



FURUNO®

Complying with IMO and IEC standards for installation after 1.1.1999

HEAVY-DUTY HIGH PERFORMANCE RASTERSCAN RADARS/ARPAS

Models FR/FAR-28x5 series



The future today with FURUNO's electronics technology.
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Catalogue No. R-144d

TRADE MARK REGISTERED
MARCA REGISTRADA

New standard of shipborne radars and Technology and Sophisticated Software

- Daylight-bright raster-scan 28-inch screen
- Audio-visual guard zone and CPA/TCPA alarms
- Target trails in true or relative bearing by synthetic afterglow. Trails may be superimposed with past positions
- Radar maps and navlines, ground stabilized
- Electronic parallel index lines
- Optional interswitch RJ-7 for dual or multiple radar/ ARPA installation
- Enhanced visual target detection by the use of echo Average, Echo Stretch, Interference Rejector, and new noise rejector
- Exclusive FURUNO MIC low noise receiver for unsurpassed sensitivity
- Complies with IMO Res MSC.64(67) Annex 4, IMO Res A.823(19), IEC 60936-1 Shipborne radar, IEC 60936-2 HSC radar, IEC 60872-1 ARPA.

Also complies with IEC 60945 (general requirements), IEC 61162 (digital interface).



ARPA's through Advanced Microelectronics Design looking at the 21st Century

The new FR-28x5 series of radars and FAR-28x5 series of ARPA's are the result of FURUNO's 50 years of experience in the marine electronics and advanced computer technology fields. This series of equipment is designed to meet the exacting standards of the International Maritime Organization (IMO) for installations on all classes of vessels on and after January 1, 1999.

The display unit employs a 28" multi-color CRT. It provides an effective picture diameter of 360 mm, larger than the IMO minimum requirement of 340 mm for ships of 10,000 GT and above.

Target detection is enhanced by sophisticated signal processing techniques such as multi-level quantization (MLQ), echo stretch, echo average, and radar interference rejector.

Two guard zones can be set at required ranges in any sector. Other ship's movements are assessed by advanced target tracking software and alerted by CPA/TCPA data readouts. The FAR-28x5 series of ARPA's improves the standard of collision avoidance by producing various information on multiple targets.

The ARPA functions include automatic acquisition of up to 20 targets plus manual acquisition of up to 20 targets, or manual acquisition of all 40 targets. Manual acquisition takes precedence over automatic acquisition; manually acquired targets are identified by symbols heavier than automatically acquired target symbols. Data on up to 3 selected targets can be read at a time. Their readouts include CPA/TCPA, range/bearing, and bow crossing information, together with the type of sensors.



Radar	ARPA	Principal Spec
FR-2815	FAR-2815	X-band, 12 kW, TR up
FR-2825	FAR-2825	X-band, 25 kW, TR up
FR-2825W	FAR-2825W	X-band, 25 kW, TR down
FR-2855	FAR-2855	X-band, 50 kW, TR up
FR-2855W	FAR-2855W	X-band, 50 kW, TR down
FR-2835S	FAR-2835S	S-band, 30 kW, TR up
FR-2835SW	FAR-2835SW	S-band, 30 kW, TR down
FR-2865SW	FAR-2865SW	S-band, 60 kW, TR down

For type approval status, ask your representative.

S-band Turning Unit (Gearbox)

RSB-0026/0031/0027/0032, etc.



X-band Turning Unit (Gearbox)

