COP-05 Input Panel

Hardware Module Description

Document history

Document number: 300984		
Rev. D	October 2009	New trackball and cleaning procedure. Refer to CO08366

Note

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Comments

To assist us in making improvements to the product and to this manual, we welcome comments and constructive criticism.
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Glossary

CPLD	Complex Programmable Logic Device
COP	Common Operator Panel
DI	Digital Input
DO	Digital Output
ESD	Electrostatic Discharge
GND	Ground
IE	Instrumentation Earth
IO	Input/Output
LED	Light Emitting Diode
PE	Protective Earth
PWM	Pulse Width Modulation
USB	Universal Serial Bus

1 OVERVIEW

The COP-05 Input Panel contains a 19 buttons keypad for screen navigation, entering numbers and text into the system and a trackball with seven buttons integrated in the circular trackball cover.

Backlight for buttons and trackball can be dimmed from the operator station the panel is a part of.

A light sensor registers the light intensity above the panel and can be used for controlling backlight and status lamps automatically.

The COP-05 Input Panel is powered from 24 Vdc.

2 FUNCTION

Figure 1   COP-05 Input Panel function diagram
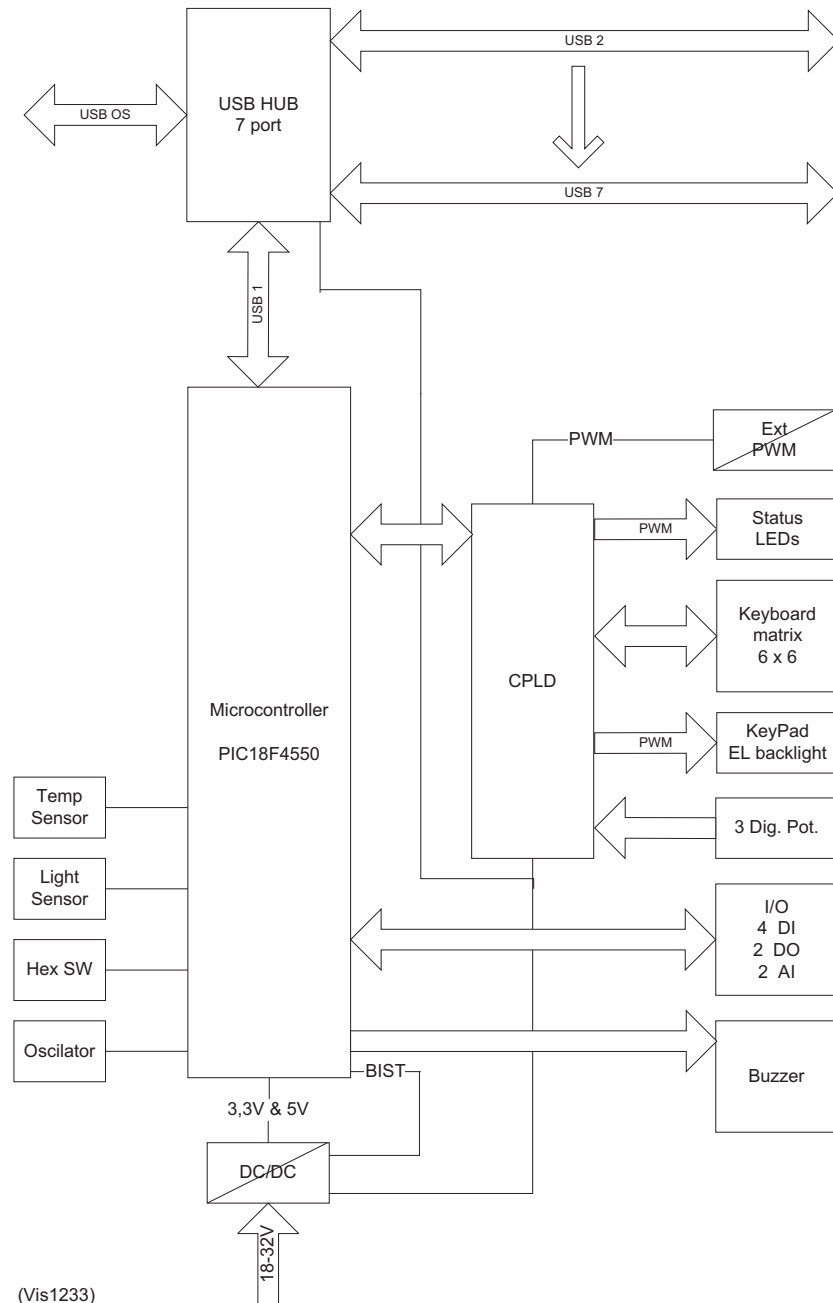
The COP-05 Input Panel comprises a keypad for entering numbers and letters into the system and a trackball for controlling cursor position on the operator station screen. In addition an eight port USB hub is provided connecting all panel modules to the computer.

