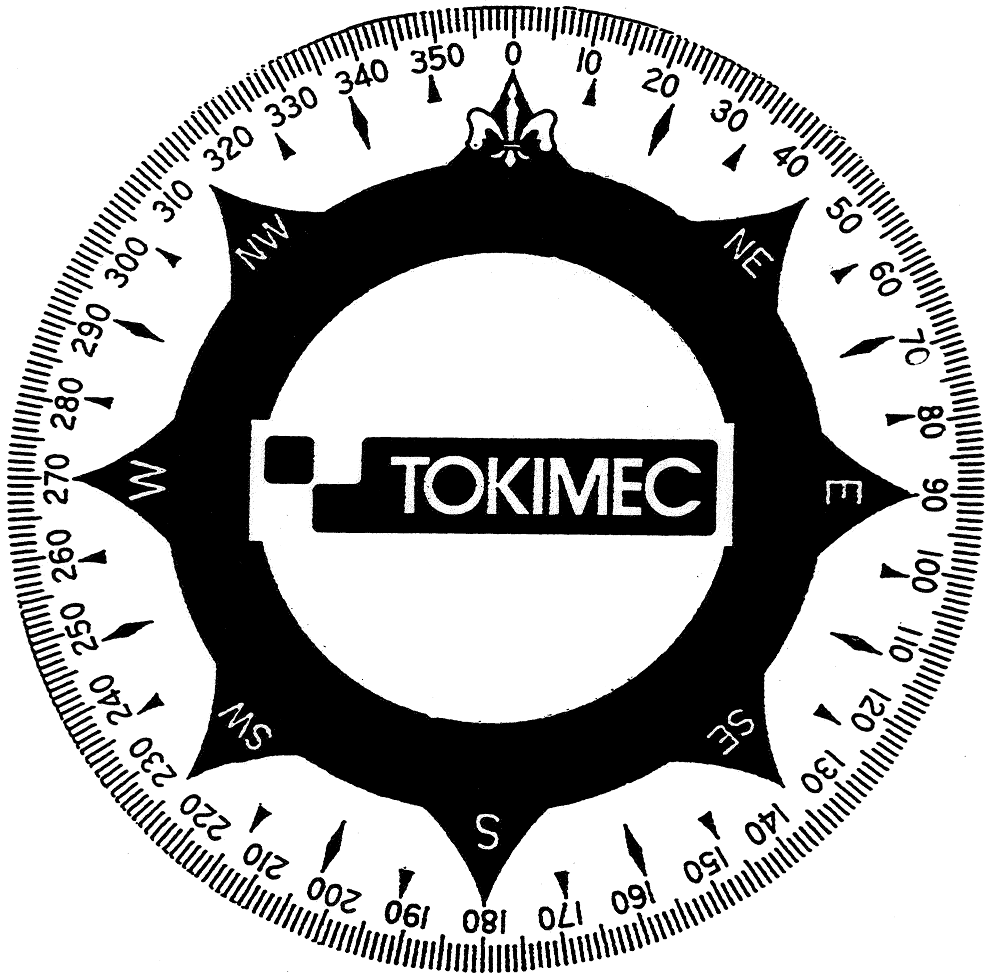
TG－8000

GYRO COMPASS

SERVICE MANUAL



TOKIMEC INC

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CONTENTS

CHAPTER 8 PARTS LIST

CONTENTS

CHAPTER 1 Basic specifications

CHAPTER 2 OPERATION

CHARTER 3 INSTALLATION

CHAPTER 4 System description

CHAPTER 5 Electrical adjustment and confirmation

CHAPTER 7 Troubles and necessary countermeasures

CHAPTER 8 PARTS LIST

CHAPTER 9 **ATTACHED FIGURES**

CHAPTER 1 Basic specifications

CHAPTER 1 Basic specifications

1.1 Features

1.1.1 Master compass

This unit detects the true bearing (meridian) by utilizing the earth's rotation and gravity and produces serial signal output as bearing information to the control unit.

The structure of this unit is explained as follows briefly.

The sensitive element is supporting the gyro sphere with the built-in rotor by the suspension wire float system to keep it with high accuracy.

The upper bracket which supports the movable unit including the sensitive element in the phantom ring, is supported by four shock absorbers.

The ship body's vibration and shocks are absorbed by these shock absorbers.

The north-seeking motion is controlled by the CPU (MCC pwb). The actuators controlled by the CPU are "DST" for the horizontal system, and by "step motor" for the bearing system.

The operation can be continued by the backup power supply even if the system main power is lost.

1.1.2 Control unit

The control box consists of a control / distribution unit for the system input / output signals, a display unit and a power supply unit. However, the power supply unit may be the separated unit (for part of type D and optional type I).

The control of all signals is performed by the CPU (SCC pwb), and all information required for the system operation are indicated on the display panel.

The abnormalities occurred during operation are memorized by the CPU and they can be indicated going back to the past.

Besides, the CPU produces serial signal output and step signal outputas bearing information.

The power supply unit provides all required power supply for the system operation.

1.1.3 Repeater

After the initial bearing setting, it follows the true bearing by 24 V DC 1/6 degree 3 phase signal from the control box.

There is also a system driven with a serial signal. This Repeater of an initial Bearing setup by manual operation is unnecessary.

1.2 Appearance and mass

Refer to Chapter 9 Attached drawings.

1.3 Basic specifications

1.3.1 Electrical Specification

1.Main POWER SUPPLY :AC100/110/115/220V, 50/60Hz 1ϕ (MAX290VA)

2.POWER SUPPLY FOR ALARM AND BACK-UP FOR MASTER COMPASS :DC24V

3.VOLTAGE FLUCTUATION :AC$\pm$10%, DC-20%~+30%

4.FREQUENCY VARIATION :$\pm$5%

5.POWER CONSUMPTION :

MASTER COMPASS :START WITHIN 140VA ORDINARY WITHIN 70VA

REPEATER COMPASS :ALL REPEATERS WITHIN 150VA

1.3.2 Accuracy

1.SETTLING TIME :WITHIN 3 (THREE) HOURS *1

*IMO RECOMMENDATION WITHIN 6 (SIX) HOURS

2.SETTLE POINT ERROR : LESS THAN $\pm$0.1deg.$\times$(1/COSψ) Note: ψ:LATITUDE

*IMO RECOMMENDATION LESS THAN $\pm$0.75deg.$\times$(1/COSψ)

3.RMS VALUE OF THE DIFFERENCES : LESS THAN 0.1deg.$\times$(1/COSψ)

*IMO RECOMMENDATION LESS THAN 0.25deg.$\times$(1/COSψ)

4.REPEATABILITY OF SETTLE POINT ERROR :

LESS THAN $\pm$0.1deg.$\times$(1/COSψ)

*IMO RECOMMENDATION LESS THAN $\pm$0.25deg.$\times$(1/COSψ)

5.ERROR DUE TO THE SHIP ROLLING, PITCHING AND YAWING :

LESS THAN $\pm$0.4deg.$\times$(1/COSψ)

*IMO RECOMMENDATION LESS THAN $\pm$1deg.$\times$(1/COSψ)

6.SETTLE POINT ERROR UNDER GENERAL CONDITIONS :

LESS THAN $\pm$0.4deg.$\times$(1/COSψ)

*IMO RECOMMENDATION LESS THAN $\pm$1deg.$\times$(1/COSψ)

*1 start from heading

ψ : LATITUDE

1.3.3 General Specification

1. FOLLOW-UP SPEED : WITHIN 75deg./sec.
2. GIMBAL FREEDOM : FOR BOTH ROLLING AND PITCHING ±45deg.
3. RANGE OF SPEED ERROR CORRECTION (AUTO/MANUAL) :
   AUTO--IF 200/400PULSE/NM. OR SERIAL SIGNAL ARE INPUTTED
   SPEED:0~50 Knots / LATITUDE:0~70deg. TG-8000
   SPEED:0~70 Knots / LATITUDE:0~70deg. TG-8500

4.REPEATER TYPE : DC24V 3 PHASE SIGNAL STEP MOTOR TYPE OR
SERIAL SIGNAL TYPE *DC24V(POWER SUPPLY)

5.NUMBER OF REPEATER SIGNAL/SERIAL SIGNAL OUTPUT :

DC24V 3 PHASE SIGNAL STEP MOTOR TYPE	:STEP SIGNAL	TYPE-I	NON
		TYPE-S	9
		TYPE-D	9
	:SERIAL SIGNAL	TYPE-I	NON
		TYPE-S	5
		TYPE-D	5
SERIAL SIGNAL TYPE	:STEP SIGNAL	TYPE-I	1
		TYPE-S	4
		TYPE-D	4
	:SERIAL SIGNAL	TYPE-I	4
		TYPE-S	10
		TYPE-D	10

6.AMBIENT TEMPERATURE :-10℃~+50℃

1.3.4 Serial signal input specification

1.GPS : Based on IEC61162-1 IEC61162-1 ed.2

CIRCUIT :1

ELECTRICAL :RS422 OR NMEA0183

BAUD RATE :4800 bps

DATA BITS :8 bits

PARITY :NON

STOP BIT :1 bit

FREQUENCY :1 Hz

INPUT FORMAT : $--GGA,x,**xxx.x,N**,xx.x,E,**x**,~*hh<CR><LF> *2

LATITUDE GPSQI

$--GLL,**xxxx.xx,N**,xxxx.xx,E,~*hh<CR><LF> *2

LATITUDE

$--VTG,xx,T,xx,M,**xx.x,N**,xx,K*hh<CR><LF>

SPEED(knot)

*2 : GGA SENTENCE IS HIGH PRIORITY.

2.SPEED : Based on IEC61162-1 IEC61162-1 ed.2

CIRCUIT :1

ELECTRICAL :RS422 OR NMEA0183

BAUD RATE :4800 bps

DATA BITS :8 bits

PARITY :NON

STOP BIT :1 bit

FREQUENCY :1 Hz

INPUT FORMAT :$--VBW,**x.x**,x.x,**A**,**x.x**,x,x,**A**,~*hh<CR><LF> *3

SPEED(knot) GPSQI

GROUND SPEED(knot)

WATER SPEED(knot)

*3 : GROUND SPEED IS HIGH PRIORITY.

3.EXTERNAL AZIMUTH SENSOR : Based on IEC61162-1 IEC61162-1 ed.2 and IEC61162-2

CIRCUIT :1

ELECTRICAL :RS422 OR NMEA0183

BAUD RATE :4800 bps

DATA BITS :8 bits

PARITY :NON

STOP BIT :1 bit

FREQUENCY :1 Hz / 50Hz

INPUT FORMAT :$--HDT,<u>xxx.x</u>,T*hh<CR><LF>

TRUE BEARING(deg.)

1.3.5 Serial signal output specification

1.SERIAL SIGNAL OUTPUT 1-a : Based on IEC61162-1 IEC61162-1 ed.2 *4

ELECTRICAL : RS422/RS485

BAUD RATE :4800 bps

DATA BITS :8 bits

PARITY :NON

STOP BIT :1 bit

FREQUENCY :1 Hz or 5Hz DATA NO.1,2

0.5Hz or when any alarm occurs. DATA 3

WHEN GYRO SELECTED :

DATA NO.1 :$HEHDT,<u>xxx.x</u>,T*hh<CR><LF>

TRUE BEARING(deg.)

DATA NO.2 :$HEROT,<u>-xxx.x</u>,A*hh<CR><LF>

RATE OF TURN (°/min) - :PORT

DATA NO.3 :$PTKM,HEALM,xxxx,x,xx*hh<CR><LF> *5

WHEN EXT. SENSOR SELECTED :

DATA NO.1 :$--HDT,<u>xxx.x</u>,T*hh<CR><LF> *6

TRUE BEARING(deg.)

DATA NO.3 :$PTKM,--ALM,xxxx,x,xx*hh<CR><LF> *5*6

*4 : OUT PUT SIGNAL IS AVAILABLE TO SELECT **1-a** or **1-b**.

*5 : IT IS ONLY MANUFACTURE'S CHECKING.

*6 : 「TALKER ID」 CHANGES BY THE CONNECTED EQUIPMENT.

2.SERIAL SIGNAL OUTPUT 1-b : Based on IEC61162-2 *4

ELECTRICAL : RS422/RS485

BAUD RATE :38400 bps

DATA BITS :8 bits

PARITY :NON

STOP BIT :1 bit

FREQUENCY :50Hz DATA NO.1,2

0.5Hz or when any alarm occurs. DATA 3

WHEN GYRO SELECTED :

DATA NO.1 :$HEHDT,xxx.x,T*hh<CR><LF>

TRUE BEARING(deg.)

DATA NO.2 :$HEROT,-xxx.x,A*hh<CR><LF>

RATE OF TURN (°/min) - :PORT

DATA NO.3 :$PTKM,HEALM,xxxx,x,xx*hh<CR><LF> *5

WHEN EXT. SENSOR SELECTED :

DATA NO.1 :$--HDT,xxx.x,T*hh<CR><LF> *6

TRUE BEARING(deg.)

DATA NO.3 :$PTKM,--ALM,xxxx,x,xx*hh<CR><LF> *5*6

*4 : OUT PUT SIGNAL IS AVAILABLE TO SELECT **1-a** or **1-b**.

*5 : IT IS ONLY MANUFACTURE'S CHECKING.

*6 : 「TALKER ID」 CHANGES BY THE CONNECTED EQUIPMENT.

3. SERIAL SIGNAL OUTPUT 2-a : Based on IEC61162-1 or IEC61162-ed2 *7

NUMBER OF CIRCUITS :

DC24V 3 PHASE SIGNAL STEP MOTOR TYPE	:TYPE-I	NON
	TYPE-S	1
	TYPE-D	2
SERIAL SIGNAL TYPE	:TYPE-I	NON
	TYPE-S	1
	TYPE-D	2

ELECTRICAL : RS422/RS485

BAUD RATE :4800 bps

DATA BITS :8 bits

PARITY :NON

STOP BIT :1 bit

FREQUENCY :1Hz or 5Hz DATA NO.1,2

0.5Hz or when any alarm occurs. DATA 3

DATA NO.1 :$HEHDT,xxx.x,T*hh<CR><LF>

TRUE BEARING(deg.)

DATA NO.2 :$HEROT,-xxx.x,A*hh<CR><LF>

RATE OF TURN (°/min) - :PORT

DATA NO.3 :$PTKM,HEALM,xxxx,x,xx*hh<CR><LF> *5

*5 : IT IS ONLY MANUFACTURE'S CHECKING.

*7 : Regardless of a sensor change, the direction information on each Gyro-compass is outputted.

OUT PUT SIGNAL IS AVAILABLE TO SELECT **2-a** or **2-b**.

4.SERIAL SIGNAL OUTPUT 2-b : Based on IEC61162-2 *7

NUMBER OF CIRCUITS :

DC24V 3 PHASE SIGNAL STEP MOTOR TYPE :TYPE-I NON
TYPE-S 1
TYPE-D 2

SERIAL SIGNAL TYPE :TYPE-I NON
TYPE-S 1
TYPE-D 2

ELECTRICAL : RS422/RS485

BAUD RATE :38400 bps

DATA BITS :8 bits

PARITY :NON

STOP BIT :1 bit

FREQUENCY :50Hz DATA NO.1,2
0.5Hz or when any alarm occurs. DATA 3

DATA NO.1 :$HEHDT,**xxx.x**,T*hh<CR><LF>
TRUE BEARING(deg.)

DATA NO.2 :$HEROT,**-xxx.x**,A*hh<CR><LF>
RATE OF TURN (°/min) - :PORT

DATA NO.3 :$PTKM,HEALM,xxxx,x,xx*hh<CR><LF> *5

*5 : IT IS ONLY MANUFACTURE'S CHECKING.

*7 : Regardless of a sensor change, the direction information on each Gyro-compass is outputted.
OUT PUT SIGNAL IS AVAILABLE TO SELECT **2-a** or **2-b**.

1.3.6 Analog signal output specification *9

NUMBER OF CIRCUITS :3

TURN RATE :±30deg./min. or ±120deg./min. or ±300deg./min. *8

OUTPUT VOLTAGE :±30deg./min. = ±5V DC
±120deg./min. = ±10V DC
±300deg./min. = ±10V DC

SCALE OVER VOLTAGE : ALL ±5V DC

*8 : OUTPUT SIGNAL IS AVAILABLE TO SELECT ONE OF THREE TURN RATES.

*9 : "TYPE-I" DOES NOT OUTPUT THIS SIGNAL.

1.3.7 Dry Contact signal input specification

1.SPEED LOG :200p.p.n.m. or 400p.p.n.m. NUMBER OF CIRCUITS :1 5V/5mA max.

2.HEADING SENSOR SELECT :NUMBER OF CIRCUITS :1 32V/20mA max.

3.ALARM ACK. :NUMBER OF CIRCUITS :1 5V/5mA max.

4.BUZZER :NUMBER OF CIRCUITS :1 5V/5mA max.

1.3.8 Dry Contact signal output specification

1.RUNNING :NUMBER OF CIRCUITS :1 24V/1A max.

2.DIFFERENCE ALARM :NUMBER OF CIRCUITS :1 24V/1A max. *9

3.ALL ALARMS :NUMBER OF CIRCUITS :1 24V/1A max.

*9 : TYPE D ONLY.

CHAPTER 2 OPERATION

· CHAPTER 2　OPERATION

⚠ WARNING
●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 alarm in this system, and the emergency steering method should be well understood to treat such matters smoothly.

· Gyro-compass operation

2.1 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.

2.2 Operating panel

For position and details of the operating panel, read explanation of this chapter referring to "Figure 2.1 Operating Panel" attached in the end of this chapter.

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.

2.2.1 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.
Gyro-compass true bearing / ship's speed / latitude / rate of turn
Input system can be changed for the following indicated items. *1
  Ship's speed (MANUAL, GPS, LOG and LOG (serial signal))
  Latitude (GYRO and GPS)

④ ACK/ENT switch
It determines the changed data and the changed input system.
When an alarm has been generated, pushing this switch causes the alarm 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 "2.4.2 System selection" in this chapter.

⑦ System select switch (EXT)
It is used to select the system.
"External heading sensor" system is selected.
For the system select, refer to "2.4.2 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 Alarm indicator

Alarm status is displayed. When an alarm is generated, it goes blinking.
After | ACK/ENT | switch④ is pushed, it is still lit if alarm state is continued and goes off if alarm state was restored.

⑪ System select indicator

Selected system is displayed.

2.2.2 Indication

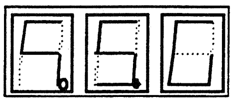
(1) True bearing 1 : The true bearing of the sensor selected as system, either the gyro-compass true bearing or the external heading sensor true bearing, is displayed.
For the system selection, refer to "2.4.2 System Selection" in this chapter.

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

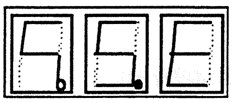
System selection	Heading	NO.1 GYRO indication		NO. 2 GYRO indication	
		Data indicator	Mode indicator	Data indicator	Mode indicator
NO.1 GYRO	123.4	123.4	S.S.G	234.5	GYt
NO.2 GYRO	234.5	123.4	GYt	234.5	S.S.G
External Heading	345.6	345.6	S.S.E	345.6	S.S.E

Note:

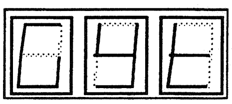
- Only shaded areas are indicated for one gyro-compass system.
- The meaning of a display of a "mode indicator" is the following.



S.S.G = Steering Sensor. Gyro-compass



S.S.E = Steering Sensor. External sensor



Gyt = Gyro-compass true bearing

- When GPS 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 "2.4.4 (2) Countermeasures when GPS communication abnormality is generated", "2.4.4 (4) Countermeasures when LOG (serial signal) communication abnormality is

generated" or "2.4.4 (5) Countermeasure wen LOG (contact) communication abnormality is generated" in this chapter , because the true bearing 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 "2.4.4 (3) Countermeasures when the external heading sensor related communication abnormality is generated" because the true bearing determination is required.

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

System selection	Heading	NO.1 GYRO indication		NO. 2GYRO indication	
		Data indicator	Mode indicator	Data indicator	Mode indicator
NO.1 GYRO	123.4	345.6	ESt	345.6	ESt
NO.2 GYRO	234.5	345.6	ESt	345.6	ESt
External Heading	345.6	123.4	Gyt	234.5	Gyt

Note:

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

ESt

ESt = External Sensor true bearing

- When communication abnormality with "External heading sensor" is generated, the data indicator is blinking.

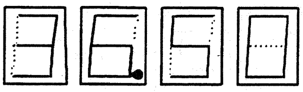
(3) Master bearing: Master compass bearing is displayed.

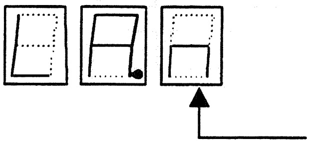
Data indicator 123.4

Mode indicator CPS

Compass

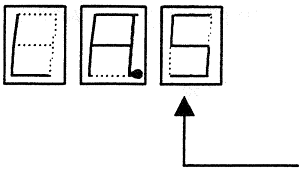
(4) Latitude: Latitude of the place where the ship is at present is displayed.
Indicated example) Present latitude is 36 degree 50 minute north.

Data indicator 

Mode indicator  Latitude. North

This shows the north latitude.

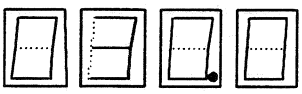
For the south latitude, it is shown below.

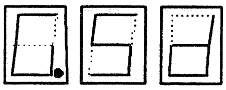
Mode indicator  Latitude. South

This shows the south latitude.

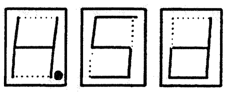
Note :
When GPS communication abnormality is generated, the data indicator goes blinking.

(5) Ship's speed: Current ship's speed is displayed.
The following example is when the ship's speed input system is "GPS".

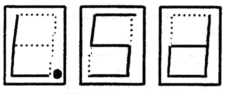
Data indicator 

Mode indicator  Gps. Speed

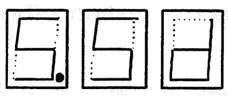
- When the ship's speed input system is "MANUAL".

Mode indicator  Hand. Speed

- When the ship's speed input system is "LOG".

Mode indicator  Log. Speed

- When the ship's speed input system is "LOG (serial signal)".

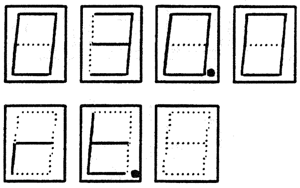
Mode indicator  Serial. Log Speed

Note :
- When GPS communication abnormality is generated, the data indicator goes blinking.
- When LOG (contact) abnormality is generated, the data indicator goes blinking.
- When LOG (serial) abnormality is generated, the data indicator goes blinking.

(6) Rate of turn : Current ship's turn rate is displayed.
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 gyro-compass 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.

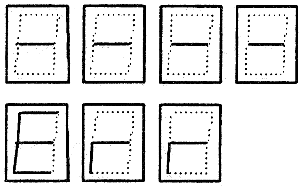
(7) Alarm content: Alarm content generated in the gyro-compass is displayed by alarm code.

For the alarm code indication, refer to "2.4.4 Alarm" in this chapter.

- When alarms are not generated.

Data indicator

Mode indicator



Error

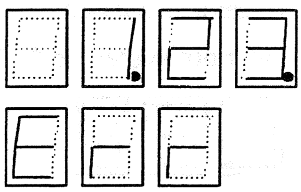
- When an alarm is generated.

Alarms are displayed in the data indicator ⑧ in the generated order from the left as shown below.

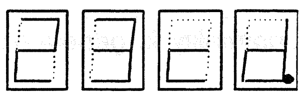
The following example shows that alarms of alarm code 1, 2 and 3 were generated in the order.

Data indicator

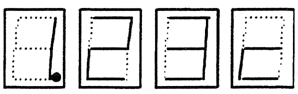
Mode indicator



Where alarm codes indicated at the same time are up to 4.
If the indicated fourth place dot is extinguished, it shows that more than 5 alarms were generated.
Example) When alarms of alarm code 1, 2, 3, c and d were generated in the order.



In this case, not-indicated alarm code can be confirmed by pushing △ switch as shown below.

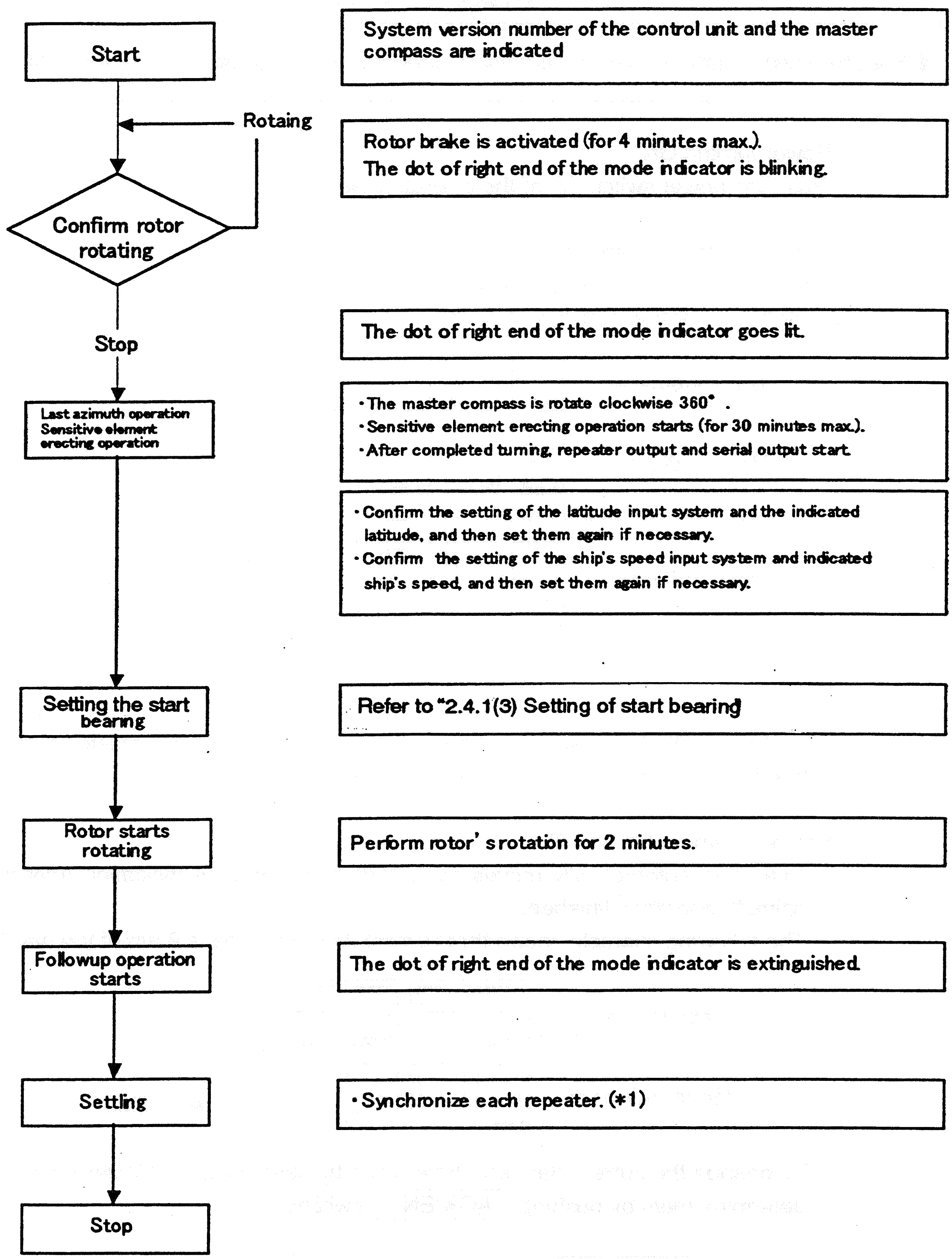


To return to the previous indication, push ▽ switch.

2.3 Start and Stop Sequence

This system operates in the sequence shown below.

For each operation in the sequence, refer to "2.4 Start and Running" and "2.5 Stop" 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 bearing" selected by this system after the repeater switch turned "ON".

2.4 Start and running

2.4.1 Start

⚠ CAUTION
●Start this system after turned the automatic steering system to other mode than "AUTO".

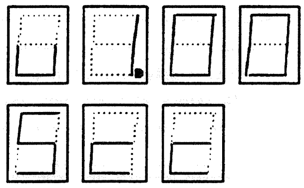
(1) Power turning ON
Push the power switch ① of the operating panel.

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

Data indicator

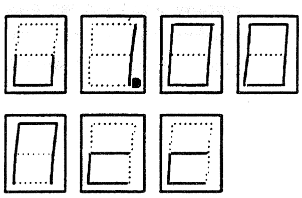
Mode indicator



・Software version of the master compass

Data indicator

Mode indicator



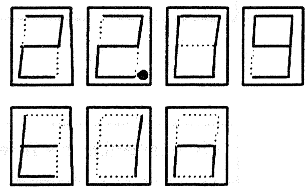
After turned ON the power, confirm that the rotor stops. The master compass is rotate clockwise 360°. (Last azimuth operation)

(2) Setting of timer start time *1

1. Indication automatically moves to current date and time indication after the last azimuth operation finished.
The following example shows that current date and time is 9 am of the day 22.

Data indicator

Mode indicator



Current. TIMe

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 switch④ if the current date and time are not changed.

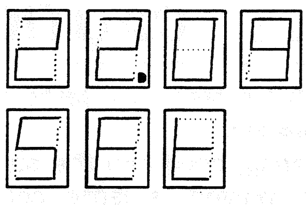
---

*1: For the case where this function is not included, after indicating software version, it become the indication which set up a start bearing.

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

Data indicator

Mode indicator



SET. time

4. Set the departure date and time by pushing △ or ▽ switch⑤ and determine them by pushing [ACK/ENT] switch④.

   Note: When the current date and time does not reach the previously set departure date and time, the previously set departure date and time is displayed in the above data indicator.

5. Indication automatically moves to start bearing setting. Set the start bearing. Refer to "2.4.1 Start (3) Setting of start bearing" in this chapter.

6. The set departure date and time are displayed for 3 seconds after the start bearing setting. Then, all indications are extinguished except the power switch① and the timer is started.

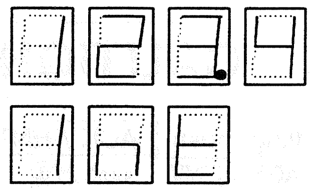
   Note: This system will start 4 hours before the set date and time.

(3) Setting of start bearing.

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 bearing input" indication as shown below.

Data indicator

Mode indicator



Initial bearing

1. Set the start bearing by pushing △ or ▽ switch⑤.
2. Determine the entered value by pushing [ACK/ENT] switch④.
3. The indicator indicates the gyro-compass true bearing and the master compass turns to the entered bearing.

   Note: When the system starts from the bearing when the last azimuth operation completed, setting of "the start bearing" 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.

(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 bearing.
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 alarm related to GPS (alarm code "c" or "d") is generated and the true bearing of the gyro-compass has not been determined, once turn the steering mode to "MANUAL" or "Non Follow Up", then determine the true bearing because erroneous bearing information (repeater signal and serial signal) is possible to be outputted to the outside.
Refer to "2.4.4 (2) Countermeasures when GPS communication abnormality is generated" in this chapter , for determination method of the true bearing.

⚠ CAUTION

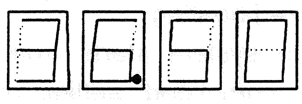
●When "GYRO" is selected for the latitude input system, latitude is automatically updated by the ship's speed and the gyro-compass true bearing. (When the ship's speed input system is "MANUAL", it is not updated automatically.) During navigation, confirm once in 2 hours that the ship's actual latitude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

⚠ CAUTION

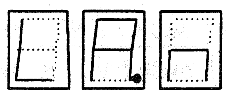
●Whenever to complete the setting, push ACK / ENT switch④. Changed setting is not updated unless pushing ACK / ENT switch④.

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

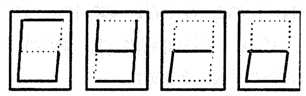
Data indicator



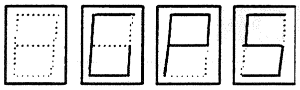
Mode indicator



2. After pushed [SET] switch③, select either "GPS" or "GYRO" by pushing [△] or [▽] switch⑤.
Every pushing of [△] or [▽] switch⑤ caused blinking display of the following two kinds of data alternately as shown below.
· Input system: GYRO



· Input system: GPS



3. Determine it by pushing [ACK/ENT] switch④.

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 ④.
Hereafter calculated latitude by ship's speed and true bearing 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 gyro-compass true bearing, 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 bearing" selected by this system after the repeater switch turned "ON".

(7) Setting of ship's speed input system

⚠ CAUTION
●Change of the ship's input system or large change of ship's speed may cause large change of the true bearing. 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 alarm related to GPS (alarm code "c" or "d") is generated and the true bearing of the gyro-compass has not been determined, once turn the steering mode to "MANUAL" or "Non Follow Up", then determine the true bearing because erroneous bearing information (repeater signal and serial signal) is possible to be outputted to the outside. Refer to "2.4.4 (2) Countermeasures when GPS communication abnormality is generated" in this chapter , for determination method of the true bearing.

⚠ CAUTION
●When alarm regarding to LOG (serial signal) (alarm code "P" or "U") is generated and the true bearing of the gyro-compass has not been determined, once turn the steering mode to "MANUAL" or "Non Follow Up", then determined the true bearing because the erroneous bearing information (repeater signal and serial signal) is possible to be outputted to the outside. Refer to "2.4.4 (4) Countermeasures when LOG (serial) communication abnormality is generated" in this chapter , for determination method of the true bearing.

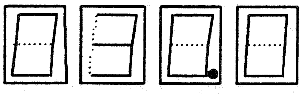
⚠ CAUTION
●When alarm regarding to LOG (contact) (alarm code "u") is generated and the true bearing of the gyro-compass has not been determined, once turn the steering mode to "MANUAL" or "Non Follow Up", then determined the true bearing because the erroneous bearing information (repeater signal and serial signal) is possible to be outputted to the outside. Refer to "2.4.4 (5) Countermeasures when LOG (contact) communication abnormality is generated" in this chapter , for determination method of the true bearing.

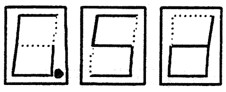
⚠ CAUTION
●The setting of the ship's speed input system (and its values for "MANUAL") is stored, and when re-started, the previous ship's speed system setting is restored and starts. When "MANUAL" is selected, stop after ship's speed setting is set to zero knot. Also, when turned off and on again with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

⚠ CAUTION

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

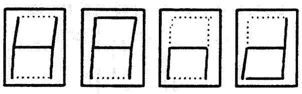
1. Let the indicators be in the following ship's speed indication state by pushing DISP switch② The following example is when "GPS" is selected for the ship's speed input system.

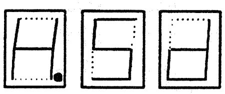
   Data indicator 

   Mode indicator 

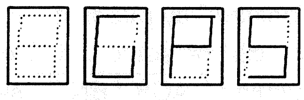
2. Push SET switch③, and select one of either "MANUAL", "GPS", "LOG" or "LOG (serial signal)" by △ or ▽ switch⑤. The indicators shows the following successively with blinking.

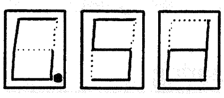
   · Input system: MANUAL

   Data indicator 

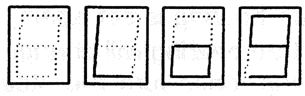
   Mode indicator 

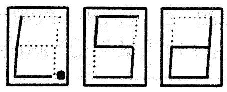
   · Input system: GPS

   Data indicator 

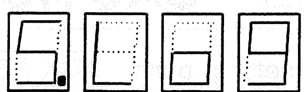
   Mode indicator 

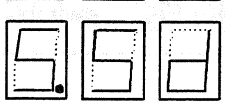
   · Input system: LOG (contact signal)

   Data indicator 

   Mode indicator 

   · Input system: LOG (serial signal)

   Data indicator 

   Mode indicator 

3. Determine it by pushing ACK/ENT switch④.
4. When "MANUAL" was selected, ship's speed is indicated in the indicator. Then, set ship's speed by pushing △ or ▽ switch⑤, and push ACK / ENT switch ④ again.

(8) Setting of the "rate of turn filter constant"

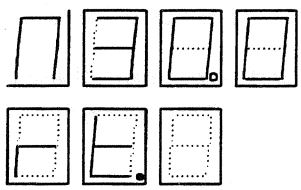
⚠ CAUTION

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

1. Let the indicators be in the following "rate of turn filter constant" indication state by pushing DISP switch②.

Data indicator

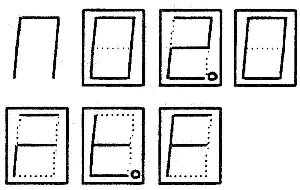
Mode indicator



2. When the "rate of turn filter constant" is changed, push SET switch③.

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 bearing

⚠ CAUTION

●When the gyro-compass true bearing is set again, the repeater indication value and the serial signal gyro-compass true bearing 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

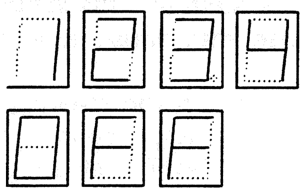
●Whenever to complete the setting, push ACK / ENT switch④. Changed setting is not updated unless pushing ACK / ENT switch④.

Confirm that the gyro-compass true bearing indicated in this system coincides with the heading by some target or by observation.
If there is some deviation, set the gyro-compass true bearing according to the following procedure.

1. Let the indicators be in the gyro-compass true bearing indication state by pushing DISP switch ②.
2. The indicator changes to the following by pushing SET switch③, and make the setting by △ or ▽ switch⑤.

Data indicator

Mode indicator



Offset bearing

3. Determine it by pushing ACK/ENT switch④.
   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 bearing indication
After all settings are completed, let the indicators be in the true bearing indication state by pushing DISP switch②. If it is in other indication than the true bearing indication, it goes to the true bearing indication if no switch operation for 30 seconds.

2.4.2 System selection

⚠ CAUTION
●System selection (switching) may cause large change of the true bearing. 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 gyro-compass.
(1) Turn "OFF" the repeater switch. *1
(2) To select "GYRO" system, push the system selection switch GYRO switch⑥ with pressing ACK/ENT switch④.
In the two gyro-compasses system, push the system selection switch GYRO ⑥ with pressing the ACK/ENT switch ④on the operating panel of the gyro-compass to be selected.
To select "External heading sensor" system, push thesystem selection switch EXT switch⑦ with pressing ACK / ENT switch④.

*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 bearing" 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 bearing. *1

(4) Turn "ON" the repeater switch. *1

2.4.3 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 gyro-compass true bearing. 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 alarm status

Confirm that the alarm indicator lamp⑩ on the operation panel is off.

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

Confirm the alarm code indicated in the indicator, and stop buzzer by pushing ACK/ENT switch④.

If the alarm indicator lamp is still on after pushed ACK/ENT switch④, the abnormality continues.

(For the case that abnormality is momentary, the alarm indicator lamp⑩ is extinguished at the same time when pushed ACK/ENT switch④.)

Take suitable countermeasures according to "2.4.4 Alarm" in this chapter.

(2) Confirmation of the gyro-compass true bearing

Confirm that the gyro-compass true bearing indicated in this system coincides with the heading by some target or by observation.

If some variation exists, make correction according to "2.4.1 (9) Confirmation of the true bearing" 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 bearing" selected by this system after the repeater switch turned "ON".

(3) Confirmation of the latitude

⚠ CAUTION
●Change of the latitude input system or large change of the latitude may cause large change of the true bearing. 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 "GPS" is selected as the latitude input system, the latitude obtained by GPS is displayed.
   Confirm that the latitude value indicated on GPS 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 "2.4.1 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 bearing. 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 gyro-compass generates error due to the ship's speed.
This system calculates error due to the ship's speed and corrected true bearing 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 "2.4.1 Start (7) Setting of the ship's speed input system" in this chapter.

2.4.4 Alarm

⚠ CAUTION
●When the following alarms are generated, the bearing information from this system may not be outputted at all or may have large error. All units operated by the bearing 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 alarms of the system by buzzer sound and indication of alarm code.

When an alarm is generated, confirm the alarm code and push ACK/ENT switch④ to stop buzzer sound.
If the alarm is momentary, the alarm indicator⑩ goes off by pushing ACK/ENT switch ④.
When the alarm indicator⑩ did not go off by pushing ACK/ENT switch④, it shows that the alarm conditions continues.

When the alarm conditions continue, confirm the alarm code and take suitable countermeasures.

(1) Alarm content

1. Power supply abnormality

   Alarm code: 1

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

2. Power supply unit abnormality

   Alarm code: 2

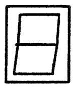
   It is alarmed when the control unit power supply shows over current or over voltage, or the power supply output goes off.

3. Inverter abnormality

   Alarm code: 3

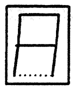
   It is alarmed when the inverter unit in the master compass shows over current or over voltage.

4. Zero cross abnormality

Alarm code: 

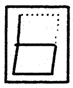
It is alarmed when reference angle (zero cross angle) of the master compass bearing can not be detected properly or abnormality is generated in bearing calculation.

5. System communication abnormality (1)

Alarm code: 

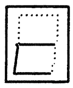
It is alarmed when abnormality is generated in the communication from the master compass to the control unit.

6. System communication abnormality (2)

Alarm code: 

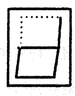
It is alarmed when abnormality is generated in the communication from the control unit to the master compass.

7. GPS communication break

Alarm code: 

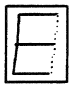
It is alarmed when the serial signal from GPS stops or GPS operation stops.
When this alarm is generated, operate according to "2.4.4 (2) Countermeasures when GPS communication abnormality generated" in this chapter.
Note: This alarm is generated only when "GYRO" is selected as the system selection and "GPS" is selected as the ship's speed input system or the latitude input system.

8. GPS communication data abnormality

Alarm code: 

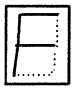
It is alarmed when abnormality is generated in the serial signal from GPS.
When this alarm is generated, operate according to "2.4.4 (2) Countermeasures when GPS communication abnormality generated" in this chapter.
Note: This alarm is generated only when "GYRO" is selected as the system selection and "GPS" is selected as the ship's speed input system or the latitude input system.

9. System internal communication abnormality (1) (Option)

Alarm code: 

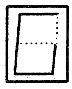
It is alarmed when internal communication from the external heading sensor signal processing unit built in this system to the gyro-compass operation processing unit (in this system) stopped.
When "External heading sensor" is selected as system, operate according to "2.4.4 (3) Countermeasures when external heading sensor related communication abnormality is generated" in this chapter.

10. System internal communication abnormality (2) (Option)

Alarm code: 

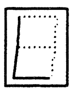
It is alarmed when abnormality is generated in internal communication from the external heading sensor signal processing unit built in this system to the gyro-compass operation processing unit (in this system).
When "External heading sensor" is selected as system, operate according to "2.4.4 (3) Countermeasures when external heading sensor related communication abnormality is generated" in this chapter.

11. Master compass heading abnormality

Alarm code: 

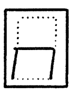
It is alarmed when abnormality is generated in the monitor signal of the master compass heading.

12. External heading sensor communication stop

Alarm code: 

It is alarmed when the serial signal from the external heading sensor stopped or the external heading sensor stopped its operation.
When this alarm is generated, operate according to "2.4.4 (3) Countermeasures when external heading sensor related communication abnormality is generated" in this chapter.

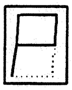
13. External heading sensor data abnormality

Alarm code: 

It is alarmed when abnormality is generated in the serial signal from the external heading sensor.

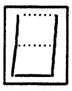
When this alarm is generated, operate according to "2.4.4 (3) Countermeasures when external heading sensor related communication abnormality is generated" in this chapter.

14. LOG (serial signal) communication stop

Alarm code: 

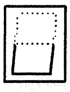
It is alarmed when the serial signal from LOG (serial) stopped or LOG (serial signal) stopped its operation.
When this alarm is generated, operate according to "2.4.4 (4) Countermeasures when LOG (serial) communication abnormality is generated".
Note: This alarm is generated only when "GYRO" is selected in the system selection and "LOG (serial signal)" is selected as the ship's speed input system.

15. LOG (serial signal) data abnormality

Alarm code: 

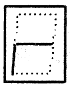
It is alarmed when abnormality is generated in the serial signal from LOG (serial signal).
When this alarm is generated, operate according to "2.4.4 (4) Countermeasures when LOG (serial signal) communication abnormality is generated".
Note: This alarm is generated only when "GYRO" is selected in the system selection and "LOG (serial signal)" is selected as the ship's speed input system.

16. LOG (contact) abnormality

Alarm code: 

It is alarmed when abnormality is generated in LOG (contact)
Note: This alarm is generated only when "LOG" is selected for the ship's speed input system.

17. E5V abnormality

Alarm code: 

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

(2) Countermeasures when GPS communication abnormality is generated

> ⚠ **CAUTION**
>
> ●When an alarm related to GPS (alarm code "c" or "d") is generated and the true bearing of the gyro-compass has not been determined, once turn the steering mode to "MANUAL" or "Non Follow Up", then determine the true bearing because erroneous bearing information (repeater signal and serial signal) is possible to be outputted to the outside. Refer to "2.4.4 (2) Countermeasures when GPS communication abnormality is generated" in this chapter , for determination method of the true bearing.

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

The true bearing which is currently indicated and outputted to the external is the corrected value based on the corrected value immediately before GPS alarm was generated.

1. When "GPS" is selected as the ship's speed input system, select the other mode than "GPS".
   (Refer to "2.4.1 (7) Setting of the ship's speed input system" in this chapter.)
2. When "GPS" is selected as the latitude input system, select the other mode than "GPS".
   (Refer to "2.4.1 (4) Setting of the latitude input system" in this chapter.)
3. As the true bearing indication is blinking showing the true bearing calculated based on the changed ship's speed and latitude, determine this true bearing by pushing [ACK/ENT] switch④.
4. The true bearing indication goes lit and the true bearing outputted to the external is also determined.

(3) Countermeasures when external heading sensor related communication abnormality is generated

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

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

When the alarm related to the external heading sensor is generated, the true bearing of the data indicator⑧ is blinking.

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

When the alarm is continued, the true bearing cannot be determined.

The true bearing outputted to the external is the bearing immediately before the alarm was generated.

1. Confirm that the alarm related to the external heading sensor has been recovered.
2. Push $\boxed{\text{ACK / ENT}}$ switch④ in the state where the true bearing is indicated.
3. The external heading sensor true bearing indication for the true bearing goes lit, and the outputted true bearing to the external is also determined true bearing.

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

⚠ CAUTION

- When an alarm related to LOG (serial signal) (alarm code "P" or "U") is generated and the true bearing of the gyro-compass has not been determined, once turn the steering mode to "MANUAL" or "Non Follow Up", then determine the true bearing because erroneous bearing information (repeater signal and serial signal) is possible to be outputted to the outside.
  Refer to "2.4.4 (4) Countermeasures when LOG (serial signal) communication abnormality is generated" in this chapter , for determination method of the true bearing.

⚠ CAUTION

- Determination of the true bearing may cause large change of the outputted bearing 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 indicator⑧ is blinking.

The gyro-compass true bearing and the bearing information outputted to the external which are currently indicated, is the corrected value based on the ship's speed immediately before the alarm was generated.

1. Select the other than "LOG (serial signal)" for the ship's speed input system.
   (Refer to "2.4.1 (7) Setting of the ship's speed input system.)
2. As the gyro-compass true bearing calculated from the corrected ship's speed is blinking, determine the true bearing by pushing $\boxed{\text{ACK / ENT}}$ switch④.
3. The true bearing indication goes lit and the true bearing outputted to the external is also determined.

(5) Countermeasures when LOG contact abnormality is generated

CAUTION
●When an alarm related to LOG (contact) (alarm code "u") is generated and the true bearing of the gyro-compass has not been determined, once turn the steering mode to "MANUAL" or "Non Follow Up", then determine the true bearing because erroneous bearing information (repeater signal and serial signal) is possible to be outputted to the outside. Refer to "2.4.4 (5) Countermeasures when LOG (contact) abnormality is generated" in this chapter , for determination method of the true bearing.

When abnormality related to LOG (contact) is generated, the data indicator⑧ is blinking.

The gyro-compass true bearing and the bearing information outputted to the external which are currently indicated, is the corrected value based on the ship's speed immediately before the alarm was generated.

1. Select the other than "LOG" for the ship's speed input system.
   (Refer to "2.4.1 (7) Setting of the ship's speed input system.)
2. As the gyro-compass true bearing calculated from the corrected ship's speed is blinking, determine the true bearing by pushing ACK / ENT switch④.
3. The true bearing indication goes lit and the true bearing outputted to the external is also determined.

2.5 Stop

(1) Turn "OFF" the switches of each repeater.

(2) Turn "OFF" the power switch.

· Change over unit operation

2.6 Operating panel

For position and details of the operating panel, read explanation of this chapter referring to "Figure 2.2 Change over panel" attached in the end of this chapter.
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.

2.6.1 Explanation of the operation panel

① 「POWER」 switch

This switch performs starting of this equipment, and a stop.
Usually, it turns "ON."
This equipment will also start if a gyro-compass start when this switch is "ON."

② [DISP] switch

The item and data to display are chosen with this switch.
If this switch is pushed, data will be displayed one by one.
Please refer to display part ⑧ about data.

③ [ACK／ENT] switch

In the following cases, this switch is used.
Decision of the changed data.
Decision of system change of the signal to input.
The acknowledgement of an alarm.

④ [△] [▽] switch

In the following cases, this switch is used.
Change of data.
System change of the signal to input.
However, this switch usually adjusts the dimmer of a display.

[△] : brighter.
[▽] : darker.

It is a lamp test when [△] and [▽] switch are pushed simultaneously.
A buzzer also sounds at the time of a lamp test.

⑤ System selection switch([NO. 1])

Gyro-compass to be used is chosen with this switch.
"NO.1 gyrocompass" will be chosen if this switch is pushed, with the [ACK／ENT] switch.

⑥ System selection switch(NO. 2)
Gyro-compass to be used is chosen with this switch.
"NO. 2 gyro-compass" will be chosen if this switch is pushed, with the ACK/ENT switch.

⑦ System selection switch(EXT)
External sensor to be used is chosen with this switch.
" External sensor " will be chosen if this switch is pushed, with the ACK/ENT switch.

⑧ Display part
It displays the data of two lines of 1 to 5 clauses at a time.
The alarm data of 6 to 9 clauses is displayed by two lines.

1	1-GYRO:123.4° SA*	Note 1), 2), 3)
2	2-GYRO:123.4° S	Note 3)
3	E-SENS:123.4°	Note 4)
4	HDM SET:05.0°	
5	-PARAMETER SET-	
6	G1 ALARM 01/01 GPS Com Alarm	
7	G2 ALARM 01/01 GPS Com Alarm	
8	MON ALARM 01/01 PLT. Com Alarm	

Note 1) The true direction of the direction sensor chosen is displayed on the 1st clause.
「*」: Being chosen is shown.
Note 2) 「A」: It is displayed when it connects with the automatic steering gear of TOKIMEC. Steering mode is "AUTO"
Note 3) 「S」: It is shown that a gyrocompass starts and about 2 hours have not passed.
Note 4) It is not displayed when the "external heading sensor" is not connected.

⑨ Alarm indicator
Indication LED shows an alarm state.
It blinks, when an alarm occurs.
The 「LED」 will be continuous light if the alarm state is continuing after ACK/ENT switch is pushed. The light will be put out if it has restored.

⑩ System select indicator
The direction sensor chosen is shown.

2.6.2 Data to display.

(1) [1－GYRO]

It is the true bearing of NO.1 gyro-compass.

When abnormalities occur in communication with NO.1 gyrocompass, a true bearing display part serves as a bar display (blink) as follows.

1－GYRO：－－－－　A＊

(2) [2－GYRO]

It is the true bearing of NO.2 gyro-compass.

When abnormalities occur in communication with NO.2 gyro-compass, a true bearing display part serves as a bar display (blink) as follows.

1－GYRO：－－－－　A＊

(3) [HDM SET]

This is the setting value of difference alarm.

When you set up a value, display this value on the 1st line of a display part.

Next, a value can be set up by pushing the [ACK／ENT] switch.

The value which can be set up is 5-15 degrees.

(4) [－PARAMETER SET－]

They are the various displays for a parameter setup.

When you set up a value, display the 「－PARAMETER SET－」 on the 1st line of a display part.

Next, a value can be set up by pushing the [ACK／ENT] switch.

For details, please refer to "2.7.4 setting parameters".

(5) [G1 ALARM]

The alarm generated with the NO.1 gyro-compass is displayed.

・ It is not displayed when the alarm has not occurred.
・ It becomes the following displays when two or more alarms occur.

The following example is showing the case where five alarms occurred.

And it is the case where the newest alarms are "the GPS communication error."

G1　ALARM 01／05
GPS Com Alarm

At this time, another alarm can be checked with a [△] [▽] switch.

(6) [G2 ALARM]

The alarm generated with the NO.2 gyro-compass is displayed.

・ It is not displayed when the alarm has not occurred.

The displaying method is the same as the (5)th clause.

(7) [MON ALARM]

The alarm generated with the 「HDM」 is displayed.

・ It is not displayed when the alarm has not occurred.

The displaying method is the same as the (5)th clause.

2.7 Running

2.7.1 Start

⚠ CAUTION
●Start in the other steering mode of the automatic steering system than "AUTO".

(1) Start

The 「POWER」 switch of an operation panel is turned "ON."

Usually, it turns "ON."

This equipment will also start if a gyro-compass start when this switch is "ON."

As follows, a product name and a system version number are displayed.

```
HDM220        V100
by SIMRAD
```

It changes to the displays following after that.

```
1-GYRO:123.4°  A*
2-GYRO:123.4°
```

(2) The check of a gyro-compass true bearing

Check that the NO.1 gyro-compass true bearing in this unit coincides with the NO.1 gyro-compass true bearing display.

Check that the NO.2 gyro-compass true bearing of a NO.2 gyro-compass true bearing display and this equipment is in agreement.

2.7.2 Setting difference alarm value

> ⚠ **CAUTION**
>
> ●The heading difference alarm is generated when the difference between the No.1 gyro-compass true bearing and the No.2 gyro-compass true bearing exceeded the preset heading difference alarm width in this term.
> Accordingly, when this alarm is generated, immediately confirm the ship's course and perform infallible steering.

1. Display a 「difference alarm value "HDM SET:"」 on the 1st line of a display part,and push the ACK／ENT switch.
   The display becomes as follows.

```
SET=ENT  ESC=DISP
HDM  THRESHOLD
```

2. Again, push a ACK／ENT switch.
   The display changes as follows.

```
SET=ENT  ESC=DISP
HDM  SET:010.0°
```

   Note : Please push the "DISP" switch, when you do not change a value.
   The display returns to normal.

3. By pressing △ ▽ switches, this value changes.
   The value which can be set up is 5 - 15 degrees.

4. Press the ACK／ENT switch at a suitable value.

2.7.3 System selection

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

Choose the gyro-compass to be used.
"NO.1 gyro-compass" will be chosen if [NO. 1] switch is pushed, with the
"NO. 2 gyro-compass" will be chosen if [NO. 2] switch is pushed, with the
[ACK／ENT] switch.

When the "external heading sensor" is connected, an external heading sensor can be chosen.
" external heading sensor " will be chosen if [EXT] switch is pushed, with the
[ACK／ENT] switch.
When the system was changed, short buzzer sounds three times.

2.7.4 Setting parameters

(1) Setting display contrast

1. When you set up a value, display the 「－PARAMETER SET－」 on the 1st line of a display part.
   Next, push the [ACK／ENT] switch.
   The display becomes as follows.

```
SET=ENT  ESC=DISP
LCD  CONTRAST
```

2. Again, push a [ACK／ENT] switch.
   The display changes as follows.

```
SET=ENT  ESC=DISP
CONT.:■■■■■■■
```

3. By pressing [△] [▽] switches, the display contrast changes.
   Note : Please push the "DISP" switch, when you do not change a contrast.
   The display returns to normal.

4. Press the [ACK／ENT] switch at a suitable value.

(2) Setting back light off time of display

This unit has a function which goes off the back light when a set time elapsed after finishing switch operation. (When 0 minute is set the back light does not go off.)

1. When you set up a value, display the 「－PARAMETER SET－」 on the 1st line of a display part.
   Next, push the [ACK／ENT] switch.
   The display becomes as follows.

```
SET=ENT  ESC=DISP
LCD  CONTRAST
```

2. Push [△] switch.
   The display becomes as follows.

```
SET=ENT  ESC=DISP
LIGHT  OFF  TIME
```

3. Push [ACK／ENT] switch.
   The display becomes as follows.

```
SET=ENT  ESC=DISP
TIME:01. 0(min.)
```

4. Set the time with [△] or [▽] switch.
   The settable time is 0~10 minutes.(1 minutes step)
   Note : Please push the "DISP" switch, when you do not change time.
   The display returns to normal.

5. Push [ACK／ENT] switch.

2.7.5 Alarm

> ⚠ **CAUTION**
>
> ●When the following alarms are generated, the bearing information from this system may not be outputted at all or may have large error.
> All units operated by the bearing information from this system (in particular, the automatic steering system, etc.) should be immediately operated according to the individual emergency operating procedure.
>
> ●Also confirm surrounding safety of the own ship, and stop navigation of the ship if necessary, and take necessary countermeasures appeared in the following terms.

When alarm generates in this unit, it is informed with buzzer sound and display.
When alarm generates, the ALARM indicator flashes and the buzzer sounds.
Confirm the alarm content and press the [ACK／ENT] switch. Buzzer is stop.
When the alarm is instantaneous, the ALARM indicator goes off by pressing the [ACK／ENT] switch.

When the ALARM indicator is lighting even by pressing the $\boxed{\text{ACK/ENT}}$ switch
It shows that the alarm condition continues.

(1) Alarm content

1. [HDG. Difference]

⚠ CAUTION
●When the gyro-compass communication abnormality is generated, the heading difference alarm processing stops. When the gyro-compass communication abnormality is recovered, the heading difference alarm processing starts immediately. ●When the steering mode of the automatic steering system is the other mode than "AUTO" (automatic steering) or "NAV" (remote automatic steering), the heading difference alarm processing stops. ●Until a constant time has been elapsed since the gyro-compass started, the heading difference alarm processing stops.

difference alarm
Alarm generate when the difference between the "No.1 gyro-compass" true bearing and "No.2 gyro-compass" true bearing exceeds the set difference alarm width.

2. [No1 GYRO Comm]

⚠ CAUTION
●Automatic steering may become impossible when the sensor for steering is the "No.1 gyro-compass." Check the state of automatic steering system of operation immediately, and carry out required disposal. ●In this case, it changes to "No.2 gyro-compass".

No.1 Gyro-compass communication error alarm.
Alarms when serial signal from the No.1 gyro-compass is stop or when the No.1 gyro-compass stops operation.

3. [No1 GYRO Data]

⚠ CAUTION
●Automatic steering may become impossible when the sensor for steering is the "No.1 gyro-compass." Check the state of automatic steering system of operation immediately, and carry out required disposal. ●In this case, it changes to "No.2 gyro-compass".

No.1 Gyro-compass data error alarm.
Alarms when anomaly generates in serial signal from the NO.1 gyro-compass.

4. [No2 GYRO Comm]

⚠ CAUTION
●Automatic steering may become impossible when the sensor for steering is the "No.1 gyro-compass." Check the state of automatic steering system of operation immediately, and carry out required disposal. ●In this case, it changes to "No.1 gyro-compass".

No.2 Gyro-compass communication error alarm.
Alarms when serial signal from the gyro-compass is cut or when the No.2 gyro-compass stops operation.

5. [No2 GYRO Data]

⚠ CAUTION
●Automatic steering may become impossible when the sensor for steering is the "No.1 gyro-compass." Check the state of automatic steering system of operation immediately, and carry out required disposal. ●In this case, it changes to "No.1 gyro-compass".

No.2 Gyro-compass data error alarm.
Alarms when anomaly generates in serial signal from the NO.1 gyro-compass.

6. [MSIF Comm (Rcv)]
An alarm is carried out when the serial signal from the "input-and-output signal processing part" of this equipment to the "Change over unit" stops.

7. [MSIF Comm (Trans) Alarm]
An alarm is carried out when the serial signal from the " Change over unit " of this equipment to the " input-and-output signal processing part " unit stops.

8. [PLT. Comm Alarm]
An alarm is carried out, when the serial signal from the automatic steering system to the "Change over unit " stops, or when operation of automatic steering system stops.

9. [PLT. Data Alarm]

An alarm is carried out when abnormalities are in the "serial signal" from the automatic steering system to the "Change over unit ".

***When the "external direction sensor" is connected, there is a function which outputs the following alarms.**

10. [EXT. Comm Alarm]

⚠ CAUTION
●Automatic steering may become impossible when the sensor for steering is an "external heading sensor." Check the state of automatic steering system of operation immediately, and carry out required disposal.

An alarm is carried out, when the serial signal from the "external heading sensor" to the "Change over unit " stops, or when operation of "external heading sensor" stops.

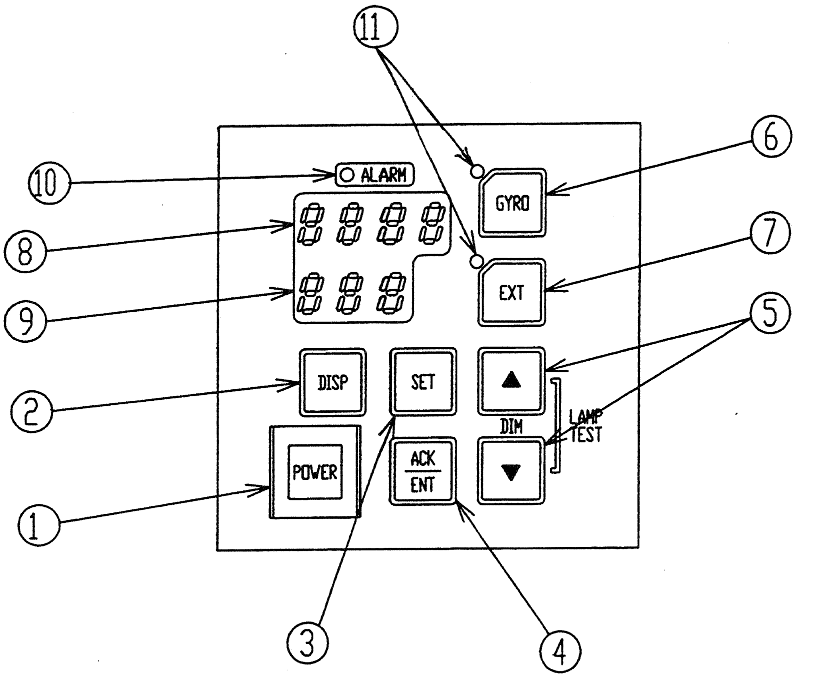
11. [EXT. Data Alarm]

⚠ CAUTION
●Automatic steering may become impossible when the sensor for steering is an "external heading sensor." Check the state of automatic steering system of operation immediately, and carry out required disposal.

An alarm is carried out when abnormalities are in the "serial signal" from the "external heading sensor" to the "Change over unit ".

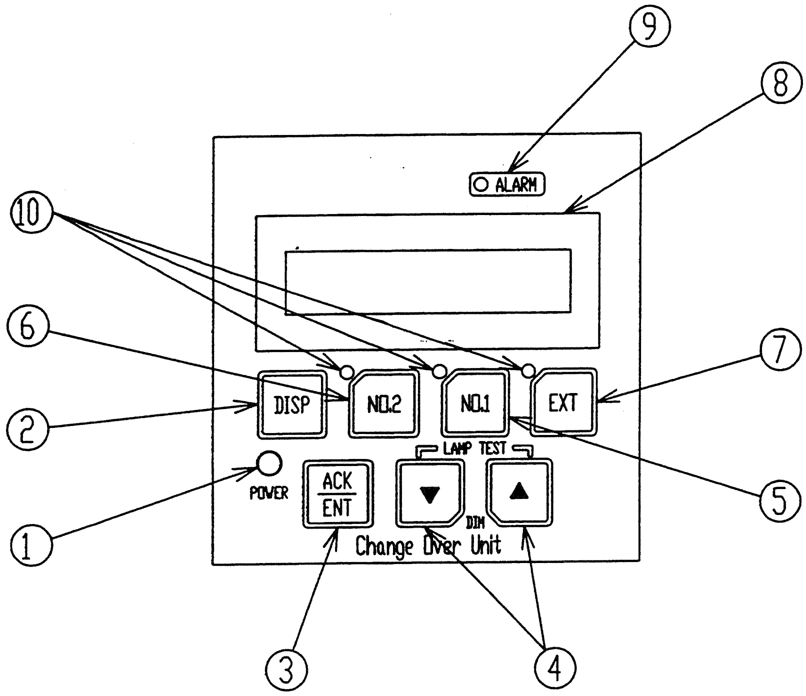
2.8 Stop

The 「POWER」 switch of an operation panel is turned "OFF."
Usually, it turns "ON."



1. POWER SWITCH
2. DISP SWITCH
3. SET SWITCH
4. ACK/ENT SWITCH
5. ? ¿ SWITCH
6. SYSTEM SELECT SWITCH(GYRO)
7. SYSTEM SELECT SWITCH(EXT.)
8. DATA DISPLAY
9. MODE DISPLAY
10. ALARM INDICATOR
11. SYSTEM SELECT INDICATOR

Fig 2.1 Operating Panel



① POWER SWITCH

② DISP SWITCH

③ ACK/ENT SWITCH

④ ?? SWITCH

⑤ SYSTEM SELECT SWITCH(NO.1 Gyro-compass)

⑥ SYSTEM SELECT SWITCH(NO.2 Gyro-compass)

⑦ SYSTEM SELECT SWITCH(Magnetic compass)

⑧ DATA DISPLAY

⑨ ALARM INDICATOR

⑩ SYSTEM SELECT INDICATOR

Fig2.2 Cange Over Operating Panel

CHARTER 3 INSTALLATION

* Attach DATA

Dip switch assign & jumper setting of each PWB

- ○ SCC PWB
- ○ ICIF PWB
- ○ SIFC PWB
- ○ SCOIF PWB
- ○ MIFC PWB
- ○ MCOIF PWB
- ○ GPOWER PWB
- ○ GTERM PWB
- ○ MCC PWB
- ○ INVERTER PWB
- ○ HRZC PWB
- ○ SMCC PWB
- ○ PCC PWB
- ○ RPCC PWB
- ○ ITERM PWB
- ○ IOPT PWB

CHAPTER 3 installation

3.1 Works before operation and system start

Make sure that each items shown "table 3.1 check list 1"are confirmed.

3.1.1 Packing & storage

* Note: storage temperature & humidity and storage period / time

Our recommendation is within +5℃～+30℃ for temp. and humidity 60% or less.

Storage period / time is 6 month or less.

If the period is exceeded above, have to perform the bench test

* Note: The maximum storage period is max. 1 year which is same as warranty period.

3.1.1.1 Master compass

The master compass is shipped with the packing appearance shown in Figure 3.1

Never fall the sensitive element down to the ground.

Keep the container of the sensitive element since it can be used for transportation in case of its overhaul work.

Do not lose the damper oil tube contained in the binnacle.

Confirm all contents of the spare parts box referring to the attached spare parts list.

3.1.1.2 Control unit

Control unit is shipped with the packing appearance shown in Figure 3.2.

3.1.1.3 Automatic steering system built-in system

For the automatic steering system built-in system, the master compass Binnacle and each unit of the control unit are installed in the automatic steering system before the shipment.

An example of this case is shown in Figure 3.3.

The sensitive element and the spare parts are shipped with the packing appearance shown in Figure 3.1

3.1.2 Steps for installation and system start

(1) Remove the case of binnacle.

(2) Remove inside packing material. Refer to item 3.1.3.

(3) Take out the sensitive element. Refer to item 3.1.3.

(4) Install the sensitive element on the binnacle. Refer to 3.1.4.

Note: Use the jig specified by TOKIMEC whenever to install the sensitive element. Otherwise it may not get original performance.

(5) Mount the connectors on the sensitive element. Refer to item 3.1.4.

(6) Confirm north-south balance of the sensitive element. Refer to item 3.1.4.

(7) Confirm that all settings of the DIP SWs and jumpers comply with the ship's specifications. Refer to item 3.1.5.

(8) Confirm input voltage of the main power supply and the back-up power supply. Refer to item 3.1.6.

(9) Turn the power supply switch to "ON". Refer to item 3.1.6.

(10) Confirm internal data. Refer to item 3.1.6.

(11) Perform initial adjustment. Refer to item 3.1.6.

(12) Verify various functions and operating modes. Refer to item 3.2 and 3.3

(13) Verify the setting with continuous running. Refer to item 3.2

3.1.3 Preparation for installation of the sensitive element

3.1.3.1 Preparation for the binnacle (Refer to Figure 3.4)

a) Installation

Consider the following conditions for the installing place as much as possible.

(1) Place with less shock and less vibration from the ship body

(2) Place with less up-down motion due to pitching and rolling of the ship body

(3) Place with less environmental temperature variation and better ventilation

(4) Place where service space indicated in the drawing is fully secured

(5) Place where the floor is flat and strong enough Install the binnacle by adjusting the "base line" located in the bottom of the binnacle to the fore and aft line or parallel with it.

Adjust the position as precisely as possible because the installation error causes heading error in that condition.

b) Preparation

By removed the case of binnacle, the inside phantom ring, the horizontal ring, the shock absorbers and others fixed by tieton and sponge are found, and remove them.

And also remove four screws for mounting the mounting ring of the sensitive element. Refer to Figure 3.4.

3.1.3.2 Preparation for the sensitive element side (Refer to Figure 3.5)

Remove the upper side of expanded plastic, or remove. the material for fixing sensitive element after opening the upper side of corrugated cardboard box.

The sensitive element is within the plastic bag.

Open top of the bag and remove the "cap" on top of the sensitive element.

Take the sensitive element out from vinyl bag.

Note: Be careful to taking it out because the sensitive element is very slippery.

Do not tilt it because the sensitive element is filled inside with oil and its top is open.

It may fall down if putting it on the floor because the bottom of the sensitive element is sphere.

3.1.4 Preparation for installation of the sensitive element (Refer to Figure 3.6)

3.1.4.1 Installation of the sensitive element

Tilt the horizontal ring of the binnacle until touching stopper, and mount quickly the sensitive element to the mounting ring.

At this time make it so that the rotor level meter points to "west side".

Next, mount the assembly jig specified by TOKIMEC for positioning of the sensitive element to the specified position.

Fix the sensitive element by inserting screws into the screw holes except ones used for inserting the jig.

Remove the jig, and fix the sensitive element with screws to that position.

Use one of securing screws for connection of grounding wire to the sensitive element case.

Then, fix the connector to the connector port located in the east side of the sensitive element by screws.

Mate the connector direction and the protrusions in the both sides of the connector.

Connect these flexible wires to the sensitive element not to be twisted.

Refer to Figure 3.6.

3.1.4.2 Confirmation and adjustment of north-south balance

(Refer to Figure 3.7.1 : TG-8000, Figure 3.7.2 : TG-8500)

Confirm static north-south balance of the sensitive element just mounted and adjust it.

Place the master compass on flat level place (tilt angle is less than around 2 degree).

a)TG-8000: (Figure 3.7.1) Confirm that the north-south tilt of the sensitive element is between 15° and 19° when the horizontal ring is almost level.

This confirmation is performed in the both cases for north side up and for south side up.

When tilting the sensitive element to the reversed side, tilt it slowly and hold it for around 30 seconds.

b)TG-8500: (Figure 3.7.2) Confirm that the north-south tilt of the sensitive element is between 18° and 22° when the horizontal ring is almost level.

This confirmation is performed in the both cases for north side up and for south side up.

When tilting the sensitive element to the reversed side, tilt it slowly and hold it for around 60 seconds.

Note : Carry out above bearing adjustment under the condition of usual temperature.

If the tilt angle is greater than this, adjust it by adding weight in the bottom of the shield case.

At this time, adjust it so that each weight mounted at four points is same amount.

If the tilt angle is smaller than this, adjust it by removing weight in the bottom of the shield case.

Once adjusted, wait for approx. 2 minutes at least and confirm it in each direction.

If required, adjust it again.

If the master compass is placed in level place and if the tilt angle is 19° , refer to Figure 3.7 as
a reference which shows that the north end (south end) of the sensitive element match the top end
of the horizontal ring.

If the master compass is not placed in level place, accordingly position relationship between the
horizontal ring and the sensitive element has mismatch
(as shown in Figure 3.7).

3.1.4.3 Refilling of damper oil (Refer to Figure 3.6)

Refill the attached damper oil into the damper oil case located in the south side of the horizontal ring.

Pour it slowly into the case since the oil has high viscosity. Whenever it overspill outside the case, wipe it cleanly.

3.1.5 System setting

Confirm that the system setting comply with the specifications of the installed ship.

Specially, the settings marked by "*" are changed according to the ship's specifications.

Refer to the table appended to the last of this chapter for a setup of a system.

Moreover, please refer to "the figure of pwb" of Chapter 5.

3.1.6 Power-on

3.1.6.1 Preparation for power-on

Do not mistake the following switch operation by seeing the Figure 3.8 Operating panel.

(1) Confirm the power supply voltage.

Main power supply: 100 V AC±10 %, 50/60 Hz±5 % or 220 V AC±10 %, 50/60 Hz±5 %

Back up power supply: DC24V +30%～-20%

3.1.6.2 Confirmation of operation 1

(Confirmation and adjustment of the rotor level and the horizontal ring level)

Confirm that the master compass is installed in level place. Otherwise, confirmation of the adjustment mentioned in the following item b) may not be made.

Start up the system in the test mode b. (Refer to item 3.3.3 in Chapter 3 for the test mode b.)

To exit from the test mode b, turn the power supply switch ① to "OFF".

Start up the system in the test mode b.

a) Turn the power switch on by pressing simultaneously [DISP] switch and [SET]switch in the operation panel.

「t-b」is indicated flickeringly in the mode indication panel. The bearing is indicated in the data indication panel.

Wait for master compass turning for 360° clockwise.

*Note: If the rotor is rotating when started up, "dot" on the right of mode indication panel and indication lamp of system selectionflash and the brakes are applied to the rotor till its stop. After confirmation of the stop "dot" and the indication lamp change to lighting, andgoes the next sequence of turning by 360° with decreasing reading (clockwise).

b) Press [ACK/ENT] switch in the operating panel.

The sensitive element erects.

*Note: Confirm that any hunting does not occur when it erects. If it occurred, use HRZC PWB: RV1 to stop hunting.
Refer to item 5.5 in Chapter 5 for adjustment of the HRZC PWB.

Wait for about 60 second in this conditions.

Then, confirm the rotor level. If a bubble in the rotor level meter is in the center position, the rotor is level.

* In this manual, "50' " is assumed when a bubble in the rotor level meter is in the center.

Erection accuracy is 50'±34'.

Erection accuracy is within 50'±34'. (A graduation in the rotor level meter is 4'.)

If the reading of the rotor level meter is not within 50'±34', adjust it by using HRZC PWB: RV2.

*Note: For the adjustment of the rotor level, adjust the HRZC PWB: RV2 a little bit and wait around 10 seconds and then confirmed the level.
Repeat this procedure for the adjustment.

*Note: The adjustment action of the HRZC PWB is effective only for 2 minutes after pressed [ACK/ENT] switch. If the adjustment was not completed within 2 minutes, once turn the power supply switch OFF and holding to press simultaneouly [▽],[△]switch in the operating panel again, turn the power switch "ON", then perform the adjustment after press [ACK/ENT].

c) Confirm the horizontal ring balance.

* In this manual, as the above rotor level meter, "50' " is assumed when a bubble in the rotor level meter is in the center.

Confirm that the reading of "level" attached to the horizontal ring is within 50'±5'. (A graduation in the level meter is 2'.)

If the value of the "level" is not within 50'±5', adjust the weight on the horizontal ring by adding or removing so that the horizontal ring (the horizontal axis) becomes level.

*Note: When changed the weight, wait for more than 5 minutes for TG-8000 and for more than 20 minutes for TG-8500 then confirm the "level". For this adjustment perform so that the total weight becomes as low as possible.

3.1.6.3 Confirmation of the repeater signal and the serial signal

After the previous confirmation and adjustment completion, perform the following confirmation.

*Note: Entered ship's speed must be zero knot.

Start up the system in the test mode b and wait until the master compass turns by 360° with decreasing reading (clockwise).

a) Press [△],[▽] switch in the operation panel to set the value in the data indication panel 0.0° , then press [ACK/ENT] switch.

b) Adjust the card reading of the connected each repeater to 0.0° .
This adjustment is not required for serial repeaters. Confirm that card reading is 0.0° ±0.3° .

c) Adjust the value in the data indication panel to 45.0° by pressing [△]switch in the operation panel, And press[ACK/ENT] switch.
Confirm that the master compass turns and the card reading becomes 45.0° ±0.1° .
At this time confirm the card reading of the connected each repeater becomes 45.0° ±0.3° .
Also confirm that the bearing of the unit received the serial signal is also 45.0° .

d) Further, by pressing [△] switch in the operating panel, set up the value in the data indication panel to 90.0° and 135.0° in 45° step, and confirm the reading of each repeater and the bearing of the unit which received the serial signal.

3.1.6.4 Confirmation and reset of the internal parameters in the extended menu

Confirmation and reset procedures for the internal parameters before normal running are explained.

Confirmation and reset of these values are performed in order to surely start proper operations during the normal running

Start up the system with the operation mode, test mode b.

To enter into the Extended Menu (setting), press simultaneously [ACK/ENT] switch and [SET] switch for more than three (3) seconds.

* To escape from the Extended Menu (setting), press simultaneously [ACK/ENT] switch and [SET] switch for more than three (3) seconds again.

All indicated values in this menu are memorized in non-volatile memory of SCC pwb.

Extended menu 1 and 2 were prepared for TG-6000. It is story-structure in one menu for TG-8000/8500.

Parameter is like 「table 3.2 Extended menu parameter summary」and items can scrolled by [DISP] switch.

And reverse scrolling is available by pressing [DISP] switch holding press of [ACK/ENT] switch.

3.1.6.4.1 The process of the confirmation of the parameter

To confirm the parameter of each item, push [DISP] and select the item (A- No.).

Then, push [SET], changes to the details item.

Next, push [DISP], and select the parameter to confirm.

For example : To confirm the value of Bearing offset B

1) [SET]+[ACK/ENT](more than 3 secnds.) Mode Indication part :A-1

2) [DISP] Mode Indication part : A-2

3) [SET] Mode Indication part : 2.1.o

Data Indication part :000.0(deg.) : Bearing off set A

4) [DISP] Mode Indication part :2.2.o

Data Indication part :000.0(deg.) : Bearing off set B

5) [SET] Mode Indication part : A-2

3.1.6.4.2 The process of the change of the value of the parameter

To chage the value of the parameter of each item, push [DISP] and select the item (A−No.).

Then, push [SET] then, changed to the details item.

Next, push [DISP], and select the parameter to change.

After that, change the value by [△][▽], and decides by [ACK/ENT].

For example : To change the value of "方位角 Offset B"from 0.00° to -2.0

1) [SET]+[ACK/ENT](more than 3 seconds.) Mode Indication part :A-1

2) [DISP] Mode Indication part :A-2

3) [SET] Mode Indication part :2.1.o

Data Indication part :000.0 / Illumination is on :Bearing off set A

4) [DISP] Mode Indication part :2.2.o

Data Indication part : 000.0 / Illumination is on :Bearing off set B

5) [▽] Mode Indication part : 2.2.O

Data Indication part : 359.9 / Illumination flashes : Bearing off set B

6) [▽]···[▽] Mode Indication part : 2.2.O

Data Indication part : 358.0 / Illumination flashes :Bearing off set B

7) [ACK/ENT] Mode Indication part : 2.2.OO

Data Indication part : 259.0 / Illumination is on :Bearing off set B

8) [SET] Mode Indication part : A-2

3.1.6.4.3. Particulars of parameter

a) Item A-1

1) Damping gain (A-1) Mode indication 1.1.U

Refer to the item "*.*.* Damping".

This value determines the damping (Damping operation in north-seeking motion = half cycle attenuation) and actually represents a coefficient (ratio) to the standard value stored in the software.

For example, when the setting value is 2.00, it is calculated by using two times damping gain of the standard value in software.

The damping gain relates to cyclic period and attenuation rate of the gyro-compass as shown in the following table.

Damping gain	Period	Attenuation rate
Large ↑ ↓ Small	Large Small	Small Large

Note : Normally, it is not required to change the standard value as it was set (in the factory before the shipment).

It is required to confirm when the sensitive element was replaced.

2) Bearing servo gain (A-1) Mode indication : 1.2.F

This value determines gain of the bearing servo loop where phi ϕ signal (deviation signal around rotor's vertical axis) is calculated, drives the azimuth step motor and has the sensitive element follow to the gyro-sphere vertical axis (around azimuth axis) rotation.

And it actually represents a coefficient (ratio) to the standard value stored in software.

The servo gain becomes double of standard value in software when the setting value is 2.00.

Note :Normally, it is not required to change staying with the standard value (1.00) as it was.

3) Horizontal servo gain (A-1) Mode indication : 1.3.Ṡ

This value determines gain of the horizontal servo loop where theta θ signal (rotor tilting angle signal) is calculated, drives the horizontal DST and has the sensitive element follow to the gyro sphere tilting angle (rotor tilting angle).

And it actually represents a coefficient (ratio) to the standard value stored in the software.

The servo loop gain becomes double of software standard value when the setting value is 2.00.

Note : Normally, it is not required to change the standard value (1.00) as it was.

4) Leveling servo gain (A-1) Mode indication : 1.4.u

Leveling motion (sensitive element erection motion) calculates X signal (equivalent inclination angle) which is outputted from the sensitive element and relative inclination angle signal from HRZC pwb, controls to have the sensitive element keep horizontal.

The value determines this control loop gain.

And it actually represents a coefficient (ratio) to the standard value stored in the software.

The servo loop gain becomes double of software standard value when the setting value is 2.00.

Note : Normally, it is not required to change the standard value (1.00) as it was.

5) ϕ Fai offset (A-1) Mode indication : 1.5.L Unit ; deg.

This is offset value (deg.) value around the vertical axis of gyro sphere (rotor axis) and the sensitive element.

Note : Normally, it is not required to change the standard value (0.00) since it is adjusted in the factory.

6) θ Theta offset (A-1) Mode indication : 1.6.t Unit ; deg.

This is offset value (deg.) value around the horizontal axis of gyro sphere (rotor axis) and the sensitive element.

Note : Normally, it is not required to change the standard value (0.00) since it is adjusted in the factory.

7) X signal pick up gain (A-1) Mode indication : 1.7.G Unit : v/deg.

X signal represents the distance of the sensitive element share and the rotor axis direction.

Inclination angle around horizontal axis is obtained equivalently by monitoring this signal.

For example, when north side of the rotor axis rises, the sensitive element follows to rise its north side, then gyro sphere suspended by the suspension wire moves to south side.

X signal represents this amount of movement and it is represented by 「v/deg.」.

Note : Normally, it is not required to change the standard value since it is adjusted in the factory.

This value is effective only for TG-8500. For TG-8000, fixed value is used for calculation.

8) Suspension wire twist torque fixed value

Note : Normally, it is not required to change the standard value since it is adjusted in the factory.

9) Maximum rate of turn (A-1) Mode indication : 1.9.r Unit : deg./sec.

Maximum rate of turn (maximum turn rate) in the turn rates which the bearing servo system followed up to this moment. (Unit: deg./ sec.)

Note : The maximum is measured after 3 hours from the system start.

Note : Reset this data certainly after completion of installation.

Method of reset : Select detailed item by pressing [DISP] switch and [SET] switch in the Operation panel.

If the detailed item is selected, indication becomes as follows.

Mode indication : 1.9.r Data indication : 10.50 (example)

If [△] switch or [▽] switch is pressed, the indication becomes as follows flickeringly.

Mode indicatiob : 1.9.r   Data indication : 00.00

Confirm by pressing [ACK/ENT] switch.

10) Maximum deviation of bearing servo (A-1) Mode indication : 1.A. F   Unit : deg.

Maximum deviation value in the bearing servo loop that occurred up to this moment. (Unit: °/ sec.)

Note : The maximum is measured after 3 hours from the system start.

Note : Reset this data certainly after completion of installation.

Method of reset : Reset according to the method represented in 3.1.6.4.3-a)-9) Maximum rate of turn after selected this detailed item.

11) Maximum deviation of horizontal servo (A-1) Mode indication : 1.b.S Unit : deg.

Maximum deviation value in the horizontal servo loop that occurred up to this moment. (Unit: °/ sec.)

Note : The maximum is measured after 3 hours from the system start.

Note : Reset this data certainly after completion of installation.

Method of reset : Reset according to the method represented in 3.1.6.4.3-a)-9) Maximum rate of turn after selected this detailed item.

b) Item A-2

Parameters of control unit

1) Bearing offset A (A-2) Mode indication : 2.1.o Unit : deg.

This is offset value included in the "master bearing" and used for correction of fixed error. (unit is deg.)

Normally, this value is 0.00. However, if the master compass cannot be set or parallel to the fore and aft line, this offset value is entered to compensate this small angle.

* Note: Install the master compass to adjust to the fore and aft line or parallel..

Entered and displayed value is 0 through 359.9° .

For example, –2.0° offset is entered in case the master compass is set at 0° and the master compass settled At 2.0° , however actually the entered value is to be 358.0° (360.0° -2.0°).

And +2.0° offset is entered in case the master compass is set at 0° and the master compass settled At 358.0° , however actually the entered value is to be 2.0° (360.0° (0°) +2.0°).

Note ; This value can be set only in the this extended menu.

2) Bearing offset B (General bearing error collection) (A-2) Mode indication : 2.2.O Unit : deg.

This is offset value for general bearing error collection to enter to master compass bearing..

Normally, this value is 0.00.

It is entered in order to collect the bearing in case the bearing was deviated due to some reason.

This value is cleared (0.0°) when it passed zero-cross pin or power was switched OFF.

Entered and displayed value is 0 through 359.9° .

Entered value and polarity are the same as above Bearing offset 1.

For example, enter 350° , If entering –10.0° is required.

Note ; This value can be set in the this extended menu or 「Gyro compass true bearing indication condition 」 under ordinal operation.

3) Zero-cross bearing (A-2) Mode indication : 2.3.h Unit : deg.

This value is absolute bearing set for MCU PWB when zero-cross pin was passed during start-up sequence (last azimuth operation) and normal running operation.

Zero-cross bearing can be set in this menu, too, however normally set it up by measuring position (angle) of the zero-cross pin in the master compass by the test mode A.

Refer to item 3.3.2 test mode A.

4) Zero-cross error allowance (A-2) Mode indication : 2.4.E Unit: deg.

This value is a threshold to generate zero-cross error alarm.

* Zero-cross error

The CPU of the master compass (MCC PWB) obtains relative bearing by accumulating driving signal (pulse) to the bearing step motor during operation.

The CPU (MCC PWB) sets the above zero-cross bearing (absolute bearing) when the photo interrupter on the ZRCR PWB just passed by the cross pin.

When the zero-cross bearing is set, the difference between the zero-cross

bearing and the total relative bearing angle till the time when the zero-cross point was set, is transmitted as serial signal to the CPU (SCC PWB) in the control unit. The CPU (SCC PWB) generates the zero-cross error when the received difference exceeds this zero-cross error allowance.
By using this function, error caused during relative bearing angle calculation is detected and also compensated.
Set zero-cross bearing every time zero-cross pin is detected.

5) Year (A-2) Mode indication : 2.5.y
The "year" set in the system are displayed.
Set it up again if the current "year" is not matched this year.
Note : Set up value of detailed item and item 6) 7) remains as alarm record.
Set up correctly when the installation.

6) Month and day (A-2) Mode indication : 2.6.N
Each two digits of the "month" and the "day" set in the system are displayed.
Set it up again if the current "month" and "day" are not matched current month and day.

7) Time (A-2) Mode indication : 2.7.t
Each two digits of the "hour" and the "minute" set in the system are displayed.
Set it up again if the current "hour" and "minute" are not matched.

8) Total days of operation (A-2) Mode indication : 2.8.d
Total day number that one day is added at 10 a.m. every time the system started up.
Note : Reset it certainly after installation completion.
Method of reset : Reset this data certainly after completion of installation.
Method of reset : Reset according to the method represented in 3.1.6.4.3-a)-9) Maximum rate of turn after selected this detailed item.

9) Display/setting of GPS connection (A-2) Mode indication : 2.9.G
Display and setting that the GPS is connected or not in the system.
[bE]: with GPS
[Non]: NO GPS
Note : When "No GPS" is selected, "GPS" can not be selected for input of ship's speed and latitude.

10) Display/setting of LOG (contact) connection (A-2)   Mode indication : 2.A.L

Display and setting that the Log system (contact) is connected or not in the system.

[bE]: with Log (contact)

[Non]: NO Log (contact)

Note : When "No Log (contact)" is selected, "LOG" can not be selected for ship's speed input.

11) Display/setting of LOG (serial) connection (A-2)   Mode indication : 2.b.S

Display and setting that the Log system (serial) is connected or not in the system.

[bE]: with Log (serial)

[Non]: NO Log (serial)

Note : When "No Log (serial)" is selected, "SLOG" can not be selected for ship's speed input

12) Display/setting of GPS performance index data check (A-2)   Mode indication : 2.c.c

Display and setting that performance index data of GGA sentence is checked or not.

[bE]: Check performance index

[Non]: Not check performance index

13) Setting of analogue signal output offset of circular angle speed (A-2)   Mode indication : 2.d.o   Unit : deg./min.

Offset value for analogue signal output of circular angle speed

Unit of offset is deg/min.   and

Entered value is ±5% of maximum output angle speed.

- 30 deg./min.   at set-up, ±1.6 deg./min.   (32 deg./min. x 0.05)
- 120 deg./min.   at set-up, ±6.5 deg./min.   (130 deg./min. x 0.05)
- 300 deg./min.   at set-up, ±16.0 deg./min.   (320 deg./min. x 0.05)

Refer to 3.3. 1 of this chapter.

14) Setting of filter time constant of circular angle speed (A-2)   Mode indication : 2.E.F   Unit : sec.

Filter time constant output of circular angle speed

Calculation of primary delay filter is performed with this set up value (second) for circular angle speed

Calculated from the bearing, then final circular abgle speed is obtained.

Entered value is 0.5, 1.0, 2.0, 4.0, 6.0, 8.0, 10.0 seconds.

Refer to 3.3.1 in this chapter.

Note ; This value can be set in the this extended menu or 「circular angle speed indication condition 」under ordinal operation.

15) Setting of analogue signal output gain of circular angle speed (A-2) Mode indication : 2.F.G

Analogue signal output gain of circular angle speed is set up.

Entered value is 0.9 through 1.0.

Refer to 3.3.1 in this chapter.

c) Item A-3

Setting of alarm

1) Alarm log (A-3) Mode indication : 3.1.E

The functuion is to memorize the general alarms in the past.

In the "E r r" indication, an alarm record is displayed from the latest one in the Order of "year", "month/day" and "time and the detailed code " by every pressing [△] switch.

Pressing [▽] switch makes it reverse order display.

Below example present that GPS communication (cut) abnormal 13:30 occurred on August 4, 2003 and LOG communication (cut) abnormal occurred at 09:15 on August 10, 2003.

Operation panel	Data indication : Err	Mode indication : 3.1.E
[△]	Data indication : 2003 (year 2003)	Mode indication : 3.1.E
[△]	Data indication : 08.10 (Aug.10)	Mode indication : 3.1.E
[△]	Data indication : 09.28 (Log cut at 9:00)	Mode indication : 3.1.E
[△]	Data indication : 20003 (year 2003)	Mode indication : 3.1.E
[△]	Data indication : 08.04 (Aug..4)	Mode indication : 3.1.E
[△]	Data indication : 13.25 (GPS cut at 09:00)	Mode indication : 3.1.E
[▽]	Data indication : 08.04 (Aug.4)	Mode indication : 3.1.E
[▽]	Data indication : 2003 (year 2003)	Mode indication : 3.1.E

Note : Clear this data certainly after installation completion.

Method of clear : select this detailed item and confirm following indication.

Data indication : Err   Mode indication : 3.1.E

Press [SET] switch, then data indication flicker.

All recorded alarms are cleared after data indication became flickering by pressing [SET] switch.

After clear, confirm that it was cleared certainly by pressing [△].

2) Occurred number of zero-cross error (A-3) Mode indication : 3.2.n

Total times number that zero-cross alarm generated.)

Total number of the case when zero-cross error value exceeded the threshold level set by "A-2, 2.4.E.

Note : Reset this data certainly after installation completion.

Method of reset : Reset according to the method represented in 3.1.6.4.3-a)-9) Maximum rate of turn after selected this detailed item.

3) Maximum value of zero-cross error (A-3) Mode indication : 3.3.H Unit : deg.

Maximum value of zero-cross error which was detected until now.

Note : Reset this data certainly after installation completion.

Method of reset : Reset according to the method represented in 3.1.6.4.3-a)-9) Maximum rate of turn after selected this detailed item.

4) Occurred year of zero-cross error (A-3) Mode indication : 3.4.y

The year when zero-cross error of the above item 2) occurred.

Note : Reset this data certainly after installation completion.

Method of reset : Reset according to the method represented in 3.1.6.4.3-a)-9) Maximum rate of turn after selected this detailed item.

5) Occurred month/day of zero-cross error (A-3) Mode indication : 3.5.N

Month and day when zero-cross error of the above item 2) occurred.

Note : Reset this data certainly after installation completion.

Method of reset : Reset according to the method represented in 3.1.6.4.3-a)-9) Maximum rate of turn after selected this detailed item.

6) Occurred hour/minute of zero-cross error (A-3) Mode indication : 3.6.t

Two digits of hour and minute when zero-cross error of the above item 2) occurred.

Note : Reset this data certainly after installation completion.

Method of reset : Reset according to the method represented in 3.1.6.4.3-a)-9) Maximum rate of turn after selected this detailed item.

7) Occurred number of encorder error (A-3) Mode indication : 3.7.n

Total times number that encorder error generated.)

Note : Reset this data certainly after installation completion.

Method of reset : Reset according to the method represented in 3.1.6.4.3-a)-9) Maximum rate of turn after selected this detailed item.

8) Number of CPU (SCC pwb) reset (A-3) Mode indication : 3.8.r

Number of reset which was performed with watch dock timer by CPU of SCC pwb.

Note : Reset this data certainly after installation completion.

Method of reset : Reset according to the method represented in 3.1.6.4.3-a)-9) Maximum rate of turn after selected this detailed item.

d) Item A-4

Setting for receiving serial signal from GPS

1) Character length of serial signal (A-4) Mode indication : 4.1.C

"8 bits" or "7 bits" is set up.

Data indication : "8 bits" : 「8」 "7 bits" :「7」

2) Serial signal data parity bit (A-4) Mode indication : 4.2.P

"Non", "Even" or "Odd" is set up.

Data indication : "Non" : 「non」 "Even" :「EuEu」 "Odd" : 「Odd」

3) Serial signal data stop bit (A-4) Mode indication : 4.3.S

"1 bit" or "2 bits" is set up.

Data indication : "1 bit" : 「1」 "2 bits" :「2」

e) Item A-5

Setting for receiving serial signal from LOG

1) Character length of serial signal data (A-5) Mode indication : 5.1.C
"8 bits" or "7 bits" is set up.
Data indication : "8 bits" : 「8」 "7 bits" :「7」

2) Serial signal data parity bit (A-5) Mode indication : 5.2.P
"Non", "Even" or "Odd" is set up.
Data indication : "Non" : 「non」 "Even" :「EuEu」 "Odd" : 「Odd」

3) Serial signal data stop bit (A-5) Mode indication : 5.3.S
"1 bit" or "2 bits" is set up.
Data indication : "1 bit" : 「1」 "2 bits" :「2」

f) Item A-6 (applied after V1.01)

Setting for receiving serial signal from external azimuth sensors

1) Character length of serial signal data (A-6) Mode indication : 6.1.C
"8 bits" or "7 bits" is set up.
Data indication : "8 bits" : 「8」 "7 bits" :「7」

2) Serial signal data parity bit (A-6) Mode indication : 6.2.P
"Non", "Even" or "Odd" is set up.
Data indication : "Non" : 「non」 "Even" :「EuEu」 "Odd" : 「Odd」

3) Serial signal data stop bit (A-6) Mode indication : 6.3.S
"1 bit" or "2 bits" is set up.
Data indication : "1 bit" : 「1」 "2 bits" :「2」

g) Item A-7 (applied after V1.01. V1.00 is performed as A-6)

1) Product type (A-7) Mode indication : 7.1.t
"std" : TG-8000
"HSC" : TG-8500

2) SCC software version number (A-7) Mode indication : 7.2.u
MCC software version number (A-7) Mode indication : 7.3.u

h) item A-8 (Applied after V1.01. V1.00 is performed as A-7)

Content confirmation of the extended menu (A-8)   Mode indication : 8.1.t

Indication changes one after the other like 「----」「trnS」every time [△] switch is pressed.

After indicate 「trnS」, content of the extended menu is outputted only once in serial signal by pressing [ACK/ENT] switch.

Example of output is shown in 3.4.6.3.8.

Presence of speed error collection filter (A-8)   Mode indication : 8.2.S

[on] : Use the filter for the calculation of speed error

[oFF] : Do not use the filter for the calculation of speed error

Note : This setting return to default value (filter ON) by power OFF.

3.1.6.4.4 Example of output of the extended menu

Following data in serial signal is outputted once from the serial signal port for software writing.

Baud rate is 38400 bps.

Example of data output

*** Ext Menu A1 Data ***

Damping gain ratio   :0.95
Bearing servo gain ratio   :1.00
Horizontal servo gain ratio   :1.00
Leveling servo gain ratio   :0.45
phi offset   :0.00
Theta offset   :-0.04
X signal pickup gain   :2.25
Ks/H   :1.300
Maximum rate of turn   :0.00
Maximum deviation of bearing servo   :0.00
Maximum deviation of horizontal servo   :0.00

*** Ext Menu A2 Data ***

Bearing offset   :0.0
Zero-cross bearing   :345.4
Zero-cross error allowance   :2.0
Year   :2003
Month and day   :519

Hour and minute :954

Total days of operation :121

GPS connection : bE

LOG connection : bE

LOG(serial) connection : bE

ROT analog offset(x10 deg./min) :0

ROT filter(sec) :1.0

ROT gain(x1000) :975

*** Ext Menu A3 Data ***

Occurred number of zero-cross error :0

Maximum zero-cross error :0

Occurred year of zero-cross error :0

Occurred month/day of zero-cross error :0

Occurred hour/minute of zero-cross error :0

Occured number of encoder error :0

Occured number of reset with WATCH DOG TIMER :0

*** Ext Menu A4 Data ***

GPS serial data character length: 8

GPS serial data parity bit : Non

GPS serial data stop bits : 1

*** Ext Menu A5 Data ***

LOG serial data character length: 8

LOG serial data parity bit : Non

LOG serial data stop bits : 1

*** Ext Menu A6 Data ***

Master compass type : Std

SCC software version number:1000

MCC software version number:1000

*** Alarm Log ***

00001 2002:07:10:02 30(Signal from Backup unit is cut)

00002 2002:07:10:02 31(Signal from Backup unit is abnormal)

00003 2002:07:09:18 30(Signal from Backup unit is cut)

00004 2002:07:09:18 26(Signal from LOG(serial) is cut)

00005 2002:07:09:18 24(Signal from GPS is cut)

00006 2002:07:09:18 03(Power supply becomes over voltage)

00007 2002:07:09:18 02(Power supply becomes over current)

00008 2002:07:09:18 01(The main power is lost)

3.2 Preliminary running

3.2.1 Start up

3.2.1.1 Preparation

Confirm that Chapter 3.1 was certainly performed.

a) Confirm the power supply voltage.

Main power supply: 100 V AC±10 %, 50/60 Hz±5 % / 220 V AC±10 %,
50 / 60 Hz±5 %

Back up power supply: 24 V DC +30 % - -20 %

b) Confirm all cable connections.

c) Confirm that internal switch for service is "ON" and turn on power-switch in the operation panel.

d) Wait for the master compass turning for 360° clockwise.

If rotor is rotating, break rotor. During breaking, it is notified by flicker of "dot" on right in mode indication panel and system select indication lamp.

When rotor stops, flicker of "dot" on right in mode indication panel and system select indication lamp turn into lighting.

In case "timer start" is set up, set departure time to the time of system.

e) Set latitude at that in the field.

1) Set latitude to below condition by pushing [DISP] switch. Below example shows 「36° 50' N」

Data indication panel : 「36.50」

Mode indication panel : 「LA.n」

2) Press [SET] switch and select 「GPS」 or 「Gyro」 using switch [△] or [▽].

Following data is indicated flickeringly one after the other in data indication panel every time switch [△] or [▽] are pressed.

Gyro is selected : 「Gyro」

GPS is selected : 「GPS」

3) Press [ACK/ENT] switch for settlement.

4) When 「Gyro」 is selected, 「Latitude」 is displayed in data indication panel. Set up latitude correctly using switch [△], [▽] and press [ACK/ENT] switch for settlement.

f) Select [manual mode] for ship speed and set it at 「0 knot」 .

1) Set ship speed to below condition by pressing [DISP] switch. Below example shows ship speed 30 knot obtained from GPS.

Data indication panel : 「30.0 」

Mode indication panel : 「G.Sd」

2) Press [SET] switch and select 「Manual」 using switch [△] or [▽].

Data indication panel and mode indication panel show following data every times witch [△], [▽] are pressed. (Flickering indication)

Manual is selected : Data indication panel : 「HAnd」

Mode indication panel : 「H.Sd」

GPS is selected : Data indication panel : 「 GPS」

Mode indication panel : 「G.Sd」

LOG (contact signal) is selected : Data indication panel : 「 Log」

Mode indication panel : 「L.Sd」

LOG (serial signal) is selected : Data indication panel : 「S.Log」

Mode indication panel : 「S.Sd」

3) Select 「Manual」 and press [ACK/ENT] switch for settlement.
As 「ship speed」, which is established at present, is displayed flickeringly in data indication panel, set it at 「0.0(knot)」 using 「▽」.

g) After completion of the above procedure, turn off power switch of operation panel once.

3.2.1.2 Start up procedures

* Start up the system leaving the binnacle case open.

a) Confirm that internal switch for service is set at 「ON」 and turn on power switch of Operation panel.

b) Wait for the master compass turning for 360° clockwise. If rotor is rotating, break rotor. During breaking, it is notified by flicker of "dot" on right in mode indication panel.
When rotor stops, flicker of "dot" on right in mode indication panel turns into lighting.

c) In case "timer start" is set up, set departure time to the time of system.

d) Master compass bearing is displayed in data indication panel of operation panel, and 「Int」 is displayed flickeringly in mode indication panel.

e) Adjust the value indicated in the data indication panel to the starting bearing by pressing [△],[▽] switches of the operating panel, and press [ACK/ENT] switch.
Deviate the starting bearing by around 90° to the meridian.
For example, the starting bearing is to be 140° or 320° if the ship is in bearing 50° .
The master compass turns towards the set bearing and stops at the set bearing position.
At this time, the bearing in data indication panel starts flicker and mode indication panel Indicates 「SSG」.
Then the sensitive element erects.

*note: Operation of (5) is available only once at the time of start up.

f) The erecting action of the sensitive element continues for approximately 2 minutes (Maximum 30 minutes for TG-8500), and the rotor starts to rotate, and then it reaches to the prescribed number of revolutions in approx. 2 minutes.

g) The follow up of the bearing system starts and north-seeking motion starts about 2 minutes after the rotor started to rotate.

h) Confirm in the operation panel that the ship's speed is 0 knot and the latitude indicates the current own position latitude.

i) Close the binnacle case.

* On closing the case, pay attention so that the case does not hit any of the binnacle consisting components (specially the sensitive element).

j) Record the true bearing data every approx. 5 minutes from starting till settlement.

* The master compass settles after about 3 hours.
* After the master compass settled, watch this stationary state for a while (at least for about one hour).

Also perform the continuous running as long as possible and observe if any abnormal sound, smell or extreme heating are found from the master compass and the control unit.

3.2.1.3 Adjustment and confirmation

After confirmed set state of the master compass, adjust and confirm the following items.

* Note: Pay special attention not to touch the sensitive element, etc. because the following adjustment and confirmation are performed in running state.

1) Confirmation of the master compass azimuth bearing

Confirm that ship speed is 0「knot」and the indicated value of「compass bearing」in the operation panel coincides to ship's heading azimuth.

And confirm that indicated「compass bearing」and indicated「true bearing」are within $\pm 0.1°$.

2) Confirmation of θ theta offset

a) Carefully open the binnacle case. Pay special attention to the case not to hit any of the binnacle consisting components (specially, the sensitive element) just as when closing the case.

b) Confirm the rotor level of the sensitive element. (A graduation in the rotor level meter is 4'.)

Reading of the rotor level of the sensitive element depends upon the latitude. Rotor level in the set state can be obtained by the following formula.

Rotor tilting angle (°) = $(0.1027 \times \sin \lambda) \pm 0.23$, where λ: latitude (°)

Example: When $\lambda = 37°$

$$((0.1027 \times \sin 37°) \pm 0.23) = (0.0618° \times 60) \pm (0.23 \times 60)$$
$$= 3.7' \pm 14'$$

* The north side of the rotor level rises for north latitude.
* The south side of the rotor level rises for south latitude.
* Its re-setting is performed in the Extended Menu.

Change the value of Extended Menu 「item A-1」 (1.6.t). Its unit is 「deg.」. After setting, observe the movement of rotor level and confirm that it turns to the value corresponding to own position latitude after settlement (2–3 hours after setting) Make re-setting if necessary.

c) Confirmation of the damping gain

a) Obtain the damping factor from the bearing data obtained in (10) of 3.2.1.2. Refer to Figure 3.10 for obtaining the damping factor.

b) Get the damping gain by the following formula from the obtained damping factor.

* Note: Normally, the damping factor is 0.3±0.05.
If the obtained damping factor is within 0.3±0.05, the re-setting of the damping gain is not required.

$$(Df / 0.3) \times Dg1 = Dg2 \text{ (Normally, 0.6 through 0.9)}$$

where Df: Obtained damping factor
Dg1: Damping gain when Df was obtained.
Dg2: New damping gain

Example: Assuming that the obtained damping factor Df = 0.4, and the damping gain Dg1 is 0.6

$$(0.4 / 0.3) \times 0.60 = 0.8$$

* If re-setting is required, perform it the Extended Menu 「item A-1」 (1.1.U).
* When re-setting was performed, start up the system according to 3.2.1.2 in this chapter with the binnacle case closed and confirm the damping factor.

4) Confirmation of the speed error correction function

a) Confirm that the master compass is fully settled with speed 0 knot.

b) Confirm that "TRUE" bearing and "COMPASS" bearing in the operation panel are the same.

c) Confirm the "LATITUDE" in operation panel.

d) Select the ship's "SPEED" in the operation panel and enter an appropriate speed manually.

e) Confirm "TRUE" bearing in the operation panel.

At this time, the speed error is obtained from the compass bearing, the latitude and the ship's speed.

$V / (5 \times \pi) \times \mathrm{Sec}\ \lambda \times \mathrm{Cos}\ C = \Delta \phi$ * $\mathrm{Sec}\ \lambda = (1 / \mathrm{Cos}\ \lambda)$

where V : Ship's speed (in knot)

λ : Latitude

C : Compass bearing

$\Delta \phi$: Speed error

For example: Assuming compass bearing C=0.5° , latitude λ=60° , ship's speed V=20 knot,

$20 / (5 \times \pi) \times \mathrm{Sec}\ 60° \times \mathrm{Cos}\ 0.5° = 2.546°$,

when the true bearing is obtained as (compass bearing - speed error).

0.5 - 2.546 = 357.954

Then, the true bearing "358.0" is indicated in the display.

And, when the compass bearing is in the range of 90° → 180° → 270° , the true bearing is obtained as (compass bearing + speed error).

Note: As understood from the above formula, speed error is not generated when the master compass bearing is 90° and 270° .

Accordingly select in the range of 0° (180°) ±45° for this test.

Preliminary running during installation has been completed now.

Refer to Chapter 2 System Operation for the operation procedures during system running.

*In case failure takes place after installation and start of operation, collect information according to 「Table 3.3 check list 2」.

3.3 Operation Mode

This chapter describes about operations in the various operation modes except the normal operation mode. Refer to Chapter 5 for the hardware adjustment.

3.3.1 ROTI mode

Note : Output of Rate of turn analogue signal is not available in Type I.

This is the mode to confirm the analog output of rate of turn signal.

3.3.1.1 General

The master compass rotates by the rate of turn, which was set in the operating panel.

The rate of turn is indicated in the operation panel.

Confirm the analog signal output corresponding to the rate of turn and the rate of turn output by serial signal.

3.3.1.2 Operation

1) Turn the power switch on by pressing simultaneously [ACK/ENT] switch and [▽]switch in the operation panel, then it turns into the main mode.
2) Turn off power switch to escape from the main mode.

3.3.1.3 Output optional Rate of Turn signal

1) Turn the power switch on by pressing simultaneously [ACK/ENT] switch and [▽]switch in the operation panel.

   Wait for master compass turning for 360° clockwise.

   Rate of turn is displayed in the operation panel, and 「r t.」is displayed in the mode indication panel.

   Polarity : 「Minus」 when the master compass rotates clockwise, and 「rt.」 is displayed.

   「Plus」 when the master compass rotates counterclockwise, and 「rt.」 is displayed

2) Setting of Rate of Turn .

   Press [SET] switch and set at desired value by pressing [△],[▽] switch, then confirm It by pressing [ACK/ENT] switch.

   *Value of rate of turn, which can be set, depends on the setting of 「SCC/ICIFpwb DIP SW No.SW3-3, 4」

   SCCpwb : Type S/D   ICIFpwb : Type I

   a) Full Scale : ±30° /min./±5V

Setting of dip switch : SCC/ICIF pwb DIPSW SW3 No.3[OFF] No.4[OFF]
Speed available to set : 0, ±5, ±10, ±20, ±30, ±32° / min
*Confirmation :Confirm that voltage of analogue signal is ±5V ±0.2V when the ship turns at ±30° / min. Confirm that voltage of analogue signal is ±0V ±0.2V when the ship turns at 0° / min.

b) Full scale : ±120° /min./±10V
Setting of dip switch : SCC/ICIF pwb DIPSW SW3 No.3[ON] No.4[OFF]
Speed available to set : 0, ±5, ±10, ±20, ±30, ±32, ±60, ±120, ±130° / min
* Confirmation :Confirm that voltage of analogue signal is DC±10V ±0.4V when the ship turns at ±120° / min. Confirm that voltage of analogue signal is ±0V ±0.2V when the ship turns at 0° / min.

c) Full scale : ±300° /min./±10V
Setting of dip switch : SCC/ICIF pwb DIPSW SW3 No.3[OFF] No.4[ON]
Speed available to set : 0, ±5, ±10, ±20, ±30, ±32, ±60, ±120, ±130, ±200, ±300, ±320° / min
* Confirmation :Confirm that voltage of analogue signal is DC±10V ±0.4V when the ship turns at ±300° / min. Confirm that voltage of analogue signal is ±0V ±0.2V when the ship turns at 0° / min.
Execute item 2) if the settled rate of turn is changed.

3.3.1.4 Set off-set to analogue output signal of rate of turn

Off-set can be set to analogue output signal of rate of turn.
Set off-set so as not to be below ±0.2° / min for analogue signal output when rate of turn is 0.0° /min.

Note : Off-set is effective only for analogue signal.
It does not influence on rate of turn displayed in the indication panel and rate of turn of serial signal output data.
As this setting is to be memorized in non-volatile memory, it may revert to default value (0.0) due to software update, etc.
And off-set adjustment of rate of turn analogue signal is essentially carried out by hardware (trimmer)
If it cannot be adjusted by hardware, make off-set adjustment by this function.

1) Turn the power switch on by pressing simultaneously [ACK/ENT] switch and [▽]switch in the operation panel.
Wait for master compass turning for 360° clockwise.
2) Press [SET] switch and press [DISP] switch

「OFF」 is displayed in mode indication panel.

3) Change the value in the data indication panel by pressing [△],[▽], and fix it by pressing [ACK/ENT]switch.
This data can be set in extension menu 「A-2」 (2.d.o) too.
Value which can be input is within 5% of rate of turn full scale value which is set.

3.3.1.5 Set the filter time constant of rate of turn output

The filter time constant of rate of turn output can be changed.

Note : This setting is applied to the indicated value in the indication panel, serial signal output data and analogue signal output.
As this setting is to be memorized in non-volatile memory, it may revert to default value (0.0) due to software update, etc.

1) Turn the power switch on by pressing simultaneously [ACK/ENT] switch and [▽]switch in the operation panel.
Wait for master compass turning for 360° clockwise.
2) Press [SET] switch and press [DISP] switch "twice".
「rtF」 is displayed in the mode indication panel.
3) Change the value in the data indication panel by pressing [△],[▽], and fix it by pressing [ACK/ENT]switch.
This data can be set in the extension menu 「A-2」 (2.E.F) too in case of "Rate of turn Indication" in the ordinary operation mode.
Value which can be input is 0.5, 1.0, 2.0, 4.0, 6.0, 8.0, 10.0 (sec.).

3.3.1.6 Setting of rate of turn analogue signal output gain

Setting of rate of turn analogue signal output gain is available.
This setting is executed when output voltage in the Chapter 3.3.1.3 is out of the regular value.

Note : This setting is effective only for analogue signals.
It does not influence on rate of turn displayed in the indication panel and rate of turn of serial signal output data.
As this setting is to be memorized in non-volatile memory, it may revert to default value (0.0) due to software update, etc.
And gain adjustment of rate of turn analogue signal is essentially carried out by hardware (trimmer).
If it cannot be adjusted by hardware, gain adjustment by this function.

1) Turn the power switch on by pressing simultaneously [ACK/ENT] switch and [▽]switch in the operation panel.
Wait for master compass turning for 360° clockwise.

2) Press [SET] switch and press [DISP] switch "three times".
「GIn」 is displayed in the mode indication panel.

3) Change the value in the data indication panel by pressing [△],[▽], and fix it by pressing [ACK/ENT]switch.
This data can be set in the extension menu 「A-2」 (2.F.G) too.
Value which can be input is 0.900~1.00.

3.3.2 Test Mode A

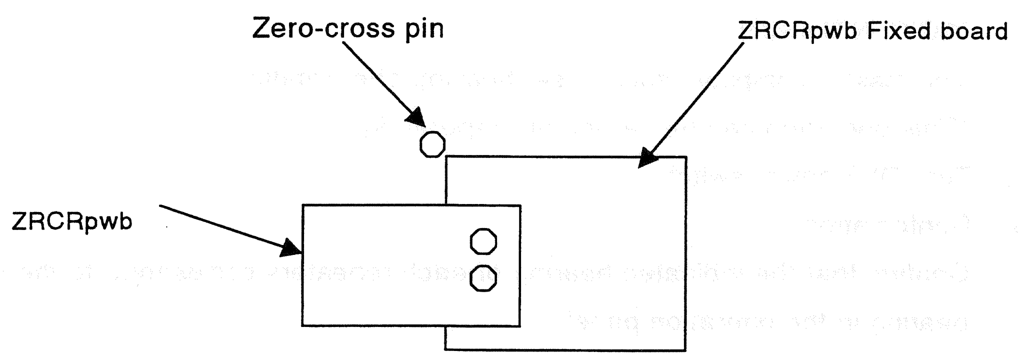
Note : Careful operation is required because zero-cross bearing set in this mode becomes the standard of bearing signal outputted from the system.
Escape from this mode after the completion of setting of zero-cross bearing in this mode.

3.3.2.1 General

This mode is for the purpose of setting of zero-cross bearing.
Re-setting of zero-cross bearing is required for below cases.
When the zero cross pin of master compass is removed because of repair, replacement, etc.
When the zero cross sensor PWB (ZRCR PWB) is removed because of repair, replacement, etc.
Absolute bearing is set in MCC pwb every time it passes this pin after the last azimuth operation of start-up sequence and the start of follow-up.
Zero-cross bearing is about 345.3° .

3.3.2.2. Operation

1) Set the phantom ring of master compass to 0° according to following procedure.
Adjust phantom ring to the position where the corner of ZRCR pwb's installation plate and the center of pin are overlapped from peeping window in the installation plate of MCC pwb.



2) Turn the power switch on by pressing simultaneously [DISP] switch, [SET]switch and [△]switch in the operation panel, then 「t-A」 (test mode A) is displayed flickeringly in the mode indication of the operation panel.

3) Wait for the master compass turning for 360° clockwise.

4) Press [ACK/ENT] switch.

Zero-cross bearing is memorized in the system by pressing [ACK/ENT] switch. Buzzer sounds at this time.

5) Turn OFF power switch.

6) Confirmation

Confirm the value of zero-cross bearing in the indication panel by the extension menu 「A-2」 (2.3.h).

Zero-cross bearing is ordinarily 345.2° ～345.3° .

Execute this setting again if it is far from this bearing.

3.3.3. Test Mode B

This mode is prepared for confirming repeater signal, serial signal (only true bearing).

It is available to confirm the condition of electric connection with interfaced units during the installation.

3.3.3.1 General

It is available to turn the master compass toward any bearing repeatedly.

3.3.3.2 Operation

1) Turn the power switch on by pressing simultaneously [DISP] switch, [SET]switch in the operation panel, then 「t-b」 is displayed flickeringly in the mode indication of the operation panel.

And the bearing indication in the data indication panel is displayed flickeringly.

2) Wait for the master compass turning for 360° clockwise.

3) Set any bearing by pressing [△],[▽]switch in the operation panel, then press [ACK/ENT] switch.

The master compass stops at set bearing after rotation.

*This operation can be carried out repeatedly.

4) Turn OFF power switch.

5) Confirmation

Confirm that the indicated bearing of each repeaters correspond to the indicated bearing in the operation panel.

Confirm that the bearing of outputted serial data corresponds to the indicated bearing in the operation panel.

Table 3.1 CHECK LIST 1

Date :

S[illegible]'s Name		Company Name				
		Name (Person who indicated)				
Circle the corresponding type.			TG−6000	TG−8000	TG−8500	
Circle the corresponding form.		Stand alone		Gylot		
Sensitive element serial No.						
Mastercompass serial No.						
Control unit serial No.						
Received Date		Installed Date		Deffective Date		
Circle the corresponding deffective Location.						
Deffective Location	Open package	Install	Anchorage	Seatrial	Navigation	

			YES	NO
Check Item	Open package	1. Upon receipt, was carton damaged, soiled, or deformed?		
		2. When the s/element was removed the package,was there silicon oil adhering to the rubber cap?		
		3. When the s/element was removed the package,was there silicon oil adhering to the vinyl packaging or s/element?		
		4. When the s/element is placed horizontally, is the gyro sphere parallel?		
		5. Are any of the 4 stopper pins of a gyro sphere bent?		
		6. Is the resistance of the s/element between M-8 within 45Ω ±3Ω?		
		7. Is the resistance of the s/element between G-B within 900Ω ±50Ω?		
		8. Is the resistance of the s/element between G-A and G-C within 480Ω ±40Ω?		
	Installation	1. Were the two setting screws (ø3.2 & ø3.4) used when fitting the s/element? *Caution : During fitting, insure that s/element is not tilted for 10 seconds or more.		
		2. Is the connector connected to s/element in the suitable direction? 8→M→A→B→C		
		3. Was the slip ring thoroughly cleaned?		
		4. Is the shipboard supply source voltage normal? (within ±10% of specified supply voltage)		
		5. TG3000/5000 : After fitting the s/element, the horizontal ring should be brought level nd at least two minutes.Then, a power supply switch is turned on.		
		6. After fitting the s/element, allow at least two minutes before turning ON. Have you done such a procedure?		
		7. Reset parameter in the extension menu which needs to be reset. For details, please refer the following *1.		
	Operation	1. Does the rotor rotate quietly?		
		2. After unit has been turned ON for more than 3 hours, is the bubble in the horizontal ring's level within ±2.5 scales of the level center? Adjust as necessary		
		3. After unit has been turned ON for more than 3 hours, is the bubble of the s/element's level within ±5 scales of the level center?		
Malfunction Situation		1. Does gyro rotor rotate?		
		2. Is azimuth error of the master compass more than 10 degrees?		
		3. Does master compass turn in one direction?		
		4. Does"follow-up" motion of the master compass operate?		
		5. S/element tips over simultaneously with "follow-up" start.		

*1 Reset item:
1.M[illegible]num rate of turn 2. Maximum deviation of bearing servo 3.Maximum deviation of horizontal servo 4 .Total operating days
5.Alarm history 6. Occurred number of zero-cross error 7. Maximum zero-cross error 8. Occurred year of zero-cross error
9. Occurred month and day of zero-cross error 10. Occurred hour and minute of zero-cross error
11.Occured number of encoder error 12.Occured number of reset with WATCH DOG TIMER

SIGNETURE

ble 3.2 Extension Menu

Item No.	Block	3Digit LED display	Pramameter	Default value	Range	Unit
1	A-1	1.1.U	Damping gain ratio	1.00	0.00 ~ 2.00	%
2		1.2.F	Bearing servo gain ratio	1.00	0.00 ~ 2.00	%
3		1.3.S	Horizontal servo gain ratio	1.00	0.00 ~ 2.00	%
4		1.4.u	Leveling servo gain ratio	1.00	0.00 ~ 2.00	%
5		1.5.L	(ϕ) phi offset	0.00	-3.00 ~ 3.00	deg.
6		1.6.t	(θ) Theta offset	0.00	-3.00 ~ 3.00	deg.
7		1.7.G	X signal pickup gain	2.32	1.00 ~ 5.00	v/deg.
8		1.8.c	Ks/H	1.477	1.000 ~ 2.000	
9		1.9.r	Maximum rate of turn	0.00	-	deg./sec
10		1.A.F	Maximum deviation of bearing servo	0.00	-	deg.
11		1.b.S	Maximum deviation of horizontal servo	0.00	-	deg.
12	A-2	2.1.o	Bearing offset A (for correction of fixed error)	0.00	0.0 ~ 359.9	deg.
13		2.2.O	Bearing offset B (for correction of temporary error) *2	0.0	0.0 ~ 359.9	deg.
14		2.3.h	Zero-cross bearing	345.3	0.0 ~ 359.9	deg.
15		2.4.E	Zero-cross error allowance	2.0	0.0 ~ 5.0	deg.
16		2.5.y	Year	-	2000 ~ 2099	
17		2.6.N	Month and day	-	-	
18		2.7.t	Hour and minute	-	-	
19		2.8.d	Total days of operation	-	-	
20		2.9.G	Display/setting of GPS connection	-	bE or Non	
21		2.A.L	Display/setting of LOG connection	-	bE or Non	
22		2.b.S	Display/setting of LOG(serial) connection	-	bE or Non	
23		2.c.t	Display/setting of "GGA" performance index is ignored or evaluated.	-	bE or Non	
24		2.d.o	Analog output offset for rate of turn	0.00	0.0~16 *1	deg./min
25		2.e.F	Filter time constant for rate of turn	2.00	0.5~10.0	sec
26		2.F.G	Analog output gain for rate of turn	1.00	0.900~1.00	-
27	A-3	3.1.E	Alarm (error)	-	-	
28		3.2.n	Occurred number of zero-cross error	-	-	
29		3.3.H	Maximum zero-cross error	-	-	
30		3.4.y	Occurred year of zero-cross error	-	-	
31		3.5.N	Occurred month/day of zero-cross error	-	-	
32		3.6.t	Occurred hour/minute of zero-cross error	-	-	
33		3.7.n	Occured number of encoder error	-	-	
34		3.8.r	Occured number of reset with WATCH DOG TIMER	-	-	
35	A-4	4.1.C	GPS serial data character length	8	8 or 7	
36		4.2.P	GPS serial data parity bit	Non	Non, Even,Odd	
37		4.3.S	GPS serial data stop bits	1	1 or 2	
38	A-5	5.1.C	LOG serial data character length	8	8 or 7	
39		5.2.P	LOG serial data parity bit	Non	Non, Even,Odd	
40		5.3.S	LOG serial data stop bits	1	1 or 2	
41	A-6	6.1.C	External Sensor(standard) serial data character length	8	8 or 7	
42		6.2.P	External Sensor(standard) serial data parity bit	Non	Non, Even,Odd	
43		6.3.S	External Sensor(standard) serial data stop bits	1	1 or 2	
44	A-7	7.1.t	Master compass type	Std	Std or Hsc	
45		7.2.u	SCC software version number	-	-	
46		7.3.u	MCC software version number	-	-	
47	A-8	8.1.t	For the confirmation of extention memu(serial signal)	-	-	
48		8.2.S	Filter of speed error correction	on	on or oFF	

*1:The maximum value is 5% of the maximum analog output for rate of turn.(32 deg./min:1.6deg./min、130deg./min:6.5deg./min、320deg./min:16.0deg./min、)

*2:This value is cleared at the time of zero crossing pin passage and a power supply OFF.

