

## The ICOM IC-275 All-Mode 2 Meter Transceiver

BY DAVE INGRAM\*, K4TWJ

**E**volutions and expansions are a natural part of our amateur radio world, and the unit featured in this CQ review is a prime example of that situation. Our migration toward upper spectrum bands continues to gain momentum, with 2 meters being the center hub of activity. FM and repeater operations "kicked off" this evolution, then the use of SSB, globe spanning/Phase III OSCAR satellites, and interlinked Packet operations set the band flourishing with action 24 hours a day. The more this trend continues, the more appealing our VHF bands become, and the greater significance all-mode transceivers such as ICOM's new IC-275 hold for today's amateurs.

Measuring 3½"H x 9½"W x 10"D, the IC-275 is size-identical to ICOM's popular IC-735 HF transceiver. Also, like the IC-735, there's a massive heat sink within the cabinet's rear area. The cabinet and front panel are flat black, with chrome switches and a brightness-adjustable amber display adding an air of sophistication. The main tuning knob is drag-adjustable, perfectly balanced, and fitted with a rubberized grip for a professional feel. The unit's bottom left row of front controls fit flush with the cabinet, but they spring out for easy adjustment when needed.

There are actually two variations of this transceiver. The IC-275A is a 25 watt output unit with a built-in AC supply. The IC-275H is a 100 watt output unit that requires an external 20 amp, 13 volt DC supply such as ICOM's PS55. Both IC-275 versions include a 6-pin rear connector like those on the IC-730, 735, 745, 751, 271, etc., for DC power. This "plug compatibility" is quite handy for "instant upgrading" or "switch hitting" in the mobile setup. One day you can operate HF, the next day VHF, etc. Nice!

It's difficult to pick the IC-275's most outstanding aspect, but its frequency coverage is a good starting point. The unit

