

**FURUNO**

# **RADAR**

**Model: FAR-2xx8 series**

***Keep Steady At Sea***

*with the safe, reliable and user-friendly next generation Radar*



# Keep Steady At Sea

*with the safe, reliable and user-friendly next generation Radar*



## RADAR

### **FAR-23x8 series**

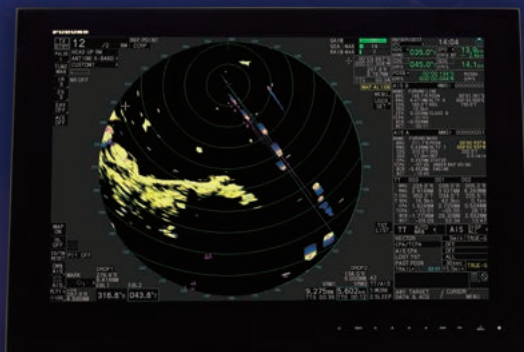
*for Category 1 of ship/craft, with 27" LCD*

|                      |                            |
|----------------------|----------------------------|
| FAR-2318             | X-band, 12 kW              |
| FAR-2328/FAR-2328W   | X-band, 25 kW              |
| FAR-2328-NXT         | X-band, 600 W, Solid State |
| FAR-2338S/FAR-2338SW | S-band, 30 kW              |
| FAR-2338S-NXT        | S-band, 250 W, Solid State |

### **FAR-20x8-MARK-2 series**

*for Category 1/2 of ship/craft, with 27"/19" LCD*

|                     |                            |
|---------------------|----------------------------|
| FAR-2018-MARK-2     | X-band, 12 kW              |
| FAR-2028-MARK-2     | X-band, 25 kW              |
| FAR-2028-NXT-MARK-2 | X-band, 600 W, Solid State |



### **FAR-22x8 series**

*for Category 2 of ship/craft, with 19" LCD*

|                                |                            |
|--------------------------------|----------------------------|
| FAR-2218/FAR-2218-BB           | X-band, 12 kW              |
| FAR-2228/FAR-2228-BB           | X-band, 25 kW              |
| FAR-2228-NXT/FAR-2228-NXT-BB   | X-band, 600 W, Solid State |
| FAR-2238S/FAR-2238S-BB         | S-band, 30 kW              |
| FAR-2238S-NXT/FAR-2238S-NXT-BB | S-band, 250 W, Solid State |

Complies with the following regulations:

|                      |                  |
|----------------------|------------------|
| IEC 60945 Ed.4.0     | IEC 62288 Ed.3.0 |
| IEC 61162-1 Ed.5.0   | IEC 62388 Ed.2.0 |
| IEC 61162-2 Ed.1.0   | IEC 62923-1      |
| IEC 61162-450 Ed.2.0 | IEC 62923-2      |
| IEC 61174 Ed.4.0     |                  |



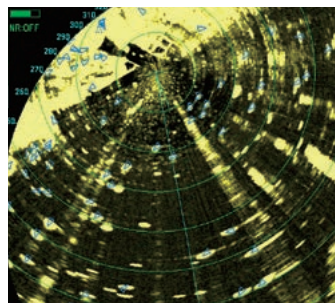
# Advanced technologies for navigation safety

The Furuno FAR-2xx8 series is a brand-new Radar series characterized by its state-of-the-art antenna design and innovative signal processing technologies.

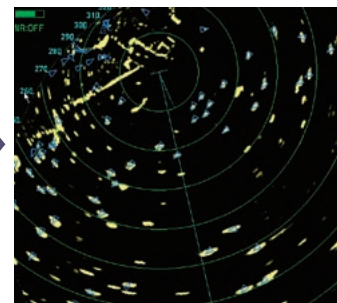
Furuno's latest, advanced technologies and intuitive design will increase situational awareness, facilitating unparalleled navigational safety.

## ► Automatic Clutter Elimination (ACE) for unprecedented echo clarity

The ACE adjusts the Radar image with a single button press. When the ACE is activated, the system automatically optimizes clutter reduction filters and gain control according to the sea and weather conditions.



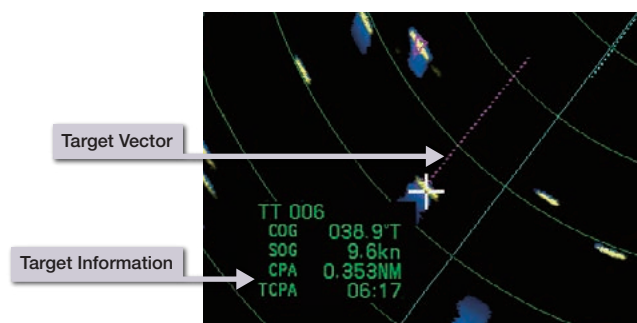
ACE OFF



ACE ON

## ► Fast Target Tracking™ provides early-stage collision avoidance

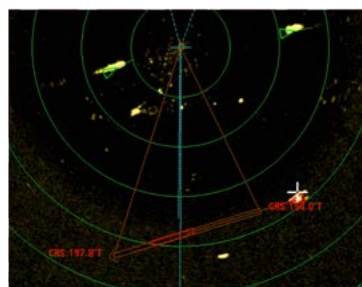
The Fast Target Tracking™ provides accurate tracking information; speed and course vectors are displayed in mere seconds, allowing operators to take action and avoid incidents at a very early stage.



