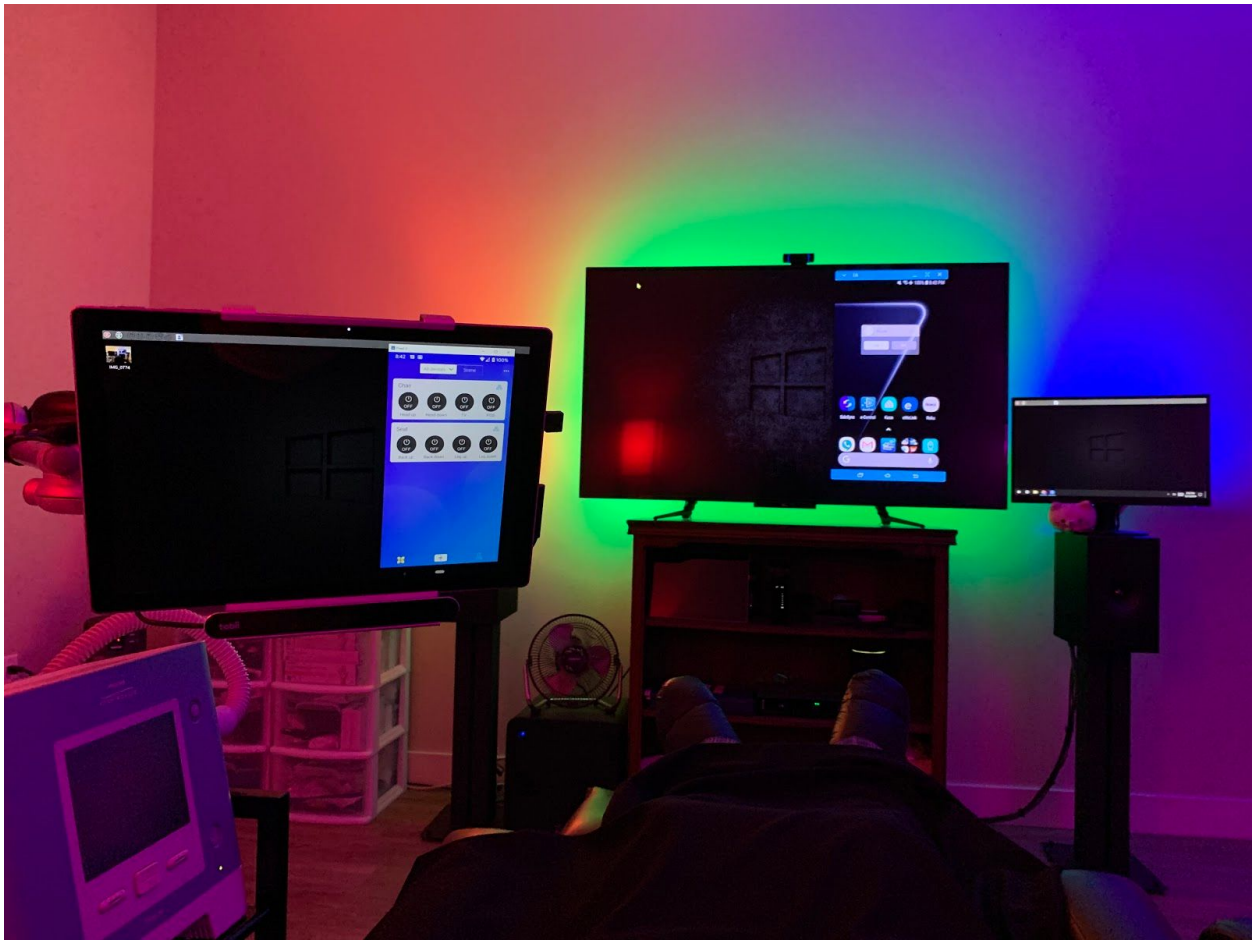
Project box with components in place. Originally velcroed later was organized and added hot glue in places for stability.

View of smart control in service on chair all components velcroed/hot glued securely.



