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Yaesu FT-600 MF/HF Transceiver

Down East Microwave Model DEM 50-28CK 6-Meter Transverter Kit

Product Review

*Edited by **Rick Lindquist, N1RL**• Senior Assistant Technical Editor*

Yaesu FT-600 MF/HF Transceiver

By Steve Ford, WB8IMY
Managing Editor

A friend of mine, also a ham, was peering over my shoulder as I lifted the Yaesu "System 600" transceiver from its box. "That isn't a rig for sissies," he commented.

"What do you mean?"

"I mean, it's a *real* radio, not a Christmas tree decorated with a thousand knobs and LEDs you'll never use. You have to be a true ham to appreciate a rig like that."

The more I looked at the radio—known as the FT-600 in its amateur incarnation—the more I had to agree. There was an **ON/OFF** switch, **VOLUME, SQUELCH** and **RIT** controls, a tiny keypad, a VFO control, and a few other small push buttons. The design was decidedly Spartan, and the overall impression was one of no-nonsense ruggedness.

When I began reading the manual, I discovered that my impressions were right on target. The FT-600 is an HF transceiver designed for three applications: marine, land-mobile or Amateur Radio. Only the firmware programming and a few bits of hardware make the difference.

Maritime and land-mobile operators need a transceiver that can "take a licking and keep on ticking." Moreover, they want a rig that's simple to use. They don't have time to fiddle with two dozen features when seconds count. They need to pick up the microphone and communicate—period.

Durability isn't quite as important to hams, but it never hurts (especially in mobile applications). Simplicity, however, is a big plus to beginners and hams on a budget. No steep learning curve here. A simple rig won't confuse the neophyte, and a lack of bells and whistles translates to a much lower price. In an era when 100-W amateur HF transceivers often sell at $1200 and beyond, the FT-600 comes at a street price of around $900.

Features

The front panel layout is extremely clean, with a bright amber LCD display dominating the upper third (you can set display brightness to high or low). Unlike many amateur transceivers (but like some receivers of yesteryear), the FT-600 provides a front-panel, forward-firing speaker. You can crank up the rig to ear-splitting volume, but distortion is held to a minimum. The frequency readout is big and easy to read at all angles. The little LCD-segment S meter/power-output meter below the frequency readout shows signals up to only around S9, so if the signal is any stronger than that, you won't be able to tell by how much.

The rugged Yaesu MH-31 hand mike (included) plugs into the front panel at the lower-left corner. The mike includes **DWN**, **FST** and **UP** buttons plus a rudimentary audio equalization switch that enables a little bass clipping circuit. A 1/4-inch headphone jack is immediately to the right of the modular type mike jack.

I was a little confused when I examined the front-panel controls for the first time. The manual showed the **UP/DOWN** bandswitching buttons just below the **ON/OFF** switch, but I could only find what appeared to be an inset piece of black plastic. Had someone at the factory neglected to install the switches? A quick call to the dealer solved the mystery. "Look in the box for a tiny piece of metal that looks like a key. You're supposed to use that to pry off the switch cover." Sure enough, the "key" was there and, with some gentle persuasion, I used it to unveil the switches. Too bad the manual didn't warn me in advance. (Depending on how your FT-600 arrives from the dealer, the keypad may also be covered, and you might have to install the ham radio identity module yourself. The key is used to remove this cover as well.)

BOTTOM LINE

The Yaesu FT-600 is a sturdy, no-frills HF transceiver package that will appeal to those who value reliability and don't like to twiddle lots of knobs.

The tuning knob is large and has a slip-resistant rubber surface. Unlike the tuning knob on the typical HF transceiver however, the FT-600 tuning knob is detented—something you expect to find only on a VHF or UHF mobile radio. There's no way to defeat or disable this, and it takes a little getting used to (you can't "spin" a detented knob up or down the band very easily, for example). Changing the tuning step rate is very easy. Just push the **STEP** key and you have a choice of step sizes, from 1 kHz down to 10 Hz. The readout only displays down to 100 Hz, however, so in the 10-Hz-step mode, you'll have to turn the knob 10 clicks before the display rolls over. Similarly, the RIT (clarifier) does not show up on the display.

