

# AUTOPILOT NAVpilot-700/711/720 Installation Manual

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**ECF**

(Elemental Chlorine Free)

The paper used in this manual  
is elemental chlorine free.

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\* 0 0 0 1 7 1 8 1 3 1 3 \*



# SAFETY INSTRUCTIONS

Please read these safety instructions before you install the equipment.



## WARNING

Indicates a condition that can cause death or serious injury if not avoided.



## CAUTION

Indicates a condition that can cause minor or moderate injury if not avoided.



Warning, Caution



Prohibitive Action



Mandatory Action



## WARNING



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

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



**Use the proper power cable.**

Use JIS type DPY-2.5 or the equivalent. Other types can cause fire.



**Confirm that no one is near the rudder when bleeding air from oil cylinder.**

The rudder may move unexpectedly, possibly causing bodily injury.



**When connecting a geomagnetism detection type heading sensor, correct magnetic field deviation.**

If an autopilot is used without the compensation, unexpected course change may occur.



**Set REMOTE CONTROLLER 1/2 on SYSTEM SETUP menu properly according to remote controller connected.**

If not done properly, malfunction may occur. Especially, take care when setting the NFU-type remote controller.



## CAUTION



**Confirm that the power supply voltage is compatible with the voltage rating of the equipment.**

Connection to the wrong power supply can cause fire or damage the equipment.



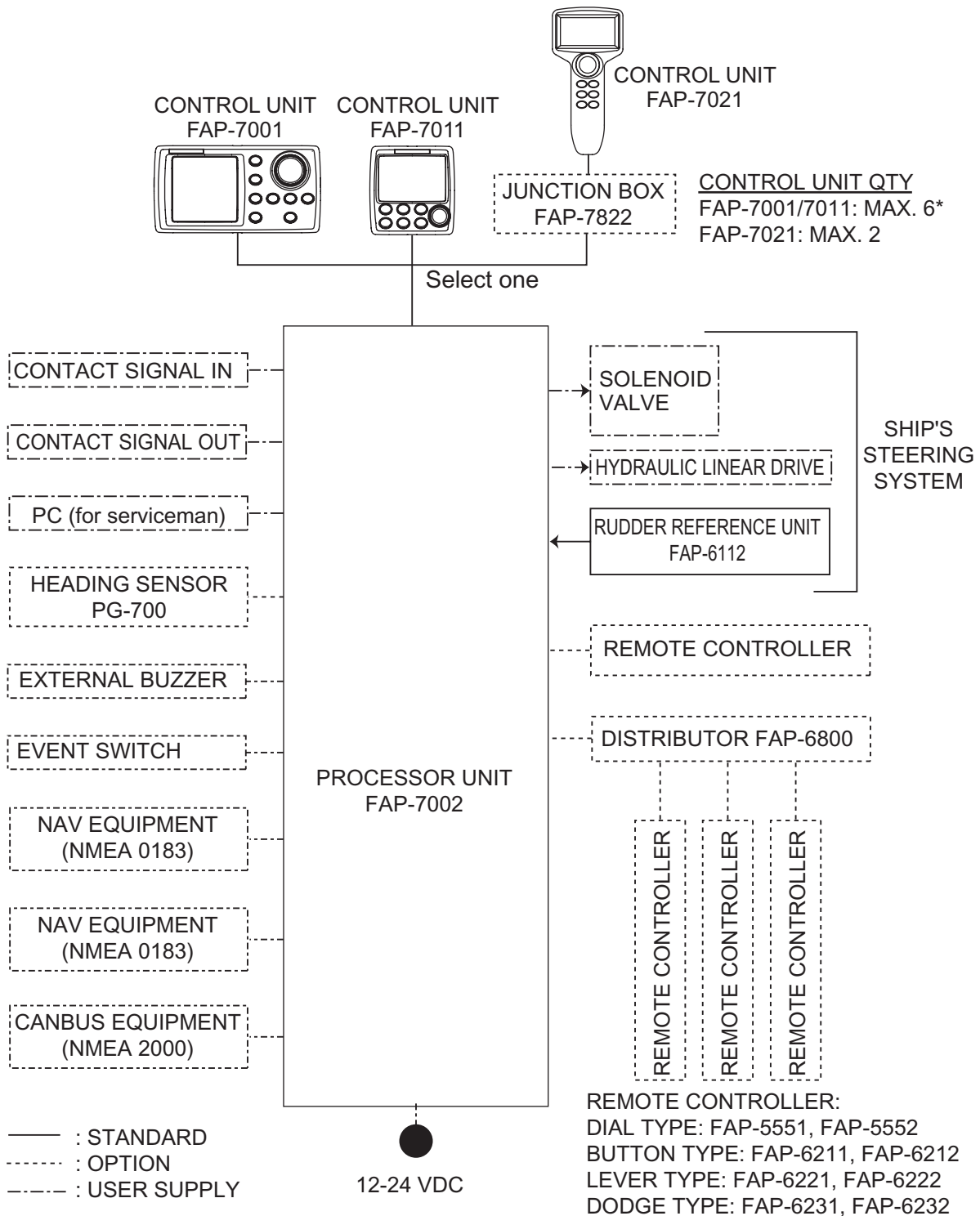
**Observe the following compass safe distances to prevent interference to a magnetic compass:**

|                         |          | Standard compass | Steering compass |
|-------------------------|----------|------------------|------------------|
| Control Unit            | FAP-7001 | 0.35 m           | 0.30 m           |
|                         | FAP-7011 | 0.35 m           | 0.30 m           |
|                         | FAP-7021 | 0.35 m           | 0.30 m           |
| Processor Unit FAP-7002 |          | 0.45 m           | 0.30 m           |
| Remote controllers      |          | 0.30 m           | 0.30 m           |



**Separate the reversible pump at least one meter from communications equipment, communications antenna and communications cabling to prevent interference.**

# SYSTEM CONFIGURATION



\*: ANY COMBINATION OF FAP-7001 AND 7011 IS AVAILABLE. ALSO, FAP-7021 CAN BE CONNECTED AT THE END OF SERIES.

# EQUIPMENT LISTS

## Standard supply for NAVpilot-700

| Name                   | Type         | Code No.    | Qty   | Remarks   |
|------------------------|--------------|-------------|-------|---|
| Control Unit           | FAP-7001     | -           | 1     |   |
| Processor Unit         | FAP-7002     | -           | 1     |   |
| Rudder Reference Unit  | FAP-6112-200 | -           | 1     | w/20 m cable  |
| Installation Materials | CP64-02900   | 000-016-414 | 1 set | For Control Unit, w/cable assy. BD-07AFFM-LR-150 and CP64-02901 |
|                        | CP64-03101   | 001-082-720 | 1 set | For Processor Unit  |
|                        | CP64-02601   | 009-001-170 | 1 set | For Rudder Reference Unit                                       |
| Spare Parts            | SP64-01501   | 001-082-710 | 1 set | For Processor Unit, fuse  |
| Accessories            | FP64-01401   | 001-082-700 | 1 set | For Control Unit  |

## Standard supply for NAVpilot-711

| Name                   | Type         | Code No.    | Qty   | Remarks   |
|------------------------|--------------|-------------|-------|---|
| Control Unit           | FAP-7011     | -           | 1     |   |
| Processor Unit         | FAP-7002     | -           | 1     |   |
| Rudder Reference Unit  | FAP-6112-200 | -           | 1     | w/20 m cable  |
| Installation Materials | CP64-03000   | 000-016-415 | 1 set | For Control Unit, w/cable assy. BD-07AFFM-LR-150 and CP64-03001 |
|                        | CP64-03101   | 001-082-720 | 1 set | For Processor Unit  |
|                        | CP64-02601   | 009-001-170 | 1 set | For Rudder Reference Unit                                       |
| Spare Parts            | SP64-01501   | 001-082-710 | 1 set | For Processor Unit, fuse  |
| Accessories            | FP64-01401   | 001-082-700 | 1 set | For Control Unit  |

## Standard supply for NAVpilot-720

| Name                   | Type         | Code No.    | Qty   | Remarks                   |
|------------------------|--------------|-------------|-------|---------------------------|
| Control Unit           | FAP-7021     | -           | 1     |                           |
| Processor Unit         | FAP-7002     | -           | 1     |                           |
| Rudder Reference Unit  | FAP-6112-200 | -           | 1     | w/20 m cable              |
| Installation Materials | CP64-03101   | 001-082-720 | 1 set | For Processor Unit        |
|                        | CP64-02601   | 009-001-170 | 1 set | For Rudder Reference Unit |
| Spare Parts            | SP64-01501   | 001-082-710 | 1 set | For Processor Unit, fuse  |
| Accessories            | FP64-01411   | 001-082-770 | 1 set | For Control Unit          |

**Optional supply**

| <b>Name</b>       | <b>Type</b>         | <b>Code No.</b> | <b>Remarks</b>                                 |
|-------------------|---------------------|-----------------|--|
| Control Unit      | FAP-7001            | -               | Max. 5 optional units                          |
|                   | FAP-7011            | -               | Max. 5 optional units                          |
|                   | FAP-7021            | -               | Max. 2 optional units                          |
| Remote Controller | FAP-5551-E          | 000-090-224     | Dial type, w/connector                         |
|                   | FAP-5552-E          | 000-090-269     | Dial type, no connector                        |
|                   | FAP-6211-E          | 000-090-235     | Button type, w/connector                       |
|                   | FAP-6212-E          | 000-090-271     | Button type, no connector                      |
|                   | FAP-6221-E          | 000-090-239     | Lever type, w/connector and w/CP64-01100       |
|                   | FAP-6222-E          | 000-090-273     | Lever type, no connector, w/CP64-01100         |
|                   | FAP-6231-E          | 000-090-251     | Dodge type, w/connector                        |
|                   | FAP-6232-E          | 000-090-279     | Dodge type, no connector                       |
| Distributor       | FAP-6800            | 000-090-242     | For connection of three remote controllers     |
| Terminator        | BD-07AFFM-LR7001    | 001-081-140-10  |  |
| Cable Assy        | MJ-A10SPF0001-060+  | 001-081-150-10  | For Distributor Unit, 6 m                      |
|                   | MJ-A10SPF0001-120+  | 001-081-160-10  | For Distributor Unit, 12 m                     |
|                   | BD-07AFFM-LR-100    | 001-081-170-10  | For Control Unit, 10 m, connector at one end   |
|                   | BD-07AFFM-LR-150    | 001-081-180-10  | For Control Unit, 15 m, connector at one end   |
|                   | BD-07AFFM-LR-200    | 001-081-190-10  | For Control Unit, 20 m, connector at one end   |
|                   | BD-07AF-07AF-LR-100 | 001-081-200-10  | For Control Unit, 10 m, connector at both ends |
|                   | BD-07AF-07AF-LR-200 | 001-081-210-10  | For Control Unit, 20 m, connector at both ends |
|                   | M12-05BFFM-010      | 000-167-965-10  | CAN bus drop cable, 1 m, micro                 |
|                   | M12-05BFFM-020      | 000-167-966-10  | CAN bus drop cable, 2 m, micro                 |
|                   | M12-05BFFM-060      | 000-167-967-10  | CAN bus drop cable, 6 m, micro                 |
|                   | CB-05BFFM-010       | 000-167-971-10  | CAN bus drop cable, 1 m, mini                  |
|                   | CB-05BFFM-020       | 000-167-972-10  | CAN bus drop cable, 2 m, mini                  |
|                   | CB-05BFFM-060       | 000-167-973-10  | CAN bus drop cable, 6 m, mini                  |
| T-type Connector  | SS-050505-FMF-TS001 | 000-168-603-10  | For CAN bus, micro+micro                       |
|                   | NC-050505-FMF-TS001 | 000-160-507-10  | For CAN bus, mini+micro                        |

| <b>Name</b>           | <b>Type</b>         | <b>Code No.</b> | <b>Remarks</b>                            |
|-----------------------|---------------------|-----------------|---|
| Termination Resistor  | LTWMC-05BMMT-SL8001 | 000-168-604-10  | For CAN bus, micro, male                  |
|                       | LTWMN-05AMMT-SL8001 | 000-160-508-10  | For CAN bus, mini, male                   |
|                       | LTWMC-05BFFT-SL8001 | 000-168-605-10  | For CAN bus, micro, female                |
|                       | LTWMN-05AFFT-SL8001 | 000-160-509-10  | For CAN bus, mini, female                 |
| Cable Extension Kit   | FAP-7822            | 000-016-670     |   |
| Cradle                | FP64-01411          | 001-082-770     |   |
| Flush Mount Kit       | FAP-7001-FLUSH-KIT  | 001-082-730     | For FAP-7001                              |
|                       | FAP-7011-FLUSH-KIT  | 001-082-740     | For FAP-7011                              |
| Hanger                | FAP-7001-HANGER     | 001-082-750     | For FAP-7001, w/hanger and two knob bolts |
|                       | FAP-7011-HANGER     | 001-082-760     | For FAP-7011, w/hanger and two knob bolts |
| Rudder Reference Unit | FAP-6112-200        | -               | w/20 m cable                              |
| Junction Box          | FI-5002             | 000-010-765     | w/self-tapping screws                     |
| Hanger                | OP64-2              | 009-004-030     | For FAP-5551/5552                         |
| Flush Mount Kit       | OP64-4              | 009-005-790     | For FAP-6221/6222, panel type             |
|                       | OP64-5              | 009-005-800     | For FAP-6221/6222, surface type           |

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# 1. HOW TO INSTALL THE UNITS

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## 1.1 Control Unit FAP-7001/FAP-7011

- The Control Unit can be installed three ways:
  - Surface mount (fixed from front panel or fixed from rear panel (FAP-7011 only))
  - Desktop mount, and
  - Flush mount (Optional kit required, instructions, supplied separately).



Control Unit-FAP-7001



Control Unit FAP-7011

Select a mounting location for the Control Unit, keeping the following in mind.

- Select a location with good ventilation.
- Shock and vibration must be the least possible.
- Use the supplied display hard cover when the system is not in use.
- Do not install the display unit under "Plexiglas" or other type of shielding material. Plexiglas can trap heat and moisture or magnify sunlight energy onto the surface of the display.
- For maintenance and checking purposes, leave space at the sides and rear of the unit and leave slack in cables. See the outline drawing for recommended maintenance space.
- Observe the compass safe distances shown in the safety instructions on page i to prevent interference to a magnetic compass.

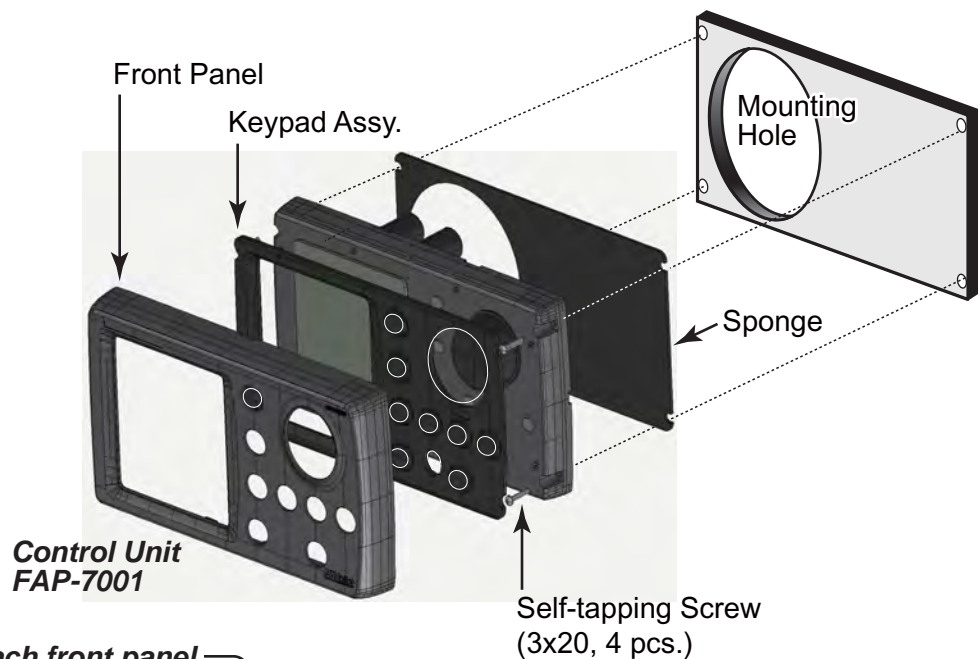
## 1. INSTALLATION

### 1.1.1 Surface mount

There are two types of surface mounts: Fasten from front panel and fasten from rear panel (FAP-7011 only).

#### **How to fasten Control Unit from front panel (FAP-7001/FAP-7011)**

1. Using the surface mount template at the back of this manual, open a mounting hole in the installation site.
2. Detach the front panel together with the keypad assy. Attach the sponge (supplied) to the rear of display unit.
3. Set the Control Unit to the mounting hole, and fasten the unit with four self-tapping screws (3x20, supplied).
4. Attach the front panel and keypad assy. to the Control Unit.

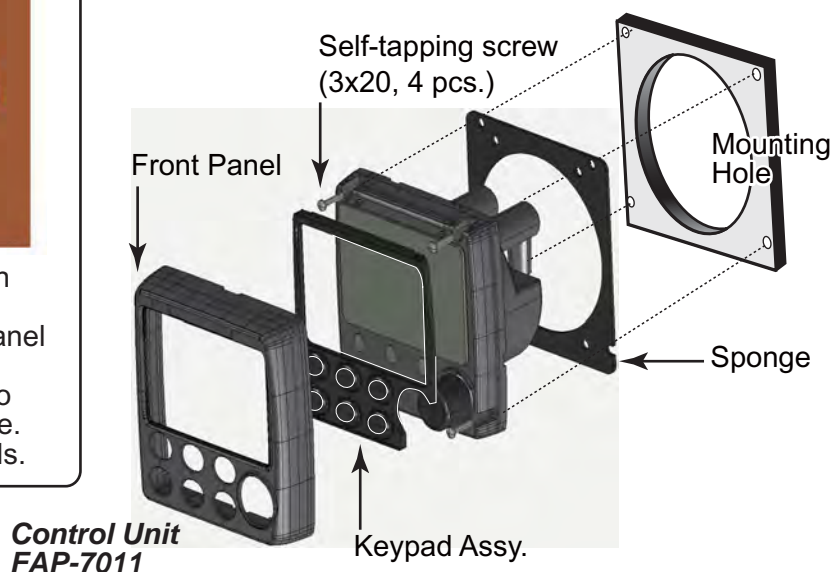


#### **How to detach front panel**

Procedure is similar for FAP-7001.

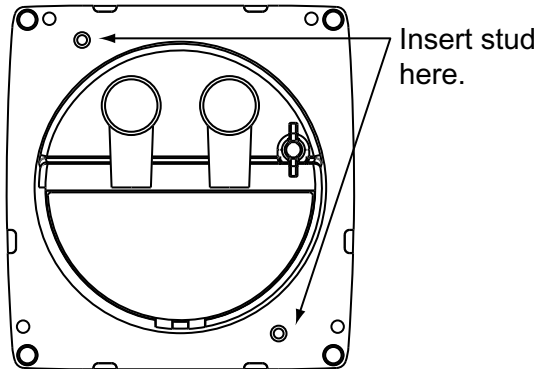


1. Set remover to notch on upper side of unit.
2. Pull remover to raise panel slightly.
3. Similarly use remover to raise panel at lower side.
4. Detach panel with hands.

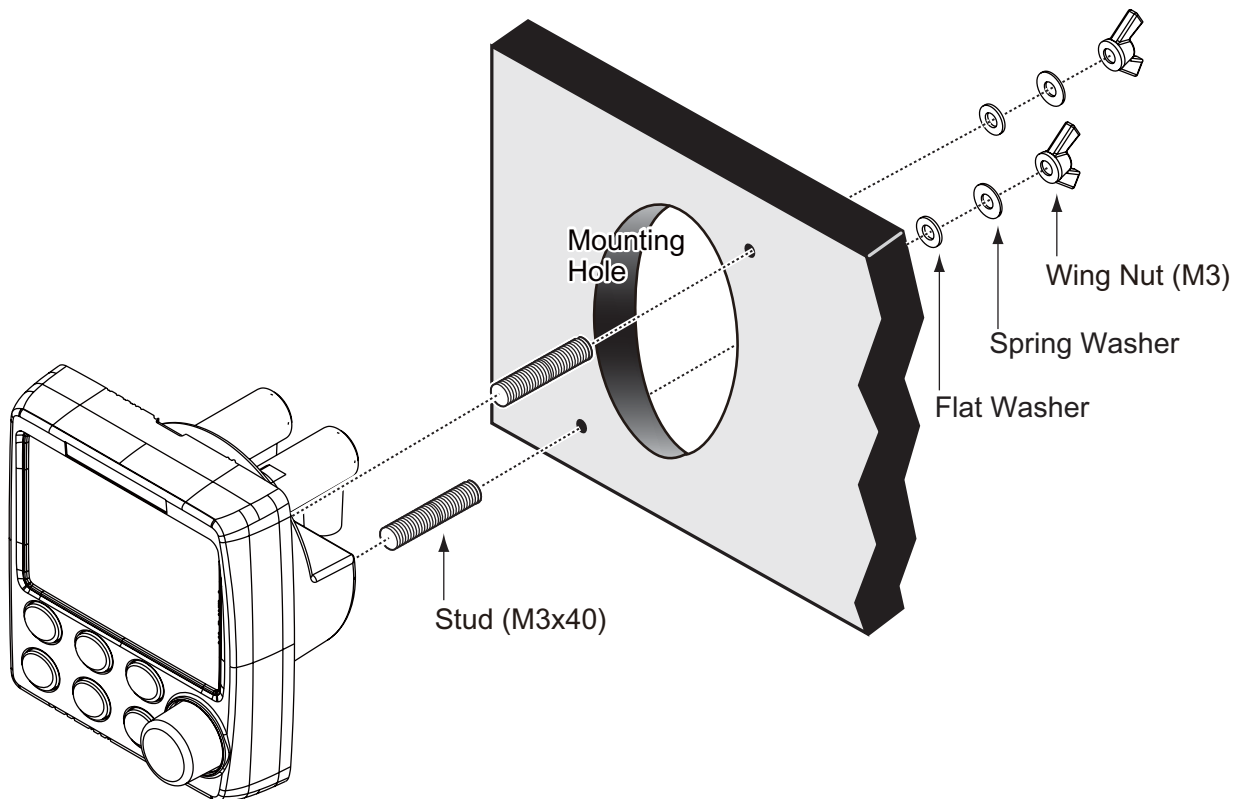


**How to fasten Control Unit from rear panel (FAP-7011 only)**

1. Using the surface mount template at the back of this manual, open a mounting hole in the installation site.
2. Set studs (M3x40, 2 pcs, supplied) in the holes marked in the illustration below. (Use only the studs supplied.)



3. Set the unit to the mounting hole. Fasten the unit with the flat washers, spring washers and wing nuts (supplied).



## 1. INSTALLATION

### 1.1.2 Desktop mount

Use the optional hanger installation kit to install the Control Unit on a desktop or the over-head.

#### **Hanger installation kit for FAP-7001**

Type: FAP-7001-HANGER, Code No.: 001-082-750

| Name               | Type          | Code No.       | Qty |
|--------------------|---------------|----------------|-----|
| Hanger             | 64-028-1201-1 | 100-352-221-10 | 1   |
| Connecting plate   | 64-028-1201-1 | 100-356-381-10 | 1   |
| Knob               | 64-028-1203-0 | 100-352-240-10 | 2   |
| Self-tapping screw | 4x16          | 000-162-605-10 | 4   |
| Pan Head screw     | M3x12         | 000-163-809-10 | 4   |
| Liner              | 64-026-1033   | 100-321-340-10 | 2   |

#### **Hanger installation kit for FAP-7011**

Type: FAP-7011-HANGER, Code No.: 001-082-760

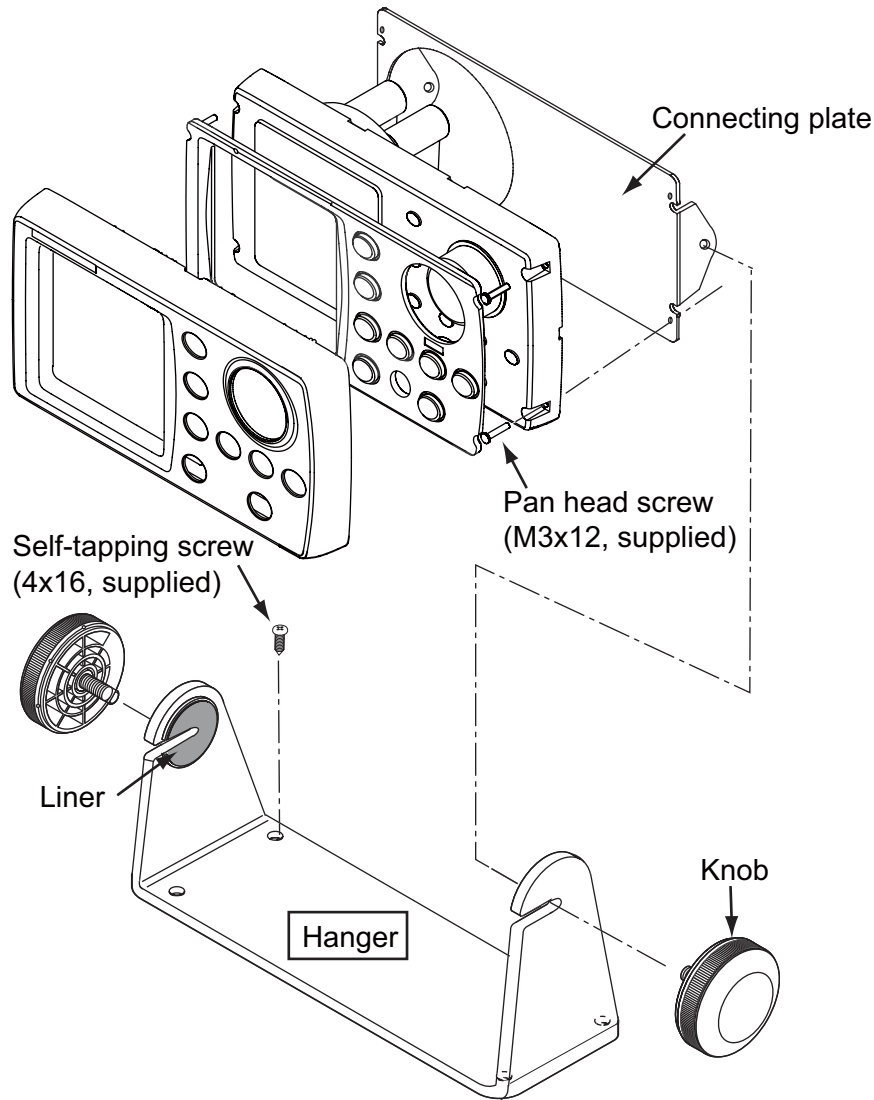
| Name               | Type           | Code No.       | Remarks |
|--------------------|----------------|----------------|---------|
| Hanger             | 64-028-3201-1  | 100-352-281-10 | 1       |
| Connecting plate   | 64-028-3202-1  | 100-356-451-10 | 1       |
| Knob               | 64-1028-1203-0 | 100-352-240-10 | 2       |
| Self-tapping screw | 4x16           | 000-162-605-10 | 4       |
| Pan head screw     | M3x12          | 000-163-809-10 | 4       |
| Liner              | 64-026-1033    | 100-321-340-10 | 2       |

#### **Procedure**

The procedure shown below shows how to install the FAP-7001. The procedure for the FAP-7011 is similar.

1. Fasten the hanger to the mounting location with four self-tapping screws (supplied with option).
2. Detach the front panel and keypad assy., following the instructions provided.
3. Attach the connecting plate at the back of the Control Unit with four pan head screws (supplied).
4. Screw knob bolts in connection plate, set the unit to the hanger, and tighten the knob bolts.
5. Attach the front panel and keypad assy.

6. Attach the hard cover to protect the LCD.



## 1.2 Processor Unit FAP-7002

This unit can be installed on a desktop or on a bulkhead. Select a mounting location considering the following points:

- Install the unit away from direct sunlight and water splash.
- Select a location where temperature and humidity are moderate and stable.
- Consider the length of the cable connected between the Processor Unit and other units.
- Install the unit where you can easily remove the cover and access controls and connectors.
- For the installation on a bulkhead, make sure the mounting location is strong enough to support the unit under the pitching and rolling normally found on the boat.
- To prevent interference, separate the processor unit and its cables at least one meter from communications equipment, communications antennas and cables for communications equipment.

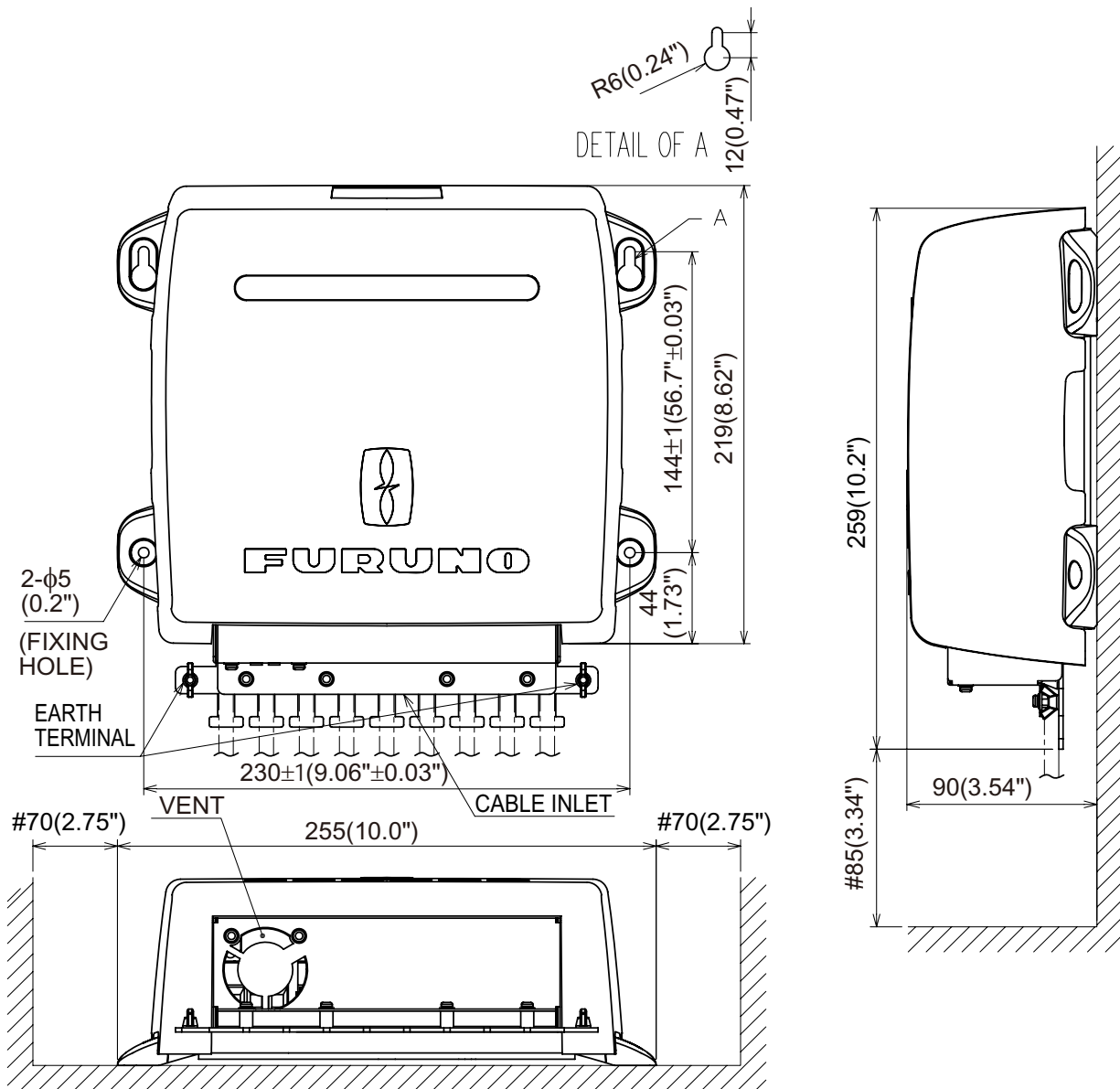
## 1. INSTALLATION

- Make sure there are no objects near the vent.
- Leave enough space around the unit for maintenance and servicing. The recommended maintenance space appears in the outline drawing at the back of this manual.
- Observe the compass safe distances shown in the safety instructions on page i to prevent interference to a magnetic compass.

Install the unit as follows:

**Tabletop:** Fasten with four self-tapping screws.

**Bulkhead:** Screw in two self-tapping screws for the upper side. Leave approximately 5 mm of the screws exposed. Hang unit on screws and tighten screws. Screw in two self-tapping screws for lower side and tighten.



## 1.3 Rudder Reference Unit FAP-6112

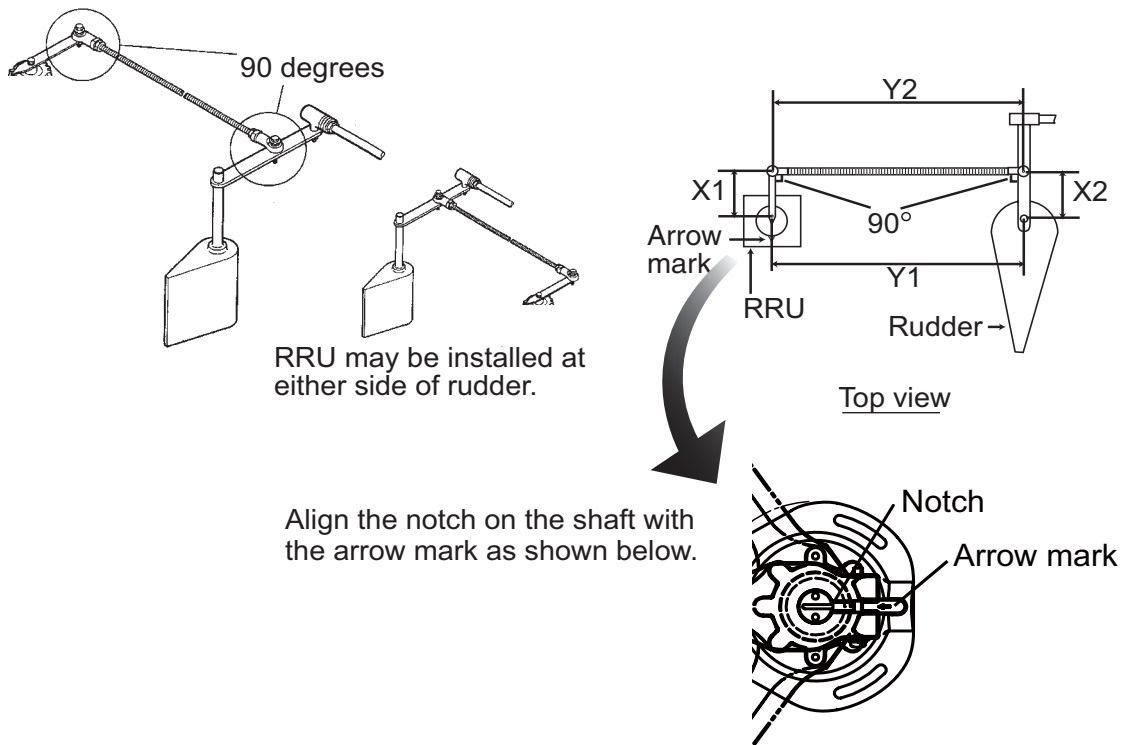
- Leave sufficient space around all moving parts.
- The unit must be fastened to the rudder as shown below, where the following conditions are met:

$$350 \text{ mm}(13.8'') < Y2 < 540 \text{ mm}(21.3'')$$

$$X1 = X2$$

$$Y1 = Y2$$

Use four self-tapping screws (supplied) to fasten the rudder reference unit.



**After mounting the RRU unit adjust it as follows:**

1. Center the rudder.
2. With the rudder centered, check if the notch is aligned with the arrow mark. If it is, no further adjustment is necessary. If not, go to step 3.
3. Loosen the screw on the arm of the RRU then align notch with the arrow mark.
4. Tighten the screw.

