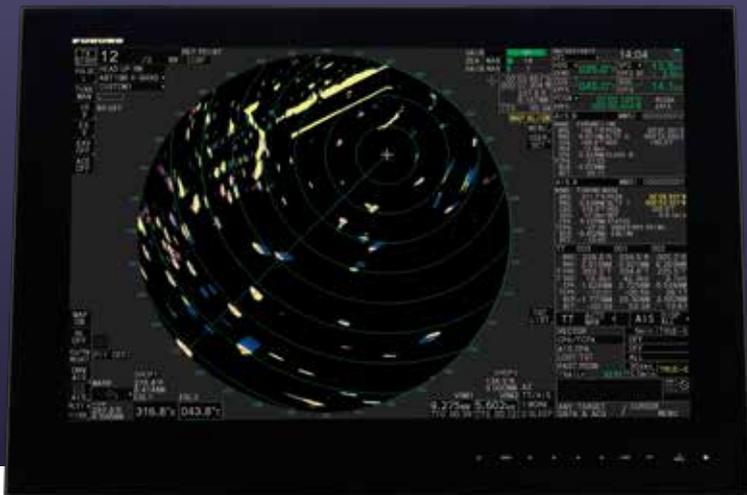


RADAR

Model: FAR22x8BB series

Keep Steady at Sea
with the safe, reliable and user-friendly next generation Radar



Category 1 FAR22x8BB Radar series
shown with optional MU270W wide display



Category 2 FAR22x8BB Radar series
shown with optional MU190 display

Navigate With Confidence

with highly-reliable commercial X-Band and S-Band Radars



RADAR

FAR22x8 series

for Category 1 of ship/craft, with 27" wide or 23" LCD
for Category 2 of ship/craft, with 19" LCD (shown)

FAR2218BB

FAR2228BB

FAR2238SBB

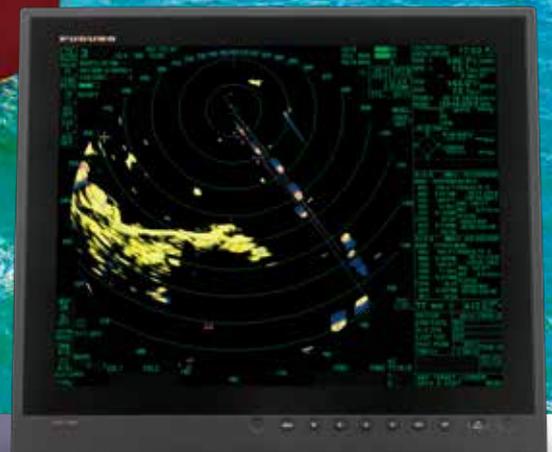
FAR2238SNXTBB

X-band, 12 kW, TR up

X-band, 25 kW, TR up

S-band, 30 kW, TR up,

S-band, 250 W, TR up, Solid State



Complies with the following regulations:

| | |
|------------------|--------------------|
| IEC 62388 Ed.2.0 | IEC 61162-1 Ed.5.0 |
| IEC 62288 Ed.2.0 | IEC 60945 Ed.4.0 |
| IEC 61162-2 | IEC 61162-450 |

Category 1 = All ships/craft \geq 10,000 gross tonnage

Category 2 = 500 gross tonnage to < 10,000 gross tonnage
and HSC < 10,000 gross tonnage

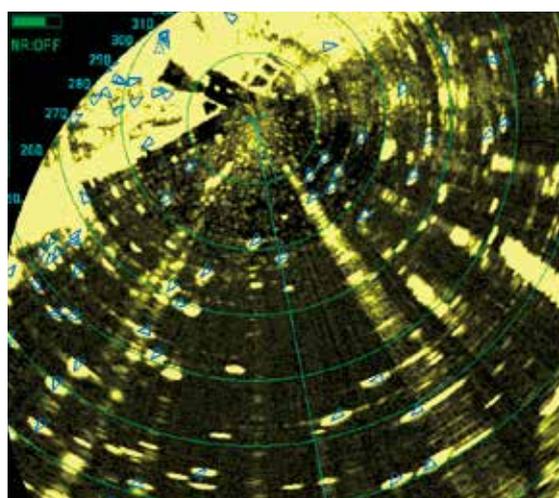
Advanced technologies for safe navigation

The *FURUNO FAR22x8* series is a brand-new radar series characterized by its state-of-the-art antenna design and innovative signal processing techniques.