Because of its multipurpose design, the front panel includes some buttons you won't need in Amateur Radio service: There's an

Table 1

Yaesu FT-600, serial number 6D010066

Manufacturer's Claimed Specifications	***Measured in the ARRL Lab***
Frequency coverage: Receive, 50 kHz–30 MHz; transmit, 1.8-30 MHz, amateur bands only.	Receive, as specified; transmit, 1.8-2; 3.5-4; 7-7.5; 10-10.5; 14-14.5; 18-18.5; 21-21.5; 24.5-25; 28-30 MHz.
Modes of operation: USB, LSB, CW, AM, FSK.	As specified.
Power requirement: Receive, 1.2 A (no signal); transmit, 20 A, at 13.5 V.	Receive, 0.9 A (max volume, no signal); transmit, 16 A (max), tested at 13.8 V.
Size (height, width, depth): 4.2×9.8×11.4 inches; weight, 9.9 lb.	
Receiver	*Receiver Dynamic Testing*
SSB/CW sensitivity, bandwidth not specified, 10-dB S/N: 0.5-1.8 MHz, 2 μV (–101 dBm); 1.8-30 MHz, 0.25 μV (–119 dBm).	Minimum discernible signal (500-Hz IF filter): 1.0 MHz –128 dBm 3.5 MHz –137 dBm 14 MHz –139 dBm
AM sensitivity, bandwidth not specified, 10-dB S/N: 0.5-1.8 MHz, 8 μV (–89 dBm); 1.8-30 MHz, 1 μV (–107 dBm).	10-dB (S+N)/N, signal 30% modulated with a 1-kHz tone: 1.0 MHz 2.8 μV 3.8 MHz 0.9 μV
Blocking dynamic range: Not specified.	Blocking dynamic range (500-Hz IF filter): 1.0 MHz 100 dB* 3.5 MHz 109 dB* 14 MHz 112 dB*
Two-tone, third-order IMD dynamic range: Not specified.	Two-tone, third-order IMD dynamic range (500-Hz IF filter): 1.0 MHz 88 dB 3.5 MHz 90 dB* 14 MHz 95 dB
Third-order intercept point: Not specified.	1.0 MHz +15 dBm† 3.5 MHz +12 dBm† 14 MHz +11 dBm†
Second-order intercept point: Not specified.	14 MHz, +37 dBm.
S-meter sensitivity: Not specified.	S9 signal at 14 MHz: 426 μV.
Squelch sensitivity: <2 μV (1.8-30 MHz).	At threshold, USB, 1 μV.
Receiver audio output: At least 1.5 W at 10% THD into 4 Ω.	2.6 W at 8% THD into 4 Ω.
IF/audio response: Not specified.	Range at –6 dB points, (bandwidth): CW narrow: 408-982 Hz (574 Hz) CW wide: 261-2534 Hz (2273 Hz) USB wide: 291-2621 Hz (2330 Hz) LSB wide: 299-2469 Hz (2170 Hz) AM: 74-1660 Hz (1347 Hz)
IF rejection: Better than 60 dB (1.8-30 MHz).	83 dB.
Image rejection: Better than 70 dB (1.8-30 MHz).	110 dB.
Transmitter	*Transmitter Dynamic Testing*
Power output: SSB and CW, 100 W; AM, 25 W (carrier).	SSB, 104 W; CW, 97-104 W (varies slightly from band to band); AM, 22 W.
Spurious-signal and harmonic suppression: 40 dB.	As specified. Meets FCC requirements for equipment in its power output class and frequency range.
SSB carrier suppression: Greater than 40 dB.	As specified.
Undesired sideband suppression: At least 50 dB.	As specified.
Third-order intermodulation distortion (IMD) products: –25 dB or less.	See Figure 1.
CW keying characteristics: Not specified.	See Figure 2.
Transmit-receive turnaround time (PTT release to 50% audio output): Not specified.	S9 signal, SSB mode, 124 ms; data mode, 18 ms.
Receive-transmit turnaround time ("tx delay"): Not specified.	45 ms.
Composite transmitted noise: Not specified	See Figure 3.

Note: All dynamic range measurements are taken at the ARRL Lab standard of 20 kHz.

*Measurement was noise-limited at the value indicated.

†Third-order intercept points were determined using S5 reference.

S button to program a SELCALL and an **E** button that enables an optional encryption function.

The rear panel of the FT-600 offers ports for computer control, an external speaker, a CW key, external amplifier and automatic antenna tuner control, an SO-239 antenna jack, a dc power jack and so on. There is even a port labeled **AFSK** to connect your multimode digital controller for PACTOR, RTTY or whatever. Oddly enough, the AFSK port requires a three-conductor, 1/8-inch "stereo" plug rather than the more typical multipin DIN plug.

The FT-600 seems especially well suited for digital hamming. A separate data mode allows you to use wide or narrow filtering. Its transmit/receive switching speed is more than adequate for any of the modes in common use (I tried it on PACTOR-I, and it worked flawlessly).

Computer control is also a terrific feature in a rig of this type. It opens the door to using the FT-600 with contest software, or even remote control through various programs such as *PC Remote*. The only catch is that the FT-600 computer port offers *only* TTL levels. You'll have to buy the Yaesu FIF-232C converter. Yaesu does not offer control software for the FT-600, but compatible software is available from a number of third-party sources.

