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KLM 220-22LBX 220-MHz Yagi

MFJ Enterprises MFJ-1270 Terminal Node Controller

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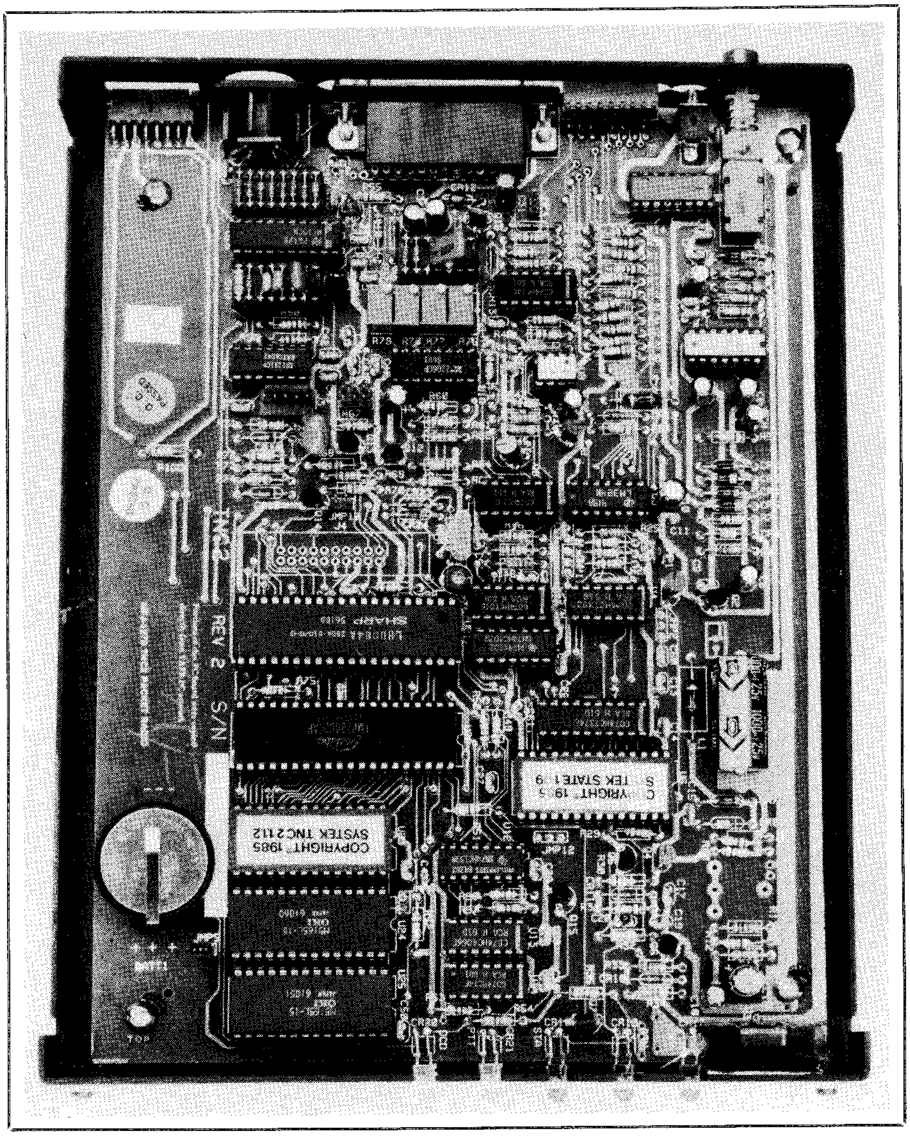
MFJ Enterprises MFJ-1270 Terminal Node Controller

The Tucson Amateur Packet Radio Corporation (TAPR) has been responsible for two major developments in packet-radio hardware, the TNC1 and the TNC2 terminal node controllers. Thousands of TAPR TNC1 kits were built by amateurs, and the design was duplicated by AEA as the AEA PKT-1 and by Heath as the HD-4040. In late 1985, TAPR announced the TNC2, and long-distance trunk lines in Arizona were actually closed down from overload the day the TNC2 went on sale. When TAPR sold out the TNC2 kits, they licensed manufacturers to build TNC2 "clones." MFJ is one of the companies now marketing the TNC2 design.

