Document No. E10-1103

Gyro-compass

TG-8000 Series TG-8100 / 8600 Operator's Manual

2018.03

TOKYO KEIKI INC.

Marine Systems Company

SAFETY PRECAUTIONS

1. Safety-related designations used in this manual and products are as follows.

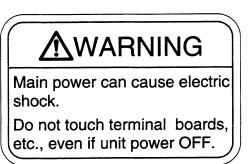
 ⚠ DANGER
 Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

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

 Indicates an potentially hazardous situation which, if not avoided, may result in minor or moderate injury or property damage accident.

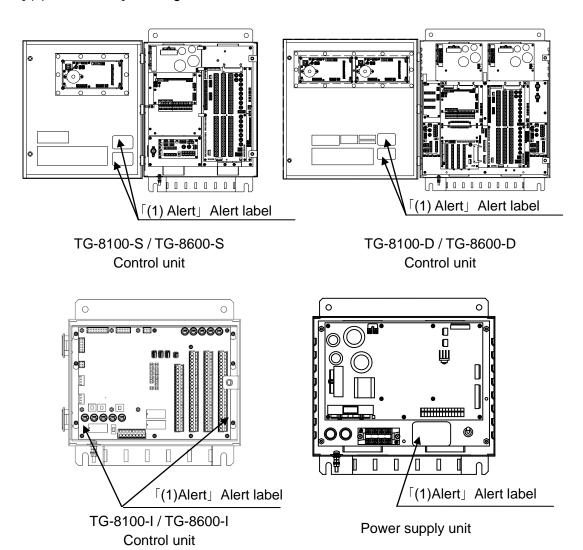
2. The following warning label is attached to this system.

(1) WARNING



3. Attached position of warning label in this system is as follows.

[(1) WARNING] Warning label



^{*} For the system that this system is built in the automatic steering system, the warning label is attached on the automatic steering system side. Refer to the label attached position mentioned in the Operator's Manual for the automatic steering system.

- 4. Safety-related precautions, etc., mentioned in this manual are summarized as follows (related page to each item is in parentheses).
- (1) Warning regarding general caution for use of this system (See page 1-1.)

⚠ WARNING

- Improper operations caused by failure of this system or malfunctions caused by operator's misunderstanding may cause distress such as collision and grounding, and may result in property damages and environmental pollution. Further, death or serious injury may happen.
- Full attention should be paid on use of this system by understanding limitations in performance or characteristics of this system and by familiarizing with operation methods.
- (2) Warning regarding operation (See page 3-1.)

- There are matters to be attended in starting of this system and operations during running. These matters are described in each related item in this chapter with CAUTION or WARNING, etc., which should always be observed.
- ■Read the Operator's Manual of the automatic steering system carefully preparing for occurrence of trouble or alert in this system, and the emergency steering method should be well understood to treat such matters smoothly.
- (3) Warning regarding maintenance and check (See page 5-1.)

⚠ WARNING

●In the stage of maintenance and check of the system, touching internal parts may cause electric shock because the ship's power supply is still applied to the system distribution board even if the main power switch of this system is turned "OFF". Do not touch internal parts such as internal terminal boards and power supply unit, etc. If necessary, disconnect the power cable from the ship's distribution board.

The following warning label is attached to the dangerous position of this system

MARNING

Main power can cause electric shock.

Do not touch terminal boards, etc., even if unit power OFF.

(4) Warning regarding general caution for use of this system (See page 1-1.)

△ CAUTION

This system displays gyrocompass heading and outputs the heading information to the outside.

Although the safety design such as the alert function against failure, etc., is provided, there is no perfect safety design at the present time.

In addition, as this system has many important functions, it is hard to say that any one can use this system without failure.

Failures or malfunctions of this system may cause distress, and full attention should be paid on use of this system.

User's responsibility and obligation in insuring safe navigation and the proper exercise of navigational techniques is in no way reduced by the use of this equipment.

The following cautions should be observed.

- 1. Always perform daily check to maintain normal system condition.
- 2. When anomalies are detected in the result of daily check, investigate and repair at once to recover to normal conditions and request advice of our service engineer.
- 3. When the alert system operates during use, always check to confirm the cause and recover the troubled point.
- (5) Warning regarding kinds of function (See page 1-2.)

⚠ CAUTION

- ●When an alert related to GNSS (alert code "c" or "d") is generated and the gyrocompass true heading has not been determined, once turn the steering mode to "MANUAL" or "Non Follow Up", then determine the true heading because erroneous heading information (repeater signal and serial signal) is possible to be outputted to the outside. Refer to "3.4.5 (2) Countermeasures when GPS communication abnormality is generated" in Chapter 3 Operation, for determination method of the true heading.
- ●When an alert regarding to LOG (serial) (alert code "P" or "U") is generated and the true heading of the gyrocompass has not been determined, once turn the steering mode to "MANUAL" or "Non Follow Up", then determined the true heading because the erroneous heading information (repeater signal and serial signal) is possible to be outputted to the outside. Refer to "3.4.5 (4) Countermeasures when LOG (serial) communication abnormality is generated" in Chapter 3 Operating Method, for determination method of the true heading.
- ●When an alert regarding to the log contact (alert code "u") is generated and the true heading of the gyrocompass has not been determined, once turn the steering mode to "MANUAL" or "Non Follow Up", then determine the true heading because erroneous heading information (repeater signal and serial signal) is possible to be outputted to the outside. Refer to "3.4.5 (5) Countermeasures when LOG contact abnormality is generated" in Chapter 3 Operating Method, for determination method of the true heading.
- ●When an alert regarding to the external heading sensor (alert code "E", "F", "L" and "N") is generated, the heading information immediately before the alert generated is outputted. Once turn the steering mode to "MANUAL" or "Non Follow Up", and then determine the true heading. Refer to "3.4.5 (3) Countermeasures when external heading sensor related communication abnormality is generated" in Chapter 3 Operating Method, for determination method of the true heading.

After the true heading is determined, this system's heading is outputted to the outside.

●When the system is switched, perform it after once turned the automatic steering system to "MANUAL" or "Non Follow Up" to prevent course turning with larger angle.

(6) Warning regarding configuration (See page 2-1.)

↑ CAUTION

- ●When this system is assembled in the automatic steering system stand (autopilot built-in), the master compass and each unit of the control unit are assembled in the steering stand and the sensitive element is separately packed.
- (7) Warning regarding start (See page 3-9.)

△ CAUTION

- Start this system after turned the automatic steering system to other mode than "AUTO".
- (8) Warning regarding setting of latitude input system (See page 3-11.)

⚠ CAUTION

● Change of the latitude input system or a large change of latitude value may cause a large change of the true heading.

During the automatic steering, once turn the steering mode of the automatic steering system to "MANUAL" to prevent a large course changing, and after confirming surrounding safety of own ship, turn to "AUTO" steering again.

(9) Warning regarding setting of latitude input system (See page 3-11.)

△ CAUTION

●When an alert related to GNSS (alert code "c" or "d") is generated and the true heading of the gyrocompass has not been determined, once turn the steering mode to "MANUAL" or "Non Follow Up", then determine the true heading because erroneous heading information (repeater signal and serial signal) is possible to be outputted to the outside

Refer to "3.4.5 (2) Countermeasures when GNSS communication abnormality is generated" in Chapter 3 Operating Method, for determination method of the true heading.

(10) Warning regarding setting of latitude input system (See page 3-11.)

△ CAUTION

●When "GYRO" is selected for the latitude input system, latitude is automatically updated by the ship's speed and the gyrocompass true heading. (When the ship's speed input system is "MANUAL", it is not updated automatically.) During navigation, confirm once in 2 hours that the ship's actual latitude coincides with the indicated latitude.

(11) Warning regarding setting of latitude input system (See page 3-11.)

△ CAUTION

●Whenever to complete the setting, push ACK / ENT switch④. Changed setting is not updated unless pushing ACK / ENT switch④.

(12) Warning regarding setting of ship's speed input system (See page 3-13.)

△ CAUTION

●Change of the ship's input system or large change of ship's speed may cause large change of the true heading.

During the automatic steering, once turn the steering mode of the automatic steering system to "MANUAL" to prevent a large course changing, and after confirming surrounding safety of own ship, turn to "AUTO" steering again.

(13) Warning regarding setting of ship's speed input system (See page 3-13.)

△ CAUTION

■When an alert related to GNSS (alert code "c" or "d") is generated and the true heading of the gyrocompass has not been determined, once turn the steering mode to "MANUAL" or "Non Follow Up", then determine the true heading because erroneous heading information (repeater signal and serial signal) is possible to be outputted to the outside.

Refer to "3.4.5 (2) Countermeasures when GNSS communication abnormality is generated" in Chapter 3 Operating Method, for determination method of the true heading.

(14) Warning regarding setting of ship's speed input system (See page 3-13.)

A CAUTION

■When alert regarding to LOG (serial signal) (alert code "P" or "U") is generated and the true heading of the gyrocompass has not been determined, once turn the steering mode to "MANUAL" or "Non Follow Up", then determined the true heading because the erroneous heading information (repeater signal and serial signal) is possible to be outputted to the outside.

Refer to "3.4.5 (4) Countermeasures when LOG (serial) communication abnormality is generated" in Chapter 3 Operating Method, for determination method of the true heading.

(15) Warning regarding setting of ship's speed input system (See page 3-13.)

△ CAUTION

•When alert regarding to LOG (contact) (alert code "u") is generated and the true heading of the gyrocompass has not been determined, once turn the steering mode to "MANUAL" or "Non Follow Up", then determined the true heading because the erroneous heading information (repeater signal and serial signal) is possible to be outputted to the outside.

Refer to "3.4.5 (5) Countermeasures when LOG (contact) communication abnormality is generated" in Chapter 3 Operating Method, for determination method of the true heading.

(16) Warning regarding setting of ship's speed input system (See page 3-13.)

△ CAUTION

- ■The setting of the ship's speed input system (and its values for "MANUAL") is stored, and when re-started, the previous ship's speed system setting is restored and starts. When "MANUAL" is selected, stop after ship's speed setting is set to zero knot. Also, when turned off and on again with "GNSS" selected, confirm that GNSS is operating properly.
- (17) Warning regarding setting of ship's speed input system (See page 3-14.)

△ CAUTION

- ●Whenever to complete the setting, push ACK/ENT switch④. Changed setting is not updated unless pushing ACK/ENT switch④.
- (18) Warning regarding setting of the "rate of turn filter constant" (See page 3-15.)

△ CAUTION

- ●Whenever to complete the setting, push ACK / ENT switch④. Changed setting is not updated unless pushing ACK / ENT switch④.
- (19) Warning regarding confirmation of the true heading (See page 3-15.)

△ CAUTION

•When the gyrocompass true heading is set again, the repeater indication value and the serial signal gyrocompass true heading will change by the changed angle.
During the automatic steering, once turn the steering mode of the automatic steering system to "MANUAL" to prevent a large course changing, and after confirming surrounding safety of own ship, turn to "AUTO" steering again.

(20) Warning regarding confirmation of the true heading (See page 3-15.)

△ CAUTION

- ●Whenever to complete the setting, push ACK / ENT switch④. Changed setting is not updated unless pushing ACK / ENT switch④.
- (21) Warning regarding system selection (See page 3-16.)

△ CAUTION

- System selection (switching) may cause large change of the true heading. During the automatic steering, once turn the steering mode of the automatic steering system to "MANUAL" to prevent a large course changing, and after confirming surrounding safety of own ship, turn to "AUTO" steering again.
- (22) Warning regarding monitoring in running (See page 3-17.)

riangle Caution

Change of the ship's speed input system and the latitude input system, or large change of the ship's speed and the latitude, may cause large change of the gyrocompass true heading.

During the automatic steering, once turn the steering mode of the automatic steering system to "MANUAL" to prevent a large course changing, and after confirming surrounding safety of own ship, turn to "AUTO" steering again.

(23) Warning regarding confirmation of the latitude (See page 3-18.)

△ CAUTION

- Change of the latitude input system or large change of the latitude may cause large change of the true heading. During the automatic steering, once turn the steering mode of the automatic steering system to "MANUAL" to prevent a large course changing, and after confirming surrounding safety of own ship, turn to "AUTO" steering again.
- (24) Warning regarding confirmation of the ship's speed (See page 3-18.)

⚠ CAUTION

◆ Change of the ship's speed input system or large change of the ship's speed may cause large change of the true heading. During the automatic steering, once turn the steering mode of the automatic steering system to "MANUAL" to prevent a large course changing, and after confirming surrounding safety of own ship, turn to "AUTO" steering again. (25) Warning regarding system selection (See page 3-19.)

△ CAUTION

- System selection (switching) may cause large change of the true heading. During the automatic steering, once turn the steering mode of the automatic steering system to "MANUAL" to prevent a large course changing, and after confirming surrounding safety of own ship, turn to "AUTO" steering again.
- (26) Warning regarding Operation procedure of master compass power switch (Option) (See page 3-19.)

△ CAUTION

●DO NOT touch the master compass power switch while the gyrocompass runs normally to prevent the sensitive element from serious damage which may cause reducing the life time or unexpected trouble.

The master compass power switch must be operated only when the master compass is in abnormal condition.

(27) Warning regarding alert (See page 3-20.)

△ CAUTION

- ●When the following alerts are generated, the heading information from this system may not be outputted at all or may have large error.
 - All units operated by the heading information from this system (in particular, the automatic steering system, etc.) should be immediately operated according to the individual emergency operating procedure.
- (28) Warning regarding countermeasures when GNSS communication abnormality is generated (See page 3-24.)

riangle Caution

- ●When an alert related to GNSS (alert code "c" or "d") is generated and the true heading of the gyrocompass has not been determined, once turn the steering mode to "MANUAL" or "Non Follow Up", then determine the true heading because erroneous heading information (repeater signal and serial signal) is possible to be outputted to the outside. Refer to "3.4.5 (2) Countermeasures when GNSS communication abnormality is generated" in Chapter 3 Operating Method, for determination method of the true heading.
- (29) Warning regarding countermeasures when GNSS communication abnormality is generated (See page 3-24.)

● Determination of the true heading may cause large change of the outputted heading information. During the automatic navigation, great care should be taken because large course change may be happened.

(30) Warning regarding countermeasures when external heading sensor related communication abnormality is generated (See page 3-24.)

●When an alert related to the external heading sensor (alert code "E", "F", "L" and "n") is generated, the heading information (repeater signal and serial signal) immediately before the alert was generated is outputted to the outside.

Once turn the steering mode to "MANUAL" or "Non Follow Up", and then determine the true heading.

After the true heading is determined, the heading of this system is outputted to the outside.

(31) Warning regarding countermeasures when external heading sensor related communication abnormality is generated (See page 3-24.)

△ CAUTION

- Determination of the true heading may cause large change of the outputted heading information. During the automatic navigation, great care should be taken because large course change may be happened.
- (32) Warning regarding countermeasures when LOG (serial signal) communication abnormality is generated (See page 3-25.)

△ CAUTION

•When an alert related to LOG (serial signal) (alert code "P" or "U") is generated and the true heading of the gyrocompass has not been determined, once turn the steering mode to "MANUAL" or "Non Follow Up", then determine the true heading because erroneous heading information (repeater signal and serial signal) is possible to be outputted to the outside.

Refer to "3.4.5 (4) Countermeasures when LOG (serial signal) communication abnormality is generated" in Chapter 3 Operating Method, for determination method of the true heading.

(33) Warning regarding Countermeasures when LOG (serial signal) communication abnormality is generated (See page 3-25.)

↑ CAUTION

● Determination of the true heading may cause large change of the outputted heading information. During the automatic navigation, great care should be taken because large course change may be happened.

(34) Warning regarding countermeasures when LOG (contact) abnormality is generated (See page 3-26.)

CAUTION

■When an alert related to LOG (contact) (alert code "u") is generated and the true heading of the gyrocompass has not been determined, once turn the steering mode to "MANUAL" or "Non Follow Up", then determine the true heading because erroneous heading information (repeater signal and serial signal) is possible to be outputted to the outside.

Refer to "3.4.5 (5) Countermeasures when LOG (contact) abnormality is generated" in Chapter 3 Operating Method, for determination method of the true heading.

(35) Warning regarding troubleshooting (See page 4-1.)

- ●When an alert is generated, immediately confirm content of the generated alert and take suitable measures according to "4.3 Countermeasures" in this chapter.
- ●When failure has generated, confirm surrounding safety and perform checking and required measures at non-dangerous sea area, stopping the ship as a rule.
- (36) Warning regarding countermeasures (See page 4-2.)

