

UMF5021

MiniFIR

Datasheet

Support information

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Description

The miniFIR **UMF5021** is Fault Injection Module purpose-built for electronic device testing. with two channels, dedicated to injecting distinct electrical fault conditions, such as Open Circuit, Short to Ground (GND), and Short to Voltage Input (VIN).

The miniFIR **UMF5021** is equipped with internal PWM frequency and voltage measurement capabilities.

The connection to the device via USB is made using of FTDI technology, ensuring high-quality and efficient communication.

Safety notices

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Features

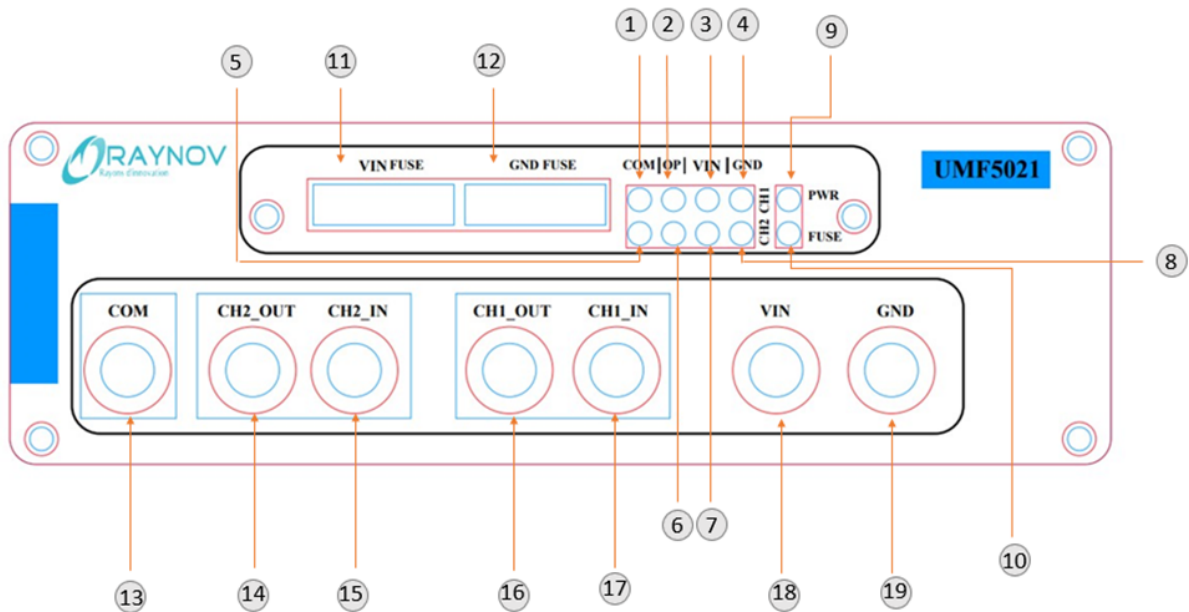
The following table describes the miniFIR **UMF5021** device electrical characteristics:

Parameters	Values		Unit
	min	max	
Number of channels	2		-
Channels Voltage	5	25	V DC
Power Supply	9	14	V DC
Measuring PWM Frequency	0.02	200	Khz
Measuring voltage range	5	25	V DC
Relays Response time	80		ms
Channels Peak current	30 (8ms)		A
Continuous channel current	15		A
Galvanic Isolation	Up to 3000		V

MiniFIR front panel

The following section description the main miniFIR **UMF5021** front panel.

Overview



LEDs indicator of each channel status

LED	Description
1 & 5 COM	Common bus LED LED ON when frequency measurement is in progress to the channel X.
2 & 6 OP	Open circuit LED LED ON when open circuit fault is applied to the channel X.
3 & 7 VIN	VIN Short circuit LED LED ON when a short circuit to VIN is applied to the channel X.
4 & 8 GND	GND short circuit LED LED ON when short circuit fault to GND is applied to the channel X.
8	Fuse LED LED on when VIN and GND are powered and fuses are not damaged
9	Power ON LED

*Channel X (Channel 1 or Channel 2)

