7171 Full Follow Up (FFU) Control Lever

Owner's Operation, Installation & Maintenance Manual

Kobelt Manufacturing Co. Ltd.

NOTES:

RECORD DATA BEFORE INSTALLATION FOR FUTURE REFERENCE	
Model #:	
Serial #:	
Date of Purchase:	
Date of Installation:	

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1 INTRODUCTION

1.1 CONTACT

Kobelt Manufacturing Co. Ltd.
8238 129th Street
Surrey, British Columbia
Canada, V3W 0A6

Sales Tel: +1-604-572-3935
Fax: +1-604-590-8313
Email: sales@kobelt.com
Website: www.kobelt.com

This document is intended to clearly present comprehensive product data and provide technical information to assist the end user in design applications. Kobelt reserves the right, without notice, to change the design, or construction, of any products and to discontinue or limit distribution of any products. Kobelt also reserves the right to change, or update, without notice, any technical information contained within this document.

Kobelt recommends that customers visit our website to check for updates to this Manual. Once a product has been selected for use, it should be tested by the user to ensure proper function in all possible applications. For further instructions, please contact our distributors or visit our website.

1.2 SAFETY

1.2.1 Safety Alerts

Throughout this manual, the following symbols, and their accompanying explanation, are used to alert the user to special instructions concerning a service or operation that may be hazardous if performed incorrectly or carelessly. The associated risk levels are stated below.

⚠ DANGER	This symbol indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
⚠ WARNING	This symbol indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
⚠ CAUTION	This symbol indicates a hazardous situation, which if not avoided, could result in minor or moderate injury.
NOTICE	This symbol informs the reader of events not related to personal injury but which there is a risk of damage to property or equipment.
SAFETY INSTRUCTIONS	This symbol informs the reader of safety-related instructions or procedures.

1.2.2 Notice to Installer

Disregarding the following safety measures can result in an accident causing severe injury to personnel and damage to material assets.

- Only use the product as directed in this manual.
- Never put the product into service if there is evidence of visible damage.
- Never put the product into service before fully completing installation and commissioning.
- Do not make any modifications to the product.
- Only use authentic Kobelt spare parts.
- Observe all local regulations, directives, and laws during the installation of this product.
- All installation, commissioning, and maintenance work must only be conducted by qualified personnel. (For the purpose of this manual, qualified personnel are persons who are familiar with the assembly, installation, commissioning, and operation of the product and who have the qualifications necessary for their occupation.)
- Observe all specifications in this manual. If these guidelines are not followed and damage occurs, the warranty will be voided.

1.2.3 Product Hazards

⚠WARNING	**Disconnect Power:** Turn off power at distribution panel before beginning installation to protect installer from electrical hazards.

⚠CAUTION	**Voltage and Current Compatibility:** Confirm that the power source is compatible with the maximum voltage and current ratings of is product variant. Failure to do so could result in damage or fire.

2 PRODUCT DESCRIPTION

The Kobelt 7171 Full Follow Up (FFU) Control Lever is used as an input to FFU electronic steering systems. The operator can maneuver the vessel by moving the lever port or starboard to adjust its internal potentiometer. The FFU Control Lever can be used for steering applications, other marine applications, or industrial installations.

The 7171 can be purchased with electrical switches at the far port and starboard extremes to handle Non-Follow Up (NFU) mode command signals to the on-board control system.

The 7171 is designed for indoor and outdoor installation with a robust die cast bronze and stainless-steel construction to provide a long service life in a harsh marine environment. The standard configuration includes a polished chrome jog handle and black surface finish. Optionally, the 7171 can be configured to use a small wheel in place of the jog handle.

Figure 1: 7171 Overview Diagram

2.1 TECHNICAL DATA

Table 1: 7171 Technical Data

MODEL		7171 SERIES	
KOBELT P/N:		7171-P, 7171-PP	7171-B, 7171-SWB, 7171-G
ELECTRICAL SWITCH CONTACTS		--	Form A, NO (Normally Open) (per direction)
MAX. CONTACT VOLTAGE		--	250 VAC / 24 VDC
MAX. CONTACT CURRENT[1]	12 VDC	--	6 A
	24 VDC	--	5 A
	250 VAC	--	6 A
CONTROL POTENTIOMETER		Up to 2x 1kΩ	
MAX. POTENTIOMETER POWER		1 W	
OPERATING TEMPERATURE		-13°F … 158°F [-25°C … 70°C]	
PRODUCT WEIGHT		5 lbs [2.2 kg]	
INGRESS PROTECTION (IP) RATING		IP56[2] (above dash only)	

[1]Maximum reported current is for an inductive load. Current is per switch contact.

[2]**Requirements to achieve IP56:** Minimum 3/16" [5mm] thick steel dash, or equivalent. Requires 4x installation screws to be sealed. IP rating only applies to units manufactured after March 2022

3 INSTALLATION

3.1 MECHANICAL

The Full Follow Up (FFU) Control Lever should be mounted:

- In a central location at each station on-board the vessel
- With sufficient room for the handle to swing fully to both extreme conditions
- Within 6 feet [1.8 m] of electrical junction box
- On a horizontal or angled dash surface
- With the external electrical cables protected from potential damage

The FFU lever must be mounted on a flat surface with a maximum roughness of ra = 125 micro-inches [500 μm]. The mounting surface must have the following minimum thickness to prevent excessive flexing:

Steel consoles: 0.19 inches [4.8 mm]
Aluminum consoles: 0.27 inches [6.8 mm]

The FFU Lever is equipped with (4) four mounting holes for #10 [M5]. Use #10 or M5 sealing screws or bonded sealing washers to prevent water ingress below the dash. Tighten the fasteners to 23 in-lbs [4 Nm] with an anaerobic thread locker such as Loctite 243.

3.2 ELECTRICAL

The FFU Control Lever has 6 foot [1.8 m] long 3C/18 cables for external connections. Connect them to an electrical junction box and the electronic or power hydraulic steering system interface as required.

The product's 3C/18 electrical cables contain the following wires and related functions:

Table 2: 7171 Wire Connections – Potentiometer 1

7171 - Potentiometer 1				
Wire #	**Wire Name**	**Colour**	**Gauge**	**Function**
1	POT+	White	18AWG	FFU potentiometer 1 power supply connection.
2	POT WIPER	Red	18AWG	FFU potentiometer 1 signal connection.
3	POT-	Black	18AWG	FFU potentiometer 1 ground connection.

Table 3: 7171 Wire Connections – Potentiometer 2 (Dual Pot Configurations Only)

7171 - Potentiometer 2				
Wire #	**Wire Name**	**Colour**	**Gauge**	**Function**
1	POT+	White	18AWG	FFU potentiometer 2 power supply connection.
2	POT WIPER	Red	18AWG	FFU potentiometer 2 signal connection.
3	POT-	Black	18AWG	FFU potentiometer 2 ground connection.

Table 4: 7171 Wire Connections - Switches ('B' Configurations Only)

7171 - Switches				
Wire #	**Wire Name**	**Colour**	**Gauge**	**Function**
1	SWA-NO	Black	18AWG	Connects to COM when Switch A is activated.
2	SWB-NO	White	18AWG	Connects to COM when Switch B is activated.
3	COM-AB	Green	18AWG	COM connection.

The cable penetration locations shown in Figure 2 and the internal wiring connections are shown in Figure 3. Note that the internal wiring connections may differ depending on the configuration variant ordered. For example, not all variants contain two potentiometers or internal switches.

