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1 STAGE RACER 2 SUMMARY

1.1 OVERVIEW

The STAGE RACER 2 is a complete optical fibre transmission solution for every broadcast event, ranging from simple OB interconnect to complex star, ring or linear topology spread over a whole TV compound. It also supports long distance transmission for remote production capacity allowing content exchange between distant locations.

Stage Racer 2 is designed to accept all kinds of signal on a same device without external adapter. Internally those signals can be associated together / routed / distributed to all other machines of the network.

Stage Racer 2 also offers processing capabilities with Audio Embedding/De-embedding, Audio SRC, Frame buffering, and much more...

Stage Racer 2 network can be controlled by a built-in intuitive web interface or with automation systems like VSM, KSC Core...

1.2 CONNECTIVITY

The Stage Racer 2 is available in two standard configurations: 12 or 24 SDI channels plus a common set of signals. Each equipment assumes transmission of a comprehensive set of signals as follows:

Stage Racer 2 – 24 SDI version	Stage Racer 2 – 12 SDI version
16 SD to 3G bidirectional channels (direction configurable)	8 SD to 3G bidirectional channels (direction configurable)
8 SD to 12G bidirectional channels (direction configurable)	4 SD to 12G bidirectional channels (direction configurable)
1 Distributed Genlock (Composite video / Black burst / Tri-level)	
16 Bidirectional analog audio	
2 Ethernet 10/100/1000Mbps	
2 Data RS 232/422/485	
8 Contact closures	
4 AES 3 bidirectional (Intercom panel compatible)	
1 Bidirectional MADI (AES10) Signal (Shared with 2 of the 4 AES connectors)	



1.3 TRANSMISSION

Transmission is based on TDM multiplexing for the all signals managed by the system. Each TDM multiplex is transmitted to another machine by "Trunk" ports. Each machine can have up to 4 trunk ports on dual LC/PC socket.

For remote production applications, the machine will act as a bridge between the standard and the IP world with future compliance to SMPTE ST2110 standards. Signals managed locally can be sent over IP and vice versa.

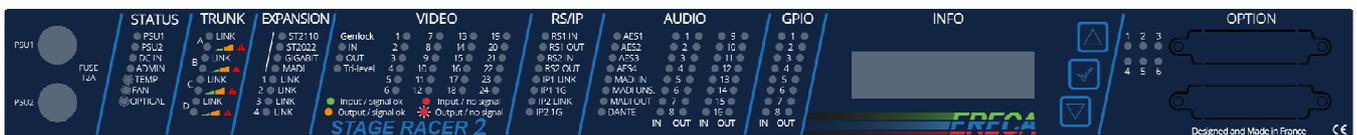
1.4 OPTIONS

Numerous hardware options can be fitted in the Stage Racer 2:

- 8 switchable mic/line gain blocks with phantom power injection and gain management,
- Dante module providing 64 I/O channels of Dante / AES67 (shared with Ethernet port 1),
- 6 additional 500Kbs RS422 serial channels,
- 10-16VDC input to connect an external battery used in case of mains power loss,
- Extended range QSFP+ for up to 40km transmission.

1.5 VISUALISATION

The equipment has multiple front-facing LED for signal presence and alarm display as well an Oled screen for visualisation of IP address, trunk occupancy and optical power.



1.6 SETUP

Each frame runs an internal web server to enable remote management and setup of the entire network or individual machine. The web interface can be accessed via the admin port of any machine from any device.

1.7 POWER

Each equipment has a built in redundant Mains power supply and can optionally be equipped with a DC input compatible with batteries used for Cameras. Battery energy will be drawn only if both mains sources are down, when mains will reappear battery current draw stops.

2 DETAILED DESCRIPTION

2.1 SMALL FORM FACTOR / INTEGRATION

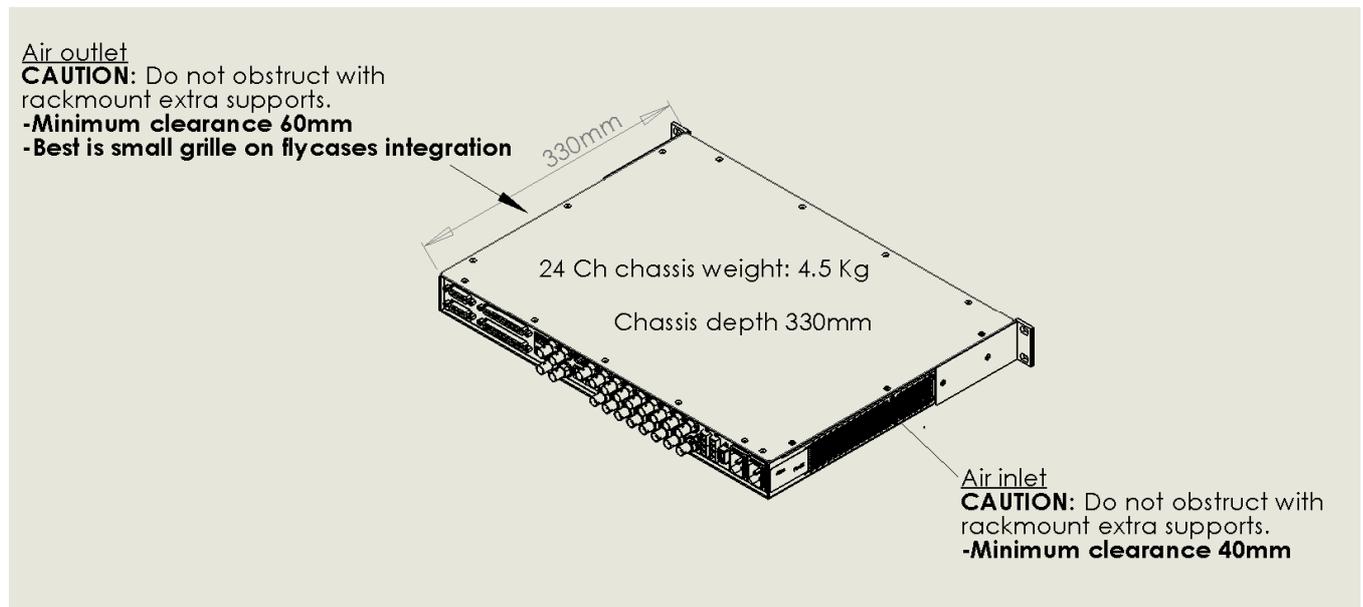
The Stage Racer 2 is a 1RU rack solution ideally designed for space restricted installations. Chassis depth is 330mm excluding connectors.

The Stage Racer 2 benefit from a very well-studied thermal conception and can operate from -20°C to +60°C. The internal fans speed is automatically adjusted depending on the internal motherboard temperature. At room temperature, the fans runs at minimal speed allowing the stage Racer 2 to be used in a quiet environment.

For field application a 4 to 5 RU fly case integration offers sufficient room for properly expending all the connections on panel BNC and XLR sockets.

Care should be taken regarding heat accumulation when proceeding to a flight case or any closed container integration. It is important to understand the airflow of the unit and not to obstruct the air inlet and outlet located on the side of the unit (see drawing below).

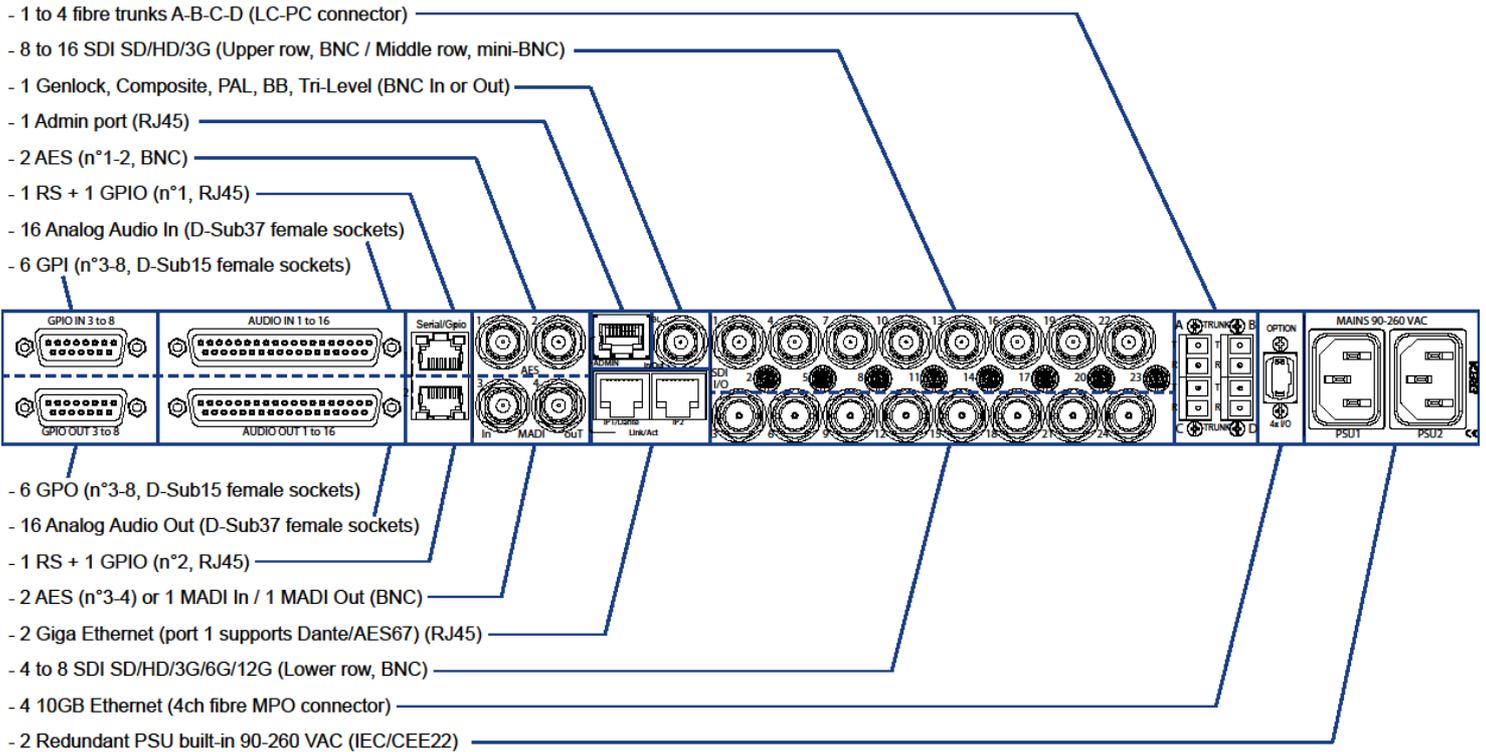
If space is limited, it is more important to allow more space for the air outlet using a small grille located in regard of the stage racer exhaust grille. Alternatively a forced air cooling of the flight case would be sufficient as well.



