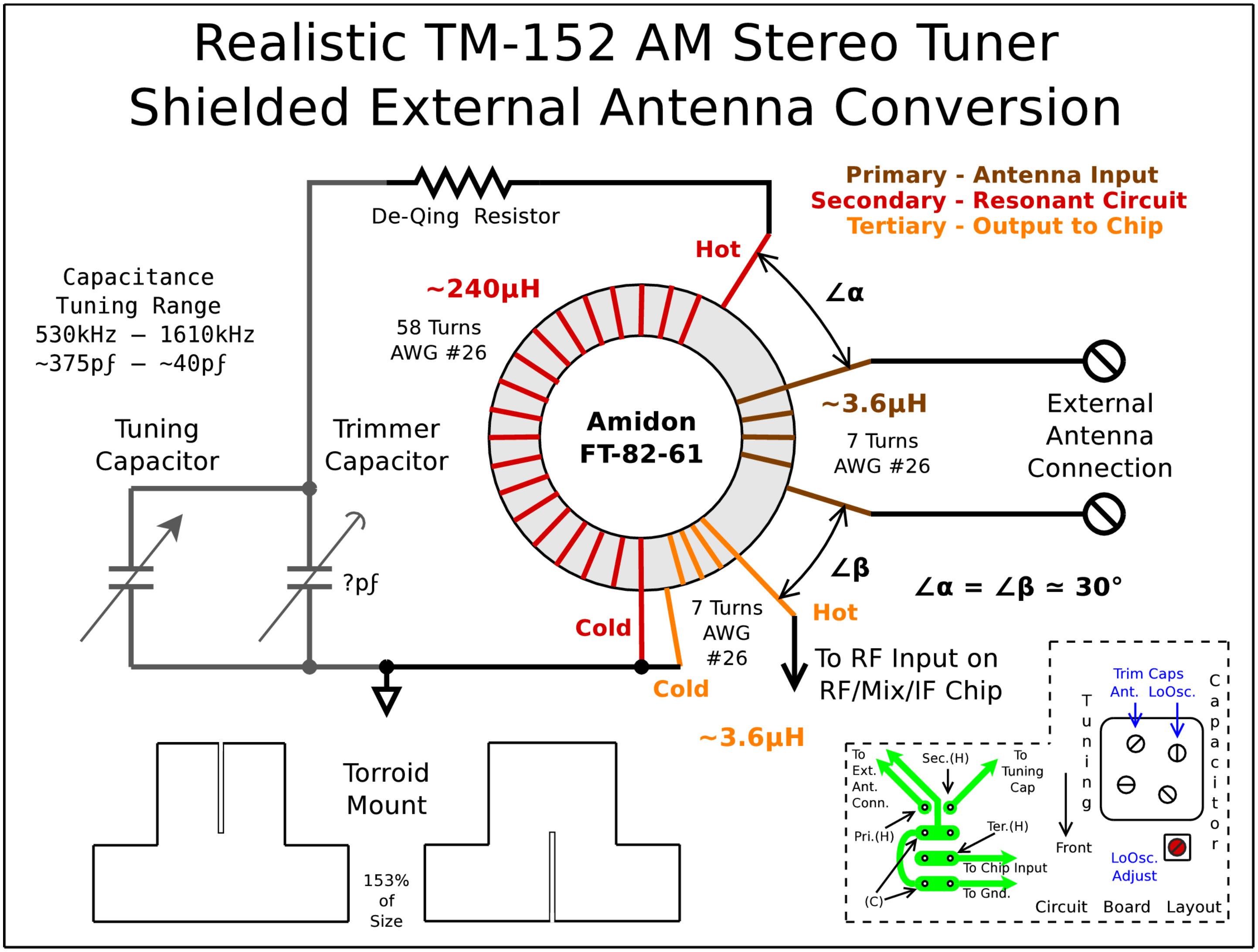


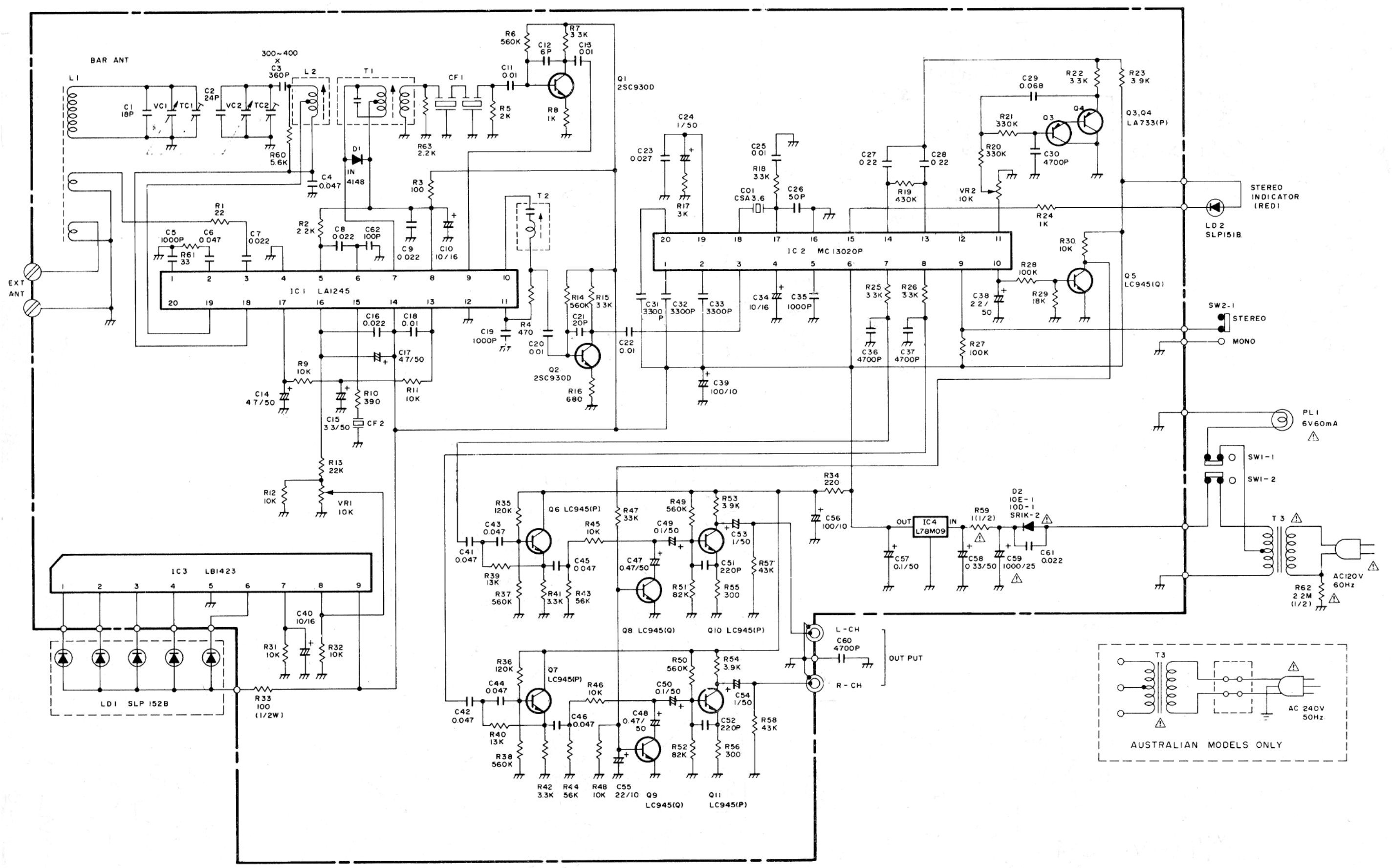
This is an experimental project but these detailed instructions should help clarify the process.

This 'external only' antenna interface is a replacement for the internal resonant ferrite bar antenna in a Realistic® TM-152 AM-Stereo Tuner. Its purpose is to eliminate the interference problem when the unit is placed near other electronic (digital) gear that is not properly shielded and is to be used with an antenna far removed from the interfering source. For the core material an Amidon FT-82-61 torroid will be used. It has a high Q and a moderate temperature stability for the frequency range used. This torroid inductor along with the tuning capacitor forms a resonant tank circuit for the RF pre-selector There are three windings, primary – external antenna input, secondary – resonant circuit, and tertiary – output to the AM RF/Mix/IF/AGC/Det Chip (LA1245).

The secondary / resonant winding is connected in parallel with the tuning capacitor. The measured capacitance ranges from ~375pƒ to ~40pƒ for the 530kHz to 1610kHz tuning range. This will require an estimated inductance for the secondary winding to be ~240µH but could range from 200µH to 270µH. There is no hard and fast way of finding out what the exact inductance is, maybe with a dip meter or such, only estimating it from the capacitance tuning range and this will vary slightly also from unit to unit from when the units were calibrated at the factory.

When replacing the existing internal antenna with this the torroid's secondary inductance will have to be adjusted to match the original's for the RF pre-selector to properly track the local oscillator. The trimmer capacitor on the tuning capacitor will probably need adjusting also since the torroid's windings actually have space between them and may have less parasitic capacitance than the original antenna. If the unit was tuned well at the factory you may get by with just tuning the inductor since the capacitance is already set for the dial so try this first. If there is a significant difference between the parasitic capacitances of the two the trimmer capacitor will need adjusting also. If the difference is large enough there might be a possibility that the trimmer capacitor may not have enough adjustment range. In that case the 18pf (C1) capacitor in parallel with the tuning capacitor may need to be increased to the next value if not more.