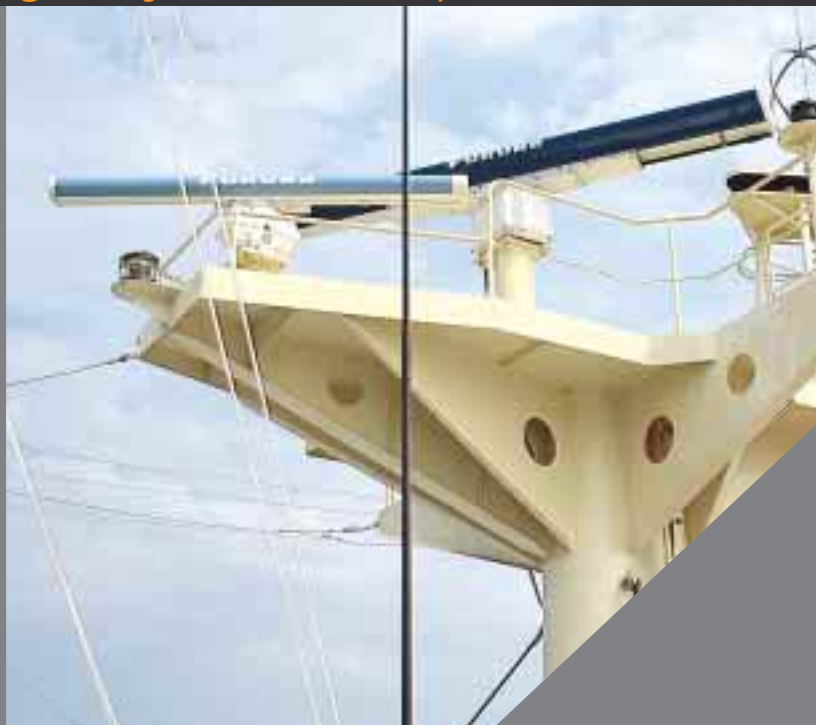
RSB-0074/0075 (42 rpm)/0076, etc.



ARPA



Two target acquisition areas are provided at 3 and 6 n.m. These areas also act as suppression areas, avoiding unnecessary overloading to the processor and clutter on the screen by disabling acquisition and tracking. The operator can acquire important targets without restriction outside of these areas by manual acquisition. Manually acquired targets appear as heavy symbols to discriminate them from the automatically acquired ones. Targets, which enter guard zones, change their tracking symbols from a circle to an inverse triangle. A target appears as a triangle when its predicted motion violates the operator set CPA and TCPA. The operator can readily change the vector lengths to evaluate the target movement trend.

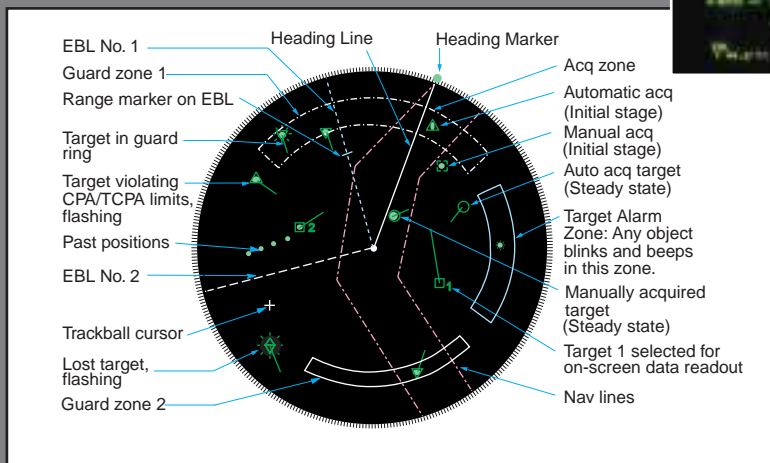


TARGET DATA READOUT



Up to three data cells for any selected targets. Targets specified by the operator for data display are marked with a square symbol.

The second and third cells may be removed to indicate the wind, water depth, water temperature, etc. as provided by external sensors.

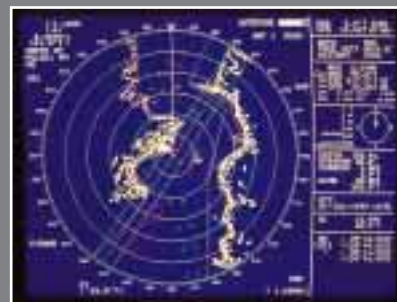


Heading Line: A continuous radial line for indicating own ship's heading (called heading flasher or heading marker in older radar standards.)

Heading Marker: A mark on the bearing scale, required by the IMO MSC.64(67) Annex 4 after 1.1.1999. If off centering is performed on the above display, the Heading Line will move accordingly but the Heading Marker will remain at the same place on the bearing scale.

Past positions are shown only for target 2, but in reality all targets have their own past positions at operator selected intervals. All ARPA symbols comply with IEC 60872-1.