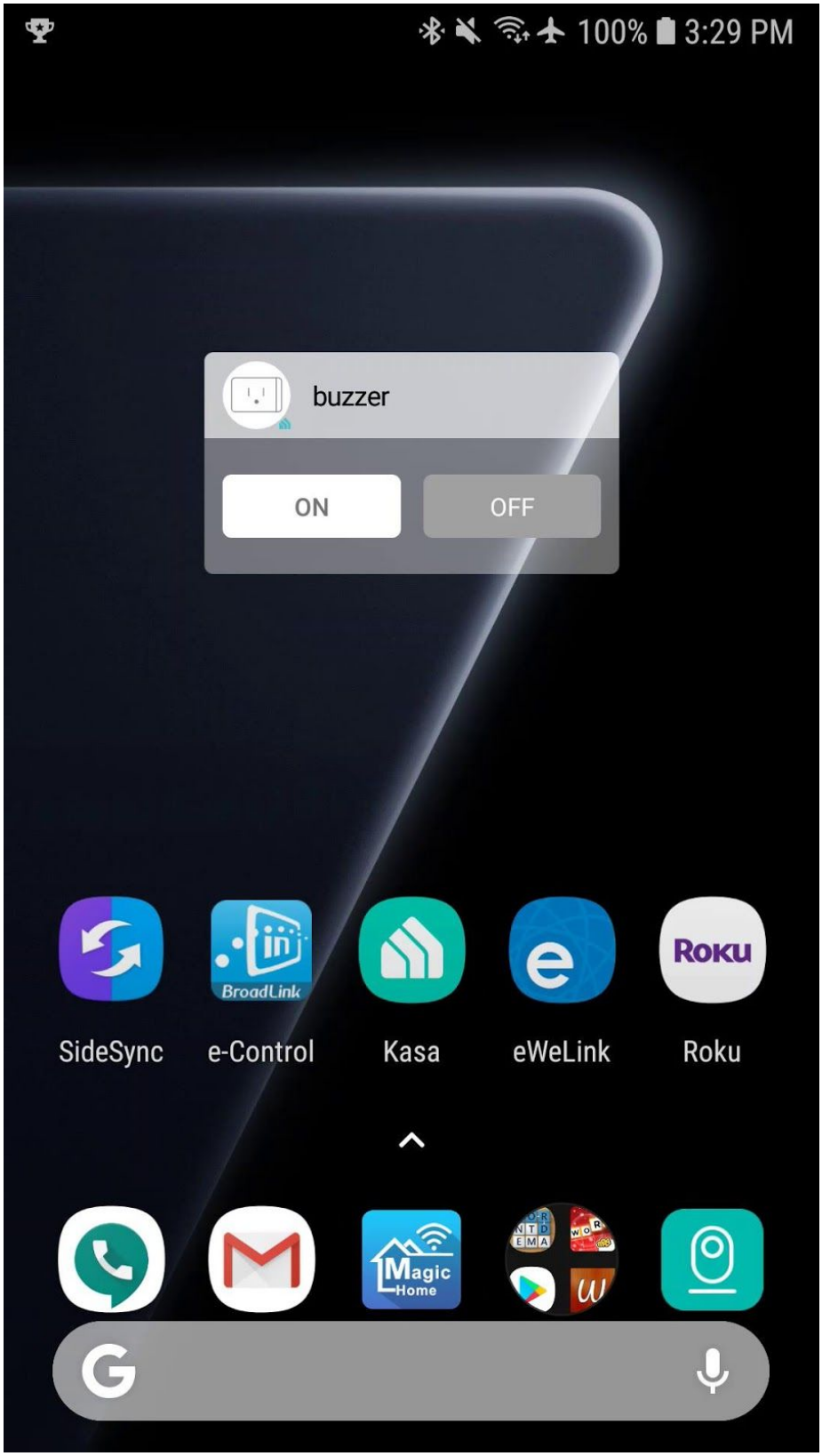
Original PCB out of the chair control.

View from recliner perspective from photo makes the television look smaller.