⚠ CAUTION

- ■Before checking and replacement of fuses, and disconnecting / connecting of each unit, connector, printed circuit, terminal cable, turn "OFF" the power switch of the operating panel, and further disconnect the power cable from the ship's distribution board, etc. It may cause electric shock and failure if left "ON" position.
- (37) Warning regarding failure phenomena and countermeasures (See page 4-2.)

⚠ CAUTION

- •Whenever the internal setting of the system is changed, follow our service engineer's instruction.
- ●When other malfunction than appeared in this clause is generated or the replaced fuse has blown again, turn "OFF" the power switch of the operating panel, disconnect the power cable from the ship's distribution board and request our service engineer's repair.
- ●When a failure is has occurred and it has not been repaired according to this clause, turn "OFF" the power switch of the operating panel and request our service engineer's repair on making a call to the port. Also even when it was repaired according to "4.3.2 Failure and countermeasures" in this chapter, request our service engineer's checking in a like manner on making a call to the port.

(38) Warning regarding power supply abnormality (alert code "1") (See page 4-3.)

△ CAUTION

- Fully pay attention to electric shock when checking the power supply.
- ●When checking fuses, turn "OFF" the power switch on the operating panel and further disconnect the power cable from the ship's distribution board before checking fuses.
- (39) Warning regarding Inverter abnormality (alert code "3") (See page 4-7.)

△ CAUTION

- ●When checking fuses, turn "OFF" the power switch on the operating panel and further disconnect the power cable from the ship's distribution board when checking fuses.
- (40) Warning regarding rotor level abnormality (alert code "6") (See page 4-7.)

⚠ CAUTION

- ●When an alert code "6" is generated, the gyrocompass true heading may have error. Turn the steering mode to "MANUAL" then determine the true heading to prevent course turning with larger angle.
- (41) Warning regarding zero cross abnormality (alert code "8") (See page 4-7.)

⚠ CAUTION

- Determination of the gyrocompass true heading during alert code "8" is generated may cause a large change of the true heading. During automatic navigation, great care should be taken because large course change may be happened
- (42) Warning regarding master compass heading abnormality (alert code "G") (See page 4-11.)

↑ CAUTION

●When an alert code "G" is generated, the gyrocompass true heading may have error. And new input of the true heading may cause a large change of the true heading. During automatic navigation, once turn the steering mode to "MANUAL" then determine the true heading to prevent course turning with larger angle, and after confirming surrounding safety of own ship, turn to "AUTO" steering again.

(43) Warning regarding the gyrocompass does not operate, if turned "ON" the power switch on the operating panel turned "ON". (See page 4-12.)

△ CAUTION

- Fully pay attention to electric shock when checking the main power supply.
- ●When checking fuses, turn "OFF" the power switch on the operating panel and further disconnect the power cable from the ship's distribution board before checking fuses.
- (44) Warning regarding each repeater does not operate. (See page 4-13.)

△ CAUTION

- ■When checking fuses, turn "OFF" the power switch, and further disconnect the power cable from the ship's distribution terminal board.
- (45) Warning regarding all repeaters does not operate. (See page 4-13.)

△ CAUTION

- ■When checking fuses, turn "OFF" the power switch, and further disconnect the power cable from the ship's distribution board.
- (46) Warning regarding maintenance and check (See 5-1.)

⚠ CAUTION

- Main units of this system consist of electronic circuits having high reliability. However, it is impossible to say that no failure should happen.
 - Accordingly, the check and maintenance described in this chapter should be sincerely carried out to remove failure risk as much as possible and to maintain the system performance. Otherwise, detection of the failure sign will be delayed and may cause distress such as collision or grounding.
- Request our service engineer when trouble is detected and cannot be repaired on board.

PREFACE

- 1. This manual provides safety-related precautions and outline of this system, and includes detailed information on specifications, construction, operation, troubleshooting and countermeasures, etc.
 - (1) Please use this system correctly with a full understanding.
 - (2) The readers (operators) of this manual are assumed to be qualified persons according to Japanese governmental law for ship's officers (ships under Japanese flag) or the corresponding laws.
 - (3) Only qualified persons described in the above (2) or persons under the supervision of the qualified person can handle this system. Do not have other persons handle this system.

2. Items to be observed with respect to the manual

Items to be observed with respect to the manual are as follows.

- Please read this manual carefully.
 Important items are described in this manual and it should thoroughly be read.
- (2) Maintain this manual with care.
 - This manual is very important for handling this equipment. Keep it at hand for reference whenever needed. Assign a person in charge of maintaining this manual and fixed location for storage.
 - Relevant drawing for the finished plan of this system should be maintained together.
- (3) This manual should be provided to the personnel actually handling the equipment. Distributors, etc. should insure that these people receive this manual.
- (4) Replace manual at once if lost.
 If the manual is lost, request TOKYO KEIKI or our sales agency. A replacement manual can be supplies at charge.
- 3. When the warning labels become dirty or detached, request TOKYO KEIKI. Replacement labels can be supplied at charge.

4. Prohibitions and notations for protection of the system (prevention from damage of the product itself and maintenance of quality).

The following items should be observed for protection of this system. For details, see corresponding pages of this manual.

Prohibitions - - - Items to be prohibited

(1) Prohibition regarding insulation test (See page 5-1.)

PROHIBITION

Do not use insulation tester or other device to test system insulation as it will damage internal electrical components.

Always disconnect the wirings connected to this system before testing related power distribution lines with such testers.

Notations - - - Items to be noted

(1) Notation regarding to storage (See page 5-7.)

NOTE

Observe the following items for storage.

- (1) Turn all power switches of this system to OFF position to disconnect the power.
- (2) Storage temperature should be between –20°C to +55°C. Avoid the place with high humidity as much as possible. High humidity may cause rust.
- (3) Prevent the storage place from generation of corrosive gas, breeding of bacteria such as mold or intrusion of insects and small animals.
- (4) Cover the system with a plastic sheet, etc., when generation of dust is foreseen. When welding works, etc., are carried out near this system, be sure to mount a suitable protection cover on the system to prevent damage caused by spark, etc.

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CHAPTER 1 GENERAL DESCRIPTIONS

⚠ WARNING

- Improper operations caused by failure of this system or malfunctions caused by operator's misunderstanding may cause distress such as collision and grounding, and may result in property damages and environmental pollution. Further, death or serious injury may happen.
- Full attention should be paid on use of this system by understanding limitations in performance or characteristics of this system and by familiarizing with operation methods.

⚠ CAUTION

 This system displays gyrocompass heading and outputs the heading information to the outside.

Although the safety design such as the alert function against failure, etc., is provided, there is no perfect safety design at the present time.

In addition, as this system has many important functions, it is hard to say that any one can use this system without failure.

Failures or malfunctions of this system may cause distress, and full attention should be paid on use of this system.

User's responsibility and obligation in insuring safe navigation and the proper exercise of navigational techniques is in no way reduced by the use of this equipment.

The following cautions should be observed.

- 1. Always perform daily check to maintain normal system condition.
- 2. When anomalies are detected in the result of daily check, investigate and repair at once to recover to normal conditions and request advice of our service engineer.
- 3. When the alert system operates during use, always check to confirm the cause and recover the troubled point.

1.1 General

The gyrocompass Series TG-8100/8600, based on the gyrocompass TG-5000 / 6000 that has been actually used for many middle and large ships, provides increased rate of turn and rich input / output signals and the following features.

- (1) Function of automatic speed error correction
- (2) Digital signal processing (Conformed to International Standards IEC61162)
- (3) Long service life
- (4) Conformance to IMO Standards (Series TG-8100/Series TG-8600 for high speed ships)

This system is designed as a product line that enables to build up system configuration to meet various requirements of installed ships.

TG-8100/8600- I: One gyrocompass system (Minimum function, space saving)

-S: One gyrocompass system (Standard single gyrocompass)

For the above systems, -S and -D, the following types are provided depending on the output signal.

Step type : System mainly the step signal (repeater signal) used Serial type : System mainly the serial signal (repeater signal) used

1.2 Display and alert

Considering the navigational safety, various indicators and indicator lamps required for the system operation and alert function are built in the system.

These are concentrated and arranged on the operating panel.

1.3 Kinds of function

△ CAUTION

- ●When an alert related to GNSS (alert code "c" or "d") is generated and the gyrocompass true heading has not been determined, once turn the steering mode to "MANUAL" or "Non Follow Up", then determine the true heading because erroneous heading information (repeater signal and serial signal) is possible to be outputted to the outside. Refer to "3.4.5 (2) Countermeasures when GNSS communication abnormality is generated" in Chapter 3 Operation, for determination method of the true heading.
- ●When an alert regarding to LOG (serial) (alert code "P" or "U") is generated and the true heading of the gyrocompass has not been determined, once turn the steering mode to "MANUAL" or "Non Follow Up", then determined the true heading because the erroneous heading information (repeater signal and serial signal) is possible to be outputted to the outside. Refer to "3.4.5 (4) Countermeasures when LOG (serial) communication abnormality is generated" in Chapter 3 Operating Method, for determination method of the true heading.
- ●When an alert regarding to the log contact (alert code "u") is generated and the true heading of the gyrocompass has not been determined, once turn the steering mode to "MANUAL" or "Non Follow Up", then determine the true heading because erroneous heading information (repeater signal and serial signal) is possible to be outputted to the outside. Refer to "3.4.5 (5) Countermeasures when LOG contact abnormality is generated" in Chapter 3 Operating Method, for determination method of the true heading.
- ●When an alert regarding to the external heading sensor (alert code "E", "F", "L" and "N") is generated, the heading information immediately before the alert generated is outputted. Once turn the steering mode to "MANUAL" or "Non Follow Up", and then determine the true heading. Refer to "3.4.5 (3) Countermeasures when external heading sensor related communication abnormality is generated" in Chapter 3 Operating Method, for determination method of the true heading.
 - After the true heading is determined, this system's heading is outputted to the outside.
- ■When the system is switched, perform it after once turned the automatic steering system to "MANUAL" or "Non Follow Up" to prevent course turning with larger angle.

1.3.1 Step signal type repeater signal output function

This system can drive the ship's repeater by the step signal of the gyrocompass. Also even when the gyrocompass is operated by the emergency power supply, the connected repeater can be driven (Repeater backup function).

Refer to the finished plan maintained in the ship for details of the repeater.

When the external heading sensor signal is connected to this system (magnetic compass system, etc.), the repeater operates as follows when the system is switched. (Refer to "3.4.2 System Selection" in Chapter 3, for the system selection.)

When "GYRO" is selected: The step signal is outputted by the gyrocompass

true heading.

When "EXT" is selected : The step signal is outputted by the true heading of

the external heading sensor.

1.3.2 Serial signal type repeater signal output function

This system can drive the ship's repeater by the serial signal of the gyrocompass. Also even when the gyrocompass is operated by the emergency power supply, the connected repeater can be driven (Repeater backup function).

When this system's serial signal is not used for the repeater, the following serial signal can be outputted.

- (1) Output conformed to IEC61162-1 ed. 2
- (2) Output conformed to IEC61162-2

These signals can be individually set for each circuit.

Refer to the finished plan maintained in the ship for details of the repeater and the serial signal.

When the external heading sensor signal (the magnetic compass system, etc.) is connected to this system, the repeater operates as follows when the system is switched. (Refer to "3.4.2 System Selection" in Chapter 3, for the system switching.)

When "GYRO" is selected: The serial signal is outputted by the gyrocompass

true heading.

When "EXT" is selected : The serial signal is outputted by the true heading of

the external heading sensor.

1.3.3 Automatic steering function by this system

Automatic steering can be attained by this system when combined use with TOKYO KEIKI's automatic steering system series PR-9000/2000.

1.3.4 Rate of turn signal output function

The ship's rate of turn can be outputted as an analog signal from this system. Refer to the finished plan maintained in the ship for details of the analog signal.

Also, when the external heading sensor signal (the magnetic compass system, etc.) is connected to this system and the external heading sensor is selected as the system, the ship's rate of turn analog signal is not outputted.

1.3.5 Automatic speed error correction function

The system has functions to calculate speed error, inherent error to the /200gyrocompass, and to correct it automatically.

Required data of latitude and speed to calculate the speed error are selected and entered in the individual systems of {"GYRO" / "GNSS"} and {"LOG (contact signal)" / "LOG (serial signal)" / "GNSS" / "MANUAL"}.

(For the selection of latitude and ship's speed input system, operate according to "(4) Setting of the latitude input system and (7) Setting of the ship's speed input system" in Chapter 3 Operation, for 3.4.1 System Start-up.)

When "GNSS" is selected as the input system, the serial signal conformed to IEC61162-1 / IEC61162-1 ed. 2 is received.

When "LOG (serial signal)" is selected as the input system, the serial signal conformed to IEC61162 / IEC61162-1 ed. 2 is received.

Also other than "MANUAL" is selected as the input system, speed error correction can be performed in real time.

1.3.6 Timer start

The gyrocompass can be automatically started according to date and time set for the departure. (It can be set up to one month maximum)

For setting up the departure date and time, operate according to "(2) Setting of timer start time" in Chapter 3 Operation, for 3.4.1 Start.

1.3.7 Function by the external heading sensor

When the external heading sensor signal (the magnetic compass system, etc.) is connected to this system, the repeater signal (serial signal or step signal) can be outputted from this system by using the external heading sensor.

Also when the processing unit for the external heading sensor signal is built in this system as an option, the repeater signal (2 circuits for serial signal and 1 circuit for step signal) can be backup by using the external heading sensor even if the gyrocompass stops. (For the system selection, refer to "3.4.2 System Selection" in Chapter 3.)

1.3.8 Master compass running stop function (Optional)

When any abnormal condition or failure (as E-3/E-A is provided or true heading is largely unstable) occurs in the master compass, turn the "master compass power switch" in the steering stand or the control unit to OFF.

Then it enables to stop the master compass running and change the output of heading information to an external heading sensor if connected, for minimizing the loss of heading signal.

Note that while this switch is turned off, gyrocompass heading is out of use.

1.4 Warranty conditions

Warranty period : 12 months after delivery of this system

Warranty contents: TOKYO KEIKI will immediately undertake to repair this system

without charge in the event of breakdown, failure or defect caused clearly by TOKYO KEIKI's design, manufacturing or materials

supplied by TOKYO KEIKI.

Items to which warranty is not applied: Warranty is not applied to the following items:

- 1. Failures and malfunctions caused by misuse against the described maintenance, handling and operation procedures in the manual.
- 2. Failures and malfunctions caused from the repair performed by non-TOKYO KEIKI or the service company not specified by TOKYO KEIKI.
- 3. Reworked portion performed by user without relation to TOKYO KEIKI or failures and malfunctions caused by that reworked portion.
- 4. Indirect loss and the cause-and-effect relations loss generated by the failures of this system.
- 5. In case of force majeure such as earth quake, fire, etc.

Provided, however, that when other warranty provisions have been established separately in writing, those should have priority.

CHAPTER 2 SPECIFICATIONS AND CONFIGURATION

2.1 General

Configuration, specifications and structure of this system is explained in this chapter. As this manual does not include the items related to system installation, please refer to the separate finished plan maintained in the ship for the installation procedure.

2.2 Configuration

This system consists of the following units and the spare parts box.

1 ea. Master compass

1 ea. Control unit

1 ea. Spare parts box

(1 ea. Power supply unit) When one gyrocompass is separate type in the two

gyrocompasses system connected with Automatic

Steering System.

For shipment, the sensitive element in the master compass is packed separately.

CAUTION

●When this system is assembled in the automatic steering system stand (autopilot built-in), the master compass and each unit of the control unit are assembled in the steering stand and the sensitive element is separately packed.

2.3 Specifications

Refer to the finished plan maintained in the ship.

