Product Review Column from *QST* Magazine

January 1988

AEA PK-232 Multi-Mode Digital Communications Terminal

Heathkit HK-232 Packkit Multi-Mode Digital Communications Terminal

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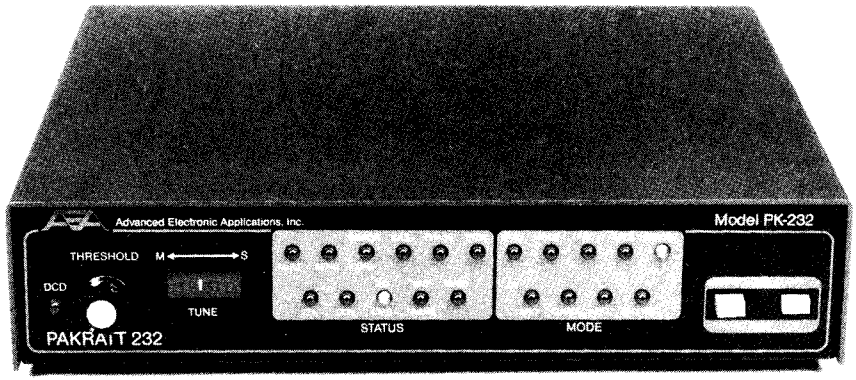
AEA PK-232™ Multi-Mode Digital Communications Terminal

Reviewed by Bruce Hale, KB1MW



"Presenting the new Baud-o-Matic. It slices, dices, and chops bits; tells the time, date, temperature and your shoe size. How much would you pay for this fantastic device? But wait...there's more!" All kidding aside, the AEA PK-232 is really an *all-mode* communications terminal. It sends and receives the usual CW, RTTY (Baudot and ASCII) and AMTOR, and it can be used on HF and VHF packet. The PK-232 even receives and sends facsimile pictures. (Funny how "all-mode" used to mean CW, RTTY and AMTOR—we've redefined the term since the packet-radio explosion.) Prompted by the success of their PK-64 all-mode (there's that term again) communications terminal for the Commodore C-64, AEA has produced a similar unit "for the rest of us" computer users.

Control and Display

The PK-232 is a fairly complex-looking piece of hardware. There are 21 LEDs, a tuning display, two switches (power and RADIO 1/RADIO 2) and a THRESHOLD control on the front panel. On the rear panel, there is a POWER jack (the unit requires an external 12-V dc, 1-A supply); jacks for cables to connect two separate radios; a DIN socket that provides oscilloscope outputs for RTTY tuning and direct FSK outputs; an external modem jack; CW keying jacks for both positive- and negative-polarity keying; a DB-25S connector for the RS-232-C I/O from a computer or terminal (*and* the FAX-to-printer output); and an AFSK level control.

Connections

It is possible to connect two separate radios to the PK-232. A front-panel switch selects which radio is in use. This is handy for the combined VHF/HF station—changing from the HF radio to the VHF unit is as easy as pressing the switch. PTT, audio-out and audio-in lines are brought out to a pair of 5-pin inline jacks on the rear panel. AEA provides cables with matching plugs, and the manual tells you to make sure the cables are plugged into the PK-232 correctly. The plug is *not* polarized in any way; it is possible to plug it into the back of the PK-232 upside down, although once you read the manual this should not be a problem.

A VHF FM radio is connected to the audio-in, audio-out and PTT lines from one of the radio connectors. A dc blocking capacitor and/or a special keying circuit may be required for some transceivers. (See the Kantronics KPC-2400 review in November 1987 *QST* or the ICOM IC-μ2AT review in May 1987 *QST* for examples of this circuit.)

Connecting the PK-232 to an HF radio can be done in two ways. The AFSK output from the 5-pin jack can be connected directly to the microphone input of an SSB transceiver. Audio input to the PK-232 can be taken from the transceiver's speaker jack, or from another source—such as a phone-patch output. There is no monitor speaker in the PK-232, so you have to provide some other way to listen to the received audio if the speaker in your rig is defeated when you connect the audio-output cable.

The PK-232 can also provide direct FSK for a transceiver capable of being keyed this way. The FSK outputs are provided on the 5-pin DIN socket on the back panel. This may be the best way to go on RTTY—if your rig allows it—because the filters in most radios are sharper in the FSK position than in the SSB positions. The manual warns that many rigs are not capable of 300-baud direct FSK, so packet FSK operation may not be possible. If you plan to operate both HF packet and HF RTTY, you may want to use the AFSK output for both.

