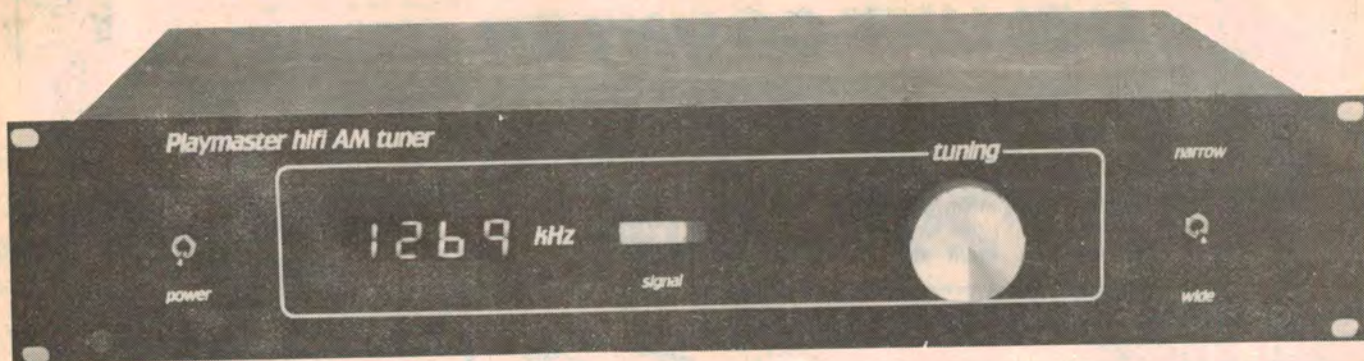


Second article has the construction details



A high performance AM tuner: Pt. 2

Despite the circuit complexity, construction of our new Playmaster AM tuner is fairly straightforward. Most of the circuitry is contained on three printed circuit boards: the main tuner PCB, the main readout PCB and the LED readout PCB.

by JOHN CLARKE & GREG SWAIN

By now, you've probably got the parts for our new AM tuner together, ready to commence assembly. Before diving in with soldering iron "a-smoking", however, readers should note that some of the components used in this project can be damaged by careless or unnecessary handling.

In particular, the RF, IF and local oscillator coils should be handled carefully. Do not idly twiddle the slugs of these coils, as they are quite fragile and easily broken. The slugs are adjusted only during the alignment procedure (to be described next month), and then only using a plastic alignment tool.

Similarly, take care not to damage the toroids (they are quite brittle) and leave the CMOS ICs in their static-protection foam until you are ready to mount them in position. Because this is a fairly complex project, we suggest that you take your time and proceed carefully. Double-check each step for mistakes as you go, and pay particular attention to component orientation.

That's enough sermonising! Let's turn our attention to the construction details.

As already mentioned, virtually all the

circuitry is accommodated on three PCBs. The main tuner PCB carries the RF circuitry plus power supply components, while the remaining two boards carry the digital readout and signal strength indication circuitry. The latter two boards are soldered together at right angles, thus keeping internal wiring to a minimum.

We'll describe the assembly of each board in turn, beginning with the main tuner PCB.

Main Tuner PCB

This board is coded 82qr12a and measures 161mm × 178mm. Before actually mounting components, inspect the copper side of the board and repair any track faults at this stage. You should also check that all the holes have been drilled, and that the holes beneath the two 9817 coil positions are large enough to accept the alignment tool (ie, about 4mm). Holes are not required under the other coils, since these have only one slug and are tuned from the top.

The tuner PCB can now be assembled according to the parts overlay diagram. Mount the low profile components first

before moving on to the larger components. We used PC stakes for all external connections to the PCB and to terminate all those components which are only connected during the alignment procedure. These include resistors R1, R2, R3 and R4; capacitors C4, C5 and C6; and links LK1 and LK2.

Note that IC6 is a CMOS device, so observe the usual precautions. When soldering it into circuit, connect the barrel of your soldering iron to the earth track on the PCB (use a small clip lead) and solder the supply pins (7 and 14) first. Note also that IC1 is in a metal can package, so its leads will need to be splayed to suit the dual-in-line holes in the PCB.

