**POWER-OVER-ETHERNET
WAVEGUIDE SWITCH
MODEL 338**

INSTRUMENT MANUAL

Version 1.1

May 2020

CONTENTS

GENERAL INFORMATION

WARRANTY

Flann 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 (transistors, integrated circuits, batteries, diodes and displays) within one year after making delivery to the original purchaser and which in our examination shall disclose to our satisfaction to have been thus defective. Such returns must have prior authorization from Flann and must be returned as our detailed instructions with transportation charges prepaid. Warranty returns or repairs must first be authorized by Flann. Flann does not authorize any third party to assume for them any other liability in connection with the original sale than the foregoing. ***Unauthorized tampering with sealed screws will invalidate the warranty and may result in damage to the product.***

DESIGN CHANGES

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

SPECIFICATION CHANGES

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

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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Dunmere Road,	***Fax: +44 (0) 1208 76426***
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PL31 2QL,	
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In USA, contact:

Flann Microwave Inc.	***Tel: (617) 621 7034***
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PRODUCT DESCRIPTION

The Model 338 Precision Waveguide Switch is designed to provide Power-over-Ethernet (PoE) control removing the need for a separate dedicated controller. Flann's Precision Waveguide Switches offer unrivalled repeatability, high reliability and extremely long service life, making them ideal for automated test and systems applications. They are four port devices and are available with either a two- or three-channel rotor (See Figure 1). They provide high RF isolation between non coupled ports by means of an efficient choke design. Accurate channel to port alignment and excellent repeatability are achieved by a light and positive rotor locating mechanism.
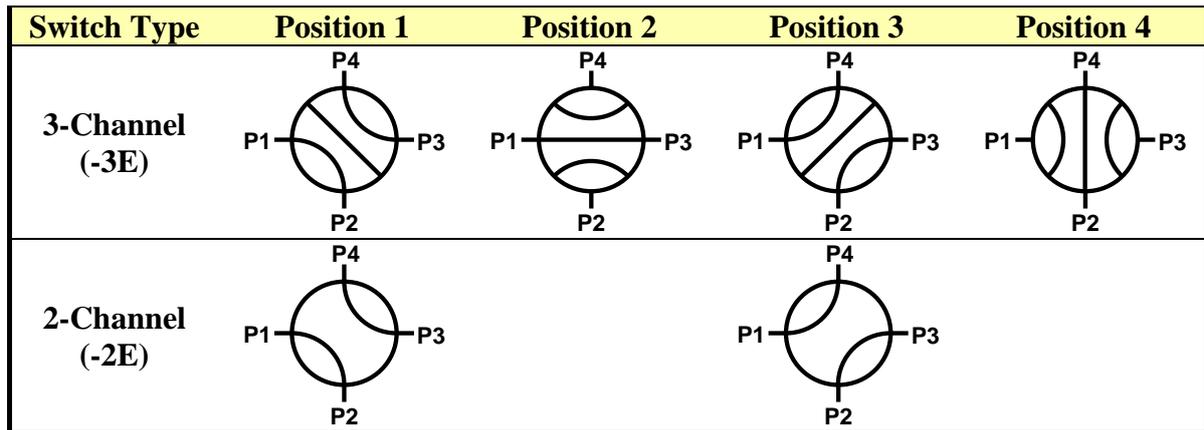

Figure 1: Precision Waveguide Switch Rotor Positions

Series 338 switches use a bi-polar stepper motor and drive electronics that enable bi-directional positioning to ensure optimum microwave path repeatability. The motor output shaft drives the microwave switch rotor through a loose coupling, which is designed to allow the precision indexing mechanism to operate correctly without excessive settling time. A radially magnetised disk is mounted on the motor shaft, and a precision Hall-effect sensor IC provides accurate positioning of the rotor (2 or 3 channel). Full power is only applied to the motor during switch repositioning, with reduced holding current being provided when stationary.

The Model Number, Serial Number, and MAC Address of the Microwave Switch will be found on the switch label. It is essential to quote the model and serial number of the Waveguide Switch when contacting the manufacturer for service information.