Commands

Almost all of the PK-232 functions are controlled from your terminal keyboard. On packet, the commands are familiar to anyone accustomed to the command set for a TAPR TNC 2. Other operating modes use easy-to-remember commands. When you change a command setting, the PK-232 tells you what the parameter was, and then tells you what it is now. For example, if you are in packet mode and you want to go to Morse code, you type the CONTROL C character (to get into command mode) and "MORSE." The PK-232 responds with

OPMODE was PACKET
OPMODE now MORSE

Similarly, when you change the sending speed, the PK-232 tells you what the old speed was and acknowledges the new speed. Commands are detailed in the comprehensive manual, along with acceptable parameters and examples of how the commands are used.

On The Air

My first experience with the PK-232 was on VHF packet. It worked well at my station. The command set is similar to that of the TAPR TNC 2, with some notable additions. Instead of the simple MONITOR ON/OFF of the TNC 2, the PK-232 provides several monitor modes, selected by the word MONITOR (or simply MON) followed by a number. MON 0 is equivalent to the TNC 2 MON OFF—no channel monitoring is performed. MON 1, 2 and 3 let you see some variations of unprotocol packets, numbered I frames and Connect and Disconnect requests. MON 4 is equivalent to the TNC 2 MON ON—you see unprotocol frames, I frames, connect and disconnect frames and acknowledgment of connect and disconnect frames. The enhancement of this command really becomes obvious when you use MON 5 or 6. MON 5 lets you see Receive Ready, Receive Not Ready, Reject and Frame Reject frames in addition to MON 4 frames, and MON 6 shows you everything,

including poll final bits and frame sequence numbers. Whew! The PK-232 can show you *everything* that's happening on the frequency—probably more information than you will understand, at first. If you want to understand how the AX.25 protocol works, though, you can watch all the frames flying across your screen. I left MONITOR set at 6 most of the time; the inner workings of packet operation interested me more than the messages themselves. An interesting aside to all this—I found that the standard MON ON and MON OFF command also work on the PK-232—MON ON sets MONITOR to 4, and MON OFF sets it to 0. This allows the PK-232 to be used with the WØRLI PBBS software with no modifications to the software.

Another place AEA has enhanced the command set is in the area of what call signs are or are not allowed to connect with your station. The TNC 1 had a simple CONOK ON/OFF command. CONOK ON meant anyone could connect to you, CONOK OFF excluded everyone. The TNC 2 went a bit farther, and added the BUDLIST and LCALLS commands—you could exclude or allow the stations in the LCALLS list, depending on the setting of BUDLIST. With the PK-232, you have a command called CFROM (abbreviated CF)—CFROM ALL is equivalent to CONOK ON—anyone can connect to your station. CFROM NONE is CONOK OFF—no one can connect. CFROM YES KB1MW means *only* KB1MW can connect, and CFROM NO KE3Z, AA2Z, WA3VIL means that those three stations will *not* be able to connect. CONOK ON and CONOK OFF also work, setting CF to ALL and NONE respectively, and again providing compatibility with the WØRLI software.

MFROM means "monitor from" and it works like CFROM. MF ALL means all stations are monitored. MF YES KE3Z means *only* packets from KE3Z are displayed. MF NO W1AW-4 means no packets from W1AW-4 are shown. This is especially useful if you want to monitor traffic on a channel used by a busy PBBS, but do not want your disk buffer to fill up with messages *from* the PBBS.

Even the error messages are enhanced. In addition to the simple "?what?" when the TNC has no idea what you want it to do, the PK-232 tells you "?not enough" when you don't type enough arguments for a command, and "?too many" when you type too many. The PK-232 responds "?bad" if it understands a command, but not the command parameters. It tells you "?callsign" if a call you enter does not conform to its requirements (any string of numbers and letters containing at least one letter). It even tells you "?too long" if you type in more commands on one line than it can understand.

The PK-232 also has error messages that help prevent common operating mistakes. If you try to set the beacon interval to a short time (type BEACON EVERY 10, for every 100 seconds), the PK-232 tells you "WARNING: BEACON too often." The PK-232 *will* beacon every 100 seconds, but it tells you that it's not a very good idea *every time you type a command* until you set the beacon interval to something longer than every 900 seconds (15 minutes). Changing the serial-port parameters works the same way; if you type a command that will change the serial-port parameters (change the data-word format or parity, for example) the PK-232 responds with "WARNING: Serial port configuration will change with next restart" every time you type another command. It's obvious that AEA put a lot of thought into the enhanced software. The PK-232 performs very well on packet, and a new user will probably find the commands easy to understand and use.

