

IC-M424

HF Marine Transceiver

Practical Sailor Review

“Feature Loaded High-end VHF’s”

by Frank Lanier

Testers put seven top-of-the-line VHF’s through bench testing to determine which ones offer the most value for sailors. Icom’s new M424’s many features are reviewed and analyzed.

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Feature Loaded High-end VHF's

Fixed marine radios priced at \$300-plus offer plenty of extras.

The high-end, fixed-mount marine VHF radios that *Practical Sailor* recently tested go way beyond the basic capabilities offered by many of the moderately priced VHF units in our June 2012 review. Standard features for this group include integral high-wattage hailers, multiple remote microphone connections, and the capability to store more Maritime Mobile Service Identity (MMSI) numbers and inbound Digital Selective Calling (DSC) data. Bonus capabilities in these top-of-the-line radios include the ability to act as part of an intercom system, to display vast amounts of navigation data, and to produce automated fog signals at the touch of a button. (See "Features 411" for a glossary of features and functions.)

Taking advantage of all the features found in these top-of-the-line units often requires purchasing additional equipment—navigation data must be supplied by a compatible, onboard GPS/chartplotter; external horns must

be installed to use hailer and foghorn options; and so on. The radio itself ends up being the base for building a communications system, and buyers could spend hundreds more to fully capitalize on the capabilities of one of these multi-function marine VHF radios.

Sailors who rarely use the bells-and-whistles may be better served with one of the mid-priced radios we reviewed in the June article, and bluewater cruisers might want to consider buying two budget-friendly VHF's (one to wire to a mast-top antenna and the other to a stern-rail antenna) to add redundancy and a layer of security for about the same price as one of the high-end VHF's. However, if you're in the market for a primary VHF and have the budget for the added features, you will be well served with one of the seven following high-end radios.

WHAT WE TESTED

During our last look at high-end VHF's (*PS*, October 2009), the Standard Hori-

zon GX5500S took Best Choice honors and the company's GX5000S was named Budget Buy. For our 2012 evaluation, we tested seven fixed marine VHF's priced above \$300. Testers evaluated one radio from industry leader Standard Horizon, the Matrix AIS+ GX2150, and two (VHF 200 and VHF 300) from Garmin, a worldwide provider of navigation, communication, and information devices. Icom, a global manufacturer of marine and avionics communications products, provided three units for our test: the IC-M424, IC-M504A, and IC-M604A. We also tested the Ray 218 from Raymarine, a world leader in marine electronics for recreational boating.

All of the units in our test group are NMEA 0183 network compatible, and the two Garmin radios are also NMEA 2000 compatible. Each of the test products also featured microphones with various control options (from channel changing to channel scanning); some featured removable primary mics, which can be handy when troubleshoot-