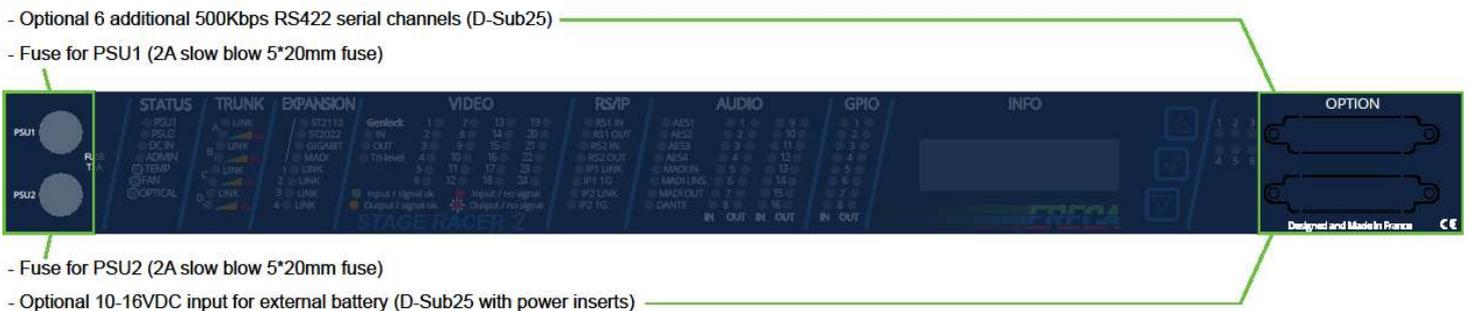
2.2 CONNECTORS LOCATION

The Stage Racer 2 provides signals, optical and power connectors on the rear panel. Optional Serial connectors and optional DC power are fitted on the visualization panel.

• Rear connectors



• Front connectors (For Serial and DC Power options)



2.3 INTERFACES DESCRIPTION/ PORTS MODE

This section includes the pinout for all electrical access and describes protocol audio interfaces such as MAD1 / SDI embedded Audio / Dante. For SDI, MAD1 and Ethernet the input process is also described in this section in order to keep concise documentation.

2.3.1 General Purpose IN

For forward product compatibility the GP IN section is split on two kind of connectors.

Inputs 1 and 2 are shared with each Serial signal transmission RJ 45 terminal, labeled "Serial/Gpio". These inputs are protected by an opto-coupler but are not floating; a grounding on the input pin triggers the GP-IN.

	1: GND
	2: GP IN
	3: RX RS 422 – or RX RS 232
	4: TX RS 422 – or TX RS 232
	5: TX RS 422 +
	6: RX RS 422 +
	7: GP OUT
	8: GP OUT

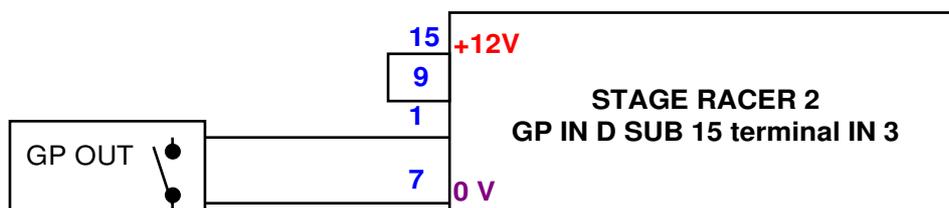
Inputs 3 to 8 are on one D-SUB 15 terminal female socket. Inputs are independent and electrically isolated by opto-couplers. Each input is non-polarised and feature an automatic 5mA current limitation working with an input voltage of 5 to 24 volts. The wiring polarity does not matter in this case.

Ground and power pins are available on the connector to ease interfacing with others machines especially if a dry contact, open connector or ground closure supplies the information.

The 12 volts output of the Stage Racer 2 is protected against external short circuit by an internal 100mA resettable fuse (polyswitch) common to the GPI and GPO sockets.

GP IN N°	SIGNAL	Socket contact	D SUB 15 GP IN	Socket contact	SIGNAL
3	GP IN 3a	1		9	GP IN 3b
4	GP IN 4a	2		10	GP IN 4b
5	GP IN 5a	3		11	GP IN 5b
6	GP IN 6a	4		12	GP IN 6b
7	GP IN 7a	5		13	GP IN 7b
8	GP IN 8a	6		14	GP IN 8b
	GND (0V)	7		15	+ 12V 100 mA
	GND (0V)	8			

Example: GP IN 3 (with dry contact, ground closure, open collector drive).



2.3.2 General Purpose OUT

For forward product compatibility the GP OUT section is split on two kind of connectors.

Outputs 1 and 2 are shared with each Serial signal transmission RJ 45 terminal, labeled " Serial/Gpio ". These outputs are on floating dry contact relays with 50 Volts AC/DC and 0.25A switching capacity. The relay is open if the corresponding remote input is not triggered.

	1: GND 2: GP IN 3: RX RS 422 – or RX RS 232 4: TX RS 422 – or TX RS 232 5: TX RS 422 + 6: RX RS 422 + 7: GP OUT 8: GP OUT
--	--

Outputs 3 to 8 are on one D-SUB 15 terminal female socket. These outputs are also on floating dry contact relays with 50 Volts AC/DC and 0.25A switching capacity. The relay is also open if the corresponding remote input is not triggered.

Ground and power pins are available on the connector to ease interfacing with others machines especially if the driven machine need a voltage information rather than a contact closure.

The 12 volts output of the Stage Racer 2 is protected against external short circuit by an internal 100mA resettable fuse (polyswitch) common to GPI and GPO sockets.

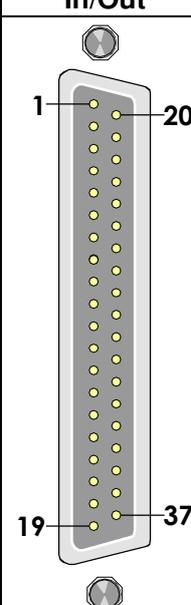
Relay N°	SIGNAL	Socket contact	D SUB 15 GP OUT	Socket contact	SIGNAL
3	GP OUT 3a	1		9	GP OUT 3b
4	GP OUT 4a	2		10	GP OUT 4b
5	GP OUT 5a	3		11	GP OUT 5b
6	GP OUT 6a	4		12	GP OUT 6b
7	GP OUT 7a	5		13	GP OUT 7b
8	GP OUT 8a	6		14	GP OUT 8b
	GND (0V)	7		15	+ 12V 100 mA
	GND (0V)	8			

Each GPI can be affected to one or Multiple GPO by using the GPIO routing grid of the Stage racer 2.

2.3.3 Analog AUDIO

2.3.3.1 Pinout

One D-SUB 37 pin female socket provides the access to the 16 balanced analog AUDIO IN.
 One D-SUB 37 pin female socket provides the access to the 16 balanced analog AUDIO OUT.