Pay particular attention when mounting the 3-terminal regulators and the FETs, since they are easy to install the wrong way round. Pin connection diagrams for the FETs, regulators and transistors were published last month with the circuit diagrams.

The RF, IF and local oscillator coils are all polarised, and can only be mounted one way on the board since the two centre pins are slightly offset from centre. The main thing to watch here is that you use the correct coil type in each position. You'll find the type number on the side of the metal can.

The 8010 whistle filter coil is not polarised and can be mounted either way.

The toroid transformers are all wound identically. First, take three two-metre

lengths of 0.4mm (26 B&S) enamelled copper wire and twist them together using a hand drill until the twist approaches one crossover every 4mm. The triple-twisted (trifilar) wire is then wound on the toroid to give about 65 tight, closely-spaced turns. Terminate the start and finish off the winding by lightly twisting the ends together for a few turns.

The ends can now be trimmed to a length of 35mm and the insulation removed from the tip of each wire using a sharp knife. One end of the trifilar winding can now be terminated in each of the three start positions: S1, S2 and S3. The corresponding finish wires — F1, F2 and F3 — must now be identified using a multimeter and then terminated in the F1, F2 and F3 positions on the PCB.

It does not matter which end of the trifilar winding you actually choose as the start. What is important is that you identify which start and finish is actually S1 and F1 and so on. Note that S3 and F2 of coil L5 are connected together in a common hole on the PCB.

The toroid coils are secured using U-shaped wire links to clamp the coils in position. First, solder one end of the link in the hole provided and sleeve the wire with 35mm of spaghetti insulation. Now terminate the other end of the link in the opposite hole, pull it down tight over the coil with a pair of pliers, and solder it to the PCB.

The ganged capacitor can now be mounted on the PCB using three 1/8-inch Whitworth screws (3/16-inch long). Do not use longer screws, otherwise they may short the capacitor plates. Solder wire links between the capacitor lugs and the PCB as shown on the overlay diagram. There are five connections in all — three to the fixed capacitor plates, and two to the separator plates.