AS VALUE GUIDE

HIGH-END FIXED VHF RADIOS

MAKER	GARMIN		ICOM		
MODEL	VHF 200	VHF 300 w/GHS remote handset	IC-M424 ✓	IC-M504A ✓	IC-M604A ★
PRICE	\$310	\$546	\$330	\$331	\$512
WARRANTY	2 years limited (Americas, Caribbean)	2 years limited (Americas, Caribbean)	3 years	3 years	3 years
NMEA COMPATIBILITY	NMEA 0183 & 2000	NMEA 0183 & 2000	NMEA 0183	NMEA 0183	NMEA 0183
MIC CONTROLS*	1,2,3	1,2,3,4,5,6,7	1,2,6	1,2,6	1,2,6
REMOTE MIC CAPABLE	Yes (3 total)	Yes	Yes	Yes	Yes (2 total)
FOOTPRINT (H x W x D)	4.65 x 7.56 x 6.42 inches	7.09 x 9.75 x 2.5 inches	3.23 x 6.46 x 4.72 inches	4.33 x 6.5 x 4.27 inches	4.34 x 8.65 x 4.31 inches
DISPLAY SIZE (H x W)	2.75 x 1.6 inch	1.63 x 1 inch (mic)	2.75 x 1.38 inch	2.75 x 1.38 inch	2.75 x 1.38 inch
SCRAMBLER	No	No	No	Yes	Yes
HAILER	25 watts	30 watts	10 watts	25 watts	30 watts
AUTO FOG	Yes	Yes	No	Yes	Yes
WATERPROOF	IPX7	IPX7	IPX7	IPX8	IPX7
TEST RESULTS					
AUDIO OUTPUT (@ 3 feet)	97 decibels	83 decibels	88 decibels	84 decibels	97 decibels
TRANSMIT POWER (high/low at 13.8 volts)	24.8 / 1.0 watts	21.8 / .85 watts	22.2 / .81 watts	22 / .80 watts	22.5 / .81 watts
TRANSMIT POWER (high/low at 11.8 volts)	24.2 / 1.0 watts	21.7 / .85 watts	21.5 / .76 watts	21.7 / .80 watts	21 / .80 watts
POWER DRAW (high/low transmit at 13.8 volts)	4.5 / 1.2 amps	4.3 / 1.1 amps	3.0 / .4 amps	3.7 / 1.1 amps	3.9 / 1.4 amps
POWER DRAW (high/low transmit at 11.8 volts)	4.7 / .5 amps	4.6 / .5 amps	3.0 / .3 amps	3.7 / .5 amps	3.5 / .7 amps
TRANSMITTER FREQUENCY STABILITY	Very good	Very good	Good	Very good	Excellent
RECEIVE SENSITIVITY	Very good	Excellent	Very good	Very good	Very good
DISPLAY RATING	Good	Good	Good	Good	Good
AUDIO QUALITY	Very good	Good	Good	Good	Excellent
TRANSMIT POWER STABILITY	Very good	Excellent	Excellent	Excellent	Good
COMMENTS	Position tracking; detachable mic; intercom (when coupled with GHS 10 mic); highest power output and highest amp draw.	Uses Garmin GHS handset for display and control; lowest power output and lowest audio output; best receiver sensitivity.	Lowest power draw, but worst frequency error of group (still within specs).	AquaQuake speaker draining feature, intercom (when coupled with optional Command Mic); rear mic connection; front panel mic not detachable.	AquaQuake; intercom (when coupled with Command Mic); mic detachable; only one with keypad.

★ Best Choice \$ Budget Buy ✓ Recommended

* Mic controls: 1= Push to talk, 2= Channel change, 3= Quick 16/9, 4= Distress key, 5= Volume adjust, 6+ High/Low power, 7=Other

	RAYMARINE	STANDARD HORIZON
	Ray 218 ★	Matrix AIS + GX2150 \$
	\$456	\$340
	3 years limited	3 years
	NMEA 0183	NMEA 0183
	1,2,3,6,7	1,2,3
	Yes	Yes
	3.84 x 7.79 x 7.06 inches	3.1 x 7.1 x 4.8 inches
	2 5/8 x 1 3/8 inch	2 7/8 x 1 3/8 inch
	No	Yes
	30 watts	30 watts
	Yes	Yes
	IPX7	IPX7
TEST RESULTS		
	89 decibels	88 decibels
	22.8 / .90 watts	23.5 / .81 watts
	22.8 / .90 watts	23.2 / .80 watts
	3.4 / .6 amps	3.8 / 1.2 amps
	3.4 / .6 amps	3.6 / .6 amps
	Excellent	Excellent
	Good	Very good
	Good	Good
	Excellent	Good
	Very good	Very good
	Receiver sensitivity was lowest of group but was good and within specs.	Only unit with built-in AIS; least frequency error.

ing; and all were capable of supporting remote “smart” mics. A few even supported multiple remote mics.

All of the radios had channel scanning features, ranging from standard and custom memory scanning to dual watch, which monitors channel 16 every couple of seconds, and tri-watch, which monitors both 16 and 9. Each radio is also waterproof to IPX7 (can handle immersion in 3 feet of water for up to 30 minutes) or IPX8 standards (rated for continuous underwater use), and all can be interfaced with a GPS.

One test unit, Standard Horizon’s Matrix GX2150, featured a built-in Automatic Identification System (AIS) receiver that displays other boats’ AIS data (including vessel name, speed, course, etc.) on a radar-like screen.

Only one test radio, the IC-M604A, featured an alphanumeric keypad, which can make entering MMSI contact numbers and DSC call data faster. According to Icom Sales Manager David McLain, fewer than 5 percent of recreational boaters use DSC functions, so an alphanumeric keypad is not always considered a must-have feature. VHF’s without keypads are also typically cheaper and require less mounting space; however, access to a keypad is still a valuable benefit, in our opinion.

All of the test radios feature automatic fog signals via a hailer, and all have Class D DSC capabilities and operation, which means they have one receiver that monitors voice channels and another that continuously monitors channel 70 for digital DSC calls. Also, all DSC Class D radios will make distress, individual, all ships, and group calls.

