



FURUNO®

23" High resolution Multi-color LCD **MARINE RADAR** WITH ARPA AND AIS DISPLAY Models **FAR-28x7** series

- Advanced signal processing for improved detection in rough sea
- LCD display providing crisp radar images
- Designed to comply with SOLAS carriage requirements for all ships
- Up to four radars can be interswitched in the network without an extra device
- Automatic plotting/tracking of 100 targets manually or automatically acquired
- Easy operation by customizable function keys, trackball/wheel palm module and rotary controls
- Low spurious magnetrons meeting ITU-R unwanted emission standards
- Displays 1000 AIS equipped targets



The future today with FURUNO's electronics technology.

FURUNO ELECTRIC CO., LTD.

9-52 Ashihara-cho, Nishinomiya City, Japan Phone: +81 (0)798 65-2111
Fax: +81 (0)798 65-4200, 66-4622 URL: www.furuno.co.jp

Catalogue No. R-185c

TRADE MARK REGISTERED
MARCA REGISTRADA

FURUNO's user friendly concept and leading-edge technology are integrated! Reliable performance, Ease of installation



EBL controls

VRM controls

Trackball

Menu Item Selector
(wheel and enter keys)

User
Customizable
Function Keys



Full-keyboard Control Unit

The control head has logically arranged controls in a combination of push keys and trackball. Well organized menu ensures that all operations can be done by trackball.

Palm Control Unit

Alternative to the Full-keyboard Control Unit or additional as a remote operation.

The revolutionary FAR-28x7 series of X- and S-band radars are the result of FURUNO's 50 years of experience in marine electronics and advanced computer technology. This series is designed to meet the exacting standards of the International Maritime Organization (IMO) for all ships.

The display unit employs a 23.1" LCD which provides an effective picture diameter of larger than 340 mm. The VXGA monitor provides crisp radar images, which are presented in a selectable color with a day and night background color for easy observation in all lighting conditions. Different colors are assigned for marks, symbols and texts for user-friendly operations.

Target detection is enhanced by sophisticated signal processing techniques. 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-28x7 series can display AIS-equipped ships, when connected with an AIS transponder.

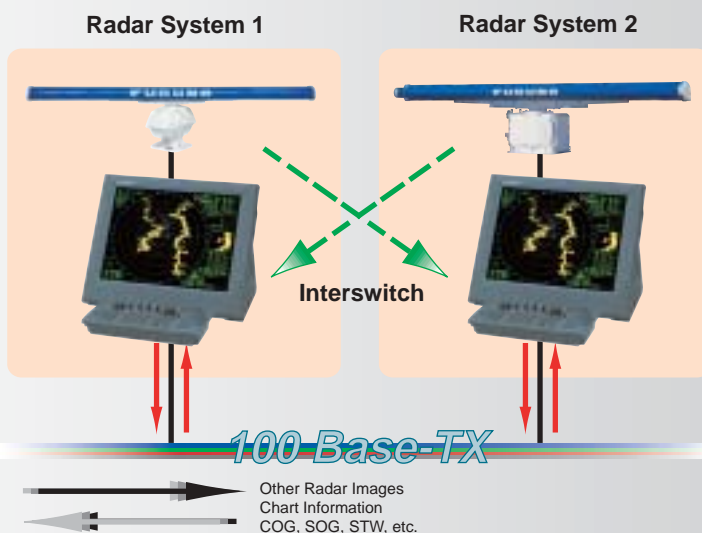
The radar antenna is available with 4, 6.5, or 8 feet radiator. For the X-band, the rotation speed is selectable from 24 rpm for standard radars or 42 rpm for HSC. The S-band radar is also available with the antenna radiator of 10 or 12 feet. The S-band radar assures target detection in adverse weather where an X-band is heavily affected by sea or rain clutter.