Table 3.3 CHECK LIST 2

Date :

Ship's Name		Company Name					
		Name (Person who indicated)					
Circle the corresponding type.		TG−6000		TG−8000	TG−8500		
Circle the corresponding form.		Stand alone		Gylot			
Sensitive element serial No.							
Mastercompass serial No.							
Control unit serial No.							
Received Date		Installed Date		Deffective Date			
Circle the corresponding deffective Location.							
Deffective Location	Open package	Install	Anchorage	Seatrial	Navigation		
						YES	NO
Malfunction Situation		1. Does gyro rotor rotate?					
		2. Is azimuth error of the master compass more than 10 degrees?					
		3. Does master compass turn in one direction?					
		4. Does"follow-up" motion of the master compass operate?					
		5. S/element tips over simultaneously with "follow-up" start.					
Onboard check record	Extension Memory	1.Alarm history, Pl					
		Warning code :					
		2. Turn rate max value, Indicate max. turn rate recorded				deg./s	
		3. Total operating day				day(s)	
Ambient conditions during maltifunction	Sea condition	1.Calm					
		2.Rough sea					
	Navigation	1.Go on straight					
		2.Vessel turning					
	TG6000/8000	1.What alarm code activated? Enter warning code when malfunction occurs.					
	Circle the corresponding item.						
	Kind of vessel	1.Tanker	2.Cargo	3.Ferry	4.Fishing boat		
	Bulk of vessel	a. 500 tons〜	b. 1000 tons〜	c.10000 tons〜	d. 100000 tons〜		

SIGNETURE

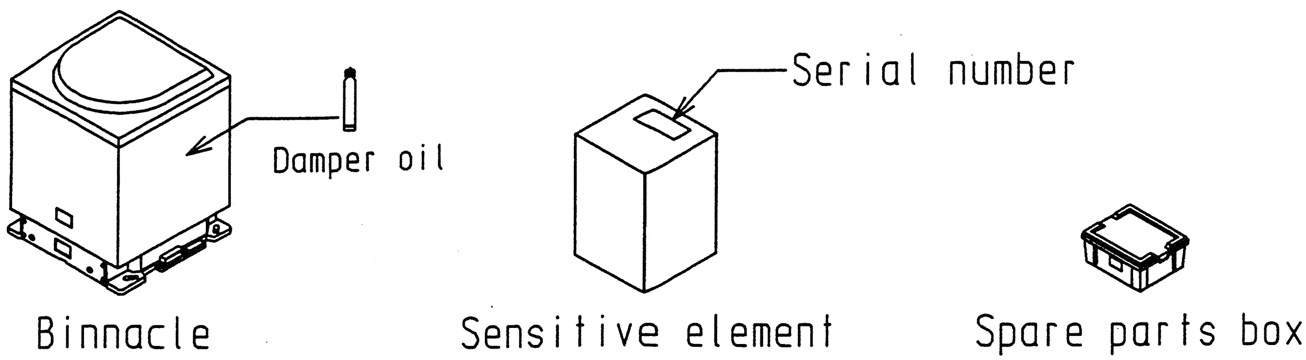


Figure 3.1

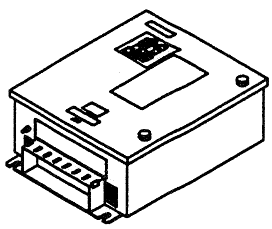


Figure 3.2

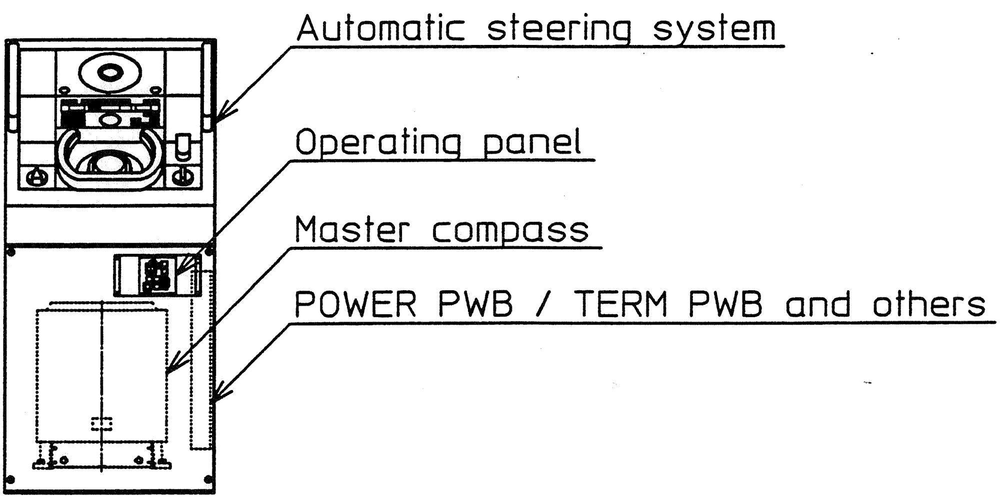


Figure 3.3

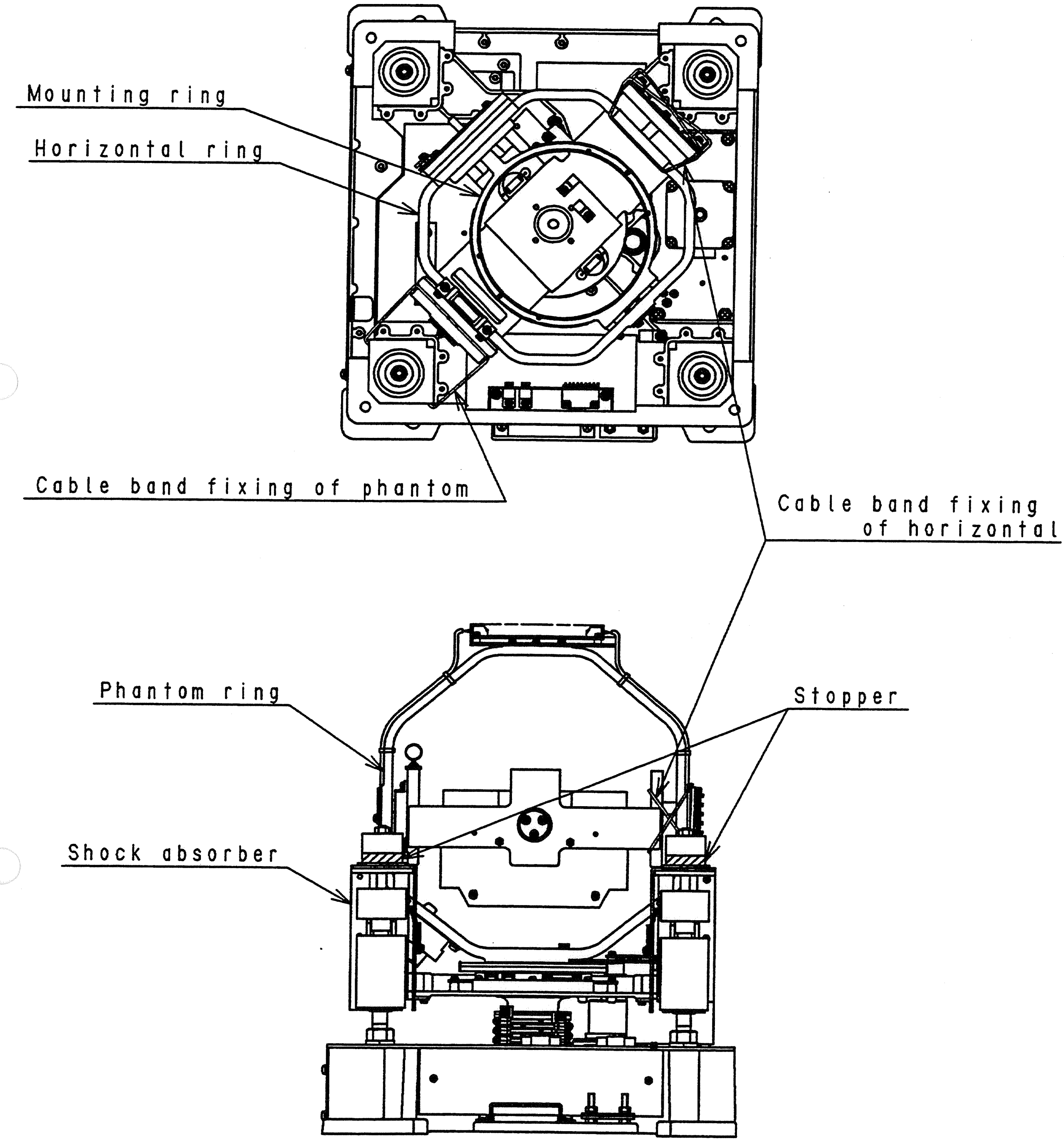


Fig 3.4 Package Of Binnacle

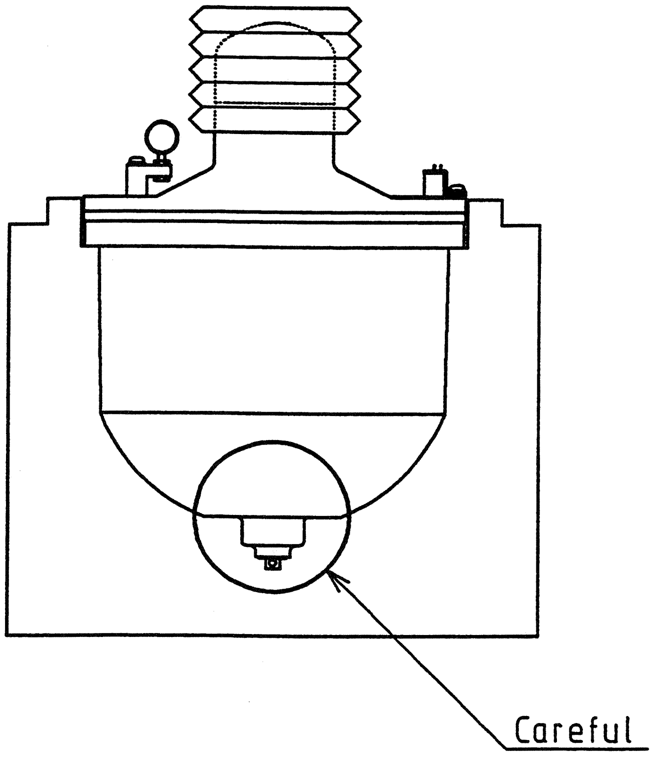


Fig3.5 Package of Sencitive Element

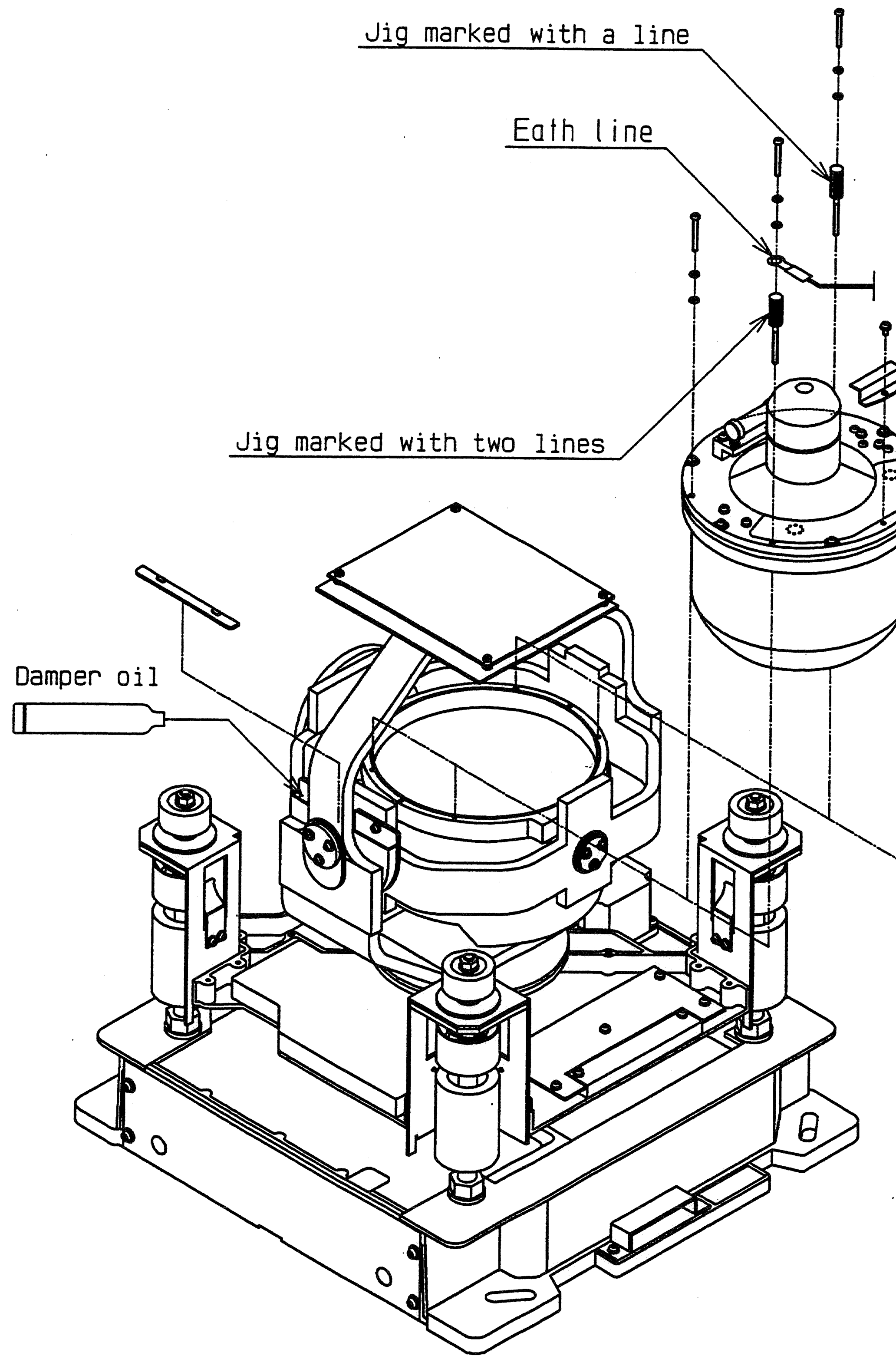


Fig 3.6 Binnacle

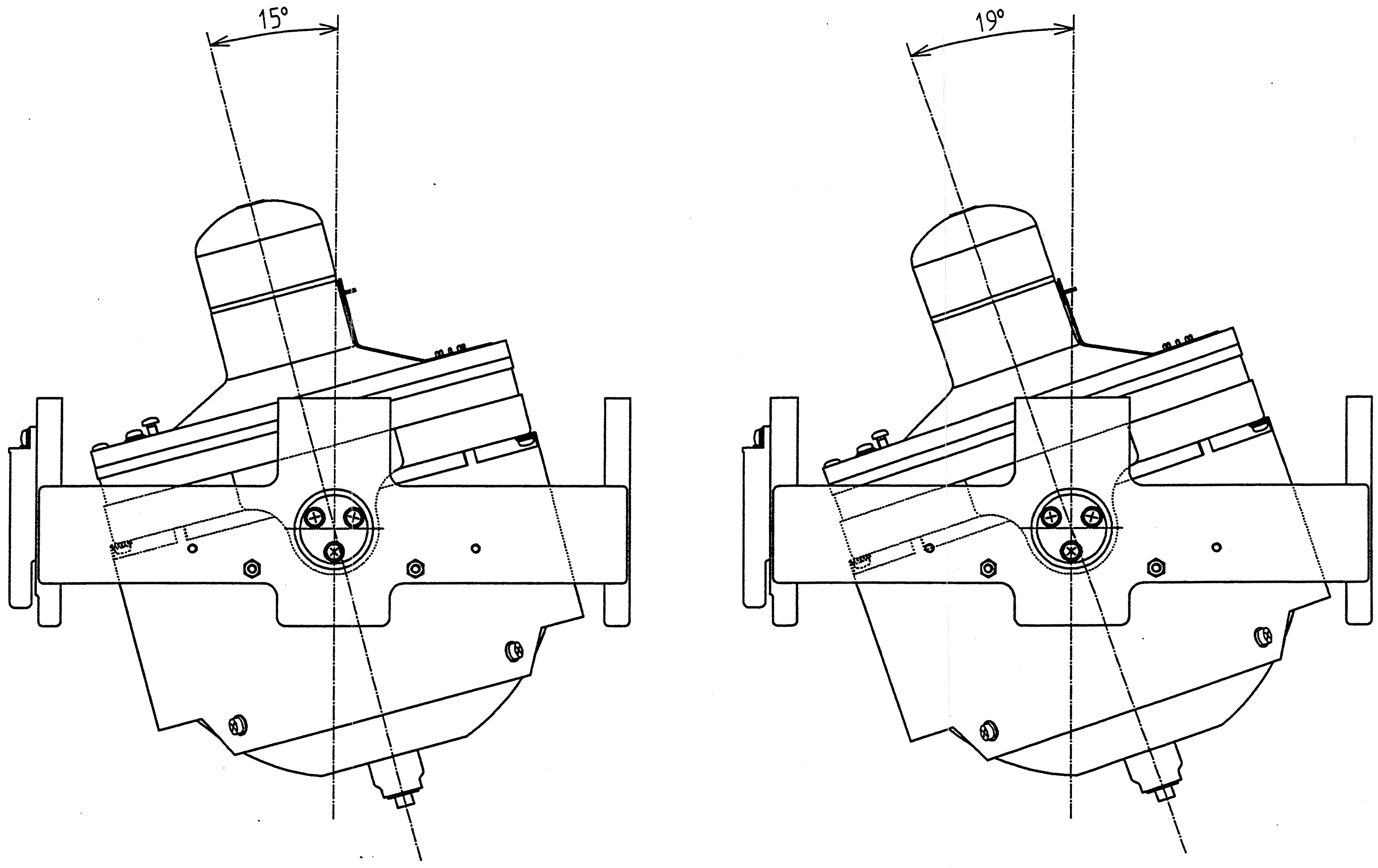


Fig3.7.1 TG-8000 Sencitive Element With Horizontal Ring

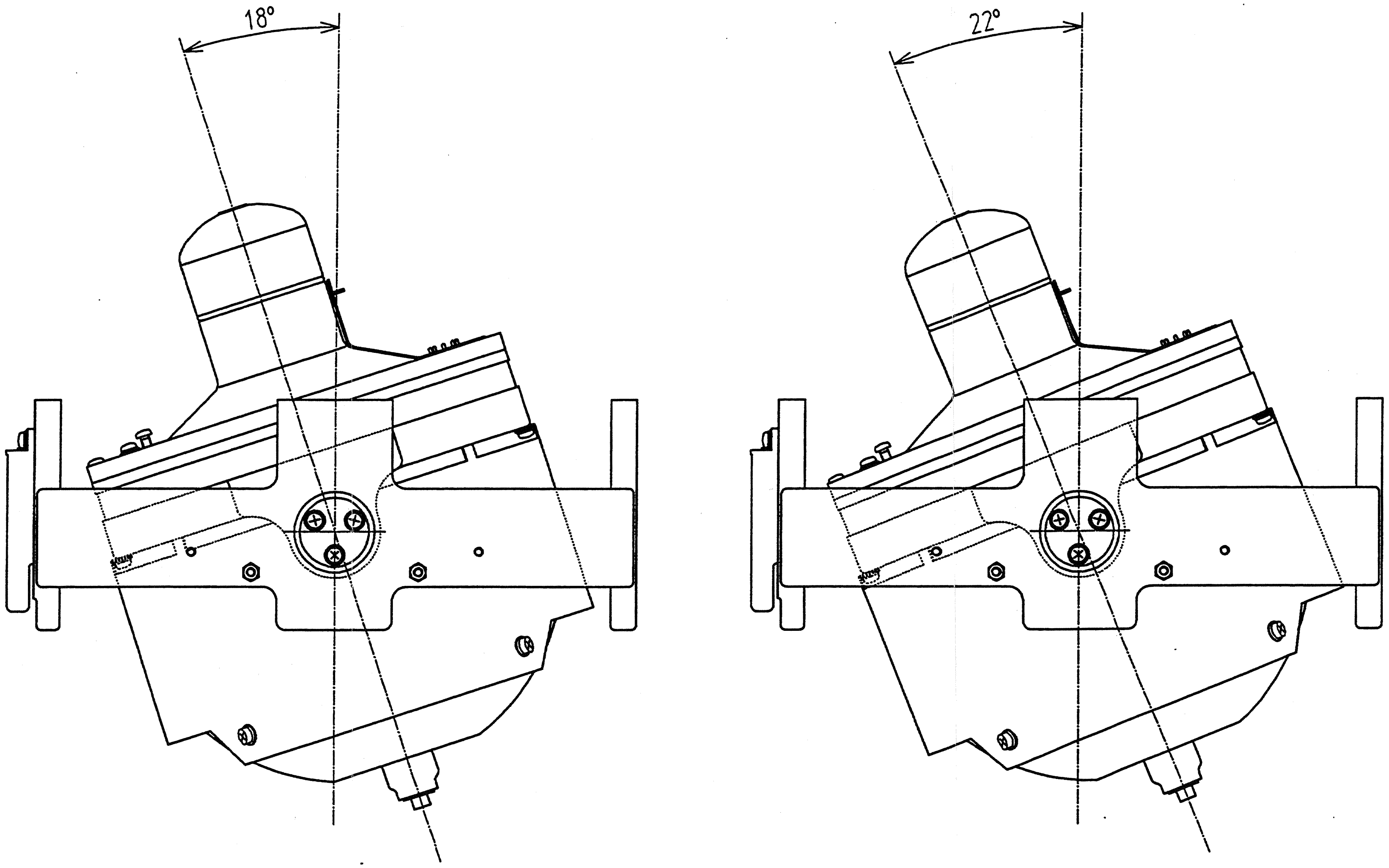
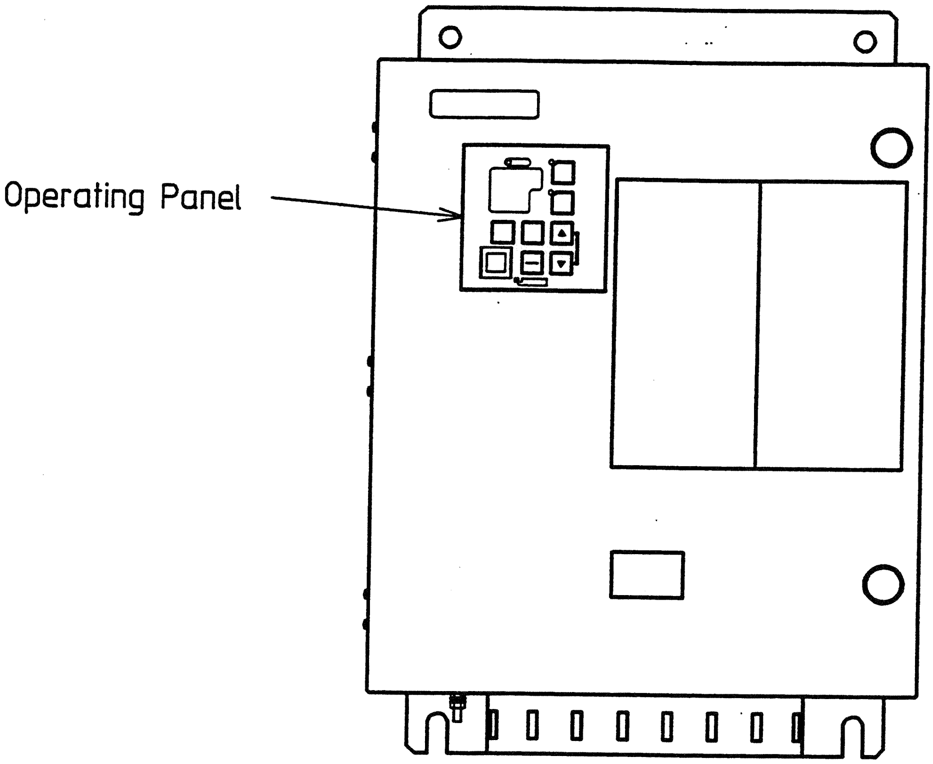
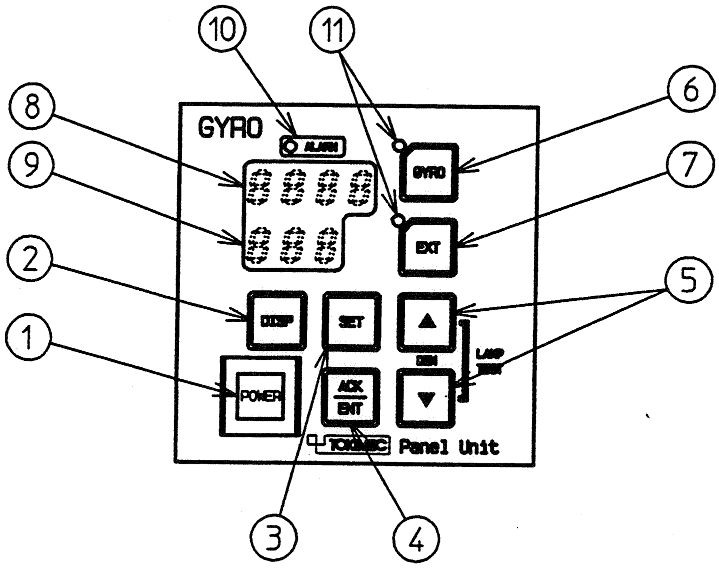


Fig3.7.2 TG-8500 Sencitive Element With Horizontal Ring



Control Unit Operating Panel



① Power Sitch
② Disp Switch
③ Set Switch
④ Ack/Ent Switch
⑤ ▵▿ Switch
⑥ System Select Switch(GYRO)
⑦ System Select Switch (EXT.)
⑧ Data Display
⑨ Mode Display
⑩ Alarm Indicator
⑪ System Select Indicator

Fig 3.8 Control Unit Operating Panel

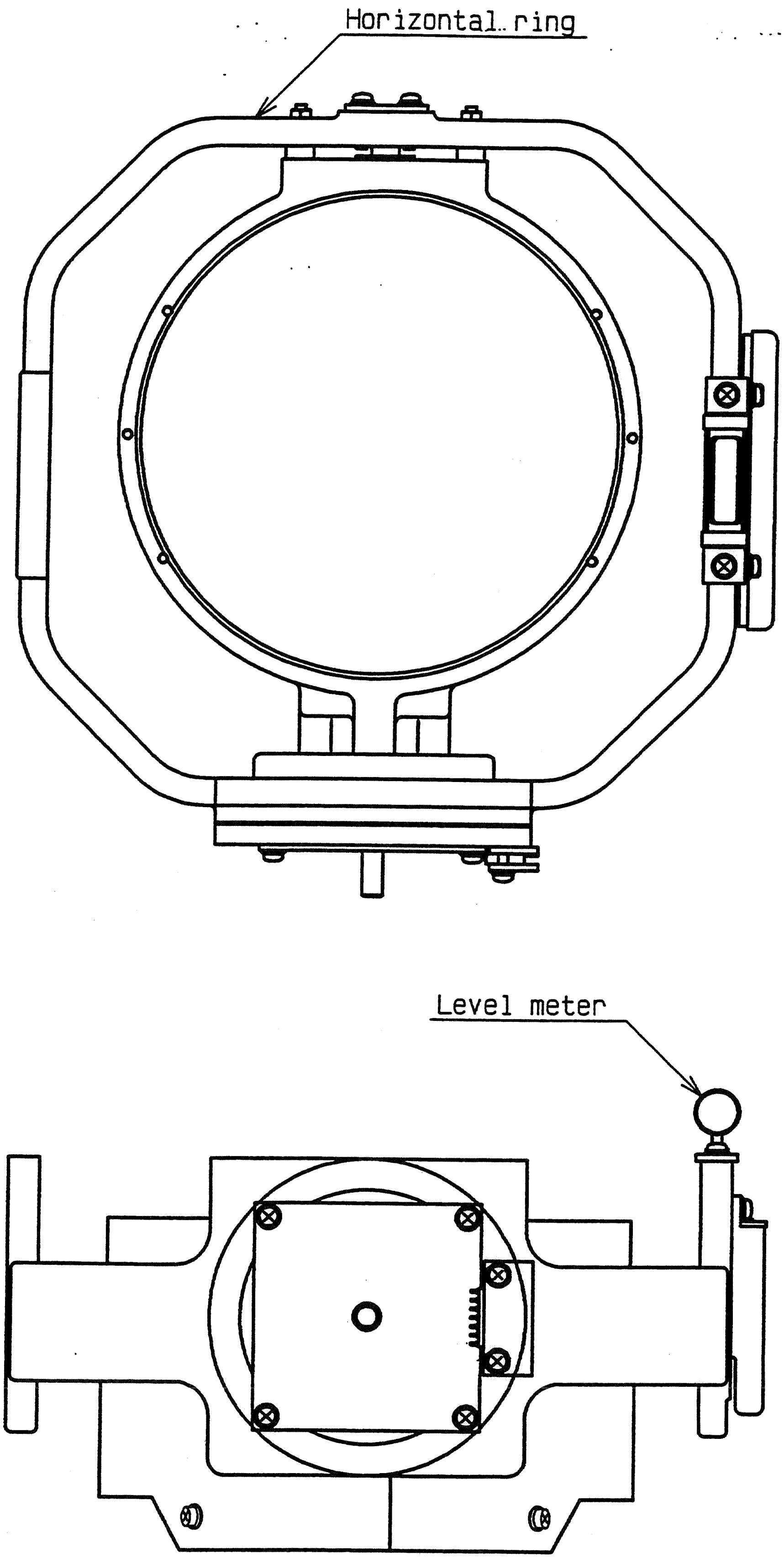
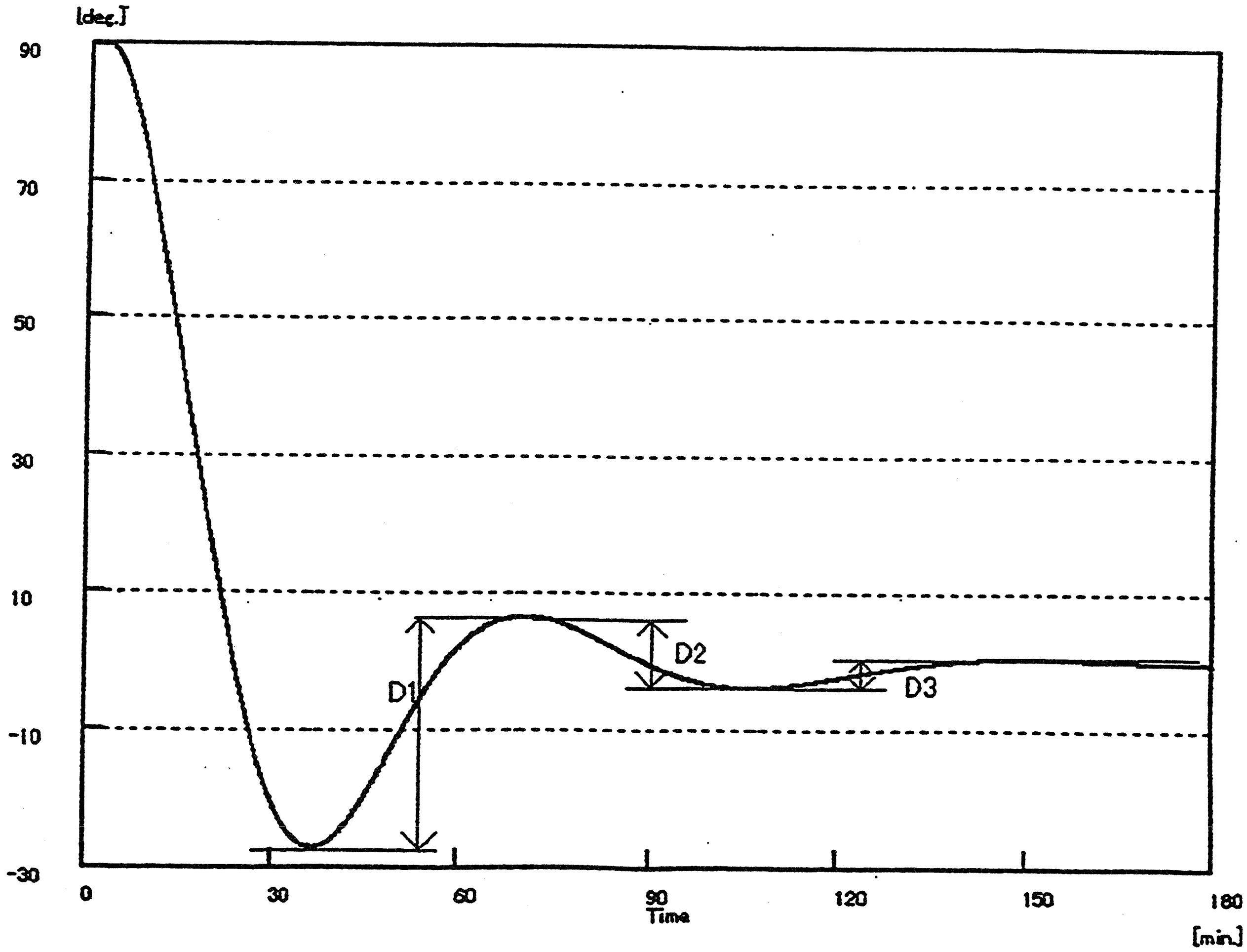


Fig3. 9 HORIZONTAL RING WITH LEVEL



$$Df = ((D2 / D1) + (D3 / D2)) / 2$$

Fig 3.10 Damping Factor

SCC pwb dip switch assign

S1	Standard setting	Function	Details		Read timi	Remarks
NO.1	-	control box type	[OFF] : Type S [ON] : Type I		startup	
NO.2	[OFF]	master compass type	[OFF] : Standard type [ON] : HSC type		startup	
NO.3	[OFF]	control box type	[OFF] : Type S [ON] : Type D(dual gyro)		startup	
NO.4	[OFF]	No.2 gyro or not	[OFF] : No [ON] : Yes		startup	
NO.5	[OFF]	External sensor connection	NO5.[OFF] NO6.[OFF] : Non	NO5.[ON] NO6.[OFF] :External sensor connectio	startup	
NO.6	[OFF]		NO5.[OFF] NO6.[ON] :Mag. System connection(	NO5.[ON] NO6.[ON] :Ext. System connection(bac		
NO.7	[OFF]	serial signal select	[OFF] : IEC61162-2 [ON] : Tokimec format		startup	
NO.8	[OFF]	Alarm output setup	[OFF] : All alarm output [ON] : only power fail		startup	

S2	Standard setting	Function	Details		Read timi	Remarks
NO.1	[OFF]	For debugging(don't touch)			-	
NO.2	[OFF]	For debugging(don't touch)			-	
NO.3	[OFF]	don't touch				
NO.4	[OFF]	don't touch				
NO.5	[OFF]	serial signal transmit frequency	NO5.[OFF] NO6.[OFF] : 1sec	NO5.[ON] NO6.[OFF] : 200msec	startup	
NO.6	[OFF]	IEC61162-1 ed.2	NO5.[OFF] NO6.[ON] : 100msec	NO5.[ON] NO6.[ON] : Invalid(1sec)		
NO.7	[OFF]	don't touch	-			
NO.8	[OFF]	don't touch	-			

S3	Standard setting	Function	Details		Read timi	Remarks
NO.1	[OFF]	timer startup	[OFF] : no [ON] : yes		startup	
NO.2	[OFF]	Talker ID of "ROT" sentence	[OFF] : "HE" [ON] : "TI"		startup	
NO.3	[OFF]	rate of turn scale	NO3.[OFF] NO4.[OFF] : Max 30.0deg./min.	NO3.[ON] NO4.[OFF] : Max 120.0deg./min.	startup	
NO.4	[OFF]		NO3.[OFF] NO4.[ON] : Max 300.0deg./min.	NO3.[ON] NO4.[ON] : don't setting		
NO.5	[OFF]	ban or permission of a "ROT" sentence output	**Valid at the time of external sensor(stadard) selection** [OFF] : disable [ON] : enable		startup	
NO.6	[OFF]	for SIMRAD or not	[OFF] : no [ON] : yes("GC-80" is displayed at the time of starting.)		startup	
NO.7	[OFF]	don't touch	-		-	
NO.8	[OFF]	don't touch	-		-	

S4	Standard setting	Function	Details	Read timi	Remarks
NO.1	[OFF]	LOG(serial) baud rate of transmisstio	38400 bps	-	
NO.2	[OFF]	LOG(serial) baud rate of transmisstio	9600 bps	-	
NO.3	[ON]	LOG(serial) baud rate of transmisstio	4800 bps	-	
NO.4	[OFF]	LOG(serial) baud rate of receive	38400 bps	-	
NO.5	[OFF]	LOG(serial) baud rate of receive	9600 bps	-	
NO.6	[ON]	LOG(serial) baud rate of receive	4800 bps	-	

SCC pwb jumper setting

NO.	Standard setting	Function	Details
J5 (RESET)	OPEN	CUP reset	This jumper is used when resetting "CPU."
J6 (FLASH)	SHORT	Software install	OPEN:Software is installed in SCCpwb Note:(Type S)Be sure to set "J10" of "SIFC or MIFCpwb" to "OPEN". Note:(Type D)Be sure to set "J25 and J26" of "SCOIF or MCOIFpwb" to "OPEN". Note:A damage will be given to a circuit if software is installed while this jumper has been short.
J7 (1TX)	3-4 SHORT	Output serial signal chosen	Output port:GTERMpwb TB2 "1TX" 3-4 Short:IEC-61162-2 or TOKIMEC version 5-6 Short:IEC-61162-1 ed.2 1-2 Short:It is not used. Note:It is one that it can choose. Don't short two or more.
J8 (2TX)	3-4 SHORT	Output serial signal chosen	Output port:GTERMpwb TB2 "2TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 Note:It is one that it can choose. Don't short two.
J9 (ALCN)	3-4 SHORT	Alarm contact output	Output port:GTERMpwb TB1 "ALCN" 3-4 Short:Alarm"OPEN" Normal"CLOSES" 1-2 Short:Alarm"CLOSES" Normal"OPEN" Note:It is one that it can choose. Don't short two.
J10 (RNCN)	1-2 SHORT	Running contact output	Output port:GTERMpwb TB1 "RNCN" 1-2 Short:Running"CLOSES" Normal"OPEN" 3-4 Short:Running"OPEN" Normal"CLOSES" Note:It is one that it can choose. Don't short two.

ICIF pwb dip switch assign (TYPE I)

S1	Standard setting	Function	Details		Read timi	Remarks
NO.1	-	control box type	[OFF] : Type S [ON] : Type I		startup	
NO.2	[OFF]	master compass type	[OFF] : Standard type [ON] : HSC type		startup	
NO.3	[OFF]	control box type	[OFF] : Type S [ON] : Type D(dual gyro)		startup	
NO.4	[OFF]	No.2 gyro or not	[OFF] : No [ON] : Yes		startup	
NO.5	[OFF]	External sensor connection	NO5.[OFF] NO6.[OFF] : Non	NO5.[ON] NO6.[OFF] : External sensor connecti	startup	
NO.6	[OFF]		NO5.[OFF] NO6.[ON] : Mag. System connectio	NO5.[ON] NO6.[ON] : Ext. System connection(ba		
NO.7	[OFF]	serial signal select	[OFF] : IEC61162-2 [ON] : Tokimec format		startup	
NO.8	[OFF]	Alarm output setup	[OFF] : All alarm output [ON] : only power fail		startup	

S2	Standard setting	Function	Details		Read timi	Remarks
NO.1	[OFF]	For debugging(don't touch)			-	
NO.2	[OFF]	For debugging(don't touch)			-	
NO.3	[OFF]	don't touch				
NO.4	[OFF]	don't touch				
NO.5	[OFF]	serial signal transmit frequency	NO5.[OFF] NO6.[OFF] : 1sec	NO5.[ON] NO6.[OFF] : 200msec	startup	
NO.6	[OFF]	IEC61162-1 ed.2	NO5.[OFF] NO6.[ON] : 100msec	NO5.[ON] NO6.[ON] : Invalid(1sec)		
NO.7	[OFF]	don't touch	-			
NO.8	[OFF]	don't touch	-			

S3	Standard setting	Function	Details		Read timi	Remarks
NO.1	[OFF]	timer startup	[OFF] : no [ON] : yes		startup	
NO.2	[OFF]	Talker ID of "ROT" sentence	[OFF] : "HE" [ON] : "TI"		startup	
NO.3	[OFF]	rate of turn scale	NO3.[OFF] NO4.[OFF] : Max 30.0deg./min.	NO3.[ON] NO4.[OFF] : Max 120.0deg./min.	startup	
NO.4	[OFF]		NO3.[OFF] NO4.[ON] : Max 300.0deg./min.	NO3.[ON] NO4.[ON] : don't setting		
NO.5	[OFF]	ban or permission of a "ROT" sentence output	**Valid at the time of external sensor(stadard) selection** [OFF] : disable [ON] : enable		startup	
NO.6	[OFF]	for SIMRAD or not	[OFF] : no [ON] : yes("GC-80" is displayed at the time of starting.)		startup	
NO.7	[OFF]	don't touch	-		-	
NO.8	[OFF]	don't touch	-		-	

S4	Standard setting	Function	Details	Read timi	Remarks
NO.1	[OFF]	LOG(serial) baud rate of transmissic	38400 bps	-	
NO.2	[OFF]	LOG(serial) baud rate of transmissic	9600 bps	-	
NO.3	[ON]	LOG(serial) baud rate of transmissic	4800 bps	-	
NO.4	[OFF]	LOG(serial) baud rate of receive	38400 bps	-	
NO.5	[OFF]	LOG(serial) baud rate of receive	9600 bps	-	
NO.6	[ON]	LOG(serial) baud rate of receive	4800 bps	-	

ICIF pwb jumper setting

NO.	Standard setting	Function	Details
J5 (FLASH)	SHORT	Software install	OPEN: Software is installed in ICIFpwb Note: Be sure to set "J1" of "IOPTpwb" to "OPEN". Note: A damage will be given to a circuit if software is installed while this jumper has been short.
J6 (RESET)	OPEN	CUP reset	This jumper is used when resetting "CPU."
J7 (1TX)	3-4 SHORT	Output serial signal chosen	Output port: ITERMpwb TB1 "1TX" 3-4 Short: IEC-61162-2 or TOKIMEC version 1-2 Short: IEC-61162-1 ed.2 Note: It is one that it can choose. Don't short two.
J8 (2TX)	3-4 SHORT	Output serial signal chosen.	Output port: ITERMpwb TB1 "2TX" 3-4 Short: IEC-61162-1 ed.2 1-2 Short: IEC-61162-2 or TOKIMEC version Note: It is one that it can choose. Don't short two.
J9 (3TX)	3-4 SHORT	Output serial signal chosen	Output port: ITERMpwb TB1 "3TX" 3-4 Short: IEC-61162-1 ed.2 1-2 Short: IEC-61162-2 or TOKIMEC version Note: It is one that it can choose. Don't short two.
J10 (4TX)	3-4 SHORT	Output serial signal chosen.	Output port: ITERMpwb TB1 "4TX" 3-4 Short: IEC-61162-1 ed.2 1-2 Short: IEC-61162-2 or TOKIMEC version Note: It is one that it can choose. Don't short two.
J11 (GPSPOL)	1-2 SHPRT	Polarity of the "GPS" signal setting	Input port: ITERMpwb TB2 "GRX" 1-2 Short: Standard 3-4 Short: Polarity is carried out reversely. Note: When a signal cannot be received by "1-2 short", it is set as "3-4 short." Note: It is one that it can choose. Don't short two.
J14 (ALCN)	3-4 SHORT	Alarm contact output	Output port: ITERMpwb TB1 "ALCN" 3-4 Short: Alarm"OPEN" Normal"CLOSES" 1-2 Short: Alarm"CLOSES" Normal"OPEN" Note: It is one that it can choose. Don't short two.
J15 (LOG)	1-2 SHORT	LOG contact signal chosen	Input port: ITERMpwb TB2 "SL" 1-2 Short: 200p.p.n.m. 3-4 Short: 400p.p.n.m. Note: It is one that it can choose. Don't short two.

SIFC pwb jumper setting (type S : for serial signal repeater)

NO.	Standard setting	Function	Details
J6 (3TX)	3-4 SHORT	Output serial signal chosen.	Output port:GTERMpwb TB2 "3TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:It is one that it can choose. Don't short two.
J7 (4TX)	3-4 SHORT	Output serial signal chosen.	Output port:GTERMpwb TB2 "4TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:It is one that it can choose. Don't short two.
J8 (5TX)	3-4 SHORT	Output serial signal chosen.	Output port:GTERMpwb TB2 "5TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:It is one that it can choose. Don't short two.
J9 (6TX)	3-4 SHORT	Output serial signal chosen.	Output port:GTERMpwb TB2 "6TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:It is one that it can choose. Don't short two.
J10 (7TX)	3-4 SHORT	Output serial signal chosen.	Output port:GTERMpwb TB2 "7TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:It is one that it can choose. Don't short two.
J11 (8TX)	3-4 SHORT	Output serial signal chosen.	Output port:GTERMpwb TB2 "8TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:It is one that it can choose. Don't short two.
J12 (9TX)	3-4 SHORT	Output serial signal chosen.	Output port:GTERMpwb TB1 "9TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:It is one that it can choose. Don't short two.
J13 (10TX)	3-4 SHORT	Output serial signal chosen.	Output port:GTERMpwb TB1 "10TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:It is one that it can choose. Don't short two.
J14 (GTX)	3-4 SHORT	Output serial signal chosen.	Output port:GTERMpwb TB2 "GTX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:The true heading information on "Gyro-compass" is outputted regardless of a system change.(with HDM or EHS unit) However, when a "standard external heading sensor" is connected, the true direction of the selected sensor is outputted. Note:It is one that it can choose. Don't short two.
J15 (IEC2)	SHORT	Type setup	Short:Standard Open:With an external heading sensor. (with HDM or EHS unit) Type M or E
J16 (IEC1)	SHORT	Type setup	Short:Standard Open:With an external heading sensor. (with HDM or EHS unit) Type M or E
J17 (WR/EXT)	SHORT	Software install or internal	Short:Internal communication with "External heading sensor " Open:Software is installed in SCCpwb Note:Be sure to set "J6" of "SCCpwb" to "OPEN". Note:A damage will be given to a circuit if software is installed while this jumper has been short.
J18 (ROT)	1-2 SHORT	"rate of turn" Analog signal level selection.	Output port:GTERMpwb TB1 "1RT~3RT" 1-2 Short:Output voltage 0v to ±5v DC or 0v to ±10v DC 3-4 Short:Output voltage 0v to +5v DC or 0v to +10v DC Note:It is one that it can choose. Don't short two.
J19 (LOG)	1-2 SHORT	LOG contact signal chosen	Input port:GTERMpwb TB1 "SL" 1-2 Short:200p.p.n.m. 3-4 Short:400p.p.n.m. Note:It is one that it can choose. Don't short two.
J20 (GPSPOL)	1-2 SHORT	Polarity of the "GPS" signal setting	Input port:GTERMpwb TB1 "GRX" 1-2 Short:Standard 3-4 Short:Polarity is carried out reversely. Note:When a signal cannot be received by "1-2 short", it is set as "3-4 short." Note:It is one that it can choose. Don't short two.
J21 (LOGPOL)	1-2 SHORT	Polarity of the "LOG" signal setting	Input port:GTERMpwb TB1 "LRX" 1-2 Short:Standard 3-4 Short:Polarity is carried out reversely. Note:When a signal cannot be received by "1-2 short", it is set as "3-4 short." Note:It is one that it can choose. Don't short two.
J22 (ESPOL)	1-2 SHORT	Polarity of the "external heading sensor" signal setting	Input port:GTERMpwb TB1 "ESRX" 1-2 Short:Standard 3-4 Short:Polarity is carried out reversely. Note:When a signal cannot be received by "1-2 short", it is set as "3-4 short." Note:It is one that it can choose. Don't short two.
J23 (RXD3SEL)	1-2 SHORT	The receiving port of CPU in SCCpwb is chosen	1-2 Short:An option serial signal is received. 3-4:Short:"GPS"serial signal(38400bps only) is received.(Reservation) Note:It is one that it can choose. Don't short two.
J24 (SSEL)	1-2 SHORT	Output serial signal chosen.	Output port:GTERMpwb TB2 "5TX" 1-2 Short:The signal set up by "J6" is outputted. 3-4 Short:The true heading information on "Gyro-compass" is outputted regardless of a system change.(with HDM or EHS unit) Note:When a "standard external heading sensor" is connected, the true direction of the selected sensor is outputted. Note:It is one that it can choose. Don't short two.
J25 *1 (ST1)	1-2 SHORT	An output port setup of "GTERM pwb"	Output port:GTERMpwb TB2 "ST1/OPRX+" 1-2 Short:The step signal for "Step signal type repeater" is outputted. (ST1) 3-4 Short:Serial signal receive.(OPTION) (OPRX+) Note:It is one that it can choose. Don't short two.
J26 *1 (ST2)	1-2 SHORT	An output port setup of "GTERM pwb"	Output port:GTERMpwb TB2 "ST2/OPRX-" 1-2 Short:The step signal for "Step signal type repeater" is outputted. (ST2) 3-4 Short:Serial signal receive.(OPTION) (OPRX-) Note:It is one that it can choose. Don't short two.
J27 *1 (ST3)	1-2 SHORT	An output port setup of "GTERM pwb"	Output port:GTERMpwb TB2 "ST2/OPRXC" 1-2 Short:The step signal for "Step signal type repeater" is outputted. (ST3) 3-4 Short:Serial signal receive.(OPTION) (OPRXC) Note:It is one that it can choose. Don't short two.

*1:Change all of 3 jumpers simultaneously.

SIFC pwb pot meter

NO.	Standard setting	Function	Details
VR1		Gain adjustment of "rate of turn."	The gain of a "rate of turn" analog signal is adjusted. In "±30 degrees/min", it adjusts to "±5v ±0.33v DC.
VR2		Off set adjustment of "rate of turn."	The off set of a "rate of turn" analog signal is adjusted. In "±0 degrees/min.", it adjusts to "0v ±80mv DC.

SCOIF pwb dip switch assign (type D : for serial s[illegible]al repeater)

S1	Standard setting	Function(mane)	Details			
NO.1	[OFF]	External sensor connection	NO5.[OFF] NO6.[OFF] : Non	NO5.[ON] NO6.[OFF] :External sensor connec		
NO.2	[OFF]		NO5.[OFF] NO6.[ON] :Mag. System connection(back u	NO5.[ON] NO6.[ON] :Ext. System connection(	startup	
NO.3	[OFF]	automatic system change	[OFF] : no [ON] : yes		startup	
NO.4	[OFF]	don't touch				
NO.5	[OFF]	don't touch				
NO.6	[OFF]	don't touch				
NO.7	[OFF]	don't touch				
NO.8	[OFF]	don't touch				

SCOIF pwb jumper setting

NO.	Standard setting	Function	Details
J15 (3TX)	3-4 SHORT	Output serial signal chosen.	Output port:GTERMpwb TB2 "3TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:It is one that it can choose. Don't short two.
J16 (4TX)	3-4 SHORT	Output serial signal chosen.	Output port:GTERMpwb TB2 "4TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:It is one that it can choose. Don't short two.
J17 (5TX)	3-4 SHORT	Output serial signal chosen.	Output port:GTERMpwb TB2 "5TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:It is one that it can choose. Don't short two.
J18 (IEC2)	SHORT	Type setup	Short:Standard Open:With an external heading sensor. (with HDM or EHS unit) Type M or E
J19 (IEC1)	SHORT	Type setup	Short:Standard Open:With an external heading sensor. (with HDM or EHS unit) Type M or E
J20 (G1TX)	3-4 SHORT	Output serial signal chosen.	Output port:DTERMpwb TB21B "G1-1TX" and TB21D "G1-2TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:The true heading information on "NO.1 Gyro-compass" is outputted regardless of a system change.
J21 (G2TX)	3-4 SHORT	Output serial signal chosen.	Output port:DTERMpwb TB21C "G2-1TX" and TB21D "G2-2TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:The true heading information on "NO.1 Gyro-compass" is outputted regardless of a system change.
J22 (GPSPOL)	1-2 SHORT	Polarity of the "GPS" signal setti	Input port:GTERMpwb TB1 "GRX" 1-2 Short:Standard 3-4 Short:Polarity is carried out reversely. Note:When a signal cannot be received by "1-2 short", it is set as "3-4 short." Note:It is one that it can choose. Don't short two.
J23 (LOGPOL)	1-2 SHORT	Polarity of the "LOG" signal setti	Input port:GTERMpwb TB1 "LRX" 1-2 Short:Standard 3-4 Short:Polarity is carried out reversely. Note:When a signal cannot be received by "1-2 short", it is set as "3-4 short." Note:It is one that it can choose. Don't short two.
J24 (RXD3SEL)	1-2 SHORT	The receiving port of CPU in SCCpwb is chosen	1-2 Short:An option serial signal is received. 3-4 Short:The serial signal outputted from SCOIFpwb is received. 5-6:Short:"GPS"serial signal(38400bps only) is received.(Reservation) Note:It is one that it can choose. Don't short two or more.
J25 (1WR/EXT)	SHORT	Software install or internal communication with "NO.1 Gyro-compass"	Short:Internal communication with "NO.1 Gyro-compass" Open:Software is installed in SCCpwb Note:A damage will be given to a circuit if software is installed while this jumper has been short.
J26 (2WR/EXT)	SHORT	Software install or internal communication with "NO.2 Gyro-compass"	Short:Internal communication with "NO.2 Gyro-compass" Open:Software is installed in SCCpwb Note:A damage will be given to a circuit if software is installed while this jumper has been short.
J27 (LOG)	1-2 SHORT	LOG contact signal chosen	Input port:GTERMpwb TB1 "SL" 1-2 Short:200p.p.n.m. 3-4 Short:400p.p.n.m. Note:It is one that it can choose. Don't short two.
J28 (ROT)	1-2 SHORT	"rate of turn" Analog signal level selection.	Output port:GTERMpwb TB1 "1RT～3RT" 1-2 Short:Output voltage 0v to ±5v DC or 0v to ±10v DC 3-4 Short:Output voltage 0v to +5v DC or 0v to +10v DC Note:It is one that it can choose. Don't short two.
J29 (ESPOL)	1-2 SHORT	Polarity of the "external heading sensor" signal setting	Input port:GTERMpwb TB1 "ESRX" 1-2 Short:Standard 3-4 Short:Polarity is carried out reversely. Note:When a signal cannot be received by "1-2 short", it is set as "3-4 short." Note:It is one that it can choose. Don't short two.
J30 (MWR/EXT)	SHORT	Software install or internal communication with "SCOIF"	Short:Internal communication with "External heading sensor " Open:Software is installed in SCOIFpwb Note:A damage will be given to a circuit if software is installed while this jumper has been short.
J31 (FLASH)	SHORT	Software install	Open:Software is installed in SCOIFpwb Note:A damage will be given to a circuit if software is installed while this jumper has been short.
J32 (RESET)	OPEN	CUP reset	This jumper is used when resetting "CPU."
J33 (ESSEL1)	1-2 SHORT	Type setup	1-2 Short:Standard(The serial signal of a standard external direction sensor is received, and the signal is sent to "NO.1 Gyro-compass".) 3-4 Short:With an external heading sensor. (with HDM or EHS unit) Type M or E
J34 (ESSEL2)	1-2 SHORT	Type setup	1-2 Short:Standard(The serial signal of a standard external direction sensor is received, and the signal is sent to "NO.2 Gyro-compass".) 3-4 Short:With an external heading sensor. (with HDM or EHS unit) Type M or E
J35 (ESSEL3)	1-2 SHORT	Type setup	1-2 Short:Standard(The serial signal of a standard external direction sensor is received, and the signal is receive from "external headir 3-4 Short:With an external heading sensor. (with HDM or EHS unit) Type M or E
J36 (ESSEL4)	1-2 SHORT	Type setup	1-2 Short:Standard(The serial signal of a standard external direction sensor is received, and the signal is receive from "external headir 3-4 Short:With an external heading sensor. (with HDM or EHS unit) Type M or E
J37 (6TX)	3-4 SHORT	Output serial signal chosen.	Output port:GTERMpwb TB2 "6TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:It is one that it can choose. Don't short two.
J38 (7TX)	3-4 SHORT	Output serial signal chosen.	Output port:GTERMpwb TB2 "7TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:It is one that it can choose. Don't short two.
J39 (8TX)	3-4 SHORT	Output serial signal chosen.	Output port:GTERMpwb TB2 "8TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:It is one that it can choose. Don't short two.
J40 (9TX)	3-4 SHORT	Output serial signal chosen.	Output port:GTERMpwb TB1 "9TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:It is one that it can choose. Don't short two.
J41 (10TX)	3-4 SHORT	Output serial signal chosen.	Output port:GTERMpwb TB1 "10TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:It is one that it can choose. Don't short two.
J42 (MALCN)	3-4 SHORT	Alarm contact output of HDM(or CHANGE OVER)	Output port:DTERMpwb TB21D "MALCN" 3-4 Short:Alarm"OPEN" Normal"CLOSES" 1-2 Short:Alarm"CLOSES" Normal"OPEN" Note:It is one that it can choose. Don't short two.
J43 (MRNCN)	1-2 SHORT	Running contact output of HDM(CHANGE OVER)	Output port:DTERMpwb TB21D "MRNCN" 3-4 Short:Running"OPEN" Normal"CLOSES" 1-2 Short:Running"CLOSES" Normal"OPEN" Note:It is one that it can choose. Don't short two.
J44 (DFCN)	3-4 SHORT	Deference alarm contact output of HDM(or CHANGE OVER)	Output port:DTERMpwb TB21D "DFCN" 3-4 Short:Alarm"OPEN" Normal"CLOSES" 1-2 Short:Alarm"CLOSES" Normal"OPEN" Note:It is one that it can choose. Don't short two.
J45 (OCACN)	3-4 SHORT	Off course alarm contact output	Output port:DTERMpwb TB21D "OCACN" 3-4 Short:Alarm"OPEN" Normal"CLOSES" 1-2 Short:Alarm"CLOSES" Normal"OPEN" Note:It is one that it can choose. Don't short two.
J46 *1 (ST1)	1-2 SHORT	An output port setup of "GTERM pwb"	Output port:GTERMpwb TB2 "ST1/OPRX+" 1-2 Short:The step signal for "Step signal type repeater" is outputted. (ST1) 3-4 Short:Serial signal receive.(OPTION) (OPRX+) Note:It is one that it can choose. Don't short two.
J47 *1 (ST2)	1-2 SHORT	An output port setup of "GTERM pwb"	Output port:GTERMpwb TB2 "ST2/OPRX-" 1-2 Short:The step signal for "Step signal type repeater" is outputted. (ST2) 3-4 Short:Serial signal receive.(OPTION) (OPRX-) Note:It is one that it can choose. Don't short two.
J48 *1 (ST3)	1-2 SHORT	An output port setup of "GTERM pwb"	Output port:GTERMpwb TB2 "ST2/OPRXC" 1-2 Short:The step signal for "Step signal type repeater" is outputted. (ST3) 3-4 Short:Serial signal receive.(OPTION) (OPRXC) Note:It is one that it can choose. Don't short two.

*1:Change all of 3 jumpers simultaneously.

SCOIF pwb pot meter

NO.	Standard setting	Function	Details
VR1		Gain adjustment of "rate of turn.	The gain of a "rate of turn" analog signal is adjusted. In "±30 degrees/min", it adjusts to "±5v ±0.33v DC.
V[illegible]		Off set adjustment of "rate of tur	The off s[illegible]f a "rate of turn" analog signal is adjusted. In "±0 d[illegible]s/min.", it adjusts to "0v ±80mv DC.

MIFC pwb jumper setting

NO.	Standard setting	Function	Details
J4 (3TX)	3-4 SHORT	Output serial signal chosen.	Output port: GTERMpwb TB2 "3TX" 3-4 Short: IEC-61162-1 ed.2 1-2 Short: IEC-61162-2 or TOKIMEC version Note: It is one that it can choose. Don't short two.
J5 (4TX)	3-4 SHORT	Output serial signal chosen.	Output port: GTERMpwb TB2 "4TX" 3-4 Short: IEC-61162-1 ed.2 1-2 Short: IEC-61162-2 or TOKIMEC version Note: It is one that it can choose. Don't short two.
J6 (5TX)	3-4 SHORT	Output serial signal chosen.	Output port: GTERMpwb TB2 "5TX" 3-4 Short: IEC-61162-1 ed.2 1-2 Short: IEC-61162-2 or TOKIMEC version Note: It is one that it can choose. Don't short two.
J7 (GTX)	3-4 SHORT	Output serial signal chosen.	Output port: GTERMpwb TB2 "GTX" 3-4 Short: IEC-61162-1 ed.2 1-2 Short: IEC-61162-2 or TOKIMEC version Note: The true heading information on "Gyro-compass" is outputted regardless of a system change.(with HDM or EHS unit) However, when a "standard external heading sensor" is connected, the true direction of the selected sensor is outputted. Note: It is one that it can choose. Don't short two.
J8 (IEC2)	SHORT	Type setup	Short: Standard Open: With an external heading sensor. (with HDM or EHS unit) Type M or E
J9 (IEC1)	SHORT	Type setup	Short: Standard Open: With an external heading sensor. (with HDM or EHS unit) Type M or E
J10 (WR/EXT)	SHORT	Software install or internal	Short: Internal communication with "External heading sensor " Open: Software is installed in SCCpwb Note: Be sure to set "J6" of "SCCpwb" to "OPEN". Note: A damage will be given to a circuit if software is installed while this jumper has been short.
J11 (LOG)	1-2 SHORT	LOG contact signal chosen	Input port: GTERMpwb TB1 "SL" 1-2 Short: 200p.p.n.m. 3-4 Short: 400p.p.n.m. Note: It is one that it can choose. Don't short two.
J12 (ROT)	1-2 SHORT	"rate of turn" Analog signal level selection.	Output port: GTERMpwb TB1 "1RT～3RT" 1-2 Short: Output voltage 0v to ±5v DC or 0v to ±10v DC 3-4 Short: Output voltage 0v to +5v DC or 0v to +10v DC Note: It is one that it can choose. Don't short two.
J13 (SSEL)	1-2 SHORT	Output serial signal chosen.	Output port: GTERMpwb TB2 "5TX" 1-2 Short: The signal set up by "J6" is outputted. 3-4 Short: The true heading information on "Gyro-compass" is outputted regardless of a system change.(with HDM or EHS unit) Note: When a "standard external heading sensor" is connected, the true direction of the selected sensor is outputted. Note: It is one that it can choose. Don't short two.
J14 (GPSPOL)	1-2 SHORT	Polarity of the "GPS" signal setting	Input port: GTERMpwb TB1 "GRX" 1-2 Short: Standard 3-4 Short: Polarity is carried out reversely. Note: When a signal cannot be received by "1-2 short", it is set as "3-4 short." Note: It is one that it can choose. Don't short two.
J15 (LOGPOL)	1-2 SHORT	Polarity of the "LOG" signal setting	Input port: GTERMpwb TB1 "LRX" 1-2 Short: Standard 3-4 Short: Polarity is carried out reversely. Note: When a signal cannot be received by "1-2 short", it is set as "3-4 short." Note: It is one that it can choose. Don't short two.
J16 (ESPOL)	1-2 SHORT	Polarity of the "external heading sensor" signal setting	Input port: GTERMpwb TB1 "ESRX" 1-2 Short: Standard 3-4 Short: Polarity is carried out reversely. Note: When a signal cannot be received by "1-2 short", it is set as "3-4 short." Note: It is one that it can choose. Don't short two.
J18 *1 (RXD3SEL)	1-2 SHORT	The receiving port of CPU in SCCpwb is chosen	1-2 Short: An option serial signal is received. 3-4: Short: "GPS"serial signal(38400bps only) is received.(Reservation) Note: It is one that it can choose. Don't short two.
(ST1)		pwb"	1-2 Short: The step signal for "Step signal type repeater" is outputted. (ST1) 3-4 Short: Serial signal receive.(OPTION) (OPRX+) Note: It is one that it can choose. Don't short two.
J19 *1 (ST2)	1-2 SHORT	An output port setup of "GTERM pwb"	Output port: GTERMpwb TB2 "ST2/OPRX-" 1-2 Short: The step signal for "Step signal type repeater" is outputted. (ST2) 3-4 Short: Serial signal receive.(OPTION) (OPRX-) Note: It is one that it can choose. Don't short two.
J20 *1 (ST3)	1-2 SHORT	An output port setup of "GTERM pwb"	Output port: GTERMpwb TB2 "ST2/OPRXC" 1-2 Short: The step signal for "Step signal type repeater" is outputted. (ST3) 3-4 Short: Serial signal receive.(OPTION) (OPRXC) Note: It is one that it can choose. Don't short two.

*1: Change all of 3 jumpers simultaneously.

MIFC pwb pot meter

NO.	Standard setting	Function	Details
VR1		Gain adjustment of "rate of turn."	The gain of a "rate of turn" analog signal is adjusted. In "±30 degrees/min", it adjusts to "±5v ±0.33v DC.
VR2		Off set adjustment of "rate of turn.	The off set of a "rate of turn" analog signal is adjusted. In "±0 degrees/min.", it adjusts to "0v ±80mv DC.

MCOIF pwb dip switch assign

S1	Standard setting	Function(mane)	Details			
NO.1	[OFF]	External sensor connection	NO5.[OFF] NO6.[OFF] : Non	NO5.[ON] NO6.[OFF] :External sensor connect		
NO.2	[OFF]		NO5.[OFF] NO6.[ON] :Mag. System connection(back u	NO5.[ON] NO6.[ON] :Ext. System connection(b	startup	
NO.3	[OFF]	automatic system change	[OFF] : no [ON] : yes		startup	
NO.4	[OFF]	don't touch				
NO.5	[OFF]	don't touch				
NO.6	[OFF]	don't touch				
NO.7	[OFF]	don't touch				
NO.8	[OFF]	Debugging	[ON] : The serial signal for debugging is outputted.			

MCOIF pwb jumper setting

NO.	Standard setting	Function	Details
J15 (3TX)	3-4 SHORT	Output serial signal chosen.	Output port:GTERMpwb TB2 "3TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:It is one that it can choose. Don't short two.
J16 (4TX)	3-4 SHORT	Output serial signal chosen.	Output port:GTERMpwb TB2 "4TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:It is one that it can choose. Don't short two.
J17 (5TX)	3-4 SHORT	Output serial signal chosen.	Output port:GTERMpwb TB2 "5TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:It is one that it can choose. Don't short two.
J18 (IEC2)	SHORT	Type setup	Short:Standard Open:With an external heading sensor. (with HDM or EHS unit) Type M or E
J19 (IEC1)	SHORT	Type setup	Short:Standard Open:With an external heading sensor. (with HDM or EHS unit) Type M or E
J20 (G1TX)	3-4 SHORT	Output serial signal chosen.	Output port:DTERMpwb TB21B "G1-1TX" and TB21D "G1-2TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:The true heading information on "NO.1 Gyro-compass" is outputted regardless of a system change.
J21 (G2TX)	3-4 SHORT	Output serial signal chosen.	Output port:DTERMpwb TB21C "G2-1TX" and TB21D "G2-2TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:The true heading information on "NO.1 Gyro-compass" is outputted regardless of a system change.
J22 (GPSPOL)	1-2 SHORT	Polarity of the "GPS" signal settir	Input port:GTERMpwb TB1 "GRX" 1-2 Short:Standard 3-4 Short:Polarity is carried out reversely. Note:When a signal cannot be received by "1-2 short", it is set as "3-4 short." Note:It is one that it can choose. Don't short two.
J23 (LOGPOL)	1-2 SHORT	Polarity of the "LOG" signal settir	Input port:GTERMpwb TB1 "LRX" 1-2 Short:Standard 3-4 Short:Polarity is carried out reversely. Note:When a signal cannot be received by "1-2 short", it is set as "3-4 short." Note:It is one that it can choose. Don't short two.
J24 (RXD3SEL)	1-2 SHORT	The receiving port of CPU in SCCpwb is chosen	1-2 Short:An option serial signal is received. 3-4 Short:The serial signal outputted from SCOIFpwb is received. 5-6:Short:"GPS"serial signal(38400bps only) is received.(Reservation) Note:It is one that it can choose. Don't short two or more.
J25 (1WR/EXT)	SHORT	Software install or internal communication with "NO.1 Gyro-compass"	Short:Internal communication with "NO.1 Gyro-compass" Open:Software is installed in SCCpwb of NO.1 Gyro-compass. Note:A damage will be given to a circuit if software is installed while this jumper has been short.
J26 (2WR/EXT)	SHORT	Software install or internal communication with "NO.2 Gyro-compass"	Short:Internal communication with "NO.2 Gyro-compass" Open:Software is installed in SCCpwb of NO.2 Gyro-compass. Note:A damage will be given to a circuit if software is installed while this jumper has been short.
J27 (LOG)	1-2 SHORT	LOG contact signal chosen	Input port:GTERMpwb TB1 "SL" 1-2 Short:200p.p.n.m. 3-4 Short:400p.p.n.m. Note:It is one that it can choose. Don't short two.
J28 (ROT)	1-2 SHORT	"rate of turn" Analog signal level selection.	Output port:GTERMpwb TB1 "1RT～3RT" 1-2 Short:Output voltage 0v to ±5v DC or 0v to ±10v DC 3-4 Short:Output voltage 0v to +5v DC or 0v to +10v DC Note:It is one that it can choose. Don't short two.
J29 (ESPOL)	1-2 SHORT	Polarity of the "external heading sensor" signal setting	Input port:GTERMpwb TB1 "ESRX" 1-2 Short:Standard 3-4 Short:Polarity is carried out reversely. Note:When a signal cannot be received by "1-2 short", it is set as "3-4 short." Note:It is one that it can choose. Don't short two.
J30 (MWR/EXT)	SHORT	Software install or internal communication with "SCOIF"	Short:Internal communication with "External heading sensor " Open:Software is installed in SCOIFpwb Note:A damage will be given to a circuit if software is installed while this jumper has been short.
J31 (FLASH)	SHORT	Software install	Open:Software is installed in SCOIFpwb Note:A damage will be given to a circuit if software is installed while this jumper has been short.
J32 (RESET)	OPEN	CUP reset	This jumper is used when resetting "CPU."
J33 (ESSEL1)	1-2 SHORT	Type setup	1-2 Short:Standard(The serial signal of a standard external direction sensor is received, and the signal is sent to "NO.1 Gyro-compass".) 3-4 Short:With an external heading sensor. (with HDM or EHS unit) Type M or E
J34 (ESSEL2)	1-2 SHORT	Type setup	1-2 Short:Standard(The serial signal of a standard external direction sensor is received, and the signal is sent to "NO.2 Gyro-compass".) 3-4 Short:With an external heading sensor. (with HDM or EHS unit) Type M or E
J35 (ESSEL3)	1-2 SHORT	Type setup	1-2 Short:Standard(The serial signal of a standard external direction sensor is received, and the signal is receive from "external heading sensor".) 3-4 Short:With an external heading sensor. (with HDM or EHS unit) Type M or E
J36 (ESSEL4)	1-2 SHORT	Type setup	1-2 Short:Standard(The serial signal of a standard external direction sensor is received, and the signal is receive from "external heading sensor".) 3-4 Short:With an external heading sensor. (with HDM or EHS unit) Type M or E
J37 (MALCN)	3-4 SHORT	Alarm contact output of HDM(or CHANGE OVER)	Output port:DTERMpwb TB21D "MALCN" 3-4 Short:Alarm"OPEN" Normal"CLOSES" 1-2 Short:Alarm"CLOSES" Normal"OPEN" Note:It is one that it can choose. Don't short two.
J38 (MRNCN)	1-2 SHORT	Running contact output of HDM(o CHANGE OVER)	Output port:DTERMpwb TB21D "MRNCN" 3-4 Short:Running"OPEN" Stop"CLOSES" 1-2 Short:Running"CLOSES" Stop"OPEN" Note:It is one that it can choose. Don't short two.
J39 (DFCN)	3-4 SHORT	Deference alarm contact output of HDM(or CHANGE OVER)	Output port:DTERMpwb TB21D "DFCN" 3-4 Short:Alarm"OPEN" Normal"CLOSES" 1-2 Short:Alarm"CLOSES" Normal"OPEN" Note:It is one that it can choose. Don't short two.
J40 (OCACN)	3-4 SHORT	Off course alarm contact output	Output port:DTERMpwb TB21D "OCACN" 3-4 Short:Alarm"OPEN" Normal"CLOSES" 1-2 Short:Alarm"CLOSES" Normal"OPEN" Note:It is one that it can choose. Don't short two.
J41 *1 (ST1)	1-2 SHORT	An output port setup of "GTERM pwb"	Output port:GTERMpwb TB2 "ST1/OPRX+" 1-2 Short:The step signal for "Step signal type repeater" is outputted. (ST1) 3-4 Short:Serial signal receive.(OPTION) (OPRX+) Note:It is one that it can choose. Don't short two.
J42 *1 (ST2)	1-2 SHORT	An output port setup of "GTERM pwb"	Output port:GTERMpwb TB2 "ST2/OPRX-" 1-2 Short:The step signal for "Step signal type repeater" is outputted. (ST2) 3-4 Short:Serial signal receive.(OPTION) (OPRX-) Note:It is one that it can choose. Don't short two.
J43 *1 (ST3)	1-2 SHORT	An output port setup of "GTERM pwb"	Output port:GTERMpwb TB2 "ST2/OPRXC" 1-2 Short:The step signal for "Step signal type repeater" is outputted. (ST3) 3-4 Short:Serial signal receive.(OPTION) (OPRXC) Note:It is one that it can choose. Don't short two.

*1:Change all of 3 jumpers simultaneously.

MCOIF pwb pot meter

NO.	Standard setting	Function	Details
VR1		Gain adjustment of "rate of turn."	The gain of a "rate of turn" analog signal is adjusted. In "±30 degrees/min", it adjusts to "±5v ±0.33v DC.
VR2		Off set adjustment of "rate of turn	The off set of a "rate of turn" analog signal is adjusted. In "±0 degrees/min.", it adjusts to "0v ±80mv DC.

GPOWER pwb jumper setting P/N 10189517「1」

NO.	Standard setting	Function	Details
J7	OPEN or SHORT	"over-current limit" set	The over-current value of dc24v for "master compass" is set up. Since it is determined at the time of factory shipments, do not make a setting change after shipment.
J8	OPEN	"over-current limit" change time.	SHORT: It is used for inspection at a factory.
TB3−TB4	−	Main power supply voltage setup	OPEN: 220v AC SHORT: 100v/110v/115v AC

GPOWER pwb jumper setting P/N 10189517「2」

NO.	Standard setting	Function	Details
J7	OPEN or SHORT	"over-current limit" set	The over-current value of dc24v for "master compass" is set up. Since it is determined at the time of factory shipments, do not make a setting change after shipment.
J8	OPEN	"over-current limit" change time.	SHORT: It is used for inspection at a factory.
J9 *1	1-2 SHORT	Power supply alarm setup	1-2 Short: "Main power supply alarm" and "DC power supply alarm" are separately. 3-4 Short: "Main power supply alarm" and "DC power supply alarm" are one alarm. Note: It is one that it can choose. Don't short two.
J10 *1	1-2 SHORT	Power supply alarm setup	1-2 Short: "Main power supply alarm" and "DC power supply alarm" are separately. 3-4 Short: "Main power supply alarm" and "DC power supply alarm" are one alarm. Note: It is one that it can choose. Don't short two.
TB3−TB4	−	Main power supply voltage setup	OPEN: 220v AC SHORT: 100v/110v/115v AC

*1 Now only "1-2 short" can choose.

GTERM pwb jumper setting

NO.	Standard setting	Function	Details
TB3−TB4	−	Type setup	SHORT: One gyro-compass system. OPEN: Tow gyro-compass system.

MCC pwb dip switch assign

S1	Standard setting	Function	Details	Read timing	Ramarks
NO.1	[OFF]	Master compass type	[OFF] : Standard [ON] : HSC	Startup	
NO.2	[OFF]	Display of master compass type	[ON]:In a standard type case, it is displayed as "Std." In a HSC type case, it is displayed as "HIGH."(LED on mcc PWB)	All time	
NO.3	[OFF]	Rate limitter	[ON] :Rotation of Master compass is stopped at the turnning rate more than 30°/sec. [OFF] :With no rate limiter	All time	
NO.4	[OFF]	Startup sequence	Standard[ON]:leveling time is 2 minutes. HSC [ON]: special sequense for dumping test.	Startup	
NO.5	[OFF]	don't touch	-		
NO.6	[OFF]	don't touch	-		
NO.7	[OFF]	Master compass installation	[ON]:Master compass is installed reversely 180 degrees.	Startup	
NO.8	[OFF]	don't touch	-		

MCC pwb jumper setting

NO.	Standard setting	Function	Details
J7 (RESET)	OPEN	CUP reset	This jumper is used when resetting "CPU."
J8 (FLASH)	SHORT	Software install	OPEN:Software is installed in MCCpwb Note:A damage will be given to a circuit if software is installed while this jumper has been short.

MCC pwb pot meter

NO.	Standard setting	Function	Details
VR1		Phase adjustment of a p/u signal.	" ϕ " " θ ", and "x" pick up signals of "Sensitive element" are correctly changed into "DC voltage." Note:You should adjust, when "Sensitive element" is replaced.

INVERTER pwb jumper setting

NO.	Standard setting	Function	Details
JP1	SHORT	"over-current limit" set (start)	"over-current limit" at starting. This setting value is valid till the time set up by JP5.
JP2	OPEN	"over-current limit" set (running)	"over-current limit" at running. This setting value is effective if the time set up by JP5 passes.
JP3	OPEN	Input current detection gain.	The gain which transforms input current into voltage is determined.
JP4	OPEN	"over-current limit" set	It is a setup common to "JP1" and "JP2".
JP5	OPEN	"over-current limit" change time.	It is set in about 9 minutes.
JP6 JP7	OPEN SHORT	"rota power supply" output "rota power supply" output	J6:[short] J7:[open] 3phase rotor power supply. J6:[open] J7:[short] Single phase rotor power supply. Note:Both "J6" and "J7" do not make it "short" or "open".
JP8	OPEN	"over-current limit" change time.	It is used for inspection at a factory.

Note:The above-mentioned setup is changed with directions of only the engineer of tokimec.

INVERTER pwb pot meter

NO.	Standard setting	Function	Details
VR1		Voltage adjustment of rotor power supply	When the Rota rotation is stabilized enough, it adjusts correctly. Note:You should adjust, when "Sensitive element" is replaced.

HRZC pwb pot meter

NO.	Standard setting	Function	Details
RV1		"Hanting stops" adjustment of sensitive element	Adjustment during the leveling action by the "hole sensor." Note: Recommend the "test mode B." (same TG-6000/RGC-12)
RV2		"Level" adjustment of sensitive element	Adjustment during the leveling mode. Note: Recommend the "test mode B." (same TG-6000/RGC-12)

SMCC pwb jumper setting

NO.	Standard setting	Function	Details
J5	OPEN	"step motor signal controller" reset.	This jumper is used when resetting "step motor signal controll IC"

PCC pwb dip switch assign

sw1	standard setti	details	fundtion		read timing	remarks
NO.1	[OFF]	HDM function	[OFF] : yes [ON] : no		startup	
NO.2	[OFF]	OCA function	[OFF] : no [ON] : yes		startup	
NO.3	[OFF]	External sensor connection	NO5.[OFF] NO6.[OFF] : Non	NO5.[ON] NO6.[OFF] :External sensor connection		
NO.4	[OFF]		NO5.[OFF] NO6.[ON] :Mag. System connection(back up)	NO5.[ON] NO6.[ON] :Ext. System connection(back up)	startup	
NO.5	[OFF]	input of steering mode information	[OFF] : serial signal [ON] : contact		startup	
NO.6	[OFF]	for SIMRAD or not	[OFF] : no [ON] : yes("by SIMRAD" is displayed at the time of starting.)		startup	
NO.7	[OFF]	don't touch				
NO.8	[OFF]	don't touch	-			

PCC pwb jumper setting

NO.	Standard sett	Function	Details
J4 (RESET)	OPEN	CUP reset	This jumper is used when resetting "CPU."
J5 (FLASH)	SHORT	Software install	OPEN:Software is installed in SCCpwb Note:A damage will be given to a circuit if software is installed while this jumper has been short.
J6 (POWER)	OPEN	"Power supply" switch	Short:Power "ON."(Power supply switch" pass.)

RPCC **pwb dip switch assign (serial signal type repeater)**

S1	standard setting	details	function		read timing	ramarks
NO.1	[OFF]	Setup of a receive format	NO.1[OFF] NO.2[OFF] NO.3[OFF]:20msec(IEC-2	NO.1[ON] NO.2[OFF] NO.3[OFF]:100msec(IEC-1)	startup	
NO.2	[OFF]		NO.1[OFF] NO.2[ON] NO.3[OFF]:200msec(IEC-1	NO.1[ON] NO.2[ON] NO.3[OFF]:1sec(IEC-1)		
NO.3	[OFF]		NO.1[OFF] NO.2[OFF] NO.3[ON]:TK fotmat			
NO.4	[OFF]	don't touch				
NO.5	[OFF]	don't touch			-	
NO.6	[OFF]	repeater type	[OFF]:standard [ON]:steering repeater		startup	
NO.7	-	polarity of offset	[OFF]:+ [ON]:− (A value is inputted with the digital switch S2.)		all time	
NO.8	[ON]	software update	[OFF]:At the time of software update [ON]:usual operation		-	

S3	standard setting	details	function	read timing	ramarks
NO.1	[OFF]	don't touch			
NO.2	[OFF]	don't touch			
NO.3	[OFF]	don't touch			
NO.4	[OFF]	don't touch			
NO.5	[OFF]	don't touch			
NO.6	[OFF]	don't touch			
NO.7	[OFF]	don't touch			
NO.8	[OFF]	don't touch			

S2	standard setting	details	function	read timing	ramarks
−	−	Offset value		startup	

ITERM pwb jumper setting

NO.	Standard setting	Function	Details
J5 (CONNECTER)	—	With "Power supply uint" or no "Power supply unit"	2-4 Short: With "Power supply uint" 3-TB2 16 Short: With "Power supply uint" All open: No "Power supply unit"
J6 (CONNECTER)	—	With "Power supply uint" or no "Power supply unit"	2-4 Short: With "Power supply uint" 1-3 Short: With "Power supply uint" All open: No "Power supply unit"

SCC pwb dip switch assign

S1	Standard settin	Function	Details		Read timi	Remarks
NO.1	-	control box type	[OFF] : Type S [ON] : Type I		startup	
NO.2	[OFF]	master compass type	[OFF] : Standard type [ON] : HSC type		startup	
NO.3	[OFF]	control box type	[OFF] : Type S [ON] : Type D(dual gyro)		startup	
NO.4	[OFF]	No.2 gyro or not	[OFF] : No [ON] : Yes		startup	
NO.5	[OFF]	External sensor connection	NO5.[OFF] NO6.[OFF] : Non	NO5.[ON] NO6.[OFF] : External sensor connectio	startup	
NO.6	[OFF]		NO5.[OFF] NO6.[ON] : Mag. System connection(	NO5.[ON] NO6.[ON] : Ext. System connection(bac		
NO.7	[OFF]	serial signal select	[OFF] : IEC61162-2 [ON] : Tokimec format		startup	
NO.8	[OFF]	Alarm output setup	[OFF] : All alarm output [ON] : only power fail		startup	

S2	Standard settin	Function	Details		Read timi	Remarks
NO.1	[OFF]	For debugging(don't touch)			-	
NO.2	[OFF]	For debugging(don't touch)			-	
NO.3	[OFF]	don't touch				
NO.4	[OFF]	don't touch				
NO.5	[OFF]	serial signal transmit frequency	NO5.[OFF] NO6.[OFF] : 1sec	NO5.[ON] NO6.[OFF] : 200msec	startup	
NO.6	[OFF]	IEC61162-1 ed.2	NO5.[OFF] NO6.[ON] : 100msec	NO5.[ON] NO6.[ON] : Invalid(1sec)		
NO.7	[OFF]	don't touch	-			
NO.8	[OFF]	don't touch	-			

S3	Standard settin	Function	Details		Read timi	Remarks
NO.1	[OFF]	timer startup	[OFF] : no [ON] : yes		startup	
NO.2	[OFF]	Talker ID of "ROT" sentence	[OFF] : "HE" [ON] : "TI"		startup	
NO.3	[OFF]	rate of turn scale	NO3.[OFF] NO4.[OFF] : Max 30.0deg./min.	NO3.[ON] NO4.[OFF] : Max 120.0deg./min.	startup	
NO.4	[OFF]		NO3.[OFF] NO4.[ON] : Max 300.0deg./min.	NO3.[ON] NO4.[ON] : don't setting		
NO.5	[OFF]	ban or permission of a "ROT" sentence output	**Valid at the time of external sensor(stadard) selection** [OFF] : disable [ON] : enable		startup	
NO.6	[OFF]	for SIMRAD or not	[OFF] : no [ON] : yes("GC-80" is displayed at the time of starting.)		startup	
NO.7	[OFF]	don't touch	-		-	
NO.8	[OFF]	don't touch	-		-	

S4	Standard settin	Function	Details	Read timi	Remarks
NO.1	[OFF]	LOG(serial) baud rate of transmissio	38400 bps	-	
NO.2	[OFF]	LOG(serial) baud rate of transmissio	9600 bps	-	
NO.3	[ON]	LOG(serial) baud rate of transmissio	4800 bps	-	
NO.4	[OFF]	LOG(serial) baud rate of receive	38400 bps	-	
NO.5	[OFF]	LOG(serial) baud rate of receive	9600 bps	-	
NO.6	[ON]	LOG(serial) baud rate of receive	4800 bps	-	

SCC pwb jumper setting

NO.	Standard settin	Function	Details
J5 (RESET)	OPEN	CUP reset	This jumper is used when resetting "CPU."
J6 (FLASH)	SHORT	Software install	OPEN:Software is installed in SCCpwb Note:(Type S)Be sure to set "J10" of "SIFC or MIFCpwb" to "OPEN". Note:(Type D)Be sure to set "J25 and J26" of "SCOIF or MCOIFpwb" to "OPEN". Note:A damage will be given to a circuit if software is installed while this jumper has been short.
J7 (1TX)	3-4 SHORT	Output serial signal chosen	Output port:GTERMpwb TB2 "1TX" 3-4 Short:IEC-61162-2 or TOKIMEC version 5-6 Short:IEC-61162-1 ed.2 1-2 Short:It is not used. Note:It is one that it can choose. Don't short two or more.
J8 (2TX)	3-4 SHORT	Output serial signal chosen	Output port:GTERMpwb TB2 "2TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 Note:It is one that it can choose. Don't short two.
J9 (ALCN)	3-4 SHORT	Alarm contact output	Output port:GTERMpwb TB1 "ALCN" 3-4 Short:Alarm"OPEN" Normal"CLOSES" 1-2 Short:Alarm"CLOSES" Normal"OPEN" Note:It is one that it can choose. Don't short two.
J10 (RNCN)	1-2 SHORT	Running contact output	Output port:GTERMpwb TB1 "RNCN" 1-2 Short:Running"CLOSES" Normal"OPEN" 3-4 Short:Running"OPEN" Normal"CLOSES" Note:It is one that it can choose. Don't short two.

ICIF pwb dip switch assign (TYPE I)

S1	Standard setting	Function	Details	Read timi	Remarks
NO.1	-	control box type	[OFF] : Type S [ON] : Type I	startup	
NO.2	[OFF]	master compass type	[OFF] : Standard type [ON] : HSC type	startup	
NO.3	[OFF]	control box type	[OFF] : Type S [ON] : Type D(dual gyro)	startup	
NO.4	[OFF]	No.2 gyro or not	[OFF] : No [ON] : Yes	startup	
NO.5	[OFF]	External sensor connection	NO5.[OFF] NO6.[OFF] : Non NO5.[ON] NO6.[OFF] :External sensor connecti	startup	
NO.6	[OFF]		NO5.[OFF] NO6.[ON] :Mag. System connectior NO5.[ON] NO6.[ON] :Ext. System connection(ba		
NO.7	[OFF]	serial signal select	[OFF] : IEC61162-2 [ON] : Tokimec format	startup	
NO.8	[OFF]	Alarm output setup	[OFF] : All alarm output [ON] : only power fail	startup	

S2	Standard setting	Function	Details	Read timi	Remarks
NO.1	[OFF]	For debugging(don't touch)		-	
NO.2	[OFF]	For debugging(don't touch)		-	
NO.3	[OFF]	don't touch			
NO.4	[OFF]	don't touch			
NO.5	[OFF]	serial signal transmit frequency	NO5.[OFF] NO6.[OFF] : 1sec NO5.[ON] NO6.[OFF] : 200msec	startup	
NO.6	[OFF]	IEC61162-1 ed.2	NO5.[OFF] NO6.[ON] : 100msec NO5.[ON] NO6.[ON] : Invalid(1sec)		
NO.7	[OFF]	don't touch	-		
NO.8	[OFF]	don't touch	-		

S3	Standard setting	Function	Details	Read timi	Remarks
NO.1	[OFF]	timer startup	[OFF] : no [ON] : yes	startup	
NO.2	[OFF]	Talker ID of "ROT" sentence	[OFF] : "HE" [ON] : "TI"	startup	
NO.3	[OFF]	rate of turn scale	NO3.[OFF] NO4.[OFF] : Max 30.0deg./min. NO3.[ON] NO4.[OFF] : Max 120.0deg./min.	startup	
NO.4	[OFF]		NO3.[OFF] NO4.[ON] : Max 300.0deg./min. NO3.[ON] NO4.[ON] : don't setting		
NO.5	[OFF]	ban or permission of a "ROT" sentence output	Valid at the time of external sensor(stadard) selection [OFF] : disable [ON] : enable	startup	
NO.6	[OFF]	for SIMRAD or not	[OFF] : no [ON] : yes("GC-80" is displayed at the time of starting.)	startup	
NO.7	[OFF]	don't touch	-	-	
NO.8	[OFF]	don't touch	-	-	

S4	Standard setting	Function	Details	Read timi	Remarks
NO.1	[OFF]	LOG(serial) baud rate of transmissti	38400 bps	-	
NO.2	[OFF]	LOG(serial) baud rate of transmissti	9600 bps	-	
NO.3	[ON]	LOG(serial) baud rate of transmissti	4800 bps	-	
NO.4	[OFF]	LOG(serial) baud rate of receive	38400 bps	-	
NO.5	[OFF]	LOG(serial) baud rate of receive	9600 bps	-	
NO.6	[ON]	LOG(serial) baud rate of receive	4800 bps	-	

ICIF pwb jumper setting

NO.	Standard setting	Function	Details
J5 (FLASH)	SHORT	Software install	OPEN:Software is installed in ICIFpwb Note:Be sure to set "J1" of "IOPTpwb" to "OPEN". Note:A damage will be given to a circuit if software is installed while this jumper has been short.
J6 (RESET)	OPEN	CUP reset	This jumper is used when resetting "CPU."
J7 (1TX)	3-4 SHORT	Output serial signal chosen	Output port:ITERMpwb TB1 "1TX" 3-4 Short:IEC-61162-2 or TOKIMEC version 1-2 Short:IEC-61162-1 ed.2 Note:It is one that it can choose. Don't short two.
J8 (2TX)	3-4 SHORT	Output serial signal chosen.	Output port:ITERMpwb TB1 "2TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:It is one that it can choose. Don't short two.
J9 (3TX)	3-4 SHORT	Output serial signal chosen	Output port:ITERMpwb TB1 "3TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:It is one that it can choose. Don't short two.
J10 (4TX)	3-4 SHORT	Output serial signal chosen.	Output port:ITERMpwb TB1 "4TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:It is one that it can choose. Don't short two.
J11 (GPSPOL)	1-2 SHPRT	Polarity of the "GPS" signal setting	Input port:ITERMpwb TB2 "GRX" 1-2 Short:Standard 3-4 Short:Polarity is carried out reversely. Note:When a signal cannot be received by "1-2 short", it is set as "3-4 short." Note:It is one that it can choose. Don't short two.
J14 (ALCN)	3-4 SHORT	Alarm contact output	Output port:ITERMpwb TB1 "ALCN" 3-4 Short:Alarm"OPEN" Normal"CLOSES" 1-2 Short:Alarm"CLOSES" Normal"OPEN" Note:It is one that it can choose. Don't short two.
J15 (LOG)	1-2 SHORT	LOG contact signal chosen	Input port:ITERMpwb TB2 "SL" 1-2 Short:200p.p.n.m. 3-4 Short:400p.p.n.m. Note:It is one that it can choose. Don't short two.

SIFC pwb jumper setting (type S : for serial signal repeater)

NO.	Standard setting	Function	Details
J6 (3TX)	3-4 SHORT	Output serial signal chosen.	Output port:GTERMpwb TB2 "3TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:It is one that it can choose. Don't short two.
J7 (4TX)	3-4 SHORT	Output serial signal chosen.	Output port:GTERMpwb TB2 "4TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:It is one that it can choose. Don't short two.
J8 (5TX)	3-4 SHORT	Output serial signal chosen.	Output port:GTERMpwb TB2 "5TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:It is one that it can choose. Don't short two.
J9 (6TX)	3-4 SHORT	Output serial signal chosen.	Output port:GTERMpwb TB2 "6TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:It is one that it can choose. Don't short two.
J10 (7TX)	3-4 SHORT	Output serial signal chosen.	Output port:GTERMpwb TB2 "7TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:It is one that it can choose. Don't short two.
J11 (8TX)	3-4 SHORT	Output serial signal chosen.	Output port:GTERMpwb TB2 "8TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:It is one that it can choose. Don't short two.
J12 (9TX)	3-4 SHORT	Output serial signal chosen.	Output port:GTERMpwb TB1 "9TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:It is one that it can choose. Don't short two.
J13 (10TX)	3-4 SHORT	Output serial signal chosen.	Output port:GTERMpwb TB1 "10TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:It is one that it can choose. Don't short two.
J14 (GTX)	3-4 SHORT	Output serial signal chosen.	Output port:GTERMpwb TB2 "GTX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:The true heading information on "Gyro-compass" is outputted regardless of a system change.(with HDM or EHS unit) However, when a "standard external heading sensor" is connected, the true direction of the selected sensor is outputted. Note:It is one that it can choose. Don't short two.
J15 (IEC2)	SHORT	Type setup	Short:Standard Open:With an external heading sensor. (with HDM or EHS unit) Type M or E
J16 (IEC1)	SHORT	Type setup	Short:Standard Open:With an external heading sensor. (with HDM or EHS unit) Type M or E
J17 (WR/EXT)	SHORT	Software install or internal	Short:Internal communication with "External heading sensor " Open:Software is installed in SCCpwb Note:Be sure to set "J6" of "SCCpwb" to "OPEN". Note:A damage will be given to a circuit if software is installed while this jumper has been short.
J18 (ROT)	1-2 SHORT	"rate of turn" Analog signal level selection.	Output port:GTERMpwb TB1 "1RT～3RT" 1-2 Short:Output voltage 0v to ±5v DC or 0v to ±10v DC 3-4 Short:Output voltage 0v to +5v DC or 0v to +10v DC Note:It is one that it can choose. Don't short two.
J19 (LOG)	1-2 SHORT	LOG contact signal chosen	Input port:GTERMpwb TB1 "SL" 1-2 Short:200p.p.n.m. 3-4 Short:400p.p.n.m. Note:It is one that it can choose. Don't short two.
J20 (GPSPOL)	1-2 SHORT	Polarity of the "GPS" signal setting	Input port:GTERMpwb TB1 "GRX" 1-2 Short:Standard 3-4 Short:Polarity is carried out reversely. Note:When a signal cannot be received by "1-2 short", it is set as "3-4 short." Note:It is one that it can choose. Don't short two.
J21 (LOGPOL)	1-2 SHORT	Polarity of the "LOG" signal setting	Input port:GTERMpwb TB1 "LRX" 1-2 Short:Standard 3-4 Short:Polarity is carried out reversely. Note:When a signal cannot be received by "1-2 short", it is set as "3-4 short." Note:It is one that it can choose. Don't short two.
J22 (ESPOL)	1-2 SHORT	Polarity of the "external heading sensor" signal setting	Input port:GTERMpwb TB1 "ESRX" 1-2 Short:Standard 3-4 Short:Polarity is carried out reversely. Note:When a signal cannot be received by "1-2 short", it is set as "3-4 short." Note:It is one that it can choose. Don't short two.
J23 (RXD3SEL)	1-2 SHORT	The receiving port of CPU in SCCpwb is chosen	1-2 Short:An option serial signal is received. 3-4:Short:"GPS"serial signal(38400bps only) is received.(Reservation) Note:It is one that it can choose. Don't short two.
J24 (SSEL)	1-2 SHORT	Output serial signal chosen.	Output port:GTERMpwb TB2 "5TX" 1-2 Short:The signal set up by "J6" is outputted. 3-4 Short:The true heading information on "Gyro-compass" is outputted regardless of a system change.(with HDM or EHS unit) Note:When a "standard external heading sensor" is connected, the true direction of the selected sensor is outputted. Note:It is one that it can choose. Don't short two.
J25 *1 (ST1)	1-2 SHORT	An output port setup of "GTERM pwb"	Output port:GTERMpwb TB2 "ST1/OPRX+" 1-2 Short:The step signal for "Step signal type repeater" is outputted. (ST1) 3-4 Short:Serial signal receive.(OPTION) (OPRX+) Note:It is one that it can choose. Don't short two.
J26 *1 (ST2)	1-2 SHORT	An output port setup of "GTERM pwb"	Output port:GTERMpwb TB2 "ST2/OPRX-" 1-2 Short:The step signal for "Step signal type repeater" is outputted. (ST2) 3-4 Short:Serial signal receive.(OPTION) (OPRX-) Note:It is one that it can choose. Don't short two.
J27 *1 (ST3)	1-2 SHORT	An output port setup of "GTERM pwb"	Output port:GTERMpwb TB2 "ST2/OPRXC" 1-2 Short:The step signal for "Step signal type repeater" is outputted. (ST3) 3-4 Short:Serial signal receive.(OPTION) (OPRXC) Note:It is one that it can choose. Don't short two.

*1:Change all of 3 jumpers simultaneously.

SIFC pwb pot meter

NO.	Standard setting	Function	Details
VR1		Gain adjustment of "rate of turn."	The gain of a "rate of turn" analog signal is adjusted. In "±30 degrees/min", it adjusts to "±5v ±0.33v DC.
VR2		Off set adjustment of "rate of turn."	The off set of a "rate of turn" analog signal is adjusted. In "±0 degrees/min.", it adjusts to "0v ±80mv DC.

SCOIF pwb dip switch assign (type D : for serial s[illegible]al repeater)

S1	Standard setting	Function(mane)	Details		
NO.1	[OFF]	External sensor connection	NO5.[OFF] NO6.[OFF] : Non / NO5.[ON] NO6.[OFF] :External sensor connec		
NO.2	[OFF]		NO5.[OFF] NO6.[ON] :Mag. System connection(back u / NO5.[ON] NO6.[ON] :Ext. System connection(	startup	
NO.3	[OFF]	automatic system change	[OFF] : no [ON] : yes	startup	
NO.4	[OFF]	don't touch			
NO.5	[OFF]	don't touch			
NO.6	[OFF]	don't touch			
NO.7	[OFF]	don't touch			
NO.8	[OFF]	don't touch			

SCOIF pwb jumper setting

NO.	Standard setting	Function	Details
J15 (3TX)	3-4 SHORT	Output serial signal chosen.	Output port:GTERMpwb TB2 "3TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:It is one that it can choose. Don't short two.
J16 (4TX)	3-4 SHORT	Output serial signal chosen.	Output port:GTERMpwb TB2 "4TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:It is one that it can choose. Don't short two.
J17 (5TX)	3-4 SHORT	Output serial signal chosen.	Output port:GTERMpwb TB2 "5TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:It is one that it can choose. Don't short two.
J18 (IEC2)	SHORT	Type setup	Short:Standard Open:With an external heading sensor. (with HDM or EHS unit) Type M or E
J19 (IEC1)	SHORT	Type setup	Short:Standard Open:With an external heading sensor. (with HDM or EHS unit) Type M or E
J20 (G1TX)	3-4 SHORT	Output serial signal chosen.	Output port:DTERMpwb TB21B "G1-1TX" and TB21D "G1-2TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:The true heading information on "NO.1 Gyro-compass" is outputted regardless of a system change.
J21 (G2TX)	3-4 SHORT	Output serial signal chosen.	Output port:DTERMpwb TB21C "G2-1TX" and TB21D "G2-2TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:The true heading information on "NO.1 Gyro-compass" is outputted regardless of a system change.
J22 (GPSPOL)	1-2 SHORT	Polarity of the "GPS" signal setti	Input port:GTERMpwb TB1 "GRX" 1-2 Short:Standard 3-4 Short:Polarity is carried out reversely. Note:When a signal cannot be received by "1-2 short", it is set as "3-4 short." Note:It is one that it can choose. Don't short two.
J23 (LOGPOL)	1-2 SHORT	Polarity of the "LOG" signal setti	Input port:GTERMpwb TB1 "LRX" 1-2 Short:Standard 3-4 Short:Polarity is carried out reversely. Note:When a signal cannot be received by "1-2 short", it is set as "3-4 short." Note:It is one that it can choose. Don't short two.
J24 (RXD3SEL)	1-2 SHORT	The receiving port of CPU in SCCpwb is chosen	1-2 Short:An option serial signal is received. 3-4 Short:The serial signal outputted from SCOIFpwb is received. 5-6:Short:"GPS"serial signal(38400bps only) is received.(Reservation) Note:It is one that it can choose. Don't short two or more.
J25 (1WR/EXT)	SHORT	Software install or internal communication with "NO.1 Gyro-compass"	Short:Internal communication with "NO.1 Gyro-compass" Open:Software is installed in SCCpwb Note:A damage will be given to a circuit if software is installed while this jumper has been short.
J26 (2WR/EXT)	SHORT	Software install or internal communication with "NO.2 Gyro-compass"	Short:Internal communication with "NO.2 Gyro-compass" Open:Software is installed in SCCpwb Note:A damage will be given to a circuit if software is installed while this jumper has been short.
J27 (LOG)	1-2 SHORT	LOG contact signal chosen	Input port:GTERMpwb TB1 "SL" 1-2 Short:200p.p.n.m. 3-4 Short:400p.p.n.m. Note:It is one that it can choose. Don't short two.
J28 (ROT)	1-2 SHORT	"rate of turn" Analog signal level selection.	Output port:GTERMpwb TB1 "1RT～3RT" 1-2 Short:Output voltage 0v to ±5v DC or 0v to ±10v DC 3-4 Short:Output voltage 0v to +5v DC or 0v to +10v DC Note:It is one that it can choose. Don't short two.
J29 (ESPOL)	1-2 SHORT	Polarity of the "external heading sensor" signal setting	Input port:GTERMpwb TB1 "ESRX" 1-2 Short:Standard 3-4 Short:Polarity is carried out reversely. Note:When a signal cannot be received by "1-2 short", it is set as "3-4 short." Note:It is one that it can choose. Don't short two.
J30 (MWR/EXT)	SHORT	Software install or internal communication with "SCOIF"	Short:Internal communication with "External heading sensor " Open:Software is installed in SCOIFpwb Note:A damage will be given to a circuit if software is installed while this jumper has been short.
J31 (FLASH)	SHORT	Software install	Open:Software is installed in SCOIFpwb Note:A damage will be given to a circuit if software is installed while this jumper has been short.
J32 (RESET)	OPEN	CUP reset	This jumper is used when resetting "CPU."
J33 (ESSEL1)	1-2 SHORT	Type setup	1-2 Short:Standard(The serial signal of a standard external direction sensor is received, and the signal is sent to "NO.1 Gyro-compass".) 3-4 Short:With an external heading sensor. (with HDM or EHS unit) Type M or E
J34 (ESSEL2)	1-2 SHORT	Type setup	1-2 Short:Standard(The serial signal of a standard external direction sensor is received, and the signal is sent to "NO.2 Gyro-compass".) 3-4 Short:With an external heading sensor. (with HDM or EHS unit) Type M or E
J35 (ESSEL3)	1-2 SHORT	Type setup	1-2 Short:Standard(The serial signal of a standard external direction sensor is received, and the signal is receive from "external headir 3-4 Short:With an external heading sensor. (with HDM or EHS unit) Type M or E
J36 (ESSEL4)	1-2 SHORT	Type setup	1-2 Short:Standard(The serial signal of a standard external direction sensor is received, and the signal is receive from "external headir 3-4 Short:With an external heading sensor. (with HDM or EHS unit) Type M or E
J37 (6TX)	3-4 SHORT	Output serial signal chosen.	Output port:GTERMpwb TB2 "6TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:It is one that it can choose. Don't short two.
J38 (7TX)	3-4 SHORT	Output serial signal chosen.	Output port:GTERMpwb TB2 "7TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:It is one that it can choose. Don't short two.
J39 (8TX)	3-4 SHORT	Output serial signal chosen.	Output port:GTERMpwb TB2 "8TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:It is one that it can choose. Don't short two.
J40 (9TX)	3-4 SHORT	Output serial signal chosen.	Output port:GTERMpwb TB1 "9TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:It is one that it can choose. Don't short two.
J41 (10TX)	3-4 SHORT	Output serial signal chosen.	Output port:GTERMpwb TB1 "10TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:It is one that it can choose. Don't short two.
J42 (MALCN)	3-4 SHORT	Alarm contact output of HDM(or CHANGE OVER)	Output port:DTERMpwb TB21D "MALCN" 3-4 Short:Alarm"OPEN" Normal"CLOSES" 1-2 Short:Alarm"CLOSES" Normal"OPEN" Note:It is one that it can choose. Don't short two.
J43 (MRNCN)	1-2 SHORT	Running contact output of HDM(CHANGE OVER)	Output port:DTERMpwb TB21D "MRNCN" 3-4 Short:Running"OPEN" Normal"CLOSES" 1-2 Short:Running"CLOSES" Normal"OPEN" Note:It is one that it can choose. Don't short two.
J44 (DFCN)	3-4 SHORT	Deference alarm contact output of HDM(or CHANGE OVER)	Output port:DTERMpwb TB21D "DFCN" 3-4 Short:Alarm"OPEN" Normal"CLOSES" 1-2 Short:Alarm"CLOSES" Normal"OPEN" Note:It is one that it can choose. Don't short two.
J45 (OCACN)	3-4 SHORT	Off course alarm contact output	Output port:DTERMpwb TB21D "OCACN" 3-4 Short:Alarm"OPEN" Normal"CLOSES" 1-2 Short:Alarm"CLOSES" Normal"OPEN" Note:It is one that it can choose. Don't short two.
J46 *1 (ST1)	1-2 SHORT	An output port setup of "GTERM pwb"	Output port:GTERMpwb TB2 "ST1/OPRX+" 1-2 Short:The step signal for "Step signal type repeater" is outputted. (ST1) 3-4 Short:Serial signal receive.(OPTION) (OPRX+) Note:It is one that it can choose. Don't short two.
J47 *1 (ST2)	1-2 SHORT	An output port setup of "GTERM pwb"	Output port:GTERMpwb TB2 "ST2/OPRX-" 1-2 Short:The step signal for "Step signal type repeater" is outputted. (ST2) 3-4 Short:Serial signal receive.(OPTION) (OPRX-) Note:It is one that it can choose. Don't short two.
J48 *1 (ST3)	1-2 SHORT	An output port setup of "GTERM pwb"	Output port:GTERMpwb TB2 "ST2/OPRXC" 1-2 Short:The step signal for "Step signal type repeater" is outputted. (ST3) 3-4 Short:Serial signal receive.(OPTION) (OPRXC) Note:It is one that it can choose. Don't short two.

*1:Change all of 3 jumpers simultaneously.

SCOIF pwb pot meter

NO.	Standard setting	Function	Details
VR1		Gain adjustment of "rate of turn.	The gain of a "rate of turn" analog signal is adjusted. In "±30 degrees/min", it adjusts to "±5v ±0.33v DC.
VR[illegible]		Off set adjustment of "rate of tur	The off s[illegible]f a "rate of turn" analog signal is adjusted. In "±0 d[illegible]s/min.", it adjusts to "0v ±80mv DC.

MIFC pwb jumper setting

NO.	Standard setting	Function	Details
J4 (3TX)	3-4 SHORT	Output serial signal chosen.	Output port:GTERMpwb TB2 "3TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:It is one that it can choose. Don't short two.
J5 (4TX)	3-4 SHORT	Output serial signal chosen.	Output port:GTERMpwb TB2 "4TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:It is one that it can choose. Don't short two.
J6 (5TX)	3-4 SHORT	Output serial signal chosen.	Output port:GTERMpwb TB2 "5TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:It is one that it can choose. Don't short two.
J7 (GTX)	3-4 SHORT	Output serial signal chosen.	Output port:GTERMpwb TB2 "GTX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:The true heading information on "Gyro-compass" is outputted regardless of a system change.(with HDM or EHS unit) However, when a "standard external heading sensor" is connected, the true direction of the selected sensor is outputted. Note:It is one that it can choose. Don't short two.
J8 (IEC2)	SHORT	Type setup	Short:Standard Open:With an external heading sensor. (with HDM or EHS unit) Type M or E
J9 (IEC1)	SHORT	Type setup	Short:Standard Open:With an external heading sensor. (with HDM or EHS unit) Type M or E
J10 (WR/EXT)	SHORT	Software install or internal	Short:Internal communication with "External heading sensor " Open:Software is installed in SCCpwb Note:Be sure to set "J6" of "SCCpwb" to "OPEN". Note:A damage will be given to a circuit if software is installed while this jumper has been short.
J11 (LOG)	1-2 SHORT	LOG contact signal chosen	Input port:GTERMpwb TB1 "SL" 1-2 Short:200p.p.n.m. 3-4 Short:400p.p.n.m. Note:It is one that it can choose. Don't short two.
J12 (ROT)	1-2 SHORT	"rate of turn" Analog signal level selection.	Output port:GTERMpwb TB1 "1RT～3RT" 1-2 Short:Output voltage 0v to ±5v DC or 0v to ±10v DC 3-4 Short:Output voltage 0v to +5v DC or 0v to +10v DC Note:It is one that it can choose. Don't short two.
J13 (SSEL)	1-2 SHORT	Output serial signal chosen.	Output port:GTERMpwb TB2 "5TX" 1-2 Short:The signal set up by "J6" is outputted. 3-4 Short:The true heading information on "Gyro-compass" is outputted regardless of a system change.(with HDM or EHS unit) Note:When a "standard external heading sensor" is connected, the true direction of the selected sensor is outputted. Note:It is one that it can choose. Don't short two.
J14 (GPSPOL)	1-2 SHORT	Polarity of the "GPS" signal setting	Input port:GTERMpwb TB1 "GRX" 1-2 Short:Standard 3-4 Short:Polarity is carried out reversely. Note:When a signal cannot be received by "1-2 short", it is set as "3-4 short." Note:It is one that it can choose. Don't short two.
J15 (LOGPOL)	1-2 SHORT	Polarity of the "LOG" signal setting	Input port:GTERMpwb TB1 "LRX" 1-2 Short:Standard 3-4 Short:Polarity is carried out reversely. Note:When a signal cannot be received by "1-2 short", it is set as "3-4 short." Note:It is one that it can choose. Don't short two.
J16 (ESPOL)	1-2 SHORT	Polarity of the "external heading sensor" signal setting	Input port:GTERMpwb TB1 "ESRX" 1-2 Short:Standard 3-4 Short:Polarity is carried out reversely. Note:When a signal cannot be received by "1-2 short", it is set as "3-4 short." Note:It is one that it can choose. Don't short two.
J18 *1 (RXD3SEL)	1-2 SHORT	The receiving port of CPU in SCCpwb is chosen	1-2 Short:An option serial signal is received. 3-4:Short:"GPS"serial signal(38400bps only) is received.(Reservation) Note:It is one that it can choose. Don't short two.
(ST1)		pwb"	1-2 Short:The step signal for "Step signal type repeater" is outputted. (ST1) 3-4 Short:Serial signal receive.(OPTION) (OPRX+) Note:It is one that it can choose. Don't short two.
J19 *1 (ST2)	1-2 SHORT	An output port setup of "GTERM pwb"	Output port:GTERMpwb TB2 "ST2/OPRX-" 1-2 Short:The step signal for "Step signal type repeater" is outputted. (ST2) 3-4 Short:Serial signal receive.(OPTION) (OPRX-) Note:It is one that it can choose. Don't short two.
J20 *1 (ST3)	1-2 SHORT	An output port setup of "GTERM pwb"	Output port:GTERMpwb TB2 "ST2/OPRXC" 1-2 Short:The step signal for "Step signal type repeater" is outputted. (ST3) 3-4 Short:Serial signal receive.(OPTION) (OPRXC) Note:It is one that it can choose. Don't short two.

*1:Change all of 3 jumpers simultaneously.

MIFC pwb pot meter

NO.	Standard setting	Function	Details
VR1		Gain adjustment of "rate of turn."	The gain of a "rate of turn" analog signal is adjusted. In "±30 degrees/min", it adjusts to "±5v ±0.33v DC.
VR2		Off set adjustment of "rate of turn.	The off set of a "rate of turn" analog signal is adjusted. In "±0 degrees/min.", it adjusts to "0v ±80mv DC.

MCOIF pwb dip switch assign

S1	Standard setting	Function(mane)	Details			
NO.1	[OFF]	External sensor connection	NO5.[OFF] NO6.[OFF] : Non	NO5.[ON] NO6.[OFF] :External sensor connect		
NO.2	[OFF]		NO5.[OFF] NO6.[ON] :Mag. System connection(back u	NO5.[ON] NO6.[ON] :Ext. System connection(b	startup	
NO.3	[OFF]	automatic system change	[OFF] : no [ON] : yes		startup	
NO.4	[OFF]	don't touch				
NO.5	[OFF]	don't touch				
NO.6	[OFF]	don't touch				
NO.7	[OFF]	don't touch				
NO.8	[OFF]	Debugging	[ON] : The serial signal for debugging is outputted.			

MCOIF pwb jumper setting

NO.	Standard setting	Function	Details
J15 (3TX)	3-4 SHORT	Output serial signal chosen.	Output port:GTERMpwb TB2 "3TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:It is one that it can choose. Don't short two.
J16 (4TX)	3-4 SHORT	Output serial signal chosen.	Output port:GTERMpwb TB2 "4TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:It is one that it can choose. Don't short two.
J17 (5TX)	3-4 SHORT	Output serial signal chosen.	Output port:GTERMpwb TB2 "5TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:It is one that it can choose. Don't short two.
J18 (IEC2)	SHORT	Type setup	Short:Standard Open:With an external heading sensor. (with HDM or EHS unit) Type M or E
J19 (IEC1)	SHORT	Type setup	Short:Standard Open:With an external heading sensor. (with HDM or EHS unit) Type M or E
J20 (G1TX)	3-4 SHORT	Output serial signal chosen.	Output port:DTERMpwb TB21B "G1-1TX" and TB21D "G1-2TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:The true heading information on "NO.1 Gyro-compass" is outputted regardless of a system change.
J21 (G2TX)	3-4 SHORT	Output serial signal chosen.	Output port:DTERMpwb TB21C "G2-1TX" and TB21D "G2-2TX" 3-4 Short:IEC-61162-1 ed.2 1-2 Short:IEC-61162-2 or TOKIMEC version Note:The true heading information on "NO.1 Gyro-compass" is outputted regardless of a system change.
J22 (GPSPOL)	1-2 SHORT	Polarity of the "GPS" signal settir	Input port:GTERMpwb TB1 "GRX" 1-2 Short:Standard 3-4 Short:Polarity is carried out reversely. Note:When a signal cannot be received by "1-2 short", it is set as "3-4 short." Note:It is one that it can choose. Don't short two.
J23 (LOGPOL)	1-2 SHORT	Polarity of the "LOG" signal settir	Input port:GTERMpwb TB1 "LRX" 1-2 Short:Standard 3-4 Short:Polarity is carried out reversely. Note:When a signal cannot be received by "1-2 short", it is set as "3-4 short." Note:It is one that it can choose. Don't short two.
J24 (RXD3SEL)	1-2 SHORT	The receiving port of CPU in SCCpwb is chosen	1-2 Short:An option serial signal is received. 3-4 Short:The serial signal outputted from SCOIFpwb is received. 5-6:Short:"GPS"serial signal(38400bps only) is received.(Reservation) Note:It is one that it can choose. Don't short two or more.
J25 (1WR/EXT)	SHORT	Software install or internal communication with "NO.1 Gyro-compass"	Short:Internal communication with "NO.1 Gyro-compass" Open:Software is installed in SCCpwb of NO.1 Gyro-compass. Note:A damage will be given to a circuit if software is installed while this jumper has been short.
J26 (2WR/EXT)	SHORT	Software install or internal communication with "NO.2 Gyro-compass"	Short:Internal communication with "NO.2 Gyro-compass" Open:Software is installed in SCCpwb of NO.2 Gyro-compass. Note:A damage will be given to a circuit if software is installed while this jumper has been short.
J27 (LOG)	1-2 SHORT	LOG contact signal chosen	Input port:GTERMpwb TB1 "SL" 1-2 Short:200p.p.n.m. 3-4 Short:400p.p.n.m. Note:It is one that it can choose. Don't short two.
J28 (ROT)	1-2 SHORT	"rate of turn" Analog signal level selection.	Output port:GTERMpwb TB1 "1RT～3RT" 1-2 Short:Output voltage 0v to ±5v DC or 0v to ±10v DC 3-4 Short:Output voltage 0v to +5v DC or 0v to +10v DC Note:It is one that it can choose. Don't short two.
J29 (ESPOL)	1-2 SHORT	Polarity of the "external heading sensor" signal setting	Input port:GTERMpwb TB1 "ESRX" 1-2 Short:Standard 3-4 Short:Polarity is carried out reversely. Note:When a signal cannot be received by "1-2 short", it is set as "3-4 short." Note:It is one that it can choose. Don't short two.
J30 (MWR/EXT)	SHORT	Software install or internal communication with "SCOIF"	Short:Internal communication with "External heading sensor " Open:Software is installed in SCOIFpwb Note:A damage will be given to a circuit if software is installed while this jumper has been short.
J31 (FLASH)	SHORT	Software install	Open:Software is installed in SCOIFpwb Note:A damage will be given to a circuit if software is installed while this jumper has been short.
J32 (RESET)	OPEN	CUP reset	This jumper is used when resetting "CPU."
J33 (ESSEL1)	1-2 SHORT	Type setup	1-2 Short:Standard(The serial signal of a standard external direction sensor is received, and the signal is sent to "NO.1 Gyro-compass".) 3-4 Short:With an external heading sensor. (with HDM or EHS unit) Type M or E
J34 (ESSEL2)	1-2 SHORT	Type setup	1-2 Short:Standard(The serial signal of a standard external direction sensor is received, and the signal is sent to "NO.2 Gyro-compass".) 3-4 Short:With an external heading sensor. (with HDM or EHS unit) Type M or E
J35 (ESSEL3)	1-2 SHORT	Type setup	1-2 Short:Standard(The serial signal of a standard external direction sensor is received, and the signal is receive from "external heading sensor".) 3-4 Short:With an external heading sensor. (with HDM or EHS unit) Type M or E
J36 (ESSEL4)	1-2 SHORT	Type setup	1-2 Short:Standard(The serial signal of a standard external direction sensor is received, and the signal is receive from "external heading sensor".) 3-4 Short:With an external heading sensor. (with HDM or EHS unit) Type M or E
J37 (MALCN)	3-4 SHORT	Alarm contact output of HDM(or CHANGE OVER)	Output port:DTERMpwb TB21D "MALCN" 3-4 Short:Alarm"OPEN" Normal"CLOSES" 1-2 Short:Alarm"CLOSES" Normal"OPEN" Note:It is one that it can choose. Don't short two.
J38 (MRNCN)	1-2 SHORT	Running contact output of HDM(o CHANGE OVER)	Output port:DTERMpwb TB21D "MRNCN" 3-4 Short:Running"OPEN" Stop"CLOSES" 1-2 Short:Running"CLOSES" Stop"OPEN" Note:It is one that it can choose. Don't short two.
J39 (DFCN)	3-4 SHORT	Deference alarm contact output of HDM(or CHANGE OVER)	Output port:DTERMpwb TB21D "DFCN" 3-4 Short:Alarm"OPEN" Normal"CLOSES" 1-2 Short:Alarm"CLOSES" Normal"OPEN" Note:It is one that it can choose. Don't short two.
J40 (OCACN)	3-4 SHORT	Off course alarm contact output	Output port:DTERMpwb TB21D "OCACN" 3-4 Short:Alarm"OPEN" Normal"CLOSES" 1-2 Short:Alarm"CLOSES" Normal"OPEN" Note:It is one that it can choose. Don't short two.
J41 *1 (ST1)	1-2 SHORT	An output port setup of "GTERM pwb"	Output port:GTERMpwb TB2 "ST1/OPRX+" 1-2 Short:The step signal for "Step signal type repeater" is outputted. (ST1) 3-4 Short:Serial signal receive.(OPTION) (OPRX+) Note:It is one that it can choose. Don't short two.
J42 *1 (ST2)	1-2 SHORT	An output port setup of "GTERM pwb"	Output port:GTERMpwb TB2 "ST2/OPRX-" 1-2 Short:The step signal for "Step signal type repeater" is outputted. (ST2) 3-4 Short:Serial signal receive.(OPTION) (OPRX-) Note:It is one that it can choose. Don't short two.
J43 *1 (ST3)	1-2 SHORT	An output port setup of "GTERM pwb"	Output port:GTERMpwb TB2 "ST2/OPRXC" 1-2 Short:The step signal for "Step signal type repeater" is outputted. (ST3) 3-4 Short:Serial signal receive.(OPTION) (OPRXC) Note:It is one that it can choose. Don't short two.

*1:Change all of 3 jumpers simultaneously.

MCOIF pwb pot meter

NO.	Standard setting	Function	Details
VR1		Gain adjustment of "rate of turn."	The gain of a "rate of turn" analog signal is adjusted. In "±30 degrees/min", it adjusts to "±5v ±0.33v DC.
VR2		Off set adjustment of "rate of turn	The off set of a "rate of turn" analog signal is adjusted. In "±0 degrees/min.", it adjusts to "0v ±80mv DC.

GPOWER pwb jumper setting　P/N 10189517「1」

NO.	Standard setting	Function	Details
J7	OPEN or SHORT	"over-current limit" set	The over-current value of dc24v for "master compass" is set up. Since it is determined at the time of factory shipments, do not make a setting change after shipment.
J8	OPEN	"over-current limit" change time.	SHORT: It is used for inspection at a factory.
TB3−TB4	−	Main power supply voltage setup	OPEN: 220v AC SHORT: 100v/110v/115v AC

GPOWER pwb jumper setting　P/N 10189517「2」

NO.	Standard setting	Function	Details
J7	OPEN or SHORT	"over-current limit" set	The over-current value of dc24v for "master compass" is set up. Since it is determined at the time of factory shipments, do not make a setting change after shipment.
J8	OPEN	"over-current limit" change time.	SHORT: It is used for inspection at a factory.
J9 *1	1-2 SHORT	Power supply alarm setup	1-2 Short: "Main power supply alarm" and "DC power supply alarm" are separately. 3-4 Short: "Main power supply alarm" and "DC power supply alarm" are one alarm. Note: It is one that it can choose. Don't short two.
J10 *1	1-2 SHORT	Power supply alarm setup	1-2 Short: "Main power supply alarm" and "DC power supply alarm" are separately. 3-4 Short: "Main power supply alarm" and "DC power supply alarm" are one alarm. Note: It is one that it can choose. Don't short two.
TB3−TB4	−	Main power supply voltage setup	OPEN: 220v AC SHORT: 100v/110v/115v AC

*1 Now only "1-2 short" can choose.

GTERM pwb jumper setting

NO.	Standard setting	Function	Details
TB3−TB4	−	Type setup	SHORT: One gyro-compass system. OPEN: Tow gyro-compass system.

MCC pwb dip switch assign

S1	Standard setting	Function	Details	Read timing	Ramarks
NO.1	[OFF]	Master compass type	[OFF] : Standard [ON] : HSC	Startup	
NO.2	[OFF]	Display of master compass type	[ON]: In a standard type case, it is displayed as "Std." In a HSC type case, it is displayed as "HIGH."(LED on mcc PWB)	All time	
NO.3	[OFF]	Rate limitter	[ON] :Rotation of Master compass is stopped at the turnning rate more than 30°/sec. [OFF] : With no rate limiter	All time	
NO.4	[OFF]	Startup sequence	Standard[ON]: leveling time is 2 minutes. HSC [ON]: special sequense for dumping test.	Startup	
NO.5	[OFF]	don't touch	-		
NO.6	[OFF]	don't touch	-		
NO.7	[OFF]	Master compass installation	[ON]: Master compass is installed reversely 180 degrees.	Startup	
NO.8	[OFF]	don't touch	-		

MCC pwb jumper setting

NO.	Standard setting	Function	Details
J7 (RESET)	OPEN	CUP reset	This jumper is used when resetting "CPU."
J8 (FLASH)	SHORT	Software install	OPEN: Software is installed in MCCpwb Note: A damage will be given to a circuit if software is installed while this jumper has been short.

MCC pwb pot meter

NO.	Standard setting	Function	Details
VR1		Phase adjustment of a p/u signal.	" ϕ " " θ ", and "x" pick up signals of "Sensitive element" are correctly changed into "DC voltage." Note: You should adjust, when "Sensitive element" is replaced.

INVERTER pwb jumper setting

NO.	Standard setting	Function	Details
JP1	SHORT	"over-current limit" set (start)	"over-current limit" at starting. This setting value is valid till the time set up by JP5.
JP2	OPEN	"over-current limit" set (running)	"over-current limit" at running. This setting value is effective if the time set up by JP5 passes.
JP3	OPEN	Input current detection gain.	The gain which transforms input current into voltage is determined.
JP4	OPEN	"over-current limit" set	It is a setup common to "JP1" and "JP2".
JP5	OPEN	"over-current limit" change time.	It is set in about 9 minutes.
JP6 JP7	OPEN SHORT	"rota power supply" output "rota power supply" output	J6:[short] J7:[open] 3phase rotor power supply. J6:[open] J7:[short] Single phase rotor power supply. Note:Both "J6" and "J7" do not make it "short" or "open".
JP8	OPEN	"over-current limit" change time.	It is used for inspection at a factory.

Note:The above-mentioned setup is changed with directions of only the engineer of tokimec.

INVERTER pwb pot meter

NO.	Standard setting	Function	Details
VR1		Voltage adjustment of rotor power supply	When the Rota rotation is stabilized enough, it adjusts correctly. Note:You should adjust, when "Sensitive element" is replaced.

HRZC pwb pot meter

NO.	Standard setting	Function	Details
RV1		"Hanting stops" adjustment of sensitive element	Adjustment during the leveling action by the "hole sensor." Note : Recommend the "test mode B." (same TG-6000/RGC-12)
RV2		"Level" adjustment of sensitive element	Adjustment during the leveling mode. Note : Recommend the "test mode B." (same TG-6000/RGC-12)

SMCC pwb jumper setting

NO.	Standard setting	Function	Details
J5	OPEN	"step motor signal controller" reset.	This jumper is used when resetting "step motor signal controll IC"

PCC pwb dip switch assign

sw1	standard setti	details	fundtion		read timing	remarks
NO.1	[OFF]	HDM function	[OFF] : yes [ON] : no		startup	
NO.2	[OFF]	OCA function	[OFF] : no [ON] : yes		startup	
NO.3	[OFF]	External sensor connection	NO5.[OFF] NO6.[OFF] : Non	NO5.[ON] NO6.[OFF] :External sensor connection		
NO.4	[OFF]		NO5.[OFF] NO6.[ON] :Mag. System connection(back up)	NO5.[ON] NO6.[ON] :Ext. System connection(back up)	startup	
NO.5	[OFF]	input of steering mode information	[OFF] : serial signal [ON] : contact		startup	
NO.6	[OFF]	for SIMRAD or not	[OFF] : no [ON] : yes("by SIMRAD" is displayed at the time of starting.)		startup	
NO.7	[OFF]	don't touch				
NO.8	[OFF]	don't touch	-			

PCC pwb jumper setting

NO.	Standard sett	Function	Details
J4 (RESET)	OPEN	CUP reset	This jumper is used when resetting "CPU."
J5 (FLASH)	SHORT	Software install	OPEN:Software is installed in SCCpwb Note:A damage will be given to a circuit if software is installed while this jumper has been short.
J6 (POWER)	OPEN	"Power supply" switch	Short:Power "ON."(Power supply switch" pass.)

RPCC **pwb dip switch assign (serial signal type repeater)**

S1	standard setting	details	function		read timing	ramarks
NO.1	[OFF]	Setup of a receive format	NO.1[OFF] NO.2[OFF] NO.3[OFF] : 20msec(IEC-2	NO.1[ON] NO.2[OFF] NO.3[OFF] : 100msec(IEC-1)	startup	
NO.2	[OFF]		NO.1[OFF] NO.2[ON] NO.3[OFF] : 200msec(IEC-1	NO.1[ON] NO.2[ON] NO.3[OFF] : 1sec(IEC-1)		
NO.3	[OFF]		NO.1[OFF] NO.2[OFF] NO.3[ON] : TK fotmat			
NO.4	[OFF]	don't touch				
NO.5	[OFF]	don't touch			-	
NO.6	[OFF]	repeater type	[OFF] : standard [ON] : steering repeater		startup	
NO.7	-	polarity of offset	[OFF] : + [ON] : − (A value is inputted with the digital switch S2.)		all time	
NO.8	[ON]	software update	[OFF] : At the time of software update [ON] : usual operation		-	

S3	standard setting	details	function	read timing	ramarks
NO.1	[OFF]	don't touch			
NO.2	[OFF]	don't touch			
NO.3	[OFF]	don't touch			
NO.4	[OFF]	don't touch			
NO.5	[OFF]	don't touch			
NO.6	[OFF]	don't touch			
NO.7	[OFF]	don't touch			
NO.8	[OFF]	don't touch			

S2	standard setting	details	function	read timing	ramarks
—	—	Offset value		startup	

ITERM pwb jumper setting

NO.	Standard setting	Function	Details
J5 (CONNECTER)	—	With "Power supply uint" or no "Power supply unit"	2-4 Short: With "Power supply uint" 3-TB2 16 Short: With "Power supply uint" All open: No "Power supply unit"
J6 (CONNECTER)	—	With "Power supply uint" or no "Power supply unit"	2-4 Short: With "Power supply uint" 1-3 Short: With "Power supply uint" All open: No "Power supply unit"

IOPT pwb jumper setting

NO.	Standard setting	Function	Details
J1 (FLASH)	SHORT	Software install	OPEN : Software is installed in ICIFpwb Note : A damage will be given to a circuit if software is installed while this jumper has been short.
J3 (RNCN)	1-2 SHORT	Running contact output	Output port : IOPTpwb TB4 "RNCN" 1-2 Short : Running"CLOSES" Normal"OPEN" 3-4 Short : Running"OPEN" Normal"CLOSES" Note : It is one that it can choose. Don't short two.
J6 (LOGPOL)	1-2 SHORT	Polarity of the "LOG" signal setting	Input port : GTERMpwb TB1 "LRX" 1-2 Short : Standard 3-4 Short : Polarity is carried out reversely. Note : When a signal cannot be received by "1-2 short", it is set as "3-4 short." Note : It is one that it can choose. Don't short two.
J7 (ESPOL)	1-2 SHORT	Polarity of the "external heading sensor" signal setting	Input port : GTERMpwb TB1 "ESRX" 1-2 Short : Standard 3-4 Short : Polarity is carried out reversely. Note : When a signal cannot be received by "1-2 short", it is set as "3-4 short." Note : It is one that it can choose. Don't short two.

CHAPTER 4 System description

CHAPTER 4 System descriptions

The system descriptions are shown in Figure 4.1.1 through Figure 4.1.3.
The system basic configuration consists of a master compass, a control unit and a repeater compass.

4.1 Master compass

4.1.1 Structural descriptions

The sensitive unit is integrated in the master compass and it has thenorth-seeking control function by the sensitive unit. And it consists of two brackets, the upper and the lower, separated by the shock absorbers. Refer to Figure 4.14.

(1) Upper bracket

The main structure of the master compass is placed on the upper bracket because the ship motion vibration and shock are absorbed by the shock absorbers.

Besides, a balance weight is mounted on the upper bracket to maximize anti-vibration characteristics.

The phantom ring supporting the sensitive element is located in the center, and MCC pwb (CPU) controlling the master compass is installed on the top of it.

The horizontal ring mounting the sensitive element is mounted inside of the phantom ring.

In the horizontal ring, the DST (Direct Servo Torque) is installed in the eastern side to make the sensitive element follow in the horizontal axis.

The DST consists of a ring type coil and bar type permanent magnets distributed inside of the coil.

The permanent magnets are fixed on the axis supporting the sensitive element.

The DST is surrounded by the shield plate so that the sensitive element is not affected by the magnetic field caused by these permanent magnets.

If DC current is applied to the coil, revolution force of the constant direction (torque) is generated by effect of DC current magnetic field caused by the coil and the inner permanent magnets.

The direction of generated torque can be changed by the DC current direction applied to the coil.

The actual control signal is PWM (pulse width modulation) signal from the CPU (MCC pwb), and it has constant level, constant cycle and its polarity is alternate (efer to Figure 4.15).

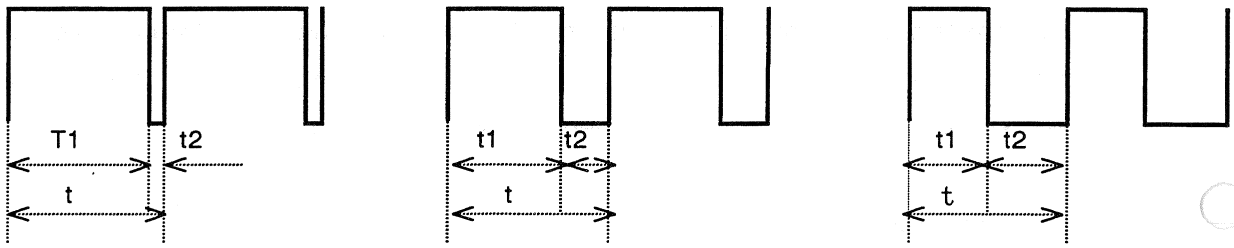
Not to give any torque to the DST, the times for alternate polarities should be the same period (refer to Figure 4.15, c).

And to give torque to the DST, make either one of the times for polarities longer.

By doing so, some torque can be given corresponding to the time difference.

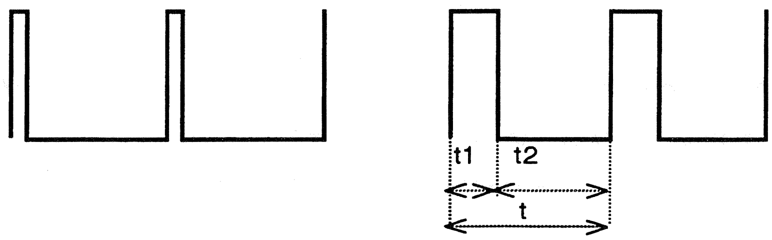
The larger the time difference, the bigger torque can be given (refer to Figure 4.15 a).

To change the direction of this torque, the time difference is reversed (Figure 4.15 b).



a. Larger torque, t1 >> t2 b. Smaller torque, t1 > t2 c. Zero torque, t1 = t2

Revolution direction, reverse



b. Smaller torque, t1 <t2

Figure 4.15

The DST is heavy due to its structure. Accordingly, the center point of the sensitive element is forced not to match the phantom ring center and shifted to the eastern side.

By doing so, it prevents for the center of gravity to shift from the phantom ring rotation center.

In the southern side of the horizontal ring, the level vial is installed to confirm (adjust) the horizontal ring's inclination.

In the lower northern side of the horizontal ring, the power supply transformer (T1) is mounted.

Its primary is rotor power supply and it provides power supply for the MCC pwb (CPU).

In the bottom of the phantom ring, the follow-up gears are mounted.

They consist of two, connected by a spring each other.

It prevents backlash by pinching an engaged gear by two gears.

Therefore when these gears are engaged again after disengaged, engage them with five teeth difference between two gears of the upper and the lower.

The bearing follow-up structure to drive the phantom ring is constructed as an assembly.
Its structure is rather simple, and consists of a step motor and a gear shaft.
The step motor and the gear are connected by timing belt.
Appropriate tension is given to the timing belt.
Gear ratio from the step motor to the phantom ring is 1:54.
The step motor is two-phase type, and its rotation angle per one pulse is 0.225 degree, accordingly, follow-up resolution of the phantom ring is 1/240 degree.
The SMCC pwb to send the driving signal to the step motor is also mounted on the upper bracket.

In the most bottom of the phantom ring, the slip-ring to send / receive signals and power supply with the lower bracket, is mounted.
The brush contacting this slip-ring is mounted in the rear side of the upper bracket.
The brush tip consists of some special metals.
The slip-ring is also specially treated on the surface.

It prevents electrical poor contact occurred between the slip-ring and the brush.
Accordingly, when dust and dirts are attached to the slip-ring, electrical poor contact occurs between the ring and the brush, and it may cause malfunction.
Pay full attention not to contact directly by hand. It is also important to clean it periodically by soft cloth. Besides, when the brush is dismounted and mounted again, be careful not to damage its spring characteristics.

The upper bracket is supported by four shock absorbers.
The coil spring and the plate spring is adopted for the vertical and horizontal direction respectively, in the shock absorbers structure.
This plate spring works as vertical damper, too.
The damper for the horizontal direction is located in the top of the shock absorbers, and it has white circle shape and it has been pushed with the coil spring.

To strengthen anti-vibration effect, mass balance is considered for whole upper bracket.
It is realized by the lead weight in the rear side and stern side, and the iron weight in

the port side.

(2) Lower bracket

The lower bracket consists of an inverter unit, a noise filter, an anti-noise capacitor and an external terminal board (MTTRM pwb).

The inverter unit is located in the stern side.

The power supply required for the master compass operation is applied from the control unit (24 V DC). It is applied through the slip-ring.

"Window" is provided in the front cover of the inverter unit to confirm simply if it is working properly.

The noise filter is located in the bow port side.

The external terminal board (MTTRM pwb) and the grounding terminal are located in the starboard side.

The grounding terminal is connected to the noise filter by a copper plate in the bottom.

4.1.2 Overview of the servo system (refer to Figure 4.18)

(1) Horizontal servo system

This servo system is for the container to follow-up the motion around horizontal axis of the gyro sphere.

As shown in "Figure 4.16 Horizontal servo system block diagram" , the horizontal follow-up difference signal (θ) output from the pick up unit is applied to the MCC pwb, shaped wave form and amplified by the pre-amplifier.

Then, it goes through the synchronized rectifier circuit (demodulator) and is converted into DC voltage indicating the difference direction and amplitude.

This signal is A/D converted by the circuit referred to the quantization circuit and applied to the CPU.

The CPU performs servo operation based on this signal, and produces PWM signal output and the follow-up direction signal output.

The PWM signal (TTL level) is converted to $\pm$12.5 V signal level and drives DST (Direct Servo Torque) mounted on the horizontal ring through the DST driver (HRZC pwb), and let the container follow-up the gyro sphere.

In this control system, off-set in each circuit poses a problem because the follow-up error and the gyrocompass bearing error are closely related.

Off-set value correction of the circuit is performed by adding to the input difference the correction value obtained when the CPU measured the circuit off-set during initial starting sequence.

The circuit off-set correction is also performed for ϕ and X signals to be explained later.

(2) Bearing (damping) servo system

This servo system is to follow-up the phantom ring and also to give the north-seeking torque and the anti-vibration torque for the movement around the gyro sphere vertical axis and the south-north direction movement by using the input signals of the bearing follow-up difference signal (ϕ) from the mentioned pick up unit and the gyro inclination signal (X) (distance in south-north direction between the gyro sphere and the container).

As shown in "Figure 4.17 Bearing servo system block diagram", the output signal from the pick up unit is applied to the MCC pwb, and shaped wave form and amplified by each pre-amplifier.

Then, it goes through each synchronized rectifier circuit (demodulator) and converted to DC voltage indicating difference direction and amplitude.

These signals are A/D converted by the circuit referred to the quantization circuit and applied to the CPU.

The CPU performs damping calculation based on the inclination signal (X).

In the damping calculation, latitude error is not generated because differentiation time constant 2000 seconds is used in the filter calculation.

Also filter constants are designed not to respond to fast disturbance such as ship's rolling.

The result of this damping calculation is added to the bearing follow-up difference signal (ϕ), and performs appropriate servo operation to produce the PWM signal output and the follow-up direction signal output.

The PWM signal is converted to DC voltage, and in the next stage it is converted to pulse signal by the V/F converter.

This pulse signal is sent to the step motor driver (SMCC pwb) through the slip-ring, and it drives the step motor mounted on the upper bracket, causing following-up the container (phantom ring) to the gyro sphere.

(Maximum pulse rate: 75 deg. / sec. / around 18 kHz, scale factor: 1 / 240deg. / pulse)

Also the step motor shaft has the encoder (ENCC pwb), and it produces the encoder signal output to the control unit.

The bearing step motor operation can be monitored by this signal from the control unit.

(3) Bearing calculation

The CPU (MCC pwb) obtains the relative bearing of the sensitive element by counting the control signal (pulse signal) of the bearing servo system performed in the above (1).

The reference angle in order to get the absolute bearing is obtained when a photo interrupter (ZRCR pwb) is passing through the zero cross pin (around 345 degree point) mounted in the upper bracket.

(The absolute bearing angle at initial starting time is obtained from the last azimuth action in the initial starting sequence to be explained later.)

The absolute bearing angle is obtained by this angle and the calculated relative bearing angle.

(4) Sequence control

The CPU (MCC pwb) performs the starting sequence after checked the sensitive element state at starting time.

