modifying the Yaesu FT-301
for 30-meter coverage

Five straightforward steps convert this transceiver for 10-10.5 MHz operation

The Yaesu FT-301 is an attractive looking modern transceiver marketed in the very late 1970s and early 1980s. It was built in four basic models identified as the FT-301, FT-301D, FT-301S, and FT-301SD. The suffix D denotes the model with a built-in frequency counter which drives a digital frequency readout. The suffix S denotes the QRP version, for which the final power amplifier is not included. It uses the driver as the output amplifier, and is rated at 10 watts output. The full power version was designed to run about 230 watts input, and is rated at 100 watts output.

The FT-301's operating capability includes SSB (upper and lower sideband), CW, AM, and FSK. The rig is all solid-state, including the final amplifier, and has provisions for the usual crystal filters for controlling receiver bandwidth. Also included is a noise blanker, an optional RF speech processor, marker generator, RIT, and provision for an external VFO option. The transceiver operates on 13.5 volts, and draws 21 amperes on transmit (3.1 amperes for the S model), and 1.1 amperes on receive.

The transceiver covers the Pre-WARC 10 through 160-meter bands (the 10 meter band is divided into four 500 kHz segments designated 10A, 10B, 10C, and 10D), and one additional position on the bandswitch designated AUX. It is this last position that can be converted to provide coverage of the range 10.0 to 10.5 MHz, including the 30-meter Amateur band from 10.1 to 10.15 MHz.

The AUX position was originally intended by Yaesu to be an option that could provide coverage of the 27-MHz Citizen Band. Altering it to cover the 30-meter band is not difficult, but does require some care and patience. Fortunately, the conversion can be accomplished with the tools and test equipment found in most Amateur stations. Conversion has no effect on the operation of the other bands in the transceiver.

The conversion project is divided into five steps, one of which is not required in the dial (nondigital) models. These steps cover conversion of the digital display PB-1542; the band oscillator crystal unit PB-1441; the bandpass filter unit PB-1442B; the tunable filter trimmer unit PB-1446; and the output low-pass filter unit PB-1445. (The PB designations above are the same as shown in the documentation included in the Yaesu instruction manual for the FT-301.)

overview of the transceiver block diagram

Understanding the principles employed in the design of this transceiver will make the description of the conversion steps easier to follow.

In the transmit mode, the signal originates at 9 MHz, where crystal filters and a balanced mixer provide upper and lower sideband capability, and where provision is also included to generate CW, AM, and FSK signals.

The 9-MHz signal is heterodyned to the desired output operating frequency by being mixed with a pre-mix frequency in a 500-kHz segment located between 13.9985 MHz and 39.0 MHz, with its exact location dependent upon the band in use. This pre-mix frequency is itself the heterodyne product of two frequencies set by the main tuning VFO (between 5.0 and 5.5 MHz), and a band-determining crystal. (An exception is the 80-meter band, for which the 5.0-5.5 MHz VFO output is used directly as the pre-mix frequency.) **Table 1** shows the data as presented in the Yaesu instruction manual, to which a final line has been added showing the proper frequency relationships for 30-meter band coverage.

The same pre-mix frequency is used in the receive mode, and several of the same tuned circuits are switched so that they serve the same frequency-determining function for receive as for transmit. Consequently, one set of modification steps serves for both transmit and receive, and essentially the same

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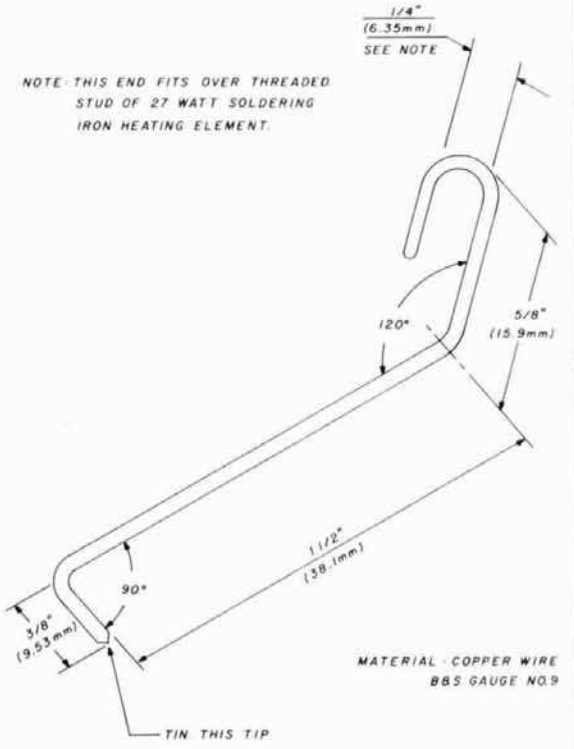

fig. 1. Soldering tool.