As noted in our June mid-priced VHF test, GPS compatibility and DSC capability are imperative for a VHF to serve its intended function: distress notification. Providing the unit with GPS data and a properly programmed Maritime Mobile Service Identity number (MMSI) for DSC operation means the boat can be more easily identified and located in an emergency.

To make a distress call with a DSC-equipped VHF, users simply press the well-marked, red distress button for five seconds. Once the DSC call is acknowl-

edged, users would then issue a voice Mayday on VHF channel 16.

Future articles will take a look at other marine communication products and accessories, including remote VHF microphones, handheld VHF’s, portable sat phones, and AIS standalone units.

HOW WE TESTED

Practical Sailor testers ran all the radios through a series of bench tests—including transmitter power output, frequency accuracy and stability, and receiver sensitivity—using our Ramsey COM3010 service monitor. All radios in our test group met industry standards with regards to the above tests, but some did it better than others.

Regulations set by the U.S. Federal Communications Commission (FCC) restrict the maximum power output of a marine VHF transmitter to 25 watts and specify the need for a low-power setting, typically 1 watt, for harbor use. Testers took transmitter power measurements directly off the VHF’s radio antenna ports, because in any real-world scenario, factors such as antenna size and design, connecting cable length and type, or faulty connections or corrosion could limit the actual radio frequency (RF) power emitted from the antenna.

Transmitter power stability was rated over a range of tests that included varying the input voltage and radio temperature. The less variation in power output, the higher the radio was rated.

Frequency accuracy is the ability of the transmitter to send out signals on a selected frequency. Frequency stability measures the transmitters’ ability to maintain frequency accuracy. The FCC mandates an accuracy of 10 parts per million (about 1550 Hz off frequency). Industry groups typically call for half that error.

Each unit was connected to a regulated power supply using the factory leads and appropriate crimp-on terminals. All manufacturer-supplied power leads contained a fuse holder and fuse. Power draw was recorded while transmitting at 13.8 and 11.8 volts DC, in both high and low power modes.

Receiver sensitivity, the ability of the radio to hear a weak signal, is normally



stated in microvolts—usually from 0.22 to 0.35 microvolts for marine VHF's, with industry groups recommending a minimum of 0.50. Each VHF was tested for the minimum signal it could receive at a specific industry standard setting between background noise and generated signal. All the radios proved more than sensitive enough to pick up weak signals within industry standards.

VHF displays were rated on size and readability, the quality of information displayed, and backlighting.

One very important function of the marine VHF radio is its ability to reproduce the sounds of incoming voice communications via internal audio amplifier and speaker. If you can't hear the audio, it doesn't really matter how well the transmitter or receiver works. To rate audio systems, testers measured the sound pressure levels at maximum volume while inputting a 1-kHz tone. The measurements were taken from 1 meter away. Testers also monitored a weather channel at various volume levels to evaluate overall sound quality.

GARMIN VHF 200

While very similar to the Garmin VHF 100 unit reviewed during our June 2012 evaluation of mid-level radios, the VHF 200 brings additional features to the table. These include expanded NMEA 2000 capabilities, re-locatable speaker and mic, hailer and foghorn functions,

and compatibility with Garmin's GHS 10 or GHS 10i remote microphones. Front panel controls include three rotating knobs for channel selection, volume, and squelch, and the channel selector also serves as an "enter" key. The power button does double-duty as the quick-select key for channel 16/9, high/low power selection, DSC, menu, and clear. Three soft keys below the display are linked to onscreen menus and provide access to functions such as screen adjustments, navigation data configuration, channel group selection, channel name editing, etc. Testers found the menu functions to be well-labeled and easy to use.

The 200 uses a monochrome dot-matrix screen to display channel numbers, transmitter power level, selected channel group, and channel comments. Information too long to display in one view scrolls across the bottom of the screen. The 200 has numerous scanning options—normal, saved channels, dual watch, tri-watch, etc.—and also features NOAA weather alerts and position tracking, which allows a mariner to locate and keep tabs on up to three other boats in the area.

The VHF 200, which features a unique low-profile flush-mount, was rated Very Good for transmit power stability, frequency stability, and receiver sensitivity. Audio output was one of the highest of the group (97 decibels), earning a Very Good for sound quality. At 24.8 watts (13.8 vDC), it had the highest transmit power output of our test group, but conversely, it also had the highest power draw.