The FT-600 also includes a general-coverage receiver with extraordinary low-end range—all the way down to 50 kHz! No doubt that is a byproduct of the maritime version of the radio.

The transceiver provides 100 memory

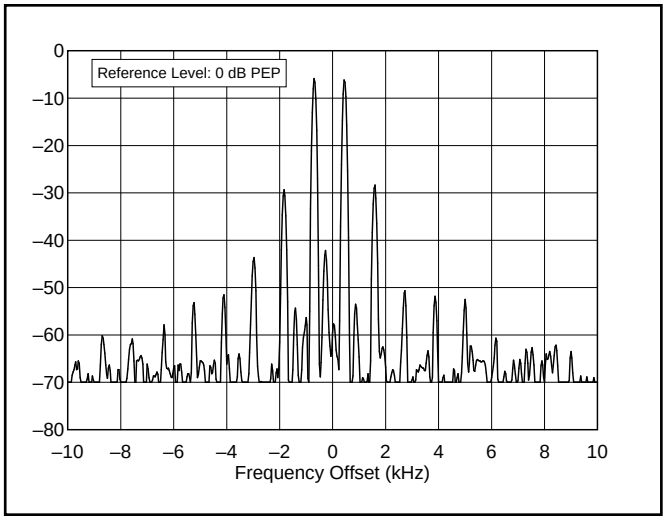

Figure 1—Worst-case spectral display of the FT-600 transmitter during two-tone intermodulation distortion (IMD) testing. The worst-case third-order product is approximately 28 dB below PEP output, and the worst-case fifth-order product is about 44 dB down. The transceiver was being operated at 100 W output at 21.250 MHz.

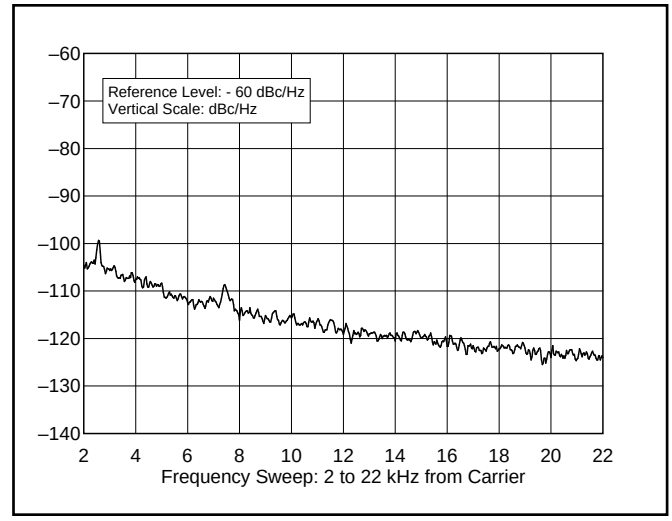

Figure 3—Worst-case tested spectral display of the FT-600 transmitter output during composite-noise testing. Power output is 100 W at 3.5 MHz. The carrier, off the left edge of the plot, is not shown. This plot shows composite transmitted noise 2 to 22 kHz from the carrier.

channels available arranged in four banks of 25 channels each. Not only can you designate alphanumeric labels for each channel (such as the name of your favorite Sunday-afternoon net), you can program odd transmit/receive frequency splits.

Another item worth mentioning includes the *dual watch* function. Every five seconds it switches the FT-600 to whichever frequency you've programmed into the first memory channel. Unless there is activity on the channel, it jumps back to your primary frequency two seconds later. Dual watch is convenient when you want to monitor two frequencies at once. Of course, you have to use the squelch, which is always a little tricky on HF signals.

On the Air

If you plan to operate the FT-600 at maximum output (100 W), you'll need a regulated power supply capable of providing 13.5 V dc at 20 A. You can get away with smaller power supplies if you reduce the rig's output, but there is a slight problem in that department. The FT-600 does not include a front-panel RF power control, so you must pop the cover and find the **50/100 W** switch (this information is in the manual, but it is difficult to locate). As the manual states, this switch allows you to cut your output power by 50%. You can even adjust potentiometer VR1016 (nearby) and achieve *lower* output levels, down to about 10 W. This is not the kind of power adjustment you'll want to do often! But bear in mind that the FT-600 first and foremost is a marine and land-mobile rig. Those operators are not in the habit of continually adjusting their power output. For the same reason, the transceiver also does not have a mike gain control.

How easy is it to operate the FT-600?