table 1. Frequency relationships.

band	frequency MHz	crystal MHz	premix out MHz
160 meters	1.5- 2.0	16.0	10.5-11.0
80 meters	3.5- 4.0	none	5.5- 5.0
40 meters	7.0- 7.5	21.5	16.0-16.5
20 meters	14.0-14.5	28.5	23.0-23.5
15 meters	21.0-21.5	35.5	30.0-30.5
11 meters	27.0-27.5	41.5	36.0-36.5
10 meters A	28.0-28.5	42.5	37.0-37.5
10 meters B	28.5-29.0	43.0	37.5-38.0
10 meters C	29.0-29.5	43.5	38.0-38.5
10 meters D	29.5-30.5	44.0	38.5-39.0
WWV	5.0	13.9985	13.9985
30 meters	10.0-10.5	24.5	19.0-19.5
	VFO: 5.0-5.5 MHz	IF: 9.0 MHz	

steps that align the receiver also align the transmitter.

The front panel band-peaking control adjusts a set of three permeability-tuned circuits, which resonate the receiver mixer, RF stage, and transmitter driver. Each band has its own set of trimmer capacitors. The permeability-tuned coils permit the user to peak the tuned circuits for the band in use, and also set the proper L/C ratio over the 1.5-30 MHz frequency range.

Finally, the output of the transceiver is connected to the 50-ohm antenna coaxial receptacle through a

AUX setting of bandswitch used for 30 meters.

set of low-pass filters, with the proper filter selected by the bandswitch for the band in use.

conversion steps

The five conversion steps may be tackled in any order you prefer; however, the order described below is recommended. In this order, you'll become familiar with the transceiver's interior by accomplishing the easier tasks first. None of the steps is unreasonably difficult, nor is any likely to cause problems with adjustment. You will have to fabricate one special soldering iron tip, which is described below. The conversion is not for the rank beginner in electronics, but you don't need to be a PhD either. Carefully follow the description and instructions below, work slowly, and you'll be rewarded with very attractive results. (The work should take about five or six hours.)

parts and tools needed

Only ordinary tools are needed for completion of this project. They include the following:

- miniature wire cutters and needle-nose pliers
- electronics grade forceps, with locking handle
- assorted small screwdrivers with conventional flat blades
- plastic hex alignment tool to fit T-1006 in the band-pass filter unit
- small (27 watt) soldering iron, with screw-on tip (Ungar or Radio Shack)
- medium-size soldering iron (approximately 60 watts)
- flashlight and magnifying glass (or magnifying glasses you can wear)
- proper size Phillips screwdrivers (see below)
- grip-dip meter (optional, but desirable)
- dummy load (50 ohm)
- RF wattmeter or equivalent power meter

Be sure the Phillips screwdrivers really fit the screw heads properly. When they are correctly matched, the screwdriver securely grabs the screw; when they are

poorly mated, it is impossible to crack free a tight screw. *Don't bypass this step.* Four of the screws you'll have to remove are hard to reach, and have been glyptal-locked in place. You'll need a good match between the screwdriver and the screw head. It seems to me that Japanese screws have shallower wells than the American screwdrivers can accommodate, and it's sometimes necessary to file or grind off a little of the screwdriver point in order for it to seat properly.

The grid-dip meter is optional, but it is very handy for checking and preliminary alignment.

You'll have to fabricate a special tip for the soldering iron. **Figure 1** shows its design. A convenient source of hard copper wire of the proper gauge is the copper rod sold in hardware stores for replacing the pull rod in a ball-type toilet tank valve. It is 105 mils in diameter, and is equivalent to B&S 9 gauge wire.

Materials for the project include the following:

HC-25U crystal, 24.50000 MHz

5 signal diodes, 1N914 or equivalent

1 good quality fixed ceramic capacitor 15 or 20 pF

2 good quality fixed ceramic capacitors 45 pF

3 miniature compression trimmers, 200 pF

miscellaneous hookup wire, insulating tubing, etc.

The crystal should be ordered for a 30-pF load capacitance, fundamental frequency of 24.50000 MHz, parallel resonance, and 0.001 percent accuracy.

