

Installation Manual **FISH FINDER/HI-RES FISH FINDER** **FISH SIZE INDICATOR**

Model FCV-1900/FCV-1900B/FCV-1900G

(Product Name: FISH FINDER)

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SAFETY INSTRUCTIONS

The installer must read the appropriate safety instructions before attempting to install the equipment.



WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION

Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.



Warning, Caution



Prohibitive Action



Mandatory Action



WARNING



ELECTRICAL SHOCK HAZARD
Do not open the equipment unless totally familiar with electrical circuits and service manual.

Only qualified personnel are allowed work inside the equipment.



Turn off the power at the switchboard before beginning the installation.

Fire or electrical shock can result if the power is left on.



Do not install the equipment where it may get wet from rain or water splash.

Water in the equipment can result in fire, electrical shock or damage the equipment.



Be sure no water leaks in at the transducer mounting location.

Water leakage can sink the vessel. Also, confirm that vibrations will not loosen the transducer. The installer of the equipment is solely responsible for the proper installation of the equipment. FURUNO will assume no responsibility for any damage associated with improper installation.



Use the proper cable and fuse.

Use of an incorrect cable and fuse can damage the equipment and cause fire.



CAUTION



Ground the equipment to prevent mutual interference.



Do not transmit with the transducer out of water.

The transducer may become damaged.



Do not allow warm water or any other liquid other than sea water or fresh water to contact the transducer.

Damage to the transducer may result.



Observe the following compass safe distance to prevent interference to a magnetic compass:

	Standard compass	Steering compass
FCV-1901	1.00 m	0.60 m
FCV-1902	0.60 m	0.35 m
FCV-1903	0.70 m	0.45 m

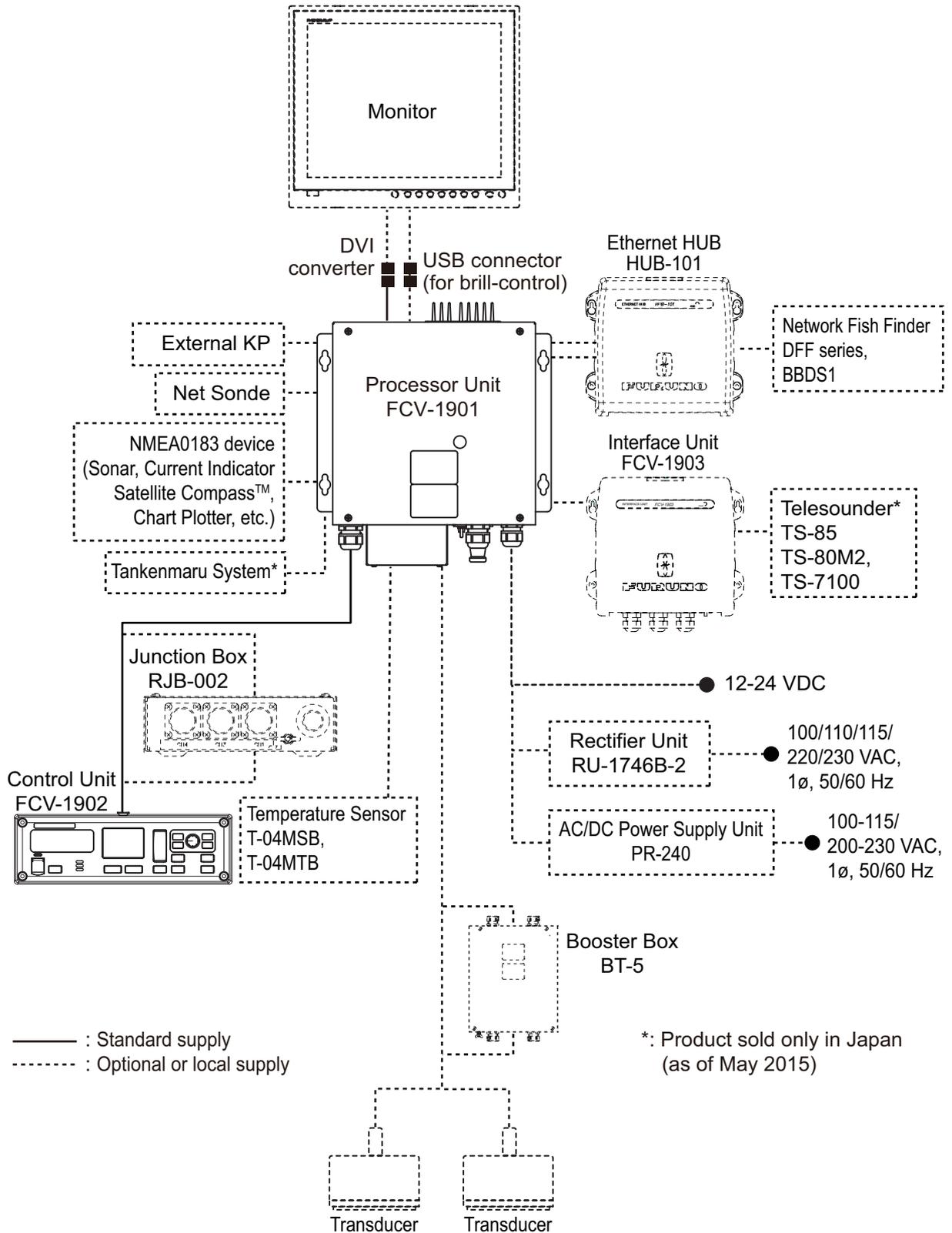


The transducer cable must handled carefully, following the guidelines below.

- Keep fuels and oils away from the cable.
- Locate the cable where it will not be damaged.

The cable sheath is made of chlorophrane or polychloride vinyl, which are easily damaged by plastic solvents such as toluene. Locate the cables away from plastic solvents.

SYSTEM CONFIGURATION



EQUIPMENT LISTS

Standard Supply

Name	Type	Code No.	Qty	Remarks
Processor unit	FCV-1901	-	1	
Control unit	FCV-1902	-	1	
Spare parts	SP02-05801	001-372-670	1 set	For Processor unit
Installation materials	CP02-09110	000-029-472	1 set	For Processor unit CP02-09101+Adapter
	CP03-34401	001-194-530	1 set	For Control unit

Optional Supply

Name	Type	Code No.	Remarks
Transducer	See next several pages.	-	
Thru-hull pipe		-	
Interface unit	FCV-1903*1	-	
Cable	MJ-A6SPF0003-020C	000-154-029-1	2 m
	MJ-A6SPF0003-050C	000-154-054-1	5 m
	MJ-A6SPF0003-100C	000-168-924-1	10 m
	MJ-A6SPF0003-150C	000-159-643-1	15 m
LAN cable	MOD-Z072-020+	001-167-880-1	2 m
	MOD-Z072-050+	001-167-890-1	5 m
	MOD-Z072-100+	001-167-900-1	10 m
Temperature sensor	T-04MSB	000-026-893	Thru-hull mount
	T-04MTB	000-026-894	Transom mount
Rectifier	RU-1746B-2	000-030-439	
AC/DC power supply unit	PR-240	000-013-632	
Ethernet HUB	HUB-101	000-011-762	
Booster box	BT-5-1/2	001-411-880	
Cable (for transducer extension)	C44-02 30M	001-374-620	30 m, *2
	C44-02 50M	001-374-580	50 m, *2
	C334 30M	001-374-640	30 m, *3
Junction box	RJB-002	000-020-367	For control unit
Cable assembly	MJ-A7SPF0007-050C	000-154-028-10	For external equipment
	RNS-08-132	001-107-540-1	5m, for display unit brilliance adj. *1
	HDMI-TO-DVI-L=5.3M	000-190-724-10	5.3m, *1
	HDMI-TO-DVI-L=10.3M*2	000-190-725-10	10.3m, *1
Cable assembly (USB)	CP013638-07-A (550MM)	001-498-910	USB cable
Installation material	CP03-28900[10M]	000-082-658	10 m
	CP03-28910[20M]	000-082-659	20 m
	CP03-28920[30M]	000-082-660	30 m

*1: Required for connection of MU-190/190HD/190V/150HD/231.

*2: Tank w/transducer (CM265LH, CM265LM, CM599LH, CM599LM, PM111LH, PM111LM, CM275LH-W)

*3: For thru-hull transducer.

Transducer (option)

The contents in the table below are for your information only. Some tanks are not RoHS compliant.

Output (W)	Frequency (kHz)	Transducer	Hull Material	Thru-hull pipe	Tank
1 k/ 1 k	28/50	28F-8, 50B-6/6B	Steel/ FRP	-	-
		28F-8, 50B-9B	Steel	TWB-6000 (2)	T-656
	28/68	28F-8, 68F-8H	Steel/ FRP	-	-
	28/88	28F-8, 88B-8	Steel	TWB-6000 (2)	T-657
	50/88	50B-6/6B, 88B-8	Steel	TWB-6000 (2)	T-658
		50B-9B, 88B-8	Steel	TWB-6000 (2)	T-658
	50/200	50B-6/6B, 200B-5S	Steel/ FRP	-	-
		50B-9B, 200B-5S	Steel	TWB-6000 (2)	T-658
50/200-1T*1		Steel	TFB-6000 (2)	T-659	
1 k/ 2 k	50/200	50B-9B, 200B-8/8B	Steel	TWB-6000 (2)	T-658
	88/200	88B-8, 200B-8/8B	Steel	TWB-6000 (2)	T-659
2 k/ 2 k	28/200	28BL-6HR, 200B-8/8B	Steel	TFB-7000 (2) or TWB-6000 (2)	T-693
			FRP	TRB-1100 (2)	T-693-F
	38/200	38BL-9HR, 200B-8/8B	Steel	TFB-7000 (2) or TWB-6000 (2)	T-693
			FRP	TRB-1100 (2)	T-693-F
	82/200	82B-35R, 200B-8/8B	Steel	TFB-7000 (2) or TWB-6000 (2)	T-649
			FRP	TRB-1100 (2)	T-649-F
	88/200	88B-10, 200B-8/8B	Steel	TFB-7000 (2) or TWB-6000 (2)	T-649
			FRP	TRB-1100 (2)	T-649-F
2 k/ 3 k	28/150	28F-18, 150B-12H	Steel	TFB-7000 (2)	T-637
			FRP	TRB-1100 (2)	T-637-F
3 k/ 2 k	68/200	68F-30H, 200B-8/8B	Steel	TFB-7000 (2) or TWB-6000 (2)	T-647
			FRP	TRB-1100 (2)	T-647-F
	107/200	100B-10R, 200B-8/8B	Steel	TFB-7000 (2) or TWB-6000 (2)	T-649
			FRP	TRB-1100 (2)	T-649-F

EQUIPMENT LISTS

Output (W)	Frequency (kHz)	Transducer	Hull Material	Thru-hull pipe	Tank
3 k/ 3 k	28/38	28BL-12HR, 38BL-15HR	Steel	TFB-7000 (2) or TWB-6000 (2)	T-681
			FRP	TRB-1100 (2)	T-681-F
	28/50	28BL-12HR, 50BL-24HR	Steel	TFB-7000 (2) or TWB-6000 (2)	T-681
			FRP	TRB-1100 (2)	T-681-F
	28/88	28BL-12HR, 88F-126H	Steel	TFB-7000 (2) or TWB-6000 (2)	T-682
			FRP	TRB-1100 (2)	T-682-F
	28/150	28BL-12HR, 150B-12H	Steel	TFB-7000 (2) or TWB-6000 (2)	T-683
			FRP	TRB-1100 (2)	T-683-F
	28/200	28BL-12HR, 200B-12H	Steel	TFB-7000 (2) or TWB-6000 (2)	T-683
			FRP	TRB-1100 (2)	T-683-F
	38/50	38BL-15HR, 50BL-24HR	Steel	TFB-7000 (2) or TWB-6000 (2)	T-681
			FRP	TRB-1100 (2)	T-681-F
	38/88	38BL-15HR, 88F-126H	Steel	TFB-7000 (2) or TWB-6000 (2)	T-682
			FRP	TRB-1100 (2)	T-682-F
	38/150	38BL-15HR, 150B-12H	Steel	TFB-7000 (2) or TWB-6000 (2)	T-683
			FRP	TRB-1100 (2)	T-683-F
	38/200	38BL-15HR, 200B-12H	Steel	TFB-7000 (2) or TWB-6000 (2)	T-683
			FRP	TRB-1100 (2)	T-683-F
	50/88	50BL-24HR, 88F-126H	Steel	TFB-7000 (2) or TWB-6000 (2)	T-682
			FRP	TRB-1100 (2)	T-682-F
	50/150	50BL-24HR, 150B-12H	Steel	TFB-7000 (2) or TWB-6000 (2)	T-683
			FRP	TRB-1100 (2)	T-683-F
	50/200	50BL-24HR, 200B-12H	Steel	TFB-7000 (2) or TWB-6000 (2)	T-683
			FRP	TRB-1100 (2)	T-683-F
	68/150	68F-30H, 150B-12H	Steel	TFB-7000 (2) or TWB-6000 (2)	T-646
			FRP	TRB-1100 (2)	T-646-F
	68/200	68F-30H, 200B-12H	Steel	TFB-7000 (2) or TWB-6000 (2)	T-646
			FRP	TRB-1100 (2)	T-646-F
88/150	88F-126H, 150B-12H	Steel	TFB-7000 (2) or TWB-6000 (2)	T-685	
		FRP	TRB-1100 (2)	T-685-F	
88/200	88F-126H, 200B-12H	Steel	TFB-7000 (2) or TWB-6000 (2)	T-685	
		FRP	TRB-1100 (2)	T-685-F	

Output (W)	Frequency (kHz)	Transducer	Hull Material	Thru-hull pipe	Tank	
1 k	28	28F-8	Steel	TFB-5000 (1)	T-604	
			FRP	TRB-1000 (1) or TRB-1200	T-604-F	
	50	50B-6/6B	Steel	TFB-5000 (1)	T-605	
			FRP	TRB-1000 (1)	T-605-F	
		50B-9B	Steel	TFB-5000 (1)	T-603	
			FRP	TRB-1000 (1) or TRB-1200	T-603-F	
	68	68F-8H	Steel	TFB-5000 (1)	T-621	
			FRP	TRB-1000 (1) or TRB-1200	T-621F	
	88	88B-8	Steel	TFB-5000 (1)	T-606	
			FRP	TRB-1000 (1) or TRB-1200	T-606F	
	200	200B-5S	Steel	TFB-5000 (1)	T-605	
			FRP	TRB-1000 (1)	T-605-F	
	2 k	38	38BL-9HR	Steel	TFB-5000 (1)	T-702
				FRP	TRB-1000 (1)	T-702-F
50		50BL-12HR	Steel	TFB-5000 (1)	T-702	
			FRP	TRB-1000 (1)	T-702-F	
82		82B-35R	Steel	TFB-5000 (1)	T-609	
			FRP	TRB-1000 (1) or TRB-1200	T-609-F	
88		88B-10	Steel	TFB-5000 (1)	T-609	
			FRP	TRB-1000 (1) or TRB-1200	T-609-F	
200		200B-8/8B	Steel	TFB-5000 (1)	T-608	
			FRP	TRB-1000 (1) or TRB-1200	T-608-F	
3 k		28	28BL-12HR	Steel	TFB-5000 (1)	T-616
				FRP	TRB-1000 (1)	T-616-F
	38	38BL-15HR	Steel	TFB-5000 (1)	T-616	
			FRP	TRB-1000 (1)	T-616-F	
	50	50BL-24HR	Steel	TFB-5000 (1)	T-616	
			FRP	TRB-1000 (1)	T-616-F	
	68	68F-30H	Steel	TFB-5000 (1)	T-614	
			FRP	TRB-1000 (1)	T-614-F	
	88	88F-126H	Steel	TFB-5000 (1)	T-618	
			FRP	TRB-1000 (1)	T-618-F	
	107	100B-10R	Steel	TFB-5000 (1)	T-649	
			FRP	TRB-1000 (1)	T-649-F	
	150	150B-12H	Steel	TFB-5000 (1)	T-685	
			FRP	TRB-1000 (1)	T-685-F	
	200	200B-12H	Steel	TFB-5000 (1)	T-646	
			FRP	TRB-1000 (1)	T-646-F	

EQUIPMENT LISTS

Output (W)	Frequency (kHz)	Transducer	Hull Material	Thru-hull pipe	Tank
1 k/ 1 k	42-65/130-210	CM265LH ^{*2}	Steel	-	T-711
			FRP	-	T-711-F
	42-65/85-135	CM265LM	Steel	TFB-7000 (1)	T-711
			FRP	-	T-711-F
	42-65/150-250	CM275LH-W ^{*3}	Steel	TFB-7000 (1)	T-711
			FRP	-	T-711-F
2 k/ 2 k	38-75/130-210	PM111LH ^{*2}	Steel	TFB-7000 (1)	T-712
			FRP	TRB-1100 (1)	T-712-F
	38-75/80-130	PM111LM	Steel	TFB-7000 (1)	T-712
			FRP	TRB-1100 (1)	T-712-F
3 k/ 2 k	28-60/130-210	CM599LH ^{*2}	Steel	TFB-7000 (1)	T-712
			FRP	TRB-1100 (1)	T-712-F
	28-60/80-130	CM599LM	Steel	TFB-7000 (1)	T-712
			FRP	TRB-1100 (1)	T-712-F

*1: ACCU-FISH™ compatible.

*2: ACCU-FISH™ and fish size histogram compatible.

*3: Wide beam type transducer with high frequency beam width of 25°.

1. MOUNTING

1.1 Processor Unit

1.1.1 Installation considerations

The processor unit can be installed on a desktop or a bulkhead. When selecting a mounting location, keep in mind the following points:

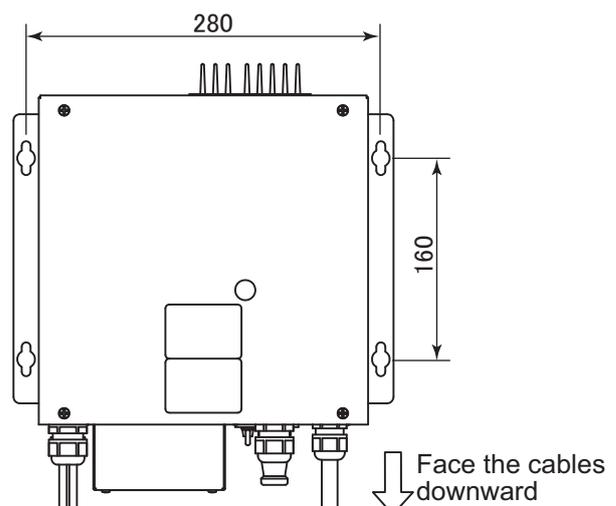
- Locate the unit out of direct sunlight.
- Select an installation location that is well ventilated.
- Locate the unit where shock and vibration are minimal.
- Leave sufficient space around the unit for maintenance and service.
- Face the cable connectors downward for bulkhead mounting.
- Keep in mind the compass safe distances shown on page i.

1.1.2 Tabletop mounting

- 1) Drill four pilot holes in the tabletop for the self-tapping screws.
- 2) Screw four self-tapping screws ($\phi 5 \times 20$, supplied) into the pilot holes, leave 5 mm protruding.
- 3) Set the processor unit to the screws, then slide the processor unit to the front to fix the unit.
- 4) Fasten the screws to fix the unit in place.

1.1.3 How to bulkhead mount the processor

- 1) Drill four pilot holes in the bulkhead for the self-tapping screws.
- 2) Screw four self-tapping screws ($\phi 5 \times 20$, supplied) to the pilot holes, leave 5 mm protruding.
- 3) Hang the processor unit on the screws. The cable connectors should be faced downward.
- 4) Fasten the screws to secure the unit in place.



