

Product Review Column from *QST* Magazine

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Alinco DR-110T 2-Meter FM Transceiver

MFJ-1278 Multi-Mode Data Controller

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MFJ-1278 Multi-Mode Data Controller

Reviewed by Jeff Kilgore, KC1MK

With the ever-increasing popularity of digital modes such as packet radio and AMTOR, more and more multimode communications processors are showing up on the market. (In this review, I'll use MCP to refer to this category of devices.) MCPs offer a variety of modes; many have AMTOR, ASCII and Baudot RTTY, facsimile (FAX), and slow-scan television (SSTV) capabilities. This is a mixed blessing for you if you're ready to test the waters of digital operation; choosing the MCP that will serve you best can be a bewildering process indeed.

MFJ Enterprises has thrown their hat into the many-mode-communications-processor ring with their introduction of the MFJ-1278 Multi-Mode Data Controller, which offers HF and VHF packet radio, AMTOR, ASCII and Baudot RTTY, CW, SSTV and FAX operation. This variety of operating modes is enough to keep you occupied for some time!

To get you on the air in a hurry, MFJ offers three Starter Packs for the '1278. These packages are available for use with IBM® PC, Apple® Macintosh and Commodore 64™, C128 and VIC 20™ computers. Each Starter Pack contains terminal software, a '1278-to-computer cable and instructions.

Setup

Connecting the '1278 to most modern equipment is not difficult. A cable for connection to the radio, complete with an installed MCP-end connector, is supplied with the '1278. You must connect the other end of this cable to your rig's audio output, transmit-audio input and PTT lines. There are several ways to make these connections, depending on your preferences and on the radio you are using.

Many radios provide one rear-panel jack where all these connections are made. This provides an element of convenience; you only need to plug in one cable to connect the radio to the '1278. Many rigs also have jacks for AFSK input and output, which leaves you to supply the PTT connection elsewhere (either through a rear-panel jack or via the rig's front-panel microphone connector). Making the connection at the microphone jack has the disadvantage of requiring that you exchange the microphone and MCP cables when you switch between voice and MCP operation.

Once the MCP is connected to the radio, you'll need to connect the MCP to your computer. I used the optional Macintosh Starter Pack, which comes with a cable for this. Unfortunately, the Macintosh Starter Pack is supplied with a DB25 connector to match current-generation Macintoshes, so I had to replace the DB25 with a DB9 connector to



Table 1

MFJ-1278 Multi-Mode Data Controller, serial no. 03010256

Power requirements: 12 V dc at 500 mA.

Terminal/computer interface: RS-232-C interface with DB25 connector; 8-pin TTL serial port.

Data rates: 300, 1200, 2400, 4800 and 9600 bauds.

Radio interfaces: 5-pin DIN connectors (two). Each provides connections for audio output, audio input, push-to-talk (PTT), ground and squelch input (use of the squelch input is optional).

match my older computer.

Operation

Operation of the '1278 is relatively straightforward as multimode communications processors go. That is, if you've never used an MCP before, some reading of the manuals and a little practice on your part are required before MCP operation becomes second nature. Even so, you'll have fun learning by doing.

The '1278 has two modes: command and converse. Changing modes and operating parameters on the MCP is done in the command mode, and operating is performed in the converse mode. Toggling between the two is a simple matter—CTRL C places the unit in the command mode, which is signified by a CMD: prompt. In command mode, select the desired mode and any operating parameters you want to change, type K to place the unit in the converse mode, and you're ready to talk via the bit stream.

Note: Although the '1278 operates on text-only modes (such as packet radio and AMTOR) with any terminal (or a computer running terminal-emulation software), use of the '1278's SSTV and FAX modes requires specialized software. Software contained in the optional Starter Packs (discussed later) provides FAX and SSTV video-graphics capability. The '1278 allows you to print directly to an Epson®-compatible printer in the FAX and SSTV modes.

The '1278 is a versatile unit; its CW operation is a reflection of this. In addition to receiving CW with the '1278, you can transmit CW from the keyboard at any speed from 5 through 99 WPM, or use the '1278 as an iambic keyer. That's right—you can connect your keyer paddles to the '1278 and have at it.

