W5MAE Rootenna HSMM-MESH Node

The Rootenna provides a cost effective way to build a high-gain outdoor mesh node using off-the-shelf parts. It is most conveniently powered using PoE. It can be built in an hour or two for $75-$140. Inspiration for this project was provided by a similar N5OOM project.

Three used WRT54GS v1.1 routers were purchased on eBay for $35 each with free shipping. One of them was bricked with a hardware fault. Routers are also often available on CraigsList. It is advisable to verify the model number before buying a router, see the HSMM-MESH WRT54G descriptions.

The router board must be removed from the router case before mounting in the antenna enclosure. Start by cutting the warranty seal at the seam between the front panel and the bottom panel. Using your thumbs press up on the front panel legs to separate the front panel. It requires moderate force. The top panel can now be separated. The router board can be removed from the bottom panel after removing the screw. The router has two RP-TNC female connectors, a 2.1mm power plug, 4 LAN ports, 1 WAN port, and a reset switch on the rear of the board.

The Rootenna is available from FAB Corp and Titan Wireless. There are 19dBi and 15dBi versions. The Titan Wireless package will require an additional RP-TNC male to SMA male pigtail to connect the antenna to the router, FAB Corp provides an option for the correct pigtail with the antenna package. The Titan Wireless antenna may also require the purchase of the mast mounting bracket, FAB Corp includes the bracket in the antenna package. Titan Wireless has a brick-n-mortar store in Round Rock, TX.
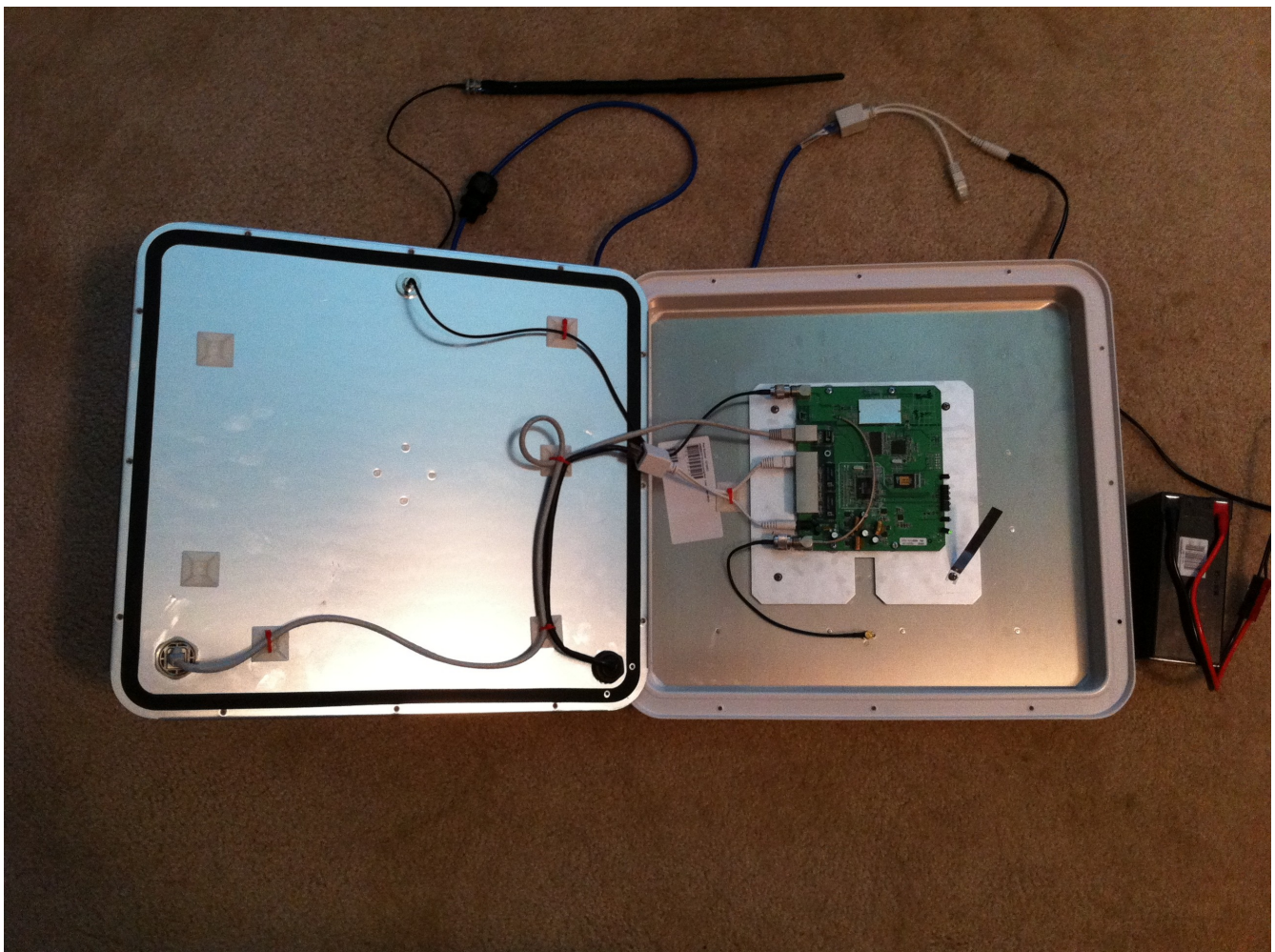
Assembly begins by mounting the Ethernet pass through connector in the back panel. Weather proofing can be assured by using Silicone Adhesive (RTV) of a type with low Acetic Acid out-gassing. An optional RP-TNC male to N female bulkhead pigtail can be added to the node to provide a connection to an external omnidirectional antenna. The additional bulkhead pigtail can be installed by cutting a new hole in the back panel using a step drill bit available at most hardware stores. Additional optional Ethernet pass throughs can be installed to allow for connections to a up-link WAN or a device such as an IP camera.

