

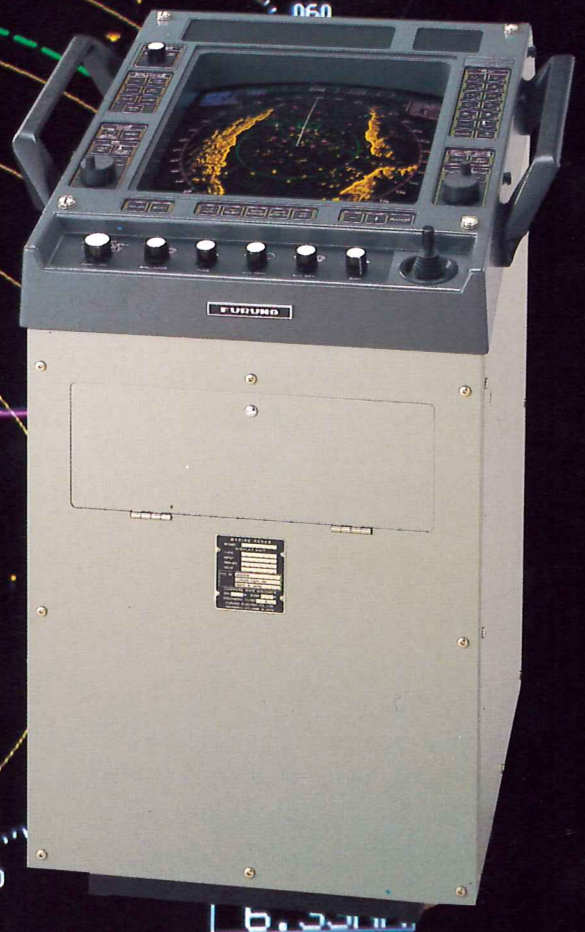
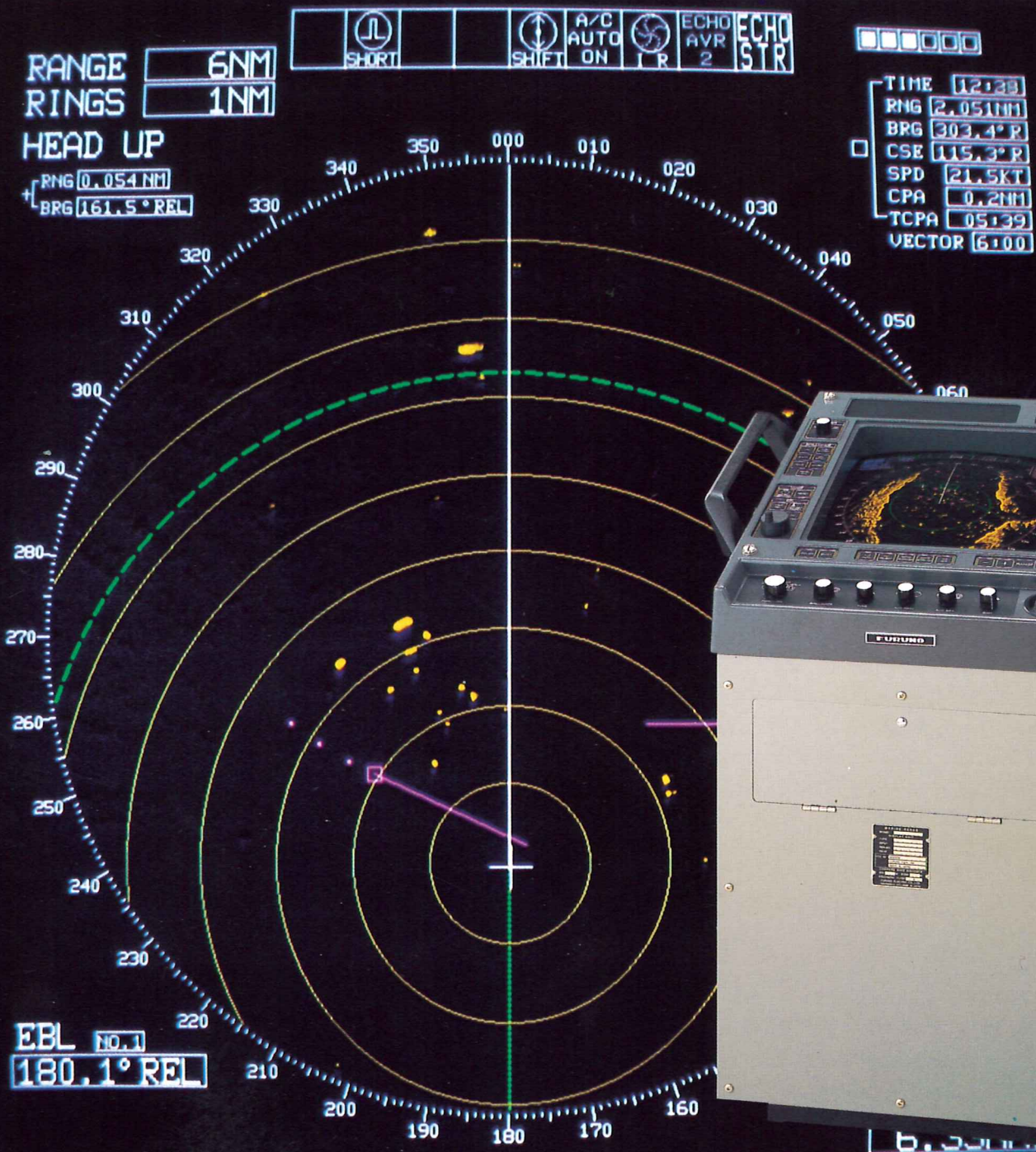
FURUNO®