Constructed to IPX7 stan-

dards, the 200 comes with a two-year limited warranty good in the Americas and Caribbean.

Bottom line: The Garmin 200 is a solid radio that covers all the basics, but it also has the shortest and most limited warranty.

GARMIN VHF 300

Unique in our test group, the 300 is essentially a multi-station communications "black box" that supports up to three Garmin GHS full-function remote mics. Operation of the unit is via the provided GHS 10 mic, which allows full radio control from a remote location.

The GHS 10 mic features a 2-inch LCD display. Testers noted that some sight-challenged sailors might have problems reading the small screen, which is the VHF's only display.

The mic also has a rotary key for frequently used tasks and three soft buttons for dynamic controls. Audio is provided by the GHS 10's built-in speaker and the 300's four-inch active speaker with a volume knob. A third-party passive speaker could be added.

The VHF 300 provides full NOAA weather alerts and DSC capabilities when interfaced with a compatible GPS chartplotter (NMEA 0183 or 2000). Its position-tracking feature allows users to locate and keep tabs on up to three other DSC-equipped boats in the area. The 300 also has a two-way, 30-watt hailer system.

Two of its most unique features are a voicemail function that allows users to record a 15-second voicemail message that can be delivered to any MMSI number, and the ability to record and replay the last 90 seconds of any incoming voice transmission with the touch of a button.

The 300's remote-mic setup is a good space-saving option, and testers liked



Garmin 200



Garmin 300

A Rundown on Common VHF Features and Functions

AquaQuake: A draining function specific to Icom radios; a vibrating "buzz" clears water from the speaker grill.

Noise-canceling: Reduces background noise, so you can be heard and can hear more clearly.

PA/hailer and foghorn: Public address function allows users to make announcements from the mic like a loud speaker when an optional external speaker is installed. The foghorn emits horn sounds from the external speaker.

Waterproof ratings: IPX7 means the VHF can handle submersion to 3 feet deep for up to 30 minutes. An IPX8 rating means the unit can handle continuous underwater use.

Dual-watch scan: A channel scan mode that monitors channel 16 and another selected channel every few seconds.

Tri-watch scan: Monitors both channel 16 and two other selected channels while scanning.

Priority scan: Channel 16 is checked between every other channel during scan.

Memory scan: All VHF channels in the VHF memory are scanned from lowest to highest.

Normal scan: VHF channels are scanned in numeric order.

MMSI: Maritime Mobile Service Identity number. Boats are assigned one nine-digit MMSI for all onboard equipment capable of transmitting and receiving digital signals—EPIRBs, AIS devices, DSC-capable VHF, INMARSAT satellite terminals, etc.—and that number serves as an identifier for the boat. The boat's emergency contact info is linked to the MMSI, so when a distress call is broadcast, the info is included in the message, giving rescue and emergency personnel accurate details of the boat.

DSC: Digital Selective Calling; primarily a distress-alerting function. Users can send a pre-configured digital distress message (over channel 70) to emergency personnel and other DSC-equipped boats in their area. The message contains information about the boat and its owner, its MMSI number, the nature of the distress, and priority of the call. When a DSC radio is connected to a GPS, the Mayday includes the boat's location. The transmission takes about one-third of a second and is automatically repeated until a rescue authority answers.

Class D DSC: Class D radios have two separate receivers, one for voice communications and the second for continuously monitoring channel 70 for any DSC calls.



Icom IC-M424

being able to add multiple stations. However, having multiple mics should not be confused with having system redundancy since the mics depend on a single transceiver. The redundancy provided by a second VHF radio might be a more prudent approach than relying only on remote mics for long-distance cruisers.

Performance-wise, the VHF 300 held its own. Power and audio output was the lowest of the test group, but it did have the best receiver sensitivity. Transmit power stability was Excellent, while frequency stability was Very Good. Audio quality was also rated Good.

The 300 carries the same limited two-year warranty as the Garmin 200.

Bottom line: The 300, the most expensive VHF in the group, is well-built and offers a lot of options from both operational and installation standpoints,

but its limited warranty kept it out of the winner's circle in this close evaluation.

ICOM IC-M424

Icom bills the IC-M424 as the world's first fixed-mount VHF with Class D DSC and active noise canceling, a feature that our test setup unfortunately didn't allow us to try out.

