



Pixel Processing Operating Juggler 2 Pixel Processor

User Guide



Operating Juggler 2 Pixel Processor : User Guide

Trademark Information

The 7thsense logo, and various hardware and software product names are trademarks of 7thSense Design Ltd. Product or company names that may be mentioned in 7thSense publications are tradenames or trademarks of their respective owners, and such trademarks may also be registered in their respective countries. Windows is a registered trademark of Microsoft Corporation in the United States and other countries.

Copyright Information

All Rights Reserved. This document is copyrighted © by 7thSense Design Ltd and shall not be reproduced or copied without express written authorisation from 7thSense Design Ltd.

The information in this document is subject to change without notice. 7thSense Design Ltd assumes no responsibility for errors, and/or omissions contained in this information.

Printed: July 2024

This edition is for software version N/A
Document ref.: M757-2

E: info@7thsense.one
W: 7thsense.one

7thSense Design Ltd
2 The Courtyard, Shoreham Road
Upper Beeding
Steyning
West Sussex
BN44 3TN
UK

T: +44 (0) 1903 812299

7thSense Design LLC
4207 Vineland Rd
Suite M1
Orlando, FL 32811
USA

T: +1 407 505 5200



Introduction	4
Installation	6
Environment	8
Care and Maintenance	9
Rear Panel Connections	11
Front Panel	13
Front Panel Controls and Display	14
Workflow: Physical Connections	20
Connect a Juggler Optical Data Bus	21
Connecting to a Network and Devices	23
Juggler 2 Physical Specifications	24
Warranty, Support and Service	25
Regulatory Compliance	26
Document Information	27
Index	28

Introduction

Juggler® 2 is a highly configurable and powerful modular pixel processor, designed for and scalable up to the demands of very largest venues. Multiple Juggler 2 units can be bussed together via a high-speed box-to-box fibre-optic link to expand system requirements and with complete failover capability almost without limit. The configuration of a particular Juggler 2 unit will optimise use of the available bandwidth according to requirement.



Jugglers run the Compere® software to form integrated systems with Actor® media servers, Conjurer® generative content servers, with ST 2110 transport over IP supported throughout. It is the Compere software that creates integrated projects, manages all networking and external control.

For setting network connections, connecting and routing a fibre bus, and building project groups of multiple devices, see the Compere User Guides on the [7thSense user portal](#).

Summary features and capability of the Juggler 2 pixel processor

- Configurability: multiple Juggler processors can be linked via high-speed box-to-box fibre-optic cables, to add additional input and output capability.
- Video signals: up and down scaling, video matrixing, picture-in-picture, time base correcting, format conversion, framerate conversion, signal type conversion, and bit-depth.
- Features SMPTE ST 2110 input and output to support the latest in video signal distribution standards.
- DisplayPort™ 1.4, 12G SDI (available soon) and HDMI® 2.0 baseband modules.
- Supports input and output bandwidth up to DCI 4K @ 60 FPS 12-bit 4:4:4
- Video signal type conversion between most digital input and output interfaces, including baseband and ST 2110 (analogue not supported).
- Warp and blend via 2D MPCDI file import.
- Colourspace mapping via colour space conversion.
- DisplayPort SST to MST Conversion.
- External control over IP (TCP, UDP, Art-Net™).

- User interface: 7thSense Compere software.
- Confidence monitoring for all inputs via front panel.

Installation

Lifting

The weight of the Juggler 2 unit is stated in the [Physical Specifications](#) ²⁴ and on the product label. Observe your internal manual handling recommendations to avoid injury, especially when manoeuvring units into a rack at height.

Rack Mounting

The fascia panel must first be removed before mounting in a rack.

Note: Once mounted, sufficient finger access should be allowed in the rack sides to again remove the fascia for maintenance.



Remove the two small retaining screws bottom left and right, and then pull the fascia off its push-fit fasteners. Refit the fascia after mounting. Where side access is restricted for unranking, a 7thSense tool is available to insert into the grille. Take care not to damage the grille with other tools, or force when removing.



Juggler 2 is supplied with rack-mount slide rails and fixings. Installation instructions are included with the slide rails. Ensure that each unit is properly secured to the rack cabinet using M6 bolts.

Rack stability warnings

- Ensure the rack is stable (e.g. bolted to the floor) before sliding out the Juggler unit.
- Do not place objects on equipment projecting from a rack (e.g. do not use as a shelf).
- Only slide out one piece of equipment from the rack at a time.

Airflow and cooling

Airflow intake is through the filtered vents in the front panel, and exhaust is out through the rear panel. These vents must all have a clearance of at least 50 mm.

