

**PROGRAMMABLE  
PRECISION ATTENUATOR  
MODEL 625-03**

INSTRUMENT MANUAL

Version 3.1

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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 the 24V Power Supply provided with the 625-03 to the Power Input connector of the instrument. Connect an Ethernet cable between your network Ethernet port (switch, router or adaptor) and the 625-03. Turn on the instrument.

The Ethernet interface is provided by a Lantronix XPORT device. Under no circumstances should this device be re-configured.

If the label showing the instrument MAC address is accidentally removed from the instrument, it is possible to run a utility that will read the instrument's MAC address. This 'DeviceInstaller' program can be downloaded from:

<https://www.lantronix.com/products/deviceinstaller/>

When supplied from the factory, the device is configured to connect automatically to a network using the DHCP protocol with dynamic IP address. The IP address assigned by your network can be found using the DeviceInstaller program.

### 2.1 ETHERNET CONTROL

The following are examples of establishing communication with the attenuator using Telnet or RAW:

#### TELNET

To control the instrument using a Telnet connection, with a Telnet client (control program) such as PuTTY:

Enter the instrument's IP address, e.g. 128.0.0.59, and the port number of 10001;  
To test the connection type 'identity?' and press return. The instrument will return its identity string, e.g. FLANN MICROWAVE, 625PRVA, 123456, V1.0 (where 123456 is the instrument serial number).

The Windows Operating System includes a Telnet function which can be used from a Command Line window. This feature may have to be turned on in Windows first.

**Some clients do not echo the typed information, or at least not without changing default settings to allow this. The \n terminator is not required in Telnet.**

#### RAW

To control the instrument using a RAW connection, with a suitable client program such as PuTTY:

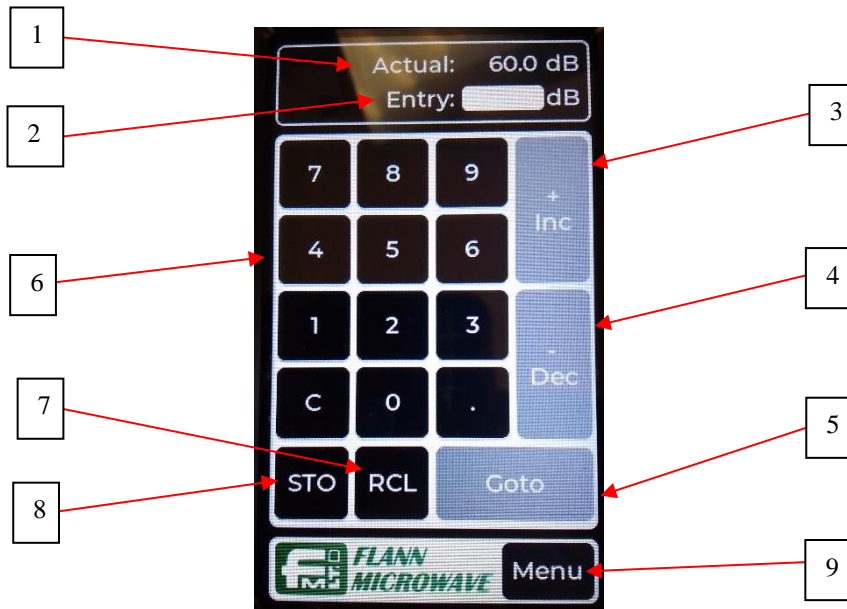
Enter the IP address, eg 128.0.0.59 and use port 10001;  
You are now connected to the instrument;  
To test the connection, enter 'identity?\n' and press return. The instrument will return its identity string, eg FLANN MICROWAVE, 625PRVA, 123456, V1.0.

Note that the \n terminator is required for RAW commands unless using a program, such as PuTTY, that terminates every command string.

## 2.2 MANUAL INTERFACE

The 625 features a touch screen display that displays the current attenuation of the system while allowing easy input for the user to change the attenuation. This section details some of the features of the screen.

### 2.2.1 Main Display Screen



#### 1. Actual

This displays the current position of the vane. The value displays with 1 decimal place for an attenuation of 50.0 dB and higher, and 2 decimal places for an attenuation of 49.99 dB and lower.

#### 2. Entry

The Entry display shows the user entered value that will be used within the functions of the device, see 3, 4 and 5 for more information. The entry field is limited to 2 figures before the decimal point and 2 figures after the decimal point.

