

AM/FM Frequency Display

Part II. Update your hi-fi with this digital frequency and time display that you can add on or build into a modified AM/FM set. The construction is simple and inexpensive.

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IN THE JANUARY 1978 ISSUE, WE WENT step-by-step through the theory of operation and the basic wiring and construction of this time/frequency display that you can add to your AM/FM radio. In effect, it is a 12-hour clock that doubles as a radio frequency indicator.

Now that you have completed the modules, you have two choices in the final packaging. You can build the entire project inside the receiver as I did in a Sansui model 331 or build the display section as an add-on in an attractive cabinet that sits on top of the radio.

To build everything inside the radio takes a lot of courage. But, if you are an experienced electronics experimenter and constructor and don't mind tearing into a receiver, you should be successful. The advantages are that the finished modification looks very professional. The first thing you must do is to be sure you have room for all the parts. This includes a metal box or enclosure 7 inches high, 4 inches wide and 6 1/4 inches deep for the display and a box 3 1/4 inches high, 2 1/8 inches wide and 1 1/8 inch deep for the interface board. Then, there must be room for transformer T1 and space on the back panel for switches S1 and S2.

Figure 11 shows the additional parts and circuitry needed in the built-in version. The additional parts are mounted using point-to-point wiring on a small piece of perforated board. There are several points of interest in Fig. 11. Display switching is done by taking voltages from the radio function selector switch which selects time, AM or FM. This switch must include a section that switches a positive supply voltage between the AM and FM sections.

The first step is to get the display working properly outside the receiver. Then you connect the switching and modify the receiver mechanically. The switching voltage for the time, AM and FM functions is not critical; it can range from

+6 to +24 volts. Interface connections are shown in Fig. 12. This is covered in detail later in this article.

The second, and easier, method is to build the add-on version. This is because you don't have to make extensive mechanical modifications on the receiver. Also, if you have any doubts about your electronic skills, play it safe and build this version. Refer to Fig. 13 for the related wiring on the display board and then to Fig. 12 for the interface connections. Mount the interface board in a type 772 LMB box, or similar enclosure, after punching holes for the RF input and output cables. Then build the display section into a type 463N LMB box or

other suitable cabinet.

Connecting to the receiver

Connecting the interface board to the receiver is the toughest part of the project but it's not too hard—you just have to know where to connect several wires. Figure 12 shows the local oscillator sections of a typical radio receiver. Dig out the schematic of your set and locate the local oscillators. In the less expensive sets you may find a single converter section—the same transistor is used for AM and FM. Interfacing is much the same.

Note that you will be working around the tuning capacitor and it is imperative that the interface board be mounted as

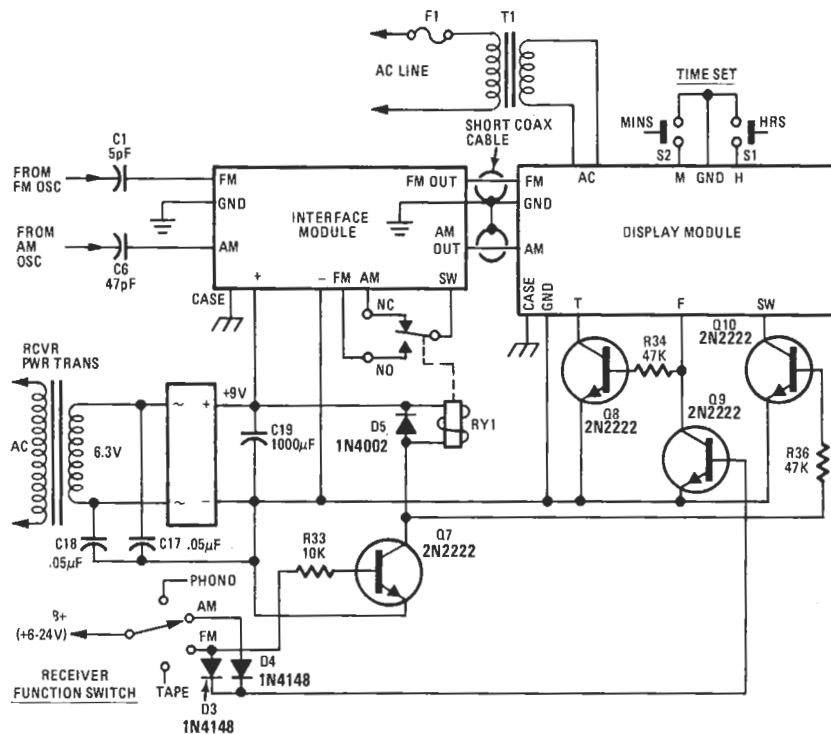


FIG. 11—HOW TIME/FREQUENCY DISPLAY is wired in built-in version. All external parts are mounted on a small piece of perforated circuit board. This arrangement was used in the Sansui receiver.



close as possible to the FM local oscillator. The AM section is not critical—you can even use a short length of coax for the connections.

