The Latest in Digital Echo Sounders

Echo sounder with "next level performance" is the talk of the industry.
This report documents the latest trends in echo sounders.

The latest topic with respect to echo sounders intended for pleasure boats is the advent of so-called "Digital echo sounders."
It is said that the digital echo sounders, in comparison with the analog ones, offer advanced detecting capabilities that are one or two steps ahead or are capable of distinguishing fish schools near the bottom of the sea from the bottom itself. Do they really deliver such outstanding performance?
We have checked true capabilities of digital echo sounders in cooperation with Mr. Isao Toji called the "Boatman Tama-chan" who supports our "Hands-on Fish Detection Training" column.

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* The images presented on the echo sounder displays included in this article may not accurately reproduce the real color hues shown on the displays of the actual echo sounder used, due to digital cameras used and printing conditions. In particular, inserted images of the reflected signals which seem to be orange red (representing the bottom of the sea or fish) are shown as more reddish on the actual echo sounder displays.

Elementary explanation about differences between the digital echo sounders and the analog ones

What is the digital echo sounder?

The digital echo sounder is not greatly different from the analog one in terms of workings and functions of echo sounder.
The only difference between them is the method of processing and displaying received signals. Now, let's see, in the first place, what the digital echo sounder is and how it is better than the analog one.

Mr. Toji is an electronics engineer by trade. This time, we brought two different models of digital echo sounders to his boat called "DAI-NI TAMANEGI-MARU" to check their performance by comparing images of reflected signals presented on their displays with those presented on the display of the analog one.

The transducer bracket prepared for shipboard testing. It would have been better to test both the analog echo sounder and the digital ones exactly at the same time and same location. However, we carried out tests by changing over switches of those echo sounders at a certain time interval to prevent interference between them.

How does an analog echo sounder work

As you know, an echo sounder shows the under sea objects by sending ultrasonic waves toward the sea bottom, capturing the reflected signals and visually indicating their strength on the echo sounder display.

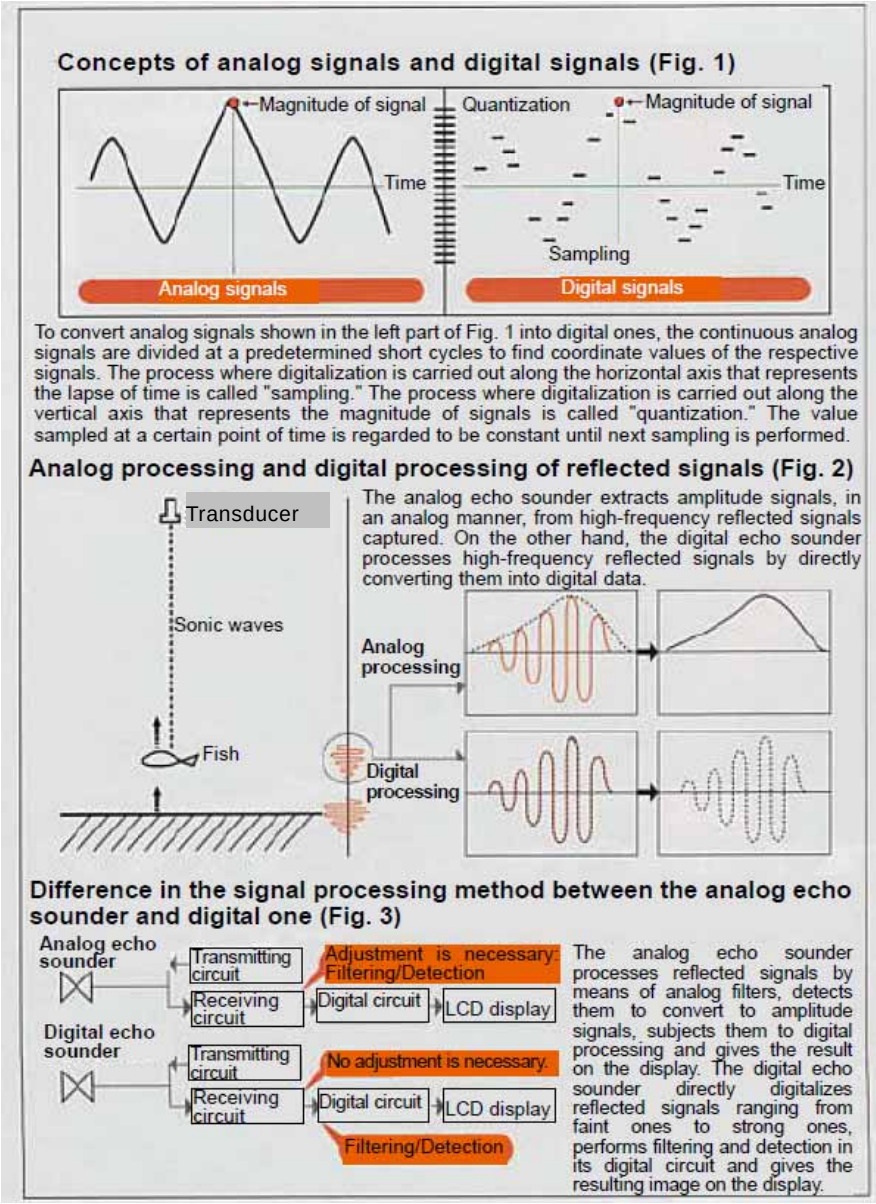
The transmitter section that emits the ultrasonic wave is nearly common between the analog echo sounder and digital one. What makes the digital echo sounder different from the analog one is its receiver section for capturing reflected signals.