1.2 Control Unit

1.2.1 Installation considerations

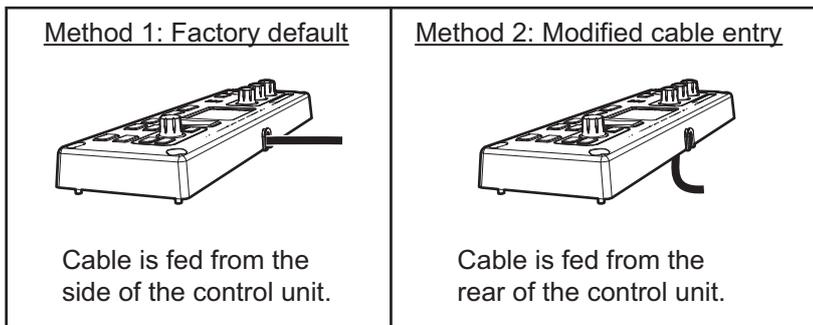
The control unit is designed to be mounted on a tabletop. When selecting a mounting location, keep in mind the following points:

- Locate the unit where shock and vibration are minimal.
- Leave sufficient space around the unit for maintenance and servicing.
- Locate the unit with consideration for cable length.
- Keep in mind the compass safe distances shown on page i.

Note: The ground terminal is attached to the bottom of the unit. Connect a ground wire (1V-1.25 sq, local supply) to the terminal before installing the unit.

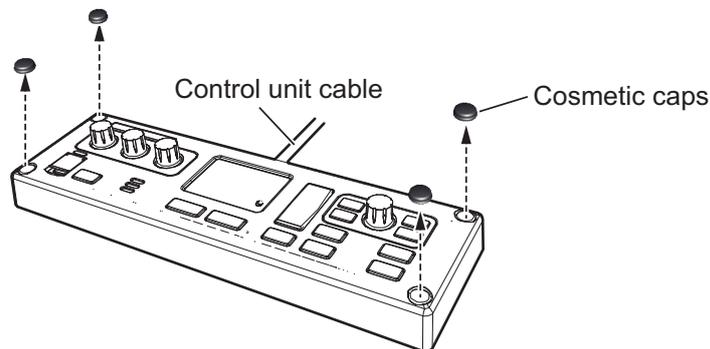
1.2.2 How to mount the control unit

There are two methods you can use to mount the control unit.



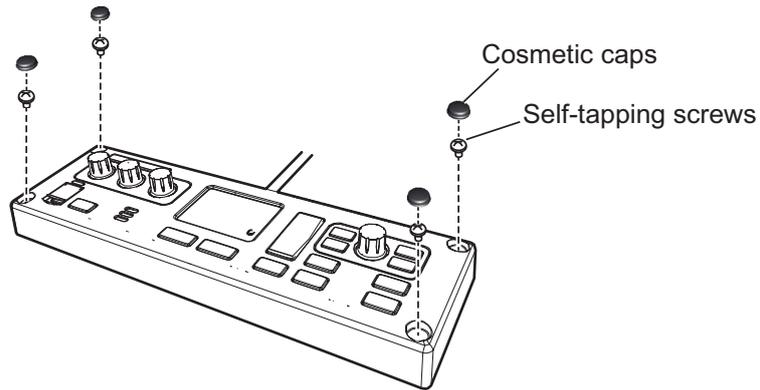
Method 1: Factory default

1. Referring to the outline drawings at the back of this manual, drill four pilot holes for the self-tapping screws.
2. Remove the four cosmetic caps from the control unit.



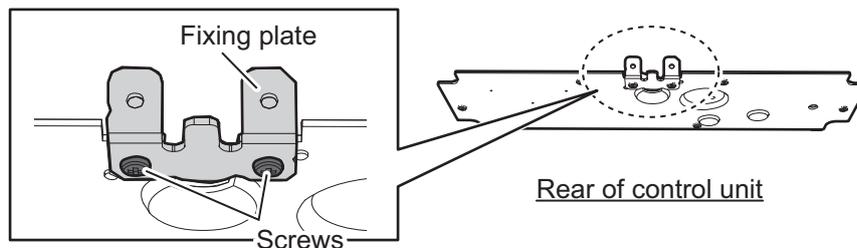
3. Secure the control unit to the mounting location with the supplied self-tapping screws ($\phi 4 \times 20$, four pieces).

4. Fit the cosmetics caps (removed at step 2) to the control unit.

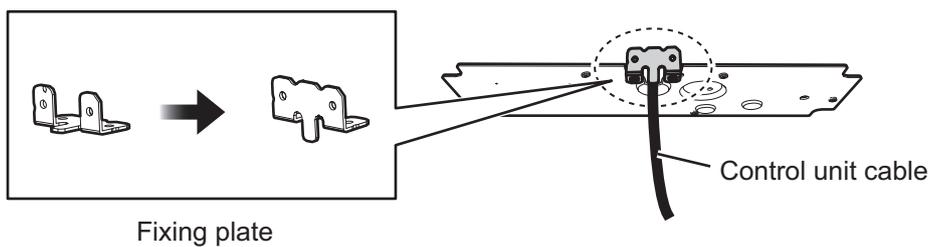


Method 2: Modified cable entry

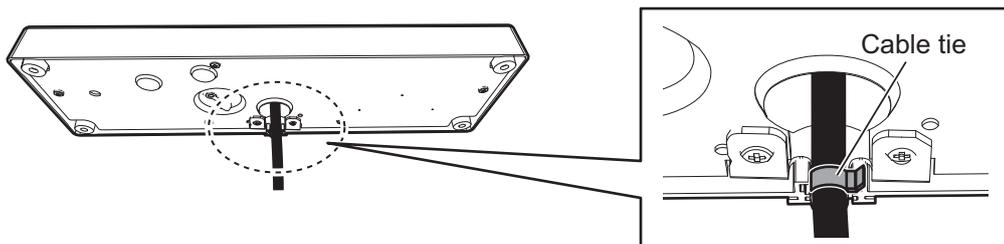
1. Follow the steps outlined in steps 1 and 2 of "Method 1: Factory default" on page 2.
2. Unfasten the two screws from the fixing plate at the rear of the control unit.



3. Adjust the cable to face the rear of the control unit.
4. Orient the fixing plate as shown in the figure below, then fix the plate in place with the two screws removed at step 2. Check that the cable is aligned with the fixing plate and facing the rear of the control unit.



5. Secure the cable to the fixing plate with a cable tie (local supply).



1.3 Transducer

The performance of the fish finder depends upon the transducer position. A place least affected by air bubbles should be selected since turbulence blocks the sounding path. Further, select a place least influenced by engine noise. It is known that air bubbles are fewest at the place where the bow first falls and the next wave raises, at usual cruising speed. In small, slow-speed boats, the position between 1/2 and 2/3 of the ship's length from the bow is usually a good place.

The face of the transducer must be facing the sea bottom in normal cruising trim of the boat.

The cable length of the transducers is as follows:

Type	Cable length (m)
50B-6, 50/200-1T, 200B-5S, 200B-8	10
CM265LH, CM265LM, CM275LH-W	12
28F-8, 28BL-6HR/18/12HR, 38BL-9HR/15HR, 50B-6B/9B, 50BL-12HR/24HR, 68F-8H/30H, 82B-35R, 88B-8/10, 88F-126H, 100B-10R, 150B-12H, 200B-8B/12H, CM599LH/LM, PM111LH/LM	15

Note: Do not cut the transducer cable when installing an Airmar transducer.

1.4 External Monitor

You can connect a MU-190/V/HD, MU-150HD, MU-231 or a commercial monitor as an external monitor. The external monitor must have the following specifications.

- Video signal: HDMI or DVI-D, Single link, DVI-D requires optional cable assembly.
- Resolution: SXGA (1280 x 1024), SXGA (1024 x 1280), XGA (1024 x 768) or Full HD (1920 x 1080)

Note: Brilliance control is available for MU-190/150/231 series with the optional USB cable (RNS-08-132) and USB cable (CP013638-07-A (550MM)). Brilliance control is not available for other monitors.

1.5 Interface Unit

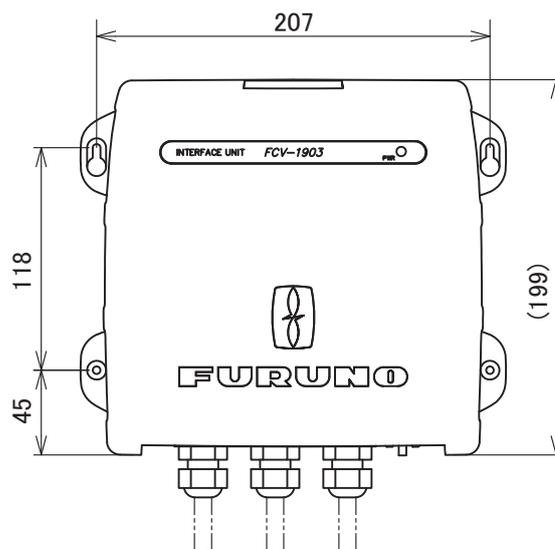
The interface unit FCV-1903 enables connection of a telesounder. Keep in mind the following points when selecting a mounting place.

- Locate the unit away from areas subject to water splash.
- The length of the cable to the processor unit is 5 m.
- Referring to the outline drawing at the back of this manual, leave sufficient space for maintenance and service around the unit.
- Keep in mind the compass safe distances shown on page i.

1.5.1 Bulkhead mounting

1. Drill four pilot holes on the bulkhead for self-tapping screws.
2. Screw in self-tapping screws ($\phi 3 \times 20$, supplied) for the upper fixing holes, leave 5 mm protruding.
3. Set the interface unit to the screws. Screw in two self-tapping screws for the lower fixing holes.
4. Fasten the four screws to secure the unit.

Note: Face the cables downward for bulkhead mount.



1.5.2 Tabletop mounting

For tabletop or deck mount, fix the unit with four self-tapping screws.

1. Drill four pilot holes in the tabletop or deck for self-tapping screws.
2. Set the interface unit to the installation location.
3. Secure the unit with four self-tapping screws ($\phi 3 \times 20$, supplied).

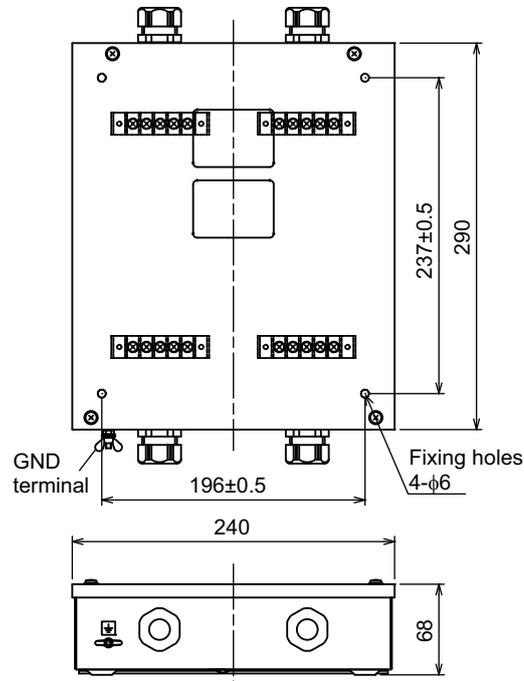
1.6 Ethernet HUB

You can connect to a network sounder with the Ethernet HUB (HUB-101, option). For further details, see the installation guide for the HUB-101 (C42-00707).

1.7 Booster Box

The booster box (BT-5, option) enables connection of 5 kW transducers in 28.8 and 50 kHz. For dual frequencies, use the model BT-5-2.

1. Unfasten four binding screws to remove the cover.
2. Select a mounting location, referring to the figure below.



3. Fasten the self-tapping screws (φ5x25, supplied) at the fixing holes.
4. Fasten the cover screws to secure the cover.

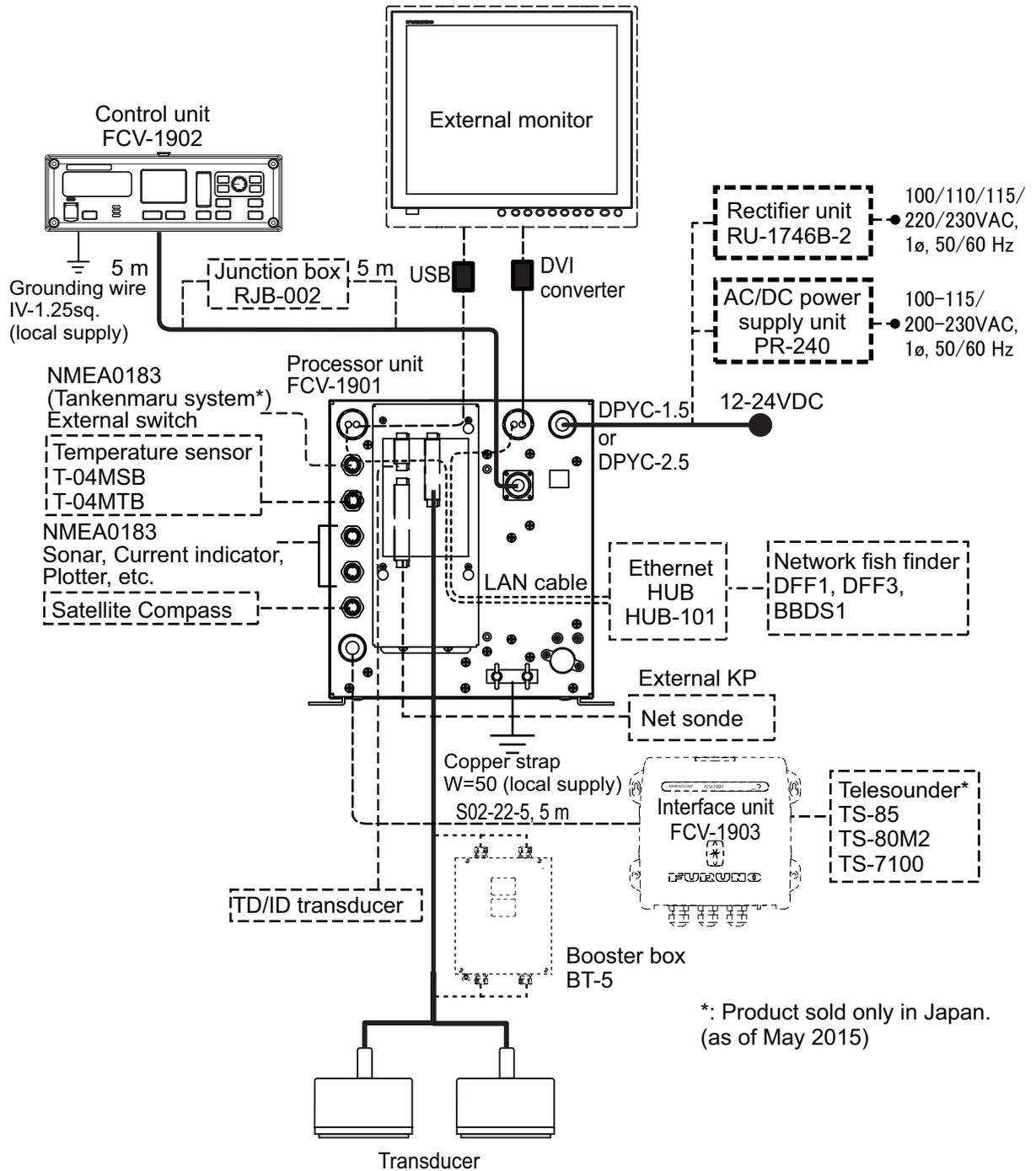
1.8 Temperature Sensor

The temperature sensor (T-04MSB/04MTB, option) or transducer with temperature sensor provides the water temperature data. To install these water sensors, see appendix 2.

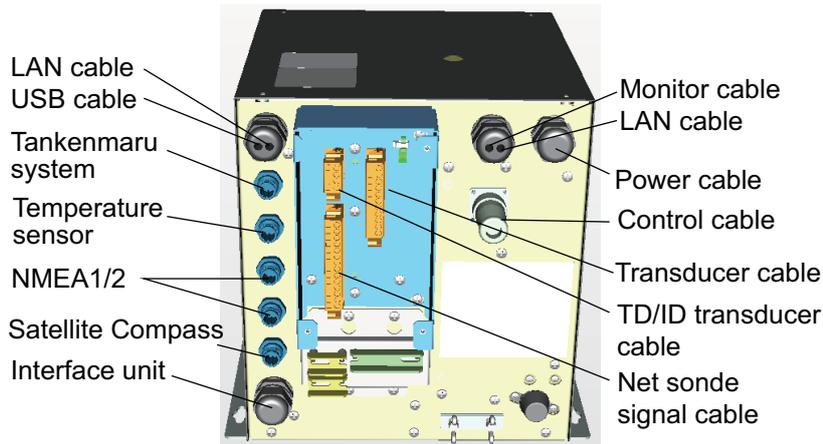
2. WIRING

2.1 Interconnection

Refer to the interconnection diagram at the back of this manual for detailed information.



2.2 Processor Unit

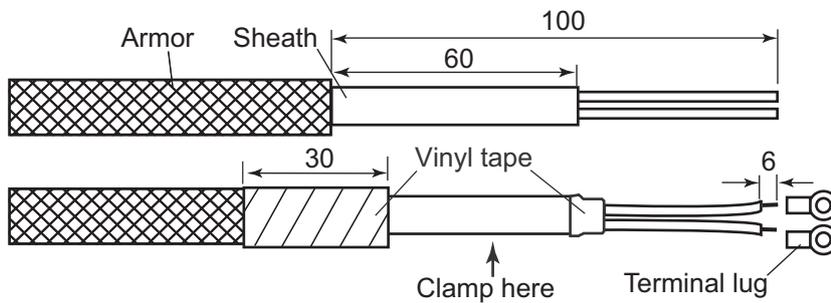


Location of the connectors in the processor unit

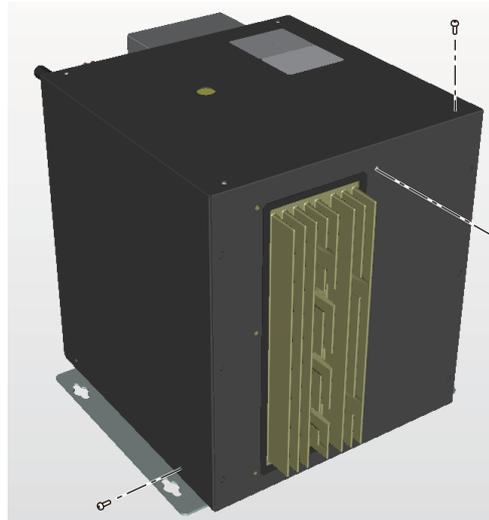
2.2.1 Power cable and grounding

Depending on the cable length, use either a DPYC-1.5 or a DPYC-2.5 cable (Japanese Industrial Standards cable or equivalent cable, local supply). This unit should be grounded to prevent mutual interference. Connect a copper strap (local supply) between this unit and the ship's ground. The length of the ground strap should be as short as possible.

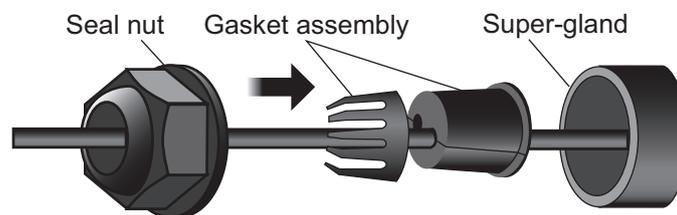
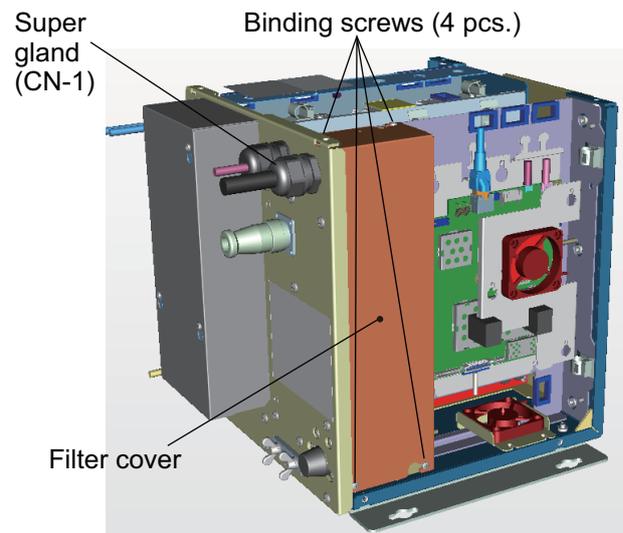
1. Fabricate the cable (see the appendix for equivalent cables if not available locally) as shown below.



