



TEXAS INSTRUMENTS CHALLENGE: THE DISASSEMBLY OF NETGEAR AC1450 ROUTER



BY: THE GUMMY BEARS #10746B

INTRODUCTION

OUR TEAM DECIDED TO DISASSEMBLE A NETGEAR AC1450 ROUTER. WE PICKED THE ROUTER BECAUSE WE THOUGHT IT WOULD BE EASY TO TAKE APART AND WOULD BE INTERESTING IN THE INSIDE. HERE IS WHAT WE OBSERVED, HOW WE TOOK THE ROUTER APART, WHAT WE SAW, AND WHAT THE IDENTIFIED PIECES ARE.



OBSERVATION

IN THE BEGINNING, WE TOOK THE ROUTER OUT OF THE BOX AND EXAMINED IT. WE SEARCHED FOR SCREWS AND TRIED TO FIND A WAY OF OPENING IT BEFORE WE DID ANYTHING. WE ALSO PEERED THROUGH HOLES IN THE OUTSIDE OF THE ROUTER.

UNBOXING THE ROUTER

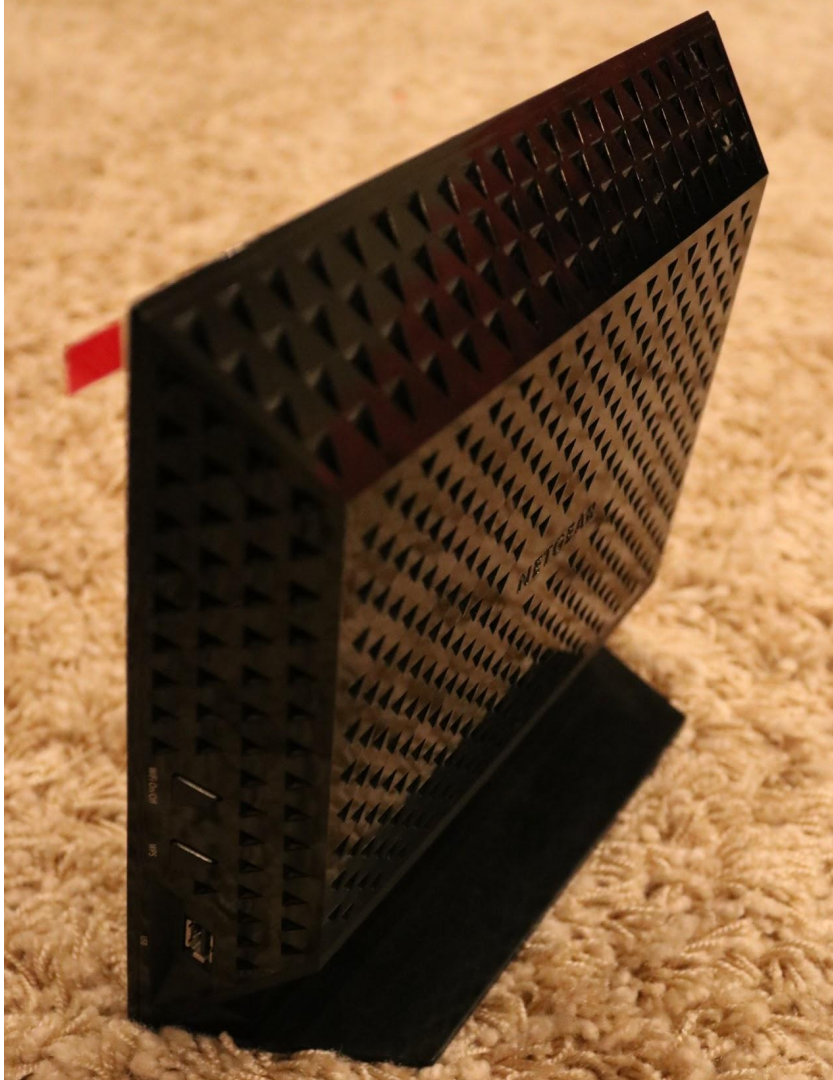




THIS IS THE
FRONT SIDE OF
THE ROUTER. IT
HAS A SCREEN
PROTECTOR.



THIS IS THE
BACKSIDE OF
THE ROUTER.



THIS IS A SIDE
VIEW.



THIS IS THE
BOTTOM.



