Indigo 4

4U frames

(Includes Indigo 4 and 4SE)

USER MANUAL

Crystal Vision

Crystal Vision Ltd., Lion Technology Park, Station Road East, Whittlesford, Cambridge, CB22 4WL, England.
E-mail: sales@crystalvision.tv Website: www.crystalvision.tv Tel: +44(0) 1223 497049 Fax: +44(0) 1223 497059

Contents

Revision 2	Ethernet control information added	02/01/07
Revision 3	PSU-160i information added	01/03/07
Revision 4	Note added to Bus IO table, page 13	29/08/08
Revision 5	Updated information regarding the PS-55i (replaced by the PS-80i), PSU-75i and PSU-150i (both superseded by the PSU-160i) and the Mains Combiner (now obsolete)	26/05/10
Revision 6	Removed Indigo 4S (obsolete)	11/07/10
Revision 7	PSU Alarm relay function clarified, page 12.	08/08/12

1 Introduction

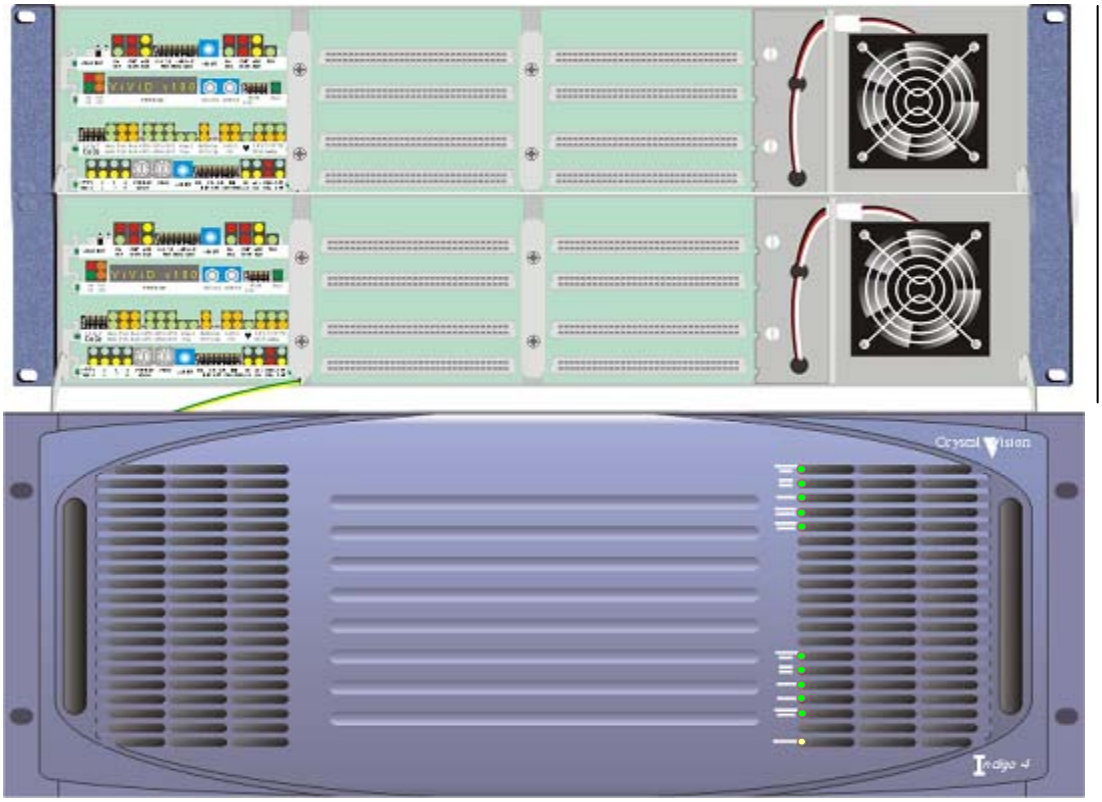
The Indigo range comprises four frame types: 4U frames for up to 24 modules, 2U frames for up to 12 modules, 1U frames for up to six modules and 1U desk top boxes for up to two modules.

There are two 4U frame variants - passive front panel and a Statesman enabled version with Ethernet capability.

This manual covers:

Indigo 4 with passive front panel
Indigo 4SE Ethernet capable Statesman enabled with active panel, no controls or display.

The frames provide configurable rear connections and the facility for a maximum of three separate plug-in power supplies. This allows a dual supply facility for redundancy and continued operation in the event of a power supply failure. A hinged front panel and removable fan assembly provides access to the power supply unit and all of the modules.



The Crystal Vision Indigo 4 frame with front control panel open

There are four easily accessible front fans. Two are fitted on detachable plates in front of the PSU modules and the other two are attached to the rear of the front panel.

On opening the front panel an optical sensor switches the PSU fans to fast operation and the panel mounted fans are stopped by removing their power.

If one fan fails, or operates too slowly, the other fans are automatically switched to full power and an alarm raised.

The frame internal temperature is monitored by sensors mounted at the rear of the upper and lower middle bays, the fans speed is adjusted to maintain an optimum operating temperature over a wide range of load and ambient temperatures.

There are three cooling modes: normal, quiet and maximum.

With normal cooling all fans run continuously, increasing in speed as the temperature inside the frame goes up.

Quiet mode is intended for a lightly loaded frame in an environment where ambient noise is a concern. When the frame temperature is below approximately 45°C the panel fans are switched off and the PSU fans runs at minimum speed. If the frame temperature goes above 45°C it reverts to normal cooling and goes back to quiet mode when the frame temperature again falls below 42°C.

In Maximum cooling mode all four fans never run below near maximum speed. Fan speed increases to maximum at high frame temperature. This mode is ideal for equipment bays where noise is not a concern.

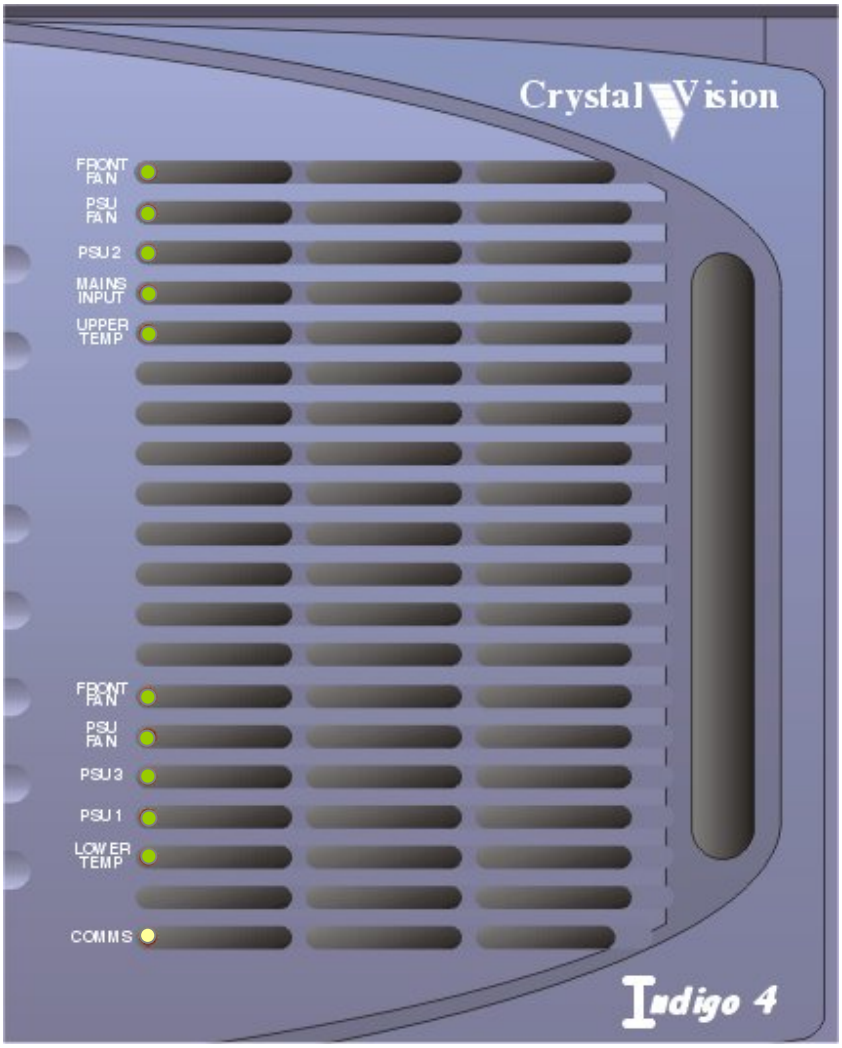
Only one fan in each of the upper and lower frames is essential in normal operation. If one of the fans should fail, the closed frame can still operate indefinitely with an ambient temperature of 40 °C.

Warning: Although it is possible to operate the frame with the front panel open, the frame may not meet electromagnetic compatibility (EMC) requirements in this condition.

All Indigo PSU modules have a built in processor, this processor (referred to as a PIC) communicates with the front panel processor to pass on status information such as power rail voltage levels (+5.75V and -6.0 V) and the PSU fan speed.

The panel processor regularly receives status updates from the PSU processors about power rails and fan speed. This allows the front panel to update its status LEDs and control the alarm changeover relay. The relay contacts are available on Remotes 2 and 8 connectors on the rear of the frame. If third and fourth PSUs are fitted, any alarms will appear on Remotes 4 and 6.

There are ten two-colour LEDs on the front panel, with yellow/green indicating a normal condition and red an abnormal condition. An eleventh LED indicates external comms activity.



Ten of the LEDs show the status of the front fan, PSU fan, upper power supply, lower power supply and frame temperature. If a PSU is not fitted, the corresponding LED will not illuminate.