It is said that the receiving circuit of an echo sounder is similar to that of a radio. The radio's receiving circuit picks up signals from radio waves received with the antenna (detection) and processes the electromagnetic signals to return them to audible sound. Since the received signals are faint, they have to be amplified to a required magnitude at the detection stage and passed through a filter (signal processing circuit) to reject noise.

Basically, the analog echo sounder works in the similar manner as the radio. First, faint signals captured by the receiver of the transducer are amplified and their noise is filtered out. Second, the signals are detected to extract waveform of reflected signals (amplitude information) that corresponds to sound signals for the radio. In this regard, the old-time recording type echo sounder draws the waveform of those reflected signals on a sheet of paper as they are. At present, the A scope which represents reflected signals on the real-time basis also shows the waveform of reflected signals.

The processes described above are carried out in the receiving circuit in an analog manner. To show the extracted reflected signals on the display, however, the microcomputer in the analog echo sounder processes them in a digital manner. Thanks to this process, we can visually see the shape of the sea bottom and fish schools not only as the magnitude of reflected signals but also as more realistic shapes. In this regard, the analog echo sounder also carries out digital processing at the final stage of its operation.

How does a digital echo sounder work



Now, how does the digital echo sounder work? It amplifies reflected signals captured in the similar manner as the analog one. However, the digital echo sounder does not extract the amplitude information from them but directly performs digital conversion for visualization. The digital echo sounder carries out subsequent processes until it shows the data on its display, entirely in a digital manner. Because of this, the digital echo sounder is sometimes called "full digital echo sounder" as opposed to the analog one.

Digital conversion (A/D conversion) is carried out by dividing continuous analog signals at predetermined short intervals to digitize them at each division point (Fig. 1). For direct digital processing of analog reflected signals, the echo sounder has to carry out A/D conversion at a very high speed, and also has to read and process the converted digital data at an increased speed. Recently, high-performance A/D converters and high-speed digital processing integrated circuits became available at reasonable costs, thereby making digital processing more and more popular. Under those circumstances, digital processing has been introduced in compact-sized echo sounders.

One of the advantages of digital signal processing is to enable processing of complicated and diversified data. The processing of such data might need extremely large circuits if it is to be done by means of analog filters and be hard to implement. But, it can be easily done only by changing a program by means of digital filters. This means that the echo sounder can be made smaller if using digital filters.

Advantages of the digital echo sounder

With the digital echosounder, for example, the band-pass filter's receiving bandwidth (range of frequencies of ultrasonic waves to be received) can be changed depending on the range of sea depth. The pulse width (length of ultrasonic waves to be sent) can be shortened to improve the range discrimination (capability of separating adjacent reflected signals from each other for easy discrimination between them) by widening the bandwidth.

Let's assume a fish school is swimming near the sea bottom. When the fish school is at a certain distance from the sea bottom, signals reflected from the fish school and those reflected from the sea bottom should be presented separately in a distinctive manner. If the band-pass filter's response is slower, however, those signals would be overlapped when passing though the filter and could not be discriminated.

To prevent this, the bandwidth is widened to pass shorter pulses through the filter, the filter's response speed will be increased to enable the echo sounder to give images of the reflected signals from the fish school and those from the sea bottom separately and distinctively on the display. Noise will increase by broadening the bandwidth. This will not cause a problem at shallow depths of the sea where the magnitude of reflected signals from fish schools is great.

On the contrary, at greater ocean depths, ultrasonic waves are likely to spread (ultrasonic waves transmitted by the echo sounder toward the sea bottom spread in a conical shape), the range discrimination near the sea bottom cannot be expected by its nature. Therefore, it may be better to send ultra sonic waves of a broader pulse width which can reach deeper sea bottom and narrow the bandwidth in order to reduce the noise.

To enable the analog echo sounder to select the optimum bandwidth according to the depth of the sea in this way, two or more analog filters had to be prepared (this was practically impossible). For the digital echo sounder, however, the bandwidth selection can be easily done only by means of one digital filter. As a result, when compared with the analog echo sounder, the digital one can present images of reflected signals with higher range discrimination at shallow depths of the sea and to present clearer images with a less powerful transducer at greater depths of the sea.

With respect to noise rejection, the digital echo sounder permits easier processing since it can directly digitize reflected signals. This process may be easy to be understood if you think of radio signals. If electro magnetic signals received are converted into audible sound, it will be difficult to reject noise from it. The analog echo sounder is similar to the radio in this point. If the analog echo sounder converts reflected signals to amplitude signals, it will be difficult to reject noise from them.

In addition, the digital echo sounder can filter out or enhance certain signals with considerable accuracy for rejecting noise, etc. It can "adjust" signals according to the conditions with more flexibility than the analog one, for adjustment of rejecting reflected signals from other small objects than fish or enhancing reflected signals from fish. From the next page, let us describe the actual models while paying attention to those adjustments.

The echo sounder is safely installed on the open cockpit since its body is waterproof. The viewability of the LCD display under the direct sunlight is considerably improved as compared with its predecessor models. This is the first model from KODEN that is equipped with a sea tide graph .

KODEN CVS-126 Echo Sounder

Impressions from the-shipboard test 1

We have subjected two different models of digital echo sounders to a sea trial.
One was "KODEN CVS-126" introduced at the Boat Show in the spring of 2008. This is one of the latest models that not only promises improved image representation which is specific to digital echo sounders but also permits GPS connection, stores images and has improved capabilities such as alarming of fish schools. Let's see how Mr. Toji has evaluated this model.

The KODEN CVS-126 gives smooth images of the sea bottom features on the display.