The COP-05 Input Panel is built around a micro controller handling mainly the communication via USB and a CPLD handling mainly I/O for keyboard buttons and lamps.

The COP-05 Input Panel electronics part is encapsulated to resist ESD and dust.

See Figure 1 for block/function diagram of the COP-05 Input Panel.

2.1 Power supply input (X10)

The COP-05 Input Panel accepts 18 to 32 Vdc as supply voltage.

Power status LED

A Power status LED is located on the rear side of the panel. It is lit green when the power is ok and red if the polarity of the power supply is faulty.

Voltage monitoring

VCC (5 Vdc) and 3.3 Vdc are monitored as analog signals to discover any change over time (trending) or if being outside defined limits.

2.2 Data communication (X3)

The panel module communicates with a controller computer through a single USB. The controller computer is the master and polls the panel module at given time intervals.

Address switch

The panel has a fixed address part that is panel-type specific. In addition the panel is provided with a hexadecimal switch, which defines the lower part of the address for the panel. Allowed addresses are 0 to F. Address 0 (default) is used when only one of this panel type is used or for the first one if more panels of the same type are used. The second panel of this type will then have the address 1 etc.

The Table *Address switch values and functions* on page 7 defines the hexadecimal-switch values and corresponding functions.

Table 1   Address switch values and functions

Value	Function
0	Default Product ID (First panel of this type)
1	Sub-panel 1 Product ID (Second panel of this type)
2	Sub-panel 2 Product ID (Third panel of this type)
3	Sub-panel 3 Product ID (Fourth panel of this type)

Table 1   Address switch values and functions (cont'd.)

4	Sub-panel 4 Product ID (Fifth panel of this type)
5	Sub-panel 5 Product ID (Sixth panel of this type)
6	Sub-panel 6 Product ID (Seventh panel of this type)
7	Sub-panel 7 Product ID (Eight panel of this type)
8	No function
9	No function
A	No function
B	No function
C	No function
D	No function
E	For development and manufacturer use only (Loads fixed Product ID via Boot Loader to regain communication contact)
F	For service use only (Reloads software via Boot Loader)

COM LED

A LED is located on the rear side of the panel and is flashing green as long as the communication on the USB is OK.

2.3 INPUT group buttons and lamp(s)

The INPUT group comprises 19 buttons. One of these has a lamp. This is the **abc...** (toggle) button.

- **2 / abc**

  If the button is pressed when the panel is in numeric mode, the number 2 will be entered. When the panel is in alphanumeric mode the letter A will be entered. You need to press the button two times to enter the letter B and three times to enter the letter C.

- **abc...** (toggle button)

  Toggles between numeric and alphanumeric mode. Numeric mode is default. Press the button for one second to toggle. A short beep will confirm the change. The lamp is lit green when the panel is in alphanumeric mode (letters) and not lit when in numeric mode (numbers).

- **PAGE UP**

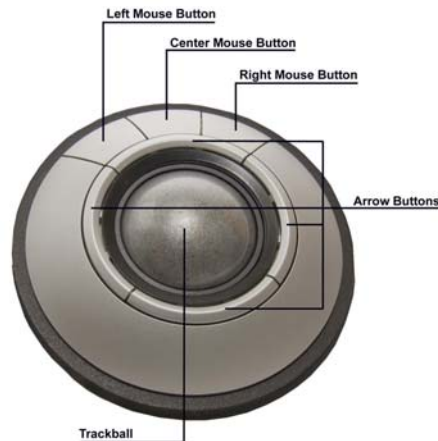 Same function as on a standard keyboard.

The lamp intensity can be adjusted from the computer.

2.4 Trackball

The trackball module comprises one rollerball and seven buttons. Three of these buttons are the mouse buttons in front. The other four are located on each side of the rollerball.

Figure 2   Front layout of the Trackball

- Trackball

  This is used for navigation on the screen.
- Mouse buttons

  Same function as an ordinary PC-mouse.
- Arrow buttons

  These buttons work like arrow buttons on an ordinary alphanumeric keyboard.

