Product Review & Short Takes Columns from *QST* Magazine

January 2001

Product Reviews

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Alinco DR-135TP 2-Meter FM Mobile Transceiver

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QST *Contributing Editor*

The Alinco DR-135TP is a 2-meter FM transceiver that is relatively small in size, but big in capabilities.

The radio is available in two versions, either with or without a built-in 1200/9600-baud TNC. Should you initially decide to buy the version without the TNC and later change your mind, an optional plug-in TNC accessory board—the EJ-41U—can be purchased and installed.

The transceiver is also available in a choice of two front panel colors—black or pewter. Choose the color that best complements the interior of your car or the equipment in your shack.

The DR-135TP has an expanded receive range that spans 136 to 174 MHz for FM and 118 to 136 MHz for AM (the AM aircraft band). The AM mode is automatically selected when the receiver is tuned within the lower frequency range.

Other prominent features include 100 memory channels with alphanumeric labeling capabilities, CTCSS and DCS encode and decode, three RF power output settings (50, 10 or 5 W), DTMF autodial memories, an automatic power on/off system and an integrated theft alarm system.

Outside of the Box

The front panel includes a large amber LCD that displays the operating frequency or, when in the memory mode, your choice of either the frequency or an alphanumeric tag in a nice large format. The window also displays icons that indicate the state of many of the transceiver's selectable functions, and the brightness of the background illumination can be toggled between two levels. A vertically oriented 5-section LCD signal strength/RF output meter is located along the extreme right edge.

Surrounding the window are six multifunction keys, volume and frequency controls, a lighted power pushbutton, an LED transmit indicator and jacks for the microphone and "data." No squelch knob is provided. The threshold is adjusted by pressing a front panel **SQL** button and rotating the main encoder. Pressing and holding the same key will open the squelch.

The transceiver's controls are laid out nicely. The knobs and buttons are located far enough apart and are sensibly positioned for easy operation. I didn't run into any difficulties working this radio even while tooling around in my land barge.

The hefty EMS-56 hand mike has a large PTT lever, top-mounted **UP** and **DOWN** buttons and two front-mounted slide switches. One switch controls the backlighting for the mike's DTMF pad; the other disables the **UP** and **DOWN** buttons.

The radio consistently received glowing reports on the quality of the transmit audio.

The DR-135TP's rear panel offers an external speaker jack, a female DB-9 RS-232-C serial port (for computer connection) and a chassis-mounted SO-239 antenna connector. Dc power connection is made through a short pigtail terminated in a standard T-type connector. A mating 9½-foot dc power cord, fused in both leads at the source end, is provided.

There's a small coaxial-style dc power jack positioned just above the external speaker jack. If a connection is made between this socket and a low current (5 mA) vehicle dc power source that is controlled by the ignition switch, the radio will automatically turn on and off with the vehicle. This is a very nice arrangement for the more active mobile operators among us.

Most of the cast aluminum enclosure serves double-duty as a heat sink. Large cooling fins cover both the top and back side, and a sheet metal cover on the bottom provides access to the circuitry inside. The receiver's 2-W audio output and top-mounted internal speaker proved up to the task of supplying plenty of audio for my fairly noisy mobile environment.

Bottom Line

The Alinco DR-135TP is a nicely appointed 2-meter FM mobile transceiver with an interesting twist—a built in 1200/9600-baud terminal node controller. The resulting package simplifies hardware integration for packet and APRS communications applications.

Selecting an Operating Frequency

The DR-135TP offers three means of frequency control.

In the VFO mode the frequency is selected by rotating the front panel encoder knob or by pressing the microphone **UP** and **DOWN** pushbuttons. In either case, the frequency changes by a user-programmable step size. Pressing a front panel **MHz** key first allows you to use these same controls to hop around in 1-MHz increments.

In the memory mode, the memory channels are dialed up with the main encoder or the **UP** and **DOWN** buttons. In addition to the operating frequency, each memory is also capable of storing several other related parameters. These include the repeater duplex offset frequency and direction (+ or –), the CTCSS encode and decode tones, the DCS (*digital code squelch*) encode and decode codes, the memory channel lockout state, the busy channel lockout setting and the type of FM (either narrow or wide). Separate CTCSS tones can be programmed for use on transmit and on receive in a single memory position.

Joe Bottiglieri, AA1GW ♦ Assistant Technical Editor

Table 1
Alinco DR-135TP, serial number T000510

Manufacturer's Claimed Specifications	*Measured in the ARRL Lab*
Frequency coverage: Receive, 118-136 MHz (AM), 136-174 MHz (FM); transmit, 144-148 MHz.	Receive and transmit, as specified.
Power requirement: Receive, 0.6 A; transmit, 11 A (high power).	Receive, 0.8 A; transmit, 9.0 A. Tested at 13.8 V.
Modes of operation: FM, AM (AM receive only).	As specified.
Receiver	***Receiver Dynamic Testing***
Sensitivity: FM, 12 dB SINAD: <0.25 μV.	FM, 12 dB SINAD, 0.18 μV; AM, 10 dB S+N/N, 120 MHz, 0.7 μV.
FM adjacent channel rejection: Not specified.	20 kHz channel spacing: 64 dB.
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz channel spacing: 64 dB*. 10 MHz channel spacing: 78 dB.
FM two-tone, second-order IMD dynamic range: Not specified.	82 dB.
S-meter sensitivity: Not specified.	Maximum indication: 5.0 μV.
Squelch sensitivity: 0.1 μV.	At threshold: 0.13 μV.
Receiver audio output: 2.0 W at 10% THD into 8 Ω.	2.3 W at 5% THD[1] into 8 Ω.
Spurious and image rejection: Not specified.	First IF rejection, 99 dB; image rejection, 74 dB.
Transmitter	***Transmitter Dynamic Testing***
Power output (H/M/L): 50 / 10 / 5 W.	53 / 9.5 / 4.0 W.
Spurious-signal and harmonic suppression: ≥60 dB	70 dB. Meets FCC requirements for spectral purity.
Transmit-receive turn-around time (PTT release to 50% audio output): Not specified.	S9 signal, 170 ms.
Receive-transmit turn-around time (tx delay): Not specified.	102 ms.
Bit-error rate (BER), 9600-baud: Not specified.	Receiver: BER at 12-dB SINAD, 5.9×10^{-4}; BER at 16 dB SINAD, 1.0×10^{-5}; BER at –50 dBm, $<1.0\times10^{-5}$; transmitter: BER at 12-dB SINAD, 2.4×10^{-3}; BER at 12-dB SINAD + 30 dB, 8.5×10^{-5}.
Size (hwd): 1.6×5.6×6.8 inches; weight, 2.2 pounds.	