The echo sounder was brought into Mr. Toji's boat (DAI-NI TAMANEGI-MARU) for the sea trial. The transducer was put into the sea directly over the side to check images of reflected signals given on the display at depths of 10, 50, 150 and 300 meters. Then, the same test was carried out with an analog echo sounder at the same depths for the purpose of comparison. It should be noted that the test was performed on one-by-one basis since using two transducers with same frequency at a time would cause interference between the two. Therefore, we have to tell you in the first place to remember that the comparison display images shown side by side in the pictures shown on the subsequent pages do not represent exactly the same reflected signals.

We commenced the test on the KODEN CVS-126. It has two different frequencies 50 and 200 kHz and output power of 600 watts. It is equipped with a 5.7-inch color LCD. As compared with KODEN's analog models, the design has been changed to achieve simplified control layout.

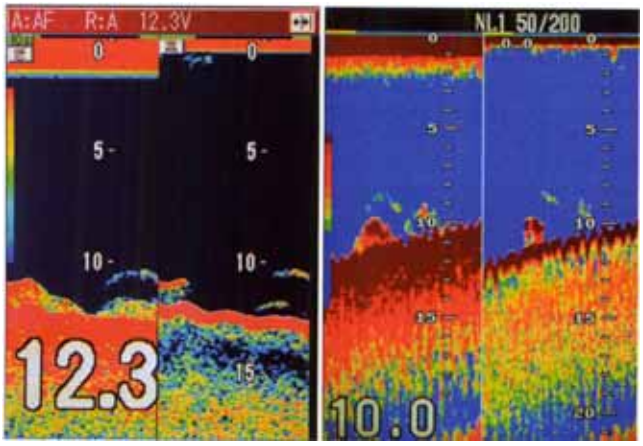
"This digital echo sounder is really easy to use. Such simple and large switches are very convenient since they can be operated without looking once we get familiar with them. The display has a wide viewing angle and sufficient brilliance, and is very friendly to eyes." (Mr. Toji)

First, we moved to shallow depth area to find a horse mackerel fishing point on Toji's boat. Unfortunately, we could not find large schools of horse mackerel as we expected.
"Well, it is difficult to get images of same reflected signals from fish on both the digital and analog echo sounders. Still the digital echo sounder gives smooth images of bottom contours. It gives clear view of small dents there. The images appearing on the analog one have, somewhat, rough texture. I think this difference in presented images is caused by a difference in range discrimination. The digital echo sounder has a higher discrimination."

Then, we moved to different points the depths of which were 50 m and 150 m. According to the manufacturer (KODEN), the device, being fully digital, will achieve the same performance under the AUTO mode as under the MANUAL operation, we decided to operate the device under the AUTO mode throughout the testing.

Furthermore, the CVS-126 is provided with capabilities to shift images of the sea bottom smoothly from one range to another without showing an abrupt difference in height when the device automatically changes its range under the AUTO mode, and to increase the sensitivity from the current image appearing on the display, instead of a new image to be displayed, when the operator selects an increased sensitivity. Those functions are achieved by enabling complicated processing of reflected signals through fully digital circuits.

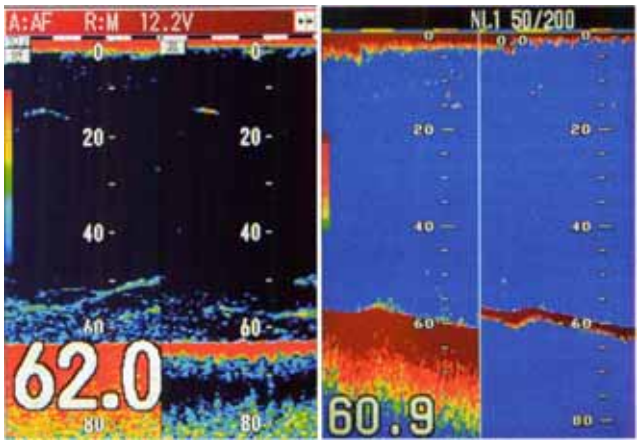
Images of underwater area around a depth of 10 m



CVS-126 Analog echo sounder

For both echo sounders, images obtained at two different frequencies are given at a time (the right half indicates 200 kHz and the left half 50 kHz). It should be noted that, for the analog echo sounder, the sea bottom appears jagged, but, for the CVS-126, the sea bottom appears smooth. We can't tell for sure whether the returned echo near the sea bottom represents fish. Still, details of the returned echo appear clearer on the CVS-126 than on the analog one. At a frequency of 50 kHz, the signals reflected from around the target area are combined to make one solid projection of the sea bottom presented on the left part of the display. At a frequency of 200 kHz which is narrower in beam width, however, the same reflected signals are presented separately from the sea bottom.

Images of underwater area around a depth of 60 m



CVS-126 Analog echo sounder

The CVS-126 shows faint reflected signals from plankton or the like near the sea bottom. Since the digital echo sounder does not show an object which does not reflect signals, the resulting image is clear. Reflected signals captured around a depth of 20 meters are not displayed on the analog echo sounder. We believe that the highly possible reason is, for the purpose of this test, that there was nothing in the intermediate layer of the sea. We also suppose that the reason why the analog echo sounder does not visualize faint reflected signals is that the device takes reflected signals which are weaker than a certain level as just noise and forcibly cuts them. Anyway, thanks to digitalization, the digital echo sounder gives clear and crisp images on its display with no noise in the areas immediately under the sea surface and the intermediate layer of the sea.

