JLN-550

DOPPLER SONAR

INSTRUCTION MANUAL

JRC Japan Radio Co., Ltd.

General Information

Thank you for purchasing the Japan Radio Co., Ltd. JLN-550 Doppler Sonar. The JLN-550 conforms to the IMO (International Maritime Organization) performance standards, provides accurate displays of ship's speed over a wide range from dead slow to maximum.

- Before attempting to operate this equipment, read this instruction manual thoroughly to ensure correct and safe operation in accordance with the warning instructions and operation procedures.

- You are strongly recommended to store this instruction manual carefully for future reference.
  In the event that you have an operational problem or malfunction, this manual will provide useful instructions.

Before You Begin

Symbols Used In This Manual

In this manual, and on the equipment, we use several warning signs to call your attention to important items that, if not handled correctly, could present danger to yourself or property. These warning note classifications are as described below.

Please be fully aware of the importance of these items before using this manual.

⚠ WARNING	**Indicates warning items that, if ignored, may result in serious personal injury or even death.**
⚠ CAUTION	**Indicates cautionary items that, if ignored, may result in personal injury or physical damage.**

Examples of Related Symbol Marks Used in this Manual and on the Unit

Each △ mark is intended to alert the user to the presence of precautions including danger and warning items. The picture in each △ mark ("Electric shock" in the example on the left.) alerts you to operations that should be carefully performed.

Each ⃠ mark is intended to alert the user to the presence of prohibited activity. The picture/word in/beside each mark ("Disassembling Prohibited" in the example on the left.) alerts you to operations that are prohibited.

Each ● mark is intended to alert the user to the presence of necessary instructions. The picture in each ● mark ("Disconnect the power plug" in the example on the left.) alerts you to operations that must be performed.

WARNING LABEL

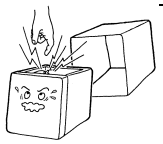
You can see the warning label on the top of the unit.

Do not attempt to remove the warning label from the unit or impair or modify it.

Usage Hints

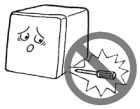
⚠ WARNING

Do not remove the cover of this unit. Otherwise, you may touch a high-voltage part and suffer from an electrical shock.



Do not touch the radiator fin of the unit. Doing so may cause a burn by high temperature.

Do not disassemble or modify this unit. Otherwise, a fire, an electrical shock, or a failure may occur.

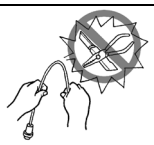


Do not place a vessel containing water, etc. or a metallic object on this unit. When water spills or when water or the object enters the unit, a fire, an electrical shock, or a failure may occur.

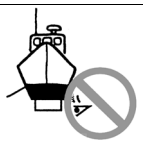
Do not use this unit at a voltage other than the supply voltage stated on the unit. Otherwise, a fire, an electrical shock, or a failure may occur.

Do not insert or remove the power cord or operate switches with a wet hand. Otherwise, you may suffer from an electrical shock.

Do not damage or modify the power cord(s). Placing a heavy object onto, heating, streching or bending the cord May cause a fire or electrical shock.

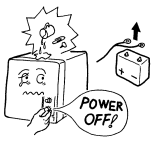


Do not preform maintenance on the transducer while the ship is in the water. Doing so may cause injury or water leakage to the ship.

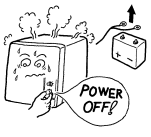


There are no customer-serviceable parts inside. Unauthorized inspections and repairs could cause fires and electrical shock hazards. Please call our field representative or your nearest JRC office for inspection and repair services.

In the event that you spill or drop any liquids or metals etc., turn off the main unit, unplug the power, and contact your sales agent outlet or one of JRC's branch offices, sales centers or liaison offices. Continuing operation as is may cause a fire, electric shock or malfunction.



In the event that smoking or burning odors are detected, immediately terminate operation of the unit and contact your sales agent outlet or one of JRC's branch offices, sales centers or liaison offices. Continuing operation as is may cause a fire or electrical shock. Never attempt to service the interior of the unit.

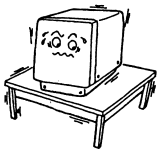


⚠ CAUTION

Contact our service center or agent for any electrical work or installation of this unit. With the exception of qualified service personnel, do not attempt to service this unit, as doing so may cause malfunction.

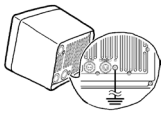
Do not install this unit is exposed to direct sunlight for a long time or the temperature rises above 55°C. Doing so may cause a fire or electrical shock. (Expect Wing Display)

Do not place the unit on a wobbly stand or any unsteady foundation. Doing so may cause the unit to fall resulting in injury or damage.



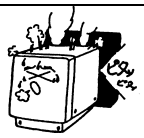
Do not bring the unit in a cooled state abruptly into a warm room. A high voltage may leak due to condensation may result in failure. In this case, use the unit set after leaving it alone for 30 min.

When installing this set, be sure to connect the grounding wire to the grounding terminal of the unit. Otherwise, you may suffer an electrical shock during a failure or leak.



Do not turn on the power switch of the unit while the ship is on the shore. Otherwise, the transducer may malfunction.

Do not covering for the unit. Otherwise, fire hazards or system failure can result from the heated set.



Reasonable care must be exercised for the routing of the transducer cable, power cable and grounding cable. Otherwise, the unit may adversely effect other equipment or vice versa.

External View

2-axis type

3-axis type

Contents

1. Introduction

1.1 Function

The JLN-550 Doppler Sonar is a system with one transducer mounted on the bottom of the vessel which direct beams of sonic radiation at an angle downward and measures the water speed and ground speed by using signals that are reflected from the sea bottom or an underwater layer.

It measures the speed along two different directions: longitudinal, bow transverse.

It calculates the speed stern transverse using the ROT(Rate of turn gyro) signal.

It also measures and display run distance.

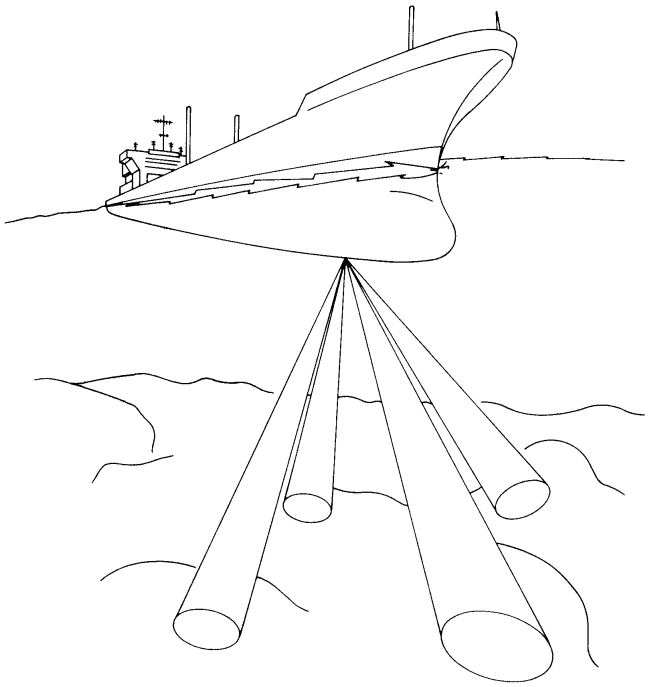


Figure 1.1 Doppler Sonar

1.2 Features

JLN-550 Doppler Sonar has the following features:

1) It can measure the ground speed within the depth range of approximately 2 meters through approximately 250 meters.

2) The water speed is measured simultaneously with ground speed.

3) Compact transducers.

4) High-recognition Main display using large size LED.

5) Supper-bright-LED units for the wing display which are easy to read even in direct sunlight.

6) Confirms to the following standards: IMO A.824(19), as amended by MSC.96(72), IMOA.694(17), IEC 62288:2014 IEC 61023:2007, IEC 60945:2002, IEC 61162-1:2016

1.3 Components

The standard equipment and options are shown in the tables below.

Standard Equipment

Description	Model No.	QTY	MASS	Remarks
MAIN DISPLAY	NWW-60DA -60DB -60TA -60TB	1	2kg	DA: 2 axis/Wall mount type DB: 2 axis/Flush mount type TA: 3 axis/Wall mount type TB: 3 axis/Flush mount type Select one.
SIGNAL DISTRIBUTOR	NQA-3012	1	10kg	
SIGNAL PROCESSOR	NJC-24	1	15kg	
TRANSDUCER	NKF-770	1	120kg	Flush mount type With cable 40m
SPAIR PARTS	7ZXBS0018	1		
INSTRUCTION MANUAL	7ZPBS2802F			

Options

Description	Model No.	QTY	MASS	Remarks
WING DISPLAY	NWW-61D -61T	2	5kg	D: 2 axis type T: 3 axis type Select one.
REMOTE DISPLAY	NWW-62DA/DB NWW-62TA/TB	1	1.3kg	D: 2 axis, T: 3 axis type A: Wall, B: Flush mount type
GYRO SENSOR	NJZ-1080	1	3kg	
OPERATOR UNIT	NWZ-120GA -120GB	1	3.5kg	GA: Wall mount type GB: Flush mount type Select one
RECTIFIER	NBA-3263	1	8Kg	For NWZ-120G
REMOTE DISPLAY	NWW-24xxxxx	2max	6.5kg	Analog flush mount type
REMOTE DISPLAY	NWW-25xxxxx		7kg	Analog wall mount type
REMOTE DISPLAY	NWW-26xxxxx		2.5kg	Analog small flush mount type
REMOTE DISPLAY	NWW-49A -49B	1	2.5kg	A: Wall mount type B: Flush mount type
DIMMER UNIT	NCM-227	1		For NWW-60/62 (For digital display)
DIMMER UNIT	NCM-329H	1		For NWW-24/26 (For analog display)
DIMMER UNIT	NCM-506	1		For NWW-49 (For digital display)
DISTANCE COUNTER	NWW-7	1		Flush mount type
TRANSDUCER	NKF-772	1		Gate Valve type With cable 40m

1.4 Construction

Equipment Outline

The unit dimension is as follow:

(1) Main Display NWW-60DB/TB

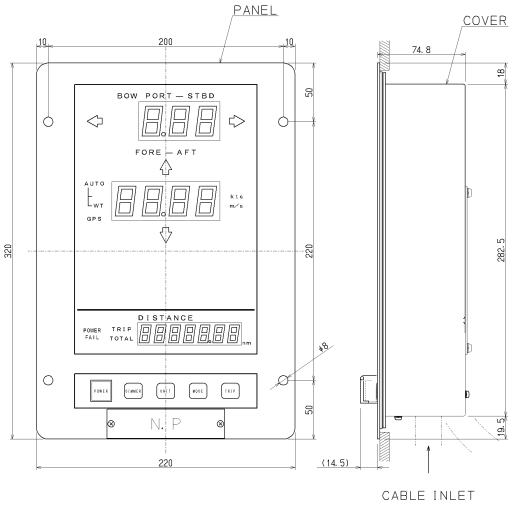


Figure 1.2 NWW-60DB (Unit: mm)

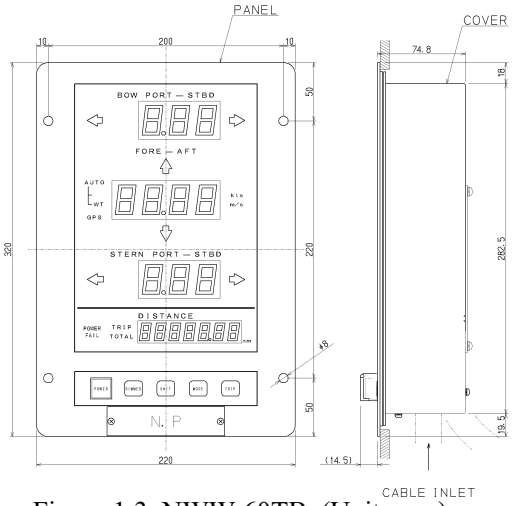


Figure 1.3 NWW-60TB (Unit: mm)

(2) Signal Distributor NQA-3012

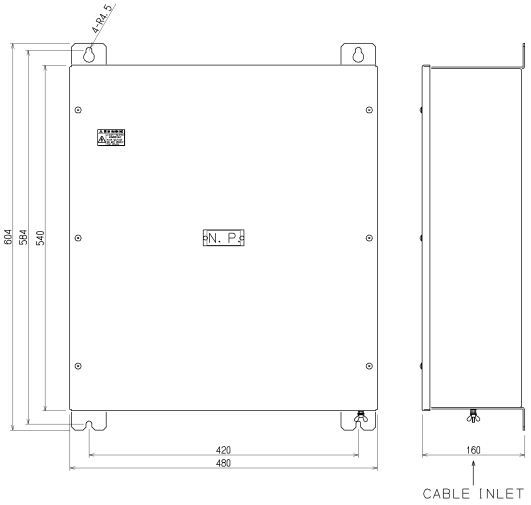


Figure 1.4 NQA-3012 (Unit: mm)

(3) Signal Processor NJC-24

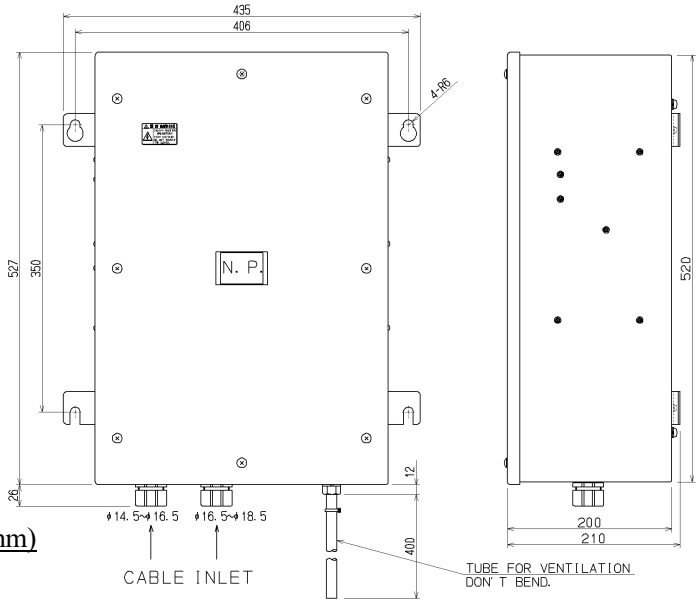


Figure 1.5 NJC-24 (Unit: mm)

