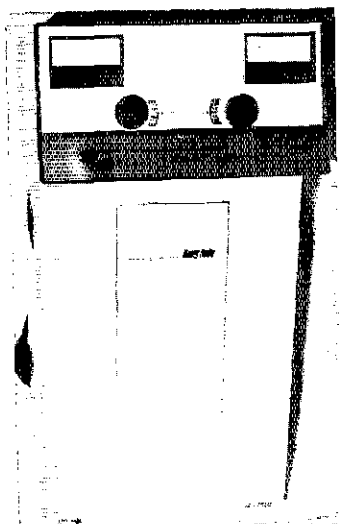


# Recent Equipment



To acquaint you with the technical features of current amateur gear.



## The Henry 2K-4 Amplifier

**T**HE PURPOSE of the Recent Equipment column in *QST*, as defined in the masthead above, "is to acquaint you with the technical features of current amateur gear." The Henry 2K-4 amplifier, while not new in a stringent sense of the word, is still current and very popular with amateurs today. The earlier model (2K-2) was reviewed several years ago<sup>1</sup> and since then a few changes have been

<sup>1</sup>Recent Equipment for June, 1965, *QST*.

made to add to the convenience of operation and to change the appearance. The front-panel styling includes modern-looking square meters and a "trap door" has been added to the power supply pedestal to allow easy access to the overload relay system.

The comment by WIICP in *QST* for June, 1965, about the original Henry 2K is still appropriate: "In departure from the present trend of packaging everything into one small box, Henry has come out with a kilowatt amplifier . . . which in every sense of the word is rugged." One must be careful, however, to correctly interpret the term "rugged." A check of *Webster's New Collegiate Dictionary* gives the following concise definition: showing signs of strength, sturdy. While some of the components, especially those in the power supply, are overrated for typical amateur operation, the rf deck is built for two-kilowatt linear-amplifier operation. Contrary to what some rumors indicate, this device will not deliver three or four kilowatts of "superpower" operation. The parallel-connected pair of 3-500Z triodes operates at two-kilowatts dc input for ssb service, and one kilowatt in the cw mode. Laboratory measurements indicate the unit tested could be overdriven by about 20 percent before nonlinear operation occurred.

### *The RF-Amplifier Compartment*

The upper section of the console contains all of the rf-output circuitry as well as the antenna relay, the alc control, and an SWR monitor. Adjustment potentiometers for SWR meter full-scale deflection and for alc threshold are located on the rf compartment rear panel. The antenna relay operates with 12 volts dc and requires exciter contacts to apply a ground to the rear-panel phono jack to activate the 2K-4. This relay provides exciter feed-through operation to the antenna when de-energized.

The rf-input connector is a BNC type, but for those amateurs who might object to the "odd" jack, Henry Radio includes a completely assembled cable for exciter interconnection. The input circuit for the amplifier is a tuned pi network and requires no adjustment for amateur operation. For those owners wishing to use the amplifier outside the amateur bands, the instruction book may be

Inside top view of the rf compartment. The antenna relay is located at the left. Each of the pi-network input circuits is located in a shield can. The row of cans is shown to the rear of the tubes.

