Product Review Column from *QST* Magazine

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AEA KT-1 Keyer/Trainer

Bird Model 6736 Termaline Wattmeter

ICOM IC-2A 2-Meter Hand-Held Transceiver

Telex/Hy-Gain HDR-300 Heavy Duty Rotator

Product Review

Conducted By Paul K. Pagel,* N1FB

ICOM IC-2A 2-Meter Hand-Held Transceiver

ICOM's contribution to the world of synthesized, 2-meter hand-held transceivers is the rugged, compact IC-2A. With the Touch-Tone pad installed, it is called the IC-2AT. ICOM provided Hq. with one of the first production models, and in the seven months I have operated this transceiver, it has undergone a lot of rugged use and given no problems.

What do I mean by rugged use? How about clipping it on my belt for monitoring the local repeater while bicycling the 12 miles from home to League Hq. and back two or three times a week during this summer? Or using it to keep in touch with civilization while climbing Mount Katahdin, Maine's tallest mountain, and camping at Baxter State Park? (I wish *I* were as unaffected by that mountain climb as the hand-held was. Whew!) On top of that, I lent it to K1FHN, who used it to get onto 2-meter fm for the first time. The little ICOM saw no rest that month! Believe me, this rig was *not* babied. Yet, it performed flawlessly. On-the-air reports gave it high marks for overall signal intelligibility and clarity.

The best thing going for this rig, in my opinion, is its small size and light weight. The rig is so light it's easy to forget you're carrying it until someone breaks the squelch.

Metamorphosis: IC-2A Becomes IC-2AT

The unit ICOM sent to Hq. was the IC-2A because, at that time, production models of the IC-2AT were not available. A few months later however, ICOM sent a new case front, including the Touch-Tone pad, allowing me to change the IC-2A into an IC-2AT. This required only the removal of six screws and disconnection of the wires to the speaker and microphone. The case front with the Touch-Tone pad was installed by plugging in the Touch-Tone connections and soldering the wires for the speaker and microphone. The whole procedure took about 10 minutes. For those of you who purchase the IC-2A and then decide to retrofit your rig with the pad, you may order the 2A-TTN from your ICOM dealer.

The ICOM factory tests and adjusts the tones for the IC-2AT. However, retrofitting the IC-2A with the Touch-Tone pad required a minor adjustment of the tone level to get the autopatch on the local repeater to accept the tones. This was a simple matter of adjusting R77. Page 19 of the owner's instruction manual shows where this potentiometer is located. The tone frequencies were measured in the ARRL lab and were found to be within 0.7% of the standard, an extremely accurate figure.

I used the standard IC-BP3 NiCad battery pack and BC-25U wall charger exclusively and found the IC-BP3 to be adequate for most of my needs, though there were a few times when longer battery life would have been nice. The radio has a small, red transmit/battery indicator that is illuminated while transmitting.

*Assistant Technical Editor

Fig. 1 — The IC-2AT. A BNC antenna connector permits rapid and positive antenna connections to be made. The flexible antenna is a part of the standard package. To the right of the transceiver is the original case front. Conversion from the IC-2A to IC-2AT is discussed in the text.

Table 1

IC2A/AT Battery Packs

Battery Pack Model	*Height*	*Charger Required*	*Batteries*	*Voltage*	*Typical Output (in watts)*	*Dealer's Suggested Retail Price*	*Brief Description*
IC-BP2	1.5 in. (39 mm)	BC-30	N-425 AR	7.2	1.0	$34.50	Low voltage/ high capacity
IC-BP3	1.5 in. (39 mm)	BC-25 or BC-30	N-250 AA	8.4	1.5	$27.50	Standard voltage/ standard capacity
IC-BP4	1.9 in. (49 mm)	BC-30	UM-3 N-450 AA	9.0 7.2	1.5 1.0	$9.50 (no cells included)	Holder for dry cells or NiCads
IC-BP5	2.4 in. (60 mm)	BC-30	N-425 AR	10.8	2.3	$47.50	High voltage/ high capacity

Note: The BC-25 is a wall charger and is supplied as standard equipment with the transceiver. A drop-in charger, the BC-30, is optional and sells for approximately $70.