2.4 Names and functions of each portion

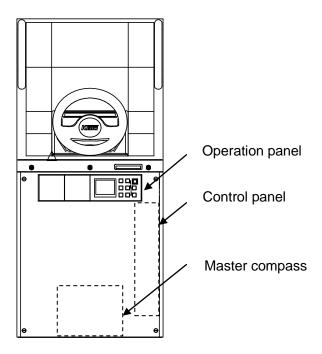
	- Hambe and randions of saon portion					
No.	Name	Function				
1.	Master compass (Figure 7.3)	The sensitive element is built-in. It is a unit to detect the ship's heading.				
2.	Control unit (Figure 7.1)	t is a unit having various indicators for true heading, latitude, rate of turn, ship's speed and alarms, and the operating switches.				
3.	Indicators (Figure 7.2®, ®)	It indicates operating conditions of this system and all setting values data. Indicated contents can be selected by the operating switches.				
4.	Operating switches (Figure 7.2②to ⑦)	They are used for all kinds of operation required for this system.				
5.	Power switch (Figure 7.21)	It is used to start and stop this system. The indicator lamp in the power switch goes lit when started.				

2.5 Mounting position of each unit

One example of the mounting position is show below.

Refer to the finished plan maintained in the ship.

 Mounting positions of the master compass, operating panel, power supply and control unit. (In case of PR-9000 automatic steering system)



2.6 Alert list

2.0	,	
Alarm code	Alarm content	Possible cause
"1"	Main power is abnormal	When the main power (AC power source) was lost.
"2"	Power is abnormal	When the power supply in the control unit went over-voltage or over-current.
"3"	Inverter is abnormal	When the inverter in the master compass went over-voltage or over-current.
"6"	Rotor level abnormally	When the "rotor" (sensitive element) in the master compass level abnormally.
"8"	Zero cross is abnormal	When the reference heading of the master compass was not detected properly or abnormality is generated in heading calculation.
"A"	System communication abnormality (1)	When abnormality is generated in communication function of the master compass.
"b"	System communication abnormality (2)	When abnormality is generated in communication function of the control unit.
"c"	GNSS communication break	When GNSS operation stopped or the serial signal from GNSS has stopped.
"d"	Abnormality of GNSS data	When abnormality is generated in the serial signal from GNSS.
"E"	System internal communication abnormality (1)	When the External heading sensor signal processing unit stopped its operation or the serial signal from the External heading sensor signal processing unit has stopped.
"F"	System internal communication abnormality (2)	When abnormality is generated in the serial signal from the External heading sensor signal processing unit.
"G"	Master compass heading abnormality	When abnormality is generated in the heading monitor signal of the master compass.
"L"	External heading sensor communication off	When the External heading sensor signal processing unit stopped its operation or the serial signal of the external sensor has stopped.
"n"	External heading Sensor data abnormality	When abnormality is generated in the serial signal from the External heading sensor.
"P"	LOG (serial) communication off	When the LOG stopped its operation or the serial signal from LOG has stopped.
"r"	E5V abnormality	When abnormality is generated in the power supply for the serial signal.
"U"	LOG (serial) data abnormality	When abnormality is generated in the serial signal from LOG.
"u"	LOG contact abnormality	When abnormality is generated in the LOG contact.

2.7 Alert list to meet the requirements of Alert Management system(AMS)

This system provides alert information which meets the specification of the Alert Management System.

The alert list below shows alert codes displayed on the operation panel of this system and the alert information to be noticed to Alert Management System.

Alert code On the operation panel	Alert code to meet AMS specification	Name of alert	Priority: 4	Category ※5	Remarks
「1」	10300	MAIN PWR FAIL	W	В	
Γ2J	10301	24R PWR FAIL	W	В	
[3]	10302	INVERTER FAIL	W	В	
۲4]	10303	CONT.PWR FAIL	W	В	
Г 5 Ј	10304	ROTOR FAIL	W	В	
[6]	10305	LEVEL FAIL	W	В	
[8]	10320	ZERO CROSS	W	В	
ΓΑΙ	10308	INNER COMM1	W	В	
ГbЈ	10309	INNER COMM2	W	В	
ГсJ	10310	GNSS COMM	W	В -	※ 1
ГdЈ	10311	GNSS DATA	W C	B -	※ 1
ΓEJ	10316	EXT SENSOR COMM	W	В	
[F]	10317	EXT SENSOR DATA	W	В	
ΓGJ	10319	STEP ERROR	W	В	
ſĹJ	10314	EXT UNIT COMM	W	В	
ГnЈ	10315	EXT UNIT DATA	W	В	
ГРЈ	10312	LOG COMM	W C	B -	※ 2
ΓrJ	10318	E5V FAIL	W	В	
لال	10313	LOG DATA	W C	B -	% 2
ГиЈ	10330	PLOG ERROR	W C	B -	* 3

^{※1 :} Alert priority is Warning if 「c」 and/or 「d」 alert activated while GNSS is selected for ship's latitude and speed sensor.

^{※2 :} Alert priority is Warning if 「P」 and/or 「U」 activated while Speed log (serial comm.) is selected for ship's speed.

^{*3:} Alert priority is Warning if 「u」 activated while Speed log (contact) is selected for ship's speed.

※4: Alert Priority

Alerts are provided with three levels of priority corresponding to alert descriptions: Alarm, warning and caution.

Alert priority		Description	Indication	Buzzer sound
High	A : Alarm	Alert requiring immediate attention and action. (The operator should stop the automatic steering and switch to the manual steering because the steering by the system may be unavailable)	Red	Sound three times with short sounds "beep beep beep". It repeats every seven seconds unless pressing ACK key.
Middle	W : Warning	Alert not requiring immediate action but immediate attention. (After acknowledging the alert displayed on the system, take measures depending on the situation. Some alerts escalate to alarms if acknowledging after a certain time.	Yellowish orange	Sound twice with short sound "beep beep". It repeats every 60 seconds until pressing ACK key.
Low	C: Caution	Alerts not falling under alarm and warning. (The alert does not have an influence on the current steering. Recover it before switching the steering mode from the manual to the automatic steering.)	Yellow	None

Note: This equipment has no alert which priority is specified as alarm level.

※5: The description of Categories

Category A: Alert which allows an operator to acknowledge (ACK operation) alerts activated in the system only by operating the system.

Category B: Alert which allows an operator to acknowledge (ACK operation) alerts activated on the system by operating either the system or external equipment (CAM-HMI)

Note: This equipment has no Category A alert.

CHAPTER 3 OPERATING METHOD

- There are matters to be attended in starting of this system and operations during running. These matters are described in each related item in this chapter with CAUTION or WARNING, etc., which should always be observed.
- ■Read the Operator's Manual of the automatic steering system carefully preparing for occurrence of trouble or alert in this system, and the emergency steering method should be well understood to treat such matters smoothly.

3.1 General

In this chapter, procedure of operation, start and stop of this system are explained.

Before operation, confirm that each unit of the master compass and the control unit are properly installed.

For the automatic steering system, read carefully the related Operator's Manual in separate volume supplied by the manufacturer, and perform appropriate preparation and handling before its operations.

3.2 Operating panel

For position and details of the operating panel, read explanation of this chapter referring to Figure 7.1 and Figure 7.2 attached in the end of this manual.

Also for the cases of the automatic steering system built-in type and the console built-in type, confirm the operating panel position by referring to the finished plan of the ship.

3.2.1 Explanation of the operating panel

1) Power switch / Power indicator

It is used to start or stop this system.

By pushing this switch after opened the cover, it starts.

After started, close the cover not to push inadvertently.

2 DISP switch

It is used to select the indicated item and the indicated data.

By pushing this switch, data is indicated in order.

By pushing this switch with pressing ACK/ENT switch 4, data is indicated in reverse order.

For the indicated data, refer to explanation of data indicator (8) and mode indicator (9).

3 SET switch

It is used to change data and to change the input system.

Data can be changed for the following items.

Gyrocompass true heading / ship's speed / latitude / rate of turn

Input system can be changed for the following indicated items. *1

Ship's speed (MANUAL, GNSS, LOG and LOG (serial signal))

Latitude (GYRO and GNSS)

4	ACK/ENT	switch

It determines the changed data and the changed input system.

When an alert has been generated, pushing this switch causes the alert buzzer to stop.

⑤ Switches of △ and ▽

They are used to change data and to change the input system.

Normally they are used to adjust illumination of the indicator.

△ : It goes brighter.▽ : It goes darker.

Simultaneous pushing the both switches is used for lamp test.

The data indicator, the mode indicator and all lamps go lit and it buzzes in the lamp test.

6 System selection switch (GYRO)

It is used to select the system.

"GYRO" system is select.

For the system selection, refer to "3.4.2 System selection" in this chapter.

System select switch (EXT)

It is used to select the system.

"External heading sensor" system is selected.

For the system select, refer to "3.4.2 System selection" in this chapter.

8 Data indicator and 9 Mode indicator

Data indicator (4 figures, 7 segments red LED) : Data is displayed.

Mode indicator (3 figures, 7 segments green LED) : Kind of displayed data is

displayed.

Note:

When the rotor is in stop state, the dot of right end of the mode indicator is lit.

When the rotor is in running state, it is blinking.

When in the follow up state, it is extinguished.

^{*1} Selectable system is different depending on the system type connected to this system.

(10) Alert indicator

Alert status is displayed. When an alert is generated, it goes blinking.

After ACK/ENT switch is pushed, it is still lit if alert state is continued and goes off if alert state was restored.

System select indicator
 Selected system is displayed.

3.2.2 Indication

(1) True heading 1: The true heading of the sensor selected as system, either the gyrocompass true heading or the external heading sensor true heading, is displayed.

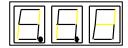
For the system selection, refer to "3.4.2 System Selection" in this chapter.

The indicated data in the data and mode indicators are shown below depending upon the system selection.

System	Headin	N O . 1	G YRO indication	N O . 2	G Y R O in dication
s e le c t io n	пеацііі	Data indicat	or Mode indicato	nData indicat	or Mode indicato
NO.1 GYR	123.4	123.4		234.5	
NO.2 GYR	234.5	123.4		234.5	
External H e a d in g	345.6	345.6		345.6	

Note:

- Only shaded areas are indicated for one gyrocompass system.
- The meaning of a display of a "mode indicator" is the following.



S.S.G = Steering Sensor. Gyrocompass



S.S.E = Steering Sensor. External sensor



Gyt = \underline{Gy} rocompass \underline{t} rue heading

 When GNSS communication abnormality, LOG (serial signal) communication abnormality or LOG (contact) abnormality is generated, the data indicator is blinking.

At this time, if "GYRO" system is selected, operate according to "3.4.5 (2) Countermeasures when GNSS communication abnormality is generated", "3.4.5

(4) Countermeasures when LOG (serial signal) communication abnormality is

generated" or "3.4.5 (5) Countermeasure wen LOG (contact) communication abnormality is generated" in Chapter 3 Operating Method, because the true heading determination is required.

•When communication abnormality with "the external heading sensor" is generated, the data indicator is blinking.

At this time, if "External heading sensor" system is selected, operate according to "3.4.5 (3) Countermeasures when the external heading sensor related communication abnormality is generated" because the true heading determination is required.

(2) True heading 2: The true heading of the sensor not selected as system, either the gyrocompass true heading or the external heading sensor true heading, is displayed.

System	H e a d in	N O .1 (G YRO indication	N O . 2	G YRO indication
se le ctio n	пеацііі	Data indicat	or M ode indicato	r Data indicat	or M ode indicato
NO.1 GYR	0123.4	345.6		345.6	
NO.2 GYR	234.5	345.6		345.6	
External H e a d in g	345.6	123.4		234.5	

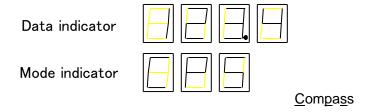
Note:

- Only shaded areas are indicated for one gyrocompass system.
- The meaning of a display of a "mode indicator" is the following.



ESt = External Sensor true heading

- When communication abnormality with "External heading sensor" is generated, the data indicator is blinking.
- (3) Master heading: Master compass heading is displayed.



	Data indicator		
	Mode indicator		<u>La</u> titude. <u>N</u> orth
			This shows the north latitude.
	For the south latitude, it	is shown below.	
	Mode indicator		<u>La</u> titude. <u>S</u> outh
			This shows the south latitude.
	Note: When GNSS commodified blinking.	unication abnormality is	generated, the data indicator goes
(5)	• •	ship's speed is displayed is when the ship's speed	
	Data indicator		
	Mode indicator		<u>G</u> nss. <u>S</u> pee <u>d</u>
	 When the ship's sp 	peed input system is "MA	NUAL".
	Mode indicator		Hand. <u>Speed</u>
	 When the ship's sp 	peed input system is "LO	G".
	Mode indicator		<u>L</u> og. <u>S</u> pee <u>d</u>
	When the ship's sp	peed input system is "LO	G (serial signal)".
	Mode indicator		<u>S</u> erial. Log <u>S</u> pee <u>d</u>
	Note:		
		munication abnormality is	generated, the data indicator goes
	•	,	ted, the data indicator goes blinking. d, the data indicator goes blinking.
		-	·

Latitude: Latitude of the place where the ship is at present is displayed.

Indicated example) Present latitude is 36 degree 50 minute north.

(4)

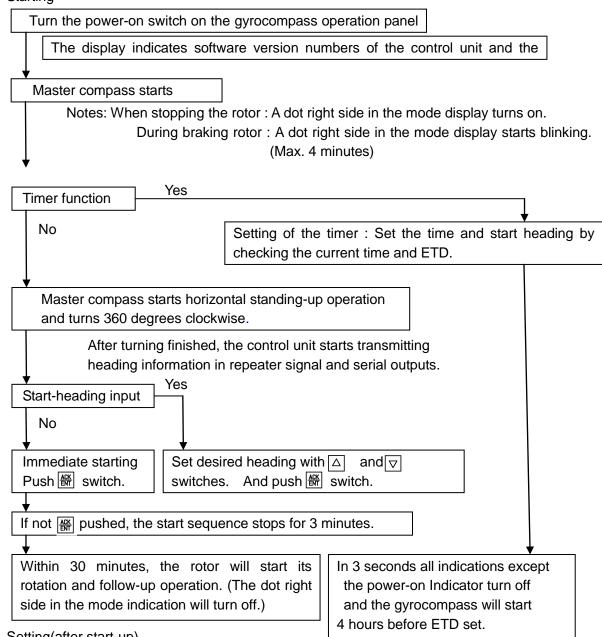
(6)	Rate of turn : Current ship's turn rate is displayed.
(0)	Unit of the indicated rate of turn is in degrees / minutes.
	The following example shows right turn with 30 degree / minute.
	Data indicator
	Mode indicator Rate. of turn
	Note:
	 The data indicator shows bar indication (blinking) until the master gyrocompass starts to follow up or when "External heading sensor" system is selected. When the ship makes left turn, the mode indicator shows minus sign (-) is indicated in the right end.
(7)	Alert content: Alert content generated in the gyrocompass is displayed by alert code.
	For the alert code indication, refer to "3.4.5 Alert" in this chapter.
	• When alerts are not generated.
	Data indicator
	Mode indicator
	When an alert is generated.
	Alerts are displayed in the data indicator (8) in the generated order from the left as shown below.
	The following example shows that alerts of alert code 1, 2 and 3 were generated in the order.
	Data indicator
	Mode indicator Error
	Where alert codes indicated at the same time are up to 4.
	If the indicated fourth place dot is extinguished, it shows that more than 5 alerts were
	generated. Example) When alerts of alert code 1, 2, 3, c and d were generated in the order.
	In this case, not-indicated alert code can be confirmed by pushing []
	switch as shown below.
	To return to the previous indication, push

3.3 Start and Stop Sequence

This system operates in the sequence shown below.

For each operation in the sequence, refer to "3.4 Start and Running" and "3.5 Stop" in this chapter.

1. Starting



2. Setting(after start-up)

Latitude setting :Confirm the latitude indication and set again if necessary.

Speed setting :Confirm the speed indication and set again if necessary.

Repeater synchronization :Synchronize each repeater

3. Setting (Just before the departure or 6 hours or more after starting)

Item 2 above :Reconfirm

Heading error correction : Fixed error can be corrected in output heading if necessary.

4. Alert

If any alert is provided, check the alert code and push switch.

5. System selection(Gyrocompass to be selected normally)

System selection (switching) may cause large change of the true heading. During the automatic steering, once turn the steering mode of the automatic steering system to "MANUAL" to prevent a large course changing, and after confirming surrounding safety of own ship, turn to "AUTO" steering again.

Select the gyrocompass : While pushing $\begin{tabular}{ll} \begin{tabular}{ll} \begi$

Repeater synchronization: Synchronize the each repeater indication with the selected true heading information. *1

6. Stop

Turn the each repeater switch to OFF and turn the power-on switch on the gyrocompass operation panel to OFF.

▼ Gyrocompass stops.