**Relationship between reversing pump flow rate and steering cylinder capacity**

The table below shows a rough guideline to determine the proper reversing pump flow rate to match with the hydraulic steering cylinder capacity. Your experience with specific boat designs may cause you to select a pump/cylinder relationship outside of the range of these guidelines.

| Pump spec.            | Hardover to Hardover is 70° | Hardover to Hardover is 90° |
|-----------------------|-----------------------------|-----------------------------|
| 1.0 cu. in./sec. pump | 5.85 to 17.5 cu. in.        | 7.5 to 22.5 cu. in.         |
| 1.6 cu. in./sec. pump | 9.36 to 28.0 cu. in.        | 12.0 to 36.0 cu. in.        |

If the hydraulic cylinder capacity is much smaller than the recommended values in the table, the rudder turning speed may be too fast for the pilot to deliver proper performance. The rudder deadband will decrease and the NAVpilot may not apply enough voltage for the pump motor to start because the applied "duty cycle" will be too low.

If the hydraulic cylinder capacity is much larger than the recommended values in the table, the rudder turning speed may be too slow to allow the NAVpilot to control the boat effectively.

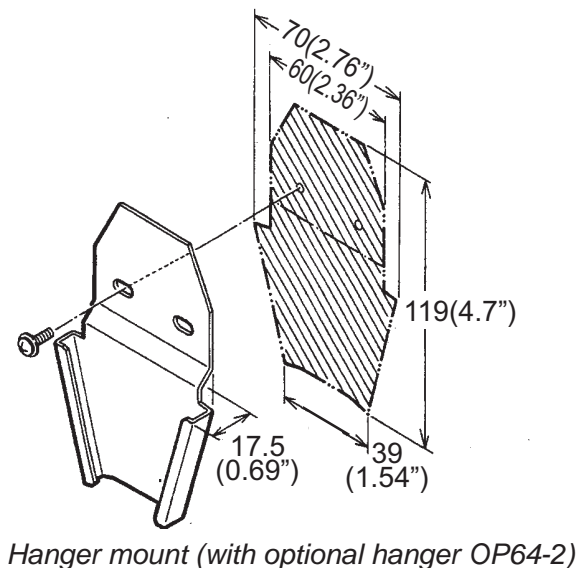
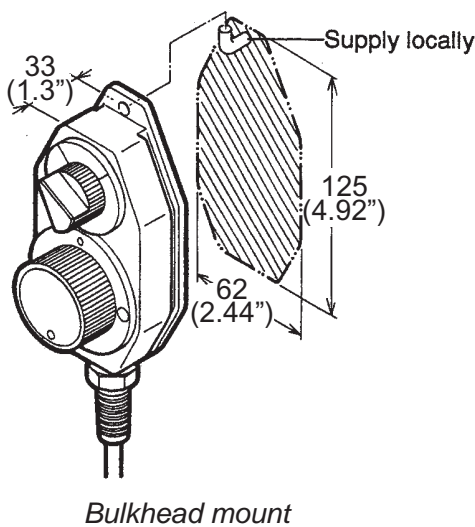
**1.4 Remote Controllers (option)**

Two remote controllers may be connected to the Processor Unit. To connect three NFU- (Non-Follow Up) type remote controllers (button and lever) to the Processor Unit, connect them via the optional Distributor FAP-6800.

Keep the remote controllers away from areas subject to rain and water splash.

**Dial-type remote controller FAP-5551/FAP-5552**

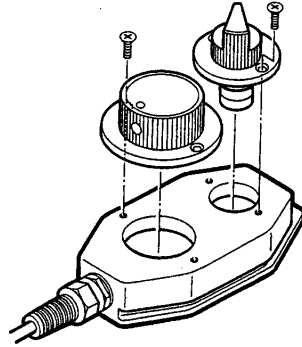
Fasten these remote controllers to a bulkhead. They can also be mounted on the bulkhead by using the optional hanger OP64-2 (Code No.: 009-004-030).



FAP-5551, bulkhead, hanger mount

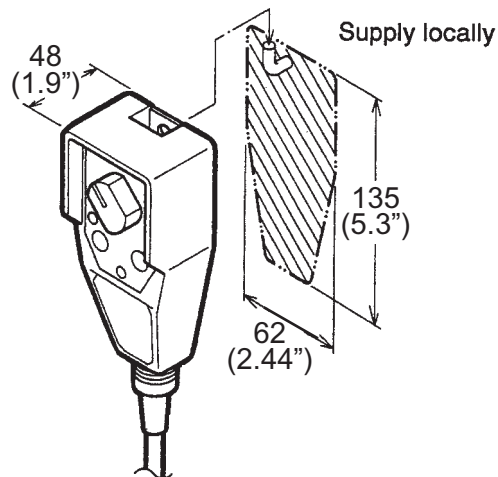


For handheld operation in the opposite direction, reverse the switch and dial blocks so that the dial is readable. To do this, loosen the four screws shown below. Note that the switch and dial blocks are inserted into the controller body with O-rings. Be careful not to damage them.



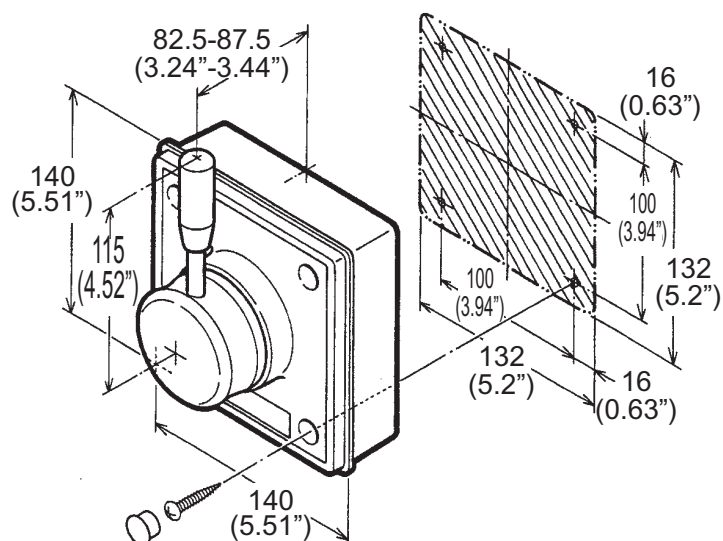
*How to reverse the switch and dial blocks*

### **Button-type remote controller FAP-6211/6222**



### **Lever-type remote controller FAP-6221/6222**

Allow sufficient space around the unit for maintenance.



## 1. INSTALLATION

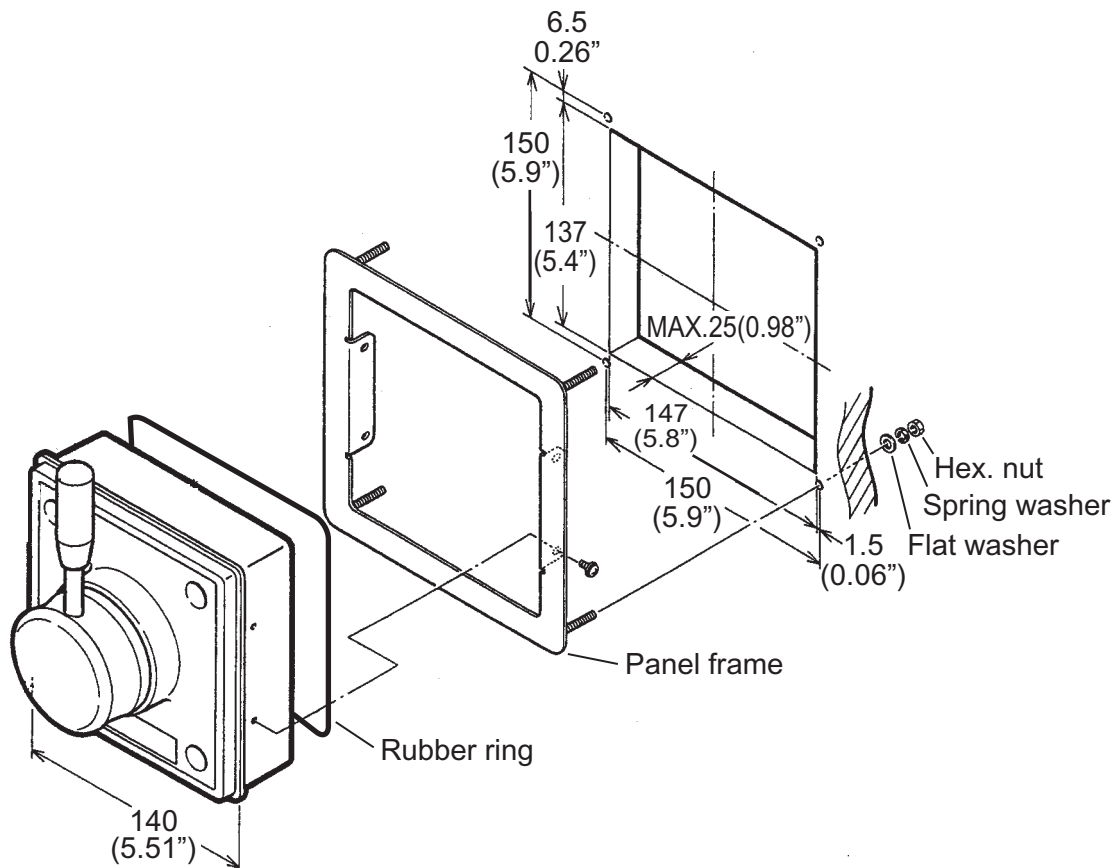
To mount the FAP-6221/6212 in a panel, the optional flush mount kit OP64-4 or OP64-5 is required.

### *Flush mount kit OP64-4 (Code no. 009-005-790)*

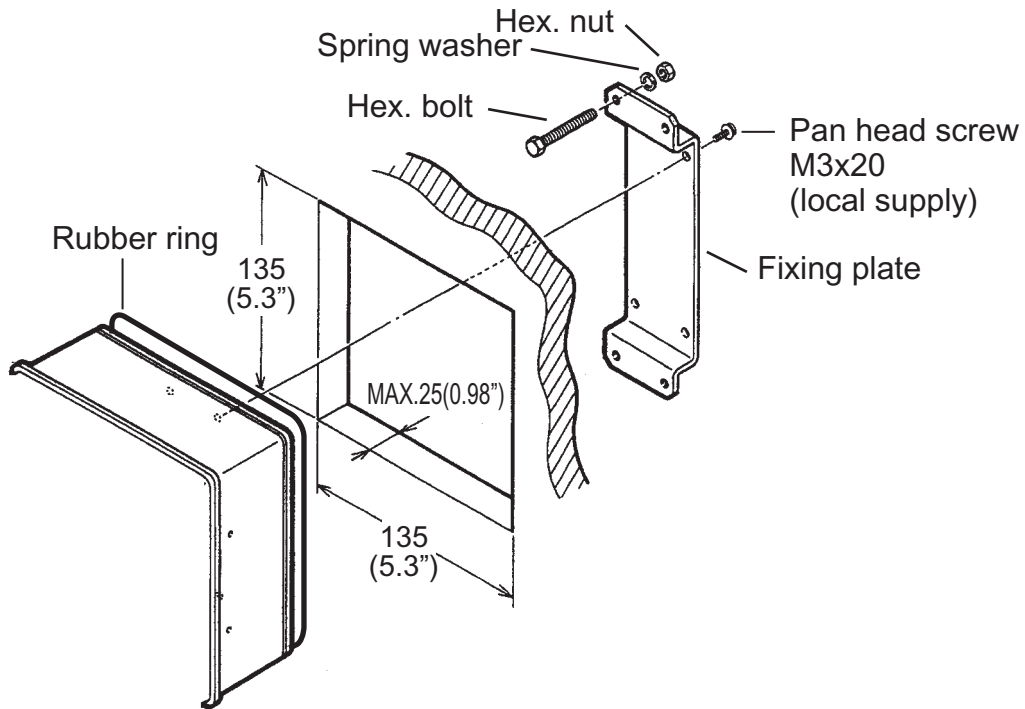
| Name          | Type        | Code No.       | Qty |
|---------------|-------------|----------------|-----|
| Panel frame   | OP64-4      | 009-006-170    | 1   |
| Rubber ring   | 64-015-4524 | 100-145-111-10 | 1   |
| Hex. nut      | M4          | 000-167-488-10 | 4   |
| Flat washer   | M4          | 000-167-455-10 | 4   |
| Spring washer | M4          | 000-167-405-10 | 4   |

### *Flush mount kit OP64-5 (Code no. 009-005-800)*

| Name          | Type        | Code No.       | Qty |
|---------------|-------------|----------------|-----|
| Fixing plate  | OP64-5      | 009-006-200    | 1   |
| Rubber ring   | 64-015-4524 | 100-145-111-10 | 1   |
| Hex. nut      | M4          | 000-167-488-10 | 4   |
| Spring washer | M4          | 000-167-405-10 | 4   |
| Hex. bolt     | M4x35       | 000-162-861-10 | 4   |



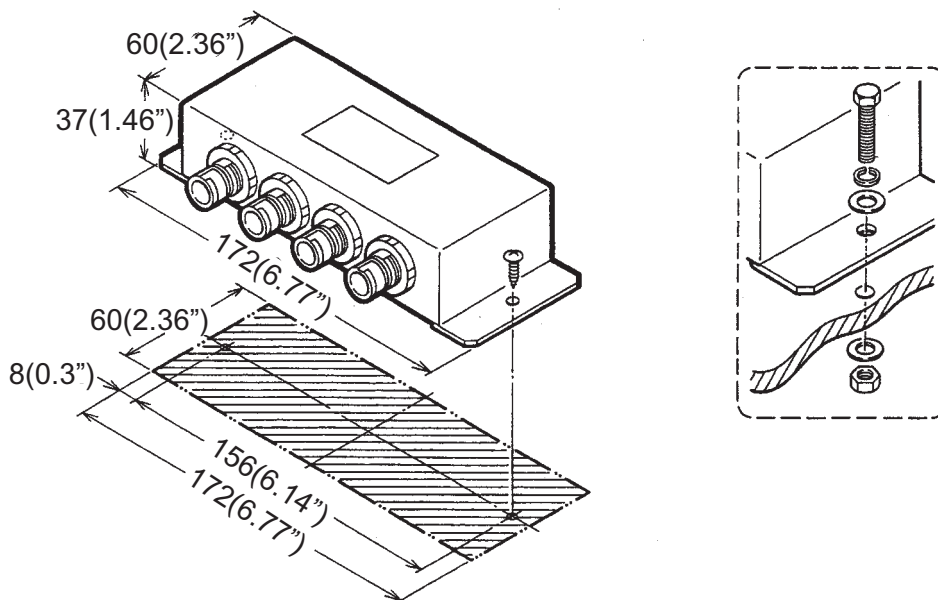
*How to flush mount the FAP-6221 with flush mount kit OP64-4*



*How to flush mount the FAP-6221 with flush mount kit OP64-5*

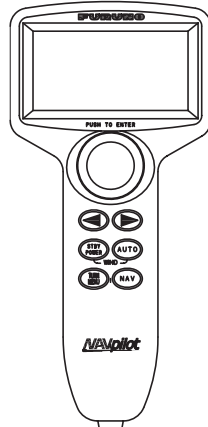
## 1.5 Distributor FAP-6800 (option)

Use the Distributor to connect three Non-Follow Up-type remote controllers to the Processor Unit. Fix the unit to the mounting location with wood screws. For added support, use nuts, bolts and washers (all local supply) instead of the wood screws.



## 1.6 Control Unit FAP-7021

The Handheld Control Unit FAP-7021 can be mounted on the bulkhead or desktop using the cradle.



When selecting a location for the Control Unit, keep the following in mind.

- Mount the unit where shock and vibration are minimal.
- Do not install the display unit under "Plexiglas" or other type of shielding material. Plexiglas can trap heat and moisture or magnify sunlight energy onto the surface of the display.
- Follow the compass safe distances shown in the safety instructions on page i to prevent interference to a magnetic compass.

For the cradle mount, fix the cradle to the mounting location with four self-tapping screws (4x20, supplied), referring to the outline drawing for mounting dimensions. Put the Control Unit in the cradle.

## 1.7 Cable Extension Kit FAP-7822 (option)

The Control Unit FAP-7021 comes with a 10 m cable. If the cable is not long enough, use the Cable Extension Kit FAP-7822, which provides for extension of the cable an additional 10 m.

Type: Cable Extension Kit FAP-7822 Code No.: 001-082-780

| Name                 | Type                | Code No.       | Qty |
|----------------------|---------------------|----------------|-----|
| Connector fixing box | 64-027-1011-2       | 100-327-882-10 | 1   |
| Label                | 64-027-1012-1       | 100-327-891-10 | 1   |
| Self-tapping screw   | 4x20                | 000-158-850-10 | 4   |
| Cable                | BD-07PM-07AF-LR-100 | 000-172-016-10 | 1   |

Fix the Connector Fixing Box with four self-tapping screws (4x20, supplied). Refer to the outline drawing for mounting dimensions.

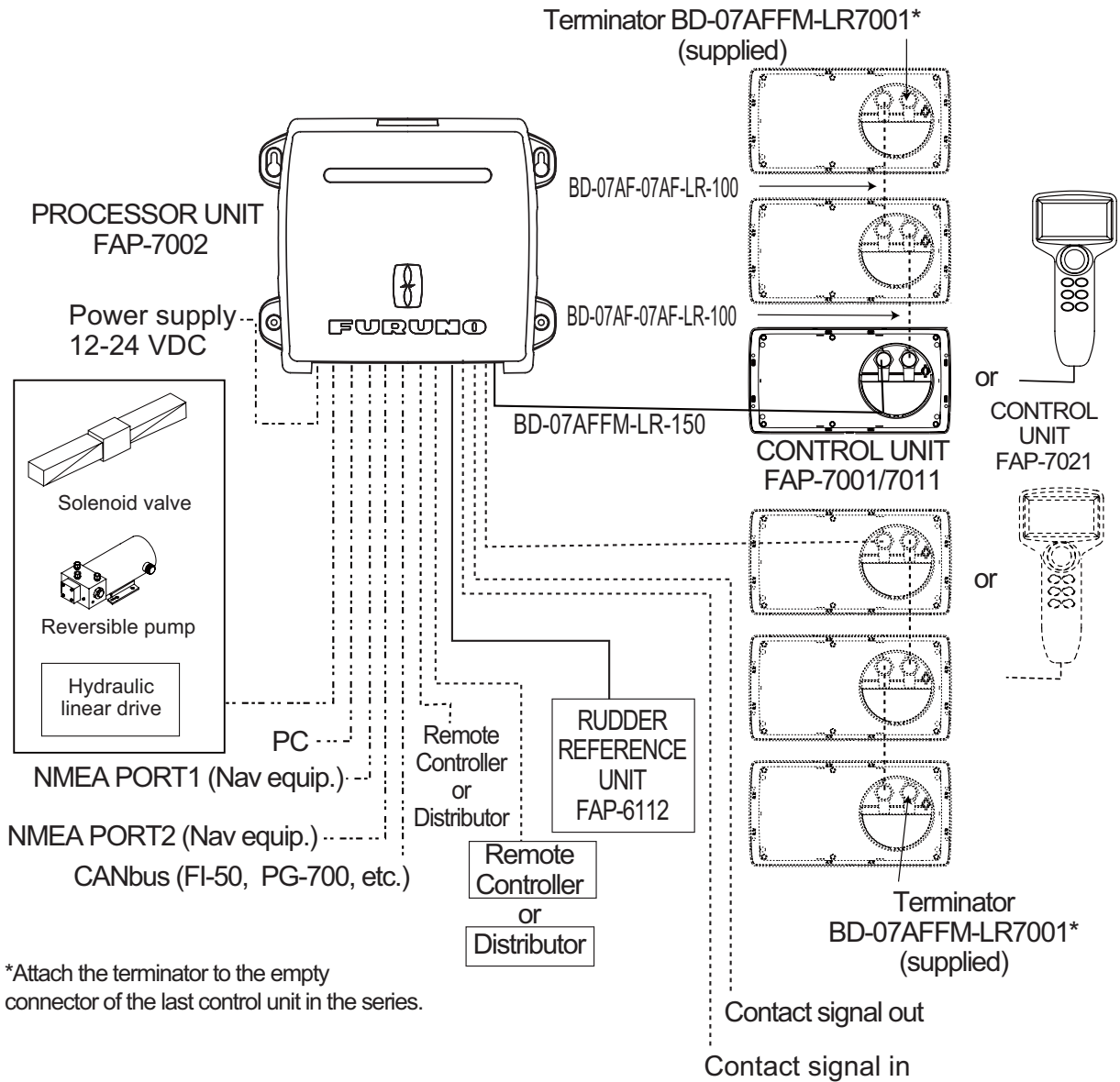
**Note 1:** When the Control Unit is not connected, attach the terminator (supplied) to the Connector Fixing Box.

**Note 2:** To connect the extension cable to the Processor Unit, remove the connector.

# 2. WIRING

## 2.1 General Wiring

All units are connected to the Processor Unit. Separate the cables as far as possible from the cables that transmit radio frequency or pulsed signals. At least one meter separation is recommended.



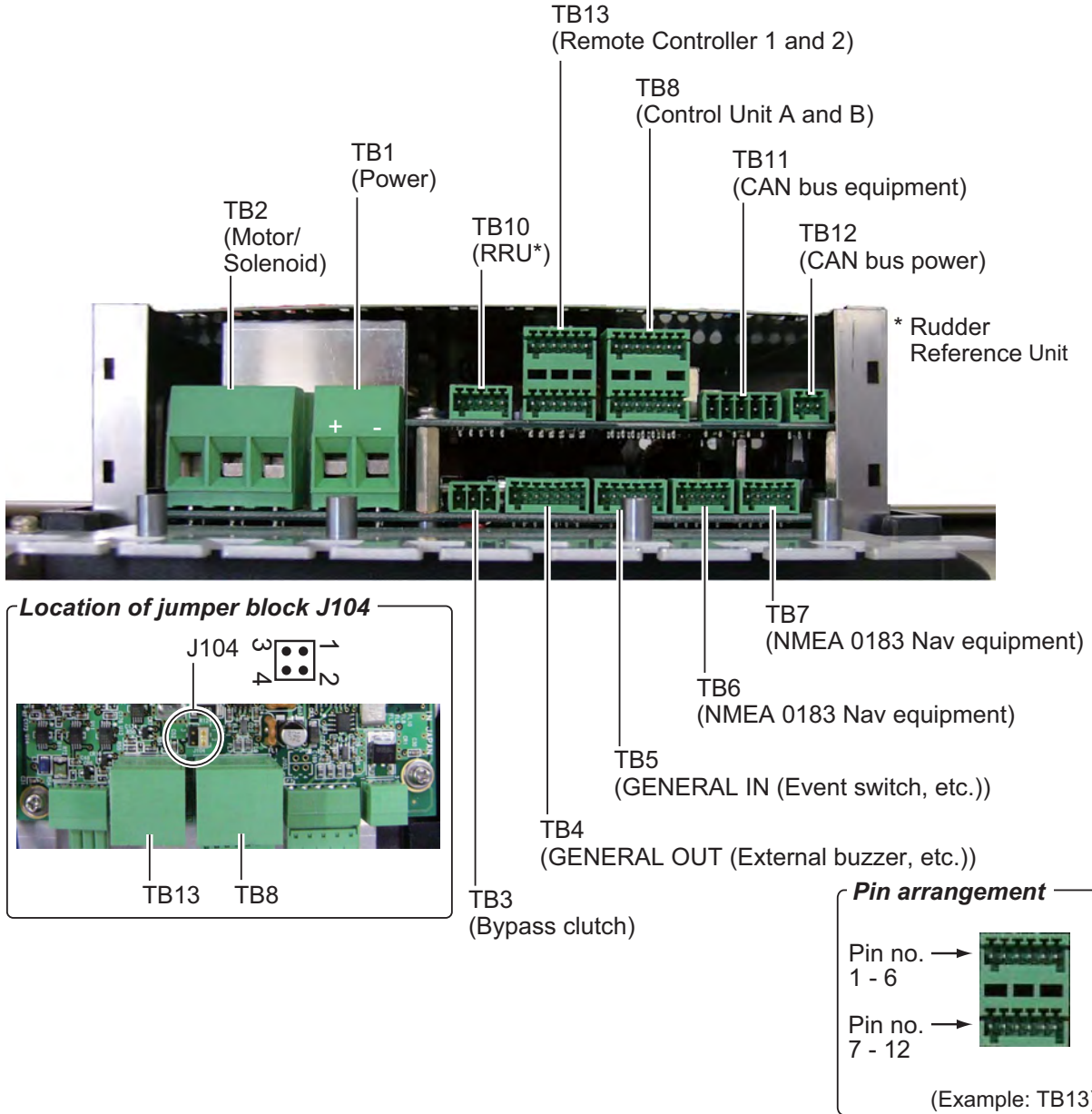
\*Attach the terminator to the empty connector of the last control unit in the series.

## 2.2 Processor Unit

All cables are connected in the Processor Unit. To connect the FAP-7021 and FAP-6112 to the Processor Unit directly, remove the connector at the end of their cables.

### 2.2.1 Connections inside the processor unit

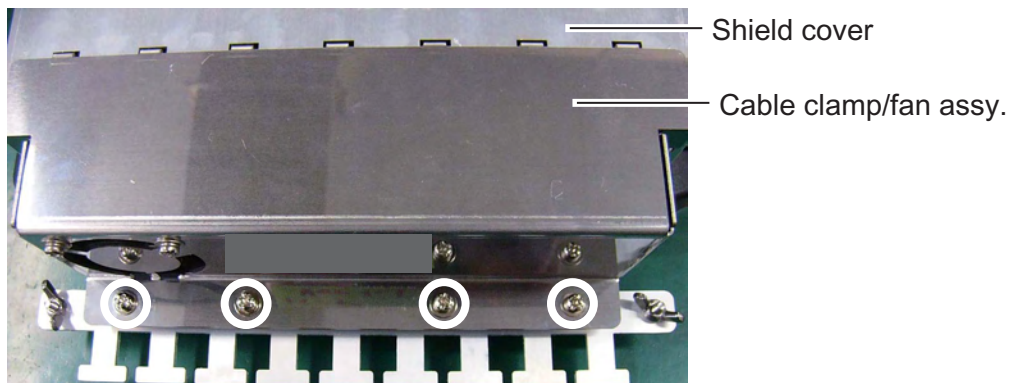
Pins are “numbered” from left to right, in ascending order. See the inset in the figure below for details.



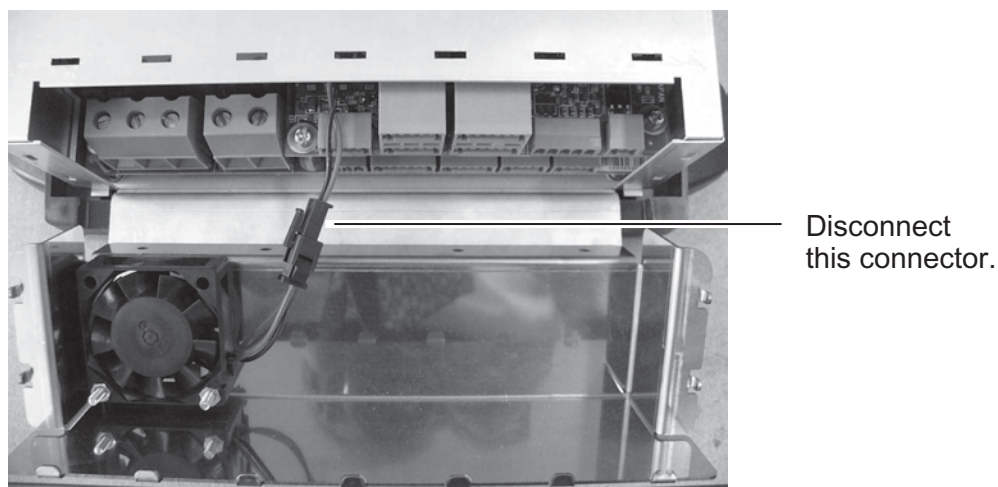
## 2.2.2 How to fasten cables to the cable clamps

Fasten the cables to the processor unit as shown below. There is no specified order to fasten the cables.

1. Remove the outside cover:
  - 1) Hold the right and left sides of the cover.
  - 2) Pull the cover outward and lift to remove.
2. Remove the four screws marked with circles in the figure shown below.



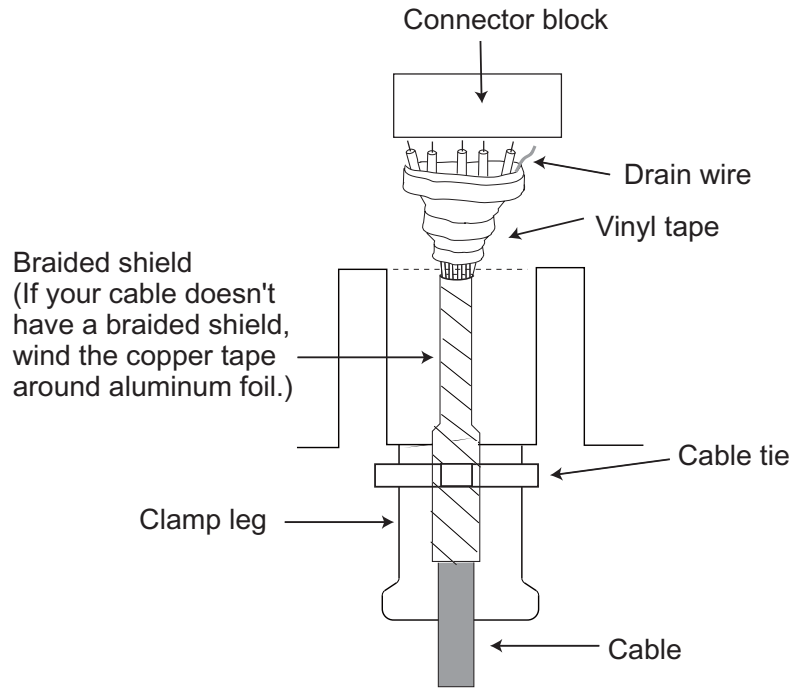
3. Separate the cable clamp/fan assy from the shield cover as shown in the figure below. Open the assembly carefully to prevent damage to the cable connected to the fan.
4. Disconnect the fan connector.



5. Twist cable cores then put the cores into their correct connector blocks. (See the next page for how to put wires into a connector block.)
6. For the NMEA cable, wind vinyl tape around the cable cores.

## 2. WIRING

7. Fasten a cable tie (supplied) to a cable and the "clamp leg".

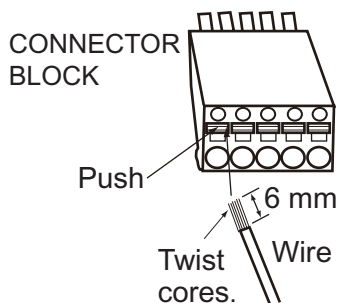


8. Connect the fan connector.

9. After you have connected all equipment, fasten the cable clamp/fan assy.

### 2.2.3 How to put wires into the connector blocks

The cables are connected to their connector blocks inside the Processor Unit. Open the unit and put cables into the connector blocks as shown in the figure below.



#### How to put wire into connector block

1. Remove shield of wire by 6 mm.
2. Twist core.
3. Push spring-loaded catch with slotted-head screwdriver.
4. Insert core into hole.
5. Release screwdriver.
6. Pull wire to confirm it is securely inserted.

**Note:** To connect two Control Units (to TB8 and TB9), change the position of the jumper block J104 from #1-2 to #3-4. (See the illustration on page 2-2 for location.) For single Control Unit, use TB8 and set J104 at position #1-2.



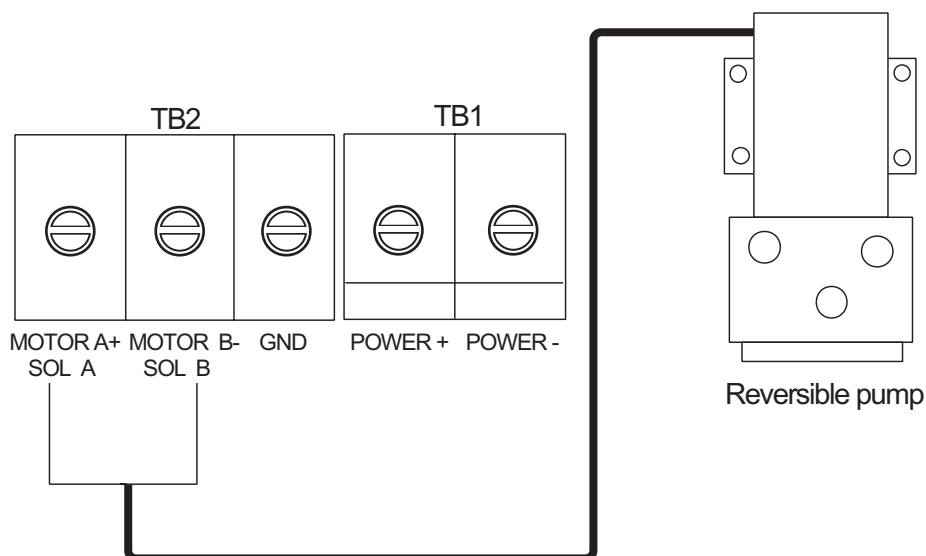
## 2.2.4 Power and motor cables

For the power cable and motor line cable, see the table below to select cables. Connect the power cable to a breaker that has a rating acceptable to the motor.

| Cable length | Motor voltage                     |     |                                   |     |
|--------------|-----------------------------------|-----|-----------------------------------|-----|
|              | 12 VDC                            |     | 24 VDC                            |     |
|              | Section of core(mm <sup>2</sup> ) | AWG | Section of core(mm <sup>2</sup> ) | AWG |
| 3 m or less  | 2.5                               | 12  | 2.5                               | 12  |
| 6 m or less  | 4                                 | 10  | 2.5                               | 12  |
| 10 m or less | 6                                 | 8   | 4                                 | 10  |
| 16 m or less | 10                                | 6   | 6                                 | 8   |

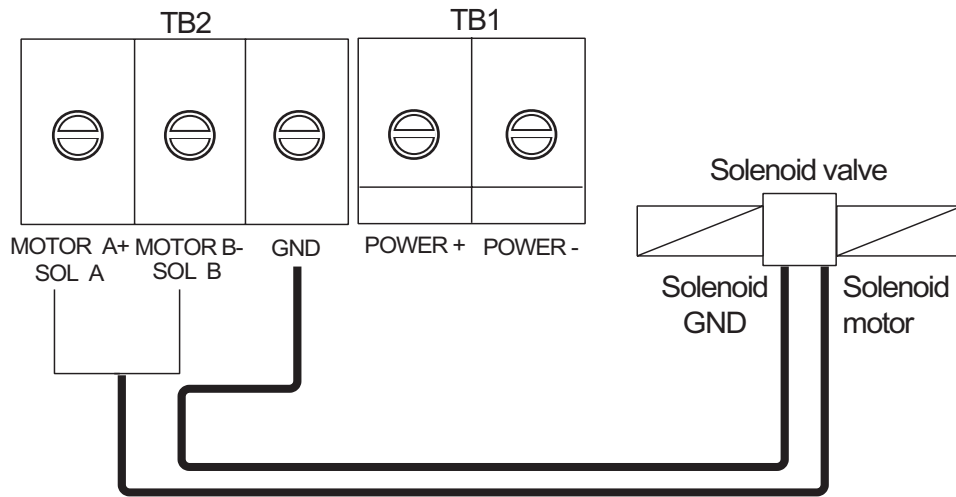
- The thickness of the cables varies with the rated current of the motor. The table shows the specifications for 25A motor.
- Use single core wire or stranded wire. (For stranded wire the max. no of wires is seven).
- Do not twist cores to prevent them from disconnecting.