Environment

- Juggler 2 is intended for use in a commercial (not domestic) environment and should be operated in a clean, dust free area (e.g. a server room).
- It is intended for operation in benign environments (not subject to corrosive or explosive atmospheres, moisture or flammable gases).
- Units are not protected against ingress of liquid (IPx0) or designed to be subject to excessive mechanical shock or vibration.



Only used at altitude not exceeding 2000 m



Only used in not-tropical climate regions

Thermal

Do not block any of the unit's air vents and ensure the ambient temperature around the Juggler 2 is compatible with the environmental characteristics stated in the [Physical Specifications](#)²⁴.

Particularly when mounted in a rack cabinet with front or rear doors the ambient temperature around the unit may be higher than the ambient room temperature.

Electrical

Before connecting power to the unit, ensure the electricity supply is compatible with the electrical ratings shown in this document and on the unit's product label. The unit shall not be connected to an IT (unearthed neutral) power distribution system and the mains socket-outlet used shall connect to the building installation ground.

Juggler 2 is connected to and disconnected from the mains supply with the IEC 60320 power connector on the rear of the unit.

Care and Maintenance

Cleaning

External casing and the front panel should be carefully wiped with a soft cloth and antistatic solution.

Air filters

Juggler 2 units are supplied with spare filter pads. Others can be provided by your supplier. Juggler 2 should not be run without filters, since accumulations of dust inside the unit can affect performance.

Replacing filters

The front fascia is mounted on push-fit fasteners and secured by two small screws. Remove these screws before attempting to remove the fascia (see [Installation](#) ⁶):



The front fascia can then be pulled straight off. The right-side filter has a cutout for the power switch. Each filter pad is simply fitted under the respective rails.



Dual Redundant Power Supply Fuses

The Juggler 2 is protected by 2 × 5 A removable fuses mounted in the rear panel. If either malfunctions, both must only be replaced by a qualified person, using only T5A/250VAC 5 × 20 mm

ceramic cartridge fuses (Eaton-Bussmann series S505-5-R T speed). Disconnect the Juggler 2 from the mains supply before rotating the holders using a suitable tool and withdrawing the fuses. Fit new fuses, reinsert, and secure both before reconnecting.

Internal maintenance

There are no internal user-serviceable electrical parts.

I/O cards are not hot-swappable: power off the unit before removing or replacing.

Certain custom I/O cards may carry a user-replaceable coin cell battery. Switch the unit off before releasing the two panel mounting screws and withdraw the card. Replace the cell before reinserting and securing the card.

Electrostatic discharge (ESD)

When handling electronic assemblies, take precautions to avoid electrostatic discharge (ESD) causing damage. Precautions should include the wearing of an ESD protective wrist strap and using antistatic bags for electronic assemblies when not installed in any equipment.

Warning: Do not operate the Juggler with any covers removed as the air flow through the unit will be compromised and may lead to overheating. The lid of the Juggler forms an integral part of the cooling circuit. Operation of the unit with the lid removed can cause overheating.

Any alterations to the product's specification, e.g. additional/alternative components, may invalidate the warranty or impact the unit's performance. Additionally, such changes or modifications could cause equipment no longer to comply with the relevant EMC regulations, and void the user's authority to operate the equipment. If in doubt, please contact your supplier.

End of Service Life



Dispose of the equipment and any components in accordance with all local and national safety and environmental requirements.

Rear Panel Connections

The Juggler 2 rear panel reflects its highly configurable nature. It has 6 available slots for I/O cards, ranging from QSFP, SFP, to HDMI, DP or even custom cards.*

Slot 7 on the far left is always the System I/O module, and the power and communications panel lies to the right of slot 1.



The I/O cards in slots 6-1 (numbered right to left) are push-fit but are not hot-swappable. The firmware of each Juggler 2 unit is custom to the physical arrangement of the unit. The example above shows two QSFP 28 cards, which can be used for optical bus or ST 2110 functionality, one HDMI 2.0 card and one DisplayPort 1.4.

Power and Communications Panel

Power is supplied to the dual redundant power supply units in the Juggler via a standard IEC connector. This can be retained using the mounted sprung clip:

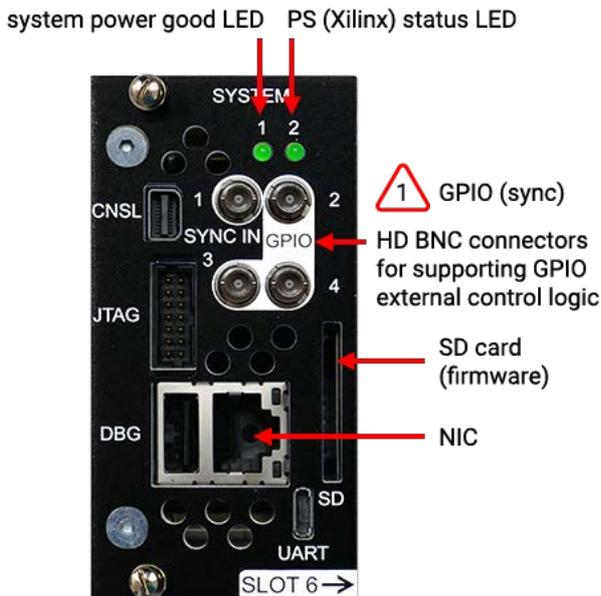


To the left of this are the two fuses for each internal power supply. (For replacement, see [Care and Maintenance](#) ⁹.)

Juggler 2 is capable of hosting a 10G NIC. Where this is not included, there will be a blanking plate in this location.

Debug features are for systems support only.

System I/O Module



This panel contains the unit's RJ45 network connection, four GPIO connectors, and the firmware SD card.

 GPIO 1 is used for receiving tri-level sync signals. All other ports are configuration and debug purposes only.

Note that Compere software and Juggler-specific firmware can be updated via the Compere UI. The SD card will never normally be required to be accessed.

Connecting External Equipment

To ensure best performance from the Juggler 2 and compliance with relevant EMC regulations, this equipment should only be used with high-quality shielded data and signal cables.

Only equipment and accessories approved to IEC 60950-1 and SELV circuits may be connected to the unit. All equipment and accessories shall comply to the relevant standard for the port or ports to which it is connected.

Front Panel



The Juggler 2 front panel has a touch-screen display, the 7-symbol power button (recessed into the fascia, top right) and a single USB 3 connector to the internal processor that runs Compere and the front panel display. The USB connector is for keyboard access to the internal processor (single board computer running Linux).

Switching on

Juggler 2 must first be connected to an appropriate power source using the supplied IEC power cord. The front panel power button will show a dimly illuminated '7' indicating this connection. Press and release the power button to start the unit. The power button will show bright and the display panel will go through a start-up cycle before settling to the landing page shown above.

Reset

Should you need to reset the internal FPGA board only, the power button can be pressed and held for 3 seconds then released when the '7' light dims. The button will flash for 2 seconds before returning to normal status.

Front Panel Controls and Display

The front panel display is a touch-screen controller for the Juggler. It is used for configuration, monitoring and play control. Touch and swipe navigation provides selection menus, and NDI media display in user-selectable layouts. The panel can itself be tested and calibrated.

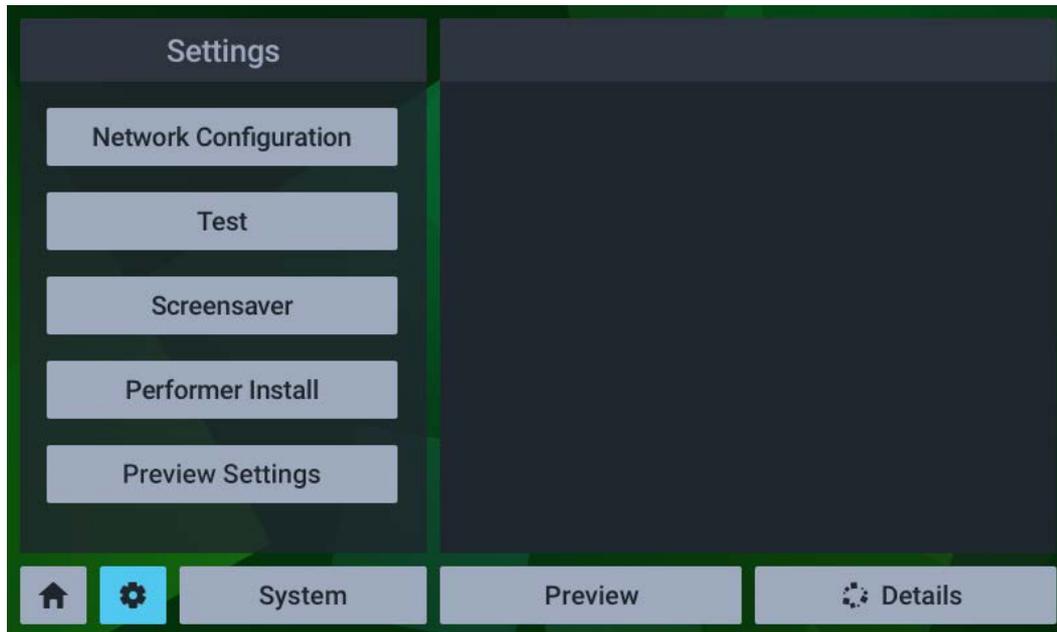
Landing Page

When powered up, the home/landing page on the touch-screen display identifies the Juggler unit, its name, role, Project Group, and IP address.