^{*1:} When repeater is a serial signal type, this operation is not required because it will synchronize automatically, however, confirm that the indicated value coincides with "the true heading" selected by this system after the repeater switch turned "ON".

3.4 Start and running

3.4.1 Start

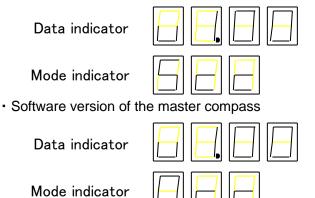
. i Start		
	\triangle	CAUTION
●Start this system after turn	ned the a	utomatic steering system to other mode than "AUTO".

(1) Power turning ON

Push the power switch ① of the operating panel.

System software version number of the control unit and the master compass are indicated in order as shown below.

- Software version of the control unit



After turned ON the power, confirm that the rotor stops. The master compass is rotate clockwise 360° . (Last azimuth operation)

(2) Setting of timer start time *1

1. Indication automatically moves to current date and time indication after the power turning ON and software version number indicate finished.

The following example shows that current date and time is 9 am of the day 22.



2. To change the current date and time, set it by pushing △ or ▽ switch⑤ Then, determine them by pushing ACK/ENT switch④.

Only push ACK/ENT switch if the current date and time are not changed.

^{*1:} For the case where this function is not included, after indicating SOftWare version, it become the indication which set up a start heading.

Data indicator
Mode indicator SET. time
 Set the departure date and time by pushing
 Indication automatically moves to start heading setting. Set the start heading. Refer to "3.4.1 Start (3) Setting of start heading" in this chapter.
 The set departure date and time are displayed for 3 seconds after the start heading setting. Then, all indications are extinguished except the power switch and the timer is started. Note: This system will start as automatically finishing last azimuth operation and turning to the set heading 4 hours before the set date and time.
(3) Setting of start heading. After Software version number is indicated for the case without timer start function, or after departure date and time is indicated for the case with timer start function, the indicator becomes "start heading input" indication as shown below.
Data indicator
Mode indicator Initial heading
 Set the start heading by pushing △ or ▽ switch⑤. Determine the entered value by pushing ACK/ENT switch④. The indicator indicates the gyrocompass true heading and the master compass turns to the entered heading. Note: When the system starts from the heading when the last azimuth operation completed, setting of "the start heading" is not necessary. However, push ACK / ENT switch④. If ACK/ENT switch④ is not pushed, this system automatically proceeds to the next sequence after 3 minutes.

3. Indication automatically moves to departure date and time indication.

(4) Setting of latitude input system

△ CAUTION

● Change of the latitude input system or a large change of latitude value may cause a large change of the true heading.

During the automatic steering, once turn the steering mode of the automatic steering system to "MANUAL" to prevent a large course changing, and after confirming surrounding safety of own ship, turn to "AUTO" steering again.

⚠ CAUTION

■When an alert related to GPS (alert code "c" or "d") is generated and the true heading of the gyrocompass has not been determined, once turn the steering mode to "MANUAL" or "Non Follow Up", then determine the true heading because erroneous heading information (repeater signal and serial signal) is possible to be outputted to the outside. Refer to "3.4.5 (2) Countermeasures when GNSS communication abnormality is generated" in Chapter 3 Operating Method, for determination method of the true heading.

■When "GYRO" is selected for the latitude input system, latitude is automatically updated by the ship's speed and the gyrocompass true heading. (When the ship's speed input system is "MANUAL", it is not updated automatically.) During navigation, confirm once in 2 hours that the ship's actual latitude coincides with the indicated latitude.

●Whenever to complete the setting, push ACK / ENT switch④. Changed setting is not updated unless pushing ACK / ENT switch④.

Let the indicators be to the following indication state by pushing DISP switch
 ②.

Data indicator	
Mode indicator	

2.	After pushed \square switch \square , select either "GNSS" or "GYRO" by pushing \square or \square switch \square .
	Every pushing of △ or ▽ switch⑤ caused blinking display of the following two
	kinds of data alternately as shown below.
	Input system: GYRO
	Input system: GNSS
2	Determine it by pushing ACK/ENT quitab (

- 3. Determine it by pushing ACK/ENT switch(4).
- 4. When "GYRO" was selected, as the latitude is displayed in the data indicator, set the latitude by pushing △ or ▽ switch⑤ and push again ACK/ENT switch

Hereafter calculated latitude by ship's speed and true heading is indicated.

- (5) Synchronization of the repeater compass *1 After the last azimuth operation completed, the repeater signal and the serial signal are outputted. Turn "OFF" each repeater switch and adjust it to the gyrocompass true heading, then turn "ON" the repeater switch.
- (6) Settling time

The time to "settled" requires approx. 6 hours maximum although it depends upon the starting condition.

^{*1:} When repeater is a serial signal type, this operation is not required because it will synchronize automatically, however, confirm that the indicated value coincides with "the true heading" selected by this system after the repeater switch turned "ON".

△ CAUTION

● Change of the ship's input system or large change of ship's speed may cause large change of the true heading.

During the automatic steering, once turn the steering mode of the automatic steering system to "MANUAL" to prevent a large course changing, and after confirming surrounding safety of own ship, turn to "AUTO" steering again.

△ CAUTION

•When an alert related to GNSS (alert code "c" or "d") is generated and the true heading of the gyrocompass has not been determined, once turn the steering mode to "MANUAL" or "Non Follow Up", then determine the true heading because erroneous heading information (repeater signal and serial signal) is possible to be outputted to the outside.

Refer to "3.4.5 (2) Countermeasures when GNSS communication abnormality is generated" in Chapter 3 Operating Method, for determination method of the true heading.

⚠ CAUTION

■When alert regarding to LOG (serial signal) (alert code "P" or "U") is generated and the true heading of the gyrocompass has not been determined, once turn the steering mode to "MANUAL" or "Non Follow Up", then determined the true heading because the erroneous heading information (repeater signal and serial signal) is possible to be outputted to the outside.

Refer to "3.4.5 (4) Countermeasures when LOG (serial) communication abnormality is generated" in Chapter 3 Operating Method, for determination method of the true heading.

△ CAUTION

•When alert regarding to LOG (contact) (alert code "u") is generated and the true heading of the gyrocompass has not been determined, once turn the steering mode to "MANUAL" or "Non Follow Up", then determined the true heading because the erroneous heading information (repeater signal and serial signal) is possible to be outputted to the outside.

Refer to "3.4.5 (5) Countermeasures when LOG (contact) communication abnormality is generated" in Chapter 3 Operating Method, for determination method of the true heading.

⚠ CAUTION

■The setting of the ship's speed input system (and its values for "MANUAL") is stored, and when re-started, the previous ship's speed system setting is restored and starts. When "MANUAL" is selected, stop after ship's speed setting is set to zero knot. Also, when turned off and on again with "GNSS" selected, confirm that GNSS is operating properly.

\wedge	CAUTION
Whenever to complete the setting updated unless pushing ACK/EN	, push ACK/ENT switch4. Changed setting is not
	n the following ship's speed indication state by pushin following example is when "GNSS" is selected for them.
Data indicator	
Mode indicator	
	_
Data indicator	
Mode indicator	
• Input system: GNSS	
Data Indicator	
Mode Indicator	
· Input system: LOG (contact signal)
Data indicator	
Mode indicator	
· Input system: LOG (serial signal)
Data indicator	
Mode indicator	

- 3. Determine it by pushing ACK/ENT switch 4.
- 4. When "MANUAL" was selected, ship's speed is indicated in the indicator. Then, set ship's speed by pushing

 or

 or

 switch

 switch

 again.
- (8) Setting of the "rate of turn filter constant"

●Whenever to complete the setting, push ACK / ENT switch④. Changed setting is not updated unless pushing ACK / ENT switch④.

 Let the indicators be in the following "rate of turn filter constant" indication state by pushing DISP switch 2.

Data indicator	
Mode indicator	

2. When the "rate of turn filter constant" is changed, push SET switch 3.

Data indicator	
Mode indicator	Rate of Turn Filter

- 3. Select the "filter constant" by pushing △ or ▽ switch⑤.

 The "filter constant" can be set to 0.5, 1 or 2 through 10 in 2 seconds step.
- 4. Determine it by pushing ACK / ENT switch 4.
- (9) Confirmation of the true heading

△ CAUTION

•When the gyrocompass true heading is set again, the repeater indication value and the serial signal gyrocompass true heading will change by the changed angle.
During the automatic steering, once turn the steering mode of the automatic steering system to "MANUAL" to prevent a large course changing, and after confirming surrounding safety of own ship, turn to "AUTO" steering again.

CAUTION Whenever to complete the setting, push ACK / ENT switch④. Changed setting is not updated unless pushing ACK / ENT switch④.

Confirm that the gyrocompass true heading indicated in this system coincides with the heading by some target or by observation.

If there is some deviation, set the gyrocompass true heading according to the following procedure.

Let the indicators be in the gyrocompass true heading indication state by pushing DISP switch ②.

2.	The indicator ch	anges to the	following by	pushing	SET switch	3, and	make	the
	setting by \triangle or	switch(5).			. <u></u>			
	Data indicator			<u> </u>				

Mode indicator

Offset heading

3. Determine it by pushing ACK/ENT switch 4.

Note:

The inputted offset is cleared when system turned off or when the master compass passed through the reference angle of master compass heading.

(10) True heading indication

After all settings are completed, let the indicators be in the true heading indication state by pushing DISP switch②. If it is in other indication than the true heading indication, it goes to the true heading indication if no switch operation for 30 seconds.

3.4.2 System selection

△ CAUTION

System selection (switching) may cause large change of the true heading. During the automatic steering, once turn the steering mode of the automatic steering system to "MANUAL" to prevent a large course changing, and after confirming surrounding safety of own ship, turn to "AUTO" steering again.

Normally use the system by selected the gyrocompass.

- (1) Turn "OFF" the repeater switch. *1
- (2) To select "GYRO" system, push the system selection switch GYRO switch with pressing ACK/ENT switch 4.

In the two gyrocompasses system, push the system selection switch GYRO 6 with pressing the ACK/ENT switch 4 on the operating panel of the gyrocompass to be selected.

To select "External heading sensor" system, push the system selection switch EXT switch with pressing ACK / ENT switch 4.

^{*1} When repeater is a serial signal type, this operation is not required because it will synchronize automatically, however, confirm that the indicated value coincides with "the true heading" selected by this system after the repeater switch turned "ON".

When changed system selection, it buzzes shortly three times.

- (3) Synchronize the repeater indication connected to this system with the selected system's heading. *1
- (4) Turn "ON" the repeater switch. *1

3.4.3 Monitoring in running

△ CAUTION

Change of the ship's speed input system and the latitude input system, or large change of the ship's speed and the latitude, may cause large change of the gyrocompass true heading.

During the automatic steering, once turn the steering mode of the automatic steering system to "MANUAL" to prevent a large course changing, and after confirming surrounding safety of own ship, turn to "AUTO" steering again.

Perform monitoring in running as follows.

(1) Confirmation of alert status

Confirm that the alert indicator lamp(1) on the operation panel is off.

When abnormality is generated in the system, the alert indicator lamp goes blinking and buzzes.

Confirm the alert code indicated in the indicator, and stop buzzer by pushing ACK/ENT switch 4.

If the alert indicator lamp is still on after pushed ACK/ENT switch 4, the abnormality continues.

(For the case that abnormality is momentary, the alert indicator lamp (1) is extinguished at the same time when pushed ACK/ENT switch (4).)

Take suitable countermeasures according to "3.4.5 Alert" in this chapter.

(2) Confirmation of the gyrocompass true heading

Confirm that the gyrocompass true heading indicated in this system coincides with the heading by some target or by observation.

If some variation exists, make correction according to "3.4.1 (9) Confirmation of the true heading" in this chapter.

^{*}¹ When repeater is a serial signal type, this operation is not required because it will synchronize automatically, however, confirm that the indicated value coincides with "the true heading" selected by this system after the repeater switch turned "ON".

△ CAUTION

- Change of the latitude input system or large change of the latitude may cause large change of the true heading. During the automatic steering, once turn the steering mode of the automatic steering system to "MANUAL" to prevent a large course changing, and after confirming surrounding safety of own ship, turn to "AUTO" steering again.
 - 1. When "GNSS" is selected as the latitude input system, the latitude obtained by GNSS is displayed.

Confirm that the latitude value indicated on GNSS coincides with the latitude value indicated on the indicator.

2. When "GYRO" is selected as the latitude input system and other than "MANUAL" is selected as the ship's speed input system, the latitude is automatically updated. In this case, confirm the indicated value at every occasion of berth (or anchor) and in the interval within 2 hours, and if the difference exists from the ship's actual latitude, set it again according to "3.4.1 Start (4) Setting of the latitude input system" in this chapter.

Note:

When "MANUAL" is selected as the ship's speed input system, the indicated latitude value is not updated.

Please enter the ship's actual latitude at every occasion of berth (or anchor) and in the interval within 2 hours.

(4) Confirmation of the ship's speed

△ CAUTION

◆ Change of the ship's speed input system or large change of the ship's speed may cause large change of the true heading. During the automatic steering, once turn the steering mode of the automatic steering system to "MANUAL" to prevent a large course changing, and after confirming surrounding safety of own ship, turn to "AUTO" steering again.

The gyrocompass generates error due to the ship's speed.

This system calculates error due to the ship's speed and corrected true heading is outputted to the external as repeater signal and serial signal.

Confirm that the indicated ship's speed coincides with the ship's actual speed in the interval within 2 hours, and if the difference exists from the ship's actual speed, set it again according to "3.4.1 Start (7) Setting of the ship's speed input system" in this chapter.

3.4.4 Operation procedure of master compass power switch (Option)

△ CAUTION

● System selection (switching) may cause large change of the true heading. During the automatic steering, once turn the steering mode of the automatic steering system to "MANUAL" to prevent a large course changing, and after confirming surrounding safety of own ship, turn to "AUTO" steering again.

riangle Caution

■DO NOT touch the master compass power switch while the gyrocompass runs normally to prevent the sensitive element from serious damage which may cause reducing the life time or unexpected trouble.

The master compass power switch must be operated only when the master compass is in abnormal condition.

IF any failure occurred in the master compass as providing alerts coded [E3/E-A], or unstable heading, turn OFF the master compass power supply switch located inside the steering stand or the control unit to stop the operation of the master compass.

An external heading sensor connected backs-up the gyrocompass heading by changing the heading sensor to keep transmitting the true heading information.

Heading information changeover is carried out as follows when the master compass is in failure condition.

See the Figure 7.11 for the position of master compass power-off switch.

When any abnormal condition or failure occurs in the master compass, operate the gyrocompass as follows.

(1) Operation procedure

- 1. See 3.4.2 System selection and change the heading output to external heading sensor system(GNSS compass or magnetic compass).
- 2. Turn the master compass power switch optionally provided in the steering stand or the control unit to OFF.
- 3. DO NOT turn the main power-on switch on the operation panel to OFF.
- 4. Although the alert code 「3」 or 「A」 will appear and be kept indicating, the output with the external heading sensor selected will be transmitted and kept on.

(2) Return procedure

- 1. Turn once the steering mode of the steering control system to HAND.
- 2. Turn the compass power switch of the operation panel to OFF.
- 3. Turn the Master compass power switch located either in the steering stand or in the control unit of the gyrocompass to ON.
- 4. Turn the power switch in the operation panel of the gyrocompass to ON.
- 5. Synchronize the repeater heading with the heading information provided from the external heading sensor as selected in (1) changeover procedure.
- 6. Note that the changeover to the gyrocompass heading should be done in about three hours after re-starting the gyrocompass.

3-20

7. Once the heading information is changed to the gyrocompass, synchronize the

heading of each repeater with the heading from the gyrocompass.

3.4.5 Alert

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<u> </u>	CAL	JII	U	N

●When the following alerts are generated, the heading information from this system may not be outputted at all or may have large error.

All units operated by the heading information from this system (in particular, the automatic steering system, etc.) should be immediately operated according to the individual emergency operating procedure.

This system generates alerts of the system by buzzer sound and indication of alert code.

When an alert is generated, confirm the alert code and push ACK/ENT switch to stop buzzer sound.

If the alert is momentary, the alert indicator goes off by pushing ACK/ENT switch . When the alert indicator did not go off by pushing ACK/ENT switch , it shows that the alert conditions continues.