SIGNAL	Socket contact	D SUB 37 AUDIO In/Out	Socket contact	SIGNAL
AUDIO 1 +	1		20	AUDIO 1 -
AUDIO 2 +	2		21	AUDIO 2 -
AUDIO 3 +	3		22	AUDIO 3 -
AUDIO 4 +	4		23	AUDIO 4 -
AUDIO 5 +	5		24	AUDIO 5 -
GND	6		25	GND
AUDIO 6 +	7		26	AUDIO 6 -
AUDIO 7 +	8		27	AUDIO 7 -
AUDIO 8 +	9		28	AUDIO 8 -
AUDIO 9 +	10		29	AUDIO 9 -
AUDIO 10 +	11		30	AUDIO 10 -
GND	12		31	GND
AUDIO 11 +	13		32	AUDIO 11 -
AUDIO 12 +	14		33	AUDIO 12 -
AUDIO 13 +	15		34	AUDIO 13 -
AUDIO 14 +	16		35	AUDIO 14 -
AUDIO 15 +	17	36	AUDIO 15 -	
GND	18			
AUDIO 16 +	19	37	AUDIO 16 -	

Those audio signals will appear in the Audio grid of Stage racer 2.

2.3.3.2 Audio Mic gain (option)

The gain blocks are connected to channels 9 to 16.

Thru the web server each input 9 to 16 can be amplified independently with a gain ranging from 9 to 60 dB (3dB steps) with or without Phantom power supply.

If the gain on a channel is not desired the gain block can be totally bypassed and the input recovers the line input level.

The phantom power capacity is 10mA for each channel.

Caution: Beware of the input phantom power, after switching off the phantom power the 48Volts will still be present for few seconds on the inputs, time needed by the inputs capacitor to discharge thru the internal discharge resistor.

Note: The Mic gain board can be fitted afterwards.

2.3.4 AES / MADI

Digital audio is available on true 75 Ohms BNC sockets.

The total capacity of the Stage Racer 2 is 4 simultaneous bidirectional AES signals. Thru the web server, the AES 3 and 4 can be disabled to allow for MADI.

Caution: Avoid connecting 50 ohms plugs it will damage the socket central pin causing costly repair especially if this one is on the lower part of the connector side.

2.3.4.1 Bidirectional AES

Each AES port is internally equipped with a 2-4 wire converter connected to transmit a fully bidirectional path to any distant AES port of the Stage Racer 2 network. It appear in the AES audio grid of the network.

This allow to interconnect talkback panels working in a bidirectional manner on one 75 Ohms coax. The ports still can be used without configuration to transport unidirectional signal, no setup needed for channel direction.

Note1: For the internal 2-4 wire converter correct behaviour the source/terminal impedance of the machine connected to the AES ports must be 75 Ohms.

Note2: The bidirectional function of the device constraint the design especially to provide an accurate AES activity led display and avoid signal loop if port impedance is not 75 ohms. The internal FPGA seeks for AES3 audio XYZ preamble at 48 KHz to light the corresponding AES Led and enable transmission in this direction.

2.3.4.2 MADI

When selected through the web server, madi can be transmitted and port 3 become MADI input and port 4 become MADI output.

Stage racer 2 offers 2 principles for MADI transmission described below.

- **MADI RAW transport and routing:**

MADI is transmitted with the packet engine and the stage racer does not takes care of the MADI content. A MADI signals can be distributed to multiple MADI outputs thanks to the routing grid.

For transmission, the MADI clock information is transmitted along the MADI signal. At the receiving side the original clock is precisely regenerated and the MADI data is delivered accordingly to this clock.

The MADI output VCXO capture range is +/- 100 ppm.

- **MADI signal pick-up and insertion:**

In parallel to the raw transport, the MADI input signal can be internally decoded and its channels affected to other internal audio resources (Analog/Dante/Madi/SDI Embedded) of the stage racer 2 network. All decoded MADI audio transits thru SRC on order to be at Stage racer internal audio frequency.

Similarly a Madi output can be created by picking signals of various sources (Analog/Dante/Madi/SDI De-Embedded) present in the stage racer 2 network. In this case MADI is synchronous of the internal audio clock.

Madi formats supported are 56/64 channels at 48 Khz.

2.3.5 DANTE

The optional Dante board capacity provided by Ereca is 64 channels in and out.

Each individual Dante board channel can be selected and affected to the stage racer internal audio bus and routed to any stage racer 2 audio output interface (Analog/Dante/Madi/SDI Embedded).

Similarly Dante output channels can be populated by picking signals of various sources (Analog/Dante/Madi/SDI De-Embedded) present in the stage racer 2 network. All of those signals appear in the Audio audio grid of the stage racer 2 network.

The Dante board embedded in the Stage racer 2 will appear as a slave in the user Dante controller.

Two SRC are used to synchronize DANTE inputs to the Stage racer 2 internal audio frequency and to synchronize Stage racer 2 internal audio to DANTE outputs.

Note1: The Dante board is available on port IP-1. It can be “disconnected” from IP-1 port if unused, so Dante controller will not see undesired interfaces and no address conflict may happen.

Note2: The Dante board can be fitted afterwards.

2.3.6 SDI Embedding / De-Embedding.

Each SDI channel of a stage racer 2 frame is equipped with a 2 groups Embedder / De-Embedder. Depending of the SDI port direction only one is active. For 12G/6G channels only the first 3G stream is equipped with embedding / de-embedding resources. This logic is working for 48Khz embedded audio rates.

- **SDI port is an Input:**

Up to 2 groups can be de-embedded and up to 8 audios can be selected and affected to the stage racer internal audio bus and routed to any stage racer 2 audio output interface (Analog/Dante/Madi/SDI Embedded). An SRC is used to adapt from Embedded audio rate to the Stage racer 2 internal audio frequency.

- **SDI port is an Output:**

Up to 2 groups can be Embedded and up to 8 audios can be sent by picking signals of various sources (Analog/Dante/ Madi/SDI De-Embedded) present in the stage racer 2 network. An SRC is used to adapt the Stage racer 2 internal audio frequency to the SDI clock locked 48Khz.

Caution: All SDI ports features de-embedders. On early FW embedder is not available on all ports (actually only ports 4,5,10,11,16,17 and 23 do have).

2.3.7 Serial ports

Two multiprotocol RS232/422/485 serial signals are transmitted in standard by the equipment.
The supported data rate of each signal is about 500Kbds.

The setting of the serial protocol is done within the web server of the Stage Racer 2.

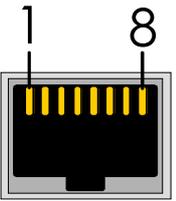
2.3.7.1 RS422/485

The RJ 45 connector provide 1 differential pair for RS422 transmission and 1 differential pair for RS422 reception.

To build a half-duplex RS485 transmission, just bridge “pin 3 with pin 4” and “pin 5 with pin 6”.

For RS485, setup the corresponding Baud rate within the web server to enable the Stage Racer 2 to manage the output impedance at the right serial byte duration.

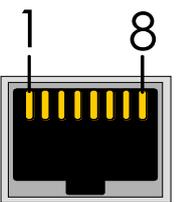
Connect the Shield to pin 1.

	<ul style="list-style-type: none">1: GND (Shield)2: GP IN3: RX RS 422 – (Stage Racer 2 electrical OUTPUT)4: TX RS 422 – (Stage Racer 2 electrical INPUT)5: TX RS 422 + (Stage Racer 2 electrical INPUT)6: RX RS 422 + (Stage Racer 2 electrical OUTPUT)7: GP OUT8: GP OUT
--	---

Note: For RS 485 Telex/RTS talkback panels please ask ERECA for wiring tip.

2.3.7.2 RS232

Refer The RS 232 signal ground to pin 1. Leave pins 5 and 6 unconnected.

	<ul style="list-style-type: none">1: GND (Ground ref/Shield)2: GP IN3: RX RS 232 – (Stage Racer 2 electrical OUTPUT)4: TX RS 232 – (Stage Racer 2 electrical INPUT)5: Do not connect6: Do not connect7: GP OUT8: GP OUT
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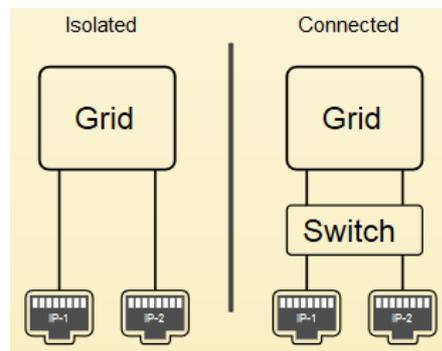
Those serial ports appear in the RS232/422/485 grid and are connectable in a peer 2 peer manner.

2.3.8 Ethernet ports/ Mode

The Stage Racer 2 offers 2 independent Gigabit Ethernet ports, which can either be isolated or connected together through an internal switch. Setting is done in the web Gui.

- When they are isolated, they behave like two completely separate ports which enables to create totally independent Peer to Peer connexions over the Stage racer 2 network.
- When the ports are connected, they can communicate with each other through an internal switch. Thus allow to create a distributed switch along the Stage racer 2 network in a daisy chained manner.

Note: The extremity nodes of the daisy chain can be isolated or connected. If they are isolated the remaining port can be used to create another separate network connexion.



Note1: The Dante board is available on port IP-1.