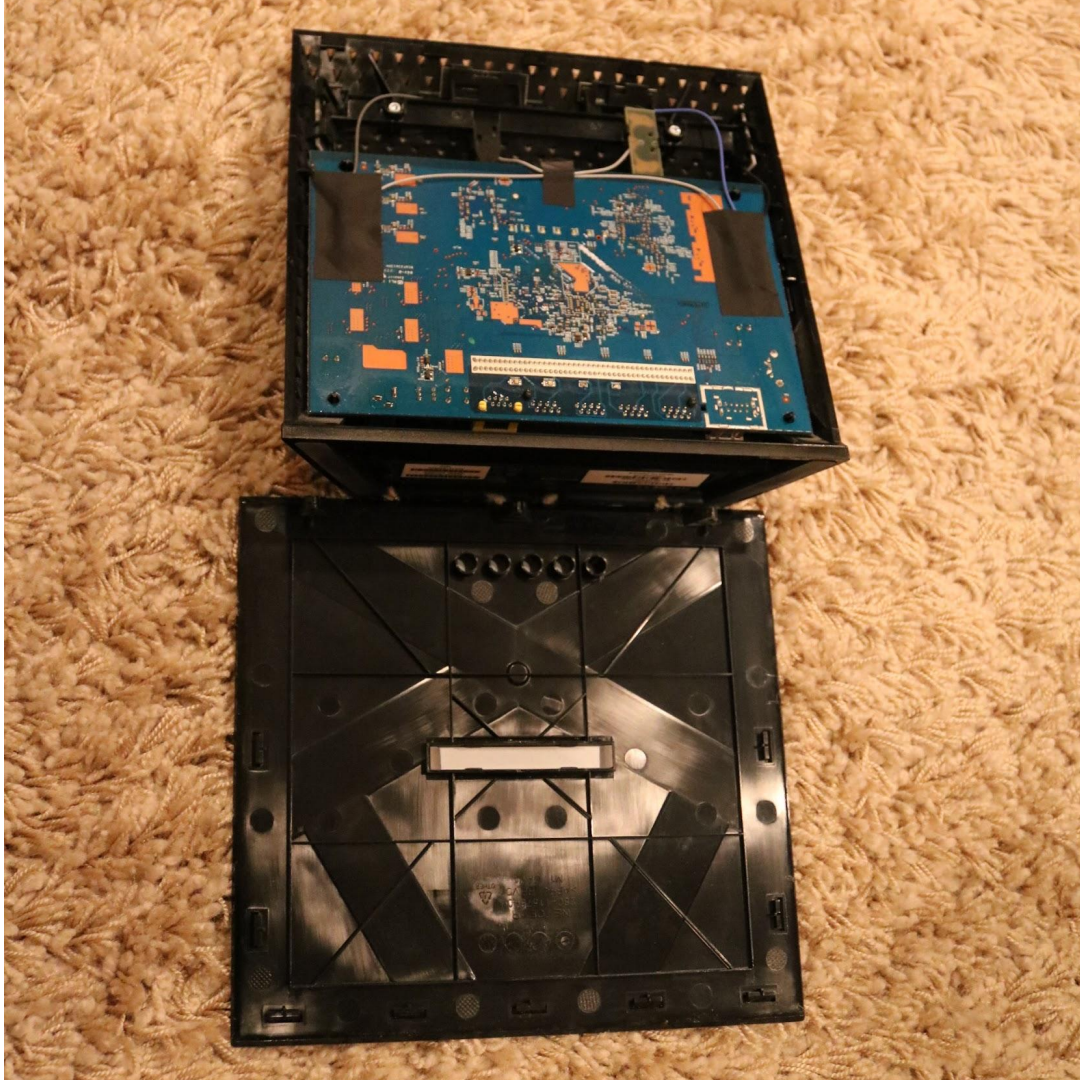
THE DISASSEMBLY

WE STARTED BY TAKING OUT THE SCREWS AND REMOVING THE SCREEN PROTECTOR. THERE WAS A CREVICE BETWEEN THE FRONT PANEL AND THE REST OF THE ROUTER, SO WE STARTED TO DISASSEMBLE THE ROUTER FROM THERE.



WE HAD TO USE A
SPECIAL SCREWDRIVER
CALLED A TORX
SCREWDRIVER. IT
HAS A 6-POINT STAR
SHAPED PATTERN ON
ITS HEAD.

ONCE WE REMOVED THE FRONT PANEL, WE FOUND OURSELVES THE ROUTER'S MOTHERBOARD. WE FIGURED THE SCREWS WE UNSCREWED BEFORE WAS TO HOLD THE FRONT PANEL IN. THERE WERE SCREWS HOLDING IN THE MOTHERBOARD THAT WE TOOK OUT. NOW, WE HAD A FULL VIEW OF THE FRONT AND BACK SIDE OF THE MOTHERBOARD. THE FRONT OF THE MOTHERBOARD HAD WIRES THAT CONNECTED TO THE FRONT PANEL AND WAS SECURED BY A KIND OF BLACK TAPE. THE BACK OF THE MOTHERBOARD WAS FULL OF CARDS, PORTS, LETTERS, NUMBERS, ETC. WE SEARCHED THE CODE OF THE CHIP/COMPONENT ON-LINE TO FIND OUT WHAT EACH ONE IS AND WHAT EACH ONE DOES.