The IC-M424 also features Icom's new soft-key user interface, which is intuitive, easy to use, and provides quick access to radio functions with fewer button pushes than a typical menu-driven interface. The radio is compatible with the new Icom CommandMicIV (HM-195) microphone, which shares the same soft-key user interface.

The IC-M424 has a built-in 10-watt amplifier that increases audio output for functions such as the PA and foghorn with the addition of an external speaker. When connected to an external GPS receiver, it displays time and current position. When receiving position information from another vessel, the IC-M424 can also transfer it to a compatible chartplotter.

Other features include priority and normal scan, dual/tri-watch monitoring function, and weather channels (with alert function). When coupled with an Icom MA-500TR Class B AIS transponder, the IC-M424 can make calls to an AIS-equipped target boat using the transponder with a few button pushes and without entering the target's MMSI number. Users simply select the AIS target from the display screen, select the VHF channel you want to use, then push the DSC call button.



Icom IC-M504A



1



2



3

The test group ran the gamut as far as front panel controls—from dedicated buttons and soft keys to traditional rotary knobs. The displays on the Garmin 200 (#1), Icom 504A (#2), and Raymarine 218 (#3) all were rated Good.

After seeing the acknowledgement “Able to comply” on the 500TR screen, users key up the VHF and talk.

The IC-M424 performed well overall. It had the lowest power draw of the group and had Good transmit power stability. Both audio level and quality were rated Good.

Bottom line: The IC-M424 offers very good overall performance and a long list of desirable features. We’d recommend it as an affordable VHF for those who already have an AIS or those not seeking a VHF with built-in AIS.

ICOM IC-M504A

The IC-M504A is a compact, robustly constructed radio well suited for the marine environment. It’s the only radio of our test group with a waterproof rating of IPX8 (continual submersion in conditions identified by the maker). It performed well compared to the other test radios, garnering an Excellent for transmit power stability and a Very Good for receiver sensitivity and frequency error.

The M504A can connect to one remote mic and can operate as part of an intercom system. When interfaced with a compatible GPS, it will display time and position data, boat course, and boat speed. Like all DSC Class D radios, it will make distress, individual, all ships, and group calls. Own ship and other ship position data can also be exchanged easily using the position re-

quest or position report functions. The received position info can be transferred to external navigation equipment. The polling (request reply) function checks whether a specific ship is within the communications range.

The M504A can store up to 100 MMSI numbers and as many as 40 incoming messages. Coupled with an Icom MA-500TR Class B AIS transponder, calls can be made to an AIS target using the transponder without entering the target’s MMSI number.

One-button control is available for transmitter power, toggling between weather and voice channels, and making a quick channel 16/9 selection. Volume, squelch, and channel selection are knob controlled. Scan modes include dual-watch, tri-watch, normal, and priority.

A low-battery icon blinks when input power drops below 10 volts. The M504A’s large screen shows customizable channel comments, time and position, frequency group, transmitter power, scan tag, and transmit/receive icons. The unit can accept a voice scrambler and comes with a three-year warranty.

Bottom line: A good performer and moderately priced, the IC-M504A offers a number of useful and some unique features. It gets a solid Recommended.

Icom IC-M604A



ICOM IC-M604A

Icom’s most sophisticated marine VHF radio, the IC-M604A,

features an alphanumeric keypad, large display, and a \$512 price tag, making it the second most expensive test radio. The only test unit with a keypad, the M604A had the largest footprint.

It can connect to two optional remote mics and can operate as part of an intercom system. When interfaced with a compatible GPS, the M604A will display time and position data, boat course, and boat speed. Like the M504A, it will transmit and receive position data, and can store up to 100 MMSI numbers and 40 messages. Users also can call an AIS target without entering its MMSI number when the VHF is coupled with the MA-500TR AIS transponder.

The IC-M604A has the same scan modes, one-button and knob controls, low-battery warning, and displayed information as the IC-M504A.

As for performance, transmit power stability was rated Good, while frequency stability and receiver sensitivity were Excellent. Audio quality was also top notch, with an output of 97 decibels, tying it with the Garmin VHF 200 as the loudest unit.

Bottom line: This radio has very good overall performance and numerous user-friendly features. It gets PS’s Best Choice for a fixed VHF with a keypad.

