



# Product Catalog 1992



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# Antennas

## IsoLoop™ model 10-30 HF Antenna

Once again AEA has achieved a significant engineering breakthrough with its redesigned high-performance, low profile HF IsoLoop model 10-30 antenna. Performance isn't compromised by its small size. Operate your favorite HF band (10 to 30 MHz continuous) from areas with restrictive zoning ordinances or apartments and condos. Or take it with you on vacation... it's the ideal go-anywhere portable antenna. ONE antenna instead of numerous dipoles, unsightly verticals, antenna tuners or ground radials. The IsoLoop model 10-30 is also ideal for filling in the new WARC bands your current antenna may not tune to (such as 30, 17 and 12 meters). The IsoLoop makes the PERFECT Standby portable antenna!

Rated up to 150 watts, the IsoLoop model 10-30 transmits and receives on any frequency between 10 and 30 MHz.

**Innovative design.** The IsoLoop model 10-30 represents the latest hi-tech, weather-and corrosion-resistant low-profile design. The IsoLoop model 10-30 has no mechanical joints, so the possibility of corrosion is kept to a minimum.

**Omnidirectional.** When mounted with the loop in the horizontal plane, the radiation pattern is omni-directional and horizontally polarized, with gain similar to a dipole. Maximum radiation is at low angles which is ideal for DX operation.

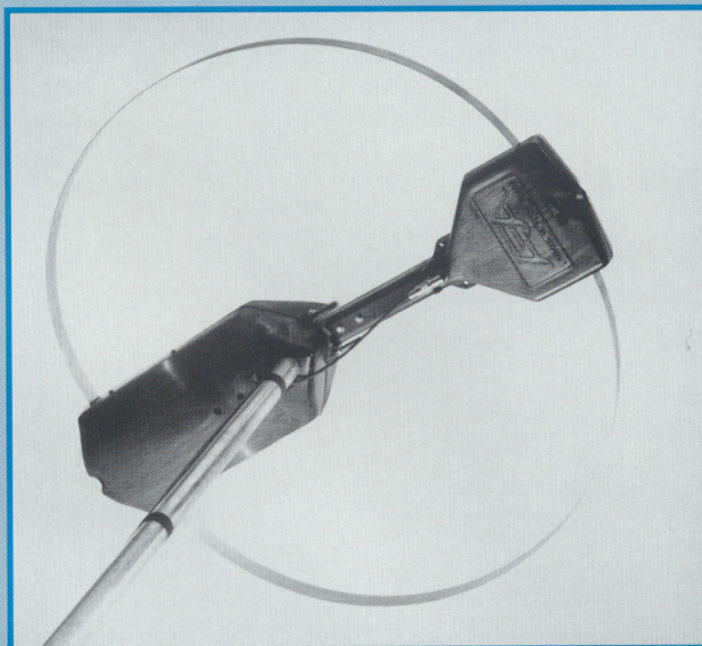
The IsoLoop may also be mounted with the loop in the vertical plane to provide a null in a desired direction.

**Easy Tuning.** Tuning is provided by a direct-drive precision stepper-motor and a small remote control box, the LC-2 (supplied with 50ft control cable). Signal strength LEDs on the LC-2 make tuning a snap. An optional frequency indicator provides information to make tuning even easier.

**Fully Assembled.** The IsoLoop model 10-30 comes fully assembled from the factory. To get on the air, you simply slide the loop on the mast (not included), tighten down the U-bolt and attach the coax. That's it! No complicated instructions and no mechanical joints.

No additional tuner or antenna rotor is required. With only a simple mast required for mounting, the IsoLoop makes a very cost effective antenna system.

The IsoLoop is isolated from the feedline (hence its name) at radio frequencies which keeps the feedline from becoming part of the radiating structure. This provides an undistorted radiation pattern and less stray RF in the ham shack. The IsoLoop is also much more effective at very low elevations than dipoles. This antenna also makes the ideal marine antenna with **no** ground plane or expensive automatic tuner required.



**Efficient High-Q design.** One of the unique features of the IsoLoop is its inherent High-Q. The IsoLoop can be considered a very sharp tunable filter that radiates. The narrow bandwidth suppresses harmonics from your transmitter, reducing TVI problems. It also attenuates out-of-band signals from nearby transmitters that could overload your receiver. No mechanical joints means minimal IR losses and better reception.

**Compact.** The IsoLoop model 10-30 is round, measuring 43 inches in diameter and weighing only 14 pounds. And because it comes fully assembled, it is ideal for Field Day, DXpeditioning, etc.

Includes AC-1 power supply (U.S. model only).

*Patents Pending.*

### Specifications

Frequency Coverage:	10 to 30 MHz
Nominal Impedance:	50 ohms
Power Rating:	150 watts
VSWR:	Less than 1.5:1 (no nearby obstructions)
Temperature Range:	Operating 0 to 150 degrees F Storage -50 to 200 degrees F
Dimensions:	43"(109cm) diameter circle
Maximum Mast Outside Diameter:	2"(51mm)
Shipping Weight:	25 lbs.(11.3kg) UPS shippable
Coax Connector:	UHF (SO-239)
Gain over dipole:	Depends on elevation

*Mast and coax cable not included. Optional LC-2 shielded control cable with connectors available in 100ft length.*



# Antennas

## IsoPole™ Omni-Directional VHF/UHF Vertical Antennas

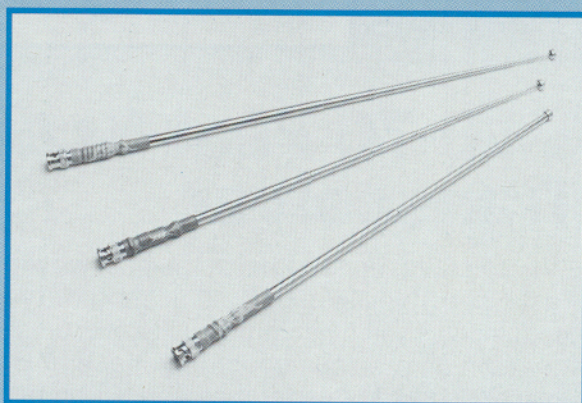
The maximum gain antenna with patented cone decoupling is AEA's IsoPole.™

Available in 144, 220 or 440 MHz, all IsoPole antennas yield the maximum gain attainable for their respective lengths, and a zero-degree angle of radiation. Exceptional decoupling results in simple tuning and a significant reduction in TVI potential. There is less feedline pickup of computer hash noise with the IsoPole than any equivalent antenna. Cones offer greater efficiency over obsolete radials which radiate in the horizontal plane. Plus the IsoPoles have a broad frequency coverage. This means no loss of power output from one end of the band to the other, when used with SWR-protected solid-state transceivers. Experience a typical SWR of 1.4 to 1 or better across the entire band!

VHF versions include a 50 ohm SO-239 connector recessed within the base sleeve for full weather protection. With the IsoPole you won't experience the aggravating deviation in SWR when the weather changes. Also, the impedance matching network is designed for maximum legal power and compensates for the impedance lump introduced by the SO-239 connector used in the VHF models.

AEA's IsoPoles are built to withstand the environment. The insulating material offers superb strength and dielectric properties plus excellent long-term ultra-violet resistance. Mounting hardware is stainless steel. The decoupling cones and radiating elements are made of corrosion resistant aluminum alloys. The aerodynamic cones are the only appreciable windload and are attached directly to your TV mast (mast not supplied).

## Hot Rod™ Telescoping Antennas



AEA's high-performance telescoping handheld antennas provide maximum gain and extended range. The Hot Rod antennas make the same improvement to handheld communications that the IsoPole antennas make to base station operation. Achieve higher gain than ANY 5/8 wave two-meter telescopic antenna for handhelds. The HR-1 is 20% shorter and lighter than a 5/8 wave, placing less stress on your handheld connector and case. It will handle over 25 watts of power, making it an excellent portable base or mobile antenna. In the collapsed position, the Hot Rod antenna will perform electrically like a helical quarter-wave flexible antenna.