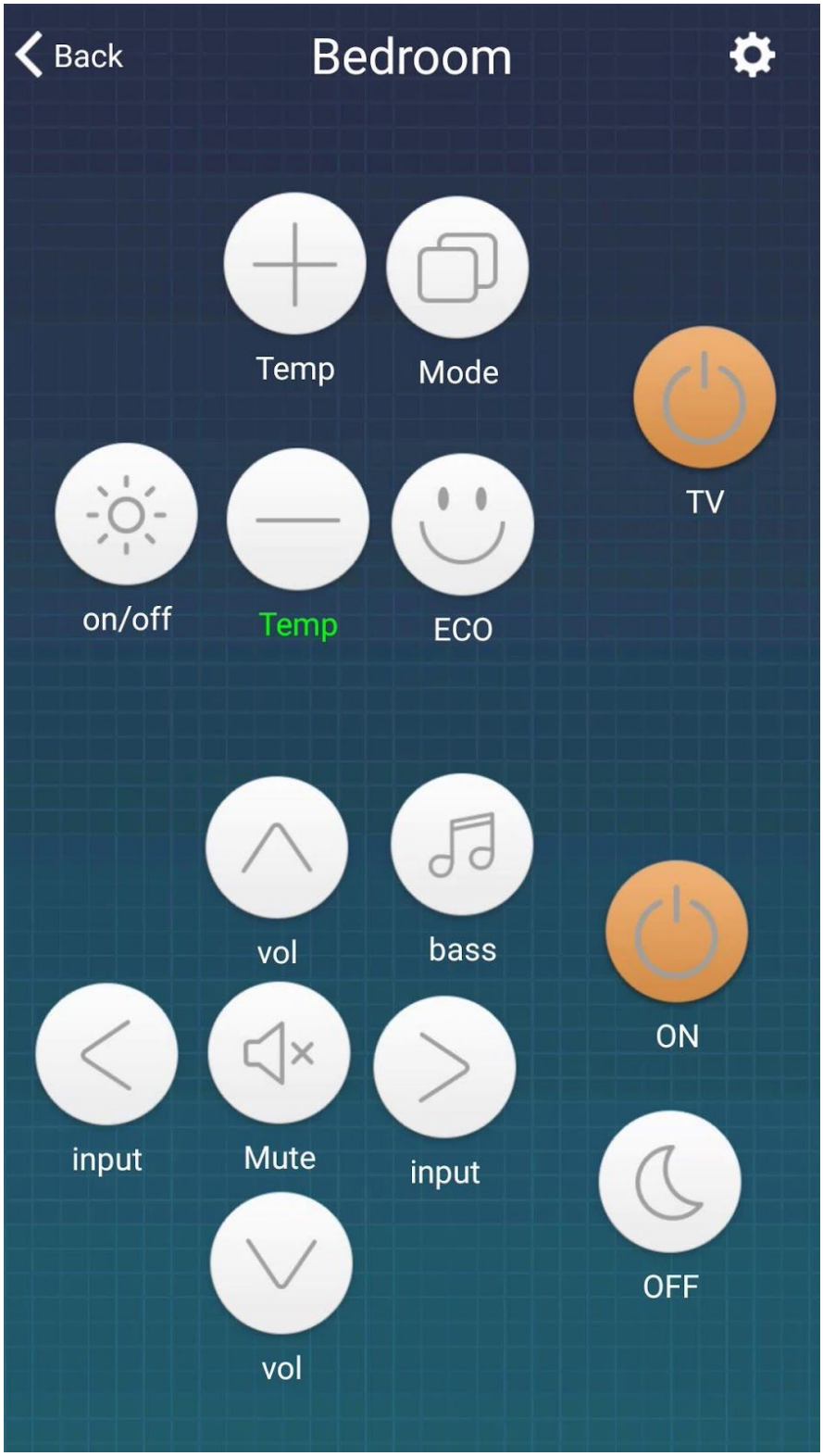


Night view with google home “rainbow” routine.