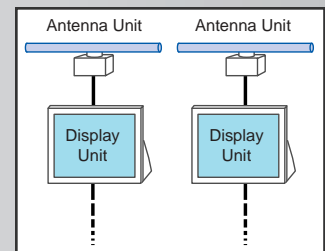
This series of radar comply with the following IMO and IEC regulation:

- IEC 60936-1 shipborne radar
- IEC 60936-2 HSC radar
- IEC 60872-1 ARPA
- IEC 60872-2 ATA
- IEC 601993-2 AIS
- IEC 60945 General requirements
- IEC 61162-1 ed 2
- IMO MSC.64(67) Annex 4
- IMO A.820(19)
- IMO A.823(19)
- IMO MSC.74(69) Annex 3

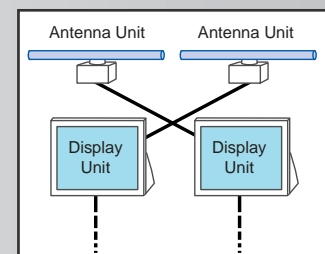
100 Base-TX Ethernet Network System



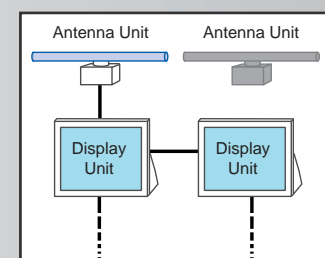
The radars can be connected to an Ethernet network for a variety of user requirements. SOLAS Chapter V as amended requires X- and S-band radars for ships 3000 GT and over. Each of X- and S-band radars can be interswitched without using an extra option. Up to four radars can be interchanged in the network. In addition, the essential navigational information including the electronic chart, L/L, COG, SOG, STW, etc. can be shared in the network.



Independent



Interswitch



Repeater

ARPA/AIS

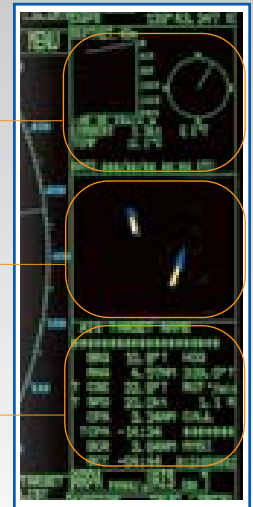


Own ship data cell

DATA Cell 1
Tracking data

DATA Cell 2
Tracking data

DATA Cell 3
Tracking data
AIS Information



Water temp, Depth, Wind

Magnify

AIS Information

Targets automatically acquired

AIS-equipped target selected for data reading.

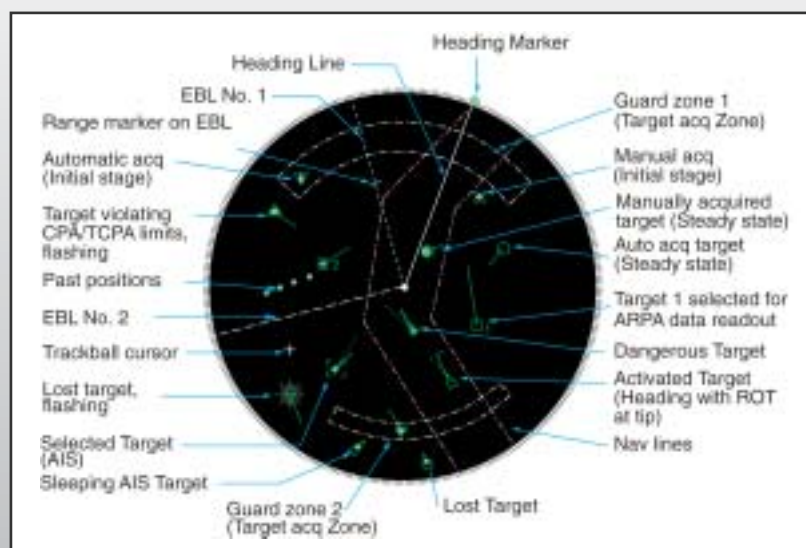
DATA DISPLAY

A variety of navigational information, own ship status, radar plotting data, wind, water temperature and information from other shipborne sensors are displayed on the cells. These selected targets are marked with a square symbol on the radar display. Magnify is a special feature of the FURUNO radars FAR-28x7 series. This looks like a delayed-sweep zoom that the IMO strictly prohibits, but where the Administration accepts, the Magnify feature enlarges part of radar display for some special maritime activity.

TARGET ASSOCIATION (Fusion)

An AIS-equipped ship may be displayed by both AIS and ARPA symbols. This is because the AIS position is measured by a GPS in L/L while the ARPA target blip and data are measured by range and bearing from own ship and located on the radar PPI. When the symbols are within an operator-set criteria, the ARPA symbol is merged in the AIS symbol. The criteria are determined by the differences in range, bearing, course, speed, etc.