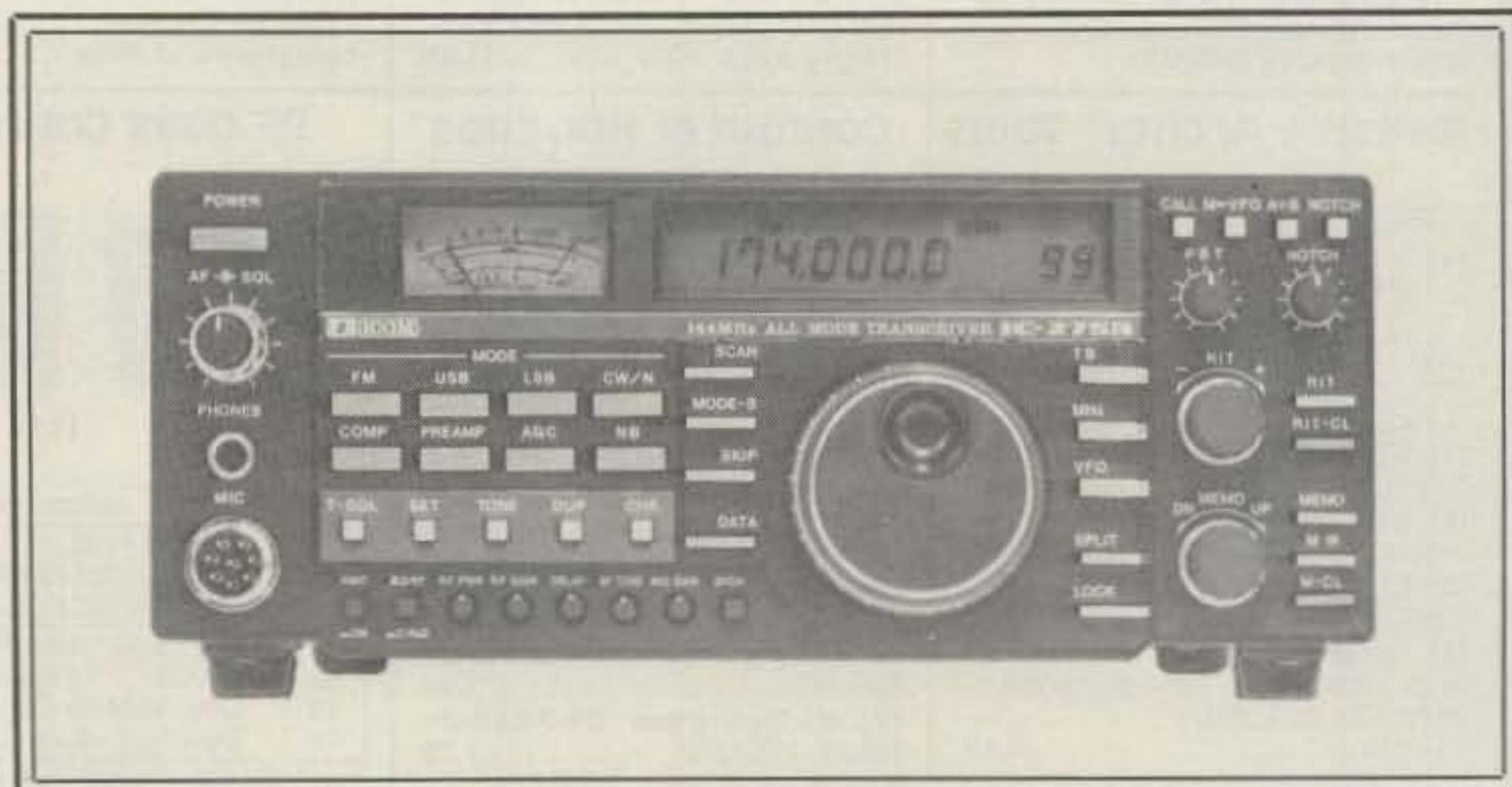


Fig. 1— The ICOM IC-275 all-mode 2 meter transceiver. Unit is quite compact and ultimately deluxe.

receives 138 to 174 MHz, which means you can tune all of 2 meters, the public-service frequencies, mobile phones, pagers, utilities, some weather satellites, plus nationwide NOAA weather stations in the 162 to 163 MHz range. Visualize using this rig in your car during an emergency or while traveling. You could call for help, shift frequencies, and monitor ambulance, police, fire, wrecker, etc. The IC-275's transmit range of 140.0 to 150.0 MHz should also appeal to MARS and CAP enthusiasts interested in deluxe performance. If you're considering computer control, there's a serial RS-232C connector on the IC-275's rear panel. It uses a 1200 baud data rate and allows control of frequency, mode, VFO (A or B) and memory selection via a home computer. Additional IC-275 specifications are included in Table I.

### Special Features Galore!

The transceiver's dual VFOs are complemented by 99 tunable memories that store frequency, transmitter offset, and PL tones. Memories are selected by an indented action "Memo" knob. The main

tuning knob swings any memory or either VFO across the IC-275's full frequency range. Remote tuning is also provided with the unit's mike "UP/DOWN" buttons. The overall results are similar to 99 VFOs that remember favorite spots when initially selected, plus two "general-purpose" VFOs. Another attraction is the "call" channel. Program it with your favorite frequency, offset, and PL tone, press the button, and bingo, you're there. The unit also includes 32 PL tones, and their actual subaudible frequency (in Hz) can be displayed on the dial's readout. Standard repeater offsets of ±600 kHz are selected by pressing the "DUP" button. Any odd offset is available by pressing the "SET" button (offset then appears in display), rotating the main tuning knob, then pressing "DUP" again to store the preferred offset for that VFO or memory.

A fascinating variety of scanning methods are included in the IC-275. It will scan the full (138 to 174 MHz) spectrum, or you can program limits into special memories P1 and P2. It will also scan memories (non-programmed memories are skipped), or scan by a selected mode. Constantly busy memories can also be scan-locked

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out via a front switch. A newly designed high-speed Direct Digital Synthesizer and PLL unit operate as a double-PLL system to produce super-fast scanning and T/R operation. The latter aspect is also beneficial in Packet radio operations.

Pressing the front-panel "DATA" button disables the IC-275's front mike input while allowing rear DIN connector input for Packet operations and providing a 5 millisecond PLL lockup time—a clever and convenient idea.

The IC-275's performance "trump card" is in its SSB and CW department. Unique features here include Passband Tuning, IF Notch, speech processor, transmit and receive audio tone controls (they function on all modes), noise blanker, semi or full CW break-in, continuously variable RF output control that functions on all modes and independent of the mike gain, and a multifunction meter that includes FM "center tuning" and SWR bridge operation.