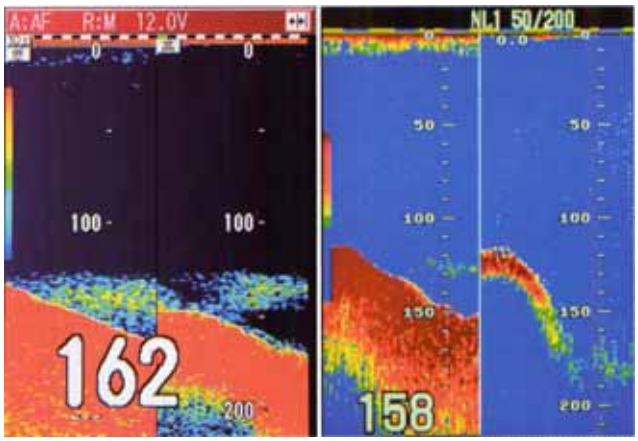
Clear and crisp images on the display

In the area deeper than 150 meters, the analog echo sounder could not capture the image of the sea bottom with a frequency of 200 kHz. However, the CVS-126 gave clear images of the sea bottom even with a frequency of 200 kHz. In addition, the display does not show faint reflected signals captured in the surface and intermediate layers of the sea but clearly shows the sea bottom in red. In fact, the CVS-126 shows clearer and crisper images on the display as compared with the analog echo sounder.

"This may be because the relation between the depth of water and gain (sensitivity) of the device is adequately corrected. In other words, the more the depth increases, the greater the attenuation of ultrasonic waves becomes. I guess that the device can correct the gain enough to give clear and crisp images on its display. I think this is the technique which can only be achieved by a digital echo sounder."

When the depth exceeded 300 meters, the CVS-126 gave images of the sea bottom on the 200 kHz side display. Mr. Toji told us "The device may narrow the bandwidth as far as possible." We confirmed at the end of test that the device gave clear images of the sea bottom at a depth of 730 meters with a frequency of 50 kHz. For your reference, the manufacturer's staff explained to us that the CVS-126 could give images of the sea bottom as deep as approximately 800 meters (with a frequency of 50 kHz) if we needed images only of the sea bottom. The analog echo sounder, on the other hand, could only give images of the underwater zone at a depth of 600 meters at the maximum with a frequency of 50 kHz and the images contained lots of noise. When comparing those two types of the echo sounders, we may say that the bandwidth adjusting function and noise rejection performance that are specific to the digital one considerably improve deepwater sounding capabilities.

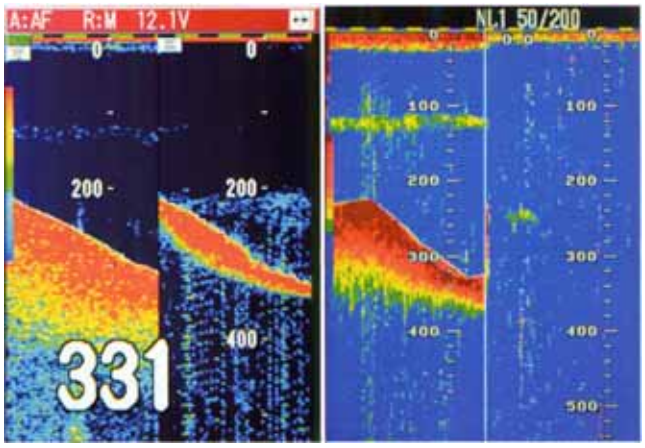
Images of underwater area around a depth of 160 m



CVS-126 Analog echo sounder

At a depth of 160 meters, images of reflected signals of the sea bottom are not displayed on the analog echo sounder using the frequency of 200 kHz. The CVS-126, on the other hand, can give clear images of the sea bottom even using a frequency of 200 kHz. With a frequency of 200 kHz, the digital echo sounder is definitely better in sensitivity than the analog one. At the same time, the part of the image corresponding to the intermediate layer of the sea is simple in appearance, and noise in the part of the image showing near surface of the sea is well rejected. Any images that represent weak signals from the neighboring area of the sea bottom may be caused by plankton or very small fish such as white bait.

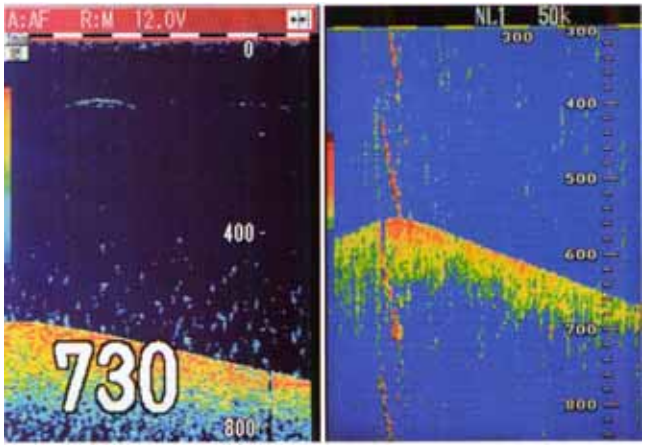
Images of underwater area around a depth of 300 m



CVS-126 Analog echo sounder

At the depth of 300 meters or more, the analog echo sounder can't display the image of the sea bottom with a frequency of 200 kHz. Even with a frequency of 50 kHz, the depth indication disappears from the display and capturing of the sea bottom seems to be unstable. The CVS-126, on the other hand, can still display the sea bottom with a frequency of 200 kHz. The image of weak targets reflected from around a depth of 100 meter partly presented on the display with 50 kHz is clearer on the analog echo sounder than on the digital one, though the former has lots of noise instead. We can speculate that, for the CVS-126, its noise rejecting function works to reject the noise, thereby giving the image as weak targets.