MFJ makes it perfectly clear that their MFJ-1270 TNC is a TAPR clone. The PC board has the words "portions of this board were copied directly from TAPR artwork" printed on it, and the instruction manual states "portions of this manual were copied directly from TAPR documentation." This review focuses on the specifics of the MFJ TNC. For additional information on packet radio operation, see "What's All This Racket About Packet?" in Jul 1985 *QST* and "A Closer Look at Packet Radio" in Aug 1985 *QST*.



Physical Description

The first thing you notice about the MFJ-1270 is its size. The TNC is small compared to a TNC1 or AEA PKT-1. With dimensions of approximately 7 × 9½ × 1¾ inches, the '1270 will fit almost anywhere. The cabinet is black, with a simple brushed-aluminum front panel. The front-panel display includes a PWR on indicator, a CON indicator that shows that the TNC is connected to another station, a DCD (data carrier detect) indicator, a PTT indicator that shows that the transmitter is keyed and a STA (status) indicator that shows that a packet has been sent but not yet acknowledged by the receiving station. The rear panel provides a DB-25S socket for the RS-232-C connection, a 5-pin DIN socket for the radio connections, the power switch, the TTL-level serial port and the power input socket. Power is supplied by a 12-V dc wall transformer furnished with the unit.

Setting Up the TNC

The first setup step is to interface the TNC to your computer or terminal. This procedure is clearly covered in the MFJ manual. The baud rate at which the TNC communicates with your computer is set by a DIP switch on the rear panel. The MFJ-1270 will "speak" to the terminal at 300, 1200, 2400, 4800 or 9600 bauds. I used it with a Xerox 820 computer, a Commodore® VIC 20 and a Commodore C64®. The Xerox has a standard RS-232-C serial port, and I used a standard 9-line RS-232-C cable to connect it to the '1270. Since the TNC also has a TTL-level output, it may be connected directly to a VIC 20 or C64. MFJ sells a cable for this purpose, along with a simple terminal program for either computer, or you can make your own cable if you already have a terminal program. Finding a mating plug for the connector on the back of the TNC may be a bit difficult, however.

Terminal Software

Almost any terminal software will work with the TNC. If your terminal software works with a modem, it will probably work with the '1270. The MFJ terminal software supplied with the Commodore cable is a bit disappointing—the data-word format (stop bits, data bits and parity) must be set by selecting choices from a menu each time the software is run. Because the program is written in BASIC, however, it is a simple matter to rewrite the program to start with the parameters already set to whatever you choose as default values. In addition, MFJ's terminal software will not allow you to transmit a file stored on disk, or capture received text from the TNC to a disk file. This latter feature is handy if you want to monitor a frequency, and being able to send a file from disk can be useful for composing messages off line for later transmission to a bulletin board. The software rate is fixed at 300 bauds, but the C64 and VIC 20 will operate at 1200 bauds with other software. Although the MFJ software is adequate for casual operating and for checking out the TNC, most packet operators will probably want to use another terminal program.

Connecting the TNC to a Radio

Following the Introduction and Computer Interfacing chapters, Chapter 3 of the manual details the procedure for connecting the TNC to a radio. Transmit audio, receive audio and push-to-talk (PTT) are brought out to a 5-pin DIN connector on the rear panel. MFJ supplies a cable with a matching DIN plug on one end. You must solder connectors for your radio to the other end of the cable. Detailed information for accomplishing this is given in the manual, as well as instructions for building an interface so you can use your radio for voice communications without disconnecting the TNC.