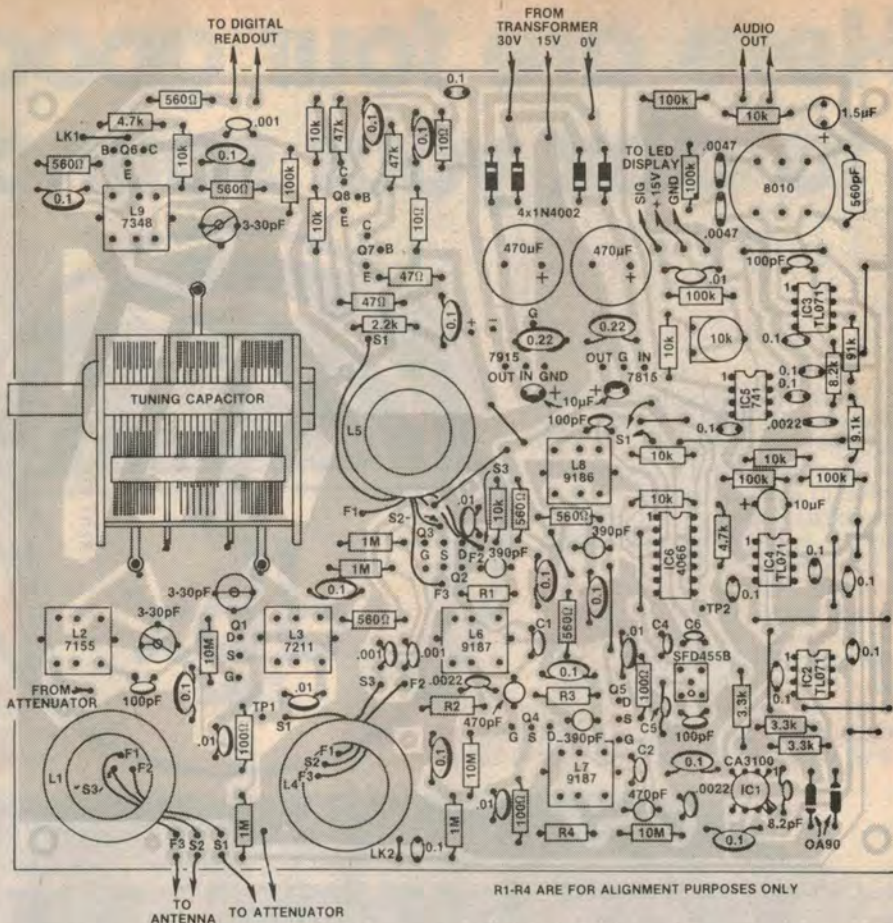
Main Readout PCB

This board is identical to the main board used in the Digital Tuner Readout described in the October issue. It is coded 82fc8a and measures 160mm x 125mm.

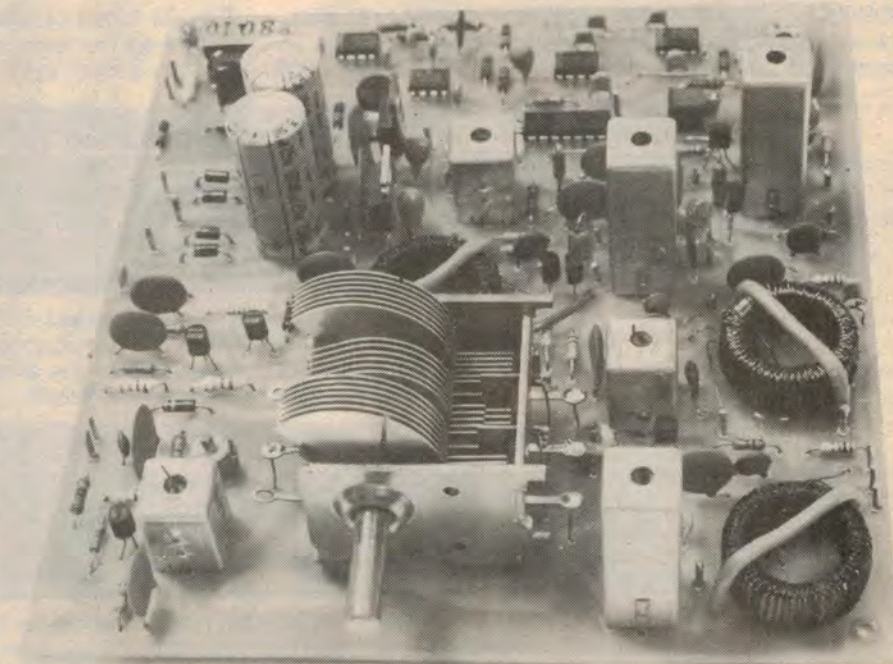
Note that IC2 is not used here, since it is only necessary for the counter to cover the broadcast band (520-1630kHz). Instead, link LK3 bypasses IC2 while link LK2 ensures that IC3 divides by 10. At the same time, the decimal points used in the original version are omitted so that the tuner displays the frequency in kHz rather than in MHz.

Because switch S1 is no longer used, all preload encoding links are now wired permanently into circuit. These include the three links adjacent to IC6 and IC7 that were previously shown dotted. As shown, the links encode the required 455kHz offset.

