CE

KODEN

SERVICE MANUAL

GPS Compass

KGC-222

This product is specifically designed to be installed on boats and other means of maritime transport. If your country forms part to the EU, please contact your dealer for advice before attempting to install elsewhere.

KGC-222.SM.E 0093822202-01

KGC-222 Service Manual
Doc No: 0093822202

Document Revision History

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2			
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Document No. Revised Version Norm

When part of the document needs to be revised, the document has advanced revision number. The document No. is indicated at the lower right side on the cover and at the left or right side of the footer region of each page.

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For Your Safe Operation

Pictograms used in this Service Manual

The following pictograms are used in this manual. The meaning of each symbols shall be well understood and the maintenance and inspection shall be carried out.

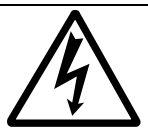
Symbol	Meaning
 Warning	**Mark for warning** This mark denotes that there is a risk of death or serious injury when dealt with incorrectly.
	**Mark for danger of high voltage** This mark denotes that there is a risk of death or serious injury due to electric shock when dealt with incorrectly.
 Caution	**Mark for caution** This mark denotes that there is a risk of slight injury or damages of devices when dealt with incorrectly.
	**Mark for prohibition** This mark denotes prohibition of specified conducts. Description of the prohibition is displayed near the mark.

Precautions on equipment

	**Be careful of high voltage inside** High voltage, which may risk you life, is used. This high voltage may remain in the circuit even after the power is switched off. To prevent contact with the high voltage circuits accidentally, a protective cover or the label with this mark is provided on the high voltage circuit. When the inside is to be checked, ensure to switch off the power and to discharge the residual voltage for safety. An engineer authorized by Koden shall carry out the inspection and maintenance works.
 Warning	**Power off in the boat** An accidental power-on during works may result in worker's electrification. To prevent such accident in advance, ensure that power in the boat and on the equipment are switched off. Furthermore, it is safer to hang a caution tag saying "Under work" near the power switch of equipment.
 Warning	**Be careful of dust** Inhaled dust may cause respiratory affection. At the time of cleaning the inside of equipment, be careful not to inhale dust. Wearing a safety mask is recommended.
 Caution	**Caution on location of installment** The equipment shall not be installed at locations which are excessively damp and suffers from water drops. Otherwise, dew condensation may occur inside the display screen, and corrosion may occur inside the unit box.

 **Caution**	**Measures against static electricity** Static electricity may be generated from the carpet on the floor in the cabin or clothes made of synthetic fiber, and it may destroy the electronic components on circuit boards. The circuit boards shall be handled with appropriate measures against static electricity.
 **Caution**	**Caution at installation of transducer** Transducer shall be installed at locations where there is no effect by bubble and noise. Bubble and noise may seriously degrade the performance of this equipment.

Precautions on handling

 **Warning**	No disassembly or modification of this equipment is allowed. It may lead to failure, firing, smoking or electric shock. In case of failure, please contact Koden's dealers or Koden.
 **Warning**	In case of smoking or firing, switch off the power in the boat and of this equipment. It may lead to firing, electric shock or damages.
	**Be careful of residual high voltage** High voltage may remain in capacitors for several minutes after switching off the power. Before inspection of the inside, please wait at least 5 minutes after switching off or discharge the residual electricity in an appropriate manner. Then, start the work.
 **Caution**	The information displayed on this equipment is not intended to use for your navigation. For your navigation, be sure to see the specified materials.
 **Caution**	Please use the specified fuses. If un-specified fuses are used, they may cause firing, smoking or damages.
 **Caution**	Be sure to submerge the transducer in water before transmission. If not, it may be damaged.

Contents

Introduction

KGC-222 is a GPS compass.

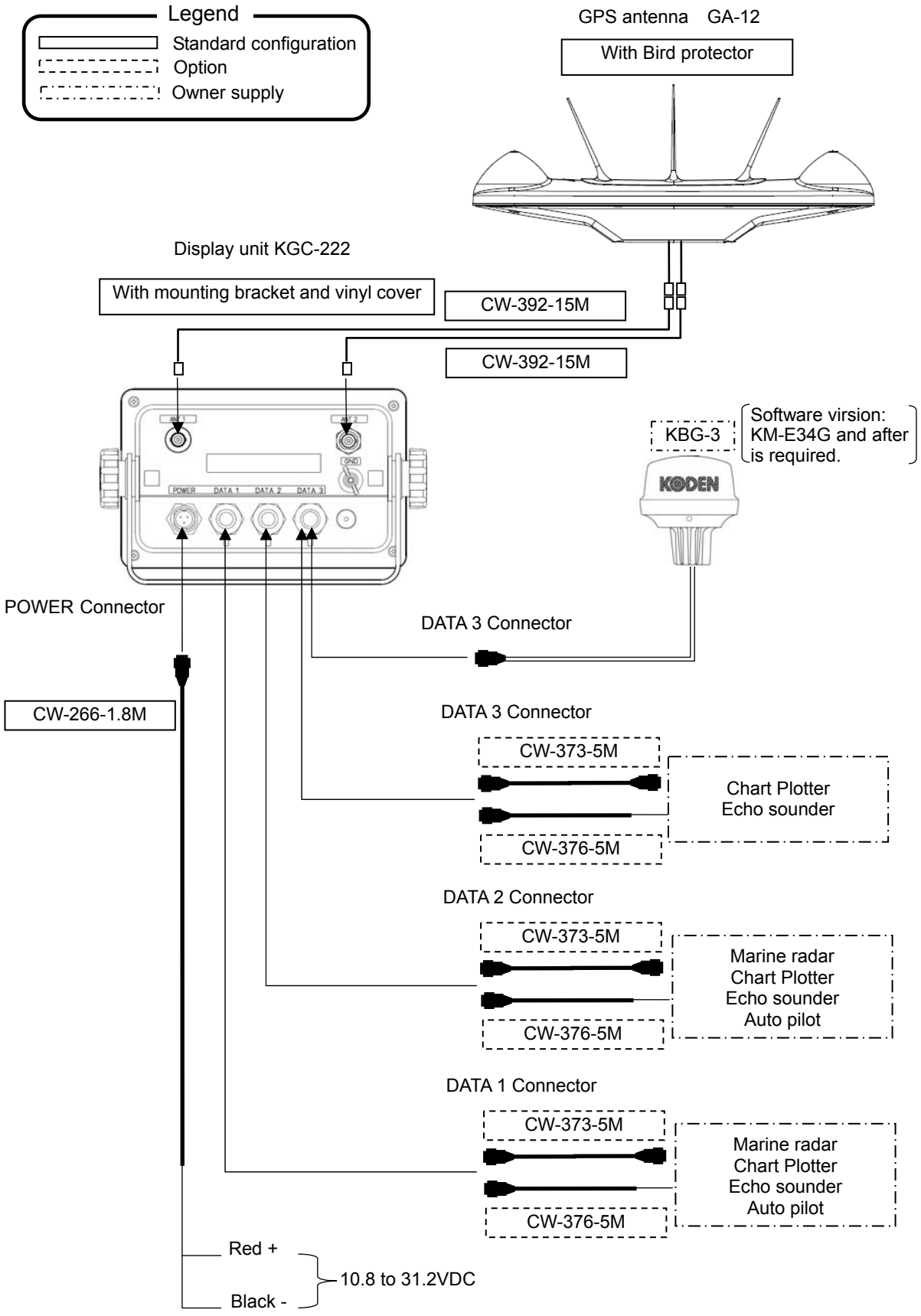
Through the use of GPS satellites, it outputs the heading of vessel with a high degree of accuracy by calibrating the phase difference of two GPS antennas.

The main features of this unit are as follows:

- KGC-222 consists of two main components, Display and Antenna.
  Display unit has processor, receiver and LCD display built-in.
- KGC-222 has internal electronic compass as backup sensor.
  This enables the backup sensor to output heading even if the GPS signals are interrupted in such case as the vessel passing under a bridge.
- KGC-222 can also output pitch / roll and heaving data.
  When KGC-222 is used with an echo sounder with heaving compensation function, you can obtain stable sea bottom without effect from heaves and waves.
- It has 3 heading data output ports. Up to 5 ports will be available with connecting an optional junction box.

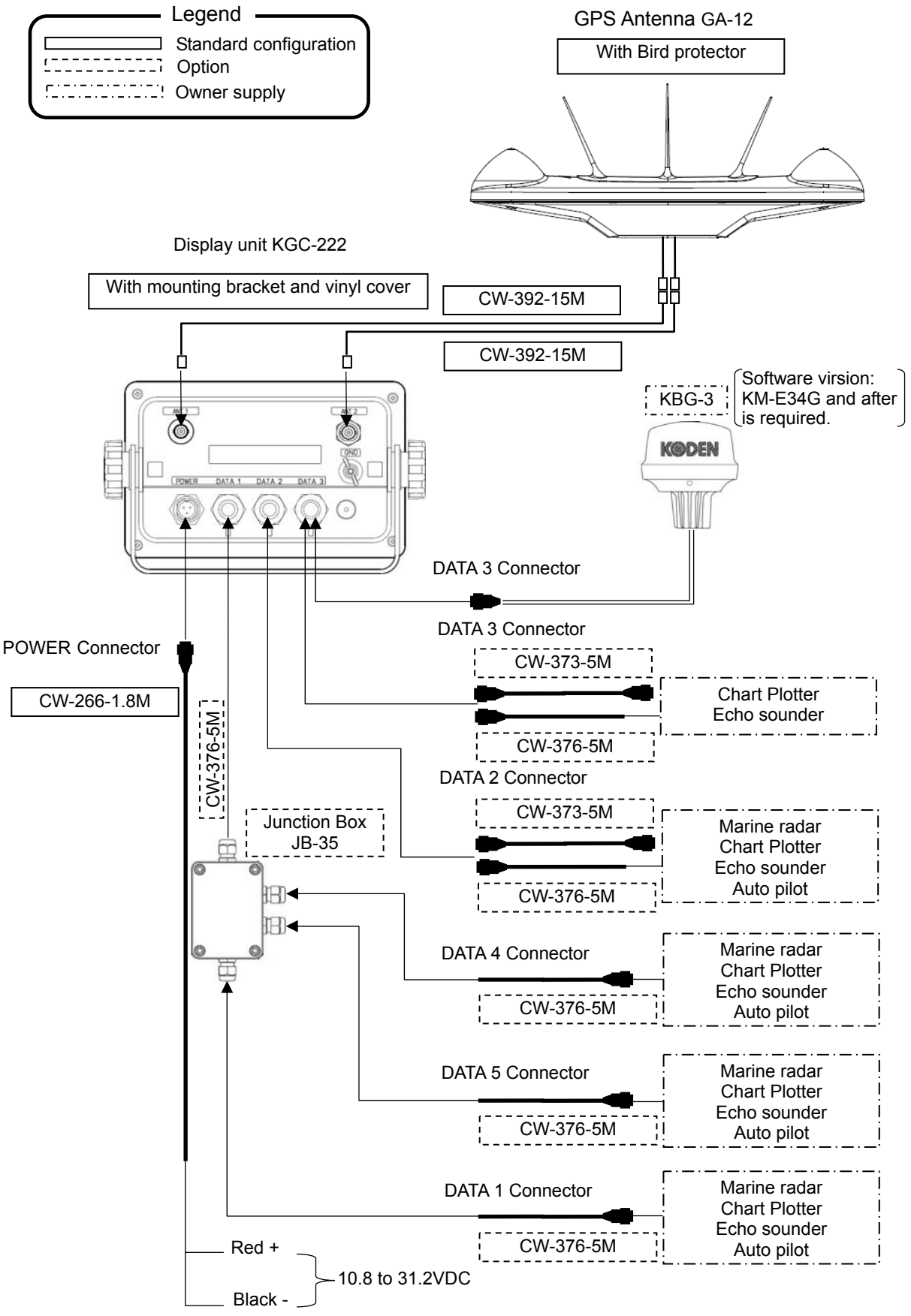
System Configuration

Connection diagram



System Configuration (with Junction box)

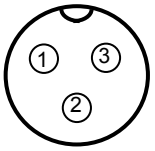
Connection diagram



Pin Assignment of Rear Connector

The pin assignment is viewed from the rear of the Display unit.

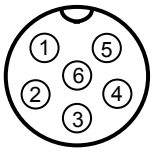
Power Input



① POWER+
② F.GND
③ POWER-

POWER

DATA IN/OUT



① GND
② TX+
③ TX-
④ RX+
⑤ RX-
⑥ +12V (Maximum 300 mA)

DATA1/2/3

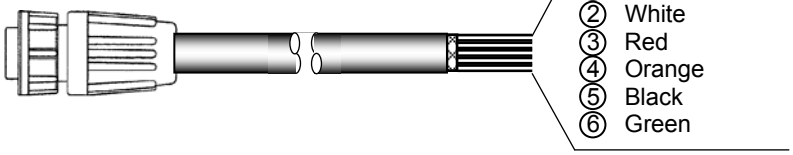
⚠ Caution: The maximum current capacity is 300 mA in total, then it should not exceed.
Take care that the grand total of each connector does not exceed 300 mA.

Connector acceptable: LTWBD-06BFFA-L18

⚠ Caution: KGC-222 Compass has 12V power on PIN 6 of each DATA connector. Please pay attention not to accidentally connect 12V to other equipment NMEA input. Equipment damage may occur.

