宽带有源环形接收天线

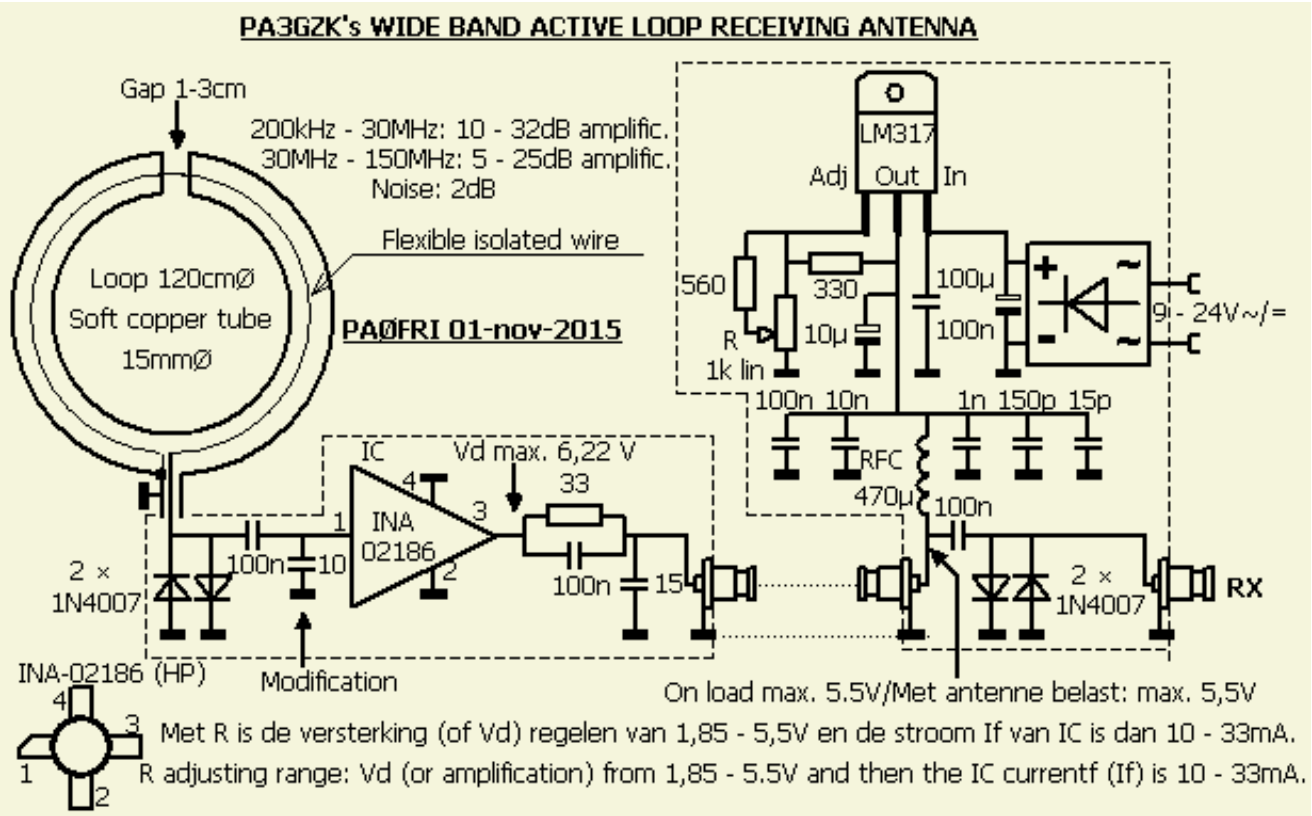
PA3GZK **03 -jan-2018**

WebSDR Weert（荷兰）使用这种有源环形天线。

在我的花园中留下了我的绿色环型作为独特的“灌木丛”，在 PA3GZK 的花园右侧留下了本文所述的试用模型。

介绍

如果没有足够长度的天线来接收无线电信号，那么小型有源天线可能是解决方案，您可以在互联网上找到许多相关的出版物。如果您想要一个能够减少或抑制干扰信号的系统，大多数文章都不合适！以下设计具有降噪质量，您可以通过收听本文后面的 MP3 文件来确认它！



PA3GZK 以各种形式构建了许多有源天线，并进行了广泛的实验。这里描述的天线（上图）给出了迄今为止最好的性能，它是各种电路和系统的许多测试的最终结果。对于功能正常的天线以及系统的基本对称性，建议尽可能遵循机械结构。

对我来说，接收减少了干扰噪声，特别是减少了对 160 和 80 m 频段的干扰。其他火腿也受到了系统的青睐。大约 16 公里外的人在 80 米处听不到，但他的天线是一个带有反射单元的 SWL 天线。

一般说明

所提出的屏蔽宽带（~200 MHz）有源环形天线提供更安静且相对较少的干扰接收。众所周知，用于发射的天线也可以很好地用作接收机天线，只能忘记所有干扰信号都是成比例的。因此 PA3GZK 认为你实际上必须使用两个天线，一个用于发射，一个用于接收。后者在较低频段最需要。

这种天线受到作为偶极子或其他类似天线的衰落（QSB）的影响要小得多。导致最大干扰的近场中的电场被很好地抑制，因为该场内的天线将主要响应于 H 场。通过转动天线，干扰几乎可以被抑制为零而不会丢失所需的 NVIS 信号。对于 DX 信号，建立了方向灵敏度。与参考天线相比，该环路平均具有一个 S 点降低的接收。使用经典的 80 米 Zepp 天线作为参考，高度为 20 米，而环路安装在 2 米长的管道上。有源天线的信噪比或信号干扰比要好得多，请听本文中的 MP3 文件。

实际上，120 厘米直径是所需信号和减少干扰之间经过验证的折衷方案。较大或较小的型号对于接收或干扰强度降低的程度是不利的。我没有在其他出版物中遇到建议的最大尺寸。进一步表明接触天线的叶子对操作没有明显的负面影响，因此在树上挂起或伪装不是问题。

天线采用 15 mm 软铜管制成，设计为屏蔽对称环路。这样做是为了尽可能地减少周围导电物体（例如树木，栅栏和大门）的干扰影响。在使用先前的结构和模型进行测试期间，对称结构的轻微干扰会影响噪声抑制的程度。

有源环形天线可以安装在发射天线附近而没有问题。PA3GZK 使用距接收天线 4 米远的发射天线，尽管有时发射功率为 1KW，但仍然完好无损。

录制 MP3 文件

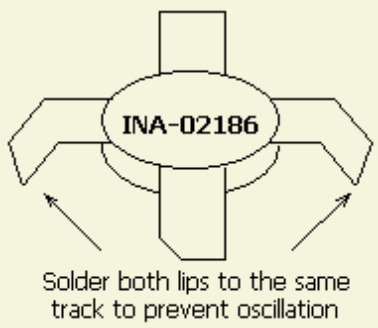
PA3GZK 使用调谐到 80 米波段的 Kenwood TS-480 和距离 500 米远的农场发出的噪声信号进行了测试。记录在 80 米 Zepp 天线或直径为 3.7 米的磁环天线之间切换。旋转有源环形天线，以便抑制干扰信号。顺序是：前 10 秒 Zepp - 10 秒。大磁（发射）回路 - 10 秒。Zepp - 10 秒 主动循环 - 10 秒 Zepp - 最后一个活动循环。点击 MP3-1。

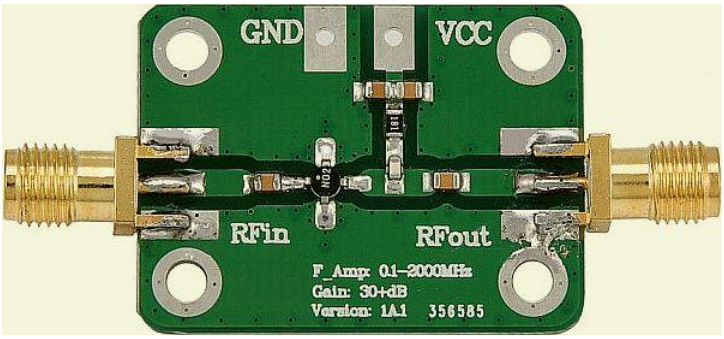
接下来的测试是关于 ZEPP 和有源天线之间的区别。在两个天线之间切换了几次。点击 MP3-2。

在测试中，如果有效环路在约 500 米距离处从“干扰”源引导或转向，您将听到差异。点击 MP3-3。

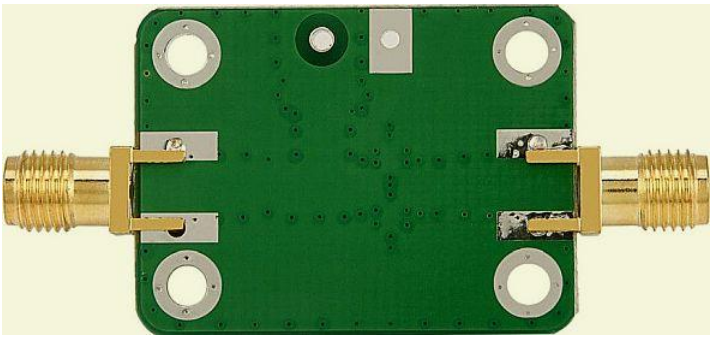
所有测试均以荷兰语进行。

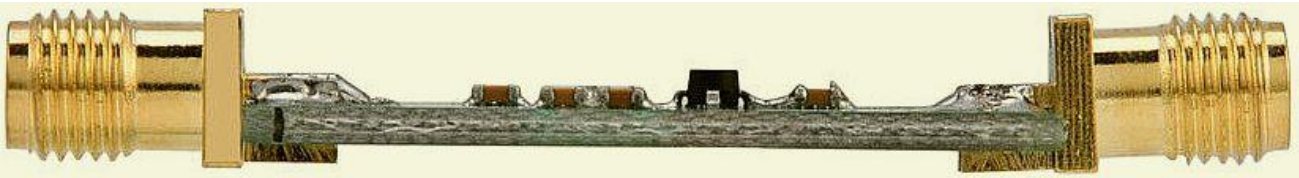
IC INA-02186





IC INA-02186 现已成为“复古”，读者邮寄了更多现代型的产品。但是，PA3GZK 经历过后继者不能很好地抵抗超载。 该 IC 仍然通过 eBay 提供。





Dave Bunyan 在 eBay 上发现了一块现成的放大器板，当他仔细观察我们板上 MMIC 的照片并将其与现成板上的 MMIC 进行比较时，它们看起来都是相同的 - MMIC 显示的是 N02。他写道：“eBay 广告上的增益/频率曲线与 INA-02186 数据表中的相同。完整的 PCB（5.2×2.4 cm）可能会让您和其他可能想要尝试循环的人感兴趣。保护二极管和输入端的 10 pF 电容以及输出端的 15 pf 电容应该很容易。对于同轴

电缆的上电，Vcc 和 sma 连接器的中心引脚之间的 RF 扼流圈可以工作 - 我希望没有不稳定 - 以及用于输出的 SMA 到 F 连接器适配器"。

它花了我很长时间，但我终于得到了屏蔽磁环的工作模型。它使用 E-bay 提供的电路板。

一个重要的区别。我在 BN-73-202 核心上使用 1:1 巴伦接口。它安装在 stripbroad 上，上面有一个公头 PCB 连接器，便于连接前置放大器。结果非常令人印象深刻 - 我无法进行适当的比较 - 但是今天晚上我正在收听来自顶级乐队的 DK1 和 DF1 的清晰 CW 信号。当我是 G4XHN（1983-1988）时，我无法使用顶级乐队它是如此嘈杂。我在 QSO 听到了 JK1P，在 80 米处有一个葡萄牙站。通过同轴电缆馈送的短偶极子会产生更差的信号 - 但我只能用于短波/中波。