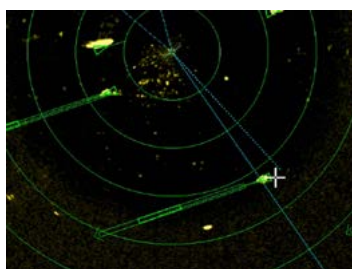
## ► See potential collisions with Risk Visualizer™

The Risk Visualizer™ assists operators in making avoidance decisions by visualizing the areas where there is a risk of collision if own ship keeps current speed and other ship(s) continue to navigate at their current speed and course.

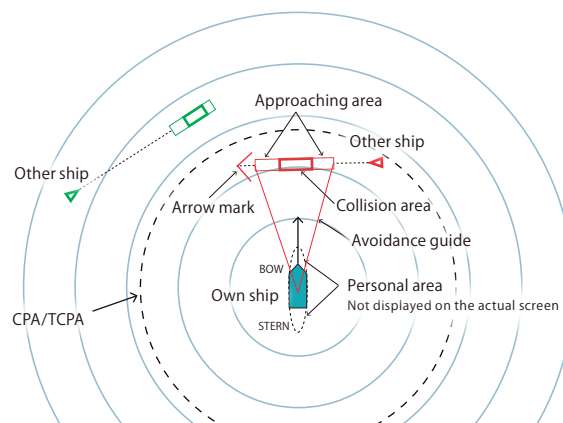
The Risk Visualizer™ makes it easier to identify the risk of approaching or colliding with other vessels in challenging environments—such as during nighttime navigation, low-visibility conditions, high-traffic areas, or when the operator is managing a high workload.



In the example image, by altering course so that your ship does not enter the approaching area, you can avoid the other ship by maintaining a distance equal to the personal area.



Risk Visualizer display image



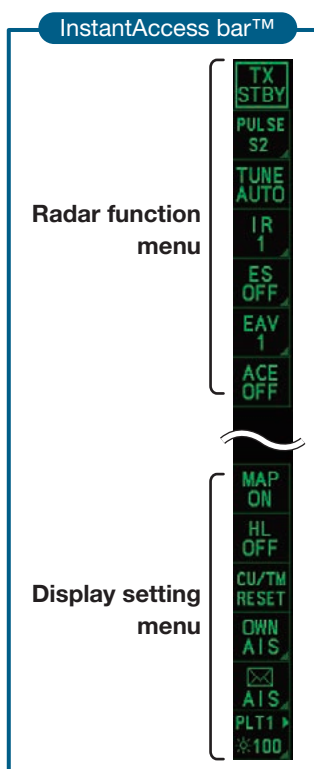
Maneuver your vessel to avoid the approaching/collision areas, you will be able to avoid other ships. If your ship's course is within an approaching area, there is a risk of coming close to other ship, so the operators must steer with caution.

If target's CPA and TCPA are less than the threshold, the approaching /collision area will flash in red and the CPA/TCPA alert occurs. After acknowledging the alert, the flashing stops.

※If a target's speed or course is changed after your vessel changes its course, the risk of collision may increase. Maneuver your vessel accordingly to avoid collision.  
 ※When the vector mode is set to the ground stabilization or sea stabilization(true), the approaching/collision area is shown with a thick solid line in the same direction as the vector of the target that is on a collision course with own ship.  
 ※The color for the approaching/collision areas change according to the color of the target symbol.