### Circuitry Overview

As I explained in my September and October 1985 CQ "World of Ideas" columns, the most effective and unbiased way of evaluating any unit's "innards" is through a brief block-diagram study. The IC-275's block diagram is thus shown in fig. 3. The rig may initially appear complex, so let's simplify it. We'll first point out that the receiver's "front end" and transmitter's "final" stages have been broadbanded so exact frequency/memory selection, stability, T/R timing, etc., are determined by a single "local oscillator" signal from the PLL unit (bottom middle of diagram). After that process, other signal-handling stages in the IC-275 are fixed in frequency. Overall, the multi-stage PLL unit can be visualized as a VCO that's controlled by the CPU in its adjacent "logic/front unit" (bottom left of diagram).

Frequency-tuning the IC-275 involves rotating the main knob/main sensor, which chops an LED beam via its flywheel and sends beam interruption signals to a decoder and dial pulse counter. The counter's information is used along with the CPU's RAM/ROM-stored data to establish the PLL's output frequency. If that description was too complex, merely think of the logic/front unit as the "tuner" for the PLL unit, and the PLL unit as a local oscillator for the receiver and transmitter. Its output moves from the 127.25 BPF (middle bottom area) to Q8, the LO amp.

Now let's trace the IC-275's receive path (a pocket magnifier is helpful in circuit study). First notice that activating the front-panel "PREAMP" switch applies 13 volts to the antenna connector for powering the optional mast-mounted preamp. Now follow incoming signals from the antenna through the LPF, into the attenuator, through the BPF, and to the RF ampli-

• Frequency coverage	: U.S.A. version	138.000 ~ 174.000		
	Europe version	144.0000 ~ 146.0000MHz		
	Australia version	144.0000 ~ 148.0000MHz		
	*Specifications guaranteed from 143.8000 to 148.2000MHz.			
• Number of memory channels	: 99 channels plus P1, P2 and CALL CHANNEL			
• Antenna impedance	: 50Ω unbalanced			
• Frequency stability	: ±5ppm (0°C ~ +50°C)			
• Power supply requirement	: U.S.A. version	117V AC ±10%		
	Europe, Australia versions	240V AC ±10%		
	All versions	13.8V DC ±15%		
• Current drain (at 13.8V DC)	: Transmitting	At 25W output	Approx.	6A
		At 2.5W output	Approx.	3A
	Receiving	At maximum audio output	Approx.	1A
		Squelched	Approx.	0.9A
• Dimensions	: 241(244)mm(W) x 95(108)mm(H) x 239(295)mm(D)			
	Bracketed values include projections.			
• Weight	: 6.2kg			
• Usable temperature range	: -10°C ~ +60°C			

### 14 - 2 TRANSMITTER

• Emission modes	: FM (F3E), SSB (J3E), CW (A1A)
• RF output power	: 2.5 ~ 25W continuously adjustable
• Modulation system	: FM Variable reactance frequency modulation
	SSB Balanced modulation
• Maximum frequency deviation	: ±5kHz (FM mode)
• Spurious output	: More than 60dB below peak power output
• Carrier suppression	: More than 40dB below peak power output
• Unwanted sideband	: More than 40dB down with 1000Hz AF input
• Microphone impedance	: 600Ω

### 14 - 3 RECEIVER

• Receive system	: Double-conversion superheterodyne
• Receive modes	: FM (F3E), SSB (J3E), CW (A1A)
• Intermediate frequencies	: 1st 10.75MHz (FM, SSB) 10.7491MHz (CW)
	2nd 455kHz (All modes)
• Sensitivity	: FM Less than 0.18μV for 12dB SINAD
	Less than 0.25μV for 20dB NQL
	SSB, CW Less than 0.1μV for 10dB S/N
• Squelch sensitivity	: FM Less than 0.1μV
	SSB Less than 0.56μV
• Selectivity	: FM 15.0kHz/6dB 30.0kHz/60dB
	SSB, CW 2.2kHz/6dB 4.2kHz/60dB
• Spurious response rejection	: More than 70dB
• Audio output impedance	: 8Ω
• Audio output power	: More than 2W at 10% distortion with an 8Ω load
• RIT variable range	: ±9.99kHz

Table 1—General specifications of ICOM's IC-275 transceivers.

fier, Q7. This 3SK121 is a GaAsFET, and its high gain and low noise figure really make the IC-275 a hot performer. After the next BPF there's a high dynamic-range balanced mixer consisting of two 2SK125's (Q1, Q2). These gems provide exceptionally low intermod in the IC-275. The resultant 10.75 MHz-converted signal is then passed to FL1, noise gated,

and moved through Q10 and on to FL2 or FL4, depending on the selected mode.