TM-152 Schematic



NOTES: (1) ALL RESISTANCE VALUES ARE INDICATED IN "OHM" (K=10^{3} OHM, M=10^{6} OHM).
(2) ALL CAPACITANCE VALUES ARE INDICATED IN "uF" (P=10^{6} uF).
(3) MAY VARY FROM UNIT TO UNIT FOR BEST PERFORMANCE.

Schematic subject to change without notice.
For most accurate Schematic (and parts) contact Radio Shack, National Parts Dept., Fort Worth TX 76101.
In UK, contact Tandy Electronics, National Parts Dept., Bilston Road, Wednesbury, West Midlands WS10 7JN.
In Australia, contact Tandy Australia Limited, National Parts Dept.; 91 Kurrajong Avenue, Mount Druitt, N.S.W. 2770.

For the torroid windings #26 A.W.G. is specified as this is the largest gauge usable to get all the turns with sufficient space left over. If you can get the multi-stranded Litz wire like what the original antenna was wound with then do since it will offer higher Q. There's no polarity to the primary and either lead can be hot or cold for the antenna connection. For both the primary and tertiary windings they have 7 turns each and the windings are closely spaced. On the inside the turns should be touching with no spaces but on the outside they should be evenly spaced. The cold side of the tertiary is started at the same spot that the cold side of the secondary starts going in the opposite direction. The secondary windings should be evenly spaced on both the inside and outside and spread out so that there will be ~30° on each side of the primary windings. It's important that the primary winding for the external antenna connection be spaced away from both the secondary and tertiary windings to minimize any De-Qing effects caused by the antenna loading. The goal is to have a loosely coupled inductive field to transfer the antenna signal to the resonant circuit and for the tertiary winding to pick up the signal entirely from the resonant secondary and not the primary.

The general approach to calibrate the torroid, to make it track the local oscillator without extensive bench equipment, is to tune the dial to a station around 650kHz and adjust the inductance and then tune to a station around 1300kHz station and adjust the trimmer capacitor, each time adjusting for minimum treble in the audio and/or strongest signal on the LED meter. The inductance tuning affects all of the dial while the trimming capacitance affects almost entirely the upper end of the dial. This procedure will need to be repeated several times until no more improvement can be obtained. Tune to several stations all across the dial to check for tracking accuracy. It may be necessary to deviate from the procedure above somewhat to get the best calibration needed across the dial. Increasing / decreasing inductance will lower / raise resonance frequency respectively. For coarse adjustment add / remove windings from the secondary to increase / decrease inductance. For fine adjustment compress / expand windings to increase / decrease inductance. Leave enough extra wire available on the hot end of the secondary if you need to add more turns. Once the number of turns needed is determined the extra wire on the hot end can be shortened. When fully calibrated the windings will need to be anchored down to avoid movement with something like Polystyrene Q-Dope from GC Electronics. This can also be made with packing peanuts and solvent. Recipes available on the internet.

Once calibrated the torroid should be mounted some way onto the circuit board. Using light cardboard a mounting form can be fashioned and glued to the circuit board. It is better to put some distance between the circuit board and the torroid since there may be copper plating on the opposite side that may affect the Q and tuning of the coil.

If the Q of the resonant circuit is too high, characterized by reduced audio bandwidth and/or difficulty in calibration a De-Qing resistor can be added to widen the bandwidth of the RF per-selector The maximum value this resistor should be is ~40Ω. Using a 50Ω trimmer for this is an easy way of adding an adjustable RF bandwidth control. If the Q is reduced too much then the image rejection capability of the RF pre-selecter will not be enough and also will not provide good selectivity from adjacent channels.

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The TM-152 usually comes with a ±4.5kHz ceramic IF filter and is a little narrow for music but OK for voice. This is the one that comes in the U.S units and is probably the same for the other countries. It is usually a blue cube shaped plastic part located towards the front of the unit. The part number is most likely SFG450G made by Murata. There are several manufactures of these filters and most will work as a replacement. Replacing it with a ±6kHz (SFG450F) or a ±7.5kHz (SFG450E) will help boost the higher audio frequencies. A ±6kHz is a good choice for high quality voice and nighttime music without too great a need for 10kHz notch filters if the band is not overcrowded. A ±7.5kHz will offer excellent voice quality and good music quality for daytime and nighttime but having notch filters is a must especially if the band is over crowded. The ±7.5kHz an wider ones require a different load impedance, 1.5KΩ instead of 2KΩ for the ±6kHz or narrower filters. This means that the 2.2KΩ and 2KΩ resistors that load the input and output of the filter should be replaced for optimal performance with 1.6KΩ and 1.5KΩ resistors respectively.