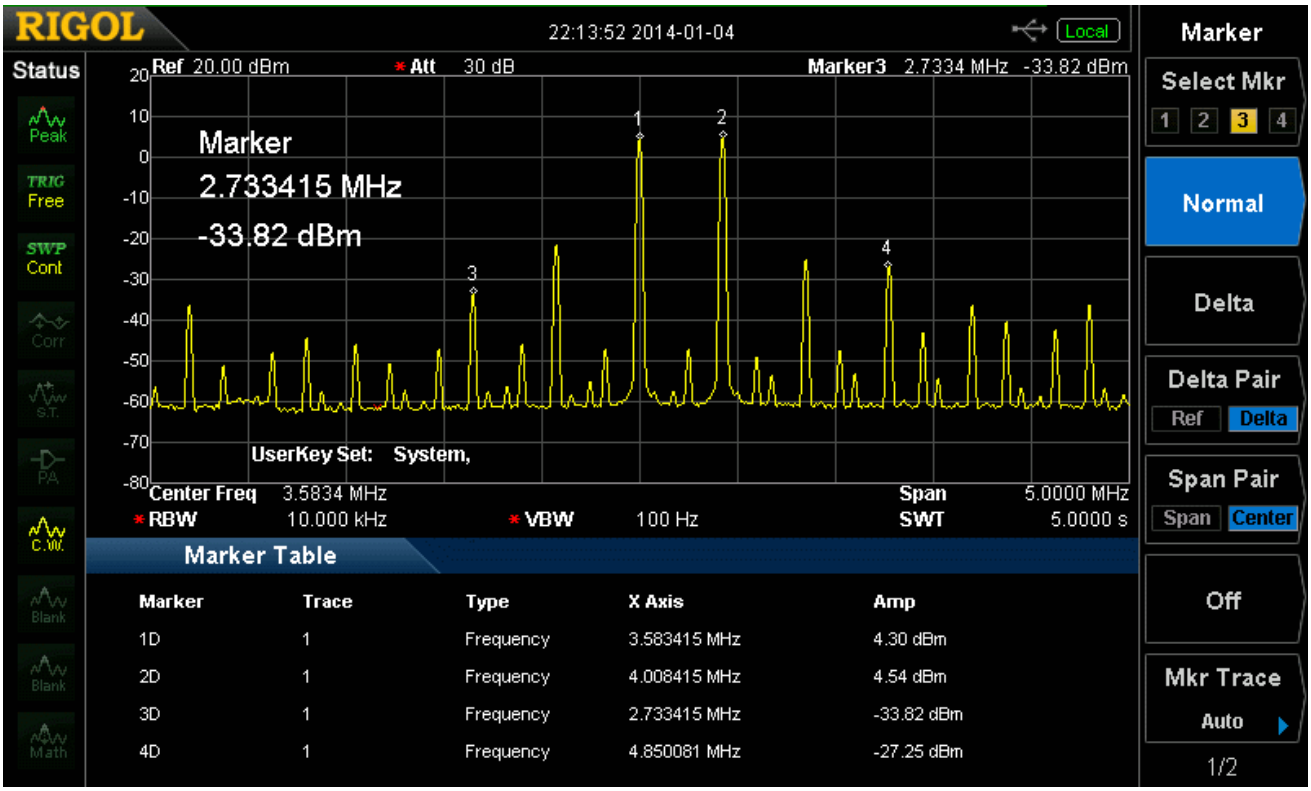
该环路在 LW 广播频段内提供良好的信号，而不会改变输入电容（100nF） - 电路图中的相同值。它在 FM 频段中运行良好 - 我将在 Es 赛季开始时在 50 MHz 和 66-74 MHz 俄罗斯 FM 频段进行测试。

该环路为 SDRPlay RSP 供电，我必须先安装 10dB 衰减器。如果没有衰减器，即使增益向右转，LNA 关闭，也会有互调杂散干扰。

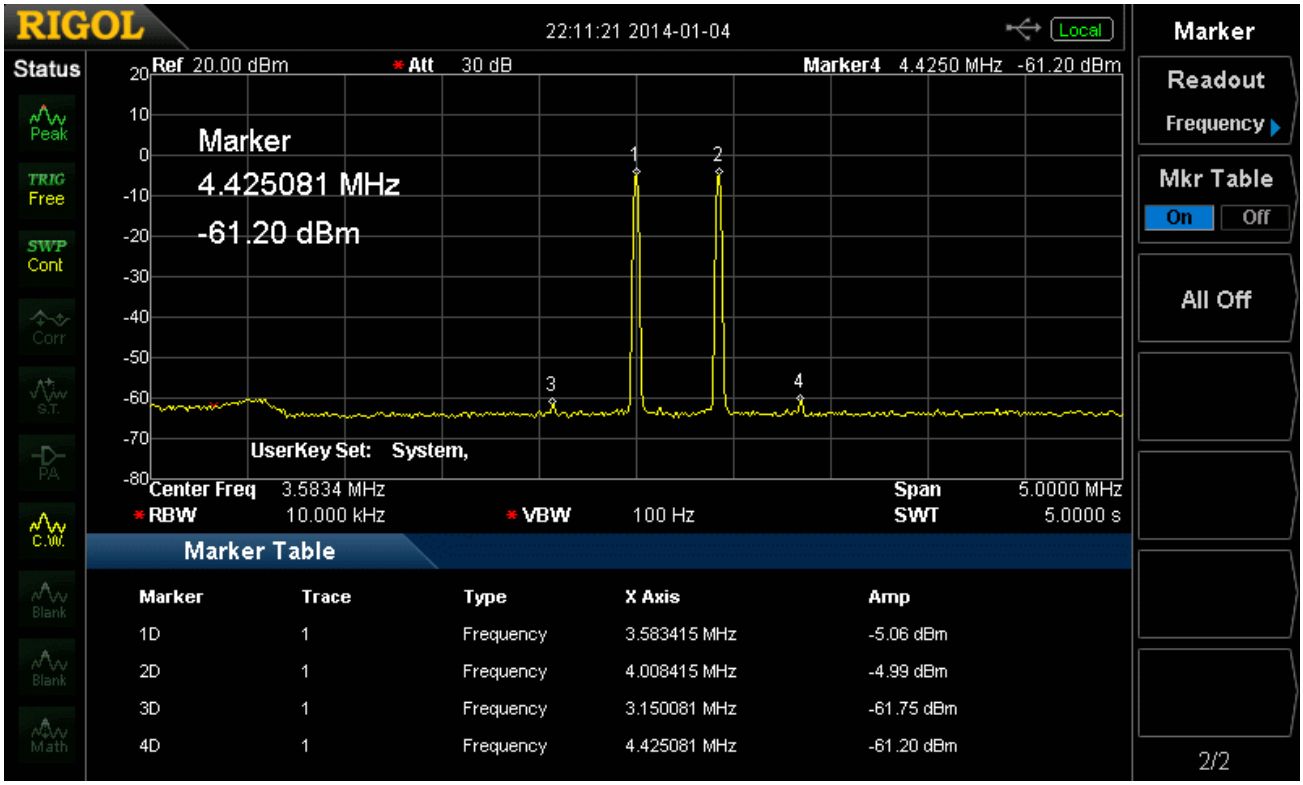
感谢您发布该文章。

大卫

互调



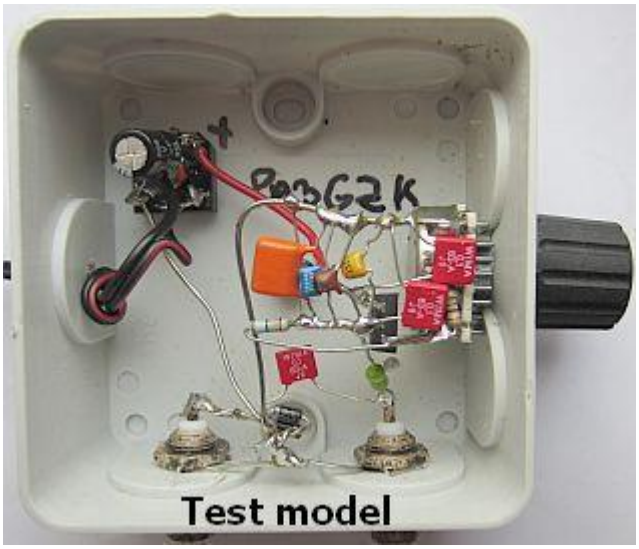
标记 1D = 2 音频发生器 3.58 MHz　　标记 2D = 2 音调发生器 4 MHz　　标记 3D = intermod 信号 3 的顺序= -33dBm　　标记 4D = intermod 信号 3 的顺序= -27dBm　　放大器输入端的发生器电平为-26 dBm（S9 + 50 dBm）。天线不太可能接收到如此强的信号。

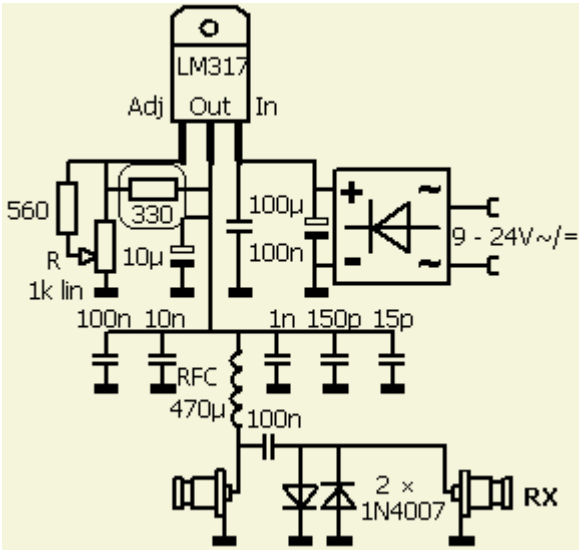


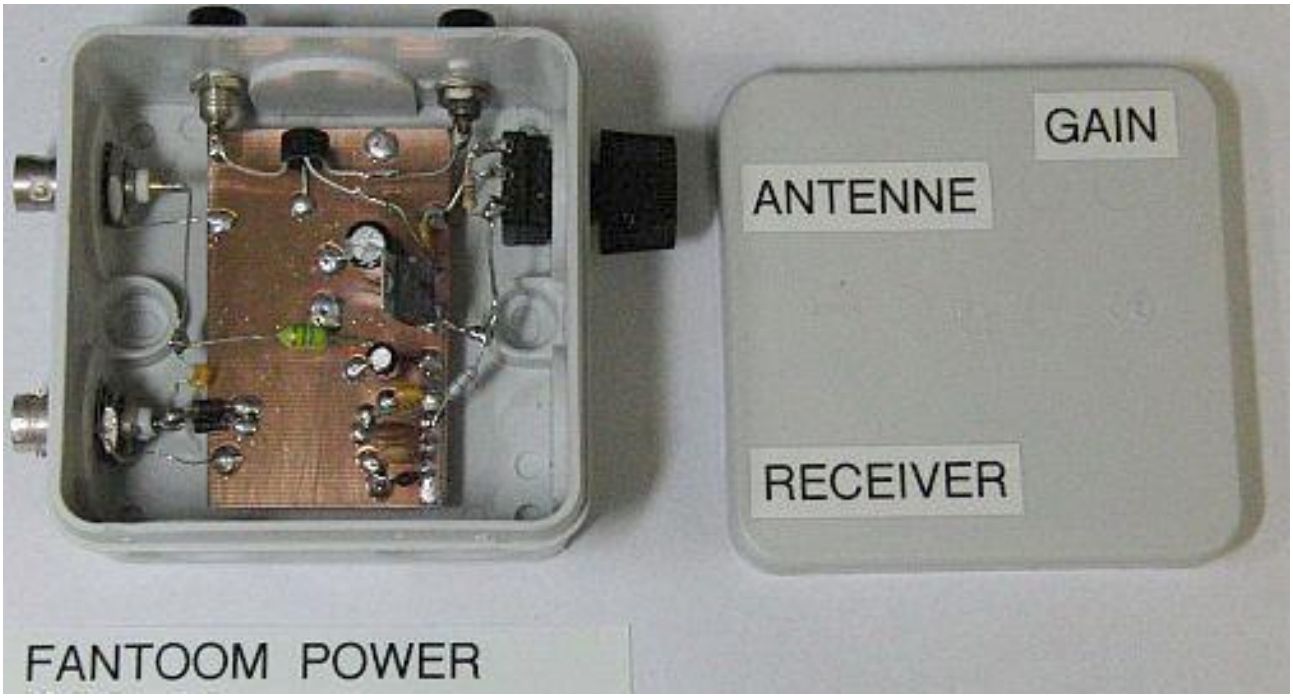
标记 1D = 2 音频发生器 3.58 MHz　　标记 2D = 2 音调发生器 4 MHz　　标记 3D = intermod 信号 3 的顺序= -55dBm　　标记 4D = intermod 信号 3 的顺序= - 55 dBm　　放大器输入端的发生器电平为-36 dBm（S9 + 35 dBm）。　　很明显，只有非常强的信号才能使放大器过载。