#### 3. + Inc – Increment

The unit will move the vane to increase the attenuation by the value in the Entry field. This button will be greyed out and not respond if the end position is unachievable, for example if the Actual position was 55.0 dB and an Entry value of 6dB was entered.

#### 4. – Dec – Decrement

The unit will move the vane to decrease the attenuation by the value in the Entry field. This button will be greyed out and not respond if the end position is unachievable, for example if the Actual position was 5.00 dB and an Entry value of 6dB was entered.

#### 5. Goto

The unit will move to the position that corresponds to the attenuation value in the Entry field. This button will be greyed out and not respond if the end position is unachievable, for example if a value of 65 dB was entered when the unit is not in High Attenuation Mode

#### 6. Keypad

Allows user entry. The “C” button will delete the last figure that has been entered.

#### 7. STO – Store

This button saves the current value in the Entry field onto the device.

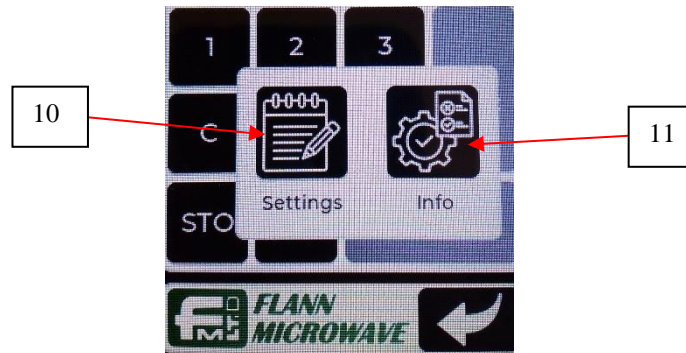
#### 8. RCL – Recall

This button loads the last value saved using the STO button and places it into the entry field, this value can be recalled. The value can be recalled even when the device has lost power.

**9. Menu**

The menu button brings up additional functionality buttons. See below for more details.

**2.2.2 Menu Screen**



**10. Settings**

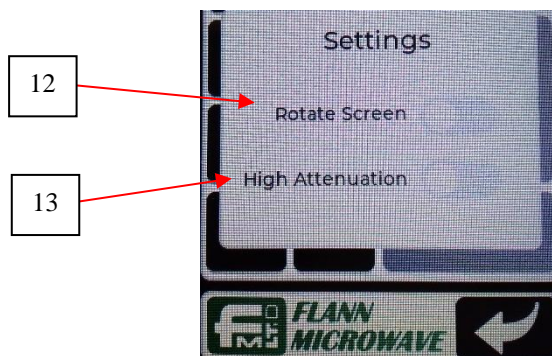
The Settings button will open a new window that allows access to some settings for the device. See below for more details.

**11. Info**

The Info button brings up system information for the device including;

- Model Number
- Serial Number
- System Revision
- Motor Revision
- MAC Address


**2.2.3 Settings Screen**



**12. Rotate Screen**

This option allows for the screen to be rotated 180° to allow for easier use if the application requires it.

**13. High Attenuation**

When the unit is put into the high attenuation mode the max attenuation level is raised from 60 dB to 90dB. When in this mode a  flashes next to the Actual field in the top bar.

### 3 ENVIRONMENTAL CONSIDERATIONS

The Model 625-03 Programmable System 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 to +40°C
Humidity operating (max)	90 % without condensation
Humidity Non-operating (max)	95 % without condensation

*Table 1: Environmental Limits*



## 4 SYSTEM FUNCTIONS AND FEATURES

### 4.1 POWER-UP PROCEDURE

When the instrument is powered up, it resets to the 60 dB reference position. A soft reset, equivalent to a power cycle is available, using the 'RESET\_INST' command described in section 5.2.

The instrument can be programmed to return to the last setting prior to power being removed. Refer to the 'HOLD\_SET' command.

### 4.2 SETTING ATTENUATION

The instrument can be set to attenuation values in the range 0.0 dB to 60.0 dB using the VALUE\_SET command. The smallest incremental value depends on the absolute attenuation: 0.01 dB (up to 20 dB attenuation), 0.02 dB (20 to 30 dB attenuation), 0.05 dB (30 to 50 dB attenuation) and 0.1 dB (50 to 60 dB attenuation). It is possible to position the instrument using motor steps in the range 0 to 9799, giving increased resolution at lower attenuation settings. Refer to the 'STEPS\_SET' command in section 5.2, and Table 2 below. Note that the steps are from 0 dB, and the characteristic is non-linear.