Back to the schematic, locate the emitter resistor of the FM local oscillator/converter and tie C1 between it and the interface board. Keep the leads under 1 inch in length. Also, be sure to enclose the board in an aluminum utility box as mentioned earlier. Tie a short piece of ground braid from the interface board ground to the radio ground. Repeat this procedure with the AM section. Note that short leads are not as important here.

(For those readers that are concerned about the possibility of detuning the RF circuits caused by the additions, we tried this project with the following results: A

slight detuning effect was noticeable only on FM. It was so slight that realignment proved to be a waste of time. In addition to the Sansui model 331, we tried the time/frequency display on an Arvin receiver, a Radio Shack portable, a Delco AM/FM car radio and a Panasonic table model. All installations worked fine.)

While you are inside the radio, find a source of 8 volts or more to power the interface board. Usually you can get this voltage by removing the ground from the 6.3-volt AC dial lamp supply and attaching a bridge rectifier and filter capacitor as shown in Fig. 12. This source of power is desirable because it goes off and on

with the receiver. If you prefer, substitute a 6.3-volt, 600 mA filament transformer. If you get hum on strong AM stations add capacitors C17 and C18. Route the output cables out of the back and attach a plug PL1 to match the 9-pin tube socket or connector (J1) on the back panel of the main module.

Let's try it out

If you used the built-in version, plug in the receiver. The clock colons will light and you will get a reading of 000. Press SET HRS and, after a delay of several seconds, the hours will advance. Do the same with SET MIN and adjust the display for the correct time. Your clock is now working. (Remember the delay whenever you set the clock. This is a built-in feature.)

Turn on the AM radio and you'll get readings such as 640, 1220, 1540 and so on. The last digit will always be 0 in this mode. You should now be able to look up a station, dial its frequency and hear it! Do the same with FM. Note that you get a smooth transition between odd numbers such as 97.3, 97.6 MHz, etc.

The add-on version works the same way, but you must manually change the switch (S3) to read time or radio frequency. You can select the time mode without disturbing the radio—a bonus feature over the built-in version.

There are a few advantages this display has that haven't been mentioned. First, the clock section can be operated as an elapsed-time indicator. When you plug it in—after allowing 5 minutes for the filter capacitor to discharge—the entire clock is zeroed and will begin counting elapsed time in hours and minutes until the interval you are timing has ended. Also, the add-on display will run without the receiver and the receiver can operate without the display so the clock can be handy around the house.

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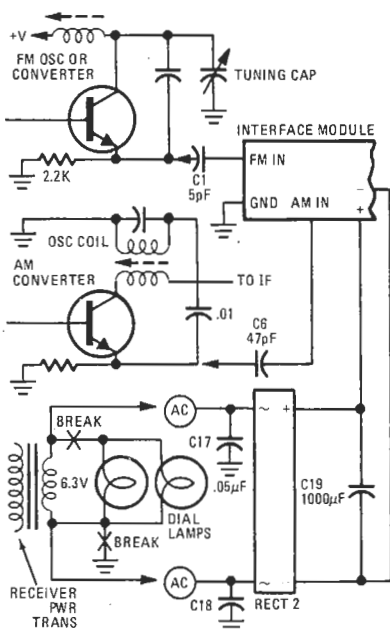


FIG. 12—HOW THE INTERFACE BOARD IS CONNECTED to the receiver. You can use set's dial-lamp supply or separate filament transformer to feed the rectifier.

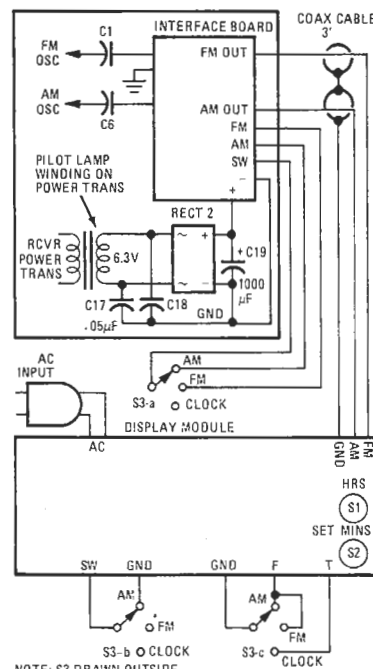


FIG. 13—AUXILIARY CIRCUITRY for the add-on version. Mode switch S3 is installed inside the display module box but is drawn outside for clarity.