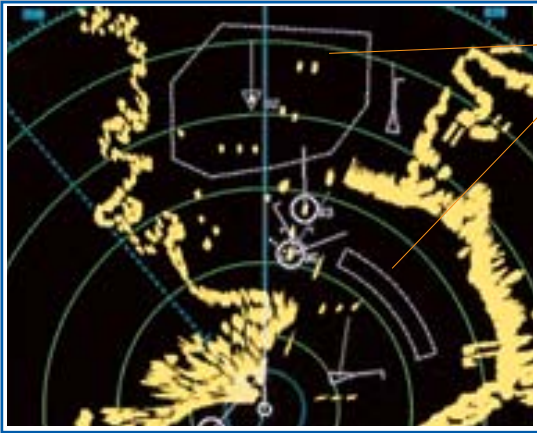
MARKS AND SYMBOLS FOR ARPA AND AIS



AIS information

- **Static Data**
 - MMSI (Maritime Mobile Service Identity)
 - IMO number (Where available)
 - Call sign & name
 - Length and beam
 - Type of ship
 - Location of position-fixing antenna on the ship
- **Voyage related data**
 - Ship's draught
 - Hazardous cargo (type)
 - Destination and ETA (at masters discretion)
- **Dynamic data**
 - Ship's position with accuracy indication and integrity status
 - UTC
 - Course over ground (COG)
 - Speed over ground (SOG)
 - Heading
 - Navigation status (manual input)
 - Rate of turn (where available)
 - Update rates Dependent on speed and course alternation (2 s – 3 min)
- **Short safety-related messages**
 - Free messages

GUARD ZONES



Guard Zone

Automatic Acquisition Zone

Two automatic acquisition zones may be set in a sector or any form. They also act as suppression zones, avoiding unnecessary overloading to the processor and clutter by disabling automatic acquisition and tracking outside them. Targets in a automatic acquisition zone appear as inverse triangle. The operator can manually acquire important targets without restriction.

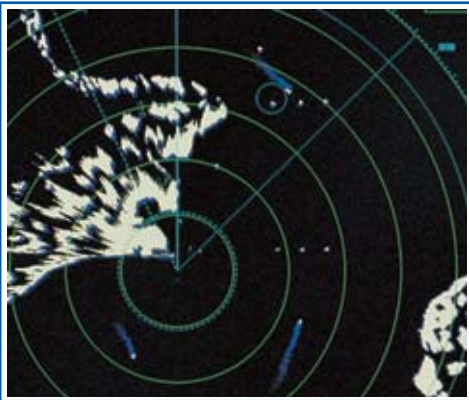
CPA Alarm Zone

Target tracking symbol changes to a triangle when its predicted course (vector) violates the operator set CPA/TCPA. The operator can readily change the vector lengths to evaluate target movement trend.

Guard Zones and Anchor Watch Zone

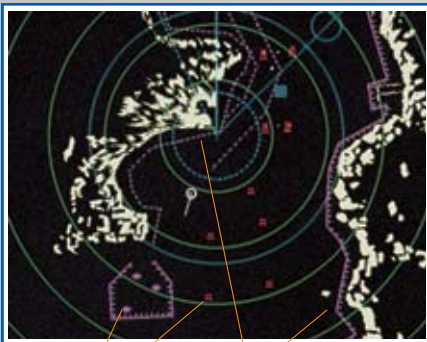
Guard Zones generate visual and audible alarms when targets enter the operator set zones. One of Guard Zones may be used as an anchor watch to alert the operator when own ship or targets drift away from the set zone.

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. The monotone trails are useful to show own ship movement and other ship tracks in a specific fishing operation. The trail time is adjustable for 15, 30 s, 1, 3, 6, 15, 30 min or continuous. The target trails are indicated in a different color from background. The unique feature in this radar is a choice of True or Relative mode in Relative Motion (only True in TM).

RADAR MAP



Map Marks

Map Lines

Up to 200 waypoints and up to 30 routes can be stored. Each route may contain up to 30 waypoints. A radar map is a combination of map lines and marks whereby the user can define and input the navigation area, route planning and monitoring data. The radar map has the capacity of 3,000 points for map lines and marks. The map data can be memorized to facilitate repeated use on a routine navigation area.