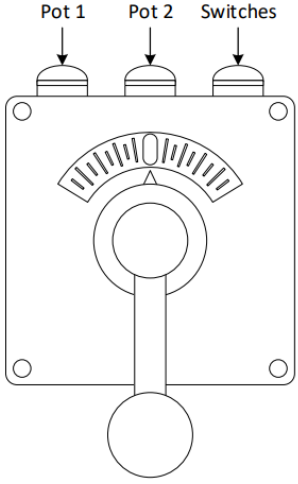


Figure 2: 7171 Cable Penetration Location

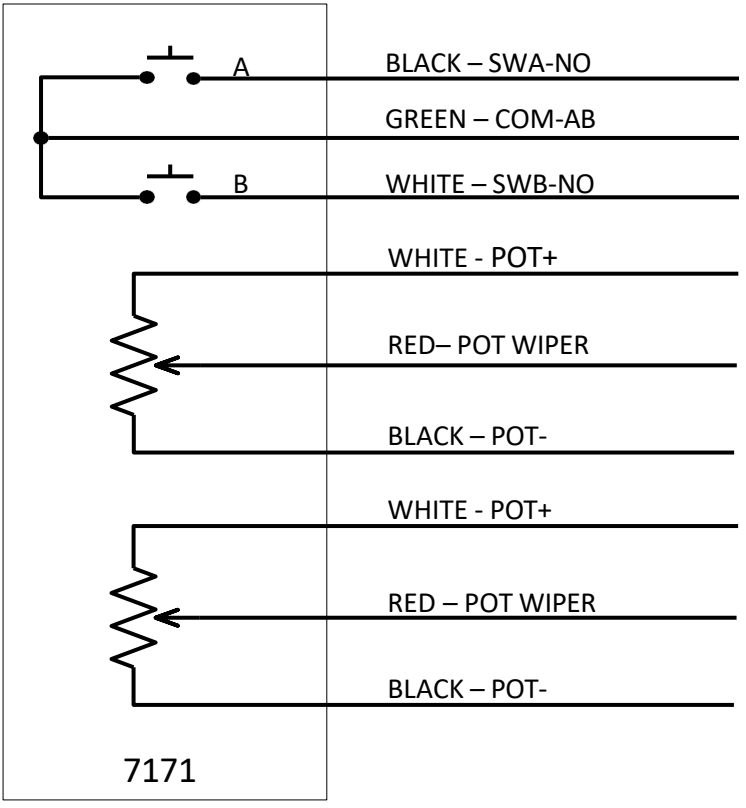


Figure 3: 7171 Internal Wiring Diagram

NOTICE	Note that the secondary potentiometer and switches may not be present on all configurations of this product. Refer to product code key for definition of internal components.

The operating direction of the Potentiometer in relation to the Full Follow Up Control Lever handle is shown in Figure 4.

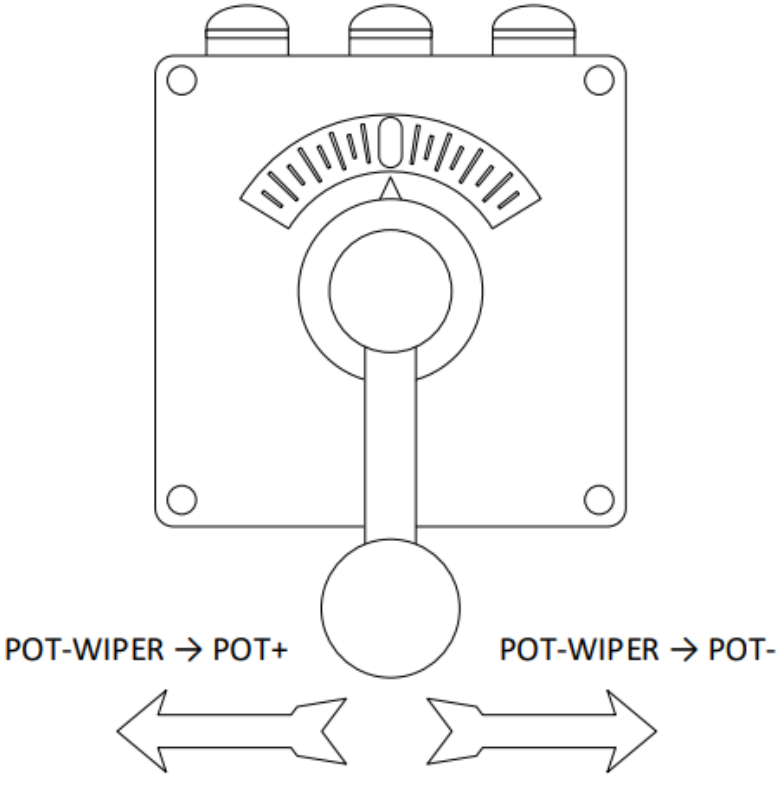


Figure 4: 7171 Potentiometer Direction Diagram

3.2.1 Contact Protective Circuit

The control lever with switch contacts shall not exceed the rated current as specified in the technical data (Section 2.1), including AC or DC inductive ratings, under any operating condition.

Where the controlled load or coil current exceeds the control lever switch contact rating, the switch shall interface through an interposing relay. Direct switching of such loads by control lever switches is not permitted.

For inductive loads within the switch rating, appropriate suppression shall be applied to minimize contact arcing and electromagnetic interference.

- **DC Coil Loads**
  For DC coils, a flyback diode or a DIN connector with protection diodes or varistors shall be installed across the coil terminals. The diode should be selected such that:
  - Reverse voltage rating ≥ 10 × coil supply voltage
  - Forward current rating ≥ coil operating current

  Below is recommended for typical 12 VDC and 24 VDC relay coil applications.

Table 5: DC Coil Suppression Methods and Approved Models

Suppression Category	Approved Model
Flyback diode (General Purpose)	1N4007
Flyback diode (Alternative Rating)	1N4006
Valve connector cable with integrated suppression	Phoenix Contact (1443103) Phoenix Contact (1400588) Murrelektronik (7000-18021-6160500) Murrelektronik (7000-18021-2160500) Hirschmann (GAN22LU-S24-6091000)

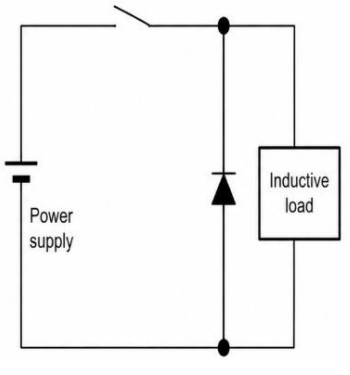


Figure 5: Protection by Diode Method

- **AC Coil Loads**
  For AC coils, an RC snubber shall be installed across the coil terminals. Typical starting values:
  - Capacitor: 0.5 µF to 1 µF per 1 A of switching current (AC-rated, non-polarized, minimum voltage rating suitable for supply voltage, typically 200–300 V class), adjusted based on load characteristics and verified during commissioning
  - Resistor: 0.5 Ω to 1 Ω per 1 V of switching voltage, selected according to load voltage and current, and optimized during commissioning for effective arc suppression

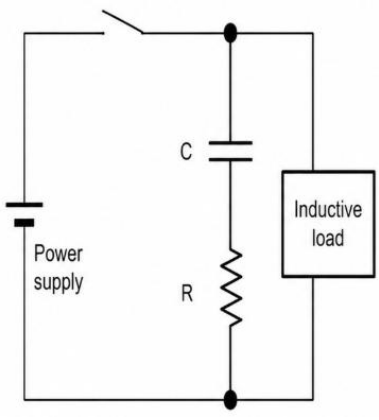


Figure 6: Protection by RC circuit Method

4 COMMISSIONING

4.1 ELECTRICAL CHECK

⚠CAUTION	Ensure that the rear cover is installed and secured before powering on the 7171.

Confirm that the electrical connections to the 7171 have been made correctly and correspond to the requirements of your system installation.

4.2 FUNCTIONAL TEST

⚠CAUTION	The Functional Test should be carried out while the vessel is still at dock and before it is taken out to sea after installation has been completed.

A complete functional test should be performed on the system that the Full Follow Up Control Lever has been installed within before entering operational use.