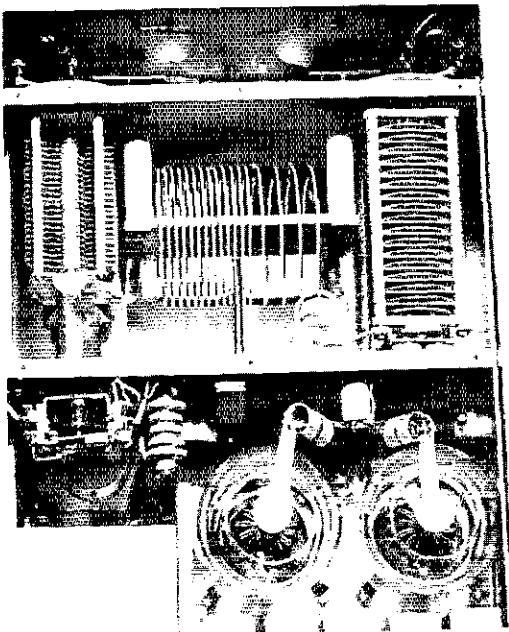


Table 1 — Henry 2K-4 Characteristics

Mode	Input Power* (Watts)	Output Power** (Watts)	Grid Current***	Drive Power (Watts)	Input Circuit (SWR)	Efficiency (Percent)
80	CW	1000	140	45	2.1	65
	SSB	2000	1260	275	2.1	63
40	CW	1000	190	34	1.2	67
	SSB	2000	1300	290	1.2	65
20	CW	1000	150	40	1.2	67
	SSB	2000	1310	310	1.2	66
15	CW	1000	130	35	1.0	64
	SSB	2000	1200	295	1.0	60
10	CW	1000	170	28	1.1	63
	SSB	2000	1200	285	1.1	60

\* Power input measurements made with a plate voltage of 2800. Plate current for cw operation was 360 mA; for ssb it was set for 710 mA.

\*\* Output measurements include drive power.

\*\*\* Approximate value.

consulted for retuning details. Half way (in frequency) between amateur bands it may not be possible to adjust the slugs to obtain proper tuning of the circuit. But there is a simple solution: Henry Radio has designed the input modules to be plugged in, and they may be removed from their sockets and replaced with "specials" from the factory. One not-so-obvious feature exists here: Should the operator accidentally overdrive the amplifier with one of today's high-power exciters (500-watt class) and damage the input circuit, it can be replaced easily. Or, if damage should occur (unlikely) because the operator had the amplifier on one band and the exciter on another, repair is simple.

The rf-output circuit is a pi-L network and will match a wide range of load impedances. The entire amplifier is rf-tight and will pass the most rigid of TVI tests.

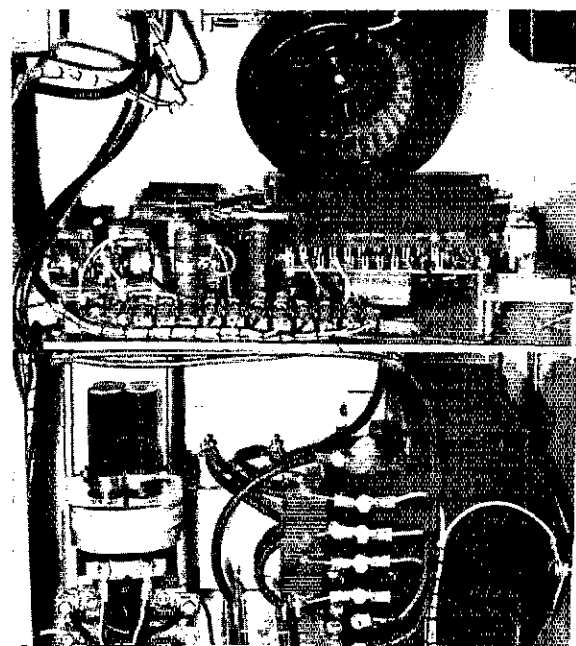
### The Power Supply

All of the power supply components and the air blower are located in a compartment below the rf deck. The supply is completely enclosed, but has an air filter on the rear panel. This solid enclosure provides a nearly noiseless air circulation for cooling the 3-500Z amplifier tubes.

Interior view of the power supply. This section of the amplifier console is completely enclosed which greatly reduces any noise developed by the blower motor.

High voltage is developed by a full-wave bridge rectifier followed by a resonant-choke filtering system. The output capacitor is rated for 20  $\mu$ F at a voltage of 5000. The supply delivers approximately 3 kV under load (two-kW input to the amplifier plate circuit) with a line voltage of 235. The primary of the transformer has a dual winding which can be connected for 117-volt service.