Standard width (5/8-inch/1.59-cm) compression trimmers may be used, but if you can find the narrower version (3/8 inch/0.95 cm), such as Calectro Catalog No. R1-248, 55-300 pF), installation is easier. The capacitance when resonated will be between 100 and 175 pF.

preparation

Disconnect all cables from the FT-301 transceiver, and remove the top cover by snapping out the four cover locks. Lift the cover free, but be careful not to tear free the speaker cable. It has an in-line connector that may be released to permit setting the cover aside in a safe place.

Turn the transceiver over, placing it on a soft protective surface. Remove the twelve small screws that hold the bottom cover in place (four on the bottom, four each on the left and right sides), and carefully lift the cover free and place it aside.

Position the transceiver with the front panel toward you (and the rear apron away from you), upside down, so you're looking into the bottom of the chassis. This is the position in which **steps 1** through **4** are completed, and is the position to which directions below apply.

Inspect the transceiver to familiarize yourself with the general layout. Make notes to assist in reassembly when you're finished. It goes without saying that you should be satisfied that the rig works properly before you begin; no modification should ever be started unless the equipment is in good working order to start with. Otherwise, if problems arise, you may never know their true cause.

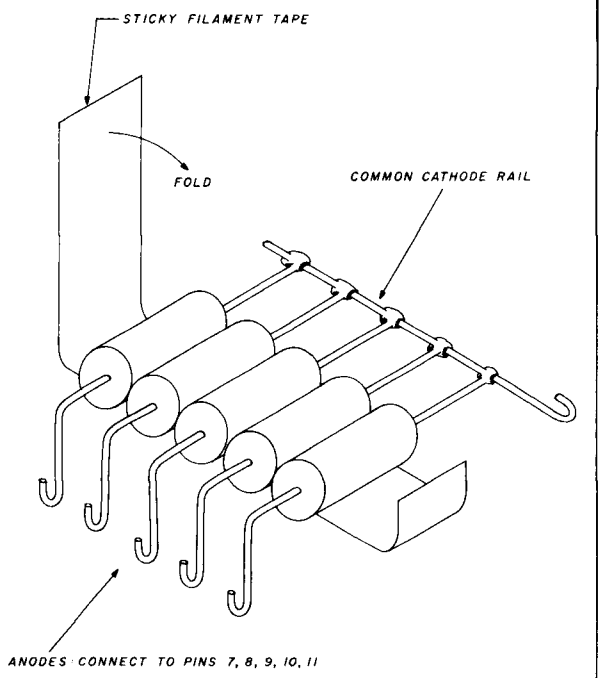

fig. 2. Matrix pack of 5 diodes, 1N914 typical.

step 1: conversion of the digital display

If the model you are converting does not have the digital display, but is instead the analog dial model, skip this step and go directly to **step 2.**

Locate the display logic unit, PB-1542 — the vertical printed wiring board, immediately behind the center of the front panel, and parallel to it. It is the board on which the LED digit displays are mounted. Along the bottom edge of this board (which is now "up" because the rig is upside down), you'll find a row of 15 terminals, part of a 15-pin receptacle/plug combination which connects the board to a small cable harness (which itself has an in-line receptacle/plug combination 1 inch (2.54 cm) or so further toward the rear). Counting from your left, identify pins 7, 8, 9, 10, and 11. (Pins 14 and 15 have no wires connected to them; be sure you count correctly.) These five pins must be pulled to ground when in the AUX band position so that the display reads 10 to the left of the decimal point.

A few words of explanation may be helpful at this point. The digital display is not entirely a genuine frequency counter. The digits to the left of the decimal

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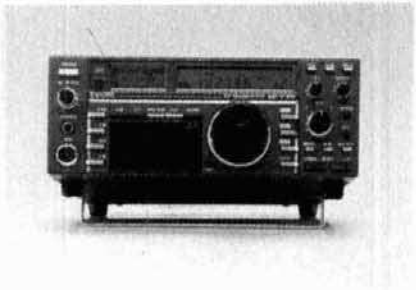

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Another concerns the current lack of activity on 900 MHz. Who'll be the first to have a radio for sale? Will they be in compliance with the JA personal radio band plan or will they conform to the ARRL version? It's too soon to tell. This band has a tremendous amount of potential for digital and other forms of specialized communication as well as for voice.