装配

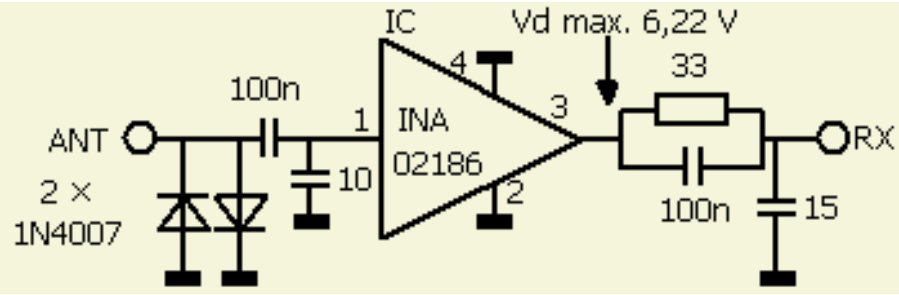
这些组件与曼哈顿系统一起安装，即焊接岛是胶合 PCB 条带。

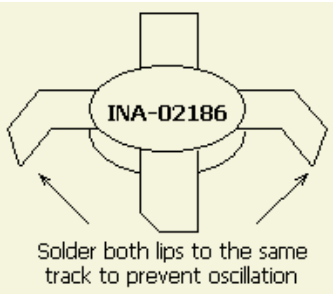


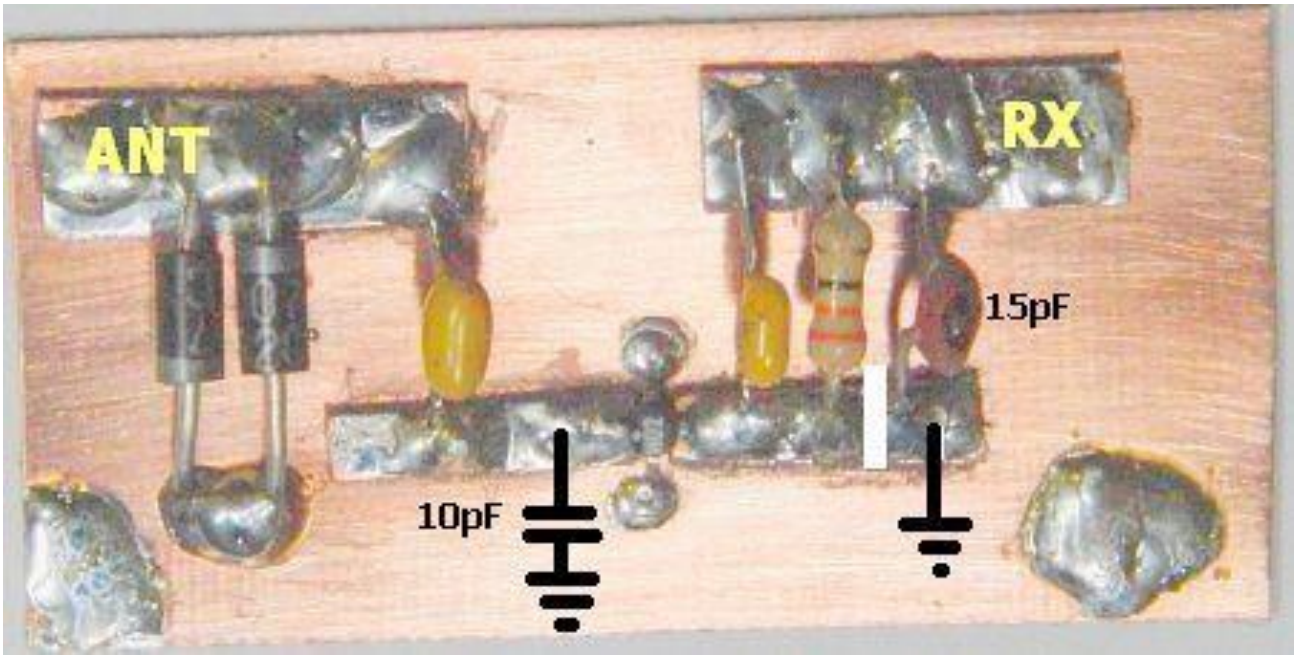




在先前的示意图中，330 欧姆电阻器为 240 欧姆。有时 IC 使用短同轴电缆自激，因此电阻增加，IC 的电源电压降至 5.5 伏。







该 INA02186 具有较高的增益，良好的接地连接是必不可少的。 一些 DIY 业余爱好者不得不处理引起的自激。为了防止不稳定确保输入输出信号有一个直接的通道，不要分开加工焊接，沿着信号通道在一块板子上按顺序直通焊接。

POTMETER R

事实证明，调整 R 以获得最小噪声是最好的，而不是最大 S-meter 读数。然后信噪比是最佳的。这里的电路由 13.8 V 供电。如果测量仪表转得太远，系统会振荡并产生强烈的噪音。当调整电阻 R 减少时噪音停止。当 R 从 13.8 V 电源设置为 5.5V 约 30 mA 时，我觉得的最佳效果。

机械结构　配件

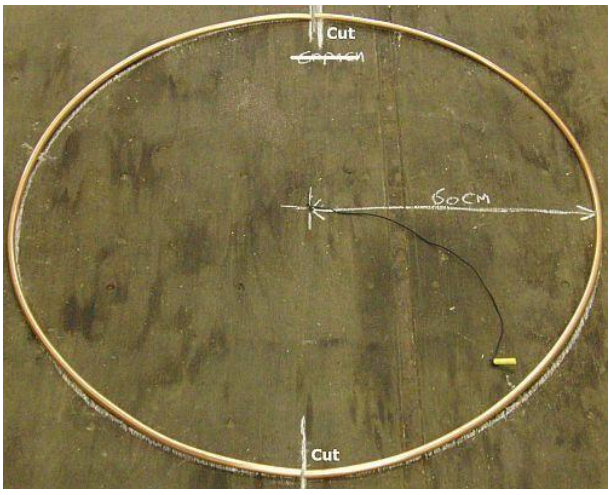
“硬件”

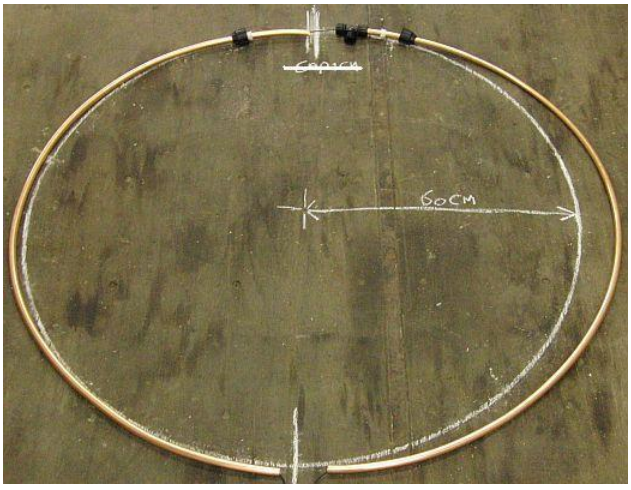
软铜管长 **15** 毫米，长 **4** 米。	黄铜 **T** 片 **15×22×15** 厘米压缩配件。
黄铜端盖 **22 mm** 压缩接头。	铜管 **22** 毫米长 **15** 厘米。
塑料 **T** 片 **15×15×15mm**。	**PVC** 或聚酯管 **32** 毫米长 **160** 厘米。
千思板 **6** 毫米×**13** 厘米。	不锈钢螺纹杆 **M6 4** 螺母和垫圈。
PL femail 机箱连接器	**IC 02-186 INA** 在 **eBay.com** 上发售

数据表可以在 **Alldatasheet.come** 找到

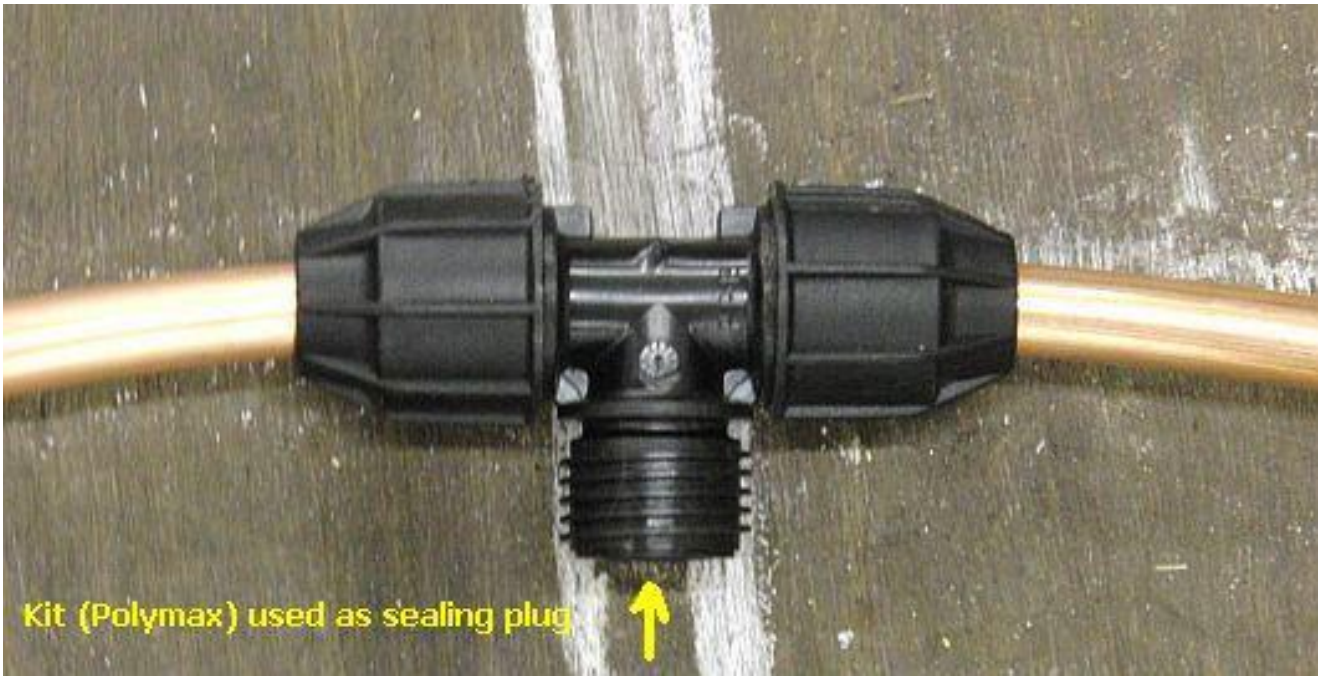
除 IC 和 PL 机箱外，可以在常规硬件商店中获取其他项目。

对于敏锐的 DIY，以下图片将足够清晰，以成功构建天线。之前的设计采用厚同轴电缆制造，但目前的结构更易于组装，各种机械部件是标准配置。

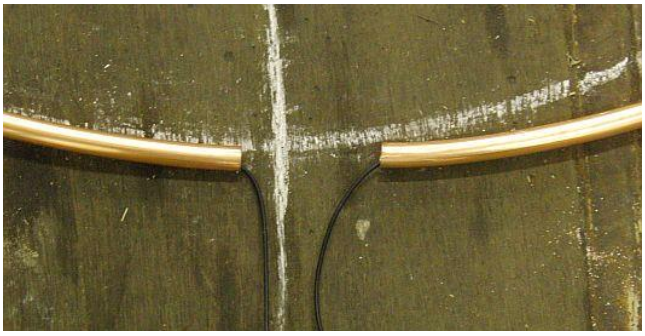


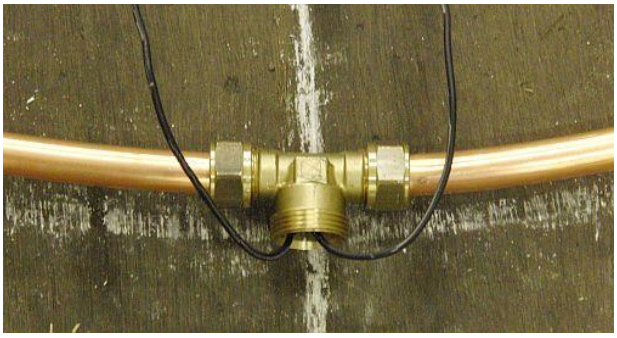


15 毫米直径的软铜管（来自五金店）长 4 米，实际上有两个易弯曲的 2 米长的碎片。“弯曲轨道”标有蜡笔和一根绳子。　（用一根绳子为圆的半径用蜡笔或粉笔画出尺寸图纸）