(4) Transducer NKF-770

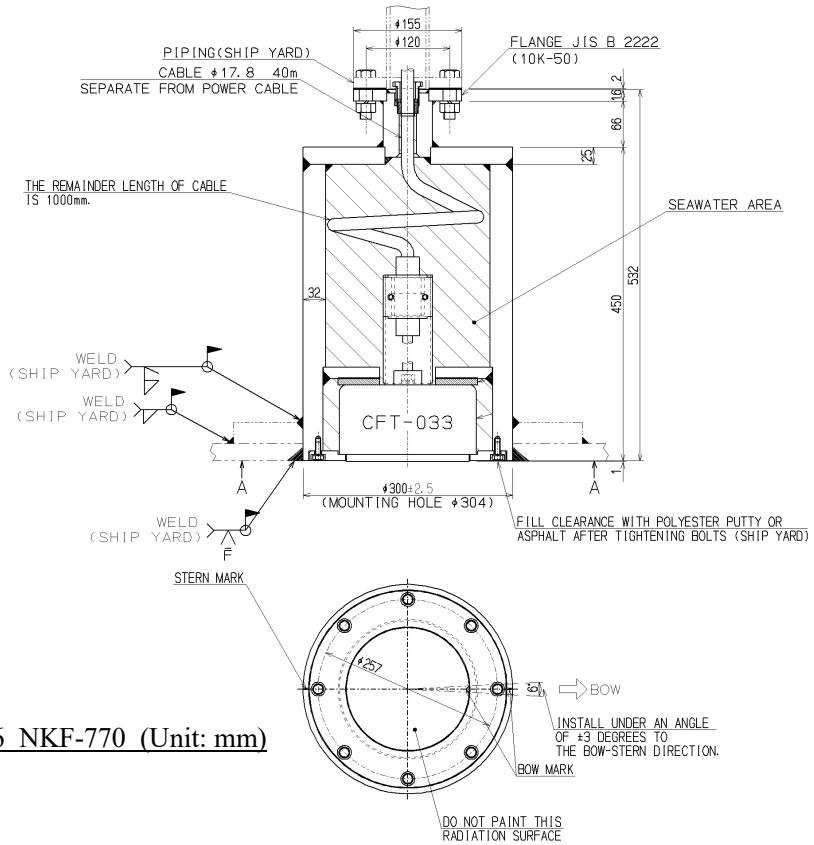


Figure 1.6 NKF-770 (Unit: mm)

(5) Wing Display NWW-61D/T (Option)

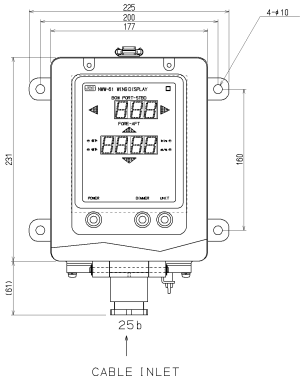


Figure 1.7 NWW-61D (Unit: mm)

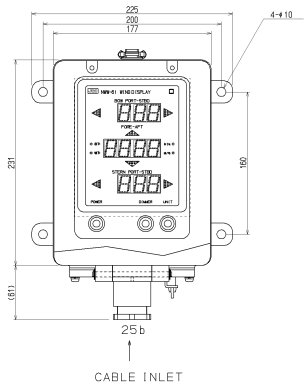


Figure 1.8 NWW-61T (Unit: mm)

(6) Remote Display NWW-62DB/TB (Option)

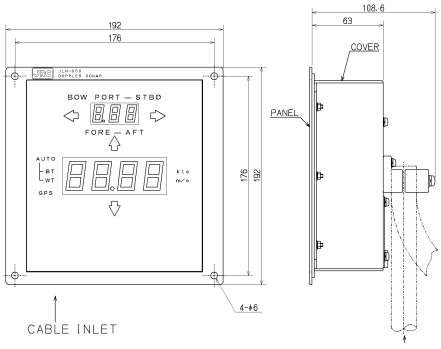


Figure 1.9 NWW-62DB (Unit: mm)

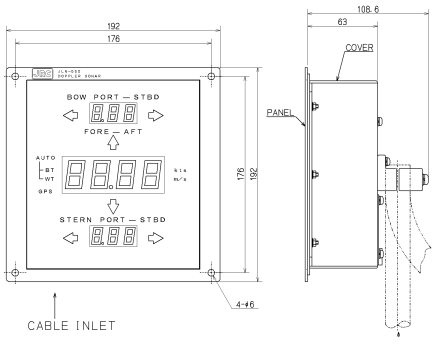


Figure 1.10 NWW-62TB (Unit: mm)

(7) Gyro Sensor NJZ-1080 (Option)

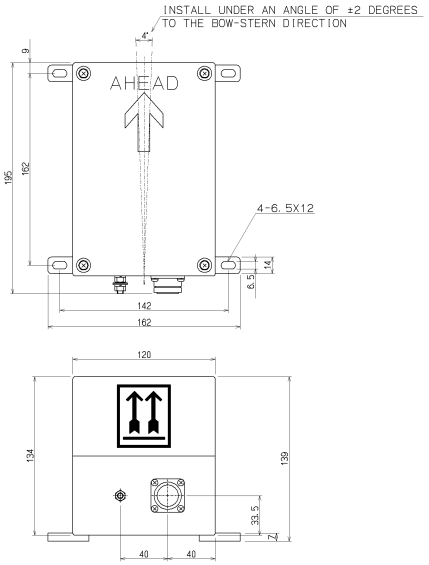
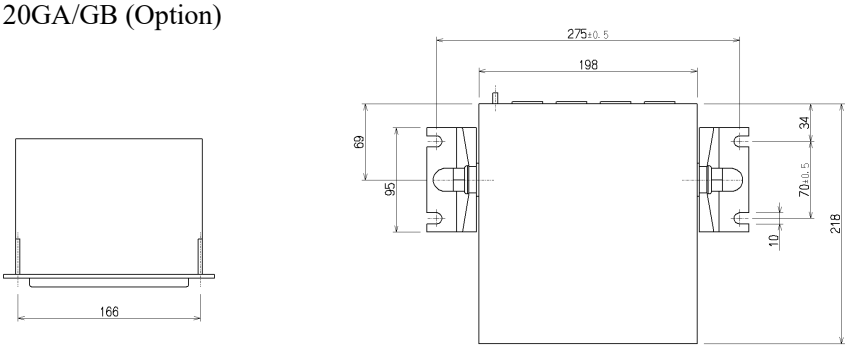


Figure 1.11 NJZ-1080 (Unit: mm)

(8) Operating Unit NWZ-120GA/GB (Option)



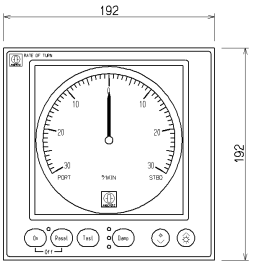


Figure 1.12 NWZ-120GA (Unit: mm)

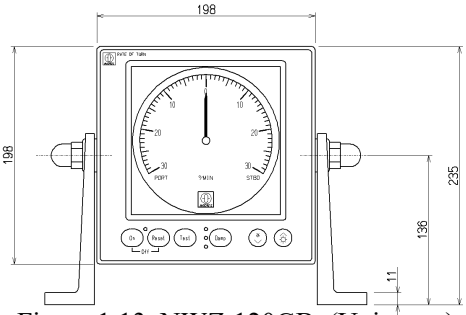


Figure 1.13 NWZ-120GB (Unit: mm)

(9) Rectifier NBA-3263 (Option)

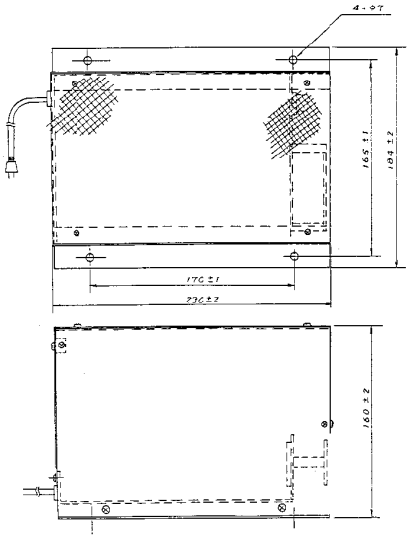


Figure 1.14 NBA-3263 (Unit: mm)

(10) Remote Display NWW-49A/B (Option)

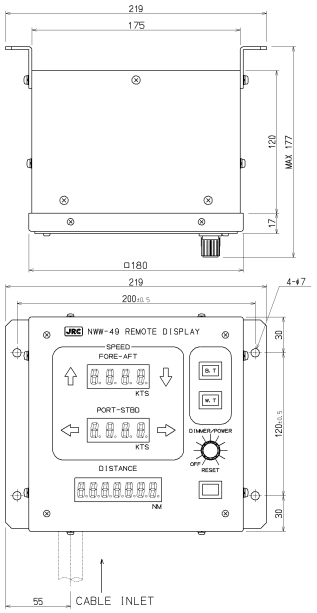


Figure 1.15 NWW-49A (Unit: mm)

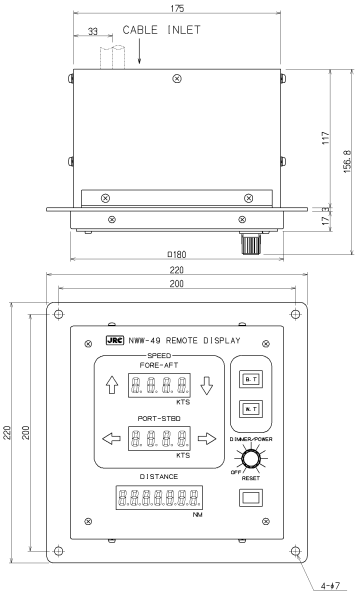


Figure 1.16 NWW-49B (Unit: mm)

(11) Remote Display NWW-24/25/26 (option)

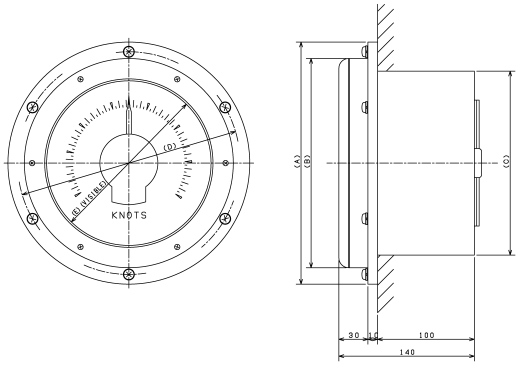


Figure 1.17 NWW-24 (Unit: mm)

Model

		NWW-24 (Finish mount)		NWW-25 (Wall mount)		NWW-26 (Panel mount)	
Area	Size	Green	Orange	Green	Orange	Green	Orange
-4~20kt	L	NWW-24L20G	NWW-24L20O	NWW-25L20G	NWW-25L20O	NWW-26L20G	NWW-26L20O
	M					NWW-26M20G	NWW-26M20O
	S	NWW-24S20G	NWW-24S20O	NWW-25S20G	NWW-25S20O	NWW-26S20G	NWW-26S20O
-5~25kt	L	NWW-24L25G	NWW-24L25O	NWW-25L25G	NWW-25L25O	NWW-26L25G	NWW-26L25O
	M					NWW-26M25G	NWW-26M25O
	S	NWW-24S25G	NWW-24S25O	NWW-25S25G	NWW-25S25O	NWW-26S25G	NWW-26S25O
-6~30kt	L	NWW-24L30G	NWW-24L30O	NWW-25L30G	NWW-25L30O	NWW-26L30G	NWW-26L30O
	M					NWW-26M30G	NWW-26M30O
	S	NWW-24S30G	NWW-24S30O	NWW-25S30G	NWW-25S30O	NWW-26S30G	NWW-26S30O

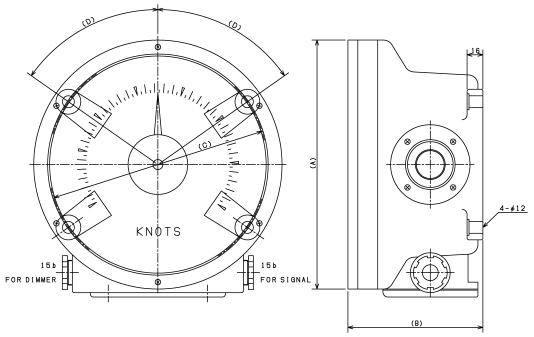


Figure 1.18 NWW-25 (Unit: mm)

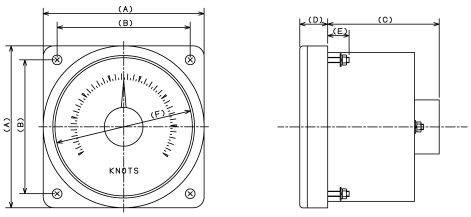


Figure 1.19 NWW-26 (Unit: mm)

(12)Dimmer Unit NCM-227 / NCM-329H / NCM-506 (Option)

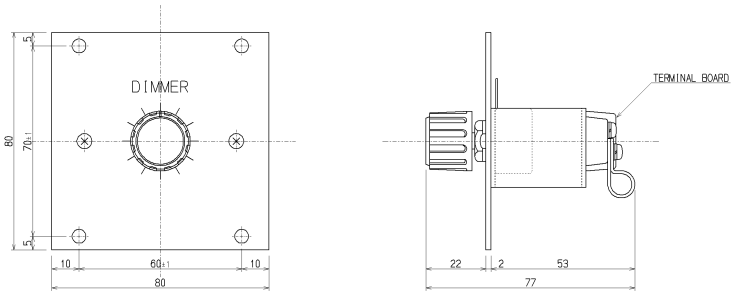


Figure 1.20 NCM-227/329H/506 (Unit: mm)