For reference:

Wire color of CW-376-5M



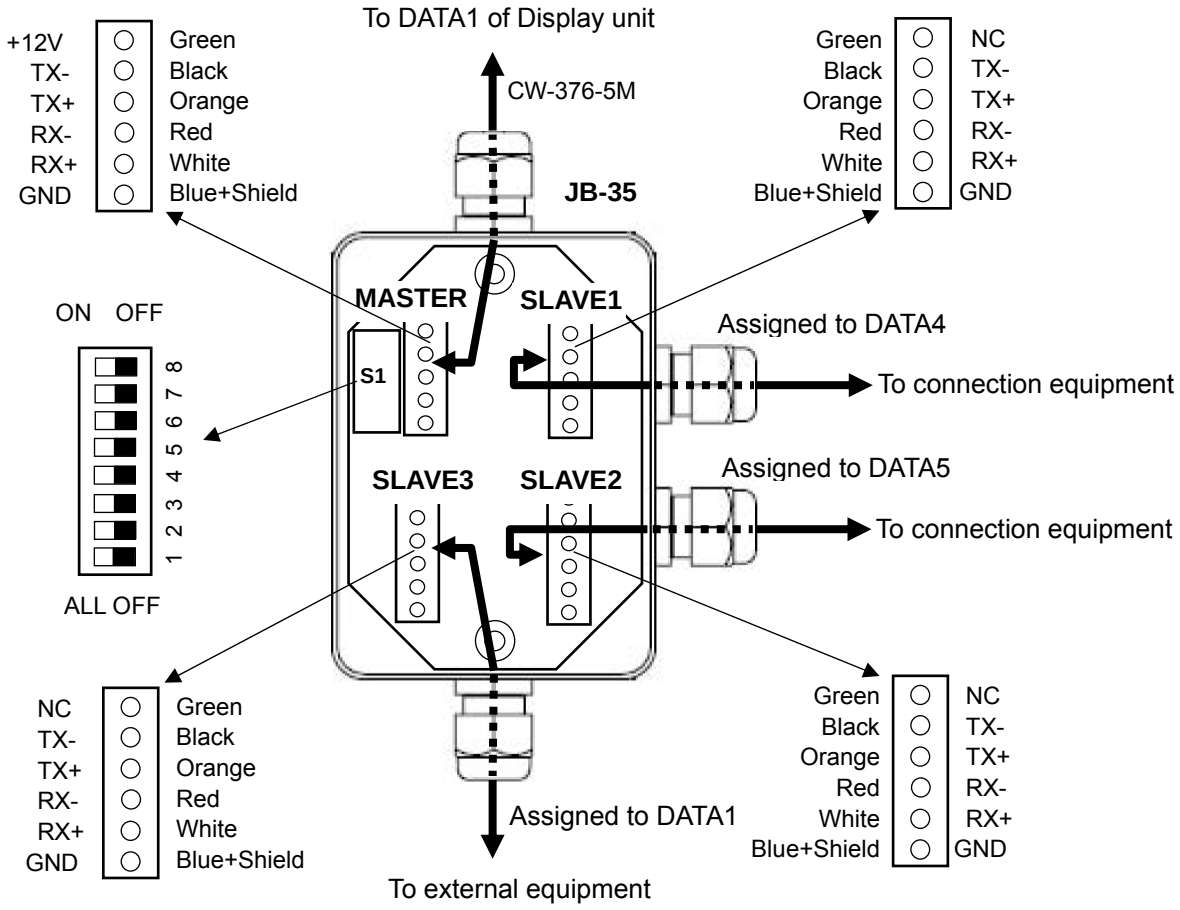
① Blue+Shield
② White
③ Red
④ Orange
⑤ Black
⑥ Green

Connection with Junction box (JB-35)

To extend the ports, connect the junction box (JB-35) to the data connectors as shown in the figure below.

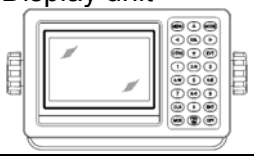
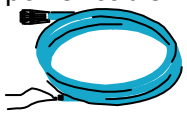
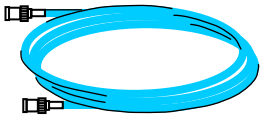
Set the DIP switch (S1) as shown in the figure below.

Wire the cables with the CW-376-5M (option) as shown in the following color chart.

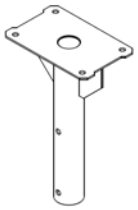
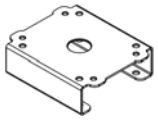


Configuration of Equipment

Standard Equipment Configuration List

No.	Name of item	Type	Remark	Weight/ Length	Qty
1	Display unit 	KGC-222.MU	With mounting bracket and vinyl cover	0.87 kg	1
2	DC power cable 	CW-266-1.8M	With a 3-pin connector and one end plain	1.8m	1
3	GPS antenna 	GA-12	With bird protector		1
4	Antenna cable 	CW-392-15M	3D-2V With BNC connectors on the both sides	15m	2
5	Installation material	TPT5 X 20U T.5X20MMX10M 10M [gray] B8X25U	Truss tapping screw (2) Self-bonding tape (1) PVC tape (1) Hexagon bolt for antenna installation (4)		1 set
6	Operation Manual	KGC-222.OM.E	English		1
7	Cautionary Note	KGC-222.RM.E	English		1

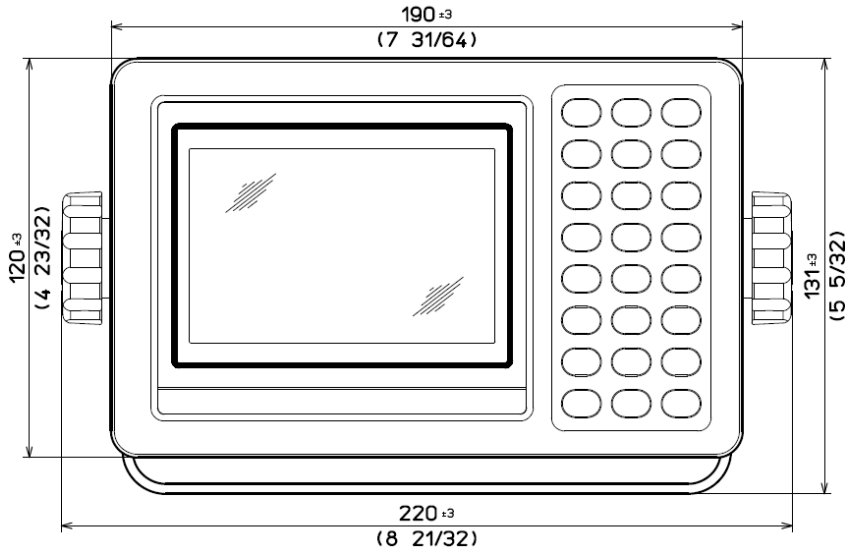
Option List

No.	Name of Item	Specification	Remark	Weight/ Length
1	Connecting cable	CW-373-5M	6P water resistant connectors at both ends	5m
2		CW-376-5M	With 6P water resistant connector and one end plain	5m
3	Junction box	JB-35	1 input, 3 outputs with CW-376-5M	
4	Power rectifier	PS-010	With 5A fuses 2pcs	3.5kg
5	AC power cable	VV-2D8-3M	Without connectors on the both sides (cable for PS-010)	3m
6	Flush mount kit	FMK-1	Flush mount frame with bolts, washers and screws	
7	Antenna cable extension kit	CW-393-30M	5D-FB cable with BNC connectors at both ends (2cables/1 unit)	30m
8		CW-394-60M KIT	8D-SFA cable with N connector and other end plain, N connector, and CW-826-0.5M (2sets/1 unit)	60m
9	Connector	LTWBD-06BFFA-L180	6P water resistant connector	
10	Mount base 	D86MB21110	For Antenna (GA-12)	1
11	Attachment 	D86MB21120	Conversion metal attachment (Switching the mounting holes of GA11 to GA12)	1

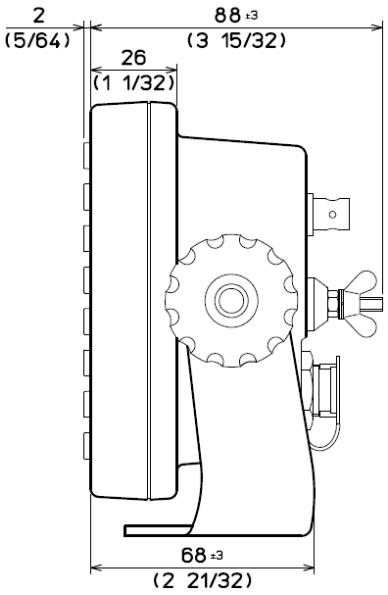
External view and dimensions

Display unit: KGC-222.MU

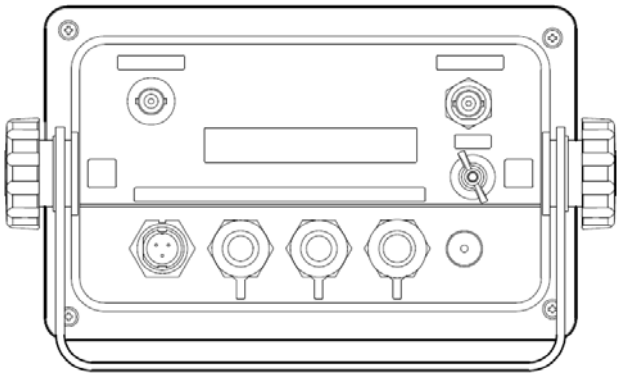
Front view



Side view



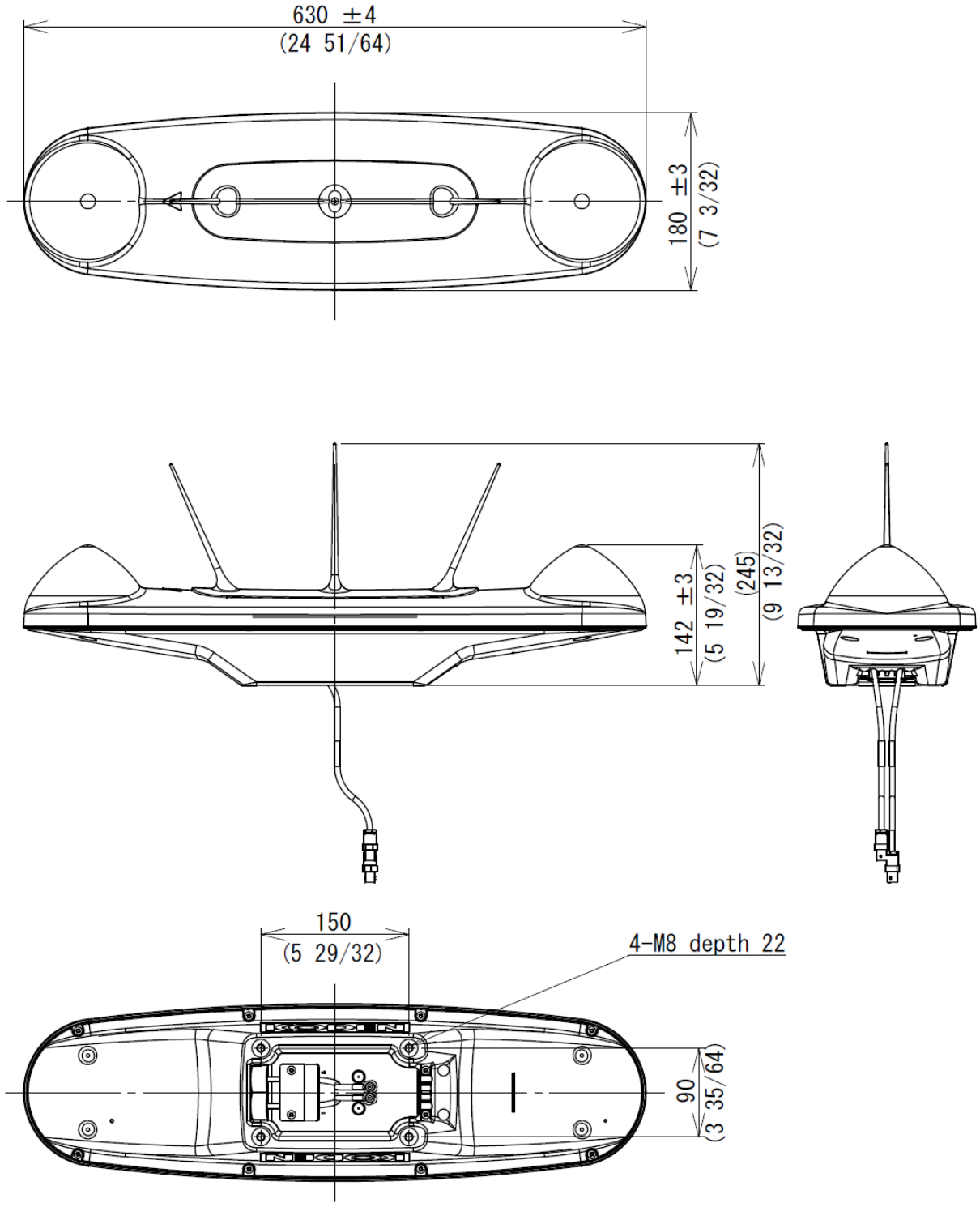
Rear view



Weight: 0.89kg (With mounting bracket)

Unit: mm (inch)

GPS antenna: GA-12



Weight: 2.2kg (With antenna cables)

Unit: mm (inch)