Note2: Port speed is 10/100/1000Mbs Autosense and support straight or crossed cables.

2.3.9 Admin port

The Stage Racer 2 is equipped with a dedicated admin port to access the web interface. Port speed is 10/100Mbs Autosense and support straight or crossed cables.

The IP of the machine can be found using the navigation buttons next to the LCD INFO screen.

Firefox browser is recommended for Gui usage.

2.3.10 Genlock/Composite VIDEO port

This port supports Composite PAL, SECAM & NTSC / Black Burst / Tri-level sync compatible is transmitted thru the Stage Racer 2 via the G/L port.

In a Stage Racer 2 network, the G/L port is direction switchable and work as follows: when the Genlock port direction is set to input on a particular unit, the direction of all the other Genlock ports of all units connected to the network will automatically be set to output. Then genlock is distributed to all the machines over the network.

Composite video is carefully processed with Minimal latency and high quality process with +/-3dB AGC input, 2x over sampling and 10 bits digital filtering and transmission is provided for this signal. Internally each machine extracts Video and Audio genlocked clocks for frame buffering purposes.

2.3.11 SDI VIDEO ports

Depending on the option chosen at the time of order, the Stage Racer 2 can be built with either 12 or 24 video channels. This is not retrofittable afterwards.

The 8 BNC of the upper row and 8 mini-BNC of the middle row can accept SD/HD/3G signals. The 8 BNC of the lower row can accept SD/HD/3G/6G/12G.

Each video port is direction switchable helping user to avoid congestion at locations with highly unbalanced number of Inputs or Outputs.

Each interface will automatically accept a standard at equal or lower rate than the standard set in the machine.

Caution: Avoid connecting 50 ohms plugs it will damage the socket central pin causing costly repair especially if this one is on the lower part of the connector side.

Note: ASI support is internally developed but not yet validated.

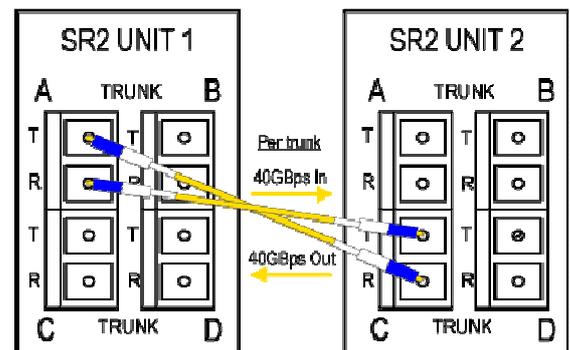
2.3.12 OPTICAL transmission ports

2.3.12.1 Optical connexion

The Stage Racer 2 transmission is based on TDM multiplexing for the all signals managed by the system. Each TDM multiplex is transmitted to another machine by "Trunk" ports.

Each unit can have up to 4 trunk ports on dual LC/PC socket for Single Mode fibre (minimum is 1 for a network endpoint).

Trunks are labelled A-B-C-D and can be connected randomly as long as the duplex fiber is connected properly : (Tx & Rx of the same trunk -> Rx & Tx of another trunk of a different unit).



Each trunk is capable of transporting up to 40Gbps of data In and Out. Trunks can be combined to offer more bandwidth or redundancy between network nodes.

2.3.12.2 Transmission principle.

Most part of the bandwidth is dynamically allocated for high datarate signals (SDI / Ethernet / Raw Madi), For any signal bandwidth is consumed only between the sources and the destinations programmed for this signal. Elsewhere on the network this amount of bandwidth is free for other signals.

A small remaining bandwidth is fixed and guaranteed, dedicated to low datarate signals (Genlock / Audio / Serial / GPIO / System management) with a predefined maximum channel capacity per signal type.

As a base rule, each trunk total capacity is:

- 25 HD signals (or similar rate signals like GB Ethernet), or 12x3G or 3x12G or any combination,
- 1 Genlock / Trilevel / Composite,
- 400 Bidirectional Audio channels,
- 50 Bidirectional Serial channels,
- 200 Bidirectional GPIO.

2.3.12.3 Trunk types

Internally a Trunk comprises of a QSFP+ mounted and connected inside the machine to the LC/PC sockets on the back of the unit. Different models can cohabitate in the unit depending of customer needs.

There are at least two types of modules available:

STAR2-T4LR: Long Reach optical module offering a guaranteed optical transmission of up to 10km. This is the most common type of Trunk used in Stage Racer 2.

STAR2-T4ER: For much longer distance the Extended Reach optical module is designed for 40Km transmission.

CAUTION: The high sensitivity APD receivers of the T4ER may be destroyed by optical power overload, do NOT apply more than -10dBm on the input port (labelled R). A damaged T4ER receiver port is not covered by warranty.

Similarly if too much power is applied the receiver may overload and the link will not establishes, in this case the optical power reading on the interface may be false as well.

NOTE: The Extended Reach module transmission length it may be affected by fiber chromatic dispersion. Losses in some rare cases of very old fiber.

REMARK: *It is advised to source the QSFP+ at Ereca as factory validates it one by one for compliance with Stage Racer 2 standard. Also the warranty label will be broken.*

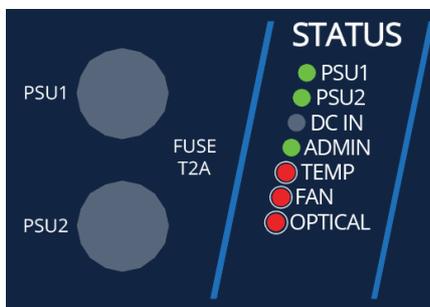
2.4 VISUALISATION

The display face provides a comprehensive LED panel of the STAGE RACER 2. For ease of trouble shooting one LED is affected per transmitted signal.



The 2 mains PSU fuses are also located on this side of the equipment for ease of replacement. (Model is 250Vac 2Amp time lag 5x20mm fuse).

2.4.1 General Status



Status related to power supply

- **PSU 1:** Green LED, ON when the PSU module 1 is powered.
- **PSU 2:** Green LED, ON when the PSU module 2 is powered.
- **DC IN:** Green LED, ON when the battery is in use (in that case PSU1 and PSU2 are unpowered)

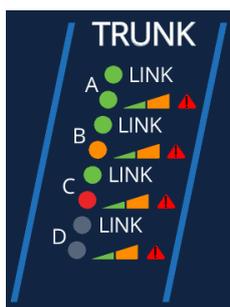
General

- **ADMIN:** GREEN LED, ON when a connection is established on the admin port.

Technical alarms

- **TEMP:** Red LED, ON when the internal temperature is over 70°C
- **FAN:** Red LED, ON when an internal fan is out of service (Open circuit or Stuck)
- **OPTICAL:** Red LED, ON when the power is low on a connected trunk

2.4.2 Trunks



Trunk activity

- **LINK:** Green LED, ON when a connection is established with another machine on that particular trunk port (A, B, C or D).

Trunk occupation

- **LED OFF,** when trunk is not used (occupation at 0%)
- **Green LED, ON** when trunk occupation is between 0% to 49%
- **Orange LED, ON** when trunk occupation is between 50 to 100%
- **Red LED, ON** when there is a problem with the trunk

2.4.3 Expansion

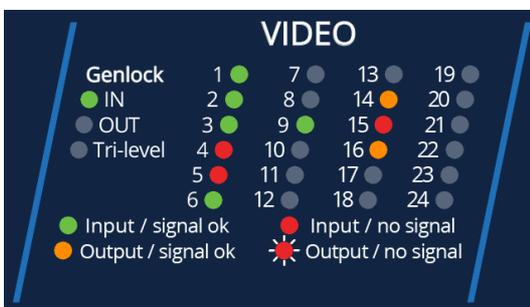


The stage racer 2 offers 4x10GB Ethernet expansion channels via the MPO connector for remote production and future various other applications. As an example of what can be done:

- **ST2110: Green LED, ON** when ST2110 mode is activated in the machine.
- **ST2022: Green LED, ON** when ST2110 mode is activated in the machine.
- **GIGABIT: Green LED, ON** when extra Gbe ports are transmitted.
- **MADI: Green LED, ON** when extra MADI's are transmitted on this machine.

- **Link 1-4: Green LED, ON** to indicate which expansion channel is linked with a peer.

2.4.4 Video Status Leds



Genlock I/O

- **IN: Green LED, ON** when the unit is Genlock master on the network and a valid Genlock signal is detected on the input.
- **OUT: Green LED, ON** when the unit is Genlock slave on the network and a valid Genlock signal is detected on the output.
- **Tri-Level: Green LED, ON** when a Tri-level signal is detected on the G/L port.

The SDI LED (1 to 24) section indicates the detection of a video signal and its direction.