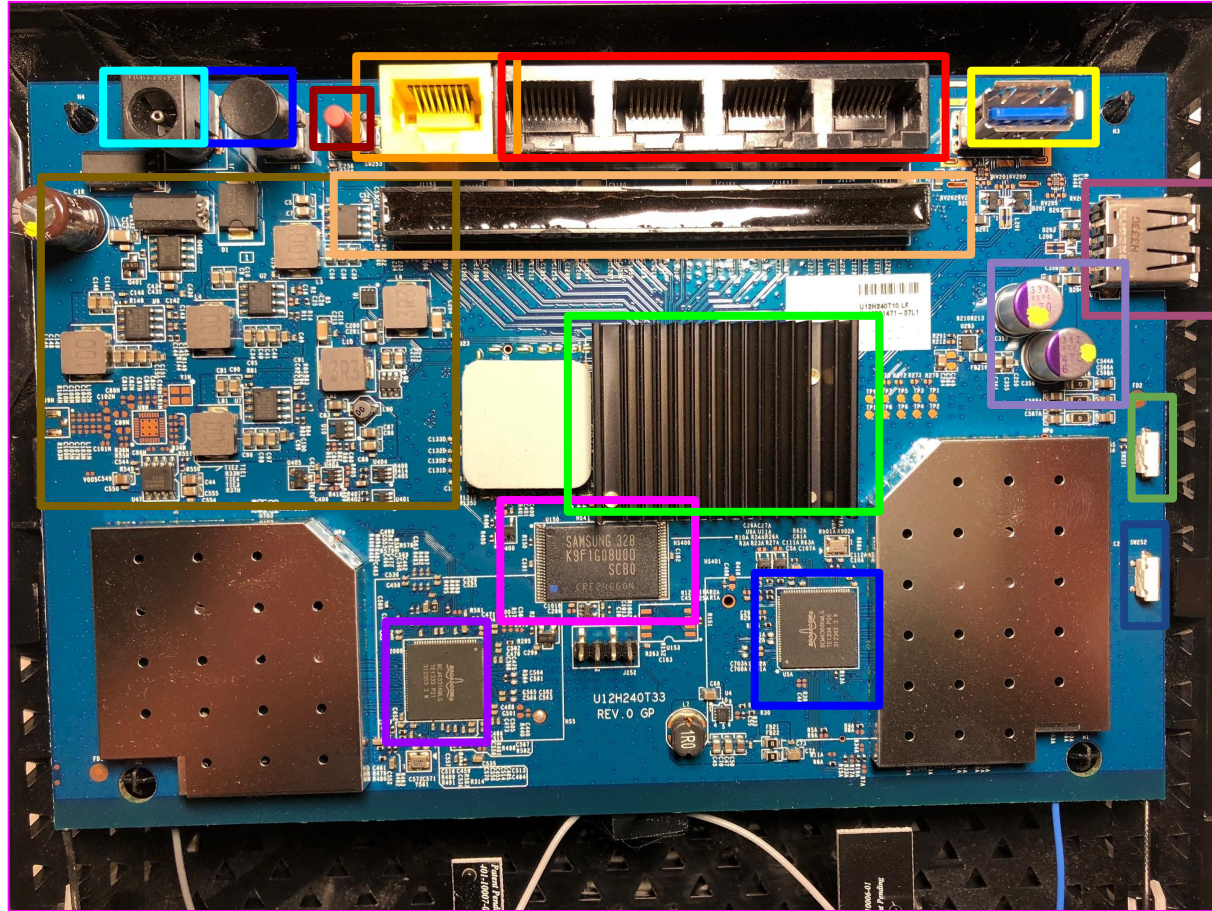


THIS IS AFTER WE
REMOVED THE FRONT
PANEL, WHICH
REVEALED THE FRONT
OF THE
MOTHERBOARD.

WE FLIPPED THE
MOTHERBOARD OVER TO
FIND THE BACK SIDE OF
THE MOTHERBOARD. WE
FOUND THE CHIPS AND
COMPONENTS THAT WE
WANTED TO RESEARCH.



SUMMARY OF MAIN CHIPS & COMPONENTS



Samsung 328 chip
Broadcom BCM4331
Broadcom
BCM4360
Internet port
Ethernet ports
Reset button
On/off button
DC port
USB 3.0 port
USB port
WPS button
WiFi on/off button
Heat sink
Voltage regulators
Transform Module
Capacitors