DAY AND NIGHT VIEW



RADAR MAP



The VideoPlotter RP-25 (built-in board) facilitates the operator to produce radar maps and navlines while maintaining the radar observation, as required by the new IMO performance standards. A map is a combination of map lines and symbols to aid route planning and monitoring on the radar equipment. The data is stored on the standard memory on the RP-25 board in 1,500 points of capacity for repeated use. The RP-25 also permits use of two IC cards; Memory card (SRAM IC) stores 6,000 points of own ship and other reference locations, and the Chart card (ROM IC) carries electronic charts, from official or private source, in an ample capacity. One type of official electronic charts is ERC (Electronic Reference Charts) available from the Japanese Hydrographic Bureau.

CHART OVERLAY



The VideoPlotter RP-25 has a basic function as Radar Map and Navlines and extended function as a Chart Display.

The Chart Display mode is subject to authorities. The chart appears in a different color from the radar echoes and is distinguishable from all radar related objects and markings. The radar range setting determines the chart area.

TARGET TRAILS



The target trails feature generates monotone or gradual shading afterglow on all objects on the display. The shading afterglow paints the display just like on an analog PPI for general use, whereas the monotone trails are useful to show own ship movement and other ship tracks in a specific fishing operation. Pressing the Echo Trails key changes the length of afterglow from 30 s, 1, 3, 6, 15, 30 min to continuous. The target trails are indicated in a different color from the target echoes. The unique feature in this radar/ARPA is a choice of True or Relative mode in Relative Motion (only True in TM).

TRIAL MANEUVER



The trial maneuver is a collision avoidance simulation used to predict collisions by changing the course and speed of own ship. The simulation is available in dynamic or static modes. The dynamic mode presents target ship movement at one-minute intervals and the static mode displays the final situation immediately. In either case, a delay option to start the simulation may be selected depending on the ship's dynamic characteristics. Actual target data can always be monitored during the trial maneuver by observing the target data cells.

SPECIFICATIONS OF FR/FAR-28x5 SERIES

Antenna Radiators

- 1. Type** Slotted waveguide array
- 2. Beamwidth and sidelobe attenuation**

Radiator Type	X-Band				S-Band
	XN3 6.5'	XN3A 6.5'	XN4A/20AF 8'	XN24AF 10'	SN7AF 12'*
Beamwidth (H)	1.23°	1.23°	0.95°	0.75°	1.9°
Beamwidth (V)	25°	20°	20°	20°	25°
Sidelobe within ±10°	24 dB	28 dB	28 dB	26 dB	25 dB
Sidelobe outside ±10°	30 dB	32 dB	32 dB	30 dB	30 dB

* 9 ft S-band radiator SN5AF available for non-SOLAS ships
(Beamwidth 2.3°H, 25°V, Sidelobe atten 20 dB)

- 3. Rotation** 26/21 rpm (60/50 Hz),
42 rpm (scanner RSB-0075)

RF Transceiver

1. Frequency

X-band: 9410 MHz ±30 MHz
S-band: 3050 MHz ±30 MHz

2. Output power

FR/FAR-2815: 12 kW
FR/FAR-2825/2825W: 25 kW
FR/FAR-2855/2855W: 50 kW
FR/FAR-2835S/2835SW: 30 kW
FR/FAR-2865SW: 60 kW

3. Pulselength/PRR

Range scale (nm)	Pulselength (µs)	PRR (Hz)
0.125, 0.25	0.08	2200
0.5, 0.75	0.08/0.2	2200
1.5	Two from 0.08, 0.2, 0.4	2200/1000
3	Two from 0.2, 0.4, 0.7	2200/1000
6	Two from 0.4, 0.7, 1.2	1000/600
12, 24	0.7, 1.2	1000/600
48	1.2	600
96	1.2	500

- 4. I.F.** 60 MHz, Logarithmic
Bandwidth Short pulse: 28 MHz
Long pulse: 3 MHz
- 5. Noise Figure** 6 dB (4 dB in FR/FAR-2835SW)

RADAR DISPLAY

1. Picture tube

28" color CRT, Effective display dia. 360 mm
IMO type: Yellow or green echoes in 16 levels
Regular type: Yellow or green echoes in 16 levels
or 3 colors depending on echo strengths. Different color for VRM, range rings, alarms, etc.