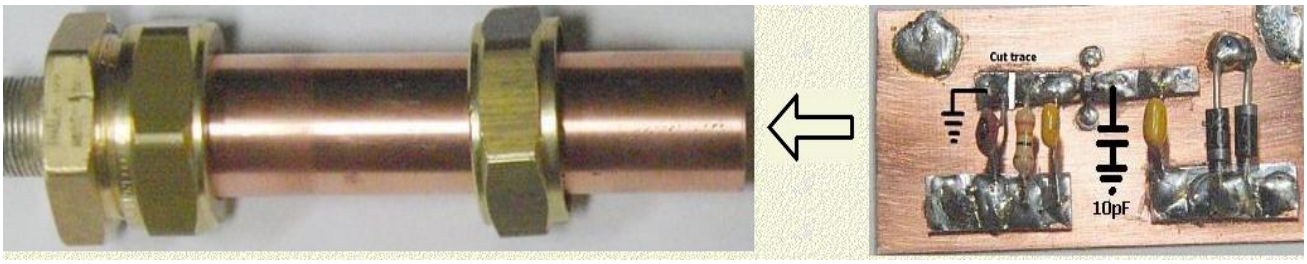


安装在立管上的塑料 T 型连接器用合适的套件（如 Polymax）密封，以避免任何漏水或冷凝。

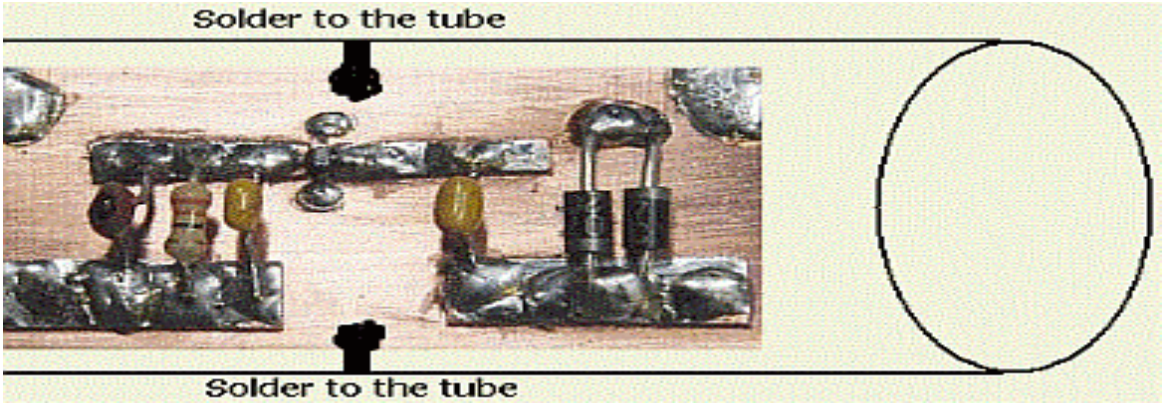




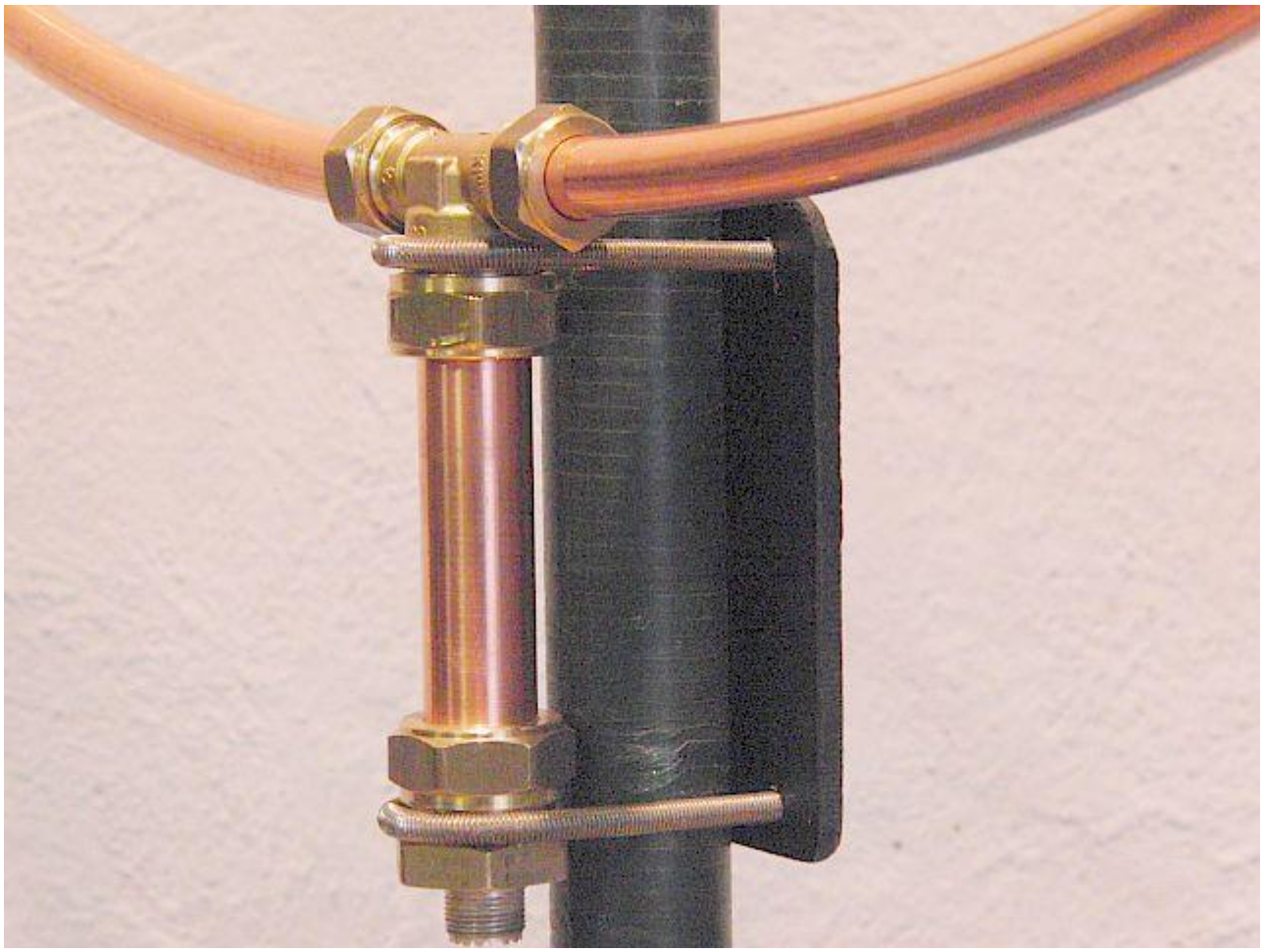
柔性绝缘线不需要在铜管中心布置，只要穿过铜管就可以。



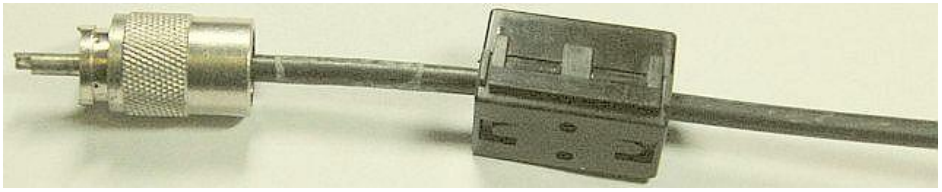
将放大器滑入 22 毫米铜管中。使用合适的烙铁在管内部焊接 PCB 的质量。也可以在柔性线的一侧使用该点。将导线的另一侧焊接到放大器的输入端。



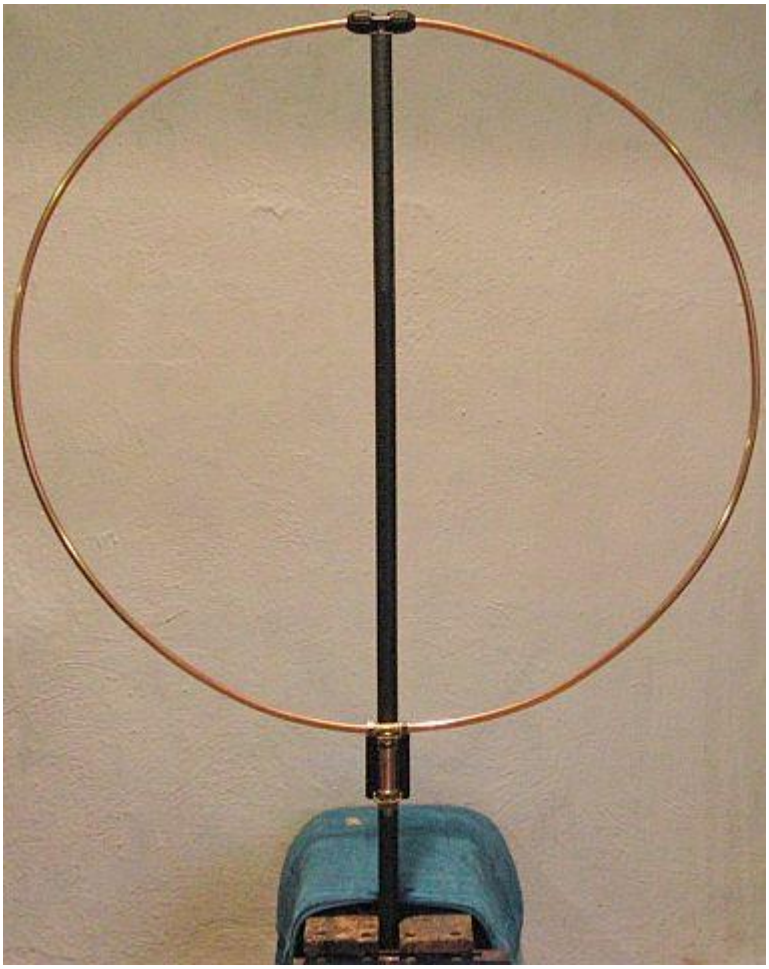
将 PCB 的两侧焊接到管的内侧（“无花果”）。 首先将粗线焊接到管上，然后将 PCB 焊接到电线上。



EMI / RFI



在以前的型号中，使用了更多的塑料部件。同轴电缆的外护套用作发射信号的天线，从而扰乱了 IC 放大器的操作。为了抑制扼流圈巴伦被安装。在这里提出的模型中，没有必要使用扼流圈。但是，如果发生任何不稳定性，可以使用电缆抑制器。



您可以对天线进行喷漆，但氧化铜不会影响天线的运行

PA3GZK

以上信息必须足以 DIY。在遇到问题的极端情况下，请通过电子邮件联系 PA3GZK：pa3gzk @amsat.org，但尽可能限制电子邮件流量！他仍然会通过仔细阅读本文来收到本可以预防的问题。

