

work well with power levels up to 1000 watts. Some, however, are capable of operation up to only about 200 watts and should not be acquired if you entertain notions of getting high-power gear after upgrading your license. The Dentron Model W-2 is a very handy unit as it doubles as a direct-reading wattmeter as well as an SWR bridge.

Also highly recommended is a crystal calibrator to provide known reference marker signals for receiver dial calibration and as insurance that one is operating within the band—the FCC frowns on out-of-band operation! In selecting a calibrator, if one is not already an integral part of the receiver or transceiver, be sure that it is capable of putting out markers a maximum of every 100 kHz. A calibrator requires a simple initial adjustment—zero beating the calibrator output with the carrier of the National Bureau of Standards' time and frequency station, WWV. If your receiver doesn't cover the frequencies on which WWV transmits (2.5, 5, 10, and 15 MHz), you can use a general-coverage receiver to trim the calibrator. A very interesting calibrator is that produced by Rainbow Industries, Indianapolis, Ind. It is capable of generating markers as low as 25 Hz, making it

useful as an audio generator and oscilloscope calibrator in addition to its primary function. It is available in an attractive cabinet or as a wired circuit board for custom installation in the receiver.

A receiving preamp is generally not necessary if you are using contemporary solid-state equipment with good sensitivity [1 microvolt or less for 10 dB (S + N)/N]. A preamp can even cause receiver overloading and cross-modulation if used improperly. However, the gain of even some of the best receiving gear tends to decrease on 10 meters and, to a lesser extent, on 15 meters. A preamp may be of some value in compensating for this roll-off in gain. Whether a homebrew or commercial unit is selected, make sure that, if you are using it with a transceiver, there is a positive means of switching the preamp out of the circuit (by either a relay or electronic switching) to prevent its ruin by application of the rig's r-f output on transmit. Ameco's PC-series of preamps and MFJ's Model 1030BX are popular and highly effective commercial units. Building an equivalent preamp is not too difficult even for the beginner. There are many designs to choose from in the ARRL Handbook and other amateur radio publications.

If your Novice transmitter is crystal-controlled, a vfo (variable frequency oscillator) would most certainly be a valuable addition, providing considerable operating flexibility and convenience. Anyone contemplating vfo construction should have some mechanical ability and good tools to make a mechanically rugged unit, plus enough circuit knowledge to troubleshoot any key clicks or chirps (common maladies in poorly designed vfo's) which may develop. A number of good vfo's are on the market and they can be made to work with a wide variety of transmitters. The old Heath Model HG-10 or Johnson Viking vfo's are good companions for the crystal-controlled Heath DX series transmitters or such old-timers as the Johnson Adventurer and Challenger.

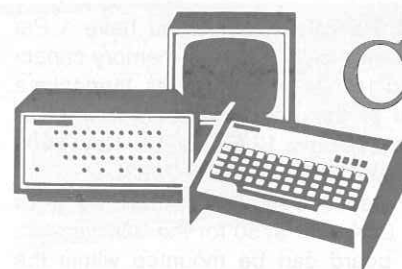
Most operators can send better code if they can actually hear what they are sending. Many beginners using equipment which doesn't contain a built-in sidetone oscillator simply use the station receiver or an auxiliary receiver as an on-the-air monitor. Employing the main receiver for code monitoring is inconvenient because you must constantly retune the receiver and "ride the gain" to prevent blasting and overloading. There are many different ways to monitor your

keying, such as using a small r-f-actuated audio oscillator or simultaneously keying both the transmitter and a separate code practice oscillator. If your transmitter or transceiver doesn't have a built-in monitor, your best bet is to buy a keyer which contains its own sidetone (most do). This will allow you to practice your sending off the air without connecting the keyer to a practice oscillator.

Necessities. Two accessories which belong in every ham shack are a low-pass filter and a dummy load. Although the use of a good antenna coupler can add 10 to 20 dB of harmonic suppression, this still might not be enough in "fringe" TV reception areas. Also, the use of a multi-band antenna, such as a trap dipole, actually increases the possibility of harmonic radiation. A good TVI filter, such as a Drake, Nye Viking or Barker and Williamson model can provide 70 to 90 dB of harmonic suppression. That should make the rig "clean" as far as TVI harmonics are concerned, assuming the rig itself is well shielded and grounded.

A dummy load absorbs the power output of the transmitter and allows you to make practically any transmitter adjustment without actually radiating a signal and interfering with other hams. Most dummy loads are nothing more than 50-ohm air- or oil-cooled resistors. In a pinch, an ordinary light bulb can be used to absorb the transmitter's power output. One disadvantage of using the light bulb is that its resistance changes with filament temperature, causing transmitter loading to change as the bulb gets warm. Various commercial products are available, some of which include a direct-reading wattmeter to indicate actual transmitter output power so you can keep a continuous check on transmitter performance. However, the simpler units should be adequate for most purposes, such as the Heathkit Cantenna. This load, if filled with oil coolant, can handle a full kilowatt at frequencies up to 30 MHz and sells for under \$15. It can be used in conjunction with your SWR bridge or directional wattmeter to tune the rig for maximum power without conducting excessive on-the-air tuning—something the FCC frowns upon.