3. Minimum Range

35 m

4. Range scales and ring intervals (nm)

Range: .125, .25, .5, .75, 1.5, 3, 6, 12, 24, 48, 96
Ring: .025, .05, .1, .25, .5, 1, 2, 4, 8, 16

5. Range accuracy

1% of range in use or 15 m whichever is the greater

- 6. Range discrimination** 35 m on 0.25 nm range scale

7. Bearing discrimination

Better than 2.5°

8. Presentation modes

Head-Up, Head-Up TB, North-Up, Course-Up, TM North-Up

9. Electronic Plotting Aid (EPA)

10 targets. Disabled when ARPA function in use.

10. Parallel index lines

2, 3 or 6 lines (menu selectable)

11. Radar map

1500 points to create coastlines, own ship safety contour, isolated underwater dangers, buoys, traffic routing systems, prohibited areas, fairways as required by IMO. (RP-25 required)

ARPA FUNCTIONS (FAR-28x5 series)

1. Acquisition

Auto acquisition in 0.5 nm deep sector or circles within 0.3-32 nm, or 3-3.5 and 5.5-6 nm zones. Auto 20 targets plus manual 20 targets, or Manual 40 targets.

2. Tracking

Automatic tracking of all acquired targets on the display in 0.1 to 32 nm

3. Suppression areas

Combined with two acquisition areas of 3-3.5 and 5.5-6 nm, or 0.5 nm deep sector or circle in 0.3-32 nm.

4. Vector

True or relative 30 s, 1, 2, 3, 6, 12, 15, 30 min for prediction of target motion

5. Past positions

5, 10 or 20 past positions of tracked targets at intervals of 30 s, 1, 2, 3, 6 min.

6. Collision warning

CPA limit: 0.2 - 10 nm, TCPA limit: 0 - 99 min.

7. Guard zone

Two zones. 1st: 0.5 nm depth in 3-6 nm, 2nd anywhere. Sector 1-360°.

8. Trial maneuver

Dynamic or static, with selected delay time.

POWER SUPPLY (specify when ordering)

1. Display Unit

115/230 VAC, 1ø, 50/60 Hz,
115 VAC, 1ø (FR/FAR-2855/2855W/2865SW)

2. Antenna Unit

FR/FAR-2825W/2855W:
230 VAC, 1ø, 50/60 Hz; 230 VAC, 3ø, 60 Hz;
380 VAC, 3ø, 50 Hz; 440 VAC, 3ø, 60 Hz
FR/FAR-2835S/2835SW/2865SW:
230 V, 3ø, 60 Hz; 380 V, 3ø, 50 Hz; 440 V, 3ø, 60 Hz

For other mains, optional transformer is required.

EQUIPMENT LIST

Standard

1. Display unit with hand grip RDP-115 (Radar), RDP-115A (ARPA)
2. Antenna unit with 30 m antenna cable or waveguide
3. RF transceiver unit for RF-down system
4. PSU-001 for FR/FAR-2855 antenna
5. PSU-004 for FR/FAR-2825W/2855W/2835S/2835SW/2865SW
6. Gyro interface GC-8 (built in display unit)
7. Standard spare parts and installation materials

Optional

1. Display pedestal
2. Interswitch unit RJ-7
3. Performance monitor PM-30 (X-band), PM-50 (S-band)
4. 42 rpm scanner motor for FR/FAR-2815/2825
5. VideoPlotter RP-25
Required for Convention Ships to produce Radar Map
6. Transformer RU-1758/18093/5693/6522/6347/65466-1/3305
7. Gyro converter AD-100
8. Interface unit IF-2300 for multiple inputs of EPFS, water temp, water depth, wind, etc.

Note:

1. Some items in the optional section are mandatory with respect to the carriage rules.
2. For individual installations, please ask the details of the equipment list.
3. Basic items are type approved by the German BSH under MED. They will carry a steering wheel mark.



Memory card (SRAM) for storing own ship tracks and other reference locations. Capacity 6,000 points. May be used for storing the extended radar maps.



Chart card (ROM) stores electronic charts from an official or private source.