Test to find the maximum depth range



CVS-126 Analog echo sounder

Finally, we checked what was the maximum depth of the sea images of which could be displayed on the echo sounders with a frequency of 50 kHz. The analog echo sounder only has a range of 500 meters. It manages to capture the sea bottom at a depth of 600 meters by means of the screen shift function and the image has a considerable noise. The CVS-126, on the other hand, can capture the sea bottom at a depth of 730 meters with ease though the image has some noise. In this depth, even the CVS-126 cannot easily capture reflected signals from fish schools since the beam width is substantially increased. However, it manages to display images of them (maybe mackerel) around a depth of 150 meters.

Mr. Toji says, "Today, only a very small number of fish schools were shown by the two echo sounders.
It is therefore difficult to clearly tell how the CVS-126 is different from the analog echo sounder. In shallow bottom zones, the CVS-126 gives images of small objects and detailed shape of the sea bottom. I think that the ability of the CVS-126 to give clear images of 600 meter deep area may be equivalent to an analog echo sounder which has output power of 1 kW or more. Needless to say, a larger transducer would be necessary to capture reflected signals from fish schools at such a depth. If we don't need really exact reflected signals from fish schools, the CVS-126 can be used totally under the FULL AUTO mode from shallow to deep sea.

Traditionally, images of the same reflected signals have been displayed differently due to a change in surrounding conditions. For the CVS-126, such a variation in conditions can be corrected by computation. This is an advantage of the digital device. The CVS-126 gives clear and crisp images that can be easily understood. I believe that this echo sounder can be used even by beginners with ease."
It may also be said that full-digitalization makes echo sounders to be more friendly to every user.

KODEN CVS-126

Major Specifications

* Transmitter output power: 600 W
* Display unit: 5.7-inch color LCD (240 x 320 dots)
* Display colors: 8/16/64 colors
  Background color (blue/dark blue/black/white/presentation color for night time/four other colors)
* Frequency: 50 kHz/200 kHz Dual
* Depth range: 2.5 to 800 m/hiro (0-2800 feet), 8 different ranges can be preset from among 36 ranges.
* Range: 2.5 to 200 m/hiro (0 to 650 feet) in 23 steps
* Shift: 0 to 300 m/hiro (0 to 1000 feet), automatic or manual
* Display mode: High-frequency, Low-frequency and dual display with expanded picture (Zoom, Bottom lock or Bottom follow zoom) etc., A-scope display can be additionally shown with the above-stated ones
* Power supply: 10.8 to 31.2 VDC
* Power consumption: 10 W or less (12 VDC)
* Outside dimensions: 208 (H) x 182 (W) x 130 (D) mm
  8.2 H x 7.2 W x 4.1 D inches
* Weight: 1.3 kg (2.9 lbs.)

Contact: Koden Electronics Co., Ltd.
Phone: 03-3756-6918
http://www.koden-electronics.co.jp/

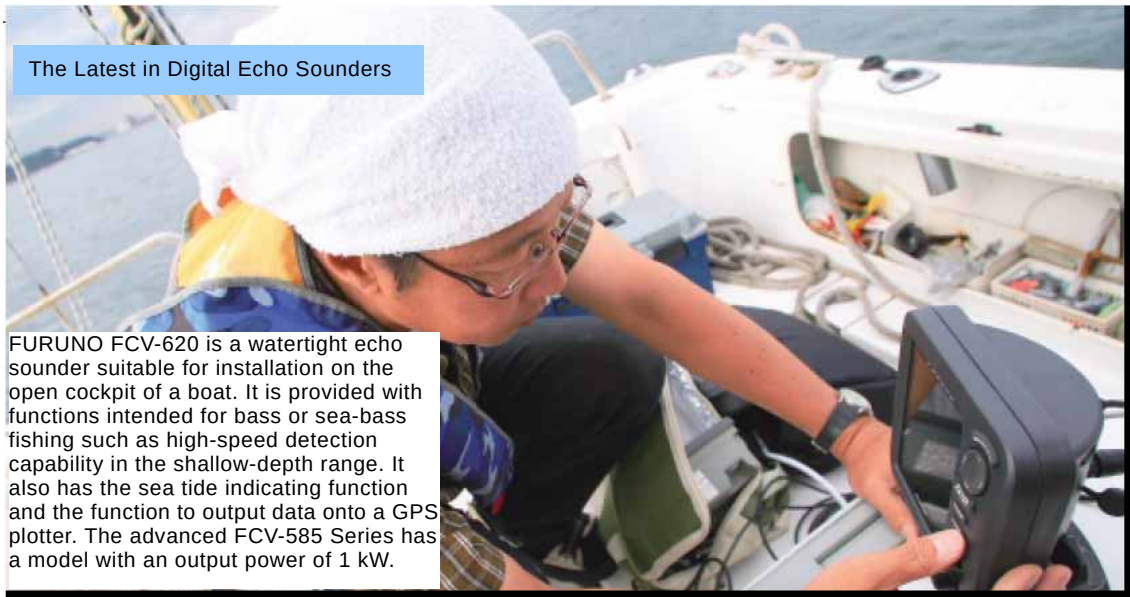
Brief comment from the manufacturer

With digitalization, the CVS-126 offers capabilities equivalent to or higher than those offered by an analog echo sounder of one or two grades higher in quality. It has increased discrimination in shallow bottom areas. What we are mostly confident is the images the CVS-126 gives on its display in deep bottom areas. In addition, we emphasize its AUTO functions.
For the analog echo sounders, the AUTO functions have been provided only for beginners and MANUAL functions have been recommended for users as they become familiar with the device. For this model, however, we would like to recommend the AUTO functions instead of the MANUAL ones for every user since they have been substantially improved.
The model's features include a simplified plotter function when connected to a GPS, 10-different displays storage function and Sona-Tone function. The Sona-Tone function is designed to sound during oscillation and produce different tones of sound when the device gets reflected signals from a fish school. I think this sona-tone function is interesting since, if the user connects an external speaker to the device, he/she can know when a fish school is coming near by hearing the audible alarm.