Start construction by assembling the



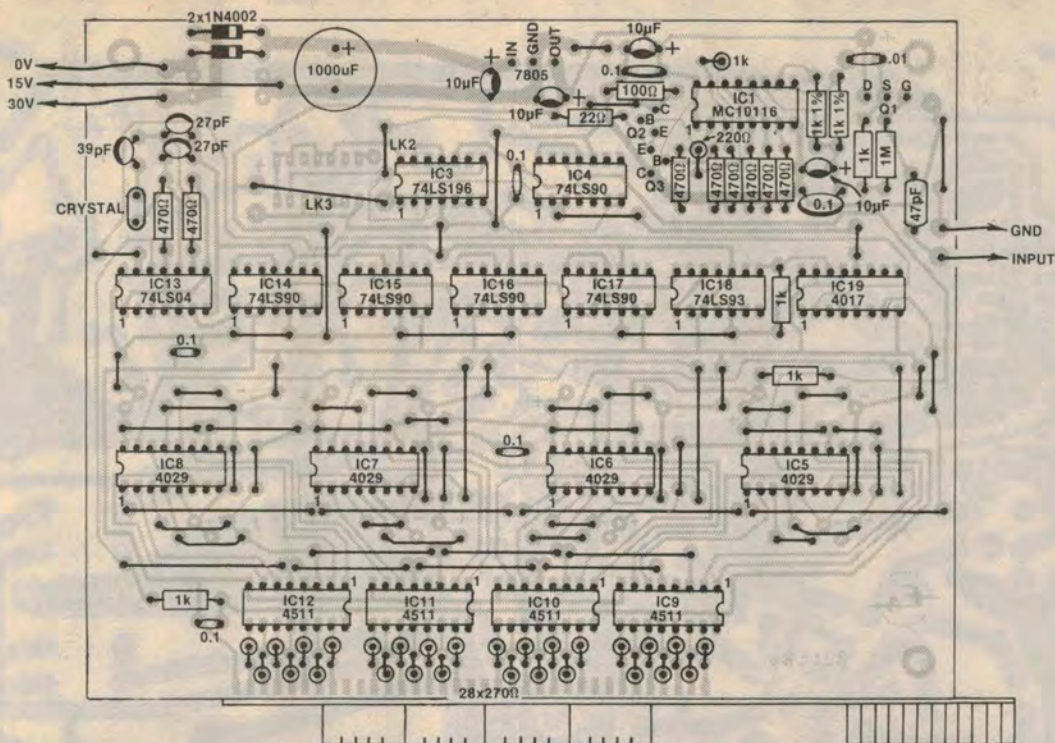
Above is the parts overlay for the main tuner PCB while below is a photograph of the fully assembled board. See text for coil winding details.



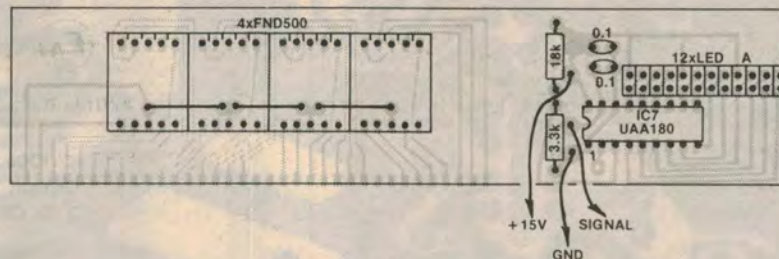
components on to the PCB according to the overlay diagram. All the ICs face in the same direction except for CMOS ICs 9, 10, 11 and 12. When soldering the CMOS ICs, solder the power supply pins (8 and 16) first to enable the internal

static protection diodes. As before, the barrel of the soldering iron should be connected to the earth track on the PCB with a small clip lead before soldering.

The CMOS ICs are recognised by their 4029 and 4511 type numbers.



Parts layout diagrams for the main readout PCB (above) and the LED readout PCB (right). Make sure that all links are correctly inserted, and that the LED displays are oriented so that the ribbed edge of each display is at the top.



Note that many of the resistors are mounted end on, including two adjacent to IC1 and 28 adjacent to ICs 9, 10, 11 and 12. The remaining resistors are mounted in the conventional manner.

We recommend the use of PC stakes to facilitate external wiring connections to the power transformer and tuner PCB.

LED Readout PCB

With assembly of the main readout PCB complete, attention can now be turned to the LED readout board. This board is coded 82qr12b, measures 146mm x 33mm and accommodates the FND500 LED displays, the UAA180 bar graph display driver IC, and the 12 signal strength indicator LEDs. Eight red LEDs are used at the low signal (left-hand) end of the signal strength indicator, while four green LEDs are used at the high end.