(13) Distance Counter NWW-7 (Option)

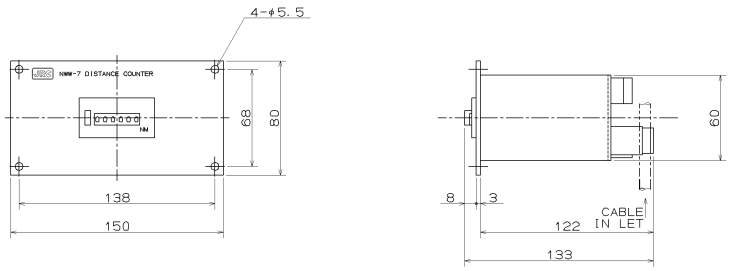


Figure 1.21 NWW-7 (Unit: mm)

(14) Transducer NKF-772 (Option)

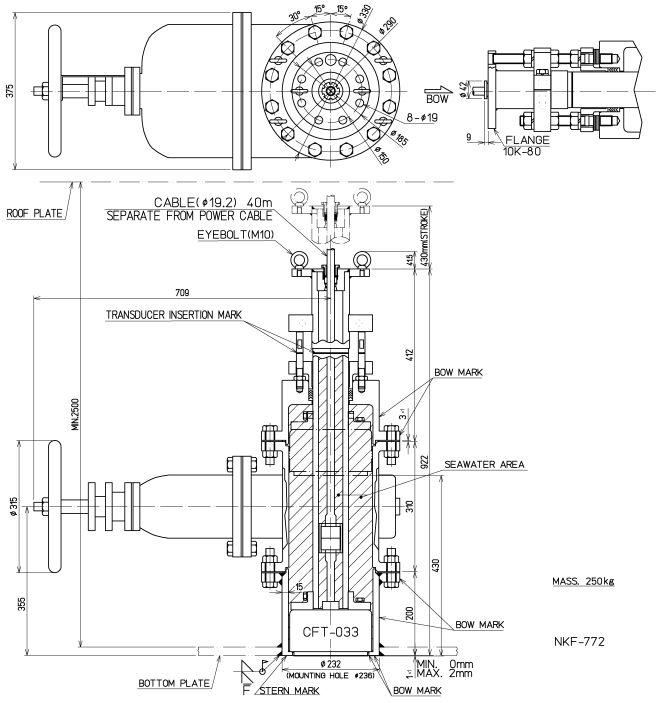
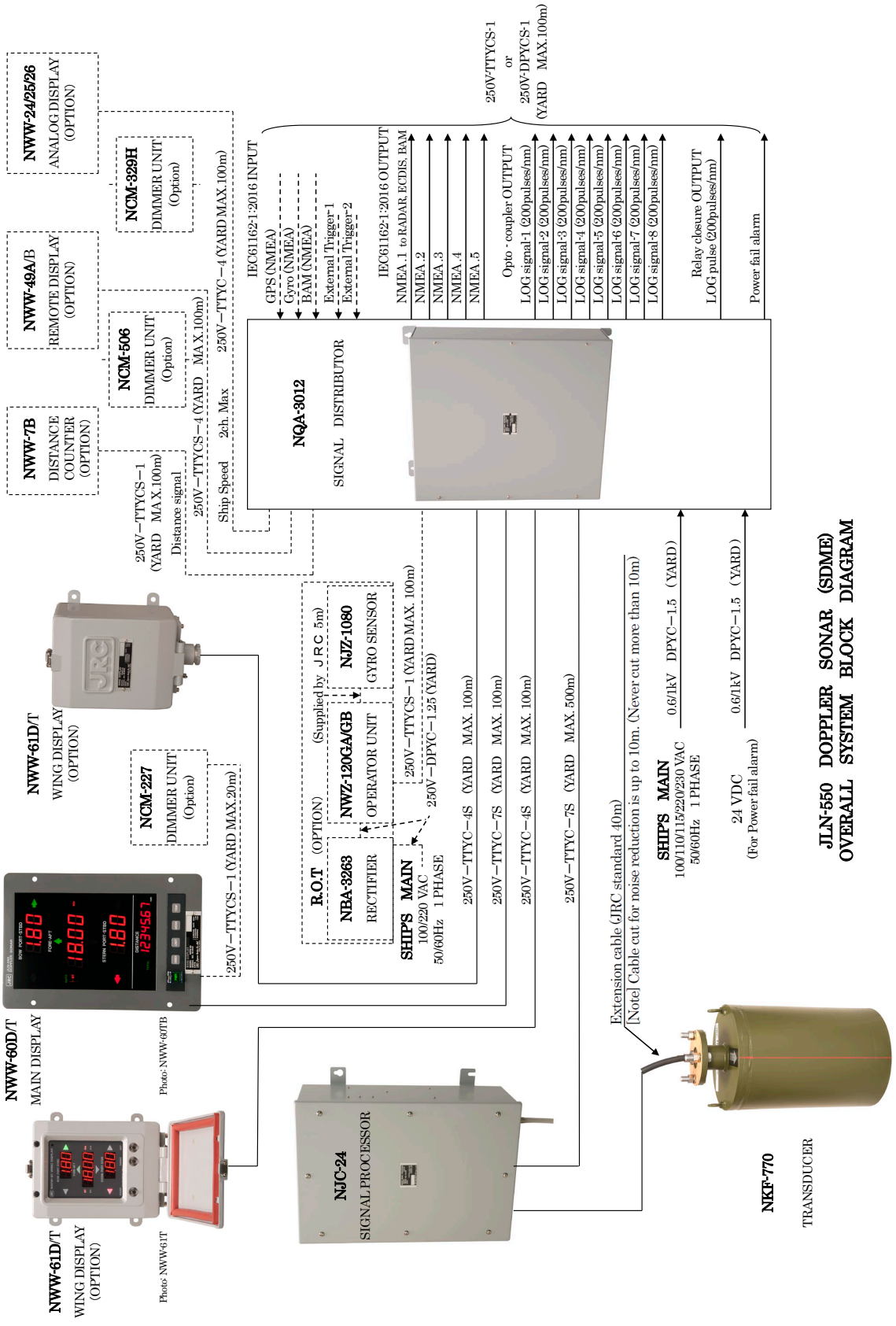


Figure 1.22 NKF-772 (Unit: mm)

1.5 System Configuration



2. Names and Functions of the Components

The panel keys and their functions are shown below.

(1) Main Display

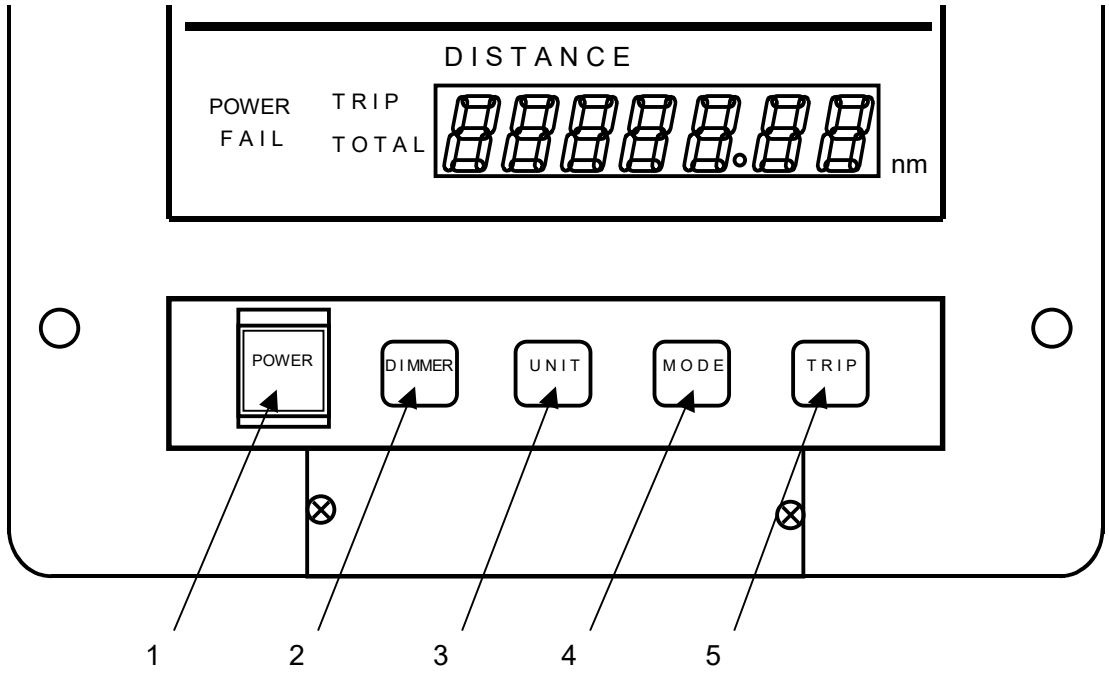


Figure 2.1 Operation Panel in the Main Display

No.	Keys	Functions
1	POWER	Alternately change POWER ON or POWER OFF
2	DIMMER	Adjust brightness
3	UNIT	Alternately change kts or m/s of speed unit
4	MODE	Cyclic change AUTO, BT, WT, GPS
5	TRIP	Alternately change TOTAL or TRIP of the distance

(2) Wing Display (Option)

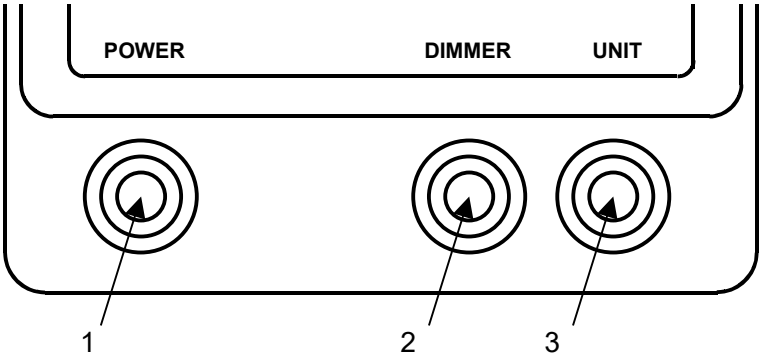


Figure 2.2 Operation Panel in the Wing Display

No.	Keys	Functions
1	POWER	Alternately change POWER ON or POWER OFF
2	DIMMER	Adjust brightness
3	UNIT	Alternately change kts or m/s of speed unit

(3) Remote Display (Option)

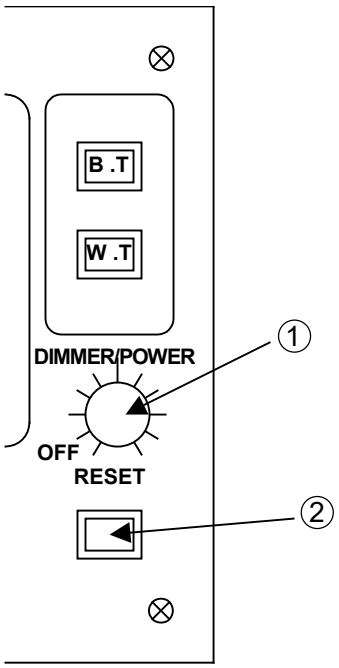


Figure 2.3 Operation Panel in the Remote Display

No.	Keys	Functions
1	DIMMER/POWER	Switch POWER ON or POWER OFF, and Adjust Brightness
2	RESET	Reset distance

(4) Operator Unit (Option)

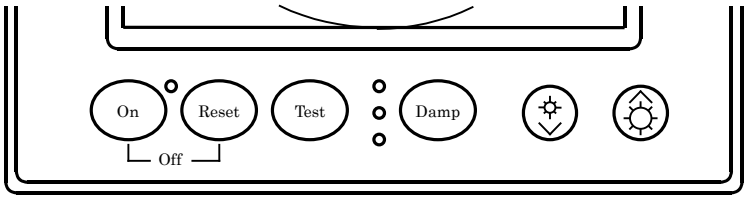


Figure 2.4 Operation Panel in the Operator Unit

See ORETATOR MANUAL (Rate-of-Turn Indicator Equipment)

3. Installation

⚠ CAUTION	
	When installing this set, be sure to connect the grounding wire to the grounding terminal of the unit. Otherwise, you may suffer an electrical shock during a failure or leak.
	Do not install this unit is exposed to direct sunlight for a long time or the temperature rises above 55°C. Doing so may cause a fire or electrical shock. (Expect Wing Display)
	Do not place the unit on a wobbly stand or any unsteady foundation. Doing so may cause the unit to fall resulting in injury or damage.
	Do not covering for the unit. Otherwise, fire hazards or system failure can result from the heated set.
	Reasonable care must be exercised for the routing of the transducer cable, power cable and grounding cable. Otherwise, the unit may adversely effect other equipment or vice versa.

3.1 Installing the Display and Distributor and Processor Unit

Mounting Location

As the signal cable may receive or generate noise, install the unit in a place that is free of interference.

Do not install the unit near DSB devices, amateur radio or their coaxial cables.

Install it in a place that is more than 1.8 meters from equipment that generates a strong magnetic field (for example, radar magnetron or speakers) and magnetic compasses.

Install it in a place where it will not be in direct sunlight (expect Wing Display) or hit by spray from waves or hot air exhaust.

