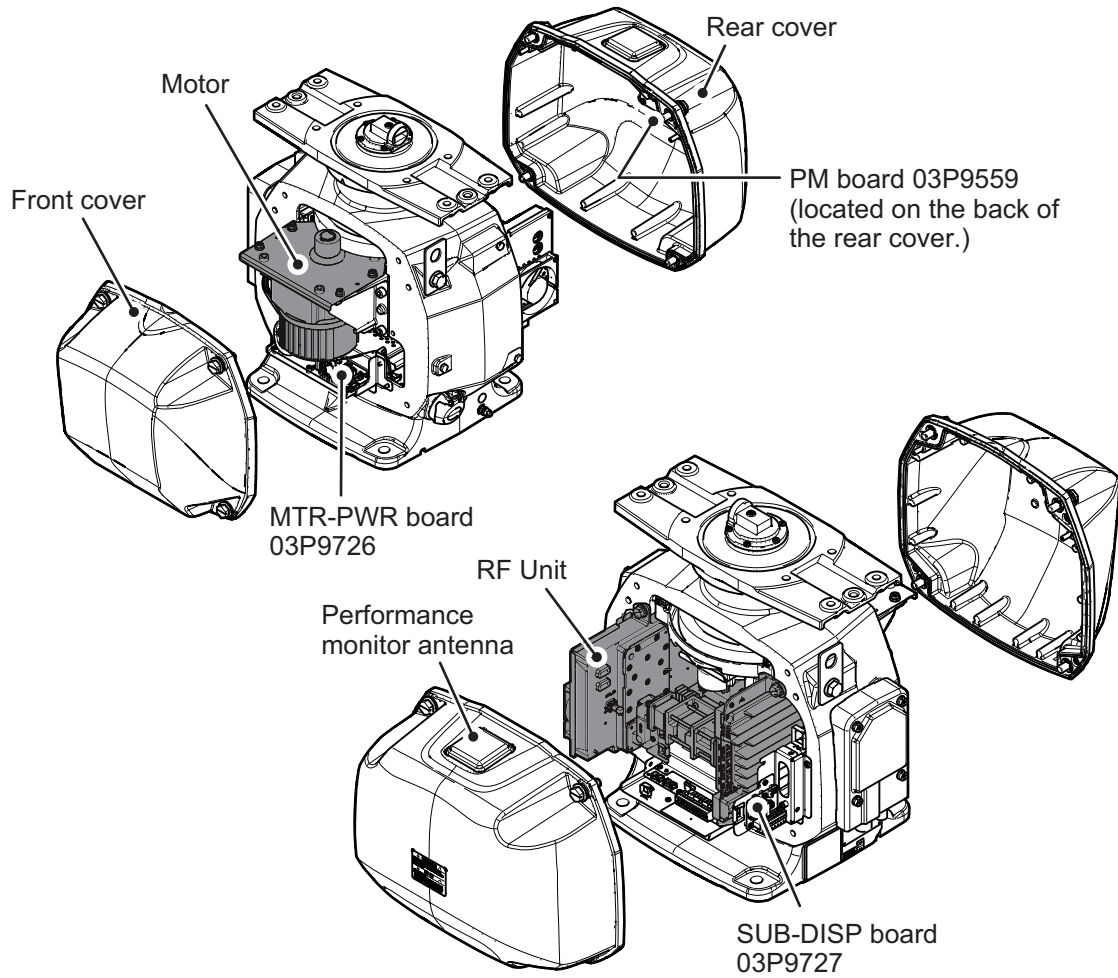
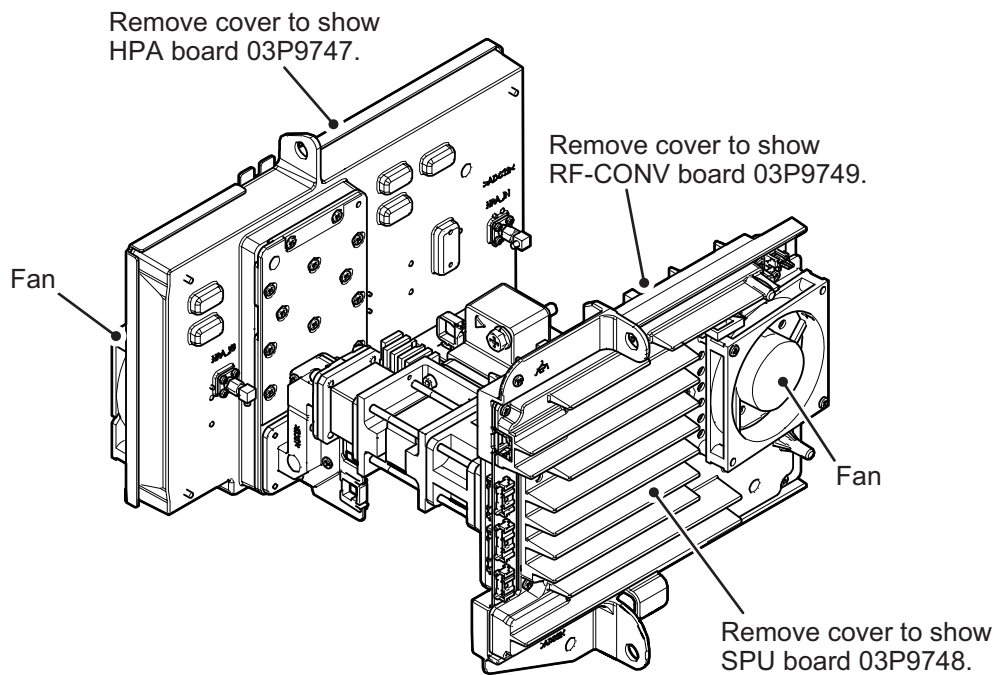
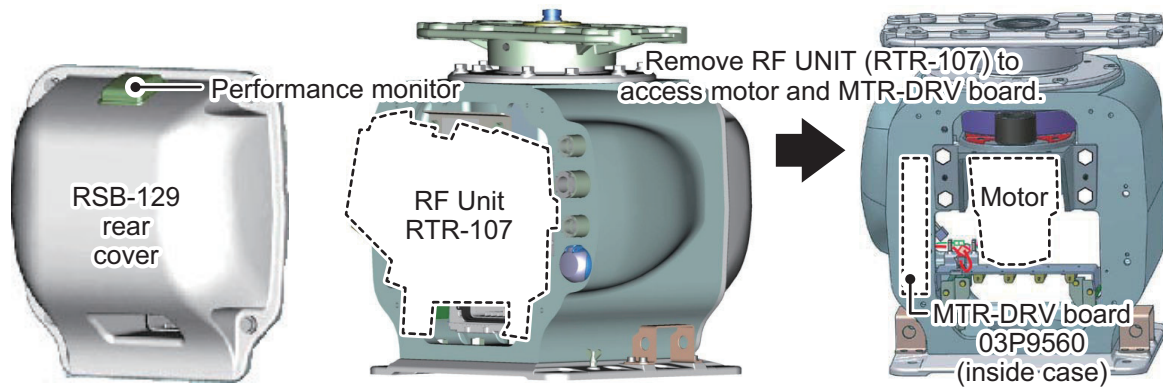