CHART OVERLAY

NIGHT VIEW



This radar incorporates a VideoPlotter that allows to display electronic charts, plot own and other ship's track, enable entry of waypoints/routes, and make a radar map. Chart is displayed in combination of radar images. (For non-SOLAS ships only)



Specifications of FAR-28x7 series

Antenna Radiators

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

Radiator Type	X-Band			S-Band	
	XN-12AF	XN-20AF	XN-24AF	SN-30AF	SN-36AF
Length	4 ft	6.5 ft	8 ft	10 ft	12 ft
Beamwidth(H)	1.9°	1.23°	0.95°	2.3°	1.8°
Beamwidth(W)	20°	20°	20°	25°	25°
Sidelobe (within ± 10°)	-24 dB	-28 dB	-28 dB	-24 dB	-24 dB
Sidelobe (outside ± 10°)	-30 dB	-32 dB	-32 dB	-30 dB	-30 dB

S-band 10 ft radiator usable for an HSC

3. Rotation

X-Band	
Rotation	24 rpm
Gear Box	RSB-096/103
S-Band	
Rotation	21/26 rpm
Gear Box	RSB-098/099/104/105

RF Transceiver

1. Frequency

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

2. Output power

	FAR-2817	FAR-2827	FAR-2827W	FAR-2837S	FAR-2837SW
Output Power	12 kW	25 kW	25 kW	30 kW	30 kW
Transceiver	RTR-078	RTR-079	RTR-0081	RTR-080	RTR-082

3. Pulselength/PRR

Range scale (nm)	Pulselength (µs)	PRR (Hz)
0.125, 0.25	0.07	3000
0.5	0.07, 0.15	3000
0.75, 1.5	0.07, 0.15, 0.3	3000, 1500
3	0.15, 0.3, 0.5, 0.7	3000, 1500, 1000
6	0.3, 0.5, 0.7, 1.2	1500, 1000, 600
12, 24	0.5, 0.7, 1.2	1000, 600
48, 96	1.2	600

4. I.F. Bandwidth

60 MHz, Logarithmic
Short pulse: 40 MHz
Middle pulse: 10 MHz
Long pulse: 3 MHz

RADAR DISPLAY

1. Display

23.1" color LCD (UXGA 1600 x 1200 pixels),
470 (H) x 353 (V) mm,
Effective display diameter: 340 mm
Echo Color: Yellow, green or white in 32 levels

2. 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

3. Minimum range

30* m on 0.75 nm range scale
*Using a 10 m² test target at 3.5 m high above sea and antenna at 15 m high (IEC 60936-1). Different conditions give a different result, maybe close to 20 m in actual installations.

4. Range discrimination

30 m on 0.75* nm range scale

5. Range ring accuracy

±0.2 %

6. Presentation modes

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

7. Heading information

Furuno GPS compass SC-60/120 is a recommendable heading sensor as a backup of a gyrocompass. Confirm with your Administrations.

8. Parallel index lines

1, 2, 3 or 6 lines (menu selectable)

9. Radar map

20,000 points to create coastlines, own ship safety contour, isolated underwater dangers, buoys, traffic routing systems, prohibited areas, fairways as required by IMO.

Automatic Plotting

1. Acquisition

100 targets (e.g. manually 50, automatically 50)

2. Tracking

Automatic tracking of all acquired targets in 0.1 to 32 nm

3. Guard zone (Target Acquisition Area)

Two guard zone, one of them 0.5 nm depth

4. Vector

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

5. Past positions

5 or 10 past positions 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. Trial maneuver

Dynamic or static, with selected delay time.

AIS FUNCTIONS (Data input from AIS is required)

1. Symbols

Sleeping, Activated, Dangerous, Selected, Lost targets

2. Number of targets

1,000 targets max.

3. Data indication

Basic and expanded data

POWER SUPPLY (specify when ordering)

1. Processor Unit

24 VDC or 115/230 VAC, 1ø, 50/60 Hz
440 VAC, 1ø, 50/60 Hz with optional transformer RU-1803

2. Display Unit

24 VDC or 115/230 VAC, 1ø, 50/60 Hz
440 VAC, 1ø, 50/60 Hz with optional transformer RU-1803

3. Antenna Unit

FAR-2837S/2837SW:
200 VAC, 3ø, 50 Hz; 220 VAC, 3ø, 60 Hz; 380 VAC, 3ø, 50 Hz;
440 VAC, 3ø, 60 Hz; 110 VAC, 3ø, 60 Hz with RU-5693;
220 VAC, 3ø, 50 Hz with RU-6522;
440 VAC, 3ø, 50 Hz with RU-5466-1

