

F60 Series – Military Trackball, Protocol Output



1. DESCRIPTION

The F60 Series trackball is a high specification military device for use in extremely demanding environments where servicing and robustness are essential.

The unique chassis design provides excellent impact strength, electrical shielding, and environmental capabilities to make an all round robust solution for the most demanding of military applications.

High-grade stainless steel shafts and bearings ensure a solid and precise pointer control, whilst the military grade micro switch arrangement provides excellent tactile feedback and reliability.

A choice of top plate and chassis configurations are available to provide optional mounting arrangements and service requirements.

The unit has been designed to be front panel mounted as part of military keyboards and consoles.

2. FEATURES

- Outputs: PS/2, USB, SUN Systems
- Smooth operation in rugged environments
- IP65 sealing capability
- High level of corrosion resistance
- Various top plate configurations providing alternative mounting arrangements
- Custom connection options available
- High impact strength
- Operates under extreme shock and vibration
- Excellent environmental capabilities
- For use in military keyboards and consoles
- Custom solutions available (please contact your local sales office)



3. SPECIFICATIONS

3.1 Mechanical

Weight	1.4Kg
Ball size	Ø63.2 mm (2.5")
Ball material	Phenolic
Ball tracking force	15 grams: Top ring in un-locked position 500 grams: Top ring in locked position
Chassis material	Aluminium HE30, Alochrom 1200 finish to DEF STAN 03-18 1200
Top plate material	Aluminium HE30, Black anodised to DEF STAN 03-25 TYPE 1
Base plate material	Aluminium HE30, Alochrom 1200 finish to DEF STAN 03-18 1200
Removable ring	Aluminium HE30, Black anodised to DEF STAN 03-25 TYPE 1
Operating position	Horizontal to 60°
Sealing/sealing material	IP65, Felt seal
Screws/fasteners	All screws/fasteners A4 stainless steel
Switch actuation force	100-120 grams
Static load	500N for 2 minutes
Lifetime	1 million ball revolutions
MTBF	50,000 hours

3.2 Electrical

Protocol	PS/2, USB, SUN (see section 12 for ordering code details)
Supply voltage	4.4 to 5.25V D.C.
Supply current	15mA typical
Resolution	219 pulses per ball revolution (878 counts per ball revolution)
Output connector	25 way D-sub connector, Cannon type DBMM 25P
Spring latch	Canon type D100277
Switch Inputs	3 switches: Left, Middle, and Right (other options available)

3.3 Environmental

Operating temperature	0°C to +55°C (IEC 60068-2-1, Test Aa, Cold) (IEC 60068-2-2, Test Ba, Dry Heat)
Storage temperature	-40°C to + 71°C (IEC 60068-2-1, Test Aa, Cold & IEC 60068-2-2, Test Ba, Dry Heat)
Power on temperature	-15°C, IEC 60068-2-1
Humidity	0-95% non condensing environment 40 deg C, 56 days IEC 60068-2-78
Vibration	2g, 10 to 500Hz, octave per minute, 1 hour/axis. IEC 60068-2-6
Shock non operating	20g/11ms 3 shocks in +-directions (In total 18 shocks) IEC 60068-2-27
Shock operating	6g/11ms 3 shocks in +-directions (In total 18 shocks) IEC 60068-2-27
Ball Impact	20 Joules
Switch impact	5 joules
ESD	15kV air-discharge and 6kV contact discharge.
Low pressure:	57 kPa, operating, 40 kPa non-operating, RTCA/DO 160 B, July. 1984, para 4.6.1
Rapid decompression Op:	The equipment shall be in operation, but full performance is not required during the pressure drop. From 75 kPa to 40 kPa in 15 seconds, staying at 40kPa for 3 minutes RTCA/DO 160 B, July. 1984, para 4.6.2
Over pressure Non-operating:	170 kPa (absolute pressure) RTCA/DO 160 B, July. 1984, para 4.6.3
Impact:	18g, horizontal and vertical direction.
EMC:	MIL-STD-461 E



4. CONNECTION DETAILS

The F60 Series trackball can be specified to combine the three most common protocols found in computer systems into a single device. A list of the protocol options can be found in section 8 of this document entitled "Product Ordering Code System".

Connection is made to the F60 trackball by means of a 25 way D-Sub male connector (Cannon type DBMM 25P) with associated spring latch assembly D100277. The connector meets the requirements stated in MIL-C-24308. The connector mates with cannon spring latch plate assembly, type D110278.

Table 1 highlights the connection details. Custom connections are available (please contact your local sales office for further details).

4.1 Output Connector

Pin Number	PS/2 Output	USB Output	SUN Type 5 Output
6	EARTH	EARTH	EARTH
8	0V	0V	0V
18	PS/2 Data	D-	Tx Data low
20	PS/2 Clock	D+	Tx Data high
22	5V D.C	5V D.C	5V D.C
All Other pins	NOT USED	NOT USED	NOT USED

Table.1 Output Connections

4.2 Protocol Selection

For trackball devices specified with multiple outputs (e.g. USB, PS/2 and SUN) the protocol may be selected using the protocol jumper pins located on the printed circuit board (see table.2). Please see application note AN0010 for more details on setting the jumper pins.

