Mosquito *(Version 3.0)* 1 Watt AM Modulator

Introduction

The ***Mosquito*** 1 Watt AM Transmitter has been designed to cater for the new 1 Watt Low Power AM standards being introduced worldwide, *(for example in Scandinavia and the Netherlands).*

Using both Class E & C technology *(dependant on operating frequency)* with extremely linear modulation characteristics, suited for high quality, amplitude modulation.

The output is protected from a short circuit to ground, and also has thermal shutdown in the to protect the output stage if the antenna is badly tuned.

Front View

Specifications

Frequency: MW	1350 Hz to 1720kHz. *(see Note 1)*
Frequency: SW	160M Band
Power Output:	Power output 1+ Watt
Output Protection:	Short Circuit and Thermal
Modulation:	0 to 100%
Audio input:	Mono or Stereo signal
Audio connector:	3.5mm Jack Socket
Antenna: *(User Supplied)*	3 Metre Loaded Vertical Antenna *(or suitable alternative 50 Ohm)*
Antenna connector:	RCA Phono or BNC
Crystal controlled	9kHz or 10kHz Channels
LED Monitor:	Combined Antenna Tuning and Modulation
Power Input:	15 VDC at < 400mA (Regulated)
Power connector:	2.1mm coaxial (tip positive)
Devices:	4 x IC, 2 x Transistor and 3 x MOSFET
Compliance:	Compliant with Netherlands regulations for 1 Watt transmitter running on 1485kHz.
Note 1:	*The upper part of the Medium Wave band, with the best efficiency when using a 3 meter vertical antenna.*

Before using your ***Mosquito***, please read Installation and Operating instructions.

Installation

Open the Case

Turn the Mosquito upside down and undo the two screws to release the top cover. Remove the top cover, you can now see the PCB.

Power Supply

Connect the power adapter flying lead, to the 2.1mm Power Jack socket. Do not switch on yet.

Audio Input

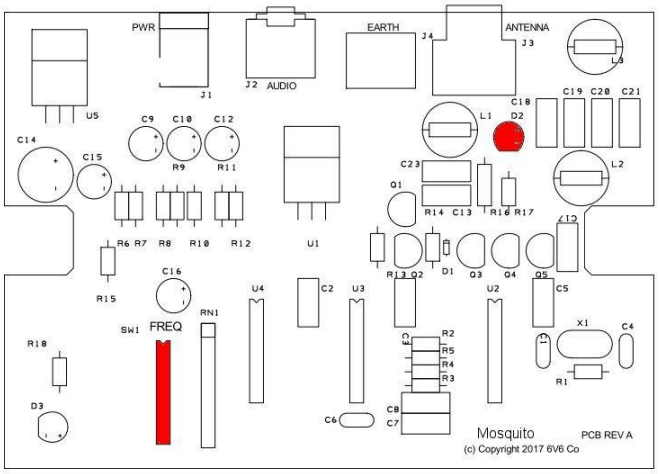
Connect the audio cable to the Audio Jack 3.5mm input socket. And connect the other end to your chosen audio source. For example an PC sound card or iPod headphone output.

EARTH and GROUNDING

Connect the transmitter to GROUND via the EARTH connection on the rear of the unit.

Antenna / Modulation Monitor LED

The Antenna / Modulation LED is shown in RED in the diagram below.



Selecting Operating Frequency

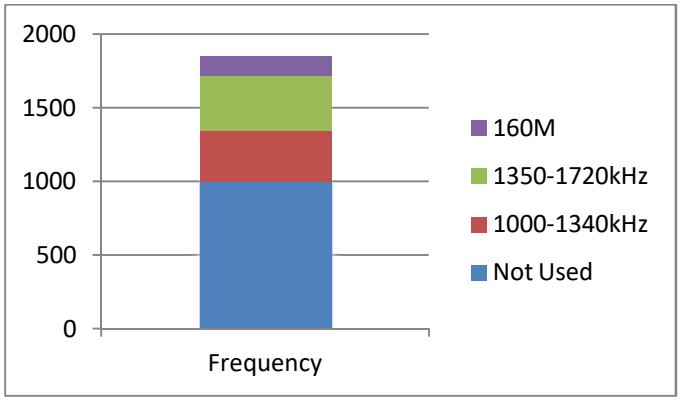
The operating frequency is configured by setting the Eight way DIP switch marked FREQ and using the settings given in the Frequency Setting Chart below.