2.5 Backlight

The backlight is integrated in the panel film and has yellow colour. The backlight intensity can be adjusted from the computer via USB, and the function is implemented in the module using PWM.

2.6 Temperature sensor

A temperature sensor is provided within the module to monitor the operation temperature. If the temperature rises above a specified and configured limit, a system alarm is given.

2.7 PWM output (X2)

The panel has a galvanic isolated PWM output for controlling backlight of a slave panel etc. The output is implemented using the optocoupler transistor.

*Figure 3   PWM wiring*
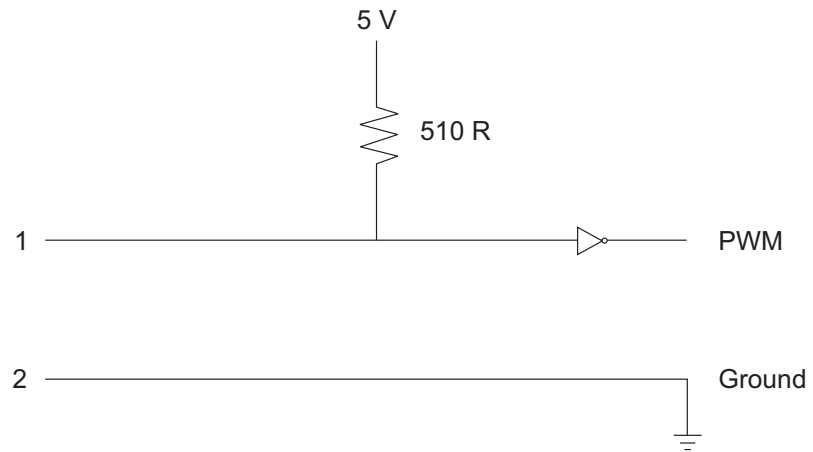
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3 TECHNICAL SPECIFICATIONS

Table 2   Technical specifications

| Power specifications	
Input voltage	24 Vdc. nom, 18 to 32 Vdc input range
Power consumtion	10 W nom, 20 W maximum
Current consumtion	125 mA nom at 24 Vdc, 233 mA maximum at 24 Vdc
Connectors	
Power (X10)	Weidmuller, SLDV-THR5.08/ 8/180FSNSW 1828910000
USB B (X3)	AMP 787834-1, USB B-type connector
USB A (X4/X5/X6/X7/X8)	LUMBERG 2410 01
PWM output (X2)	Weidmuller, SLDV-THR5.08/ 8/180FSNSW 1828910000
Signal (X1)	Weidmuller, SLDV-THR5.08/ 28/180FSNSW 1829010000
USB interface	
Standard	USB ver 2.0
Data transfer rate	12 Mbit/s
PWM interface	
Maximum allowed ON current	25 mA
Maximum allowed OFF voltage	32 V
Frequency	600 Hz
Duty cycle range	1– 99 %
Mechanical specification	
Size without strain relief and trackball (WxHxD)	236 x 120 x 44 mm
Size with strain relief and without trackball (WxHxD)	236 x 120 x 84 mm
Weight	1.0 kg
IP	IP22
Environmental requirements	
Operating temperature	-15 - +55 °C
Storage temperature	-25 - +70 °C
Refer to Kongsberg Maritime Environmental Specification, reg. no.: 848-161011	
Life cycle specifications	
MTBF	not yet available

4 CONFIGURATION

The illustration below shows the front layout of the COP-05 Input Panel.

Figure 4   Front layout of the COP-05 Input Panel
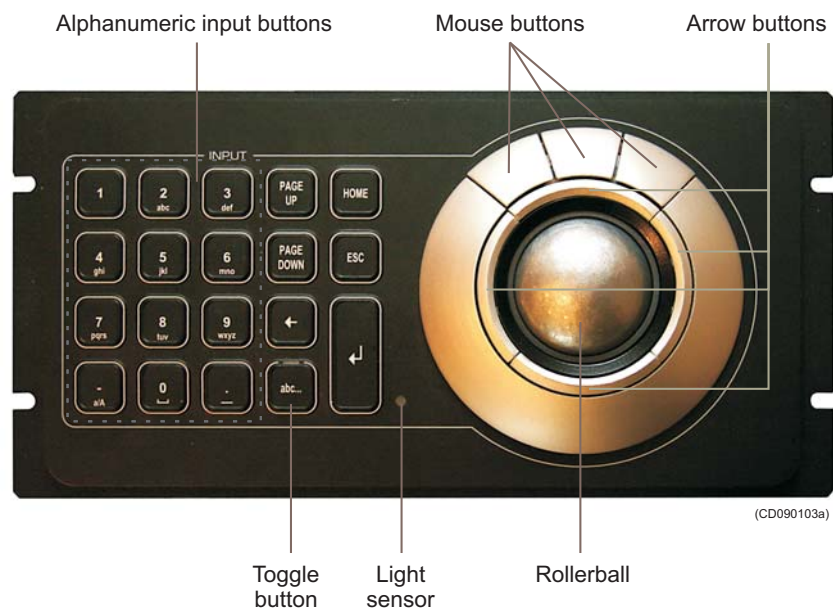
The illustration below shows the location of the LED, hexadecimal switch and connectors on the rear of the COP-05 Input Panel.