DIGITIZED MARINE RADAR

Daylight Bright 20" High-Resolution Color CRT

...Exceeds IMO Specifications for vessels less than 10,000 grt

Models **FR-2010/FR-2020**



The future today with FURUNO's electronics technology.

FURUNO ELECTRIC CO., LTD.

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Catalogue No. R-089d

TRADE MARK REGISTERED
MARCA REGISTRADA

Heavy-duty FURUNO



(Handgrip optional)

The new FURUNO FR-2000 Series of Heavy Commercial radars is the product of many years of experience in radar design and manufacturing. This new Series has been designed to meet fully the exacting rules of the International Maritime Organization (IMO) for vessels less than 10,000 grt. These new radars are equally at home on a hard-working commercial tugboat, or a fishboat, or on the most elegant of large pleasure yachts.

The bright 20" diagonal raster-scan CRT is the equivalent of older 12" round analog radars, and a quality non-glare color CRT is employed to show radar echoes in high-contrast yellow orange on a dark background (operator-selectable as either black for nighttime or blue for daytime use). Other alphanumeric and digital information is shown in other colors.

Sophisticated computer algorithms are used to enhance target detection, such as Echo Stretch, Echo Average, and the built-in Radar Interference Rejector. Electronic aids, such as

the calculation of CPA, TCPA, Target Course, Echo Plotting, plus Speed, Range and Bearing to a selected target and an easy-to-use Target Alarm, give the operator the ability to assess dangerous situations quickly and accurately.

The combination of sensibly arranged, backlit tactile touchpads, rotary knobs, and a joystick make the FR-2000 Series radars easy and intuitive to use.

Like all FURUNO digitized radars, the FR-2000 Series uses Multi-Level Quantization (MLQ) of incoming radar echoes, utilizing eight levels to produce the most detailed and accurate representation of targets possible. FURUNO does not skimp or cut corners where Safety of Life at Sea is concerned.

The new FURUNO FR-2000 Series is truly on the leading edge of computerized marine radar technology.

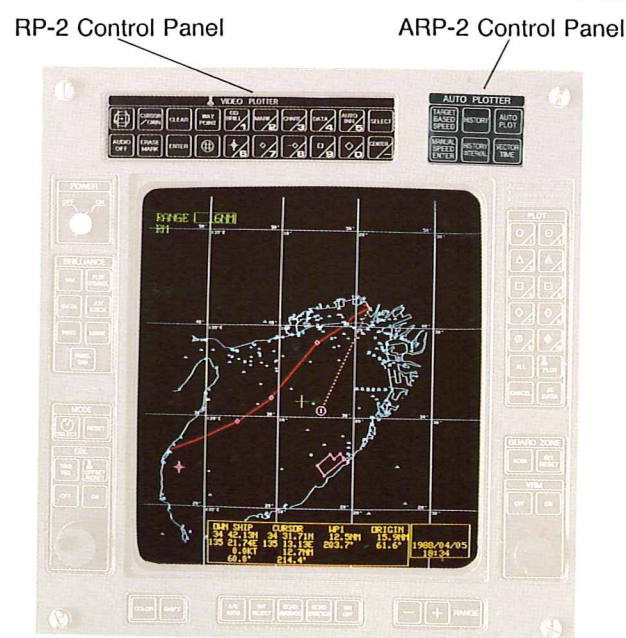
FR-2010:10 kW, 72 n.m.

