JIM KANESS SYSTEMS ENGINEERING
4267 Varsity St., Ventura, CA 93003

HIGH PERFORMANCE WIFI ANTENNA

Revised 8 March 2012

INTRODUCTION

The basic design is taken from http://www.mikestechblog.com and I thank Mike for inspiring me to build this antenna. Commonly available electrical and plumbing parts make this antenna economical to build and maintain, and rugged to survive.

The high-power (1000 milliwatt, or 1-watt, or +30 dBm) wireless adapter is located directly below the antenna for minimal radio-frequency (RF) losses. The ”lead in” is a 33-foot (10-meter) long repeatered USB 2.0 cable that connects directly to the computer. Power for the adapter is sent up the USB cable from the computer.

This antenna provides me a “five bar” 54-megabit (802.11g) connection to one commercial WiFi provider 1,000 feet (300 meters) distant, a “five bar” 11-megabit (802.11b) connection to a second provider one-half mile (800 meters) distant and a “four to five bar” 11-megabit (802.11b) connection to a third provider 2.4 unobstructed miles (3.8 km) distant. These are not just “signals seen” but accounts used operationally by me.

CONSTRUCTION DETAILS

Start with a length of 4-inch (102 mm.) diameter galvanized steel dryer vent from a local plumbing shop. Cut off 13.5 inches (343 mm.) for the antenna. A metal abrasive blade in a 10-inch chop saw may be used to provide square cuts.

Some of the leftover duct can be opened up and flattened for making the end cap. Set one end of the duct down on the flat piece and draw around the duct with a marking pen to indicate the duct size. Draw another circle on the flat piece about one-inch outside the first circle. Cut along the larger circle. Then make lots of radial cuts (about 3/8" or 9 mm. apart) from the outside to the inner circle and bend up the resulting tabs to form a cap that will fit snugly over the end of the duct nearest the coax connector. Holding the cap snugly against the end of the duct, wrap black electrical tape over the tabs to hold them down. Then secure the cap with one of the 4" clamps (discussed below) over the tape.

Two 4-inch (102 mm.) duct or hose clamps are used to attach the flare at the front end and the cap at the rear end, and to help keep the duct round. Two 3-inch (76 mm.) single-hole electrical conduit hangers (Minerallac #7) are used to secure the duct and the PVC electronics housing. One of these is put in a vise to spread out the base so it will reach around most of the 4-inch duct. A 2 ½-inch (64 mm.) long ¼-20 bolt and nylon stopnut secures the hanger to the duct. Two 1-inch (25 mm.) single-hole conduit hangers (Minerallac #2B) are used to attach the antenna to the pole, a 10-foot length of 1-inch EMT or PVC pipe. All four conduit hangers are attached to a 1-inch by 5-inch (25 mm. By 125 mm.) framer's tie plate (Simpson TP15) which has a quarter-inch (6 mm.) of the long edges bent up to form a channel or cradle to keep the 3-inch hangers from rotating. The four hangers are attached to the tie plate using two ½" long (12 mm.) ¼"-20 bolts and nylon stopnuts. This mounting design puts the entire antenna to one side of the pole so the antenna may be mounted anywhere along an existing pole as well as at the top.

A 4" to 6" (102 to 152 mm.) long tapered flare adapter (a heating duct part by Wellmade) is used for the front extension but this may be left off if it is too hard to find. A round piece of polyethylene is fitted into the groove of the flare to discourage birds from nesting in the antenna!

The dipole radiator inside the duct is made from a Type-N female bulkhead connector and 1.25" (32 mm.) of #14 solid copper wire soldered to the center pin of the N-connector. The N-connector is a single-hole bulkhead connector that inserts from the outside of the duct and secures with a 19 mm. (wrench size) nut on the inside of the duct. As needed, use some ½" washers over the N-connector on the outside of the duct to ensure the connector only protrudes inside the duct just enough to secure its mounting nut. The dipole radiator is located 1.75" (44 mm.) from the rear wall of the duct and stands 1.25" inch (32 mm.) high from the inside wall of the duct.

