MAINTENANCE MANUAL

GYROCOMPASS
TG-8000

SG12-SE005

Mar. 21, 2013

TOKYO KEIKI INC

CONTENTS

[1] MAINTENANCE INTERVAL

GYROCOMPASS

TG-8000

1. Maintenance and check interval

Perform **"[2] MAINTENANCE AND CHECK"** once a year.

2. Recommendation of replacement parts

Parts	Interval (Year)	Parts No.	Q'ty	Remark
SENSITIVE ELEMENT	2～3	10229409H	1	
BRUSH	2	10239379 and 10239380	1set	
STEP MOTOR	6	10189046	1	
BELT	6	10160030	1	
HRZC PWB	6	10169503	1	Need following insulation separator (tube). 20565709 Q'ty:1
INVERTER PWB	6	10169109 or (10169537)	1	10169109, includes insulation separators (tube). 10169537, need following insulation separators (tube). 20565708 Q'ty:3 20565709 Q'ty:8
GPOWER PWB	6	10189517	1	
FLEXIBLE WIRE (EAST)	8	10169706	1	
SLIP-RING	8	10169260	1	

[2] MAINTENANCE AND CHECK

GYROCOMPASS
TG-8000

Record data to attached sheet
"GYROCOMPASS TG-8000 CHECK SHEET"
TKS FORM CSA-CK2056A

1. Internal parameter check

1-1. Internal parameter.

1-1-1. Press SET & ACK/ENT at the same time for more than 3 seconds.
This will enter into extended menu.

1-1-2. Record parameters.
Parameter : Standard value (Press SET or DISP and change it.)

1	A-1	1.1.U	Damping gain: 00.75
2		1.2.F	Azimuth servo gain: 01.00
3		1.3.S	Horizontal servo gain: 01.00
4		1.4.u	Leveling servo gain ratio: 00.50～01.00
5		1.5.L	Φ offset: 00.00
6		1.6.t	Θ offset: 00.00
7		1.7.G	X pickup gain: 02.25
8		1.8.c	Ks/H: 1.300
*9		1.9.r	Maximum rate of turn: ***.*
*10		1.A.F	Maximum deviation Azimuth servo: **.**
*11		1.b.S	Maximum deviation horizontal servo: **.**
12	A-2	2.1.o	Azimuth offset A: ***.*
13		2.2.O	Azimuth offset B: **000.0 (No use)**
14		2.3.h	Zero cross Azimuth: 345.3
15		2.4.E	Zero cross error width: 002.0
16		2.5.y	Year: ****
17		2.6.N	Month, Day: **.**
18		2.7.t	Hour, minute: **.**
*19		2.8.d	Total operating days: ****
20		2.9.G	Display/setting of GPS connection: **
21		2.A.L	Display/setting of LOG connection: **
22		2.b.S	Display/setting of LOG(serial) connection: **
23		2.c.t	Display/setting of "GGA" performance index is ignored or evaluated: **
24		2.d.o	Analog output offset for rate of turn: ***.*
25		2.e.F	Filter time constant for rate of turn: ***.*
26		2.F.G	Analog output gain for rate of turn: *.***
※27	A-3	3.1.E	Alarm(Error):
*28		3.2.n	Zero cross error number of occurrences: ****
*29		3.3.H	Zero cross error maximum: ***.*
*30		3.4.y	Zero cross error occurrences year: ****
*31		3.5.N	Zero cross error occurrences month day: **.**
*32		3.6.t	Zero cross error occurrences hour minute: **.**
*33		3.7.n	Encoder error number of occurrences: ****
*34		3.8.r	SCC reset number of occurrences: ****
35	A-7	7.2.t	SCC Software version: *.***
36		7.3.u	MCC Software version: *.***
37	A-8	8.3.L	Rotor tilting angle monitor: **.**
38		8.4.t	Master compasses temperature: ***.*(Below 65℃)

*** Clear it only at the time of overhaul in ▲ or ▼→ENT.**

※ Clear it only at the time of overhaul in SET→ENT.

(Push ▲ and change it.)
Err
↓
Y 2011 (2011:year)
↓
0217 (2:month 17:day)
↓
0912 (9:hour Rotor inclination abnormal.)

Error code

Record more than most recent ten errors.

Fig. 2-1 Internal parameter display

1-1-3. Press SET & ACK/ENT at the same time for more than 3 seconds.
This will return to normal mode.

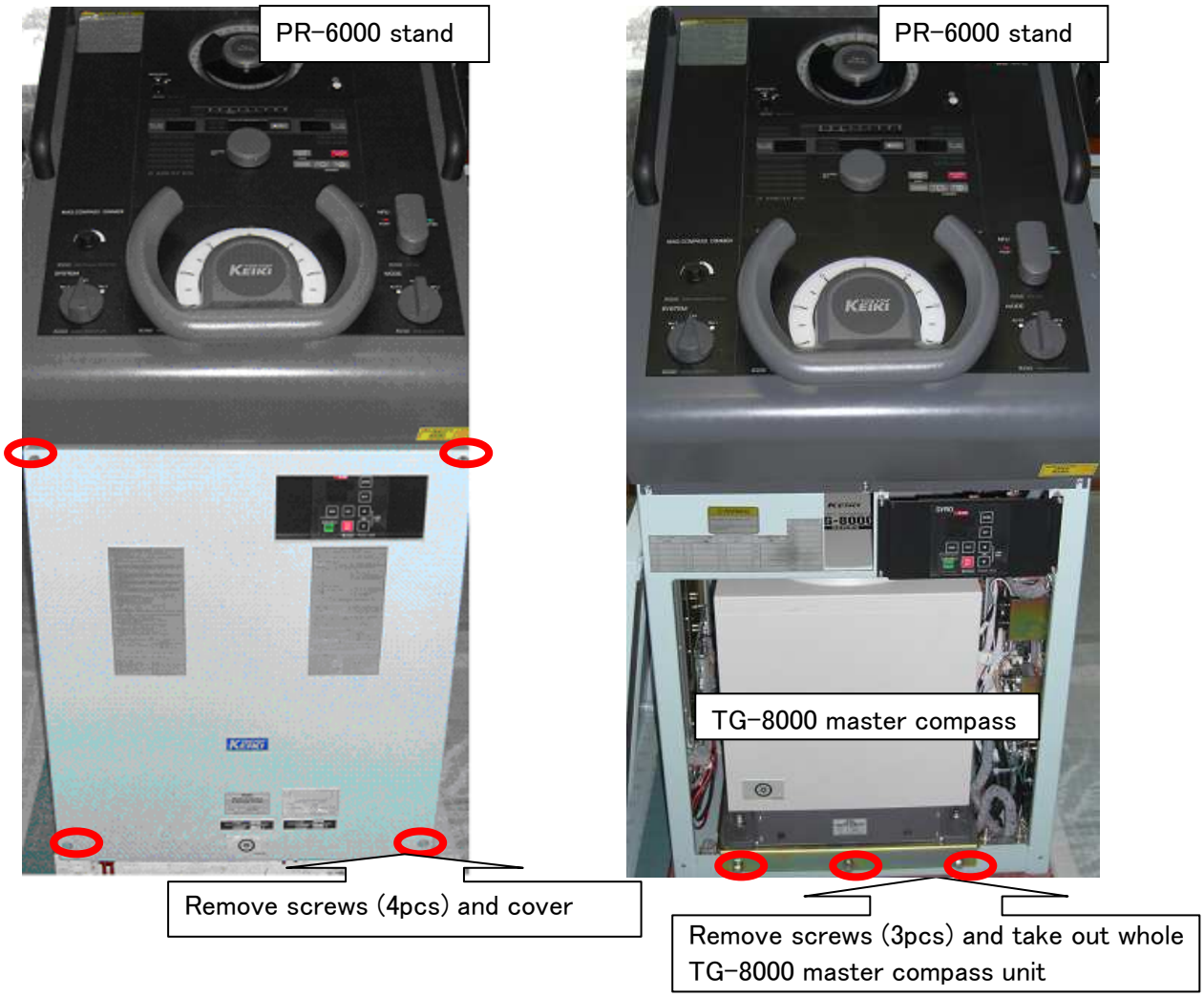
2. Preparations

2-1. Press DISP+ SET on the operation panel, then turn on the POWER (Test mode b).
Wait until the phantom ring turns for 360 degrees. Wait up to 4 minutes until the rotor in the sensitive element stops spinning.

2-2. Turn off the POWER.

Fig. 2-2 PR-6000 stand and TG-8000 operation panel

2-3. In case TG-8000 master compass is in PR-6000 stand, remove the master compass from PR-6000.



2-4. Remove 4 screws “A”～“D” and remove the case of TG-8000 master compass.

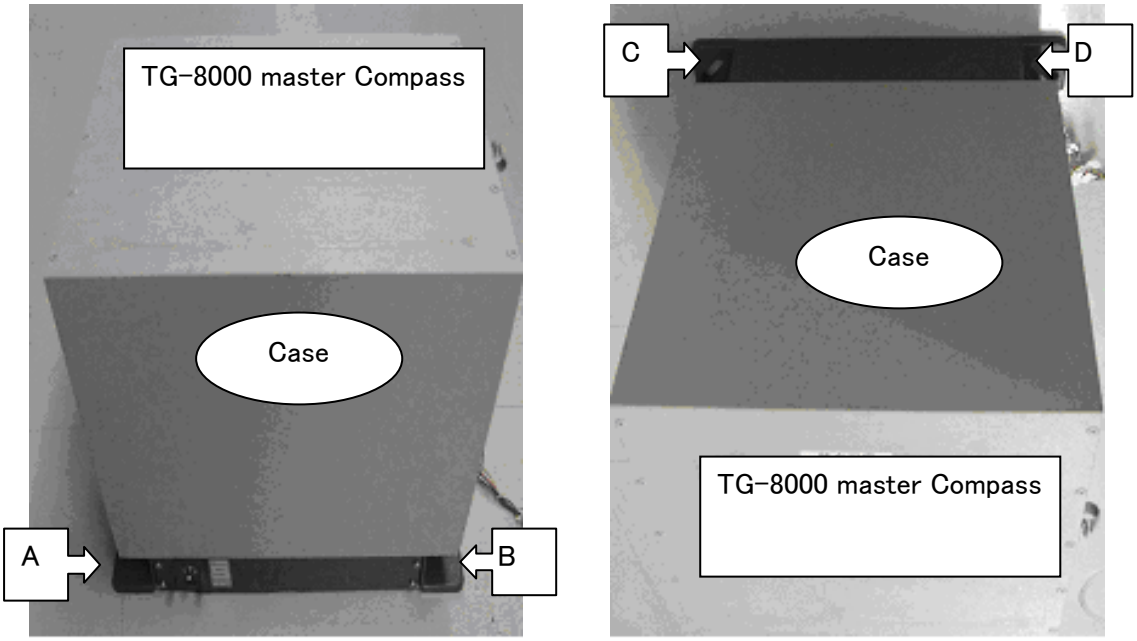
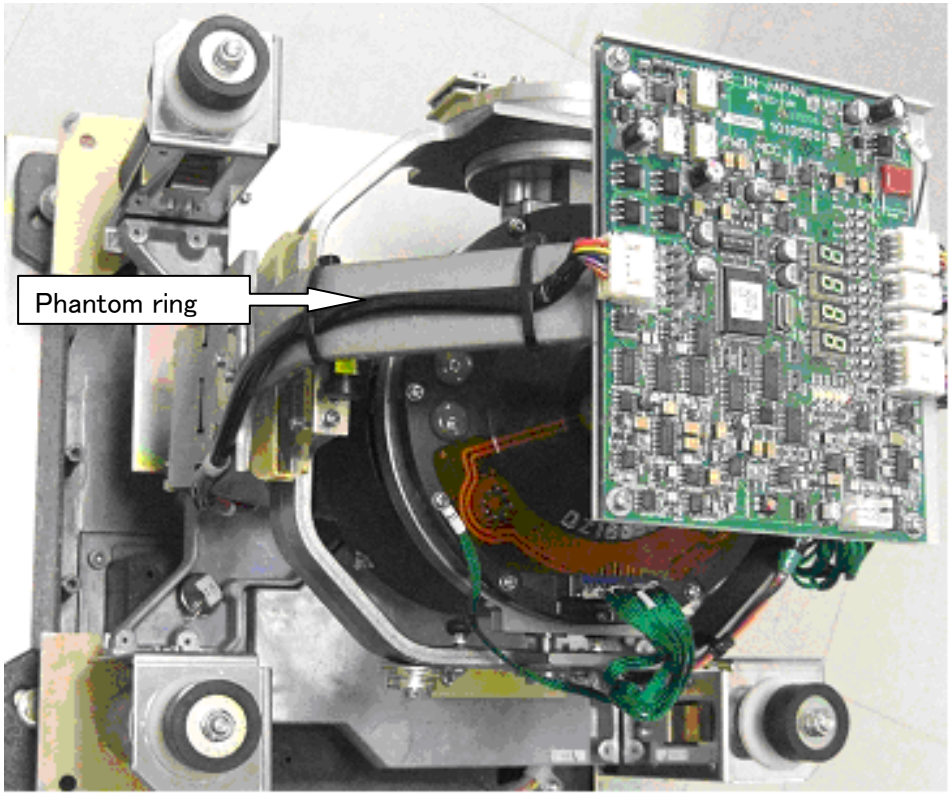


Fig. 2-3 PR-6000 stand and TG-8000 master Compass

☆ If sensitive element is not replaced, proceed to 「3. Step motor assembly check」

☆ 2-5. Rotate the phantom ring until the connector comes to the front as shown in the picture.



☆ 2-6. Remove 4 screws “E”～“H”.
Loosen screw “I” to remove the connector.

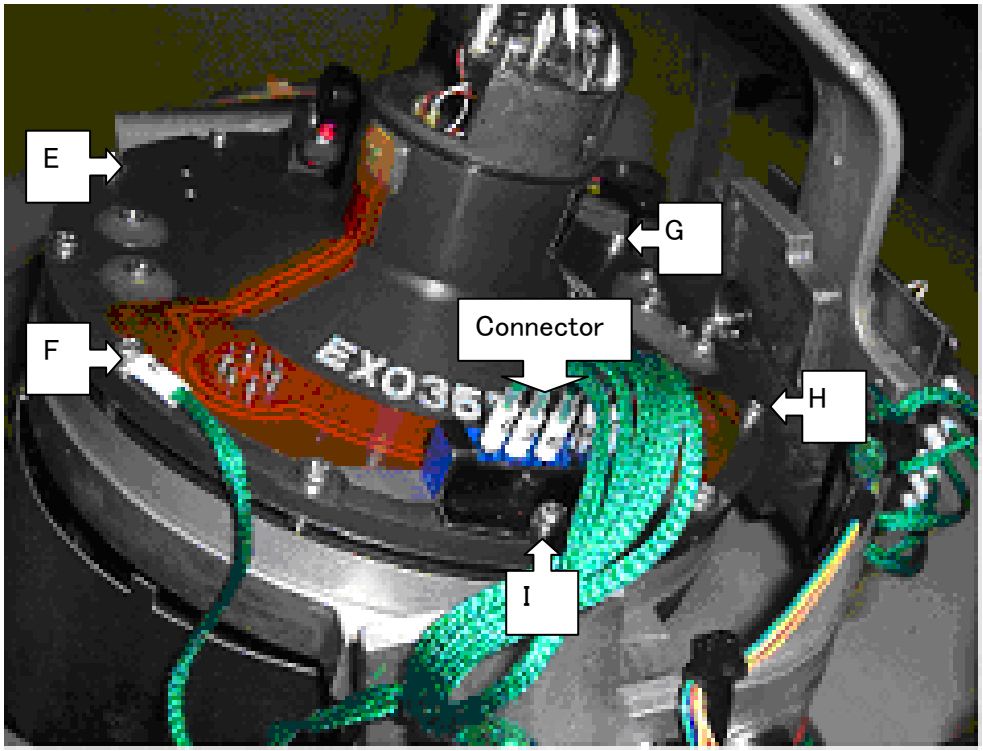


Fig. 2-4 Phantom ring and sensitive element

☆ 2-7. Grab the neck of sensitive element firmly as shown in the picture and take it out from the mounting ring.

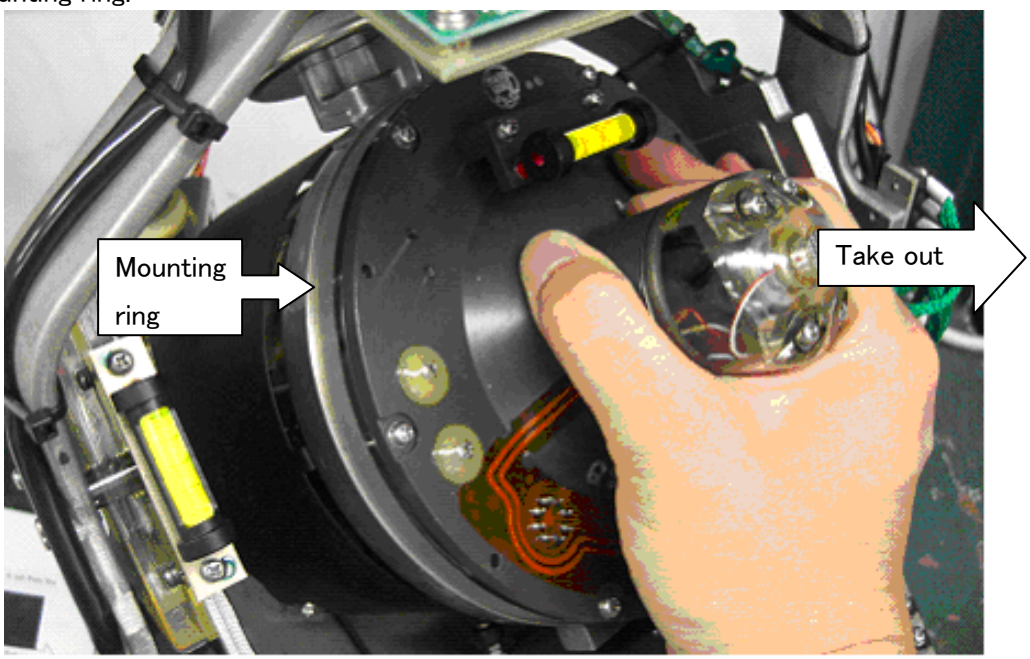


Fig. 2-5 Mounting ring and sensitive element

3. Step motor assembly check

If step motor exchange is necessary,
refer to "[3] STEP MOTOR EXCHANGE"

3-1. Take out nuts (all 4 corners), remove the shock absorbers.

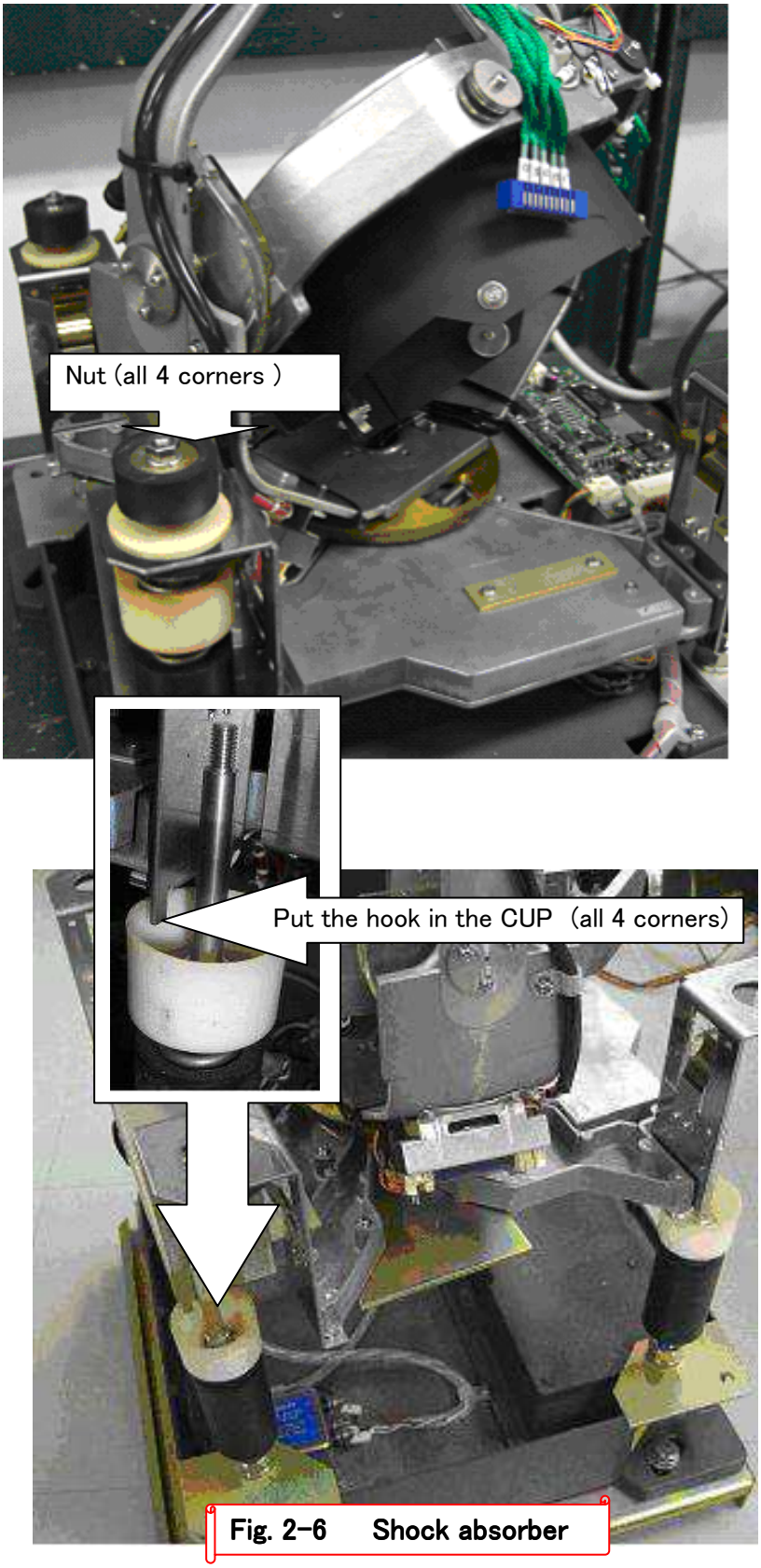
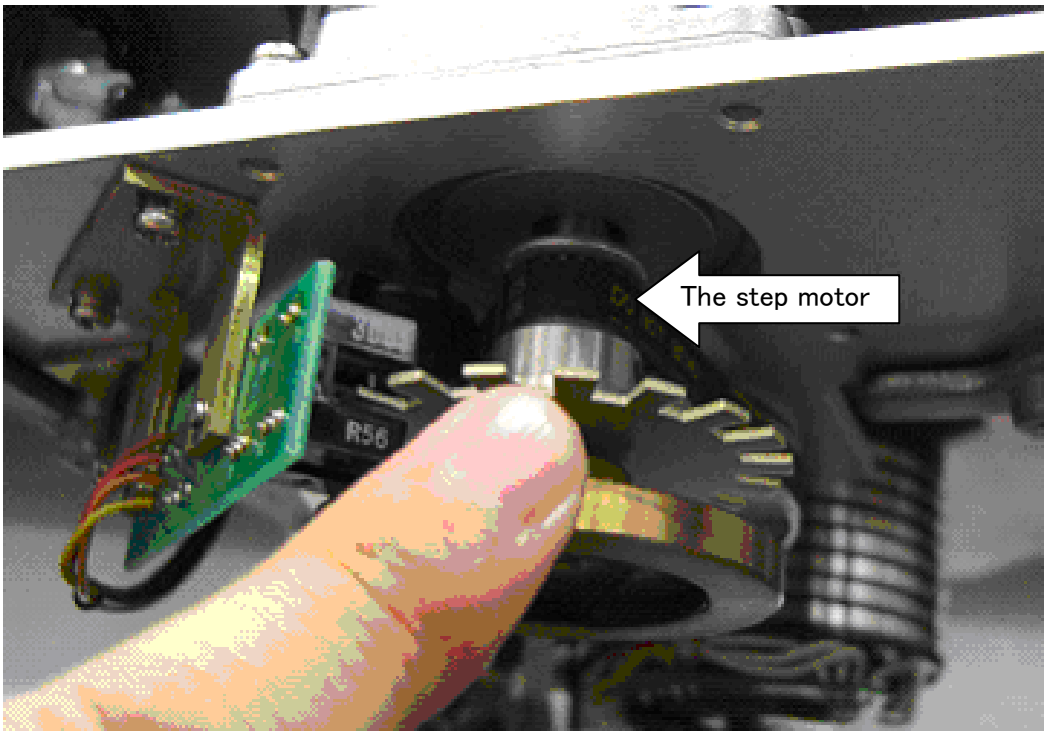


Fig. 2-6 Shock absorber

3-2. Step motor axis rotation should be smooth.



3-3. Tension pressure of step motor assembly belt should be appropriate and the belt should move smoothly.

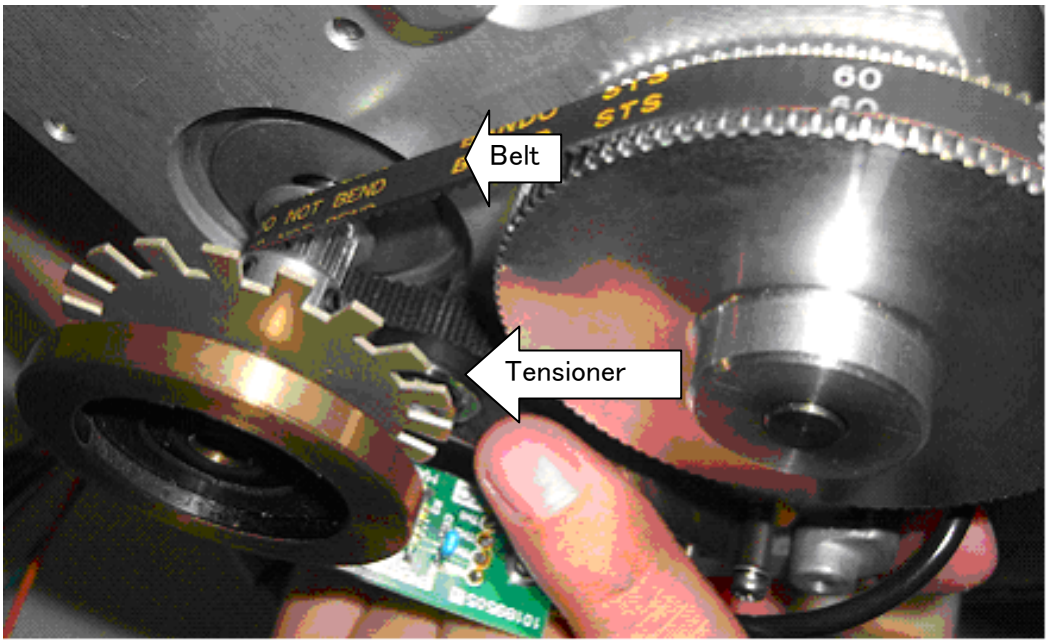
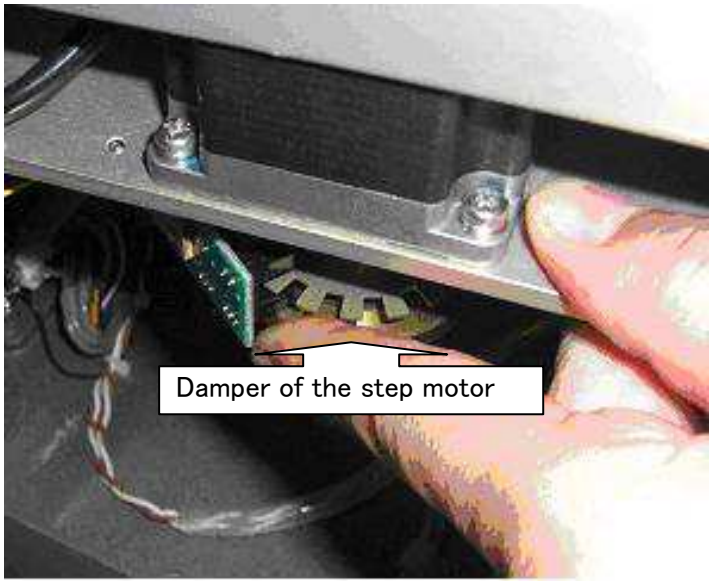


Fig. 2-7 Step motor assembly

3-4. Azimuth double gears check.

3-4-1. Hold the damper of the step motor, so that one side of the Azimuth gears do not move.



3-4-2. The play of phantom ring (azimuth double gears) (CW/CCW) should be about 0.1°
Check the play of azimuth double gears at phantom ring position : 0/90/180/270° (4 points).

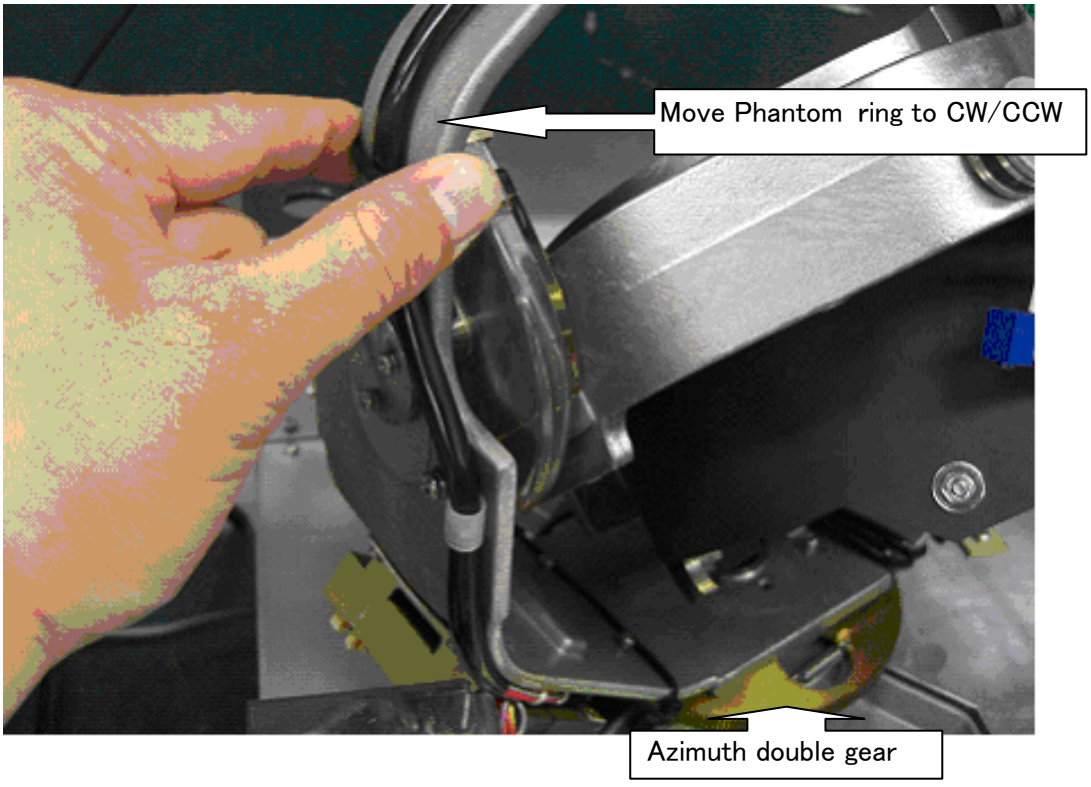


Fig. 2-8(1) Phantom ring (azimuth double gears) play check

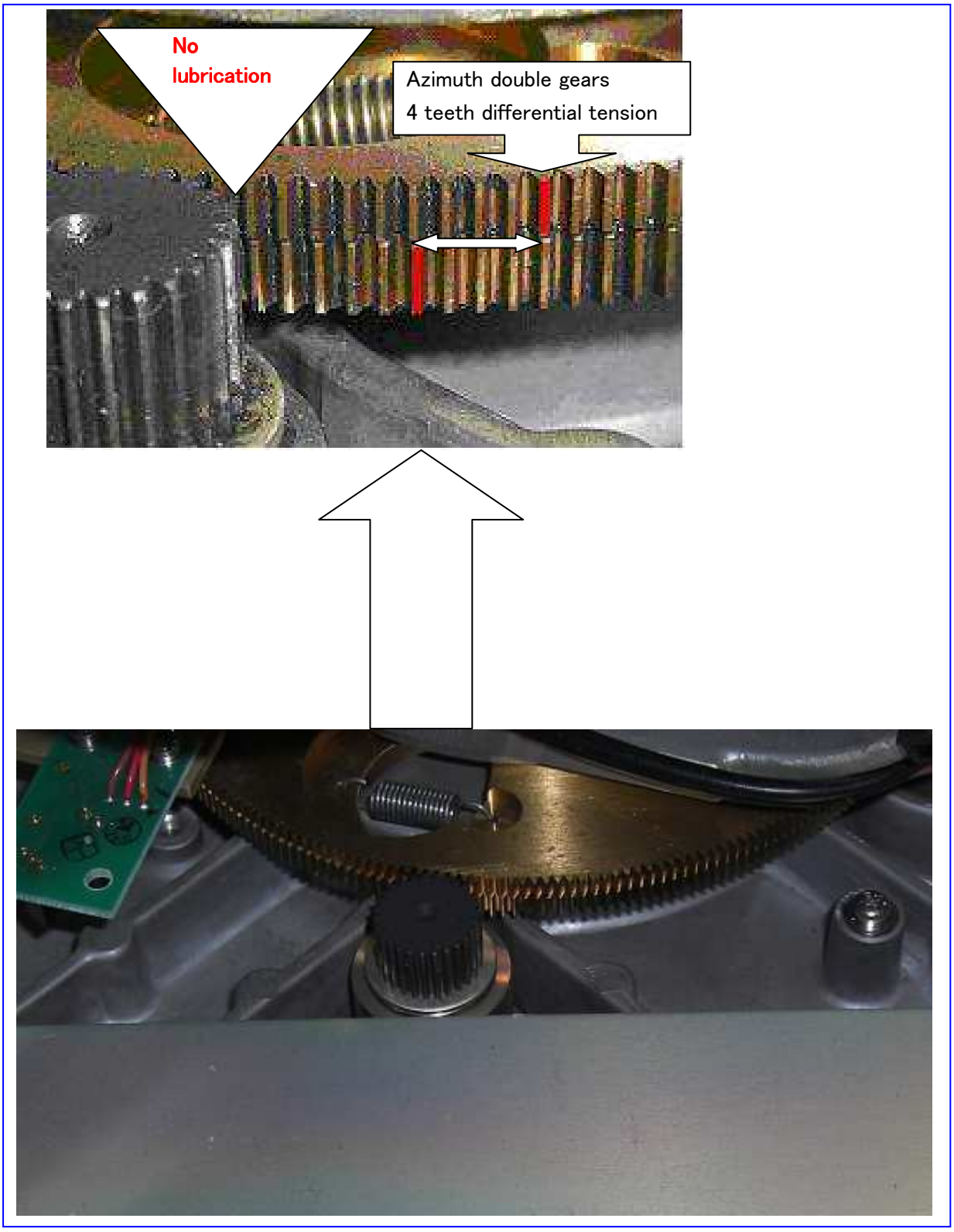


Fig. 2-8(2)　Azimuth double gears

4. Brush and slip-ring check

If brush(exchange) and slip-ring cleaning is necessary,
refer to "[4] BRUSH (EXCHANGE) AND SLIP-RING CLEANING".

If slip-ring exchange is necessary,
refer to "[5] SLIP-RING EXCHANGE ".

4-1. Brush head should be firmly in contact with slip-ring rotor.

4-2. Slip-ring and brush should be clean.

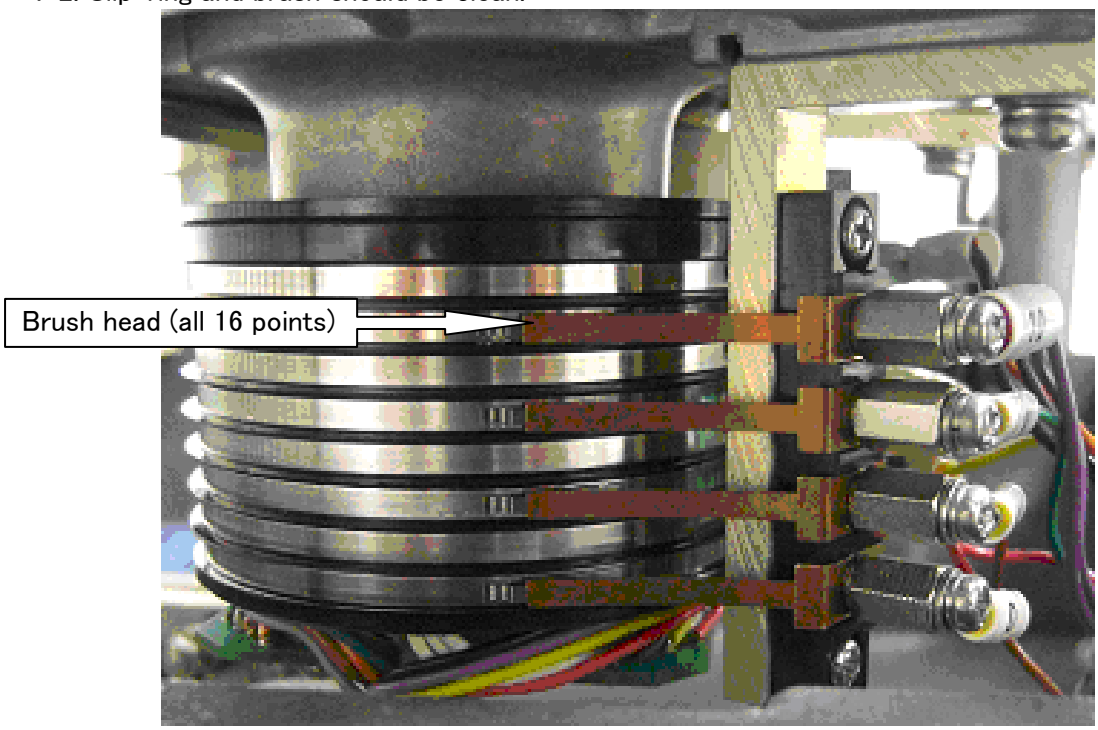
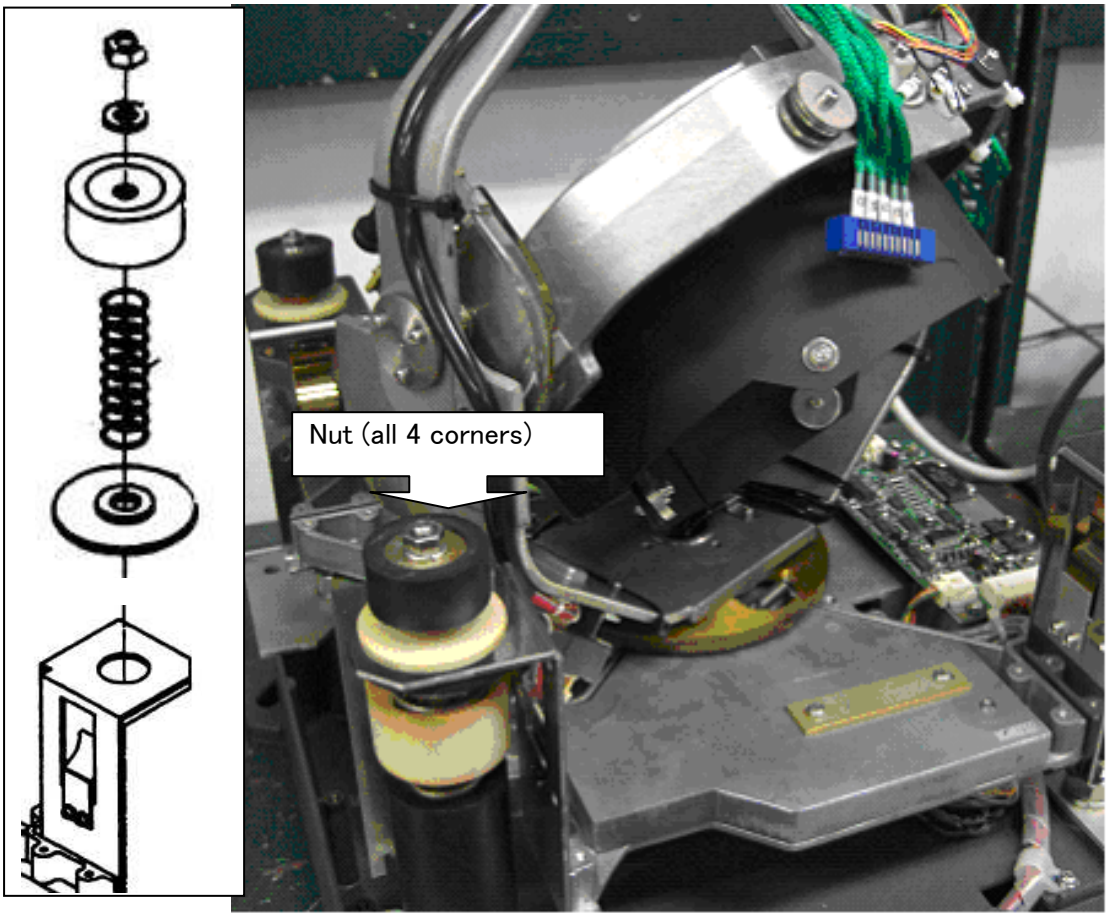


Fig. 2-9 Brush and slip-ring

5. Shock absorbers check

5-1. Install the shock absorbers.