### How to connect a reversible pump

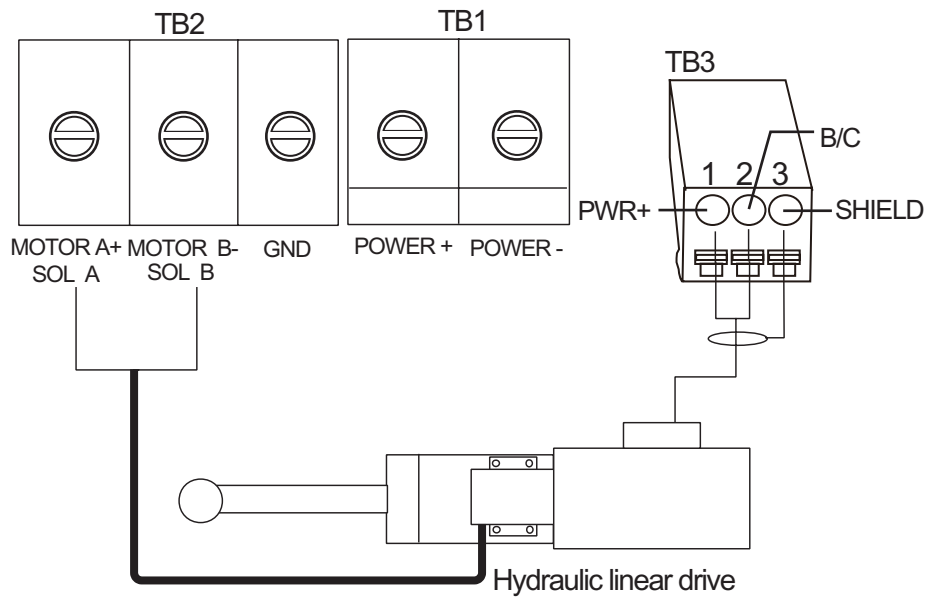


## 2. WIRING

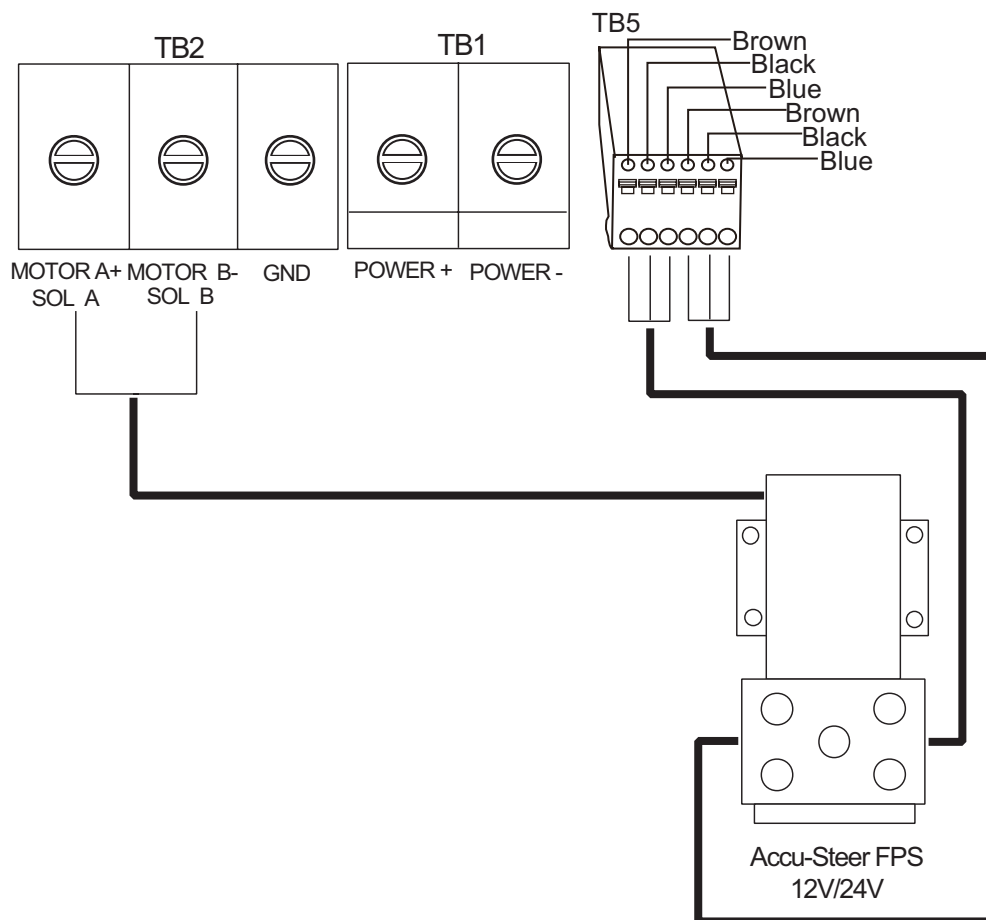
### How to connect a solenoid drive



### How to connect a hydraulic linear drive



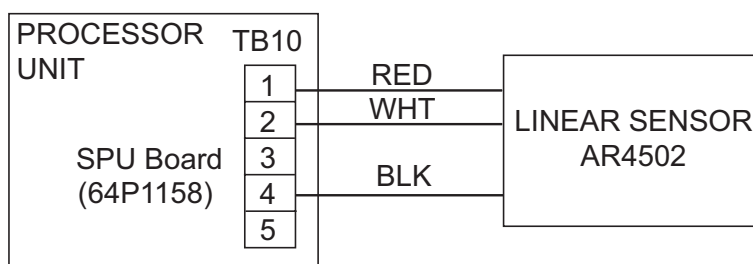
### How to connect the Accu-Steer FPS 12V/24V helm sensor



#### 2.2.5 Teleflex linear sensor

To connect a Teleflex linear sensor AR4502 (instead of the FAP-6112), do the following modification.

1. Make the cable connection as shown below. Refer to the installation manual of the linear sensor for recommended cable.



Wind tape where shield was removed.

2. Set the RRU type to [LINEAR SENSOR] on the [DOCKSIDE SETUP] menu when you do the initial settings, in the next chapter.

### **2.2.6 CAN bus power**

The maximum current that can be supplied to the CAN bus network is 1A. Use a “floating power supply” and make sure it meets with CAN bus (NMEA 2000) regulations.

For complete information about CAN bus wiring, see the “Furuno CAN bus Network Design Guide (TIE-00170-\*)” on Tech-Net.

### **2.2.7 Connection to TB4**

TB4 is for contact relay output. The No.1 line is Normal Open, and the No.3 line is Normal Close. For Active Close, use Normal Open; for Active Open use Normal Close. The rated current of the contact is 3A. The maximum acceptable open-close is 50VA.

## **2.3 Control Unit**

### **FAP-7001/FAP-7011**

A maximum of six Control Units can be connected. The Processor Unit has two ports for connection of two main Control Units, and two Control Units can be connected in series to each main Control Unit.

Use the cable BD-07AFFM-LR-150 (supplied) to connect the Control Unit and Processor Unit, and use cable BD-07AF-07AF-LR-100 (optional supply) to connect two Control Units.

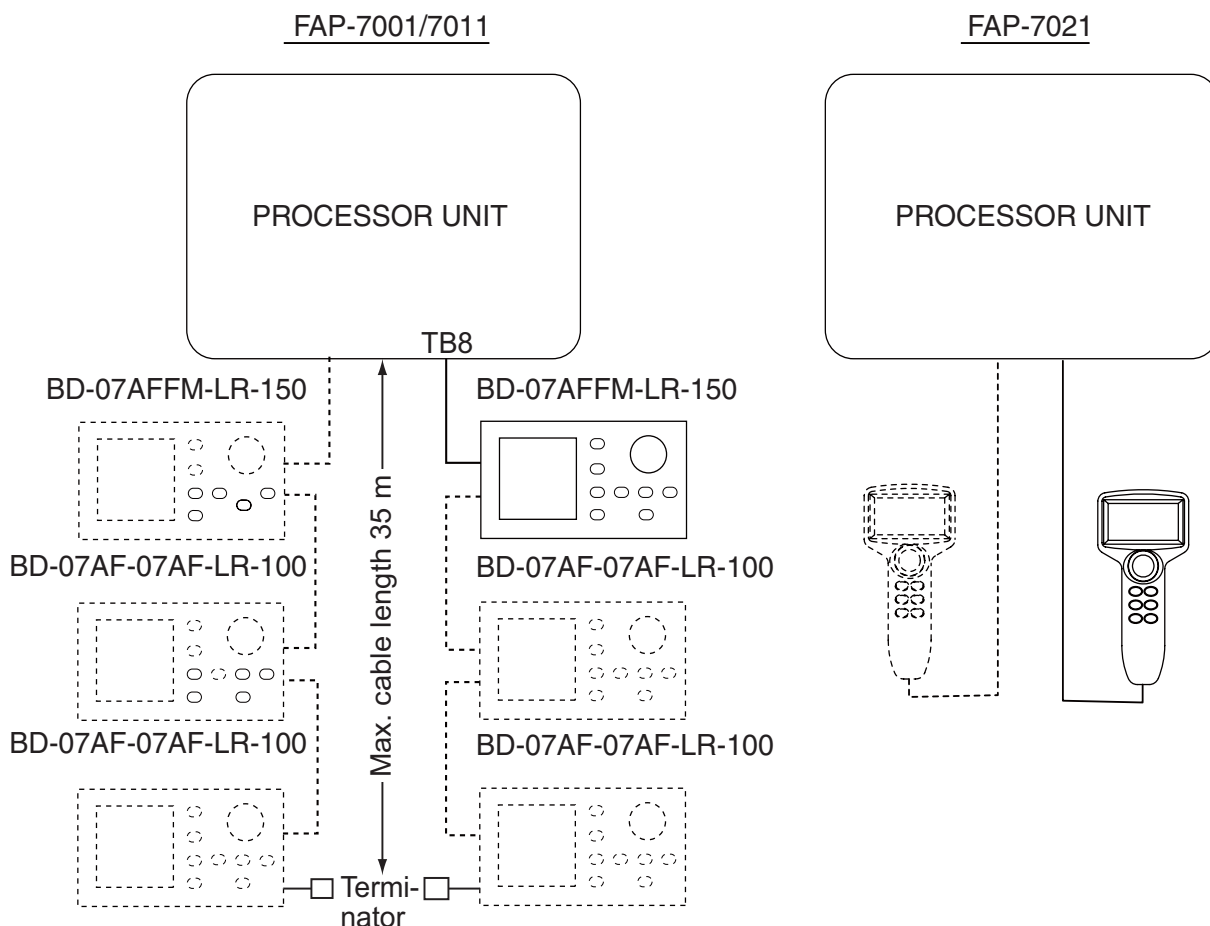
### **FAP-7021**

A maximum of two Control Units can be connected. Use the cable attached to the Control Unit (10 m) to connect the Control Unit to the Processor Unit. To increase the length, use the optional Cable Extension Kit.

### **Notes on connection of Control Units**

- Attach the terminator BD-07AFFM-LR7001 to the port not used on the last Control Unit in the series.
- To connect a single Control Unit, use TB8.
- The total length of cables in a series must be within 35 m.

- FAP-7021 can be connected at the end of FAP-7001/FAP-7011 Control Unit.



## 2.4 Remote Controllers (option)

The Processor Unit has two ports for connection of two remote controllers.

The Distributor FAP-6800 allows you to connect three NFU (Non Follow-Up) type remote controllers to the Processor Unit.

**Note 1:** Connect remote controllers that have connectors to the Distributor FAP-6800.

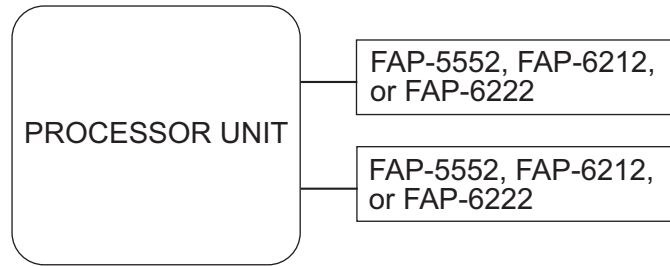
**Note 2:** Set the remote controller type on the [SYSTEM SETUP] menu, in chapter 3.

| Remote controllers with connector                                      | Remote controller without connector                                    |
|--|--|
| FAP-5551 (dial), FAP-6211 (button), FAP-6221 (lever), FAP-6231 (dodge) | FAP-5552 (dial), FAP-6212 (button), FAP-6222 (lever), FAP-6232 (dodge) |

### 2.4.1 Example remote controller connections

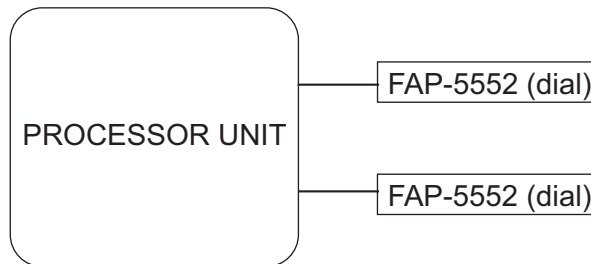
#### No distributor

Connect any two remote controllers.



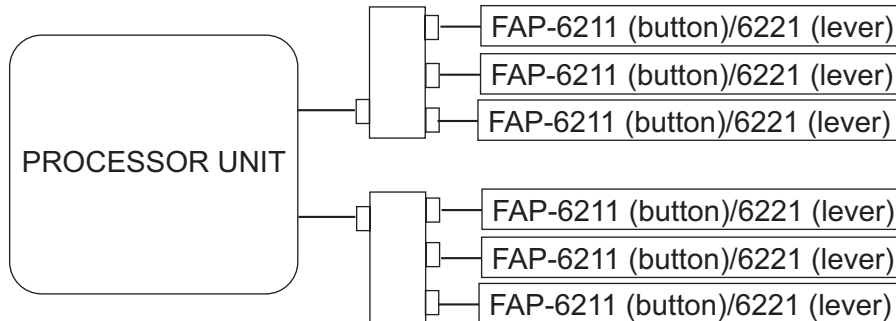
#### Dial-type remote controller

The distributor cannot be used with the dial-type remote controller.



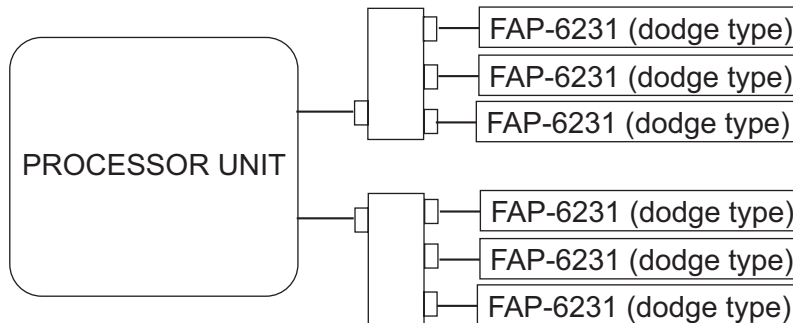
#### Button- or lever-type remote controller with distributor

Connect a maximum of six button- or lever-type remote controllers.



#### Dodge-type remote controller with distributor

Connect a maximum of six dodge-type remote controllers.

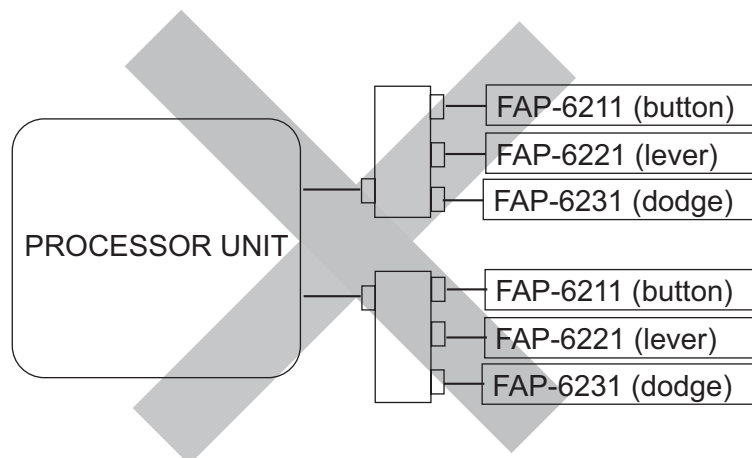


## 2.4.2 Prohibited remote controller connections

The remote controller combinations shown in this section are not allowed.

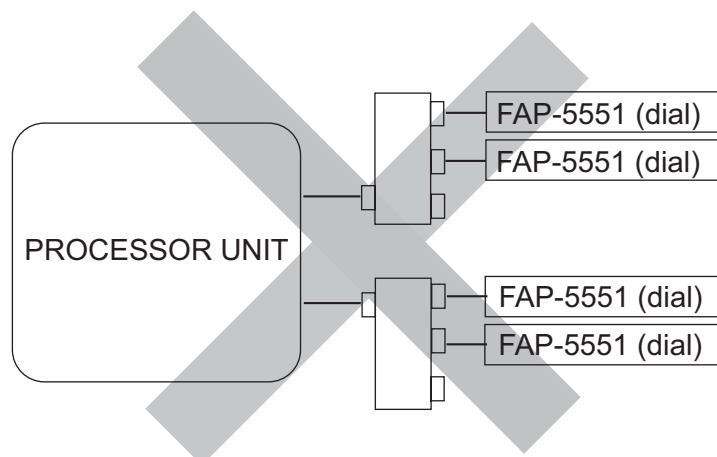
### Wrong connection no.1

You cannot connect different types of remote controllers.



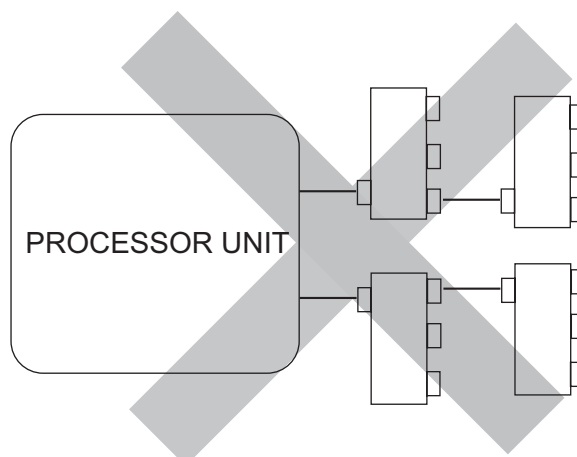
### Wrong connection no.2

Connect only one dial-type remote controller.



### Wrong connection no.3

You cannot connect multiple distributors.



## 2.5 Input/Output Sentences

### NMEA0183 Port1, NMEA0183 Port 2, Input

| Data   | Sentences(Priority)   | Remarks  |
|--|---|--|
| Heading(True)  | THS>HDT>(Heading(Mag)+Mag Var.)   | NMEA0183<br>Ver.1.5/2.0/<br>3.0<br>200ms inter-<br>val |
| Heading(Mag)   | HDG>HDM>(Heading(True)-Mag Var.)  | 200ms inter-<br>val                                    |
| Mag variation  | HDG>RMC   |  |
| Position   | GNS>GGA>GLL>RMC   |  |
| Speed  | (STW)(VHW)>(SOG)(VTG>RMC)   |  |
| Waypoint Information<br>(Waypoint location)<br>(XTE)<br>(Waypoint arrival alarm)<br>(Bearing and distance to waypoint) | APB>RMB>(BWR+XTE+AAM)>(BWC+<br>XTE+AAM)>(BOD+XTE+AAM)<br><br><b>Note:</b> The following conditions apply:<br><b>APB or RMB selected:</b><br>AAM's "Arrival circle radius".<br><b>APB or (BOD+XTE+AAM) selected:</b><br>RMB's "Waypoint location".<br><b>APB or (BOD+XTE+AAM) selected:</b><br>RMB>BWR>BWC's "Distance". |  |
| Course   | RMC>VTG   |  |
| Depth  | DPT>DBT   |  |
| Water temperature  | MTW   |  |
| Time and Date  | ZDA>RMC   |  |
| Wind speed, direction(True)  | MWV>VWT   |  |
| Wind speed, direction(Apparent)  | MWV>VWR   |  |
| Rate of Turn   | ROT   |  |
| Target L/L   | TLL   |  |

### NMEA0183 Port1, NMEA0183 Port 2, Output

| Data                            | Sentences(Priority) | Remarks |
|---------------------------------|---------------------|---------|
| Heading(True)                   | HDT                 |         |
| Heading(Mag)                    | HDG, HDM            |         |
| Mag variation                   | HDG, RMC            |         |
| Position                        | GNS, GGA, GLL, RMC  |         |
| Speed                           | VHW, VTG, RMC       |         |
| Course                          | RMC, VTG            |         |
| Depth                           | DPT, DBT            |         |
| Water temperature               | MTW                 |         |
| Time and Date                   | ZDA, RMC            |         |
| Wind speed, direction(True)     | MWV, VWT            |         |
| Wind speed, direction(Apparent) | MWV, VWR            |         |
| Rate of Turn                    | ROT                 |         |
| Rudder angle                    | RSA                 |         |



**CAN bus Port. Input**

| PGN Title   | PGN    |
|---|--------|
| Actual Pressure   | 130314 |
| Additional Weather Data   | 130880 |
| COG & SOG, Rapid Update   | 129026 |
| Cross Track Error   | 129283 |
| Direction Data  | 130577 |
| Direction Data  | 130577 |
| Engine Parameters, Dynamic  | 127489 |
| Engine Parameters, Rapid Update   | 127488 |
| Environmental Parameters (Temperature (Sea, Ambient), Atmospheric Pressure)           | 130310 |
| Environmental Parameters (Temperature (Sea, Ambient))                                 | 130312 |
| Environmental Parameters (Temperature (Sea, Ambient), Humidity, Atmospheric Pressure) | 130311 |
| GNSS Position Data  | 129029 |
| Humidity  | 130313 |
| ISO Acknowledgement   | 059392 |
| ISO Address Claim   | 060928 |
| ISO Request   | 059904 |
| Magnetic Variation  | 127258 |
| Memory Clear Group Function   | 126720 |
| Navigation - Route/WP Information   | 129285 |
| Navigation Data   | 129284 |
| NMEA - Request Group Function   | 126208 |
| PGN List - Transmit PGN's Group Function  | 126464 |
| Position, Rapid Update  | 129025 |
| Product Information   | 126996 |
| Rate of Turn  | 127251 |
| Self Test Group Function  | 061184 |
| Speed, Water Referenced   | 128259 |
| System Time   | 126992 |
| Time and Date   | 129033 |
| Vessel Heading  | 127250 |
| Water Depth   | 128267 |
| Wind Data   | 130306 |

2. WIRING

**CAN bus Port, Output**

| PGN Title   | PGN    |
|---|--------|
| Browser Control Status  | 130823 |
| COG & SOG, Rapid Update   | 129026 |
| Cross Track Error   | 129283 |
| Environmental Parameters (Temperature (Sea, Ambient), Atmospheric Pressure)           | 130310 |
| Environmental Parameters (Temperature (Sea, Ambient))                                 | 130312 |
| Environmental Parameters (Temperature (Sea, Ambient), Humidity, Atmospheric Pressure) | 130311 |
| GNSS Position Data  | 129029 |
| ISO Acknowledgement   | 059392 |
| ISO Address Claim   | 060928 |
| ISO Request   | 059904 |
| Magnetic Variation  | 127258 |
| Memory Clear Group Function   | 126720 |
| Navigation - Route/WP Information   | 129285 |
| Navigation Data   | 129284 |
| NMEA - Request Group Function   | 126208 |
| PGN List - Transmit PGN's Group Function  | 126464 |
| Position, Rapid Update  | 129025 |
| Product Information   | 126996 |
| Rate of Turn  | 127251 |
| Rudder  | 127245 |
| Self Test Group Function  | 061184 |
| Speed, Water Referenced   | 128259 |
| System Time   | 126992 |
| Time & Date   | 129033 |
| Unit Division Code  | 130822 |
| Vessel Heading  | 127250 |
| Water Depth   | 128267 |
| Wind Data   | 130306 |

# 3. INITIAL SETTINGS

## 3.1 About Initial Settings, Menu Operation

This chapter shows you how to enter initial settings, on the [INSTALLATION] menu. The menu contains some items that may not apply to your system. To return to the [INSTALLATION] menu, push the **MENU** key.

Minimally, the following settings must be done:

- Ship's characteristics
- Rudder Reference Unit (RRU) setup
- Air bleeding
- Rudder limit
- Rudder test
- Helm sensor test (For Accu-Steer FPS only)

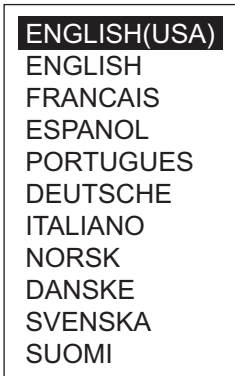
All operations on the menu are done with the **Course control** knob and **MENU** key

| Control, key               | Usage  |
|----------------------------|--|
| <b>Course control</b> knob | Rotate the knob to select a menu item then push the knob. Rotate the knob to select setting or enter alphanumeric value then push the knob to confirm setting. This manual refers to the <b>Course control</b> knob as "knob". |
| <b>MENU</b> key            | Go to previous screen.   |

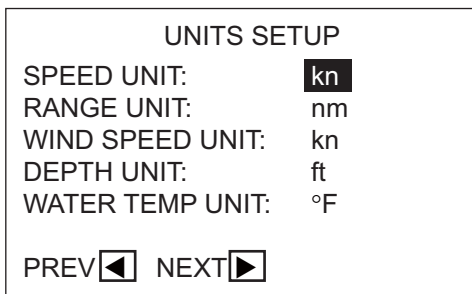


## 3.2 How to Select Language and Units, Open the Installation Menu

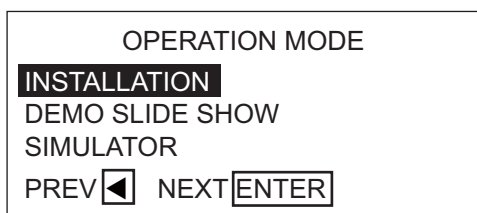
1. Press the **POWER/BRILL** key (NAVpilot-700) or the **POWER/STBY** key (NAVpilot-711/720) to turn on the power. The splash screen appears followed by the startup test and the language selection menu, shown right. The default language is English(USA). If you don't need to change the language, push the knob and go to step 2. To change the language, rotate the knob to select a language then push the knob.



2. Press the **▶** key to show the [UNIT SETUP] menu.



3. The units on the [UNIT SETUP] menu are set according to the language selected. If you require different units, change them as follows.
  - 1) Rotate the knob to select the setting to change then push the knob.
  - 2) Rotate the knob to select a unit then push the knob.
4. Press the **▶** key to show the [OPERATION MODE] menu.



5. [INSTALLATION] is selected. Push the knob to show the [INSTALLATION] menu.

*Page 1*

| INSTALLATION MENU            |
|------------------------------|
| LANGUAGE: ENGLISH            |
| UNITS SETUP                  |
| DISPLAY SETUP                |
| SHIP'S CHARACTERISTICS       |
| DOCKSIDE SETUP               |
| CAN BUS SETUP                |
| NMEA0183 SETUP               |
| SENSOR SELECTION             |
| UNIVERSAL PORT               |
| SEA TRIAL                    |
| RUDDER LIMIT SETUP: NO*      |
| RUDDER TEST: NO*             |
| SET CENTER RUDDER POS.: NO*  |
| COMPASS CALIBRATION: NO*, ** |

*Page 2*

| INSTALLATION MENU  |
|--------------------|
| DATA CALIBRATION   |
| PARAMETER SETUP    |
| AUTO OPTION        |
| NAV OPTION         |
| FISH HUNTER OPTION |
| SYSTEM SETUP       |
| RC SETUP           |
| ALARM              |

\* NO is replaced with DONE when respective setup is successfully completed.

\*\* Shown if PG-500 or PG-700 is connected.

(NAVpilot-700 installation menu shown.)

**Note:** The [INSTALLATION] menu can be opened from the STBY display by pressing the knob three times while pressing and holding down the **MENU** key.

6. Follow the procedures in the remaining sections (in the order shown) of this chapter to set up the NAVpilot.

### 3.3 Display Setup

The [DISPLAY SETUP] menu lets you set display indications according to your needs, like how to show the date and time.

DISPLAY SETUP

HEADING FORMAT: **HHH°**

XTE FORMAT: \* \*\*

POSITION FORMAT:  
DD°MM.MM'

HEADING DISPLAY: TRUE

DATE DISPLAY: MM DD, YYYY

TIME DISPLAY: 24HOUR

DATA BOX FORMAT: 2BOXES

TEMP GRAPH: 5min

*Items of the DISPLAY SETUP menu*

| Item, description  | Settings  | Item, description  | Settings   |
|--|---|--|--|
| [HEADING FORMAT]<br>Select how to show the heading indication, in three or four figures.       | HHH°<br>HHH.H°  | [DATE DISPLAY]<br>Select how to show the date.   | MMM DD, YYYY<br>DD MMM YYYY<br>YYYY MM DD  |
| [XTE FORMAT]<br>Select how to show the XTE indication, in three or four figures.               | * **<br>. .<br>* ***<br>. .                           | [TIME DISPLAY]<br>Select how to show the time.   | 12HOUR<br>24HOUR   |
| [POSITION FORMAT]<br>Select how to show the position indication, in degrees, minutes, seconds. | DD°MM.MM'<br>DD°MM.MMM'<br>DD°MM.MMMM'<br>DD°MM.SS.S" | [DATA BOX FORMAT]<br>Select how many data boxes to show on the nav data display. (Requires appropriate sensors.) | 2BOXES<br>3BOXES<br>NAVpilot-700<br><br>1BOX<br>2BOXES<br>NAVpilot-711<br>NAVpilot-720 |
| [HEADING DISPLAY]<br>Select how to show heading, true or magnetic.                             | MAGNETIC<br>TRUE                                      | [TEMP GRAPH]<br>Select the time scale for the water temperature graph. (Requires water temperature sensor.)      | 5min<br>10min<br>20min   |

## 3.4 Ship's Characteristics Menu

The [SHIP'S CHARACTERISTICS] menu sets up the NAVpilot according to boat type, length, cruising speed and rate of turn.

|   |
|---|
| SHIP'S CHARACTERISTICS<br>BOAT TYPE: <b>SEMI-DISPLACE</b><br>BOAT LENGTH: 40ft(12.2m)<br>CRUISING SPD: 30kn<br>RATE OF TURN: 5°/s |
|---|

1. The cursor is selecting the setting for [BOAT TYPE]; push the knob.

|   |
|---|
| PLANING<br><b>SEMI-DISPLACE</b><br>DISPLACEMENT<br>SAILBOAT |
|---|

2. Rotate the knob to select your boat type then push the knob.

[PLANING]: Jet boats, fast patrol boats, sport fishing boats

[SEMI-DISPLACE]: Pilot boats, power boats, fast catamaran boats

[DISPLACEMENT]: Pedal boats, fishing boats, work boats, houseboats

[SAILBOAT]: Sailboats

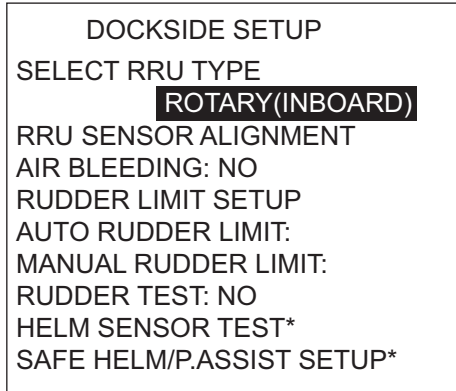
3. Set [BOAT LENGTH], [CRUISING SPD], and [RATE OF TURN] as follows:

- 1) Rotate the knob to select the current value of an item then push the knob.

- 2) Rotate the knob to set a value then push the knob.

**Note:** Set the rate of turn according to your boat's specifications. If the rate is set higher than your boat's specifications, the rudder may turn abruptly when arriving at a waypoint, creating a dangerous situation. Further, it may not be possible to change course correctly if the rate is higher than the actual rate of turn of your boat.

### 3.5 Dockside Setup Menu



\* Displayed if Accu-Steer drive unit is selected.

#### RRU type

1. The cursor is selecting [SELECT RRU TYPE]; push the knob.
2. Rotate the knob to select correct option then push the knob.

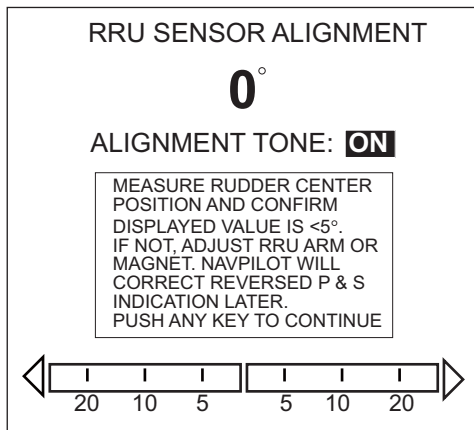


[ROTARY(INBOARD)]: For FURUNO Rudder Reference Unit FAP-6112.

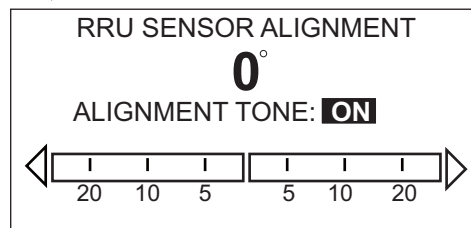
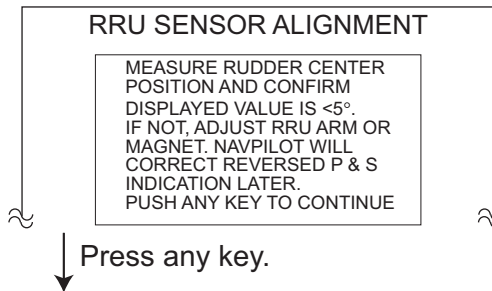
[LINEAR(OUTBOARD)]: For Teleflex linear sensor AR4502.

#### RRU sensor alignment

3. Go back to the [DOCKSIDE SETUP] menu.
4. Rotate the knob to select [RRU SENSOR ALIGNMENT] then push the knob.



NAVpilot-700



NAVpilot-711/720

5. With the rudder physically centered, confirm that the displayed rudder angle indication is less than or equal to  $\pm 5^\circ$ . If not, you must adjust the rudder sensor body or magnet position (for Teleflex linear sensor AR4502) so that the indicator is within  $\pm 5^\circ$  before continuing.

**Alignment Tone:** There is an alignment tone that you can use to help you make this adjustment remotely. A beep sounds continuously when the indicator is within  $\pm 5^\circ$ . If you do not need the alignment tone, you may turn it off by pushing the knob and selecting [OFF] with [ALIGNMENT TONE].

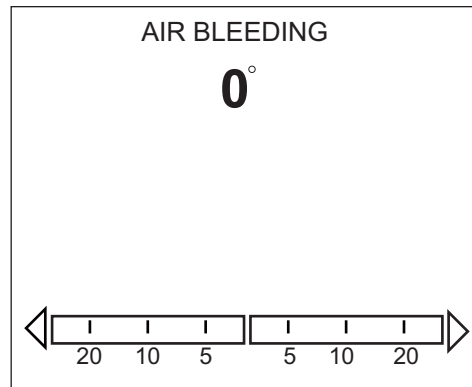


**Air bleeding**

6. Go back to the [DOCKSIDE SETUP] menu. Select [AIR BLEEDING] and push the knob.



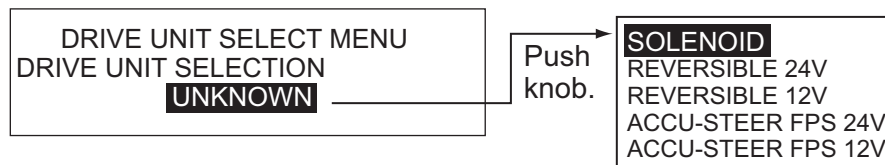
7. The cursor is selecting [NO]; push the knob. Rotate the knob to select [YES] then push the knob to show the following display.



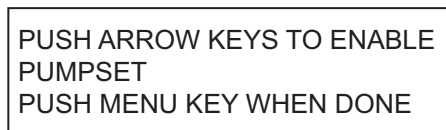
8. The display shows “DETECTING DRIVE UNIT” while searching your drive unit.

If your drive unit is “REVERSIBLE,” the display shows [REVERSIBLE 12V], [REVERSIBLE 24V], [ACCU-STEER FPS 12V], or [ACCU-STEER FPS 24V]. If your drive unit is “SOLENOID”, nothing appears on the display.

**Note:** If the drive type could not be detected, the left-hand screen shown below appears. [UNKNOWN] is selected; push the knob to display the popup. Select your drive type.



9. The following popup message appears.



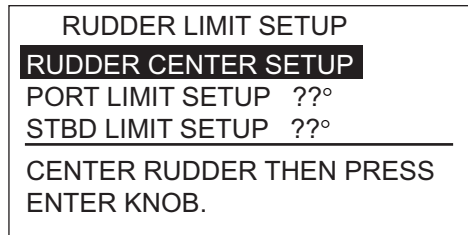
**Note:** If you have the Accu-Steer helm sensor, the message “A HELM SENSOR IS INSTALLED. SAFE HELM AND POWER ASSIST IS AVAILABLE. PUSH ENTER TO CONTINUE.” appears before the above popup message. Push the knob to show the above message.

10. Press the ◀ (or ▶) key until the indicator is completely filled (in black).
11. Remove the appropriate rubber cap of the cylinder to bleed air.
12. Press the ◀ (or ▶) key until the indicator is completely filled (in black).
13. Remove the appropriate rubber cap of the cylinder to bleed air.
14. Repeat steps 10-13 to bleed air completely.

### 3. INITIAL SETTINGS

#### **Rudder limit setup**

15. Go back to the [DOCKSIDE SETUP] menu. Select [RUDDER LIMIT SPEED] and push the knob.

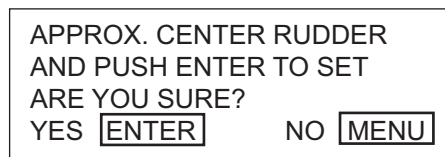


Set the rudder center position, then set the maximum rudder limits or "hard-over" points for the rudder system.