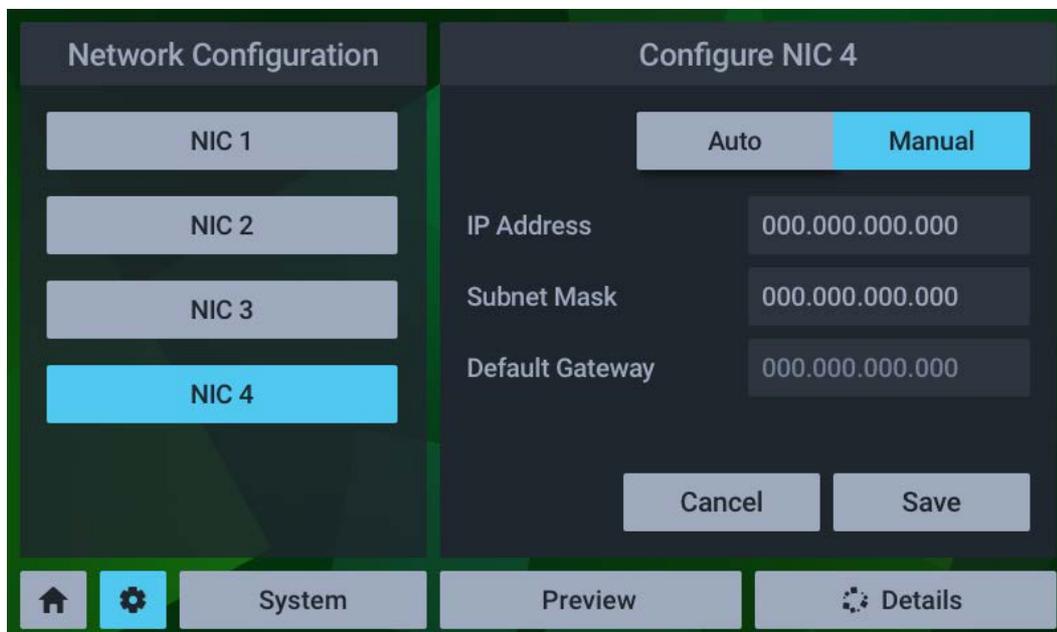
Touch-the display menu to access NIC settings, system information and timeline controls, details, and preview settings.

 **Settings**



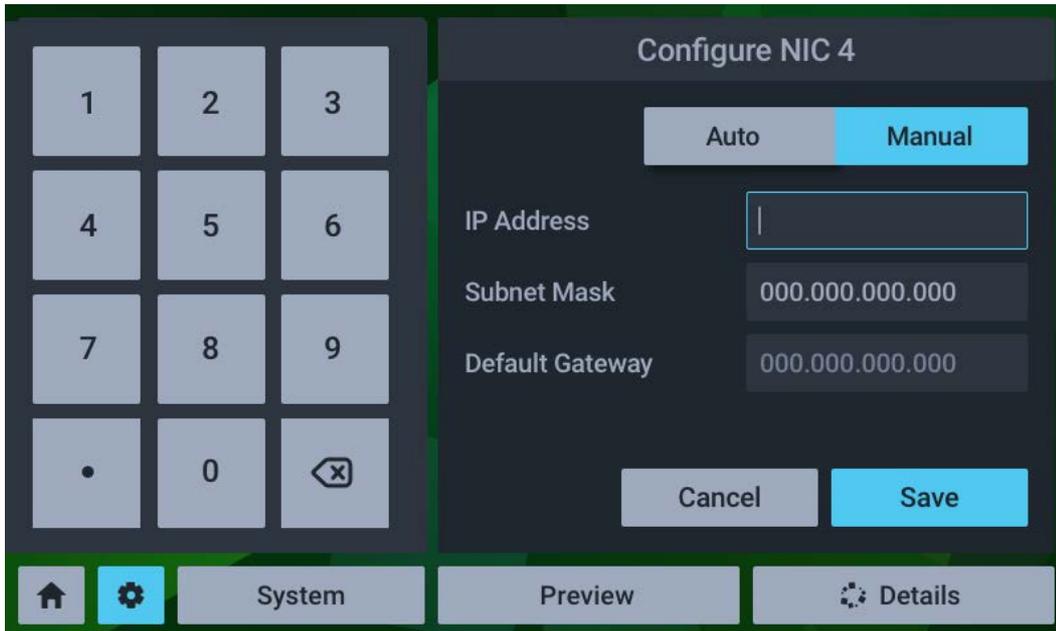
Settings > Network configuration

This shows all IP addresses and allows Auto (DHCP) and manual NIC configuration:



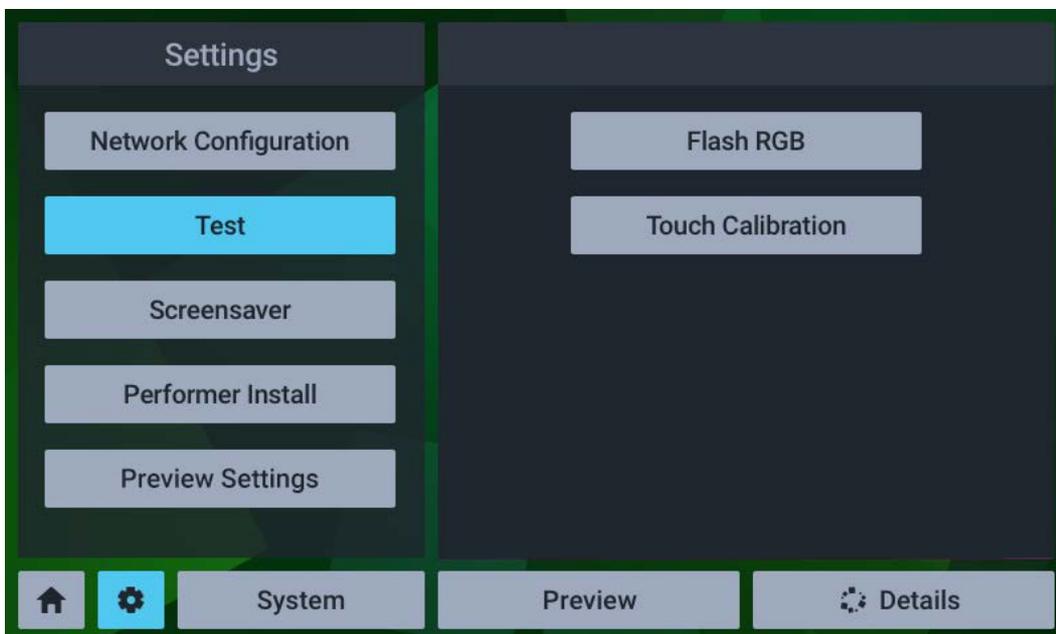
The NIC naming follows the 'friendly names' given in the software.

For manual edit of a selected NIC, select manual and click on the required field:



Edit the required octet(s) and save.

Settings > Test



The **Test** button has two functions, to cycle all outputs once through solid red, blue, green, and to calibrate the touch function.

The touch calibration simply requires a touch to be traced across the range of the display panel:



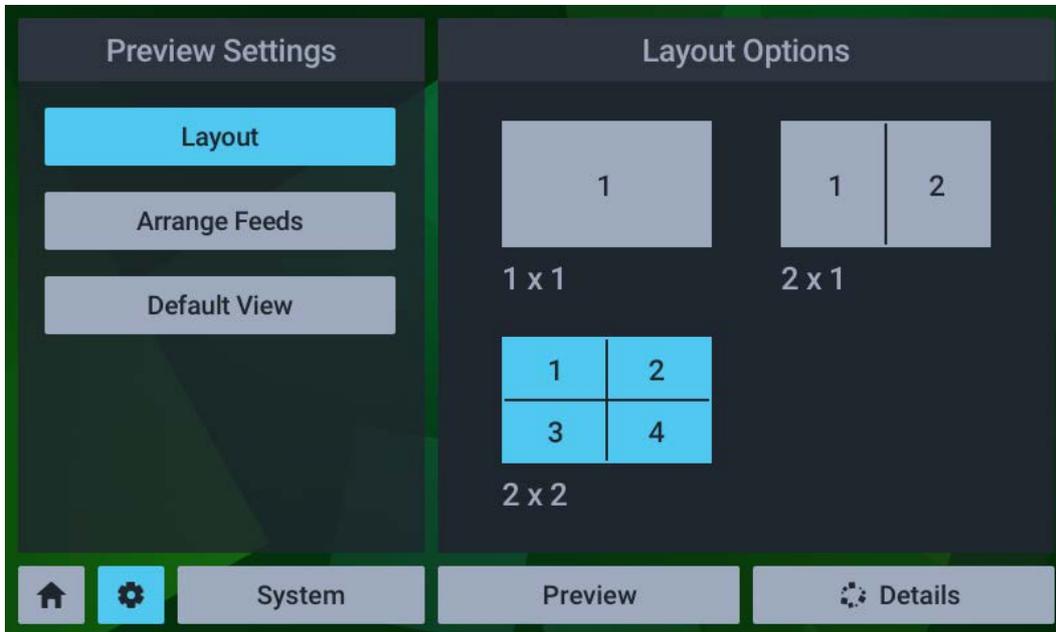
If insufficient data is collected you will be prompted to try again, otherwise a success message will briefly be displayed.