The Realtek RTL-8187L high power USB WiFi adapter is protected from weather inside a 7.5-inch (about 190 mm.) length of 3-inch (76 mm.) inside diameter PVC thin wall sewer/drain pipe mounted just below the antenna for minimal RF losses. A 3-inch (76 mm.) single-hole electrical conduit hanger is used to attach the PVC adapter housing to the antenna.

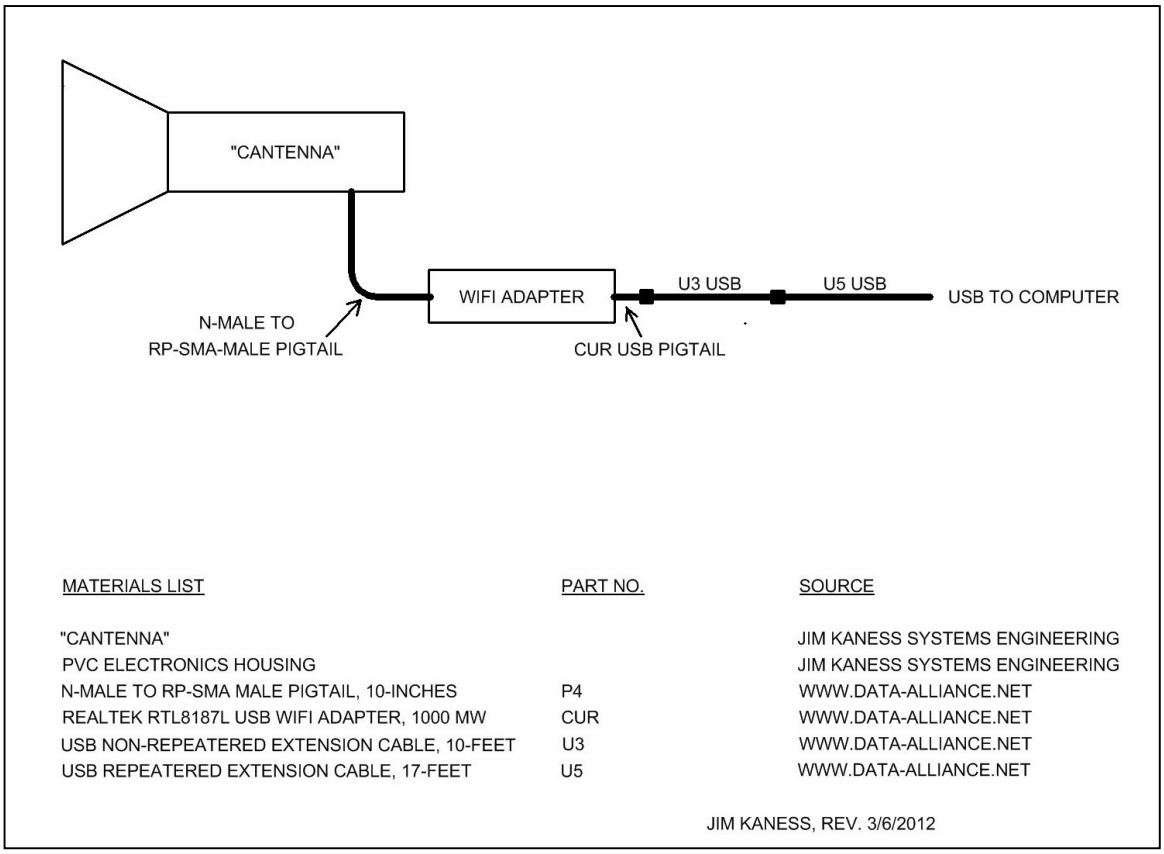
This PVC pipe is capped at each end with a PVC pipe cap. Each cap is slotted (about 1/4-inch or 6 mm. wide slot) lengthwise to provide a small opening for the cable entering through it, and for any rainwater to leak out of. The two caps are not glued to the pipe but are simply pushed snugly onto the pipe with the slots pointing toward the ground.

