Joyu — Manual

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Revision 1.1

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A lot of useful and recent information can be also found on the Internet. See `http://www.kanardia.eu` for more details.

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Revision History

The following table shows the revision history of this document.

Revision	Date	Description
1.2	April 2023	Joyu connection cable color codes. Rotary knob corrosion example.
1.1	June 2021	Various clarifications.
1.0	July 2016	Initial release

Contents

1   Introduction

First of all, we would like to thank you for purchasing our device.

Joyu is an advanced flight control stick which acts as a remote control for various Kanardia devices and adds functionallity to the autopilot. When it is connected to Boxi it can be configured to control electrical actuators such as pitch and roll trim actuators, landing gear actuators, electronic throttle, radio transmission (PTT), etc.

This manual describes the technical description of the unit, installation and operation.

1.1   General Description

Joyu is a modern flight control stick. Under the leather skin is a strong nylon base which encloses the electronics. Metal top plate with metal buttons provides excellent comfort and ease of button use.

The electronics constantly monitors several push-buttons, navigation joystick and wheel. Button and wheel actions are packed into dedicated CAN message and transmitted over CAN bus. Other devices listen to these actions and react accordingly.

One Joyu can command one or several devices on the CAN bus. Furthermore, two Joyus can be also used to setup a complex system of actions.

One of the key advantages is the ease of installation. Only four small-gauge wires need to be routed through the control bar which simplifys the installation.

1.2   Technical Specification

Table 1 shows some basic technical specification of Joyu.

1.3   Special Versions

Default version of Joyu comes with black leather and black stiches. You can order Joyu with custom colour of leather and stitches. Ask Kanardia for available colors.

Description	Value
Weight	155 g
Size	140 x 65 x 45 mm
Control rod mounting hole	2.54 mm (1 inch) diameter
Operational voltage	6 $\sim$ 32 V
Power consumption	0.3 W
Current	25 mA at 12 V
Operating temperature	-30 $\sim$ +85 °C
Humidity	30 $\sim$ 90 %, non condensing
Communication	CAN bus, 29 bit header, 500 kbit, Kanardia protocol

Table 1: Basic technical specifications.

2 Installation

Joyu is mounted on a control bar via aluminum adapter insert.

2.1 Cable Installation

Supplied CAN cable must be routed from the top end of the control bar to the bottom end. The outgoing end of the cable must be routed away from control cables and must be assured that has enough loom in each of the flight control bar position not to breake the wire. Figure 1 shows some good and bad installation practices.

2.1.1 RJ11 Connector

Although the Joyu connector is small, it can happen that it is still too large to be inserted trough a small hole into the pilot stick or there may be other obstacles inside the stick. In this case, cut off the connector, guide cable though the stick tubing and crimp a new connector back. *Be gentle and do not pull the cable from Joyu.*

You need special RJ crimping tool to install. If you do not own it, you may borrow it. Most electricians, avionic shops or computer shops have it. Figure 2 shows correct cable colors. The cable colors come in two variants. Older color codes (v1) were delivered/used until 2023. In 2023 we started to use color codes (v2). Table 2 resumes meaning of individual pins.
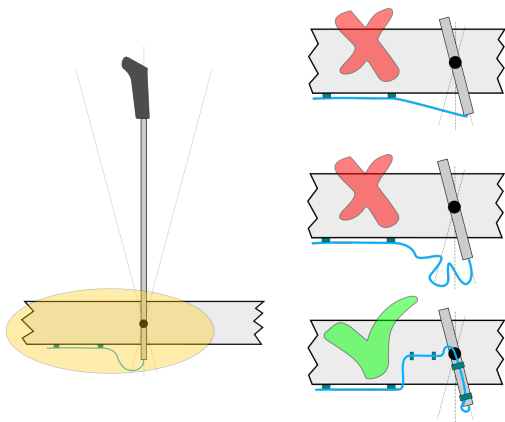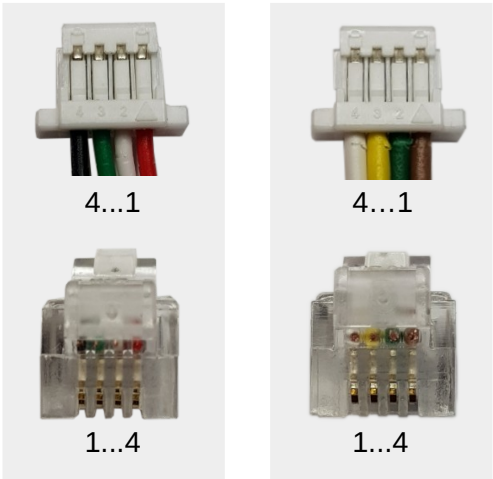
Figure 1: Cable installation.