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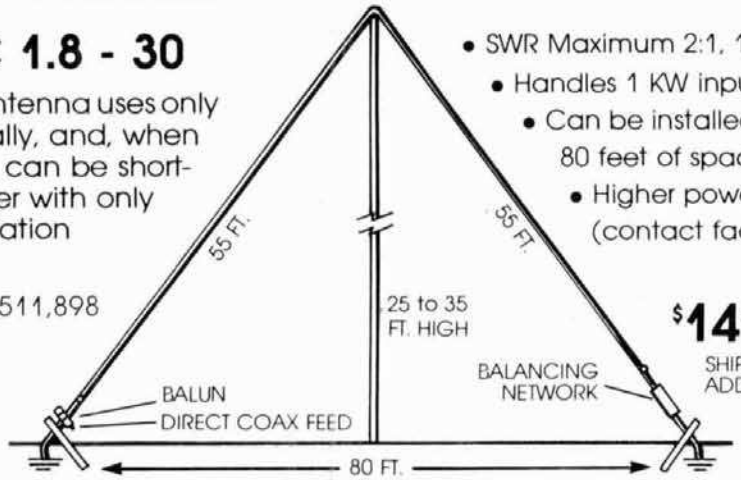

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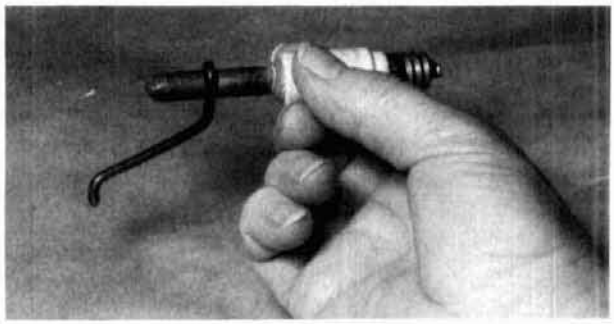


Assembly of soldering tool behind screw-on tip with old tip end removed.

point are "forced," in that a diode matrix activated by the bandswitch commands a display of 28 for 10 meters, 21 for 15 meters, etc. The diode matrix is located in the counter mixer unit (the square box a few inches further toward the rear). Unfortunately, the diode matrix is potted in a 14-DIP package, and altering the 27-MHz section to yield 10 is not possible. We shall use the five diodes to construct an external diode matrix, which will have the same effect as reprogamming the matrix in the DIP package. As a matter of fact, it's easier to do the job as described below than it would be if it were possible to reprogram the DIP package because no disassembly of the counter mixer unit will be required.

Form the five diodes in a small pack as shown in **fig. 2**. The cathodes should be connected together as a common bus. Carefully position the diode pack on the up-facing surface of the 15-pin receptable, and connect the five diode anode leads to pins 7, 8, 9, 10, and 11. (Pin 11 causes the first digit to be 1; pins 7, 8, 9, and 10 cause the second digit to be 0.) With care (watch out for solder bridges!), solder the five diode leads to the correct pins. Inspect your work.

Now, locate the black wire, the far end of which connects to the AUX lug on the bandswitch wafer (SW2A-1 in the Yaesu documentation) closest to the front panel. If your rig doesn't have the 27-MHz option installed, the near end of the black wire will be found connected to pin 13 of the same group to which you just connected the diodes. If your rig has the 27-MHz option installed, the near end will be found connected to one of the center lugs (pin 6, but double check) of the cable in-line receptacle-plug combination mentioned above. When you've located the correct wire, disconnect its near end from whichever place you found it, and connect it now to the common rail of the new five diode matrix you just installed. The purpose is to ground the common bus of the five diodes when the bandswitch is in the AUX position. Using some sticky filament tape or equivalent, fasten the five diodes down neatly to the top of the 15-pin receptacle.

You've now completed the conversion of the digital display. You may check your work by connecting the power supply to your rig and turning it on. With the bandswitch in the AUX position, the display should operate normally, and the first two digits should read 10. Before you consider this step completed, run through the other band positions, and verify that the display reads the correct digits to the left of the decimal point for each band. If not, the likely cause is either that you connected to wrong pins, or (more likely), that you have a short or solder bridge between two pins. You should not encounter such problems if you work very carefully and take your time. It's very satisfying to see that 10-MHz frequency displayed, but don't be fooled: the rig isn't yet on 30 meters! Carefully redress the wires around the display unit to their original positions, and go on to **step 2**.

step 2: conversion of the band oscillator crystal unit PB-1441

This one is easy. On your left you'll find a flat horizontal metal shield plate. It has access holes for various alignment trimmers and is held in place with eight screws. Remove them, noting their position carefully (they're not all the same length). Remove the flat shield and lay it aside in a safe place.

