

Optimode
User manual



Dear user,

Thank you for choosing this SRA Instruments product.

This manual contains all the necessary information for the correct use of your instrument. Should you need further information or if you encounter any problems, please contact our After Sales Service:

Hotline: +33 (0)4 78 44 22 09
E-mail : service@sra-instruments.com


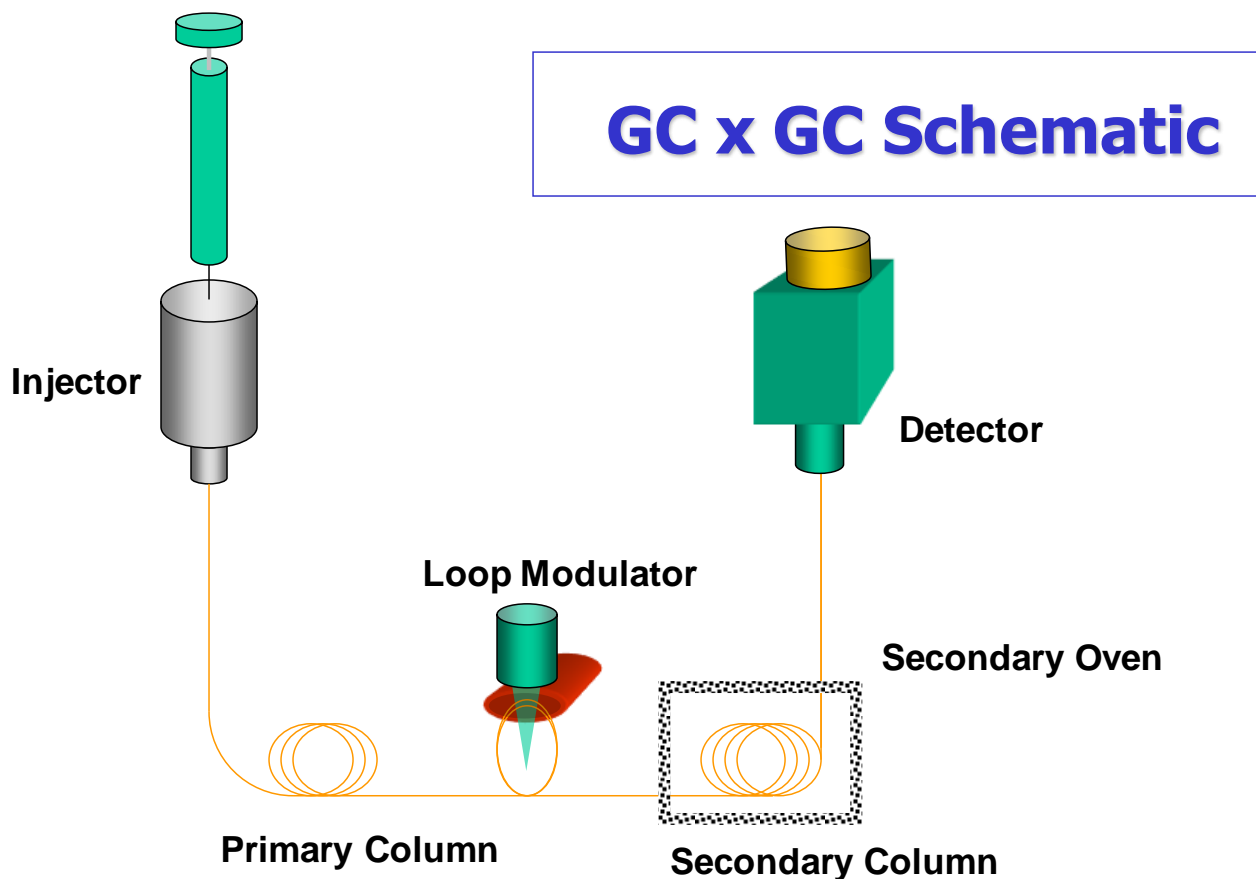
 <p>SRA INSTRUMENTS ANALYTICAL SOLUTIONS</p>	<p>SRA Instruments 210 rue des Sources 69280 Marcy l'Etoile FRANCE</p>	<p>Tel : +33 (0)4 78 44 29 47 Fax : +33 (0)4 78 44 29 62 info@sra-instruments.com www.srainstruments.com</p>
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1. Description

1.1 Presentation



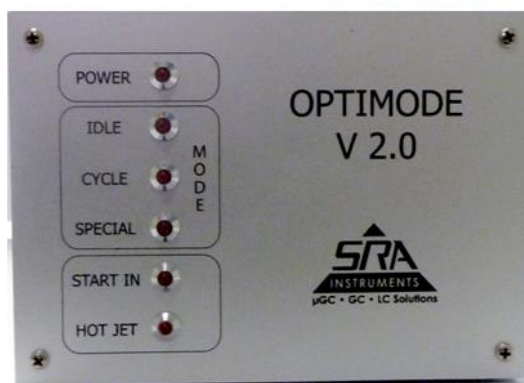
The Optimode is a modulation controller used in two-dimensional chromatography (GCxGC), developed by SRA Instruments. It is the heart of your 2D chromatography system because it controls the injection of gases from the first column into the second column. The Optimode controls a mass flow meter that regulates the flow of the cold air jet and thus ensures the adsorption of chemical species in the intermediate zone. Their desorption occurs periodically by the hot air jet pulse controlled by an electrovalve also controlled by the Optimode. For 2D imaging, it is essential to keep this period (modulation) repeatable.

The Optimode offers the following possibilities for the GCxGC:

- Good accuracy and repeatability of modulation time.
- A multi-modulation management allowing to adapt the modulation time during the analysis.
- An intuitive web programming interface, without the need for additional software.
- A control by network connection (Ethernet) like the rest of the GC installation.