PROTOCOL	SWITCH 1	SWITCH 2
USB/PS/2 (Auto select)	ON	ON
USB only	OFF	ON
PS/2 only	ON	OFF
SUN	OFF	OFF

Table.2 Protocol Selection

4.3 SUN Protocol Information:

Baud rate: 1200
Data bits: 8
Stop bits: 2
Start bits: 1
Parity bits: 0
Logic: Inverted

4.4 SUN Packet Format:

BIT	D7	D6	D5	D4	D3	D2	D1	D0
Byte1	1	0	0	0	0	LB	MB	RB
Byte 2	X7	X6	X5	X4	X3	X2	X1	X0
Byte 3	Y7	Y6	Y5	Y4	Y3	Y2	Y1	Y0
Byte 4	0	0	0	0	0	0	0	0
Byte 5	0	0	0	0	0	0	0	0

X7..0 – X displacement, 7 bit signed binary number, positive protocol output for positive X ball movement (ball moves right)

Y7..0 – Y displacement, 7bit signed binary number, positive protocol output for positive Y ball movement (ball moves up). Positive Y is up.

5. SWITCH CONNECTIONS

5.1 Switch Details

Figure 1 below highlights the switch arrangement for the F60 trackball assembly.

Left Switch: The functionality corresponds to the left button on a standard mouse.

Middle Switch: The functionality corresponds to the middle button on a standard mouse.

Right Switch: The functionality corresponds to the right button on a standard mouse.

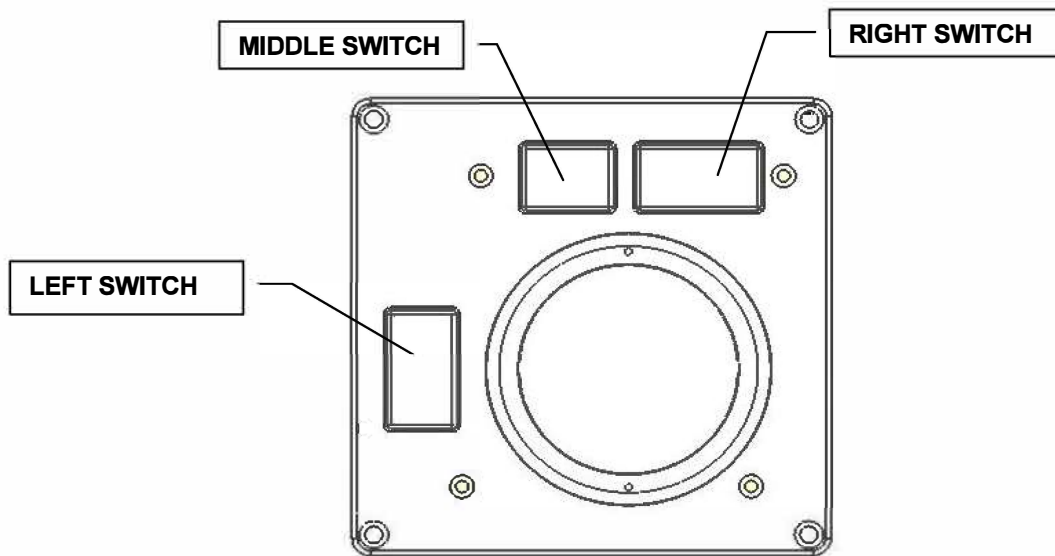


Figure 1 Switch Arrangement

5.2 Button/ Micro Switch Details

Table.3 below highlights the performance characteristics of the three micro-switch assemblies integrated into the F60 trackball device.

DETAIL	SPECIFICATION
Micro-switch manufacturer	ITW switches
Part Number	19N412L18
Switch sealing rating	IP67
UL rating	UL94-V0
Mechanical life	10,000,000 cycles
Operating force	100-120 grams
Current	1mA 5V d.c.
Life full load	100,000 cycles
Contact bounce	5ms (max)
Switch travel	2.5mm
Switch button material	Delrin-500
Switch button colour	Black

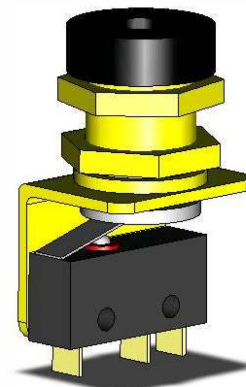


Table.3 Micro-switch characteristics



6. Drainage

The housing of the Trackball unit provides drainage holes to protect the printed circuit board from damage. See outline drawing DS60001 (sheet 2) for further details of the hole sizes and locations.

7. Maintenance

The F60 trackball can be disassembled for cleaning and maintenance - see application note AN0011 for further details.

8. Workmanship

The trackball device is designed and produced according to IPC-A-610, Class 2. All Printed Circuit Boards and all soldering are conformal coated to IPC standards.

