PRODUCT REVIEW

ACOM 1010 HF Linear Amplifier

Reviewed by Mark Wilson, K1RO
QST *Product Review Editor*

By now most everyone is familiar with ACOM, the Bulgarian company that hit the ground running with the top-of-the-line model 2000A legal-limit autotune HF amplifier in 1999 and followed up a few years later with the model 1000, a manually tuned 1 kW amplifier for 160 through 6 meters. Both of these amplifiers have been reviewed favorably in *QST*.[1,2]

You might think that ACOM's next amplifier would be an entry in the popular 1500 W manually tuned category. After all, these workhorses are found in ham shacks across the nation. Sorry, no. ACOM's newest model, the 1010, goes in a completely different direction. Upon reflection, that's not particularly surprising. Remember, this is the company that sent a high dollar legal-limit autotune amplifier as its *first* entry in the US market.

You Can Take It with You

As noted in the ACOM 1000 review, there is a market for smaller, more portable amplifiers that can be whisked off to a distant land for a DXpedition or contest operation. The 1000 found its way into quite a few Pelican cases, but it's still big enough and heavy enough that hauling it around gets old after a while. The 1000 was also a hit at home. Not every home station needs the legal limit, and some just don't have the space or power source required.

ACOM's new 1010 is an amplifier that's been put on a serious diet. At just under 40 pounds, it makes the 49 pound 1000 seem porky. It's about half an inch wider than the 1000, but ACOM shaved 1.3 inches off the height and 1.6 inches off the depth. The 1010 is also about $900 less than the 1000 at current pricing. That would go a long way toward a compact transceiver or some antennas to round out your portable station. The 1010 reminds me of a Heath SB-200 I once owned, but with modern capabilities and features.

I know, I know. We grew up thinking *heavier is better* when judging RF amplifiers. That's fine as long as you don't have to move the beast once it's in place on your operating table. So what does the 1010 give up in exchange for its svelte packaging and lower price? The short answer is about 300 W output, full break-in CW (QSK) and 6 meter coverage. The 1010 uses the Svetlana 4CX800A (GU74B), a popular and inexpensive ceramic/metal tetrode with 800 W plate dissipation. The 1000 uses that same tube to deliver 1000 W output on 160 through 6 meters, but the 1010 is scaled back to 700 W PEP for SSB and CW and 500 W for RTTY or other continuous carrier modes on 160 through 10 meters. Like the 1000, the 1010 uses a broadband tuned input circuit and a π-L output circuit that works over a broad range (SWR up to 3:1). Unlike the 1000, there is no provision for QSK, but the 1010 adds built-in switching for two antennas — a fair trade in my book.

The 1010's front panel includes the usual TUNE and LOAD controls and BAND switch. There's a power switch and push buttons for OPERATE/STANDBY and RTTY (to lower the

Table 1
ACOM 1010, serial number 050160

Manufacturer's Specifications	Measured in the ARRL Lab
Frequency Range (US units): All amateur frequencies, 1.8 to 30 MHz.	As specified.
Power output: 700 W PEP or 500 W continuous carrier.	As specified for SSB and CW.
Driving power required: 50 to 70 W for rated output.	60 W typical.
Input SWR: Less than 1.3:1.	As specified.
Output matching: Up to 3:1 SWR.	Not tested.
Spurious signal and harmonic suppression: 50 dB below rated output.	53 dB. Meets FCC requirements.
Intermodulation distortion (IMD): –35 dB.	3rd/5th/7th/9th order (worse case): –37/–53/–56/–62 dB PEP.
Primary power requirements: 85-132/170-264 V ac (in eight user settable taps).	
Size (height, width, depth): 5.9 × 16 × 12.4 inches; weight, 39.7 pounds.	
Typical retail price: $2340.	

Bottom Line

This compact and reliable 700 W, 160 to 10 meter amplifier is sized for traveling, but it's a good solution for your home station too.

[1]D. Sumner, "ACOM 2000A HF Linear Amplifier," Product Review, *QST*, May 2000, pp 64-66. *QST* Product Reviews are available on the Web at **www.arrl.org/members-only/prodrev/**.
[2]M. Wilson, "ACOM 1000 HF + 6-Meter Linear Amplifier," Product Review, *QST*, Nov 2002, pp 70-72.

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power for continuous operation). Antennas are selected by a push button labeled A1 A2. All metering, tuning and status monitoring is handled by rows of LEDs.

The rear panel includes a phono jack labeled KEY IN for the TR key line from your transceiver (ground to transmit). SO-239 connectors handle RF INPUT, ANT1 and ANT2. The ac power cord is detachable, something I've not seen on a power amplifier before. That makes packing easier, and if you travel a lot you can make up power cords with a variety of connectors for quick swaps.