Protection overcurrent fuses

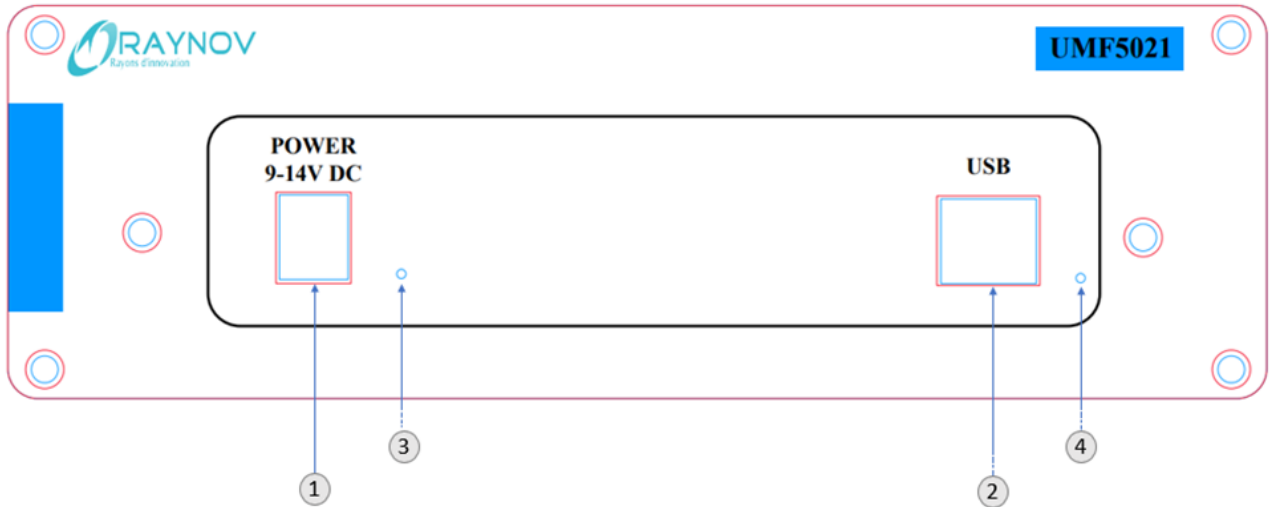
Fuse	Description
11	Protection fuse for VIN. 25A fuse is used
12	Protection fuse for GND. 25A fuse is used


Socket Banana 4mm

Socket	Description
13 COM	COMMUN BUS 1 Input socket for Commun BUS (*supported only in Version 3)
14 CH1_OUT	Output channel 2 Output socket for channel 2.
15 CH2_IN	Input channel 2 Input socket for channel 2.
16 CH1_OUT	Output channel 1 Output socket for channel 1.
17 CH1_OUT	Input channel 2 Input socket for channel 2.
17 VIN	Input socket for voltage VIN fault supply.
18 GND	Input socket for Ground GND fault supply.

Mini FIR back panel

The back panel includes 2 connectors and 2 LEDs represented as following:



Socket	Description
1 Power	POWER input, is jack connector, the main power supply of the mini FIR  Positive polarity
2 USB	USB type B connector, with USB2.0 compatibility.
3 LED	LED power supply indicates that the miniFIR UMF5021 is on.
4 LED	LED USB indicates the miniFIR UMF5021 is connected to the USB.

System command configuration

Communication Requirements

This section presents and explains the essential configuration commands transmitted via the serial port through USB to fulfill the specified requirements of the 'miniFIR UMF5021' module.

Computer connexion :

The miniFIR UMF5021, is detected as serial COM port, when plugged to the computer usign usb cable, to Initiate communication with the device, the flowing configuration should be used when communicating with COM port :

COM Port Configurations:

Baud rate : 9600, **Stop** : bit 1, **Parity** : Non.

The miniFIR **UMF5021** supports two type of commands: ASCII(Text) and hexadecimal (binary) formats. This dual command capability simplifies the communication, and thus enhances the compatibility with a wide range of programming environments and the interfaces.

1. ASCII commands

The table below outlines the fundamental ASCII commands to configure the 'miniFIR **UMF5021**' module:

Command*	x channel	y relay	z state	Description
CHxRyz	1 to 2	1 to 3	0	Inactivate RELAY y of channel x
			1	activate RELAY y of channel x
Vx	1 to 2	-		Return the voltage measured in CH_IN x
Fx	1 to 2	-		Return the frequency and the duty cycle of the CH_IN x (Frequency + " " +duty cycle).

Table1.ASCII commands

**The characters of each command must be in uppercase, and the commands have to be followed by new line(\n).*

Relays functions

Relay 1 : GND fault

Relay 2 : VIN fault

Relay 3 : Open Circuit fault

E.X., "CH1R11":