- **LED OFF**, when the SDI port is disabled via the web interface.
- **Green LED, ON** when the port is configured as Input and a signal is detected conform to its standard.
- **Red LED, ON** when the port is configured as Input, but no signal is received or the signal is not conform to its configured standard. (for example, the port is configured to receive an SD signal but a 3G signal is actually present)
- **Orange LED, ON** when the port is configured as output and a valid signal is routed to that port
- **Red blinking LED, ON** when an input channel is routed to that output port but no signal is detected

2.4.5 Serial and IP



Serial RS

- **RS1 IN, Green LED ON**, when a serial signal is received on the serial port 1
- **RS1 OUT, Green LED ON**, when a serial signal is sent via the serial port 1
- **RS2 IN, Green LED ON**, when a serial signal is received on the serial port 2
- **RS2 OUT, Green LED ON**, when a serial signal is sent via the serial port 2

Ethernet

- **IP1 LINK, Green LED ON**, when an Ethernet link is established on port IP1
- **IP1 1G, Green LED ON**, when the IP link 1 is linked at 1GBps
- **IP2 LINK, Green LED ON**, when an Ethernet link is established on port IP 2
- **IP2 1G, Green LED ON**, when the IP link 2 is linked at 1GBps

2.4.6 AUDIO



AES/MADI led state depends of the equipment setting (4 AES **or** 2 AES + MADI IN + MADI OUT).

4 bidirectional AES signals.

- **AES 1-4, Green LED ON**, when a 48Khz AES signal is fed on the corresponding port
In that case, All Madi Led are Off.

2 bidirectional AES signals + 1 MADI I/O

- **AES 1-2 Green LED ON**, when a 48KHz AES signal is fed on the corresponding port
- **MADI IN, Green LED ON**, when a MADI signal is received on MADI In Port
- **MADI OUT, Green LED ON**, when a MADI signal is sent on MADI Out Port
- **MADI UNS., Red LED ON**, if the internal reclocker is not locked on the input MADI signal.

Dante

- **Dante, Green LED ON**, when the Dante hardware module is properly installed and recognised by the external Dante controller.

Analog Audio

- **1-16, Green LED ON**, indicates the activity of an analog audio signal received on the input port and/or the output port.

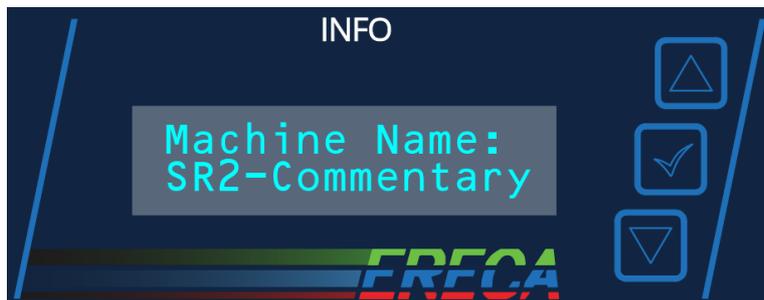
Note: The trigger level is set to -10dBm approximatively. Audio activity LEDs are refreshed every 500ms displaying if there was a level > -10dBm on the past 500ms period providing a smooth display.

2.4.7 GPIO



- **GPIO 1-8, Green LED ON**, when a GPI or GPO is activated on their respective input and output.

2.4.8 OLED Display



- **Screen**

This section provides a list of real time information for control purposes.

The blue buttons on the right allow navigating between the different information listed below and allows performing a factory reset of the unit. (Need firm finger press in their center).

- **List of messages**

Machine Name: SR2-Commentary	Name of the machine set in the web interface
IP address: 192.168.1.248	IP address of the machine set in the web interface
MAC Address: 507E:EC00:4107	MAC address of the machine
TA Rx 0.2 dBm TB Rx -0.4 dBm	Lowest optical power received on Trunks A & B
TC Rx -6.5 dBm TD Rx -40 dBm	Lowest optical power received on Trunks C & D
Intern Tp 38 Deg Fan Speed 9%	Internal temperature of unit (operating range: -20°C to +60°) Fan speed is automatically adjusted depending on internal temperature
Trunk A load In: 4% Out: 0%	Occupation of trunk A In: Bandwidth occupation of signals coming from the distant Node Out: Bandwidth occupation of signals sent to the distant Node
Trunk B load In: 40% Out: 32%	Occupation of trunk B In: Bandwidth occupation of signals coming from the distant Node Out: Bandwidth occupation of signals sent to the distant Node
Trunk C load In: 75% Out: 67%	Occupation of trunk C In: Bandwidth occupation of signals coming from the distant Node Out: Bandwidth occupation of signals sent to the distant Node
Trunk D load In: 0% Out: 0%	Occupation of trunk D In: Bandwidth occupation of signals coming from the distant Node Out: Bandwidth occupation of signals sent to the distant Node

- **Reset from pushbuttons**

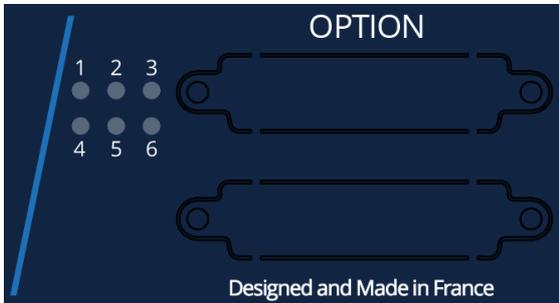
The unit can be individually reset to factory default configuration. It is important to understand all configuration made on this unit will be lost. Therefore, we recommend you to make a backup of the unit via the web interface prior to this operation.

To perform a factory reset:

- Disconnect the unit from the network by temporarily remove the trunks fibres connected to it
- Press and hold the **up** and **down** button for 3s and wait for the message "Press Val..." to appear
- Then the **validate** button on the right side of the screen needs to be pressed within 5s, otherwise, the operation will cancel automatically.
- After the operation is complete, it is recommended to reboot the unit.

2.5 OPTIONAL CONNECTORS

2.5.1 Description



Available hardware options

There are two hardware options available on D-Sub25 connectors:

- **6 additional 500Kbps RS422 channels**
In this case the 6 LED next to the connector will display the IN/OUT activity of each additional serial links.
- **DC input** Provision for D sub socket with power inserts to connect a 10-16 VDC battery to power the Stage Racer 2, used in case of mains power loss.

Caution: The DC input is protected by internal fast acting fuse, any polarity reversal will blow the fuse. Due to the high current involved a resettable protection is not possible.

2.5.2 RS422 option pinout

One D SUB 25 pin female socket provides access to additional RS422 optional channels 1 to 6.

Channel	SIGNAL	Socket contact	D SUB 25 RS422 1to6	Socket contact	SIGNAL
1 (3)	IN 1 -	1		14	IN 1 +
1 (3)	OUT 1 +	2		15	OUT 1 -
2 (4)	IN 2 -	3		16	IN 2 +
2 (4)	OUT 2 +	4		17	OUT 2 -
3 (5)	IN 3 -	5		18	IN 3 +
3 (5)	OUT 3 +	6		19	OUT 3 -
all	GND	7		20	IN 4 -
4 (6)	IN 4 +	8		21	OUT 4 +
4 (6)	OUT 4 -	9		22	IN 5 -
5 (7)	IN 5 +	10		23	OUT 5 +
5 (7)	OUT 5 -	11		24	IN 6 -
6 (8)	IN 6 +	12		25	OUT 6 +
6 (8)	OUT 6 -	13			

Remark: (x) denotes the logical channel in the GUI.

It is strongly recommended to connect the shield of the signals transmitted to the GND pin.

Each LED summarize the Input and Output signal activity on the corresponding channel. Each signal activity is also reported on the web interface.

Each differential input is not 120Ohms loaded internally for optimum compatibility with transmitted protocols. If impedance matching is needed a small SFR16 resistor could be added directly on the D SUB pins, together with the signal wire.

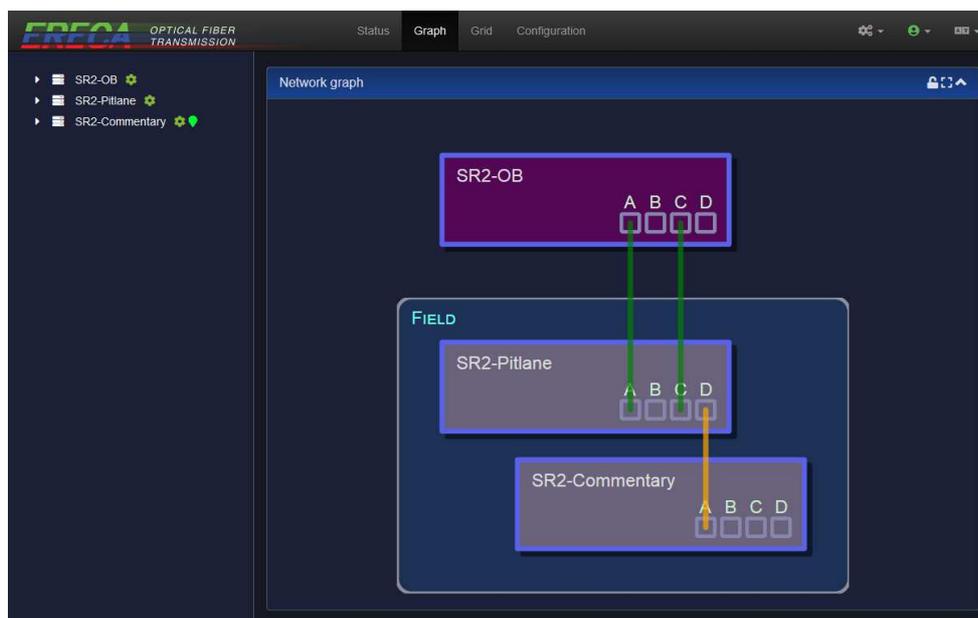
Note 1: For RS 485 Telex/RTS talkback panels please ask ERECA for wiring tip.