NAVpilot will AUTOMATICALLY set the port/starboard direction of the rudder angle in this step. It does not matter which way the rudder reference unit arm or linear sensor rod is installed as this correction will be done electronically.

NAVpilot will AUTOMATICALLY "linearize" the rudder indication values if the rudder turns further in one direction than the other direction. Therefore, it is recommended that you make both port and starboard rudder values the same. This will avoid confusion for the customer during operation. Also, numeric value selected is not critical and need not be measured as long as you feel that your estimation is close to the proper value.

16. The cursor is selecting [RUDDER CENTER SETUP]; push the knob.



17. Turn the helm so rudder is centered then push the knob. The [RUDDER LIMIT SETUP] menu appears.

18. Rotate the knob to select [PORT LIMIT SETUP].

19. Turn the helm hard-over to port then enter port rudder limit.

20. Rotate the knob to select [STBD LIMIT SETUP].

21. Turn helm hard-over to starboard then enter starboard rudder limit.

**Note 1:** If the angle is wrong at step 16, 19 or 21 an error message appears. In this case go back to the [RRU SENSOR ALIGNMENT] menu and check if the RRU setting is correct.

**Note 2:** If the setup failed, one of the following messages appears. Re-do the rudder limit setup. If the message appears again, re-adjust the RRU. See page 1-7 for the rotary sensor. For the linear sensor, see its manual.

- RRU CENTER(PORT or STBD) POS IS OUT OF RANGE-TURN HELM OR ADJUST RRU THEN TRY AGAIN
- BELOW STEPS NOT COMPLETE RUDDER CENTER(,PORT LIMIT or STBD LIMIT) RETRY?
- RRU SETUP ERROR-MUST TURN HELM HARD OVER PORT/STBD RETRY?

**Auto rudder limit**

Auto rudder limit determines the maximum rudder movement in degrees from the mid position in the Auto, Nav, Turn, Fish Hunter, Dodge and Wind modes. The value set here should not be greater than the limit set for Rudder Limit.

22. Go back to the [DOCKSIDE SETUP] menu, select [AUTO RUDDER LIMIT:] then push the knob. The current value is circumscribed with a double rectangle.

23. Rotate the knob to set the rudder limit desired then push the knob. (Setting range: 10° to max. rudder limit)

**Manual rudder limit**

In the Remote (FU and NU), FU Dodge or NFU Dodge modes, usually a wide range of rudder angles are used, and therefore a larger number should be entered. However, the setting must not exceed the rudder limit angle which is inherent on your boat.

Do not set the limit higher than the rudder limit. It is recommended to set the manual rudder limit equal to or greater than the auto rudder limit. If the manual rudder limit is set lower than the auto one, the rudder may be returned to center position too quickly when the vessel is doing automatic turning by operation from the remote controller or DODGE key.

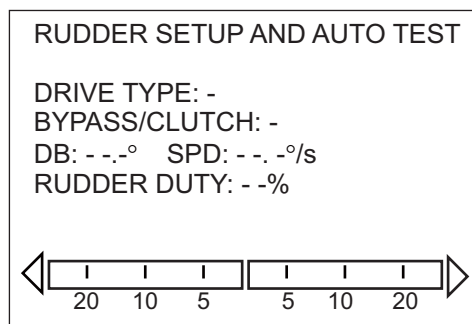
24. Go back to the [DOCKSIDE SETUP] menu and select [MANUAL RUDDER LIMIT:] then push the knob. The current value is circumscribed with a double rectangle.

25. Rotate the knob to set the rudder limit desired then push the knob. (Setting range: 10° to max. rudder limit)

**Rudder test**

For power steering vessels with an engine driven power steering pump, the engines must be running and slightly above idle before this test is done. BEFORE doing this test, check that [RUDDER DEADBAND] in the [SEA TRIAL] menu is set to [AUTO].

26. Go back to the [DOCKSIDE SETUP] menu, select [RUDDER TEST] then push the knob. The cursor is selecting [NO]; push the knob. Select [YES] then push the knob to start the test.



The rudder test automatically detects drive unit type as follows:

**Successful detection**

SOLENOID: The test automatically continues.

### 3. INITIAL SETTINGS

**REVERSIBLE:** The following menu appears. Select correct drive unit type with the **Course control** knob and push the knob. Then, the test continues.

|   |
|---|
| DRIVE UNIT SELECT MENU<br>DRIVE UNIT SELECTION<br><b>REVERSIBLE 24V</b><br>REVERSIBLE 12V<br>ACCU-STEER FPS 24V<br>ACCU-STEER FPS 12V |
|---|

**Note:** IN PORT1 and INPORT2 are disabled when ACCU-STEER is selected.

#### Failed detection

“RUDDER TEST FAILED” appears. The rudder test is discontinued.

When the rudder test is finished, the message "RUDDER TEST COMPLETED." appears.

The results are shown on the screen as follows:

[DRIVE TYPE]: [REVERSIBLE12V](or 24V), [ACCU-STEER 12V](or 24V), or SOLENOID

[BYPASS/CLUTCH]: [NOT PRESENT] or [PRESENT]

[DB]: Rudder deadband. If rudder DB is higher than 1.3°, the boat cannot be controlled correctly. In this case, open the [SEA TRIAL] menu, set [RUDDER DEADBAND] to [MANUAL] then adjust rudder deadband so that no hunching occurs.

[SPD]: Rudder speed. If out of the recommended value for the NAVpilot, a warning message appears.

[RUDDER DUTY]: PWM (Pulse Width Modulation) duty cycle for control of pump output.

- For solenoid systems, the rudder duty indication is 100% always.
- For reversing motor system, this value should be in a range from 50% to 100% for optimum performance. If the value is lower than 50%, the pump capacity is oversized for the steering cylinder volume. While the system may work well, there is a chance that the pump will fail to start (stalled pump) when there is a heavy load on the rudder system in heavy seas or large turns because the average voltage applied to the pump is too low. If the rudder speed is lower than 3 degrees/s and the rudder duty is higher than 90%, the pump capacity is undersized for the steering cylinder volume. While the system may also work well, the NAVpilot control unit may not be able to increase the average voltage to the pump adequately to improve the NAVpilot performance in heavy or following seas.
- If the boat type is “sailboat”, the rudder duty indication is 100% always. (Even if the speed exceeds 5°/s, no damage will result.)

27. Press the [MENU] key to return to the [DOCKSIDE SETUP] menu.

28. Set the deadband of the rudder, automatically or manually. The setting is normally performed automatically during the RUDDER TEST. Manually setting the parameter is normally not recommended and may in fact be only useful on older vessels with chain driven or old worn rudder system. If it is necessary to set it manually, do the following:

- 1) Select [RUDDER DEADBAND] on the [SEA TRIAL] menu then push the knob.
- 2) Select [MANUAL] then push the knob.
- 3) Rotate the knob to select the value shown then push the knob.
- 4) Rotate the knob to set the value shown then push the knob.

**Note 1:** If rudder DB is higher than  $1.3^\circ$ , the boat cannot be controlled correctly. Check for air in the steering system and if the rudder speed is greater than  $10^\circ/s$ .

**Note 2:** If you set the deadband manually, do not set the value too low. Hunching can result.

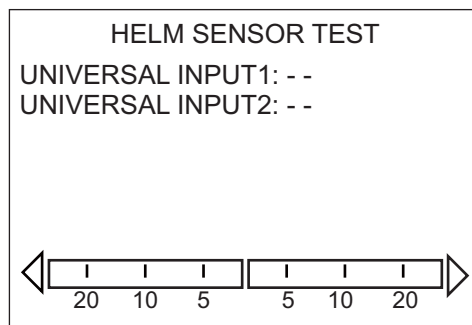
**Note 3:** if the rudder test could not be completed successfully one of the following messages appears. Do the test again after resolving the problem.

- RUDDER TEST FAILED.
- RUDDER SPEED IS TOO FAST TO CONTROL THE VESSEL. THE VESSEL MAY NOT BE CONTROLLED PROPERLY.
- RUDDER SPEED IS TOO SLOW TO CONTROL THE VESSEL. THE VESSEL MAY NOT BE CONTROLLED PROPERLY.
- DEADBAND IS TOO BIG TO CONTROL THE VESSEL. THE VESSEL MAY NOT BE CONTROLLED PROPERLY. PLEASE SEE INST MANUAL FOR MANUAL DB SETTING.
- RUDDER ANGLE ERROR CHECK DRIVE CIRCUIT
- RUDDER DRIVE ERROR

### **Helm sensor test (for Accu-Steer FPS 12V (or 24V) drive)**

The helm sensor test checks the connection between the processor unit and the Accu-Steer FPS 12V (or 24V) drive. If your drive unit is different, go to section 3.6.

29. Go back to the [INSTALLATION] menu, select [HELM SENSOR TEST] then push the knob.



30. Select [YES] then push the knob. The message “TURN HELM PORT OR STBD. PUSH ANY KEY TO ABORT.” appears. Turn the helm to port or starboard.

31. The message “TURN HELM To OPPOSITE. PUSH ANY KEY TO ABORT.” Turn the helm in the direction opposite that done in step 30.

If the connection is normal, the message “HELM SENSOR TEST COMPLETED. PUSH ENTER TO CONTINUE.” appears. For failure, “HELM SENSOR TEST FAILED. CHECK THE SENSOR. PUSH ENTER TO CONTINUE.” appears. In case of failure, check to see if your drive is the Accu-Steer FPS 12 V (or 24 V). Also, check that the helm sensor cable is correctly connected to TB5.

### 3. INITIAL SETTINGS

#### **Safe helm/p.assist setup (for Accu-Steer FPS 12V (or 24V) drive)**

The safe helm and power assist features are available with the Accu-Steer FPS 12V (or 24V) drive unit.

The safe helm feature stops helm steering then restores the AUTO or NAV mode when the helm is operated past a specific time interval in the AUTO or NAV mode. This prevents unintentional continuous turning of the helm. Automatic steering operation is disabled after safe helm has activated. The mode and course indications flash when the safe helm mode goes on.

The power assist mode customizes manual steering to meet your ship's steering characteristics to your own preferences. The mode is available during the safe helm and STBY modes.

The safe helm/p.assist menu appears after the helm sensor test is successfully completed.

#### **How to set the safe helm mode**

|                          |
|--------------------------|
| SAFE HELM/P.ASSIST SETUP |
| SAFE HELM: <b>ON</b>     |
| RETURN DELAY 5 SEC       |
| SAFE HELM RESPONSE       |
| POWER ASSIST: OFF        |

32. Use the knob to select [SAFE HELM] then push the knob.

33. Use the knob to select [YES] then push the knob to activate safe helm.

34. Use the knob to select [RETURN DELAY] then push the knob.

35. Rotate the knob to set the return delay, the amount of time that elapses before the safe helm mode is deactivated and the AUTO or NAV mode is restored. The setting range is 1-20 seconds.

36. Use the knob to select [SAFE HELM RESPONSE] then push the knob.

|   |
|---|
| SAFE HELM RESPONSE  |
| RESPONSE: <b>6</b> PORT STBD  |
| TURN HELM PORT/STBD TO<br>SET SAFE HELM RESPONSE<br>TIME. HIGHER VALUE =<br>FASTER RESPONSE |
| PUSH MENU KEY TO CONTINUE   |

37. Turn the knob to set the response then push the knob. The higher the value the faster the response. Turn the helm to port or starboard. A beep sounds and the indication PORT or STBD on the menu appears in reverse video.

**How to set the power assist mode**

|                          |
|--------------------------|
| SAFE HELM/P.ASSIST SETUP |
| SAFE HELM: <b>ON</b>     |
| RETURN DELAY 5 SEC       |
| SAFE HELM RESPONSE       |
| POWER ASSIST: OFF        |

38. Use the knob to select [POWER ASSIST] then push the knob.

39. Use the knob to select [ON] then push the knob. When this is done the menu items for power assist appear.


|                           |
|---------------------------|
| SAFE HELM/P.ASSIST SETUP  |
| SAFE HELM: <b>ON</b>      |
| RETURN DELAY 5 SEC        |
| SAFE HELM RESPONSE        |
| POWER ASSIST: ON          |
| FOR SPEEDS UNDER 3.0kn    |
| POWER ASSIST STBY: ON     |
| POWER ASSIST RUDDER SPEED |

40. Use the knob to select [FOR SPEEDS UNDER] then push the knob.

41. Rotate the knob to set the highest speed at which power assist activates. The setting range is 1.0 to 9.9 knots.

42. **If you want power assist in the STBY mode**, use the knob to set [POWER ASSIST STBY] to [ON].

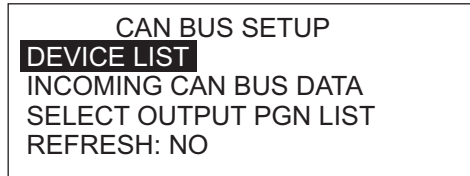
43. Use the knob to select [POWER ASSIST RUDDER SPEED] then push the knob.

|   |
|---|
| POWER ASSIST RUDDER SPEED   |
| RUDDER SPEED: <b>10</b>   |
| TURN HELM PORT/STBD TO<br>SET RUDDER SPEED.<br>HIGHER VALUE = FASTER SPEED<br>PUSH MENU KEY TO CONTINUE |
|                     |

44. Turn the helm to port and starboard to set safe helm response time then push the knob.

## 3.6 CAN bus Port Setup

The [CAN BUS SETUP] menu sets up the equipment connected to the CAN bus port.



1. The cursor is selecting [DEVICE LIST]; push the knob.



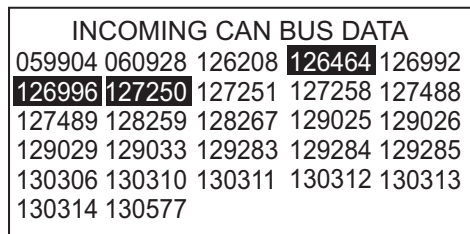
This display shows the name of the CAN bus equipment connected to the CAN bus port. (In the example illustration, the FURUNO Heading Sensor PG-700 is connected. The series of alphanumeric characters which follow the model name are the CAN bus unique number.) The name of the device can be changed. If you do not need to change the name, go to step 3.

2. To change the device name, do the following:

- 1) Push the knob.
- 2) Rotate the knob to select character then push the knob.
- 3) The cursor moves to the next character. Repeat step 2 to change the character.  
You can select the input location with the ◀ and ▶ keys. The name can have a maximum of 14 characters.

3. Press the **MENU** key to go back to the [CAN BUS SETUP] menu.

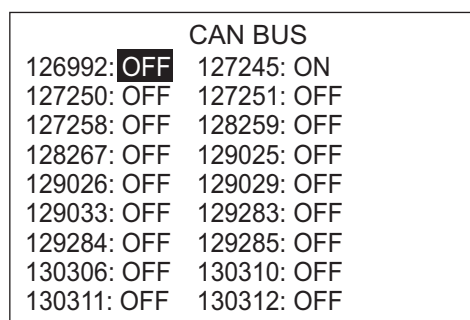
4. Rotate the knob to select [INCOMING CAN BUS DATA] to show the following display.



This display shows all the NMEA 2000 sentences that the NAVpilot is capable of receiving. The Parameter Group Number (PGN) the NAVpilot is currently receiving are highlighted.

5. Press the **MENU** key to go back to the [CAN BUS SETUP] menu.

6. Rotate the knob to select [SELECT OUTPUT PGN LIST], and the display looks something like the one shown below.





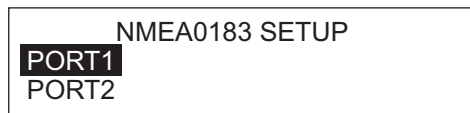
This display shows all the NMEA 2000 sentences that can be output to the NAVpilot. The sentences selected for output show "ON". To turn a sentence ON or OFF, go to step 7. (Corresponding equipment must be connected to turn a sentence ON.) If you do not need to change the settings, go to step 8.

7. To turn an NMEA 2000 sentence on or off, do the following:
  - 1) Rotate the knob to select a sentence then push the knob.

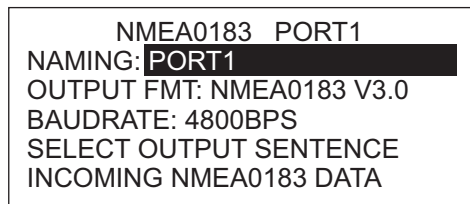


- 2) Rotate the knob to select [ON] or [OFF] then push the knob.
8. Press the **MENU** key to return to the [CAN BUS SETUP] menu.
9. Rotate the knob to select [REFRESH] then push the knob.
10. Wait five seconds to allow the system to refresh the device list.

### 3.7 NMEA0183 Port Setup



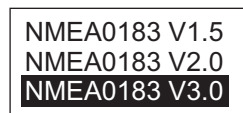
1. The cursor is selecting [PORT1]; push the knob.



2. The cursor is selecting [NAMING: PORT1]. This menu item lets you change the name of the port. For example, equipment type, model number, etc. The name can have a maximum of 14 alphanumeric characters. If you don't need to change the name, go to step 3.

- 1) Push the knob.
  - 2) Rotate the knob to select character then push the knob.
  - 3) The cursor moves to the next character. Repeat step 2 to change the character.  
You can select the input location with the ◀ and ▶ keys.

3. Rotate the knob to select [OUTPUT FMT] then push the knob.
4. Rotate the knob to select the output format of the equipment then push the knob.



5. Rotate the knob to select [BAUDRATE] then push the knob.
6. Rotate the knob to select the baud rate of the equipment then push the knob.



### 3. INITIAL SETTINGS

7. Rotate the knob to select the [SELECT OUTPUT SENTENCE] then push the knob. One of the following displays appears depending on the NMEA output format selected.

|          |          |          |
|----------|----------|----------|
| VER 1.5  |          |          |
| DBT: OFF | GGA: OFF | GLL: OFF |
| HDM: OFF | HDT: OFF | MTW: OFF |
| RMB: OFF | RMC: OFF | ROT: OFF |
| VHW: OFF | VTG: OFF | VWR: OFF |
| VWT: OFF | ZDA: OFF |          |

|          |          |          |
|----------|----------|----------|
| VER 2.0  |          |          |
| DBT: OFF | DPT: OFF | GGA: OFF |
| GLL: OFF | HDG: OFF | HDT: OFF |
| MTW: OFF | MWV: OFF | RMB: OFF |
| RMC: OFF | ROT: OFF | RSA: OFF |
| VHW: OFF | VTG: OFF | VDA: OFF |

|          |          |          |
|----------|----------|----------|
| VER 3.0  |          |          |
| DBT: OFF | DPT: OFF | GGA: OFF |
| GLL: OFF | GNS: OFF | HDG: OFF |
| HDT: OFF | MTW: OFF | MWV: OFF |
| RMB: OFF | RMC: OFF | ROT: OFF |
| RSA: OFF | VHW: OFF | VTG: OFF |
| ZDA: OFF |          |          |

8. To turn a sentence ON or OFF, rotate the knob to select the sentence, push the knob, rotate the knob to select [ON] or [OFF] then push the knob.
9. Press the **MENU** key to return to the [NMEA0183 PORT1] menu.
10. Rotate the knob to select [INCOMING NMEA0183 DATA] then push the knob.

|                        |     |     |     |     |     |
|------------------------|-----|-----|-----|-----|-----|
| INCOMING NMEA0183 DATA |     |     |     |     |     |
| AAM                    | DBT | HDG | RMB | VHW | ZDA |
| APB                    | DPT | HDM | RMC | VTG |     |
| BOD                    | GGA | HDT | ROT | VWR |     |
| BWC                    | GLL | MTW | THS | VWT |     |
| BWR                    | GNS | MWV | TLL | XTE |     |

This display shows the NMEA0183 sentences currently being received.

11. Press the **MENU** key twice to return to the [NMEA0183 PORT SETUP] menu. If you have equipment connected to NMEA0183 PORT2, set up the equipment similar to how you set up the equipment in NMEA0183 PORT1.

## 3.8 Sensor Setup

Before doing this procedure, turn on all CAN bus equipment connected to the CAN bus network of the NAVpilot.

|                       |  |
|-----------------------|--|
| SENSOR SELECTION      |  |
| <b>HEADING SENSOR</b> |  |
| SPEED (STW)           |  |
| SPEED (SOG)           |  |
| POSITION SENSOR       |  |
| WIND SENSOR           |  |
| DEPTH SENSOR          |  |
| TEMP SENSOR           |  |

1. Turn on all sensors then push the knob.

- The cursor is selecting [HEADING SENSOR]; push the knob.

```

HEADING SENSOR
AUTO DETECT : NO
1ST: PG-700 : 0019E4
2ND: -----
3RD: -----

```

When [AUTO DETECT] is selected to [YES], all the heading sensors connected to the NAVpilot are shown. In case of multiple heading sensors, the sensors are ordered by FURUNO CAN bus heading sensor, other CAN bus heading sensor, NMEA 0183 heading sensor. If desired you can change the order; select number, push the knob, rotate the knob to select a sensor then push the knob. [AUTO DETECT] automatically re-orders sensors in the above-mentioned order. Select [YES] at [AUTO DETECT] to re-order.

- Set up speed, position, wind, depth and temp sensors similarly.

### 3.9 Universal Port Setup

```

UNIVERSAL PORT
IN PORT1: DISABLE
IN PORT2: DISABLE
OUT PORT1: DISABLE
OUT PORT2: DISABLE

```

The [UNIVERSAL PORT] menu sets up the GENERAL IN and GENERAL OUT ports.

**GENERAL IN:** A switch box is connected to this port to control the NAVpilot from a remote location.

**GENERAL OUT:** A buzzer sounds or a lamp lights at a remote location when the specified function is done on the NAVpilot.

If you have equipment connected to only the GENERAL OUT port, go to step 5.

- The cursor is selecting the setting for [IN PORT1]; push the knob.

```

DISABLE
AP ENABLE
GO STBY
GO AUTO
PORT ARROW KEY
STBD ARROW KEY
FUNCTION KEY*

```

\* This feature is not available when boat type is selected as sailboat.

- Rotate the knob to select the command or function for [IN PORT1]. This is the command or function assigned to the switch box connected to this port.

[DISABLE]: The port is disabled.

[AP ENABLE]: Select ON to get full control of the boat with the NAVpilot. In the OFF setting only the STBY mode is available.

[GO STBY]: The switch, when operated, puts the NAVpilot in the STBY mode.

### 3. INITIAL SETTINGS

[GO AUTO]: The switch, when operated, puts the NAVpilot in the AUTO mode.

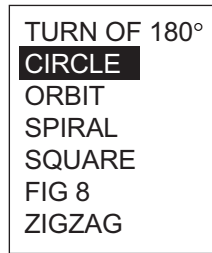
[PORT ARROW KEY]: The switch, when operated, controls the ◀ key on the NAVpilot.

[STBD ARROW KEY]: The switch, when operated, controls the ▶ key on the NAVpilot.

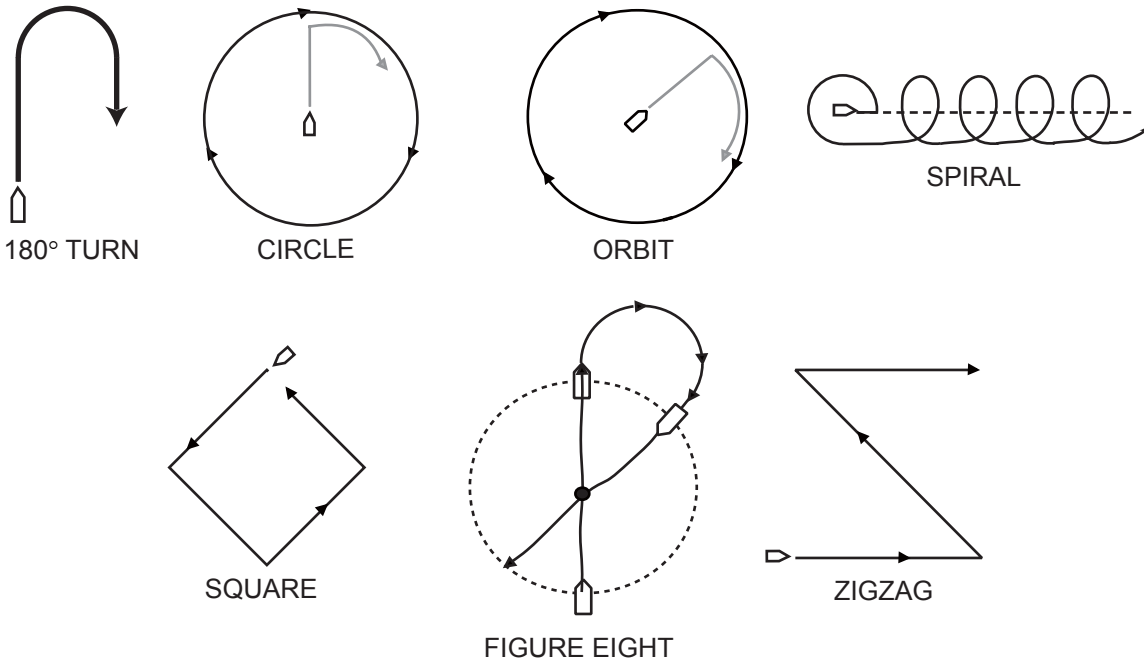
[FUNCTION KEY]: Assign function of equipment connected to NAVpilot.

3. If you selected [FUNCTION KEY], do the following to select a function. If not go to step 4.

1) Rotate the knob to select [FUNC KEY] then push the knob.



2) Rotate the knob to select an option then push the knob.



3) Rotate the knob to select [PORT/STBD] then push the knob.



4) Rotate the knob to select the direction of the turn then push the knob.

4. If you have another device connected to the UNIVERSAL IN port, set it up at [IN PORT2].

5. Rotate the knob to select [OUT PORT1] then push the knob.

|                |  |
|----------------|--|
| EXT BUZZER*    | A lamp lights or an external buzzer sounds when;                     |
| STBY MODE      | the NAVpilot goes into the STBY mode.                                |
| AUTO MODE      | the NAVpilot goes into the AUTO mode.                                |
| NAV MODE       | the NAVpilot goes into the NAV mode.                                 |
| AUTO/NAV MODE  | the NAVpilot switches between the AUTO and NAV modes and vice versa. |
| AP CONTROL     | the rudder is moved.   |
| PORT ARROW KEY | the PORT arrow key (◀) on the NAVpilot is operated                   |
| STBD ARROW KEY | the STBD arrow key (▶) on the NAVpilot is operated.                  |
| <b>DISABLE</b> | Function disabled.   |

\* The [BUZZER] setting on the [ALARM] menu is automatically selected to [INTERNAL+EXTERNAL].  
Applicable to both OUT PORT1 and OUT PORT2.

6. Rotate the knob to select the action that triggers an external buzzer or lamp then push the knob.
7. If you have another device connected to the UNIVERSAL OUT port, set it up at [OUT PORT2].

### 3.10 Sea Trial

|                        |                  |
|------------------------|------------------|
| SEA TRIAL              |                  |
| MAG. VAR.:             | <b>AUTO</b> --.° |
| COMPASS SETUP          |                  |
| SET CENTER RUD. POS.   |                  |
| RUDDER DEADBAND*: AUTO |                  |
|                        |                  |
| COG --.°               | HDG: T178°       |

\* Set to AUTO to do rudder test.  
Set to MANUAL to adjust rudder deadband. See page 3-10.

With a magnetic heading sensor (PG-500/700 etc.), magnetic variation information is necessary to display true heading data. In almost all cases, a GPS will be connected to the NAVpilot and the GPS will send this variation information to the NAVpilot automatically. Therefore, select "AUTO". In special cases where a manual variation is required, you may input these values manually. Note that this selection is only effective when the heading indication for the NAVpilot is selected to "TRUE".

When true heading display is selected in the [DISPLAY SETUP] menu, the NAVpilot will display true heading information even though the NAVpilot may be connected to a magnetic heading sensor. This is very valuable when connecting a FURUNO radar FAR-21X7 series to the NAVpilot because these radars cannot be set for a magnetic heading input and the "Waypoint Lollipop" will only align properly when true heading is used.

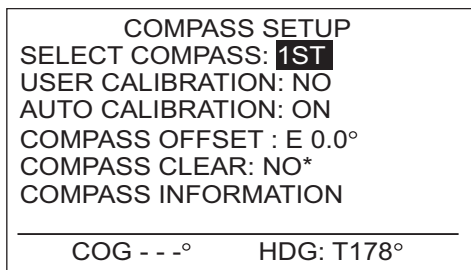
**If you have selected the FURUNO PG-500/700 as a heading sensor**, do the procedure below to calibrate the compass and get automatic distortion compensation. Otherwise, go to step 4.

- The procedure is not applicable to other heading sensors.

### 3. INITIAL SETTINGS

- It is not necessary to perform any adjustments locally at the PG-500/700. NAVpilot has full control of these heading sensors.

1. Rotate the knob to select [COMPASS SETUP] then push the knob.



\* Appears with connection of PG-500, PG-700.  
Restores sensor's factory defaults. For recalibrating compass.

2. [SELECT COMPASS] is selected to [1ST]. Calibrate the 1st compass and then calibrate others.

1) Rotate the knob to select [USER CALIBRATION] then push the knob.



2) Rotate the knob to select [AUTO] or [MANUAL] then push the knob.

**AUTO:** The boat turns to starboard about three or four full circles for calibration.

Note that the boat will turn to starboard with the degree set at [MANUAL RUDDER LIMIT] on the [DOCKSIDE SETUP] menu.

**MANUAL:** Use the helm to turn the boat to port or starboard for three or four full circles in a speed of about one minute/circle to perform the calibration.

3) Push the knob to start the calibration.

For [AUTO], the boat starts to turn to starboard, and then the calibration starts automatically. For [MANUAL], turn the boat to starboard or port in a circular course.

Take about two minutes to complete the circle.

- To stop the calibration while the ship is turning, press any key to show the message "CALIBRATION STOPPED". Press any key again to return to the [SEA TRIAL] menu.
- When the calibration is successfully completed, the message "CALIBRATION COMPLETED" appears. Press any key to return to the [SEA TRIAL] menu.
- If the calibration failed, the message "CALIBRATION NOT COMPLETED. RETRY CALIBRATION?" appears. Push the knob to redo the calibration, or press any key to escape.

4) Rotate the knob to select [AUTO CALIBRATION] then push the knob.

5) Rotate the knob to select [ON] then push the knob. The AUTO LED lights on the PG-500.

3. If you have another PG-500/700, select it at [SELECT COMPASS] and calibrate it following the above procedure.

4. If the heading data shown on the Control Unit differs from the indication of the ship's compass, apply an offset at [COMPASS OFFSET]. This offset is applied to the heading sensor data. For example, if the Control Unit display shows 125° though the ship's compass reading is 120°, for example, enter "5".
  - 1) Rotate the knob to select [COMPASS OFFSET] then push the knob.
  - 2) Rotate the knob to set a value (setting range: E0.0°-E180.0°, W0.1°-W179.9°) then push the knob.
5. [COMPASS INFORMATION] shows the name and software version of the compass connected to the NAVpilot. Select it and push the knob to show compass information, provided your compass outputs such information.

COMPASS INFORMATION

MODEL ID:  
PG-700

SOFTWARE VERSION:  
01.01:99.99

6. Press the **MENU** key to return to the [COMPASS SETUP] menu.
7. Rotate the knob to select [SET CENTER RUDDER POS] then push the knob.  
You must set the rudder position at zero degrees on the [SEA TRIAL] menu. If this setting is not completely, the boat may wander. For dual-engine boats, be sure that the engines are synchronized and maintain a normal cruising speed.

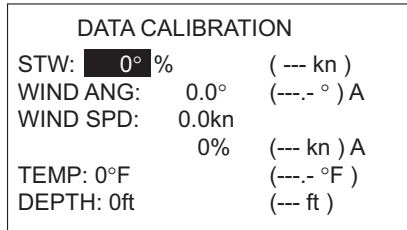
FOLLOW STRAIGHT COURSE  
AND PUSH ENTER TO SET  
ARE YOU SURE?

YES       NO

8. Run the boat between 10 and 15 knots (your cruising speed).
9. When the ship runs straight, push the knob to set.

### 3.11 Data Calibration

The [DATA CALIBRATION] menu lets you apply an offset to speed, wind, temperature and depth data. If the indication on the Control Unit differs from actual value apply and offset to correct the indication. Current indications on the Control Unit appears in parentheses.



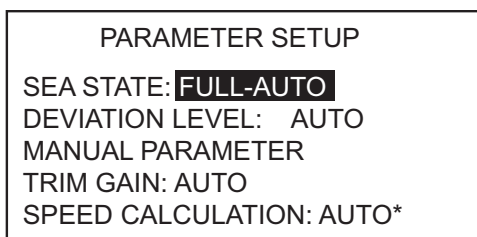
1. Rotate the knob to select the sensor you want to compensate then push the knob.
2. Rotate the knob to set a value then push the knob. Enter a negative value when the indication is higher than the actual value; a positive value when it is lower than the actual value. For example, if the depth indication is 100 feet and the actual depth is 98 feet, enter -2.

| Item     | Range of compensation                | Item  | Range of compensation        |
|----------|--------------------------------------|-------|------------------------------|
| STW*     | -50 - +50(%)                         | TEMP  | -10 - +10(°C), -18 - +18(°F) |
| WIND ANG | -180.0 - +180.0(°)                   | DEPTH | -15 - +100(ft/m/fa/PB)       |
| WIND SPD | -50 - +50(%)<br>(kn, km/h, m/s, mph) |       |                              |

\*STW=Speed Through Water

3. Press the ► key to show the [PARAMETER SETUP] menu, which adjust the NAVpilot according to sea state, trim, etc.

### 3.12 PARAMETER SETUP Menu



\* Appears on page 2 of menu for NAVpilot-711/720.

NAVpilot-700

#### Sea state

Your NAVpilot has an automatic adjustment feature which sets up the equipment according to ship's characteristics and sea state, for optimum performance in the AUTO, NAV and WIND modes. In addition, a self-learning algorithm is incorporated: Parameters for rudder ratio, counter rudder and auto trim gain are constantly optimized based on the steering history of your boat, and are stored in memory for future navigation.

Set how the NAVpilot steers your boat as follows:



1. Rotate the knob to select [SEA STATE] then push the knob.



2. Rotate the knob to select the option which best matches current sea state then push the knob. For items other than [FULL-AUTO], go to step 4.

[FULL-AUTO]: Auto adjustment and self-learning are on.

[SEMI-AUTO]: Auto adjustment is on, self-learning is off.

[MANUAL-CALM]: Self-learning is off, using the parameter selected for calm sea.

[MANUAL-MODERATE]: Self-learning is off, using the parameters for a typical normal sea state.

[MANUAL-ROUGH]: Self-learning is off, using preset parameters for a typical rough sea state.

For normal, everyday operation, the [FULL-AUTO] mode is recommended. However, if you want the NAVpilot to steer the boat based on experience-related parameters, but you don't want the pilot to be in "self-learning" mode, choose the [SEMI-AUTO] option.

Note that the course keeping quality may be decreased if the sea state is different from the experience-related parameters. This option is provided if you happen to be using the pilot in a situation that you do not anticipate encountering again.

3. For [FULL-AUTO], set the deviation level as follows:

- 1) Rotate the knob to select [DEVIATION LEVEL] then push the knob.



- 2) Rotate the knob to select [AUTO] or [LEVEL]. For [LEVEL], you may set a value between 1 and 9. A lower number keeps the course more precisely but the rudder may be turned more often. With a higher number, the rudder turns slowly, but the course may not be kept as precisely.

- 3) Push the knob to confirm setting.

### 3. INITIAL SETTINGS

#### **How to manually set NAVpilot steering parameters**

When [MANUAL-CALM], [MANUAL-MODERATE] or [MANUAL-ROUGH] is selected as the sea state, set [MANUAL PARAMETERS] as below.

You can set three parameters for the MANUAL function: Weather, Rudder gain and Counter rudder.

1. Rotate the knob to select [MANUAL PARAMETERS] from the [PARAMETER SETUP] menu then push the knob. The display now looks like the one shown below.