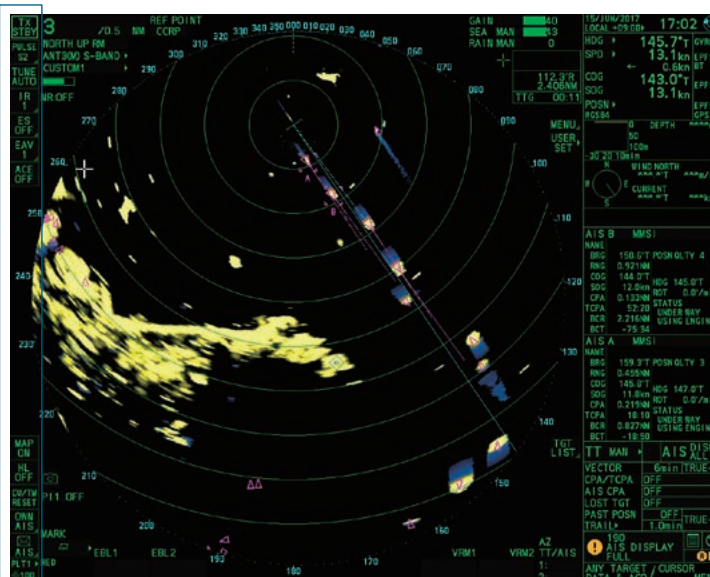


## Exceptionally intuitive user interface



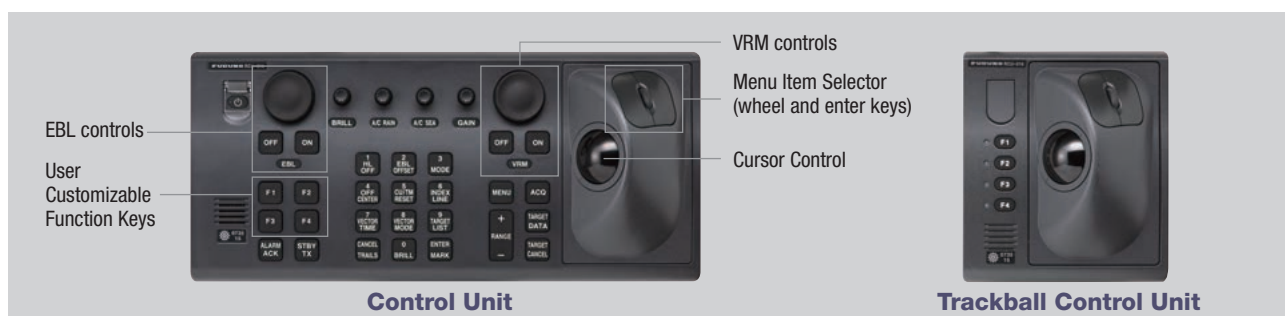
### ► InstantAccess bar™ for quick access to your frequently used functions

InstantAccess bar™ contains shortcut menus for frequently used functions and actions, allowing for quick access to essential tasks.



### ► Well-designed controllers for stress-free operation

Comfortable usability is very important on long voyages. With that in mind, these control units are ergonomically designed to comfortably accommodate the operator's hand. All operations can be performed with the trackball.





## Refined antenna design provides excellent reliability and easy maintenance



\*Only AF antennas can be connected to FAR-2018/2028-MARK-2, and only CF antennas can be connected to FAR-22x8.

The FAR-2xx8 series is designed to provide clearer and more accurate Radar images of the surroundings, while increasing reliability and decreasing overall cost of ownership with easy maintenance.

The Ethernet network between the antenna and below-deck equipment allows for high reliability, directly converting analog to digital signals before sending them to the main processor unit.

The new antenna's refined shape significantly reduces aerodynamic drag and decreases the burden on the gear box. The gear box itself has also been redesigned. Decreased aerodynamic drag and a DC brushless motor result in a very durable gear box that can be used for prolonged periods of time.

Installation and maintenance are now easier than ever. All components of the gear box are integrated into one block that can easily be removed from the gear box when maintenance is required. The cable to the gear box can be connected from the side of the gear box.

## Flexible fit, effortless setup — Perfect for new builds or retrofits

- Existing monitor, control unit and cables can be used in retrofitting\*.

\*Only when retrofitting the FAR-2xx7 series

- Optional LAN Signal Converter enables Ethernet communication. Extend the cable between the antenna unit and the processor unit utilizing existing cables when retrofitting is possible.
- Ethernet connectivity enables interface and information exchange.  
Ethernet expands the Radar's capability with connection between either existing or a newly installed system, such as ECDIS and VDR.
- Utilize Inter-Switching with optional Ethernet HUB.
- DVI-I cable can be connectible to VDR in retrofitting.

How to connect VDR with FAR-2xx8 series

|                          |                                                                  |
|--------------------------|------------------------------------------------------------------|
| VR-7000/7000S            | Directly connect VDR with LAN.                                   |
| VR-3000/3000S            | Directly input the RGB signal from a DVI-I port to the VDR.      |
| Other manufacturer's VDR | Please check with the VDR manufacturer to connect appropriately. |

## Advanced Detection Meets Low Maintenance — Discover the Power of NXT Solid-State Radar

Compared to the traditional Magnetron Radar, the Solid-State Radar NXT Series provides highly reliable target detection while requiring low power.