5-1-1. Put back the shock absorbers, fasten nuts at all 4 corners.



5-2. All the shock shock absorbers should move smoothly.

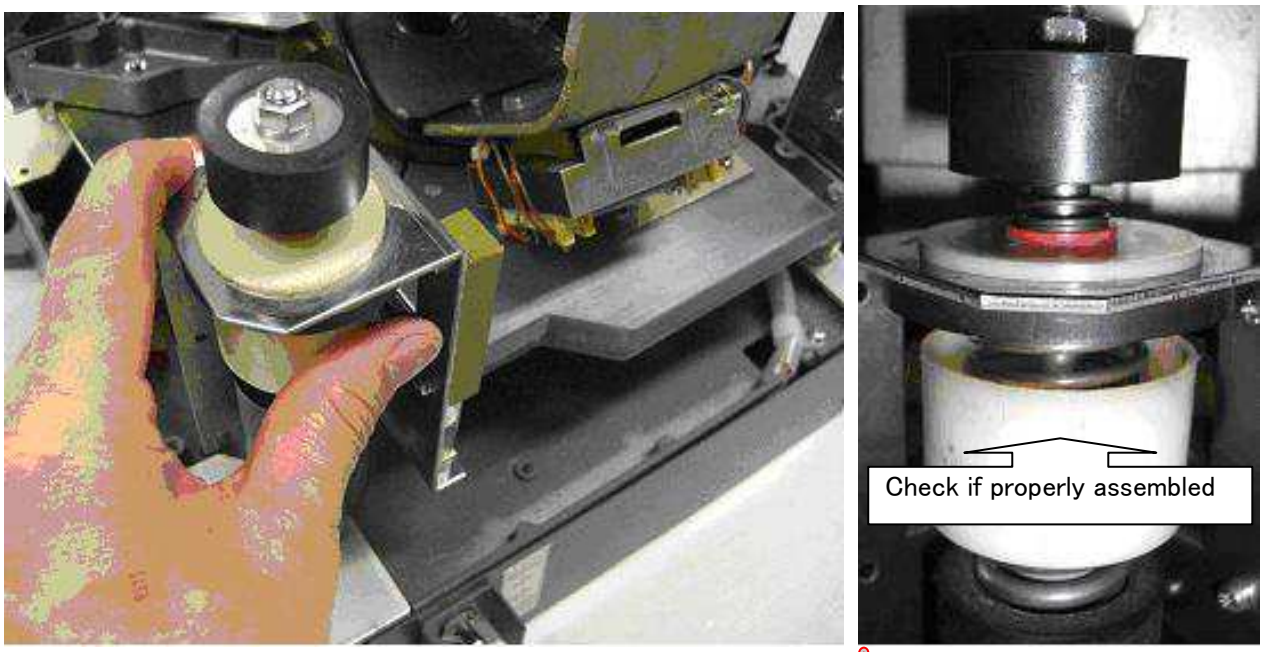


Fig. 2-10 Shock absorbers

6. Sensitive element check

If sensitive element exchange is necessary,
refer to "[6] SENSITIVE ELEMENT EXCHANGE".

6-1. Sensitive element should not have oil leakage.
6-2. Sensitive element connector should be firmly in contact.

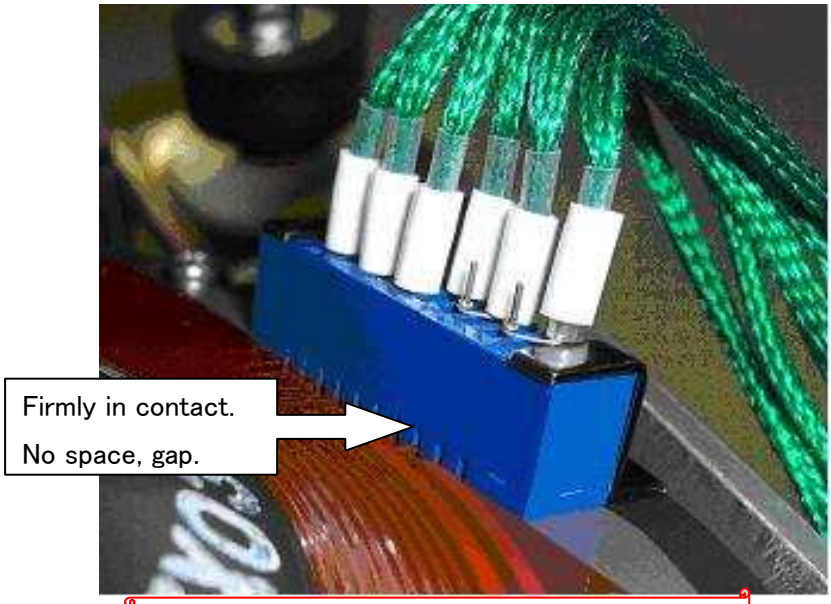


Fig. 2-11 Sensitive element connector

6-3. Sensitive element should tilt about 15～20 degrees with no power.

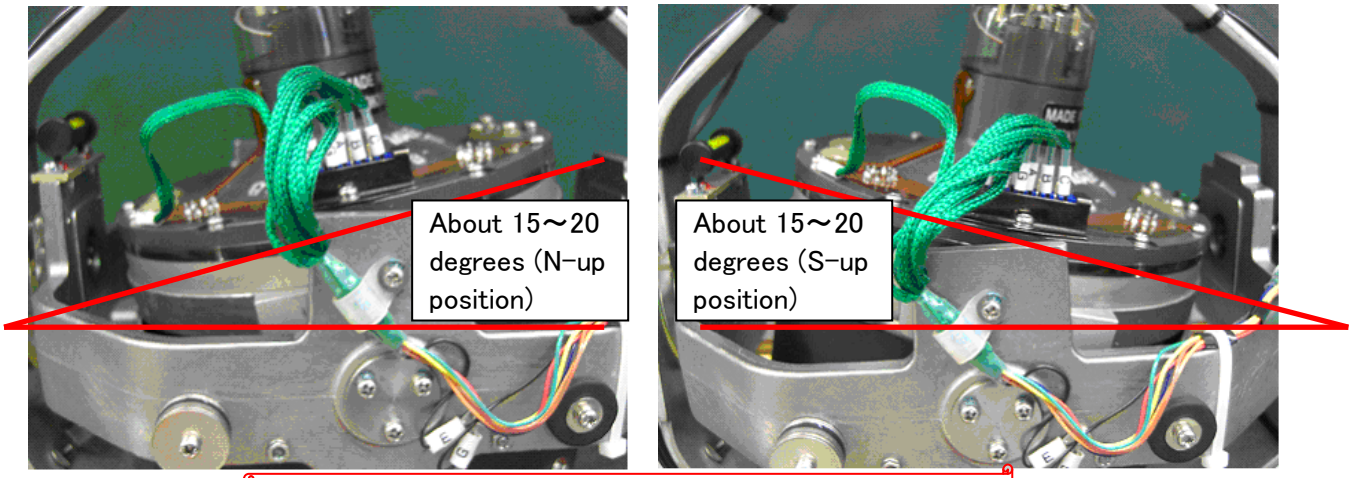


Fig. 2-12 Sensitive element tilt (N/S-up position)

6-4. Sensitive element should move smoothly until it hits the stopper in both directions (N-up、S-up).

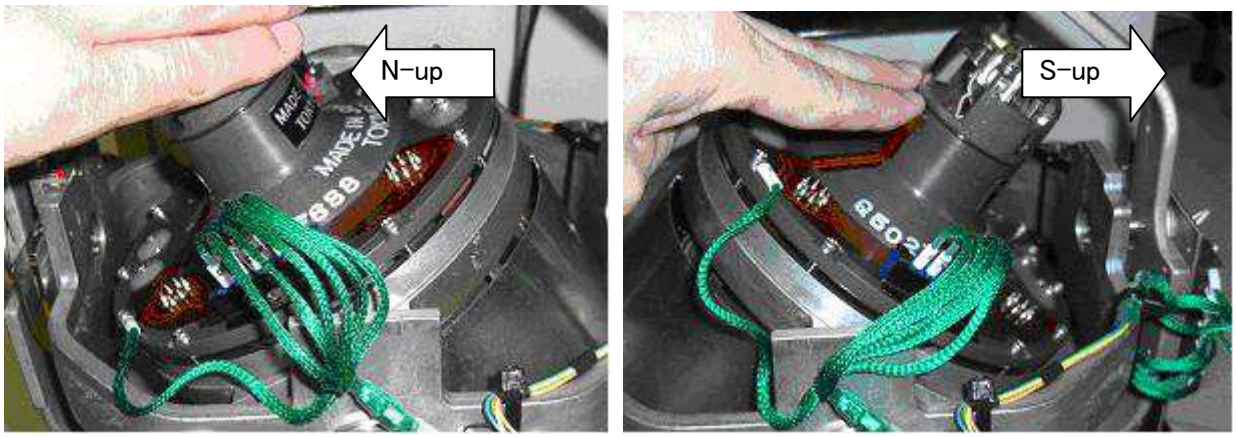
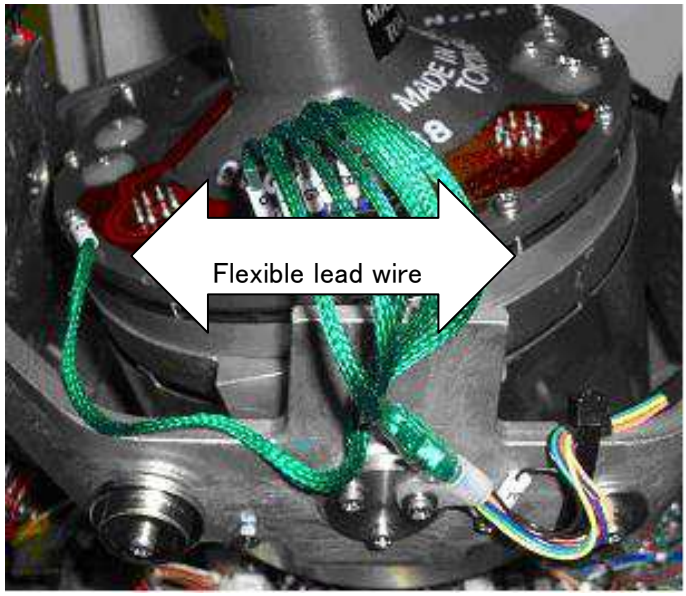


Fig. 2-13
Sensitive element
N/S-up directions

6-5. Flexible lead wire should be shaped in line and do not have friction.



6-6. Horizontal ring should move smoothly until it hits the stopper in both directions (E-up、W-up).

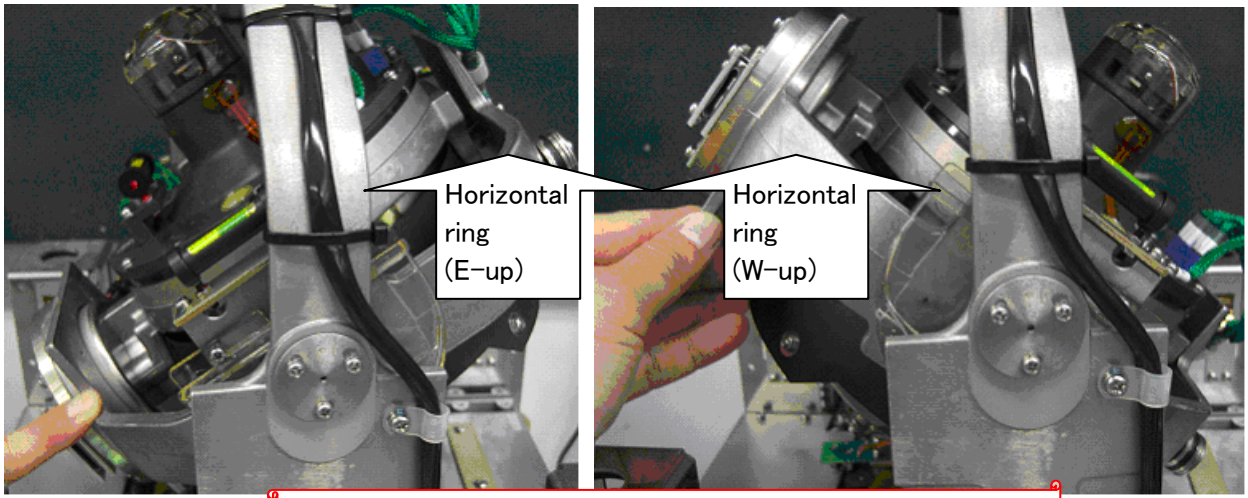


Fig. 2-14(1)　Sensitive element　E/W-up directions

6-7. Flexible lead wire should be shaped.

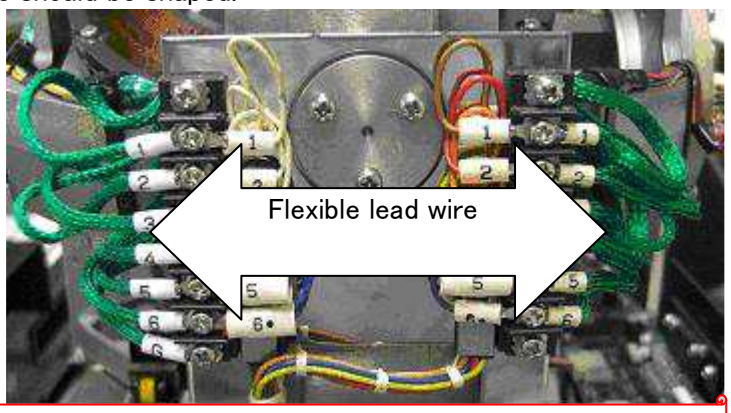


Fig. 2-14(2)　Sensitive element E/W-up directions

6-8. Phantom ring should turn smoothly while azimuth rotate for more than 360 degrees.

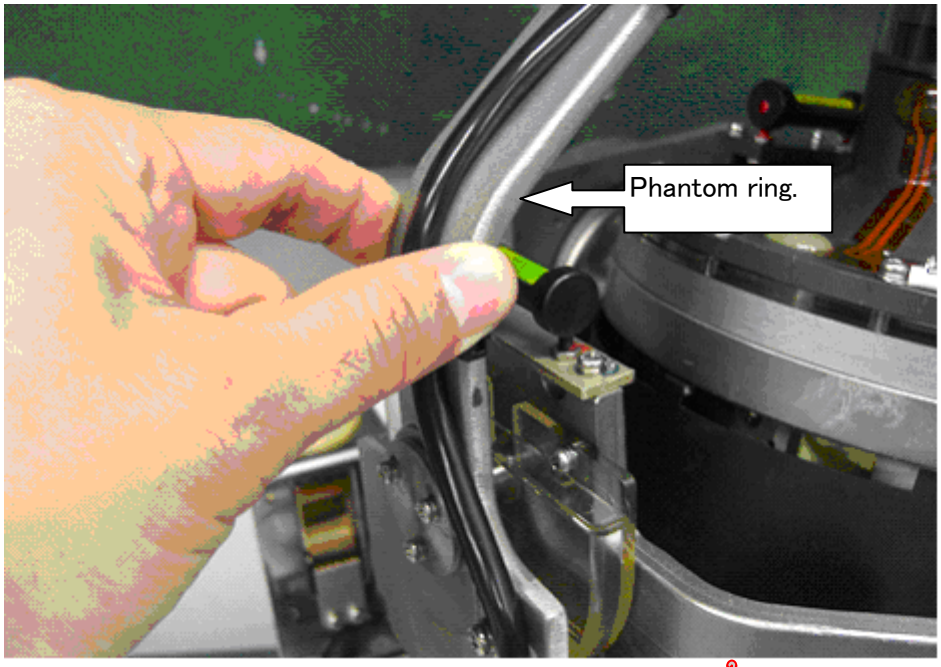


Fig. 2-15　Phantom ring

7. Damper oil check

7-1. Damper oil should be filled in half of the case.

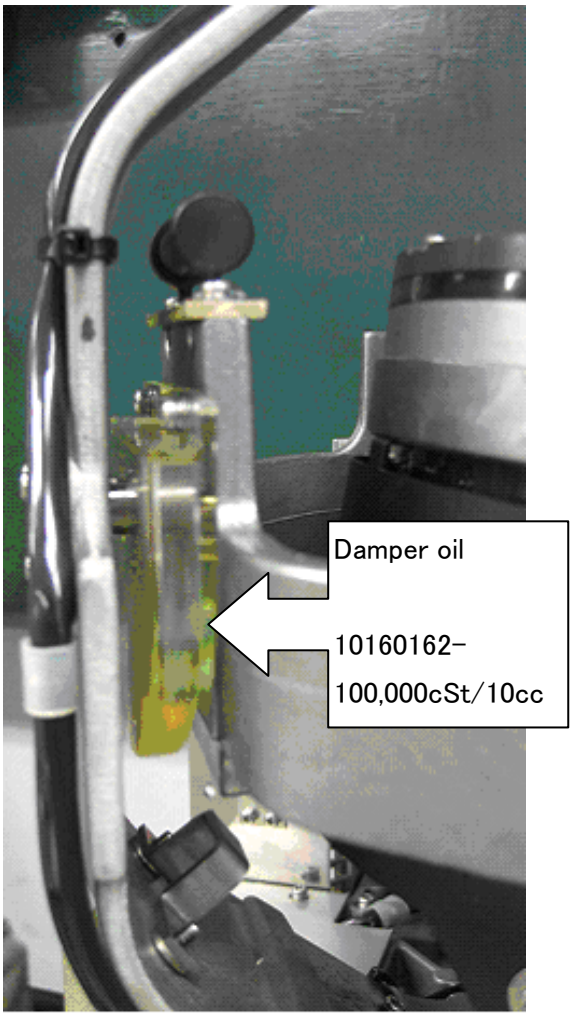


Fig. 2-16 Damper oil

8. Fuse & holder check

8-1. INV. PWB F1(12A) fuse & holder should not be debased, burnout, poor contact.

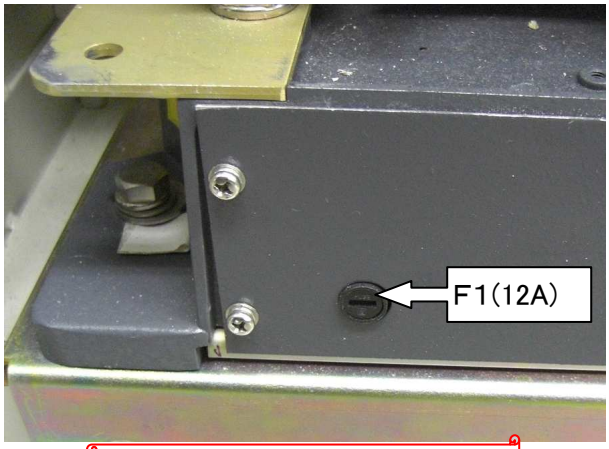


Fig. 2-17 INV. PWB fuse

8-2. F101(6.3A) & holder should not be debased, burnout or poor contact.

8-3. F102(20A) & holder should not be debased, burnout or poor contact.

8-4. GTERM PWN F1～F14(1A) & holder should not be debased, burnout or poor contact.

8-5. GTERM PWB F15(15A) & holder should not be debased, burnout or poor contact.

8-6. GTERM PWB F16(3.16A) & holder should not be debased, burnout or poor contact.

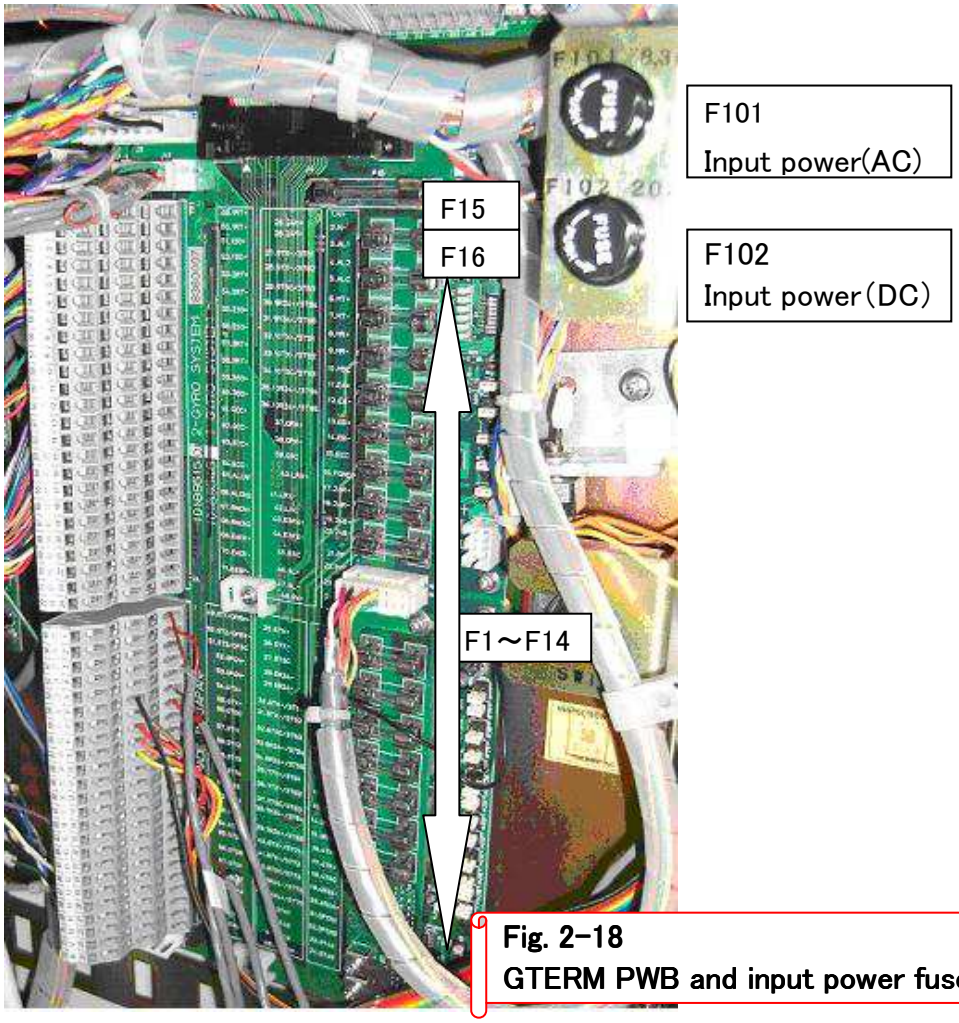


Fig. 2-18
GTERM PWB and input power fuse

9. Output signal check

9-1. Step and serial signals

9-1-1. Press DISP+ SET on the operating panel, then turn on the POWER (Test mode b).
9-1-2. Set 0/90/180/270° by ▲/▼ then press ACK/ENT
9-1-3. Step signals reception machinery (repeater compass) should follow-up within ±0.5° .
9-1-4. Equipment which receive serial signals from the GYRO should follow-up the azimuth within ±0.5° .

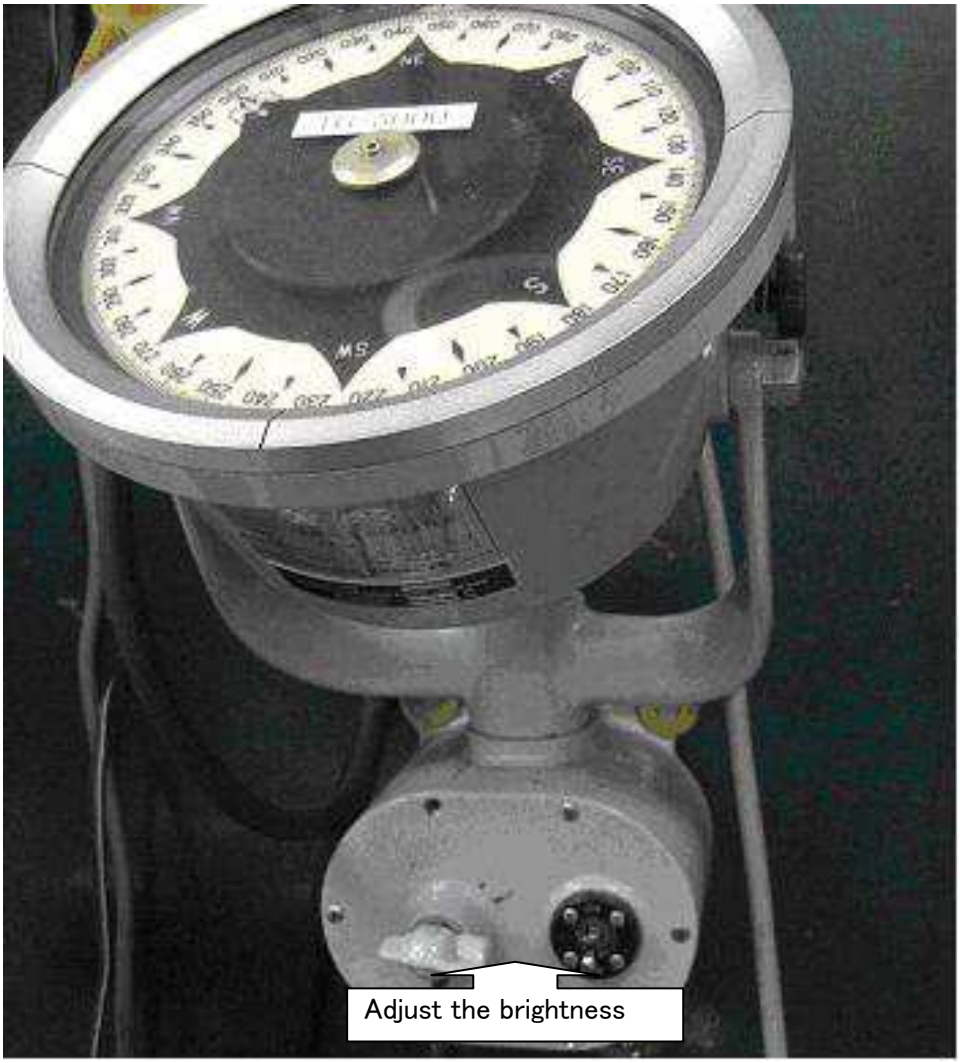


Fig. 2-19 Repeater compass

9-2. Brightness of the light should be adjusted on the repeater compass.

9-3. Turn off the POWER.

9-4. ROTI signals

9-4-1. Press ACK/ENT+▼ on the operating panel at the same time, then turn on the POWER. (ROTI mode).

9-4-2. Press SET, Set to 0 deg/min 、P/S 20 deg/min by ▲/▼, then press ACK/ENT.

9-4-3. Output signals should follow-up within 0±0.5 deg/min、P/S 18.5～21.5 deg/min.

⇒Adjustment point MIFC/MCOIF PWB VR1/gain and VR2/offset.

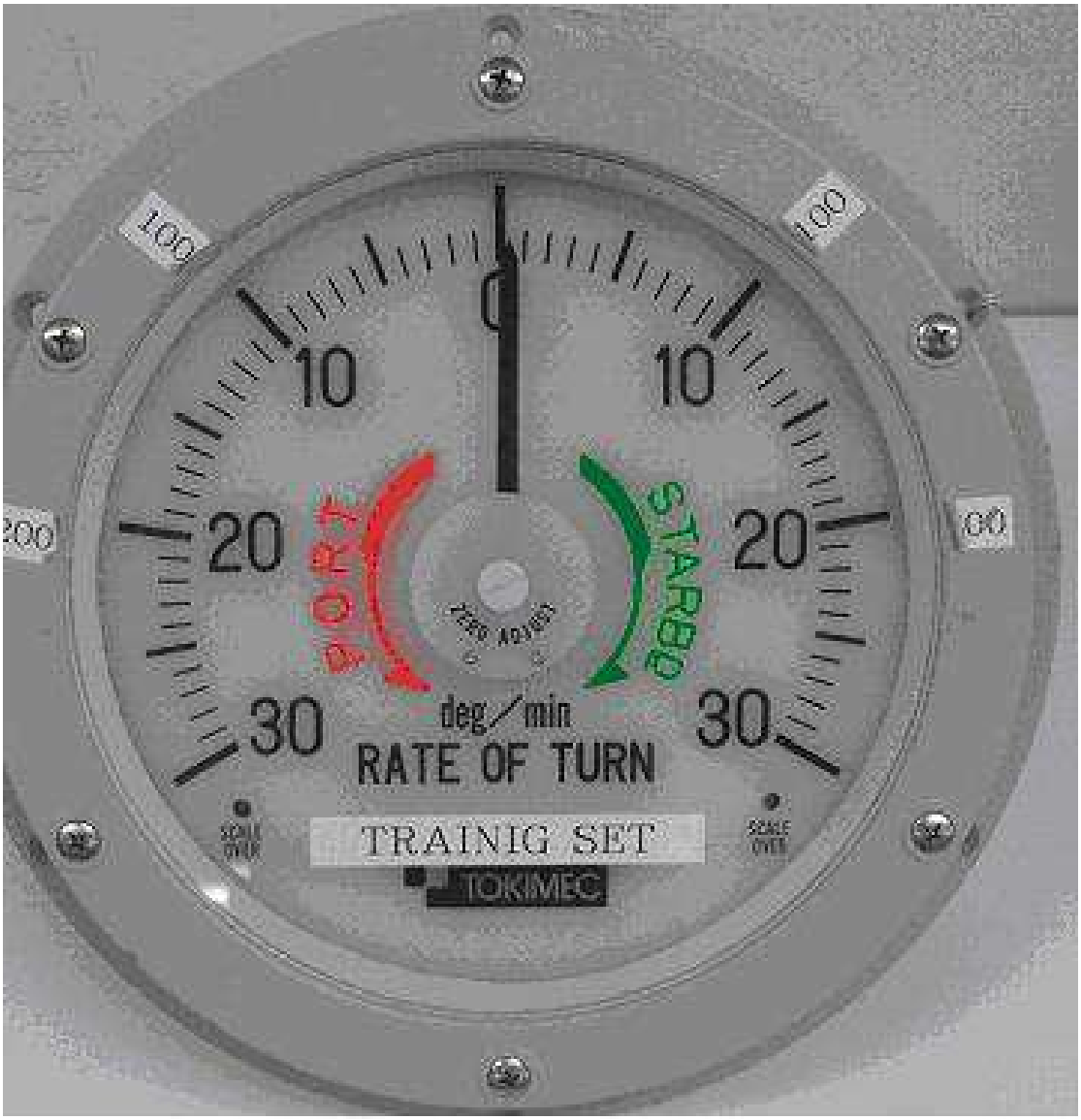
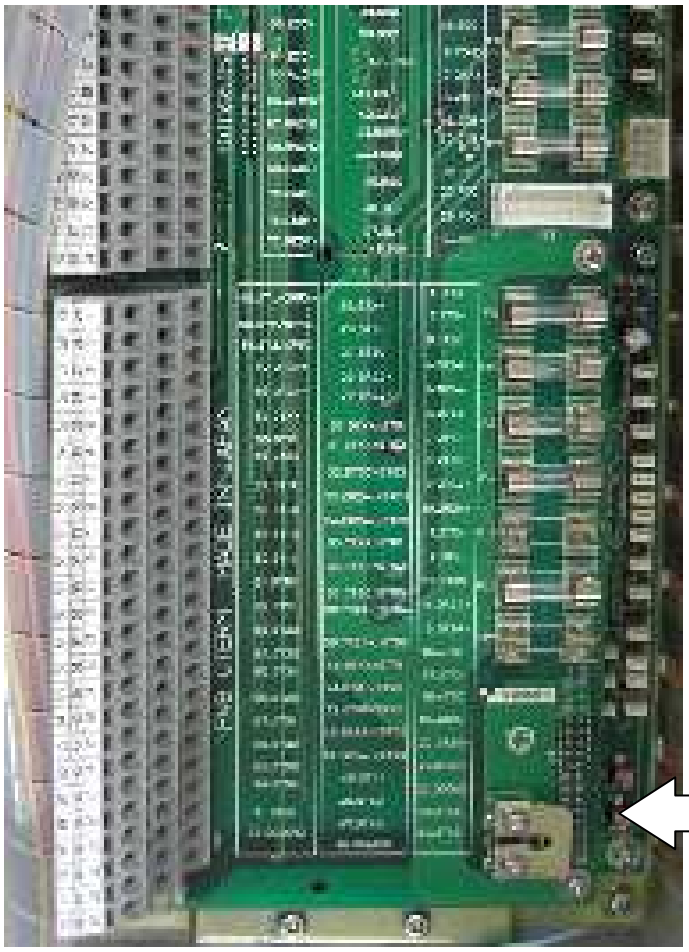


Fig. 2-20 Rate of turn indicator (ROTI)



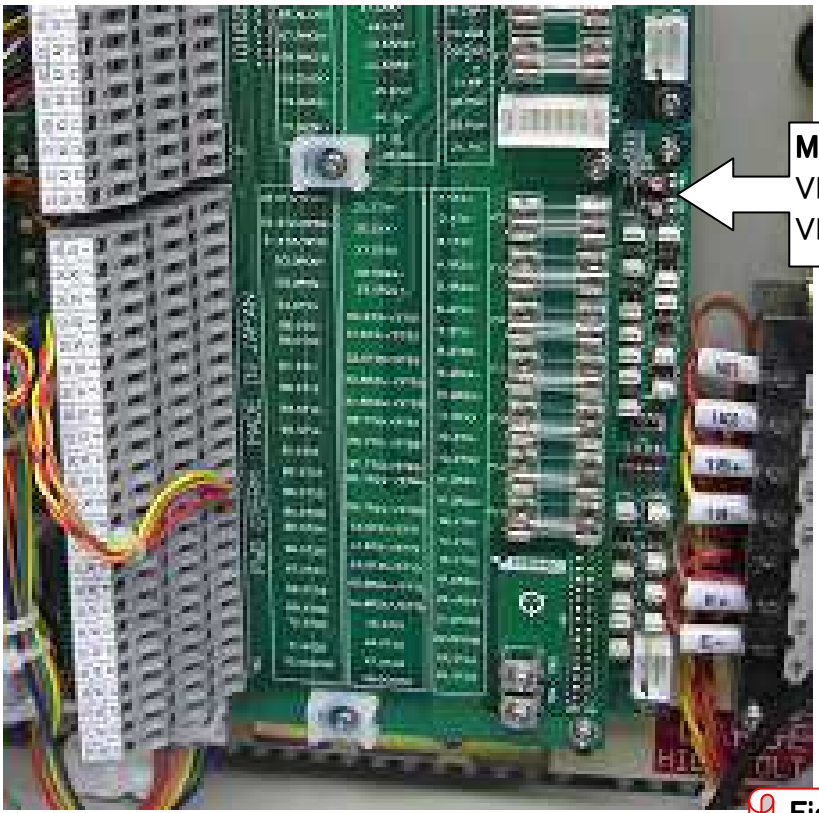


Fig. 2-21
MIFC PWB
and MCOIF PWB

9-4-4. Turn off the POWER.

10. Start up sequence check

10-1. All the sequence should be normal in “last azimuth finding”, “sensitive element standing up”, “rotor revolution“ and “follow-up” motion.

10-1-1. Turn on the POWER.

↓ 8～240 seconds. The brake is applied to the rotor until it stops.

10-1-2. Last azimuth finding motion starts. The phantom ring rotates for 360° .

↓ 0 second.

10-1-3. Sensitive element should stand up.

(1) Keep your eyes at certain position to observe the horizontal ring reference line and sensitive element top reference line.