X-band antenna for FAR-2817/2827/2827W



8 ft antenna
(4 or 6.5 ft also available)

S-band antenna for FAR-2837S/2837SW



FAR-2817: X-band, 12 kW, TR up
FAR-2827: X-band, 25 kW, TR up
FAR-2827W: X-band, 25 kW, TR down
FAR-2837S: S-band, 30 kW, TR up
FAR-2837SW: S-band, 30 kW, TR down

EQUIPMENT LIST

Standard

1. Display Unit MU-231CR
2. Processor Unit RPU-013
3. Full-keyboard Control Unit RCU-014
Trackball Control Unit (Palm Control Unit) RCU-015
(Specify when ordering)
4. Antenna Unit with cable (15/30/40/50 m)
5. Transceiver Unit
6. Power Supply Unit PSU-007 for FAR-2837S
7. Standard Spare Parts and Installation Materials

Option

1. Performance Monitor PM-31 for X-band, PM-51 for S-band (Specify when ordering)
2. Remote Control Unit RCU-016
3. Gyro Interface GC-10
4. DVI-Analog RGB Conversion Kit OP03-180
5. RGB Connector DSUB-BNC-1 (for VDR)
6. Memory Card Interface Unit CU-200
7. Transformer RU-1803/5466-1/5693/6522
8. Rectifier RU-3424/1746B
9. Junction Box RJB-001
10. Antenna Cable RW-9600
11. Hand Grip FP03-09840
12. Bracket FP03-09820
13. Switching Hub HUB-100



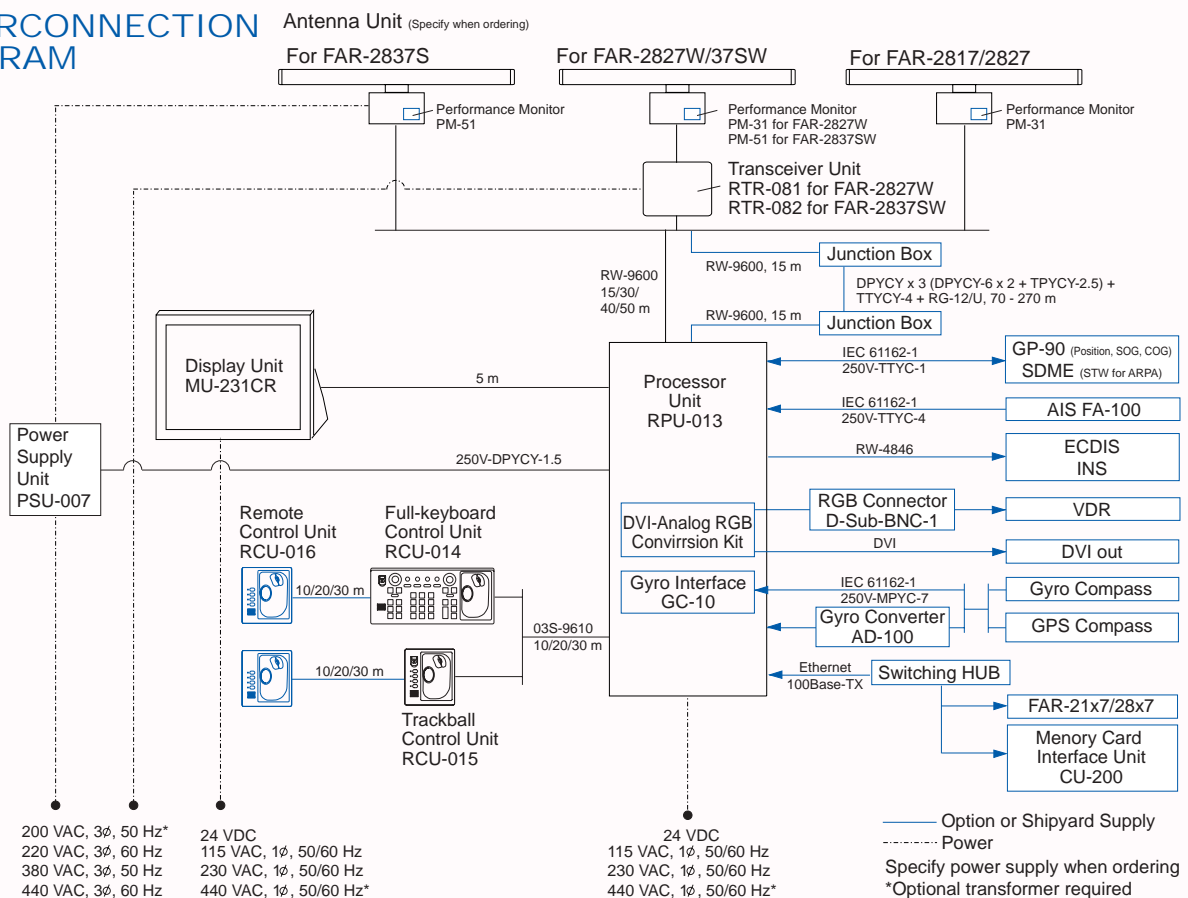
The display unit can be supplied in a special cabinet matching the FURUNO New INS configuration as FAR-28x7 series.