5 OPERATION

The Kobelt 7171 Full Follow Up (FFU) Control Lever contains one or two potentiometers and optionally a set of switches for each direction of travel. Operating the FFU Control Lever causes the steering gear to move in the desired direction. When the lever is released, it stays at the set position and does not spring back to centre.

Operating the lever in either Port and Starboard, or Left and Right, directions commands motion in the system it is controlling.

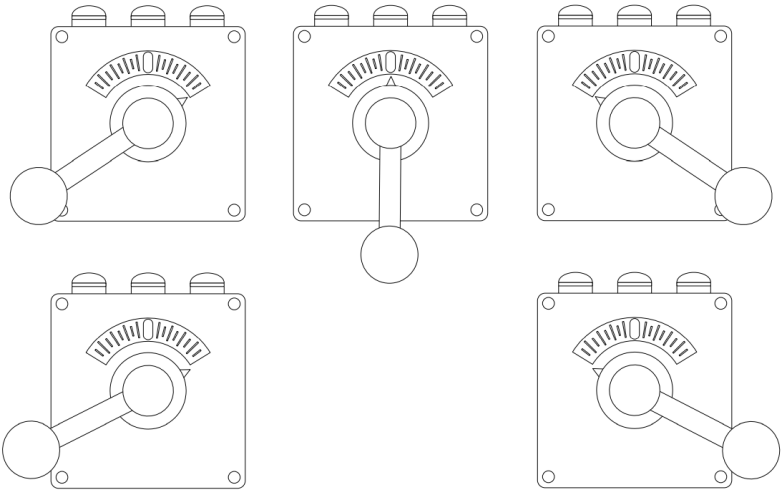


Figure 7: 7171 Positions of Operation, SWITCH LEFT, FFU LEFT, CENTRE, FFU RIGHT and SWTICH RIGHT

⚠CAUTION	Ensure that the FFU Jog Lever is set to within a few degrees of the current rudder angle before switching into FFU mode. Not doing so will result in immediate movement of the rudder to the commanded position.

6 MAINTENANCE

6.1 PREVENTATIVE MAINTENANCE

- Quarterly (4 times per year)
  - Visually inspect wire and cable insulation for splits or damage.
  - Ensure there is no visible corrosion on the unit.
  - Conform cable glands are secured to cables.

6.2 RECOMMENDED SPARE PARTS

NOTICE	It is recommended that any required service work on a Kobelt unit be performed by a factory authorized service representative. Please contact the nearest Kobelt authorized distributor for assistance.

The table below itemizes which spare part numbers change with the various configuration options. Please reference this table to ensure you receive the correct parts.

Table 6: Configuration Part Numbers

Configuration Part Numbers		
Operator Code	**Shaft**	**Operator Type**
(blank)	7171-0008	lever
-SW	7171-1008	star wheel
Potentiometer Code	**Potentiometer**	**Resistance**
(blank)	POT-1	1 kohm
-H	POT-5	5 kohm
-J	POT-10	10 kohm

There are several repair kits available for the 7171 FFU lever. The kits are summarized in Table 7 along with the FFU lever model they pertain to. For critical applications, it is recommended to keep at least one repair kit on hand.

Table 7: Available repair kits

ITEM	KOBELT PART #	Applicable model codes	Contents
Microswitch repair kit; FFU w/ 2 microswitches	7171-RK-01	-A, -B	2X Microswitches, 3C 18AWG x 2m long cable
Microswitch repair kit; FFU w/ 4 microswitches	7171-RK-02	-G	4X Microswitches, 2X 3C 18AWG x 2m long cables.

7 TROUBLESHOOTING

If you encounter problems with the operation of your product, please refer to the trouble-shooting suggestions before contacting Kobelt for assistance. If the steps below do not resolve your issue, please reach out either Kobelt directly or our Dealers in your area.

Table 8: Common Solutions

Problem (Issue encountered)	Cause (What it means)	Corrective Action (What to do)
Full Follow Up Control Lever action is reversed.	Wiring is backwards.	Swap the POT+ and POT- output wires to their respective potentiometer and system connections.
Full Follow Up Control Lever does not move rudder at all.	The rest of the system isn't hooked up correctly.	Check system wiring. Confirm wiring to Full Follow Up Control Lever.
	Broken potentiometer or contact.	Use a multi-meter to monitor the resistance of the wiring between potentiometer contacts. Check for normal operation of the potentiometer by measuring the connection while moving the Full Follow Up Control Lever. Check potentiometer directions. Replace any damaged potentiometers.
	Wiring is wrong.	Check wiring. Refer to system design drawing for proper wiring.

8 WARRANTY

Kobelt Manufacturing Co. Ltd. ("Kobelt") warrants the Products and Parts manufactured by Kobelt to be free from defects in workmanship or material and that said products are designed mechanically and functionally to perform to specifications.

This warranty is effective providing:

- The equipment is used within the intended operating conditions and in accordance with Kobelt recommendations
- The equipment is installed according to equipment diagrams, specifications and recommendations which Kobelt has provided

This warranty becomes invalid if the factory supplied serial number has been removed or altered on the product. This warranty does not cover cosmetic damage or damage caused by an act of God, accident, misuse, abuse, negligence or modification of any part of the product. This warranty does not cover damage due to improper operation or maintenance, connection to inappropriate equipment or attempted repair by anyone other than an authorized Kobelt representative.

Upon identification of a potential issue or defect with a Kobelt Product or Part, the Warranty Applicant ("Applicant") must immediately contact Kobelt and describe the issue in writing, by letter, fax, email or other electronic conveyance. Kobelt will then assess the cause of the defect and determine warranty applicability and appropriate remediation.

If any part is found to be defective, Kobelt will replace said part FOB the Kobelt factory provided that any such defective part is returned by the Buyer with freight and applicable forwarding charges prepaid by the Buyer. Kobelt's sole obligation to the Applicant will be to repair or replace the defective part with same or similar product, to a maximum value of the list price of the product or part. The Kobelt warranty does not cover labour charges, travel or any other associated expenses.

All Products and Parts manufactured by Kobelt, are subject to a warranty against manufacturer's defects in materials or workmanship for a period of two (2) years from the date of purchase.

Kobelt will be responsible for all Products or Parts sold by Kobelt but manufactured by 3rd party manufacturing companies. However, these products and parts are subject to applicable 3rd party warranties and may not be the same as the Kobelt warranty.

9 REVISIONS HISTORY

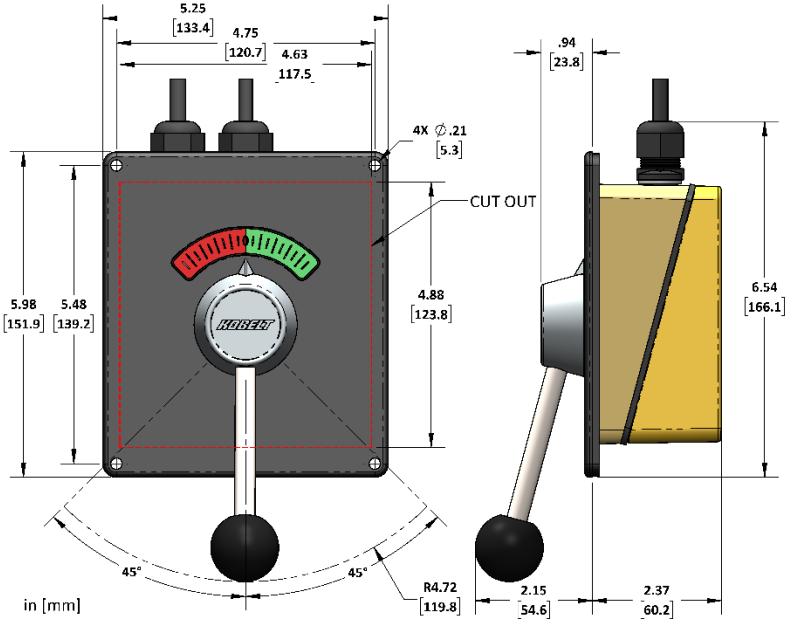
Table 9: Table of revision changes

Document Revision	Release Date	ECN	Author	Revision Summary
F	2026-08-10	01475	MW	• Added section 3.2.1

E	2025-11-13	01028	GG	• Updated technical specification, reported microswitch current for inductive load.
				• Updated Section 6.2: Spare parts;
				  ○ Added microswitch repair kits to spare parts list.
				• Updated parts list:
				  ○ Corrected assembly part number, was 7171-B.
				  ○ Updated 7171-B BOM to use new microswitches.
				• Added Appendix C: Determination of Microswitch generation.
				• Added Appendix D: Microswitch retrofit/replacement instructions.