Three versions are available:

- HR-1 half-wave 2M
- HR-2 half-wave 220 MHz
- HR-4 half-wave 440 MHz

### IsoPole Specifications

Model	144	220	440
Frequency Coverage:	135-160 MHz	210-230 MHz	415-465 MHz
Impedance:	50 ohms	50 ohms	50 ohms
2.1 VSWR Bandwidth:	10 MHz @ 146 MHz	15 MHz @ 220 MHz	22 MHz @ 435 MHz
Power Rating:	1.0 kW	1.0 kW	1.0 kW
Length:	125.5"(3.2m)	79.25"(2m)	46"(1.2m)
Wind Area:	< 1 ft <sup>2</sup>	< .75 ft <sup>2</sup>	< 0.2 ft <sup>2</sup>
Maximum Mast OD:	1.25"(32mm)	1.25"(32mm)	1.25"(32mm)
Min. Mast Length*:	8.0'(2.4m)	5.25'(1.6m)	6"(50mm)
Coax Connector:	SO-239	SO-239	Type N
Gain (on horizon):	3dBd	3dBd	3dBd

\*Mast not included.



# Amateur TV

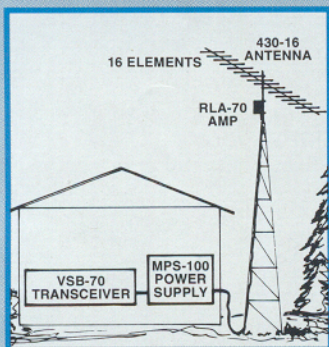


## VSB-70 Fast-Scan Transceiver

Vestigial Sideband remains the best way to send Fast-Scan Television signals. It's the **only** type of modulation used by commercial television stations. It preserves precious spectrum space, minimizes adjacent channel interference and is unbeatable for overall picture and sound quality.

Only AEA offers VSB technology to Amateur Television operators with the new VSB-70 transceiver. The complex circuitry is more costly to manufacture than double sideband television transceivers, but top-of-the-line quality is what hams have come to expect from AEA.

The VSB-70 Transceiver features a low-noise UHF GaAsFET preamp with a typical system noise figure of less than 1.5dB and a crystal-controlled or variable tuning down converter. Output is available on channel 3 or 4 for signal reception AND monitoring transmissions. Two frequencies can be selected from the front panel for transceive. The AEA design is optimized for superior video and audio quality without sync buzz, which is important for weak signal DX work. The VSB-70 is the only transceiver you need to work ATV. It also allows you to use your TV set to monitor your transmitted **and** received pictures.



If you already own a video camera, all you need to get on the air is the VSB-70 and a 440 MHz antenna. Come Join in on the fun!

If you've been putting off getting into amateur television, now is the time to act! There has never been a better value in amateur television transceivers. The VSB-70 is easy to hook up and easy to use, and with our exclusive VSB technology, it offers unmatched picture and sound quality. All this backed up by AEA's reputation for quality and service. Don't be left behind!

### Specifications (Typical)

#### TRANSMITTER

Frequency Range: 420 to 440 MHz  
 Operational Frequencies: 434 MHz and 439.25 MHz supplied (CH 3); 421.25 MHz and 426.25 MHz optional  
 Power Output: 1 watt P.E.P. on sync peaks  
 Modulation: Vestigial sideband video, FM audio  
 Intermodulation Distortion: Less than -42 dBc  
 Harmonic: Less than -40 dBc  
 Power Requirement: 13.6 ± 0.5 VDC, 1.5 A plus camera current  
 Protocol: NTSC only

#### RECEIVER

Conversion gain: More than 25 dB  
 Noise Figure: Less than 1.5 dB  
 Power Requirement: 13.6 ± 0.5 VDC  
 Impedance: 50 ohms nominal

#### PHYSICAL

Front Panel Controls: Video/camera, camera on/off, F1/F2, receive/transmit, power on/off, video gain, audio gain, Rx tune, camera 10-pin connector, microphone and PTT input jacks  
 Rear Panel Connectors: Power, antenna and TV coax connectors, audio in and video in jacks  
 Dimensions: 7.4"(188mm)W x 8.3"(211mm)D x 2.6"(66mm)H  
 Weight: 2.2lbs.(.99kg)

Now available to ham clubs, AEA's ATV videotape, "Seeing is Believing." Contact AEA for more information.



# Amateur TV

## ATV / OSCAR

### Accessories

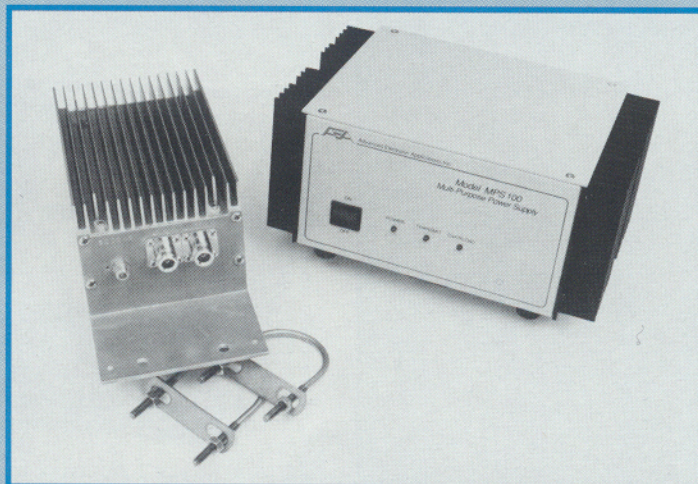
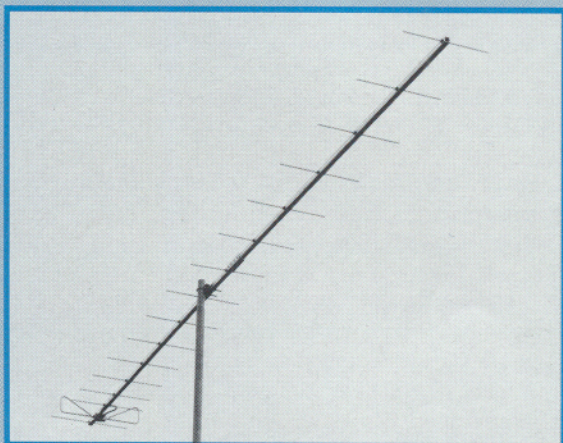
Optimized for operation in the 440 MHz band, these products make perfect accessories for amateur television operation with the VSB-70, or OSCAR satellite work.

**The RLA-70 Amplifier** with Power Supply gives a boost to your signal while keeping the bandwidth narrow. When used with the VSB-70, this amplifier helps preserve the characteristics of Vestigial Sideband. The 50W P.E.P. mast-mounted Linear Amplifier (patent pending) covers 420 to 450 MHz and utilizes the feedline for DC power. The GaAsFET preamp is built-in to the mast-mount assembly and includes all necessary relay circuitry. Mast mounting eliminates the line loss between the amplifier/preamplifier and the antenna to improve both transmission and reception.

The amplifier is housed in a weather-resistant anodized aluminum case, and is sturdily built to withstand some of the toughest climates. The MPS-100 power supply comes with the amplifier and provides 28 VDC for the amplifier plus a 13.6 volt output for the VSB-70.

**The 430-16 Antenna** is a high-performance, computer-optimized yagi specifically designed for ATV and OSCAR operation. Its broadband frequency coverage (420 to 440 MHz) makes it the perfect companion to the above listed RLA-70 amplifier.

Other features include 14.3 dBd of gain, O-ring sealed connectors, 28 degree E-plane and 32 degree H-plane beam width and 16 elements on a 10-foot boom.