Optional cards



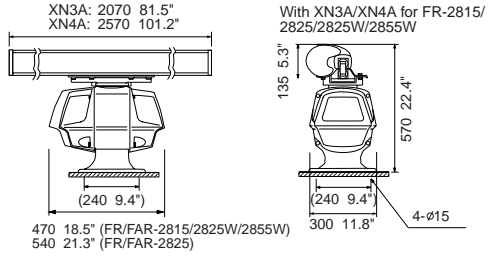
The display unit is supplied in the standard tabletop cabinet. The display pedestal is optional, but the user can design the pedestal to suit the bridge design.

VOYAGER

The display unit can be supplied in a special cabinet matching the IBS configuration as FAR-2805i series.

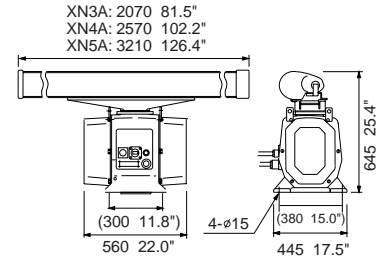


ANTENNA UNIT for FR/FAR-2815/2825/2825W/2855W

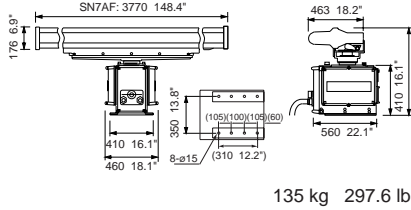


	w/XN3A	w/XN4A	w/XN5A		20AF	24AF
FR/FAR-2815 C2P7N2N(24rpm) RSB-0068(42rpm) RSB-0064(36rpm)	38.5 kg	38.5 kg		RSB-0074(24rpm)	39 kg	42 kg
FR/FAR-2825 RSB-0014(24rpm) RSB-0069(42rpm) RSB-0064(36rpm)	47 kg	49.5 kg		RSB-0075(42rpm)	39 kg	42 kg
FR/FAR-2825W/ RSB-0041 RSB-0042 RSB-0043 RSB-0046	39.5 kg	42 kg		RSB-0077(220VAC 3Ø) RSB-0076(220VAC 3Ø)	39.5 kg	42 kg
FR/FAR-2855 RSB-0049 RSB-0050	57.3 kg	74 kg	77 kg			