During operation it monitors the sensitive element state and detects abnormalities.

a: Detection of the rotor revolution

At starting time, the CPU (MCC pwb) controls K1 through K3, and detects the rotor revolution by detecting frequency of back electromotive voltage of the rotor.

b: Rotor brake

At starting time, the CPU (MCC pwb) performs brake action to the rotor by controlling K1 through K3 when the rotor's rotation is detected.

The brake action is performed by exciting the rotor (between 8 and M of the sensitive element) with 12 V DC.

* At starting time, (a) rotor rotation detection and (b) rotor brake are performed, and then the last azimuth action is performed when the rotor rotation stops.

c: Leveling

At the same time when the master compass started and the last azimuth is performed, the leveling is started. At this time, the CPU (MCC pwb) controls K1 through K3 and the rotor (between 8 and M of the sensitive element) is excited with 15 V AC (400 Hz).

d: Rotor rotation and rotor current detection

The master compass starts to rotate the rotor after performed the last azimuth and leveling.

At this time, the CPU (MCC pwb) controls K1 through K3 and the rotor (between 8 and M of the sensitive element) is excited with 100 V AC (400 Hz).

After the rotor rotation started, the CPU (MCC pwb) monitors the rotor current of the current transformer and detects the rotor current abnormality.

(5) Master compass serial signal sending

The CPU (MCC pwb) sends the bearing angle obtained in the above (3) as TTL level serial signal to the SMCC pwb through the slip-ring.

The SMCC pwb converts this signal to RS485 (equivalent to RS422) level signal and sends it to the control unit.

(6) Serial signal receipt from the control unit

The CPU (MCC pwb) receives various parameters for the master compass to operate properly by serial signal from the control unit.

This serial signal is inputted as RS485 (equivalent to RS422) level signal from the control unit and converted to TTL level signal.

The TTL level signal is inputted to the CPU (MCC pwb) through the slip-ring.

4.2 Control unit

The control unit performs all indication and setting required for proper system operation.

Then, based on the obtained true bearing information, it produces the serial signal output, step signal output and analog signal output.

And abnormalities occurred in the system are informed and recorded.

Also it provides all power supply required for the system operation.

4.2.1 Control unit, type I (Refer to Figure 4.19.)

The control unit, type I is designed aiming at compact type.

Input power supply is 2 systems of 24 V DC, and the power supply unit is optional.

(1) Receiving of the serial signal from the master compass (ITERM pwb TB1 MR+/-)

The serial signal (RS485 level, equivalent to RS422) is applied to the CPU (ICIF pwb) through the ITERM pwb.

The CPU (ICIF pwb) receives it after the RS485 level (equivalent to RS422) signal is converted to TTL level signal.

The CPU (ICIF pwb) obtains the master compass bearing by received this signal.

(2) Sending of the serial signal to the master compass (ITERM pwb TB1 MT+/-)

The CPU (ICIF pwb) sends the master compass parameters which were set in the control unit, to the master compass by the serial signal .

Also for the TG-8500 (GC85), it produces latitude and speed information output, too.

This serial signal (RS485 level, equivalent to RS422) output is produced from the CPU (ICIF pwb) through the ITERM pwb.

(3) True bearing calculation

The CPU (ICIF pwb) obtains the true bearing information, by calculating speed error value from the master compass bearing obtained in the above (1) and the inputted latitude and ship's speed signal, and by correcting the master compass bearing.

(4) Indication and setting

The various LEDs, buzzer and keys mounted in the operating panel (GPANEL pwb) are controlled by the indication driver IC on the GPANELpwb through the serial signal communication with the CPU (ICIF pwb).

The master compass bearing, the true bearing and latitude data, etc. obtained in the above (1) and (3) are displayed in the indicator of the operating panel.

(For the indicated data in details, refer to Chapter 2 Operation.)

(5) True bearing output

a. Serial signal (4 circuits) (ITERM pwb TB1 1TX through 4TX)

Two kinds of serial signal output are produced by the CPU (ICIF pwb).

1. IEC61162 ed. 2
2. IEC61162-2 or TOKIMEC specifications

Either one of two kinds is decided by jumper.

The jumper is provided for each circuit. (Total 4 circuits)

b. Step signal (1 circuit) (ITERM pwb TB1 ST11 through ST15)

The output signal is 24 V DC 3ϕ step signal.

The 3-bit signal output from the CPU (ICIF pwb) through data bus is converted in level as electrically isolated 3ϕ step signal and the current is amplified, and outputted from the terminal board of the ITERM pwb.

(6) Alarm contact output (ITERM pwb TB1 ALCN1 / 2)

If any abnormality occurred in the system, the CPU (ICIF pwb) generates an alarm and also contact signal output is produced at the same time.

The contact signal output is produced from a relay on the ICIFpwb, and either one of A / B contacts is selected by jumper and outputted.

The contact signal output is produced to the outside from the ITERMpwb.

(7) GPS serial signal receiving (ITERM pwb TB2 GRX+/-)

The serial signal (NMEA0183, IEC61162-1 (ed. 2)) from the GPS is connected to the ITERM pwb.

This serial signal is applied to the CPU (ICIF pwb) after electrically isolated and converted level.

The CPU (ICIF pwb) obtains latitude and ship speed data used for the true bearing calculation by this signal.

(8) Ship speed log signal receiving (200 ppnm / 400 ppnm) (ITERM pwb TB2 SL+/-)

The log signal is connected to the ITERM pwb.

This contact signal is applied to the CPU (ICIF pwb) after electrically isolated.

Switching of 200 ppnm or 400 ppnm is decided by jumper of the ICIF pwb.

The CPU obtains ship speed data by measuring the time interval of this signal.

(9) Alarm confirmation and buzzer stop from outside

Each contact signal is connected to the ITERM pwb. Select surely momentary contact.

a: Alarm confirmation (ITERM TB1 EACK+/-)

Alarm confirmation can be performed by the contact signal from outside.

When an alarm is generated, the indicator turned from blinking to lit state and the buzzer stops after the contact signal is applied.

(If it is momentary abnormality, the alarm is removed at the same time when the contact is applied, and the buzzer stops.)

b: Buzzer stop (ITERM TB1 BZSP+/-)

Buzzer can be stopped by the contact signal from outside.

The indicator remains as it was when an alarm generated and only buzzer stops.

(10) Detection of power supply abnormality

The power supply abnormality in each unit is detected by monitoring the alarm contact signal in the master compass INVERTER pwb and GPOWER pwb (optional) in the power supply unit.

Detectable power supply abnormalities are as follows.

- GPOWER pwb: Main power supply abnormality, over current abnormality for master compass, over voltage abnormality (ITERM pwb PF / POC / POV / PC)

- INVERTER pwb: Over current abnormality for rotor power supply, over voltage abnormality (ITERM pwb AL1 / 2 / C)

(11) Power supply monitoring

The state of the power supply applied from outside and the internal control power supply are monitored and alarmed.

Lost or dropping of each power supply voltage is monitored by the power supply monitoring circuit in the ICIF pwb.

The monitored power supplies are as follows.

- Standard main power supply (24 V DC) (ITERM pwb TB3 24M+/-)
- Repeater power supply (24 V DC) (ITERM pwb TB2 24R+/-)
- Serial signal system power supply (5 V DC) (Inside of the control unit, signal name:E5V)

(12) LOG serial signal receiving (optional) (IOPT pwb TB3 LRX+/-)

The serial signal (NMEA0183, IEC61162-1 (ed. 2)) from the LOG is connected to the IOPT pwb.

This serial signal is applied to the CPU (ICIF pwb) after electrically isolated and converted level in the IOPT pwb.

The CPU (ICIF pwb) obtains ship speed data to be used for true bearing calculation from this signal.

(13) Serial signal receiving from the external heading sensor (optional) (IPOT pwb TB4 ESRX+/-)

The serial signal (NMEA0183, IEC61162-1 (ed. 2) or IEC61162-2) from the external heading sensor is connected to the IOPTpwb.

This serial signal is applied to the CPU (ICIF pwb) after electrically isolated and converted level in the IOPT pwb.

The CPU (ICIF pwb) enables system switching by the dip switch setting and the serial signal receiving state.

(If the serial signal is abnormal, switching to "external heading sensor" can not be performed.)

System switching is performed on the operating panel.

When "external heading sensor" is selected, the true bearing output becomes the true bearing of the external heading sensor.

(14) System switching contact (optional) (IOPT pwb SEL1 / 2 / 3)

Each switching contact (2 contacts for GYRO and EXT) is connected to the IOPT pwb.

When the external heading sensor serial signal (optional) in the above (11) is received, the system switching can be performed from outside by connecting this switching contact.

In this case, the connectable contact is only momentary type.

4.2.2 Control unit, type S (Figure 4.20.1 / 4.20.2)

This unit provides more universal and rich output feature for the TG-6000 Gyrocompass.

(1) Serial signal receiving from the master compass (GTERM pwb TB1 MR+/-)

The serial signal (RS485, equivalent to RS422) from the master compass is applied to the CPU (SCC pwb) through the GTERM pwb.

The CPU (SCC pwb) receives it after this signal (RS485 level, equivalent to RS422) is converted to TTL level.

The CPU (SCC pwb) obtains the master compass bearing angle by receiving this signal.

(2) Serial signal transmitting to the master compass (GTERM pwb TB1 MT+/-)

The CPU (SCC pwb) sends the master compass parameters which has been set in the control unit by the serial signal to the master compass.

It also sends latitude and ship speed information for the case of the TG-8500 (GC85).

This serial signal (RS485 level, equivalent to RS422) output is produced by the CPU (SCC pwb) through the GTERM pwb).

(3) True bearing calculation

The CPU (SCC pwb) obtains the true bearing angle by calculating speed error value from the master compass bearing angle obtained by the above (1) and the inputted latitude and ship speed signal, and correcting the master compass bearing angle.

(4) Indication and setting

The various LEDs, buzzer and keys mounted in the operating panel (GPANEL pwb) are controlled by the serial signal communication with the CPU (ICIF pwb) through the driver IC on the GPANEL pwb.

The master compass bearing, the true bearing and latitude data, etc. obtained in the above (1) and (3) are displayed in the indicators of the operating panel.

(For the indicated data in details, refer to Chapter 2 Operation.)

(5) True bearing output

a. Serial signal

- 3ϕ step motor repeater type (I/F unit: MIFC pwb):
  5 circuits (GTERM pwb TB2 1TX through 4TX) + 1 circuit
- Serial signal repeater type (I/F unit: SIFC pwb):
  10 circuits (GTERM pwb TB2 1TX through 8TX, TB1 9TX through 10 TX)+ 1 circuit

2 kinds of serial signal outputs are produced from the CPU (SCC pwb).

1. IEC61162-1 ed. 2
2. IEC61162-2 or TOKIMEC specifications

Either one serial output of the above two is decided by jumper on the SCC pwb and MIFC pwb / SIFC pwb.

The jumper is provided for each circuit.

* About the serial signal (true bearing) appeared in the above "+ 1 circuit" (GTERM pwb TB2 GTX+/-)

Pay attention to the point that the serial signal output (true bearing) (1 circuit) from GTERM pwb TB2 GTX+/- is different from the other serial signal.

1. When standard case (not combined with HDM / EHS unit)
   The same true bearing as the other circuit is outputted as serial signal.
2. When connected to the standard external heading sensor serial signal (not combined with HDM / EHS unit)
   The same true bearing as the other circuit is outputted as serial signal.

* When GYRO is selected, the gyrocompass true bearing is outputted.
* When standard external heading sensor is selected, the standard external heading sensor true bearing is outputted.

3. The external heading sensor unit is connected, combining with HDM or EHS unit.
   Only the gyrocompass true bearing is outputted regardless of system selection.
   The gyrocompass true bearing is continually outputted even if the external heading sensor is selected.

* About expansion of the serial signal

To expand the serial signal, add an NSD pwb.

b. 3ϕ step signal

- 3ϕ step motor repeater type (I/F unit: MIFC pwb) 9 circuits

(GTERM pwb TB2 ST1x – ST7x, TB1 ST8x – ST9x) + 1 circuit

- Serial signal repeater type (I/F unit: SIFC pwb) 4 circuits

(GTERM pwb TB2 ST1x – ST4x) + 1 circuit

The output signal is 24 V DC 3ϕ step signal.

The 3-bit output signal from the CPU (SCC pwb) through data bus is converted in level in I/F unit (MIFC pwb / SIFC pwb) as electrically isolated 3ϕ step signal and its current is amplified, and outputted from the terminal board of the GTERM pwb.

Also 1 circuit can be expanded by jumper setting of MIFC pwb / SIFC pwb.

* About expansion of 3ϕ signal

To expand the step signal, add an ADD pwb.

At this time, a harness is required for jumper of the repeater protection circuit in the control unit.

Also the connection terminal to the ADD pwb is GTERM pwb TB2 ST41 through ST45.

(6) Turn rate analog signal output (GTERM pwb TB1 1RT through 3RT and 1S0 through 3S0)

The CPU (SCC pwb) calculates turn rate (deg. / min.) from the bearing obtained in the above (1), and outputs the result as PWM signal.

This PWM signal is converted to DC voltage signal in I/F unit (MIFC pwb / SIFC pwb), and distributed to 3 circuits, then outputted from the GTERM pwb. (xRT+/-).

Also, the turn rate is displayed in the indicator and outputted as serial signal.

Similarly, scale over signal is outputted as PWM signal from the CPU (SCC pwb), converted to DC voltage, distributed to 3 circuits and outputted from the GTERM pwb. (xS0+/-)

(7) Alarm contact output (GTERM pwb TB1 ALCN1 / 2)

If any abnormality occurred in the system, the CPU (SCC pwb) generates an alarm and also outputs contact signal at the same time.

The contact signal output is produced from a relay on the SCC pwb, and either one of A / B contacts is selected by jumper and outputted.

The contact signal is outputted to outside from the GTERM pwb.

(8) Running contact output (GTERM pwb TB1 RNCN1 / 2)

The CPU (SCC pwb) outputs the contact signal indicating that the gyrocompass is running.

The contact output is produced from a relay on the SCC pwb, and either one of A / B contacts can be selected by jumper and outputted.

The contact signal is outputted from the GTERM pwb.

(9) GPS serial signal input (GTERM pwb TB1 GRX+/-)

The serial signal (NMEA0183, IEC61162-1 (ed. 2)) is connected to GTERM pwb.

This serial signal is applied to the CPU (SCC pwb) after electrically isolated and converted in level in I/F unit (MIFC pwb / SIFC pwb).

The CPU (SCC pwb) obtains latitude and ship speed data to be used for the true bearing calculation from this system.

(10) LOG serial signal input (GTERM pwb TB1 LRX+/-)

The serial signal (NMEA0183, IEC61162-1 (ed. 2)) from the LOG is connected to the GTERM pwb.

This serial signal is applied to the CPU (SCC pwb) after electrically isolated and converted in level in I/F unit (MIFC pwb / SIFC pwb).

The CPU (SCC pwb) obtains ship speed data to be used for the true bearing calculation from this signal.

(11) Standard external bearing serial signal input (GTERM pwb TB1 ESRX+/-)

The serial signal (NMEA0183, IEC61162-1 (ed.2) or IEC61162-2) from the external heading sensor is connected to the GTERM pwb.

This serial signal is applied to the CPU (SCC pwb) after electrically isolated and converted in level in I/F unit (MIFC pwb / SIFC pwb).

The CPU (SCC pwb) enables system switching by the dip switch setting and the serial signal receiving state.

(If the serial signal is abnormal, switching to "external heading sensor" can not be performed.)

System switching is performed on the operating panel.

When the external heading sensor is selected, the true bearing output to the following circuit becomes the true bearing of the external heading sensor.

a. Serial signal (3 ϕ step motor repeater type step type: 4 circuits,
Serial signal repeater type: 10 circuits)

b. Step signal (3 ϕ step motor repeater type step type: 9 circuits,
Serial signal repeater type: 4 circuits)

However, when standard external heading sensor is selected, turn rate analog signal output is not produced.

(12) LOG ship speed contact signal input (200 ppnm / 400 ppnm)
(GTERM pwb TB1 SL+/-)

The log signal is connected to the GTERM pwb.

This contact signal is applied to the CPU (SCC pwb) after electrically isolated in I/F unit (MIFC pwb / SIFC pwb).

Switching of 200 ppnm or 400 ppnm is decided by the jumper of I/F unit (MIFC pwb / SIFC pwb).

The CPU (SCC pwb) obtains ship speed data by measuring the time interval of this signal.

(13) Alarm confirmation and buzzer stop from outside

Each contact signal is connected to the GTERM pwb. Definitely select momentary contact.

a: Alarm confirmation (GTERM TB1 EACK+/-)

Alarm confirmation can be performed by the contact signal from outside.

When an alarm is generated, after the contact signal is applied, the indicator turned from blinking to lit state and the buzzer stops.

(If it is momentary abnormality, the alarm is removed at the same time when the contact is applied, and the buzzer stops.)

b: Buzzer stop (GTERM TB1 BZSP+/-)

Buzzer can be stopped by the contact signal from outside.

The indicator remains as it was when an alarm generated and only buzzer stops.

(14) Power supply related alarm detection

Power supply abnormality in each unit is detected by monitoring alarm contact signals in the master compass INVERTER pwb and GPOWER pwb (optional) in the power supply unit.

Detectable power supply abnormalities are as follows.

- GPOWER pwb: Main power supply abnormality, over current abnormality for master compass, over voltage abnormality
- INVERTER pwb: Over current abnormality of rotor power supply, over voltage abnormality (GTERM pwb AL1 / 2 / C)

(15) Power supply monitoring

The state of the power supply applied from outside and the internal control power supply are monitored and alarmed.

Lost or dropping of each power supply voltage is monitored by the power supply monitoring circuit in the SCC pwb.

The monitored power supplies are as follows.

- Power supply for repeater (24 V DC) (Signal name: 24R)
- Power supply for the serial signal related (5 V DC) (Signal name: E5V)

(16) System switching contact (GTERM pwb TB1 GCC+/-, ECC+/-)

Each switching contact (2 contacts for GYRO and EXT) is connected to the GTERM pwb.

The system switching can be performed from outside by connecting this switching contact when standard external heading sensor in the above (11) is connected, or HDM / EHS external heading sensor unit is combined with.

However, connectable contact is only momentary type.

* "Standard external heading sensor" and "HDM / EHS external heading sensor" can not be connected simultaneously.

4.2.3 Control unit, type D (Figure 4.21.1 / Figure 4.21.2.)

It is a dual gyrocompass system that two gyrocompass control units and one gyro monitor (heading monitor unit) are integrated to one unit.

(1) Serial signal receiving from the master compass (No. 1 Gyro: GTERM pwb TB1 MR+/- and No. 2 Gyro: DTERM pwb TB21 MR+/-)

Two CPUs (SCC pwb) are integrated in the system.

Each is independent and connected to respective gyrocompass.

The serial signal (RS485 level, equivalent to RS422) from the master compass is applied to respective CPU (SCC pwb) through the GTERM / DTERM pwb.

The CPU (SCC pwb) receives it after this signal (RS485 level, equivalent to RS422) is converted to TTL level.

The CPU (SCC pwb) obtains the master compass bearing angle by receiving this signal.

(2) Serial signal transmitting to the master compass (No. 1 Gyro: GTERM pwb TB1 MT+/- and No.2 Gyro: DTERM pwb TB21 MT+/-)

Two CPUs (SCC pwb) are integrated in the system.

Each is independent and connected to respective gyrocompass.

The CPU (SCC pwb) sends the master compass parameters which have been set in the control unit by the serial signal to the master compass.

Also for the TG-8500 (GC85), latitude and speed information output are produced, too.

This serial signal (RS485 level, equivalent to RS422) is outputted through the GTERM pwb from the CPU (SCC pwb).

(3) True bearing calculation

Two CPUs (SCC pwb) are integrated in the system. Each is independent and connected to respective gyrocompass.

The CPU (SCC pwb) obtains the true bearing information by calculating speed error value from the master compass bearing obtained in the above (1) and inputted latitude and ship's speed signal, and correcting the master compass bearing.

This calculation is independently performed for No. 1 gyrocompass and No. 2 gyrocompass.

(4) Indication and setting

Two kinds of operating panel, two operating panels (GPANEL pwb) for each gyrocompass and one operating panel for the gyro monitor / heading monitor explained later, are integrated.

The various LEDs, buzzer and keys located in the operating panel (GPANEL pwb) is controlled by the serial signal communication with respective CPU (SCC pwb) through the driver IC on the GPANEL pwb.

The master compass bearing, the true bearing and latitude data, etc. obtained in the above (1) and (3) are displayed in the indicator of the operating panel. (For the indicated data in details, refer to Chapter 2 Operation.)

Also, the operating panel for the gyro monitor / heading monitor explained later, is controlled by the CPU on the PCC pwb through serial communication with MCOIF / SCOIF pwb.

(5) Heading monitor / gyro monitor function (referred to "HDM" hereafter)

Two-gyrocompass system has HDM operating panel in addition to two operating panels for each gyrocompass.

The HDM operating panel has functions, to display the bearing of two gyrocompasses and alarm information, to monitor the difference between two gyrocompass true bearings, to output the difference alarm, and to switch the system selection.

Also, off-course alarm and system automatic switching can be performed depending on the specifications.

(6) System switching

Switching of No. 1 Gyro, No. 2 Gyro and the external heading sensor (including MAG / EHS unit) can be performed from the HDM operating panel or the operating panel of each gyrocompass.

The switching is as follows.

a: From the HDM operating panel

Switching to No. 1 Gyro → Yes

Switching to No. 2 Gyro → Yes

Switching to the external heading sensor → Yes (if it connected)

b: From No.1 Gyro operating panel

Switching to No. 1 Gyro → Yes

Switching to No. 2 Gyro → No

Switching to the external heading sensor → Yes (if it connected)

c: From No.2 Gyro operating panel

Switching to No. 1 Gyro → No

Switching to No. 2 Gyro → Yes

Switching to the external heading sensor → Yes (if it connected)

(7) External output of the true bearing

a. Serial signal

3ϕstep motor repeater type (I/F unit: MCOIF pwb)

5 circuits (GTERM pwb 1TX through 4TX) + 2 circuits for each gyro

Serial signal repeater type (I/F unit: SCOIF pwb)

10 circuits (GTERM pwb 1TX through 10TX) + 2 circuits for each gyro

Two kind outputs of serial signal are produced from each CPU (SCC pwb).

1. IEC61162-1 ed. 2
2. IEC61162-2 or TOKIMEC specifications

One serial signal of these two is decided by jumper on each SCC pwb and MCOIF pwb / SCOIF pwb. The jumper is provided for each circuit.

∗ About the serial signal (true bearing) appeared in the above "+ 2 circuit"
(DTERM pwb No. 1 Gyro: TB21 G1-1TX+/-, G1-2TX+/-)

(DTERM pwb No. 2 Gyro: TB21 G2-1TX+/-, G2-2TX+/-)

a. "True bearing" output of No.1 Gyrocompass is produced from DTERM pwb G1-1TX+/- and G1-2TX+/- (2 circuits).

b. "True bearing" output of No.2 Gyrocompass is produced from DTERM pwb G2-1TX+/- and G2-2TX+/- (2 circuits).

Pay attention to the point that the serial signal (true bearing) (each 2 circuits) output is different from the other serial signal.

1. Standard case (MAG / EHS unit is not combined)

When No. 1 Gyrocompass is selected:

The above item a. No. 1 Gyrocompass true bearing output is produced as serial signal.

The above item b. No. 2 Gyrocompass true bearing output is produced as serial signal.

When No. 2 Gyrocompass is selected:

The above item a. No. 1 Gyrocompass true bearing output is produced as serial signal.

The above item b. No. 2 Gyrocompass true bearing output is produced as serial signal.

2. Standard external heading sensor serial signal is connected (MAG / EHS unit is not combined)

When No. 1 Gyrocompass is selected:

The above item a. No. 1 Gyrocompass true bearing output is produced as serial signal.

The above item b. No. 2 Gyrocompass true bearing output is produced as serial signal.

When No. 2 Gyrocompass is selected:

The above item a. No. 1 Gyrocompass true bearing output is produced as serial signal.

The above item b. No. 2 Gyrocompass true bearing output is produced as serial signal.

When EXT (external heading sensor) is selected:

The above item a. External heading sensor true bearing output is produced as serial signal.

The above item b. External heading sensor true bearing output is produced as serial signal.

3. When MAG of the external heading sensor or EHS is combined:

* Respective gyrocompass true bearing is outputted regardless of system selection.

The above item a. No. 1 Gyrocompass true bearing output is produced as serial signal.

The above item b. No. 2 Gyrocompass true bearing output is produced as serial signal.

When No. 2 Gyro is selected for the system selection

The above item a. No. 1 Gyrocompass true bearing output is produced as serial signal.
The above item b. No. 2 Gyrocompass true bearing output is produced as serial signal.
When EXT (external heading sensor) is selected for the system selection
The above item a. No. 1 Gyrocompass true bearing output is produced as serial signal.
The above item b. No. 2 Gyrocompass true bearing output is produced as serial signal.

* About expansion of the serial signal
To expand the serial signal, add an NSD pwb.

b. 3φ step signal

- 3φ step motor repeater type (I/F unit: MIFC pwb) 9 circuits
(GTERM pwb TB2 ST1x through ST7x, TB1 ST8x through ST9x)+ 1 circuit
- Serial signal repeater type (I/F unit: SIFC pwb) 4 circuits
(GTERM pwb TB2 ST1x through ST4x) + 1 circuit

The output signal is 24 V DC 3φ step signal.

The 3-bit output signal from the CPU (SCC pwb) through data bus is converted in level in the I/F unit (MIFC pwb / SIFC pwb) as electrically isolated 3φ step signal and its current is amplified, and outputted from the terminal board of the GTERM pwb.

Also 1 circuit can be expanded by jumper setting of MIFC pwb / SIFC pwb.

*** About expansion of 3φ signal**

To expand the step signal, add an ADD pwb.

At this time, a harness is required for jumper of the repeater protection circuit in the control unit.

Also the connection terminal to the ADD pwb is GTERM pwb TB2 ST41 though ST45.

(8) Turn rate analog signal output
(GTERM pwb TB1 1RT through 3RT and 1S0 through 3S0)

The CPU (SCC pwb) calculates turn rate (deg. / min.) from the bearing obtained in the above (1), and outputs the result as PWM signal.

This PWM signal is converted to DC voltage signal in the I/F unit (MIFC pwb / SIFC pwb), and distributed to 3 circuits, then outputted from the GTERM pwb. (xRT+/-).

Also, the turn rate is displayed in the indicator and outputted as serial signal.

Similarly, scale over signal is outputted as PWM signal from the CPU (SCC pwb), converted to DC voltage, distributed to 3 circuits and outputted from the GTERM pwb. (xS0+/-)

(9) Alarm contact output (GTERM pwb TB1 ALCN1 / 2)

a: Gyrocompass

(No. 1 Gyro: GTERM pwb TB1 ALCN1/2,
No.2 Gyro: DTERM pwb TB21 2ALCN1/2)

If any abnormality occurred in the system, each CPU (SCC pwb) generates an alarm and also outputs contact signal at the same time.

The contact signal output is produced from a relay on the SCCpwb, and either one of A / B contacts is selected by jumper and outputted.

The contact signal output is produced from the GTERM pwb for No. 1 Gyrocompass, and from the DTERM pwb for No. 2 Gyrocompass.

b: HDM (DTERM TB21 MALCN1/2)

Similarly if any abnormality occurred in the HDM unit, the CPU (MCOIF pwb / SCOIF pwb) generates an alarm and also outputs contact signal at the same time.

The contact signal output is produced from a relay on the MCOIF / SCOIFpwb, and either one of A / B contacts is selected by jumper and outputted.

(10) Running contact output

a: Gyrocompass

(No. 1 Gyro: GTERM pwb TB1 RNCN1/2, No.2 Gyro: DTERM TB21 2RNCN1/2)

Each CPU (SCC pwb) outputs contact signal indicating that the gyrocompass is running.

The contact output is produced from a relay on the SCC pwb, and either one of A / B contacts can be selected by jumper and outputted.

b: HDM (DTERM TB21 MRNCN1/2)

Similarly, the CPU (MCOIF / SCOIF pwb) of the HDM outputs contact signal indicating that HDM is running.

The contact output is produced from a relay on the MCOIF / SCOIFpwb, and either one of A / B contacts can be selected by jumper and outputted.

(11) Other contact outputs (difference alarm: DTERM pwb DFCN1/2,
off-course alarm: DTERM pwb OCACN1/2)

Each CPU generates difference alarm or off-course alarm, and outputs alarm contact signal at the same time.

The contact signal output is produced from a relay on the MCOIF / SCOIFpwb, and either one of A / B contacts can be selected by jumper and outputted.

The contact signal output is produced to outside from DTERM pwb (difference alarm or off-course alarm).

(12) GPS serial signal input (GTERM pwb TB1 GRX+/-)

The serial signal (NMEA0183, IEC61162-1 (ed. 2)) from the GPS is connected to the GTERM pwb.

This serial signal is applied to the CPU (SCC pwb) after electrically isolated and converted in level in the I/F unit (MCOIF pwb / SCOIF pwb).

The CPU (SCC pwb) obtains latitude and ship speed data to be used for the true bearing calculation from this signal.

(13) LOG serial signal input (GTERM pwb TB1 LRX+/-)

The serial signal (NMEA0183, IEC61162-1 (ed. 2)) from the LOG is connected to the IOPT pwb.

This serial signal is applied to the CPU (SCC pwb) after electrically isolated and converted in level in I/F unit (MIFC pwb / SIFC pwb).

Each CPU (SCC pwb) obtains ship speed data to be used for true bearing calculation from this signal.

(14) Standard external heading sensor serial signal input (GTERM pwb TB1 ESRX+/-)

The serial signal (NMEA0183, IEC61162-1 (ed. 2)) from the external heading sensor is connected to the GTERM pwb.

This serial signal is applied to each CPU (SCC pwb) after electrically isolated and converted in level in I/F unit (MCOIF pwb / SCOIF pwb).

The CPU (MCOIF pwb / SCOIF pwb) enables system selection by the dip switch setting and the serial signal receiving state.

(If the serial signal is abnormal, switching to "external heading sensor" can not be performed.)

System switching is performed on the operating panel.

When "external heading sensor" is selected, the output true bearing to the following circuits becomes the true bearing of the external heading sensor.

a. **Serial signal** (3 ϕ step motor repeater type step type: 4 circuits,
Serial signal repeater type: 10 circuits)

b. **Step signal** (3 ϕ step motor repeater type step type: 9 circuits,
Serial signal repeater type: 4 circuits)

However, when standard external heading sensor is selected, turn rate analog signal output is not produced.

(15) LOG ship speed contact signal input (200 ppnm / 400 ppnm)

(GTERM pwb TB1 SL+/-)

The log signal is connected to the GTERM pwb.

This contact signal is inputted to each CPU (SCC pwb) after electrically isolated in I/F unit (MCOIF pwb / SCOIF pwb).

Switching of 200 ppnm or 400 ppnm is decided by jumper of I/F unit (MCOIF pwb / SCOIF pwb).

Each CPU (SCC pwb) obtains ship speed data by measuring the time interval of this signal.

(16) Alarm confirmation and buzzer stop from outside

Each contact signal is connected to the GTERM pwb. Select momentary contact.

These contact signals are applied to each CPU (SCC pwb / MCOIF pwb / SCOIF pwb) after electrically isolated and distributed in the I/F unit (MCOIF pwb / SCOIF pwb).

a: Alarm confirmation (GTERM TB1 EACK+/-)

Alarm confirmation can be performed by the contact signal from outside.

When an alarm is generated, after the contact signal is applied, the indicator turned from blinking to lit state and the buzzer stops.

(If it is momentary abnormality, the alarm is removed at the same time when the contact is applied, and the buzzer stops.)

b: Buzzer stop (GTERM TB1 BZSP+/-)

Buzzer can be stopped by the contact signal from outside.

The indicator remains as it was when an alarm generated and only buzzer stops.

(17) Power supply related alarm detection

Power supply abnormality in each unit is detected by monitoring alarm contact signals in the master compass INVERTER pwb and GPOWER pwb (optional) in the power supply unit.

Detectable power supply abnormalities are as follows.

- GPOWER pwb : Main power supply abnormality, over current abnormality for master compass, over voltage abnormality (internal)
- INVERTER pwb : Over current abnormality of rotor power supply, over voltage abnormality

(No. 1 Gyrocompass: GTERM pwb TB1 AL1 / 2 / C, No.2 Gyrocompass: DTERM pwb TB21 AL1 / 2 / C)

The detection is performed independently for No. 1 and No. 2 Gyrocompass.

(18) Power supply monitoring

The state of the power supply applied from outside and the internal control power supply are monitored and alarmed.

Lost or dropping of each power supply voltage is monitored by the power supply monitoring circuit in the SCC pwb.

The monitored power supplies are as follows.

- Power supply for repeater (24 V DC) (Signal name: 24R)
- Power supply for the serial signal related (5 V DC) (Signal name: E5V)

The detection is performed independently for No. 1 and No. 2 Gyrocompass.

(19) System switching contact (GTERM pwb TB1 GCC+/-, ECC+/-)

Each switching contact (3 contacts for No. 1 Gyro, No. 2 Gyro and EXT)is connected to the DTERM pwb.

When switching of No. 1 and No. 2 Gyrocompass and the above (14) standard external heading sensor are provided, or when MAG / EHS external heading sensor unit is combined, the system switching can be performed from outside by connecting this switching contact.

However, connectable contact is only momentary type.

* "Standard external heading sensor" and "HDM / EHS external heading sensor" in the above (14) can not be connected simultaneously.

4.3 Sensitive element

4.3.1 North-seeking action and vibration suppressing action

The principles of gyro-compass is perfectly given by the classic mechanics.
Here, to avoid going into the details of mathematical formulations, we are trying to proceed the explanation assuming that the users have understood the mechanical characteristics of the gyroscope.
The "gyroscope" is defined as an apparatus consisting of a rotating wheel so mounted that its axis can turn freely around a fixed axis. (Imagine a flywheel rotating at high speed in a general way.)
The gyroscope having three axial freedom of movement is referred to as a free gyroscope.
We will call simply "gyro" on occasions for gyroscope hereafter.
The three axial freedoms of movement mean that each axis A, B and C can rotate freely as shown in Figure 4.2.
That is, the gyro rotor rotates at high speed around the axis A (this rotation is called as spin.), the gyroscope rotates around the axis B (as a gyro-compass, the rotation around this axis represents bearing) and the axis A rotates about the axis C (as a gyro-compass,
the rotation around this axis represents tilt).
Such free gyroscope has two inherent characteristics as follows: (Thought that the gyroscope is supported at the center of gravity)

(1) The spin axis of the gyroscope continues to point at a constant direction in space as long as no external torque applied.

(2) When external torque is applied to the spin axis, the spin axis starts to rotate in a direction perpendicular to the direction of the force. (Refer to Figure 4.3.
When the force F is applied to the spin axis to the direction as shown by the arrow in the figure, a torque is generated to the direction as shown by the arrow.
The gyroscope tries to rotate so that the spin axis direction agrees the direction of this torque.)

The first nature (1) is referred to as "rigidity" of the gyroscope, and the second nature (2) is referred to as "precession".
Then, it is explained how the gyroscope having such natures functions as the compass.
Assume that a free gyroscope is placed at a some point A in the Northern Hemisphere as shown in Figure 4.4.
At this time, the direction of the spin axis is placed level at this point and is coincided with the meridian.

After a certain time elapsed, the point A moves to the point B since the earth is rotated. At this time, the direction of the spin has changed to the different direction, pointing at a deviated direction from the level line and also from the meridian line at that earth surface as shown in the Figure 4.4.
To have the spin axis keep the direction to the north, the spin axis is to be rotated to the direction of the earth's rotation at that point with the same rate as the rotation rate (angular velocity) of the earth at that point.
To rotate the spin axis, "precession" of the gyroscope can be utilized.
To apply "precession" to the spin axis while keeping it to be level, a force is to be given to the spin axis as shown in Figure 4.3.
Since the angular velocity of the "precession" is proportional to the applied force, the spin axis can be always kept to be level by selecting an appropriate magnitude of force.

Note: The angular velocity of the earth's rotation at an arbitrary point on the earth is defined as follows.
Assuming the angular velocity of the geographic axis direction at the point A as Ω, its vertical directional component at the point is expressed as $\Omega \text{ Sin } \lambda$ (where λ represents the latitude at the point A of Figure 4.5).
Here if the spin axis is level, the "precession" of the gyroscope in the horizontal
Surface is given by the angular velocity $\Omega \text{ Sin } \lambda$.

Then, the mechanism causing the "precession" is explained.
The brief structure of the container inside is explained before explaining about the Action of the "precession".
Figure 4.6 is an illustration explaining the principle of the gyro-compass, viewing the container inside from the east side.
The gyro sphere having the gyro (rotor) inside which rotates at high speed is a sphere body so sealed that the liquid does not enter, and suspended by a suspension wire in the container from the upper end of it.

The lower end of the suspension wire is connected to the gyro sphere at the position higher than its center of gravity, and the gyro sphere and the suspension wire comprises a pendulum in the container.
The container is filled with vibration suppressing fluid of high viscosity and the pendulum motion is attenuated.
The pick-up devices which detect the position relationship of the gyro sphere and the

container are installed at the crossing points on the container with the elongation of the gyro sphere spin axis.

The pick-up devices consist of the horizontal pick-up to detect relative angular displacement around the horizontal axis, the bearing pick-up to detect relative angular displacement around the vertical axis and the tilt pick-up to detect relative distance between the gyro sphere and the container in the spin axis direction.
The angle and distance data detected by each pick-up device are converted to electrical signal and sent to the CPU (MCCpwb).

The output from the horizontal pick-up is processed in the CPU (MCCpwb) and the processed result is applied to the horizontal DST (Direct Servo Torque).
The output from the bearing pick-up is processed in the CPU (MCCpwb) and the processed result is applied to the bearing step motor.
As a result the relative angular displacement around the horizontal axis of the container and the gyro sphere and the vertical axis are to be kept "zero".
The output of the tilt pick-up is mixed with the output of the bearing pick-up in the CPU (MCCpwb) and the damping of the north-seeking action, explained later, is performed by twisting the suspension wire.

Figure 4.6 shows such case that the north-seeking end point A is tilted by the angle θ upward from the horizontal line H-H'. The point B is at 180° from the point A on the gyro sphere.
In the same figure it is seen that the point A' and B' on the container are always kept on the straight line of the point A and the point B on the gyro sphere by the action of the horizontal servo system and the container is also tilted by the angle θ upward from the horizontal line H-H'.
At this time, the suspension wire is vertical and the gravitational force acts to the gyro sphere.
As the result, a torque is generated around the horizontal axis and "precession" is generated around the vertical axis.
That is, the north-seeking action is kept in this manner.

Let us explain an example of this north-seeking action. Assume that a gyro-compass is so placed on the equator that its spin axis is level and its north-seeking end is pointing at the east and this gyro is observed from the south (Refer to Figure 4.7 A.).
At this point the spin axis is level and the north-seeking end is pointing at the east and the gyro continues to keep the same direction since any torque is not applied.

After a certain time elapsed, the spin axis of the gyro is tilting due to the earth's rotation as shown in the point B while the direction of the spin axis is kept as it was.
At the same time when the spin axis is tilting, the container is also tilting by the same amount by the action of the horizontal servo system.
As the suspension wire is vertical at the point B, the gravitational force acts and starts the "precession" due to a torque around the horizontal axis.
The spin axis of the gyro starts to point gradually at the north because the gyro tries to rotate so that the spin axis direction agrees the direction of this torque.

The manner mentioned in the above is shown by C and D of the Figure 4.7.
At this point, seeing the figure please notice that the spin axis is tilted when the gyro is at the point D, that is, when the spin axis points at the north.
As explained before the spin axis must be level when it points the north.
What the spin axis is tilted at this time means that the "precession" is still continuing.
Actually, if the movement of the gyro spin axis end point is projected, it is seen as the dotted line of Figure 4.8.
The end point of the spin axis acts the elliptic motion which is expanded to east-west direction with its center on the vertical plane of the meridian of that point.
Then it is understood that it may be used as a compass if the damping torque is introduced to the motion of the spin axis end point as shown in the transformed solid spiral line.
As a method to give the damping torque, it is conceived that the torque decreasing the tilt of the spin axis is given inversely to the gyro when the tilt of the spin axis increases.

The manner when the motion of the spin axis end point is being damped is shown in Figure 4.9.
In this figure, the outermost ellipse represents a locus of the undumped spin axis end point starting from the point a, and the next inner ellipse locus starting from the point b (assuming 0b is 2/3 of 0a), and so on (assuming 0c/ob = 0d/oc = 0e/od = 2/3).
Then if assuming that after the locus started from the point a, the tilt angle of the spin axis is decreased by 1/3 when it reaches at the point f which is crossing point with the vertical line from the center of the ellipse, and it moves to the inner elliptic locus started from the point b, and then to the c, and d, so on, and finally it is converged to the center point.
Actually not like such stepwise, but the tilt angle is decreased continuously as proportional to the tilt forming a spiral curve.
Then the required torque is obtained by the function of the pick-up devices.
Refer to Figure 4.6 again.

Assuming the distance between the center of the gyro sphere O 1 and the center of The container O 2 in the direction of the spin axis as ξ, and the suspension wire length as a, ξ is expressed by the following equation using the tilt angle of the gyro θ.

$$\xi = a \sin \theta$$

Since θ is very small angle, Sin $\theta \fallingdotseq \theta$, and the above is expressed as

$$\xi \fallingdotseq a\theta.$$

Instead of detecting the gyro tilt angle θ directly, the spin axis tilt angle θ is obtained from this equation if the distance ξ between O 1 and O 2 is detected.
Then, by adding the output of the tilt pick-up corresponding to ξ, i.e. the gyro tilt angle, to the bearing pick-up output, the follow-up error is produced in the bearing follow-up system and a torque is given around the vertical axis of the gyro by twisting the suspension wire.
This torque is proportional to the gyro tilt angle, that is, the more the tilt increases, the more the torque is increased, and the more the tilt decreases, the more the torque is decreased and the torque is "zero" if the gyro is level.
The precession is given to the gyro to the direction of decreasing the tilt by this torque.
Even if the tilt of the gyro is reversed and the damping is applied to the motion of the gyro, his situation is not changed because the direction of the torque and the precession are reversed.
Accordingly, although the deviated amount in the locus depends upon the position of the starting point, it continues to be decreased.
That is, finally it points at the north and stops after the elliptic motion with damping.

It is explained before that the precession corresponding to the angular velocity of the earth's rotation must be given to the stopped gyro pointing at the north when it is placed on except the equator.
That is, if trying to explain more details about what the gyro is in the set state, the precession which equals to the earth's rotation must be given to the gyro simultaneously around the bearing axis (right-left direction in Figure 4.8) and around the horizontal axis(up-down direction in Figure 4.8).
For around the bearing axis, it is carried out by giving the precession corresponding to the vertical component of the earth's rotation Ω Sin λ keeping the north-seeking axis end point a little upward.

On the other hand, as the damping is given to the tilt of the spin axis, the tilt angle is detected by the pick-up device and the precession is given downward to the north-seeking end by twisting the suspension wire, and as a result the gyro can not stop with pointing at the north on the earth.

This downward precession raises the north-seeking end by corresponding to the vertical component of the earth's rotation, and deviates it to the west by a certain angle around the bearing axis, and it can be attained an equilibrium status by having the north-seeking end have a nature to lower it by the horizontal component of the earth's rotation.

The deflection angle required for giving the up-down directional equilibrium has a nature which is proportional to the tangent of the latitude and it was called as the latitude error of the gyro-compass in the past.

As this error is given theoretically, it is possible to correct the bearing signal sent from the gyro in the other point than the gyro.

However, when the gyro stops with pointing at the north, if the tilt pick-up output is adjusted to zero even if the spin axis is tilted, a torque due to the tilt is not generated around the vertical axis.

That is any error is not generated. Then so-called "KA filter" was studied out.

When the tilt signal and the bearing follow-up signal are added for the damping, "KA filter" is inserted after the addition to generate the tilt signal. (These processing is performed in the CPU.)

The time constant of the filter is set to more than 30 minutes.

The filter acts as a simple proportional amplifier for the tilt signal which changes at Equal to or more rapid cycle than the cycle of the north-seeking motion of the gyro and the output is closing to "zero" as the gyro is closing to the stationary state.

That is, a torque is not generated around the vertical axis and any error is not generated.

Restating this, the "KA filter" has a function to correct automatically the latitude error of the gyro-compass.

4.3.2 Speed error

The speed error is explained here which can not be avoided when the gyro-compass is installed on the ship.

As explained before, the gyro-compass utilizes the earth's rotation to keep the north-seeking feature.

In other words, the gyro spin axis is tried to be agreed with the north-south directional component of the earth's rotation.

The north-south directional component of the earth's rotation is expressed as Ω Cos λ at the point of the latitude λ of northern hemisphere as shown in Figure 4.10.

Assume that a ship installed the gyro-compass is navigating at speed υ in the north-south direction.

At this time, the angular velocity υ /R (where R is radius of the earth) is applied to the gyro-compass as shown in the Figure 4.11.

If the heading is not to the north but an arbitrary direction, its north-south directional component is expressed as υ Cos θ and angle velocity added to the gyro-compass is

υ Cos θ / R.

From the Figure 4.11, the direction of this angular velocity is perpendicular to the paper toward upward.

That is, it is to the west direction.

The error is generated because the gyro-compass axis agrees to the resultant direction of this apparent angular velocity and the direction of the earth's rotation.

This error is expressed by the following equation.

$$\delta = \upsilon \text{ Cos } \theta / R \ \Omega \text{ Cos } \lambda$$

(Since (ν / R) Sin θ is extremely small compared to Ω Cos λ, it is omitted, and

$$\tan \delta \fallingdotseq \delta \quad \text{for small } \delta .)$$

This error is automatically corrected in the CPU (SCCpwb) in the control box (unit) which is explained later.

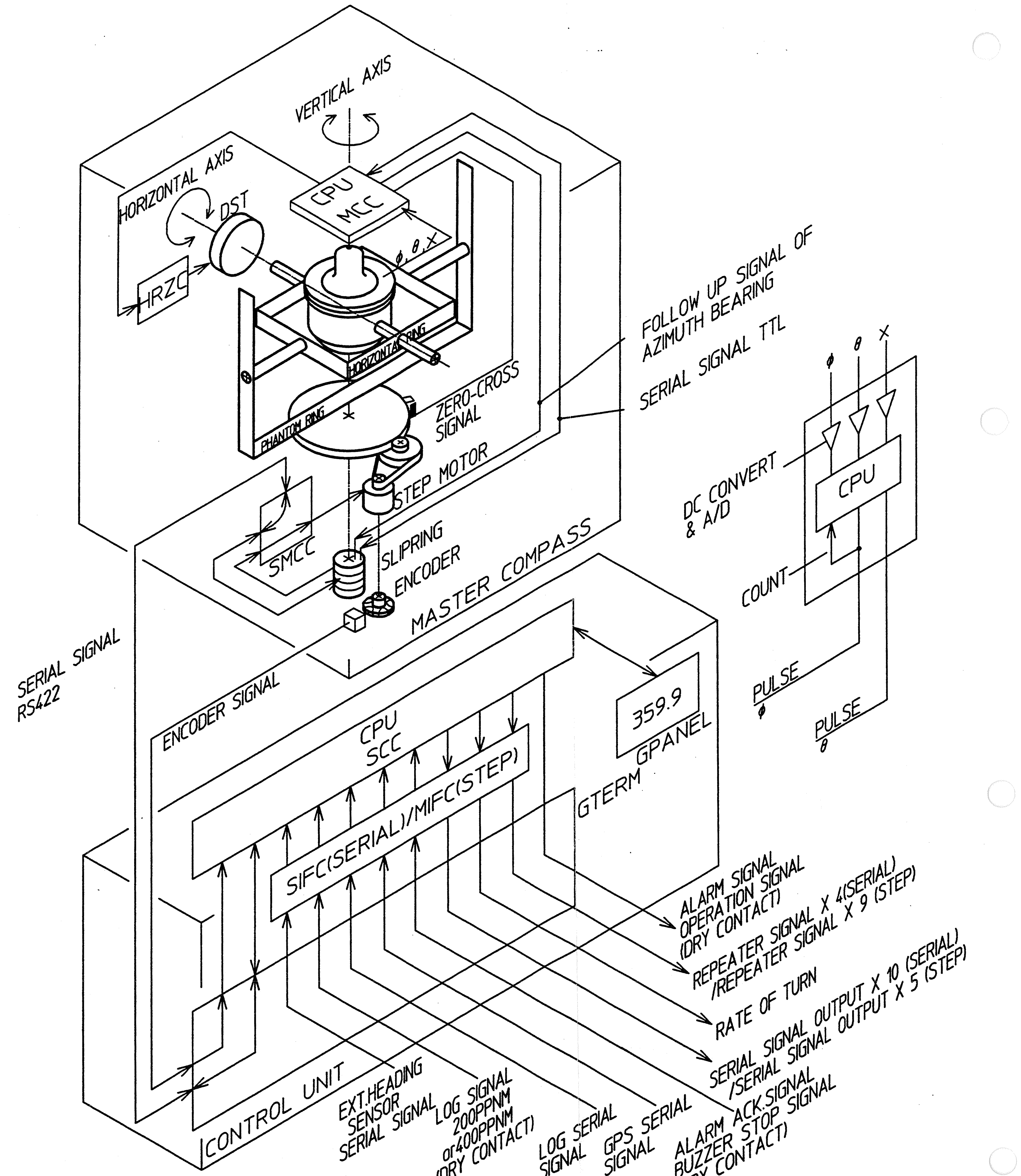


Fig4.1.1 TG-8000/8500 Type-S System

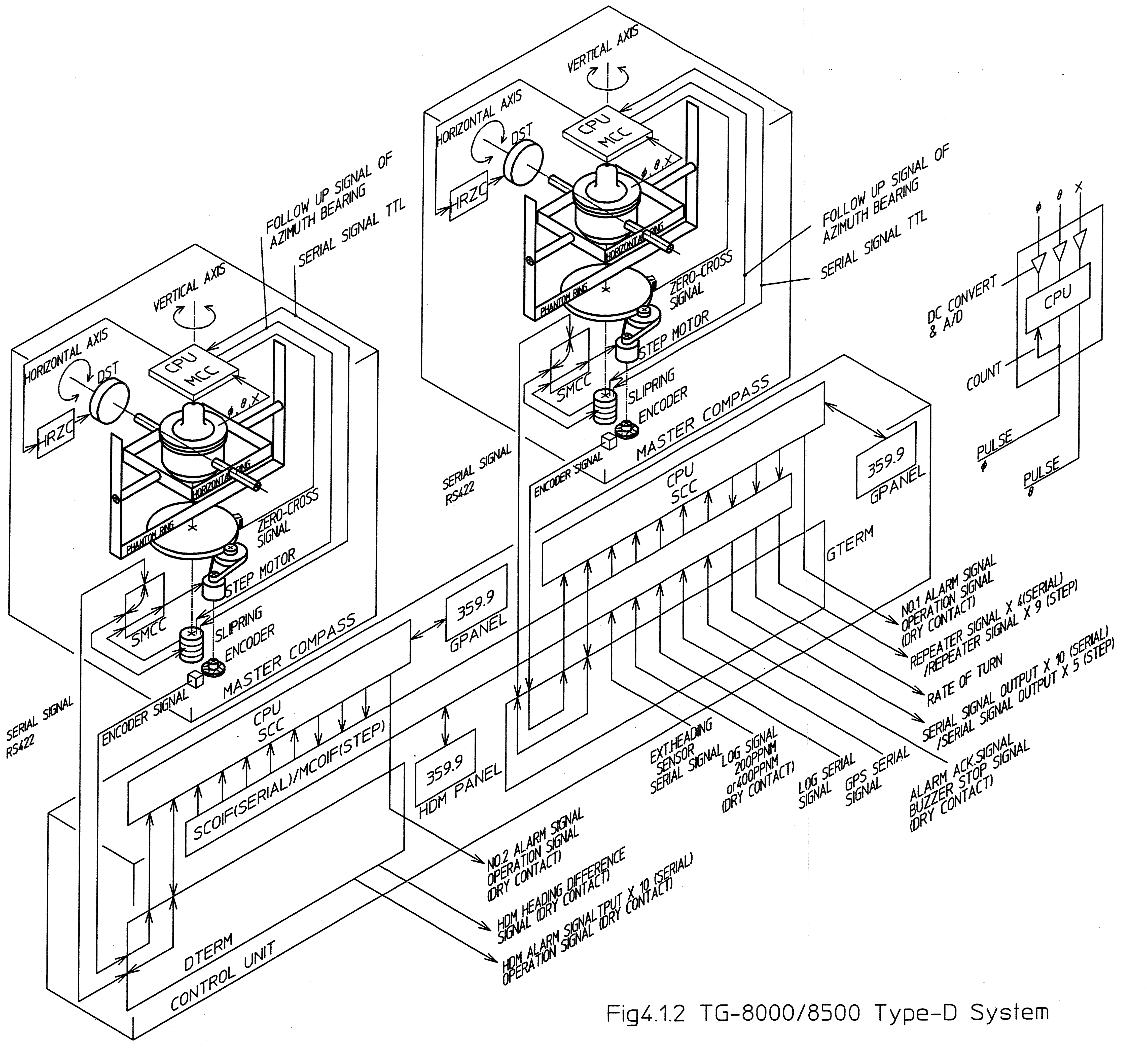


Fig4.1.2 TG-8000/8500 Type-D System

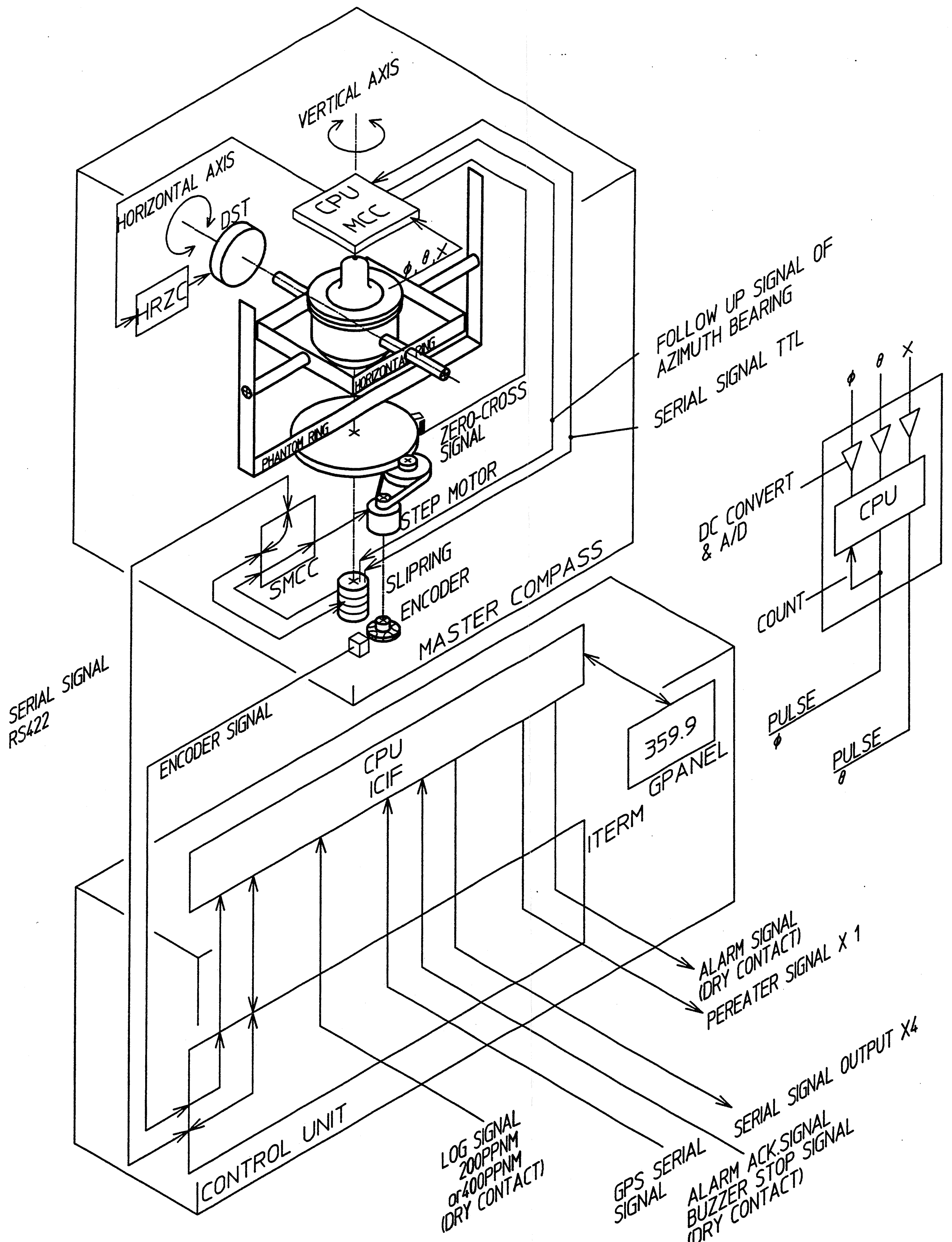


Fig4.1.3 TG-8000/8500 Type-I SYSTEM

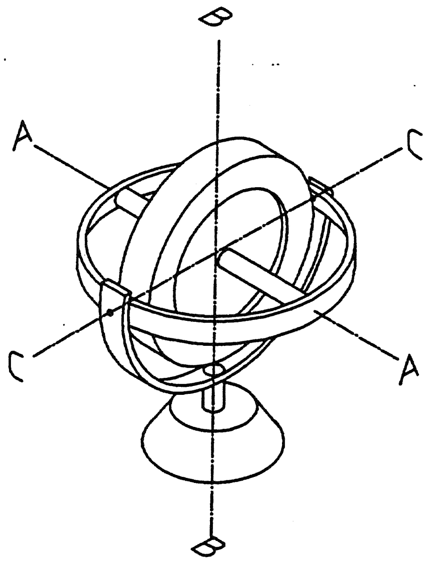


Fig4.2

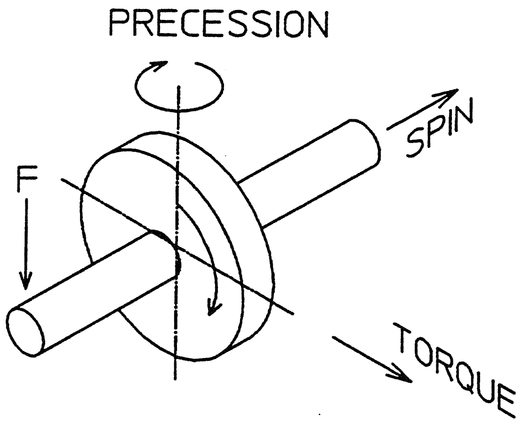


Fig4.3

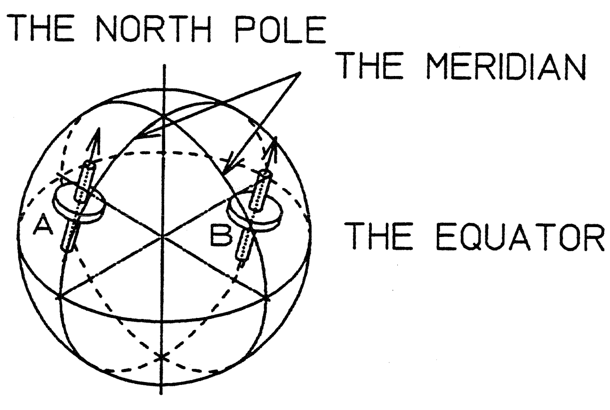


Fig4.4

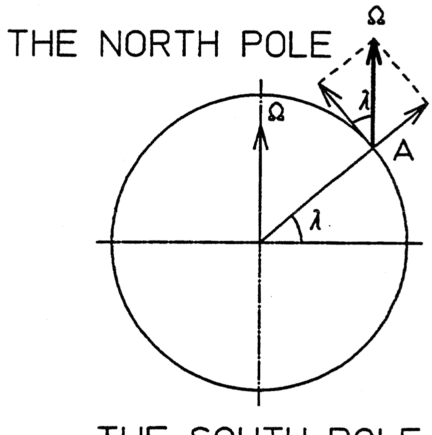


Fig4.5

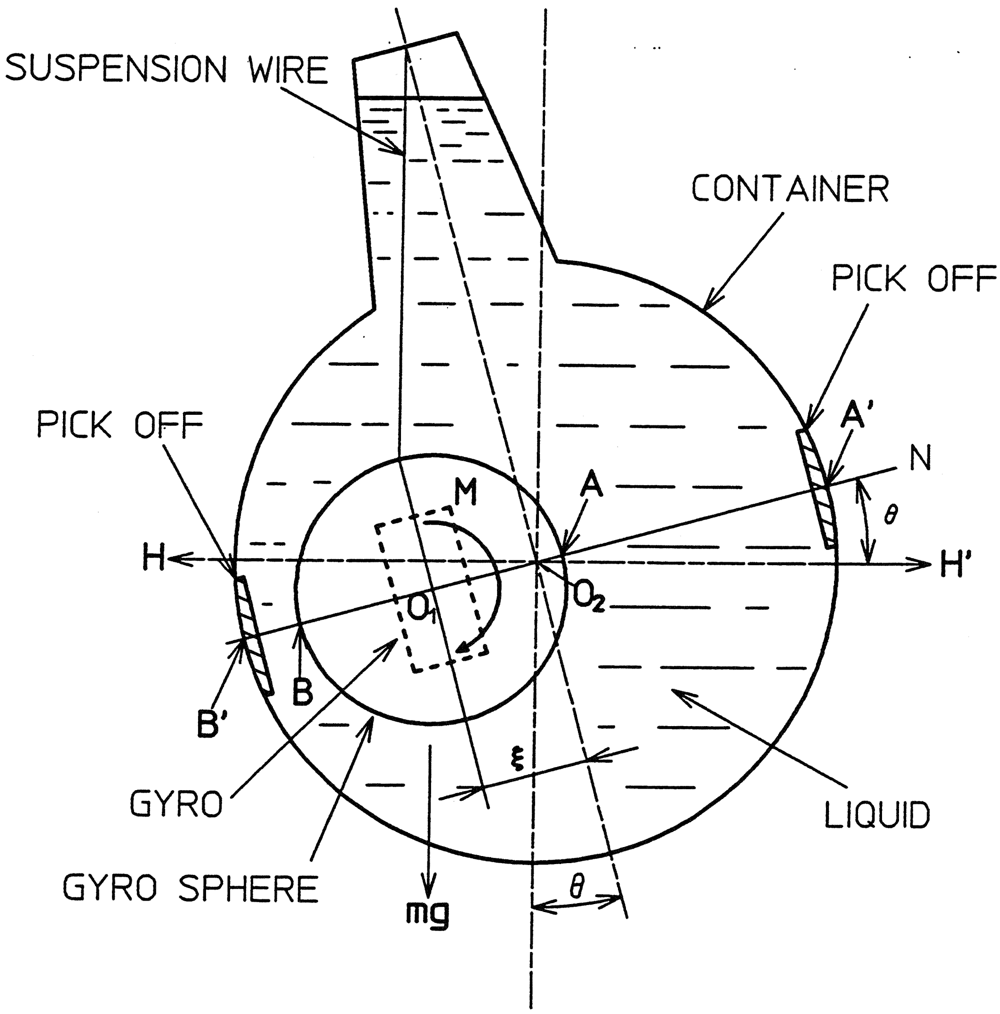

SUSPENSION WIRE
CONTAINER
PICK OFF
PICK OFF
A'
N
M
A
H
H'
O1
O2
θ
B'
B
GYRO
GYRO SPHERE
ξ
LIQUID
mg
θ

Fig4.6

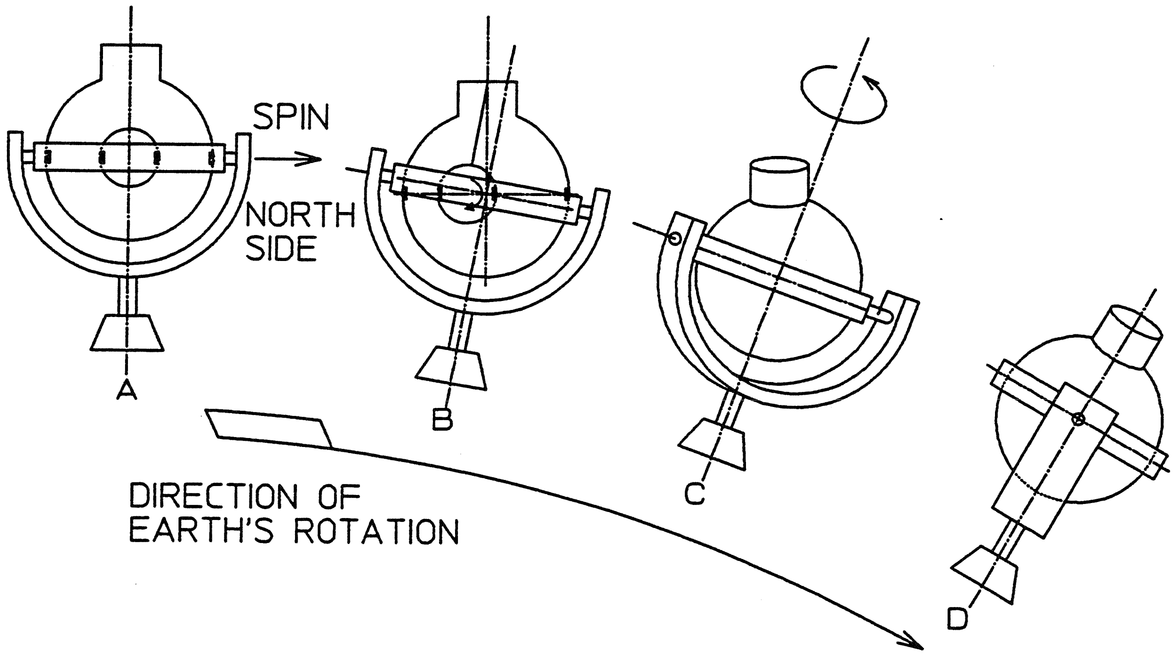

SPIN
NORTH SIDE
A
B
C
D
DIRECTION OF EARTH'S ROTATION

Fig4.7

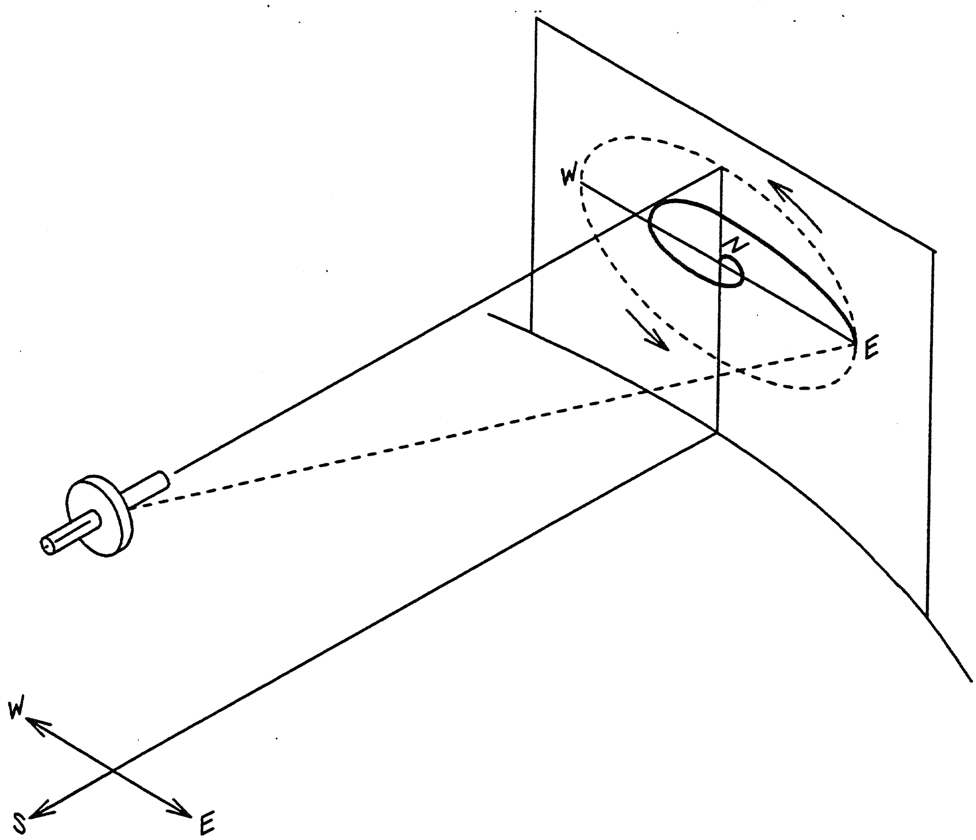


Fig4.8

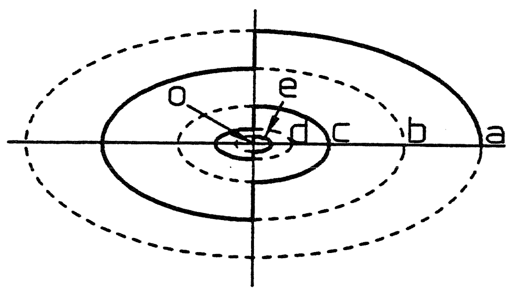


Fig4.9

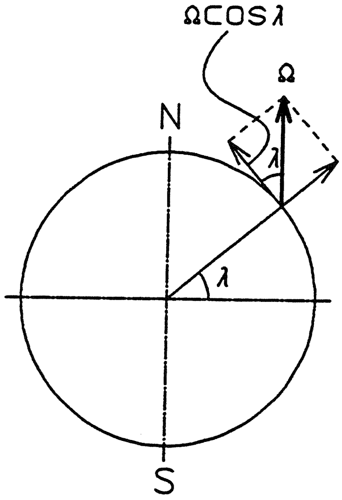


Fig4.10

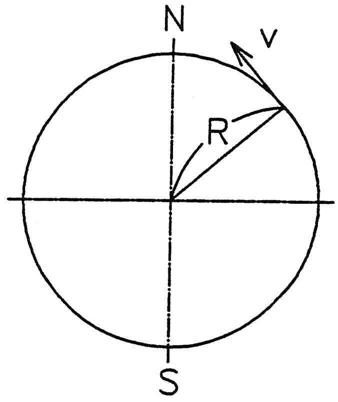


Fig4.11

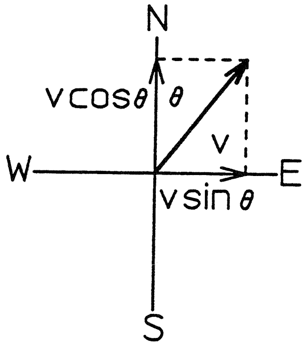


Fig4.12

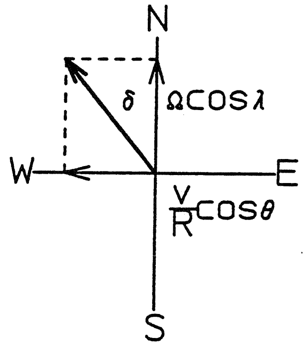


Fig4.13

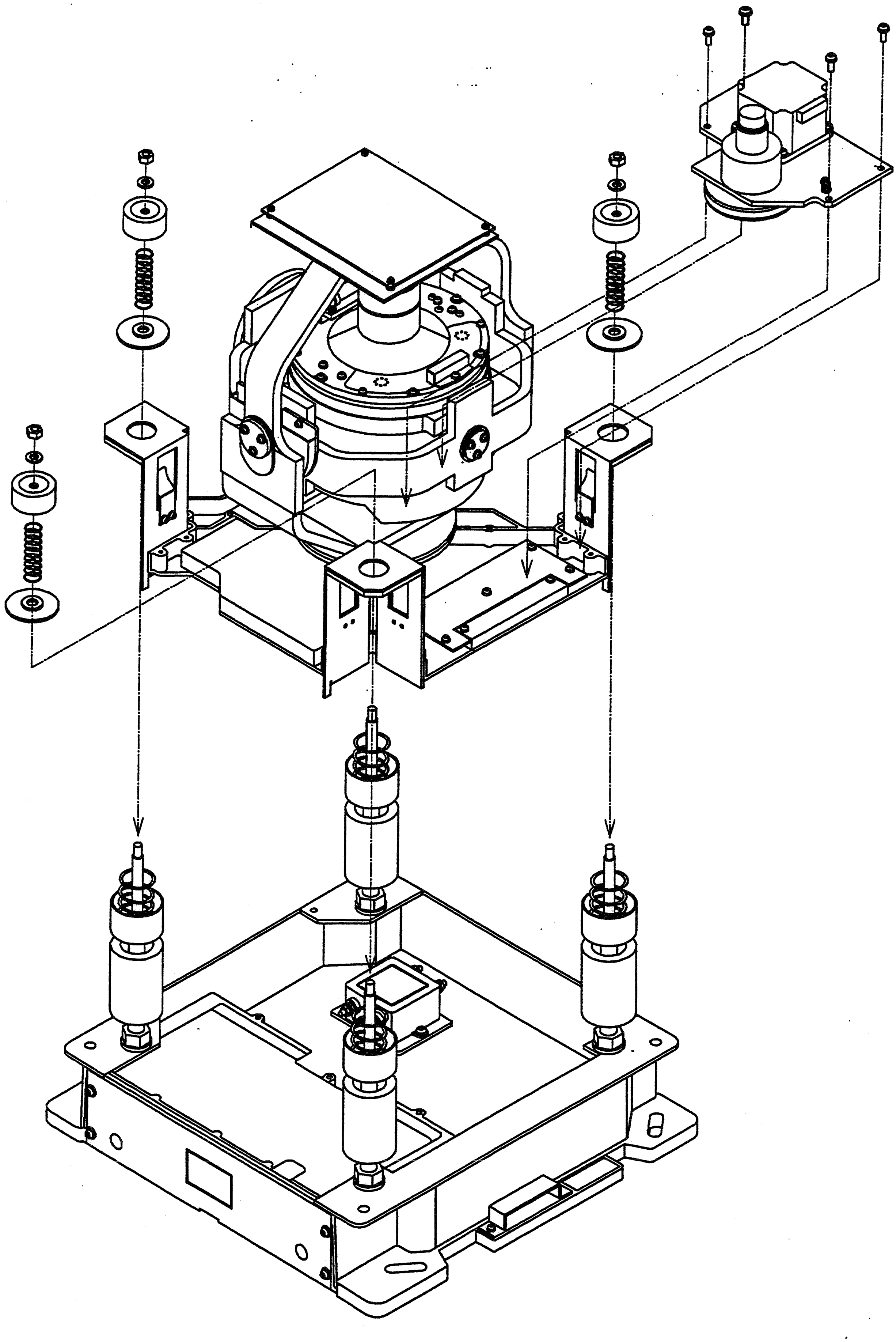


Fig 4.14

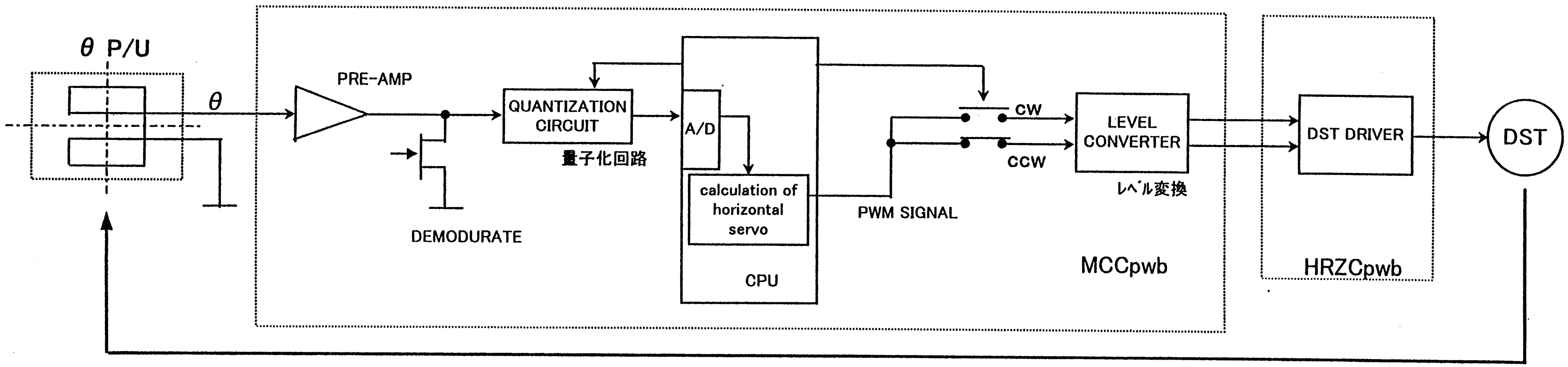


Fig. 4.16

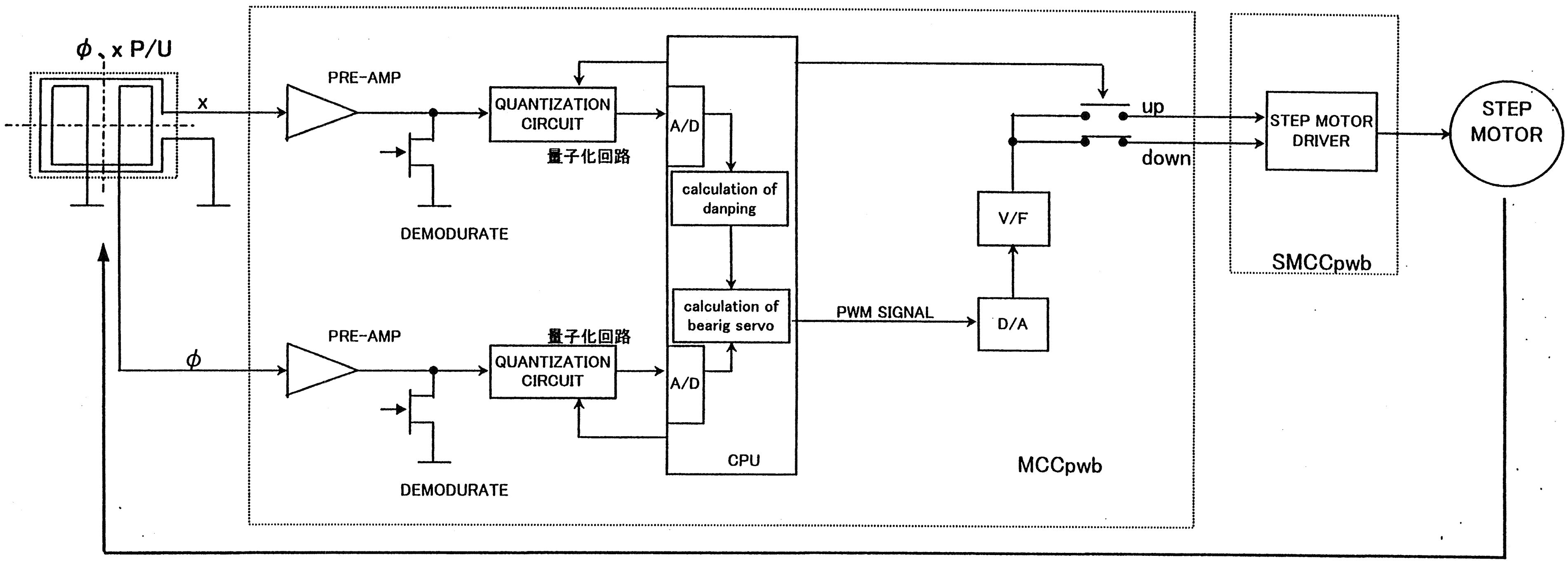


Fig. 4.17

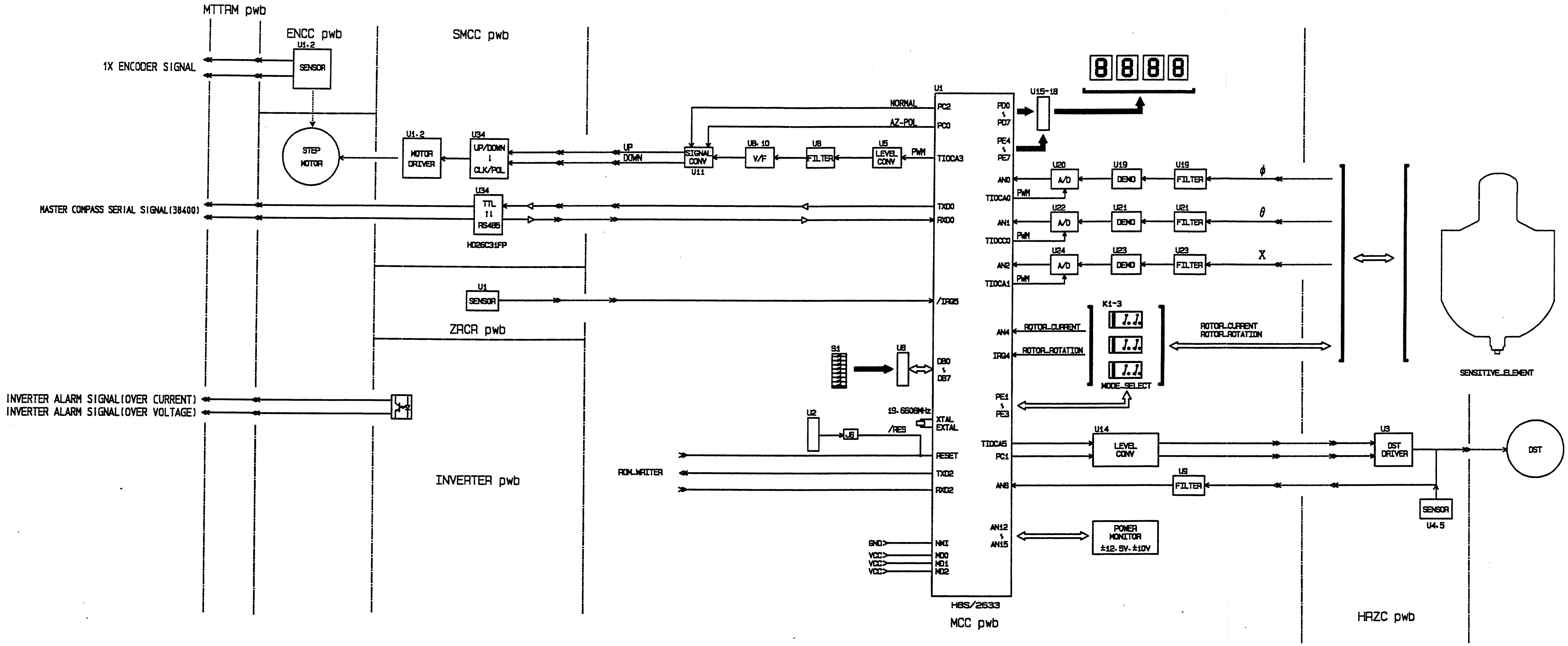


Fig. 4.18
TG-8000/8500 MASTER_COMPASS
GC 80/85 MASTER_COMPASS
System block diagram

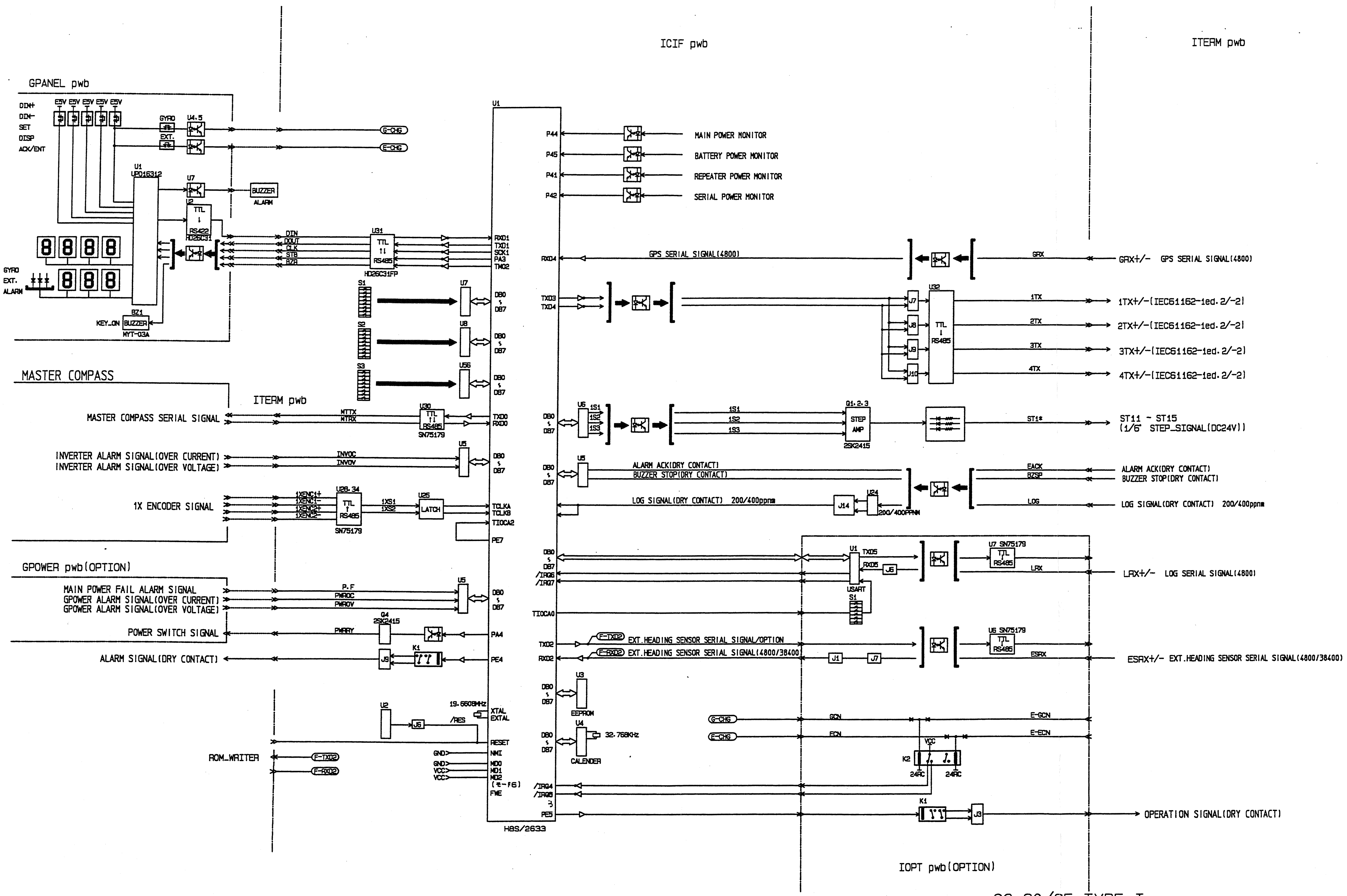


Fig.4.19 GC 80/85 TYPE I
System block diagram

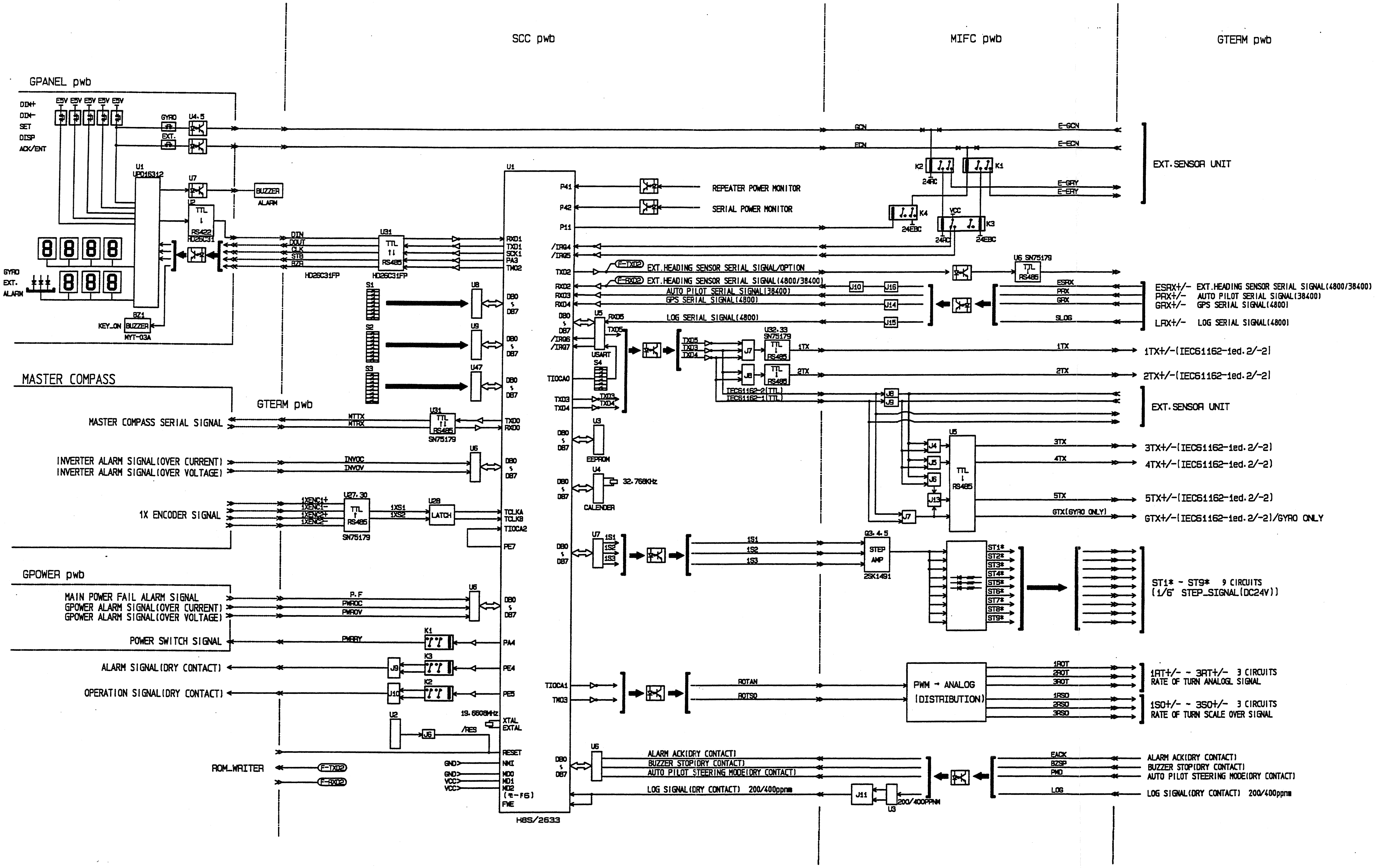


Fig.4.20.1 TG-8000/8500 TYPE S(STEP)
System block diagram

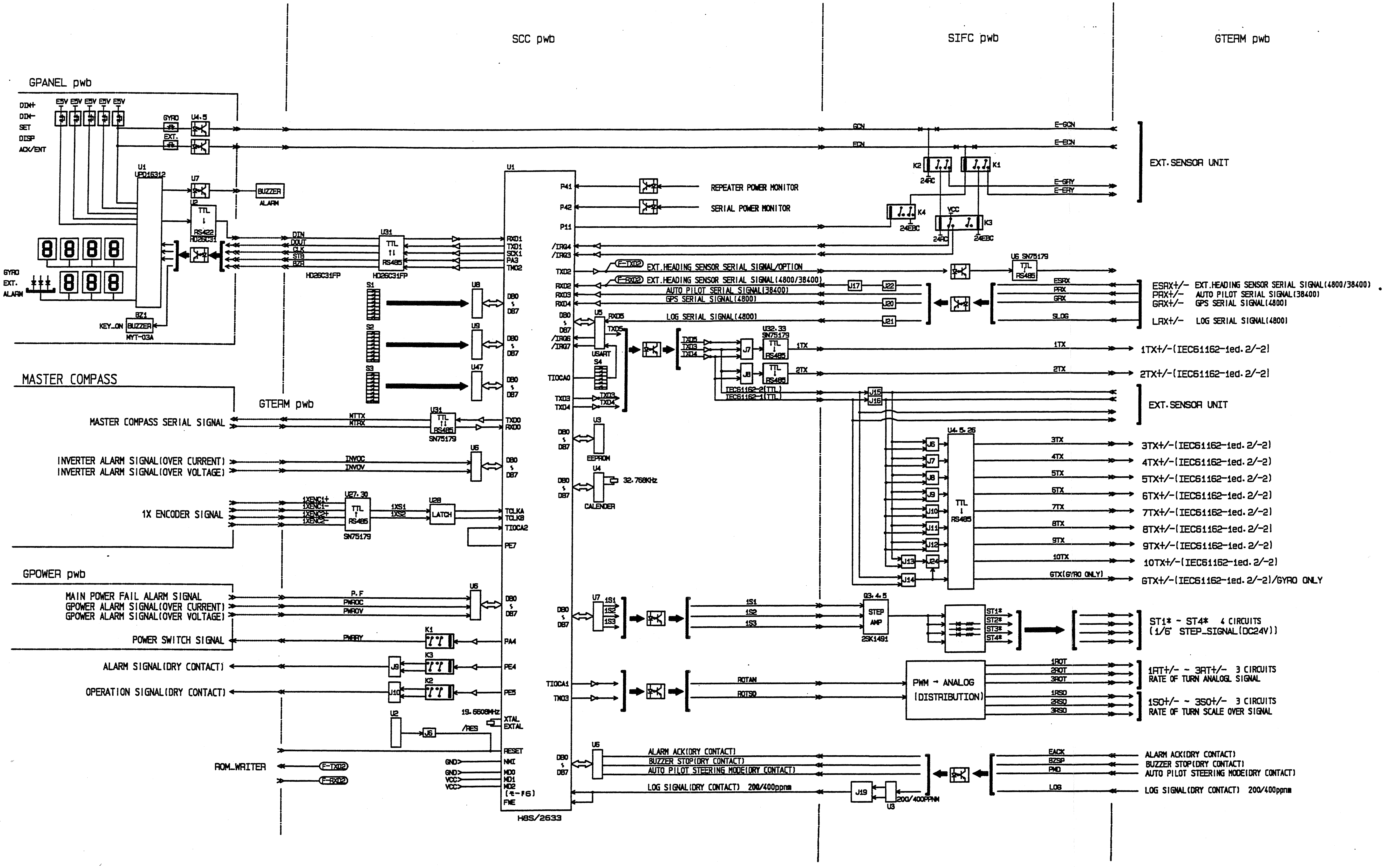


Fig.4.20.2 TG-8000/8500 TYPE S(SERIAL)
GC 80/85 TYPE S
System block diagram

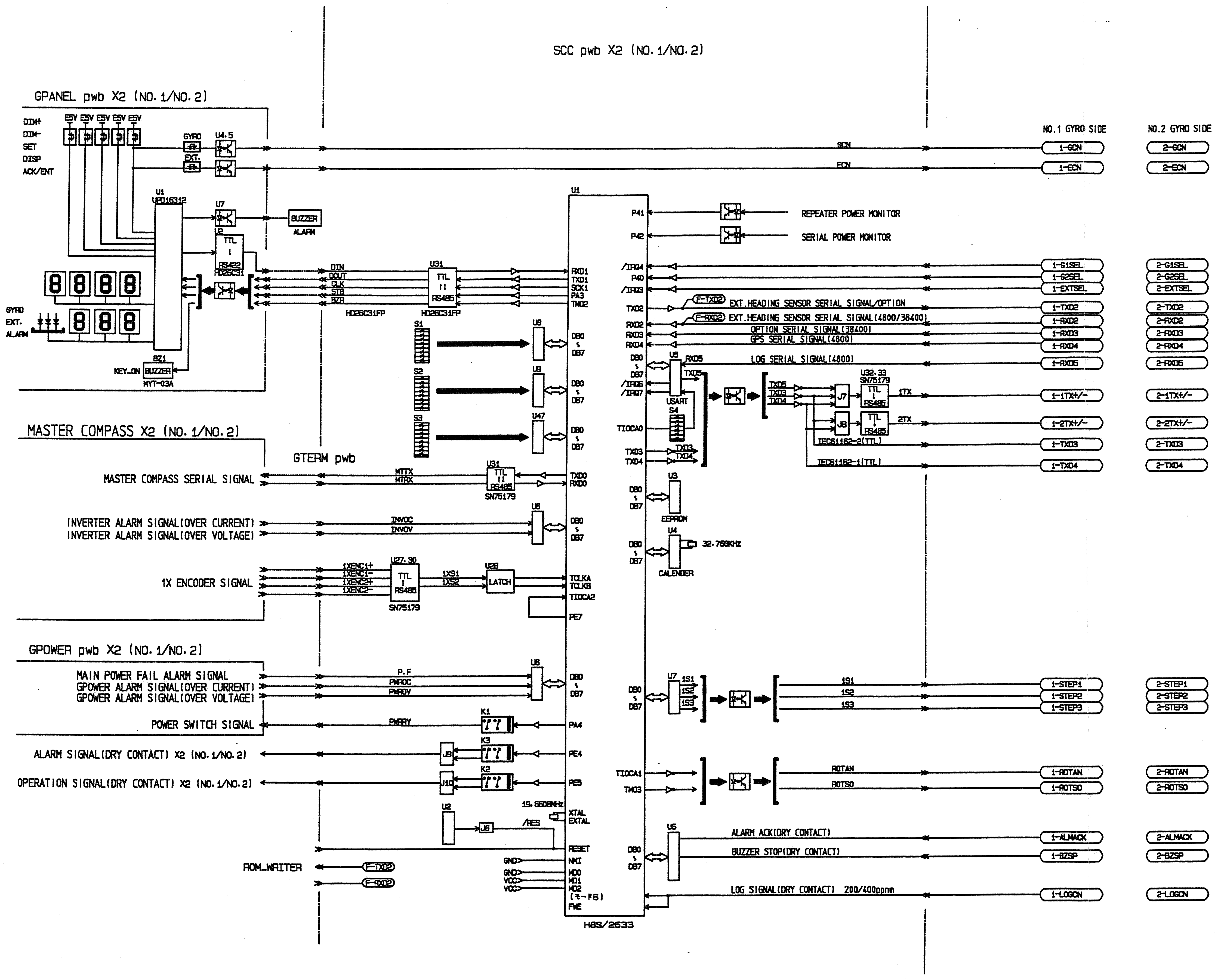


Fig. 4.21.1 1/3

TG-8000/8500 TYPE D(STEP) (1/3)
System block diagram

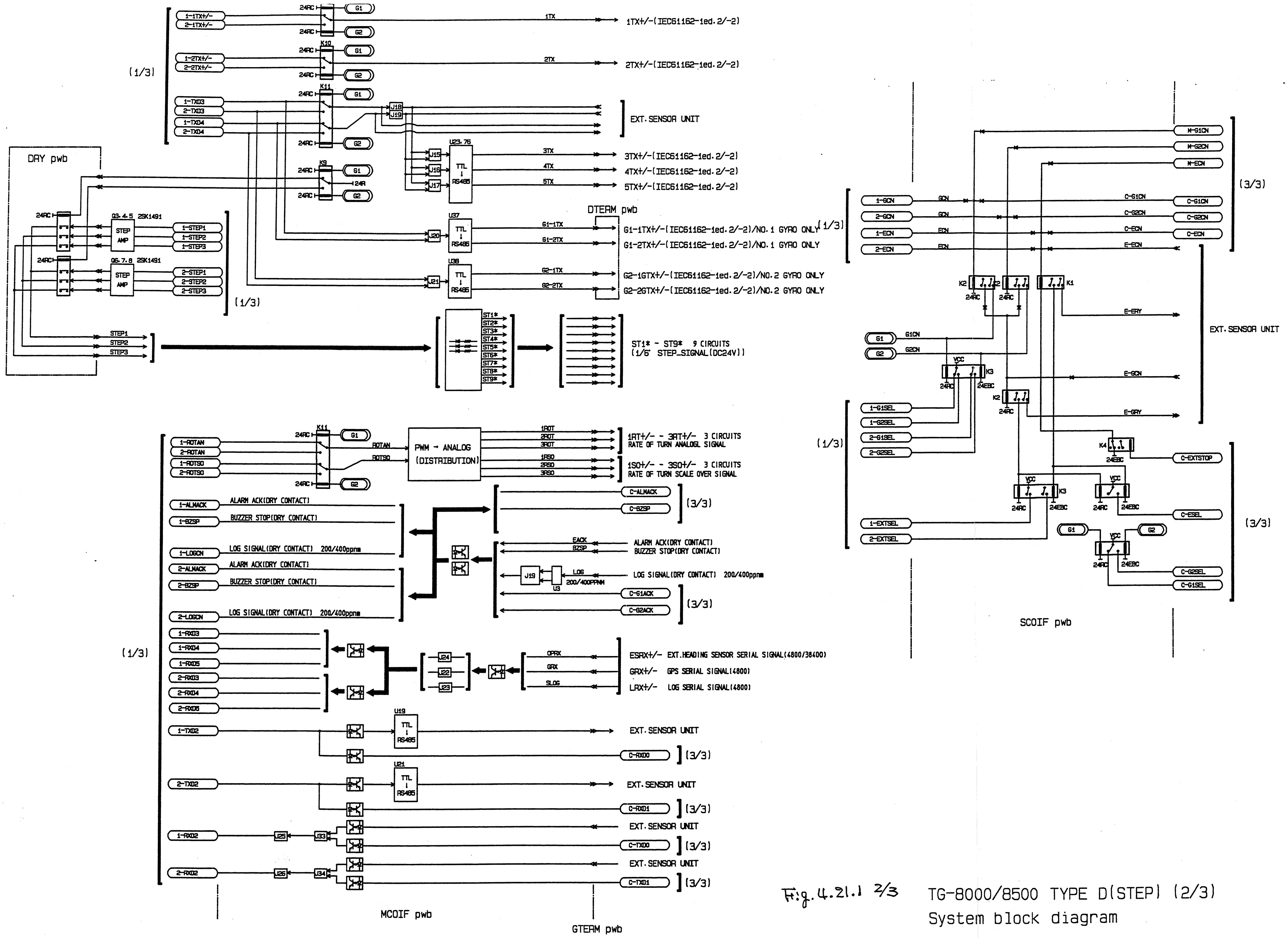


Fig. 4.21.1 2/3

TG-8000/8500 TYPE D(STEP) (2/3)
System block diagram

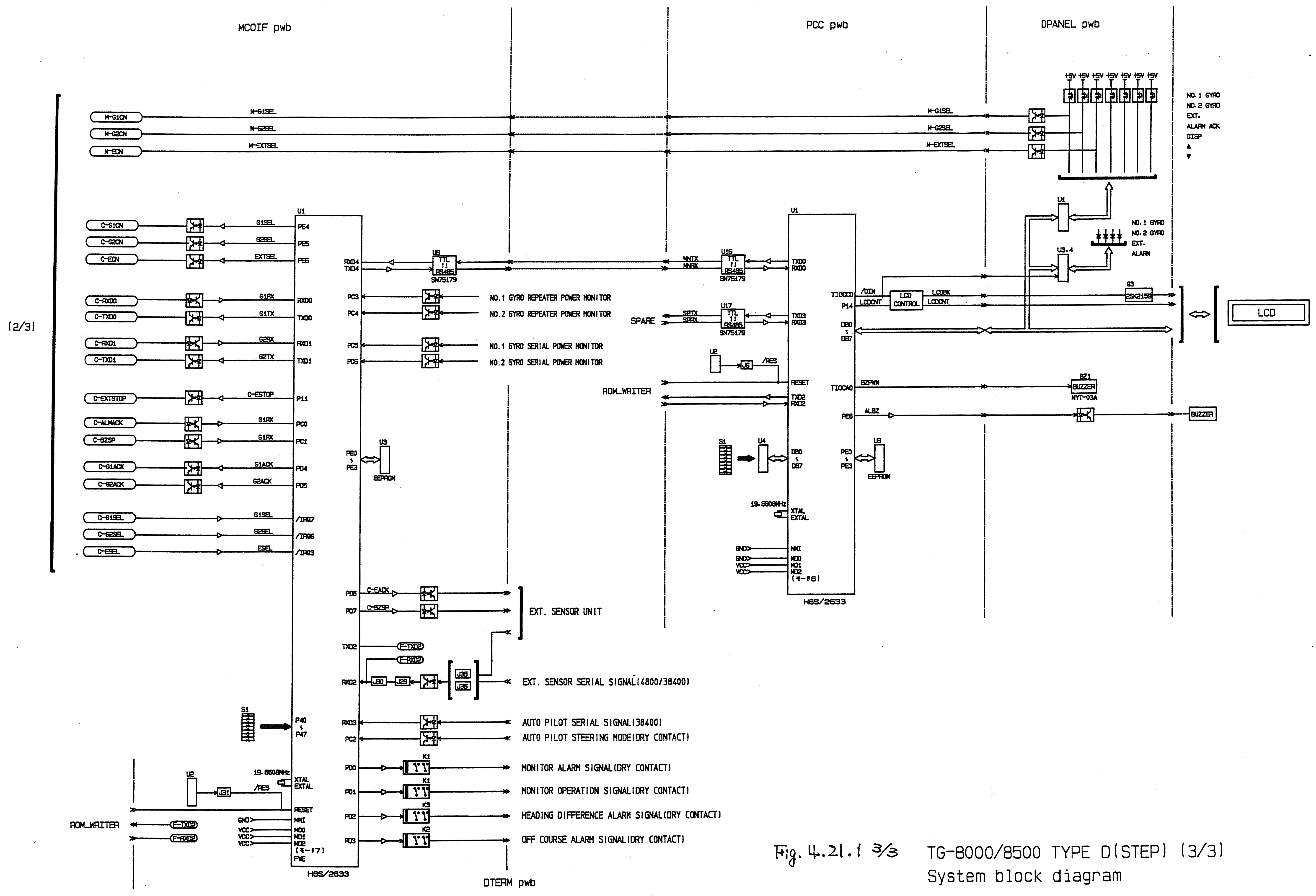


Fig. 4.21.1 3/3 TG-8000/8500 TYPE D(STEP) (3/3)
System block diagram

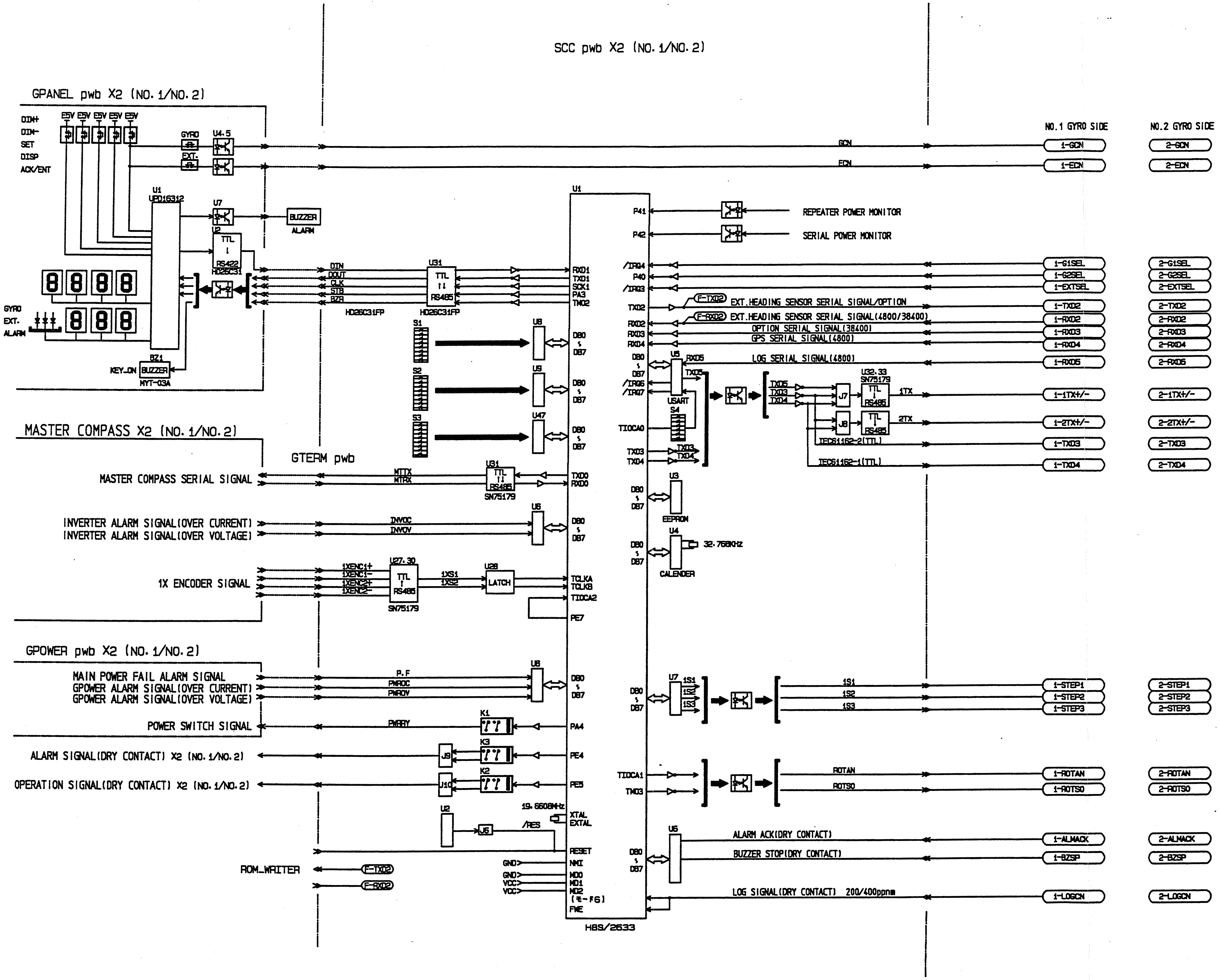


Fig. 4.21.2 1/3 TG-8000/8500 TYPE D(SERIAL) (1/3)
GC 80/85 TYPE D (1/3)
System block diagram

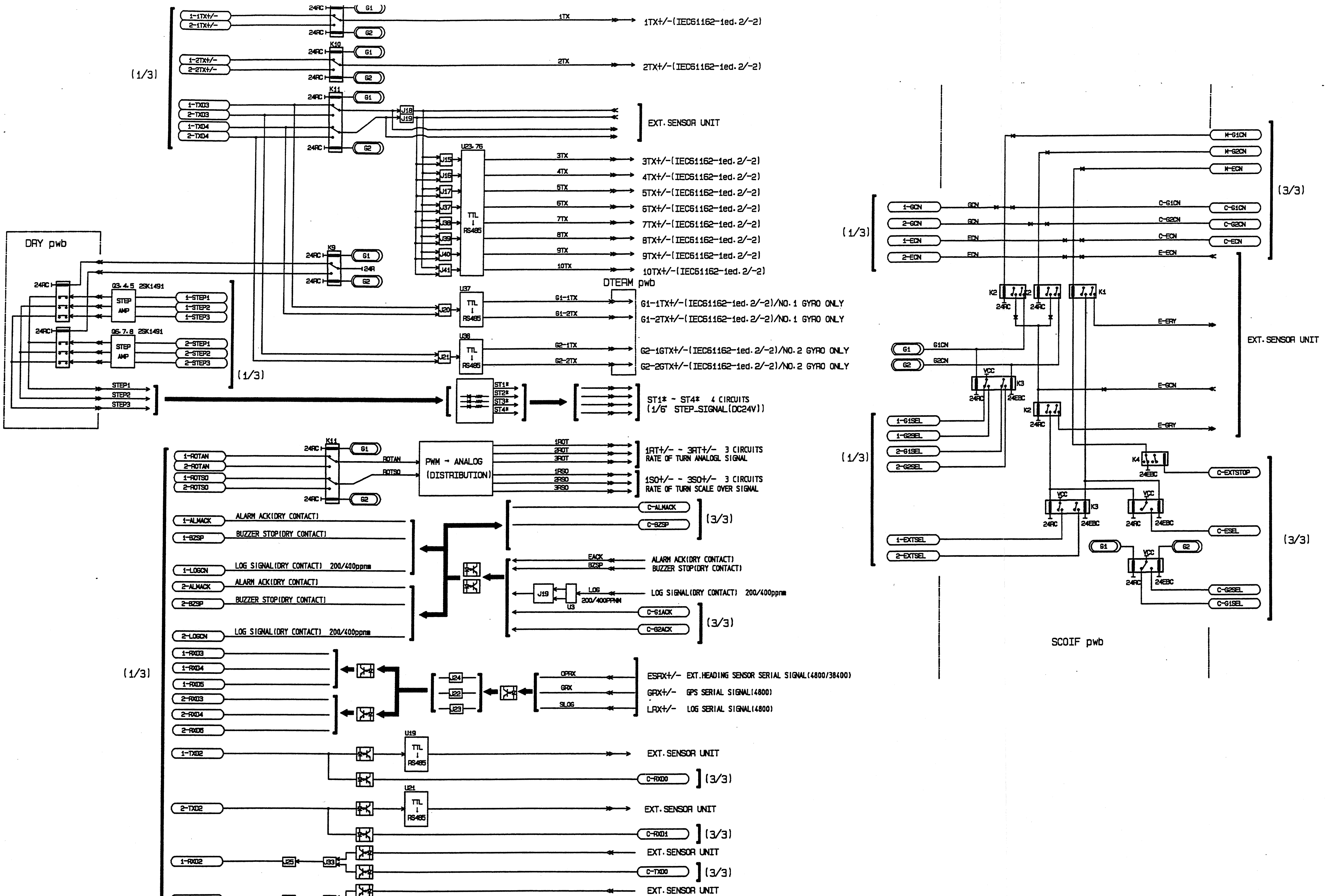


Fig. 4.21.2 2/3 TG-8000/8500 TYPE D(SERIAL) (2/3)
GC 80/85 TYPE D(2/3)
System block diagram

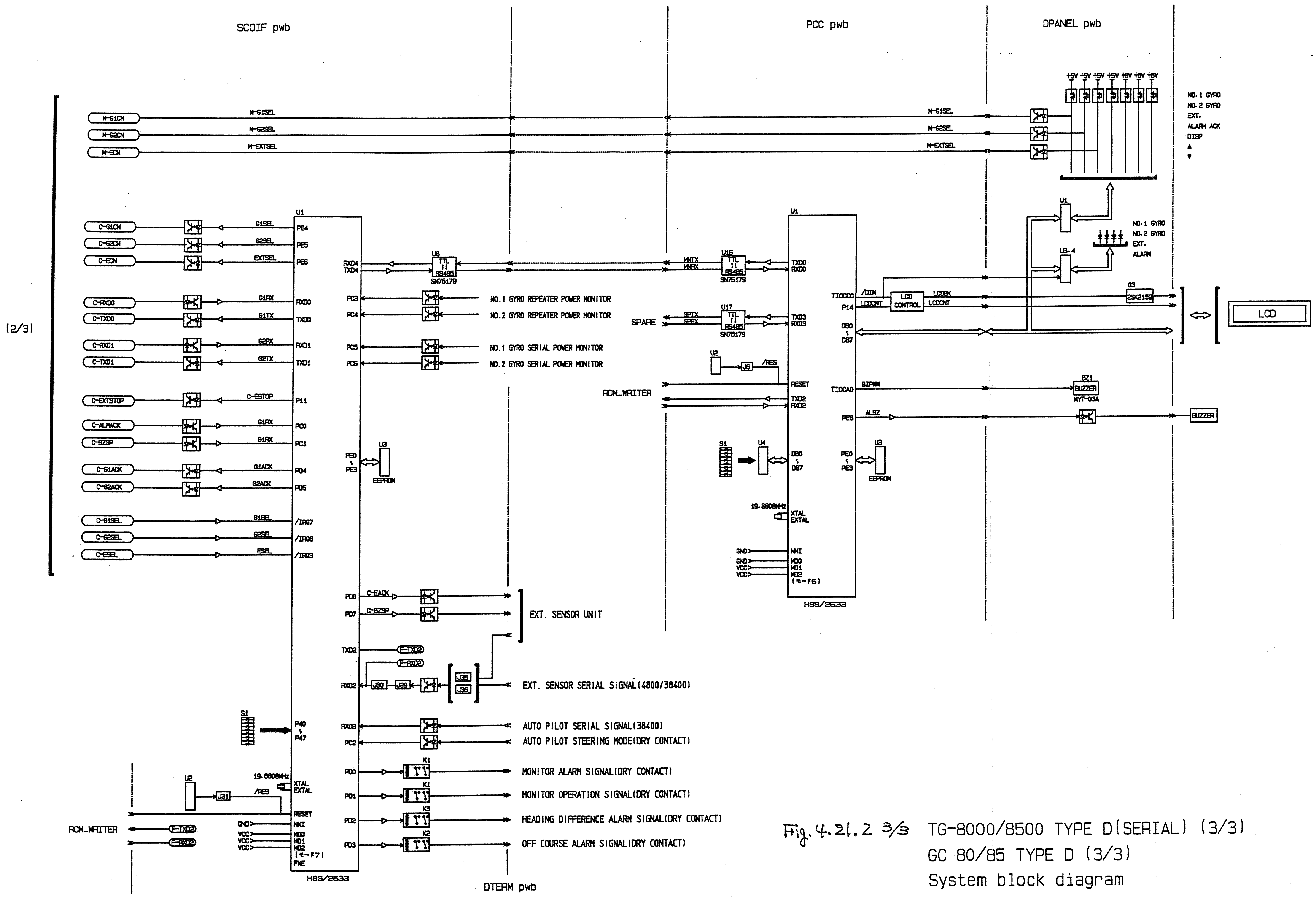


Fig. 4.21.2 3/3 TG-8000/8500 TYPE D(SERIAL) (3/3)

GC 80/85 TYPE D (3/3)

System block diagram

CHAPTER 5 Electrical adjustment and confirmation

CHAPTER 5 Electrical adjustment and confirmation

＊Trimmer function for adjustment for each PWBs are summarized in "Table 5.1 Trimmer for adjustment".

5.1 GPOWER pwb Fig. 5.17/18

* Each adjustments are performed after confirmation that ship's power supply voltage is ±10% and frequency is ±5%.

Main power : AC100, 110, 115 220V 1ϕ 50/60Hz

Emergency power : DC24V +30% -20%

* Note : Remove short peace between TB3 and TB4 onpwb in case main power supply is AC220V.

5.1.1. Adjustment of power supply (24M) voltage for the master compass

Measuring point : Terminal board of the master compass ; 「N+」 ～ 「N－」

Standard : DCDC24V ±2V

Adjustment method : Measure the main power and confirm that it is standard DC24V ±2V when start-up. If it is out of standard, make adjustment to operate.

* Do not operate with nonstandardized voltage.

Adjust again to make voltage after the master compass start follow-up to be within the standard.

Adjustment : VR1

5.1.2 Confirmation of voltage of power supply (24R) for the repeater

Power supply voltage for repeaters cannot be adjusted. It is determined by adjusted value of power supply voltage (24M) for master compass, however it does not become to the same value of the master compass.

Measuring point : GTERM pwb TB1/2 「ST□5」 ～ 「ST□4」
(Polarity : 「ST□5」 is 「+」)

Standard : DC24V ±4V

Adjustment of the overcurrent limit value

Monitor power supply electric current and stop the supply of power to the master compass if it exceeds the set-up value of current.

* Supply of power for repeaters is continued.

Adjustment on board is extremely difficult. No necessary to make adjustment and confirmation.

* VR2 and VR3 are trimmer for adjustment. Recommend to replace pwb if they are turned by mistake.

It has been already adjusted at factory before shipment as follows.

・Up to 13 min. from start time: The power is stopped to apply to the master compass when the current becomes greater than 9.0 A. (set up at VR3)

・Since 13 min. elapsed from start: The power is stopped to apply to the master compass when the current becomes greater than 4.5 A. (set up at VR2)

5.2 INVERTER PWB Fig 5.4

* This PWB is the same as TG-6000 and adjustment is similar to that for TG-6000.
* Confirm that 4-LED in this PWB are lighted. After start up.

D37/38 : Simplified monitor for rotor power supply voltage

D45/47 : Simplified monitor for SMCC pwb power supply voltage (DC ±12V)

5.2.1 Adjustment of the rotor power supply voltage

Measurement point : between pin 6 and pin 7 of the connector CN4 on the INVERTER PWB.

Standard : AC100~105V (rectangle wave)

Adjustment method : Measure it when start up and confirm that it is standard AC100V ±5V

To operate. Make re-adjustment to operate if it is nonstandardized.

* Do not operate with nonstandardized voltage.

Adjust again to make voltage after the master compass start follow-up to be within the standard.

Adjustment : VR1

5.2.2 Confirmation of the frequency of the rotor power supply

Make confirmation only because the frequency is determined by crystal oscillator.

Measurement point : between pin 6 and pin 7 of the connector CN4 on the INVERTER PWB.

Standard : 400Hz ±2Hz

5.2.3 Confirmation of SMCC pwb control power supply (SMCC pwb fig. 5.2)

* This control power supply is power supply for bearing follow up control.
* make confirmation only because power supply voltage is fixed.

Measurement point : between pin 3 and pin 4 of the connector CN4 on the INVERTER PWB.

(Polarity : 「3」 is 「+」)

Standard : DC12V±1V

5.3 SMCC PWB　Fig.5.2

* Confirm power supply voltage for driving bearing step motor and its control power supply voltage

Power supply for driving step motor is supplied from GPOWER PWB and control power supply is supplied from INVERTER PWB.

This is confirmation only for voltage.

5.3.1 Power supply for driving step motor

Measurement point : between 「FL6」 and 「FL7」 on the SMCC PWB

(Polarity : 「FL6」 is 「+」)

Standard　　　　　: DC24V±2V

5.3.2 Control power supply for driving step motor

Measurement point : between 「FL4」 and 「FL5」 on the SMCC PWB

(Polarity : 「FL4」 is 「+」)

Standard　　　　　: DC12V±1V

5.4 MCC PWB　Fig. 5.1

* It has been already adjusted for assembled sensitve element at factory before shipment.

Accordingly, it does not required to adjust the MCC PWB at installation time.

However, it is required to adjust if the sensitive element or the MCC PWB was replaced.

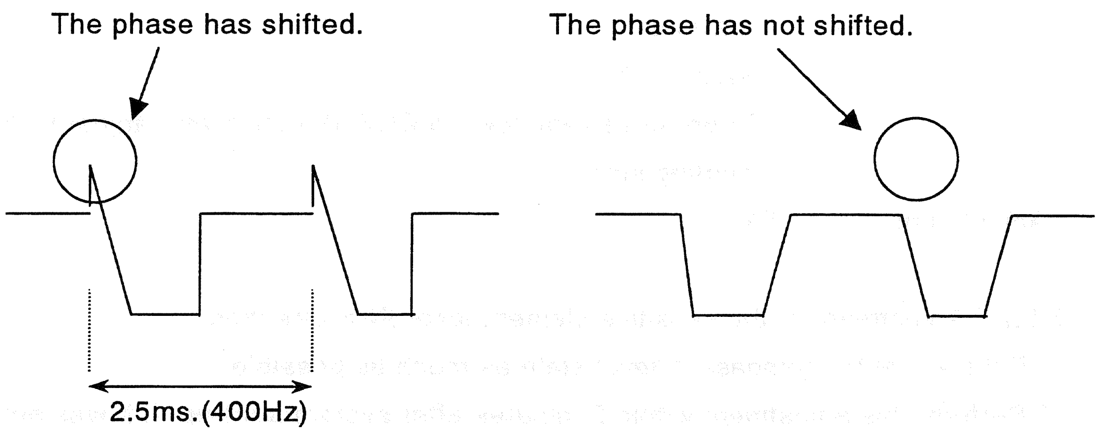
Phase adjustment of the pick up signal

* This is adjustment for changing P/U signal from the master compass to rectification signal where the displaced bearing of gyro sphere can be distinguished.

If this adjustment is deviated, P/U gain becomes smaller equivalently.

Measuring point : this PWB　「TP 17」 ～ 「TP1」 (confirm the shape of the wave)

Standard : See below



Adjustment method : Start up the system in the 「test mode B」 (leveling mode) of the system. (Refer to Chapter 3, 3.3.3 Test mode B)
Perform the adjustment when two minutes elapsed since the leveling by the hole sensor started. (since started mixing with X signal)
Tilt the sensitive element for about 20 Nup at RV2 on HRZC PWB.
At this time, adjust so that the phase deviation of P/U waveform becomes minimum.
After the adjustment, set the sensitive element Sup and confirm at the opposite polarity (+ side) too, and adjust it so that each phase deviation becomes minimum.

Adjustment : VR1

5.5 HRZC PWB Fig. 5.3

* It has been already adjusted for assembled sensitive element at factory before shipment.
Accordingly, it does not required to adjust the MCC PWB at installation time.
However, it is required to adjust if the sensitive element or the HRZC PWB was replaced, or above 5.4.1 was performed .
* This PWB is same as TG-6000.

5.5.1 Adjustment of the sensitive element N-S direction hunting

* Put the master compass in level state as much as possible.
* Perform this adjustment within 2 minutes after system start up. If it was not completed within 2 minutes, perform again after turn system power OFF once and start up again.

Adjustment method : Start with 「Test mode B」 (leveling mode) of the system.
Have the sensitive element occur hunting by turning RV1 to maximum
Value (CW max).
Then turn slowly toward CCW direction and adjust it where the hunting stops.

Adjustment : RV1

5.5.2 Adjustment of the sensitive element level (N-S direction)

* Put the master compass in level state as much as possible.
* Perform this adjustment within 2 minutes after system start up. If it was not

completed within 2 minutes, perform again after turn system power OFF once and start up again.

Adjustment method : Start with 「Test mode B」 (leveling mode) of the system.
Confirm if the rotor level is within 0' ±34' at least after 30 seconds from start up.
(Scale of rotor level gauge is 4' for one scale)
Re-adjust if it is out of standard.

Adjustment : RV2

5.6 MCIF PWB / SCIF PWB (Type S) Fig.5.11/Fig.5.12

* Make adjustment of circular angle speed signal (analogue signal)
* Start up the system with 「ROTI mode」 (Refer to Chapter 3, 3.3.1 ROTI mode) and make following adjustment after finish of last azimuth motion.
* Set dip switch of SCC PWB as follows.

± 30° /min : SCC PWB DIP SW3 No.3 [OFF] No.4 [OFF]
±120° /min : SCC PWB DIP SW3 No.3 [ON] No.4 [OFF]
±300° /min : SCC PWB DIP SW3 No.3 [OFF] No.4 [ON]

5.6.1 Zero adjustment

Set the rate of turn to "0.0° / min.".

Measuring point : GTERM PWB between 「TB1 1RT+」 and 「TB1 1RT-」

Standard : DC0V, ±0.08V

Adjustment method : Confirm that the indication of circular angle speed is "0.0".
(Mode Indication indicates 「rt」)
Turning RV1 to maximum value (CW max).
At this time, adjust at VR2 to make the voltage of above measuring
Point to be the standard value.
And confirm that the voltage of 「TB1 2RT+」 ~ 「TB1 2RT-」, 「TB1 3RT+」 ~ 「TB1 3RT-」 on GTERM PWB are the same.

Adjustment : VR2

* related part : VR1

5.6.2 "Gain" adjustment

* Note : Perform this adjustment certainly after completion of item 5.6.1.

±30° /min. DC±5V Specification

Measuring point : GTERM PWB 「TB1 1RT+」 ~ 「TB1 1RT-」

Standard : DC±5V ±0.33V

Adjustment method : Confirm that the indication is 「30.0」 after setting the circular angle speed to 「+30/min.」.

Mode indication indicates 「rt」.

At this time, adjust VR1 to make voltage of above measuring point to be DC+5V ± 0.33V.

Next set the circular angle speed to 「-30° /min.」.

Mode indication indicates 「rt-」,and confirm that data indication is 「30.0」.

At this time, confirm that the voltage of above measuring point is DC -5V ±0.33V.

Also conform that the voltage of 「TB1 2RT+」~「TB1 2RT-」,「TB1 3RT+」~「TB1 3RT-」 on GTERM PWB are the same.

Adjustment : VR1

±120° /min. DC±10V Specification

Measuring point : GTERM PWB 「TB1 1RT+」~「TB1 1RT-」

Standard : DC±10V ±0.33V

Adjustment method : Confirm that the indication is 「120.0」 after setting the circular angle speed to 「+120/min.」.

Mode indication indicates 「rt」.

At this time, adjust VR1 to make voltage of above measuring point to be DC+10V ± 0.33V.

Next set the circular angle speed to 「-120° /min.」.

Mode indication indicates 「rt-」,and confirm that data indication is 「120.0」.

At this time, confirm that the voltage of above measuring point is DC -10V ±0.33V.

Also conform that the voltage of 「TB1 2RT+」~「TB1 2RT-」,「TB1 3RT+」~「TB1 3RT-」 on GTERM PWB are the same.

Adjustment : VR1

±300° /min. DC±10V Specification

Measuring point : GTERM PWB 「TB1 1RT+」~「TB1 1RT-」

Standard : DC±10V ±0.33V

Adjustment method : Confirm that the indication is 「300.0」 after setting the circular angle speed to 「+300/min.」.

Mode indication indicates 「rt」.

At this time, adjust VR1 to make voltage of above measuring point to be DC+10V ± 0.33V.

Next set the circular angle speed to 「-300° /min.」.

Mode indication indicates 「rt-」,and confirm that data indication is 「300.0」.

At this time, confirm that the voltage of above measuring point is DC -10V ±0.33V.

Also conform that the voltage of 「TB1 2RT+」～「TB1 2RT-」,「TB1 3RT+」～「TB1 3RT-」 on GTERM PWB are the same.

Adjustment : VR1

5.6.3 Confirmation of "Scale over signal"

* No adjustment, only confirmation is required.

5.6.3.1 ±30° /min. DC±5V Specification

Measuring point : GTERM PWB 「TB1 1SO+」～「TB1 1SO-」, 「TB1 2SO+」～「TB1 2SO-」, 「TB1 3SO+」～「TB1 3SO-」

Standard : DC +10V～ +12V / DC −10V～-12V (value under non loaded condition)

Adjustment method : Confirm that the indication is 「32.0」 after setting the circular angle speed to 「+32/min.」.

Mode indication indicates 「rt」.

Confirm that the voltage of above measuring point is DC +10V ～ +12V.

Next set the circular angle speed to 「-32° /min.」.

Mode indication indicates 「rt-」 and confirm that data indication is 「30.0」.

At this time, confirm that the voltage of above measuring point is DC −10V ～ -12V.

5.6.3.2 ±120° /min. DC±10V Specification

Measuring point : GTERM PWB 「TB1 1SO+」～「TB1 1SO-」, 「TB1 2SO+」～「TB1 2SO-」, 「TB1 3SO+」～「TB1 3SO-」

Standard : DC +10V～ +12V / DC −10V～-12V DC±10V ±0.33V

Adjustment method : Confirm that the indication is 「130.0」 after setting the circular angle speed to 「+130/min.」.

Mode indication indicates 「rt」.

Confirm that the voltage of above measuring point is DC +10V ～ +12V.

Next set the circular angle speed to 「-130° /min.」.

Mode indication indicates 「rt-」 and confirm that data indication is 「130.0」.

At this time, confirm that the voltage of above measuring point is DC −10V ～ -12V.

5.6.3.3 ±300° /min. DC±10V Specification

Measuring point : GTERM PWB 「TB1 1SO+」 ~ 「TB1 1SO-」,
「TB1 2SO+」 ~ 「TB1 2SO-」, 「TB1 3SO+」 ~ 「TB1 3SO-」

Standard : DC +10V~ +12V / DC −10V~-12V

Adjustment method : Confirm that the indication is 「330」after setting the circular angle speed to 「+320/min.」.
Mode indication indicates 「rt」.
Confirm that the voltage of above measuring point is DC +10V ~ +12V.
Next set the circular angle speed to 「-320° /min.」.
Mode indication indicates 「rt-」 and confirm that data indication is 「320.0」.
At this time, confirm that the voltage of above measuring point is DC −10V ~ -12V.

5.7 MCOIF PWB / SCOIF PWB (Type D) Fig. 5.13 / 5.14

*Make adjustment of circular angle speed signal (analogue signal)

*Perform adjustment after more than 1 minute from each gyros start up with "ROTI mode".

*Point of adjustment (VR1, 2), adjustment method and point of confirmation are the same as item 5.5.

Point of adjustment is the same for No.1 and No.2 gyro. Adjust with one gyro and change over gyro, confirm each voltage deviation, then adjust to make both to be within the standard value.

* Remark : It can be adjusted more correctly by using "the extended menu A-2 : 2.d.o and A-2 : 2.F.G" of one gyro, however normally adjustment by VR1/2 is enough for use.

5.8 ICIF PWB (Type I) Fig. 5.16

* Confirm control power supply voltage and power supply voltage for communication.
Make only confirmation because these power supply is fixed.

5.8.1 Control power supply voltage (VCC)

Measuring point : ICIF PWB 「TP2」 ~ 「TP1」 (Polarity : 「TP2」 is 「+」)

Standard : DC5V ±0.2V

5.8.2 Power supply voltage for communication (E5V)

Measuring point : ICIF PWB 「TP5」 ~ 「TP4」 (Polarity : 「TP5」 is 「+」)

Standard : DC5V ±0.2V

5.9 RPCC PWB (serial type repeater) Fig. 5.30

* It has been already adjusted at factory before shipment. Accordingly, it does not required to adjust the RPCC PWB However, it is required to adjust if this PWB, ZRCR PWB or step motor was replaced.

Measuring point : Card

Standard : ±0.2°

Adjustment method : Start gyro compass system with 「test mode B」.

: Set the bearing of master compass to 「0° 」.

At this time, adjust with below instruction, DIGSW and DIPSW to make the indication of repeater compass card to be the standard value.

Adjustment : DIGSW : S2 DIPSW : only use S1 – 7 bit

* Range of adjustment is ±1.5°

Set DIGSW to the value of o.1° unit and DIPSW to the "polarity" (ON : minus).