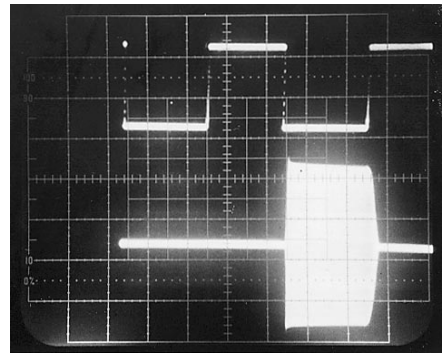

Figure 2—CW keying waveform for the FT-600 to show the first two dits. The equivalent keying speed is 60 wpm. The upper trace is the actual key closure; the lower trace is the RF envelope. Horizontal divisions are 10 ms. The transceiver was being operated at 100 W output at 14.2 MHz. Note that the first dit is missing entirely. With slightly slower keying, much of the first dit is still clipped.

Let's say you want to work upper sideband on 20 meters. With the FT-600, it's a simple five-step process: Turn on the radio, press the band **UP/DOWN** switch until you arrive on 20 meters, press the **MODE** button on the keypad to select USB, spin the VFO to the proper frequency, and talk.

If you're not familiar with modulation designators, the mode display may seem cryptic. Instead of displaying **USB**, or something similar, you'll see:

USB
J3E
LSB

The FT-600 is showing you the modulation designator for single sideband (**J3E**) and giving you the choice of upper or lower sideband. Similarly, the AFSK digital mode selection is shown as **J2B**, CW as **A1A** and AM as **A3E**. It takes a little getting used to!

I tried the FT-600 during several phone contests, and it acquitted itself remarkably well. Yes, it would have been nice to have IF shift or audio filtering at times, but the receiver seemed selective enough to keep the extraneous garbage at tolerable levels. I received a number of compliments on the FT-600's audio quality on transmit. Several described it as being "full-bodied" or "punchy." I noticed that my average power levels were somewhat higher than I would have expected. Perhaps the FT-600 employs some form of speech processing. The manual is mute on that point, though.

I also managed to bust a few split-frequency DX pileups with the FT-600, but it wasn't easy. You can program the FT-600 to listen on one frequency and transmit on another, but it is a multistep process using the small keypad. You must, for example, enter the complete frequency, digit by digit. There is no way to simply "copy" the VFO frequency into temporary memory with the push of a single button. And since the FT-600 has only one VFO, you cannot shift your transmit frequency once you've entered the split mode. If the DX station is listening throughout a *range* of frequencies, you'll have to go through the entire entry process again if the transmit frequency you've chosen seems "unpopular."

It's important to note that the split-frequency function allows you to set transmit and receive on frequencies that are in entirely different *bands*. This came in handy when I used the FT-600 to work the RS-12 satellite. I programmed a 15-meter transmit frequency, then used the VFO to listen on the 10-meter downlink. The FT-600 was sensitive enough to hear the

satellite on 10 meters loud and clear with just a wire dipole antenna.

The FT-600 also performed reasonably well in the CW mode, but when you finish transmitting, the FT-600 takes the better part of a full second to return to receive. This might be fine for slow-speed operating or on the Novice bands, but during a contest or for working a DX pileup, that kind of delay is simply intolerable; you'll miss all or part of the other station's transmission. Unfortunately, Yaesu says the delay is fixed by a 10-µF capacitor and there's no "secret pot" to adjust it lower. The radio does not offer full break-in (QSK), and it does not have a built-in keyer. At high keying speeds, the radio clips the first dit completely (see Figure 2). Clearly the FT-600 was not designed with CW in mind.

As I mentioned, I also used the FT-600 for digital operating, primarily on PACTOR. The radio keyed perfectly and was exceedingly stable (a big benefit with many digital modes, PACTOR-II and CLOVER in particular). The FT-600 automatically defaults to lower sideband when you enter the AFSK mode, which is fine. Should you ever need to change the default, the manual describes a four-step process to do so.

I enjoyed using the FT-600 for casual shortwave listening. The AM receive audio was good, although some stations sounded a bit "muddy," the likely result of the tight bandwidth imposed by the default filter (see Table 1). We'd highly recommend the optional 6-kHz filter, if you intend to listen to AM very often. For SWLing, the only annoying aspect is that there is no easy way to cruise from one shortwave broadcast band to another. If you punch the **UP/DOWN** bandswitch buttons, you'll find yourself listening to the next highest (or lowest) *amateur* band. The only way to change shortwave broadcast bands is to key in a frequency that corresponds to the beginning, middle or end of the band you want, or to put the desired frequencies into memories.

Memory channel programming is straightforward, with one exception: When you enter the programming mode, the frequency portion of the LCD display goes blank! So, you'd better have a good memory yourself, or jot down the frequency on a scratchpad, before you enter the programming mode. The ability to tag every memory channel with an alphanumeric label is handy. You can zip right through your memory channels without having to wonder why you programmed this or that frequency. For example, I programmed one of Radio Sweden's frequencies into memory, then added the tag "Sweden."