There are several protective circuits contained in the 2K-4 amplifier. A primary-line circuit breaker will shut off power to the supply in the event of a transformer failure. A high-voltage



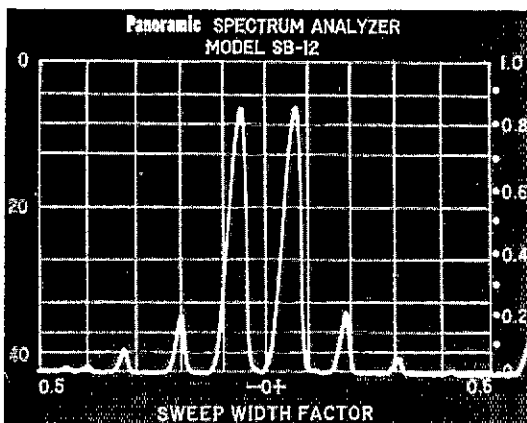


Fig. 1 - Spectrum-analyzer display of the output of the Henry Radio 2K-4 amplifier with a two-tone 2000-W PEP input. The horizontal axis of the display represents frequency, and the vertical axis amplitude. Each "pip" represents a single-frequency component of the rf output. The display is adjusted so the amplitude of each component may be read from the scale at the left, directly in decibels below the peak-envelope power (PEP) output, as rated by the manufacturer. Each reticle division represents 5 dB. Responses other than the two individual tones near the center are distortion products; third-order products 32 dB down may be seen here. Individual tones of the two-tone signal are down by 6 dB from the PEP output. This is because the tones are displayed as two discrete frequencies. At the instant when voltages of the individual tones are in phase, they add to produce a peak in the envelope wave-form pattern which is twice the voltage amplitude of a single tone alone. The power at the peaks of the envelope (PEP) is therefore four times that of a single tone, a 4:1 power ratio being equivalent to 6 dB.

overload detector is included to prevent damage to the power supply in the event a high-voltage arc over takes place. This relay will trip if the operator runs the amplifier for a very long period of time in a mistuned condition (excessive plate current). Resetting either breaker is accomplished easily by actuating the proper switch behind the trap door which is located on the front of the amplifier console. A small red indicator lamp illuminates when the high-voltage breaker activates; when the primary breaker overloads, the main ac line is interrupted. For those absent-minded folks who open the top inside cover while the power is turned on, an interlock will engage, shorting out the B plus.

### Operational Testing

The most difficult task this writer had in preparing the 2K-4 for operation was getting the device out of the shipping container! There is a trick to it but it was not learned until after the crate was destroyed. A special cardboard box was designed to handle the considerable weight of the amplifier. The box should be tilted from the upright position, then the bottom box flaps opened completely. The unit (in the box) may then be set erect again and the container lifted straight up over the 2K-4. Simple! If one doesn't adopt this procedure, he is likely to spend an hour at the task.

The instruction manual for the 2K-4 is complete in almost every detail. The diagram appears to match the electronic equipment and the component lists of part numbers seems quite complete. The tune-up procedure is easy to follow. Initial knob settings are given in the rear of the manual for each band; the knob settings were determined for the particular amplifier being operated. Output power (watts) and grid current readings are also given. This not only indicates the amplifier has been completely tested on each band, it also

provides the new owner with a starting point to begin the tune-up learning process.

A couple of bits of information are missing from the instruction booklet; however, neither was serious enough to cause any problems. First, the book doesn't mention how to gain access to the overload reset switches. It's easy; just pull down the small panel which contains the name Henry Radio. There is no handle. The other item missing from the book is how to reset the high-voltage overload circuit. It is possible to overdrive the amplifier or mistune it, and cause the overload relay to shut off the B plus. A red lamp will indicate when this has happened. But the red lamp is located behind the front trap door and is visible only if the door is open. The apparent indications of a high-voltage overload are lack of output power, excessive grid current, and zero plate current. A word of caution here: the antenna relay activates normally no matter what the condition of the overload relay. This means that *it is possible to apply drive to the 3-500Zs when B plus has been automatically shut off*. If this condition exists for a long period of time, *damage could result to the tubes*. But since the operator usually keeps his eye on the plate meter when running a kilowatt amplifier, he will notice the problem almost immediately. It should be pointed out that during seven months of extensive testing, the overload relay never actuated. It did kick out however, during one tune-up learning session. It was apparent the moment it happened. Checking behind the trap door, revealed the glowing red lamp. This writer, being somewhat cautious, turned off the main power before depressing the high-voltage reset button. When the normal power was restored, the red lamp was still on. A recycle of these events produced the same results. After a few moments of thought, it was decided that perhaps the resetting of the kick-out relay needed power to function. Pressing the reset button (while the ac main power was on) reset the breaker. This point is not covered in the book.

