MOTORISED
VARIABLE ATTENUATOR
MODEL 024

INSTRUMENT MANUAL

Version 1.0

March 2026

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1 GENERAL INFORMATION

1.1 WARRANTY

Flann Microwave Ltd warrants each product of its manufacture to be free from defects in material and workmanship. Our obligation under this warranty is limited to servicing or adjusting any products returned to our address for that purpose, and to make good at our facility any part or parts thereof, within one year of the date of delivery to the original purchaser, and which after examination shall be shown to our satisfaction to have been thus defective. Warranty returns or repairs must first be authorised by Flann Microwave Ltd, and then returned in accordance with our detailed instructions, with transport charges prepaid. Flann does not authorise any third party to assume for them any other liability in connection with the original sale than the foregoing. ***Unauthorised tampering with sealed screws will invalidate the warranty and may result in damage to the product.***

1.2 DESIGN CHANGES

Flann Microwave Ltd reserves the right to make changes in the design of its products without reference to, and without incurring any obligation to make the same alterations on, products previously purchased.

1.3 SPECIFICATION CHANGES

Flann Microwave Ltd reserves the right to change any specification noted herein without prior notice.

1.4 REPAIRS

When wishing to return instruments for repairs, or for any other reason, please contact this Company for shipping instructions. To expedite repair service, it is important to provide type number, serial number and a detailed description of the reason, including all fault symptoms, for the return of the instrument.

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2 GETTING STARTED

Connect a USB-C Cable between the 024 Attenuator and the controller. Power is provided via this connection.

When supplied from the factory, the instrument will power up with the attenuation at a relatively high level, between 40 and 50 dB. After first use, the instrument will power up in the position it powered down at.

2.1 USB CONTROL

The instrument is controlled and monitored using text commands sent over the USB connection. A serial client (control utility), such as PuTTY, can be used for this purpose.

When controlling the attenuator from a Windows computer, it will appear in the Device Manager utility as follows:

It may be necessary to download drivers from the Silicon Labs website at:
https://www.silabs.com/developer-tools/usb-to-uart-bridge-vcp-drivers?tab=downloads

With a control utility such as PuTTY, a serial connection must be established using the COM port listed in your device manager, and setting the speed to 31250, as shown in Figure 1. In the terminal menu it is advisable to force on both 'Local echo' and' Local line editing', and to enable 'Implicit CR in every LF' and 'Implicit LF in every CR'.

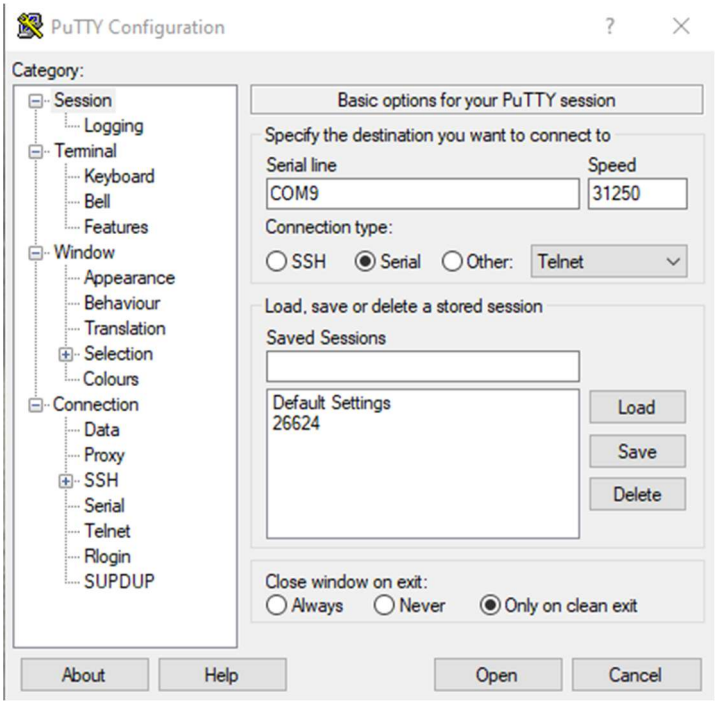

Figure 1: PuTTY settings example

To test the connection, type 'CL_IDENTITY?#' and press return. The instrument will return its identity string, e.g. FLANN MICROWAVE, 024, 123456, V1.0 (where 123456 is the instrument serial number). When using PuTTY, or any other serial link utility, with this instrument, the # character must terminate every command.