Example : Case of the true bearing of master compass [0°], the indicated bearing of repeater, [1°]. :

DIGSW 「A」, DIPSW 「ON」 in case of setting –1.0° .

After setting the amended value at 0° , confirm the deviation at each bearings by rotating the master compass for 45° by 45° , then confirm that each deviations become less than ±0.2° .

In case each deviations is not less than ±0.2° , change the setting of above] switches and set again to distribute the deviation of each bearings.

Table 5.1 Trimmer function for adjustment

Unit	PWB	No.	Function
Master Compass	MCC PWB	VR1	Phase Adjustment for P/U signal of the sensitive element
	HRZC PWB	VR1	Adjustment of the sensitive element N-S direction hunting
		VR2	Adjustment of the sensitive element level (N-S direction)
	INVERTER PWB	VR1	Adjustment of the rotor voltage AC100V rms (400Hz)
Control Unit (Type I/S/D/)	GPOWER PWB	VR1	Adjustment of the power supply (24M) & Voltage (DC24V) for the master compass.
		VR2	Adjustment of the power supply (24M) & the overcurrent limit value DC24V for the master compass (Adjustment : Prohibition)
		VR3	Adjustment of the power supply (24M) & the overcurrent limit value DC24V for the master compass (Adjustment : Prohibition)
Control Unit (Type S)	MIFC/SIFC PWB	VR1 VR2	Gain adjustment of circular angle speed signal (analogue signal) Off set adjustment of circular angle speed signal (analogue signal)
Control Unit (Type D)	MOIF/SOIF PWB	VR1 VR2	Gain adjustment of circular angle speed signal (analogue signal) Off set adjustment of circular angle speed signal (analogue signal)

AZIFC adjustment

5.10.1 Azimuth sensor exiting source

5.10.1.1 voltage adjust.

Voltage depend on R.M.S

Between TP1 – TP18

AC 8.5v ± 0.2 5000Hz ±50

Adjust by VR3

5.10.1.2. Azimuth sensor exiting frequency

Between TP1 – TP18

5kHz ± 1%

5.10.2 Azimuth sensor out put signal (Sin / Cos wave)

this adjusting to be same it Sin / Cos max value

but never adjust that lower than DC + 3.9v / (−3.9v)

in case Sin DC + 4.2v / (−4.2v) , Cos DC + 4.5v / (−4.5v)

have to adjust Cos DC + 4.2v / (−4.2v).

5.10.2.1. Cos signal

Check TP1 – TP14 not available to DC + 4.5v / (−4.5v)

1) VR2 turn CW at max and little bit back CCW.

2) Azimuth sensor exiting adjust VR3 between TP1- TP14
to be readjust DC + 4.5v / (−4.5v).
In order this adjust take no notice previous adjust voltage of AC 8.5v .
Even this adjust procedure but not be able to DC + 4.5v / (−4.5v)
That case adjust DC + 4.0v / (−4.0v) ± 0.1v , also 5.10.2.2 item Sin signal to be same.
This result TP1- TP14 are
DC−4.5v± 0.1v (azimuth 000°)
DC + 4.5v± 0.1v (azimuth 180°)
0v± 0.1v (azimuth 090° & 270°)

Actual adjust : magnetic compass heading point be put 000° , and screw (2 pcs) of " azimuth sensor " loosen .
there are freedom zone approximate 14° so ,have to decide exactly mechanical / electrical / magnetically " Zero " point as follow,
Check voltage of TP1 – TP14 minus (−) maximum by mechanical moving (move area approximate 14°), after that fixed the screw (2 pcs)

Adjust : TP1- TP14 are DC−4.5v± 0.1v (azimuth 000°) by VR2.

Confirm : TP1- TP14 are DC+4.5v± 0.1v (azimuth 180°)

Confirm : TP1- TP14 are 0v± 0.1v (azimuth 090° & 270°)

5.10.2.2. Sin signal

Check TP1 – TP9 not available to DC + 4.5v / (−4.5v)

1) VR1 turn CW at max and little bit back CCW.

2) Azimuth sensor exiting adjust VR3 between TP1- TP9
to be readjust DC + 4.5v / (−4.5v).
In order this adjust take no notice previous adjust voltage of
AC 8.5v .
Even this adjust procedure but not be able to DC + 4.5v / (−4.5v)
That case adjust DC + 4.0v / (−4.0v) ± 0.1v , also 5.10.2.1 item
Cos signal to be same.
This result TP1- TP9 are
DC−4.5v± 0.1v (azimuth 270°)
DC + 4.5v± 0.1v (azimuth 090°)
0v± 0.1v (azimuth 000° & 180°)

Adjust : TP1- TP14 are DC+4.5v± 0.1v (azimuth 090°) by VR1.
Confirm : TP1- TP14 are DC−4.5v± 0.1v (azimuth 270°)
Confirm : TP1- TP14 are 0v± 0.1v (azimuth 000° & 180°)

5.10.3. Check azimuth accuracy

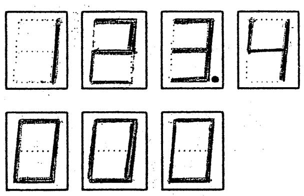
* One (1) cycle correction value which setting inside to be "0".
  Magnetic compass heading around every 45° turn 360° and
  Check eight (8) points then those points error to be within ±3° .
* Incase If this error more than ±3° , carry out again 5.10.2 item .
  to be confirm difference between Sin to Cos signal voltage not so big.
  After complete above procedure ,next item 5.11 carry out.

5.11 1 CYCLE ERROR VALUE MEASUREMENT MODE

① Turn on with pushing “ACK/ENT” and “▼” together.

② Display become as follows

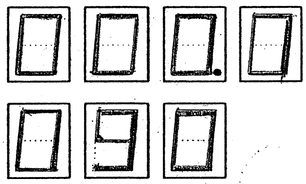
DATA DISPLAY UNIT
MODE DISPLAY UNIT



DATA DISPLAY UNIT displays Magnetic Compass azimuth.
MODE DISPLAY UNIT displays “0000”, this means 0 degrees measuring presently .

③ Push “ACK/ENT” switch after Magnetic Compass indicator put 0 degrees.
After that , then DISPLAY UNIT shown as follows. Measure 90 degrees

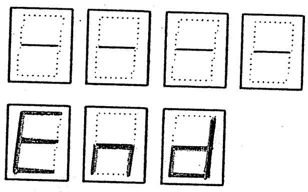
DATA DISPLAY UNIT
MODE DISPLAY UNIT



④ Push “ACK/ENT” switch after Magnetic Compass indicator put 90 degrees.
Push “ACK/ENT” switch after Magnetic Compass indicator put 180 degrees and 270 degrees as same as previous.

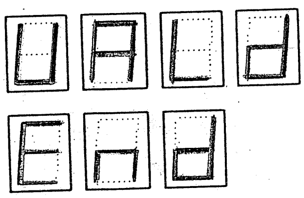
⑤ DISPLAY UNIT shown as follows after finished measurement 270 degrees.

DATA DISPLAY UNIT
MODE DISPLAY UNIT



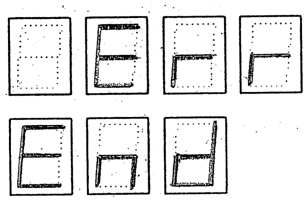
⑥ Calculation for 1 cycle error value starts after pushing “ACK/ENT”
If the value of calculation result(fixed, Sin and Cos error value) are less than or up to (+/- 15 degrees) range , DISPLAY UNIT shown as follows, all values are memorized for Non-volatile.

DATA DISPLAY UNIT
MODE DISPLAY UNIT



If the values are out of (+/- 15 degrees) range, DISPLAY UNIT shown as follows.

DATA DISPLAY UNIT
MODE DISPLAY UNIT



⑦ Confirm the values of result in Extension menu.

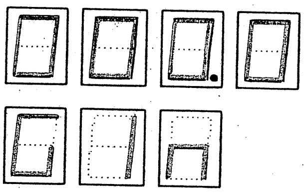
⑧ Off and On this system, Magnetic compass turns 0 -> 90 -> 180 -> 270 heading , confirm
Value between this system "MAG" indication value(digital) and magnetic compass indication value(card) , their difference is less than +/- 1 degrees.

Confirmation for Sin(Cos) signal analog gain measure of the system

① Turn on with pushing "DISP" "SET" and "▲" together.

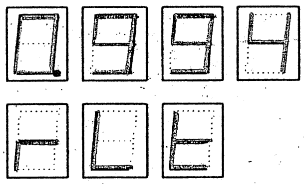
② Display become as follows

DATA DISPLAY UNIT
MODE DISPLAY UNIT



③ Magnetic compass turn around 360 degrees(turn direction is not fixed)
After turns, DISPLAY UNIT shown as follows.

* Normal situation
DATA DISPLAY UNIT
MODE DISPLAY UNIT

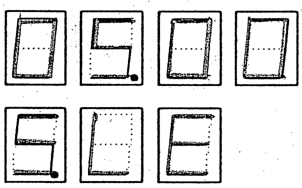


DATA UNIT displays gain value (Sin signal / Cos signal)

* In case Sin value or Cos value is over the range (less than 4.0V or over than 5.0V)

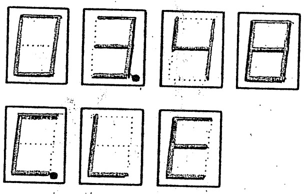
This case DATA DISPLAY UNIT shown out of range voltage that Sin signal abnormal

DATA DISPLAY UNIT
MODE DISPLAY UNIT



In case Cos value is over the range (less than 4.0V or over than 5.0V) .
MODE DISPLAY UNIT shown as below.

DATA DISPLAY UNIT
MODE DISPLAY UNIT



④ Push "ACK/ENT" after normal measurement.

⑤ Turn OFF this system, confirm that all values are memorized by Extension menu

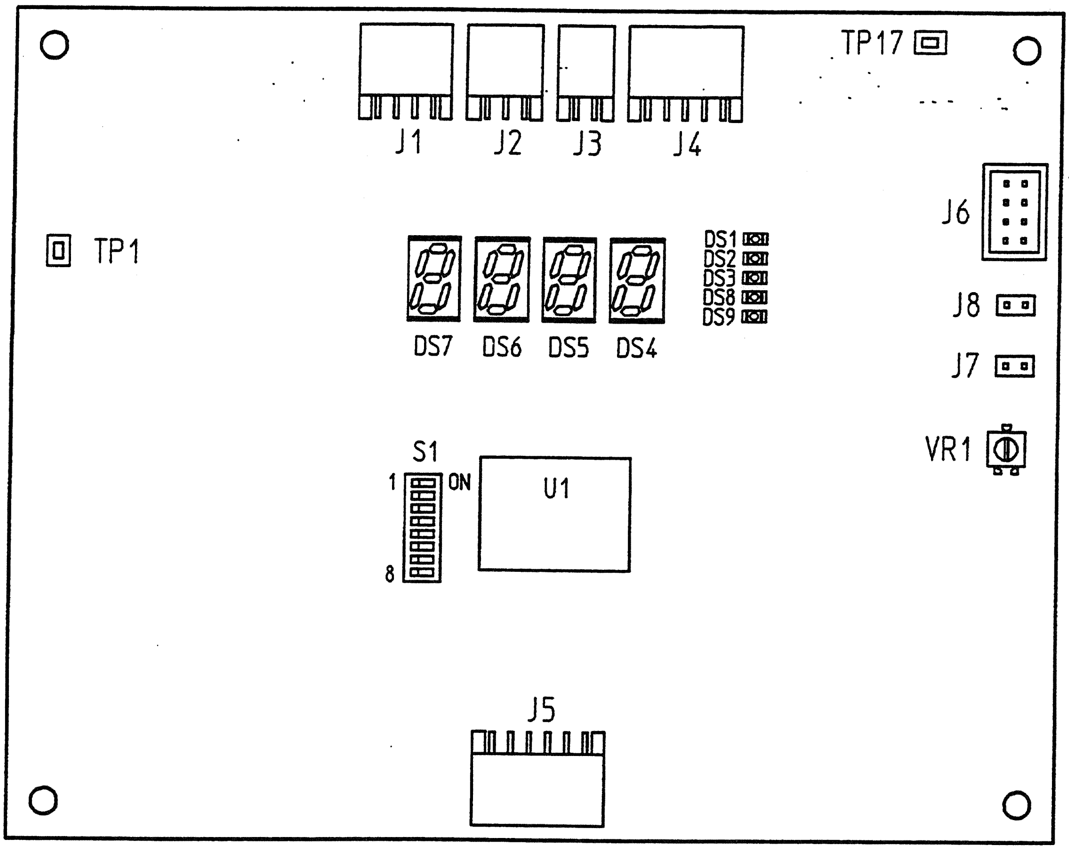


Fig5.1 MCC pwb

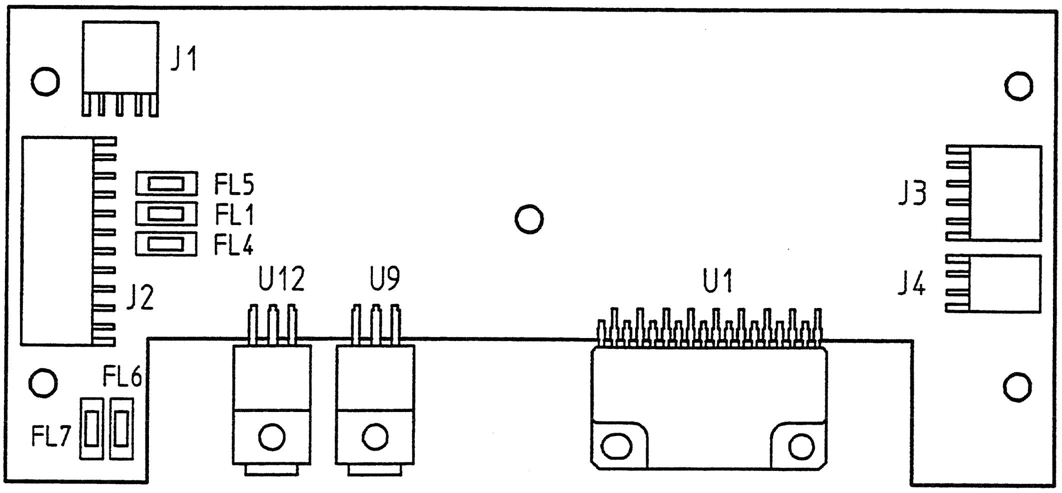


Fig5.2 SMCC pwb

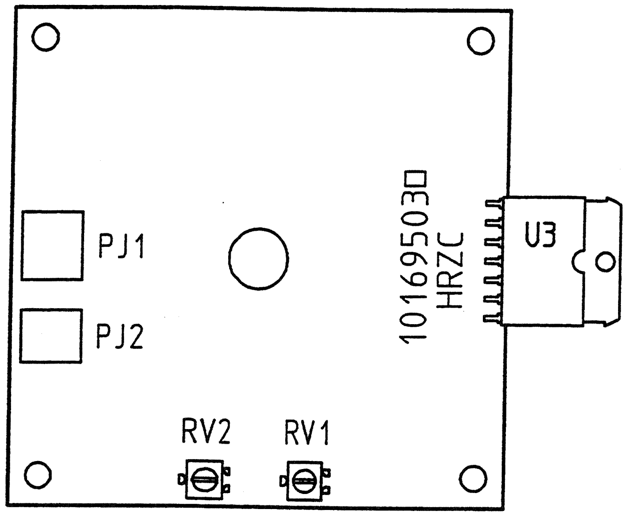


Fig5.3 HRZC pwb

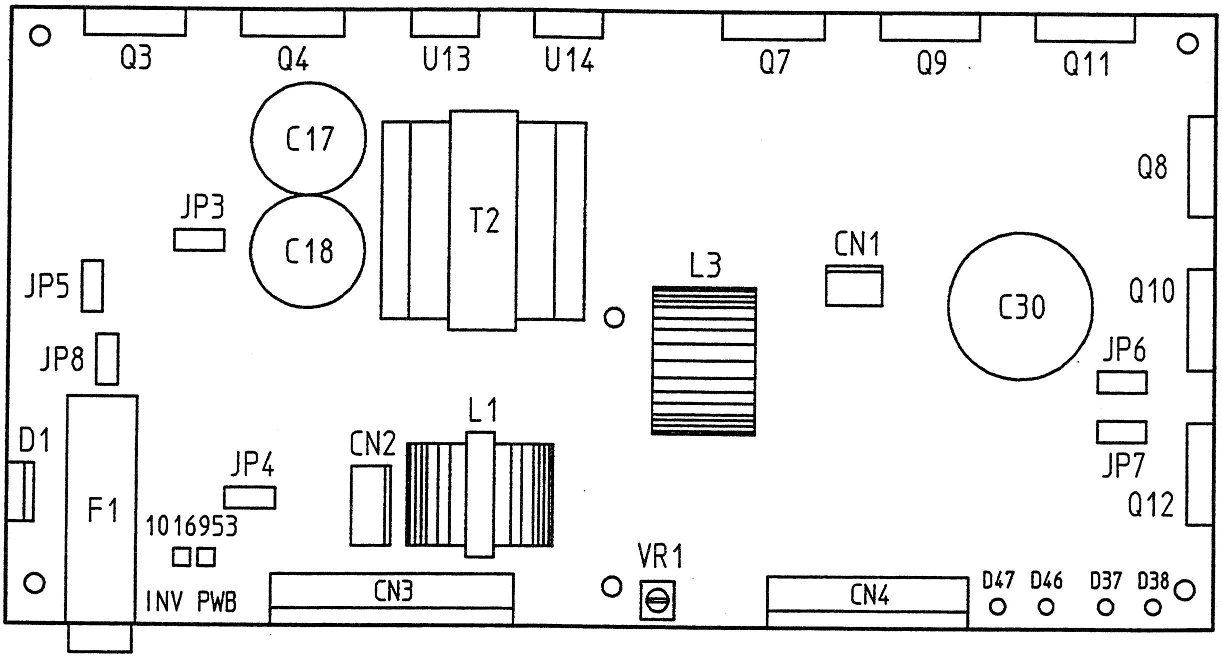


Fig5.4 INVERTER pwb

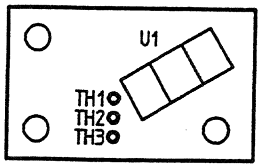


Fig5.5 ZRCR pwb

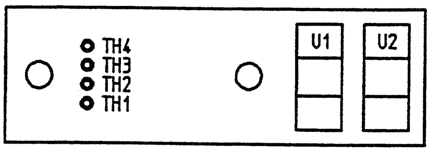


Fig5.6 ENCC pwb

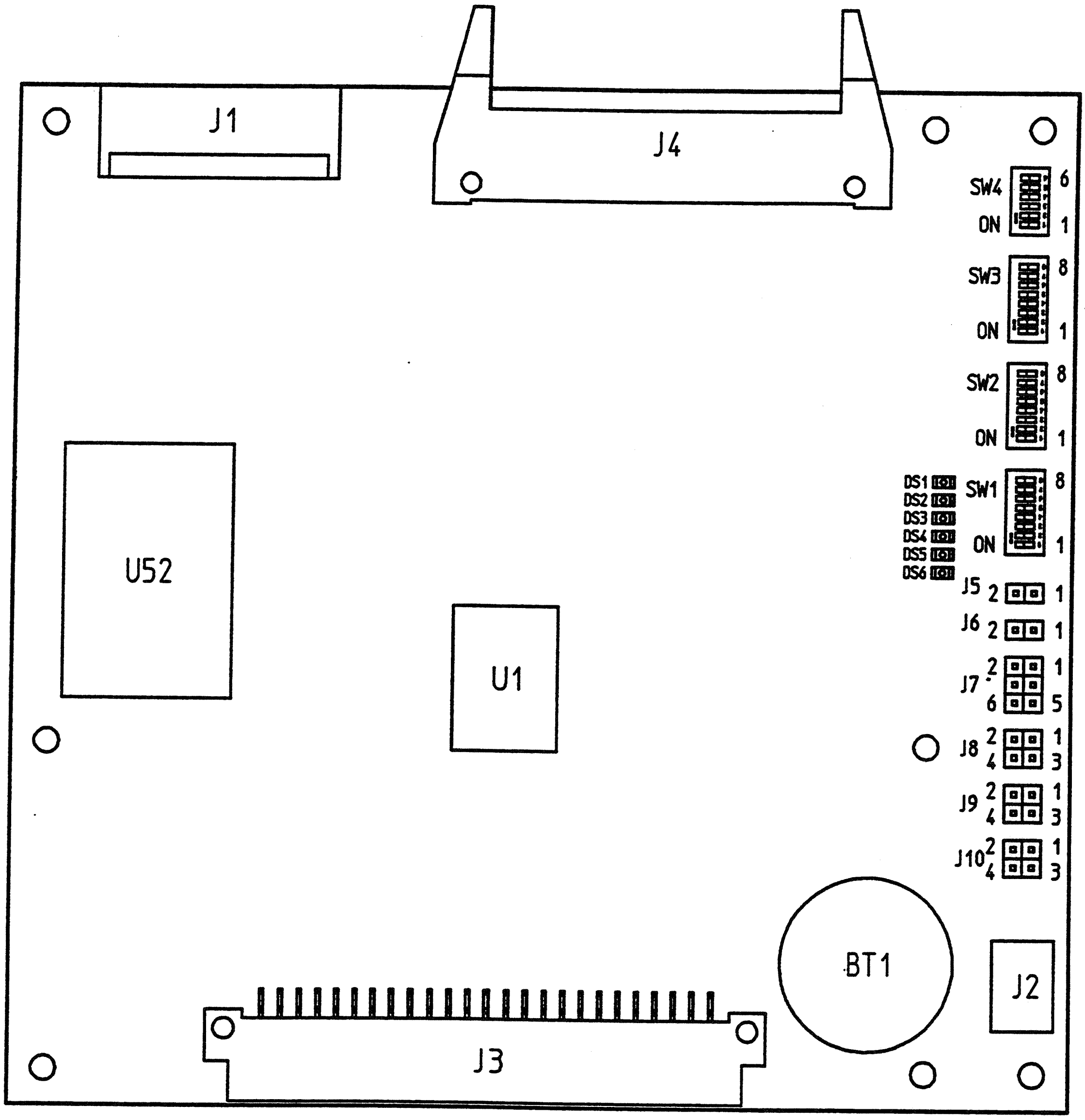


Fig5.10 SCC pwb

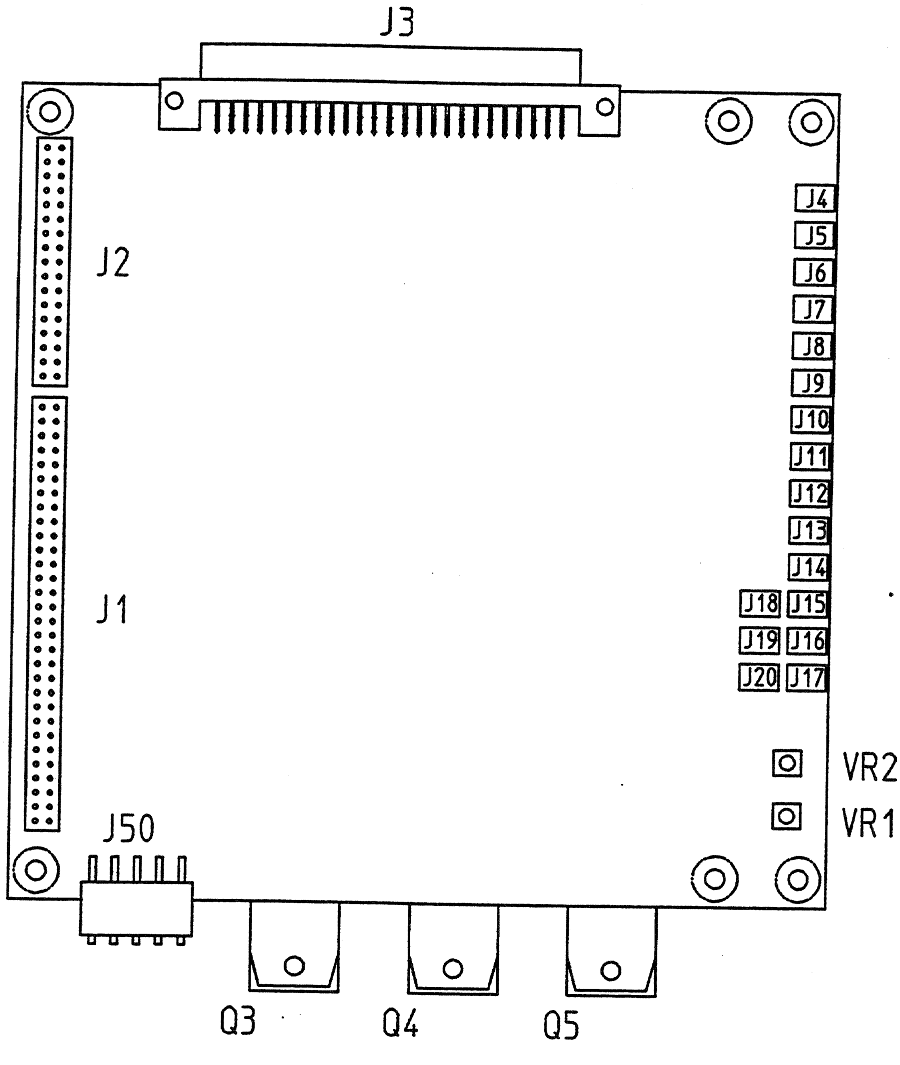


Fig5.11 MIFC PWB

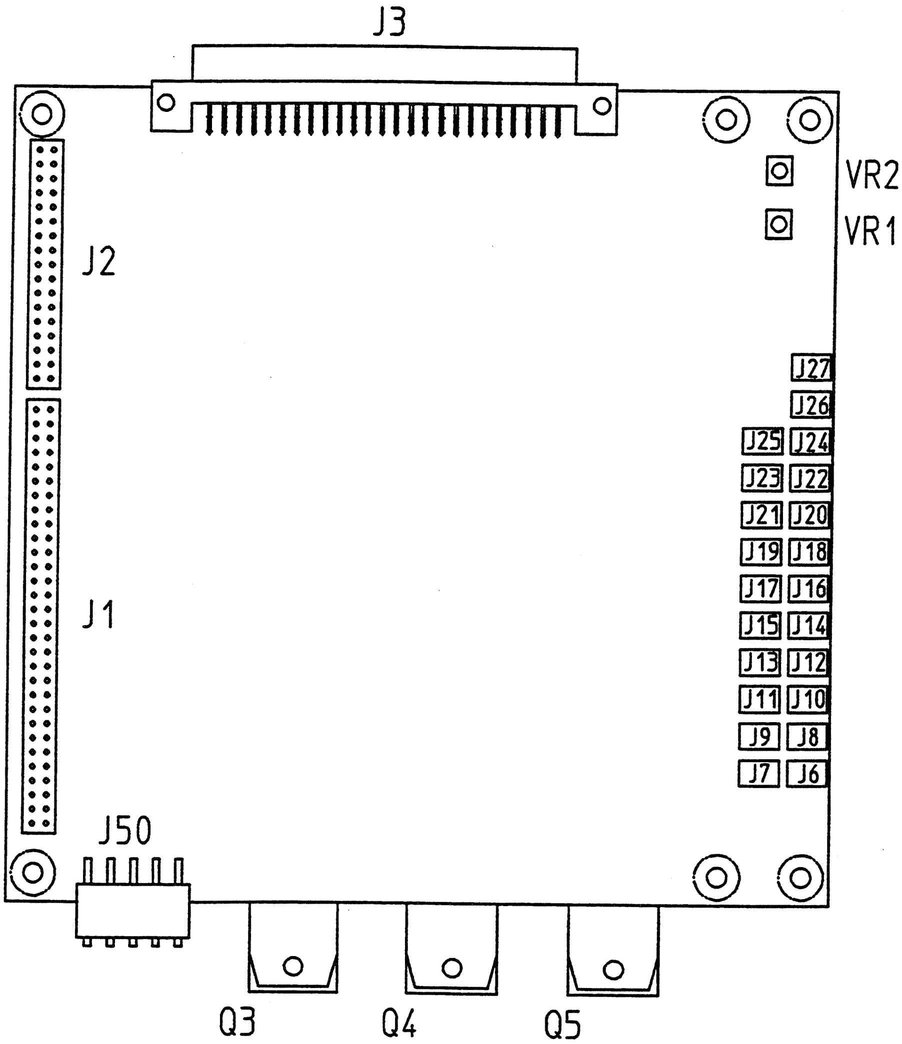


Fig5.12 SIFC PWB

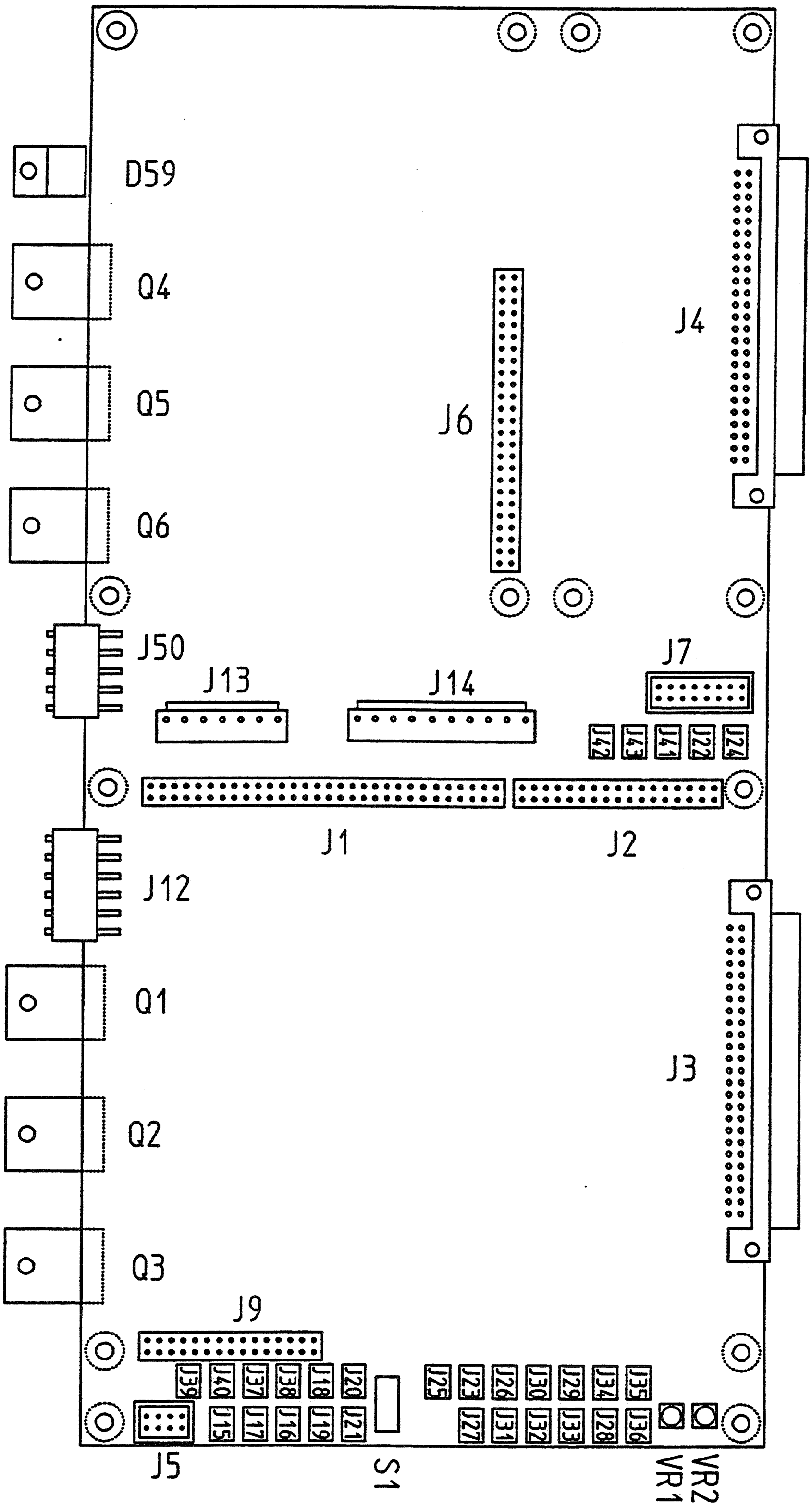


Fig5.13 MCOIF PWB

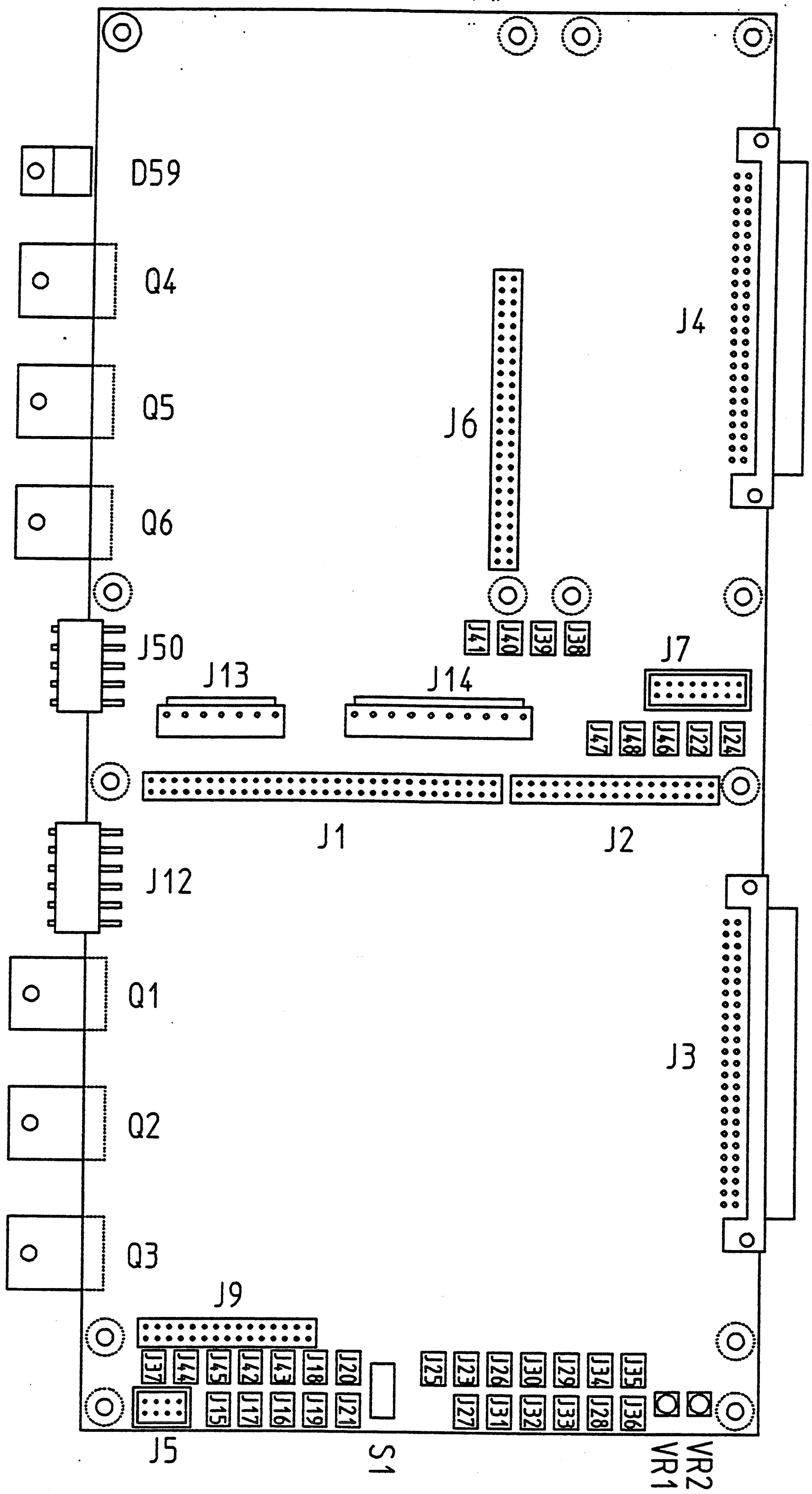


Fig5.14 SCOIF PWB

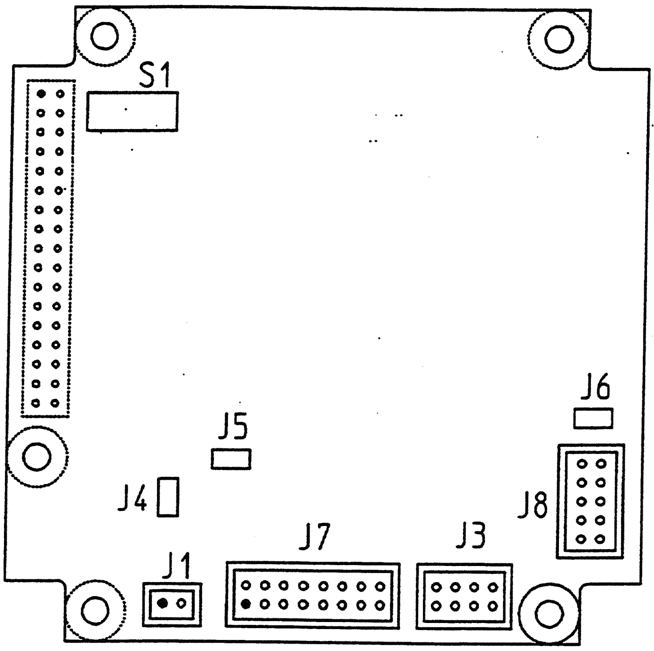


Fig5.15 PCC PWB

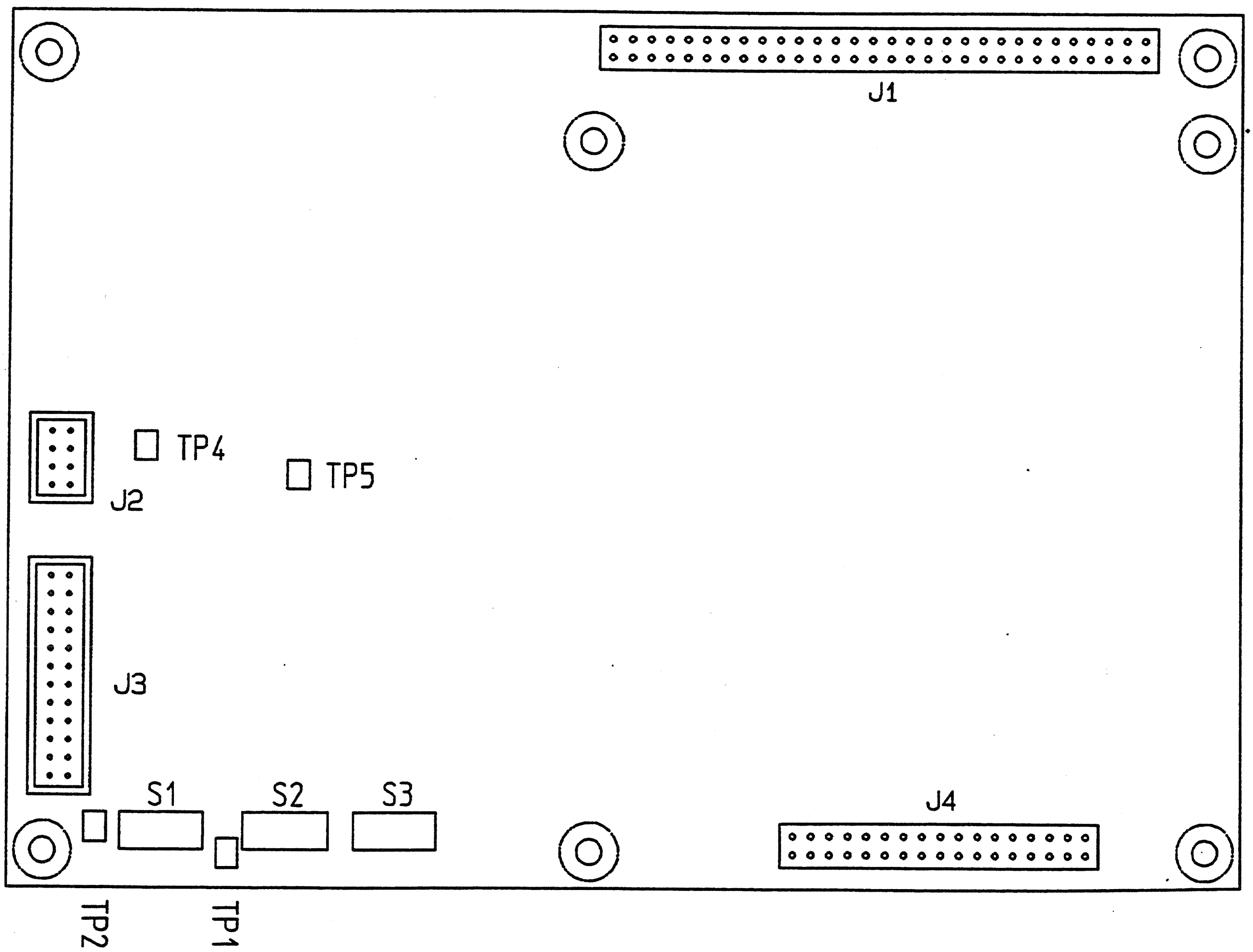


Fig5.16 ICIF PWB

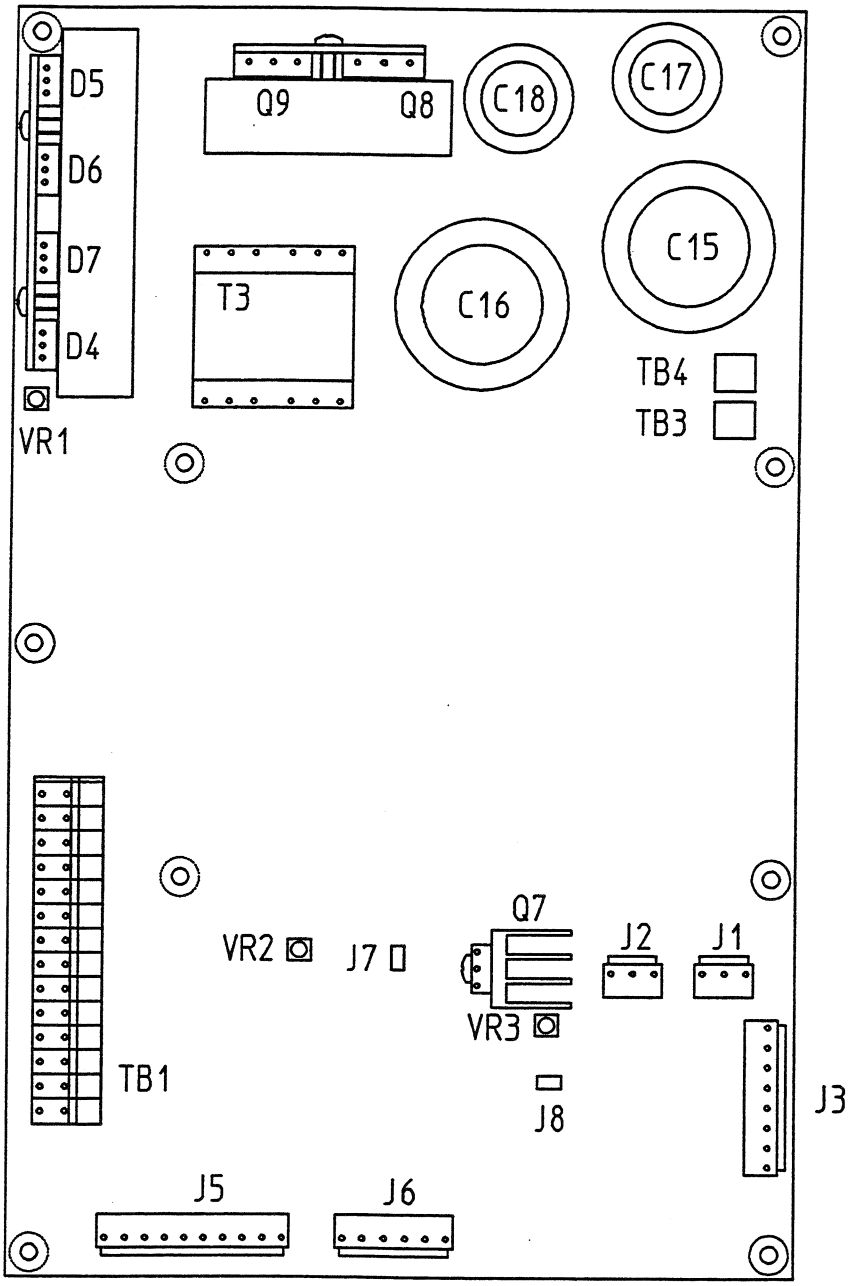


Fig5.17 GPOWER PWB(1)

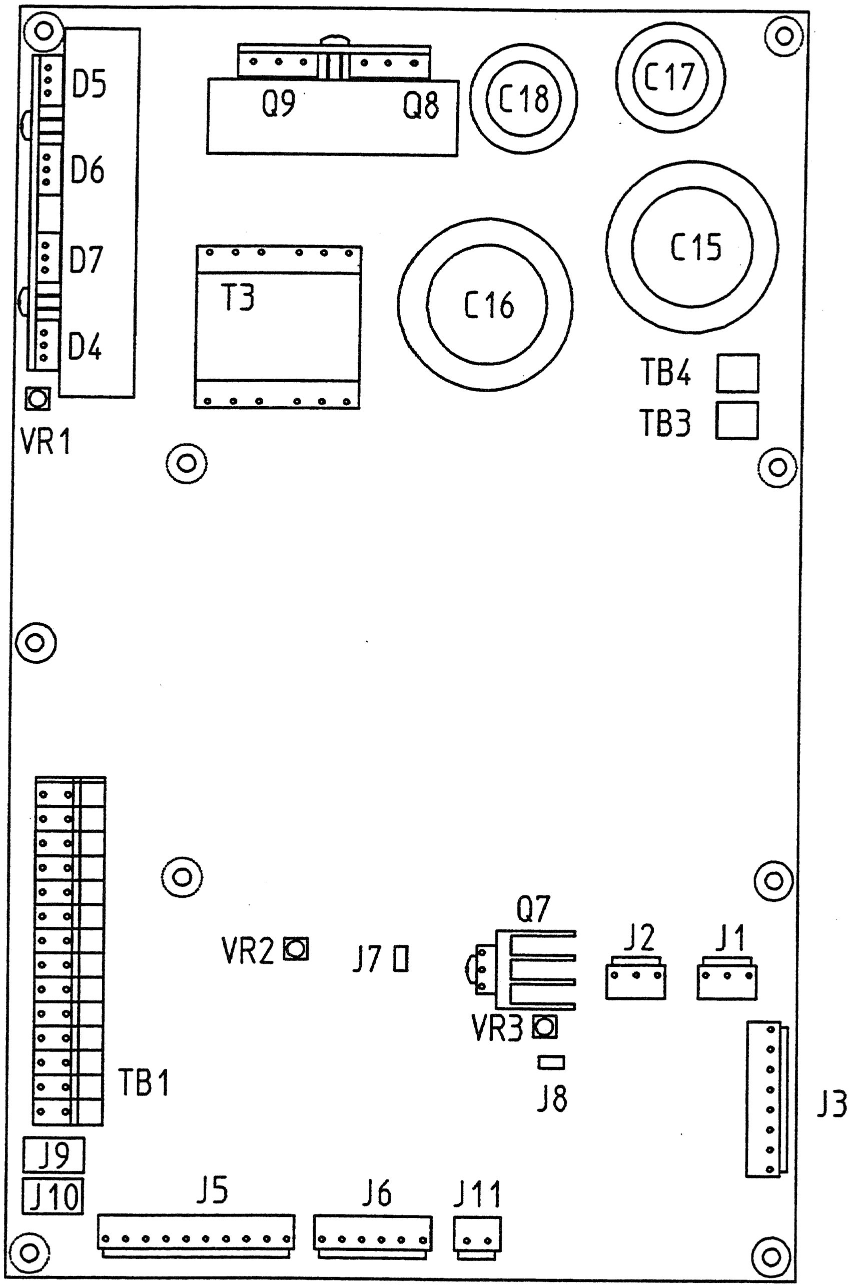


Fig5.18 GPOWER PWB(2)

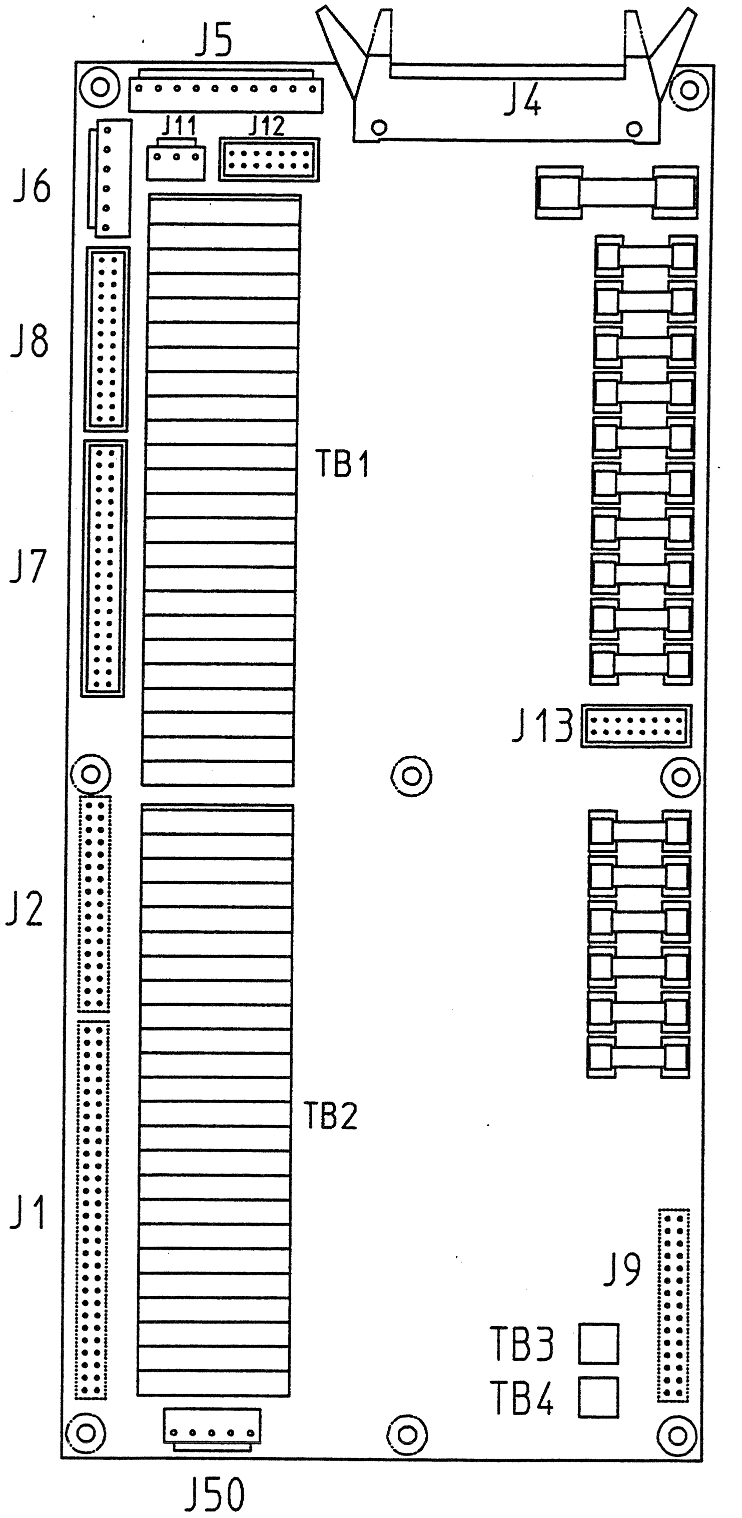


Fig5.19 GTERM PWB

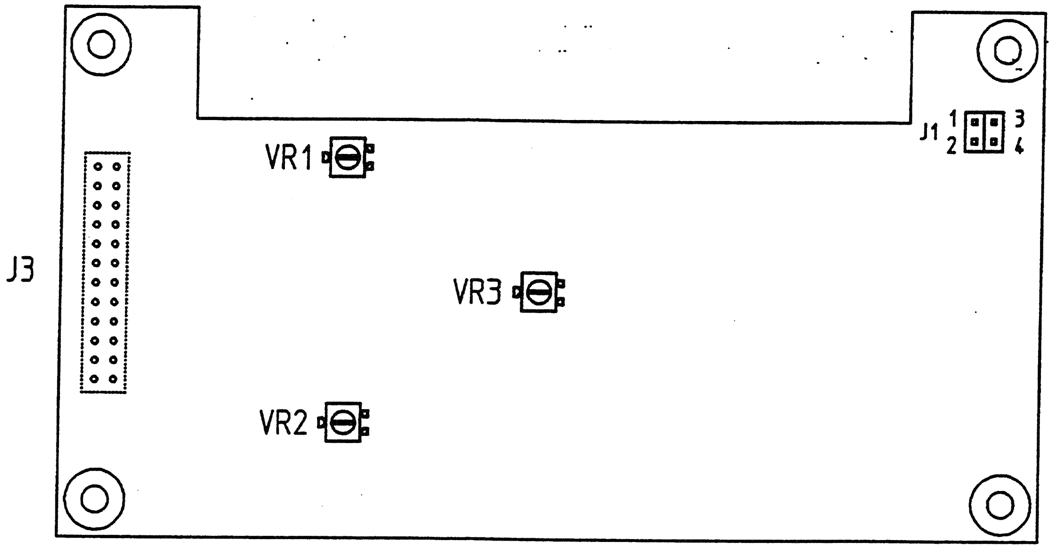


Fig5.20 AZIFC PWB

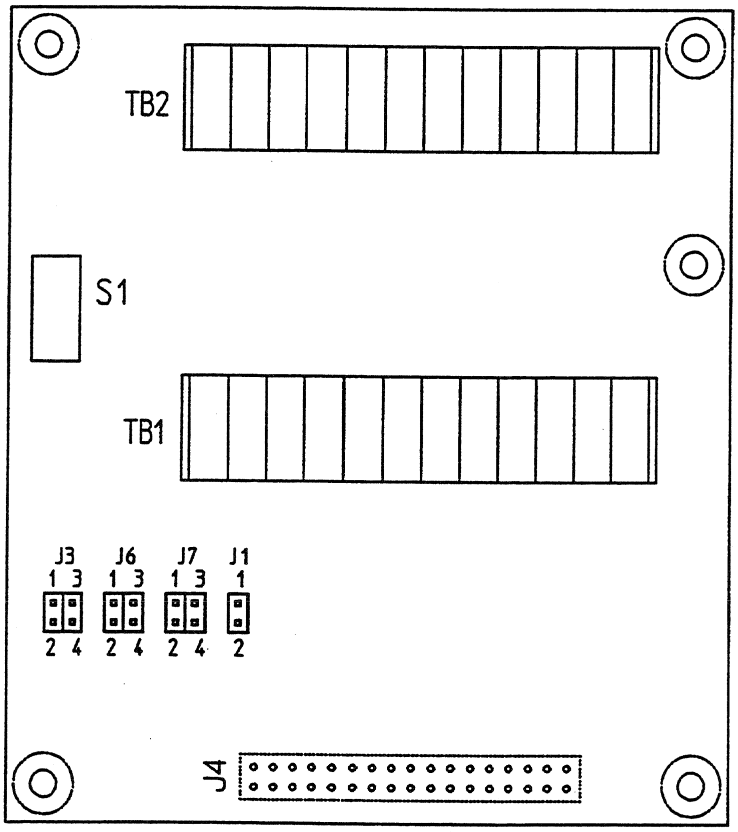


Fig5.21 IOPT PWB

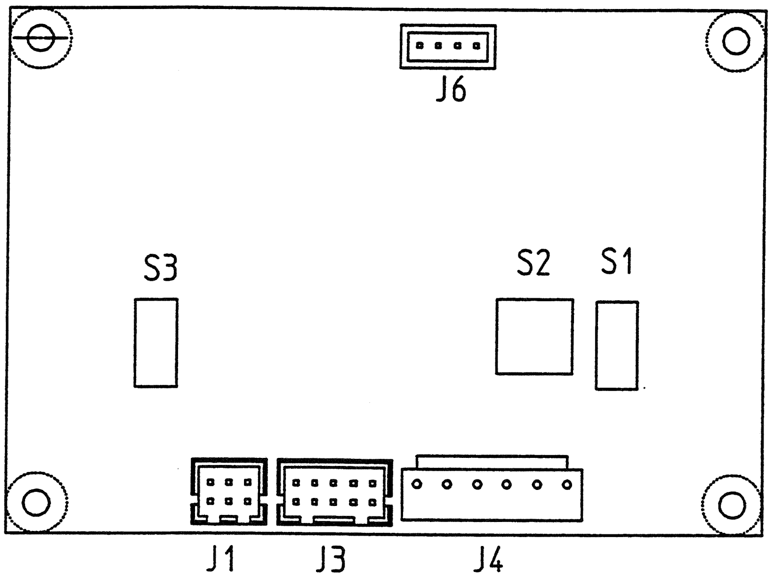


Fig5.30 RPCC PWB

CHAPTER 6 MAINTENANCE

CHAPTER 6 Maintenance

6.1 Maintenance interval

Periodical maintenance should be performed once two years.

6.2 Maintenance work

6.2.1 Control unit

Specially the following items are to be performed.

(1) Record of manufacturing number

(2) Power switch operation

(3) Starting sequence operation

The following items are also performed to confirm the starting sequence operation.

1) When started from the state where the gyro rotor has been stopped

After started, push [ACK / ENT] key during the last azimuth, and record the time until "the right most dot in the mode indicator" goes off.

TG-8000 standard	:	Less than 4 min.
TG-8000 special specifications	:	Less than 5 min.
TG-8500	:	Less than 34 min.

2) When started again after turned "OFF" once the power switch in the state where the gyro rotor was under full rotation.

When started, "the right most dot in the mode indicator" goes blinking.

It shows that the gyro rotor is under rotation.

Record the time until "the right most dot in the mode indicator" blinking turns to lit.

TG-8000 / 8500: Less than 4 min.

(4) Each indication and operational condition of the operating panel

(5) Dimmer function of each indicator on the operating panel

(6) Lamp test function

(7) Main power supply alarm function (buzzer, alarm indication, alarm stop [ACK / ENT] switch and error code indication)

(8) Data record in the extended menu (record of software version installed in the SCC and MCC pwb)

6.2.2 Master compass

Specially the following items are to be performed.

* Stop the gyro rotor perfectly before starting maintenance work.

It will take around 30 minutes until the gyro rotor stops perfectly since turning "OFF" the power switch in the steady state running.

Perform the following items after the gyro rotor stopped.

(1) Record the sensitive element number.
(2) Record manufacturing number.
(3) Check flexible wires (scratch and elasticity)
(4) Check the timing belt of the step motor (scratch and looseness)
Confirm spring tension of the tensioner because it effects timing belt looseness.
(5) Follow-up gear in the bearing system (scratch and dirts)
(6) Contact resistance (less than 0.5 ohm) between the slip-ring and brush and dirts
* Measure resistance between the slip-ring and brush at the following points.
Also, during this measurement, slowly rotate the phantom ring for 360 degrees.
Slip-ring A: Connector J1-1 for SMCC pwb and connector J2-1 for MCC pwb
Slip-ring D: Connector J1-2 for SMCC pwb and connector J2-2 for MCC pwb
Slip-ring M: Connector J1-3 for SMCC pwb and connector J2-3 for MCC pwb
Slip-ring B: Connector J1-4 for SMCC pwb and connector J2-4 for MCC pwb
Slip-ring H: Connector J1-5 for SMCC pwb and connector J2-5 for MCC pwb
* Clean dirts on the slip-ring and the brush with "cotton tape", and apply "Applube" by a cotton swabs. Try to apply "Applube" lightly not to run from the ring.
If some wear is observed on the brush and slip-ring, replace it.
(7) The shock absorbers should have adequate spring pressure for all directions.
(8) Check looseness for connectors and screws.
(9) Check wear on the ball bearing in the horizontal ring.

6.2.3 Check of voltage of power supplies (Refer to figures in Chapter 5 for check of each pwbs)

(1) External terminal board of the master compass
Voltage between N+ and N- of MTTRM pwb TB1: 24 V DC 2 V
Voltage between 1 and 2 of MTTRM pwb J11: 24 V DC 2 V
(2) Repeater power supply (control unit I / S / D)
Voltage between x5 and x4 (Comm.) of GTERM pwb TB1/2: 24 V DC ±4 V
(3) Gyro rotor power supply (master compass)
Voltage between connector CN4 pin 6 and 7 of INVERTER pwb :
100 V ACrms ± 1 V Frequency: 400 Hz±3 Hz
(4) Step motor control power supply (master compass)
Voltage between connector CN4 pin 3 and 4 of INVERTER pwb: 12 V DC±1 V
(5) Panel power supply (control unit I / S / D)

Check terminal between TP4 and TP3 (Comm.) of GPANEL pwb: 24 V DC±4 V

Check terminal between TP2 and TP1 (Comm.) of GPANEL pwb: 5 V DC±0.1 V

(6) HDM operating panel power supply (control unit)

Check terminal between TP2 and TP1 (Comm.) of PCC pwb: 5 V DC±0.1 V

(7) Control power supply (control unit I)

Check terminal between TP2 and TP1 (Comm.) of ICIF pwb: 5 V DC±0.1 V

Check terminal between TP5 and TP4 (Comm.) of ICIF pwb: 5 V DC±0.1 V

*When maintenance / replacement work has completed, perform 3.1.4 and thereafter of Chapter 3.

6.3 Maintenance parts

6.3.1 Master compass

The parts required replacement are shown in Table 6.3.1.

Year for replacement shows only a guideline.

Repair or replace it regardless of this value if any malfunction is detected.

6.3.2 Control unit

The parts required to replace are shown in Table 6.3.2.

Year for replacement shows only a guideline.

Repair or replace it regardless of this value if any malfunction is detected.

This table is for Control unit type-S, and it covers one GPOWER pwb.

The control unit Type-D requires double quantity because it contains two GPOWER pwbs.

6.4 Breaking down procedure for each parts and assemblies

6.4.1 Master compass

6.4.1.1 Dismounting procedure of the sensitive element (Refer to Figure 6.1.)

Remove the connector by removing the M3 pan screws (Figure 6.1-2) fixing this connector of the sensitive element.

Remove four M3 pan head screws (Figure 6.1-4) fixing the sensitive element with inclining the horizontal ring (Figure 6.1-3).

Then dismount the sensitive element from the horizontal ring.

6.4.1.2 Removing procedure of the gimbal bearing (Refer to Figure 6.2 and Figure 6.3.)

- Remove all terminal contacts (Figure 6.2-3) of the harness side entered to the horizontal ring (Figure 6.2-2) from two terminal boards fixed in the phantom ring (Figure 6.2-1).

- Remove a cover (Figure 6.3-4) of the damper case (Figure 6.3-3) fixed on the horizontal ring (Figure 6.3-2).
- Remove a damper shaft (Figure 6.3-5) from S-side axis (Figure 6.3-7).
- Remove three M3 pan head screws (Figure 6.3-6) fixing S-side axis (Figure 6.3-7).
- Remove three M3 pan head screws (Figure 6.3-9) fixing N-side axis (Figure 6.3-10).
- By supporting the horizontal ring (Figure 6.3-2) with hand, remove S-side axis (Figure 6.3-7), shim (Figure 6.3-8) and N-side axis (Figure 6.3-10), then remove the horizontal ring from the phantom ring.
- Remove N-side bearing (Figure 6.3-13).
- Remove two M3 pan head screws (Figure 6.3-11) fixing the damper case (Figure 6.3-3) on the horizontal ring, and remove the damper case.
- Remove S-side bearing (Figure 6.3-12).

6.4.1.3 Removing procedure of the horizontal axis bearing (Refer to Figure 6.4 and Figure 6.5.)

- Remove the connector PJ1 of the HRZC pwb (Figure 6.4-1) fixed on the housing (Figure 6.4-2).
- Remove four M3 pan head screws (Figure 6.5-1) fixing the housing (Figure 6.5-2) and the HRZC pwb (Figure 6.4-1).
- Remove the HRZC pwb (Figure 6.4-1), the housing (Figure 6.5-2) and the shield plate (Figure 6.5-3) from the horizontal ring (Figure 6.5-8).
- Remove a bearing (Figure 6.5-4) from the housing (Figure 6.5-2).
- Remove two M4 flat head screws (Figure 6.5-5) fixing the axis (Figure 6.5-6).
- Remove the axis (Figure 6.5-6) and the shield cover (Figure 6.5-7) from the mounting ring (Figure 6.5-11).
- Remove three M3 pan head screws (Figure 6.5-10) fixing the axis (Figure 6.5-9) on the horizontal ring (Figure 6.5-8).
- Remove the axis (Figure 6.5-9) from the horizontal ring (Figure 6.5-8).
- Remove the bearing (Figure 6.5-12) from the mounting ring (Figure 6.5-11)

6.4.1.4 Removing procedure of a bearing of the bearing follow-up axis (Refer to Figure 6.6 and Figure 6.7)

- Confirm that the sensitive element has been removed.
- Remove the nuts (Figure 6.6-3) fixed on the upper portion of four supports (Figure 6.6-9) fixed on the lower bracket (Figure 6.6-2), and remove spring

washer (Figure 6.6-4), stopper (Figure 6.6-5), coil spring (Figure 6.6-6) and friction plate (Figure 6.6-7).

- Dismount the upper bracket (Figure 6.6-1) by lifting it up, taking care of the harness, and place it side of the lower bracket (Figure 6.6-2).
- Remove all wires soldered on the relay pwb (Figure 6.7-10) fixed on the bottom of the slip-ring (Figure 6.7-6).
- Remove two M3 pan head screws (Figure 6.7-11) fixing the relay pwb (Figure 6.7-10), and remove the relay pwb and two spacers (Figure 6.7-9).
- Remove flat head screw fixed (Figure 6.7-8) on the holding nut (Figure 6.7-7).
- Remove the holding nut (Figure 6.7-7) fixing the slip-ring (Figure 6.7-6).
- Remove the slip-ring (Figure 6.7-6), the bearing (Figure 6.7-5) and the shim (Figure 6.7-3).
- Remove the phantom ring (Figure 6.7-1) from the upper bracket (Figure 6.7-2), and remove the bearing (Figure 6.7-3).

6.4.1.5 Dismounting and mounting procedure of the step motor unit for the bearing system following-up (Refer to Figure 6.7.)

- Remove four M4 pan head screws (Figure 6.7-12) fixed on the upper bracket (Figure 6.7-2).

  The encoder pwb is mounted on the bottom of the step motor unit.

  The step motor can be removed by removing the connector connected to this pwb.
- To mount it, let engage precisely the bearing follow-up system gear (Figure 6.7-13) with the step motor last stage gear (Figure 6.7-14).

  The bearing follow-up gears consist of two, upper and lower (the upper is fixed to the phantom ring), and they are coupled with two coil springs.

  To engage this gear with the step motor last stage gear, follow the following procedure.

  (1) Confirm "tooth" position relationship of two bearing follow-up gears when they are not engaged with the step motor last stage gear.

  (2) Shift the "tooth" position of two bearing follow-up gears of the above (1) by five teeth.

  (3) In the state of the above (2), engage it with the step motor last stage gear.

6.4.1.6 Dismounting procedure of MCC pwb (Refer to Figure 6.8.)

- MCC pwb is mounted on the mounting plate (Figure 6.8-1) fixed on the upper side of the phantom ring.
- Remove all connectors connected to MCC pwb (Figure 6.8-2).
- MCC pwb can be dismounted by removing four M3 pan head screws (Figure 6.8-3) to fix MCC pwb.

6.4.1.7 Dismounting procedure of SMCC pwb (Refer to Figure 6.8.)

- Remove all connectors connected to SMCC pwb (Figure 6.8-5).
- Three terminal regulator (Figure 6.8-6) of SMCC pwb and the step motor driver (Figure 6.8-7) is fixed on the upper bracket through the heat sink plate (Figure 6.8-4).

  Remove four M3 pan head screws (Figure 6.8-8) fixing this three-terminal regulator (Figure 6.8-6) and the step motor driver (Figure 6.8-7).

  SMCC pwb (Figure 6.8-5) can be dismounted by removing five M3 pan head screws (Figure 6.8-9) fixing it.

6.4.2 Control unit, Type S (Refer to Figure 6.9.)

6.4.2.1 Dismounting procedure of PWB_AZIFC (when with MAG unit)

- Remove four M3 pan head screws fixing this pwb.
- This pwb is connected to PWB_EMCC by the bottom connector.
- Dismount this pwb by extracting vertically to the pwb after removed the screws.

6.4.2.2 Dismounting procedure of PWB_MTERM (when with MAG unit)

- Remove the harness by cutting the cable band as it is fixed on the holding plate (Figure 6.9-3) of this pwb by a cable band.
- Remove all connectors connected to this pwb.
- Remove the fixed four M3 pan head screws (Figure 6.9-2).
- Similarly to the above 6.4.2.1, dismount this pwb by extracting vertically to the pwb as it is connected to PWB_EMCC by the bottom connector.

6.4.2.3 Dismounting procedure of PWB_EMCC (when with MAG or EHS unit)

- Remove PWB_AZIFC and MTERM pwb. (Refer to 6.4.2.1 and 6.4.2.2.)
- Remove all connectors connected to this pwb.
- Remove the fixed eight M3 supports (Figure 6.9-4).
- Dismount this pwb from the plate (Figure 6.9-5).

6.4.2.4 Dismounting procedure of PWB_GPOWER

- Remove all connectors and harness, etc. connected to PWB_AZIFC, MTERM and EMCC.
- Remove four M3 screws fixing the plate (Figure 6.9-5).
- Remove PWB_AZIFC, MTERM and EMCC as they are fixed in the plate (Figure 6.9-5).
- Remove all connectors connected to these pwb.

- Remove the fixed four M3 supports (Figure 6.9-7) and four M3 pan head screws (Figure 6.9-8).
- Dismount this pwb from the control unit.

6.4.2.5 Dismounting procedure of PWB_GTERM

- Remove all connectors connected to this pwb.
- Remove the harness by cutting the cable band as it is fixed on the fixing plate of this pwb by a cable band.
- Remove the harness by removing two M3 pan head screws (Figure 6.9-11) as it is fixed to the two clamps (Figure 6.9-10).
- Remove four M3 pan head screws (Figure 6.9-12) fixing this pwb.
- This pwb is connected to PWB_SIFC / MIFC by the bottom connector.
- Dismount this pwb by extracting vertically to the pwb after removed screws.

6.4.2.6 Dismounting procedure of PWB_SCC

- Dismout PWB_GTERM. (Refer to 6.4.2.5.)
- Remove all connectors connected to this pwb.
- Remove the fixed two M3 supports (Figure 6.9-13) and four M3 pan head screws (Figure 6.9-14).
- This pwb is connected to PWB_SIFC / MIFC by the upper right-angled connector.
- Dismount this pwb by extracting horizontally to the pwb after removed the screws.

6.4.2.7 Dismounting procedure of PWB_SIFC / MIFC

- Dismout PWB_GTERM. (Refer to 6.4.2.5.)
- Remove all connectors connected to this pwb.
- Remove the mounting plate (Figure 6.9-15) and two M4 pan head screws (Figure 6.9-16) fixing FET.
- Remove the four M3 supports (Figure 6.9-17) and two M3 pan head screws (Figure 6.9-18) fixing this pwb.
- This pwb is connected to PWB_SCC by the upper right-angled connector.
- Dismount this pwb by extracting horizontally to the pwb after removed the screws.

6.4.2.8 Dismounting procedure of the mounting plate assembly (S)

- Dismout PWB_GTERM, SCC and SIFC / MIFC. (Refer to 6.4.2.5 through 6.4.2.7.)
- Remove one M4 pan head screw (Figure 6.9-20) fixing the clamp (Figure 6.9-19) and remove the harness.
- Remove five M4 pan head screws (Figure 6.9-21) fixing this mounting plate (S).

This mounting plate assembly is dismounted by removed the screws.

As the filter (Figure 6.9-22), etc. is still connected by harness, remove the harness, etc. by turning this mounting plate assembly (S) upside down.

- By removed the harness, etc., this mounting plate assembly is dismounted completely.

6.4.2.9 Dismounting procedure of the panel unit

- Remove all connectors connected to the panel unit.
- Remove four M4 spring nuts (Figure 6.9-23) fixing the panel unit.
- Dismount the panel unit.

6.4.3 Control unit, type D (Refer to Figure 6.10 and Figure 6.11.)

6.4.3.1 Dismounting procedure of PWB_AZIFC (when with MAG unit)

- Remove four M3 pan head screws (Figure 6.10-1) fixing this pwb.
- This pwb is connected to PWB_EMCC by the bottom connector.
- Remove this pwb by extracting it vertically to the pwb after removed the screws.

6.4.3.2 Dismounting procedure of PWB_MTERM (when with MAG unit)

- Remove all connectors connected to this pwb.
- Remove the harness by cutting the cable band as it is fixed on the holding plate (Figure 6.10-5) of this pwb by a cable band.
- Remove the harness by removing one M4 pan head screw (Figure 6.10-3) as it is fixed on the clamp (Figure 6.10-2).
- Remove three M3 pan head screws (Figure 6.10-4) fixing this pwb.
- Similarly to 6.4.3.1, remove this pwb by extracting vertically to the pwb as it is connected to PWB_EMCC by the bottom connector.

6.4.3.3 Dismounting procedure of PWB_EMCC (when with MAG or EHS unit)

- Dismount PWB_AZIFC and MTERM. (Refer to 6.4.3.1 and 6.4.3.2.)
- Remove all connectors connected to this pwb.
- Eight M3 supports are fixed in this pwb, and dismount this pwb by removing six M3 supports (Figure 6.10-6) out of eight.
- The other two M3 supports (Figure 6.10-7) are fixed by two M3 pan head screws (Figure 6.10-8) from the bottom of this pwb.

6.4.3.4 Dismounting procedure of PWB_DTERM

- Remove the harness by cutting the cable band as it is fixed to the holding plate (Figure 6.10-10) of this pwb cover (Figure 6.10-9) by a cable band.
- Remove four M3 pan head screws (Figure 6.10-11) fixing the cover.
- Four M3 supports are fixed in this pwb, and dismount this pwb by removing two M3 supports (Figure 6.10-13) out of two and two M3 pan head screws (Figure 6.10-12).
- The other two M3 supports (Figure 6.10-14) are fixed by two M3 pan head screws (Figure 6.10-15) from the bottom of this pwb.

6.4.3.5 Dismounting procedure of PWB_GTERM

- Remove all connectors connected to this pwb.
- Remove the harness by cutting the cable band as the harness is fixed to two holding plates (Figure 6.10-16) of this pwb by a cable band.
  Also remove the harness by removing one M3 pan head screw (Figure 6.10-18) as the harness is fixed to the clamp (Figure 6.10-17), too.
- Remove five M3 pan head screws (Figure 6.10-19) fixing this pwb.
- This pwb is connected to PWB_SCOIF / MCOIF by the bottom connector.
- Dismount this pwb by extracting it vertically to this pwb after removed the screws.

6.4.3.6 Dismounting procedure of PWB_SCC

- Dismount PWB_GTERM. (Refer to 6.4.3.5.)
- Remove all connectors connected to this pwb.
- Two of these pwbs are mounted for No. 1 Gyro and No. 2 Gyro.
- To remove a pwb for No. 1 Gyro, remove two M3 supports (Figure 6.10-20) and four M3 pan head screws (Figure 6.10-21) fixing this pwb.
- To remove a pwb for No. 2 Gyro, remove two M3 supports (Figure 6.10-22) and four M3 pan head screws (Figure 6.10-23) fixing this pwb.
- This pwb is connected to PWB_SCOIF / MCOIF by the upper right-angled connector.
- Dismount this pwb by extracting it horizontally to this pwb after removed the screws.

6.4.3.7 Dismounting procedure of PWB_SCOIF / MCOIF

- Dismount PWB_GTERM, AZIFC, MTERM, EMCC and DTERM. (Refer to 6.4.3.1 through 6.4.3.5.)
- Remove all connectors connected to this pwb.
- Remove the mounting plate (Figure 6.10-24, 25) and five M4 pan head screws (Figure 6.10-26) fixing FET.

- Remove ten M3 supports (Figure 6.10-27, 29, 30) and four M3 pan head screws (Figure 6.10-28) fixing this pwb.
- This pwb is connected to SCC by the upper right-angled connector.
- Dismount this pwb by extracting it horizontally to this pwb after removed the screws.

6.4.3.8 Dismounting procedure of PWB_DRY

- Remove all connectors connected to this pwb.
- Remove four M3 pan head screws (Figure 6.10-31) fixing this pwb.
- Dismount this pwb from the control unit.

6.4.3.9 Dismounting procedure of the mounting plate assembly (D)

- Remove all connectors of this pwb fixed in the mounting plate assembly (D).
- Remove the harness from the terminal board (Figure 6.10-35).
- Remove two M4 pan head screws (Figure 6.10-33) fixing two clamps (Figure 6.10-32) of the mounting plate assembly (D), and remove the harness.
- Remove seven M4 pan head screws (Figure 6.10-34) fixing the mounting plate assembly (D).
- When removed the screws, the mounting plate assembly (D) still fixing the pwb is removed.

  Then, as the fuses (Figure 6.10-36) and the switches (Figure 6.10-37) are connected by the harness, remove the harness by turning the mounting plate assembly upside down.

6.4.3.10 Dismounting procedure of PWB_GPOWER

- Remove the mounting plate assembly (D) together with the fixed pwb. (Refer to 6.4.3.9.)
- Remove all connectors connected to this pwb.
- Two of this pwb are mounted for No. 1 Gyro and No. 2 Gyro.
- For No. 1 Gyro side PWB_GPOWER, remove nine M3 pan head screws (Figure 6.11-1) fixing this pwb, then remove this pwb from the control unit.
- For No. 2 Gyro side PWB_GPOWER, remove nine M3 pan head screws (Figure 6.11-2) fixing this pwb, then remove this pwb from the control unit.

6.4.3.11 Dismounting procedure of PWB_PRY

- Remove the mounting plate assembly (D) together with the fixed pwb. (Refer to 6.4.3.9.)
- Remove all connectors connected to this pwb.

- Remove four M3 pan head screws (Figure 6.11-3) fixing this assembly.
- Dismount this pwb from the control unit.

6.4.3.12 Dismounting procedure of the filter assembly

- Remove the mounting plate assembly (D) together with the fixed pwb. (Refer to 6.4.3.9.)
- Remove the harness connected to this filter assembly and all connectors connected to PWB_PRY.
- Remove six M4 pan head screws (Figure 6.11-4) fixing this assembly.
- Dismount this filter assembly from the control unit.

6.4.3.13 Dismounting procedure of the panel unit

- Remove all connectors connected to this panel unit.
- Remove four M4 spring nuts (Figure 6.11-5) fixing this panel unit.
- Dismount this panel unit from the control unit.

6.4.4 Control unit, type I (Refer to Figure 6.12.)

6.4.4.1 Dismounting procedure of PWB_IOPT (optional)

- Remove all connectors connected to this pwb.
- Remove the harness by cutting the cable band since it is fixed to the fixing plate (Figure 6.12-2) by a cable band.
- Remove four M3 pan head screws (Figure 6.12-1) fixing this pwb.
- This pwb is connected to PWB_ICIF by the bottom connector.
- Dismount this pwb by extracting it vertically to this pwb after removed the screws.

6.4.4.2 Dismounting procedure of PWB_ITERM

- Remove all connectors connected to this pwb.
- Remove the harness by cutting the cable band since it is fixed to the holding plate (Figure 6.12-3) by a cable band.
- Remove four M3 pan head screws (Figure 6.12-4) fixing this pwb.
- Dismount this pwb from the control unit.

6.4.4.3 Dismounting procedure of PWB_ICIF

- Dismount PWB_IOPT and ITERM. (Refer to 6.4.4.1 through 6.4.4.2.)
- Remove all connectors connected to this pwb.
- Remove eight M3 supports (Figure 6.12-5, 6, 7) and one M3 pan head screw (Figure 6.12-8) fixing this pwb.
- Dismounut this pwb from the control unit.

6.4.4.4 Dismounting procedure of the mounting plate assembly (I)

- Dismount PWB_IOPT, ITERM and ICIF. (Refer to 6.4.4.1 through 6.4.4.3.)
- Remove the harness connected to the terminal board (Figure 6.12-11) and the relay.
- Remove seven M3 supports (Figure 6.12-9) fixing this mounting plate assembly (I).
- The mounting plate assembly (I) is dismounted by removing the screws, however the noise filter(Figure 6.12-10), etc. are still connected by the harness.

  Remove the harness by turning the mounting plate assembly (I) upside down.

6.4.4.5 Removing procedure of the relay

- Dismount PWB_IOPT, ITERM and ICIF. (Refer to 6.4.4.1 through 6.4.4.3.)
- Remove the harness connected to the relay.
- Remove the relay from the holding plate (Figure 6.12-12).

6.4.4.6 Dismounting procedure of the panel unit

- Remove all connectors connected to the panel unit.
- Remove four M4 spring nuts (Figure 6.12-13) fixing the panel unit.
- Dismount the panel unit from the control unit.

6.4.5 Power supply unit (optional) (Refer to Figure 6.13.)

6.4.5.1 Dismounting procedure of PWB_GPOWER

- Remove all connectors connected to this pwb.
- Remove nine M3 pan head screws (Figure 6.13-1) fixing this pwb.
- Dismount this pwb from the power supply unit.

6.4.5.2 Dismounting procedure of the mounting plate assembly

- Remove the harness connected to the terminal board.
- Remove eight M4 supports (Figure 6.13-2, 3), four spring washers (Figure 6.13-4) and four flat washers (Figure 6.13-5) fixing this mounting plate assembly.
- When removed the screws, this mounting plate assembly still fixed with PWB_GPOWER is dismounted.
- Refer to 6.4.5.1 to remove PWB_GPOWER.

  Also, remove the harness as required since the harness, filter and fuse are still connected.

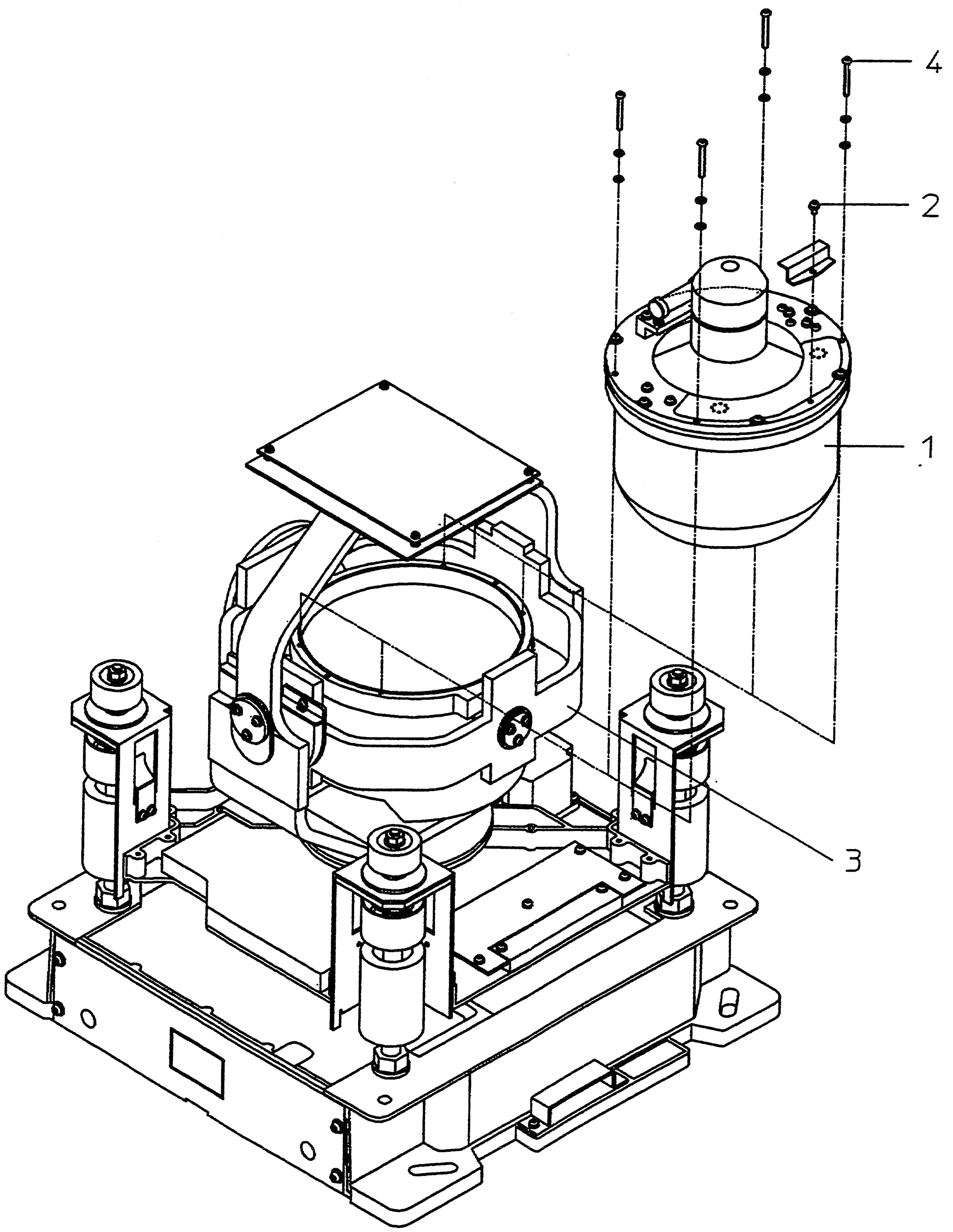


Fig 6.1 Dismounting of the sensitive element

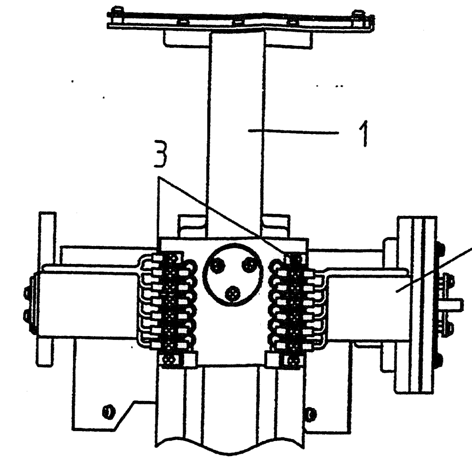


Fig 6.2 Dismounting of the ginbal bearing

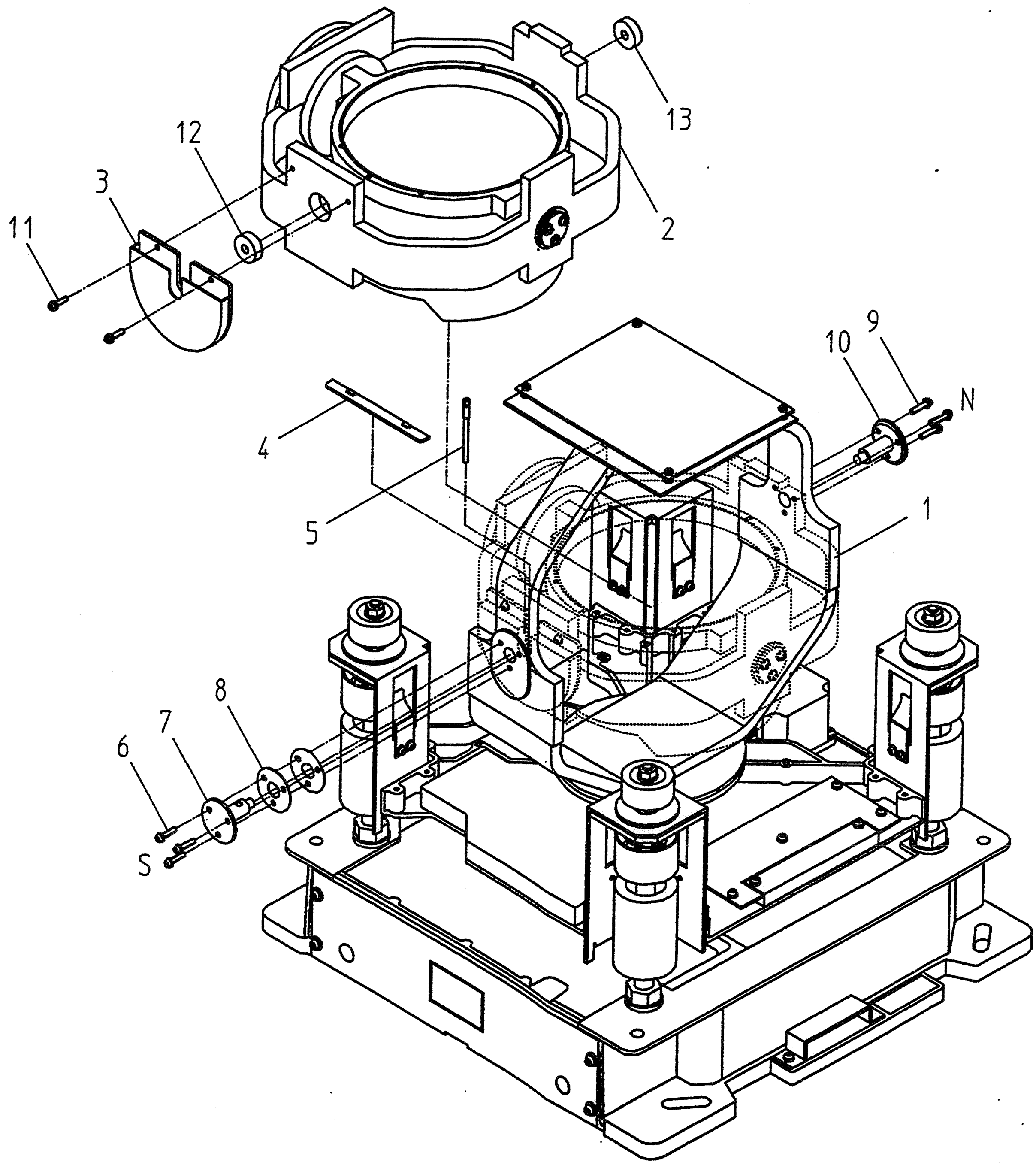


Fig 6.3 Dismounting of the ginbal bearing

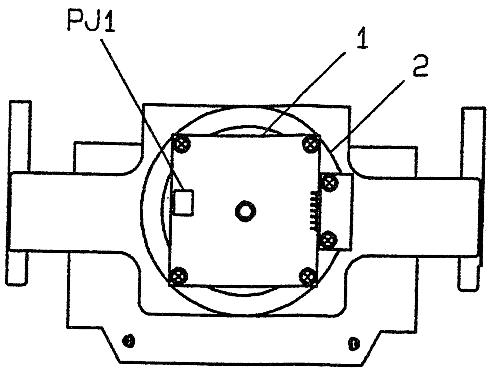


Fig 6.4 HRZC PWB

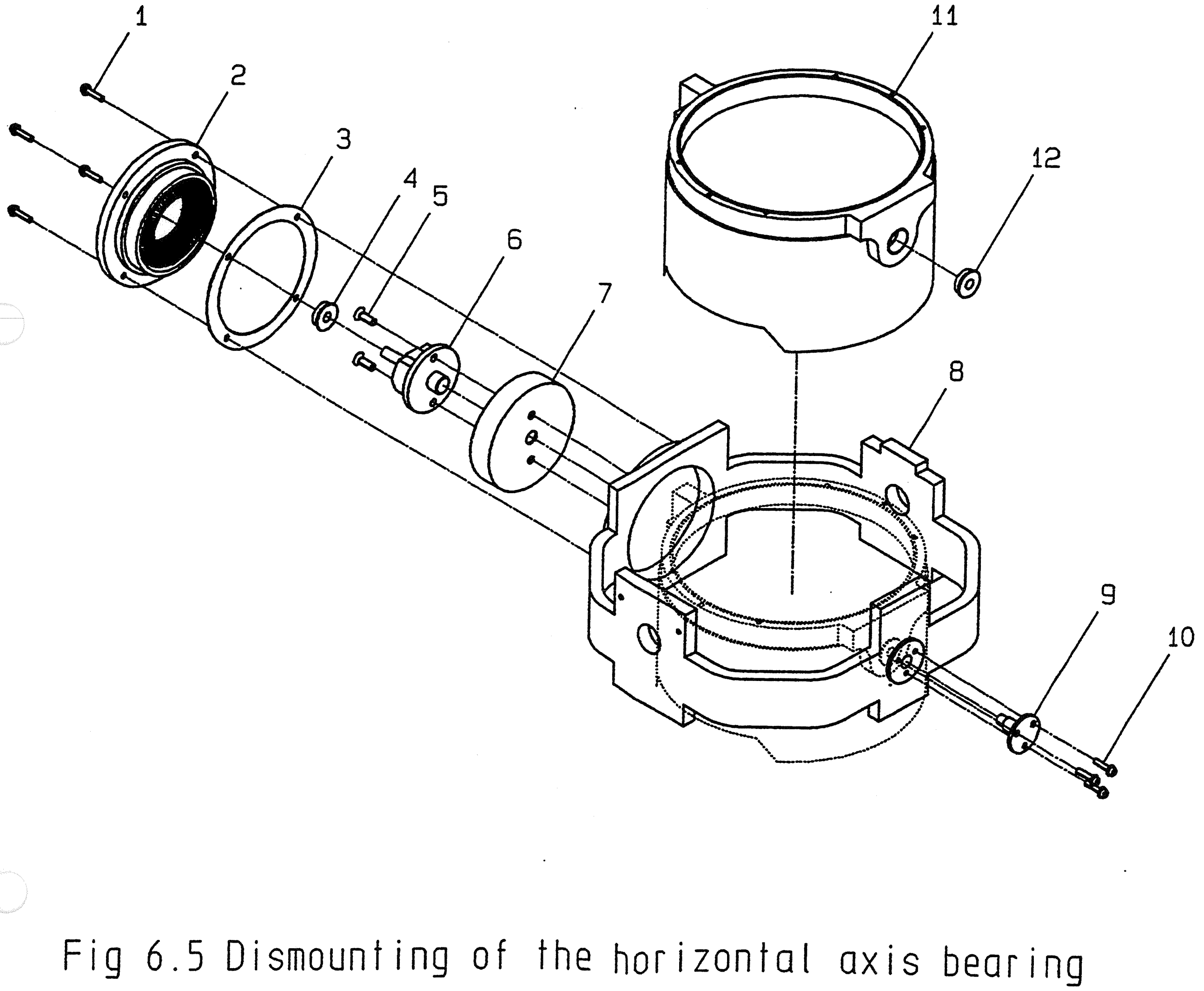


Fig 6.5 Dismounting of the horizontal axis bearing

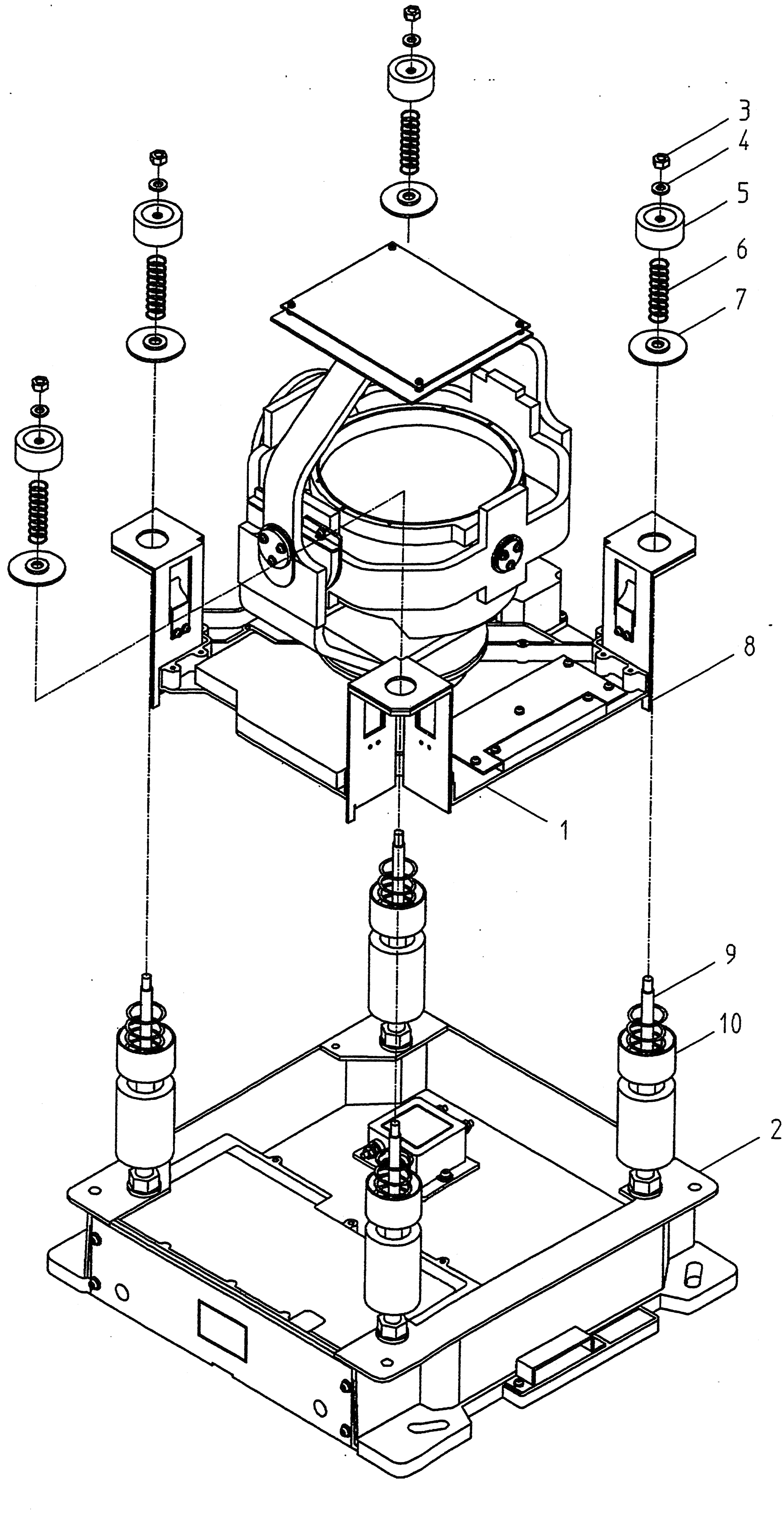


Fig 6.6 Dismounting of the phantom ring bearing

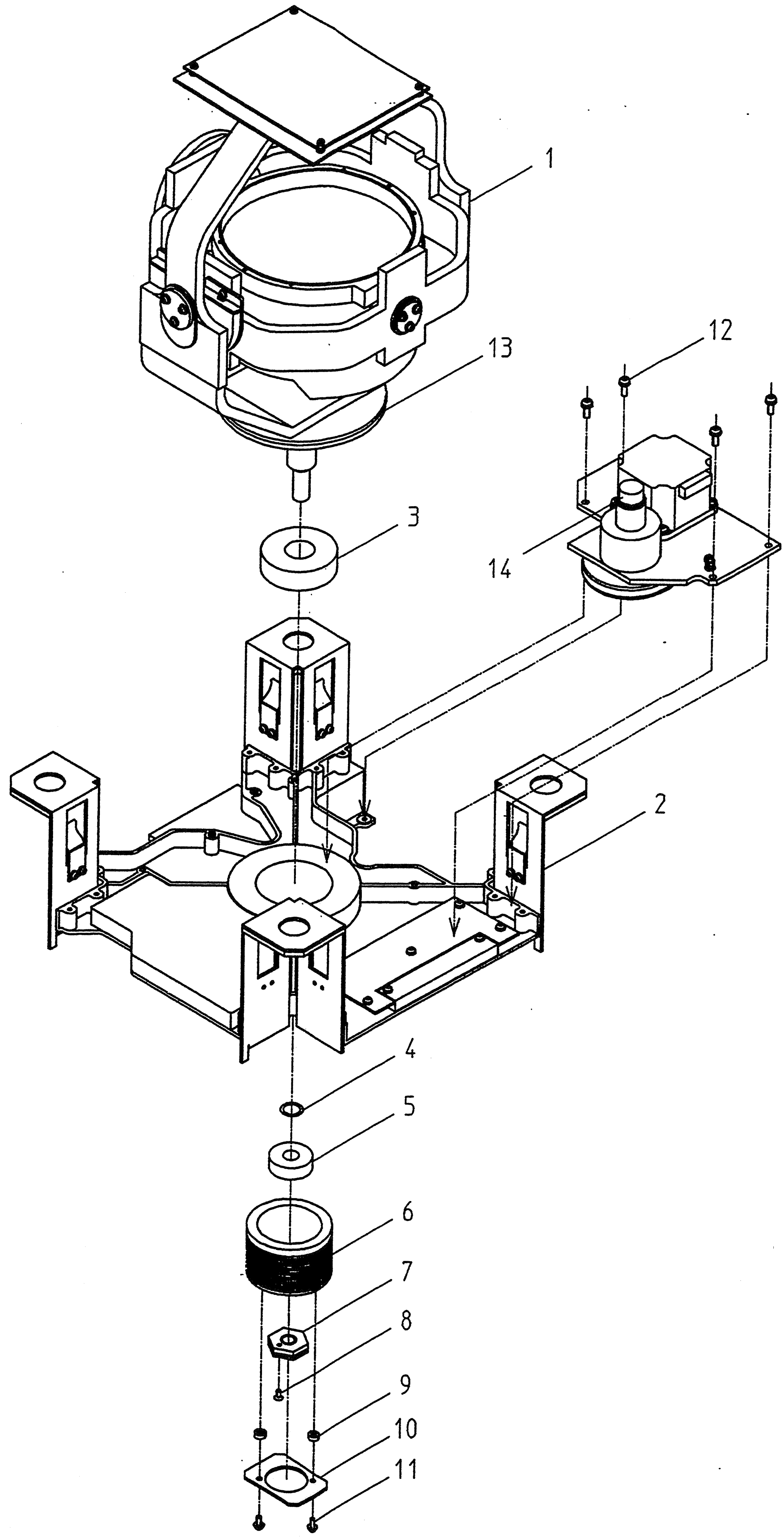


Fig 6.7 Dismounting of the phantom ring bearing

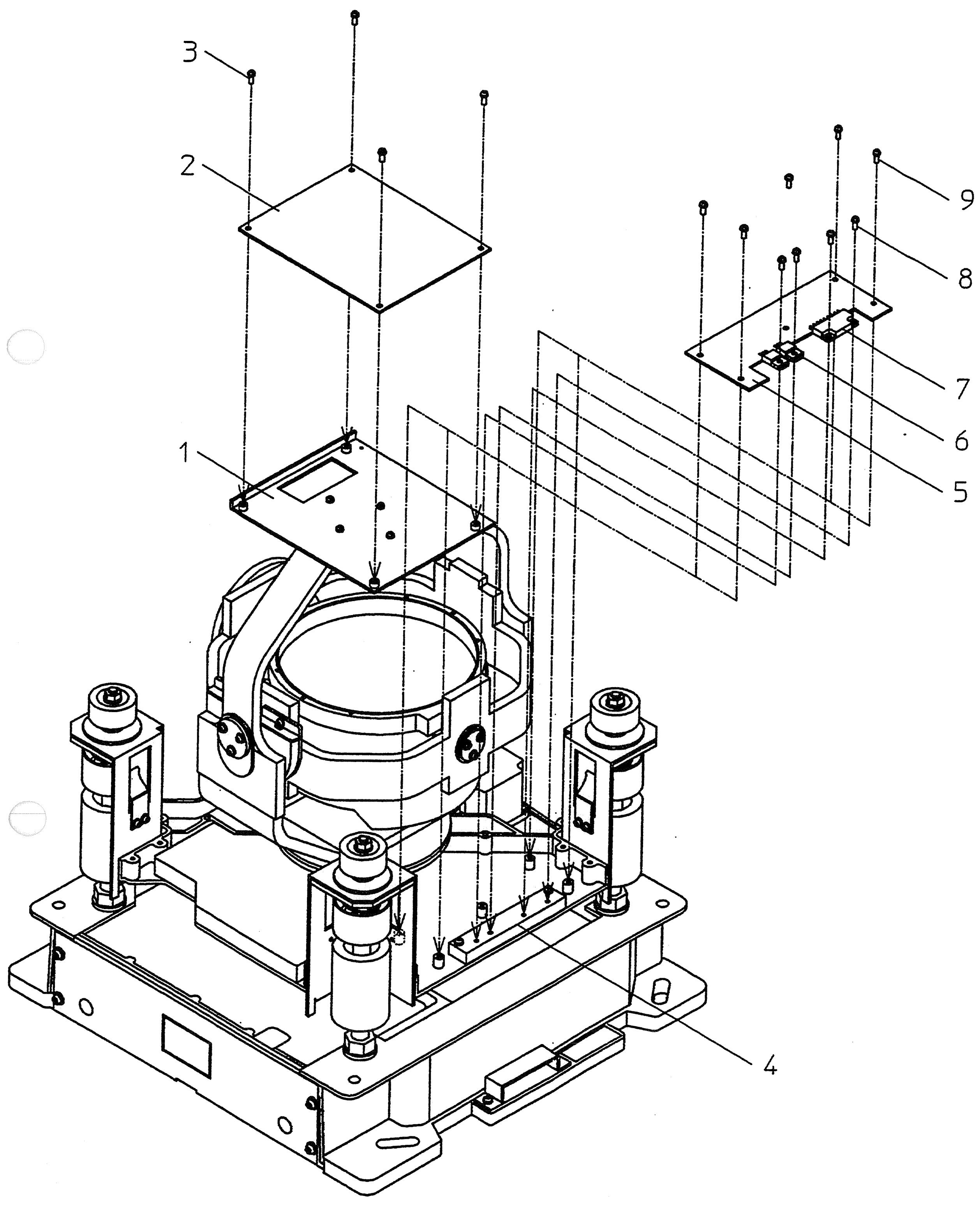


Fig 6.8 Dismounting of the MCC PWB and SMCC PWB

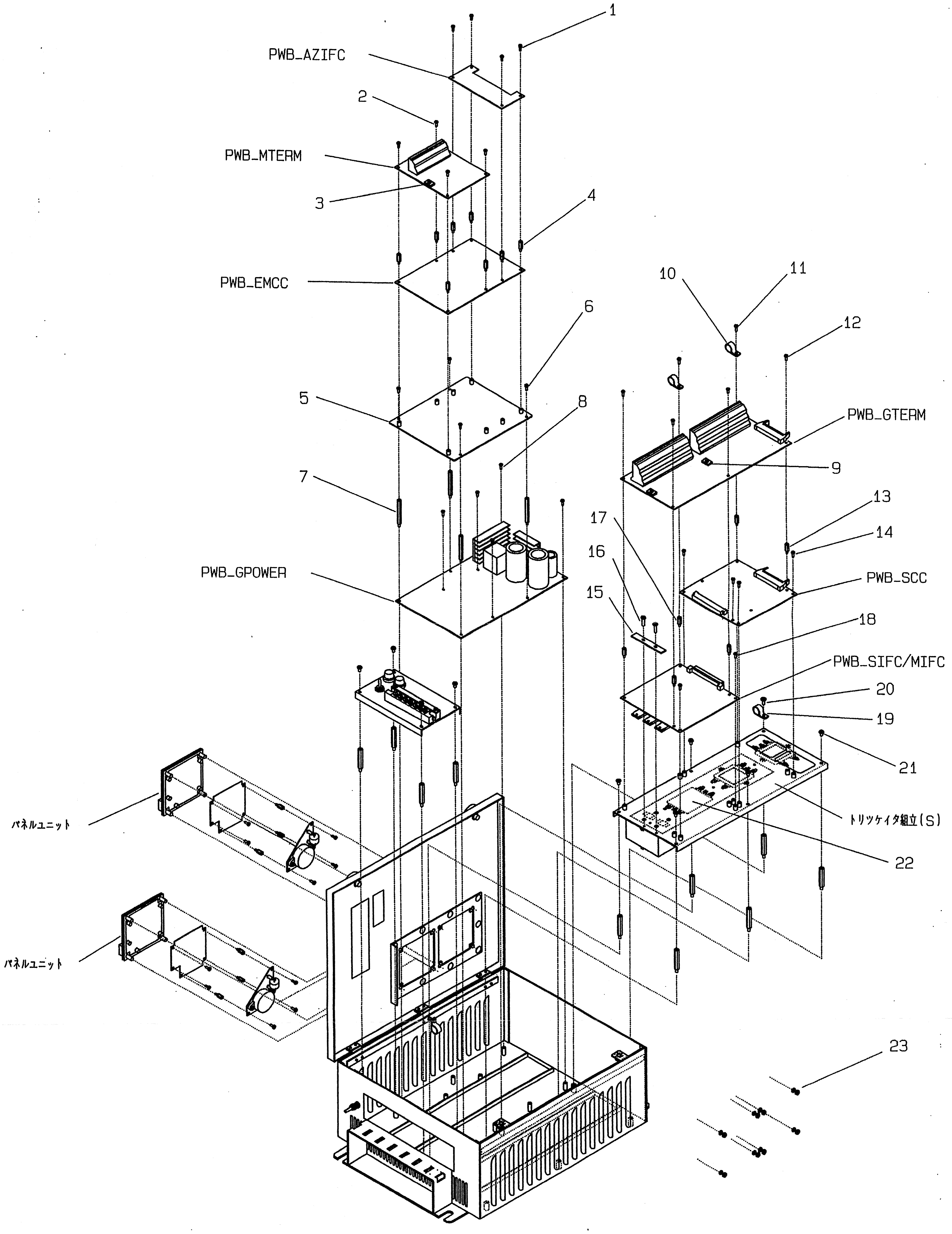


Fig6.9 Control Unit Type S

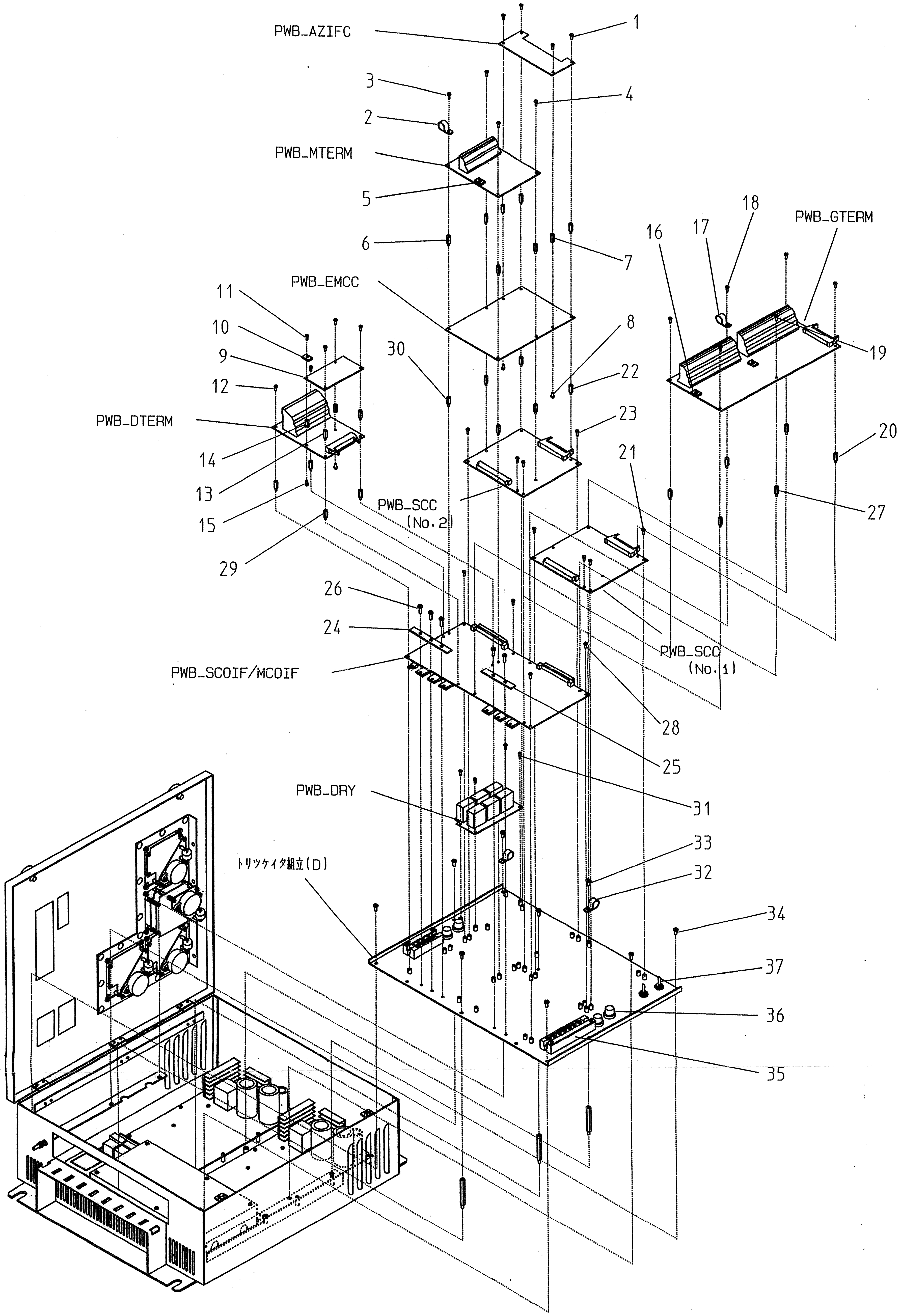


Fig6.10 Control Unit Type D

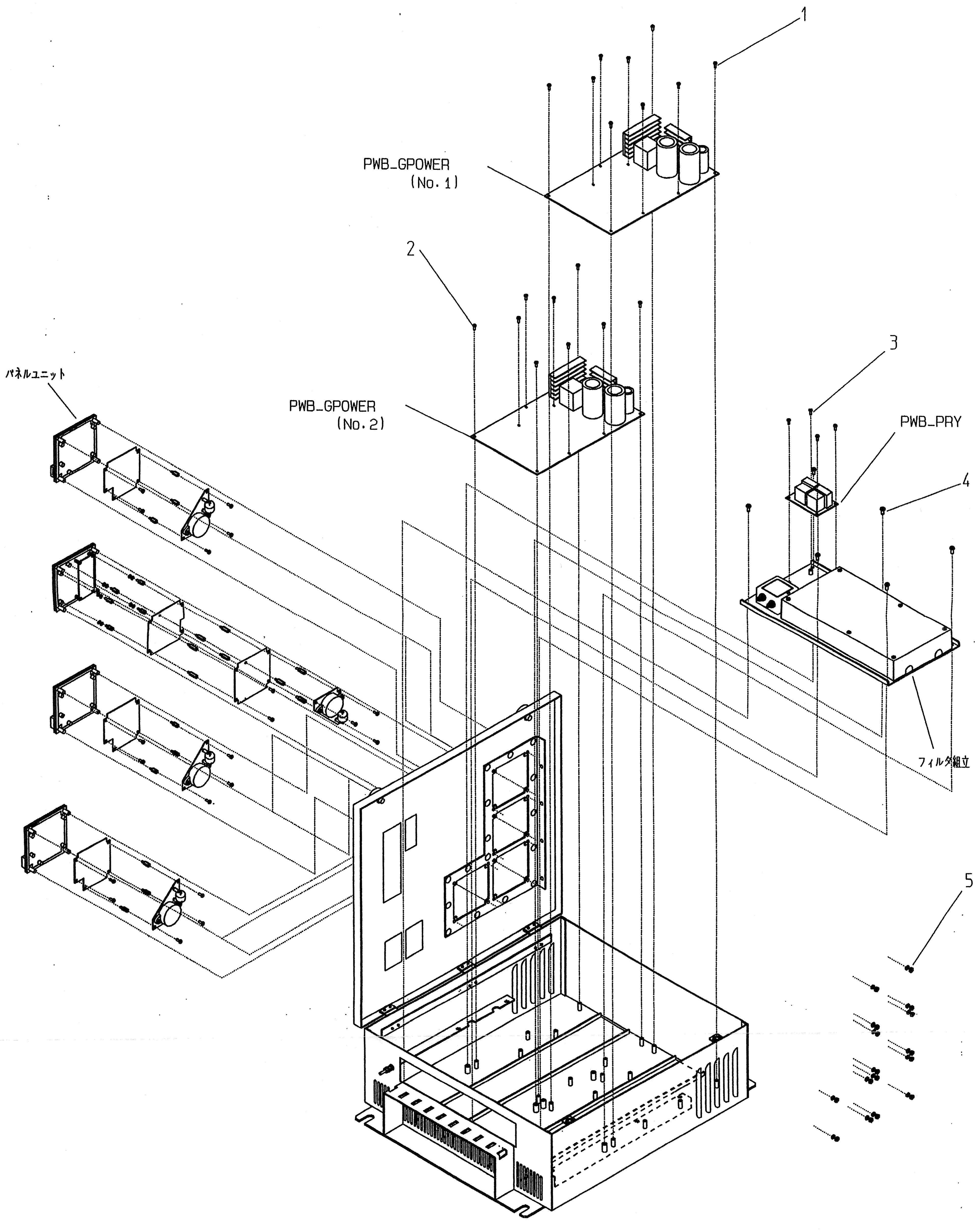


Fig6.11 Control Unit Type D

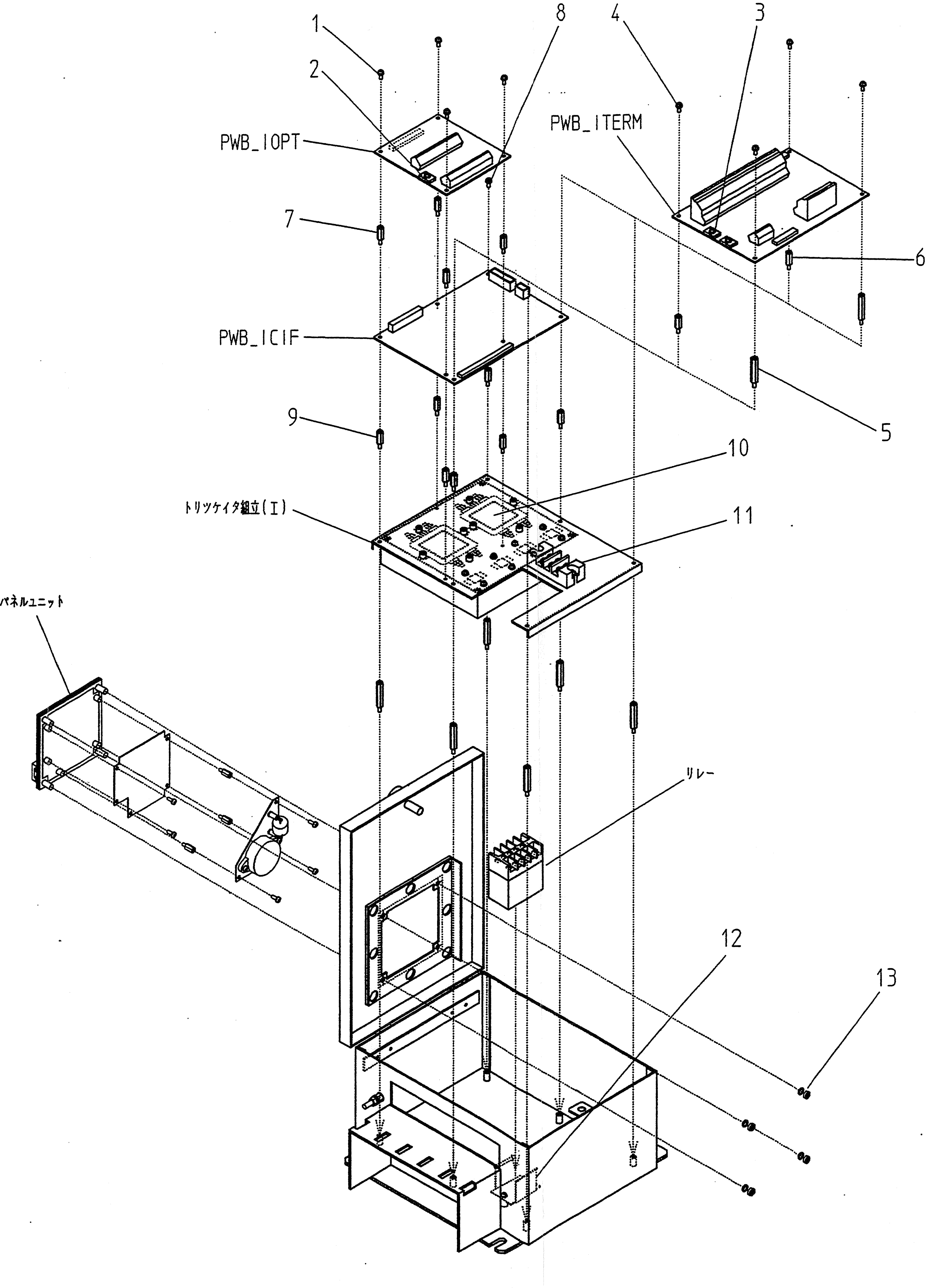


Fig6.12 Control unit Type-I

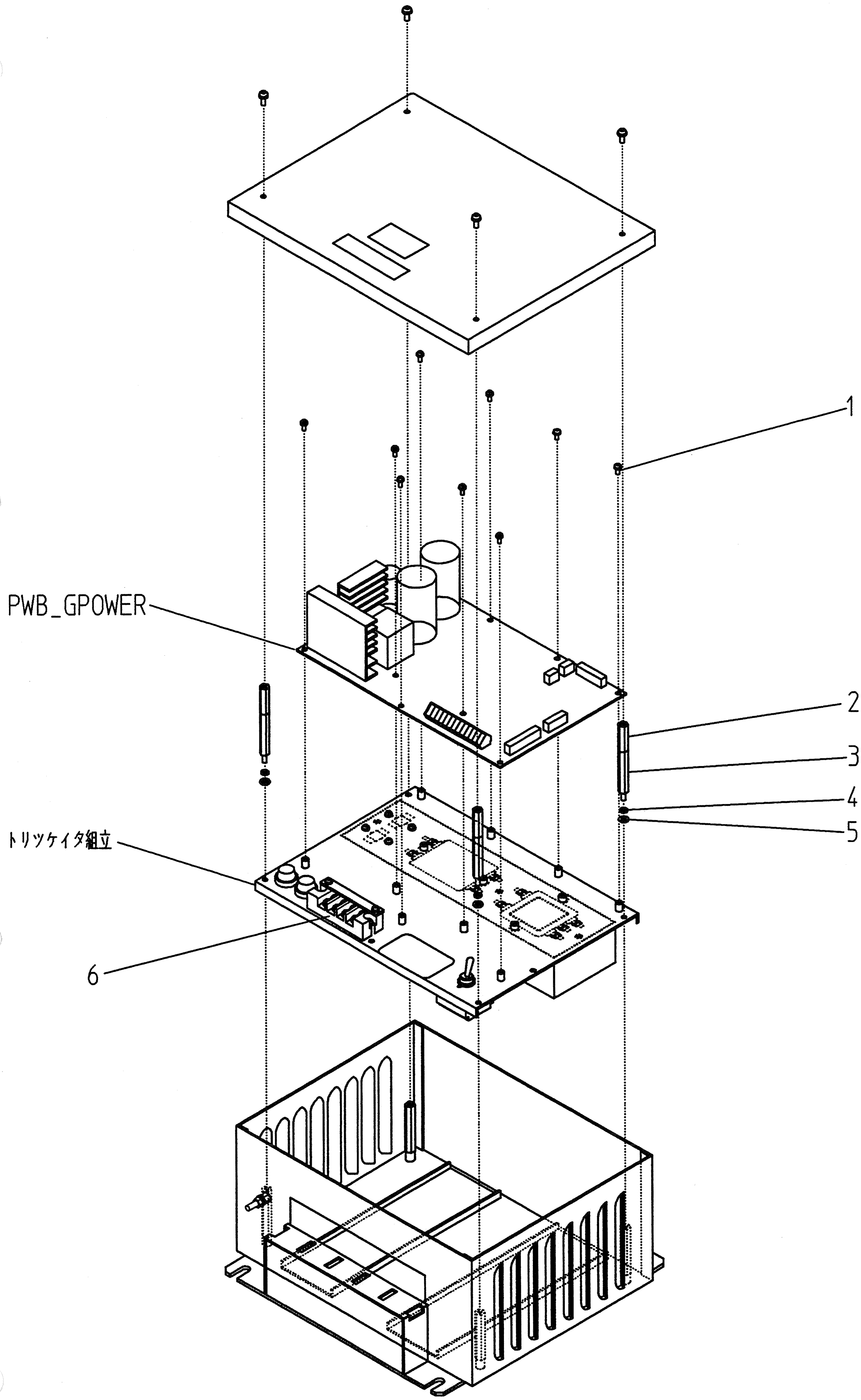


Fig6.13 Power unit

CHAPTER 7 Troubles and necessary countermeasures

CHAPTER 7 Troubles and necessary countermeasures

Operational status of this system is always monitored by the on-board CPU.
In this chapter, countermeasures are shown for each abnormality item (refer to alarm code).
When checking the system, pay full attention to avoid electric shock, and never try to perform such items that are not written in these checking items because it may result in the second hazard.
Refer to Chapter 6 of the Operator's manual where countermeasures are also appeared.

For the alarm code indication and the detailed code, refer to "Table 7.1Alarm code ".

Note 1

Whenever fuse or printed circuit is replaced, or when connection is checked, disconnect the applied power supply cable from the originated distribution panel.
(GPOWER pwb is still operating even when the power supply switch of the control unit was turned off.)

Note 2

When the primary of the GPOWER pwb is measured by an oscilloscope, perform it after isolated the power supply of the oscilloscope from the power supply of the gyrocompass.
It may cause damage the GPOWER pwb without this isolation.

7.1 Alarm code E-1 (Detailed code 1) Main power supply abnormality

This abnormality is detected by the GPOWER pwb in the control unit and processed by the SCC pwb (CPU), for Type S / D.
It is detected and processed by ICIF pwb (CPU) in the control unit, for standard and Type I.
Also, it is detected by GPOWER pwb (CPU) and processed by ICIF pwb (CPU), for Type I with the power supply.

7.1.1 (Type I)

【Alarm conditions】

Standard type

This alarm is generated when the main power supply (24 V DC) dropped or was lost.
At this time, the gyrocompass continues operation by automatically switched to the emergency power supply (24 V DC).

With the power supply unit (optional)

This alarm is generated when the main power supply (100 V / 110 V / 115 V / 220 V AC) dropped lower than -10 %. At this time, the gyrocompass continues operation by automatically switched to the emergency power supply (24 V DC).

【Countermeasures】

Standard type

(1).Check the fuse F6 on the ITERM pwb in the control unit.
If it has blown, check the operation after replaced the fuse.
If the fuse has blown again, perform the item (2), and replace the GPOWER pwb if not any problem.

(2).Confirm that the voltage at 24M / 24- (Comm.) of TB3 in the external terminal board of the control unit ITERM pwb is within +30 % or -20 % of 24 V DC.

(3). Replace the ICIB pwb if the above (1) and 2 are normal.
When the ICIF pwb was replaced, do not forget to change the parameters stored in the non-volatile memory.

With power supply unit (optional)

(1).Check the fuse F201 of the power supply unit.
If it has blown, check the operation after replaced the fuse.
If the fuse has blown again, perform the item (2), and replace GPOWER pwb if it not any problem.

(2).Confirm that the voltage at 2AC1 / 2AC2 of TB201 in the external terminal board of the power supply unit is within 10 % of 100 V / 110 V / 115 V / 220 V AC.

(3).Check the connection between the GPOWER pwb (terminal board TB1) and the ITERM pwb (terminal board TB2).

(4).Replace the power supply unit GPOWER pwb when the above (1),(2), (3) are normal.
Replace the ICIF pwb when it still causes abnormality after replaced GPOWER pwb.
When the ICIF pwb was replaced, do not forget to change the parameters stored in the non-volatile memory.

7.1.2 (Type S)

【Alarm conditions】

This alarm is generated when the main power supply (100 V / 110 V / 115 V / 220 V AC) dropped lower than -10 %.

At this time, the gyrocompass continues operation by automatically switched to the emergency power supply (24 V DC).

【Countermeasures】

(1).Check the fuse F101 of the power supply unit.
If it has blown, check the operation after replaced the fuse.
If the fuse is blown again, perform the item (2), and replace GPOWER pwb if it was OK.

(2).Confirm that the voltage applied to TB101 AC1 / AC2 on the external terminal board of the control unit is within 10 % of 100 V / 110 V / 115 V / 220 V AC.

(3).Check the connection (harness) from GPOWER pwb (connector J6) to GTERM pwb (connector J6).
Check the connector inserting state from GTERM pwb (connector J4) to SCC pwb (connector J4).

(4).Replace GPOWER pwb if above (1), (2) and (3) are normal.
Replace SCC pwb if abnormality still generated after replaced GPOWER pwb.
When the SCC pwb was replaced, do not forget to change the parameters stored in the non-volatile memory.

7.1.3 (Type D)

【Alarm conditions】

This alarm is generated when the main power supply (100 V / 220 V AC) dropped lower than -10 %.

At this time, the gyrocompass continues operation by automatically switched to the emergency power supply (24 V DC).

【Countermeasures】

<u>No. 1 Gyrocompass</u>

(1).Check the fuse F101 in the control unit. If it has blown, check the operation after replaced the fuse.
If the fuse is blown again, perform the item (2), and replace GPOWER pwb if it was OK.
Refer to Figure 6.11 Control unit type D for the position of GPOWER of No. 1 Gyrocompass.

(2).Confirm that the voltage applied to TB101 AC1 / AC2 on the external terminal board of the control unit is within 100 V / 110 V / 115 V / 220 V AC ±10 %.

(3).Check the connection (harness) from GPOWER pwb (connector J6) to GTERM pwb (connector J6).

Check the connector inserting state from GTERM pwb (connector J4) to No. 1 SCC pwb (connector J4).

(4). Replace GPOWER pwb if above (1), (2) and (3) are normal.

Replace No. 1 SCC pwb if abnormality still generated after replaced GPOWER pwb.

Refer to Figure 6.10 Control unit type D for the position of SCC of No. 1 Gyrocompass.

When the SCC pwb was replaced, do not forget to change the parameters stored in the non-volatile memory.

No. 2 Gyrocompass

(1).Check fuse F201 in the control unit.

If it has blown, check the operation after replaced the fuse.

If the fuse is blown again, perform the item (2), and replace GPOWER pwb if it was OK.

Refer to Figure 6.11 Control unit type D for the position of GPOWER of No. 2 Gyrocompass.

(2).Confirm that the voltage applied to TB201 2AC1 / 2AC2 on the external terminal board of the control unit is within 100 V / 110 V / 115 V / 220 V AC±10 %.

(3).Check the connection (harness) from No. 2 GPOWER pwb (connector J6) to DTERM pwb (connector J8).

Check the connector inserting state from DTERM pwb (connector J4) to No. 2 SCC pwb (connector J4).

(4).Replace GPOWER pwb if above (1), (2) and (3) are normal.

Replace No. 2 SCC pwb if abnormality still generated after replaced GPOWER pwb.

Refer to Figure 6.10 Control unit type D for the position of SCC of No. 2 Gyrocompass.

When the SCC pwb was replaced, do not forget to change the parameters stored in the non-volatile memory.

7.2 Alarm code E-2 (Detailed code 2) Power supply abnormality (1)

Master compass power supply over current abnormality

This abnormality is detected by GPOWER pwb in the control unit, and processed by SCC pwb (CPU) for Type S / D.
It is detected by GPOWER pwb and processed by ICIF pwb for type I with power supply unit.

7.2.1 (Type I)

【Alarm conditions】

Standard type

This alarm is not generated in itself because the over current of the master compass power supply is not monitored.

With power supply unit (optional)

Power supply applying is stopped when the current of the power supply to the master compass exceeds 9 A from starting time through 13 minutes then exceeds 4.5 A since then.
Pay full attention because the power supply unit is in operating state.

【Countermeasures】

Standard type

(1).Confirm the setting of DIPSW on ICIF pwb in the control unit.
(SW1-1 bit should be "ON".)

With power supply unit (optional)

(1).Confirm the connection from GPOWER pwb (terminal board TB1) to ITERM pwb (terminal board TB2) when the master compass is operating regardless of this over current alarm generation.
Replace ICIF pwb if no problem in the connection.

(2).Turn "OFF" the power switch when the over current alarm generated and the master compass stopped, and remove GTERM pwb TB1 N+ / N- of the control unit applying the power supply to the master compass.
Then turn "ON" the power switch and confirm an alarm code.
At this time, although this alarm code "E-3, A" is generated, neglect it.

(3).There is possibility of malfunction in the master compass side if the alarm code "E-2" is not generated in the above (2).
In this case, refer to "7.5, 6 Inverter abnormality" explained later.

(4).Replace the power supply unit GPOWER pwb if the alarm code "E-2" is generated again in the above (2).
Replace SCC pwb if abnormality still generated after GPOWER pwb replaced.
When the SCC pwb was replaced, do not forget to change the parameters stored in the non-volatile memory.

7.2.2 (Type S)

【Alarm conditions】

Power supply applying to the master compass is stopped when the current of the power supply to the master compass exceed 9 A from starting time through 13 minutes then exceeds 4.5 A since then.

Pay full attention because the power supply unit is in operating state.

【Countermeasures】

(1).When the master compass is operating regardless of the over current alarm generation, check the connection (harness) from GPOWER pwb (connector J6) to GTERM pwb (connector J6), and check the connector inserting state from GTERM pwb (connector J4) to SCC pwb (connector J4).
Replace GPOWER pwb if no problem in the connection.
Replace SCC pwb if abnormality still generated after GPOWER pwb replaced.