D	2023-12-27	-	SV	• Changed the wire in potentiometer to shielded type (from Green to Red) P10, Cable part number changed from (6014-0001 to 6525W-CT-RL) P20

10 APPENDIX A: INSTALLATION DIMENSIONS



11 APPENDIX B: PARTS LIST

7171-B

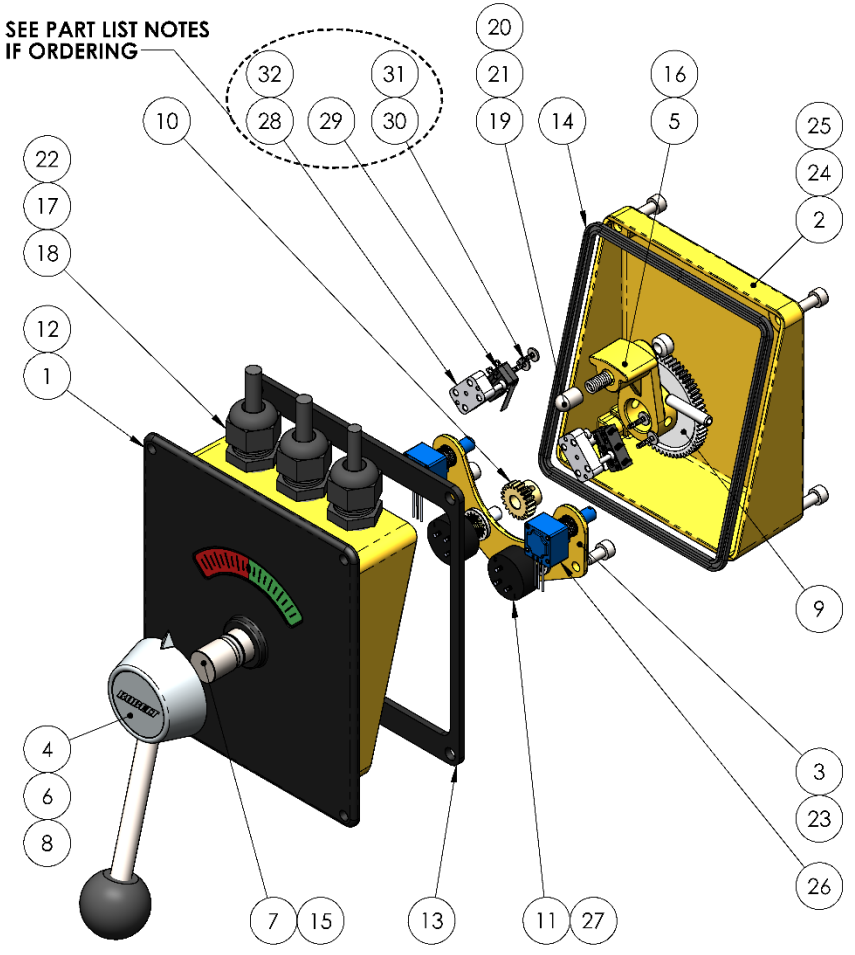


Table 10: 7171-B Bill of Materials

ITEM	QTY.	UOM	PART NUMBER	DESCRIPTION	Notes (See sec
1	1	EA	7171-0001-BT	HOUSING; FFU CONTROL LEVER / TEXTURED BLACK FINISH	-
2	1	EA	7171-0002	COVER	-
3	1	EA	7171-0003	4 HOLE POTENTIOMETER PLATE	-
4	1	EA	7171-0004-K	HUB (CHROME PLATED)	-
5	1	EA	7171-0005	CAM; FFU LIMIT SWITCH	-
6	1	EA	7171-0006	HANDLE	-
7	1	EA	7171-0008	SHAFT, FFU HANDLE	-
8	1	EA	2030-0001	HANDLE KNOB, SPHERICAL, BLACK	-
9	1	EA	YPB-3264	SPUR GEAR 64T DERLIN W/ 5/16 BRASS INSERT	-
10	2	EA	Y-3220	SPUR GEAR - BRASS; 32P/20T/B STYLE/.250IN BORE + 2 SET SCREWS	-
11	2	EA	POT-1	POTENTIOMETER, 1K, 1TURN, 340 DEG, 22MM DIA	-
12	1	EA	7171-0016	SCALE LABEL (7171)	-
13	1	EA	7171-0015	GASKET, 7171 DASH, 1/8IN, EPDM, 70D	-
14	1	EA	7171-0026	SEAL 70 DURO E.P.D.M.	-
15	1	EA	1101-0014	O-RING, 2-014, 1/2IN X 1/16IN, NBR70	-
16	1	EA	1024-0816	PIN; SLOTTED SPRING; 3/16 DIA X 1LG; AISI 304	-
17	6	MTR	6525W-CT-RL	CABLE; 3C/18AWG / SHLD / 600V / 105C / GRY	-
18	3	EA	6001-0248	CABLE GLAND; M16 X 1.5, .197-.394 CABLE, PA6, BLACK	-
19	1	EA	2012-0007	DETENT PLUG	-
20	1	EA	1016-1204	SET SCREW - SKT; CP PT, 3/8 UNC X 1/4, 18-8	-
21	1	EA	1201-0063	COMPRESSION SPRING	-
22	3	EA	6001-0248-W-M16	WASHER, SEALING, M16, POLYETHYLENE	-
23	3	EA	1002-0806	SCREW, SKT HEAD, 10-24 X 3/8, 18-8 SS, ASTM F837	-
24	2	EA	1002-0810	SCREW, SOCKET HD, 10-24 X 5/8, 18-8SS	-

25	2	EA	1002-0828	CAP SCREW - SCKT HD; #10-24 X 1 3/4, 18-8	-
26	2	EA	TRIMPOT-1	POTENTIOMETER, TRIM, 10K, SINGLE TURN, 5/8 X 11/16 RECT	-
27	2	EA	6639-0001	SHIM WASHER, 10MM X 2MM, AISI 304	-
28	2	EA	7196-0017	BRACKET, MICROSWITCH, 7196	1
29	2	EA	6001-0112	MICRO SWITCH; SUBMINIATURE / STRAIGHT LEVER / SPDT / 5A 24VDC INDUCTIVE	1
30	4	EA	1012-3210	SCREW; PAN HEAD; PHP DR; M2X.4; 10MM LG; 18-8	1
31	4	EA	1023-0102	WASHER; FLAT; #2 X 1/4 OD; 18-8	1
32	4	EA	1009-0306	SCREW, FLT HD PHP, 3-48 X 3/8LG, 18-8	1