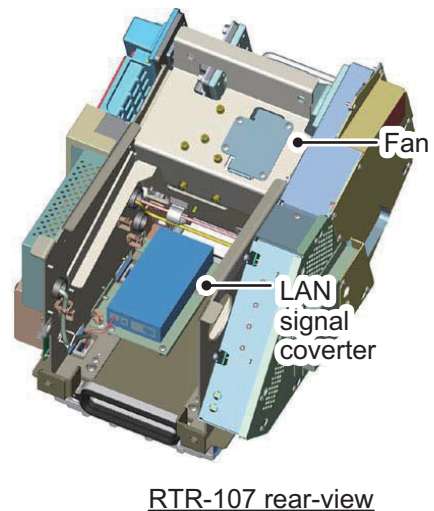
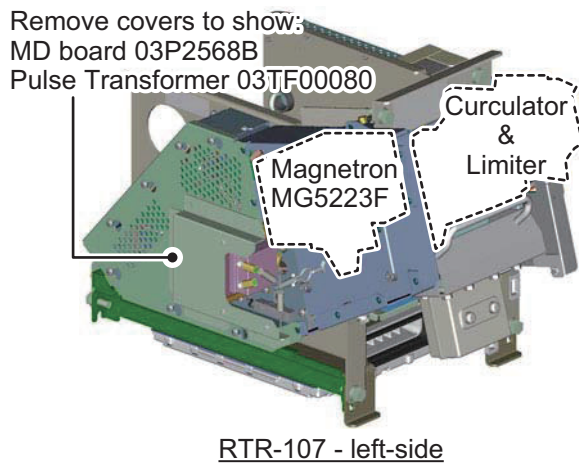
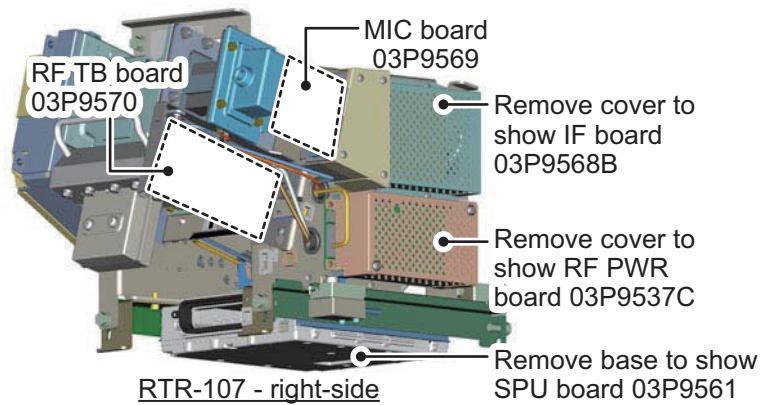
Scanner Unit RSB-146 (FAR-2028-NXT-MARK-2)RF Unit RTR-137 (FAR-2028-NXT-MARK-2)

Scanner Unit RSB-129 (FAR-2238S(-BB), FAR-2338S)

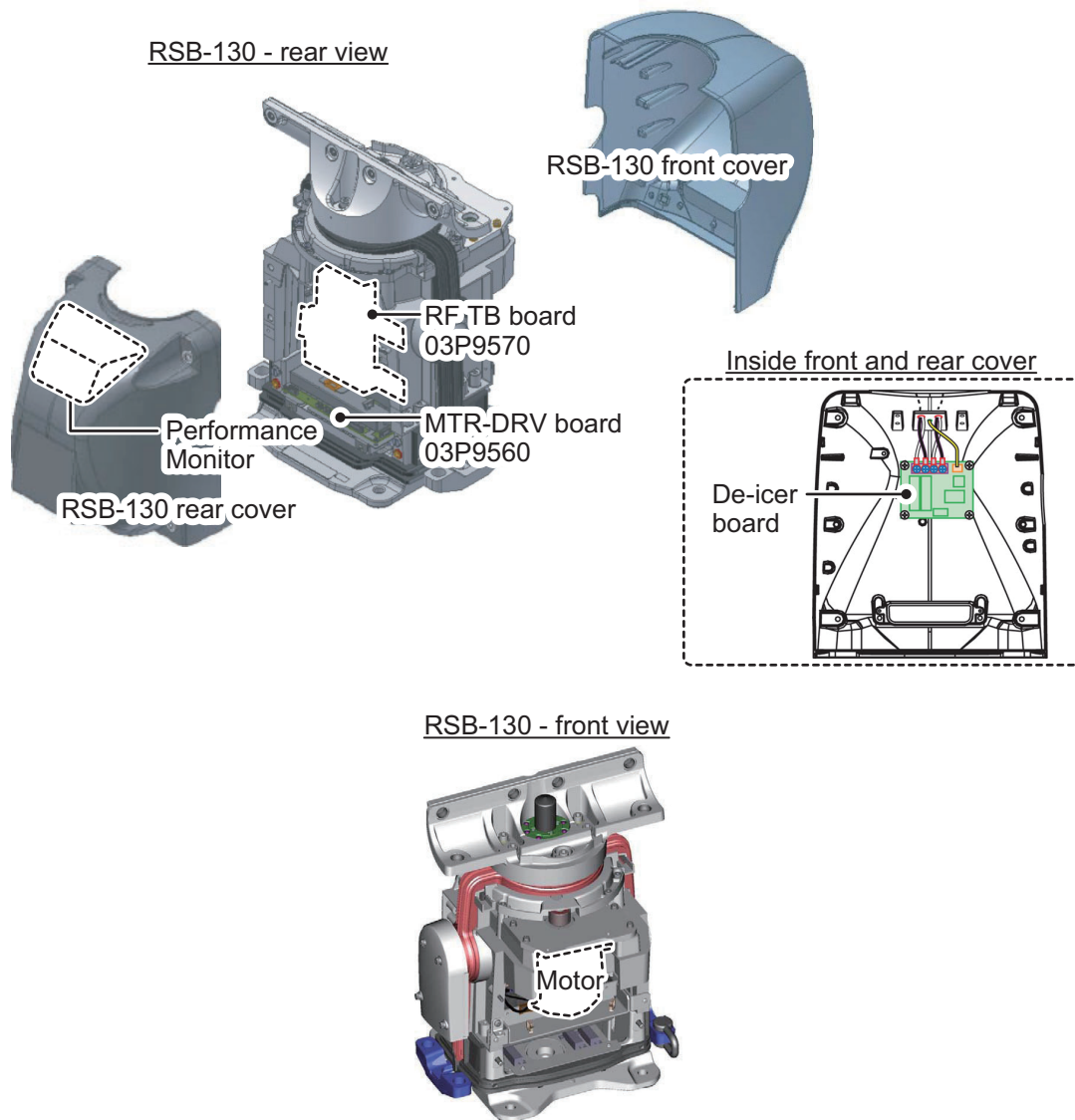


Remove rear cover to show the RF UNIT (RTR-107)

RF Unit RTR-107 (FAR-2238S(-BB), FAR-2338S)

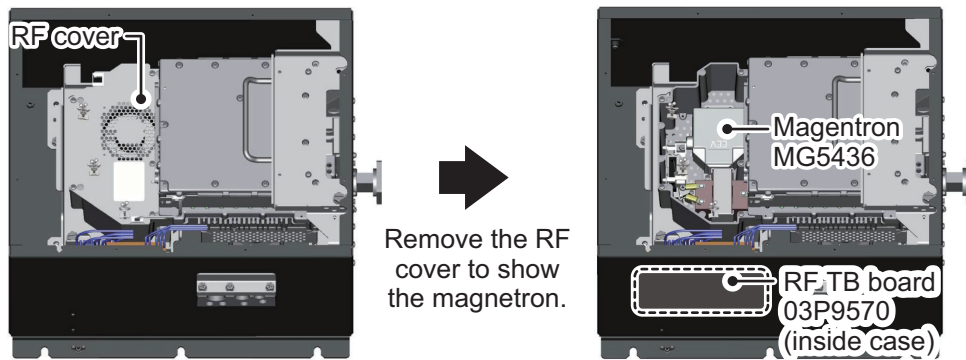


Scanner Unit RSB-130 (FAR-2328W)

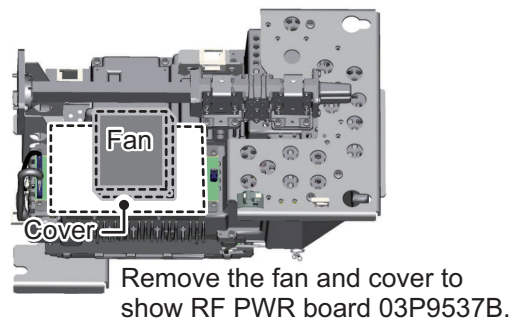


RF Unit RTR-108 (FAR-2328W)