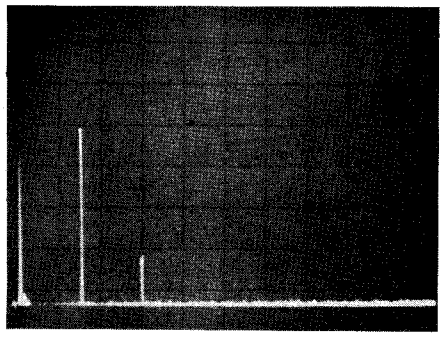

Fig. 2 — A spectral photograph of the IC-2A/AT output. The fundamental signal has been reduced in amplitude some 30 dB by means of notch cavities; this prevents analyzer overload. The second harmonic is shown approximately 62 dB below peak fundamental output. Vertical divisions are 10 dB; horizontal divisions are 100 MHz. Power output was 2.5 watts at a frequency of 146.52 MHz. Tests were performed in the ARRL lab. The IC-2A/AT complies with current FCC specifications for spectral purity.

ICOM IC-2A Serial no. 11501169

Manufacturer's Claimed Specifications	*Measured in ARRL lab*
Frequency coverage: 144.000-147.995 MHz	Same
Frequency resolution: 5-kHz steps, 800 channels.	Same
Frequency control: Digital PLL synthesizer, with thumbwheel switches.	
Antenna impedance: 50 ohms, unbalanced; no VSWR protection claimed.	
Power supply requirements: 8.4 V dc	
Dimensions: 4.6 × 2.6 × 1.4 inches (117 × 65 × 35 mm) HWD without battery pack. IC-BP3 pack dimensions: 1.9 × 2.6 × 1.4 inches (49 × 65 × 35 mm) HWD.	
Weight: 16.6 oz (470 g) including IC-BP3 and flexible antenna.	
Transmitter output power: High — 1.5 W, low — 0.15 W at 8.4 V dc.	High — 2.5 W, low — 0.5 W
Receiver: Double-conversion superheterodyne.	
Intermediate frequencies: 1st — 10.695 MHz; 2nd — 455 kHz.	
Sensitivity: > 26 dB S + N + D/N + D at 1 μV; < 0.5 μV for 20 dB noise quieting.	

If the light fails to go on, the battery voltage is too low. Bringing the BP3 back up to full charge takes 15 hours. However, optional battery packs have more capacity and can be quick-charged in 1 to 1-1/2 hours with the BC-30 drop-in charger.

Four different battery packs can be used with the IC-2A/AT (see Table 1). The hand-held's receiver is self-regulating; however, the transmitter will draw more current from the higher voltages. This means a higher-voltage battery pack will deliver more output. Each battery pack, with the exception of the BP-4, is a sealed NiCad battery. The BP-4 is actually a battery holder for six AA-sized cells. This case will accept dry cells, zinc or alkaline, for 1.5-W output, or NiCad cells for 1-W output.

The BC-30 drop-in charger is necessary to charge any NiCad battery pack except for the CO-3. The BP-3 can be charged with either the wall charger or the BC-30. However, the other battery packs, including the BP-4 if loaded with NiCad cells, must use the BC-30. The BC-30 drop-in charger is a "smart" charger. If you drop in the hand-held with any of the battery packs, the notches on the bottom of the pack identify it for the charger and it will supply the right voltage and current. The BC-30 has a heat-sensing device that makes use of the fact that a fully charged NiCad cell's temperature elevates once it reaches a full charge. When it senses the temperature elevation, the BC-30 knows the NiCads are fully charged and shuts down. It takes the BP2, BP4 (with NiCad cells) and BP-5 about 1 to 1-1/2 hours to charge. Though the BP-3 can be charged with the drop-in charger, it still takes 15 hours.