The router board is mounted to the accessory plate in the enclosure using 3/8" #10 SS sheet metal screws and 1/4" nylon standoffs after drilling appropriate holes in the plate. The Rootenna will be vertically polarized when the antenna SMA connector is at the bottom. It can be horizontally polarized
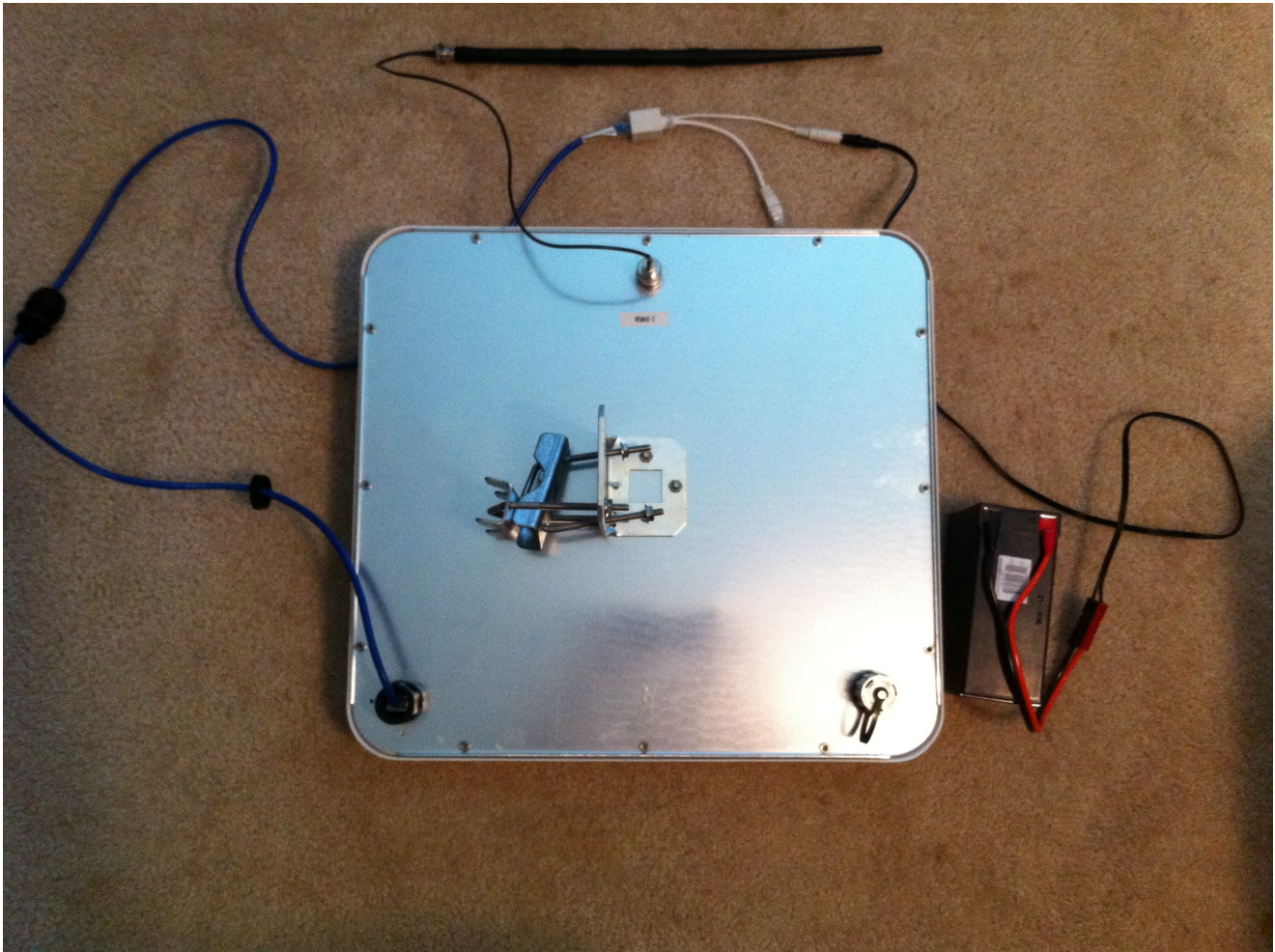
by rotating it 90 degrees. When rotating the antenna, make sure that the small drain holes around the Ethernet pass through are at the bottom of the antenna. The Rootenna antenna pigtail is installed. The optional N pigtail is installed. The optional WAN port Ethernet pass through pigtails are connected to the router WAN port or a LAN port depending on its intended usage.