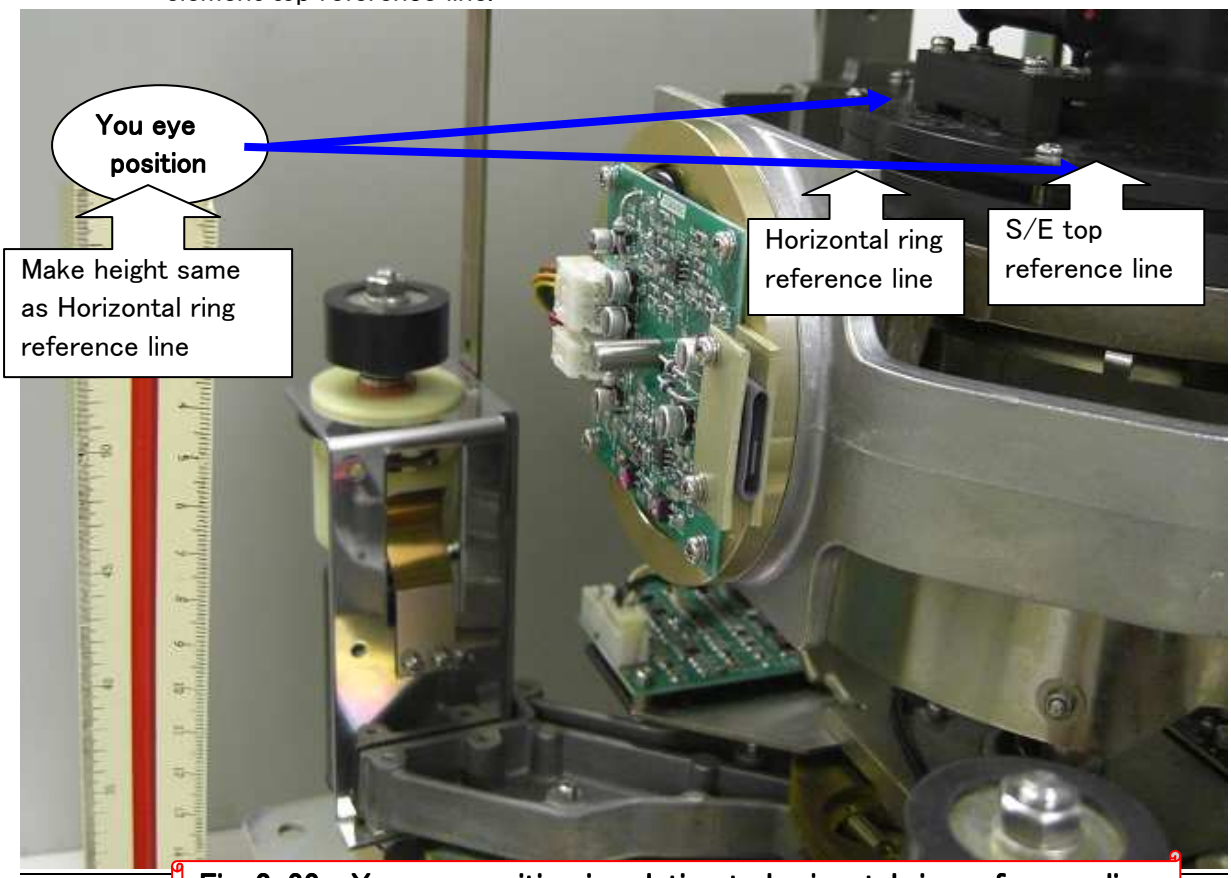


Fig. 2-22 You eye position in relation to horizontal ring reference line

(2) Criteria

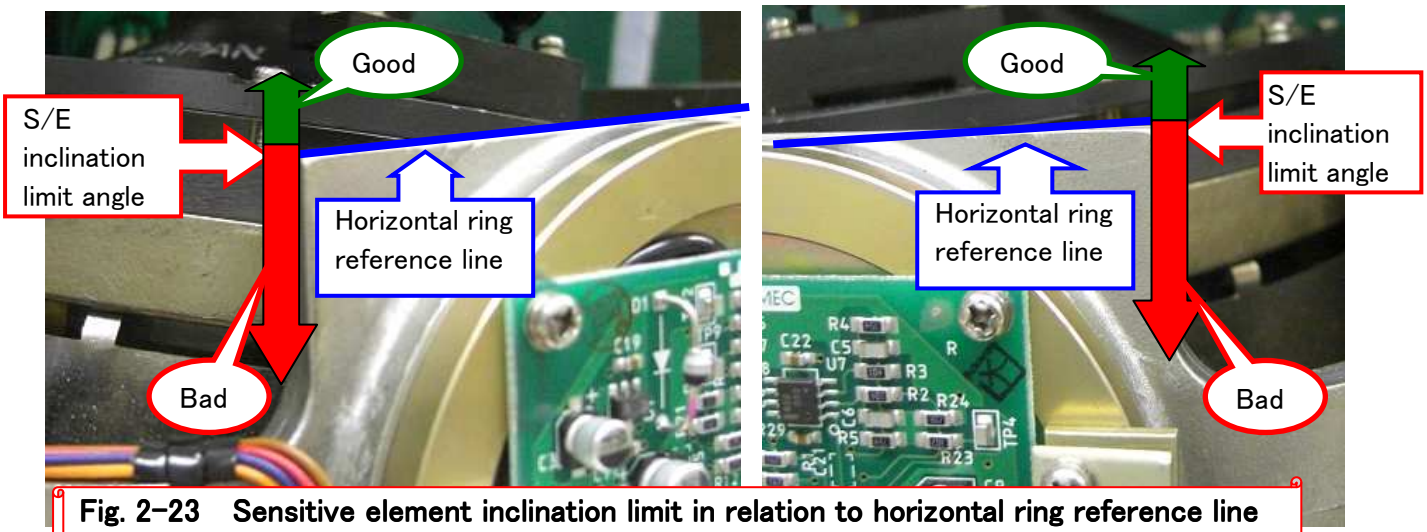


Fig. 2-23 Sensitive element inclination limit in relation to horizontal ring reference line

(3) Example : Good condition

(Sensitive element top reference line is almost parallel to horizontal ring reference line.)

・Sensitive element inclination angle is small enough as shown in Fig. 2–24.

・Stable and no vibration.

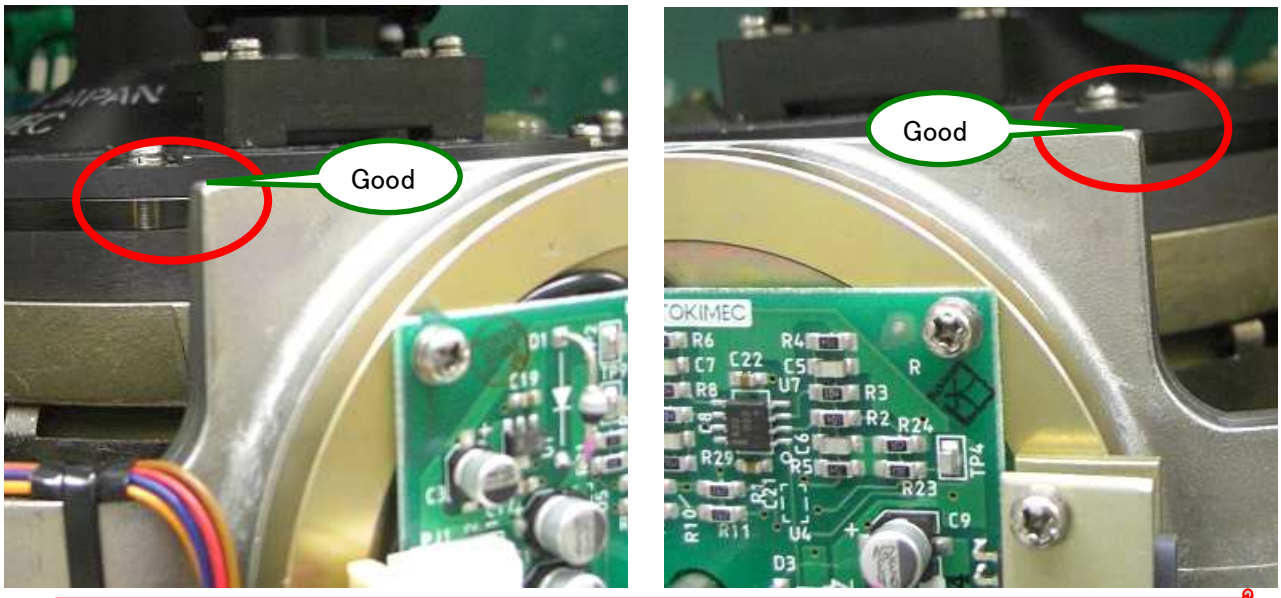


Fig. 2–24　Good alignment of sensitive element at the beginning of leveling mode

(4) Example : Bad condition

・Sensitive element inclination angle is bigger as shown in Fig. 2–25.

・Vibrate.

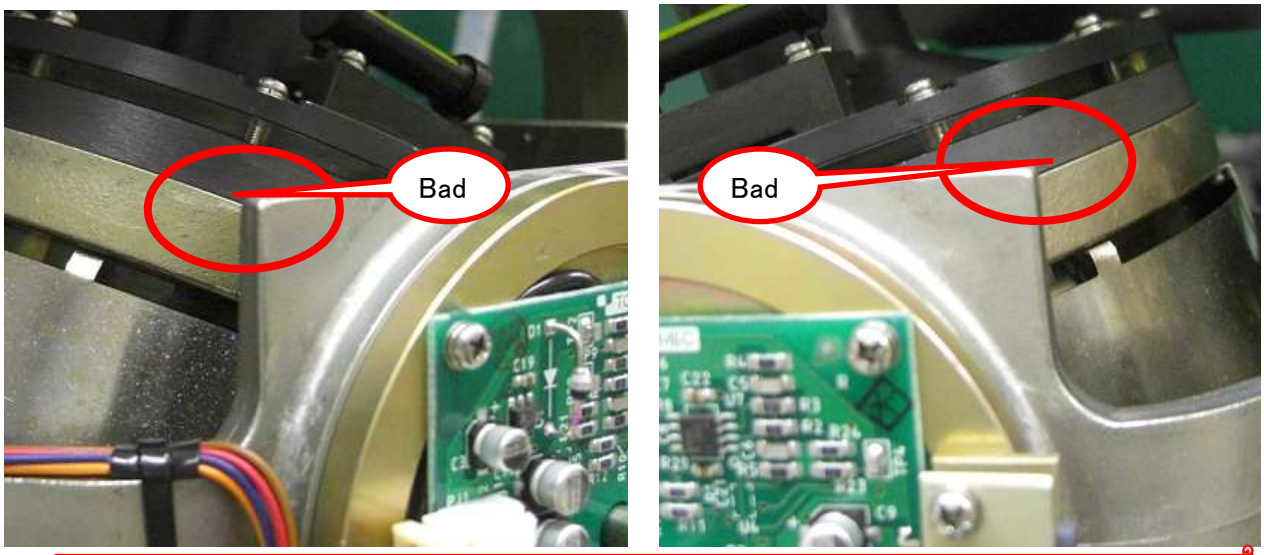


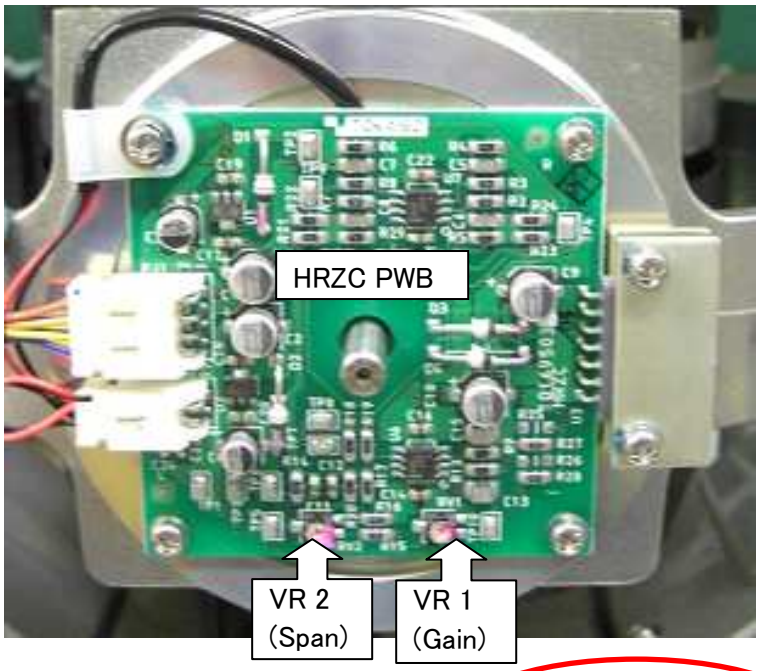
Fig. 2–25　Bad alignment of sensitive element at the beginning of leveling mode

(5) In case of bad condition(alignment) shown in Fig. 2-25.

・Turn off the POWER.

・VR1 (gain) and VR2 (span) on HRZC PWB to be center position as show in Fig. 2-26.

・Start over from item 10-1-1.



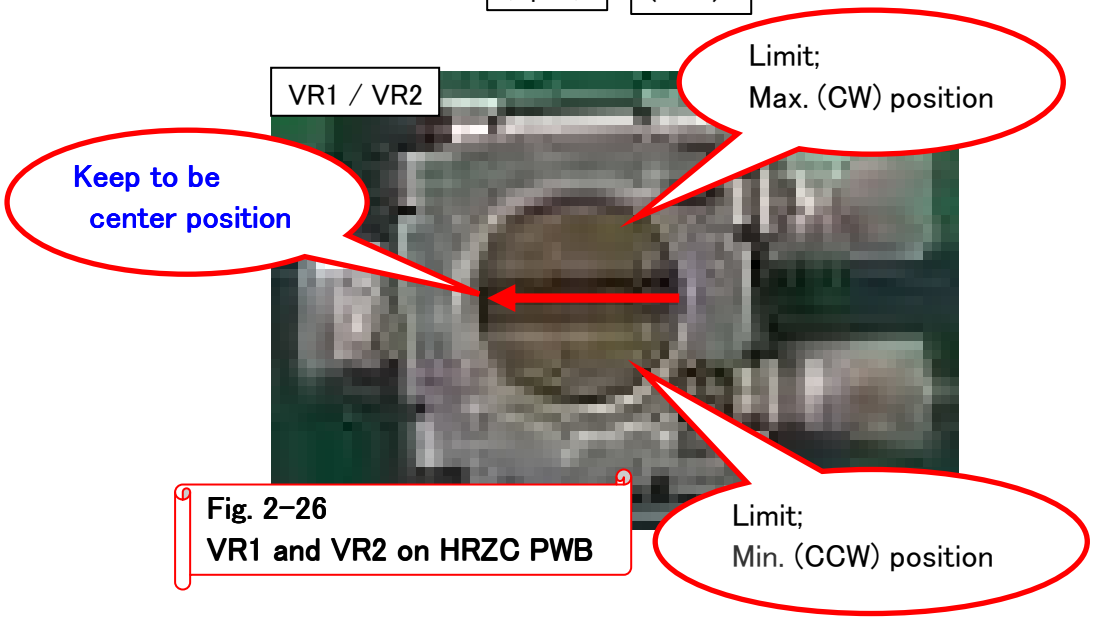


Fig. 2-26
VR1 and VR2 on HRZC PWB

< Caution >

Do not turn the trimmer more than the limits (Max. (CW) or Min. (CCW)). Otherwise the trimmer and HRZC PWB will be broken.

↓ 60～172 seconds. (Until ACK/ENT key is pressed.)

10-1-4. Sensitive element rotor starts rotating.

↓ 120 seconds.

10-1-5. Follow-up start of horizontal and azimuth. (Setting start. GYRO LED light up)

Sensitive element should not have abnormal noise or vibration.

11. Operating panel check

11-1. POWER switch ON/OFF movement should be normal.

11-2. LAMP TEST(▲+▼) should light up all LED.

11-3. Brightness of LED light should be able to adjust by (▲/▼).

11-4. The following indicate check. (Press DISP and change it.)
11-4-1. 「**S.S.G./S.S.E/GYt**」(TRUE) should be able to indicate.
11-4-2. 「**E.St./GYt**」(EXT」) should be able to indicate.
11-4-3. 「**C.P.S.**」(COMPASS) should be able to indicate.
11-4-4. 「**LA.n./LA.S.**」(LATITUDE) should be able to indicate.
11-4-5. 「**G.Sd/H.Sd/L.Sd/S.Sd**」(SPEED) should be able to indicate.
11-4-6. 「**rt.**」(TURN) should be able to indicate.
11-4-4. 「**Err**」 should be able to indicate.

Fig. 2-27 Operating panel

12. Performance check

12-1. Performance

12-1-1. Turn on the POWER.
12-1-2. True bearing should be steady (within 0.7°) within 3～4 hours after start.

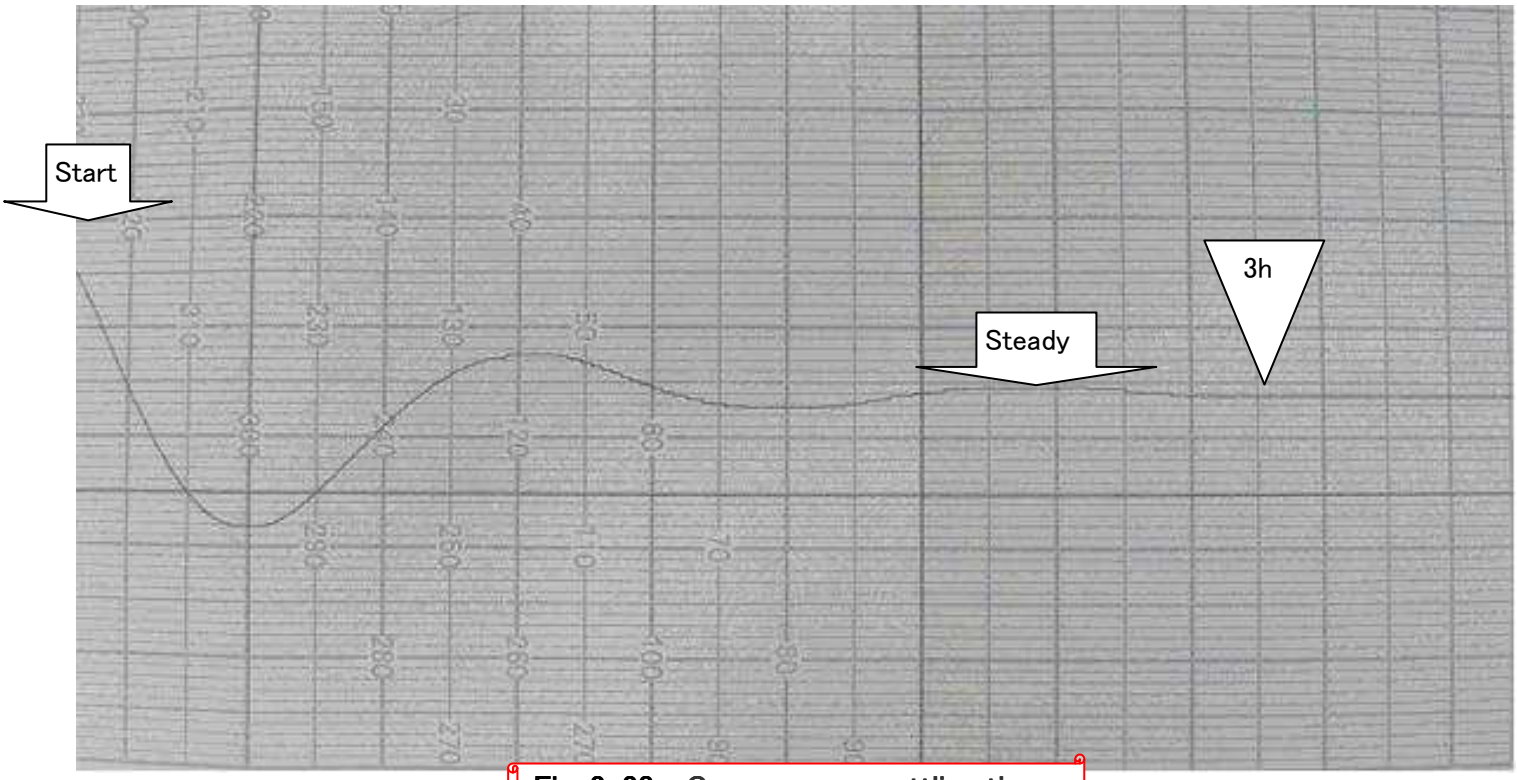


Fig. 2-28 Gyrocompass settling time

12-2. Confirm the bubble position of the levels at the horizontal ring and the rotor.

12-2-1. Air bubble position of the horizontal ring level should be almost at the center.
(Guideline within ±5 minutes / 1 division is 2 minutes)

⇒Adjustment point refer to **"[6] SENSITIVE ELEMENT EXCHANGE"**

12-2-2. Air bubble of rotor level should be almost the center.
(Guideline within ±14 minutes / 1 division is 4 minutes)

⇒Adjustment point 「Θ offset 1.6.t」of internal parameter.
Example:
・When input 「Θ offset "0.16"」, move to N-up 10 minutes.
・When input 「Θ offset "-0.16"」, move to S-up 10 minutes.

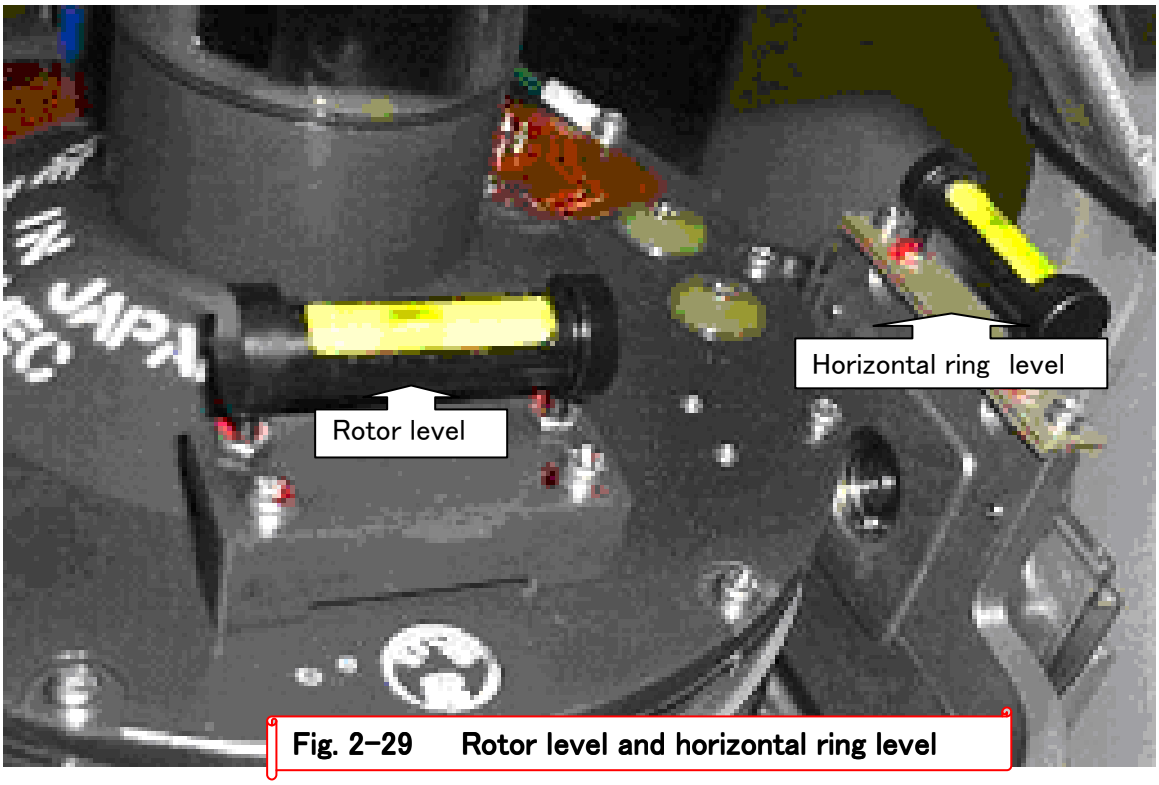
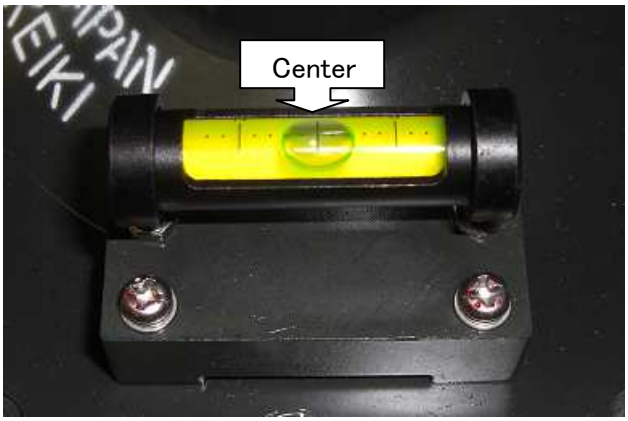


Fig. 2-29 Rotor level and horizontal ring level

Rotor level



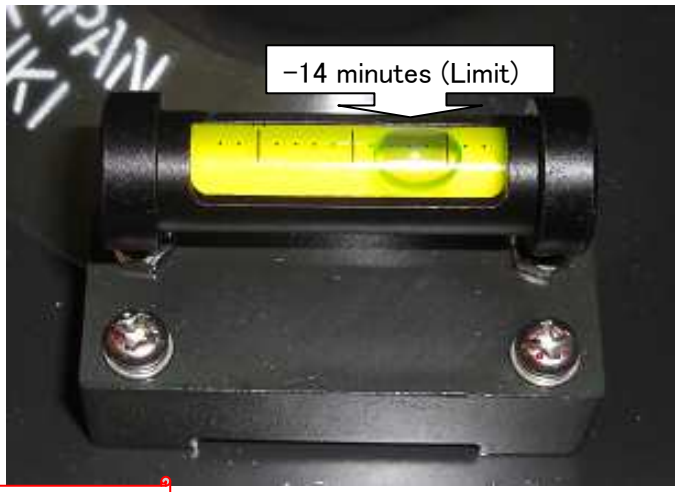
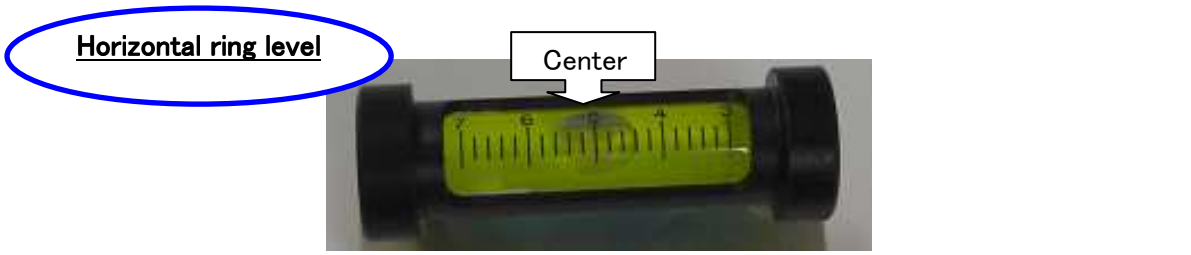
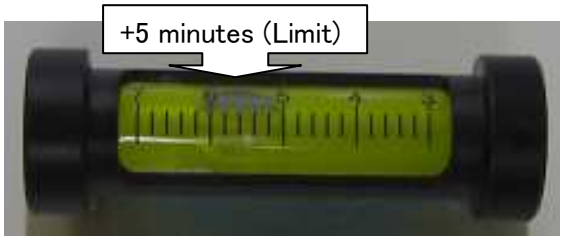


Fig. 2-30 Rotor level





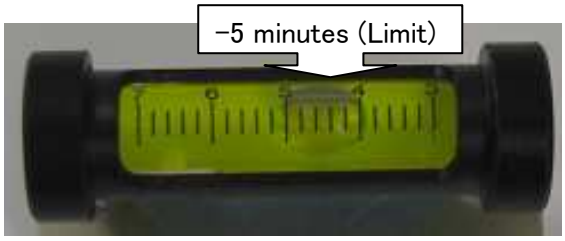


Fig. 2−31　Horizontal ring level

12−3. Phantom ring should not be start vibration, when you hit the shock absorber by hand.
⇒Adjustment point 「azimuth servo gain 1.2.F」of internal parameter.

Example:
・If start vibration, 「azimuth servo gain down to “0.5～0.7”」.

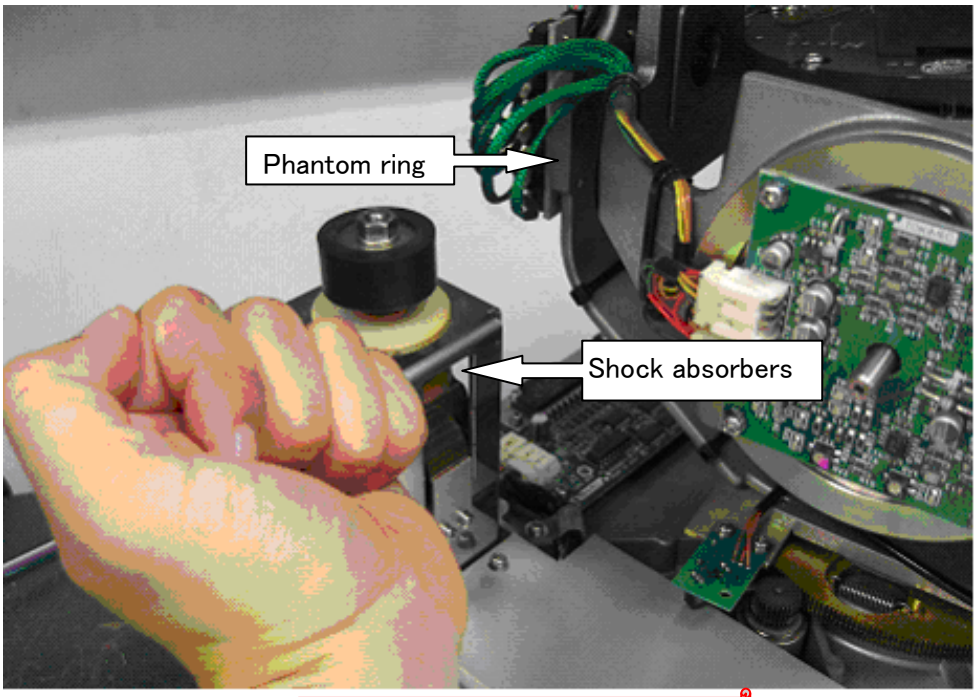


Fig. 2−32　Shock absorbers

13. Voltage check

13-1. Main power supply should be AC100/220V ±10%.
Back-up power supply should be DC24V -20%～+30%.

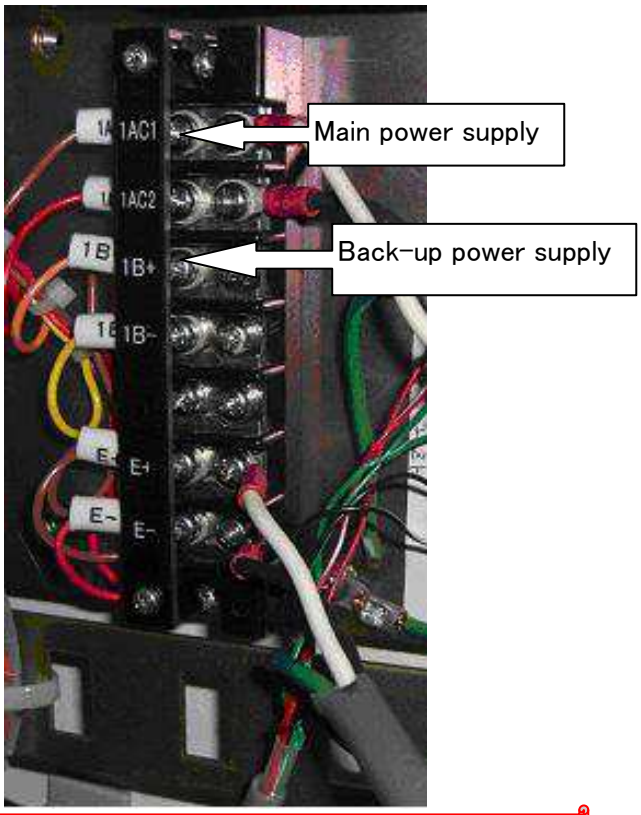


Fig. 2-33 Input power supply terminal

13-2. Master compass power supply (MTTRM PWB TB1-1/2) should be DC24V ±2V.
⇒Adjustment point GPOWER PWB VR1

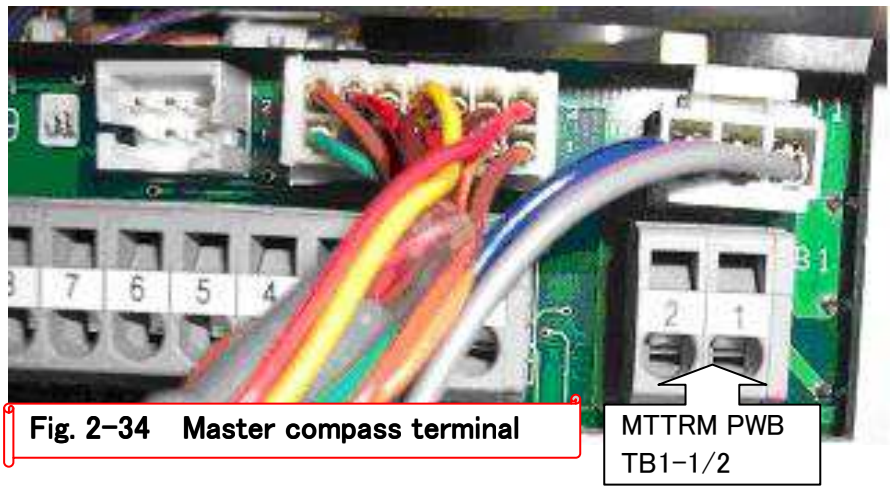


Fig. 2-34 Master compass terminal

Fig. 2-35 GPOWER PWB

13-3. Repeater compass power supply (GTERM PWB ST14/ST15) should be DC24V ±4V.

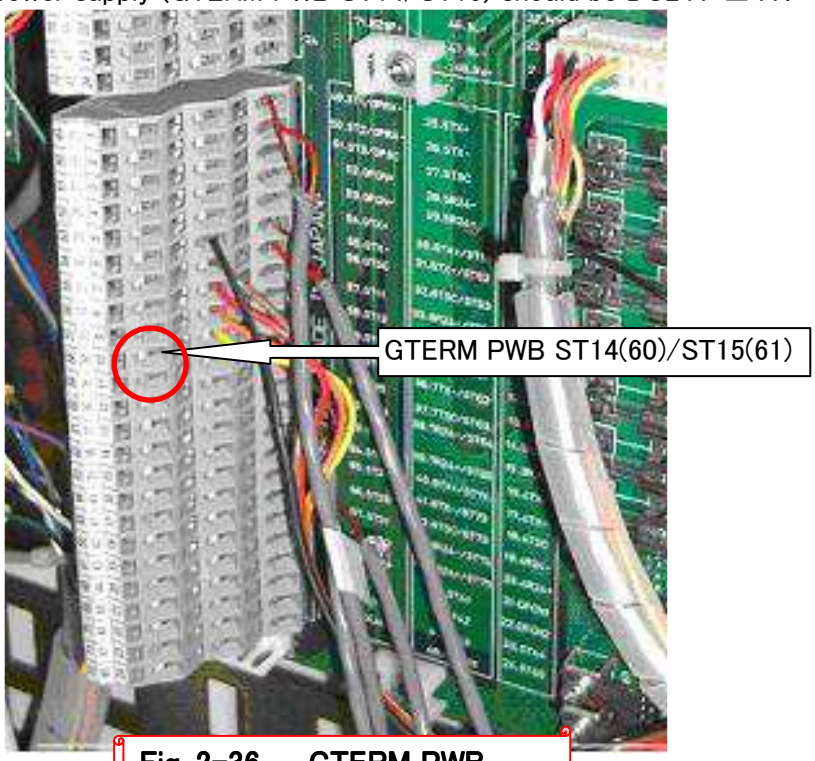


Fig. 2-36 GTERM PWB

13-4. Measure the voltage and frequency of the sensitive element's power supply.

13-4-1. Confirm the voltage of phantom ring terminal # 5 and 6.

13-4-2. If the tester (multi-meter) is Vrms type : **AC100Vrms ±2Vrms、400Hz ±2Hz**

If the tester (multi-meter) is Vavg(average) type : **AC110Vavg ±2Vavg、400Hz ±2Hz**

⇒Adjustment point　INV. PWB VR1(Voltage).

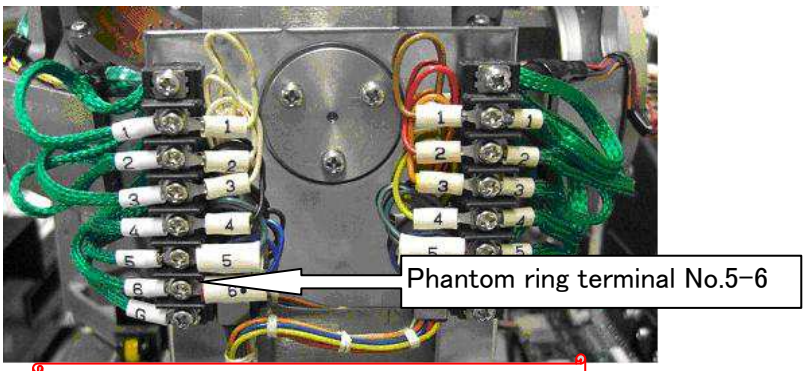


Fig. 2-37　Phantom ring terminal.

CAUTION: How to check the tester (multi-meter) type

☆Adjust the voltage between TP9(0V) and TP10 to DC101V by INV PWB VR1.

☆Measure the voltage between CN4 6and 7.

・In case the reading is AC100V, the tester is **Vrms** type.

・In case the reading is AC110V, the tester is **Vavg**(average) type.

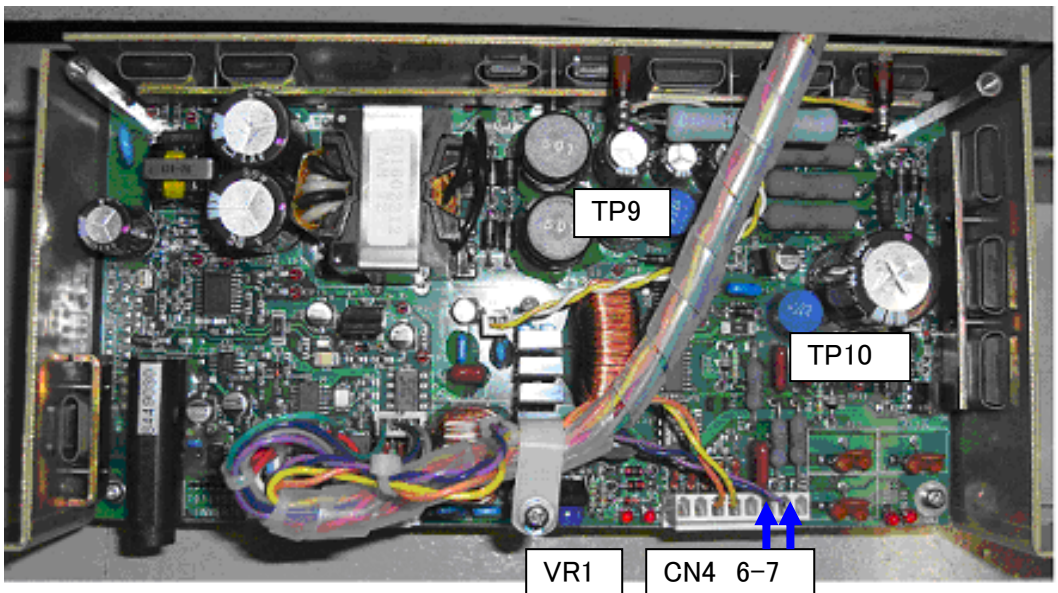


Fig. 2-38　INV. PWB

13-5. Turn off the POWER.

13-6. Press DISP+ SET on the operating panel, then turn off the POWER (Test mode b).
Wait until the bearing will rotate 360 degrees. Wait up to 4 minutes until the rotor in the sensitive element stops spinning.

13-7. Turn off the POWER.

13-8. Put back the TG-8000 case which was removed in step「2-4」

13-9. Put back TG-8000 master compass to PR-6000, Refer to step「2-3」

13-10. Turn on the POWER.

14. Internal parameter check

14-1. Press SET & ACK/ENT at the same time for more than 3 seconds.
This will enter into extended menu.

14-2. Record parameters. **(Only record the changes you made for step 1-1-2.)**

Parameter : Standard value (Push SET or DISP and change it.)

1・A-1	1.1.U	Damping gain: 00.75
2・	1.2.F	Azimuth servo gain: 01.00
3・	1.3.S	Horizontal servo gain: 01.00
4・	1.4.u	Leveling servo gain ratio: 00.50～01.00
5・	1.5.L	Φ offset: 00.00
6・	1.6.t	Θ offset: 00.00
7・	1.7.G	X pickup gain: 02.25
8・	1.8.c	Ks/H: 1.300
9・	1.9.r	Maximum rate of turn: **.**
10・	1.A.F	Maximum deviation Azimuth servo: **.**
11・	1.b.S	Maximum deviation horizontal servo: **.**
12・A-2	2.1.o	Azimuth offset A: ***.*
13・	2.2.O	Azimuth offset B: **000.0 (No use)**
14・	2.3.h	Zero cross Azimuth: 345.3
15・	2.4.E	Zero cross error width: 002.0
16・	2.5.y	Year: ****
17・	2.6.N	Month, Day: **.**
18	2.7.t	Hour, minute: **.**
19・	2.8.d	Total operating days: ****
20・	2.9.G	Display/setting of GPS connection: **
21・	2.A.L	Display/setting of LOG connection: **
22・	2.b.S	Display/setting of LOG(serial) connection: **
23・	2.c.t	Display/setting of "GGA" performance index is ignored or evaluated: **
24・	2.d.o	Analog output offset for rate of turn: ***.*
25・	2.e.F	Filter time constant for rate of turn: ***.*
26・	2.F.G	Analog output gain for rate of turn: *.***
27・A-3	3.1.E	Alarm(Error):
28・	3.2.n	Zero cross error number of occurrences: ****
29・	3.3.H	Zero cross error maximum: ***.*
30・	3.4.y	Zero cross error occurrences year: ****
31・	3.5.N	Zero cross error occurrences month day: **.**
32・	3.6.t	Zero cross error occurrences hour minute: **.**
33・	3.7.n	Encoder error number of occurrences: ****
34・	3.8.r	SCC reset number of occurrences: ****
35・A-7	7.2.t	SCC Software version: *.***
36・	7.3.u	MCC Software version: *.***
37.A-8	8.3.L	Rotor tilting angle monitor: **.**
38	8.4.t	Master compasses temperature: ***.*

Fig. 2-39 Internal parameter display

1-1-3. Press SET & ACK/ENT at the same time for more than 3 seconds.
This will return to normal mode.