A Comms LED monitors external RS422 activity and will flash amber when there is external communications with the frame.

Statesman users will be able to remotely monitor frame temperature and fan speed.

2 Installation

General Safety Summary

The following warnings are intended for user guidance and safety.

Ground This product must be grounded through the grounding conductor of the power cord.

Power cable Use only power cords that meet the required specification for this product.

Fuses To avoid fire hazard use only fuses of the type and rating specified.

Service These servicing instructions are for use by qualified personnel only. To reduce risk of electric shock, do not perform any servicing other than that contained in this manual unless you are qualified to do so. Refer all servicing to qualified service personnel.

Apart from procedures described in this manual there are no user serviceable parts within the frame. If the frame requires any other servicing it should be returned to the manufacturer or dealer.

On no account should the unit be powered whilst any covers are removed.

Ventilation The unit must have adequate ventilation. Installation should be in standard 19" racks with cool air circulation available at the front. The left and right ventilation grilles must not be obstructed.

EMC To comply with EMC regulations the following guide lines should be observed:

Do not operate this unit for extended periods with the front panel open.

Do not use the frame unless all the rear connector positions are filled, either with Crystal Vision Rear Modules, or with Crystal Vision blanking plates.

Do not operate the equipment with covers or panels removed.

General To avoid electric shock do not operate this product in wet or damp conditions.

To avoid injury or fire hazard do not operate this product in an explosive atmosphere.

Only use this rack in conjunction with Crystal Vision modules designed for that purpose.

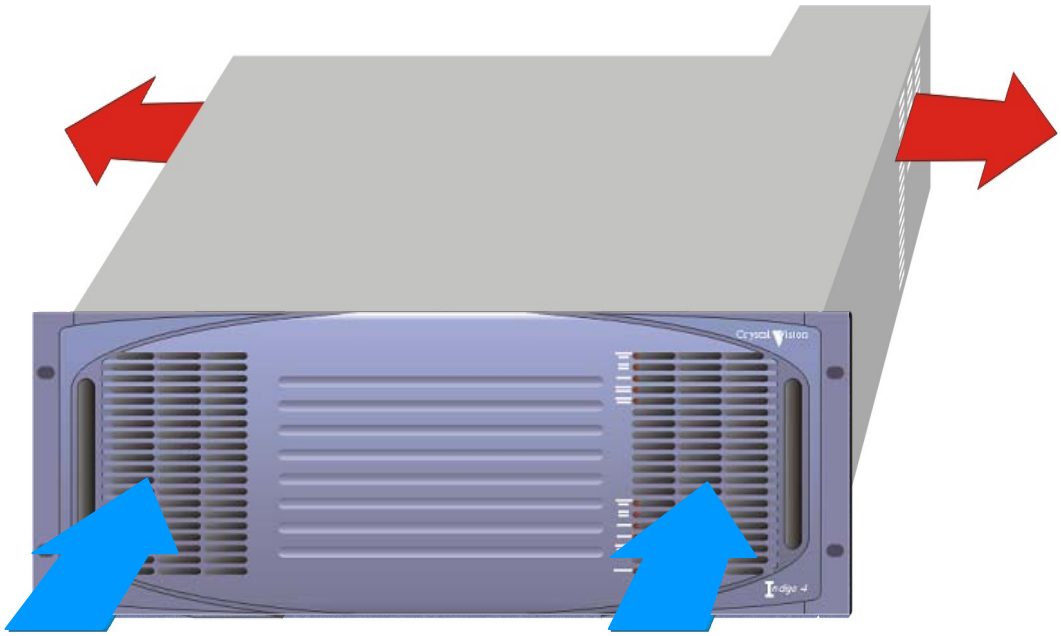
Handling The Indigo 4 frame can exceed 10kg in weight. Care must be taken when lifting and carrying the frame.

Under no circumstances should it be attempted to lift the frame by the front panel opening loop handles as this can result in injury and damage to the front panel assembly.

The Indigo 4 frame is capable of housing the Crystal Vision range of optical modules. Although these modules are not capable of causing personal injury, care should be exercised when exposing unshielded optical signals to not look directly into the light beam.

2.1 Rack mounting and ventilation

The unit must have adequate ventilation. Install in standard 19" racks with cool air circulation at the front and with both side ventilation grilles unobstructed.



Indigo 4 air-flow

Install the Indigo frame in a standard 19-inch rack as follows:

- Mount in the rack and secure via the rack ears
- Allow adequate space for the fan intakes at the front and the exhaust through the left and right sides

Note: The upper and lower sections of the frame are able to operate normally with only one of the fans in action. If one of the fans should fail, the closed frame can still operate indefinitely with an ambient temperature of 40 °C.
It is also possible to operate the frame with the front panel open, however the frame may not meet electromagnetic compatibility (EMC) requirements in this condition.

2.2 Frame connectors

The following connectors are available at the rear of the frame:

Connector	Function	Notes
IEC (top)	Upper PSU AC input	85 to 264V, fuse under flap
IEC (bottom)	Lower PSU AC input	85 to 264V, fuse under flap
Upper frame		
Remote 1	GPI and DC out	Refer to pinout tables
Remote 2	GPI, PSU 2 (upper PSU) alarm relay and DC out	Refer to pinout tables
Remote 3	GPI and DC out	Refer to pinout tables
Remote 4	GPI and PSU 4 alarm relay	Refer to pinout tables
Lower frame		
Remote 5	GPI and DC out	Refer to pinout tables
Remote 6	GPI, serial/Statesman, PSU 3 alarm relay and DC out	Refer to pinout tables
Remote 7	GPI and DC out	Refer to pinout tables
Remote 8	GPI and PSU 1 (lower PSU) PSU alarm relay	Refer to pinout tables
Statesman RS422	Statesman RS422 control using CAT-5 cabling	Refer to pinout tables
RS422 in/bus	RS422 control using CAT-5 cabling	Refer to pinout tables
Ethernet	Ethernet control using CAT-5 cabling	Refer to pinout tables

All frame connectors are grouped together behind the PSU modules at the rear of the frame.

Connecting mains cables

The Indigo 4 frame is powered by connecting an IEC power cord(s) to the upper and/or lower IEC connectors depending on the number of installed power supply modules.

Mains cables that are used must have a minimum current rating of 6A and be fitted with an IEC 320 female connector; include a protective ground connection and meet relevant local safety standards.

Tip: To reduce the risk of electric shock, if two power supply cords are used plug each power supply cord into separate branch circuits employing separate service grounds.

Note: The fuse holder is part of the mains inlet. The mains cable must be disconnected before the fuse can be accessed. Replace the fuse only with one of the same type and rating. Refer to the Maintenance section of the trouble shooting guide for more information.

Indigo 4 rear connectors

Remote control / GPI connections

Each frame slot has six connections that are brought out to one or more of the four high-density D-Type connectors on the rear of the frame labelled Remote 1 to 8. These connections are referred to as lines 'a' to 'f'. The functions assigned to them are dependent on the module inserted in each slot, but a typical use is as a GPI line. Refer to the documentation supplied with each Crystal Vision module to determine the actual functions assigned.

Remote 1 – 4 Upper frame connections (26 way high density D-Type plug/socket)

Pin number	Remote 1 function (socket)	Remote 2 function (plug)	Remote 3 function (socket)	Remote 4 function (plug)
1	+5.5V nom. dc out	Slot 5 GPI 'e'	+5.5V nom. dc out	Slot 7 GPI 'e'
2	Frame GND	Slot 5 GPI 'f'	Frame GND	Slot 7 GPI 'f'
3	Slot 9 GPI 'a'	Slot 6 GPI 'e'	Slot 11 GPI 'a'	Slot 8 GPI 'e'
4	Slot 6 GPI 'a'	Slot 6 GPI 'f'	Slot 8 GPI 'a'	Slot 8 GPI 'f'
5	Slot 5 GPI 'a'	Relay close on fault, upper PSU 2	Slot 7 GPI 'a'	Relay close on fault, upper mains input
6	Slot 5 GPI 'b'	Frame GND	Slot 7 GPI 'b'	Frame GND
7	Slot 2 GPI 'a'	N/C	Slot 4 GPI 'a'	N/C
8	Slot 1 GPI 'a'	N/C	Slot 3 GPI 'a'	N/C
9	Slot 1 GPI 'b'	N/C	Slot 3 GPI 'b'	N/C
10	Slot 10 GPI 'a'	Slot 2 GPI 'e'	Slot 12 GPI 'a'	Slot 4 GPI 'e'
11	Slot 10 GPI 'b'	Slot 2 GPI 'f'	Slot 12 GPI 'b'	Slot 4 GPI 'f'
12	Slot 9 GPI 'b'	Slot 9 GPI 'e'	Slot 11 GPI 'b'	Slot 11 GPI 'e'
13	Slot 6 GPI 'c'	Slot 9 GPI 'f'	Slot 8 GPI 'c'	Slot 11 GPI 'f'
14	Slot 6 GPI 'b'	Relay common, upper PSU 2	Slot 8 GPI 'b'	Relay common, PSU 4
15	Slot 5 GPI 'c'	+5.5V nom. dc out	Slot 7 GPI 'c'	N/C
16	Slot 2 GPI 'b'	N/C	Slot 4 GPI 'b'	N/C
17	Slot 2 GPI 'c'	N/C	Slot 4 GPI 'c'	N/C
18	Slot 1 GPI 'c'	N/C	Slot 3 GPI 'c'	N/C
19	Slot 10 GPI 'c'	Slot 1 GPI 'e'	Slot 12 GPI 'c'	Slot 3 GPI 'e'
20	Slot 10 GPI 'd'	Slot 1 GPI 'f'	Slot 12 GPI 'd'	Slot 3 GPI 'f'
21	Slot 9 GPI 'd'	Slot 10 GPI 'e'	Slot 11 GPI 'd'	Slot 12 GPI 'e'
22	Slot 9 GPI 'c'	Slot 10 GPI 'f'	Slot 11 GPI 'c'	Slot 12 GPI 'f'
23	Slot 6 GPI 'd'	Relay open on fault, upper PSU 2	Slot 8 GPI 'd'	Relay close on fault, lower mains inlet
24	Slot 5 GPI 'd'	N/C	Slot 7 GPI 'd'	N/C
25	Slot 2 GPI 'd'	N/C	Slot 4 GPI 'd'	N/C
26	Slot 1 GPI 'd'	N/C	Slot 3 GPI 'd'	N/C