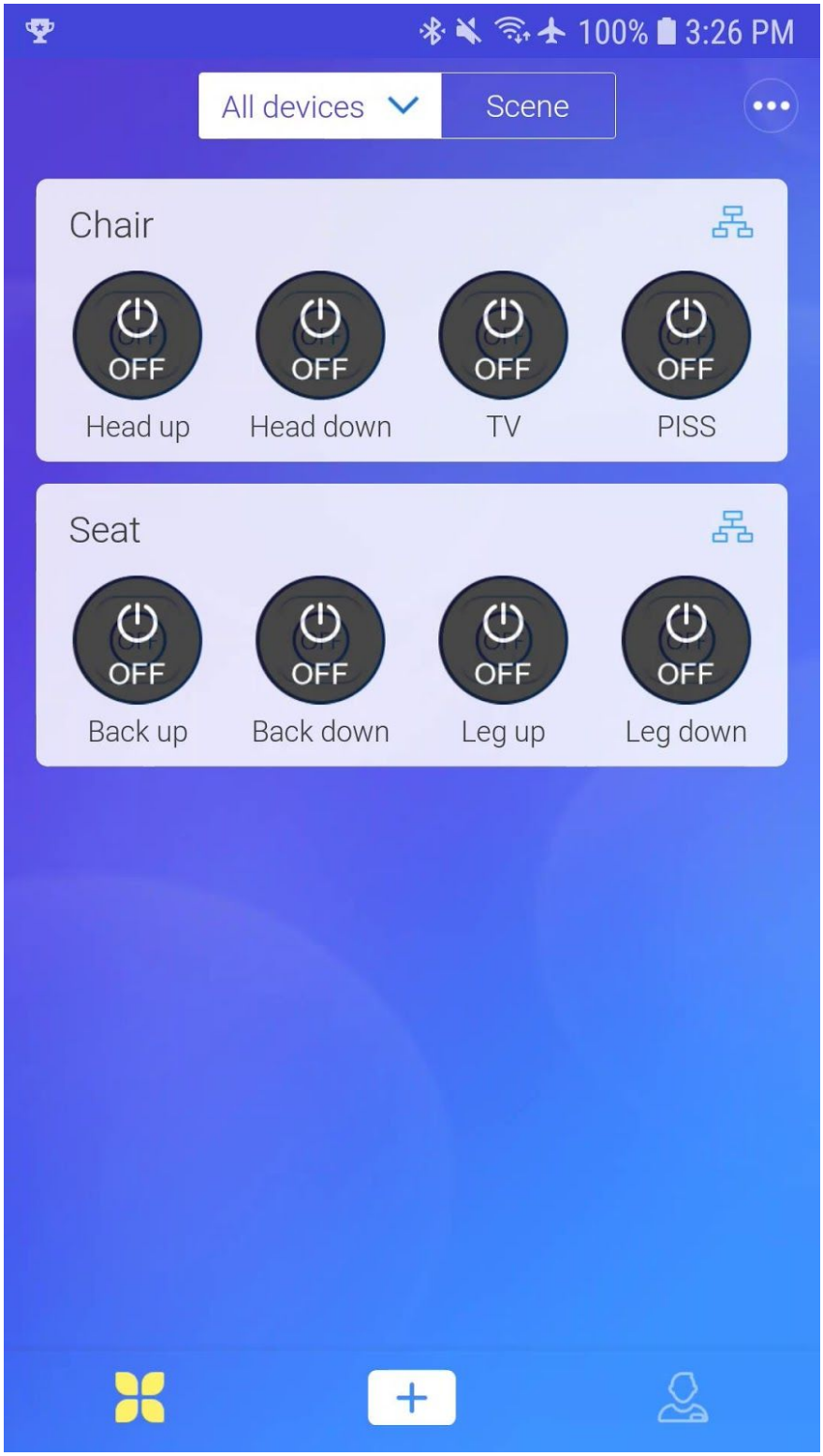
Modified control pendant in project box easily reaches original remote connection point in side pocket. Spare original control also stored in the side pocket incase of emergency.



Screen capture of Galaxy S7 displayed on tv showing the Emergency Buzzer widget on home screen.



e-Control app with heater, stereo and Tv power on same screen.



eWeLink app with control of two 4 channel switches. Names are user defined and different to make google home commands less confusing. “PISS” position is used for the urinal and when sling is being placed. “TV” position is typical position where cameras are all aimed for eViacam. Cameras track my face through almost entire travel of recliner.

View of water bladder and most importantly backup battery charging status for BiPap breathing support. (Yi camera app Android)