1.2 Front and back panels

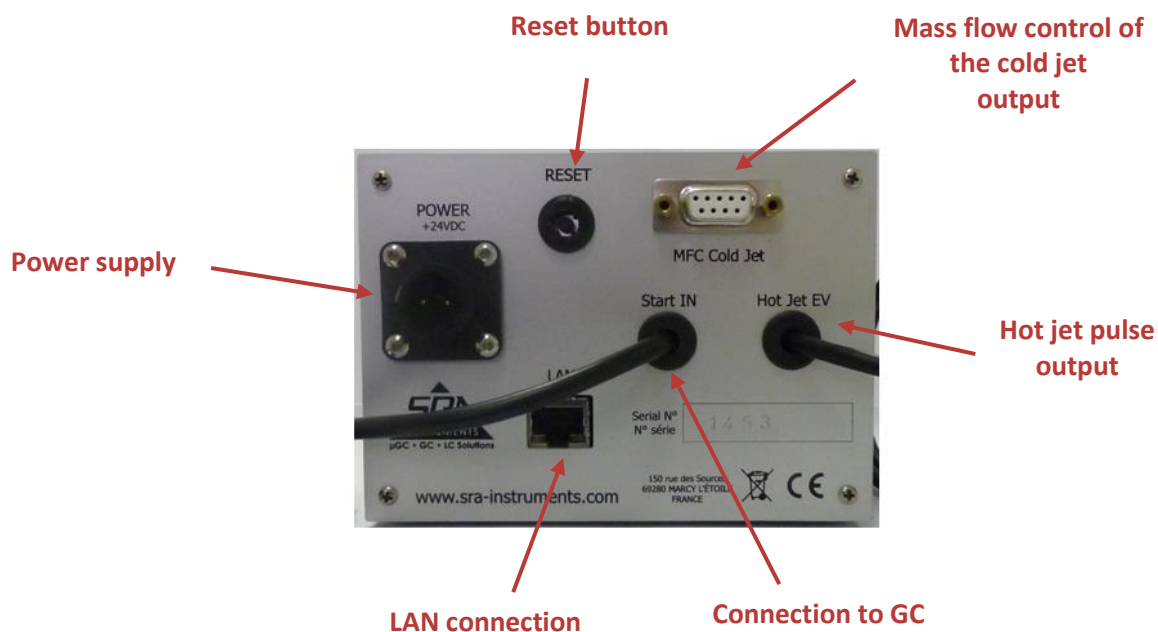
1.2.1 Front panel



The 6 LEDs on the front panel provide information on the system status:

- POWER : this light is on when the system is powered and operational.
- IDLE : this light is on if the system is waiting for instructions.
- CYCLE : this light indicates that the system is in use.
- SPECIAL : this light indicates that a special action is in progress (configuration, cooling).
- START IN : this light is on when the Optimode receives the Start from the GC.
- HOT JET : this light indicates that the hot jet signal is activated.


1.2.2 Back panel



1.3 Embedded web server

The Optimode interface is fully integrated because the module hosts an embedded server. This provides the necessary web pages to control the settings. Access to this interface requires only a LAN connection and a web browser. By default, the address is: 10.1.1.111

The home page looks like this:



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SRA Optimode

Release Version: 3.00 TCP/IP Version: v5.36
 Compiling Date: Oct 1 2018 10:15:27 Serial Number: 2013

Menu

- OVERVIEW
- SIMPLE-MODULATION
- MULTI-MODULATION
- MAINTENANCE
- IP CONFIGURATION
- SPECIFICATIONS

Status : Stand By

Current Cycle
Stand By

Next Cycle
Main Cycle

GC Contact off

Modulation off

Mass Flow Value 3

Elapsed Time

Not Initialized

Start

Start

Simple Run

From this page, you can set the parameters of a simple cycle and run it. The Optimode provide a 0V-24V pulse for hot jet control, and the aperture of an analogic mass-flow controller via a 4mA-20mA or 0-10V signal.

As seen on this graph, a start (via the corresponding GC contact or the START button on this page) launch the cycle at t_0 . The Modulation starts right ahead with a hot jet pulse in less than 2 ms. If you reset the SRA-Optimode with the START contact on, the cycle shall be running right now. Until t_1 , the first time coordinate of the mass-flow, is reached, the mass-flow is kept to the idle value. If $t_1 = 0$ s (strongly advised), the first mass-flow value is set at the same time as the first modulation. The mass-flow signal is linear with time between coordinates. When t_N , the last time coordinate, is reached, the system enter an "End" cycle, the mass-flow is kept to its last known value, and the modulation is stopped. A STOP(via the corresponding button or the GC contact on a shift down) is required to go back to the idle cycle.

The mass-flow and modulation parameters can be modified with the following formulary. Data won't be taken in account if the system is currently running. The number of mass-flow coordinate can be set between 1 and 10. The mass-flow time parameters must be sorted from smallest (0s advised) to longest. There is a 1 s time precision, up to approximately 5h. The mass-flow aperture is given in percentage, with a built in precision of 0.39%, and thus a 0.1% step in entry. The hot jet time, corresponding to the hot pulse, must be strictly superior to 0 ms, and the modulation time must be strictly superior to the hot jet. Both hot jet and modulation are defined with a 1 ms precision, up to a hundred hour.

If you enter an incorrect parameter, no value will be taken in account in the program. The current parameters appear above the entries.

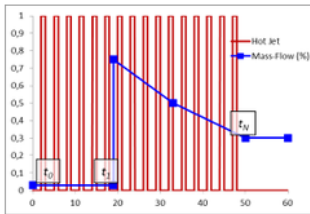
- **Black** means the values are synchronized and your parameters have been accounted for.
- **Green** means the parameters haven't been updated due to a mistake somewhere in the formulary, and show you the current parameters used.
- **Red** also indicates parameters which haven't been taken in account, but are not part of the current cycle. (They are default values stored for further use)

All values are hard-saved only once the whole formulary is correct.


Configuration

Hot Jet	MF Check Points	Idle Mass Flow	
Modulation (s) <input style="width: 80px;" type="text" value="20"/>	<input style="width: 80px;" type="text" value="2"/>	Mass Flow Idle (%) <input style="width: 80px;" type="text" value="3"/>	<input type="button" value="Download"/>
HotJet (s) <input style="width: 80px;" type="text" value="0.5"/>	<input style="width: 80px;" type="text" value="00m00s500"/>		
Mass Flow			
Time (s) <input style="width: 80px;" type="text" value="0"/>	<input style="width: 80px;" type="text" value="00h15m00"/>		
<input style="width: 80px;" type="text" value="70"/>	<input style="width: 80px;" type="text" value="35"/>		
Mass Flow (%) <input style="width: 80px;" type="text" value="70"/>	<input style="width: 80px;" type="text" value="35"/>		


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 Siege Social: 150, rue des Sources , 69280 Marcy l'Etoile
 SA a Directoire et a Conseil de Surveillance au capital de 150 000 Euros