Frequency Setting Chart

When using this chart please make sure you use the correct frequency column **EU is for 9 KHz** Channel spacing and **US is for 10 KHz** Channel spacing.

Class E & C Operation

The diagram below shows the relationship between operating frequency and operating mode. The transmitter is optimised for Class E operation in the upper part of the MW band.



Select operating Frequency in the Green Area

Channel KHz		Frequency Select Switch							
9kHz	10kHz	S1	S2	S3	S4	S5	S6	S7	S8
☒	1000			ON	ON	ON			ON
☒	1010	ON	ON		ON	ON			ON
☒	1020		ON		ON	ON			ON
☒	1030	ON			ON	ON			ON
☒	1040				ON	ON			ON
☒	1050	ON	ON	ON		ON			ON
☒	1060		ON	ON		ON			ON
☒	1070	ON		ON		ON			ON
☒	1080			ON		ON			ON
☒	1090	ON	ON			ON			ON
☒	1100		ON			ON			ON
☒	1110	ON				ON			ON
1008	1120					ON			ON
1017	1130	ON	ON	ON	ON				ON
1026	1140		ON	ON	ON				ON
1035	1150	ON		ON	ON				ON
1044	1160			ON	ON				ON
1053	1170	ON	ON		ON				ON
1062	1180		ON		ON				ON
1071	1190	ON			ON				ON
1080	1200				ON				ON
1089	1210	ON	ON	ON					ON
1098	1220		ON	ON					ON
1107	1230	ON		ON					ON
1116	1240			ON					ON
1125	1250	ON	ON						ON
1134	1260		ON						ON
1143	1270	ON							ON
1152	1280								ON
1161	1290	ON	ON	ON	ON	ON	ON	ON	
1170	1300		ON	ON	ON	ON	ON	ON	
1179	1310	ON		ON	ON	ON	ON	ON	
1188	1320			ON	ON	ON	ON	ON	
1197	1330	ON	ON		ON	ON	ON	ON	
1206	1340		ON		ON	ON	ON	ON	
1215	1350	ON			ON	ON	ON	ON	
1224	1360				ON	ON	ON	ON	
1233	1370	ON	ON	ON		ON	ON	ON	
1242	1380		ON	ON		ON	ON	ON	
1251	1390	ON		ON		ON	ON	ON	
1260	1400			ON		ON	ON	ON	
1269	1410	ON	ON			ON	ON	ON	
1278	1420		ON			ON	ON	ON	
1287	1430	ON				ON	ON	ON	
1296	1440					ON	ON	ON	
1305	1450	ON	ON	ON	ON		ON	ON	
1314	1460		ON	ON	ON		ON	ON	
1323	1470	ON		ON	ON		ON	ON	
1332	1480			ON	ON		ON	ON	
1341	1490	ON	ON		ON		ON	ON	
1350	1500		ON		ON		ON	ON	