The '1270 will work "right out of the box" with most radios; I used it with an ICOM IC-2AT with no problems. When I connected the TNC to my Drake TR-22, the radio sounded like it was sending packets, but the local bulletin-board station was not receiving them. The cause was excessive deviation. I had the same problem when I connected the Drake to a TNC1—the deviation was found to be close to 12 kHz! Adjusting the deviation to a lower level and reducing the audio output from the TNC1 cured that problem, but with the MFJ TNC the audio level was again overdriving the Drake. Most newer radios have sufficient AGC or limiting circuitry, so this will not be a problem. But if you use an older radio and have trouble on packet, the excessive deviation may be the cause.

And Putting It On the Air

The manual gives clear operating instructions, with two chapters that provide the procedure for setting up the TNC when first powered up, and cover some of the computer- and radio-interfacing problems. Anyone who has used a TNC1 (or an AEA PKT-1 or Heath HD-4040) will find most of the commands familiar; however, a few new commands have been added. One interesting command is the "monitor heard" function. The TNC stores the calls of all stations it hears on the frequency, and when you type "MH," it lists the calls. By typing "MHCLEAR," the list is erased from memory. The TNC has an internal clock; when the clock is set, it will time- and date-stamp all incoming packets as well as the calls in the MH list. You also have the option of having a "header line" on each packet; for example

KB1MW>KE3Z, W1AW-5*, W1AW-4:
  Hello Jon.
KB1MW>KE3Z, W1AW-5, W1AW-4*:
  Hello Jon.

indicates a packet sent from KB1MW through W1AW-4 and W1AW-5 to KE3Z. In the first line, the asterisk by W1AW-5 indicates that the TNC is displaying the packet as it was "digipeated" by W1AW-5. The asterisk in the second line of the display indicates that the TNC also heard and displayed the packet when it was digipeated by W1AW-4. By watching the asterisks you can observe the progress of a packet through the network.

Another useful command is "BUDLIST". This command works in conjunction with call signs that you enter into a list called "LCALLS". With BUDLIST "on", the TNC will ignore frames from stations that are not in the LCALLS list. With BUDLIST "off", frames are ignored from stations that *are* in the LCALLS list.

All commands are well documented and indexed in the manual. The STA (status) on the front panel is a welcome addition; it is particularly useful on a busy channel or in a weak connection to know that your last packet has not yet been acknowledged.

A departure from the TNC1 design is the use of a battery backup for RAM, rather than nonvolatile RAM (NOVRAM) for storing the operating parameters. With the TNC1, you set the operating parameters and then issue the command "PERM" to store the parameters in NOVRAM. Changes that are made and not PERMed are "forgotten" when the power is turned off. With the '1270, once a parameter is changed, the TNC remembers the change, even after a power down. Default settings are stored in EPROM and issuing the "RESET" command sets all the parameters back to their default values.

The radio data rate is selected by a DIP switch on the rear panel; rates of 300, 1200 and 9600 bauds are available. I did not test the '1270 on HF, but the manual gives instructions for recalibrating the modem and optimizing the input filter for HF operation. This is not an easy modification. As an alternative, the internal modem can be completely bypassed to allow use of an external modem for HF operation.

Hardware

While the operation of the '1270 is similar to operation of a TNC1, the hardware complement is quite different. The TNC1 uses a Motorola 6809 processor, a high-level data link controller (HDLC) chip for processing packets and a UART for serial communication to a computer or terminal. In the '1270 design, a Zilog Z80® A processor is used, with a Z80 SIO for both packet processing and serial-port communications. While the TNC1 has a parallel port, the '1270 does not. The modems in both TNCs use the same chips: an MF-10 switched-capacitor filter, XR-2206 AFSK modulator and XR-2211 demodulator. The MFJ-1270 comes with 32 kbytes of ROM programmed with TNC software and 16 kbytes of RAM, with the option of increasing RAM to 32 kbytes.