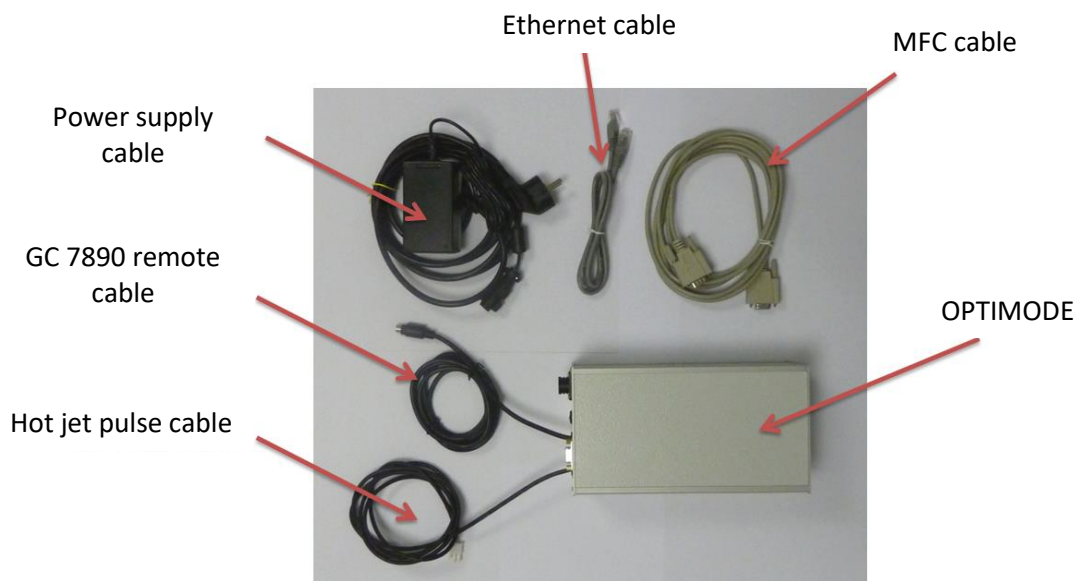
The Optimode can also be used offline with predefined settings after configuration with the web interface.



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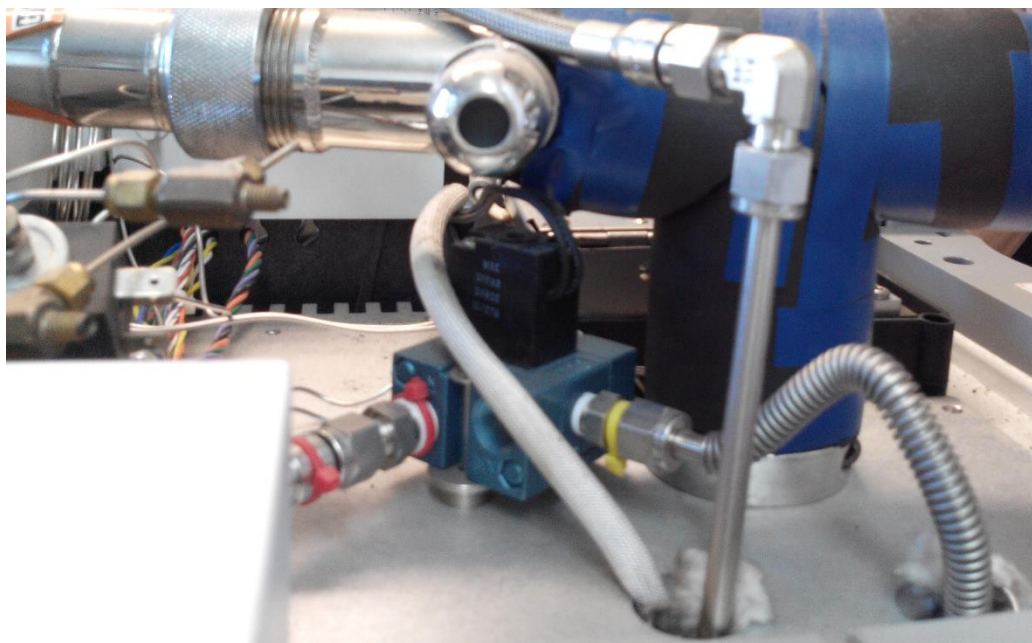
1.4 Accessories supplied with the device



The Optimode can be supplied with a thermal mass flow meter, range 0.8 to 40 l/min and the electro-valve which controls the supply of the hot air jet.

1.5 Installation

The Optimode is generally used with Zoex GC Image GCxGC software. The mass flow meter is mounted on the cold air inlet before the chromatograph and the electro-valve is mounted above the GC on the hot air inlet.



Overview of the top of the GC

2. Principle of operation

On power-up, the Optimode is in Stand By mode. Modulation is disabled and the mass flow rate is maintained at an initial value, set in the **Simple Modulation** menu with the **Idle Mass Flow** parameter. The 'Idle' LED is lit.

There are two operating cycles:

- Simple modulation
- Multi modulation

Whatever the cycle defined, it is activated either by pressing the **Start** button on the web page or by receiving the Start from the GC. The 'Cycle' LED is lit for its entire duration. At the level of the Web interface, it is possible to track the actions performed and the time elapsed. At the end of the cycle, the Optimode remains in state and it is necessary to press the **Stop** button to return to Stand By mode.

During the cycle, pressing the **Pause** button temporarily interrupts the cycle and the flow rate remains unchanged. Pressing the **Continue** button restarts the cycle from where it was at the time of the pause. Pressing the **New** button restarts a new cycle.

2.1 Simple modulation

In this mode, the modulation and duration of the Hot Jet are fixed. Up to 10 mass flow changes (MF Check Points) can be programmed during the cycle.

2.2 Multi modulation

In this mode, it is possible to change the modulation and duration of the Hot Jet up to 10 times (HJ Check Points). As in the Simple Modulation cycle, it is possible to program mass flow changes.

2.3 Initialization of parameters and module

On power-up, the last saved settings are restored. The LEDs blink rapidly at the same time.

To reset the parameters to factory settings, simply hold down the reset button for 15 seconds: the three LEDs (Idle, Cycle, Special) blink successively and the Optimode returns to IP address 10.1.1.111. This reset can be performed at any time (not necessarily at power-up).

Notes :

- When the reset button is pressed, there is a transitory phase after 5 seconds, when all three LEDs blink simultaneously.
- In the event of memory loss or damaged data, the factory settings are also loaded. The 'Idle' and 'Special' LEDs blink together.

3. Web interface

The Web interface is accessible by entering the IP address or host name (if DHCP is supported) in the address field of the web browser. By default, the Optimode address is **10.1.1.111**.
By default, the *Simple Modulation* page is displayed.

