AM PLL High Power Medium-Wave Transmitter

The newest version of our High-Power AM Transmitters, this version operates between 1100KHz and 1700KHz over the Medium Waveband (AM Band) and is designed for high quality audio and a stable RF signal. Signals lower than 1100KHz requires a Coil change made specially to order.
It can deliver up to 30 watts of RMS power into a random short length aerial.
This equates to 100 watts peak power cleanly driven up to 100% modulation.
The signal does tail off at lower frequencies due to inefficiencies of the output coil.
This transmitter has been designed to operate into a reasonably short 'long-wire' aerial, minimum length approximately 5 metres and up to 20 metres. The design therefore makes it easy to tune and operate. The longer and higher the aerial, the further the range will be.
Although the unit comes with a 24volt power pack, it is advised that you use a bench style DC power supply capable of delivering up to 4 amps at up to 25v. At certain frequencies the unit will draw a heavier load from the power supply, but so long as the current does not draw any more than 3.5A the output will not be distorted. Therefore, the supply volts can be varied to avoid an overload situation. (at 1224KHz into my 10 Metre aerial, the transmitter is happy at 3.4A with 20v DC. Any more voltage and it distorts)
The Transmitter circuit design uses a CMOS oscillator in a Phase-locked loop circuit for accuracy and ease of frequency selection. It is very stable and therefore does not drift off frequency. The Phase Lock circuit provides selection in 9KHz steps, so that the unit can be used in the UK or Europe, for the 9KHz spacing between channels.
For use in the USA and other parts of the World where 10kHz is used between channels a different Crystal will be fitted as requested. A rugged Power MOSFET is also used on the RF

output stage, which drives the output toroid and variable tuning capacitor. High voltage rated components are used in the output section.
Audio modulation is series-derived using a Power Transistor. It is driven by low level amplification. A CD player, mixer, PC etc plugs directly into the RCA audio sockets on the rear. Audio Modulation level is adjusted by the internal trimmer VR2.
The transmitter is housed in a Steel box with ABS front and rear panels.
Ventilation holes to improve air flow for component cooling. Two fans are used on this model, one for the Modulator and the other is used to force cool the output RF Mosfet and output coil.

POWER SUPPLY --- IMPORTANT --- PLEASE NOTE
Power is provided from an external plug-top power unit. A transmitter is supplied with a 24V power unit, although as previously stated, a bench style Power Supply capable or up to 4 Amps would be an advantage. Absolute maximum DC supply voltage of 30V but the critical limit is the 3.4Amps draw, beyond which the output becomes unstable audio wise. (because of too much RF swamping the audio circuits)

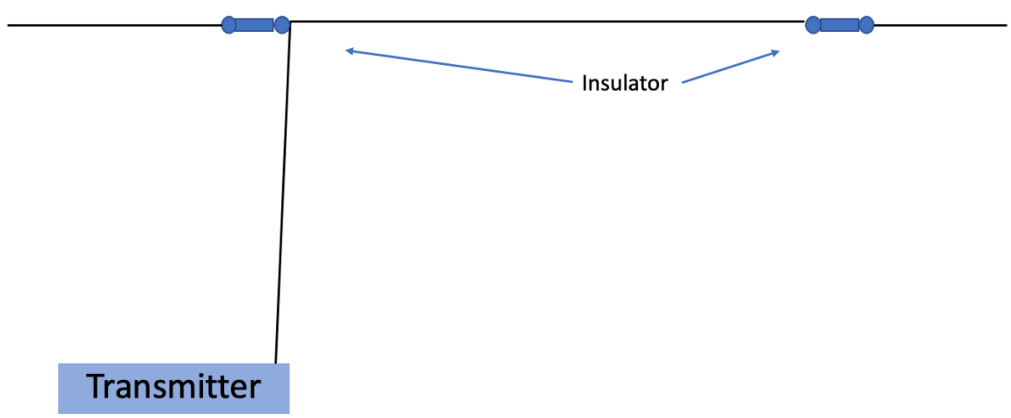
Setup

1. Insert Aerial wire into the Aerial terminal and screw into place. Connect earth if you have one available.
2. Adjust frequency using DIP switches on the rear as per required settings.
3. Connect phono audio cable (L and R) to transmitter and audio source.
4. Connect power supply to DC socket and turn on unit from power switch
5. Adjust aerial tune knob for maximum power on output power display