ANTENNA UNIT for FR/FAR-2855 RSB-0049/0050

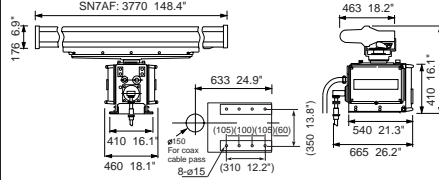


**ANTENNA UNIT for FR/FAR-2835S
RSB-0026/0031**



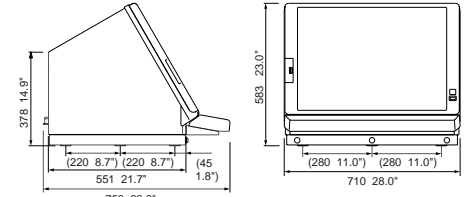
135 kg 297.6 lb

**ANTENNA UNIT for FR/FAR-2835SW/2865SW
RSB-0027/0032**



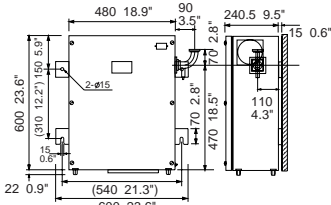
130 kg 286.6 lb

DISPLAY UNIT RDP-115/115A



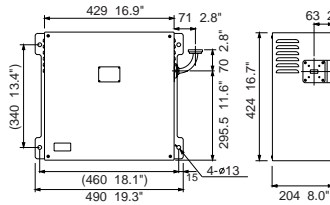
88 kg 194.0 lb

**TRANSCIVER UNIT
RTR-010 for FR/FAR-2855W**



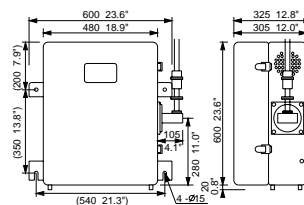
35 kg 77.2 lb

RTR-046 for FR/FAR-2825W



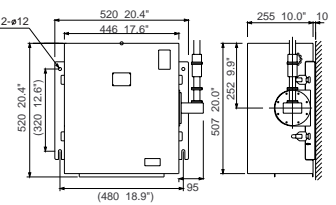
13.5 kg 29.8 lb

RTR-018 for FR/FAR-2865SW

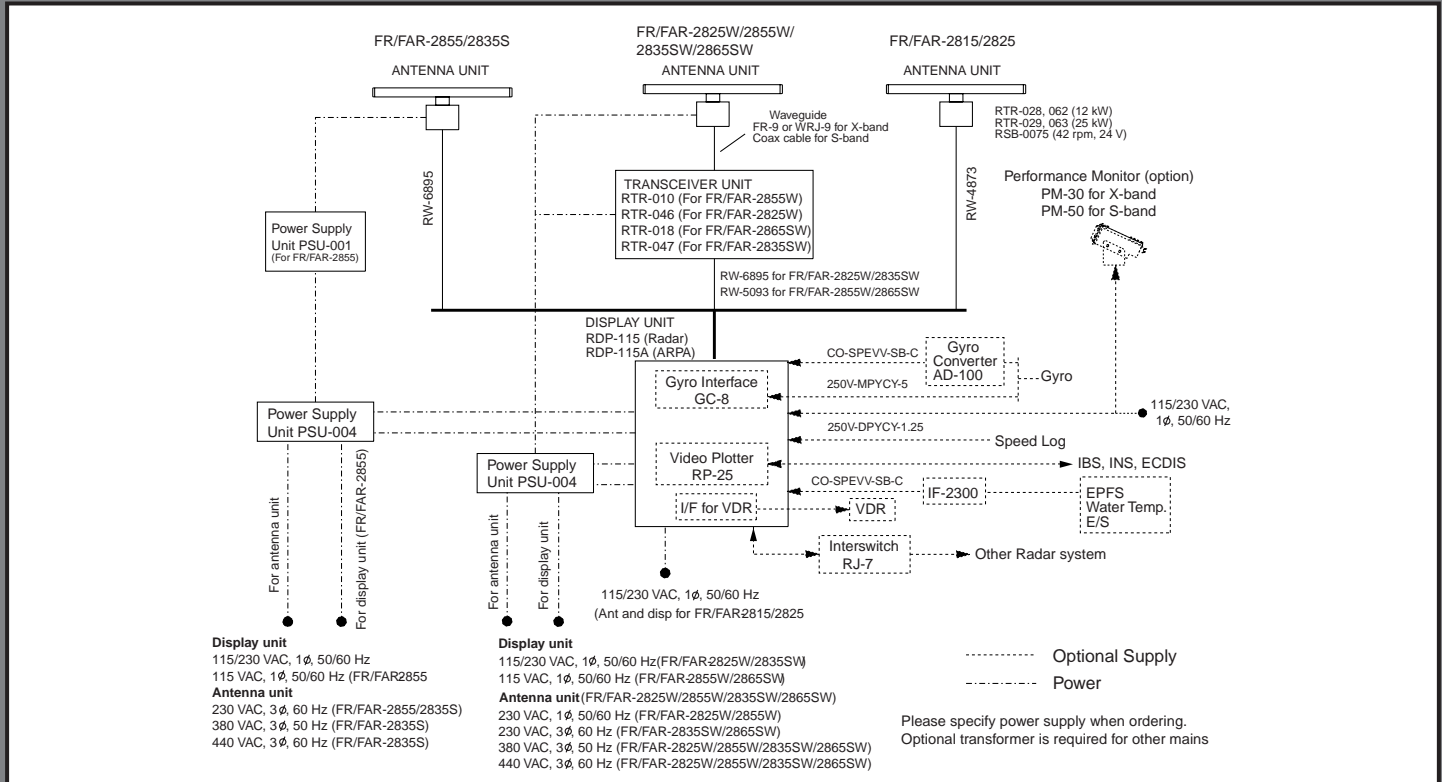


44 kg 97.0 lb

RTR-047 for FR/FAR-2835SW



28 kg 61.2 lb



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9910XVKS Printed in Japan