Note 2: As the differential inputs are unloaded internally a small crosstalk should happen on the adjacent channel only if it is unused and left floating.

3 MANAGEMENT

3.1 WEB MANAGEMENT INTERFACE

The STAGE RACER 2 whole network can be monitored and configured through a single web interface. The RJ45 Ethernet **admin port** (not IP1 neither IP2) provides access to the embedded web server interface.

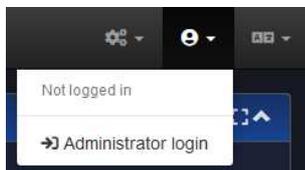


Note: Firefox browser preferred / minimal resolution of 1920x1080

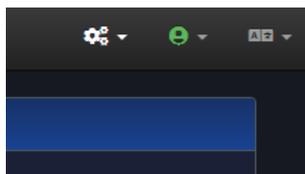
Tip: To locate the IP address of the unit, use the Up/Down button on the front of the unit and navigate to the IP address section (cf. [2.4.8](#)) and type the IP in your browser (Stage racer 2 default is: 192.168.1.248).

3.1.1 Admin login / Language selection

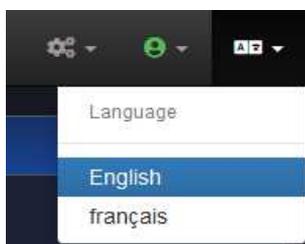
It is necessary to have an administrator access to proceed with any changes in the configuration. First thing to be done is to log in as Administrator by doing the following:



Click the icon on the top right bar and select "administrator login"; the default password is "ereca".



When the user is now connected as an administrator, the icon turns green.



Finally the web interface automatically detects the browser language. However it is also possible to select a different one.

3.1.2 Web interface Organisation

There are three main pages on the web interface accessible from the top navigation bar:

Graph

Provides a live overview of the network and allow configuration of all units available in the network and their respective input/outputs ports.

Grid

Allows to route and distribute signals across the network.

Configuration

Allows to modify administrator settings / firmware update.

Note: On older firmware revisions a status page was indicating local machine settings and optical power received locally. On, Firmware's > 2.9 status info's have been much enhanced and is now integrated in the graph page. Rest of functions are moved to the configuration pages.

Status

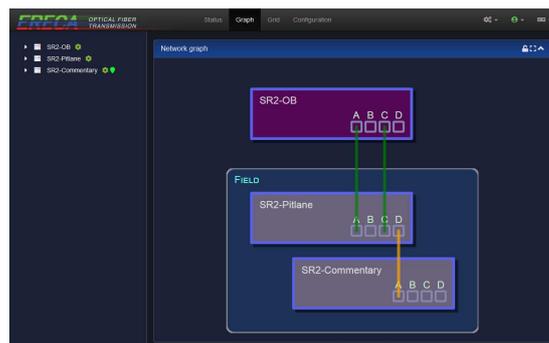
Provides information on the status of the machine, the optical power of the active trunks and allows to proceed to a firmware upgrade.

3.2 GRAPH PAGE ESSENTIALS

The landing page of the web interface is "Graph" which presents a live overview of the network and how units are physically interconnected.

The page auto-populates in real-time when a unit or trunk is connected/disconnected.

The list of the nodes (Stage racer 2 frames) composing the network units also appear on the left side presented in a tree view manner.



Redundant links between nodes are represented as Green while non-redundant links appear in Orange.

Additionally, A green landing icon in the tree view list indicates the unit on which user is connected to (physical admin connexion).

3.2.1 Configure a specific node



Click on the green wheel icon next to the unit name.

The machine configuration window pops-up allowing to:

- Name the machine so it can be identified throughout the network. *Nb: the name is also visible in the front LCD of the unit*
- Group multiple machines together (all units with the same group name will be visually circled together in the graph)
- Assign a colour for each unit (same color will be reused on the Grid view).
- Set the IP address, netmask, gateway of the Admin port.

3.2.2 Port Setting

Before any routing attempt, each desired port must be activated properly.

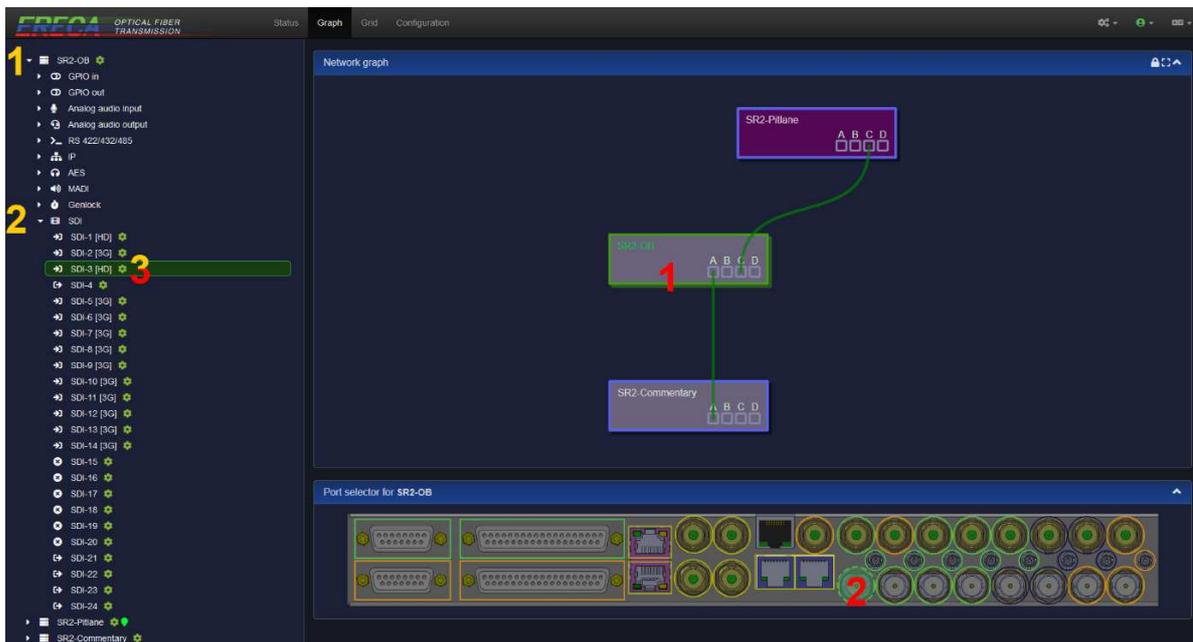
Most of ports can be simply enabled or disabled but SDI ports require more setup as follow:

- Direction of the port have to be set.
- Maximum SDI rate allowed must be set for any inputs.

Every port can be renamed, otherwise the default machine name will be used.

Every port that is not enabled will not appear in the grid view.

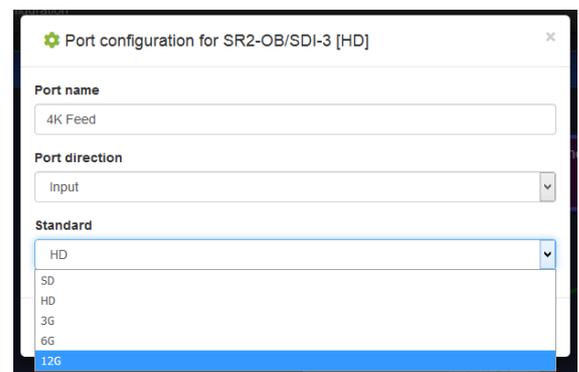
There are two methods to configure a port, the *Port selector* or the *Tree view*.



3.2.2.1 Port selector

Port selector acts as a quick select for ports involving a single signal (SDI / Serial / Ethernet / Genlock).

- 1 - Select one node on the network graph, then the port selector view opens below the graph,
- 2 - Select one or multiple ports (using Ctrl + Click),
- 3 - Click the configuration wheel next to one selected port label to open the port configuration windows then set the desired parameters.



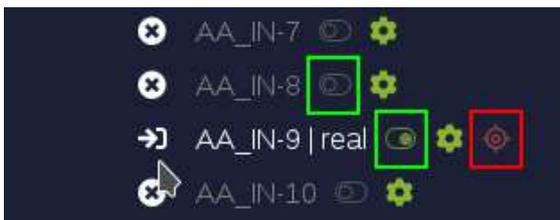
Note: In case of multiple ports selection same settings are affected to those ports (Direction / Standard). The name cannot be changed while doing multiple selection.