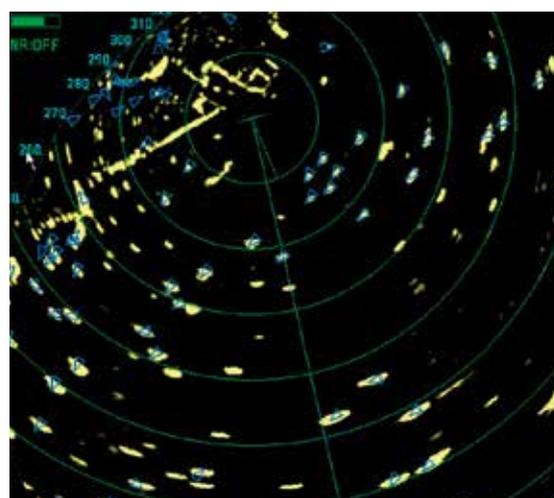
FURUNO latest and finest technologies and intuitive design will increase situational awareness and enable safer than ever navigation.

► Automatic Clutter Elimination (ACE) for unprecedented echo clarity

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



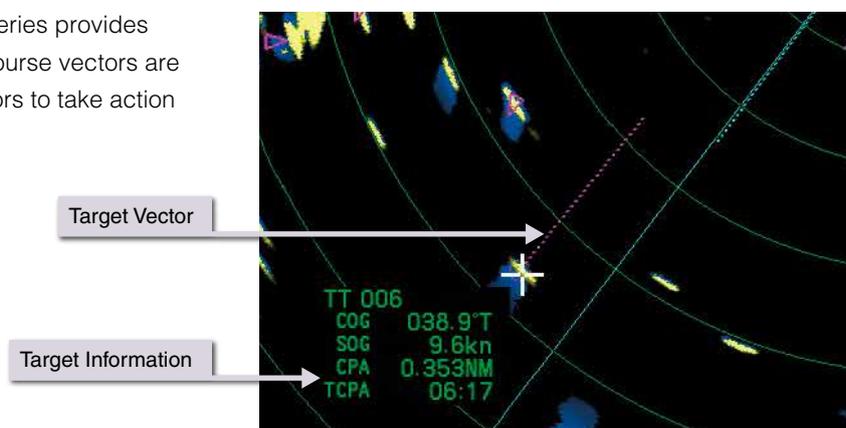
ACE OFF



ACE ON

► Fast Target Tracking™ function to prevent collision at an early stage

With Fast Target Tracking™, the FAR22x8 series 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.





User interface designed for the ultimate intuitive operation

InstantAccess bar™

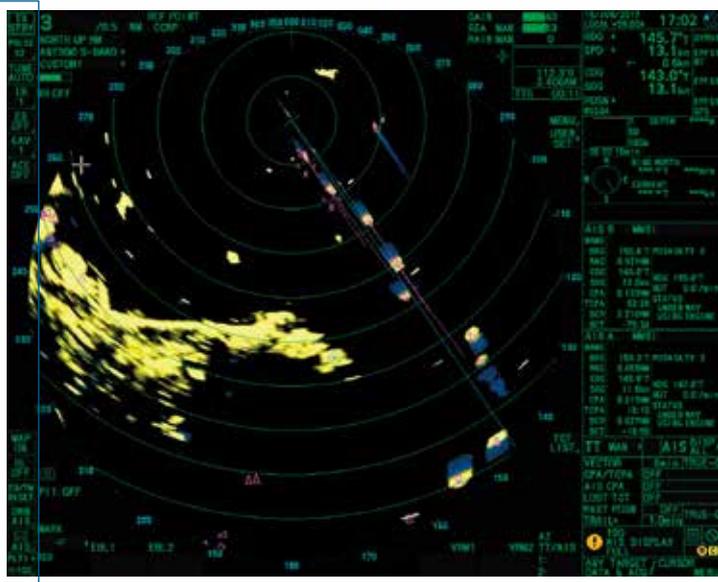
▶ InstantAccess bar™ gives immediate access to the functions you need. InstantAccess bar™ contains shortcut menus of tasks (functions/actions) which operators frequently use, so users can quickly access necessary tasks.