When the alert conditions continue, confirm the alert code and take suitable countermeasures referring to "Chapter 4 Troubleshooting".

- (1) Alert content
 - 1. Power supply abnormality

Alert code:

It is alerted when the power supply for this system was lost.

2. Power supply unit abnormality

Alert code:

It is alerted when the control unit power supply shows over current or over voltage, or the power supply output goes off.

3. Inverter abnormality

Alert code:

It is alerted when the inverter unit in the master compass shows over current or over voltage.

4. Rotor level abnormality

Alert code:

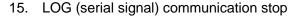
It is alerted when "rotor" (sensitive element) in the master compass level abnormally.

	Alert code:
h	t is alerted when reference angle (zero cross angle) of the master compass leading can not be detected properly or abnormality is generated in heading calculation.
6. \$	System communication abnormality (1) Alert code:
	t is alerted when abnormality is generated in the communication from the master compass to the control unit.
7. \$	System communication abnormality (2) Alert code:
	t is alerted when abnormality is generated in the communication from the control unit to the master compass.
8. (GNSS communication break Alert code:
V	t is alerted when the serial signal from GNSS stops or GNSS operation stops. When this alert is generated, operate according to "3.4.5 (2) Countermeasures when GNSS communication abnormality generated" in this chapter. Note: This alert is generated only when "GYRO" is selected as the system selection and "GNSS" is selected as the ship's speed input system or the latitude input system.
 	Alert code: It is alerted when abnormality is generated in the serial signal from GNSS. When this alert is generated, operate according to "3.4.5 (2) Countermeasures when GNSS communication abnormality generated" in this chapter. Note: This alert is generated only when "GYRO" is selected as the system
	selection and "GNSS" is selected as the ship's speed input system or the latitude input system.

5. Zero cross abnormality

10.	System internal communication abnormality (1) (Option)
	Alert code:
р	is alerted when internal communication from the external heading sensor signal processing unit built in this system to the gyrocompass operation processing unit in this system) stopped.
",	When "External heading sensor" is selected as system, operate according to 3.4.5 (3) Countermeasures when external heading sensor related ommunication abnormality is generated" in this chapter.
11. \$	System internal communication abnormality (2) (Option)
	Alert code:
e g	is alerted when abnormality is generated in internal communication from the external heading sensor signal processing unit built in this system to the pyrocompass operation processing unit (in this system). When "External heading sensor" is selected as system, operate according to
114	3.4.4 (3) Countermeasures when external heading sensor related communication abnormality is generated" in this chapter.
12.	Master compass heading abnormality
	Alert code:
	t is alerted when abnormality is generated in the monitor signal of the master compass heading.
13. I	External heading sensor communication stop
	Alert code:
1	It is alerted when the serial signal from the external heading sensor stopped or the external heading sensor stopped its operation. When this alert is generated, operate according to "3.4.5 (3) Countermeasures
	when external heading sensor related communication abnormality is generated" in this chapter.
14. l	External heading sensor data abnormality
	Alert code:
	It is alerted when abnormality is generated in the serial signal from the external heading sensor.
	When this alert is generated, operate according to "3.4.5 (3) Countermeasures

when external heading sensor related communication abnormality is generated" in this chapter.



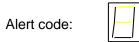
Alert code:

It is alerted when the serial signal from LOG (serial signal) stopped or LOG (serial signal) stopped its operation.

When this alert is generated, operate according to "3.4.5 (4) Countermeasures when LOG (serial signal) communication abnormality is generated".

Note: This alert is generated only when "GYRO" is selected in the system selection and "LOG (serial signal)" is selected as the ship's speed input system.

16. LOG (serial signal) data abnormality

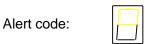


It is alerted when abnormality is generated in the serial signal from LOG.

When this alert is generated, operate according to "3.4.5 (4) Countermeasures when LOG (serial signal) communication abnormality is generated".

Note: This alert is generated only when "GYRO" is selected in the system selection and "LOG (serial signal)" is selected as the ship's speed input system.

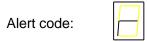
17. LOG (contact) abnormality



It is alerted when abnormality is generated in LOG (contact)

Note: This alert is generated only when "LOG" is selected for the ship's speed input system.

18. E5V abnormality



It is alerted when abnormality is generated in the power supply for the serial signal.

(2) Countermeasures when GNSS communication abnormality is generated

riangle Caution

●When an alert related to GNSS (alert code "c" or "d") is generated and the true heading of the gyrocompass has not been determined, once turn the steering mode to "MANUAL" or "Non Follow Up", then determine the true heading because erroneous heading information (repeater signal and serial signal) is possible to be outputted to the outside. Refer to "3.4.5 (2) Countermeasures when GNSS communication abnormality is generated" in Chapter 3 Operating Method, for determination method of the true heading.

⚠ CAUTION

Determination of the true heading may cause large change of the outputted heading information. During the automatic navigation, great care should be taken because large course change may be happened.

The true heading which is currently indicated and outputted to the external is the corrected value based on the corrected value immediately before GNSS alert was generated.

- 1. When "GNSS" is selected as the ship's speed input system, select the other mode than "GNSS".
 - (Refer to "3.4.1 (7) Setting of the ship's speed input system" in this chapter.)
- 2. When "GNSS" is selected as the latitude input system, select the other mode than "GNSS".
 - (Refer to "3.4.1 (4) Setting of the latitude input system" in this chapter.)
- 3. As the true heading indication is blinking showing the true heading calculated based on the changed ship's speed and latitude, determine this true heading by pushing ACK/ENT switch4.
- 4. The true heading indication goes lit and the true heading outputted to the external is also determined.
- (3) Countermeasures when external heading sensor related communication abnormality is generated

△ CAUTION

- ●When an alert related to the external heading sensor (alert code "E", "F", "L" and "n") is generated, the heading information (repeater signal and serial signal) immediately before the alert was generated is outputted to the outside.
 - Once turn the steering mode to "MANUAL" or "Non Follow Up", and then determine the true heading.
 - After the true heading is determined, the heading of this system is outputted to the outside.

● Determination of the true heading may cause large change of the outputted heading information. During the automatic navigation, great care should be taken because large course change may be happened.

When the alert related to the external heading sensor is generated, the true heading of the data indicator® is blinking.

The true heading which is currently indicated is the heading immediately before the alert was generated if the alert has been continued, and the heading currently received if the alert has been recovered.

When the alert is continued, the true heading cannot be determined.

The true heading outputted to the external is the heading immediately before the alert was generated.

- 1. Confirm that the alert related to the external heading sensor has been recovered.
- 2. Push ACK / ENT switch in the state where the true heading is indicated.
- 3. The external heading sensor true heading indication for the true heading goes lit, and the outputted true heading to the external is also determined true heading.
- (4) Countermeasures when LOG (serial signal) communication abnormality is generated

⚠ CAUTION

•When an alert related to LOG (serial signal) (alert code "P" or "U") is generated and the true heading of the gyrocompass has not been determined, once turn the steering mode to "MANUAL" or "Non Follow Up", then determine the true heading because erroneous heading information (repeater signal and serial signal) is possible to be outputted to the outside.

Refer to "3.4.4 (4) Countermeasures when LOG (serial signal) communication abnormality is generated" in Chapter 3 Operating Method, for determination method of the true heading.

● Determination of the true heading may cause large change of the outputted heading information. During the automatic navigation, great care should be taken because large course change may be happened.

When abnormality related to LOG (serial signal) is generated, the data indicator® is blinking.

The gyrocompass true heading and the heading information outputted to the external which are currently indicated, is the corrected value based on the ship's speed immediately before the alert was generated.

- 1. Select the other than "LOG (serial signal)" for the ship's speed input system. (Refer to "3.4.1 (7) Setting of the ship's speed input system.)
- 2. As the gyrocompass true heading calculated from the corrected ship's speed is blinking, determine the true heading by pushing ACK / ENT switch 4.
- 3. The true heading indication goes lit and the true heading outputted to the external is also determined.

(5) Countermeasures when LOG (contact) abnormality is generated

CAUTION

●When an alert related to LOG (contact) (alert code "u") is generated and the true heading of the gyrocompass has not been determined, once turn the steering mode to "MANUAL" or "Non Follow Up", then determine the true heading because erroneous heading information (repeater signal and serial signal) is possible to be outputted to the outside

Refer to "3.4.4 (5) Countermeasures when LOG (contact) abnormality is generated" in Chapter 3 Operating Method, for determination method of the true heading.

When abnormality related to LOG (contact) is generated, the data indicator® is blinking.

The gyrocompass true heading and the heading information outputted to the external which are currently indicated, is the corrected value based on the ship's speed immediately before the alert was generated.

- 1. Select the other than "LOG" for the ship's speed input system. (Refer to "3.4.1 (7) Setting of the ship's speed input system.)
- 2. As the gyrocompass true heading calculated from the corrected ship's speed is blinking, determine the true heading by pushing ACK / ENT switch 4.
- 3. The true heading indication goes lit and the true heading outputted to the external is also determined.

3.5 Stop

- (1) Turn "OFF" the switches of each repeater.
- (2) Turn "OFF" the power switch.

CHAPTER 4 TROUBLESHOOTING

△ CAUTION

- ■When an alert is generated, immediately confirm content of the generated alert and take suitable measures according to "4.3 Countermeasures" in this chapter.
- ●When failure has generated, confirm surrounding safety and perform checking and required measures at non-dangerous sea area, stopping the ship as a rule.

4.1 General

When any failure has generated in this system or in the connected external equipment, the following will be thought.

- (1) An alert is displayed in this system.
- (2) Abnormality exists in partial or all functions of this system.

4.2 Before troubleshooting

- (1) Secure the ship's safety first according to the emergency steering procedure of the automatic steering system. Then, it is required to identify where the failure cause locates, in this system side or in the external equipment side.
 - How to identify the failed side

Confirm the alert content according to "3.4.5 Alert" in Chapter 3 Operating Method.

- When the following alerts are displayed, the cause may locate in the external equipment or the connected line.
- •When the following alerts are displayed, the cause may locate in this system.

· E-G

• E-r

• E-1 • E-n • E-P

• E-2 • E-3

· E-d · E-U

• E-6

• E-E • E-u

• E-8

· E-F

• E-A

• E-L

- E-b
- (2) Tools (instruments) required for checking
 - Flat head screw driver and general tools
 - · Circuit tester

4.3 Countermeasures

△ CAUTION

■Before checking and replacement of fuses, and disconnecting / connecting of each unit, connector, printed circuit, terminal cable, turn "OFF" the power switch of the operating panel, and further disconnect the power cable from the ship's distribution board, etc. It may cause electric shock and failure if left "ON" position.

4.3.1 Measures when an alert is generated

- (1) When it buzzes to inform abnormality, confirm the alert indicator lamp® blinking and alert content indicated in the data indicator®.
 - Then, push ACK / ENT switch 4 to stop the buzzer.
- (2) If the alert indicator lamp goes OFF after pushed ACK / ENT switch , it shows that the abnormality has been removed and the system has been restored. In such case, wait a while to look if that alert repeats and then take suitable action from the result. Write down the setting values and the other data related to the alert, and various status conditions including sea state.
- (3) If the alert indicator lamp® goes continuously lit from blinking after pushed ACK / ENT switch®, it shows that the abnormality has still continued. In such case, confirm alert occurrence number and alert content from the data indicator® (Refer to "3.4.5 Alert" in Chapter 3 Operating Method), and check according to "4.3.2 Failure symptoms and countermeasures" in Chapter 3 Operating Method, seeing the indicated alert content.

4.3.2 Failure phenomena and countermeasures

When a failure has occurred, take the following countermeasures.

Also, if it was not repaired, please contact our service station or agency.

△ CAUTION

- •Whenever the internal setting of the system is changed, follow our service engineer's instruction.
- ●When other malfunction than appeared in this clause is generated or the replaced fuse has blown again, turn "OFF" the power switch of the operating panel, disconnect the power cable from the ship's distribution board and request our service engineer's repair.
- •When a failure is has occurred and it has not been repaired according to this clause, turn "OFF" the power switch of the operating panel and request our service engineer's repair on making a call to the port. Also even when it was repaired according to "4.3.2 Failure and countermeasures" in this chapter, request our service engineer's checking in a like manner on making a call to the port.

(1) Power supply abnormality (alert code "1")

△ CAUTION

- Fully pay attention to electric shock when checking the power supply.
- ●When checking fuses, turn "OFF" the power switch on the operating panel and further disconnect the power cable from the ship's distribution board before checking fuses.
 - Confirm power applying state of the power supply.
 Confirm the automatic steering system type according to the finished plan of this ship.
 - 1-1. One gyrocompass system
 - (1) Stand alone type (Model TG-8100/8600-S)

The system where both of the master compass and the control unit are not built in the automatic steering system.

Input terminals of the main power supply (between 1AC1 and 1AC2 of the external terminal board TB101 in the control unit)

Voltage: 100 / 110 / 115 / 220 V AC, within $\pm 10 \%$

Frequency: 50/60 Hz, within $\pm 5\%$

Input terminals of the emergency power supply (between 1B+ and 1B- of the external terminal board TB101)

Voltage: 24 V DC, within -20 % to +30 %

(2) Automatic steering system built-in type ①(Model PR-9□1□D / PR-9□1□E)

The system where both of the master compass and the control unit are built in the automatic steering system.

Input terminals of the main power supply (between 1AC1 and 1AC2 of the external terminal board TB101 in the control unit)

Voltage: 100 / 110 / 115 / 220 V AC, within $\pm 10 \%$

Frequency: 50/60 Hz, within $\pm 5\%$

Input terminals of the emergency power supply (between 1B+ and 1B- of the external terminal board TB101)

Voltage: 24 V DC, within -20 % to +30 %

1-2. Two gyrocompasses system

(1) Stand alone type (Model TG-8100/8600-D)

The system where the master compass and the control unit for two gyrocompasses are not built in the automatic steering system.

No. 1 gyrocompass side

Input terminals of the main power supply (between 1AC1 and 1AC2 of the external terminal board TB101 in the control unit)

Voltage: 100 / 110 / 115 / 220 V AC, within $\pm 10 \%$

Frequency: 50/60 Hz, within $\pm 5\%$

Input terminals of the emergency power supply (between 1B+ and 1B- of the external terminal board TB101 in the control unit)

Voltage: 24 V DC, within -20 % to +30 %

No. 2 gyrocompass side

Input terminals of the main power supply (between 2AC1 and 2AC2 of the external terminal board TB201 in the control unit)

Voltage: 100 / 110 / 115 / 220 V AC, within $\pm 10 \%$

Frequency: 50/60 Hz, within $\pm 5\%$

Input terminals of the emergency power supply (between 2B+ and 2B- of the external terminal board TB201 in the control unit)

Voltage: 24 V DC, within -20 % to +30 %

(2) Automatic steering system built-in type ②

(Model PR-9□37D, PR-9□47D, PR-6□37E and PR-9□47E)

The system where two gyrocompasses are built in the automatic steering system.