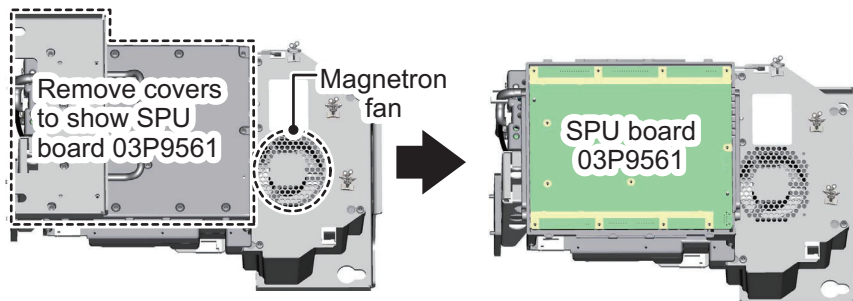
RTR-108 - Case cover removed



RTR-108 - RF Unit removed from case (top view)



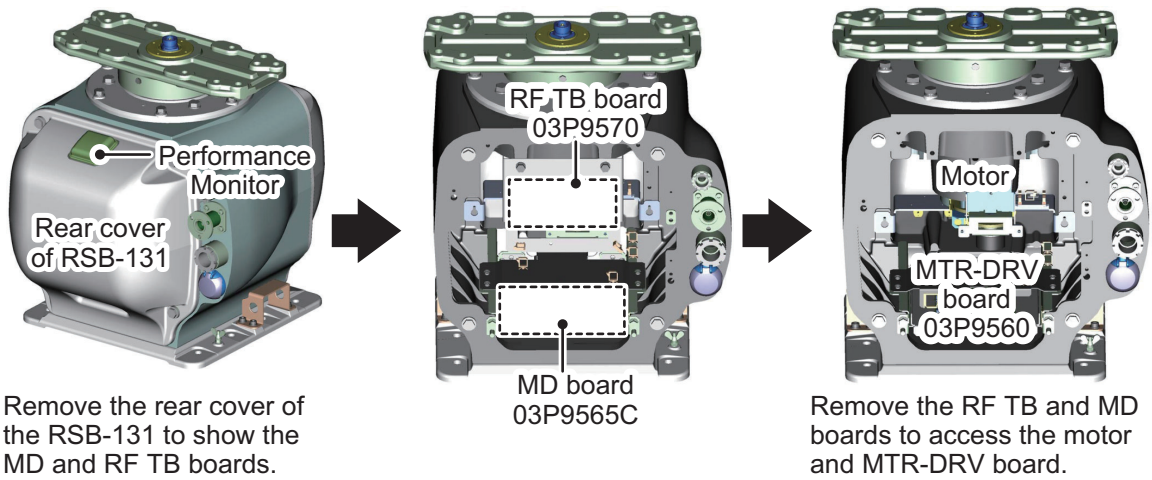
RTR-108 - RF Unit removed from case (bottom view)



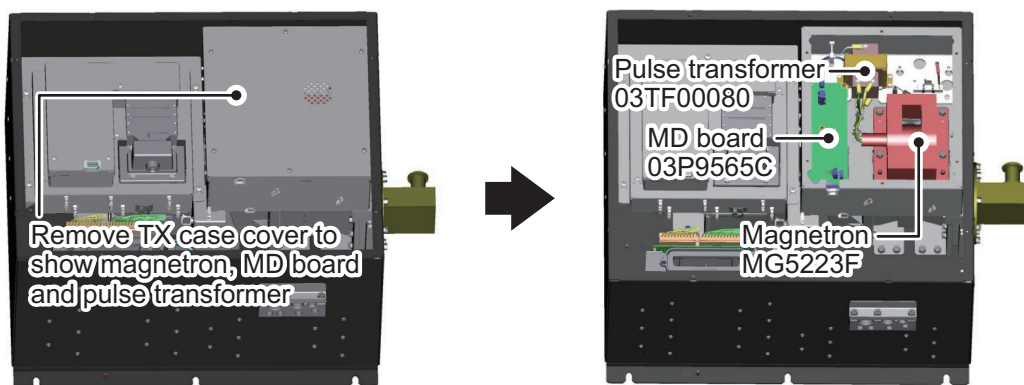
Remove the SPU board to show:
MD board 03P9565B
IF board 03P9568A
MMIC board 03P9567
Pulse Transformer 03TF00073

Scanner Unit RSB-131 (FAR-2338SW)

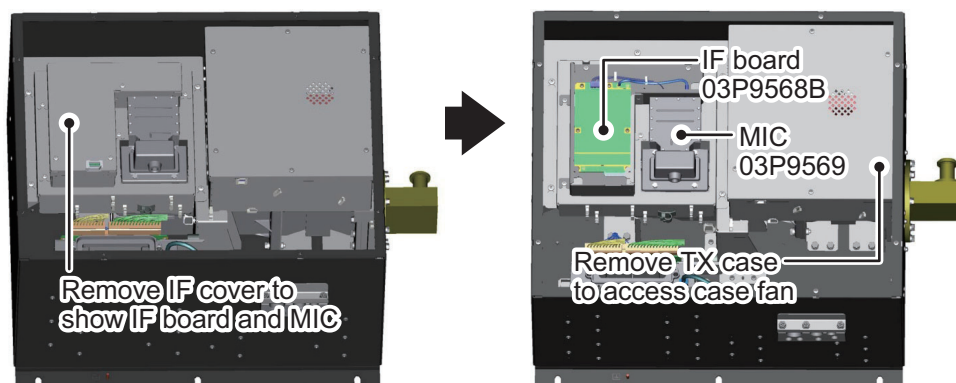
RSB-131 - rear view

RF Unit RTR-109 (FAR-2338SW)