Specifications

Model	Display unit : KGC-222.MU GPSantenna : GA-12
Receiving frequency	1575.42MKz±1MHz
Receiving channel	Parallel 16 channel
Sensitivity	Better than -130 dBm
Setting time	2 minutes (at standard hot-start time)
Heading accuracy	1° rms
Heading resolution	0.1°
Maximum rate of turn	45°/s
Maximum follow-up acceleration	1g
Maximum role / pitch angle	30°
Base line length	0.5m
Time to position fix Cold start Warm start Hot start	 50 sec (standard) 45 sec (standard) 20 sec (standard)
Positioning accuracy Position Velocity	 GPS: 10m (2 drms, SA:OFF, PDOP: 3 or less) DGPS: 3m (2 drms, SA:OFF, PDOP: 3 or less) 1 m / sec (rms, SA:OFF, PDOP: 3 or less)
Datum	88 (WGS-84, Tokyo etc.)
Output data port	3 (standard), 5 (with connecting an optional junction box)
Output data Format Heading data sentence Navigation data sentence Data level Output current Output interval	 NMEA 0183 Ver2.0 ATT, HDM, HDT, HVE, ROT, PKODG,21 DTM, GGA, GLL, GSA, GSV, MSS, RMC, VTG, ZDA, PKODA, PKODG,1, PKODG,7, PKODQ RS-422 20mA 20ms, 40ms, 50ms, 100ms, 200ms, 1s
Power supply	10.8 to 31.2VDC
Power Consumption	9W or less (at 24 VDC)
Operating temperature	-15°C to +55°C
Water protection Display unit GPS antenna	 IPX4 IPX6
Store temperature	-30°C to +70°C
Upper limit of humidity	93% +/- 3% @ +40°C

Chapter 1 Installation

1.1 Items of Caution on Installation

In order to obtain the maximum performance of the GPS compass, this compass should be installed by a qualified technician. Installation procedures include the following:

(1) Unpacking the components

(2) Inspection of configuration unit, spare parts, accessories and installation materials

(3) Checking of supply voltage and current capacity

(4) Selection of installation location

(5) Installation of Display unit and Antenna

(6) Attachment of accessories

(7) Planing and implementation of cable layout and connection

(8) Coordinataion after installation

Unpacking the components

Unpack components and check that all of the items correspond with the contents discription of the packing list. When a discrepancy or damage has been found, contact the dealer you purchased this product.

Appearance varification of each unit and accessories

Inspect the appearance of each components and accessories and check that no dents or damage exist.

If any dents or damages exist and they are believed to be caused by accident during transportation, contact the transportation and insurance company and consult our sales company or our dealer nearest to you.

Selection of location for installation

In order to obtain the maximum performance of the unit, it is necessary to install following below recommendations.

1. Display unit of KGC-222

(1) Install the display in the bridge where it will be easy to see and read.

(2) Choose the best location from humidity, spray, rain and direct sunlight.

(3) Keep safety distance from magnetic objects such as magnetic compass~~es~~.

(4) Keep sufficient maintenance space around the equipment, pay attention to the back of the display where cables are connected.

(5) Keep the equipment as far away from wireless transmitter/receivers as possible.

2. GPS antenna: GA-12

To operate the equipment in good order, the following points should be observed for installation of GPS antenna.

The GPS antenna GA-12 must be installed where good radio wave reception is achieved. No obstacles should be located above the antenna otherwise the radio wave reception may be interrupted. This causes the available GPS service hours to be reduced and degrades the positioning accuracy.

(1) Select a site away from metallic objects, where possible.

(2) Locate the GPS antenna at least 4 m away from radio antennas such as, Inverted-L antennas for MF/HF transmission, Whip Antennas for VHF or UHF.

(3) Locate the GPS antenna at least 1.5 m above any Inverted-L antenna for MF/HF transmission.

(4) Locate the GPS antenna at least 1 m from receiving antennas.

(5) Locate the GPS antenna away from radar beams (Vertical beam width: 30^{o} to 40^{o}).

(6) Locate the GPS antenna at least 1 m away from radar antennas.

(7) Locate the GPS antenna at least 5 m away from Inmarsat radomes.

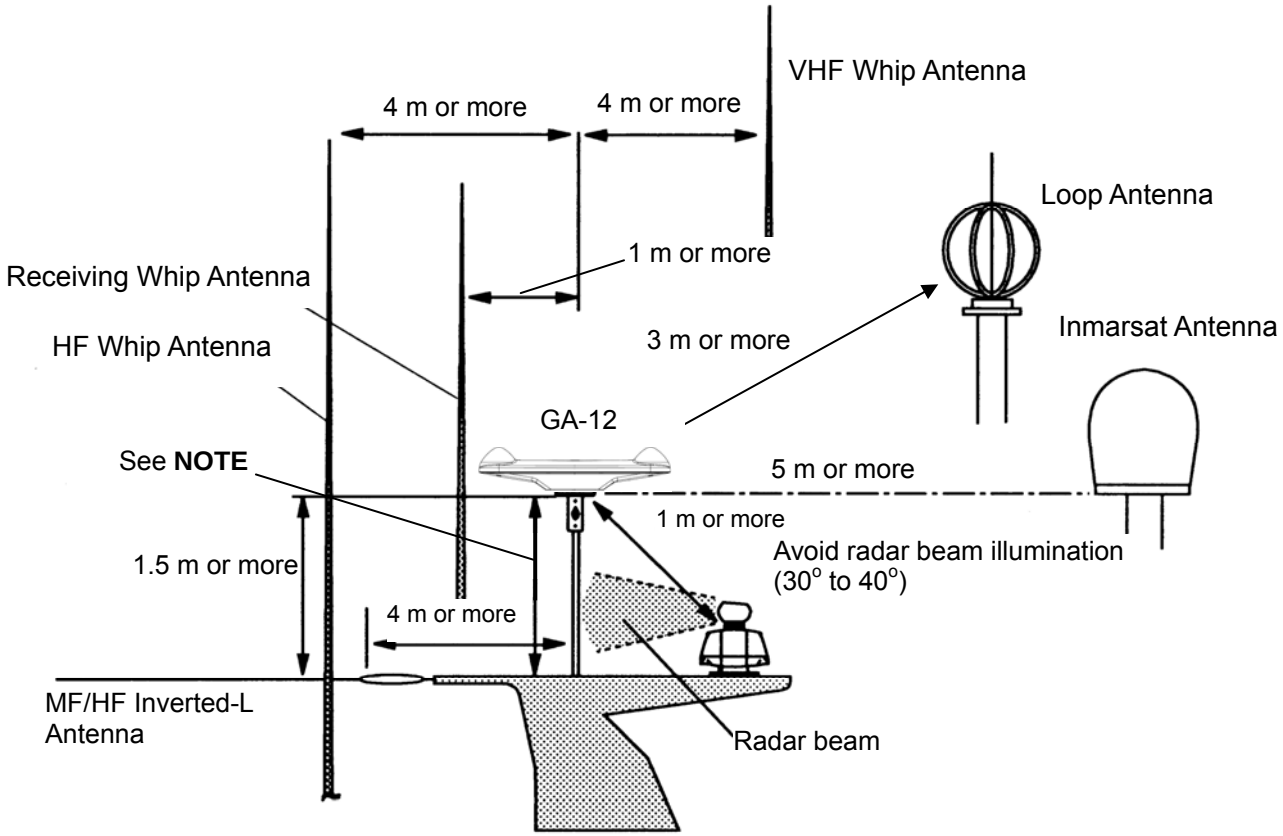
(8) Locate the GPS antenna at least 3 m away from DF loop antennas.

(9) Locate the GPS antenna at least 2 m away from the ship's engine.

(10) Locate the GPS antenna at least 0.5 m away from metallic objects.

Should any of the requirements mentioned in item (1) to item (10) not be met, try to fulfill the requirements of item (10) and install the GPS Antenna as far as possible from the antennas described in item (1) to item (9). Put the GPS Antenna as trial on a promising site to make sure that the unit operates as specified before fixing the GPS Antenna position and then fix the antenna firmly. The GPS Antenna installed in an improper site may result in poor bearing accuracy and positioning error that may lead to potential hazards.

[Scale differs among drawings.]



NOTE: Keep away from metallic objects at least 0.5 m.

Laying and Connection of Cable

(1) Keep the antenna cable and power cable as far away from the cables of other electronic equipment as possible.

(2) The cabinet of Display unit shall be securely grounded to the hull, using the ground terminal on the rear panel.

(3) If you connect the power cable directly to the battery, the interference from other electronic equipment is expected to be less. (See Fig. 1.1.)

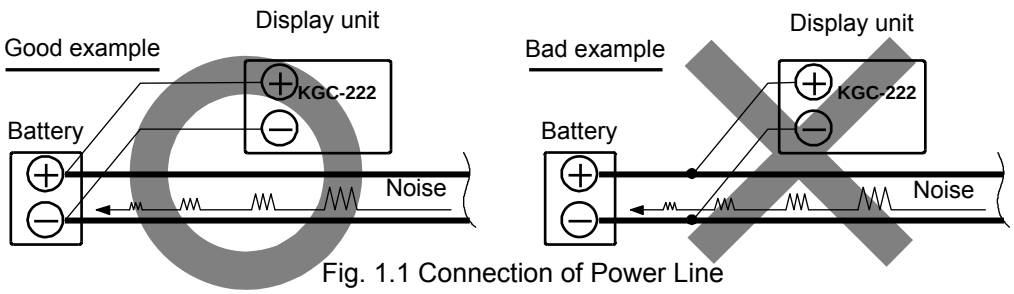


Fig. 1.1 Connection of Power Line

Confirmation after Installation

Be sure to confirm the following points before starting up this equipment. The confirmation is mandatory to operate the equipment normally.

(1) Is the power voltage in the boat within the appropriate voltage range? Is the current capacity enough?
(Voltage Range: 10.8 to 31.2 VDC when measured at the power connector input.)

(2) Is the electric current capacity sufficient? (Power consumption: 10 W)

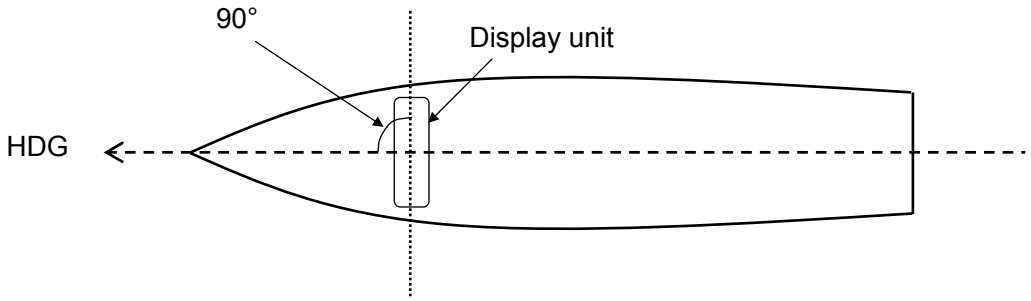
(3) Is the wiring correct? Is the wiring shorted?

1.2 Installation of Display unit

Display unit can be installed either on pedestal or flush-mounted.
The following points shall be taken into consideration:

(1) The KGC-222 has a magnetic backup sensor built in and needs to be installed as far away from other magnetic equipment or ferrous objects as possible, such as compass and others. Strong magnetic field may cause interference during backup function of the display.

(2) When Pitch/Roll and Heaving data is used with other equipment such as echo sounder, the display needs to be installed in head up orientation, if display is installed at an angle with the bow line then it needs to be compensated in the menu.



Install the Display unit as follows.

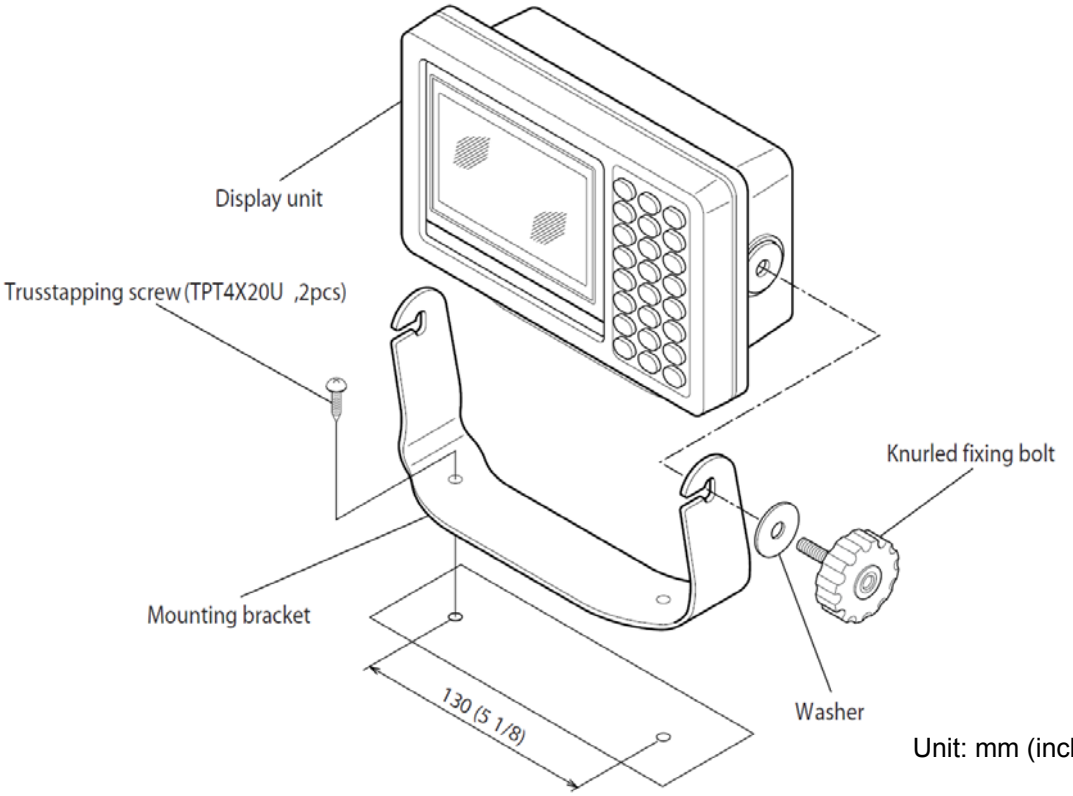
Table mounting

(1) Remove two knob bolts fixing the display unit to the bracket.