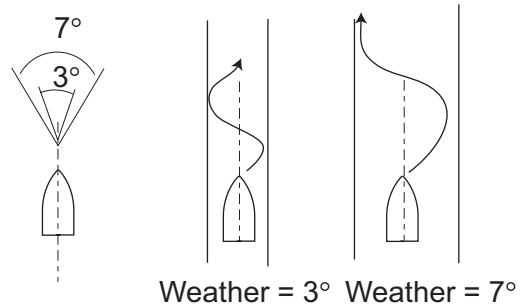
|                | [CALM] | [MODERATE] | [ROUGH] |
|----------------|--------|------------|---------|
| [WEATHER]      | 1°     | 2°         | 3°      |
| [RUDDER GAIN]  | 3      | 5          | 10      |
| [COUNT RUDDER] | 1      | 2          | 4       |

2. Rotate the knob to select the setting of [WEATHER-CALM] then press the knob.
3. Rotate the knob to set value (0° to 10° for weather).
4. Push the knob.
5. Set [WEATHER-MODERATE], [WEATHER-ROUGH] and [RUDDER GAIN] and [COUNT RUDDER] similarly (Setting range: 1-20 for rudder gain, 0-20 for counter rudder).
6. Press the **MENU** key to finish.

#### **Guidelines for how to set SEA STATE**

**[WEATHER]:** When the sea is rough, the boat's heading fluctuates to port and starboard. If the rudder is driven very often to maintain the set course, the helm mechanism may wear out. To prevent this, the weather adjustment makes the NAVpilot insensitive to minute course deviations. You may choose a degree between 0° to 10°. Until the course deviation exceeds the selected setting, steering to correct the heading will not be initiated.

The illustration at the top of the next page shows boat's track lines with weather setting 3° and 7°. When 7° is set, for example, the rudder is not driven until the course deviation exceeds 7°. Increasing the setting reduces activation of the steering gear, however the boat tends to zigzag. When the sea is calm, set a smaller value.



**[RUDDER GAIN]:** When the boat's heading deviates from the set course, the NAVpilot adjusts the rudder to correct it. The rudder angle (number of degrees) which is steered against every degree of course deviation is known as the rudder gain.

The following illustrations show how many degrees the NAVpilot steers the rudder in order to nullify 4 degrees of course deviation with various settings of the rudder gain.

Rudder gain = 1°



Rudder angle =  $4^\circ \times 1 = 4^\circ$

Rudder gain = 2°



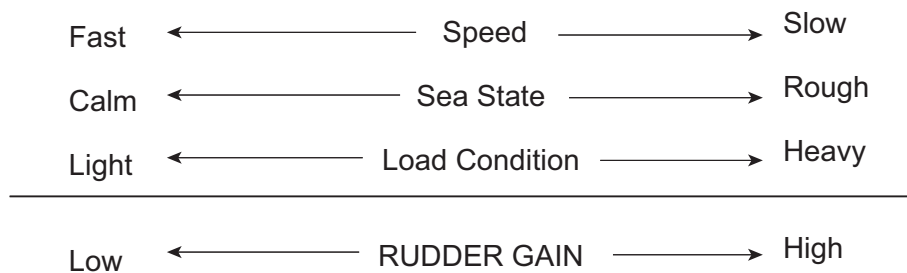
Rudder angle =  $4^\circ \times 2 = 8^\circ$

Rudder gain = 3°



Rudder angle =  $4^\circ \times 3 = 12^\circ$

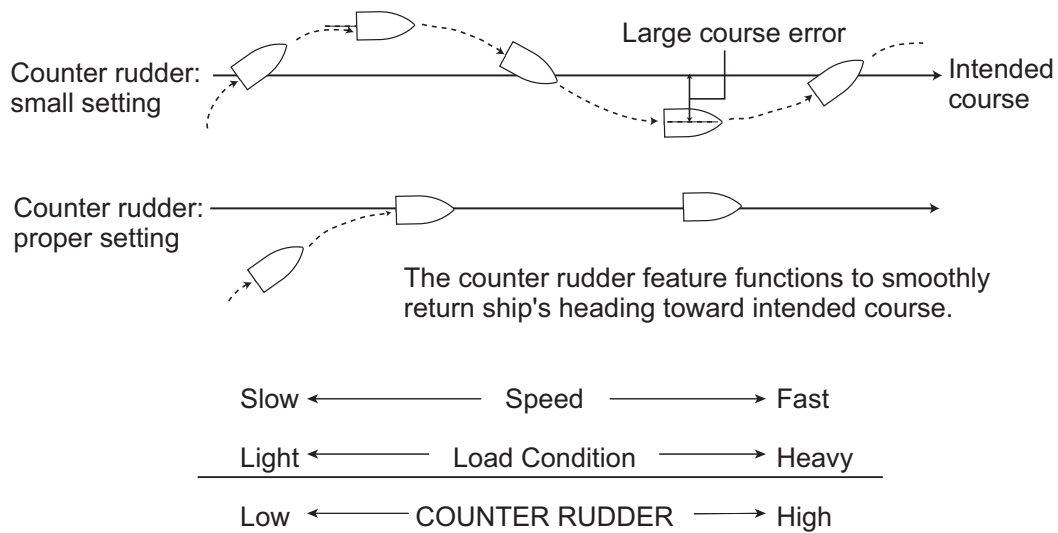
Set rudder gain so that the boat does not make frequent yaw. The figure shown below provides general guidelines for setting rudder gain.



**[COUNT RUDDER]:** If the boat is heavily loaded, the heading could change excessively because of inertia. This phenomenon causes the vessel to "overshoot" the intended course. If this happens, the NAVpilot will steer the rudder to the opposite side and the heading will turn in opposite direction excessively again. In an extreme case the heading oscillates several times until it finally settles in the new course. An adjustment known as "counter rudder" prevents this kind of oscillation.

Counter rudder is usually not required for small boats. When your boat zigzags a lot before settling in the new course, increase the counter rudder setting.

### 3. INITIAL SETTINGS



#### **Trim gain**

The NAVpilot continually monitors the boat's trim in order to keep the trim sensitivity optimum. A lower setting is common because boat's trim usually does not change quickly. A large number changes the trim compensation value more frequently. Too high of a setting may result in the following problems.

- Trim sensitivity is over-affected, resulting that a trim appears in both port and starboard directions alternately.
- Trim compensation mechanism responds to the yawing, resulting in more serious oscillation of ship's heading.

To automatically set the trim, do as follows:

1. Rotate the knob to select [TRIM GAIN] from the [PARAMETER SETUP] menu.



2. Push the knob to show the options for [TRIM GAIN].
3. Rotate the knob to select [AUTO] or [MANUAL] then push the knob. For [AUTO] go to step 4. For [MANUAL] do as follows:
  - 1) Rotate the knob to select the current value and push the knob.
  - 2) Rotate the knob to set a value (1 to 20, the default value is automatically calculated according to length of your boat, entered on the [SHIP'S CHARACTERISTICS] menu.
4. Push the knob to finish.

**Speed calculation**

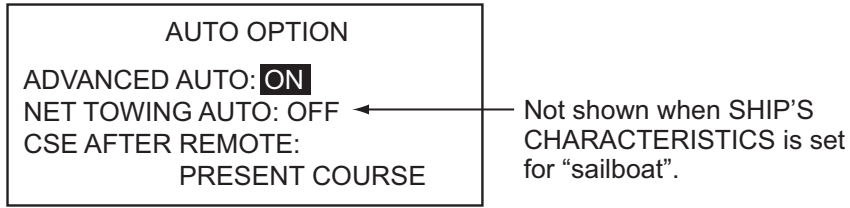
Speed is normally entered automatically, from your navigator. If the navigator fails, manually enter speed.

1. Rotate the knob to select [SPEED CALCULATION] from the [PARAMETER SETUP] menu.
2. Push the knob to the options for [SPEED CALCULATION].

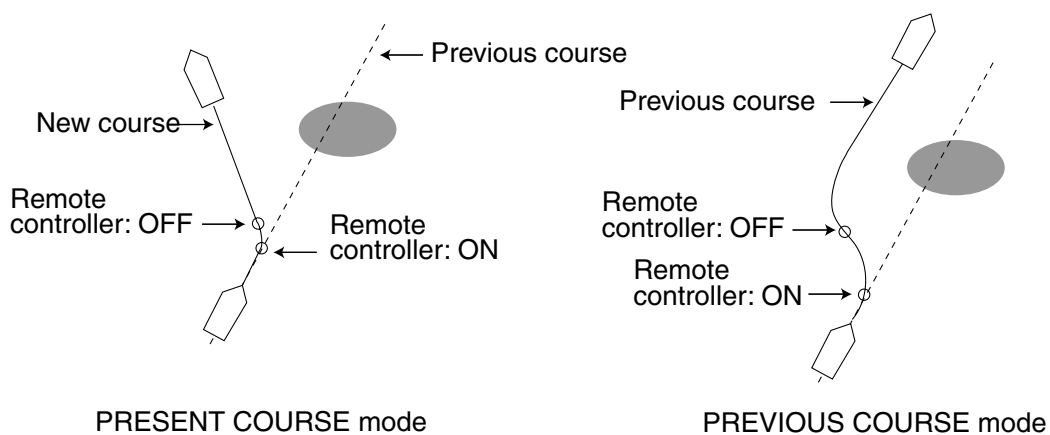


3. Rotate the knob to select [AUTO] or [MANUAL] then push the knob. For [AUTO] go to step 5. For [MANUAL], do as follows:
  - 1) Rotate the knob to select the current value and push the knob.
  - 2) Rotate the knob to set a value (0.1 - 99.0).
4. Push the knob to finish.

### 3.13 AUTO OPTION Menu



| Item               | Description  | Settings                            |
|--------------------|--|-------------------------------------|
| [ADVANCED AUTO]    | The AUTO mode will maintain a set course, but your vessel's course may be shifted by the effects of tide and wind. To compensate for the effects of tide and wind, set [ADVANCED AUTO] to [ON]. Your NAVpilot must be connected to a GPS navigator which outputs position data (Latitude and Longitude) in CAN bus or NMEA 0183 format.  | [OFF], [ON]                         |
| [NET TOWING AUTO]  | When a boat is towing fishing gear its stern is "dragged" by the net. This causes the boat to stray from its intended course. To keep the boat on course, you need to adjust the trim manually, which can be bothersome. If you do not want to be bothered with trim adjustments, you can enable the automatic towing function to have the trim automatically adjusted. This feature is useful for trawlers and purse seiners. Not available for "boat type" "sailboat". | [OFF], [ON]                         |
| [CSE AFTER REMOTE] | Select the course to follow after a remote controller is operated. See the figure below.   | [PREVIOUS COURSE], [PRESENT COURSE] |



After you have completed this menu, press the ► key to show the [NAV OPTION] menu. The [NAV OPTION] menu sets up the conditions for the NAV mode.

## 3.14 NAV OPTION Menu

|   |
|---|
| NAV OPTION<br>NAV MODE: <b>XTE (ECONOMY)</b><br>NAV DATA SOURCE<br>WAYPOINT SWITCHING: AUTO<br>AFTER ARRIVAL:<br>GO STRAIGHT<br>NAVNET2: ON |
|---|

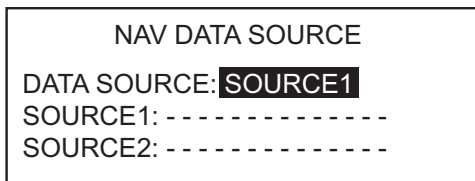
| Item                 | Description   | Settings   |
|----------------------|---|--|
| [NAV MODE]           | Your vessel may go off course when navigating between waypoints in the NAV mode. This can happen when, for example, a command is received from a remote controller. To get you back on course, three methods are available: [COURSE] and [XTE (PRECISION)], [XTE (ECONOMY)]. For [COURSE], the NAVpilot calculates a new course based on your new position after dodging, etc. that takes you directly to your destination waypoint. [XTE PRECISION] and [XTE ECONOMY] both use the XTE (cross-track error) value to steer the boat towards your ORIGINAL course before dodging. PRECISION provides for more precise steering than ECONOMY. | [COURSE], [XTE(PRECISION)], [XTE(ECONOMY)]   |
| [NAV DATA SOURCE]    | Select the source of nav data to use in the NAV mode. See the procedure on the next page.   |  |
| [WAYPOINT SWITCHING] | When you arrive at a waypoint on a route in the NAV mode, you can switch to the next waypoint automatically or manually. The [AUTO] setting will automatically switch to the next destination waypoint when your boat is within the arrival alarm area (set on the chartplotter). The [MANUAL] setting requires operator confirmation (pushing the knob) before switching to the next waypoint.   | [AUTO], [MANUAL],  |
| [AFTER ARRIVAL]      | Set how the boat is to be steered after arriving at the last waypoint in a route, in the NAV mode. This function is not available when boat type is selected as sailboat.   | [GO STRAIGHT],<br>[ORBIT TO PORT].<br>[ORBIT TO STBD].<br>[FIGURE EIGHT TO PORT],<br>[FIGURE EIGHT TO STBD],<br>[SQUARE PORT],<br>[SQUARE STBD], |
| [NAVNET2]            | The NAVpilot can automatically go to the NAV mode when it receives a P sentence (FURUNO proprietary) from a NavNet vx2 equipment. You can turn this feature on or off. This feature is invalid when you use the fish hunter mode.   | [OFF], [ON]  |

After setting the items of this menu, press the ► key to go to the [FISH HUNTER OPTION] menu (other than sailboats) or the [WIND OPTION] menu (sailboats).

### 3. INITIAL SETTINGS

#### **How to select the source for nav data**

1. At the [NAV OPTION] menu, rotate the knob to select [NAV DATA SOURCE] then push the knob.



2. Rotate the knob to select [DATA SOURCE] and push the knob.



3. Rotate the knob to select source then push the knob. If you have more than one source of nav data, you can select [BOTH]. In this case, the nav data fed by [SOURCE2] is used when that of [SOURCE1] is not available.

4. Rotate the knob to select [SOURCE1] then push the knob.



If you have some equipment which outputs nav data, the name appears in the window. In the example above, a NavNet3 equipment, with unique number of 000C2F, is connected.

5. Rotate the knob to select source then push the knob. If you have more than one device that outputs nav data, you can select it at [SOURCE2].

**Note:** If you have NavNet vx2 equipment connected and it is synchronized with the NAVpilot ([NAVNET2] turned on in the [AUTO OPTION] menu), [SOURCE2] is automatically selected.

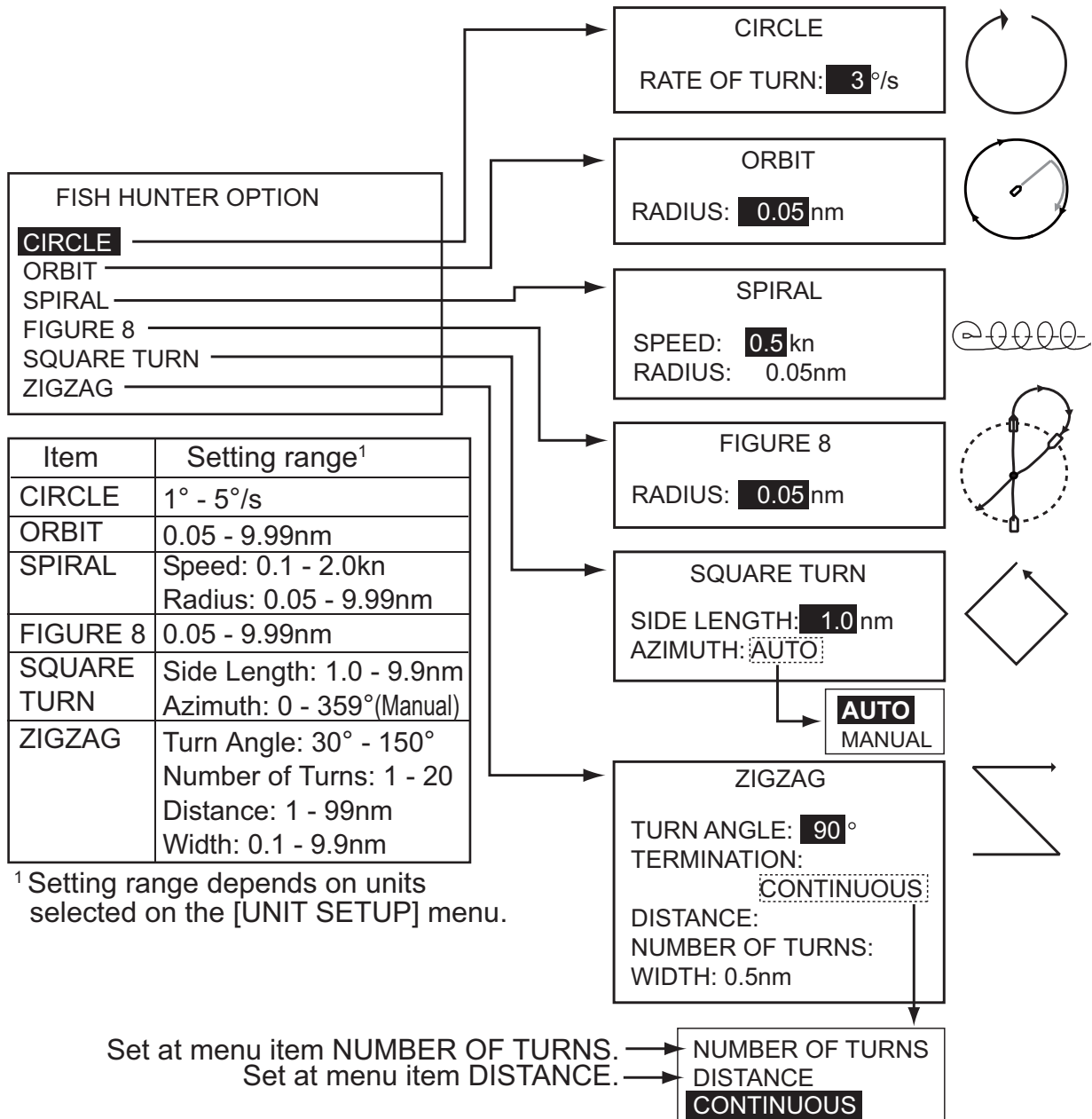


### 3.15 FISH HUNTER OPTION Menu or WIND OPTION Menu

Depending on the setting for [SHIP'S CHARACTERISTICS], the [FISH HUNTER OPTION] menu or the [WIND OPTION] menu follows the [NAV OPTION] menu.

#### 3.15.1 FISH HUNTER OPTION menu

The [FISH HUNTER OPTION] menu lets you preset the parameters for the various turns, which you access with the **TURN** key (NAVpilot-700) or **TURN/MENU** key (NAVpilot-711/720).



## 3.15.2 WIND OPTION menu

| WIND OPTION          |            |
|----------------------|------------|
| MODE TYPE:           | <b>AWA</b> |
| WIND TACK RUD ANGLE: | 35°        |
| WIND DAMPING:        | ON 5.0SEC  |
| FIXED TACK ANGLE:    | 100°       |
| RATE OF SLOW TACK:   | 3°/s       |
| RATE OF FAST TACK:   | 20°/s      |
| TACK TIMER:          | OFF        |

| Item                  | Description   | Settings                     |
|-----------------------|---|------------------------------|
| [MODE TYPE]           | There are three wind angle modes: AWA (Apparent Wind Angle), TWA (True Wind Angle), and AUTO.<br><b>AWA:</b> The direction (in relation to ship's bow) of the wind as it appears on board your boat, detected by the wind sensor. AWA mode requires wind angle and speed data. Use this mode when wind is stable.<br><b>TWA:</b> The actual wind direction, which is a combination of the apparent wind and your boat's movement. This mode requires apparent wind angle, apparent wind speed, your boat's speed and heading. Use this mode when there is an unstable downwind. | [AWA], [TWA]                 |
| [WIND TACK RUD ANGLE] | The tacking in the WIND mode requires the setting of maximum rudder angle. This angle is calculated automatically when the NAVpilot is installed. If you need to change the value, do it here.  | 10° - 45°                    |
| [WIND DAMPING]        | You can set the damping interval for wind data to compensate for random fluctuation in wind data. The higher the setting the more "smooth" the data. However a high damping interval causes delay in receiving wind data, the amount of delay equivalent to the damping interval. Turn off wind damping if the wind data is received stably. This option is effective for port and starboard wind angles of 55° or higher and [MODE TYPE] is selected to [AWA].   | [OFF], [ON]<br>(0.7 - 99.9)  |
| [FIXED TACK ANGLE]    | The fixed tacking mode requires the setting of tacking angle.   | 15° - 179°                   |
| [RATE OF SLOW TACK]   | Set the rate of slow tack.  | 1° - 10°s                    |
| [RATE OF FAST TACK]   | Set the rate of fast tack.  | 10° - 30°s                   |
| [TACK TIMER]          | Set the amount of time to wait before starting a turn, after pushing the knob.  | [OFF], [ON]<br>(1 - 99(sec)) |

After setting all options on the [FISH HUNTER OPTION] menu (or [WIND OPTION] menu), press the ► key to go to the [SYSTEM SETUP] menu. The [SYSTEM SETUP] menu sets system settings such as key beep, panel dimmer, etc.

## 3.16 SYSTEM SETUP Menu

Page 1

| SYSTEM SETUP              |
|---------------------------|
| KEY BEEP: <b>OFF</b>      |
| BUZZER VOL: LARGE         |
| ARROW KEY: DODGE          |
| KEY LOCK: UNLOCK          |
| TURN ANGLE: 15            |
| PANEL DIMMER: 8           |
| PASSWORD: 0000            |
| PASSWORD FUNCTION: OFF    |
| RECEIVE SCREEN: OFF       |
| SAVE USER SETTING: NO     |
| LOAD USER SETTING: NO     |
| SAVE DISPLAY SETTINGS: NO |
| LOAD DISPLAY SETTINGS: NO |

Page 2

| SYSTEM SETUP              |
|---------------------------|
| SAVE ENGINEER SETTING: NO |
| LOAD ENGINEER SETTING: NO |
| ALARM LOG                 |
| SIM/DEMO: OFF             |
| DIAGNOSTIC: OFF           |
| DISPLAY DATA SELECT MENU  |
| SYSTEM DATA               |

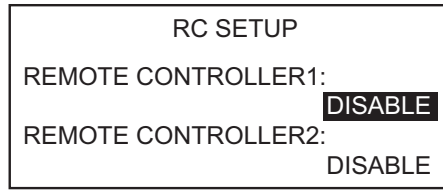
**SAVE ENGINEER SETTING:** Save the settings in the menus with the following exceptions:

- DISPLAY SETUP (except DATA BOX FORMAT, TEMP GRAPH)
- DOCKSIDE SETUP (except SELECT RRU TYPE, RRU SENSOR ALIGNMENT, AIR BLEEDING, RUDDER LIMIT SETUP, RUDDER TEST, HELM SENSOR TEST)
- CAN BUS SETUP (except INCOMING CAN BUS DATA, REFRESH)
- NMEA 0183 SETUP PORT1, PORT2 (except REFRESH)
- SENSOR SELECTION (except AUTO DETECT)
- SEA TRIAL (except COMPASS, USER CALIBRATION, COMPASS CLEAR, COMPASS INFORMATION, SET CENTER RUDDR POS)
- SYSTEM SETUP (KEY BEEP, BUZZER VOL, KEY LOCK, PANEL DIMMER, RECEIVE SCREEN, ALL CLEAR, SAVE/LOAD USER SETTINGS, SAVE/LOAD ENGINEER SETTING, DIAGNOSTIC, DISPLAY DATA SELECT MENU, SYSTEM DATA)
- ALARM MENU (CLEAR TRIP LOG)

**LOAD ENGINEER SETTING:** Load the settings saved with SAVE ENGINEER SETTING:

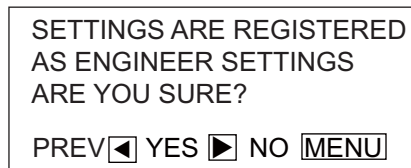
For other items, section 4.6 "SYSTEM SETUP menu" in the Operator's Manual.

## 3.17 RC (Remote Controller) SETUP Menu



Set the type of remote controller you have as follows

1. The setting for [REMOTE CONTROLLER 1] is selected; push the knob.
2. Rotate the knob to select the type of remote controller connected.  
**[NFU]**: Select for button- or lever-type remote controller.  
**[FU]**: Select for dial-type remote controller.  
**[DODGE]**: Select for dodge-type remote controller.  
**[DISABLE]**: Disable remote controller operation.
3. Set the type for remote controller 2, if connected.
4. Press the ► key to show the [ALARM SETUP] menu. For how to set this menu, see Chapter 3 in the Operator's Manual.
5. After reviewing the [ALARM SETUP menu], press the ► key to show the following message.



6. Press the ► key to save all settings. To recheck your settings, press the ◀ key. This concludes the initial settings.

## 3.18 All Clear

The all clear feature restores all default settings. Open the [INSTALLATION] and [SYSTEM SETUP] menus. Select [ALL CLEAR] and [YES] to restore all default settings.

# JIS CABLE GUIDE

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

JIS cable names may have up to 6 alphabetical characters, followed by a dash and a numerical value (example: DPYC-2.5). For core types D and T, the numerical designation indicates the *cross-sectional Area (mm<sup>2</sup>)* of the core wire(s) in the cable. For core types M and TT, the numerical designation indicates the *number of core wires* in the cable.

## 1. Core Type

D Double core power line

T Triple core power line

M 1mm Multi core

TT 0.75mm twisted pair communications (1Q = quad cable)

## 2. Insulation Type

P Ethylene Propylene

## 3. Sheath Type

Y Vinyl

## 4. Armor Type

C Steel

## 5. Shielding Type

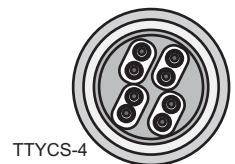
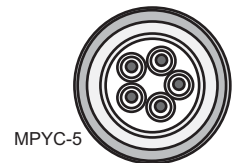
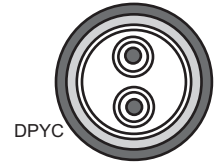
Y Corrosive resistant

## 6. Core Sheath

S All cores in one sheath

-S Individually sheathed cores

EX: <sup>1 2 3 4 5 6</sup> DPYCY S - 1.5      <sup>1 2 3 4</sup> MPYC - 5  
 Designation type      Core Area (mm<sup>2</sup>)      Designation type      # of cores



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

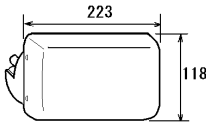
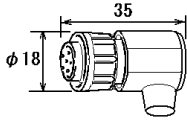
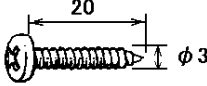
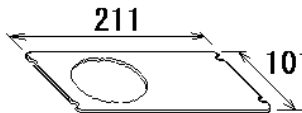
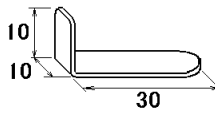
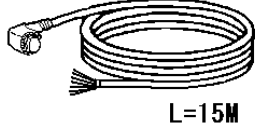
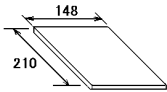
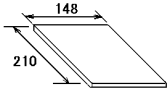
| Type       | Core                |          | Cable Diameter | Type       | Core               |          | Cable Diameter |
|------------|---------------------|----------|----------------|------------|--------------------|----------|----------------|
|            | Area                | Diameter |                |            | Area               | Diameter |                |
| DPYC-1.5   | 1.5mm <sup>2</sup>  | 1.56mm   | 11.7mm         | TPYCY-1.5  | 1.5mm <sup>2</sup> | 1.56mm   | 14.5mm         |
| DPYC-2.5   | 2.5mm <sup>2</sup>  | 2.01mm   | 12.8mm         | TPYCY-2.5  | 2.5mm <sup>2</sup> | 2.01mm   | 15.5mm         |
| DPYCY-2.5  | 2.5mm <sup>2</sup>  | 2.01mm   | 14.8mm         | TPYCY-4    | 4mm <sup>2</sup>   | 2.55mm   | 16.9mm         |
| DPYCYS-1.5 | 1.5mm <sup>2</sup>  | 1.56mm   | 14.6mm         | TPYCYS-1.5 | 1.5mm <sup>2</sup> | 1.56mm   | 15.2mm         |
| DPYCYS-2.5 | 2.5mm <sup>2</sup>  | 2.01mm   | 15.5mm         | DPY-1.5    | 1.5mm <sup>2</sup> | 1.56mm   | 10.4mm         |
| MPYC-2     | 1mm <sup>2</sup>    | 1.29mm   | 10.0mm         | DPY-2.5    | 2.5mm <sup>2</sup> | 2.01mm   | 11.5mm         |
| MPYC-4     | 1mm <sup>2</sup>    | 1.29mm   | 11.2mm         | TPY-2.5    | 2.5mm <sup>2</sup> | 2.01mm   | 12.2mm         |
| MPYC-7     | 1mm <sup>2</sup>    | 1.29mm   | 13.2mm         |            |                    |          |                |
| MPYCY-12   | 1mm <sup>2</sup>    | 1.29mm   | 19.0mm         |            |                    |          |                |
| MPYCY-19   | 1mm <sup>2</sup>    | 1.29mm   | 22.0mm         |            |                    |          |                |
| TTYCS-1    | 0.75mm <sup>2</sup> | 1.11mm   | 10.1mm         |            |                    |          |                |
| TTYCS-1Q   | 0.75mm <sup>2</sup> | 1.11mm   | 11.3mm         |            |                    |          |                |
| TTYCS-4    | 0.75mm <sup>2</sup> | 1.11mm   | 16.3mm         |            |                    |          |                |
| TTYCYS-1   | 0.75mm <sup>2</sup> | 1.11mm   | 21.1mm         |            |                    |          |                |

# PACKING LIST

64BB-X-9854 -0 1/1

FAP-7001

A-1

| NAME                                     | OUTLINE   | DESCRIPTION/CODE No.               | Q'TY |
|--|---|------------------------------------|------|
| <b>ユニット UNIT</b>                         |   |                                    |      |
| 操作部2D<br>CONTROL UNIT 2D                 |    | FAP-7001<br>000-016-411-00         | 1    |
| <b>付属品 ACCESSORIES</b>                   |   | <b>FP64-01401</b>                  |      |
| ターミナルコネクタ<br>TERMINATOR                  |    | BD-07AFFM-LR7001<br>001-081-140-10 | 1    |
| <b>工事材料 INSTALLATION MATERIALS</b>       |   | <b>CP64-02900</b>                  |      |
| ナハタツピンネジ 1シュ<br>SELF-TAPPING SCREW       |    | 3X20 SUS304<br>000-163-884-10      | 4    |
| Sマウントスポンジ 2D<br>FLUSH MOUNTING SPONGE 2D |    | 64-028-1013-0<br>100-352-540-10    | 1    |
| パネルリムーバー<br>PANEL REMOVER                |   | 19-028-3124-1<br>100-340-471-10    | 1    |
| ケーブル組品<br>CABLE ASSEMBLY                 |  | BD-07AFFM-LR-150<br>001-081-180-10 | 1    |
| <b>図書 DOCUMENT</b>                       |   |                                    |      |
| 取扱説明書(英)<br>OPERATOR'S MANUAL (EN)       |  | OME-72720-*<br>000-171-812-1*      | 1    |
| 操作要領書(多言)<br>OPERATOR'S GUIDE (MLG)      |  | MLG-72720-*<br>000-172-121-1*      | 1    |

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

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

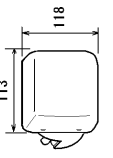
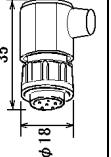
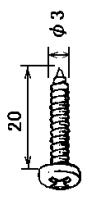
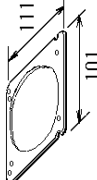
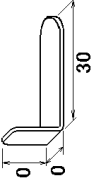


(略図の寸法は、参考値です。DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

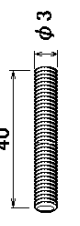
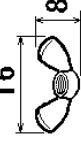
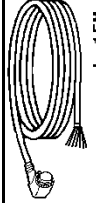
64BB-X-9854

# PACKING LIST FAP-7011

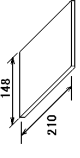
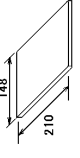
64BB-X-9855-0

1/1

| NAME                               | OUTLINE   | DESCRIPTION/CODE No.               | Q'TY |
|------------------------------------|---|------------------------------------|------|
| <b>ユニット UNIT</b>                   |   |                                    |      |
| 操作部 1D<br>CONTROL UNIT 1D          |    | FAP-7011<br>000-016-412-00         | 1    |
| <b>付属品 ACCESSORIES</b>             |   |                                    |      |
| ターミナルコネクタ<br>TERMINATOR            |    | BD-07AFFM-LR7001<br>001-081-140-10 | 1    |
| <b>工事材料 INSTALLATION MATERIALS</b> |   |                                    |      |
| ナハクワビソネジ 1シユ<br>SELF-TAPPING SCREW |    | 3X20 SUS304<br>000-163-884-10      | 4    |
| Sマウントボソジ<br>SPONGE                 |    | 26-001-1012-0<br>100-352-270-10    | 1    |
| パネリムハ<br>PANEL REMOVER             |    | 19-028-3124-1<br>100-340-471-10    | 1    |
| バネ座金<br>SPRING WASHER              |   | M3 SUS304<br>000-167-404-10        | 2    |
| ミカキ丸平座金<br>FLAT WASHER             |  | M3 SUS304<br>000-167-453-10        | 2    |

| NAME                     | OUTLINE   | DESCRIPTION/CODE No.               | Q'TY |
|--------------------------|---|------------------------------------|------|
| 寸切ボルト<br>BOLT            |  | M3X40 SUS304<br>000-167-804-10     | 2    |
| 蝶ナット<br>WING NUT         |  | M3 SUS304<br>000-167-826-10        | 2    |
| ケーブル組品<br>CABLE ASSEMBLY |  | BD-07AFFM-LR-150<br>001-081-180-10 | 1    |

## 図書 DOCUMENT

|                                     |   |                               |   |
|-------------------------------------|---|-------------------------------|---|
| 取扱説明書(英)<br>OPERATOR'S MANUAL (EN)  |  | OME-72720-*<br>000-171-812-1* | 1 |
| 操作要領書(多言)<br>OPERATOR'S GUIDE (MLG) |  | MLG-72720-*<br>000-172-121-1* | 1 |

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

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

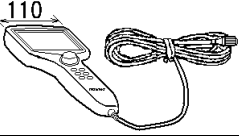
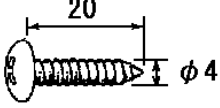
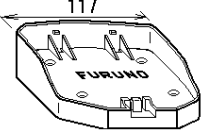
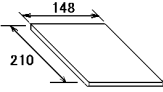
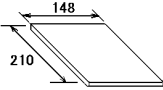
TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT. QUALITY IS THE SAME.

# PACKING LIST

64BB-X-9856 -1 1/1

FAP-7021

A-3

| NAME                                  | OUTLINE  | DESCRIPTION/CODE No.            | Q'TY |
|---------------------------------------|--|---------------------------------|------|
| <b>ユニット UNIT</b>                      |  |                                 |      |
| 操作部HANDY<br>CONTROL UNIT HANDY        |   | FAP-7021<br>000-016-413-00      | 1    |
| <b>付属品 ACCESSORIES FP64-01411</b>     |  |                                 |      |
| +トラスタップインネジ 1シユ<br>SELF-TAPPING SCREW |   | 4X20 SUS304<br>000-158-850-10   | 4    |
| クレートル(N2.5)<br>CRADLE (N2.5)          |   | 64-028-4004-1<br>100-356-481-10 | 1    |
| <b>図書 DOCUMENT</b>                    |  |                                 |      |
| 取扱説明書(英)<br>OPERATOR'S MANUAL (EN)    |   | OME-72720-*<br>000-171-812-1*   | 1    |
| 操作要領書(多言)<br>OPERATOR'S GUIDE (MLG)   |  | MLG-72720-*<br>000-172-121-1*   | 1    |

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

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

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

64BB-X-9856

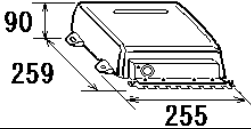
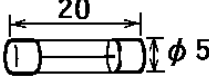
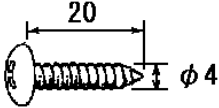
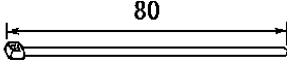
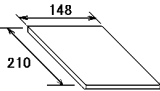


# PACKING LIST

64BB-X-9857 -1 1/1

FAP-7002/-11/-20

A-4

| NAME  | OUTLINE  | DESCRIPTION/CODE No. | Q'TY |
|---|--|----------------------|------|
| <b>ユニット UNIT</b>                              |  |                      |      |
| 制御部<br>PROCESSOR UNIT                         |   | FAP-7002/-11/-20     | 1    |
|   |  | 000-016-419-00 **    |      |
| <b>予備品 SPARE PARTS SP64-01501</b>             |  |                      |      |
| ヒューズ<br>GLASS TUBE FUSE                       |   | FGMB 125V 4A PBF     | 4    |
|   |  | 000-157-482-10       |      |
| <b>工事材料 INSTALLATION MATERIALS CP64-03101</b> |  |                      |      |
| +トラスタップソネジ 1シュ<br>SELF-TAPPING SCREW          |   | 4X20 SUS304          | 4    |
|   |  | 000-158-850-10       |      |
| コンパックス<br>CABLE TIE                           |   | CV-80N               | 20   |
|   |  | 000-162-192-10       |      |
| <b>図書 DOCUMENT</b>                            |  |                      |      |
| 装備要領書(英)<br>INSTALLATION MANUAL               |  | IME-72720-*          | 1    |
|   |  | 000-171-813-1*       |      |

コード番号末尾の[\*\*]は、選択品の代表コードを表します。

CODE NUMBER ENDING WITH "\*\*" INDICATES THE CODE NUMBER OF REPRESENTATIVE MATERIAL.