Metering and Protection

Although the 1010 doesn't have analog meters or fancy LCD panels, quite a bit of information is available on the front panel. During normal operation, the top row of LEDs displays peak forward power. The range is 50 to 800 W with 50 W resolution. Below that, a shorter row of LEDs shows 30 to 240 W reflected power, with 30 W resolution.

Four other LEDs to the right of the reflected power indicators are labeled G1, G2, IP and F. The first three illuminate to let you know if you exceed the safe limits for control grid, screen grid or plate current. When these light, you need to reduce drive power or touch up the tuning controls.

If you continue to operate the amplifier with excessive grid or plate current, or with excessive reflected power, the red F LED lights up and the amplifier switches to the standby mode. The 1010 returns to the operate mode automatically after a few seconds, but it will switch to standby again if the problem persists.

Pressing the OPER and RTTY buttons simultaneously switches the upper row of LEDs to the service mode. In the service mode, the LEDs are used to observe approximate values of control grid current, screen grid voltage and plate current (plate plus screen grid). The service mode indicators are intended for troubleshooting and checking operating parameters, not for normal operation. As described in the next section, you don't need to watch the plate current during tune-up or on-air operation.

Portable environments can be hard on equipment, but the 1010 is prepared. The amplifier can work with poor antenna systems presenting up to 250 W reflected power. The ac power supply tolerates low line voltage and voltage spikes over a wide range, as well as short duration (100 ms) RF spikes from the transceiver. The amplifier incorporates TR sequencing, and inrush current is limited when the power is turned on.

Putting the 1010 to Work

The 1010 ships in a single carton with the tube and transformer installed. Units are normally set up for 240 V ac operation, but you can change that to 100, 110, 120, 200, 210, 220 or 230 V ac by moving jumpers on a PC board. Some soldering is required, but it's not difficult and ACOM provides color photos of the jumper locations for each setting. You'll need to provide a suitable power plug for your station, readily available at your local hardware store.

Figure 1 — Inside the ACOM 1010.

As required by FCC rules, likely changing as we go to press, amplifiers destined for the US have 10 and 12 meter operation disabled. If you contact ACOM with proof of your amateur license, they will supply instructions for enabling operation on these bands. It's not difficult but requires removing the cover.

Hooking up the 1010 to my transceiver and antennas was straightforward. The manual recommends letting the amplifier sit for a few hours after unpacking it or moving it from a cold place to a warm place. The concern is that condensation may form inside the amplifier and cause high voltage arcing.

When you first press the power switch, the amplifier performs some self-testing and the OPERATE LED flashes green during a 150 second warmup period. Once the LED stays green the amplifier is ready for operation.

The tune-up process is similar to the ACOM 1000, making use of a "true resistance indicator" (TRI) circuit rather than the more traditional method of dipping the plate current and peaking the output. First preset the LOAD and TUNE controls according to a chart in the manual. Apply 10 to 20 W drive and adjust TUNE for maximum output power. Next, watch the TRI indicator (three LEDs above the LOAD knob) and adjust LOAD until the green LED in the center illuminates. If the yellow LED on the left side of the TRI display lights, turn the LOAD control to the right. If the one on the right side lights, turn LOAD control to the left.

When just the green LED in the center is lit, increase drive power until the power output is 700 W or the desired level. Then touch up the TUNE control for maximum output and, if needed, use LOAD to center the TRI indicator again. In practice, the tuning tracked very well and required only minor adjustments at full power.

With a little practice, tune-up is a snap. After years of dipping the place current with other amplifiers, I just needed a little mental reprogramming to get used to the procedure. For the most part tuning ranges were broad and smooth. I found that the LOAD control required a delicate touch on 10 meters, but the 1010 is forgiving of momentary misalignment.

Instruction Manual

The 18 page instruction manual is clear and well illustrated. It includes a lot of information on using and caring for the 1010. There's a section detailing theory of operation,

ACOM 1010: From (K7)C to Shining (WRT)C

JAN-ERIC REHM, SM3CER

Figure A — Chris, KL9A, operating at PW5Q with the compact ACOM 1010 amp located between the run (left) and multiplier (right) stations. Aluminum foil on the shelf provided a temporary RF ground for the amp and filters.