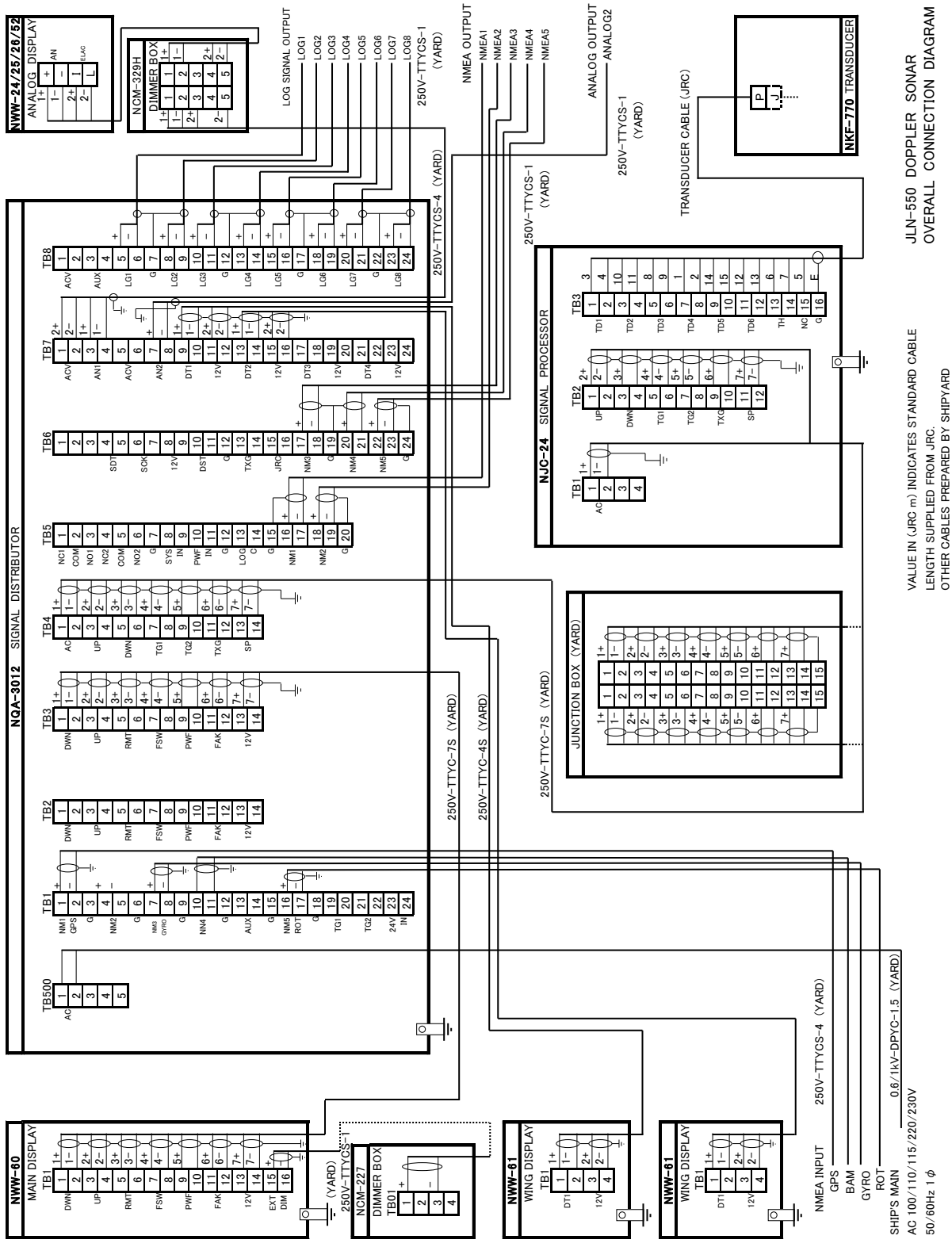
3.2 Mounting the Transducer

Mounting Location

The ultra sound waves that are used to measure ship speed can not make correct measurements if air bubbles are present effecting the transfer of sound waves. It is necessary to avoid the source of bubbles and the stream of bubbles when selecting a position to mount the transducer.

We recommend consulting with the manufacturers of the vessel, as information about the actual situation for vessels with a similar hull structure is important when selecting a position to mount the device.

3.3 Connection Diagram



4. Operation

4.1 Basic Operation

(See Fig. 2.1)

Power ON and Brightness Adjustment

Power ON/OFF

1) Press PWR switch to turn the unit on.
2) Alternately change Power ON or Power OFF.

After power-on, "550" is initially displayed in the FORE-AFT ship's speed display window and the brightness level of the display alternates between "H" (High) and "L" (low). After the elapse of about one minute, the display mode changes to normal display.

Brightness Adjustment

1) Press DIMMER switch to adjust the brightness so that you can read the screen easily.
2) Each time you press DIMMER , the display becomes brighter. The brightness levels can be adjusted in six increment.

Dark brightness levels Bright

H → L → 1 → 2 → 3 → 4 → 5 → 6

↑ ↓

The brightness level “H” and ”L” are AUTO-DIMMER mode. Depending on the amount of external light, the AUTO-DIMMER automatically controls illuminance via the photosensor provided in the panel. At the "H" setting, illuminance is controlled for brighter display, and at the "L" setting, illuminance is controlled for darker display.

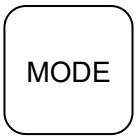
A press of the DIMMER switch on the panel displays the current setting of the brightness level for three seconds in the DISTANCE display window. A re-press of the switch during the display updates the current setting by one level.

Vessel Speed Unit

1) Press UNIT switch to turn alternately [kts] or [m/s] for the vessel speed unit.

1 [m/s] = (1852m ÷ 3600Sec)×1 [kts]

Operating Mode



1) Press MODE switch to change operating mode.
2) Each time you press MODE , the unit can be setting in fore operating mode.

Operating mode

AUTO → BT → WT → GPS

↑ ↓

AUTO: Ground speed(BT) or water speed(WT) automatic switching
BT: Forced ground speed(BT: Bottom Tracking)
WT: Forced water speed(WT: Water Tracking)
GPS: Fore/Aft. Port/Stb. Speed based upon data from the GPS navigator is displayed.

In AUTO mode, Ground speed (BT) read preferentially..
Speed measurement depth is as follows:
Ground tracking (BT): 2m to 250m below hull bottom.
Water tracking (WT): Aprox. 3m below hull bottom.
(Above figures will changed depending on installation conditions and surrounding water conditions and the hardness of bottom.)

Distance Display Mode

1) Press TRIP switch to turn alternately [TRIP] or [TOTAL] for the distance display mode.

TRIP: Trip distance counter is used to calculate the distance of each of the individual segments between the points.

TOTAL: Total distance counter is used to calculate the total run distance of the whole journey.

As shown below, when a vessel leaves point A, stop over at points B, C, and D, and then goes back to point A, the trip distance counter is used to calculate the distance of each of the individual segments between the point and the total distance counter is used to calculate the total run distance of the whole journey.

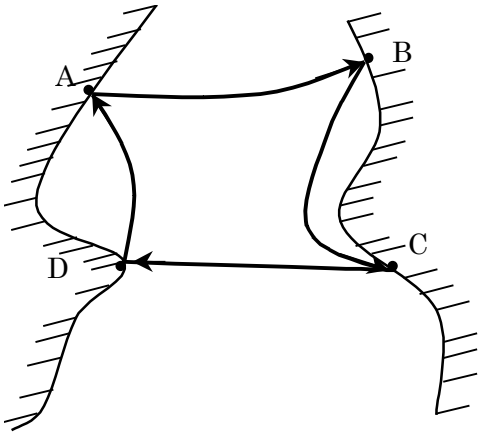
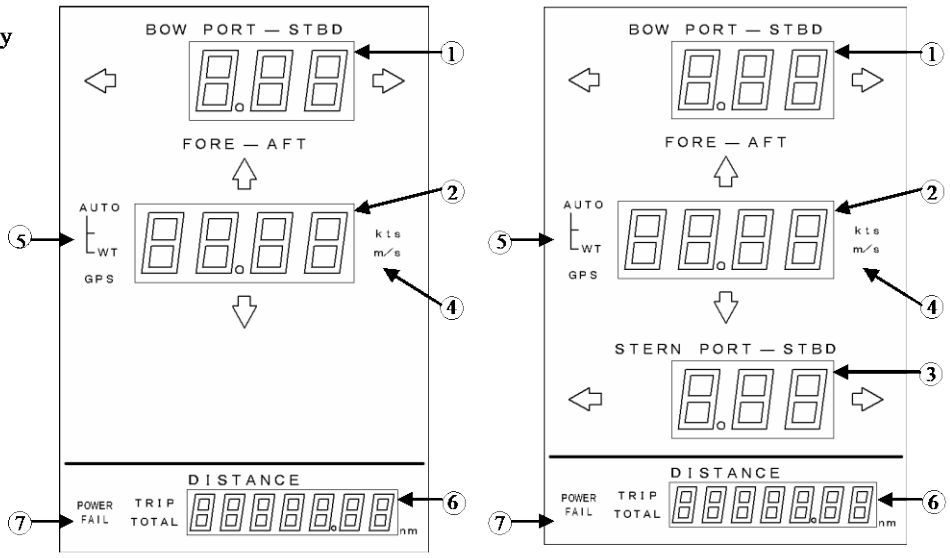


Fig.4.1 Trip-distance counter and Total-distance counter

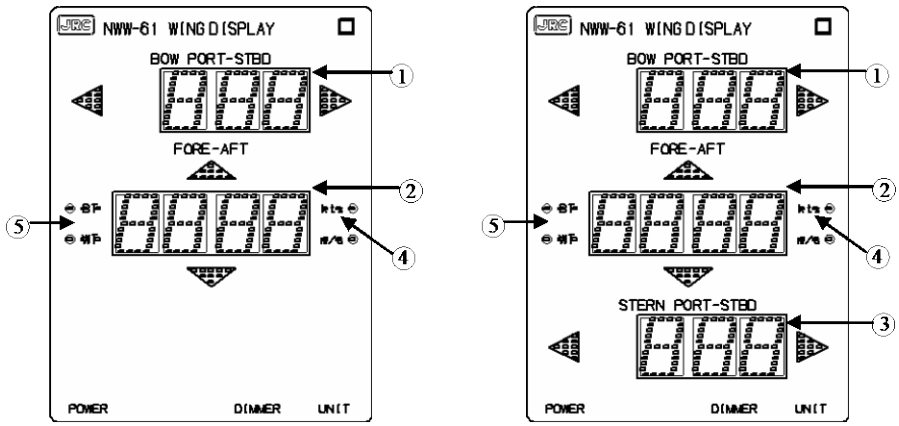
4.2 Ship speed Display

The Ship speed display shows the ship's Fore/Aft. and Port/Stb. speed and direction.

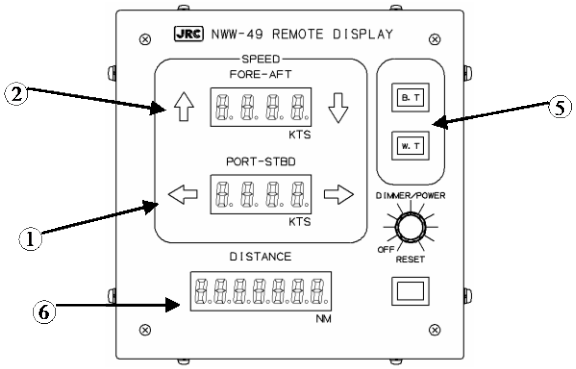
Main Display



Wing Display (Option)



Remote Display (Option)



① Transverse speed at BOW (No indication when WT mode)
② Longitudinal speed
③ Transverse speed at STERN (No indication when WT mode)
④ Speed unit
⑤ Operating mode
⑥ Trip or total distance
⑦ Power fail

Operating mode

Setting	Operation	Mode Lamp : Blinking in 2.5sec. interval
AUTO	BT /WT automatic	AUTO + BT : Bottom-Track measuring mode AUTO + WT : Water-Track measuring mode
BT	Force BT	BT : Forced Bottom-Track measuring BT : Bottom-Track is lost(Data is hold)
WT	Force WT	WT : Forced Water-Track measuring WT : Water-Track is error(Data is hold) In case of the depth shallow then 3 meters.
GPS	Based GPS	GPS : Speed based upon GPS data calculating GPS : GPS or GYRO is error(Data is hold)

Speed Display

Display / Mode	Fore/After speed	Port/Starboard speed	
		Bow	Stern
BT	Indication	Indication	Indication
WT	Indication	NO	NO
GPS	Indication	Indication	Indication

Digital Interface (IEC 61162-1) VBW Output

Data Field / Mode	Water Speed Data	Ground Speed Data
BT & WT	Doppler measuring	Doppler measuring
GPS	Doppler measuring	GPS data calculating

The details of each operation mode

- AUTO (the BT /WT automatic switching mode)

  A ground speed is indicated when the depth of water from hull bottom is in the range of about 2 - 250m. While a ground speed is indicated, both of the AUTO lamp and the BT lamp are turned on. When the depth of water from hull bottom becomes deeper than about 250m, automatically changes in the water track mode. Both of the AUTO lamp and the WT lamp are turned on during the water speed indication.

  Even if the depth of water from hull bottom is more than 2m, a ground speed can't be sometimes measured in the case such as the mud that the sea bottom absorbs a sound wave to. It changes to the water speed indication in such a case.

  And, even if the depth of water from hull bottom is under 250m, a receiving signal sometimes decrease too much in the sea area where seabed inclination is big and ups and downs are drastic.

In this case, because measuring of the ground speed becomes impossible, it sometimes changes to the water speed indication.

It sometimes changes to the ground speed indication by accident when the fish school of the very big reflection signal and a plankton layer are continuing within the depth of water 250m even if the depth of water from hull bottom is more than 250m. It is changed to the forced WT mode, and used in such a case.

- BT (the forced BT mode)

  It is used when obviously the depth of water from hull bottom always becomes stable under 250m and wants a ground speed indicated.

  It turns on a BT lamp, and a ground speed is indicated when the depth of water from hull bottom is in the range of about 2 - 250m.

  When the depth of water from hull bottom is about more than 250m, a BT lamp is made to go on and off, and switching of the mode is required. In this case, former ground speed value is held and indicated.

  Even if the depth of water from hull bottom is more than 2m, measuring of the ground speed becomes impossible during coming alongside in the case such as the mud that the sea bottom quality absorbs a sound wave to. In this case, a BT lamp is made to go on and off, and former ground speed value is held and indicated.

  The sound wave of the measuring beam is shut out when the bubble that appeared on the part of the bow at the time of the stormy weather, reaches to the transducer of hull. A ground speed can't be sometimes measured under even 250m in such a case.

  And, even if the depth of water from hull bottom is under 250m, some of the receiving signals inside the measuring beam may decrease too much, and measuring of the ground speed becomes impossible in the sea area whose seabed inclination is big, and the ups and downs. In this case, a BT lamp is made to go on and off, and former ground speed value is held and indicated.