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

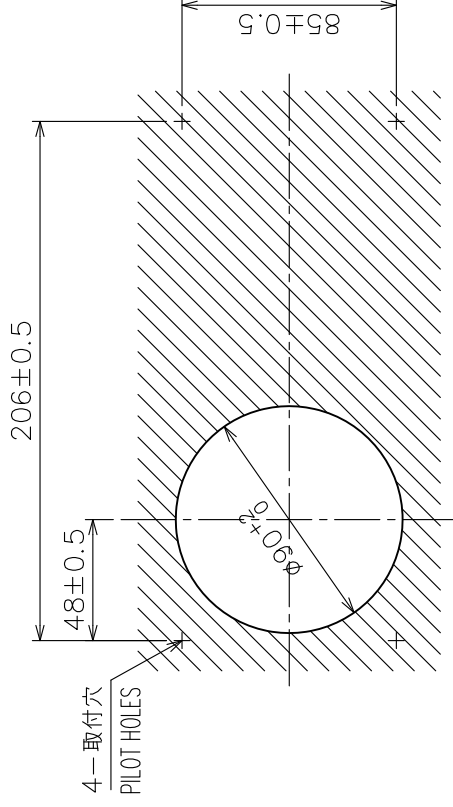
TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT. QUALITY IS THE SAME.

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

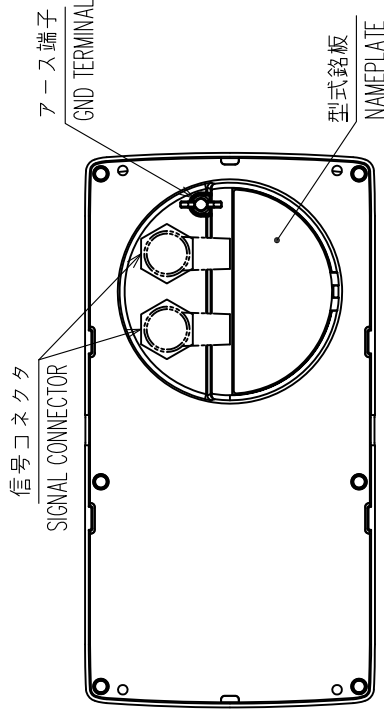
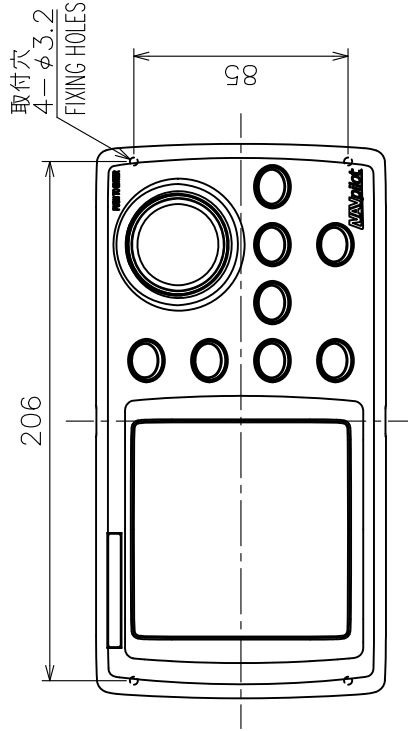
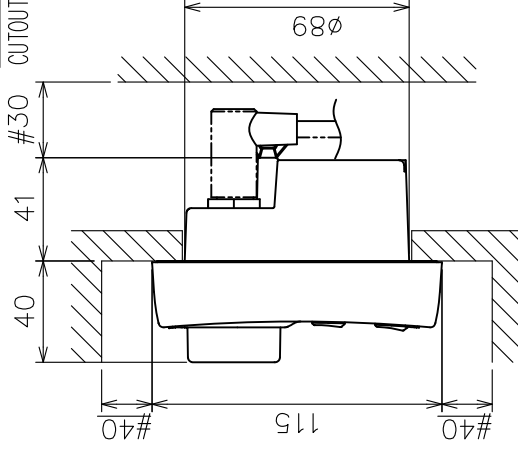
64BB-X-9857

表1 TABLE 1

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



取付穴寸法図  
CUTOOUT DIMENSIONS



注 記

- 1) 指定外の寸法公差は表1による。
- 2) #印寸法は最小サービスマウントとする。
- 3) 取付用ネジはナベタツピコンネジ呼び径3×20を使用のこと。

NOTE

1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. #: MINIMUM SERVICE CLEARANCE.
3. USE TAPPING SCREWS φ3x20 FOR FIXING THE UNIT.

|          |             |                                 |               |                              |
|----------|-------------|---------------------------------|---------------|------------------------------|
| DRAWN    | 9/Nov/09    | I.YAMASAKI                      | TITLE         | FAP-7001                     |
| CHECKED  | 9/Nov/09    | I.TAKENO                        | 名称            | 操作部 (サーフェスマウント)              |
| APPROVED | 24/Nov/09   | R. Esumi                        | 外寸図           |                              |
| SCALE    | 1/100       | 質量はケーブルを含まず。<br>MASS W/O CABLE. | NAME          | CONTROL UNIT (SURFACE MOUNT) |
| DWG.No.  | C7272-G01-A | REF.No.                         | 64-028-100G-3 | OUTLINE DRAWING              |

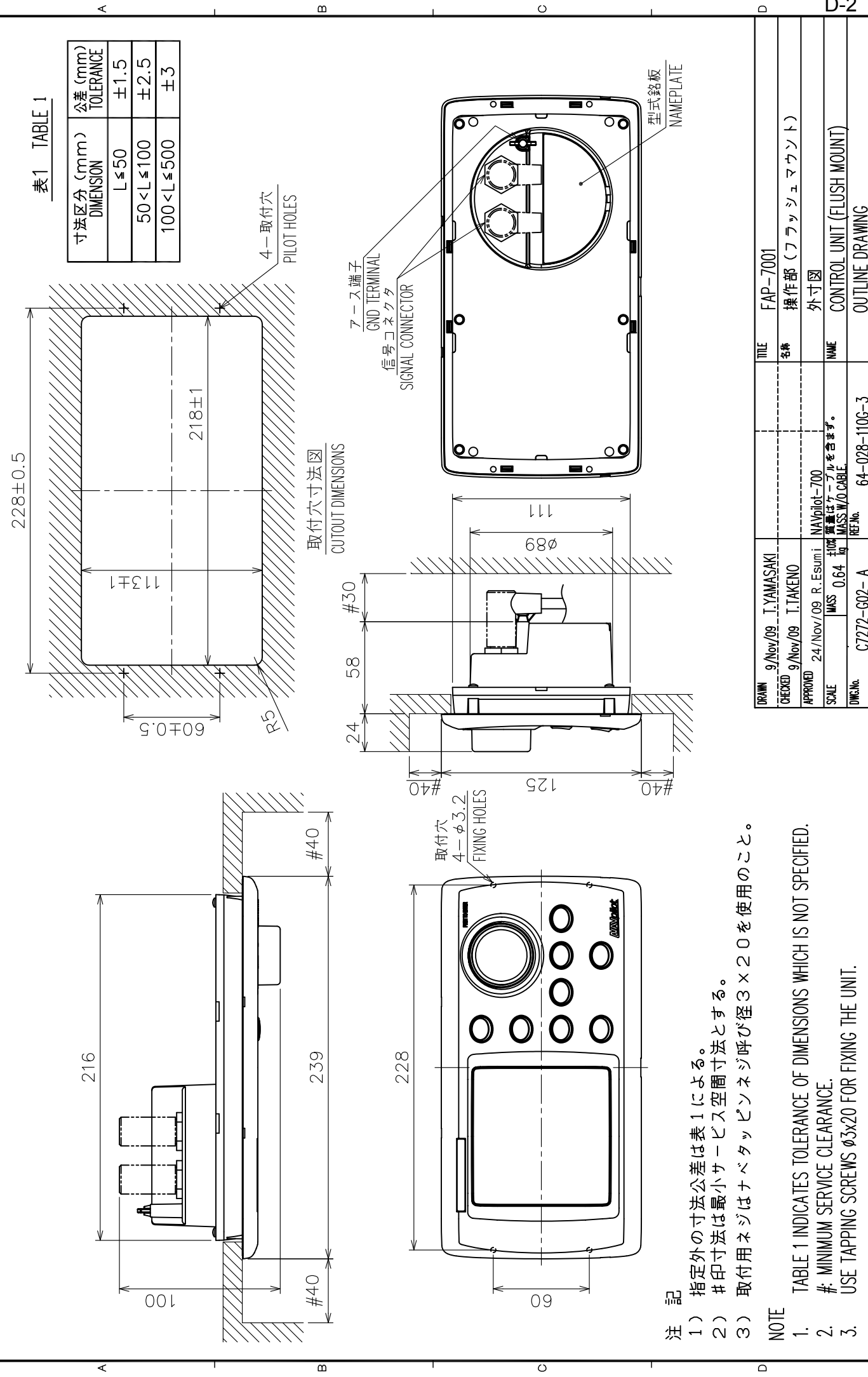


表1 TABLE 1

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

取付穴寸法図  
CUTOUT DIMENSIONS

注記

- 1) 指定外の寸法公差は表1による。
- 2) #印寸法は最小サービスマウントとする。
- 3) 取付用ネジはナベタツピンネジ呼び径3×20を使用のこと。

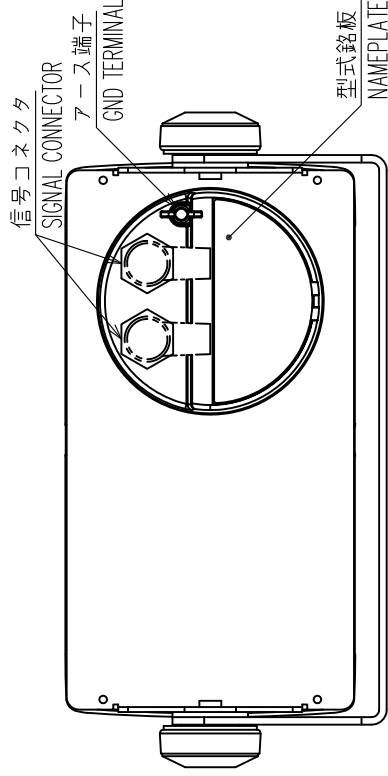
NOTE

1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. # MINIMUM SERVICE CLEARANCE.
3. USE TAPPING SCREWS φ3x20 FOR FIXING THE UNIT.

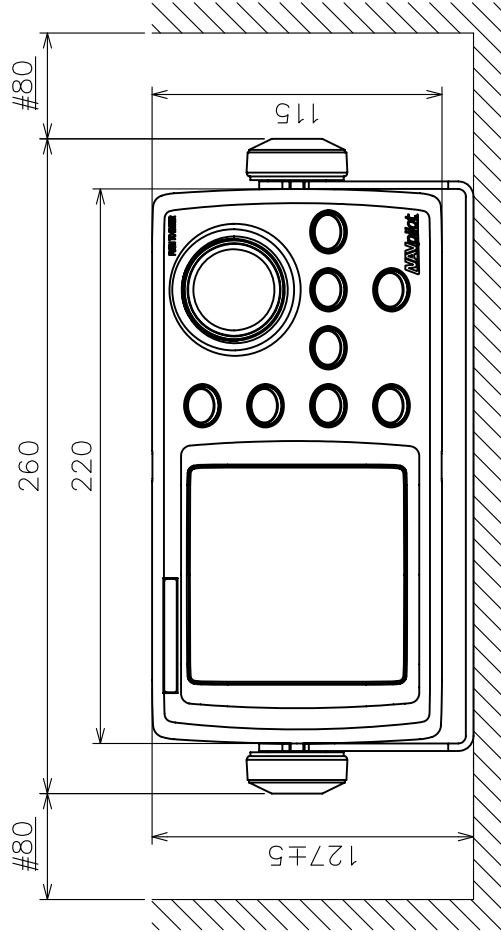
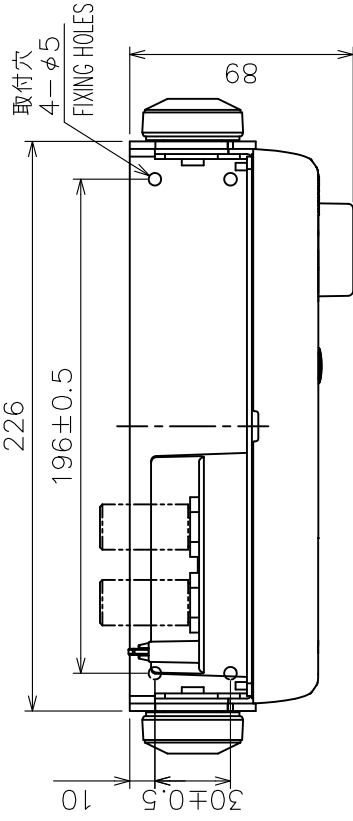
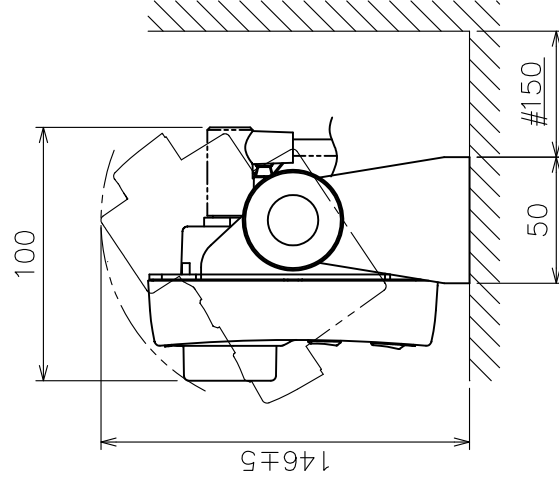
|          |             |                                 |               |                            |
|----------|-------------|---------------------------------|---------------|----------------------------|
| DRAWN    | 9/Nov/09    | I.YAMASAKI                      | TITLE         | FAP-7001                   |
| CHECKED  | 9/Nov/09    | I.TAKENO                        | 名称            | 操作部 (フラッシュマウント)            |
| APPROVED | 24/Nov/09   | R. Esumi                        | 外寸図           |                            |
| SCALE    | 1/100       | 質量はケーブルを含まず。<br>MASS W/O CABLE. | NAME          | CONTROL UNIT (FLUSH MOUNT) |
| DWG.No.  | C7272-G02-A | REF.No.                         | 64-028-110G-3 | OUTLINE DRAWING            |

表1 TABLE 1

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



背面  
REAR VIEW



注 記

- 1) 指定外の寸法公差は表1による。
- 2) #印寸法は最小サービス空間寸法とする。
- 3) 取付用ネジはトラスタツピンネジ呼び径4×16を使用のこと。

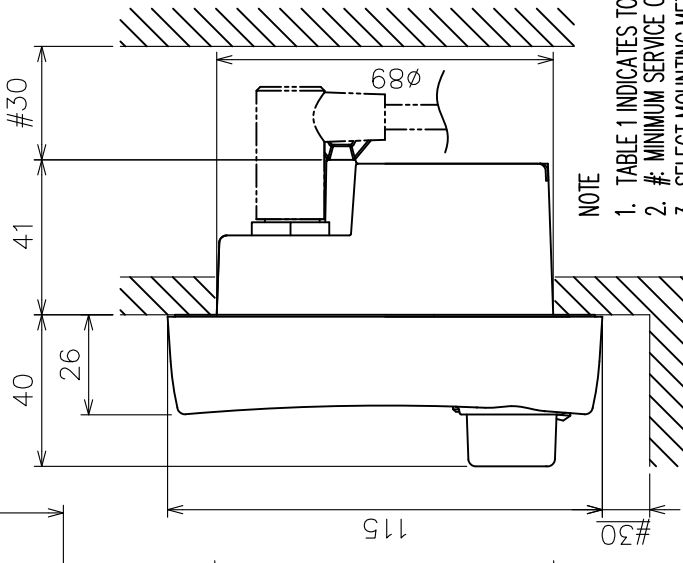
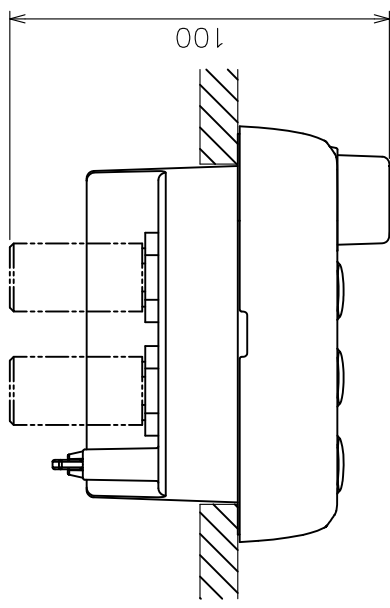
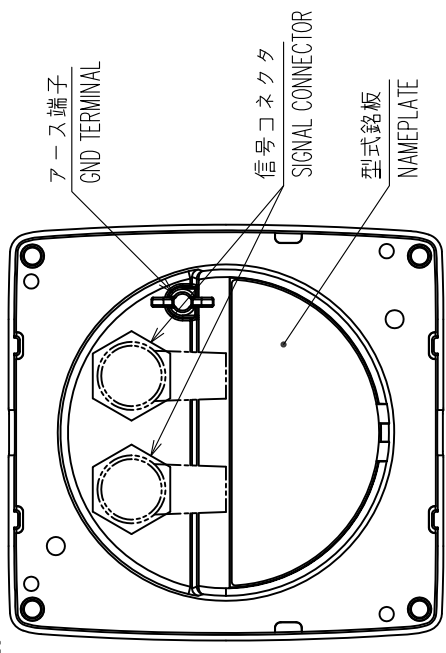
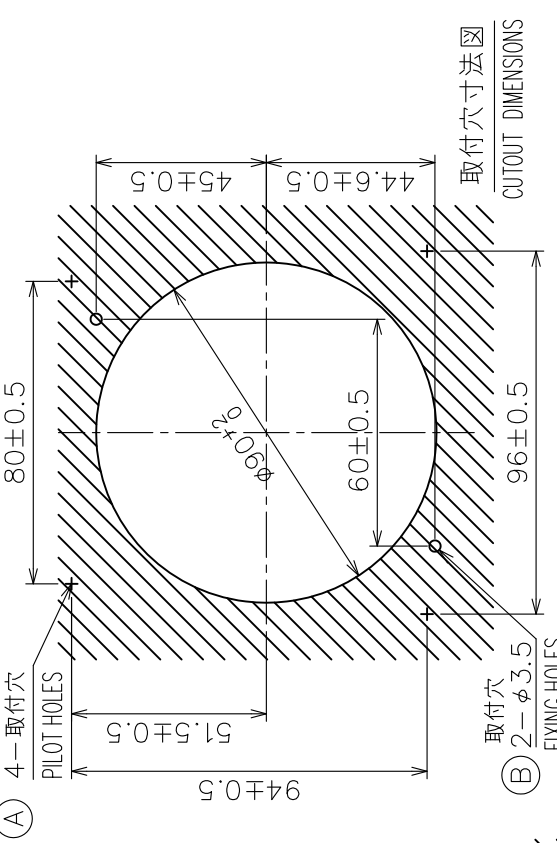
NOTE

1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. #: MINIMUM SERVICE CLEARANCE.
3. USE TAPPING SCREWS φ4x16 FOR FIXING THE UNIT.

| DRAWN    | 9/Nov/09    | T.YAMASAKI         | TITLE         | FAP-7001                      |
|----------|-------------|--------------------|---------------|-------------------------------|
| CHECKED  | 9/Nov/09    | T.TAKENO           | 名称            | 操作部 (卓上装備)                    |
| APPROVED | 24/Nov/09   | R. Esumi           | 外寸図           |                               |
| SCALE    | 1/100       | 質量はケーブルを含まず。<br>kg | NAME          | CONTROL UNIT (TABLETOP MOUNT) |
| DWG.No.  | C7272-G03-A | REF.No.            | 64-028-120G-3 | OUTLINE DRAWING               |

表1 TABLE 1

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



NOTE

- TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
- # MINIMUM SERVICE CLEARANCE.
- SELECT MOUNTING METHOD;

- (A) : USE TAPPING SCREWS  $\phi 3 \times 20$ .
- (B) : USE M3x50 STUD AND M3 P.W./S.W./WING NUT.

注記

- 指定外の寸法公差は表1による。
- #印寸法は最小サービスクリアランスとする。
- 取付方法は次の2種類から選択
  - (A) : ナベタッピンネジ呼び径3×20を使用のこと。
  - (B) : M3×50寸切ボルト、M3平座金・バネ座金・蝶ナットを使用のこと。

|          |             |                              |               |                              |
|----------|-------------|------------------------------|---------------|------------------------------|
| DRAWN    | 9/Nov/09    | I.YAMASAKI                   | TITLE         | FAP-7011                     |
| CHECKED  | 9/Nov/09    | I.TAKENO                     | 名称            | 操作部 (サーフェスマウント)              |
| APPROVED | 24/Nov/09   | R. Esumi                     | 外寸図           |                              |
| SCALE    | 1/100       | 質量はケーブルを含まず。<br>MASS 0.34 kg | NAME          | CONTROL UNIT (SURFACE MOUNT) |
| DWG.No.  | C7273-G01-A | REF.No.                      | 64-028-300G-2 | OUTLINE DRAWING              |

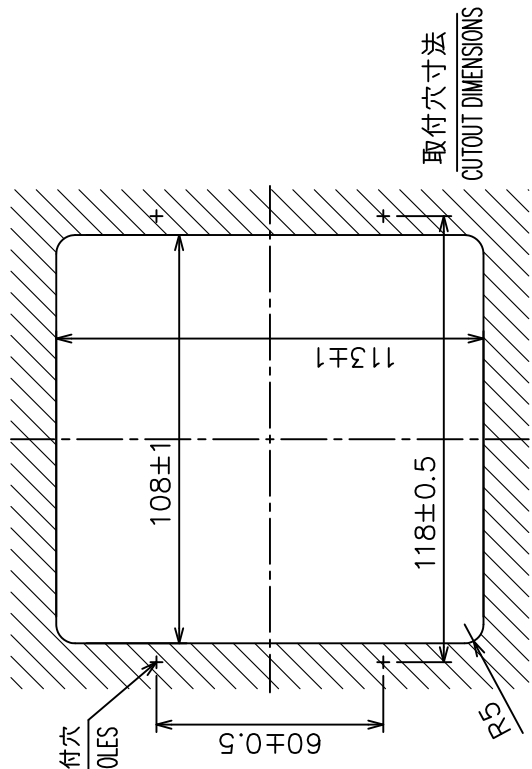
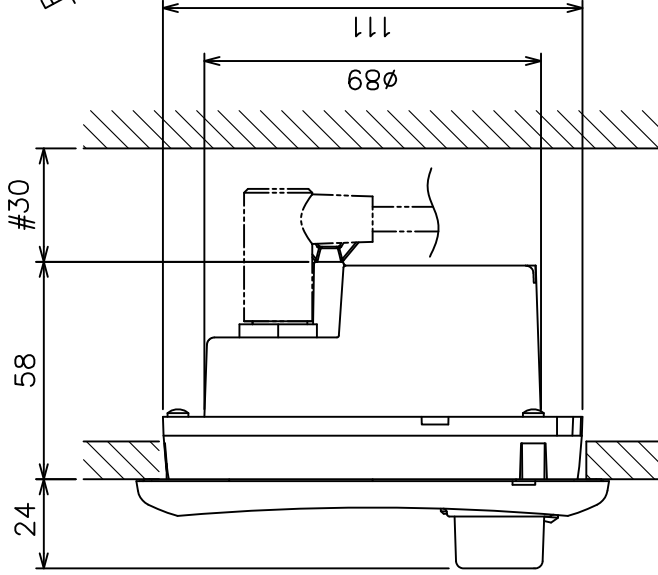
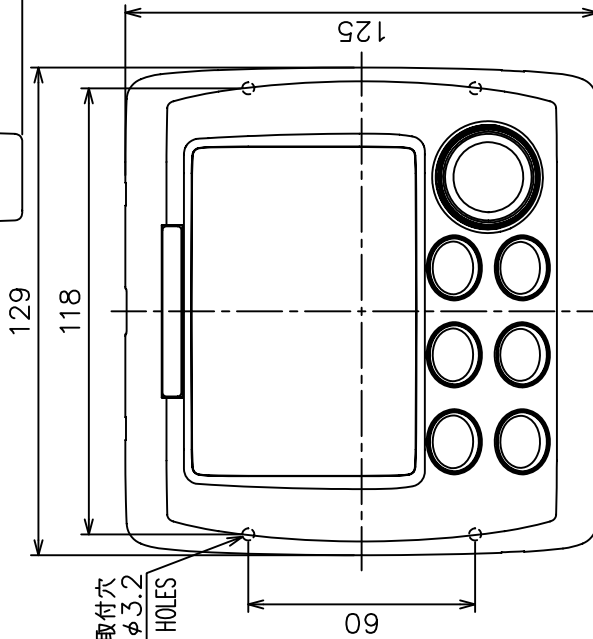
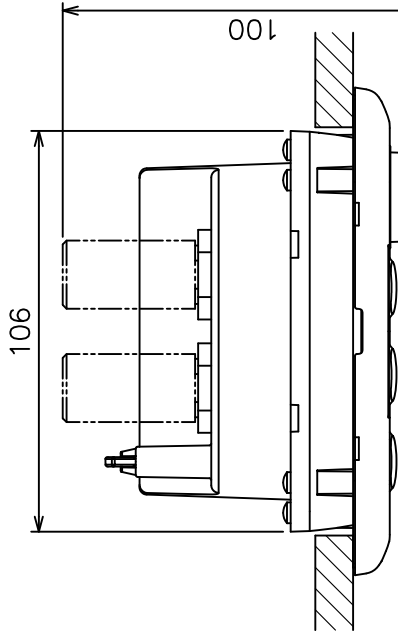
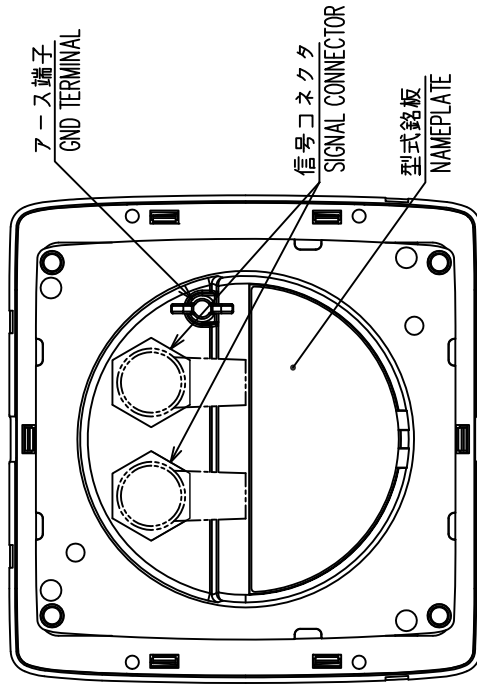


表1 TABLE 1

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



取付穴  
4-φ3.2  
FIXING HOLES



- 注記 1) 指定外の寸法公差は表1による。  
 2) #印寸法は最小サービス空間寸法とする。  
 3) 取付用ネジはナベタップピンネジ呼び径3×2.0を使用のこと。
- NOTE 1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.  
 2. # MINIMUM SERVICE CLEARANCE.  
 3. USE TAPPING SCREWS φ3x2.0 FOR FIXING THE UNIT.

|          |                                    |            |               |                            |
|----------|------------------------------------|------------|---------------|----------------------------|
| DRAWN    | 9/Nov/09                           | I.YAMASAKI | TITLE         | FAP-7011                   |
| CHECKED  | 9/Nov/09                           | I.TAKENO   | 名称            | 操作部 (7フラッシュマウント)           |
| APPROVED | 24/Nov/09                          | R. Esumi   | 外寸図           |                            |
| SCALE    | 1:100 質量はケーブルを含まず。<br>MASS 0.35 kg |            | NAME          | CONTROL UNIT (FLUSH MOUNT) |
| DWG.No.  | C7273-G02-A                        | REF.No.    | 64-028-310G-2 | OUTLINE DRAWING            |

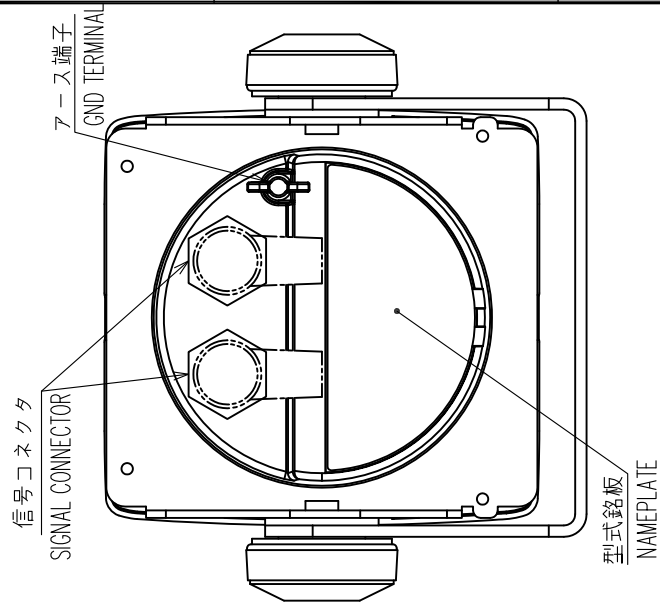
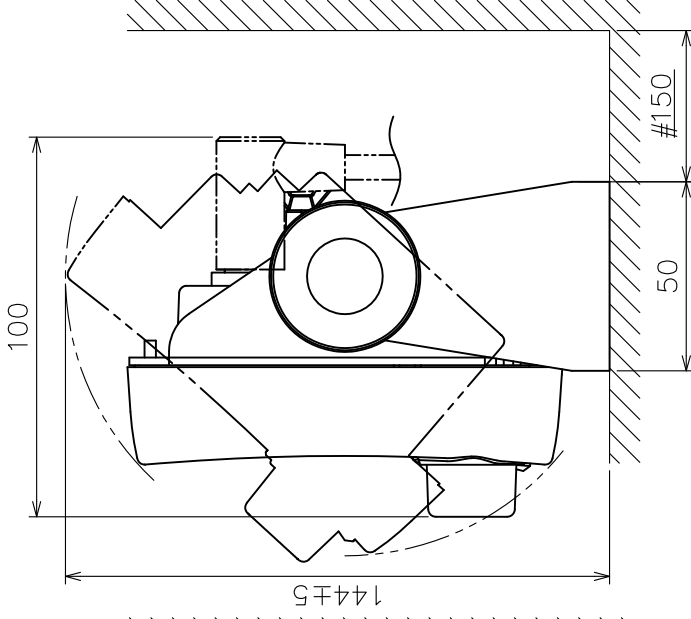
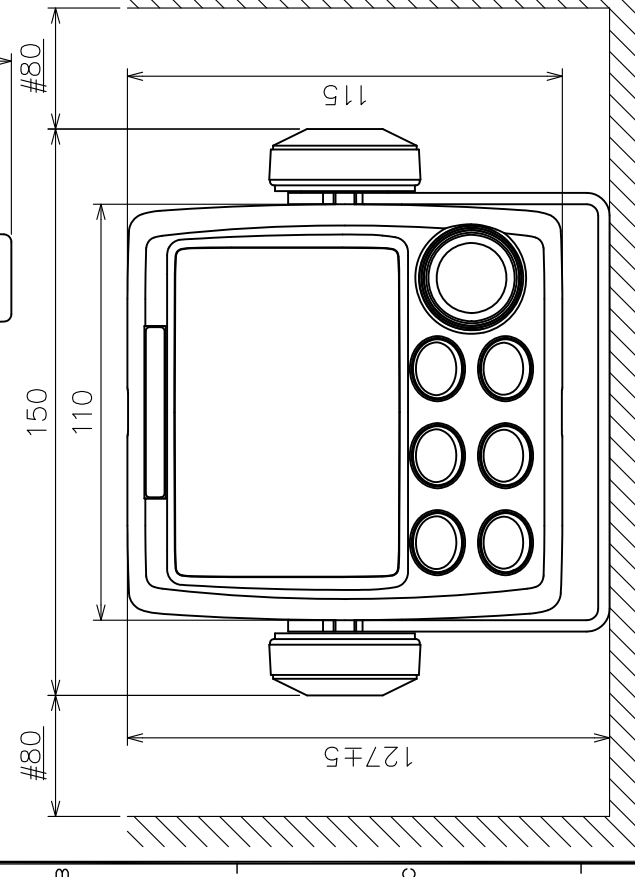
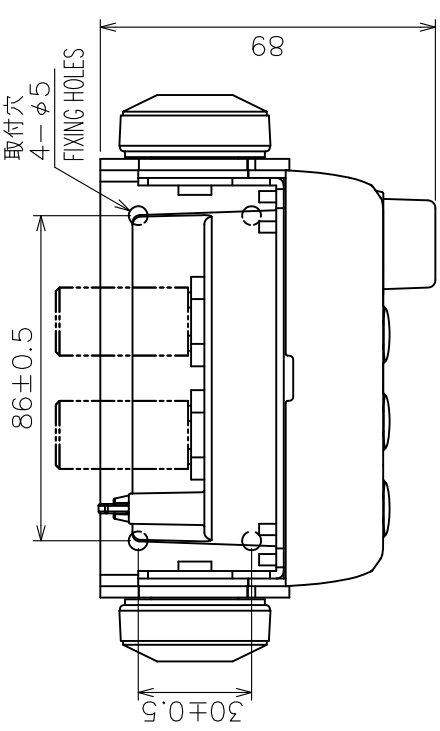


表1 TABLE 1

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

- 注記 1) 指定外の寸法公差は表1による。  
 2) #印寸法は最小サービスマウントとする。  
 3) 取付用ネジはトラスタックピンネジ呼び径4×16を使用のこと。
- NOTE 1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.  
 2. # MINIMUM SERVICE CLEARANCE.  
 3. USE TAPPING SCREWS φ4x16 FOR FIXING THE UNIT.

|          |             |                              |               |                               |
|----------|-------------|------------------------------|---------------|-------------------------------|
| DRAWN    | 9/Nov/09    | T. YAMASAKI                  | TITLE         | FAP-7011                      |
| CHECKED  | 9/Nov/09    | I. TAKENO                    | 名称            | 操作部 (卓上装備)                    |
| APPROVED | 24/Nov/09   | R. Esumi                     | 外寸図           |                               |
| SCALE    | 1/100       | 質量はケーブルを含まず。<br>MASS 0.52 kg | NAME          | CONTROL UNIT (TABLETOP MOUNT) |
| DWG.No.  | C7273-G03-A | REF.No.                      | 64-028-320G-2 | OUTLINE DRAWING               |