3.1 Web interface architecture

The interface is intuitive and divided into 6 pages, each dedicated to a specific mode of use:

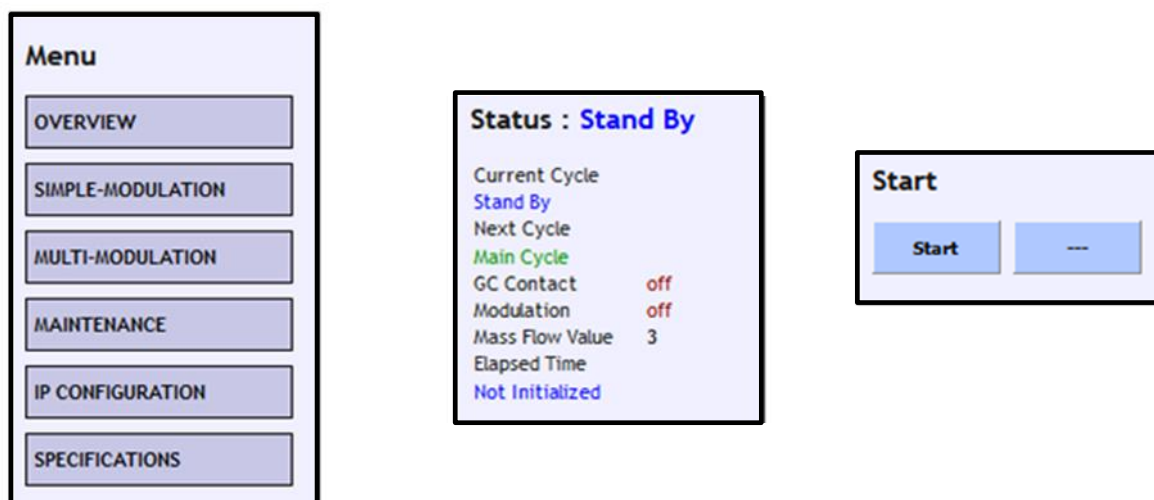
- Overview
- Simple modulation
- Multi modulation
- Maintenance
- IP configuration
- Specifications

The *Overview* and *Specifications* pages only display information and do not change the current cycle. The *Maintenance* page includes several functions such as cooling and recovering factory settings. The *IP configuration* page allows you to change the IP address of the module, its name at domain level and to validate or not the use of DHCP (Dynamic Host Configuration Protocol) which manages the IP address. If the IP configuration is changed, the system is automatically reset with the new settings.

3.2 Web page architecture

Each page of the interface is built on the same model and divided into 3 parts.

- **The left part** includes the navigation bar (**MENU**), the status section (**STATUS**) and the software start button (**START**).



The information displayed in the **Status** section is about the cycle status (*Current cycle*), the next step (*Next cycle*) and the elapsed time (*Elapsed time*). The *GC Contact* information displays the status of the chromatograph's external Start input, *Modulation* indicates the state of modulation (On/Off) and *Mass Flow Value* displays the scale percentage of the mass flow.

The *Status* information indicates the status of the Optimode (Stand By), or indicates the type of cycle in progress (Main Cycle for simple modulation or Multi Modulation).

The **Start** section includes two buttons. The name of these buttons can change depending on the state of the Optimode cycle.

- **The upper central part** provides information on the current page, the cycle to be started and the interface.

Simple Run

From this page, you can set the parameters of a simple cycle and run it. The Optimode provide a 0V-24V pulse for hot jet control, and the aperture of an analogic mass-flow controller via a 4mA-20mA or 0-10V signal.

As seen on this graph, a start (via the corresponding GC contact or the START button on this page) launch the cycle at t_0 . The Modulation starts right ahead with a hot jet pulse in less than 2 ms. If you reset the SRA-Optimode with the START contact on, the cycle shall be running right now. Until t_1 , the first time coordinate of the mass-flow, is reached, the mass-flow is kept to the idle value. If $t_1 = 0$ s (strongly advised), the first mass-flow value is set at the same time as the first modulation. The mass-flow signal is linear with time between coordinates. When t_n , the last time coordinate, is reached, the system enter an "End" cycle. the mass-flow is kept to its last known value, and the modulation is stopped. A STOP (via the corresponding button or the GC contact on a shift down) is required to go back to the Idle Cycle.

The mass-flow and modulation parameters can be modified with the following formulary. Data won't be taken in account if the system is currently running. The number of mass-flow coordinate can be set between 1 and 10. The mass-flow time parameters must be sorted from smallest (0s advised) to longest. There is a 1 s time precision, up to approximately 5h. The mass-flow aperture is given in percentage, with a built in precision of 0.39%, and thus a 0.1% step in entry. The hot jet time, corresponding to the hot jet pulse, must be strictly superior to 0 ms, and the modulation time must be strictly superior to the hot jet. Both hot jet and modulation are defined with a 1 ms precision, up to a hundred hour.

If you enter an incorrect parameter, no value will be taken in account in the program. The current parameters appear above the entries.

- **Black** means the values are synchronized and your parameters have been accounted for.
- **Green** means the parameters haven't been updated due to a mistake somewhere in the formulary, and show you the current parameters used.
- **Red** also indicates parameters which haven't been taken in account, but are not part of the current cycle. (They are default values stored for further use)

All values are hard-saved only once the whole formulary is correct.

- **The lower central part** allows you to enter the parameters. It is linked to the displayed web page. The information is sent via the **Download** button. The parameters are displayed as a default value for entry and as a text code. This redundancy is used to convert the input from seconds to explicit time and to highlight errors found in the submitted parameters.

The text parameters displayed in **black** are in accordance with the values submitted.

The **green** text indicates the actual value used by the software.

The **red** text is used to show that the displayed value is not relevant.

The parameters are stored in the internal memory only if they are correct. The parameters cannot be changed during system operation.

Configuration

Hot Jet

Modulation (s) 00m20s000

HotJet (s) 00m00s500

MF Check Points

Idle Mass Flow

Mass Flow Idle (%) 3

send

Mass Flow

00h00m00 00h15m00 02h31m00 00h00m00

Time (s)

50 35 5 0

Mass Flow (%)

of any partial or total part of the software, hardware configuration, and htm material without SRA-Instruments agreemen

In the example above, the modulation parameter is correct, but not the hot jet (it must be shorter than the modulation). The hot jet used by the software, 0.5 second, is displayed in green.

The number of mass flow steps has just been increased from 3 to 4, the 4th step parameter group is in red to indicate that the entered parameters are not correct (0) while the time of the previous step is at 2h31. In this case, only the first 3 groups of parameters are taken into account by the program. The hot jet and mass flow settings must be correct before the data is stored in the internal memory.

3.3 Overview page

This page contains information about:

- The different web pages corresponding to the menu sections, presented below.
- It presents the different states of the system:

SRA Optimode

Release Version: 3.00 TCP/IP Version: v3.36
 Compiling Date: Oct 1 2018 10:15:27 Serial Number: 2013

Menu

- OVERVIEW
- SIMPLE-MODULATION
- MULTI-MODULATION
- MAINTENANCE
- IP CONFIGURATION
- SPECIFICATIONS

Status : Stand By

Current Cycle
 Stand By
 Next Cycle
 Main Cycle
 GC Contact off
 Modulation off
 Mass Flow Value 3
 Elapsed Time
 Not Initialized

Start

Start ---

Overview

Next...