Channel KHz		Frequency Select Switch							
9kHz	10kHz	S1	S2	S3	S4	S5	S6	S7	S8
1359	1510	ON			ON		ON	ON	
1368	1520				ON		ON	ON	
1377	1530	ON	ON	ON			ON	ON	
1386	1540		ON	ON			ON	ON	
1395	1550	ON		ON			ON	ON	
1404	1560			ON			ON	ON	
1413	1570	ON	ON				ON	ON	
1422	1580		ON				ON	ON	
1431	1590	ON					ON	ON	
		Default factory frequency setting							
1440	**1600**						**ON**	**ON**	
1449	1610	ON	ON	ON	ON	ON		ON	
1458	1620		ON	ON	ON	ON		ON	
1467	1630	ON		ON	ON	ON		ON	
1476	1640			ON	ON	ON		ON	
1485	1650	ON	ON		ON	ON		ON	
1494	1660		ON		ON	ON		ON	
1503	1670	ON			ON	ON		ON	
1512	1680				ON	ON		ON	
1521	1690	ON	ON	ON		ON		ON	
1530	1700		ON	ON		ON		ON	
1539	1710	ON		ON		ON		ON	
1548	1720			ON		ON		ON	
1557	1730	ON	ON			ON		ON	
1566	1740		ON			ON		ON	
1575	1750	ON				ON		ON	
1584	1760					ON		ON	
1593	1770	ON	ON	ON	ON			ON	
1602	1780		ON	ON	ON			ON	
1611	1790	ON		ON	ON			ON	
1620	1800			ON	ON			ON	
1629	1810	ON	ON		ON			ON	
1638	1820		ON		ON			ON	
1647	1830	ON			ON			ON	
1656	1840				ON			ON	
1665	1850	ON	ON	ON				ON	
1674	1860		ON	ON				ON	
1683	1870	ON		ON				ON	
1692	1880			ON				ON	
1701	1890	ON	ON					ON	
1710	1900		ON					ON	
1719	1910	ON						ON	
1728	1920							ON	
1737	1930	ON	ON	ON	ON	ON	ON		
1746	1940		ON	ON	ON	ON	ON		
1755	1950	ON		ON	ON	ON	ON		
1764	1960			ON	ON	ON	ON		
1773	1970	ON	ON		ON	ON	ON		
1782	1980		ON		ON	ON	ON		
1791	1990	ON			ON	ON	ON		
1800	2000				ON	ON	ON		

Channel KHz		Frequency Select Switch							
9kHz	10kHz	S1	S2	S3	S4	S5	S6	S7	S8
1809	☒	ON	ON	ON		ON	ON		
1818	☒		ON	ON		ON	ON		
1827	☒	ON		ON		ON	ON		
1836	☒			ON		ON	ON		
1845	☒	ON	ON			ON	ON		
1854	☒		ON			ON	ON		
1863	☒	ON				ON	ON		
1872	☒					ON	ON		
1881	☒	ON	ON	ON	ON		ON		
1890	☒		ON	ON	ON		ON		
1899	☒	ON		ON	ON		ON		
1908	☒			ON	ON		ON		
1917	☒	ON	ON		ON		ON		
1926	☒		ON		ON		ON		
1935	☒	ON			ON		ON		
1944	☒				ON		ON		
1953	☒	ON	ON	ON			ON		
1962	☒		ON	ON			ON		
1971	☒	ON		ON			ON		
1980	☒			ON			ON		
1989	☒	ON	ON				ON		
1998	☒		ON				ON		

Warning

Do not operate the transmitter without either

- **A 50 Ohm Dummy Load {or}**
- **A 50 Ohm Antenna correctly matched and tuned to the frequency selected.**

Antenna

The unit is supplied with an RCA Plug and an RCA to BNC adapter to connect to your Antenna via Coax Cable..

Using your own Antenna

Your own Antenna must **be matched and tuned** for the operating frequency selected and presenting an **50 Ohm impedance**.

1. Insert the BNC adapter into the Antenna socket.
2. Connect your Antenna to the BNC socket using 50 Ohm coax.
3. Best transmission will be achieved when the LED Antenna & Modulation monitor on the PCB, is dimly pulsating.

If the LED is hard ON or pulsing very brightly YOUR ANTENNA IS NOT MATCHED!

Note: A good, low impedance Ground plan is required for optimum range and performance.

Operating Notes

Once set-up, the only control that needs be adjusted is the external audio level.

