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Autek WM1 SWR/Wattmeter

Henry Radio Tempo 3002A 2-Meter Linear Amplifier

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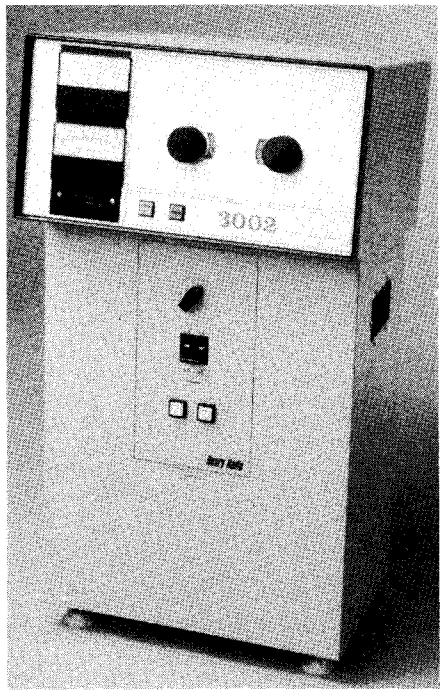
Henry Radio Tempo 3002A 2-Meter Linear Amplifier

Reviewed by Mark J. Wilson, AA2Z

There are times during 2-meter operation when legal-limit power is a big help. You don't need (nor should you want) to use high power to work through the local FM repeater or AMSAT-OSCAR 13. But if you hang around the bottom 300 kilohertz of the band, and if DX is your game, having 1500 watts of solid RF on tap can help you work those elusive tropo, aurora, scatter and moonbounce contacts.

For years, Henry Radio has offered VHF enthusiasts an alternative to bending their own sheet metal. Many a VHF DX contact has been made using power by Henry, and the 3002A carries on this tradition.

The 3002A uses a single EIMAC 8877 triode. Featuring a self-contained power supply, metering and control circuitry and an antenna relay, the 3002A is about as challenging to use as a typical HF amplifier. So much for the myths about the difficulty of serious 2-meter operation.



Construction

The 3002A looks similar to the floor-model Henry HF amplifiers. Standing almost three feet tall and tipping the scales at close to 200 pounds, the 3002A makes an impressive package. The power supply and control circuitry are housed in the base, and the RF deck is mounted on top.

The 8877 and associated RF circuitry are built in a solid aluminum case that fits inside the main enclosure. The output circuit uses a pair of striplines with the tube in the center, reminiscent of the classic W6PO 2-meter amplifier design that many hams have duplicated. Tuning and loading are handled by a pair of capacitors, with a thick sheet of Teflon® dielectric material between the two plates of each capacitor.

The blower, which pressurizes the RF deck, is mounted inside the power supply. After cooling air passes over the tube's base, a chimney forces the air to travel through the tube's anode-cooling fins. Hot air exits through a screened hole in the cabinet top. Blower noise is moderate.

In these days of microprocessor control and fancy displays, the 3002A's front panel is relatively Spartan. Two meters dominate the left side of the RF deck: One reads anode current (0-1 A), the other is switchable between grid current (0-100 mA) and high voltage (0-10 kV). There is, of course, no band switch. The two large knobs with counter dials are for **INPUT TUNE** and **OUTPUT TUNE**. The **PA LOAD** control is located on the rear panel, which is not a problem because it's a set-and-forget adjustment. (You need only use this control when you switch antennas.) Push-button switches below the meters are for switching between standby and operate, and for switching the multimeter between grid current and high voltage. A pair of indicator lamps show **POWER** and **STAND BY**. The **STAND BY** light glows when the 3002A's two-minute warm-up period is over (the 8877 must be warmed up before use). The **POWER** lamp glows when ac power is applied, the warm-up period is over and the amplifier is switched to operate.

On the front of the base is the **POWER ON/OFF** circuit breaker that serves as the main power switch. The **SSB/CW** switch does not affect class of operation; it simply switches between two taps on the high-voltage transformer. **CW** (suggested for tune-up, CW, FM, RTTY and AM operation) provides about 2500 V with no load. **SSB** raises the high voltage to about 3500.

In addition to the **PA LOAD** control, the rear of the RF deck has a BNC connector for **RF INPUT**, an N connector for **RF OUTPUT** and a phono jack for **RELAY CONTROL**. A large air filter occupies much of the rear of the base. A 1.5-A fuse that protects the cathode circuit is also accessible from the rear panel.