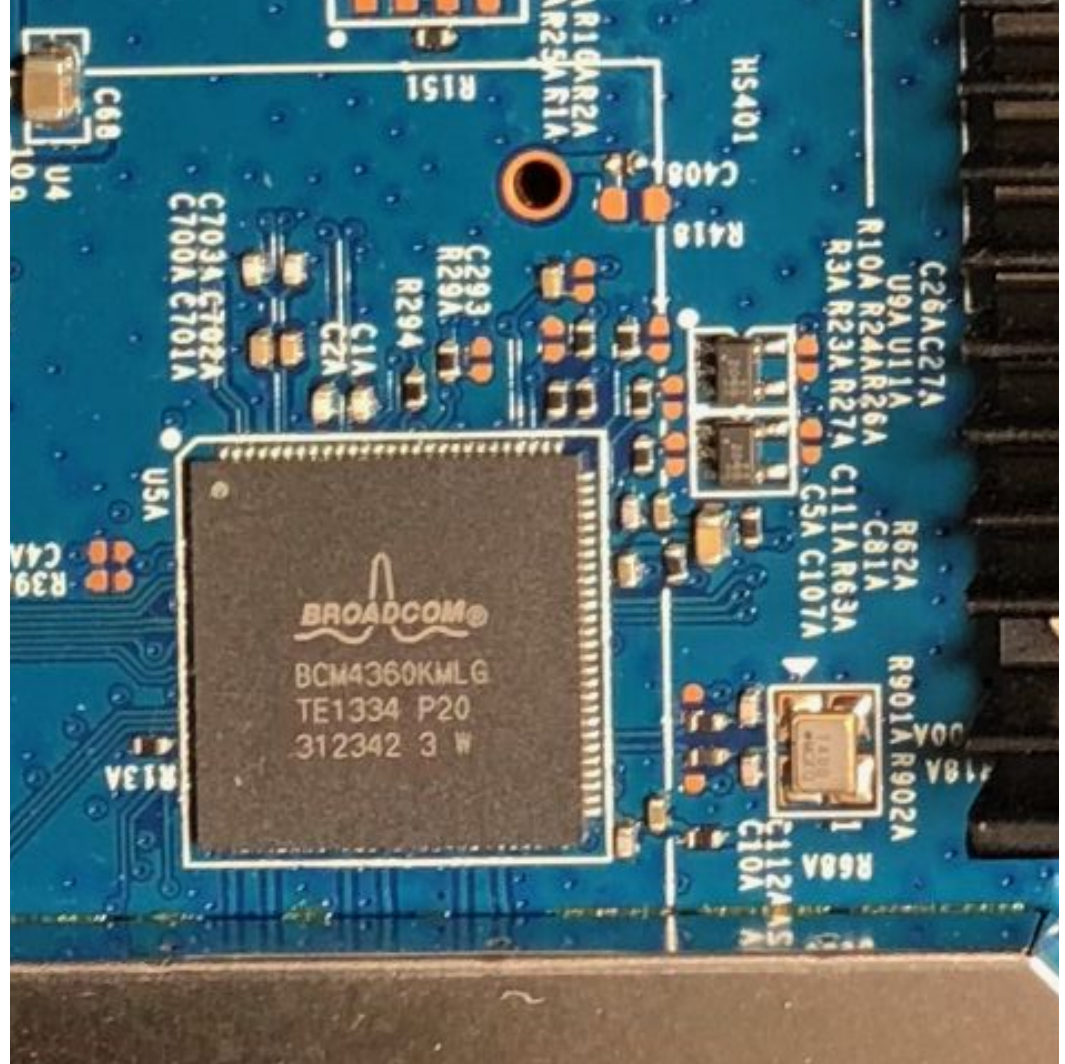


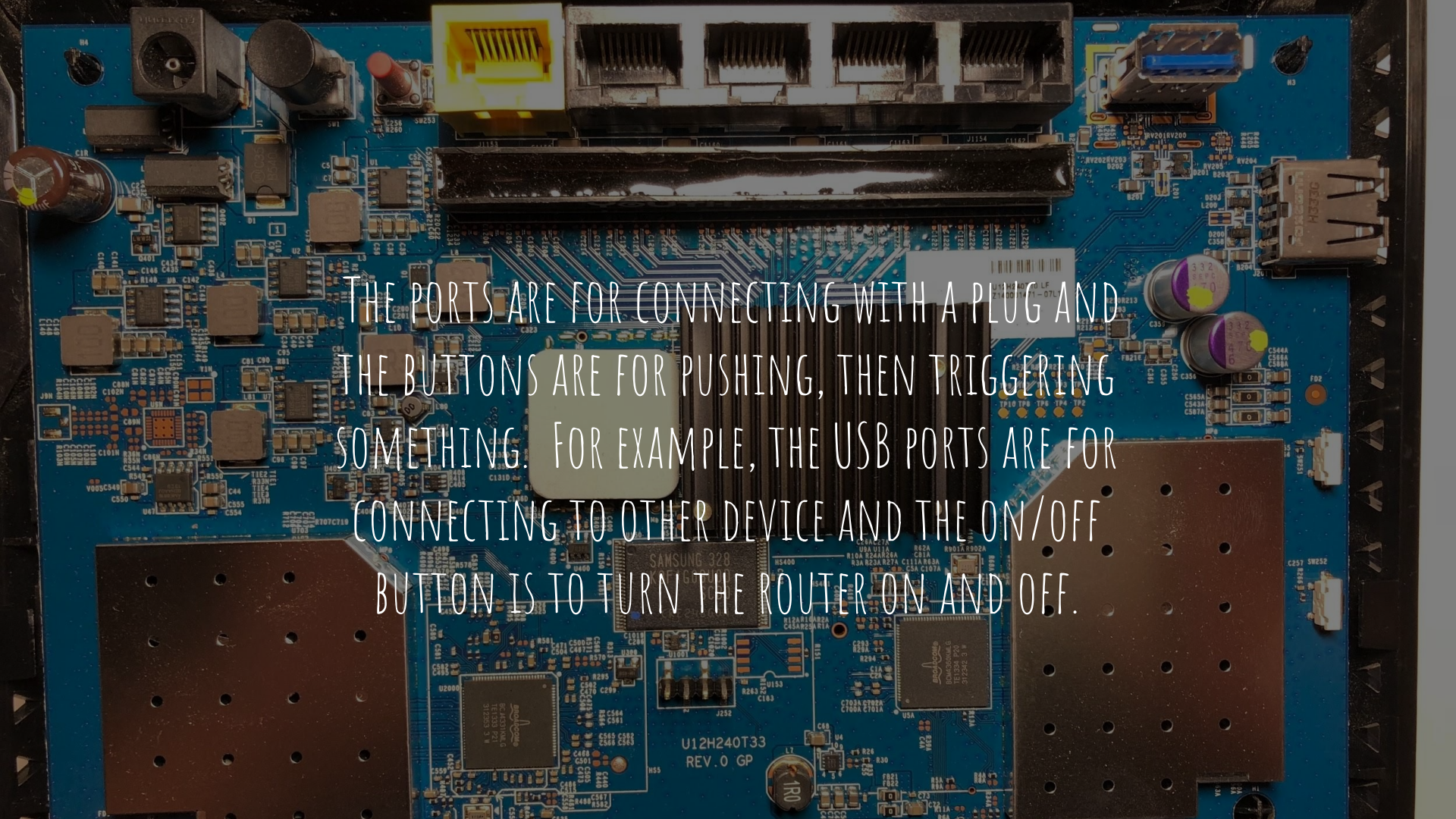
RESEARCH RESULTS

WE FOCUSED OUR RESEARCH ON THE BACK SIDE OF THE MOTHERBOARD BECAUSE IT HAD THE MAIN CHIPS, LETTERS, AND NUMBERS. IT ALSO HAD PORTS AND BUTTONS. HERE IS THE INFORMATION WE FOUND ABOUT THEM ALONG WITH PICTURES. CLICK ON THE HYPERLINK ON EACH PAGE TO LEARN MORE!



THE BROADCOM BCM4331
IS A WLAN TRANSCEIVER
THAT SUPPORTS 802.11N
STANDARD
(2.4GHz/5GHz).