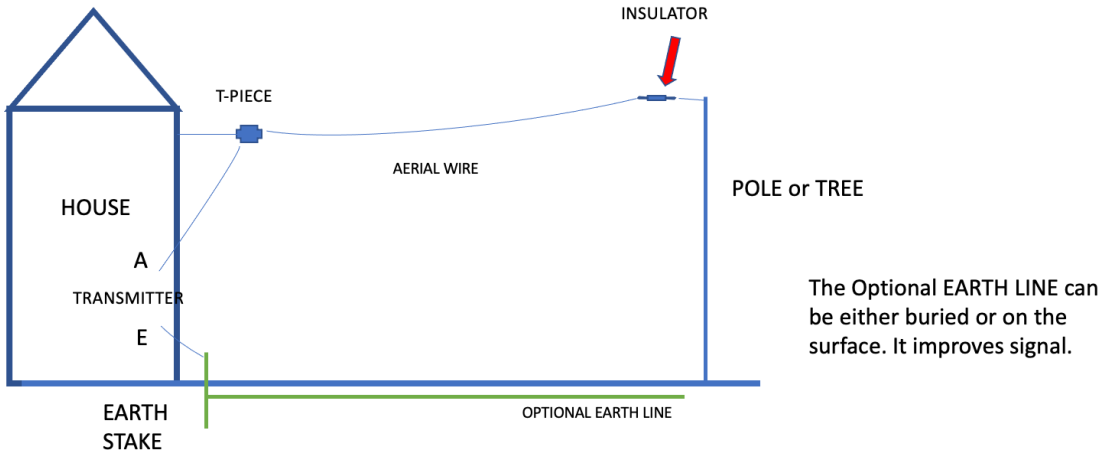
Adjustment is made using the Tuning Control for maximum signal on the LCD display.
Note.....this is just a guide. Better to use a 'field/signal strength meter'

Advanced setup

On some models internally there is a tapping on the output coil for ‘best match’ of the aerial. If the tuning capacitor is operating at the end of its travel, then the aerial tap can be altered. Remove top cover to gain access.
‘No Tap’ is the full coil inductance and is used for lower frequency operation, whereas ‘Tap’ provides less inductance of the coil for higher frequencies.
A little bit of experimentation may be required here, as your aerial will no doubt be different to mine. A longer aerial at lower frequencies is much better than a short aerial, so no tap will be best. Conversely, a longer aerial at higher frequency may be best fed with the ‘tap’ selected.



Recommended arrangement using long-wire . Minimum length 5M, design length 15M.
A longer aerial wire can be used with the transmitter and will give a better range. Excellent results have been obtained using a single long wire of approximately 18 metres length as shown in the diagram. The aerial is essentially the length of the back garden, using insulators that radio hams use. Roof top is the end of the wire, suspended via a tree at the other end.
The use of a good Earth will help with signal range. A copper stake in the ground is a good start. Search the Internet for further advice.
Also, a short vertical aerial works well too. See our design on the website for details.
Maximise the signal level with the tuning control, whilst observing the signal level LED display. Or even better is the use of a Field Strength Meter, which are readily available on eBay.



AERIAL ARRANGEMENT

It is possible to fine-tune the operating frequency by adjusting VC1 on the main circuit board. (see pic) This adjustment is for 'zero-beat' of the signal (in comparison to another signal*) but is not an essential adjustment and can be left if not required. (cap may look different)

If you experience hum (normally most noticeable the further the receiver is away from the transmitter) then reposition transmitting antenna or receiver.
When used indoors the wiring running through the house picks up the signal causing "hum spots". Repositioning to a 'non hum' area will cure this or try adjusting the 'Hum' preset on the circuit board to try 'nulling-out' the hum. Sometimes it helps!