Unfortunately, like other units that offer CW reception, the '1278 doesn't do very well in this mode (more on this later). The '1278 also serves as a memory keyer—something contesters should appreciate (more on this, too, later).

Front-panel LEDs provide you with information on MCP status. A yellow LED, DCD, aids in setting the THRESHOLD control. A green LED, PTT, and red LEDs, STA, CON and PWR, fill out the picture. A 20-segment LED indicator, TUNE, operates on all modes and shares front-panel space with the other indicators and controls.

My Impressions

As I said earlier, the '1278 is relatively easy to hook up and operate. I had a few difficulties that are worth mentioning, however.

The first problem I had was getting the unit to receive properly—not just on one mode, but on *all* modes. The '1278 required more audio drive than that available from either the ACC 2 or the AFSK OUT jacks on my Kenwood TS-440S. Only when signals were more than 40 dB over S9, as indicated on the '440's S meter, did the DCD light come on—even with

the '1278's THRESHOLD control set to maximum sensitivity. I had to resort to getting a signal directly at the '440's speaker leads! This crude approach works, but is inconvenient. And, altering the setting of the '440's AF-gain control necessitates adjustment of the '1278's THRESHOLD control. This is a minor, but annoying, inconvenience.

After getting the unit set up to receive properly, it was time to transmit. I had another minor problem doing this: RF somehow got into the '1278. I reasoned that this was most likely occurring because of the extra cable I had attached to the '440's speaker to get sufficient audio for the '1278. Wrapping a few turns of this speaker-to-'1278 cable around a ferrite core took care of the problem.

HF-Packet-Radio Operation

The '1278's HF-packet-radio performance is best described as adequate. I made plenty of contacts, but under weak-signal or noisy conditions, it was rough going. It's hard to fault the '1278 too much for this, however, because the same problem exists in many other MCPs that use PLL modems on HF. Many PLL-modem MCPs don't work well with varying-amplitude signals. Multipath and selective fading also add their deleterious effects. Nonetheless, the '1278 provided hours of HF-packet-radio enjoyment.

The same problems that beset the '1278 during HF-packet-radio operation also affects the unit during HF AMTOR, ASCII and Baudot RTTY operation. Again, this is not an indictment of the '1278 in particular; many current MCPs perform likewise. I did little HF-RTTY operating, but I did listen around quite a bit, and copy was good enough—under the right conditions—to have some fun on RTTY.

VHF-Packet-Radio Operation

The '1278 was a real pleasure to use in VHF packet-radio operation. The '1278 performed flawlessly in this mode. If VHF packet radio is your thing, the '1278 is a fine unit for you. One of the '1278's nice features is its ability to be connected to two radios simultaneously. This avoids the hassle of connecting and disconnecting cables when switching between HF and VHF operation. In addition, either of the '1278's radio ports can be set up for HF or VHF (300 or 1200 bauds, respectively) packet-radio operation, so you could, for example, connect a 2-meter rig to one port and a 220-MHz rig to the other. If you're into multi-band VHF/UHF packet-radio operation, this is a real plus. The '1278 can even be set up as a gateway between two bands.¹

CW Operation

Operating the '1278 on CW left me with mixed emotions. As with some other current MCPs that offer CW operation, receiving CW on the '1278 is like having teeth pulled—in lots of little pieces. Even with strong

¹For more information on gateway operation, see Larry Wolfgang's review of the Kantronics KAM™ in June 1989 QST, beginning on p. 39.