Settings > Performer Install

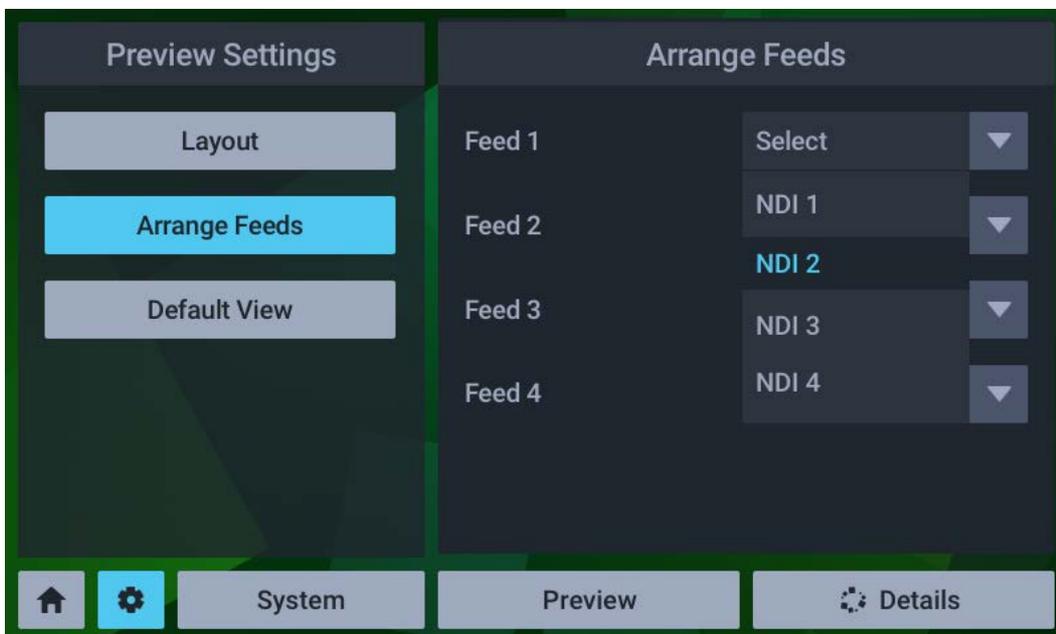
This is a service function for the configuration of the Compere software.

Settings > Preview Settings

Layout: The display can show up to four available NDI feeds. Choose between 1, 2 and 4 feeds, laid out as shown:



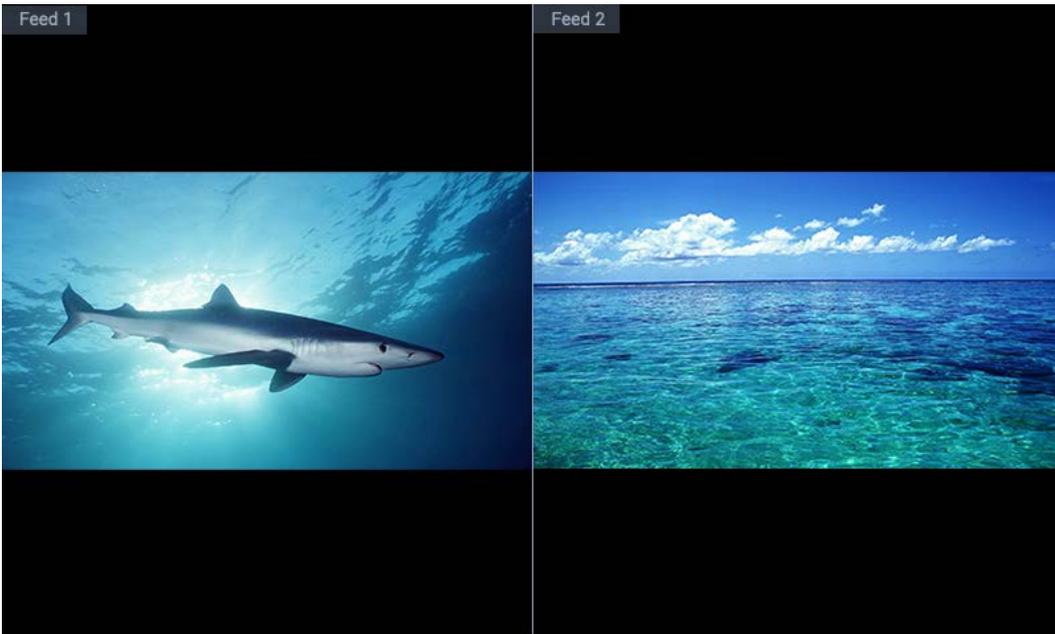
Arrange Feeds: Allocate which feeds to assign to each part of the display.