Remote 5 – 8 Lower frame connections (26 way high density D-Type plug/socket)

Pin number	Remote 5 function (socket)	Remote 6 function (plug)	Remote 7 function (socket)	Remote 8 function (plug)
1	+5.5V nom. dc out	Slot 17 GPI ‘e’	+5.5V nom. dc out	Slot 19 GPI ‘e’
2	Frame GND	Slot 17 GPI ‘f’	Frame GND	Slot 19 GPI ‘f’
3	Slot 21 GPI ‘a’	Slot 18 GPI ‘e’	Slot 23 GPI ‘a’	Slot 20 GPI ‘e’
4	Slot 18 GPI ‘a’	Slot 18 GPI ‘f’	Slot 20 GPI ‘a’	Slot 20 GPI ‘f’
5	Slot 17 GPI ‘a’	Relay close on fault, PSU 3	Slot 19 GPI ‘a’	Relay close on fault, PSU 1
6	Slot 17 GPI ‘b’	Frame GND	Slot 19 GPI ‘b’	Frame GND
7	Slot 14 GPI ‘a’	RX+ bus RS422	Slot 16 GPI ‘a’	N/C
8	Slot 13 GPI ‘a’	TX- RS422 o/p Statesman	Slot 15 GPI ‘a’	N/C
9	Slot 13 GPI ‘b’	TX+ RS422 o/p Statesman	Slot 15 GPI ‘b’	N/C
10	Slot 22 GPI ‘a’	Slot 14 GPI ‘e’	Slot 24 GPI ‘a’	Slot 16 GPI ‘e’
11	Slot 22 GPI ‘b’	Slot 14 GPI ‘f’	Slot 24 GPI ‘b’	Slot 16 GPI ‘f’
12	Slot 21 GPI ‘b’	Slot 21 GPI ‘e’	Slot 23 GPI ‘b’	Slot 23 GPI ‘e’
13	Slot 18 GPI ‘c’	Slot 21 GPI ‘f’	Slot 20 GPI ‘c’	Slot 23 GPI ‘f’
14	Slot 18 GPI ‘b’	Relay common, PSU 3	Slot 20 GPI ‘b’	Relay common, PSU 1
15	Slot 17 GPI ‘c’	+5.5V nom. dc out	Slot 19 GPI ‘c’	N/C
16	Slot 14 GPI ‘b’	RX- bus RS422	Slot 16 GPI ‘b’	N/C
17	Slot 14 GPI ‘c’	TX+ bus RS422	Slot 16 GPI ‘c’	N/C
18	Slot 13 GPI ‘c’	RX+ RS422 i/p Statesman	Slot 15 GPI ‘c’	N/C
19	Slot 22 GPI ‘c’	Slot 13 GPI ‘e’	Slot 24 GPI ‘c’	Slot 15 GPI ‘e’
20	Slot 22 GPI ‘d’	Slot 13 GPI ‘f’	Slot 24 GPI ‘d’	Slot 15 GPI ‘f’
21	Slot 21 GPI ‘d’	Slot 22 GPI ‘e’	Slot 23 GPI ‘d’	Slot 24 GPI ‘e’
22	Slot 21 GPI ‘c’	Slot 22 GPI ‘f’	Slot 23 GPI ‘c’	Slot 24 GPI ‘f’
23	Slot 18 GPI ‘d’	Relay open on fault, PSU 3	Slot 20 GPI ‘d’	Relay open on fault, PSU 1
24	Slot 17 GPI ‘d’	N/C	Slot 19 GPI ‘d’	N/C
25	Slot 14 GPI ‘d’	TX- bus RS422	Slot 16 GPI ‘d’	N/C
26	Slot 13 GPI ‘d’	RX- RS422 i/p Statesman	Slot 15 GPI ‘d’	N/C

Note: The total current available from the 5.5V DC outputs is limited to approximately 1.0amp from the upper frame and 1.0 amp from the lower frame.

Note: The upper frame and lower frame DC outputs are separately fused with thermal auto resetting fuse.
To maintain EMC compliance only good quality screened cable assemblies should be used.

All comms connections are common to all remotes and RJ45s.

Power supply relay connections

Each power supply module has a changeover relay to indicate if the frame is in an alarm state caused by a power supply problem, a fan stopping or an overheating frame.

Pinout is as follows:

Upper Power Supply (PSU 2) Relay Connections

Description	pin number
relay common	Remote 2 pin 14
open on fault	Remote 2 pin 23
close on fault	Remote 2 pin 5

Power Supply (PSU 4) Relay Connections

Description	pin number
relay common	Remote 4 pin 14
open on fault	Remote 4 pin 23
close on fault	Remote 4 pin 5

Power Supply (PSU 3) Relay Connections

Description	pin number
relay common	Remote 6 pin 14
open on fault	Remote 6 pin 23
close on fault	Remote 6 pin 5

Lower Power Supply (PSU 1) Relay Connections

Description	pin number
relay common	Remote 8 pin 14
open on fault	Remote 8 pin 23
close on fault	Remote 8 pin 5

The PSU alarm relays are grouped in two groups. PSU1 and PSU3 relays act together and similarly PSU2 and PSU4 relays act together. Should an error occur in the top half of the frame, say a front panel fan failure or PSU failure, assuming all PSUs are fitted, both relays situated in that half of the frame will go to the alarm state. Note there may be a delay between the relays changing state depending on the type of error. This is because the relay can be controlled both locally by the PSU and by being asserted by the front panel which could rely on the front panel completing a poll before initialising the alarm.

The failure of any one mains inlet will result in all PSU relays indicating an alarm.

Note: The current through the relay contacts should be limited to a maximum of 200mA.

RJ45 422 Bus IO connector

Pin number	Function
1, 2 and 3	Not used – 75 Ohm resistor to GND in frame
4	TX+ bus RS422
5	TX- bus RS422
6	Not used – 75 Ohm resistor to GND in frame
7	RX+ bus RS422
8	RX- bus RS422

The signals on pins 4, 5, 7 and 8 are also available on the Remote 6 connector.

Note: TX and RX are defined on the boards. This connector can be used to connect a REMIND remote control panel. If an external RS422 control device is to be used ensure that the controller will drive the RX+ with TX+ etc.

Note: Since the 422 Bus Output connector has no GND pin, two frames or other pieces of equipment which make a connection from the 422 Bus Output should ensure the GND of the two frames are connected together. This will normally occur through the earth pin on the mains connector.

RJ45 422 control input connector

Pin number	Function
1	RX+ RS422 i/p Statesman
2	RX- RS422 i/p Statesman
3	TX+ RS422 o/p Statesman
4 and 5	Not used – 75 Ohm resistor to GND in frame
6	TX- RS422 o/p Statesman
7 and 8	Not used – 75 Ohm resistor to GND in frame

The signals on pins 1, 2, 3 and 6 are also available on the Remote 6 connector.

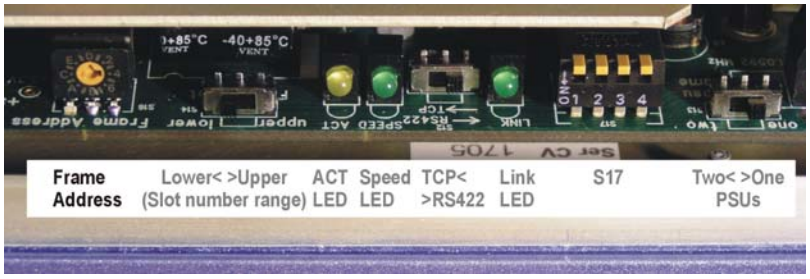
2.3 Terminating the RS422 Statesman chain

The RS422 communication chain used for Statesman should be terminated when a frame is the last device in a chain or when a frame is the only device. It is unterminated for all other applications including when frames are used with a Statesman Hub.

To change the RS422 communications termination access the RS422 term/unterm switch at the bottom of the lower front control panel PCB by opening the panel and lifting it upwards.

2.4 Setting frame address

The frame address, which only relates to a non-passive panel, is normally set to zero. However unique frame addresses are required in Statesman systems where multiple frames communicate with a single PC port.



Indigo active/remote/Statesman panel hardware settings – Frame address

Note: Passive panels do not have a Frame Address switch.