Welcome to the SRA-Optimode interface. The section in the left border allows navigation between the different sections.

- Overview (this section) offers a brief presentation of the configuration pages and of the status bar
- Simple-modulation enables simple runs of the Optimode with a fixed modulation period, configuration of the mass flow idle level, and mass-flow in-run control.
- Multi-modulation is used for more complex runs with different modulation and hot jet periods during a single run.
- Maintenance is a technical section where you can finely tune the internal Optimode dock, launch a defrost initiating cycle, test the mass-flow and hot-jet valve, and restore factory parameters
- IP-Config enables the setting of the board with fixed IP or automatically attributed DHCP address, and your network configuration.

Under the navigation tab is a status section, gathering the main information about the board and the software. The information displayed are quite straightforward, we shall nevertheless detail the "Current Cycle" and "Next Cycle" fields.

- Stand By is the default idle state of the device. The modulation is off and the mass-flow kept at idle value. The Idle Led is lit. Stand By is automatically entered at the reset of the board, if the "Start" connector is off (the connector status can be monitored on the "GC Start" status field. A down shift on the connector or the "STOP" button also engage Stand By mode.
- Main Cycle is a simple cycle with fixed modulation and mass-flow control. The Cycle Led is lit during operation. A Main Cycle shift to a Stand By mode if a stop (software button of connector) occurs, or to a "End" phase at the end of the cycle's duration. The time elapsed since the beginning of the run is displayed, along with the real time mass-flow value. The hot jet state (software) can also be monitored in real time.
- Special Cycle is similar to the Main Cycle, but enables different modulations in the same run. This cycle shall be launched from the proper web page (Multi-Modulation). If "Special Cycle" appears in the Next cycle field instead of "Main Cycle", reload the current web page with the "MAIN CYCLE" Button in the navigation bar.
- The End Cycle occurs at the end of an active cycle (Main or Multi). In this state, the modulation is off, and the mass-flow is kept at the last known value. To exit this state, one must call a stop (software or GC Start down shift), and go to Stand By mode. When the system enters the End Cycle, a "Press Stop" Message is displayed in the current Cycle field.
- Pause is a simple state entered with the corresponding software button, putting the device idle and on again. The Idle Led is lit during pause.
- Cold Up is a special function used at the beginning of your experiment. Via a brief sequence of hot pulses at 50% mass-flow aperture, the system is awakened and put in optimal conditions. Every hypothetical ice is removed by the hot jet, and the mass-flow arrival is cooled down. The cold up automatically ends in Stand By mode. The "Special Cycle" Led is lit when called, and "Initializing" is displayed.
- Config-MF is a special mode (the Special Led is lit) enabling fine tuning and test of the mass-flow controller and of the hot-jet. The Special Cycle Led is lit, this function is used at factory to set the 4 mA - 20 mA output trimmers.
- Factory Cycle is sometime selected. "Setting Factory Reset" is displayed, and the device parameters are set to their initial value. The IP configuration is not changed in between.

If something goes wrong in the software, an error message can occur. It shall be very unlikely, and you are advised to tell SRA Instrument of such occurrence. Using a software Start/Stop button a few times or resetting the board shall be enough to start anew.

...Next

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 SA a Directoire et a Conseil de Surveillance au capital de 150 000 Euros

- **Stand By**: This is the default state of the device. Modulation is disabled and the mass flow rate is maintained at the initial value (Idle Mass Flow). The 'Idle' LED is lit. The Optimode switches to Stand By cycle automatically when the board is reset. If the "Start" input is closed (the status of the input can be controlled by the "GC Contact" information). A downward front on the GC connector or the "Stop" button also activates Stand By mode.
- **Main Cycle**: It is a simple cycle with fixed modulation and mass flow control. The 'Cycle' LED lights up during the operation. This cycle switches to **Stand By** mode in case of stop (connector software button), or to **End** phase at the end of the cycle. The time elapsed since the beginning of the cycle is displayed together with the mass flow value in real time. The Hot Jet control is also displayed in real time.
- **Multi-modulation**: This cycle is similar to the **Main Cycle**, but allows multi-modulation. It is launched from the appropriate web page (Multi-Modulation). If "Special cycle" appears in the Next cycle field instead of "Main cycle", reload the current web page with the "Main Cycle" link in the navigation bar.
- **End**: This is the step that takes place after the cycle (Main or Multi). In this state, modulation is disabled and the mass flow rate is maintained at the last known value. To exit this state, you must


request a stop (software or GC Start downward front), and switch to Stand By mode. When the system enters this cycle, a "Press Stop" message is displayed on the interface.

- **Pause** : The Optimode goes into this simple state after pressing the Pause button, it goes into standby. To continue the cycle, simply press the *Continue* button and the cycle starts again. The 'Idle' LED lights up during the pause. Pause is not available from the **Stand By** state.
- **Cold Up** : This is a special function available at the beginning of your experiment. Thanks to a short sequence of hot pulses (5) at an opening of 50% of the mass flow rate, the system is placed in optimal conditions. All the ice at the end of the nozzle is removed by the hot jet and the mass flow inlet is cooled. Cooling automatically ends in **Stand By** mode. The 'Special cycle' LED lights up during operation. Cold Up is available on the maintenance web page.
- **Mass Flow** : This button is also available in the maintenance page. It lights the 'Special' LED. It allows the fine adjustment and testing of the mass flow controller and the hot jet. This function is used at the factory to set the 4 mA - 20 mA output potentiometers.
- **Factory Cycle** sets the device parameters to their initial value. The IP configuration is not changed in the meantime.

3.4 Simple modulation page

Simple modulation allows cycles to be performed with a fixed modulation period. However, it is possible to program several mass flow steps (1 to 10).

From this page, you can define the parameters of a simple cycle and execute it. The Optimode provides a 0-24 V pulse for hot jet control, and controls the mass flow meter via a 4-20 mA or 0-10 V signal.



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SRA Optimode

Release Version: 3.00 TCP/IP Version: v5.36
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Menu

- OVERVIEW
- SIMPLE-MODULATION
- MULTI-MODULATION
- MAINTENANCE
- IP CONFIGURATION
- SPECIFICATIONS

Status : Stand By

Current Cycle
Stand By
Next Cycle
Main Cycle
GC Contact off
Modulation off
Mass Flow Value 3
Elapsed Time
Not Initialized

Start

Start ---

Simple Run

From this page, you can set the parameters of a simple cycle and run it. The Optimode provide a 0V-24V pulse for hot jet control, and the aperture of an analogic mass-flow controller via a 4mA-20mA or 0-10V signal.

