POWER-OVER-ETHERNET SYSTEM ATTENUATOR MODEL 625

INSTRUMENT MANUAL

Version 1.2

June 2020
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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United Kingdom

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Fax: (617) 577 8234
Email mail@flann.com
http://www.flann.com
2 GETTING STARTED

Plug an Ethernet cable into an Ethernet switch, router or adaptor capable of providing Power-over-Ethernet (PoE) to IEEE 802.3af, and connect the other end to the 625 instrument.

The Ethernet interface is provided by a Lantronix xPICO 110 device. Under no circumstances should this device be re-configured.

In the event that 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.

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, V1.1.

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, V1.1.

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 screen displays the **current** position and the **target** position and has icons to signify when it is receiving a **remote command** or a state **save** is taking place.

The central button has three distinct functions and they are accessed by hold time.

- A short/momentary press will cause the screen to flash and toggle between coarse (1 dB) mode and fine (0.1 dB) step size
- Holding the button for 1-2 seconds will give a medium press which is signified by a colour inversion. This will step through the display function
- Holding the button for in excess of 5 seconds will constitute a long press, which re-initialises the instrument (i.e. it resets to the 60 dB reference position, or to the current position if HOLD_SET, as described in 5.2 below, is ON).

The display function will cycle through brightness, revision information and then back to the standard display.

The dB target can be set by rotating your finger around the touchpad. The target will change immediately and the current position will be seen to catch up. There is coarse selection for speed when selecting whole dBs and a fine selection mode for adjusting in small increments.
3 ENVIRONMENTAL CONSIDERATIONS

The Model 625 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.

<table>
<thead>
<tr>
<th>Environmental Condition</th>
<th>Ranges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature Operating</td>
<td>+5°C to +35°C</td>
</tr>
<tr>
<td>Temperature Non-Operating</td>
<td>0 to +40°C</td>
</tr>
<tr>
<td>Humidity operating (max)</td>
<td>90 % without condensation</td>
</tr>
<tr>
<td>Humidity Non-operating (max)</td>
<td>95 % without condensation</td>
</tr>
</tbody>
</table>

*Table 1: Environmental Limits*
4 SYSTEM FUNCTIONS AND FEATURES

4.1 POWER-UP PROCEDURE

When the instrument is connected to a PoE-compatible network, it resets to the 60 dB reference position. This action may be disabled if required, but the instrument must be reset as soon as possible to establish the correct reference alignment. Refer to the ‘PWR_ON_RST’ and ‘RESET_INST’ commands in section 5.2. The instrument is supplied with ‘PWR_ON_RST’ set to ON.

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 20dB 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.

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

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 refer to Table 3).

4.4 FIRMWARE UPGRADES

Users will be able to upgrade to the latest version of the Model 625 firmware over the Ethernet interface by following the instructions given on the Flann Microwave Ltd website, 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 'PWR_ON_RST' command has three possible applications:

1. PWR_ON_RST ON - Switch on the Power-on Reset
2. PWR_ON_RST OFF - Switch off the Power-on Reset
3. PWR_ON_RST? - Query the present state of the Power-on Reset

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

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

INCR_SET value
Sets the stored increment to value
Query:   Valid, returns stored increment
Value  0 to 60.0 (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
**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 1 for on, or 0 for 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 1 for on, or 0 for off

**PWR_ON_RST (ON|OFF)**
Enables or disables the Power-on reset
Query: Valid, returns 1 for on, or 0 for 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.
Query: Invalid

**IDENTITY?**
Outputs the identity string, e.g. ‘FLANN MICROWAVE, 625PRVA, 123456, V1.1’, where 123456 is the instrument serial number, and V1.1 is the firmware version
Query: Valid, returns the identity string of the instrument.