A grid-dip meter and field-strength meter are also useful additions to the ham shack and, if bought in kit form, offer good construction practice. They are especially helpful when you are tuning a directional antenna such as a Yagi or cubical quad. ◇



Computer Bits

By Leslie Solomon

ANOTHER GRAPHICS SYSTEM

THERE IS no doubt that the next advancement in personal computing will be in graphics. Alphanumerics are great if the program you are running has to be read or printed out. However, the old adage about one picture being worth 10K words still applies.

Currently, most computers use either their associated CRT terminal or a "plug-in" video module to display a coarse form of graphics that uses character-generator types of symbols. Resolution, in such cases, is fine for games. In many other instances, however, higher resolution is desirable.

A couple of manufacturers have indeed made high-resolution plug-ins, especially for the ubiquitous S-100 bus that can create up to 256 x 256 pixels (picture elements) for an excellent image on a monitor CRT screen.

Now, another company has entered the lists: Vector Graphics Inc., 790 Hampshire Rd., Westlake Village, CA 91361 (Tel: 805-497-6853). They introduced a "High Resolution Graphics" board at \$235 assembled, and \$195 in kit form. This S-100 bus plug-in is raster scan and can operate in either of two modes—digital with 256 horizontal by 240 vertical screen elements or a 16-level gray scale having 128 horizontal by 120 vertical elements. In either case, the video output conforms to RS-170 to allow interface with any raster-scan video monitor.

Special circuitry on the new board allows the video screen to be updated without "glitches."

The board, specifically designed for the Vector Graphic 8K static RAM mem-

ory board, is used for both screen refresh memory and as conventional memory. The two boards are interconnected by five small cables.

The graphics board has all the circuitry required to multiplex the address and data signals to the associated 8K memory board. This logic allows the memory to be addressed by the MPU and the video counters, thus delivering both conventional data transfer and video to the monitor.

Software provided includes the source listing for a callable alphanumeric U/L case character generator set that could also be used to create special symbols and graphics. A North Star diskette is also provided, and includes a robot control language by Dr. LiChen Wang, and some demo graphics.

We installed the graphics/memory pair in our computer and ran the demo program. Some of the images generated were of excellent quality. We understand that these photographic demos were created by digitizing a slow-scan TV camera.

The robot language was interesting. The cursor forms a "bodyless" robot that can be programmed to move around the screen in almost any pattern desired. Routines within the language can be called to make the "robot" move around. We assume that once a robot is built, the bits that position the cursor can then be transmitted to the robot mechanics to make the machine physically move in the same programmed manner.

This is the second high-resolution graphics board that we have had the opportunity to work with. We feel that such



This is the kind of resolution obtained from Vector Graphics video board.

graphic displays open up new application areas for the computer enthusiast.

Hard Copy Stuff. If you have, or are going to get, a Selectric Model 731 or 735 I/O Writer, then take a look at the "Typeaway." This is an S-100-to-Selectric interface from Micromation, Inc., 524 Union St., San Francisco, CA 94133 (Tel: 415-398-0289). This \$350 assembled (\$275 in kit) board includes a single S-100 plug-in that has solenoid drivers, I/O ports, complete software in PROM, all necessary cabling and connectors, and a power supply.

Software is supplied in two 1702A PROM's; all code conversions and control functions are included.

SWTP Board. National Multiplex Corp., 3474 Rand Ave., Box 288, South Plainfield, NJ 07080 (Tel: 201-561-3600) is now selling a Z80 board that plugs into the SWTP bus. Costing \$190 assembled and tested (plus \$3 shipping and handling), the new board uses a 2-MHz clock, and on-board baud-rate generator up to 9600 baud. A 1K ROM monitor, and tape recorder read/write routines for both KC and National NRZ recorders are included. This new board replaces the 6800 board currently used.

This same company also has a 2SIO plug-in for the SWTP machine. It features 3K of ROM space and two I/O ports. One or two recorders can be controlled via a 4-bit parallel port along with two serial ports.

Apple Stuff. Electronic Systems, Box 9641, San Jose, CA 95157 (Tel: 408-374-5984) announced its serial I/O board for the Apple II. The board comes with software to input or output BASIC programs, monitor a serial 20-mA device, or for using the Apple II as a video terminal. Both input and output are RS-232 compatible. The board also features selectable parity, number of stop bits, and has a jumper-selectable address. Data rate is to 30,000 baud.

The board is available as an assembled and tested unit for \$62, or as a kit for \$42. Full documentation and software is included with each board. The circuit board is available for \$15.

Other available kits include a tape interface, modem, r-f modulator, power supply, 8K static RAM for the S-100 bus, UART and baud-rate generator, tape interface DMA board for the S-100 bus, a TVT, and RS-232 to TTL or TTY.

Microproducts, 1024 17th St., Hermosa Beach, CA 90254 (Tel: 415-318-1111)



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