Optional pedestal (Slim type)

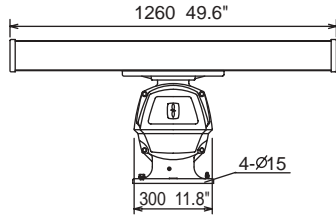
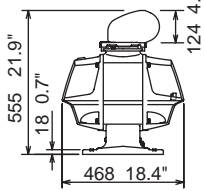


INTERCONNECTION DIAGRAM

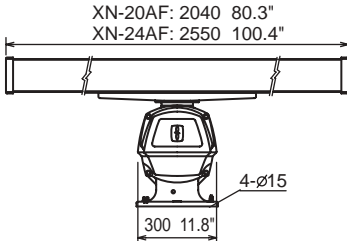
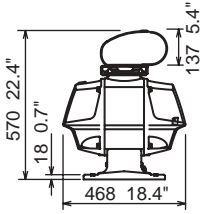


Antenna Unit for FAR-2817/2827 RSB-096/097

XN-12AF: 33 kg 73 lb

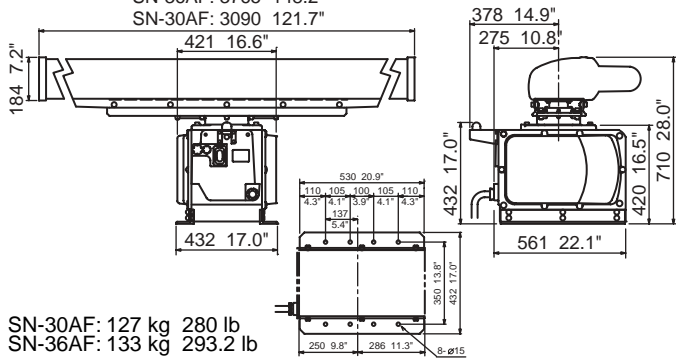


XN-20AF: 39 kg 86 lb
XN-24AF: 42 kg 93 lb



Antenna Unit for FAR-2837S RSB-098/099/100/101/102

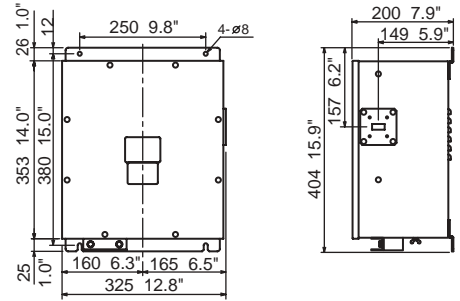
SN-36AF: 3765 148.2"
SN-30AF: 3090 121.7"