Hookup and Operation

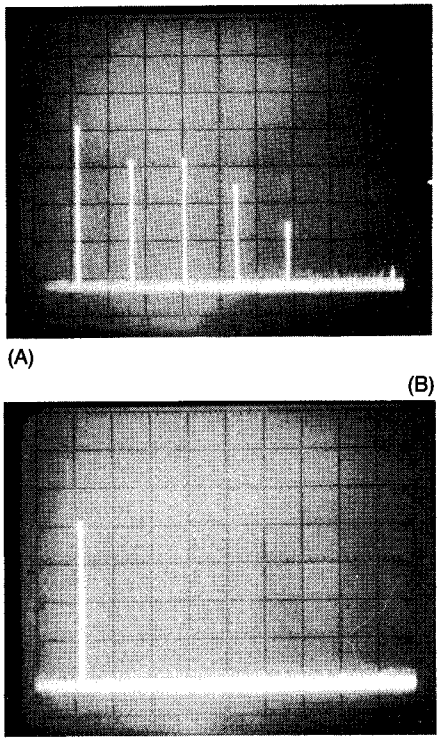
Because of its weight, the 3002A must be shipped by truck. The review unit was packed in a sturdy cardboard carton, mounted on a wooden platform, and it survived the cross-country journey with just one small dent in its RF-deck cabinet.

Henry ships the amplifier with tube and power transformer installed, and ready for operation. You must supply your own ac power plug. I had no trouble installing a standard 20-A, 240-V plug to match the outlet in my shack. Primary taps on the transformer allow 200, 220 or 240-V operation. From the factory, the 3002A is ready for 220-V use. Operation from 120 V is not possible (and is not desirable for any amplifier in this power class).

Included accessories are the operator's

Table 1
Henry 3002A 2-Meter Amplifier, Serial no. 60-162

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Frequency coverage: Available for 100 to 200 MHz; 144 to 148 MHz standard. Tunable over ±5% of center frequency.	144 to 148 MHz.
Driving power required: 40 to 60 W typical.	50 W for 1500 W output.
Maximum power output: 1500 W continuous.	As specified.
Spurious emissions: Reduced in accordance with requirements for application by means of external output filter	Complies with current FCC specifications. See Fig 1.
Keying: Ground to transmit.	
Primary power requirements: Primary taps for 200, 220 and 240 V ac, 30 A maximum.	
Color: Light gray.	
Size (HWD): 32.75 × 15 × 16.5 inches.	
Weight: 190 lb (shipping weight).	



(A)

(B)

Fig 1—Worst-case spectral display of the Henry 3002A. Horizontal divisions are each 100 MHz; vertical divisions are each 10 dB. Output power is approximately 800 W at 144.2 MHz. The fundamental has been reduced by approximately 28 dB by means of notch cavities to prevent spectrum-analyzer overload. Photo A shows the 3002A operating without its external output filter; photo B shows the output with the filter in place. With the filter installed, all harmonics and spurious emissions are at least 60 dB below peak fundamental output. With the output filter, the Henry 3002A complies with current FCC specifications for spectral purity.

manual, RF-input cable, relay-control cable, spline wrench (for the dials), a box of 1.5-A fuses and an output filter. That's right, an output filter. Henry can supply the 3002A for any frequency between 100 and 200 MHz for many uses other than ham DXing, and they supply an appropriate filter for the intended use. Note that you must connect the filter between the 3002A's **RF OUTPUT** connector and your antenna to suppress the 3002A's harmonics to a legal level. See Fig 1.

Hooking up the 3002A was a breeze. (The hard part was wrestling it into my shack...) As suggested in the instruction manual, I first drove the amplifier with 10 watts from my transverter. This allowed me to familiarize myself with tuning and loading the amp at reduced power—and at reduced risk of damaging the 3002A. Initial tune-up yielded almost 400 watts output—Henry rates amplifier gain at 15 dB!

Operation was smooth and trouble free, so I added an RF Concepts solid-state amplifier in line between the transverter and amplifier input. This time, I had no trouble slamming my Bird wattmeter needle against the peg (the 1-kW element was installed). Off to the telephone to borrow a higher-power Bird element! The 3002A easily tunes up to 1500 W output with about 50 W drive, and operation at that power level is well within the safe anode- and grid-current ratings for the 8877.

It's hard to describe the difference that legal-limit power makes during 2-meter weak-signal operation. I normally run about 400 W output, and the difference on aurora, meteor scatter and marginal tropo contacts is tremendous. The extra 6 dB or so in signal strength made the difference in being just another signal on the band and being able to attract a lot of callers during the many auroral events we've had recently.

The 3002A's biggest test came during the September VHF QSO Party at W1XX/3. Although the 3002A does not exactly lend itself to mountaintop-portable operation, we dragged it along anyway because we thought that it would be worth the trouble. The amplifier ran flawlessly for the entire contest period, and the end result was 672 2-meter contacts in 87 grid squares—with flat band conditions! In 1988, operating from the same site with similar antennas and 500 W, we worked 88 grids with the help of two aurora sessions and a little tropo enhancement. Our 2-meter op, Clarke Greene, K1JX, attributes the difference to running high power and being able to attract very weak stations at the edge of the normal tropo range.