(2) Remove the display unit from the bracket and place it on the stable flat place.

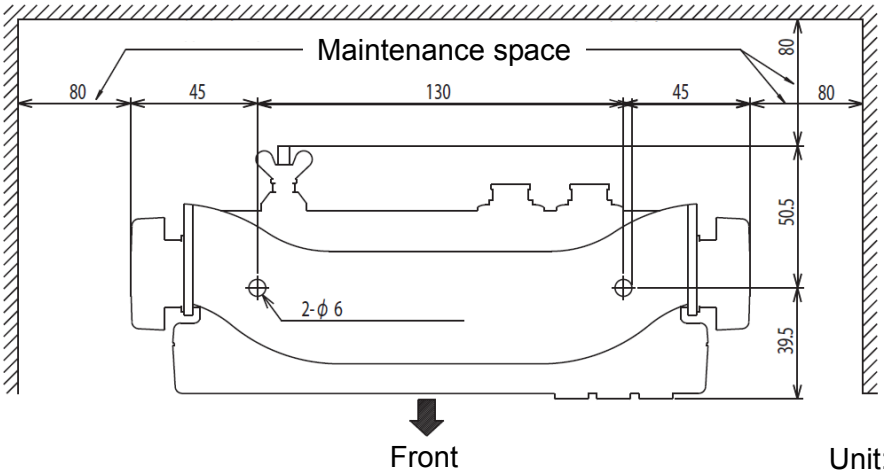
(3) Place the bracket on the position where the display unit will be installed and fix the bracket with two (2) attached truss tapping screws.

(4) Place the display unit on the installation bracket and fix the display unit with two knob bolts removed in step 1.



Unit: mm (inch)

Caution: In the case of mounting the display unit on the table, some maintenance space is required for cabling, connector access, fuse replacement, fastening of bolts, etc. as shown in the following illustration.



Unit: mm

Flush mounting

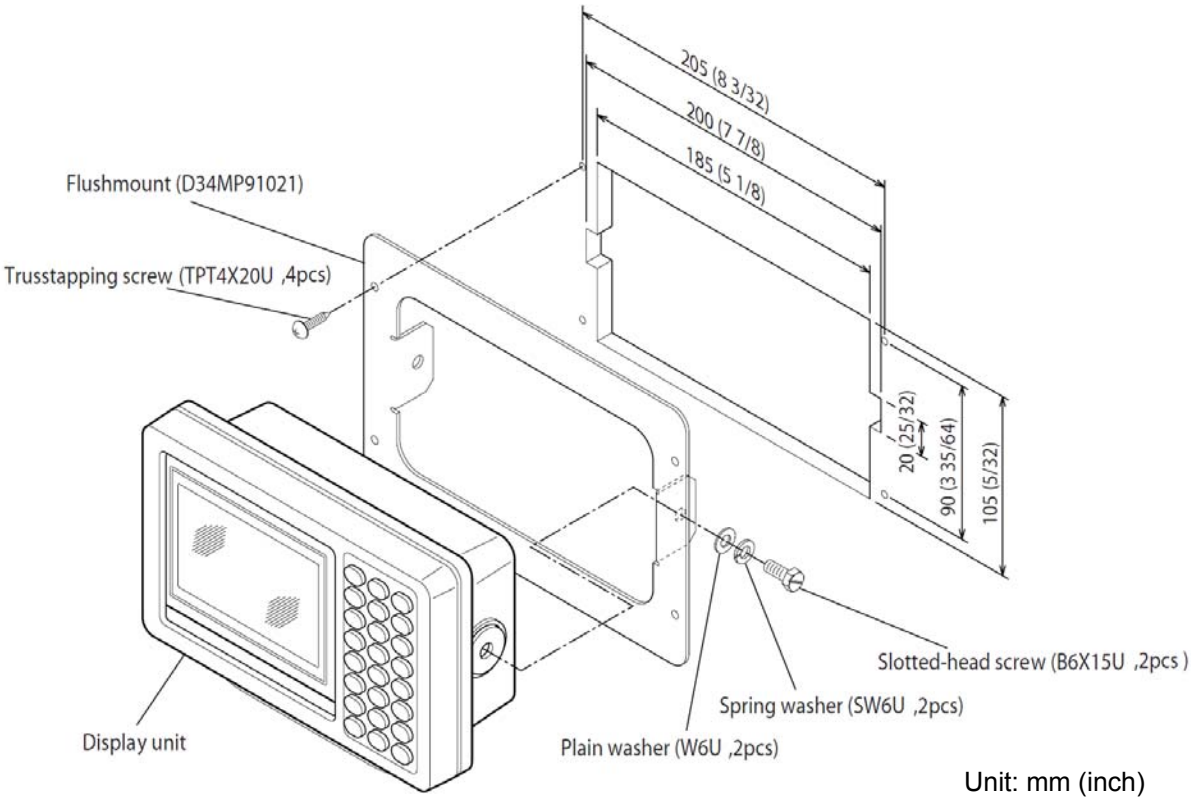
(1) Make a square hole at the location to be installed.

(2) Loosen two (2) fixing knobs that fasten the Display unit onto the mounting bracket. The bracket and knob bolts are no longer used.

(3) Install the Display unit on the Flush mount kit and fix it with two (2) slotted-head screws.

(4) Connect the connectors for power, DATA, and antenna to the Display unit respectively.

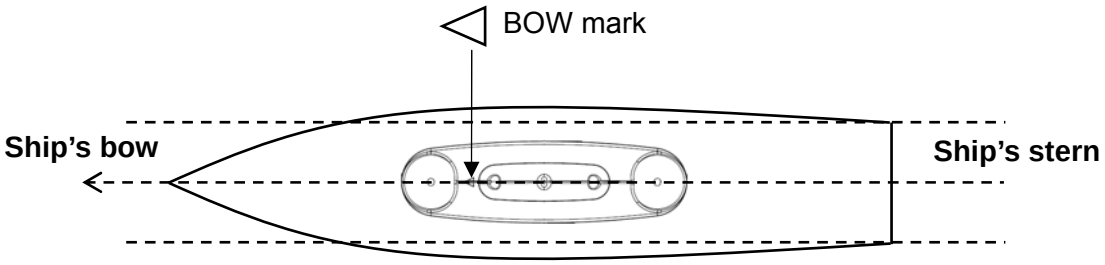
(5) Install the Display unit in the installing location (square hole) and fix it with four 4mm tapping screws. (Prepare 4mm screws suitable for thickness of installing location.)



Unit: mm (inch)

1.3 Installation of GPS antenna GA-12

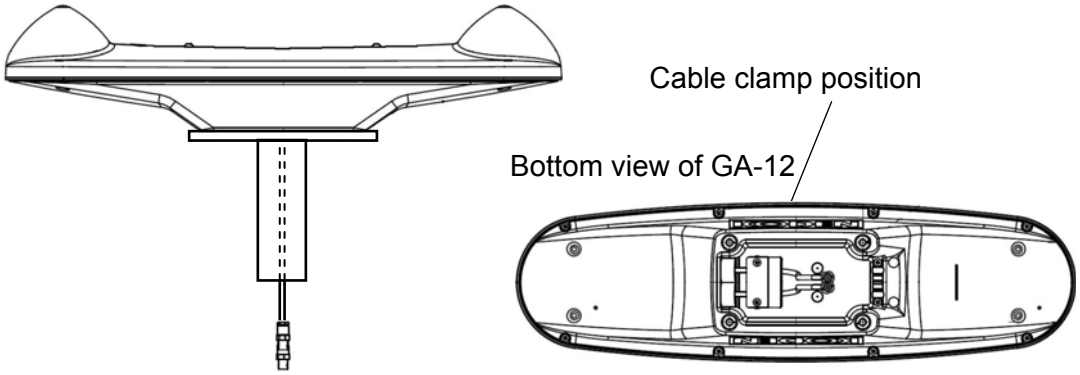
The GPS antenna GA-12 should be installed, as illustrated below, on the keel line with the BOW mark oriented to the ship's bow. If this is not possible due to the ship's superstructure, the antenna may be moved in parallel to the keel line. However, the antenna should be, where possible, installed on the midship, to minimize bearing deviation between the ship's bearing and course.



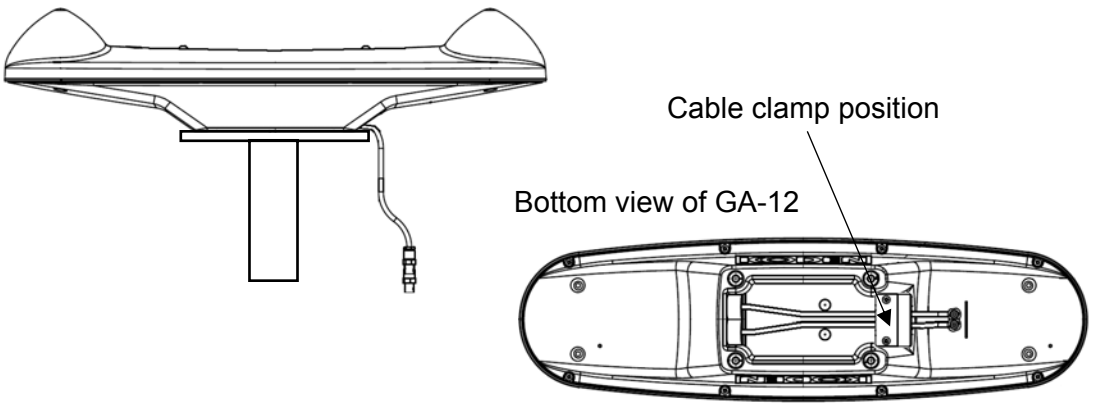
Antenna cable layout method

Two ways to run antenna cable from the antenna.

(1) Antenna cable inserted into the bracked and ran inside the mast pipe.

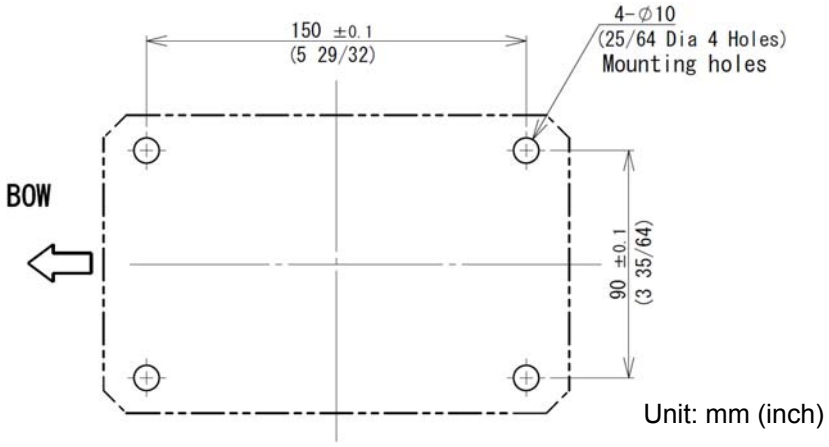


(2) Antenna cable is dropped off from the side of the antennal and ran outside of the mast pipe.
In this case it is necessary to change the setting position of the cable clamp.



Installation of GPS antenna

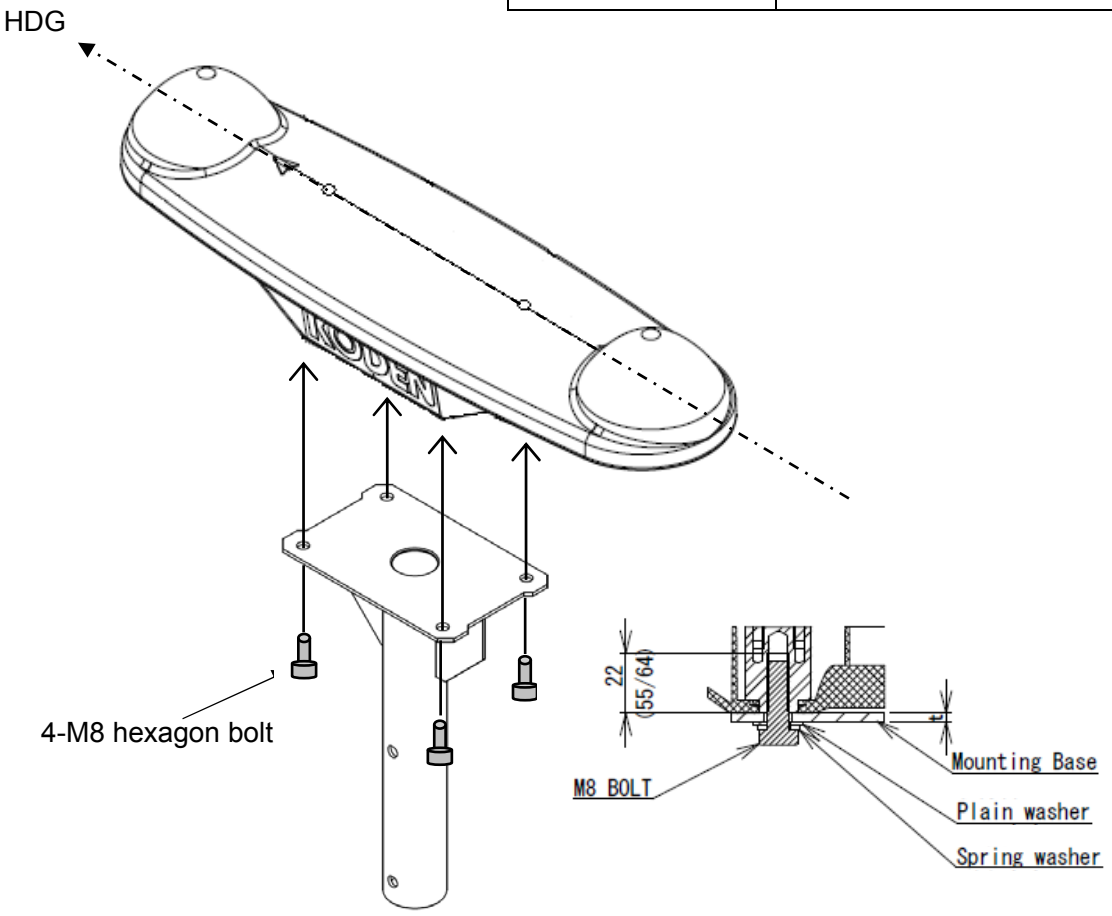
To attach the GPS antenna, four (4) M8 bolts are used. Referring to the illustration below, make four (4) holes on the cradle, fix the bracket. When the thickness of the bracket is 4 to 5mm, supplied bolts may be used (M8 x 25). When the bracket is more than 6 mm thick, the bolts should be choosen from the below table.