Figure 5   Rear layout of the COP-05 Input Panel
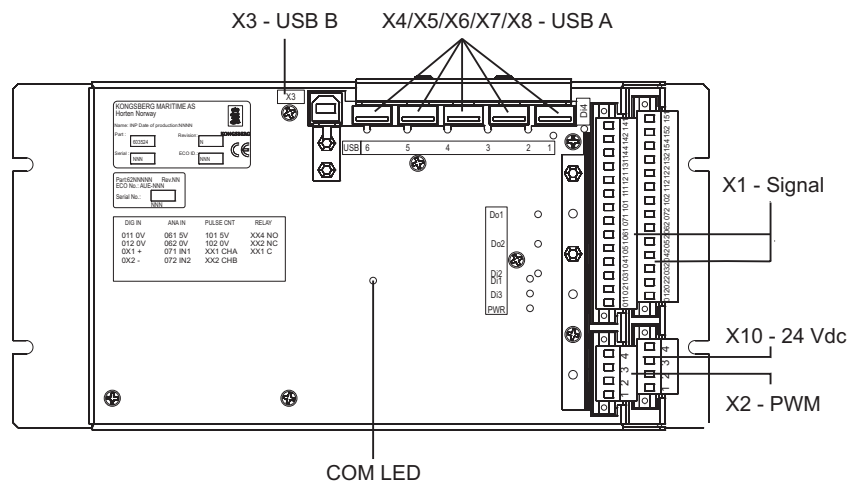
4.1 X1 - Signal

X1 contains two fourteen-terminal, plugable screw connectors. The plug can be locked to the header by one screw at each end of the plug.

Table 3   X1 – Signal connector terminal allocation

Pin no.	Name	Function
Digital Input		
011	+24 Vdc	Power supply, positive terminal
012	0 Vdc	Power supply, ground reference
021	+	Ext. powered loop (24 Vdc)
022	−	Ext. powered loop (return)
031	+	
032	−	
041	+	
042	−	
051	+	
052	−	
Analog Input		
061	+5 Vdc	Power supply, positive terminal
062	0 Vdc	Power supply, ground reference
071	IN1	AI (0–5 V)
072	IN2	AI (0–5 V)
Pulse Control		
101	+5 Vdc	Power supply, positive terminal
102	0 Vdc	Power supply, ground reference
111	CHA	Track A 0, Optical Encoder
112	CHB	Track B 0, Optical Encoder
121	CHA	Track A 1, Optical Encoder
122	CHB	Track B 1, Optical Encoder
131	CHA	Track A 2, Optical Encoder
132	CHB	Track B 2, Optical Encoder
Relay 1		
144	NO	
142	NC	
141	C	Maximum 1 A
Relay 2		
154	NO	
152	NC	
151	C	Maximum 1 A

4.2 X2 - PWM connector

X2 is a two-terminal, screw connector with plugable header. The header can be locked to the connector body by one bolt at each end of the header.

Table 4   X2 - PWM connector terminal allocation

Pin no.	Name	Function
1	P	Output positive terminal
2	N	Output negative terminal
3		
4		

4.3 X3 - USB connector

X3 is a vertical, type B USB connector with metal shell. The USB cable can be strapped to the cable support to obtain strain relief (see Figure *Rear layout of the COP-05 Input Panel* on page 12).

Table 5   X3 - USB connector terminal allocation

Pin no.	Name	Function
1	VBUS	Power supply, positive terminal
2	D-	Data signal, negative terminal
3	D+	Data signal, positive terminal
4	GND	Power supply, ground reference
Shell	Shield	Cable shield

4.4 X4/X5/X6/X7/X8 - USB connector

X4/X5/X6/X7/X8 are type A USB connectors with metal shell. The USB cables can be strapped to the cable support to obtain strain relief (see Figure *Rear layout of the COP-05 Input Panel* on page 12).