I really enjoyed using the 3002A. It's a solid performer, and it does what all good amplifiers should: Make lots of watts with a minimum of hassle.

Price class: 3002A (including power supply, 8877, vacuum antenna-changeover relay), $2395; RF deck only (including 8877, but less power supply and relay), $1595. Manufacturer: Henry Radio, 2050 S Bundy Dr, Los Angeles, CA 90025, tel 213-820-1234.

AUTEK WM1 SWR/WATTMETER

Reviewed by Kirk Kleinschmidt, NTØZ

Before acquiring the Autek WM1 SWR/wattmeter, I found myself in a predicament many hams probably face: I needed an easy way to measure the PEP output of my transceiver and amplifier—without spending a lot of money, and without using more than one metering device. To make matters even more challenging, my "ultimate" power meter has to perform well from 5 to 1500 watts! The Autek WM1 does the job; it saved me the trouble of building two wattmeters: one for QRP, and one for medium- and high-power operation.

Description

The WM1 is an RF-power and SWR-computing meter that operates from 1.5 to 30 MHz with a usable power-measurement range of 0.5 to 2000 W. The unit measures PEP or average power in three ranges: 0 to 20 W, 0 to 200 W and 0 to 2 kW. SWR is indicated on a separate meter, eliminating the need to switch back and forth between forward- and reflected-power readings.

The WM1's RF-sensing head is attached to the main meter unit via a 4-foot cable, allowing the head to be installed in any convenient location. In my setup, the WM1 sits on a shelf above my operating table, and the sensing head is fastened directly to my amplifier's **RF OUTPUT** connector. This arrangement eliminates a couple of short runs of coaxial cable, and keeps the coax from dragging the meter around (I call this the *tail wagging the dog* syndrome).

Autek regards the schematic diagram for the WM1 as proprietary. Other than a circuit diagram for the sensing head (a typical toroid-and-diode directional-coupler design), the rest of the meter, in-

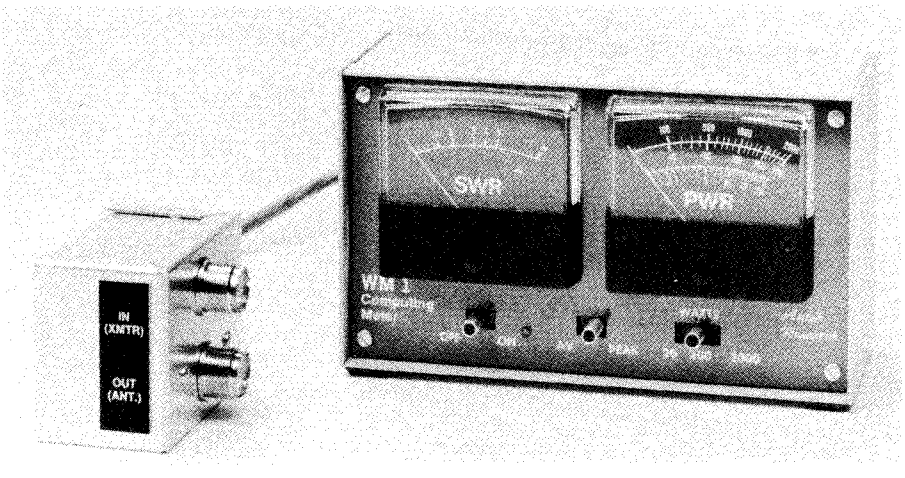


Table 2
Autek WM1 SWR/Wattmeter

Manufacturer's Claimed Specifications	*Measured in the ARRL Lab*
Accuracy: ±5% of full-scale (FS) reading, ±10% of FS reading below 20% of FS.	As specified.
Power source: 9 to 18 V dc (battery or ac-to-dc adapter [supplied]) at 15 mA.	As specified.
Insertion VSWR: Less than 1.1:1.	As specified.
Low-power threshold for SWR-computation circuit: 0.5 W.	As specified.
Color: Gray.	
Weight: Approx 1 lb.	
Size (HWD): 3½ × 6½ × 2¾ inches.	

cluding peak detectors, voltage regulator and divider network (the computing part) is presented only in block-diagram form.

The sensing head and main unit appear to be well-made. All of the components in the main enclosure are mounted on a small, high-quality circuit board. Access for calibration adjustments is provided through a large slot in the back of the enclosure.

Using the WM1

Setting up the WM1 is not difficult. Simply plug in the ac-to-dc supply (supplied) and connect the sensing head in series with your 50-Ω antenna cable (just before your antenna tuner, if you use one). The WM1 may be powered from a 9- or 12-V battery, in lieu of the supplied ac-to-dc adapter, making the meter suitable for portable operation.