#### Specifications

##### RLA-70 Amplifier

Frequency Range:	420 to 450 MHz
Power Output:	50 watts PEP minimum on sync peaks
Mode:	Linear, Class AB
Gain:	20 dB min at 0.5W input
Inter-Mod. Distortion:	LSB audio subcarrier -20 dBc, typically -30 dBc
Power Input (RF):	0.5 watt max for 50 watts out
Power Input (DC):	28 VDC at 4-5 amps (supplied by the MPS-100 power module)
Connectors:	Antenna: Type N
Input:	Type N (Both drive and DC power are supplied by the feedline)
PTT:	Type F
TR Switching:	RF sensing and/or contact closure (PTT)

##### Preamplifier

Gain:	10 dB typical
Noise Figure:	1.5 dB typical
Device:	Motorola MRF 966 GaAsFET

##### MPS-100 Power Supply

Line input:	120 VAC nominal (60 or 50 Hz)
RF Input:	BNC connector for 70 cm input
Outputs:	Adj. 28 to 30 VDC @ 6 amps max on N connector. 13.8 VDC @ 2 amps for ATV xcvr on coaxial power connector
Controls:	AC power switch Coax length adjust (28 Volt output adjust)
Fuse:	2 amp slow-blow
Indicators:	AC Power, Transmit and Overload LEDs

##### 430-16 Antenna

Frequency:	420 to 440 MHz
Gain over a dipole:	14.3 dB
Feed impedance:	50 ohms nominal
VSWR:	1.3:1 or better
Driven element type:	Butterfly dipole
Balun:	4:1 coaxial halfwave
Power handling:	250 watts
Stacking distance:	48 to 52 inches
Wind load:	0.82 square feet
Weight:	4 lbs.



# Keyer-Trainer



*Simply the world's  
BEST electronic  
Morse keyer ever  
offered!*

## The Morse Machine™

The Morse Machine has all the features you need in a memory keyer, including 2-255 WPM speed selection and over 8,000 characters of memory that can be stored in 20 soft-partitioned memories. Memory can be expanded up to 36,000 characters, and all memory is backed up by an internal lithium battery so that once a message is loaded, it will stay there until you delete it or write another message over it.

Whether you're an expert or a novice, The Morse Machine has three ways to help you improve your skill in both sending and receiving:

- A proficiency trainer allows random code group practice with steadily increasing speed
- Random word generator that randomly generates four-letter words for a more realistic practice session
- QSO simulator based on AEA's program for the Commodore 64 computer. You can call and work simulated stations, answer a CQ or just sit back and listen to realistic QSOs very much like those you would hear on the air
- DX Contest Simulator based on AEA's program for the Commodore 64 computer. You can participate in a realistic DX contest or just listen in.

**Full Featured.** The Morse Machine is a full-featured keyer for the serious contesteer, with automatic serial number insertion and incrementing in any memory message. One memory may be used as a repeating CQ. You can use the front panel knob to adjust your sending speed or enter a precise speed with the keypad, toggling between the two at any time. Exchanges can be speeded up by having parts of your message sent at a higher speed. You can also add remote switches for four of the memories so you can instantly send your responses or call CQ.

**Computer Compatible.** A computer can be interfaced to The Morse Machine through its RS-232 compatible I/O.

Any front panel keypad function may be programmed by the computer. This makes loading memories as simple as typing them in from your keyboard. The MM-3 can display your random code, QSO or DX contest practice sessions or your simulated contest score on the computer screen.

**Automatic Beacon.** AEA's MM-3 can also be programmed to be an automatic beacon. This can be used to automatically repeat a Morse (or RS-232 ASCII) message at a programmed interval of one to 999 seconds.

**Customization.** The Morse Machine's keypad offers an intuitive, easy-to-use method of quickly changing parameters to customize the MM-3 to meet your specific needs. Most commands are clearly labeled on the front panel so the manual is rarely necessary for normal operation.

### Specifications

Speed Range: 2 to 99 (variable) or 2 to 255 (programmable) WPM (Front Panel Pot or Keypad)

Memory: 8,192 bytes (approx. 8,400 characters)

Memory Option: 32,768 bytes (approx. 36,000 characters)

Keying Output: +50 V, 500 mA max.; -35 V, 30 mA max.

Computer I/O: 150 to 9600 baud, RS-232 compatible

Serial Numbers: 1 to 9,999

Beacon Interval Range: 1 to 999 seconds

Increase Speed Time: 0.1 to 59.9 minutes

Dot-Dash Memory On/Off: Program selectable

Dot-Space Ratio: Programmable from 0.5 to 1.5

Dash-Space Ratio: Programmable from 2.0 to 4.0

Semi-Automatic (Bug) Mode: Program selectable

Power Requirement: 9 to 16 VDC at 200 mA

Dimensions: 7.4"(188mm)W x 4.75"(121mm)D x 1.9"(48mm)H

Weight: 1.4 lbs.(0.64 kg)

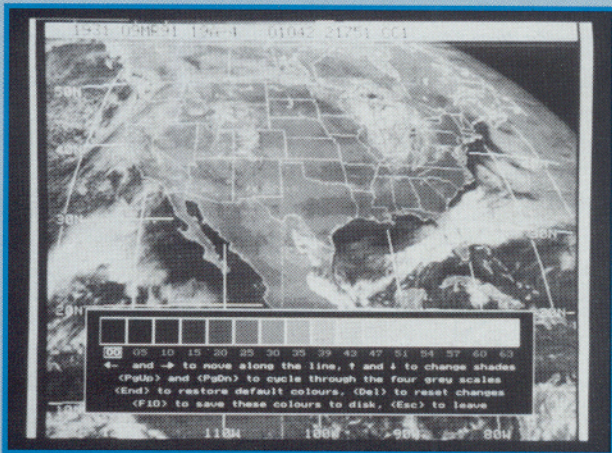


# Fax

## AEA-FAX™

### Multi-intensity grey scale hardware and software.

From the company which brought you the first multi-mode data controller with digital fax capabilities, the latest engineering breakthrough in analog FAX reception is now available. The PK-232 was the first multi-mode controller to handle digital WEFAX images, and it still receives those images as well as ever.



**No Compromise.** AEA introduces AEA-FAX, a stand-alone, multi-intensity grey scale demodulator and display software package for IBM compatible computers which can work with or without a PK-232, and won't affect the other modes at all. On a VGA monitor, up to 16 grey levels are possible, giving you outstanding detail on satellite maps and wire photos. WEFAX images can also be received. EGA, CGA and Hercules monochrome adaptors and monitors are supported as well (with fewer "grey" scales).

**Hardware.** The hardware consists of a small RS-232 connector housing, which contains the circuitry for demodulation. A two-conductor shielded audio cable runs from this assembly to your HF receiver's external speaker output. The connector housing has a female DB-25 connector on one side to interface with your computer's COM 1 or 2 port, and a male DB-25 connector on the other side to "daisy chain" with your PK-232, telephone modem or other external RS-232 device. The software automatically switches the external RS-232 input out of the circuit when AEA-FAX is active, and switches the audio input out of the circuit when AEA-FAX is not being used. No additional COM port is needed for AEA-FAX!



The complete AEA-FAX hardware and software package.

**Software.** The software (one 3-1/2" and two 5-1/4" disks are included) provides on-screen display of the received images, as well as disk and printer access. You can program AEA-FAX to automatically receive images when you are away from the shack, and it will even automatically detect grey scale, line speed and IOC (Index of Cooperation)! The program will work with or without your mouse and is menu driven for ease of use. Other software features include an on-screen tuning scope display that can remain active even when receiving data to the screen, an automatic screen blank feature to help prolong the life of your monitor and versatile color selections for menu and screen colors. Your facsimile images can also be displayed with false color separations on an EGA monitor.

**Requirements.** To run AEA-FAX, you must have the following:

- IBM Compatible computer (with 640K conventional memory, DOS 2.1.1 or higher, at least one serial port, a floppy disk drive [360K 5-1/4" or 720K 3-1/2"], a Printer [Epson or HP LaserJet Compatible]\*, a Mouse [Microsoft compatible]\* and a Hard Disk Drive\*).
- General Coverage HF Receiver.

(Items marked with a \* are optional; that is, they are not required but their use will enhance the operation of AEA-FAX).

**Don't Compromise!** If you want to receive multi-intensity grey scale FAX images, don't compromise! Don't buy a digital multi-mode with an analog mode built in. AEA-FAX is the right way to do grey-scale fax.