FR-2020:25 kW, 120 n.m.

commercial quality for all vessels less than 10,000 grt

- Daylight-bright high-resolution color display; yellow-orange images with a selectable background color for night and day
- High accuracy- range; 7m or 0.8% of range in use, bearing; 0.1 degree resolution
- Easy operation by combination of tactile backlit touchpads and rotary controls
- Audio-visual alert for targets in guard zone
- Superior performance in sea and rain clutter by both manual and automatic clutter circuitry
- Enhanced visual target detection through Echo Average, Target Stretch, and Radar Interference Rejector, together with MLQ (Multi-level quantization)
- Echo plot providing an instant readout for CPA, TCPA, vector course and speed of 10 targets
- Exclusive FURUNO MIC low noise receiver
- Choice of 10 or 25 kW transceiver
- Optional – Performance Monitor PM-30 (required on Convention ships above 500 GT in many countries), Video Plotter RP-2, Auto Plotter ARP-2 Interswitch Box RJ-2 (for two 10 kW or two 25 kW radars)

VIDEO PLOTTER RP-2 and AUTO PLOTTER ARP-2



The Auto Plotter **ARP-2** provides automatic tracking on 10 targets. Targets' course and speed are shown with vector. Course/speed/range/bearing/CPA/TCPA are digitally indicated on screen. Also, it displays targets' past positions and echo-based own ship speed.

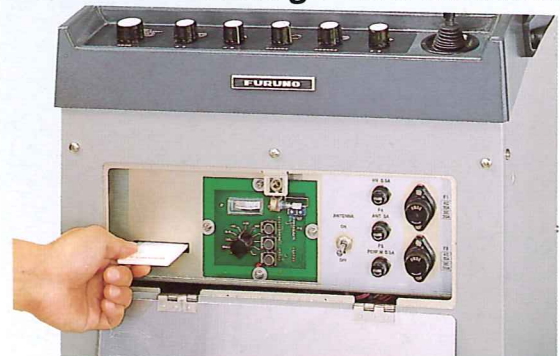
The **RP-2** is a unique Video Plotter which allows overlay of course plotting and chart on the radar picture. The RP-2 works with an IC card (RAM or ROM card) for storage/retrieval of chart data.

ARP-2 and RP-2 control panels can be readily fitted in the existing radars FR-2000 series.

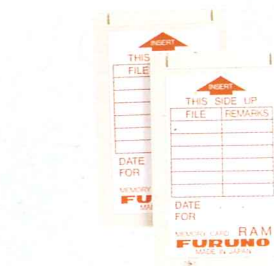
On Convention ships (SOLAS, IMO governed), Video Plotting will be permitted on a second display unit. Use of the RP-2 in the primary radar is subject to the Authority.

Photo: Ship's course is plotted on a factory digitized chart. Map scale 16 n.m. with RP-2

Storage and Retrieval of Chart data (by RP-2)



RAM or ROM Card is inserted into the slot on the front side of the display unit



RAM Card for storing user made chart
Battery life: 3 years
(Common to RP-1, RP-2, RP-3)