7171-RK-01

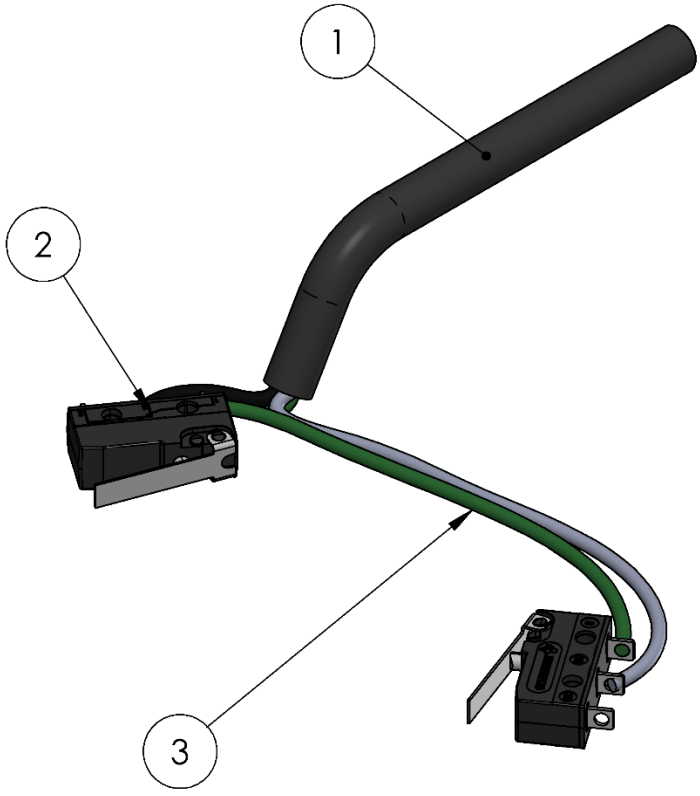


Figure 8: 7171-RK-01 Parts Diagram

Table 11: Bill of Materials 7171-RK-01

ITEM	QTY.	UOM	PART NUMBER	DESCRIPTION
1	2	MTR	6014-0001	Cable, 3C/18AWG, SVT, 300V, 105C
2	2	EA	6001-0112	Microswitch, Sub-Miniature / Straight Lever / SPDT / 5A 24VDC Inductive
3	6	IN	6014-0018G	Wire, Stranded, Type MW, 18AWG, GRN

7171-RK-02

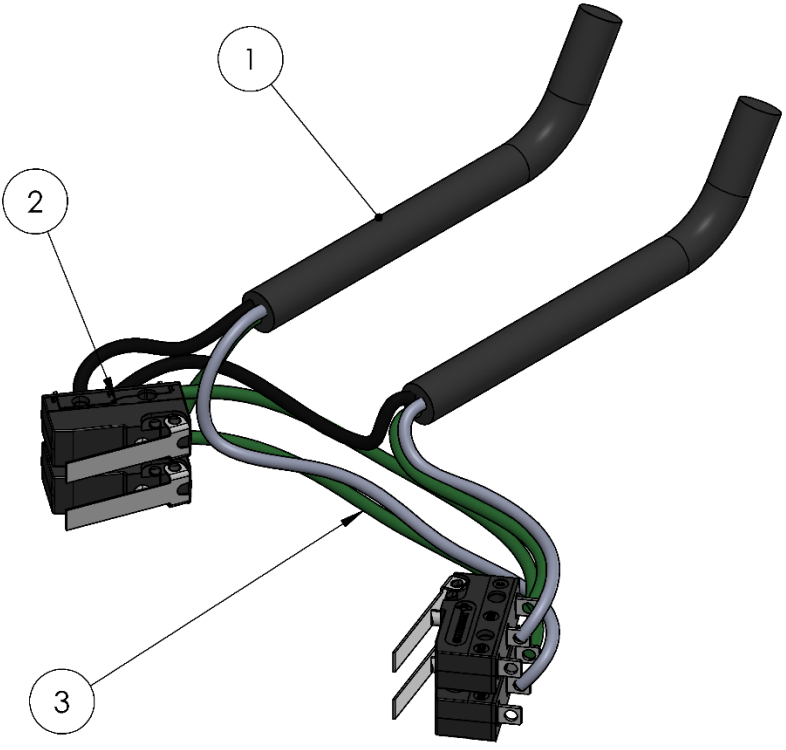


Table 12: Bill of Materials, 7171-RK-02

ITEM	QTY.	UOM	PART NUMBER	DESCRIPTION
1	4	MTR	6014-0001	Cable, 3C/18AWG, SVT, 300V, 105C
2	4	EA	6001-0112	Microswitch, Sub-Miniature / Straight Lever / SPDT / 5A 24VDC Inductive
3	12	IN	6014-0018G	Wire, Stranded, Type MW, 18AWG, GRN

11.1 PARTS LIST NOTES:

1. Contained in microswitch retrofit kit 7171-RF-01 or 7171-RF-02. See section 12.1 to determine if a retrofit kit is required or if a repair kit can be purchased on its own.

12 APPENDIX C: DETERMINATION OF FFU GENERATION

The original microswitches in the 7171 FFU lever were phased out in mid 2024; The change is not backwards compatible. Customers with old microswitches who require replacements will not be able to order the old microswitch. They must perform a retrofit to allow the new microswitch to become compatible with their units. FFU levers with the old microswitch are referred to as 'Generation 1', and FFU levers with the new microswitch are referred to as 'Generation 2'.

The change to the FFU levers only applies to models with the jog switches, '-A', '-B', or 'G' models. All other FFU levers that use potentiometers still remain as a 'Generation 1' FFU levers and replacement parts can be ordered as normal.

12.1 MICROSWITCH DETERMINATION AND REPLACEMENT ORDERING

Customers can identify which generation of FFU lever they have by examining their FFU lever microswitch and comparing to the microswitches pictured in Table 13. The generation 1 style microswitch was a larger, plunger style microswitch. The generation 2 microswitch is slightly smaller and has an actuation lever.

Table 13: Joystick generation determination via microswitch identification

Key Features		**Generation 1**	**Generation 2**
Microswitch part number		6001-0104	6001-0112
Picture			
Replacement part number	-A, -B Models (Two Microswitches)	7171-RF-01 Retrofit kit	7171-RK-01 Microswitch repair kit
	-G Models (Four Microswitches)	7171-RF-02 Retrofit kit	7171-RK-02 Microswitch repair kit

If you identify that you have a generation 1 microswitch and require a replacement, then you must order the retrofit kit, 7171-RF-01 or 7171-RF-02 to utilize the new microswitches. The retrofit will need to be installed following the instructions given in Appendix D. If you identify that you already have a Generation 2 microswitch, then you may simply order the microswitch repair kit and replace the microswitches following the directions given in Appendix D.

13 APPENDIX D: 7171-RF-01(02) & 7171-RK-01(02) MICROSWITCH RETROFIT/REPAIR KIT INSTALLATION

⚠WARNING	Only factory authorized personnel should perform a microswitch replacement or retrofit. Failure to do so could result in damage to the microswitches and loss of function of the FFU lever.
⚠WARNING	The microswitches come pre-soldered in a Normally Opened(N.O) configuration. Do not change the solder connections without consulting the factory. Soldering the microswitches without the correct procedures can result in damage to the microswitch.
NOTICE	Please read through and review steps and figures in section Appendix D before starting the removal of the old microswitch and installation of the new microswitch.

For microswitch retrofit:

The parts included in the retrofit kits are given in Figure 9, Figure 10, Table 14 and Table 15. If you are replacing the old generation 1 microswitches with a generation 2 microswitches you require all of the parts shown in Figure 9 or Figure 10. Please check you have the correct kit for retrofitting your model of FFU lever and all the parts are present before starting the retrofit. Review Appendix C for determination of which kit is required.

For microswitch replacement:

The parts lists for the repair kits are available in Appendix B. If you are simply replacing generation 2 microswitches with new generation 2 microswitches, then you only require the parts included in the repair kits, 7171-RK-01 or 7171-RK-02. Ensure you have all the components depicted for your model of FFU lever before starting the microswitch replacement. Review Appendix C for determination of which repair kit is required.

Table 16 and Table 17 gives the required minimum tools and technical specifications to perform a microswitch retrofit/replacement. Please review and ensure you have access to these tools before starting with the retrofit/replacement.