Radar function menu

- TX STBY
- PULSE SZ
- TUNE AUTO
- IR 1
- ES OFF
- EAV 1
- ACE OFF

Display setting menu

- MAP ON
- HL OFF
- CU/TM RESET
- OWN AIS
- AIS
- PLT1
- %100



▶ Well-designed controllers for stress-free operation

Comfortable usability is very important on long voyages. With that in mind, these control units are designed based on ergonomics to fit the operator's hand. All operations can be controlled with the trackball.



Control Unit (RCU014)



Optional Trackball Control Unit (RCU016)

- EBL controls
- User Customizable Function Keys

- VRM controls
- Menu Item Selector (wheel and enter keys)
- Cursor Control



Refined antenna with high signal accuracy and excellent reliability



SN36CF 12' IMO S-Band Antenna

XN20CF 6.5' IMO X-Band Antenna

The FAR22x8 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.

High image quality is achieved by the signal processor inside the antenna unit directly converting analog to digital signals before sending them to the main processor unit. Signals are safely transported through the Ethernet network between the antenna and below deck processing unit.

The gearbox itself has been redesigned to reduce aerodynamic drag that lightens the environmental burden on the gearbox. This, along with an all new brushless DC motor, results in a very durable gearbox that can be used for prolonged periods.

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.

Solid State Radar model - NXT - specialized in target detection and maintainability (S-band only)

FURUNO Solid State Radars emphasize quality and reliability, while also meeting the rigorous demands of the marine environment.



Power Amplifier Module of the Solid State transceiver

► 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 craft.

► Reduced maintenance and running costs

Fanless Solid State antenna dramatically reduces maintenance costs for the magnetron and CPU fan.

► Solid State Radar keeps almost same power ability as conventional magnetron radar.

Easy installation for new building as well as retrofits, with expanded capabilities

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

*Only when retrofitting in lieu of FAR2xx7 series

► Optional LAN Signal Converter enables Ethernet communication. Also extension of the cable between antenna unit and 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 newly installed system such as ECDIS and VDR.

With the optional Ethernet HUB, Inter-switch can be utilized only with LAN cable.

► DVI-I cable is connectible to VDR in retrofitting.

How to connect VDR with FAR22x8 series

| | |
|---------------------------------|--|
| VR7000/7000S | Directly connect VDR with LAN or convert the RGB signal from a DVI-I port using video LAN converter, and input to the VDR. |
| VR3000/3000S | 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. |

Equipment List

Standard

1. Processor Unit
2. Control Unit
3. Gearbox
4. Standard Spare Parts and Installation Materials

Options

1. Antenna Radiator XN12CF/XN20CF/XN24CF/SN24CF/SN30CF/SN36CF
 2. Remote Control Unit RCU016
 3. Trackball Control Unit RCU015
 4. AD Converter AD-100-E
 5. Switching HUB HUB-100
 6. Intelligent HUB HUB-3000
 7. De-icer OP03-226/227/231/232
 8. Performance Monitor
 9. MU190 - 19" LCD Display
 7. MU231 - 23" LCD Display
 8. MU270W - 27" Wide LCD Display
 9. Junction Box RJB-001
 10. LAN Signal Converter
- X-band OP03-247-3, S-band (magnetron) OP03-247-2, S-band (NXT) OP03-247-1