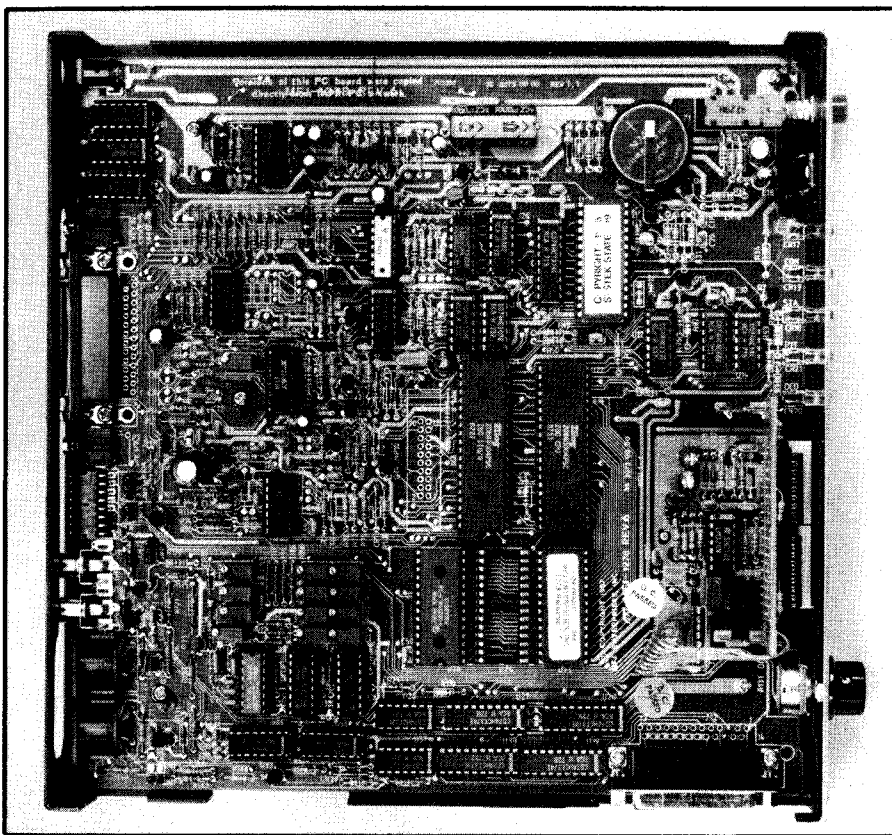


Fig 1—This photo of the main PC board inside the MFJ-1278's enclosure gives nary a hint at the numerous operating modes that the '1278 provides.

signals, what is displayed on the screen bears little resemblance to what's actually being sent. Although the '1278 does a passable job of decoding machine-sent code when signals are strong and in the clear, this CW-reception facility is of little practical use under real-world conditions. Furthermore, tuning CW signals to the center of the '1278's passband places these signals outside the passband of the 500-Hz CW filter in my TS-440S; I had to adjust the '440's IF SHIFT control to compensate for this. The human ear and brain are still the best thing going for copying CW signals.

Sending CW with the '1278 is another matter. As a CW keyboard, the '1278 performs flawlessly. Using the '1278, I made CW contacts at speeds from 5 to 18 WPM, with no problems. I didn't try using paddles with the '1278, but based on the '1278's keyboard-generated keying, I believe that this feature should work well. The '1278's memory-keyer functions also work well, though I made little use of them after trying them out.

FAX and SSTV

In these two areas, the '1278 simply doesn't perform well enough to satisfy anything more than a short-term curiosity. The '1278's major problem in this area is that, although FAX and SSTV are generally transmitted in many shades of gray, the '1278 displays them on the computer screen in only two shades: black and white. Therefore, most of the picture

detail is lost, even under ideal conditions.

I also found it impossible to get FAX and SSTV pictures to line up properly, both on the screen and the printer. The pictures were angled to varying degrees. The '1278's manual states that you can adjust the image angle with a trimmer capacitor on the '1278's PC board, but I was unable to make the pictures line up properly by adjusting this control.

The incoming synchronization pulses (used to line up frames) are often missed by the '1278, resulting in FAX pictures that are skewed to the left or right. When I tried SSTV operation, the '1278 almost never caught the incoming sync pulse; the few times the '1278 did start itself, it seemed to key on noise bursts. It is possible to start frame reception manually, but I was unable to receive SSTV pictures accurately using this method. SSTV pictures also appeared in odd sizes on my monitor; many pictures filled only 15% or so of the screen! Another staffer had no better luck than I with FAX and SSTV reception using the '1278. Although they may be the fault of the software and not the '1278 itself, these operational bugs are hardly conducive to hours of enjoyment!

Although I was disappointed with the FAX and SSTV performance of the '1278, none of the current multimode communications processors that I've seen perform well enough for serious FAX or SSTV work.