(2).Turn "OFF" the power switch when the over current alarm generated and the master compass stopped, and remove GTERM pwb TB3 N+ / N- of the control unit applying the power supply to the master compass.
Then turn "ON" the power switch and confirm an alarm code.
(When the automatic steering system is integrated, remove GTERM pwb J11. Then turn "ON" the power switch and confirm the alarm code.)
At this time, although an alarm code "E-3, A" is generated, neglect it.

(3).There is possibility of malfunction in the master compass side if the alarm code "E-2" is not generated in the above (2).
In this case, refer to "7.5, 7.6 Inverter abnormality" explained later.

(4).Replace the power supply unit GPOWER pwb if the alarm code "E-2" is generated again in the above (2).
Replace SCC pwb if abnormality still generated after GPOWER pwb replaced.
When the SCC pwb was replaced, do not forget to change the parameters stored in the non-volatile memory.

7.2.3 (Type D)

【Alarm conditions】

Power supply applying to the master compass is stopped when the current of the power supply to the master compass exceed 9 A from starting time through 13 minutes then exceeds 4.5 A since then.

Pay full attention because the power supply unit is in operating state.

【Countermeasures】

No. 1 Gyrocompass

(1).When the master compass is operating regardless of the over current alarm generation, check the connection (harness) from No. 1 GPOWER pwb (connector J6) to GTERM pwb (connector J6), and check the connector inserting state from GTERM pwb (connector J4) to No. 1 SCC pwb (connector J4).
Replace No. 1 GPOWER pwb if no problem in the connection.
Replace SCC pwb if abnormality still generated after GPOWER pwb replaced.

(2).Turn "OFF" the power switch when the over current alarm generated and the master compass stopped, and remove GTERM pwb TB3 N+ / N- of the control unit applying the power supply to the master compass.
Then turn "ON" the power switch and confirm an alarm code.
(When the automatic steering system is integrated, remove GTERM pwb J11. Then turn "ON" the power switch and confirm the alarm code.)
At this time, although an alarm code "E-3, A" is generated, neglect it.

(3).There is possibility of malfunction in the master compass side if the alarm code "E-2" is not generated in the above (2).
In this case, refer to "7.5, 7.6 Inverter abnormality" explained later.

(4).Replace the power supply unit No. 1 GPOWER pwb if the alarm code "E-2" is generated again in the above (2).
Replace No. 1 SCC pwb if abnormality still generated after No. 1 GPOWER pwb replaced.
When the SCC pwb was replaced, do not forget to change the parameters stored in the non-volatile memory.

No. 2 Gyrocompass

(1). When the master compass is operating regardless of the over current alarm generation, check the connection (harness) from No. 2 GPOWER pwb (connector J6) to DTERM pwb (connector J8), and check the connector inserting state from DTERM pwb (connector J4) to No. 2 SCC pwb (connector J4).
Replace No. 2 GPOWER pwb if no problem in the connection.
Replace SCC pwb if abnormality still generated after No. 2 GPOWER pwb replaced.

(2).Turn "OFF" the power switch when the over current alarm generated and the master compass stopped, and remove GTERM pwb TB3 N+ / N- of the control unit applying the power supply to the master compass.

Then turn "ON" the power switch and confirm the alarm code.

(When the automatic steering system is integrated, remove DTERM pwb J11.

Then turn "ON" the power switch and confirm the alarm code.)

At this time, although an alarm code "E-3, A" is generated, neglect it.

(2).There is possibility of malfunction in the master compass side if the alarm code "E-2" is not generated in the above (2).

In this case, refer to "7.5, 6 Inverter abnormality" explained later.

(3).Replace the power supply unit No. 2 GPOWER pwb if the alarm code "E-2" is generated again in the above (2).

Replace No. 2 SCC pwb if abnormality still generated after No. 2 GPOWER pwb replaced.

When the SCC pwb was replaced, do not forget to change the parameters stored in the non-volatile memory.

7.3 Alarm code E-2 (Detailed code 3) Power supply abnormality (2)

Master compass power supply over voltage abnormality

This abnormality is detected by GPOWER pwb in the control unit and processed by SCC pwb (CPU) for Type S / D

It is detected by GPOWER pwb and processed by ICIF pwb (CPU) for Type I (with the power supply unit).

7.3.1 (Type I)

【Alarm conditions】

Standard type

This alarm is not generated in itself because the over voltage of the master compass power supply is not monitored.

With the power supply unit (optional)

The abnormality is defined when the power supply voltage to the master compass reaches 24 V DC + 30 % and the main power supply is switched to the emergency power supply.

Although the switched emergency power supply voltage exceeds 24 V DC + 30 %, the system is operated successively by the emergency power supply, "abnormality of the power supply over voltage" is alarmed by the control unit.

At this time, try to recover to the normal voltage as it may result in system malfunction.

When this alarm is generated, alarm code "E-2", detailed code "3" and "E-1" outputs are produced.

【Countermeasures】

Standard type

(1).Confirm the setting of DIPSW on the ICIF pwb in the control unit.
(SW1-1 bit should be "ON".)

With the power supply unit (optional)

(1).Stop applying of the main power supply and start the gyrocompass by the emergency power supply.
At this time confirm that "E-2" is not generated. Although "E-1" is generated, neglect it.

(2).heck the emergency power supply voltage when alarm code "E-2", detailed code "3" is generated in the above (1).
Perform the following (4) when the emergency power supply voltage is less than 24 V DC + 30 %.

(3).Check the main power supply applying state from the ship power supply when alarm code "E-2, detailed code "3" is not generated in the above (1).
(100 / 110 / 115 / 220 V AC±10 %)
Perform the following (4) if no problem in the main power supply.

(4).Check the connection from GPOWR pwb (terminal board TB1) to ITERM pwb (terminal board TB2).
Replace ICIF pwb if no problem in the connection.
Replace ICIF pwb when abnormality still generated after GPOWER pwb replaced.
When the ICIF pwb was replaced, do not forget to change the parameters stored in the non-volatile memory.

7.3.2 (Type S)

【Alarm conditions】

The abnormality is defined when the power supply voltage to the master compass eaches 24 V DC + 30 % and the main power supply is switched to the emergency power supply.
Although the switched emergency power supply voltage exceeds 24 V DC + 30 %, the system is operated successively by the emergency power supply, "abnormality of the power supply over voltage" is alarmed by the control unit.
At this time, try to recover to the normal voltage as it may result in system malfunction.
When this alarm is generated, alarm code "E-2", detailed code "3" and "E-1" outputs are produced.

【Countermeasures】

(1).Stop applying of the main power supply and start the gyrocompass by the emergency power supply.
At this time confirm that "E-2" is not generated.
Although "E-1" is generated, neglect it.

(2).Check the emergency power supply voltage when alarm code "E-2", detailed code "3" is generated in the above (1).
Perform the following (4) when the emergency power supply voltage is less than 24 V DC + 30 %.

(3).Check the main power supply applying state from the ship power supply when alarm code "E-2, detailed code "3" is not generated in the above (1).
(100 / 110 / 115 / 220 V AC±10 %)
Perform the following (4) if no problem in the main power supply.

(4).Check the connection (harness) from GPOWR pwb (connector J6) to GTERM pwb (connector J6), and check the connector inserting state from GTERM (connector J4) to SCC pwb (connector J4).
Replace GPOWER pwb if no problem in the connection.
Replace SCC pwb when abnormality still generated after GPOWER pwb replaced.
When the SCC pwb was replaced, do not forget to change the parameters stored in the non-volatile memory.

7.3.3 (Type D)

【Alarm conditions】

The abnormality is defined when the power supply voltage to the master compass reaches 24 V DC + 30 % and the main power supply is switched to the emergency power supply.
Although the switched emergency power supply voltage exceeds 24 V DC + 30 %, the system is operated successively by the emergency power supply, "abnormality of the power supply over voltage" is alarmed by the control unit.
At this time, try to recover to the normal voltage as it may result in system malfunction.
When this alarm is generated, alarm code "E-2", detailed code "3" and "E-1" outputs are produced.

【Countermeasures】

No. 1 Gyrocompass

(1).Stop applying of the main power supply and start No. 1 gyrocompass by the emergency power supply.

At this time confirm that "E-2" is not generated. Although "E-1" is generated, neglect it.

(2).Check the emergency power supply voltage when alarm code "E-2", detailed code "3" is generated in the above (1).

Perform the following (4) when the emergency power supply voltage is less than 24 V DC + 30 %.

(3).Check the main power supply applying state from the ship power supply when alarm code "E-2, detailed code "3" is not generated in the above (1).

(100 / 110 / 115 / 220 V AC±10 %)

Perform the following (4) if no problem in the main power supply.

(4).Check the connection (harness) from No. 1 GPOWR pwb (connector J6) to GTERM pwb (connector J6).

Check the inserting state from GTERM pwb (connector J4) to No. 1 SCC pwb (connector J4).

Replace No. 1 GPOWER pwb if no problem in the connection.

Replace No. 1 SCC pwb if abnormality still generated after No. 1 GPOWER pwb replaced.

When the SCC pwb was replaced, do not forget to change the parameters stored in the non-volatile memory.

No. 2 Gyrocompass

(1).Stop applying of the main power supply and start No. 1 gyrocompass by the emergency power supply.

At this time confirm that "E-2" is not generated. Although "E-1" is generated, neglect it.

(2).Check the emergency power supply voltage when alarm code "E-2", detailed code "3" is generated in the above (1).

Perform the following (4) when the emergency power supply voltage is less than 24 V DC + 30 %.

(3).Check the main power supply applying state from the ship power supply when alarm code "E-2, detailed code "3" is not generated in the above (1).

(100 / 110 / 115 / 220 V AC±10 %)

Perform the following (4) if no problem in the main power supply.

(4).Check the connection (harness) from No. 2 GPOWR pwb (connector J6) to DTERM pwb (connector J8).

Check the inserting state from DTERM pwb (connector J4) to No. 2 SCC pwb (connector J4).

Replace No. 2 GPOWER pwb if no problem in the connection.
Replace No. 2 SCC pwb if abnormality still generated after No. 2 GPOWER pwb replaced.
When the SCC pwb was replaced, do not forget to change the parameters stored in the non-volatile memory.

7.4 Alarm code E-2 (Detailed code 4) Power supply abnormality (3)

Repeater power supply abnormality
This alarm is generated when signal name "24R+ and 24R-" voltage is monitored and dropped or was lost.

7.4.1 (Type I)

【Alarm conditions】

Standard type

This alarm is generated when the power supply for the repeater (24 V DC) dropped or was lost.

With power supply unit (optional)

This alarm is generated when the power supply for the repeater (24 V DC) dropped or was lost.

【Countermeasures】

Standard type

(1).Confirm that connector (J6) is mounted on the ITERM pwb of the control unit and its contact.
(2).Confirm that the voltage between (1) and 2 pin of the connector (J6) on the ITERM of the control unit is within 24 V DC, +30 % / -20 %.
(3).Replace ICIF pwb if no problem in the above (1) and (2).

With power supply unit (optional)

(1).Turn "ON" the power switch after removed external wires to 24R+ / 24R- on the terminal board (TB1) of the power supply unit.
(2).Confirm that the voltage between 24R+ / 24R- pin is within 24 V DC, +30 % / -20 %.
(3).Replace the power supply unit GPOWER pwb when the voltage is abnormal in the above (2).
(4).Confirm that ITERM pwb connector (J6) is not attached in the control unit when the voltage is normal in the above (2).

Also check the fuse (F6). If it has blown, confirm the operation after replaced it.

Replace ICIF pwb if it has blown again.

When the ICIF pwb was replaced, do not forget to change the parameters stored in the non-volatile memory.

7.4.2 (Type S)

【Alarm conditions】

This alarm is generated when the power supply for the repeater (24 V DC) dropped or was lost.

【Countermeasures】

(1).Turn "ON" the power switch after removed GTERM pwb connector (J5) in the control unit.

(2).Confirm that the voltage between 5-7 pin of GPOWER pwb connector (J5) is within 24 V DC, +30 % / - 20 %.

(3).Replace GPOWER pwb of the control unit when the voltage is abnormal in the above (2).

(4).Confirm that a jumper exists between TB3-TB4 of GTERM pwb in the control unit when the voltage is normal in the above (2).

And check the fuse (F15).

If it has blown, confirm the operation after replaced it.

Replace MIFC / SIFC pwb if it has blown again.

(5).Replace SCC pwb when it is not improved after performed the above (4).

When the SCC pwb was replaced, do not forget to change the parameters stored in the non-volatile memory.

7.4.3 (Type D)

【Alarm conditions】

This alarm is generated when the power supply for the repeater (24 V DC) dropped or was lost.

【Countermeasures】

No.1 Gyrocompass

(1).Turn "ON" the power switch after removed GTERM pwb connector (J5) in the control unit.

(2).Confirm that the voltage between 5-7 pin of No. 1 GPOWER pwb connector (J5) is within 24 V DC, +30 % / - 20 %.

(3).Replace No. 1 GPOWER pwb of the control unit when the voltage is abnormal in the above (2).

(4).Check the fuse (F15) when the voltage is normal in the above (2).
If it has blown, confirm the operation after replaced it.
Replace MCOIF / SCOIF pwb if it has blown again.

(5).Replace No. 1 SCC pwb when it is not improved after performed the above (4).
When the SCC pwb was replaced, do not forget to change the parameters stored in the non-volatile memory.

No.2 gyrocompass

(1).Turn "ON" the power switch after removed GTERM pwb connector (J7) in the control unit.

(2).Confirm that the voltage between 5-7 pin of No. 2 GPOWER pwb connector (J5) is within 24 V DC, +30 %, - 20 %.

(3).Replace No. 2 GPOWER pwb of the control unit when the voltage is abnormal in the above (2).

(4).Check the fuse (F15) when the voltage is normal in the above (2).
If it has blown, confirm the operation after replaced it.
Replace MCOIF / SCOIF pwb if it has blown again.

(5).Replace No. 2 SCC pwb when it is not improved after performed the above (4).
When the SCC pwb was replaced, do not forget to change the parameters stored in the non-volatile memory.

7.5 Alarm code E-3 (Detailed code 5) Inverter abnormality (1)
Over current abnormality
This abnormality is detected by INVERTER pwb in the master compass and processed by SCC pwb (CPU) for Type S / D.
It is processed by ICIF pwb for Type I.

(Alarm condition: Common to Type I, S and D.)
【Alarm conditions】
Power supply applying to the rotor and each pwb in the master compass is stopped when the input current of the power supply to the INVERTER pwb exceed 6 A from starting time through 9 minutes then exceeds 3.5 A since then.
Pay full attention because the main power supply is in operating state.

7.5.1 (Type I)

【Countermeasures】

(1) When the master compass is operating although the inverter over current alarm is generated, confirm the connection from MTERM pwb (terminal board TB2 AL2 / ALC) to ITERM pwb (terminal board TB1 AL2 / ALC).

Replace INVERTER pwb when no problem in the connection.

Replace ICIF pwb when abnormality still generated even if INVERTER pwb replaced.

When the ICIF pwb is replaced, do not forget to change the parameters stored in the non-volatile memory.

(2) If the inverter over current abnormality alarm was generated and the master compass stopped, turn "OFF" the power switch, then after removed INVERTER pwb connector "CN4" in the master compass, turn "ON" the power switch again.

At this time, confirm that four LEDs (D26, D29, D34 and D35) in the INVERTER pwb are lit.

(3) If they are not lit in the above (2), check if the fuse F1 in the INVERTERpwb has blown.

If it has not blown, replace the inverter unit.

(4) If the LEDs are lit in the above (2) and the output voltage is not abnormal, turn "OFF" the power switch.

After 20 minutes elapsed, check the connection from the transformer CN4 on the phantom ring of the master compass to T1 and the sensitive element.

Specially, carefully check the connection related to the connector "8" and "M" in the sensitive element.

(5) If the connection is not abnormal in the above (4), measure resistance between "8" and "M" after removed the sensitive element connector, and replace the sensitive element if the value is not within 44±5 ohms.

7.5.2 (Type S)

【Countermeasures】

(1) When the master compass is operating although the inverter over current alarm is generated, confirm the connection from MTERM pwb (terminal board TB2 AL2 / ALC) to GTERM pwb (terminal board TB1 AL2 / ALC).

(If the automatic steering system is integrated, confirm the connection (harness) from MTTRM pwb (connector J12) to GTERM pwb (connector J12).)

Confirm the inserting state from GTERM pwb (connector J4) to SCC pwb (connector J4).

Replace INVERTER pwb when no problem in the connection.

Replace SCC pwb when abnormality still generated even if INVERTER pwb replaced.

When the SCC pwb is replaced, do not forget to change the parameters stored in the non-volatile memory.

(2) If the inverter over current abnormality alarm was generated and the master compass stopped, turn "OFF" the power switch, and then after removed INVERTER pwb connector "CN4" in the master compass, turn "ON" the power switch again.

At this time, confirm that four LEDs (D26, D29, D34 and D35) in the INVERTER pwb are lit.

(3) If they are not lit in the above (2), check if the fuse F1 in the INVERTERpwb has blown.

If it has not blown, replace the inverter unit.

(4) If the LEDs are lit in the above (2) and the output voltage is not abnormal, turn "OFF" the power switch.

After 20 minutes elapsed, check the connection from the transformer CN4 on the phantom ring of the master compass to T1 and the sensitive element.

Specially, carefully check the connection related to the connector "8" and "M" in the sensitive element.

(5) If the connection is not abnormal in the connection in the above (4), measure resistance between "8" and "M" after removed the sensitive element connector, and replace the sensitive element if the value is not within 44±5 ohms.

7.5.3 (Type D)

【Countermeasures】

No. 1 Gyrocompass

(1) When the master compass is operating although the inverter over current alarm is generated, confirm the connection from No. 1 master compass MTTRM pwb (terminal board TB2 AL2 / ALC) to GTERM pwb (terminal board TB1 AL2 / ALC).

(If the automatic steering system is integrated, confirm the connection (harness) from MTTRM pwb (connector J12) to GTERM pwb (connector J12).)

Confirm the inserting state from GTERM pwb (connector J4) to No. 1 SCC pwb (connector J4).

Replace INVERTER pwb when no problem in the connection.

Replace No. 1 SCC pwb when abnormality still generated even if INVERTER pwb replaced.

When the SCC pwb is replaced, do not forget to change the parameters stored in the non-volatile memory.

(2) If the inverter over current abnormality alarm was generated and the master compass stopped, turn "OFF" the power switch, and then after removed INVERTER pwb connector "CN4" in the master compass, turn "ON" the power switch again.

At this time, confirm that four LEDs (D26, D29, D34 and D35) in the INVERTER pwb are lit.

(3) If they are not lit in the above (2), check if the fuse F1 in the INVERTERpwb has blown.

If it has not blown, replace the inverter unit.

(4) If the LEDs are lit in the above (2) and the output voltage is not abnormal, turn "OFF" the power switch. After 20 minutes elapsed, check the connection from the transformer CN4 on the phantom ring of the master compass to T1 and the sensitive element.

Specially, carefully check the connection related to the connector "8" and "M" in the sensitive element.

(5) If the connection is not abnormal in the connection in the above (4), measure resistance between "8" and "M" after removed the sensitive element connector, and replace the sensitive element if the value is not within 44±5 ohms.

No. 2 Gyrocompass

(1) When the master compass is operating although the inverter over current alarm is generated, confirm the connection from No. 2 master compass MTTRM pwb (terminal board TB2 AL2 / ALC) to DTERM pwb (terminal board TB21 AL2 / ALC).

(If the automatic steering system is integrated, confirm the connection (harness) from MTTRM pwb (connector J12) to DTERM pwb (connector J12).)

Confirm the inserting state from DTERM pwb (connector J4) to No. 2 SCC pwb (connector J4).

Replace INVERTER pwb when no problem in the connection.

Replace No. 2 SCC pwb when abnormality still generated even if INVERTER pwb replaced.

When the SCC pwb is replaced, do not forget to change the parameters stored in the non-volatile memory.

(2) If the inverter over current abnormality alarm was generated and the master compass stopped, turn "OFF" the power switch, and then after removed INVERTER pwb connector "CN4" in the master compass, turn "ON" the power

switch again.

At this time, confirm that four LEDs (D26, D29, D34 and D35) in the INVERTER pwb are lit.

(3) If they are not lit in the above (2), check if the fuse F1 in the INVERTERpwb has blown.

If it has not blown, replace the inverter unit.

(4) If the LEDs are lit in the above (2) and the output voltage is not abnormal, turn "OFF" the power switch. After 20 minutes elapsed, check the connection from the transformer CN4 on the phantom ring of the master compass to T1 and the sensitive element.

Specially, carefully check the connection related to the connector "8" and "M" in the sensitive element.

(5) If the connection is not abnormal in the connection in the above (4), measure resistance between "8" and "M" after removed the sensitive element connector, and replace the sensitive element if the value is not within 44±5 ohms.

7.6 Alarm code E-3 (Detailed code 6) Inverter abnormality (2)

Over voltage abnormality

(Alarm condition: Common to Type I, S and D.)

【Alarm conditions】

The power supply applying to the rotor and each pwb in the master compass is stopped if the output voltage (100 V AC rms) of INVERTER pwb exceeds 150 V.

Pay full attention because the power supply unit is in operating state.

7.6.1 (Type I)

【Countermeasures】

(1) When the master compass is operating although the inverter over current alarm is generated, confirm the connection from MTERM pwb (terminal board TB2 AL1 / ALC) to ITERM pwb (terminal board TB1 AL1 / ALC).

Replace INVERTER pwb when no problem in the connection.

Replace ICIF pwb when abnormality still generated even if INVERTER pwb replaced.

When the ICIF pwb is replaced, do not forget to change the parameters stored in the non-volatile memory.

(2) Re-start with the variable resistor VR1 of voltage adjustment for the INVERTER pwb placing in MIN (CCW max) when the inverter over voltage alarm is generated and the master compass is stopped.

At this time, adjust the output voltage to 100 V ACrms by slowly turning clockwise the VR1.

After this adjustment, confirm that the alarm is not generated when restarted several times.

(3) Replace INVERTER pwb when the over voltage alarm is generated in the above (2).

7.6.2 (Type S)

【Countermeasures】

(1) When the master compass is operating although the inverter over current alarm is generated, confirm the connection from MTTRM pwb (terminal board TB2 AL1 / ALC) to GTERM pwb (terminal board TB1 AL1 / ALC).
(If the automatic steering system is integrated, confirm the connection (harness) from MTTRM pwb (connector J12) to GTERM pwb (connector J12).)
Confirm the inserting state from GTERM pwb (connector J4) to SCC pwb (connector J4).
Replace INVERTER pwb when no problem in the connection.
Replace SCC pwb when abnormality still generated even if INVERTER pwb replaced.
When the SCC pwb is replaced, do not forget to change the parameters stored in the non-volatile memory.

(2) Re-start with the variable resistor VR1 of voltage adjustment for the INVERTER pwb placing in MIN (CCW max) when the inverter over voltage alarm was generated and the master compass stopped.
At this time, adjust the output voltage to 100 V ACrms by slowly turning clockwise the VR1.
After this adjustment, confirm that the alarm is not generated when restarted several times.

(3) Replace INVERTER pwb when the over voltage alarm was generated in the above (2).

7.6.3 (Type D)

【Countermeasures】

<u>No. 1 Gyrocompass</u>

(1) When the master compass is operating although the inverter over current alarm is generated, confirm the connection from No. 1 master compass MTTRM pwb (terminal board TB2 AL1 / ALC) to GTERM pwb (terminal board TB1 AL1 / ALC).

(If the automatic steering system is integrated, confirm the connection (harness) from MTTRM pwb (connector J12) to GTERM pwb (connector J12).)

Confirm the inserting state from GTERM pwb (connector J4) to No. 1 SCC pwb (connector J4).

Replace INVERTER pwb when no problem in the connection.

Replace No. 1 SCC pwb when abnormality still generated even if INVERTER pwb replaced.

When the SCC pwb is replaced, do not forget to change the parameters stored in the non-volatile memory.

(2) Re-start with the variable resistor VR1 of voltage adjustment for the INVERTER pwb placing in MIN (CCW max) when the inverter over voltage alarm was generated and the master compass stopped.

At this time, adjust the output voltage to 100 V ACrms by slowly turning clockwise the VR1. After this adjustment, confirm that the alarm is not generated when restarted several times.

(3) Replace INVERTER pwb when the over voltage alarm was generated in the above (2).

No. 2 Gyrocompass

(1) When the master compass is operating although the inverter over current alarm is generated, confirm the connection from No. 2 master compass MTTRM pwb (terminal board TB2 AL1 / ALC) to DTERM pwb (terminal board TB21 AL1 / ALC).

(If the automatic steering system is integrated, confirm the connection (harness) from MTTRM pwb (connector J12) to DTERM pwb (connector J12).)

Confirm the inserting state from DTERM pwb (connector J4) to No. 2 SCC pwb (connector J4).

Replace INVERTER pwb when no problem in the connection.

Replace No. 2 SCC pwb when abnormality still generated even if INVERTER pwb replaced.

When the SCC pwb is replaced, do not forget to change the parameters stored in the non-volatile memory.

(2) Re-start with the variable resistor VR1 of voltage adjustment for the INVERTER pwb placing in MIN (CCW max) when the inverter over voltage alarm was generated and the master compass stopped.

At this time, adjust the output voltage to 100 V ACrms by slowly turning clockwise the VR1.

After this adjustment, confirm that the alarm is not generated when restarted several times.

7.7 Alarm code E-4 (Detailed code 7 through 10) Master compass control power supply abnormality

This alarm is not usually informed to the user.

However, it is stored as "alarm log" in the non-volatile memories of SCC pwb and ICIF pwb.

This abnormality is detected by MCC pwb (CPU) in the master compass.

7.7.1 +12.5 V DC abnormality (Detailed code 7)

(Alarm condition: Common to Type I, S and D)

【Alarm condition】

This alarm is generated when the voltage "+12.5 V DC" in MCC pwb fluctuates more than ±30 %.

【Countermeasures】

(1) Turn "OFF" the power switch, and remove the other connectors than "J5" of MCC pwb, then turn "ON" the power switch and check the voltage between MCC pwb "TP1(COM)" and "Cathode of D15". (+12.5 V)

(2) Replace MCC pwb if the voltage is not abnormal in the above (1).

(3) Turn "OFF" the power switch if the voltage is abnormal in the above (1), and turn "ON" the power switch again after removed MCC pwb PJ5.

Then confirm that the voltage between "7" and "8" of the transformer T1 mounted on the phantom ring is around 13 V AC rms.

(4) Check the output voltage of INVERTER pwb if the voltage between "7" and "8" of T1 is abnormal in the above (3).

(The voltage between "6" and "7" of INVERTER pwb connector CN4 should be 100 V AC rms.)

If the output voltage of INVERTER pwb is abnormal, adjust the output voltage (by INVERTER pwb VR1).

Replace the transformer T1 when the output voltage cannot be adjusted.

(5) Replace MCC pwb when the voltage between "7" and "8" of T1 is not abnormal in the above (3).

7.7.2 -12.5 V DC abnormality (Detailed code 8)

(Alarm condition: Common to Type I, S and D)

【Alarm condition】

This alarm is generated when the voltage "-12.5 V DC" in MCC pwb fluctuates more than ±30 %.

【Countermeasures】

(1) Turn "OFF" the power switch, and remove the other connectors than "J5" of MCC pwb, then turn "ON" the power switch and check the voltage between MCC pwb "TP1(COM)" and "Cathode of D18". (-12.5 V)

(2) Replace MCC pwb if the voltage is not abnormal in the above (1).

(3) Turn "OFF" the power switch if the voltage is abnormal in the above (1), and turn "ON" the power switch again after removed MCC pwb PJ5.
Then confirm that the voltage between "8" and "9" of the transformer T1 mounted on the phantom ring is around 13 V AC rms.

(4) Check the output voltage of INVERTER pwb if the voltage between "8" and "9" of T1 is abnormal in the above (3).
(The voltage between "6" and "7" of INVERTER pwb connector CN4 should be 100 V AC rms.)
If the output voltage of INVERTER pwb is abnormal, adjust the output voltage (by INVERTER pwb VR1).
Replace the transformer T1 when the output voltage cannot be adjusted.

(5) Replace MCC pwb when the voltage between "8" and "9" of T1 is not abnormal in the above (3).

7.7.3 +10.0 V DC abnormality (Detailed code 9)

(Alarm condition: Common to Type I, S and D)

【Alarm condition】

This alarm is generated when the voltage "+10.0 V DC" in MCC pwb fluctuates more than ±10 %.

【Countermeasures】

(1) Turn "OFF" the power switch, and remove the other connectors than "J5" of MCC pwb, then turn "ON" the power switch and check the voltage between MCC pwb "TP1(COM)" and "TP23". (+10 V)

(2) Replace MCC pwb if the voltage is not abnormal in the above (1).

(3) Check the voltage between "TP1(COM)" and "Cathode of D15". (+12.5 V)

(4) Replace MCC pwb if the voltage is not abnormal in the above (3).

(5) Turn "OFF" the power switch if the voltage is abnormal in the above (3), and turn "ON" the power switch again after removed MCC pwb PJ5.

Then confirm that the voltage between "7" and "8" of the transformer T1 mounted on the phantom ring is around 13 V AC rms.

(6) Check the output voltage of the inverter if the voltage between "7" and "8" of T1 is abnormal in the above (5).

(The voltage between "6" and "7" of INVERTER pwb connector CN4 should be 100 V AC rms.)

If the output voltage of the inverter is abnormal, adjust the output voltage (by INVERTER pwb VR1).

Replace the transformer T1 when the output voltage cannot be adjusted.

(7) Replace MCC pwb when the voltage between "7" and "8" of T1 is not abnormal in the above (5).

7.7.4 -10.0 V DC abnormality (Detailed code 10)

(Alarm condition: Common to Type I, S and D)

【Alarm condition】

This alarm is generated when the voltage "-10.0 V DC" in MCC pwb fluctuates more than ±10 %.

【Countermeasures】

(1) Turn "OFF" the power switch, and remove the other connectors than "J5" connector of MCC pwb, then turn "ON" the power switch and check the voltage between MCC pwb "TP1(COM)" and "TP24". (-10 V)

(2) Replace MCC pwb if the voltage is not abnormal in the above (1).

(3) Check the voltage between "TP1(COM)" and "Cathode of D18". (-12.5 V)

(4) Replace MCC pwb if the voltage is not abnormal in the above (3).

(5) Turn "OFF" the power switch if the voltage is abnormal in the above (3), and turn "ON" the power switch again after removed MCC pwb PJ5. Then confirm that the voltage between "8" and "9" of the transformer T1 mounted on the phantom ring is around 13 V AC rms.

(6) Check the output voltage of the inverter between "7" and "8" of T1 is abnormal in the above (5). (The voltage between "6" and "7" of INVERTER pwb connector CN4 should be 100 V AC rms.)

If the output voltage of the inverter is abnormal, adjust the output voltage (by INVERTER pwb VR1).

Replace the transformer T1 when the output voltage cannot be adjusted.

(7) Replace MCC pwb when the voltage between "7" and "8" of T1 is not abnormal

in the above (5).

7.8 Alarm code E-5 (Detailed code 11) Sensitive element rotor current abnormality

This alarm is not normally informed to the user.

However, it is stored as "alarm log" in the non-volatile memories of SCC pwb and ICIF pwb.

This abnormality is detected by MCC pwb (CPU) in the master compass.

【Alarm condition】

This alarm is generated when the rotor current (190 mA) fluctuates more than ±30 %.

Monitoring of this alarm starts after 2 minutes since the follow-up started.

【Countermeasures】

(1) While the system is running, check the voltage and frequency between "5" and "6" of the terminal board (left side) on the phantom ring.
(100 V AC±3 V / 400 Hz±3 Hz)
Adjust the voltage by INVERTER pwb trimmer VR1 if it exceeded the range.

(2) Replace INVERTER pwb if the frequency exceeded the range in the above (1).

(3) Turn "OFF" the power switch if no problem in the above (1).
After 20 minutes elapsed, check the connection from the inverter unit, the transformer T1 on the phantom ring and the sensitive element.
Specially, carefully check the connection related to the connector between "8" and "M" in the sensitive element.

(4) If no problem in the connection in the above (3), measure resistance between "8" and "M" after removed the sensitive element connector.
(Resistance value: 45±2 ohms)
Replace the sensitive element if the value exceeds the range.

(5) If it was no problem up to the above (4), replace MCC pwb after turned "OFF" the power switch.

7.9 Alarm code E-6 (Detailed code 12) Sensitive element inclination abnormality (Common to Type I, S and D)

This alarm is detected by MCC pwb (CPU).

【Alarm condition】

This alarm is generated when the inclination (more than 1.5 deg.) has very rarely occurred in the sensitive element due to the north-seeking action, ship's rapid speed up / down or turning action.

Monitoring of this alarm starts after 2 hours since starting.

This abnormality state may be generated because the sensitive element cannot be controlled when the above-mentioned control voltage abnormality or rotor current abnormality has been generated in the master compass.

【Countermeasures】

(1) Perform checking according to the above-mentioned "7.7 Master compass control power supply abnormality" and "7.8 sensitive element rotor current abnormality".

If no problem, turn "OFF" the power switch and leave the system as it is for more than 20 minutes.

(2) Check contact state of the sensitive element connector and the connection from the sensitive element to MCC pwb.

(3) Check the connection between HRZC pwb and MCC pwb.

(4) Check DST resistance value after removed HRZC pwb connector PJ2. (23±20 ohms)

(5) Replace the sensitive element if not improved in the countermeasures (1) through (4).

(6) Replace MCC pwb if not improved in the countermeasure (5).

(7) Replace HRZC pwb if not improved in the countermeasure (6).

When replaced HRZC pwb, adjust HRZC pwb again according to Chapter 5, item 5.5.

7.10 Alarm code E-7 (Detailed code 13, 15) Servo abnormality

7.10.1 Horizontal servo abnormality (Detailed code 13)

＊＊This alarm is not detected for the moment. ＊＊

(Common to Type I, S and D)

(【Alarm condition】)

(This alarm is generated when the servo difference in the horizontal servo loop exceeded 1.0 degree.

Start the system again because it caused the master compass stop when this abnormality is generated.)

(【Countermeasures】)

(This abnormality is generated due to malfunction of the horizontal servo loop.

Accordingly, perform checking and taking countermeasures according to "7.9 Inclination abnormality".)

7.10.2 Rate limiter abnormality (Detailed code 15)

(Common to Type I, S and D)

【Alarm condition】

The master compass has a function to limit the maximum follow-up turning speed.

The setting of DIPSW on MCC pwb makes it valid.

The maximum turning speed (rate limit value) by DIPSW is 10 degree / sec.

This function is provided only for testing.

＊＊Note: Do not perform the setting usually.

Usually, turn "OFF" MCC pwb DIPSW SW1-3.

When "rate limit" is set, this alarm is generated when the larger turn rate than the turn rate which can be followed is applied (when struck by wave), and it stops the master compass.

This alarm state continues until the restarting.

Turn "OFF" the power switch once, and start it again.

【Countermeasures】

(1) Confirm that MCC pwb DIPSW SW1-3 has been "OFF".

7.11 Alarm code E-8 (Detailed code 36) Zero cross abnormality

This abnormality is detected by ZRCR pwb and processed by MCC pwb.

(Common to Type I, S and D)

【Alarm condition】

(1) Zero cross angle (master compass reference angle) is detected by "photo interrupter" mounted on the ZRCR pwb and "pin" mounted on the upper bracket.

Zero cross angle is detected as initial bearing setting during the last azimuth operation.

During the system is running, the zero cross angle is set every time the photo interrupter passed through the zero cross pin.

This alarm is generated when the zero cross pin has not been detected even after 3 rotations by the phantom ring in the last azimuth operation.

However, during system running, this alarm is not generated even when the photo interrupter cannot detect the cross pin (when the zero cross pin was lost due to some reason or ZRCR pwb becomes abnormal).

(2) Zero cross width is defined as the variation between the zero cross angle set when the photo interrupter passed through the zero cross pin and the accumulated relative bearing angle until passed the pin when the system

running.

This alarm is generated when this zero cross width exceeds the set zero cross width by the extended menu (A-2 2.4.E).

【Countermeasures】

For alarm condition (1)

(1) After turned "ON" the power switch, confirm that MCC pwb "DS3(LED)" goes lit at the moment when the photo interrupter passed through the zero cross pin.

(2) Turn "OFF" the power switch when LED was not lit in the above (1), and confirm the mounting of the cross pin and ZRCR pwb.
Specially pay attention to their relative positions.
Confirm that the pin height matches photo interrupter detector.
Also check the harness contact between ZRCR pwb and MCC pwb connector (J3).

(3) Replace MCC pwb if no problem in the above (2).

(4) Replace ZRCR pwb if not improved in the above (3).

For alarm condition (2)

(1) Confirm the mounting of the cross pin and ZRCR pwb.
Also check the harness contact between ZRCR pwb and MCC pwb connector (J3).

(2) Confirm the connection of communication line from MCC pwb (J2) to SMCC pwb (J1).
Specially, confirm the contact resistance between the slip-ring and the brush, and looseness of the "screw" used for the brush connection.

7.12 Alarm code E-9 (Detailed code 16 through 20) Non-volatile memory abnormality

This alarm is not usually informed to the user.

However, it is stored as "alarm log" in the non-volatile memories of SCC pwb and ICIF pwb.

Note that it may not be stored precisely due to abnormality of the memory.

This abnormality is detected by SCC pwb (CPU) and ICIF pwb (CPU).

7.12.1 Non-volatile memory abnormality 1 (Detailed code 16)

(Common to Type I, S and D)

【Alarm condition】

This alarm is generated when writable memory area went null.

【Countermeasures】

(1) Replace SCC pwb and ICIF pwb.
When replaced SCC pwb or ICIF pwb, make setting of each parameter again.
(Contact to TOKIMEC service station when it is not clear.)

7.12.2 Non-volatile memory abnormality 2 (Detailed code 17)
(Common to Type I, S and D)
【Alarm condition】
When "checksum" does not match during reading "internal data 1" at starting time (Whether "checksum" is checked or not is automatically decided, i.e. it is checked if the data has "checksum" and not checked if no "checksum".)
【Countermeasures】
(1) Replace SCC pwb and ICIF pwb.
When replaced SCC pwb or ICIF pwb, make setting of each parameter again.
(Contact to TOKIMEC service station when it is not clear.)

7.12.3 Non-volatile memory abnormality 3 (Detailed code 18)
(Common to Type I, S and D)
【Alarm condition】
When "checksum" does not match during reading "internal data 2" at starting time (Whether "checksum" is checked or not is automatically decided, i.e. it is checked if the data has "checksum" and not checked if no "checksum".)
【Countermeasures】
(1) Replace SCC pwb and ICIF pwb.
When replaced SCC pwb or ICIF pwb, make setting of each parameter again.
(Contact to TOKIMEC service station when it is not clear.)

7.12.4 Non-volatile memory abnormality 4 (Detailed code 19)
(Common to Type I, S and D)
【Alarm condition】
When "checksum" does not match during reading "internal data 3" at starting time (Whether "checksum" is checked or not is automatically decided, i.e. it is checked if the data has "checksum" and not checked if no "checksum".)
【Countermeasures】
(1) Replace SCC pwb and ICIF pwb.
When replaced SCC pwb or ICIF pwb, make setting of each parameter again.
(Contact to TOKIMEC service station when it is not clear.)

7.12.5 Non-volatile memory abnormality 5 (Detailed code 20)

(Common to Type I, S and D)

【Alarm condition】

When "tag" of the non-volatile memory does not match at starting time.

【Countermeasures】

(1) Replace SCC pwb and ICIF pwb.
When replaced SCC pwb or ICIF pwb, make setting of each parameter again.
(Contact to TOKIMEC service station when it is not clear.)

7.13 Alarm code E-A (Detailed code 21, 23) Communication abnormality (1) (Communication from the master compass to the control unit)

This abnormality is detected by SCC pwb (CPU) and ICIF pwb (CPU).

7.13.1 Communication abnormality MCC pwb (CPU) → ICIF / SCC pwb (CPU) (Detailed code 21)

(Common to Type I, S and D)

【Alarm condition】

This alarm is generated when communication from the master compass to the control unit (from MCC pwb (CPU) to ICIF / SCC pwb (CPU) has broken for more than 5 seconds.

7.13.1.1 (Type I)

【Countermeasures】

(1) Check the connection from the master compass MTTRM pwb MR+ / MR- to the control unit ITERM pwb TB1 MR+ / MR-.

(2) Check the communication line connection from MCC pwb (J2: 3 and 4 pin) to SMCC pwb (J1: 3 and 4 pin).
Specially, confirm the contact resistance between the slip-ring and the brush, and looseness of the "screw" used for the brush connection.
(Terminal name: M and B)

(3) Replace MCC pwb and SMCC pwb if the above (1) and (2) are not abnormal.

(4) Replace ICIF pwb if the alarm was not recovered after performed the above (1) through (3).
When the ICIF pwb is replaced, do not forget to change the parameters stored in the non-volatile memory.

7.13.1.2 (Type S)

【Countermeasures】

(1) Check the connection from the master compass MTTRM pwb MR+ / MR- to the

control unit GTERM pwb TB1 MR+ / MR-.
(When the automatic steering system is integrated, check the connection (harness) from the master compass MTTRM pwb (connector J12) to GTERM pwb (connector J12).

(2) Check the communication line connection from MCC pwb (J2: 3 and 4 pin) to SMCC pwb (J1: 3 and 4 pin).
Specially, confirm the contact resistance between the slip-ring and the brush, and looseness of the "screw" used for the brush connection.
(Terminal name: M and B)

(3) Check the connector contact between the control unit GTERMpwb (J4) and SCC pwb (J4).

(4) Replace MCC pwb and SMCC pwb if the above (1) through (3) are not abnormal.

(5) Replace SCC pwb if the alarm was not recovered after performed the above (1) through (4).
When the SCC pwb is replaced, do not forget to change the parameters stored in the non-volatile memory.

7.13.1.3 (Type D)

【Countermeasures】

No. 1 Gyrocompass

(1) Check the connection from No. 1 master compass MTTRM pwb MR+ / MR- to the control unit GTERM pwb TB1 MR+ / MR-.
(When the automatic steering system is integrated, check the connection (harness) from the master compass No. 1 master compass MTTRM pwb (connector J12) to GTERM pwb (connector J12).

(2) Check the communication line connection from MCC pwb (J2: 3 and 4 pin) to SMCC pwb (J1: 3 and 4 pin).
Specially, confirm the contact resistance between the slip-ring and the brush, and looseness of the "screw" used for the brush connection.
(Terminal name: M and B)

(3) Check the connector contact between the control unit GTERMpwb (J4) and No. 1 SCC pwb (J4).

(4) Replace MCC pwb and SMCC pwb if the above (1) through (3) are not abnormal.

(5) Replace No. 1 SCC pwb if the alarm was not recovered after performed the above (1) through (4).

When the SCC pwb is replaced, do not forget to change the parameters stored in the non-volatile memory.

No. 2 Gyrocompass

(1) Check the connection from No. 2 master compass MTTRM pwb MR+ / MR- to the control unit DTERM pwb TB21 MR+ / MR-.
(When the automatic steering system is integrated, check the connection (harness) between the master compass No. 2 master compass MTTRM pwb (connector J12) and DTERM pwb (connector J12).

(2) Check the communication line connection from MCC pwb (J2: 3 and 4 pin) to SMCC pwb (J1: 3 and 4 pin).
Specially, confirm the contact resistance between the slip-ring and the brush, and looseness of the "screw" used for the brush connection.
(Terminal name: M and B)

(3) Check the connector contact between the control unit DTERMpwb (J4) and No. 2 SCC pwb (J4).

(4) Replace MCC pwb and SMCC pwb if the above (1) through (3) are not abnormal.

(5) Replace No. 2 SCC pwb if the alarm was not recovered after performed the above (1) through (4).
When the SCC pwb is replaced, do not forget to change the parameters stored in the non-volatile memory.

7.13.2 MCC pwb (CPU) reset (Detailed code 23)

(Common to Type I, S and D)

【Alarm condition】

This alarm is generated when abnormality was generated in the control power supply 5 V DC of MCC pwb (CPU) in the master compass and the CPU was reset.

When this alarm is generated, the system starts to operate from the starting sequence.

【Countermeasures】

When this alarm is generated, confirm the source power supply 5 V DC (between TP1(COM) and TP2) applied to "CPU" of MCC pwb.

As this 5 V DC is produced by the control power supply, check and take necessary countermeasures according to "7.7 Master compass control power supply abnormality".

7.14 Alarm code E-B (Detailed code 22, 24) Communication abnormality(2)

(Communication from the control unit to the master compass)

7.14.1 Communication abnormality from ICIF / SCC pwb (CPU) to MCC pwb (CPU) (Detailed code 22)

(Common to Type I, S and D)

【Alarm condition】

This alarm is generated when communication from the control unit to the master compass (from ICIF / SCC pwb (CPU) to MCC pwb (CPU) has broken for more than 5 seconds.

7.14.1.1 (Type I)

【Countermeasures】

Standard type

(1) Check the connection from the master compass MTTRM pwb MR+ / MR- to the control unit ITERM pwb TB1 MR+ / MR-.

(2) Check the communication line connection from MCC pwb (J2: 3 and 5 pin) to SMCC pwb (J1: 3 and 5 pin).

Specially, confirm the contact resistance between the slip-ring and the brush, and looseness of the "screw" used for the brush connection.

(Terminal name: M and H)

(3) Replace MCC pwb and SMCC pwb if the above (1) and (2) are not abnormal.

(4) Replace ICIF pwb if the alarm was not recovered after performed the above (1) through (3).

When the ICIF pwb is replaced, do not forget to change the parameters stored in the non-volatile memory.

With the power supply unit (optional)

(1) Confirm whether ICIF pwb is operating or not.

It is decided that it is operating when even one LED is lit on ICIFpwb.

(2) It is decided that ICIF pwb is not operating when all LEDs on ICIF pwb are extinguished.

At this time, confirm that the voltage between ITERM pwb TB3 24B+ and 24B- is 24 V DC (+30 %, -20 %).

(3) If the voltage is abnormal in the above (2), confirm the connection between the power supply unit and the control unit, and if the voltage is normal, replace GPOWER pwb of the power supply unit.

(4) If the voltage is normal in the above (2), confirm that the control unit ITERM pwb connector (J5) does not exist.

Also, check the fuse (F7).

If it has blown, confirm the operation after replaced the fuse.
If the fuse has blown again, replace ICIF pwb.
When replaced ICIF pwb, do not forget to change the parameters stored in the non-volatile memory.

(5) When it is decided that ICIF pwb is operating in the above (1), confirm the connection from the master compass MTTRM pwb MT+ / MT- to the control unit ITERM pwb TB1 MT+ / MT-.

(6) Confirm the communication line connection from MCC pwb (J2: 3 and 5 pin) to SMCC pwb (J1: 3 and 5 pin).
Specially, confirm the contact resistance between the slip-ring and the brush, and looseness of the "screw" used for the brush connection.
(Terminal name: M, H)

(7) Replace MCC pwb and SMCC pwb if the above (5) and (6) are not abnormal.

(8) Replace ICIF pwb if the alarm was not recovered after performed the above (5) through (7).
When the ICIF pwb is replaced, do not forget to change the parameters stored in the non-volatile memory.

7.14.1.2 (Type S)

【Countermeasures】

(1) Confirm whether SCC pwb is operating or not.
It is decided that it is operating when even one LED is lit on SCC pwb.

(2) It is decided that SCC pwb is not operating when all LEDs on SCC pwb are extinguished.
At this time, confirm that the voltage between GTERM pwb connector (J5) "9" and "10" is 24 V DC (+30 %, -20 %).

(3) If the voltage is abnormal in the above (2), confirm the connection from GPOWER pwb (J5) to GTERM pwb (J5), and if the voltage is normal, replace GPOWER pwb of the power supply unit.

(4) If the voltage is normal in the above (2), check the fuse (F16) on GTERM pwb.
If it has blown, confirm the operation after replaced the fuse.
If the fuse has blown again, replace SCC pwb.
When replaced SCC pwb, do not forget to change the parameters stored in the non-volatile memory.

(5) When it is decided that SCC pwb is operating in the above (1), confirm the connection from the master compass MTTRM pwb MT+ / MT- to the control unit GTERM pwb TB1 MT+ / MT-.
(When the automatic steering system is integrated, confirm the connection

(harness) from the master compass MTTRM pwb (connector J12) to GTERM pwb (connector J12).

(6) Confirm the communication line connection from MCC pwb (J2: 3 and 5 pin) to SMCC pwb (J1: 3 and 5 pin).

Specially, confirm the contact resistance between the slip-ring and the brush, and looseness of the "screw" used for the brush connection.

(Terminal name: M, H)

(7) Confirm the connector contact from the control unit GTERM pwb (J4) to SCC pwb (J4).

(8) Replace MCC pwb and SMCC pwb if the above (5) through (7) are not abnormal.

(9) Replace SCC pwb if the alarm was not recovered after performed the above (5) through (8).

When the SCC pwb is replaced, do not forget to change the parameters stored in the non-volatile memory.

7.14.1.3 (Type D)

【Countermeasures】

<u>No. 1 Gyrocompass</u>

(1) Confirm whether No.1 SCC pwb is operating or not.

It is decided that it is operating when even one LED is lit on SCC pwb.

(2) It is decided that SCC pwb is not operating when all LEDs on No. 1 SCC pwb are extinguished.

At this time, confirm that the voltage between No.1 GTERM pwb connector (J5) "9" and "10" is 24 V DC (+30 %, -20 %).

(3) If the voltage is abnormal in the above (2), confirm the connection from No. 1 GPOWER pwb (J5) to GTERM pwb (J5), and if the voltage is normal, replace No. 1 GPOWER pwb of the power supply unit.

(4) If the voltage is normal in the above (2), check the fuse (F16) on GTERM pwb in the control unit.

If it has blown, confirm the operation after replaced the fuse.

If the fuse has blown again, replace No. 1 SCC pwb.

When replaced SCC pwb, do not forget to change the parameters stored in the non-volatile memory.

(5) When it is decided that No. 1 SCC pwb is operating in the above (1), confirm the connection from No. 1 master compass MTTRM pwb MT+ / MT- to the control unit GTERM pwb TB1 MT+ / MT-.

(When the automatic steering system is integrated, confirm the connection (harness) from the master compass MTTRM pwb (connector J12) to GTERM pwb (connector J12).

(6) Confirm the communication line connection from MCC pwb (J2: 3 and 5 pin) to SMCC pwb (J1: 3 and 5 pin).

Specially, confirm the contact resistance between the slip-ring and the brush, and looseness of the "screw" used for the brush connection.

(Terminal name: M, H)

(7) Confirm the connector contact from the control unit GTERM pwb (J4) to No. 1 SCC pwb (J4).

(8) Replace MCC pwb and SMCC pwb if the above (5) through (7) are not abnormal.

(9) Replace No. 1 SCC pwb if the alarm was not recovered after performed the above (5) through (8).

When the SCC pwb is replaced, do not forget to change the parameters stored in the non-volatile memory.

No. 2 Gyrocompass

(1) Confirm whether No.2 SCC pwb is operating or not.

It is decided that it is operating when even one LED is lit on SCC pwb.

(2) It is decided that SCC pwb is not operating when all LEDs on No. 2 SCC pwb are extinguished.

At this time, confirm that the voltage between DTERM pwb connector (J5) "9" and "10" is 24 V DC (+30 %, -20 %).

(3) If the voltage is abnormal in the above (2), confirm the connection from No. 2 GPOWER pwb (J7) to DTERM pwb (J7), and if the voltage is normal, replace No. 2 GPOWER pwb of the power supply unit.

(4) If the voltage is normal in the above (2), check the fuse (F19) on DTERM pwb in the control unit.

If it has blown, confirm the operation after replaced the fuse.

If the fuse has blown again, replace No. 2 SCC pwb.

When replaced SCC pwb, do not forget to change the parameters stored in the non-volatile memory.

(5) When it is decided that No. 1 SCC pwb is operating in the above (1), confirm the connection from No. 2 master compass MTTRM pwb MT+ / MT- to the control unit DTERM pwb TB21 MT+ / MT-.

(When the automatic steering system is integrated, confirm the connection (harness) from the master compass MTTRM pwb (connector J12) to GTERM pwb (connector J12).

(6) Confirm the communication line connection from MCC pwb (J2: 3 and 5 pin) to SMCC pwb (J1: 3 and 5 pin).

Specially, confirm the contact resistance between the slip-ring and the brush, and looseness of the "screw" used for the brush connection.

(Terminal name: M, H)

(7) Confirm the connector contact from the control unit GTERM pwb (J4) to No. 2 SCC pwb (J4).

(8) Replace MCC pwb and SMCC pwb if the above (5) through (7) are not abnormal.

(9) Replace No. 2 SCC pwb if the alarm was not recovered after performed the above (5) through (8).

When the SCC pwb is replaced, do not forget to change the parameters stored in the non-volatile memory.

7.14.2 SCC pwb (CPU) / ICIF (CPU) reset (Detailed code 24)

This alarm is not usually informed to the user.

However, it is stored as "alarm log" in the non-volatile memories of SCC pwb and ICIF pwb.

(Common to Type I, S and D)

【Alarm condition】

This alarm is generated when abnormality is generated in the control power supply 5 V DC of the control unit SCC pwb (CPU) and ICIF pwb (CPU), and the CPU was reset.

7.14.2.1 (Type I)

【Countermeasures】

When this alarm is generated, confirm the source power supply 5 V DC (between TP1(COM) and TP2) applied to "CPU" of ICIF pwb.

Standard type

(1) Confirm that ITERM pwb connector (J5) is mounted in the control unit and check the connector contact.

(2) Replace ICIF pwb.

When ICIF pwb is replaced, do not forget to change the parameters stored in the non-volatile memory.

With the power supply unit (optional)

(1) Confirm whether ICIF pwb is operating or not.

It is decided that it is operating when even one LED is lit on ICIF pwb.

(2) It is decided that ICIF pwb is not operating when all LEDs on ICIF pwb are

extinguished.

At this time, confirm that the voltage between ITERM pwb TB3 24B+ and 24B- is 24 V DC (+30 %, -20 %).

(3) If the voltage is abnormal in the above (2), confirm the connection between the power supply unit and the control unit, and if the voltage is normal, replace GPOWER pwb of the power supply unit.

(4) If the voltage is normal in the above (2), confirm that the control unit ITERM pwb connector (J5) does not exist.

Also, check the fuse (F7).

If it has blown, confirm the operation after replaced the fuse.

If the fuse has blown again, replace ICIF pwb.

When replaced ICIF pwb, do not forget to change the parameters stored in the non-volatile memory.

7.14.2.2 (Type S)

【Countermeasures】

(1) Confirm whether SCC pwb is operating or not.

It is decided that it is operating when even one LED is lit on SCC pwb.

(2) It is decided that SCC pwb is not operating when all LEDs on SCC pwb are extinguished.

At this time, confirm that the voltage between GTERM pwb connector (J5) "9" and "10" is 24 V DC (+30 %, -20 %).

(3) If the voltage is abnormal in the above (2), confirm the connection from GPOWER pwb (J5) to GTERM pwb (J5).

Replace GPOWER pwb if the connection is normal.

(4) If the voltage is normal in the above (2), confirm the fuse (F16) on GTERM pwb in the control unit.

If it has blown, confirm the operation after replaced the fuse.

If the fuse has blown again, replace SCC pwb.

When replaced SCC pwb, do not forget to change the parameters stored in the non-volatile memory.

7.14.2.3 (Type D)

【Countermeasures】

No. 1 Gyrocompass

(1) Confirm whether NO. 1 SCC pwb is operating or not.

It is decided that it is operating when even one LED is lit on SCC pwb.

(2) It is decided that SCC pwb is not operating when all LEDs on No. 1 SCC pwb

are extinguished.

At this time, confirm that the voltage between No.1 GTERM pwb connector (J5) "9" and "10" is 24 V DC (+30 %, -20 %).

(3) If the voltage is abnormal in the above (2), confirm the connection from No. 1 GPOWER pwb (J5) to GTERM pwb (J5).
Replace No. 1 GPOWER pwb if the connection is normal.

(4) If the voltage is normal in the above (2), confirm the fuse (F16) on GTERM pwb in the control unit.
If it has blown, confirm operation after replaced the fuse.
If the fuse has blown again, replace No. 1 SCC pwb.
When replaced SCC pwb, do not forget to change the parameters stored in the non-volatile memory.

<u>No. 2 Gyrocompass</u>

(1) Confirm whether NO. 2 SCC pwb is operating or not.
It is decided that it is operating when even one LED is lit on SCC pwb.

(2) It is decided that SCC pwb is not operating when all LEDs on No. 2 SCC pwb are extinguished.
At this time, confirm that the voltage between No.1 DTERM pwb connector (J7) "9" and "10" is 24 V DC (+30 %, -20 %).

(3) If the voltage is abnormal in the above (2), confirm the connection from No. 2 GPOWER pwb (J7) to DTERM pwb (J7). Replace No. 2 GPOWER pwb if the connection is normal.

(4) If the voltage is normal in the above (2), confirm the fuse (F19) on DTERM pwb in the control unit.
If it has blown, confirm operation after replaced the fuse.
If the fuse has blown again, replace No. 2 SCC pwb.
When replaced SCC pwb, do not forget to change the parameters stored in the non-volatile memory.

7.15 Alarm code E-c (Detailed code 25) GPS communication break

This alarm is detected by SCC pwb (CPU) and ICIF pwb (CPU).
(Alarm condition: Common to Type I, S and D.)

【Alarm condition】

This alarm is generated when the serial signal from the GPS has broken successively for 15 seconds.

This alarm is generated only when the latitude / ship speed information input system was set to "GPS" on the operating panel.

And also it is not generated when "A-2 2.9.G: No connection to GPS" was set.

7.15.1 (Type I)

【Countermeasures】

(1) Confirm that the GPS is operating properly.

At this time, by using a protocol analyzer or the like, confirm the serial signal data output from the GPS.

(2) Confirm the connection from ITERM pwb TB2 GRX+ / GRX- in the control unit to the GPS.

Also confirm after inversely connected ITERM pwb TB2 GRX+ and GRX-.

(3) Confirm after changed the setting of ICIF pwb jumper "GPSPOL (J11)" in the control unit.

When the signal cannot be received, confirm after inversely connected ITERM pwb TB2 GRX+ and GRX-.

(4) Confirm that "GPS communication format" in the extended menu "A-4" matches the format set in the GPS.

(5) Replace ICIF pwb when it was not improved by the above (1) through (4).

When the ICIF pwb was replaced, do not forget to change the parameters stored in the non-volatile memory.

7.15.2 (Type S)

【Countermeasures】

(1) Confirm that the GPS is operating properly.

At this time, by using a protocol analyzer or the like, confirm the serial signal data output from the GPS.

(2) Confirm the connection between GTERM pwb TB1 GRX+ / GRX- in the control unit and the GPS.

Also confirm after inversely connected GTERM pwb TB1 GRX+ and GRX-.

(3) Confirm after changed the setting of MIFC / SIFC pwb jumper "GPSPOL (MIFC pwb: J14, SIFC pwb: J20" in the control unit.

When the signal cannot be received, confirm after inversely connected GTERM pwb TB1 GRX+ and GRX-.

(4) Confirm that "GPS communication format" in the extended menu "A-4" matches the format set in the GPS.

(5) Replace MIFC / SIFC pwb when it was not improved by the above (1) through (4).

Replace each SCC pwb when it was not improved after replaced MIFC / SIFC pwb.

When the SCC pwb was replaced, do not forget to change the parameters stored in the non-volatile memory.

7.15.3 (Type D)

【Countermeasures】

(1) Confirm that the GPS is operating properly.

At this time, by using a protocol analyzer or the like, confirm the serial signal data output from the GPS.

(2) Confirm the connection between GTERM pwb TB1 GRX+ / GRX- in the control unit and the GPS.

Also confirm after inversely connected GTERM pwb TB1 GRX+ and GRX-.

(3) Confirm after changed the setting of MCOIF / SCOIF pwb jumper "GPSPOL (MCOIF pwb: J22, SCOIF pwb: J22" in the control unit.

When the signal cannot be received, confirm after inversely connected GTERM pwb TB1 GRX+ and GRX-.

(4) Confirm that "GPS communication format" in the extended menu "A-4" matches the format set in the GPS.

(5) Replace MCOIF / SCOIF pwb when it was not improved by the above (1) through (4).

Replace SCC pwb when it was not improved after replaced MCOIF / SCOIF pwb.

When the SCC pwb was replaced, do not forget to change the parameters stored in the non-volatile memory.

Note :

The recovering condition of this alarm is following two.

1. When the serial signal from the GPS has been recovered.
2. When the latitude / ship speed information input system was changed to other than the GPS and the true bearing (displayed with blinking) was determined.

While this alarm is generated, the latitude / ship speed data immediately before this abnormality occurred are retained.

The speed error correction is performed based on these data until this alarm condition is removed.

7.16 Alarm code E-d (Detailed code 26, 27) GPS data abnormality (Common to Type I, S and D)

This alarm is detected by SCC pwb (CPU) and ICIF pwb (CPU).

7.16.1 Latitude data abnormality (Detailed cod 26)

【Alarm condition】

It is alarmed when the following abnormality is generated in the serial signal data from the GPS.

This alarm is generated only when the latitude information input system was set to "GPS" on the operating panel.

And also it is not generated when the extended menu "A-2 2.8.G: No connection to GPS" was set.

(1) When GPS performance index of "GGA" received "0" more than 10 times successively.

(However, it is not alarmed when "A-7 7.3.G: Performance index check" was set to "OFF".)

(2) When latitude value is "null field".

(3) When both of "GGA" and "GLL" cannot be received successively for more than 17 seconds.

(4) "Checksum" of data did not match.

(Whether "checksum" is checked or not is automatically decided, i.e. it is checked if the data has "checksum" and not checked if no "checksum".)

* "GGA" sentence data is received at priority when both of "GGA" and "GLL" sentences are inputted where "GPS" was selected for the latitude information input system.

However, "GLL" sentence is automatically received when "GGA" sentence was lost for more than 3 seconds.

Then "GGA" sentence is immediately received when "GGA" sentence was recovered.

【Countermeasures】

(1) Take the similar countermeasures to "7.15 GPS communication break" for Type I / S / D.

7.16.2 Ship speed data abnormality (Detailed code 27)

【Alarm condition】

It is alarmed when the following abnormality is generated in the serial signal data from the GPS.

This alarm is generated only when the ship speed information input system was set to "GPS" on the operating panel.

And also it is not generated when the extended menu "A-2 2.9.G: No connection to GPS" was set.

(1) When "VTG" was not received for more than 17 seconds.

(2) When ship speed value was "null field".

(3) "Checksum" of data did not match.
(Whether "checksum" is checked or not is automatically decided, i.e. it is checked if the data has "checksum" and not checked if no "checksum".)

【Countermeasures】

(1) Take the similar countermeasures to "7.15 GPS communication break" for Type I / S / D.

7.17 Alarm code E-E (Detailed code 32) External heading sensor unit (HDM / EHS / MAG) communication break

This alarm is detected by SCC pwb (CPU). (Type I cannot be combined.)

(Alarm condition: Common to Type S and D)

【Alarm condition】

This alarm is generated when the serial signal from the external heading sensor unit (HDM / EHS / MAG) has broken for more than 15 seconds successively.

This alarm is generated only when TG-8000 series was set with the external heading sensor unit (HDM / EHS / MAG).

This setting is performed by DIPSW (SCC pwb / ICIF pwb SW1 5 and 6 bit).

7.17.1 (Type I)

【Countermeasures】

Turn "OFF" ICIF pwb DIPSW SW1 5, 6 bit because the external heading sensor unit (HDM / EHS / MAG) cannot be connected.

7.17.2 (Type S)

【Countermeasures】

(1) Confirm that the external heading sensor unit (HDM / EHS / MAG) is operating properly.

(2) Check the connection and its contact between the GTERMpwb connector (J7) in the control unit and EMCC pwb connector (J7) of the external heading sensor unit (HDM / EHS / MAG).

(3) Confirm after changed the setting of MIFC / SIFC pwb jumper "ESPOL (MIFC pwb: J16, SIFC pwb: J22)

(4) Confirm that MIFC / SIFC pwb jumper "WR / EXT (MIFC pwb: J10 and SIFC pwb: J17) are shorted.
(Also confirm its contact state.)

(5) Replace MIFC / SIFC pwb if it was not improved by the above (1) through (4). Replace SCC pwb when it was not improved after replaced MIFC / SIFC pwb. When the SCC pwb was replaced, do not forget to change the parameters stored in the non-volatile memory.

7.17.3 (Type D)

【Countermeasures】

(1) Confirm that the external heading sensor unit (HDM / EHS / MAG) is operating properly.

(2) Check the connection and contact between the GTERMpwb connector (J7) in the control unit and EMCC pwb connector (J7) of the external heading sensor unit (HDM / EHS / MAG).

(3) Confirm that "3" and "4" of MCOIF / SCOIF pwb jumper "ESSEL1 through 4 (MCOIF pwb: J33 / 34 / 35 / 36, SCOIF pwb: J33 / 34 / 35 / 36)" are shorted.

(4) Confirm that MCOIF / SCOIF pwb jumper "1WR / EXT, 2WR / EXT (MCOIF pwb: J25, 26 and SCOIF pwb: J25, 26) are shorted.
(Also confirm its contact state.)

(5) Replace MCOIF / SCOIF pwb if it was not improved by the above (1) through (4).
Replace each SCC pwb when it was not improved after replaced MCOIF / SCOIF pwb.

7.18 Alarm code E-F (Detailed code 33)

External heading sensor unit (HDM / EHS / MAG) data abnormality

This alarm is detected by SCC pwb (CPU). (Type I cannot be combined.)
(Alarm condition: Common to Type S and D)

【Alarm condition】

This alarm is generated when the serial signal cannot be received properly from the external heading sensor unit (HDM / EHS / MAG) for more than 17 seconds successively.

This alarm is generated only when TG-8000 series was set with the external heading sensor unit (HDM / EHS / MAG).

This setting is performed by DIPSW (SCC pwb / ICIF pwb SW1 5 and 6 bit).

【Countermeasures】

(1) Take the similar countermeasures to "7.17 External heading sensor unit (HDM / EHS / MAG) communication break.

7.19 Alarm code E-L (Detailed code 30) Standard external heading sensor communication break

This alarm is detected by SCC pwb (CPU) and ICIF pwb (CPU). (Type I is optional.)

(Alarm condition: Common to Type I, S and D)

【Alarm condition】

This alarm is generated when the serial signal from the standard external heading sensor unit has broken for more than 15 seconds successively.

This alarm is generated only when TG-8000 series was set with the standard external heading sensor unit.

This setting is performed by DIPSW (SCC pwb / ICIF pwb SW1 5 and 6 bit).

7.19.1 (Type I)

【Countermeasures】

(1) Confirm that the IOPT pwb is mounted in the control unit.

(2) Confirm that the connected external heading sensor is operating properly.
At this time, by using a protocol analyzer or the like confirm the output signal data from the external heading sensor.

(3) Confirm the connection between IPOT pwb TB4 ESRX+ / ESRX- in the control unit and the external heading sensor.
Also confirm after inversely connected IPOT pwb TB4 ESRX+ / ESRX-.

(4) Confirm after changed the setting of IOPT pwb jumper "ESPOL (J7)".
Confirm after inversely connected IPOT pwb TB3 ESRX+ / ESRX- if it cannot be received.

(5) Confirm that ICIF pwb jumpers "FLASH (J1)" are shorted.
(Also confirm its contact state.)

(6) Confirm that the extended menu "A-6, Standard external heading sensor communication format" matches the external heading sensor format.

(7) Replace IOPT pwb if it was not improved by the above (1) through (6).
Replace ICIF pwb if it was not improved after replaced IOPT pwb.
When the ICIF pwb was replaced, do not forget to change the parameters stored in the non-volatile memory.

7.19.2 (Type S)

【Countermeasures】

(1) Confirm that the connected external heading sensor is operating properly.
At this time, by using a protocol analyzer or the like, confirm the output signal data from the external heading sensor.

(2) Confirm the connection between GTERM pwb TB1 ESRX+ / ESRX- in the

control unit and the external heading sensor.

Also confirm after inversely connected GTERM pwb TB1 ESRX+ / ESRX-.

(3) Confirm after changed the setting of MIFC / SIFC pwb jumper "ESPOL (MIFC pwb: J16, SIFC pwb: J22)" in the control unit.

Confirm after inversely connected GTERM pwb TB1 ESRX+ / ESRX- if it cannot be received.

(4) Confirm that MIFC / SIFC pwb jumpers "WR / EXT (MIFC pwb: J10, SIFC pwb: J17)" are shorted.

(Also confirm its contact state.)

(5) Confirm that the extended menu "A-6, Standard external heading sensor communication format" matches the external heading sensor format.

(6) Replace MIFC / SIFC pwb if it was not improved by the above (1) through (5).

Replace SCC pwb if it was not improved after replaced MIFC / SIFC pwb.

When the SCC pwb was replaced, do not forget to change the parameters stored in the non-volatile memory.

7.19.3 (Type D)

【Countermeasures】

(1) Confirm that the connected external heading sensor is operating properly.

At this time, by using a protocol analyzer or the like, confirm the output signal data from the external heading sensor.

(2) Confirm that "1" and "2" of MCOIF / SCOIF pwb jumper "ESSEL1 through 4 (MCOIF pwb: J33 / 34 / 35 / 36, SCOIF pwb: J33 / 34 / 35 / 36)" are shorted.

(3) Confirm the connection between GTERM pwb TB1 ESRX+ / ESRX- in the control unit and the external heading sensor.

Also confirm after inversely connected GTERM pwb TB1 ESRX+ / ESRX-.

(4) Confirm after changed the setting of MCOIF / SCOIF pwb jumper "ESPOL (MCOIF pwb: J29, SCOIF pwb: J29)" in the control unit.

Confirm after inversely connected GTERM pwb TB1 ESRX+ / ESRX- if it cannot be received.

(5) Confirm that MCOIF / SCOIF pwb jumpers "MWR / EXT (MCOIF pwb: J30, SIFC pwb: J30)" are shorted. (Also confirm its contact state.)

(6) Confirm that the extended menu "A-6, Standard external heading sensor communication format" matches the external heading sensor format.

(7) Replace MCOIF / SCOIF pwb if it was not improved by the above (1) through (6).

Replace SCC pwb if it was not improved after replaced MCOIF / SCOIF pwb.

When the SCC pwb was replaced, do not forget to change the parameters stored in the non-volatile memory.

7.20 Alarm code E-n (Detailed code 31) Standard external heading sensor communication data abnormality

This alarm is detected SCC pwb (CPU) and ICIF pwb (CPU). (Optional for Type I)
(Alarm condition: Common to Type I, S and D)

【Alarm condition】

This alarm is generated when the serial signal from the standard external heading sensor unit cannot be received properly for more than 17 seconds successively.

This alarm is generated only when TG-8000 series was set with the standard external heading sensor unit.

This setting is performed by DIPSW (SCC pwb / ICIF pwb SW1 5 and 6 bit).

【Countermeasures】

(1) Take the similar countermeasures to "7.19 Standard external heading sensor unit communication break".

7.21 Alarm code E-P (Detailed code 28) LOG communication break

(Alarm condition: Common to Type I, S and D)

【Alarm condition】

This alarm is generated when the serial signal from the LOG has broken for 15 seconds successively.

This alarm is generated only when the ship speed was set to obtain from the LOG (serial signal).

This alarm is not generated when the extended menu "A-2 2. A. S: No LOG (serial signal)" was set.

7.21.1 (Type I)

【Countermeasures】

(1) Confirm that IOPT pwb is mounted in the control unit.

(2) Confirm the setting of DIPSW SW1 on the IOPT pwb.
Set baud rate of the serial signal from the LOG.

(3) Confirm that the LOG is operating properly.
At this time, by using a protocol analyzer or the like, confirm the output signal data from the GPS.

(4) Confirm the connection between IOPT pwb TB3 LRX+ / LRX- in the control unit and the LOG.
Confirm after inversely connected IOPT pwb TB3 LRX+ / LRX-.

(5) Confirm the setting of IOPT pwb jumper "LOGPOL (J6)" in the control unit.
Confirm after inversely connected IOPT pwb TB3 LRX+ / LRX- if it cannot be received.

(6) Confirm that "A-5" LOG communication format matches the format set for the LOG.

(7) Replace IOPT pwb if it was not improved by the above (1) through (6).
Replace ICIF pwb if it was not improved after replaced IOPT pwb.
When the ICIF pwb was replaced, do not forget to change the parameters stored in the non-volatile memory.

7.21.2 (Type S)

【Countermeasures】

(1) Confirm that LOG is operating properly.
At this time, by using a protocol analyzer or the like, confirm the output signal data from the GPS.

(2) Confirm the connection between GTERM pwb TB1 LRX+ / LRX- in the control unit and the LOG.
Confirm after inversely connected GTERM pwb TB1 LRX+ / LRX-.

(3) Confirm after changed the setting of MIFC / SIFC pwb jumper "LOGPOL (MIFC pwb: J15, SIFC pwb: J21)" in the control unit.
Confirm after inversely connected GTERM pwb TB1 LRX+ / LRX- if it cannot be received.

(4) Confirm that the extended menu "A-5 LOG communication format" matches the format set for the LOG.

(5) Replace MIFC / SIFC pwb if it was not improved by the above (1) through (4).
Replace SCC pwb if it was not improved after replaced MIFC / SIFC pwb.
When the SCC pwb was replaced, do not forget to change the parameters stored in the non-volatile memory.

7.21.3 (Type D)

【Countermeasures】

(1) Confirm that LOG is operating properly.
At this time, by using a protocol analyzer or the like, confirm the output signal data from the GPS.

(2) Confirm the connection between GTERM pwb TB1 LRX+ / LRX- in the control unit and the LOG.
Confirm after inversely connected GTERM pwb TB1 LRX+ / LRX-.

(3) Confirm after changed the setting of MCOIF / SCOIF pwb jumper "LOGPOL

(MCOIF pwb: J23, SCOIF pwb: J23)" in the control unit.

Confirm after inversely connected GTERM pwb TB1 LRX+ / LRX- if it cannot be received.

(4) Confirm that the extended menu "A-5 LOG communication format" matches the format set for the LOG.

(5) Replace MCOIF / SCOIF pwb if it was not improved by the above (1) through (4).

Replace each SCC pwb if it was not improved after replaced MCOIF / SCOIF pwb.

When the SCC pwb was replaced, do not forget to change the parameters stored in the non-volatile memory.

7.22 Alarm code E-U (Detailed code 29) LOG data abnormality

This alarm is detected by SCC pwb (CPU) and ICIF pwb (CPU) (Optional for Type I)
(Alarm condition: Common to Type I, S and D)

【Alarm condition】

This alarm is generated when the following abnormality is generated in the serial signal data from the LOG.

This alarm is generated only when the ship speed information input system was set to "LOG serial signal".

Also it is not generated when the extended menu "A-2 2.A.S: No LOG (serial signal)" was set.

(1) When both of the speed over ground status and the speed over water status are invalid.

(2) When both of the speed over ground value and the speed over water value are "null field".

(3) When "VBW" cannot be received for more than 17 seconds successively.

(4) When data "checksum" did not match.
(Whether "checksum" is checked or not is automatically decided, i.e. it is checked if the data has "checksum" and not checked if no "checksum".)

【Countermeasures】

(1) Take the similar countermeasures to "7.21 LOG communication break" for Type I / S / D.

7.23 Alarm code E-u (Detailed code 37) LOG pulse abnormality

This alarm is detected by SCC pwb (CPU) and ICIF pwb (CPU).

(Alarm condition: Common to Type I, S and D)

【Alarm condition】

This alarm is generated when the time interval of the output pulse (contact) from the LOG changed suddenly more than 3 times.

It is treated as an alarm condition because sudden speed change does not occur while the ship is normally operated.

This alarm is generated only when the ship speed information input system was set to "LOG pulse".

Also it is not generated when the extended menu "A-2 2.9.L: No LOG connection" was set.

7.23.1 (Type I)

【Countermeasures】

(1) Confirm that the LOG is operating properly.
When it is operating properly, confirm the LOG output pulse (contact) movement by an oscilloscope, tester or the like.
If possible, confirm that the gyrocompass can receive the speed properly when pulses (contact) corresponding to a constant ship speed are outputted in LOG test mode.

(2) Confirm the connection between ITERM pwb TB2 SL+ / SL- in the control unit and the LOG.

(3) Confirm the contact of ICIF pwb jumper "LOG (J14)" in the control unit.

(4) Confirm that ICIF pwb LED DS11 is blinking during the ship speed input.
Replace ICIF pwb if it was not blinking.
When the ICIF pwb was replaced, do not forget to change the parameters stored in the non-volatile memory.

7.23.2 (Type S)

【Countermeasures】

(1) Confirm that the LOG is operation properly.
If it is operating properly, confirm the LOG output pulse (contact) movement by an oscilloscope, tester or the like.
If possible, confirm that the gyrocompass can receive the speed properly when pulses (contact) corresponding to a constant ship speed are outputted in LOG test mode.

(2) Confirm the connection between GTERM pwb TB1 SL+ / SL- in the control unit and the LOG.

(3) Confirm the contact of MIFC / SIFC pwb jumper "LOG (MIFC pwb: J11, SIFC

pwb: J19)" in the control unit.

(4) Confirm that MIFC / SIFC pwb LED DS1 is blinking during the ship speed input.

Replace MIFC / SIFC pwb if it was not blinking.

Replace SCC pwb if it was not improved after replaced MIFC / SIFC pwb.

When the SCC pwb was replaced, do not forget to change the parameters stored in the non-volatile memory.

7.23.3 (Type D)

【Countermeasures】

(1) Confirm that the LOG is operating properly.

If it is operating properly, confirm the LOG output pulse (contact) movement by an oscilloscope, tester or the like.

If possible, confirm that the gyrocompass can receive the speed properly when pulses (contact) corresponding to a constant ship speed are outputted in LOG test mode.

(2) Confirm the connection between GTERM pwb TB1 SL+ / SL- in the control unit and the LOG.

(3) Confirm the contact of MCOIF / SCOIF pwb jumper "LOG (MCOIF pwb: J27, SCOIF pwb: J27)" in the control unit.

(4) Confirm that MCOIF / SCOIF pwb LED DS1 is blinking during the ship speed input.

Replace MCOIF / SCOIF pwb if it was not blinking.

Replace each SCC pwb if it was not improved after replaced MCOIF / SCOIF pwb.

When the SCC pwb was replaced, do not forget to change the parameters stored in the non-volatile memory.

7.24 Alarm code E-G (Detailed code 35) Encoder abnormality

This alarm is detected by SCC pwb (CPU) and ICIF pwb (CPU).

(Alarm condition: Comon to Type I, S and D)

【Alarm condition】

This alarm is generated when such state that the difference between the master compass bearing and the bearing obtained by the encoder is more than 3 degrees, has continued for more than 3 seconds.

7.24.1 (Type I)

【Countermeasures】

(1) Confirm the connection between the master compass MTTRM pwb EA+/- ,

EB+/- and the control unit ITERM pwb TB1 EA+/-, EB+/-.

(2) Confirm the connection from MCC pwb (J2) to SMCC pwb (J1).
Specially, confirm the contact resistance between the slip-ring and the brush, and looseness of the "screw" used for the brush connection.

(3) Confirm that the master compass step motor is operating smoothly, and the encoder unit is operating properly.
If possible, confirm that the 90 degree phase shifted wave form is observed by connected an oscilloscope to MTTRM pwb EA+/- and EB+/- of the master compass.
Replace ENCC pwb if the wave form is abnormal.

(4) Replace ICIF pwb if no problem in the above (1) through (3).
When the ICIF pwb was replaced, do not forget to change the parameters stored in the non-volatile memory.

7.24.2 (Type S)

【Countermeasures】

(1) Confirm the connection from the master compass MTTRM pwb EA+/- , EB+/- to the control unit GTERM pwb TB1 EA+/-, EB+/-.
(When the automatic steering system is integrated, confirm the connection (harness) from the master compass MTTRM pwb (connector J12) to GTERM pwb (connector J12).

(2) Confirm the connection from MCC pwb (J2) to SMCC pwb (J1).
Specially, confirm the contact resistance between the slip-ring and the brush, and looseness of the "screw" used for the brush connection.

(3) Confirm that the master compass step motor is operating smoothly, and the encoder unit is operating properly.
If possible, confirm that the 90 degree phase shifted wave form is observed by connected an oscilloscope to MTTRM pwb EA+/- and EB+/- of the master compass.
Replace ENCC pwb if the wave form is abnormal.

(4) Confirm the connector inserting state from GTERM pwb (connector J4) to SCC pwb (connector J4).

(5) Replace SCC pwb if no problem in the above (1) through (4).
When the SCC pwb was replaced, do not forget to change the parameters stored in the non-volatile memory.

7.24.3 (Type D)

【Countermeasures】

No. 1 Gyrocompass

(1) Confirm the connection from the master compass MTTRM pwb EA+/- , EB+/- to the control unit GTERM pwb TB1 EA+/-, EB+/-.
(When the automatic steering system is integrated, confirm the connection (harness) from the master compass MTTRM pwb (connector J12) to GTERM pwb (connector J12).

(2) Confirm the connection from MCC pwb (J2) to SMCC pwb (J1).
Specially, confirm the contact resistance between the slip-ring and the brush, and looseness of the "screw" used for the brush connection.

(3) Confirm that the master compass step motor is operating smoothly, and the encoder unit is operating properly.
If possible, confirm that the 90 degree phase shifted wave form is observed by connected an oscilloscope to MTTRM pwb EA+/- and EB+/- of the master compass.
Replace ENCC pwb if the wave form is abnormal.

(4) Confirm the connector inserting state from GTERM pwb (connector J4) to No. 1 SCC pwb (connector J4).

(5) Replace No. 1 SCC pwb if no problem in the above (1) through (4).
When the SCC pwb was replaced, do not forget to change the parameters stored in the non-volatile memory.

No. 2 Gyrocompass

(1) Confirm the connection from the master compass MTTRM pwb EA+/- , EB+/- to the control unit GTERM pwb TB1 EA+/-, EB+/-.
(When the automatic steering system is integrated, confirm the connection (harness) from the master compass MTTRM pwb (connector J12) to GTERM pwb (connector J12).

(2) Confirm the connection from MCC pwb (J2) to SMCC pwb (J1).
Specially, confirm the contact resistance between the slip-ring and the brush, and looseness of the "screw" used for the brush connection.

(3) Confirm that the master compass step motor is operating smoothly, and the encoder unit is operating properly.
If possible, confirm that the 90 degree phase shifted wave form is observed by connected an oscilloscope to MTTRM pwb EA+/- and EB+/- of the master compass.
Replace ENCC pwb if the wave form is abnormal.

(4) Confirm the connector inserting state from GTERM pwb (connector J4) to No. 2 SCC pwb (connector J4).

(5) Replace No. 2 SCC pwb if no problem in the above (1) through (4).
When the SCC pwb was replaced, do not forget to change the parameters stored in the non-volatile memory.

7.25 Alarm code E-r (Detailed code 34) Communication system power supply abnormality (E5V abnormality)

This alarm is detected by SCC pwb (CPU) and ICIF pwb (CPU)
(Alarm condition: Common to Type I, S and D)

【Alarm condition】

This alarm is generated when the power supply for the communication system control circuit was lost (or dropped).

7.25.1 (Type I)

【Countermeasures】

(1) Confirm after removed all serial signal cables connected to ITERM pwb.
(2) Replace ICIF pwb if abnormality continued after performed the above (1).
When the ICIF pwb was replaced, do not forget to change the parameters stored in the non-volatile memory.

7.25.2 (Type S)

【Countermeasures】

(1) Confirm after removed all serial signal cables connected to GTERM pwb.
(2) Replace MIFC / SIFC pwb if abnormality continued after performed the above (1).
(3) Replace SCC pwb if it was not improved after performed the above (1) and (2).
When the SCC pwb was replaced, do not forget to change the parameters stored in the non-volatile memory.

7.25.3 (Type D)

【Countermeasures】

(1) Confirm after removed all serial signal cables connected to GTERM pwb.
(2) Replace MCOIF / SCOIF pwb if abnormality continued after performed the above (1).
(3) Replace each SCC pwb if it was not improved after performed the above (1) and (2).
When the SCC pwb was replaced, do not forget to change the parameters stored in the non-volatile memory.

7.26 Other abnormality

7.26.1 3 step motor type repeater compass is not operating.

The signal output to the repeater compass starts after the master compass completed the last azimuth operation.

7.26.1.1 When no repeater is operating.

a (Type I)

(1) Confirm that the voltage between ITERM pwb TB1 ST15 and ST14 (Comm.) is 24 V DC +30 % / -20 %.

(2) Check ITERM pwb fuse F5 if no problem in the above (1).

Replace it if it has blown and confirm after removed the connected repeater compass.

Replace ICIF pwb if it has blown again.

When the ICIF pwb was replaced, do not forget to change the parameters stored in the non-volatile memory.

b (Type S)

(1) Confirm that the voltage between GTERM pwb TB2 STx5 and STx4 (Comm.) is 24 V DC ±4 V.

Replace GPOWER if the value exceeds the range.

(2) Check GTERM pwb fuse F5 if no problem in the above (1).

Confirm after replaced it if it has blown.

Replace MIFC / SIFC pwb if it has blown again.

(3) Replace SCC pwb if it was not improved after performed the above (1) and (2).

When the SCC pwb was replaced, do not forget to change the parameters stored in the non-volatile memory.

c (Type D)

(1) Confirm that the voltage between GTERM pwb TB2 STx5 and STx4 (Comm.) is 24 V DC ±4 V.

Replace GPOWER if the value exceeds the range.

(2) Check GTERM pwb fuse F15 if no problem in the above (1).

And also check DTERM pwb fuse F17.

Confirm after replaced it if it has blown.

Replace MCOIF / SCOIF pwb if it has blown again.

(3) Replace each SCC pwb if it was not improved after performed the above (1) and (2).

When the SCC pwb was replaced, do not forget to change the parameters stored in the non-volatile memory.

7.26.2 When one or more repeater compasses are not operating.
(Common to Type I, S and D)

(1) Confirm the fuse on the GTERM / ITERM pwb circuit connected to the not-working repeater compass.
Refer to the separate circuit drawings for the relationship between the fuse and GTERM / ITERM pwb connecting terminal to the repeater compass.

7.26.3 When serial signal type repeater is not operating.

The signal output to the repeater compass starts after the master compass completed the last azimuth operation.

(1) Confirm that card illumination is blinking by maximizing illumination intensity of the repeater compass.
(2) When the card illumination is blinking, there is possibility that the serial signal specifications applying to the repeater do not match the receiving serial signal specifications of the internal RPCC pwb in the repeater.
Check the DIPSW setting of the gyrocompass side, jumper setting and DIPSW setting of the repeater side.

Table 7.1 Alarm code summary

Alarm Code	Alarm Contents	Detailed Code	Alarm Condition
E-1	Main power supply abnormality	1	When the main power supply (AC power supply) dropped by 10 %.
E-2	Power supply abnormality	2	When over current (more than 9 A at starting time,and more than 4.5 A in steady,state) has occurred in the control unit power supply
		3	When over voltage (master compass power supply voltage is more than 31.2 V) has occurred in the control unit power supply.
		4	Repeater power supply 24 V was lost.
E-3	Inverter power supply abnormality	5	When over current (more than 9 A at starting time, and more than 5 A in steady state (after 13 min.)) has occurred in the master compass inverter.
		6	When over voltage (more than 150 V at peak value) has occurred in the rotor power supply (100 V AC) of the inverter in the master compass.
E-4	Master compass control power supply abnormality	7	When +12.5 V fluctuated more than±30 %.
		8	When −12.5 V fluctuated more than±30 %.
		9	When +10.0 V fluctuated more than±20 %.
		10	When −10.0 V fluctuated more than±20 %.
E-5	Rotor current abnormality	11	When rotor current fluctuated more than 30 %.
E-6	Rotor inclination abnormality	12	When the rotor inclined more than±1.5 degree. (Monitoring starts after 2 hours since starting.)
E-7	Servo abnormality	13	When θ servo difference exceeds 1.0 degree. (Monitoring starts after 2 seconds since servo on.)
		14	Reserved
		15	When turn rate was over **.* degree.
E-8	Zero cross abnormality	36	When the difference exceeds the set width at zero cross passed point.
E-9	Non-volatile memory abnormality	16	When writable memory area is null.
		17	When checksum does not match for internal data 1 reading at starting time.
		18	When checksum does not match for internal data 2 reading at starting time.
		19	When checksum does not match for internal data 3 reading at starting time.
		20	When tag of the non-volatile memory does not match.
E-A	Communication abnormality (1)	21	When communication from MCC to SCC has broken for more than 5 seconds.
		23	When reset was generated in MCC.
E-b	Communication abnormality (2)	22	When communication from SCC to MCC has broken for more than 5 seconds.
		24	When reset was generated in SCC.
E-c	GPS communication break	25	When serial signal from GPS has broken for more than 15 seconds.
E-d	GPS data abnormality (latitude)	26	When latitude data abnormality due to serial signal from GPS continued for more than 17 sec.
	GPS data abnormality (latitude)	27	When ship speed data abnormality due to serial signal from GPS continued for more than 17 sec.
E-E	MAG / EHS communication break	32	When serial signal from MAG / EHS has broken for more than 15 sec.
E-F	MAG / EHS data abnormality	33	When serial signal from MAG / EHS has broken for more than 17 sec.
E-L	EXT. sensor communication break	30	When serial signal from EXT. sensor has broken for more than 15 sec.
E-n	EXT. sensor abnormality	31	When EXT. serial signal data abnormality continued for more than 17 sec.
E-p	LOG communication break	28	When serial signal from LOG (serial) has broken more than 15 sec.
E-U	LOG data abnormality	29	When LOG serial signal data abnormality continued for more than 17 sec.
E-u	LOG pulse abnormality	37	When LOG pulse becomes abnormal.
E-G	Encoder abnormality	35	When the state where the difference between the master bearing and the encoder bearing is more than 3 degree, continued for more than 3 seconds.
E-r	E5V abnormality	34	When serial signal processing power supply was lost.

: Usually not indicated to the user.

: Usually not detected.

CHAPTER 8 PARTS LIST

1-set Gyrocompass

PC. NO.	NOMENCLATURE	NO. REQ'D	DESCRIPTION	PART NO.
1	Master Compass	1	TG-8000	10189000-
	Master Compass	1	TG-8500	10189001-
2	Control Unit Type-S (Standard)	1	Bulkhead Type, Step Type	10189103-
	Control Unit Type-S (With EHS)	1	Bulkhead Type, Step Type	10189104-
	Control Unit Type-S (With MAG)	1	Bulkhead Type, Step Type	10189105-
	Control Unit Type-S (Standard)	1	Flush Type, Step Type	10189106-
	Control Unit Type-S (With EHS)	1	Flush Type, Step Type	10189107-
	Control Unit Type-S (With MAG)	1	Flush Type, Step Type	10189108-
	Control Unit Type-S (Standard)	1	Bulkhead Type, Serial Type	10189161-
	Control Unit Type-S (With EHS)	1	Bulkhead Type, Serial Type	10189162-
	Control Unit Type-S (With MAG)	1	Bulkhead Type, Serial Type	10189163-
	Control Unit Type-S (Standard)	1	Flush Type, Serial Type	10189164-
	Control Unit Type-S (With EHS)	1	Flush Type, Serial Type	10189165-
	Control Unit Type-S (With MAG)	1	Flush Type, Serial Type	10189166-

2-set Gyrocompass

PC. NO.	NOMENCLATURE	NO. REQ'D	DESCRIPTION	PART NO.
1	Master Compass	2	TG-8000	10189000-
	Master Compass	2	TG-8500	10189001-
2	Control Unit Type-D (Standard)	1	Bulkhead Type, Step Type	10189109-
	Control Unit Type-D (With EHS)	1	Bulkhead Type, Step Type	10189110-
	Control Unit Type-D (With MAG)	1	Bulkhead Type, Step Type	10189111-
	Control Unit Type-D (Standard)	1	Flush Type, Step Type	10189112-
	Control Unit Type-D (With EHS)	1	Flush Type, Step Type	10189113-
	Control Unit Type-D (With MAG)	1	Flush Type, Step Type	10189114-
	Control Unit Type-D (Standard)	1	Bulkhead Type, Serial Type	10189167-
	Control Unit Type-D (With EHS)	1	Bulkhead Type, Serial Type	10189168-
	Control Unit Type-D (With MAG)	1	Bulkhead Type, Serial Type	10189169-
	Control Unit Type-D (Standard)	1	Flush Type, Serial Type	10189170-
	Control Unit Type-D (With EHS)	1	Flush Type, Serial Type	10189171-
	Control Unit Type-D (With MAG)	1	Flush Type, Serial Type	10189172-

Fig.8.1 TG-8000/8500 Gyrocompass
(sheet 1 of 1)

PC. NO.	NOMENCLATURE	NO. REQ'D	DESCRIPTION	PART NO.
	Master Compass	1	TG-8000	10189000-
	Master Compass	1	TG-8500	10189001-
1	Sensitive Element Ass'y	1	TG-8000	10229409-
	Sensitive Element Ass'y	1	TG-8500	10189021-
2	Horizontal Ring Ass'y	1		10189056-
3	Binnacle Ass'y	1		10189040-
4	Case	1	TG-8000/8500	10180073-
5	Knob	4		10038901-
6	Washer, Spring	4		003860002
7	Washer, Plain	4		003560002

Fig.8.2 Master Compass
(Sheet 1 of 2)

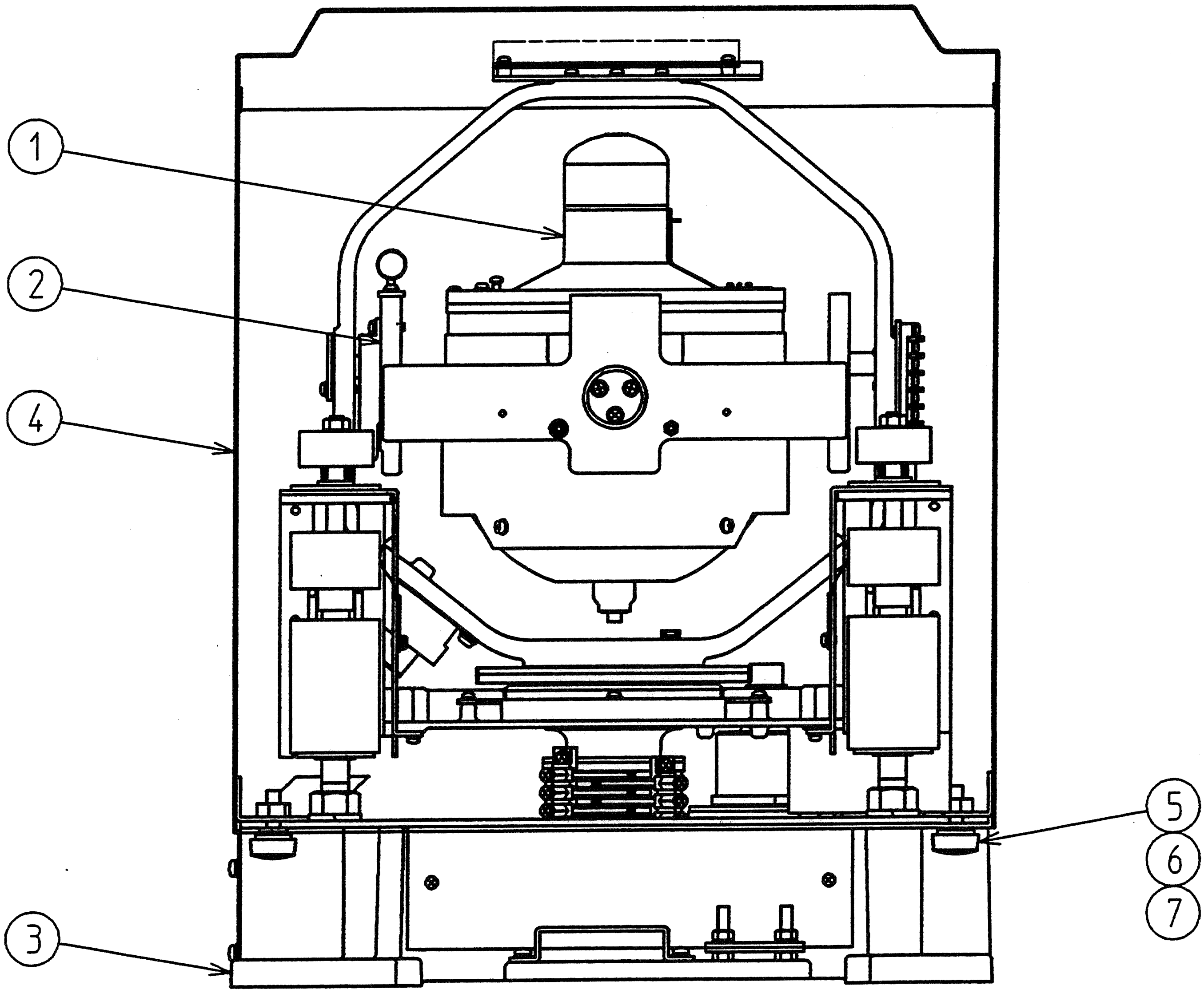


Fig 8.2 Master Compass
(Sheet 2 of 2)

PC. NO.	NOMENCLATURE	NO. REQ'D	DESCRIPTION	PART NO.
	Horizontal Ring Ass'y	1		10189056-
1	Horizontal Ring	1		10180025-
2	Bearing	2		012000491
3	Retainer	2		006901372
4	Shield Plate	1		10160004-
5	Screw, Flat M4×12	2		000640122
6	HRZC pwb Ass'y	1		10169503-
7	Horizontal DST Ass'y	1		10169103-
8	Shield Plate	1		10160005-
9	Screw, Pan M3×14	4		000503142
10	Axis, Horizontal	1	East Side	10160007-
11	Shim	1		10221260-
12	Shim	2		10220719-
13	Screw, Pan M3×14	2		000503142
14	Screw, Pan M3×14	1		000593142
15	Stopper	2		10230225-
16	Screw, Pan M3×20	2		000503202
17	Nut	6		002530002
18	Washer, Plain	4		003530002
19	Washer, Spring	2		003830002
20	Radiation Plate	2		10160008-
21	Screw, Pan M3×14	2		000503142
22	Radiation Seat	1		20565709
23	Damper Case	1		10230038-
24	Cover	1		10230039-
25	Screw, Pan M3×14	2		000503142
26	Bar	1		10210810-
27	Mounting Ring Ass'y	1		10169102-
28	level meter Ass'y	1		10219121-
29	Plate	1		10180032-
30	Nut	4		002630002
31	Screw, Pan M3×8	2		10169102-

Fig.8.3 Horizontal Ring
(Sheet 1 of 2)

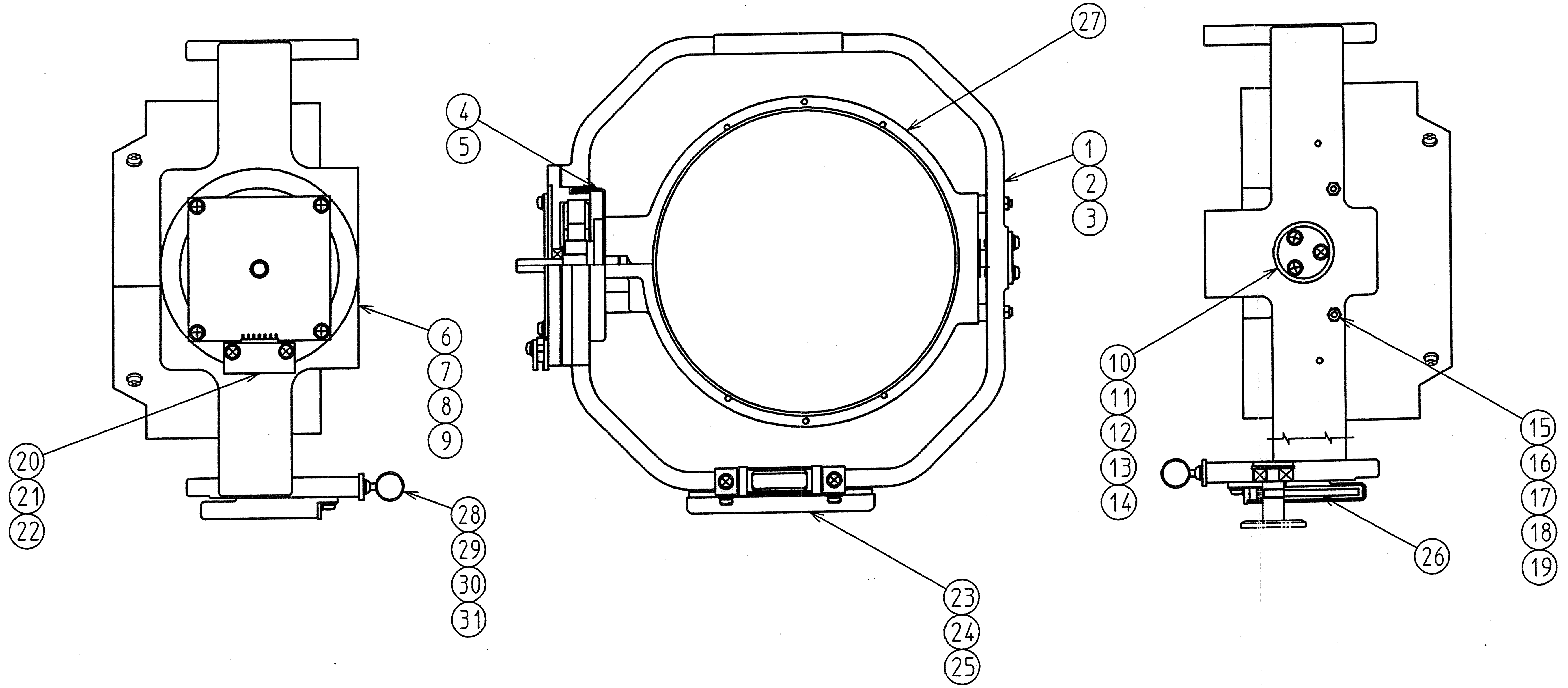


Fig 8.3 Horizontal Ring
(Sheet 2 of 2)

PC. NO.	NOMENCLATURE	NO. REQ'D	DESCRIPTION	PART NO.
	Mounting Ring Ass'y	1		10169102-
1	Mounting Ring	1		10160082-
2	Bearing, Ball	1	$\phi 6 \times \phi 15 \times 5$	10220156-
3	Shield Cover	1		10160089-
4	Screw, Pan M3×6	2		000503062
5	Screw, Pan M3×8	4		000503082
6	Nut	4		002530002

Fig.8.4 Mounting Ring
(Sheet 1 of 2)

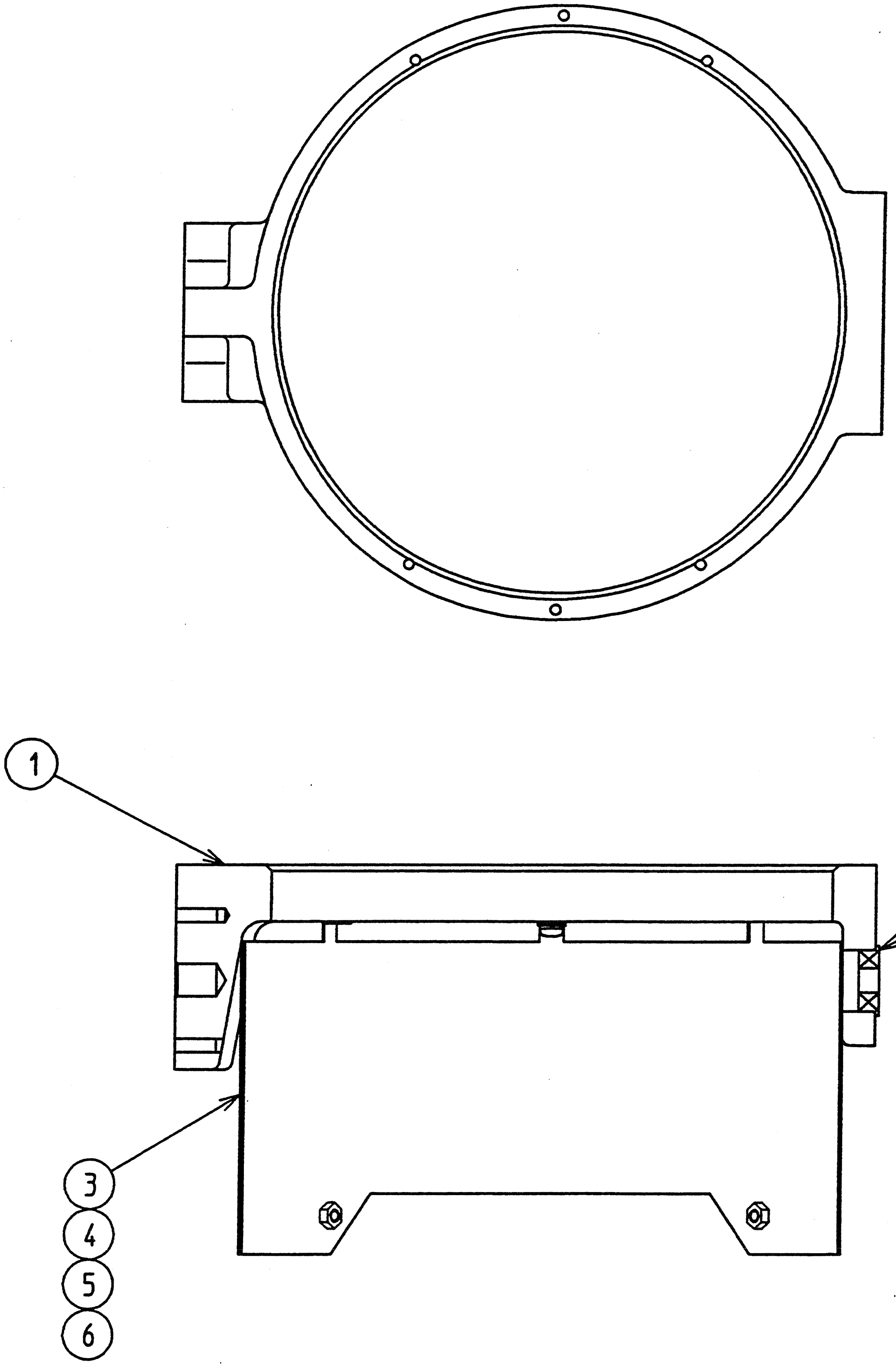


Fig.8.4 Mounting Ring
(Sheet 2 of 2)

PC. NO.	NOMENCLATURE	NO. REQ'D	DESCRIPTION	PART NO.
	Horizontal DST Ass'y	1		10169103-
1	Stator Ass'y	1		10169201-
2	Rotor Ass'y	1		10169204-
3	Housing (W)	1		10160003-
4	Bearing,Ball	1	$\phi 6 \times \phi 15 \times 5$	10220156-

Fig.8.5 Horizontal DST Ass'y
(Sheet 1 of 2)

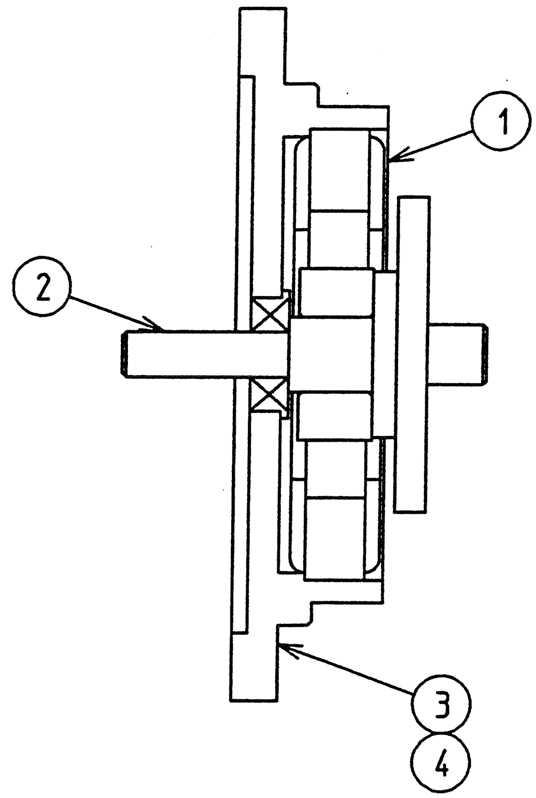


Fig.8.5 Horizontal DST
(Sheet 2 of 2)

PC. NO.	NOMENCLATURE	NO. REQ'D	DESCRIPTION	PART NO.
	Binnacle Ass'y	1		10189040-
1	Phantom Ring Ass'y	1		10189041-
2	Upper Base Plate Ass'y	1		10189042-
3	Lower Base Plate Ass'y	1		10189043-
4	Shock Absorber Ass'y	4		10189048-

Fig.8.6 Binnacle
(Sheet 1 of 2)

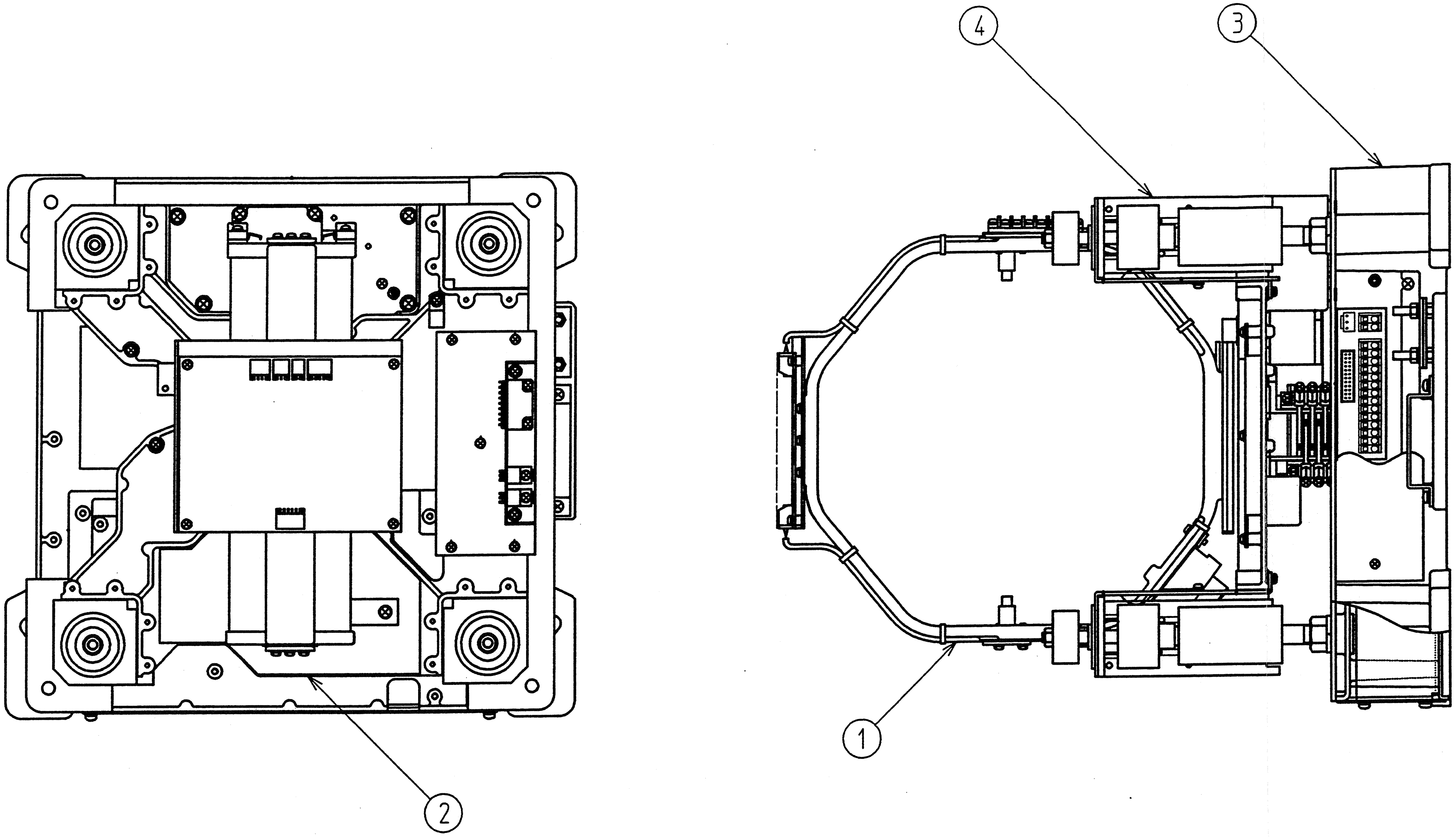


Fig 8.6 Binnacle
(Sheet 2 of 2)

PC. NO.	NOMENCLATURE	NO. REQ'D	DESCRIPTION	PART NO.
	Phantom Ring Ass'y	1		10189041-
1	Phantom Ring	1		10180020-
2	Support Plate	1		10180022-
3	Screw, Flat M3×8	2		000630082
4	Gear	1		10160019-
5	Gear	1		10160020-
6	Screw, Flat M4×16	4		000640162
7	Spring	2		10220393-
8	Phantom Ring Axis	1		10160021-
9	Bearing	1		10230044-
10	Bearing	1		007262011
11	Shim	2		10210839-
12	Retainer	1		006901462
13	Slip Ring	1		10169260-
14	Slip Ring Supporter	1		10230114-
15	Screw, Flat M3×8	2		000630082
16	Nut	1		10220418-
17	Screw, Flat M3×6	1		000630062
18	RERAY pwb	1		10230227-
19	Support	2		11470157-
20	Screw, Pan M3×8	2		000503082
21	Axis	1	North Side	10210811-
22	Shim	1		10210827-
23	Shim	2		10210828-
24	Shim	1		10210320-
25	Screw, Pan M3×14	3		000503142
26	Axis	1	South Side	10210812-
27	Screw, Pan M3×14	3		000503142
28	Terminal	2		10030924-
29	Wire Holder	2		10230377-
30	Screw, Pan M3×10	4		000503102
31	MCC pwb	1		10189501-
32	Screw, Pan M3×8	4		000503082
33	Support Plate	1		10180023-
34	Screw, Pan M3×10	4		000503102

Fig.8.7 Phantom Ring
(Sheet 1 of 3)

PC. NO.	NOMENCLATURE	NO. REQ'D	DESCRIPTION	PART NO.
35	Stopper	1		10160092-
36	Plate	2		10210106-
37	Screw, Pan M3×16	2		000503162
38	Power Transformer	1		10037788-
39	Nut	1		10160086-
40	Screw, Pan M3×14	2		000503142
41	Wire Holder	2		10230377-
42	Screw, Pan M3×8	2		000503082
43	ZRCR pwb Ass'y	1		10189091-
44	Screw, Pan M3×6	1		000503062

Fig.8.7 Phantom Ring
(Sheet 2 of 3)

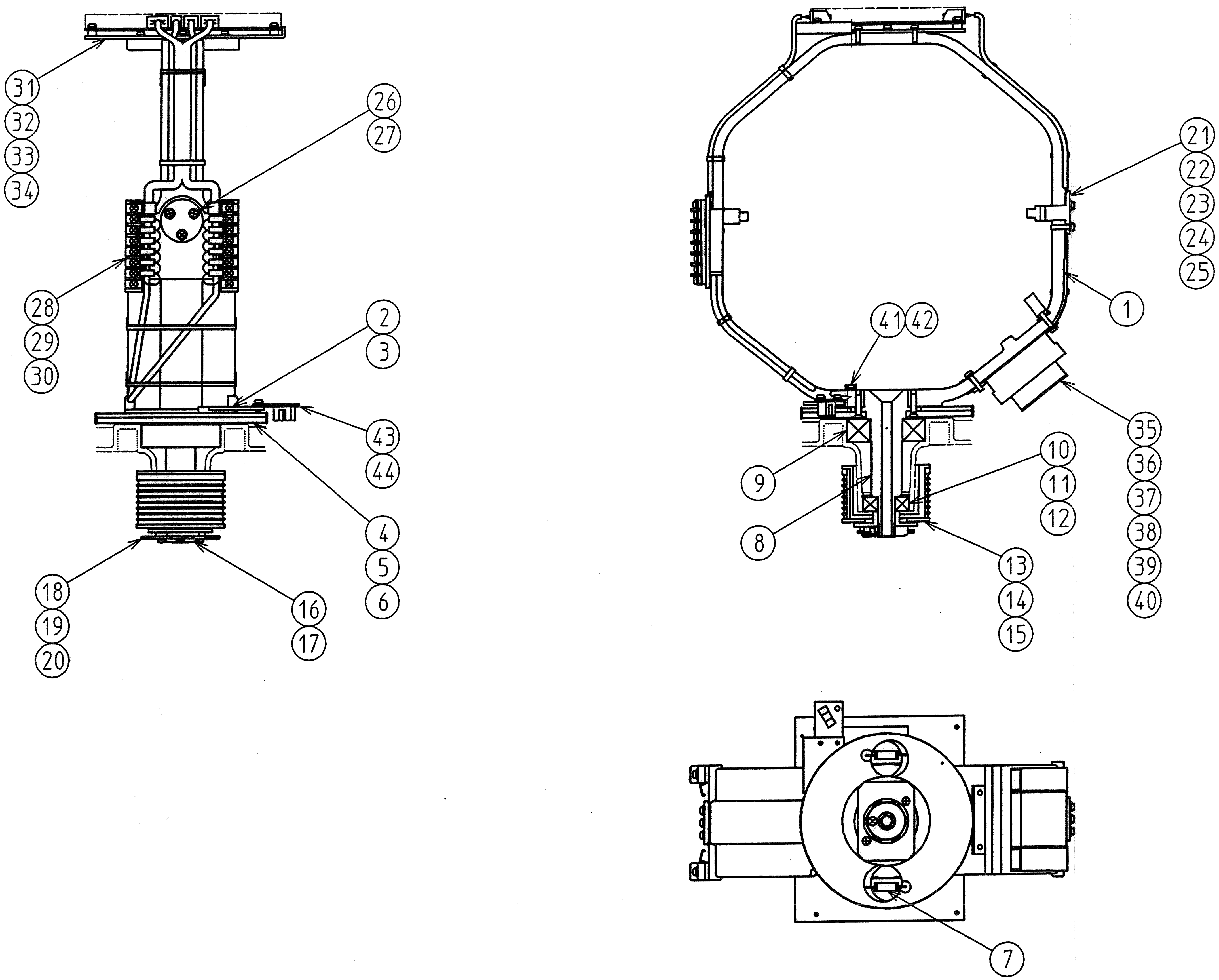
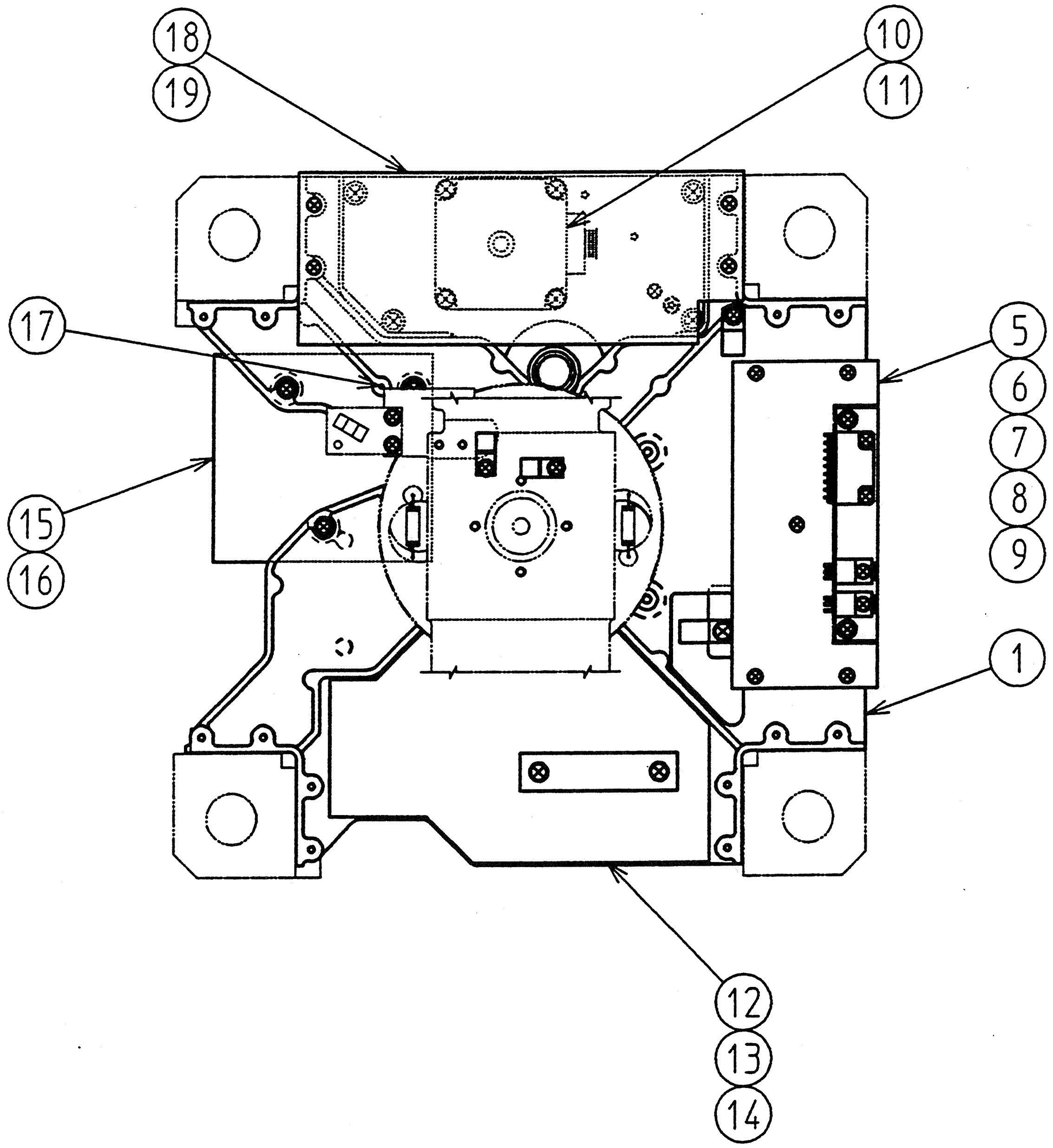


Fig 8.7 Phantom Ring
(Sheet ~~2~~ 3 of ~~2~~ 3)

PC. NO.	NOMENCLATURE	NO. REQ'D	DESCRIPTION	PART NO.
	Upper Base Plate Ass'y	1		10189042-
1	Base Plate	1		10180030-
2	Brush Ass'y (3)	1		10239379-
3	Brush Ass'y (4)	1		10239380-
4	Screw, Pan M4 × 14	2		000504142
5	SMCC pwb	1		10189503-
6	Screw, Pan M3 × 8	5		000503082
7	Plate	1		10180031-
8	Screw, Pan M3 × 8	4		000503082
9	Screw, Pan M3 × 16	2		000503162
10	Step Motor Ass'y	1		10189045-
11	Screw, Pan M4 × 10	4		000504102
12	Weight	1		10160071-
13	Plate	1		10160058-
14	Screw, M4 × 12	2		000540122
15	Weight	1		10230397-
16	Screw, M3 × 25	3		000593252
17	Spring Pin	1		00491622
18	Cover	1		10180085-
19	Screw, Pan M3 × 8	4		000503082

Fig.8.8 Upper Base Plate
(Sheet 1 of 2)



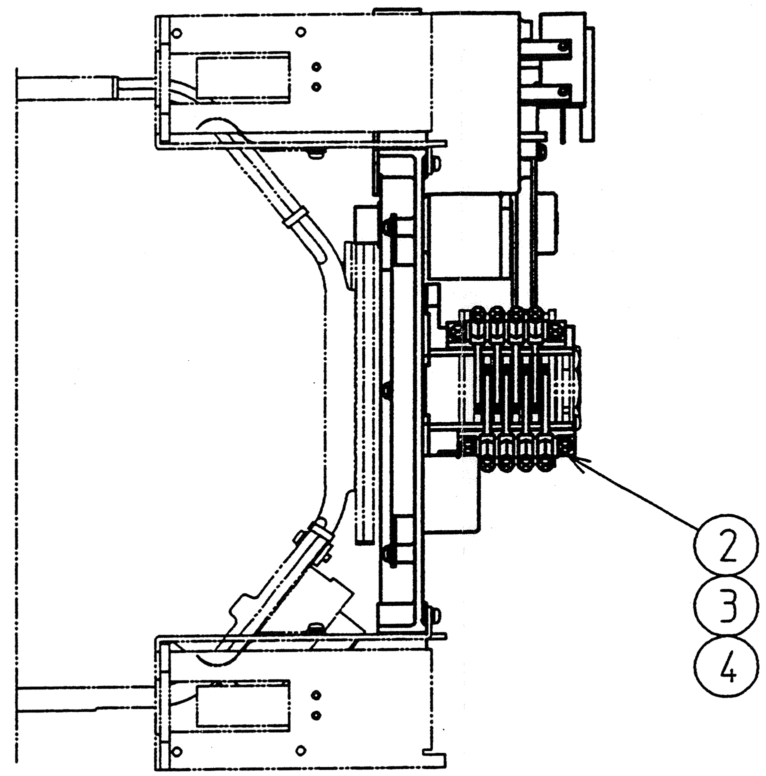
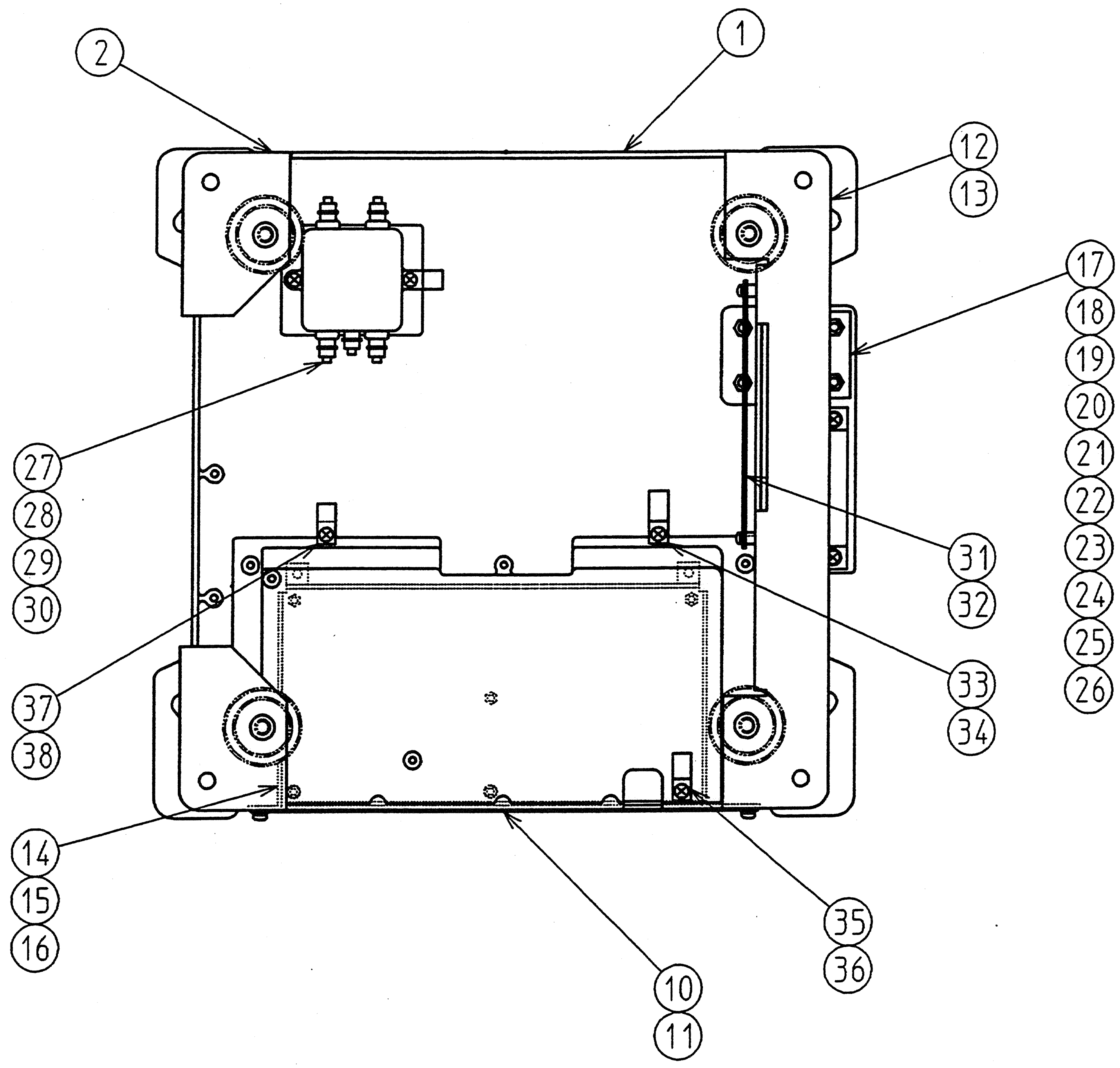


Fig 8.8 Upper Base Plate
(Sheet 2 of 2)

PC. NO.	NOMENCLATURE	NO. REQ'D	DESCRIPTION	PART NO.
	Lower Base Plate Ass'y	1		10189043-
1	Base Plate	1		10230330-
2	Plate, Mounting	2		10180042-
3	Wire Holding	1		10230362-
4	Screw, Pan M4×12	2		000504122
5	Cover	1		10230352-
6	Screw, M3×8	2		000593082
7	Support	2		20022020-
8	Washer, Plain	2		003530002
9	Washer, Spring	2		003830002
10	Cover Ass'y	1		10189062-
11	Screw, Pan M4×12	4		000504122
12	Plate, Mounting	1		10180041-
13	Screw, Pan M4×10	2		000504102
14	Inverter Ass'y	1		10169109-
15	Plate, Mounting	1		10230346-
16	Screw, Pan M4×8	5		000504082
17	Plate, Ground	1		10230364-
18	Plate, Mounting	2		10230365-
19	Screw, Pan M4×16	2		000504162
20	Nut	2		002540002
21	Washer, Spring	2		003840002
22	Washer, Plain	2		003540002
23	Screw, Pan M5×30	2		000550302
24	Nut	4		002550002
25	Washer, Spring	4		003850002
26	Washer, Plain	2		003550002
27	Filter	1		GF-2150
28	Clamp	1		009907110
29	Screw, Pan M4×10	1		000594102
30	Screw, Pan M4×8	1		000504082
31	MTTRM pwb	1		10189509-
32	Screw, Pan M3×8	4		000503082
33	Clamp	1		009907150
34	Screw, Pan M4×8	1		000504082
35	Clamp	1		009907130
36	Screw, Pan M4×8	1		000504082
37	Clamp	1		009907120
38	Screw, Pan M4×8	1		000594082

Fig.8.9 Lower Base Plate
(Sheet 1 of 2)



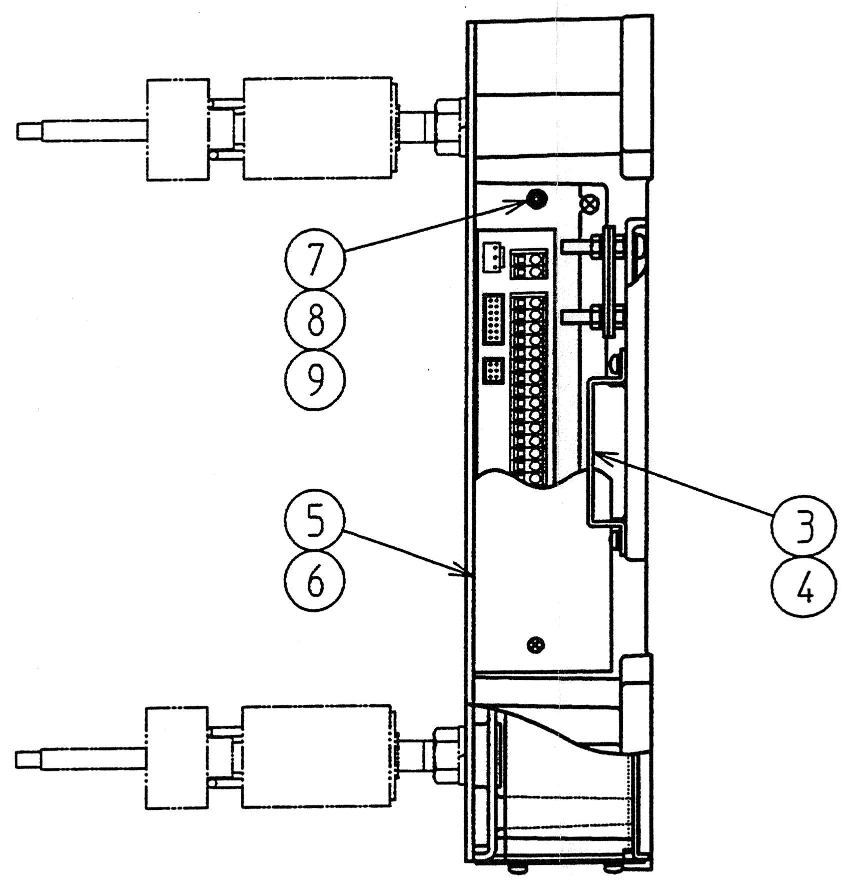


Fig 8.9 Lower Base Plate
(Sheet 2 of 2)