Attenuation dB	Steps	Attenuation dB	Steps	Attenuation dB	Steps
0.0	0	20.0	7952	40.0	9362
1.0	2139	21.0	8070	41.0	9398
2.0	2997	22.0	8181	42.0	9432
3.0	3635	23.0	8285	43.0	9464
4.0	4156	24.0	8384	44.0	9494
5.0	4602	25.0	8476	45.0	9522
6.0	4992	26.0	8563	46.0	9549
7.0	5340	27.0	8644	47.0	9574
8.0	5653	28.0	8721	48.0	9598
9.0	5938	29.0	8794	49.0	9621
10.0	6198	30.0	8862	50.0	9642
11.0	6437	31.0	8926	51.0	9662
12.0	6658	32.0	8987	52.0	9681
13.0	6862	33.0	9044	53.0	9699
14.0	7052	34.0	9098	54.0	9716
15.0	7229	35.0	9149	55.0	9731
16.0	7393	36.0	9196	56.0	9746
17.0	7547	37.0	9242	57.0	9761
18.0	7691	38.0	9284	58.0	9774
19.0	7826	39.0	9324	59.0	9787
20.0	7952	40.0	9362	60.0	9799

Table 2: Attenuation – Steps from 0dB

When the high attenuation setting is active, this enables a coarse attenuation setting of up to 90 dB. Refer to the 'HIGH\_ATTEN' command. The attenuation accuracy beyond 60 dB is not guaranteed. The front panel display colours are inverted when the attenuation is set to a value greater than 60 dB.

### **4.3 INSTRUMENT ERRORS**

Instrument errors can be identified by interrogating the Status Byte (see information for the 'INST\_STAT?' in section 5.2 and Table 3).

### **4.4 FIRMWARE UPGRADES**

Users will be able to upgrade to the latest version of the Model 625-03 firmware over the Ethernet interface by following the instructions given on the Flann Microwave Ltd website, [www.flann.com](http://www.flann.com).

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

## 5 ETHERNET COMMAND STRUCTURE

This section details the commands available and the valid operands that may be used with them.

### 5.1 NOTATION

Upper case bold characters represent the (program code) commands, which must appear exactly as listed. Program code commands are not case sensitive, i.e. upper and lower case characters are accepted. The input buffer is 50 bytes maximum.

Characters enclosed in the {} brackets are qualifiers attached to the basic command. A space may be inserted between it and basic command, e.g. {ON|OFF} shows that either ON or OFF can be attached to the root mnemonic.

For example, the 'HOLD\_SET' command has three possible applications:

1. **HOLD\_SET ON**            -        Switch on the Hold\_Set
2. **HOLD\_SET OFF**         -        Switch off the Hold\_Set
3. **HOLD\_SET?**             -        Query the present state of the Hold\_Set

Each program command must be terminated with \n (Hex 0x0a), *unless using Telnet*

For example: 'VALUE\_SET45.3\n'

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. For an ON/OFF command, the response is a '1' or a '0' to indicate On or Off. For a settable function, such as VALUE\_SET *value*, using VALUE\_SET? returns the function's current value.

### 5.2 COMMAND SET

*Note that for the Model 30625-03 only, the standard attenuation is 0 to 50 dB (rather than 0 to 60 dB), and therefore 50 dB is the maximum setting unless HIGH\_ATTEN is on.*

#### VALUE\_SET [*value*]

Sets the attenuation of the microwave instrument, in dB, to *value*

Query:            Valid, returns setting

**Value**            0 to 60.0 (dB)

#### STEPS\_SET [*value*]

Sets the attenuation of the microwave instrument, in steps, to *value*

Query:            Valid, returns number of steps from reference

**Value**            0 to 9799

#### VANE\_STEPS

Returns the vane position in steps without calibration.

Query:            Valid, i.e. 60dB = 10099 when the calibration is -300

#### INCR\_SET *value*

Sets the stored increment to *value*

Query:            Valid, returns stored increment

**Value**            0 to 10 (dB)

#### INCREMENT

Increase the microwave instrument setting by the stored increment (dB only)

Query:            Invalid

**DECREMENT**

Decrease microwave instrument setting by the stored increment (dB only)

Query: Invalid

**IDENTITY?**

Outputs the identity string, e.g. 'FLANN MICROWAVE, 625PRVA, 123456, V2.20', where 123456 is the instrument serial number, and V2.20 is the firmware version

Query: Valid, returns the identity string of the instrument.

**\*IDN**

Outputs same as above

Query: Valid, returns identity string of the instrument.