Frequency setting

Setting frequency using dip switches

At the rear of the transmitter there are a set of dip switched numbered 1 to 8.
Using the frequency table set the switches to the desired frequency.
On the High Frequency unit for example, if your desired frequency is 1377 Khz, look it up in the table and you will see its binary setting to the left.
As we can see the binary position for 1377 is 10011000

The switch positions are up for 0 and down for 1. So therefore, starting from the left-most switch and working our way to the right we get the following:

Binary number	1	0	0	1	1	0	0	0
Switch position	on	off	off	on	on	off	off	off

It looks like this:

On the rear of the unit, the DIP switches determine the frequency. (in this case up is off and down is on)

PLEASE NOTE: EUROPEAN CHANNELS ARE IN BLUE BELOW.
The transmitter is supplied for EU/UK use unless requested at time of purchase.

Binary switch positions

Frequency Setting on S1 (kHz) Blue=UK/EU. Red=USA

Pre-set	S1 S2 S3 S4 S5 S6 S7 S8							
UK-EU	USA							
477	540	00110101	594	660	01000001	702	780	01001101
495	550	00110110	603	670	01000010	711	790	01001110
504	560	00110111	612	680	01000011	720	800	01001111
513	570	00111000.	621	690	01000100	729	810	01010000
522	580	00111001	630	700	01000101	738	820	01010001
531	590	00111010	639	710	01000110	747	830	01010010
540	600	00111011	648	720	01000111	756	840	01010011
549	610	00111100	657	730	01001000	765	850	01011100
558	620	00111101	666	740	01001001	774	860	01010101
567	630	00111110	675	750	01001010	783	870	01010110
576	640	00111111	684	760	01001011	792	880	01010111
585	650	01000000	693	770	01001100	801	890	01011000
810	900	01011001	918	1020	01100101	1026	1140	01110001
819	910	01011010	927	1030	01100110	1035	1150	01110010
828	920	01011011	936	1040	01100111	1044	1160	01110011
837	930	01011100	945	1050	01101000	1053	1170	01110100
846	940	01011101	954	1060	01101001	1062	1180	01110101
855	950	01011110	963	1070	01101010	1071	1190	01110110
864	960	01011111	972	1080	01101011	1080	1200	01110111
873	970	01100000	981	1090	01101100	1089	1210	01111000
882	980	01100001	990	1100	01101101	1098	1220	01111001
891	990	01100010	999	1110	01101110	1107	1230	01111010
900	1000	01100011	1008	1120	01101111	1116	1240	01111011
909	1010	01100100	1017	1130	01110000	1125	1250	01111100

1134	1260	01111101	1242	1380	10001001	1350	1500	10010101
1143	1270	01111110	1251	1390	10001010	1359	1510	10010110
1152	1280	01111111	1260	1400	10001011	1368	1520	10010111
1161	1290	10000000	1269	1410	10001100	1377	1530	10011000
1170	1300	10000001	1278	1420	10001101	1386	1540	10011001
1179	1310	10000010	1287	1430	10001110	1395	1550	10011010
1188	1320	10000011	1296	1440	10011111	1404	1560	10011011
1197	1330	10000100	1305	1450	10010000	1413	1570	10011100
1206	1340	10000101	1314	1460	10010001	1422	1580	10011101
1215	1350	10000110	1323	1470	10010010	1431	1590	10011110
1224	1360	10000111	1332	1480	10010011	1440	1600	10011111
1233	1370	10001000	1341	1490	10010100	1449	1610	10100000

1458	1620	10100001	1521	1690	10101000	1584	1760	10111111
1467	1630	10100010	1530	1700	10101001	1593	1770	10110000
1476	1640	10100011	1539	1710	10101010	1602	1780	10110001
1485	1650	10100100	1548	1720	10101011	1611	1790	10110010
1494	1660	10100101	1557	1730	10101100	1620	1800	10110011
1503	1670	10100110	1566	1740	10101101	1629		10110100
1512	1680	10100111	1575	1750	10101110	1638		10110101

Adjustment and alignment.