PC. NO.	NOMENCLATURE	NO. REQ'D	DESCRIPTION	PART NO.
	Shock Absorber Ass'y	4		10189048-
1	Washer, Spring	4		003860002
2	Nut	4		002560002
3	Stopper	4		10230234-
4	Plate	4		10220616-
5	Slide Bearing	4		10230235-
6	Spring	4		10230054-
7	Fliction Plate	4		10230053-
8	Cushion	4		10230049-
9	Spring	4		10160036-
10	Cup	4		10220986-
11	Spring	4		10160035-
12	Seat	4		10220985-
13	Interference Rubber	4		10230050-
14	Support	4		10230371-
15	Retainer	8		006902352
16	Side Plate	4		10230360-
17	Spring, Leaf	8		10230236-
18	Plate	8		10220731-
19	Screw, Pan M3×6	16		000503062
20	Screw, Pan M3×14	16		000503142
21	Nut	4		002512902
22	Washer, Spring	4		003812902

Fig.8.10 Shock Absorber
(Sheet 1 of 2)

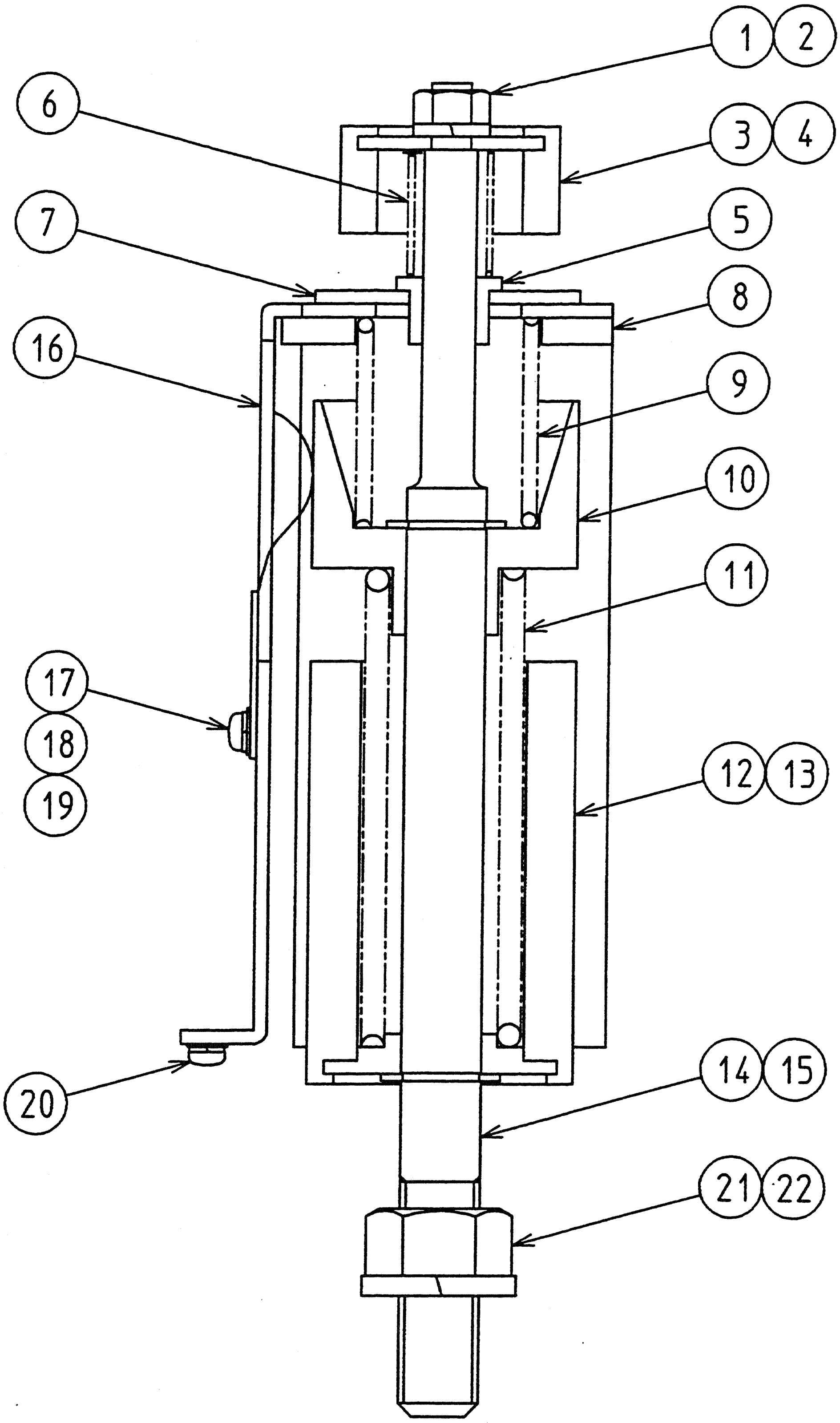


Fig 8.10 Shock Absorber
(Sheet 2 of 2)

PC. NO.	NOMENCLATURE	NO. REQ'D	DESCRIPTION	PART NO.
	Step Motor Ass'y	1		10189045-
1	Support Plate	1		10180081-
2	Screw, Pan M4×10	4		000594102
3	Housing	1		10160023-
4	Bearing	2		10160024-
5	Screw, Flat M4×10	3		000640102
6	Gear	1		10160025-
7	Spacer	2		11451172-
8	Spacer	1		10160026-
9	Pulley	1		10160027-
10	Set Screw	2		20021154-
11	Motor Ass'y	1		10189046-
12	Screw, Pan M4×10	4		000504102
13	Pulley	1		10160029-
14	Set Screw	2		20021151-
15	Belt	1		10160030-
16	Tensioner Ass'y	1		10169206-
17	Screw, Pan M3×25	1		000503252
18	Washer Plain	1		003530002
19	Washer Spring	1		003830002
20	Nut	2		002530002
21	Plate	1		10160033-
22	Screw, Pan M3×20	1		000503202
23	Encoder Ass'y	1		10189090-
24	Screw, Pan M3×6	2		000503062
25	Plate	1		10180085-
26	Screw, Pan M3×8	2		000503082
27	Damper	1		10180088-
28	Set Screw	2		20021153-
29	Disk Ass'y	1		10189047-
30	Set Screw	1		20021152-

Fig.8.11 Step Motor Ass'y
(Sheet 1 of 2)

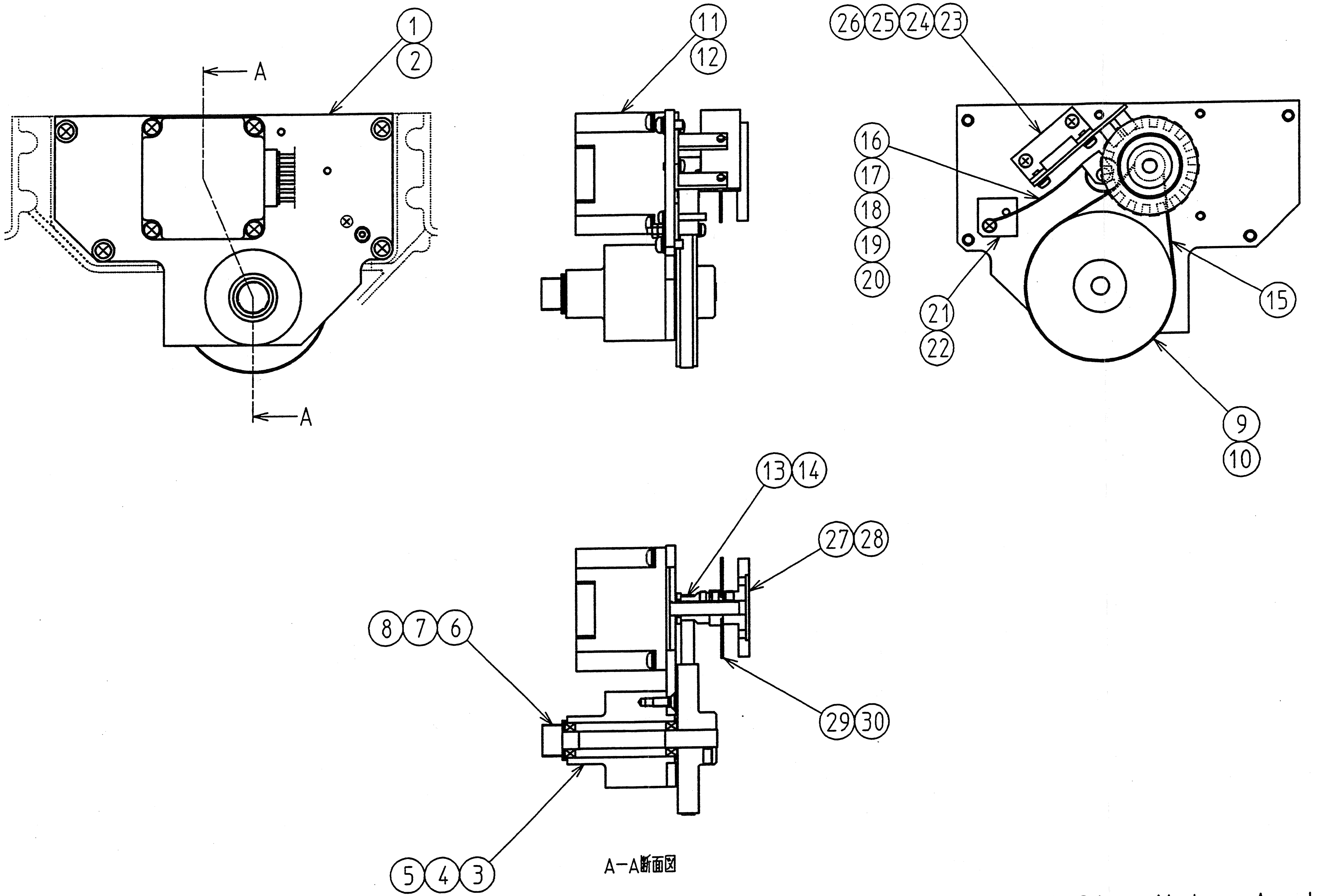


Fig 8.11 Step Motor Ass'y
(Sheet 2 of 2)

PC. NO.	NOMENCLATURE	NO. REQ'D	DESCRIPTION	PART NO.
	Inverter Ass'y	1		10169109-
1	INVERTER pwb	1		10169537-
2	Case	1		10160073-
3	Nut	2		10160074-
4	Screw, Pan M3×12	3		000503122
5	Screw, Flat M3×12	1		000630122
6	Nut	1		10160075-
7	Screw, Pan M3×12	1		000503122
8	Screw, Flat M3×12	1		000630122
9	Nut	1		10160076-
10	Screw, Pan M3×12	2		000503122
11	Radiation Seat	8		20565709-
12	Radiation Seat	3		20565708-
13	Support	1		20022028-
14	Clamp	1		009907140
15	Screw, Pan M3×8	1		000593082
16	Support	2		20022029-
17	Terminal	2		083314112
18	Resistor	1		048151102
19	Screw, Pan M3×6	1		000503062
20	Screw, Flat M3×5	1		000630052
21	Washer, Spring	1		003830002
22	Harness 1	1		10239359-

Fig.8.12 Inverter
(Sheet 1 of 2)

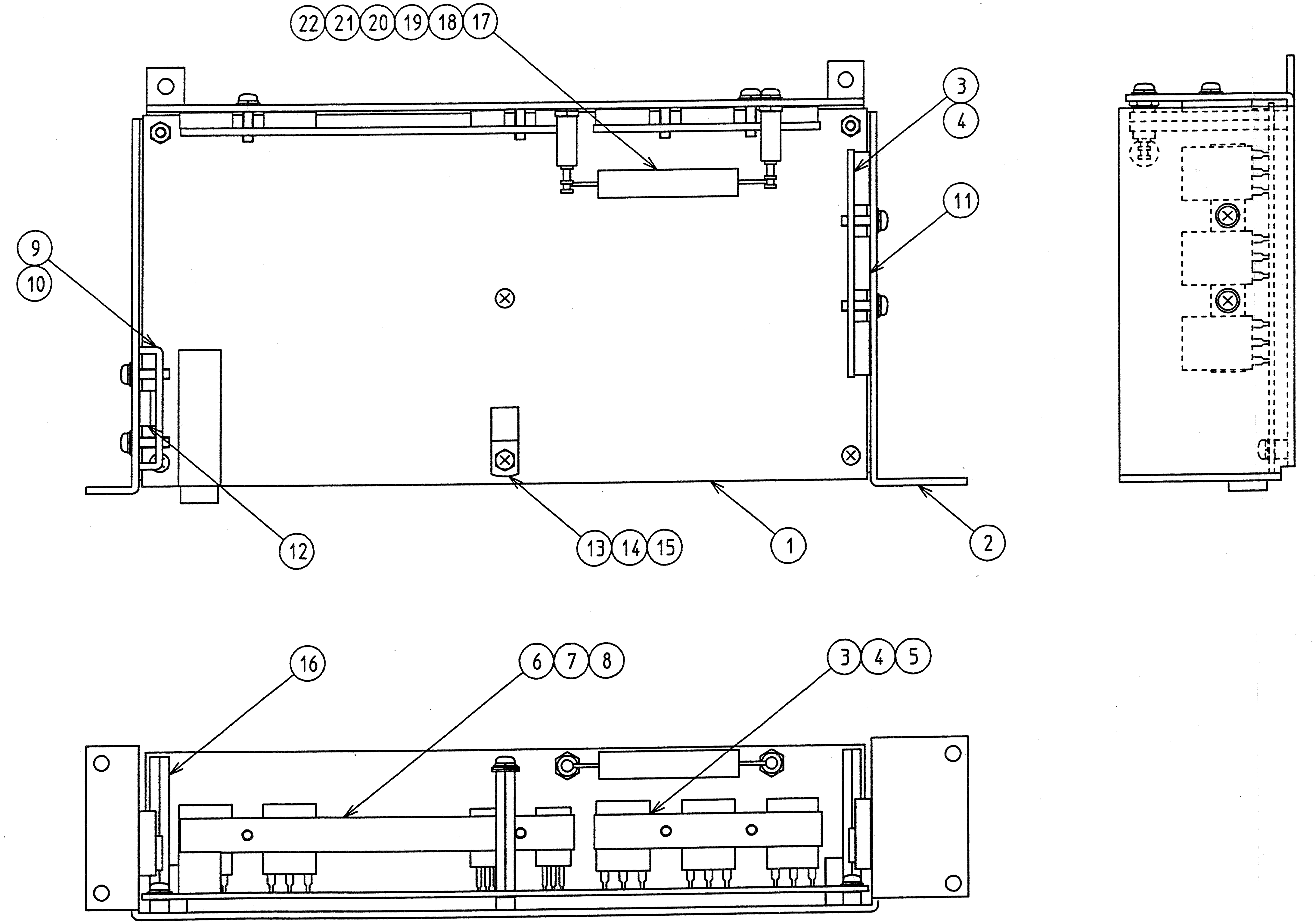


Fig.8.12 Inverter
(Sheet 2 of 2)

PC. NO.	NOMENCLATURE	NO. REQ'D	DESCRIPTION	PART NO.
	Control Unit	1	Bulkhead Type	10189102-
1	Panel Unit	1		10189211-
2	Name Plate	1		10180223-
3	Nut	4		10180729-
4	Name Plate	1		10180719-
5	Name Plate	1		20900198-
6	Name Plate	1		10180825-
7	Name Plate	1		10038952-
8	Screw, Mounting	1		010201411
9	Washer Plain	1		12010496-
10	Washer	1		10230170-
11	Cover	1		10180802-
12	Case	1		10180801-
13	Screw, Pan M5×30	1		000505302
14	Washer Plain	3		003550002
15	Washer Spring	1		003850002
16	Nut	3		002550002
17	Name Plate	1		10221357-
18	Packing (1)	1		10180803-
19	Name Plate	1		10212169-
20	Packing (2)	1		10180804-
21	PWB Ass'y ICIF	1		10189523-
22	Support, M3×14	6		20022019-
23	Screw, Pan M3×8	1		000503082
24	PWB Ass'y ITERM	1		10189525-
25	Screw, Pan M3×8	6		000503082
26	Holding Plate	2		TM2S6
27	Nut	2		002530002
28	Name Plate	1		10038934-
29	Name Plate	1		10180811-
30	Name Plate	1		10221684-
31	PWB Ass'y IOPT	1	Option	10189527-
32	Screw, Pan M3×8	5	Option	000503082
33	Holding Plate	1	Option	TM2S6
34	Nut	1	Option	002530002

Fig8.13 Control Unit Type-I (Bulkhead Type)
(Sheet 1 of 3)

PC. NO.	NOMENCLATURE	NO. REQ'D	DESCRIPTION	PART NO.
35	Hinge	2		TH-62SUS
36	Nut	2		10180710-
37	Screw, Pan M3×8	8		000503082
38	Support, M3×14	7		20022019-
39	Washer Plain	7		003530002
40	Washer Spring	7		003830002
41	Mount Ass'y (I)	1		10189128-
42	Support, M3×30	2		20022027-
43	Washer Spring	2		003830002
44	Relay	1		G7J-4A-B-DC24V
45	Metal Fittings	1		R99-04
46	Screw, Pan M4×8	2		000504082
47	Washer Plain	2		003540002
48	Support, M3×30	6		20022027-
49	Washer Plain	6		003530002
50	Washer Spring	6		003830002

Fig8.13 Control Unit Type-I (Bulkhead Type)
(Sheet 2 of 3)

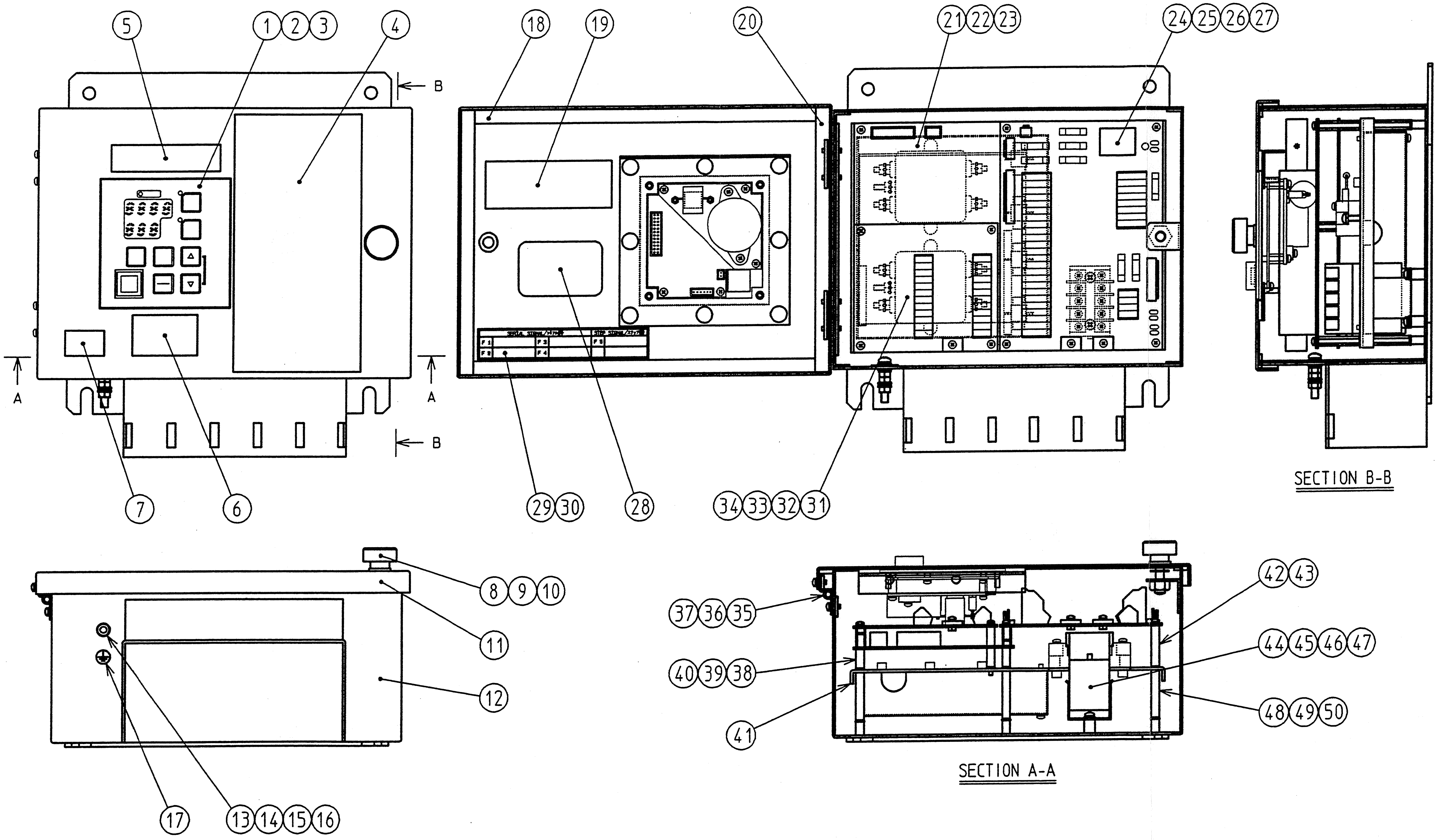


Fig 8.13 Control Unit Type-I
(Sheet 3 of 3)

PC. NO.	NOMENCLATURE	NO. REQ'D	DESCRIPTION	PART NO.
	Control Unit (Standard)	1	Bulkhead Type, Step Type	10189103-
	Control Unit (With EHS)	1	Bulkhead Type, Step Type	10189104-
	Control Unit (With MAG)	1	Bulkhead Type, Step Type	10189105-
	Control Unit (Standard)	1	Bulkhead Type, Serial Type	10189161-
	Control Unit (With EHS)	1	Bulkhead Type, Serial Type	10189162-
	Control Unit (With MAG)	1	Bulkhead Type, Serial Type	10189163-
1	Name Plate	1		006916571
2	Panel Unit	1		10189201-
3	Nut	4		10180729-
4	Name Plate	1	With EHS/MAG, English	10180813-
5	Name Plate	1	With EHS/MAG, Japanese	10180814-
6	Name Plate	1	English	10180719-
7	Name Plate	1	Japanese	10180720-
8	Panel Unit	1	With EHS/MAG	10189201-
9	Nut	4	With EHS/MAG	10180729-
10	Name Plate	1	With EHS/MAG	10180217-
11	Name Plate	1	English	11425420-
12	Name Plate	1	Japanese	11425421-
13	Name Plate	1		20900198-
14	Name Plate	1		10038942-
15	Name Plate	1		10180745-
16	Name Plate	1		20900198-
17	Name Plate	1	Step Type	10011234-
18	Name Plate	1	Serial Type	10020400-
19	Hinge	3		TH-62SUS
20	Nut	3		10180710-
21	Screw, Pan M3×8	11		000503082
22	Screw, Pan M3×12	1		000503122
23	Screw, Pan M5×30	1		000505302
24	Washer Plain	3		003550002
25	Washer Spring	1		003850002
26	Nut	3		002550002
27	Name Plate	1		10221357-
28	Case (1)	1		10180701-
29	Screw, Mounting	2		010201411
30	Washer Plain	2		12010496-

Fig8.14 Control Unit Type-S (Bulkhead Type)
(Sheet 1 of 4)

PC. NO.	NOMENCLATURE	NO. REQ'D	DESCRIPTION	PART NO.
31	Washer	2		10230170-
32	Cover (2)	1	Standard	10180703-
33	Cover (1)	1	With EHS/MAG	10180702-
34	Packing (1)	1		10180704-
35	Packing (2)	1		10180705-
36	PWB Ass'y AZIFC	1	With MAG	10189543-
37	Screw, Pan M3×8	4	With MAG	000503082
38	PWB Ass'y GPOWER	1		10189517-
39	Screw, Pan M3×8	5		000503082
40	Support, M3×50	4		20022031-
41	Name Plate	1	100V	372381950
42	Name Plate	1	220V	372381980
43	Name Plate	1	Japanese	10038938-
44	Name Plate	1	English	10038934-
45	Support, M3×14	2		20022019-
46	Screw, Pan M3×8	4		000503082
47	PWB Ass'y SCC	1		10189511-
48	Clamp	1		009907150
49	Screw, Pan M4×10	1		000594102
50	Screw, Pan M4×8	5		000504082
51	Mount Ass'y (S)	1	With EHS/MAG	10189122-
52	Mount Ass'y (S)	1	Standard	10189121-
53	Plate	1	With EHS/MAG	10180742-
54	Screw, Pan M3×8	4	With EHS/MAG	000503082
55	PWB Ass'y MTERM	1	With EHS/MAG	10189545-
56	Screw, Pan M3×8	5	With EHS/MAG	000503082
57	Holding Plate	1	With EHS/MAG	TM2S6
58	Nut	1	With EHS/MAG	002530002
59	Plate (2)	1		10180708-
60	Screw, Pan M4×8	4		000504082
61	Name Plate	1		10180718-
62	Name Plate	1	English	10221684-
63	Name Plate	1	Japanese	10221685-
64	Name Plate	1		10212169-
65	Fuse Holder	2		F-70

Fig8.14 Control Unit Type-S (Bulkhead Type)
(Sheet 2 of 4)

PC. NO.	NOMENCLATURE	NO. REQ'D	DESCRIPTION	PART NO.
66	Fuse	1	6.3A	MF61NR6.3
67	Fuse	1	20A	MF61NN20
68	Switch	1		11160036-
69	Terminal, 7P	1		083041117
70	Symbol Plate	1		083141117
71	Symbol Pattern	1		10180709-
72	Screw, Pan M4×16	2		000504162
73	Hoiding Plate	1		10180730-
74	Screw, Pan M4×16	2		000504162
75	Radiation Seat	3		20565709-
76	PWB Ass'y MIFC	1	Step Type	10189519-
77	PWB Ass'y SIFC	1	Serial Type	10189513-
78	Screw, Pan M3×8	2		000503082
79	Support, M3×14	4		20022019-
80	Support, M3×12	1		20022002-
81	Screw, Pan M3×8	2		000593082
82	Clamp	1		009907150
83	PWB Ass'y EMCC	1	With EHS/MAG	10189541-
84	Support, M3×14	8	With EHS/MAG	20022019-
85	Support, M4×40	4		20022044-
86	Support, M4×40	6		20022044-
87	PWB Ass'y GTERM	1		10189515-
88	Screw, Pan M3×8	6		000503082
89	Holding Plate	2		TM2S6
90	Nut	2		002530002
91	Screw, Pan M3×10	2		000593102
92	Clamp	1		009907130
93	Clamp	1		009907150

Fig8.14 Control Unit Type-S (Bulkhead Type)
(Sheet 3 of 4)

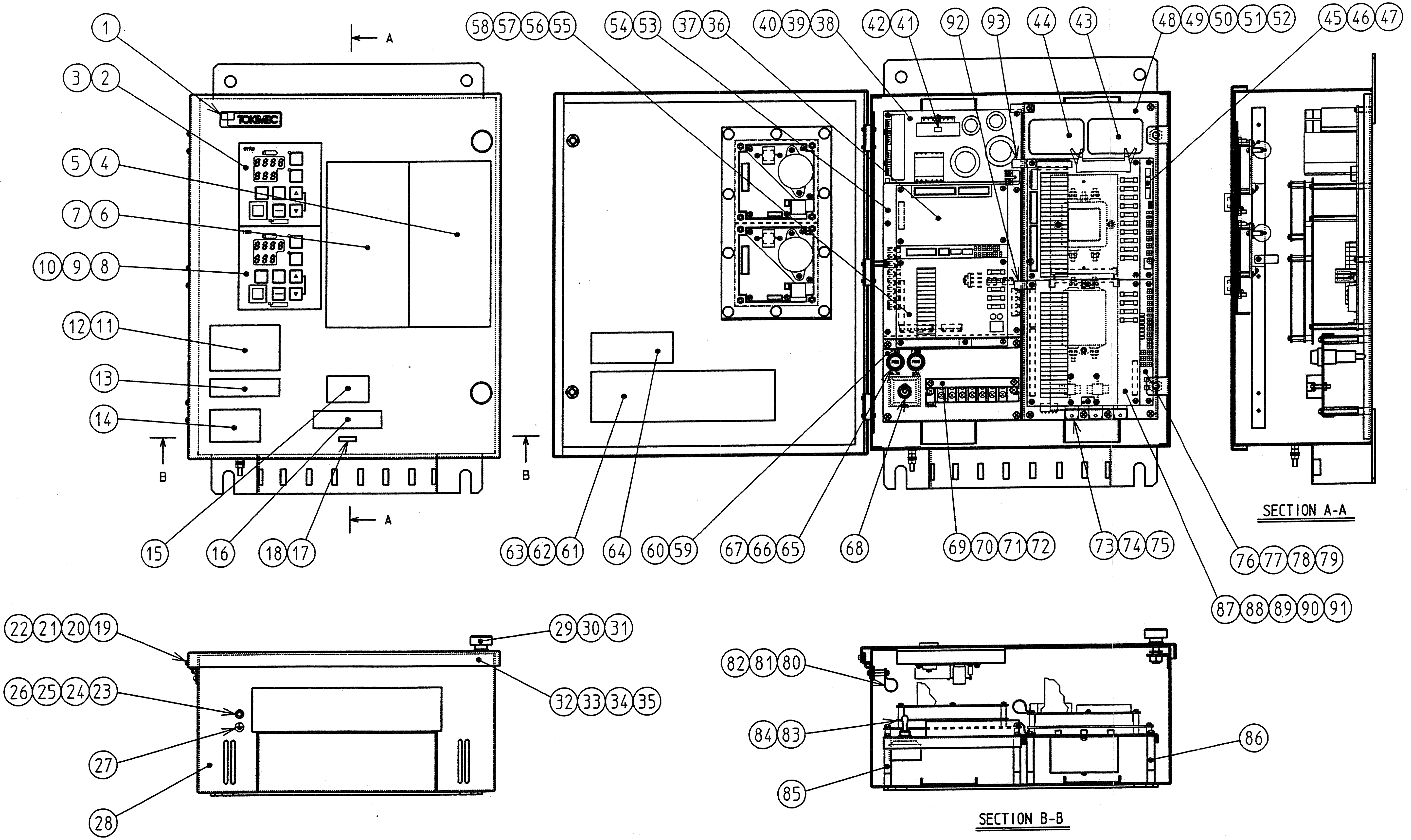


Fig8.14 Control Unit Type-S (Bulkhead Type)
(Sheet 4 of 4)

PC. NO.	NOMENCLATURE	NO. REQ'D	DESCRIPTION	PART NO.
	Control Unit (Standard)	1	Flush Type, Step Type	10189106-
	Control Unit (With EHS)	1	Flush Type, Step Type	10189107-
	Control Unit (With MAG)	1	Flush Type, Step Type	10189108-
	Control Unit (Standard)	1	Flush Type, Serial Type	10189164-
	Control Unit (With EHS)	1	Flush Type, Serial Type	10189165-
	Control Unit (With MAG)	1	Flush Type, Serial Type	10189166-
1	Name Plate	1		006916571
2	Panel Unit	1		10189201-
3	Nut	4		10180729-
4	Name Plate	1	With EHS/MAG,English	10180813-
5	Name Plate	1	With EHS/MAG,Japanese	10180814-
6	Name Plate	1	English	10180719-
7	Name Plate	1	Japanese	10180720-
8	Panel Unit	1	With EHS/MAG	10189201-
9	Nut	4	With EHS/MAG	10180729-
10	Name Plate	1	With EHS/MAG	10180217-
11	Name Plate	1	English	11425420-
12	Name Plate	1	Japanese	11425421-
13	Name Plate	1		20900198-
14	Name Plate	1		10038942-
15	Name Plate	1		10180745-
16	Name Plate	1		20900198-
17	Name Plate	1	Step Type	10011234-
18	Name Plate	1	Serial Type	10020400-
19	Hinge	3		TH-62SUS
20	Nut	3		10180710-
21	Screw, Pan M3×8	11		000503082
22	Screw, Pan M3×12	1		000503122
23	Screw, Pan M5×30	1		000505302
24	Washer Plain	3		003550002
25	Washer Spring	1		003850002
26	Nut	3		002550002
27	Name Plate	1		10221357-
28	Case (2)	1		10180711-
29	Screw, Mounting	2		010201411
30	Washer Plain	2		12010496-

Fig8.15 Control Unit Type-S (Flush Type)
(Sheet 1 of 4)

PC. NO.	NOMENCLATURE	NO. REQ'D	DESCRIPTION	PART NO.
31	Washer	2		10230170-
32	Cover (4)	1	Standard	10180713-
33	Cover (3)	1	With EHS/MAG	10180712-
34	Packing (4)	2		10180715-
35	Support, M4 × 40	6		20022044-
36	PWB Ass'y AZIFC	1	With MAG	10189543-
37	Screw, Pan M3 × 8	4	With MAG	000503082
38	PWB Ass'y GPOWER	1		10189517-
39	Screw, Pan M3 × 8	5		000503082
40	Support, M3 × 50	4		20022031-
41	Name Plate	1	100V	372381950
42	Name Plate	1	220V	372381980
43	Name Plate	1	Japanese	10038938-
44	Name Plate	1	English	10038934-
45	Support, M3 × 14	2		20022019-
46	Screw, Pan M3 × 8	4		000503082
47	PWB Ass'y SCC	1		10189511-
48	Clamp	1		009907150
49	Screw, Pan M4 × 10	1		000594102
50	Screw, Pan M4 × 8	5		000504082
51	Mount Ass'y (S)	1	With EHS/MAG	10189122-
52	Mount Ass'y (S)	1	Standard	10189121-
53	Plate	1	With EHS/MAG	10180742-
54	Screw, Pan M3 × 8	4	With EHS/MAG	000503082
55	PWB Ass'y MTERM	1	With EHS/MAG	10189545-
56	Screw, Pan M3 × 8	5	With EHS/MAG	000503082
57	Holding Plate	1	With EHS/MAG	TM2S6
58	Nut	1	With EHS/MAG	002530002
59	Plate (2)	1		10180708-
60	Screw, Pan M4 × 8	4		000504082
61	Name Plate	1		10180718-
62	Name Plate	1	English	10221684-
63	Name Plate	1	Japanese	10221685-
64	Name Plate	1		10212169-
65	Fuse Holder	2		F-70

Fig8.15 Control Unit Type-S (Flush Type)
(Sheet 2 of 4)

PC. NO.	NOMENCLATURE	NO. REQ'D	DESCRIPTION	PART NO.
66	Fuse	1	6.3A	MF61NR6.3
67	Fuse	1	20A	MF61NN20
68	Switch	1		11160036-
69	Terminal, 7P	1		083041117
70	Symbol Plate	1		083141117
71	Symbol Pattern	1		10180709-
72	Screw, Pan M4×16	2		000504162
73	Hoiding Plate	1		10180730-
74	Screw, Pan M4×16	2		000504162
75	Radiation Seat	3		20565709-
76	PWB Ass'y MIFC	1	Step Type	10189519-
77	PWB Ass'y SIFC	1	Serial Type	10189513-
78	Screw, Pan M3×8	2		000503082
79	Support, M3×14	4		20022019-
80	Support, M4×40	4		20022044-
81	Screw, Pan M3×8	1		000593082
82	Clamp	1		009907150
83	PWB Ass'y EMCC	1	With EHS/MAG	10189541-
84	Support, M3×14	8	With EHS/MAG	20022019-
85	Holding Plate	1		10180736-
86	Screw, Pan M4×10	2		000504102
87	PWB Ass'y GTERM	1		10189515-
88	Screw, Pan M3×8	6		000503082
89	Holding Plate	2		TM2S6
90	Nut	2		002530002
91	Screw, Pan M3×10	2		000593102
92	Clamp	1		009907130
93	Clamp	1		009907150

Fig8.15 Control Unit Type-S (Flush Type)
(Sheet 3 of 4)

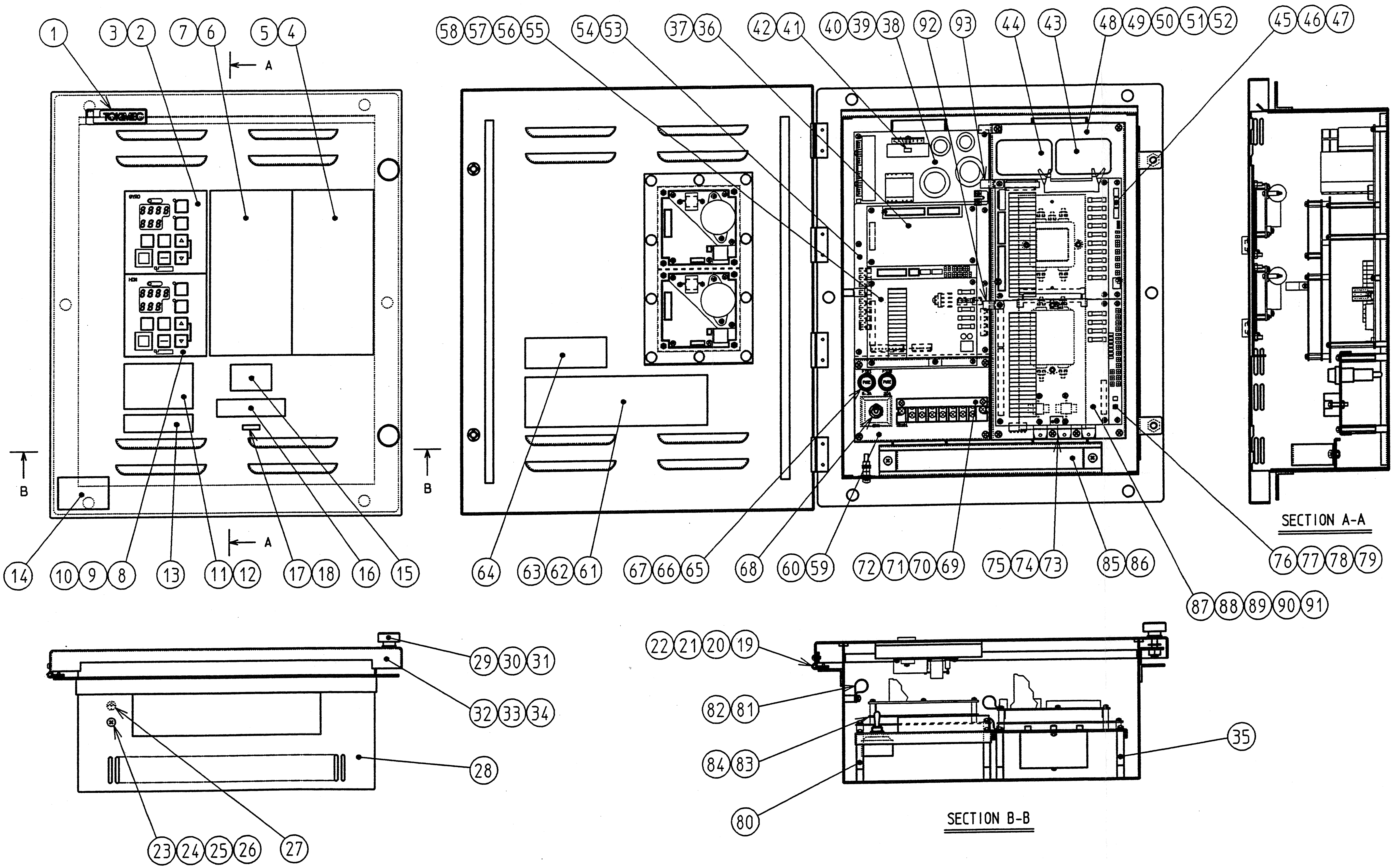


Fig8.15 Control Unit Type-S (Flush Type)
(Sheet 4 of 4)

PC. NO.	NOMENCLATURE	NO. REQ'D	DESCRIPTION	PART NO.
	Control Unit (Standard)	1	Bulkhead Type, Step Type	10189109-
	Control Unit (With EHS)	1	Bulkhead Type, Step Type	10189110-
	Control Unit (With MAG)	1	Bulkhead Type, Step Type	10189111-
	Control Unit (Standard)	1	Bulkhead Type, Serial Type	10189167-
	Control Unit (With EHS)	1	Bulkhead Type, Serial Type	10189168-
	Control Unit (With MAG)	1	Bulkhead Type, Serial Type	10189169-
1	Panel Unit	1		10189205-
2	Nut	4		10180729-
3	Panel Unit	1		10189201-
4	Nut	4		10180729-
5	Name Plate	2		11451193-
6	Screw, Mounting	2		010201411
7	Washer Plain	2		12010496-
8	Washer	2		10230170-
9	Name Plate	2		11451194-
10	Name Plate	1		006916571
11	Panel Unit	1		10189201-
12	Nut	4		10180729-
13	Panel Unit	1	With EHS/MAG	10189201-
14	Nut	4	With EHS/MAG	10180729-
15	Name Plate	1	With EHS	10180213-
16	Name Plate	1	With MAG	10180212-
17	Name Plate	1	English	10180719-
18	Name Plate	1	Japanese	10180720-
19	Name Plate	1	English	10180815-
20	Name Plate	1	Japanese	10180816-
21	Name Plate	1	With EHS, English	10180817-
22	Name Plate	1	With EHS, Japanese	10180818-
23	Name Plate	1	With MAG, English	10180819-
24	Name Plate	1	With MAG, Japanese	10180820-
25	Name Plate	1	English	11425420-
26	Name Plate	1	Japanese	11425421-
27	Name Plate	1		10038942-
28	Name Plate	1		20900198-
29	Name Plate	1		10180745-
30	Name Plate	1		20900198-
31	Name Plate	1	Step Type	10011234-
32	Name Plate	1	Serial Type	10020400-

Fig8.16 Control Unit Type-D (Bulkhead Type)
(Sheet 1 of 4)

PC. NO.	NOMENCLATURE	NO. REQ'D	DESCRIPTION	PART NO.
33	Hinge	3		TH-62SUS
34	Nut	3		10180710-
35	Screw, Pan M3×8	12		000503082
36	Name Plate	1		10221357-
37	Support, M3×14	10		20022019-
38	Mount Ass'y (D)	1		10189123-
39	Screw, Pan M4×10	7		000504102
40	Screw, Pan M4×12	2		000594122
41	Support, M4×50	3		20022046-
42	Cover (5)	1	Standard	10180722-
43	Cover (6)	1	With EHS/MAG	10180723-
44	Packing (5)	1		10180724-
45	Packing (6)	1		10180725-
46	Name Plate	2	100V	372381950
47	Name Plate	2	220V	372381980
48	Case (3)	1		10180721-
49	PWB Ass'y GPOWER	2		10189517-
50	Screw, Pan M3×8	18		000503082
51	Name Plate	1		10212169-
52	Name Plate	1		10180718-
53	Name Plate	1	English	10221684-
54	Name Plate	1	Japanese	10221685-
55	Name Plate	1	Japanese	10038938-
56	Name Plate	1	English	10038934-
57	Filter Ass'y	1	Standard	10189125-
58	Filter Ass'y	1	With EHS/MAG	10189126-
59	Screw, Pan M4×10	6		000504102
60	Clamp	1		009907220
61	PWB Ass'y DRY	1		10189539-
62	Screw, Pan M3×8	4		000503082
63	PWB Ass'y EMCC	1	With EHS/MAG	10189541-
64	Support, M3×14	6	With EHS/MAG	20022019-
65	Support, M3×14	2	With EHS/MAG	20022003-
66	Screw, Pan M3×8	2	With EHS/MAG	000503082
67	PWB Ass'y MTERM	1	With EHS/MAG	10189545-
68	Screw, Pan M3×8	4	With EHS/MAG	000503082
69	Holding Plate	1	With EHS/MAG	TM2S6

Fig8.16 Control Unit Type-D (Bulkhead Type)
(Sheet 2 of 4)

PC. NO.	NOMENCLATURE	NO. REQ'D	DESCRIPTION	PART NO.
70	Nut	1	With EHS/MAG	002530002
71	Screw, Pan M3×10	1		000593102
72	Clamp	1		009907130
73	PWB Ass'y DTERM	1		10189535-
74	Support, M3×14	2		20022019-
75	Support, M3×14	2		20022003-
76	Screw, Pan M3×8	4		000503082
77	Holding Plate	1		10180741-
78	Radiation Seat	1		20565708-
79	Radiation Seat	3		20565709-
80	Screw, Pan M4×16	3		000504162
81	Cover	1		11330689-
82	Holding Plate	1		TM2S6
83	Screw, Pan M3×8	4		000503082
84	PWB Ass'y AZIFC	1	With MAG	10189543-
85	Screw, Pan M3×8	4	With MAG	000503082
86	Clamp	1		009907210
87	PWB Ass'y SCC	2		10189511-
88	Screw, Pan M3×8	8		000503082
89	Support, M3×14	6		20022019-
90	PWB Ass'y GTERM	1		10189515-
91	Screw, Pan M3×8	7		000503082
92	Holding Plate	2		TM2S6
93	Nut	2		002530002
94	Screw, Pan M3×10	1		000593102
95	Clamp	1		009907140
96	PWB Ass'y MCOIF	1	Step Type	10189537-
97	PWB Ass'y SCOIF	1	Serial Type	10189529-
98	Screw, Pan M3×8	4		000503082
99	Holding Plate	1		10180730-
100	Radiation Seat	3		20565709-
101	Screw, Pan M4×16	2		000504162
102	Washer Spring	1		003850002
103	Screw, Pan M5×30	1		000505302
104	Washer Plain	3		003550002
105	Nut	3		002550002

Fig8.16 Control Unit Type-D (Bulkhead Type)
(Sheet 3 of 4)

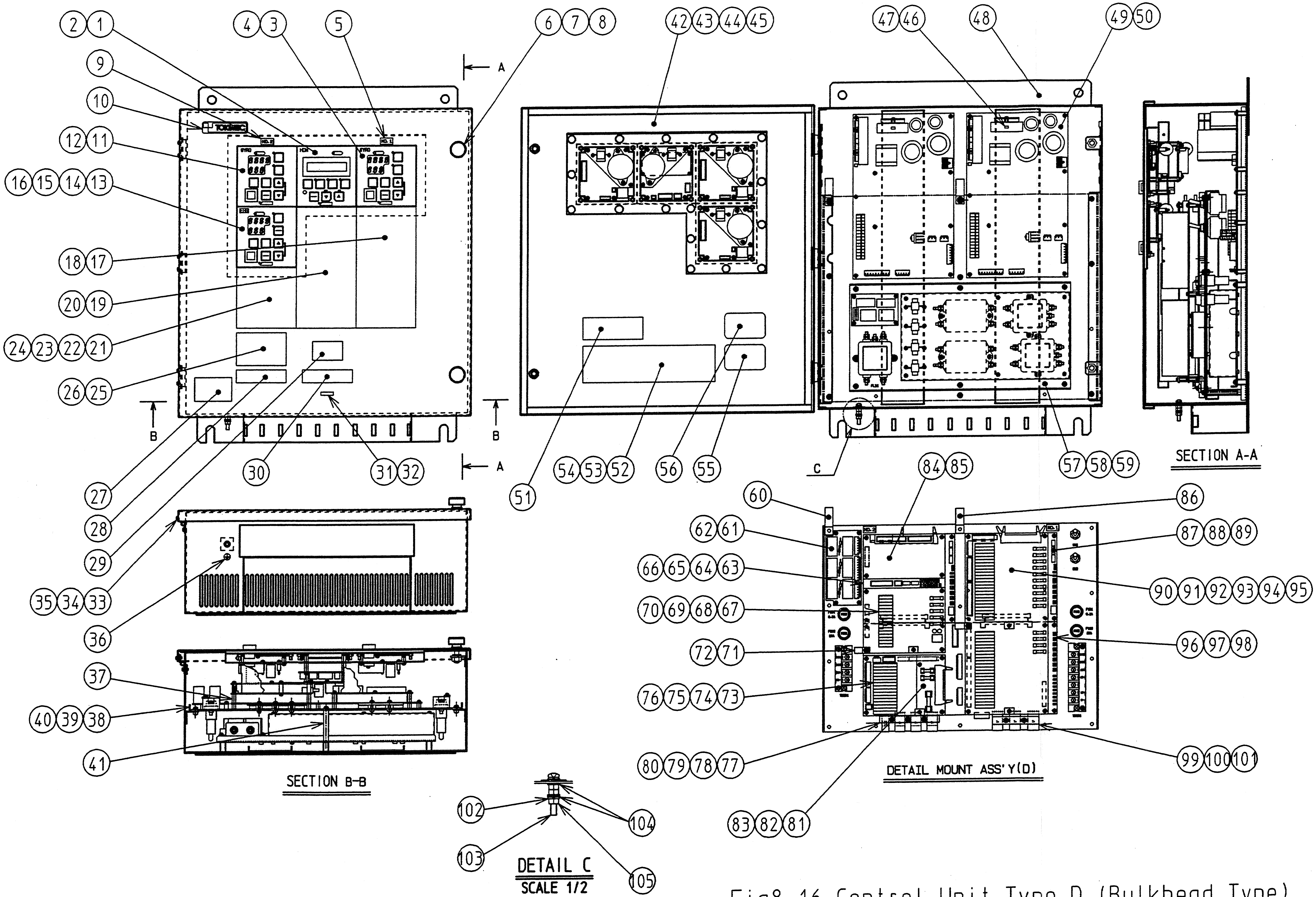


Fig8.16 Control Unit Type-D (Bulkhead Type)
(Sheet 4 of 4)

PC. NO.	NOMENCLATURE	NO. REQ'D	DESCRIPTION	PART NO.
	Control Unit (Standard)	1	Flush Type, Step Type	10189112-
	Control Unit (With EHS)	1	Flush Type, Step Type	10189113-
	Control Unit (With MAG)	1	Flush Type, Step Type	10189114-
	Control Unit (Standard)	1	Flush Type, Serial Type	10189170-
	Control Unit (With EHS)	1	Flush Type, Serial Type	10189171-
	Control Unit (With MAG)	1	Flush Type, Serial Type	10189172-
1	Panel Unit	1		10189205-
2	Nut	4		10180729-
3	Panel Unit	1		10189201-
4	Nut	4		10180729-
5	Name Plate	2		11451193-
6	Screw, Mounting	2		010201411
7	Washer Plain	2		12010496-
8	Washer	2		10230170-
9	Name Plate	2		11451194-
10	Name Plate	1		006916571
11	Panel Unit	1		10189201-
12	Nut	4		10180729-
13	Panel Unit	1	With EHS/MAG	10189201-
14	Nut	4	With EHS/MAG	10180729-
15	Name Plate	1	With EHS	10180213-
16	Name Plate	1	With MAG	10180212-
17	Name Plate	1	English	10180719-
18	Name Plate	1	Japanese	10180720-
19	Name Plate	1	English	10180815-
20	Name Plate	1	Japanese	10180816-
21	Name Plate	1	With EHS, English	10180817-
22	Name Plate	1	With EHS, Japanese	10180818-
23	Name Plate	1	With MAG, English	10180819-
24	Name Plate	1	With MAG, Japanese	10180820-
25	Name Plate	1	English	11425420-
26	Name Plate	1	Japanese	11425421-
27	Name Plate	1		10038942-
28	Name Plate	1		20900198-
29	Name Plate	1		10180745-
30	Name Plate	1		20900198-
31	Name Plate	1	Step Type	10011234-
32	Name Plate	1	Serial Type	10020400-

Fig8.17 Control Unit Type-D (Flush Type)
(Sheet 1 of 4)

PC. NO.	NOMENCLATURE	NO. REQ'D	DESCRIPTION	PART NO.
33	Hinge	3		TH-62SUS
34	Nut	8		10180710-
35	Screw, Pan M3×8	8		000503082
36	Screw, Flat M3×8	8		000603082
37	Name Plate	1		10221357-
38	Mount Ass'y (D)	1		10189123-
39	Screw, Pan M4×10	7		000504102
40	Screw, Pan M4×12	2		000594122
41	Support, M4×50	3		20022046-
42	Cover (7)	1	Standard	10180732-
43	Cover (8)	1	With EHS/MAG	10180733-
44	Packing (8)	1		10180734-
45	Support, M3×12	10		20022019-
46	Name Plate	2	100V	372381950
47	Name Plate	2	220V	372381980
48	Case (4)	1		10180731-
49	PWB Ass'y GPOWER	2		10189517-
50	Screw, Pan M3×8	18		000503082
51	Name Plate	1		10212169-
52	Name Plate	1		10180718-
53	Name Plate	1	English	10221684-
54	Name Plate	1	Japanese	10221685-
55	Name Plate	1	Japanese	10038938-
56	Name Plate	1	English	10038934-
57	Filter Ass'y	1	Standard	10189125-
58	Filter Ass'y	1	With EHS/MAG	10189126-
59	Screw, Pan M4×10	6		000504102
60	Clamp	1		009907220
61	PWB Ass'y DRY	1		10189539-
62	Screw, Pan M3×8	4		000503082
63	PWB Ass'y EMCC	1	With EHS/MAG	10189541-
64	Support, M3×14	6	With EHS/MAG	20022019-
65	Support, M3×14	2	With EHS/MAG	20022003-
66	Screw, Pan M3×8	2	With EHS/MAG	000503082
67	PWB Ass'y MTERM	1	With EHS/MAG	10189545-
68	Screw, Pan M3×8	4	With EHS/MAG	000503082
69	Holding Plate	1	With EHS/MAG	TM2S6
70	Nut	1	With EHS/MAG	002530002

Fig8.17 Control Unit Type-D (Flush Type)
(Sheet 2 of 4)

PC. NO.	NOMENCLATURE	NO. REQ'D	DESCRIPTION	PART NO.
71	Screw, Pan M3×10	1		000593102
72	Clamp	1		009907130
73	PWB Ass'y DTERM	1		10189535-
74	Support, M3×14	2		20022019-
75	Support, M3×14	2		20022003-
76	Screw, Pan M3×8	4		000503082
77	Holding Plate	1		10180741-
78	Radiation Seat	1		20565708-
79	Radiation Seat	3		20565709-
80	Screw, Pan M4×16	3		000504162
81	Cover	1		11330689-
82	Holding Plate	1		TM2S6
83	Screw, Pan M3×8	4		000503082
84	PWB Ass'y AZIFC	1	With MAG	10189543-
85	Screw, Pan M3×8	4	With MAG	000503082
86	Clamp	1		009907210
87	PWB Ass'y SCC	2		10189511-
88	Screw, Pan M3×8	8		000503082
89	Support, M3×14	6		20022019-
90	PWB Ass'y GTERM	1		10189515-
91	Screw, Pan M3×8	7		000503082
92	Holding Plate	2		TM2S6
93	Nut	2		002530002
94	Screw, Pan M3×10	1		000593102
95	Clamp	1		009907140
96	PWB Ass'y MCOIF	1	Step Type	10189537-
97	PWB Ass'y SCOIF	1	Serial Type	10189529-
98	Screw, Pan M3×8	4		000503082
99	Holding Plate	1		10180730-
100	Radiation Seat	3		20565709-
101	Screw, Pan M4×16	2		000504162
102	Washer Spring	1		003850002
103	Screw, Pan M5×30	1		000505302
104	Washer Plain	3		003550002
105	Nut	3		002550002
106	Holding Plate	1		10180744-
107	Nut	2		000504102

Fig8.17 Control Unit Type-D (Flush Type)
(Sheet 3 of 4)

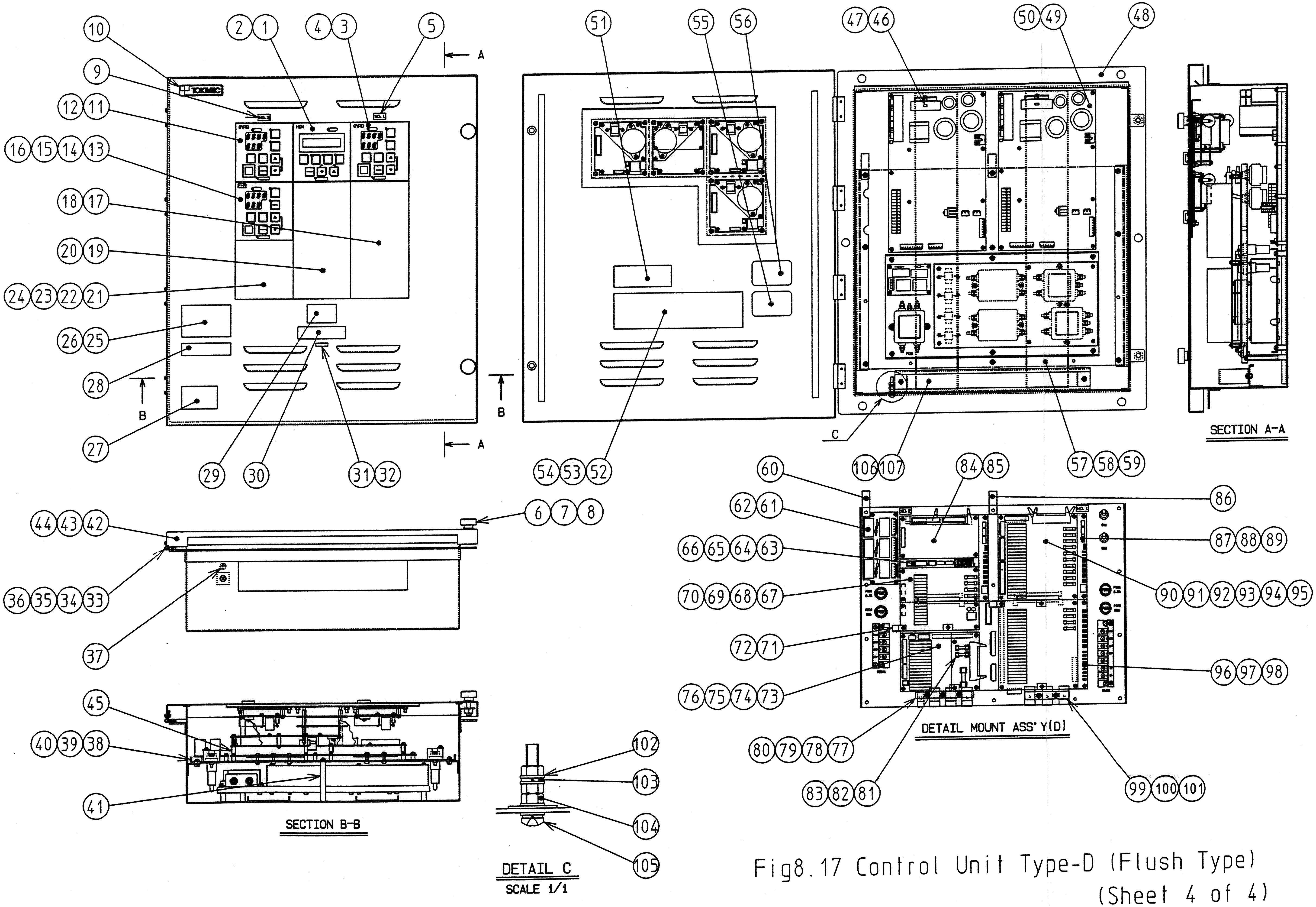


Fig8.17 Control Unit Type-D (Flush Type)
(Sheet 4 of 4)

PC. NO.	NOMENCLATURE	NO. REQ'D	DESCRIPTION	PART NO.
	Power Supply	1	Bulkhead Type	10189401-
1	Case	1		10180841-
2	Name Plate	1		10038942-
3	Name Plate	1	English	10180846-
4	Name Plate	1	Japanese	10180847-
5	Name Plate	1		20900198-
6	Cover	1		10180842-
7	Packing (1)	2		10180849-
8	Packing (2)	2		10180850-
9	Screw, Pan M4×8	4		000504082
10	Name Plate	1		10212169-
11	Screw, Pan M5×30	1		000505302
12	Nut	3		002550002
13	Washer Plain	3		003550002
14	Washer Spring	1		003850002
15	Name Plate	1		10221357-
16	Mount Ass'y	1		10189402-
17	Support, M4×50	4		200220460
18	Support, M4×28	4		200220410
19	Support, M4×45	4		200220450
20	Washer Plain	4		003540002
21	Washer Spring	4		003840002
22	Screw, Pan M3×8	9		000503082
23	PWB Ass'y GPOWER	1		10189517-
24	Name Plate	1	English	10038934-
25	Name Plate	1	Japanese	10038938-

Fig.8.18 Power Supply Unit
(Sheet 1 of 2)

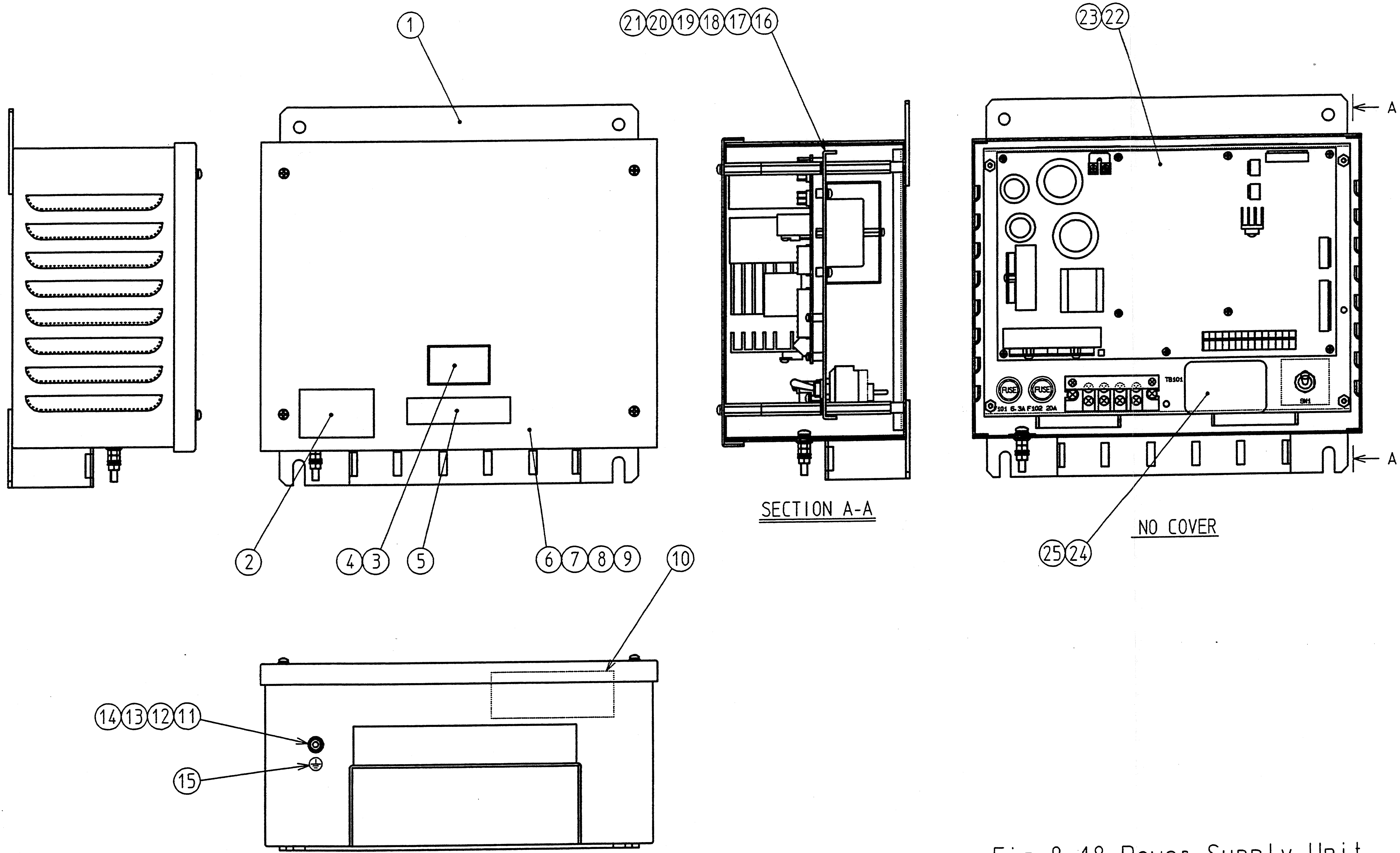


Fig 8.18 Power Supply Unit
(Sheet 2 of 2)

PC. NO.	NOMENCLATURE	NO. REQ'D	DESCRIPTION	PART NO.
	Operating Panel Ass'y	1		10189201-
1	Operating Panel	1		10180201-
2	Packing	1		11330004-
3	PWB Ass'y GPANEL	1		10189521-
4	Screw, Pan M3×8	2		000503082
5	Support	3		20022017-
6	Spacer	7		10180215-
7	Switch Ass'y	1		10189207-
8	Switch Cover	1		AT-4171
9	Name Plate	1		10180214-
10	Support Plate	1		10180211-
11	Screw, Pan M3×8	2		000503082
12	Buzzer Ass'y	1		10189215-
13	Screw, Pan M3×8	2		000503082
14	Coil	1		SHP-012
15	Terminal	2		083314112
16	Screw, Pan M3×6	2		000503062
17	Spacer	1		10160099-

Fig.8.19 Operating Panel
(Sheet 1 of 2)

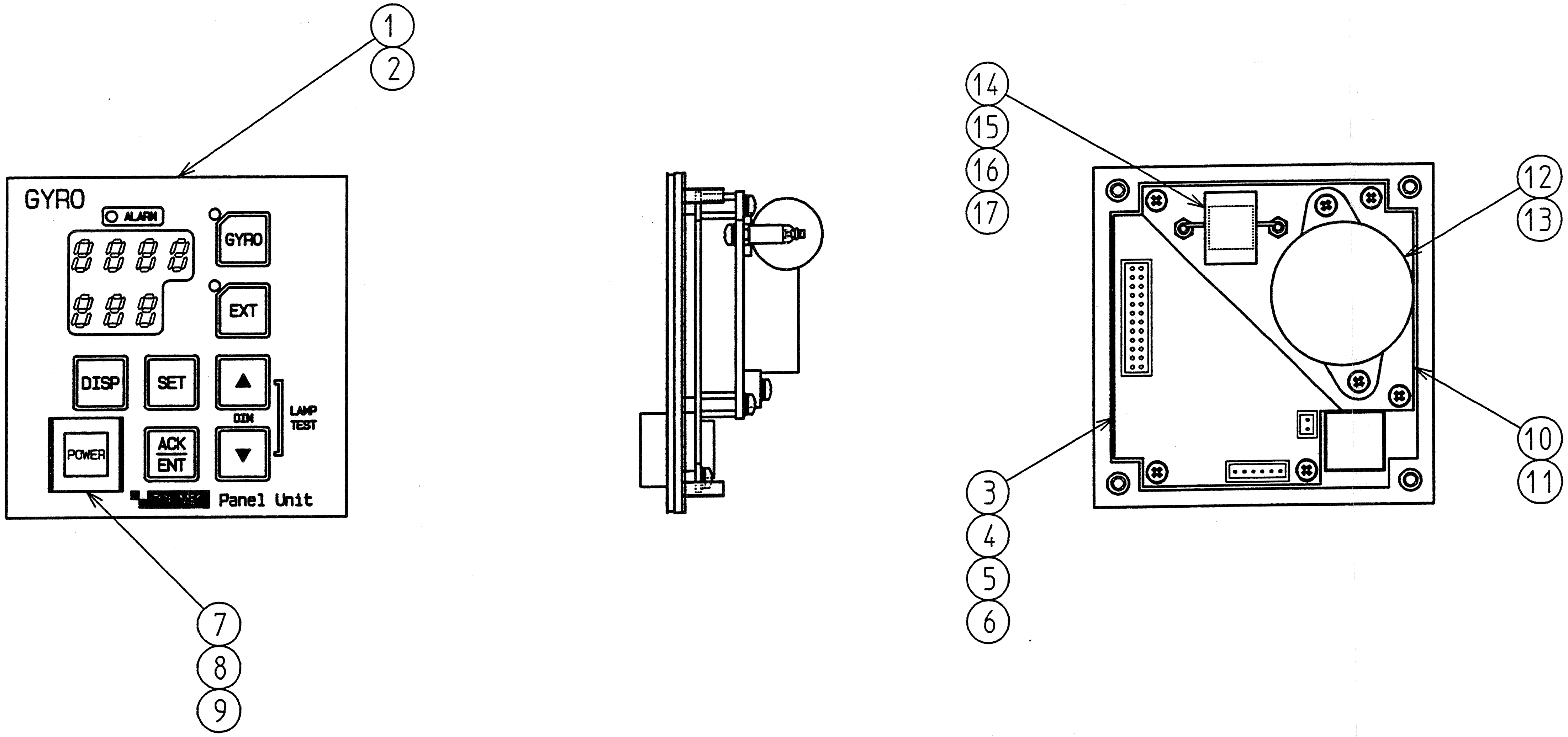


Fig 8.19 Operating Panel
(Sheet 2 of 2)

PC. NO.	NOMENCLATURE	NO. REQ'D	DESCRIPTION	PART NO.
	Operating Panel Ass'y	1		10189205-
1	Operating Panel	1		10180206-
2	Support Plate	1		10180207-
3	Packing	1		11330004-
4	LCD Ass'y	4		10179150-
5	Support	4		2MQ-8
6	Screw, Flat M2×6	4		000620062
7	Nut	4		002520002
8	Washer, Plain	4		003720002
9	Washer, Spring	4		003820002
10	PWB Ass'y DPANEL	1		10189533-
11	Support	5		20022017-
12	Washer, Plain	5		003530002
13	Washer, Spring	5		003830002
14	Support	5		20022019-
15	Spacer	7		10180216-
16	PWB Ass'y PCC	1		10189531-
17	Screw, Pan M3×8	2		000503082
18	Support	3		20022019-
19	Support Plate	1		10180211-
20	Buzzer	1		10189215-
21	Screw, Pan M3×8	5		000503082

Fig.8.20 HDM Operating Panel
(Sheet 1 of 2)

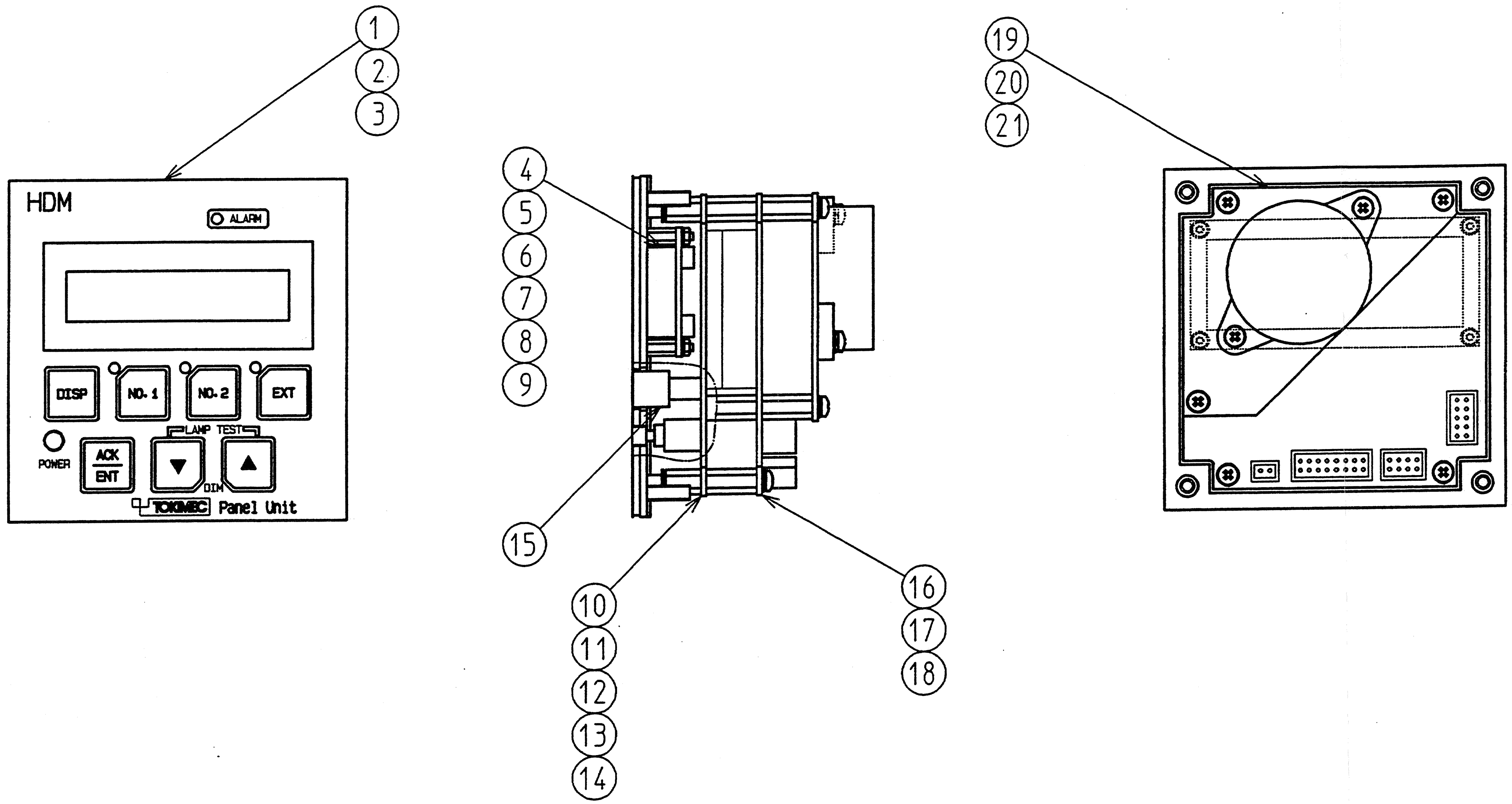


Fig 8.20 HDM Operating Panel
(Sheet 2 of 2)

PC. NO.	NOMENCLATURE	NO. REQ'D	DESCRIPTION	PART NO.
	Repeater	1	Standard	10189451-
	Repeater	1	Plug Type	10189452-
1	Case	1		10180929-
2	Cover	1		10212862-
3	Screw, Pan M4×20	6		000504202
4	Glass Ass'y	1		10219204-
5	Packing	1		10212449-
6	"O"Ring	1		016000050
7	Lubber Line Ass'y	1		10219587-
8	Card	1		10212858-
9	Screw, Pan M3×8	1		000503082
10	Cap	1		10212859-
11	Gear	1		10180908-
12	Set Screw	2		000830041
13	Support Plate	1		10180909-
14	Screw, Pan M3×6	4		000503062
15	Motor Ass'y	1		10180928-
16	Screw, Flat M3×8	4		000630082
17	Packing	1		TM-96-9
18	Packing	1		10212985-
19	RPCC pwb	1		10189549-
20	Screw, Pan M3×6	4		000503062
21	Support Plate	1		10180911-
22	Support	4		SQ-6
23	Screw, Pan M3×12	2		000503122
24	Lamp	2		100043450
25	Socket	2		085012012
26	Tapping Screw	4		010201540
27	Washer Plain	4		003730002
28	Washer Spring	4		003830002
29	Support Plate	1		10180901-
30	ZRCR pwb Ass'y	1		10189476-
31	Screw, Pan M3×8	3		000503082
32	Support Plate	1		10180926-
33	Screw, Pan M3×8	2		000503082

Fig8.21 Serial Repeater
(Sheet 1 of 3)

PC. NO.	NOMENCLATURE	NO. REQ'D	DESCRIPTION	PART NO.
34	Shaft Ass'y	1		10189465-
35	Housing	1		10180902-
36	Bearing	2		10230077-
37	Support	4		20022018-
38	Washer Plain	4		003530002
39	Screw, Pan M3×8	4		000503082
40	Gear Ass'y	1		10189454-
41	Set Screw	2		000830081
42	Support	4		SQ-6
43	Packing	1		10212984-
44	Cover	1		10212977-
45	Screw, Pan M4×16	6		000504162
46	Cable Ass'y	1	Standard	10189475-
47	Cable Ass'y	1	Plug Type	10189478-
48	Tapping Screw	4		010201530
49	Washer Plain	4		003730002
50	Washer Spring	4		003830002
51	Name Plate	1		10180964-
52	Name Plate	1		20900198-

Fig8.21 Serial Repeater
(Sheet 2 of 3)

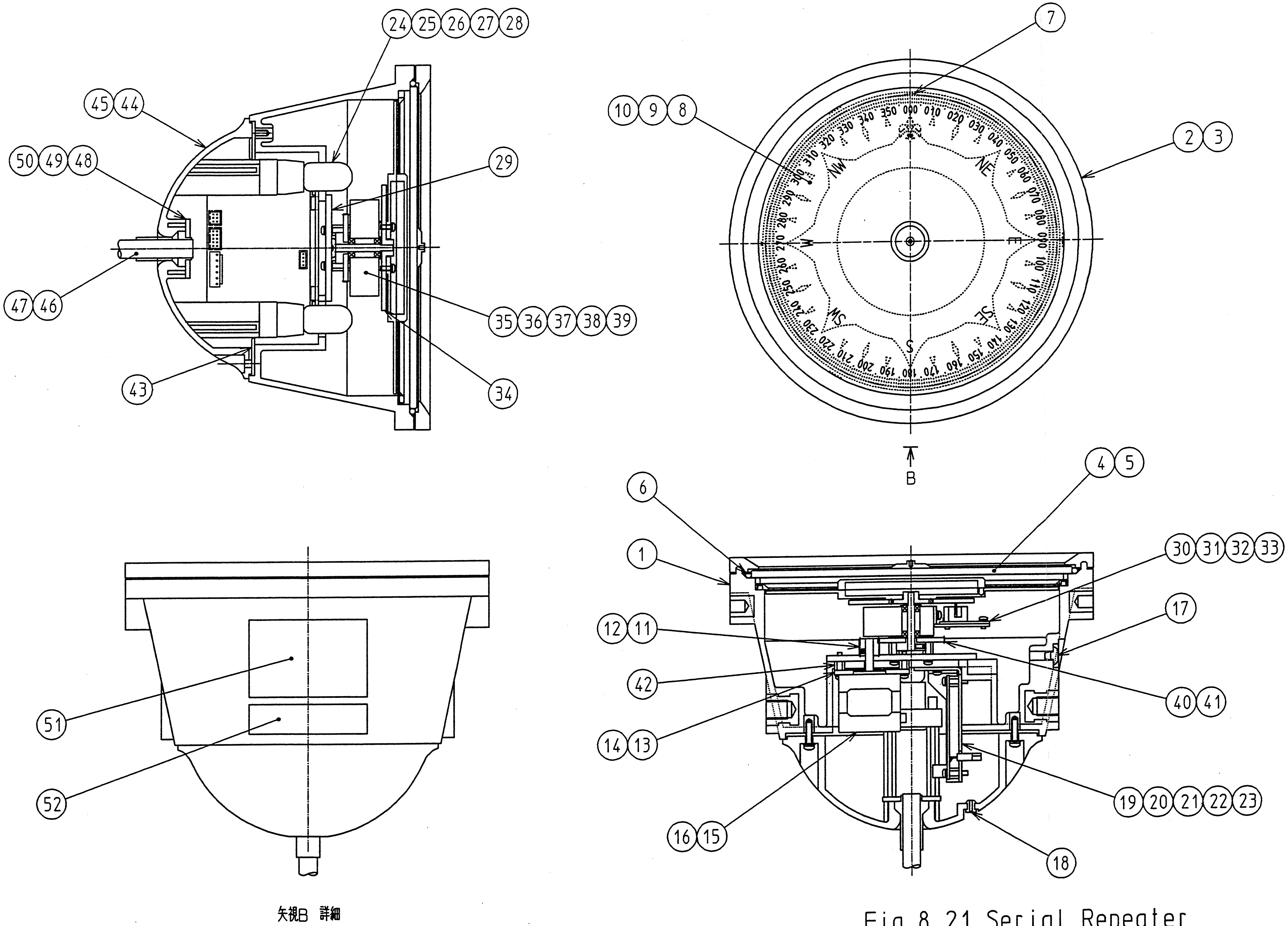


Fig 8.21 Serial Repeater
(Sheet 3 of 3)

PC. NO.	NOMENCLATURE	NO. REQ'D	DESCRIPTION	PART NO.
	Repeater	1	Open scale	10189453-
1	Case	1		10180929-
2	Cover	1		10212862-
3	Screw, Pan M4×20	6		000504202
4	Glass Ass'y	1		10219204-
5	Packing	1		10212449-
6	"O"Ring	1		016000050
7	Lubber Line Ass'y	1		10189485-
8	Card	1		10180927-
9	Plate	1		10212999-
10	Screw, Flat M2×8	3		000620082
11	Gear Ass'y	1		10189470-
12	Set Screw	2		000830041
13	Support Plate	1		10180909-
14	Screw, Pan M3×6	4		000503062
15	Motor Ass'y	1		10180928-
16	Screw, Flat M3×8	4		000630082
17	Packing	1		TM-96-9
18	Packing	1		10212985-
19	RPCC pwb	1		10189549-
20	Screw, Pan M3×6	4		000503062
21	Support Plate	1		10180911-
22	Support	4		SQ-6
23	Screw, Pan M3×12	2		000503122
24	Lamp	2		100043450
25	Socket	2		085012012
26	Tapping Screw	4		010201540
27	Washer Plain	4		003730002
28	Washer Spring	4		003830002
29	Support Plate	1		10180901-
30	ZRCR pwb Ass'y	1		10189476-
31	Screw, Pan M3×8	3		000503082
32	Support Plate	1		10180926-
33	Screw, Pan M3×8	2		000503082
34	Shaft Ass'y	1		10189471-

Fig8.22 Open Scale Serial Repeater
(Sheet 1 of 3)

PC. NO.	NOMENCLATURE	NO. REQ'D	DESCRIPTION	PART NO.
35	Bearing	2		10213020-
36	Housing	1		10180916-
37	Bearing	2		11470109-
38	Support	4		200220210
39	Screw, Pan M3×8	4		000503082
40	Gear Ass'y	1		10189469-
41	Set Screw	2		000830081
42	Support	4		SQ-6
43	Packing	1		10212984-
44	Cover	1		10212977-
45	Screw, Pan M4×16	1		000504162
46	Cable Ass'y	1		10189475-
47	Tapping Screw	4		010201530
48	Washer Plain	4		003730002
49	Washer Spring	4		003830002
50	Collar	1		11470115-
51	Set Screw	2		000830081
52	Shaft Ass'y	1		10189472-
53	Card	1		10212996-
54	Ring	1		10212997-
55	Screw, Flat M2×10	4		000630102
56	Spacer	1		10180925-
57	Support Plate	1		10212995-
58	Screw, Flat M3×6	4		000630062
59	Stopper	1		10230225-
60	Screw, Pan M3×10	1		000593102
61	Name Plate	1		10180952-
62	Name Plate	1		20900198-

Fig8.22 Open Scale Serial Repeater
(Sheet 2 of 3)

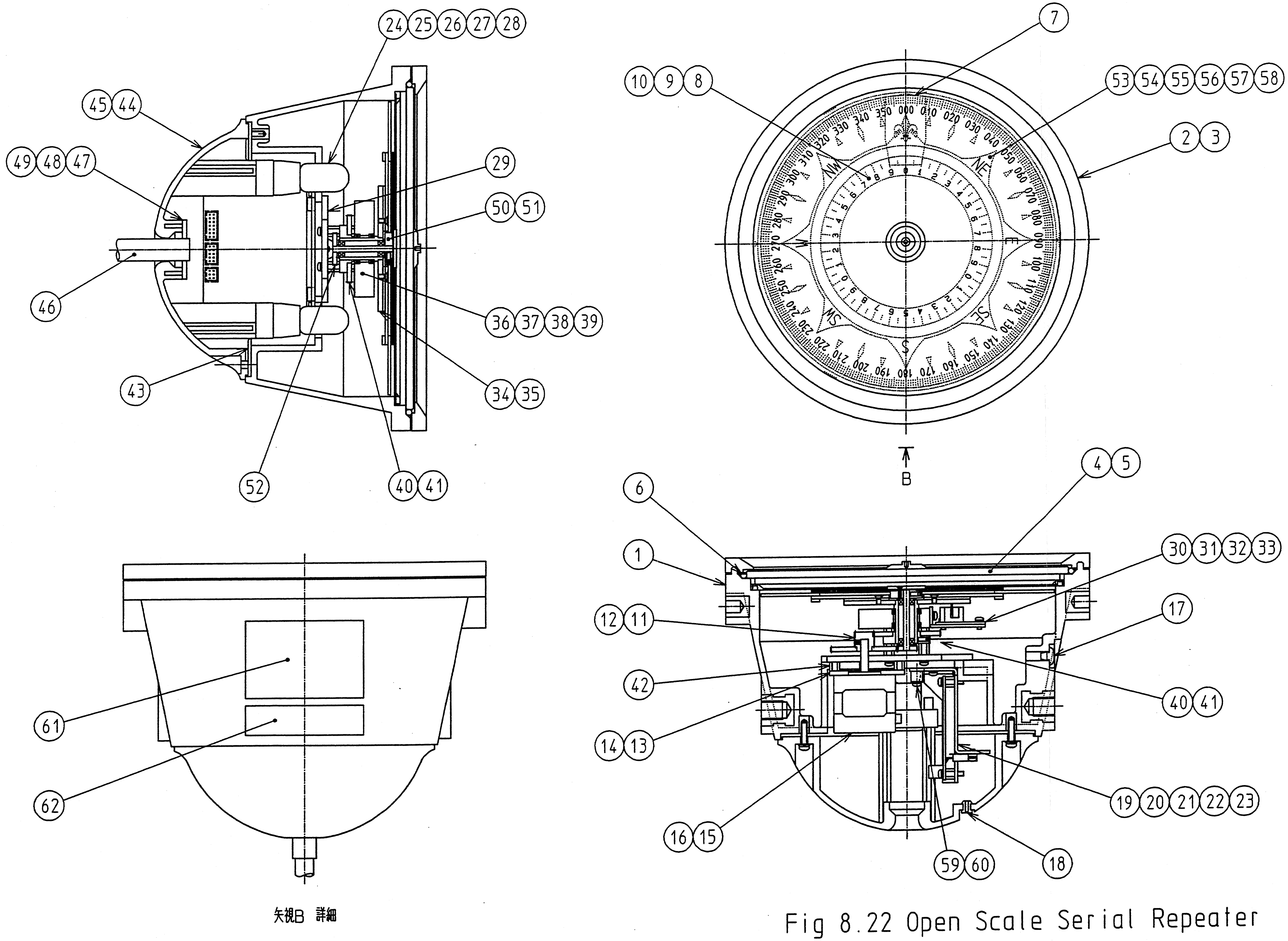
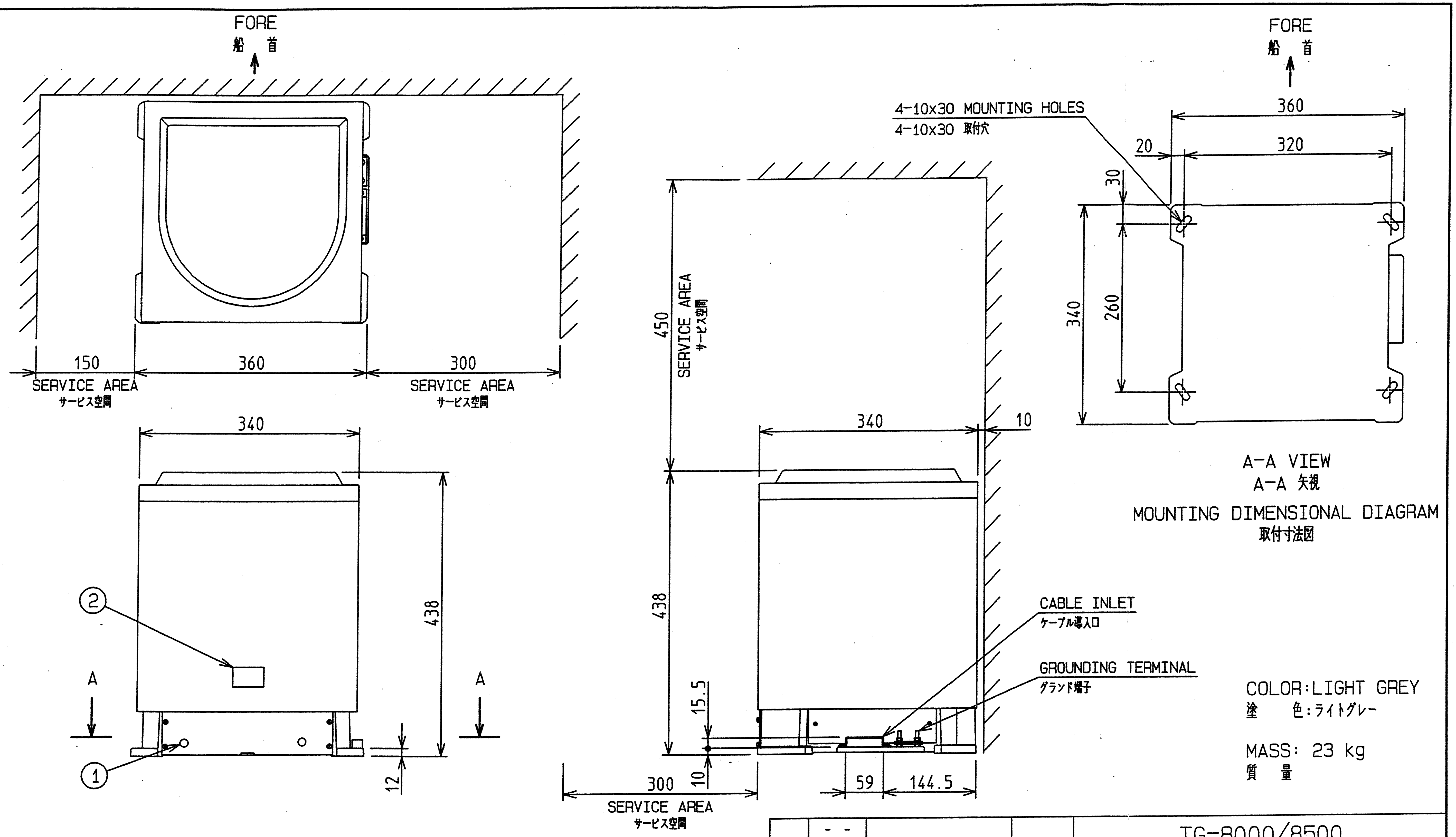


Fig 8.22 Open Scale Serial Repeater
(Sheet 3 of 3)

第9章　付図

CHATER 9　ATTACHED FIGURES



NO.	NAME 名称
1	FUSE ヒューズ
2	NAME PLATE 銘板

MARK	日付 DATE	変更項目 REVISION	担当 SIGN
	- -		
	- -		
	- -		
	- -		

記事 NOTE

サイズ SIZE: B

TG-8000/8500
MASTER COMPASS
マスタコンパス

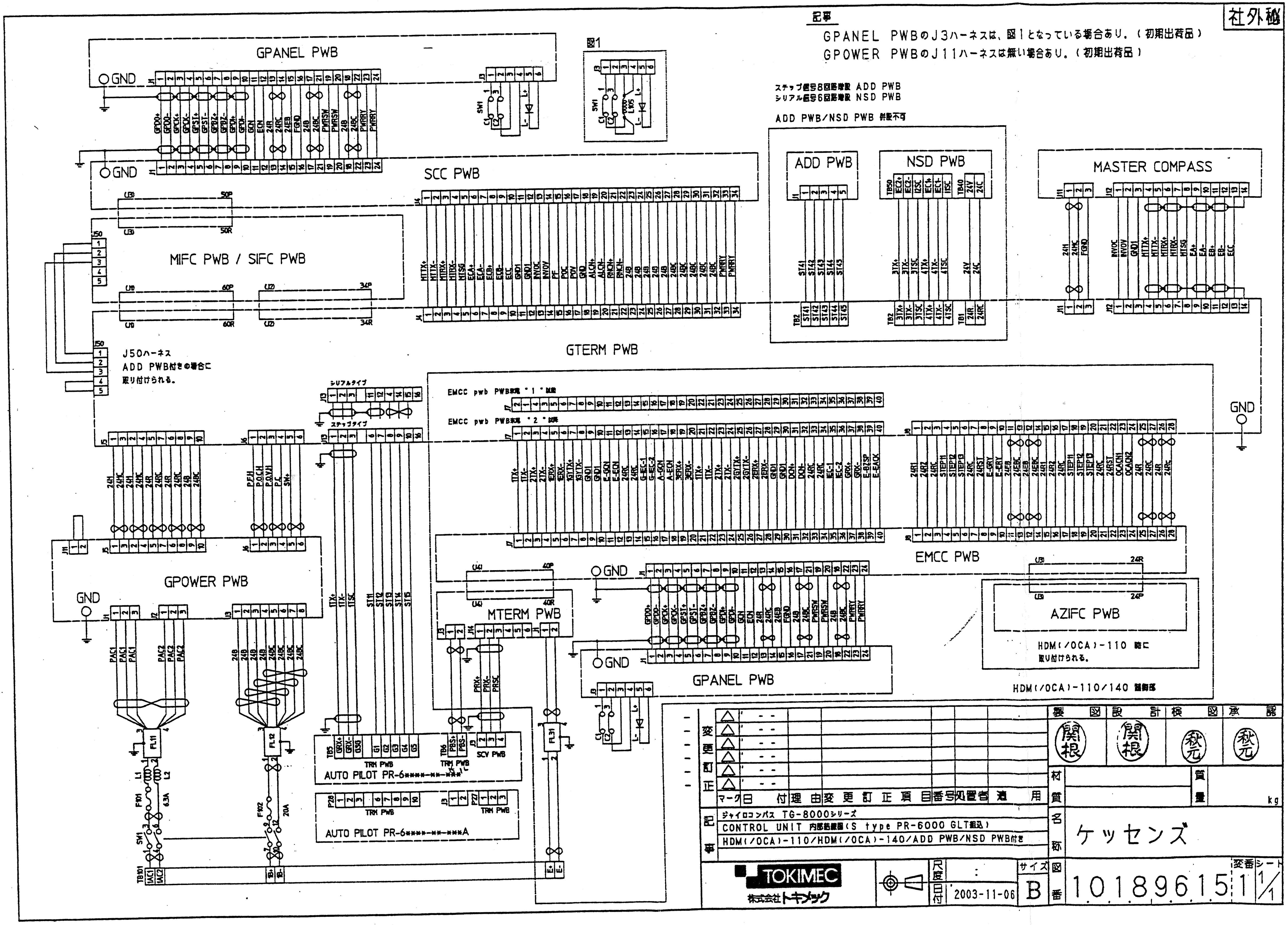
製図 DRAWN BY	設計 CHARGED BY	検図 CHECKED BY	承認 APPROVED BY
Y. Yoshida	Y. Yoshida	M. Akimoto	K. Yamamoto

尺度 SCALE: ~
日付 DATE: 2002-10-31
図番 DRAWING: 1099002700
REV: 0
SHT: 1/1

株式会社 トキメック TOKIMEC INC.

(H)

Fig. 9.1.1


社外秘
記事
GPANEL PWBのJ3ハーネスは、図1となっている場合あり。（初期出荷品）
GPOWER PWBのJ11ハーネスは無い場合あり。（初期出荷品）
図1
ステップ信号8回路増設 ADD PWB
シリアル信号6回路増設 NSD PWB
ADD PWB/NSD PWB 併設不可
GPANEL PWB
SCC PWB
ADD PWB
NSD PWB
MASTER COMPASS
MIFC PWB / SIFC PWB
J50ハーネス
ADD PWB付きの場合に
取り付けられる。
GTERM PWB
シリアルタイプ
ステップタイプ
EMCC pwb PWB実装 "1" 設置
EMCC pwb PWB実装 "2" 設置
EMCC PWB
GPOWER PWB
MTERM PWB
GPANEL PWB
AZIFC PWB
HDM(/OCA)-110 時に
取り付けられる。
HDM(/OCA)-110/140 接続部
GND
AUTO PILOT PR-6####-##-###
AUTO PILOT PR-6####-##-###A
TRM PWB
SCV PWB
ジャイロコンパス TG-8000シリーズ
CONTROL UNIT 内部結線図（S type PR-6000 GLT組込）
HDM(/OCA)-110/HDM(/OCA)-140/ADD PWB/NSD PWB付き
ケッセンズ
TOKIMEC
株式会社トキメック
2003-11-06
B
10189615
1
1/1

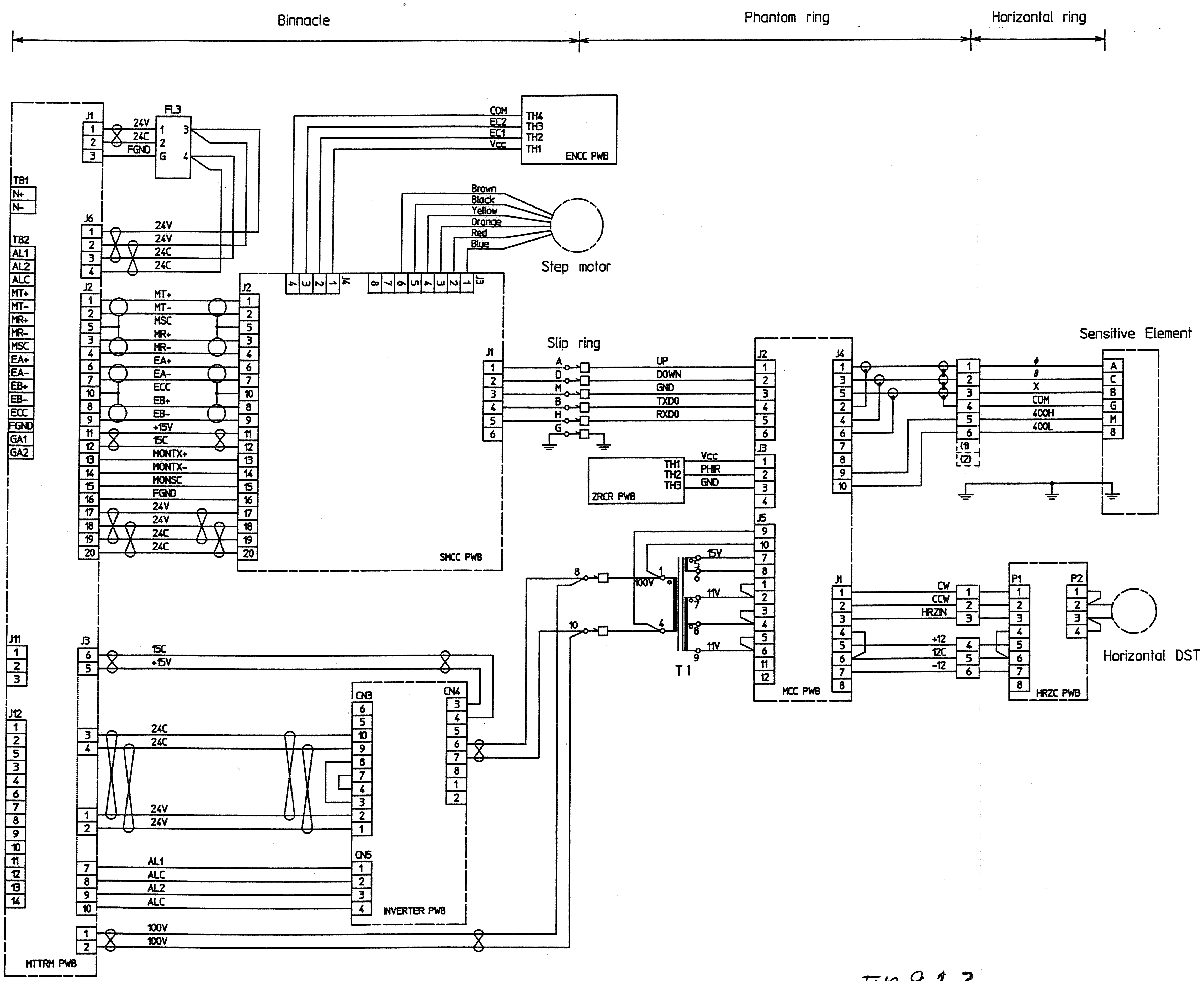


Fig. 9.1.2

TG-8000/8500、GC80/85 MASTER COMPASS
Internal wiring diagram

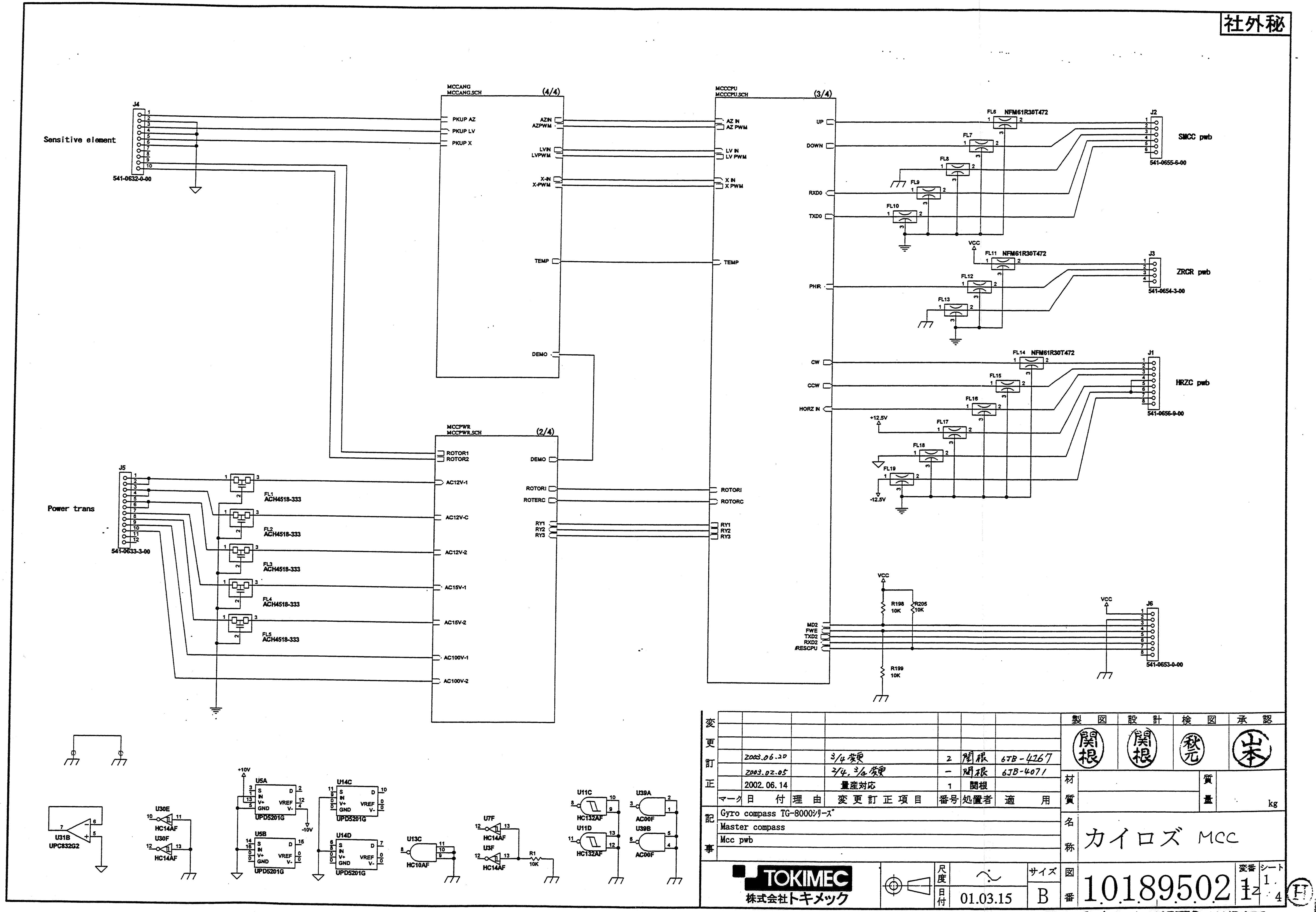
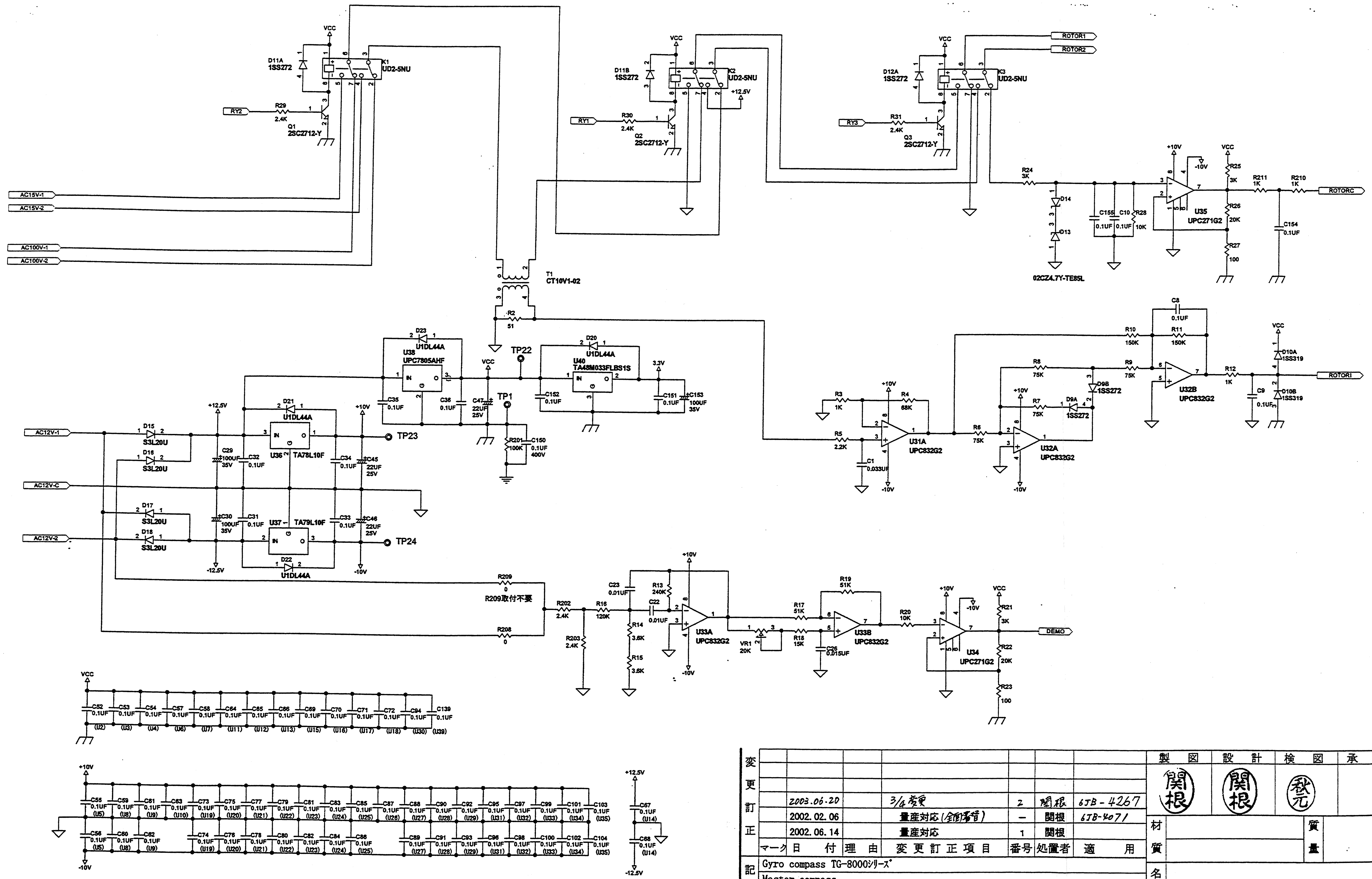


Fig. 9.1.3.1 MASTER COMPASS

社外秘



変更訂正					
2003.06.20	3/4 変更	2	関根	6JB-4267	
2002.02.06	量産対応(全面?)	−	関根	6JB-4071	
2002.06.14	量産対応	1	関根		
マーク 日付 理由	変更訂正項目	番号	処置者	適用	

製図	設計	検図	承認
関根	関根	秋元	

材質

質量 kg

記事:
Gyro compass TG-8000シリーズ
Master compass
Mcc pwb

名称: カイロズ MCC

TOKIMEC
株式会社トキメック

尺度: ~
日付: 01.03.15
サイズ: B
図番: 10189502
変番: 1z
シート: 2/4

Fig. 9.1.3.2 MASTER COMPASS

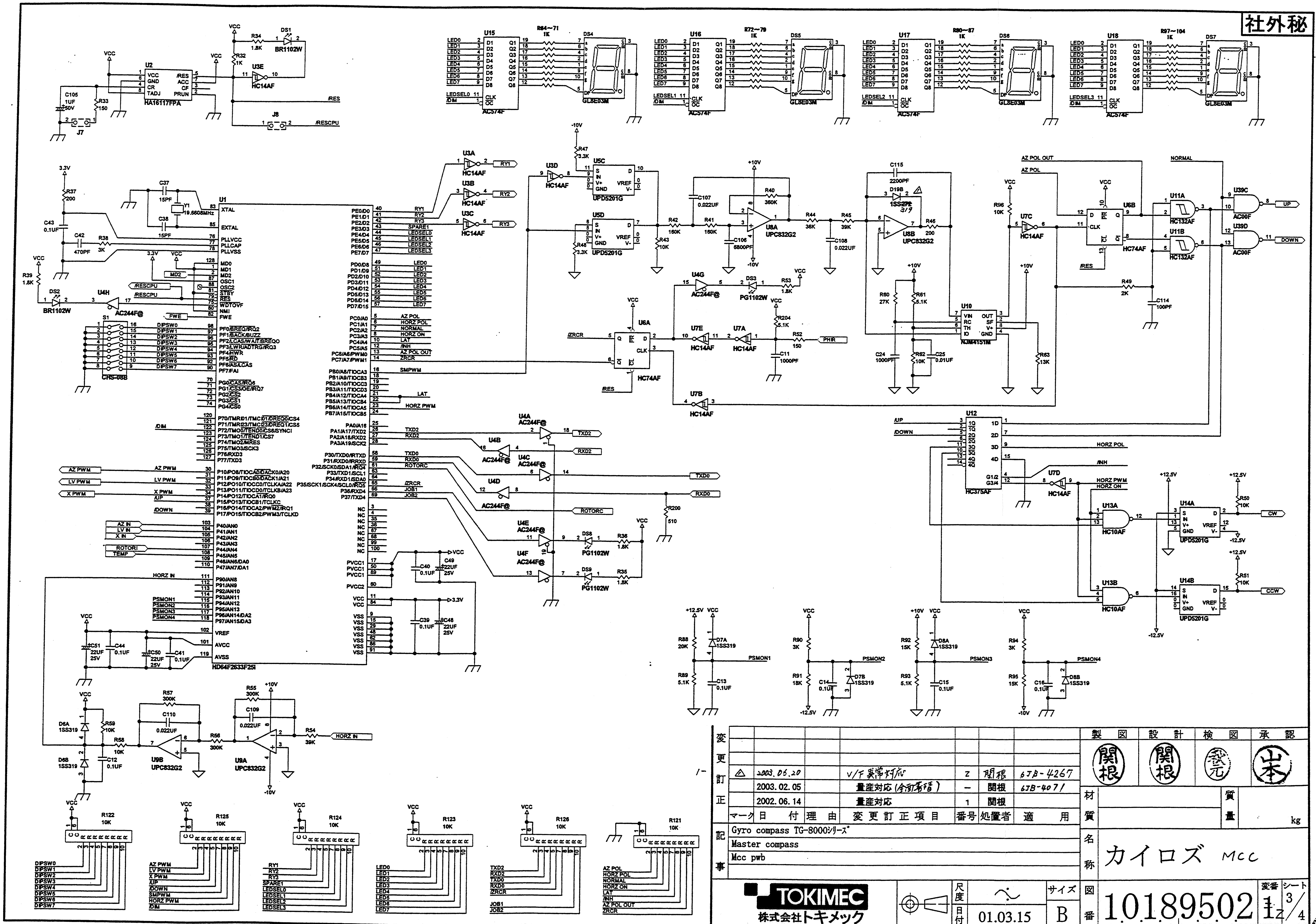


Fig. 9.1.3.3 MASTER COMPASS

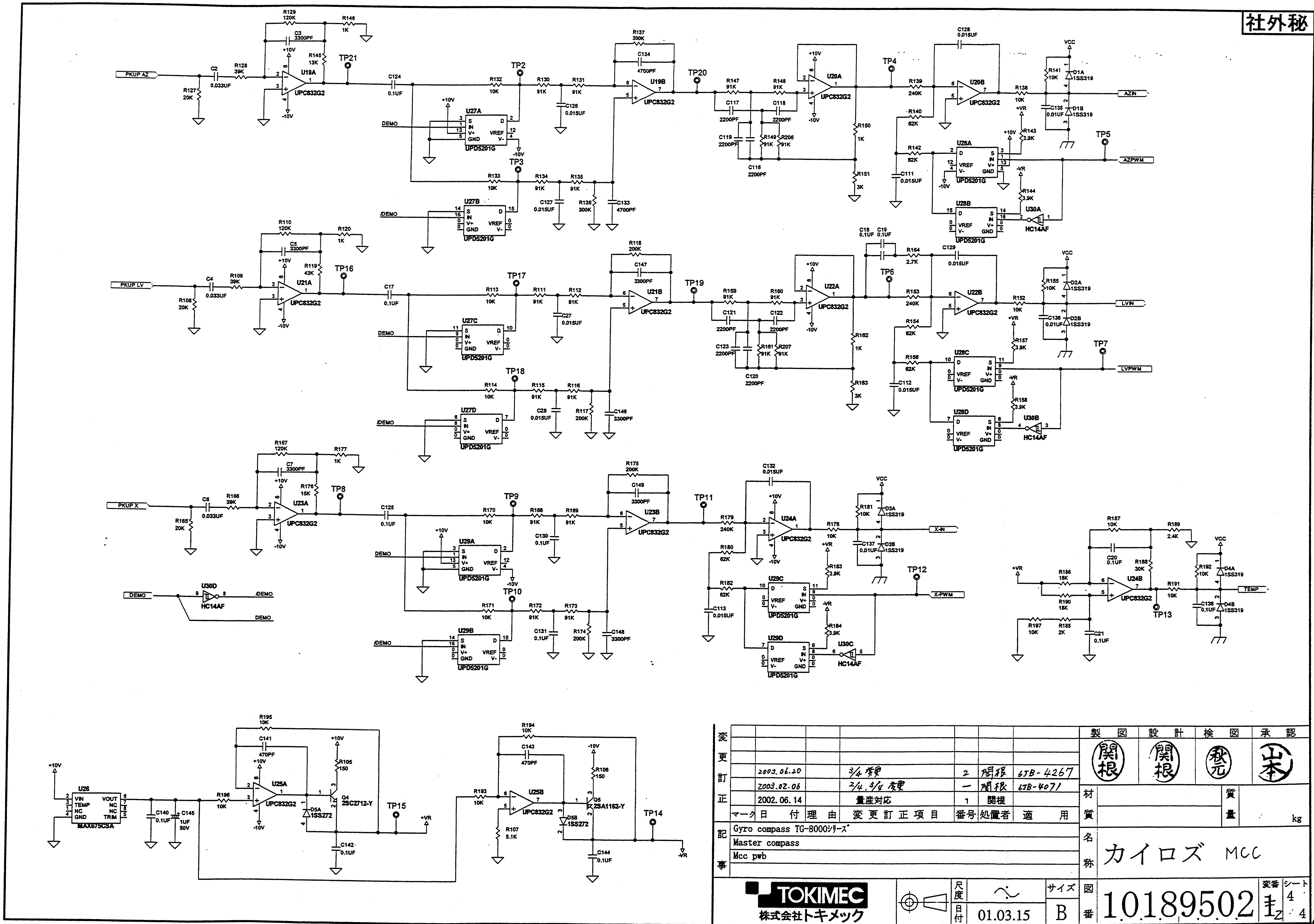
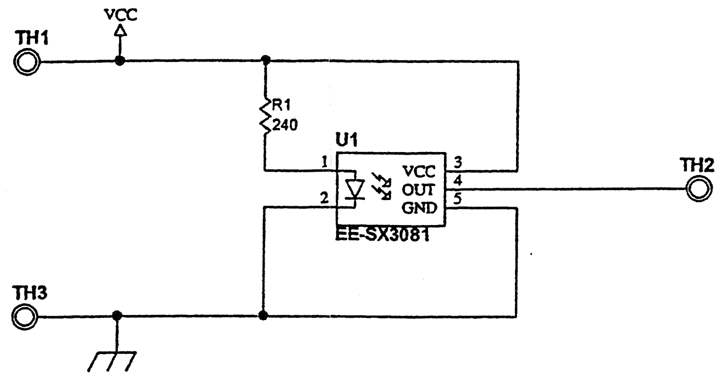


Fig.9.1.3.4 MASTER COMPASS

社外秘



変更訂正

マーク	日付	理由	変更訂正項目	番号	処置者	適用
	2002. 11. 10		量産対応	1	関根	

製図	設計	検図	承認
関根	関根	秋元	山本

材質:

質量: kg

記事:
Gyro compass TG-8000シリーズ
Master compass
ZRCR pwb

名称: カイロズ ZRCR

株式会社トキメック TOKIMEC

尺度	日付	サイズ	図番	変番	シート
～	01.03.15	A	10189508	1	1 / 1

Fig. 9.1.4 MASTER COMPASS

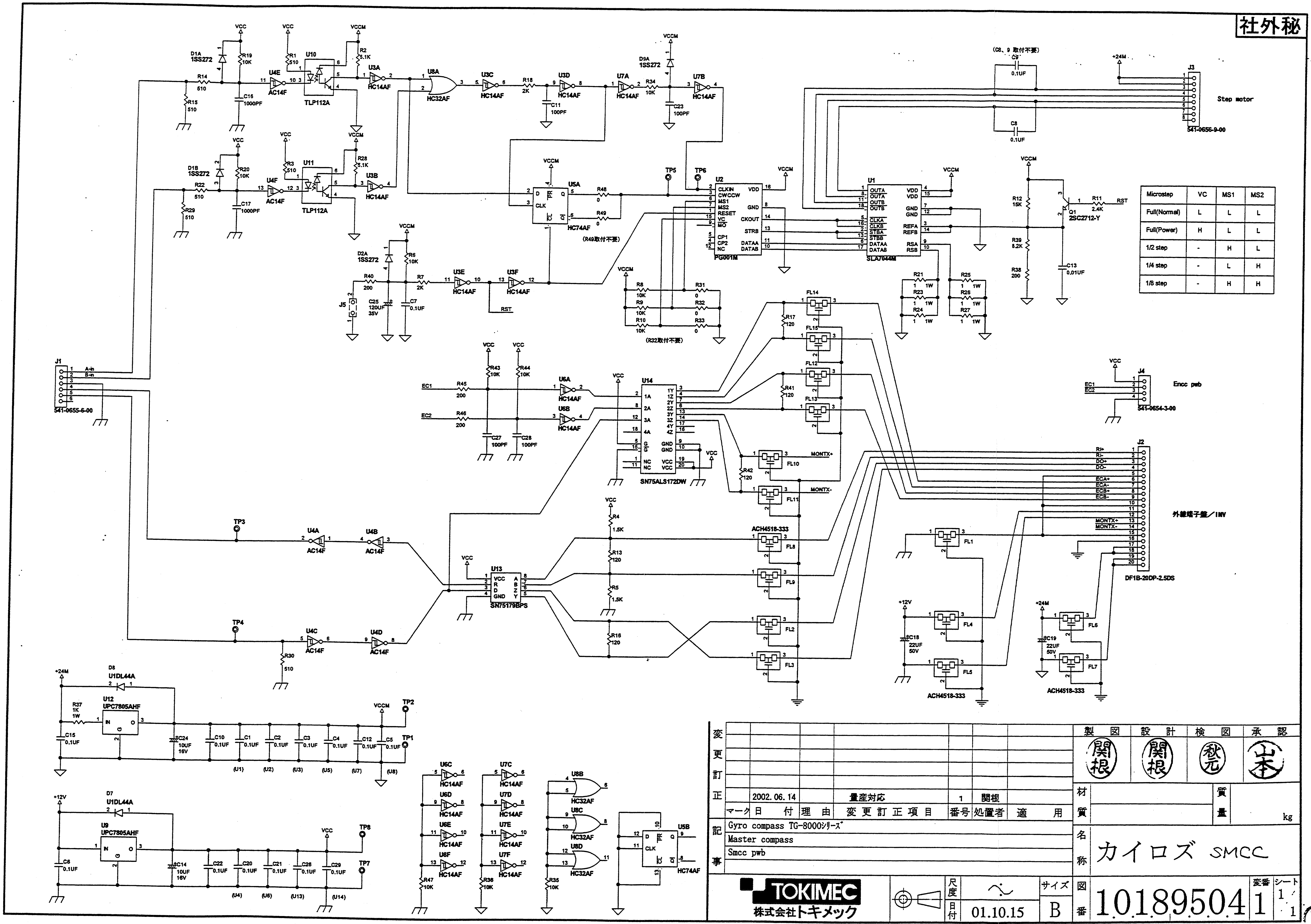
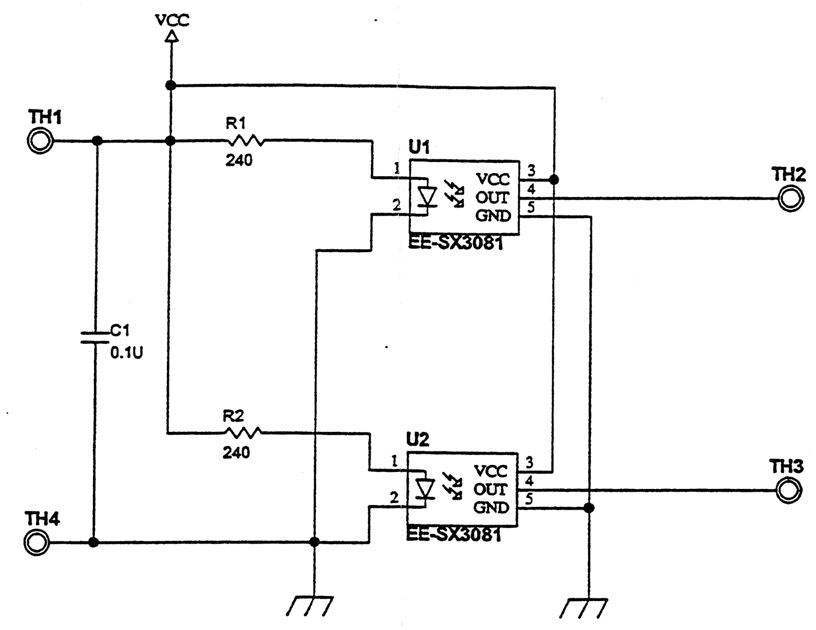


Fig. 9.1.5 MASTER COMPASS

社外秘



変更訂正						
マーク	日付	理由	変更訂正項目	番号	処置者	適用
	2002.11.10		量産対応	1	関根	

記事
Gyro compass TG-8000シリーズ
Master compass
ENCC pwb

製図	設計	検図	承認
関根	関根	秋元	山本

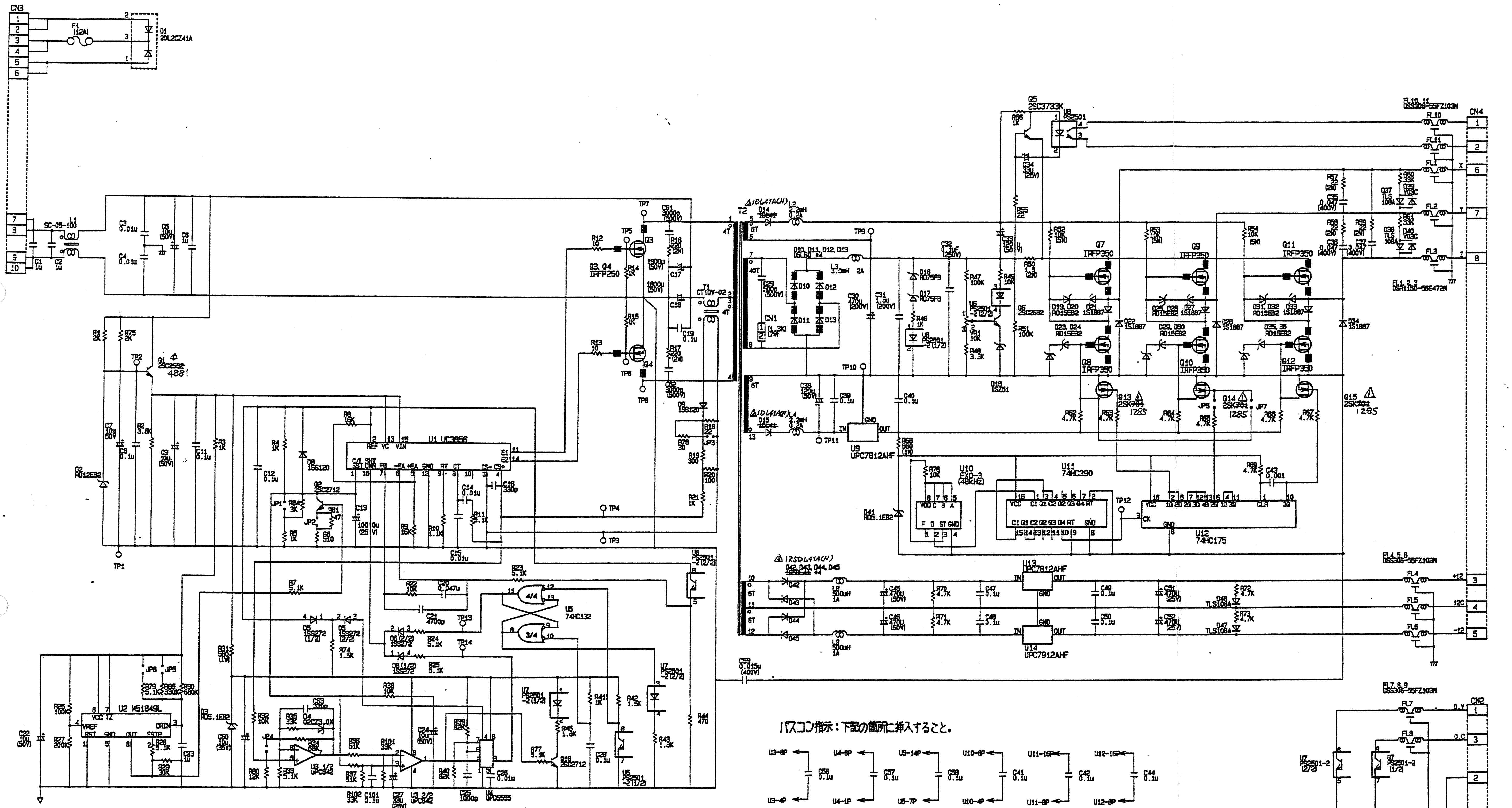
材質
質量 kg
名称 カイロズ ENCC

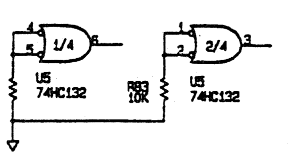
TOKIMEC
株式会社トキメック

尺度 ~
日付 01.03.15
サイズ A
図番 10189506
変番 1
シート 1 / 1

Fig. 9.1.6 MASTER COMPASS

社外秘





ジャンパーの設定

	TG-6000	ES	備考
JP1	SHORT	OPEN	
JP2	OPEN	SHORT	
JP3	OPEN	SHORT	
JP4	OPEN	SHORT	
JP5	OPEN	SHORT	
JP6	OPEN	SHORT	
JP7	SHORT	OPEN	
JP8	-----	-----	PWB単体試験時にSHORT

注記：

1：電力の指示無き抵抗は、1／4Wとする。

2：耐圧の指示無きコンデンサは、50Vとする。

3：■　左図は、アモビーズ ~~AB4＊2＊6~~を示す。△2 AB4＊2＊6W

4：⏚　左図は、フレームGNDを示す。

MARK	日付 DATE	変更項目 REVISION	NO.	SIGN
△				
3 △3	2003.7.08	形式変更 D14,15 D42~45	8	関根
1 △2	2002.5.29	△2 型名変更 6JB-3820	—	関根
4 △1	01.07.27	D1 D13-15代替 6JB-3444	7	秋元
△	2000.12.29	全面改訂 6JB-3186	6	関根

材質

記事 NOTE: TG-6000、ESシリーズ INVERTER pwb

製図 DWN: 関根 設計 CHG: 関根 検図 CHK: 秋元 承認 APPD: 村林

名称 TITLE: カイロズ INVERTER

株式会社トキメック TOKIMEC INC.

尺度 SCALE: 〜

日付 DATE: '2000.03.14

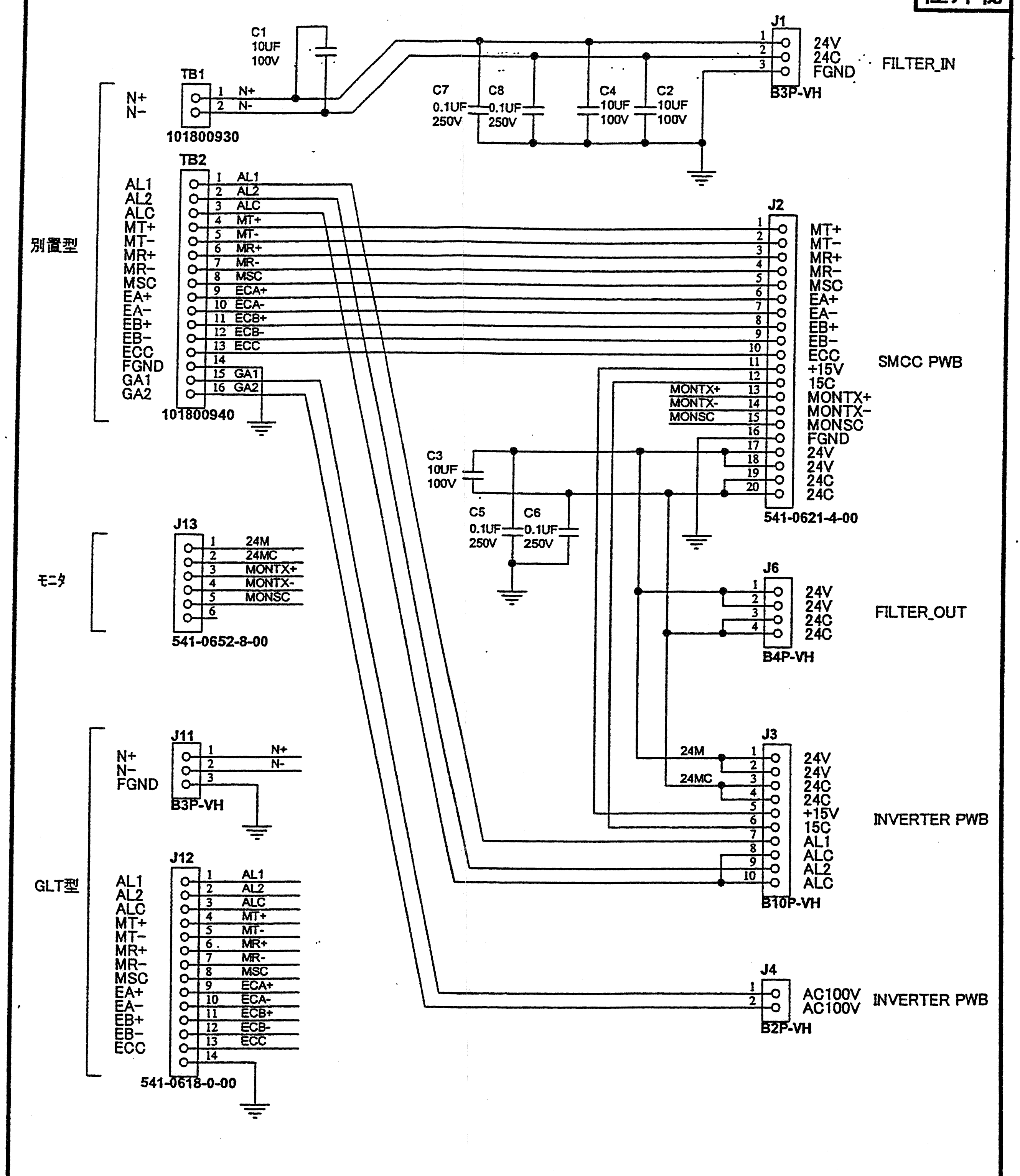
SIZE: C

図番 DRAWING NO.: 1016 9527 8

SHEET: 1/1

Fig. 9.1.7 MASTER COMPASS

社外秘



変更訂正記事						
マーク	日付	理由	変更訂正項目	番号	処置者	適用

記事: ジャイロコンパス TG-8000シリーズ マスタコンパス
MTTRM pwb

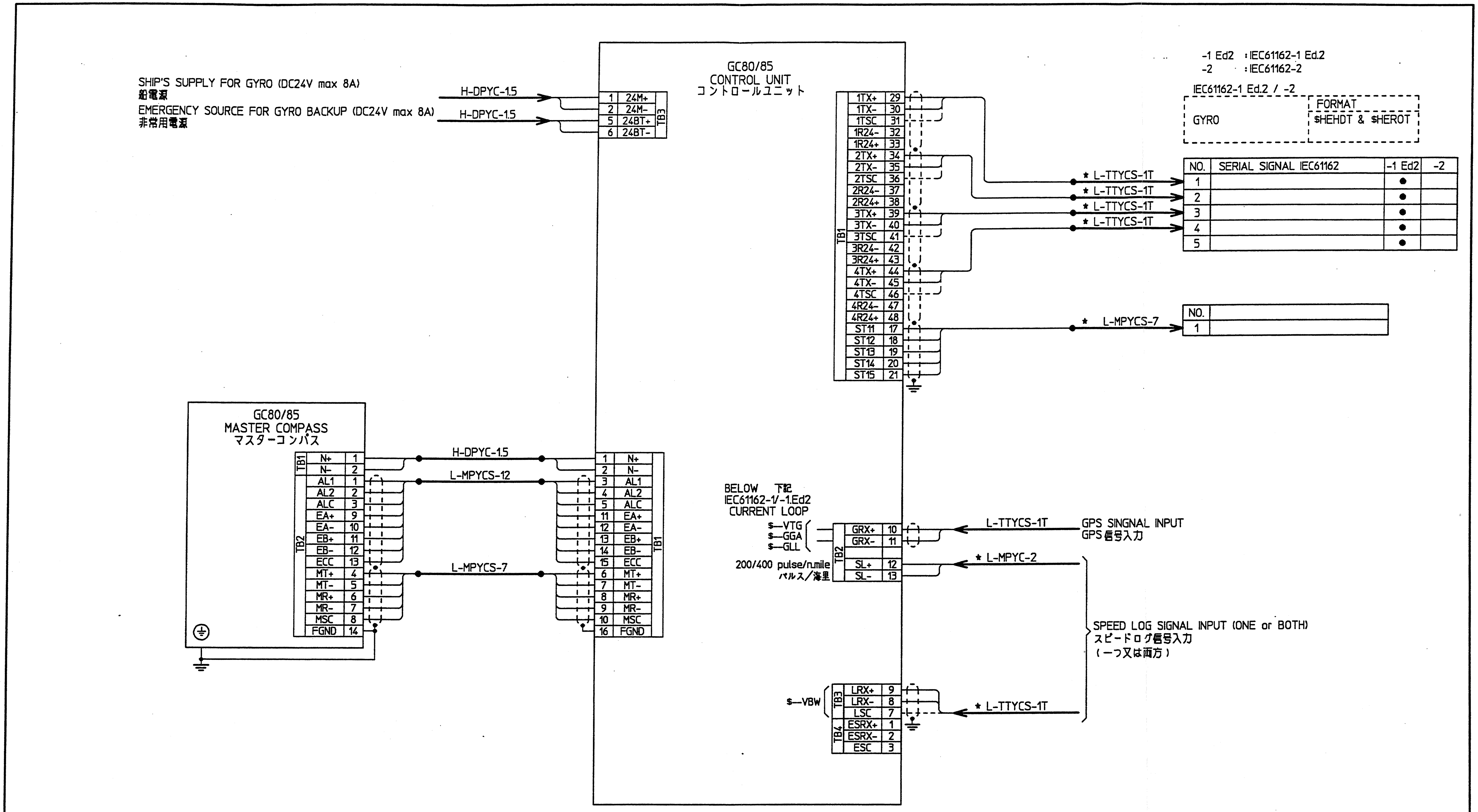
製図	設計	検図	承認
関根	関根	秋元	山本

材質		質量	kg
名称	カイロズ MTTRM		

TOKIMEC 株式会社トキメック

尺度	〜	サイズ	図番	変番	シート
日付	02.07.01	A	10189510	0	1/1

Fig. 9.1.8 MASTER COMPASS



---- CONNECT FOR RS422

H:0.6/1kV
L:250V

* IF NECESSARY TO BE INSTALLED.
* 印のケーブルは必要な時だけ接続してください。

MARK	日付DATE	変更項目 REVISION	担当 SIGN

INTER UNIT WIRING DIAGRAM
機 器 間 結 線 図

製図 DRAWN BY	設計 CHARGED BY	検図 CHECKED BY	承認 APPROVED BY

記事 NOTE GC80/85
I TYPE
製作図番：

サイズSIZE B

TOKIMEC
株式会社トキメック TOKIMEC INC.