Naming follows that given in the Compere project.

Preview

Select the Preview button to see NDI feeds available in the Juggler arranged as in Settings > Preview Settings.



Details

Here you access server information, version and licence details.



Workflow: Physical Connections

Configure the Physical Connections

1. Unbox Jugglers and perform an all-round physical check for any signs of transit damage.
2. Rack the Jugglers so that the units are fully supported at the back and bolted securely at the front.
3. Connect power, press the front panel power button, and confirm that each unit comes to life.
4. The front panel will go through an initialising routine and settle to show an IP address for the unit and the Juggler logo.
5. Reassign IP addresses for each Juggler as required.
6. Switch off all units.
7. Connect any [data bus](#) ⁽²¹⁾ or buses between Jugglers that will combine to form a system.
8. Connect all input devices available at this stage, and required output devices.
9. Switch on or boot all the components of your system. You may find it best to establish your own preferred order, for example projectors first, working back through devices that take most time to boot up.

To configure the internal system connections in Compere, see the appropriate Compere User Guide:

➤ [Connecting Juggler Systems in Compere](#)

This guide also shows how to establish Project Groups, assemble display outputs, and configure Juggler 1 I/O connectors.

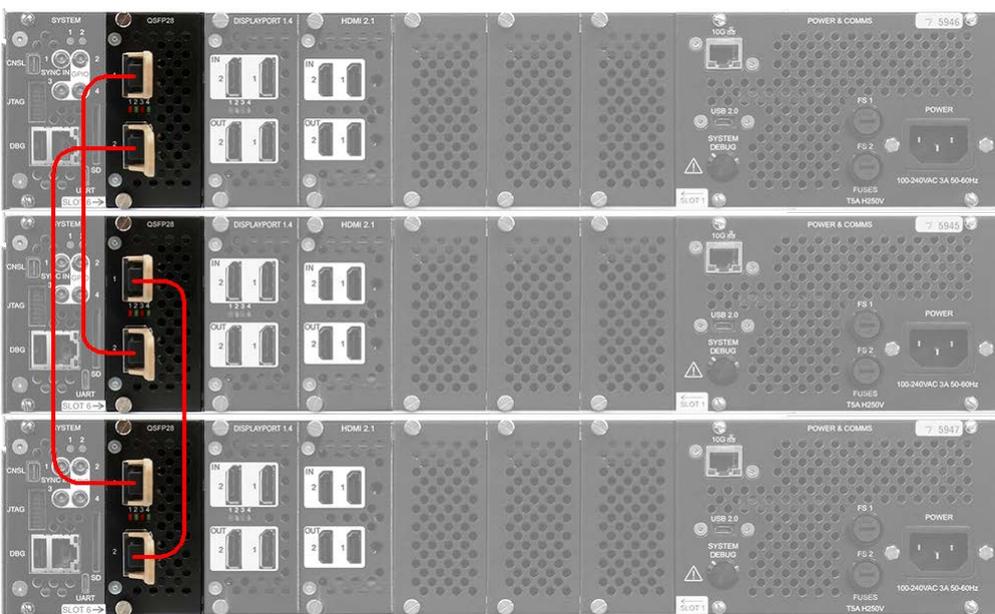
Connect a Juggler Optical Data Bus

Jugglers in a system should be racked adjacent to each other, since optical connections must be short and loop freely. If you are using multiple Jugglers on a data bus, make these connections first, before inputs and outputs; they can become quite congested with many units. Juggler 2 employs 8 lanes, with each lane having a capacity of up to the equivalent of UHD 60 fps 10-bit 4:4:4.

Please note that as a critical component, optical cables used should be supplied or approved by 7thSense. Cables do not need to be short but the minimum bend radius of a free-hanging cable should be not less than 10 times the cable outside diameter.

This page covers the physical cabling of a single bus. For an explanation of how this works, and the use of the data bus in the Compere software, see the relevant sections in the Compere User Guide.

Each fibre-optic cable carries 8 lanes, 4 in each direction:



Units are daisy-chained unit to unit, 1 to 2 and loop back from the last unit to the first in the same way.

Cables

Use MTP/MPO 12-fibre 50/125 patch cables, type B, Female to Female.

Care with Optical Connectors



Optical connectors are a Class 1 laser product.

Never look directly into the end of fibre cables until you are positive that there is no light source at the other end.