**SEEK\_INDEX**

Instrument will seek the index point on the encoder disc.

Query: Invalid, instrument will locate the index point

**STORE\_VAL *value***

Sets the stored setting to *value*.

Query: Valid, returns stored setting

**Value** 0 to 60.0 (dB)

**REC\_SETTING**

Sets the instrument to the stored setting (dB)

Query: Invalid

**HIGH\_ATTEN {ON|OFF}**

Sets the high attenuation feature on or off.

Query: Valid, returns ON or OFF

The front panel display colours are inverted when the attenuation is set to a value greater than 60 dB.

**HOLD\_SET {ON|OFF}**

Returns the microwave instruments to the position when power was removed.

Query: Valid, returns ON or OFF

**RESET\_INST**

Re-synchronise the instrument by driving to the reference position of 60.0 dB. This is the software equivalent of cycling the power. It will also delete the 'STORE\_VAL' from the memory back to default.

Query: Invalid

**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 3)

**TEMP?**

Returns the internal temperature of the instrument (°C)

Query: Valid

### 5.3 STATUS BYTE

Bit	Value	Error
0	1	EEPROM error – failure to read or write to the EEPROM
1	2	Illegal value - Out of range request – incorrect value requested
2	4	Power on – a power-on has occurred since the last read of the register
3	8	Command error – incorrect syntax in a command line
4	16	Over temperature (60 °C). Cleared on temperature dropping below 55 °C.
5	32	Stepper stalled error
6	64	Error E2 – no encoder output found
7	128	Error E1 – encoder index not found

*Table 3 – Status Byte interpretation*

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

## 5.4 COMMAND SUMMARY

Command	Suffix	Action	Query
INCREMENT		Increase setting by stored increment	
DECREMENT		Decrease setting by stored increment	
VALUE_SET	Value	Switches to value mode and sets to value	?
STEPS_SET	Value	Switches to steps mode and sets to value	?
INCR_SET	Value	Stores increment in the present operating mode	?
RESET_INST		Reinitialise the instrument on the active channel	
HIGH_ATTEN	ON/OFF	Enable or disable the high attenuation feature	?
REC_SETTING		Returns the instrument to the stored setting (see below)	
STORE_VAL	Value	Store a setting determined by value (mode dependent)	?
IDENTITY? (*IDN)		Returns the instrument identity string	?
INST_STAT?		Returns the Status Register value from 0 to 255	?
HOLD_SET	ON/OFF	Return instrument to last power-off condition	?
SEEK_INDEX		Seeks index same as power on	
VANE_STEPS		Returns vane position in steps without calibration	?
TEMP		Returns internal temperature of the instrument	?

Table 4 – Command Summary

## 5.5 EXAMPLES

RESET_INST	reset the instrument
VALUE_SET?	returns a value of 60
VALUE_SET23.4	position to 23.4 dB
VALUE_SET?	returns the value 23.4
STEPS_SET453	switch to steps mode and position to 453
STEPS_SET?	returns the value 453
INCR_SET10	store an incremental value of 10 steps
INCREMENT	move +10 steps
DECREMENT	move -10 steps

A command string must be no more than 50 bytes. The command must be terminated by a newline (\n) when in RAW; the \n terminator is not required when using Telnet.

## 6 CARE OF THE INSTRUMENT

Internally, the 625-03 Programmable System Attenuator is a delicate instrument. When the waveguide ports are not connected, it is recommended that flange covers (such as 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.



## 7 REGULATORY INFORMATION

### 7.1 DECLARATIONS OF CONFORMITY

#### EC DECLARATION OF CONFORMITY



Manufacturer	Flann Microwave Ltd Dunmere Road Bodmin Cornwall PL31 2QL United Kingdom
Product	Programmable Precision Attenuator Model Number **625-03 (* = Waveguide size, from 23 to 32, and 570)
European Standards	EN 61326-1:2021 EN 55022:2016 - A2 EN61000
Technical File Number	TCF17

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  
04 October 2023



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**UKCA DECLARATION OF CONFORMITY**



Manufacturer	Flann Microwave Ltd Dunmere Road Bodmin Cornwall PL31 2QL United Kingdom
Product	Programmable Precision Attenuator Model Number **625-03 (** = Waveguide size, from 23 to 32, and 570)
European Standards	EN 61326-1:2021 EN 55011: 2016 + A2 EN61000
Technical File Number	TCF17

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  
04 October 2023



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## **7.2 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  
Bodmin  
Cornwall PL31 2QL  
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.