3.2.2.2 Tree View

The tree view selector allow you to navigate to the right signal you need by unfolding the desired machine / signal set and finally the right signal. Then click on the configuration wheel to do the settings.

Selection of multiple ports of the same category is also supported.

Note that on Firmware's > 2.10 quick enable/disable switch were added next to the configuration wheel allowing fast enable / disable of ports without renaming it neither changing standard. Additionally if the signal is actually used in the grid a small crosspoint icon is also displayed as a warning against undesired disable action.



3.2.3 Machine status

On Firmware's > 2.10 the selected node technical status is displayed at the bottom of the graph page.



This enhanced reprint of the display screen allows user to know the detailed condition of this node.

3.2.3.1 Status / Signals presence

On the left side general status and the signal presence are displayed as on the visualization screen. Optional parts like extra RS422 and Trunks are masked or grayed if not present in the machine

3.2.3.2 Node condition

On the right side the node technical condition is displayed as follows:

- Main components temperature,
- Main power supplies,
- Fan currents,
- Optical power received on trunks.

Nominally all values are displayed in Green. If value start to be out of tolerance, value turn to Orange and if it is totally out of tolerance display turns Red.

Note on thermal management: with normal airflow Fpga and Motherboard Temperature are similar. If Airflow is obstructed, FPGA will become hotter at high operating temperatures. A protective thermal shutdown is operated when FPGA temperature is over 95°C in order to protect silicon with a good safety margin. Power cycle is needed to restart the internal PSU section after unit self-cooling (The fans are still running after thermal shutdown allowing fast cool down when fresh air is allowed again to flow thru the unit).

3.2.3.3 Optical power measurement

Particular care have been done on optical power display for advanced users. As the Trunks are based on QSFP standard with 4 wavelength only the lowest power is displayed at first. At hover of the mouse the four optical powers are displayed to help trouble shooting of unequal losses on the fiber.

Each figure is displayed in different colours if the alarm threshold is reached:

- Green, when optical power is above -10dBm,
- Orange, when optical power is between -10dBm to -13dBm,
- Red, when optical power below -13dBm.

The optical level below -10dBm warns the user against a too high fibre attenuation or a dirty connection, it does not mean that the signal will be lost but that a connector cleaning or fibre trouble shoot has to be done as soon as possible.

Note1: When optical power received is much too low 2 (< -40 dBm) white dashes (“--”) are displayed.

Note2: The optical thresholds are fixed and apply for T4LR trunks. In a future FW revision they will adapt automatically if a trunk is equipped with T4ER (receiver with +6 dB more sensitivity).

3.2.4 Signal type summary

The port configuration option allows you to set a name for each port, the direction, its standard and some other specific options.

Here is a summary of all possibilities depending on signal type

Signal Type	GPIO	Analog audio	Serial	IP	AES	MADI In	MADI Out	Genlock	SDI (top & middle row)	SDI 12G (bottom row)
Port Direction	In & Out.	In & Out.	In & Out.	In & Out.	Bidi	In	Out	In or Out	In or Out	In or Out
Standard available			RS422 RS232 RS485	10 Mbs 100Mbs Gigabit (Autosense)	AES 48Khz	MADI 64ch 48Khz	MADI 64ch 48Khz	Composite Bilevel Trilvel (Auto sense)	SD *ASI HD 3G	SD HD 3G 6G 12G
Option				Peer to Peer Chained	Switch between AES3/4 or MADI In+Out					

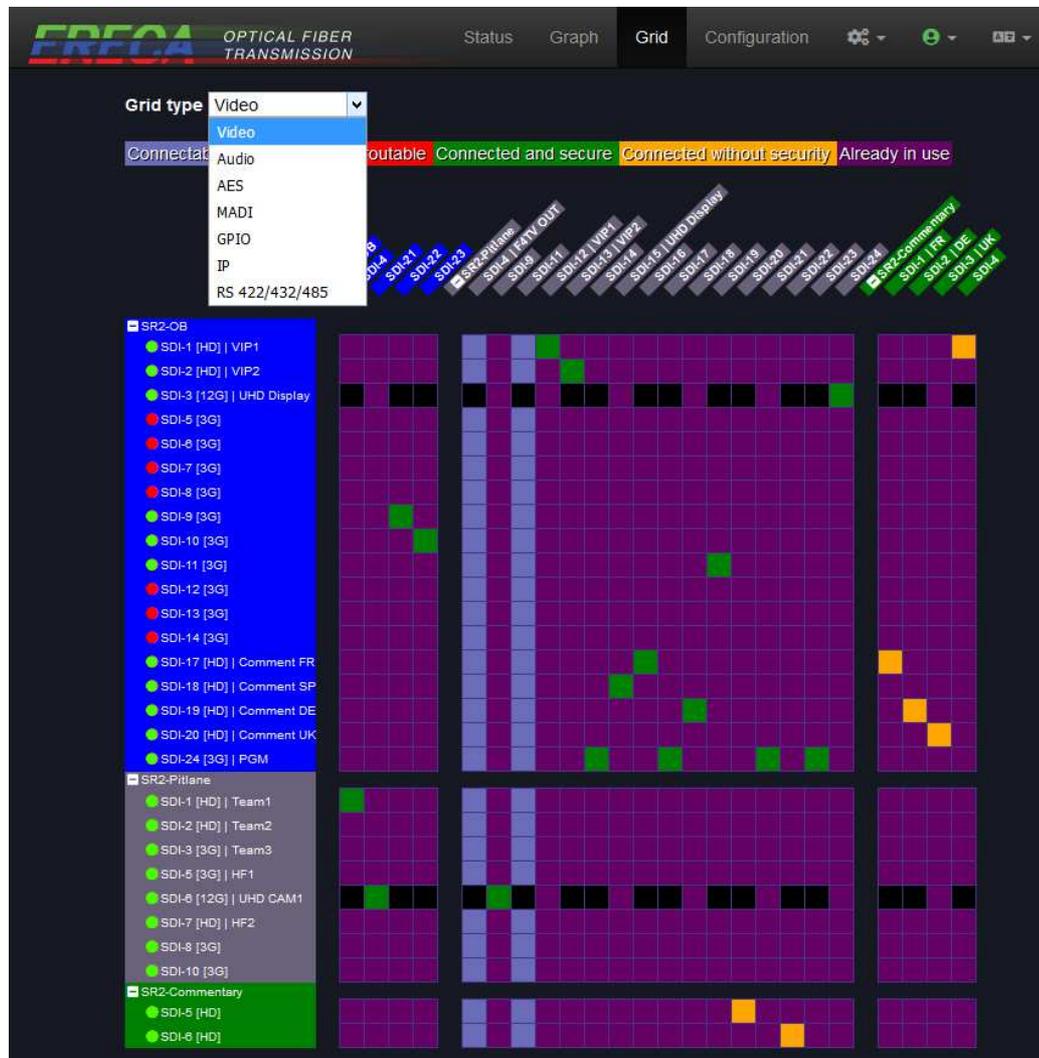
By setting the standard, the bandwidth is allocated in advance. Therefore, a port set up in 3G can accept any signal of lower bandwidth like HD or SD, but not above (eg. 6G or 12G). The same way a port set to 12G can accept any signal with lower bandwidth. The bandwidth constraint is done on the inputs signal only any output can accept a datarate up to its theoretical maximum.

Note: * Asi signals can be routed on the 3G ports only. This feature is already implemented but cannot be used in the actual Firmware.

3.3 GRID PAGE / ROUTING SIGNALS

3.3.1 Grid Page Presentation

The Grid page allows to route all signals available on the network (peer to peer or distribution)



The routing crosspoints are filtered by signal type with the dropdown menu above allowing to switch between matrix for the Video, Audio, AES, MADI, GPIO, IP or Serial channels.

In the grid, signals listed vertically correspond to all input signals available and configured, while all signals listed horizontally correspond to output signals. These ports are grouped per Stage Racer 2 units for easier filtering.

The port name labelling is formatted in the following manner of “Physical Port Type-Number” “[Input Signal Type]” | “User Label”. For example: *SDI-3 [12G] UHD Monitor*

The Green / Red dot indicates signal presence on each port.

3.3.2 Establish a route between ports

The connection between an input and an output is done by a simple click between two ports (in & out).



The route can be established, meaning user can click to establish a new crosspoint.



The route is already in use, which means the output is already fed by an input signal. To change the latter, simply select another input to establish a new route.



A correctly established route is represented in Green when the path taken by the signals have redundancy.



A correctly established route is represented in Orange when the path taken by the signals cannot have redundancy regarding the actual network topology.



If there is not enough bandwidth available between two machines, then connection is unrouteable. If possible, it is recommended to add another trunk between the units to increase bandwidth.

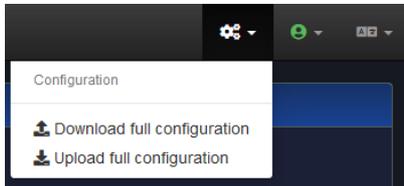


Any input can be patched to an output as long as the corresponding output is compatible. For example: A 12G input can only be sent to a 12G output port. As well a 12G input cannot be routed to a 3G output. In this case, the grid cross point is displayed in back and cannot be selected.