PBBS Operation

I used the PK-232 as the main TNC at my home station, along with a Xerox® 820 computer and the WØRLI PBBS software. The PK-232 worked well with no modifications to the configuration file I had been using with a TNC 2.

Only two small problems surfaced while the PBBS was running. The PK-232 displays the string of digipeaters in a packet a bit differently in the MRPT mode. A TNC 2 shows a packet that has traveled through several digipeaters like this:

W1AW-4>KB1MW, W1AW-5*, KE3Z

This packet is traveling from W1AW-4 to KB1MW, and we are seeing the packet as retransmitted by W1AW-5. The PK-232 displays the same packet as

W1AW-4>W1AW-5*>KE3Z>KB1MW

with the source first and the destination last. This is easy for a human to understand (perhaps a bit easier than the TNC 2 version, in fact) but the WØRLI software is confused by the different format, and as a result, the "J" list (calls heard) on the PBBS does not get updated correctly. With MRPT OFF, the J list functions correctly, but you cannot observe the path of monitored packets.

Another potential problem for PBBS users is the MDIGI command. With MDIGI ON, the TNC displays *all* packets that are digipeated by your station, *even when you are connected.* This may be useful for someone who wants to know when his station is being used as a digipeater, but it can be fatal for a PBBS. If the PBBS is connected and a digipeated packet is displayed by the TNC, the PBBS tries to interpret the monitored packet as a command; this can cause the PBBS to go off into never-never land for a bit. Like the MRPT problem, the fix for MDIGI is simple; make sure you don't set MDIGI ON if you are running a PBBS!

CW Operation

I used the PK-232 for only two QSOs on CW, although I did a fair amount of monitoring to get a feel for how well the tuning indicator worked and how the software handled poor fists. The tuning indicator shows a CW signal on the MARK side of the LED when the signal is tuned correctly. It worked well; signals that the PK-232 received well showed a full displacement of the tuning indicator. I wasn't too impressed with the CW receiving performance, but I really didn't expect to be. CW reception is a very difficult job for a communications terminal. The PK-232 was bothered by strong adjacent signals perhaps a bit less than some of the other CW-receiving devices I've used, but I still found that I could copy many signals better in my head than the PK-232 software could.

The PK-232 sends excellent CW, although there is no way to vary the dot/dash weighting. An interesting feature is the use of 15 WPM "Farnsworth" code for speeds less than 15 WPM. Morse at 7 WPM, for example, is sent using 15-WPM characters spaced far enough apart to give a final speed of 7 WPM.

RTTY

As expected, the PK-232 works very well on RTTY. The unit uses a filter-based modem rather than the simple XR-2211 or AM7910 one-chip demodulators found in some TNCs. As a result, even noisy signals produce good copy. I was a bit concerned that the 200-Hz shift used in the modulator might cause some problems, but the Product Review unit actually had the shift set at 185 Hz—halfway between the 170 Hz used for most RTTY work and the 200 Hz used on packet! I worked several stations on Baudot RTTY, and all told me that the PK-232 produces good signals. Finding a station to work on ASCII was a bit difficult, but I copied the W1AW ASCII bulletins fine.

The tuning indicator works well, although I find an oscilloscope display much easier to use than an LED tuning indicator. I connected an oscilloscope to the tuning outputs available at the DIN socket on the back panel. The PK-232 produces a typical "crossed bananas" tuning output, and I found that even weak signals could be tuned in easily with the scope. Some of the weaker signals did not produce a satisfactory display on the LED tuning indicator.

Monitoring Commercial RTTY

When AEA enhanced the PK-232 to allow it to receive facsimile pictures, they also added an interesting feature for RTTY reception. The Signal Identification and Acquisition Mode (SIAM™) allows you to tune in a RTTY signal and ask the PK-232 to determine the speed, shift and code being used. SIAM also allows the PK-232 to receive Russian Cyrillic and Japanese Katakana Morse code. To use the SIAM system, set the PK-232 operating mode to SIGNAL and tune in an unknown

signal. After about 10 seconds, the PK-232 responds with what it thinks the sending speed is, along with a "confidence factor" indicating the probable accuracy of the speed prediction. For example, "0.47: 50 Baud" indicates that the PK-232 is 47% sure that the speed is 50 bauds. After another 15 seconds or so, the PK-232 indicates the code in use and whether mark and space are reversed: "0.65: 110 Baud, ASCII, RXREV ON" indicates a 65% probability that the transmission is reversed 110-baud ASCII. To begin printing the transmission, you type "OK" and copy should appear on your terminal. If you're not satisfied with the confidence level, you can let the SIGNAL mode run until you are satisfied.