GYROCOMPASS TG-8000 Check Sheet [Maintenance]

Ship's Name _____ **Which Gyro** Single No.1 No.2

IMO No. _____ **M/C Ser. No.** _____

Engineer _____ **S/E Ser. No.** _____

Date _____

1. Parameter : (Standard value) **Data record --> (Any changed data)**

Press [SET]&[ACK/ENT]

1)	A-1	1.1.U	Damping gain : 00.75	1.1.U		
2)		1.2.F	Azimuth servo gain : 01.00	1.2.F		
3)		1.3.S	Horizontal servo gain : 01.00	1.3.S		
4)		1.4.u	Leveling servo gain ratio 00.50 ~ 01.00	1.4.u		
5)		1.5.L	Φ offset : 00.00	1.5.L		
6)		1.6.t	Θ offset : 00.00	1.6.t		
7)		1.7.G	X pickup gain 02.25	1.7.G		
8)		1.8.c	Ks/H : 1.300	1.8.c		
9)		1.9.r	Maximum rate of turn : * * *.*	1.9.r		
10)		1.A.F	Maximum deviation Azimuth servo : * *.* *	1.A.F		
11)		1.b.S	Maximum deviation horizontal servo : * *.* *	1.b.S		
12)	A-2	2.1.o	Azimuth Offset A : * *.* *	2.1.o		
13)		2.2.O	Azimuth offset B : 00.00 (No use)	2.2.O		
14)		2.3.h	Zero cross Azimuth : 345.3	2.3.h		
15)		2.4.E	Zero cross error width : 002.0	2.4.E		
16)		2.5.y	Year : * * * *	2.5.y		
17)		2.6.N	Month, Day : mm.dd	2.6.N		
18)		2.7.t	Hour, minute : hh.mm	2.7.t		
19)		2.8.d	Total operating days : * * * *	2.8.d		
20)		2.9.G	Display/setting of GPS connection : * *	2.9.G	be	Non
21)		2.A.L	Display/setting of LOG connection : * *	2.A.L	be	Non
22)		2.b.S	Display/setting of LOG(serial) connection : * *	2.b.S	be	Non
23)		2.c.t	Display/setting of "GGA" performance : * *	2.c.t	be	Non
24)		2.d.o	Analog output offset for rate of turn : 000.0	2.d.o		
25)		2.e.F	Filter time constant for rate of turn : 002.0	2.e.F		
26)		2.F.G	Analog output gain for rate of turn : 01.00	2.F.G		
27)	A-3	3.1.E	Alarm (Error)	3.1.E	**(Record to item 2)**	
28)		3.2.n	Zero cross error number of occurrences : * * * *	3.2.n		
29)		3.3.H	Zero cross error maximum : * * *.*	3.3.H		
30)		3.4.y	Zero cross error occurrences year : * * * *	3.4.y		
31)		3.5.N	Zero cross error occurrences month day : * *.* *	3.5.N		
32)		3.6.t	Zero cross error occurrences hour minute : * *.* *	3.6.t		
33)		3.7.n	Encoder error number of occurrences : * * * *	3.7.n		
34)		3.8.r	SCC reset number of occurrences : * * * *	3.8.r		

				Data record --> (Any changed data)	
35)	A-7	7.2.u	SCC Software version : *.* * *	7.2.u	
36)		7.3.u	MCC Software version : *.* * *	7.3.u	
37)	A-8	8.3.L	Rotor tilting angle monitor: * *.* *	8.3.L	
38)		8.4.t	Master compasses temperature: * * *.*	8.4.t	

2. Error code check : A-3 3.1.E Alam(Error)

Record it more than most recent ten.

	Year	Month	Day	Hour	Error code
1)					
2)					
3)					
4)					
5)					
6)					
7)					
8)					
9)					
10)					

3. Step motor assembly check	**Result / Measures**
1) Step motor axis should move smoothly.	Good / Adjust / Replace
2) Phantom ring play (CW/CCW) should be about 0.1deg.	Good / Adjust / Replace

4. Slip-ring and Brush check	
1) Brush head should be firmly in contact with slip-ring rotor.	Good / Adjust / Replace
2) Slip-ring and brush should be clean.	Good / Adjust / Replace

5. Shock absorber check	
1) Shock absorber should move smoothly.	Good / Adjust / Replace

6. Sensitive element check	
1) Sensitive element should not have oil leakage.	Good / Adjust / Replace
2) Sensitive element connector should be firmly in contact.	Good / Adjust / Replace
3) Sensitive element should tilt about 15 ~ 20 deg without power supply.	Good / Adjust / Replace
4) Sensitive element should move smoothly until it hits the stopper in both directions(N-up, S-up).	Good / Adjust / Replace
5) Horizontal ring should move smoothly until it hits the stopper in both directions(E-up, W-up).	Good / Adjust / Replace
6) Phantom ring should turn smoothly while azimuth rotate for more than 360 deg.	Good / Adjust / Replace

7. Damper oil check **Result / Measures**

1) Damper oil should be filled in about half of the case. Good / Adjust / Replace

8. Fuse & Holder check

1) INV. PWB F1(12A) should not be debased, burnout, poor contact. Good / Adjust / Replace
2) F101(6.3A) and F102(20A) should not be debased, burnout, poor contact. Good / Adjust / Replace
3) GTERM PWB F1 ~ F14(1A) should not be debased, burnout, poor contact. Good / Adjust / Replace
4) GTERM PWB F15(15A) and F16(3.16A) should not be debased burnout, poor contact. Good / Adjust / Replace

9. Output signals check

1) Step signal reception machinery (repeater compass) should follow-up . within +/-0.5deg. Good / Adjust / Replace
2) Equipment which receive signal from the GYRO, should follow-up the azimuth within +/-0.5. Good / Adjust / Replace
3) Brightness of the light should be adjusted on the repeater compass. Good / Adjust / Replace
4) ROTI output signal should follow-up within 0+/-0.5deg/min, P/S 18.5 ~ 21.5deg/min. Good / Adjust / Replace

10. Start Up sequence check

1) Last azimuth ~ rotor rotaing ~ follow-up start should be normal. Good / Adjust / Replace

11. Operating panel check

1) POWER switch ON/OFF movement should be normal. Good / Adjust / Replace
2) LAMP TEST(▲ / ▼) should light up all LED. Good / Adjust / Replace
3) Brightness of LED light should be able to adjust by (▲ / ▼). Good / Adjust / Replace
4) [S.S.G/S.S.E/GYt/ESt], [C.P.S], [LA.n/LA.S], [G.Sd/H.Sd/L.Sd/S.Sd], [rt.] and [Err] should be able to indicate. Good / Adjust / Replace

12. Performance check

1) True bearing should be steady (within 0.7deg) within about 3 ~ 4 hours after start. Good / Adjust / Replace
2) Air bubble of horizontal ring levels should be almost the center. (guideline within +/-5 min) Good / Adjust / Replace
3) Air bubble of rotor levels should be almost the center. (guideline within +/-14 min) Good / Adjust / Replace
4) Phantom ring should not be vibration, when a shock is given to Shock absorber. Good / Adjust / Replace

13. Voltage check

1) Main power supply should be AC100/220V +/-10%. Good / Adjust / Replace
2) Back-up power supply should be DC24V -20% ~ +30%. Good / Adjust / Replace
3) Master compass power supply (MTTRM PWB TB1-1/2) should be DC24V +/-2V. Good / Adjust / Replace
4) Repeater compass power supply (GTERM PWB ST14/ST15) should be DC24V +/-4V. Good / Adjust / Replace
5) Phantom ring Terminal 5/6(sensitive element) should be AC100Vrms +/-2Vrms (AC110V +/-2V avg). Good / Adjust / Replace

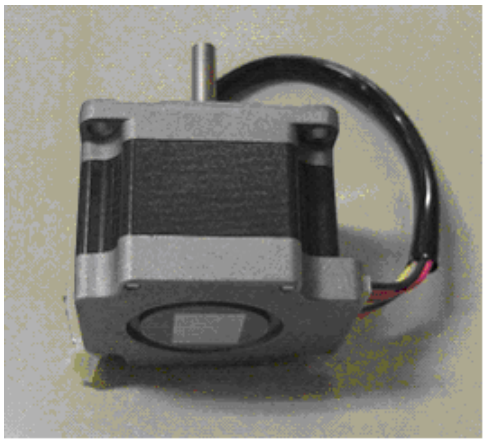
[3] STEP MOTOR EXCHANGE

GYROCOMPASS
TG-8000

1. Preparations

1-1. Required parts and tools

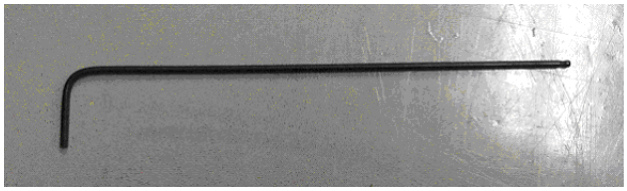
1-1-1. Step motor 10189046　(1pc)



1-1-2.Belt 10160030　(1pc)

1-1-3. Phillips screw　driver　: regular size　　(1pc)

1-1-4. Hexagon wrench 3mm (1pc)



1-1-5. Hexagon wrench 4mm (1pc)

Fig. 3-1　Required parts and tools

2. Step motor exchange

2-1. Remove plate and screws “A”～“D”.

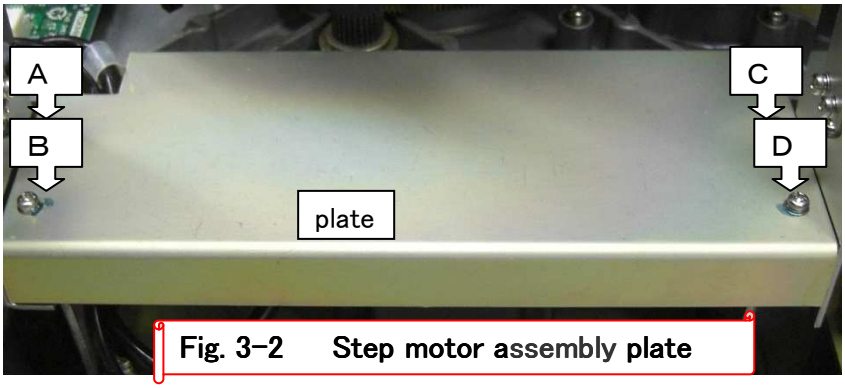


Fig. 3-2 Step motor assembly plate

2-2. Remove screws “E”～“H”.

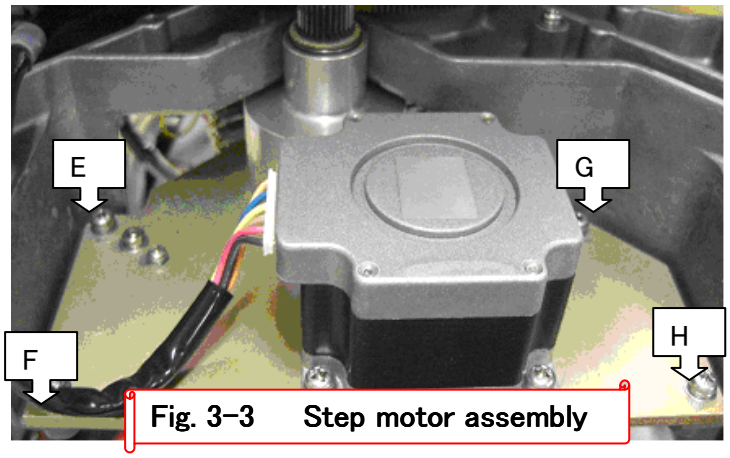


Fig. 3-3 Step motor assembly

2-3. Remove connector and screw “I”.

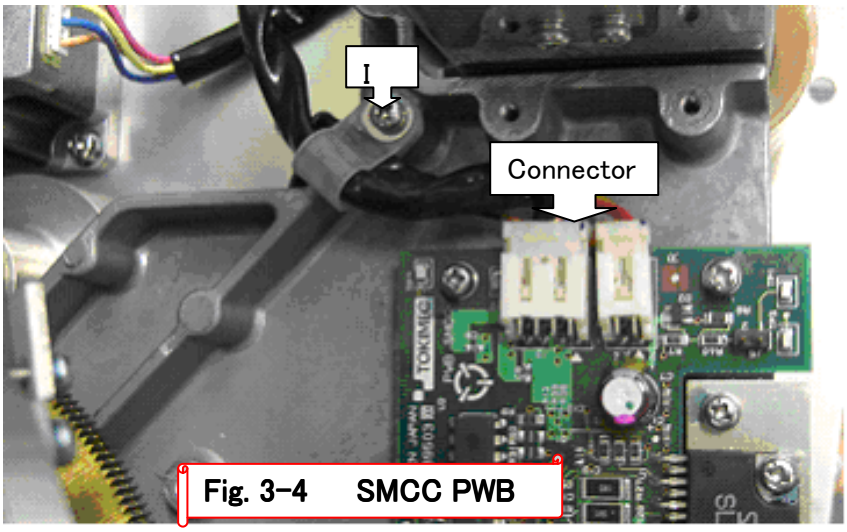


Fig. 3-4 SMCC PWB

2-4. Remove belt.

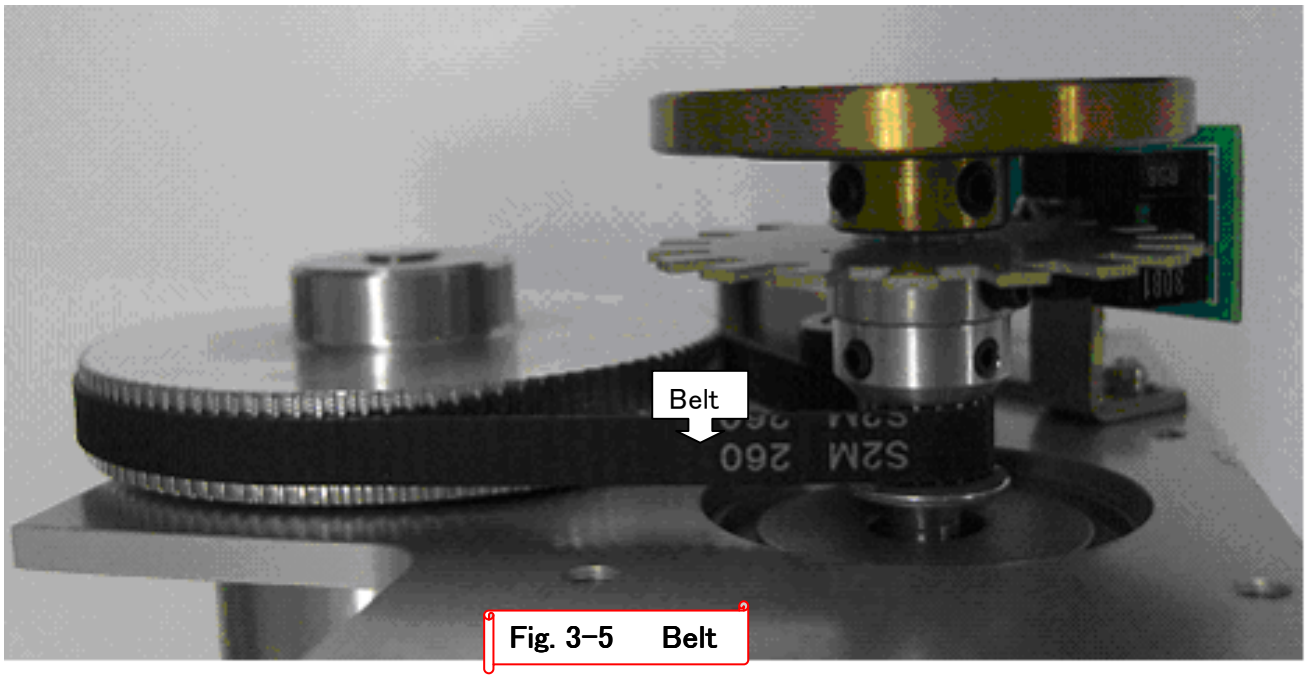


Fig. 3-5 Belt

2-5. Loosen screws “J”～“N”. Remove pulley “O” and damper.

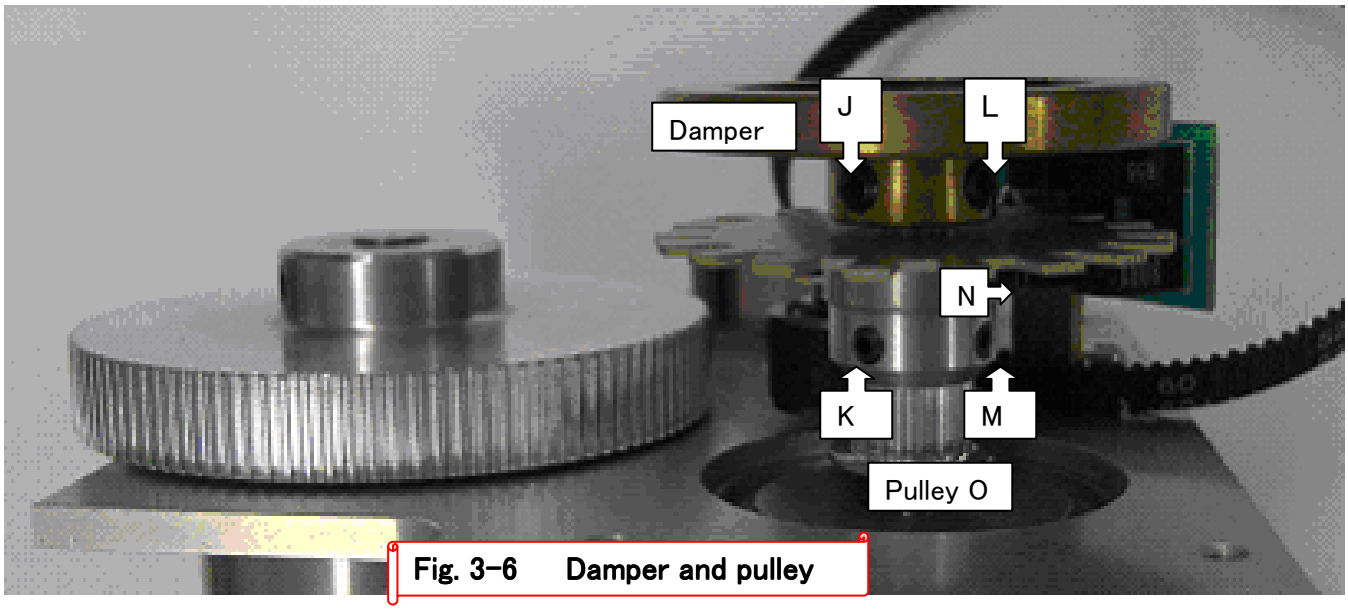


Fig. 3-6 Damper and pulley

2-6. Remove “O”～“R” screws. Remove step motor (old).

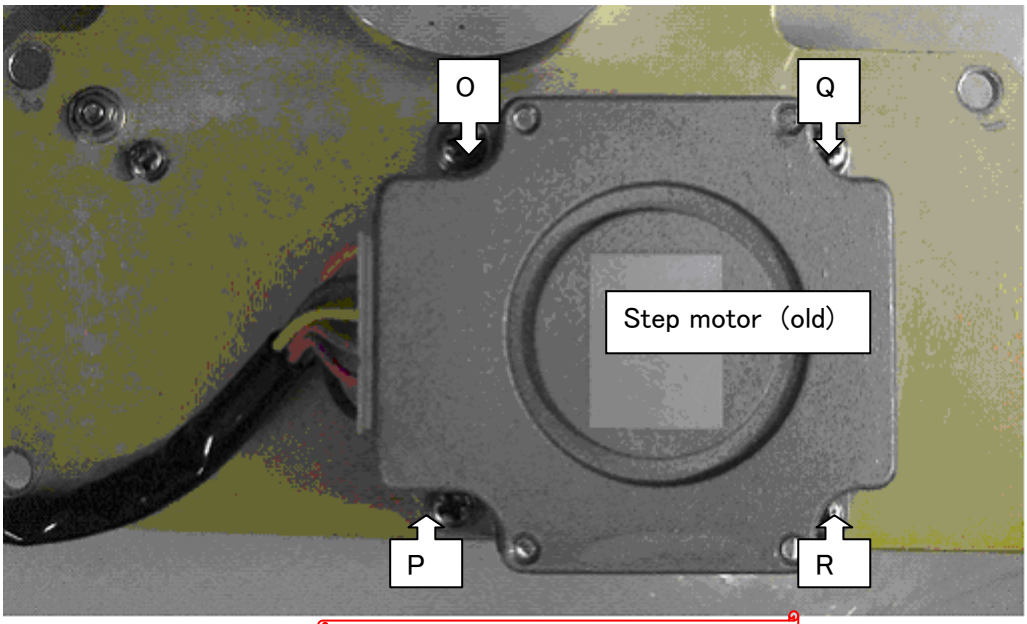


Fig. 3-7(1) Step motor (old)

2-7. Install the step motor (New). Install the “O”～“N” screws.

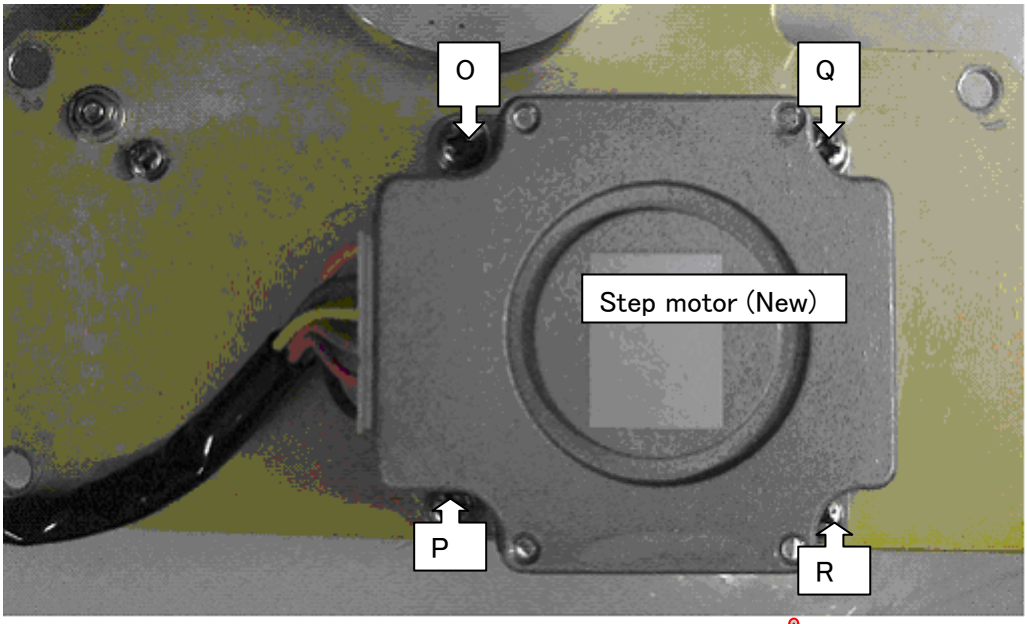


Fig. 3-7(2) Step motor (new)

2-8. Install the pulley “O” and damper which removed with 「2-4」.

Install the temporary screw “J”～“N”.

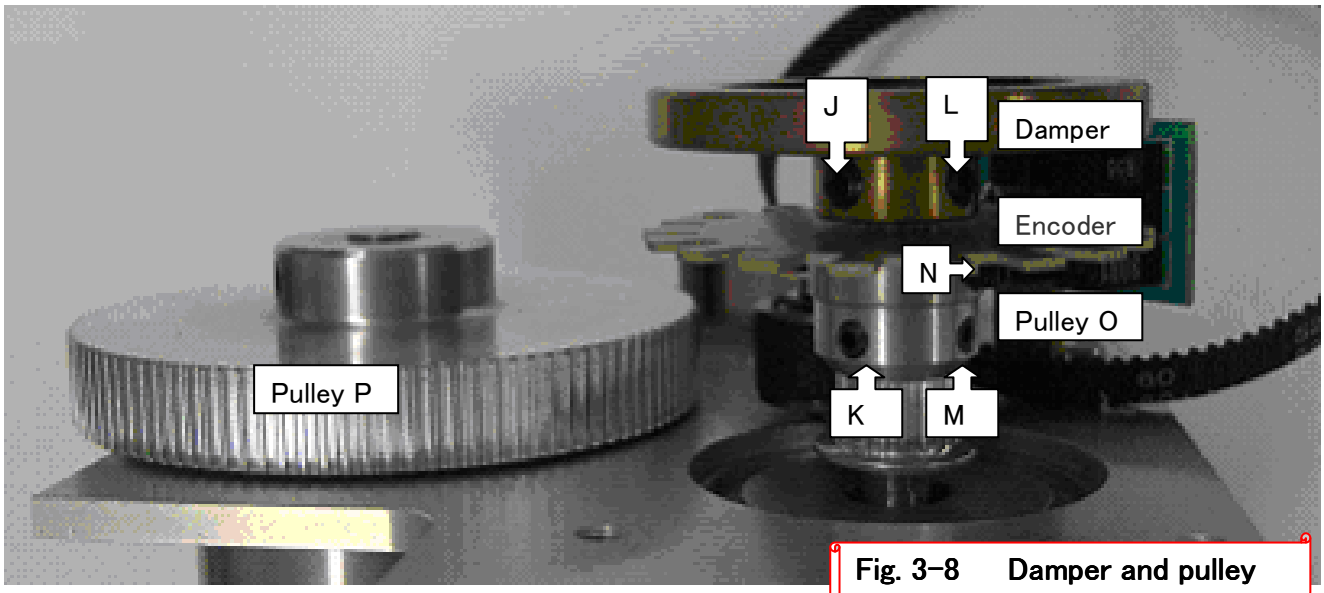
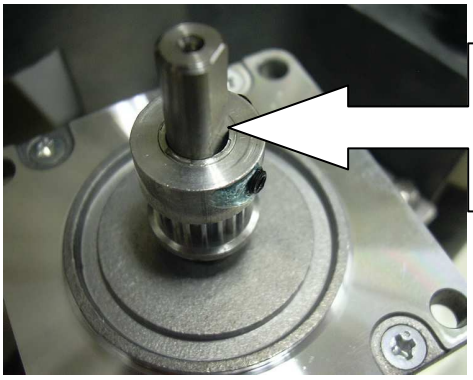


Fig. 3-8 Damper and pulley



2-8-1. Make sure that one of the screws “L”,“M” and ”N” has to be secured on the flat face side of the step motor.

2-8-2. While turning a damper, adjust pulley “O” position so that belt position to become the center of pulley “P”.

2-8-3. Tighten screw “J” ～ “N”. (Damper, Encoder and pulley “O” should be in contact.)

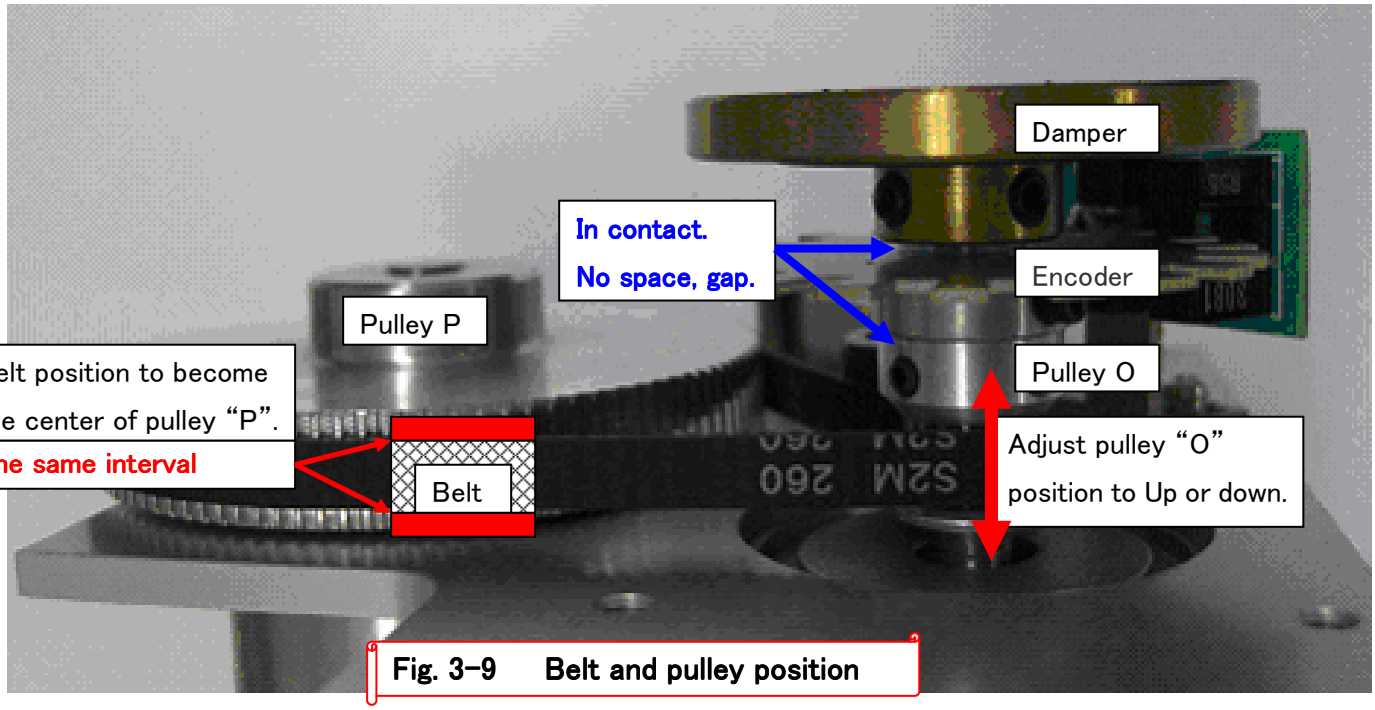
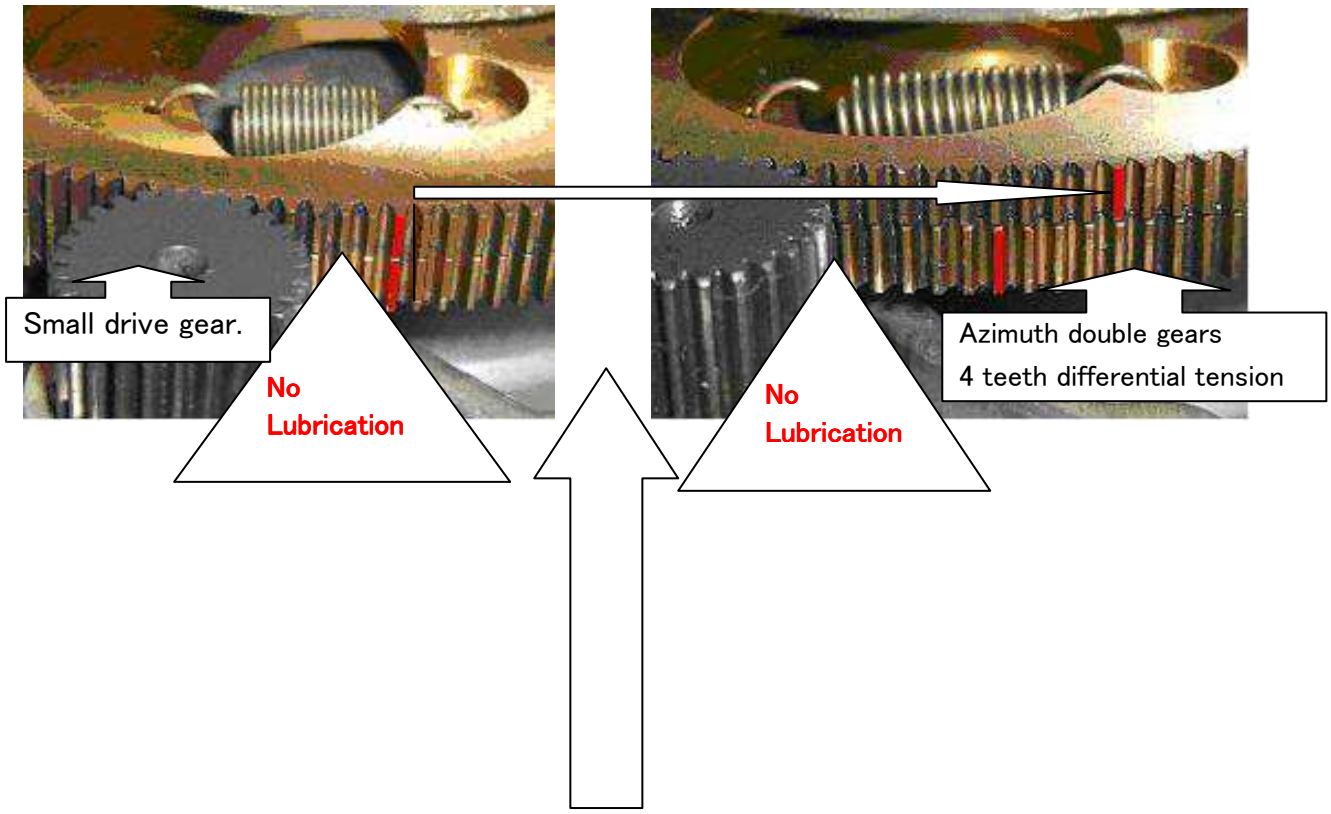


Fig. 3-9 Belt and pulley position

2-9. Upper gear of azimuth double gears should have 4 teeth worth of tension before engaging with a small drive gear.



2-10. Install step motor assembly while keeping 4 teeth tension to small driver gear. Fasten the screws "E" ～"H" temporarily, but not firm. You need final tightening after step 2-12.

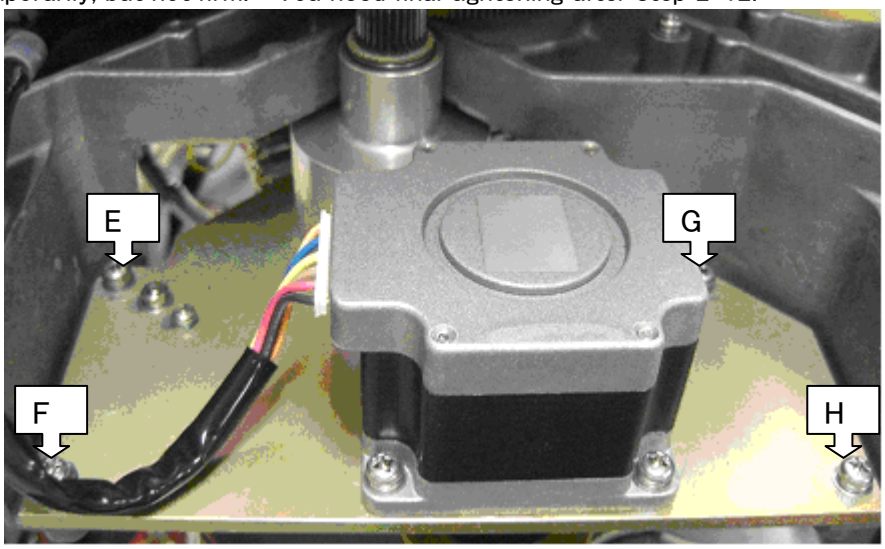
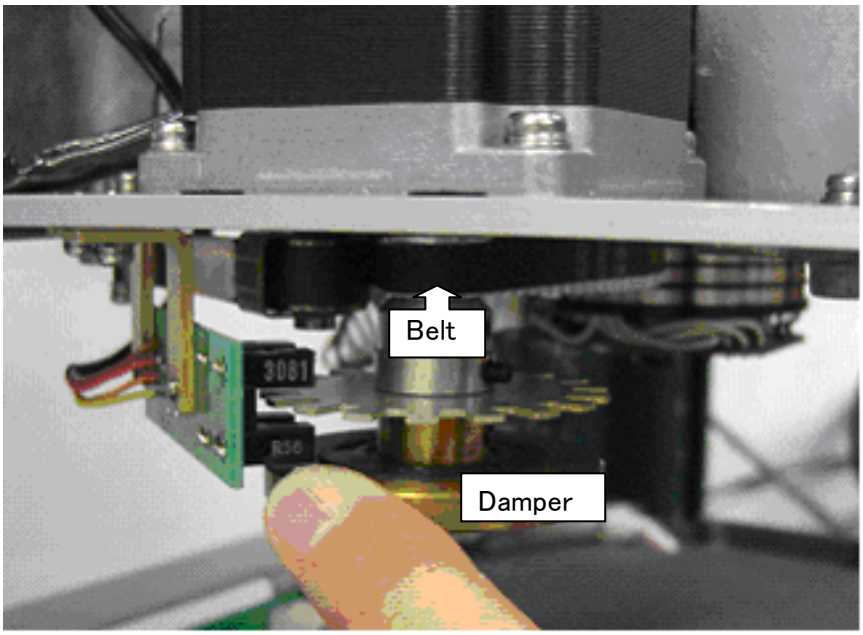


Fig. 3-10 Azimuth double gears and step motor assembly

2-11. Hold the damper of the step motor, so that one side of the azimuth gears do not move.



2-12. The play of phantom ring (azimuth double gears) (CW/CCW) should be about 0.1° .
Check the play of azimuth double gears at phantom ring position : 0/90/180/270° (4 points).

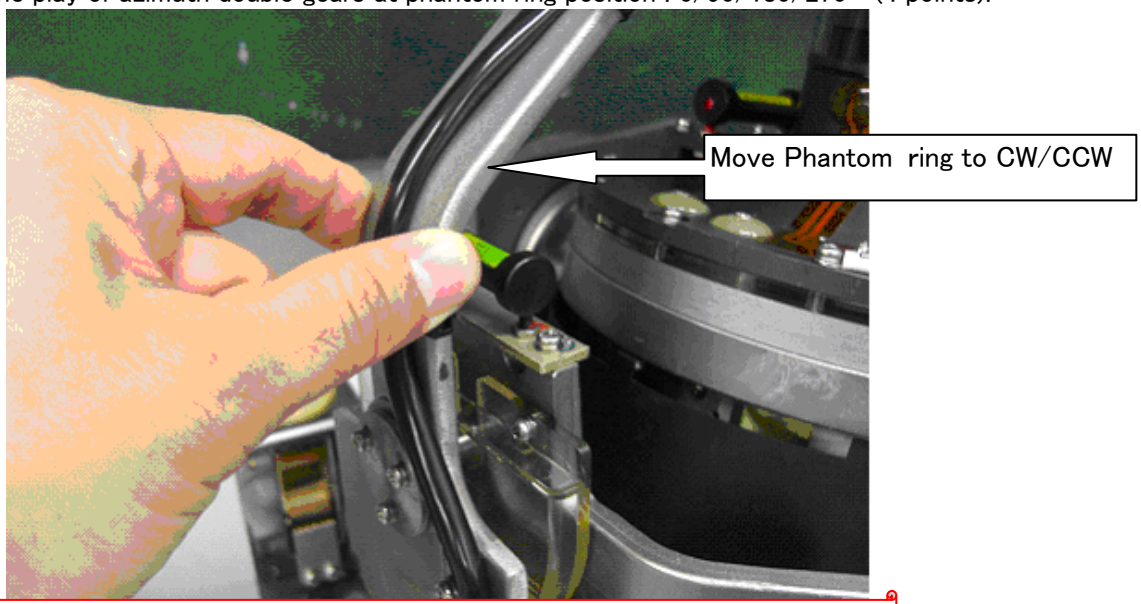


Fig. 3-11 Phantom ring (azimuth double gears) play check

2-13. Fasten screws “E”～“H” which were installed in step 「2-10」.