Conclusion

The MFJ-1270 TNC2 performed flawlessly during the whole time I had it on the air. It was used in normal operations at KB1MW and in packet bulletin-board service at W1AW-4, where it ran 24 hours a day for two weeks with no problems. It appears to be a close clone of the TAPR TNC2, with the valuable addition of the TTL-level connection for use with Commodore computers. It is available at dealers or from MFJ Enterprises, Inc, Box 494 Mississippi State, MS 39762, tel 800-647-1800. Price class: MFJ-1270, $130; Commodore starter packs, MFJ-1282 (disk) or MFJ-1283 (tape), $20 ea.—*Bruce S. Hale, KB1MW*

KLM 220-22LBX 220-MHz YAGI

KLM's latest 22-element, 220-MHz antenna is the longest ever, and it features the latest in mechanical and electrical design techniques. It is based on design and development work done by Gunter Hoch, DL6WU, whose high-performance Yagis have captured the attention of serious VHF/UHF operators here and in Europe. His high-gain, low-side-lobe designs are a favorite among EME operators.

Hardware

As shipped, the antenna elements are bundled together securely, and the hardware is packaged in separate bags. It didn't take me long to determine that nothing was missing. KLM provides first-class hardware with this antenna. All nuts, bolts and lockwashers are stainless steel.

All parasitic elements are made of 3/16-in aluminum rod. The elements mount through the boom and are insulated from it by plastic shoulder washers. Plated steel pushnuts secure the elements in place.

Multiple driven elements have become synonymous with KLM, and the 220-22LBX is no exception. The purpose of this approach is to provide a low SWR across the band. The two driven elements, made of 3/8-in aluminum tubing, mount on top of the boom and are insulated from it by molded plastic blocks. The driven elements are connected together by aluminum straps. The feed-point impedance is 200 ohms, so KLM includes a 4:1 balun made of RG-303 coaxial cable. This cable features silver-plated conductors and Teflon® dielectric, so it weathers well. The coaxial feed line connects to solder lugs, so it is particularly important to do a good weatherproofing job to keep moisture out.

The 30-foot boom is tapered to reduce weight and wind loading. Indeed, the completed antenna weighs in at just over 10 pounds. The center of the boom is made of a 5-foot length of 1½-inch-OD aluminum tubing. Each end of the center section is swaged to accept a 5-foot length of 1¼-inch-OD tubing, and these, in turn, are swaged to accept 5-foot sections of 1-in tubing. A 5-foot length of 7/8-in tubing at the front of the antenna completes the boom.

A 1/8-in-thick aluminum plate comprises

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Table 1

KLM 220-22LBX 220-MHz Yagi Antenna

Manufacturer's Claimed Specifications	*ARRL Evaluation*
Frequency of operation: 220-225 MHz.	As specified.
Longest element: 26 in.	As specified.
Boom Length: 29 ft, 9 in.	As specified.
Weight: 10 lb.	As specified.
Turning radius: 196 in.	As specified.
Wind load: 2.0 sq ft.	Not measured.
SWR: 1.5:1 or better.	1.6:1 (See text.)

The Benefits of Packet Radio

In a nutshell, here's why everyone's raving about packet radio's potential in emergency communications.

Speed. Typical packet transmission speeds on the 2-meter band are upwards of 1200 words per minute.

Accuracy. As long as your system is in the connected mode, it simply will not accept a packet that has acquired errors in transmission. If you get it, you get it perfectly.

Easy to learn use. Once a radio amateur has established the packet link, anyone who can type can send messages, freeing hams for tactical work. And since many packet systems include full-fledged computers, software can be written to make traffic entry even easier (for instance, by automatically inserting repetitive information such as date and place of origin).

Suitable in noisy environments. Emergency-operations centers, hospitals and the like are not always known for having calm, quiet environments. Noise doesn't interfere with your reception of packet traffic.

Provides written transcript of all traffic. Unless you're using a system without a printer, packet automatically puts your traffic in the form that emergency personnel need it: on paper.

Reduces tedious writing and typing. Once information is entered into a computer at the originating station, it may never have to be typed or written down again. This makes packet especially useful for long lists of people, supplies, etc.

Efficient frequency utilization. Unlike a phone or CW net, many packet stations can transmit and receive on one channel at the same time with minimal interference. Also, by including storage capability in the system (such as a microcomputer), massive amounts of data can be entered off line, then quickly sent to another station without wasting valuable air time.