The PK-232 also allows you to experiment with bit inversion on received signals. Bit inversion is a signal encoding technique where selected bits in a data word are inverted from their normal level. This feature is useful for identifying RTTY "intruders" in the amateur bands. There are many ways to encode RTTY signals, however. The bit-inversion scheme may be changed many times during a single transmission, so it may be difficult to complete a positive identification before such a change occurs—even if you can figure out which bits are inverted.

AMTOR

AMTOR is one of my favorite operating modes when I'm using a computer on the air. It amazes me to watch perfect copy from DX stations—even with fairly heavy QRM—after I've been looking at the hits and misses on Baudot. The PK-232 worked very well on AMTOR, and I had several good QSOs with European stations on 20 meters.

Weather Facsimile

The PK-232 can receive and print weather FAX pictures, as well as news service FAX photos and other facsimile information. The printer connects to the DB-25 socket on the back of the unit. To connect a terminal at the same time, a Y cable must be used—some of the DB-25 lines go to the terminal and some go to the printer. More information about using the PK-232 for FAX reception can be found in the Heath HK-232 elsewhere in this month's Product Review column.

Conclusion

I have no complaints about the PK-232, although I wish that AEA had used a polarized connector for the rear-panel radio jacks. The unit worked as well or better than I expected it to in all the operating modes I tried. This box is a great way to put a computer on the air. With the VHF/HF switch, one box can be used for both; no switch box or recabling is required to go from one band to the other. The manual is well written and easy to understand. The filter-based modem is a great performance advantage over a single-chip modem, especially for weak-signal RTTY work. AEA has produced a winner—a great addition to any computerized ham shack. Price class: $380. Manufacturer: Advanced Electronic Applications, PO Box 2160, Lynnwood, WA 98036, tel 206-775-7373.

HEATHKIT® HK-232 PACKKIT® MULTI-MODE DIGITAL COMMUNICATIONS TERMINAL

Reviewed by Chuck Hutchinson, K8CH

There is no coincidence in the model number—the HK-232 is the Heathkit version of the AEA PK-232. What you'll get for your money with the HK-232 is the pleasure of building your own multi-mode communications terminal, and you'll have the Heath documentation (an assembly manual and a user's manual). The Heath user's manual seems to be based on the AEA manual, but there are some differences. For example, you get a full schematic diagram with the HK-232. Both manuals are held in three-ring binders (provided)—a welcome feature when you want to leave a manual open to a particular page.

Assembly and Alignment

There are only two PC boards in the HK-232—the display board and the main circuit board. All parts mount directly to these two boards. A "Y" cable is provided that connects to the DB-25S on the back of the HK-232 and to your terminal and printer. The only cables that you need to make are the cables that connect your radio(s) to the controller, and you only have to assemble the radio end of these!

Assembly instructions are top-notch. I took my time on the project, double checking every step as I went, and working only an hour or two at a time. I spent the first hour of the project updating the documentation and organizing my work area. After that it took me about 14 hours to assemble the '232. I encountered no problems in building the unit.

I did have a small problem with alignment, however. Since my FET VOM died, I only have a VOM. The meter was not sensitive enough for the AFSK tone alignment process. After I borrowed an oscilloscope from the ARRL Lab, the alignment proceeded smoothly. A FET VOM or VTVM would probably be adequate for this process, but a standard VOM is not. The total alignment, with the scope, took about an hour.