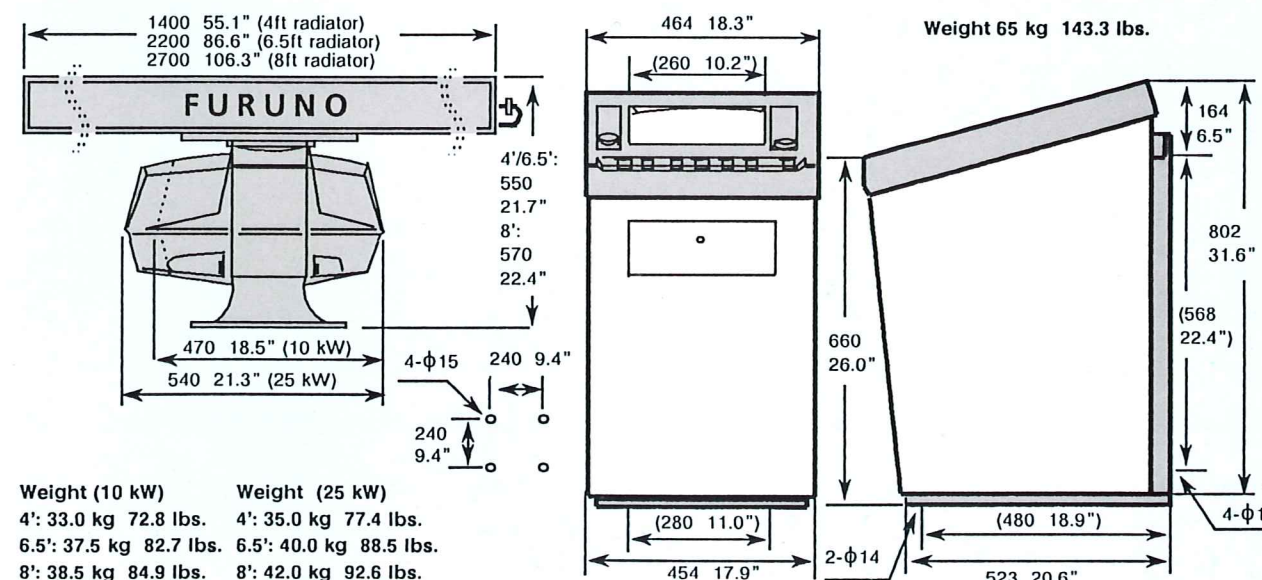
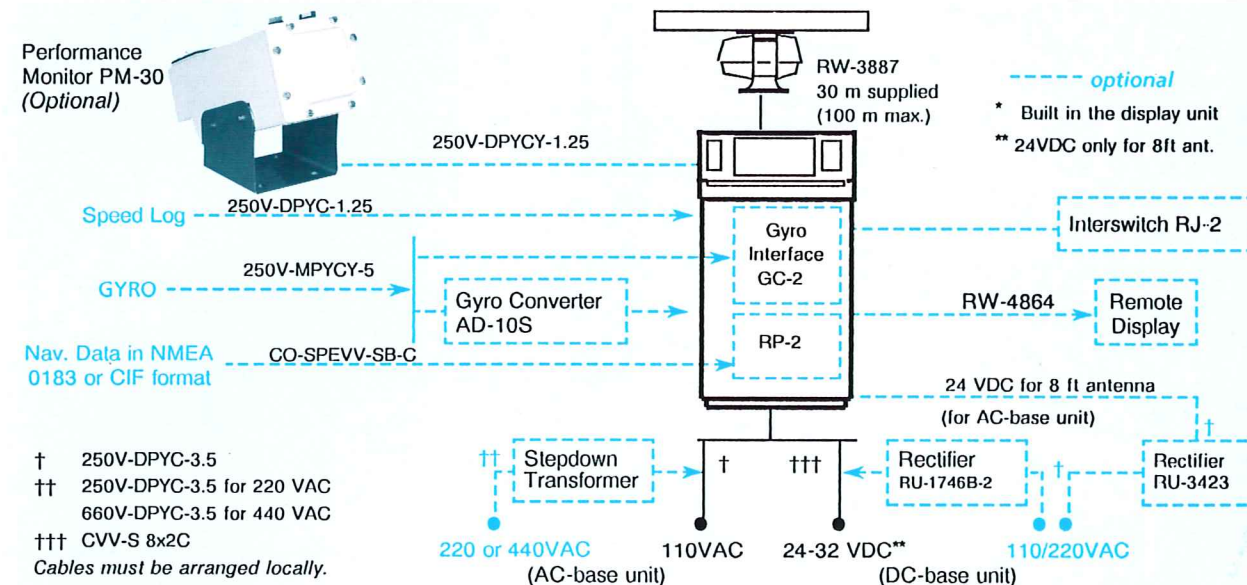
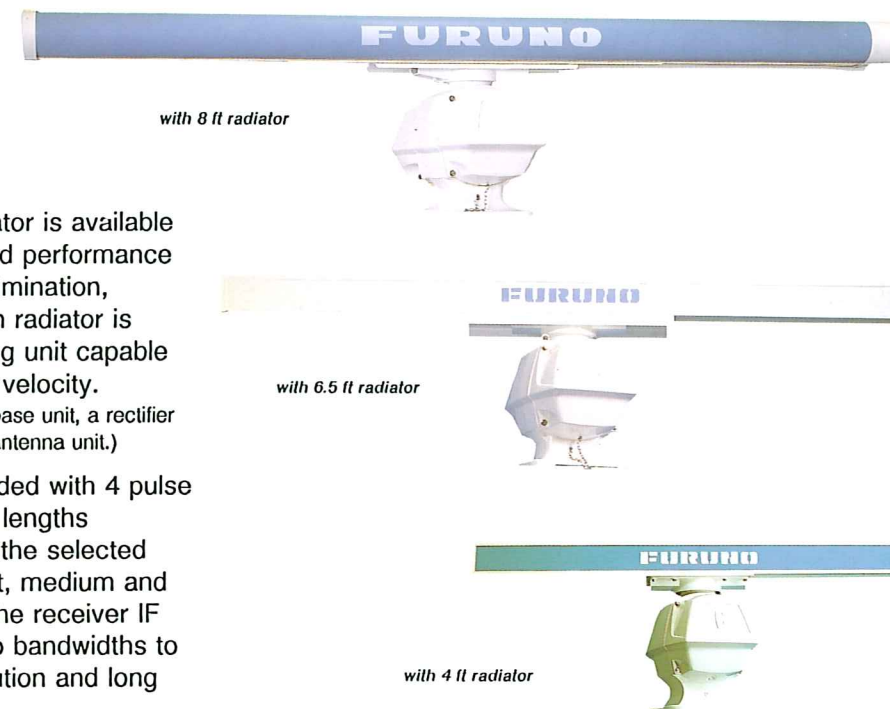