Some clients do not echo the typed information, or at least not without changing default settings.

2.2 ENVIRONMENTAL CONDITIONS

The Model 024 Motorised Variable Attenuator is designed to operate in 'non-hazardous' indoor industrial or laboratory areas, or in a protected outdoor environment.

The operating environment must conform to the conditions shown in Table 1. Operation outside these ranges cannot be guaranteed and may pose dangers to the operator or cause mechanical or electrical failure of the equipment. The instrument can become warm during operation, and it is important to maintain adequate ventilation at all times.

Environmental Condition	Ranges
Temperature Operating	+5°C to +35°C
Temperature Non-Operating	0°C to +40°C
Humidity operating (max)	90 % without condensation
Humidity Non-operating (max)	95 % without condensation

Table 1: Environmental Limits

3 SYSTEM FUNCTIONS AND FEATURES

3.1 POWER-UP PROCEDURE

When the instrument is powered up, it will be set to the same attenuation as when it was last powered down. A reset command, 'CL_RESET_INST' is available to return the attenuation to a high setting (see section 4.2 for full description of the command set).

3.2 SETTING ATTENUATION

The instrument can be set to attenuation values in the range 0.0 dB to 50.0 dB using the 'CL_VALUE_SET' command. The smallest incremental value is 0.1 dB.

The current attenuation setting can be read using the query command 'CL_VALUE_SET?'.

3.3 INSTRUMENT ERRORS

Instrument errors can be identified by interrogating the Status Byte (see information for the command 'CL_INST_STAT?' in section 4.2 and Table 2).

3.4 FIRMWARE UPGRADES

Users will be able to upgrade to the latest version of the Model 024 firmware using a bootloader, but this functionality is not available yet. Instructions will made available on the Support page of the Flann Microwave website, www.flann.com.

A copy of the latest issue of this manual will also be available for download.

4 USB COMMAND STRUCTURE

The commands available and the valid operands that may be used with them are described below.

4.1 NOTATION

The instrument commands in this section are shown in upper case bold characters. which must appear exactly as listed. Program code commands are not case sensitive, but the text must otherwise be exactly as listed. Characters shown as enclosed in the [ ] brackets are numerical values attached to the basic command. A space between command and value may be included or not. The terminating character (#) is always required.

For instrument state commands (identified with 'Query: Valid'), append the question mark character (?) to the basic command without qualifiers to interrogate the state of the functions. The instrument responds to the query as described for each command.

4.2 COMMAND SET

CL_VALUE_SET [*value*]
Sets the attenuation of the microwave instrument, in dB, to ***value***. For most instruments the maximum is 50 dB, although in some waveguide sizes it may be less, as defined in the instrument specification.
Query: Valid, returns setting
Value 0 to 50.0 (dB)

CL_INCR_SET [*value*]
Sets the stored increment, in dB, to ***value***
Query: Valid, returns stored increment
Value 0 to 10.0 (dB)

CL_INCREMENT
Increase the microwave instrument setting by the stored increment (dB only)
Query: Invalid

CL_DECREMENT
Decrease microwave instrument setting by the stored increment (dB only)
Query: Invalid

CL_IDENTITY?
Outputs the identity string, e.g. 'FLANN MICROWAVE, 024, 123456, V1.0', where 123456 is the instrument serial number, and V1.0 is the firmware version
Query: Valid, returns the identity string of the instrument.