Unit: mm (inch)

Drawing of work for mounting holes on the Bracket

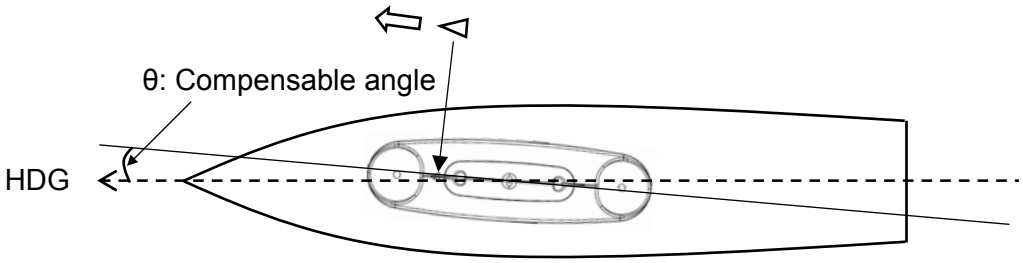
Platform thickness	Bolt for fixing the antenna
4 to 5 mm	M8x25
6 to 10 mm	M8x30



Unit: mm (inch)

Angle compensation of Antenna

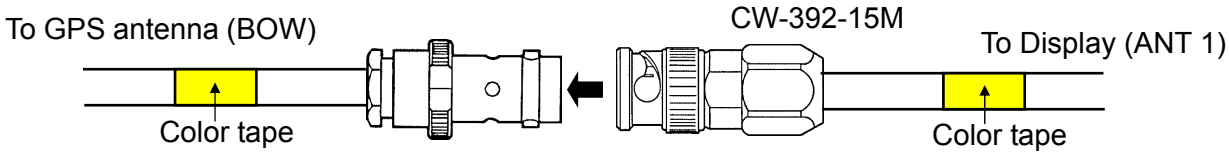
The GPS antenna should be installed on the keel line with the BOW mark oriented to the ship's bow. If not, HDG should be compensated.
When it is installed with θ° clockwise off, enter a compensation value [-θ] in the "MENU 3, COMPENSATION". When it is installed with θ° counterclockwise off, enter a compensation value [+θ] in the menu.



Connecting and waterproofing the connector

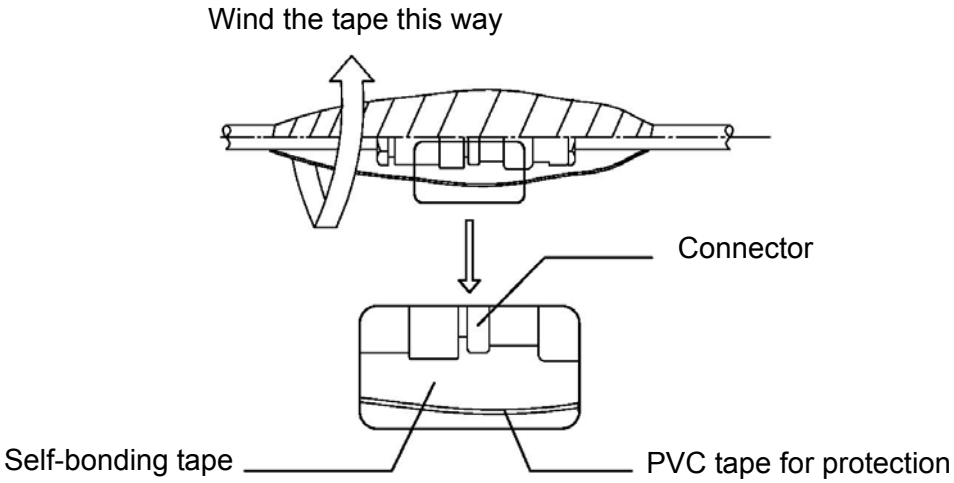
Make sure the BOW antenna cable is connected to ANT 1 of the display unit.

(1) Pay attention to the BOW antenna cable marked with tape.

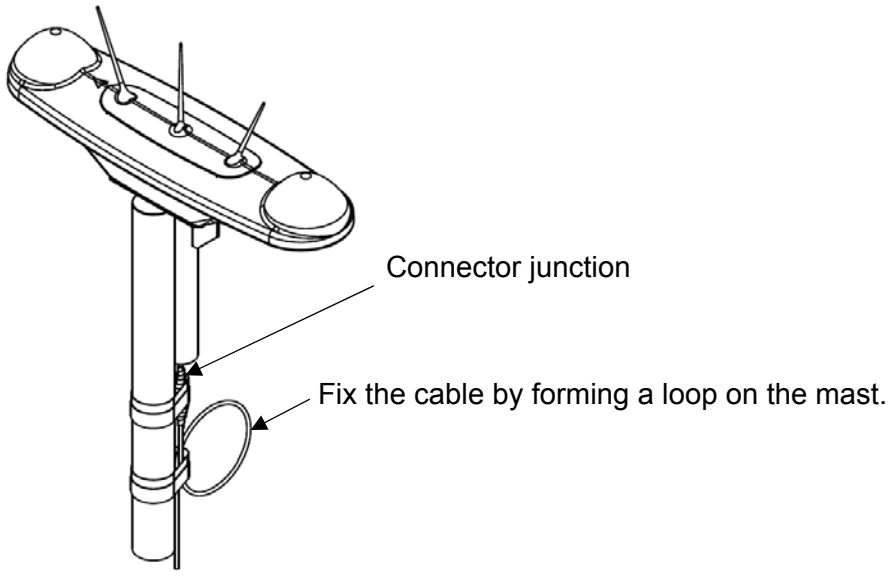


(2) Wind the self-bonding tape around the joint section after connecting.
Pull the end of the tape and stretch it to twice its length. Wrap it around joint section a total of 3 layers. When completed, apply gentle pressure over the surface with fingers to expedite the fusion.

(3) Use PVC tape for extra protection.
PVC tape should not be strained. Wrap it around joint section a total of 3 layers. When finished, press the surface evenly without strain for complete adhesion of the tape.



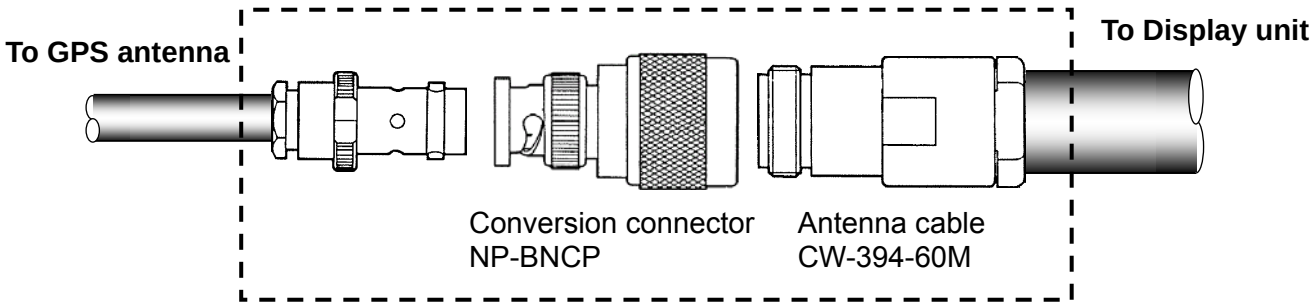
To prevent the tension hanging over the connector junction, the cable shall be fixed as described in the illustration below.



Connecting the 60m antenna cable kit CW-394.KIT to GPS antenna

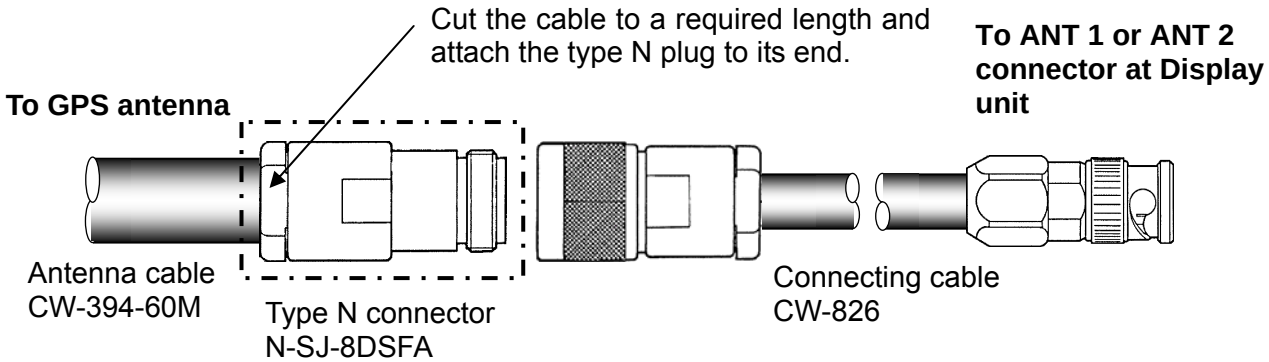
The optional 60 m length cable kit, CW-394.KIT, is composed of the Antenna cable CW-394-60M and the N-to BNC conversion connector. Connect the GPS antenna and Display unit via the cable kit as shown in the following figure.

(1) Connection at GPS Antenna side



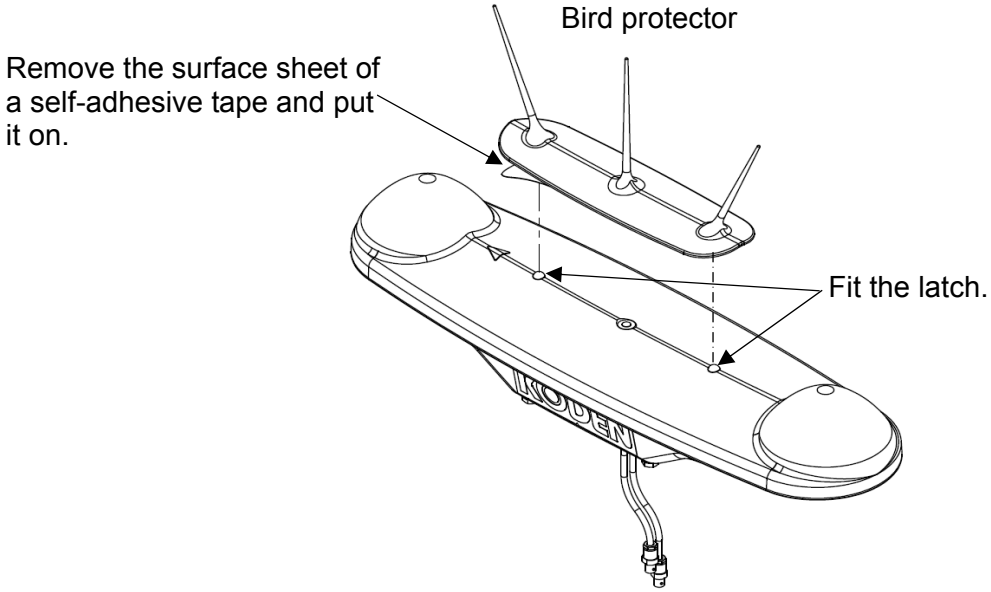
Waterproof the jointing section using self-bonding tape and PVC tape. (Refer to page 1-9 for detail)

(2) Connecting the Display unit



Installing the bird protector to Antenna unit

Sea birds such as seagulls may be the cause of poor reception of the GPS signal when perched on top of the GPS antenna unit. The use of bird protector is recommended to avoid this problem. To fit this device, use the following procedure:

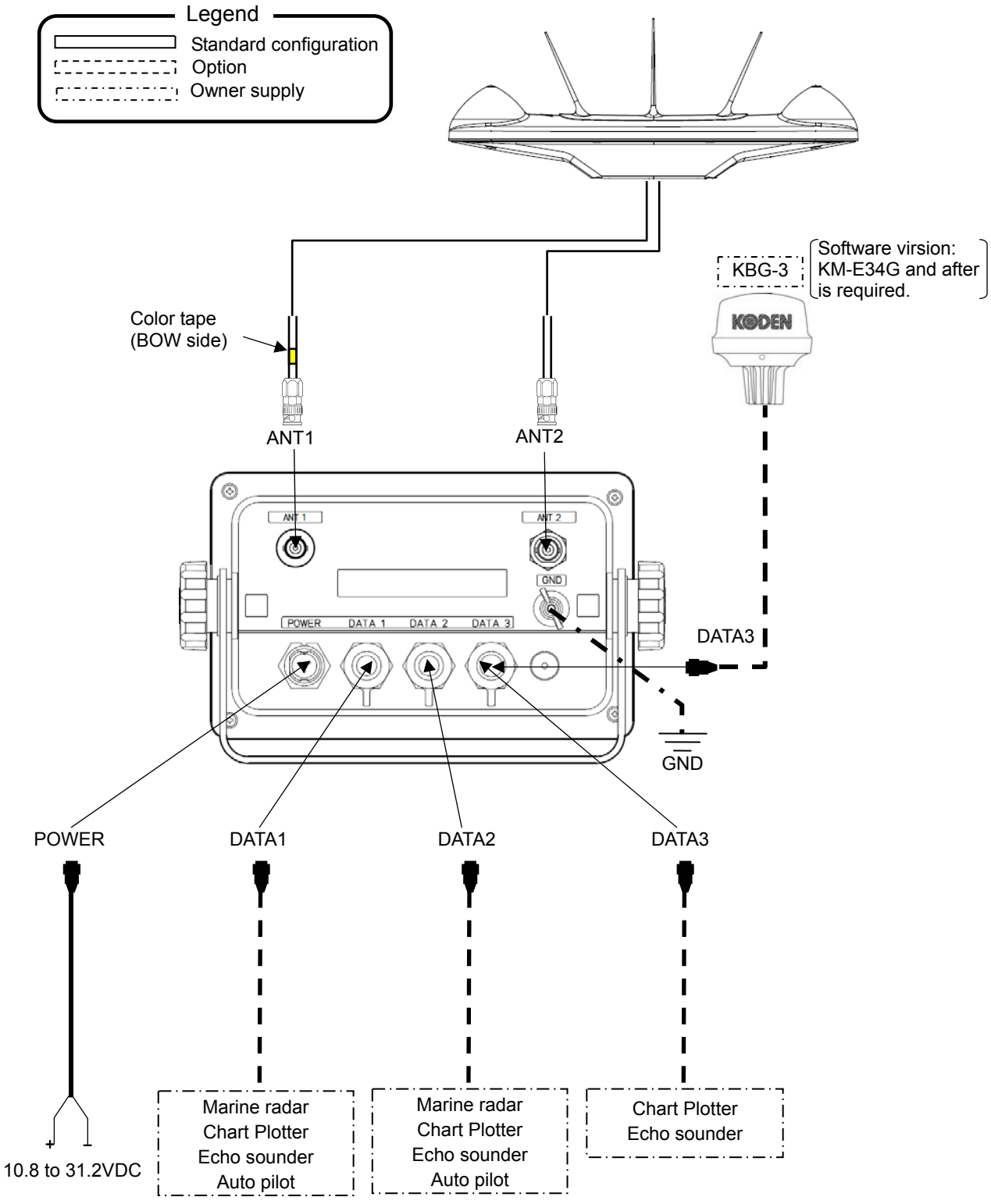


Caution: Put it on the surface without any gaps.

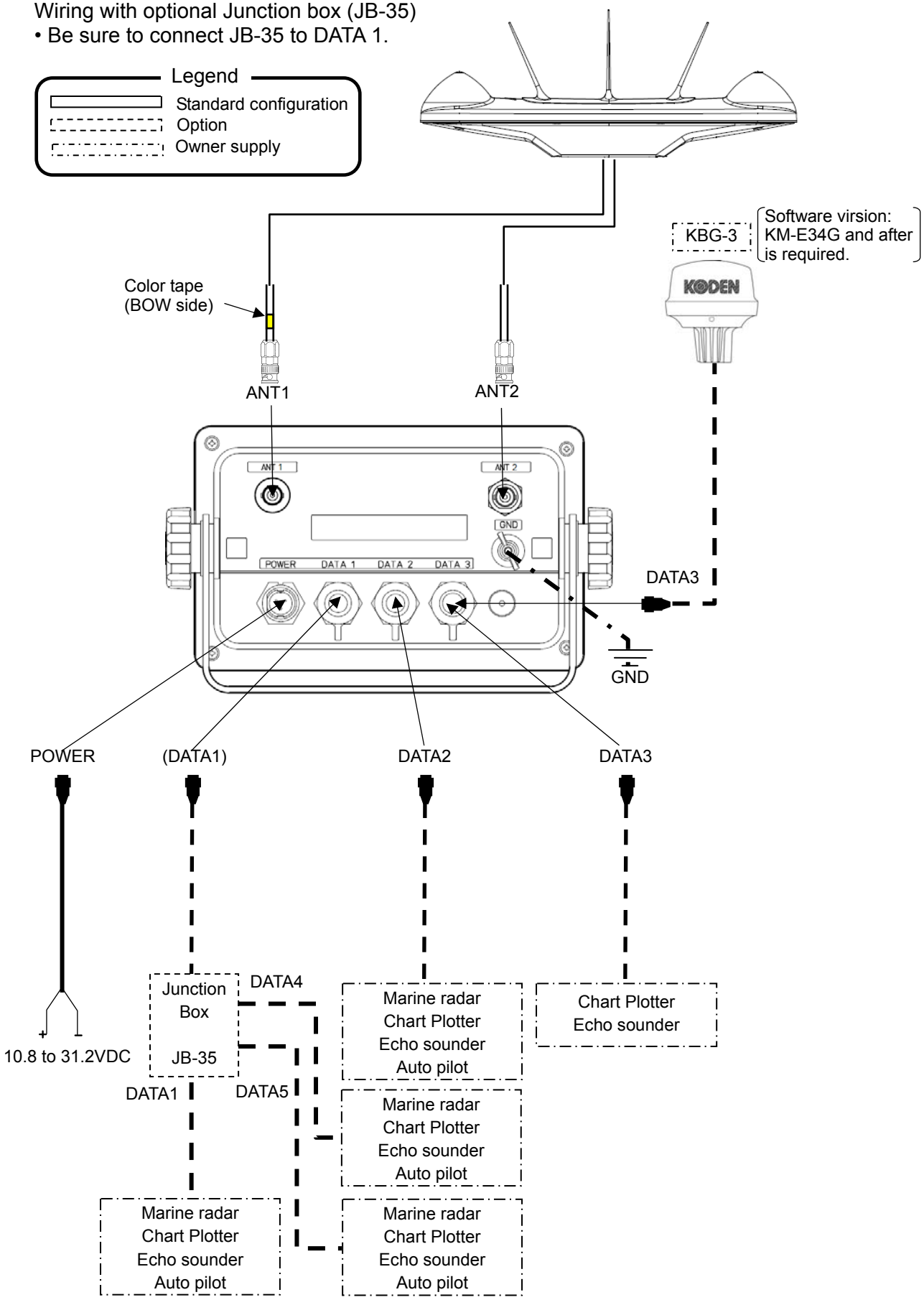
1.4 Wiring

Connect the power cable and cables from the antenna to the connectors on the Display unit. Connect the cables from the external equipments to the DATA connectors on the Display unit.

• DATA 3 is for navigational data. Be sure to connect the Plotter or the KBG-3 to DATA 3.



Wiring with optional Junction box (JB-35)
• Be sure to connect JB-35 to DATA 1.



Chapter 2 Maintenance and Troubleshooting

2.1 Inspection

The daily maintenance and inspection extends the life of equipment. To always keep the equipment in the best condition, implement periodically the inspection shown in the table below.

Item	Content of Inspection
Connector at the rear of Display unit	Check the looseness.
Wiring of cables	Check the wiring of cables connecting the equipment and the damage of cable.
Grounding of display unit	Scrape the rust off the ground terminal and make its contact well.

2.2 Cleaning

Display unit

Contamination on the screen may cause faint images. For cleaning the screen, wipe the screen with soft and clean cloth dipped with diluted neutral detergent. Pay full attention as the screen is easily getting scratched. No thinner shall be used.

⚠Caution: Do not use a solvent such as paint thinner, acetone, alcohol, and benzene, etc.
Strong rubbing may cause bruising and scratching.

For cleaning the housing, do not use a solvent such as thinner or alcohol. Painting on the surface and characters at the operating portion may melt. After wiping with soft and clean cloth dipped with diluted neutral detergent, wipe away with dry soft and clean cloth.

2.3 If you suspect a trouble

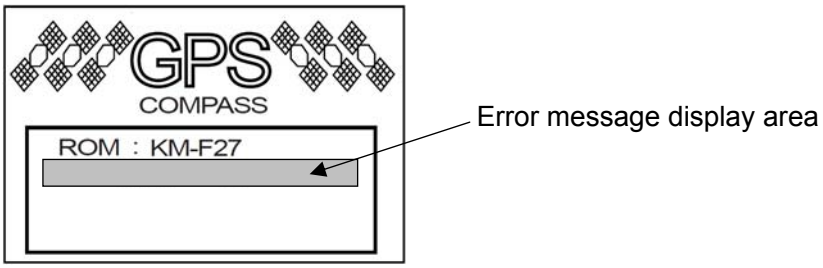
Symptom	Possible cause of trouble	Measure
Even with power on, nothing is displayed.	• Power connector may be loose. • The power supply voltage is out of specification (10.8 to 31.2 VDC). • Poor connection between power cable and battery. • Defect of LCD display block.	• Connect the connector securely. • Use a proper power as per specification. • Check the connection between power cable and battery. • Replace the main PCB (D86-700*)
Heading bearing is not displayed. (---.-° is displayed)	• Antenna Connection on the back of display may be loose. • Antenna View may be blocked by obstacles.	• Connect the connector securely. • Change the installation position of the Antenna.

*Subject to version change

Heading bearing is displayed, but heading output is not available.	• DATA connector of Display unit may be loose. • The baud rate output for external equipment is wrong. • Heading data output may be turned off in settings.	• Tighten the connector surely. • Change the baud rate output (4800 or 38400) for proper connection with external equipment.(Refer to MENU 5:Interface, 3:BAUD RATE) • Check Sentence output.
Incorrect heading bearing data is displayed / output.	• Cables on the back of the display may be swapped between ANT1 and ANT2 • Forward orientation of the antenna may not be correct.	• Connect the bow side antenna cable to ANT 1 of Display unit, and connect the stern side antenna cable to ANT 2 of Display unit. • The direction of GPS antenna should be installed in conformity to the ship's bow. Compensate of HDG. (Refer to MENU 3: Compensation, 1:HDG)
The heaving data is not compensated. The rolling/pitching data is abnormal.	• Compensated value of Display unit installation is wrong.	• Input the Compensation angle value of Display unit installation correctly. (Refer to MENU 3: Compensation, 2:DISPLAY)

2.4 Error Message

The error messages are as follows.



Error message	Possible cause	Measure
Power Down ****	• Instantaneous interruption of the power source is occurred. • Power supply voltage is below normal.	• Check the connection betweeen power cable and battery. • Set the power supply voltage to more than 10.8V.
Vin High ****	• Power supply voltage is too high.	• Set the power supply voltage below 31.2V.
Over Load ****	• Electrical power of internal equipment is over load. (For effect of external equipment) • Electrical power of internal equipment is over load. (Display unit may be broken.)	• Check the external equipment. • Replace the main PCB (D86-700*)

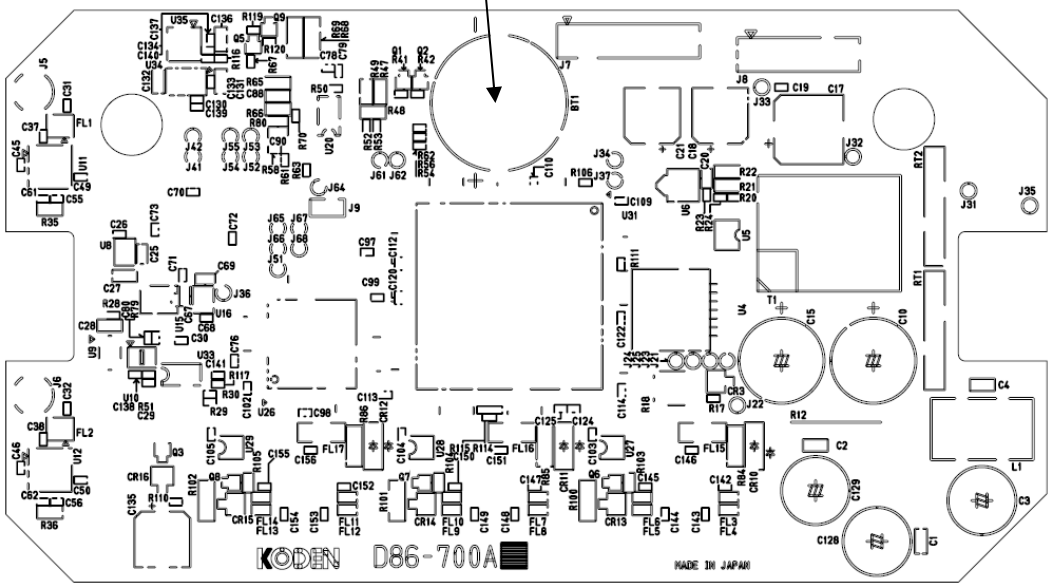
*Subject to version change

RTC Error ****	• Back up of Time Clock failure. • Consumption of the battery (BT1).	• Replace the main PCB (D86-700*) • Replace the battery (BT1). (Reference figure below)
ANT Error ****	• Short-circuits of the antenna cable.	• Check the insulation of antenna cables.
RAM1 Error ****	• Backup DATA failure.	• Press CLR to initialize. • If the situation does not change even if the unit has been initialized, replace the main PCB (D86-700*)
FPGA Error **** LSI Error **** CPU1 Error **** ROM2 Error **** CPU2 Error ****	• Internal circuits or parts failure.	• Replace the main PCB (D86-700*)

*Subject to version change

BT1: CR-2032-1HF

[Main PCB: D86-700*]



*Subject to version change

2.5 Initialize

Initialization of KGC-222 is performed.