Cleaning Optical Connectors

The most common problem with fibre optical connectors is contamination – residues or dust. Plastic easily generates static, which attracts fine particles, too small to see with the naked eye, and any contamination will affect performance or cause failure. **Avoid troubleshooting by inspecting first.**

Inspect before you connect

Hand-held fibre inspection microscopes may seem expensive, but prevention is cheaper than troubleshooting, and it is essential to ensure optical connector end-faces are clean *before you connect*. Problems arise when components are left unconnected and uncapped, so keep caps on until the point of connection. Residues can even be present in an out-of-the-bag cable, or from the moulded cap itself, and can transfer to a bulkhead connector.

Inspect, clean, reinspect

We recommend that the polished ends of fibre leads should be cleaned with a push-click pen cleaner. Dry cleaning is always recommended; alcohol-based agents should *not* be used. Specialist cleaning kits are available that ensure contaminants are not just moved about, or reintroduced by a second use of a tool.

After cleaning, reinspect. You may still have contamination. Do not connect until you know a connection is clean on both sides.

Connecting to a Network and Devices

Juggler systems must be connected on a single network each with a static IP address. All devices running Compere will be visible in any Compere UI, along with their host names. Network configuration is done in Compere.

- See [Network Configuration](#) in the Compere 1.0-7 User Guide.

Process

Having established any [data bus between Jugglers](#) ⁽²¹⁾, connect your source inputs and display outputs. First identify the Rx and Tx ports – and in particular the numbering on the rear panel – so you understand how these are represented in Compere’s representations in the Nodes panel. All live ports are automatically identified in Compere, and it is there that you will make the internal and process connections.

- See [Connecting Juggler Systems](#) in the Compere user guide

You can regard outputs and inputs across the system as independent. Unlike many devices, the Juggler in and out (Tx and Rx) are not linked one-to-one. You will decide in the Compere control software precisely how input streams are processed, where they end up via which outputs and into what visual space.

Switch everything on. Jugglers take a short while to self-configure, and then you will see the Juggler front panel landing page. The order in which you switch system components on should not matter. Compere will recognise every member of the shared network, and all their connection types.

Juggler 2 Physical Specifications

Environmental Characteristics	Operating	Non-operating
Temperature	+15 to +30 °C	-10 to +50 °C
Humidity (non-condensing)	10 to 90%	5 to 95%
Altitude	≤ 2 000 m	≤ 10 000 m

Specification	Rating/Description	Notes
Rackmount Dimensions (H × W × D)	(2U) 88 × 429 × 491.5 mm (3.5 × 16.9 × 19.4 in)	Width including mounting ears: 483 mm (19 in)
Rackmount weight (approx.)	9 kg (approx)	
Power Supply	100-240 V, 3 A, 50-60 Hz	Autoranging, IEC 60320 inlet
Power	300 W	
Cooling	Forced air	Inlets at front, exhaust at rear

Warranty, Support and Service

Standard warranty is 24 months, return-to-distributor. Please contact 7thSense Design if you require an extended warranty.

Please ask for instructions and request authorisation before returning a Juggler unit to your distributor.

➤ Visit our Support Portal for [support and service](#)

Regulatory Compliance

FCC

Juggler 2 Pixel Processor complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Note: The equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with this user guide, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.

UK and European Union

Juggler 2 Pixel Processor is a Class A product. In a domestic environment, this product may cause radio interference, in which case the user may be required to take adequate measures.

Document Information

Date	Document edition	Revision Details	Author/Editor
June 2023	1	New release	Andie Davidson
July 2024	2	Updates for connecting optical bus, setting IP addresses, front panel controls	Andie Davidson

A

air filters 9

B

bus connection 21

C

cleaning 9
Compere software suite 4
compliance and conformity 26
connections, physical 20
cooling 6

D

data bus 21
disposal 9
document information 27

E

electrical fuses 9
environment, thermal, electrical 8

F

fascia attachment 6
fibre-optic patch cables 21
front panel controls 14
front panel display 14
front panel features 13

N

network connections 23

O

optical connectors, cleaning 21
overview of Juggler 2 4

P

physical specification of Juggler 2 24

R

rack mounting 6

racking 20
rear panel connections 11

S

service 25
switching on 13, 20

T

technical support 25

U

unboxing 20

W

warranty 25

E: info@7thsense.one
W: 7thsense.one

7thSense Design Ltd
2 The Courtyard, Shoreham Road
Upper Beeding
Steyning
West Sussex
BN44 3TN
UK

T: +44 (0) 1903 812299

7thSense LLC
4207 Vineland Rd
Suite M1
Orlando, FL 32811
USA

T: +1 407 505 5200