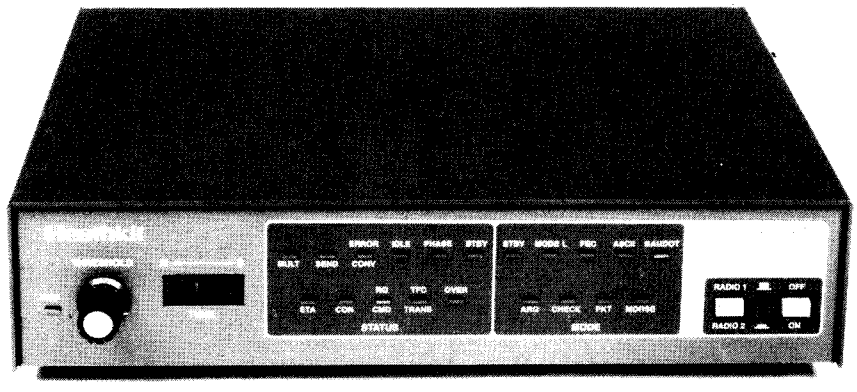
Installation proved no problem at all. The manuals are excellent; everything worked as the documentation described. Operation of the unit, as you would expect, is identical to the operation of the PK-232, described in this month's review.

Facsimile

Since most of the PK-232 review was written before the facsimile option was available, and my HK-232 arrived with the FAX option, I'll cover the operation of both units here. Weather facsimile is transmitted on various frequencies in the shortwave portion of the radio spectrum. Weather FAX stations transmit maps showing current conditions, trends, and forecasts, as well as satellite photographs showing cloud cover patterns. The broadcasts are used by ships at sea and weather forecasters.

The facsimile (FAX) command defaults in the HK-232 are set for copying HF weather maps. HF facsimile pictures are sent by frequency modulating an audio tone. The frequency varies from 1500 Hz to 2300 Hz; 1500 Hz represents pure black, and 2300 Hz represents pure white. In between these frequencies is a gray scale that continuously varies from black to white. The PK-232 and HK-232 use a 1700-Hz center frequency to resolve the continuously variable FAX signal into "black" and "white." Anything below 1700 Hz is black; anything above 1700 Hz is white. This is adequate for weather maps that are sent as line drawings, but wire-service photos will not reproduce in a full gray scale.

The FAX format used by the HK-232 and PK-232 is different from the weather



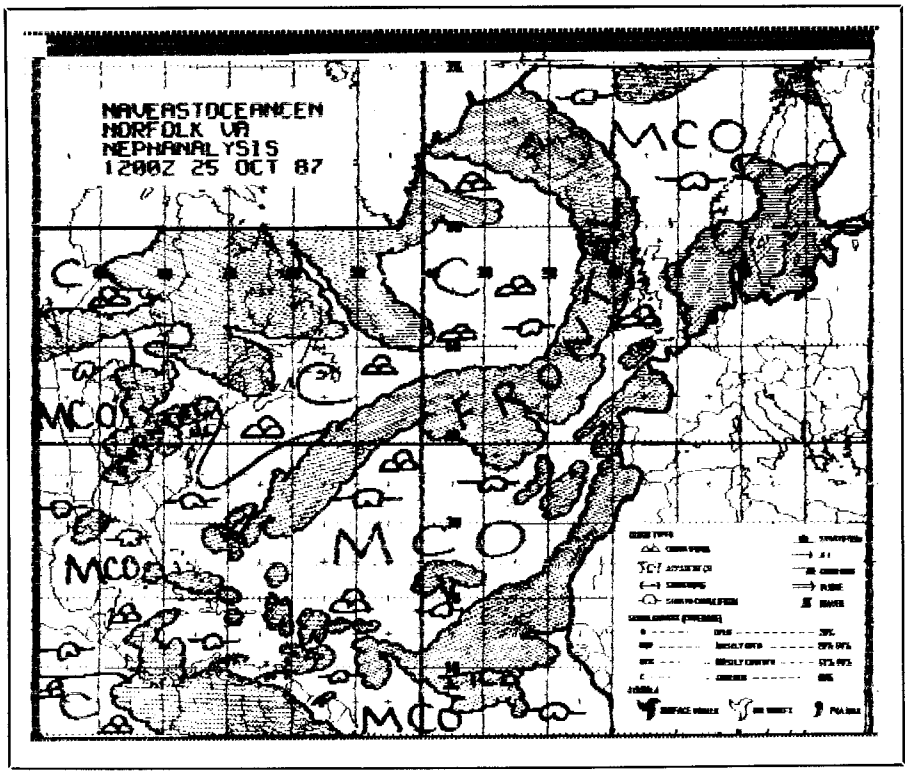


Fig 1—This weather FAX picture, showing the location of weather fronts over the North Atlantic, was copied on 8080 kHz from NAM, Norfolk, Virginia.

satellite APT format. Weather satellites transmit their photos by amplitude modulating a 2400-Hz subcarrier. The HK-232 and PK-232 cannot be used to receive weather satellite photos.