Table 6   X4/X5/X6/X7/X8 - USB connector terminal allocation

Pin no.	Name	Function
1	VBUS	Power supply, positive terminal
2	D-	Data signal, negative terminal
3	D+	Data signal, positive terminal
4	GND	Power supply, ground reference
Shell	Shield	Cable shield

4.5 X10 - Power connector

X10 is a four-terminal, screw connector with plugable header. The header can be locked to the connector body by one bolt at each end of the header.

Table 7   X10 - Power connector terminal allocation

Pin no.	Name	Function
1	+24 Vdc	Power supply, positive terminal
2	+24 Vdc	Power supply, positive terminal
3	0 Vdc	Power supply, ground reference
4	0 Vdc	Power supply, ground reference

4.6 Trackball

The trackball can be mounted in different directions if the switches are set to the corresponding position.

Switches

The switches are mounted behind the rollerball. To get access to the switches, the back cover must be taken off by removing the screws.

Switch 1 and 2

Allows four possible mounting orientations for the trackball.

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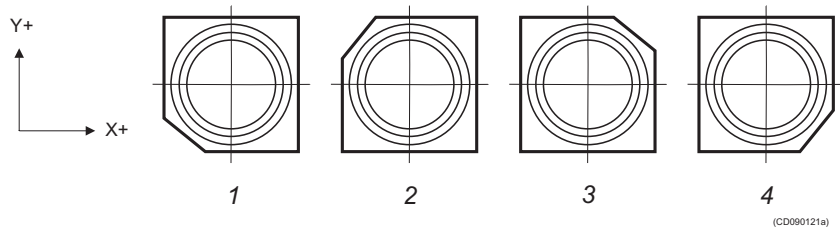
| Orientation	1	2	3	4
Switch 1	On	Off	Off	On
Switch 2	Off	On	Off	On

Switch 5

Y-axis is inverted for overhead operation.

5 INSTALLATION

5.1 Mechanical preparation before installation

1 Make a cut-out in the panel plate according to trackball dimensions shown in drawing HA464014 (optical sensor) or 333573 (mechanical sensor).

2 Attach nuts to the panel plate on its rear side for the four fixing bolts of the COP-05 Input Panel.

Panel plate console

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Operator panel
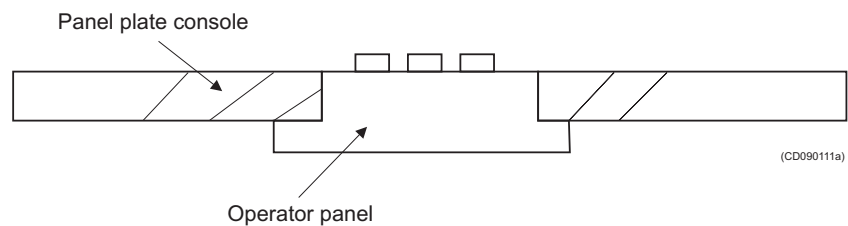
5.2 Electrical installation

1 Set correct USB address for the module on the hexadecimal switch.

2 Place the COP-05 Input Panel in its position and fasten the four nuts attaching the COP-05 Input Panel to the panel plate.

3 Terminate the PWM wires to the X2 screw terminals. Fasten the fixing bolts, one at each end of the connector header.

4 Terminate the Power wires to the X10 screw terminals. Fasten the fixing bolts, one at each end of the connector header.

5 Terminate the I/O Signal wires to the X1 screw terminals. Fasten the fixing bolts, one at each end of the connector header.

6 Connect the USB cable plug to X3.

7 Connect the USB cables plug to X4 – X8.

8 Strap the cables to the strain relief.

9 Provided the corresponding operator station (computer and colour monitor) is up and running, verify that the COP-05 Input Panel is functioning OK.

6 REPLACEMENT

1   Remove bolts that fixes the panel plate to its console body.

2   Place the panel plate in a position you can gain access on both sides.

3   Unstrap the cables from the strain relieves.

4   Remove the cable plugs X4 – X8.

5   Remove the cable plug X3, and remove the connector headers X2, X10 and X1 by releasing the end bolts using a screw driver with flat bit to split the connector header from the connector body.