Note: Unless otherwise noted, all dynamic range measurements are taken at the ARRL Lab standard spacing of 20 kHz.

*Measurement was noise-limited at the value indicated.
[1]Maximum volume was reached without distortion exceeding 5%.

The memories can also be assigned an alphanumerical label. That way, instead of trying to remember that 144.95 MHz is the local DX packet cluster frequency, you could tag that particular memory channel "DXCLSTR." The labels can be up to 7 characters long.

A press of the **CALL** button will instantly tune the radio to the programmed call channel. The factory default setting is 145.000 MHz, but this can be reassigned to any simplex or repeater frequency desired.

Direct frequency or memory channel number input from the microphone's DTMF keypad is not supported.

Searching for Activity

The DR-135TP offers several different scanning types and scan configuration options. One is the "VFO Scan." This scan searches the entire range of the receiver's VFO. In "Memory Scan" the receiver searches for activity on the memory channels. Memories with the lockout setting enabled will be skipped.

The "Program Scan" checks all of the frequencies within a particular range. For example, if 146.500 MHz is set as the lower scan limit (by programming it in the "PL" channel memory position) and 147.600 MHz is set as the high scan limit (…in the "PH" memory), the receiver will search frequencies between 146.500 and 147.600 MHz.

When the receiver encounters activity in any of these cases, the scan will stop. A menu setting allows you to have the scan pause on a frequency for 5 seconds or for as long as the activity continues.

The radio is also capable of scanning the signals it receives for a CTCSS tone or DCS code. Activate the "Tone Scan" mode while receiving a particular signal, and this feature will quickly step through the available tones or codes until it finds a matching value.

Features Galore

A variety of additional features and operational setting options are included. Most of these are controlled through a "Parameter Setting Mode" menu.

The channel step setting determines the step size of the increments or decrements when changing the frequency with the main encoder, the mike's **UP** and **DOWN** buttons or when scanning. The available step values are 5, 8.33, 10, 12.5, 15, 20, 25, 30 or 50 kHz.

If you are using a voice repeater that has a time-out timer (intended to limit long-winded transmissions), you can set up the DR-135TP to sound an alert just before the repeater is about to time out. Ignore the alert and the transceiver will

automatically stop transmitting 5 seconds later. In addition, a time-out penalty feature can be enabled to prevent transmission for up to 15 seconds after exceeding the time-out period.

An automatic power-off feature can shut the transceiver off after 30 minutes of inactivity. This is a handy way to avoid inadvertently running down a car or storage battery.

A theft deterrent feature can be enabled that will activate an alarm if a security cable is improperly removed. This system is set up by plugging in two provided cables. One cable is looped through the steering wheel (or an alternative fixed point) of your vehicle and is mated to the second cable. The second cable is plugged into the radio's front panel **DATA** connector. Once the system is armed, breaking the connection between the cables (when an attempt is made to remove the unit from the vehicle or when the cable is unhooked to allow rotation of the steering wheel) will sound the alarm.

The alarm can be turned off remotely via radio. Once the alarm is set off, the radio begins monitoring the frequency programmed into memory channel 99. If it receives a signal, the alarm will deactivate. While this did raise some eyebrows at HQ, this is legal in the 2-meter band under the FCC rules on "telecommand" (defined under 97.3(a)(43)) and is permitted in these frequencies as outlined in 97.111(b)(3).

The alarm emits a fairly loud, high-pitched sound that should certainly attract attention, but it's not exactly ear-shattering.

The memory data and operating parameters that have been programmed into one DR-135TP can be "cloned" to another. The **DATA** jacks on the "master" and the "slave" are interconnected using a cable with 1/8-inch stereo plugs on each end (not included). The radios are then commanded to perform the data transfer and the master replicates its setup information in the slave.

The DR-135TP also features a DTMF autodialer. This will store up to ten 16-digit DTMF strings for commonly used phone numbers or for DTMF remote control sequences. The instructions in the manual for programming and transmitting these are incomplete though.

Follow the directions in the manual and program the DTMF memories. The last digit in the string—"0"—will always remain flashing—this digit is not transmitted (For example, if the desired phone number is 594-0216, it should appear in the display as 59402160. The final digit—the "0"—should be flashing.)

To select and transmit the contents of one of the memories, enter the autodial mode and select the desired DTMF memory by scrolling through the choices with the microphone's **UP** and **DOWN** buttons. Next, exit the autodial mode while the desired memory is still in the display. From this point on, any time that the PTT lever is held down and the mike's **UP** button is pressed, the sequence in that DTMF memory position will be transmitted.

The radio can generate tone-burst frequencies of 1000, 1450, 1750 or 2100 Hz. Tone burst is used as an access control system in some repeater systems outside the US.

The TNC Within

Our product review unit—being a DR-135TP ("P" stands for packet)—came equipped with the EJ-41U 1200/9600-baud packet radio terminal node controller.

There are two jacks on the transceiver that are used for interfacing external equipment to the internal TNC. A female DB-9 connector on the back panel provides an RS-232-C serial interface for connecting a personal computer. An 1/8-inch stereo phone jack on the front panel—the **DATA** jack—allows for connection of a GPS receiver. The GPS receiver used with this radio must be one that is NMEA-0183 compatible or one that outputs data in a "SONY" proprietary format.