尺度 SCALE
日付 DATE 2003-10-10
図番 DRAWING NO. 11001957
REV 0
SHT 1/1

Fig. 9.2.1 Type I

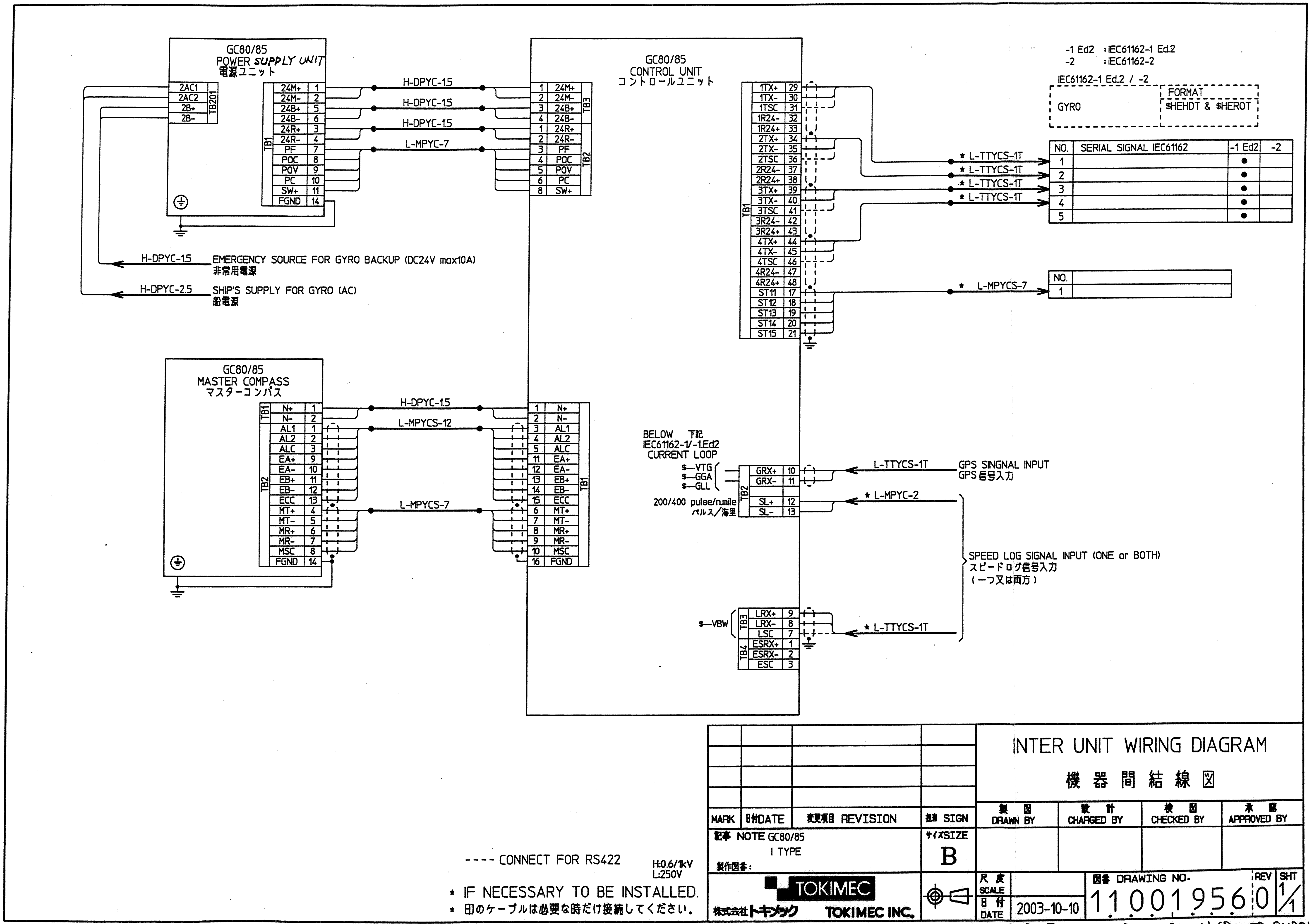
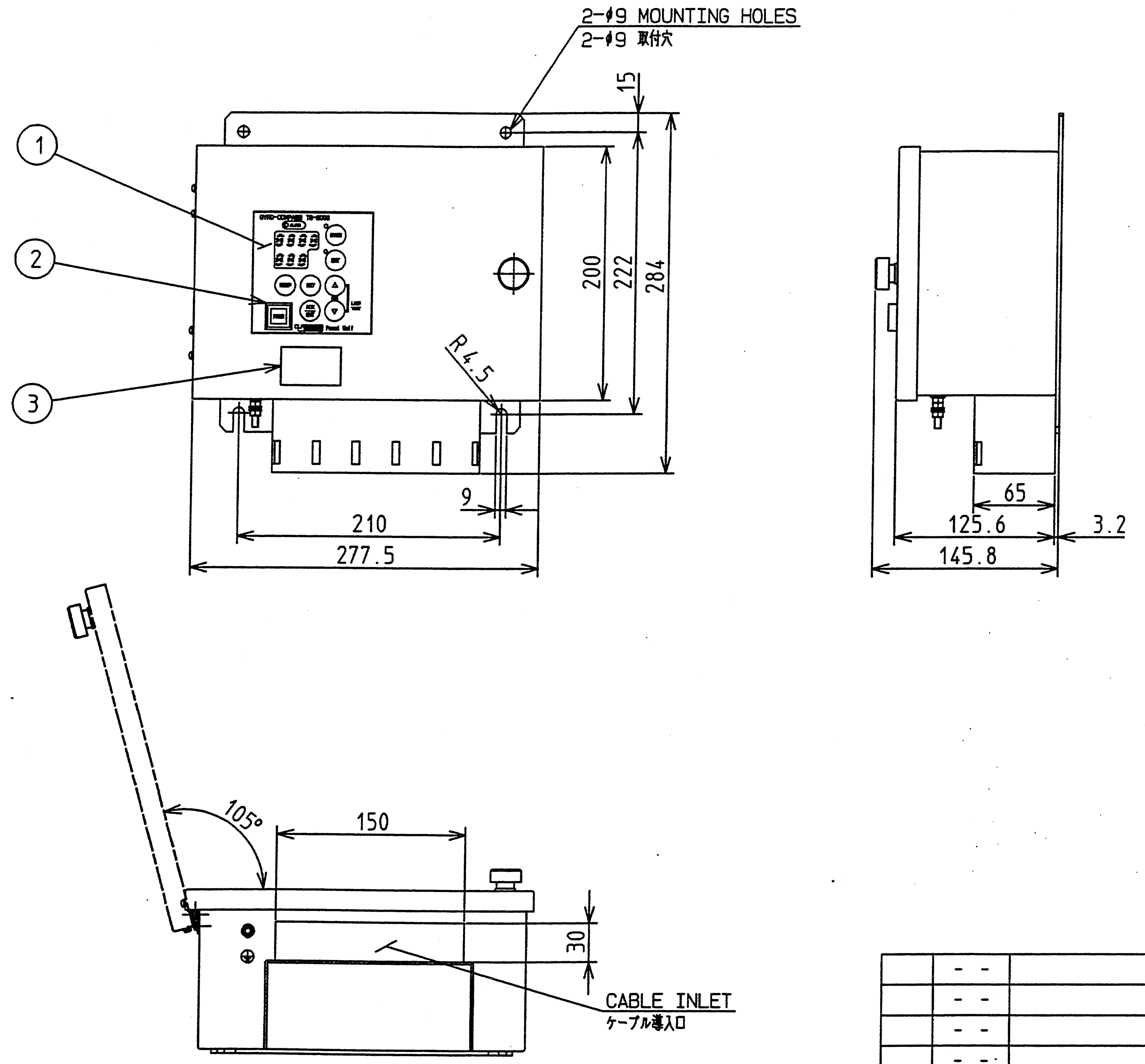


Fig. 9.2.2 Type I OPTION (POWER SUPPLY UNIT)



NO.	NAME 名称
1	OPERATING PANEL 操作パネル
2	POWER SWITCH 電源スイッチ
3	NAME PLATE 銘板

COLOR : LIGHT GRAY
塗 色 : ライトグレー

MASS : 7 kg
質 量

MARK	日付 DATE	変更項目 REVISION	担当 SIGN
	- -		
	- -		
	- -		
	- -		

記事 NOTE
Type I

サイズ SIZE: B

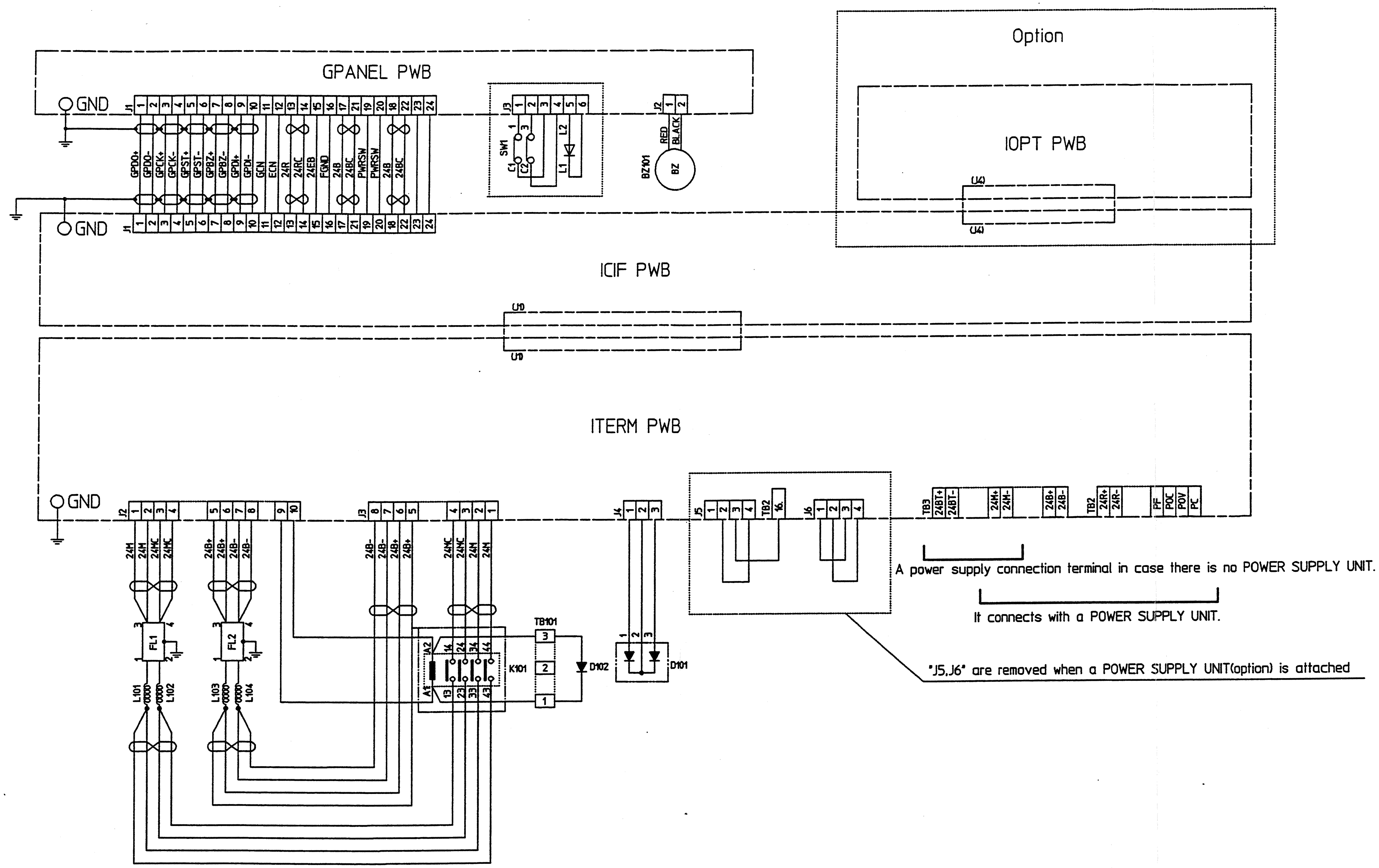
TG-8000/8500
CONTROL UNIT
コントロールユニット

製図 DRAWN BY	設計 CHARGED BY	検図 CHECKED BY	承認 APPROVED BY
Y. Yoshida	Y. Yoshida	M akimoto	K. Yamamoto

TOKIMEC
株式会社 トキメック TOKIMEC INC.

尺度 SCALE: 1:5
日付 DATE: 2002. 4. 1
図番 DRAWING: 1099001 20
REV: 0
SHT: 1/1

Fig.9.2.3 Type I



note

"IOPT PWB" is option.

"ITERM PWB J5,J6" are removed when a POWER SUPPLY UNIT(option) is attached

With an early product,there is also a unit which changed connection of "GPANEL PWB J3" into "Fig.1".

Fig.1

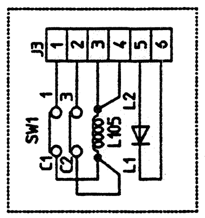
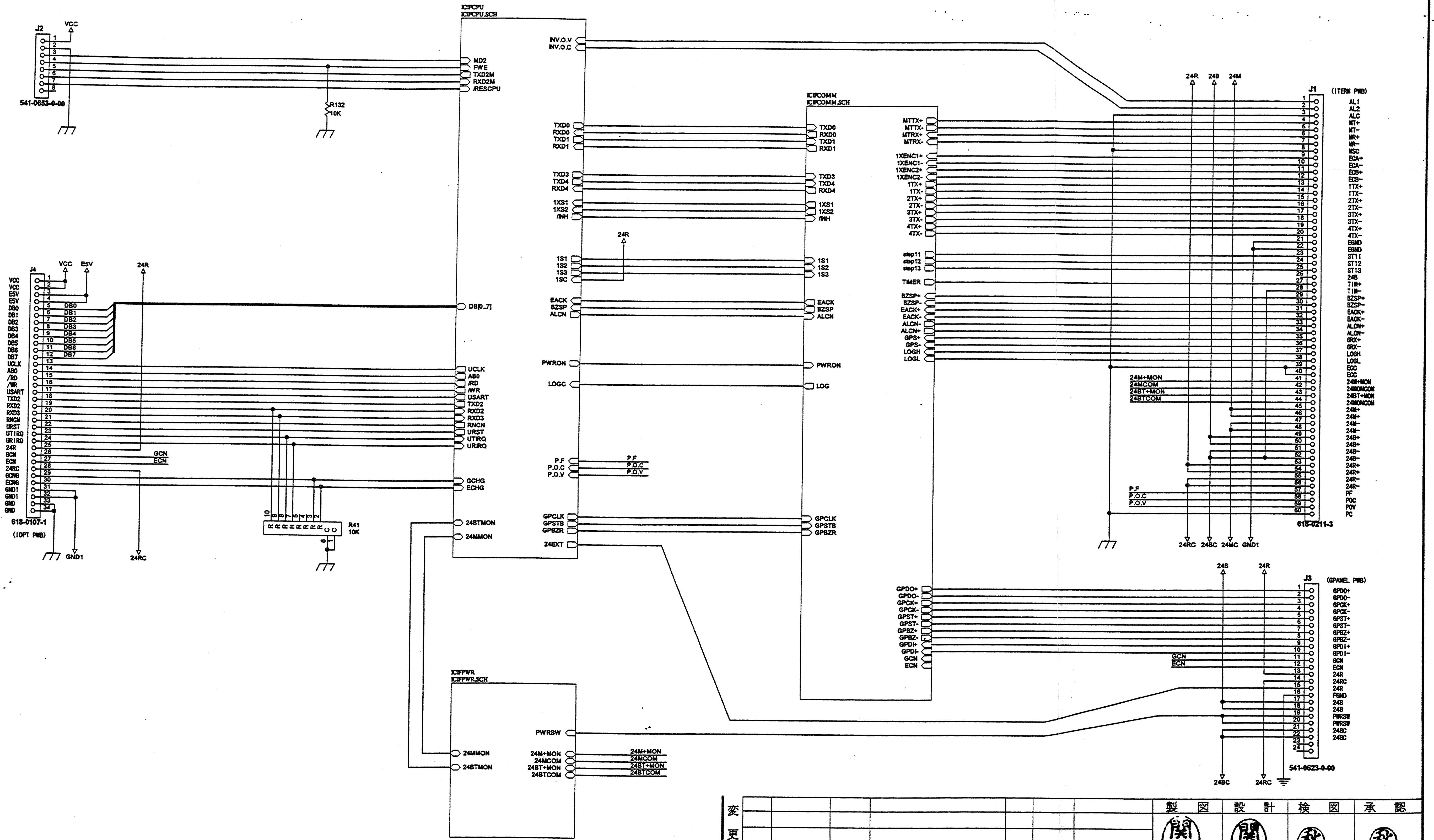


Fig. 9.2.4

GC 80/85 TYPE I

Internal wiring diagram

社外秘



変更訂正		2003.07.07	仕様変更(全面書替)	−	関根	63B-4289
		2003.06.07	2/4〜4/4(全面書替)	−	関根	
		2003.06.03	量産対応(全面書替)	2	関根	63B-4245
	マーク	日付	理由 / 変更訂正項目	番号	処置者	適用

製図	設計	検図	承認
関根	関根	秋元	秋元

材質:

質量: kg

記事:
Gyro compass TG-8000ｼﾘｰｽﾞ
Control unit type I
ICIF pwb

名称: カイロズ_ICIF

TOKIMEC
株式会社トキメック

尺度: ~ 日付: 01.04.03 サイズ: B 図番: 10189524 変番: 2 シート: 1/4

Fig. 9.2.5.1 Type I

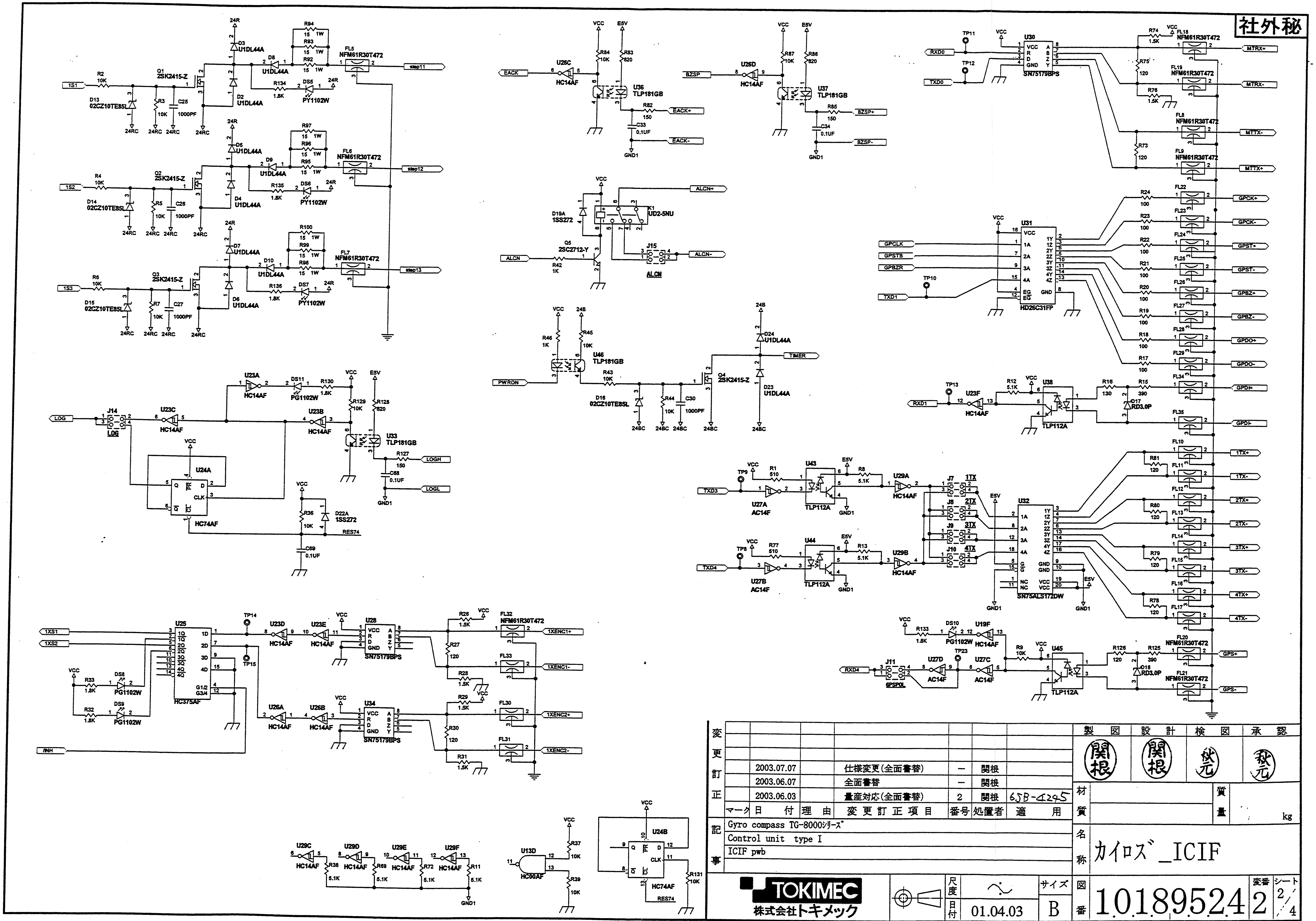


Fig. 9.2.5.2 Type I

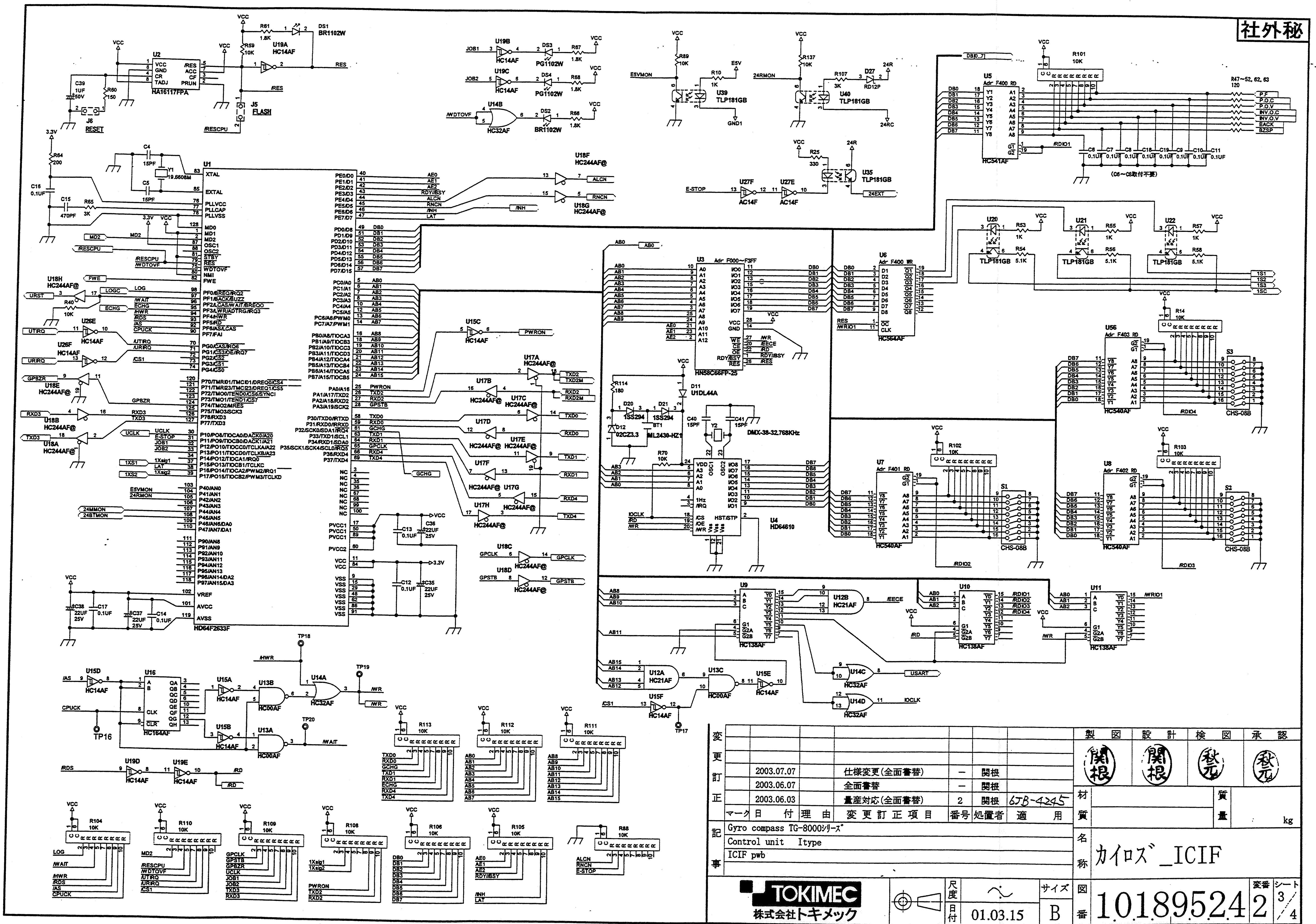
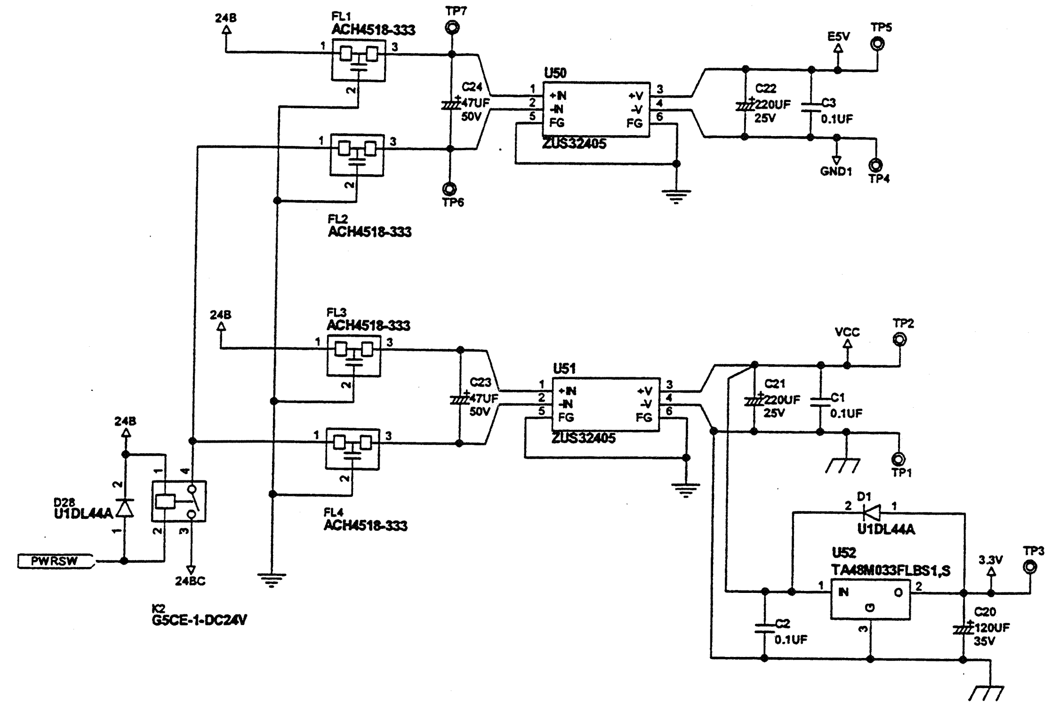
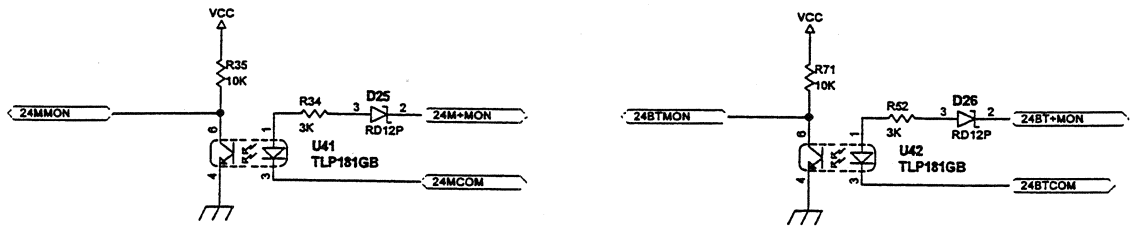
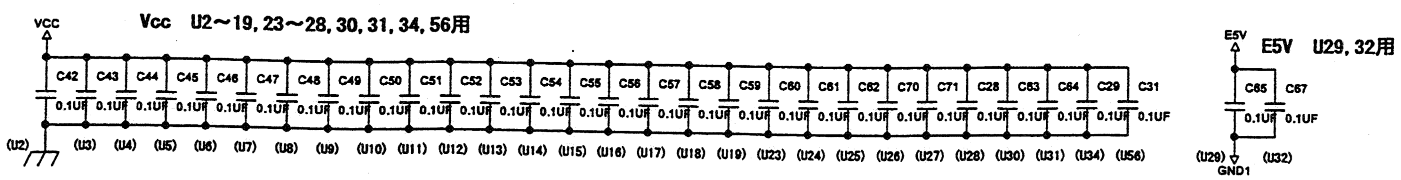


Fig. 9.2.5.3 Type I

社外秘







変更訂正	マーク	日付	理由	変更訂正項目	番号	処置者	適用
		2003.07.07		仕様変更(全面書替)	―	関根	
		2003.06.07		全面書替	―	関根	
		2003.06.03		量産対応(全面書替)	2	関根	6JB-4245

製図	設計	検図	承認
関根	関根		

材質

質量 kg

記事
Gyro compass TG-8000ｼﾘｰｽﾞ
Control unit type I
ICIF pwb

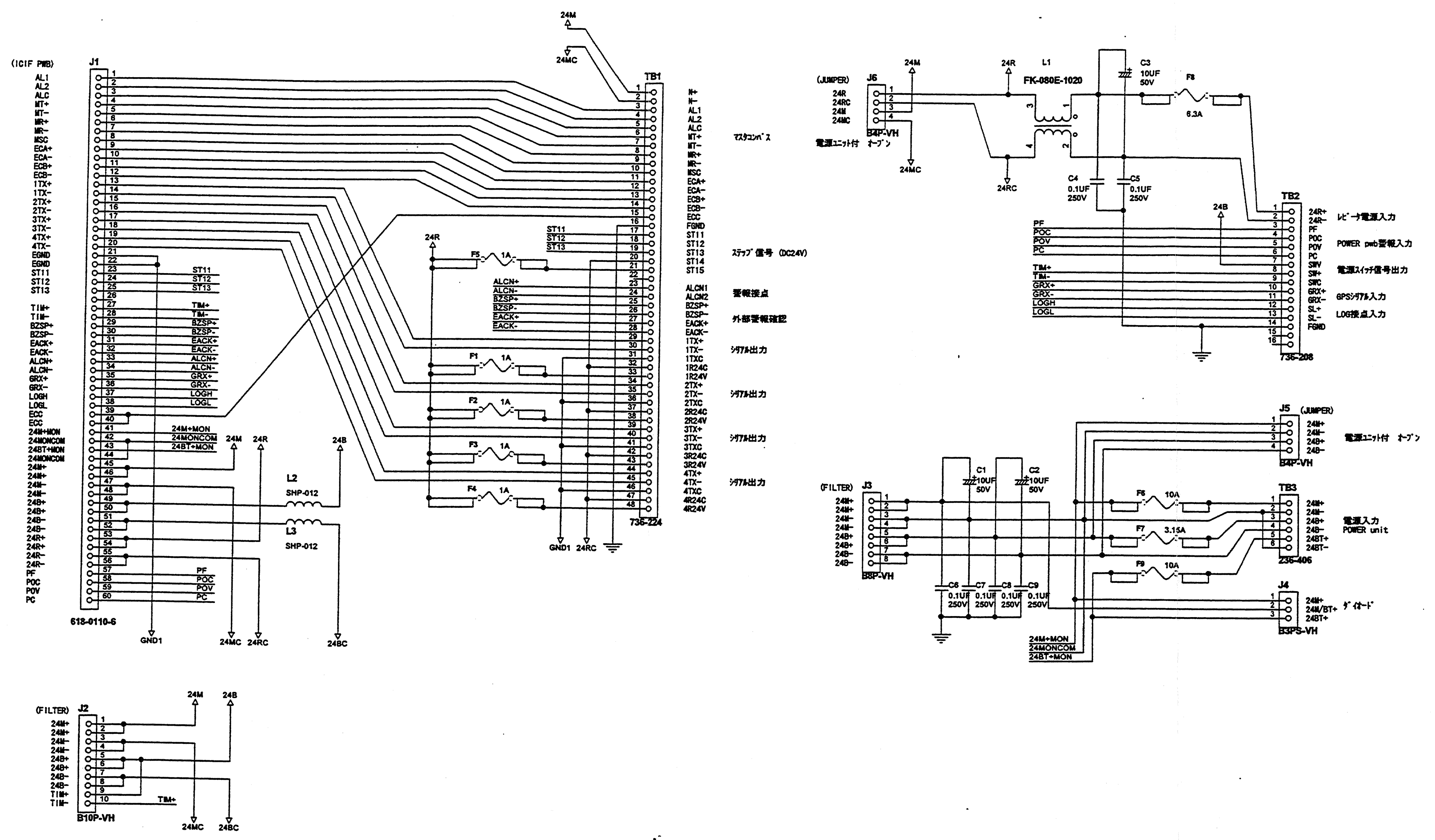
名称 カイロズ_ICIF

TOKIMEC
株式会社トキメック

尺度 ～ | 日付 01.04.03 | サイズ B | 図番 10189524 | 変番 2 | シート 4/4

Fig. 9.2.5.4 Type I

社外秘



変更訂正記事						
	2003.07.05	仕様変更(全面書替)	-	関根	6JB-4290	
	2003.06.03	量産対応(全面書替)	2	関根	6JB-4243	
マーク	日付	理由	変更訂正項目	番号	処置者	適用

Gyrocompass TG-8000シリーズ
Control unit type I
ITERM pwb

製図	設計	検図	承認
関根	関根	荒元	荒元

材質:
質量: kg

名称: ジャイロズ_ITERM

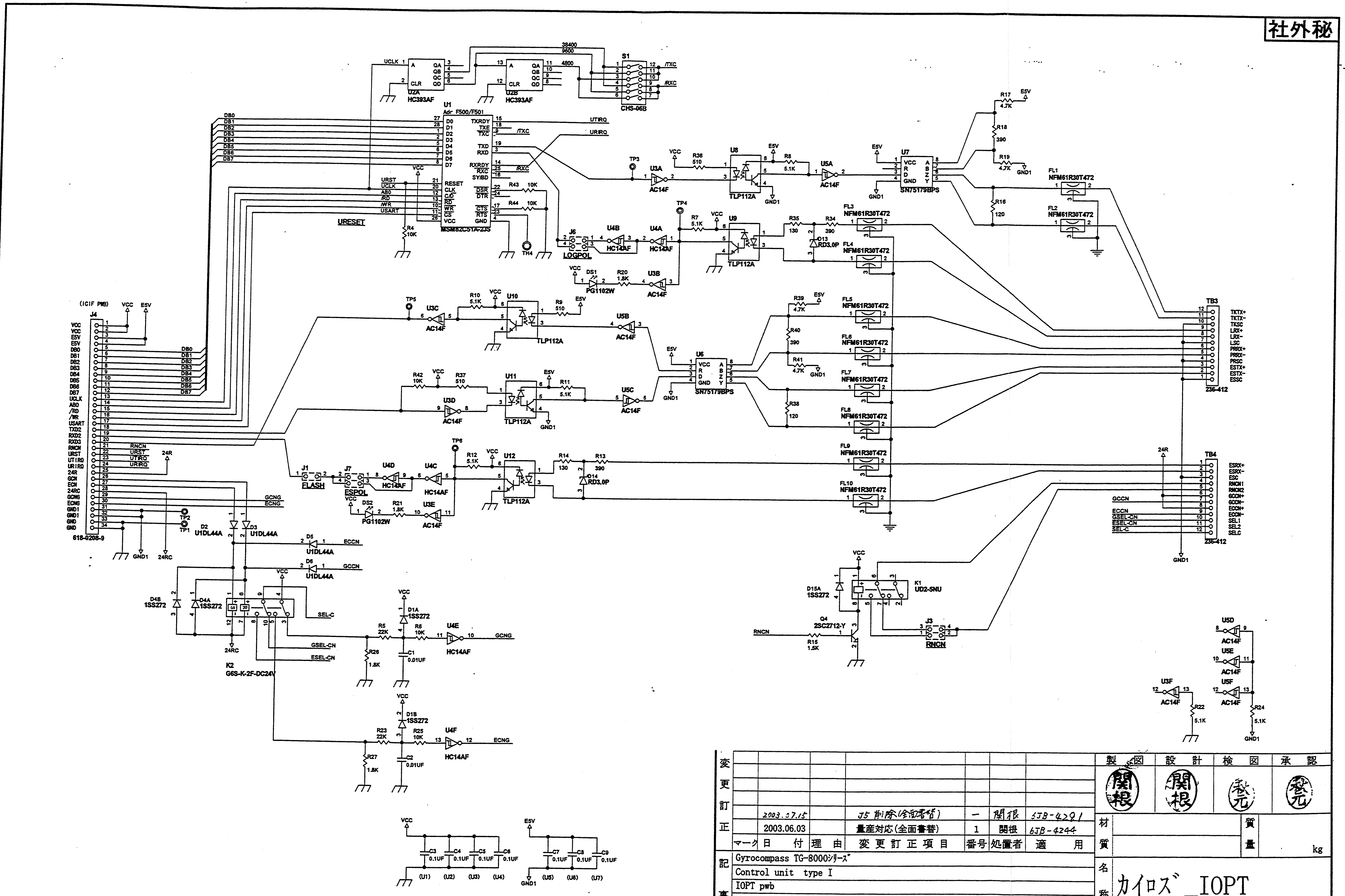
TOKIMEC
株式会社トキメック

尺度: ~
日付: 02.01.21
サイズ: B
図番: 10189526
変番: 2
シート: 1 / 1

Fig. 9.2.6 Type I

H

社外秘



	2003.07.15	J5 削除(全面書替)	一	関根	6JB-4291
	2003.06.03	量産対応(全面書替)	1	関根	6JB-4244
マーク	日付	理由 変更訂正項目	番号	処置者	適用

変更訂正

製図 | 設計 | 検図 | 承認

材質 | 質量 kg

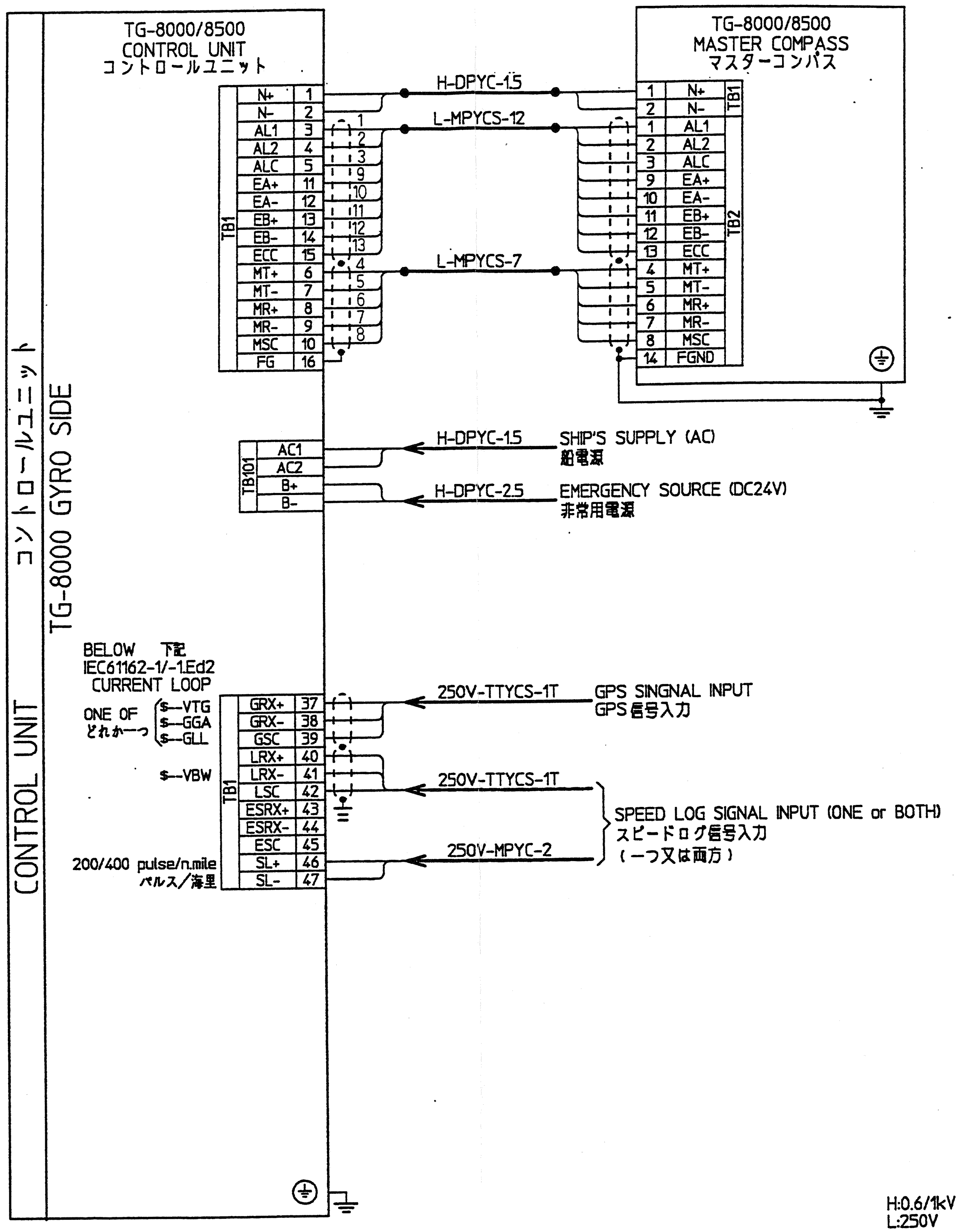
記事:
Gyrocompass TG-8000シリーズ
Control unit type I
IOPT pwb

名称: カイロズ_IOPT

TOKIMEC 株式会社トキメック

尺度 ~ | 日付 01.04.24 | サイズ B | 図番 10189528 | 変番 1 | シート 1 / 1

Fig. 9.2.7 Type I



1	2003-03-14	シリアル・ログ入力追加	田 村
MARK	日付DATE	変更項目 REVISION	担当 SIGN

記事 NOTE TG-8 1台ジャイロ別置

製作図番:

サイズSIZE A

INTER UNIT WIRING DIAGRAM

機器間結線図

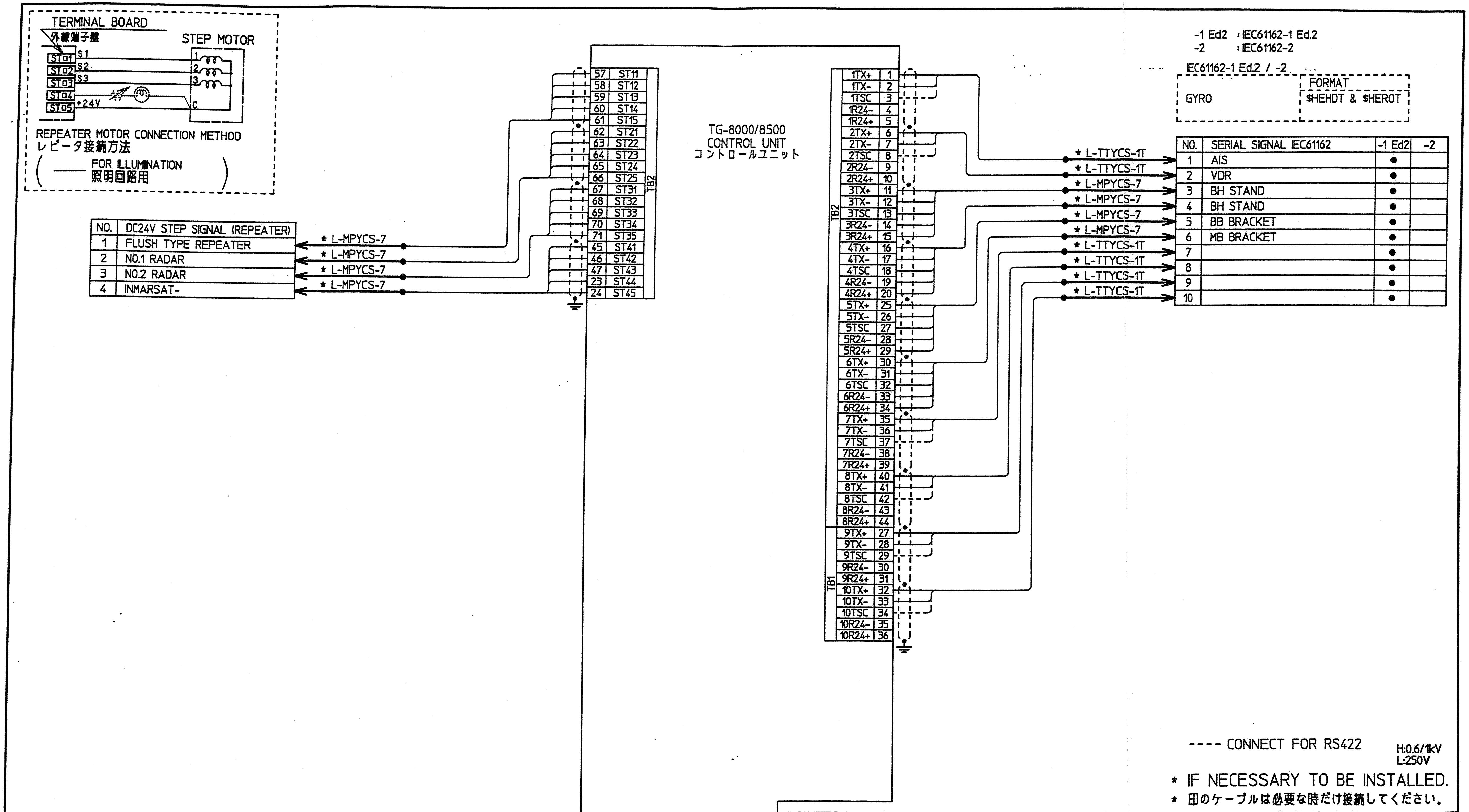
製図 DRAWN BY	設計 CHARGED BY	検図 CHECKED BY	承認 APPROVED BY
J. Tamura		S. Sasaki	J. Miyazawa

TOKIMEC

株式会社トキメック TOKIMEC INC.

尺度 SCALE	:	図番 DRAWING NO.	REV	SHT
日付 DATE	2003-02-12	16993387	1	1/1

Fig 9.3.1 Type S



* IF NECESSARY TO BE INSTALLED.
* 印のケーブルは必要な時だけ接続してください。

MARK	日付 DATE	変更項目 REVISION	担当 SIGN

INTER UNIT WIRING DIAGRAM
機器間結線図

製図 DRAWN BY	設計 CHARGED BY	検図 CHECKED BY	承認 APPROVED BY

記事 NOTE TG-8000/8500 単体
SERIAL TYPE
製作図番：

サイズ SIZE B

尺度 SCALE
日付 DATE 2003-10-10

図番 DRAWING NO. 169939520 | REV 0 | SHT 1/1

株式会社トキメック
TOKIMEC INC.

Fig. 9.3.2.1 Type S/D
SERIAL SIGNAL TYPE REPEATER.

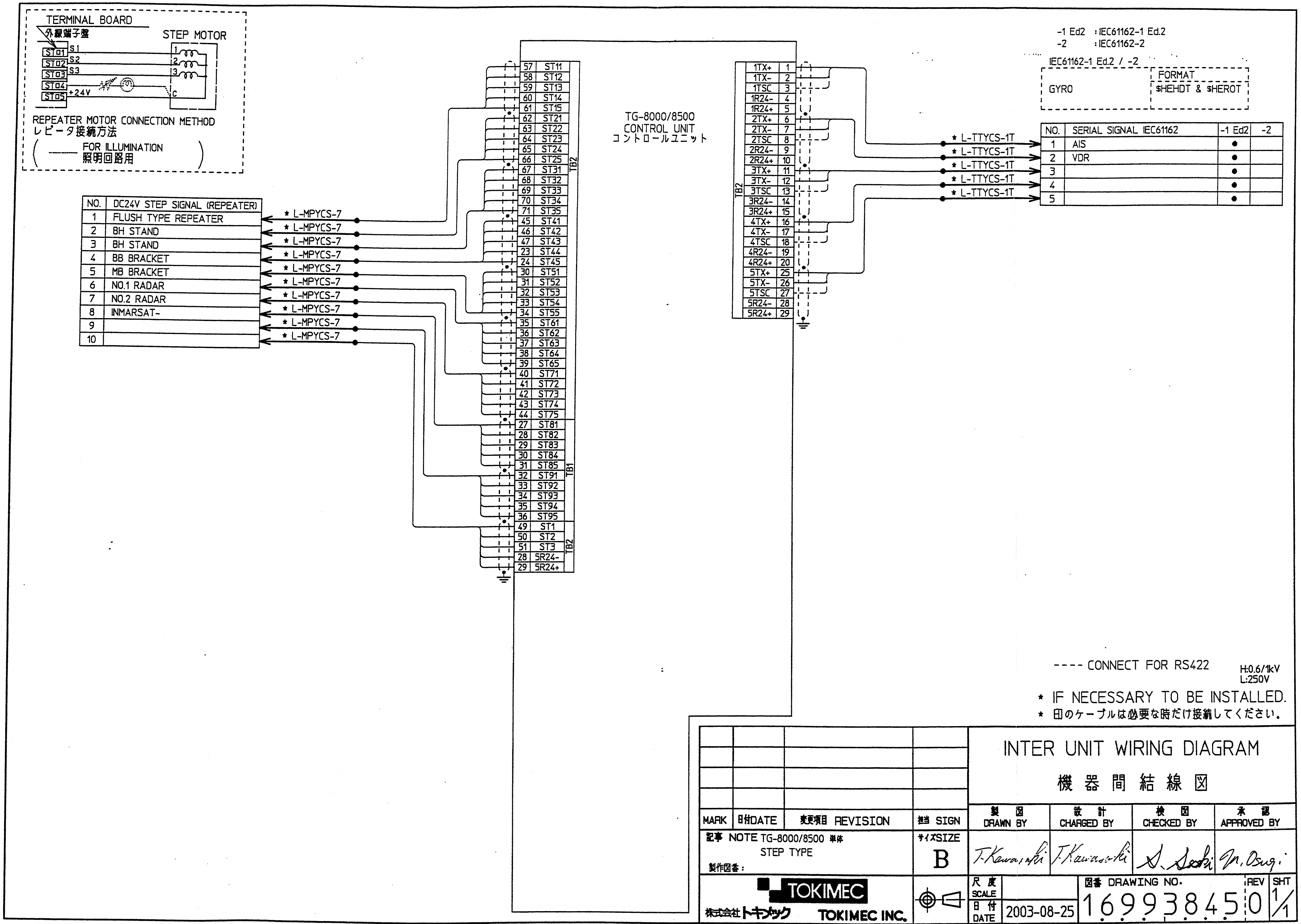
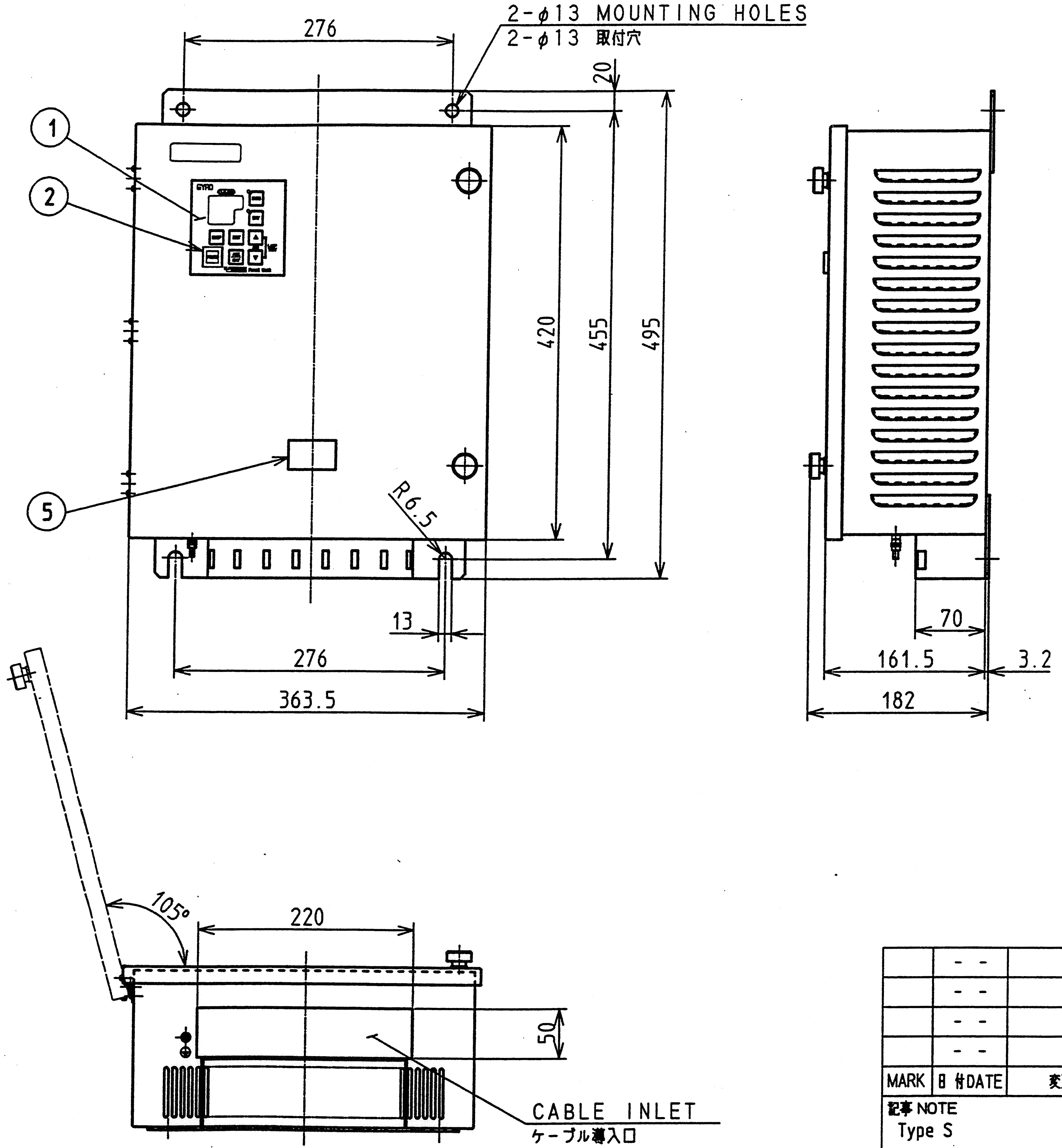


Fig. 9.3.2.2 Type S/D
STEP MOTOR TYPE REPEATER



NO.	NAME 名称
1	OPERATING PANEL(GYRO) 操作パネル(ジャイロ)
2	POWER SWITCH(GYRO) 電源スイッチ(ジャイロ)
5	NAME PLATE 銘板

COLOR : LIGHT GRAY
塗　色 : ライトグレー

MASS : 16 kg
質　量

MARK	日付DATE	変更項目 REVISION	担当SIGN
	- -		
	- -		
	- -		
	- -		

記事 NOTE
Type S

サイズ SIZE: B

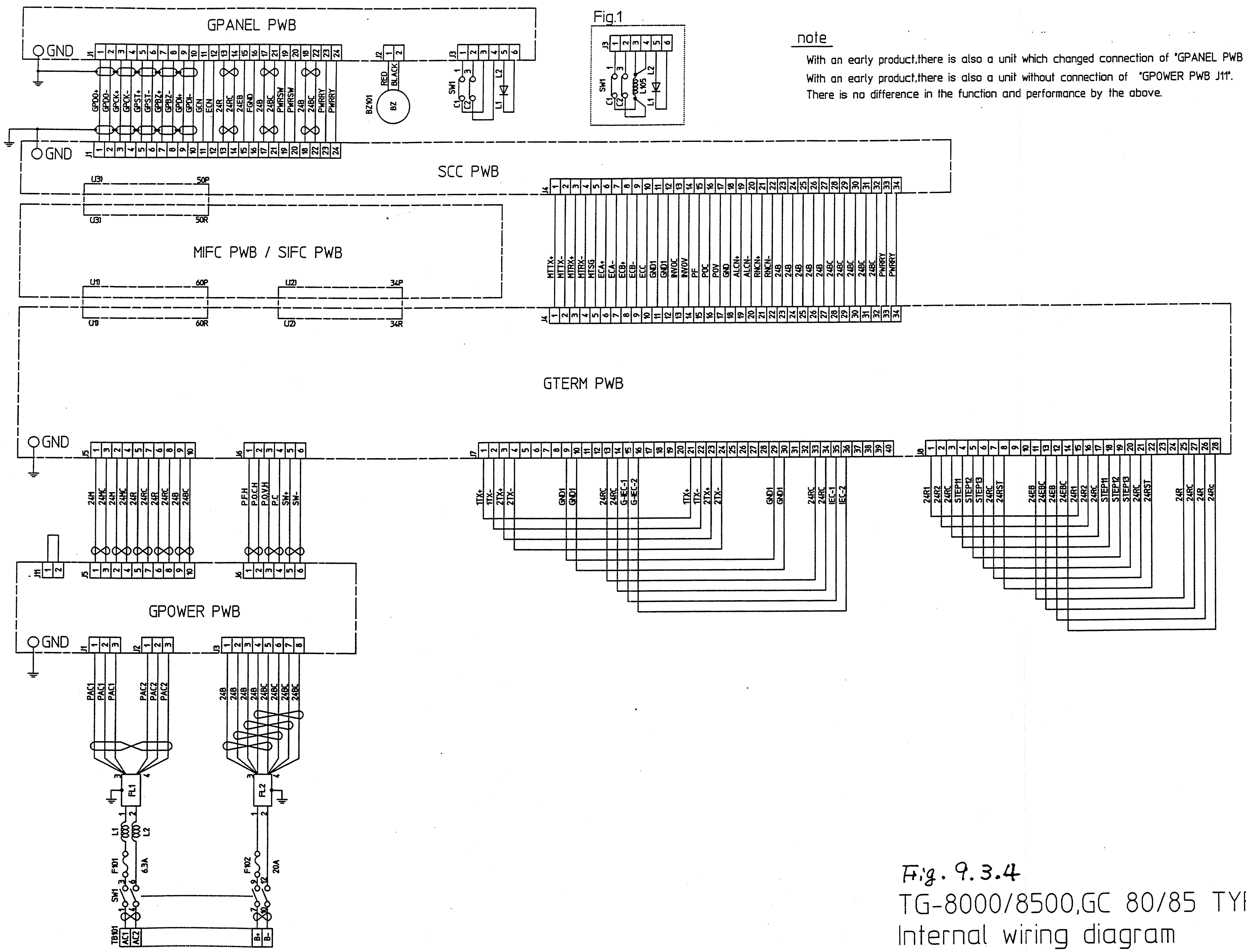
TG-8000/8500
CONTROL UNIT(BULKHEAD TYPE)
コントロールユニット(壁掛け型)

製図 DRAWN BY	設計 CHARGED BY	検図 CHECKED BY	承認 APPROVED BY
Y. Yoshida	Y. Yoshida	N. Itakura	K. Yamamoto

TOKIMEC
株式会社 トキメック TOKIMEC INC.

尺度 SCALE: 1:5
日付 DATE: 2002.08.20
図番 DRAWING: 109900520
REV: 0
SHT: 1/1

Fig. 9.3.3 Type S



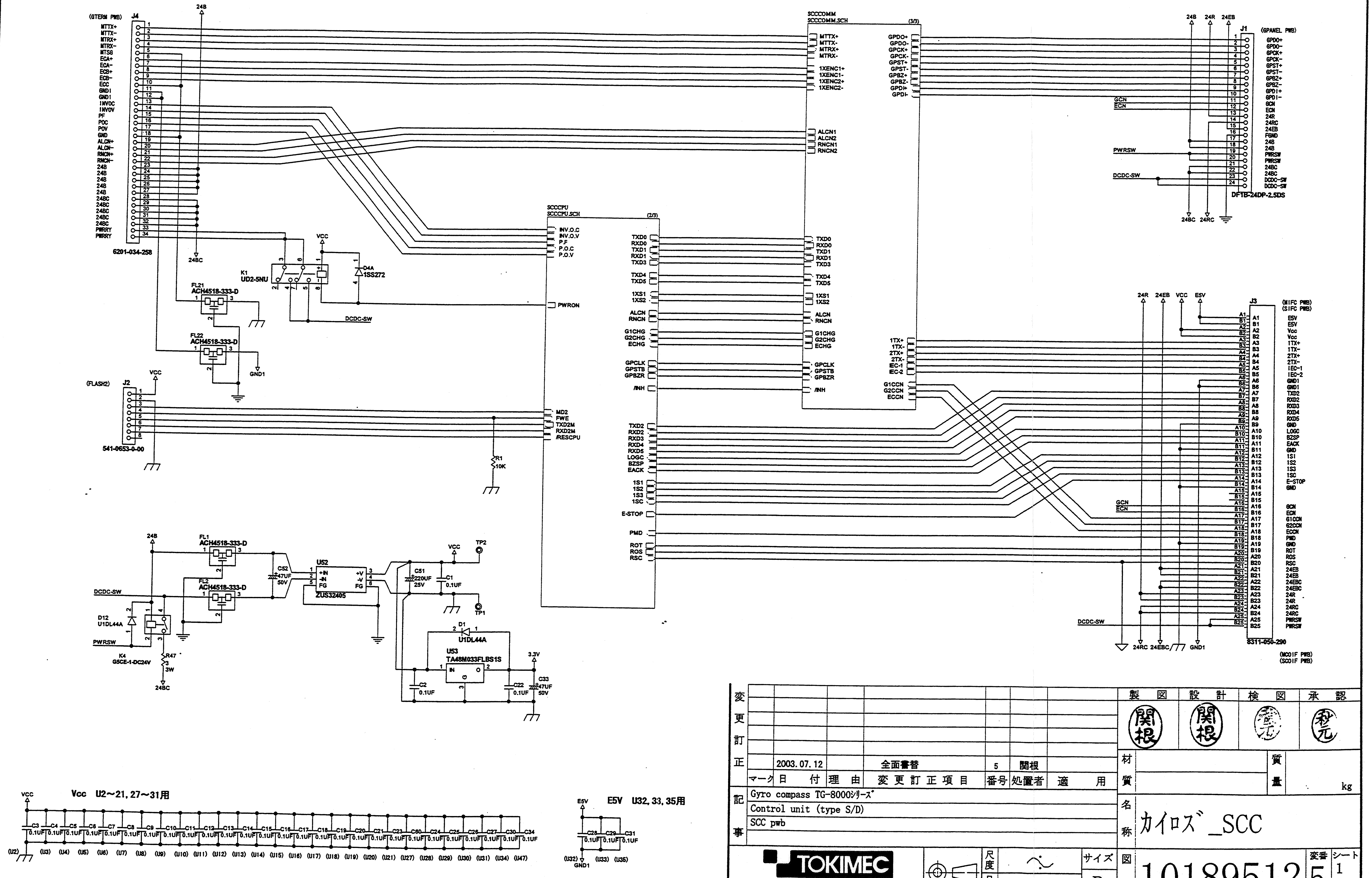
note

With an early product,there is also a unit which changed connection of "GPANEL PWB J3" into "Fig.1".
With an early product,there is also a unit without connection of "GPOWER PWB J11".
There is no difference in the function and performance by the above.

Fig. 9.3.4

TG-8000/8500,GC 80/85 TYPE S
Internal wiring diagram

社外秘



変更訂正記事						
	2003.07.12		全面書替	5	関根	
マーク	日付	理由	変更訂正項目	番号	処置者	適用

Gyro compass TG-8000シリーズ
Control unit (type S/D)
SCC pwb

製図	設計	検図	承認
関根	関根		秋元

材質:
質量: kg
名称: カイロズ_SCC

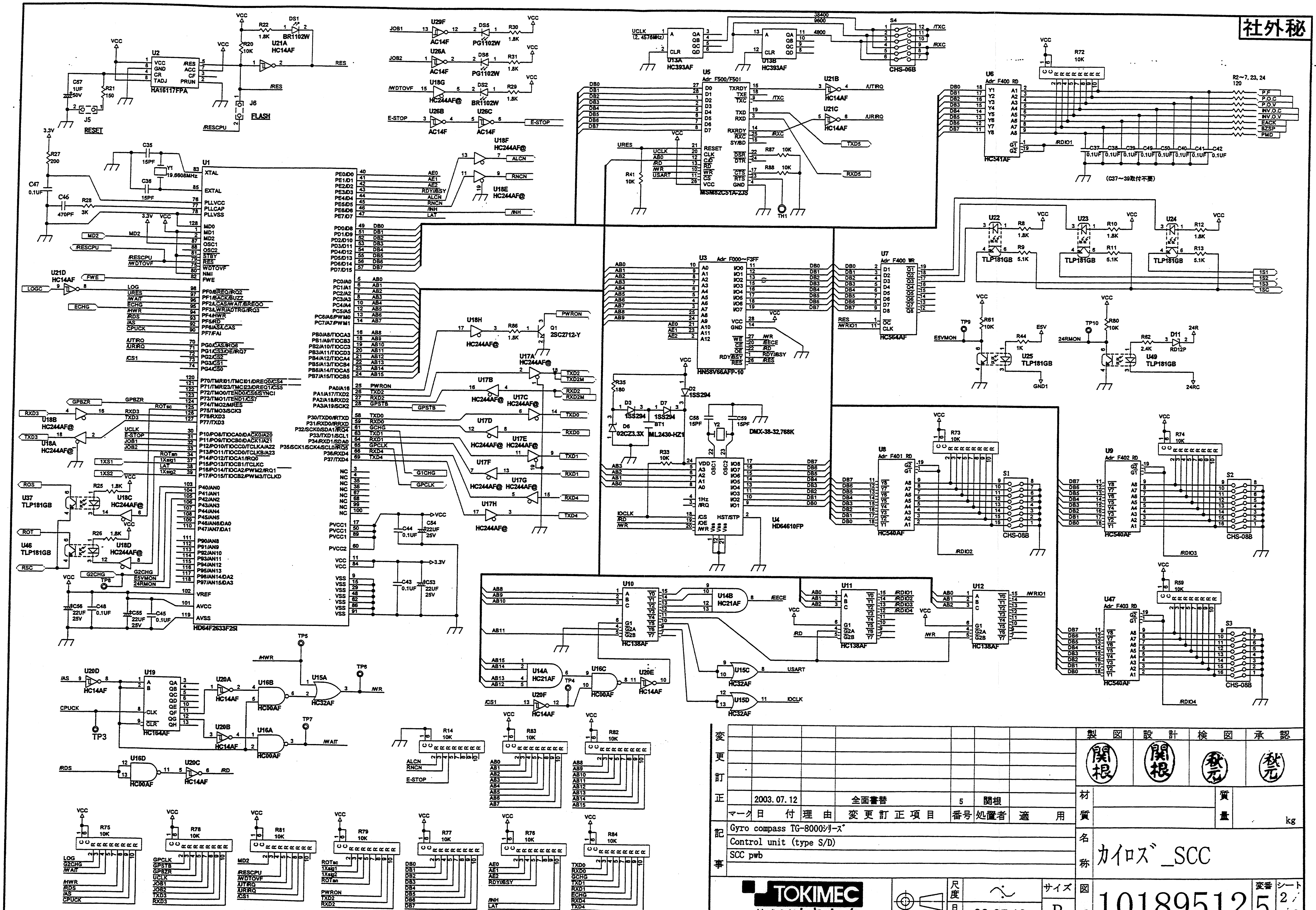
TOKIMEC
株式会社トキメック

尺度: ~ | 日付: 03.07.12 | サイズ: B | 図番: 10189512 | 変番: 5 | シート: 1/3

Fig. 9.3.5.1 Type S/D

(H)

社外秘



変更訂正記事					
	2003.07.12	全面書替	5	関根	
マーク	日付	理由	変更訂正項目	番号	処置者	適用

Gyro compass TG-8000シリーズ
Control unit (type S/D)
SCC pwb

製図	設計	検図	承認
関根	関根	秋元	秋元

材質

質量 kg

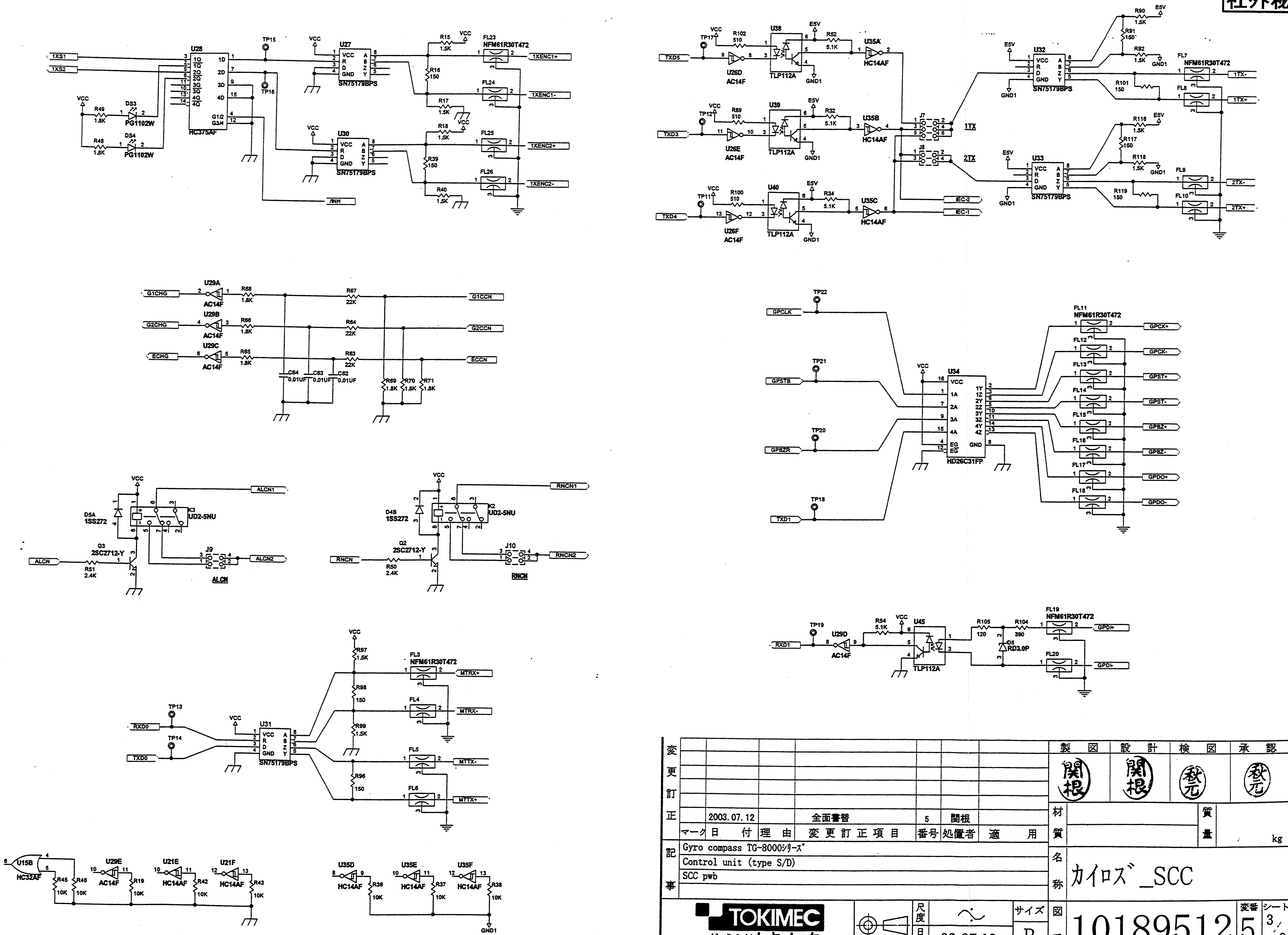
名称 カイロズ゛_SCC

TOKIMEC
株式会社トキメック

尺度	日付	サイズ	図番	変番	シート
～	03.07.12	B	10189512	5	2/3

Fig 9.3.5.2 Type S/D

社外秘



変							
更							
訂							
正		2003.07.12		全面書替	5	関根	
	マーク	日付	理由	変更訂正項目	番号	処置者	適用

製図	設計	検図	承認
関根	関根	秋元	秋元

材質		質量	kg

記事
Gyro compass TG-8000シリーズ
Control unit (type S/D)
SCC pwb

名称 カイロズ゛_SCC

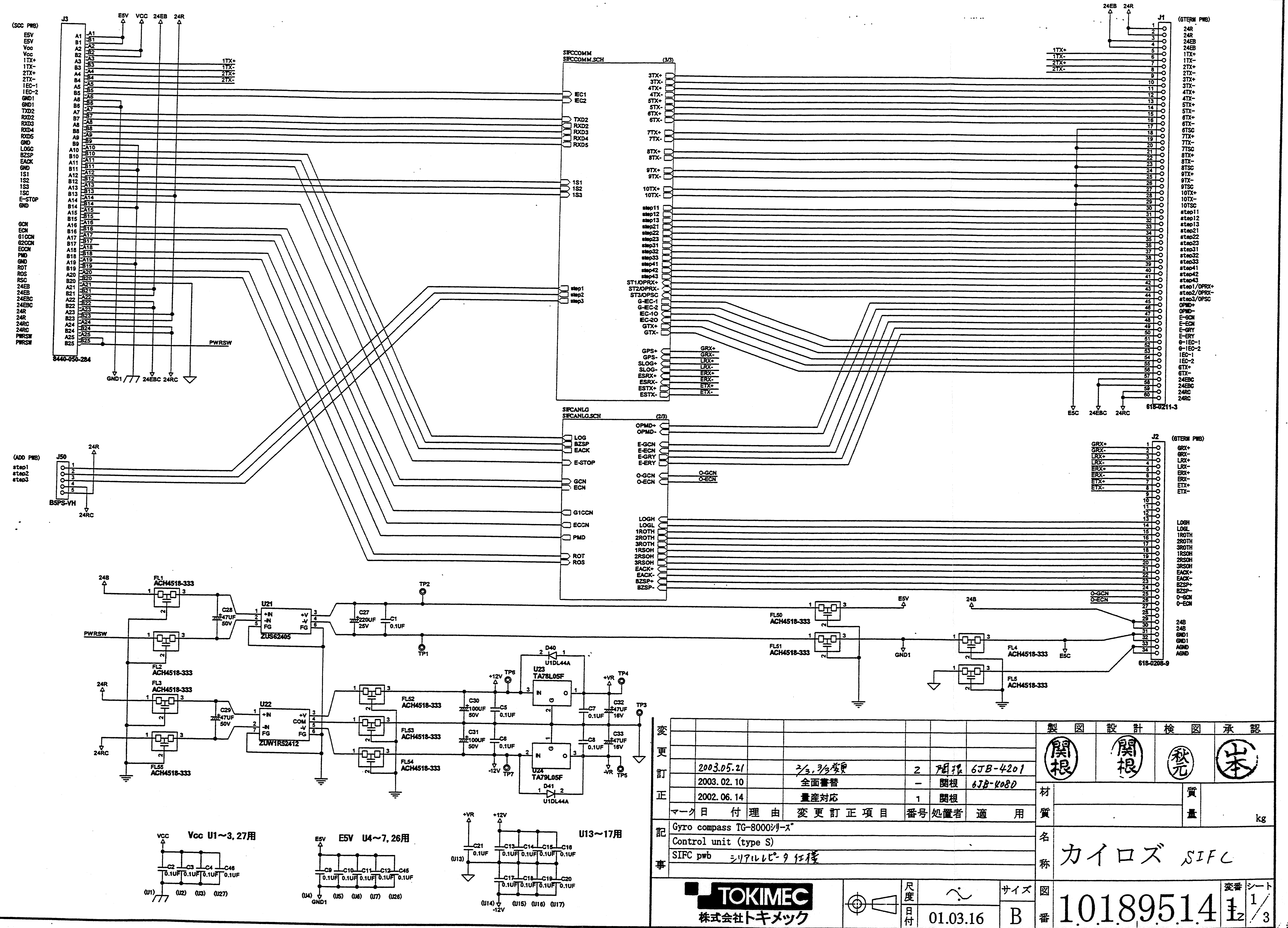
TOKIMEC
株式会社トキメック

尺度	~	サイズ	図番	変番	シート
日付	03.07.12	B	10189512	5	3/3

Fig 9.3.5.3 TYPE S/D

(H)

社外秘



	2003.05.21	2/3, 3/3変更	2	関根	6JB-4201
	2003. 02. 10	全面書替	—	関根	6JB-4080
	2002. 06. 14	量産対応	1	関根	
マーク	日付	理由 変更訂正項目	番号	処置者	適用

記事:
Gyro compass TG-8000シリーズ
Control unit (type S)
SIFC pwb シリアルレピータ仕様

製図	設計	検図	承認
関根	関根	秋元	山本

材質 / 質量 kg

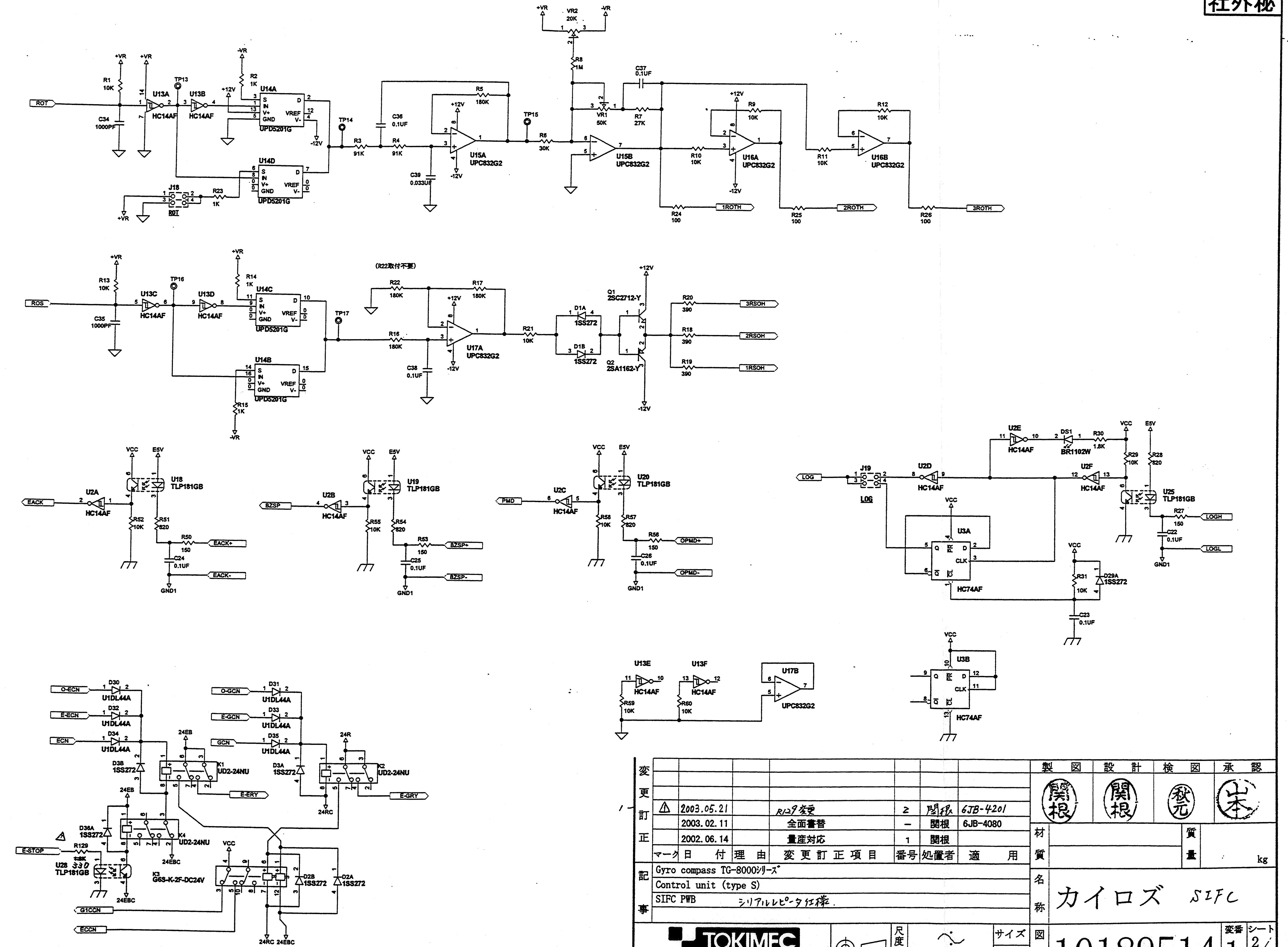
名称: カイロズ SIFC

TOKIMEC
株式会社トキメック

尺度 〜 | 日付 01.03.16 | サイズ B | 図番 10189514 | 変番 1z | シート 1/3

Fig. 9.3.6.1 TYPE S
SERIAL SIGNAL TYPE REPEATER

社外秘



変更訂正						
⚠	2003.05.21	R129変更	2	関根	6JB-4201	
	2003.02.11	全面書替	−	関根	6JB-4080	
	2002.06.14	量産対応	1	関根		
マーク	日付	理由　変更訂正項目	番号	処置者	適用	

記事:
Gyro compass TG-8000シリーズ
Control unit (type S)
SIFC PWB シリアルレピータ仕様

製図	設計	検図	承認
関根	関根	秋元	山本

材質

質量 kg

名称 カイロズ SIFC

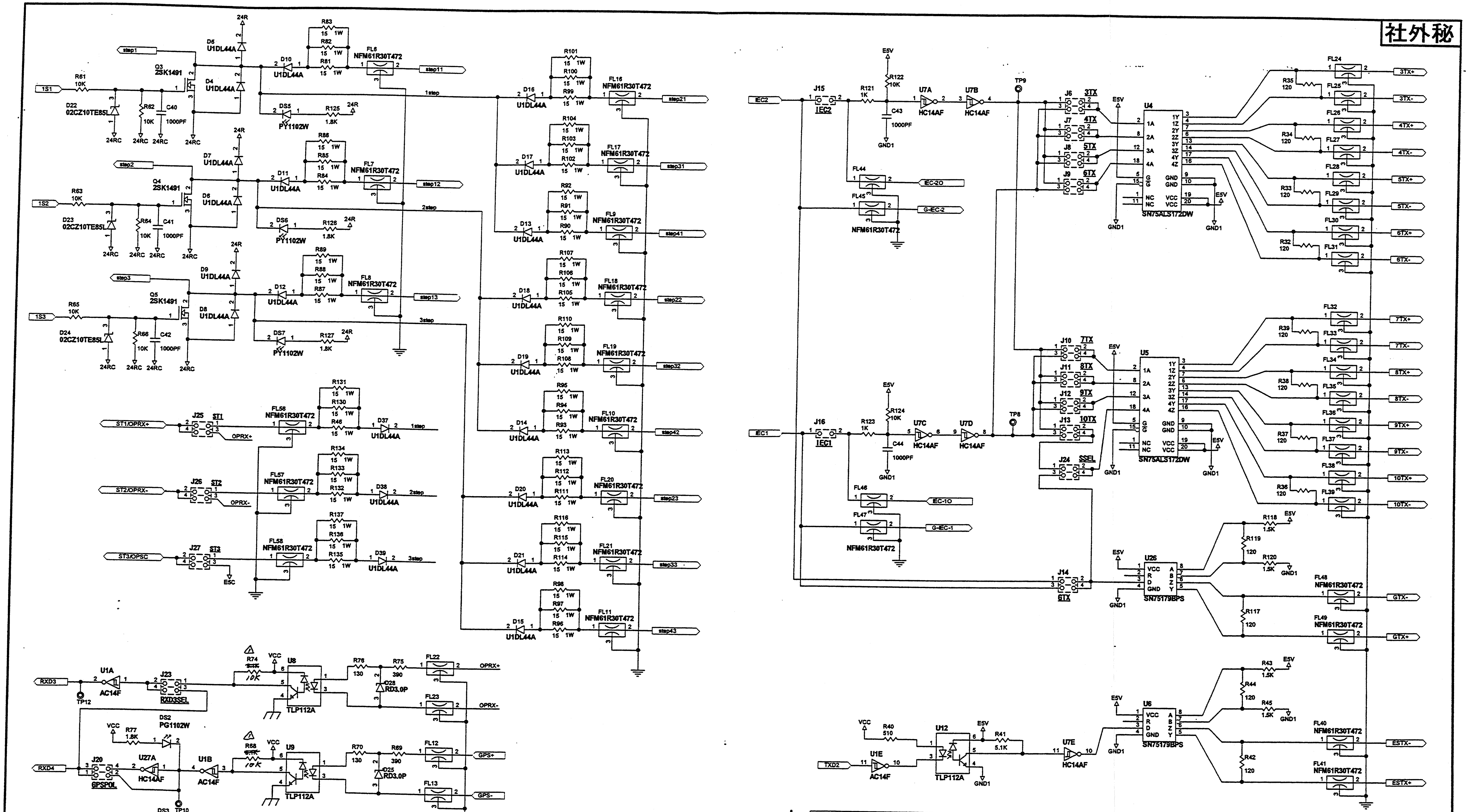
TOKIMEC 株式会社トキメック

尺度 〜 | 日付 00.03.16 | サイズ B | 図番 10189514 | 変番 1 2 | シート 2/3

Fig. 9.3.6.2 Type S SERIAL SIGNAL TYPE REPEATER

(H)

社外秘



マーク	日付	理由 変更訂正項目	番号	処置者	適用
△	2003.05.21	R47.68.71.74 変更	2	関根	6JB-4201
	2002.02.10	全面書替	—	関根	6JB-4080
	2002.06.14	量産対応	1	関根	

記事:
Gyrocompass TG-8000シリーズ
Control unit (type S)
SIFC pwb シリアルレピータ仕様

製図	設計	検図	承認
関根	関根	秋元	山本

材質 / 質量 kg

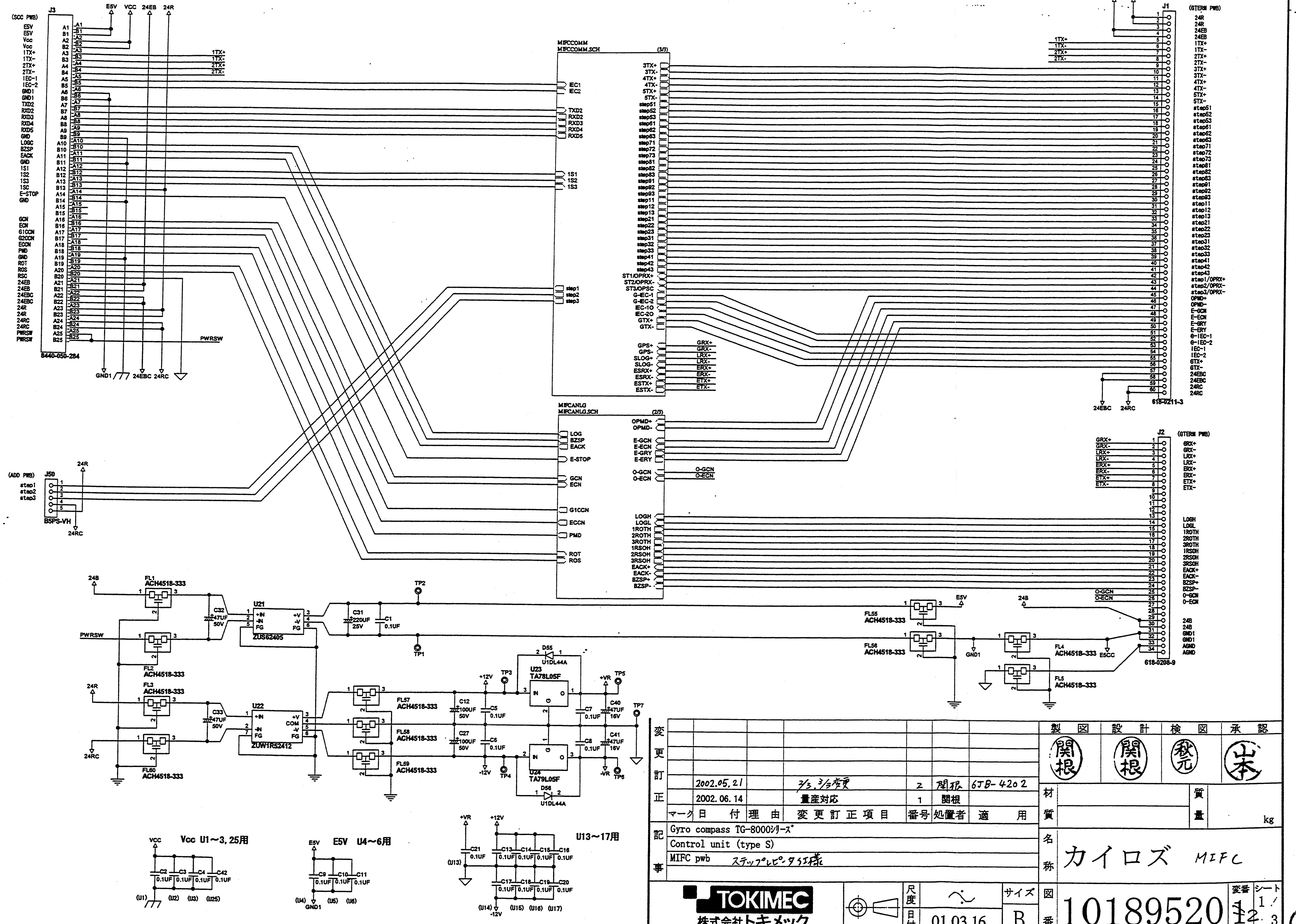
名称: カイロズ SIFC

TOKIMEC 株式会社トキメック

尺度 ～ | 日付 01.03.16 | サイズ B | 図番 10189514 | 変番 1/2 | シート 3/3

Fig. 9.3.6.3 TYPE S SERIAL SIGNAL TYPE REPEATER (H)

社外秘

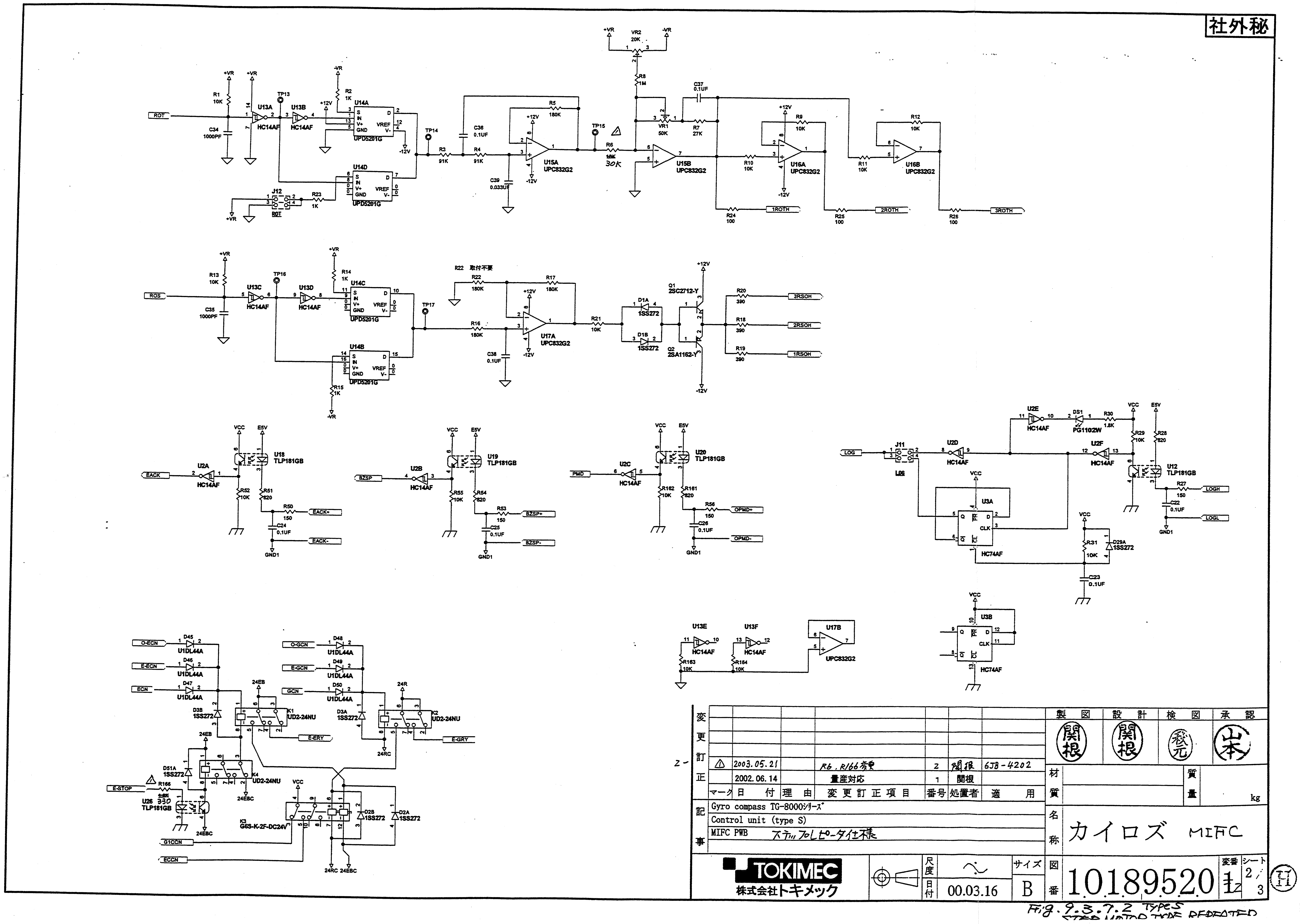


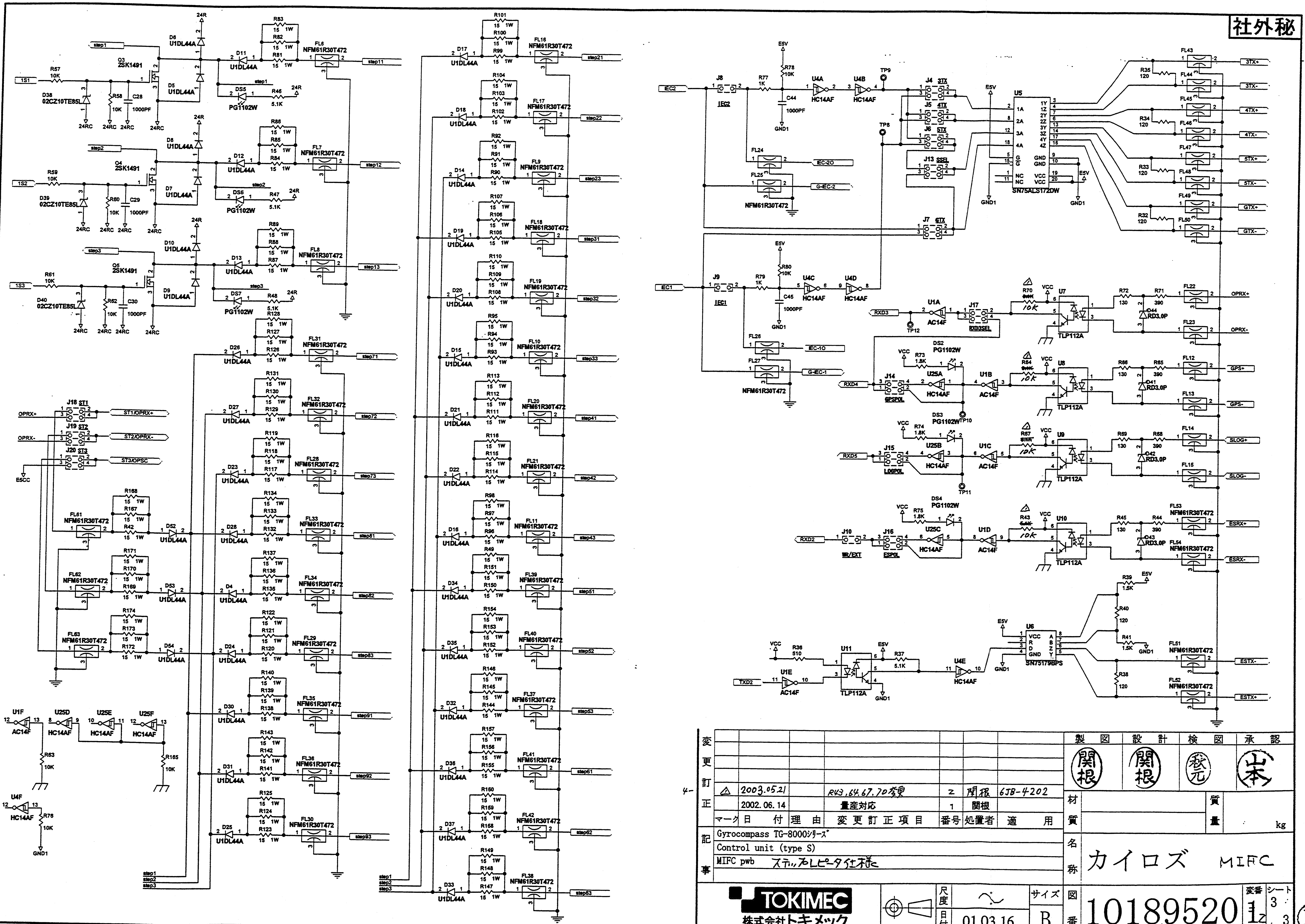
マーク	日付	理由	変更訂正項目	番号	処置者	適用
	2002.05.21		3/3, 3/3変更	2	関根	6JB-4202
	2002. 06. 14		量産対応	1	関根	

記事	Gyro compass TG-8000シリーズ Control unit (type S) MIFC pwb ステップレピータ仕様
製図	関根
設計	関根
検図	秋元
承認	山本
材質	
質量	kg
名称	カイロズ MIFC
尺度	～
日付	01.03.16
サイズ	B
図番	10189520
変番	2
シート	1/3

TOKIMEC
株式会社トキメック

Fig. 9.3.7.1 TYPE S
STEP MOTOR TYPE REPEATER


社外秘
ROT
ROS
EACK
EACK+
EACK-
BZSP
BZSP+
BZSP-
PMD
OPMD+
OPMD-
LOG
LOGH
LOGL
1ROTH
2ROTH
3ROTH
3RSOH
2RSOH
1RSOH
O-ECN
E-ECN
ECN
O-GCN
E-GCN
GCN
E-ERY
E-GRY
E-STOP
G1CCN
ECCN
R22 取付不要
変更訂正
2003.05.21 R6, R166 変更 2 関根 6JB-4202
2002.06.14 量産対応 1 関根
マーク 日付 理由 変更訂正項目 番号 処置者 適用
記事
Gyro compass TG-8000シリーズ
Control unit (type S)
MIFC PWB ステップレピータ仕様
製図 設計 検図 承認
関根 関根 秋元 山本
材質
質量 kg
名称 ジャイロ MIFC
TOKIMEC
株式会社トキメック
尺度
日付 00.03.16
サイズ B
図番 10189520
変番 1 2
シート 2/3
Fig. 9.3.7.2 TYPE S STEP MOTOR TYPE REPEATER



4-

変更訂正記事						
△	2003.05.21	R43,64,67,70変更	2	関根	6JB-4202	
	2002.06.14	量産対応	1	関根		
マーク	日付	理由 変更訂正項目	番号	処置者	適用	

Gyrocompass TG-8000シリーズ
Control unit (type S)
MIFC pwb ステップレピータ仕様

製図	設計	検図	承認
関根	関根	秋元	山本

材質

質量 kg

名称 カイロズ MIFC

TOKIMEC
株式会社トキメック

尺度 ~ | 日付 01.03.16 | サイズ B | 図番 10189520 | 変番 1z | シート 3/3

Fig. 9.3.7.3 TYPE S
STEP MOTOR TYPE REPEATER

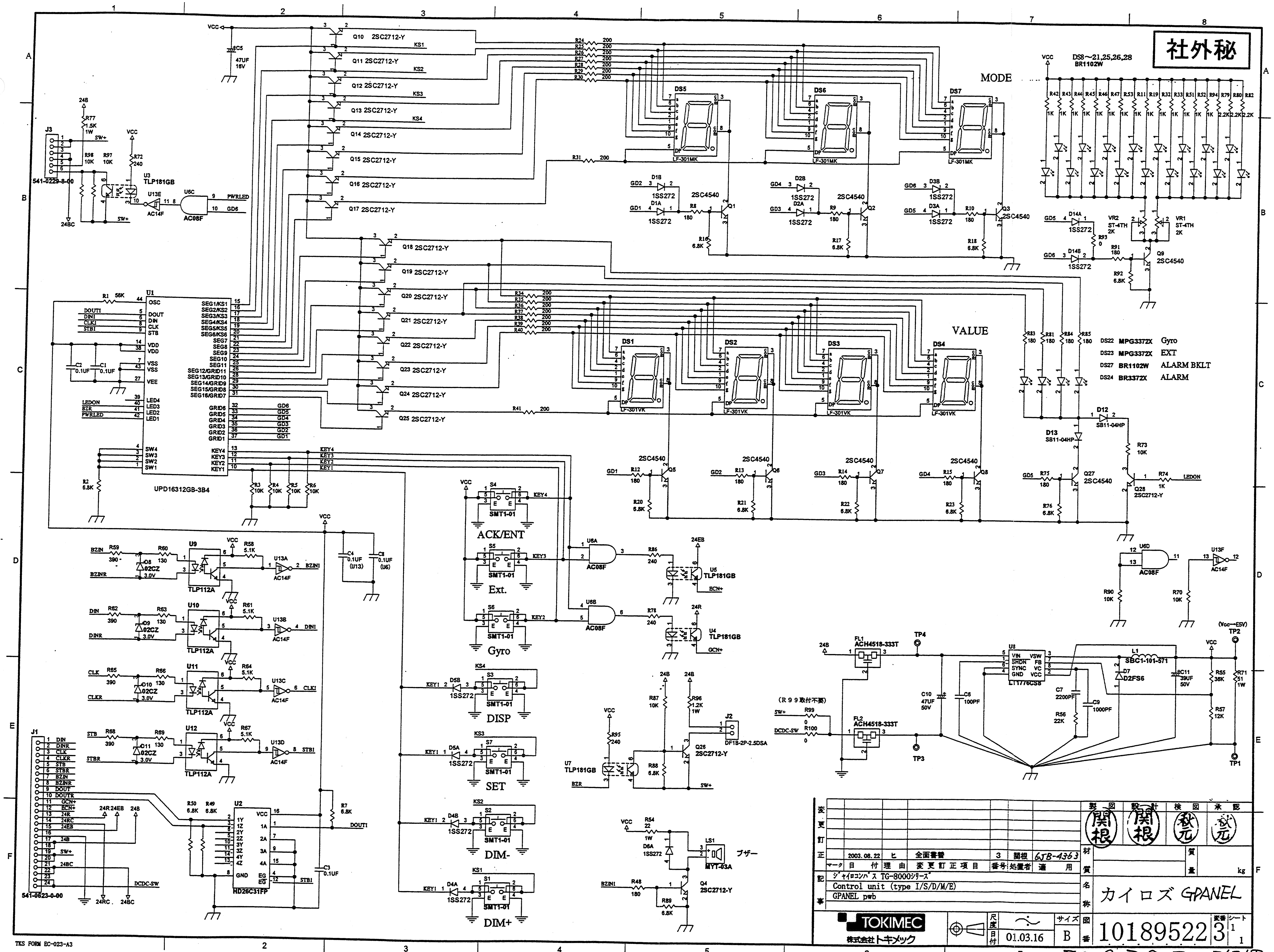
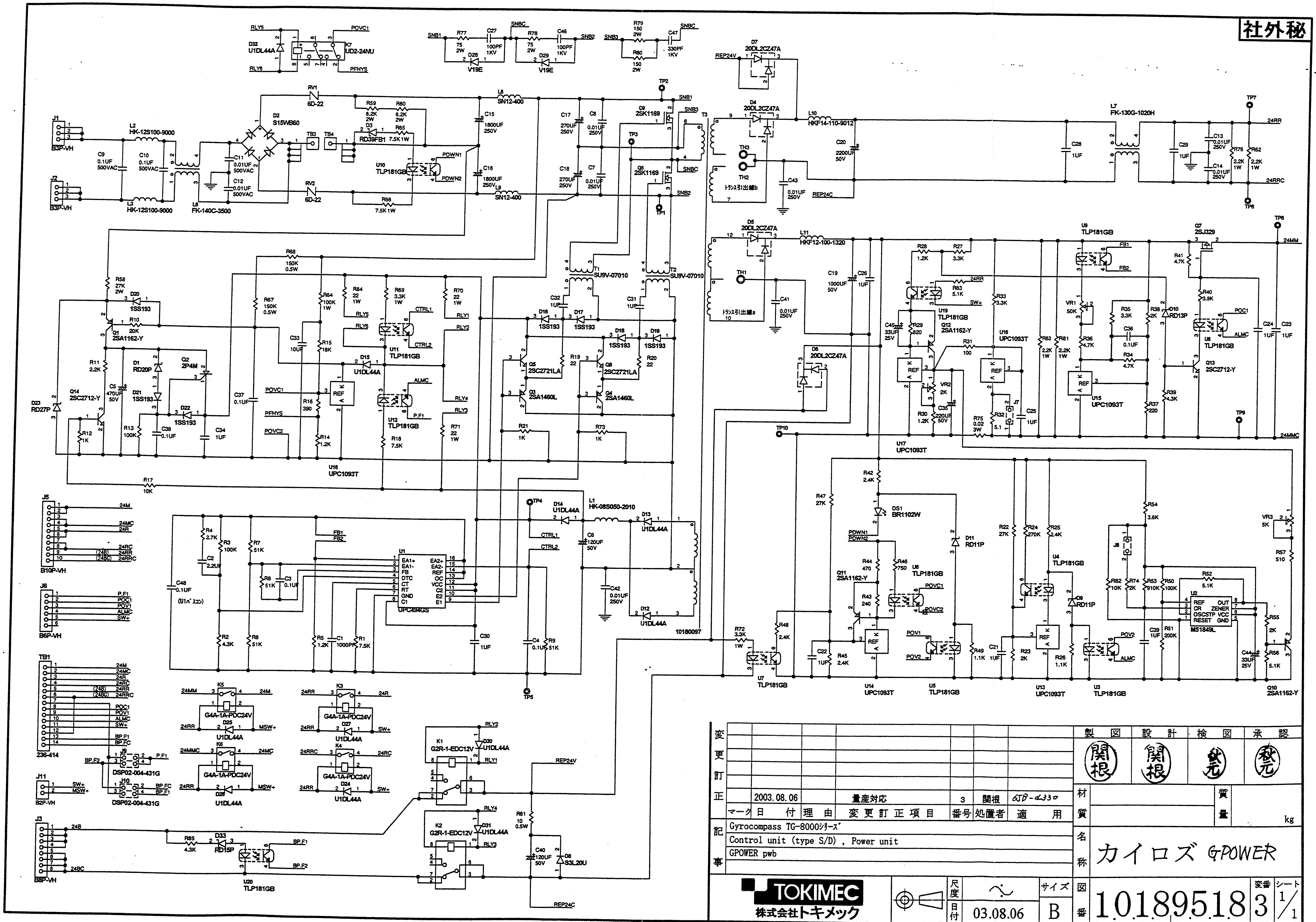


Fig. 9.3.8 Type I/S/D

社外秘



変更訂正記事						
2003.08.06	量産対応	3	関根	6JB-4330		
マーク	日付	理由	変更訂正項目	番号	処置者	適用

Gyrocompass TG-8000シリーズ

Control unit (type S/D), Power unit

GPOWER pwb

製図	設計	検図	承認
関根	関根	秋元	秋元

材質:

質量: kg

名称: カイロズ GPOWER

TOKIMEC 株式会社トキメック

尺度: 〜

日付: 03.08.06

サイズ: B

図番: 10189518

変番: 3

シート: 1/1

Fig. 9.3.9 Type I/S/D

(H)

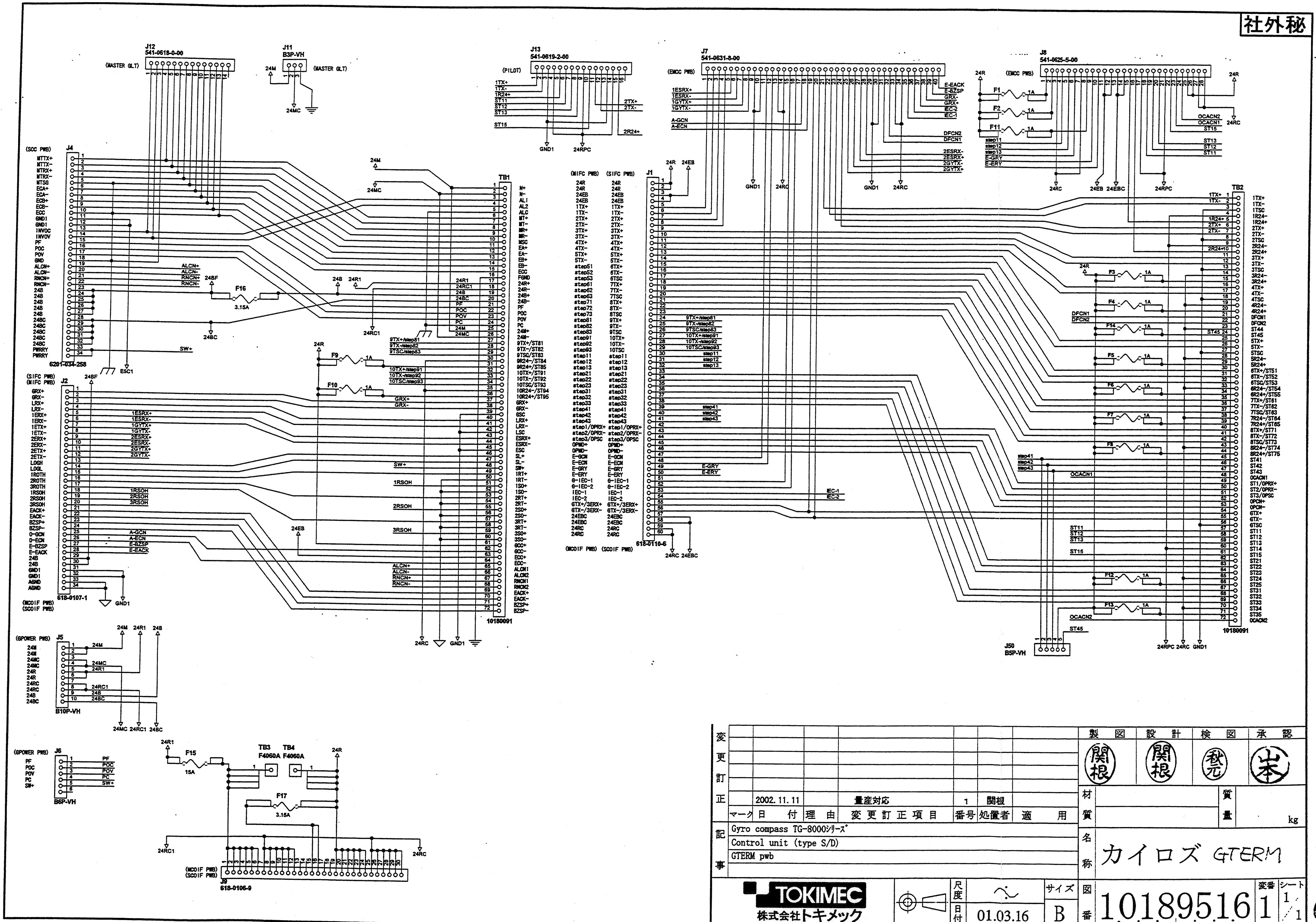
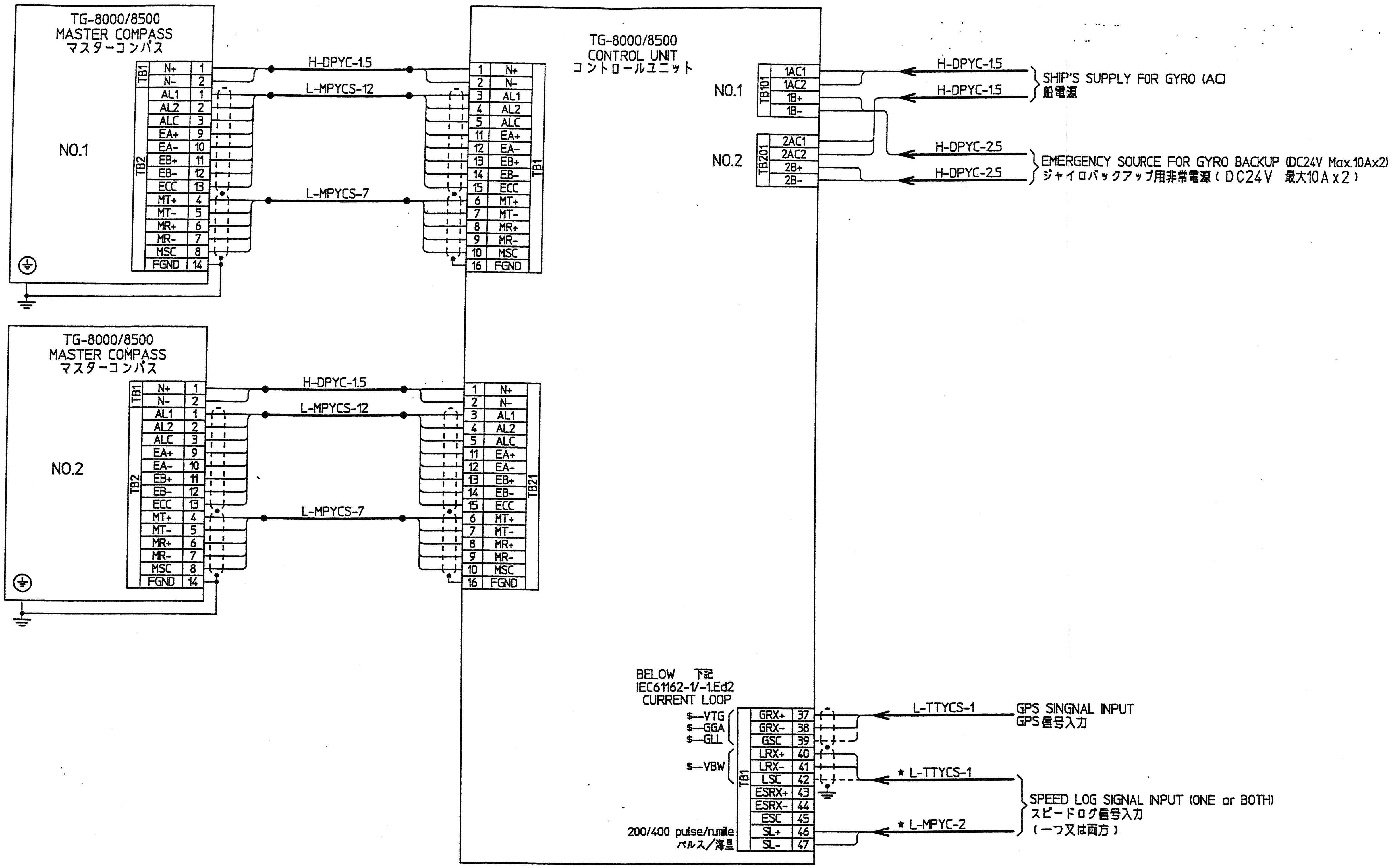


Fig. 9.3.10 Type S/D



---- CONNECT FOR RS422

* IF NECESSARY TO BE INSTALLED.
* 印のケーブルは必要な時だけ接続してください。

CAUTION 注意

1 DO NOT MEGGER SHIP'S CABLING WITH EQUIPMENT CONNECTED.
この装置はメガ試験をしてはならない。

2 IT IS ESSENTIAL THAT CONDUCTORS ARE GROUPED IN SEPARATE CABLES AS SHOWN.
図に示したように 別れて書かれたケーブルは機能上必ず分離して接続してください。

3 SINCE THE SPRING-PRESSURE TYPE TERMINAL BOARDS FOR GYROCOMPASS ARE APPLIED FOR CABLE CONNECTIONS, DO NOT CONNECT PLURAL WIRES TO ONE TERMINAL.
ジャイロ用端子盤の入出力用ケーブルの接続は圧接式の端子盤を使用していますので、一端子に複数の線を接続しないでください。

H:0.6/1kV
L:250V

MARK	日付DATE	変更項目 REVISION	担当 SIGN

記事 NOTE TG-8000/8500
D_ CONTROL UNIT
製作図番：

サイズSIZE B

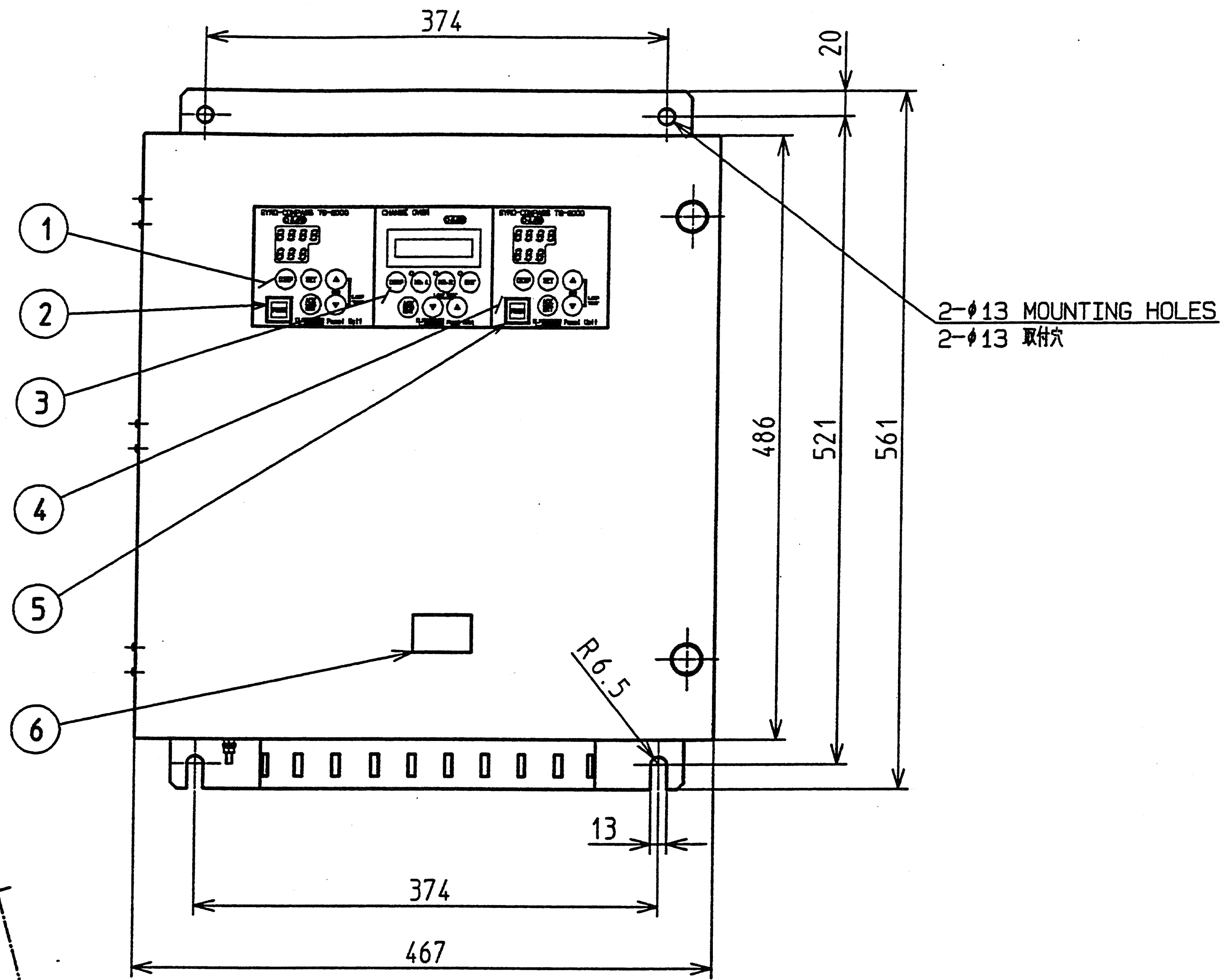
TOKIMEC
株式会社トキメック TOKIMEC INC.

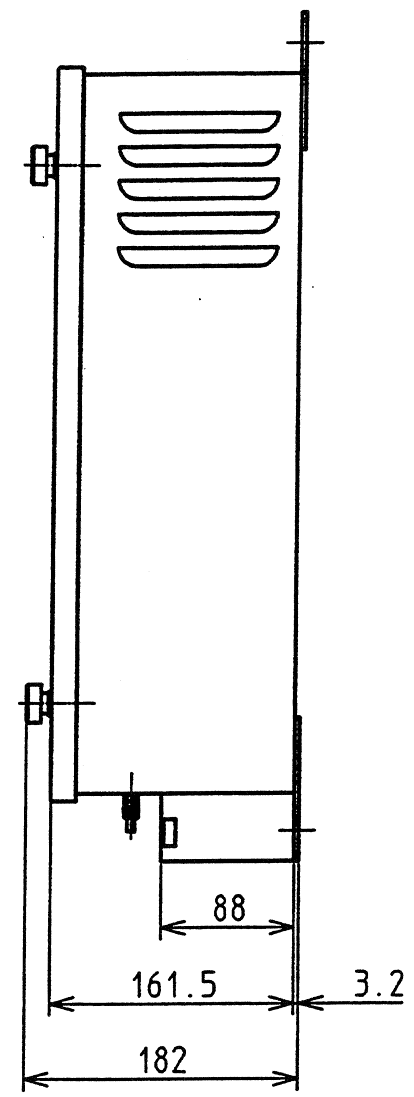
INTER UNIT WIRING DIAGRAM
機器間結線図

製図 DRAWN BY	設計 CHARGED BY	検図 CHECKED BY	承認 APPROVED BY
T. [signature]	T. [signature]	S. Sasaki	M. Osug.

尺度 SCALE
日付 DATE 2003-05-27
図番 DRAWING NO. 1699361 4
REV 0
SHT 1/1

Fig. 9.4.1 Type D

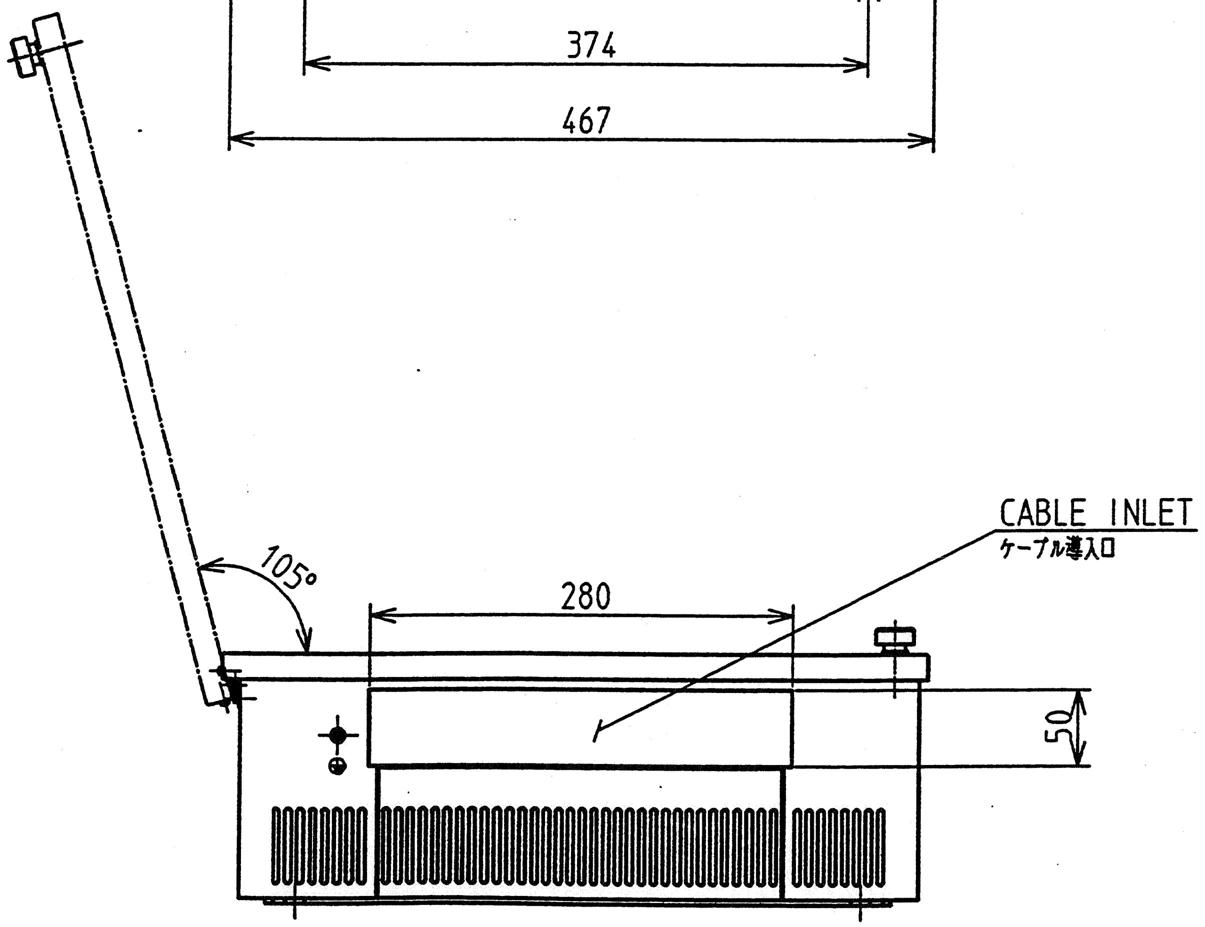




NO.	NAME 名称
1	OPERATING PANEL(NO.1) 操作パネル(NO.1)
2	POWER SWITCH(NO.1) 電源スイッチ(NO.1)
3	CHANGE OVER UNIT 切替ユニット
4	OPERATING PANEL(NO.2) 操作パネル(NO.2)
5	POWER SWITCH(NO.2) 電源スイッチ(NO.2)
6	NAME PLATE 銘板

COLOR : LIGHT GRAY
塗　色 : ライトグレー

MASS : 23 kg
質　量



MARK	日付 DATE	変更項目 REVISION	担当 SIGN
	- -		
	- -		
	- -		
	- -		

記事 NOTE
Type D

サイズ SIZE: B

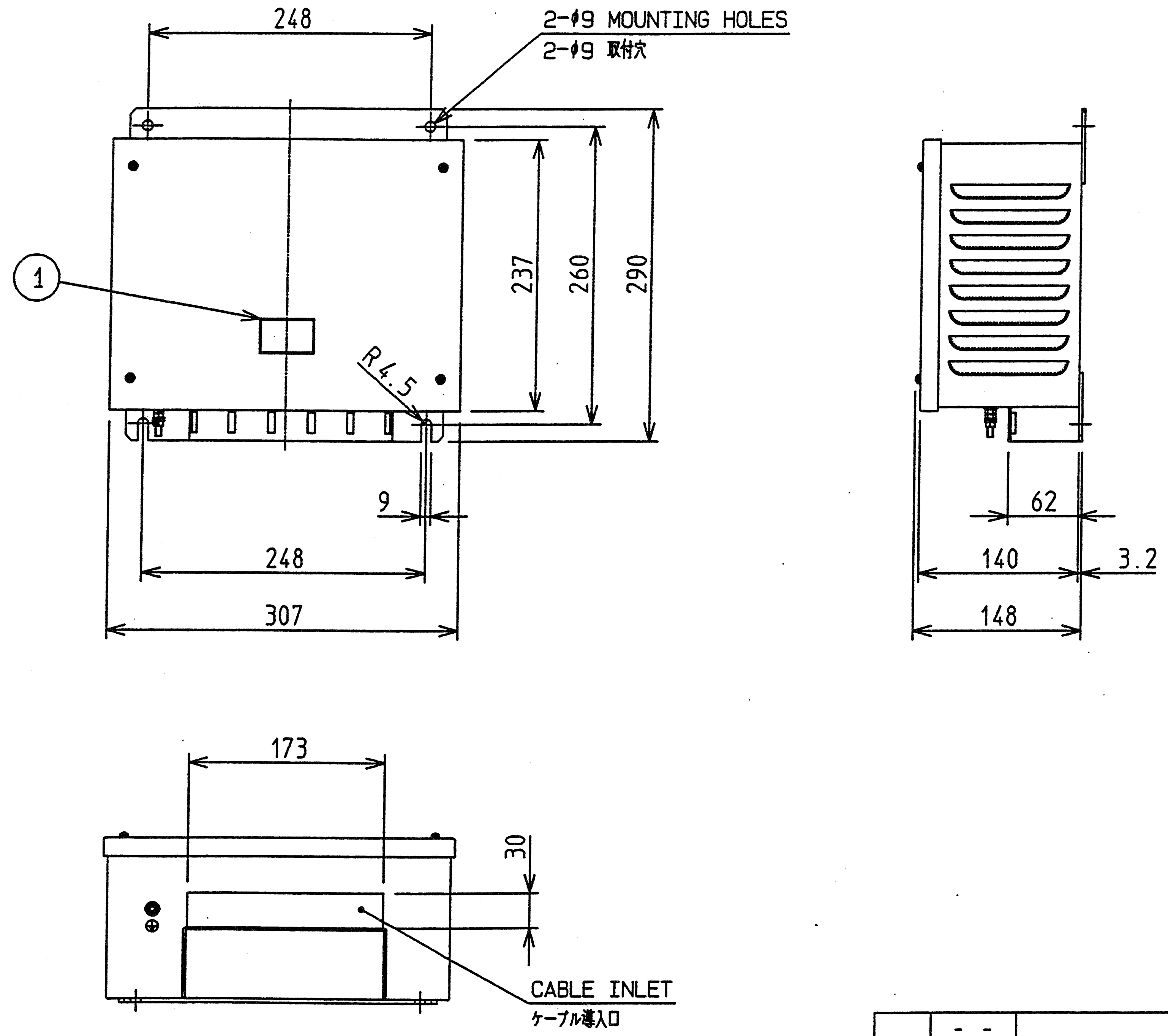
TG-8000/8500
CONTROL UNIT
コントロールユニット

製図 DRAWN BY	設計 CHARGED BY	検図 CHECKED BY	承認 APPROVED BY
Y. Yoshida	Y. Yoshida	Makimoto	K. Yamamoto

尺度 SCALE	1:5	図番 DRAWING	REV	SHT
日付 DATE	2002- 4- 2	109900140	0	1/1

TOKIMEC
株式会社 トキメック TOKIMEC INC.