6   Release the four nuts attaching the COP-05 Input Panel to the panel plate.

7   Lift the COP-05 Input Panel out of the panel plate.

8   Label the old panel with its error symptoms and put it aside.

9   Set the correct USB address for the new module on its hexadecimal switch.

10 Place the panel in its position and fasten the four bolts attaching the COP-05 Input Panel to the panel plate.

11 Reconnect the cable plug X3, and the connector headers X2, X10 and X1 by fastening the end bolts.

12 Strap the cables to the strain relieves.

13 Provided the corresponding operator station (computer and colour monitor) is up and running, verify that the COP-05 Input Panel is functioning OK.

7 MECHANICAL TRACKBALL CLEANING

1 Release and remove the trackball protection cover. Insert a screwdriver into one of the two holes at the top next to the top pushbuttons and lift to release — if one end is difficult to release try the other.

2 Verify that the pushbutton plate is a replacable model with mechanical sensors. Look for three large screws — head in front indicate optical sensor and shall not be cleaned in the field.

3 Release the four nuts (only) attaching the pushbutton plate to the panel — three large screws are holding the trackball parts together and may be difficult to reconnect.

4 Remove the pushbutton plate.

5 Remove the trackball from the socket.

6 Clean the trackball, the socket and 3 mechanical rollers. Clean the pushbutton electrical contacts if needed. Use an evaporating cleaning liquid, preferably containing alcohol — caution: water may damage the electronics!

7 Replace the trackball into the socket.

8 Replace the pushbutton plate. Pushbutton contacts must be connected — notice that the nut-holes and four plastic spikes are asymmetrical, so the pushbutton plate will only fit in one direction.

9 Replace the four screws attaching the pushbutton plate to the panel. Fasten the screws so that the pushbutton electrical contacts are connected — using force may damage the electronics.

10 Replace the protection cover — notice that the four asymmetrical connectors, put them over the connectors on the pushbutton plate and press to fasten.
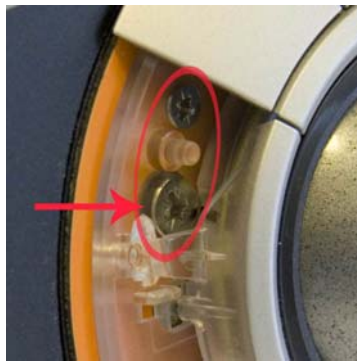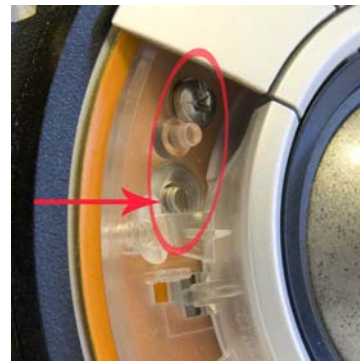
Step 1: Release protection cover.

Step 1: Use two holes in front.

Step 2: If the plate is fastened with 4 small and 3 large screws — STOP

Step 2: If the plate is fastened with 4 small screws only — proceed.

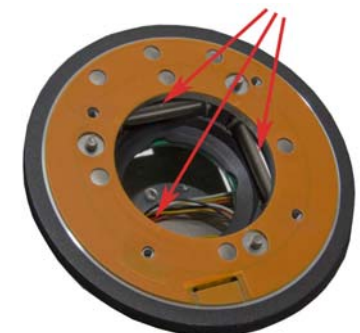**Step 3:** Release four small screws

Step 4: Remove pushbutton plate
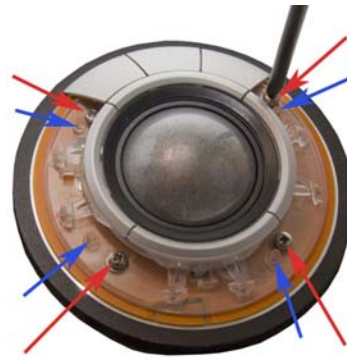
Step 5: Remove trackball.

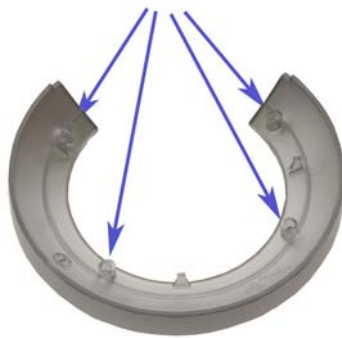**Step 6:** Clean the socket and mechanical rollers.

Step 7–8:
Replace
trackball and
pushbutton
plate

Step 9:
Replace
and fasten
pushbutton
plate

Step 10:
Notice
connectors
on the cover

Step 10:
Press to
connect
protection
cover.

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