Antenna Radiator Options

1. **Type** Slotted waveguide array

2. Beam width and sidelobe attenuation

| Radiator type | X-Band | | | S-Band | | |
|-----------------------|--------|--------|--------|--------|--------|--------|
| | XN12CF | XN20CF | XN24CF | SN24CF | SN30CF | SN36CF |
| Length | 4 ft | 6.5 ft | 8 ft | 8 ft | 10 ft | 12 ft |
| Horizontal beam width | 1.9° | 1.23° | 0.95° | 2.6° | 2.3° | 1.8° |
| Vertical beam width | 20° | 20° | 20° | 25° | 25° | 25° |
| Sidelobe within ±10° | -24 dB | -28 dB | -28 dB | -23 dB | -24 dB | -24 dB |
| Sidelobe outside ±10° | -30 dB | -32 dB | -32 dB | -27 dB | -30 dB | -30 dB |

3. **Polarization** Horizontal
4. **Rotation** 24 rpm or 42 rpm (for high speed craft)
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

PRODUCT SPECIFICATIONS

Transceiver

1. TX Frequency and modulation

- X-band (Magnetron) 9410 MHz ±30 MHz, P0N
S-band (Magnetron) 3050 MHz ±30 MHz, P0N
S-band (Solid state) CH1 P0N: 3043.75 MHz/ Q0N: 3063.75 MHz ±5 MHz or
CH2 P0N: 3053.75 MHz/ Q0N: 3073.75 MHz ±5 MHz

2. Output power

- FAR2218BB 12 kW
FAR2228BB 25 kW
FAR2238SBB 30 kW
FAR2238SNXTBB 250 W (equivalent to 30 kW magnetron Radar)

3. Range scale, Pulse Repetition Rate and Pulselength

Magnetron radar: FAR2218BB/2228BB/2238SBB

| PRR (Hz approx.) | Range scale (NM) | | | | | | | | | | |
|---------------------|------------------|------|-----|------|-----|---|---|----|----|----|----|
| | 0.125 | 0.25 | 0.5 | 0.75 | 1.5 | 3 | 6 | 12 | 24 | 48 | 96 |
| 3000 | S1 | | | | | | | | | | |
| 3000 | S2 | | | | | | | | | | |
| 1500 | M1 | | | | | | | | | | |
| 1200 | M2 | | | | | | | | | | |
| 1000 | M3 | | | | | | | | | | |
| 600* | L | | | | | | | | | | |

*: 500 Hz on 96 NM range.

Solid state radar: FAR2238SNXTBB

| PRR (Hz approx.) | Range scale (NM) | | | | | | | | | | |
|---------------------|------------------|------|-----|------|-----|---|---|----|----|----|----|
| | 0.125 | 0.25 | 0.5 | 0.75 | 1.5 | 3 | 6 | 12 | 24 | 48 | 96 |
| 2400 | S1 | | | | | | | | | | |
| 2000 | S2 | | | | | | | | | | |
| 1500 | M1 | | | | | | | | | | |
| 1060 | M2 | | | | | | | | | | |
| 1000 | M3 | | | | | | | | | | |
| 600 | L | | | | | | | | | | |

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), 1.5° (XN20CF), 1.2° (XN24CF), 2.8° (SN24CF), 2.5° (SN30CF), 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 | 3 | 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 menu for maintenance)
Auto tracking on all acquired targets,
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 Units

| Screen type | MU190 | MU231 | MU270W |
|--------------------------|-------------------------------|-------------------------------|-------------------------------|
| Size | 19-inch | 23.1-inch | 27-inch |
| Resolution | 1280 x 1024 (SXGA) | 1600 x 1200 (UXGA) | 1920 x 1200 (WUXGA) |
| Brightness | 450 cd/m ² typical | 400 cd/m ² typical | 400 cd/m ² typical |
| Visible Distance | 1.02 m nominal | 1.2 m nominal | 1.02 m nominal |
| Radar Effective Diameter | 282 mm | 340 mm | 350 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
(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, 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, 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
Output Arbitrary (default: TGTD)
Multicast address 239.192.0.1 to 239.192.0.16
Destination port 60001 to 60016
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