Instrument Errors

Instrument errors can be identified by interrogating the Status Byte. Refer to the '*STB?' command and interpretation list, Table 2, on page 9.

Temperature Warning

If the internal temperature of the Waveguide Switch exceeds +60°C, the instrument will stop functioning and the Temperature Error bit (Bit 0) in the Status Byte will be set. Refer to the '*STB?' command and the interpretation list, Table 2, on page 9.

Disconnect the Waveguide Switch immediately and allow it to cool before re-connecting. Ensure that adequate ventilation is provided around the instrument. If installed within a confined area, forced air cooling may be required to prevent further interruptions.

The internal temperature can be monitored by using the "TEMP?" command. Refer to page 8 for details.

SPECIFICATIONS

Electrical Specifications

PoE Connector | RJ45 contained within Amphenol weatherproof housing
Mating Connector | Amphenol part RJF 544 6 provides IP67 protection
Note that the Ethernet status LEDs will not be visible when the IP67 connector housing is used
PoE Power Requirement | +44V to +57V D.C. to comply with IEEE 802.3at (25.5W max)
PoE Supply Current | Motor Driving:
Motor Stationary:
Motor Steps per Revolution | 200, micro-stepped 4:1, giving a total of 800 steps per revolution

Mechanical Specifications

Operating Orientation | Any
Direction of Rotation | Bi-directional

Dimensions and weight vary according to the waveguide size – consult the Flann Microwave Ltd. sales team for details.

All switches are supplied in the E-plane configuration as standard.

Environmental Considerations

The switch is designed to operate in 'non-hazardous' industrial and commercial environments, and can be used either indoors or in a protected outdoor area.

The operating environment must conform to the conditions shown in Table 1. Operation outside these ranges cannot be guaranteed and may pose dangerous implications to the operator or cause mechanical or electrical failure to the equipment. ***The device can generate heat during operation. It is important to maintain adequate ventilation or cooling at all times.***

Condition	Range
Operating Temperature	0°C to +40°C
Storage Temperature	-20°C to +60°C
Humidity – Operating (max)	90% without condensation
Power-over-Ethernet Supply (IEEE 802.3at)	+44V to +57V d.c. (max. 25.5W)
Control Interface	Ethernet, Baud Rate 115,200

Table 1: Operating Specifications

Performance

Max Switching Time   (2 Channel)   < 250 ms*
                     (3 Channel)   < 350 ms*

*Note that the indicated switching times are measured from the initial command to the motor stopping, and do not include the rotor settling time. Switching time varies according to the mass of the instrument rotor, i.e. the larger the rotor, the slower it will operate. Consult the Flann Microwave sales team for more details.

Care of Microwave Flanges

The microwave flange surfaces require careful handling to ensure consistent results and long life. In particular, avoid scratching, over-tightening the screws, or leaving the flange surfaces unprotected. Always cover the flanges with the protective covers supplied with the switch to prevent ingress of dust, etc., when not in use.

WARNING: Any grit or protrusions on flange surfaces will cause damage to the mating flange. Before mating flanges, each surface should be cleaned with alcohol to remove any grease or particles, and inspected to ensure that the flange is undamaged. Ensure that debris from cleaning materials is not deposited into the waveguide apertures during this process.
Do not, at any time, insert objects into the waveguide ports as the slightest damage to the inner surfaces will impair the microwave performance of the switch.

REFERENCE SECTIONS

Getting Started

When supplied from the factory, the device is configured to connect automatically to a network using the DHCP protocol – the device name is shown on the instrument label, additionally T**elnet control is enabled by default**.

Plug an Ethernet cable into a switch or router capable of providing Power-over-Ethernet to IEEE 802.3at (PoE+). i.e. capable of maximum power of 25.5W.

The Ethernet interface is provided by a Lantronix xPico110 device.
For detailed information on the configuration of this interface, please see the Lantronix website:
https://www.lantronix.com/products/xpico-110/

The 'DeviceInstaller' program is available from:
https://www.lantronix.com/products/deviceinstaller/

This program enables the user to identify the IP address of the instrument, and configure the communication protocol for the device.