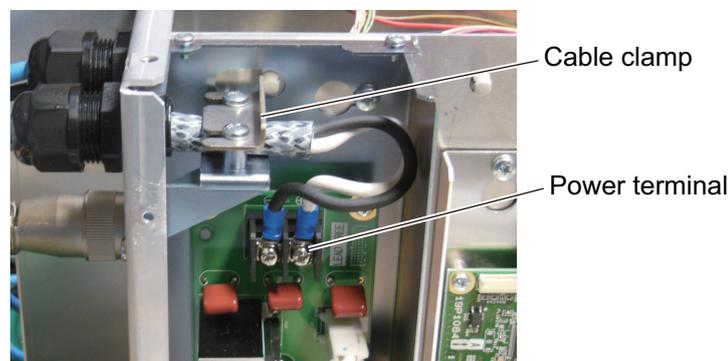
2. Unfasten 14 binding screws to remove the cover from the processor unit.



3. Unfasten four binding screws to detach the filter cover from the power terminal.
4. Unfasten and remove the seal nut from the power cable's super-gland, then remove the gasket and fixture from the super-gland.
5. Pass the cable end through the seal nut, fixture and gasket in order, then pass the cable through the super-gland and into the chassis.
6. Set the gasket assembly onto the cable. Push the assembly into the seal nut, then tighten the seal nut.



7. Remove the screws from the power terminal.
8. Check the cable and the terminal polarities, then connect the cable to the terminal.



9. Clamp the cable with the cable clamp.
10. Reattach the filter cover to the power terminal.
11. Fasten the unit cover. When installing an external monitor, continue to the paragraph 2.2.2 without closing the cover.

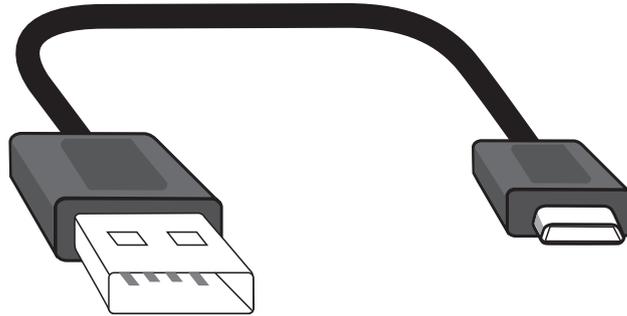
2.2.2 External monitor

The external monitor should have 1920 x 1080 (Full HD), 1028 x 1024 (SXGA), 1024 x 1028 (SXGA portrait type) or 1024 x 768 (XGA) resolution. As the output video signal is HDMI, a HDMI compatible monitor is required.

Note: The processor unit FCV-1901 outputs a vertical synchronous video signal of 70 Hz to XGA monitors.

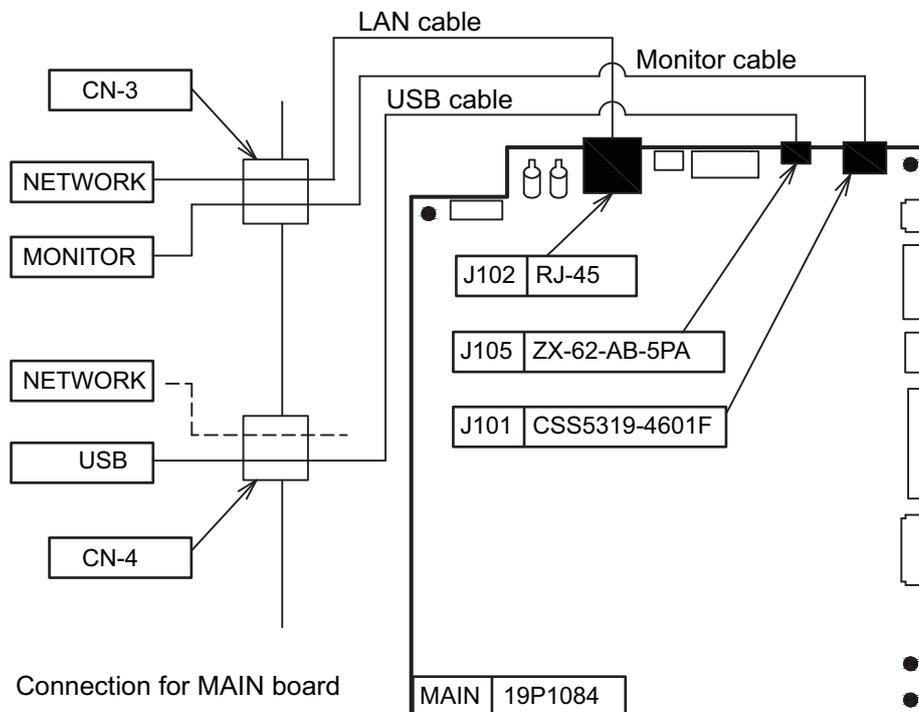
2. WIRING

An optional DVI-D cable is available for monitors with a DVD-D port. For MU-190/231/150HD monitors, brilliance control is available by connecting the optional USB cable (RNS-08-132, pictured below) and USB cable (CP013638-07-A (550MM)).

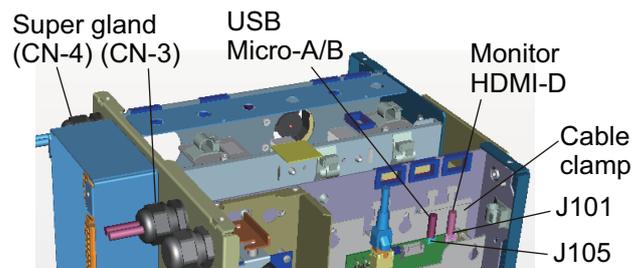


The following procedure shows how to connect the processor unit to the MU-190 monitor unit.

1. Unfasten 14 binding screws to remove the cover.
2. Connect the A-TO-D ADAPTER cable to HDMI port (J101) on the MAIN board.

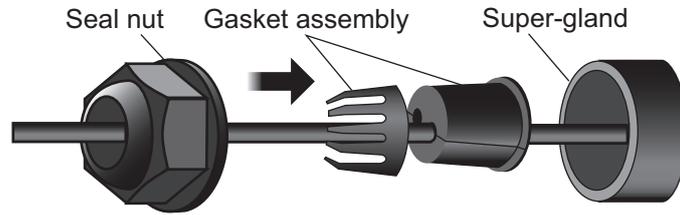


3. Connect a USB cable (local supply) to the USB port (J105) on the MAIN board. Secure the cable with a cable-tie at the cable clamp.

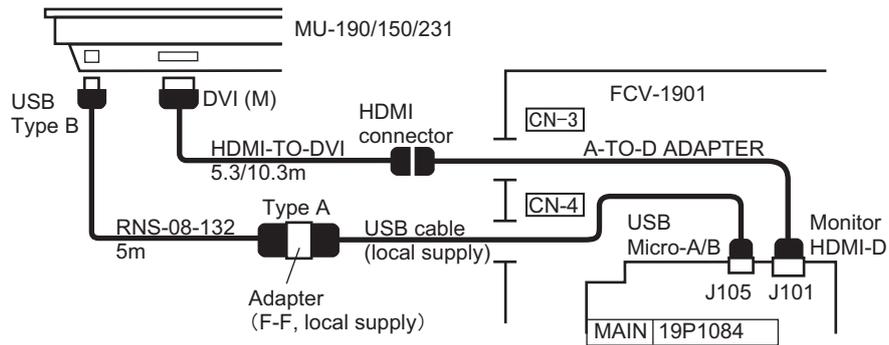


4. Unfasten the CN-3 seal nut at the top-right on the rear panel of the processor unit, then pull out the gasket assembly.

5. Pass the A-TO-D ADAPTER cable and USB cable through the super-gland from inside.
6. Pass the gasket assembly onto the cable.
7. Insert the assembly into the seal nut, then tighten the seal nut.



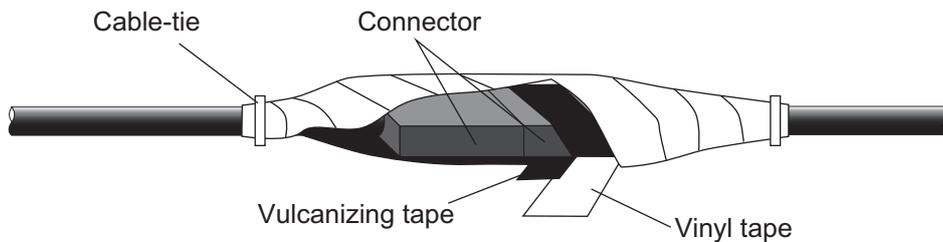
8. Connect the monitor cables and the USB cables to the monitor, referring to the following figure.



9. Close the cover.

Waterproofing the connectors

Wrap the connectors with vulcanizing tape and then wrap with vinyl tape. Bind the tape ends with a cable-tie.

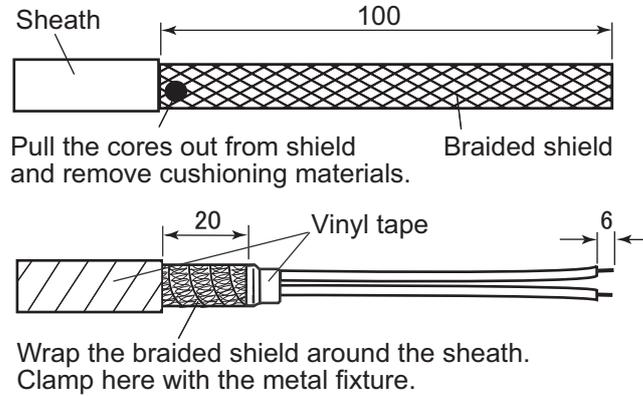


2. WIRING

2.2.3 Transducer

Lay the transducer cable well away from power cables to prevent interference. Connect the cable to the transducer port (for high frequency and/or low frequency) on the processor unit. Fabricate the cables as shown below.

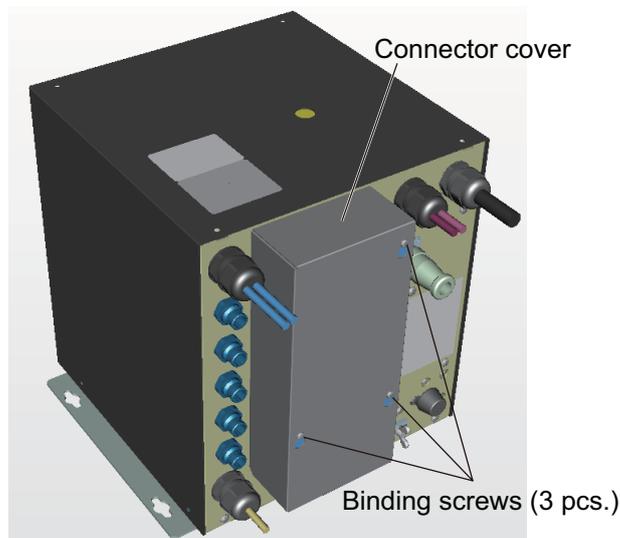
Note: Only use the specified optional cables when extending the transducer cable.



Note: If the transducer cable label interferes with installation, remove the label. (Do not remove the warranty label from Airmar transducers.) Record the cable assembly series number then store it for reference.

Transducer cable connection

1. Unfasten three binding screws to remove the connector cover.

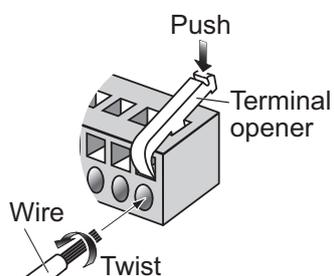


2. Disconnect the WAGO connector (CN-2) on the right side of the connector panel.

3. Connect the transducer cable to the WAGO connector referring to the interconnection diagram at the back of this manual. For dual frequency connections, connect both transducer cables to the WAGO connector. The terminal opener is attached to the connector board on the cover.

NOTICE

When connecting the transducer cable, do not do reverse the transducer cable polarity.



Procedure

1. Twist core.
2. Insert terminal opener and push.
3. Insert wire into hole.
4. Release terminal opener.
5. Pull wire to confirm it is correctly inserted.

Terminal opener



4. Reconnect the WAGO connector.
5. Unfasten the cable clamp screws, then pass the cables through the cable clamp. Fasten the screws to fix the cables with the cable clamp.
6. Fasten the connector cover to the chassis.
For connecting the TD-ID transducer, use the WAGO connectors on CN-7. Connect each core to the terminal, referring to the instructions supplied with the TD-ID transducer. For connection details, refer to the interconnection diagram at the end of this manual.

2.2.4 Control unit

Connect the control unit's cable connector to the CN-5 connector on the processor unit. For cable extension, the junction box RJB-002 (option) is available for a 5 m length addition. A ground terminal is attached under the unit. Connect an IV-1.25sq grounding wire between the ground terminal on the control unit and the ship's ground.

2.2.5 External equipment

Use the optional cable with connector to connect the external equipment to the processor unit.

For NMEA signal communication, the optional cable assembly MJ-A6SPF0003 is used. Connect the cables to the processor unit via the CN-10 or CN-11 port. For connection to the external equipment, see the equipment's installation manual.

Temperature sensor

Connect the sensor's cable with connector attached to connector CN-9.

Satellite compass

Connect Satellite Compass™ SC-30/50/70/110/130 to the connector CN-12. The cable assembly MJ-A6SPF0003 (available as an optional extra) is required for connection. Set as follows.

1. Press the **MENU/ESC** key, then open the [Setting] or [External fish finder] tab.
2. Select [System], then push the **ENTER** knob.
3. Rotate the **ENTER** knob to select the [Stabilization] window, then press the knob.
4. Select [Stabilization Sensor], then push the **ENTER** knob.
5. When a satellite compass SC-70/130 or GS-100 is connected, select the [SC-30] on the [Stabilization Sensor].
6. Press the **MENU/ESC** key to close the window.

See the interconnection diagram at the back of this manual for details.

External fish finder

Connect a network fish finder DFF1/3 or BBDS1. An Ethernet HUB is required for connection. Set the mode switch on the fish finder as follows;

- Power on/off control: Sounder not powered from network.
- Automatic IP setting: Automatic IP disabled.

To set the mode switch, refer to the respective equipment manual.

Note: When connecting an external fish finder, do not change the default IP address of the external fish finder (172.31.91.1).

External equipment or switch

Connect the external equipment to connector CN-8. An optional cable assembly MJ-A7SPF0007 is required. To connect an external switch, see the interconnection diagram at the back of this manual.

When the transmitter unit FN-6-2 is used, connect the plug and cable attached on the unit to connector CN-8 directly.

External BK control

When the transducer unit is connected to external equipment for BK control, use the connector CN-6 (Pin #7-11). A MPYCSLA-4 cable is required (Japanese Industrial Standards cable or equivalent cable, local supply). The external sounder should be able to transmit a BK control signal.

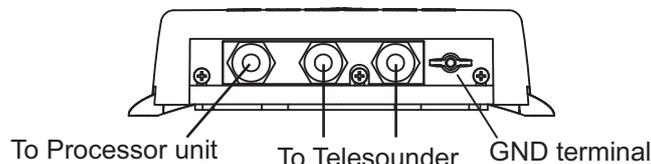
2.3 Interface Unit

The interface unit FCV-1903 (option) is used to connect the FCV-1900 system to the telesounder TS-7100, TS-80M2 or TS-85. To connect the unit to the processor unit, use the S02-22-5 cable assembly attached to the interface unit.

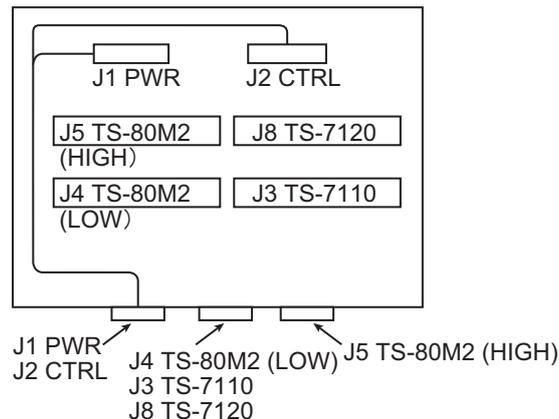
Note 1: The telesounder products are sold only in Japan.

Note 2: To prevent warping of the picture, do not use FCV-1200L/1500L on the mother ship for receiving data sent from a sister ship, via telesounder, from a FCV-1900.

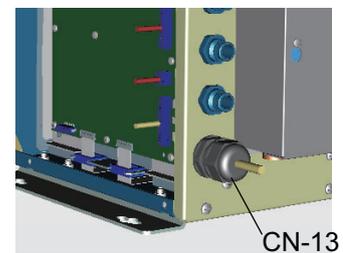
1. Remove the cover from the interface unit.
2. Remove the cover from the processor unit.
3. Unfasten the binding screws from the case inside the interface unit.
4. Unfasten the left-hand super-gland seal nut, then remove the gasket assembly from the seal nut.



5. Pass the S02-22-5 cable assembly end through the seal nut, fixture and gasket in order, then pass the cable through the super-gland and into the processor unit.
6. Connect the harness plugs to the sockets J1 and J2.

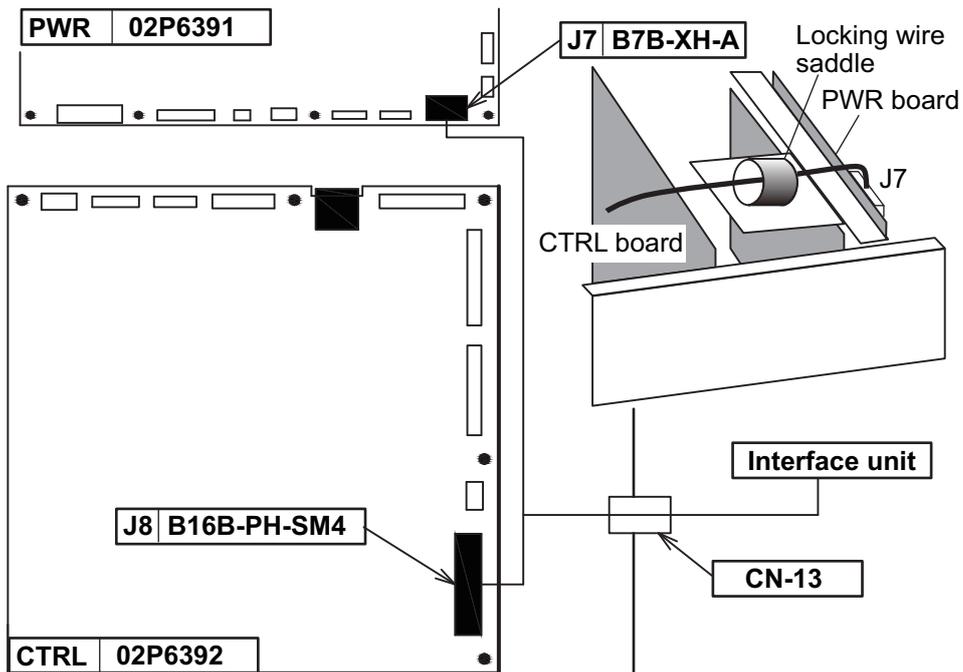


7. Adjust the cable length inside the interface unit, place the gasket assembly in the seal nut and then fasten them both securely.
8. Unfasten the seal nut at the left bottom of the processor unit, then pull out the gasket assembly from the nut.
9. Pass the loose end of the cable assembly through the seal nut, fixture and gasket then pass it into the processor unit through the super-gland.



2. WIRING

10. Connect the harness plug 7P to the socket J7 on the PWR board and the harness plug 16P to the socket J8. Fix the wire from connector J7 with a locking wire saddle in the unit.