Take a second look at the noise gate's circuitry. Sampled noise pulses go through two amplifiers before detection (and deriving its own AGC), then they're detected, amplified, and used to "gate off" signal flow from FL1 to Q10 during the precise time of a noise pulse.



Fig. 2—Overview of the IC-275's main display indicates readout of frequency memory, VFO, mode, scan, etc.

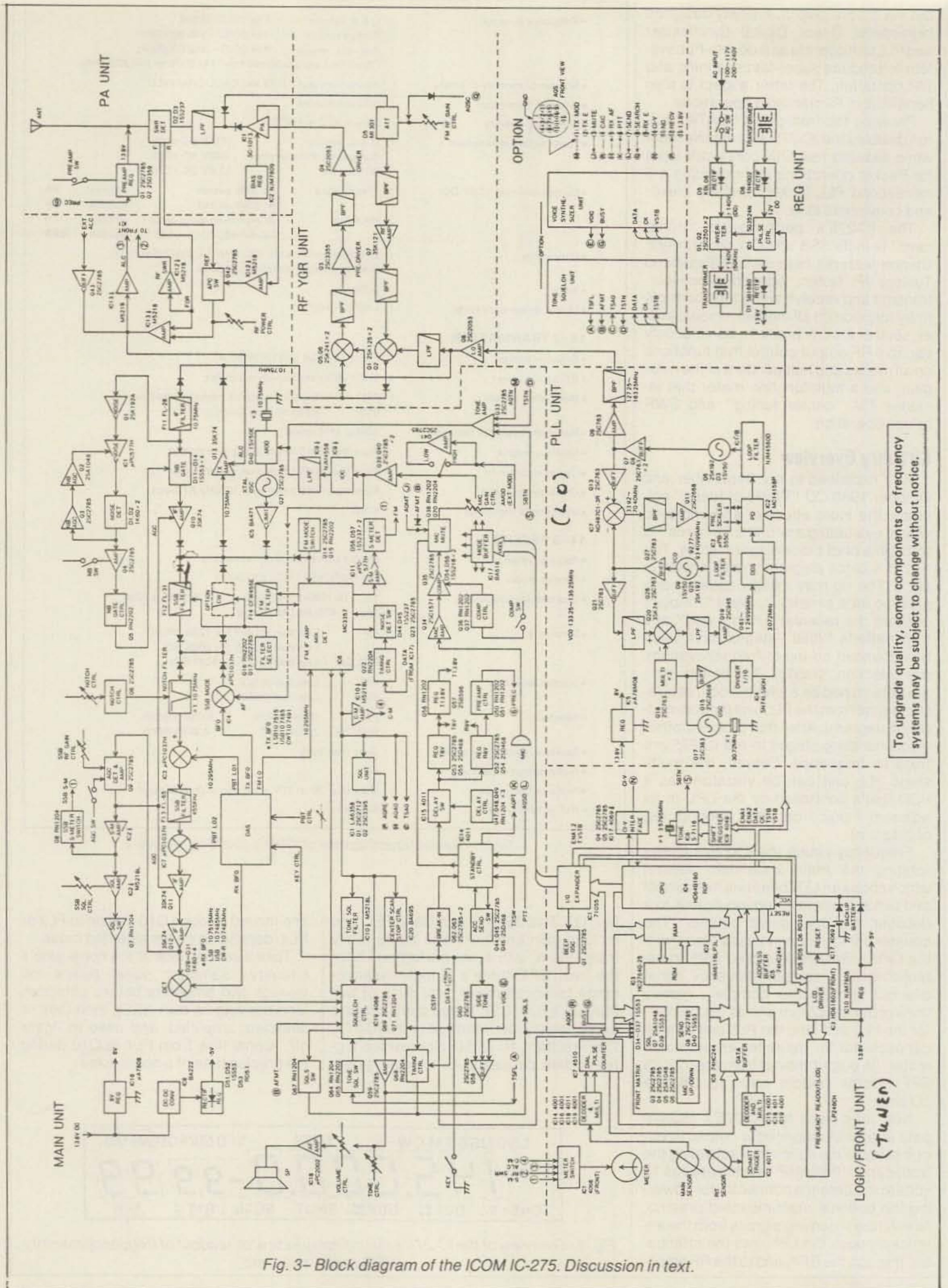


Fig. 3—Block diagram of the ICOM IC-275. Discussion in text.