You need an Epson-graphics-compatible printer to copy FAX with the HK-232. I used the HK-232 with an IBM® PC and an Epson FX-286e printer. The first step is to "turn on" the printer with the PRCON ON command. The status LEDs light in a certain pattern and will not work normally again until you issue the command PRCON OFF. Remember to turn PRCON OFF when you are through copying FAX—it will save you the frustration of trying to figure out what has gone wrong with the status indicators when you try to operate another mode.

When you first enter the FAX mode, the HK-232 waits for the sync signal at the beginning of a new picture. You can force a start, although the picture lines may not start at the edge of the printed lines. Another command allows you to change the break point so the picture lines appear properly on the page.

In addition to the weather maps transmitted by facsimile, various news organizations use shortwave frequencies to transmit news photographs to their subscribers. These transmissions use a variety of protocols. Weather facsimile pictures are sent at two lines per second, but other facsimile services may use different rates. With practice, you can "hear" the line rate. Weather FAX signals sound like "Brrrrip, Brrrrip"—with the "Brrrrips" repeated twice a second. Some news photo services use 1 line/s—that means you'll hear one "Brrrrip" each second. The HK-232 tuning indicator LEDs show you when a signal is tuned correctly. It takes 15-20 minutes to print a FAX picture.

To see a picture the way it should appear, you may have to change some of the parameters using the HK-232 command set. In addition to adjusting the speed, you may have to change the aspect ratio or change from positive to negative printout. You can also change whether the signal is scanned left to right or right to left.

One word of warning: Trying to copy just one FAX picture is like trying to eat just one potato chip. Maybe you can do it—I can't!

The documentation on FAX operation is very good. I experienced no problems in using, and enjoying, this mode. One helpful feature is a list of frequencies used for FAX transmissions. These frequencies are a great starting point. Once you've become familiar with the sound of FAX transmissions, you should have no trouble finding other stations.

The Bottom Line

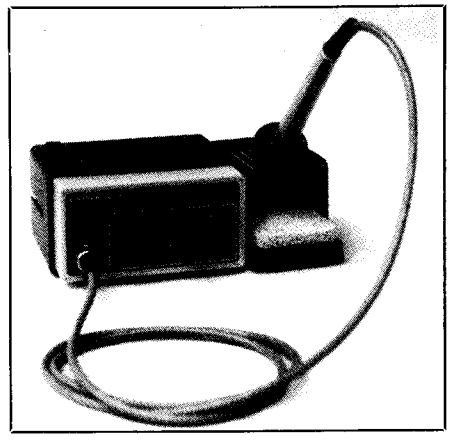
The HK-232 is a relatively easy-to-build kit. Most of the construction consists of simply stuffing the two circuit boards. If you enjoy construction and you'd like to build a full-featured communications terminal, the HK-232 is for you. Price class: $280. Manufacturer: Heath Co, Benton Harbor, MI 49022, tel 800-253-0570. QST

Table 1

AEA PK-232 (Serial No. 03097) and Heathkit HK-232 (Series No. 74762) Multi-Mode Digital Communications Terminals

Power requirements: 12 to 16 V dc at 700 mA
Terminal interface: RS-232-C interface with DB-25S connector (using lines 1-8 and 20 only). Autobaud data rate selection of 300, 1200, 2400, 4800 and 9600 bauds. Manual selection adds 110, 150, 200 and 600 bauds.
Radio interface: Two five-pin connectors (cables supplied), selectable from the front panel. Lines for receive audio, transmit audio, PTT, external squelch input and ground.
Dimensions: 2.5 × 11 × 8.25 inches (height, width, depth).
Weight: 3 lb.

New Products



ERSA MS 6000 SOLDERING STATION

☐ The ERSA MS 6000 soldering station features a positive-temperature-coefficient ceramic heating element that makes it suitable for applications ranging from delicate IC soldering to operations requiring a 100-W uncontrolled iron. Tip temperature is continuously variable from 300 to 840 °F, and warm-up time is 60 seconds. Five different tips, as well as desoldering inserts, are available. The MS 6000 has a number of features that make it comfortable to use. For example, the ceramic funnel that holds the soldering iron can be mounted on either side of the control unit, making it suitable for right- and left-handed users. Price class: MS 6000, $120; tips, $3.75 each. For more information, contact Robert W. Mink Import-Export, PO Box 6437, Fair Haven, NJ 07704, tel 201-758-8388.—*Mark Wilson, AA2Z*