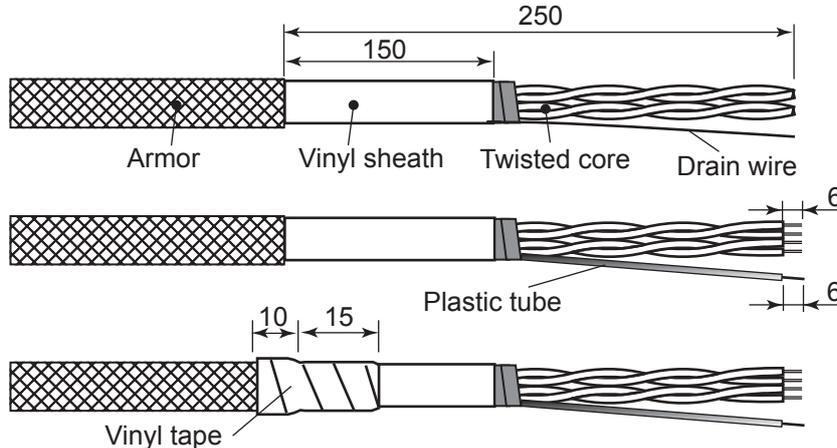
Connection for PWR/CTRL board

11. Adjust the cable length inside the interface unit, set the seal nut to the cable, then tighten the seal nut.
12. Close the inner case and outside cover of the interface unit.
13. Close the cover of the processor unit.
14. The connections for telesounder are different by models. Connect them to the interface unit referring to the interconnection diagram at the back of this manual.

2.4 Net Sonde

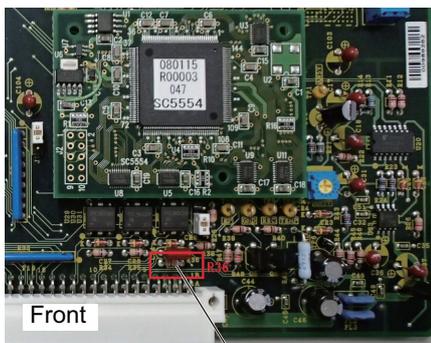
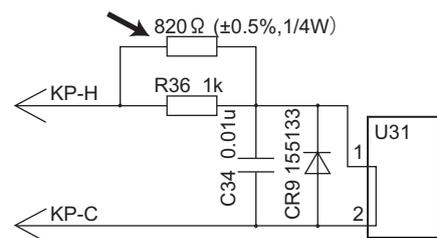
Connect the net sonde FNZ-18 or FNZ-28 to the WAGO connector CN-6 in the connector box inside the processor unit. Connect the net sonde to the display unit with a TTYCSLA-4 cable (Japanese Industrial Standards cable or equivalent cable). The following procedure shows how to connect the cables from the net sonde to the processor unit.

1. Fabricate the TTYCSLA-4 cable ends referring to the figure below.

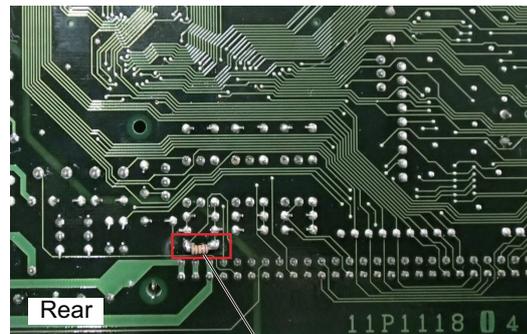


2. Unfasten three binding screws to remove the cover of the processor unit.
3. Detach the WAGO connector for the net sonde (CN-6),
4. Connect the cable cores to the WAGO connector referring to the interconnection diagram.
5. Reattach the WAGO connector.
6. Unfasten the screws on the cable clamp, then fix the cables with the cable clamp.
7. Close the cover of the processor unit.
8. Fit a connector to the loose end of the net sonde display's cable, then connect the cable to the net sonde display unit.

Note: When connecting an analog net sonde signal to the FCV-1900, the net sonde display unit must be modified. Attach an 820 ohm resistor ($\pm 5\%$, 1/4W or more) in parallel with R36 (1k ohm) on the MAIN board 11P1118. Fix the resistor on rear side of the board as follows.



R36

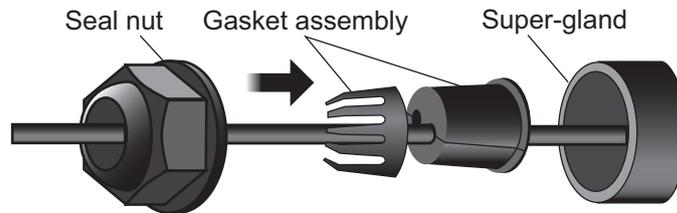


Solder the resistor with parallel on R36.

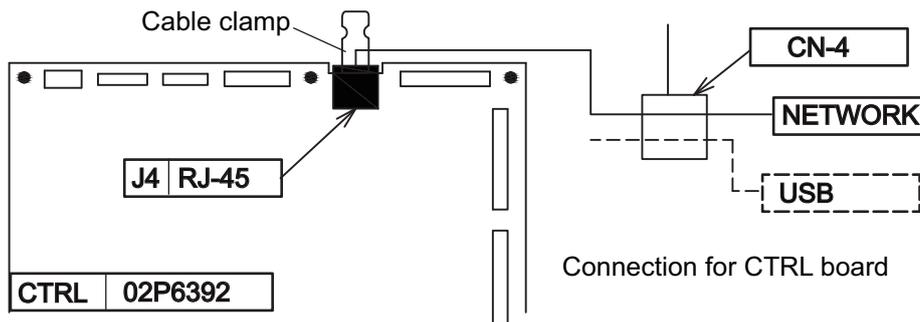
2.5 Ethernet HUB

Use the Ethernet HUB (HUB-101, option) to connect the DFF1, DFF3 or BBDS1 network sounders. No other network sounder can be connected.

1. Open the cover of the processor unit.
2. Remove super-gland CN3 and CN4.
3. Set the gasket assembly onto the LAN cable.
4. Pack the gasket assembly into the seal nut.



5. Connect the LAN cable plug to J102 connector on the MAIN board and then fasten the cable to the cable clamp with a cable tie. (Refer to the figure at page 9)
6. Fasten the seal nut to secure the cable.
7. Connect another LAN cable to J4 connector on the CTRL board and then fasten the cable to the cable clamp with a cable tie.



8. Fasten the seal nut to secure the cable after the cable length is adjusted.

2.6 Booster Box

The booster box BT-5 (option) is required to connect the 5 kW transducer. Remove the plugs from the cable assembly and connect the cable core wires to the WAGO connectors in the processor unit. When dual frequency transducers are connected, use the booster box BT-5-2. See the interconnection diagram at back of this manual for details.

2.7 Input/Output Sentences

This equipment can input/output the following NMEA data sentences.

Data	I/O	Sentence
Time, position	Input	GNS>GGA>GLL
Course over the ground (COG) and speed over the ground (SOG)	Input	VTG
Water speed and heading	Input	VHW
Time and date	Input	ZDA
Water depth	Output	DBS, DBT, DPT
Water temperature	Input/Output	MTW
Target position	Output	TLL
Proprietary sentence	Output	SDbcd, SDflg, SDmrk, pidat

3. INITIAL SETTINGS

This chapter covers the initial setup of the equipment.

Note 1: After all wiring is complete (including cable extensions with junction box RJ-002), perform the initial setup. Do not connect the USB flash memory and the USB cable for brilliance control.

Note 2: After initial setup is complete the system restarts and the new settings are applied. The screen may appear blank for a few minutes while the system initializes. The message shown below appears during the startup procedure. Do not turn the system off during the startup procedure.

WARNING: SYSTEM RECONSTRUCTING

- Keep USB memory disconnected.
- Do not disconnect the control unit.
- The screen goes blank after this page disappears. Do not turn the power off. The screen turns on again after reconstructing is completed.

3.1 Installation Menu

1. Press the power key to turn on the equipment.
The start-up screen is displayed. After a short period of time, the installation menu is displayed.

Installation		
Language	English	English
Depth	m	Français
Speed	kn	Español
Temp	°C	Dansk
Fish Size	cm	Norsk
Display Resolution SXGA (1280x1024)		中文
[Save/Exit]		日本語
		한국어
		Русский язык

2. Rotate the **ENTER** knob to select the desired language, then push the knob to set.
3. Rotate the knob to select [Depth], then push the knob to show the water depth units.
4. Select the unit desired then push the knob to set. In a similar manner set the units for ship's speed, water temperature and fish size.
5. Rotate the **ENTER** knob to select [Display Resolution], then push the knob to show the resolution options. Rotate the knob to select the applicable resolution then push the knob to set.
To set the resolution after completion of the initial settings, see section 3.2.
6. Rotate the **ENTER** knob to select [Save/Exit], then push the knob.
The following message appears.
7. Push the **ENTER** knob to apply the new settings. The equipment is restarted.

System will power down automatically. Set the transducer if the setting is changed.

Yes

3.2 Monitor Setting

Depending on your monitor, the resolution setting may need to be changed. The resolutions available are XGA (1024×768), SXGA (1280×1024), SXGA (1024×1280, portrait type) and Full HD (1920×1080). SXGA monitors (1280×1024) are set to the correct resolution and do not require this initial setting.

Note 1: When setting the monitor resolution, be sure the control unit is connected. Also, confirm that no USB memory is connected.

Note 2: For the Full HD resolution (1920×1080) setting, the monitor must 1080p (60 fps) compatible.

Service menu

1. Press the **MENU/ESC** key to open the [Setting] menu.
2. Press the **MENU/ESC** key (approximately ten seconds) to show the [Service] menu item in the menu.

Setting		
Sounder	Interference	Off
Display	Color Erase	0%
Measurement	White Edge	Off
Alarm	Clutter	▶
Data	TVG	▶
System	STC	▶
Service	Pic. Advance	x4
	Smoothing	Off
	Bottom Zone	▶

3. Rotate the **ENTER** knob to select [Service], then push the knob.
4. Rotate the **ENTER** knob to select [Display Resolution], then push the knob.

Setting		
Sounder	▶ Bottom Search	Off
Display	▶ Deference Gain	▶
Measurement	▶ Deference Bottom Level	▶
Alarm	▶ Log	▶
Data	▶ Display Resolution SXGA (1280x1024)	XGA (1024 x 768)
System	▶ TX Triggering	SXGA (1280 x 1024)
Service	▶ In Trigger	Off SXGA (1024 x 1280)
	Trigger Input	↑ FHD (1920 x 1080)
	Out Trigger	HF
	Trigger Output	Positive
	External Fish Finder Trigger	Off
	Restore Default Setting	▶
	Demonstrate	Off
	XDCR Setting	
	TD-ID Information	
	White Marker	▶
	ACCU-FISH Calib	▶
	Fish Detection Mark	Off
	TrueEchoCHIRP	▶
	Bottom Noise Rejector	On
	Fish Graph Reliability Threshold	100

3. INITIAL SETTINGS

5. Rotate the **ENTER** knob to select the resolution of your monitor, then push the knob.
The confirmation message shown to the right appears.
6. Push the **ENTER** knob to restart the system.
The message shown below appears, then the system reconstruction starts.

Display resolution was changed.
The controls will be inoperable and the screen will go dark for five to ten minutes.
Remove the USB device, then restart the system.

Yes

WARNING: SYSTEM RECONSTRUCTING

- Keep USB memory disconnected.
- Do not disconnect the control unit.
- The screen goes blank after this page disappears. Do not turn the power off.
The screen turns on again after reconstructing is completed.

The update process can take several minutes, during which the screen remains blank. When the procedure is completed, the startup display appears, then the normal display appears.

Note: Long-press the **RANGE** key for 10 seconds to set the resolution to XGA (1024×768).

3.3 Transducer Setting



The menu tabs names listed below are for setting up external transducers. This allows you to adjust the transducer settings from the FCV-1900.

- DFF1/DFF3/BBDS1 transducer
- Telesounder (products sold only in Japan)

Select the transducer

1. Referring to section 3.2, open the [Service] menu.
2. After you have selected [Service], the following message appears.

System will power down automatically. Turn the power on again, and change the transducer setting.

Yes No

3. Select [Yes] and push the **ENTER** knob to turn the power off.

- Press the power key to turn the power on.
The [XDCR Setting] menu appears.

Own XDCR Setting	DFF1,DFF3,BBDS1 XDCR Setting	Telesounder	Side Looking
HF XDCR Select		XDCR Type	
HF Connection		Connected	
Freq		200kHz	
Transducer		CM265LH	
Tx Power		1kW	
Freq		--kHz	
Band Width		--kHz	
Manual Voltage		--V	
Voltage(Standard)		90V	
Voltage(TruEcho CHIRP)		102V	
LF XDCR Select		XDCR Type	
LF Connection		Connected	
Freq		50kHz	
Transducer		CM265LH	
Tx Power		1kW	
Freq		--kHz	
Band Width		--kHz	
Manual Voltage		--V	
Voltage(Standard)		81V	
Voltage(TruEcho CHIRP)		81V	
Tankenmaru Connection		Off	
Net Sonde		Off	
Save Setting		▶	

- Select [XDCR type] at [HF XDCR select].
Confirm that the high freq. transducer is connected to the HF port.
- Select [Connected] at [HF Connection].
Note: When an Airmar's TD-ID transducer is connected, [HF Connection] and [LF Connection] are set to [TD-ID] automatically.
- Select a frequency from the [Freq.] menu.
- Select a transducer type from the [Transducer] menu.
[Tx power] and [Voltage] are set automatically.
- Set the LF transducer in a similar manner.
- If a network sounder is connected, rotate the **ENTER** knob to select [DFF1/DFF3/BBDS1 XDCR Setting].
- If a net sonde is connected, set [Net sonde] to [On].
- After the settings are complete, rotate the **ENTER** knob to select [Save Setting], then push the knob. Select [Yes] and push the knob to apply the settings.

3. INITIAL SETTINGS

Transducer lists

The table below lists the narrow band transducers which are compatible with the FCV-1900. Select the appropriate setting. For external sounders, select the transducers connected to the external sounder.

Output power (kW)	Frequency (kHz)	Model	Remarks
1	28	28F-8	
	50	50B-6	
		50B-6B	
		50B-9B	
	50/200	50/200-1T	ACCU-FISH™ compatible
	68	68F-8H	
	200	200B-5S	
2	28	28BL-6HR	
	38	38BL-9HR	
	50	50BL-12HR	
	82	82B-35R	
	88	88B-10	
	200	200B-8/8B	
3	28	28BL-12HR	
	38	38BL-15HR	
	50	50BL-24HR	
	68	68F-30H	
	88	88F-126H	
	107	100B-10R	
	150	150B-12H	
	200	200B-12H	

Dual frequency transducers

Output power (kW)	Frequency (kHz)	Model	Remarks
1	42-65/130-210	CM265LH	ACCU-FISH™ compatible
	42-65/85-135	CM265LM	
	42-65/150-250	CM275LH-W	Wide beam type
2	38-75/130-210	PM111LH	ACCU-FISH™ compatible
	38-75/80-130	PM111LM	
3	28-60/130/210	CM599LH	ACCU-FISH™ compatible
	28-60/80-130	CM599LM	

Manual setting

For transducer not listed in the table above, set [HF XDCR Select] to [Manual], then set the TX power, frequency and bandwidth.

1. Display the [XDCR setting menu], referring to the previous procedure.
2. Set [HF XDCR Select] to [Manual].
Confirm that the high freq. transducer is connected to the HF port.
3. Set [HF connection] to [Connected].
4. Set [Voltage] according to the transducer voltage.
Note: The selectable maximum voltage is changed depending on the frequency setting.
5. Set a frequency from the [Freq.] menu.
The band width is automatically set, however it can be entered manually with [Band width].
6. Set the LF transducer in a similar manner.

Single frequency setting

When only one transducer is used, connect the transducer to either the high or low transducer port, then set the connected port [connection] to [Connected].

3.4 NMEA Port Setting

The [NMEA Port Set&Monitor] menu sets up the NMEA port and shows the data input/output from the NMEA ports.

Rotate the **ENTER** knob to select the port that you want to set up and push the knob to open the [Setting] window.

Port selection

NMEA1	Set up the CN-10 (NMEA1) port
NMEA2	Set up the CN-11 (NMEA2) port
SC	Set up the CN-12 (NMEA3) port
CIF	Set up the CN-6 (SONDE/TRIG) port

↓

[Setting] window

NMEA Port 1 Input		NMEA Port 1 Output	
Setting	01,8900.0413,N,17859.99	\$SDDBT,102.6,f,31.3,M,17.1,F*05	
NMEA0183 Ver1.5	0.0,0.0,0.0,0.0,S*4F	\$SDDP,31.3,0.0,200.0*66	
Output Data	*32	\$SDDBT,T102.6,f,31.3,M,17.1,F*05	
TLL Output	TLL 59.94,M,8.10,N,,*1C	\$SDDP,31.3,0.0,200.0*66	
NMEA Port Setting	,359.95,M,6.648,N,,A*7C		
Baud Rate	600 20,24,02,2015,00,00*65		
Start Bit	1bit		
Data Length	8bit		
Stop Bit	1bit		
Parity	none		
Clear Window			
Exit			

Communication port monitor display (see section 3.5)

[MENU/ESC] : Setting
Select Exit menu to exit

[NMEA0183]: Select NMEA0183 version of navigation equipment connected to the NMEA port (SC and CIF are not available). The choices are [Ver1.5], [Ver2.0], [Ver3.0] and [Special]. [Special] is for use with a navigator whose baud rate is 600bps.

[Output Data]: Select the data to output from the NMEA port to navigation equipment (SC and CIF are not available).

[TLL Output]: Select the TLL data type to output from the NMEA port to a chart plotter (SC and CIF are not available).

[NMEA Port Setting]: Select the format for the communication port's data. The settings are as follows.

- Baud Rate: 600/4800/38400 bps for NMEA and 600/1200/2400/4800 bps for CIF
- Start Bit: 1 bit (fixed)
- Data Length: 8 bit (fixed)
- Stop Bit: 1 bit (fixed)
- Parity: none (fixed)

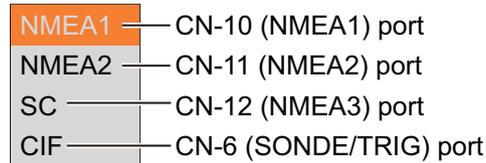
[Clear Window]: Refresh the information shown on the communication port monitor display.

[Exit]: Close the [NMEA Port Set&Monitor] menu to return to the main menu.

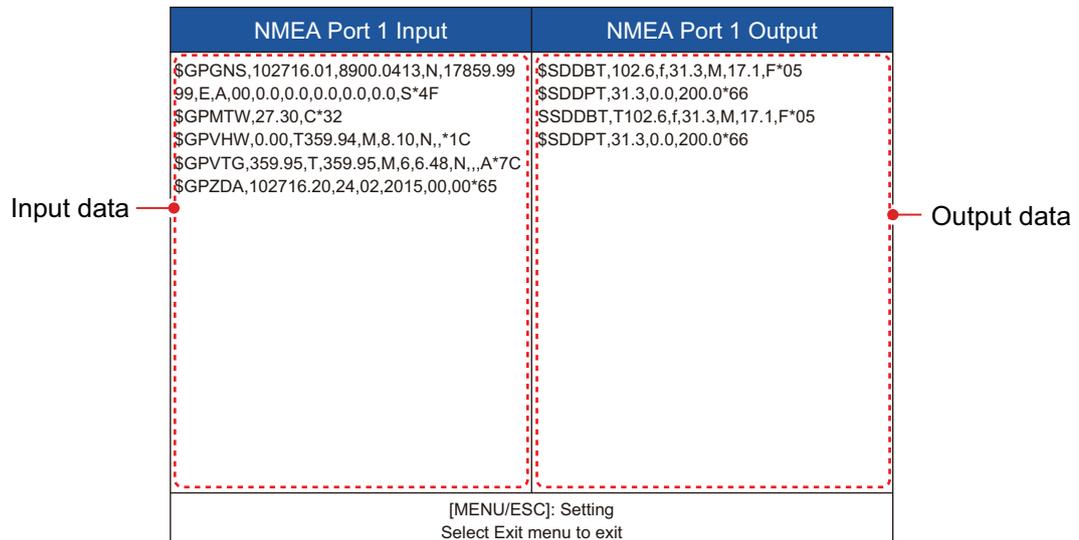
3.5 Communication Port Monitor

The communication port monitor provides information about data input/output.