4...1   4...1

1...4   1...4

Figure 2: Color codes on the RJ11 connector. Left is (v1) and right is (v2).

Pin	Description	Color (v1)	Color (v2)
1	+12V	red	brown
2	CAN high	white	green
3	CAN low	green	yellow
4	GND	black	white

Table 2: Joyu cable color codes.

At the time of this writing, the connector plug can be ordered from Farnell using the following link: https://uk.farnell.com/multicomp/7001-4p4c/modular-plug-idc-rj11-flat-4p4c/dp/1712384

2.2 Connections

There are three different typical combinations which are defined by device connected on the CAN bus.

2.2.1 Nesis/Aetos/Horis/Emsis and Boxi

This is most common use of Joyu. This setup consists of one or two Joyu devices, one Boxi unit and one or several Nesis/Aetos/Emsis/Horis units. Figure 3 illustrates device connections.
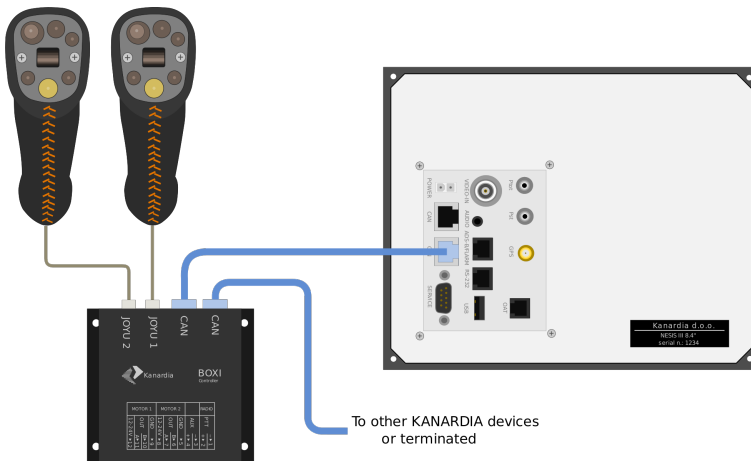

Figure 3: Connection example - Boxi and Nesis and extention to other devices.

2.2.2 Boxi Only

Sometimes Joyu unit is used only to control Boxi. In this case, is recommended that the Boxi is not connected to primary CAN bus. Figure 4 illustrates connection example for two Joyu units to Boxi where Boxi is isolated from primary CAN bus.

In the case of Boxi (produced until May 2021), one end (RJ45) of provided power cable shall be connected to one of Boxy's CAN ports, the other end shall be connected to power source.

Boxi II is slightly different. It has its own power connector, which connets to the power source.

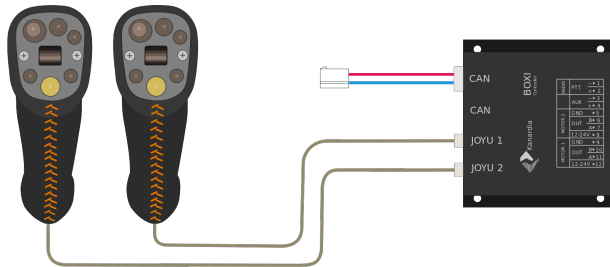Blue lead shall be connected to aircraft ground (GND) and red lead to battery terminal (+12 to +30 V) via 0.5 A fuse.

Figure 4: Connection example - Boxi. Later mode, Boxi II, has its own power connector.

2.2.3   Nesis/Aetos only

When Joyu is used only as a remote control for Nesis/Aetos/Emsis/Horis it can be connected directly to primary CAN bus via provided RJ11-to-RJ45 adapter, as illustrated on figure 5.
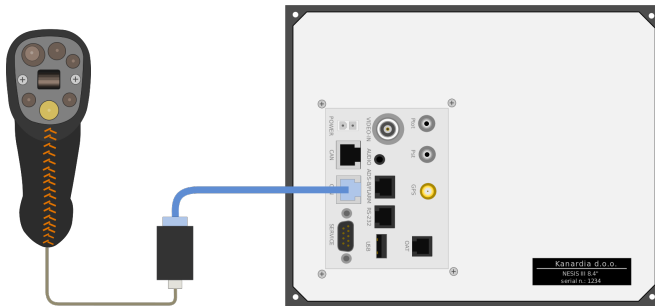

Figure 5: Connection example - Nesis.

3   Operation

Figure 6 describes organization of Joyu control inputs. Most of inputs are sim-
ple buttons. The navigation stick is a combination of four buttons. Selection
wheel has dual function. It can be rotated and also pressed.