The internal TNC employs a subset of the AX.25 Version 2 Level 2 command set, which includes the basic commands necessary to conduct packet radio communications in the 2-meter band. Although there are no built-in mailbox commands, there are commands that permit the TNC to operate as an APRS tracker. The position data is supplied by the external GPS receiver.

I successfully used the DR-135TP to access local packet bulletin boards, packet radio networks and a nearby DX packet cluster. For software I used a basic terminal program running on my laptop. All I had to do is match the communication parameters of my terminal program with the communication parameters of the DR-135TP's serial port. These are 9600 baud (the data rate between the radio and the computer), 8 character bits, no parity, 1 stop bit and Xon/Xoff flow control. I entered my call sign with the MYCALL command and then invoked the CONNECT command.

The integrated TNC makes it especially convenient to use this radio for both voice and data communications. The microphone can remain connected. In the data mode, the mike element is automatically disabled. The receiver's audio is muted as well, thus relieving the operator from having to listen to the deafening racket of all those noisy packets.

ARRL Lab test data (see Table 1) for 9600-baud BER performance shows that the bit error rate is sufficiently low under strong-signal conditions for reasonably good data throughput. The weaker signal levels *do* result in a higher level of errors, but a note in the manual clearly states that effective 9600-baud packet operation with the DR-135TP depends heavily on strong signal levels.

APRS Tracking

Being APRS active, I was anxious to test the transceiver's APRS capabilities. I connected my Macintosh laptop to the DR-135TP installation that I had set up in my car and ran *MacAPRS* software. No problem! *MacAPRS* exchanged information with the radio and the map on the computer screen soon began filling up with APRS icons.

I quit *MacAPRS* and connected a GPS receiver to the DR-135TP's front panel **DATA** jack and fired up a plain vanilla terminal program.

I invoked the RESET command to return the internal TNC's parameters to their factory default settings. I then programmed several parameters that are required for APRS tracker operation. Those parameters are:

AUTOLF OFF
ECHO OFF
FLOW OFF
GBAUD 4800 (match this setting to your GPS's data output rate)
GPSTEXT $GPRMC
LOCATION EVERY 6 (6 represents 60 seconds)
LPATH GPSMV VIA <*your digipeater path*>
LTMHEAD OFF
MYCALL <*your call sign and SSID*>
LTMON 10
UNPROTO APRS VIA <*your digipeater path*>

(My thanks to Jeff Reinhardt, AA6JR, for confirming these settings.)

The other TNC parameters can remain at their factory default values.

The DR-135TP will not operate properly in the APRS tracker mode if you depend on the directions presented in the documentation. I recommend that you keep these programming parameters handy. These will save you considerable frustration when setting up the DR-135TP as an APRS tracker.

Those using an NMEA-0183 compatible GPS receiver should set it for NMEA output at 4800 baud. Incidentally, the transceiver emits a low-volume, high-pitched buzz as it receives each packet of data from the GPS receiver. This provides a simple way to confirm that the

transceiver is actually receiving data from the GPS receiver.

After disconnecting my laptop from the DR-135TP, I headed back to my shack and ran *MacAPRS* on the station computer. I wanted to verify that I could track my DR-135TP/GPS equipped vehicle. I took a short drive around the neighborhood and then headed home again. On my return, I was very pleased to see that my tracks did indeed appear on the station computer's map.

I continued to run the tracker during my daily travels around town and back and forth to work. What a difference 50 W makes! Where my usual low-powered tracker system (5 W) normally drops out of sight in the shadow of the mountain where my APRS digipeater is located, the DR-135TP-based tracker consistently marked its path.

The Written Word

The DR-135TP comes with two manuals. A printed manual covers the general operation of the transceiver, while an electronic manual on diskette covers the operation of the TNC. A schematic diagram is also provided.

The printed *Instruction Manual* contains the usual transceiver programming instructions and includes lots of diagrams and handy quick reference tables. The electronic manual for the built-in TNC is on floppy disk. The files are supplied in two formats: plain ASCII text format and Adobe Portable Document Format (PDF). These can be viewed on any computer platform that has text or PDF support. The supplied diskette is in *DOS* format.

In general, the documentation does a reasonably good job of describing how to operate, program and tailor the settings in the DR-135TP. However, the information for programming the TNC for APRS tracker operation and setting up and using the DTMF autodialer are lacking.

The Final Word

Overall, the DR-135TP is a very nice mobile 2-meter transceiver. It is easy to use in spite of its long list of features. It offers nice-sounding transmit and receive audio and plenty of RF power to keep you within communications range as you traverse the highways and byways.

Its available built-in packet radio capabilities are icing on the cake. Anyone who is considering putting together a 2-meter packet radio station for use at home or on the road should seriously consider the Alinco DR-135TP. The space-saving aspect of the integrated radio/TNC combination makes it an especially attractive package for anyone who's trying to cram a packet radio setup inside a modern space-challenged vehicle.

The DR-135TP's facilities for dual mode operation (both voice *and* data) certainly earn it an enthusiastic two thumbs up from this digitally-inclined reviewer.

Manufacturer: USA Alinco Branch, 438 Amapola Ave, Suite 130, Torrance, CA 90501; 310-618-8616; fax: 310-618-8758; **www.alinco.com**.

Manufacturer's suggested list price, DR-135TP, $428; DR-135T, $313; EJ-41U (for installation in the DR-135T version), $140. Typical current street price, DR-135TP, $300; DR-135T, $220; EJ-41U, $120.

AOR DDS-2A External Local Generator for the Collins KWM-2 and S/Line

Reviewed by Joe Bottiglieri, AA1GW

The main operating position in my basement shack is probably fairly typical. It includes a solid-state HF/6-meter transceiver, a couple of VHF and UHF rigs, a Pentium computer, a TNC, a handful of modern station accessories and a color television set (for when propagation *really* goes south!). Nearly everything is interconnected.

In addition to phone and CW operation, I'm all wired up and ready to rock with the latest software for the sound card-based digital modes. The station computer and the radios freely exchange information for computer-aided logging and contesting and the vast resources of the World Wide Web are but a couple of mouse-clicks away.