1. Press the **MENU/ESC** key to open the menu.
2. Confirm that the [Setting] tab is selected, then rotate the **ENTER** knob to select [System]. Push the **ENTER** knob.
3. Rotate the **ENTER** knob to select [NMEA Port Set&Monitor], then push the knob. The signal port menu appears.



4. Rotate the **ENTER** knob to select the port whose data you want to display, then push the knob.
5. Press the **MENU/ESC** key to close the menu window and show the communication port monitor display.



6. To turn off the port monitor display, press the **MENU/ESC** key and select [Exit], then push the **ENTER** knob.
7. Rotate the **ENTER** knob to select [Yes], then push the knob. The port monitor is closed.
8. Press the **MENU/ESC** key several times to close the menu.

3.6 Calibration Setting

The [Calib] menu mainly lets you apply offsets to speed, water temperature, and bottom level.

For [Setting] tab

Sound Speed	1500.0 m/s
Temp	0.0°F
Bottom Level*	▶
Bottom Detect Mode	Level
Color Level Threshold	50
Zero Line Rejection	On
Zero Line Area	4.5ft
Zero Line Fill	On
Draft	▶
Gain ADJ	▶
Fish Size*	0
Time Offset	0:00

For [External fish finder] tab

Bottom Level*	▶
Zero Line Rejection	On
Zero Line Area	4.5ft
Draft	▶
Gain ADJ	▶
Fish Size*	0

*: Not available depending on the side looking setting. For details, see the operator's manual.

[Sound Speed]: Adjust the sound velocity of the TX/RX signal if the depth indication is incorrect, because of water temperature or salinity density.

[Temp]: If the water temperature indication is wrong, you can correct it here. For example, if the water temperature indication is 2°F higher than actual water temperature, enter -2°F.

[Bottom Level]: In the default bottom level setting (+0), the equipment judges consecutive strong echoes to be bottom echoes. If in that setting, the depth indication is unstable, adjust the bottom level. If vertical lines extend upward from the bottom echo in the bottom lock display, lower the bottom level to erase the vertical lines. If the level is too low, however, it may be difficult to distinguish bottom fish from the bottom echo.

[Bottom Detect Mode]: Select whether the bottom lock display detects the bottom based on the signal level or echo color.

- [Level]: The bottom lock display detects the bottom based on the signal level.
- [Color]: The bottom lock display detects the bottom based on the echo color. When [Color] is selected, adjust [Color Level Threshold].

[Color Level Threshold]: This menu item is available when [Bottom Detect Mode] is set to [Color]. The higher the setting, the strong color echo (reddish brown, red) is recognized as the bottom.

[Zero Line Rejection]: Turn the zero line (transmission line) on or off. When it is turned on, the transmission line disappears, which allows you to see fish echoes near the surface clearly. The length of the transmission line changes with transducer used and installation characteristics. If the width of the transmission line is 0.4 m (default value) or more, set the transmission line width with [Zero Line Area], as below.

[Zero Line Area]: This feature adjusts the transmission line so that the transmission line disappears when the menu item [Zero Line Rejection] is turned on. For a long tail increase the value. If the transmission line does not disappear, lower the TX power.

[Zero Line Fill]: Turn off to see fish echoes within 1 m from the surface.

[Draft]: The default depth display shows the distance from the transducer. If you would rather show the distance from the sea surface, set your ship's draft. The draft line for HF and LF can be set respectively.

[Gain ADJ]: If the gain is too high or too low, or the gain for the low and high frequencies appears unbalanced, you can compensate it here.

[Fish Size]: Compensate for incorrect indication of fish size. Set the calibration value according to the connected transducer.

- For a TD-ID transducer: See Note 1.
- For other transducer: See Note 2.

Note 1: Do the following procedure to open the [TD-ID Information] window, then confirm that [NG] does not appear on the window.

- 1) Referring to section 3.2, open the [Service] menu.
- 2) Rotate the **ENTER** knob to select [TD-ID Information], then push the knob.

TD-ID Information	
Airmar Part Number:	41-469-1
Housing style:	CM265LH
Serial number:	2877928
Nominal Frequency A:	50kHz
Lower 3dB Frequency A @20°C:	42kHz
Rp @Lower 3dB Frequency A @20°C:	16 Ohms
Upper 3dB Frequency A @20°C:	65kHz
Power A:	50 watts RMS
TVR @ Nominal Frequency A:	+163dB
RVR @ Nominal Frequency A:	-178dB
Nominal Frequency B:	160kHz
Lower 3dB Frequency B @20°C:	130kHz
Rp @Lower 3dB Frequency B @20°C:	11 Ohms
Upper 3dB Frequency B @20°C:	210kHz
Power B:	50 watts RMS
TVR @ Nominal Frequency B:	+169dB
RVR @ Nominal Frequency B:	-182dB

You can capture the [TD-ID Information] window by pressing the / key.

- 3) Press the **MENU/ESC** key to close the [TD-ID Information] window.

When [NG] does not appear on the [TD-ID Information] window, you can use the TD-ID information. Open the [Service] menu and select [ACCU-FISH Calib] and [Common Parameter], then set [swTDIDCalib] to [On]. You can use [Fish Size] for fine adjustment.

If [NG] appears on the [TD-ID Information] window, calculate the calibration value, referring to Note 2, then enter the value to [Fish Size].

Note 2: When the data sheet contains the calibration value for low frequency (50 kHz), enter the value shown on the data sheet. The calibration value is calculated from TVR and RVR values, using the following formula. For transducers with no data sheet for comparison, while out to sea, set the calibration ratio by comparing the fish size shown on the display with the actual fish size.

3. INITIAL SETTINGS

$$\text{Fish size Calibration value (\%)} = \left(\frac{A}{10^{\left(\frac{\text{TVR} + \text{RVR}}{20}\right)}} - 1 \right) \times 100$$

Transducer	CM265LH	CM599LH	PM111LH
A	0.197	0.562	0.343

[Time Offset]: Enter the time difference between UTC and local time to display the local date and time. This setting is valid when [Date Time] is set to [Local] on the [Data] menu.

3.7 Stabilization Setting

The [Stabilization] menu compensates for the effects of heaving, and requires a Satellite Compass™.

Note: This menu is not available when there is no data from the Satellite Compass™.

1. Press the **MENU/ESC** key to open the menu.
2. Rotate the **ENTER** knob to select [System], then push the knob.
3. Rotate the **ENTER** knob and select [Stabilization], then push the knob.

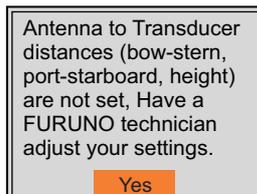
For [Setting] tab

Stabilization	On
Stabilization Sensor	SC-50
Stabilization Area	15m
[HF]	
TD fore-aft	0.0m
TD port-stbd	0.0m
ANT TD height	0.0m
[LF]	
TD fore-aft	0.0m
TD port-stbd	0.0m
ANT TD height	0.0m

For [External fish finder] tab

Stabilization Sensor	SC-30
Stabilization Area	15m
[HF]	
TD fore-aft	0.0m
TD port-stbd	0.0m
ANT TD height	0.0m
[LF]	
TD fore-aft	0.0m
TD port-stbd	0.0m
ANT TD height	0.0m

[Stabilization]: Turn heaving compensation on or off. Turn it on when seas are rough, to get stable pictures regardless of sea conditions. When heaving stabilization is turned on, the symbol () appears at the upper left corner on the screen. If the antenna position of the Satellite Compass™ has not been set, the message shown below appears. Push the knob to erase the message, then set the antenna position for the Satellite Compass™.



4. Set the antenna position for the Satellite Compass™.
 - TD fore-aft: Distance (m) from antenna to transducer on the fore-aft line.
 - TD port-stbd: Distance (m) from antenna to transducer on the port-stbd line.

- **ANT TD height:** Vertical distance (m) between the antenna and the transducer. To enter the number, move the cursor onto the column of the value and push the knob, then rotate the knob to change the number, and push the knob to set the number.

[Stabilization Area]: When heaving exceeds the value set here, stabilization is stopped and the stabilization icon at the top of the screen disappears. However, the [Stabilization] function is kept [ON]. When heaving is once again less than the value set here, stabilization is restarted and the stabilization icon reappears.

Note: For the heaving feature, set the SC-30/50/110 Satellite Compass™ output as follows.

Feature	SC-50/110 (Data out setting)	SC-30 (IF-NMEASC setting)
Sentence	ATT, HVE	ATT, HVE
Baud rate	38400 bps	38400 bps
Cycle	25 ms	25 ms
Format	IEC Ed.1	-

3.8 Telesounder Setting

When a telesounder TS-80M2, TS-85 or TS-7100 is connected to this equipment, set the telesounder mode for communication with mother/sister ship.

Note 1: When this equipment is used at high speeds in waters shallower than 20 m, set the TX rate to a lower setting from the TX setting menu.

Note 2: TS-80M2 should be used in P-mode only. Confirm that the TS-80M2 is set to “P-mode”

Note 3: When using the TS-85 for data transmission between vessels, there are some restrictions. Possible fish finder combinations are as follows:

Mother	Sister	Possible
FCV-1900/B/G	FCV-1900/B/G	Yes
FCV-1900/B/G	FCV-1200L/1500L	Yes (set TVG '0' on FCV-1900 menu)
FCV-1200L/1500L	FCV-1900B/G	No

1. Referring to steps 1 to 4 of “Select the transducer” in section 3.3, open the [XDCR Setting] menu.
2. Rotate the **ENTER** knob to select [Telesounder] tab.
3. Select [External Telesounder], then push the knob.
4. Select [On], then push the knob.

Own XDCR Setting	DFF1,DFF3,BBDS1 XDCR Setting	Telesounder	Side Looking
External Telesounder			On
Echo Setting			Input 1
Telesounder			TS-80 MARK2
Fish Finder			FCV-1900
HF TX Mode			TruEcho CHIRP
LF TX Mode			TruEcho CHIRP
Save Setting			▶

5. Rotate the **ENTER** knob to select [Echo setting], then push the knob.

3. INITIAL SETTINGS

6. Select [Input 1], [Input 2] or [Output], then push the knob.
 - [Input 1]: Select when this unit is on the mother ship. This unit receives two different frequency information from one sister ship.
 - [Input 2]: Select when this unit is on the mother ship. When [Telesounder] is set to [TS-80 MARK2], this unit receives two different frequency information from two sister ships. When [Telesounder] is set to [TS-7100], this unit receives two different frequency information from one sister ship (same behavior as [Input 1]).
 - [Output]: Select when this unit is on the sister ship. This unit transmits own ship's telesounder information.
Note: When [Output] is selected, [Time Lag] on the [TX/RX] menu is inoperative. [Time Lag] is fixed to [Off].
7. Rotate the **ENTER** knob to select [Telesounder], then push the knob.
8. Select [TS-80 MARK2] or [TS-7100], then push the knob.
 Select model of telesounder connected this equipment. Where the telesounder used is a TS-85, select "TS-80 MARK2".
9. Rotate the **ENTER** knob to select [Fish Finder], then push the knob.
10. Select [FCV-1900] or [FCV-1200L], then push the knob.
 When you select FCV-1200L, go to step 12.
11. Rotate the **ENTER** knob to select [HF TX Mode] for setting the high frequency transducer, or [LF TX Mode] for setting the low frequency transducer.
12. Select [TruEcho CHIRP] or [Std], then push the knob.
 Set the output mode for the other equipment.
13. Rotate the **ENTER** knob to select [Save Setting], then push the knob to turn the power off.
14. Press the power key to turn the power on.

3.9 Side Looking Setting

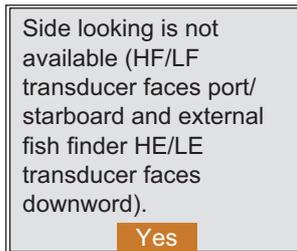
Set the side looking mode with following procedure.

1. Referring to steps 1 to 4 of "Select the transducer" in section 3.3, open the [XDCR Setting] menu.
2. Rotate the **ENTER** knob to select [Side Looking] tab, then push the knob.

Own XDCR Setting	DFF1,DFF3,BBDS1 XDCR Setting	Telesounder	Side Looking
HF			Port
LF			Downword Facing
HE			Starboard
LE			Downword Facing
Side Looking Settings			On
Save Setting			▶

3. Select [Downward Facing], [Port] or [Starboard] for transducer of this equipment or external fish finder.
 When all transducers are set to [Downward facing], the side looking mode is 'Off'.
 When at least one transducer is set to [Port] or [Starboard], the side looking mode is 'On'.

4. Rotate the **ENTER** Knob to select [Save Setting], then push the knob. The message shown below appears when the setting is not adequate.



5. Rotate the **ENTER** knob to select [Yes], then push the knob to turn the power off.
6. Press the power key to turn the power on.

Note: When side looking mode is active, the following functions are not available. Related menus are also shown in gray color and are not selectable.

- White Edge
- Depth Size
- Fish Finder Alarm
- A-scope
- Display Division
- Sonde Mark Display
- Zoom Marker
- Fish Size Histogram
- Telesounder

3.10 TX Triggering

Set the TX trigger mode from the menu when an external equipment is synchronized with this equipment or external sounder.

1. Referring to section 3.2, open the [Service] menu.
2. Set the TX triggering menu to active trigger signals.
 - This menu should be set to control timing between FCV-1900 and external equipment.
 - The connection between FCV-1900 and external sounder is required to enable the external fish finder trigger between external sounder DFF1/3, BBDS1 and FCV-1900 or external equipment (such as a sonar) connected.

Feature	Setting	Meaning
In Trigger	On/Off	Input trigger enabled
Trigger input	↑/↓	Rising edge detection
Out Trigger	Off/HF/LF	[HF]: Output trigger when transmitting HF signal. [LF]: Output trigger when transmitting LF signal.
Trigger output	Positive/Negative	Logic signal polarization
Ext. Fish Finder Trigger	On/Off	Ext. trigger enabled. Requires external fish finder connection.

3.11 Reset to Default Setting

To reset all customized settings to their default settings, do the following procedure.

Note: Customized settings cannot be restored. If necessary jot down the settings.

1. Referring to section 3.2, open the [Service] menu.
2. Rotate the **ENTER** knob to select the [Default Setting], then push the knob.
3. Select [Yes] and push the knob.
The system is restarted automatically.

3.12 Upgrading to FCV-1900B/1900G

The FCV-1900 can be upgraded to FCV-1900B or FCV-1900G with an “upgrade key”. To obtain an upgrade key, consult your local dealer.

The upgrade procedure requires a USB flash memory, USB cable (micro-A/B and type A connectors attached) and USB type A conversion adapter (female to female).

If you have a MU-190/231/150HD monitor unit, the USB cable provided with the brilliance control feature can be used for the upgrade.

Note: Only one upgrade key can be saved to the USB flash memory at any one time. Do not save multiple keys, this may cause upgrade failure.

Procedure for upgrading

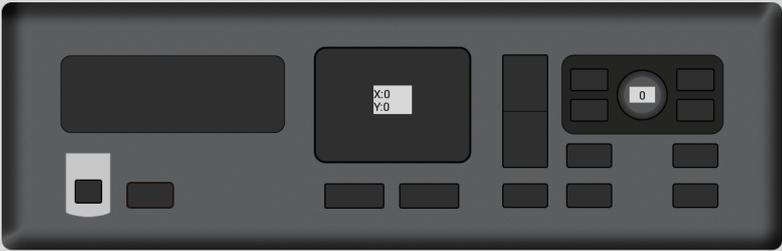
1. Turn the processor unit off.
2. If the USB cable is not provided, connect the USB cable and conversion adapter to the processor unit, referring to section 2.2.2.
3. Copy the upgrade key file to the USB flash memory. Store the license key in the following path in the USB flash memory:
[fcv-1900/license/license.bin] or
[fcv-1900/license/1000-27**-****_a_E.bin] (a: grade, *: serial number)
4. Connect the USB flash memory to the USB adapter on the processor unit.
5. Turn the processor unit on.
The message shown to the right appears when the system is lower than the upgrade key.
Note: When the upgrade key is a grade lower than the key in processor unit, the processor unit starts normally and no message is displayed.
6. Rotate the **ENTER** knob to select [Yes] and push the knob.
The upgrade starts automatically. When the process is complete, the system re-starts.
7. Press the **MENU/ESC** key to display the [Setting] menu.
8. Rotate the **ENTER** knob to select [System], then push the knob.



9. Rotate the **ENTER** knob to select [Test], select [Diagnostic Test], then push the knob.
The diagnostic test window appears.

Product grade

Display Unit			
Product Grade :	FCV-1900	Application Ver :	0252434-xx.xx
MAC Address :	00-40-9D-7D-9D-32	System Ver :	0252437-xx.xx
IP Address :	172.31.92.7	Kernel Ver :	0252436-xx.xx
CPU Status :	29	Fan Speed :	5160rpm
Signal Unit		U-Boot Ver :	0252435-xx.xx
ROM :	OK	PIC Boot Ver :	1950143-xx.xx
RAM :	OK	PIC Main Ver :	1950144-xx.xx
MAC Address :	00-D0-1D-0C-A5-31	Calib.:	OK
IP Address :	172.31.92.6	Port1(NMEA1) :	--
Power Voltage(12V) :	12.1V	Port2(NMEA2) :	--
Power Voltage(5V) :	5.0V	Port3(Tankenmaru) :	--
HF BVolt :	120.9V	Port4(SC) :	--
LF BVolt :	113.2V	Port5(CIF) :	--
		Telesounder :	--
		Temp :	10.4°C
		TX Status :	HF(0.0%)LF(0.0%)
Fish Finder Sensors			
ROM :	OK	Application Ver :	xxxxxxxxxx
RAM :	OK	Boot Ver :	xxxxxxxxxx
		Temp :	10.4°C



Press the camera icon key 3 times to capture. (1/99) Press the [MENU/ESC] key 3 times to exit.

xx.xx: Program version

10. At the first line of the [Display unit] section of the test result, confirm that the upgrading is complete. “Product Grade” shows FCV-1900B or FCV-1900G depending on the upgrade.
11. Press the **MENU/ESC** key three times to close the test window.
12. Press the **MENU/ESC** key several times to close the menu.
13. Turn the processor unit off and then remove the USB flash memory.

APPENDIX 1 JIS CABLE GUIDE

Cables listed in the manual are usually shown as Japanese Industrial Standard (JIS). Use the following guide to locate an equivalent cable locally.

JIS cable names may have up to 6 alphabetical characters, followed by a dash and a numerical value (example: DPYC-2.5).

For core types D and T, the numerical designation indicates the *cross-sectional Area (mm²)* of the core wire(s) in the cable.

For core types M and TT, the numerical designation indicates the *number of core wires* in the cable.