Automatic digipeating. Any packet station can become a repeater station, a link in a crucial post-disaster network. You don't need to rely on obtaining and placing bulky repeater systems.

Portable. An entire packet system can fit easily into one or two small cases, ready to go immediately where needed.

Bulletin-board capability. Messages can be sent to computers with automatic storage capability for later pickup; you don't have to rely on the recipient being around when you call.

Independent from the radio it's used on. A packet system can be hooked up to radios from many services: amateur, police, fire, forestry, etc.

Center in Florida. And Dallas-area hams received an enthusiastic response from city and federal officials when they used packet radio during a tornado drill.

What can your Amateur Radio group do to get in on the action? Obviously, as a first step, learn all you can about packet. The ARRL publishes *Gateway,* a newsletter devoted entirely to packet radio. Talk to people in your area who are already using packet. They may even have access to a packet "bulletin board," a computer system where people can leave messages and information about packet radio.

Then, jump in yourself! Get your own packet system together. Help create networks to link packet users throughout your state, or a larger area. (Remember: Since every packet station can become a repeater, you can get a net started without ever leaving home, although mountaintop sites are certainly preferable.) And to make sure that frequencies are set aside for packet radio in your area, get involved in frequency coordination.

Packet is real and ready to go, but it needs *you* to turn its potential into a superior emergency-communications tool. QST

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the boom-to-mast bracket. Plated-steel U bolts and saddles secure the plate to both boom and mast. The mast U bolts, as provided, will fit masts up to 2-1/8-inch OD. A truss made of nonconductive Phillystran® guy cable supports the boom. The truss attaches to the mast approximately one foot above the boom and is necessary to prevent boom sag. Turnbuckles allow proper tensioning of the boom-support cables.

Assembly

It took me about four hours to assemble the 220-22LBX antenna. The job was made easier by the fine machine work done at the factory. All holes were deburred and everything lined up well. The instruction manual is clear and well illustrated. Boom assembly is straightforward. The boom is quite long, and you'll need plenty of space to lay it out on a flat surface before tightening the screws.

The parasitic elements have a continuous taper. The reflector is the longest element, and the elements get progressively shorter. The insulators fit snugly, so the elements feel secure even without the pushnuts that lock them in place. In fact, the fit is snug enough that you don't need to use the pushnuts if you want to be able to take the antenna apart for portable operation.

Installation and On-the-Air Performance

The 220-22LBX may be installed for either vertical or horizontal polarization. I chose horizontal polarization because my main interest is SSB and CW at the low end of the band. Installing the 220-22LBX was easy. Although the antenna is long, the short elements make it easy to guide around tower guy wires. The boom is quite flexible without the truss, so take care not to place excessive stress on it. I installed the antenna with some other VHF and UHF antennas atop a 100-foot tower. It is fed with 120 feet of ¾-in Hardline.

Because of equipment limitations, I was only able to measure the SWR at two frequencies in the band: at the low end (around 220.1 MHz) and at 223.5 MHz. At both frequencies, the SWR is about 1.6:1. In a recent article in the newsletter *Cheese Bits,* published by the Mt Airy VHF RC, Jim Hold, N3AHI, states that apparently the baluns on some KLM LBX-series antennas are cut too short, so they resonate high in frequency. In some cases, the match can be improved by replacing the balun. I did not try this because it didn't seem worth the trouble to remove the antenna from the tower. If you buy one of these antennas, it's a good idea to check the SWR *before* installing the antenna in its final location.

On-the-air results are very satisfying. I installed the antenna just in time for the ARRL Spring Sprints. During the 220-MHz Sprint, I was able to work more than 50 stations in 17 different grid squares. The pattern is exceptionally sharp, so I was able to hear weaker stations by positioning the antenna to null out several loud local stations.

This modern antenna is certainly worth considering if you want to work DX on 220 MHz. Manufacturer: KLM Electronics, Inc, PO Box 816, Morgan Hill, CA 95037. Price class: $120.—*Mark Wilson, AA2Z* QST