Turn 180 degrees and take a small leap forward though, over an imaginary line that divides my radio room, and you'll take a giant step backward in time. Welcome to the ham radio equivalent of the set of "That '70s Show." Nothing manufactured after the moment Neil Armstrong set foot on the Moon was, until recently, welcome here.

As is the case with many hams my age, over the last few years I've developed a proclivity for collecting things that were once, when I was younger, the unattainable objects of my desire.

Bottom Line

The AOR DDS-2A External Local Generator adds some of the more desirable conveniences and capabilities—previously only found in contemporary amateur equipment—to the classic Collins KWM-2 and S/Line models.

A small number of well-worn boat-anchors stare down silently from the simple pine shelves. The centers of attention in this time-warped diorama, permanent fixtures on the operating desk of this second station, are my personal pride and joy: a Collins KWM-2 transceiver and a 75S-3 receiver.

Table 2
AOR DDS-2A, serial number 00146

Manufacturer's Claimed Specifications	*Measured in the ARRL Lab*
Frequency coverage: HFO, 6.55-32.95 MHz; VFO, 2.495-2.695 MHz.	As specified.
Stability: 5 ppm.	As specified.
Accuracy: Not specified.	Typically better than 1 ppm.
Power requirement: 0.6 A, 12-13.8 V dc.	0.35 A. Tested at 13.8 V.
Power output: HFO, 2.0-2.3 V RMS into 50 Ω; VFO, 2.0-2.3 V RMS into 100 Ω.[1]	As specified.
Spurious-signal and noise suppression: HFO, 70 dB at 1-25 kHz spacing, 75 dB at 26 kHz to 1 MHz spacing; VFO, 80 dB at 1-25 kHz spacing, 90 dB at 26-250 kHz spacing.	As specified.
Phase noise: 130 dBc/Hz at 25 kHz spacing.[2]	As specified. See Figure 1.
Size (hwd): 3.2×7.1×7.1 inches; weight, 4.2 pounds.	

[1]HFO output specification is equivalent to 19-20 dBm. VFO output specification is equivalent to 16-17 dBm.
[2]In a transmitter, this figure is a component of the transmitted composite noise.

An Aberration in the Time/Space Continuum

Only my antenna feed lines—and I—dared cross the line from "now" into "then." Recently however, motions have been filed for a rules change.

It all began innocently enough. For the last five years or so, AOR Inc—a well-known manufacturer of high-end scanning and shortwave receivers—has been offering a very interesting product—the DDS-2A "External Local Generator." Connect this accessory to a Collins KWM-2 or KWM-2A transceiver, or Collins S/Line equipment (the 75S-series receivers and the 32S-series transmitters) and some of the more desirable features that we've come to know and love in our more contemporary amateur rigs become available.

While, at first blush, the unit seems to be little more than an external VFO, the DDS-2A adds several enhancements to these extremely popular vintage radios.

I just *had* to give one a try…

The Generation Gap

The KWM-2 transceiver and the S/Line equipment—as delivered—covers 80, 40, 20 and 15 meters and a portion of 10—28.5 through 28.7 MHz (an additional slice of spectrum for receiving WWV on 15 MHz is also included). Each of the bands is divided into 200 kHz subsections. A band switch selects the desired band segment and the main tuning knob is used to tune around within the 200 kHz range.

The band switch controls a "High-Frequency Crystal Oscillator." The frequency of this oscillator is determined by one of 12 plug-in crystals, each corresponding to a particular band segment. Combinations of the frequencies generated by the main VFO and this HFO establish the radio's operating frequency.

(A note to other Collins aficionados: I hope you'll forgive me for not going into a protracted discussion on the 312B-5 VFO console, the 114-crystal CP-1 crystal pack, the optional crystal deck and/or the military/MARS versions of these rigs.)

Needless to say, these fine old tube-based radios didn't come equipped with digital displays, general coverage receive, 30, 17 and 12-meter coverage and programmable memories. In the case of the KWM-2, split frequency operation was also not supported. Once interconnected with a DDS-2A however, all of these features—and pinpoint frequency accuracy and TCXO-based stability to boot—are all at your fingertips.

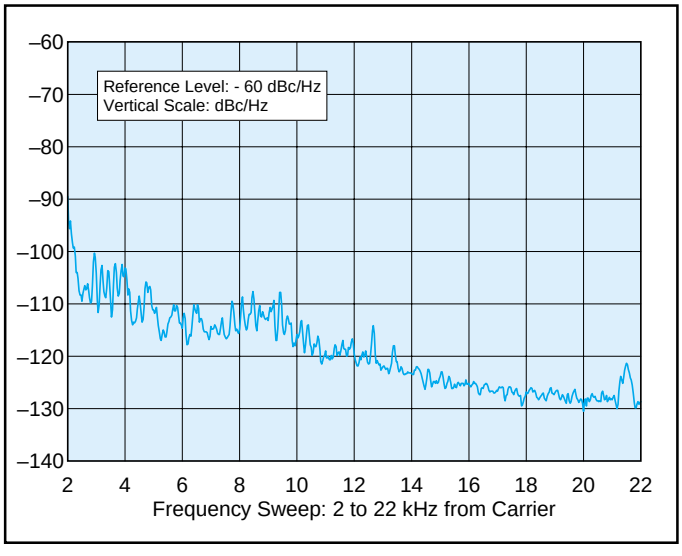


Figure 1—Worst-case spectral display of the output of the AOR DDS-2A external local generator during phase-noise testing of the HFO output at a frequency of 17.15 MHz (this is equivalent to a display frequency of 14.02 MHz). The generator's output is approximately 2.3 V RMS. The carrier, off the left edge of the plot, is not shown. The graph shows the phase noise generated 2 to 22 kHz from the carrier.