# Packet

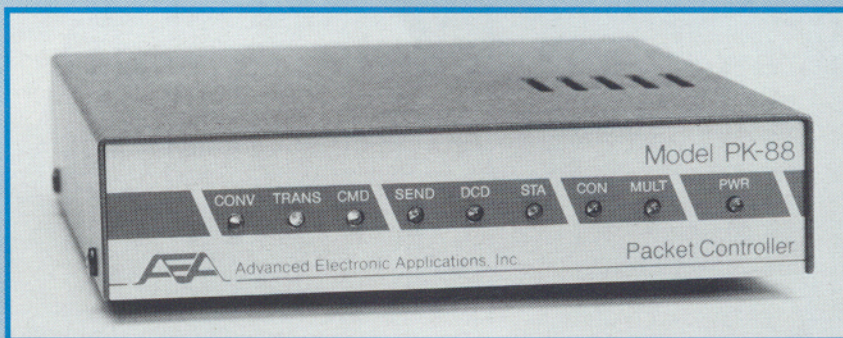
## PK-88

### HF/VHF Packet TNC

Unique operating features with a proven hardware and software design make AEA's PK-88 the best value in packet radio...now with MailDrop, an efficient 18K byte personal Mailbox with selectable third-party traffic. When your PK or PCB-88 MailDrop is active, other stations can connect to you and exchange personal messages, traffic or bulletins. Your MailDrop also accepts inbound mail forwarding and supports reverse forwarding with your local W0RLI/WA7MBL/AA4RE/MSYS auto-forwarding packet BBSs. The PK-88's internal lithium battery will hold the Maildrop contents when the unit is off.

In addition to all the features of "standard" TNCs, the PK-88 also offers these exceptional features:

- AEA's renowned Host Mode. Preferred by many programmers for efficient application programs.
- KISS command. Provides compatibility with KA9Q's "NET" TCP/IP protocol suite.
- "NET/ROM" compatibility. Turns your '88 into a Layer Three and Four networking node.
- Unique WHYNOT command. Shows reasons why some received packets are not displayed.
- Packet Dump Suppression. Prevents dumping unsent packets on the radio channel if the link fails.
- Prioritized Acknowledgment (ACKPRIOR) protocol. Improves performance on busy packet channels.
- CUSTOM command. Allows limited PK-88 customization for non-standard applications.
- Enhanced MBX command. Permits display of the data in I- and UI- frames, without showing packet headers and without retries.
- Unique MPROTO command. Controls display of non-ASCII packets from Layer Three switches and network nodes.
- Unique MFILTER value \$80. Suppresses all graphics and control characters except TAB, CR and LF.
- Unique CFROM and DFROM commands. Permits selective connecting and digipeating ("Accept" or "Reject" digipeater operation by call signs).



#### Specifications

##### MODEM

Modem Input Range: 5 to 770 mV RMS  
Demodulator: AMD 7910 World Chip  
Modulator: Phase-continuous sinewave, AFSK generator  
Modulator Output Level: 5 to 300 mV RMS  
Packet Protocol: AX.25 version 2.0 (version 1.0 supported)  
Processor System: Zilog Z-80  
RAM: Lithium battery backed, 32 KBytes  
ROM: 32 KBytes  
Hardware HDLC: Zilog 8530 SCC

##### REAR PANEL INPUT/OUTPUT CONNECTORS

Radio Interfaces: Locking 8-pin—receive audio, transmit audio, PTT, auxiliary squelch, ground  
External Modem: Transmit data, receive data, data carrier detect, clock, ground  
Terminal Interface: RS-232-C 25-pin DB-25 connector  
Terminal Data Rates: Single character auto-baud detection at 300, 600, 1200, 2400, 4800, 9600 and 19200. TBAUD adds 45, 50, 57, 75, 100, 110, 150, 200 and 400 BPS terminal rates

##### FRONT PANEL INDICATORS

PK-88 Indicators: Converse, transparent, command, send, data carrier detect, status, connect, multiple connect, power

##### PHYSICAL

Power Requirement: +12 to +16 VDC @ 550 mA  
Dimensions: 7.5"(191mm)W x 6"(152mm)D x 1.5"(38mm)H  
Weight: 2.4 lbs(1.1kg)



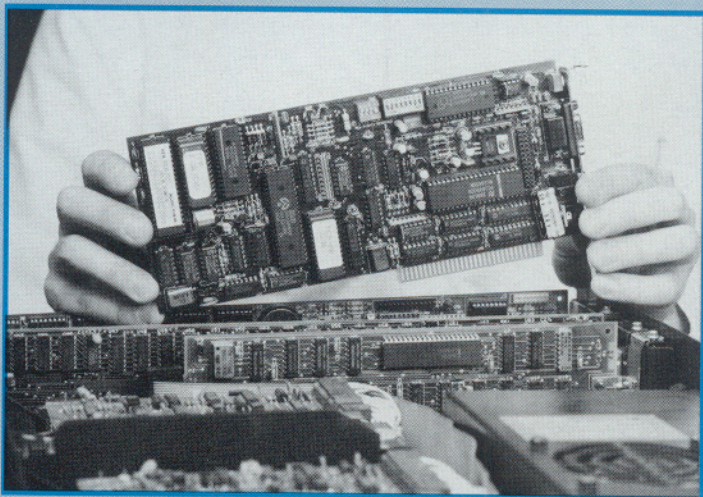
# Packet

## PCB-88

### HF/VHF Packet Controller Board

Designed for hams who want the best packet controller available but don't have a lot of room in the ham shack, the PCB-88 Packet Controller Board is another breakthrough from the AEA engineering department.

Equipped with all the features of the PK-88, the PCB-88 plugs into an 8 or 16-bit expansion slot on your IBM PC or compatible computer, leaving more room for your other AEA products.



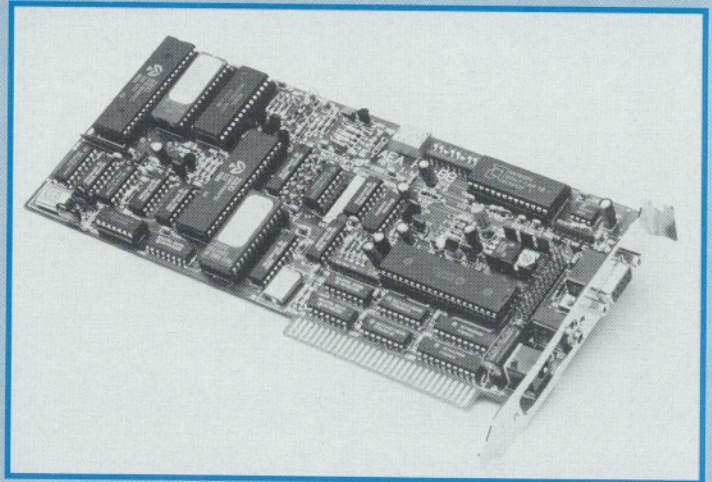
In addition to the PK-88's features, the PCB-88 also has a true DCD circuit built in, as well as a standard modem disconnect header to allow easy hook up of external modems for high speed, PSK, etc.

Included with the PCB-88 is the PC-Pakratt-88 host mode program for easy control of the packet device.

The PCB-88 can get DC power direct from the computer's bus lines or, the included (U.S. models only) AC-1 12 VDC adapter can be used so the PCB-88's maildrop can receive messages even when the computer is turned off.

All cables necessary for hook up are included, as well as a comprehensive instruction manual and installation instructions.

The PCB-88 provides you with more room and less hassle.