PLL alignment setting.
VC1 is used to adjust fine tuning of the oscillator. It alters by 1KHz.

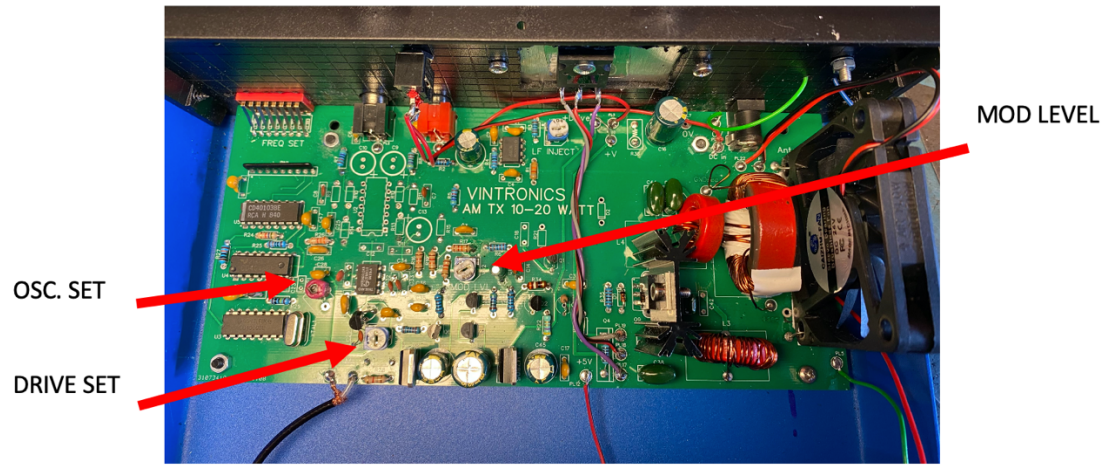
RF Drive.
The preset VR3 Is used to adjust the signal drive to the output RF transistor.
This should not need to be adjusted.
The use an oscilloscope to observe drain and gate voltages on the output FET is necessary.

Audio Level (Mod lvl)
Adjust preset VR2 for maximum modulation, ideally using an oscilloscope for maximum (but not over) modulation depth. Without breaking carrier. (Solid line at 0%)

Hum cancel
This is accomplished by adjustment of VR1. This is best done whilst operational. It introduces a very low level 30 -80 Hz signal into the drive.

RF level monitor
The Bargraph is a visual representation of carrier level and Modulation. The signal is detected by the mini RF sniffer aerial (white solid wire) inside and this converts to the LED scale. The sensitivity of this is adjusted by VR4 on the front panel PCB and by moving the sniffer near to the Tuning Capacitor. Please DO NOT let the white wire touch the tuning capacitor otherwise the circuit will most likely cause damage.

Resetting the Frequency display
The Programmed Chip can get swamped with RF and makes it display incorrectly. (very uncommon but has been known)
Press the switch on the display board once to enter setup. Scroll through the stages, so that you select ‘No PS’ (does not enter ‘sleep mode’), and Zero. (offset) Press and hold until it flashes to set. It should now exit and save setup.



Technical Specifications

Size - 220mm wide, 240mm depth, 80mm high
Weight. - 1.5Kg
Power requirement - DC 24 -28 V @ 3.4A max
Frequency Range - 1100KHz to 1700KHz in 9KHz steps (10KHz steps can be requested)
Audio input – RCA Phono sockets, left and right audio between 75mV and 775mV RMS
Audio Bandwidth (+ −3dB) - 60Hz to 6KHz
Modulation level – up to 100%
RF Output level – Average 25 Watts (up to 30W dependant on Aerial Match and Frequency)
Aerial required – Short length 'long wire' (5 -20 Metres) or base loaded Vertical
RF Output Capacitor – 370pF variable 750v rated
RF connection – screw terminal for signal and earth connection
Display -
Signal level – 10 segment Bar-Graph multi-colour LED
Frequency – 4 7-segment LED display

Ventilation and cooling – Fans forced air and convection