It is necessary to install the three wire links first, since these are situated beneath the LED displays. This done, the remaining components can be installed but do not solder the leads to the

indicator LEDs at this stage. The four FND500 displays are mounted flush against the PCB and must be oriented so that the ribbed edge of each display is at the top.

The 12 indicator LEDs are mounted slightly proud of the PCB so that they line up with the front surface of the LED displays. This is best achieved by temporarily mating the LED readout PCB with the front panel. Carefully push the FND500 displays through the front panel cutout until they sit flush with the surface of the panel, then adjust and solder each of the indicator LEDs in turn.

Exercise care when soldering the indicator LEDs – the leads are very close together so it is all too easy for the solder to bridge across to an adjacent pad.

Chassis wiring

A standard rack mounting cabinet measuring 430mm x 255mm x 88mm is used to house the new Playmaster AM tuner. This is fitted with a matching black anodised front panel with white silk-

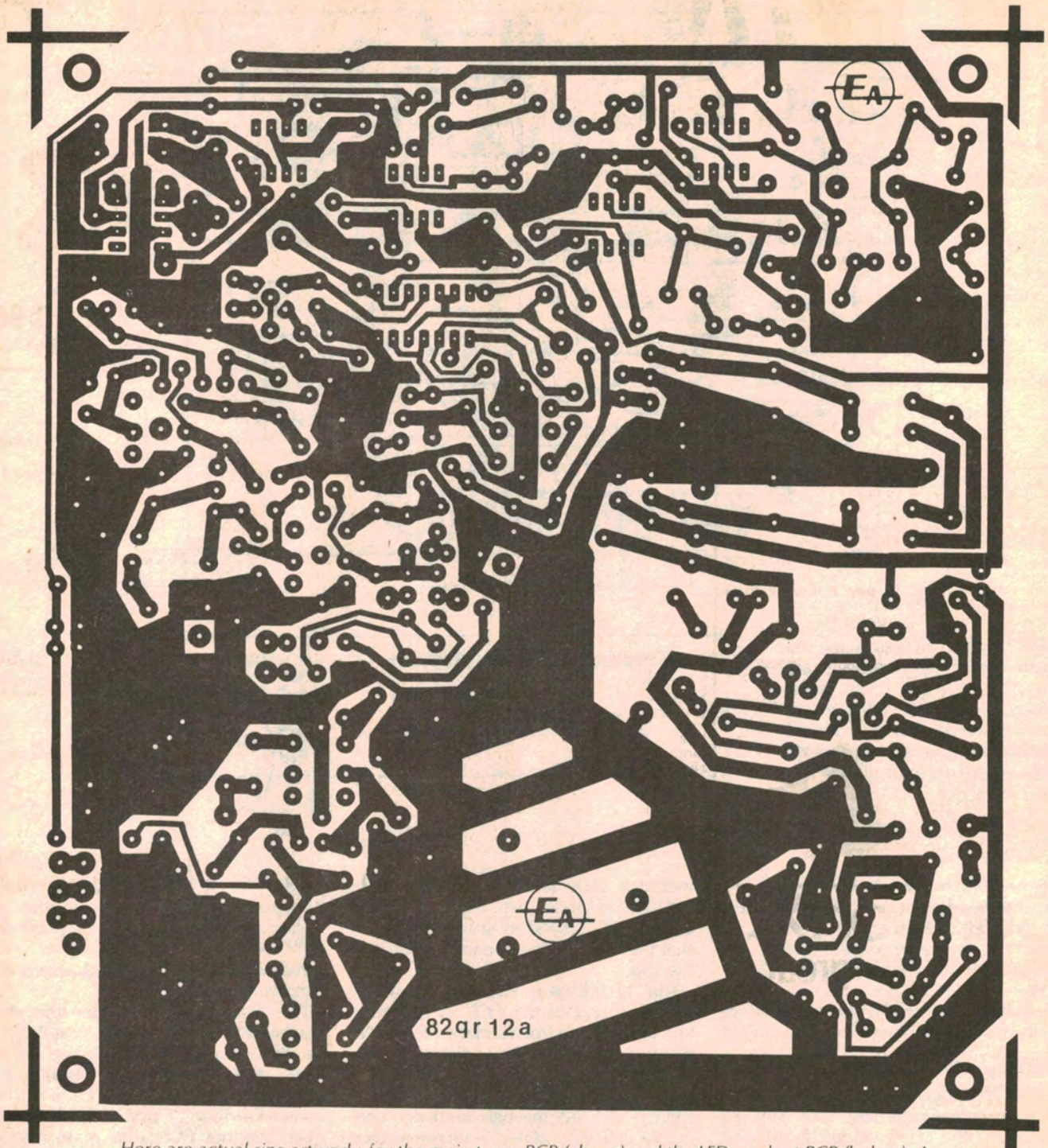
screened lettering for a really professional finish. To make the job easier, the front panel is supplied pre-punched.