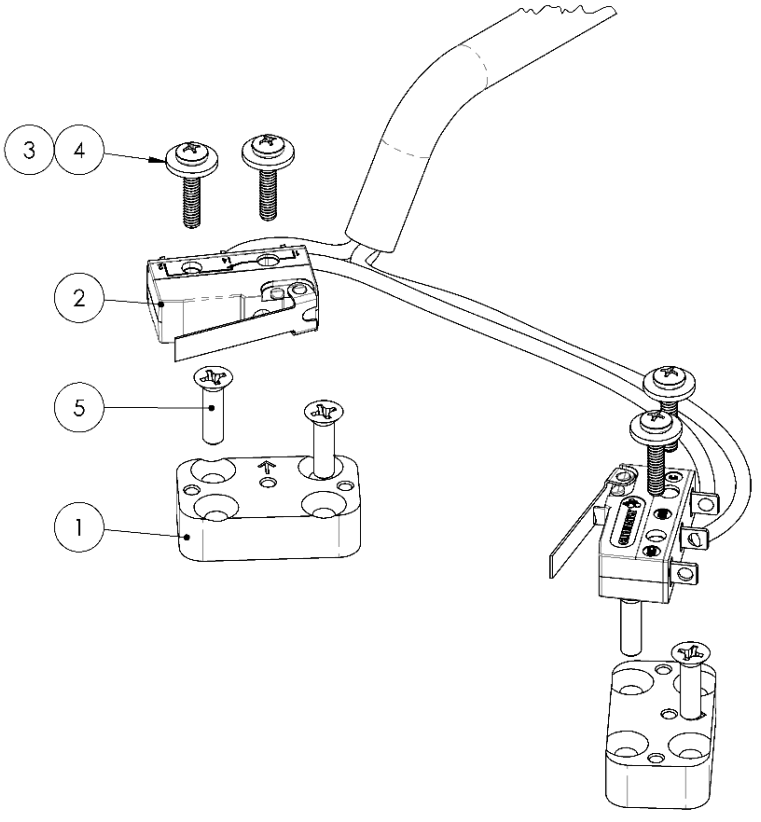


Figure 9: Microswitch Retrofit Kit, 7171-RF-01

Table 14: Bill of Materials for Microswitch Retrofit Kit, 7171-RF-01

ITEM	QTY.	PART NUMBER	DESCRIPTION
1	2	7196-0017	BRACKET, MICROSWITCH, 7196
2	1	7171-RK-01	REPAIR KIT; MICROSWITCHES; 7171 FFU LEVER W/ 2 SWITCHES
3	4	1012-3210	SCREW; PAN HEAD; PHP DR; M2X.4; 10MM LG; 18-8
4	4	1023-0102	WASHER; FLAT; #2 X 1/4 OD; 18-8
5	4	1009-0306	SCREW, FLT HD PHP, 3-48 X 3/8LG, 18-8

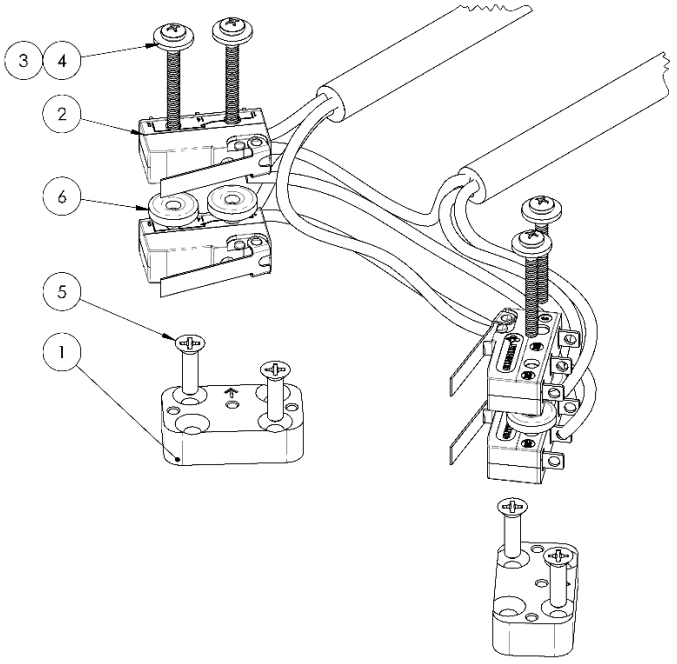


Figure 10: Microswitch retrofit kit, 7171-RF-02

Table 15: Bill of Materials for Microswitch Retrofit Kit, 7171-RF-02

ITEM	QTY.	PART NUMBER	DESCRIPTION
1	2	7196-0017	BRACKET, MICROSWITCH, 7196
2	1	7171-RK-02	REPAIR KIT; MICROSWITCHES; 7171 FFU LEVER W/ 4 SWITCHES
3	4	1012-3218	SCREW; PAN HD; PHP DR; M2-4 X 18; 18-8
4	4	1023-0102	WASHER; FLAT; #2 X 1/4 OD; 18-8
5	4	1009-0306	SCREW, FLT HD PHP, 3-48 X 3/8LG, 18-8
6	4	1023-0202	WASHER; FLAT; #2 X 5/16 OD; 18-8

Table 16: Tools/consumables for microswitch retrofit

Tool/Consumable	Application
Loctite 243	Fastener retention
5/32" Hex key wrench	Cover screw removal/installation
No.1 Phillips drive bit	Tightening microswitch and bracket mount screws
Flat head screw driver	Removal of generation 1 microswitch screws.
Torque screw driver, capable of 0.85 lbs.in [0.1Nm] setting	Tightening microswitch mount screws.
Cable end terminations (Forks, eyes etc)	Affixing new fly leads with the proper end termination.

Table 17: Technical specifications, microswitch retrofit

Specification	Value
Microswitch mount screws	0.85 lbs.in [0.1Nm]

Follow the instructions and figures below for performing a microswitch retrofit or replacement. Note, in the case of microswitch replacement, ignore steps involving installation of the microswitch bracket. Note, in some figures, internal components have been hidden from view for clarity. It is not required to remove these components during the microswitch retrofit/replacement unless specifically instructed to do so.

⚠WARNING	The FFU lever is connected to electrical power supplies. Ensure that the FFU lever has been isolated from electrical sources and locked out before starting any microswitch replacements.

Installation instructions:

1. Note, all microswitches must be replaced with the new style if the retrofit is being performed.
2. Ensure power has been isolated to the FFU lever and locked out before proceeding with the microswitch replacement/retrofit.
3. Remove the FFU lever from the dash.
4. Use the 5/32" hex key wrench and remove the cover plate and screws.
5. Note connections of all wires going to the old microswitches prior to disconnecting. It is imperative to ensure that the new microswitches are replaced with the same wires going to the same microswitches (Port/starboard, top/bottom) to maintain FFU functionality.

In the case of 4 microswitch models, note which cable glands are for the top microswitches, and which are for the lower microswitches.

For convenience a diagram is provided in Figure 11. Fill out the color of wire that is routed to each terminal.