No. 1 gyrocompass side

Input terminals of the main power supply (between 1AC1 and 1AC2 of the external terminal board TB101 in the control unit)

Voltage: 100 / 110 / 115 / 220 V AC, within $\pm 10 \%$

Frequency: 50/60 Hz, within $\pm 5\%$

Input terminals of the emergency power supply (between 1B+ and 1B- of the external terminal board TB101 in the control unit)

Voltage: 24 V DC, within -20 % to +30 %

No. 2 gyrocompass side

Input terminals of the main power supply (between 2AC1 and 2AC2 of the external terminal board TB101 in the control unit)

Voltage: 100 / 110 / 115 / 220 V AC, within $\pm 10 \%$

Frequency: 50/60 Hz, within $\pm 5\%$

Input terminals of the emergency power supply (between 2B+ and 2B- of the external terminal board TB101 in the control unit)

Voltage: 24 V DC, within -20 % to +30 %

(3) Automatic steering system built-in type ③

(Model PR-9□32D, PR-9□42D, PR-9□32E and PR-9□42E)

The system where one gyrocompass out of two is built in the automatic steering system, and the power supply unit for No. 2 master compass and No. 2 gyrocompass is separated

No. 1 gyrocompass side

Input terminals of the main power supply (between 1AC1 and 1AC2 of the external terminal board TB101 in the control unit)

Voltage: 100 / 110 / 115 / 220 emergency V AC, within $\pm 10 \%$

Frequency: 50/60 Hz, within $\pm 5\%$

Input terminals of the power supply (between 1B+ and 1B- of the external terminal board TB101 in the control unit)

Voltage: 24 V DC, within -20 % to +30 %

No. 2 gyrocompass side

Input terminals of the main power supply (between 2AC1 and 2AC2 of the external terminal board TB201 in the power supply unit)

Voltage: 100 / 110 / 115 / 220 V AC, within $\pm 10 \%$

Frequency: 50/60 Hz, within $\pm 5\%$

Input terminals of the emergency power supply (between 2B+ and 2B- of the external terminal board TB201 in the power supply unit)

Voltage: 24 V DC, within -20 % to +30 %

(4) Automatic steering system built-in type ④

(Model PR-9□31D, PR-9□41D, PR-9□31E and PR-9□41E)

The system where the control unit for two gyrocompasses is built in the automatic steering system, and No. 1 master compass and No. 2 master compass are separated

No. 1 gyrocompass side

Input terminals of the main power supply (between 1AC1 and 1AC2 of the external terminal board TB101 in the control unit)

Voltage: 100 / 110 / 115 / 220 V AC, within ±10 %

Frequency: 50/60 Hz, within $\pm 5\%$

Input terminals of the emergency power supply (between 1B+ and 1B- of the external terminal board TB101 in the control unit)

Voltage: 24 V DC, within -20 % to +30 %

No.2 gyrocompass side

Input terminals of the main power supply (between 2AC1 and 2AC2 of the external terminal board TB201 in the control unit)

Voltage: 100 / 110 / 115 / 220 V AC, within $\pm 10 \%$

Frequency: 50/60 Hz, within $\pm 5\%$

Input terminals of the emergency power supply (between 2B+ and 2B- of the external terminal board TB201 in the control unit)

Voltage: 24 V DC, within -20 % to +30 %

2. Confirm breaker status of the ship's distribution board and cable connection from the ship's distribution board.

The location of the terminal board is different depending on the ship's specification. Refer to the finished plan of this ship and the above item 1.

One gyrocompass system

Between the main distribution board and 1AC1 / 1AC2, and 1B+ / 1B- of TB101 in the external terminal board in the control unit

Two gyrocompasses system

No. 1 gyrocompass side

Between the ship's distribution board and 1AC1 / 1AC2, and 1B+ / 1B- of TB101 in the external terminal board in the control unit

No. 2 gyrocompass side

Between the ship's distribution board and 2AC1 / 2AC2, and 2B+ / 2B- of TB201 in the external terminal board in the control unit (power supply unit)

3. If the above items 1 and 2 do not show any problem, check fuses after disconnected the main power supply.

One gyrocompass system

Fuse XF101 and XF102 are located in the upper side of the external terminal board TB101 of the control unit.

When it is built in PR-9000 Automatic Steering System, it located in the right side of the master compass when removed the front panel of the system. Please check if it has blown. (Refer to Figure 7.4, 7.5)

XF1016.3 A	(main power supply)
XF10220 A	(emergency power supply)

Two gyrocompasses system

Fuse XF101 and XF102 are located near the external terminal board TB101 of the control unit.

Fuse F201 and F202 are located near the external terminal board TB201 of the control unit (or the power supply unit).

When these fuses are built in PR-9000 Automatic Steering System, its location is different depending on the automatic steering system type, also the power supply unit may be separated depending on the type.

Please perform it referring to the finished plan of this ship and Figure 7.7 through 7.11.

When it is built in the automatic steering system, confirm the location after removed the front panel of the automatic steering system and check if it has blown.

XF1016.3 A	(No. 1 main power supply)
XF10220 A	(No. 1 emergency power supply)
F2016.3 A	(No. 2 main power supply)
F20220 A	(No. 2 emergency power supply)

- 4. After checked the above items 1 to 3, immediately contact our service engineer.
- (2) Power supply abnormality (alert code "2")
 - 1. Select the other mode than "AUTO" for the automatic steering system.
 - 2. Turn "OFF" the power switch once, and turn "ON" again after around 20 seconds elapsed.
 - 3. When any alert is not generated in the above item 2, operate according to "3.4.1 Start" in Chapter 3 Operating Method.
 - 4. When an alert is generated again in the above item 2, immediately turn "OFF" the power switch and request our service engineer's repair.

(3) Inverter abnormality (alert code "3")

- ●When checking fuses, turn "OFF" the power switch on the operating panel and further disconnect the power cable from the ship's distribution board when checking fuses.
 - 1. Select the other mode than "AUTO" for the automatic steering system.
 - 2. Turn "OFF" the power switch once, and turn "ON" again after around 20 seconds elapsed.
 - 3. When any alert is not generated in the above item 2, operate according to "3.4.1 Start" in Chapter 3 Operating Method.
 - 4. When an alert is generated again in the above item 2, check the inverter fuse located in the lower of the master compass (Refer to Figure 7.3). Then, immediately turn "OFF" the power switch and request our service engineer's repair.

F1 -----12 A

(4) Rotor level abnormality (alert code "6")

△ CAUTION

- ●When an alert code "6" is generated, the gyrocompass true heading may have error. Turn the steering mode to "MANUAL" then determine the true heading to prevent course turning with larger angle.
 - 1. Select the other mode other than "AUTO" of the automatic steering system.
 - 2. Turn "OFF" the power switch once, and turn "ON" again after around 20 seconds later.
 - 3. Operate according to "3.4.1 Start" in Chapter 3 Operating Method" of operator's manual
 - 4. Observe the heading of the gyrocompass for two hours or more.
 - 5. After checked the heading of the gyrocompass, immediately contact our service engineer.
 - (5) Zero cross abnormality (alert code "8")

⚠ CAUTION

- Determination of the gyrocompass true heading during alert code "8" is generated may cause a large change of the true heading. During automatic navigation, great care should be taken because large course change may be happened
 - 1. Select the other mode than "AUTO" for the automatic steering system.
 - 2. According to the following procedure, determine the gyrocompass true heading (indication), currently blinking.
 - (a) By pushing DISP switch②, make such state that "SSG" or "GYT" is indicated in the mode indicator⑨. At this time, the data indicator⑧ is blinking.

- (b) Determine the gyrocompass true heading by pushing ACK / ENT switch 4.
- (c) If the determined true heading has error, please make setting of the true heading again according to "3.4.1 Start (9) Confirmation of the true heading" in Chapter 3.
- 3. Even if it recovered by these procedures when abnormality of zero cross is generated, immediately contact our service engineer.
- (6) System communication abnormality (1) (alert code "A")
 - 1. Select the other mode than "AUTO" for the automatic steering system.
 - 2. Turn "OFF" the power switch once, and turn "ON" again after around 20 seconds elapsed.
 - 3. When any alert is not generated in the above item 2, operate according to "3.4.1 Start" in Chapter 3 Operation.
 - 4. When an alert is generated again in the above item 2, turn "OFF" the power switch of this system, and disconnect the power cable from the ship's distribution board, then confirm the connection / contact between the external terminal board of the master compass and the external terminal board (connector) inside of the control unit.

When it is built in PR-9000 Automatic Steering System, the connection is different depending on the automatic steering system type. Perform it referring to the finished plan of this ship.

Also when it is built in the automatic steering system, confirm the connection / contact after removed the front panel of the automatic steering system.

One gyrocompass system

(a) Stand alone type (Model TG-8100/8600-S)

External terminal board of the master compass:

MTTRM PWB TB2 MR+/-

External terminal board of the control unit: GTERM PWB TB1 MR+/-

(b) Automatic steering system built-in type ① (Model PR-9□1□D/ PR-9□1□E)

Connector of the master compass: MTTRM PWB J2
Connector of the control unit: GTERM PWB J12

Two gyrocompasses system

No. 1 gyrocompass side

(a) Stand alone type (Model TG-8100/8600-D)

Automatic steering system built-in type 4

(Model PR-9□31D, PR-9□41D, PR-9□31E and PR-9□41E)

External terminal board of the master compass:

MTTRM PWB TB2 MR+/-

External terminal board of the control unit: GTERM PWB TB1 MR+/-

(b) Automatic steering system built-in type ②

(Model PR-9□37D, PR-9□47D, PR-9□37E and PR-9□47E)

Automatic steering system built-in type ③

(Model PR-9□32D, PR-9□42D, PR-9□32E and PR-9□42E)

Connector of the master compass: MTTRM PWB J2
Connector of the control unit: GTERM PWB J12

No. 2 gyrocompass side

(a) Stand alone type (Model TG-8100/8600-D)

Automatic steering system built-in type 4

(Model PR-9□31D, PR-9□41D, PR-9□31E and PR-9□41E)

Automatic steering system built-in type ③

(Model PR-9□32D, PR-9□42D, PR-9□32E and PR-9□42E)

External terminal board of the master compass:

MTTRM PWB TB2 MR+/-

External terminal board of the control unit: GTERM PWB TB21 MR+/-

(b) Automatic steering system built-in type ②

(Model PR-9□37D, PR-9□47D, PR-9□37E and PR-9□47E)

Connector of the master compass: MTTRM PWB J2
Connector of the control unit: GTERM PWB J12

- 5. After checked the above items 2 to 4, contact our service engineer.
- (7) System communication abnormality (2) (alert code "b")
 - 1. Select the other mode than "AUTO" for the automatic steering system.
 - 2. Turn "OFF" the power switch once, and turn "ON" again after around 20 seconds elapsed.
 - 3. When any alert is not generated in the above item 2, operate according to "3.4.1 Start" in Chapter 3 Operating Method.
 - 4. When an alert is generated again in the above item 2, turn "OFF" the power switch of this system, and disconnect the power cable from the ship's distribution board, then confirm the connection / contact between the external terminal board of the master compass and the external terminal board (connector) inside of the control unit.

When it is built in PR-9000 Automatic Steering System, the connection is different depending on the automatic steering system type. Perform it referring to the finished plan of this ship.

Also when it is built in the automatic steering system, confirm the connection / contact after removed the front panel of the automatic steering system.

One gyrocompass system

(a) Stand alone type (Model TG-8100/8600-S)

External terminal board of the master compass:

MTTRM PWB TB2 MT+/-

External terminal board of the control unit: GTERM PWB TB1 MT+/-

(b) Automatic steering system built-in type ① (Model PR-9□1□D/ PR-9□1□E)

Connector of the master compass: MTTRM PWB J2
Connector of the control unit: GTERM PWB J12

Two gyrocompasses system

No. 1 gyrocompass side

(a) Stand alone type (Model TG-8100/8600-D)

Automatic steering system built-in type 4

(Model PR-9□31D, PR-9□41D, PR-9□31E and PR-9□41E)

External terminal board of the master compass:

MTTRM PWB TB2 MT+/-

External terminal board of the control unit: GTERM PWB TB1 MT+/-

(b) Automatic steering system built-in type ②

(Model PR-9□37D, PR-9□47D, PR-9□37E and PR-9□47E)

Automatic steering system built-in type ③

(Model PR-9□32D, PR-9□42D, PR-9□32E and PR-9□42E)

Connector of the master compass: MTTRM PWB J2
Connector of the control unit: GTERM PWB J12

No. 2 gyrocompass side

(a) Stand alone type (Model TG-8100/8600-D)

Automatic steering system built-in type 4

(Model PR-9□31D, PR-9□41D, PR-9□31E and PR-9□41E)

Automatic steering system built-in type ③

(Model PR-9□32D, PR-9□42D, PR-9□32E and PR-9□42E)

External terminal board of the master compass:

MTTRM PWB TB2 MT+/-

External terminal board of the control unit: GTERM PWB TB21 MT+ / -

(b) Automatic steering system built-in type ②

(Model PR-9□37D, PR-9□47D, PR-9□37E and PR-9□47E)

Connector of the master compass: MTTRM PWB J2
Connector of the control unit: GTERM PWB J12

- 5. After checked the above items 2 to 4, contact our service engineer.
- (8) GPS communication stop (alert code "c") or Abnormality of GPS data (alert code "d")
 - 1. Select the other mode than "AUTO" for the automatic steering system.
 - 2. Confirm that GPS operates properly.

If not, operate GPS according to "GPS Operator's Manual".

- 3. If it was not recovered after performed the above item 2, change the input system according to "3.4.5 (2) Countermeasures when abnormality of GPS communication is generated" in Chapter 3.
- 4. After checked the above items 1 to 3, immediately contact our service engineer.
- (9) System internal communication abnormality (1) (alert code "E") or System internal communication abnormality (2) (alert code "F")
 - 1. Confirm that the external heading sensor signal processing unit of this system operates properly.

If not, operate it according to the separate TOKYO KEIKI HDM Series Operator's Manual.

- 2. After checked the above item 1, contact our service engineer.
- (10) Master compass heading abnormality (alert code "G")

⚠ CAUTION

- ●When an alert code "G" is generated, the gyrocompass true heading may have error. And new input of the true heading may cause a large change of the true heading. During automatic navigation, once turn the steering mode to "MANUAL" then determine the true heading to prevent course turning with larger angle, and after confirming surrounding safety of own ship, turn to "AUTO" steering again.
 - 1. Select the other mode than "AUTO" for the automatic steering system.
 - 2. Confirm that the gyrocompass true heading indicated in this system coincides with the heading by some target or by observation.
 - 3. If an error exists in the above item 2, make correction according to "3.4.1 (9) Confirmation of the true heading" in Chapter 3.
 - 4. After checked the above items 1 to 3, contact our service engineer.
 - (11) External heading sensor communication stop (alert code "L") or External heading sensor data abnormality (alert code "n")
 - 1. Select the other mode than "AUTO" for the automatic steering system.
 - Confirm that the external heading sensor operates properly.If not, operate it according to the Operator's Manual for the external heading sensor.
 - 3. If it was not recovered after performed the above item 2, take necessary countermeasures according to "3.4.5 (3) Countermeasures when external heading sensor related communication abnormality is generated" in Chapter 3.
 - 4. After checked the above items 1 to 3, contact our service engineer
 - (12) LOG (serial signal) communication stop (alert code "P") or LOG (serial signal) data abnormality (alert code "U")
 - 1. Select the other mode than "AUTO" for the automatic steering system.
 - Confirm that LOG operates properly.If not, operate it according to the Operator's Manual of LOG.
 - 3. If it was not recovered after performed the above item 2, change the input system according to "3.4.5 (4) Countermeasures when LOG (serial) communication abnormality is generated" in Chapter 3.
 - 4. After checked the above items 1 to 3, contact our service engineer.
 - (13) LOG contact abnormality (alert code "u")
 - 1. Select the other mode than "AUTO" for the automatic steering system.
 - Confirm that LOG operates properly.If not, operate it according to the Operator's Manual of LOG.
 - 3. If it was not recovered after performed the above item 2, change the input system according to "3.4.5 (5) Countermeasures when LOG contact abnormality is generated" in Chapter 3.

- 4. After checked the above items 1 to 3, immediately contact our service engineer.
- (14) E5V abnormality (alert code "r")
 - 1. Select the other mode than "AUTO" for the automatic steering system.
 - Confirm that all equipment connected to this system properly operate.
 (Refer to the finished plan maintained in the ship for the connected equipment.)
 When abnormality is generated operate it according to the every Operator's Manual of equipment.
 - 3. After checked the above items 1 to 2, immediately contact our service engineer.
- (15) The gyrocompass does not operate, when power switch on the operating panel turned "ON".

△ CAUTION

- Fully pay attention to electric shock when checking the main power supply.
- ●When checking fuses, turn "OFF" the power switch on the operating panel and further disconnect the power cable from the ship's distribution board before checking fuses.
 - 1. Confirm power applying state of the main power supply and the emergency power supply.
 - To confirm it, perform the same manner as 4.3.2 (1) Power supply abnormality (alert code "1") in this chapter.
 - 2. If the above item 1 does not show any problem, check fuses after disconnected the main / emergency power supply.

One gyrocompass system

Fuse XF101 and XF102 are located in the upper side of the external terminal board TB101 of the control unit.

When it is built in PR-9000 Automatic Steering System, it located in the right side of the master compass when removed the front panel of the system. Please check if it has blown. (Refer to Figure 7.5, 7.6)

XF101	6.3 A	(main power supply)
XF102	20 A	(emergency power supply)

Two gyrocompasses system

Fuse XF101 and XF102 are located near the external terminal board TB101 of the control unit.

Fuse XF201 and XF202 are located near the external terminal board TB201 of the control unit (or the power supply unit).

When it is built in PR-9000 Automatic Steering System, its location is different depending on the automatic steering system type, also the power supply unit is separated depending on the type.