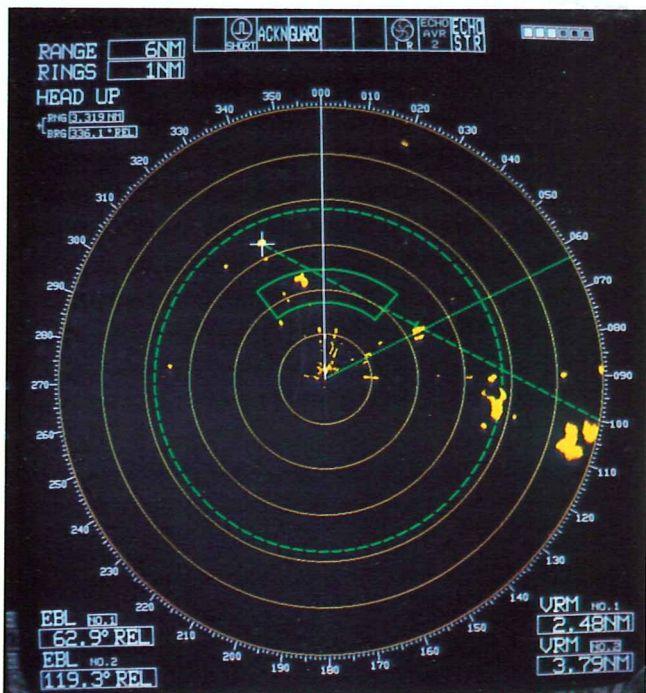
ROM Card stores factory digitized chart.
(Common to the card for GD-180, RP-1, RP-3)

ANTENNA UNIT

Precision 4, 6.5 or 8 ft radiator is available to best suit the ship size and performance requirements (bearing discrimination, detection). The field-proven radiator is mounted on a rugged turning unit capable of withstanding 100 kt wind velocity. (When 8 ft radiator is used in AC-base unit, a rectifier is required to feed 24 VDC to the antenna unit.)

The transmitter unit is provided with 4 pulse repetition rates and 4 pulse lengths automatically switched with the selected range to give optimum short, medium and long range performance. The receiver IF system is designed with two bandwidths to gain both short range resolution and long range sensitivity.





FLOATING-ORIGIN EBL

Origin can be placed anywhere with the joystick to provide measurements of range and bearing between any two targets. The EBL origin can be instantly reset to own ship position.

N-Type has only one EBL and VRM, while the regular type has a capability of switching between No.1 and 2 EBL, and No.1 and 2 VRM.

N or REGULAR is not a part of the model number, but merely an intracompany identification for software.