When some malfunction of Display unit is found, followng initialization procedure may be required. It returns all the settings in the menu to the factory settings. Before initializing please note all system parameters and reset them after initialize.

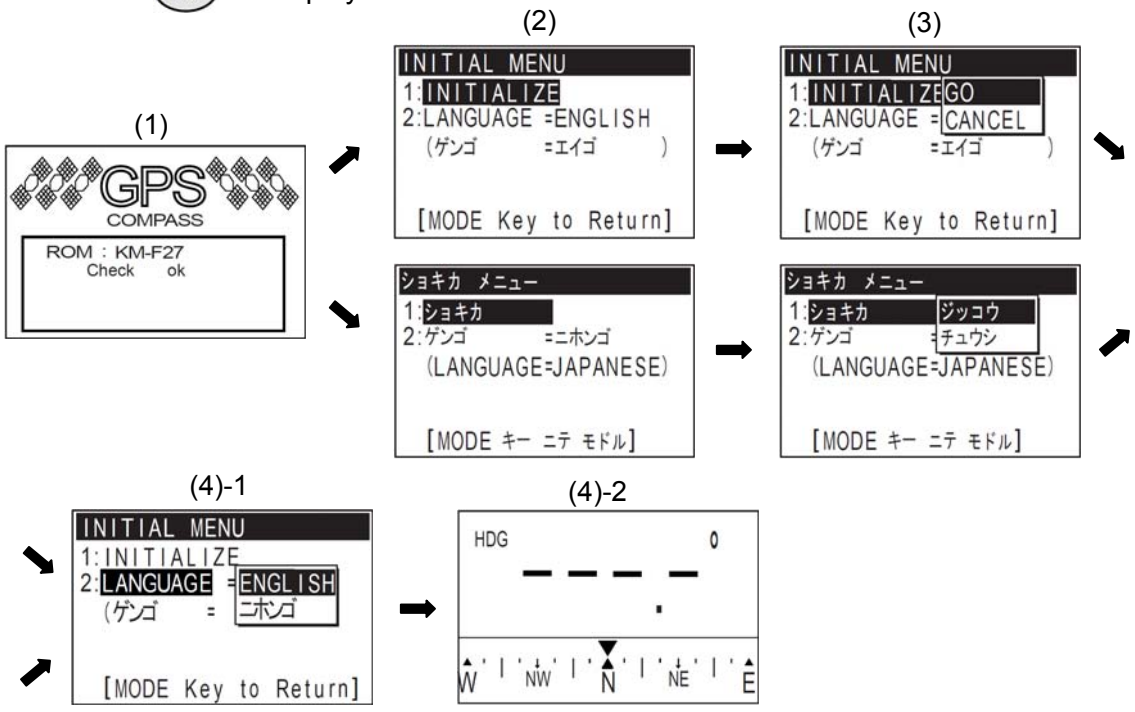
Initialization

(1) Press PWR DIM to power on.

(2) Press MENU → 5 → 6/E → ENT to move to INITIAL MENU during displaying self check.

(3) [ショキカ　メニュー] or [INITIAL MENU] will appear at the top of the display.
Press ENT → ▲ → ENT to initialize.

(4) Press ▼ / ▲ to select the language to be used, and press ENT.
Press MODE to display the HDG1 screen.



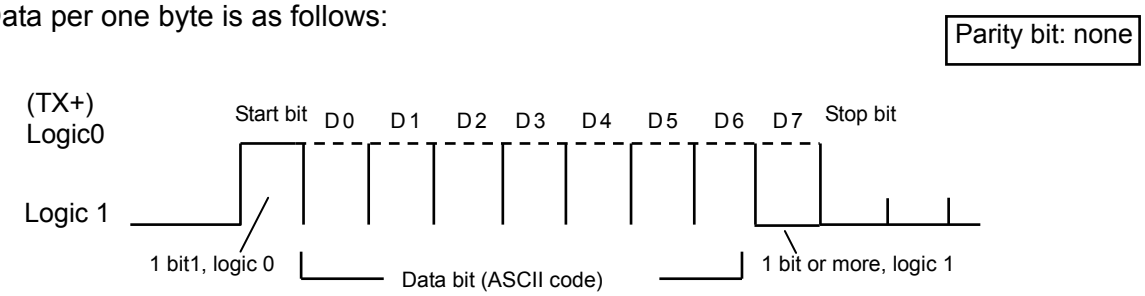
Chapter 3 Detail of the serial output data

3.1 Output data format

Serial data name: NMEA0183 Ver.2.0

3.2 Details of the output data format

Data per one byte is as follows:



3.3 Output data specification

Baud rate	Output level	Output current	Sentence	Output interval
4800/38400 bps	**RS-422**	**20mA max.**	DTM, GGA, GLL, GSA, GSV, MSS, RMC, VTG, ZDA, PKODA, PKODG,1, PKODG,7, PKODQ	1sec
			ATT, HDM, HDT, HVE, ROT, PKODG,21	20ms 40ms 50ms 100ms 200ms 1sec

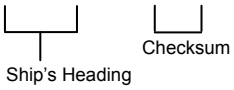
3.4 Details of output sentences

Sentence name	Data name and contents **NOTE:** *Checksum is a total sum of EX-ORed data that are put between the $ and asterisk (*) signs.*
HDT	Ship's heading (True bearing) **$ GPHDT, xxx.x, T *hh <CR><LF>** Checksum Ship's Heading Sentence name Talker device code Start of sentence

HDM

Ship's heading (Magnetic bearing)

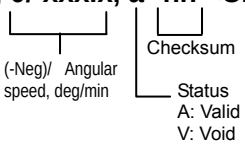
$ GPHDM, xxx.x, M *hh <CR><LF>



ROT

Rate of turn

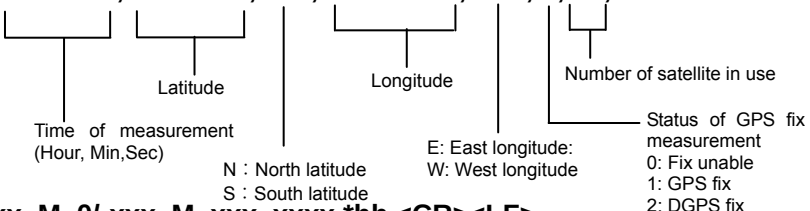
$ GPROT, 0/-xxx.x, a *hh <CR><LF>



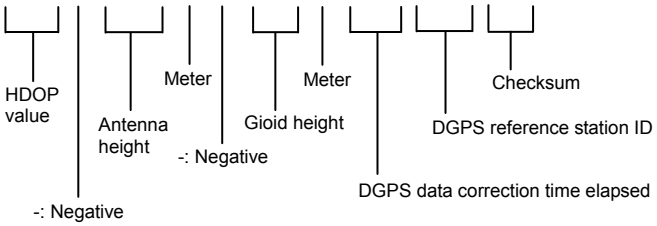
GGA

GPS position data

$ GP GGA, hhmmss, xxxx.xxx, N/S, xxxxx.xxx, E/W, x, xx,



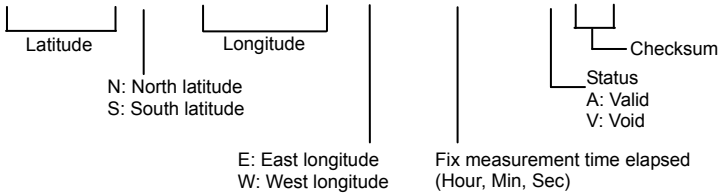
xxx, 0/-xxxx, M, 0/-xxx, M, xxx, xxxx *hh <CR><LF>



GLL

Ground position (Latitude/Longitude)

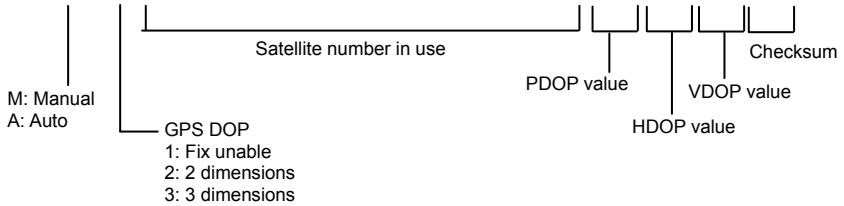
$ GP GLL, xxxx.xxx, N/S, xxxxx.xxx, E/W,hhmmss , a *hh <CR><LF>



GSA

Satellite in use and DOP

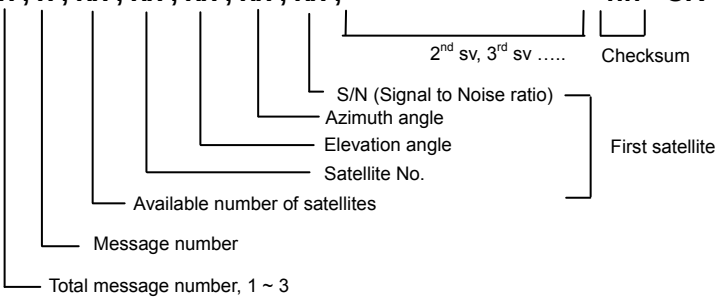
$ GP GSA, M/A, x, xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx, x.x, x.x, x.x *hh <CR><LF>



GSV

Available satellite

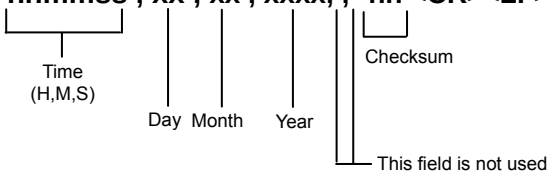
$GPGSV , x , x , xx , xx , xx , xx , xx ,· · · · · · · · · · · · · · · · · *hh <CR><LF>



ZDA

Time and date

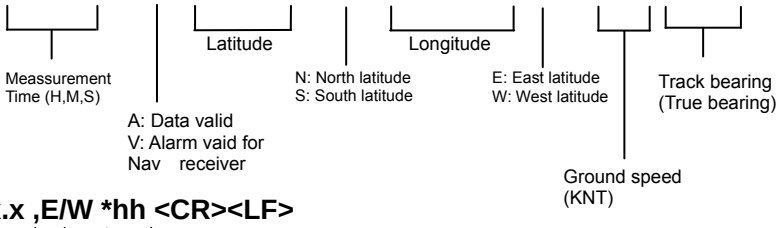
$ GPZDA , hhmmss , xx , xx , xxxx, , *hh <CR><LF>



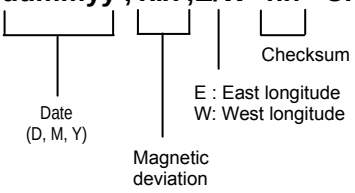
RMC

Minimum sentence for GPS/TRANSIT navigation data

$ GPRMC , hhmmss , x , xxxx.xxx, N/S, xxxxx.xxx, E/W, x.x , xxx.x ,



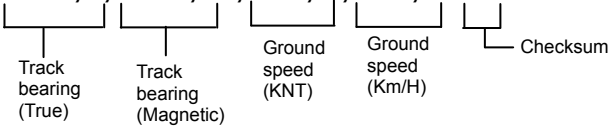
ddmmyy , x.x ,E/W *hh <CR><LF>



VTG Ver2.0

Course and ground speed

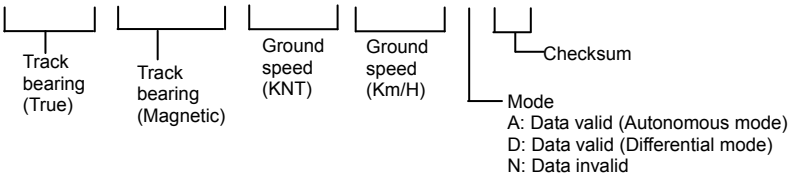
$GPVTG, xxx.x, T, xxx.x, M , xx.x, N, xx.x, K *hh <CR><LF>



VTG 61162-1

Course and ground speed

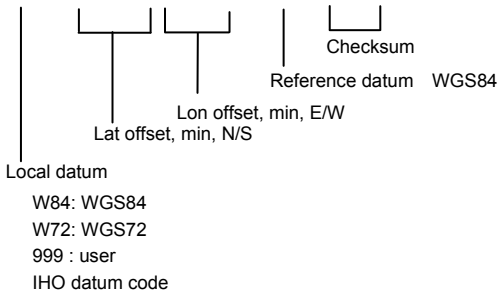
$GPVTG, xxx.x, T, xxx.x, M , xx.x, N, xx.x, K, a *hh <CR><LF>



DTM

Datum reference

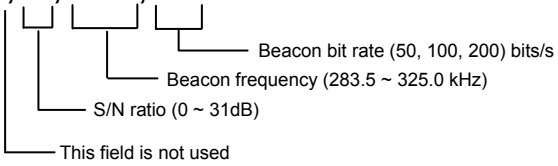
$GPDTM, ccc, , x.x, a, x.x, a, , W84 *hh <CR><LF>