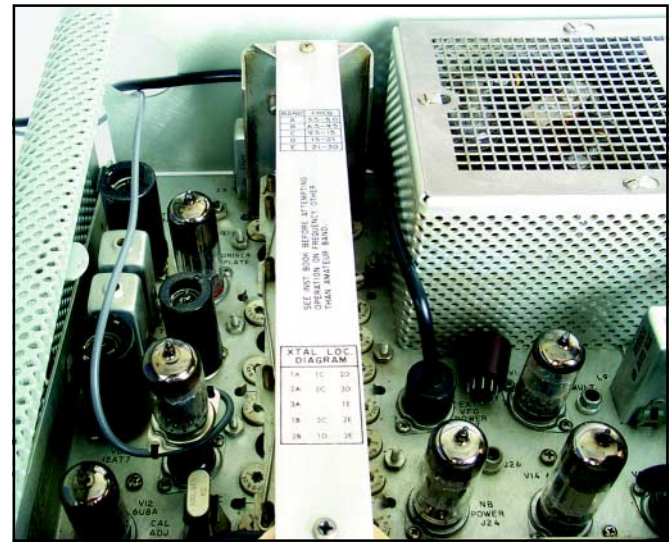


Figure 2—The DDS-2A microprocessor controlled VFO connects to the Collins KMW-2 or KWM-2A via three cables. One plugs into the EXT VFO POWER jack (the black cable on the right side of this photograph) and a second connection is made via a riser inserted between tube V13 and its socket (the gray cable on the left). A third cable, not shown, attaches to the EXT VFO phono jack located on the back panel of the transceiver.

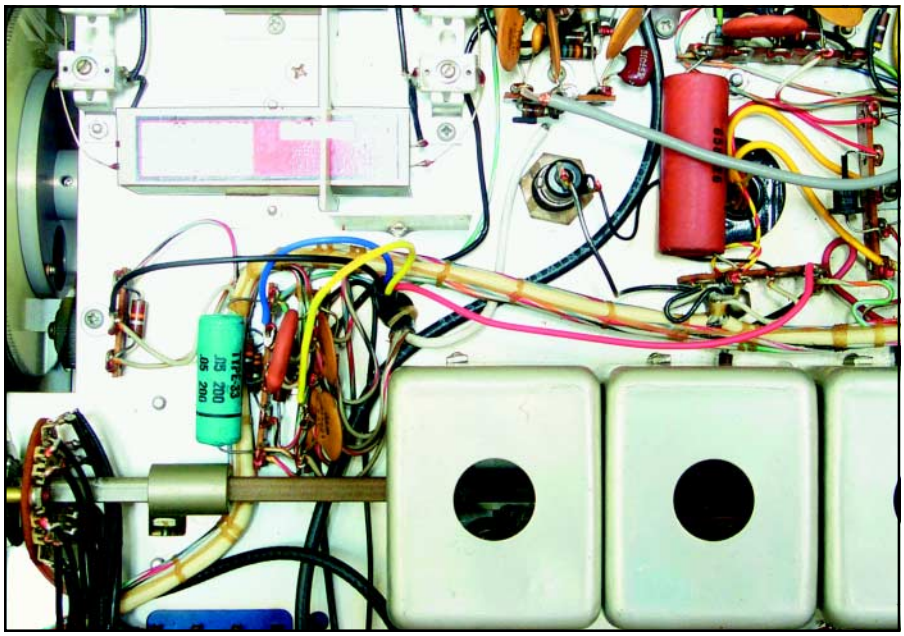


Figure 3—The DDS-2A wiring connections for a Collins 75S-3. The radio's front panel is towards the left. The black, blue, yellow and red wires attach to terminals that connect to ground, the mute line, the mode switch and B+ voltage respectively. The coax cable (with the gray jacket) connects the VFO signal input terminal and an unused (SPARE) phono jack on the rear apron.

Hooking Up

The KWM-2 and KWM-2A

Wiring the DDS-2A to the KWM-2 or '2A is a simple matter of plugging in a few interconnecting cables and feeding 12 V dc power to the unit. AOR supplies of all the necessary leads with the various plugs and jacks already installed—no soldering is required.

Two of the cable connections to the transceiver are internal, but both are readily accessible under its hinged top cover (see Figure 2). The cables are passed through a large existing hole in the back panel of the KWM-2's cabinet. A third cable is plugged into the **EXT VFO** phono jack located on the rear apron. The three cables mate with jacks on the back of the DDS-2A. Installation takes just a few minutes and converting the radio back to its normal (internal VFO) configuration is equally quick and painless.

The S/Line

Connecting the DDS-2A to Collins S/Line equipment is more challenging.

For the 75S receivers, the installation procedure begins with the addition of a 15 kΩ resistor across a power resistor within the DDS-2A. Next, the receiver's chassis is removed from its cabinet to gain access to the underside (see Figure 3).

The radio's existing VFO is contained in a small box located just behind the main tuning dial on the top side of the chassis. A multiconductor cable exits the back of this box and passes through a hole to the underside of the chassis. Only one of the five wires in this cable is coax.

The center conductor of the coax—the RF output from the internal VFO—is removed from the terminal strip that it's connected to and taped off. An RG-174 coax jumper is then prepared and installed between an unused phono plug (labeled **SPARE**) on the rear apron of the receiver and this same terminal.

Color-coded wires are soldered to four of the lugs in an inline 9-pin socket. These leads are passed down through the same hole as the VFO's multiconductor cable and are connected to ground, the mute line, the mode switch and a source of B+ voltage.

The 15 kΩ resistor, the RG-174 coax, the 9-pin socket and the four wires are all supplied with the DDS-2A.

The instructions provided by AOR do not include detailed diagrams or descriptions of recommended connection points to the receiver's circuitry. Figure 3 shows where I chose to connect the wires in *my* 75S-3. If you are *at all* squeamish about using the information given in the DDS-2A documentation and the Collins manual to trace the wiring and locate and verify these points for yourself, seek assistance from an Elmer.