1. Core Type

D: Double core power line

T: Triple core power line

M: Multi core

TT: Twisted pair communications
(1Q=quad cable)

2. Insulation Type

P: Ethylene Propylene

Rubber

3. Sheath Type

Y: PVC (Vinyl)

4. Armor Type

C: Steel

5. Sheath Type

Y: Anticorrosive vinyl sheath

6. Shielding Type

S: All cores in one sheath

-S: Individually sheathed cores

SLA: All cores in one shield, plastic tape w/aluminum tape

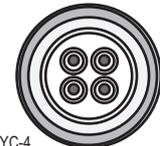
-SLA: Individually shielded cores, plastic tape w/aluminum tape



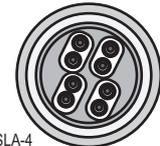
DPYC



TPYC



MPYC-4



TTYCSLA-4

EX: ^{1 2 3 4 5 6} TTYC Y S L A - 4
Designation type # of twisted pairs

EX: ^{1 2 3 4} M P Y C - 4
Designation type # of cores

The following reference table lists gives the measurements of JIS cables commonly used with Furuno products:

Type	Area	Core Diameter	Cable Diameter	Type	Area	Core Diameter	Cable Diameter
DPYC-1.5	1.5mm ²	1.56mm	11.7mm	TTYCS-1	0.75mm ²	1.11mm	10.1mm
DPYC-2.5	2.5mm ²	2.01mm	12.8mm	TTYCS-1T	0.75mm ²	1.11mm	10.6mm
DPYC-4	4.0mm ²	2.55mm	13.9mm	TTYCS-1Q	0.75mm ²	1.11mm	11.3mm
DPYC-6	6.0mm ²	3.12mm	15.2mm	TTYCS-4	0.75mm ²	1.11mm	16.3mm
DPYC-10	10.0mm ²	4.05mm	17.1mm	TTYCSLA-1	0.75mm ²	1.11mm	9.4mm
DPYCY-1.5	1.5mm ²	1.56mm	13.7mm	TTYCSLA-1T	0.75mm ²	1.11mm	10.1mm
DPYCY-2.5	2.5mm ²	2.01mm	14.8mm	TTYCSLA-1Q	0.75mm ²	1.11mm	10.8mm
DPYCY-4	4.0mm ²	2.55mm	15.9mm	TTYCSLA-4	0.75mm ²	1.11mm	15.7mm
MPYC-2	1.0mm ²	1.29mm	10.0mm	TTYCY-1	0.75mm ²	1.11mm	11.0mm
MPYC-4	1.0mm ²	1.29mm	11.2mm	TTYCY-1T	0.75mm ²	1.11mm	11.7mm
MPYC-7	1.0mm ²	1.29mm	13.2mm	TTYCY-1Q	0.75mm ²	1.11mm	12.6mm
MPYC-12	1.0mm ²	1.29mm	16.8mm	TTYCY-4	0.75mm ²	1.11mm	17.7mm
TPYC-1.5	1.5mm ²	1.56mm	12.5mm	TTYCY-4S	0.75mm ²	1.11mm	21.1mm
TPYC-2.5	2.5mm ²	2.01mm	13.5mm	TTYCY-4SLA	0.75mm ²	1.11mm	19.5mm
TPYC-4	4.0mm ²	2.55mm	14.7mm	TTYCYS-1	0.75mm ²	1.11mm	12.1mm
TPYCY-1.5	1.5mm ²	1.56mm	14.5mm	TTYCYS-4	0.75mm ²	1.11mm	18.5mm
TPYCY-2.5	2.5mm ²	2.01mm	15.5mm	TTYCYSLA-1	0.75mm ²	1.11mm	11.2mm
TPYCY-4	4.0mm ²	2.55mm	16.9mm	TTYCYSLA-4	0.75mm ²	1.11mm	17.9mm

APPENDIX 2 INSTALLATION OF TEMPERATURE SENSORS

The installation instructions in this chapter are copied from the manufacturer's (AIRMAR Technology Corporation) installation guide, which is included with your sensor.

The model numbers mentioned within the documentation should be read as follows:

T42: T-04MSB, T80: T-04MTB

OWNER'S GUIDE & INSTALLATION INSTRUCTIONS

Thru-Hull, Analog High-Precision Temperature Sensor

Model **T42**

Record the information found on the cable tag for future reference.

Part No. _____ Date _____

05/28/14

17-437-02 rev. 01

Follow the precautions below for optimal product performance and to reduce the risk of property damage, personal injury, and/or death.

WARNING: Always wear safety goggles and a dust mask when installing.

WARNING: Immediately check for leaks when the boat is placed in the water. Do not leave the boat unchecked for more than three hours. Even a small leak can allow considerable water to accumulate.

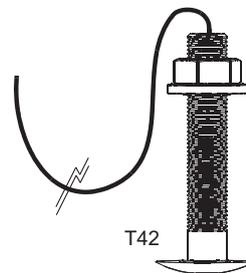
CAUTION: Never install a bronze sensor in a metal hull because electrolytic corrosion will occur.

CAUTION: Never install a metal sensor on a vessel with a positive ground system.

CAUTION: Never pull, carry, or hold the sensor by its cable; this may sever internal connections.

CAUTION: Never use solvents. Cleaner, fuel, sealant, paint, and other products may contain solvents that can damage plastic parts, especially the sensor's face.

IMPORTANT: Read the instructions completely before proceeding with the installation. These instructions supersede any other instructions in your instrument manual if they differ.



Tools & Materials

Safety goggles

Dust mask

Electric drill

Drill bit/hole saw/spade bit:

Pilot hole	3 mm or 1/8"
T42	22 mm or 7/8"

Sandpaper

Mild household detergent or weak solvent (alcohol)

Marine sealant (suitable for below waterline)

Slip-joint pliers

Installation in a cored fiberglass hull (see page 2)

Hole saw for hull interior: 30 mm or 1-1/4"

Cylinder, wax, tape, and casting epoxy

Water-based anti-fouling paint (**mandatory in salt water**)

Sensor Installation

Hole Drilling

Cored fiberglass hull — Follow separate instructions on page 2.

1. Drill a 3 mm or 1/8" pilot hole from inside the hull. If there is a rib, strut, or other hull irregularity near the selected mounting location, drill from the outside.
2. Using the appropriate drill bit, cut a hole perpendicular to the hull from outside the boat.
3. Sand and clean the area around the hole, inside and outside, to ensure that the marine sealant will adhere properly to the hull. If there is any petroleum residue inside the hull, remove it with either mild household detergent or a weak solvent (alcohol)

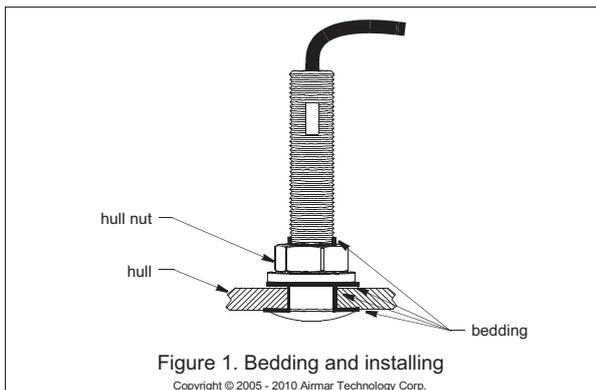
Applications

- Bronze sensor recommended for fiberglass or wood hull only.
- The hull must be a minimum of 8 mm (5/16") thick at the mounting location.

Mounting Location

Choose a location where the temperature sensor will be in contact

APPENDIX 2 INSTALLATION OF TEMPERATURE SENSORS



Bedding

CAUTION: Be sure all surfaces to be bedded are clean and dry.

1. Remove the hull nut (see Figure 1).
2. Apply a 2 mm (1/16") thick layer of marine sealant around the flange of the sensor that will contact the hull and up the stem. The sealant must extend 6 mm (1/4") higher than the combined thickness of the hull and the hull nut. This will ensure that there is marine sealant in the threads to seal the hull and hold the hull nut securely in place.
3. Apply a 2 mm (1/16") thick layer of marine sealant to the flange of the hull nut that will contact the hull.

Installing

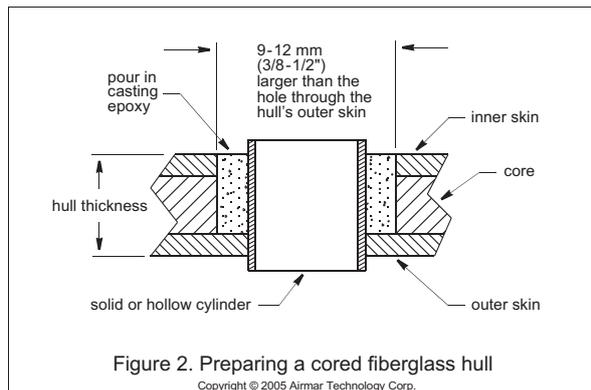
1. From outside the hull, thread the cable through the mounting hole.
2. Push the sensor into the mounting hole using a twisting motion to squeeze out excess marine sealant (see Figure 1).
3. From inside the hull, slide the hull nut onto the cable. Screw the hull nut in place. Tighten it with slip-joint pliers.
Cored fiberglass hull—Do not over tighten, crushing the hull.
Wood hull—Allow for the wood to swell before tightening.
4. Remove any excess marine sealant on the outside of the hull to ensure smooth water flow over the sensor.

Checking for Leaks

When the boat is placed in the water, **immediately** check around the thru-hull sensor for leaks. Note that very small leaks may not be readily observed. Do not leave the boat in the water for more than 3 hours before checking it again. If there is a small leak, there may be considerable bilge water accumulation after 24 hours. If a leak is observed, repeat "Bedding" and "Installing" **immediately** (see page 2).

Cable Routing & Connecting

CAUTION: If the sensor came with a connector, do not remove it to ease cable routing. If the cable must be cut and spliced, use Airmar's splash-proof Junction Box No. 33-035 and follow the instructions supplied. Removing the waterproof connector or cutting the cable, except when using a water-tight junction box, will void the sensor warranty.



1. Route the cable to the instrument being careful not to tear the cable jacket when passing it through the bulkhead(s) and other parts of the boat. Use grommet(s) to prevent chafing. To reduce electrical interference, separate the transducer cable from other electrical wiring and the engine. Coil any excess cable and secure it in place with cable ties to prevent damage.
2. Refer to the instrument owner's manual to connect the transducer to the instrument.

Installation in a Cored Fiberglass Hull

The core (wood or foam) must be cut and sealed carefully. The core must be protected from water seepage, and the hull must be reinforced to prevent it from crushing under the hull nut allowing the sensor to become loose.

CAUTION: Completely seal the hull to prevent water seepage into the core.

1. Drill a 3mm or 1/8" pilot hole from inside the hull. If there is a rib, strut, or other hull irregularity near the selected mounting location, drill from the outside. (If the hole is drilled in the wrong location, drill a second hole in a better location. Apply masking tape to the outside of the hull over the incorrect hole and fill it with epoxy.)
2. Using the 21 mm or 7/8" drill bit, cut a hole from outside the hull through the *outer* skin only (see Figure 2).
3. From inside the hull using the 30mm or 1-1/4" hole saw, cut through the *inner* skin and most of the core. The core material can be very soft. Apply only light pressure to the hole saw after cutting through the inner skin to avoid accidentally cutting the *outer* skin.
4. Remove the plug of core material so the *inside* of the outer skin and the inner core of the hull is fully exposed. Clean and sand the inner skin, core, and the outer skin around the hole.
5. Coat a hollow or solid cylinder of the correct diameter with wax and tape it in place. Fill the gap between the cylinder and hull with casting epoxy. After the epoxy has set, remove the cylinder.
6. Sand and clean the area around the hole, inside and outside, to ensure that the sealant will adhere properly to the hull. If there is any petroleum residue inside the hull, remove it with either mild household detergent or a weak solvent (alcohol) before sanding.
7. Proceed with "Bedding" and "Installing" (see page 2).

Maintenance & Replacement

Aquatic growth can accumulate rapidly on the sensor's surface reducing its performance within weeks. Clean the surface with a Scotch-Brite® scour pad and mild household detergent taking care to avoid making scratches. If the fouling is severe, lightly wet sand with fine grade wet/dry paper.

Anti-fouling Paint

Surfaces exposed to salt water must be coated with anti-fouling paint. *Use water-based anti-fouling paint only.* Never use ketone-based paint since ketones can attack many plastics possibly damaging the sensor. Reapply anti-fouling paint every 6 months or at the beginning of each boating season.

Replacement Sensor & Parts

The information needed to order a replacement sensor is printed on the cable tag. Do not remove this tag. When ordering, specify the part number and date. For convenient reference, record this information at the top of page one.

Lost, broken, or worn parts should be replaced immediately.

Hull nut	02-031-3
----------	----------

Obtain parts from your instrument manufacturer or marine dealer.

Gemeco (USA)	Tel: 803-693-0777 Fax: 803-693-0477 email: sales@gemeco.com
Airmar EMEA (Europe, Middle East, Africa)	Tel: +33.(0)2.23.52.06.48 Fax: +33.(0)2.23.52.06.49 email: sales@airmar-emea.com

OWNER'S GUIDE & INSTALLATION INSTRUCTIONS

Surface Mount, Analog Temperature Sensor

Model T80

Record the information found on the cable tag for future reference.

Part No. _____ Date _____



05/28/14

17-584-01 rev. 01

Follow the precautions below for optimal product performance and to reduce the risk of property damage, personal injury, and/or death.

WARNING: Always wear safety goggles and a dust mask when installing.

WARNING: Below the waterline mount—When the boat is placed in the water, immediately check for leaks around the screws and any other holes drilled in the hull.

CAUTION: Installation on a metal hull—The stainless steel housing must be isolated from a metal hull to prevent electrolytic corrosion. Use marine sealant.

CAUTION: Never install a metal sensor on a vessel with a positive ground system.

IMPORTANT: Read the instructions completely before proceeding with the installation. These instructions supersede any other instructions in your instrument manual if they differ.

Tools & Materials

- Safety goggles
- Dust mask
- Pencil
- Electric drill
- Drill bit/hole saw/spade bit:
 - Pilot holes 3mm or 1/8"
 - Transom hole (some installations) 18mm or 3/4"
- 2 Stainless steel, self-tapping screws 4 x 18mm or #8 x 3/4"
- Marine sealant (suitable for below waterline)
- Screwdriver(s)
- Cable clamp(s) (some installations)
- Grommet(s) (some installations)
- Cable ties

Installation

Mounting on the transom

CAUTION: Mount the sensor as close to the centerline (keel) of the boat as possible to ensure the sensor remains in the water when the boat is turning (see Figure1).

CAUTION: Fiberglass hull—Minimize surface cracking by running the drill in reverse until the gelcoat is penetrated.

CAUTION: If the sensor came with a connector, do not remove it to ease cable routing. If the cable must be cut and spliced, use Airmar's splash-proof Junction Box No. 33-035 and follow the instructions provided. Removing the waterproof connector or cutting the cable, except when using a water-tight junction box, will void the sensor warranty.

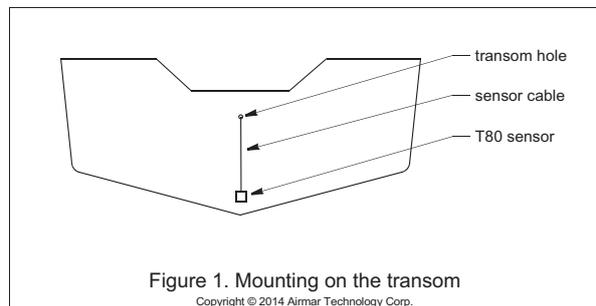
Applications

- Measures air or water temperature.
- Stainless steel sensor is compatible with all hull materials. Recommended for aluminum hulls to prevent electrolytic corrosion, provided the stainless steel sensor is isolated from the metal hull by using marine sealant.

Mounting Location

The sensor can be mounted anywhere that you want to know the temperature. For example, you can mount the sensor on the transom, in the live well, or in the engine compartment.

If you are measuring water temperature, choose a location where the sensor will be in contact with the water at all times.



Mount the sensor near the centerline and close to the bottom of the transom.

Route the sensor cable over the transom, through a drain hole, or through a hole that you have drilled in the transom **above the waterline**.

1. Place the sensor against the hull and mark the position of the screw holes with a pencil.
2. Using a 3mm or 1/8" drill bit, drill pilot holes at the marked locations, 10mm (3/8") deep.
3. Apply marine sealant to the threads of the purchased screws to prevent water from seeping into the transom.
4. Screw the temperature sensor to the hull.
5. If a hole must be drilled through the transom, choose a location **well above the waterline**. Check for obstructions such as trim tabs, pumps, or wiring inside the hull. Mark the location with a pencil. Drill a hole through the transom using the appropriate size hole saw or spade bit (to accommodate the connector). Do NOT remove the connector.
6. Route the cable over or through the transom.
7. On the outside of the hull, secure the cable against the transom using a purchased cable clamp(s). Mark the position of the screw hole(s) with a pencil.
8. Using a 3mm or 1/8" drill bit, drill a pilot hole(s) at the marked locations, 10mm (3/8") deep.
9. Apply marine sealant to the threads of the screw(s) to prevent water from seeping into the transom.
10. Fasten the cable clamp(s) in place.
11. If a hole has been drilled through the transom, apply marine sealant to the space around the cable leading through the transom.

Cable Routing & Connecting

1. Route the cable to the instrument, being careful not to tear the cable jacket when passing it through the bulkhead(s) and other parts of the boat. To reduce electrical interference, separate the sensor cable from other electrical wiring and sources of noise. Coil any excess cable and secure it in place with cable ties to prevent damage.
2. Refer to the instrument owner's manual to connect the sensor to the instrument.

Replacement Sensor & Parts

The information needed to order a replacement sensor is printed on the cable tag. Do not remove this tag. When ordering, specify the part number and date. For convenient reference, record this information at the top of page one.

Obtain parts from your instrument manufacturer or marine dealer.

Gemeco (USA)	Tel: 803-693-0777 Fax: 803-693-0477 email: sales@gemeco.com
Airmar EMEA (Europe, Middle East, Africa)	Tel: +33.(0)2.23.52.06.48 Fax: +33.(0)2.23.52.06.49 email: sales@airmar-emea.com



35 Meadowbrook Drive, Milford, New Hampshire 03055-4613, USA
• www.airmar.com

APPENDIX 3 FISH SIZE PARAMETER

The table below shows the setting ranges and default settings for the parameters for fish size information and school of fish density. Generally, the default values are suitable for most applications. However, if you have customized the parameters and need to restore certain default settings, refer to the table to find the default settings.

Fish size information parameters

Parameter		Range	Default setting
General	Peak estimation type	0, 1, 2	0
	Maximum peak gate	0 ~ 1000	25
	Minimum level	-40.0 ~ 10.0	-20.0
	Maximum level	-10.0 ~ 40.0	7.2
High freq.	Peak detection boundary	-100.0 ~ -20.0	-60
	Peak estimation deviation (up/down)	0.0 ~ 100.0	10.0
	Minimum peak width (up/down)	0 ~ 100	5
	Maximum peak width (up/down)	0 ~ 100	11
Low freq.	Peak detection boundary	-100.0 ~ -20.0	-60
	Peak estimation deviation (up/down)	0.0 ~ 100.0	10.0
	Minimum peak width (up/down)	0 ~ 100	5
	Maximum peak width (up/down)	0 ~ 100	11

School of fish density parameters

Parameter		Range	Default setting
General	Condensation revision	Off, HF, LF, Both	Both
	Condensed level boundary (up)	1 ~ 30	8
	Condensed level boundary (down)	1 ~ 30	7
	Level revision tuning (up)	-10 ~ 10	0
	Level revision tuning (down)	-10 ~ 10	0
	Gate width for peak fixing (up)	0 ~ 1000	101
	Gate width for peak fixing (down)	0 ~ 1000	101
High freq.	Peak detection boundary	-100.0 ~ -20.0	-60
	Peak estimation deviation (up/down)	0.0 ~ 100	0.0
	Minimum peak width (up/down)	0 ~ 100	5
	Maximum peak width (up/down)	0 ~ 100	11
Low freq.	Peak detection boundary	-100.0 ~ -20.0	-60
	Peak estimation deviation (up/down)	0.0 ~ 100.0	0.0
	Minimum peak width (up/down)	0 ~ 100	5
	Maximum peak width (up/down)	0 ~ 100	11

Processing information can be displayed by turning on "Fish Graph Analyzer" in the service menu.

PACKING LIST

FCV-1901-E , FCV-1901B-E , FCV-1901G-E

0260-X-9855 -0 1/1

A-1

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
ユニット UNIT			
制御部 PROCESSOR UNIT		FCV-1901/B/G-* 000-027-390-00 **	1
予備品 SPARE PARTS			
予備品 SPARE PARTS		SP02-05801 001-372-670-00	1
工事材料 INSTALLATION MATERIALS			
ケーブル組(ワズレ)		A-10-D-ADAPTER 001-407-160-00	1
CABLE ASSEMBLY		CP02-09101 001-372-700-00	1
工事材料 INSTALLATION MATERIALS			
図書 DOCUMENT			
取扱説明書 OPERATOR'S MANUAL		OME-23860-* 000-190-500-1*	1
装備要領書 INSTALLATION MANUAL		IME-23860-* 000-190-502-1*	1

コード番号末尾の[**]は、選択品の代表コードを表します。
CODE NUMBER ENDING WITH "**" INDICATES THE CODE NUMBER OF REPRESENTATIVE MATERIAL.