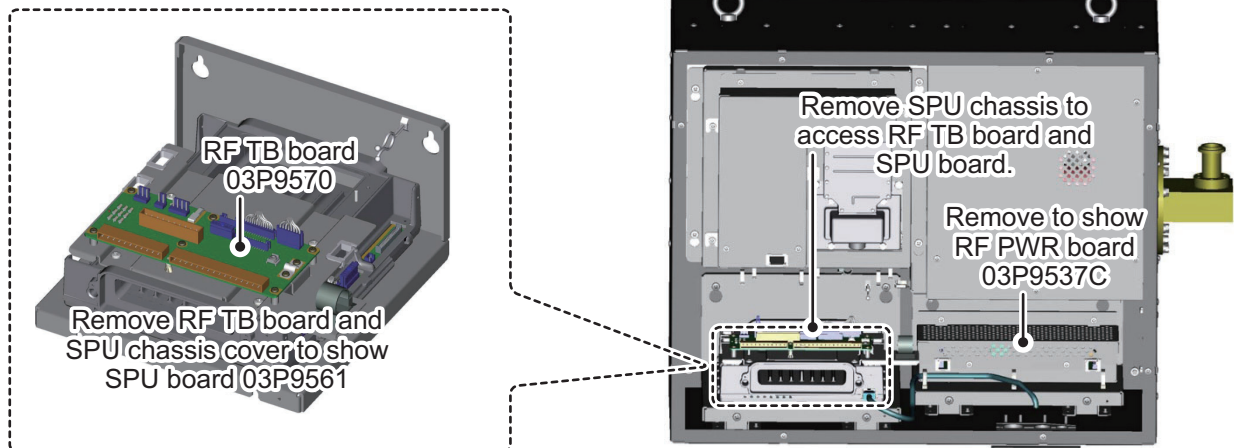
RTR-109 - case cover removed



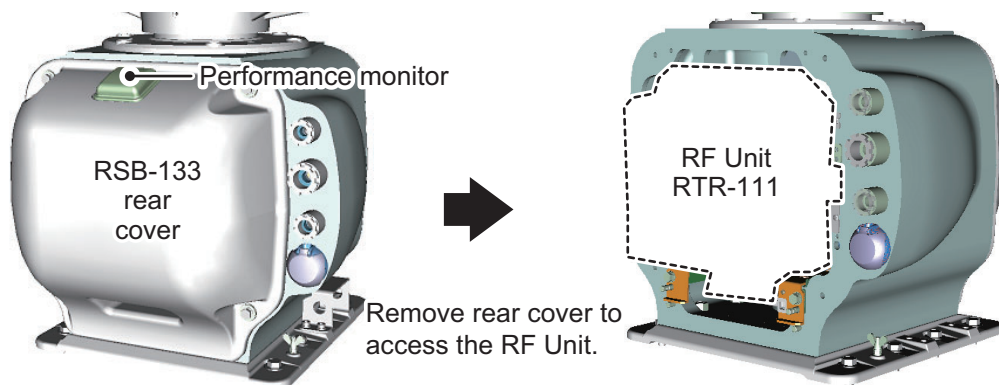
RTR-109 - case cover removed



RTR-109 - Top view, case cover removed

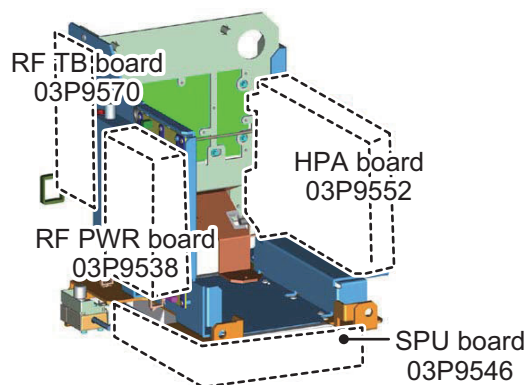


Scanner Unit RSB-133 (FAR-2238S-NXT(-BB)/2338S-NXT)

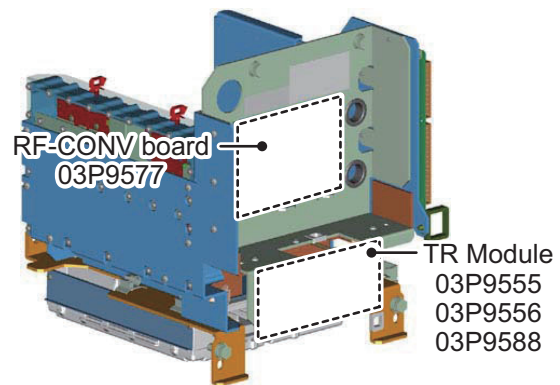


RF Unit RTR-111 (FAR-2238S-NXT(-BB)/2338S-NXT)

RTR-111 - rear view



RTR-111 - front view



APPX. 8 RADIO REGULATORY INFORMATION

USA-Federal Communications Commission (FCC)

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) This device must accept any interference received, including interference that may cause undesired operation. Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Caution: Exposure to Radio Frequency Radiation

- This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment and meets the FCC radio frequency (RF) Exposure Guidelines in Supplement C to OET65.
- This equipment should be installed and operated keeping the radiator at least XX cm or more away from person's body.
- This device must not be co-located or operating in conjunction with any other antenna or transmitter.

Innovation, Science and Economic Development Canada (ISED)

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

- (1) This device may not cause interference.
- (2) This device must accept any interference, including interference that may cause undesired operation of the device.

Cet appareil contient un ou plusieurs émetteurs / récepteurs exempts de licence qui sont conformes à la norme « exempts de licence RSS (s) » Canadienne d'Innovation, Sciences et Développement économique. L'exploitation est autorisée aux deux conditions suivantes:

- (1) l'appareil ne doit pas produire de brouillage.
- (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Caution: Exposure to Radio Frequency Radiation

This equipment complies with ISED radiation exposure limits set forth for an uncontrolled environment and meets RSS-102 of the ISED radio frequency (RF) Exposure rules. This equipment should be installed and operated keeping the radiator at least XX cm or more away from person's body.

Cet équipement est conforme aux limites d'exposition aux rayonnements définies pour un environnement non contrôlé et respecte les règles d'exposition aux fréquences radioélectriques (RF) CNR-102 de l'ISED. Cet équipement doit être installé et utilisé en maintenant une distance de XX cm ou plus entre le dispositif rayonnant et le corps.

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (EIRP) is not more than that required for successful communication.

XX cm

FAR-2218(-BB) FAR-2318	RTR-105	440 cm	FAR-2228-NXT(-BB) FAR-2328-NXT	RTR-123	330 cm
FAR-2228(-BB) FAR-2328	RTR-106	950 cm	FAR-2238S-NXT(-BB) FAR-2338S-NXT	RTR-111	100 cm
FAR-2328W	RTR-108	550 cm	FAR-2018-MARK-2	RTR-131	420 cm
FAR-2238S(-BB) FAR-2338S	RTR-107	460 cm	FAR-2028-MARK-2	RTR-132	884 cm
			FAR-2028-NXT-MARK-2	RTR-137	357 cm
FAR-2338SW	RTR-109	230 cm			

1 ANTENNA RADIATOR

- | 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° | | | 25° | | |
| Sideline within $\pm 10^\circ$ | -24 dB | -28 dB | -28 dB | — | | -24 dB |
| Sideline outside $\pm 10^\circ$ | -30 dB | -32 dB | -32 dB | | | -30 dB |
| Sideline within $\pm 20^\circ$ | — | | | -23 dB | -24 dB | — |
| Sideline outside $\pm 20^\circ$ | | | | -27 dB | -30 dB | |

1.3	Polarization	Horizontal
1.4	Rotation	24 rpm or 42 rpm (for high speed craft)
1.5	Wind load	100 kn relative
1.6	De-icer (option)	On: when temperature goes down to 0°C Off: when temperature goes up to +5°C

X-band (Magnetron)	9410 MHz $\pm$ 30 MHz, P0N
X-band (Solid state)	CH1 P0N: 9403.75 MHz/ Q0N: 9423.75 MHz $\pm$ 5 MHz or CH2 P0N: 9413.75 MHz/ Q0N: 9433.75 MHz $\pm$ 5 MHz
S-band (Magnetron)	3050 MHz $\pm$ 30 MHz, P0N
S-band (Solid state)	CH1 P0N: 3043.75 MHz/ Q0N: 3063.75 MHz $\pm$ 5 MHz or CH2 P0N: 3053.75 MHz/ Q0N: 3073.75 MHz $\pm$ 5 MHz

- FAR-2238S-NXT(BB)/2338S-NXT 250 W

- | PRR
(Hz approx.) | Range scale (NM) | | | | | | | | | | | | | | | | | | |
|---------------------|------------------|------|-----|------|---|-----|---|----|---|---|---|----|----|----|----|----|----|--|--|
| | 0.125 | 0.25 | 0.5 | 0.75 | 1 | 1.5 | 2 | 3 | 4 | 6 | 8 | 12 | 16 | 24 | 32 | 48 | 96 | | |
| 3000* | S1 | | | | | | | | | | | | | | | | | | |
| 3000* | | | S2 | | | | | | | | | | | | | | | | |
| 1500 | | | M1 | | | | | | | | | | | | | | | | |
| 1200 | | | | | | | | M2 | | | | | | | | | | | |
| 1000 | | | | | | | | M3 | | | | | | | | | | | |
| 600** | | | | | | | | | | L | | | | | | | | | |

*: 2200 Hz with TT range on 32 NM. **: 500 Hz on 96 NM range.

X-band Solid state radar

PRR (Hz approx.)	Range scale (NM)																		
	0.125	0.25	0.5	0.75	1	1.5	2	3	4	6	8	12	16	24	32	48	96		
1500	S1																		
1500			S2																
1200				M1															
1000						M2													
1000								M3											
600										L									

1/2/4/8/16/32 NM ranges: B/W-type radar only

S-band Solid state radar

PRR (Hz approx.)	Range scale (NM)																		
	0.125	0.25	0.5	0.75	1	1.5	2	3	4	6	8	12	16	24	32	48	96		
2400*	S1																		
2000*			S2																
1500			M1																
1060					M2														
1000								M3											
600										L									

1/2/4/8/16/32 NM ranges: B/W-type radar only

*: 1800 Hz (S1) and 1500 Hz (S2) with TT range on 32 NM.