Once these modifications are complete, the chassis can be reinstalled in the cabinet. Hooking up the interconnecting cables between the 75S and the DDS-2A is then very similar to the arrangement described for the KWM-2. The inline 9-pin jack becomes the **EXT VFO POWER** socket, the **SPARE** phono connector is now the **EXT VFO** jack, and the tube riser with the cable is inserted between tube **V3** and its socket. If you want to switch back to using the receiver's built-in VFO, you'll have to remove the chassis from the cabinet, unhook the coax that now goes to the **SPARE** connector and reattach the output coax from the internal VFO. The DDS-2A cables are then unplugged and removed and tube **V3** is returned to its socket. The 9-pin socket can remain installed.

With the DDS-2A set up with a 75S-series receiver, you can interconnect a 32S-series transmitter using the standard Collins S/Line integration arrangement. This allows use of the DDS-2A VFO for S/Line station transceive (including split frequency operation). The frequency of both the receiver and the transmitter will be controlled by the DDS-2A.

An installation procedure for wiring the DDS-2A directly to a 32S-series transmitter is also described in the manual. This is primarily intended for applications where these Collins transmitters are used with any non-S/Line receiver.

A couple of resistors, a capacitor and a coax cable with phono plugs on each end are needed. These components are not supplied by AOR.

Minor modifications to the transmitter's circuitry are necessary. This installation involves some part swapping, and—as you can imagine—returning the transmitter to its original internal-VFO configuration becomes a little more involved.

Looking Good

AOR did a very nice job of designing the DDS-2A so that it complements the style of the Collins gear. The cabinet has the distinctive rounded edges and front panel trim ring. The three-color paint scheme closely approximates that of the radio's. The quality of the construction and finish is top-notch.

The front panel has a nice large backlit LCD display that renders the frequency and memory channel numbers in easy-to-read digits. Icons in the display indicate which VFO—A or B—is currently in use. Ten pushbuttons set up in two rows of five are similar in title and function to the frequency controls you commonly find on present-day HF transceivers. There's **ENTER**, **M.in**, **M/VFO**, **VFO**, **A=B**, **SPLIT**, **LOCAL** and **LOCK** buttons (the **LOCAL** button is not used). Right and left arrow buttons select the frequency digit that's varied with the main tuning knob. This provides a tremendous selection of "step sizes" for moving around through the frequencies or bands. The tuning and display frequency resolution is 1 Hz. The

slowest tuning rate setting is very fine—*considerably* finer than that of the transceiver's built-in VFO.

The tuning knob on the DDS-2A is approximately 2¼-inches in diameter and features a spinner dimple. The shaft size used on the encoder is the same as that in the Collins gear, so an actual Collins tuning knob can be substituted to further enhance the "factory" look. The rotation feels smooth—nearly as good as the VFOs on the Collins.

Five LEDs are arranged in a semicircle on the left side of the front panel. Each is labeled with a letter. These letters correspond to the band switch ranges on the front of the connected Collins radio. These **BAND** LEDs indicate which band switch position to set the radio for a particular operating frequency.

Worlds Collide

With my KWM-2 and the DDS-2A all wired up and ready to go, I decided to begin with a cruise through 20 meters. I set the transceiver's band switch to the 14.2 position, dialed up 14.22500 MHz on the digital display, and then tuned the transmitter using the same old familiar time-honored procedure (peak and dip, peak and dip…). All loaded up and ready for bear, I switched from the dummy load to the antenna, touched up the loading, and began tuning down the band.

As I approached 14.200, I encountered the telltale signs of a DX station working split—folks were frantically shouting their call signs over a wide chunk of radio real estate. Split frequency operation is not supported in a standalone KWM-2, but it *is* with a DDS-2A connected.

I programmed a strategically chosen transmit frequency and the DX station's frequency into the DDS-2A's dual VFOs, pressed the front panel **SPLIT** button, and dove headfirst into the fray. I was soon rewarded with a new country contact for this band. This was *very* cool. Suddenly the imaginary line just behind my wooden chair was becoming a *dotted* imaginary line…

Next, I took a brief junket to 30 meters, a ham band hitherto unexplored by this particular piece of American iron. I set the digital display to 10.10800 MHz, clicked the transceiver's band switch to 14.0 (as suggested by the LED **BAND** indicator on the DDS-2A) and maximized the receive signal with the radio's **EXCITER TUNING** control (it serves double-duty as a preselector on receive). I was surprised to discover that the peak fell somewhere between the 80- and 40-meter band marks that are printed around the perimeter of the control. A little further reading in the KWM-2's manual revealed the reason.

A graph in the section that covers operation outside of the amateur bands (10 MHz was *not* an amateur band when this transceiver was all shiny and new) provides "logging scale" value starting points for the **EXCITER TUNING** and **P.A. TUNING** controls for the full range of this transceiver's frequency capabilities. The peak I had encountered was right where it belonged. I completed tuning up the transmitter and worked a couple of CW stations just for kicks.

Operation on 30, 17 and 12 meters results in variations in the optimum position of the radio's **INCR LOAD** lever—it may no longer line up with the **50 Ω** mark. This is not a sign of trouble in a properly working radio. Limitations in the design of the KWM-2 and S/Line radios do not allow operation between 5 and 6.5 MHz.

The DDS-2A adds general coverage receive to the KWM-2, so I spent a bit of time listening to AM shortwave broadcasters—albeit in the LSB mode. (This radio doesn't include the AM mode.) Careful tuning of the AM signals in LSB works pretty well though—especially at the 1-Hz tuning rate.

I was anxious to give the 75S-3 its turn. It took me a little over an hour to perform the conversion.

Cruising the Shortwaves in Style

The 75S-series receivers were highly respected in their day, and linking one with an external accessory that results in general coverage receive, 1-Hz tuning, a digital display and 100 memory channels is a wonderful enhancement.

I'm not an avid shortwave listener, but a setup like this could quickly turn me into a convert. The rich-sounding tube-enhanced audio pouring out of the ancient Hallicrafters speaker I had the rig connected to was enough to impress even my spouse. The selectable tuning steps and the multiple memories made it easy to tune around and locate and store interesting stations.

The Rub…

The appropriateness of tagging on one of these new-fangled solid-state DDS-2A VFOs to classic Collins gear is predictably a hot topic of debate among folks who own, operate and care for these faithful, aging classics. Some are adamant in keeping everything in their station absolutely original, while others are willing to experiment with enhancements. I'll forewarn the purists though: If you give one of these units a try you'll likely find yourself very reluctant to part with it.