The battery life varies with the battery pack being used. According to ICOM, the BP3, the standard NiCad battery pack, should last for approximately 100 minutes of continuous use. This assumes a duty cycle of 3:1, i.e., three minutes of reception for every one minute of transmission. My experience seems to bear this out. Of course, a squelched receiver draws less current (20-mA) than an active receiver (130 mA), so expect longer battery life if monitoring a quiet repeater or simplex channel.

On-the-Air-Operation

Most of the operating controls are located on the top of the hand-held. The ON/OFF switch is a little unusual because it is a small slide switch separate from the VOLUME control knob. Whenever I handed the rig to a friend, he or she would invariably twist the VOLUME control knob in an attempt to turn it on. The ON/OFF switch is clearly marked so you can chide your friends for being so impetuous! Actually, I like the separate ON/OFF switch because it saves the trouble of readjusting the volume whenever the transceiver is turned on. The other controls: VOLUME, SQUELCH and FREQUENCY SELECTION thumbwheel switches are in a convenient configuration. There is also a 5-kHz SHIFT switch located next to the ON/OFF switch to add 5 kHz to the frequency displayed. On the back of the radio there is a small depression where there are three more slide switches. The switches are, from top to bottom, HIGH/LOW POWER, SIMPLEX/DUPLEX and a +600/−600 TRANSMITTER FREQUENCY OFFSET. It works very well. You select your receiver frequency with the thumbwheel switches on the top and then relate your transmit frequency to it using the controls on the back. A friend criticized the separate SIMPLEX/DUPLEX and +600/−600 switches, saying these functions could have been incorporated into one three-position switch. I think he is a little too picky.

The only serious problem I had with this rig is that everyone wanted to borrow it! Fortunately, the radio is modestly priced so one can seriously say "go out and buy one of your own." It's light, rugged and compact — a lot of radio for the money.

ICOM supplies a 29-page instruction manual, a schematic diagram and a board layout sheet with each transceiver. The instruction manual is of excellent quality. It has a trouble-shooting section, but it is confined to possible operator errors. All in all, I give the instruction manual high marks for completeness, understandability, and good diagrams and pictorials.

The Package

The basic package includes the following: BP-3 battery pack, BC-25 wall charger, flexible antenna, belt clip, carry strap, earphone and a couple of extra earphone and microphone plugs. The flexible antenna has a standard BNC connector for quick installation and disconnection. Besides the optional battery packs already mentioned, a number of other accessories are available. The IC 2A/2AT is available from: ICOM, 3337 Towerwood Dr., Suite 307, Dallas, TX 75234. Price class: IC-2A $230; IC-2AT, $250; 2A-TTN, $30. — *Dale Clift, WA3NLO*

BIRD MODEL 6736 TERMALINE WATTMETER

☐ The 6736 combines a high-power, highly accurate, 50-ohm termination with a multirange wattmeter to provide power measurements up to 1000 watts in the 1.5- to 35-MHz range. Two units make up the 6736: a 50-ohm termination (a Bird Model 8251 that has been fitted with a 50-ohm line section and voltmeter cartridge) and a three-range meter unit. The two units are connected by a 43-1/3-inch (1100-mm) length of shielded cable (RG-58/U. The cable is attached to the termination with a screw-on connector so that the units may be separated.