CL_INST_STAT?
Request the value of the status register (byte)
Query: Valid, return the status register value, a value from 0 to 255 (see Table 2)

CL_RESET_INST
Reposition the instrument by driving to the reference attenuation. This is typically the maximum value of 50 dB, although in some waveguide sizes it may be less, as defined in the instrument specification.
Query: Invalid

4.3 STATUS BYTE

Bit	Value	Error
0	1	Overvoltage - instrument witnessed an input voltage greater than 5.5 V
1	2	Undervoltage - instrument witnessed an input voltage less than 3 V
2	4	Over Current - motor current has exceeded 300mA
3	8	Out of Range - the vane has gone past its maximum dB or 0 dB
4	16	Memory Write Error – error when trying to write to memory
5	32	Communication Error - a message to the motor was not processed correctly
6	64	USB Syntax Error - a USB error had the wrong syntax
7	128	USB Range Error – a command would have taken the motor past its defined range

Table 2 – Status Byte interpretation

Note: The value of the Status Register will return to zero after being read.

4.4 COMMAND SUMMARY

Command	Suffix	Action	Query
CL_VALUE_SET	Value	Set attenuation in dB	?
CL_INCR_SET	Value	Set increment step in dB	?
CL_INCREMENT		Increase attenuation by the increment step	
CL_DECREMENT		Decrease attenuation by the increment step	
CL_IDENTITY?		Return the instrument identity string	?
CL_INST_STAT?		Return the error byte (details as per section 5.3 above)	?
CL_RESET_INST		Reset the instrument	

Table 3 – Command Summary

4.5 EXAMPLES

CL_RESET_INST #	reset the instrument
CL_VALUE_SET ?#	returns the current attenuation setting (50dB after reset)
CL_VALUE_SET 18.5 #	sets attenuation to 18.5 dB
CL_VALUE_SET ?#	returns the attenuation setting (i.e. 18.5 after previous command)
CL_INCR_SET 2#	store an increment value of 2 dB
CL_INCREMENT #	increase attenuation by 2 dB
CL_DECREMENT #	decrease attenuation by 2 dB

5 CARE OF THE INSTRUMENT

Internally, the 024 Motorised Variable Attenuator is a delicate instrument. When the waveguide ports are not connected, it is recommended that flange covers (such as those supplied with the instrument) are fitted. This will help prevent inadvertent damage to the flange surfaces and internal vanes, and it will prevent dust from entering the waveguide structure.

6 REGULATORY INFORMATION

6.1 DECLARATIONS OF CONFORMITY

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EC DECLARATION OF CONFORMITY

CE

Manufacturer	Flann Microwave Ltd Dunmere Road Bodmin Cornwall PL31 2QL United Kingdom
Product	Motorised Variable Attenuator Model Number **024 (** = Waveguide size, from 23 to 32, 710, 570 and 470)
European Standards	EN 61000-6-2:2019 EN 61000-6-3:2021
Technical File Number	TCF18

It is declared that the above product conformed, when manufactured, to the essential requirements of Electromagnetic Compatibility Directive 2014/30/EU and the Low Voltage Directive 2014/35/EU, and when used in accordance with the Instruction for Use, as detailed in the appropriate technical file.

Ian Burnage
Chief Executive Officer
5 March 2026

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UKCA DECLARATION OF CONFORMITY

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European Standards	EN 61000-6-2:2019 EN 61000-6-3:2021
Technical File Number	TCF18

It is declared that the above product conformed, when manufactured, to the essential requirements of the UK Electromagnetic Compatibility Regulations 2016 (S.I. 2016/1091) and the UK Electrical Equipment (Safety) Regulations 2016 (S.I. 2016/1101), and when used in accordance with the instructions for use, as detailed in the appropriate technical file.

Ian Burnage
Chief Executive Officer
5 March 2026

6.2 WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT (WEEE) REGULATIONS

Flann Microwave is registered with the United Kingdom Environment Agency as a supplier of electrical and electronic equipment, and makes the required declarations in accordance with WEEE Regulations.

Where this product was supplied to a customer in the United Kingdom:

When this product is at the end of its life, Flann Microwave will accept its return for safe disposal and recycling. Please contact Flann Microwave for full instructions before returning any WEEE. The return address is:

Flann Microwave Ltd
Dunmere Road
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Tel. 01208 77777

Where this product was supplied to a customer outside the United Kingdom:

Please follow local regulations regarding the disposal and recycling of WEEE, or contact your distributor for advice.

Flann Microwave Ltd can provide information on the materials used in this instrument to assist in their recycling or safe disposal.