To use the device in RAW mode rather than Telnet mode, 'Telnet Com Port Cntrl' must be disabled.

- This can be achieved by either logging in to the web interface via Lantronix DeviceInstaller, or by entering the IP address of the instrument into a web browser.
- After logging in with the credentials supplied (blank by default), navigate to 'Channel 1 > Connection', then select the drop-down labelled 'Telnet Com Port Cntrl'.
- Disable this option if you wish to connect via a RAW connection.
- Click the 'OK' button at the bottom of the screen.
- Click apply settings and wait for the device to reboot.
- After the Lantronix chip has rebooted, RAW mode can be used to control the 338 switch device.

Note that using the incorrect protocol to connect to the device, e.g. connecting to the device using Telnet protocol when the port is configured for RAW (or vice versa) can have unintended effects on instrument operation.

Connecting to the instrument

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

Telnet:

To control the instrument using a Telnet connection

Use Lantronix DeviceInstaller to ensure the port is in Telnet mode. See 'Getting started' above regarding how to setup the device for use.

Using a Telnet client (such as the Windows command line or PuTTY), enter the instrument's IP address, e.g. 128.0.0.2, and the port number of 10001 (see 'DeviceInstaller' above regarding identification of the IP address).

To test the connection, type "*idn?" and press return. The Instrument will return its identity string, e.g. Flann Microwave Ltd, 338PoE,123456,V1.0   (manufacturer, instrument model, serial number, and firmware version)

Note that some control programs do not display the typed information, so care is required when entering control commands to prevent syntax errors. The \n terminator is not required when using Telnet.

RAW:

To control the instrument using a RAW connection:

Use DeviceInstaller to ensure the port is in RAW mode (see 'to use this device RAW mode' above regarding how to setup the device for use)

Using PuTTY, or a similar client, enter the IP address, e.g. 128.0.0.59 and use port 10001.

To test the connection, enter "*idn?\n" and press return. The Instrument will return its identity string, e.g. Flann Microwave Ltd, 338PoE,123456,V1.0   (manufacturer, instrument model, serial number, and firmware version)

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

ETHERNET COMMAND STRUCTURE

Control commands may be issued to the Model 338 Waveguide Switch singly, or combined in a string with other commands. Note that a command string must be no more than 50 bytes.

The string may optionally be terminated with an ASCII linefeed character (hex 0A, decimal 10), and commands may optionally be separated by the semicolon character ';'. The Model 338 is not case sensitive so combinations of upper and lower case are acceptable.

Note that the alternative position commands of A1, A2, A3, A4, and A? are also provided for users familiar with the Flann SD5902 Switch Driver command set.

Command Descriptions

Command: **POS1**
Function: Move Switch to Position 1

Command: **POS2** (Model -3E only)
Function: Move Switch to Position 2

Command: **POS3**
Function: Move Switch to Position 3

Command: **POS4** (Model -3E only)
Function: Move Switch to Position 4

Command: **POS?**
Function: Query Switch Position
Response: Returns a single digit '1', '2', '3', '4' indicating the current position, or '0' if the switch is in an invalid position

Command: **A1**
Function: Move Switch to Position 1

Command: **A2** (Model -3E only)
Function: Move Switch to Position 2

Command: **A3**
Function: Move Switch to Position 3

Command: **A4** (Model -3E only)
Function: Move Switch to Position 4

Command: **A?**
Function: Query Switch Position
Response: Returns a single digit '1', '2', '3', '4' indicating the current position, or '0' if the switch is in an invalid position

Command: ***IDN?**
Function: Query instrument identification string
Response: Returns Instrument ID string, E.G. "Flann Microwave Ltd, 338PoE,123456,V1.0" indicating manufacturer, instrument model, serial number, and firmware version

Command: **TEMP?**
Function: Query instrument internal temperature
Response: Returns instrument internal temperature in °C

Command: **PWRSTAT?**
Function: Query instrument power statistics
Response: Returns instrument power-up statistics string as 'Total', 'Line', 'Soft', and 'System' values