2-14. Install plate and screws “A”～“D” of step 「2-1」.

2-15. Install connector and screws “I” of step 「2-3」.

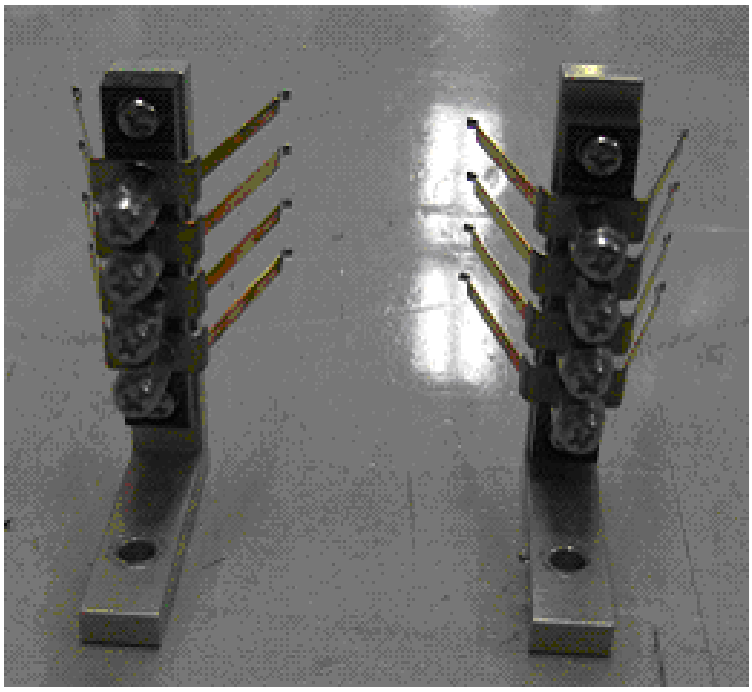
[4] BRUSH (EXCHANGE) AND SLIP-RING CLEANING

GYROCOMPASS
TG-8000

1.Preparations

1-1.Required parts and tools

1-1-1. Brush 10239379、10239380 (1set)



1-1-2. Adjustable wrench (1pc)

1-1-3. Phillips screw driver : small size　(1pc)

1-1-4. Cotton bud (about　5～6 pcs)

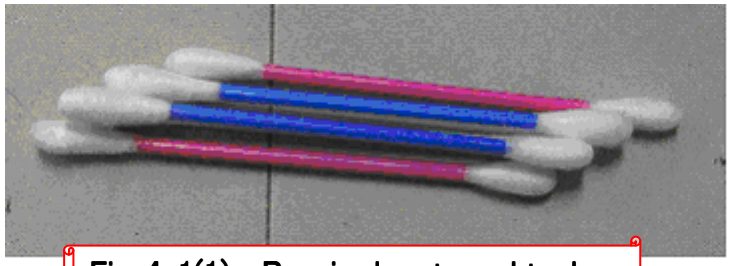
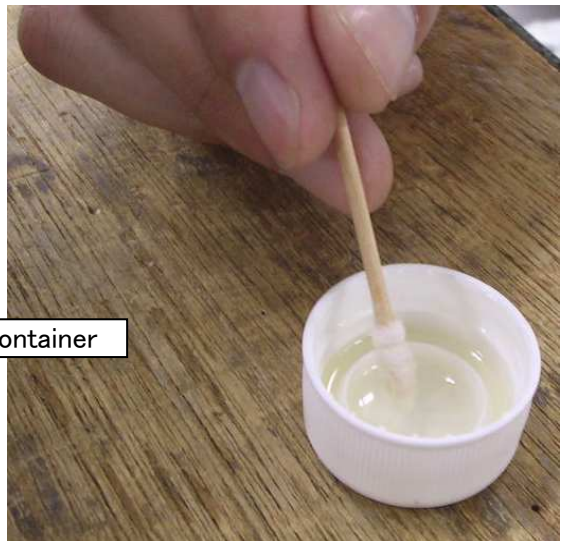


Fig. 4-1(1)　Required parts and tools

1-1-5. Cotton tape (about 300cm)

The cotton tape is cut in the length of about 60～70cm. (Three to four tapes needed.)

1-1-6. Protective solution「WD-40」 (small amount)



In container

Don't spray the solution.

Use cotton bud and dip in the solution.

Fig. 4-1(2) Required parts and tools

2. Shock absorber removal

2-1. Take out nuts (all 4 coners), remove the shock absorbers.

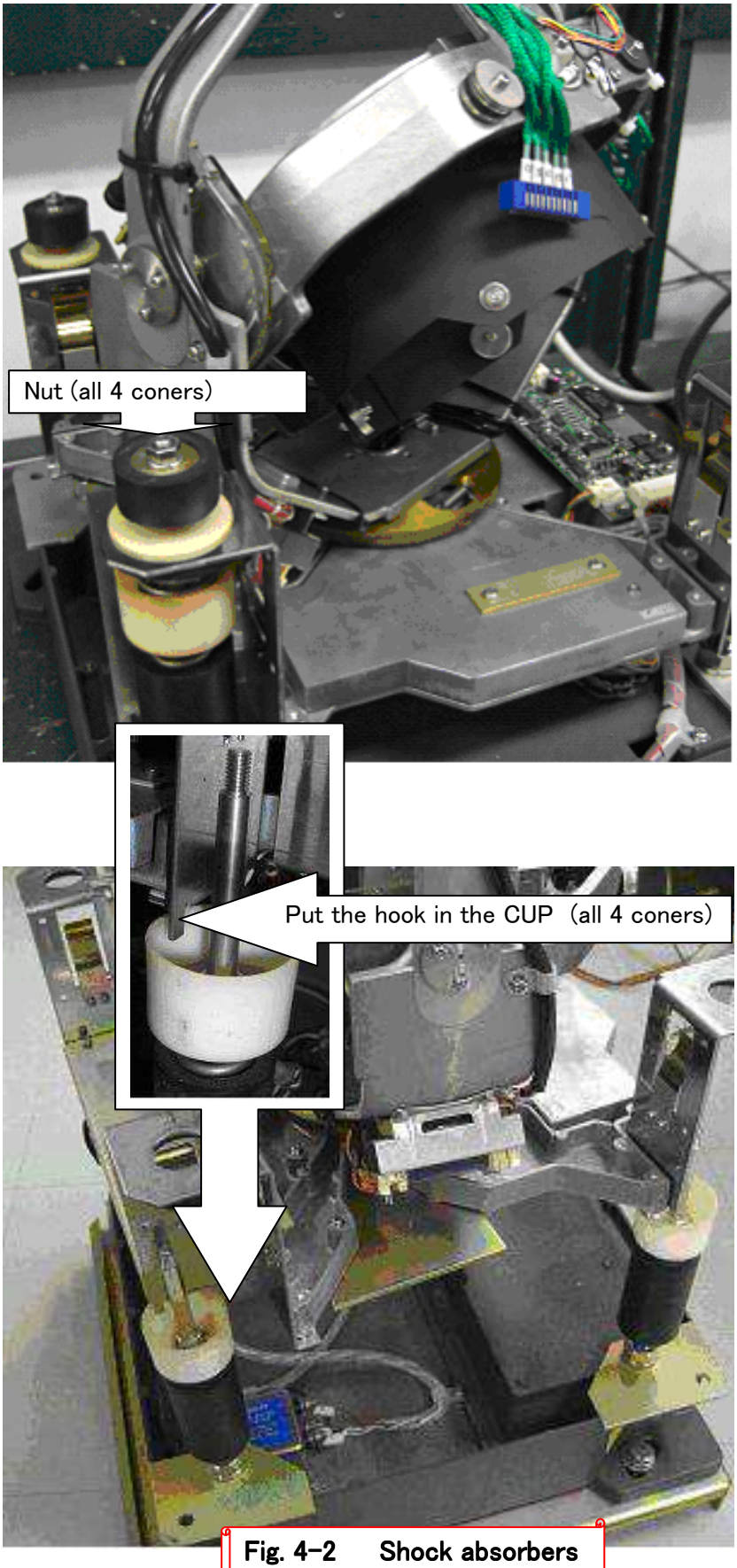
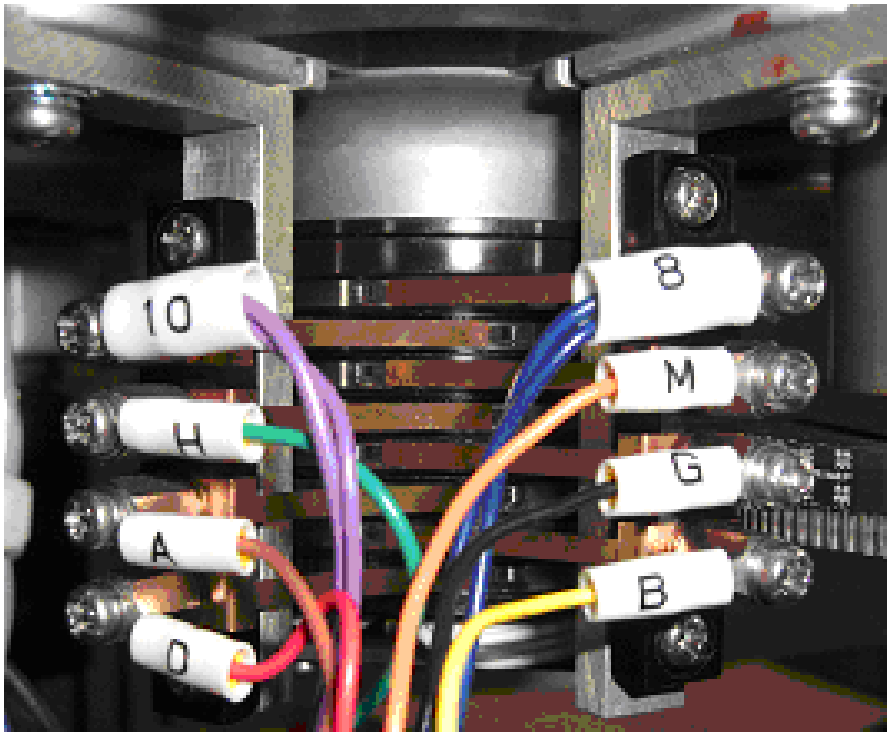


Fig. 4-2 Shock absorbers

3. Brush removal

3-1. Remove terminal 8, M, G, B, 10, H, A, D.



3-2. Remove screw A & B and take off brushes.

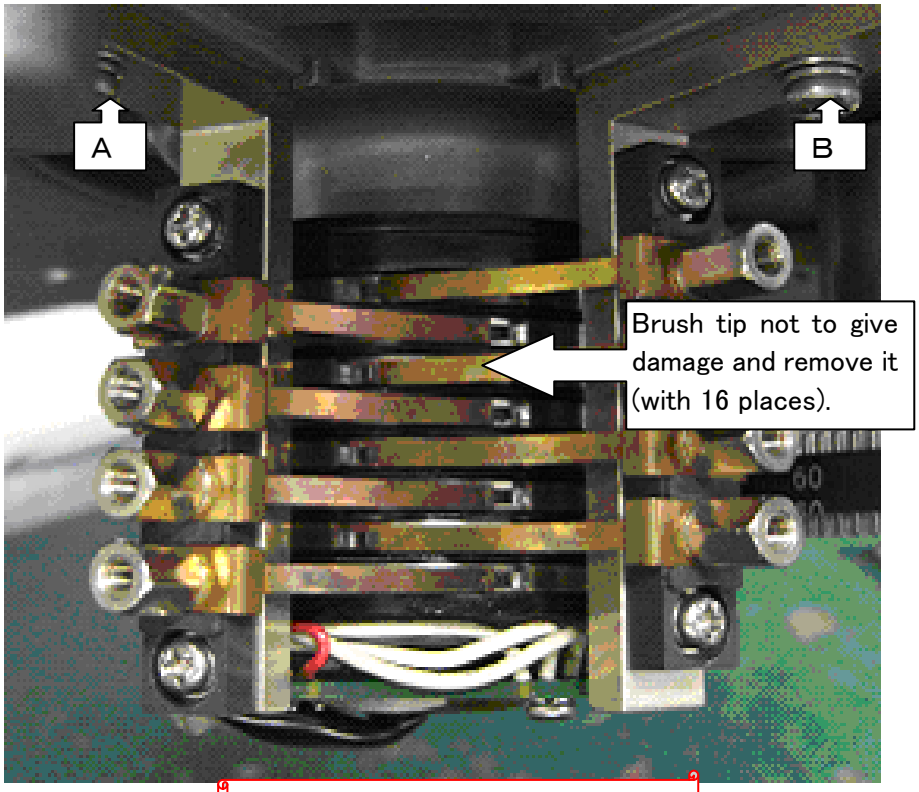


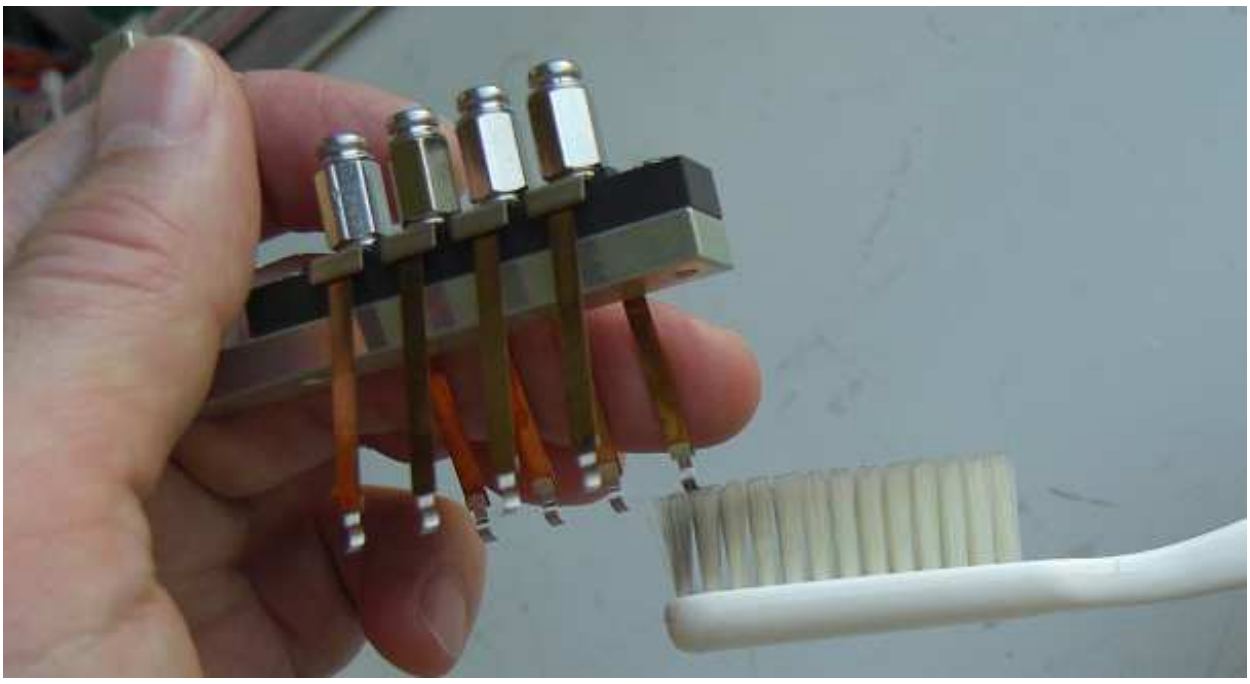
Fig. 4-3 Brush and slip ring

4. Brush and slip-ring cleaning

4-1. Clean all the tips of each brush by using soft kind toothbrush or a cotton bud.

Note:

- Do not use any cleaning solution.
- The toothbrush must be the type with the soft hair materials.
- The spring pressure may change when you add too much power to each brush. Please hold the arm while you gently clean each tip of the brushes.
- Please make sure that there are no remaining hair or debris of cotton bud.



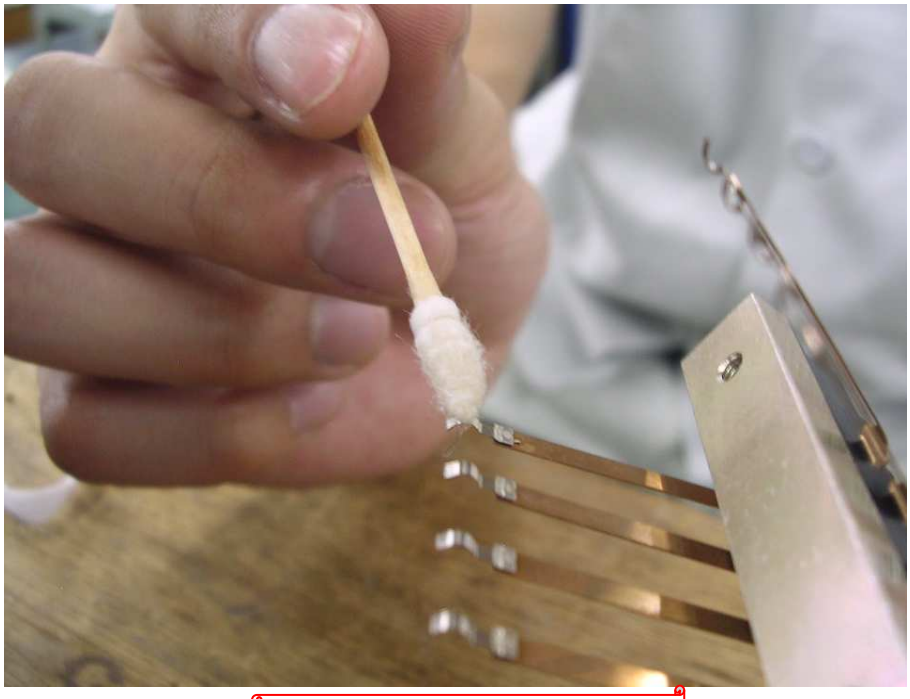


Fig. 4-4 Brush cleaning

4-2. Clean entire rings of the Slip-ring, and all layers with cotton tape or a cotton bud.

Note:
・Do not use any cleaning solution.
・Clean the edges of the Slip-ring. Refer to "A"
・Please make sure that there are no remaining hair or debris of cotton bud.

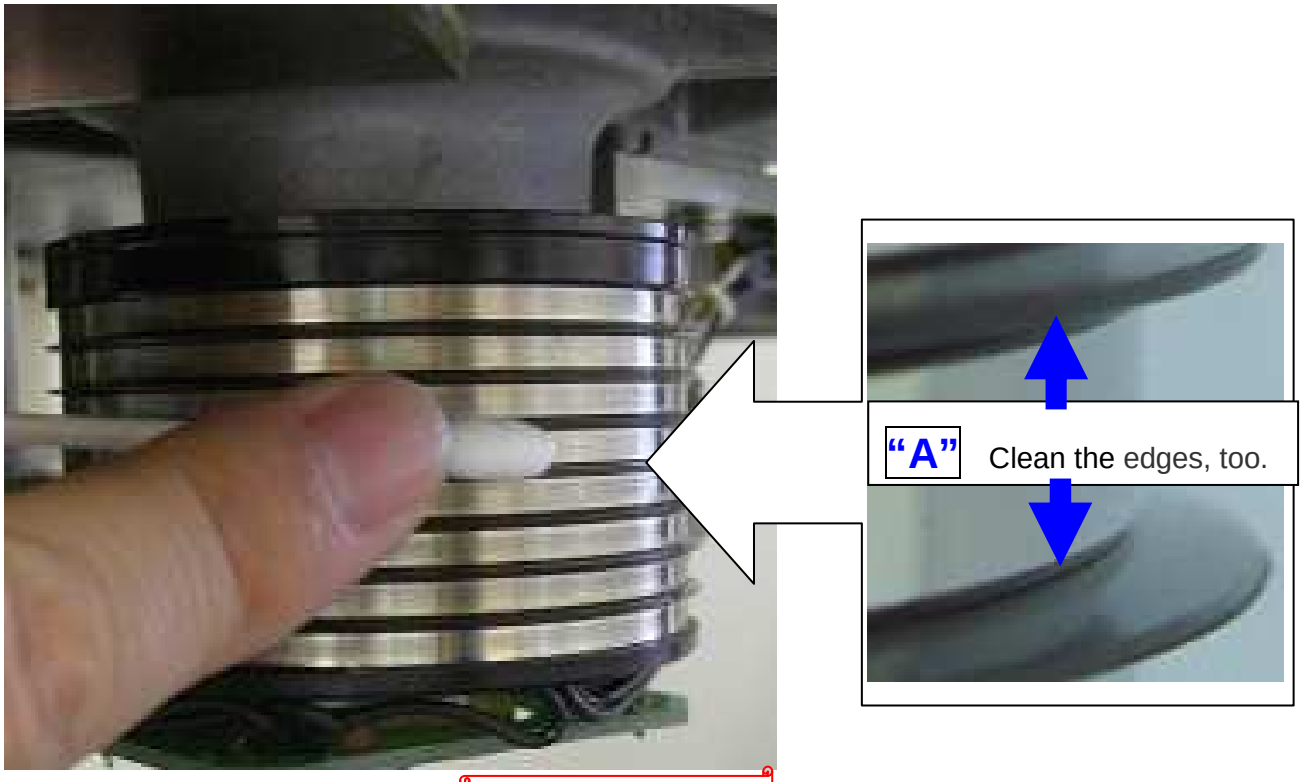


Fig. 4-5 Slip-ring

4-3. Wet the cotton bud with “WD-40”

Note:

・Do not blow to the Slip-ring/brush directly if ″WD-40″ is a spray can type.

・Take a small amount of liquid from the “WD-40” spray can in the plastic cap.

Fig. 4-6(1)　Wet cotton bud and slip-ring

4-4. Coating all layers of the Slip-ring with the cotton bud after dipping in "WD-40" liquid.

Note:

・Please make sure that there are no remaining hair or debris of cotton bud.

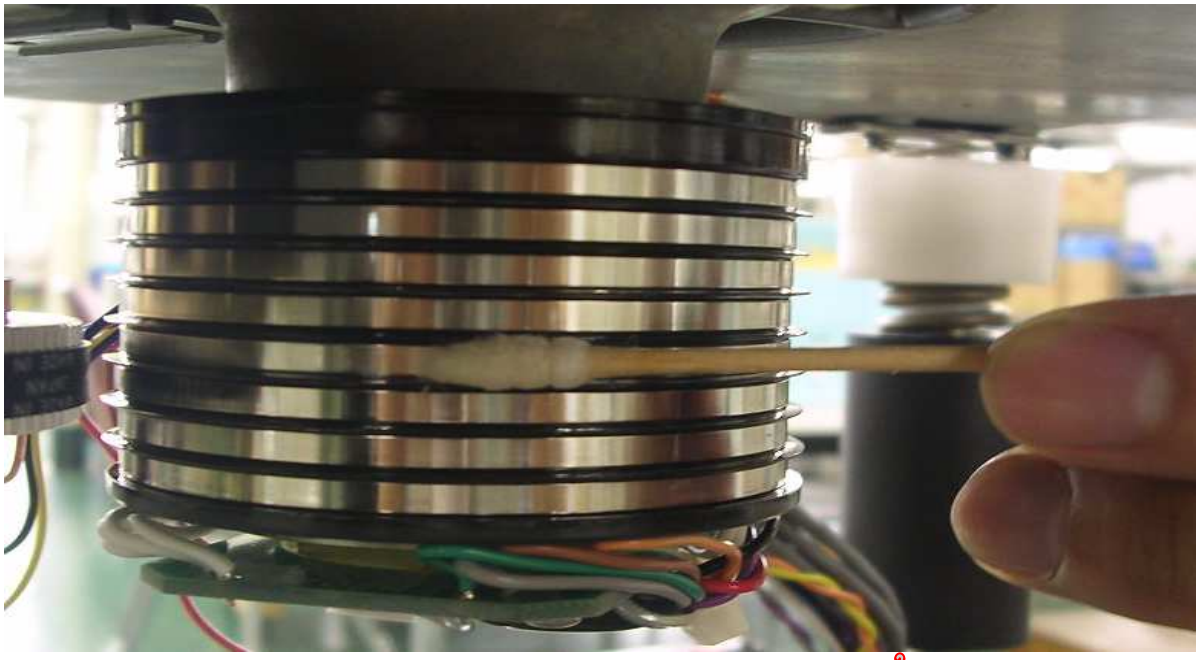
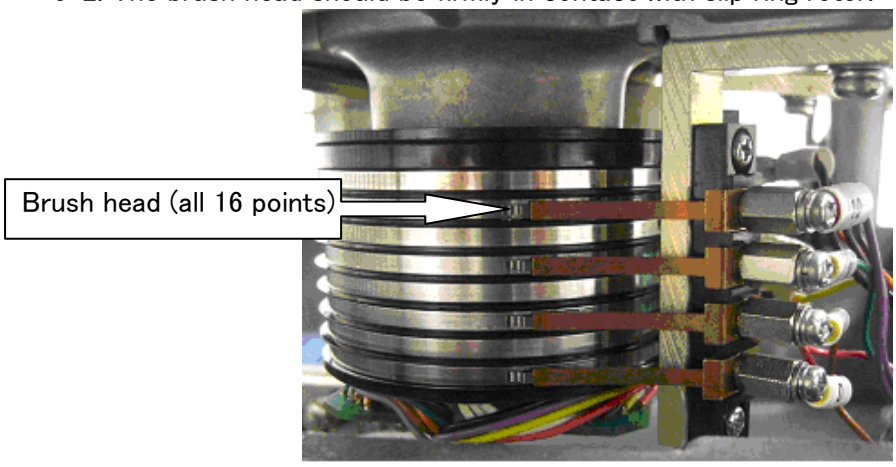


Fig. 4-6(2)　Wet cotton bud and slip-ring

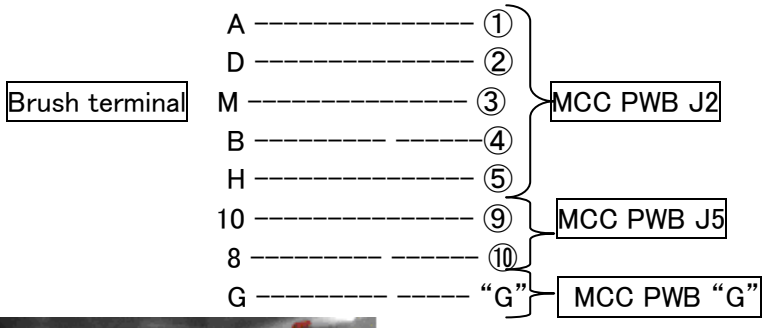
5. Brush installation

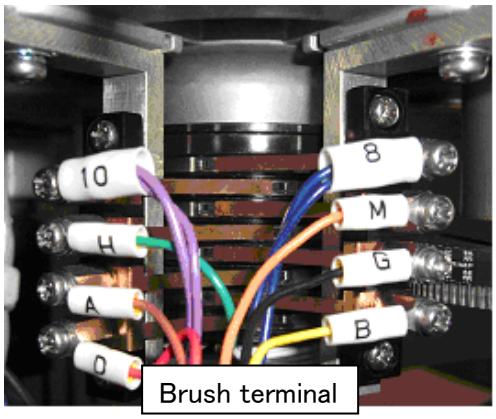
5-1. Put back the brushes to the place, where removed in 「3-1/3-2」.
Caution should be taken so that the brush tips (16) should not be damaged during installation.

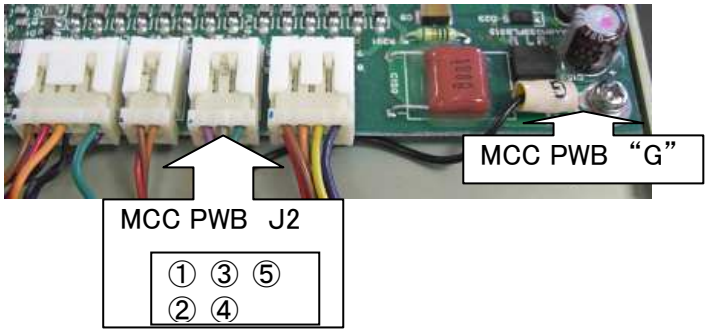
5-2. The brush head should be firmly in contact with slip ring rotor.



5-3. Check the following connections.







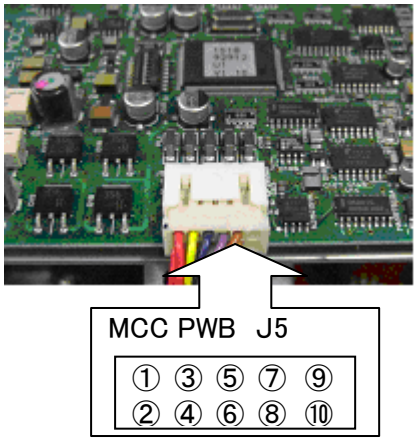
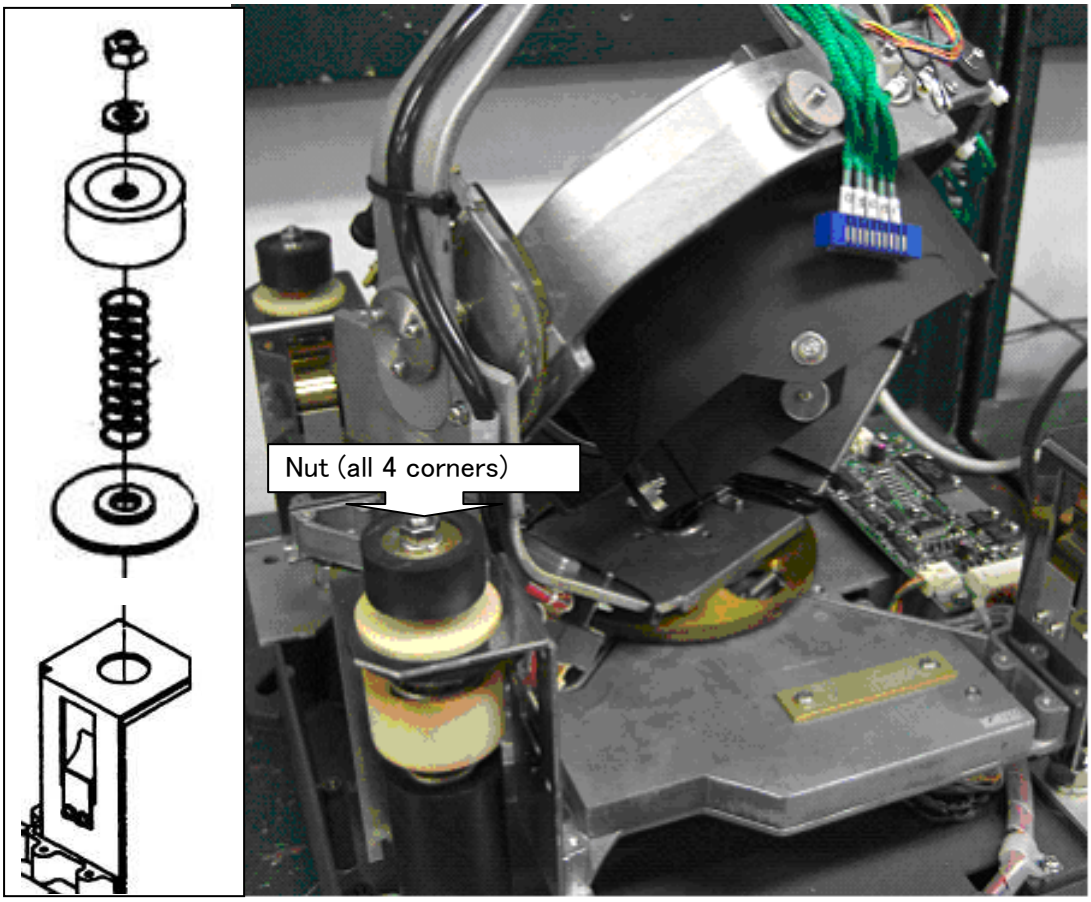


Fig. 4-7 Brush terminal connections

6. Shock absorber installation

6-1. Put back the shock absorbers, fasten nuts at all 4 corners.



6-2. All the shock shock absorbers should move smoothly.

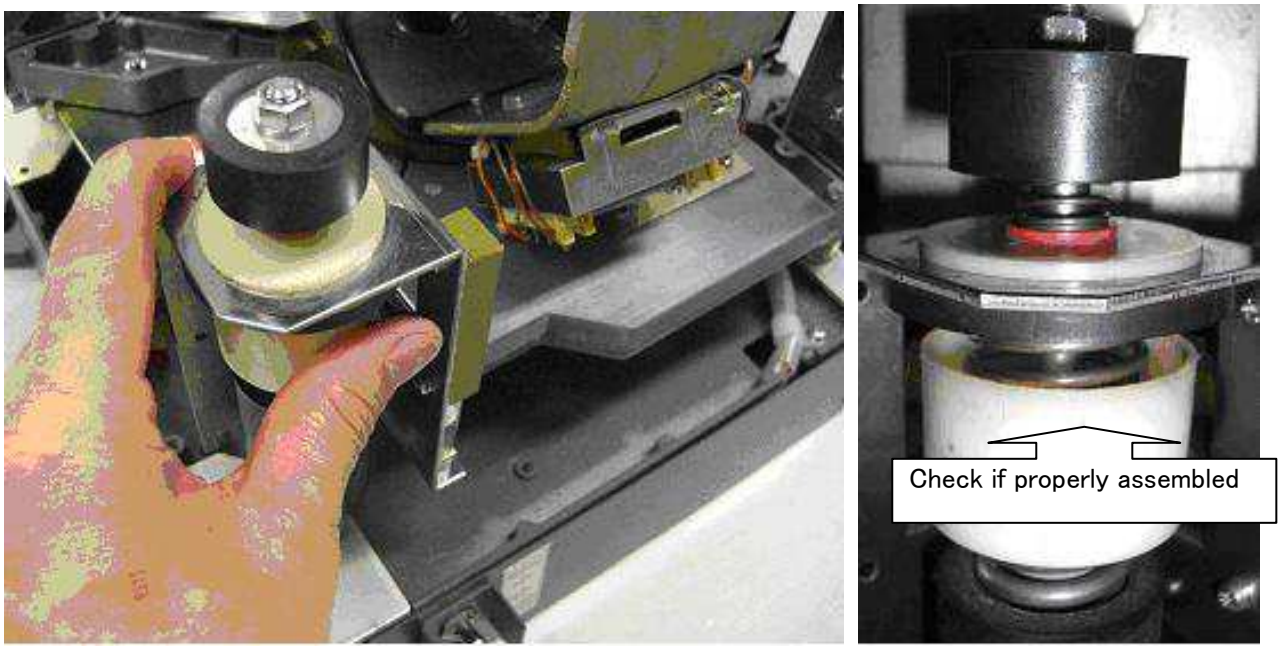


Fig. 4-8 Shock absorbers

[5] SLIP-RING EXCHANGE

GYROCOMPASS
TG-8000

1. Preparations

1-1. Required parts and tools

1-1-1. Slip-ring 10169260 (1pc)

Fig. 5-1(1)　Required part and tools

1-1-2. Soldering iron & Solder (1set)

1-1-3. Adjustable wrench (1pc)

1-1-4. Phillips screw driver : small size (1pc)

1-1-5. Cotton bud (about　5～6 pc)

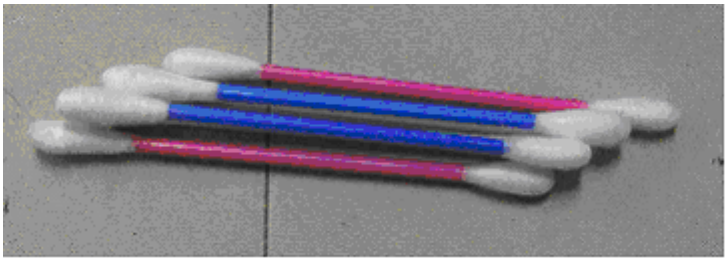
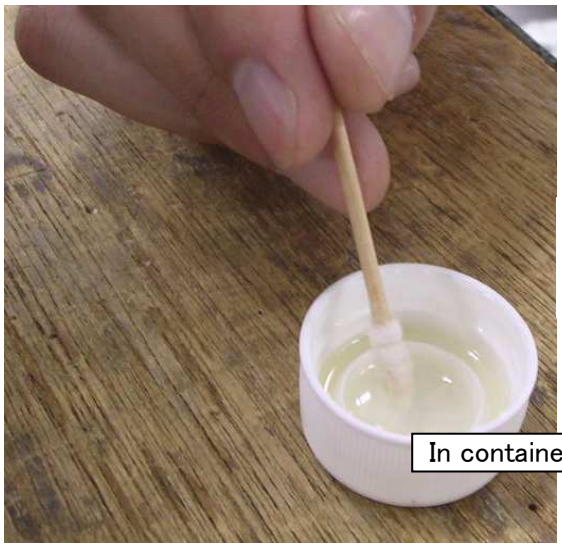


Fig. 5-1(2)　Required part and tools

1-1-6. Cotton tape (about 300cm)

Cotton tape is cut in the length of about 60～70cm. (Three to four tapes needed.)

1-1-7. Protective solution「WD-40」(small amount)



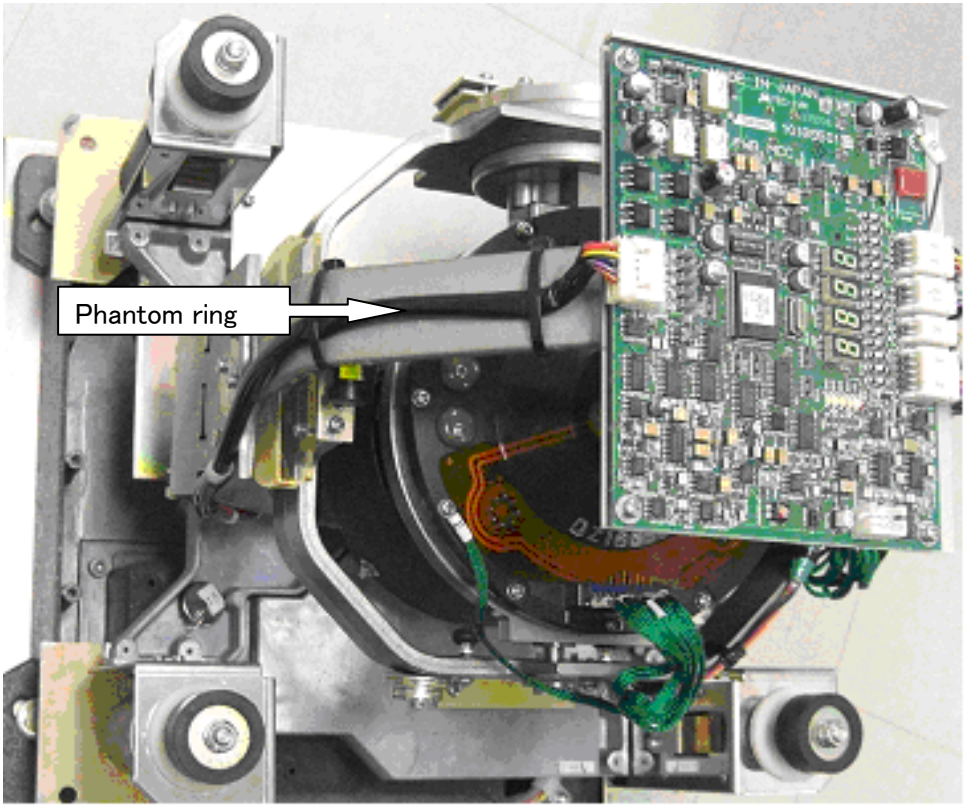
Don't spray the solution.