To upgrade quality, some components or frequency systems may be subject to change without notice.

Signals from Q10 can take one of three paths according to mode. The SSB route continues through FL2, the IF notch, SSB filter with its twin mixers (that establishes passband tuning), Q11 and Q12, the detector, squelch, and on to the speaker. Going back to Q10, FM signals go down, through IC6, through FL4, the squelch, and on to the speaker.

Tracing the transmit path begins at the mike (look in diagram's center), continues through Q34, Q35, and on to Q39 and Q40. At that point the SSB path "makes a left turn" (follow dotted line) and moves into the "SSB Mode" mixer/balance modulator. The DSB signal then moves through FL2 (exit one sideband, to produce SSB), Q13, Q5/Q6 (it's then up-converted from a 10.75 MHz to a PLL-heterodyned 2 meter frequency), on through Q3, Q4, IC1, and to the antenna. Returning to Q39 and Q40, FM-mode audio con-

tinues "straight ahead" to D40, the crystal oscillator's FMing modulator. That resultant signal then "makes its way" up to Q13 and follows the previously outlined RF path to the antenna. I would like to cover several of the diagram's additional points, but this review might become too lengthy or boring. Drop me a letter with your opinion. Do you prefer or dislike our "technical rap"? Should it be longer or shorter?

### On The Air

Although the IC-275 is quite elaborate, it's surprisingly easy to operate. The first time I used it was while mobiling home (why wait?), and I was chatting on local repeaters while listening to NOAA weather forecasts within two minutes of turn-on. Installation was a snap; my low band IC-735 was moved to the car's rear seat, the IC-275 was slipped into its front posi-


tion, and the 2 meter antenna was connected. After dialing a local repeater, I pressed the "DUP" button and bingo—600 kHz offset. I then clicked out the recessed mike gain, set it via off-air reports, and the fun began. Using the other VFO, I took a spin through the commercial bands to monitor a few mobile 'phones and suburban police (they still use VHF in this area, although metro police have moved to 460 MHz). If you haven't tried that monitoring during the day, you've missed some good chuckles. The IC-275's remote tuning via mike up/down buttons is great for mobiling.

The IC-275 quickly became a favorite little gem at the home QTH, especially for OSCAR satellite operations. The passband tuning works like a champ. Its center position gives full SSB bandwidth, while tuning it to either side shifts IF response and narrows the passband to reduce interference and noise. QRM isn't a big problem on 2 meters SSB (yet), but a bandwidth-optimized IF always improves signal-to-noise ratios and peaks receiver response. I also use the IF notch to further reduce noise, and the result is a great VHF DX or contest rig. If you're really serious in these areas, you'll want to add the rig's optional AG-25 mast-mounted preamp.

Considering the IC-275's fast T/R time also makes it attractive for 2 meter moonbounce activity. A stack of four Cushcraft "Boomer" antennas, some low-loss coax, and a healthy linear amplifier should swing that activity in fine style. Several moonbounce tests are conducted each year in which BIG setups with large antennas offer opportunities for basic-equipped amateurs to experience this unique mode. Their signals can usually be copied (and often worked) with a good multimode rig and 19-element Yagi.

Being active on Packet (and writing a book on Packet radio), I naturally connected the IC-275 to my computer setup. Its action was again smooth and fast. No hassles with TXDELAY or RETRY counts; just set the TNC's output level and enjoy.

Several other IC-275 operating features warrant mention. The built-in SWR bridge is great, and it beats "digging out" a separate unit for antenna checks. Ninety-nine memories are grand. You can use 15 for utilities, 15 for public services, 15 for SSB, 20 for OSCAR, 4 for weather, etc. The IC-275 and a mating 2 meter antenna are small and light enough to go anywhere you go—mobiling, vacationing, anything. It's a double handful of the "good life."

The IC-275 is supported by a full line of complementing accessories. They include the AG-25 preamp, UT-36 voice synthesizer, UT-34 tone squelch, CT-16 satellite interface/rig tracking unit, and FL-83 250 Hz CW filter. For more information, contact ICOM America, Inc., 2380 116th Street, S.W., Bellevue, WA 98004. 

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