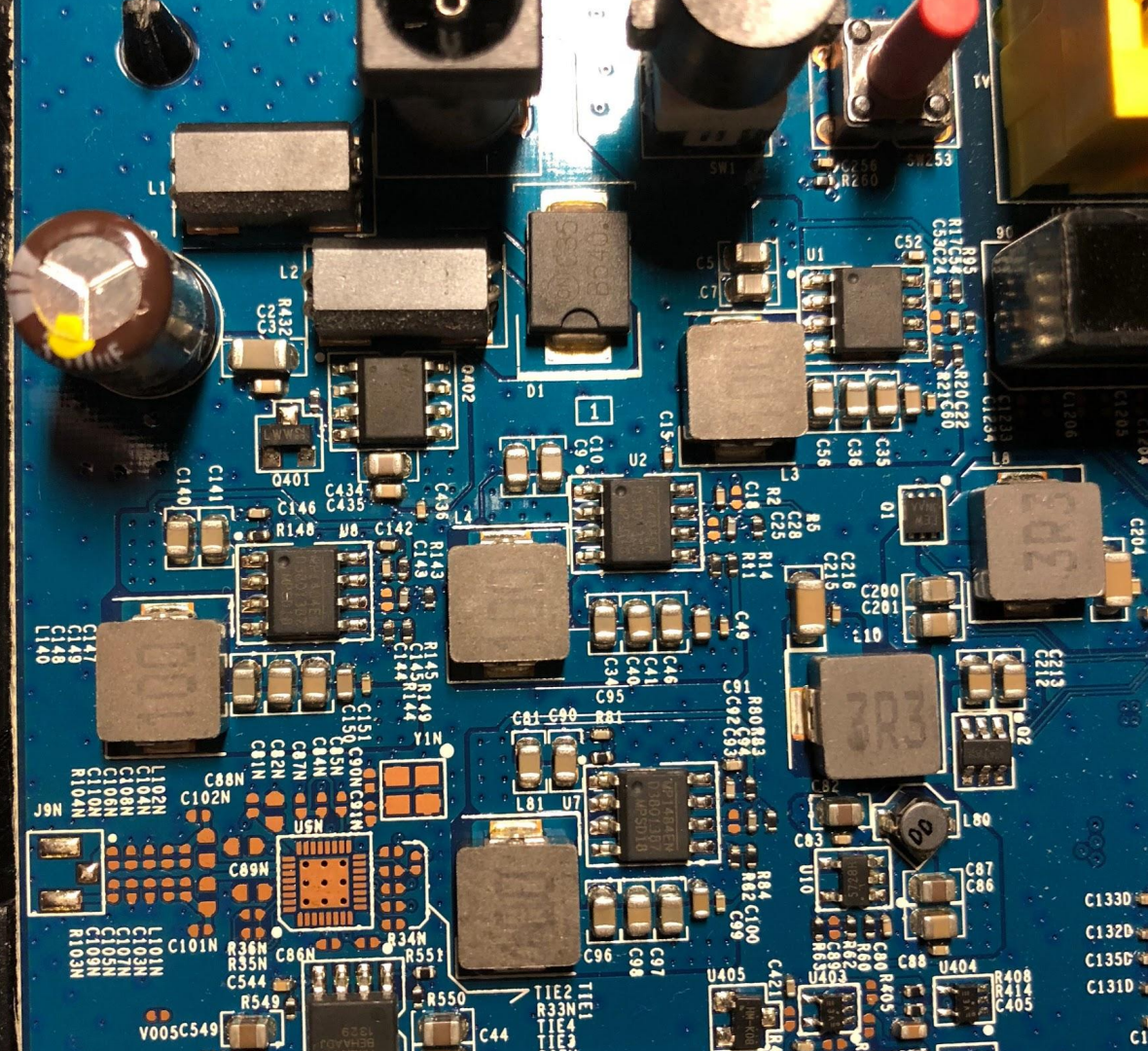




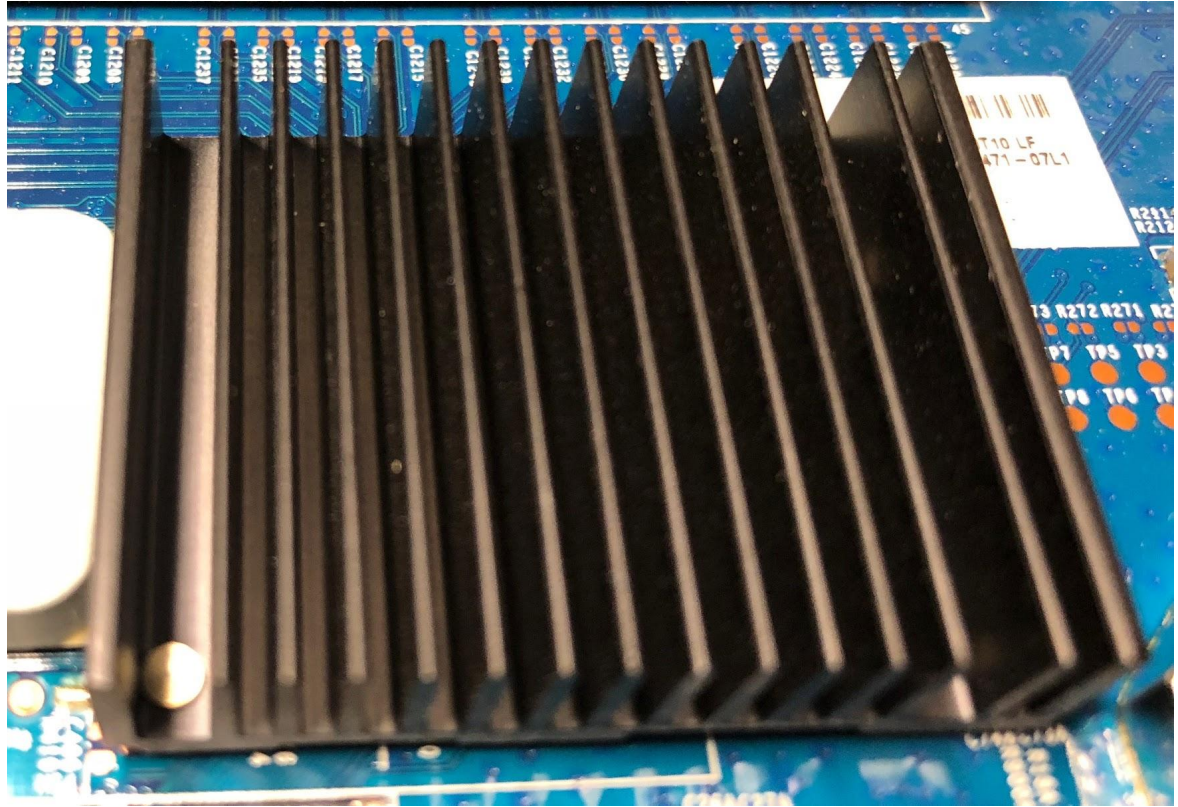
THE PORTS ARE FOR CONNECTING WITH A PLUG AND
THE BUTTONS ARE FOR PUSHING, THEN TRIGGERING
SOMETHING. FOR EXAMPLE, THE USB PORTS ARE FOR
CONNECTING TO OTHER DEVICE AND THE ON/OFF
BUTTON IS TO TURN THE ROUTER ON AND OFF.