- FAR2218BB 100-230 VAC: 2.2-1.1 A, 1 phase, 50-60 Hz
FAR2228BB 100-230 VAC: 2.6-1.3 A, 1 phase, 50-60 Hz
FAR2238SBB 100-230 VAC: 3.9-1.7 A, 1 phase, 50-60 Hz
FAR2238SNXTBB 100-230 VAC: 3.0-1.5 A, 1 phase, 50-60 Hz

2. Display Unit

- MU190 100-230 VAC: 0.7-0.4 A, 1 phase, 50-60 Hz
MU231 100-230 VAC: 1.0-0.6 A, 1 phase, 50-60 Hz
MU270W 100-230 VAC: 0.7-0.4 A, 1 phase, 50-60 Hz

3. HUB (option)

- 100-230 VAC: 0.1 A max. 1 phase, 50/60 Hz

4. De-icer (option)

- 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

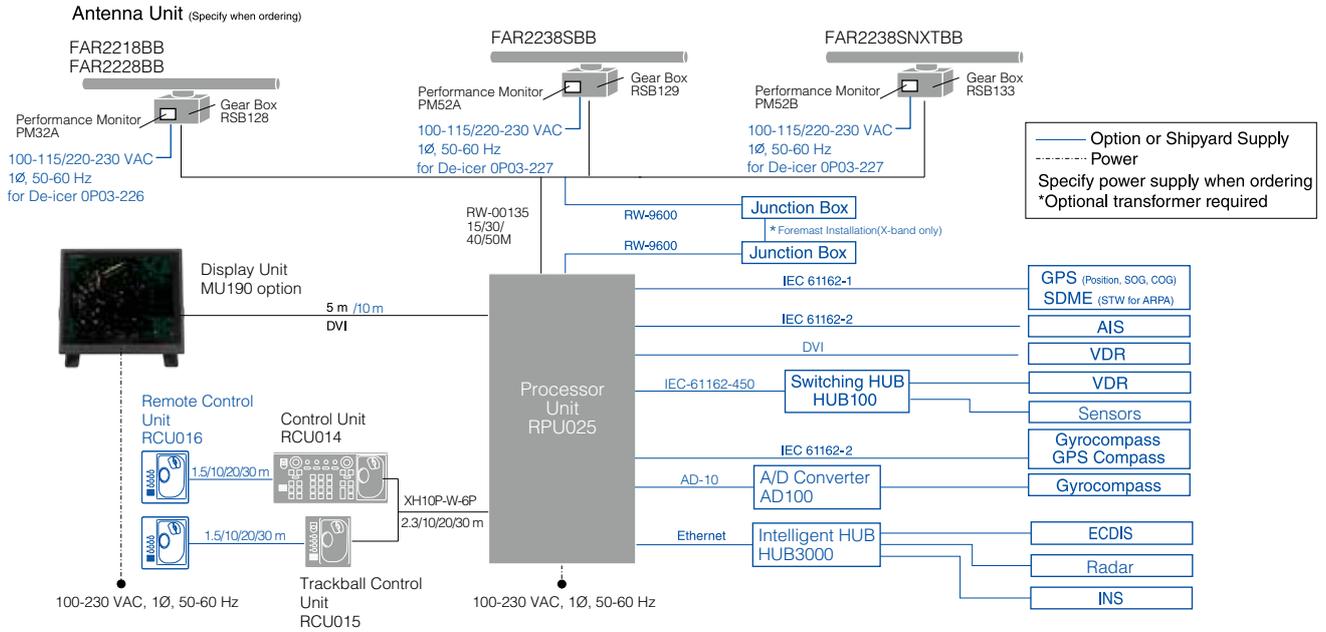
3. Degree of protection

- Antenna unit IP56
Processor/ monitor unit IP22
Control unit IP20
HUB IP20 (HUB-100), IP22 (HUB-3000)

