RECF 2018 Electronics Online Challenge Sponsored by Texas Instruments

Dynalink RTA1335 ADSL Router

Team Number 7682E

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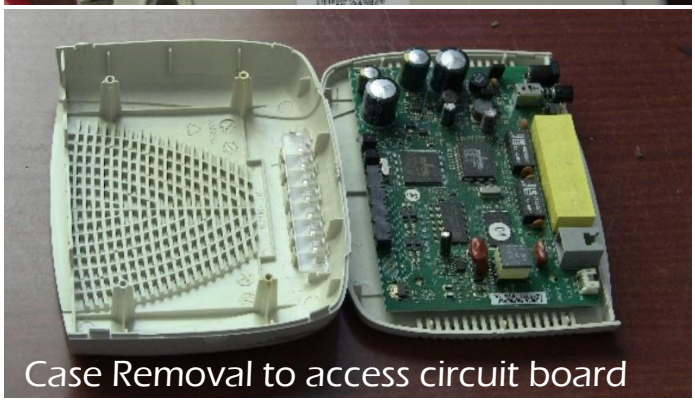
Introduction

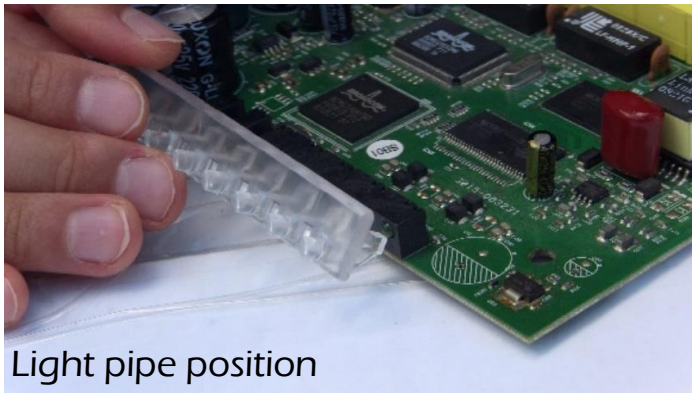
We chose a Dynalink RTA1335 we found lying around. It is an ADSL Router, used to get broadband through copper wires and is older technology replaced by VDSL which is faster.

Disassembly

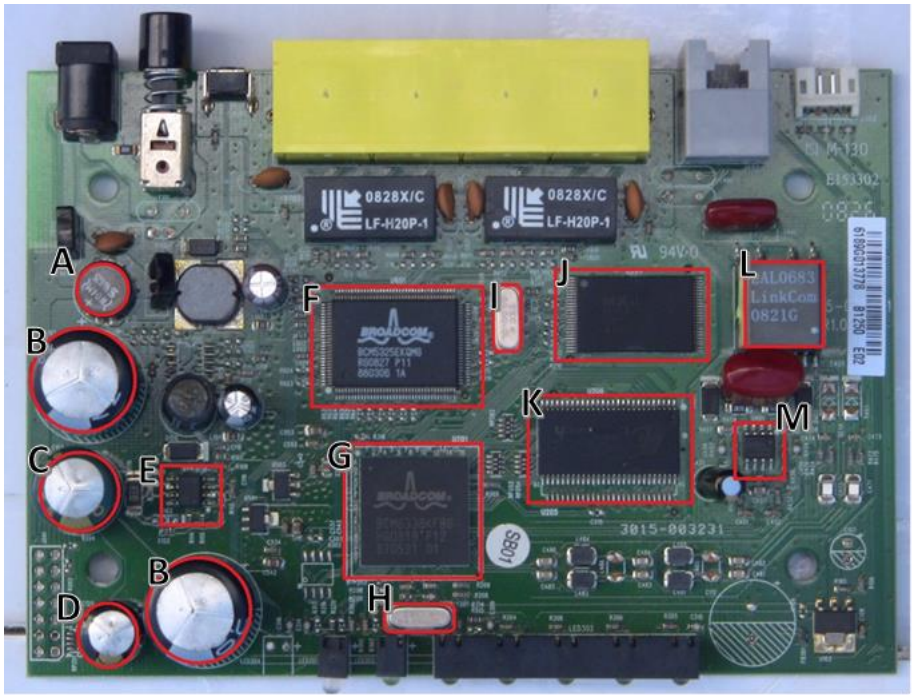
The ADSL router case came apart in two halves with the circuit board placed between the halves. The screws were hidden behind rubber feet on the bottom of the ADSL router, so we removed the rubber feet to access the screws. After taking apart the case, we found a light pipe which directed illumination from some LEDs on the circuit board. On the circuit board there were 4 main chips.