A few inches behind the front panel, in the first compartment under the shield, you'll find a crystal socket board with eight, nine, or ten crystals in it. Eight crystals are for the existing bands, 160 through 10 meters. The ninth crystal (if present) is for the JJY/WWV option. The tenth crystal (if present) is in the AUX socket and is for the 27-MHz option.

Incidentally, if your rig does not have the option to receive WWV on 5 MHz, this would be an ideal time to add it. The WWV crystal should meet the same specifications mentioned above and have a frequency of 13.99850 MHz. The WWV trimmer closest to the front panel tunes the circuit for oscillation; the WWV trimmer one step toward the rear apron adjusts for zero beat with WWV. This option works well only with the mode switch in the LSB position.

The crystal socket in the rear row, closest to the center of the rig, is the proper place for the new 24.50000 MHz crystal for the 30-meter band. You may install it now.

It will be necessary to pad the existing AUX trimmer with a 15 to 20-pF capacitor. The easiest way is to form the leads of the capacitor so it can lie alongside the AUX trimmer, and carefully tack-solder the leads to the AUX trimmer leads. The proper two AUX trimmer leads are (a) the lead facing the rear of the chassis, and (b) the lead facing the center of the chassis. Work with a clean, hot iron, and pre-tin the new capacitor leads. Don't overheat the trimmer. This task is easy if done with care.

Some of the subsequent steps depend on this circuit oscillating properly. The likelihood is that correct oscillation will be obtained if the AUX trimmer is set at mid value. However, a simple additional test can be used to verify proper operation as follows.

The sixth harmonic of 24.5 MHz is at 147 MHz, which falls conveniently in the 2-meter band. Assuming you have (or can borrow) a 2-meter HT, tune it to 147 MHz, and then listen for the squelch to open when you tune the AUX trimmer. (Power must be applied to the FT-301, of course, and the bandswitch must be in the AUX position. The FT-301 should be in the receive mode.) With the HT antenna within a few inches of the crystal compartment, the 147-MHz signal should be at full quieting. The proper setting of the AUX trimmer should be about 1/4 turn less capacitance than that at which oscillation starts; in other words, don't crowd the maximum capacitance setting at which the circuit begins to oscillate. You may, if you wish, use the HT to judge the position at which oscillation is strongest.

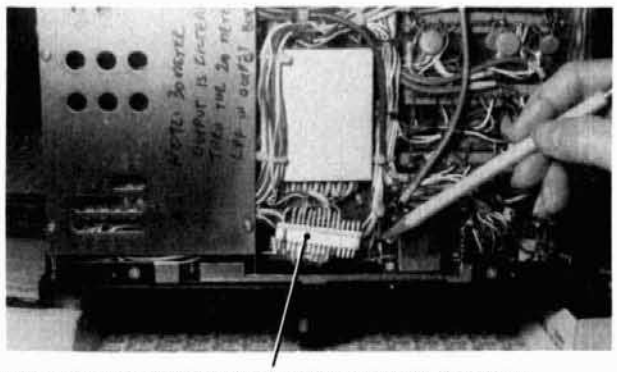
When you're satisfied with the oscillator operation, you may proceed to **step 3**. (Note: you may find that the 24.5-MHz crystal oscillates just fine without the extra 15 or 20-pF capacitor. If so, the extra capacitor may be omitted; however, to be sure you are optimally tuned, it's a good idea to add it, especially since it's easy to do.)

step 3: conversion of the bandpass filter unit

The compartment next to the crystal compartment of **step 2** is the bandpass filter unit PB-1442B. It is located one compartment away from the crystal compartment, toward the rear of the transceiver. Within this compartment, locate bandpass filter T-1006, which is toward your left and toward the rear. It is the filter that connects to the AUX lugs on bandswitch wafers SW2A-6 and 7. The primary connection has a piece of hookup wire from the AUX lug on wafer 6 (an easily accessible lug toward the center). The secondary connection has a piece of shielded cable that connects to the AUX lug on wafer 7 (also easily accessible).