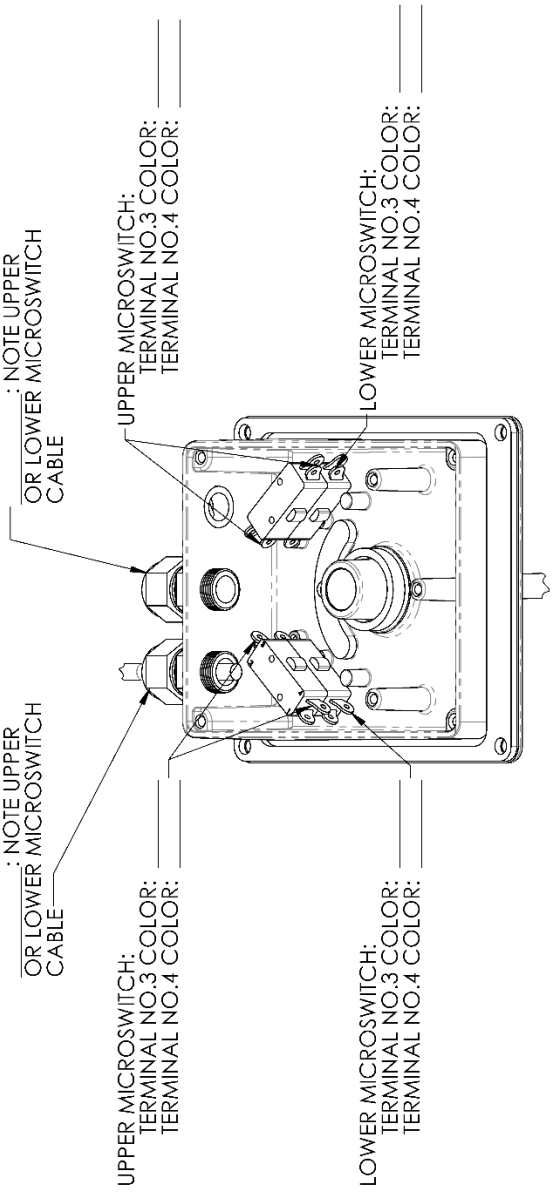


Figure 11: Wire terminal color fill out diagram, old microswitch

6. Loosen the cable gland(s) and remove and discard the old microswitches and cables.
7. Refer to Figure 12 for the next three steps.
8. Apply Loctite 243 to the flat head microswitch bracket screws ⑤.
9. Position and place the microswitch bracket ① as shown in Figure 12. The engraved arrow on the bracket should point outwards on both brackets.
10. Install the flat head bracket screws⑤ at the locations shown in Figure 12, tighten secure.

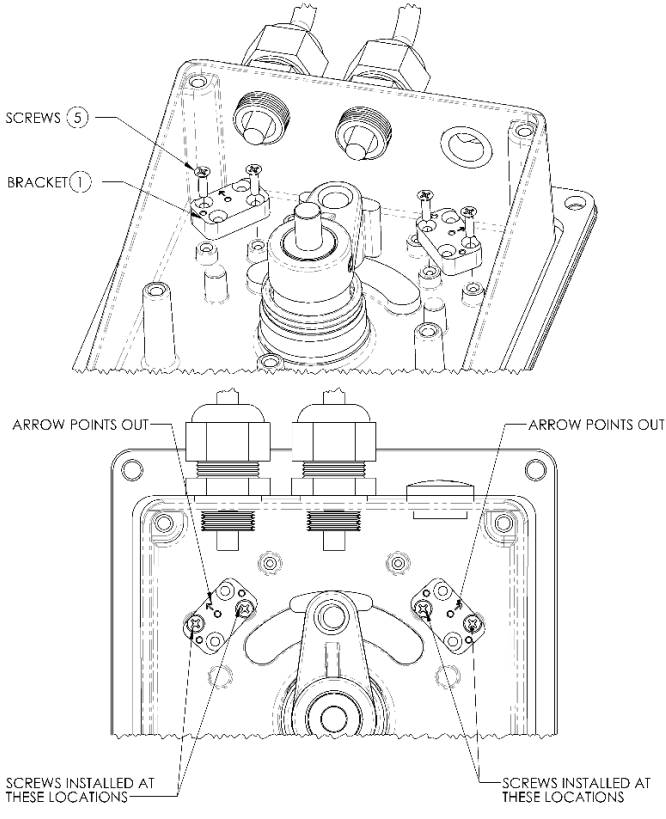


Figure 12: Installing microswitch bracket

11. [2 Microswitch models] Position the microswitch repair kit② and route the cable through the gland as shown in Figure 13.

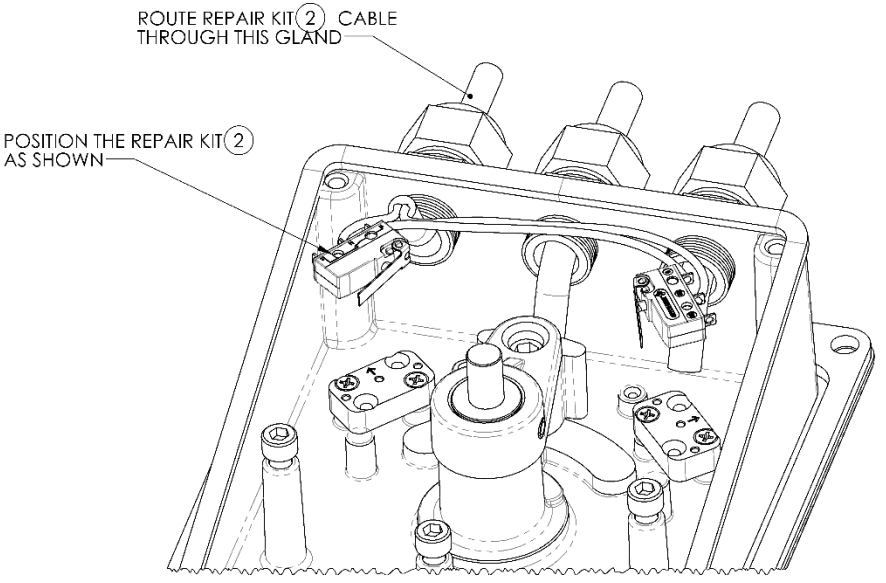


Figure 13: Routing the cable for 7171-RF-01 / 7171-RK-01

12. [4 Microswitch models] Position the microswitch repair kit② as shown in Figure 14:
    a. Ensure that microswitches from the same cable are kept at the same level (top/bottom)
    b. Route the cables for the top/bottom switches through the glands as noted in step 5. The default factory routing is given in Figure 14.

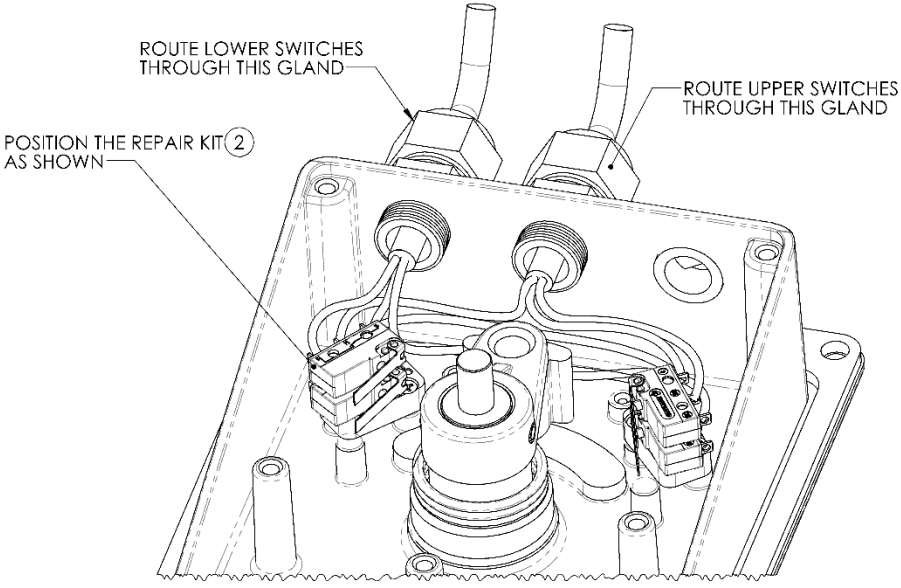


Figure 14: Routing the cables for 7171-RF-02 / 7171-RK-02

13. [4 microswitch models only] Insert the thick washers ⑥ in between the upper and lower microswitches as shown in Figure 15 ensuring the washers line up with the mounting holes of the microswitches.