MSS

MSK receiver signal status

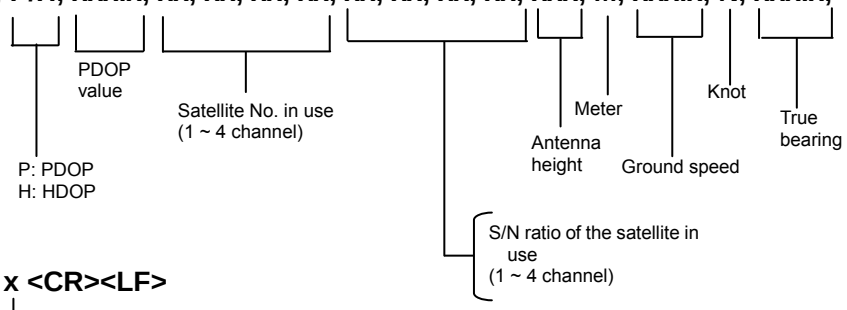
$ GPMSS, , xx, xxx.x, xxx <CR><LF>



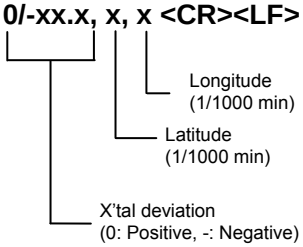
PKODA

Satellite information (KODEN proprietary sentence)

$ PKODA, P/H, xxx.x, xx, xx, xx, xx, xx, xx, xx, xx, xxx, M, xxx.x, N, xxx.x,



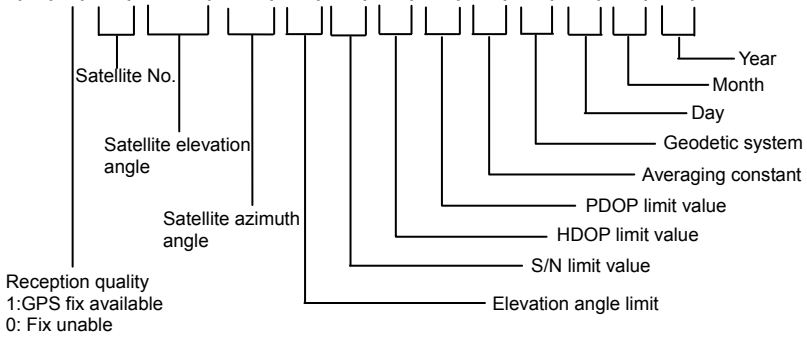
0/-xx.x, x, x <CR><LF>



PKODG,1

Satellite information (KODEN proprietary sentence)

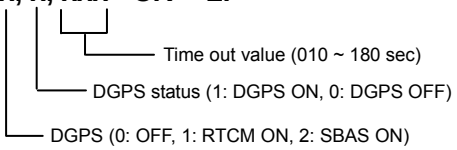
$ PKODG, 1, x, xx, +/-xx, xxx, xx, xx, xx, xx, xx, xx, xx, xx, xx, <CR><LF>



PKODG,7

DGPS information (KODEN proprietary sentence)

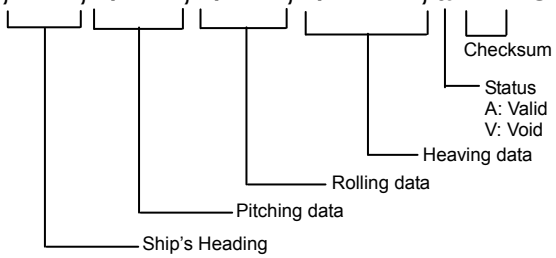
$ PKODG, 7, x, x, xxx <CR><LF>



PKODG,21

Ship's heading, Pitch/Roll and Heaving information (KODEN proprietary sentence)

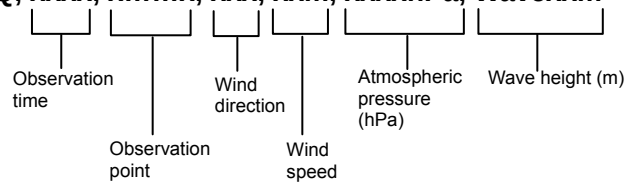
$PKODG, 21 ,xxx.x, +/-xx.x, +/-xx.x, +/-xx.xxx, a *hh <CR><LF>



PKODQ

Type 16 weather information (KODEN proprietary sentence)

$ PKODQ, xxxx, x……x, xxx, xxm, xxxxhPa, Wavexxm <CR><LF>

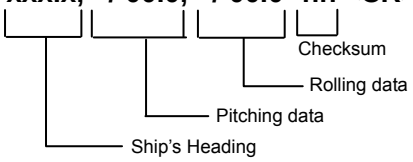


*Only be used in japan with message type 16 provided from a Japanese beacon station.

ATT

Ship's heading, Pitch and Roll information (FURUNO proprietary sentence)

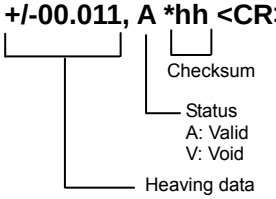
$ PEFC,GPatt, xxx.x, +/-00.0, +/-00.0 *hh <CR><LF>



HVE

Heaving information (FURUNO proprietary sentence)

$ PEFC,GPhve, +/-00.011, A *hh <CR><LF>



Chapter 4 Technical references

4.1 Maintenance parts list

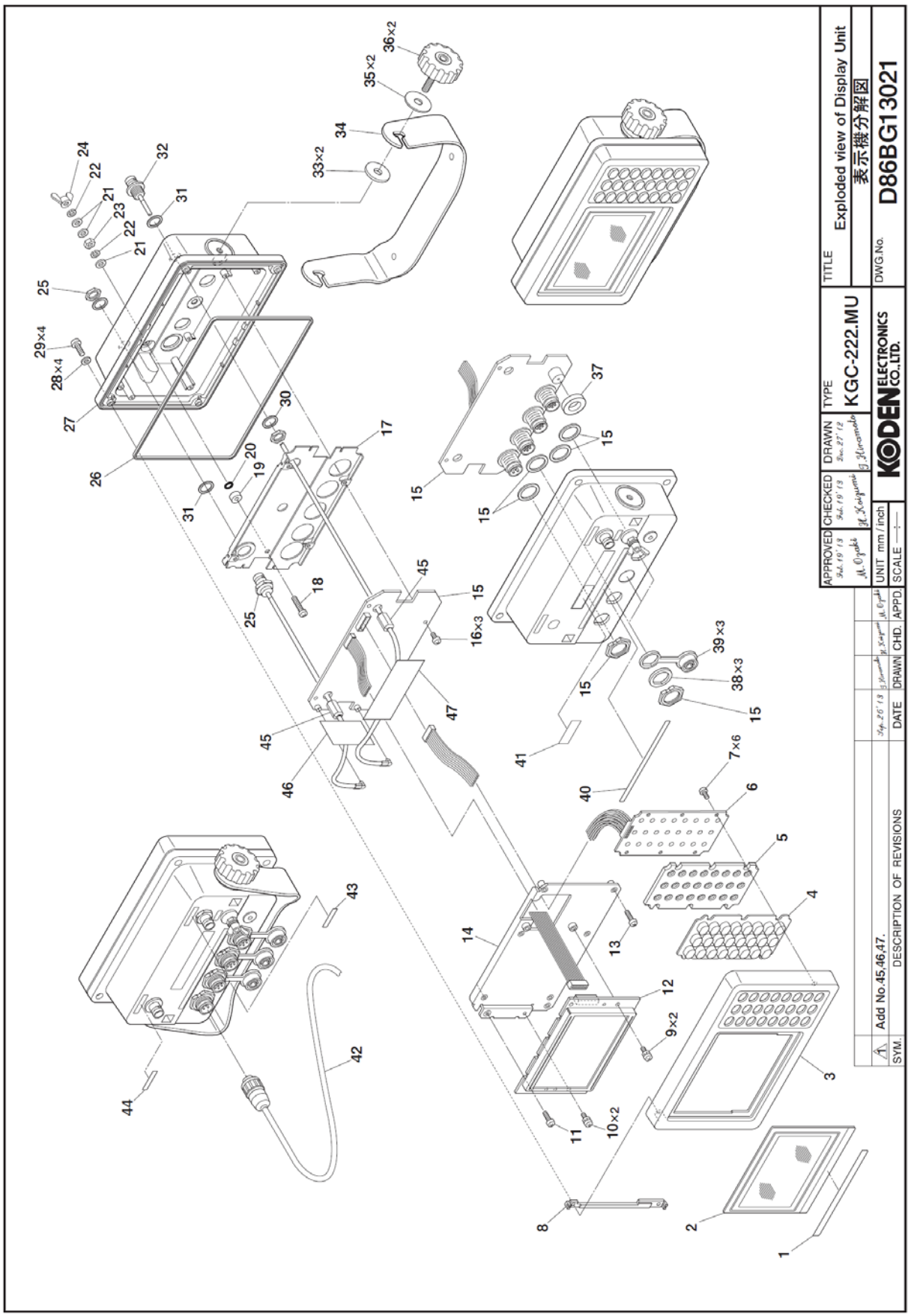
Maintenance parts list of KGC-222

* “No.” corresponds to “Exploded view of Display Unit, D86BG13021”.

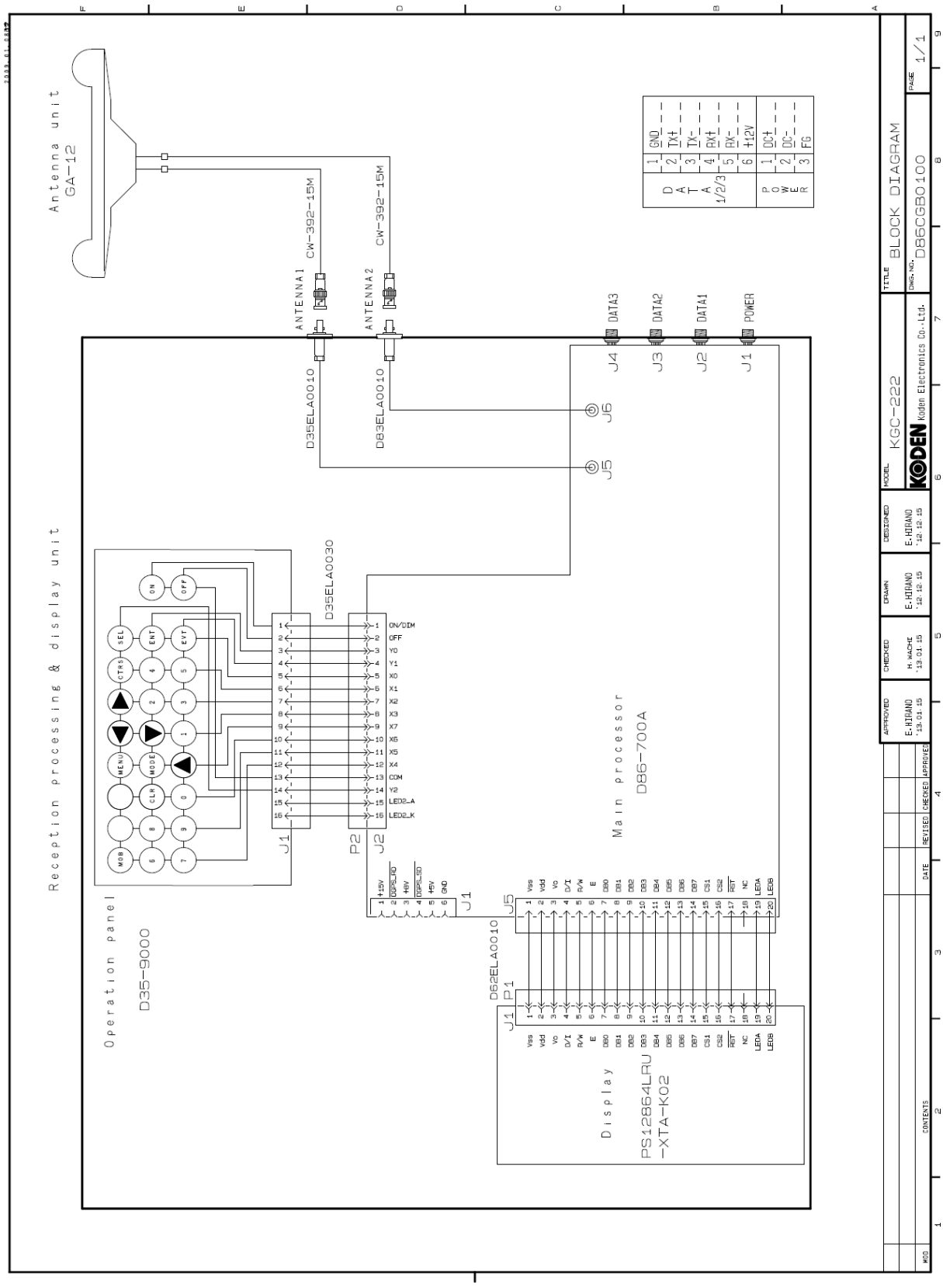
No.	Parts Code	Name	Description	Q'ty	Remarks
15	0060772012	PCB assembly	D86-700*	1	Main processor
6	0060390060	PCB assembly	D35-900*	1	Operation panel
12	0059543080	LCD module assembly	RS12864LRU-XTA-K02	1	Display
42	0056870105	DC power cable	CW-266-1.8M	1	
	0021988170	Antenna unit	GA-12	1	
	0035283925	Antenna cable	CW-392-15M	1	

*Subject to version change

4.2 Exploded view drawing



4.3 Block diagram



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