以上全文为谷歌自动翻译 如有阅读不通畅之处 请自行理解 下面为原版文章资料

PA3GZK's WIDE BAND ACTIVE LOOP RECEIVING ANTENNA

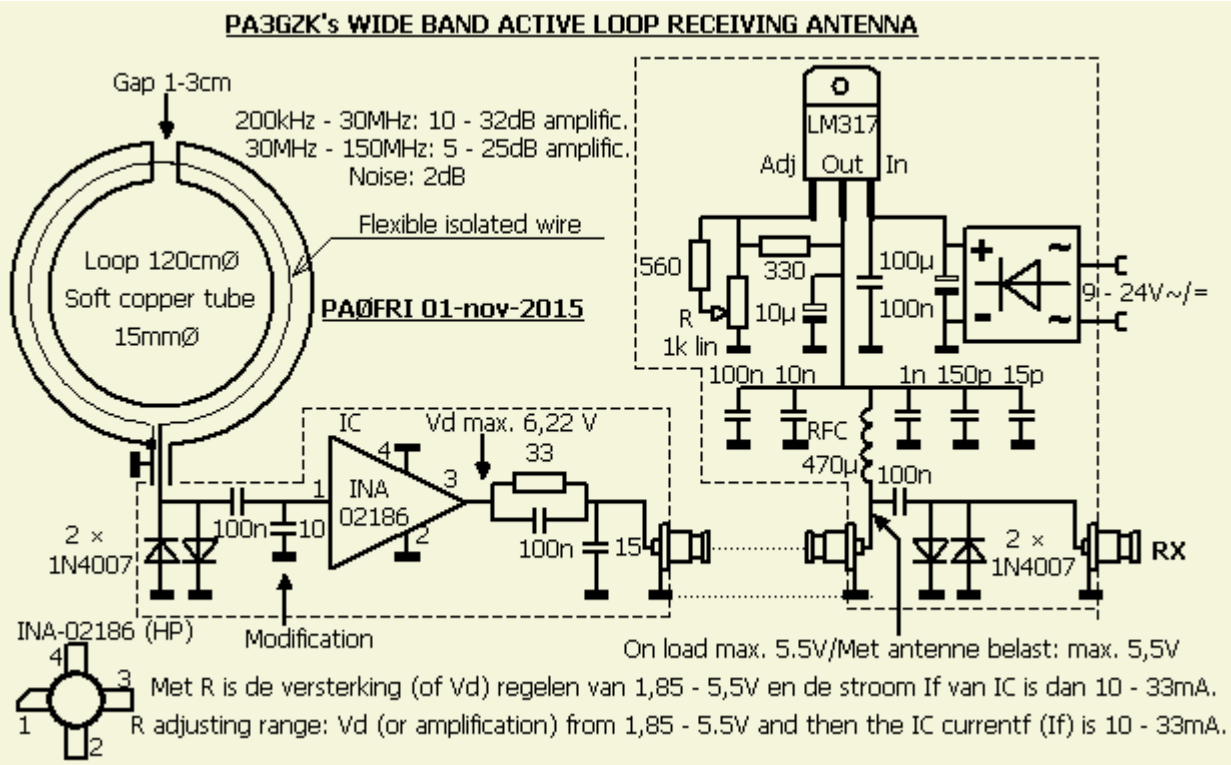
UPDATED **03-jan-2018**

WebSDR Weert (NL) use this active loop antenna.


PA0FRI's antenna

Left my green coloured loop as distinctive "bush" in my garden and on the right in PA3GZK's garden his trial model as described in this article.

INTRODUCTION



If one has no place for an antenna of sufficient length for receiving radio signals, a small active antenna may be the solution and you may find on the Internet a lot of related publications. If you want a system that is able to reduce or suppress interfering signals, most articles are not appropriate! The following design has that noise cancelling quality, you can confirm it by listen to MP3 files later in this article!

PA3GZK has built quite a number of active antennas in various forms and he experimented extensively. The antenna described here (fig ») gave by far the best performance and it was the final result of many tests with various circuits and systems. For a properly functioning antenna, and a substantial symmetry of the system, it is recommendable to follow the mechanical construction as well as possible.

For me, the reception decreased the interfering noise especially in reduced interference on the 160 and 80 m bands. Other hams have also found favour with the system. Someone about 16 kilometres away could not listen on 80 m, but he was a returned SWL with an antenna made PA3GZK.

GENERAL DESCRIPTION

 The proposed shielded broadband (~200 MHz) active loop antenna offers more quiet and relatively less interference reception. It is known that an antenna for transmit also works well as a receiver antenna, one only forget that all interference signals are proportional strong. Therefore PA3GZK believe that you actually have to use two antennas, one for transmit and one for receive. The latter is most needed at the lower frequency bands.

This antenna is much less affected by fading (QSB) as a dipole or other similar antennas. The E-field in the near field that causes the most interference is very well suppressed, because the antenna within this field will primarily responsive to

the H field. By turning the antenna the interference can be almost zero suppressed without losing the desired NVIS signal. With DX signals, there is a directional sensitivity established. Compared with a reference antenna the loop has a one S point decreased reception on average. A classic 80 meters Zepp antenna was used as reference at a height of 20 meters, while the loop was mounted on a 2 meters pipe. With active antenna the signal to noise ratio or signal to interference ratio was much better, listen to MP3 files in this article.

The 120-cm diameter is in practice a proven compromise between desired signal and reduced interference. A larger or smaller model is disadvantageous for reception or the extent to which the strength of interference decreases. I have not encountered the recommended maximum size in other publications. Further showed that leaf touching the antenna has no appreciable negative impact on the operation, so hang or camouflage in a tree is not a problem.

The antenna is built with 15 mm soft copper tube and is designed as shielded symmetrical loop. This was done in order to minimise the disturbing influence of the surrounding conductive objects such as, trees, fences and gates, as far as possible. During testing with previous structures and models, it occurs that a slight disturbance of symmetrical construction affects the degree of noise suppression.

The active loop antenna can be installed close to a transmitting antenna without a problem. PA3GZK use the transmitting antenna 4 meter away from the

receiving antenna, which is still intact despite sometimes 1 KW transmitter power.

RECORDING MP3 FILES

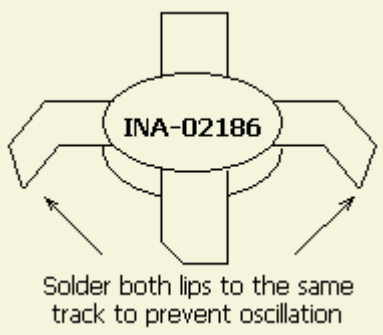
PA3GZK did the test with a Kenwood TS-480 tuned to the 80 meter band and the noise signal from a farm about 500 meters away. The recording is switched between a 80 meter Zepp antenna or a magnetic loop antenna having a diameter of 3.7 meters. The active loop antenna was rotated such that the interference signal was suppressed. The sequence was: the first 10 seconds Zepp - 10 sec. the big magnetic (transmitting) loop - 10 sec. Zepp - 10 sec. active loop - 10 sec. Zepp - at last active loop. Click on MP3-1.

The next test is about the difference between ZEPP and active antenna. PA3GZK switched several times between the two antennas. Click on MP3-2.

In this test, you will hear the difference if the active loop is directed or turned from the "jamming" source at about 500 meters distance. Click on MP3-3.

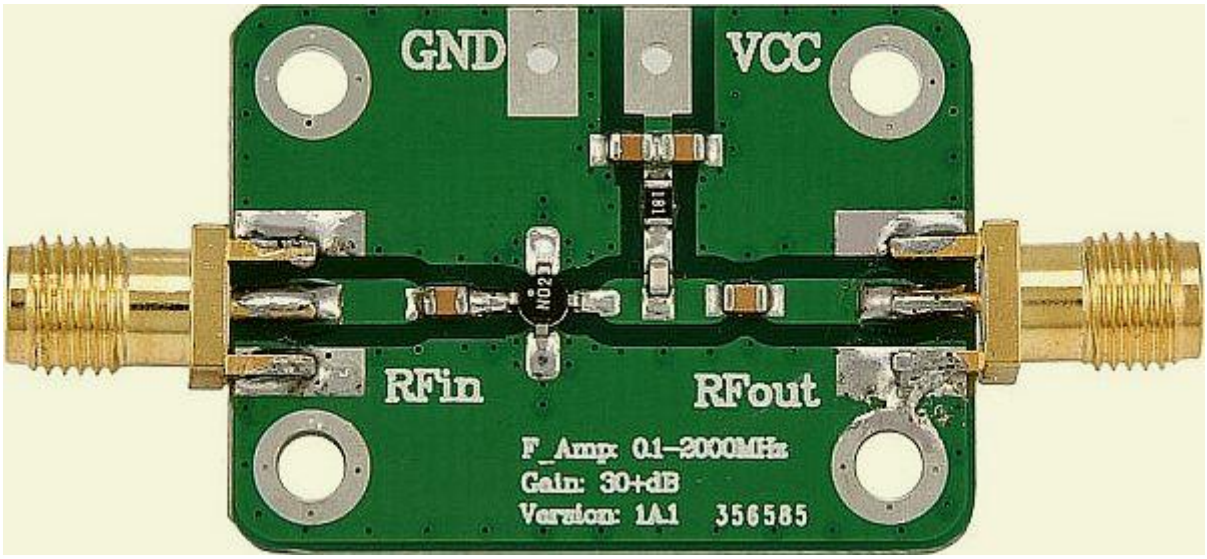
All tests run in the Dutch language.

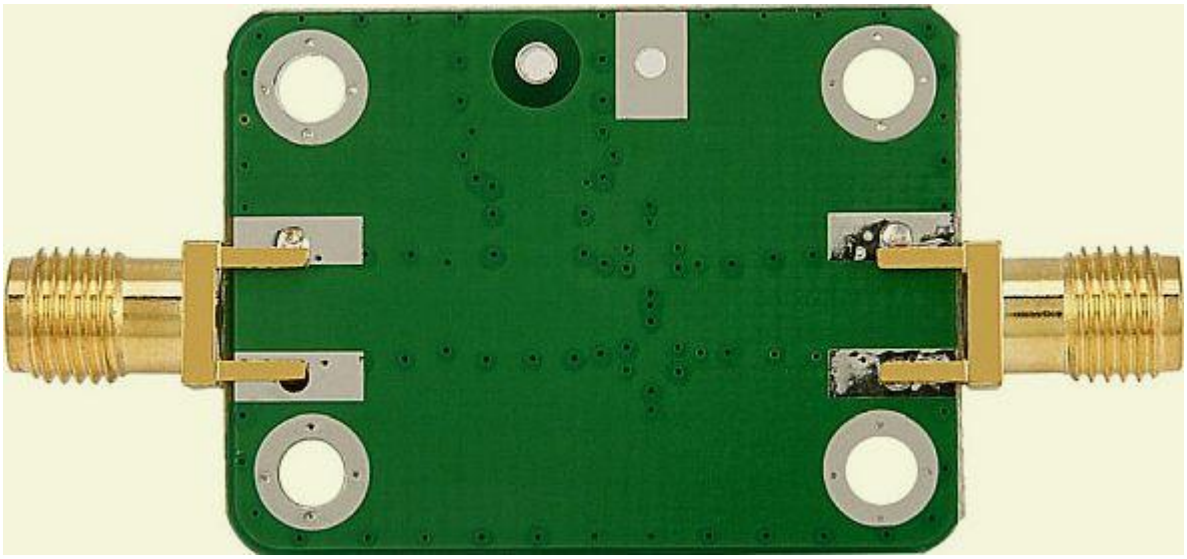
IC INA-02186

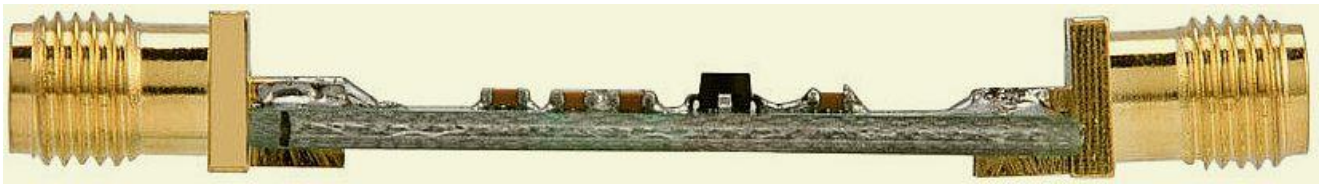


IC INA-02186 has now become "vintage" and readers mailed that more modern types are on the market. However, PA3GZK has experienced the successors are not as well resistant to overloading.

The IC is still offered via eBay.







Dave Bunyan found on eBay a ready built amplifier board and when he looked closely at the photos of the MMIC on our board and compared it to the MMIC on the ready made board they both appear to be the same - the MMIC showing the number N02. He wrote: "The gain/frequency curve on eBay ad is identical to that

on the INA-02186 datasheet. The complete PCB (5.2 × 2.4 cm) may be of interest to you and others who might want to try the loop. Adding the protection diodes and the 10 pF capacitor at the input and the 15 pf capacitor on the output should be easy to do. For powering up the coaxial cable an RF choke between the Vcc and the centre pin of the sma connector would work - I hope without instability - and SMA to F connector adapter for the output".