The ACOM 1010 amplifier was an important part of both the K7C DXpedition to Kure Atoll (**www.cordell.org/KURE/**) in September and October 2005 and my recently completed WRTC 2006 operation in Brazil (**www.wrtc2006.com**) as PW5Q with Chris Hurlbut, KL9A. In both cases, the amplifier gave a very good account of itself and proved to be reliable and tolerant. Even though operated in conditions stressful to the amplifiers (hot and sandy on Kure) and to the operators (quick setup and new antennas for WRTC) there were no failures.

The ACOM packs a lot of punch in a reasonably sized package. For DXpedition travel, the amplifiers fit in a single shipping case and could be easily transported. The amp meets the size and weight requirements for checked baggage, even with a shipping case. The 700 W output is only half an S-unit down from a full gallon. This power level proved to be perfectly sufficient for controlling pileups from Kure and starting pileups from Brazil. Over the 12 days of nearly continuous operating from broiling tents on Kure, the amps put out full power at all times.

Tuning the ACOM is greatly assisted by the LOAD "centering" indicators (TRI feature) and the LED forward/reflected power output displays. At WRTC, quick band changing was very important. After we marked the TUNE and LOAD presets on the front panel, it was a simple matter to switch and touch up the LOAD control in a few seconds. The handful of times we transmitted on the wrong antenna or did some other dumb thing, the protective circuitry prevented any damage to the amp, taking it off-line and reactivating it a few seconds later.

Anyone who has set up a portable or temporary station knows that compromise antennas are often required or the circumstances of installation may cause uncomfortably high SWR at times. The ACOM's ability to tune up and operate with a significant amount of reflected power (up to 250 W) was important at both K7C and PW5Q. We did not have to spend valuable time trying to move an antenna's low SWR point — we just operated!

While at home I'm an enthusiastic low-power or QRP operator, on contest or DXing expeditions it's important to put out a strong signal to be heard clearly. The ACOM 1010 allows you to accomplish just that without breaking the bank or your suitcase arm. — *Ward Silver, NØAX*

as well as a simplified schematic diagram. According to the manual, detailed schematics are available from ACOM upon request.

The manual offers quite a few warnings and cautions, and they're well worth reading to avoid hurting the amplifier or yourself. The only thing I found a little surprising is in the Tube Replacement section. The manual notes that tube replacement is a "complex and potentially dangerous operation that involves adjustment of the plate idling current. This should not be attempted by the user."

Parting Thoughts

The ACOM 1010 performed very well in my home station. The 1010 seems to loaf along at its rated 700 W on SSB/CW and 500 W on RTTY. I'd rate the fan noise as average. Although it isn't bothersome, it is more noticeable than other ACOM amplifiers I've used.

At first I was a bit skeptical of using rows of LEDs rather than analog meters for tuning and operation. With the 1010 tuned up according to the procedures outlined in the manual, I used the service mode to check grid current and plate current. The parameters were always within the normal ranges outlined in the manual, so after a while I realized that I should just operate and rely on the LEDs and protection circuitry to let me know if anything runs amok. When one of the yellow LEDs on the TRI indicator starts to flicker, it's time to touch up the LOAD control or readjust the antenna tuner.

Of course the 1010 really shines away from home. *QST* Contributing Editor Ward Silver, NØAX, describes his experiences in the sidebar "ACOM 1010: From (K7)C to Shining (WRT)C."

US Distributor: ACOM International, 4 Marc Rd, Medway, MA 02053, tel 508-533-7665; fax 508-533-7707; **www.hfpower.com**.

ICOM IC-91A Dual Band Handheld Transceiver

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Small enough to fit in your coat pocket, the IC-91 comes in two flavors. The model reviewed is the IC-91A, a traditional analog dual band handheld FM transceiver with 5 W of power on transmit, a wideband receiver and a host of other features. ICOM also offers the IC-91AD, which incorporates D-STAR digital voice and data features. An IC-91A can be upgraded to a D-STAR capable 'AD version with the optional UT-121 digital unit. See the June 2005 Product Review column for more information on the D-STAR system.[3]

[3]W. Silver, "D-STAR Digital Voice and Data — An Overview," Product Review, *QST*, Jun 2005, pp 67-69. This column also includes testing of the UT-118 digital voice module with an ICOM 2 meter handheld. *QST* Product Reviews are available on the Web at **www.arrl.org/members-only/prodrev/**.

Charge it Up

Like most modern handhelds, the IC-91A uses a compact, high capacity lithium-ion battery pack. A full charge for the 7.4 V, 1300 mAh battery pack takes about 6 hours with the included BC-167A/D wall charger. If you want something quicker, try the optional BC-139 drop-in charger for a full charge in about 2.5 hours. The battery also charges whenever the radio is connected to a 10 to 16 V dc source, and ICOM offers