Hits and Misses

The biggest miss is probably the FT-600 manual, unusual for Yaesu, which typically provides very thorough and comprehensible documentation for its amateur products. The manual is divided into three sections: marine, land mobile and amateur. If you're not careful, you'll find yourself reading instructions that do not apply to your version. Worse yet, some important details are difficult to find, or missing altogether (for example, there is no schematic diagram—not even a block diagram).

It's understandable that the designers wanted to minimize external controls, but an external RF-power output adjustment is sorely missed. How about a locking potentiometer on the rear panel? Anything is better than having to remove the cover and hunt for a tiny switch and pot.

The ability to instantly store frequencies in temporary (scratchpad) memory would be a big help when working in the split-frequency mode. And please let us see the frequency display when we're programming memory!

VOX was another common feature—not available on the FT-600—that some ops might miss.

The hits include ease of basic operation—it doesn't get much easier than the FT-600. You just pick up the microphone and go. The rugged "feel" of the transceiver is outstanding. You get the sense that nothing can harm this radio! I briefly ran the FT-600 at full output on RTTY—the manual cautions against this—and the rig became only a little "toasty."

The receiver is sensitive and selective, with superb audio quality. The ability to listen down to 50 kHz opens a fascinating window on the LF and VLF world. The FT-600 noise blanker is surprisingly effective, especially on impulse noise, as you'd expect.

And even though I didn't specifically use it, the presence of a computer interface port is much appreciated. More and more hams are using their PCs as tools to control transceivers.

Conclusion

Some might consider the Yaesu FT-600 a little pricey for what it offers. Even so, it would be a terrific radio for a new ham, or for someone who wants a transceiver that's rugged, highly reliable and simple to operate. The FT-600 would also be an excellent candidate for maritime-mobile operation (no, it cannot be used as both a ham radio and a marine radio) or for use in a camper or RV, or in stations dedicated to emergency operation and other public-service functions. Because of its extreme ease of operation, you won't have to spend a lot of time training new operators!

Manufacturer: Yaesu USA, 17210 Edwards Rd, Cerritos, CA 90703; tel 310-404-2700. Manufacturer's suggested retail price, $1249; YF-112C 500-Hz CW filter, $127.

Down East Microwave Model DEM 50-28CK 6-Meter Transverter Kit

By Glenn Swanson, KB1GW
Educational Programs Coordinator

"Whoa…a kit? You mean, like, *build* something?" You bet! Personally, I don't think you've "been there, done that," in ham radio until you partake of this time-honored tradition. Building something entitles you to experience that special feeling—the satisfaction of putting a project that *you* put together on the air for the very first time! It can be quite an adventure, and I'll bet that you hold your breath when the time comes! Besides,with this "kit" the hard work has already been done.

When the chance to review the Down East Microwave (DEM), 6-meter transverter came along, I was eager to get back on "The Magic Band." The last time I was on 6 meters was when we reviewed the JRC JST-245 transceiver ("Product Review," *QST*, Sep 1995). This time, all I had to do was to put this kit together, and I'd be back in business.

Why a Transverter ?

Why use a transverter instead of a ready-built commercial transceiver? You could spend your hard-earned dollars on a full-featured HF-plus-6-meter radio or even a dedicated 6-meter transceiver. That's great, if you can afford it. A transverter, however, offers the advantage of using your existing HF transceiver as an IF—certainly a more economical approach, although the typical transverter puts out less power (the DEM50-28CK is in the 20-W class).

BOTTOM LINE

The DEM 50-28CK transverter kit is one alternative to purchasing a more expensive off-the-shelf transceiver, but you'll have to supply your own output filter. Serious and casual 6-meter enthusiasts seeking decent performance should not overlook this compact, easy-to-build, fun-to-use transverter system from Down East Microwave!

Using your existing HF radio as an IF strip for a transverter also allows you to take advantage of whatever performance features your transceiver already provides, such as IF filters.