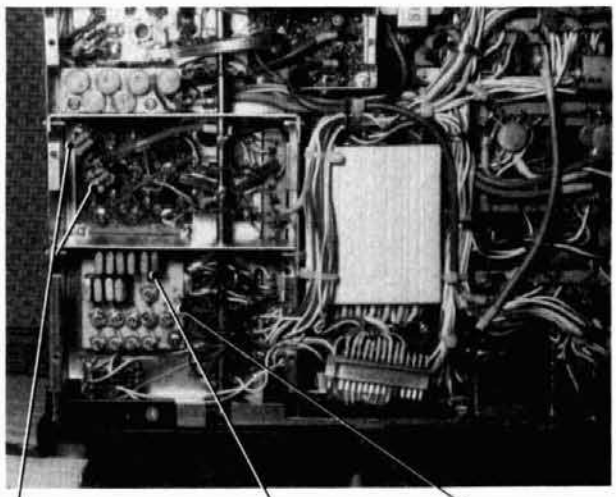
Assuming you have a grid-dip meter available, temporarily tack-solder one of the 45-pF capacitors from the AUX lug on wafer 6 to ground, and, similarly, the other 45-pF capacitor from the AUX lug on wafer 7 to ground. In other words, you'll be shunting the primary and secondary of the filter, each with a 45-pF capacitor. Leave the leads long, and form them open so you can insert the grid-dip meter coil into first the primary, and then the secondary capacitor lead loop.

Power to the FT-301 should be removed. The bandswitch should be in the AUX position. You should find a weak dip on the primary side with the grid-dip meter



In-line cable receptacle which obscures diode-pack installation beneath

Install the 5-diode matrix pack under the in-line cable receptacle.



New crystal, oscillator padder, and padding capacitors across T-1006.

somewhere between 19 and about 25 MHz. You should find a strong dip on the secondary side in the same general range.

With the alignment tool, adjust the core in T-1006 until the strong dip on the secondary side is at 19 MHz. (The weak dip on the primary side should be somewhere between 19 and about 20 MHz; don't worry about the exact value.)

Unsolder the two capacitors from their temporary positions, and, after trimming their leads, solder them permanently at the terminals of T-1006, one shunting the primary and the other shunting the secondary.

If you don't have a grid-dip meter, you may omit the above temporary installation of the capacitors and go immediately to their final installation at the terminals of T-1006. In this case, you won't be able to adjust the core of T-1006 until later.

(The above does not result in an optimal bandpass filter. However, optimal operation over the full range

of 10.0 to 10.5 MHz is not needed. The above approach is more than adequate for the Amateur 30 meter-band and also allows good reception of WWV on 10 MHz.)

You've now completed the conversion of the bandpass filter unit.

step 4: conversion of the tunable filter trimmer unit

The trimmer unit, PB-1446, is located in the center of the transceiver, and the trimmer adjustments are now facing down toward your workbench. We're not going to modify the trimmer unit itself; instead, we're going to augment it with three new trimmers to be located next to the permeability-tuned coils.

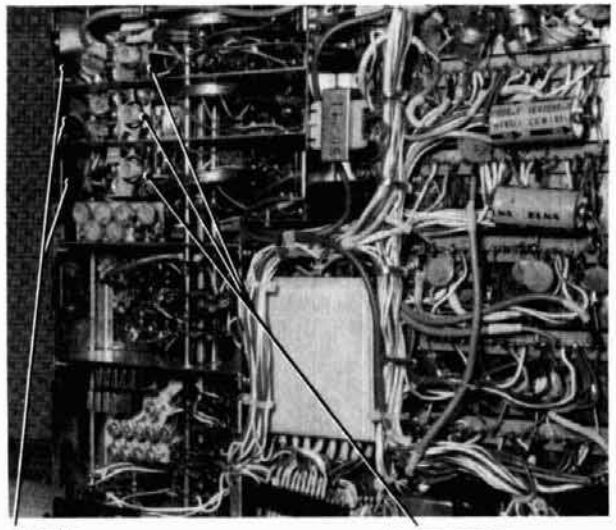
Immediately behind (toward the rear of the rig) the bandpass filter unit of the previous step, you'll find three compartments housing the permeability-tuned coils. The actual permeability-tuning mechanism is facing down toward the workbench. Each of the three compartments contains one (or two) wafers of bandswitch SW2A, and also contains the wires connecting to the underside of the above mentioned trimmer unit.

Using a clean, hot, medium-size soldering iron (about a 60-watt rating is suitable), very quickly unsolder the three flexible braid shields from the three postage-stamp-size PC boards at the base of the permeability-tuned coils, and carefully fold the shield braids back. Also, in the rearmost of the three compartments, unsolder the parallel resistor pack from the same PC board, and carefully fold it back to give full access to the switch wafer.

With a magnifying glass and flashlight, identify the AUX lugs on wafer sections SW2A-9, 10, and 11. (The wafer sections are numbered from the front panel to the rear.) You'll find that the desired lugs are not easily accessible; they're on your left side and are the next-to-lowest lugs. On each of the above wafer sections, the AUX lugs are jumper connected to the lugs for bandswitch positions 10D, 10C, 10B, and 10A. The lug next to the AUX lug is the 10D lug. It's necessary to remove the jumper from the AUX lugs (on just these three wafers, don't remove the jumper on wafer SW2A-8). The jumper wires are wrapped once around the lug.