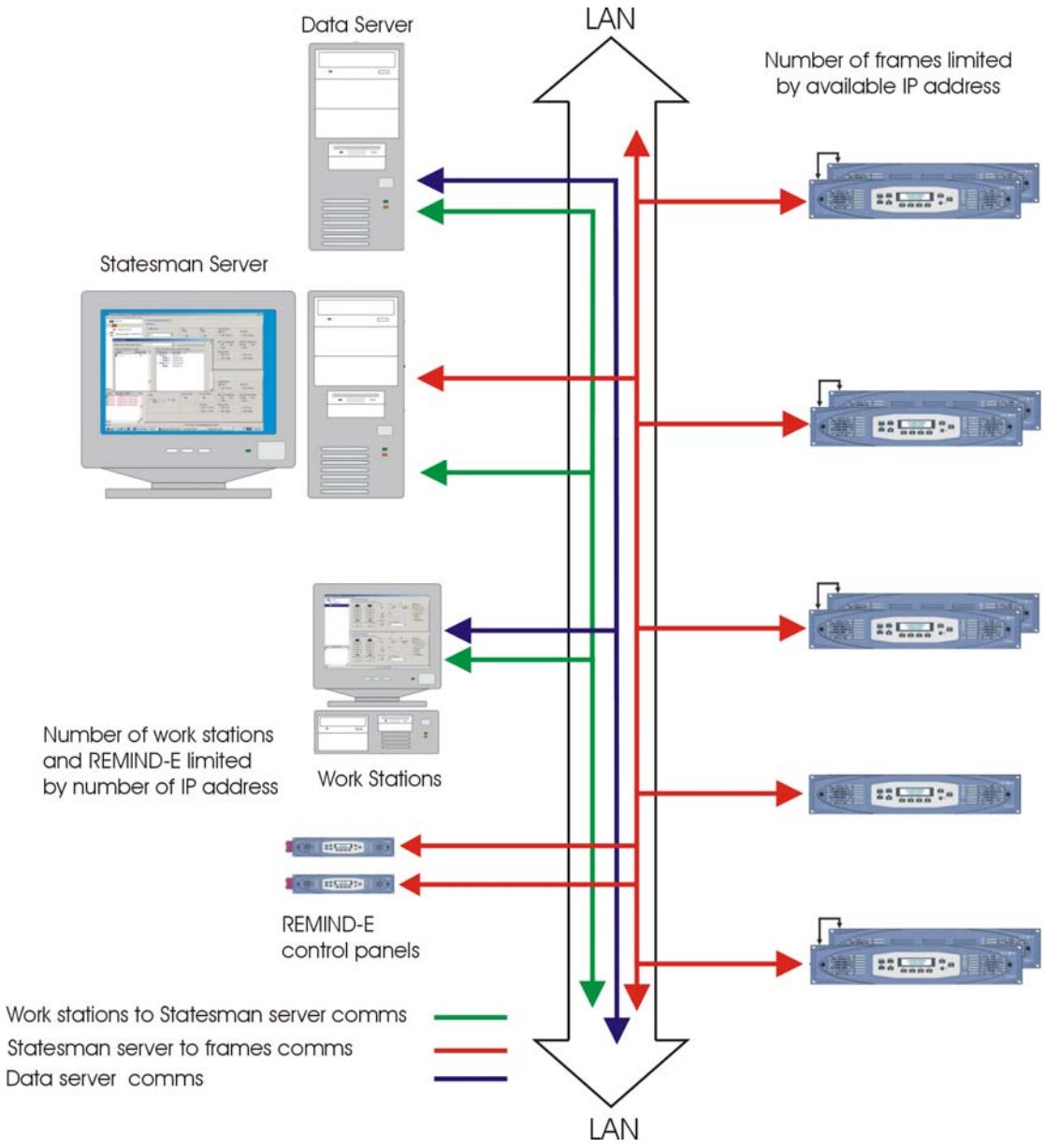
Rotary switch	Position	Description
Frame Address	Normally zero	This is usually the address of the frame from 0 to 15.

The frame address only relates to Indigo 4S (now obsolete) and is normally set to zero. However unique frame addresses are required in Statesman systems where multiple frames communicate with a single PC port.

Note: Set this switch to position 0, unless multiple frames communicate with a single PC port in a Statesman system, or if multiple control panels connect to a single frame via one multidrop cable.
Statesman will display the Hex switch settings 0 to E as frame addresses 1 to F; switch setting F will be displayed as frame address 10.

2.5 Ethernet control

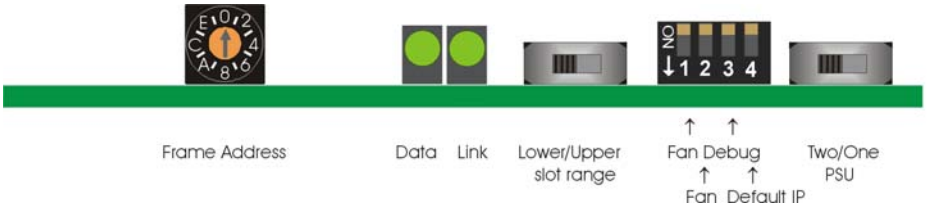
Ethernet control is provided by the Indigo E series of frames. This allows the Statesman PC control system or remote active control panels to control a large number of the Indigo Ethernet series frames over a local area network.



Statesman control over the Ethernet of Indigo frames

Board settings

On the upper edge of the lower 4U front panel PCB can be found the config switches and status LEDs.



4U lower board top-edge switches and LEDs

Frame Address

The frame address, which only relates to active panels such as the Statesman enabled or active control panel, is set to give a frame or frame pair a unique address when used in serial 422 connected systems. In a TCP system the frame address switch must be set to zero.

Rotary switch	Position	Description
Frame Address	Normally zero	This is usually the address of the frame from 0 to 15.

Note: Set this switch to position 0, unless multiple frames communicate with a single PC port in a Statesman system, or if multiple control panels connect to a single frame via one multi-drop cable.
Statesman will display the Hex switch settings 0 to E as frame addresses 1 to F. Switch setting F will be displayed as frame address 10.

Status LEDs

These LEDs are useful for trouble shooting the network link. The link LED will be illuminated whenever the frame is connected to a network. Should this LED not be lit check the cable connection between the frame and network outlet. The data LED flashing will indicate that communications between the frame and the network exists.

		Description
Data	Flashing	This LED will flash to indicate activity.
Link	Normally lit	This LED will be lit whenever the frame is connected to an Ethernet network.

Piano Switch

Switches 1 and 2 configure the cooling fan modes.

Levers 1 & 2	Function	Notes
Both up	Normal cooling	Both fans run continuously increasing in speed as the temperature inside the frame goes up.
1 down, 2 up	Quiet mode	For use with a lightly loaded frame for low ambient temperature. When the frame temperature is below approximately 45°C the panel fan is switched off and the PSU fan runs at minimum speed. If the frame temperature goes above 45°C it reverts to normal cooling and goes back to quiet mode when frame temperature falls below 42°C.
1 up, 2 down	Max cooling mode	In Maximum cooling mode both fans never run below near maximum speed. Fan speed increases to maximum at high frame temperature. This mode is ideal for equipment bays where noise is not a concern.
Both down	Reserved for future use	Operates as normal mode with current software.

Levers 3 & 4	Function	Notes
3	Debug	Normally up, no user function.
4	Default IP address	Normally up. Down sets IP address to default 10.0.0.201.

Note: Quiet mode is dependent on PSU and PSU fans not being in an alarm state.
If one of the fans should fail, the closed frame can still operate indefinitely with an ambient temperature of up to 40°C.
Although only one of the fans is essential in normal operation a faulty fan should be replaced as soon as practical to prevent the long-term stressing of the modules.

Warning: Although it is possible to operate the frame with the front panel open, the frame may not meet electromagnetic compatibility (EMC) requirements in this condition.

Switch 3 is for debug purposes and should normally be left in the up position.

Default IP address

Switch 4 in the down position sets the active front panel to the default IP address of 10.0.0.201. This default address is necessary to be able to change the IP address during installation.

PSU Configuration

PSU configuration only applies to the 2U and 4U frames where it is possible to have multiple power supplies fitted into a single frame. Should a power supply not be fitted in either the upper or lower slots of the 2U frame or the upper or lower slots of the lower section of the 4U frame the position of the two-position slide switch must be set accordingly.

If both power supplies are fitted the slide switch is set to position two. If the switch is set to one and there are two power supplies fitted, the LOWER PSU LED will flash from GREEN to OFF every two to three seconds to warn that the switch is set to one instead of two. Should only a single supply be fitted with the switch set to Two a power supply fault will be registered.