Fig. 9.4.2 Type D



NO.	NAME 名称
1	NAME PLATE 銘板

COLOR : LIGHT GRAY
塗　色 : ライトグレー

MASS : 9 kg
質　量

MARK	日付 DATE	変更項目 REVISION	担当 SIGN
	- -		
	- -		
	- -		
	- -		

記事 NOTE

サイズ SIZE: B

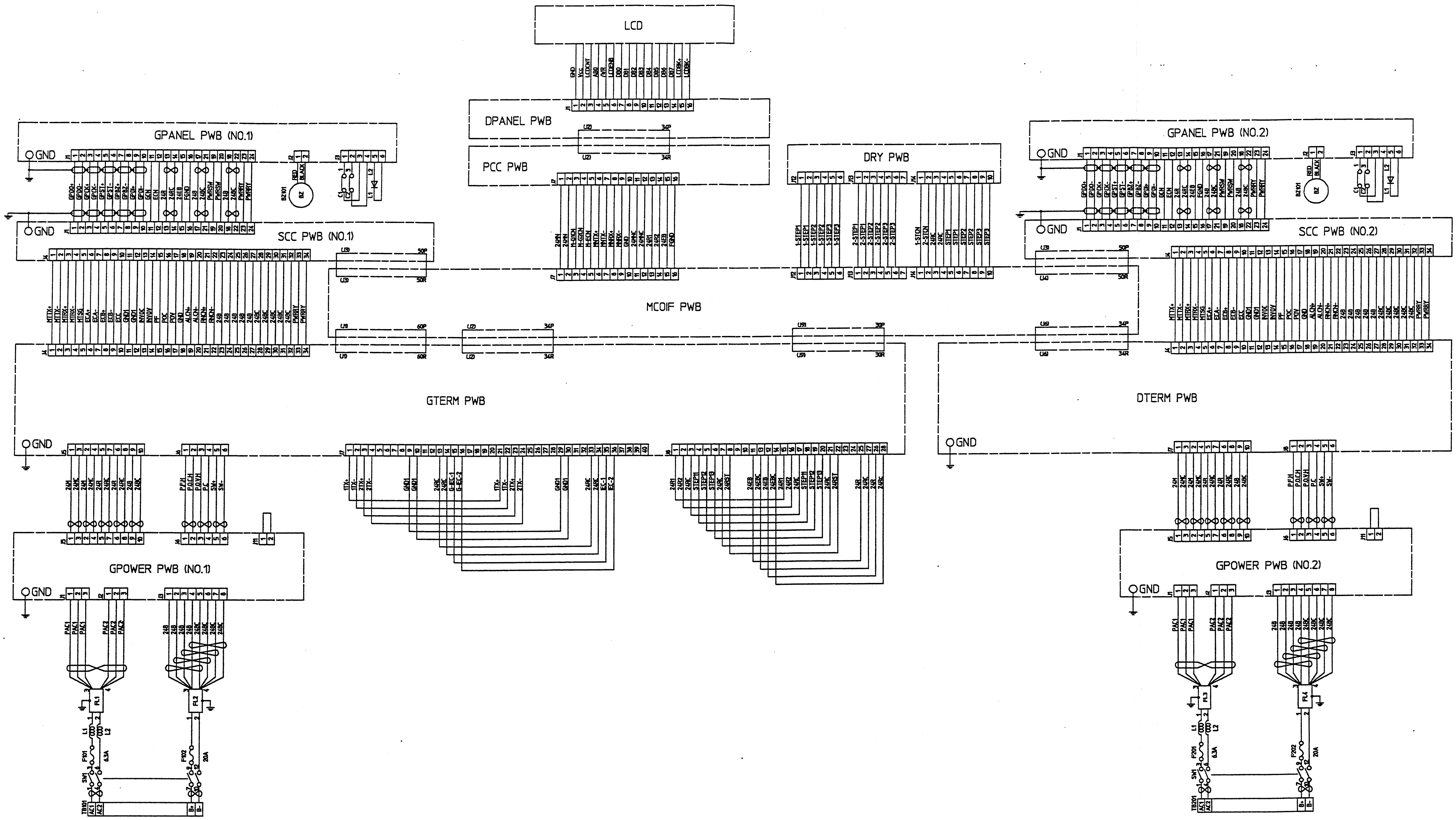
TG-8000/8500
POWER SUPPLY UNIT
電源 ユニット

製図 DRAWN BY	設計 CHARGED BY	検図 CHECKED BY	承認 APPROVED BY
Y. Yoshida	Y. Yoshida	M. Akimoto	K. Yamamoto

尺度 SCALE: 1 : 5
日付 DATE: 2002- 4- 2
図番 DRAWING: 1099001.30
REV: 0
SHT: 1/1

TOKIMEC
株式会社 トキメック TOKIMEC INC.

Fig. 9.4.3 Type I/D



note

With an early product,there is also a unit which changed connection of "GPANEL PWB J3" into "Fig.1".
With an early product,there is also a unit without connection of "GPOWER PWB J11".
There is no difference in the function and performance by the above.

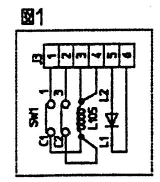


Fig. 9-4.4
TG-8000/8500,GC 80/85 TYPE D
Internal wiring diagram

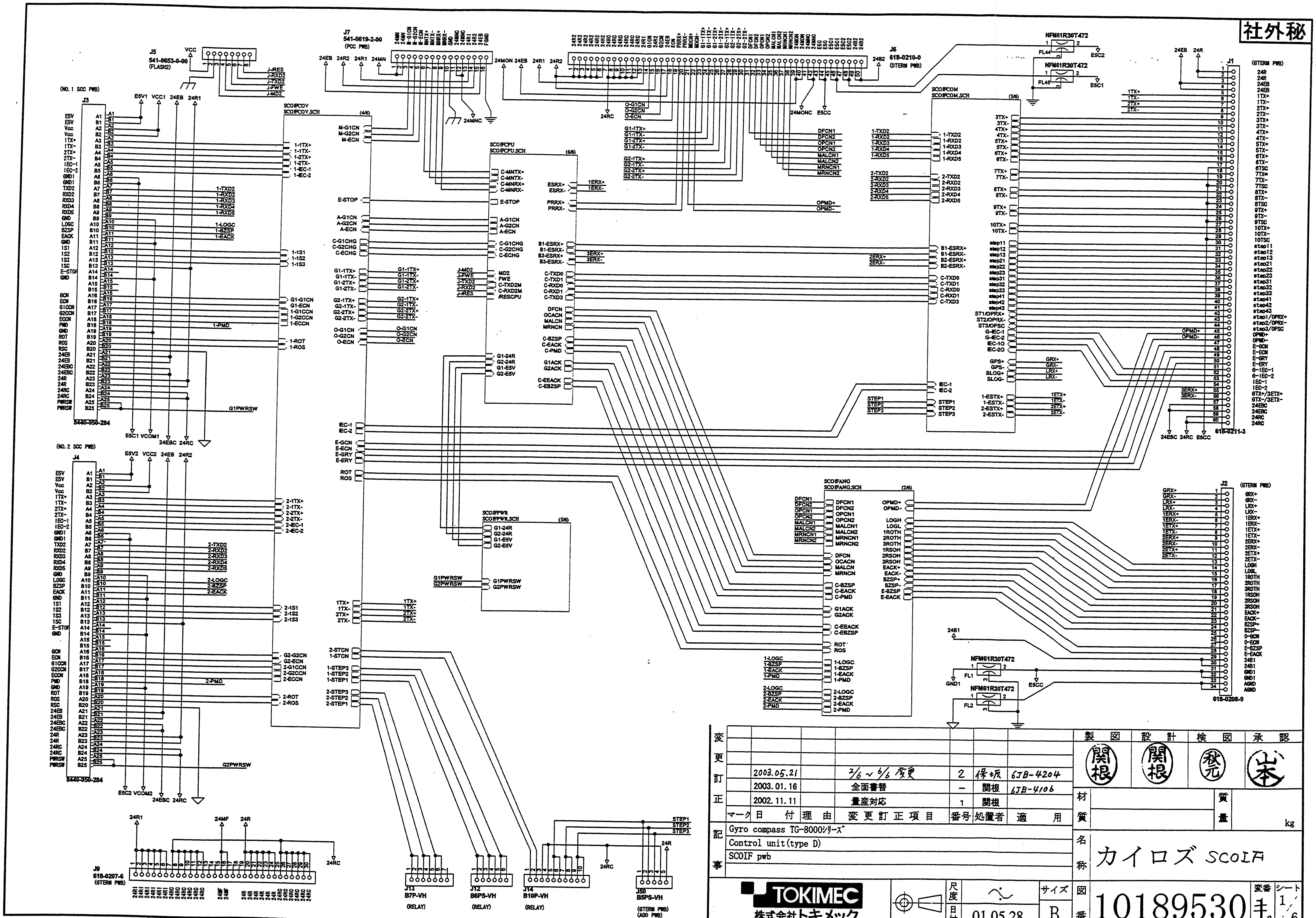
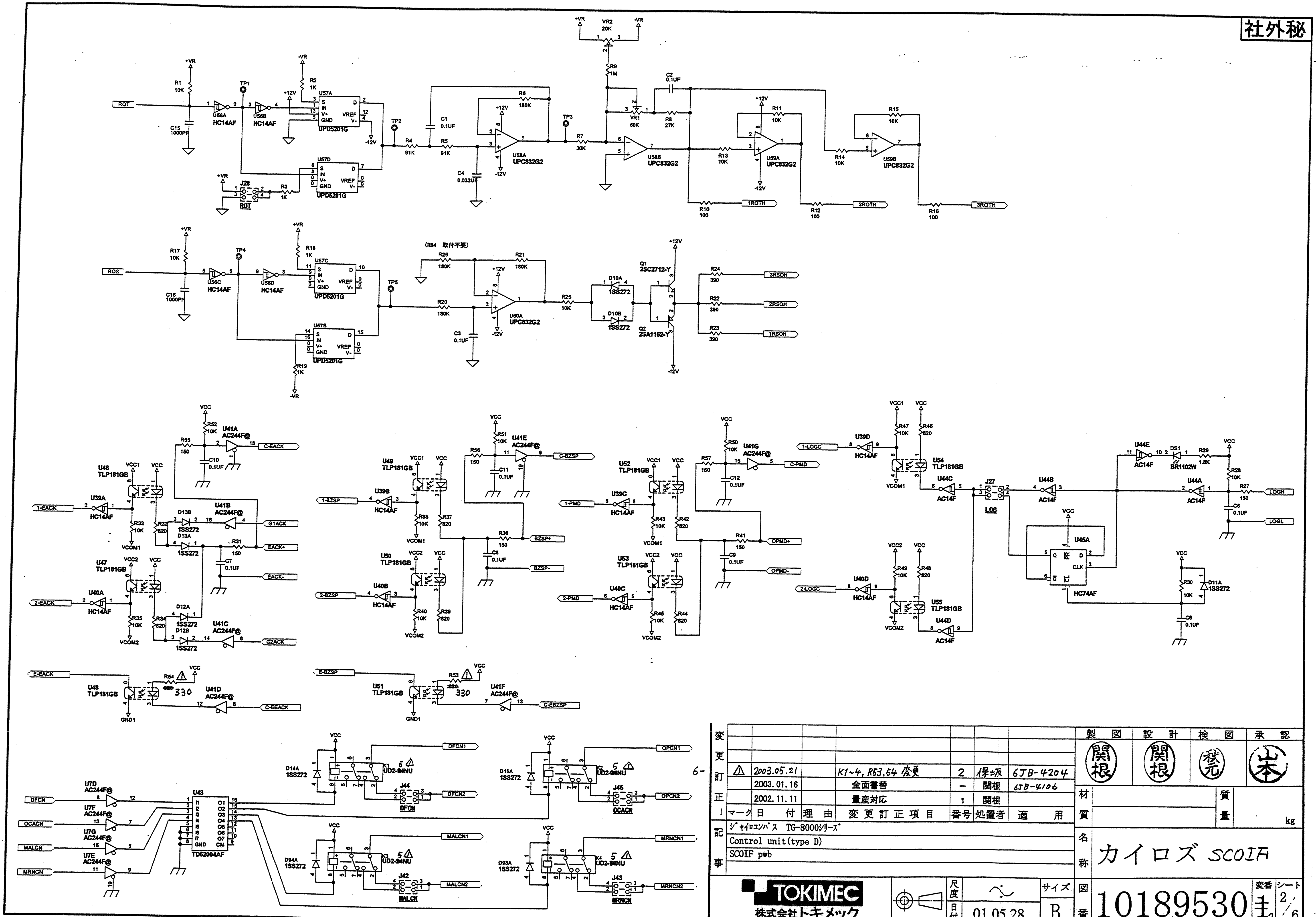


Fig. 9.4.5.1 TypeD SERIAL SIGNAL TYPE REPEATER

社外秘



変更訂正記事					
⚠ 2003.05.21	K1~4, R53,54 変更	2	保坂	6JB-4204	
2003.01.16	全面書替	–	関根	6JB-4106	
2002.11.11	量産対応	1	関根		
マーク 日付	理由 変更訂正項目	番号	処置者	適用	

製図	設計	検図	承認
関根	関根	森元	山本

記事	ジャイロコンパス TG-8000シリーズ Control unit(type D) SCOIF pwb
材質	
質量	kg
名称	カイロズ SCOIF
尺度	～
日付	01.05.28
サイズ	B
図番	10189530
変番	±2
シート	2/6

TOKIMEC 株式会社トキメック

Fig. 9.4.5.2 Type D SERIAL SIGNAL TYPE REPEATER

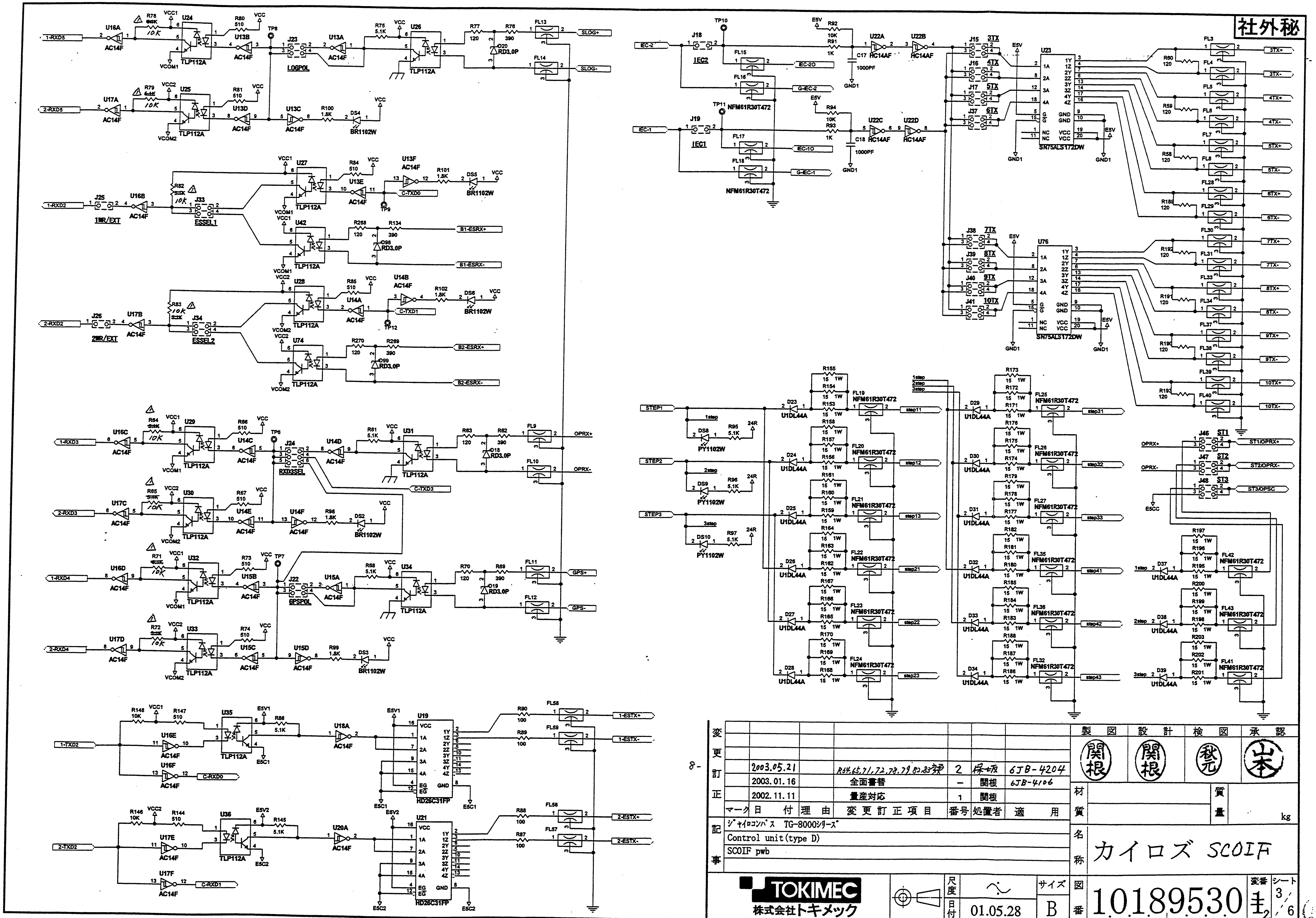


Fig. 9.4.5.3 TypeD SERIAL SIGNAL TYPE REPEATER

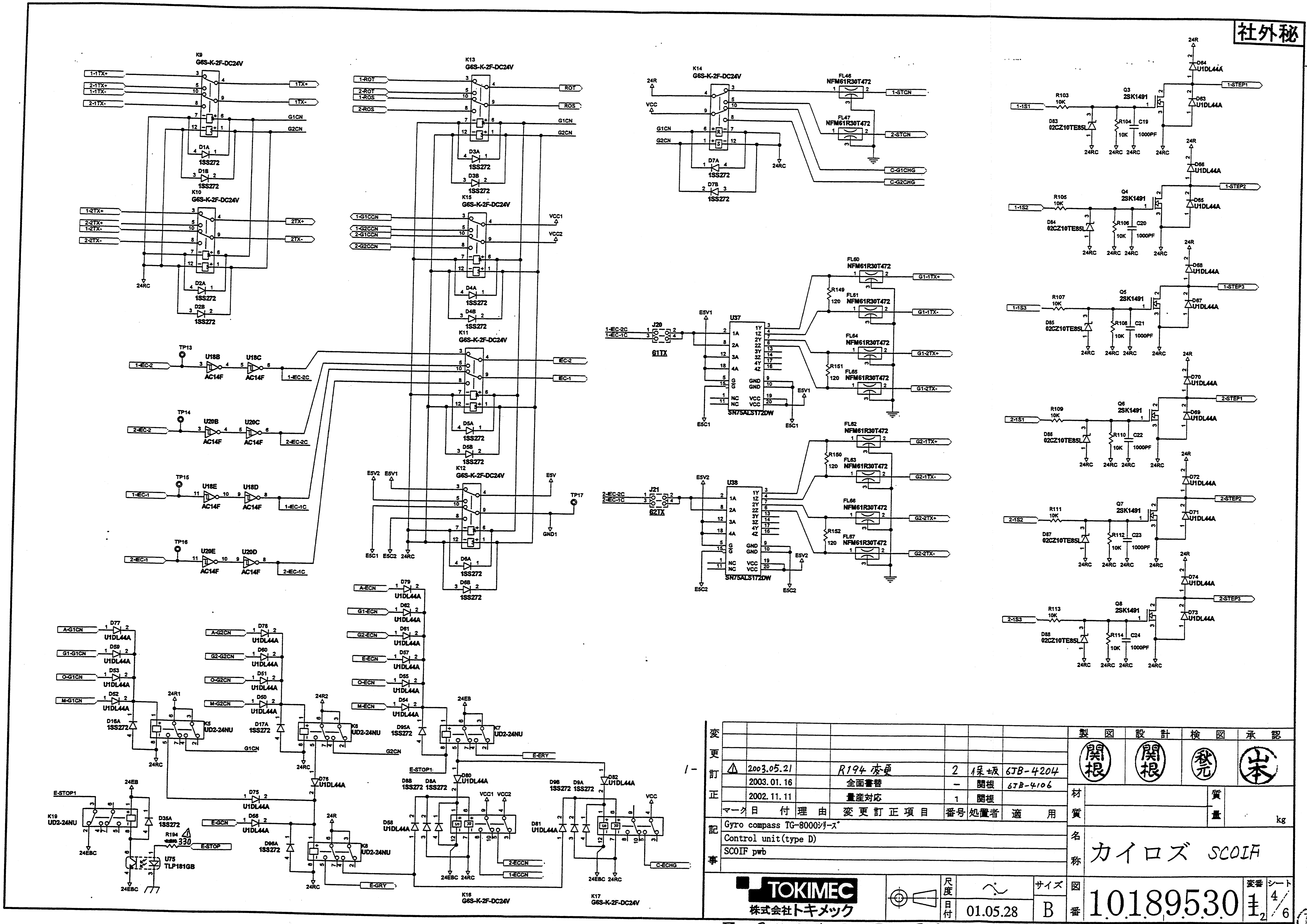
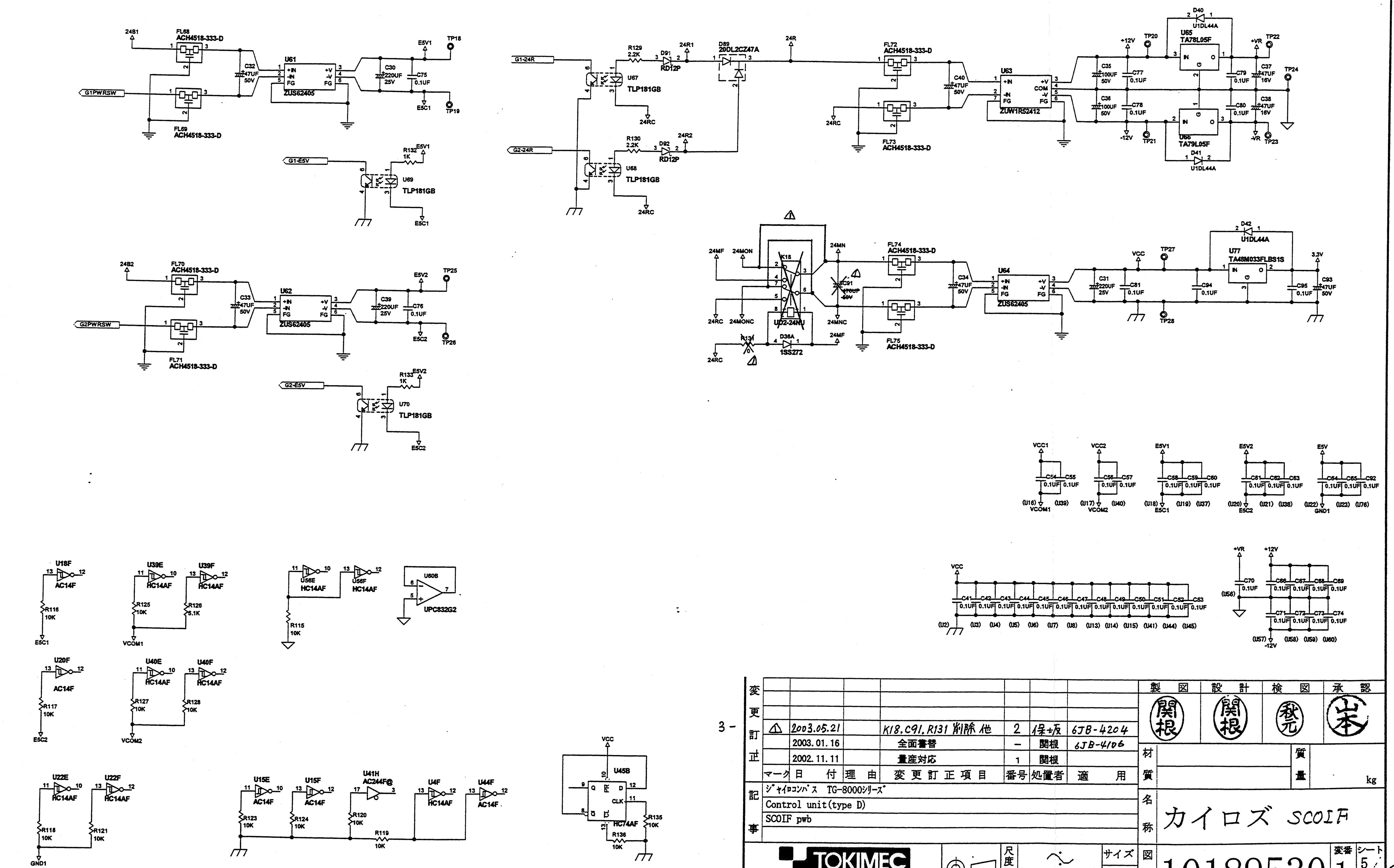


Fig. 9.4.5.4 Type D SERIAL SIGNAL TYPE REPEATER

社外秘



3 -

変更訂正記事					
△	2003.05.21	K18, C91, R131 削除 他	2	保坂	6JB-4204
	2003.01.16	全面書替	−	関根	6JB-4106
	2002.11.11	量産対応	1	関根	
マーク	日付	理由 変更訂正項目	番号	処置者	適用

記事:
ジャイロコンパス TG-8000シリーズ
Control unit(type D)
SCOIF pwb

製図	設計	検図	承認
関根	関根	秋元	山本

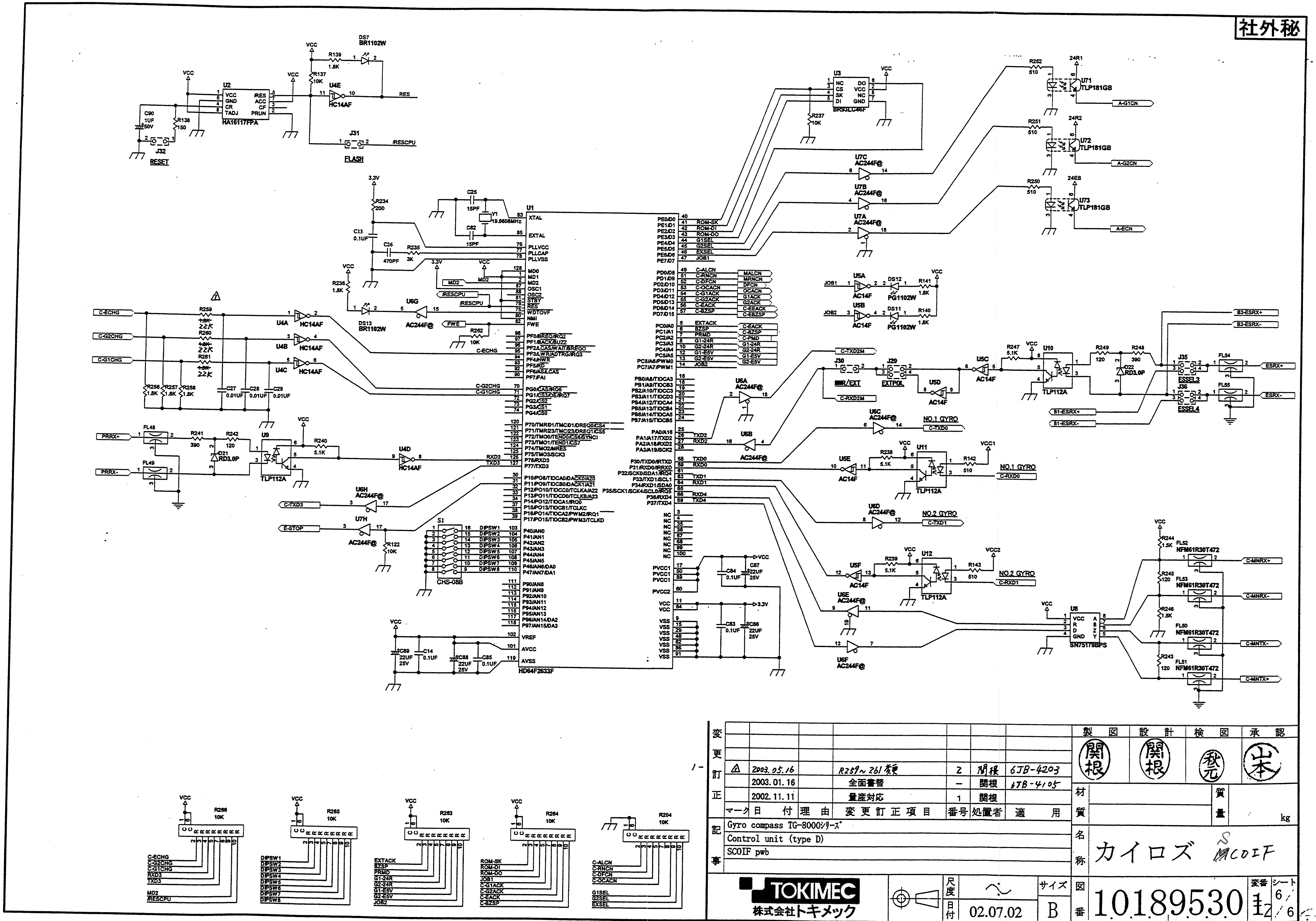
材質	
質量	kg
名称	カイロズ SCOIF

TOKIMEC
株式会社トキメック

尺度	日付	サイズ	図番	変番	シート
～	01.05.28	B	10189530	1/2	5/6

(411)

Fig. 9.4.5.5 Type D SERIAL SIGNAL TYPE REPEATER



マーク	日付	理由	変更訂正項目	番号	処置者	適用
△	2003.05.16		R259~261変更	2	関根	6JB-4203
	2003.01.16		全面書替	―	関根	6JB-4105
	2002.11.11		量産対応	1	関根	

製図	設計	検図	承認
関根	関根	秋元	山本

材質 / 質量 kg

記事: Gyro compass TG-8000シリーズ
Control unit (type D)
SCOIF pwb

名称: カイロズ SCOIF

TOKIMEC 株式会社トキメック

尺度 | 日付 02.07.02 | サイズ B | 図番 10189530 | 変番 1 2 | シート 6/6

Fig. 9.4.5.6 Type D STEP MOTOR TYPE REPEATER

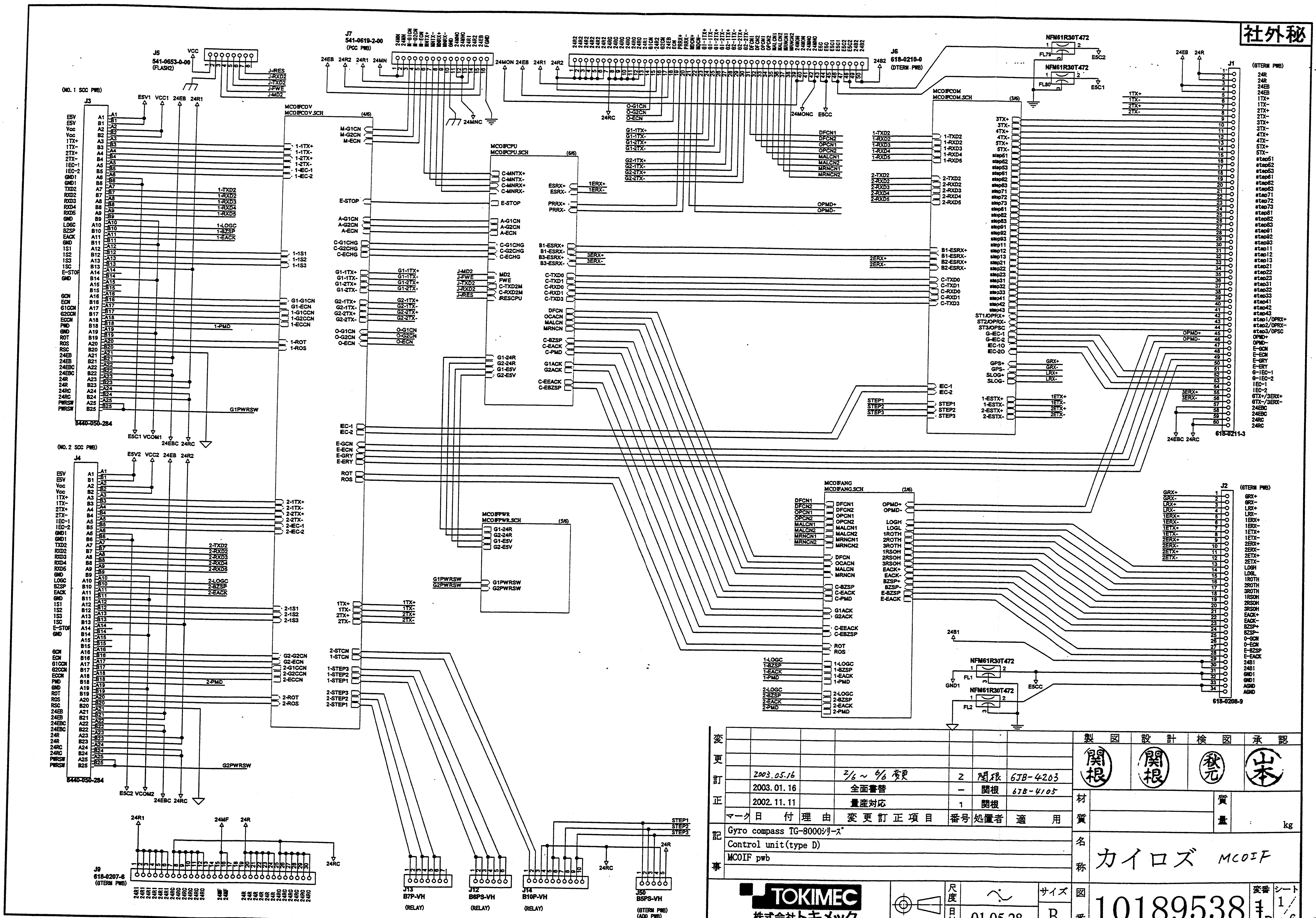


Fig. 9.4.6.1 Type D STEP MOTOR TYPE REPEATER

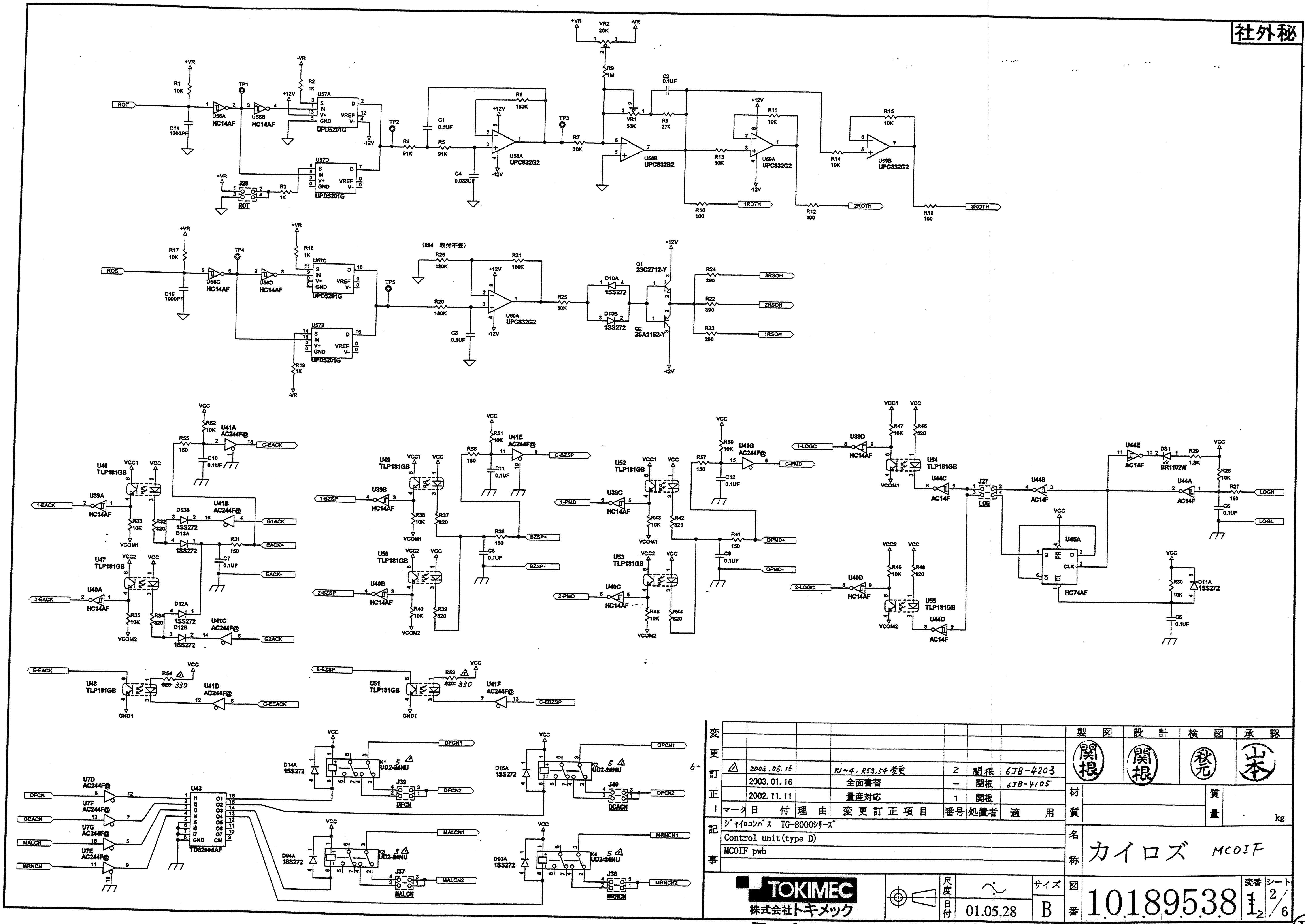


Fig. 9.4.6.2 Type D STEP MOTOR TYPE REPEATER

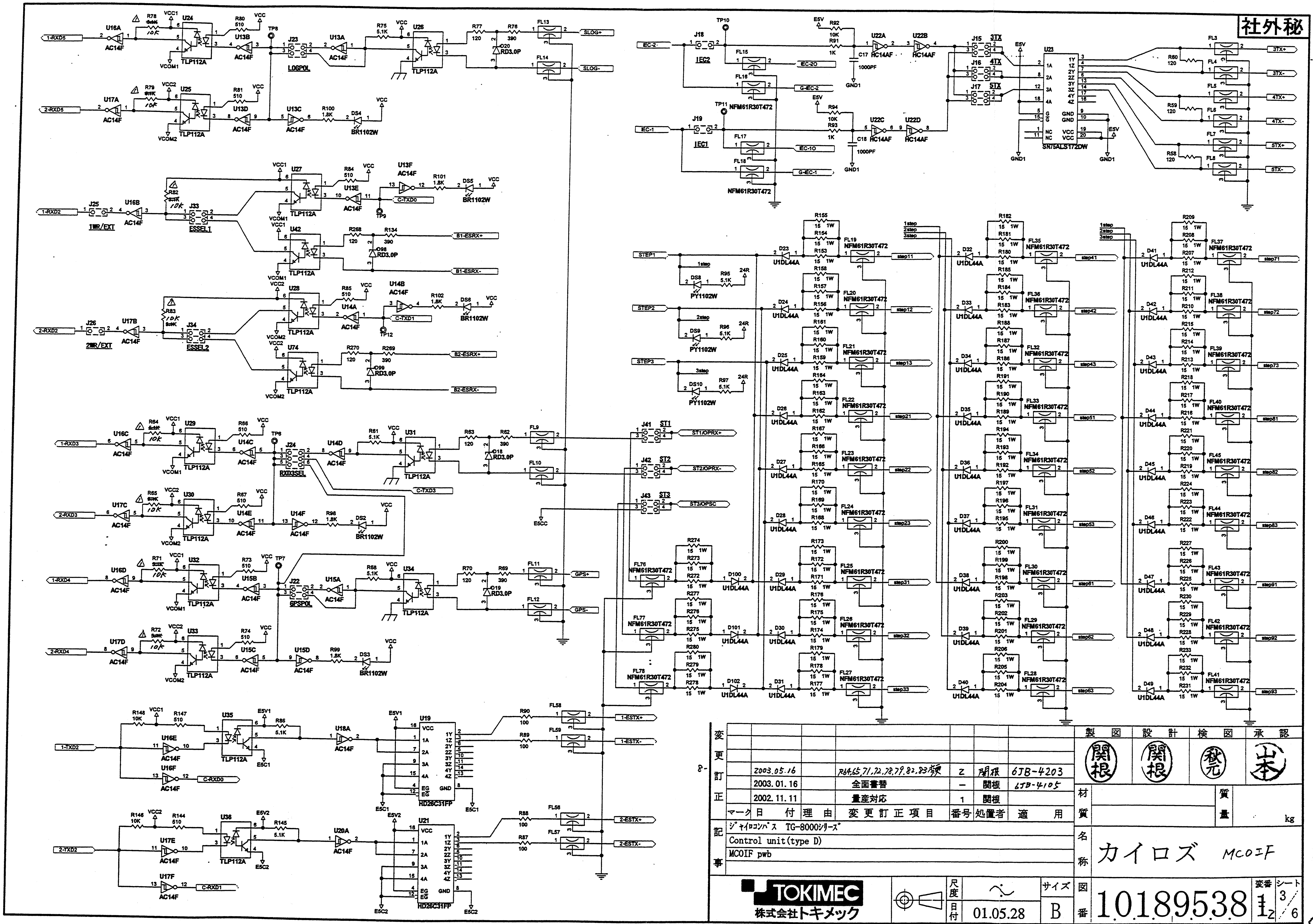
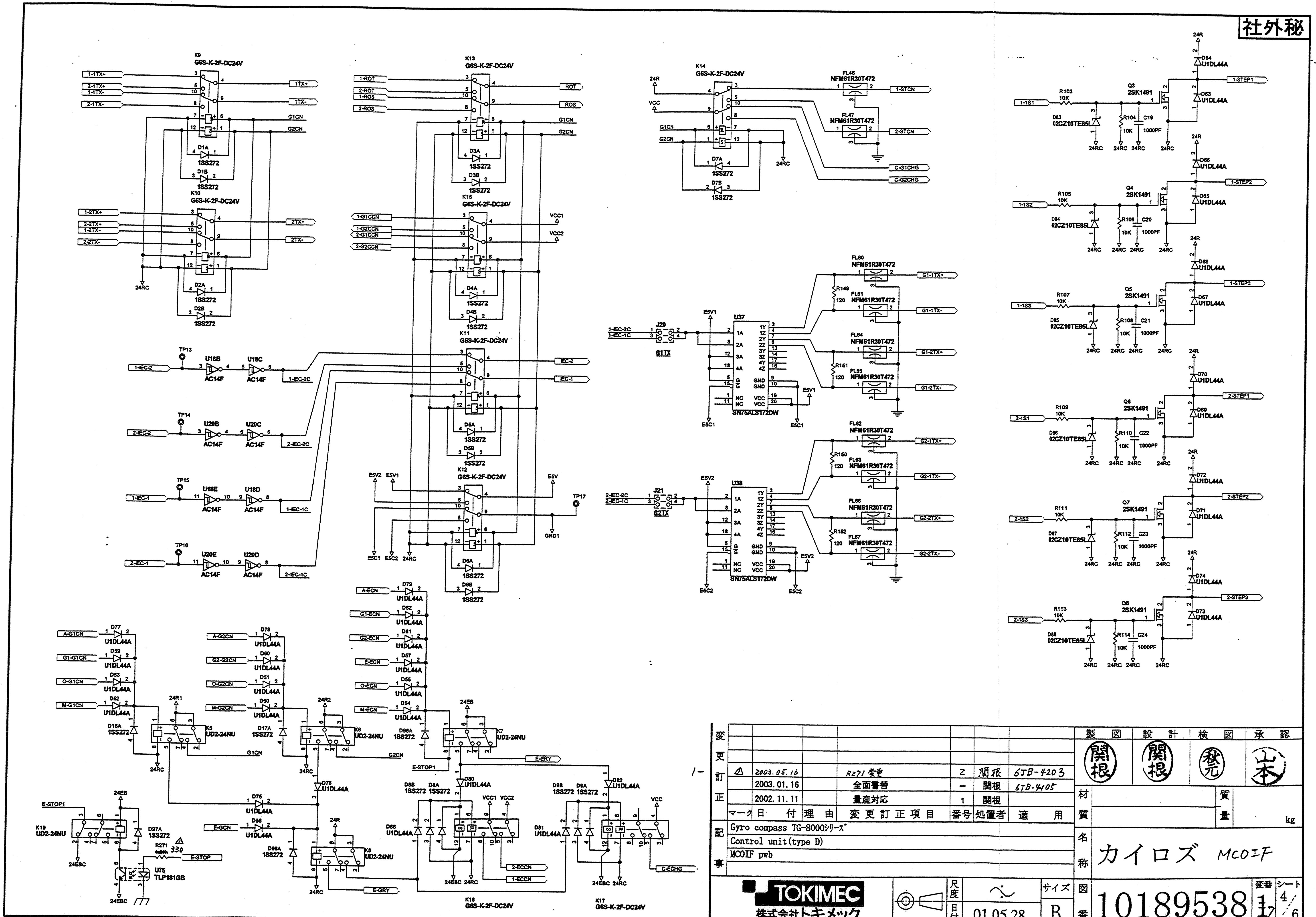


Fig. 9.4.6.3 Type D STEP MOTOR TYPE REPEATER



変更訂正記事						
2	2003.05.16	R271 変更	2	関根	6TB-4203	
	2003.01.16	全面書替	−	関根	6TB-4105	
	2002.11.11	量産対応	1	関根		
マーク	日付	理由	変更訂正項目	番号	処置者	適用

製図	設計	検図	承認
関根	関根	秋元	山本

Gyro compass TG-8000シリーズ
Control unit (type D)
MCOIF pwb

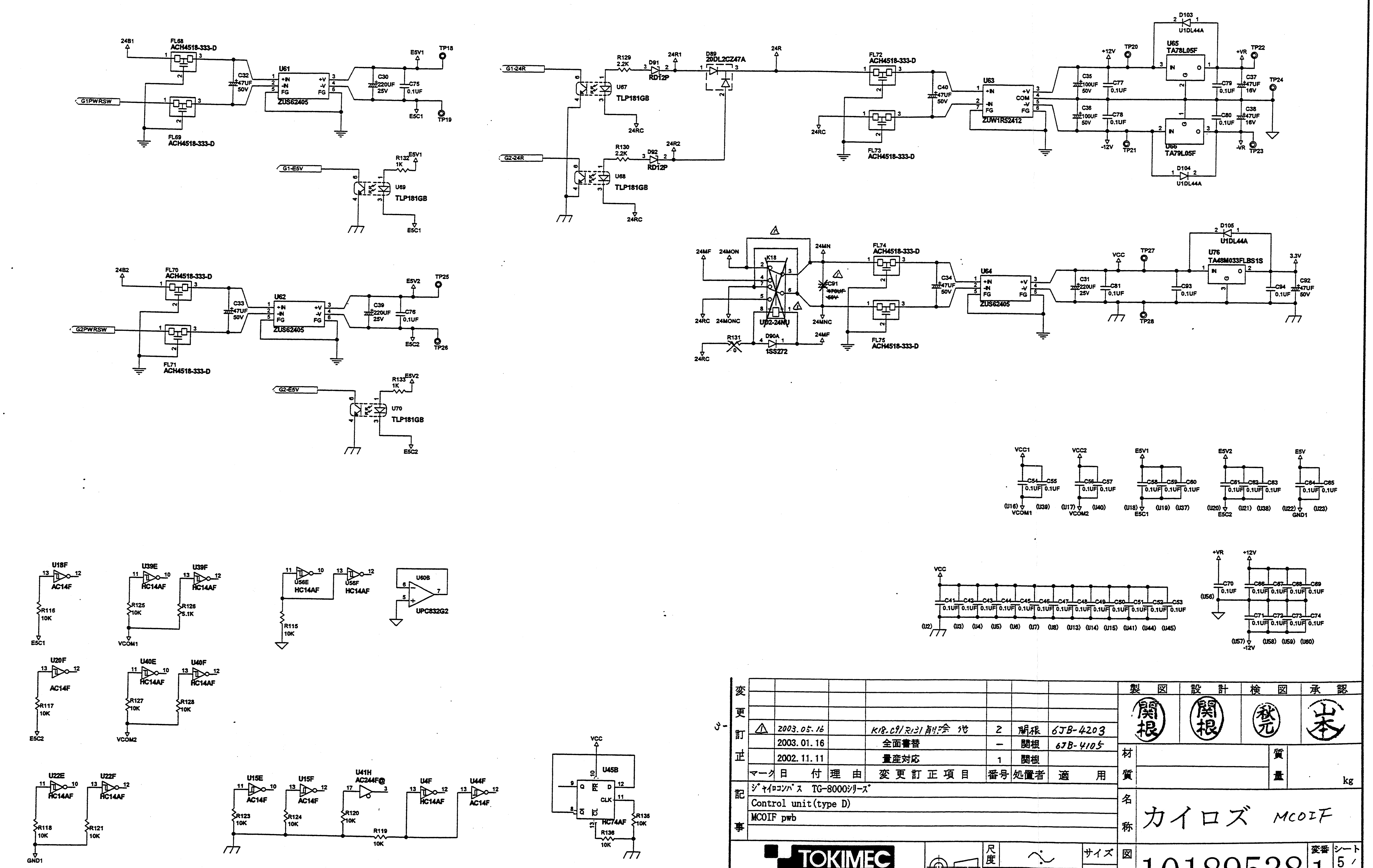
材質:
質量: kg
名称: カイロズ MCOIF

TOKIMEC 株式会社トキメック

尺度: ～ 日付: 01.05.28 サイズ: B 図番: 10189538 変番: 1 2 シート: 4/6

Fig. 9.4.6. Type D STEP MOTOR TYPE REPEATER

社外秘



マーク	日付	理由	変更訂正項目	番号	処置者	適用
△	2003.05.16		K18, C91/R131 削除 他	2	関根	6JB-4203
	2003.01.16		全面書替	—	関根	6JB-4105
	2002.11.11		量産対応	1	関根	

記事: ジャイロコンパス TG-8000シリーズ
Control unit(type D)
MCOIF pwb

製図	設計	検図	承認
関根	関根	秋元	山本

材質:
質量: kg

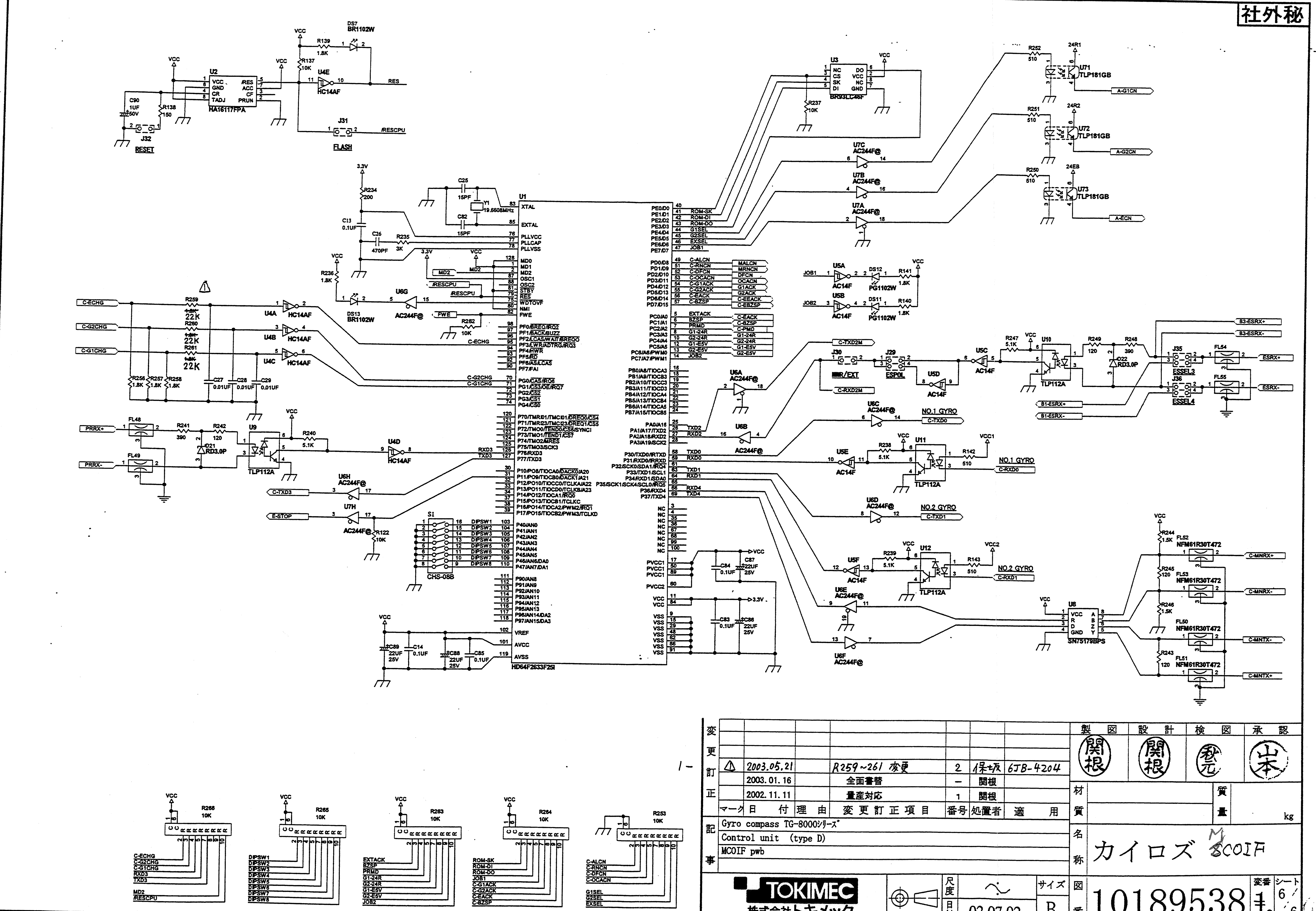
名称: カイロズ MCOIF

TOKIMEC
株式会社トキメック

尺度	日付	サイズ	図番	変番	シート
～	01.05.28	B	10189538	1	5/6

Fig. 9.4.6. Type D STEP MOTOR TYPE REPEATER

社外秘



変更訂正						
△	2003.05.21	R259~261 変更	2	保坂	6JB-4204	
	2003.01.16	全面書替	—	関根		
	2002.11.11	量産対応	1	関根		
マーク	日付	理由 変更訂正項目	番号	処置者	適用	

製図	設計	検図	承認
関根	関根	秋元	山本

材質

質量 kg

記事:
Gyro compass TG-8000シリーズ
Control unit (type D)
MCOIF pwb

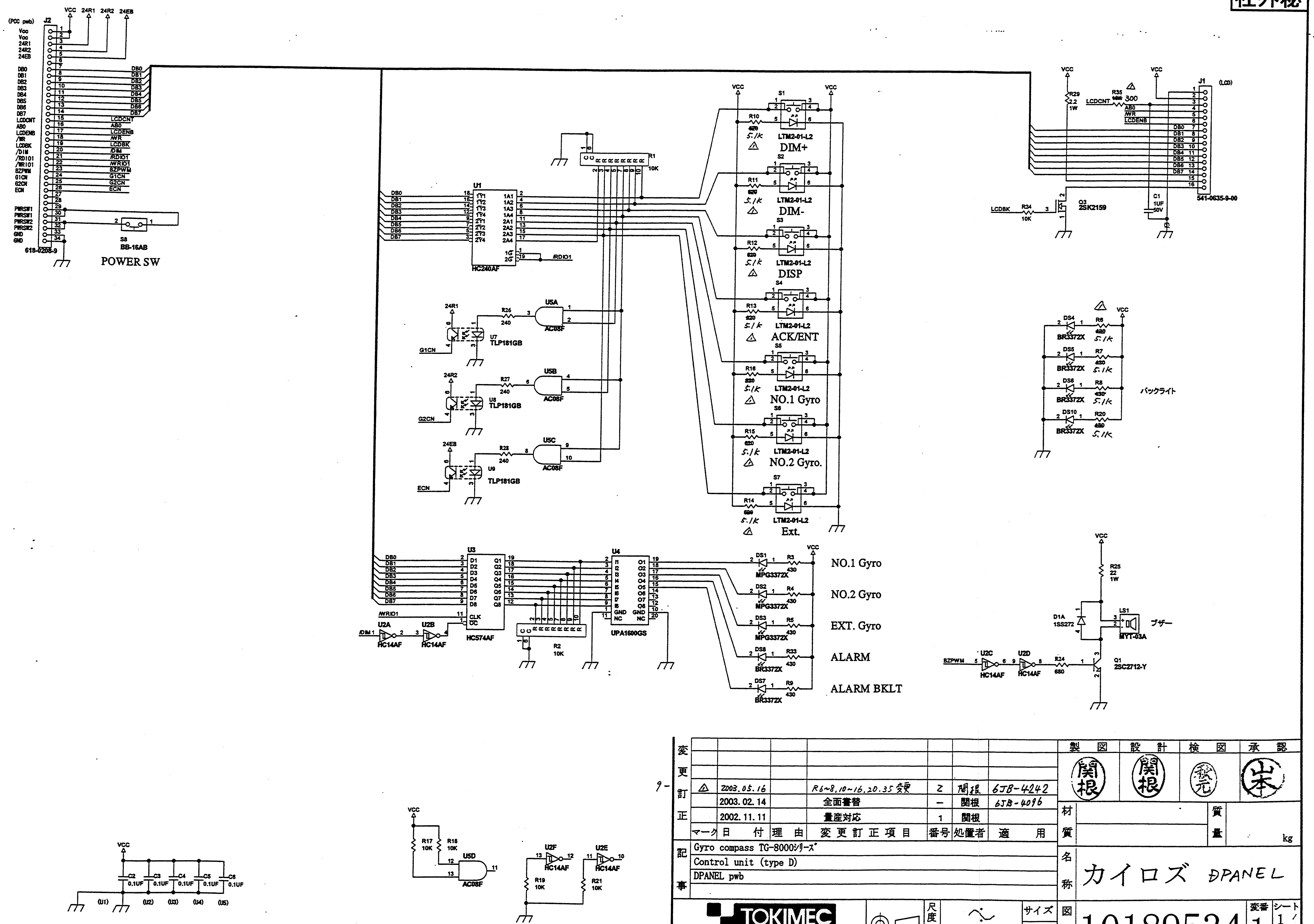
名称: カイロズ MCOIF

TOKIMEC 株式会社トキメック

尺度 ～ | 日付 02.07.02 | サイズ B | 図番 10189538 | 変番 1 2 | シート 6/6

Fig. 9.4.6.6 Type D SERIAL SIGNAL TYPE REPEATER

社外秘



変更訂正					
△	2003.05.16	R6~8,10~16,20,35 変更	2	関根	6JB-4242
	2003.02.14	全面書替	—	関根	6JB-4096
	2002.11.11	量産対応	1	関根	
マーク	日付	理由 変更訂正項目	番号	処置者	適用

製図	設計	検図	承認
関根	関根		山本

材質 | 質量 kg

記事: Gyro compass TG-8000シリーズ
Control unit (type D)
DPANEL pwb

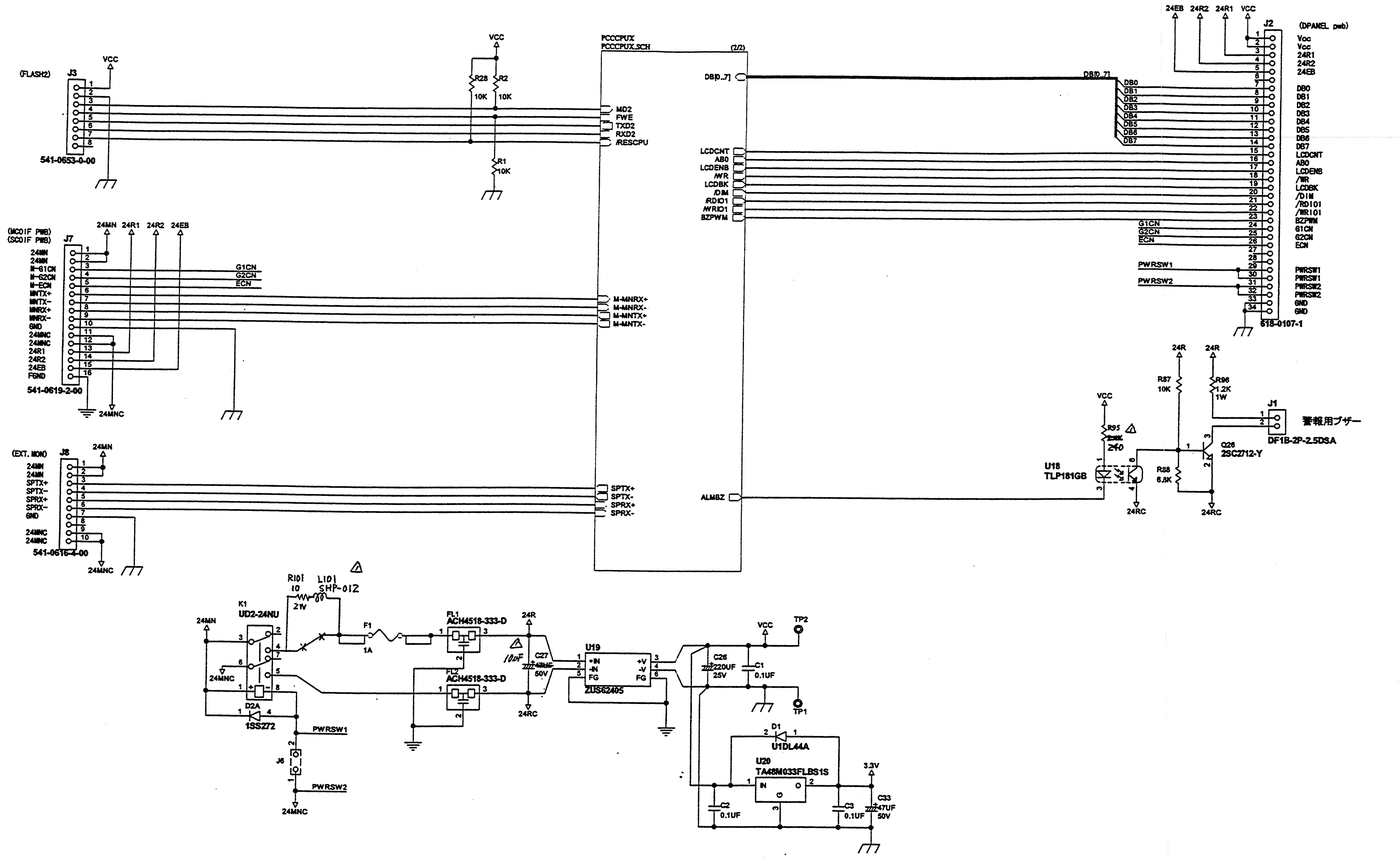
名称: カイロズ DPANEL

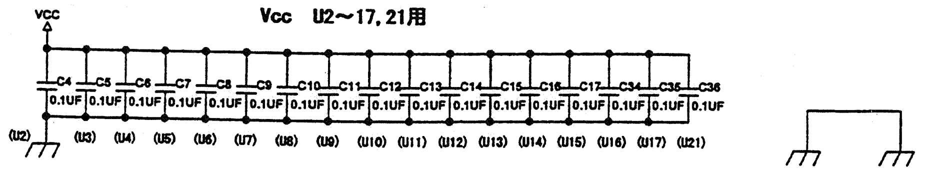
TOKIMEC
株式会社トキメック

尺度	日付	サイズ	図番	変番	シート
	02.07.02	B	10189534	2	1/1

Fig 9.4.7. Type D

社外秘





変更訂正					
△	2003.05.16	R101, L101 追加. C27, R95 変更	2	関根	6JB-4216
	2003.01.17	全面書替	—	関根	6JB-4095
	2002.11.11	量産対応	1	関根	
マーク	日付	理由 変更訂正項目	番号	処置者	適用

製図	設計	検図	承認
関根	関根	愁元	山本

材質:
質量: kg

記事:
Gyro compass TG-8000シリーズ
Control unit (type D)
PCC pwb

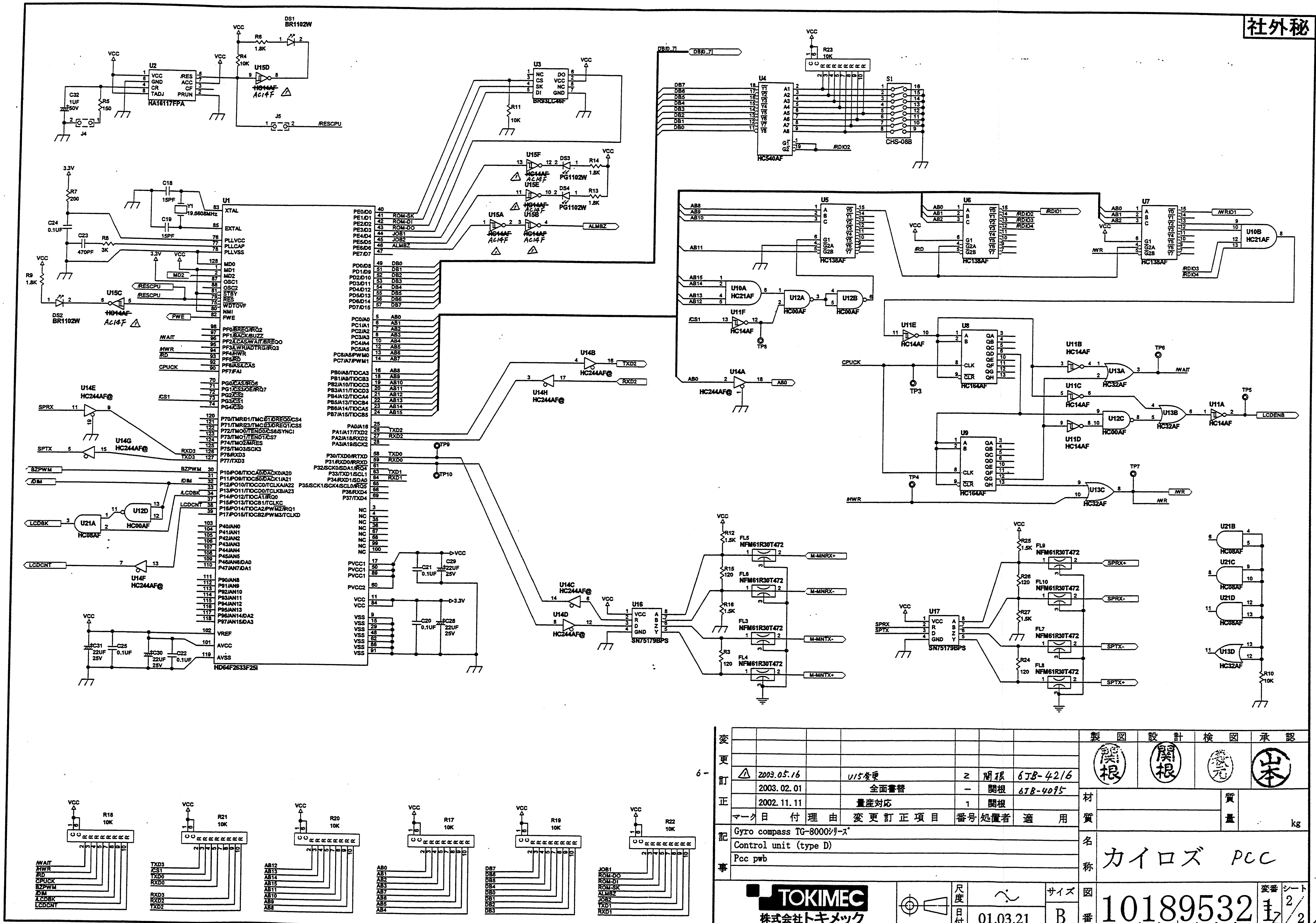
名称: カイロズ PCC

TOKIMEC
株式会社トキメック

尺度: ～ 日付: 01.03.21 サイズ: B 図番: 10189532 変番: 1/2 シート: 1/2

Fig 9.4.8.1 Type D

社外秘



変更訂正記事					
⚠	2003.05.16	U15変更	2	関根	6JB-4216
	2003.02.01	全面書替	—	関根	6JB-4095
	2002.11.11	量産対応	1	関根	
マーク	日付	理由 変更訂正項目	番号	処置者	適用

6-

Gyro compass TG-8000シリーズ
Control unit (type D)
Pcc pwb

製図	設計	検図	承認
関根	関根		山本

材質 | 質量 kg

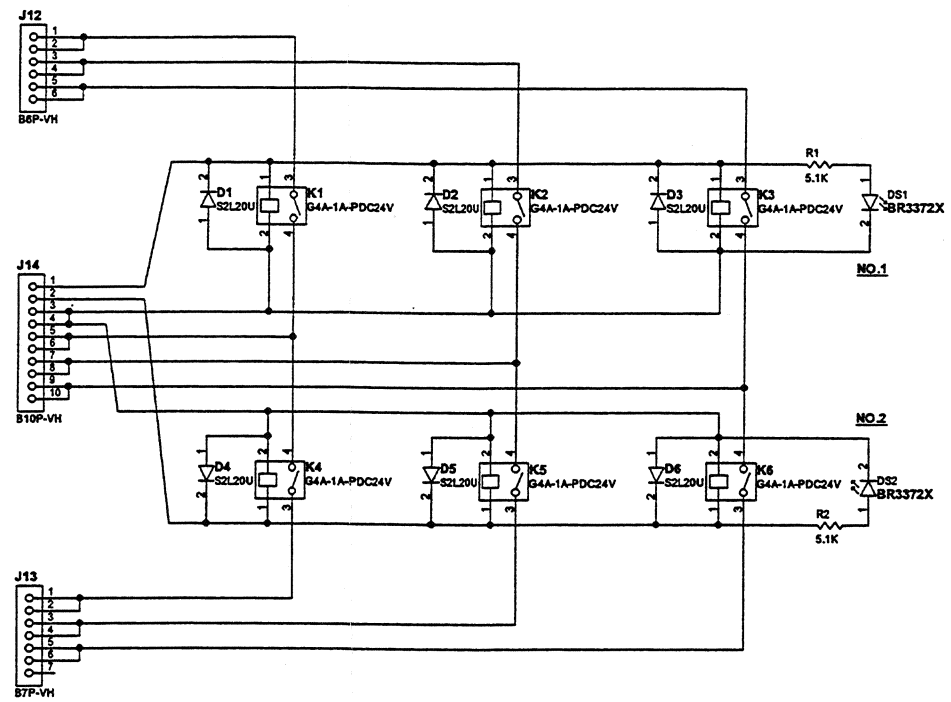
名称 カイロズ PCC

TOKIMEC
株式会社トキメック

尺度 ～ | 日付 01.03.21 | サイズ B | 図番 10189532 | 変番 1/2 | シート 2/2

Fig 9.4.8.2 Type D

社外秘



変更訂正							
マーク	日付	理由	変更訂正項目	番号	処置者	適用	

製図	設計	検図	承認
関根	関根	秋元	山本

材質 | 質量 kg

記事:
ジャイロコンパス TG-8000/シリーズ
Control unit (type D)
DRY pwb

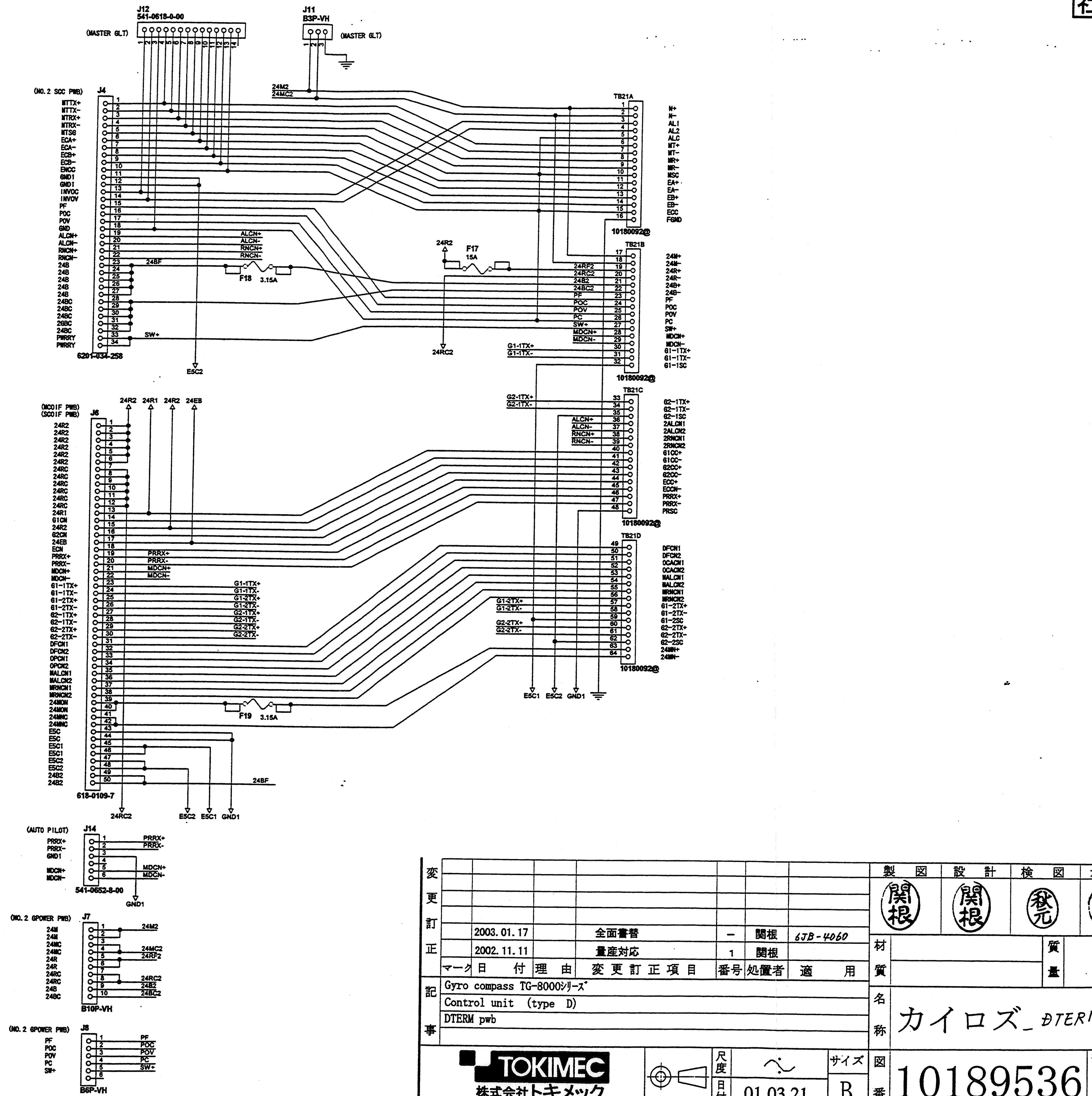
名称: カイロズ DRY

TOKIMEC
株式会社トキメック

尺度: 〜 | 日付: 02.11.25 | サイズ: A | 図番: 10189540 | 変番: 0 | シート: 1/1

Fig 9.4.9 Type D

社外秘



マーク	日付	理由	変更訂正項目	番号	処理者	適用
	2003.01.17		全面書替	−	関根	6JB-4060
	2002.11.11		量産対応	1	関根	

製図	設計	検図	承認
関根	関根	秋元	山本

材質 / 質量 kg

記事:
Gyro compass TG-8000シリーズ
Control unit (type D)
DTERM pwb

名称: カイロズ_DTERM

TOKIMEC
株式会社トキメック

尺度	日付	サイズ	図番	変番	シート
～	01.03.21	B	10189536	1	1/1

Fig 9.4.10 Type D

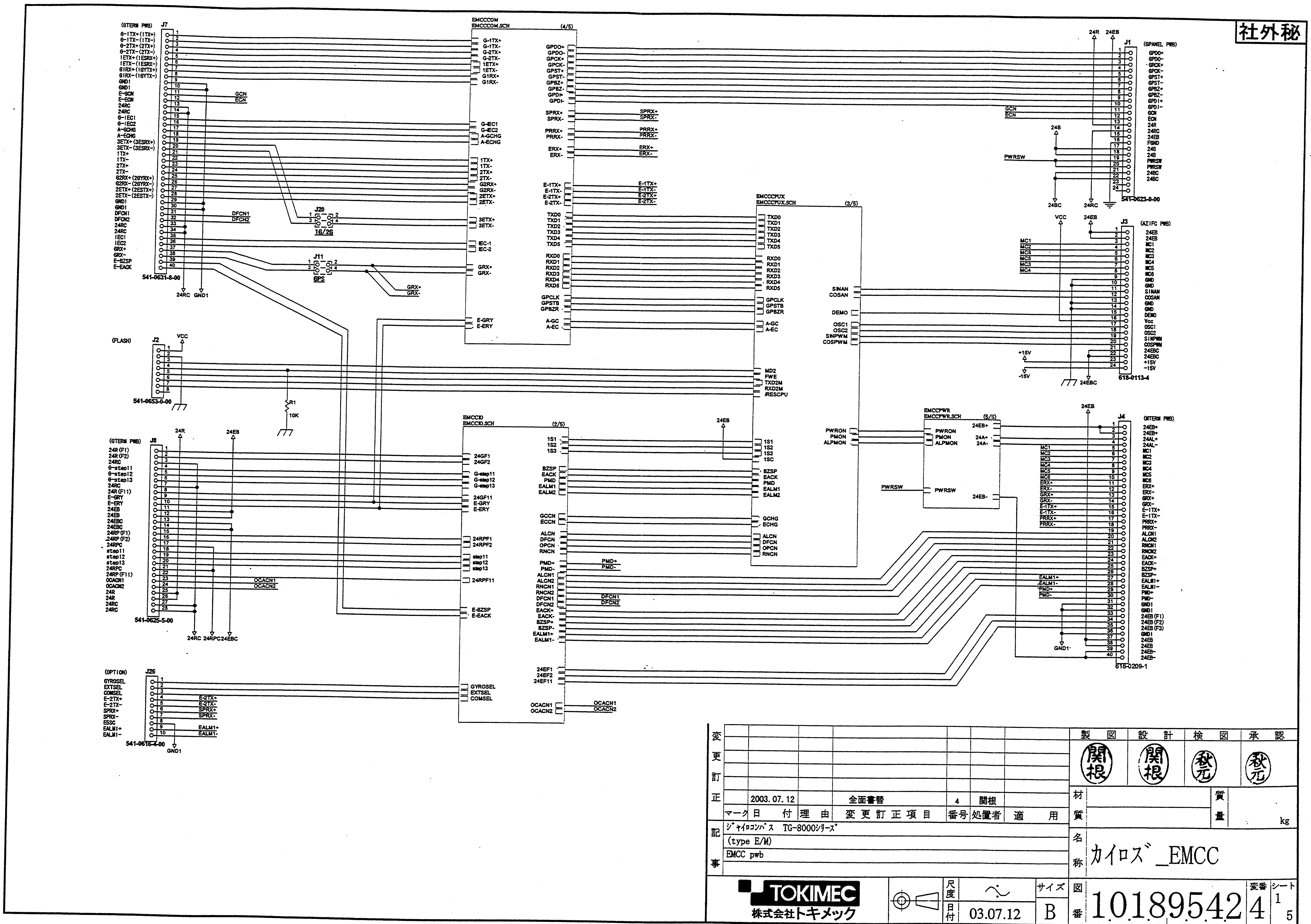
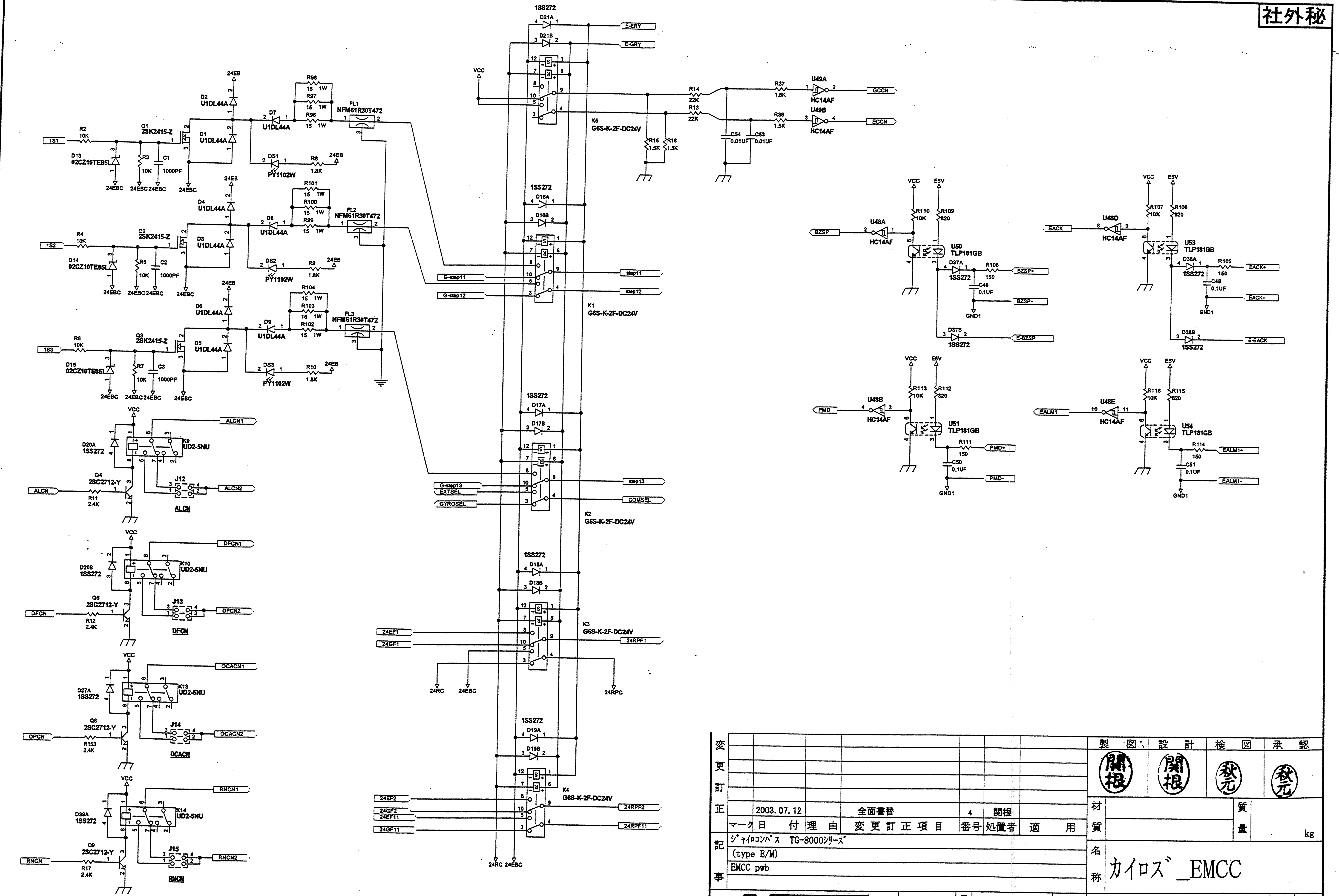


Fig 9.5.1.1 HDM. (MAG/EHS)

社外秘



変更訂正						
	2003.07.12	全面書替		4	関根	
マーク	日付	理由	変更訂正項目	番号	処置者	適用

記事: ジャイロコンパス TG-8000シリーズ (type E/M) EMCC pwb

製図	設計	検図	承認
関根	関根	秋元	秋元

材質 | 質量 kg

名称: カイロズ_EMCC

TOKIMEC 株式会社トキメック

尺度: ～ | 日付: 03.07.12 | サイズ: B | 図番: 10189542 | 変番: 4 | シート: 2/5

Fig 9.5.1.2 HDM. (MAG/EHS)

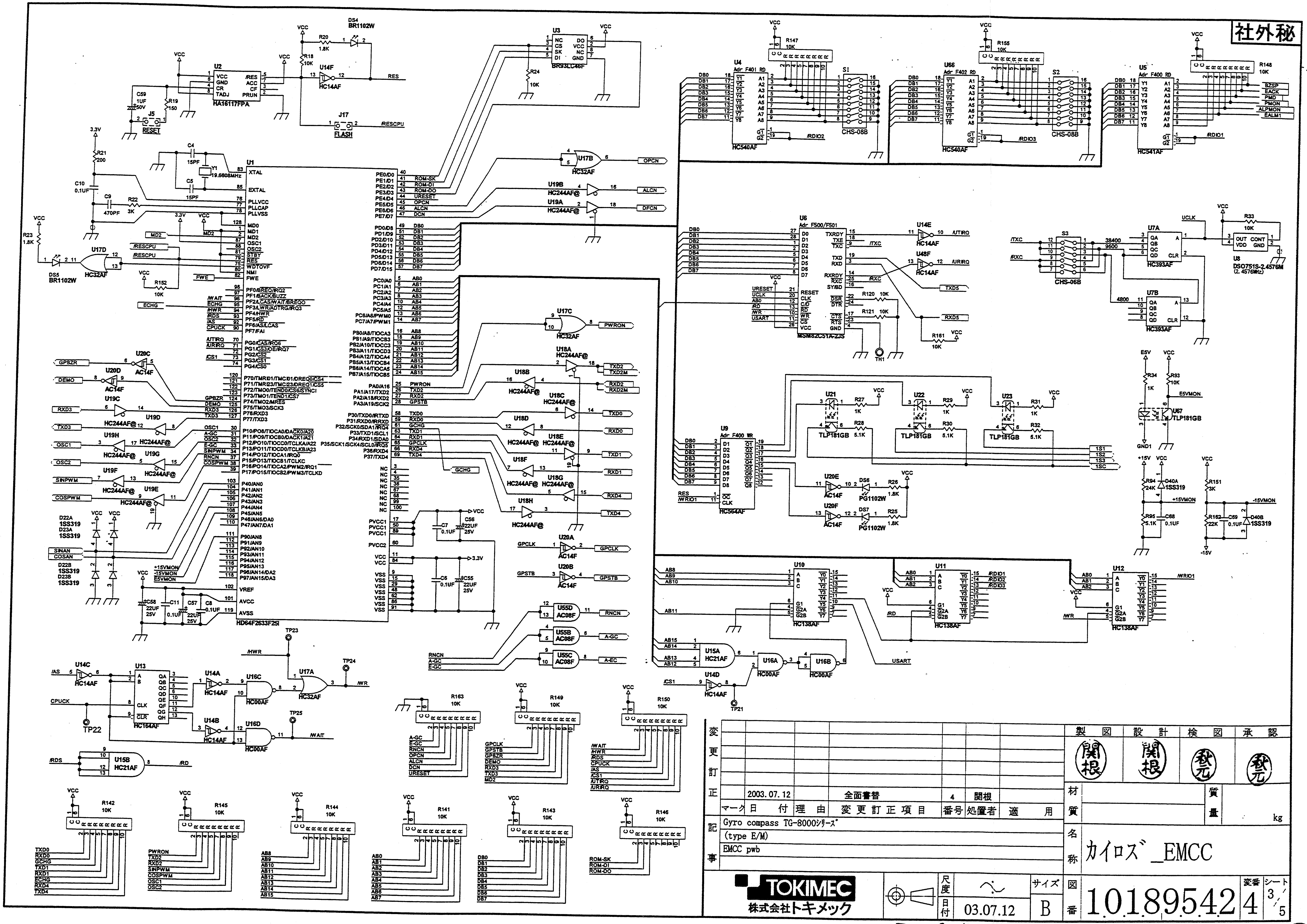


Fig 9.5.1.3 HDM. (MAG/EHS)

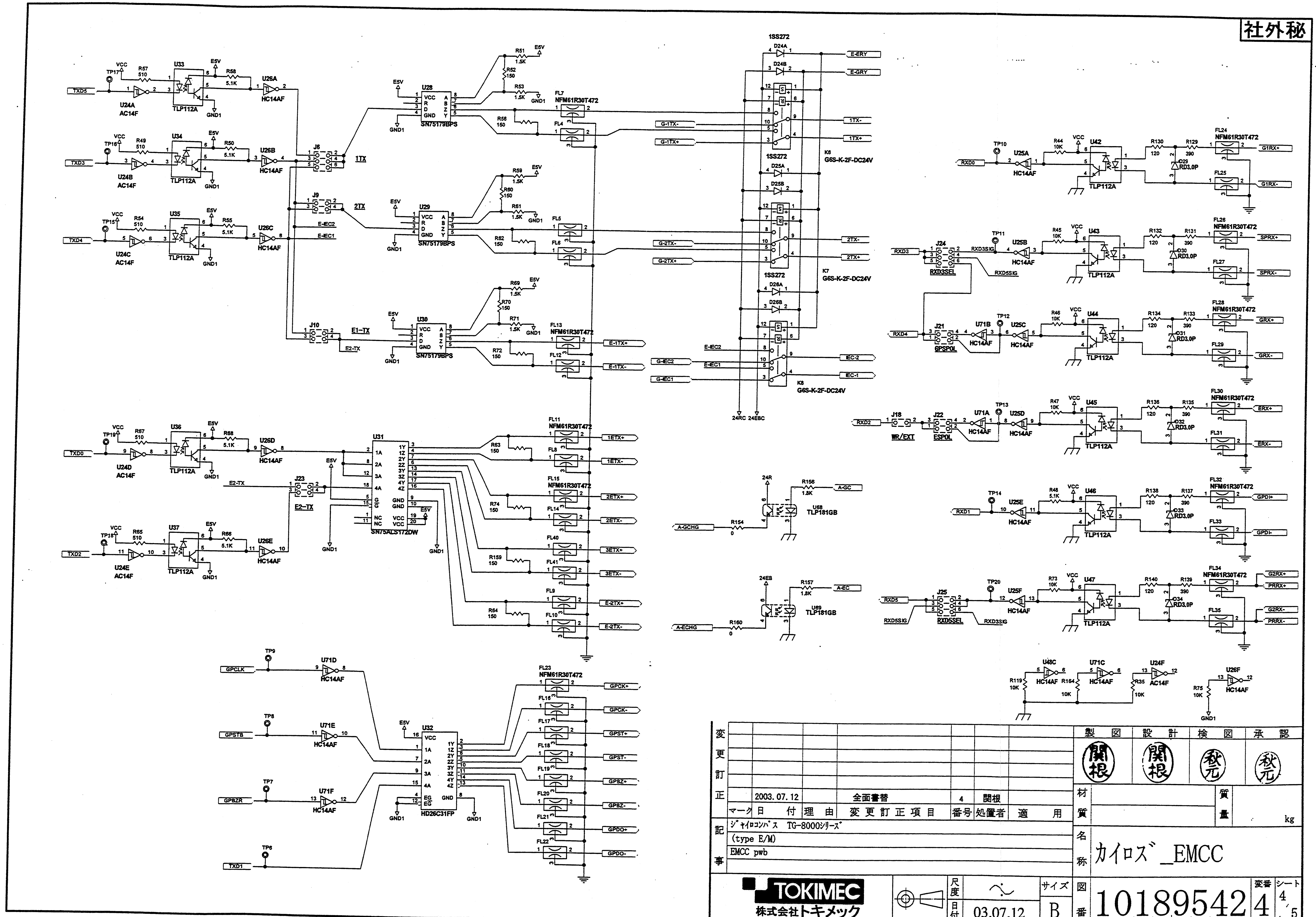
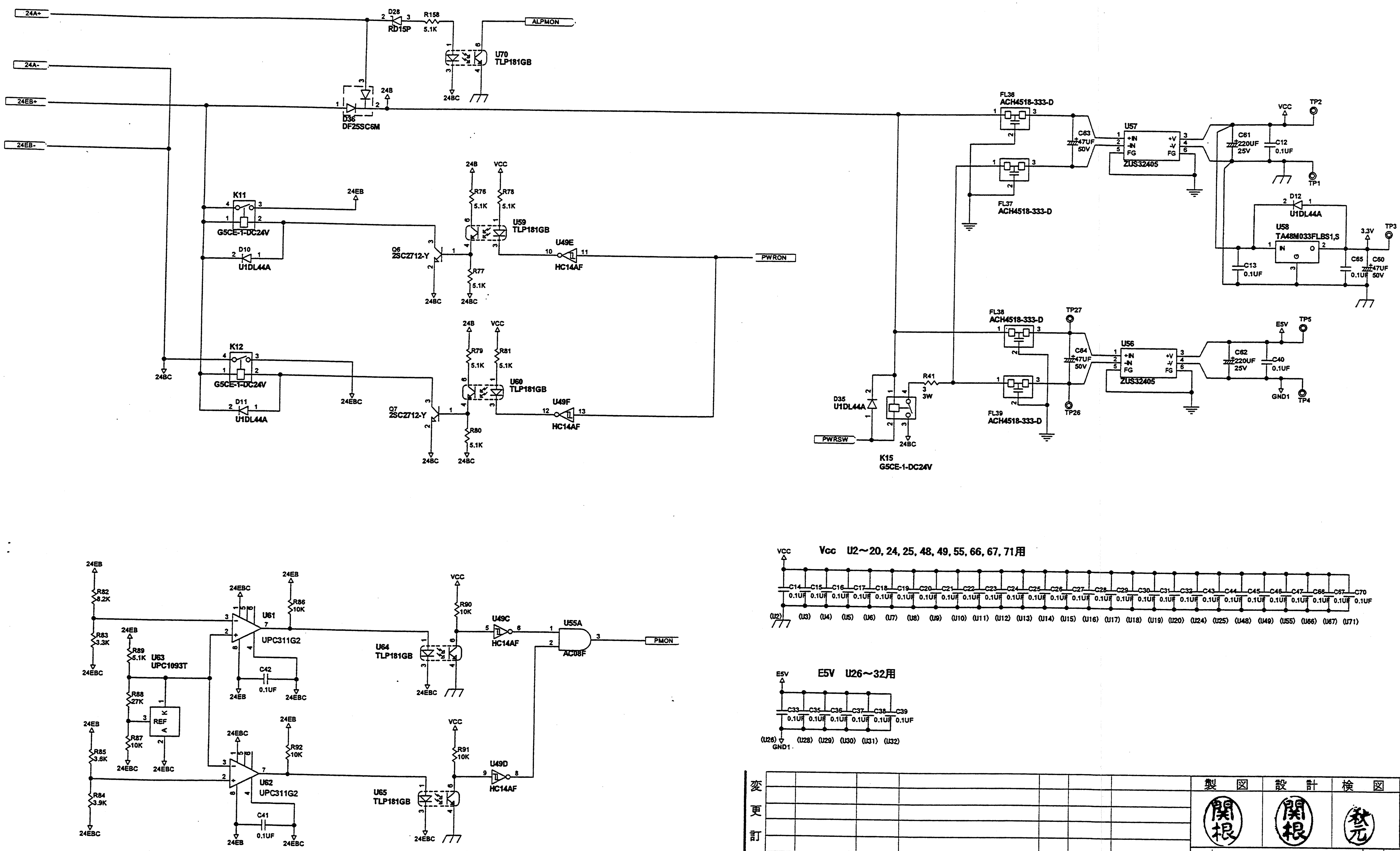


Fig 9.5.1.4 HDM.(MAG/EHS)

(H)

社外秘



変更訂正	マーク	日付	理由	変更訂正項目	番号	処置者	適用
		2003.07.12		全面書替	4	関根	

製図	設計	検図	承認
関根	関根	登元	登元

記事: ｼﾞｬｲﾛｺﾝﾊﾟｽ TG-8000ｼﾘｰｽﾞ
(type E/M)
EMCC pwb

材質:
質量: kg

名称: カイロズ_EMCC

TOKIMEC
株式会社トキメック

尺度	日付	サイズ	図番	変番	シート
〜	03.07.12	B	10189542	4	5/5

Fig 9.5.1.5 HDM. (MAG/EHS)

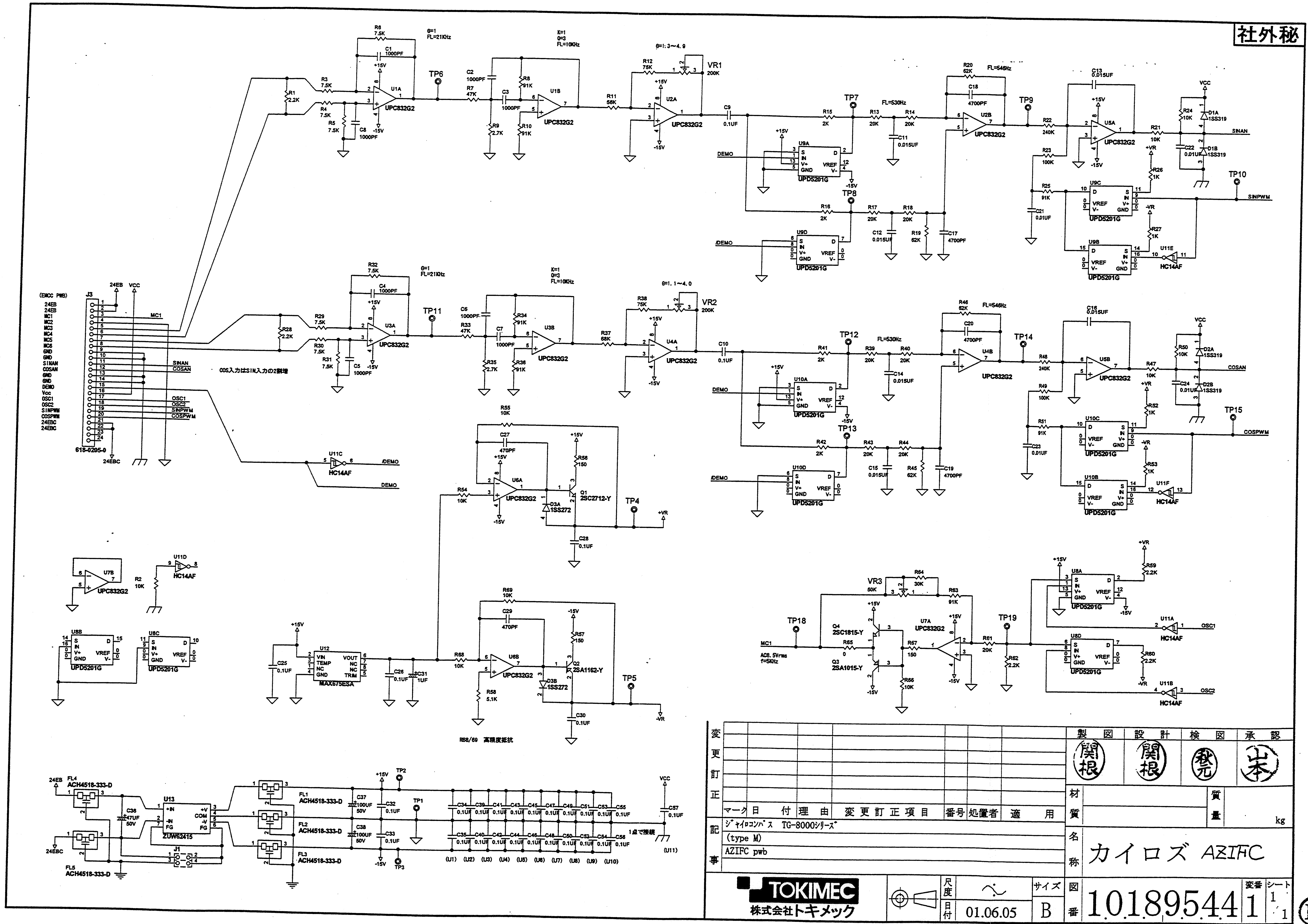
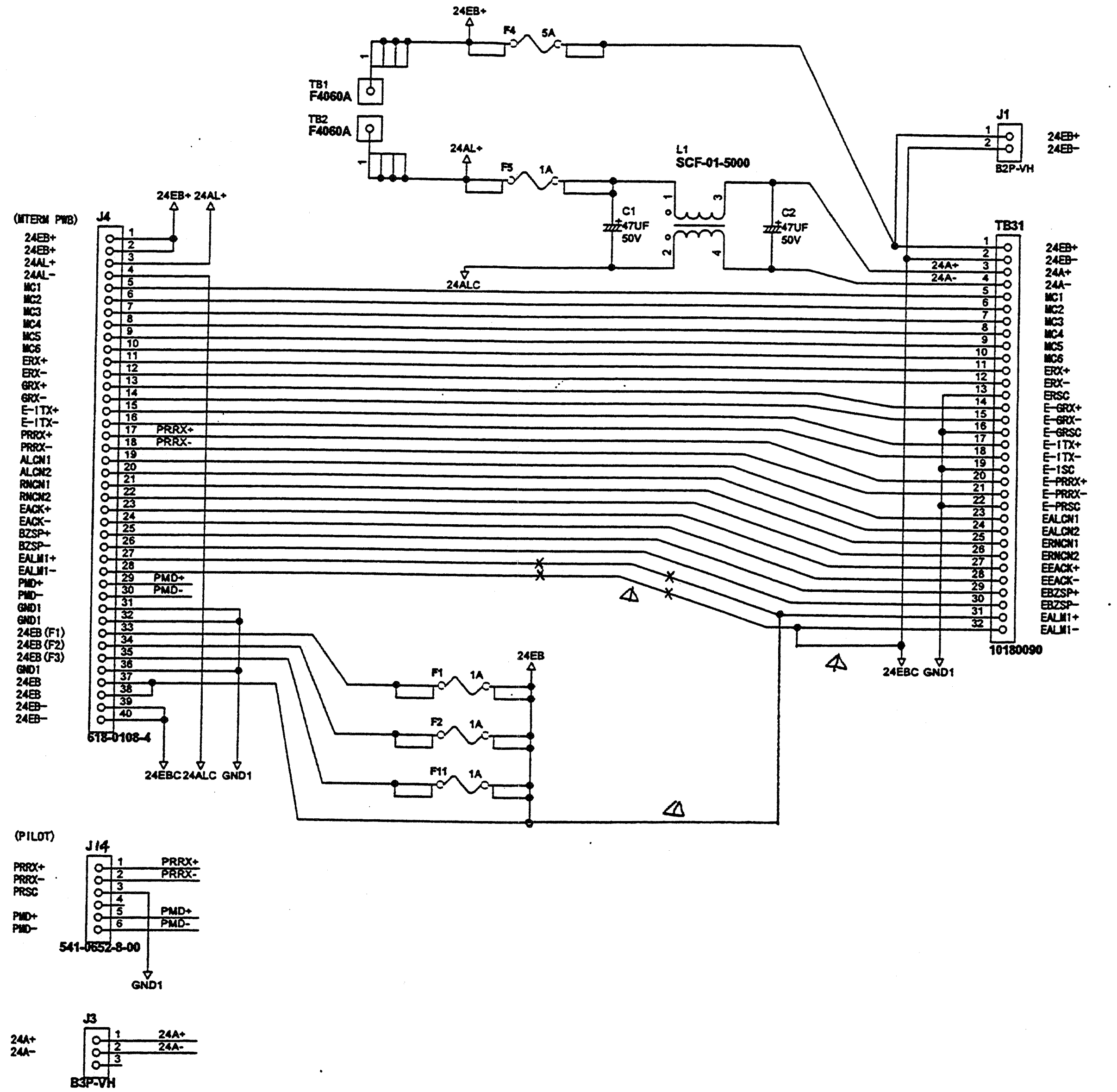


Fig 9. 5. 2. HDM. (MAG.)

社外秘



変更訂正							
	△	2003.05.16	TB31 31/32ピン変更	2	関根	6JB-4196	
		2003.01.20	全面書替	–	関根	6JB-4091	
		2002.11.11	量産対応	1	関根		
	マーク	日付	理由　変更訂正項目	番号	処置者	適用	

製図	設計	検図	承認
関根	関根	秋元	山本

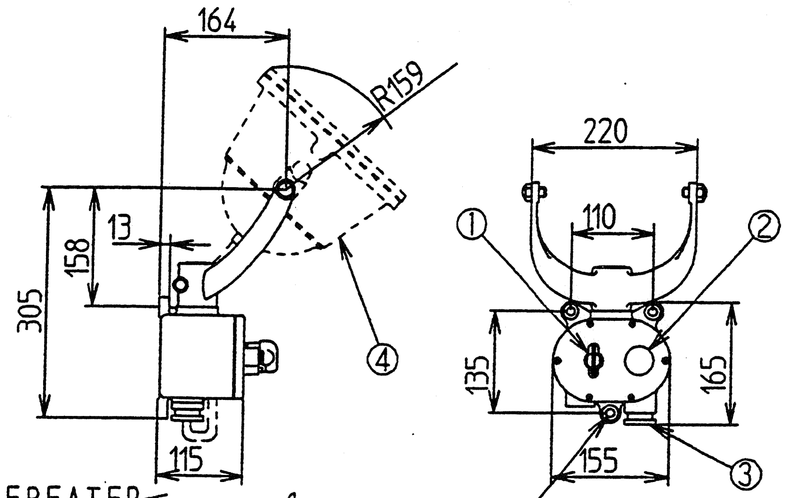
材質		質量	kg
記事	Gyrocompass TG-8000シリーズ (type E/M) MTERM pwb	名称	カイロズ_MTERM

TOKIMEC 株式会社トキメック	尺度	〜	サイズ B	図番 10189546 変番 1/2 シート 1/1
	日付	01.03.15		

3-

Fig 9.5.3 HDM. (MAG./EHS)

NAME	REPEATER MOUNTING MB TYPE	TYPE 型式番号	MB
名　称	MB型レピータ保持器	MASS 質量	3kg



REPEATER ← CABTIRE CABLE 1.8m SUPPLIED BY TOKIMEC

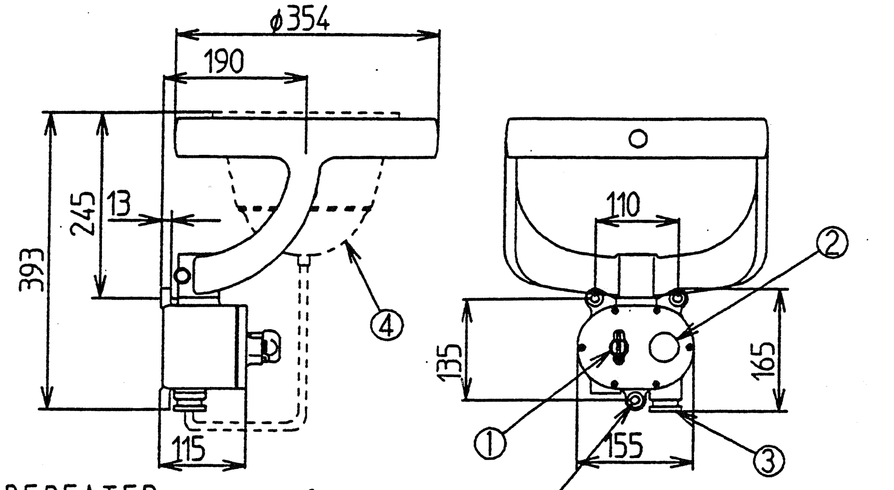
JUNCTION BOX: 11 12 13 14 15 16 / 1 2 3 4 5

GYRO COMPASS

3-φ11 MOUNTING HOLES 取付穴

NO.	NAME	名称
1	DIMMER	照明調整器
2	REPEATER SWITCH	レピータスイッチ
3	CABLE GLAND 25a	船用電線貫通金物 25a
4	(REPEATER)	(レピータ)

NAME	REPEATER MOUNTING BB TYPE	TYPE 型式番号	BB
名　称	BB型レピータ保持器	MASS 質量	6.7kg



REPEATER ← CABTIRE CABLE 1.8m SUPPLIED BY TOKIMEC

JUNCTION BOX: 11 12 13 14 15 16 / 1 2 3 4 5

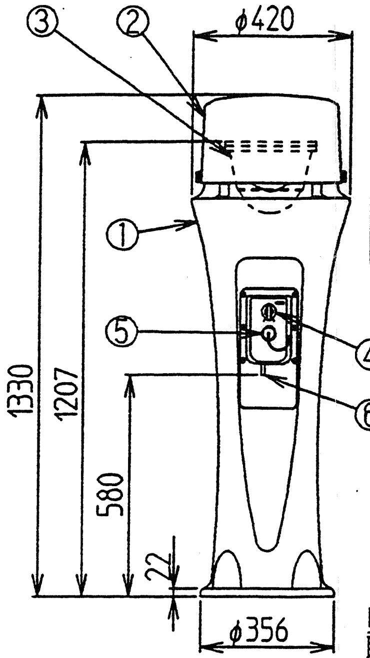
GYRO COMPASS

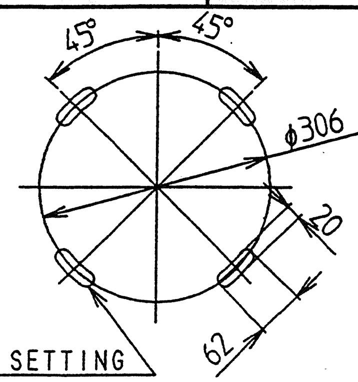
3-φ11 MOUNTING HOLES 取付穴

NO.	NAME	名称
1	DIMMER	照明調整器
2	REPEATER SWITCH	レピータスイッチ
3	CABLE GLAND 25a	船用電線貫通金物 25a
4	(REPEATER)	(レピータ)

NAME	REPEATER STAND BH TYPE	TYPE 型式番号	BH
名　称	BH型レピータスタンド	MASS 質量	24.4kg

NO.	NAME	名　称
1	STAND (F.R.P)	スタンド(F.R.P)
2	HELMET (F.R.P)	ヘルメット(F.R.P)
3	(REPEATER)	(レピータ)
4	DIMMER	照明調整器
5	REPEATER SWITCH	レピータスイッチ
6	CABLE GLAND 25a	船用電線貫通金物 25a





HOLES FOR SETTING 取付穴

COLOR(色):5Y9/0.5

NOTE:FLATNESS TOLERANCE OF INSTALLATION PLANE IS LESS THAN 0.5

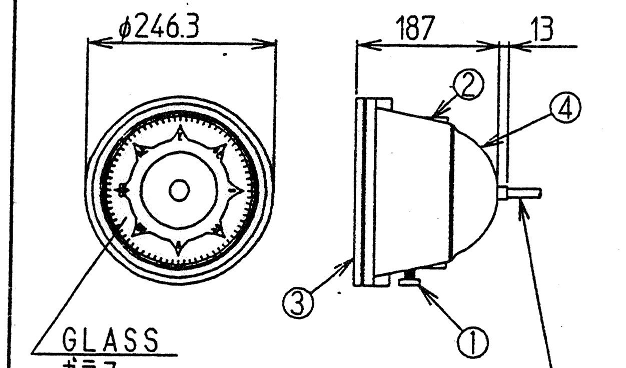
注 据え付け面の平面度0.5以下

REPEATER ← CABTIRE CABLE 1.8m SUPPLIED BY TOKIMEC

JUNCTION BOX: 11 12 13 14 15 16 / 1 2 3 4 5

GYRO COMPASS

NAME	REPEATER	TYPE 型式番号	RP-41-1
名　称	レピータ	MASS 質量	4.5kg



GLASS ガラス

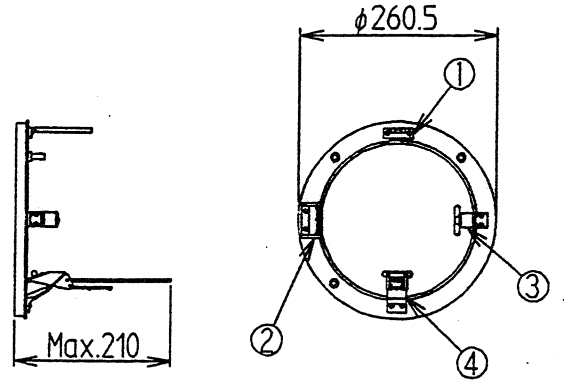
CABTIRE CABLE 1.8m SUPPLIED BY TOKIMEC

キャブタイヤケーブル1.8m トキメック所掌

NO.	NAME	名称
1	SYNCHRONIZING KNOB	同調ノブ
2	CASE(F.R.P)	ケース(FRP)
3	RING(BRONZE)	リング(青銅)
4	COVER(F.R.P)	カバー(FRP)

COLOR (色): N7.5

NAME	AZIMUTH CIRCLE	DWG NO 図番	10050009-
名　称	アジマスサークル	MASS 質量	2.8kg



NO.	NAME	名称
1	FINDER	ファインダー
2	MIRROR	鏡
3	PRISM & LENS	プリズムおよびレンズ
4	PRISM	プリズム

WITH BOX Max. 300×320×150

格納箱入 300×320×150以下

NOTE:PARTS WITH NO FIGURES ON "DELIVERED NO. PER VESSEL" OF COMPONENTS LIST ARE NOT DELIVERED.

注 構成員数表の数量欄に記入されていないものは、付属されません。

MARK	日付DATE	変更項目 REVISION	担当SIGN
	- -		
	- -		
	- -		
⚠	2001-04-10	アジマスサークル質量、高さ変更 その他寸法削除、方探接続箱削除	板倉

記事 NOTE: DC24Vステップ用

サイズ SIZE: B

GYRO COMPASS ACCESSORIES

ジャイロコンパス付属品

製図 DRAWN BY	設計 CHARGED BY	検図 CHECKED BY	承認 APPROVED BY
	N. Itakura	H. Yagisawa	K. Murbayashi

TOKIMEC

株式会社 トキメック TOKIMEC INC.

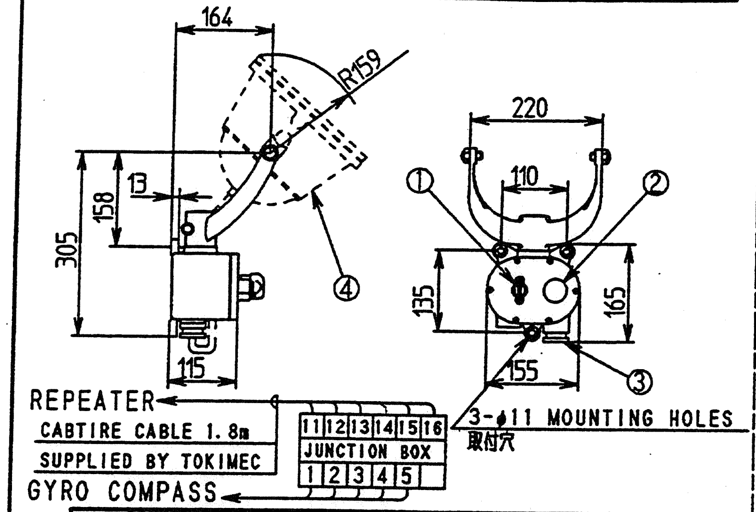
尺度 SCALE: ∾

日付 DATE: JAN.27.'95

図番 DRAWING: 10168020 | REV: 3 | SHT: 1/1

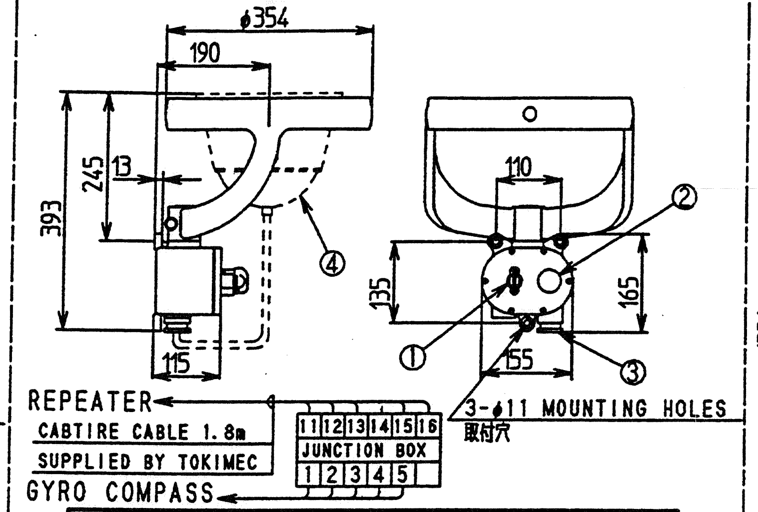
Fig. 9.6.1 (Repeater) STEP MOTOR

NAME	REPEATER MOUNTING MB TYPE	TYPE 形式	MB
名 称	MB型レピータ保持器	MASS 質量	4.0kg



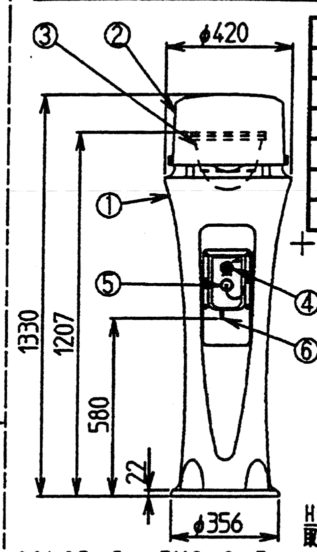
NO.	NAME	名称
1	DIMMER	照明調整器
2	REPEATER SWITCH	レピータスイッチ
3	CABLE GLAND 25a	船用電線貫通金物 25a
4	(REPEATER)	(レピータ)

NAME	REPEATER MOUNTING BB TYPE	TYPE 形式	BB
名 称	BB型レピータ保持器	MASS 質量	7.5kg

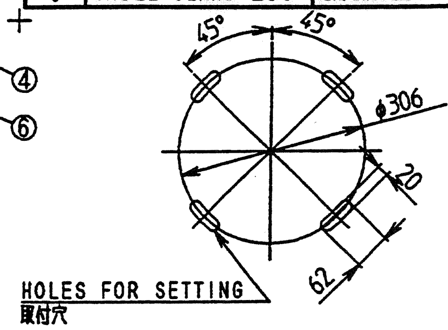


NO.	NAME	名称
1	DIMMER	照明調整器
2	REPEATER SWITCH	レピータスイッチ
3	CABLE GLAND 25a	船用電線貫通金物 25a
4	(REPEATER)	(レピータ)

NAME	REPEATER STAND BH TYPE	TYPE 形式	BH
名 称	BH型レピータスタンド	MASS 質量	24.4kg



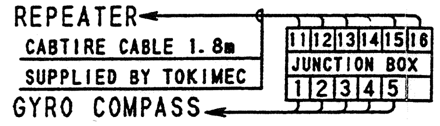
NO.	NAME	名 称
1	STAND (F.R.P)	スタンド(F.R.P)
2	HELMET (F.R.P)	ヘルメット(F.R.P)
3	(REPEATER)	(レピータ)
4	DIMMER	照明調整器
5	REPEATER SWITCH	レピータスイッチ
6	CABLE GLAND 25a	船用電線貫通金物 25a



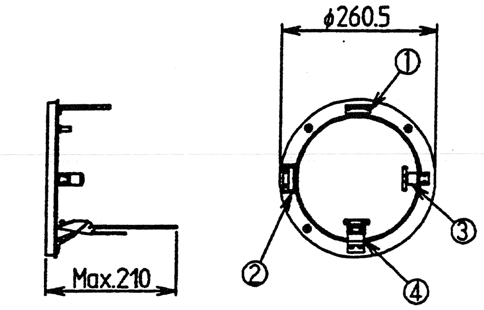
COLOR(色):5Y9/0.5

NOTE:FLATNESS TOLERANCE OF INSTALLATION PLANE IS LESS THAN 0.5

注 据え付け面の平面度0.5以下



NAME	AZIMUTH CIRCLE	DWG NO 図番	10050009-
名 称	アジマスサークル	MASS 質量	2.8kg

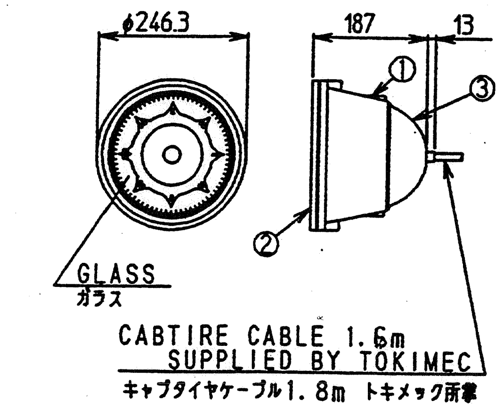


NO.	NAME	名称
1	FINDER	ファインダー
2	MIRROR	鏡
3	PRISM & LENS	プリズムおよびレンズ
4	PRISM	プリズム

WITH BOX Max.300×320×150

箱梱包入 300×320×150以下

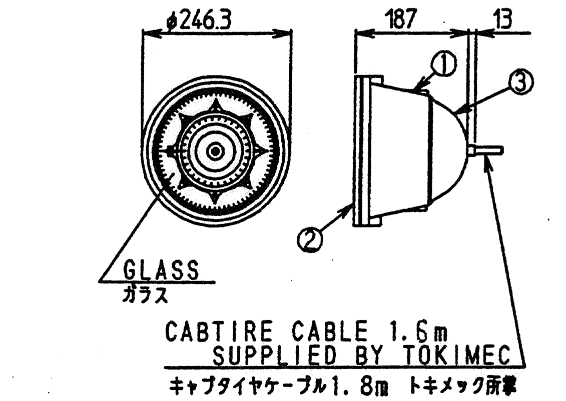
NAME	REPEATER	TYPE 形式	RP-51-1
名 称	レピータ	MASS 質量	4.5kg



NO.	NAME	名称
1	CASE(F.R.P)	ケース(FRP)
2	RING(BRONZE)	リング(青銅)
3	COVER(F.R.P)	カバー(FRP)

COLOR (色): N7.5

NAME	REPEATER(OPEN SCALE)	TYPE 形式	RP-53-1
名 称	レピータ(オープンスケール)	MASS 質量	4.5kg



NO.	NAME	名称
1	CASE(F.R.P)	ケース(FRP)
2	RING(BRONZE)	リング(青銅)
3	COVER(F.R.P)	カバー(FRP)

COLOR (色): N7.5

NOTE:PARTS WITH NO FIGURES ON "DELIVERED NO. PER VESSEL" OF COMPONENTS LIST ARE NOT DELIVERED.

注 構成品数表の数量欄に記入されていないものは、付属されません。

MARK	日付DATE	変更項目 REVISION	担当SIGN
	- -		
	- -		
	- -		
	- -		

記事 NOTE
シリアル用

サイズ SIZE: B

GYRO COMPASS ACCESSORIES
ジャイロコンパス付属品

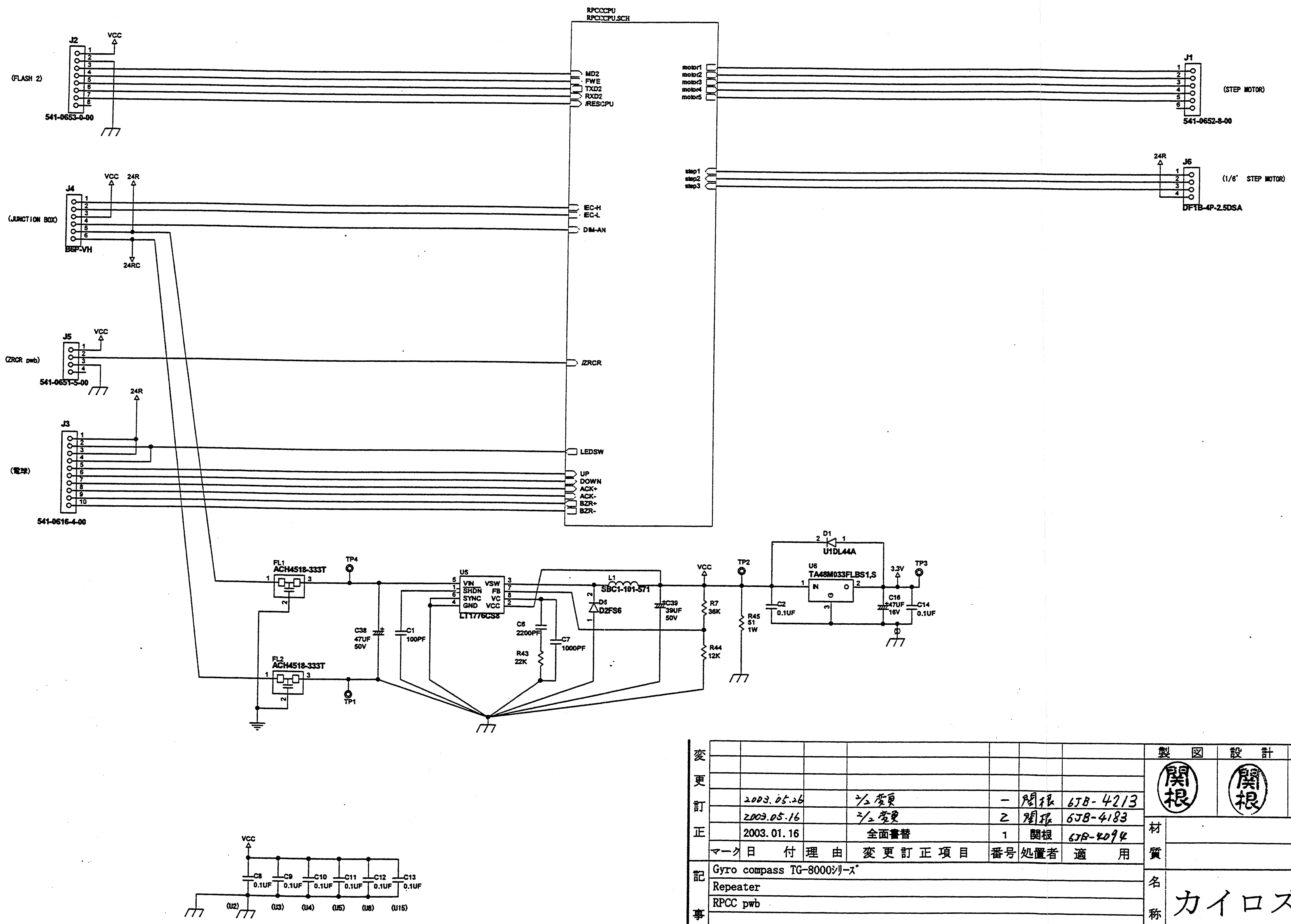
製図 DRAWN BY	設計 CHARGED BY	検図 CHECKED BY	承認 APPROVED BY
Y. Yoshida	Y. Yoshida	M. Akimoto	K. Yamamoto

TOKIMEC
株式会社 トキメック TOKIMEC INC.

尺度 SCALE	日付 DATE	図番 DRAWING	REV	SHT
~	2002-04-12	10990018	1	1/1

Fig. 9.6.2 (Repeater)
SERIAL SIGNAL

社外秘



マーク	日付	理由	変更訂正項目	番号	処置者	適用
	2003.05.26		2/2 変更	一	関根	6JB-4213
	2003.05.16		2/2 変更	2	関根	6JB-4183
	2003.01.16		全面書替	1	関根	6JB-4094

製図	設計	検図	承認
関根	関根	秋元	山本

記事:
Gyro compass TG-8000シリーズ
Repeater
RPCC pwb

材質:
質量: kg

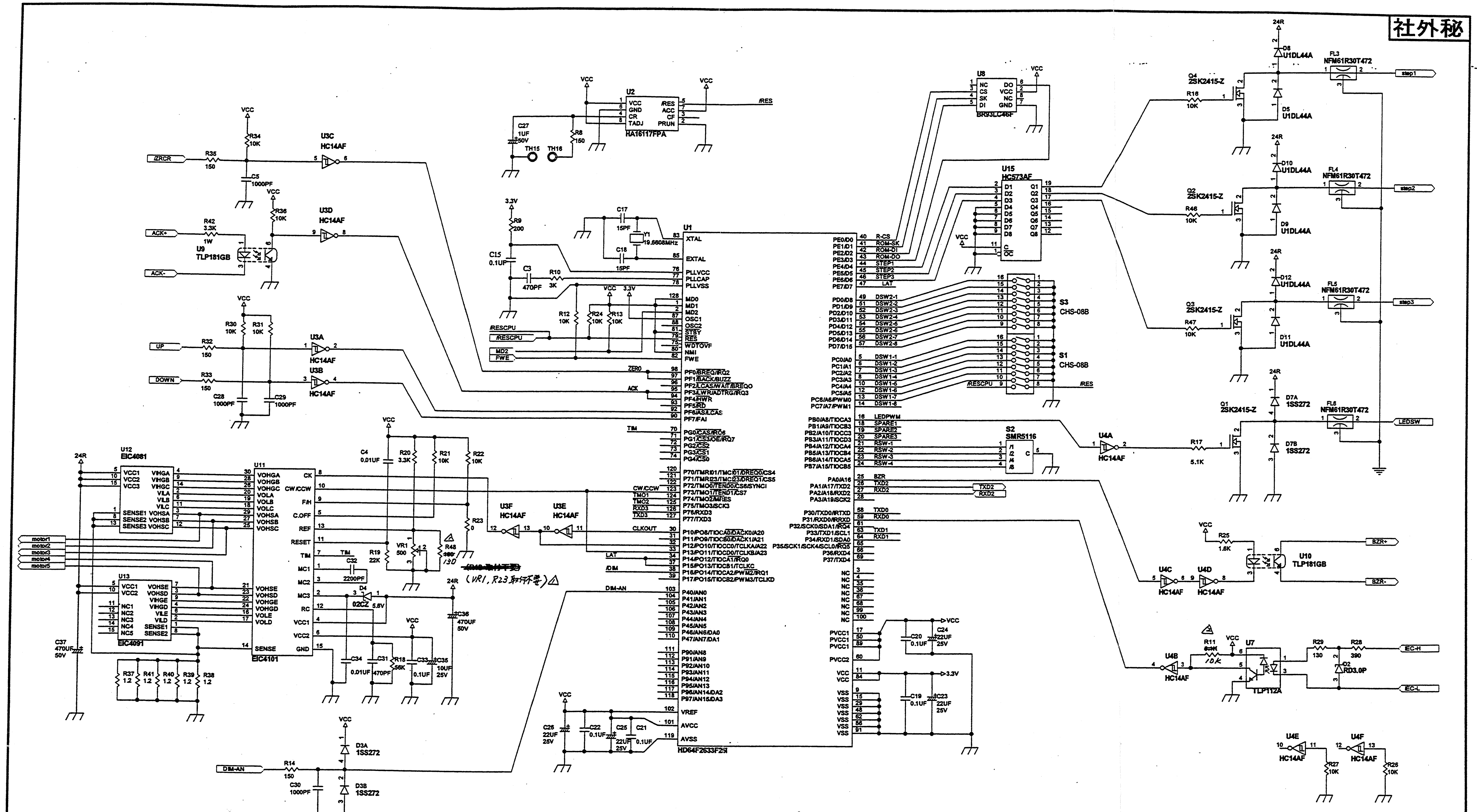
名称: カイロズ RPCC

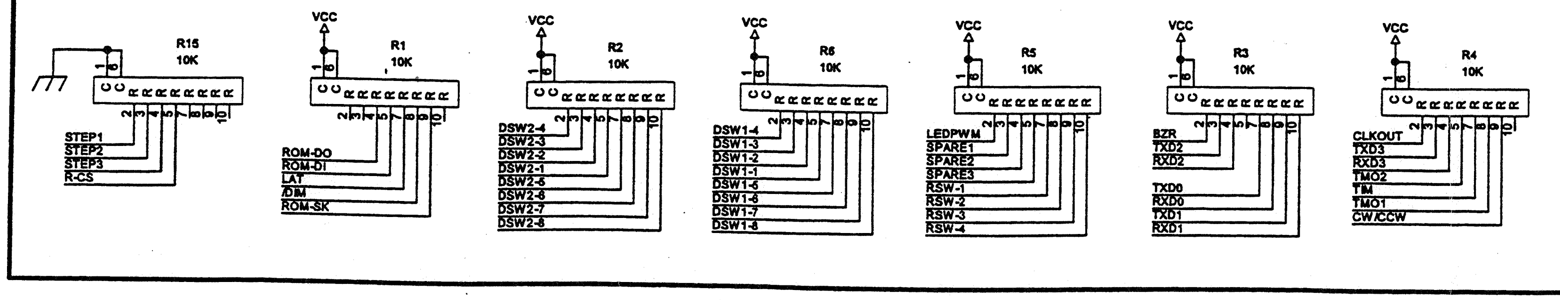
TOKIMEC
株式会社トキメック

尺度: ～
日付: 01.09.20
サイズ: B
図番: 10189550
変番: 1 2
シート: 1/2

Fig. 9.6.3.1 SERIAL SIGNAL TYPE REPEATER

社外秘





	マーク	日付	理由	変更訂正項目	番号	処置者	適用
1-	△	2003.05.26	R11変更		一	関根	6JB-4213
2-	△	2003.05.16	R48変更, VR1, R23削除		2	関根	6JB-4183
		2003.02.01	全面書替		一	関根	6JB-4094
		2003.01.16	全面書替		1	関根	

製図	設計	検図	承認
関根	関根	秋元	山本

材質		質量	kg
記事	Gyro compass TG-8000シリーズ Repeater RPCC pwb	名称	カイロズ RPCC
尺度	～	サイズ	B
日付	01.09.20	図番	10189550
変番	1 (2)	シート	2/2

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Fig 9.6.3.2 SERIAL SIGNAL TYPE REPEATER