It should be noted that while the frequency range of the 6736 is 1.5 to 35 MHz, the termination can be used as a 50-ohm load to 2.5 GHz. Full-scale power ranges of 50, 250 and 1000 watts are available on the model 6736; a fourth position of the range switch shorts the meter movement for protection during transit. Accuracy is 5% of full scale. The input connector is a Bird quick-change type that permits easy interchange so that any of the standard type connectors can be used. Though the model 6736 is normally supplied with a female type LC connector, changing to a type N connector takes less than a minute. It is also possible to

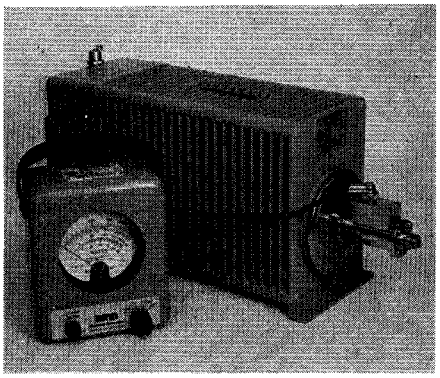

Fig. 3 — The 6736 combination shown here is only one of a number of combinations available from Bird. A multirange wattmeter eliminates the need to change slugs.

remove the voltmeter line section and place the input connector directly on the termination if desired. Both the meter unit and the termination are fitted with carrying handles for convenience. The termination unit requires 1.1 gallon (4 liters) of coolant oil (supplied by Bird) and comes with a vent plug to prevent leakage while moving the unit. Comparison to a laboratory reference meter (a Bird model 43) showed that the 6736 meets the manufacturer's specification for accuracy. There are four other Termaline wattmeters in the model 6730 series, covering power levels from 250 to 2500 watts and frequency ranges to 1 GHz. The price class for the model 6736 is $625. It is available from the Bird Electronic Corp., 30303 Aurora Rd., Cleveland OH 44139. — *George Collins, ADØW*

TELEX/HY-GAIN HDR-300 HEAVY DUTY ROTATOR

☐ In a word, the HDR-300 is *hefty*. This unit, weighing in at 27 lb (12.2 kg), is designed to support a vertical load of 500 lb (227 kg) and rotate an antenna with a projected wind surface area of 25 ft^2 (2.3 m^2) when mounted inside the tower. The antenna in use at W1SE at the time the rotator was tested was a large, six-element tribander with a 32-foot (9.8 m) boom. This 75 pound (34 kg) antenna hardly taxed the capability of the HDR-300, which operated as if it had no load upon it.

Telex/Hy-Gain recommends that the minimum outside tower width be 11.5 inches (292 mm). The top section of the tower at W1SE is just 11 inches (279 mm). This, and the fact that the HDR-300 mounts *beneath* the rotator mounting plate, at first made it impossible to mount the rotator and have it clear the tower bracing. The job was finally done on the fourth try by *inverting* the mounting plate, permitting the rotator housing to clear the tower bracing. If one has a tower with the recommended minimum-width face, or larger, no problem should be encountered. Earlier, some difficulty was experienced in determining the location of the holes to mount the rotator to the mounting plate. The required spacing is not the same as the HAM-II holes that were already there. Though a template is provided, its use is limited to two sizes of Hy-Gain towers. The second, and successful, effort at alignment of the rotator to the mounting plate was "eyeballed." Other size mounting plates, for other towers, might prove easier — or produce similar problems. As a suggestion, Hy-Gain might consider a template marked with the holes of other popular rotators. Then it would be a snap. Once these mechanical problems were solved, there were no others.

Control Unit

The nicely styled, functional HDR-300 control console is provided with a convenient digital readout accurate to ±1°. The 21 lb (9.52 kg) console, supplies 24 V ac for the rotator motor, 5 V dc for the azimuth potentiometer, and converts the analog voltage received from this potentiometer for input to the three 7-segment LEDs that display the digital azimuth readout. Both transformers are factory wired for 117 V ac, but may be re-strapped for 235 V ac operation.

Just above the ROTATE switch lever is a rocker-type switch labeled BRAKE, with FREE and LOCK positions. The switch must be moved to the FREE position before the rotator may be activated. In the LOCK position, power is removed from the ROTATE switch. Thus, the brake is not released automatically as one rotates the antenna, and then automatically applied as rotation power is removed. The antenna is free to coast to a stop as it nears the end of rotation. A simple idea, but Telex/Hy-Gain will be thanked many times by amateurs for this thoughtful feature. It is possible to lock the rotator *when* one wants it locked: Just push the BRAKE rocker-switch to LOCK. In addition, should one forget to push the BRAKE switch to LOCK at the end of an operating period, pushing the POWER switch to off automatically locks the brake on the rotator. Both the BRAKE and POWER switches are illuminated, so it is difficult to ignore them.