It has taken me a long time but I have finally got a working model of the shielded magnetic loop. It uses the board available from E-bay.

One important difference. I am using a 1÷1 balun wound on an BN-73-202 core. This is mounted on stripbroad and has a male sma PCB connector on it to make connection to the pre-amplifier easy. Results are very impressive - I cannot do a proper comparison - but I was listening to clear CW signals from DK1 and DF1 on Top band this evening. When I was G4XHN (1983-1988) I could not use top band it was so noisy. And I heard JK1P in QSO with a Portuguese station on 80 m. A short dipole fed through coax gives much poorer signals - but is all I had for short wave/medium waves.

The loop gives good signals in the LW broadcast band, without changing the input capacitors - which are 100nF - the same value in your circuit diagram. It works quite well in the FM Band - I will be testing it on 50 MHz and the 66-74 MHz Russian FM band when the Es season start.

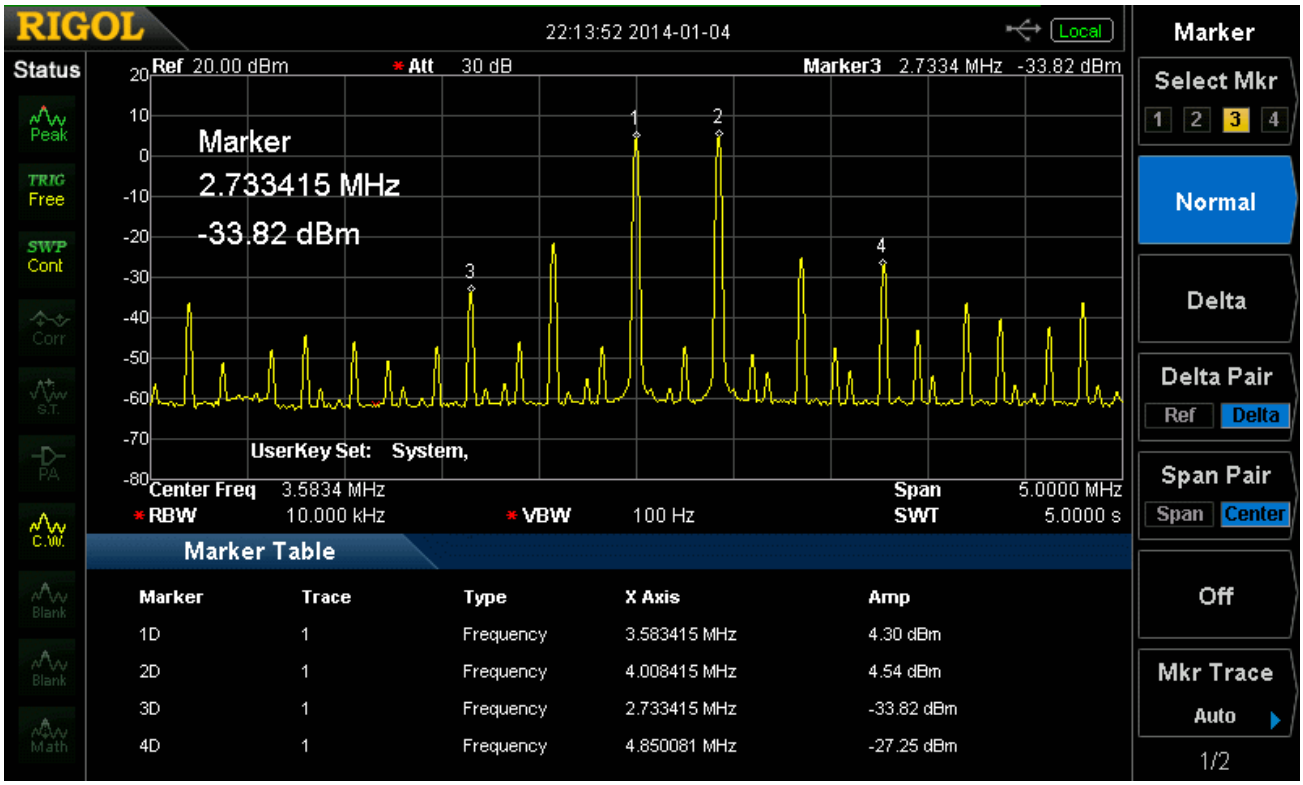
The loop feeds an SDRPlay RSP and I have had to fit a 10dB attenuator before it.

Without the attenuator there are inter-modulation products even with the gain turned right down and the LNA turned off.

Thank you for publishing the article.

David

INTERMODULATION



Marker 1D = 2 tone generator 3.58 MHz

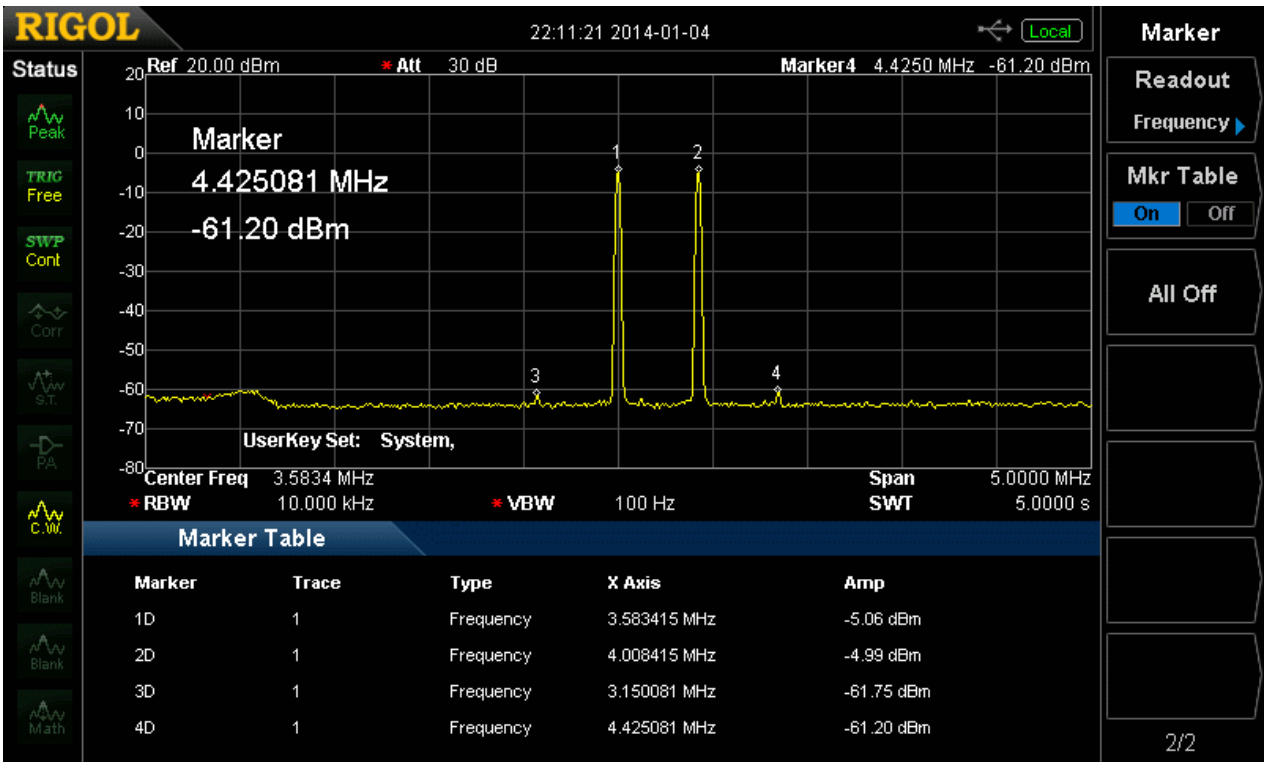
Marker 2D = 2 tone generator 4 MHz

Marker 3D = intermod signal 3^{the} order =-33 dBm

Marker 4D = intermod signal 3^{the} order = -27 dBm

The generator level at the input of the amplifier was - 26 dBm (S9 + 50 dBm).

It is unlikely that such a strong signal is ever received by the antenna.



Marker 1D = 2 tone generator 3.58 MHz

Marker 2D = 2 tone generator 4 MHz

Marker 3D = intermod signal 3^{the} order = -55 dBm

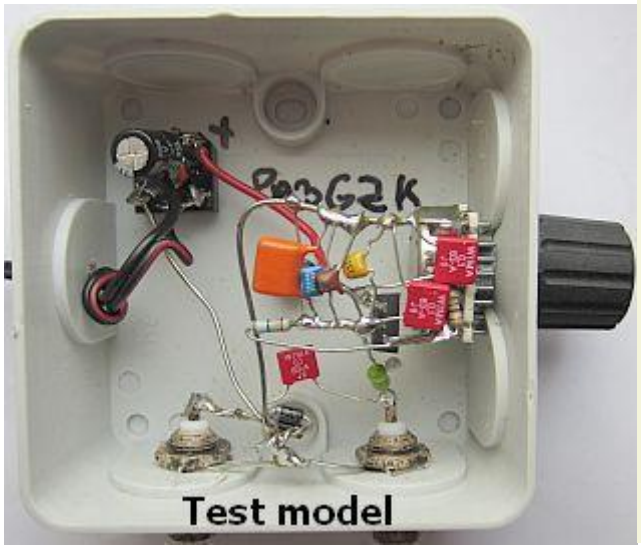
Marker 4D = intermod signal 3^{the} order = - 55 dBm

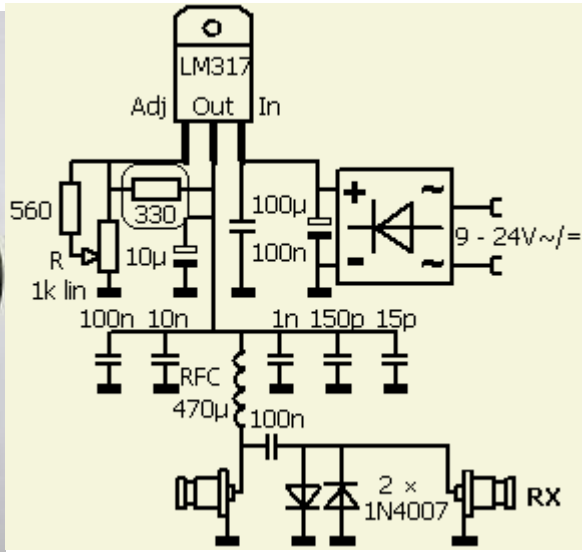
The generator level at the input of the amplifier was - 36 dBm (S9 + 35 dBm).

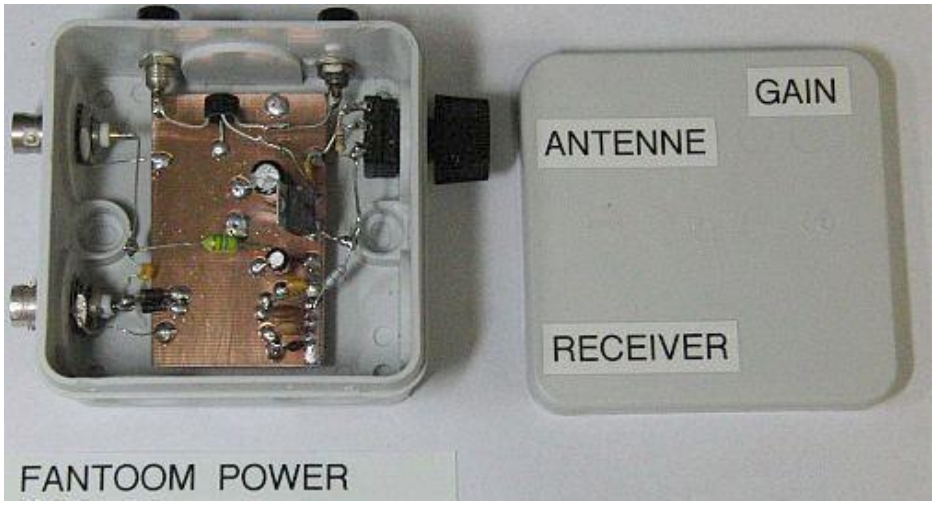
It is evident that only a very strong signal is able to overdrive the amplifier.