3 PROCESSOR UNIT

- 3.1 Minimum range 22 m
- 3.2 Range discrimination 26 m
- 3.3 Range accuracy 1% of the maximum range of the scale in use or 10 m, whichever is the greater

- 3.4 Bearing discrimination
- X-band: 2.1° (XN12CF), 1.5° (XN20CF), 1.2° (XN24CF),
- S-band: 2.8° (SN24CF), 2.5° (SN30CF), 2.0° (SN36CF)

- 3.5 Bearing accuracy $\pm 1^\circ$

- 3.6 Range scale and Range ring interval (RI)

Range (NM)	0.125	0.25	0.5	0.75	1	1.5	2	3	4	6	8	12	16	24	32	48	96
RI (NM)	0.025	0.05	0.1	0.25	0.25	0.25	0.5	0.5	1	1	2	2	4	4	8	8	16
Number of rings	5	5	5	3	4	6	4	6	4	6	4	6	4	6	4	6	6

- 3.7 Warm-up time

Magnetron radar 3 min. approx.

Solid state radar Nil

- 3.8 Presentation mode Head-up, STAB head-up, Course-up, North-up (RM/TM), Stern-up

- 3.9 Marks Cursor, Range ring, Heading mark, North mark, Bearing mark, VRM, EBL, Acquisition zone

- 3.10 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 activated targets

Vector time: Off, 30 s, 1-60 min

- 3.11 AIS Display capacity: 350 targets,

Tracking: 5/10 pts on all activated targets

	Vector time: Off, 30 s, 1-60 min
3.12 Echo trail	True/Relative, Trail length: 0 to 30 minutes (30 s steps) or continue Maximum 48 hours setting available for B/W-type radar
3.13 Radar map	20,000 pts
3.14 Acquisition zone	2 zones
3.15 Interswitch function	Selectable from menu

4 MONITOR UNIT

4.1 Screen type	MU-190/190HD/192/192HD, HD19T22 19-inch color LCD, 1280 x 1024 (SXGA) MU-231, JH23T14 23.1-inch color LCD, 1600 x 1200 (UXGA) MU-270W 27-inch color LCD, 1920 x 1200 (WUXGA)
4.2 Brightness	MU-190 450 cd/m ² typical MU-190HD/192HD 1000 cd/m ² typical MU-192/231/270W 400 cd/m ² typical HD19T22 350 cd/m ² typical JH23T14 500 cd/m ² typical
4.3 Visible distance	MU-190/190HD/192/192HD/270W, HD19T22 1.02 m nominal MU-231, JH23T14 1.2 m nominal
4.4 Radar effective diameter	MU-190/190HD/192HD 282 mm MU-231, JH23T14 331 mm MU-270W 349 mm HD19T22 265 mm

5 INTERFACE

5.1 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 250mA (Normal close/ open: 4, System fail: 1, Power fail: 1)
DVI output	2 ports: DVI-D, DVI-I or RGB picture data (for VDR) (RGB resolution 1280x1024 (SXGA), 60.0Hz or 1440x900 (WXGA+), 59.9Hz)
LAN	2 ports: Ethernet 100Base-TX
RS-232C	1 port: brilliance control
Sub display (for ECDIS)	2 ports: HD, BP, Trigger and Video signal
5.2 Data sentences (IEC61162-1/2)	
Input	ABK, ACK, ACN, ALR, BWC, BWR, CUR, DBK* ¹ , DBS* ¹ , DBT, DDC, DPT, DTM, GGA, GLL, GNS, HBT, HDT* ¹ , MTW, MWV, OSD, RAQ, RMB, RMC, ROT, RTE, THS, VBW, VDM, VDO, VDR, VHW, VSD, VTG, VWR* ¹ , VWT* ¹ , WPL, ZDA
Output	ABM, AIQ, ALC, ALF, ALR, ARC, BBM, DDC, EVE, HBT, OSD, RSD, TLB, TLL* ² , TTD, TTM, VSD
	* ¹ : for retrofit. * ² : for B/W-type radar
5.3 Ethernet interface for IEC61162-450	
LAN	100Base-TX, IPv4, 8P8C connector

Data sentences	Same as 5.2 sentences
IEC61162-450 transmission group	
Input	MISC, TGTD, SATD, NAVD, TIME, PROP, CAM1, CAM2, NETA
Output	ALC, ALF, ALR, HBT sentence: TGTD, BAM1, BAM2 (default: TGTD) other sentences: MISC, TGTD, SATD, NAVD, VDRD, RCOM, TIME, PROP, USER1 to USER8 (default: TGTD)
Multicast address	239.192.0.1 to 239.192.0.18, 239.192.0.56
Destination port	60001 to 60018, 60056
Re-transmittable binary image transfer	
Multicast address	239.192.0.26 to 239.192.0.30
Destination port	60026 to 60030
Syslog	
Multicast address	239.192.0.254
Destination port	514
5.4 Output port on antenna unit	
Sub display (for radar)	1 port: HD, BP, Trigger and Video signal

6 POWER SUPPLY

6.1 Processor unit (w/ antenna and transceiver unit)	
FAR-2218/2318	100-230 VAC: 2.1-1.0 A (2.9-1.3 A), 1 phase, 50-60 Hz or 24 VDC (21.6-31.2V): 5.4 A (9.0 A)
FAR-2228/2328	100-230 VAC: 2.3-1.1 A (3.2-1.4 A), 1 phase, 50-60 Hz or 24 VDC (21.6-31.2V): 8.9 A (12.4 A)
FAR-2228-NXT/2328-NXT	100-230 VAC: 2.1-1.1 A (2.9-1.3 A), 1 phase, 50-60 Hz or 24 VDC (21.6-31.2V): 8.2 A (11.1 A)
FAR-2328W	100-230 VAC: 2.3-1.1 A (3.2-1.4 A), 1 phase, 50-60 Hz
FAR-2238S/2338S/2338SW	100-230 VAC: 3.2-1.5 A (5.6-2.5 A), 1 phase, 50-60 Hz
FAR-2238S-NXT/2338S-NXT	100-230 VAC: 2.6-1.2 A (5.1-2.2 A), 1 phase, 50-60 Hz (A): 42 rpm
6.2 Monitor unit	
MU-190	100-230 VAC: 0.5-0.4 A, 1 phase, 50-60 Hz
MU-190HD	12-24 VDC (10.8-31.2V): 8.4-3.9 A
MU-192	100-230 VAC: 0.4-0.3 A, 1 phase, 50/60 Hz
MU-192HD (option, standard for HK config.)	12-24 VDC (10.8-31.2V): 4.9-2.3 A
MU-231	100-230 VAC: 0.7-0.4 A, 1 phase, 50-60 Hz
MU-270W	100-230 VAC: 0.6-0.4 A, 1 phase, 50-60 Hz
HD19T22-FUD-MA1/MA4-FAGA (option, standard supply for FAR-22x8 HK configuration)	100-240 VAC: 0.8-0.3 A, 1 phase, 50/60 Hz or 24 VDC: 3.1 A
JH23T14-FUD-MR1-AAOA (standard for HK config.)	100-240 VAC: 1.6-0.7 A, 1 phase. 50/60 Hz or 24 VDC: 6.5 A
6.3 HUB (option)	100-230 VAC: 0.1 A max. 1 phase, 50/60 Hz
6.4 De-icer (option)	100-115/220-230 VAC: 2.6/1.3 A, 1 phase, 50-60 Hz

7 ENVIRONMENTAL CONDITIONS

7.1 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)