In addition to the operating convenience provided by the digital readout, the brake-release feature offers a degree of safety and protection. This feature, in which the operator independently activates the brake, is designed to reduce the effects of torsional forces on a tower caused by instant deceleration when a large antenna is brought to a stop. After a few attempts, one is able to release the ROTATE lever slightly before the desired antenna position is reached, thereby permitting the antenna to coast to a stop. The desirability of coasting a large antenna to a stop before brake application is an idea that appears to have escaped the minds of most rotator manufacturers. Here is one manufacturer who has heard and answered this need with the HDR-300.

The manufacturer does not recommend operation of the rotator at its rated capacity in winds above 50 mi/h (80.5 km h). However, Telex/-Hy-Gain says it is possible as long as certain precautions are taken. (1) Always allow the antenna to coast to a stop before locking the brake. (2) Always keep the brake locked when the rotator is not being turned. (3) Avoid rotating near the ends of rotation. Do not depend on the limit switches to stop rotation of a large antenna in strong winds. The manufacturer also suggests that the above precautions be followed when rotating even medium-size antennas in light winds. The life of the rotator will be prolonged.

The HDR-300 is manufactured by Telex/Hy-Gain, 8601 Northeast Highway 6, Lincoln, NE 68505. Price class: $500. — *Lee Aurick, W1SE*

AEA KT-1 KEYER/TRAINER

☐ Do you avoid reading keyer reviews because some arrogant cw hotshot starts off by telling you how easy it is to rag chew at 40 wpm when you have trouble at 10 wpm? I'm not a cw hotshot; in fact, I struggled to get through the FCC code exams. My first three contacts were so disastrous that I dropped out of the hobby for five years! This wouldn't have happened had the KT-1 been available.

Besides being a full-feature keyer, the KT-1 is also a trainer. The trainer has approximately 24,000 characters stored in its memory. The operator can choose from among 10 fixed and 1 random starting points. So far it doesn't sound much different than a tape recorder with a cassette, but there is more — a lot more! I suspect that the designer had flexibility in mind as the utmost consideration when the circuit was developed.

The trainer can be set up to "spit out" the code at one constant speed or to start at a slow speed and build up to a fast speed (starting speed, ending speed and duration of speed change are all user programmable). The user has the option of choosing "slow" or "fast" code. Slow code employs the standard timing of dits, dahs and spaces, at whatever code speed.

"Fast" code is also known as the Farnsworth method. Characters are generated at a higher speed, but the spacing between letters is increased so that the overall speed is slow. For example, on speeds below 13 wpm, W1AW generates the characters for code practice at a 13-wpm rate, but the spacing between the characters is increased so that the rate of words per minute actually sent is that specified by the schedule. Above 13 wpm, W1AW sends code practice using slow code. The KT-1 user can

Fig. 4 — On first inspection, the outward appearance of the KT-1 gives no indication of its capabilities. Inside this 1-3/4 × 2-1/2 × 5-inch (44 × 63 × 127 mm) housing hides a tremendous amount of electronic sophistication.

program it for any speed up to 99 wpm, which means that those of us in the midrange of ability can use the Farnsworth method to help us increase our speed more rapidly. Try to find a tape recorder that will do that!

I don't know if everyone struggling to learn the code or increase speed (for a code test?) will find the KT-1 helpful, but I certainly have. For years I have been listening to cw hotshots talk about hearing characters and words instead of individual dits and dahs; I had been pretty skeptical that I would arrive at that blessed condition. Thanks to the KT-1 and the Farnsworth method I am getting there. My procedure has been to set the finishing speed (that sets the rate at which the character is generated) at 35 wpm and the beginning speed at 10 wpm. (Don't get me wrong; I wouldn't classify myself as a cw hotshot now, but I am a lot better than I was.)