In my case, using a transverter to convert 6-meter (50-MHz) signals down to 10 meters (28 MHz) gives me the best of both worlds—a transverter design optimized for 6 meters, and an IF (my HF

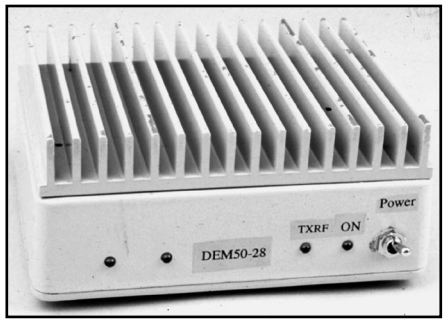

Table 2

Down East Microwave DEM 50-28CK 6-meter Transverter

Manufacturer's Claimed Specifications	*Measured in the ARRL Lab*
Power requirements: Transmit, 4 A(max); receive, 350 mA, 13.8 V (nominal).	Transmit, 4.1 A (at 20 W output); receive, 130 mA, tested at 13.8 V.
Size: (HWD) 2×4.8×3.8 inches; weight: 1.4 lb.	
Frequency coverage: Receive and transmit, 50-52 MHz.	As specified (determined by transceiver).
Modes of operation: Not specified.	Tested on SSB, CW, AM, FM.
Receiver	
Conversion gain: 17 dB (nominal).	28 MHz, with ICE band-pass filters: 15 dB; without ICE band-pass filter, 18 dB.
Noise figure: 1.0 dB (max).	28 MHz, with ICE band-pass filter: 3.6 dB; without ICE band-pass filter, 2.1 dB.
Transmitter	
Transmit RF input: 200 mW (max).	3 mW (min) input at 28 MHz required for typical 20 W output (input level is adjustable).
Transmit RF output: 22 W (max); 19 W (linear); 10 W with 0 dBm IF drive.	As specified.
Spurious signal and harmonic. suppression: Not specified	55 dB (with ICE band-pass filter in line, 18 W output). This unit does *not* meet FCC requirements for equipment in its output power class and frequency range (see text).

radio) that's designed for serious contesting and DXing in the band's "weak-signal" segment.

Weak Signal?

With the DEM transverter interfaced to my Kenwood TS-850S, the transverter converts the 50 to 52-MHz portion of 6 meters to the 28 to 30-MHz portion of 10 meters that my HF radio can tune. Since my (stock) HF radio stops tuning at 30 MHz, (which equals 52 MHz), I can't tune above 52 MHz into the FM portion of the 6-meter band. According to Steve Kostro, N2CEI, at Down East Microwave, a stock DEM 50-28CK is designed (and "crystalled") to operate in the SSB and CW—or "weak-signal"—portion of the band, 50 to 52 MHz. If you want to operate FM (52 to 54 MHz), you can order a unit from Down East Microwave with a different crystal installed that lets you to tune the upper 2 MHz of the band.

Sub-Assemblies Required

The DEM transverter is available as several sub-assemblies. You can get a single, pre-populated PC board (DEM50-28K), a box and hardware kit (DEM50-28HK), a "complete kit" (DEM50-28CK; the unit we reviewed), or a fully built and tested transverter. Our "complete" kit included a pre-drilled, cast-aluminum box and heat sink, a pre-populated main PC board with surface-mount components, a Mitsubishi M57735 hybrid RF power output module, various RCA and BNC jacks, labels for the box, a few bits of wire, and assorted hardware and parts, including LEDs, some bypass capacitors, and an on/off toggle switch.

The pre-drilled aluminum box houses the transverter's innards—the PC board, power module and T/R relay. The BNC and RCA I/O connectors fit into pre-drilled holes in the sides of the box, and the pre-drilled heat-sink mounts on top of the box. The "bottom" of the box is a removable cover held in place by four screws. While a bit of noninsulated wire is included for RF paths, you'll need to supply some insulated hook-up wire, solder, a dab or two of heat-sink compound and the usual assortment of kit-building tools, such as a soldering iron and wire cutters. DEM thoughtfully included four stick-on rubber feet.

Interface Options

Down East Microwave offers its model TIB interface option that should be suitable for most commercial HF transceivers. In the case of the Kenwood TS-850S (which presented a few transverter-interfacing "quirks,") DEM offers the TIB-850. This lets you use your TS-850 as an IF, while avoiding the possibility of accidentally transmitting 100 W from the '850 directly into the transverter! While not tested here, one of these DEM interfaces should be a viable solution for most installations.

Building the Kit

To be sure you understand any options (or choices) you'll encounter, I'd recommend first reading through the instructions and doing a "dry run" *before* you begin building the kit. If you jump right in, you may find yourself having to partially disassemble something to remove a part, re-solder a wire, or make some other change that you could have avoided.

Prior to assembling my kit, I decided to paint the case and heat sink light gray (the color that was in the spray can I found in my garage). (There should be *no* paint between the heat sink and the output module!—*Ed*.) Then, I spent a couple of evenings assembling the kit. It went together relatively smoothly.

You begin by mounting all of the I/O connectors and the power switch to the case, then securing the main PC board inside the case. After installing the power module and the T/R system, you make the required connections between the main board and the I/O connectors—and you're done! This isn't like the old Heathkits. Since the main board is pre-populated and the output circuits are inside a module, you don't have a lot of components to deal with! Most of my time was spent wiring up the connections between the main PC board and the I/O connectors and wiring the T/R relay.