SN-30AF: 127 kg 280 lb
SN-36AF: 133 kg 293.2 lb

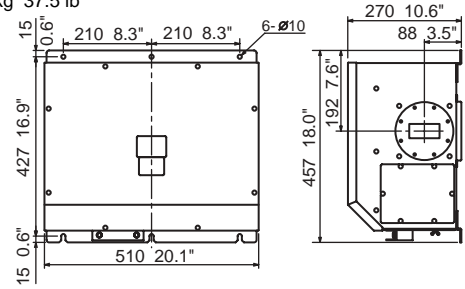
Transceiver Unit for FAR-2827W RTR-081

8.0 kg 17.6 lb

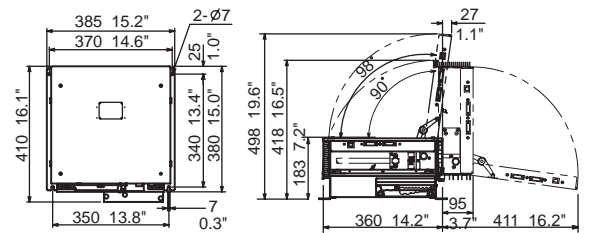


Transceiver Unit for FAR-2837SW RTR-082

17.0 kg 37.5 lb

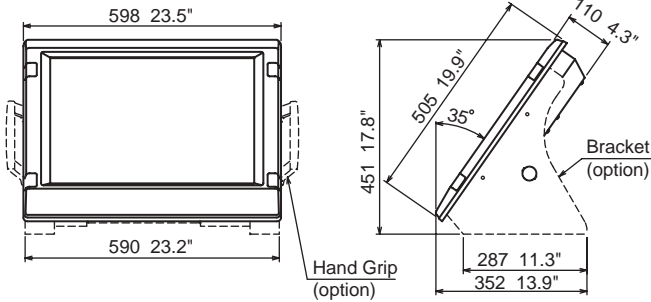


Processor Unit RPU-013 10 kg 22 lb

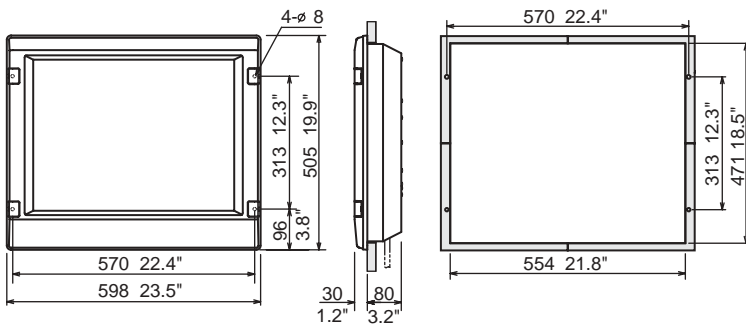


Display Unit MU-231CR

Bracket mount 23.5 kg 51.8 lb

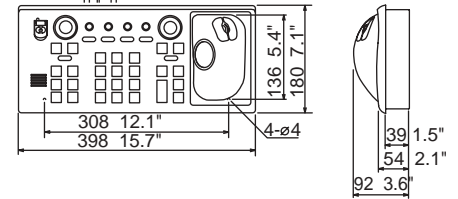


Panel mount 15.0 kg 33.0 lb



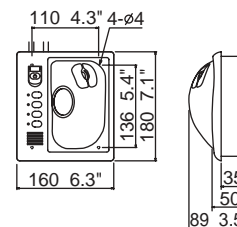
Full-keyboard Control Unit RCU-014

3.7 kg 8.2 lb



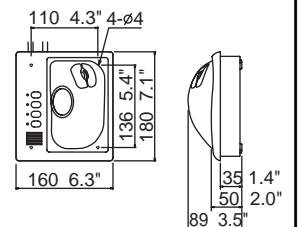
Trackball Control Unit RCU-015

2.4 kg 5.3 lb



Remote Control Unit RCU-016

2.4 kg 5.3 lb



SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

FURUNO U.S.A., INC.
Camas, Washington, U.S.A.
Phone: +1 360-834-9300 Telefax: +1 360-834-9400

FURUNO (UK) LIMITED
Denmead, Hampshire, U.K.
Phone: +44 2392-230303 Telefax: +44 2392-230101

FURUNO FRANCE S.A.
Bordeaux-Mérignac, France
Phone: +33 5 56 13 48 00 Telefax: +33 5 56 13 48 01

FURUNO ESPAÑA S.A.
Madrid, Spain
Phone: +34 91-725-90-88 Telefax: +34 91-725-98-97

FURUNO DANMARK AS
Hvidovre, Denmark
Phone: +45 36 77 45 00 Telefax: +45 36 77 45 01

FURUNO NORGE A/S
Ålesund, Norway
Phone: +47 70 102950 Telefax: +47 70 127021

FURUNO SVERIGE AB
Västra Frölunda, Sweden
Phone: +46 31-7098940 Telefax: +46 31-497093

FURUNO FINLAND OY
Espoo, Finland
Phone: +358 9 4355 670 Telefax: +358 9 4355 6710

04095Y Printed in Japan