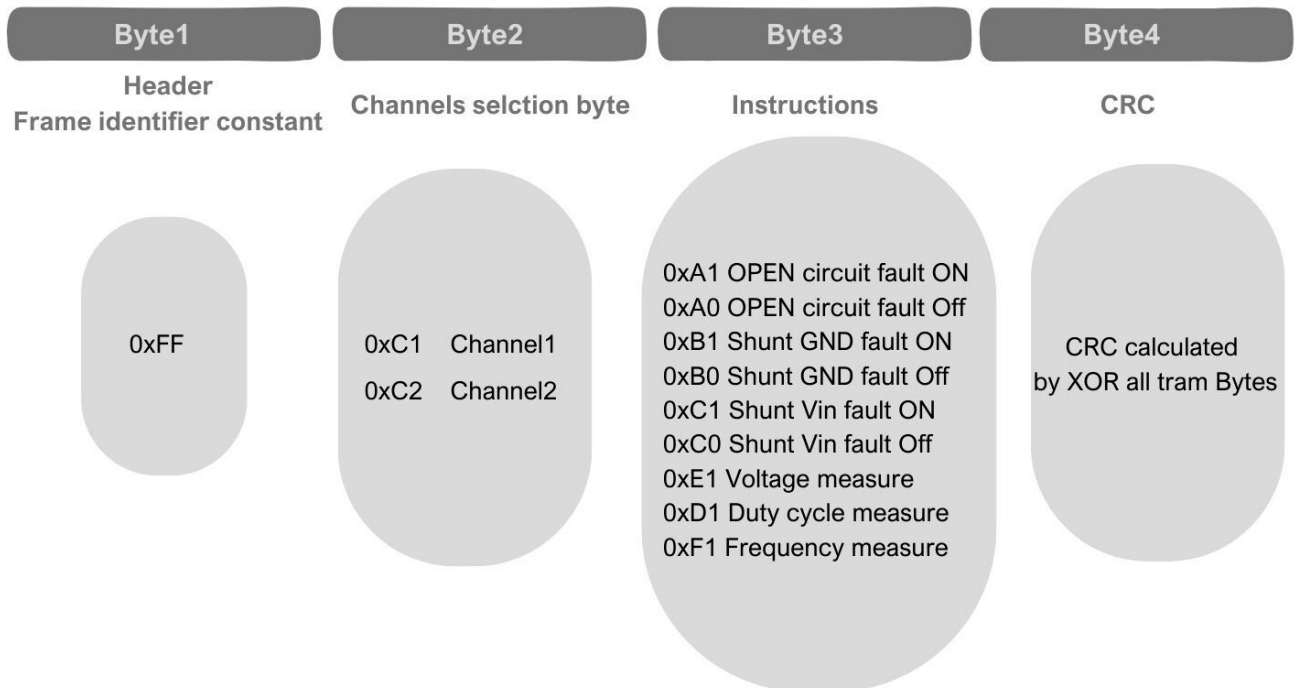
The following example explains the ASCII commands:

Command example "CH1R11" : will **activate** Relay **1** in channel **1**.

2. Hexadecimal(Binary) commands

The figure below illustrates the fundamental hexadecimal commands required to configure the 'miniFIR UMF5021' module.

Each command is a 4 octet frame, explained as below :



Byte 1:

The first byte refers to the constant header frame identifier, marking the initiation of a new frame.

Byte 2:

The second byte works as a channel selection indicator.

Byte 3:

The third byte encapsulates the instruction related to the requested commande.

Byte 4:

The last one and that corresponds to the CRC (Cyclic Redundancy Check), computed through XOR operations on all frame Bytes.

Faulting

The three different faulting injection conditions that can be applied by the miniFIR **UMF5021** are explained in the following section to each channel:

1. Open Circuit faulting

Open circuit fault simulation allows for the testing and analysis of a system in the presence of a broken or interrupted circuit. This fault condition can be simulated by disconnecting the signals between the test application and the Device Under Test (DUT).

2. Short to GND faulting

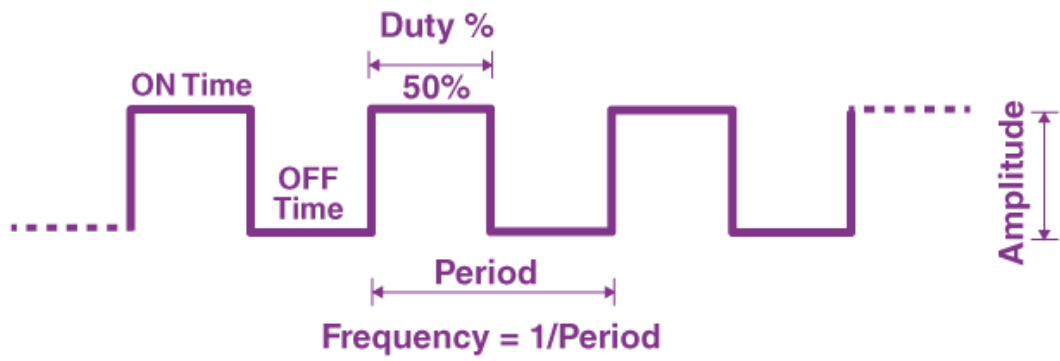
Short to GND fault simulation enables the testing and analysis of a system's response to unexpected behavior. This fault condition can occur when a direct signal connection forms between the Device Under Test (DUT) and an external fault line GND.

Short to VIN faulting

Short to VIN faulting allows for the testing and analysis of an unintended connection between a circuit and the voltage input. This fault condition can occur when a direct signal connection forms between the Device Under Test (DUT) and an external fault line VIN.

PWM Measurement

The miniFIR **UMF5021** is capable of measuring PWM frequency and duty cycle for positive signals with a maximum voltage of 25V



Range	Min	MAX	Unit
PWM frequency	0.02	200	KHZ
PWM frequency accuracy			
at PWM frequency \leq 200 kHz		0.2 %	%
at PWM frequency \leq 50 kHz		0.1 %	%
at PWM frequency \leq 10 kHz		0.1 %	%
at PWM frequency \leq 1 kHz		0.1 %	%
PWM duty cycle range			
at PWM frequency \leq 200 kHz	20 %	80 %	%
at PWM frequency \leq 50 kHz	10 %	90 %	%
at PWM frequency \leq 10 kHz	5 %	95 %	%
at PWM frequency \leq 1 kHz	1 %	99 %	%

Relay channels Schematic