U12H240T33
REV.0 GP

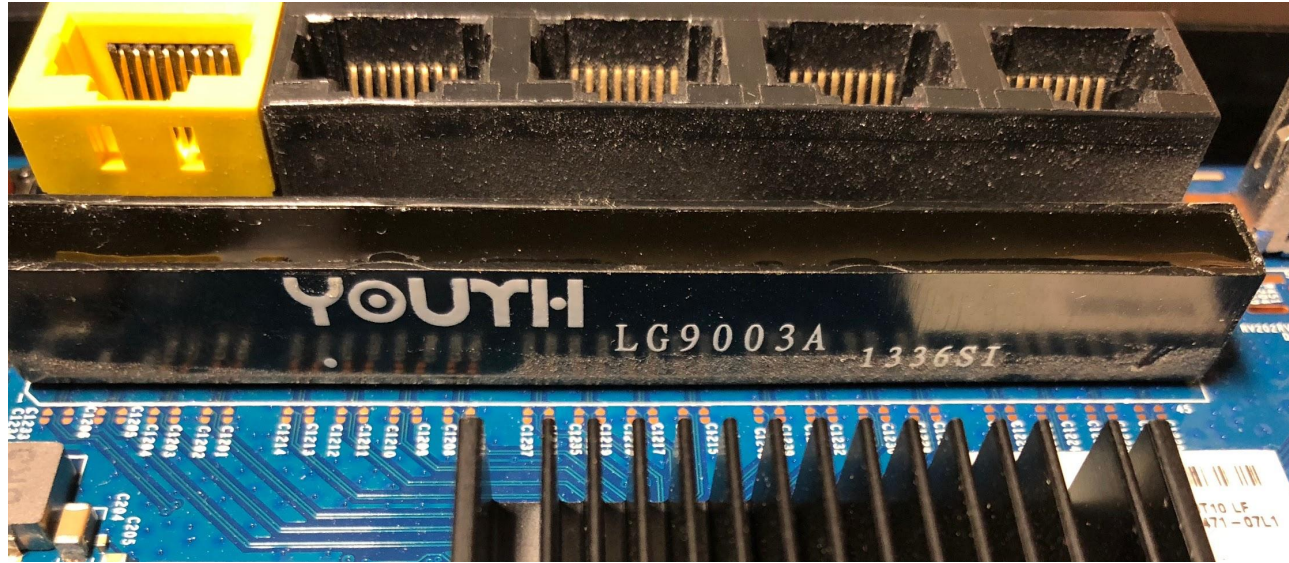
LITTLE MPI484EN BLACK
CHIPS ARE VOLTAGE
REGULATORS. THEY TAKE
AN INPUT VOLTAGE AND
CREATE A REGULATED
OUTPUT VOLTAGE OF
3.3V.



THE HEAT SINK ABSORBS
UNWANTED HEAT SO THE
ROUTER WON'T
OVERHEAT. IT HAS
"FINS," WHICH ARE THIN
SLICES OF METAL
CONNECTED TO THE BASE.



WE DIDN'T FIND
ANYTHING ON-LINE
ABOUT YOUYH LG9003A,
BUT WE WERE TOLD IT IS A
TRANSFORMER MODULE
FOR LAN FRONT END
INTERFACE.