ASSEMBLING

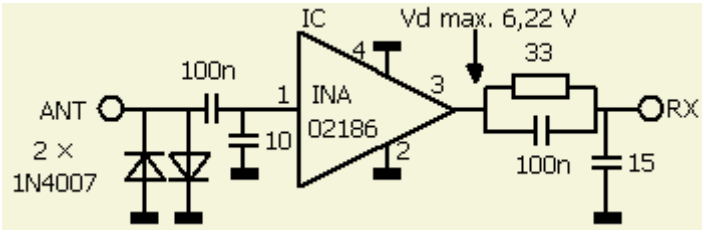
The components are installed with the Manhattan system, ie the solder islands are glued PCB strips.

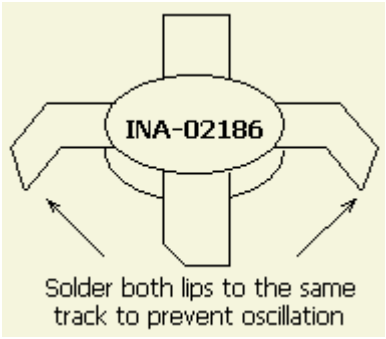


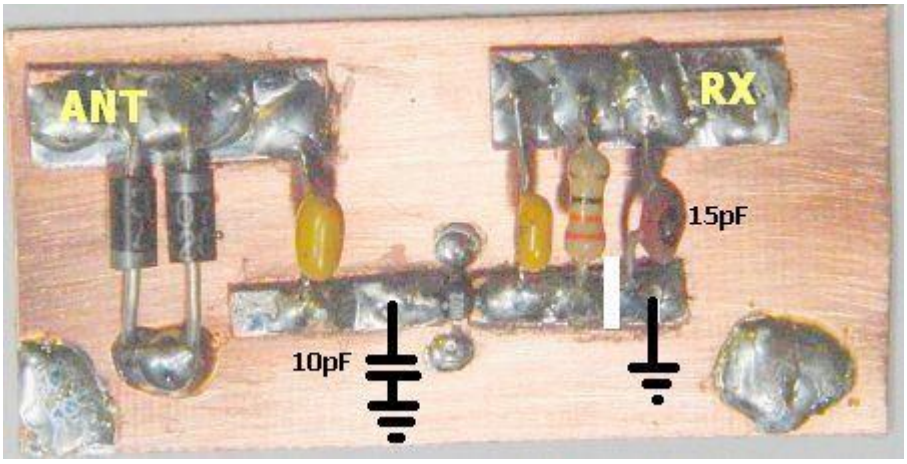




In previous schematic 330 ohm resistor was 240 ohm. Sometimes the IC was oscillating with short coaxial cable, therefore the resistance was increased and IC's supply voltage was reduced to 5.5 volts.







The INA 02186 has a high gain and a good connection to ground is essential. Some home brewers had to deal with an oscillating amplifier. To prevent instability ensure that both lips have direct contact with each other via one track. Do not separated by a machined groove, but solder on the same "island" or track.

POTMETER R

It turns out that adjusting R for the least noise is the best and not for maximum S-meter reading. Signal-to-noise ratio is then optimal.

Here the circuit is powered by 13.8 V. If the meter is turned too far, the system oscillates and a strong noise occurs. That stops when R is reduced again. My best result is achieved when R is set for about 30 mA from the 13.8 V power supply.

MECHANICAL CONSTRUCTION

"HARDWARE"

Soft copper tube 15 mm in length 4 meters.

Brass T piece 15 × 22 × 15 cm compression fitting.

Brass end cap 22 mm compression fitting.

Copper tube 22 mm length 15 cm.

Plastic T piece 15 × 15 × 15mm.

PVC or polyester tube 32 mm length 160 cm.

Trespa board 6 mm × 13 6 cm.

Stainless steel threaded rod M6 4 nuts and washers.

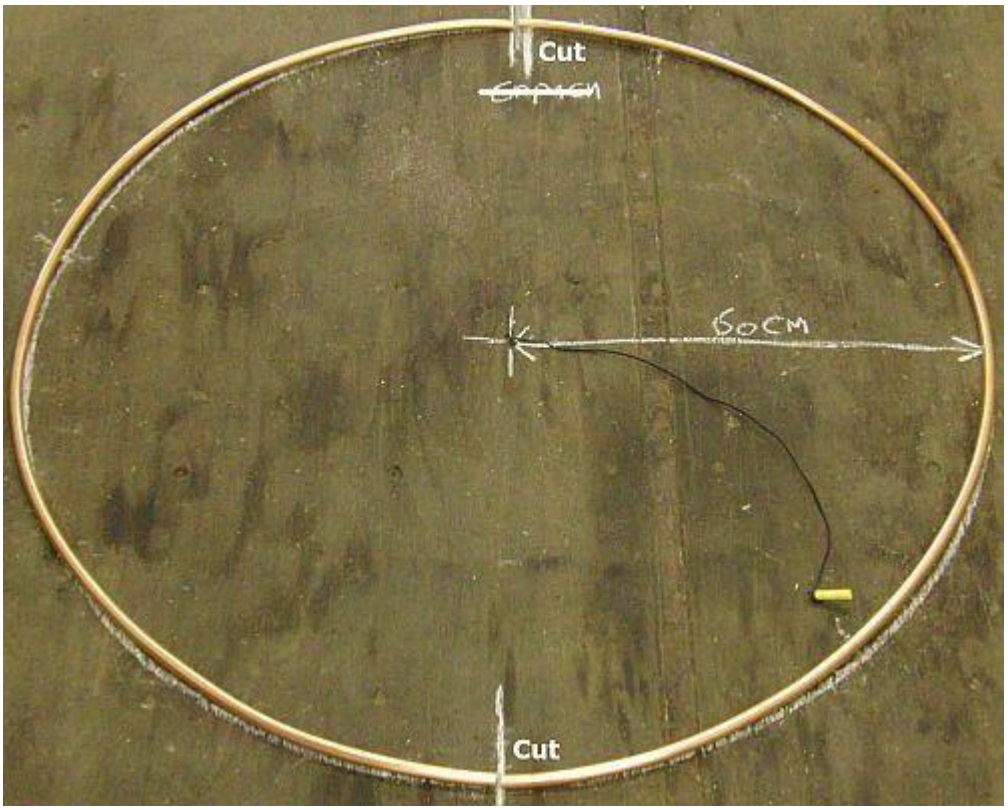
PL femail chassis connector

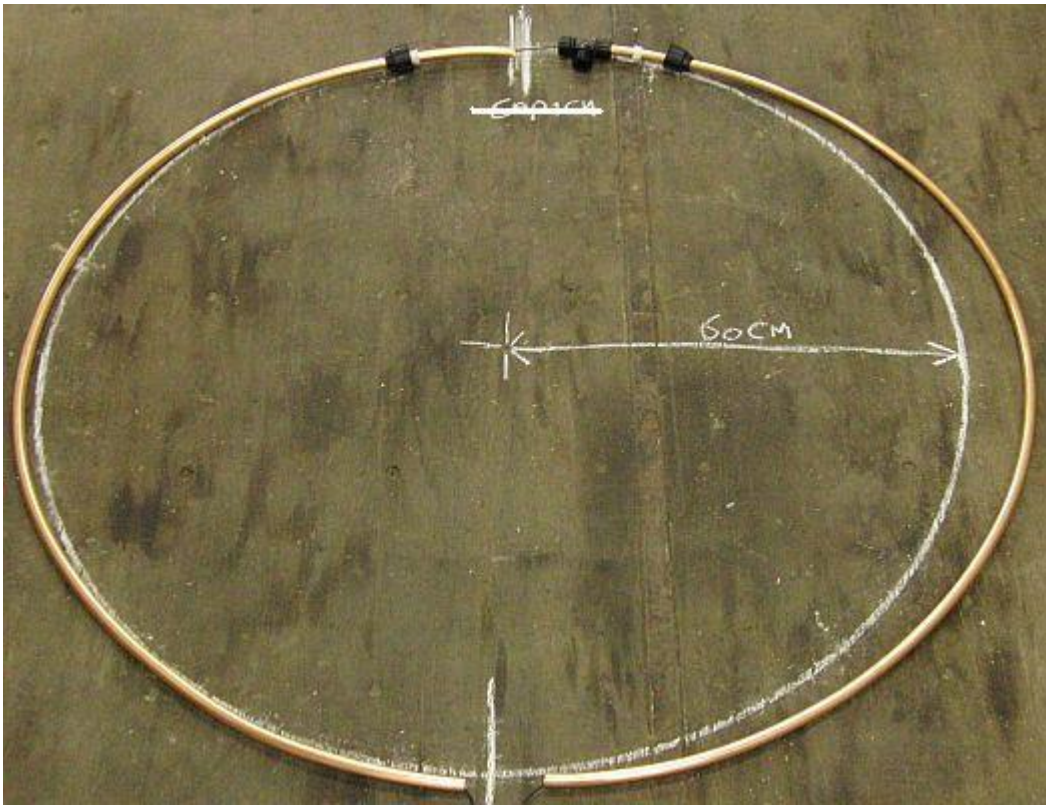
The IC 02-186 INA is for sale at eBay.com

The datasheet can be found at Alldatasheet.come

Except IC and PL chassis one can obtain the other items in a regular hardware store.

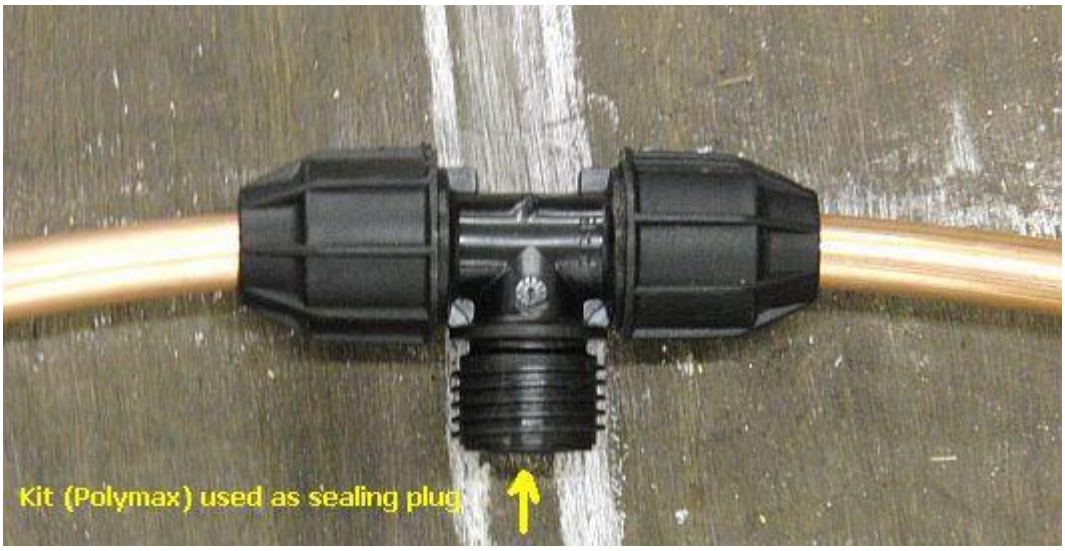
For keen DIY's the following pictures will be clear enough to construct the antenna successfully. The previous design was build with a thick coaxial cable, but the present construction is easier to assemble, and the various mechanical components are standard.