Hidden Screws


Case Removal to access circuit board

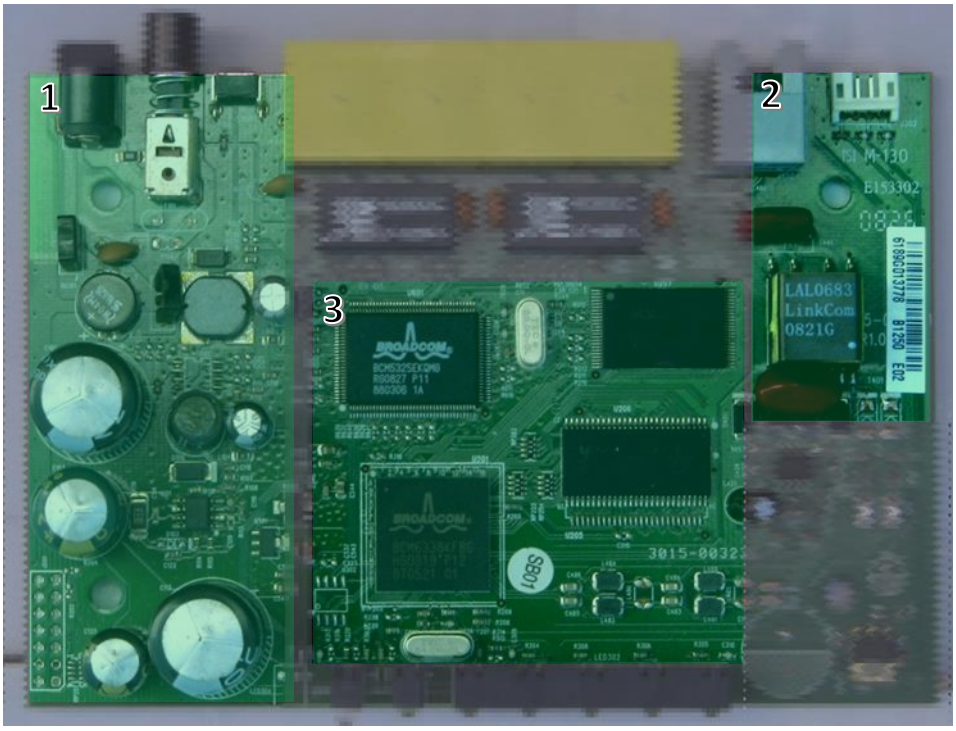

Light pipe position

Component List



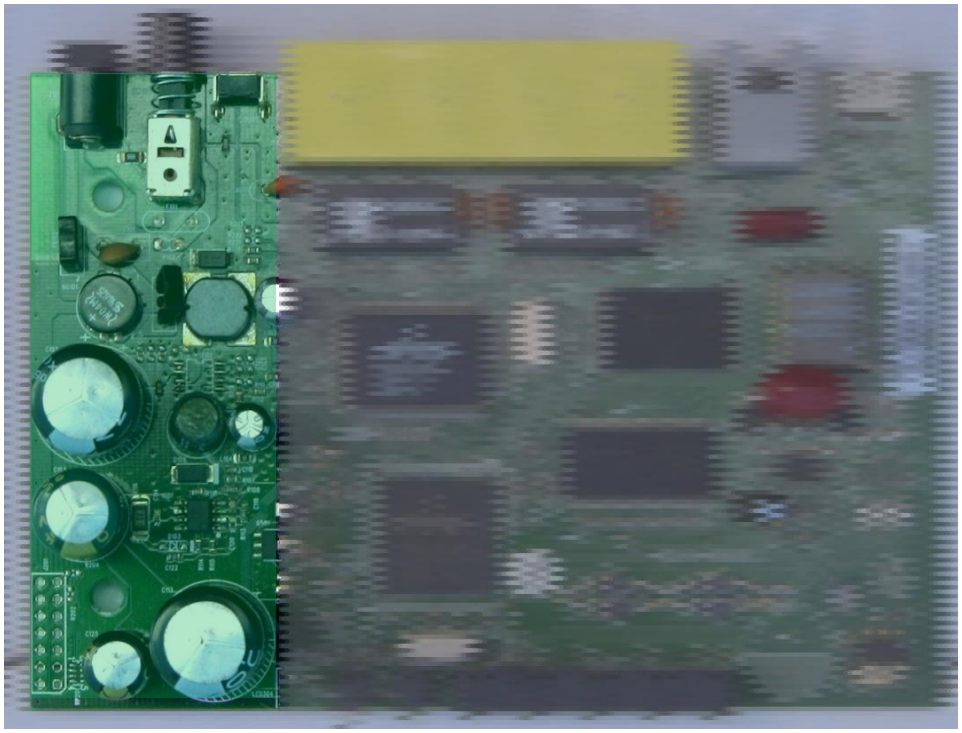
A. W04M – Bridge Rectifier
B. G Luxon 2200uF25V – Electrolytic Capacitator
C. Teapo 1000uF25V – Electrolytic Capacitator
D. G Luxon 470uF25V – Electrolytic Capacitator
E. AP34063 – DC-DC Regulator
F. BroadCom BCM5325EKQMG – Ethernet Switch System
G. BroadCom BCM6338KFBG – Microprocessor
H. TXC 64.0MuGL – Quartz Crystal
I. TXC 25.0GvQL – Quartz Crystal