Use cotton bud and dip in the solution.

Fig. 5-1(3) Required part and tools

2. Sensitive element removal

2-1. Rotate the phantom ring until the connector comes to the front as shown in the picture.



2-3. Remove 4 screws “A”～“D”. Loosen screw “E” to remove the connector.

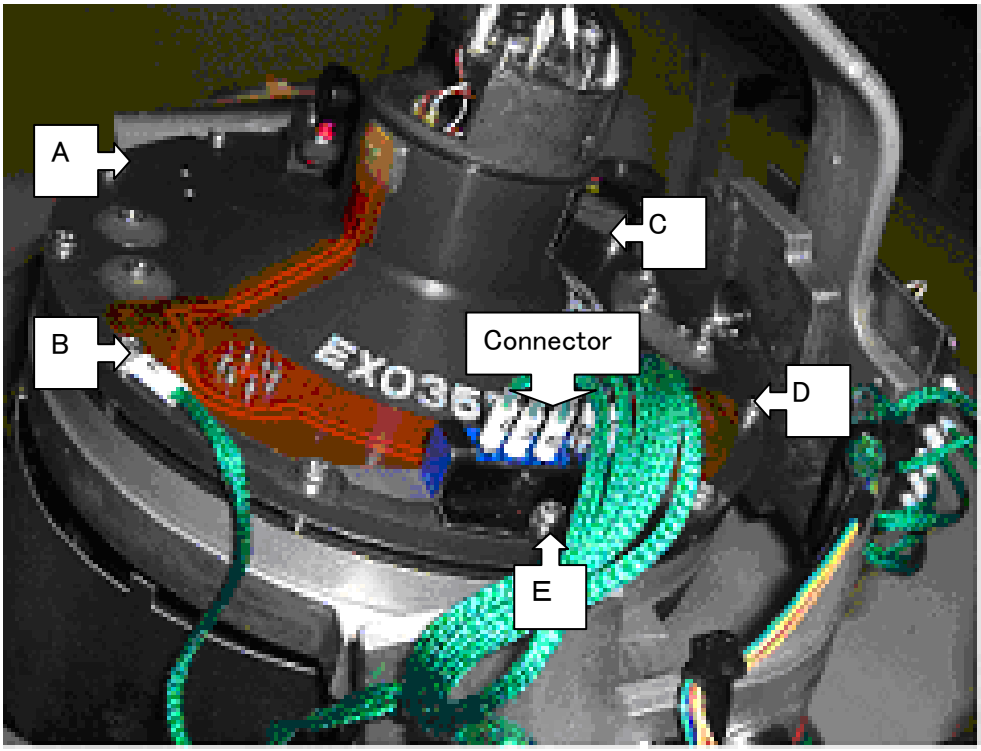


Fig. 5-2 Phantom ring and sensitive element

2-4. Grab the neck of sensitive element firmly as shown in the picture and take it out from the Mounting ring.

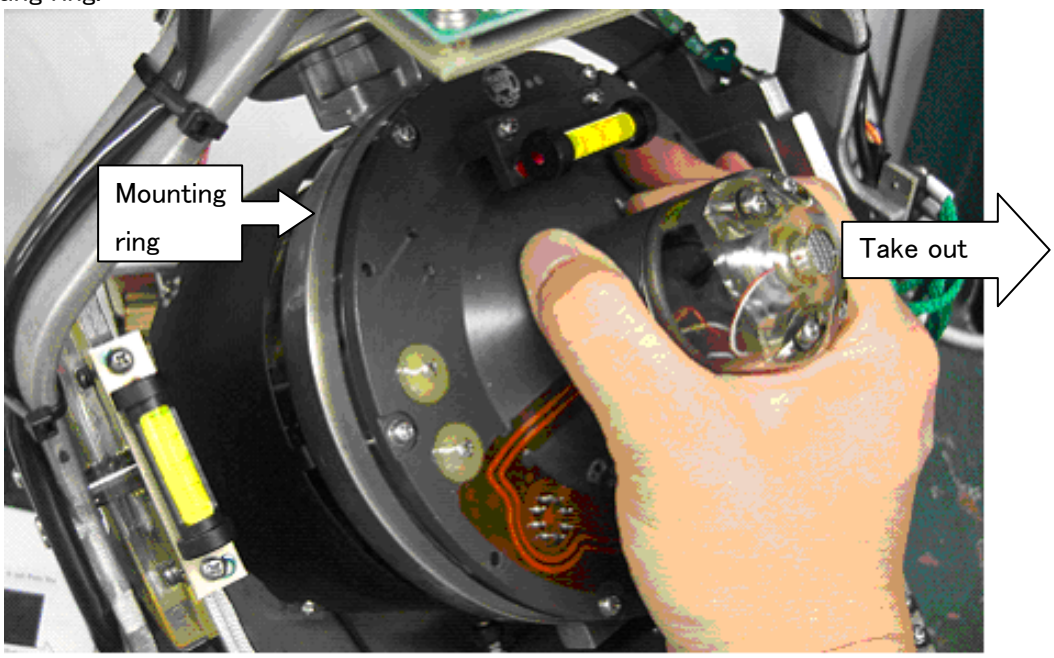
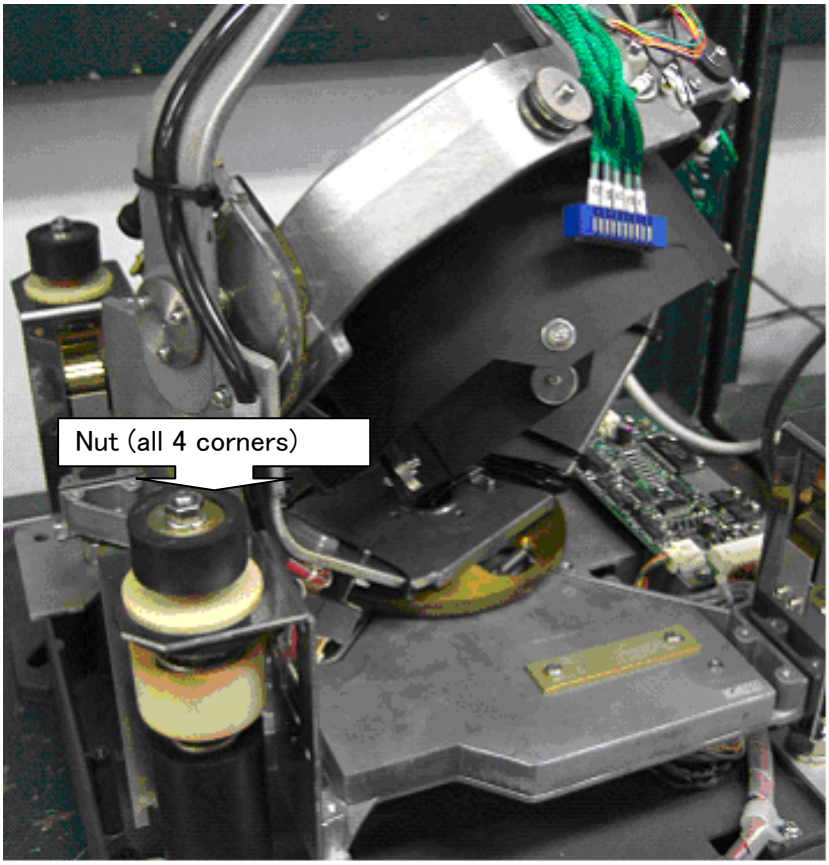


Fig. 5-3 Mounting ring and sensitive element

3. Shock absorber removal

3-1. Take out nuts (all 4 corners), remove the shock absorbers.



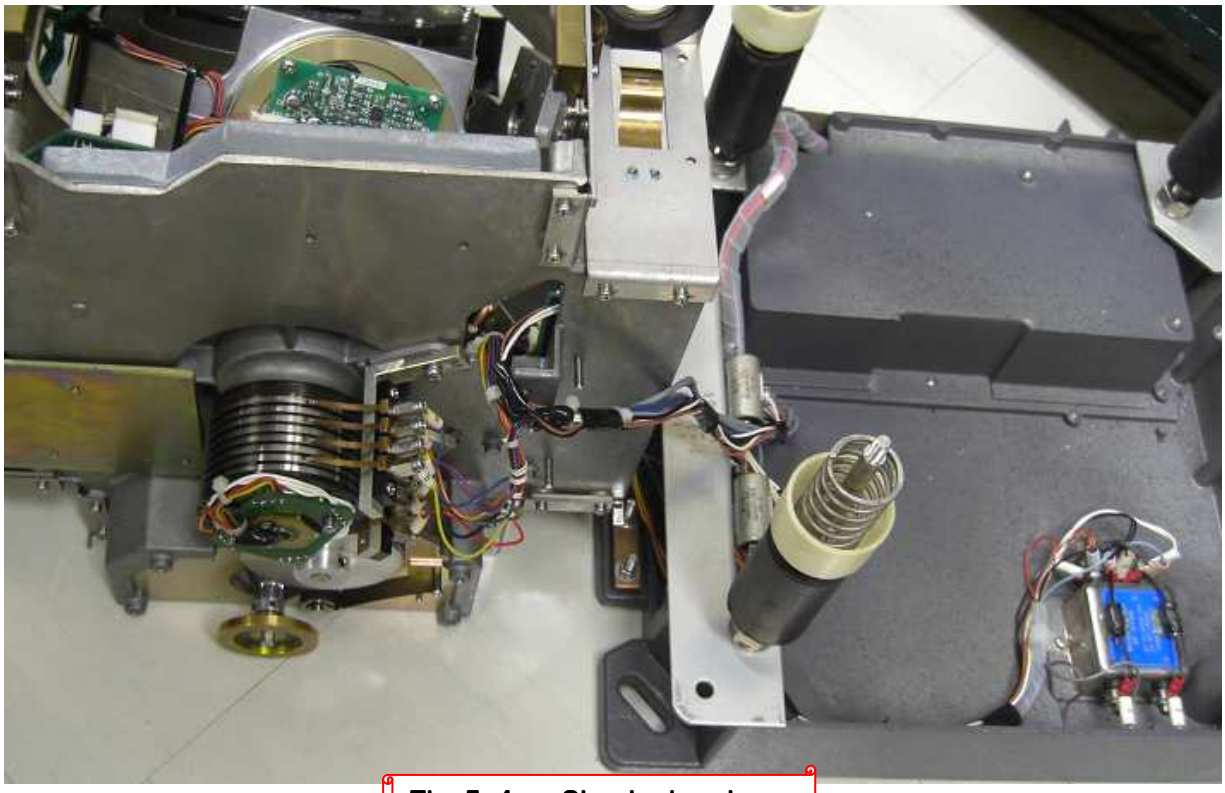
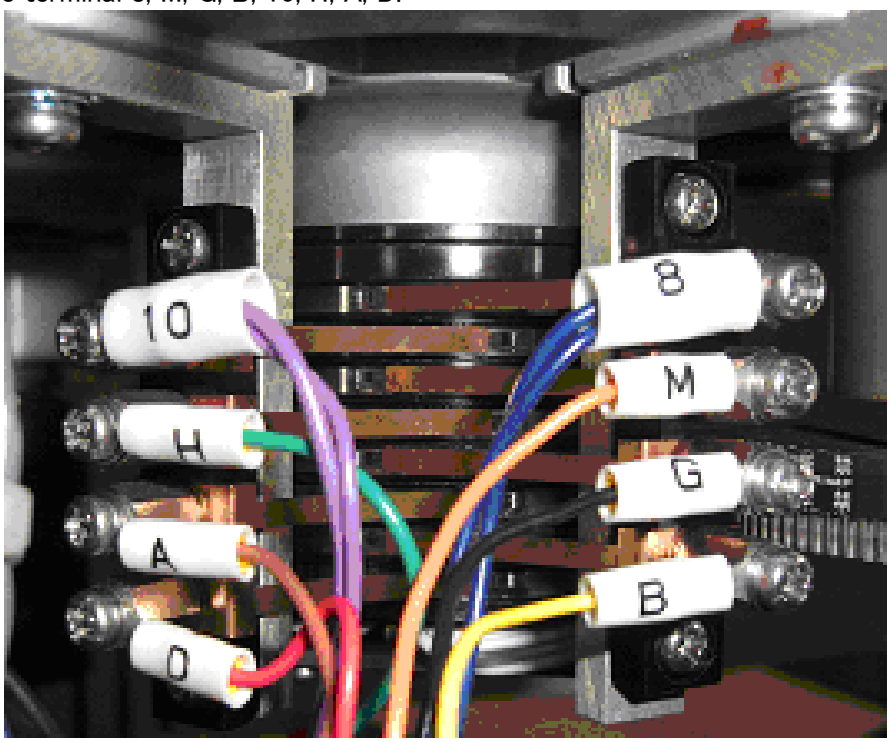


Fig. 5-4 Shock absorber

4. Brush removal

4-1. Remove terminal 8, M, G, B, 10, H, A, D.



4-2. Remove screw “F”&“G” and take off a brush.

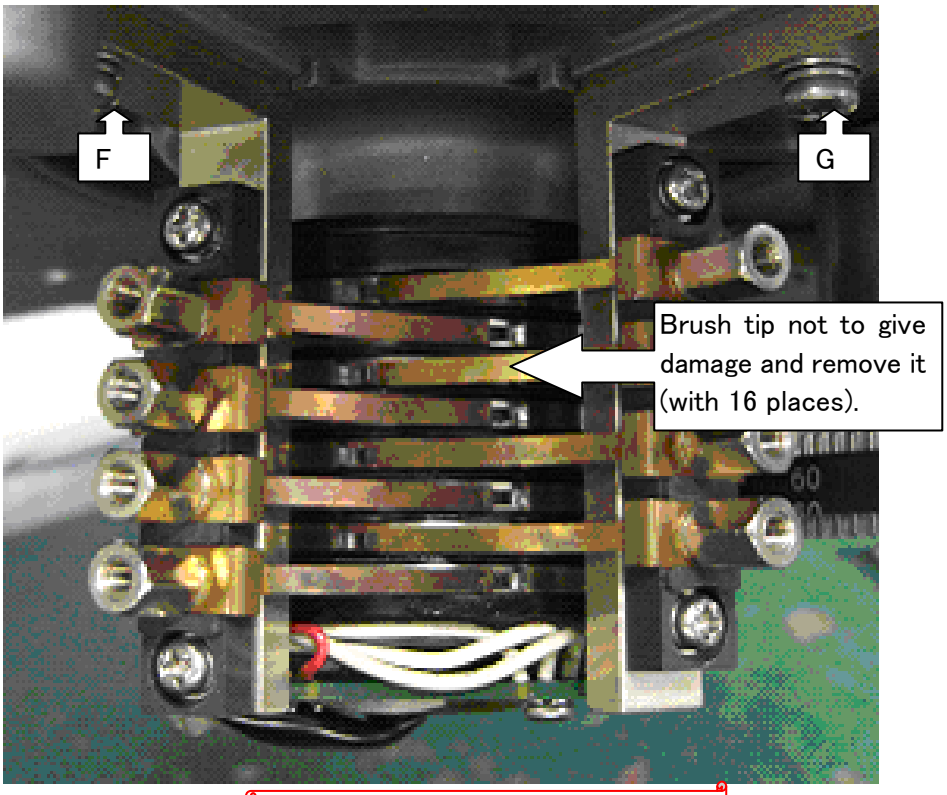
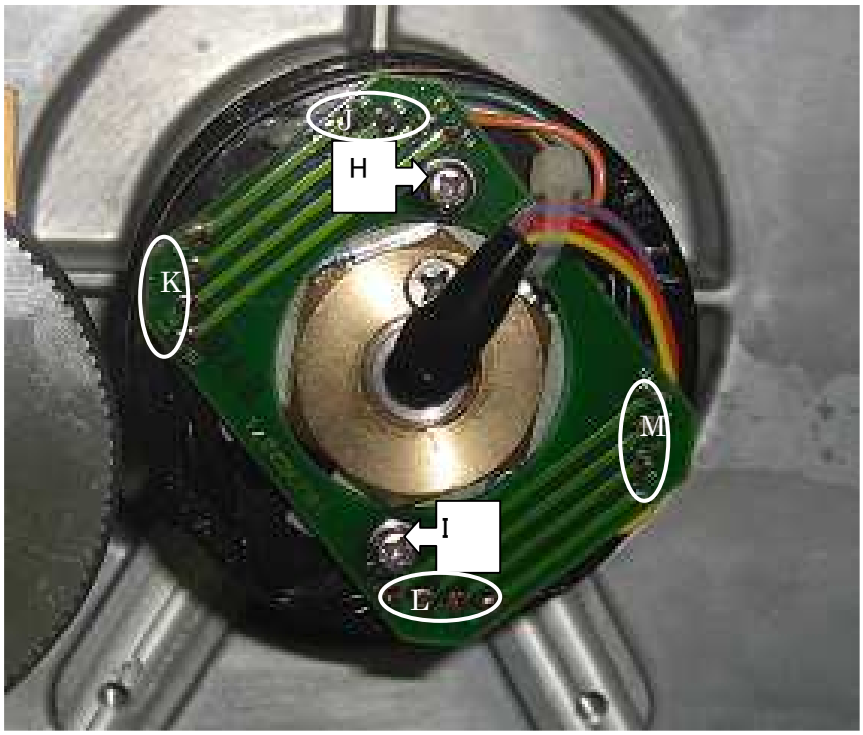


Fig. 5-5 Brush and slip-ring

5. Slip-ring exchange

5-1. Remove screw "H"&"I" and take off lead with solder "J"～"M".



5-2. Remove RELAY PWB

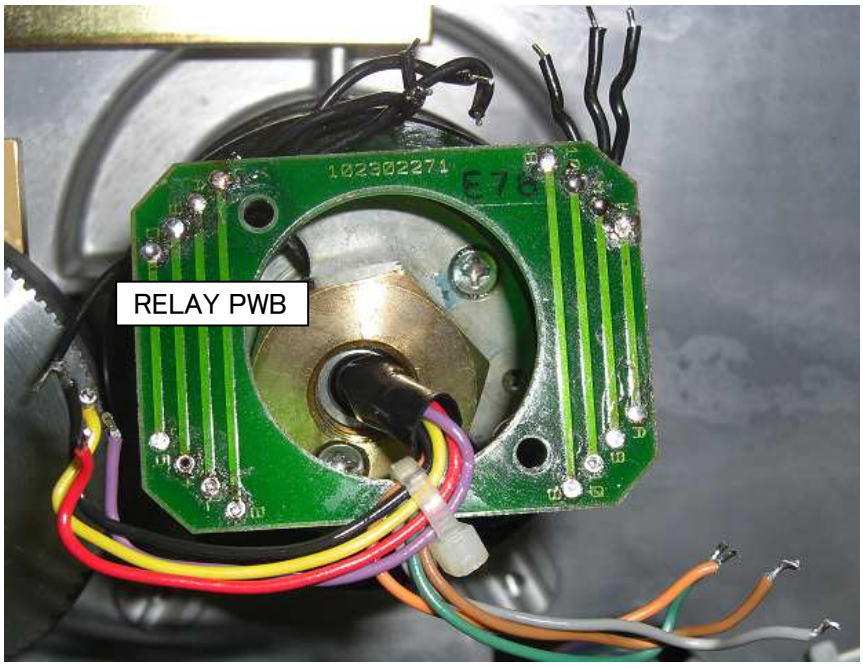
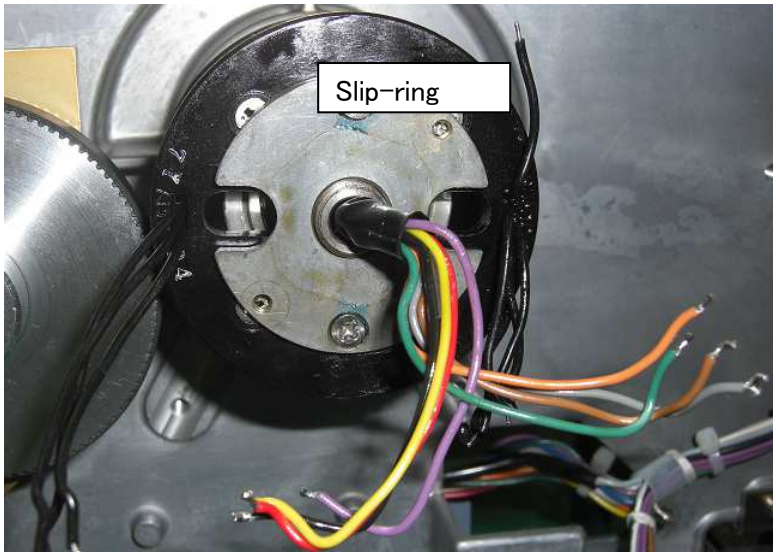


Fig. 5-6 RELAY PWB

5-3. Loosen screw “N” and remove screw “O”

5-4. Remove slip-ring.



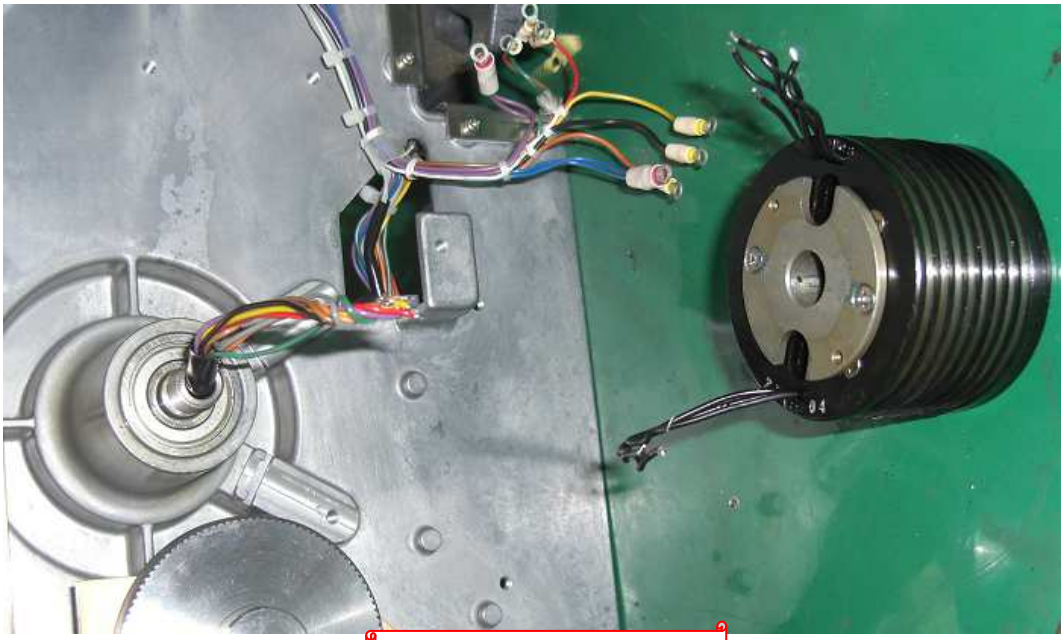
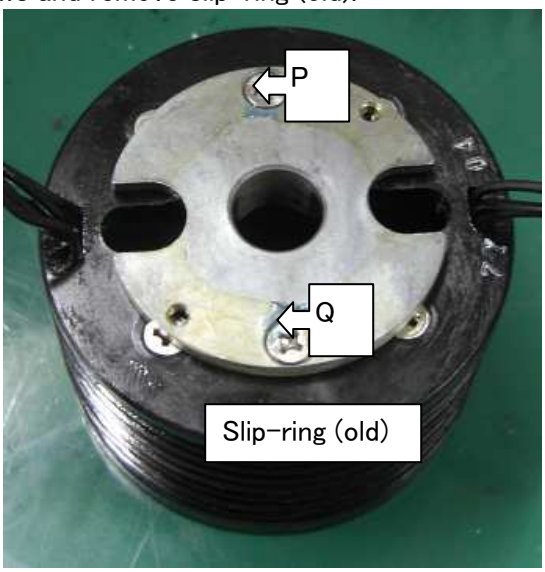


Fig. 5-7(1)　Slip-ring

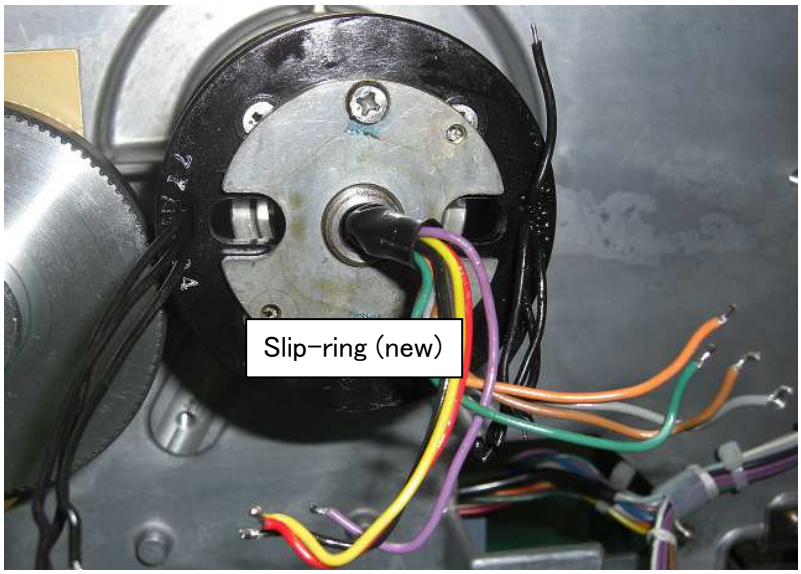
5-5. Remove “P”&”Q” screws and remove slip-ring (old).



5-6. Install slip-ring (new) and install “P”&“Q” screws.

Fig. 5-7(2)　Slip-ring

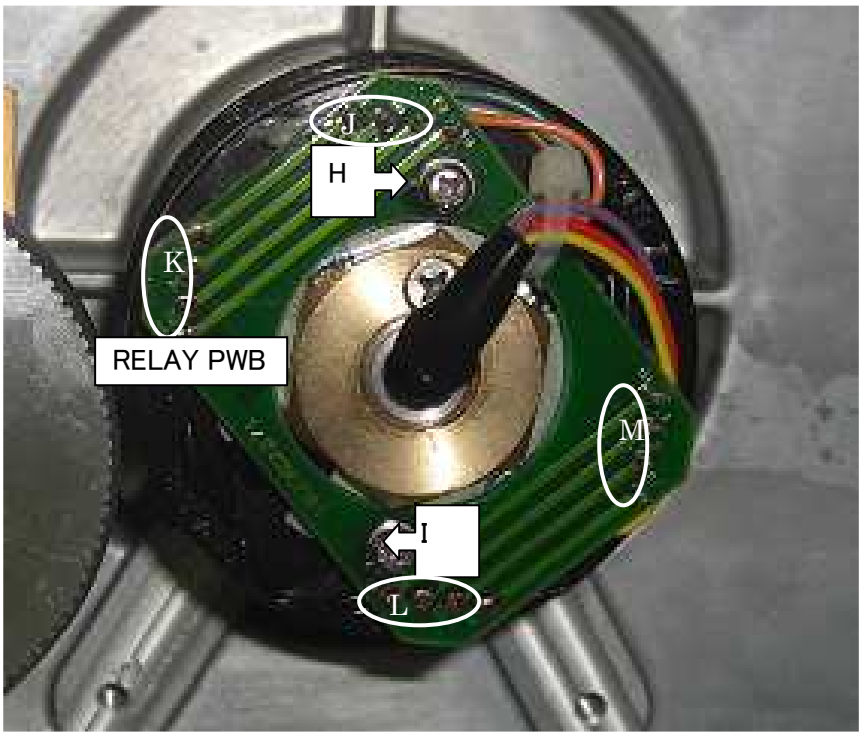
5-7. Install slip-ring (new).



5-8. Install screw “N” and screw “O”

Fig. 5-7(3)　Slip-ring

5-9. Install lead with solder　"J"～"M"and install screw "H"～"I".



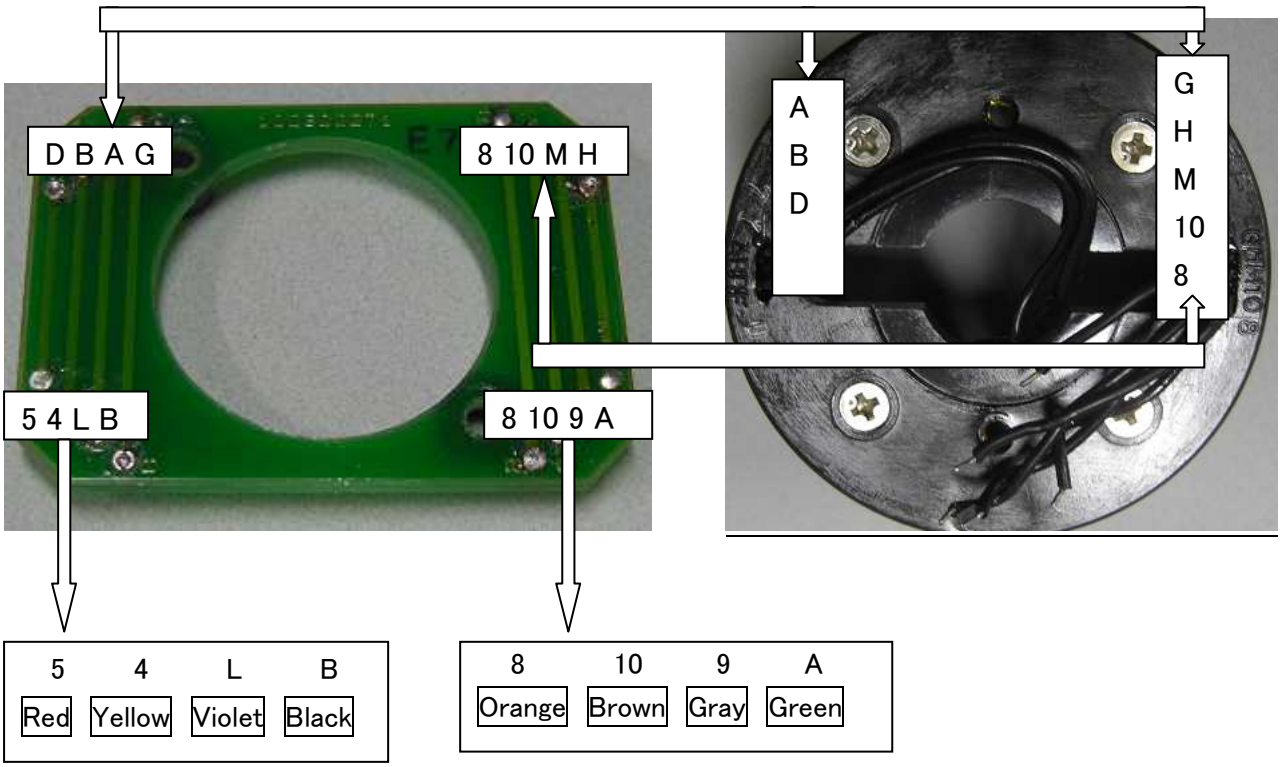
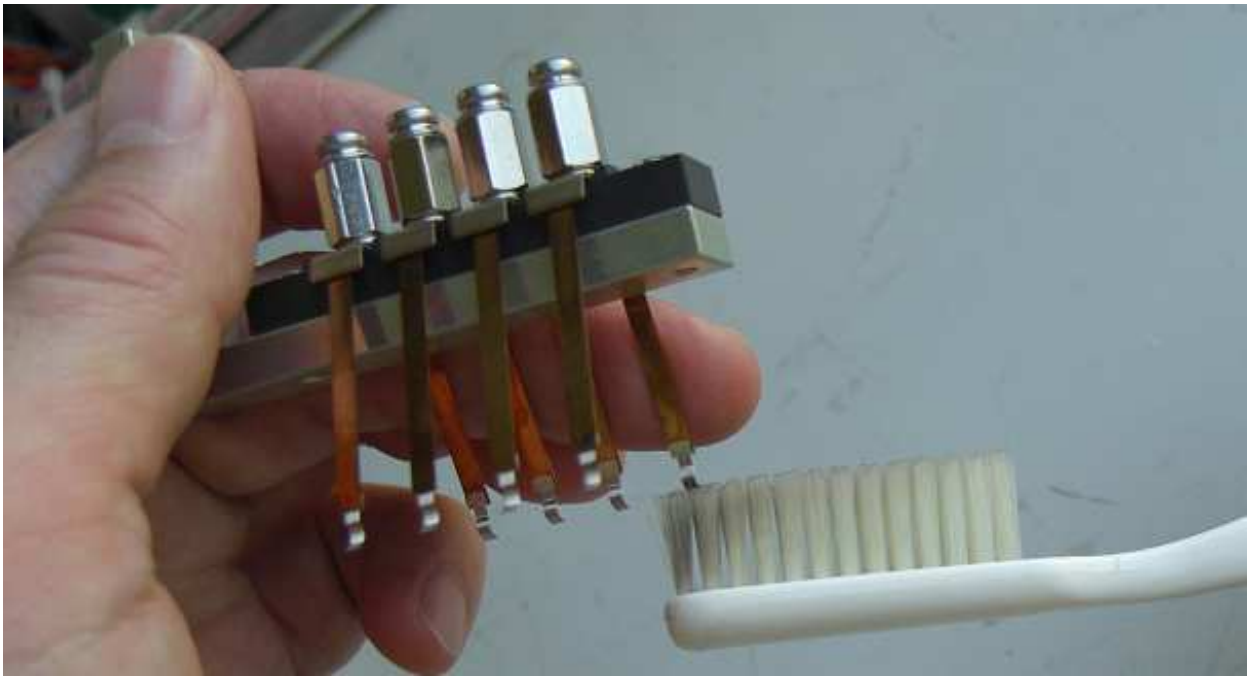


Fig. 5-8　Wiring between RELAY PWB and slip-ring

6. Brush and slip-ring cleaning

6-1. Clean all the tips of each brush by using soft kind toothbrush or a cotton bud.

Note:
- Do not use any cleaning solution.
- The toothbrush must be the type with the soft hair materials.
- The spring pressure may change when you add too much power to each brush. Please hold the arm while you gently clean each tip of the brushes.
- Please make sure that there are no remaining hair or debris of cotton bud.



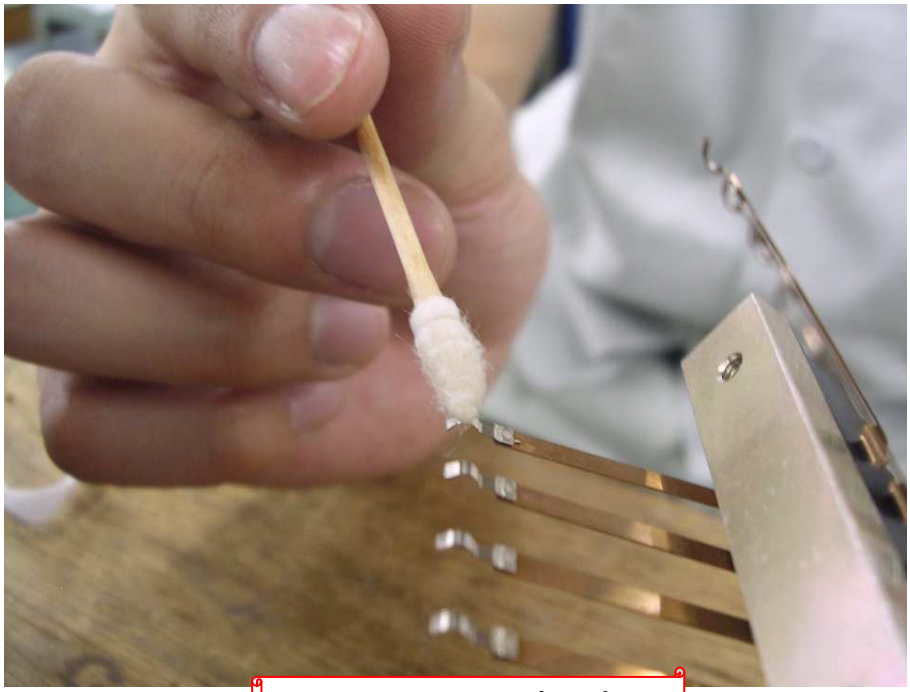
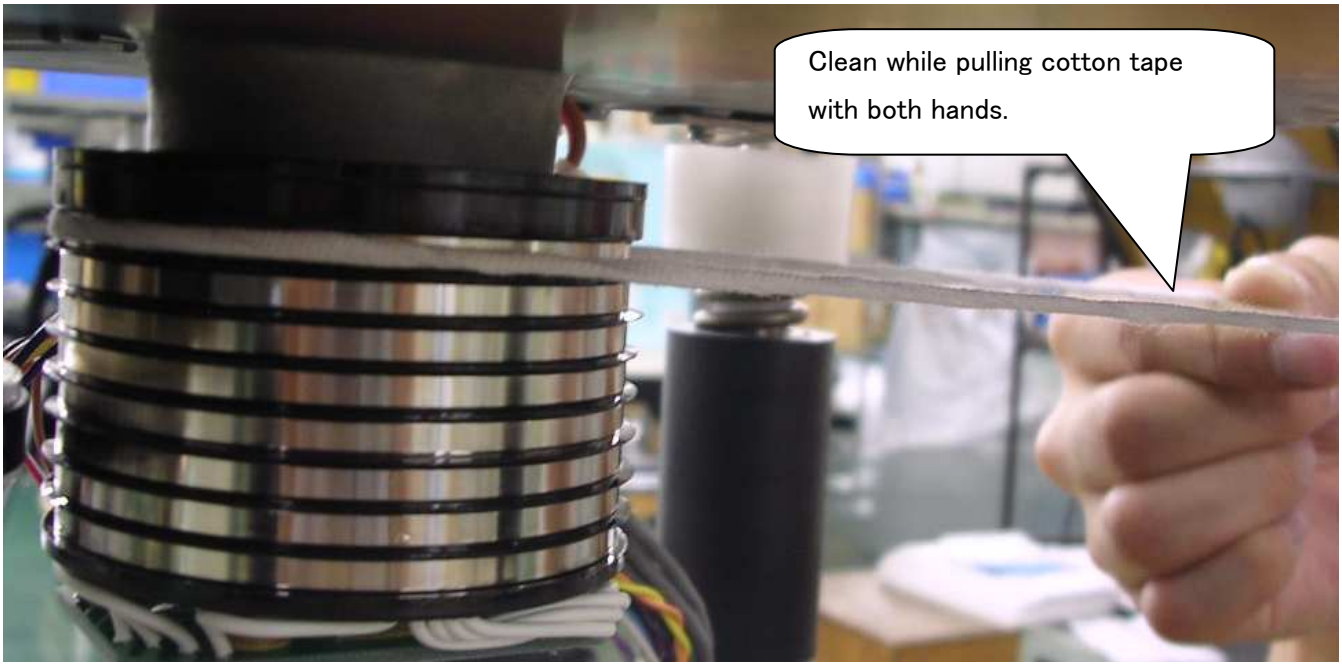


Fig. 5-9 Brush cleaning

6-2. Clean entire rings of the Slip-ring, and all layers with cotton tape or a cotton bud.

Note:
・Do not use any cleaning solution.
・Clean the edges of the Slip-ring. Refer to "A"
・Please make sure that there are no remaining hair or debris of cotton bud.