**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)

**CLR_NVRAM**
Clears the entire EEPROM back to default values.
Query: Invalid
5.3 STATUS BYTE

<table>
<thead>
<tr>
<th>Bit</th>
<th>Value</th>
<th>Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>EEPROM error – failure to read or write to the EEPROM</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>Out of range request – incorrect value requested</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>Power on – a power-on has occurred since the last read of the register</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
<td>Command error – incorrect syntax in a command line</td>
</tr>
<tr>
<td>4</td>
<td>16</td>
<td>Execution error – failure to achieve setting</td>
</tr>
<tr>
<td>5</td>
<td>32</td>
<td>Not used</td>
</tr>
<tr>
<td>6</td>
<td>64</td>
<td>Error E2 – no encoder output found</td>
</tr>
<tr>
<td>7</td>
<td>128</td>
<td>Error E1 – encoder index not found</td>
</tr>
</tbody>
</table>

*Table 3 – Status Byte interpretation*

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

5.4 COMMAND SUMMARY

<table>
<thead>
<tr>
<th>Command</th>
<th>Suffix</th>
<th>Action</th>
<th>Query</th>
</tr>
</thead>
<tbody>
<tr>
<td>INCREMENT</td>
<td></td>
<td>Increase setting by stored increment</td>
<td></td>
</tr>
<tr>
<td>DECREMENT</td>
<td></td>
<td>Decrease setting by stored increment</td>
<td></td>
</tr>
<tr>
<td>VALUE_SET</td>
<td>Value</td>
<td>Switches to value mode and sets to value</td>
<td></td>
</tr>
<tr>
<td>STEPS_SET</td>
<td>Value</td>
<td>Switches to steps mode and sets to value</td>
<td></td>
</tr>
<tr>
<td>INCR_SET</td>
<td>Value</td>
<td>Stores increment in the present operating mode</td>
<td></td>
</tr>
<tr>
<td>RESET_INST</td>
<td></td>
<td>Reinitialise the instrument on the active channel</td>
<td></td>
</tr>
<tr>
<td>INST_MODE?</td>
<td></td>
<td>Outputs the current operating mode</td>
<td></td>
</tr>
<tr>
<td>HIGH_ATTEN</td>
<td>ON/OFF</td>
<td>Enable or disable the high attenuation feature</td>
<td></td>
</tr>
<tr>
<td>PRECISION</td>
<td>ON/OFF</td>
<td>Enable or disable the precision setting feature</td>
<td></td>
</tr>
<tr>
<td>REC_SETTING</td>
<td></td>
<td>Returns the instrument to the stored setting (see below)</td>
<td></td>
</tr>
<tr>
<td>STORE_VAL</td>
<td>Value</td>
<td>Store a setting determined by value (mode dependent)</td>
<td></td>
</tr>
<tr>
<td>IDENTIFY?</td>
<td></td>
<td>Returns the instrument identity string</td>
<td></td>
</tr>
<tr>
<td>INST_STAT?</td>
<td></td>
<td>Returns the Status Register value from 0 to 255</td>
<td></td>
</tr>
<tr>
<td>PWR_STAT?</td>
<td></td>
<td>Returns the power-up statistics</td>
<td></td>
</tr>
<tr>
<td>PWR_ON_RST</td>
<td>ON/OFF</td>
<td>Enable/Disable power-on reset</td>
<td></td>
</tr>
<tr>
<td>HOLD_SET</td>
<td>ON/OFF</td>
<td>Return instrument to last power-off condition</td>
<td></td>
</tr>
</tbody>
</table>

*Table 4 – Command Summary*
5.5 EXAMPLES

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

A command string must be no more than 50 bytes, and terminated by a newline (Hex 0x0a) when in RAW. The \n terminator is not required when using Telnet.
6 CARE OF THE INSTRUMENT

Internally, the 625 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 prevent dust from entering the waveguide structure.
7 REGULATORY INFORMATION

7.1 DECLARATION OF CONFORMITY

EC DECLARATION OF CONFORMITY

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Flann Microwave Ltd Dunnere Road Bodmin Cornwall PL31 2QL United Kingdom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product</td>
<td>System Attenuator Model Number 625 (** = Waveguide size, from 14 to 30)</td>
</tr>
<tr>
<td>Technical File Number</td>
<td>TCF11</td>
</tr>
</tbody>
</table>

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

Ian Crane
Chief Operating Officer
26th March 2020

Flann Microwave

ISO 9001
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.