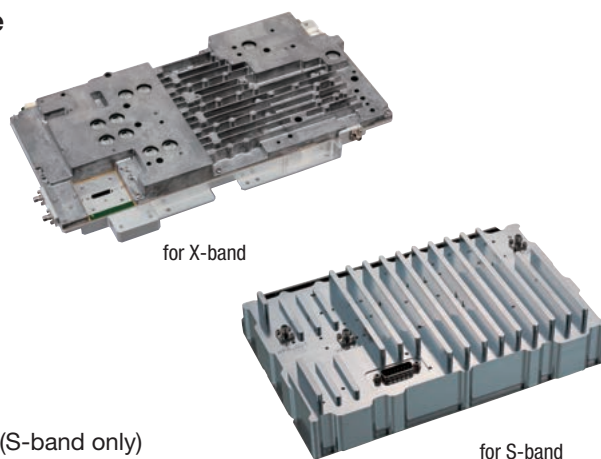
- Clear images

Furuno Solid State Radar technology generates clear echo images, which allows users to obtain a clear picture of the area around their vessel, including weaker echoes from small crafts.

- Reducing the time and cost for maintenance

- No need to replace the magnetron
- Removal of the consumable parts thanks to a fan-less antenna (S-band only)

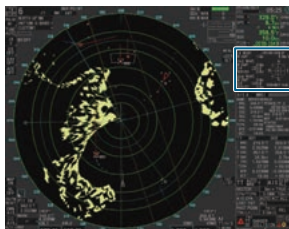
Power Amplifier Module of the Solid State transceiver



## Cutting-Edge Tech for Safer, Smarter Navigation in Every Situation (optional)

- Wave Analyzer Software \*

- Allows real-time monitoring and analysis of wave echoes
- Ensures safety at sea even at night

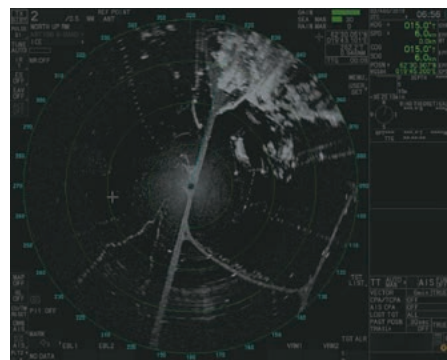


\*More details on the Wave Analyzer brochure



- Ice Mode \*\* (X-band magnetron only)

- Find the best route through ice
- Observe ice conditions by Radar



\*\*Please contact your local distributor for more details

**Product Name** MARINE RADAR**Antenna Radiator**

1. Type Slotted waveguide array
2. Beam width and sidelobe attenuation

| Radiator type         | X-Band |        |        |        |        |        | S-Band |
|-----------------------|--------|--------|--------|--------|--------|--------|--------|
|                       | XN12CF | XN20CF | XN24CF | XN12AF | XN20AF | XN24AF | SN36CF |
| Length                | 4 ft   | 6.5 ft | 8 ft   | 4 ft   | 6.5 ft | 8 ft   | 12 ft  |
| Horizontal beam width | 1.9°   | 1.23°  | 0.95°  | 1.9°   | 1.23°  | 0.95°  | 1.8°   |
| Vertical beam width   | 20°    | 20°    | 20°    | 20°    | 20°    | 20°    | 25°    |
| Sidelobe within ±10°  | -24 dB | -28 dB | -28 dB | -24 dB | -28 dB | -28 dB | -24 dB |
| Sidelobe outside ±10° | -30 dB | -32 dB | -32 dB | -30 dB | -32 dB | -32 dB | -30 dB |

3. Polarization Horizontal
4. Rotation 24 rpm or 42 rpm (for high speed craft)  
\*XN24CF/XN24AF not available in 42 rpm
5. Wind load 100 kn relative
6. De-icer (option) On: when temperature goes down to 0°C  
Off: when temperature goes up to +5°C

**Transceiver****1. TX Frequency and modulation**

|                      |                                                                                                   |
|----------------------|---------------------------------------------------------------------------------------------------|
| X-band (Magnetron)   | 9410 MHz ±30 MHz, P0N                                                                             |
| S-band (Magnetron)   | 3050 MHz ±30 MHz, P0N                                                                             |
| X-band (Solid state) | CH1 P0N: 9403.75 MHz/Q0N: 9423.75 ±5MHz or<br>CH2 P0N: 9413.75 MHz/Q0N: 9433.75 ±5MHz             |
| S-band (Solid state) | CH1 P0N: 3043.75 MHz/ Q0N: 3063.75 MHz ±5 MHz or<br>CH2 P0N: 3053.75 MHz/ Q0N: 3073.75 MHz ±5 MHz |

**2. Output power**

|                                                       |       |
|-------------------------------------------------------|-------|
| FAR-2018-MARK-2/2218/2218-BB/2318                     | 12 kW |
| FAR-2028-MARK-2/2228/2228-BB/2328/2328W               | 25 kW |
| FAR-2228-NXT/2228-NXT-BB/2328-NXT/FAR-2028-NXT-MARK-2 | 600 W |
| FAR-2238S/2238S-BB/2338S/2338SW                       | 30 kW |
| FAR-2238S-NXT/2238S-NXT-BB/2338S-NXT                  | 250 W |