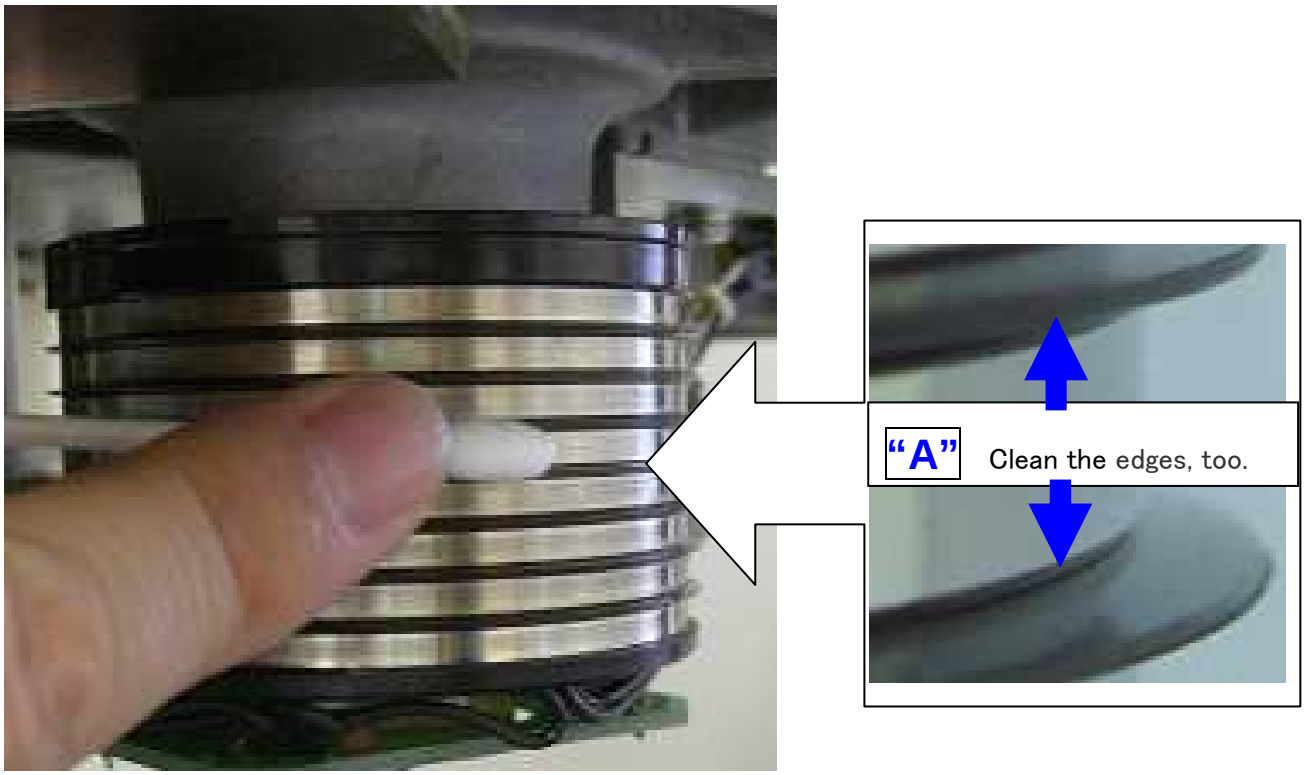


Fig. 5-10 Slip-ring

6-3. Wet the cotton bud with “WD-40”

Note:

・Do not blow to the Slip-ring/brush directly if ″WD-40″ is a spray can type.

・Take a small amount of liquid from the “WD-40” spray can in the plastic cap.

Fig. 5-11(1)　Wet cotton bud and slip-ring.

6-4. Coating all layers of the Slip-ring with the cotton bud after dipping in "WD-40" liquid.

Note:

・Please make sure that there are no remaining hair or debris of cotton bud.

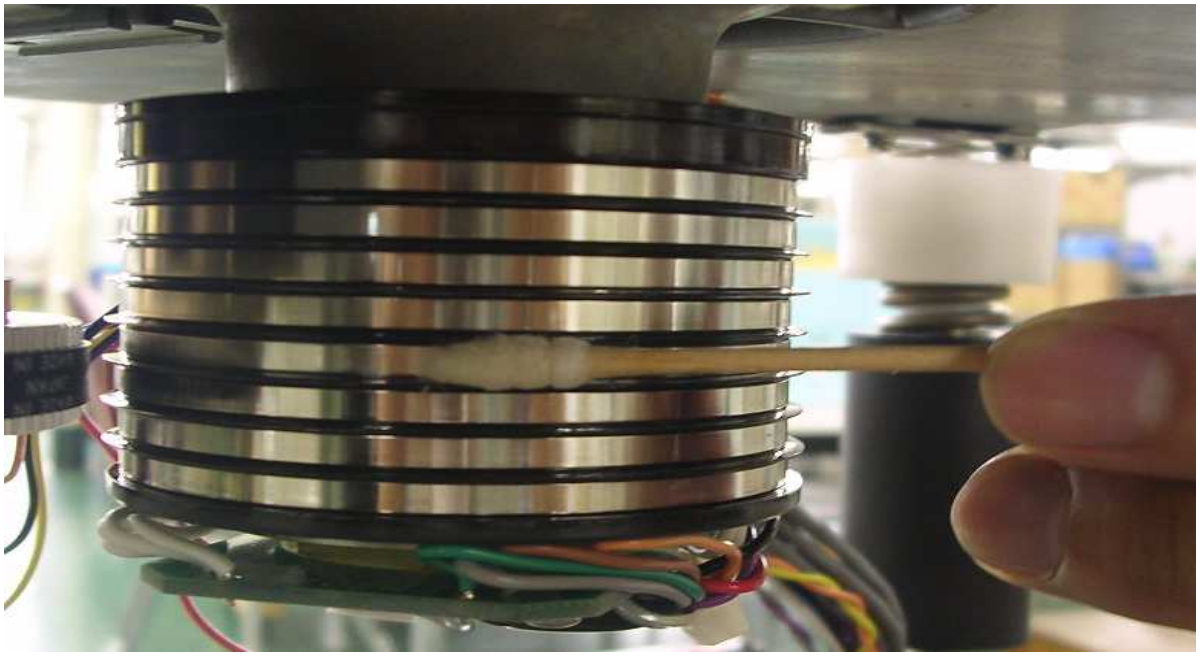
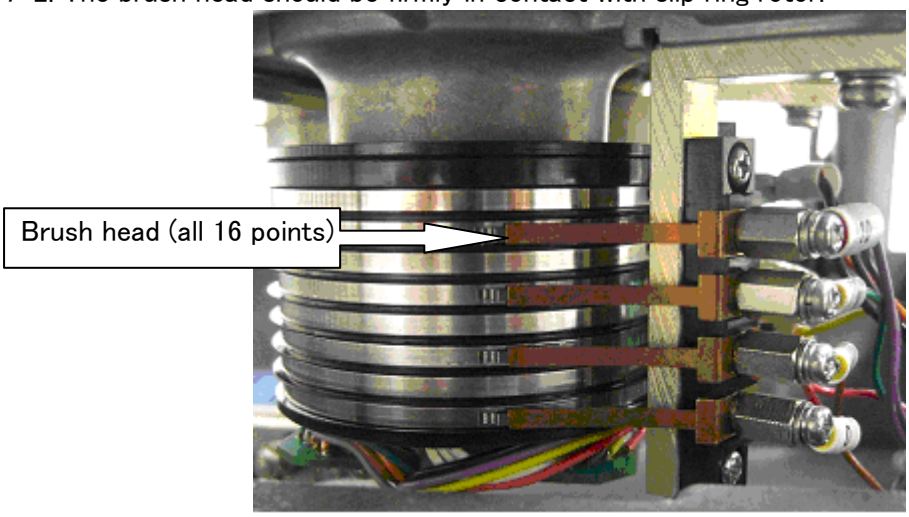


Fig. 5-11(2)　Wet cotton bud and slip-ring.

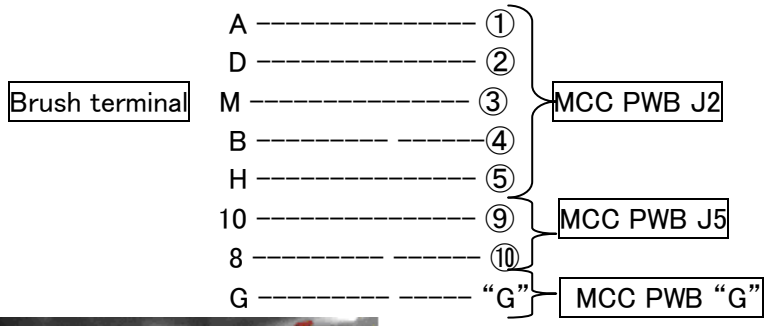
7. Brush installation

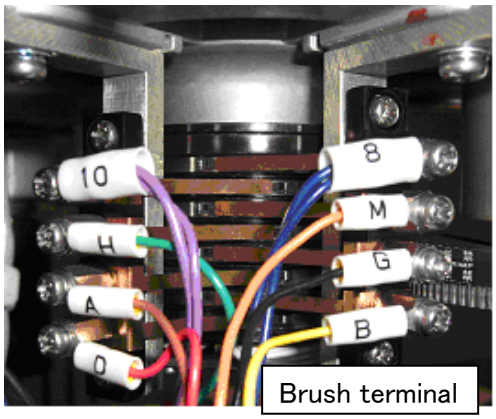
7-1. Put back the brushes which, to the place removed in 「3-1/3-2」.
Caution should be taken so that the brush heads (16) should not be damaged during installation.

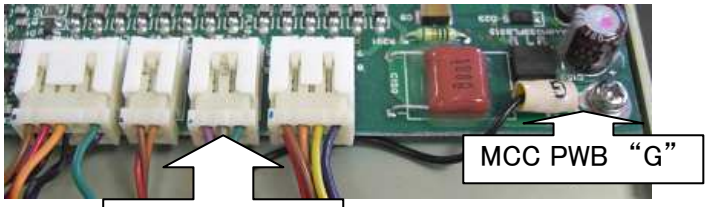
7-2. The brush head should be firmly in contact with slip ring rotor.



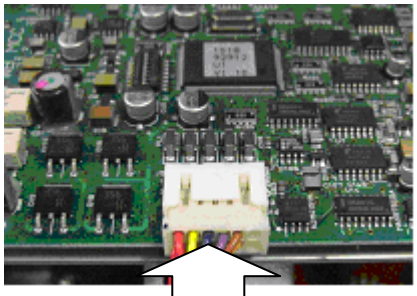
7-3. Check the following connections.







MCC PWB J2
① ③ ⑤
② ④

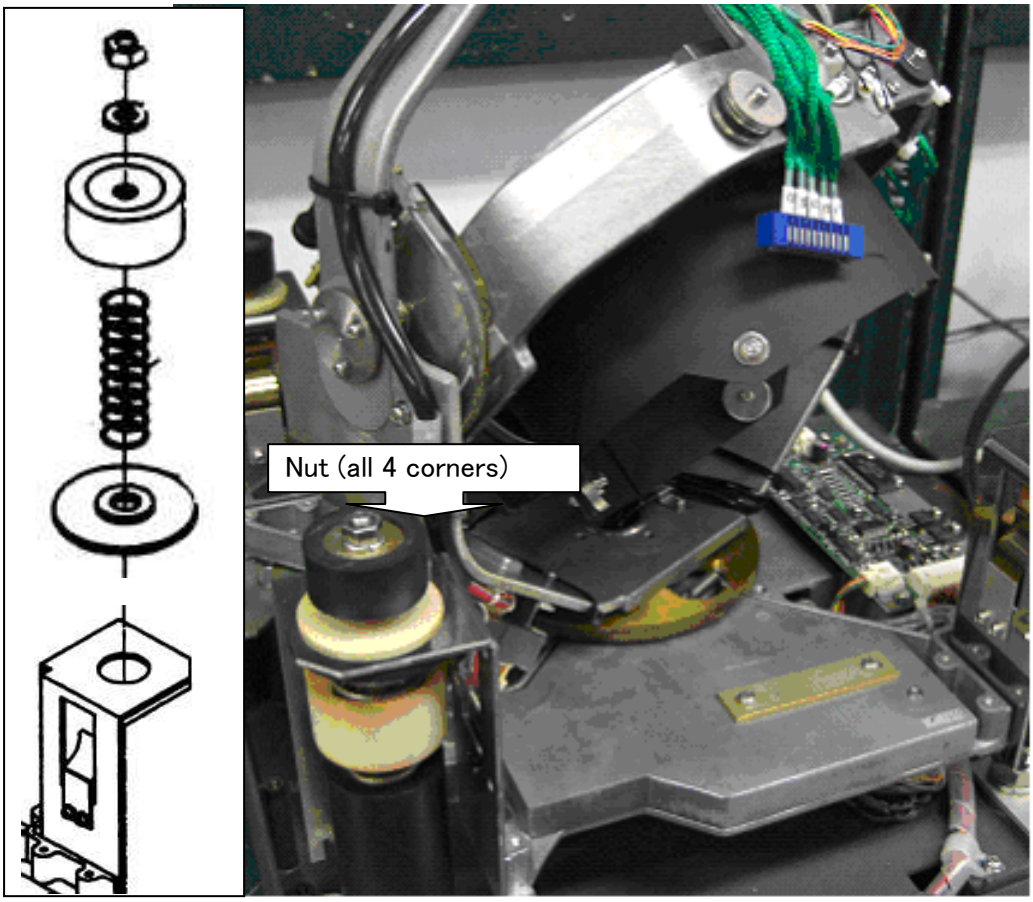


MCC PWB J5
① ③ ⑤ ⑦ ⑨
② ④ ⑥ ⑧ ⑩

Fig. 5-12 Brush terminal connections

8. Shock absorber installation

8-1. 8-1. Put back the shock absorbers, fasten nuts at all 4 corners.



8-2. All the shock shock absorbers should move smoothly.

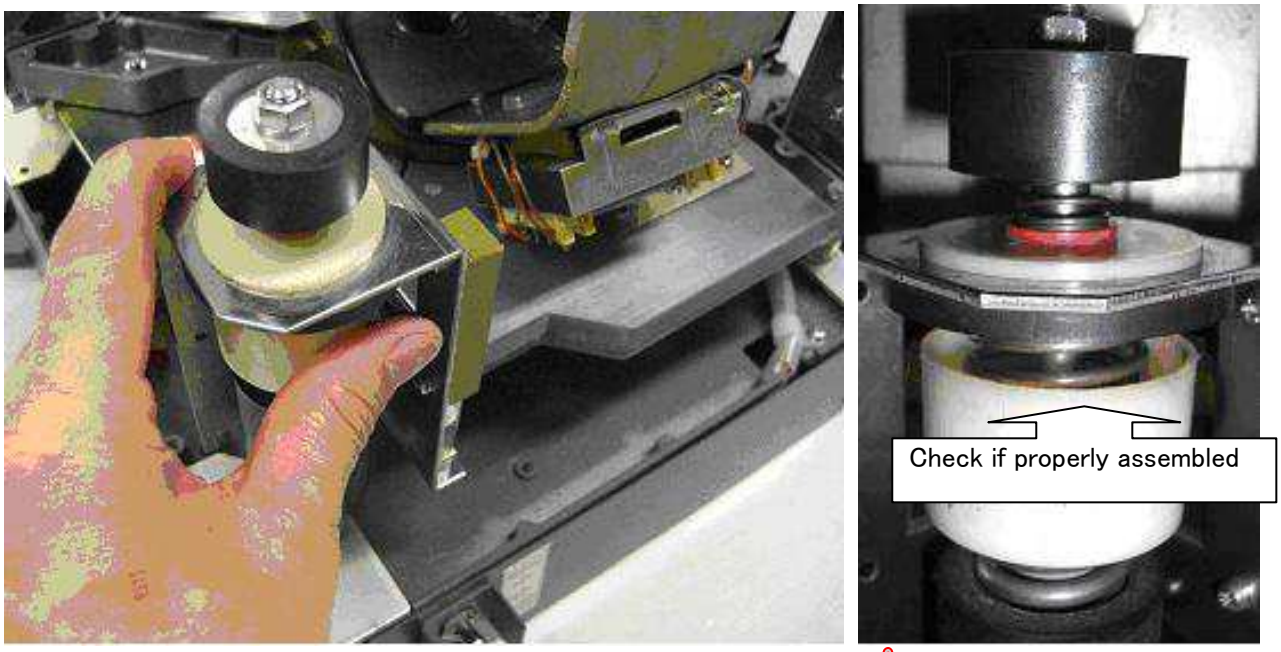


Fig. 5-13 Shock absorbers

[6] SENSITIVE ELEMENT EXCHANGE

GYROCOMPASS
TG-8000

1. Preparations

1-1.Required parts and tools

1-1-1. Sensitive Element　(P/N: 10229409H　: exchange base)　(1pc)

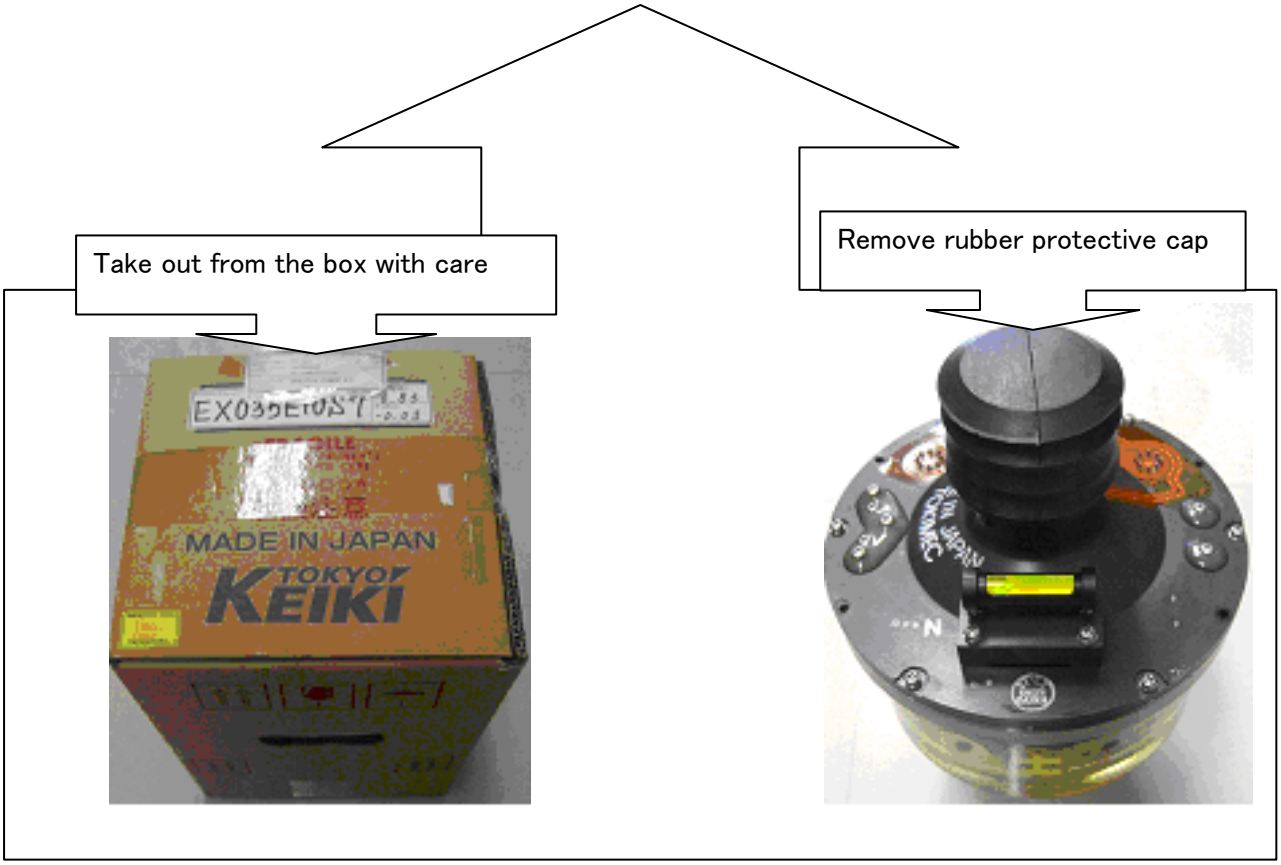


Fig. 6-1(1)　Required parts and tools

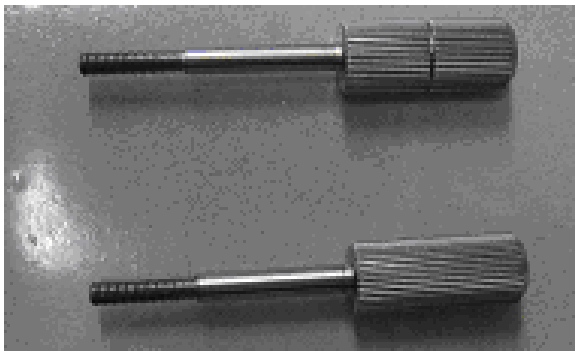
1-1-2. Weight

Sufficient amount for various weight

1-1-3. Screw guide pin type with 1stripe

・thin 3.2mm :110025950 (1pc)

・fat 3.4mm :110025960 (1pc)

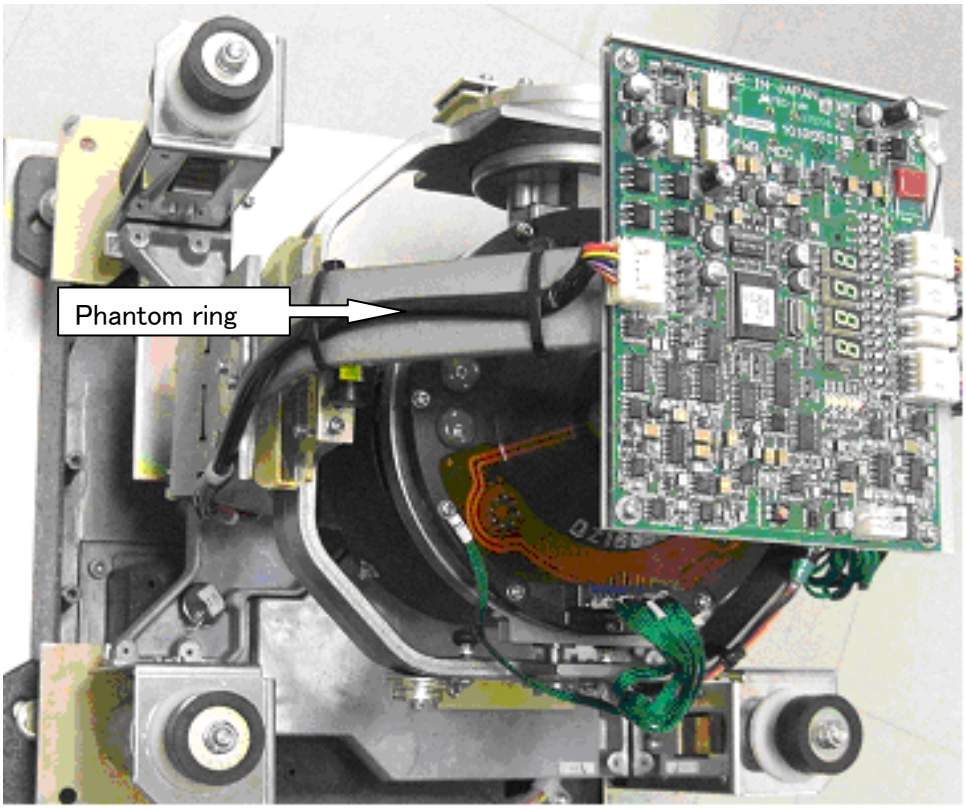


1-1-4.Phillips screw driver (regular size) (1pc)

Fig. 6-1(2) Required parts and tools

2. Sensitive element removal

2-1. Rotate the Phantom ring until the connector comes to the front as shown in the picture.



2-3. Remove 4 screws “A”～“D”.　Loosen screw “E” to remove the connector.

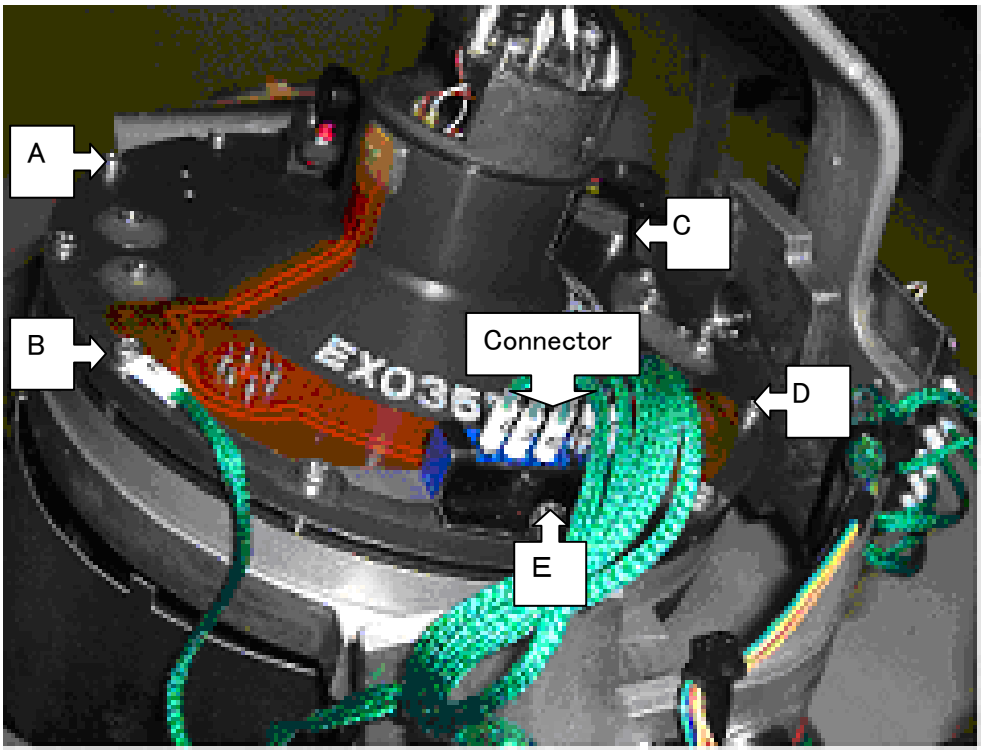


Fig. 6-2　Phantom ring and sensitive element

2-4. Grab the neck of sensitive element firmly as shown in the picture and take it out from the Mounting ring.

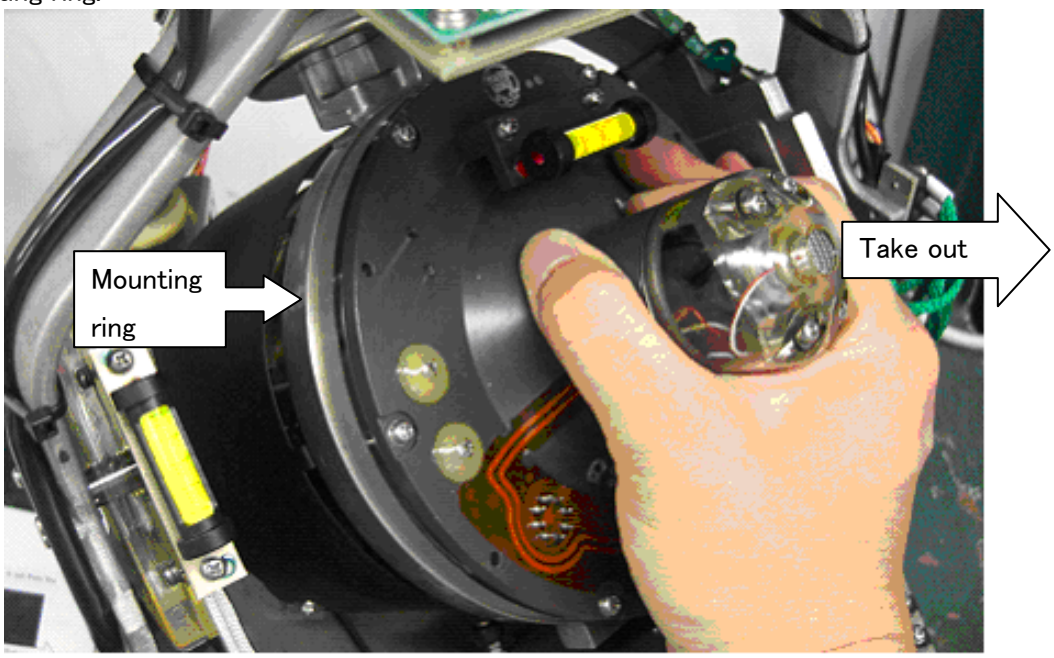


Fig. 6-3 Mounting ring and sensitive element.

3. Sensitive element installation

3-1. Grab the neck of the new sensitive element and put it back to the horizontal ring.

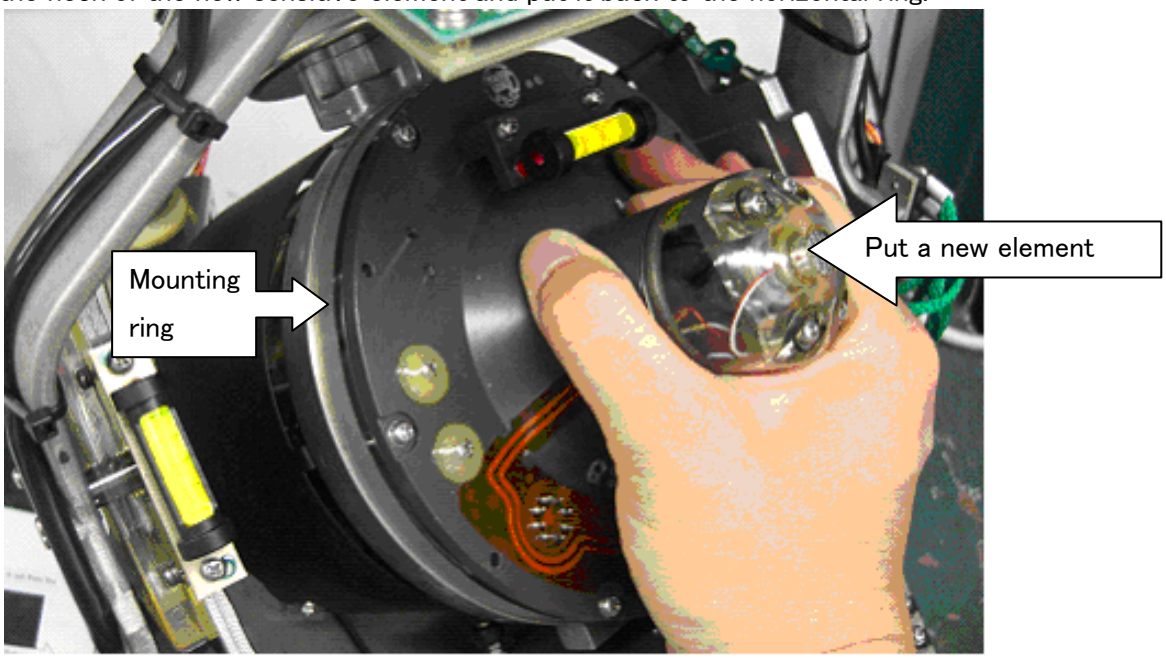


Fig. 6-4 Mounting ring and sensitive element.

3-2. Put the screw guide pin (fat 3.4mm) in "F" position all the way until the pin handle touches the frame of the sensitive element. Put the screw guide pin (thin 3.2mm) in "G" position all the way as well. Put the screw "A" & "D". Remove the guide pins "F"&"G".

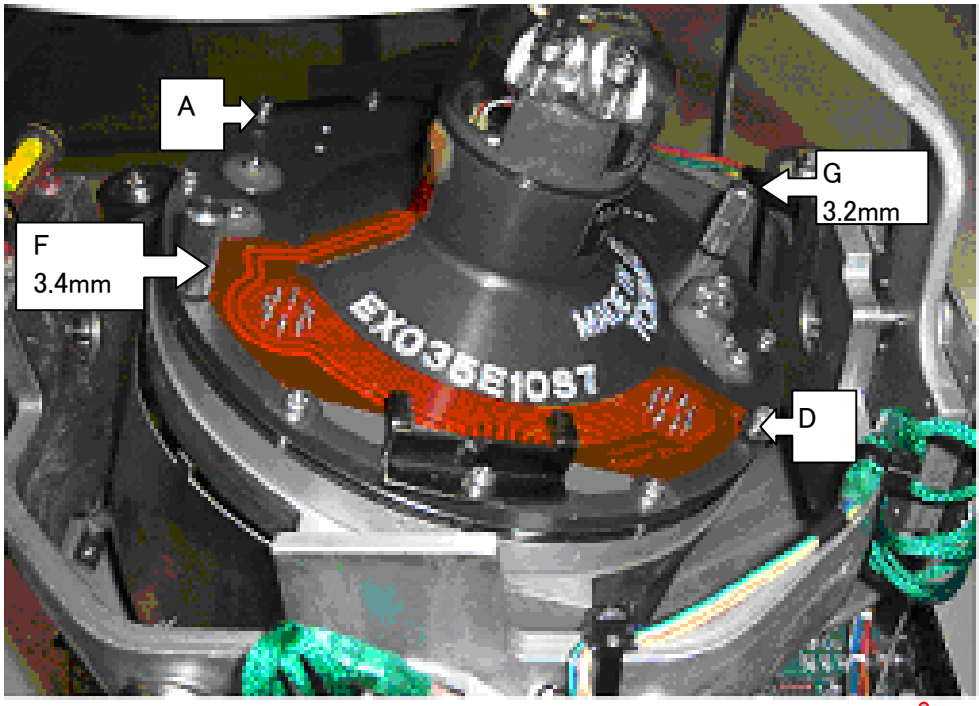
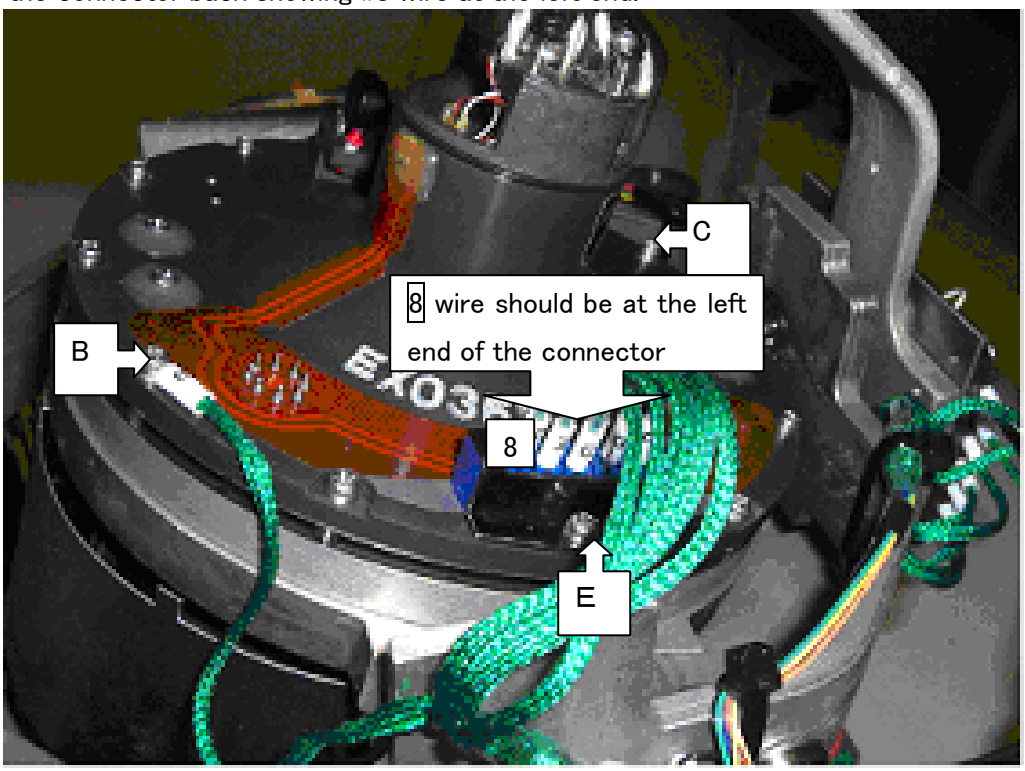


Fig. 6-5 Sensitive element and screw guide pins

3-3. Put the screws “B”&”C” in the place where guide pins were inserted and removed.
Put the connector back showing #8 wire at the left end.



3-4. Sensitive element and the connector should be firmly close in contact without any gap.

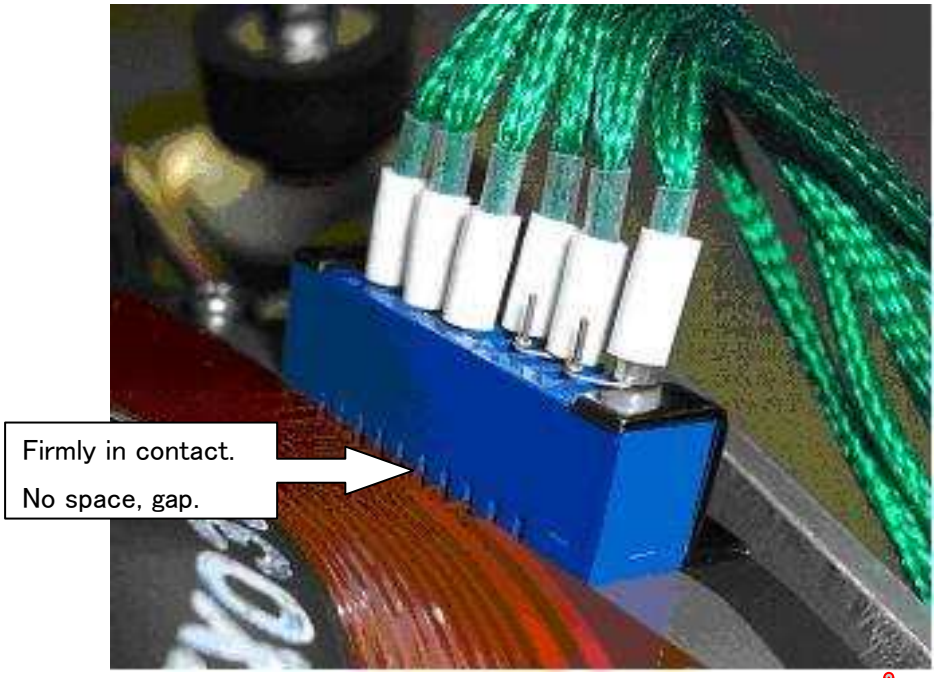


Fig. 6-6 Sensitive element and connector.

4. Sensitive element adjustment

4-1. Input DAMPING GAIN and θ OFFSET into an extended menu.

4-1-1. Press DISP+ SET on the operating panel, then turn on the POWER (Test mode b).
Wait until the bearing will rotate 360 degrees. Wait up to 4 minutes until the rotor in the sensitive element stops spinning.

4-1-2. Press SET & ACK/ENT at the same time for more than 3 seconds.
This will enter into extended menu.

4-1-3. After displaying 「A-1」「1.1.U」, enter the value of DAMPING GAIN written on each box of sensitive element using ▲ or ▼ followed by ACK/ENT.

4-1-4. Press DISP button 5 times.

4-1-5. After displaying 「A-1」「1.6.t」, enter the value of θ OFFSET written on each box of sensitive element using ▲ or ▼ followed by ACK/ENT.

4-1-6. Press SET button once. Press SET & ACK/ENT at the same time for more than 3 seconds.
This will return to normal mode.

Fig. 6-7 Operating panel and sensitive element box.

4-2. Adjust the horizontal ring level within ±5 minutes. (1 scale is 2 minutes)

4-2-1. Remove screw “H” or “I”
4-2-2. Adjust weight and put back screw “H” or “I”
4-2-3. It takes more than 5 minutes to stabilize the reading of level gauge.