2.6 Setting up and connecting

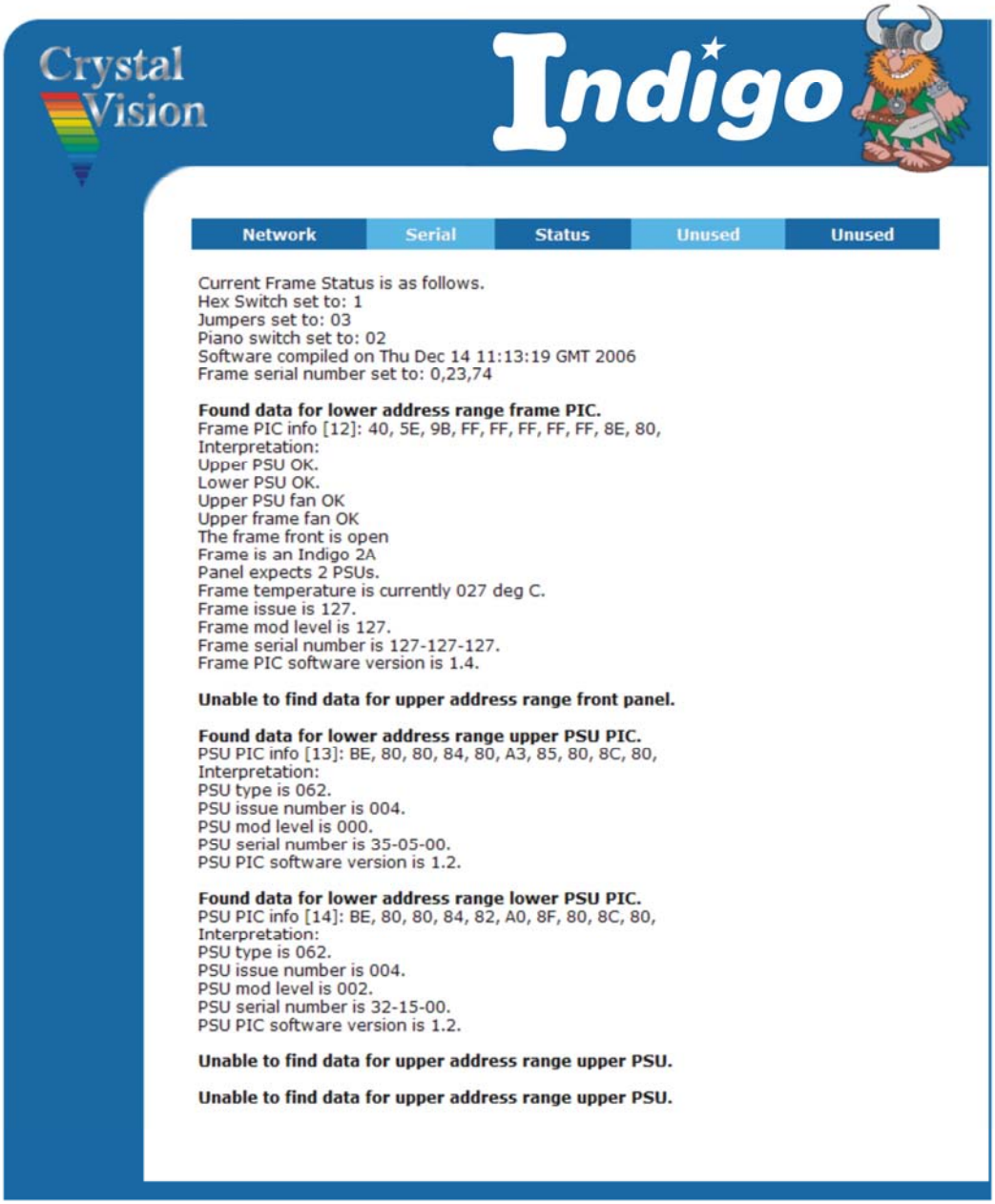
The frame can be connected to a network port or directly to a PC from the rear panel RJ45 port labelled Ethernet. If connecting directly to a PC a CAT-5 cross over cable will be required. Connecting to a network port hub uses a straight CAT-5 cable.

Changing the IP Address

An Ethernet enabled frame will need to have its IP address set upon installation. This is made possible by setting the frame to act as a web server and then accessing an internal web page. Any software upgrades can also be downloaded to the frame via this web page.

To access the internal web page set the frame to the default IP address by setting the default IP address switch to down or to the left for the 1U front. Open up your PC web browser and set its search to http://10.0.0.201 and select ‘go to’. This is the default IP address, the sub-mask being 255.255.255.0. After a dialogue box has briefly appeared the Indigo main status page will be displayed. This page will give a large amount of status information about the frame and its power supplies.

From this web page you are able then to change the IP address manually or automatically if DHCP is available. A frame serial number may also be entered.



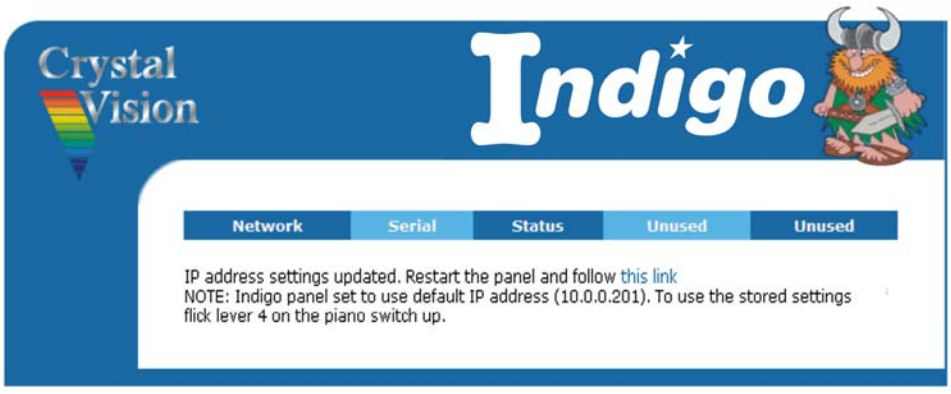
The Indigo Status page

Note: It is possible to verify that the correct frame is being viewed by first recording the Hex switch setting (second line in status list), this is the setting of the frame address switch. Rotate this switch to something other than the number displayed. Refreshing the browser will then reflect this change so verifying that the correct frame is being communicated with.

To reset the IP address, from the status page select the Network link. A new page will open allowing entry of the required IP address and Netmask. Enter the new IP address and Netmask information and select Change. Should the frame be connected to a DHCP running network and a fixed IP address is not required, leave all the information blank and tick the DHCP box before selecting Change.

Network Window

Once Change has been selected the Network screen will be replaced by a confirmation screen. As instructed, lever 4 must be returned to the up position and the front panel power cycled. This can be achieved by either briefly interrupting the power to the frame or if this is not convenient removing the ribbon-cable connection to the front panel. Care must be taken not to bend any pins in the cable connect as attempting to re-straighten any bent pins will likely result in their fracture.



Confirmation Window

Should an incorrect IP address be added an error dialogue box will be displayed indicating the likely cause of the error condition.

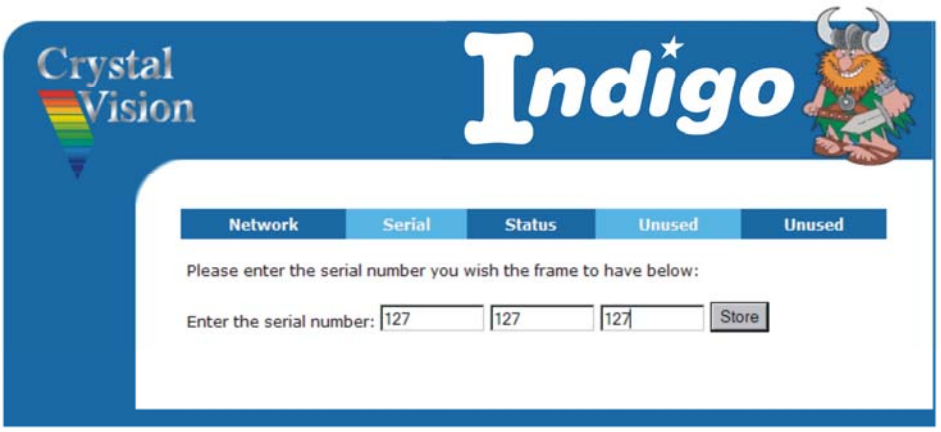
Adding a frame serial number

The facility is given to add a serial number to each frame to aid identification or for auditing purposes. The frame will have had a serial number entered during manufacture, presently this is the front panel serial number. This serial number can be freely overwritten with any series of numbers within the specified range.

The electronic serial number consists of three groups of numbers. These groups must only contain digits with no gaps and must fall into the range of 0-127.

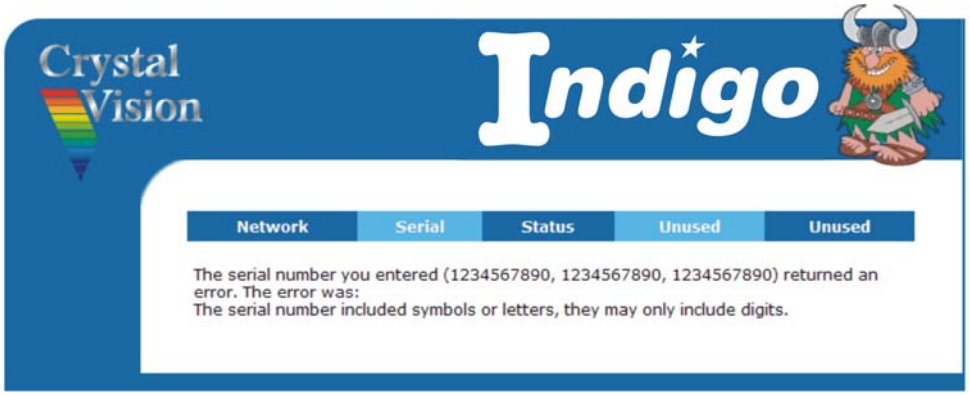
An example would be 0 0 0 or 127 127 127.

From the Status window select Serial. The following box will open.



Serial number entry box

Once the desired serial number has been entered press the Store button to save it to memory. Should the chosen serial number contain an error or be out of range an error dialogue box will be displayed.