**3. Range scale, Pulse Repetition Rate and Pulselength**

Magnetron radar: FAR-2018-MARK-2/2218/2218-BB/2318/2028-MARK-2/  
2228/2228-BB/2328/2328W/2238S/2238S-BB/2338S/2338SW

| PRR<br>(Hz approx.) | Range scale (NM) |      |     |      |     |   |   |    |    |    |
|---------------------|------------------|------|-----|------|-----|---|---|----|----|----|
|                     | 0.125            | 0.25 | 0.5 | 0.75 | 1.5 | 3 | 6 | 12 | 24 | 48 |
| 3000                |                  |      |     |      |     |   |   |    |    |    |
| 3000                |                  |      |     |      |     |   |   |    |    |    |
| 1500                |                  |      |     |      |     |   |   |    |    |    |
| 1200                |                  |      |     |      |     |   |   |    |    |    |
| 1000                |                  |      |     |      |     |   |   |    |    |    |
| 600*                |                  |      |     |      |     |   |   |    |    |    |

\*: 500 Hz on 96 NM range.

Solid state radar: FAR-2228-NXT/2228-NXT-BB/2328-NXT/2028-NXT-MARK-2

| PRR<br>(Hz approx.) | Range scale (NM) |      |     |      |     |   |   |    |    |    |
|---------------------|------------------|------|-----|------|-----|---|---|----|----|----|
|                     | 0.125            | 0.25 | 0.5 | 0.75 | 1.5 | 3 | 6 | 12 | 24 | 48 |
| 1500                |                  |      |     |      |     |   |   |    |    |    |
| 1500                |                  |      |     |      |     |   |   |    |    |    |
| 1200                |                  |      |     |      |     |   |   |    |    |    |
| 1000                |                  |      |     |      |     |   |   |    |    |    |
| 1000                |                  |      |     |      |     |   |   |    |    |    |
| 600                 |                  |      |     |      |     |   |   |    |    |    |

Solid state radar: FAR-2238S-NXT/2238S-NXT-BB/2338S-NXT

| PRR<br>(Hz approx.) | Range scale (NM) |      |     |      |     |   |   |    |    |    |
|---------------------|------------------|------|-----|------|-----|---|---|----|----|----|
|                     | 0.125            | 0.25 | 0.5 | 0.75 | 1.5 | 3 | 6 | 12 | 24 | 48 |
| 2400                |                  |      |     |      |     |   |   |    |    |    |
| 2000                |                  |      |     |      |     |   |   |    |    |    |
| 1500                |                  |      |     |      |     |   |   |    |    |    |
| 1060                |                  |      |     |      |     |   |   |    |    |    |
| 1000                |                  |      |     |      |     |   |   |    |    |    |
| 600                 |                  |      |     |      |     |   |   |    |    |    |

**Processor Unit**

1. Minimum range 22 m
2. Range discrimination 26 m
3. Range accuracy 1% of the maximum range of the scale in use or 10 m, whichever is the greater
4. Bearing discrimination 2.1° (XN12CF/XN12AF), 1.5° (XN20CF/XN20AF), 1.2° (XN24CF/XN24AF), 2.0° (SN36CF)
5. Bearing accuracy ±1°
6. Range scale and Range ring interval (RI)

| Range (NM)      | 0.125 | 0.25 | 0.5 | 0.75 | 1.5  | 3   | 6 | 12 | 24 | 48 | 96 |
|-----------------|-------|------|-----|------|------|-----|---|----|----|----|----|
| RI (NM)         | 0.025 | 0.05 | 0.1 | 0.25 | 0.25 | 0.5 | 1 | 2  | 4  | 8  | 16 |
| Number of rings | 5     | 5    | 5   | 3    | 6    | 6   | 6 | 6  | 6  | 6  | 6  |

7. Warm-up time 3 min. approx. (solid state radar excluded)
8. Presentation mode Head-up, STAB head-up, Course-up, North-up (RM/TM), Stern-up
9. Marks Cursor, Range ring, Heading mark, North mark, Bearing mark, Target trail, VRM, EBL, Acquisition zone
10. Target tracking (TT) Auto or manual acquisition 100 targets in 24/32 NM  
(range selected from setting menu)  
Tracking 5/10 pts on all targets  
Vector time Off, 30 s, 1-60 min
11. AIS Display capacity 350 targets  
Tracking 5/10 pts on activated targets  
Vector time Off, 30 s, 1-60 min
12. Radar map 20,000 points
13. Acquisition zone 2 zones
14. Interswitch function Selectable from menu

**Display Unit**

|                             | MU-192                        | MU-270W                       |
|-----------------------------|-------------------------------|-------------------------------|
| 1. Screen type              | 19-inch color LCD             | 19-inch color LCD             |
| 2. Resolution               | 1280 x 1024 (SXGA)            | 1920 x 1200 (WUXGA)           |
| 3. Brightness               | 400 cd/m <sup>2</sup> typical | 400 cd/m <sup>2</sup> typical |
| 4. Visible distance         | 1.02 m nominal                | 1.02 m nominal                |
| 5. Radar effective diameter | 282 mm                        | 349 mm                        |