CHOICE OF COLOR

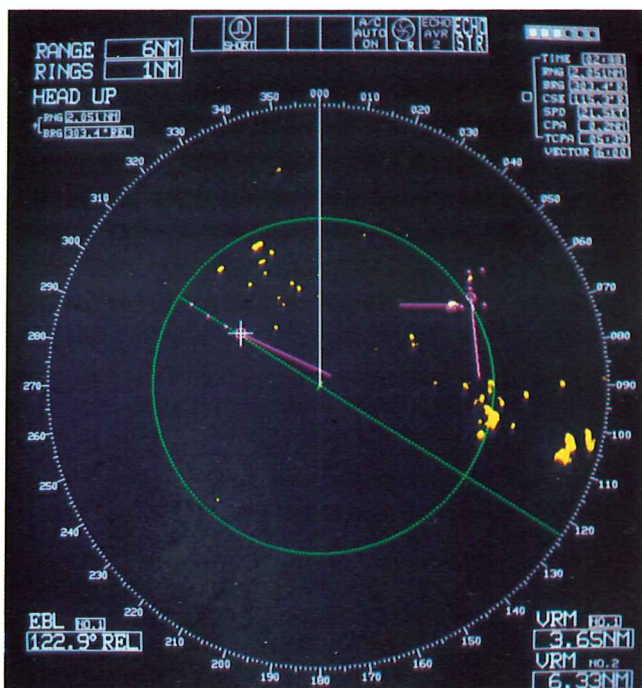
Quality non-glare color CRT provides radar echoes in high-contrast yellow orange. Background can be selected as black or blue for nighttime or daytime use.



ELECTRONIC PLOTTER

Electronic Plotting is far more effective and easier than an old-fashioned Reflection Plotter. Up to 10 targets may be acquired using the joystick (max 5 plots for each target). Electronic Plot presents important navigation data on a particular target with the selected symbol shape. The data includes: Elapsed time since the last plot entry, Range/Bearing/Course/Speed/CPA/TCPA of the last-entered plot mark (□ mark in this case).

If more powerful plotting feature is wanted, why not add the optional AUTO PLOTTER ARP-2? It provides fully automatic tracking on 10 targets in 0.2–32 nm, with adjustable vector length and past position display.



SPECIFICATIONS OF FR-2010/2020

ANTENNA RADIATORS

1. Type	Slotted waveguide array		
	4'(XN2)	6.5'(XN3)	8'(XN4A)
2. Beamwidth	Hor: 1.8°	1.23°	0.95°
	Vert: 25°	25°	20°
3. Sidelobe Atten.			
Within ± 10° (* ± 20°):	24 dB*	24 dB	28 dB
Outside ± 10° (* ± 20°):	30 dB*	30 dB	32 dB
4. Polarization	Horizontal		
5. Rotation	24 rpm		
6. Wind Load	Relative wind 100 knots		

RF TRANSCEIVER (Contained in the Scanner Unit)

1. Frequency	9410 MHz ± 30 MHz (X-band)
2. Transmitter Power	10 kW (FR-2010), 25 kW (FR-2020)
3. Pulselength/PRR	0.08 μs, 2200 Hz (0.25, 0.5 nm) 0.08/0.3 μs, 2200/1100 Hz (0.75, 1.5 nm) 0.3/0.6 μs, 1100/600 Hz (3 nm) 0.6/1.2 μs, 600 Hz (6, 12, 24 nm) 1.2 μs, 600 Hz (48 nm) 1.2 μs, 500 Hz (72 nm, 120* nm) * FR-2020 only
4. I.F.	60 MHz, Logarithmic Bandwidth Short pulse: 28 MHz Med/Long pulse: 3 MHz
5. Duplexer	Ferrite circulator with limiter diode
6. Noise Figure	6 dB nominal

DISPLAY UNIT

1. Type	20" diagonal high-resolution color CRT. Effective dia. 255 mm
2. Presentation Modes	Head up, North up, Course up
3. Range Scales	FR-2010: 0.25, 0.5, 0.75, 1.5, 3, 6, 12, 24, 48, 72 n.m. FR-2020: 0.25, 0.5, 0.75, 1.5, 3, 6, 12, 24, 48, 120 n.m.
4. Offcenter	N-type: Forward range increase Regular Type: Picture center can be moved to any position.
5. Minimum Range	25 m
6. Range Discrimination	20 m on 0.25 nm scale
7. Bearing Readout	By EBL, floating origin, 0.1 degree resolution
8. Accuracy	Range: 0.8% of maximum scale in use or 7m, whichever is greater Bearing: EBL accuracy ± 1°
9. Echo Plot	Manual entry, automatic calculation for CPA/TCPA/vector/course/speed.
10. Echo Average	Scan-to-scan correlation to improve detection in sea clutter
11. Echo Stretch	Enhances target video on medium and long ranges.
12. Interference Rejection	Sweep-to-sweep correlation to reject interference from other radars
13. Guard Zone	Targets in the guard zone are alerted audibly and visually. 3 - 6 n.m. in N-Type. Anywhere in Regular type.