Error dialogue box

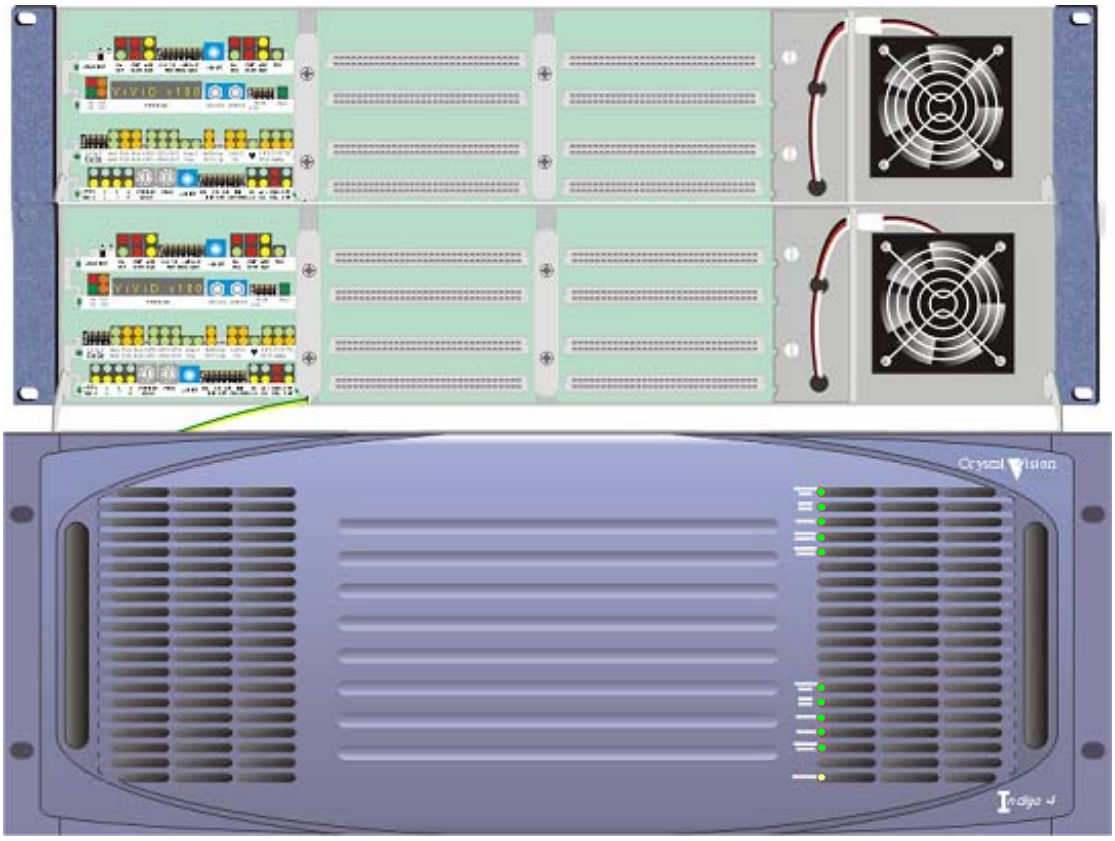
Once a serial number has been successfully entered a confirmation dialogue is displayed. The Status page will also echo the new serial number.

Serial number successfully added

2.7 Installing Crystal Vision modules

The Indigo 4 frames each have 24 slots for Crystal Vision video, audio or optical cards. Signal connections are made through rear modules.

The inside of the frame can be accessed to change the modules by pulling forward the two black handles, one on each side of the front panel.

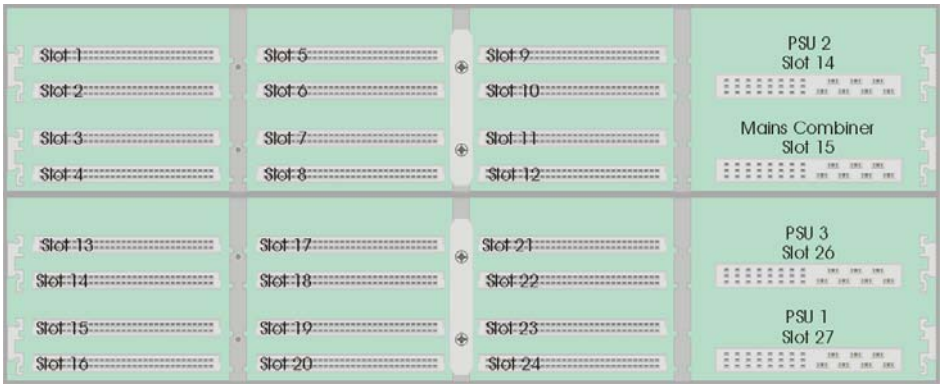


The Indigo 4 Crystal Vision frame with front control panel open

Warning: Although the frame can be operated with the front panel open, the frame may not meet electromagnetic compatibility (EMC) requirements in this condition.

Module positions

Module positions are numbered 1 to 24 as shown below:



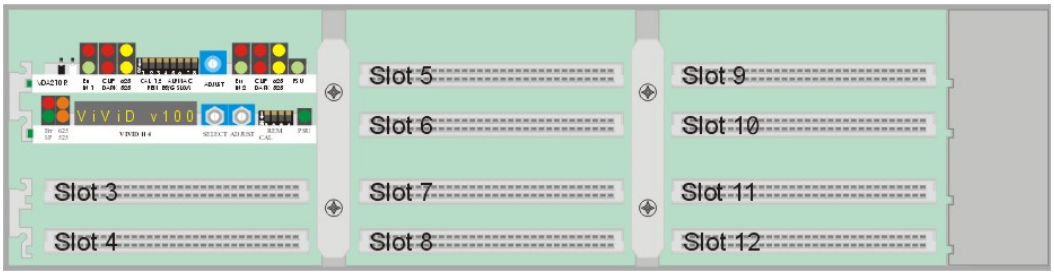
The Indigo 4 frame showing slot numbers (and left hand retaining brackets removed)

Before fitting or removing signal modules, one or more retaining brackets may need to be removed. Retaining brackets prevent the modules from being inadvertently removed or from coming out during transit. They may also prove useful in OB vehicles when travelling over rough ground.

Inserting modules

To insert a module proceed as follows:

- Remove the two screws holding the bracket adjacent to the slot intended for the module and keep both the screws and bracket in a safe place
- Insert the module into the appropriate guides and push it fully home
- Refit the retaining brackets if required



The Indigo 4 upper frame with two modules fitted in slots 1 and 2

Removing modules

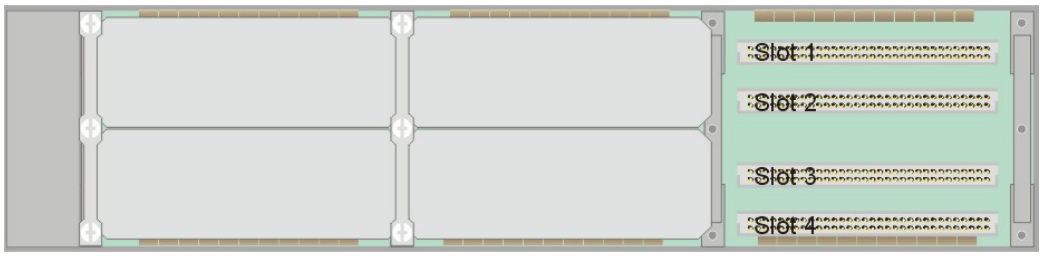
To remove signal modules simply pull on the handle and withdraw them from the frame, with the retaining brackets removed.

All Crystal Vision cards can be inserted and removed whilst the frame is powered without damage.

Rear connectors

The frame will be supplied with an appropriate selection of rear connectors for any cards installed in it at the time of order. Unused slots will be fitted with blanking plates.

Details of signal types and pin-outs are given in the documentation supplied with each Crystal Vision video or audio card.



The Indigo 4 upper frame rear view with EMC covers removed for slots 1 to 4

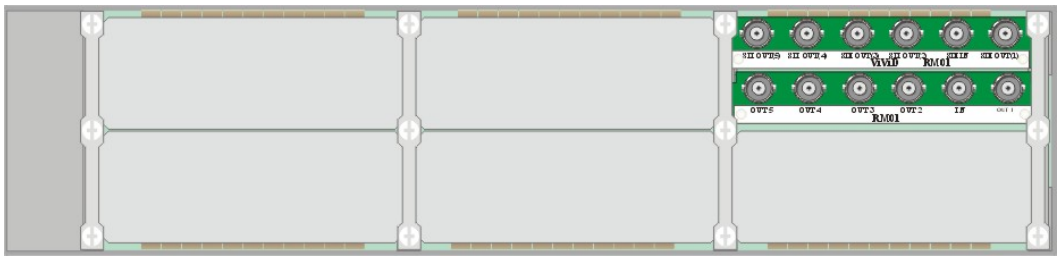
The rear modules are held in place by a retaining bar at each side. These run the height of the frame and provide mechanical support as well as ensuring EMC compliance.

To access the rear connector motherboard the appropriate EMC covers and retaining brackets must be removed.

Fitting rear connectors

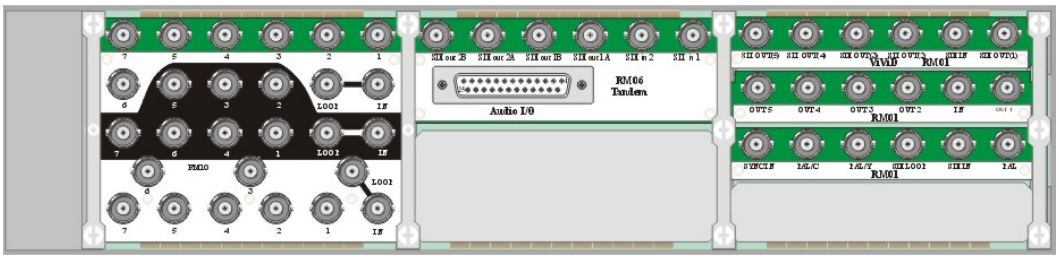
To fit a rear connector proceed as follows:

- Disconnect the mains power leads from the frame
- Remove the rear relevant EMC cover(s) at the rear of the frame by unscrewing the adjacent retaining bars
- Push fit the selected rear connector onto the appropriate frame slots
- Refit full or half size EMC covers and replace the retaining bars



The Indigo 4 upper frame rear view with EMC covers fitted and RM01 connectors fitted to slots 1 and 2

If only a single slot remains uncovered, half size EMC covers are available.



Part of an Indigo 4 upper frame showing the use of full and half size EMC covers and the use of single, double and quad rear connectors

Note: In order to accommodate the connectors of some full height (quad) rear modules such as the RM02, RM10 and RM19, special retaining bars without a central captive screw should be used. The centre of the bar is then retained with separate M3 x 8mm screw.