The DDS-2A is not exactly an inexpensive accessory. Considering that this is high quality, custom-designed equipment for a very small market—much as the Collins gear was in its day—I guess we shouldn't find this too surprising.

With a list price that's nearly equal to that of some economy-class HF transceivers, justifying the expense of one of these with my mate would definitely involve a very liberal application of fuzzy math.

Hmmm, perhaps there are a few idle treasures hanging around on those pine shelves that I could stand to part with…

Manufacturer: AOR USA Inc, 20655 S Western Ave Suite 112, Torrance, CA 90501; 310-787-8615; fax: 310-787-8619; **www.aorusa.com**.

Manufacturer's suggested list price, $769.95.

FEEDBACK

◊ Andrew S. Griffith, W4ULD, author of "A 146- and 445-MHz J-Pole Antenna," *QST*, Oct 2000, pp 50-53, has identified an antenna resonant-frequency problem resulting from the use of heavier type L copper pipe in lieu of the type M pipe. Because the description is lengthy and contains four graphs and a picture in JPG format, we're making the information available as a ZIP file downloadable from the ARRL ftp site. Visit **www.arrl.org/files/qst-binaries/** and download the file GRIFFFB.ZIP.—*Ed.*

◊ After visiting six RadioShack stores in the Chicago area, I was unable to find the DPDT relay (RS 275-249) used at K1 in Jim (N9ART) Mitrenga's article, "A Flexible Digital-Mode Interface," *QST*, Nov 2000, pp 39-42. RadioShack does stock a part with the number 275-249a (note the suffix), but that unit does not fit the holes in the FAR Circuits PC board made for this project. I did find a fitting substitute, however, at local supply house: Crash Electronics, Lombard, IL, **www.crashelectronics.com**. The NTE R40-11D2-12 (DPDT 2A-12VDC) relay fits the FAR PC-board mounting holes. This relay has contacts rated at 2 A rather than 5 A. (The difference in contact current rating will likely not matter for the switching purposes intended with modern rigs.—*Ed.*)—*tnx Peter Laws, N5UWY/9, Lombard, IL*

◊ The price of the Paddlette KP-4 Iambic Key/Keyer that appeared in the *New Products* announcement on page 94 of the December 2000 *QST* is incorrect. The $94 price includes an optional knee mount. The unit sells for $84 without the mount. Also misstated: the contents of the message memories in the KP-4 keyer *are* volatile. QST

MFJ-434 Deluxe Voice Keyer

Anyone who has ever attempted more than a casual effort in any SSB contest knows that besides the radios, antennas and logging programs, there is one more valuable piece of equipment necessary for the contest. And if you lose it, your contest efforts are sunk. Try running stations or building up your QSO totals if you lose your *voice!*

To save the voice, and hopefully build up a respectable QSO count, I recently used the MFJ-434 Deluxe Voice Keyer in the 2000 CQ World Wide SSB Contest. I was using the keyer in conjunction with a Yaesu Mark V FT1000MP transceiver. Since the factory default settings for internal jumpers are compatible with Yaesu transceivers, no internal adjustments were necessary. To configure the 434 for use with ICOM, Kenwood or Alinco radios, all that is necessary is to remove a few screws to open the top of the cabinet and reset eight jumpers on the circuit board, a relatively simple procedure. MFJ suggests leaving the setup for Yaesu and making adapter cables for other transceivers.

The rear panel of the MFJ-434 voice keyer.

Setup and Operation

As with many MFJ products, setting up the Voice Keyer was simple. Plug in a standard 8-pin microphone plug and you have finished the front-of-the-box setup. In the rear, simply plug in a 12-Vdc, 100-mA power source (not included) and attach a lead to the station's ground. At this point, you are ready to make the interface from the 434 to the radio. After that, just plug the mike into the jack input of your radio and you are all set.

The MFJ-434 has five message-storage slots that allow you to record up to 75 seconds of messages. Message #1 has a maximum length of 32 seconds. Messages #2-4 may be 10 seconds in length each, with Message #5 having a 13-second limit. The messages may be programmed using either the internal or an external microphone. I recorded all five messages using an external microphone because it seemed to have better audio quality than the internal microphone.

Recording the messages was simple. First, push the **RECORD/PLAY** switch to **RECORD**. Next, select the internal or external microphone. Then, push the **MESSAGE** button corresponding to the message you were recording. When the red **RECORD LED** begins to flash, speak clearly. Release the message button to end recording. Once you have recorded all of your messages, push the **RECORD/PLAY** button back to play. Push one of the message buttons to replay. (The **VOLUME** knob on the front panel controls the monitor speaker levels.) To change one of the recorded messages, simply re-record over the existing message. Make certain to use the **XMIT ON/OFF** button to disable the PTT line when reviewing messages.

You may adjust the output level control on the rear panel to set the output level to the radio. If the playback audio output level is outside your transceiver's drive range, you may need to make some adjustments of the internal trimpot, R29. The MFJ-434 also provides an automatic override that stops the message being played whenever the PTT switch is keyed. You can disable this feature by removing jumper JMP1 on the internal PC board.

CQ World Wide DX Contest

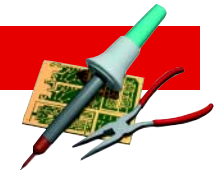
The MFJ-434 performed as expected during the contest. Several unsolicited reports of good audio were received (a function of the combination of the radio and the voice keyer being used). An external control head, allowing for remote activation of the various keyer memories, would have been convenient. MFJ does offer an optional switch (the MFJ-73), but it was not tested during this review. The keyer is also capable of interfacing with your PC, and instructions are included in the manual.

Another available feature is the ability to play back a recorded message in a loop. This can be quite handy on those long lonely hours late in the contest when CQing for those last few contacts. The loop playback can be adjusted to repeat at intervals from 3 to 50 seconds or from 30 to 500 seconds, depending on the front panel **REPEAT DELAY** adjustment and the **X10/X1** setting switch.