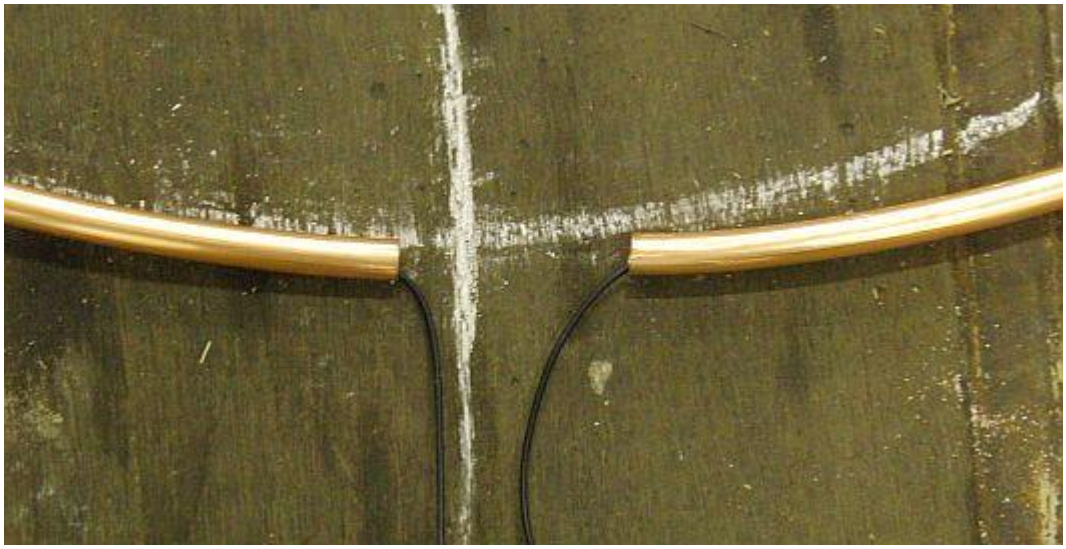


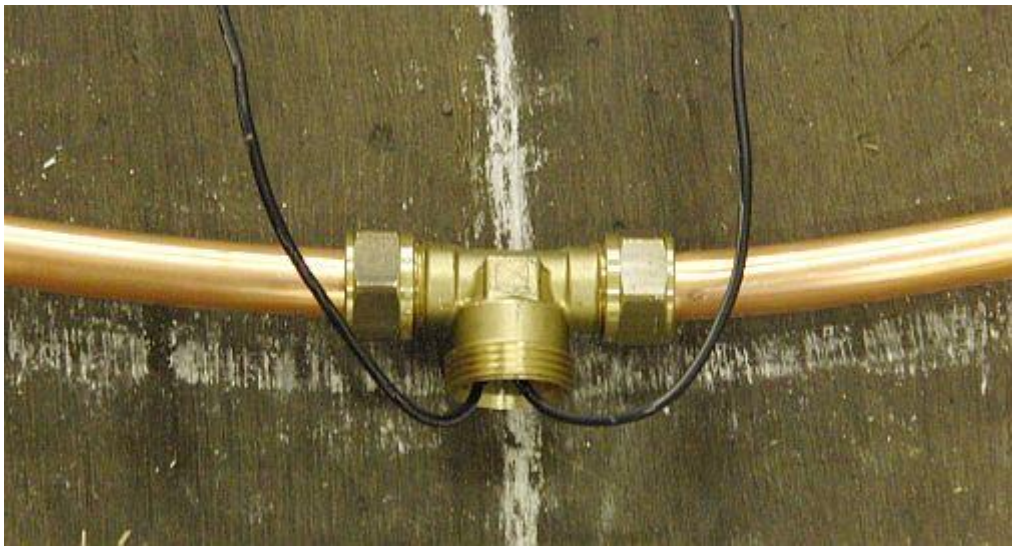
The 15 mm diameter soft copper tubing (from a hardware store) is 4 meters long, actually there are two easy to bend pieces of 2 meters.

The "bending track" is marked with a crayon and a piece of rope.



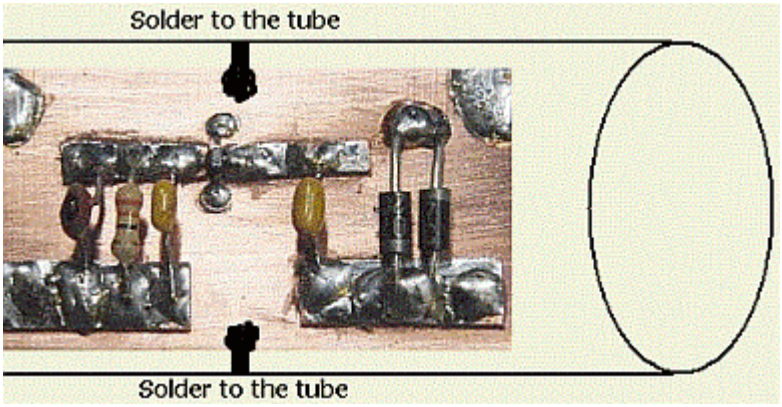
The plastic T connector, who is mounted on the standpipe, is sealed with suitable kit such as Polymax to avoid any water leakage or condensation.



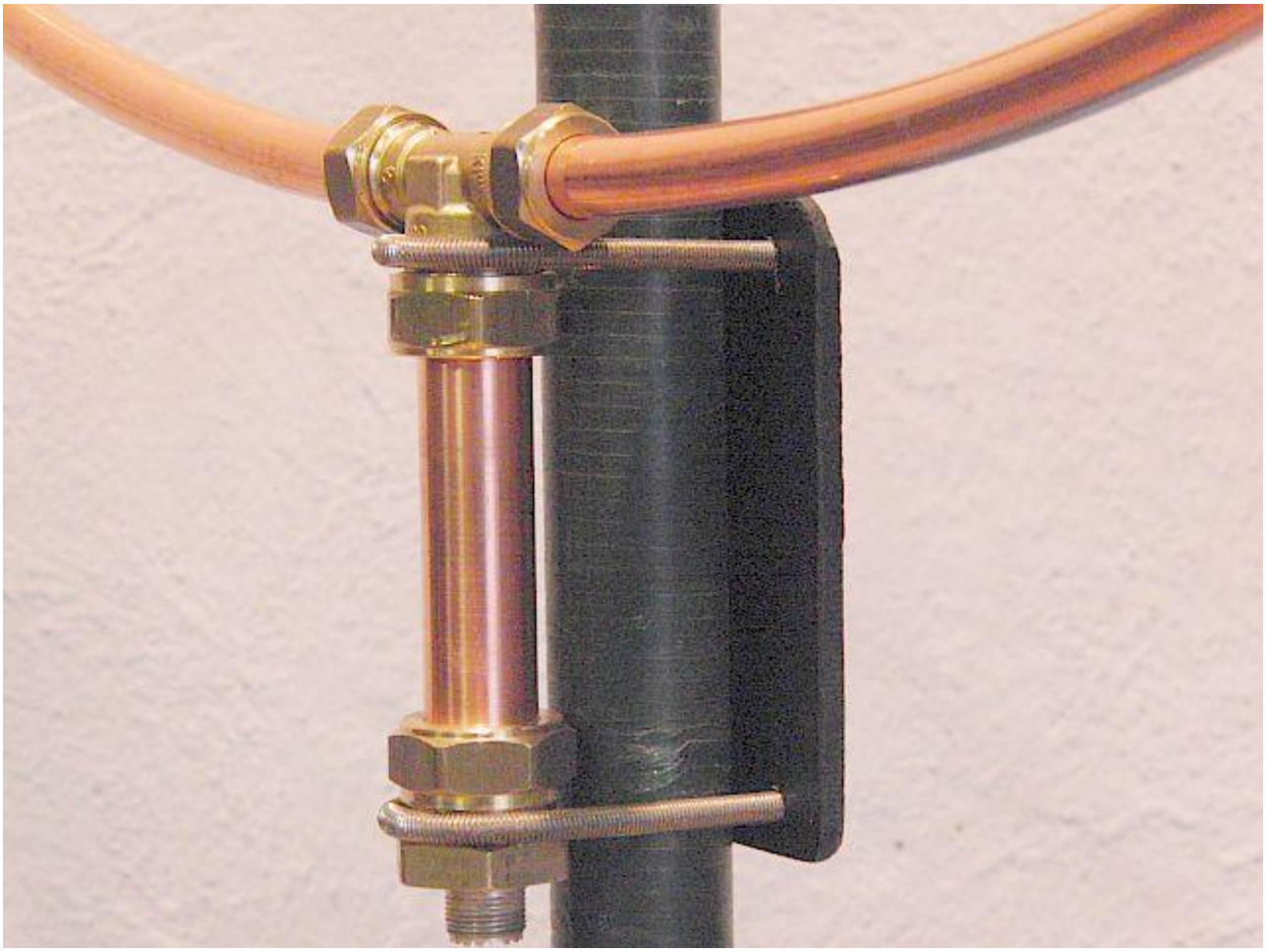


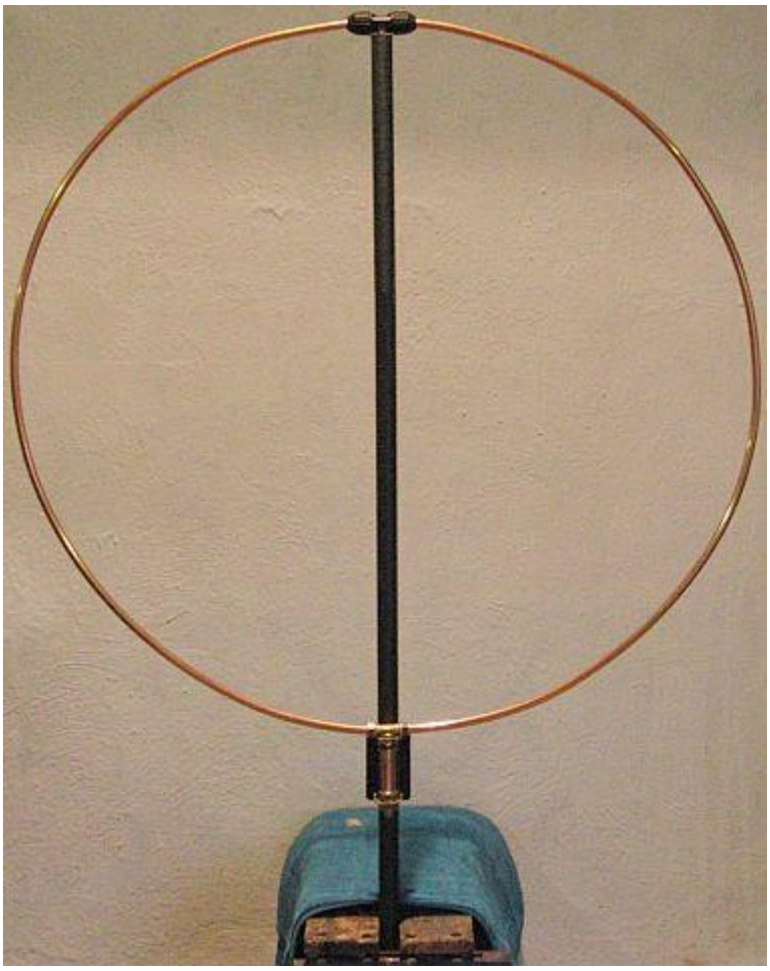
The flexible insulated wire does not need to be concentric.

Slide the amplifier in the 22 mm-copper tube. Solder the mass of the PCB with a suitable soldering iron on the inside of the tube. Also use that point for one side of the flexible wire. Solder the other side of the wire to the input of the amplifier.



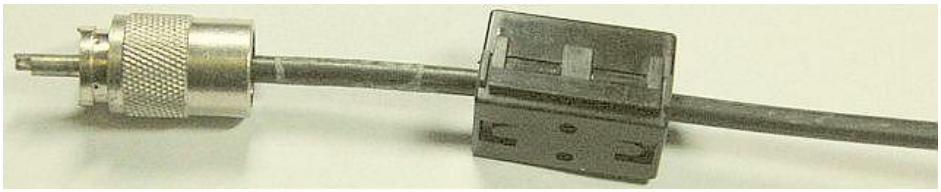
Solder both sides of the PCB to the («fig) inner side of the tube. Start with soldering thick wires to the tube and then solder pcb to the wires.





You may paint the antenna but oxidised copper does not affect the operation of the antenna

EMI/RFI



In previous models more components of plastics were used.

The outer jacket of the coaxial cable worked as antenna for the transmitted signal and thereby upset the operation of the IC amplifier. In order to suppress a choke balun was installed. In the here presented model the choke is not been necessary. However if any instability occurs a cable suppressor may be used.

PA3GZK

The above information must be sufficient to DIY. In the extreme case of having a problem please contact PA3GZK via email: pa3gzk@amsat.org, but limit the email traffic as much as possible! He still receives questions that could have been prevented by reading the article carefully.

«Back
AØFR