Please perform referring to the finished plan of this ship and Figure 7.7 through 7.11. When it is built in the automatic steering system, confirm the location after removed the front panel of the automatic steering system and check if it has blown.

XF1016.3 A	(No. 1 main power supply)
XF10220 A	(No. 1 emergency power supply)
F2016.3 A	(No. 2 main power supply)
F20220 A	(No. 2 emergency power supply)

- 3. After checked the above items 1 and 2, immediately contact our service engineer.
- (16) Each repeater does not operate.

△ CAUTION

- ■When checking fuses, turn "OFF" the power switch, and further disconnect the power cable from the ship's distribution terminal board.
 - 1. Confirm the power switch of the repeater side.
 - Check fuses since each repeater circuit of the external terminal board has an individual fuse. When it is built in PR-9000 Automatic Steering System, the fuses are located in the right side of the master compass when removed the front panel of the system. (They are in the external terminal board "GTERM PWB".)

Refer to the finished plan maintained in the ship for the details of repeater's connection circuit.

(Refer to Figure 7.5)

Step type

F5 to F9, F11 to F14 -----1 A

Serial type

F1 to F10-----1 A

- 3. In the case where repeater output circuit is expanded as an option, check each fuse (F110 to F190) of the expanded unit side.
- (17) All repeaters do not operate.

△ CAUTION

- ■When checking fuses, turn "OFF" the power switch, and further disconnect the power cable from the ship's distribution board.
 - 1. Check fuse after disconnected the main / emergency power supply.

Fuse F15 is located in the external terminal board "GTERM PWB" of the control unit.

For two gyrocompasses system, also confirm F17. Fuse F17 is located in the external distribution board "DTERM PWB" in the control unit.

When it is built in PR-9000 Automatic Steering System, it located in the right side of the master compass when removed the front panel of the system. Check if it has blown.

(Refer Figure 7.5, 7.7)

- (18) Alert is generated at the same time when turned "ON" the power switch.
 - 1. When error code "3" and "A" are generated at the same time, once turn "OFF" the power switch, and again turn "ON" after around 1 minute elapsed.
 - 2. If the status does not change after the above item 1, check the fuse for inverter located in the lower of the master compass.

(Refer to Figure 7.3)

(19) Others

When failures and alerts other than mentioned in the above are generated, and when the replaced fuse has blown again, turn "OFF" the power switch of the operating panel and after disconnected the power supply from the ship's distribution board, etc., immediately contact our service engineer. In such case, prompt service action is available when the alert code is informed.

4.3.3 Replacement of fuse

Please replace fuse when it has blown. Before the replacement, confirm that the power switch of the operating panel in "OFF" position and disconnect the main power supply and the emergency power supply from the ship's distribution board.

When fuse has blown, investigate its cause. It will occur again unless the cause is removed if replaced with the same capacity fuse and it recovered for a while. Please note that there is some characteristic dispersion for the same capacity fuse.

Replace fuse according to the following procedure.

- (1) Confirm that power is not applied to the main power supply and the emergency power supply of this system.
 - (Confirm that the voltage at the following external terminal board is zero.)

To confirm it, perform the same manner as 4.3.2 (1) Power supply abnormality (alert code "1") in this chapter.

(2) Replacement of the protection fuse for the main power supply / emergency power supply

One gyrocompass system

Fuse XF101 and XF102 are located in the upper side of the external terminal board TB101 of the control unit.

When it is built in PR-9000 Automatic Steering System, it located in the right side of the master compass when removed the front panel of the system. Please check if it has blown. (Refer to Figure 7.5, 7.6)

XF101 ------6.3 A (main power supply)
XF102 -----20 A (emergency power supply)

Two gyrocompasses system

Fuse XF101 and XF102 are located near the external terminal board TB101 of the control unit.

Fuse F201 and F202 are located near the external terminal board TB201 of the control unit (power supply unit).

When these fuses are built in PR-9000 Automatic Steering System, its location is different depending on the automatic steering system type, also the power supply unit is separated depending on the type.

Please perform referring to the finished plan of this ship and Figure 7.7 through 7.11. When it is built in the automatic steering system, confirm the location after removed the front panel of the automatic steering system and check if it has blown.

XF1016.3 A	(No. 1 main power supply)
XF10220 A	(No. 1 emergency power supply)
F2016.3 A	(No. 2 main power supply)
F20220 A	(No. 2 emergency power supply)

These fuses are located inside of the fuse holder in each unit. To open the holder, turn counterclockwise with pressing top of the holder. After replaced the fuse, turn clockwise with pressing top of the holder to close it.

(3) Replacement of the protection fuse for the control unit and the repeater ("GTERM PWB" and "DTERM PWB" in the control unit)

Common to one gyrocompass system and two gyrocompasses system (GTERM PWB) (Refer to Figure 7.5)

F1 to 14	1 A
F15	15 A
F16	3.15 A
F17	3 15 A

Only for two gyrocompasses system (DTERM PWB) (Refer to Figure 7.6)

XF17	10 A
XF18	3.15 A
XF19	3.15 A

These fuses are glass and open type.

Pull it right up from the holder. Do not handle it with strong force or hard tool not to break.

To insert a fuse, softly push it right down in the holder. If it was properly inserted, it will be fixed with 1 to 2 mm above and parallel with the mounted level. Do not push further.

(4) Master compass (Inverter fuse F1)

Fuse F1 is located inside of the fuse holder in the front. To open the fuse holder, press and turn the fuse holder edge counterclockwise with a screw driver. After replaced the fuse, turn it clockwise to close it.

4.4 Informed Items to TOKYO KEIKI Service Station

When troubles can not be recovered on board by the countermeasures described in this manual, immediately contact the closest our Service Station or its dealer / agency in your area to request advice with the following items informed.

(1)	Ship's name and owner	:					
(2)	Equipment name, type and serial no.	:					
(3)	Where is the ship now?	:					
(4)	Trouble symptoms (Error name)	:					
(5)	When did it occur?	:	year	month	1	day	hour
(6)	Where did it occur?	:	Sea are	ea	Char	nnel	
(7)	Does it still continue?	:	Continu	ie	Interr	mittent	
(8)	Does it repeatedly?	: Y	es	Inte	ermitte	nt	No
(9)	Check results	:					
(10)	Other noticed points	:					

CHAPTER 5 MAINTENANCE AND CHECK

⚠ WARNING

●In the stage of maintenance and check of the system, touching internal parts may cause electric shock because the ship's power supply is still applied to the system distribution board even if the main power switch of this system is turned "OFF". Do not touch internal parts such as internal terminal boards and power supply unit, etc. If necessary, disconnect the power cable from the ship's distribution board.

The following warning label is attached to the dangerous position of this system

MARNING

Main power can cause electric shock.

Do not touch terminal boards, etc., even if unit power OFF.

riangle Caution

- ■Main units of this system consist of electronic circuits having high reliability. However, it is impossible to say that no failure should happen.
 - Accordingly, the check and maintenance described in this chapter should be sincerely carried out to remove failure risk as much as possible and to maintain the system performance. Otherwise, detection of the failure sign will be delayed and may cause distress such as collision or grounding.
- Request our service engineer when trouble is detected and cannot be repaired on board.

PROHIBITION

Do not use insulation tester or other instrument to test system insulation since it may damage internal electrical components.

Do disconnect the related cables and wirings connected to this system whenever the related power distribution lines are tested by using such instruments.

5.1 General

This system consists of carefully selected parts based on safety design. However, periodical check (operation check) and maintenance described in the following section must be performed for long term satisfactory operation.

Main purpose of the maintenance and check of the system are aiming to catch signs of equipment failure at an early stage through continuous suitable maintenance and check. By repairing on call at port based on results of these checks, occurrence of unexpected situations and troubles in sailing will be prevented to a minimum.

For the maintenance and check of the connected equipment to this system such as the automatic steering system, magnetic compass system, etc., refer to the separate individual Operator's Manuals.

Please record in the log book, etc. content of these checks and maintenance that were performed.

Procedures of the maintenance and check only for this system are explained in this chapter. General precautions are as follows.

- (1) Assign a person in charge of maintenance and check for this system and perform those under his responsibility.
- (2) Mechanical parts in connecting and fixing sections of this system such as case and panel may be loosened due to body shock and resonance vibration. Check and re-tighten the related screws at need.
- (3) Most parts used in the main sections of this system are electronic (electric) parts. Occurrence of electronic parts trouble themselves is very seldom, and troubles in mounting sections of electronic (electric) parts, being about to disconnect wires at roots or lead wires of electric parts, occur easily due to hull body shock or resonance vibration. Accordingly these points are checked.
 Re-fix these parts, re-tighten the fixing screws, reinsert the connectors, re-fix the mounting parts, repair the cables and lead wires at need.
- (4) If strange motions, smells, sounds and heat generation, etc. different from those in normal operation exist, record those in the log book and request our service station to repair at earlier stages.
- (5) It is recommended that this system is checked periodically by our service engineer or qualified engineer. The checked items in the check list table and the log book should be also evaluated by the engineer. The trouble shooting and repair should be carried out by the engineer according to the results of the checking up of the troubled items.

5.2 Periodical check

Use the periodical check table for the periodical check.

Frequencies of the check are (1) items to be performed once a day, (2) once a half year / once a year. Checked items are decided as normal or not by comparing with the values at installation time on the ship as a standard.

Periodical check table (including operation check) [Once a day]
 (Copy and use a form in the end of this manual when the table becomes full, and file them.)

Check mark O: Normal,

 $\boldsymbol{\Delta}\,$: Normal after rework or repair

(Example of filling up)

	(⊏xample or illimę	<i>y</i> up)	
Date checked	Installation		
	completed		
	on		
	'02.06.14		
Inspector			
	service		
	engineer		
	name		
	0000		
Check items			
a. Confirm that the value of			
each repeater			
synchronizes with the	0		
displayed true heading			
on the operating panel.			
b. Confirm that the			
displayed latitude on the			
operating panel	0		
coincides with the			
current latitude.			
c. Measure error with			
observation if possible.	0		
d. Confirm that ship's			
power supply voltage is	0		
stable and within			
specifications.			
e. Confirm that all			
indicators and lamps are			
lit and it buzzes, when	0		
"lamp test" operate.			
f. Items to be dealt with,			
and items to be			
informed.			

Table 5.1 Periodical Check Table (1)

(2) Periodical check table (including operation check) [once a half year / once a year] (Copy and use a form in the end of this manual when the table becomes full, and file them.)

Check mark O: Normal,

 $\boldsymbol{\Delta}\,$: Normal after rework or repair

(Example of filling up)

(Example of filling up)					
Date checked	Installation completed on '02.06.14				
Inspector Check items	service engineer name OOOO				
a. Confirm tightness of					
fixing screws in mechanical sections and connecting screws in the terminal board. (Re-tighten if loosened.)	0				
b. Confirm connecting and wire wearing conditions at connecting wire mounting points and wire bases	0				
c. Confirm operating conditions of switches, and displayed state of LEDs and indicators.	0				
d. Confirm that warning labels and other indication labels are not dirty or detached. Clean if they become dirty.	0				
e. Items to be dealt with, and item to be informed.					

Table 5.2 Periodical Check Table (2)

5.3 Warning label check

Always check and clean warning labels to read with ease.

When warning labels became dirty or detached, request TOKYO KEIKI.

5.4 Spare parts

Spare parts shown in Table 5-3 are attached to this system.

ITE M	NAME PART	OF	OUTLINE	Quai	ntity RKING		REMARKS
	7 7 11 1			PERSET	PER VESS.	SPARE	
			FOR MASTER COMPASS				
B-1	FUSE		31.8	1	1	2	250V 12A 10038616-
			FOR CONTROL UNIT				
B-2	FUSE		31.8	1	1	2	250V 20A MF61NR20
B-3	FUSE		31.8	1	1	2	250V 6.3A MF61NR6.3
			FOR GYRO TERMINAL				
B-4	FUSE		BOARD 20	14	14	28	125V 1A 10220923-
B-5	FUSE		318	1	1	2	250V 15A MF61NR15
B-6	FUSE		20 27	2	2	4	250V 3.15A MF51NN3.15

Table 5.3 Spare Parts

5.5 Storage method

NOTE

Observe the following items for storage.

- (1) Turn "OFF" all power switches of this system to cut the power.
- (2) Storage temperature should be between –20°C to +55°C.

 Avoid humid place as much as possible. High humidity may cause rust.
- (3) Prevent the storage place from generation of corrosive gas, breeding of bacteria such as mold or intrusion of insects and small animals.
- (4) Cover the system with a plastic sheet, etc., when generation of dust is foreseen. When welding works, etc., are performed near this system, be sure to mount a suitable protection cover on the system to prevent damage caused by spark, etc.

5.6 Disposal method

Dispose of this system in proper manner treating it as an industrial waste product in accordance with the law and regulations.

CHAPTER 6 GLOSSARY

[Alphabet]

External heading sensor......General term for the heading detection sensor for magnetic compass system, electronic compass, satelitecompass, etc. External heading sensor signal processing unit Optional unit to this system. It enables to backup completely several circuits of the repeater signal (step signal / serial signal) by attached this unit when connected with the external sensor. Fixed error.....Error between this system and keel line depending on the installation. Last azimuth......This system can set and detect last azimuth of previous stop time. According to this operation, system settling time can be reduced when started the system again. Leveling operationOperation to keep the sensor horizontal Magnetic compass systemThe heading detector is mounted on the magnetic compass and detected heading signal from the heading detector is sent out as repeater signal and serial signal. This system is one of TOKYO KEIKI products. Refer to separate Operator's Manual for the details. Rate of turnSpeed of ship's turning Sensitive element Element to detect north of own ship Speed error correctionGyro-compass generates error from the north depending on the speed and position of ship's This system can calculate and navigation. correct automatically such error using speed and position data. Step signalThree phase signal with resolution of 1/6° Voltage is 24 V standard. 70 V / 35 V output can be outputted by expanded with the optional unit.