**Interface****1. Number of port (processor unit)**

|                         |                                                                                                        |
|-------------------------|--------------------------------------------------------------------------------------------------------|
| Serial                  | 7 ports (IEC61162-1/2: 2 ports, IEC61162-1: 4 ports, AD-10: 1 port)                                    |
| Alarm output            | 6 ports: contact signal, load current 250 mA<br>(Normal close/ open: 4, System fail: 1, Power fail: 1) |
| DVI output              | 2 ports: DVI-D, DVI-I or RGB picture data (VDR)                                                        |
| LAN                     | 2 ports: Ethernet 100Base-TX                                                                           |
| RS-232C                 | 1 port: brilliance control                                                                             |
| Sub display (for ECDIS) | 2 ports: HD, BP, Trigger and Video signal                                                              |

**2. Data sentences (IEC61162-1/2, IEC61162-450)**

|        |                                                                                                                                                                                                        |
|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Input  | ABK, ACK, ACN, ALR, BWC, BWR, CUR, DBK*, DBS*, DBT, DDC, DPT, DTM, GGA, GLL, GNS, HBT, HDT*, MTW, MWV, OSD, RAQ, RMB, RMC, ROT, RTE, SRP, THS, VBW, VDM, VDO, VDR, VHW, VSD, VTG, VWR*, VWT*, WPL, ZDA |
| Output | ABM, ACK, AIQ, ALC, ALF, ALR, ARC, BBM, DDC, EVE, HBT, OSD, RSD, SRP, TLB, TLL, TTD, TTM, VSD                                                                                                          |

\*1: for retrofit.

**3. Ethernet interface for IEC61162-450**

|                                              |                                                      |
|----------------------------------------------|------------------------------------------------------|
| Port (LAN2)                                  | 100Base-TX, IPv4, 8P8C connector                     |
| IEC61162-450 transmission group              |                                                      |
| Input                                        | MISC, TGTD, SATD, NAVD, TIME, PROP, CAM1, CAM2, NETA |
| Output                                       | Arbitrary (default: TGTD)                            |
| Multicast address                            | 239.192.0.1 to 239.192.0.18, and 239.192.0.56        |
| Destination port                             | 60001 to 60018, and 60056                            |
| Re-transmittable binary image transfer       |                                                      |
| Multicast address                            | 239.192.0.26 to 239.192.0.30                         |
| Destination port                             | 60026 to 60030                                       |
| Other network function excepted IEC61162-450 |                                                      |
|                                              | SNMP, HTTP, Syslog, Furuno Management Protocol (FMP) |

**4. Output port on antenna unit**

|                         |                                          |
|-------------------------|------------------------------------------|
| Sub display (for radar) | 1 port: HD, BP, Trigger and Video signal |
|-------------------------|------------------------------------------|

**Power Supply****1. Processor unit**

|                        |                                                                          |
|------------------------|--------------------------------------------------------------------------|
| FAR-2018-MARK-2        | 100-230 VAC: 2.1-1.0 (2.8-1.2)A, 1 phase, 50-60 Hz / 24VDC: 7.7 (10.6)A* |
| FAR-2218/2318          | 100-230 VAC: 2.1-1.0 (2.9-1.3)A, 1 phase, 50-60 Hz / 24VDC: 5.4 (9.0)A*  |
| FAR-2028-MARK-2        | 100-230 VAC: 2.1-1.0 (2.8-1.3)A, 1 phase, 50-60 Hz / 24VDC: 8.1 (11.2)A* |
| FAR-2028-NXT-MARK-2    | 100-230 VAC: 2.2-1.0 (2.8-1.3)A, 1 phase, 50-60 Hz / 24VDC: 8.1 (11.0)A* |
| FAR-2228/2328          | 100-230 VAC: 2.3-1.1 (3.2-1.4)A, 1 phase, 50-60 Hz / 24VDC: 8.9 (12.4)A* |
| FAR-2228-NXT/2238-NXT  | 100-230 VAC: 2.1-1.0 (2.9-1.3)A, 1 phase, 50-60 Hz / 24VDC: 8.2 (11.1)A* |
| FAR-2328W              | 100-230 VAC: 2.3-1.1 (3.2-1.4)A, 1 phase, 50-60 Hz                       |
| FAR-2238S/2338S/2338SW | 100-230 VAC: 3.2-1.5 (5.6-2.5)A, 1 phase, 50-60 Hz                       |
| FAR-2238S-NXT          | 100-230 VAC: 2.6-1.2 (5.1-2.2)A, 1 phase, 50-60 Hz                       |
| FAR-2328-NXT           | 100-230 VAC: 2.1-1.0 (2.9-1.3)A, 1 phase, 50-60 Hz                       |
| FAR-2338S-NXT          | 100-230 VAC: 2.6-1.2 (5.1-2.2)A, 1 phase, 50-60 Hz                       |