7.2	Relative humidity	93% or less at +40°C
7.3	Degree of protection	
	Antenna unit	IP56
	Processor unit	IP22
	Transceiver/ control unit	IP20
	Monitor unit	IP22 (MU-190/190HD/192/231/270W), IP56 (front) or IP22 (rear) (MU-192HD) IP66 (front) or IP22 (rear) (HD19T22) IP66 (front) or IP20 (rear) (JH23T14)
	HUB	IP20 (HUB-100), IP22 (HUB-3000)
7.4	Vibration	IEC 60945 Ed.4

8 UNIT COLOR

8.1	Antenna unit	N9.5
8.2	Processor/ transceiver unit	N2.5
8.3	Control unit	N2.5
8.4	Monitor unit	N2.5 (MU-190/190HD/231/270W), N1.0 (MU-192/192HD) RAL9011 (HD19T22/JH23T14)
8.5	HUB	N3.0 (HUB-100), N2.5 (HUB-3000)
8.6	Radar console	2.5GY5/1.5 (standard), 7.5BG7/2, 2.5G7/2, N7.5

9 PERFORMANCE MONITOR

9.1	PM-32A (X-band, MAG)	
	Frequency range	9380 to 9440 MHz
	Input power	+18 dBm to +30 dBm
	Output power	-21 dBm (1 st pulse max. output), -41 dBm (1 st pulse min. output)
	Step level	8 to 12 dB (1 st pulse to last pulse)
9.2	PM-32B (X-band, SSD)	
	Frequency range	9423.75 ±1.6 MHz
	Input power	+6 dBm to +26 dBm
	Output power	-35 dBm (1 st pulse max. output), -66 dBm (1 st pulse min. output)
	Step level	8 to 12 dB (1 st pulse to last pulse)
9.3	PM-52A (S-band, MAG)	
	Frequency range	3040 to 3080 MHz
	Input power	+25 dBm to +40 dBm
	Output power	-38 dBm (1 st pulse max. output), -58 dBm (1 st pulse min. output)
	Step level	8 to 12 dB (1 st pulse to last pulse)
9.4	PM-52B (S-band, SSD)	
	Frequency range	3063.75 ±2 MHz
	Input power	+5 dBm to +25 dBm
	Output power	-52 dBm (1 st pulse max. output), -72 dBm (1 st pulse min. output)
	Step level	8 to 12 dB (1 st pulse to last pulse)

1 ANTENNA RADIATOR

- | Radiator type | X-band | | |
|---------------------------------|--------|--------|---------|
| | XN12AF | XN20AF | XN24AF* |
| Length | 4 ft | 6.5 ft | 8 ft |
| Horizontal beam width | 1.9° | 1.23° | 0.95° |
| Vertical beam width | 20° | | |
| Sidelobe within $\pm 10^\circ$ | -24 dB | -28 dB | -28 dB |
| Sidelobe outside $\pm 10^\circ$ | -30 dB | -32 dB | -32 dB |

1.3	Polarization	Horizontal
1.4	Rotation	24 rpm or 42 rpm (for high speed craft)
1.5	Wind load	100 kn relative
1.6	De-icer (option)	On: when temperature goes down to 0°C Off: when temperature goes up to +5°C

2.1 TX Frequency and modulation

- ## 2.2 Output power

- | | |
|---------------------|-----------------------------------|
| FAR-2018-MARK-2 | 12 kW |
| FAR-2028-MARK-2 | 25 kW |
| FAR-2028-NXT-MARK-2 | 600 W (500 W for Japanese vessel) |

- ### 2.3 Range scale, Pulse Repetition Rate and Pulselength

X-band Magnetron radar

PRR (Hz approx.)	Range scale (NM)																				
	0.125	0.25	0.5	0.75	1	1.5	2	3	4	6	8	12	16	24	32	48	96				
3000*	S1																				
3000*			S2																		
1500				M1																	
1200						M2															
1000								M3													
600**										L											

1/2/4/8/16/32 NM ranges: B/W-type radar only

*: 2200 Hz with TT range on 32 NM. **: 500 Hz on 96 NM range.

X-band Solid state radar

PRR (Hz approx.)	Range scale (NM)																				
	0.125	0.25	0.5	0.75	1	1.5	2	3	4	6	8	12	16	24	32	48	96				
1500	S1																				
1500			S2																		
1200				M1																	
1000						M2															
1000								M3													
600										L											

1/2/4/8/16/32 NM ranges: B/W-type radar only

3 PROCESSOR UNIT

- 3.1 Minimum range 22 m
- 3.2 Range discrimination 26 m
- 3.3 Range accuracy 1% of the maximum range of the scale in use or 10 m, whichever is the greater
- 3.4 Bearing discrimination 2.1° (XN12AF), 1.5° (XN20AF), 1.2° (XN24AF)
- 3.5 Bearing accuracy $\pm 1^\circ$
- 3.6 Range scale and Range ring interval (RI)

Range (NM)	0.125	0.25	0.5	0.75	1	1.5	2	3	4	6	8	12	16	24	32	48	96
RI (NM)	0.025	0.05	0.1	0.25	0.25	0.25	0.5	0.5	1	1	2	2	4	4	8	8	16
Number of rings	5	5	5	3	4	6	4	6	4	6	4	6	4	6	4	6	6

1/2/4/8/16/32 NM ranges: B/W-type radar only

- 3.7 Warm-up time
- Magnetron radar 3 min. approx.
- Solid state radar Nil
- 3.8 Presentation mode Head-up, STAB head-up, Course-up, North-up (RM/TM), Stern-up
- 3.9 Marks Cursor, Range ring, Heading mark, North mark, Bearing mark, VRM, EBL, Acquisition zone
- 3.10 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 activated targets
Vector time: Off, 30 s, 1-60 min
- 3.11 AIS Display capacity: 350 targets,
Tracking: 5/10 pts on all activated targets
Vector time: Off, 30 s, 1-60 min
- 3.12 Echo trail True/Relative, Trail length: 0 to 30 minutes (30 s steps) or continue
Maximum 48 hours setting available for B/W-type radar
- 3.13 Radar map 20,000 pts
- 3.14 Acquisition zone 2 zones
- 3.15 Interswitch function Selectable from menu

4 MONITOR UNIT

- 4.1 Screen type
- MU-190/190HD/192/192HD, HD19T22 19-inch color LCD, 1280 x 1024 (SXGA)
- MU-270W 27-inch color LCD, 1920 x 1200 (WUXGA)
- JH23T14 23.1-inch color LCD, 1600 x 1200 (UXGA)
- 4.2 Brightness
- MU-190 450 cd/m² typical
- MU-190HD/192HD 1000 cd/m² typical
- MU-192/270W 400 cd/m² typical
- HD19T22 350 cd/m² typical
- JH23T14 500 cd/m² typical
- 4.3 Visible distance
- MU-190/190HD/192/192HD/270W, HD19T22 1.02 m nominal
- JH23T14 1.2 m nominal
- 4.4 Radar effective diameter
- MU-190/190HD/192/192HD 282 mm
- MU-270W 349 mm

HD19T22	265 mm
JH23T14	331 mm

5 INTERFACE

5.1 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 250mA (Normal close/ open: 4, System fail: 1, Power fail: 1)
DVI output	2 ports: DVI-D, DVI-I or RGB picture data (for VDR) (RGB resolution 1280x1024 (SXGA), 60.0Hz or 1440x900 (WXGA+), 59.9Hz)
LAN	2 ports: Ethernet 100Base-TX
RS-232C	1 port: brilliance control
Sub display (for ECDIS)	2 ports: HD, BP, Trigger and Video signal

5.2 Data sentences (IEC61162-1/2)

Input	ABK, ACK, ACN, ALR, BWC, BWR, CUR, DBK* ¹ , DBS* ¹ , DBT, DDC, DPT, DTM, GGA, GLL, GNS, HBT, HDT* ¹ , MTW, MWV, OSD, RAQ, RMB, RMC, ROT, RTE, THS, VBW, VDM, VDO, VDR, VHW, VSD, VTG, VWR* ¹ , VWT* ¹ , WPL, ZDA
Output	ABM, AIQ, ALC, ALF, ALR, ARC, BBM, DDC, EVE, HBT, OSD, RSD, TLB, TLL* ² , TTD, TTM, VSD
* ¹ : for retrofit. * ² : for B/W-type radar	