Antenna Ideas

Since the actual wavelength at for example 1485 kHz is 220 Meters, an ideal Antenna would be 1/2 wave or 110 Meters long.

Unfortunately this is not a practical option and most of us will need to use a much smaller Antenna.

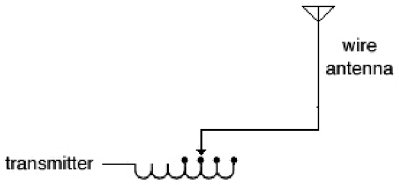
Here are some ideas for small Antennas:

Base Loaded Antenna

One possible option is a "base loaded antenna", these can be of any height, but are commonly three to nine meters high.

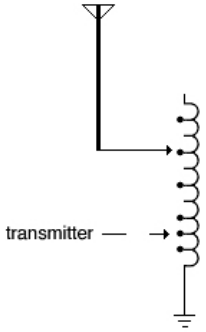
Using an vertical wire or rod, a series inductance is required to properly load the circuit.

A properly matched antenna will radiate more efficiently and, in some cases, will produce a better-sounding AM signal.



The diagram below shows a more elaborate scheme that can be used with a vertical antenna.

One end of the coil is grounded, in other words, connected to earth-ground. That lower third of the coil is made with several taps, and the transmitter can be connected to any of these taps on the ground end of the coil. From the middle to the top end of the coil are several more taps, and the antenna can be connected to any of these upper taps.



Use a field strength meter to find the best taps for both the antenna and the transmitter.

And yes, all that wire in the loading coil does introduce some resistive losses and a some of RF power is lost along the way. However, the improved radiation efficiency of a properly matched antenna more than makes up for it!

Other Antenna Ideas

There are plenty of other types of Antenna you could try, **a few hours spent on the Internet** will give all the information needed to experiment.

Delivering 1 Watt of power to a properly matched antenna will produce a much stronger signal than delivering 10 Watts to a severely mismatched antenna.

These are only a few suggestion, you will need to adapt these ideas to meet your own local conditions.

Warranty

We guarantee the product to be free from defects in materials and workmanship for one years. We will make all reasonable effort to repair or replace the unit covered by this warranty within fourteen days of receipt.

This warranty shall be void and of no force of effect in the event a covered product has been modified in design or function, or subjected to abuse, misuse, mishandling or unauthorized repair.

The customer will be responsible for all costs of transportation and insurance, in both directions.

Convert Meters to Frequency

The dials of the majority of European radios will be marked in wavelengths (metres) rather than frequencies.

To convert from one to the other, divide 300,000 by the known figure The result should be rounded up or down to the closest whole number.

Thus 300,000 divided by 1000 KHz gives 300 Metres. Conversely, 300,000 divided by 300 Metres gives 1000 KHz.