( ): 42 rpm \*Specify when ordering

**2. Display Unit**

|         |                                           |
|---------|-------------------------------------------|
| MU-192  | 100-230 VAC: 0.4-0.3 A, 1 phase, 50-60 Hz |
| MU-270W | 100-230 VAC: 0.6-0.4 A, 1 phase, 50-60 Hz |

**3. Intelligent HUB**

|                     |                                                   |
|---------------------|---------------------------------------------------|
| 4. De-icer (option) | 100-230 VAC: 0.1 A max. 1 phase, 50/60 Hz         |
|                     | 100-115/220-230 VAC: 2.6/1.3 A, 1 phase, 50-60 Hz |

**Environmental Conditions****1. Ambient temperature**

|              |                                          |
|--------------|------------------------------------------|
| Antenna unit | -25°C to +55°C (storage: -25°C to +70°C) |
| Indoor units | -15°C to +55°C (storage: -20°C to +70°C) |

**2. Relative humidity**

|  |                      |
|--|----------------------|
|  | 95% or less at +40°C |
|--|----------------------|

**3. Degree of protection**

|                         |                 |
|-------------------------|-----------------|
| Antenna unit            | IP56            |
| Processor/ monitor unit | IP22            |
| Control unit            | IP20            |
| Intelligent HUB         | IP22 (HUB-3000) |

**4. Vibration**

|  |                |
|--|----------------|
|  | IEC 60945 Ed.4 |
|--|----------------|

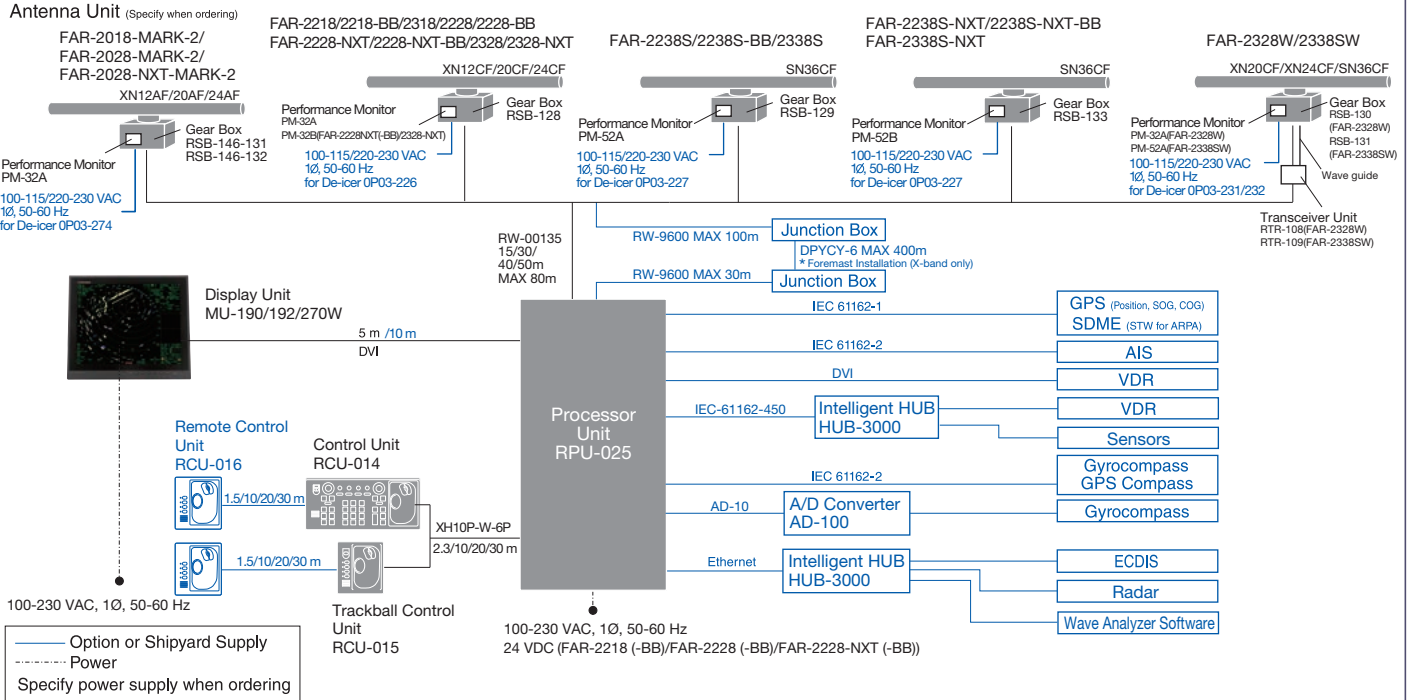
**Equipment List****Standard**

- Display Unit MU-192/MU-270W
- Processor Unit RPU-025
- Control Unit RCU-014
- Trackball Control Unit (Specify when ordering) RCU-015
- Antenna Radiator XN12CF/XN20CF/XN24CF/XN12AF/XN20AF/XN24AF/SN36CF
- Transceiver RTR-105/106/107/108/109/111
- Gear Box RSB-128/129/130/131/133
- DVI cable (5 m) DVI-D/D S-LINK 5M, not supplied with BB model
- Standard Spare Parts and Installation Materials
- Performance Monitor PM-32A/52A/52B