ELECTRONICS CONNECTIONS

A 10-inch (254 mm.) N-male to RP-SMA-male pigtail connects between the antenna N-connector and the RP-SMA antenna connector on the Realtek WiFi Adapter. The USB pigtail from the adapter connects to a 10-foot (3-meter) length of USB 2.0 cable (A-female to A-male) that connects to a 17-foot (5 meter) repeatered USB cable that

connects to the computer USB port. The USB and RF connections are flooded with silicone grease before connecting to waterproof them.

DRAWINGS AND DIMENSIONS



MATERIALS LIST	PART NO.	SOURCE
"CANTENNA"		JIM KANESS SYSTEMS ENGINEERING
PVC ELECTRONICS HOUSING		JIM KANESS SYSTEMS ENGINEERING
N-MALE TO RP-SMA MALE PIGTAIL, 10-INCHES	P4	WWW.DATA-ALLIANCE.NET
REALTEK RTL8187L USB WIFI ADAPTER, 1000 MW	CUR	WWW.DATA-ALLIANCE.NET
USB NON-REPEATERED EXTENSION CABLE, 10-FEET	U3	WWW.DATA-ALLIANCE.NET
USB REPEATERED EXTENSION CABLE, 17-FEET	U5	WWW.DATA-ALLIANCE.NET

JIM KANESS, REV. 3/6/2012

The finished antenna measures about 19 inches (483 mm.) long, 8 inches (203 mm.) high, and 8 inches (203 mm.) wide, and weighs about 3 pounds (1.4 kg.) without the USB cable.

The gain of this antenna has not been measured. Experience shows that, when using your laptop built-in wifi, if you can barely see the signal you want to use, and have trouble connecting to it, using this antenna will give you 5 bars and a solid connection.

THIS ANTENNA IS AVAILABLE TESTED AND READY TO INSTAL AND USE FOR US$180 PLUS SHIPPING. POLE NOT INCLUDED. Contact me.

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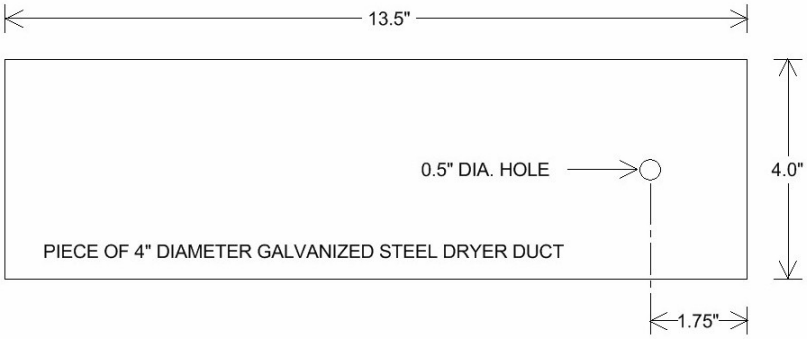
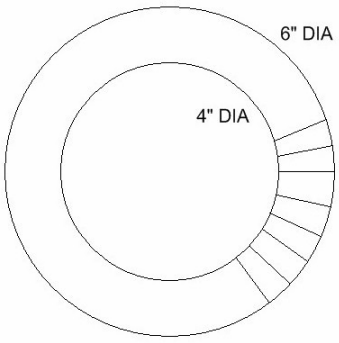
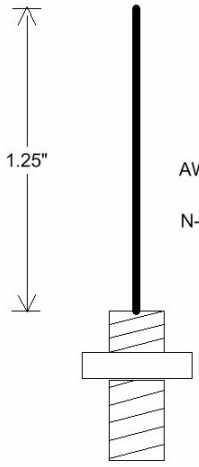




END CAP REFLECTOR
GALVANIZED STEEL
MAKE RADIAL CUTS ALL AROUND
BETWEEN THE TWO CIRCLES
AND BEND UP TO FORM A CUP
TO FIT OVER END OF DUCT



DIPOLE RADIATOR
SHOWN LARGE FOR CLARITY

2440 MHZ WIRELESS INTERNET "CANTENNA"
CONSTRUCTION DETAILS
JIM KANESS, www.jimkaness.com
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