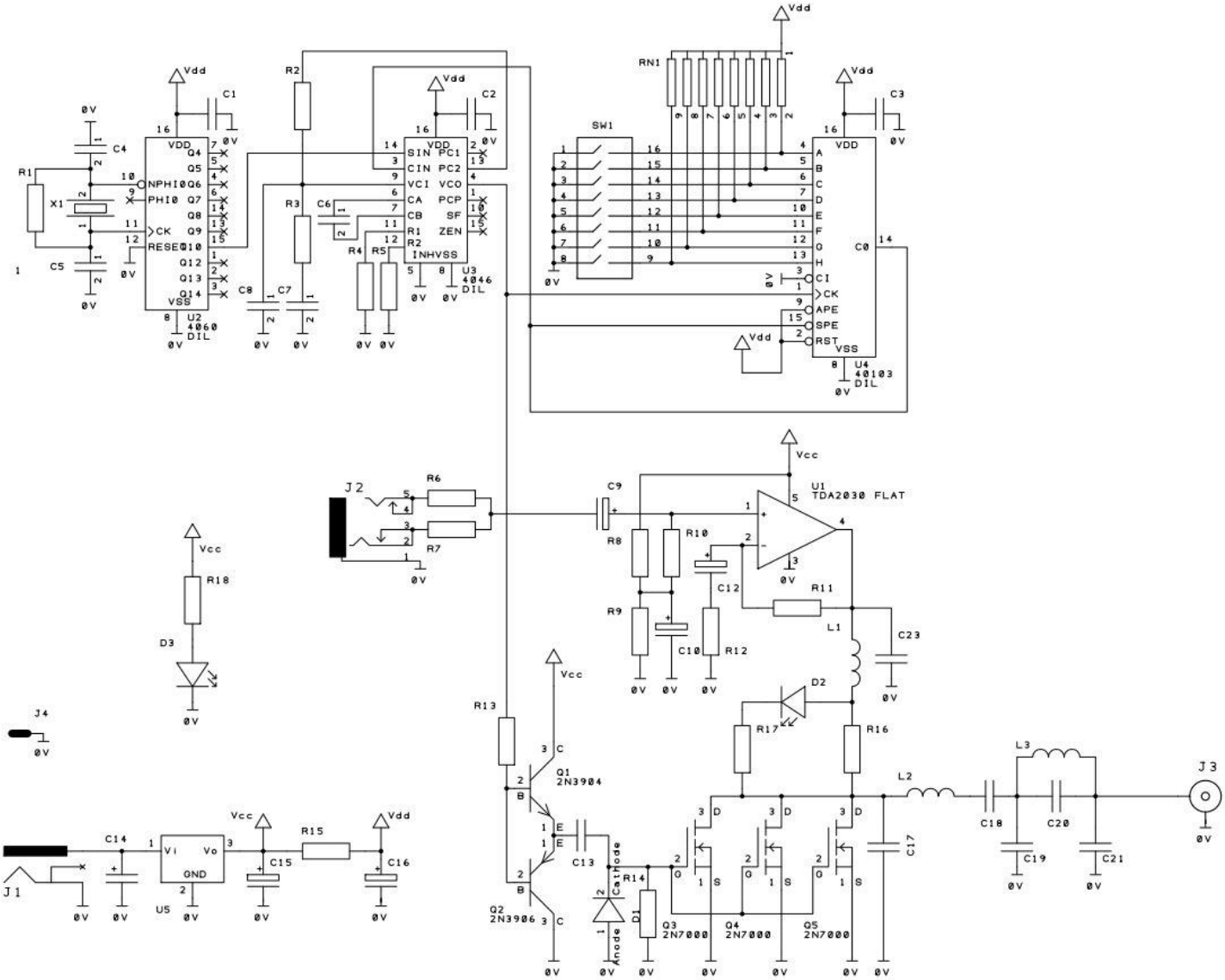
Warnings

1. **Do not short the Antenna output to Ground**
2. **Do not operate the transmitter without either**
    - **A 50 Ohm Dummy Load**
    - **A 50 Ohm Antenna correctly matched and tuned to the frequency selected.**
3. **Do not over modulate the carrier with too much audio. It just cause audio distortion**

Trouble Shooting

Audio distorted:	Audio source volume to high. Not grounding transmitter
Hum on audio:	Bad audio cables, check for broken shield wires. Not grounding transmitter
No Audio:	Bad audio cables Audio volume set to minimum.

Schematic


Vdd
Vcc
0V
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
C12
C13
C14
C15
C16
C17
C18
C19
C20
C21
C23
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
R13
R14
R15
R16
R17
R18
X1
RN1
SW1
J1
J2
J3
J4
D1
D2
D3
L1
L2
L3
U1
TDA2030 FLAT
U2
4060
DIL
U3
4046
DIL
U4
40103
DIL
U5
Q1
2N3904
Q2
2N3906
Q3
2N7000
Q4
2N7000
Q5
2N7000
Cathode
Anode
GND
VSS
VDD