  Both of the ground speed and the water speed are always outputted to the external devices regardless of the setup of this mode.

- WT (the forced WT mode)

  It sometimes changes to the ground speed indication by accident when the fish school of the very big reflection signal and a plankton layer are continuing within the depth of water 250m even if the depth of water from hull bottom is more than 250m. It is used when it isn't based on such a case and the depth of water and it always wants a water speed indicated

  When the depth of water from hull bottom is under 3m, a WT lamp is made to go on and off, and the value of the former ground speed is held and indicated.

  An error may arise in the value of water speed when the bubble that appeared on the part of the bow at the time of the stormy weather reaches it to the transducer of hull.

  Both of the ground speed and the water speed are always outputted to the external devices regardless of the setup of this mode.

- GPS (It may not be able to be chosen by the specification.)

  The ground speed that it resolved into the longitudinal and transverse direction of the ship is indicated from ship speed and course information calculated by GPS receiver.

  The part of the BT speed of the output data changes to the speed by GPS.

  The connection of the GPS receiver and GYRO is necessary for this indication.

- Reference: Indication for transverse speed at STERN (only in the case of 3 axis specification)

  It is indicated in the case of the AUTO/BT mode or forced BT mode and the GPS mode.

  The transverse speed of the BOW part and the STERN part can indicate a speed in the position to specify a vessel.

  The input of the rate of turn information of the ship is necessary for this indication.

  (The connection of ROT or GYRO)

4.3 Distance run Display

The Distance Run increase per 0.01nm of the Fore speed element only.

- Resetting the Trip-Distance

  Push UNIT and TRIP key of the panel at the same time.

  Then, the trip distance counter is reset.

- Resetting the Total-Distance

  Turn on the power switch PWR while long pushing TRIP key. And release TRIP key.

  After it rings "Pitsu" at about 1 minute, turn off power.

  After a few minutes, the total distance is initialized.

  (This operation is complex to protect it from a careless operation.)

5. Maintenance

⚠ WARNING

There are no customer-serviceable parts inside. Unauthorized inspections and repairs could cause fires and electrical shock hazards.
Please call our field representative or your nearest JRC office for inspection and repair services.

5.1 Daily maintenance

The life of the device depends on how daily maintenance and inspection are performed carefully. To keep the device in the best condition at all times, it is recommendable to perform periodical inspections constantly. Any failure in the device can be prevented before it occurs through such inspections.

Please perform the inspections shown in the table below periodically.

Maintenance and inspection methods

Caution: Be sure to turn off power before starting inspection of the device.

No.	Item	Maintenance and inspection
1	Cleaning	Remove stains from the panel face, controls, switches, top cover, and bottom cover by wiping them lightly with dry cloth. Thoroughly clean the ventilation hole, in particular, using a feather to assure good flow of air.
2	Loosening of parts	Check screws, nuts, controls, switches, volume knobs, connectors, etc. for any looseness to prevent them from dropping off and retighten them correctly.
3	Cable Unit	Inspect the state of connection of cables between units as well as connectors so that they are connected correctly.
4	Fuses	When the power fuse has blown, replace it after finding the cause. Use a fuse sealed in a glass tube (included in the spare parts).

Attention: When cleaning the surface, do not use any organic solvent such as thinner or benzine. Otherwise, the painting on the surface may be damaged. For cleaning the surface, remove the dust and refuse and wipe with clean dry cloth.

5.2 Troubleshooting for Malfunctions or Abnormalities

Contact our service center or agent when any of the following is observed:

- The display does not light up, the whole unit is not turned on after the power switch has been set ON or when does not appear on the display.
- Smoking, burning odors or unusual heat is emitted by the unit.
  When any of this happens, turn off the unit and pull out the power cable.
  Then, contact our center or agent.

6. Consider Installation

Avoid the installation of this set in one of the following places. Otherwise, a failure will occur or the life of the set will be shortened.

1. A place exposed to direct sunlight. (Expect Wing Display)

2. A place exposed to water splash. (Expect Wing Display)

3. A place with poor ventilation

   Particular care should be taken when this set is used in a water-proof box. The rear panel that is heated too much may damage the power unit and/or transmitter.

7. After-Sales Service

7.1 When ordering a repair

When a failure has been detected, stop operation and contact the dealer or agent from which you purchased the device or one of our branches, marketing offices, and representative offices.

ℓ Repair during warranty period

Should a malfunction occur when the unit has been operated according to descriptions and instructions in the instruction manual, it will be repaired free of charge. However, breakdowns resulting from abuse, negligence, natural disaster, fire or other unforeseeable incident will be charged.

ℓ Repair after warranty period

Repairs that restore normal operation made after the warranty period have to be paid in full by the client.

ℓ Product data that should be provided when you ask for service

. Name of product, model, date of manufacture and serial number
. Description of malfunction (as detailed as possible)
. Company address or name of organization, address and telephone number

7.2 Recommendation of overhaul

The performances of the set may deteriorate due to the aging of parts, and so on through the rate varies depending on the conditions of use. So it is recommendable to contact the dealer from which you purchased the device or one of our marketing offices for overhaul apart from daily service. Incidentally, such overhaul will be performed with charge.

Please contact the dealer from which you purchased the device or our marketing office that is nearest to you for any question as to the after-sales service.

8. DISPOSAL

Disposal of the Equipment

• Observe all local laws and regulations when disposing of this unit.

9. SPECIFICATIONS

Operation system	: Two - axis, four - beam pulse Doppler Sonar or Three - axis, four - beam pulse Doppler + Rate of turn gyro system (Rate of turn gyro is option)		
Operation frequency	: 240kHz (BT: Bottom Tracking) 2MHz (WT: Water Tracking)		
Speed measurement range	: BT	Fore/aft.	–10.00 to +40.00 kts
		Port/stb.	–9.99 to +9.99 kts
		Stern P/S	–9.99 to +9.99kts (need ROT)
	: WT	Fore/aft.	–10.00 to +40.00 kts
Run distance display range	: 0 to 99999.99nm		
Depth range	: BT	2 to 250m	(below hull bottom)
	: WT	greater than 3m	(below hull bottom)
Speed accuracy	: ±1% or ±0.1kts whichever value is greater		
Distance accuracy	: ±1% or ±0.1nm in each hour whichever value is greater		
Display	: Digital display Speed unit = kts or m/s		
Signal input	: External trigger pulse from onboard echo sounding equipment --- 2 circuits		
Signal output	: Ship speed --- 2 circuits DC voltage signal for remote analog display (-2VDC to +10VDC) : LOG pulse --- 1 circuit Relay closure signal (200 pulses/nm,30V,1A max) : LOG signal --- 8 circuits Opto coupler signal (200 pulses/nm, 30V,50mA max) : Distance signal --- 1 circuit Relay closure signal for distance counter (35V,0.1A max) : Power fail alarm --- 1 circuit Relay closure signal (250V,5A max)		

IEC61162-1:2016 input :5 circuits

: ROT for Stern-port/stb. speed display
(ROT)* *: except GPROT

: GPS for GPS speed display
(GGA, RMC, RMA, GLL, VTG)

: GYRO for GPS speed display
(HDT, HDG)

: BAM: for alert acknowledge
(ACN ID: 10111,10 385)

IEC61162-1:2016 output :5 circuits (VBW, VLW, DPT, DBT, HBT, ALF, ALC)
（ALF,ALC ID=10111 WT speed lost, ID=10385 BT speed lost）
(ARC Non-supported)

Power supply : 100/110/115/220/230VAC ±10%
1ϕ, 50/60Hz, 300VA or less (average)

Operating temperature range : –15 to +55°C

APPENDIX

1. Remarks on Error resulting from deviation of radiation angle from the reference value

Hull movement causes deviation of radiation angle from the reference value.

Generally, the balanced array shown in Fig. 10.1 is often adopted in the Doppler sonar in order to reduce the error caused by various hull movements. The following discusses this tolerance in comparison with the single beam method.

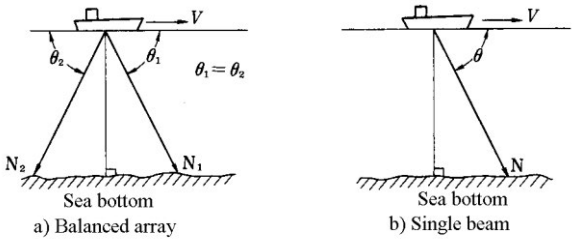


Fig. 10.1 Doppler effect

1.1 Error caused by hull movement

The speed error caused by a deviation angle such as rolling and pitching is indicated by Fig.10.4. An explanation how this is calculated is shown below.

(1) Vertical velocity

Only the velocity in the horizontal direction is important for ship. Vertical velocity is also caused by swell and other factors, and appears in the form of an error.

When the horizontal velocity is assumed as U, as shown in Fig. 10.2, the Doppler shift frequency f_{d1} with respect to beam N1 is expressed by the following equation 10.1.

$$f_{d1} = \frac{2f_0}{C}(V\cos\theta_1 - U\sin\theta_1) \qquad (10.1)$$

Similarly, Doppler shift frequency f_{d1} with respect to N2 is expressed by the following equation 10.2.

$$f_{d2} = \frac{2f_0}{C}(-V\cos\theta_2 - U\sin\theta_2) \qquad (10.2)$$

Assuming that $\theta_1 = \theta_2$, we get (10.3) in the balanced array.

$$f_d = f_{d1} - f_{d2} = \frac{4f_0V}{C}\cos\theta_1 \qquad (10.3)$$

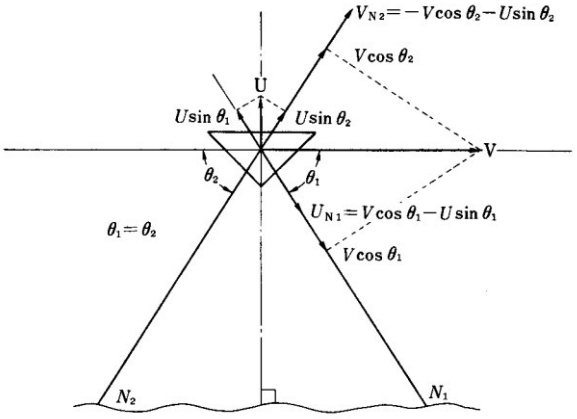


Fig. 10.2 Effect of vertical velocity

The vertical velocity components cancel each other, without affecting the Doppler shift frequency. Thus, the Doppler shift frequency is double that of the single beam method.

(2) Trim and heel

When there is an offset of δ with respect to the vertical line as shown in Fig. 10.3, the Doppler shift frequencies occurring to the beams N_1 and N_2 are expressed by the following equations, respectively:

$$f'_{d1} = \frac{2Vf_0}{C}(\cos\theta\cos\delta - \sin\theta\sin\delta)$$

$$f'_{d2} = \frac{2Vf_0}{C}(\cos\theta\cos\delta + \sin\theta\sin\delta)$$

The error due to balanced array is obtained from Eq. 10.4.

$$\varepsilon_\delta = 100(\cos\delta - 1)\ \% \qquad (10.4)$$

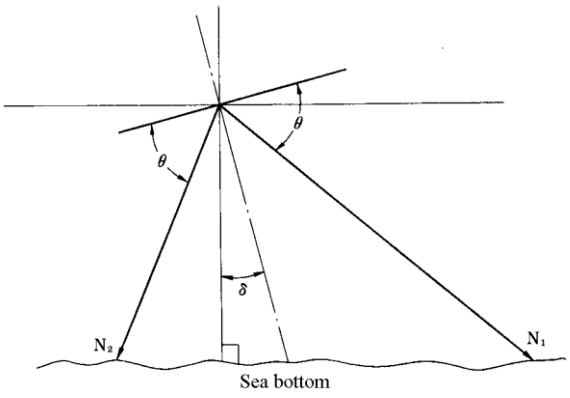


Fig. 10.3 Vertical offset errors

The error in single beam method is expressed by Eq. 10.5.

$$\varepsilon'_\delta = 100\ (\cos\delta + \tan\theta \sin\delta - 1)\ \%$$

or $$\varepsilon'_\delta = 100\ (\cos\delta - \tan\theta \sin\delta - 1)\ \% \qquad (10.5)$$

Thus, it can be seen that the error due to balanced array is always negative, independently of the beam radiation angle.

The following calculate an error when an offset of 5° degrees has occurred:

$$\varepsilon_\delta = -\ 0.38\ \%$$

$$\varepsilon'_\delta = +\ 2.15 \text{ or } -1.85\ \%$$

The balanced array has a smaller error than the single beam method, and is therefore more advantageous.

(3) Error due to pitching and rolling

When pitching and rolling have occurred, we get the same result as when δ in Eq. 10.4 and Eq. 10.5 is assigned with the following values:

$\delta \rightarrow \delta(t) = \delta_m \sin\omega t$

δ_m = Maximum deflection angle

ω = Angular frequency of motion

The average Doppler shift frequency in balanced array can be expressed by the following:

$$\overline{f'_d} = \overline{f'_{d1} - f'_{d2}} = \frac{1}{T}\int_{-\frac{T}{2}}^{\frac{T}{2}} \cos\theta \cos\delta(t)\, dt$$

$$= \frac{4Vf_0}{C}\cos\theta \cdot \frac{\omega}{2\pi}\int_{-\frac{\pi}{\omega}}^{\frac{\pi}{\omega}} \cos(\delta_m \sin\omega t)\, dt$$

$$= \frac{4Vf_0}{C} J_0(\delta_m) \qquad (10.6)$$

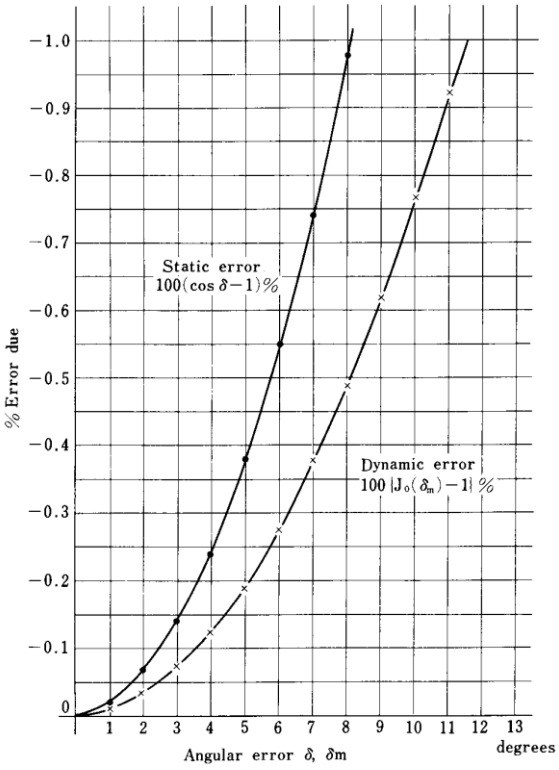


Fig. 10.4 Errors due to balanced array vertical offset

The average error is obtained as follows:

$$\overline{\varepsilon}\ \delta_m = 100\ \{J_0(\delta_m) - 1\} \qquad (10.7)$$

The above-mentioned relationship is shown in Fig. 10.4.