This is the time for a steady hand; don't attempt this step if you're tired or in a bad mood. It's certainly possible to accomplish the task without damaging anything with the soldering iron. You'll have to dress the various leads to the side a bit to get best access. Plan the job, and practice it once or twice with a cold iron so you can get the feel of the task before you begin.

With the aid of the special soldering tool and a long, thin screwdriver or scratch awl, carefully unsolder and unwrap the jumper wires from the three AUX lugs, one on each of the identified wafers. Don't mangle the lugs. The lug material is thinner gauge than is conventional in American-made switches; treat it with respect. In the two rearmost compartments, you'll have enough room to reach in with a small pair of wire cutters and snip off the unwrapped 1/4-inch (0.635 cm) or so of lead. In the forward compartment, however, such luxury is absent and you'll have to settle for just bending the lead end out of the way, or working it back and forth until it breaks off at the 10D lug.



Tunable filter unit showing new compression trimmer locations.

Prepare three pieces of thin, bare, stranded (flexible) hookup wire, each about 3 inches (7.6 cm) long. Form a suitable hook in the end of each, and carefully solder one of the wires to the now-empty AUX lug on the rearmost wafer, SW2A-11. Bring the free end of the wire up where it is readily accessible. Using the other two wires, do exactly the same thing on the AUX lugs of wafers SW2A-10 and SW2A-9.

The three compression trimmers are to be mounted alike. There's room (just barely) for them to be installed vertically (actually, at about a 60- or 70-degree angle) alongside the compartment shields, one in each of the three compartments, with the adjustment screws facing toward your right, and slightly up. It's necessary to trim the lugs on the compression trimmers so they can fit; the ground end of each trimmer is to be soldered to the postage-stamp-size PC board immediately next to (or under) the corresponding shield braid wire. The other lug on each compression trimmer is connected to the stranded wire you connected to the AUX lug in the same compartment. Be sure to slip a piece of insulation over the bare wire after you've cut it to length so it won't short to the chassis when the compression trimmer is lowered into its final position.

The purpose of the above is to separate the AUX lugs from the 10-meter positions and give each of the three AUX lugs its own compression trimmer to ground.

After the compression trimmers are properly installed, their adjustment screws should be accessible with a long, thin screwdriver or alignment tool. Following installation of the three trimmers and inspection of your work, reinstall the resistor pack lead in the rear compartment and return the three shield braids to their original position.

Now stop and breathe a sigh of relief. The worst is over. The rig will now operate on 30 meters, although **step 5** should be completed before you return the rig to service.

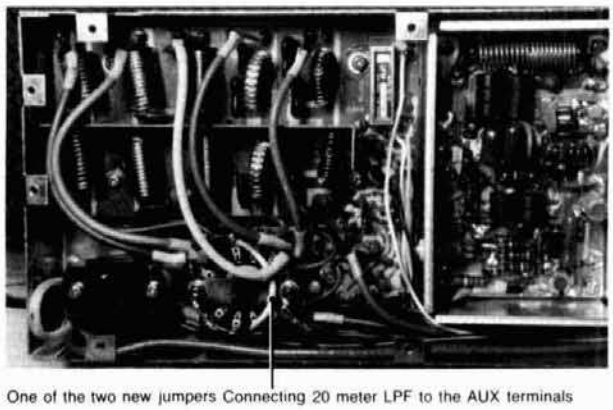
alignment

You may now connect the power cables and turn the transceiver on. Set the band-peaking control on the front panel to a point midway between the 40- and 20-meter band positions. The pointer should be just barely past the numeral 6. Tune the rig to 10.110 MHz, and use the grid-dip meter as a signal source at that frequency. When you've found the grid-dip meter signal, tune the two compression trimmers closest to the front panel for maximum signal. Also peak bandpass filter T-1006 for best reception. If you weren't able to check the adjustment of the crystal tuning earlier, this is a good time to do it.

Connect a dummy load and some kind of power meter to the antenna terminal. Set the mode switch to the CW position and key the rig. Set the drive control so that modest output is obtained and adjust the third compression trimmer (the most rear) for maximum RF output.

Now, observing the RF output, gently peak the second compression trimmer. If the maximum output does not occur at the same compression trimmer adjustment as you obtained for best receiver sensitivity, turn the band-peaking control on the front panel slightly toward the 20-meter position and repeat the alignment of the two front-most compression trimmers on receive. Then check the adjustment for maximum transmitter power as above. It should not take more than one or two tries to find a satisfactory set of adjustments.