9. Service – Kit of Parts

An additional kit can be purchased for servicing the F60 trackball device - see application note AN0012 for further details.

10. Outline Drawing

See outline drawing DS60001(sheet2) for further details on trackball dimensions.

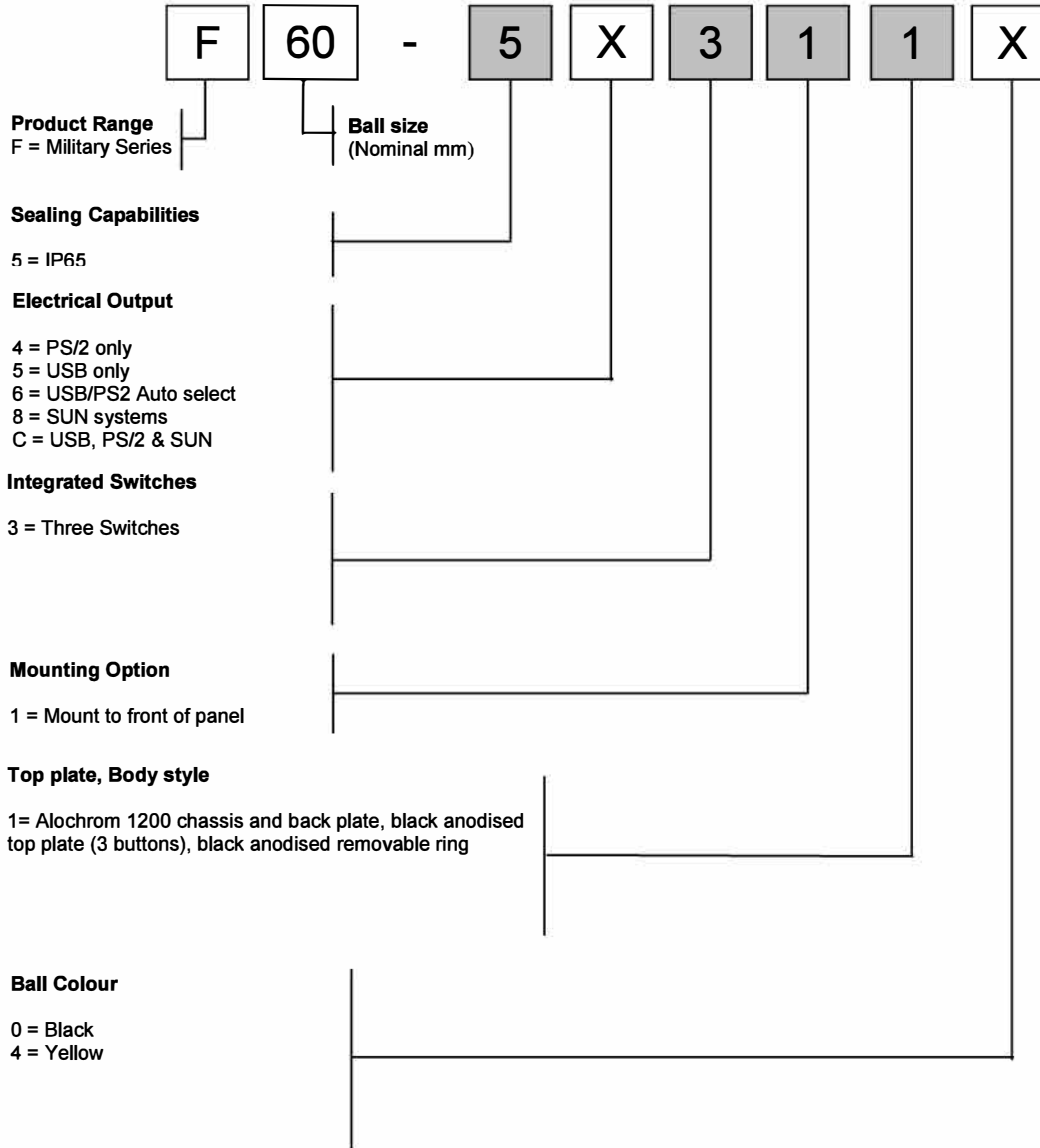
11. Relevant Documents

Document Number	Description
AN0010	Jumper settings – protocol selection
AN0011	Servicing & maintenance
AN0012	Service kit of parts
DS60001	Specification sheet
DS60001(Sheet2)	Outline drawing



12. PRODUCT ORDERING CODE SYSTEM

Please construct your standard product ordering code by selecting the numbers and letters to suit your specification:



For further options on ball colours please contact your local sales representative

12.1 Ordering Example

F60-563110: F60 Series Military, IP65, USB/PS/2, 3 switches, mount to front of panel, {Alochrom 1200 chassis and back plate, black anodised top plate (3 buttons), black anodised removable ring}, black ball.



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DS60001

13. DOCUMENT REVISION STATUS

Revision	Date	Author	Remarks
A	03.06.08	N.S	Document released
B	04.09.09	N.S	ECN 1185



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