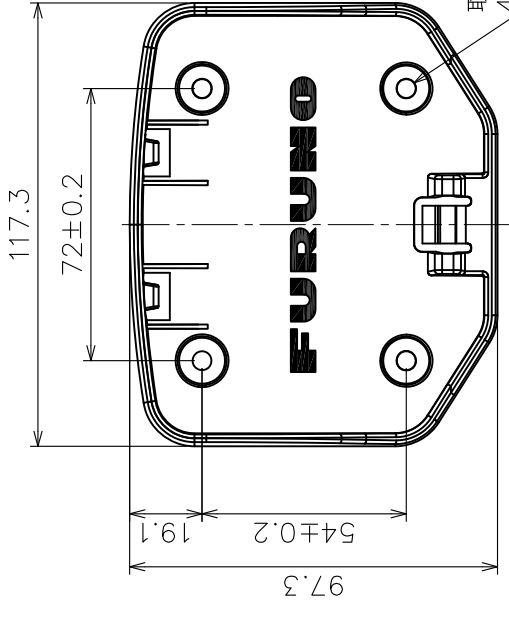
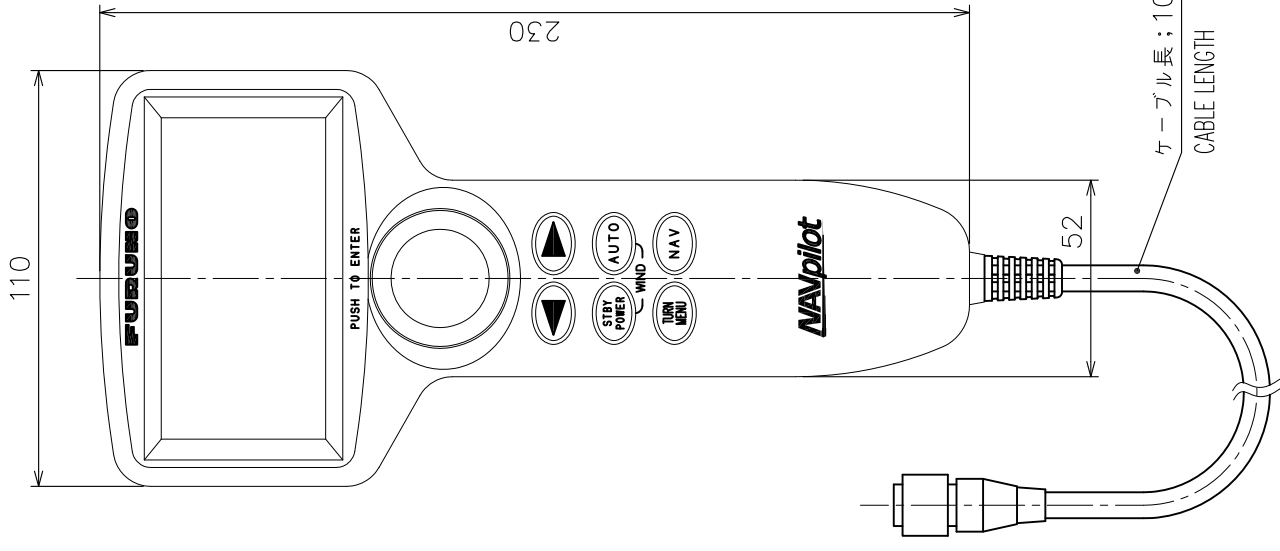
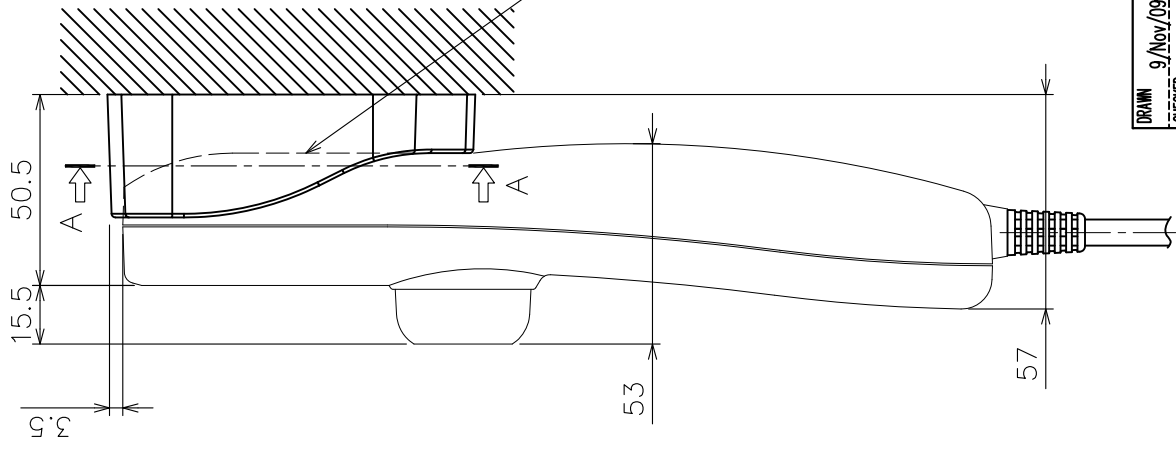


表1 TABLE 1

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

型式銘板 (本体裏側)  
NAMEPLATE (REAR SIDE)



注 記

- 1) 指定外の寸法公差は表1による。
- 2) 取付用ネジはトラスタツピンネジ呼び径4×20を使用のこと。

NOTE

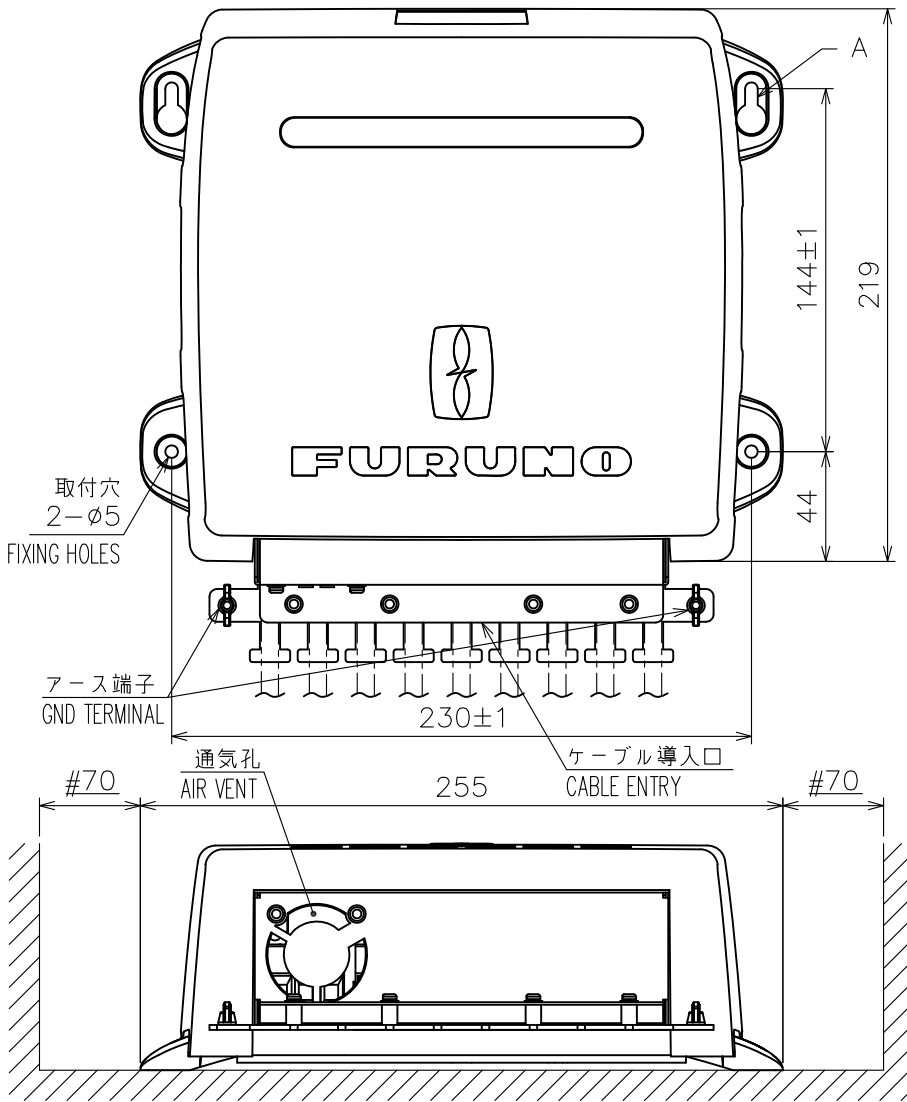
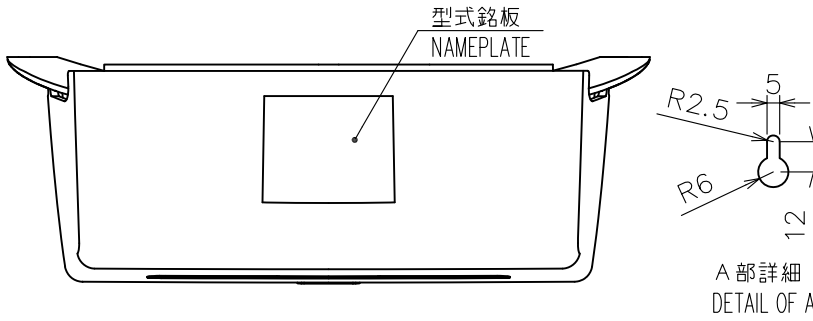
1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. USE TAPPING SCREWS φ4x20 FOR FIXING THE UNIT.

|          |              |                 |               |                 |
|----------|--------------|-----------------|---------------|-----------------|
| DRAWN    | 9/Nov/09     | I.YAMASAKI      | TITLE         | FAP-7021        |
| CHECKED  | 9/Nov/09     | I.TAKENO        | 名称            | 操作部             |
| APPROVED | 24/Nov/09    | R. Esumi        | 外寸図           |                 |
| SCALE    | MASS 0.99 kg | ±10%質量はケーブルを含む。 | NAME          | CONTROL UNIT    |
| DWG.No.  | C7274-G01-A  | REF.No.         | 64-028-400G-1 | OUTLINE DRAWING |



表1 TABLE 1

| 寸法区分 (mm)<br>DIMENSION | 公差 (mm)<br>TOLERANCE |
|------------------------|----------------------|
| $L \leq 50$            | $\pm 1.5$            |
| $50 < L \leq 100$      | $\pm 2.5$            |
| $100 < L \leq 500$     | $\pm 3$              |



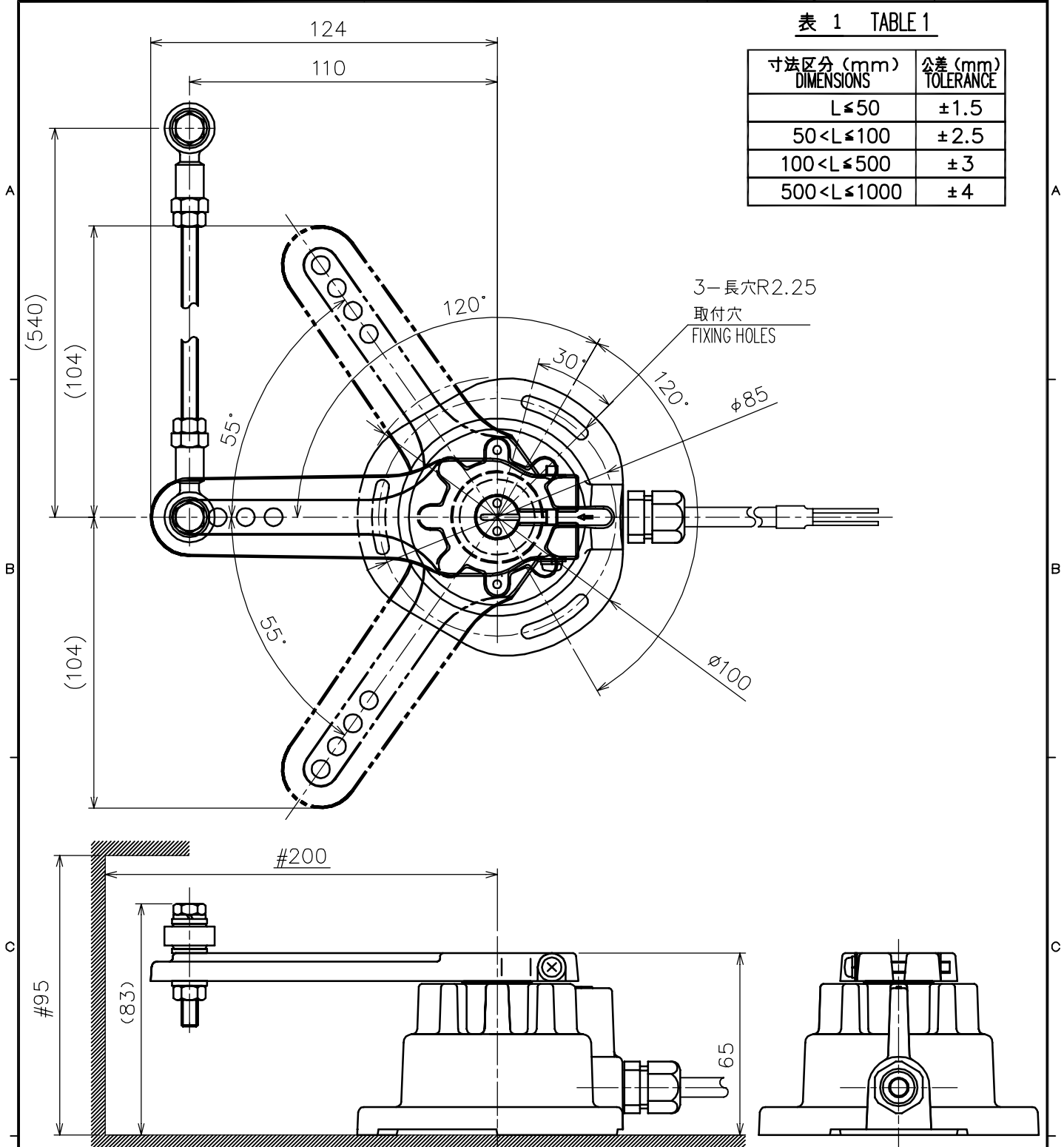
- 注 記
- 1) 指定外の寸法公差は表1による。
  - 2) #印寸法は最小サービス空間寸法とする。
  - 3) 取付用ネジはトラスタップピンネジ呼び径4×20を使用のこと。

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

|          |                     |         |                                 |
|----------|---------------------|---------|---------------------------------|
| DRAWN    | 9/Nov/09 T.YAMASAKI | TITLE   | FAP-7002                        |
| CHECKED  | 9/Nov/09 T.TAKENO   | 名称      | 制御部 (壁掛装備)                      |
| APPROVED | 24/Nov/09 R.Esumi   |         | 外寸図                             |
| SCALE    | MASS 1.9 ±10%<br>kg | NAME    | PROCESSOR UNIT (BULKHEAD MOUNT) |
| DWG.No.  | C7272-G04-A         | REF.No. | 64-028-200G-1                   |
|          |                     |         | OUTLINE DRAWING                 |

表 1 TABLE 1

| 寸法区分 (mm)<br>DIMENSIONS | 公差 (mm)<br>TOLERANCE |
|-------------------------|----------------------|
| $L \leq 50$             | $\pm 1.5$            |
| $50 < L \leq 100$       | $\pm 2.5$            |
| $100 < L \leq 500$      | $\pm 3$              |
| $500 < L \leq 1000$     | $\pm 4$              |



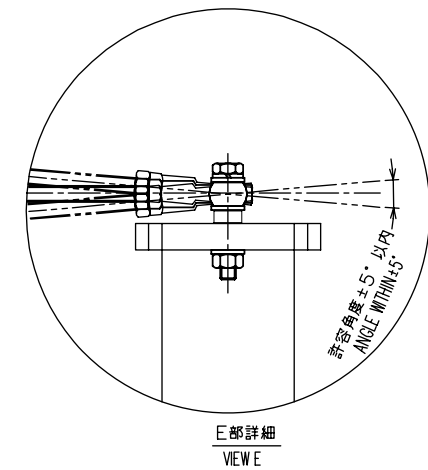
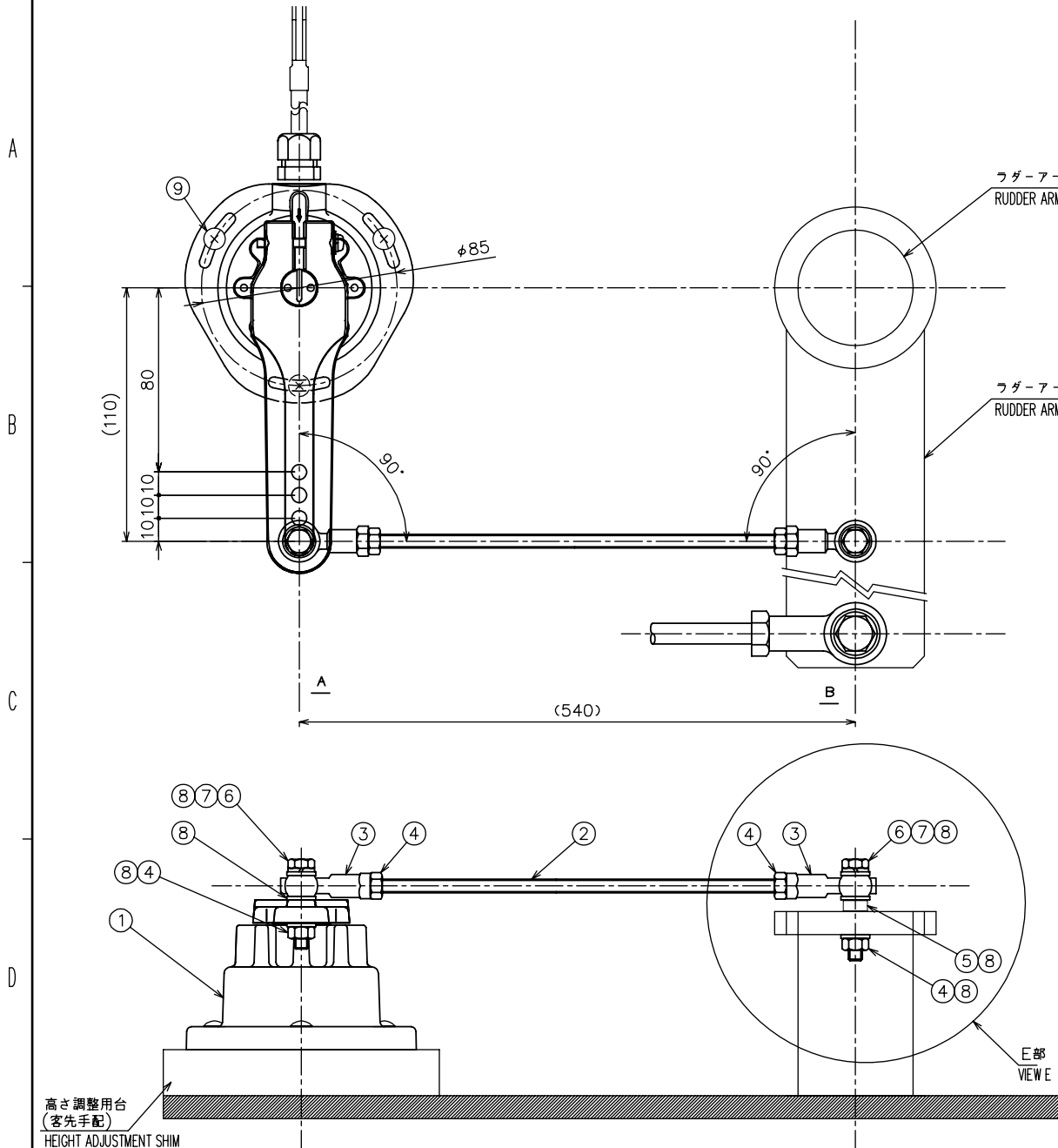
- 注 記 1) #印寸法は最小サービス空周寸法とする。  
 2) 指定外の寸法公差は表 1 による。  
 3) 取付用ネジは+トフスタッピンネジ呼び径 4×20 を使用のこと。

- NOTE 1. #: MINIMUM SERVICE CLEARANCE.  
 2. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.  
 3. USE SELF-TAPPING SCREWS 4x20 FOR FIXING THE UNIT.

|                       |                      |                               |
|-----------------------|----------------------|-------------------------------|
| DRAWN<br>Jan. 19, '06 | E. MIYOSHI           | TITLE<br>FAP-6112             |
| CHECKED               | TAKAHASHI. T         | 名称<br>追従発信器                   |
| APPROVED              | Y. Hatai             | 外寸図                           |
| SCALE                 | MASS ±10%<br>0.46 kg | NAME<br>RUDDER REFERENCE UNIT |
| DWG.No.               | C7250-G07-A          | REF.No.<br>64-024-460G-0      |
|                       |                      | OUTLINE DRAWING               |

表1 TABLE 1

| 寸法区分 (mm)<br>DIMENSIONS | 公差 (mm)<br>TOLERANCE |
|-------------------------|----------------------|
| L ≤ 50                  | ±1.5                 |
| 50 < L ≤ 100            | ±2.5                 |
| 100 < L ≤ 500           | ±3                   |
| 500 < L ≤ 1000          | ±4                   |



注記 1) A 日の軸線は平行のこと  
2) ラダーアーム上面とレンケツボウは平行になるようにFAP-6112本体の高さを調整すること。

NOTE 1. AB AXIS SHOULD BE PARALLEL.  
2. ADJUST HEIGHT OF FAP-6112 SO UPPER SURFACE OF RUDDER ARM IS PARALLEL WITH JOINT ROD.

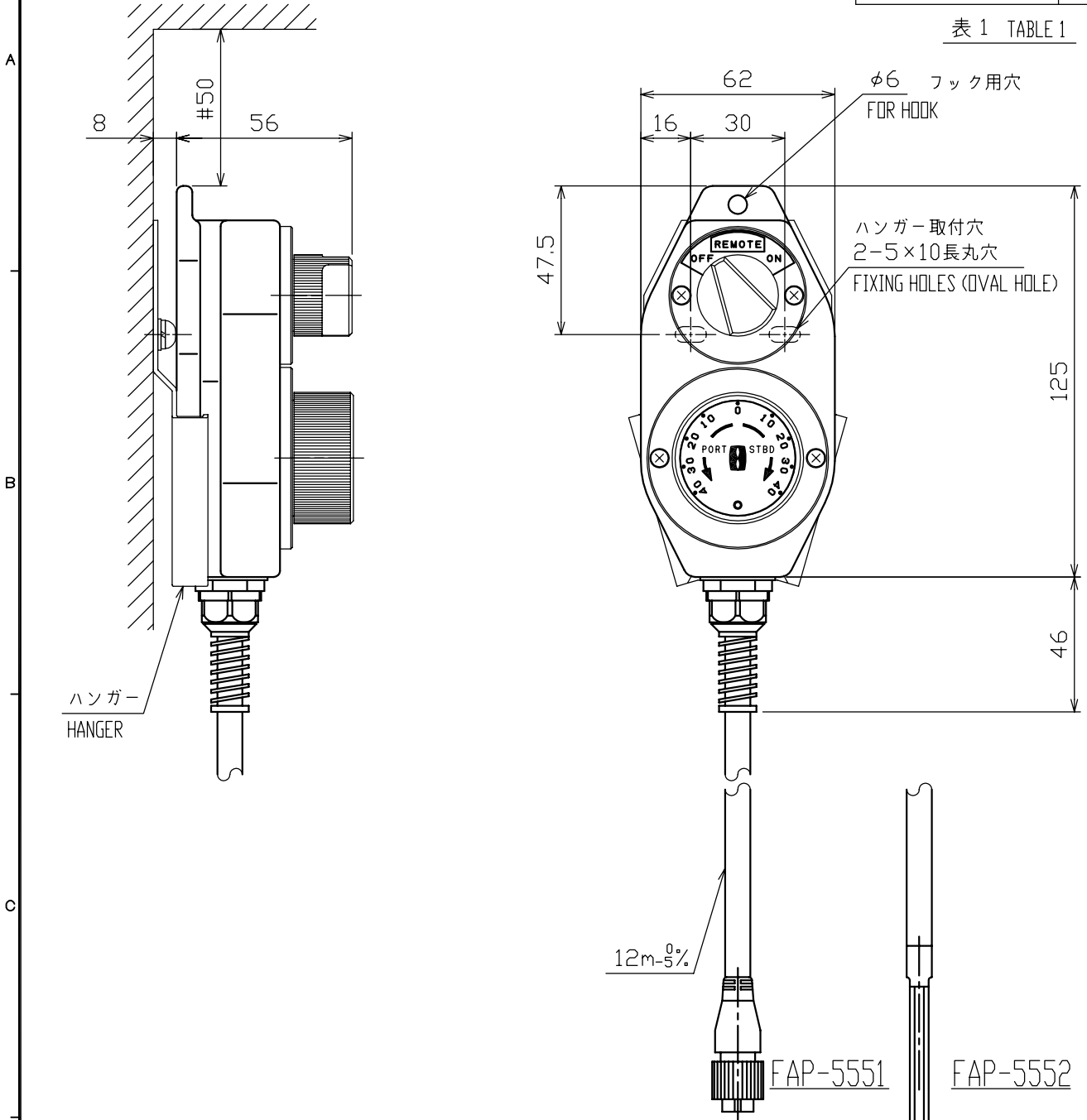
|            |                                   |                |           |               |  |
|------------|-----------------------------------|----------------|-----------|---------------|--|
| 9          | トラスタップピンネジ<br>SELF-TAPPING SCREWS | SUS304         | 3         |               | 4x20 (工事材料)<br>4x20 (INSTALLATION MATERIALS)   |
| 8          | 平座金<br>FLAT WASHER                | SUS304         | 6         |               | M6 (工事材料)<br>M6 (INSTALLATION MATERIALS)       |
| 7          | バネ座金<br>SPRING WASHER             | SUS304         | 2         |               | M6 (工事材料)<br>M6 (INSTALLATION MATERIALS)       |
| 6          | 六角ボルト<br>HEX. BOLT                | SUS304         | 2         |               | M6x40 (工事材料)<br>M6x40 (INSTALLATION MATERIALS) |
| 5          | カサアゲスペース<br>SPACER                | SUS304         | 1         | 64-024-4612   | 工事材料<br>INSTALLATION MATERIALS                 |
| 4          | 六角ナット<br>HEX. NUT                 | SUS304         | 4         |               | M6 (工事材料)<br>M6 (INSTALLATION MATERIALS)       |
| 3          | ロッドエンドベアリング<br>ROD END BEARING    | SUS303         | 2         | RBT6          | 工事材料<br>INSTALLATION MATERIALS                 |
| 2          | 連結棒<br>JOINT ROD                  | SUS304         | 1         | 64-024-4606   | 工事材料<br>INSTALLATION MATERIALS                 |
| 1          | 追従発信器本体<br>RUDDER REFERENCE UNIT  |                | 1         | FAP-6112      |  |
| 品番<br>ITEM | 品名<br>NAME                        | 材質<br>MATERIAL | 数量<br>QTY | 図番<br>DWG.NO. | 摘要<br>REMARKS                                  |

|          |              |              |   |   |
|----------|--------------|--------------|---|---|
| DRAWN    | Jun. 19, '06 | E. MIYOSHI   | TITLE   | FAP-6112  |
| CHECKED  |              | TAKAHASHI, T | 名称  | 追従発信器   |
| APPROVED |              | Y. Hatai     |   | 装備図   |
| SCALE    | MASS ±10%    | 0.46 kg      | 質量は工事材料・ケーブルを含まず。<br>MASS DOES NOT INCLUDE INSTALLATION MATERIALS OR CABLE. | NAME  |
| DWG No.  | C7250-Y01-A  | REF No.      | 64-024-461G-0   | RUDDER REFERENCE UNIT<br>INSTALLATION PROCEDURE |

高さ調整用台  
(客先手配)  
HEIGHT ADJUSTMENT SHIM  
(LOCAL SHPLY)

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

表 1 TABLE 1



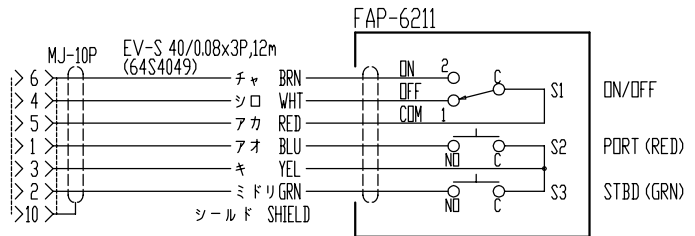
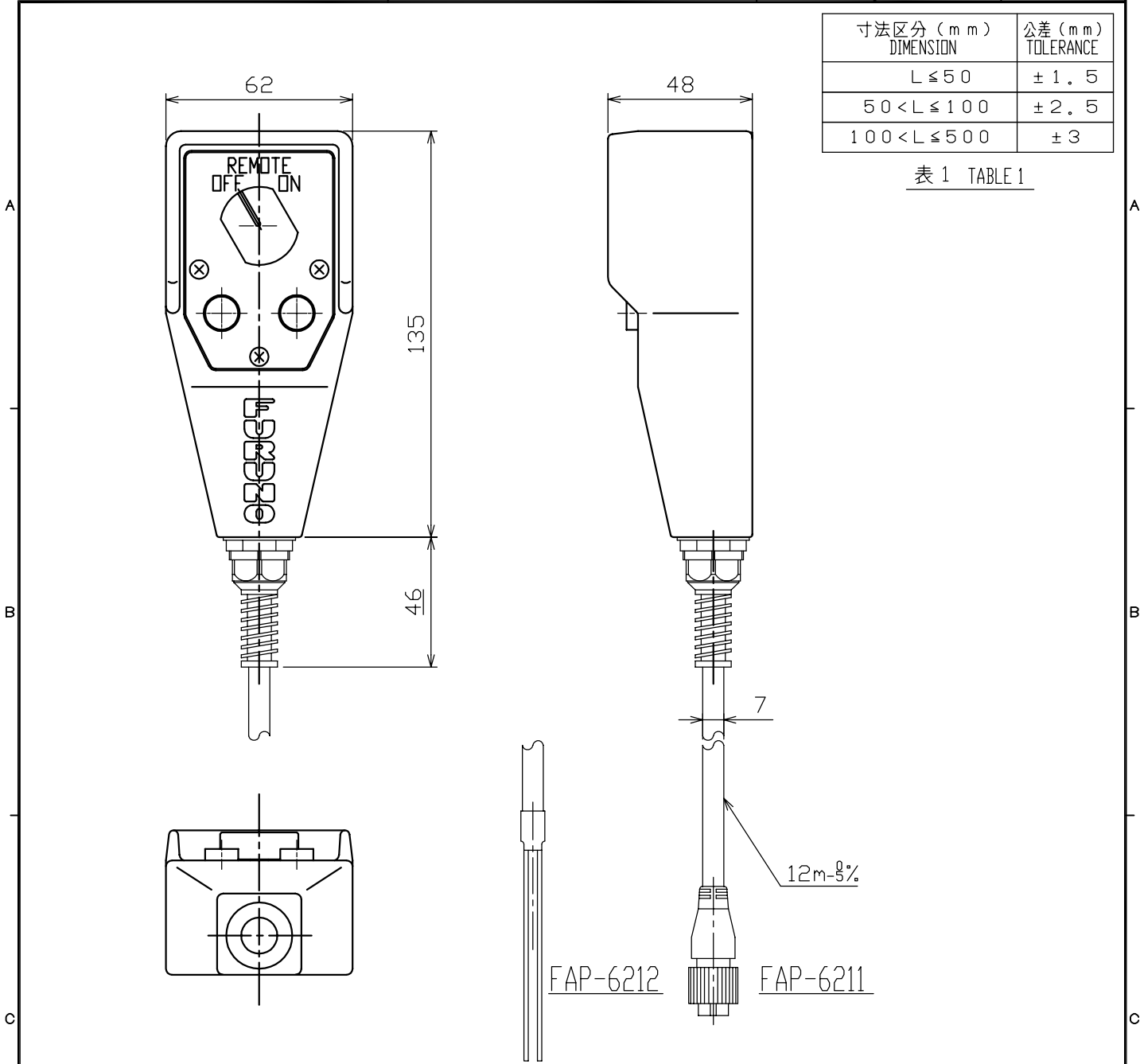
- 注 記 1) #印寸法は最小サービス空間寸法とする。  
 2) 指定外の寸法公差は表 1 による。  
 3) 取付用ネジは+マルモクネジ呼び径 4.8×20 を使用のこと。

- NOTE 1. #: RECOMMENDED SERVICE CLEARANCE.  
 2. TABLE 1 INDICATES TOLERANCE OF DIMENSION.  
 3. USE TAPPING SCREWS 4.8x20 FOR FIXING THE UNIT.

|  |                                       |
|--|---------------------------------------|
| DRAWN<br>Jun. 2 '03<br>T.YAMASAKI                            | TITLE<br>FAP-5551/5552                |
| CHECKED<br>Jun. 2 '03<br>T.Matsuguchi                        | 名称<br>遠隔管制器 (ダイヤル式)                   |
| APPROVED<br>Jun. 04 '03<br>Matsuguchi                        | 外寸図                                   |
| SCALE<br>MASS 0.5 ±10% kg<br>質量はケーブルを含まず。<br>MASS W/O CABLE. | NAME<br>REMOTE CONTROLLER (DIAL TYPE) |
| DWG.No.<br>C7235-G04-B                                       | 64-015-230G-2<br>OUTLINE DRAWING      |

| 寸法区分 (mm)<br>DIMENSION | 公差 (mm)<br>TOLERANCE |
|------------------------|----------------------|
| $L \leq 50$            | $\pm 1.5$            |
| $50 < L \leq 100$      | $\pm 2.5$            |
| $100 < L \leq 500$     | $\pm 3$              |

表 1 TABLE 1



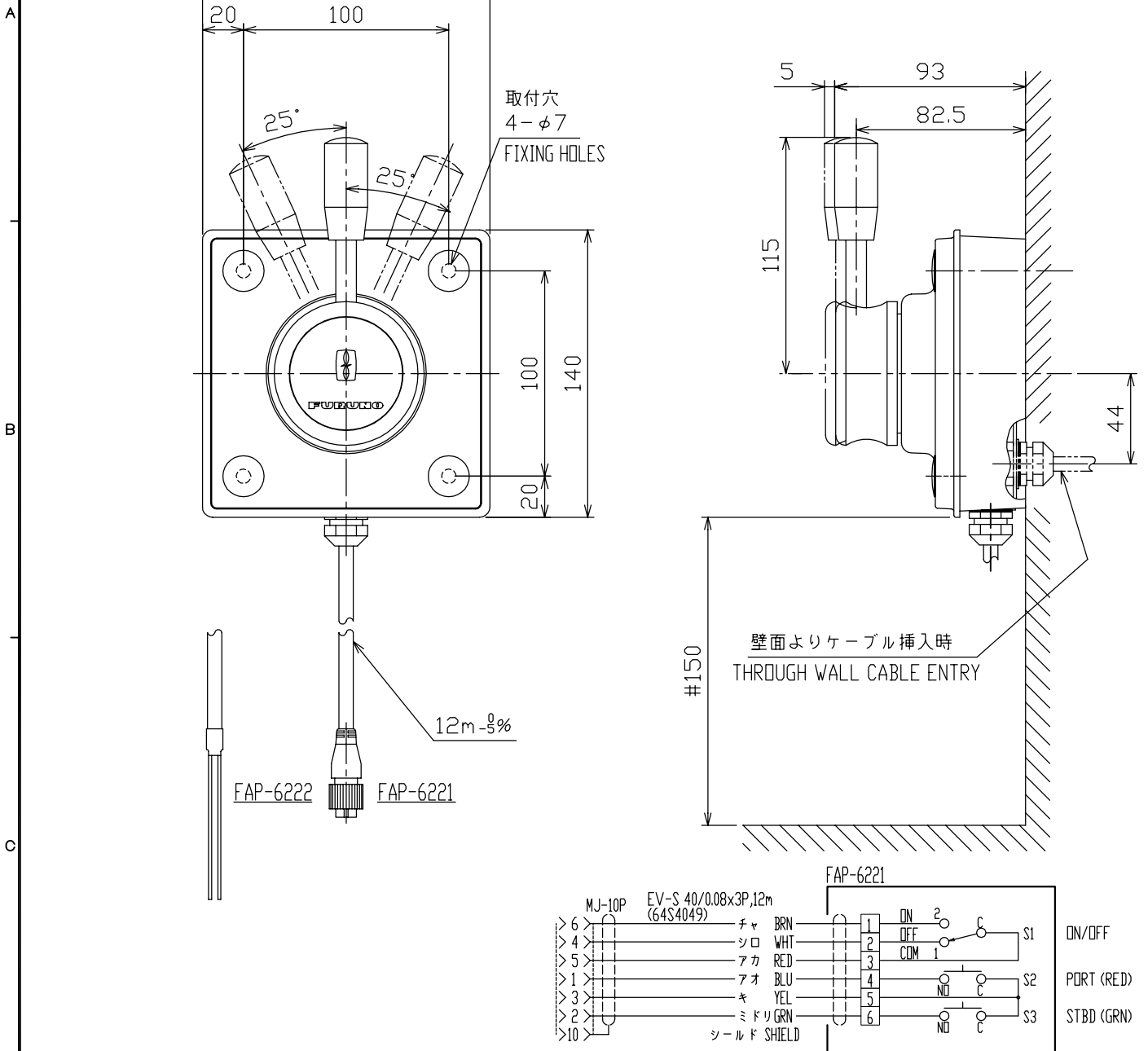
注 記 1) 指定外の寸法公差は表 1 による。

NOTE 1. TABLE 1 INDICATES TOLERANCE OF DIMENSION.