RAYMARINE 218

The Raymarine 218 offers a host of useful features, including a moderately sized display and a mount-anywhere microphone option. It can also connect to an optional remote mic to be operated

as part of an intercom system. The standard microphone has buttons to control channel selection, scan, transmitter power, local/distant receive



Raymarine 218

sensitivity, and quick 16 or 9 selection. The Ray 218 provides one-button control for toggling between weather and voice channels, making a quick channel 16 or 9 selection, and selecting menus. Volume, squelch, and channel selection are controlled via rotary knob. Ray 218 functions that are menu selected include local/distant receiver setting, channel group, transmitter power, scan mode, backlighting and contrast, key beep, and speed unit selection.

The 218's phonebook will store up to 50 MMSI numbers, and the radio scans channels using dual-watch, tri-watch, all channels, saved channels, and priority modes. It will also store three favorite channels. When it's interfaced with a GPS, the 218 displays time, boat position, course, and speed.

It also has a powerful, manual or automatic 30-watt hailer/foghorn. In manual mode, it sounds a 400-Hz tone as long as the push-to-talk button is pressed. Sound patterns are menu selectable, and output volume is controlled by soft keys.

Performance-wise, the Ray 218 ranked highly. Testers found the 218's power output over the tested temperature and voltage ranges to be Excellent. Frequency stability and audio quality also were rated Excellent, while receiver sensitivity was Good. It comes with a three-year limited warranty.

Bottom line: The Ray 218 offers outstanding performance and a long list of user-friendly features. It gets the Best Choice pick for a keypad-less fixed VHF.

STANDARD HORIZON GX2150

The GX2150 Matrix AIS+ has a built-in dual-channel AIS receiver that allows the VHF to display AIS target information, including MMSI, call sign, ship name, bearing, distance, speed over ground, and course over ground, your vessel's position in relation to them, and

a closest point of approach alarm. It can also output this AIS data to a compatible GPS chart-plotter. Like

the Icom M424, the Standard Horizon MATRIX AIS + GX2150 can direct dial AIS targets, but unlike the Icom, no standalone AIS unit is needed. Users simply select the AIS target via the soft key menu to make the call. The Matrix's AIS functions use the radio's VHF antenna to receive data, so no special or additional antenna is needed.

In addition to its 30-watt PA/loud hailer with pre-programmed fog signs, the durable, die-cast Matrix features user-changeable channel names, optional voice scrambler, clear voice noise canceling speaker microphone, 4.5-watt audio output, NOAA weather alerts, programmable scan, priority scan and dual watch.

The GX2150 is also capable of saving up to 100 waypoints, which can be navigated to via the radio's unique nav compass display that shows vessel SOG, COG, and the bearing and distance to the waypoint when connected to a GPS source. The GX2150 also supports a RAM3 remote access mic, allowing remote control of all VHF, DSC, and hailer functions (as well as an intercom between the radio and second station microphone).

Testers found the GX2150 to be a solid performer. Power output over the entire temperature and voltage ranges was Good. Frequency stability was the best of the group, while receiver sensitivity and audio quality were rated Very Good and Good, respectively.

Rated to IPX7, the GX2150 comes with a three-year warranty.

Bottom line: If you're looking for AIS functionality combined with solid VHF performance at an affordable price, the GX2150 is the one for you. It is our Budget Buy.



Standard Horizon Matrix AIS GX2150

CONCLUSION

When it comes to full-featured fixed-mount VHF radios—most of which offer excellent performance—the features, price, and warranty carry more weight in our ratings. In our last test of high-end radios, DSC operation made us lean toward units with alphanumeric keypads, which makes using the DSC features much easier (entering contact MMSI numbers and call data is faster and easier with a keypad).

The advent of options like coupling with the Icom MA-500TR Class B AIS transponder (allowing for direct calling of AIS targets without entering the target's MMSI number in the VHF) alleviates this concern to a degree. Keypads

are undoubtedly useful, but they appear to be going the way of the dodo, if our test group is any indication.

(The Icom IC-M604A was the only test VHF with a keypad).

With good performance and a number of sought-after features (not the least of which is AIS), the Standard Horizon GX2150 edged out the Icom IC-M504A, Garmin 200, and IC-M424 to take our Budget Buy recommendation.

For our top pick—based on performance and features—it was a toss-up between the Raymarine 218 and the Icom IC-M604A, so we divided the field into keypad haves and have-nots for final ratings. Buyers who want the convenience of a keypad should go with the IC-M604A; those who don't can save roughly \$83 by going with the Ray 218. ▲

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