Figure 6: Button layout.

Joyu is a bit *silly* device. It only processes button and wheel events and
transmits them to the CAN bus. Other devices receive these events and react
accordingly.

By default, all devices simply ignore Joyu events. Devices must be configured
to respond on events. As there may be several devices involved and one or two
Joyus many different combinations are possible. As one Joyu can command
different devices and one device can react to different Joyus, device serial
numbers are involved. For each button we have to define something like this:
*When a button on a Joyu with serial number X is pressed, a device with serial
number Y shall respond with some action.*

A Joyu configurator is built into Nesis/Aetos. Similar configuration works
also with Blu (combined with Kanja Android app).

Please refer to the Nesis/Aetos Installation manual or to Blu & Kanja Manual
for more details.

Note that Horis and Emsis have no Joyu configuration options. In this case
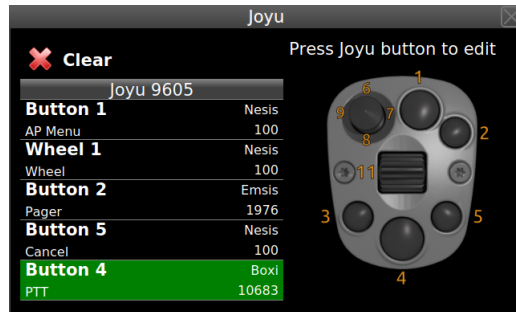you have to use Blu dongle and Kanja Android app instead.

Figure 7: A situation of Joyu configuration in Nesis/Aetos. For example, Button 4 on Joyu SN 9605 is configured to activate PTT action on the Boxi with SN 10683.

3.1   Recommended Actions

Although the user can use any button for any function, the following connections usually works well in practice. You may build upon it.

Button 1	Switch to next page
Button 2	AP disconnect
Button 3	Ok
Button 4	PTT or PTT2 or AUX
Button 5	Cancel
Button 6	Motor 1+ (pitch trim motor)
Button 7	Motor 2- (roll trim motor)
Button 8	Motor 1- (pitch trim motor)
Button 9	Motor 2+ (roll trim motor)
Wheel push	Ok
Wheel rotation	Wheel

4   Maintenance

No special maintenance is required. However, care must be taken when cleaning. Joyu shall be cleaned using only a dry and soft cloth. Never use any water, alcohol or any other solvent or liquid. A liquid will leak into the openings and corrode contacts beneath. Figure 8 illustrates an example of such corrosion.
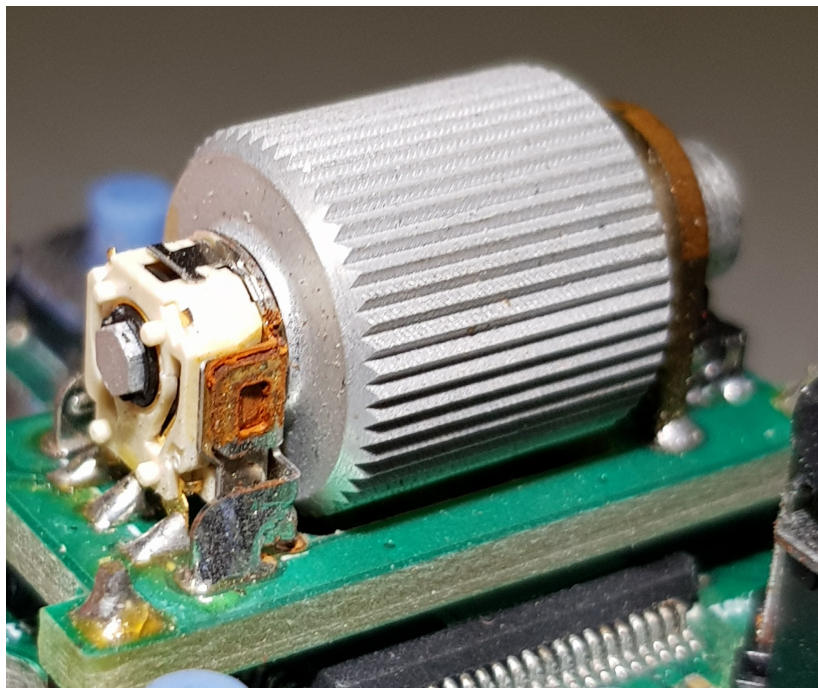
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Figure 8: Corrosion example. Some liquid was used for cleaning, which resulted in corrosion of the rotary knob.

5   Repair

The Joyu has no serviceable parts inside. In the case of malfunction, it must be sent to factory for a repair.

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