#### Specifications

##### MODEM

Modem Input Range: 5 to 770 mV RMS

Demodulator: AMD 7910 World Chip

Modulator: Phase-continuous sinewave, AFSK generator

Modulator Output Level: 5 to 300 mV RMS

Packet Protocol: AX.25 version 2.0 (version 1.0 supported)

Processor System: Zilog Z-80

RAM: Lithium battery backed, 32 KBytes

ROM: 32 KBytes

Hardware HDLC: Zilog 8530 SCC

##### REAR PANEL INPUT/OUTPUT CONNECTORS

Radio Interface: DB-9 (receive audio, transmit audio, PTT, auxiliary squelch, ground)

External Modem Connection: TAPR's Modem Disconnect header

Terminal Data Rates: Single character auto-baud detection at 300, 600, 1200, 2400, 4800, 9600 and 19200. TBAUD adds 45, 50, 57, 75, 100, 110, 150, 200 and 400 BPS terminal rates

##### PHYSICAL

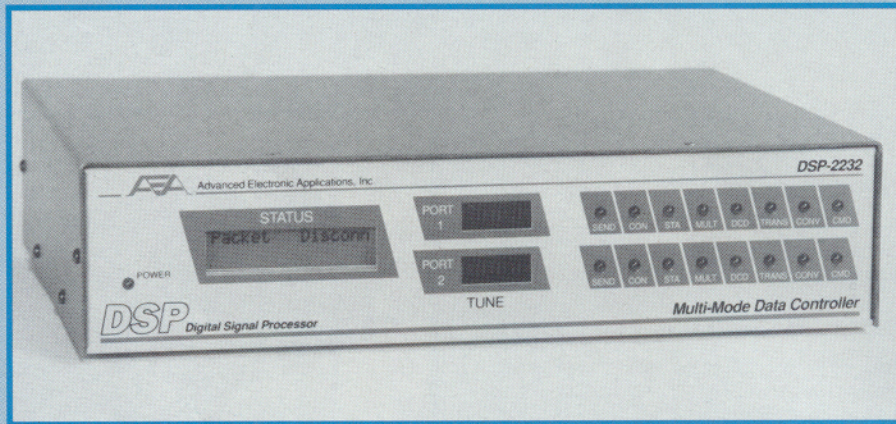
Power Requirement: +12 to +16 VDC @ 375 mA, or Internal Computer Power +12 VDC @ 375 mA

Dimensions: 9.75" (248mm) x 4.88" (124mm) x 0.88" (22mm)

Weight: 9 oz (0.25kg)



# DSP



## DSP-1232 and DSP-2232 Multi-Mode Data Controllers

Utilizing the latest DSP (Digital Signal Processing) technology, AEA announces a major breakthrough in multi-mode data controllers...the DSP-1232 (two switchable ports) and DSP-2232 (two simultaneous ports). From the company that introduced the first multi-mode data controller with Packet and FAX (the PK-232), this is the next generation to blast you into the future. This is what you've been waiting for, the most advanced and adaptable data controller on the market. Its capabilities are limited only by your imagination.

**All Modes.** Both the 1232 and 2232 have the hardware included for all available Amateur data modes now. As new modes become available, all that is required is a replacement EPROM or a telephone-BBS downloaded binary file. Available now are all of the PK-232 modems, plus the PACSAT, OSCAR 13 and OSCAR 15 satellite modems and the K9NG and G3RUH 9600 bit per second modems. Coming soon are multilevel grey scale WEFAX and WEFAX APT as well as SSTV. Any desired FSK tone pair can be programmed for the DSP units as well as QAM and QPSK or other specialized modems, which makes these DSP modem multi-mode data controllers the most versatile available.

**What is DSP?** Digital Signal Processing (DSP) provides a new level of performance and versatility. The input analog signal is digitized by a 12-bit high-speed analog-to-digital converter. The digitized data is then processed by a very fast specialized computer (the Motorola 56001 running at 24 MHz) to digitally filter and analyze the data signals. The processed, demodulated signals are then passed to a second processor (Zilog 64180) for protocol conversion. The advantage of DSP is its versatility, as new modems or modes only require new software. No new hardware or modifications are required for new modes.

**LCD Read-out.** A unique LCD read-out on the DSP-2232 displays the mode and diagnostics for both channels.

**Upgradeable.** The DSP-1232 can be upgraded to include all of the features of the DSP-2232, if you decide that you want the additional features at a later date.

**Includes PK-232 Features.** The DSP controllers include all of the outstanding features of the PK-232MBX data controller including the latest version of PakMail™ mailbox with selective control of third-party traffic and bulletin board system (BBS) compatibility so you can automatically forward your messages. Also included is the type of Host Mode preferred by many professional programmers for efficient control of the TNC. In packet, the DSP is also compatible with the TCP/IP networking protocol. This requires the data controller to feature special commands such as KISS, PERSISTENCE and SLOTTIME not found in all controllers.

Additional Features Include:

**FAX Printing.** Many parallel printers can be connected directly to the DSP or to your computer (with the appropriate application software) to print HF monitored FAX signals. The DSP supports most popular dot matrix graphics printing standards.

**Time Division Multiplex.** The DSP controllers will decode TDM signals. TDM is a mode that resembles FEC AMTOR and is used in commercial applications. TDM uses one subcarrier but assigns separate data channels to different time slots.

**Frequency Domain Multiplex.** Another commercial coding scheme the DSP controllers can receive and decode, FDM sends the different data channels over separate subcarriers, each at a different frequency.



# Multi-Mode



## PK-232MBX Multi-Mode Data Controller

With over 50,000 units sold worldwide, the PK-232MBX is the world's leading multi-mode data controller. Combining all amateur data communication modes in one comprehensive unit, the PK-232MBX offers Morse code, Baudot, ASCII, AMTOR/SITOR 476 and 625, HF and VHF Packet, WEFAX receive and transmit, as well as commercial standard NAVTEX/AMTEX automated marine/ARRL information services. The PK-232MBX provides any RS-232 compatible computer or terminal with complete amateur digital operating capabilities. All decoding, signal processing and protocol software is on ROM in the PK-232MBX. Only a simple terminal program is required to interface the PK-232MBX to your computer. The PK-232MBX package includes an RS-232 interface cable that connects the unit directly to the RS-232 port of the computer.

The real strength of the PK-232MBX is its superior design. It's a no-compromise data controller specifically designed for multi-mode operation, not just a packet controller with supplemental firmware. The PK-232MBX is a Z-80A based system and has hardware HDLC using the Zilog 8530 SCC. The internal modem of the PK-232MBX can transceive packet at rates from 45 to 1200 baud (2400 bps optional), with the option of using an external modem for higher baud rates up to 9600 baud. The PK-232MBX has a no-compromise VHF/HF/CW modem with an eight-pole Chebyshev bandpass filter followed by a limiter-discriminator with automatic threshold correction. This modem can copy shifts from 85 to 1500 Hz in two ranges. Transmitter tones are low distortion sinewave phase continuous AFSK, Bell 202 standard (1200-2200 Hz) for VHF and 2110-2310 (compatible with 170 Hz shift for RTTY) for HF.

The PK-232MBX internal software includes special features such as SIAM™ (Signal Identification and Acquisition Mode). The PK-232MBX automatically identifies Baudot, ASCII, AMTOR/SITOR and TDM (Time Division Multiplex) signals, then measures signal speed and polarity. A simple "OK" command automatically switches the PK-232MBX to the recognized mode and starts the data display.

The 18K byte PakMail™ mailbox with selective control of third-party traffic is now a standard feature. Your friends can now leave you messages around the clock. PakMail uses a subset of the popular WØRLI/WA7MBL commands which includes List Mine, Kill mine, Read Mine, Edit, Help, etc. Your local full-service BBS can automatically forward and reverse-forward messages directly to and from your PK-232MBX. You can even use the PK-232MBX with the popular WØRLI and WA7MBL packet bulletin board programs.

Only AEA provides the type of full-featured Host Mode preferred by many professional programmers for efficient control of the PK-232MBX (see chart on page 11).

In packet, the PK-232MBX internal program is also compatible with the popular TCP/IP networking protocol. This requires the TNC to feature special commands, (KISS, PERSISTENCE, SLOTTIME) not found in all controllers.