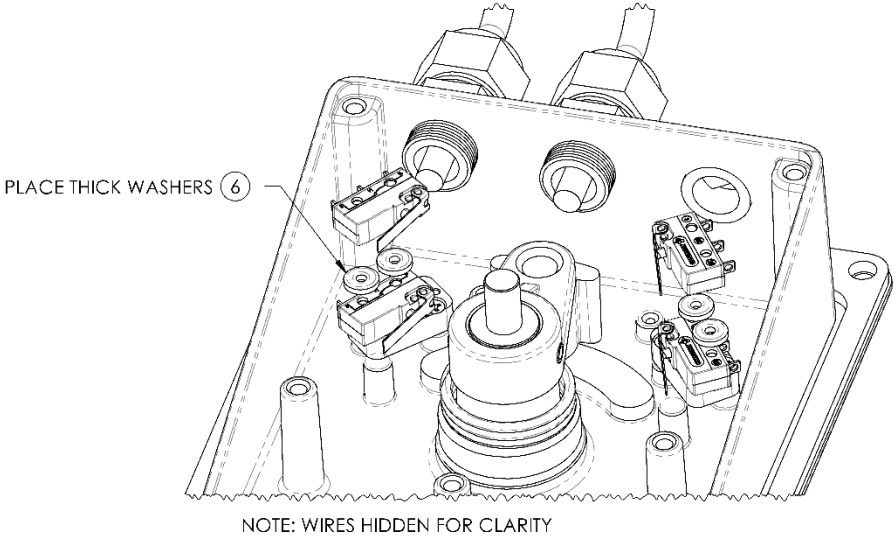


Figure 15: Placement of microswitch spacers

14. Apply Loctite 243 to the threads of the microswitch screws ③.

15. Position the thin washer ④ onto the microswitch screws ③ as shown in Figure 16.

16. Install the microswitch screws③ ensuring that the screw goes to the correct location and positions the microswitch correctly as shown in Figure 16. [4 microswitch models only] Ensure that the microswitch screw③ has gone through the inside diameter of the thick washer⑥.

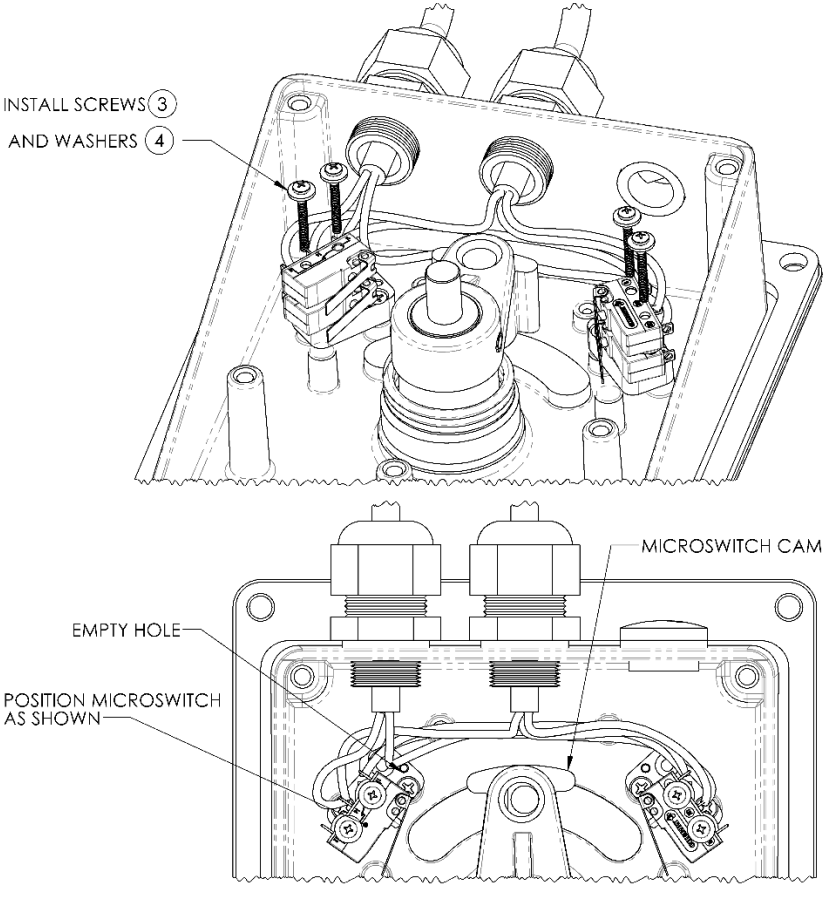


Figure 16: Installing microswitch screws

17. Tighten the microswitch screws to the torque specified in Table 17.

18. Move the FFU lever back and forth to actuate the microswitches. Ensure that:

    a. The actuation levers of microswitches② are clear of any obstructions through its range of motion. If the switch cam(see Figure 16) grabs or gets stuck on one of the microswitch actuation levers check the switches are orientated correctly.

    b. The microswitch② lever is depressed enough to actuate the switch contacts when the FFU lever is pushed to its end of travel. This can be done by checking for continuity across the common and signal wire of the switch being actuated. Refer to section 3.2, Table 4, for clarification on which wires to check.

    c. The microswitch is not over-actuated. When the microswitch lever is horizontal, this is the maximum allowable lever actuation. Beyond this, the lever is considered over actuated, and continued operation can damage the internal switch components. Refer to Figure 17 for clarification on the over actuated position.

    d. The microswitch② lever is raised enough to open the switch contacts when the joystick is in its neutral position. There should be an open circuit between the common and both of the signal wires when the joystick is at neutral.

    e. Check these conditions on both microswitches.

    If conditions ‘a’, ‘b’, ‘c’ or ‘d’ are not met, loosen the microswitch screws ③ and adjust the microswitch positions until the conditions are satisfied. Loctite should be reapplied to the microswitch screws if allowed to dry beyond the recommended setup time.

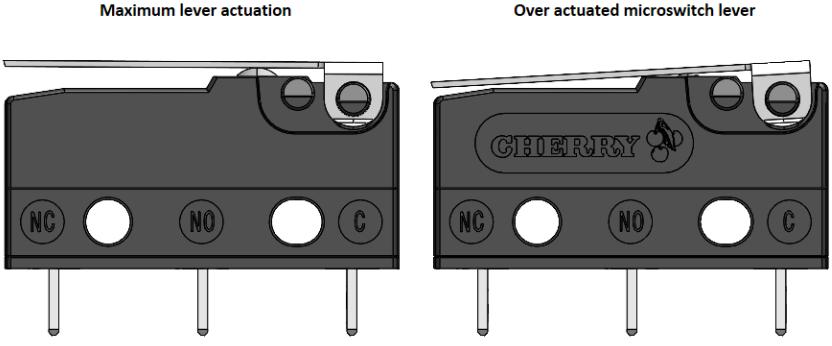


Figure 17: Maximum and over actuated microswitch lever.

19. Apply cable ties to the microswitch wires and ensure that they are positioned so that they will not come into contact with any moving parts such as the microswitch cam.

20. Before installing the cover, compare the new microswitch wire color codes to what was written down in step 5. The same microswitch(Top/bottom, port/starboard) needs to be connected to the same terminal at the junction box before the retrofit. If the wire coloring on the old microswitches was different than the new switches, appropriate adjustments will need to be noted and made when connecting the FFU lever fly leads to the external junction box.

21. Reinstall the FFU lever gasket, cover and cover screws. It is recommended to apply Loctite 243 to the cover screws.

22. Remount the FFU lever to the dash.

23. Reconnect the FFU lever fly leads to the junction box making sure the microswitch signal wires are connected to the correct junction box terminal as noted in step 20.

24. The FFU lever must be recommissioned to ensure it is performing correctly. Follow section 4 for recommissioning. Pay particular attention to ensuring the microswitches signal wires have not been reversed (top/bottom, port/starboard).

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Kobelt Manufacturing Co. Ltd.
8238 129th Street
Surrey, British Columbia,
Canada, V3W 0A6

Sales Tel: +1-604-572-3935
Fax: +1-604-590-8313
Email: sales@kobelt.com
Website: www.kobelt.com

Made in Canada / Printed in Canada