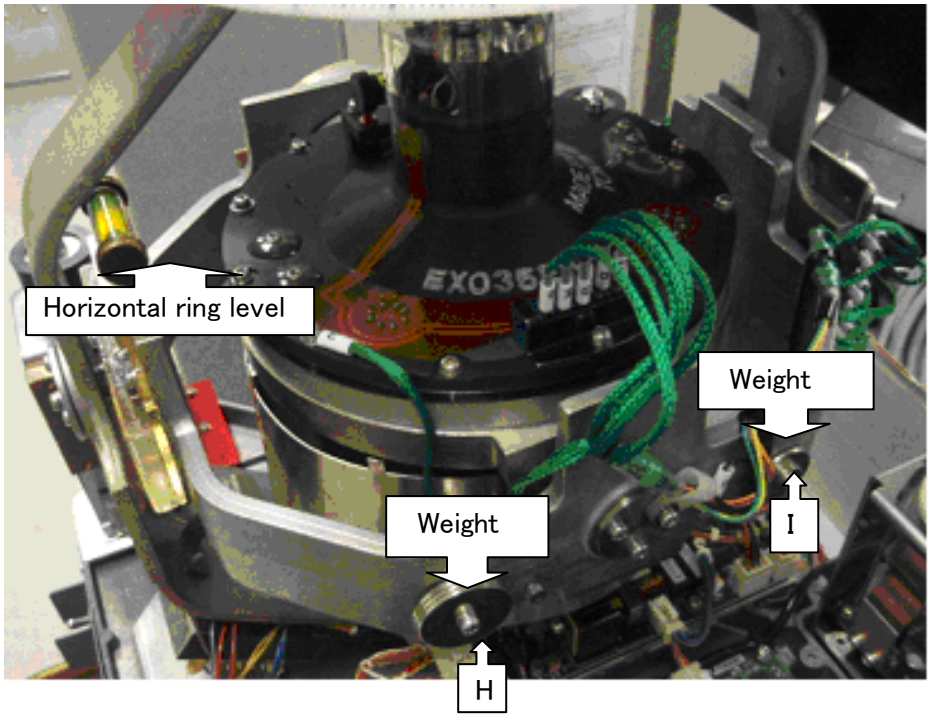


Fig. 6-8 Horizontal ring level and adjust weight.

Fig. 6-9　Rotor level and horizontal ring level.

4-3. Turn on the POWER.

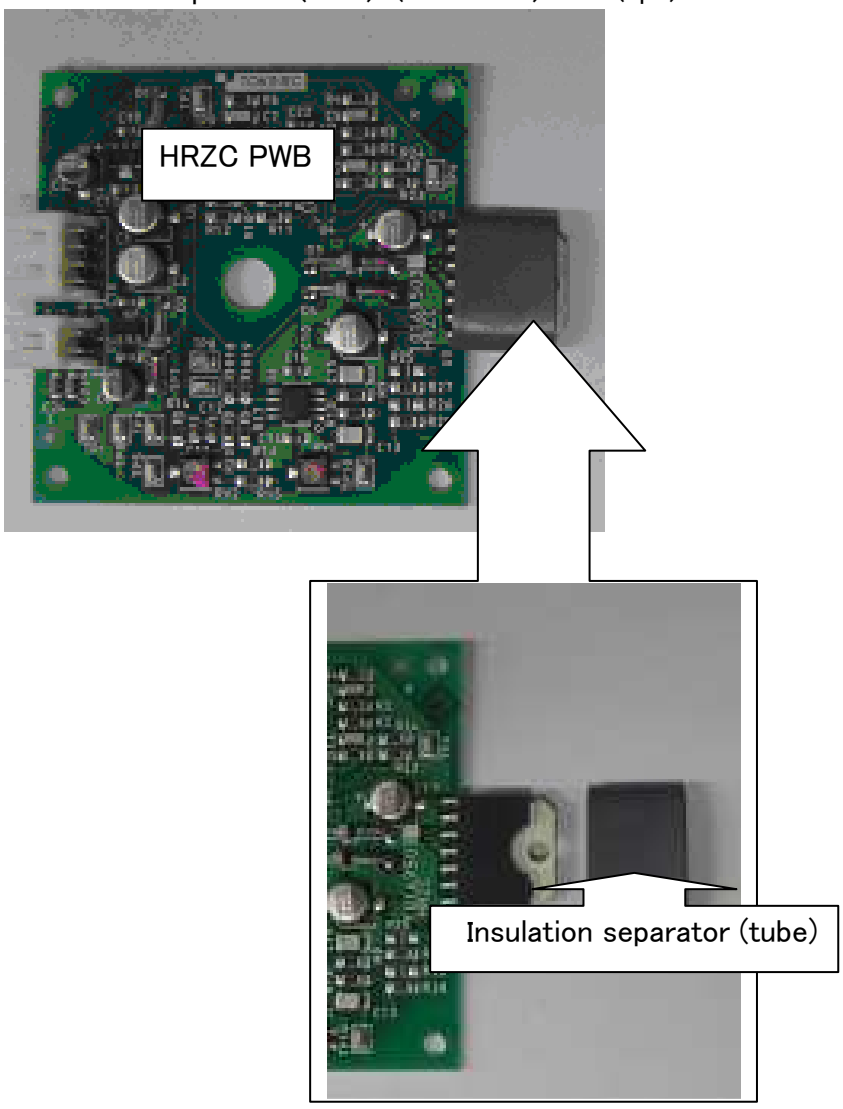
[7] HRZC PWB EXCHANGE

GYROCOMPASS
TG-8000

1. Preparations

1-1. Required parts and tools

1-1-1. HRZC PWB (10169503) (1pc)
1-1-2. Insulation separator (tube) (20565709) (1pc)



1-1-3. Phillips screw driver (regular size) (1pc)

Fig. 7-1 Required parts and tools

2. HRZC PWB removal

2-1. Remove 2 screws “A”～“B” and remove 2 plates.
2-2. Remove 2 connectors “C”～”D”.
2-3. Remove 4 screws “E”～“H” and remove HRZC PWB (Old).

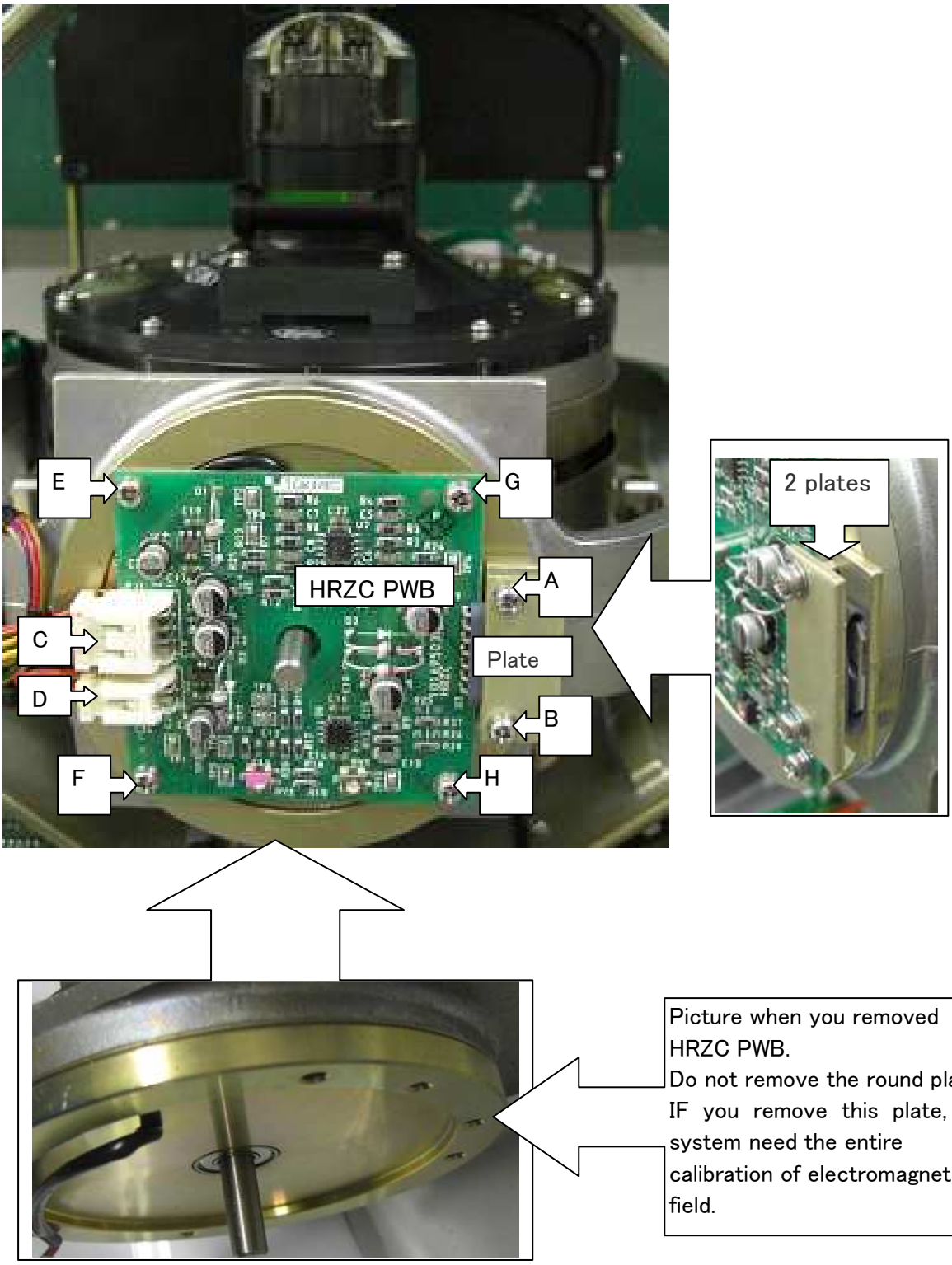


Fig. 7-2 HRZC PWB and round plate

3. HRZC PWB installation

3-1. Insert isolation tube to HRZC PWB.
3-2. Install HRZC PWB (New) and 4 back screws “E”～“H” as shown in Fig 7-2.
3-3. Put back 2 connectors “C”～”D” as shown in Fig 7-2.
3-4. Put back 2 plates with 2 screws “A”～“B” as shown in Fig 7-2.

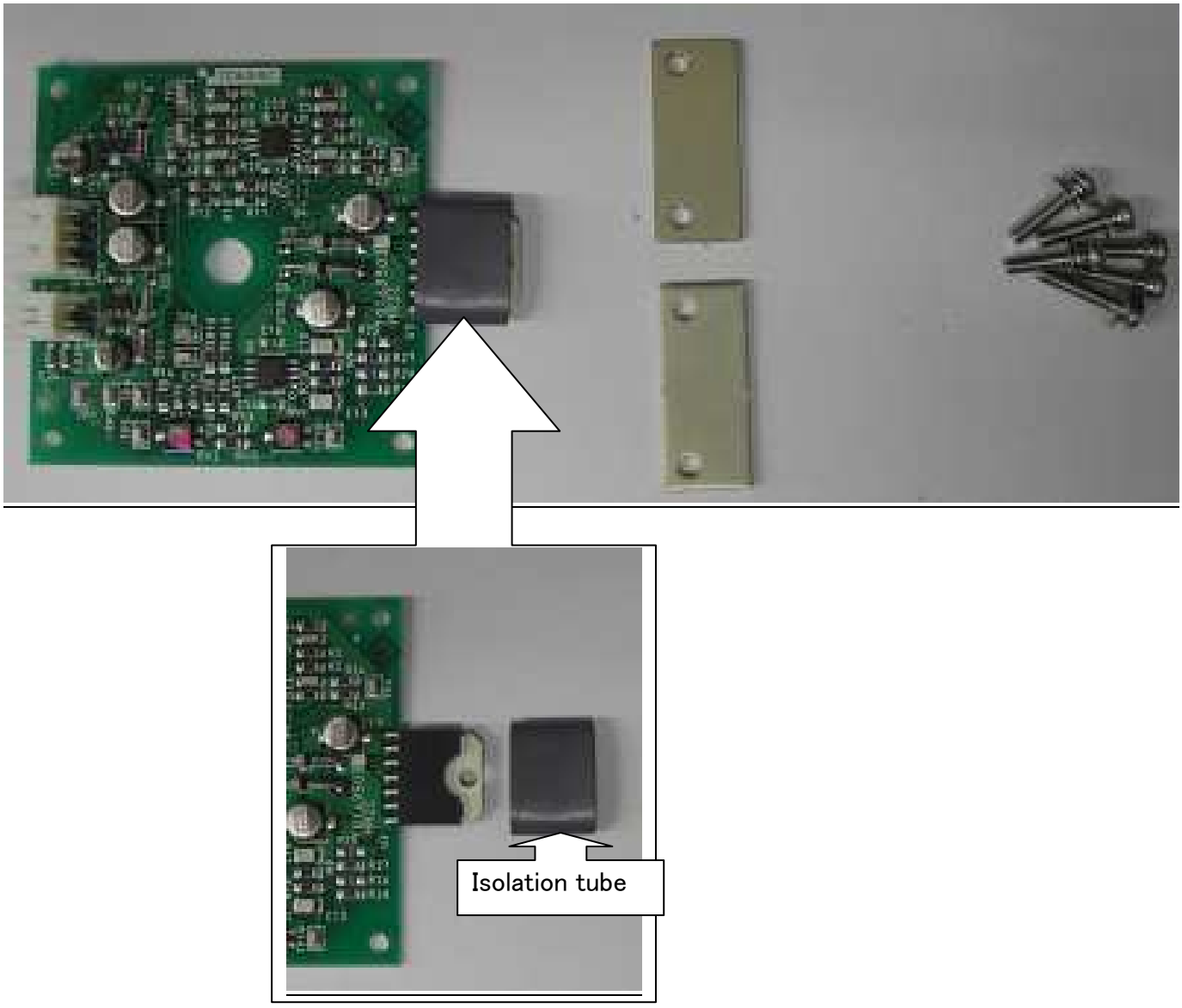
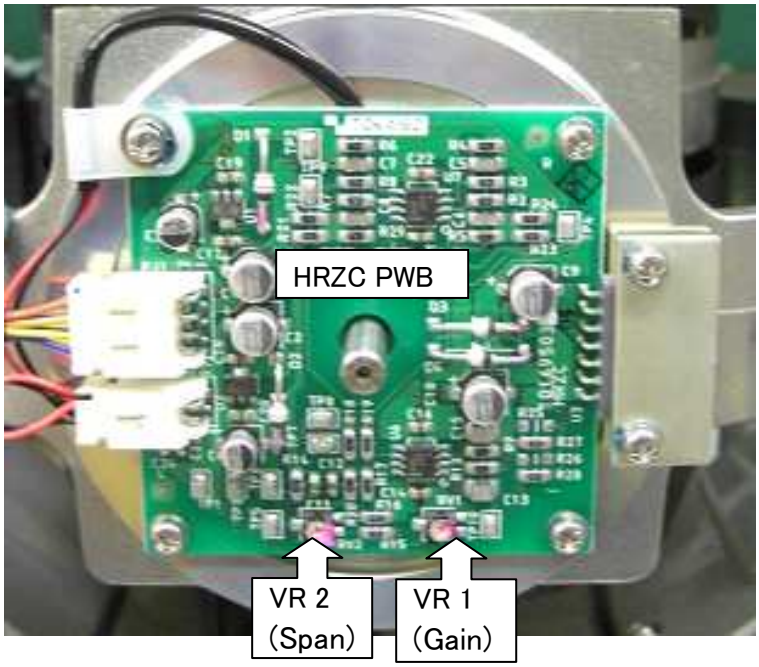


Fig. 7-3　HRZC PWB and Isolation tube

4. HRZC PWB adjustment

・VR1 (gain) and VR2 (span) on HRZC PWB to be center position.



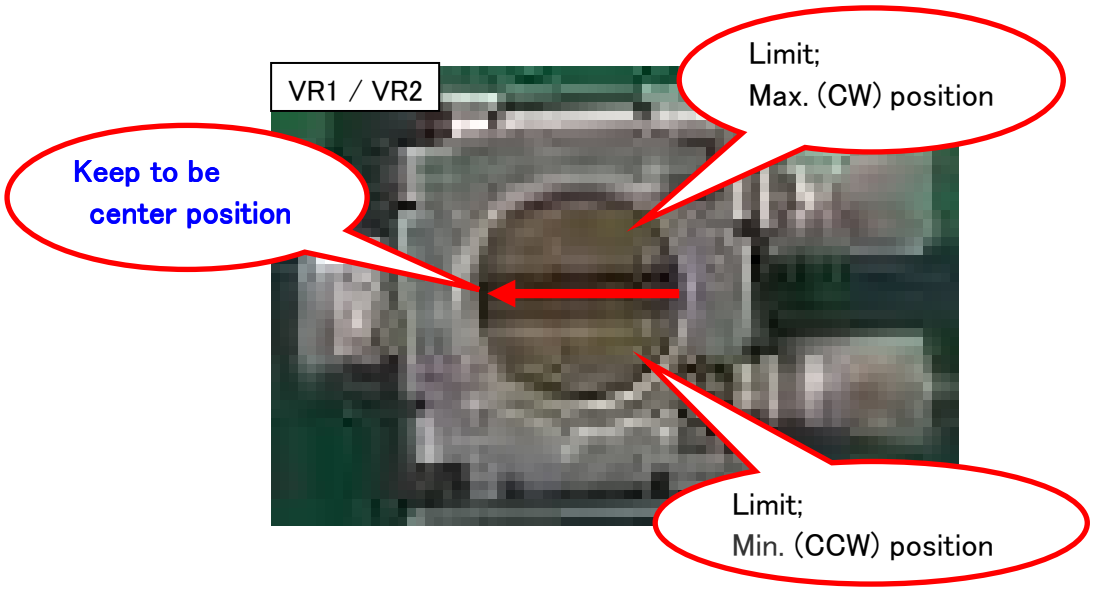


Fig. 7-4　VR1 and VR2 on HRZC PWB.

< Caution >

Do not turn the trimmer more than the limits (Max. (CW) or Min. (CCW)). Otherwise the trimmer and HRZC PWB will be broken.

[8] PARTS DESIGN CHANGE HISTORY AND THE POINT TO PAY SPECIAL ATTENTION.

GYROCOMPASS
TG-8000

Shipment day	Contents for design change and special note.	Necessary parts and setting, when part change happens.
May, 2003～	(TG-8000 Production start)	
Nov., 2003～	EMCC PWB design change. - Harness change required for Rev. 0 and Rev. 1. - IF EMCC PWB Rev. is 2 or after, you do not need to replace the harness.	**If existing EMCC PWB parts No. 10189542□(□=0 or 1), the following parts are needed;** ・EMCC PWB parts No. 10189542 (×1) ・Harness parts No. 10189135 (×1) (・Changing the wiring between the azimuth sensor and MTERM PWB.) **＊Refer to Fig. 8-3.** **＊Refer to Fig. 8-5.**
		If existing EMCC PWB parts No. 10189542□(□=2 or After), the following parts are needed; ・EMCC PWB parts No. 10189542 (×1) **＊Refer to Fig. 8-3.**
Jul., 2006～	BRUSH assembly design change (Washer addition) (Refer to technial information No. 10-074)	・Brush assembly parts No. 102393794 (×1) & 102393804 (×1) **＊Refer to Fig. 8-2.** **＊Refer to [4] BRUSH (EXCHANGE) AND SLIP RING CLEANING**
Aug., 2009～	INVERTER PWB design change (Overcurrent changing function deletion) (Refer to technial information No. 10-082)	・INVERTER PWB parts No. 10169537 (×1) or 10169109 (×1) **Note:** - 10169537, need following insulation separators (tube). 20565708 Q'ty:3 20565709 Q'ty:8 - 10169109, includes following insulation separators (tube). 20565708 Q'ty:3 20565709 Q'ty:8 **＊Refer to Fig. 8-2.** **＊Refer to Fig. 8-6.**
Apr., 2010～	HDM-200 LCD design change (CCM1620CGLS1) (Refer to technial information No. 10-083)	**If existing LCD type "WM-C1602M-1GLYF"(old), the following parts are needed;** ・LCD parts No. CCM1620CGLS1 (1-00024094-0001) (×1) ・PANEL PWB parts No. 10189533 (×1) (・Changing the wiring between the harness(J1) and LCD.) **＊Refer to Fig. 8-4.** **＊Refer to Fig. 8-7.**
		If existing LCD type "CCM1620CGLS1"(new), the following parts are needed; ・LCD parts No. CCM1620CGLS1 (1-00024094-0001) (×1) **＊Refer to Fig. 8-4.**

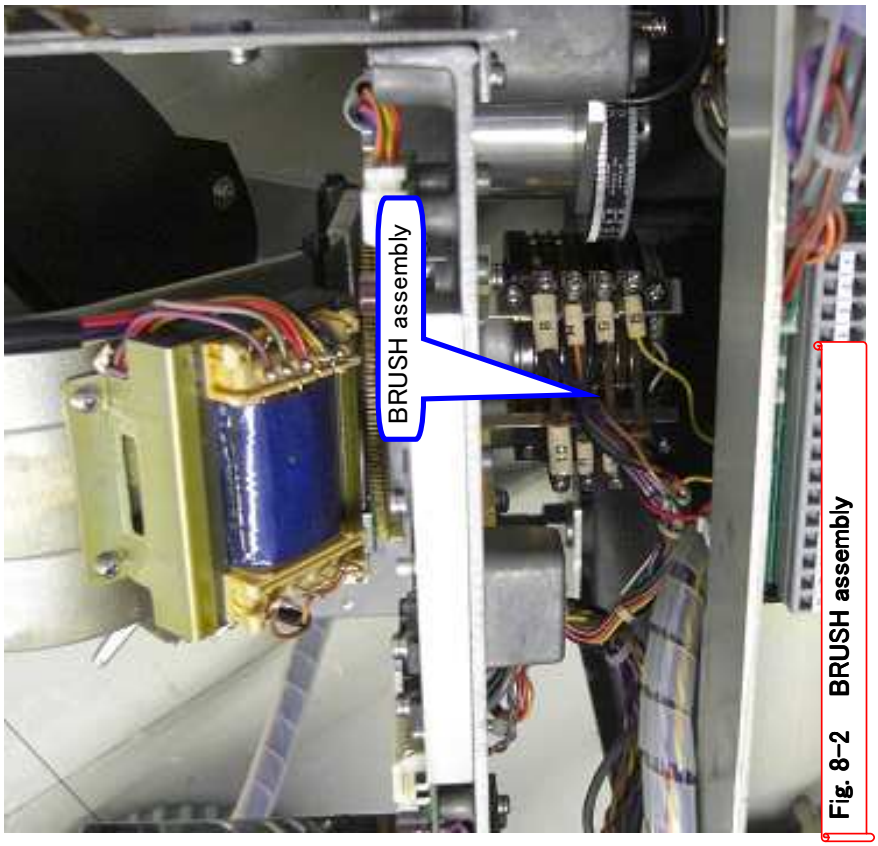


Fig. 8–2 BRUSH assembly

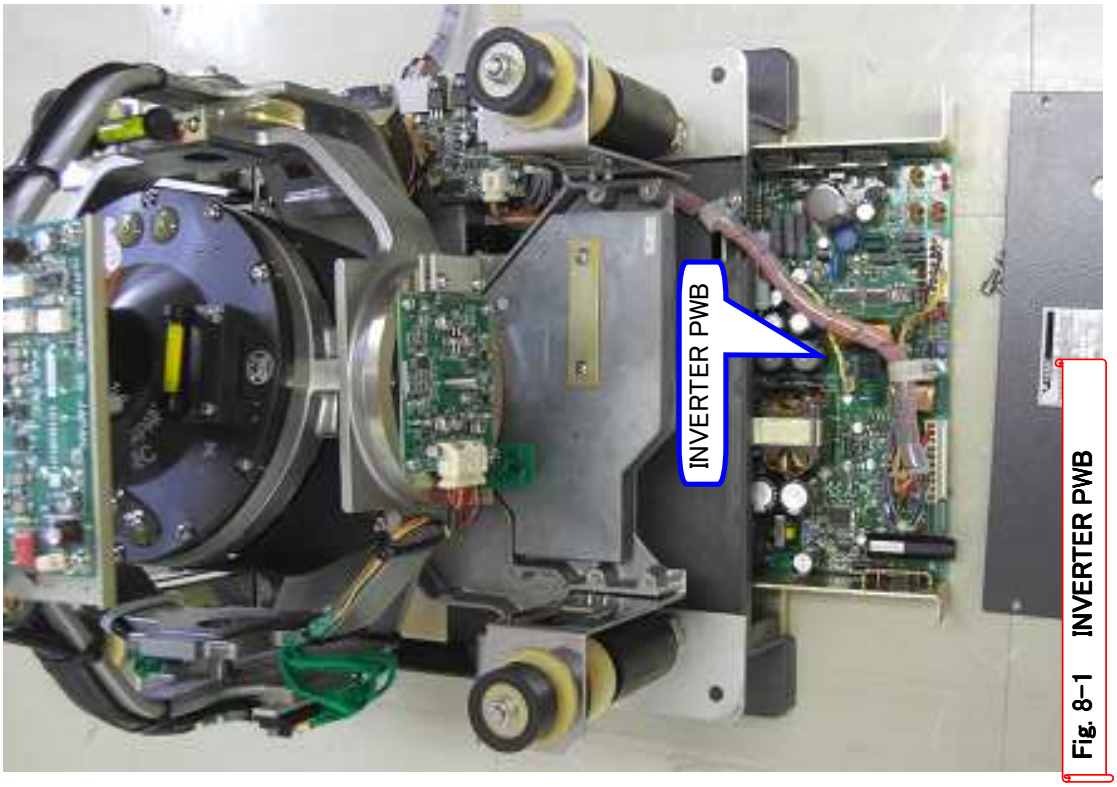


Fig. 8–1 INVERTER PWB

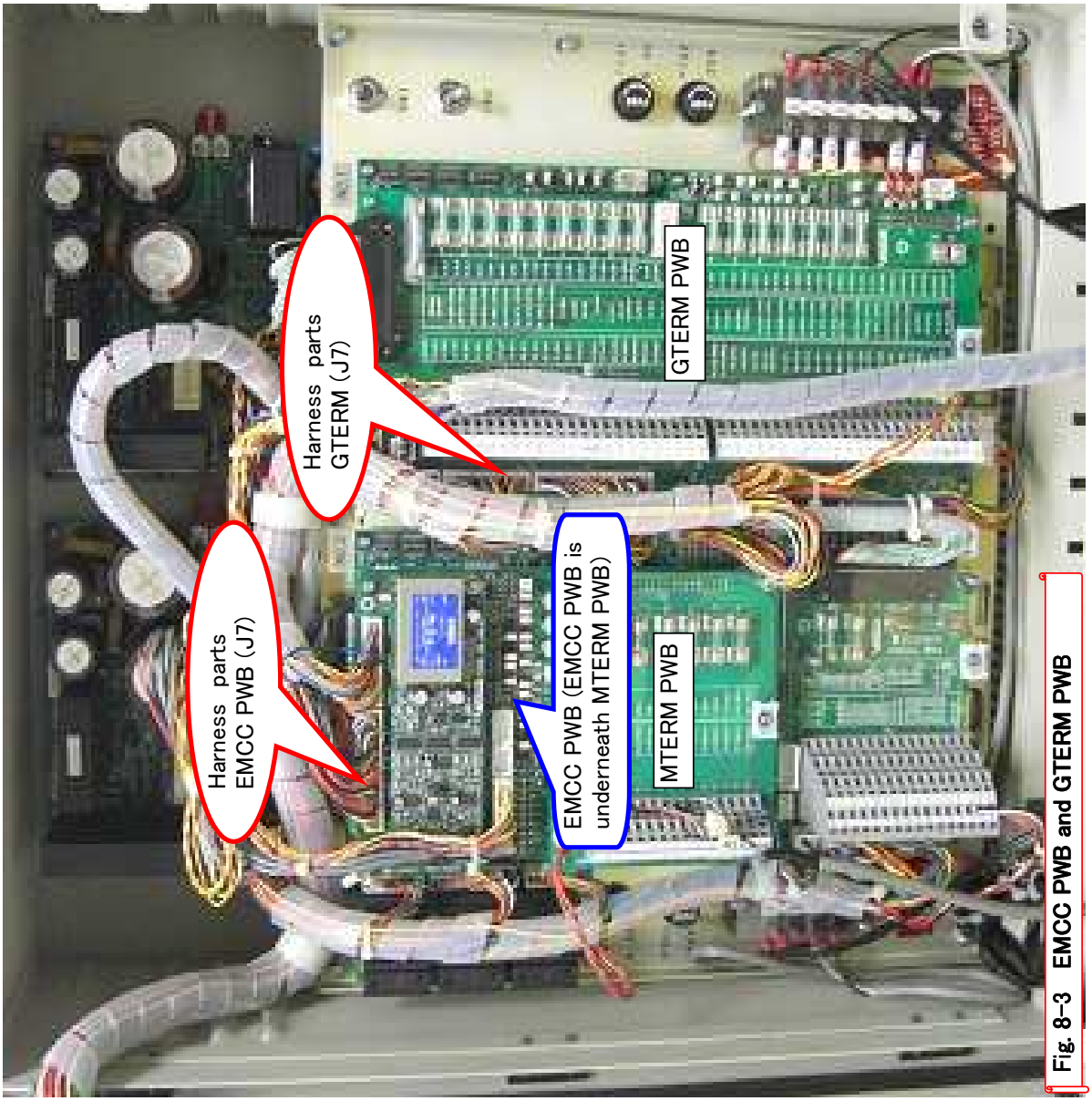


Fig. 8-3 EMCC PWB and GTERM PWB

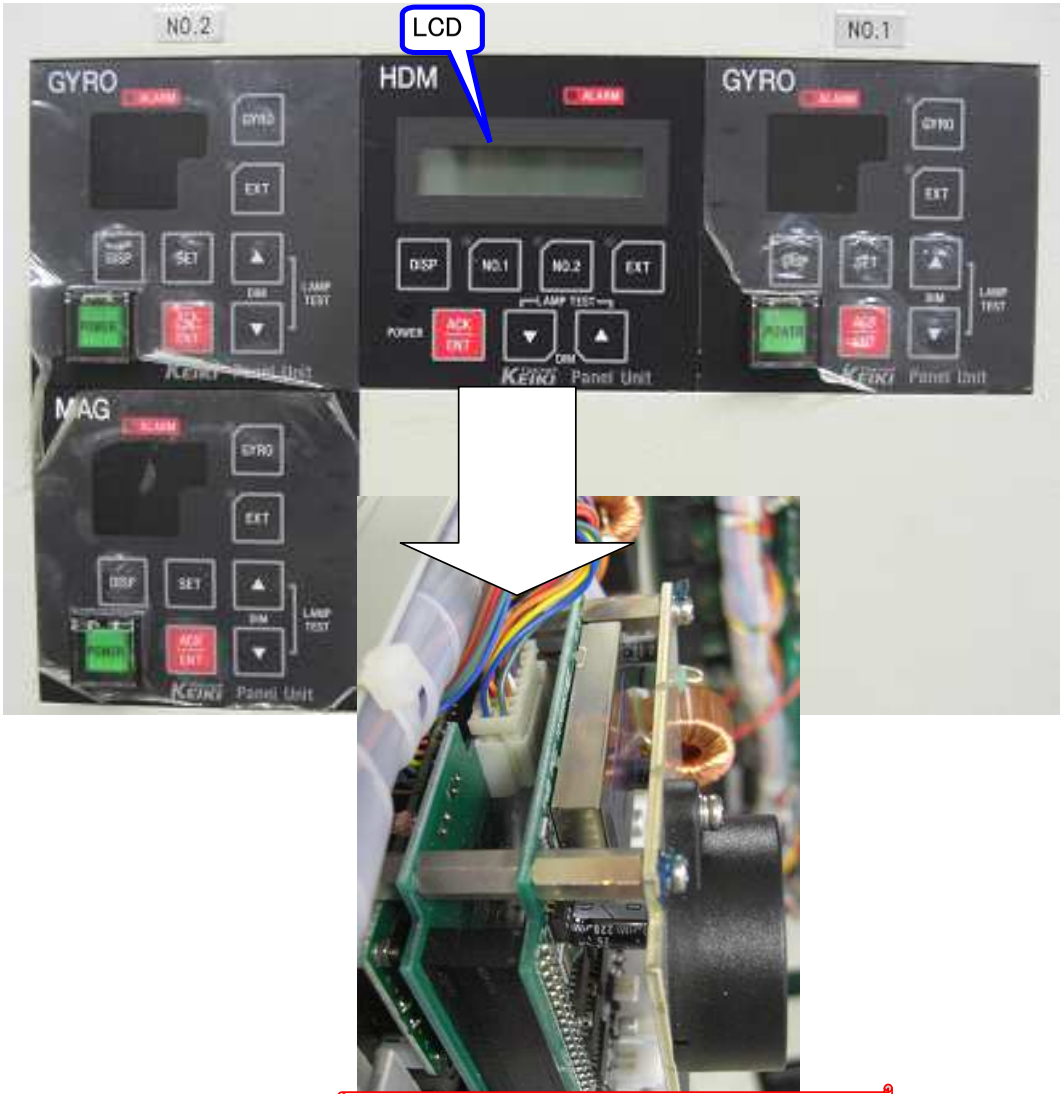


Fig. 8-4　HDM-200 panel (LCD)

Only existing EMCC PWB part number 10189542☐ (☐=0 or 1), make wiring changes.

Before
Existing EMCC PWB part number
10189542☐ (☐=0 or 1).

After
Install EMCC PWB part number
10189542☐ (2 or after).

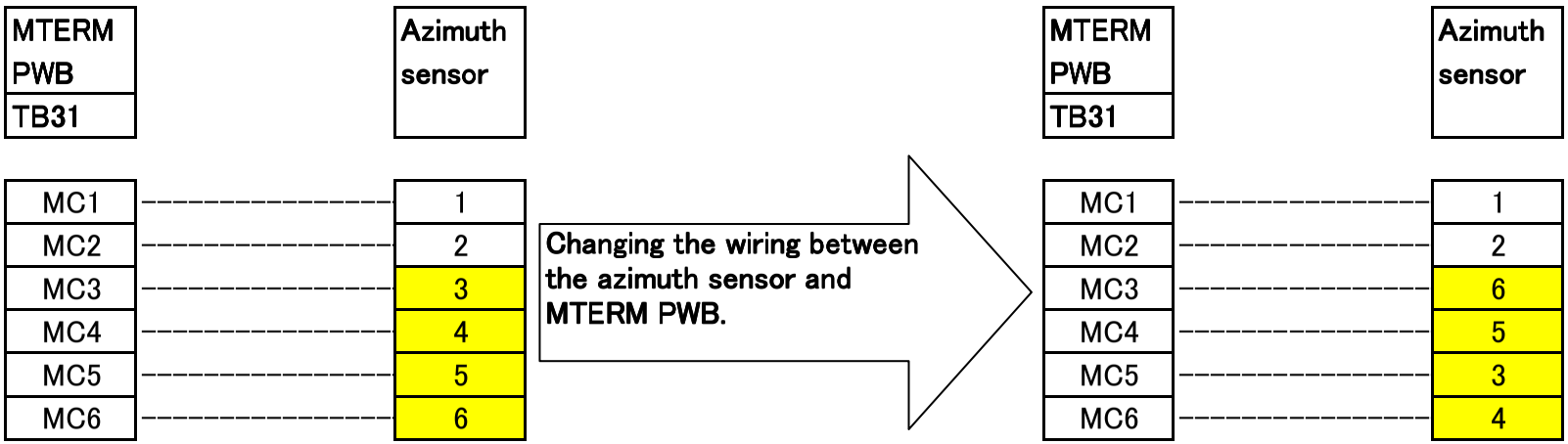


Fig. 8-5 Wiring between the azimuth sensor and MTERM PWB.

Setting of JP1 througth JP8 on the INVERTER PWB

In case of INVERTER PWB part No. 10169537□. (□=07 or before)

JP1	JP2	JP3	JP4	JP5	JP6	JP7	JP8
Short	Open	Open	Open	Open	Open	**Short**	Open

In case of INVERTER PWB part No. 10169537□. (□=08 or after)

JP1	JP2	JP3	JP4	JP5	JP6	JP7	JP8
Short	Open	Open	Open	(No)	Open	**Short**	**Short**

Fig. 8-6 INVERTER PWB setting

Only existing LCD type "WM-C1602M-1GLYF"(old), make wiring changes.

Before

Existing LCD part number
"WM-C1602M-1GLYF"(old)

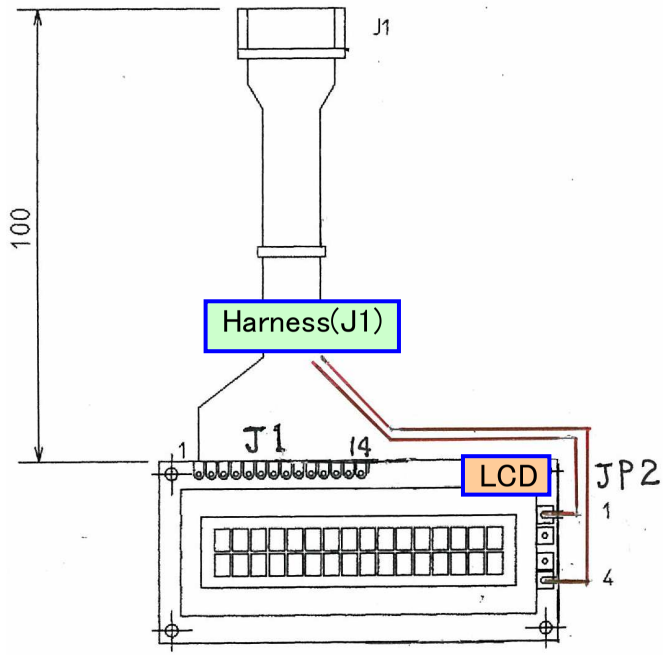
Harness(J1)		LCD
J1-15 (Green)	--------	JP2-1
J1-16 (Blue)	--------	JP2-4

Changing the wiring between the harness(J1) and LCD.

After

Install LCD part number
"CCM1620CGLS1"(new)

Harness(J1)		LCD
J1-15 (Green)	--------	J1-15
J1-16 (Blue)	--------	J1-16



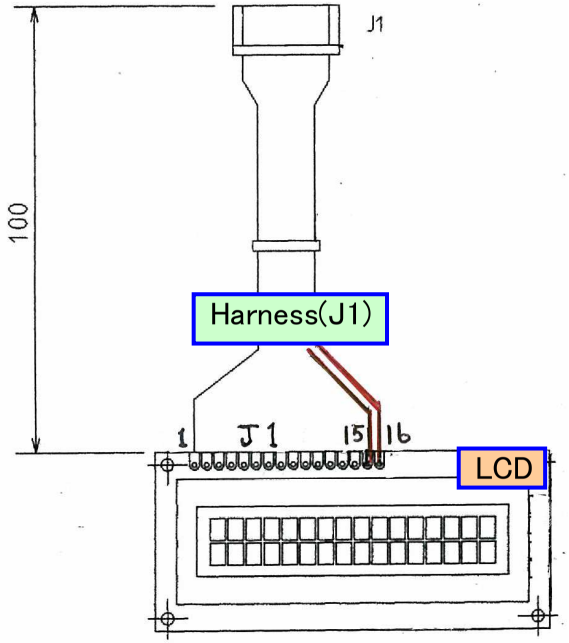


Fig. 8-7 Wiring between the harness(J1) and LCD

MAINTENANCE MANUAL
GYROCOMPASS TG-8000
[Document No. SG12-SE005]
Mar. 21, 2013

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