Additional Features:

- **FAX Printing.** Many parallel printers can be connected directly to the PK-232MBX or to your computer (with appropriate applications software) to print HF monitored FAX signals.
- **Easy and Efficient Operation.** Twenty-one front panel indicators and a tuning indicator allow easy operation, with instant operating feedback for all modes!
- **Lithium Battery Backed RAM.**
- **Adjustable Threshold Control.**
- **Two Radio Ports.** Interchangeable HF or VHF operation. Front panel pushbutton selectable.
- **External Modem Disconnect.** Internal modem bypass for compatibility with higher speed modems.
- **Scope and FSK Outputs.** A separate accessory port gives both mark and space scope outputs and permits connection to your HF radio's FSK input.
- **Upgradeable.** The very first PK-232 is upgradeable to the latest version with plug-in ROMs and upgrade kits. 2400 Baud Option now available. Contact factory for further information.
- **Included.** The PK-232MBX comes with an RS-232 shielded cable, two radio cables and all rear panel mating connectors. The optional AC-4 Power Supply is available through AEA authorized dealers. Specific radio connectors need to be supplied by the user.

### Specifications

Modem Input Dynamic Range: 5 mV to 500 mV RMS  
Demodulator: 8-pole Chebyshev bandpass filter, limiter, 4-pole discriminator, 5-pole post-detection low pass filter  
Modulator: Phase continuous sinewave, AFSK generator  
Modulator Output Level: 5-200 mV RMS  
Packet Protocol: AX.25 L2V2 (previous version supported)  
Processor System: Zilog Z-80  
RAM: Battery backed, 32 Kbytes  
ROM: 64 Kbytes standard, 128 Kbytes maximum  
Hardware HDLC: Zilog 8530 SCC

#### REAR PANEL INPUT/OUTPUT CONNECTIONS

Radio Interfaces: Two 5 pin, front panel selectable (receive audio, transmit audio, PTT, auxiliary squelch, ground)  
External Modem: 5 pin: transmit data, receive data, carrier detect, ground, PTT  
FSK Outputs: Normal and reverse  
Scope Outputs: Mark, space  
CW Keying Outputs: +100 VDC @ 200 mA max. and -25 V @ 30 mA max.  
Terminal Interface: RS-232-C 25 pin DB-25 connector (pins 1-8 and 20, software and hardware handshake)  
Terminal Data Rates: Autobaud settings at 300, 600, 1200, 2400, 4800 and 9600. TBAUD adds 45, 50, 57, 75, 100, 110, 150, 200, 400-BPS terminal rates  
Printer Interface: Centronix parallel printer output with special cable (optional)

#### FRONT PANEL CONTROLS AND INDICATORS

Controls: Power, radio 1/2 selector, threshold adjust  
Indicators: Data carrier detect LED, 10 segment HF bargraph tuning indicator, mode indicators (Baudot, ASCII, Packet, Morse, Sel FEC, FEC, ARQ, Mode L, AMTOR STBY), Status Indicators (STBY, Phase, Idle, Error, RQ, Tfc, Over, MULT, PTT, CONV, CMD, CON, Send, STA, TRANSPARENT)

#### PHYSICAL

Power Requirement: +12 to +16 VDC @ 850 mA  
Dimensions: 11"(279mm)W x 8.25"(210mm)D x 2.5"(64mm)H  
Weight: 3 lbs.(1.35kg)



# Software

## Software Selection Table for PK-88 and PK-232MBX

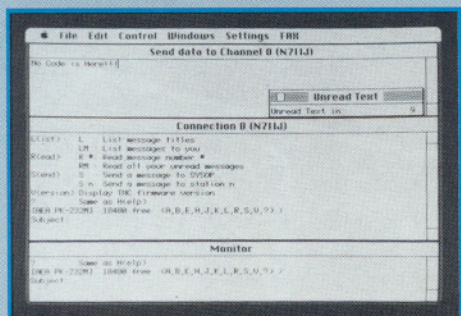
PC	Software	Data	FAX	Split Screen	Memories	Host Mode	Printer	Disk	Media	PK-88
IBM	PC-Pakratt II/FAX	yes	yes	yes	yes	yes	yes	yes	D	no
IBM	PC-Pakratt-88	yes	no	yes	yes	yes	yes	yes	D	yes
C-64	Com-Pakratt/FAX	yes	yes	yes	yes	yes	yes	yes	R*	yes
Mac	MacRatt	yes	yes	yes	yes	yes	yes	yes	D	yes

Key: D=Disk, R=Rom (\*C-64 programs are in ROM only but support a disk drive.)

## MacRATT with FAX

AEA's MacRATT with FAX version 2.1 computer program for the Apple Macintosh makes using AEA's PK-232MBX multi-mode and PK-88 packet controllers easier than ever. Every powerful feature of the PK-232MBX and PK-88 is now as easy to use as pointing with a mouse.

If you are familiar with basic Macintosh operating procedures, you'll find MacRATT very easy to use.



### Features:

- Includes cable for Mac Plus and newer models using mini-8 DIN connector
- Now with QuickRead feature for efficient PBBS operations
- Full support for the latest PK-232/PK-88 command set
- Windows for entering text, displaying the receive buffer and logging transmitted text. All windows employ standard Mac features such as scrolling and copying to the clipboard
- Window display of the status of file transfers and the link between the TNC and the Mac
- FAX is an integral part of the program, and FAX images can be sent to the printer without changing cables
- MacRATT runs the PK-232MBX or PK-88 in Host Mode for fast, efficient operation, and will run under MultiFinder

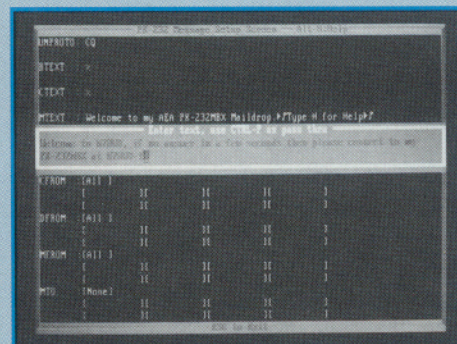
- Text uploading, downloading and printing are easy. "Unlimited" macro keys can be used to speed text entry
- Character-at-a-time sending for RTTY, AMTOR and CW
- Extended keyboard support
- Works with the Macintosh 512K Enhanced, Plus, SE, II series, and Mac Classic

## PC Pakratt II w/FAX

For the IBM-PC or compatible computers and PK-232MBX, AEA offers PC Pakratt and PK FAX as a set, complete with 5-1/4" and 3-1/2" media.

## PC Pakratt II

The PC Pakratt program is a split-screen terminal program for operation of Morse code, Baudot, ASCII, AMTOR and Packet.



### Features include:

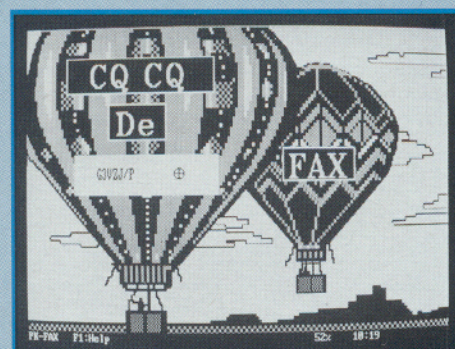
- Friendly on-screen Help menu at the touch of a key to define commands and parameters for all modes
- Mouse support
- DOS gateway
- Full QSO logging feature
- Fast Initialization cuts startup time down to a few seconds
- Complete macro key facility
- Supports COM 1 - 4
- Can save PakMail messages to disk
- Up to 900 line scroll-back buffer to store incoming data

- Includes PK-EDIT for editing message files
- Five message/command buffers so you can pre-program messages or commands for transmission with a single keystroke
- Complete parameter screen
- Requires 512K RAM minimum and DOS version 3.0 or higher

## PK FAX

The PK FAX program enables you to display, store and transmit facsimile signals on-screen. Features include:

- All standard HF radio facsimile formats can be displayed on-screen
- Received signals can be stored to either floppy or hard disk automatically
- Supports COM 1 - 4
- Converts received signal files to Paintbrush compatible format
- Transmits files, including Paintbrush files, in the FAX mode
- Prints received files with most printers capable of dot matrix graphics
- Enlarges any one-quarter screen to four times normal size for closer inspection
- Compatible with CGA, EGA and Hercules compatible graphics adapter cards. No hardware or software changes are necessary to any FAX compatible PK-232MBX.
- Requires 384K internal computer memory. Two disk drives or a hard disk are recommended.