At this point you should have no trouble hearing 30-meter signals on the air, and, at the right time of day, a very strong WWV on 10 MHz. You might find the receiver gain to be a little lower on this band than on the other bands. Much of the reason is because of the 9-MHz trap in the antenna lead. If you wish, simply short it out or tune it somewhat lower than 9 MHz and accept the slight compromise with 9-MHz suppression. (The 9-MHz trap is T-1401, and is located on trimmer unit PB-1446.) In any case, the receiver gain is entirely adequate for everyday use.



One of the two new jumpers Connecting 20 meter LPF to the AUX terminals

Low-pass output filter assembly on rear apron.

You may find it easy to overdrive the final, and that the drive control must be set back to a lower level than customary. The reason is that the exciter drive-level potentiometer serving the 10-meter band also serves the 30-meter band now. Readjust it if you wish, following the instructions for the VR Unit PB-1448 found in the instruction manual. It is easier, in my opinion, to simply reduce the drive level using the front panel control. You're now ready for the final conversion step.

step 5: conversion of the output low-pass filter unit

In the original design of the FT-301, Yaesu didn't include any low-pass filtering for the 10- and 11-meter bands. Even though the power amplifier is push-pull and is essentially linear, it's good practice to use a filter on the output. There is not sufficient room to include a low-pass filter specially dedicated to the new 30-meter band position.

A practical alternative that works well for me is using the 20-meter low-pass filter for 30 meters as well as for 20 meters. With this arrangement, no second harmonic was detectable at a listening location about 3/4 mile (1.2 km) from my location. Higher harmonics should be suppressed by the 20-meter filter, which is a conventional constant k design, without m-derived notch sections.

Remove the power cables and turn the transceiver so the rear apron faces forward. Remove the power amplifier (assuming you do not have the QRP version). The low-pass filters are located in the compartment along the rear apron. With the power amplifier (or the rear cover, for the QRP model) removed, both filters and the wafers of switch SW2B are visible. It is necessary to get at both wafers. Proceed as follows:

Locate the shaft coupling that couples the rear end of the shaft of SW2A to the forward end of the shaft of SW2B. Loosen the two rear set screws. Be sure you understand what position the switch is left in, and

which lug on the SW2B wafers correspond to AUX and to 20-meter positions.

There are four screws holding the PC board with the filter coils and four screws holding the mounting plate for SW2B. Remove all eight. *Be especially cautious removing the latter four*; it's easy to distort the switch lugs, and once bent out of shape it is a terrifying job to repair them. Here's where you'll need caution and well-fitting screwdrivers.

With the eight screws removed, lift the PC board and switch body together as a loose assembly, gaining access to the lugs on both wafers.

As before, remove the jumpers that connect the AUX lugs to the 10D lugs on both wafers. Solder a new jumper of fairly heavy wire connecting the AUX lug on the top wafer to the 20-meter lug on the same wafer. Do the same on the bottom wafer. The purpose is to use the 20-meter filter on 30 meters as well as on 20 meters.

After inspecting your work, reassemble the filter assembly, remembering to have SW2B in the correct position with respect to SW2A before tightening the shaft coupling. To ensure proper mechanical alignment, tighten the shaft coupling while holding SW2B firmly against its mounting surface, before you tighten the four switch plate mounting screws.

To avoid losing the four switch mounting screws, position the transceiver vertically with the front panel facing down. (Two old copies of the Callbook are just the right size for supporting the edges of the front panel so that no mechanical stress is placed on the knobs.)

With reassembly of the low-pass filter unit and replacement of the rear panel/power amplifier, you've completed the conversion.

final cleanup

Reassembly is easy, and follows the reverse order as disassembly. You'll want to make one final alignment before replacing the shield plate. The final alignment should be done at about 10.125 MHz and should follow the same procedure as above. The receiver alignment should be done while listening to a weak signal on the air. Adjust T-1006 this time for maximum RF drive in the transmit position; doing this makes it a little easier to tune it to the peak position.

You may notice a large amount of 1-MHz marker leakthrough on 9 MHz while working on the receiver. With the shields replaced and the rig buttoned up, this will no longer be a problem.

No special instructions are needed to enjoy 30 meters. The rig operates on this band just as if it came factory equipped with the capability. Signal reports on the air have been good, and I enjoy having WWV on 10 MHz conveniently at hand.

ham radio