I was looking for a voice keyer that was simple to setup and use for the contest, and found that the MFJ-434 met my expectations. I was able to use the keyer while running stations during the contest and searching for multipliers and new stations. We didn't win CQWW, but the MFJ-434 Deluxe Voice Keyer was a welcome addition to the station. At the end of our operation, I even had my voice intact!

Manufacturer: MFJ Enterprises, Box 494, Mississippi State, MS 39762; tel 800-647-1800; **www.mfjenterprises.com**; *$179.95.*

Dan Henderson, N1ND ♦ Contest Branch Manager



Hamtronics T301-2 2-Meter FM Transmitter

It had been almost 20 years since I had assembled a 2-meter FM transmitter kit. My last effort was a nifty little 1-W output strip made by VHF Engineering (anyone remember those kits?). It was a crystal-controlled unit with a couple of multiplier stages and a single output transistor. In contrast, the Hamtronics T301-2 design reflects 20 years of evolution in the form of a dip-switch-controlled frequency synthesizer and modern components such as a tiny surface-mount IC.

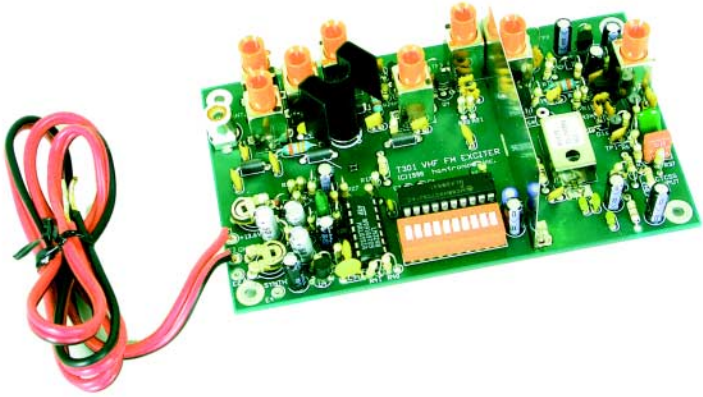
Building the T301-2

The Hamtronics T301-2 comes with informative instruction sheets and application notes, but you won't find the detailed step-by-step assembly directions that you may be accustomed to seeing with other kits. The instructions were adequate for me to build the T301-2 with a minimum of frustration, but I wouldn't recommend this kit to a beginner. The T301-2 is probably best suited to the ham with a little kit-building experience in his or her resume.

As with any kit, the first task is to identify and sort the components. New hams will need to know their resistor color codes well because the parts list only identifies the resistors by value. Capacitors, coils and chokes are straightforward, as are the transistors and ICs. (I needed a magnifying glass to read the transistor markings, though.)

The assembly went smoothly, although the tightly populated 3 × 5-inch circuit board becomes very crowded very quickly. Sockets are provided for all of the ICs except the surface-mount synthesizer chip. This little IC is mounted on the underside of the circuit board and installing it is probably the most difficult aspect of building the T301-2. You have to make sure that the chip is perfectly aligned on the circuit traces before carefully—and I really do mean *carefully*—soldering each leg. A soldering iron with a fine tip, and a set of steady hands, is a must.

My T301-2 was purchased with the high-stability TXCO option. I really didn't need that level of frequency stability, but I wanted to see what the TXCO design had to offer. The module was certainly easy to install; solder three legs and you're done.



After a total of eight hours of work, the T301-2 was complete.

The Smoke Test

I brought my T301-2 into the office and proudly presented it to Mike Tracy, KC1SX, one of the ARRL Laboratory Engineers. He scrutinized my work, then carried the transmitter to the screen room for testing. "Let's set some conservative current limiting on the power supply," he said with a smile. "Just in case."

We connected the dummy load, wattmeter, frequency meter and spectrum analyzer. Mike toggled the power supply switch and I instinctively stepped backward. No smoke! No output, either.

"Not a problem," I said, brandishing the alignment tool provided with the T301-2. I tweaked the oscillator and buffer stages. The wattmeter read 100 mW. As I adjusted the other stages, the power increased to about 1.5 W. Finally, I tweaked the output coupling capacitor and the wattmeter suddenly shot up to the T301-2's specified output of 3 W. Success! At this point the T301-2 was drawing about 500 mA from the power supply.

Turning to the spectrum analyzer, we saw that the output was fairly clean. The strongest spur was –56 dB, which was within FCC requirements. I had set the dipswitch for a frequency of 144.39 MHz and, sure enough, the frequency meter showed the output right on 144.39 MHz. Thanks to the TXCO, the frequency was rock solid throughout the tests. (Setting the dipswitch is not as easy as just dialing in the desired frequency. It uses a binary method that can be more than a little confusing. I "cheated" by going to the Hamtronics Web site and using their table of dipswitch settings for various frequencies.)

You do *not* need all of the test gear we used to check out the T301-2. According to the instructions, you can align the T301-2 with just a VHF wattmeter.

A Fun, Useful Project

So what do you do with a T301-2? I plan to hook mine up to a miniature packet TNC and GPS receiver to make an Automatic Position Reporting System (APRS) tracker. This little rig would also be useful as a foxhunting transmitter, or as a high-altitude balloon transmitter. Hamtronics offers a companion receiver that you could even use to make your own 2-meter FM transceiver. (No, such a radio wouldn't be as versatile or inexpensive as a commercial unit, but you'd have the satisfaction of knowing that you built it yourself.)

I found that T301-2 kit to be relatively easy and satisfying. I'd recommend the experience to anyone. If you don't want to assemble the T301-2 as a kit, however, Hamtronics is happy to sell you the factory built version.

Manufacturer: Hamtronics, 65 Moul Rd, Hilton, NY 14468-9535; tel 716-392-9430; **www.hamtronics.com**. *T301-2 kit (with crystal oscillator), $109; TXCO option, $40; T301-T factory built transmitter, $189.*

Steve Ford, WB8IMY ♦ QST Managing Editor