Command: ***STB?**
Function: Query instrument serial poll byte
Response: Returns serial status byte encoded as a decimal number from 0 to 255
                 Refer to Table 2

Status Byte

Bit	Value	Error
0	1	Over Temp Error – internal temperature has exceeded 60°C
1	2	Command Error – incorrect syntax in command line
2	4	Execution Error – incorrect value in command line
3	8	Power on – a power-on has occurred since the last read of the register
4	16	Position 4 Error – failed to locate position 4 (-3E model only)
5	32	Position 3 Error – failed to locate position 3
6	64	Position 2 Error – failed to locate position 2 (-3E model only)
7	128	Position 1 Error – failed to locate position 1

Table 2 – Status Byte interpretation

Note 1: The value of the Status Register will return to zero after being read.
Note 2: If bits 4,5,6 & 7 (model -3E) or bits 5 & 7 (model -2E) all set, then no position found

Command Summary

Command	Action
POS1	Drives switch to position 1
POS2	Drives switch to position 2 (-3E model only)
POS3	Drives switch to position 3
POS4	Drives switch to position 4 (-3E model only)
POS?	Returns current switch position
A1	Drives switch to position 1
A2	Drives switch to position 2 (-3E model only)
A3	Drives switch to position 3
A4	Drives switch to position 4 (-3E model only)
A?	Returns current switch position
*IDN?	Returns the instrument identity string
TEMP?	Returns internal temperature in °C
PWRSTAT?	Returns power-up statistics
*STB?	Returns the Status Register value from 0 to 255

Table 3 – Command Summary

Examples:

*IDN?\n	returns the instrument identity string
POS2; POS?\n	drives to position 2 and returns '2'
*STB?\n	Returns the Status Byte value between 0 and 255
PWRSTAT?\n	Returns power-up string, e.g. 'TOTAL47_LINE45_SOFT2_SYSTEM0'
	This displays the number and type of power-ups for diagnostic purposes.

A command string must be no more than 50 bytes, and terminated by a newline (Hex 0x0a) when in RAW. Note that the \n terminator is not required when using Telnet.

MAINTENANCE AND SERVICE

No routine maintenance is required except for cleaning.

This instrument contains no user-serviceable parts. In the event of a system malfunction, the following steps are suggested:

- Check the integrity of the Ethernet cable to the Waveguide Switch. The PoE Switch unit should indicate a valid connection for the appropriate PoE port.

- Check that the connector status LEDs flash during start-up to ensure that power is present. If neither LED illuminates, then a fault exists in the instrument's electronic circuitry.
  Note that the LEDs are only visible when using a standard Ethernet lead without the Weatherproof housing.

- If Ethernet communication is possible, read the Status Byte to establish the fault condition. If errors are constantly being generated then please inform Flann Microwave Ltd. upon return.

- Ensure the device is not over-temperature. If the instrument is above its maximum operating temperature (+60°C), the device will shut down until it cools to below the maximum operating temperature (see 'Ethernet Command Structure' for how to query the device temperature and read the device status byte).

- Read the status byte to clear any errors, before again attempting to send a command to the device (refer to 'Ethernet Command Structure' for how to read the device status byte).

If the problem cannot be rectified, please contact Flann Microwave Ltd. for advice.

REGULATORY INFORMATION

Declaration of Conformity

EC DECLARATION OF CONFORMITY

$\mathsf{C} \, \mathsf{E}$

Manufacturer	Flann Microwave Ltd Dunmere Road Bodmin Cornwall PL31 2QL United Kingdom
Product	Waveguide Switch Model Number **338 (-2E and -3E) (** = Waveguide size, from 15 to 28, or WRDxxx)
European Standards	EN61000-6-2:2005 +AC:2005 EN61000-6-4:2007 +A1:2011
Technical File Number	TCF15

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.

Dr James Watts
CEO
1 October 2018

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.

<u>Where this product was supplied to a customer in the United Kingdom</u>:

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

<u>Where this product was supplied to a customer outside the United Kingdom</u>:

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.