As seen on this graph, a start (via the corresponding GC contact or the START button on this page) launch the cycle at t_0 . The Modulation starts right ahead with a hot jet pulse in less than 2 ms. If you reset the SRA-Optimode with the START contact on, the cycle shall be running right now. Until t_1 , the first time coordinate of the mass-flow, is reached, the mass-flow is kept to the idle value. If $t_1 = 0$ s (strongly advised), the first mass-flow value is set at the same time as the first modulation. The mass-flow signal is linear with time between coordinates. When t_N , the last time coordinate, is reached, the system enter an "End" cycle, the mass-flow is kept to its last known value, and the modulation is stopped. A STOP (via the corresponding button or the GC contact on a shift down) is required to go back to the idle cycle.

The mass-flow and modulation parameters can be modified with the following formulary. Data won't be taken in account if the system is currently running. The number of mass-flow coordinate can be set between 1 and 10. The mass-flow time parameters must be sorted from smallest (0s advised) to longest. There is a 1 s time precision, up to approximately 5h. The mass-flow aperture is given in percentage, with a built in precision of 0.39%, and thus a 0.1% step in entry. The hot jet time, corresponding to the hot pulse, must be strictly superior to 0 ms, and the modulation time must be strictly superior to the hot jet. Both hot jet and modulation are defined with a 1 ms precision, up to a hundred hour.

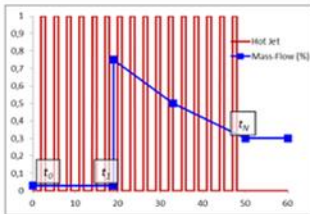
if you enter an incorrect parameter, no value will be taken in account in the program. The current parameters appear above the entries.

- Black means the values are synchronized and your parameters have been accounted for.
- Green means the parameters haven't been updated due to a mistake somewhere in the formulary, and show you the current parameters used.
- Red also indicates parameters which haven't been taken in account, but are not part of the current cycle. (They are default values stored for further use)

All values are hard-saved only once the whole formulary is correct.

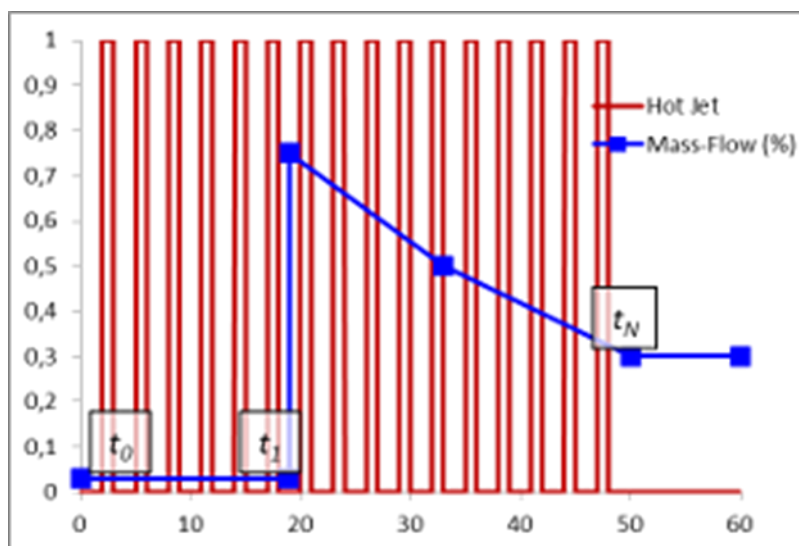
Configuration

Hot Jet	MF Check Points	Idle Mass Flow	
Modulation (s) <input style="width: 80%;" type="text" value="20"/>	<input style="width: 80%;" type="text" value="2"/>	Mass Flow Idle (%) <input style="width: 80%;" type="text" value="3"/>	Download
HotJet (s) <input style="width: 80%;" type="text" value="0.5"/>	<input style="width: 80%;" type="text" value="00m00s500"/>		
Mass Flow			
Time (s) <input style="width: 80%;" type="text" value="0"/>	<input style="width: 80%;" type="text" value="00h15m00"/>		
<input style="width: 80%;" type="text" value="70"/>	<input style="width: 80%;" type="text" value="35"/>		
Mass Flow (%) <input style="width: 80%;" type="text" value="70"/>	<input style="width: 80%;" type="text" value="35"/>		



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 Siege Social: 150, rue des Sources , 69280 Marcy l'Etoile
 SA à Directoire et à Conseil de Surveillance au capital de 150 000 Euros

As you can see on the graph above, a start (via the GC Contact input or the START button on this page) starts the cycle at t_0 . The modulation starts directly with a hot jet pulse in less than 2 ms. If you reset the Optimode by opening the START contact, the cycle is started immediately. Until time t_1 of the first stage, the mass flow rate is maintained at the initial value. If time t_1 is 0 s, strongly recommended, the mass flow value is set at the same time as the first modulation. The mass flow signal is linear with time between the stages. When the time t_N of the last level is reached, the system switches to "End" mode. The mass flow rate is maintained at the last set value and modulation is stopped. A STOP (via the corresponding button or the GC contact during a downward front) is required to return to the Stand By cycle.



The mass flow and modulation parameters can be modified using the form on the page. The data will not be taken into account if the system is in the running cycle. The number of mass flow steps can be set between 1 and 10. The mass flow time parameters must be sorted from the smallest (0 s recommended) to the longest. There is a time accuracy of 1 s, up to about 5 h. The mass flow opening is given in percentage, with an integrated accuracy of 0.39%, and therefore a step of 0.1% at the input. The hot jet time, corresponding to the hot pulse, must be strictly greater than 0 ms, and the modulation time must be strictly greater than the hot jet time. The hot jet and modulation are defined with an accuracy of 1 ms, up to a hundred hours.


If you enter an incorrect parameter, no value will be taken into account in the program. The current settings appear above the inputs.

- **Black** means that the values are synchronized and your settings have been taken into account.
- **Green** means that the settings have not been updated due to an error somewhere in the form, and shows you the current settings used.
- **Red** also indicates parameters that have not been taken into account, but are not part of the current cycle. (These are default values stored for later use).

All values are only saved in internal memory when all parameters are correct.

3.5 Multi-modulation page

The multi-modulation mode is used for more complex experiments with different modulation and hot jets periods during the same analysis.