J. MX 29LV160CBTC-70G – FLASH
K. EtronTech Em638165TS-7G Q – RAM
L. LinkCom LAL0683 – Transformer
M. BroadCom 6301KSG – Line Driver

Circuit Blocks



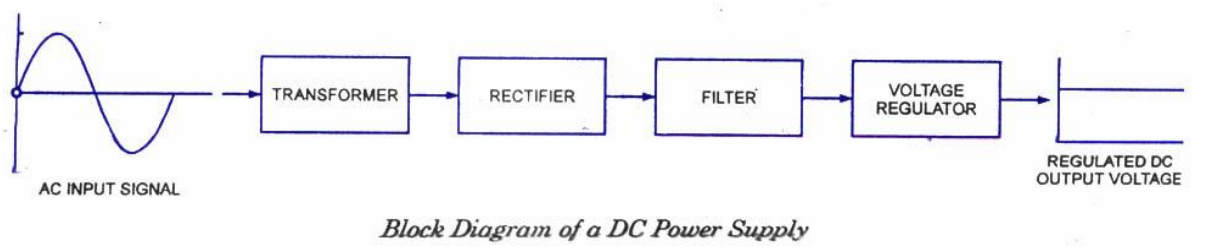
1. Power supply block
2. ADSL line interface
3. CPU/Memory/Network

Power Supply Block



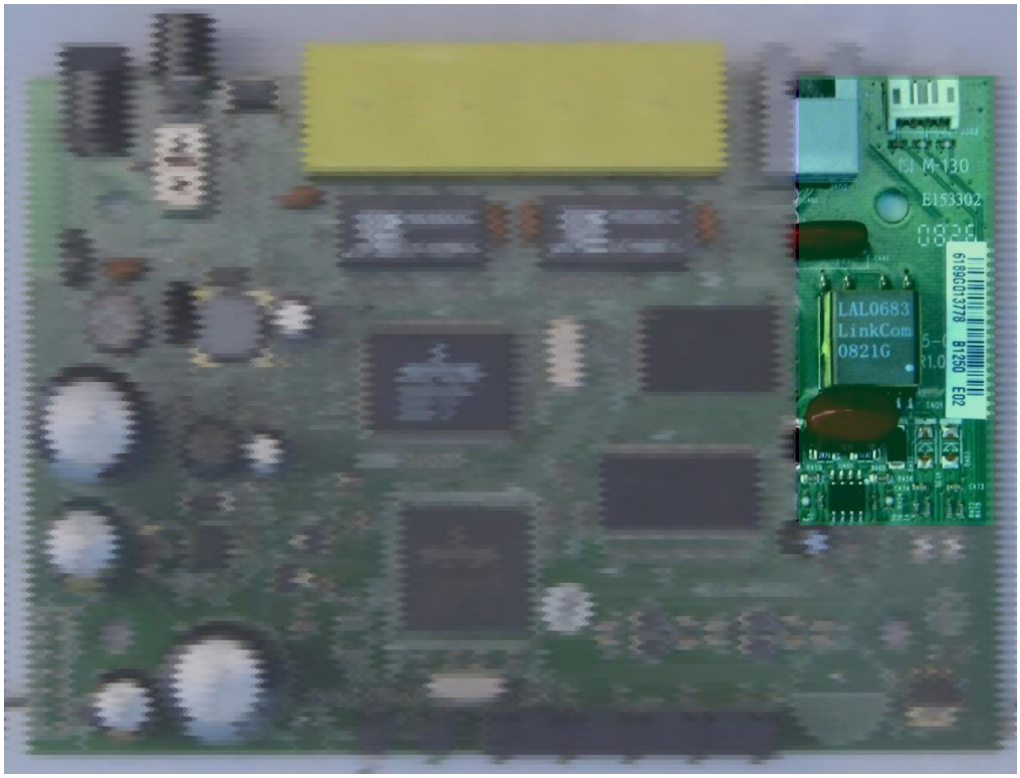
The power supply block converts the alternating current (AC) input into direct current (DC) for the electronic circuitry to use. The power supply block consists of an external transformer, diode