Warning: **To maintain product safety and EMC compliance the rear of the frame should be filled with Crystal Vision rear connectors and/or EMC covers and held in place with retaining brackets before power is reapplied.**

2.8 Indigo power supplies

The power supply module available for the Indigo 4 4U frame is the 160W rated PSU-160i. The Indigo 4 will be fitted with at least two power supply modules.

PSU-160i – top view

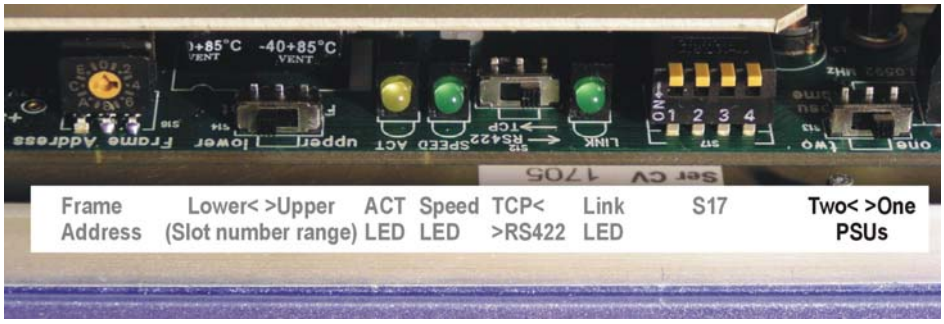
Monitoring power supply status

A signal from the each of the power supplies is routed through the frame wiring to the front panel electronics. This allows an indication by the PSU LEDs of the status of the installed power supplies.

A fault condition is indicated when the corresponding LED is red and a normal condition when it is green/yellow. If a PSU is removed for maintenance the corresponding LED will be un-lit.

Configuring PSUs

If a power supply is not fitted in the PSU 3 slot, the position of the slide switch on the top right of the lower front panel PCB must be set to one.

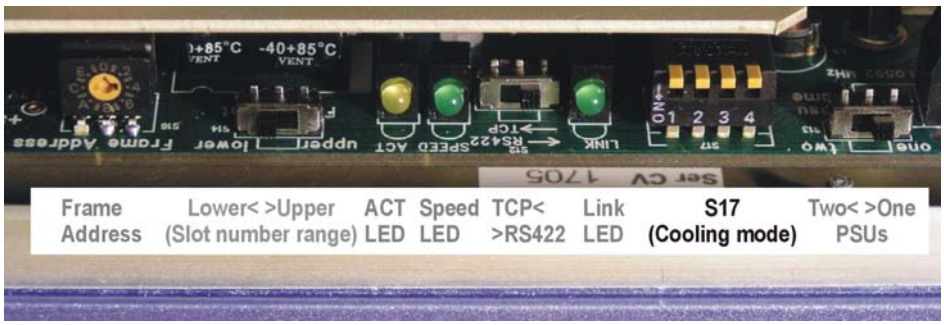


Indigo 4 front panel hardware settings – PSU configuration

If both power supplies are fitted the slide switch is set to position two. If the switch is set to one and there are two power supplies fitted, the LOWER PSU LED will flash from GREEN to OFF every two to three seconds to warn that the switch is set to one instead of two.

2.9 Select the cooling mode

Three cooling modes can be selected using a switch on the upper edge of the lower control panel PCB. The three modes available are: normal, quiet and maximum.



Front panel hardware settings – cooling mode (lower PCB)

Switches 1 & 2 of the four-position DIL switch control the three cooling modes as follows:

Levers 1 & 2	Function	Notes
Both up	Normal cooling	Both fans run continuously increasing in speed as the temperature inside the frame goes up.
1 down, 2 up	Quiet mode	For use with a lightly loaded frame in low ambient temperatures. When the frame temperature is below approximately 45°C the panel fans are switched off and the PSU fans runs at minimum speed. If the frame temperature goes above 45°C it reverts to normal cooling until the frame temperature again falls below 42°C.
1 up, 2 down	Max cooling mode	In Maximum cooling mode all fans run at near maximum speed. Fan speed increases to maximum at high frame temperature. This mode is ideal for equipment bays where noise is not a concern.
Both down	Reserved for future use	Operates as normal mode with current software.

Note: Quiet mode is dependent on PSU and PSU fans not being in an alarm state.
Switches 3 and 4 are not used.
Only one of the fans is essential in normal operation. If one of the fans should fail, the closed frame can still operate indefinitely with an ambient temperature of 40°C.

Warning: Although it is possible to operate the frame with the front panel open the frame may not meet electromagnetic compatibility (EMC) requirements in this condition.

Slot numbers

In an Indigo 4 frame, the slot or location numbers are determined by the position of the card in the frame.

The address range is shown in the following table:

Device	Address in upper frame	Address in lower frame
Modules	1.01 to 1.12	2.01 to 2.12
Indigo PIC	1.00	2.00
Upper PSU	1.14	2.14
Lower PSU	1.15	2.15

The Indigo PIC '1.00' and '2.00' modules will display the air temperature, in degrees centigrade, inside the frame above slots 1.05 and 2.05 where the temperature sensors are located.

Node numbers

Whilst most Crystal Vision cards have their unique card location address assigned automatically, older cards and frames use a ‘node’ switch on each card.

In all of the current frames, this node switch should be set to zero (factory default).

For compatibility reasons, the Home menu for each module may display the module's node number (one less than its location or slot number).

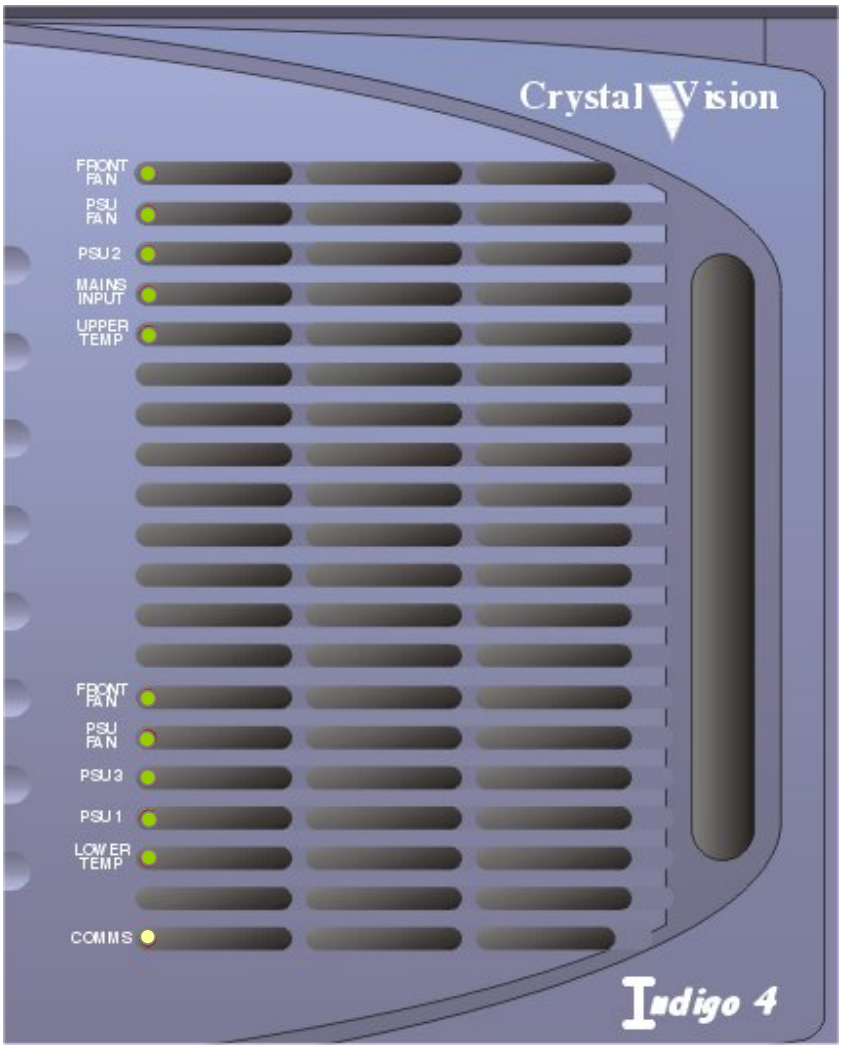
Please refer to the Appendix to find out how node numbers relate to slot numbers in particular frames and frame combinations.

Further details of control panel operation can be found in the Indigo Control Panel User manual and details of module operation can be found in the documentation supplied with each module.

3 Trouble shooting

Reading LED status and active display messages

There are six two-colour LEDs on an active or passive front panel, with yellow/green indicating a normal condition and red an abnormal condition.



The Indigo 4 LEDs

The following LED status indications may be seen:

LED	Colour	Notes
Front Fan (upper)	Unlit	Quiet mode/Door open
	Yell/Grn	Normal operation
	Red	Change the panel fan
PSU Fan (upper)	Yell/Grn	Normal operation
	Red	Change upper PSU fan
PSU 2	Yell/Grn	Normal operation
	Red	Change upper PSU
Mains Input	Unlit	No 4th PSU detected
	Yell/Grn	Normal operation
	Red	Alarm. Mains Input 1 or 2 missing, Change PSU 4, check supply, change upper inlet fuse
Upper Temp	Yell/Grn	Normal operation
	Red	UPPER FRAME TOO HOT, Ambient temperature too high/fan fault
Front Fan (lower)	Unlit	Quiet mode/Door open
	Yell/Grn	Normal operation
	Red	Change the panel fan
PSU Fan (lower)	Yell/Grn	Normal operation
	Red	Change lower PSU fan
PSU 3	Unlit	No PSU 3 detected
	Yell/Grn	Normal operation
	Red	Change PSU 3
PSU 1	Unlit	No PSU 1 detected
	Yell/Grn	Normal operation
	Red	Change lower PSU 1
Lower Temp	Yell/Grn	Normal operation
	Red	LOWER FRAME TOO HOT, Ambient temperature too high/fan fault
Comms	Unlit	No external comms being received.
	Flash amber	External comms present

If a PSU is not fitted, the corresponding LED will not illuminate. If the front panel is open, the Front Fan LED will also be unlit.