We will assume that the chassis is also supplied pre-punched.

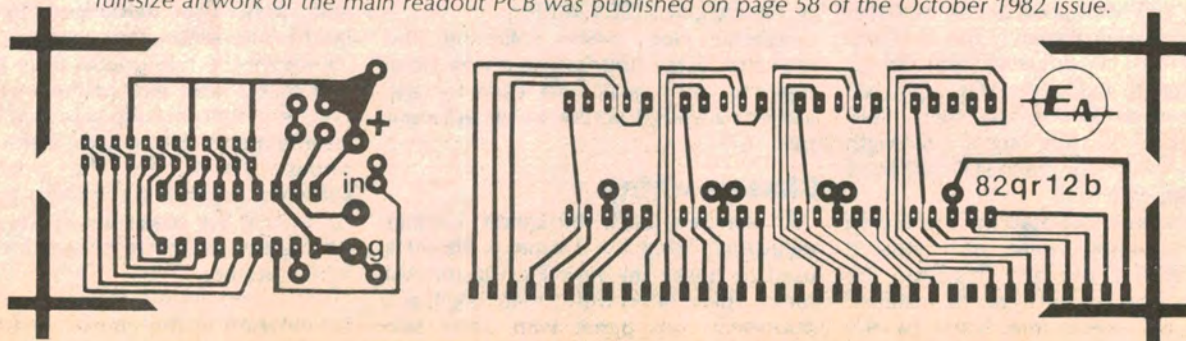
The first job is to solder the main readout PCB to the LED readout PCB. To do this, attach the front panel to the case, insert the FND500 displays and indicator LEDs into the cutouts, and screw the four 25mm standoffs to the main readout PCB. The main readout PCB can now be positioned in the case and a pencil used to mark where the two boards intersect.