rectifier bridge, filter capacitors and DC to DC converter which reduces the voltage for the integrated circuits.



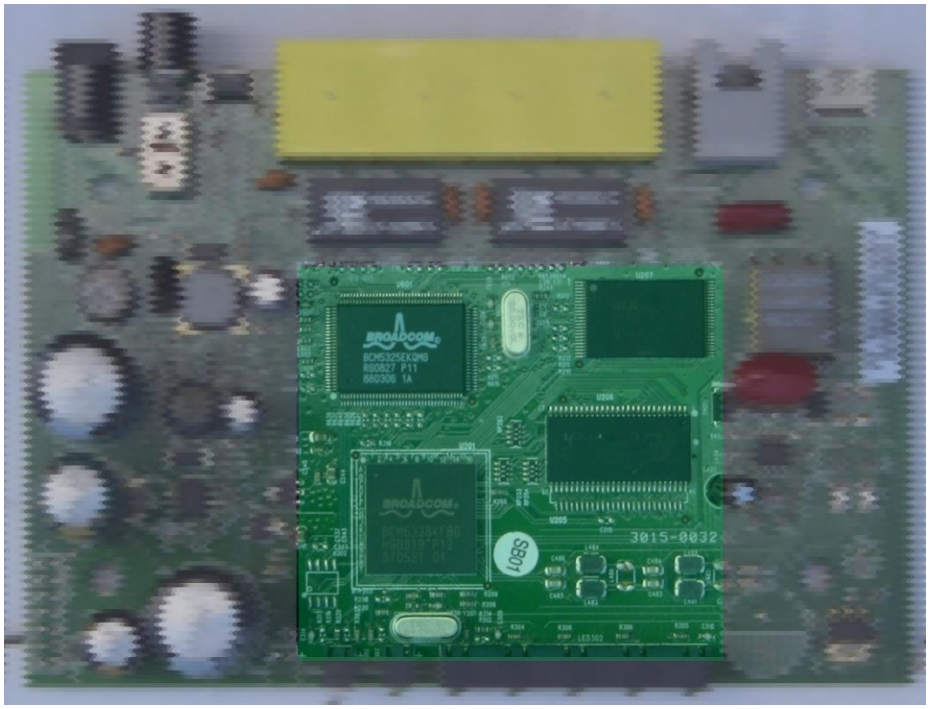
Block Diagram of a DC Power Supply

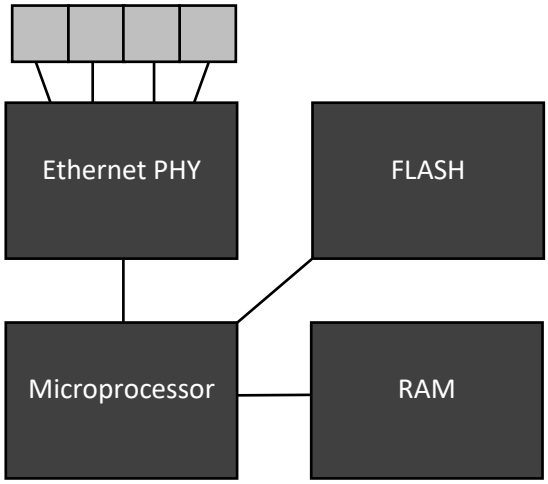
ADSL Line Interface



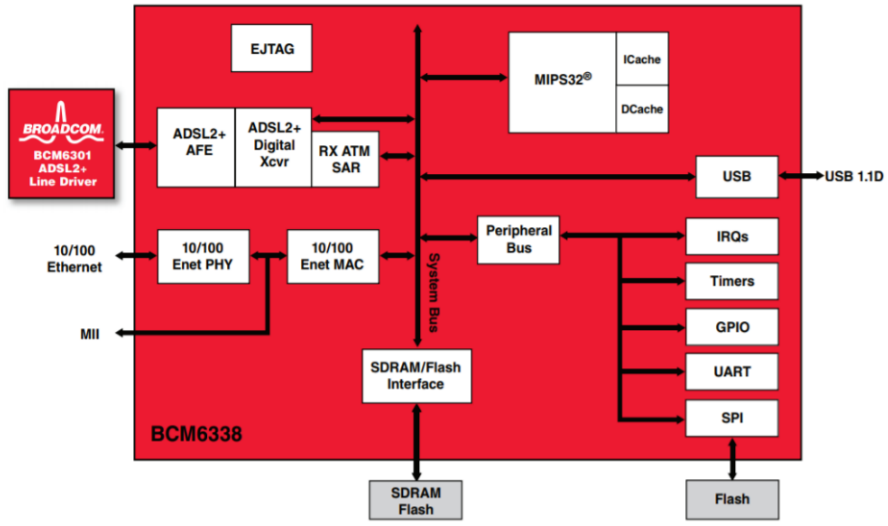
The isolation transformer LAL0683 prevents a large flow of electricity from the telephone wire, for example a lightning strike, going straight into the router and destroying the electronics inside. The line driver amplifies signals sent over the phone line.

CPU/Memory/Network

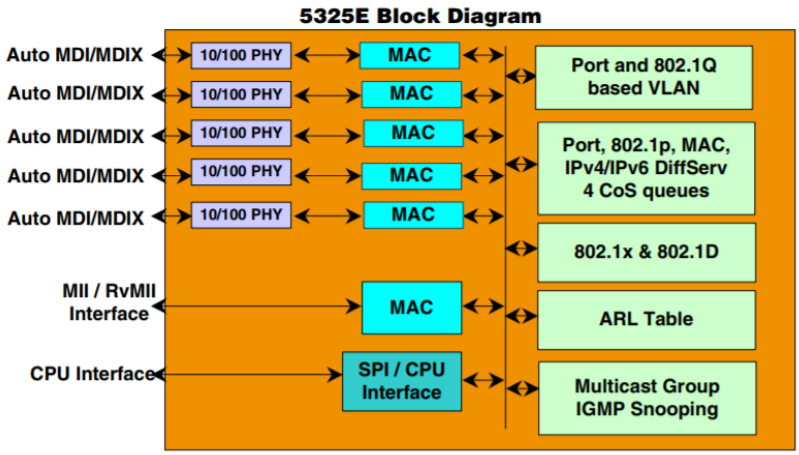




There are 4 large chips on the board: The BCM6338KFBG is a high performance MIPS32 Central Processing Unit with peripherals tailored for ADSL Bridge/Router solutions. It executes software loaded from the 29LV160CBTC-70G FLASH memory and uses the EM638165TS-7G for Random Access Memory where volatile data is stored.



BCM5325EKQMG provides a network switch so multiple computers can be plugged into the router and it also interfaces with the CPU.



Conclusion

We found it difficult to open the ADSL router because we couldn't find the screws. This led us to wonder if they were hidden due to aesthetics or to stop users opening the router.

Once we opened it up we found that some of the integrated circuits have a lot of connections. We learned that this was because the chips have a lot of transistors condensed into a small space on a silicon chip. For the RAM chip it has a 16 bit data bus which means this alone accounts for 16 connections in and out of both the BCM6338KFBG and the EM638165TS-7G.

We discovered that technology is rapidly outdated. We are now planning to responsibly e-recycle the router.