(4) Error due to deviation of radiation angle from reference value

The following equations show, with respect to axes N_1 and N_2, the Doppler shift frequency is generated the acoustic wave is radiated when there is a deviation of Δδ with respect to θ as shown in Fig. 10.5:

$$F'_{d1} = \frac{2Vf_0}{C}\cos(\theta \pm \Delta\delta)$$

$$F'_{d2} = \frac{2Vf_0}{C}\cos(\theta \pm \Delta\delta)$$

$$F''_d = F''_{d1} - F''_{d2} = \frac{4Vf_0}{C}\cos(\theta \pm \Delta\delta) \qquad (10.8)$$

$$\varepsilon_d = 100\ \{2\cos(\theta \pm \Delta\delta) - 1\}\ \% \qquad (10.9)$$

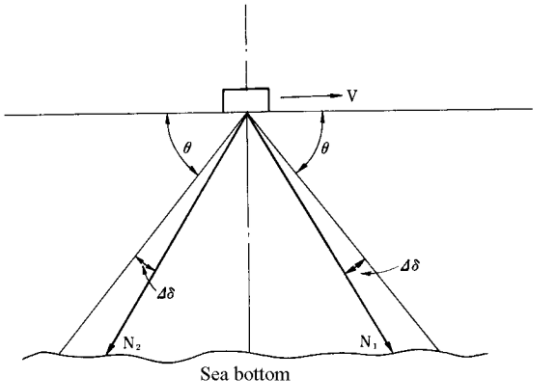


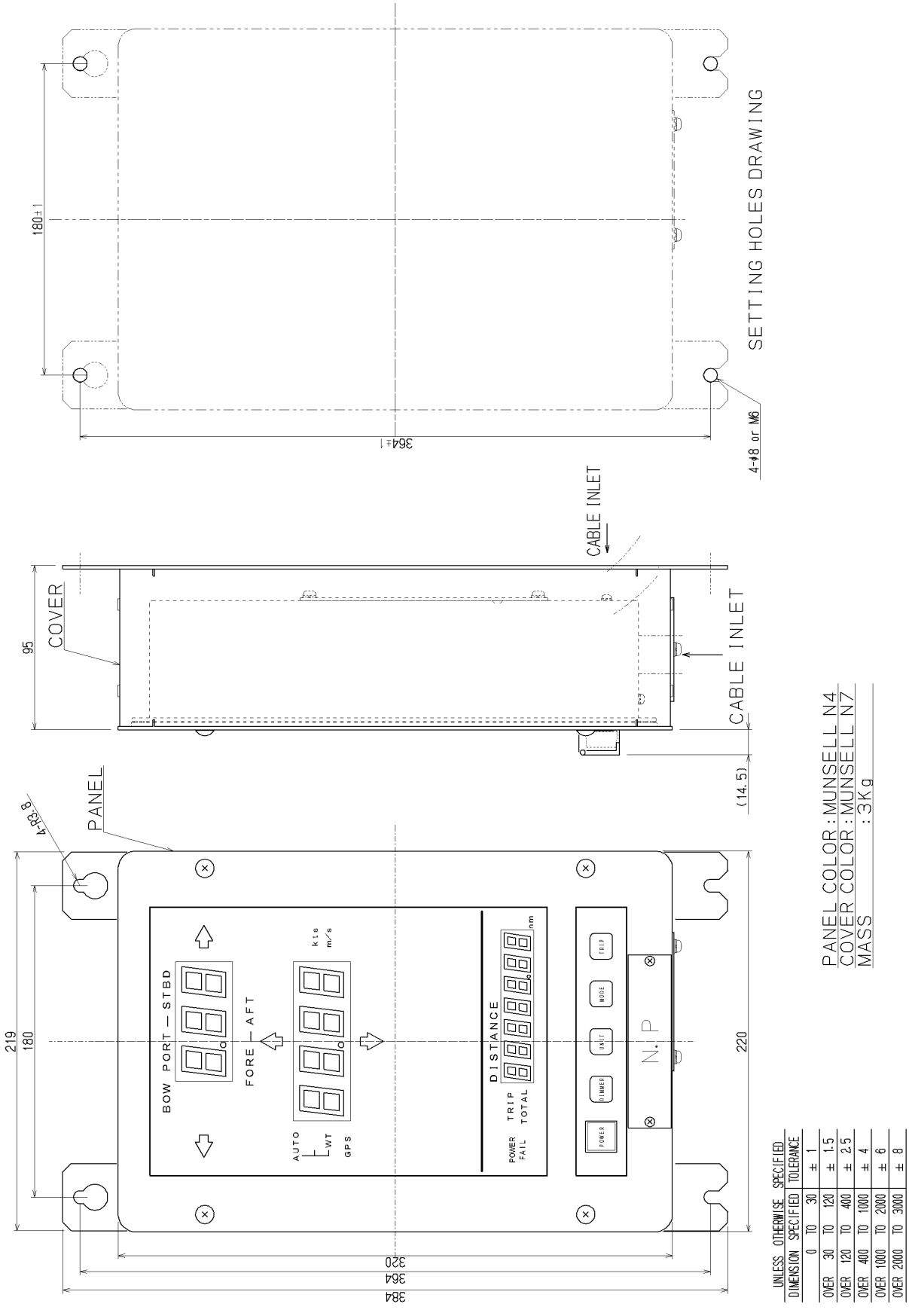
Fig. 10.5 Errors due to deviations from the reference radiation angle

Assume that $\Delta\delta \le 0.1°$, then we get:

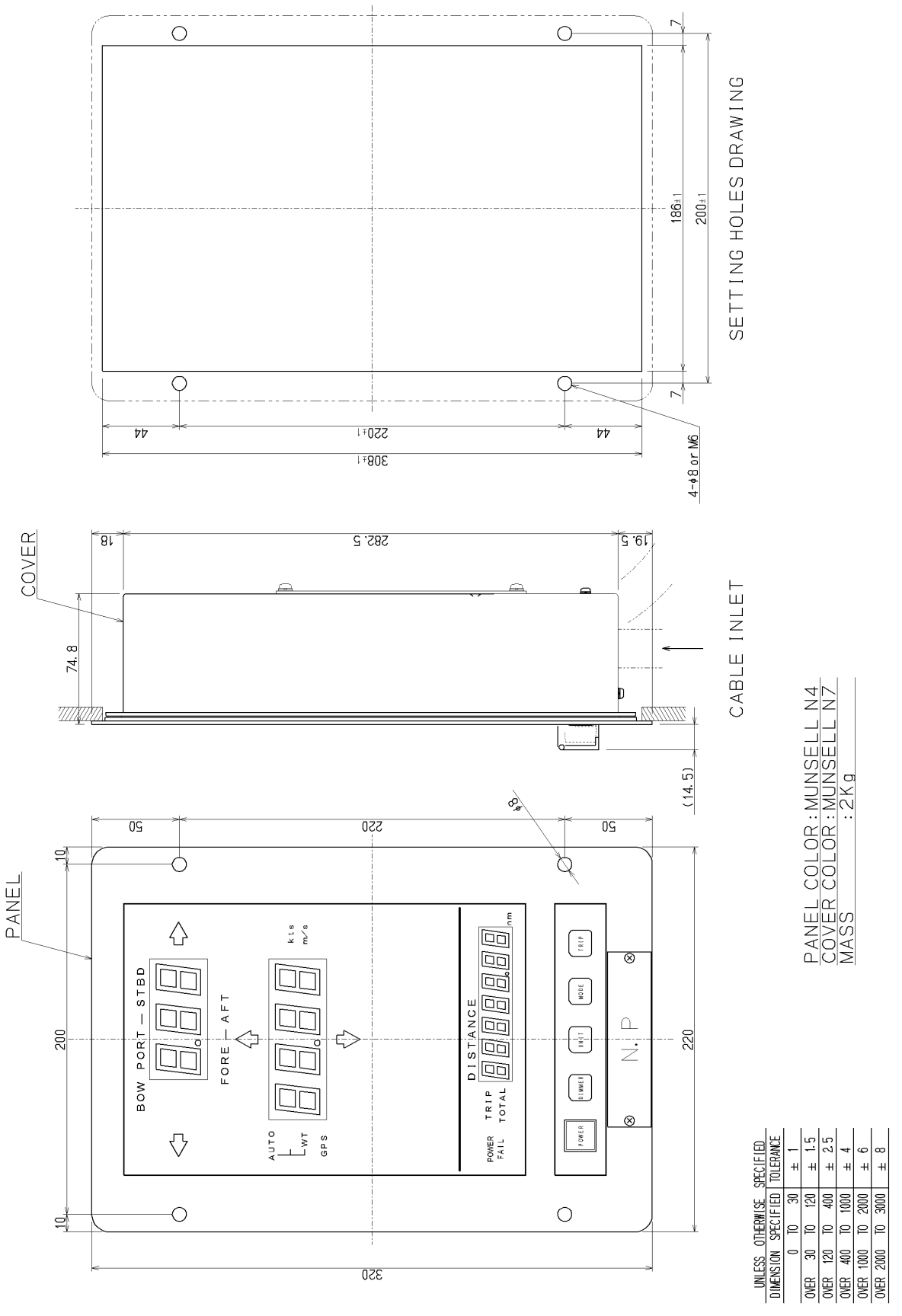
$$\varepsilon_d \le 0.3\ \%$$

2. Outline and Setting drawing: Standard Equipment.

(1) NWW-60DA MAIN DISPLAY

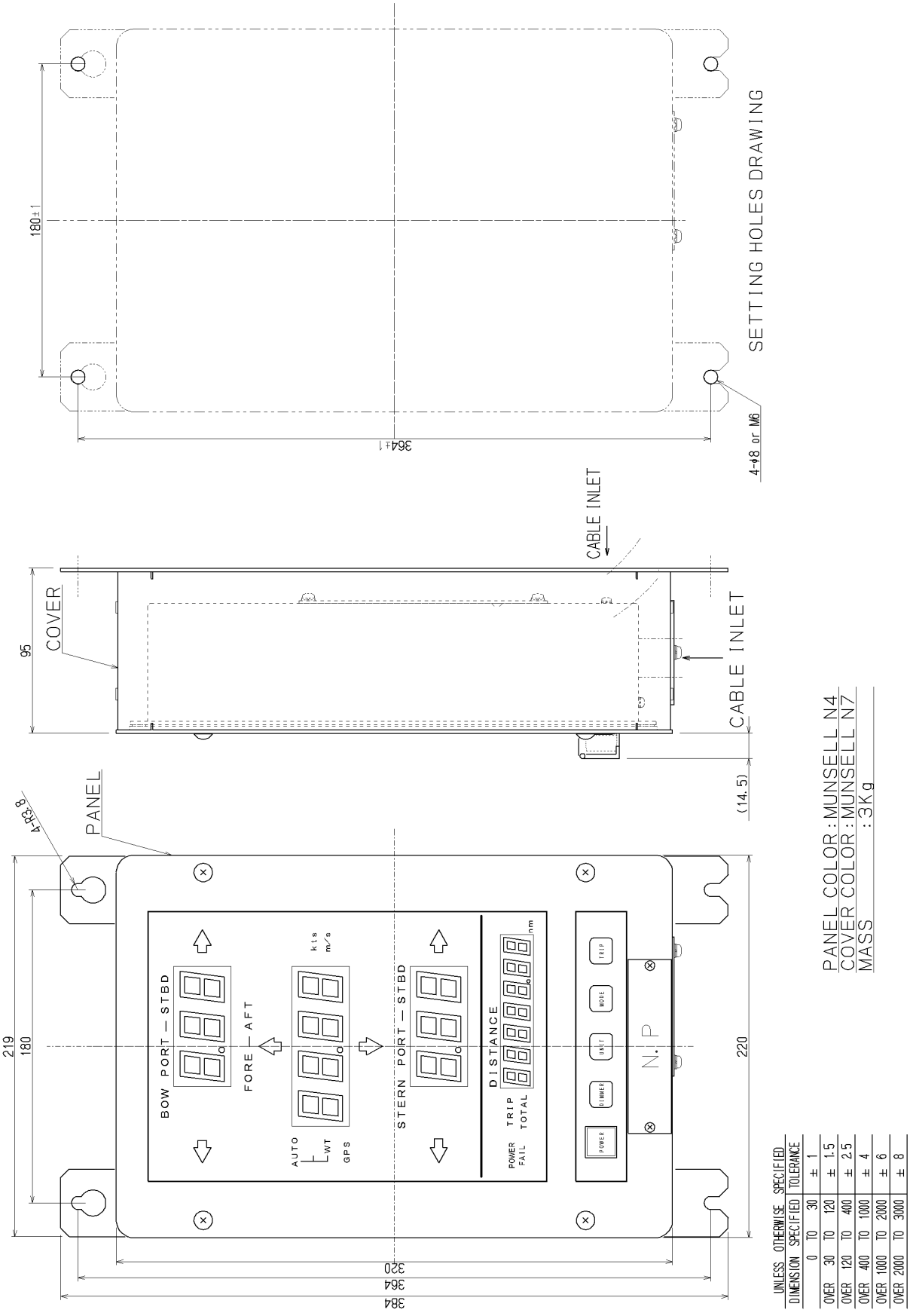


(2) NWW-60DB MAIN DISPLAY



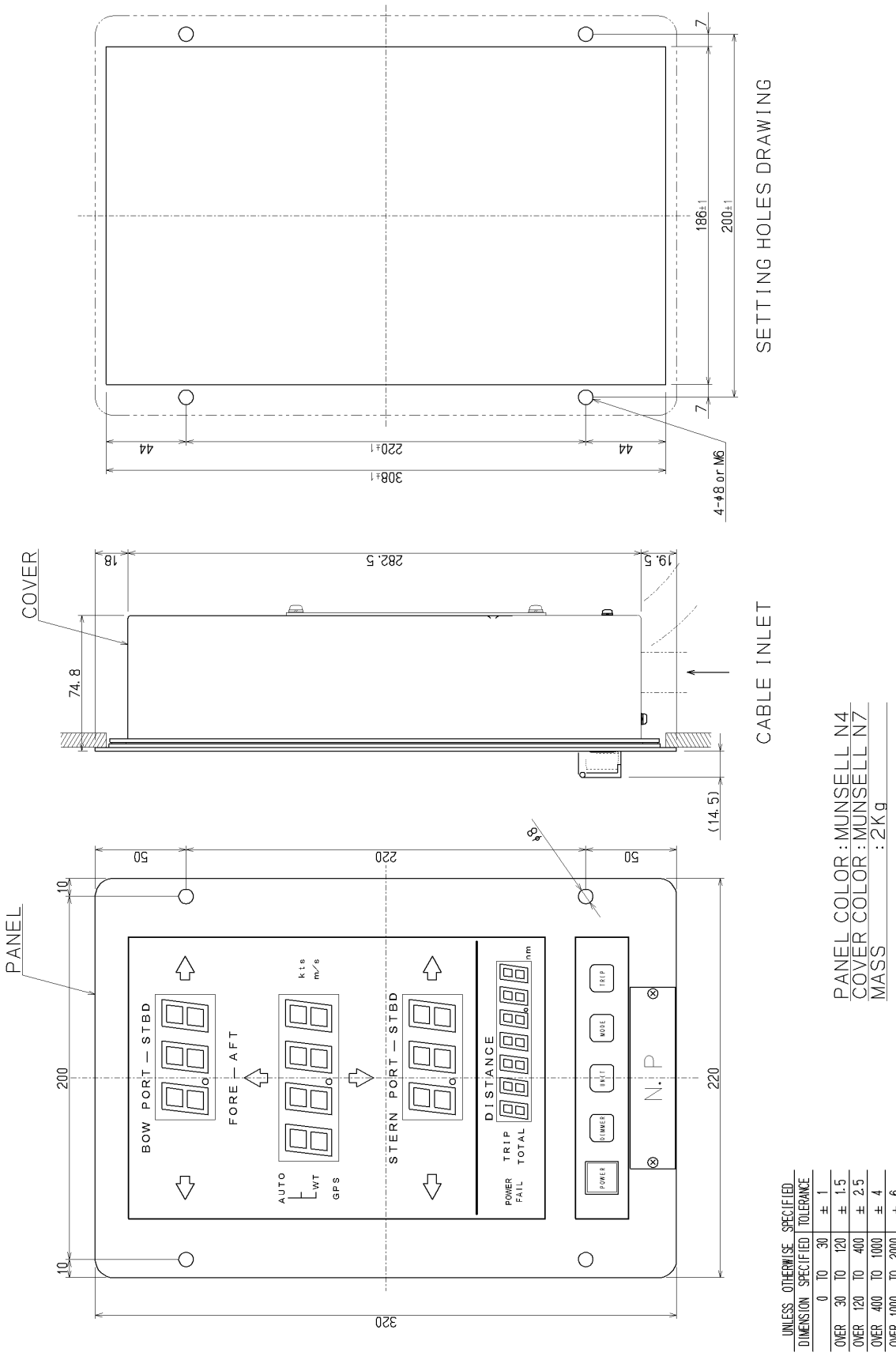
UNLESS OTHERWISE SPECIFIED			
DIMENSION	SPECIFIED		TOLERANCE
0	TO	30	± 1
OVER 30	TO	120	± 1.5
OVER 120	TO	400	± 2.5
OVER 400	TO	1000	± 4
OVER 1000	TO	2000	± 6
OVER 2000	TO	3000	± 8

(3) NWW-60TA MAIN DISPLAY



UNLESS OTHERWISE SPECIFIED	
DIMENSION SPECIFIED	TOLERANCE
0 TO 30	± 1
OVER 30 TO 120	± 1.5
OVER 120 TO 400	± 2.5
OVER 400 TO 1000	± 4
OVER 1000 TO 2000	± 6
OVER 2000 TO 3000	± 8

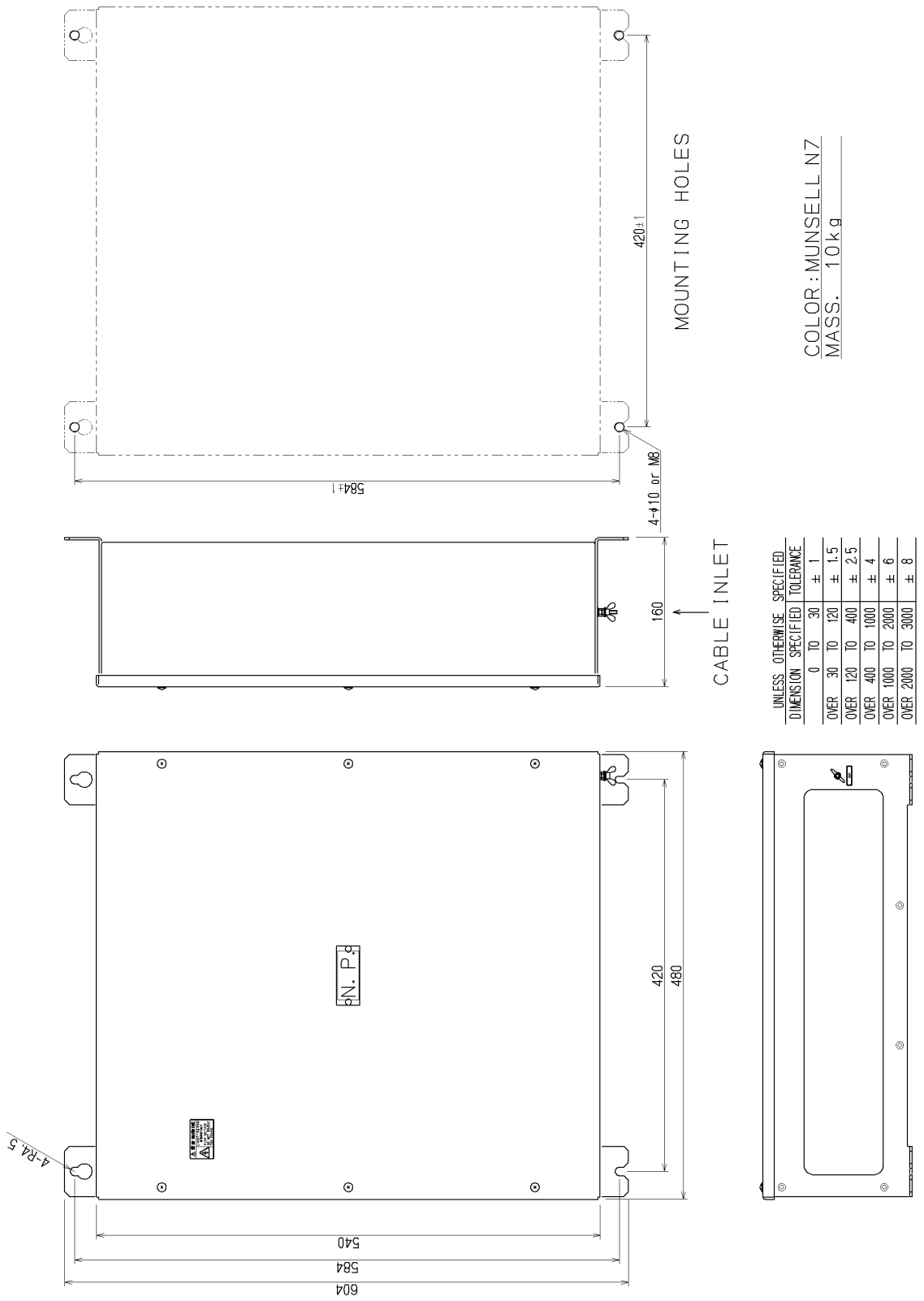
(4) NWW-60TB MAIN DISPLAY



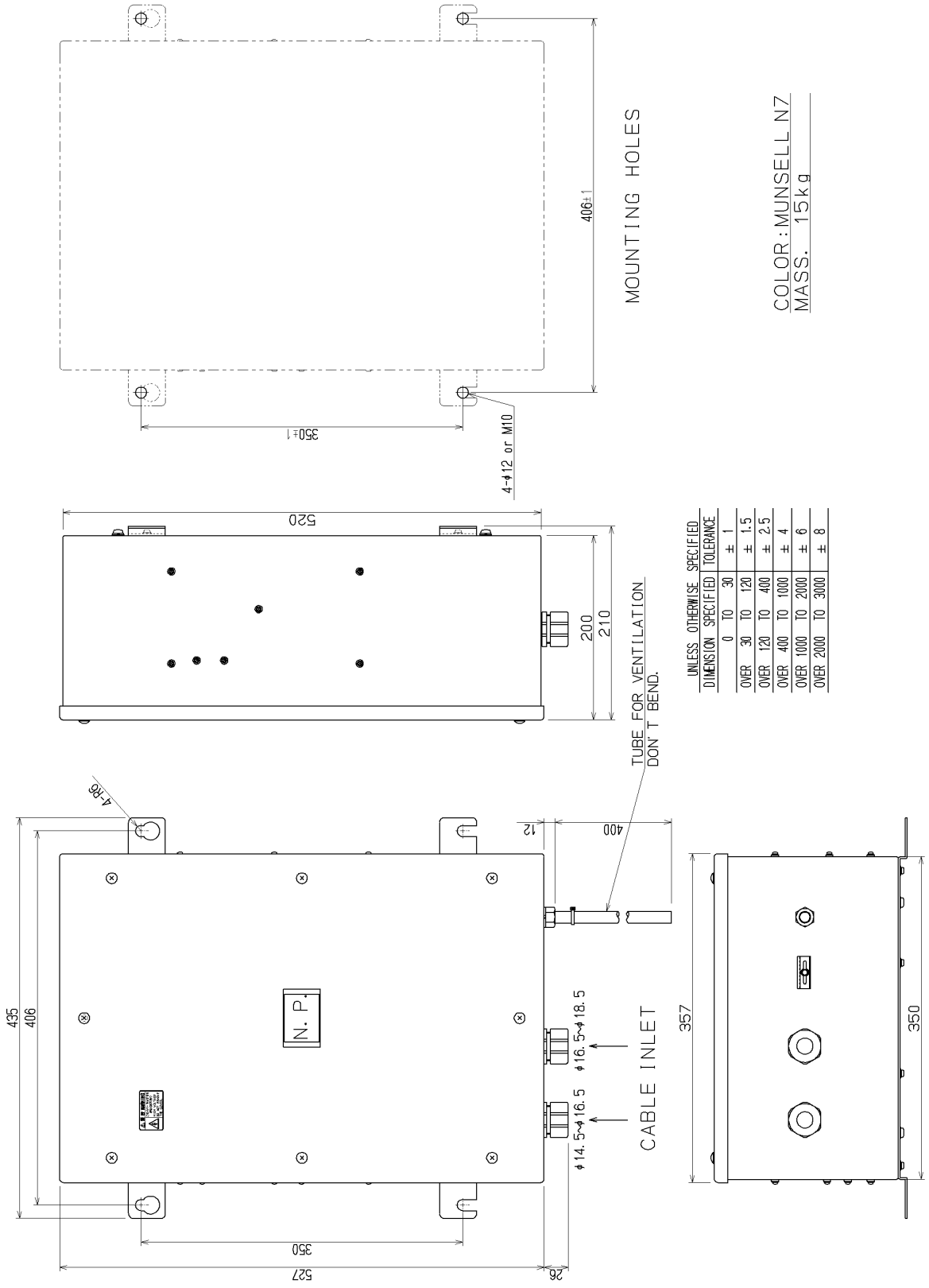
PANEL COLOR : MUNSELL N4
COVER COLOR : MUNSELL N7
MASS : 2Kg

UNLESS OTHERWISE SPECIFIED DIMENSION			TOLERANCE
0	TO	30	± 1
OVER 30	TO	120	± 1.5
OVER 120	TO	400	± 2.5
OVER 400	TO	1000	± 4
OVER 1000	TO	2000	± 6
OVER 2000	TO	3000	± 8