Software

The software included in the '1278's

Macintosh Starter Pack performed well with one exception: After leaving the program, the cursor locked up and couldn't be moved with the mouse. I had to reboot the computer to regain cursor control. This may be an incompatibility problem with older Macintoshes (mine has the original 64 kbytes of ROM).

The Manuals

The '1278's documentation (two manuals for the '1278, plus another for the Starter Pack) provides most of what you need to get going, but the information included is not as accurate or as easy to find as I would like.

The main manual is basically a TAPR TNC 2 manual with some changes made to account for the differences between the TNC 2 and the '1278. This manual covers only packet-radio operation, and covers it well, with some exceptions. For example, the manual says to type `BUFFER` plus the message number to load a message into the CW memory keyer, but the actual command is `BUF`, followed by the message number. There is an example of the correct usage on the next page, but errors like this can be a real headache as you try to learn about a new piece of equipment—particularly one that's as command-intensive as a multimode communications processor.

The main manual is indexed, but information I looked for was often not indexed. A better index would have been very helpful when I was learning to use the '1278.

The supplemental manual, which covers all modes other than packet radio, is only 58 pages long. This manual contains much information, but is noticeably less comprehensive than the main manual. Furthermore, there is no index at all, making it much more difficult to find desired information.

Summary

The MFJ-1278 represents a good value for the money, particularly for those who want to concentrate on VHF packet-radio operation and dabble in other modes. The '1278's FAX and SSTV modes are disappointing curiosities, but performance is acceptable in HF packet radio, AMTOR, ASCII and Baudot RTTY operation. Furthermore, although I feel it's poor at copying CW, the '1278's combination of a CW keyboard and a memory keyer could be of real benefit to many amateurs.

Price class: MFJ-1278, \$250; Starter Packs, \$25 each. Manufacturer: MFJ Enterprises, Box 494, Mississippi State, MS 39762, tel 601-323-5869.

ALINCO DR-110T 2-METER FM TRANSCEIVER

Reviewed by Kirk Kleinschmidt, NT0Z

If you're in the market for a small, feature-packed 2-meter FM rig that does the job but isn't burdened with too many fancy features, Alinco's new DR-110T may be for you. The '110's small size and 45-W output make it ideal for cost-conscious hams who want the



best of today's technology without having to pay for a lot of seldom-used extras.

As for its structural integrity, the '110 is a rugged, solid-feeling radio. A look "under the hood" revealed a neatly laid-out, compartmented chassis and circuits using surface-mount technology.

Features and Controls

The '110 is not a stripped-down, bare-bones rig; it simply has an unimposing, uncomplicated look about it. Here is a rig that I can relate to. (My last 2-meter FM rig had only a 12-position, rotary channel-selector switch and an AF-gain control!)

The DR-110T features selectable power output (5 or 45 W), a built-in, dual-tone multifrequency (DTMF) encoder/decoder, dual-conversion receiver circuitry, memories, scanning, variable-rate tuning, a microphone with built-in tone pad and up/down tuning keys, and an audio section with plenty of output power (more than 2 watts), among other things. Unlike many current-generation VHF FM rigs, the '110 does not have receiver coverage outside the 2-meter ham band.

Starting with the front panel, here's a run-down of the '110's controls and connectors: tuning knob; VOLUME and SQUELCH controls; High/Low-power switch; on/off button; microphone connector; Function/Memory write switch; MHz key (used in conjunction with the tuning knob to rapidly move up and down the band); VFO/Memory channel key (the second function of this key, CH.SP, is to select the tuning rate); REVERSE shift/display LOCK key; SHIFT key (selects repeater offset); TONE/BEEP key (selects CTCSS tone and enables/disables key-actuation-acknowledgment beep); PRIORITY key (selects desired priority scanning frequency); SCAN/SKIP key (initiates/stops scanning and designates memory channels to be skipped during memory-scan operation); and the CALL/CALL write key (designates an often-used frequency). Also on the front panel is the multifunction liquid crystal display (LCD).

The rear panel is dominated by the final amplifier's heat sink. Also present are the

power cable and connector, the antenna connector and an external-speaker jack.