"We are confident in the functions of the CVS-126 equivalent to those of the top-end models for displaying images of deep bottom area and AUTO functions."

Right: Mr. Keishi Watanabe
Left: Mr. Kazuhiro Moriguchi
(Both from
Koden Electronics Co., Ltd.,
Marine Division)

The Latest in Digital Echo Sounders



FURUNO FCV-620 is a watertight echo sounder suitable for installation on the open cockpit of a boat. It is provided with functions intended for bass or sea-bass fishing such as high-speed detection capability in the shallow-depth range. It also has the sea tide indicating function and the function to output data onto a GPS plotter. The advanced FCV-585 Series has a model with an output power of 1 kW.

FURUNO FCV-620

Impressions from the shipboard test 2

FURUNO FCV-620 is a digital echo sounder which has been launched on the market in 2006.
It has specifications for achieving ease-of-use when installed on small boats, taking its use for bass or sea-bass fishing into account.
It is still a fresh memory that the FCV-620 echo sounder added excitement in the pleasure boat market, with its world's first and unique capability of indicating the size of fish. It still is one of the very popular models of echo sounders available on the market.

Relatively simple image representation

This FCV-620 was once featured in this magazine under the title of "Echo sounders and GPS New Model Impressions" when the model was launched on the market. Mr. Toji was in charge of evaluating this model. This time, we have conducted shipboard testing focusing on the comparison between the FCV-620 and the analog echo sounder.

Two different frequencies 50 and 200 kHz are used as in the case of KODEN CVS-126 model. The output power is 600 W, also the same as in the case of KODEN's one. The FCV-620 has a display screen of 5.6 inches and its body is compact. The liquid crystal display applied with AR coating for preventing reflections of sunlight has a wide viewing angle and is easily viewable under the direct sunlight.

The operating section is also simple in layout. Not only the gain (sensitivity) setting but also operation mode setting such as changeover of high/low frequencies and zoomed view selection can be achieved by turning rotary knobs. According to the manufacturer, provision of rotary knobs requires additional cost because waterproofing process is essential. It is certain that the knobs achieve improved operability. Users who are not familiar with echo sounders may be less nervous when operating the device by means of the knobs than by means of lots of unfamiliar switches.

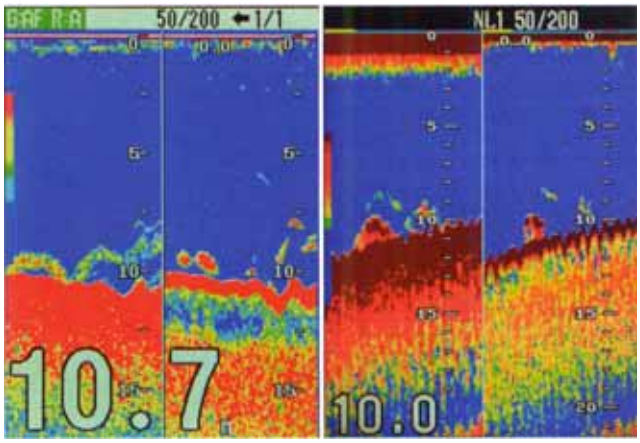
When comparing the images on the display showing actual underwater area with those on the analog one, we are first impressed by the smooth representation of the sea bottom similarly with the case of KODEN's echo sounder.

What is also impressive is that the oscillation line (the line representing a water depth of 0 (zero) meter) is very thin. For the analog echo sounder, the oscillation line covers the surface layer of the sea displayed on the display. For the digital echo sounder, on the other hand, the range discrimination is increased in shallow bottom areas of the sea to produce such a thin oscillation line. As a result, images of reflected signals from objects in the shallow bottom areas are not hidden under the oscillation line.

"Smoothness of the sea bottom seems similar to that in the case of the CVS-126. It seems that the two models of digital echo sounders are different in image representation. The CVS-126 corrects images of reflected signals and sea bottom when giving them on the display, but the FCV-620 does not make corrections but simply presents the images of reflected signals on the display. Still, the latter gives an oscillation line that is sufficiently thin and therefore gives easily viewable images on the display."

Around a depth of 60 meters, the "ACUFISH function" (for displaying the fish size) is used. This function has been developed based on data on reflected signals accumulated in FURUNO's echo sounders and is capable of assuming the size of fish based on the strength of reflected signals.