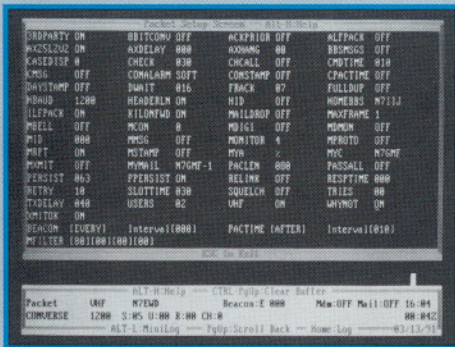




# Software

## PC-Pakratt-88

The PC-Pakratt-88 program is a lower-cost packet-only version of the PC-Pakratt II program for the PK-88. Most features of PC-Pakratt II are included, but RTTY, FAX, AMTOR, etc., support has been removed as the PK-88 is a Packet only TNC.



### Features:

- Friendly on-screen Help menu at the touch of a key
- Mouse support
- DOS gateway
- Fast Initialization cuts startup time down to a few seconds
- Complete macro key facility
- Supports COM 1 - 4
- Can save PakMail messages to disk
- Up to 900 line scroll-back buffer to store incoming data
- Includes PK-EDIT for editing message files

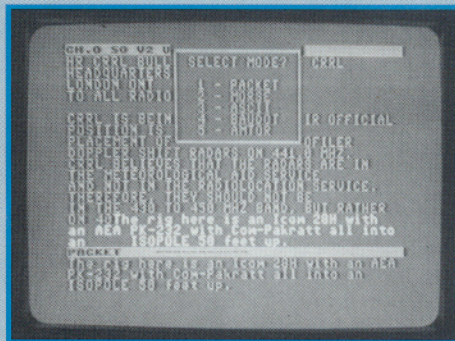
- Five message/command buffers so you can pre-program messages or commands for transmission with a single keystroke
- Complete parameter screen
- Requires 512K RAM minimum and DOS version 3.0 or higher

## Com Pakratt with FAX

AEA's Com Pakratt and Com FAX programs for the Commodore 64 computer supports the PK-232MBX data controller. The set is supplied on two ROM plug-in cartridges and includes an RS-232 level converter.

### Com Pakratt

The Com Pakratt program is a split-screen terminal program enabling full operation of Morse code, Baudot, ASCII, AMTOR and Packet modes in the PK-232/MBX.



- Most common commands are programmed for direct function key operation
- Incoming data is automatically routed into a QSO buffer capable of holding up to 13K
- Easy-to-use ROM cartridge means disk or cassette drive is not needed
- Select background, text, highlight and echo colors on a color monitor
- Six preset and four programmable memories for CQ, QBF, RY, Time, Call Sign and SELCAL
- Support disk directory, text file transfers and storage of received data
- Supports printer output for Morse code, Baudot, ASCII, AMTOR and Packet to Commodore printers directly from the computer

### Com FAX

The Com FAX program enables you to display, store and transmit facsimile signals. Features include:

- All standard HF radio facsimile formats can be displayed
- Most common commands are programmed for direct function key operation
- Supports printer output to VIC 1525 or MPS 801 compatible printers
- Enlarges any one-quarter screen to four times normal size for closer inspection
- Supports disk directory, load/save FAX buffer and disk commands
- Transmits files directly from the FAX buffer

## We feel our support software is the best available, bar none. This is how our customers often respond when asked what aided them in making their buying decision:

"Host Mode makes operation easier." L.L., Northvale, N.J.

"...more user friendly...works better than other kinds..." P.C., Yakima, WA

"My regular comm. program didn't give me the control I wanted." J.L., Irvine, CA

"(Competitor's product) would not work." A.S., Leasburg, MO

"AEA seems to be the leader in TNCs." J.G., Wyandotte, MI

"Features, Quality, Commitment to digital communications by AEA." S.S., Lancaster, OH

"Word-of-mouth & other AEA products I've owned." S.Z., Sioux City, IA

"Bought another brand which promised a lot but was a big let-down. This product does what it promotes." L.G., Ft. Benton, MT

"It 'goes' with the PK-88 - However, I bought the PK-88 because of the software!" P.M., Fairfield, CT

"I love your good customer support both at AEA & on CompuServe. Thanks a lot!" C.C., Brooklyn, NY

"Well-written manual for fast start-up for new user." C.S., Jaffrey, NH

"Numerous features, ease of operation. Very pleased!" J.R. Somerset, PA

"Word of mouth that it was the best, and had best customer support." L.E., Poulosbo, WA

"Second one I have purchased. In my opinion easiest program for ease of operation there is." E.D., Butte, MT

"Product features and company reputation for quality." J.J., NY, NY

"AEA is the best." O.J., San Francisco, CA

**All in all, AEA provides unrivaled software support for the PK-232 and PK-88 data controllers. Don't settle for anything less than the best!**



# Slow Scan

## AEA's AVT Master SSTV and FAX System

Imagine sending and receiving high resolution color or black and white images and photos via radio transceiver OR telephone. And then imagine the ability to "erase" QRM and noise effects. With AEA's AVT (Amiga Video Terminal) Master System, you get pixel perfect pictures. The AVT Master offers 55 SSTV (Slow-Scan TV) modes, many in up to 4,096 simultaneous colors with a resolution from 128 by 120 up to 640 by 400. Nine FAX modes in resolutions up to 1,024 pixels by 1,200 lines in 16 grey levels is also possible. The AVT offers every known SSTV commercial and experimental mode, as well as WEFAX, NEWSFAX and GOES FAX (with optional board from Overview Systems\*). This is a major breakthrough for SSTV and FAX enthusiasts!

**Flexible Hardware.** Five software selectable receiver inputs allow you to attach a two-meter, six-meter, HF and SWL rig plus a tape recorder...all at the same time! Plus there's an RJ-11 telephone jack. Simply plug in your phone to the interface unit and transmit a full-color image in less than 12 seconds. Both positive and negative transmitter keying, as well as individual tape recorder and transmitter audio outputs provide the ultimate connection. You don't ever need to touch the box...all controls, including system audio output levels and input selection, are accomplished on-screen using the Amiga mouse.

**High Performance.** The AVT is gaining popularity every day, passing picture-perfect images over many parts of the world. Images sent via SSTV may be damaged as much as 50 percent by QRM and QRN. The AVT recovery system has built-in image processing and signal conditioning



AVT image before transmission.

which ensures the best picture quality, picture after picture.

**Compatibility.** You can copy ANY SSTV or FAX signal that you receive... the AVT supports all modes, from the new European modes to the older color composites to black and white SSTV to 60/120/240 LPM FAX transmissions. Multiple aspect ratios provide the right picture when monitoring those unusual FAX stations, too. All of these modes are available in full transceive. The images received by the system are compatible with every paint program, digitizer, frame grabber and scanner currently known for the Commodore Amiga, allowing unparalleled flexibility and artistic freedom.

**Revolutionary.** The AVT also offers new SSTV formats that easily outperform ALL pre-existing modes...integral data recovery, narrow bandwidth, full color, multi-image (3-D), multiple resolution and synchronous transmission.

**Intuitive.** Every command is presented in a logical, consistent series of menus and control panels. Sophisticated tools such as a detailed oscilloscope simulator aids tuning. The system even transmits an "Alignment Signal" to ensure a quick match in frequency between systems when operating SSB.

**Feature-Packed.** Built-in capabilities include: Tuning oscilloscope. Mode-to-mode conversions. Interpolating zoom. Image inset. Brush "Clipart" (file artwork) cut and paste, including transparent background. Image tinting, brightness and contrast control. Thresholding. Black-and-white and color histograms. Text overlay using multiple fonts, boldface, italics and underlining in any combination or color. Automatic CW and synthesized speech ID after transmit. Extensive macro and script capability. Custom color bar generation. Luma conversion and image averaging. Black-and-white and color negatives. Eight function "repair kit" for damaged scan lines. Intelligent multiple mode full-frame image cleanup with sensitivity control. Owner defined FAX demodulation curves. Image rotation and flipping. Paint capability. Extensive ARexx language support. Real-time software filtering for scope and receive operations. Up to



Image in process of being restored after heavy QRM transmission.