The six pages of instructions that Down East Microwave supplied were not exactly of Heathkit quality, either, but most folks with some kit experience should be able to build this one with little difficulty.

As I noted earlier, you actually build this kit "upside-down" inside its case—something to keep in mind when you apply labels on the box! After mounting the parts, secure the bottom cover in place with the four screws, apply the rubber feet, and flip the box over so the heat sink is facing up.

Speaking of the heat sink, we did question the practice of mounting a somewhat expensive RF power module directly to the inside surface of the cast-aluminum box. The Mitsubishi M57735 is designed specifically for 6-meter "10-W SSB mobile radios," according to its spec sheet. The rated high-power output is 14 W. DEM suggests keeping the output power of the transverter at 15-18 W maximum for SSB, to avoid the "hot-brick" syndrome (although DEM rates its output at 22 W maximum). Zack Lau, W1VT, of the ARRL Lab tells me that the usual approach would call for cutting a hole in the die cast box and mounting the module directly to the heat sink, for maximum thermal transfer. Another approach, Zack says, is to put the power device on a milled piece of $^1/_4$-inch aluminum sheet stock, then bolt the sheet stock to the die cast box. Both approaches avoid bending the mounting flange on the module, which could destroy the device. The unit does get somewhat warm during extended transmissions, but the transverter seemed to work just fine. If you're worried about damaging the module, you might consider modifying the mounting system.

The finished product includes several

I/O connections, some of which you might not need in your installation. There's a dc power input via an RCA jack; a BNC **TXRF**-output connector; an **AUX**iliary connector that could be used to key an external amplifier; a normally open **KEY** connector for externally keying the transverter's PTT line; a BNC **TXIF** connector, which accepts the low-level transmit signal from your transceiver's transverter port (the DEM50-28CK can handle from 1 to 200 mW at the input); a BNC **RXRF** connector to hook an external receive antenna to the transverter; and a BNC **RXIF** connector to connect the receive line to the transceiver's antenna input. If you supply your own T/R relay as I did, make sure to connect the braids of the switched coaxial cables to the relay's ground point.

Filter Required!

When the ARRL Lab first tested the transverter, it failed to meet FCC spectral purity requirements for its power level. A quick telephone call to Down East Microwave revealed that we would need an optional external band-pass filter (DEM recommended the ICE model 412, which it sells) to provide the necessary filtering on the output side of the power module, which is wired via the T/R relay to the transverter's antenna jack! We were surprised to learn of this requirement—neither the sales literature nor the instructions supplied with our kit mentioned needing such a filter. DEM now states in its product specification sheet that a band-pass filter is required.

Unfortunately, even with the ICE 412 filter in line, the system just missed meeting FCC spectral purity requirements for its output power level (measurements were made at 18 W) because of a big, even-order spur at 300 MHz (the unit is legal at 11 W output, however). A homebrew low-pass filter cured the problem (see "RF" by Zack Lau, KH6CP/1, *QEX*, Sep 95, p 24).

Summary

To end up with a truly complete kit required more effort (and money) than I had first expected. The need for additional parts—such as the T/R relay, a band-pass filter, and (for some) an interface unit—made our "complete kit" seem not quite so complete after all. Nevertheless, once you've obtained all of the required extras—including a filter that will sufficiently clean up the output—you'll have a high-performance, rugged, fun addition to your station—and, after all, that's the whole idea.

Epilogue

My first QSO using the DEM50-28CK turned out to be rather special. I'd just finished assembling the kit and connecting the transverter to my HF radio. To say that I was anxious to put the transverter on the air would be an outrageous understatement! There was just one little snag. I had no 6-meter antenna! But, I *did* have an HF tribander. While I certainly don't recommend this approach, I decided to give it a try. I switched the coax from the tribander over to the transverter, tuned around, and ran smack into the CYØAA DXpedition on Sable Island! A few of the locals got through first—but, hey, they were using real antennas. After what seemed an eternity, I finally heard the DXpedition answer my call! *Wow!* My first QSO with the new transverter—with CYØAA! Chalk it up to pure luck if you must, but I prefer to believe there was a bit of *magic* in the air that day.

Manufacturer: Down East Microwave, 954 Rte 519, Frenchtown, NJ 08825; tel 908-996-3584; fax 908-996-3702; **http://www.downeastmicrowave.com.index.html**. Manufacturer's suggested retail price: DEM50-28CK complete kit, $295; DEM50-28K main PC board assembly, $175; DEM-50-28HK box and hardware kit, $45; DEM50-28 built and tested, $395; TIB or TIB-850 interface, $75 assembled and tested, $50 complete kit, $25 board only; DEM50-28KTR T/R relay, $20; ICE 412 band-pass filter, $32 to $35 (depending on the RF connector configuration).