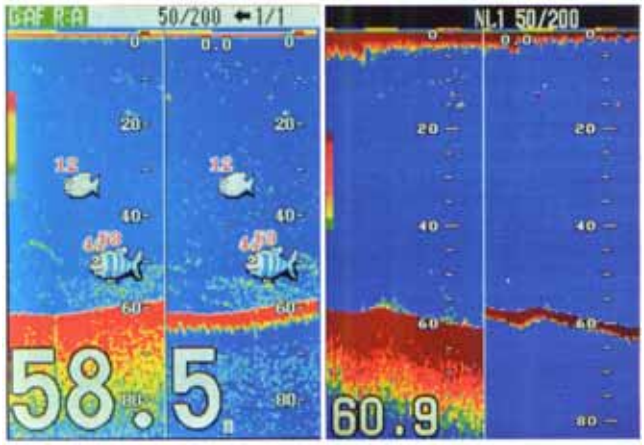
Images of underwater area around a depth of 10 m



FCV-620 Analog echo sounder

The inserted image picture of the analog echo sounder is the same one as inserted in the page describing the KODEN CVS-126. This time, it seems that both echo sounders capture relatively similar reflected signals. On the rightmost part of the picture of the FCV-620, images of reflected signals which might be from fish are displayed. When comparing the images of reflected signals on the FCV-620 with those on the analog one, the former ones are easier to be understood and changes in sea bottom topology below those images are clearly displayed. The projecting part at left of the image of fish-like reflected signals is presented separately from the sea bottom. For the analog echo sounder, such projecting part is presented as a part of the sea bottom.

Images of underwater area around a depth of 60 m



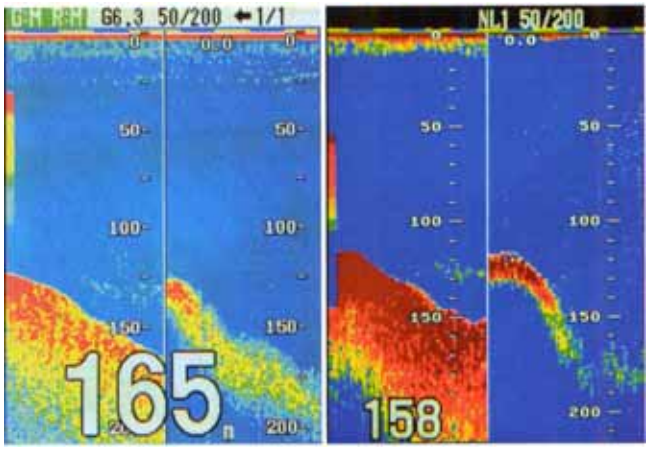
FCV-620 Analog echo sounder

When activating the ACUFISH function, the FCV-620 displays a fish symbol of a 12 cm fish in the intermediate layer and those of a 44 cm fish and 53 cm fish near the bottom. It seems that those fish symbols do not represent fish but sea weed or plankton. The ACUFISH function may be enjoyable if the user accepts that fish symbols do not always represent actual fish. In addition, this function is user-adjustable to increase accuracy. At this depth, the oscillation line width is substantially less than that on the analog echo sounder. With the FCV-620, weak signals near the surface of the sea are captured to be viewable on the display.

According to the manufacturer, the size of a fish in fish school is determined by assuming the size of a fish/fishes swimming slightly away from the fish school. During the test, some single fish symbols are given on the display.

"Well I suppose this symbol may be representing a 53 cm long fish. It is sometimes difficult to distinguish between a single fish and a fish school even by visually observing the images of reflected signals. When I used the FCV-620 before, the device gave figures at locations where fish schools swam near the surface of the sea." The fish size displayed is user-adjustable.

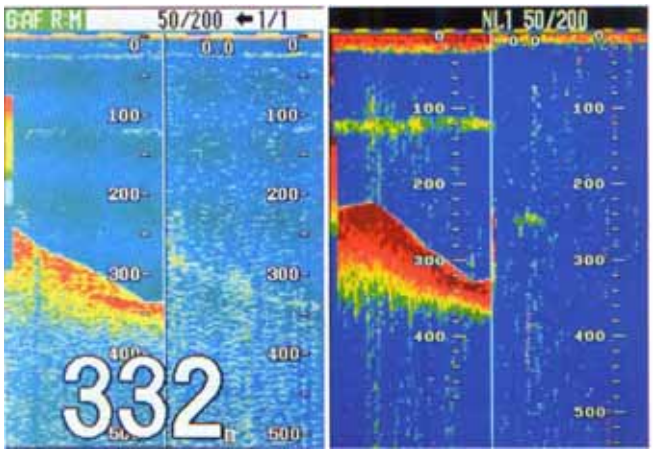
Images of underwater area around a depth of 160 m



FCV-620 Analog echo sounder

The FCV-620 presents pictures with gain (sensitivity) and range set under the MANUAL mode. At a depth where the analog echo sounder cannot capture the sea bottom with a frequency of 200 kHz, the FCV-620 presents an image of the bottom shape corresponding to weak signals even with a frequency of 200 kHz. The image of reflected signals appearing near the sea bottom with a frequency of 50 kHz may represent plankton or white bait. Images of minute reflected signals (from plankton), which are not presented on the KODEN's CVS-126, are presented on the FCV-620. In this point, it may be said that the FCV-620 adjusts reflected signals in a way more similar to the analog one.

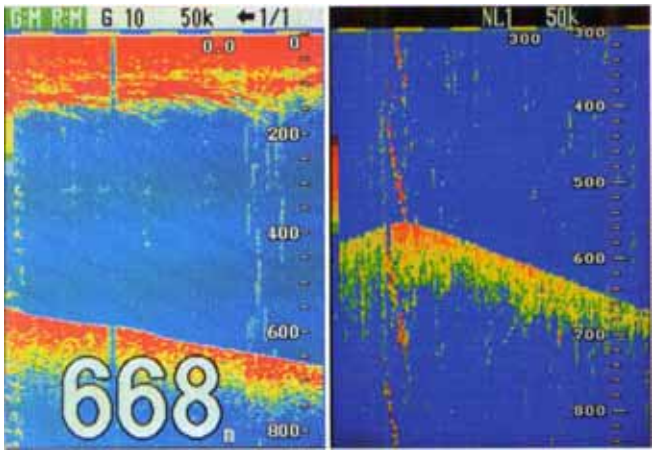
Images of underwater area around a depth of 300 m



FCV-620 Analog echo sounder

For the FCV-620, the gain setting is returned to the AUTO mode. When the depth of 300 meters is exceeded, even the FCV-620 cannot capture reflected signals from the sea bottom with a frequency of 200 kHz. However, the depth may be within its effective range with a frequency of 50 kHz. Reflected signals from the depth around 100 meters which are clearly indicated on the analog echo sounder are weak on the FCV-620 as in the case of the KODEN's device. However, we can see that the images presented on the FCV-620 have less noise than analog echo sounder.