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SRA Optimode

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Serial Number: 2013

Menu

OVERVIEW

SIMPLE-MODULATION

MULTI-MODULATION

MAINTENANCE

IP CONFIGURATION

SPECIFICATIONS

Status : Stand By

Current Cycle
Stand By
Next Cycle
Multi Modulation
GC Contact off
Modulation off
Mass Flow Value 3
Elapsed Time
Not Initialized

Start

Start ---

Multi-Modulation

Multi-Modulation is a new feature in this Optimode. The modulation and Hot Jet are dynamically adjustable to your analysis. Like the mass-flow controller, you can enable up to 10 successive steps with different modulation parameters. The new modulation parameters are changed at the time associated. The modulation doesn't start directly anyway : the parameters are stored in memory, and become effective at the next automatic update which occurs at the end of each complete modulation. As a result, the different sections of a multi-modulation all share the same time shift. If you set the first modulation at time = 0 s, this offset is null, within the 2 ms precision.

The multi-modulation mode is similar to the simple modulation : it starts and stops in the same conditions, and the behavior of the mass-flow controller is the same. If the last mass-flow time parameter is smaller than the last modulation one, the mass-flow is kept at the same value until the cycle finish and enters "Ending" mode. If the mass-flow time is longer, the last modulation and pulse parameters are kept until the "Ending" Cycle. Also, the parameters are only updated and saved on hard memory once the whole formulary is correct.

The modulation can be disabled until next modulation time with the checkbox next to the time entry. When disabled, the modulation and pulse parameters are irrelevant, and are therefore not displayed. The next modulation shall start at the precise time set. When the Modulation is disabled in the program, no values (***) is displayed. However, the parameters are still available in memory for further use.

Configuration

Modulation HJ Check Points Download

Disabled 00h00m00

Time (s)

Modulation (s)

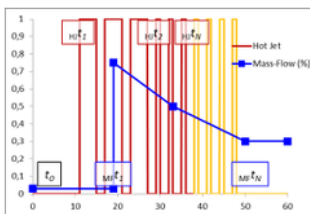
Hot Jet (s)

Mass Flow MF Check Points

00h00m00 00h15m00

Time (s)

Mass Flow (%)



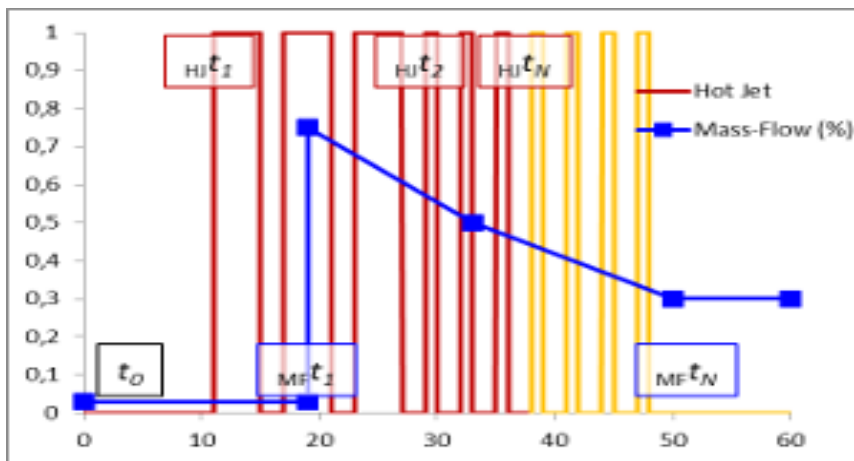
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Multi-modulation is a new feature of the Optimode. The modulation and hot jet are dynamically adjustable according to the analysis. As with the mass flow controller, you can choose up to 10 successive steps with different modulation parameters. The new modulation parameters are modified at the associated time. Modulation does not start directly anyway: the parameters are stored in memory, and become effective at the next automatic update which takes place at the end of each complete modulation. Therefore, the different sections of a multi-modulation all share the same time shift. If you set the first modulation time = 0 s, this offset is zero, with an accuracy of 2 ms.

The multi-modulation mode is similar to simple modulation: it starts and stops under the same conditions, and the behavior of the mass flow controller is the same. If the last mass flow time parameter is lower than the last modulation parameter, the mass flow is maintained at the same value until the end of the cycle and switches to "End" mode. If the mass flow time is longer, the last modulation and pulse parameters are retained until the "End" cycle. In addition, the parameters are only updated and saved in internal memory when all the parameters are correct.


The modulation can be deactivated until the next modulation by using the checkbox next to the time entry. When disabled, the modulation and pulse parameters are not relevant and are therefore not displayed. The

next modulation starts at the precise time set. When modulation is disabled in the program, no value (***) is displayed. However, the settings are still available in memory for later use.



3.6 Maintenance page

This page is a technical section where you can fine-tune the Optimode internal clock, start a defrost initiation cycle, test the mass flow rate and hot jet valve, and restore factory settings.



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Menu

- OVERVIEW
- SIMPLE-MODULATION
- MULTI-MODULATION
- MAINTENANCE**
- IP CONFIGURATION
- SPECIFICATIONS

Status : Stand By

Current Cycle
Stand By
Next Cycle

Config MF
GC Contact off
Modulation off
Mass Flow Value 3
Elapsed Time
Not Initialized

Start

Start ---

Maintenance Section

The maintenance section is composed of 4 different functions.

- Mass Flow and Hot Jet Set is used in factory for testing and hardware configuration. The system enters a special mode when the formulary is submitted. The state of the hot jet and the mass-flow value can be configured at will. The mass-flow value is displayed in percentage, in 8-bits binary (the numerical value of the mass-flow), on a 0 - 10 V scale, and on a 4 - 20 mA scale, for direct control. The mass-flow value has no incidence on the idle value.
- Cold Up is a special cycle used to put the system in optimal conditions. The mass-flow is set to 50% aperture, and successive 1 s long modulation and hot jet pulse are triggered. We can therefore de-ice the cold jet, and cool the air entry. The parameters of this special cycle are factory written in hard memory, and can't be change.
- Timer Shift enables the tuning of the SRA-Optimode internal clock. 1 ms is initially defined as 40.000 cycle on our timer, in accordance with a 80 MHz built-in quartz. As seen in the following figure, the span difference between the Optimode clock and your GC can lead to a difference in the modulation period, and to a shift in pulse over time. We can observe, by example, a 5 s shift over the course of 1h30. After characterizing the time shift and the total time, enter the required correction in the time shift formulary to synchronize your docks. The same unit (to your choice) is required, with relativ's integers only.
- The final module is used for memory save and recovery. Parameters are automatically saved after a correct entry, and this section enable factory recovering of different parameters : the timer definition of 1 ms, the Idle level of the mass-flow, the Hot Jet parameters, and the mass-flow parameters.