(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

C2386-705-A

PACKING LIST

FCV-1902-J/E

0260-X-9852 -0 1/1

A-2

NAME	UNIT	DESCRIPTION/CODE No.	Q'TY
ユニット UNIT			
操作部 CONTROL UNIT		FCV-1902-J/E 000-027-398-00 **	1
工事材料 INSTALLATION MATERIALS			
工事材料 INSTALLATION MATERIALS		CP03-34401 001-194-580-00	1

コード番号末尾の[**]は、選択品の代表コードを表します。
CODE NUMBER ENDING WITH "**" INDICATES THE CODE NUMBER OF REPRESENTATIVE MATERIAL.

型式/コード番号が2段の場合、下段より上段に代わる過渡用品であり、どちらかが入っています。なお、品質は変わりません。
TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT. QUALITY IS THE SAME.

(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

JP

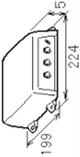
C2386-702-A

PACKING LIST

FCV-1903

0260-X-9853 -0 1/1

A-3

NAME	UNIT	OUTLINE	DESCRIPTION/CODE No.	Q'TY
ユニット IF変換器 INTERFACE UNIT			FCV-1903 000-027-401-00	1
工事材料 ケーブル/ケーブル				
CABLE ASSEMBLY			S02-22-5 001-374-440-00	1
工事材料 INSTALLATION MATERIALS			CP02-09201 001-374-410-00	1

型式/コード番号が2股の場合、下段より上段に代わる過渡期品であり、どちらが入っています。なお、品質は変わりません。

TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT. QUALITY IS THE SAME.

(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

JP

C2386-Z03-A

FURUNO

A-4

CODE NO.	001-372-700-00	0260-X-9401-1			
TYPE	CP02-09101	1/1			
工事材料表 INSTALLATION MATERIALS					
番号	名称	略図	型名/規格	数量	用途/備考
1	セルフタップスクリュー +17.7x17.7x1.1φ5 SELF-TAPPING SCREW		SX20 SUS304 CODE NO. 000-162-608-10	4	
2	ケーブルタイ CABLE TIE		CV-150HT CODE NO. 000-162-190-10	5	

型式/コード番号が2股の場合、下段より上段に代わる過渡期品であり、どちらが入っています。なお、品質は変わりません。

TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT. QUALITY IS THE SAME.

(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

FURUNO ELECTRIC CO., LTD.

JP

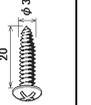
C2386-M01-B

FURUNO

CODE NO.	001-374-410-00	0260-X-9402-0	1/1
TYPE	CP02-09201		

工事材料表

INSTALLATION MATERIALS

番号 NO.	名称 NAME	略図 OUTLINE	型名/規格 DESCRIPTIONS	数量 QTY	用途/備考 REMARKS
1	+1578797C-メネジ SELF TAPPING SCREW		3X20 SUS304 CODE NO. 000-167-940-10	4	

型式/コード番号が2股の場合、下股より上股に代わる標準部品であり、どちらかが入っています。なお、品質は変わりません。
TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT.
QUALITY IS THE SAME.
(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

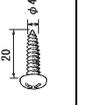
FURUNO ELECTRIC CO., LTD. JP
C2386-M02-A

FURUNO

CODE NO.	001-194-530-00	03HL-X-9401-0	1/1
TYPE	CP03-34401		

工事材料表

INSTALLATION MATERIALS

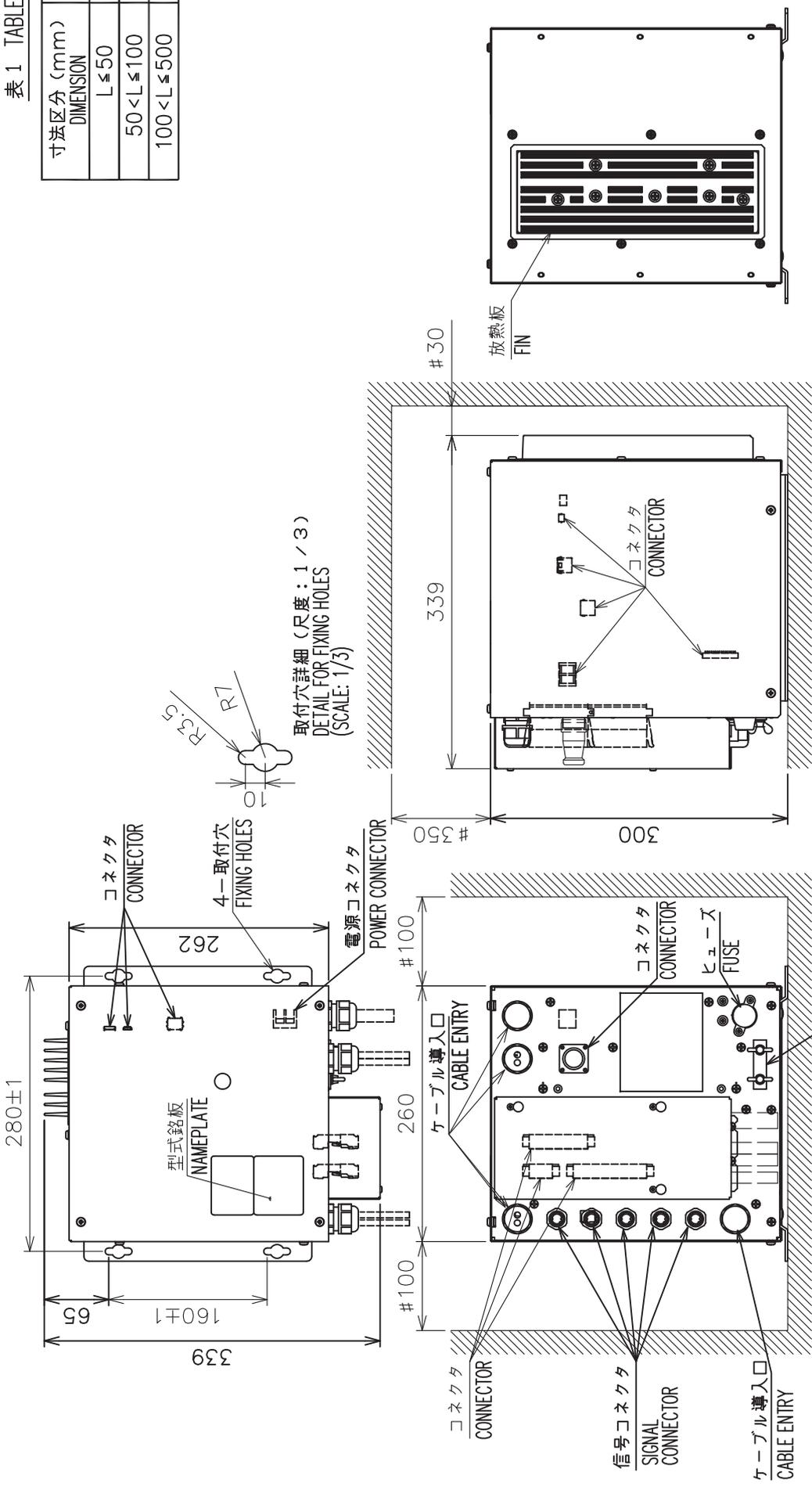
番号 NO.	名称 NAME	略図 OUTLINE	型名/規格 DESCRIPTIONS	数量 QTY	用途/備考 REMARKS
1	+1578797C-メネジ SELF-TAPPING SCREW		4X20 SUS304 CODE NO. 000-168-850-10	4	

型式/コード番号が2股の場合、下股より上股に代わる標準部品であり、どちらかが入っています。なお、品質は変わりません。
TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT.
QUALITY IS THE SAME.
(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

FURUNO ELECTRIC CO., LTD. C3614-M01-A

表 1 TABLE 1

寸法区分 (mm) DIMENSION	公差 (mm) TOLERANCE
L ≤ 50	±1.5
50 < L ≤ 100	±2.5
100 < L ≤ 500	±3

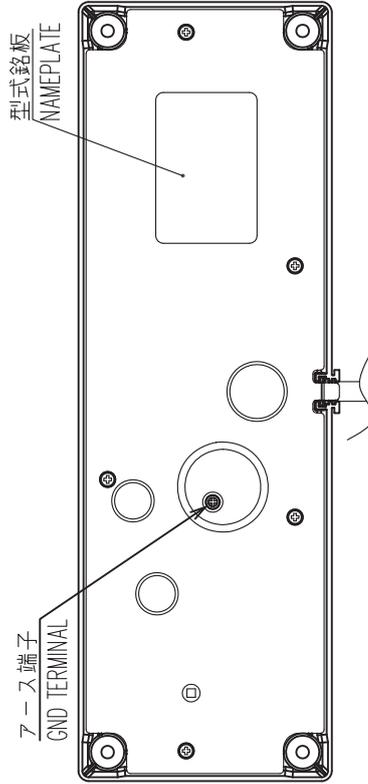
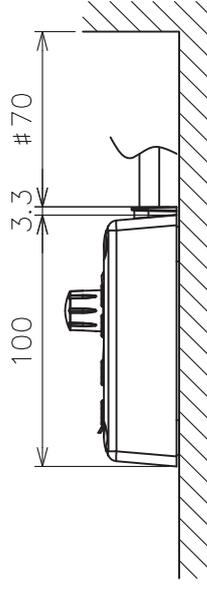
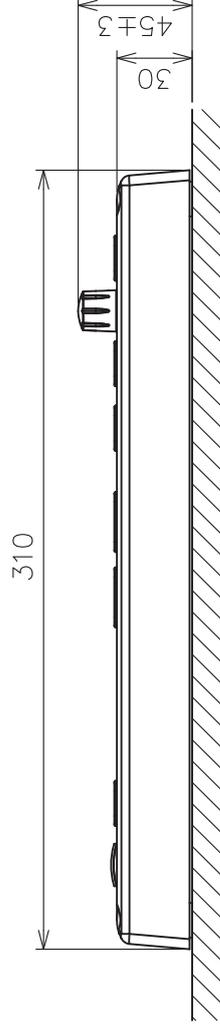
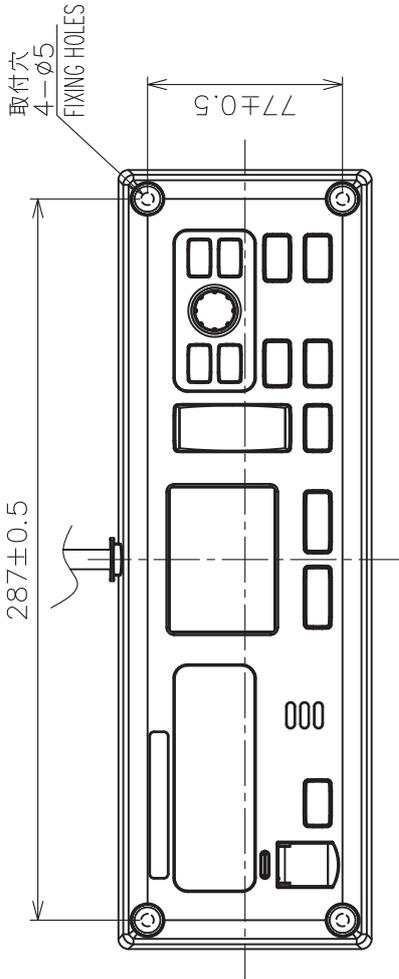


- 注記
- 1) 指定外の寸法公差は表 1 による。
 - 2) # 印寸法は最小サービス空間寸法とする。
 - 3) 取付用ネジは、+トラスチックピンネジ呼び径5×20を使用のこと。
 - 4) 壁掛け時、ケーブルは下向きとする。
- NOTE
1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
 2. # MINIMUM SERVICE CLEARANCE.
 3. USE TAPPING SCREWS Ø5x20 FOR FIXING THE UNIT.
 4. FACE THE CABLES DOWNWARD FOR BULKHEAD MOUNT.

DRAWN	14/Apr/2015	T.YAMASAKI	TITLE	FCV-1901
CHECKED	14/Apr/2015	H.MAKI	名称	制御部 (卓上・壁掛装備)
APPROVED	14/Apr/2015	H.MAKI	外寸図	
SCALE	1/6	WASS 10.2	NAME	PROCESSOR UNIT (TABLETOP/BULKHEAD MOUNT)
DWG.No.	C2386-G01-B	REF.No.	02-171-501G-1	OUTLINE DRAWING

表1 TABLE 1

寸法区分 (mm) DIMENSION	公差 (mm) TOLERANCE
L ≤ 50	±1.5
50 < L ≤ 100	±2.5
100 < L ≤ 500	±3

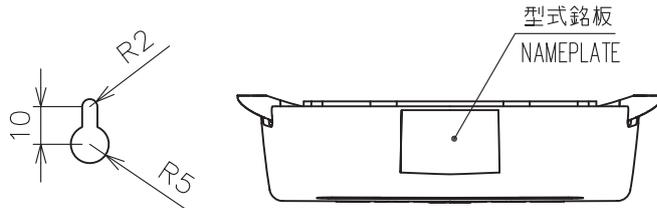


- 注 記
- 1) 指定外の寸法公差は表1による。
 - 2) #印寸法は最少サービスマン間寸法とする。
 - 3) 取付ネジはトラスターピンネジ[®]呼び径4×20を使用のこと。
- NOTE
1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
 2. #: MINIMUM SERVICE CLEARANCE.
 3. USE TAPPING SCREWS φ4x20 FOR FIXING THE UNIT.

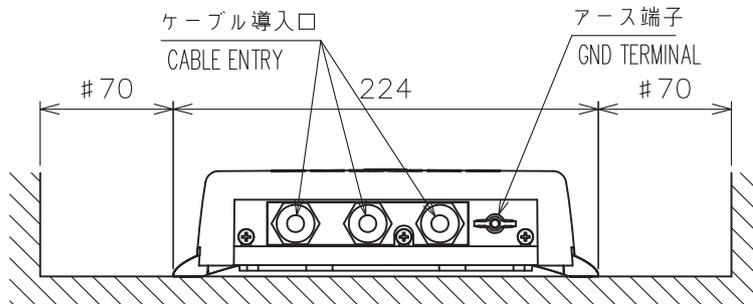
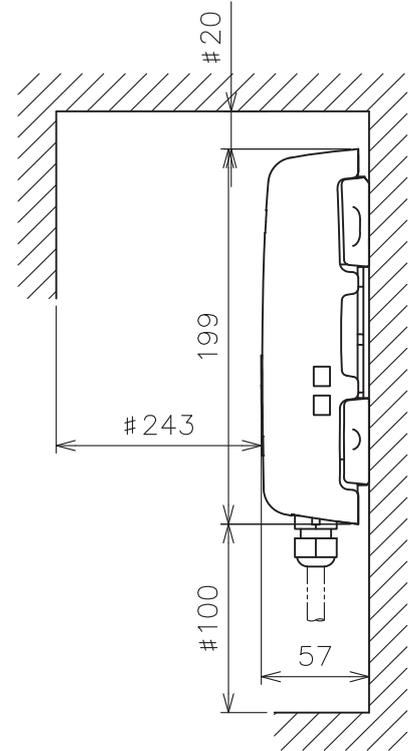
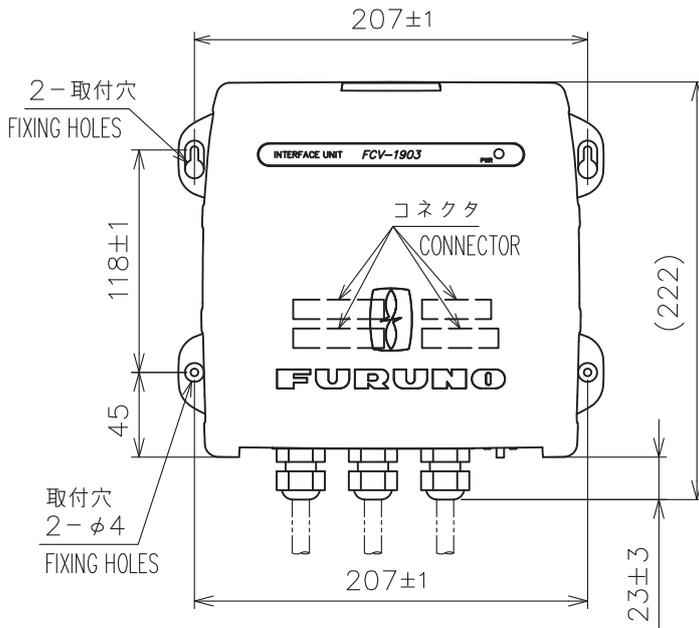
DRAWN	14/Apr/2015	I. YAMASAKI	TITLE	FCV-1902
CHECKED	14/Apr/2015	H. MAKI	名称	操作部 (卓上装備)
APPROVED	15/Apr/2015	H. M. A. K. I.	外寸図	外寸図
SCALE	1/3	質量は500gを含まず。 #104 MASS INCLUDES 500g CABLE.	NAME	CONTROL UNIT (TABLETOP MOUNT)
DWG.No.	C2386-G02-C	REF.No.	02-171-701G-0	OUTLINE DRAWING

表 1 TABLE 1

寸法区分 (mm) DIMENSION	公差 (mm) TOLERANCE
$L \leq 50$	± 1.5
$50 < L \leq 100$	± 2.5
$100 < L \leq 500$	± 3



取付穴詳細 (尺度: 1/2)
DETAIL FOR FIXING (SCALE: 1/2)



- 注 記
- 1) 指定外の寸法公差は表 1 による。
 - 2) #印寸法は最小サービス空間寸法とする。
 - 3) 取付用ネジはトラスタッピンネジ呼び径 3 x 20 を使用のこと。
 - 4) 壁掛け時、ケーブルは下向きとする。

- NOTE
1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
 2. #: MINIMUM SERVICE CLEARANCE.
 3. USE TAPPING SCREWS $\phi 3 \times 20$ FOR FIXING THE UNIT.
 4. FACE THE CABLES DOWNWARD FOR BULKHEAD MOUNT.

DRAWN 13/Jan/2015 T.YAMASAKI		TITLE FCV-1903
CHECKED 13/Jan/2015 H.MAKI		名称 IF変換器 (卓上・壁掛装備)
APPROVED 15/Jan/2015 H.MAKI	FCV-1900	外寸図
SCALE 1/4	MASS 1.5 ±10% kg	質量はケーブルを含まず。 MASS DOES NOT INCLUDE CABLE.
DWG. No. C2386-G03-A	REF. No. 02-171-800G-0	NAME INTERFACE UNIT (TABLETOP/BULKHEAD MOUNT) OUTLINE DRAWING

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1

周波数
FREQUENCY 50/200 KHZ

注記

- ※：造船所手配
- 送受波器ケースは「船底」にあわせて切断してください。
- 切断・溶接の際は、歪み防止のため送受波器を取り外した状態で「フランジ」を必ず取り付けておいてください。
- 電線貫通金物を溶接する際は、パッキンは取り外して行ってください。
- 船尾側上端に空気抜き用穴（φ10~φ20程度）をあけて下さい。
- 電線貫通金物はフレーム等の邪魔にならない所で送受波器に当たらず、キャブナットが容易に締め付けられる位置に取り付けてください。
- 網除け、保護タンクは必要に応じて造船所に注意してください。
- 塗装の際、送受波器面を塗装しない様に注意してください。
- 送受波器取付け後、A部の隙間をシリコン等で埋めてください。
- 指定外の寸法公差は、表1の通りです。
- ボルト類には焼き付き防止グリス（モリシ-ワ1910等）を塗布してください。

NOTE

- ※: SHIPYARD SUPPLY
- CUT CASING FOR SHIP'S HULL
- TO AVOID DISTORTION BY HEAT, PUT "FIXING FLANGE" W/O TRANSDUCER ONTO CASING WHILE CUTTING AND/OR WELDING.
- REMOVE THE GASKET FROM THRU-HULL PIPE BEFORE WELDING.
- MAKE A HOLE OF 10-20mm IN DIA. ON STERN SIDE OF THE TANK TO ALLOW AIR TO ESCAPE FROM TANK.
- ALLOW ENOUGH CLEARANCE AROUND THRU-HULL PIPE FOR EASY TIGHTENING AND SERVICING.
- IF NECESSARY, PROVIDE NET PROTECTOR AND PROTECTION TANK BY SHIPYARD.
- DO NOT PAINT THE TRANSDUCER FACE.
- FILL THE GAP OF 'A' WITH SILICONE SEALANT.
- TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
- APPLY BURN PREVENTION GREASE TO BOLTS.