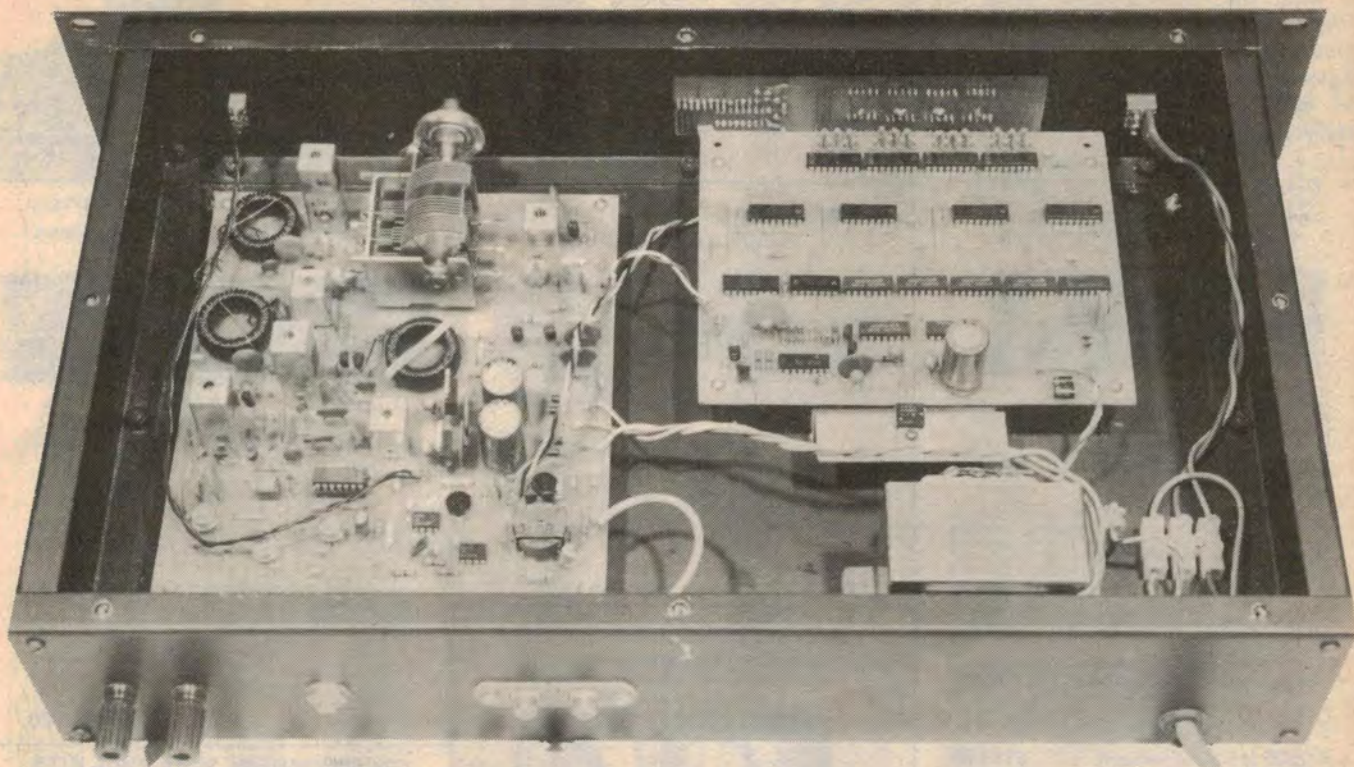
Remove the two boards from the case and tack solder two of the mating bus pads together, making sure that the two boards are at right angles. Before going further, check that the boards are soldered together in the correct position by testing the assembly in the chassis. Readjust as necessary, then solder all the pads together.

The various items of hardware can now be installed in the chassis according to



Here are actual size artworks for the main tuner PCB (above) and the LED readout PCB (below). A full-size artwork of the main readout PCB was published on page 58 of the October 1982 issue.





View inside the assembled AM tuner. Note the heatsinking arrangement for the 7805 3-terminal regulator.

attenuator as well as the wide/narrow switch.

Shielded audio cable is used for the connection between the tuner PCB and the RCA sockets. Be sure to solder the $0.1\mu\text{F}$ capacitor between the chassis and ground of the RCA sockets since this bypasses much high frequency noise.

Fit the mains entry hole with a grommet and pass the mains cord through it. Anchor the cord securely with a cord clamp and connect the earth lead (green/yellow) to a solder lug bolted to the chassis. Make sure that paint is removed from the area of the chassis around the earth connection to ensure a

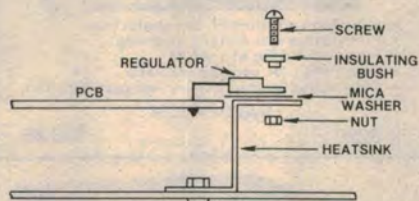



Fig. 2

Fig. 2: mounting method for the 7805 3-terminal regulator.

good contact. The active (brown) and neutral (blue) leads are connected to an insulated terminal block.

Complete the mains wiring to the power switch and transformer primary using 250VAC rated insulation hookup wire. Fit the three terminals of the mains switch with push-on sleeving to avoid the danger of accidental contact with the mains supply.

Next month we shall describe the alignment procedure and a simple CMOS RF oscillator to facilitate this task. Note that the only essential measuring instrument required is a multimeter.

NOTE: The following parts should be added to the parts list published last month: $3 \times 3\text{-}30\text{pF}$ trimmer capacitors (Philips 808); 1×4066 CMOS switch. 



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