The keyer portion has all the features (and more) that we expect in a modern piece of equipment. It can be used as an iambic keyer with dit-only memory, dah-only memory and with or without both. For anyone so inclined, the dah input can be turned into a straight-key input, which allows the KT-1 to be used as a straight key or a bug. At initial power up, the dit-space ratio is set at 1.0 to 1. The user can program the KT-1 for any ratio between 0.5 and 1.5 to 1. The dah-space ratio is set to 3.0 to 1 at power up, but the user can select any ratio between 2.0 and 4.0 to 1.

Even though I am exposed to miniaturized, computerized equipment on a daily basis, it never ceases to boggle my mind when I see so much crammed into something so small! The KT-1 has two ICs (about 23,000 transistors in one), six diodes and five discrete transistors. The only knob on the KT-1 is a dual function ON/OFF and VOLUME control for the sidetone (the tone frequency is selected from the keyboard). All programming is by means of the 12-key pad. Some of you may suspect that the KT-1 is difficult to operate because of all the features that I have described as "programmable." Just the opposite is true. The KT-1 is simple to use after you read the manual. AEA has devoted enough time and effort to produce a manual that is complete, accurate and easy to understand. A few minutes of off-the-air practice should be enough to provide most any amateur enough "programming skill" to operate the KT-1 successfully.

The KT-1 has been designed with a bipolar keying output that will handle either positive or negative keying without modification. It should work with any modern transmitter. I found it quite enjoyable to unplug the KT-1 from my Drake TR-4C and then plug it into a Kenwood TS-130 without having to alter anything. The operating manual mentions that there are a few transmitters that the KT-1 will not key. A simple modification (which involves shorting out one of the diodes in the keyer) will overcome this difficulty. This modification will make the keyer inoperable for negative keying; however, it should never be necessary to resort to an external reed relay with the KT-1, as is the case with some other keyers on the market.

The KT-1 should be of interest to those amateurs (and would-be amateurs) who are struggling to improve their code speed, those who teach Amateur Radio courses and those looking for an extremely versatile keyer. Price class is $130. Additional information on this keyer and other products can be obtained from AEA, Inc., P. O. Box 2160, Lynnwood, WA 98036. — *Peter O'Dell, AE8Q* QST

New Books

☐ *From Beverages Through OSCAR — A Bibliography,* by Rich Rosen, K2RR/∅. Published by Rich Rosen, 6043 W. Maplewood Dr., Littleton, CO 80123. Softcover edition or topical booklet form, 8-1/2 × 11 inches, 620 pages. Book price is $24.95 plus $2 handling; individual sections by subject are $2 each plus 50 cents handling.

No longer is it necessary for the amateur or engineer to become buried in a landslide of assorted publications while looking for an obscure and forgotten article of interest. Rosen's in-depth bibliography spans in chronological form a 65-year period during which pertinent data were published in 288 different magazines, journals and publications — including the amateur and professional magazines.

This massive and complete bibliography references 30,000 articles on Beverage antennas, Yagis, receivers, preamps, oscillators, filters, ssb, lasers and 84 other subjects of amateur and commercial interest. Although the complete listing cost $20 and the individual sections sell for $2, one can also order larger subject volumes (up to 2378 entries) for $5 plus $1 handling.