To use the WM1, first select the appropriate power range. For greatest accuracy, use the lowest practical range. Then, choose between average and PEP power measurement. When reading average power, the meter behaves like any other conventional wattmeter. A slight delay in the readings is caused by the meter's inability to quickly follow short RF-power peaks. The WM1's PEP mode eliminates this delay, and allows you to get an accurate picture of your station's RF-power peaks on SSB, CW or any other mode. To facilitate PEP measurement, peak RF values are sensed electronically, captured, and then displayed on the meter. The meter-deflection amplifier has a fast attack time and a slow delay time. This way, the WM1 can measure and display RF-power peaks lasting only a few milliseconds. Regardless of the power-measuring mode, the WM1 calculates SWR automatically, and requires no adjustments or calibration.

Using the WM1 makes me wonder how I managed to get along without it! I especially like the PEP mode. It's quite useful, whether I need an accurate way to keep my PEP output at less than 5 or 10 W (for QRP work), or need to know the PEP output of my kilowatt amplifier. Power readings are consistent among the three ranges.

If you're concerned about the WM1's metering accuracy (manufacturer-rated as typically within 5% of full scale), don't be. Unless you're performing critical tests, knowing whether your transceiver is putting out 100 W or 93 W is of little real value. The beauty of the WM1 is its ability to accurately track over a wide range of power levels, displaying PEP-output and SWR readings without requiring any adjustments.

Beating the WM1's price-versus-performance ratio is difficult. Autek has packed a lot of performance into the WM1, considering the unit's price tag.

Price: WM1 (including shipping and handling, plug-in ac-to-dc supply, instruction manual and one-year warranty), $109. Manufacturer: Autek Research, Box 302, Odessa, FL 33556, tel 813-920-5810. (Autek sells only factory-direct.)

SOLICITATION FOR PRODUCT REVIEW EQUIPMENT BIDS

[In order to present the most objective reviews, ARRL purchases equipment off the shelf from Amateur Radio dealers. ARRL receives no remuneration for items presented in the Product Review or New Products columns.—*Ed.*]

The ARRL-purchased Product Review equipment listed below is for sale to the highest bidder. Prices quoted are minimum acceptable bids, and are discounted from the purchase prices.

Advanced Radio Devices model 230A MF/HF linear amplifier, s/n 0126 (see Product Review, May 1989 *QST*). Minimum bid: $3500.

Heath® SB-1400 MF/HF transceiver, s/n 8K020058, including SBA-1400-4 heavy-duty power supply/speaker and SBA-1400-2 hand-held microphone (see Product Review, October 1989 *QST*). Sold as a package only. Minimum bid: $772.

Amp International (formerly Amp Supply) model LK-550 MF/HF linear amplifier (based on three 3-500Z tubes), s/n 2052. Minimum bid: $865.*

Sealed bids must be submitted by mail and must be postmarked on or before November 27, 1989. Bids postmarked after the closing date will not be considered. Bids will be opened seven days after the closing postmark date. In the case of equal high bids, the high bid bearing the earliest postmark will be declared the successful bidder.

In your bid, please clearly identify the item you wish to bid on, using the manufacturer's name, model number, or other identification number, if specified. Each item requires a separate bid and envelope. Shipping charges will be paid by the successful bidder, FOB Newington. The successful bidder will be advised by mail. No other notifications will be made, and no information will be given by telephone to anyone regarding final price or identity of the successful bidder.

Please send bids to Kathy McGrath, Product Bids, ARRL, 225 Main St, Newington, CT 06111.

*Editor's Note: The Amp International LK-550 amplifier was purchased for Product Review, but Amp International went out of business during the review period. A review of this amplifier has not appeared, and will not appear, in *QST*. The amplifier is in good working order and has had only light use. As far as we know, there is no factory or other warranty support available for this amplifier. Several Amateur Radio dealers and repair facilities provide amplifier servicing, however.

Because of the unusual circumstances under which this amplifier is being sold, an additional discount from the original purchase price is reflected in the minimum bid for this item. QST

New Products

AEA MACRATT DATA-CONTROLLER SOFTWARE FOR MACINTOSH COMPUTERS

☐ Advanced Electronic Applications (AEA) has announced the availability of their Apple® Macintosh® data-controller software, called MacRATT. MacRATT, which has FAX capability, works with (and supports all modes of) AEA's PK-232, PK-88 and PK-87 data controllers.

MacRATT's features include program operation via the computer's mouse; direct FAX-image printing (without changing cables); ten user-definable macros; and compatibility with MultiFinder™ and Macintosh models 512K, 512E, Plus, SE and Mac II.

Price: $59.95. Available through AEA dealers. Manufacturer: AEA, PO Box C-2160, Lynwood, WA 98036, tel 206-775-7373.—*Rus Healy, NJ2L*