ENVIRONMENTAL

Ambient Temp	Display Unit : -15 to +55°C Antenna Unit : -25 to +70°C
Damp Heat Test, Vibration Test	IEC/DOT/RTCM General Requirements

POWER SUPPLY

DC-base Unit

- 24-32 VDC, 220W approx. (24 VDC only for 8ft antenna)
- 110/220 VAC with optional rectifier RU-1746B-2

AC-base Unit

- 110 VAC, 50-60Hz, 1φ, 320VA approx.
- 220 or 440 VAC with optional stepdown transformer
(For 8 ft antenna, separate rectifier for 24 VDC is required for antenna motor)

EQUIPMENT LIST

Standard

1. Display Unit w/Sun Visor and L-Cradle	1 unit
(specify DC-base or AC-base unit)	
2. Antenna Unit (4', 6.5' or 8')	1 unit
3. Standard Spare Parts	1 set
4. Installation Materials incl. 30m antenna cable	1 set

Optional

1. Stepdown Transformer RU-1758B-2 (220 VAC) or RU-1803 (440 VAC) for AC-base unit	
2. Rectifier RU-1746B-2 for DC-base unit	
3. Rectifier RU-3423 for power supply for 8 ft ant. in AC-base unit	
3. Remote Display CD-140, CD-141, GD-1400 or FMD-800	
4. Gyro Interface GC-2 (built-in) or Gyro Converter AD-10S (external)	
5. Interswitch RJ-2 (for the same output and IF amplifier type)	
6. Performance Monitor PM-30	
7. Handgrip for display unit	
8. Pedestal for display unit	
9. Auto Plotter ARP-2	
10. Video Plotter Control Panel RP-2	
11. ROM Card with factory-digitized chart for RP-2	
12. RAM Card for storing user-made chart for RP-2	

SPECIFICATIONS OF RP-2

Plot: True Motion or Relative Motion for Course Plot in Mercator Projection, Combination of Course Plot and Radar or Course Plot only
Map Area: 0.25, 0.5, 0.75, 1, 1.5, 2, 3, 4, 6, 8, 12, 16, 24, 32, 48, 72/120 nm (72 n.m. in FR-2010, 120 n.m. in FR-2020)
Usable Ground: Between 85°N and 85°S
Plot Interval: 10, 30 sec, 1, 5, 10, 30 or 60 min, or Hold
Built-in Memory: 1000 course/line points max. and 1000 nav. marks max. Course/line and marks are retained by built-in battery.
Navigation Equipment: Input from nav equipment in Furuno CIF or NMEA 0183 format.
CIF: Ship L/L; Waypoint L/L; Loran TD; Water Temperature; Water Depth; Month/Day/Time; Ship Course/Speed; Event L/L
NMEA 0183: Ship L/L (\$++GLL); Waypoint L/L (\$++WPL); Loran TD (\$LTCGT); Water Temperature (\$++MTW); Water Depth (\$++DBT)
 () : NMEA sentence, ++: talker identifier LC, OM, DE, TR, GP

SPECIFICATIONS OF ARP-2

Target Tracking: 10 targets manual acquisition in 0.3 to 32 n.m., auto tracking in 0.2 to 32 n.m.
Data: Range/Bearing to a target, target Course/Speed/CPA/TCPA
Vector Mode: True (may be preset to Relative), 30 sec/1/2/3/6/10/15/30 min vector length
History: Five past positions at intervals of 15/30 sec, 1/2/3/6/10/12 min
Own Ship Speed: Log (may be preset to MAN), echo based.
Composition: 3 pc boards, 3 system ROMs, etc. to be fitted in the display unit.
 All figures typical value

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

FOR FURTHER INFORMATION
PLEASE CONTACT ➡