Power is provided to the router over the Ethernet cable using PoE Power Over Ethernet Injector Splitter Adpater Cable. The $3 parts ships from Hong Kong if you are willing to wait for it. You can also find the same part from US shippers at higher cost. The injector/splitter does not pass the power through to the RJ45 connectors so the drain resistor does not need to be cut on the router board. The splitter assembly is plugged into a LAN port on the router, the power connector is attached, and the Ethernet pass through is connected to the splitter assembly. Mounting Bases for Cable Ties can be used to secure the cables in the enclosure.

Bob WB5AOH suggests the application of a small heat sink to the Broadcom chip to extend its lifetime in hot weather.

Cat5e UTP (outdoor) cable is run from the antenna to the computer or up-link router. The pass through connector is designed to provide a weatherproof seal around the thicker cable. The PoE injector assembly is connected to the computer or up-link router in your shack. I supply power using a 2.1mm Anderson Powerpole Adapter but the wall wart that came with the router can also be used.

The completed project used a different weatherproof Ethernet pass through connector Ethernet | IP67 Connector System: RJ45 In-Line Coupler - Bayonet Lock part 17-10011; however the less expensive External Watertight Ethernet Connector System works fine.

An Ethernet Surge Protector is recommended because lightening EMP seeks to destroy your most valuable equipment.

An RP-TNC Female to N-Male pigtail can be used to connect a rubber duck antenna to the N connector for local mesh node use. The Comet 7.4dBi omni antenna is a typical high gain omnidirectional antenna for local mesh node use.

Parts List

WRT54G, WRT54GL, or WRT54GS wireless router v1.1-v4.0 eBay or CraigsList ~$30

2.4 GHz Rootenna 19dbi panel antenna $85
     with an RP-TNC pigtail
     includes the mast mounting bracket
     includes 1 Ethernet pass through

or

2.4 GHz Rootenna 15dbi panel antenna $48

PoE Power Over Ethernet Injector Splitter Adpater Cable $3

optional [RP-TNC male to N female pigtail](#) $10

optional [RP-TNC Female Bulkhead to N-Male pigtail](#) $10

optional [Ethernet pass through](#) $10

optional [Mounting bases for cable ties](#) $20

optional [Ethernet Surge Protector](#) $28

optional [2.1 mm Anderson Powerpole Adapter](#) $6

optional [Step drill bit](#) $55

optional [Universal Antenna Mount](#) $11

optional [Comet 7.4dBi omni antenna](#) $40

URLs

http://www.fab-corp.com/product.php?productid=2747&cat=0&page=1

http://www.fab-corp.com/product.php?productid=2845&cat=255&page=1

http://www.fab-corp.com/product.php?productid=16160

http://www.fab-corp.com/product.php?productid=16156

http://www.fab-corp.com/product.php?productid=16543&cat=261&page=1

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http://www.titanwirelessonline.com/External-Watertight-Ethernet-Connector-p/pe-pace-3.htm

http://www.titanwirelessonline.com/Comet-2-4GHz-7-4dBi-MESH-Omni-p/at-sf-245r.htm

http://www.powerwerx.com/adapter-cables/21mm-straight-dc-coaxial-power-plug-powerpole-adapter.html

http://www.ebay.com/itm/PoE-Power-Over-Ethernet-Injector-Splitter-Adpater-Cable-/260839924427?pt=LH_DefaultDomain_0&hash=item3cbb4562cb

http://www.homedepot.com/webapp/wcs/stores/servlet/Search?keyword=mounting+bases+for+cable+ties&selectedCatgry=SEARCH+ALL&langId=-1&storeId=10051&catalogId=10053&Ntpc=1&Ntpr=1

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