Test to find the maximum depth range



FCV-620 Analog echo sounder

With a frequency of 50 kHz, the FCV-620 is capable of capturing the sea bottom down to the depth of slightly less than 700 meters (both gain and range are manually controlled). On the day of testing, we didn't have enough time to try the device in 800 meter deep range. The specification for the device tells that its depth range is up to 800 meters. If the device is to be used for fishing in deep sea in addition to the presentation of reflected signals from the sea bottom, a 1 kW transducer of the high-line model (FCV-585) would be needed. According to the manufacturer's staff, when they conducted the tests in Australia, the FCV-620 displayed images of reflected signals from the bottom of 1000 meter deep sea under favorable conditions.

Moving towards fully digital future?

Then, we checked the digital echo sounder in deeper bottom areas to confirm that it could display the sea bottom in deeper sea than the analog echo sounder. In addition, as compared with the KODEN's model, the FURUNO's model does not make adjustments to reflected signals such as putting emphasis on or eliminating some of them even in deeper bottom areas but simply gives the strength of reflected signals similarly as in the case of the analog echo sounder.

"Regarding such a difference in the image representation between the KODEN's and FURUNO's digital echo sounders, it is rather hard to tell which is better since some users like the former and the others like the latter because of various reasons such as familiarity, etc. In fact, even the same echo sounder can represent totally different images by adjusting the gain or noise reducing function."

Anyway, through shipboard testing of the two types of digital echo sounders, we have realized their advantages specific to digital including high discrimination in the shallow bottom ranges and sounding capabilities in the deeper bottom ranges.

"On this occasion, we have not cruised the boat with transducers of the echo sounders put in the sea. So, we couldn't check how noise was controlled in the images. I'm sure, however, that digital devices permit easy rejection of noise or interference.

I don't think there are any disadvantages in digitalization of echo sounders. The price of digital processing circuits becomes less and less expensive every year. The number of components per chip is increasing to enable faster processing. The power consumption is becoming less and less. Under these favorable conditions, digitalization of echo sounders will become more and more popular. If a manufacturer had desired to realize digital circuits 10 years ago, equivalent to those used in the two types of digital echo sounders we tested, the printed circuit board as large as a desk would have been needed. The power consumption would have been enormous it could easily overheat without a cooling fan."

Mr. Toji thinks that in the near future, all echo sounders would be fully digital. The performance of an echo sounder depends on its transducer, even for the digital ones. From this point, the performance of echo sounders may not be dramatically improved. However, it may become commonplace that any echo sounder can have a display which gives clearer and finer images than the analog ones. Furthermore, it might be possible for the user to download update programs from the manufacturer's website to improve capabilities of his/her echo sounder as in the case of personal computers. We are going to keep watching the development of digital echo sounders.

FURUNO FCV-620

Major specifications

* Display: 5.6" TFT color LCD, vertical type
* 234 x 320 dots (QVGA)
* Display colors: 8/16/64 colors
* Display range: Range 2 to 800 m, shift 800 m
* Expansion range: 2 to 800 m
* Display mode: 1-frequency single display, 2-frequency dual display, marker zoom, bottom zoom, navigation display, sea tide graph, A-scope
* Image speed: 8 steps
* Frequency: 50/200 kHz
* Transmitter output power: 600 W
* Number of times of transmission: 3,000/minute (5 m range)
* Waterproofing: IEC IP55 (watertight against jet water flow)
* Power supply: 12 to 24 VDC, max. 12 W or less
* Outside dimensions: 207 (H) x 170 (W) x 132 (D) (mm)
* Weight: 1.2 kg (bracket type)

Contact: FURUNO ELECTRIC CO., LTD.
http://www.furuno.co.jp/

Brief comment from the manufacturer

The FCV-620 is characterized by sharper images and easy distinction between fish swimming near the sea bottom and the bottom itself. These features are enabled by FURUNO's unique data processing technology called "FURUNO Digital Filter." In addition, the echo sounder is provided with "ACUFISH" function for representing the size of a single fish when reacts to the signals. The development staff of our company have been adjusting the ACUFISH function based on the data accumulated through repeated investigation of the relation between reflected signals from fish and fish sizes.
Not only our development staff but also the users who use this model can further adjust the function. The function to give fish symbols on the display has been favorably received in the market since beginners can understand this with ease. In addition, we have determined settings for the AUTO mode based on huge volume of data accumulated. Consequently, we are happy to tell you that the device can adjust itself under the AUTO mode with preciseness similar to that under the MANUAL mode. The AUTO sensitivity is set under two different modes, CRUISING and FISHING. I think this will be helpful to users.
"The FCV-620 gets favorable reputation because of its sharp images of higher discrimination and its fish-size informing function."

Mr. Koji Saito from
FURUNO ELECTRIC CO., LTD.
Marine Electronic Product Division