16 high-resolution image memories at one time. Grab screens to transmit from any digitizer or operating program in real-time. Transmit and receive sequences of images using multiple memories. One button automatic reception of most SSTV modes. Automatic start and run at any time...

catch those midnight FAXes without being there (with ARexx program). Copy and exchange between image memories. On-screen DTMF pad. Image printing in both black-and-white and color on literally hundreds of different printers. You can even tell the system what to do remotely (with ARexx program), via packet and/or RTTY using standard TNCs such as AEA's high performance PK-232/MBX multi-mode data controller.

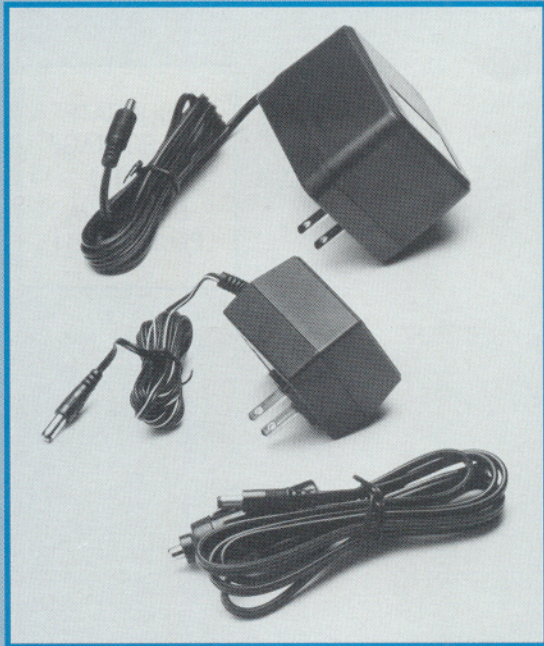
**Updates.** Since the AVT is a software driven system, there aren't any costly ROM and hardware updates. Occasional updates will be provided on a disk. Simple, inexpensive and fast.

**Inexpensive.** The good news is that you can purchase the AVT and an Amiga computer system for less than a self-contained SSTV system costs! If you already own the computer (minimum of 1.5 megabyte of memory required), you already own the most expensive components of your SSTV System!

\* Contact Tim Heffield at (305) 748-8315



# Accessories



## AC-1/AC-4 Power Adapters

AEA's 12 VDC wall adapters, the AC-1 and AC-4 are suitable power supplies for all AEA products requiring 12 VDC at 600 mA/1000 mA or less current. The AC-4 provides one amp of output and is ideal for use with the PK-232MBX, DSP-1232 and DSP-2232.

## DC-1 Cigarette Lighter Cord

The DC-1 is a fused cable with a standard cigarette lighter plug for 12V operation.



## World Clock

AEA's world clock features dual digital displays so you can see the local time and any of 24 selected time zones side-by-side. Move the slide bar to select the city/zone you want, and the display automatically changes to the proper time and date. The world clock also features an alarm, light button and compact size. Perfect for the home station or for traveling. A folding easel stand and a travel pouch are included.

## Technical Support Makes The Difference!

Over the years, AEA has provided its customers with unsurpassed customer service and technical support. Here at AEA we make customer service our number one priority. This is why our customers are our best salespeople. Just ask around and you'll hear comments like these:

"It surely does make a difference that someone takes the time and patience to assist in these matters. {Your representative} was pleasant and tactful in his dealing with this problem and it is refreshing to witness this attitude in the Service Department of an organization like yours." J.B., St. John's, Newfoundland

"I would like to thank you for having one of the best service departments in the amateur radio industry. Thank you again for the swift repair work." S.T., Athens, TX

"I want to start by saying how pleased I am with both your product (PK-232) and with the customer service I have received...Keep up the good work, and thanks again for the products, support and especially service." S.L., Lakewood, CO

"I am glad to find that AEA puts as much care into their customer support as they do into their product design. I will quickly recommend AEA to my ham friends." P.T., Annapolis, MD

"...when I had a problem, even though the unit was out of warranty you fixed it with minimum of fuss...I recommend your products highly because of your support." C.C., Redford, MI

"Great customer service. Always cheerful & pleasant when I call for 'help'." C.S., Aloha, OR

"I would like to thank you and your technical support department on your assistance...Thank you for your kind assistance and keep up the good work...your personal touch with customers is what keeps bringing them back." B.H., Miami, FL





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If you missed out on the premier issue of our newsletter, the *Communiqué*, you missed upgrade announcements, helpful technical hints, product news and more. Don't miss another issue! Fill out this card and send it in right away! We'll send you the latest issue and add you to our mailing list to make sure you stay informed of the latest AEA news and highlights.

Name \_\_\_\_\_

Call \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

AEA products owned, if any \_\_\_\_\_

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Lynnwood, WA 98036-2160

Fall 1991  
vol. 1, no. 1

Engineering Makes the Difference

## AEA Communiqué

Advanced Electronic Applications, Inc.

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**O & A with Sam Gatten, Customer Service Manager.** Page 3

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**November '91 PK-88 maintenance firmware**

The summer of 1991 brought several upgrades to our products. The PK-232MBX, PC-Pakratt II, and now the PK-88 packet controller.

The PK-88 upgrade is slightly different from what you may be used to. The two purposes of this upgrade are 1) To bring the PK-88 up to the same level as the PK-232, and 2) for maintenance reasons—to streamline and clean up the code.

There is a feature in this upgrade which will be useful to those using their PK-88 on HF. The feature is called Packet Lite, and two connected stations can improve their throughput by up to 40% when using it.

Packet Lite is an extension to the AX.25 protocol which reduces the size of the packet headers by over half. This results in fewer errors and fewer unnecessary ACKs.

If Packet Lite sounds interesting and you want to use your PK-88 on HF frequencies, be patient when tuning, and be sure the DC0 LED lights when a packet is heard.

If you wish to order this upgrade, fill out the form included. Be sure to include \$34.95 plus 8.2% tax inside Washington state for a total of \$37.52 in the form of a check, money order or credit card number (MasterCard or Visa).

Please do not send cash. COD orders are not accepted. Allow 4-6 weeks for delivery.

**PK-232MBX now with Packet Lite™, AMTOR Maildrop**

The PK-232MBX has recently undergone its seventh firmware upgrade (August 1991), this time to include the innovative Packet Lite protocol extension and AMTOR maildrop capabilities.

Packet Lite reduces packet header size, thereby improving throughput on HF.

The maildrop can now be accessed through AMTOR AHD as well as Packet.

Call our Upgrade Hot Line at (206) 774-1722 for more details.

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**Brief AEA history**

For those of you who aren't familiar with our company, AEA is a specialized electronics company dealing mainly with amateur radio products. Founded in 1977 by Mike Lamb, N7ML and the late George Boston, N7EJL, AEA stresses fairness to all customers with the motto, "under-sell, over-deliver". This motto has helped AEA establish its strong reputation in the amateur radio community.

The AD-1 Auto Dialer was the first rung on a ladder of products now reaching nearly 100. That product line includes the legendary PK-232MBX, the high-performance Iso-Pole VHF and UHF antennas, the compact Iso-Loop HF antenna, the VSR-76 flat-scan television transceiver, the DSP Digital Signal Processing Multi-mode Data Controllers and much more.

The spirit of innovation is alive and well at AEA, and you can look forward to many new and exciting products in the future.

Call our Literature Request Line at (800) 432-8873 for a catalog on our complete line of products.

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**Your Photo Here**

**"Customer Corner" Contest**

Be seen by thousands of fellow hams!

To enter this contest, simply send us a photo showing you and your prominently displayed AEA products. Also include a paragraph or two describing your use of AEA equipment and how you like it. If your picture is chosen, you'll be shown above!

Photos must be of good quality. Black & white glossy is preferred, followed by color negative and color print. Photos become the property of AEA, Inc. and cannot be returned.