CHAPTER 7 ATTACHED DRAWINGS

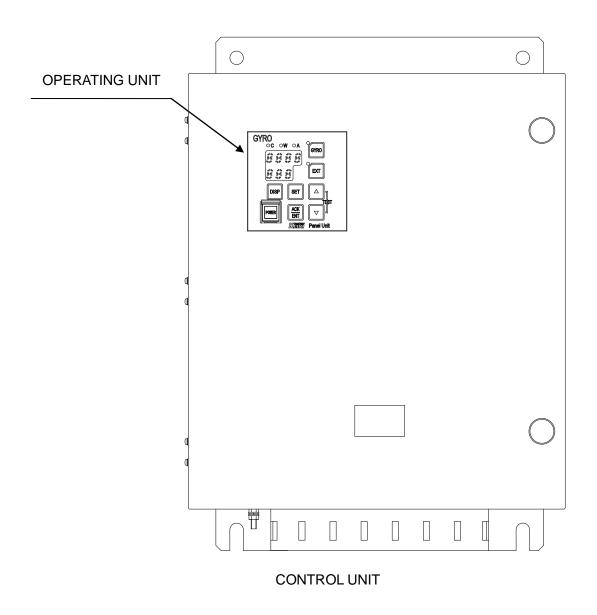
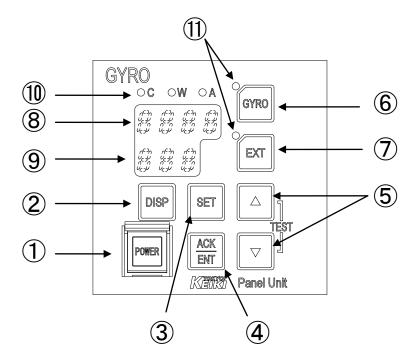


Fig 7.1 Outline of control unit (One Gyro-compass system)



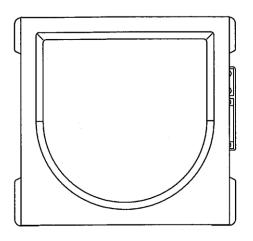
- (1) POWER SWITCH
- (2) DISP SWITCH
- (3) SET SWITCH
- (4) ACK/ENT SWITCH

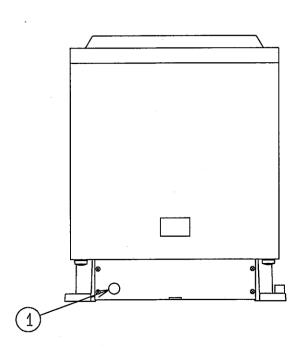
- 6 SYSTEM SELECT SWITCH(GYRO)
- (7) SYSTEM SELECT SWITCH(EXT.)
- 8 DATA DISPLAY
- (9) MODE DISPLAY
- 10 ALERT INDICATOR

OA: Alarm (Color: Red)
OW: Warning (Color: Yellowish Orange)

OC : Caution (Color : Yellow)

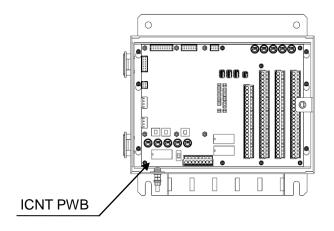
(1) SYSTEM SELECT INDICATOR





① FUSE F1(12A)

Fig 7.3 Master compass



CONTROL UNIT

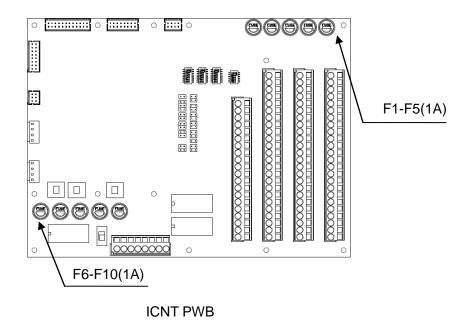
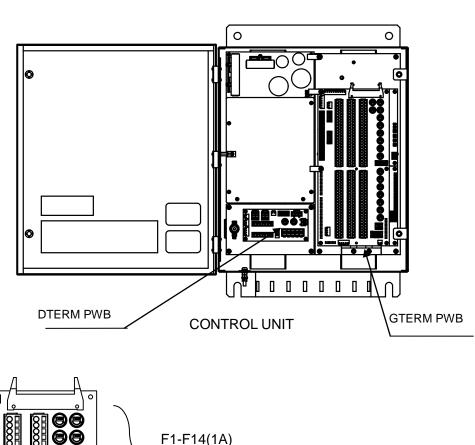


Fig 7.4 Minimum type Control unit of one compass system



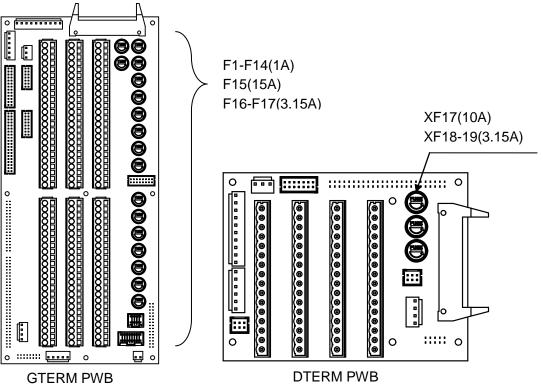


Fig 7.5 Stand-alone type Control unit of one Gyro-compass system

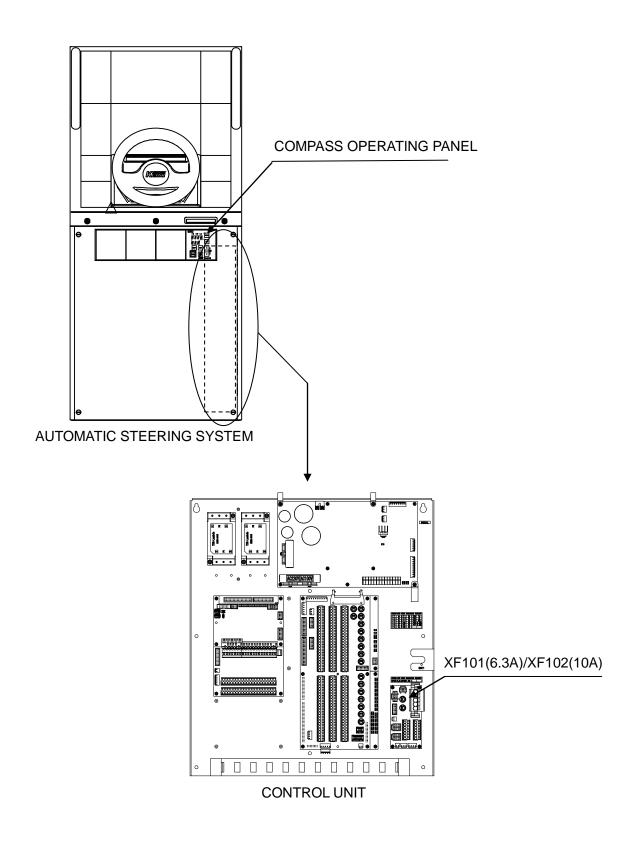
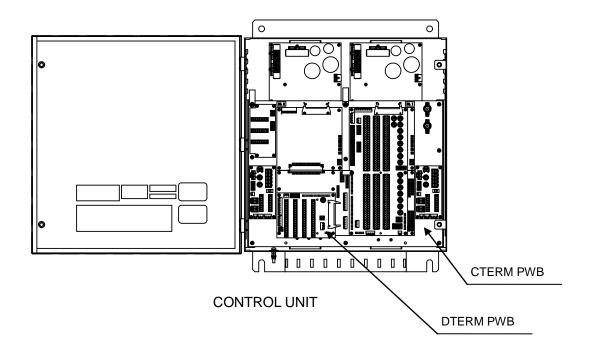


Fig 7.6 Automatic steering system built-in type① of one Gyro-compass system (Gyro-compass built-in type)



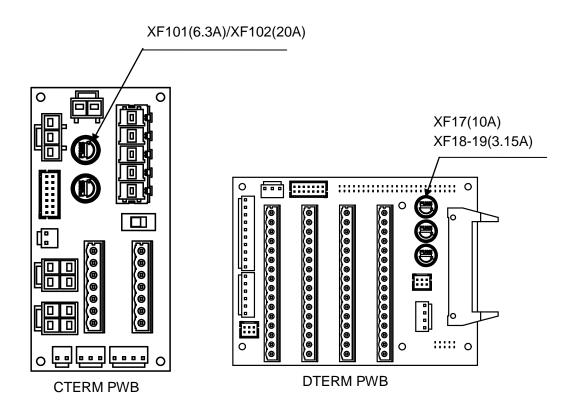


Fig 7.7 Stand-alone type Control unit of two Gyro-compass system

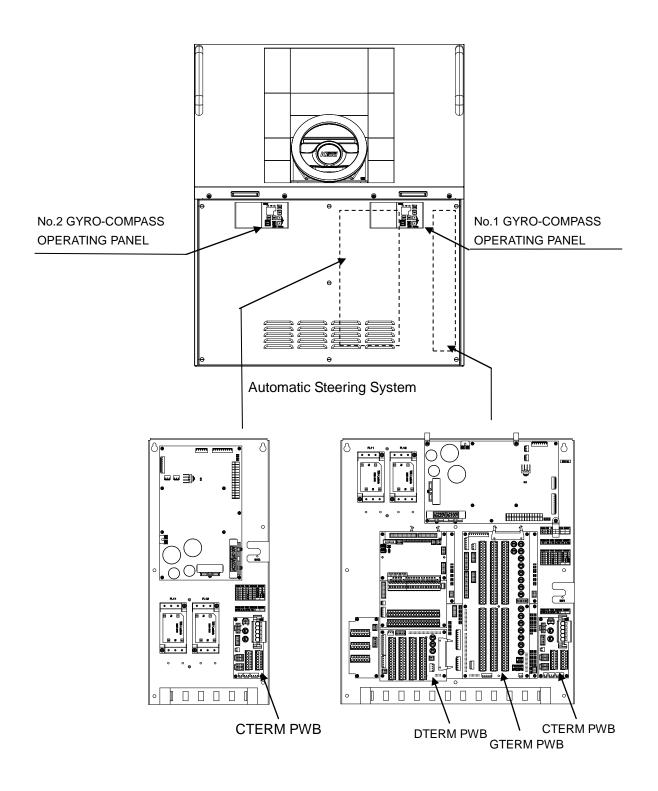


Fig 7.8 Automatic steering system built-in type② of two Gyro-compass system (Two Gyro-compass built-in type)

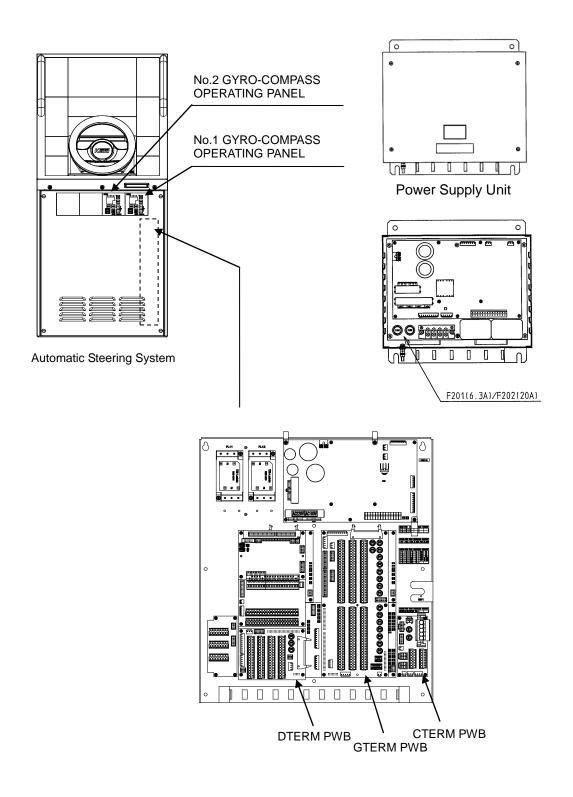


Fig 7.9 Automatic steering system built-in type③ of two Gyro-compass system (One master compass/Power supply unit outside)

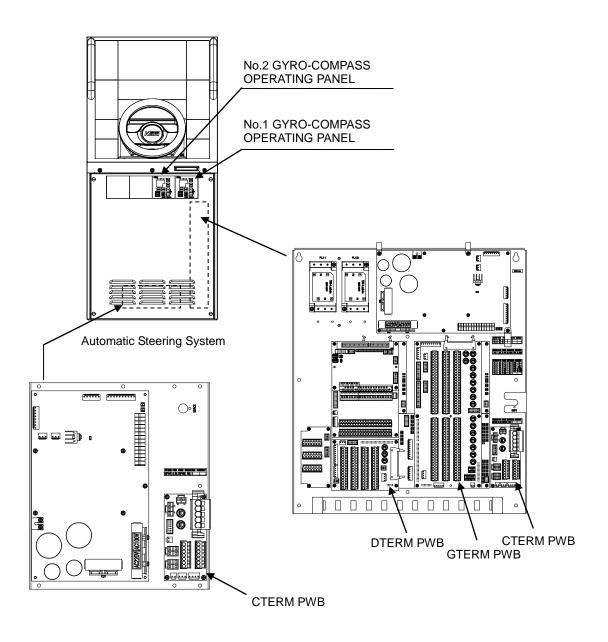
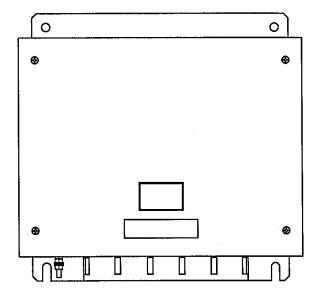


Fig 7.10 Automatic steering system built-in type 4 of two Gyro-compass system (Two master compass outside)



Power Supply Unit

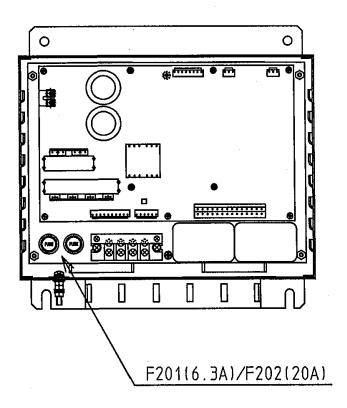
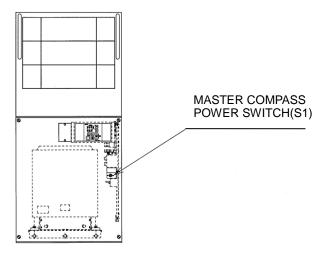
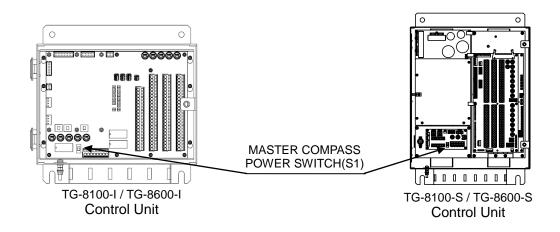


Fig 7.11 Power Supply Unit



AUTOMATIC STEERING SYSTEM



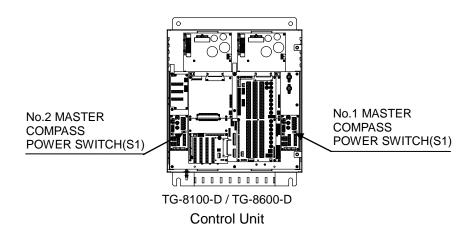


Fig 7.12 Position of the "Master compass power switch"

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(1) Periodical check table (including operation check) [Once a day]

Check mark O: Normal,

 Δ : Normal after rework or repair

Data dada d	1	Ī
Date checked		
Inspector		
Check items		
a. Confirm that the value of each repeater synchronizes with the displayed true heading on the operating panel.		
b. Confirm that the displayed latitude on the operating panel coincides with the current latitude.		
c. Measure error with observation if possible.		
d. Confirm that ship's power supply voltage is stable and within specifications.		
e. Confirm that all indicators and lamps are lit and it buzzes, when "lamp test" operate.		
f. Items to be dealt with, and items to be informed.		

(2)	Periodical check table (including operation check) [once a half year / once a year]	

Check mark O: Normal,

△ : Normal after rework or repair

	T	T	T
Date checked			
Inspector			
Check items			
a. Confirm tightness of			
fixing screws in			
mechanical sections and			
connecting screws in the			
terminal board.			
(Re-tighten if loosened.)			
b. Confirm connecting and			
wire wearing conditions at			
connecting wire mounting			
points and wire bases.			
c. Confirm operating			
conditions of switches,			
and displayed state of			
LEDs and indicators.			
d. Confirm that warning			
labels and other			
indication labels are not			
dirty or detached.			
Clean if they become			
dirty.			
e. Items to be dealt with,			
and item to be informed.			
	1	1	

Tokyo Keiki Marine Systems Service Network

01-Apr-14

	OFFICE	ADDRESS	E-mail	TEL / FAX
	Overseas			
	Overseas Service Section	2-16-46 Minami-Kamata, Ohta-ku, Tokyo 144-8551, JAPAN	overseasvc@tokyo-keiki.co.jp	+81-3-3732-6583 / +81-3-3732-5050
	East Japan			
_	Kanto Service Station	2-16-46 Minami-Kamata, Ohta-ku, Tokyo 144-8551, JAPAN	east-service@tokyo-keiki.co.jp	+81-3-3737-8642 / +81-3-3737-8643
	Hokkaido Service Station	2-2-12 Kikusui Nijo, Shiroishi-ku, Sapporo-city, Hokkaido 003-0802, JAPAN	hokkaido-ss@tokyo-keiki.co.jp	+81-11-816-6291 / +81-11-816-6296
	West Japan			
	Kobe Service Station	3-4-13 Mizukidori, Hyogo-ku, Kobecity, Hyogo-pref. 652-0802, JAPAN	kobe-ss@tokyo-keiki.co.jp	+81-78-577-6111 / +81-78-577-5335
	Imabari Service Station	4-4-7 Tokiwa-cho, Imabari-city, Ehime-pref. 794-0015, JAPAN	imabari-svc@tokyo-keiki.co.jp	+81-898-23-6161 / +81-898-23-7731
	Kitakyushu Service Station	2-7-8 Kyo-machi, Kokurakita-ku, Kitakyushu-city, Fukuoka-pref 802-0002, JAPAN	kyusyu-ss@tokyo-keiki.co.jp	+81-93-531-6881 / +81-93-521-2575

Gyro-compass TG-8100 / 8600

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TOKYO KEIKI INC.

2-16-46, MINAMI-KAMATA, OTA-KU, TOKYO 144-8551, JAPAN Marine Systems Company

Tel. (81) 3-3737-8611 Fax. (81) 3-3737-8663

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