EXPANDED PRODUCT REVIEW TEST REPORTS AVAILABLE

The ARRL Laboratory offers an *Expanded Test Result Report* on the Yaesu FT-600 MF/HF transceiver (and some other recently reviewed MF/HF transceivers) that outlines our test methods, provides in-depth, detailed technical data on the transceiver's performance, and helps you to interpret the numbers and graphs. A major feature of these reports are the very revealing dynamic range graphs that show blocking and two-tone third-order IMD dynamic range versus frequency spacing.

These reports also include spectral purity charts and receiver sensitivity figures for all bands, all CW keying waveforms (not just worst-case) and other facts to help you to make an informed buying decision. Each *Expanded Test Result Report* summarizes the results in a comparative table showing other transceivers we've tested. This summary gives you an idea of how each radio stacks up with similar, previously tested units.

Expanded Test Result Reports are available for the ICOM IC-775DSP, the Kenwood TS-870S, the ICOM IC-706, the Yaesu FT-1000MP, the Kenwood TS-570D and the Yaesu FT-600.

Request each report by manufacturer and model number (eg, Yaesu FT-600) from the ARRL Technical Department, 225 Main St, Newington, CT 06111. Each report is $7.50 for ARRL members and $12.50 for nonmembers, postpaid. ARRL members only may order three reports for $20, and four or more for $6.50 each, postpaid. Credit card orders *only* may be placed by calling 860-594-0278.

SOLICITATION FOR PRODUCT REVIEW EQUIPMENT BIDS

[In order to present the most objective reviews, ARRL purchases equipment off the shelf from dealers. ARRL receives no remuneration from anyone involved with the sale or manufacture of items presented in the Product Review or New Products columns.—*Ed.*]

The ARRL-purchased Product Review equipment listed below is for sale to the highest bidder. Prices quoted are minimum acceptable bids, and are discounted from the purchase prices. All equipment is sold without warranty.

Alinco DR-605T 2-meter/70-cm FM mobile transceiver (see "Product Review," Dec 1996 *QST*). Minimum bid: $297.

ICOM IC-2710H 2-meter/70-cm FM mobile transceiver (see "Product Review," Dec 1996 *QST*). Minimum bid: $455.

Kenwood TS-570D MF/HF transceiver with 500-Hz CW filter (see "Product Review," Jan 1997 *QST*). Minimum bid: $1073.

Oregon-Scientific The Time Machine clock (see "Product Review," Jan 1997 *QST*). Minimum bid: $66.

SCS PTC II multimode controller with Pactor II (see "Product Review," Jan 1997 *QST*). Minimum bid: $627.

Standard C5900DA 6-meter/2-meter/70-cm FM mobile transceiver (see "Product Review," Dec 1996 *QST*). Minimum bid: $594.

Timewave DSP-599zx DSP filter (see "Product Review," Dec 1996 *QST*). Minimum bid: $184.

Yaesu FT-600 MF/HF transceiver with 500-Hz CW filter (see "Product Review," Feb 1997 *QST*). Minimum bid: $715.

Yaesu FT-8000R 2-meter/70-cm FM mobile transceiver (see "Product Review," Dec 1996 *QST*). Minimum bid: $347.

Bids are resolicited for the following items, which have been previously advertised. Minimum bids have been reduced:

Sigmatech DX Peeper DX packet decoder (see "Product Review," Sep 1996 *QST*). Minimum bid: $75.

TE Systems 1412G 2-meter amplifier (see "Product Review," Oct 1996 *QST*). Minimum bid: $138.

Sealed bids must be submitted by mail and must be postmarked on or before March 1, 1997. Bids postmarked after the closing date will not be considered. Bids will be opened seven days after the closing postmark date. In the case of equal high bids, the high bid bearing the earliest postmark will be declared the successful bidder.

In your bid, clearly identify the item you are bidding on, using the manufacturer's name and model number, or other identification number, if specified. Each item requires a separate bid and envelope. Shipping charges will be paid by ARRL. Please include a daytime telephone number. The successful bidder will be advised by telephone with a confirmation by mail. No other notifications will be made, and no information will be given to anyone other than successful bidders regarding final price or identity of the successful bidder. If you include a self-addressed, stamped postcard with your bid and you are not the high bidder on that item, we will return the postcard to you when the unit has been shipped to the successful bidder.

Please send bids to Bob Boucher, Product Review Bids, ARRL, 225 Main St, Newington, CT 06111-1494.