The heat sink measures approximately 1.5 × 3.75 × 1.5-inches—not excessively large for a 45-W rig! In fact, the '110 becomes extremely warm after lengthy transmissions (more than 5 minutes). No such heat problems occur during prolonged low-power transmissions.

Using the DR-110T

The DR-110T's manual is a lot like the rig itself—simple and to the point. The manual's 15 pages tell you everything you need to know about the '110's operation and hookup, without a lot of extra or unnecessary information. There's no schematic diagram, but the figures are excellent and easy to understand. Getting the '110 on the air is a snap. Simply connect the antenna, the microphone and a power supply, and you're ready to go.

The rig has variable-rate tuning. A press of the F key, which operates the second functions of many front-panel keys, and then a push of the CH.SP key enables selection of the VFO increment. In this mode, the tuning knob is used to select increments of 5, 10, 12.5, 15, 20 or 25 kHz. Pressing the F key again returns the rig to normal operation.

The rig can now be tuned up and down the band using the newly selected tuning increment. For large frequency excursions, where spinning the tuning knob is impractical, a press of the MHz key allows the tuning knob to operate in 1-MHz steps, facilitating quick frequency changes. Another press of the MHz key returns the rig to normal VFO operation. The '110's tuning knob is conveniently located in the upper-left portion of the front panel; many other small mobile rigs don't have such appropriately placed tuning controls.

The '110 has two built-in repeater shifts: +600 and -600 kHz. It also has the ability to store the transmit and receive frequencies for one nonstandard-offset repeater. Pressing the REVERSE key swaps the transmit and receive frequencies, whether in VFO or memory mode.

An often-used simplex or repeater frequency can be programmed into the C (call)

Table 2**Alinco Electronics DR-110T 2-Meter FM Transceiver, serial no. 0000568****Manufacturer's Claimed Specifications**

Frequency coverage: 144 to 147.995 MHz.

Mode of operation: FM.

Frequency display: Not specified.

Frequency resolution: 2.5 kHz.

Frequency accuracy: Not specified.

Power requirements: Receiving, 500 mA; transmit high power, 9.5 A; transmit low power, 4.0 A.

Transmitter

Power output: Low, approx 5 W; high, 45 W.

Spurious signal and harmonic suppression: better than 60 dB.

Receiver

Type: Dual conversion; first IF, 10.7 MHz; second IF, 455 kHz.

Receiver sensitivity: Better than 0.16 μ V for 12-dB SINAD.

Squelch sensitivity: Not specified.

Receiver audio output: Approx 2 W at 10% distortion (8- Ω load).

Color: Black.

Size (W x H x D): 5.5 x 2.0 x 6.75 inches.

Weight: 2.64 lb.

Measured in ARRL Lab

As specified.

As specified.

5-digit LCD, light digits on dark background

As specified.

Indicated frequency, 146.000 MHz; measured frequency 146.0001 MHz.

Maximum audio output, 660 mA, transmit high power, 8.25 A; transmit low power, 3 A.

Transmitter Dynamic Testing

Low, 4.7 W; high, 46.5 W.

-74 dBc, See Fig 2.

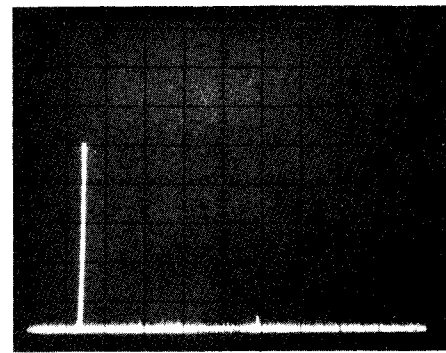
Receiver Dynamic Testing0.10 μ V for 12-dB SINAD0.27 μ V for 20-dB quieting0.01 μ V to 0.10 μ V.2.31 W at 2% total harmonic distortion (THD) with an 8- Ω load.

Fig 2—Worst-case spectral display of the Alinco DR-110T. Horizontal divisions are each 100 MHz; vertical divisions are each 10 dB. Output power is approximately 46.5 W at 146 MHz. For this photo, the fundamental was attenuated by 30 dB by means of notch cavities to prevent spectrum-analyzer overload. All harmonics and spurious emissions are at least 74 dB below peak fundamental output (-74 dBc). The DR-110T complies with current FCC specifications for spectral purity.

memory. This frequency, once stored, is available at the touch of the CALL key.