6SEPC470 DECOUPLING

CAPACITORS REDUCE NOISE

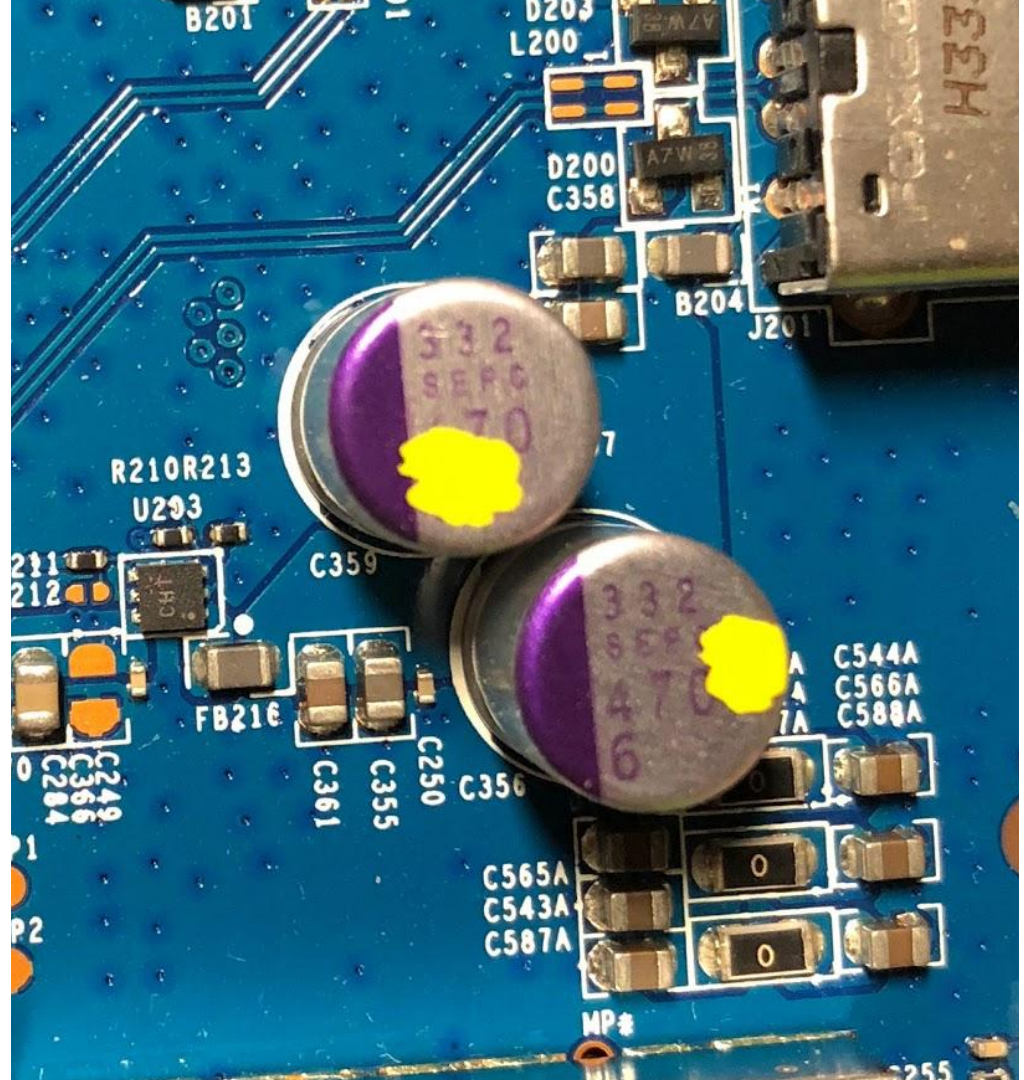
IN THE CIRCUIT THAT IS

CAUSED BY OTHER CIRCUIT

ELEMENTS. NOISE PASSES

THROUGH THE CAPACITORS &

REDUCES NOISE EFFECT.



CONCLUSION

IN CONCLUSION, WE LEARNED THAT A ROUTER IS A VERY COMPLEX ELECTRONIC DEVICE. IT CONTAINS MANY CHIPS AND OTHER COMPONENTS THAT WORK TOGETHER TO MAKE A ROUTER WORK. WE WERE AMAZED! WE LEARNED WHAT EACH INDIVIDUAL CHIPS AND COMPONENTS DO. UNFORTUNATELY, WE DIDN'T FIND A TEXAS INSTRUMENT PART IN THE ROUTER. BUT, WE HAD LOTS OF FUN TOUCHING AND RESEARCHING THE INSIDES OF A ROUTER AND WE ARE EXCITED ABOUT LEARNING THEM.

REFERENCES:

[HTTP://WWW.ALLDATASHEET.COM/DATASHEET-PDF/PDF/84340/SAMSUNG/K9F1G08U0A.HTML](http://www.alldatasheet.com/datasheet-pdf/pdf/84340/SAMSUNG/K9F1G08U0A.html)

[HTTPS://WWW.BROADCOM.COM/PRODUCTS/WIRELESS/WIRELESS-LAN-INFRASTRUCTURE/BCM4331](https://www.broadcom.com/products/wireless/wireless-lan-infrastructure/bcm4331)

[HTTPS://WWW.BROADCOM.COM/PRODUCTS/WIRELESS/WIRELESS-LAN-INFRASTRUCTURE/BCM4360](https://www.broadcom.com/products/wireless/wireless-lan-infrastructure/bcm4360)

[MOUSER.COM/PRODUCTDETAIL/MONOLITHIC-POWER-SYSTEMS-MPS/MP1484EN-LF/?qs=RC7BBW0QAAMTYZxUlxUKG==](http://mouser.com/ProductDetail/Monolithic-Power-Systems-MPS/MP1484EN-LF/?qs=RC7BBW0QAAMTYZxUlxUKG==)

[HTTP://WWW.ALLPARTS.CO.KR/SEARCH/SLIST?PART_NO=LG9003A](http://www.allparts.co.kr/search/slist?part_no=LG9003A)

[HTTPS://WWW.DIGIKEY.COM/PRODUCT-DETAIL/EN/PANASONIC-ELECTRONIC-COMPONENTS/6SEP470ME-TSS/6SEP470ME-TSS-ND/4209265](https://www.digikey.com/product-detail/en/panasonic-electronic-components/6SEP470ME-TSS/6SEP470ME-TSS-ND/4209265)

[HTTPS://EN.WIKIPEDIA.ORG/WIKI/HEAT_SINK](https://en.wikipedia.org/wiki/Heat_sink)

SPECIAL THANKS TO MR. TOMMY YU (A KNOWLEDGEABLE FRIEND OF MAYLENE'S MOM WHO HELPED US IDENTIFY THE PARTS WITH NO NUMBERS)

ABOUT US: WE ARE AN ALL-GIRL ROBOTICS TEAM COMPOSED OF 6TH GRADERS AT ANAHEIM HILLS ELEMENTARY SCHOOL EXCITED ABOUT STEM.