5.3 Ethernet interface for IEC61162-450

LAN	100Base-TX, IPv4, 8P8C connector
Data sentences	Same as 5.2 sentences
IEC61162-450 transmission group	
Input	MISC, TGTD, SATD, NAVD, TIME, PROP, CAM1, CAM2, NETA
Output	ALC, ALF, ALR, HBT sentence: TGTD, BAM1, BAM2 (default: TGTD) other sentences: MISC, TGTD, SATD, NAVD, VDRD, RCOM, TIME, PROP, USER1 to USER8 (default: TGTD)
Multicast address	239.192.0.1 to 239.192.0.18, 239.192.0.56
Destination port	60001 to 60018, 60056
Re-transmittable binary image transfer	
Multicast address	239.192.0.26 to 239.192.0.30
Destination port	60026 to 60030
Syslog	
Multicast address	239.192.0.254
Destination port	514

5.4 Output port on antenna unit

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

6 POWER SUPPLY

6.1 Processor unit (w/ antenna and transceiver unit)

FAR-2018-MARK-2	100-230 VAC: 2.1-1.0 A (2.8-1.2 A), 1 phase, 50-60 Hz or 24 VDC (21.6-31.2V): 7.7 A (10.6 A)
FAR-2028-MARK-2	100-230 VAC: 2.2-1.0 A (2.8-1.3 A), 1 phase, 50-60 Hz or 24 VDC (21.6-31.2V): 8.1 A (11.2 A) (A): for 42 rpm

FAR-2028-NXT-MARK-2

100-230 VAC: 2.2-1.0 A (2.8-1.3 A), 1 phase, 50-60 Hz or
24 VDC (21.6-31.2V): 8.1 A (11.0 A)
(A): for 42 rpm

6.2 Monitor unit

MU-190 100-230 VAC: 0.5-0.4 A, 1 phase, 50-60 Hz
MU-190HD 12-24 VDC (10.8-31.2V): 8.4-3.9 A
MU-192 100-230 VAC: 0.4-0.3 A, 1 phase, 50/60 Hz
MU-192HD (option, standard for HK config.) 12-24 VDC (10.8-31.2V): 4.9-2.3 A
MU-270W 100-230 VAC: 0.6-0.4 A, 1 phase, 50-60 Hz
HD19T22-FUD-MA1/MA4-FAGA (standard supply for HK configuration)
100-240 VAC: 0.8-0.3 A, 1 phase, 50/60 Hz or 24 VDC: 3.1 A
JH23T14-FUD-MR1-AOAA (standard for HK config.)
100-240 VAC: 1.6-0.7 A, 1 phase, 50/60 Hz or 24 VDC: 6.5 A

6.3 HUB (option)

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

6.4 De-icer (option)

100-115/220-230 VAC: 2.6/1.3 A, 1 phase, 50-60 Hz

7 ENVIRONMENTAL CONDITIONS
7.1 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)

7.2 Relative humidity

93% or less at +40°C

7.3 Degree of protection

Antenna unit IP56
Processor unit IP22
Monitor unit IP22 (MU-190/190HD/192/270W),
IP56 (front) or IP22 (rear) (MU-192HD)
IP66 (front) or IP22 (rear) (HD19T22)
IP66 (front) or IP20 (rear) (JH23T14)
Control unit IP20
HUB IP20 (HUB-100), IP22 (HUB-3000)

7.4 Vibration

IEC 60945 Ed.4

8 UNIT COLOR

8.1 Antenna unit N9.5
8.2 Processor/ control unit N2.5
8.3 Monitor unit N2.5 (MU-190/190HD/270W), N1.0 (MU-192/192HD)
RAL9011 (HD19T22/JH23T14)
8.4 HUB N3.0 (HUB-100), N2.5 (HUB-3000)
8.5 Radar console 2.5GY5/1.5 (standard), 7.5BG7/2, 2.5G7/2, N7.5

9 PERFORMANCE MONITOR

9.1 Frequency range 9380 to 9440 MHz
9.2 Input power +18 dBm to +30 dBm
9.3 Output power -21 dBm (1st pulse max. output), -41 dBm (1st pulse min. output)
9.4 Step level 8 to 12 dB (1st pulse to last pulse)

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Declaration of Conformity

[FAR-2218/FAR-2218-BB/FAR-2228/FAR-2228-BB/FAR-2228-NXT/FAR-2228-NXT-BB/FAR-2238S/
FAR-2238S-BB/FAR-2238S-NXT/FAR-2238S-NXT-BB/FAR-2318/FAR-2328/FAR-2328-NXT/FAR-2328W/
FAR-2338SW/FAR-2338S/FAR-2338S-NXT/FAR-2018-MARK-2/FAR-2028-MARK-2/FAR-2028-NXT-MARK-2]