Configuration

Mass Flow

3 Mass Flow (%)

8 Bits encoding 00001000
4.000-200.00 mA 4501
0-10.000 mV 313

Hot Jet(on/off)

Shift Timer

0 Time

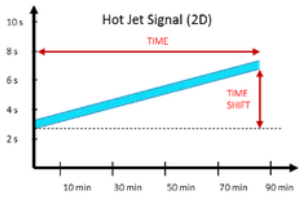
0 Time Shift

Current countdown for a ms
40000

Cold Up

Factory

Hot Jet Save Parameters
 Mass Flow Load Parameters
 Timer
 MF Idle




Hot Jet Signal (2D)

The graph shows a linear increase in signal from 2s at 10 min to 8s at 90 min. A red arrow labeled 'TIME' spans the 80-minute interval. A red arrow labeled 'TIME SHIFT' indicates a 5-second delay between the expected and actual signal at the 90-minute mark.


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The maintenance section is composed of 4 different functions:

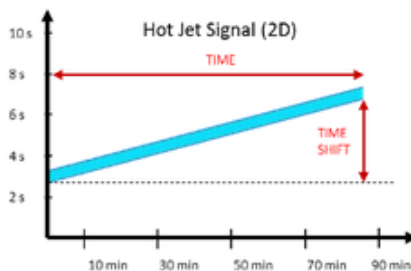
- Mass flow and Hot Jet:** Mass flow and hot jet are used in the factory for testing and hardware configuration. The system switches to special mode when these values are submitted. The hot jet status and mass flow rate value can be configured as required. The mass flow value is displayed in percentage, in 8-bit binary (digital mass flow value), on a scale of 0-10 V, and on a scale of 4-20 mA, for direct control. The mass flow value has no effect on the idle value.
- Cold up** is a special cycle used to put the system in optimal conditions. The mass flow rate is set to an opening of 50%, and a successive modulation of 1 s and a hot jet pulse are triggered. The parameters of this special cycle are stored in the factory and cannot be changed. **It is therefore possible to defrost the cold jet and cool the air inlet after nitrogen filling, for example, with a high flow rate.**
- Shift Timer** allows the internal clock of the Optimode to be set. 1 ms is initially defined as 40,000 cycles on our timer, in accordance with an integrated 80 MHz quartz. As shown in the following figure, the difference in scale between the Optimode clock and your GC can cause a difference in the modulation period and a time shift of a pulse. For example, we can observe a delay of 5 s over a



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period of 1 h 30. After characterizing the time difference and total time, enter the required correction in the time difference form to synchronize your clocks. The same unit (of your choice) is required, with relative integers only.



- **Factory** is used for in-memory backup and data recovery. The parameters are automatically saved after a correct entry, and this section allows you to retrieve different factory parameters: the 1 ms timer definition, the mass flow idle level, the hot jet parameters, and the mass flow parameters.

3.7 IP Configuration page



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Menu

- OVERVIEW
- SIMPLE-MODULATION
- MULTI-MODULATION
- MAINTENANCE
- IP CONFIGURATION
- SPECIFICATIONS

Status : Stand By

Current Cycle
 Stand By
 Next Cycle
 Config MF
 GC Contact off
 Modulation off
 Mass Flow Value 3
 Elapsed Time
 Not Initialized

IP Configuration

This page allows the configuration of the board's network settings. Be very careful, once you've submitted the new settings, the board may loose connectivity with the network. As soon as new settings are input, the board shall reset itself, resulting in the 3 status Led Blinking. Recovery options will be provided on the next page. The DHCP option is useful if you want the board to synchronize with your DHCP server. The AutoIP option (overrun by the DHCP) attributes a random IP to your board if it can't achieve connection.

Host Name:

IP Address:

Gateway:

Subnet Mask:

Primary DNS:

Secondary DNS:

MAC Address: 00:04:A3:48:68:00

Enable DHCP

Enable Auto IP

[Save Config](#)

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This page allows you to configure the network settings of the board. Be very careful, once you have submitted the new settings, the board may no longer be connected to the network. As soon as new settings are entered, the board resets itself, causing all 3 status LEDs to blink. Recovery options are provided on the next page. The DHCP option is useful if you want the board to synchronize with your DHCP server. The AutoIP option (disabled by DHCP) assigns a random IP address to your board if it can't connect.

3.8 Specifications page

This page presents the specifications of the various system parameters.

You can find them in Chapter 5 - Appendix B of this manual.



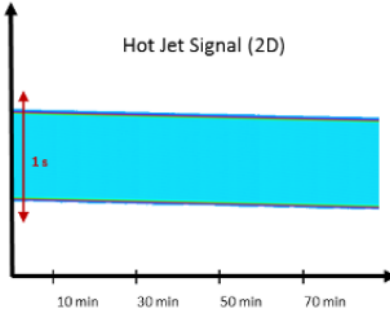
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Specifications

Specification Name	Specification Value
Hot Jet Modulation	
Modulation resolution (Mean)	0.1 µs
Hot Jet resolution (Mean)	0.1 µs
Modulation repeatability (Variance)	12.5 ns
Hot Jet repeatability (Variance)	12.5 ns
Modulation Step	1 ms
Hot Jet Step	1 ms
Modulation Length	2 ms to 1 h 40
Multi-Modulation steps	10
Multi-Modulation time parameter	up to 100 h
Initialisation delay at "Start" command	between 1 ms and 2 ms.
Mass Flow Controller	
Mass Flow Resolution	0.39 %
Mass Flow time parameter	up to 5h30 between each step up to 100h
Mass-Flow steps	10
Internal Clock	
maximum dock drift (after correction)	9 ms per hour.



Hot Jet Signal (2D)

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4. Using the Optimode with an Agilent GC

When using the Optimode with an Agilent GC, the Optimode is controlled by a GC valve configured as follows:

GC model	Valve to be configured	Type of valve
7890	Valve 5	Switching
8890 or 8860	Valve 9	Switching

5. Specifications

Hot Jet Modulation	
Modulation and Hot Jet resolution	0.1 μ s
Modulation and Hot Jet variance	12.5 ns
Modulation and Hot Jet input step	1 ms
Modulation and Hot Jet maximum span	1 h 40
Number of modulation phases	10
Phase duration	Up to 100 h
Délai on Start contact	2 ms \pm 1 ms
Mass Flow Controller	
Mass flow resolution	0.39 %
Number of mass flow interpolation coordinates	10
Max. time between mass flow coordinates	5 h 50
Horloge	
Internal clock variation	9 ms per hour
Dimensions	
Length x Base x Height	230 mm x 125 mm x 90 mm