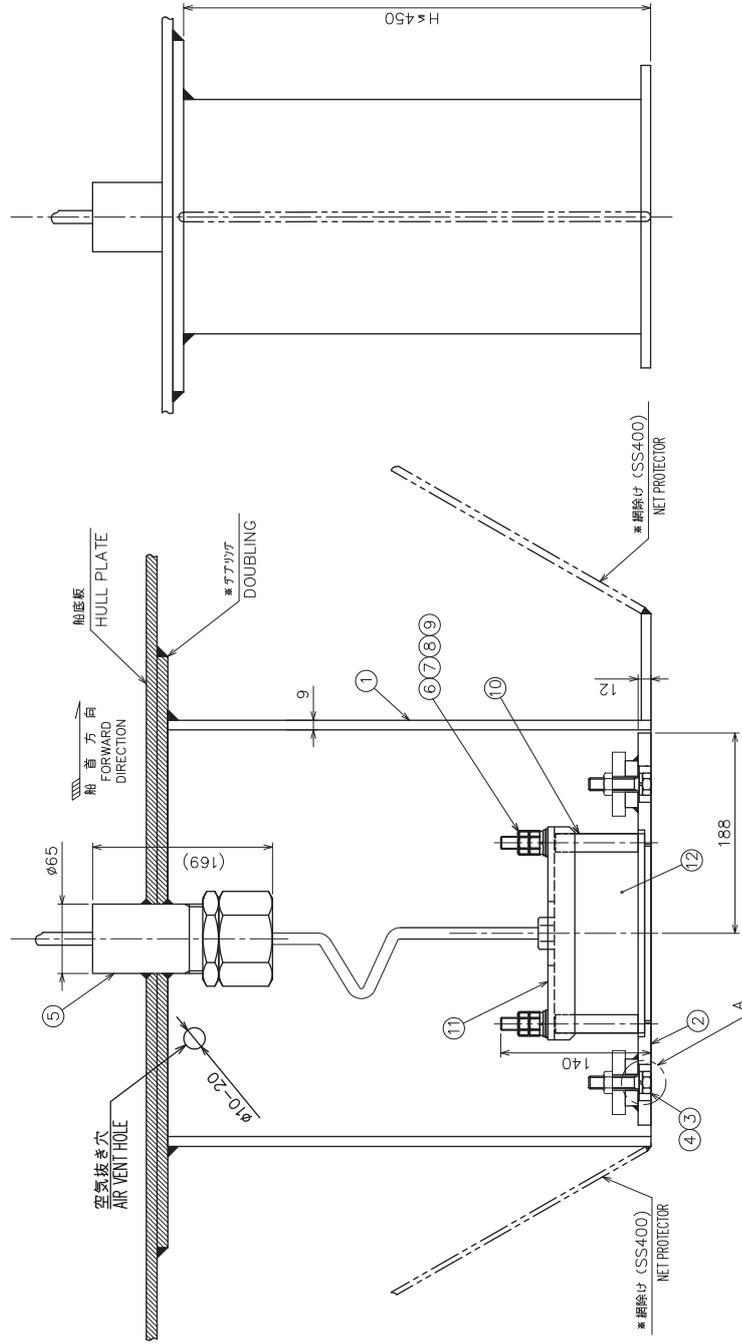
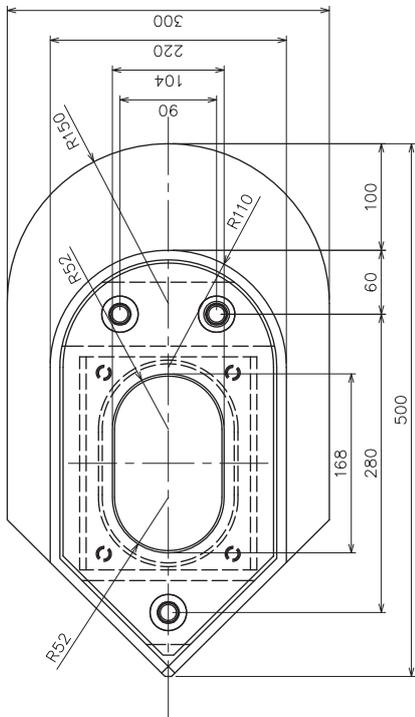


表1 (Table1)

寸法区分 (mm)	公差 (mm)
Dimension	Tolerance
L≦50	±1.5
50<L≦100	±2.5
100<L≦500	±3

送受波器 TRANSDUCER	材質 MATERIAL	数量 QTY	図番 DWG.NO.	備考 REMARKS
12 送受波器 TRANSDUCER	CM265LH	1		質量に含まず。 NOT INCLUDED IN MASS.
11 固定板 FIXING PLATE	SS400	1	02-163-6004	
10 スパチャ SPACER	SGP	4	02-163-6003	
9 平座金 FLAT WASHER	POM	4	T-201-11	呼びM12 MONI12
8 平座金 FLAT WASHER	SUS316L	4	M12	
7 スプリングワッシャー SPRING WASHER	SUS316L	4	M12	
6 六角ナット HEX. NUT	SUS316L	8	M12	
5 電線貫通金物 THRU-HULL PIPE		1	TFB-7000(1)	1HOLE 1穴
4 スプリングワッシャー SPRING WASHER	SUS316L	3	M12	
3 六角ボルト HEX. BOLT	SUS316L	3	M12×50	
2 固定フランジ FIXING FLANGE	SS400	1	02-163-6002	
1 送受波器ケース CASING	SS400	1	02-163-6001	

DRAWN	15/Feb/2013	I.YAMASAKI	図名 TITLE	T-711
CHECKED	15/Feb/2013	H.MAKI	名称 NAME	送受波器タンク (鋼船)
APPROVED	15/Feb/2013	Y.NISHIYAMA		送受波器装備図
SCALE	1/5	MASS 4.3 ±10%		TRANSDUCER TANK (STEEL HULL)
DWG. No.	C2001-139-B	REF. No.	02-163-600G-1	TRANSDUCER INSTALLATION

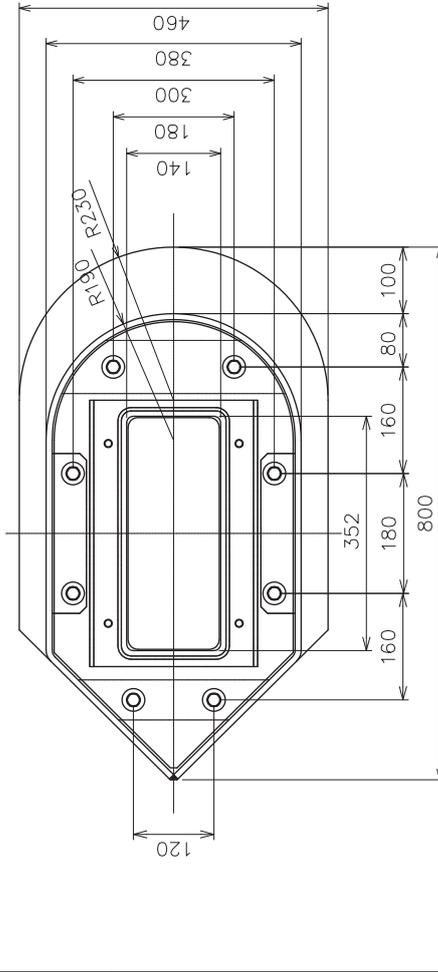
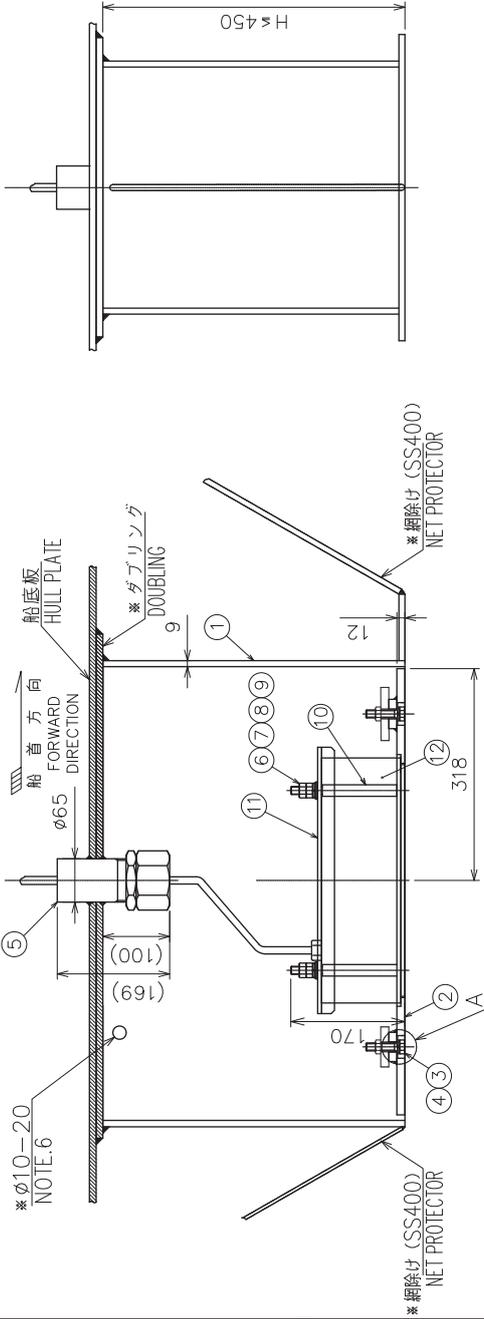


船体分番号 INSTALLATION METHOD	T- 712
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表1 (Table1)

寸法区分 (mm) Dimension	公差 (mm) Tolerance
L ≤ 50	±1.5
50 < L ≤ 100	±2.5
100 < L ≤ 500	±3
500 < L ≤ 1000	±4

- NOTE
1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
 2. * : SHIPYARD SUPPLY.
 3. CUT CASING AS RISING ANGLE OF SHIP'S HULL. ONTO CASING WHILE CUTTING AND/OR WELDING.
 4. TO AVOID DISTORTION BY HEAT, PUT "FIXING FLANGE" WITHOUT TRANSDUCER WELDING SHOULD BE PREPARED BY SHIPYARD.
 5. REMOVE GASKET FROM THE THRU-HULL PIPE BEFORE WELDING.
 6. MAKE A HOLE OF 10 TO 20MM IN DIAMETER ON STERN SIDE FOR ESCAPING AIR FROM TANK.
 7. KEEP ENOUGH CLEARANCE AROUND THRU-HULL PIPE FOR EASY TIGHTENING AND SERVICING.
 8. IF NECESSARY, PROVIDE NET PROTECTOR AND PROTECTION TANK BY SHIPYARD.
 9. DO NOT PAINT TRANSDUCER FACE.
 10. FILL THE GAP OF 'A' WITH SILICONE SEALANT.
 11. APPLY BURIN PREVENTION GREASE TO THE THREAD OF BOLTS.

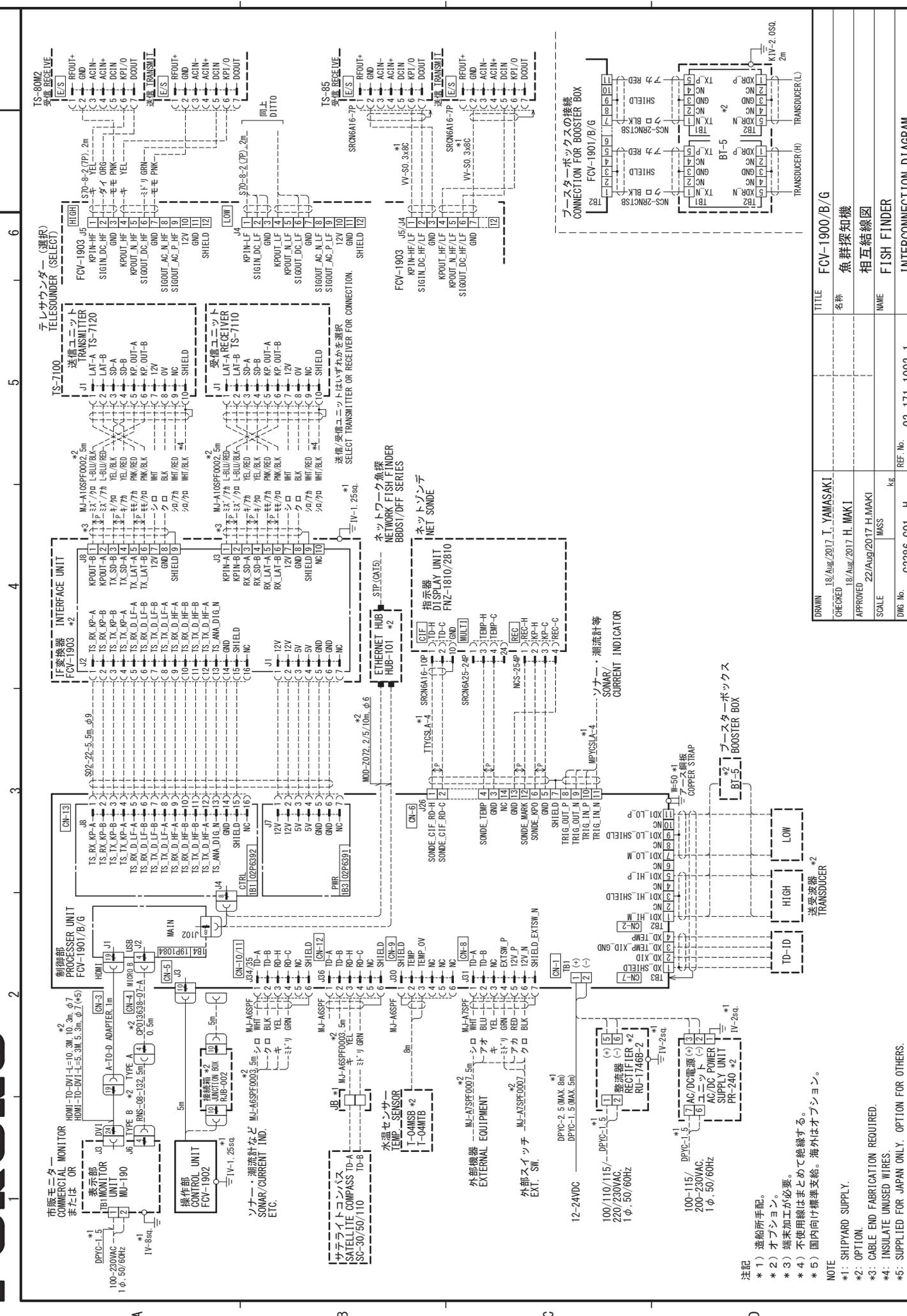


品番 ITEM	品名 NAME	材質 MATERIAL	数量 QTY	図番 DMC. No.	換 要 REMARKS
12	送波器 TRANSDUCER		1	CM599LH/LM PM111LH/LM	左記の種類より選択 SELECT AMONG 4 TYPES.
11	押え板 FIXING PLATE	SS400	1	02-171-6004	
10	スペーサ SPACER	SGP	4	02-171-6003	
9	平座金 FLAT WASHER	POM	4	T-201-11	呼び12 MONI12
8	平座金 FLAT WASHER	SUS316L	4		M12
7	バネ座金 SPRING WASHER	SUS316L	4		M12
6	六角ナット HEX. NUT	SUS316L	8		M12
5	電線貫通金物 THRU-HULL PIPE		1	TFB-7000(1)	1穴 1 HOLE
4	バネ座金 SPRING WASHER	SUS316L	8		M12
3	六角ボルト HEX. BOLT	SUS316L	8		M12x50
2	フランジ FIXING FLANGE	SS400	1	02-171-6002	
1	送波器ケース CASING	SS400	1	02-171-6001	

DRAWN	2/2015	T.YAMASAKI
CHECKED	2/2015	H.MAKI
APPROVED	4/2015	H.MAKI
SCALE	1/8	MSS
DMC. No.	C2001-141-A	
品名	送受波器タンク	
材質	送受波器装備用	
数量	1	
図番	02-171-600G-1	
換要	送受波器タンク	
備考	送受波器を含まず。 MASS DOES NOT INCLUDES TRANSDUCER.	
重量	87 kg	
REF. No.	02-171-600G-1	
品番	02-171-600G-1	

注記

- 1) 指定外の寸法公差は、表1の通りです。
- 2) * : 造船所手配
- 3) 送受波器ケースは、船底の傾きに合わせて切断してください。
- 4) 切断・溶接の際は、歪み防止のため送受波器を取り外した状態で“フランジ”を必ず取り付けておいてください。溶接方法は造船所一任。
- 5) 電線貫通金物は、パッキンを取り外して溶接してください。
- 6) 船尾側上端に空気抜き用穴(φ10×φ20程度)をあけてください。
- 7) 電線貫通金物はフレーム等の邪魔にならない所で、送受波器に当たらず、キャブナットが容易に締め付けられる位置に取り付けてください。
- 8) 網除け・保護タンクは、必要に応じて造船所にて製作してください。
- 9) 送受波器面は塗装しない様に注意してください。
- 10) 送受波器取付け後、A部の隙間をシリコン等で埋めてください。
- 11) ボルト類には焼き付き防止グリスを塗布してください。

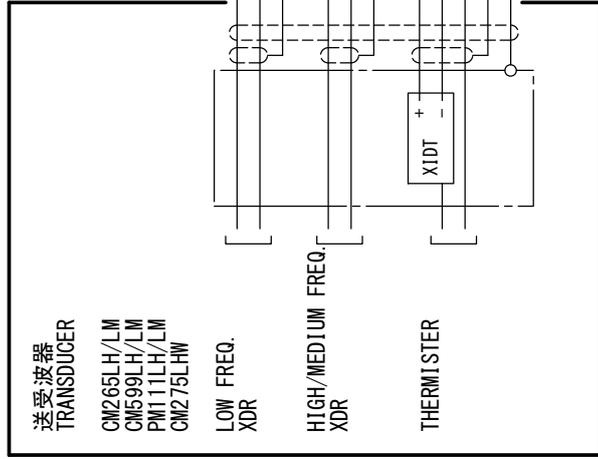


注記
 *1) 造船所手配。
 *2) オプション。
 *3) 端末加工が必要。
 *4) 不使用線はまとめて絶縁する。
 *5) 国内向け標準支給。海外はオプション。

NOTE
 *1: SHIPYARD SUPPLY.
 *2: OPTION.
 *3: CABLE END FABRICATION REQUIRED.
 *4: INSULATE UNUSED WIRES.
 *5: SUPPLIED FOR JAPAN ONLY. OPTION FOR OTHERS.

DRAWN	18/AUG/2017	I. YAMASAKI	TITLE	FCV-1900/B/G
CHECKED	18/AUG/2017	H. MAKI	名称	魚群探知機
APPROVED	22/AUG/2017	H. MAKI	相互結線図	
SCALE	1/25		NAME	FISH FINDER
DWG No.	02386-C01-H	kg	REF. No.	02-171-1002-1

INTERCONNECTION DIAGRAM



型式 MODEL	CM599LH/LM PM111LH/LM	CM265LH/LM CM275LHW
ケーブル長さ CABLE LENGTH	15 m	12 m

DRAWN	T./Jan/2016	T. YAMASAKI	TITLE	CM265LH/LM, CM599LH/LM, PM111LH/LM, CM275LHW
CHECKED	T./Jan/2016	H. MAKI	名称	送受波器
APPROVED	T./Jan/2016	H. MAKI		相互結線図
SCALE	MASS	kg	NAME	TRANSDUCER
DWG. No.	C2003-C01-B			INTERCONNECTION DIAGRAM
			REF. No.	

ECF

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9-52 Ashihara-cho,
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(ETMI) FCV-1900/1900B/1900G

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