Bulgarian (BG)	С настоящото Furuno Electric Co., Ltd. декларира, че гореспоменат тип радиосъоръжение е в съответствие с Директива 2014/53/EC, SI 2017/1206. Цялостният текст на EC/UK декларацията за съответствие може да се намери на следния интернет адрес:
Spanish (ES)	Por la presente, Furuno Electric Co., Ltd. declara que el tipo de equipo radioeléctrico arriba mencionado es conforme con la Directiva 2014/53/UE, SI 2017/1206. El texto completo de la declaración de conformidad de la EU/UK está disponible en la siguiente dirección Internet:
Czech (CS)	Tímto Furuno Electric Co., Ltd. prohlašuje, že výše zmíněné typ rádiového zařízení je v souladu se směrnicí 2014/53/EU, SI 2017/1206. Úplné znění EU/SK prohlášení o shodě je k dispozici na této internetové adrese:
Danish (DA)	Hermed erklærer Furuno Electric Co., Ltd., at ovennævnte radioudstyr er i overensstemmelse med direktiv 2014/53/EU, SI 2017/1206. EU/UK-overensstemmelseserklæringens fulde tekst kan findes på følgende internetadresse:
German (DE)	Hiermit erkläre ich die Furuno Electric Co., Ltd., dass der oben genannte Funkanlagentyp der Richtlinie 2014/53/UE, SI 2017/1206 entspricht. Der vollständige Text der EU/UK-Konformitätserklärung ist unter der folgenden Internetadresse verfügbar:
Estonian (ET)	Käesolevaga deklareerib Furuno Electric Co., Ltd., et ülalmainitud raadioseadme tüüp vastab direktiivi 2014/53/EL, SI 2017/1206 nõuetele. EL/GB vastavusdeklaratsiooni täielik tekst on kättesaadav järgmisel internetiaadressil:
Greek (EL)	Με την παρούσα η Furuno Electric Co., Ltd., δηλώνει ότι ο προαναφερθέντας ραδιοεξοπλισμός πληροί την οδηγία 2014/53/EE, SI 2017/1206. Το πλήρες κείμενο της δήλωσης συμμόρφωσης EE/UK διατίθεται στην ακόλουθη ιστοσελίδα στο διαδίκτυο:
English (EN)	Hereby, Furuno Electric Co., Ltd. declares that the above-mentioned radio equipment type is in compliance with Directive 2014/53/UE, SI 2017/1206. The full text of the EU/UK declaration of conformity is available at the following internet address:
French (FR)	Le soussigné, Furuno Electric Co., Ltd., déclare que l'équipement radioélectrique du type mentionné ci-dessus est conforme à la directive 2014/53/UE, SI 2017/1206. Le texte complet de la déclaration UE/RU de conformité est disponible à l'adresse internet suivante:
Croatian (HR)	Furuno Electric Co., Ltd. ovime izjavljuje da je gore rečeno radijska oprema tipa u skladu s Direktivom 2014/53/EU, SI 2017/1206. Cjeloviti tekst EU/UK izjave o sukladnosti dostupan je na sljedećoj internetskoj adresi:
Italian (IT)	Il fabbricante, Furuno Electric Co., Ltd., dichiara che il tipo di apparecchiatura radio menzionato sopra è conforme alla direttiva 2014/53/UE, SI 2017/1206. Il testo completo della dichiarazione di conformità UE/RU è disponibile al seguente indirizzo Internet:
Latvian (LV)	Ar šo Furuno Electric Co., Ltd. deklarē, ka augstāk minēts radioiekārta atbilst Direktīvai 2014/53/ES, SI 2017/1206. Pilns ES/AK atbilstības deklarācijas teksts ir pieejams šādā interneta vietnē:
Lithuanian (LT)	Aš, Furuno Electric Co., Ltd., patvirtinu, kad pirmiau minėta radijo įrenginių tipas atitinka Direktyvą 2014/53/ES, SI 2017/1206. Visas ES/JK atitikties deklaracijos tekstas prieinamas šiuo interneto adresu:
Hungarian (HU)	Furuno Electric Co., Ltd. igazolja, hogy fent említett típusú rádióberendezés megfelel a 2014/53/EU, SI 2017/1206 irányelvnek. Az EU/EK-megfelelőségi nyilatkozat teljes szövege elérhető a következő internetes címen:
Maltese (MT)	B'dan, Furuno Electric Co., Ltd., niddikjara li msemmija hawn fuq-tip ta' tagħmir tar-radju huwa konformi mad-Direttiva 2014/53/UE, SI 2017/1206. It-test kollu tad-dikjarazzjoni ta' konformità tal-UE/RU huwa disponibbli f'dan l-indirizz tal-Internet li ġej:
Dutch (NL)	Hierbij verklaar ik, Furuno Electric Co., Ltd., dat het hierboven genoemde type radioapparatuur conform is met Richtlijn 2014/53/EU, SI 2017/1206. De volledige tekst van de EU/VK-conformiteitsverklaring kan worden geraadpleegd op het volgende internetadres:
Polish (PL)	Furuno Electric Co., Ltd. niniejszym oświadcza, że wyżej wymieniony typ urządzenia radiowego jest zgodny z dyrektywą 2014/53/UE, SI 2017/1206. Pełny tekst deklaracji zgodności UE/UK jest dostępny pod następującym adresem internetowym:
Portuguese (PT)	O(a) abaixo assinado(a) Furuno Electric Co., Ltd. declara que o mencionado acima tipo de equipamento de rádio está em conformidade com a Diretiva 2014/53/UE, SI 2017/1206. O texto integral da declaração de conformidade da EU/UK está disponível no seguinte endereço de Internet:
Romanian (RO)	Prin prezenta, Furuno Electric Co., Ltd. declară că echipamentul radio menționat mai sus este în conformitate cu Directiva 2014/53/UE, SI 2017/1206. Textul integral al declarației de conformitate UE/RU este disponibil la următoarea adresă internet:
Slovak (SK)	Furuno Electric Co., Ltd. týmto vyhlasuje, že vyššie spomínané rádiové zariadenie typu je v súlade so smernicou 2014/53/EÚ, SI 2017/1206. Úplné EÚ/SK vyhlásenie o zhode je k dispozícii na tejto internetovej adrese:
Slovenian (SL)	Furuno Electric Co., Ltd. potrjuje, da je zgoraj omenjeno tip radijske opreme skladen z Direktivo 2014/53/EU, SI 2017/1206. Celotno besedilo izjave EU/ZK o skladnosti je na voljo na naslednjem spletnem naslovu:
Finnish (FI)	Furuno Electric Co., Ltd. vakuuttaa, että yllä mainittu radiolaitetyyppi on direktiivin 2014/53/EU, SI 2017/1206 mukainen. EU/UK-vaatimustenmukaisuusvakuutuksen täysimittainen teksti on saatavilla seuraavassa internetosoitteessa:
Swedish (SV)	Härmed försäkrar Furuno Electric Co., Ltd. att ovan nämnda typ av radioutrustning överensstämmer med direktiv 2014/53/EU, SI 2017/1206. Den fullständiga texten till EU/Storbritannien-försäkran om överensstämmelse finns på följande webbadress:

Online Resource

http://www.furuno.com/en/support/red_doc

Notice for radiated immunity

The test for the radiated immunity is performed up to 2.7 GHz only without the special condition of spot frequency being applied. There is a chance that this equipment may interfere with allocated services in the frequency range of 2.7 GHz to 6 GHz, particularly in harbors, rivers, lake banks, etc.

Declaration of Conformity



0575



0097

We **FURUNO ELECTRIC CO., LTD.**

(Manufacturer)

9-52 Ashihara-Cho, Nishinomiya City, 662-8580, Hyogo, Japan

(Address)

declare under our sole responsibility that the product

MARINE RADAR

FAR-2218, FAR-2218-BB, FAR-2228, FAR-2228-BB, FAR-2228-NXT, FAR-2228-NXT-BB,
FAR-2238S, FAR-2238S-BB, FAR-2238S-NXT, FAR-2238S-NXT-BB, FAR-2318, FAR-2328,
FAR-2328-NXT, FAR-2328W, FAR-2338SW, FAR-2338S, FAR-2338S-NXT,
FAR-2018-MARK-2 and FAR-2028-MARK-2

(Serial No. 1000-79xx/1001-34xx-xxxx)

(Model name, type number)

to which this declaration relates conforms to the following standard(s) or other normative document(s)

EU

Directive 2014/90/EU on Marine Equipment
(MED) as amended the Implementing Regulation
(EU) 2025/1533

UK

UK MCA Merchant Shipping (Marine Equipment)
Regulations 2016 (MER) as amended MSN 1874
Amendment 10

SOLAS 74 Reg. V/18, V/19 & X/3
IMO Res. MSC.36(63), MSC.97(73), A.278(VIII),
A.694(17), MSC.191(79), MSC.192(79),
MSC.302(87), MSC.1/Circ.1349
ITU-R M.1177-4

(title and number of the requirements)

For assessment, see

- EC-type examination certificate (Module B)
MEDB00002AU Rev.13: DNV AS (0575)
- Product Quality System certificate (Module D)
MEDD00002CD Rev.9: DNV AS (0575)

On behalf of Furuno Electric Co., Ltd.

Nishinomiya City, Japan
23 September 2025

Akihiko Kanechika
Department General Manager
Quality Assurance Department

(Place and date of issue)

(name and signature or equivalent marking of authorized person)

A. Kanechika

PSTI Statement of Compliance

We

FURUNO ELECTRIC CO., LTD.

(Name of manufacturer of the product)

9-52 Ashihara-Cho, Nishinomiya City, 662-8580, Hyogo, Japan

(Address of manufacturer of the product)

declare under our sole responsibility that the product

MARINE RADAR,

FAR-2218, FAR-2218-BB, FAR-2228, FAR-2228-BB, FAR-2228-NXT, FAR-
2228-NXT-BB, FAR-2328W, FAR-2238S, FAR-2238S-BB, FAR-2338S, FAR-2238S-
NXT, FAR-2238S-NXT-BB, FAR-2338S-NXT, FAR-2338SW, FAR-2258, FAR-2258-BB, FAR-2358,
FAR-2268DS

(Product type, batch)

December / 31 / 2028

(Support period for the product)

https://www.furuno.co.jp/en/csr/sociality/customer/product_security.html

(Weblink for latest information and contact to the manufacturer security issues)

to which this declaration relates conforms to the following standard(s) or other normative document(s)

Product Security and Telecommunications Infrastructure Act 2022

Product Security and Telecommunications Infrastructure (Security Requirements for
Relevant Connectable Products) Regulations 2023 Schedule 1

On behalf of Furuno Electric Co., Ltd.

Nishinomiya City, Japan
19 November 2025

Akihiko Kanechika
Department General Manager
Quality Assurance Department

(Place and date of issue)

(Signature, name and function of the signatory)

A. Kanechika