**Option**

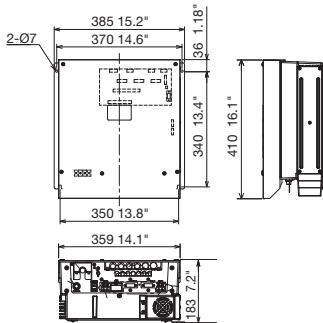
- Remote Control Unit RCU-016
- Junction Box RJB-001
- AD Converter AD-100-E
- Intelligent HUB HUB-3000
- De-icer OP03-226/227/231/232/274
- LAN Signal Converter OP03-247-1/2/3/4
- Wave Analyzer Software WV-100/WV-100ST

## INTERCONNECTION DIAGRAM



### Processor Unit RPU-025

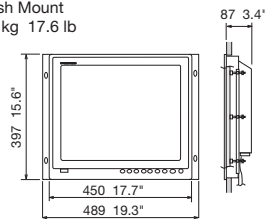
X-band/ S-band 24rpm w/ Fan 9.6 kg 21 lb  
S-band 42rpm w/ 2 Fan 11.5 kg 25 lb



### Display Unit

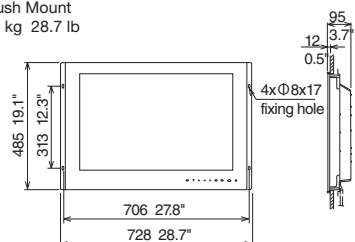
#### MU-192

Flush Mount  
8.0 kg 17.6 lb



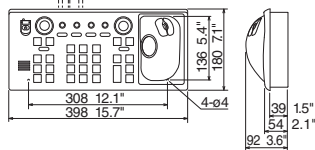
#### MU-270W

Flush Mount  
13 kg 28.7 lb



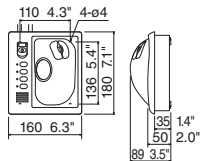
### Control Unit

RCU-014 2.5 kg 5.5 lb



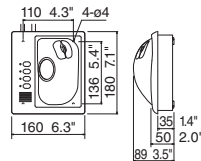
### Trackball Control Unit

RCU-015 2.4 kg 5.3 lb



### Remote Control Unit

RCU-016 2.4 kg 5.3 lb

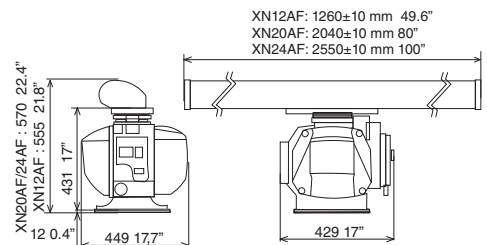


### Antenna Unit

for FAR-2018-MARK-2/2028-MARK-2/  
FAR-2028-NXT-MARK-2

#### Radiator

XN12AF 39 kg 86 lb  
XN20AF 44 kg 97 lb  
XN24AF 46 kg 101 lb

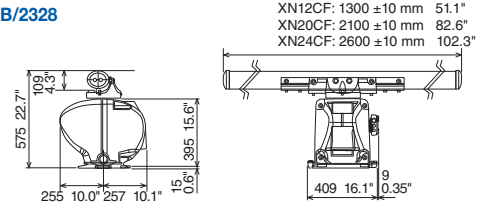


### Antenna Unit

for FAR-2218/2218-BB/2318/2228/2228-BB/2328  
FAR-2228-NXT/2228-NXT-BB  
FAR-2328-NXT

#### Radiator

XN12CF 49 kg 108 lb  
XN20CF 51 kg 112 lb  
XN24CF 52 kg 114 lb

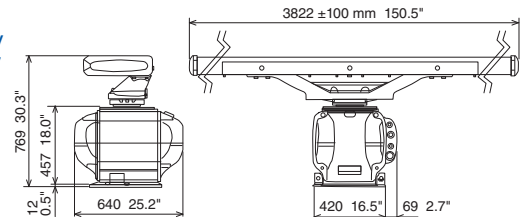


### Antenna Unit

for FAR-2238S/2238S-BB/2338S/  
FAR-2238S-NXT/2238S-NXT-BB/  
FAR-2338S-NXT

#### Radiator

SN36CF(RSB-129) 140 kg 308 lb  
SN36CF(RSB-133) 134 kg 295 lb



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