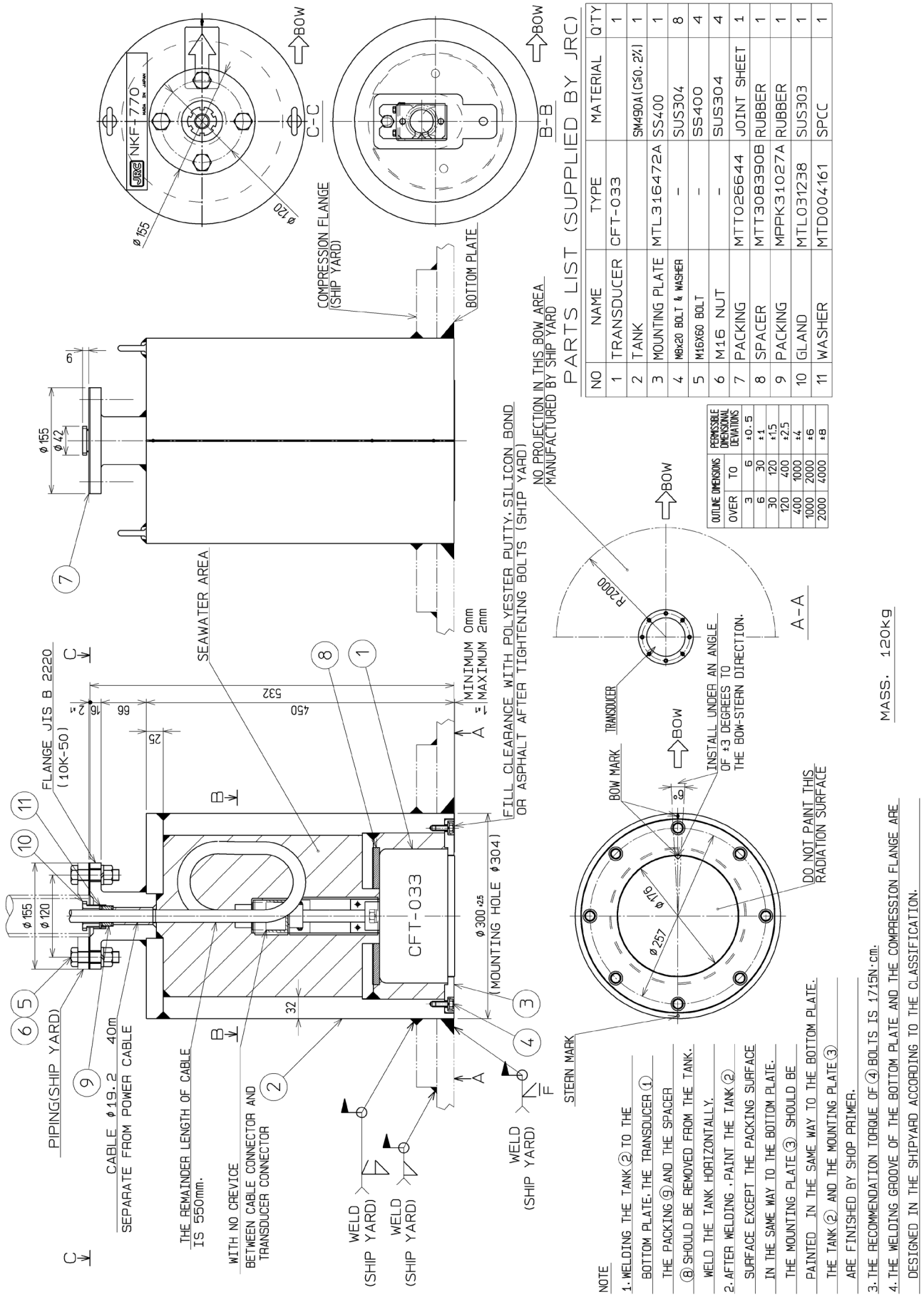
(5) NQA-3012 SIGNAL DISTRIBUTOR



(6) NJC-24 SIGNAL PROCESSOR

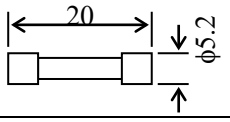
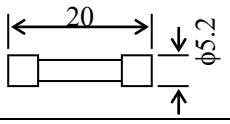
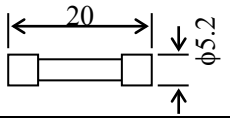
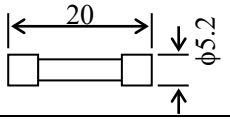


(7) NKF-770 TRANSDUCER



3. Spare Parts List

SHIP No.	SPARE PARTS LIST FOR	U S E	SET PER VESSEL
	MODEL JLN-550 ドップラ・ソナー Doppler Sonar		

ITEM No.	NEME OF PART	OUTLINE (Dimension in m/m)	QUANTITY			REMARKS	
			WORKING		SPARE	DESCRIPTION JRC CORD No.	SUB MARK OF BOX No.
			PER SET	PER VESS			
1	ヒューズ Fuse		3		2	MF51NR0.5 5ZFGD00019	
2	ヒューズ Fuse		2		2	MF51NR 250V 2 5ZFGD00200	
3	ヒューズ Fuse		3		2	250V A SC10A 5ZFCA00044	
4	ヒューズ Fuse		2		2	ULT SC 6.3AN1 5ZFCA00034	

MFR'S NAME	**JAPAN RADIO CO.,LTD.**	DRW. No.	7ZXBS0018

4. List of standard terms, units and abbreviations

Term	Abbreviation
Acknowledge	ACK
Acquire, Acquisition	ACQ
Acquisition Zone	AZ
Adjust, Adjustment	ADJ
Aft	AFT
Alarm	ALARM
Altitude	ALT
Amplitude Modulation	AM
Anchor Watch	ANCH
Antenna	ANT
Anti Clutter Rain	RAIN
Anti Clutter Sea	SEA
April	APR
Audible	AUD
August	AUG
Automatic	AUTO
Automatic Frequency Control	AFC
Automatic Gain Control	AGC
Automatic Identification System	AIS
Automatic Radar Plotting Aid	ARPA
Autopilot	AP
Auxiliary System/Function	AUX
Available	AVAIL
Azimuth Indicator	AZI
Background	BKGND
Bearing	BRG
Bearing Waypoint To Waypoint	BWW
Bottom Tracking	BT
Bow Crossing Range	BCR
Bow Crossing Time	BCT
Bridge alert management	BAM
Brilliance	BRILL
Built in Test Equipment	BITE
Calibrate	CAL
Cancel	CNCL
Carried (for example, carried EBL origin)	C

Term	Abbreviation
Central Processing Unit	CPU
Centre	CENT
Change	CHG
Circularly Polarised	CP
Clear	CLR
Closest Point of Approach	CPA
Compact Disk Read Only Memory	CDROM
Consistent Common Reference Point	CCRP
Consistent Common Reference System	CCRS
Contrast	CONT
Coordinated Universal Time	UTC
Correction	CORR
Course	CRS
Course Over the Ground	COG
Course Through the Water	CTW
Course To Steer	CTS
Course Up	C UP
Cross Track Distance	XTD
Cursor	CURS
Dangerous Goods	DG
Date	DATE
Day	DAY
Dead Reckoning, Dead Reckoned Position	DR
December	DEC
Decrease	DECR
Delay	DELAY
Delete	DEL
Departure	DEP
Depth	DPTH
Destination	DEST
Deviation	DEV
Differential GLONASS	DGLONASS
Differential GNSS	DGNSS
Differential GPS	DGPS
Digital Selective Calling	DSC
Display	DISP

Term	Abbreviation
Distance	DIST
Distance Root Mean Square	DRMS
Distance To Go	DTG
Drift	DRIFT
Dropped (for example, dropped EBL origin)	D
Double Sideband	DSB
East	E
Echo Reference	REF
Electronic Bearing Line	EBL
Electronic Chart Display and Information System	ECDIS
Electronic Chart System	ECS
Electronic Navigational Chart	ENC
Electronic Position Fixing System	EPFS
Electronic Range and Bearing Line	ERBL
Emergency Position Indicating Radio Beacon	EPIRB
Enhance	ENH
Enter	ENT
Equipment	EQUIP
Error	ERR
Estimated Position	EP
Estimated Time of Arrival	ETA
Estimated Time of Departure	ETD
European Geo-Stationary Navigational Overlay System	EGNOS
Event	EVENT
Exclusion Zone	EZ
External	EXT
F - Band (applies to Radar)	F-Band
February	FEB
Foreword	FWD
Fishing Vessel	FISH
Fix	FIX
Forward	FWD
Frequency	FREQ
Frequency Modulation	FM

Term	Abbreviation
Full	FULL
Gain	GAIN
Geographics	GEOG
Geometric Dilution Of Precision	GDOP
Global Maritime Distress and Safety System	GMDSS
Global Navigation Satellite System	GNSS
Global Orbiting Navigation Satellite System	GLONASS
Global Positioning System	GPS
Great Circle	GC
Grid	GRID
Ground	GND
Grounding Avoidance System	GAS
Group Repetition Interval	GRI
Guard Zone	GZ
Gyro	GYRO
Harmful Substances (applies to AIS)	HS
Head Up	H UP
Heading	HDG
Heading Control System	HCS
Heading Line	HL
High Frequency	HF
High Speed Craft	HSC
Horizontal Dilution Of Precision	HDOP
I - Band	I-Band
Identification	ID
In	IN
Increase	INCR
Indication	IND
Information	INFO
Infrared	INF RED
Initialisation	INIT
Input	INP
Input/Output	I/O
Integrated Bridge System	IBS
Integrated Navigation System	INS

Term	Abbreviation
Integrated Radio Communication System	IRCS
Interference Rejection	IR
Inter switch	ISW
Interval	INT
January	JAN
July	JUL
June	JUN
Label	LBL
Latitude	LAT
Latitude/Longitude	L/L
Leeway	LWY
Limit	LIM
Line Of Position	LOP
Log	LOG
Long Pulse	LP
Long Range	LR
Longitude	LON
Loran	LORAN
Lost Target	LOST TGT
Low Frequency	LF
Magnetic	MAG
Man Overboard	MOB
Manoeuvre	MVR
Manual	MAN
Map(s)	MAP
March	MAR
Maritime Mobile Services Identity number	MMSI
Maritime Pollutant (applies to AIS)	MP
Maritime Safety Information	MSI
Marker	MKR
Master	MSTR
Maximum	MAX
May	MAY
Medium Frequency	MF
Medium Pulse	MP
Menu	MENU

Term	Abbreviation
Minimum	MIN
Missing	MISSING
Mute	MUTE
Navigation	NAV
Night	NT
Normal	NORM
North	N
North Up	N UP
Not Less Than	NLT
Not More Than	NMT
Not Under Command	NUC
November	NOV
October	OCT
Off	OFF
Officer On Watch	OOW
Offset	OFFSET
On	ON
Out/Output	OUT
Own Ship	OS
Panel Illumination	PANEL
Parallel Index Line	PI
Past Positions	PAST POSN
Passenger Vessel	PASSV
Performance Monitor	MON
Permanent	PERM
Person Overboard	POB
Personal Identification Number	PIN
Pilot Vessel	PILOT
Port/Portside	PORT
Position	POSN
Positional Dilution Of Precision	PDOP
Power	PWR
Predicted	PRED
Predicted Area of Danger	PAD
Predicted Point of Collision	PPC
Pulse Length	PL
Pulse Modulation	PM
Pulse Repetition Frequency	PRF

Term	Abbreviation
Pulse Repetition Rate	PRR
Pulses Per Revolution	PPR
Racon	RACON
Radar	RADAR
Radar Plotting	RP
Radius	RAD
Rain	RAIN
Range	RNG
Range Rings	RR
Raster Chart Display System	RCDS
Raster Navigational Chart	RNC
Rate Of Turn	ROT
Real-time Kinematic	RTK
Receive	Rx RX
Receiver	RCDR
Receiver Autonomous Integrity Monitoring	RAIM
Reference	REF
Relative	REL
Relative Motion	RM
Revolutions per Minute	RPM
Rhumb Line	RL
Roll On/Roll Off Vessel	RoRo
Root Mean Square	RMS
Route	ROUTE
Safety Contour	SF CNT
Sailing Vessel	SAIL
Satellite	SAT
S-Band	S-BAND
Scan to Scan	SC/SC
Search And Rescue	SAR
Search And Rescue Transponder	SART
Search And Rescue Vessel	SARV
Select	SEL
September	SEP
Sequence	SEQ
Set (i.e., set and drift, or setting a value)	SET

Term	Abbreviation
Ship's Time	TIME
Short Pulse	SP
Signal to Noise Ratio	SNR
Simulation	SIM
Slave	SLAVE
South	S
Speed	SPD
Speed and Distance Measuring Equipment	SDME
Speed Over the Ground	SOG
Speed Through the Water	STW
Stabilized	STAB
Standby	STBY
Starboard/Starboard Side	STBD
Station	STN
Symbol(s)	SYM
Synchronised/Synchronous	SYNC
Target	TGT
Target Tracking	TT
Test	TEST
Time	TIME
Time Difference	TD
Time Dilution Of Precision	TDOP
Time Of Arrival	TOA
Time Of Departure	TOD
Time to CPA	TCPA
Time To Go	TTG
Time to Wheel Over Line	TWOL
Track	TRK
Track Control System	TCS
Tracking	TRKG
Trail(s)	TRAIL
Transmit and Receive	TXRX
Transceiver	TCVR
Transferred Line Of Position	TPL
Transmit	TX
Transmitter	TMTR)
Transmitting Heading Device	THD
Transponder	TPR

Term	Abbreviation
Trial	TRIAL
Trigger Pulse	TRIG
True	T
True Motion	TM
Tune	TUNE
Ultrahigh Frequency	UHF
Uninterruptible Power Supply	UPS
Universal Time, Coordinated	UTC
Universal Transverse Mercator	UTM
Unstable	UNSTAB
Variable Range Marker	VRM
Variation	VAR
Vector	VECT
Very High Frequency	VHF
Very Low Frequency	VLF
Vessel Aground	GRND
Vessel at Anchor	ANCH
Vessel Constrained by Draught	VCD
Vessel Engaged in Diving Operations	DIVE
Vessel Engaged in Dredging or Underwater Operations	DRG
Vessel Engaged in Towing Operations	TOW
Vessel Not Under Command	NUC
Vessel Restricted in Manoeuvrability)	RIM
Vessel Traffic Service	VTS
Vessel Underway Using Engine	UWE
Video	VID
Visual Display Unit	VDU
Voyage	VOY
Voyage Data Recorder	VDR
Warning	WARNING
Water	WAT
Water Tracking	WT
Waypoint	WPT
Waypoint Closure Velocity	WCV
West	W
Wheel Over Line	WOL

Term	Abbreviation
Wheel Over Point	WOP
Wheel Over Time	WOT
World Geodetic System	WGS
X-Band	X-BAND

アスベストは使用しておりません
Not use the asbestos

For further information,contact:

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Since 1915

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