Programming the ten regular memories is done by dialing in the desired frequency with the tuning knob, selecting the appropriate repeater offset and CTCSS tone, if desired, and then pressing the F key. Next, cycle through the available memories (displayed on the LCD). When the desired memory position is located, a press of the MW (memory write) key stores the frequency, offset and CTCSS-tone information in that memory.

The A and B memories are used to store the upper and lower frequency limits for the rig's programmable-scanning feature. Memory D is used to store an independent frequency for a nonstandard-offset repeater.

The power supplied to the DR-110T's memories and microprocessor is backed up by a lithium battery. Estimated battery life is five years. All memory information can be erased by holding in the F and VFO/M keys while momentarily turning off the power switch. (The only time you'd probably need to do this is when replacing the backup battery.)

The '110 can scan any segment of the 2-meter band by entering the upper- and lower-frequency limits into the A and B memories, activating the squelch, and pressing the SCAN key. In this mode, the rig scans upward in frequency until it encounters a signal strong enough to break the squelch. When the signal drops, the rig waits a few seconds and resumes scanning. Scanning can be stopped manually by pressing the microphone PTT switch or the SCAN key.

To activate memory scanning, you must first put the rig in the memory-recall mode, activate the squelch and press the SCAN key. The rig then scans through all programmed memory channels, stopping if it encounters a signal strong enough to break the squelch. You can terminate scanning the same way as in the band-scan mode.

For tone-squelch operation, the '110 can access 37 CTCSS-tone frequencies. Tone selection is done by pressing the VFO/M key to select VFO Mode, and then pressing the TONE key. The CTCSS-tone frequencies are then displayed on the LCD. Rotating the VFO knob or pressing the up/down keys on the microphone cycles through the available tone frequencies. Pressing the PTT switch returns the receiver frequency to the LCD. When selected, the subaudible tone will be transmitted whenever the PTT switch is pressed.

The tone-squelch function keeps the '110 quiet until the proper tone frequency is received. This function is activated by pressing the TONE key. When this is done, ENC (encode) will appear on the display. Another press of the TONE key causes DEC (decode) to appear on the display. In this mode, the '110 will remain squelched until the proper tone is received—just make sure that all of the stations you want to communicate with use the same tone frequency! To disable the tone squelch, press the TONE key again. ENC and DEC will disappear from the display.

Operating Impressions

The DR-110T is a capable 2-meter FM rig.

With it, I made many QSOs from my home station and my car (using a Hustler 5/8-wave, mag-mount vertical antenna).

The '110's selectable power output is a nice feature, and its 45-W output makes hitting faraway repeaters easy. The rig got good marks on its transmitted audio quality, and receiver audio sounds okay, although it's a bit muddy. The '110's receiver has enough audio output to overcome road noise and most other distractions. This radio has a top-mounted internal speaker that directs the received audio upward into the passenger compartment, instead of downward, into the carpeting, like too many other mobile rigs.

Learning to use the DR-110T wasn't as easy as I thought it would be. Some of the programming sequences aren't as intuitively obvious as those found on other comparable rigs. The rig is by no means difficult to operate; I simply had to refer to the manual frequently while I was getting acquainted with the rig.

Reading the LCD is easy under all ambient-light conditions; reading the markings on the nine function keys located along the bottom of the front panel is not so easy, however. The light-yellow and -blue markings are difficult to read under even the best of conditions, and tend to disappear during mobile operation.

As shown in Fig 2, the '110's spectral purity is excellent. The rig clearly surpasses the FCC's -60-dBc spectral-purity requirement for 144-MHz transmitters in this power-output class.

Minor inconveniences aside, the DR-110T is a solid-performing rig. For those who want a back-to-basics rig with few fancy features, the '110 packs a lot of performance into a reasonably priced package.

Price class: DR-110T, \$360. Manufacturer: Alinco Electronics, 20705 S Western Ave, Suite 104, Torrance, CA 90501, tel 213-618-8616.