|  |   |
|--|---|
| DRAWN<br>Jun. 2 '03 T.YAMASAKI                               | TITLE<br>FAP-6211/6212                  |
| CHECKED<br>Jun. 2 '03 T.Matsuguchi                           | 名称<br>遠隔管制器 (ボタン式)                      |
| APPROVED   | 外寸図                                     |
| SCALE<br>MASS 0.5 ±10% kg<br>質量はケーブルを含まず。<br>MASS W/O CABLE. | NAME<br>REMOTE CONTROLLER (BUTTON TYPE) |
| DWG.No. C7235-G05-B  | 64-015-350G-1<br>OUTLINE DRAWING        |

| 寸法区分 (mm)<br>DIMENSION | 公差 (mm)<br>TOLERANCE |
|------------------------|----------------------|
| $L \leq 50$            | $\pm 1.5$            |
| $50 < L \leq 100$      | $\pm 2.5$            |
| $100 < L \leq 500$     | $\pm 3$              |

表 1 TABLE 1



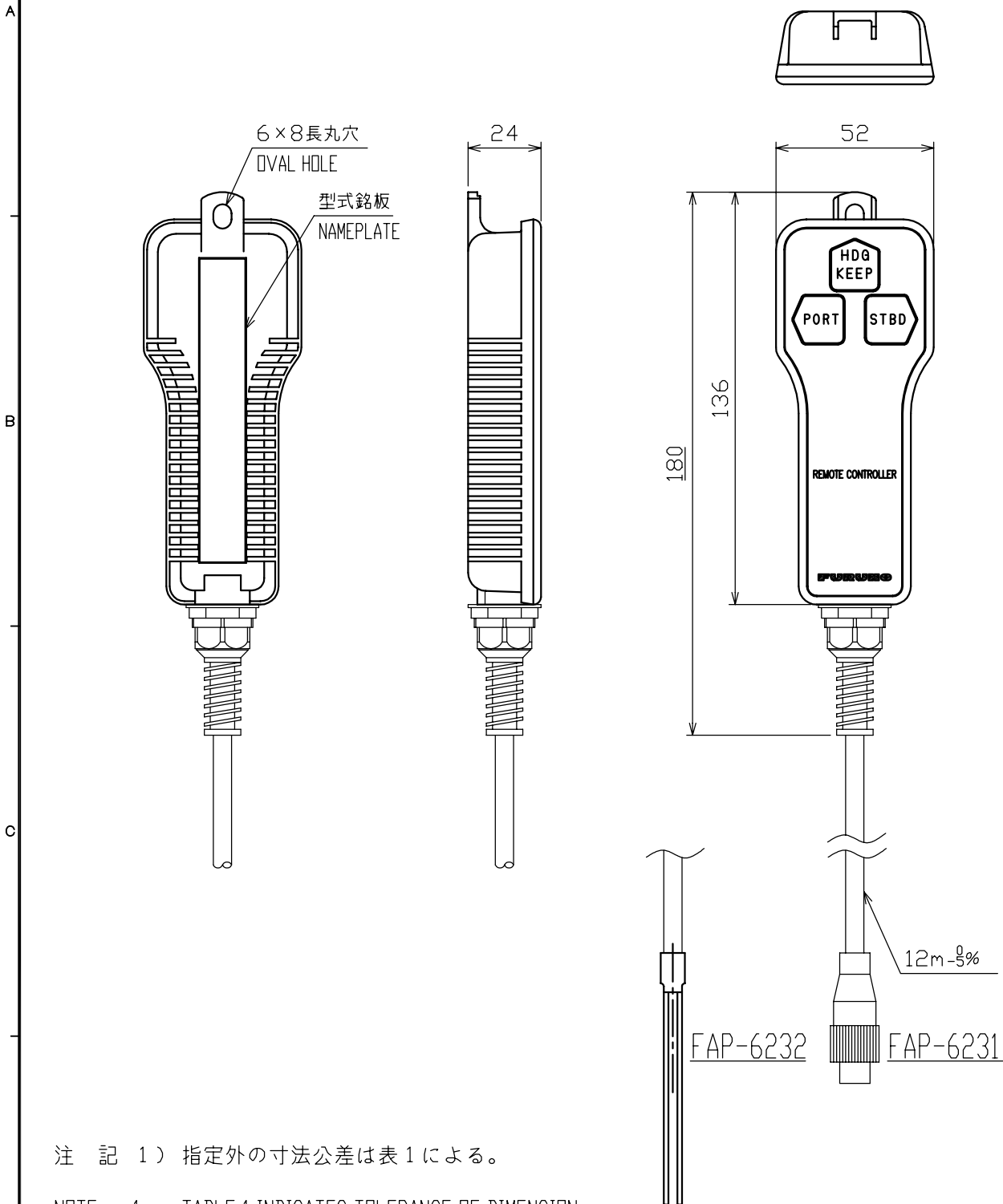
- 注 記 1) #印寸法は最小サービス空間寸法とする。  
 2) 指定外の寸法公差は表 1 による。  
 3) 取付用ネジは M6×50 ロックボルトを使用のこと。

- NOTE 1. #: RECOMMENDED SERVICE CLEARANCE.  
 2. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS.  
 3. USE M6x50 BOLTS FOR FIXING THE UNIT.

|   |  |
|---|--|
| DRAWN<br>Jun. 2 '03 T.YAMASAKI                                | TITLE<br>FAP-6221/6222                 |
| CHECKED<br>Jun. 2 '03 T.Matsuguchi                            | 名称<br>遠隔管制器 (レバー式)                     |
| APPROVED  | 外寸図                                    |
| SCALE<br>MASS 1.8 ±10% kg<br>質量はケーブルを含みます。<br>MASS W/O CABLE. | NAME<br>REMOTE CONTROLLER (LEVER TYPE) |
| DWG.No. C7235-G06-B   | 64-015-400G-1<br>OUTLINE DRAWING       |

| 寸法区分 (mm)<br>DIMENSION | 公差 (mm)<br>TOLERANCE |
|------------------------|----------------------|
| $L \leq 50$            | $\pm 1.5$            |
| $50 < L \leq 100$      | $\pm 2.5$            |
| $100 < L \leq 500$     | $\pm 3$              |

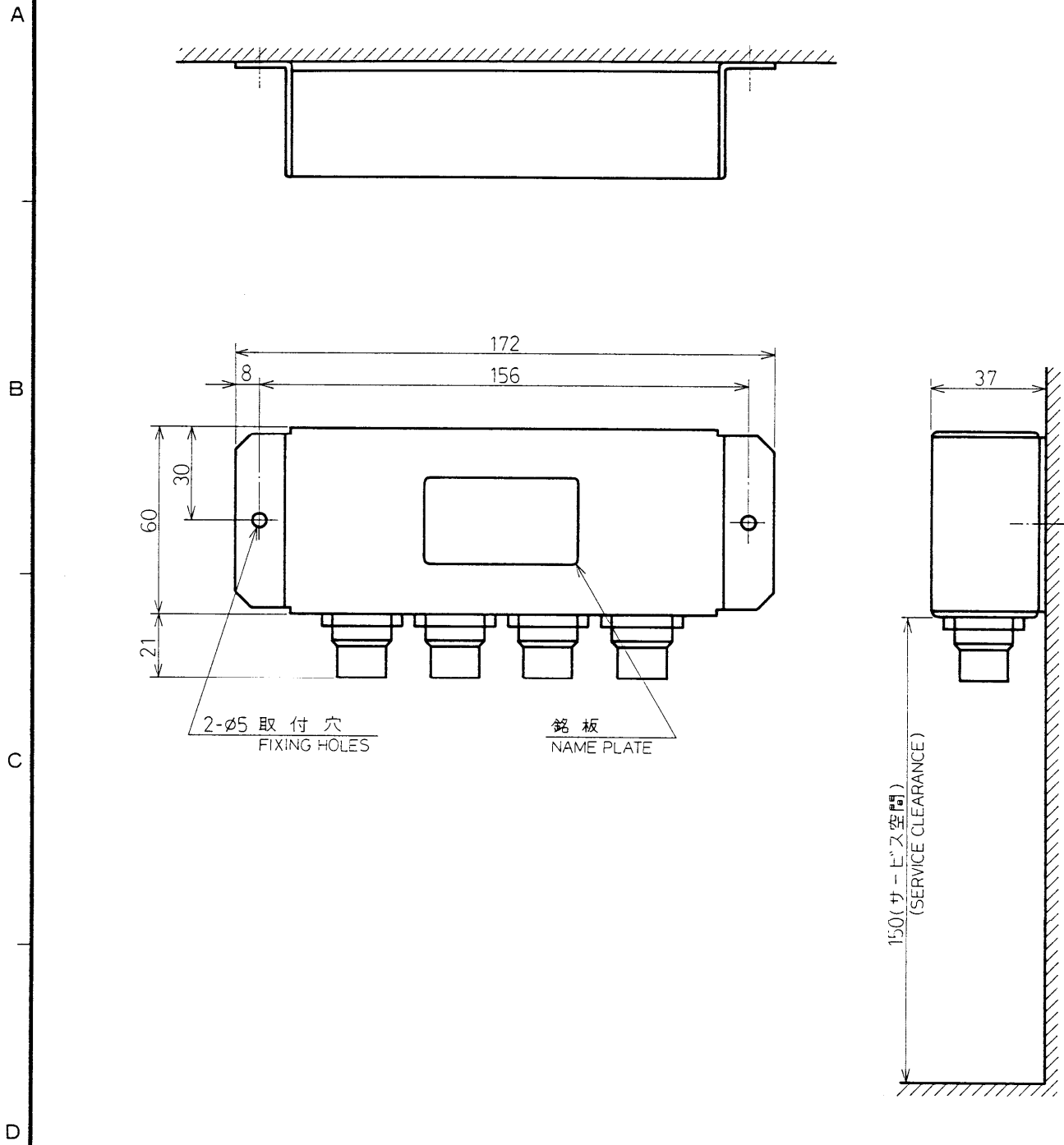
表 1 TABLE 1



注 記 1) 指定外の寸法公差は表 1 による。

NOTE 1. TABLE 1 INDICATES TOLERANCE OF DIMENSION.

|  |  |
|--|--|
| DRAWN<br>Jun. 2 '03<br>T.YAMASAKI                            | TITLE<br>FAP-6231/6232                 |
| CHECKED<br>Jun. 2 '03<br>T.Matsuguchi                        | 名称<br>遠隔管制器 (ドッジリモコン)                  |
| APPROVED<br>Jun. 04 '03<br>Matsuguchi                        | 外寸図                                    |
| SCALE<br>MASS 0.1 ±10% kg<br>質量はケーブルを含まず。<br>MASS W/O CABLE. | NAME<br>REMOTE CONTROLLER (DODGE TYPE) |
| DWG.No. C7237-G06-B  | 64-019-400G-1<br>OUTLINE DRAWING       |



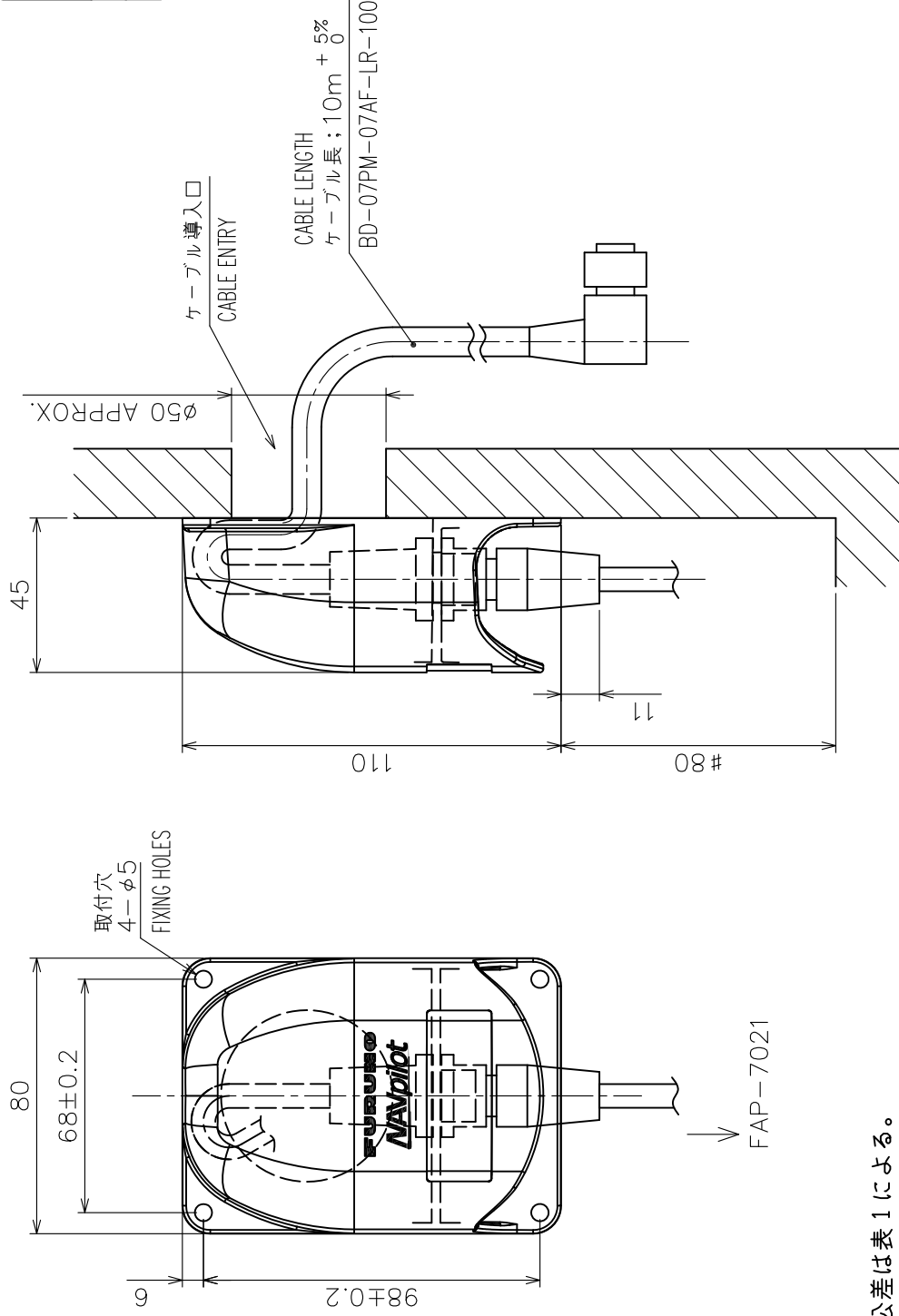
FAP-330

| 承認<br>APPROVED          | 品番<br>ITEM                 | 品名<br>NAME                    | 材質<br>MATERIAL | 数量<br>Q'TY | 図番<br>DWG. NO. | 摘要<br>REMARKS           |
|-------------------------|----------------------------|-------------------------------|----------------|------------|----------------|-------------------------|
| JUN. 3. '92<br>T. YAKKO |                            | 三角法<br>THIRD ANGLE PROJECTION |                |            |                | 名称<br>TITLE<br>リモコン分配器  |
| 検<br>CHECKED            | JUN. 2. '92<br>N. SAITO    | 尺<br>SCALE                    |                |            |                | FAP-6800<br>DISTRIBUTOR |
| 製<br>DRAWN              | JUN. 2. '92<br>S. N. S. L. | 重<br>WEIGHT                   | 0.3 kg         |            | 図番<br>DWG. NO. | C7235-G03-A             |



表1 TABLE 1

| 寸法区分 (mm)<br>DIMENSION | 公差 (mm)<br>TOLERANCE |
|------------------------|----------------------|
| $L \leq 50$            | $\pm 1.5$            |
| $50 < L \leq 100$      | $\pm 2.5$            |
| $100 < L \leq 500$     | $\pm 3$              |



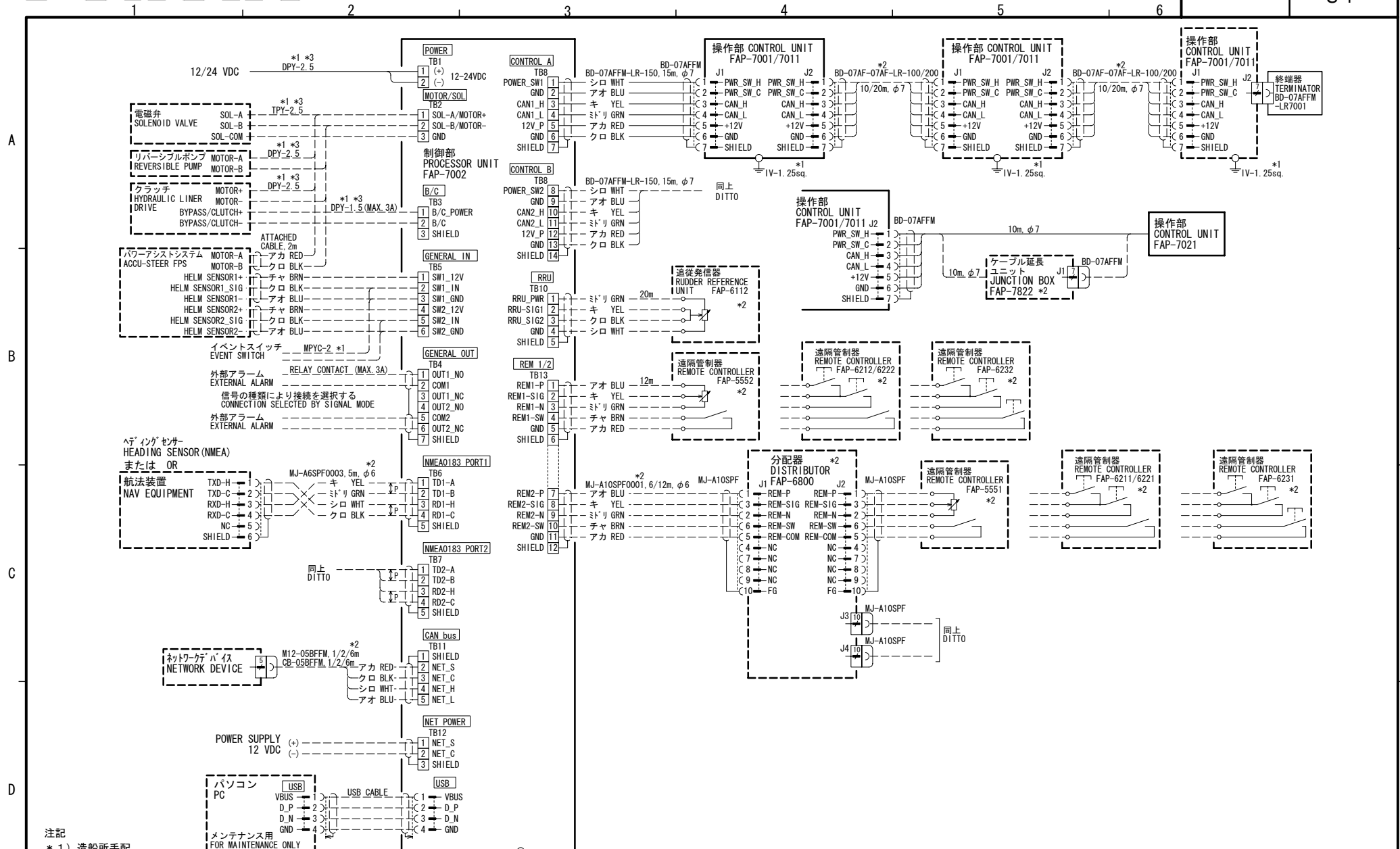
### 注記

- 1) 指定外の寸法公差は表1による。
- 2) #印寸法は最小サービスマージン寸法とする。
- 3) 取付用ネジはトラスタツピンネジ呼び径4×20を使用のこと。

### NOTE

1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. #. MINIMUM SERVICE CLEARANCE.
3. USE TAPPING SCREWS  $\phi 4 \times 20$  FOR FIXING THE UNIT.

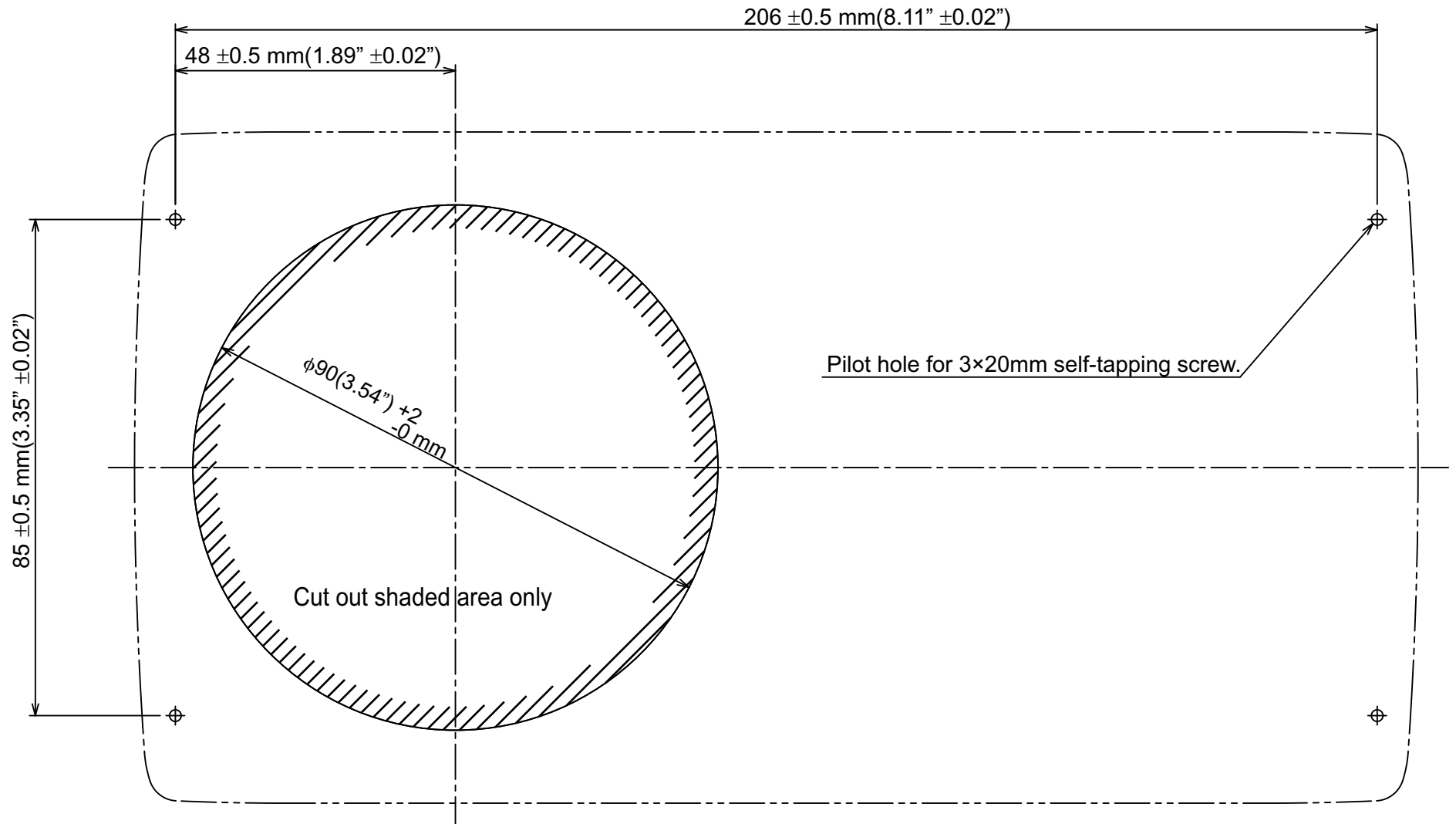
|          |             |                                       |               |                 |
|----------|-------------|---------------------------------------|---------------|-----------------|
| DRAWN    | 22/Dec/09   | T. YAMASAKI                           | TITLE         | FAP-7822        |
| CHECKED  | 22/Dec/09   | I. TAKENO                             | 名称            | ケーブル延長ユニット      |
| APPROVED | 25/Jan/10   | R. ESUMI                              | 外寸図           |                 |
| SCALE    | 1/2         | 質量はケーブルを含まず<br>±10%<br>MASS W/O CABLE | NAME          | JUNCTION BOX    |
| DWG.No.  | C7274-G02-B | REF.No.                               | 64-028-401G-0 | OUTLINE DRAWING |



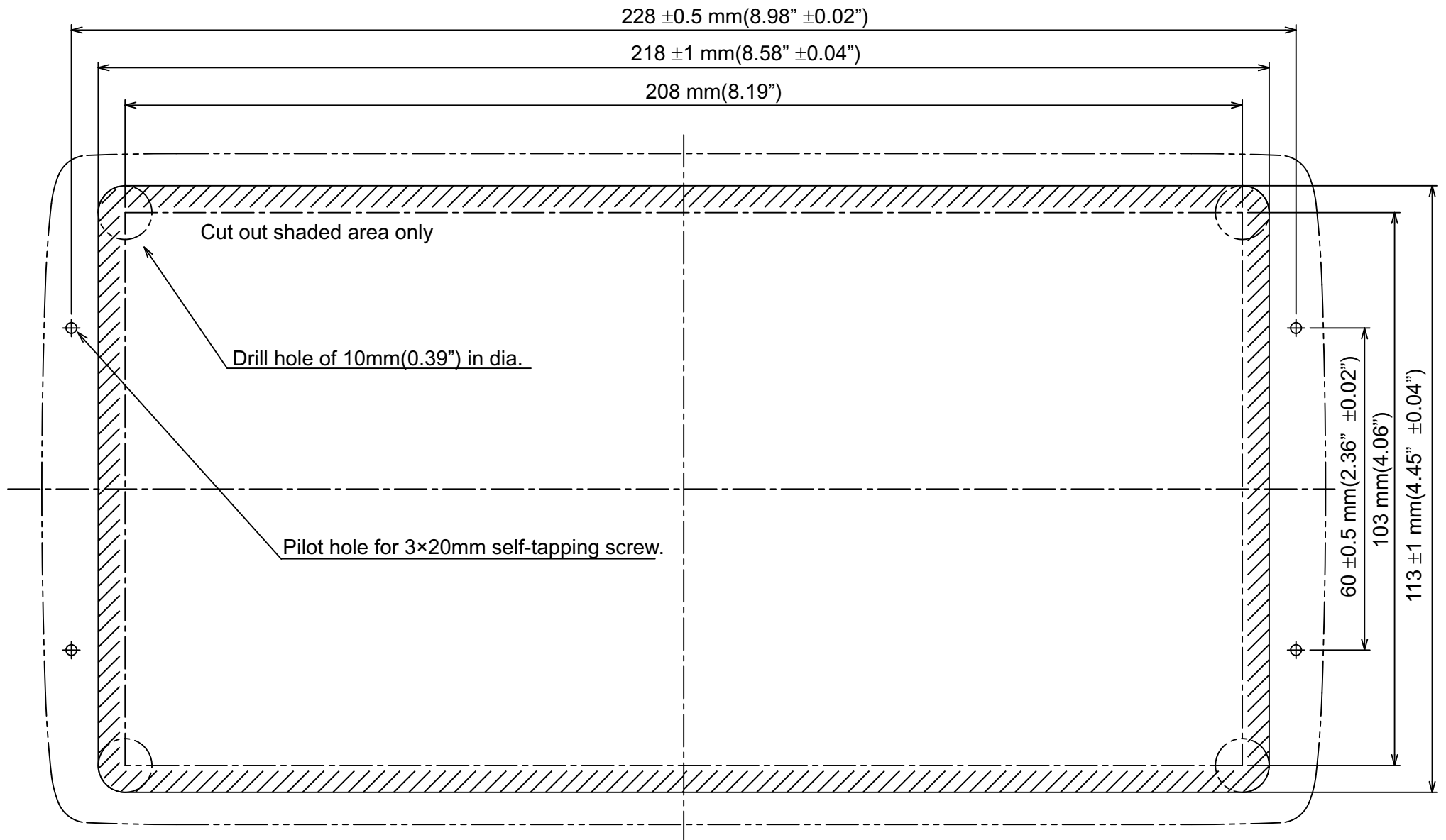
注記  
 \*1) 造船所手配。  
 \*2) オプション。  
 \*3) ケーブル長さにより芯線の太さを変更する。

NOTE  
 \*1: SHIPYARD SUPPLY.  
 \*2: OPTION.  
 \*3: CHANGE THE CORE SIZE ACCORDING TO CABLE LENGTH.

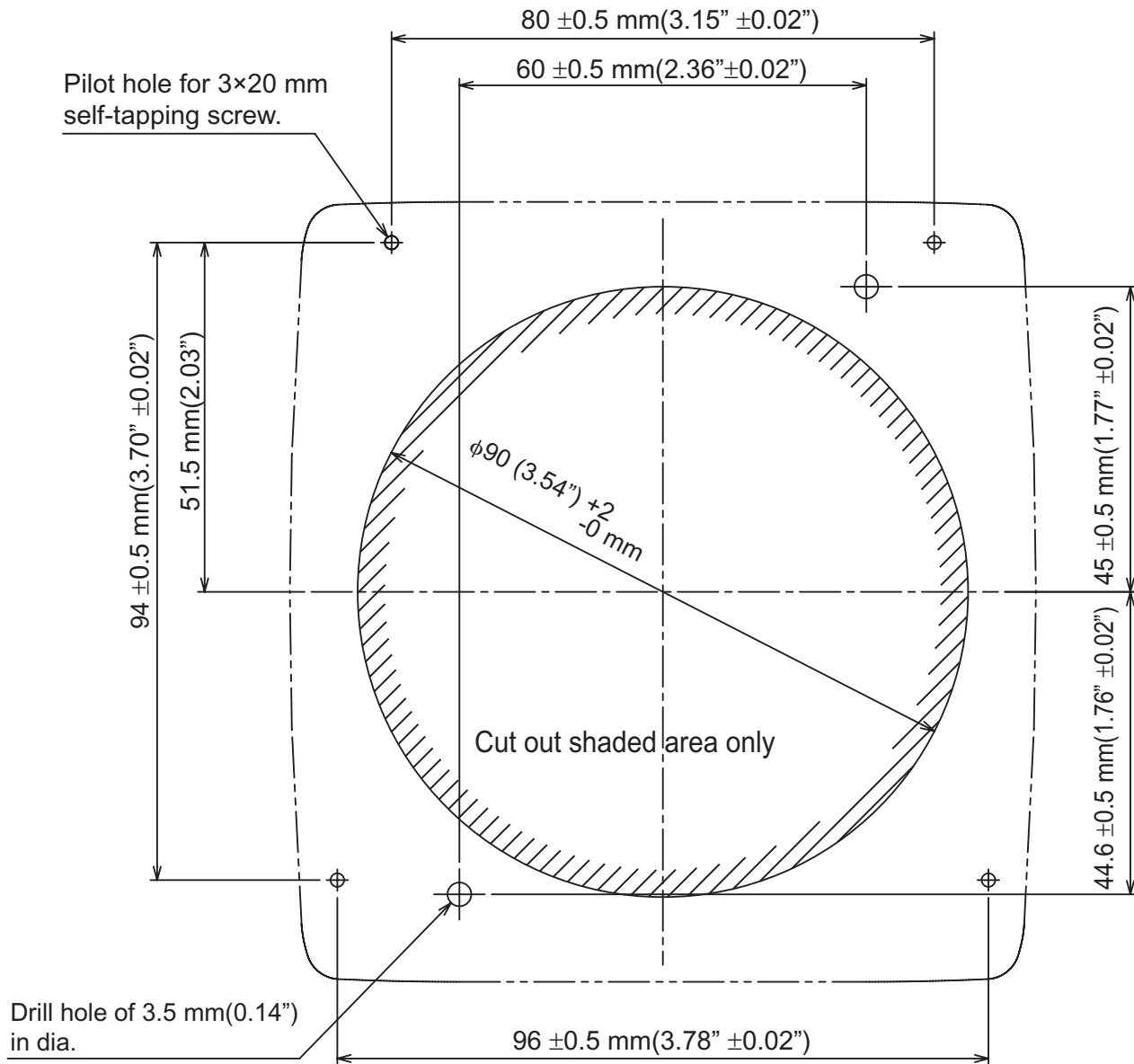
|                         |                         |          |                      |
|-------------------------|-------------------------|----------|----------------------|
| DRAWN                   | 7/Mar/2011 T. YAMASAKI  | TITLE    | NAVpilot-700/711/720 |
| CHECKED                 | 7/Mar/2011 H. MAKI      | 名称       | オートパイロット             |
| APPROVED                | 9/Mar/2011 Y. NISHIYAMA |          | 相互結線図                |
| SCALE                   | MASS kg                 | NAME     | AUTOPILOT            |
| DWG No.                 | C7272-C01-F             | REF. No. | 64-028-5001-0        |
| INTERCONNECTION DIAGRAM |                         |          |                      |



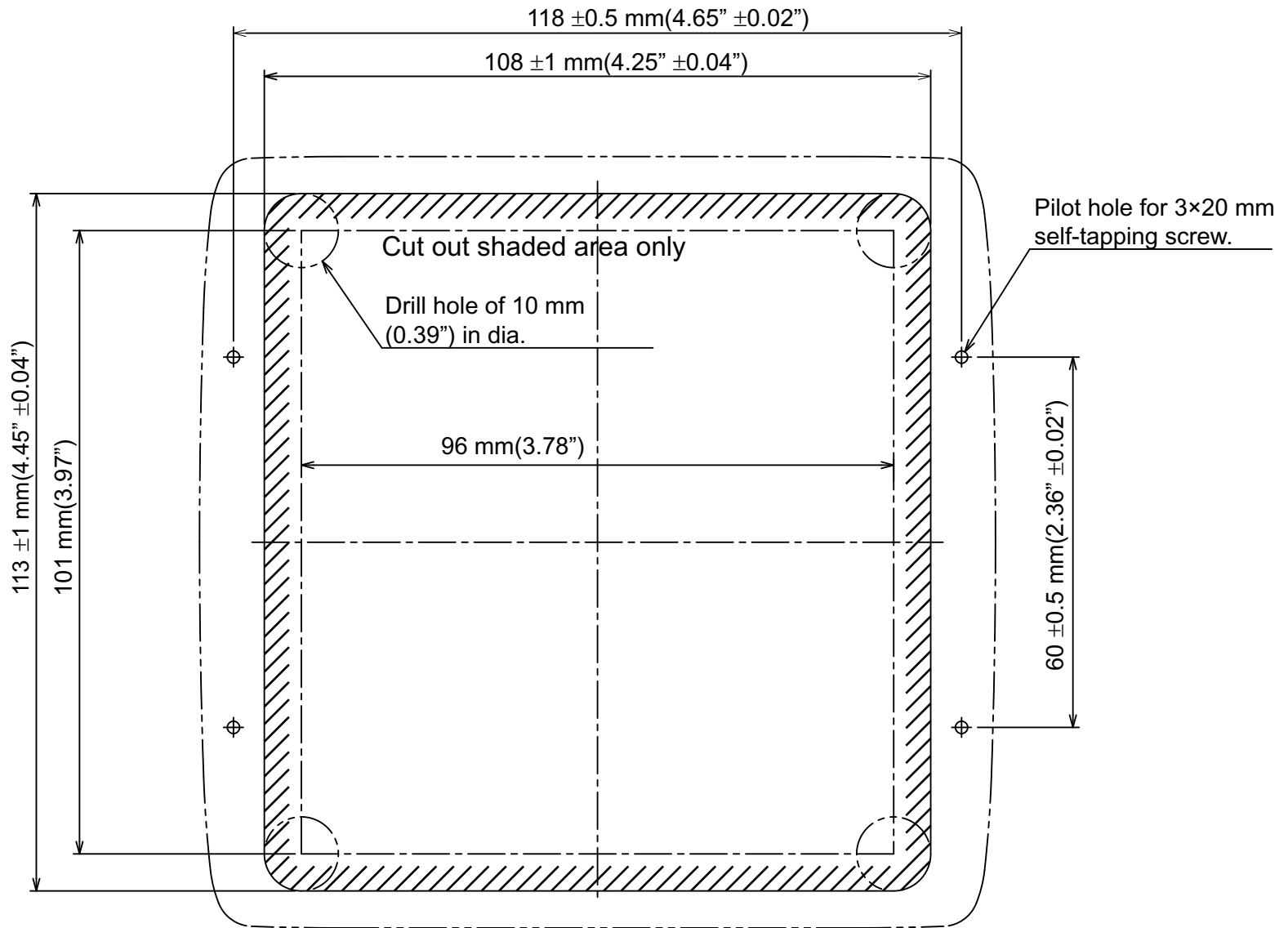
Control Unit FAP-7001  
Surface Mount Template



Control Unit FAP-7001  
Flush Mount Template



Control Unit FAP-7011  
Surface Mount Template



Control Unit FAP-7011  
Flush Mount Template