

Tugicom RF Design

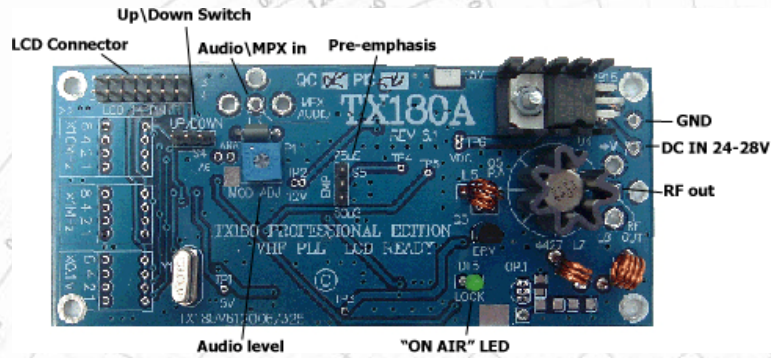
# TX180 – 1W FM Transmitter

User Manual



**TX180A - HIGH QUALITY SMD  
FM TRANSMITTER**

**TX180 is a cost effective high performance 1W FM transmitter designed to offer excellent performance, spectral cleanliness and 24/7 operation without malfunctions for years!**



**Features**

- RF Output Power: 1 Watt ± 15%*
- Output connector: RCA ready*
- Output Impedance: 50 Ohms*
- Frequency Range: 87.5MHz -108MHz*
- PLL Steps: 100 KHz (50Khz on demand)*
- Frequency stability: +/- 250Hz*
- Spurious/Harmonic rejection: Harmonics: -55dBc, Spurious: -87dBc*
- Audio Frequency Response: 20Hz-100KHz*
- Power Supply: DC 12V-28V 250mA*
- Pre-emphasis: None, 50 or 75uS*
- LCD ready*
- Compact size: 2" X 4.5" Only!*

**Basic theory of operation**

The transmitter produce a frequency with a VCO (voltage controlled oscillator) and then modulate it with an input signal (audio) in FM (Frequency modulation) where frequency is being shifted unlike AM (Amplitude modulation) where amplitude is being changed.

To make a stable FM frequency, a PLL (Phase lock loop) is responsible to correct every drift of frequency in a reference to a very stable and accurate crystal oscillator.

The frequency is the amplified by a RF power amplifier and passed threwh a low pass filter which cleans unwanted frequencies such as harmonics which generated in any RF amplifier.

The signal is then fed into an antenna and spreads to the open space.

A smart microcontroller is responsible to many tasks:

- Reading dipswitch settings
- Programming the PLL frequency every time the transmitter is powered up
- Waiting for frequency to stabilize and only then turn on the RF power amplifier and the red led
- Detect frequency drift due to a failure and turn off RF output
- In a case a LCD display is connected, write all data as frequency and status to the LCD display.

**Setting the Frequency**

Please don't connect the power to the transmitter yet, you will have the time to do that later...

First, you will need to find a free frequency, where no station is transmitting.

Please notice that quiet frequency is not free, in a free frequency you will need white noise (hiss...).

**Connecting the LCD and UP/DOWN Buttons**

While connecting the LCD and the buttons, the power supply must be off. Connecting the LCD screen with 14 Pin Flat Cable that supplied with the LCD. Pin 1 and 2 in the TX180Aboard is connected to pins 13 and 14 at the LCD screen. (VER 6.2 ONLY!) The UP/DOWN Buttons connect to S4 pins. As shown in this picture:

After the LCD and UP/DOWN buttons connected Turn on the power supply and look at the LCD screen, you should see this message:



Now push both buttons together for changing frequency, you should see this message:



Now set your frequency with UP/DOWN buttons. After setting a new frequency you should see this message:



Now the LCD shows the new frequency and the time until lock and come on air. Finally the LCD will show this message:



Note: For security reason, changing frequency is enable only after pushing both buttons together.

### **Antenna**

The antenna is one of the major elements which effect on the range of your broadcast.

You will need to pay attention to the coaxial cable which will be described later.

The Best position for a FM broadcast antenna is the highest place which from him you have line sight as far as possible without any interference from other buildings, mountains and other high object which may interfere your broadcast signal.

Always remember that the critical parameter is not whether you broadcast 1W or 5W, but whether you are 10 or 15 meters above ground.

The best antenna for this transmitter will be a 50 ohm antenna which was matched exactly to the frequency you will need to use, but the price of those antennas may be high.

For a low cost antenna, we recommend standard "dipole" FM antenna from any radio equipment which looks like 2 radiators in calculate length  $75/\text{freq}(\text{MHz})$ , example: At frequency of 100MHz, the length of each radiator will be 0.75m.

Many antenna designs are also available on the internet.

If you need a simple temporary antenna, connect a 75 cm wire to the center of the RF output connector, not ideal but will do the job to broadcast locally. Notice: you must keep distance between the temporary antenna and audio cables & devices.

### **Coaxial cable**

We recommend using RG-58 which will fit to the transmitter F-type power out connector.

If you cannot find it, use RG-213 but always try to find a good quality cable, double shielded will be preferred.

Try using the shortest cable you can, but never prefer shorter cable than higher antenna,

The mention is putting the transmitter as close as possible to the antenna and never rolls "spare" cable instead of cutting the spares.

### **Finding a good power supply**

Although power supply sounds like a simple issue, it is one of the important requirements to a quiet transmission without Hams and other not welcomed noises which add into transmission.

The best power supplies which are the most suitable for broadcast are "switching power supplies" which works on high frequency to lower the voltage from your 110V/220V AC power to a lower DC voltage, the second option is a regulated, filtered power supply which can work good as well and should make a good job also.

The worst option, and very not recommended one, is the simple wall mount power supplies, which has inside a transformer which changes 110V/220V to lower AC voltage, and 4 diodes (bridge diode) to make it a DC voltage. This power supply will make only troubles and is very not recommended to use.

\* Not every wall mounted power supply is a transformer power supply, please read complete description and look for: switching regulated or filtered which are good for us...

\* Simple power supply may work well too, you are welcome to try if you have one, but just remember that all noises can be canceled with a good power supply.

### **Finally - Make it work**

After finding a good power supply, and setting to the right frequency,

Its time to make things work!

Recheck the dipswitch settings to be sure where you are about to transmit.

Tune your FM radio to the frequency which you set on the transmitter.

Now connect the power to the transmitter.

It should take about 10-15 seconds to lock, you will hear quiet in the radio, the red led will turn on, and current should rise to 120mA-200mA because of the 1W RF amplifier.

Now, when you are transmitting and tuned in the radio, connect your Audio source which could be Discman, computer or any audio device.

To the RCA connector which labeled as "Audio In", please don't confuse which the RCA labeled as RF out, this is where the antenna should be connected, and I am really not sure that your Discman will love acting as antenna... another important point: NEVER connect speaker output but only to an audio LINE OUT, it will cause damage to the transmitter.

After connecting to Audio device gently turn the volume potentiometer for maximum volume (you probably received it at full volume so don't try to turn it more with strength).

You should hear you're your audio on your radio, that's all, you are on the air!

If sound is clipping (sound as distortion) you are probably inserting too much audio level into the transmitter. Please lower the volume at audio device and not at the transmitter, it is the audio which is too loud and not the transmitter being too sensitive.

That's all, have fun transmitting and always remember not to disturb other stations, it is against the law.

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Please check the rules in your country before operating radio equipment.