4. Vibration

- IEC 60945 Ed.4

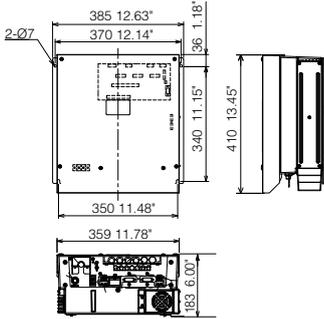
INTERCONNECTION DIAGRAM



Processor Unit

RPU025

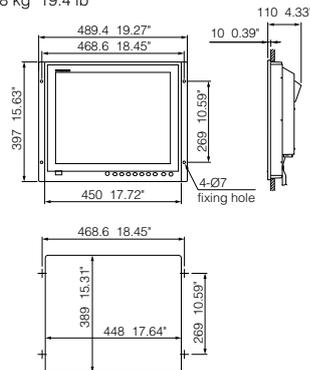
X-band/ S-band 24rpm w/ Fan 9.6 kg 21 lb
S-band 42rpm w/ 2 Fan 11.5 kg 25 lb



Display Unit

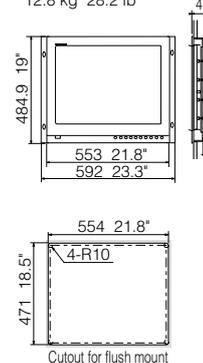
MU190

8.8 kg 19.4 lb



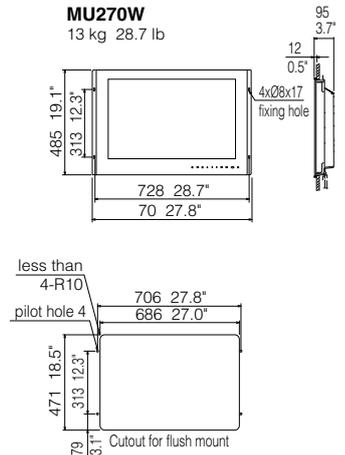
MU231

12.8 kg 28.2 lb



MU270W

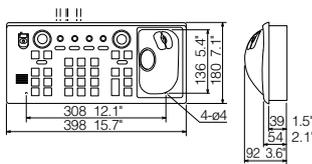
13 kg 28.7 lb



Control Unit

RCU014

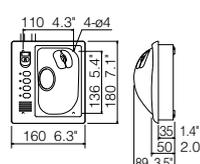
2.5 kg 5.5 lb



Trackball Control Unit

RCU015

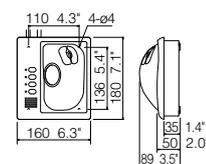
2.4 kg 5.3 lb



Remote Control Unit

RCU016

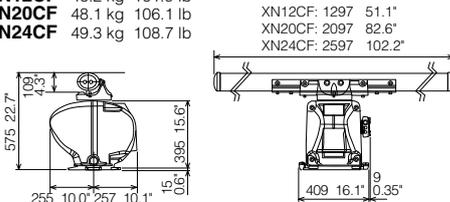
2.4 kg 5.3 lb



Antenna Unit for FAR2218BB/2228BB

Radiator

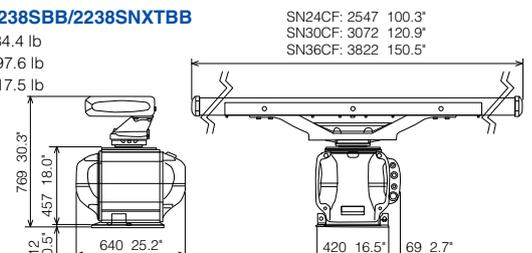
XN12CF 46.2 kg 101.9 lb
XN20CF 48.1 kg 106.1 lb
XN24CF 49.3 kg 108.7 lb



Antenna Unit for FAR2238SBB/2238SNXTBB

Radiator

SN24CF 129 kg 284.4 lb
SN30CF 135 kg 297.6 lb
SN36CF 144 kg 317.5 lb



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