The author invested four years of his spare time in compiling this enormous file of data and getting it into proper order for publication. He calls it a true "labor of love," and has read every issue of *QST* since 1945 (plus *CQ, Ham Radio, 73* and others) in order to gather the necessary information. Rosen is not only an active radio amateur, but is a professional engineer with extensive industrial experience. He is thus well qualified to have selected the best of the published material. Rosen also is editor of the trade journal, *RF Design,* of Denver, Colorado. This reviewer feels that Rosen's work will represent an important part of any active amateur's technical library. The review copy will be extremely useful here at League hq. — *Doug DeMaw, W1FB*

☐ *Interrelated Integrated Electronics Circuits for the Radio Amateur, Technician, Hobbyist, and CB'er,* by Robert M. Mendelson. Published by the Hayden Book Company, Inc., Rochelle Park, New Jersey, 1979. Softcover, 6 × 9 inches, 121 pages, $6.95.

If you fit into any one (or more) of the categories named in the title, you'll enjoy this project book. It contains approximately 25 different circuits, many of which are interrelated (note the title again) and can therefore be tackled in building-block fashion if desired.

Starting with six power-supply-oriented projects, the reader/constructor progresses to an audio mixer, two-tone generator, ssb detector, high- and low-pass filters and band-pass and notch filters using linear CMOS circuitry. Resistance boxes, a Wheatstone bridge and a passive attenuator are next. The instruments section contains information for, among others, a multipurpose rf detector, portable digital voltmeter, battery-operated frequency counter and a capacitance meter. Then, for fun and games, there are electronic dice and digital roulette.

My first impression of the book was its neatness. It's easy to read, with clear photographs and distinct parts overlays. It is evident that care was taken in the construction of the complete units shown in the photographs as they are all "well-groomed," presenting a professional appearance.

Circuit operation is discussed briefly in everyday language. While most circuits described are shown using pc-board construction (there's an appendix with complete pc layouts), there's no reason why perf-board construction cannot be used.

Be sure to read the preface pages, as they contain some general rules that apply to the construction of all the projects presented. Parts procurement should not be a problem, as most of the components are readily available. You'll note that most of the project enclosures appear to have come from the shelves of a Radio Shack outlet. Although the author cautions that some of the latest IC types may have to be obtained from an RCA distributor, this should not be a deterrent since there are some 300 such distributors nationwide. In all, I'd have to rate this book a cut above many of the project books I've seen. — *Paul K. Pagel, N1FB*

☐ *Modern Electronic Circuits Reference Manual,* by John Markus. Published by McGraw-Hill Book Co., New York, NY 10020. Hard-cover edition, 8-3/4 × 11-1/2 inches, 1238 pages including index, $44.50.

The John Markus name certainly must stand out in the minds of many amateurs and engineers, for Mr. Markus has been writing compendium-style circuit books for many years. I recall vividly how, during my early and lean years as a professional engineer, a gift of the John Markus/Vin Zeluff book, *Electronics for Communications Engineers* (McGraw-Hill 1952), became an important source of practical circuit information. By today's standards, the book would be a dismal addition to one's technical library, since it deals exclusively with vacuum-tube circuits (FETs that glow?). The current John Markus book treats practical circuits that employ semiconductors. It is perhaps the largest book of its kind that I have had the occasion to heft. One almost needs to have muscles in his shirt sleeves to carry this volume around: It weighs 8 pounds, 5 ounces!

Although the book seems to be aimed at the professional community of engineers and technicians, it is a radio amateur's cornucopia of practical data. The more than 3600 circuit diagrams have been harvested from the pages of *QST, Ham Radio, Wireless World, CQ* and *73.* Other material has been gleaned from such publications as *Byte, Kilobaud, EDN, Electronics* and other trade journals. All manner of practical circuits are represented, including rf, audio, digital and logic. There are even QRP rigs, burglar alarms, TV circuits, test equipment and temperature-control circuits. You name it; Marcus has it!

The only original writing found in the book is seen in the captions, which in capsule form tell what each circuit is and where to find the original article. The complete address of each of referenced publication is given at the beginning of the book.

If you have $44.50 to invest in an interesting and useful reference book, this may be the next publication to add to your Amateur Radio library. Better get a small red wagon to pull it in when you go from one point to another! — *Doug DeMaw, W1FB*