3.4 BACKUP / RESET / FW UPGRADE

3.4.1 Backup/Restore a configuration

It is possible to back the full configuration of the network or of a single unit to restore it later.



- **Backup – Download full configuration**

To proceed with a backup, select the “download full configuration” on the top right navigation bar. You can name the configuration file *.json and save it in the support of your choice.

This file contains the entire configuration of the network in its current state.

- Configuration of each machine connected
- Configuration of each ports
- Routing of signals in the network

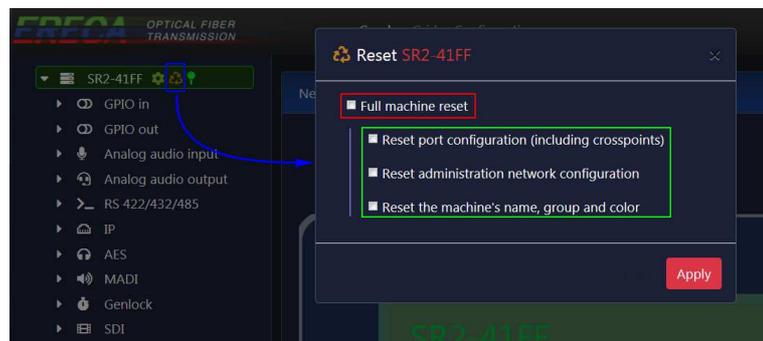
- **Restore – Upload full configuration**

To restore a configuration, use the “upload full configuration” and select a *.json file previously saved. The changes appear immediately to all connected units and do not require a reboot.

This feature allows user to backup the configuration of a network; disconnect one or multiple units and use them on different jobs; apply a different configurations to these units. Later on user can connect them back, restore the initial backup, and the configuration will be applied to them as it was saved in the full networked configuration.

3.4.2 Reset Machine Configuration

By clicking on the Icon highlighted in blue it is possible to reset totally or partially a machine.



By ticking the “Full machine reset” the entire machine settings will be reset to default: Signal names, Admin settings, Machine name...Alternatively a subset of those parameters can be reset individually, select the desired ones in the zone highlighted in green.

To cancel the operation, click on the cross in the upper right corner if the window. Otherwise click “Apply”.

Full reset can be initiated by the FRONT panel keyboard, see display section 2.4.8

3.4.3 Firmware upgrade

Each time ERECA releases a new firmware with new routing / processing functions, any known user may update his machines with this latest firmware if needed.

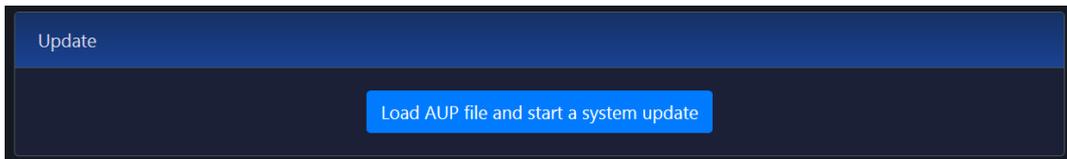
Update have to be done on each machine and takes less than one minute per machine. The update file is a package containing every info for internal Processor and FPGA's upgrade. The package will be self-extracted by the machine and flashed. At next reboot the machine will start on the new firmware.

Note that if something should go wrong in the update (power loss / corrupted file) the machine will boot on the Firmware that was ran just before the update.

It is strongly advised to do a backup of the network configuration before as database structure may change with the upgrade due to new functions. An upload of the last configuration should restore as much as possible the last settings.

Update process:

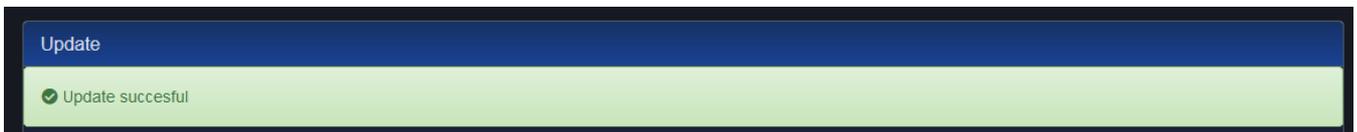
- Navigate to the configuration page and click on the “Load AUP and start upgrade” button.



- Locate the right file on your computer, select it, then the update starts automatically, a new window opens and log of update is displayed quickly.



- After “update successful” message, wait 10 seconds and reboot the unit. That is done.



4 TECHNICAL SPECIFICATIONS

4.1 MAIN HARDWARE

STAGE RACER 2 STANDARD CONFIGURATION	
Optical	
Trunk :	10Km of single mode fiber / Link power budget 10dB / LC/PC connector. (Optionally 40Km range).
SDI Video	
Number, connector:	12 or 24 Channels (Each channel is direction configurable).
Impedance:	75 Ω .
Standard (Lower row):	SDI, HD, 3G, 6G, 12G / BNC Connector.
Standard (Mid row):	SDI, HD, 3G / HD-BNC Mini Connector.
Standard (Upper row):	SDI, HD, 3G / BNC Connector.
Return loss:	Better than - 15 dB for 0 to 1,5 GHz / - 10 dB for 1,5 to 3 GHz / -6 dB for 6 to 12 GHz.
Composite Video / GL	
Number	1 port, direction configurable / BNC Connector.
Standard:	PAL, NTSC. Composite / BB / Tri-level (Auto sense). Genlock clock may not support all formats.
Impedance:	75 Ω
Bandwidth:	> 5.8 MHz at +/- 0.2 dB
Differential Gain/ Phase	< 1%, < 1°
Group delay:	< 10 ns
SNR:	> 67 dB (CCIR567)
Analog Audio	
Number, connector:	16 bidirectional channels, D-SUB 37 female socket.
Impedance:	Input: 10 K Ω differential (non floating), Output: 20 Ω differential (non floating)
Amplitude:	+4 dBm nominal (saturation at + 18 dBm)
Bandwidth:	50 Hz to 15 KHz at +/- 0.5dB, (20 Hz to 20 KHz at -3 dB)
Distortion:	0.05% at 1Khz +18 dBm
Signal to noise ratio:	90dB, "A" weighted
Digital audio	
AES ports	4 bidirectional ports (Intercom panel compatible) / 75 Ω BNC connector / Shared with Madi port BNC.
MADI port	1 input, 1 output / 48 or 96 KHz support (SRC) / 75 Ω BNC connector.
Serial	
Number, connector:	2 bidirectional channels, 1 RJ 45 socket per channel.
Protocols:	RS485, RS422, RS232
Data rate:	0 to 500 Kbps (Sony compatible).
Ethernet	
Number, connector:	2 independent channels, RJ45 Socket.
Protocols:	10, 100 or 1000 Mb/s, Full or Half-duplex (Auto), MDI or MDI-X (Auto).
GPIO	
Number, connector:	8 bidirectional GPIO contacts / 6 on D-SUB 15 female plus 1 GPIO along each RJ45 Serial connector.
Output:	Relay (dry contact). 'Common' – 'Normally Open' terminals for each relay.
Input:	Floating on the D-SUB, Input pin grounding on RJ45.
Powering	
Consumption:	80 Watts per unit maximum (All trunks and all signals used + Remote production active).
Mains source:	Dual redundant built in PSU / Voltage range 90 to 260 VAC / 47 to 63 Hz.
Mechanical	
Size :	1 RU 19" rack, depth 335mm excluding connectors.
Weight:	4.5 Kilograms.
Cooling:	Internal fan tray with transversal cooling flow / side panels in/out / Passive heatsinks on actives.
Operating Temp range:	From -20 to + 60°C. (Avoiding direct sun exposition).
Signalling / Setup	
Local display:	OLED display for main parameters (IP add / Optical power) / 1 LED per signal / Technical alarms LED.
Setup:	Web interface / Automation protocols (VSM, KSC Core...)

Remote	1 dedicated 10/100Mbps Ethernet port.
--------	---------------------------------------

4.2 OPTIONS

STAGE RACER 2 OPTIONAL MODULES (retrofit possible)	
OPTION - Analog Audio Mic preamp / 48V	
Input:	8 Microphone input gain blocks fitted on channels 9 of the 16.
Mic input, Gain:	Gain from 10 to 60dB (3dB steps) / Preamp Bypass, through internal Web Server.
Phantom power:	48 volts switchable, through internal Web Server, Source Impedance 6.8 K Ω .
OPTION - Dante/AES67	
Number, connector:	64 bidirectional channels / 48Khz support (SRC) / Routed to the gigabit port IP1.
Protocols:	Dante/AES67
OPTION - Serial	
Number, connector:	6 bidirectional channels, D-SUB 25 female socket on front side.
Protocols:	RS422
Data rate:	0 to 500 Kbps (Sony compatible)
OPTION - Battery powering	
Low voltage option:	10 to 16 VDC / D-SUB 25 with power inserts (fitted on front side) / protected by internal fast acting fuse.