## The Henry Radio 2K-4 Amplifier

Power input: 2000 watts PEP for ssb, 1000 for cw operation.\*

Power output: See Table I.\*

Output tank-circuit configuration: Pi-L network.\*

Input circuit: Tuned cathode.\*

Amplifier tube(s): A pair of 3-500Z triodes.\*

Plate dissipation: 1000 watts for the pair of tubes.

Cooling: Forced air from below chassis level.

Drive requirements: Minimum levels given in Table I.\* For levels greater than those indicated, adjustable alc is provided to prevent overdrive conditions.

IMD: See Fig. 1.\*

Frequency range: 3.5 to 29.7 MHz (80-through 10-meter band-switch positions including one for 75 meters).\*

Metering: Plate current, grid current, relative output, plate voltage, and reflected output.\*

Power requirements: 117/235 volts, 30/15 amperes maximum.\*

Color: Gray and black.

Dimensions (HWD) and Weight:

23-1/2 x 16 x 20 inches, 135 pounds.

Price class: \$895.

Manufacturer: Henry Radio, Inc. Los Angeles, CA 90064.

\*Measurements made in the ARRL lab.

### Summarizing Comments

Rating and evaluating amateur equipment can be a difficult task. This is one reason the testing takes as long as six or eight months. An attempt is made to duplicate any typical operational condition the equipment might encounter during normal use. In the case with the 2K-4, it was subjected to long periods of operation at full-power input levels with both 117 and 235 primary hookups. In fact, the 235-volt line used for the tests usually had an indicated level of 260 volts!

Mistuning and overdrive conditions produced no ill effects with the equipment.

The one feature observed by this writer, concerning the 2K-4, which was most significant, was its ability to withstand long periods of hard continuous operating. Accidental mistuning will not adversely disturb this machine. Probably the toughest service a piece of amateur equipment might be called upon to endure would be club-station duty. The Henry 2K-4 should withstand this without reacting violently! — *W1FBY*

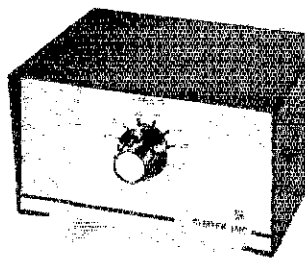
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## Signal Intensifier Symtek SABA-5

**A**T A TIME when sunspots are on the decline and band conditions are poor, the need for refinement in one's receiver becomes increasingly important. Most signals are weaker now. Symtek has produced a device that can improve the odds on hearing that weaker-than-usual station by at least 20 dB! The SABA-5 (Symtek Automatic Broad-band Amplifier) provides 20-dB of gain (minimum) on 80 through 10 meters with overlap for MARS operation. No tuning or peaking is required when changing bands; one control does it all. It's ideal for portable or fixed-station operation because of the small size and battery power supply. At the home station, there is provision for hookup to an external supply.

### The Electrical Side

The SABA-5 circuit has been engineered carefully to provide a typical gain of 25 dB on each amateur band. The gain of the preamp may be



The front view of the SABA-5. One control does it all. In the lower right, an LED shows when the unit is in operation.

adjusted by varying the dc operating voltage from 3 to 18. Aside from the additional gain, a noise figure of less than 2.5 dB can be expected from the single solid-state device. The use of a dual-gate and diode-protected MOSFET makes this preamplifier keep on "playing" even in the presence of strong rf fields; in other words, no strong-signal damage. It can be powered by two 9-volt transistor radio batteries or an external well-filtered 12- to 18-volt dc supply. The current consumption is ap-