The Comms LED indicates external communication with the frame. On a passive panel this will mean communication from the frame or an active control panel. On an active panel this will be communication with Statesman via an RS422 link or via Ethernet.

The Comms LED flashes slowly at medium intensity if communication has been established. It will flash at higher intensity when the communication channel is active.

When a fault is cleared, the corresponding LED (if appropriate) will return to normal. The Indigo REMIND active front panel can also be used to interrogate the status of the front panel and installed PSUs by pressing Enter when those devices are listed in Device view.

Statesman users will be able to remotely monitor frame temperature and fan speed.

Power supply related faults operate a relay the contacts of which are brought out to the remote connectors. These contacts can be used to operate external indicators as desired.

Please refer to the *Power supply relay connections* pin-out section for more details.

PSU relays

Each PSU contains a relay, the contacts of which are brought out to the remote connectors. This relay is under frame control and will change state whenever a frame fault is present.

Note: If the frame is fitted with more than one PSU both relays will be triggered by the frame.

These contacts can be used to operate external indicators as desired.

Note: In certain circumstances there may be a delay of several seconds between the first relay and any other relay's state changing.

Note: The red LED built into the front of the vertical PCB on the left hand side of the PSU will flash repeatedly (on for one second and off for one second) if there is no speed fan signal present on the connector SK 1 (the front left hand side of the PSU). This will occur when the PSU fan assembly is removed or if the PSU fan stops. When the fan speed signal is present the LED is unlit. The same red LED will light up continuously if levels of the power rails (+5.75V or -6.0V) are outside operational limits.

Frame diagnostics (Indigo REMIND remote active panel)

An Indigo REMIND active control panel is able to display frame diagnostics information.

The frame diagnostics display will show the following information:

- The status of the panel communications mode
- Frame node

To enter this menu, press the Device key when in Statesman mode.

Status menu	Comment
Comms* = 422/TCP	Shows Comms mode
Node = 01 Comms* = xxxx	First frame node and Comms status

Note: Comms (422/TCP) reflects the state of the RS422/TCP switch at the rear of the control panel. This switch should be left in the 422 position. See Reading Comms mode and status below for further help.
The first expression in the bottom line gives the Statesman rack address = hex switch setting + 1.

Press CAL to exit the frame diagnostics menu.

*Reading Comms mode and status

The top line indicates the mode of the external Comms connection.

Comms = 422 (TCP ok)	Comms is in 422 mode, TCP is available as a service - if TCP mode is the only method of Comms to the frame, this indicates the network connection has not been set up
Comms = TCP active	Comms in TCP mode. Network connection ok
Comms = net failed	Network connection failure
Comms = 422	Comms in 422 mode. TCP is not available as a service
Comms = TCP n/a	TCP mode selected but unavailable in this software version

The second expression in the bottom line provides further Comms status with four character positions, Comms = xxxx, each of which can be either 'y' or 'n'.

Character position	Meaning when 'y' appears in given position
1	y = valid binary Comms from PC received by front panel
2	y = binary Comms to PC transmitted from panel
3	y = valid binary Comms received from boards by front panel
4	y = binary Comms transmitted from panel to boards.

Example

A frame containing boards, but not connected to a PC could therefore have the display:

Comms *[mode]* =422

node = 03 Comms *[status]* =nnyy

3.1 Maintenance

Warning: **These servicing instructions are for use by qualified personnel only. To reduce risk of electric shock, do not perform any servicing other than that contained in the Operating Instructions unless you are qualified to do so. Refer all servicing to qualified service personnel.**
Refer also to the General Safety Summary in the Installation chapter.

Inserting and removing power supplies

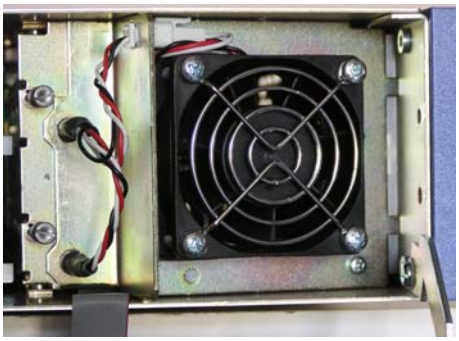
The PSU-160i power supplies can be inserted and removed while the system is powered without damage. However, this must be done quickly as there will be no forced convection air, as the PSU fan assembly has to be removed.

To gain access to the Indigo power supply modules proceed as follows:

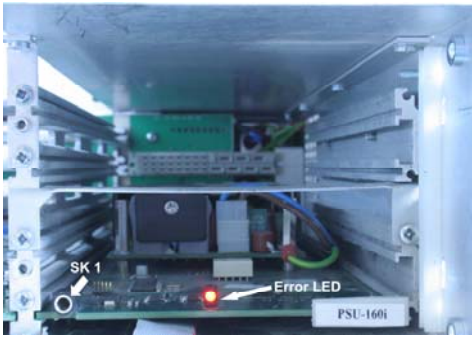
- If possible, power down the frame
- Pull down the front panel using the loop handles at either side of the panel
- Release the two captive screws to the left of the selected PSU fan
- Remove the fan assembly by applying sideways pressure on the fan assembly outwards and towards the right hand frame side

Note: Take care not to damage the panel ribbon cable when removing the lower fan assembly.

Once the fan assembly has been pulled backwards to free the fan connector plugs, the PSU fan will stop and the front panel PSU FAN LED will change from green to red.



Removing the PSU fan assembly



Lower PSU-160i – front view

In addition to the PSU and fan LEDs on the front control panel, there is also a red error LED on the PSU. This LED will flash slowly if there is no fan speed signal present on the fan connector SK 1 when the PSU fan assembly is removed or if the PSU fan stops.

The error LED will light up continuously if power rail levels are outside operational limits. When the fan speed signal is present and power rails are normal the error LED is unlit.

Removing a PSU

To remove a PSU proceed as follows:

- Apply sideways pressure on the PSU handle towards the right and remove the PSU by pulling it forward
- Take care when removing the lower PSU not to damage the panel ribbon cable

Caution: There are no user serviceable parts inside the power supply module covers. The safety covers should not be removed even when the module is disconnected.

Note: Check that the two/one switch behind the control panel is set correctly for the number of PSUs installed to prevent redundant PSU warnings.

Inserting a PSU

To insert a PSU proceed as follows:

- Check that the power supply is the same type as already fitted.
- Offer up the PSU to the frame guide rails – it may help to turn the lower PSU handle fully outwards to clear the panel hinge
- Carefully push the PSU all the way into its socket

Notes: PSU modules should only fit into the PSU slots behind the PSU fan assembly. Do not attempt to fit a PSU into a video or audio module slot.
Check that the two/one switch behind the control panel is set correctly for the number of PSUs installed to prevent redundant PSU warnings.

Fitting the fan assembly

To refit the PSU fan assembly proceed as follows:

- Offer up the fan assembly ensuring that the two lugs fit into two slots in the right hand side of the frame just in front of a plastic stop
- Carefully move the fan assembly into position ensuring that the two PSU fan jacks fit into the PSU jack sockets (SK 1)
- Take care not to damage the panel ribbon cable
- Tighten the two captive screws to the left of the PSU fan ensuring that they are not too tight to be undone without a screwdriver
- If the unit was unpowered it may now be powered and tested

Replacing the PSU fan

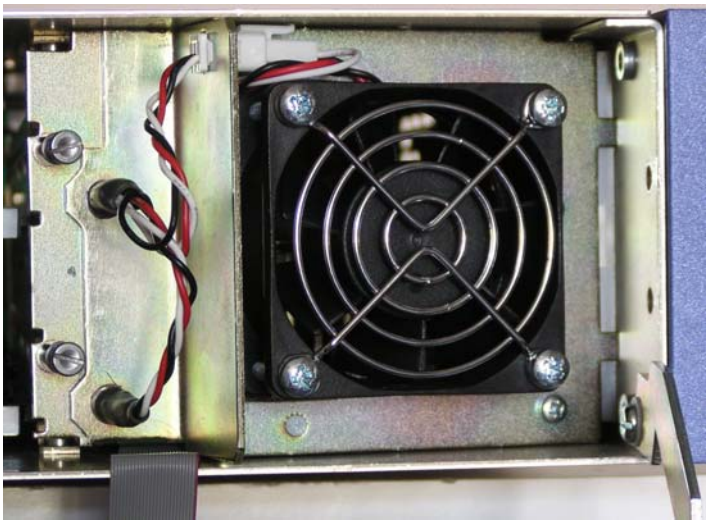
It is recommended that PSU fan replacement should be performed as quickly as possible if the frame is powered, to prevent overheating.

Tip: Close the front panel whilst the PSU fan assembly is removed when the frame is powered to allow the front panel fan to operate and provide cooling.

To replace the fan proceed as follows:

- If possible disconnect the power cord(s) connected to the frame
- Remove the PSU fan assembly as shown in the preceding section
- Undo the 3-way connector which is attached to three wires on the fan
- Remove the finger guard and fan by unscrewing the four retaining screws
- Replace the fan with a Crystal Vision supplied replacement part to ensure adequate cooling and continued fire protection
- Be sure to refit finger guards on the outer side of the mounting plate assembly
- Plug in the 3-way connector from the new fan
- Replace the PSU fan assembly as shown in the preceding section
- Reconnect the power supply cords

If the frame is powered, the PSU fan should now be operating and the PSU FAN LED should be green.



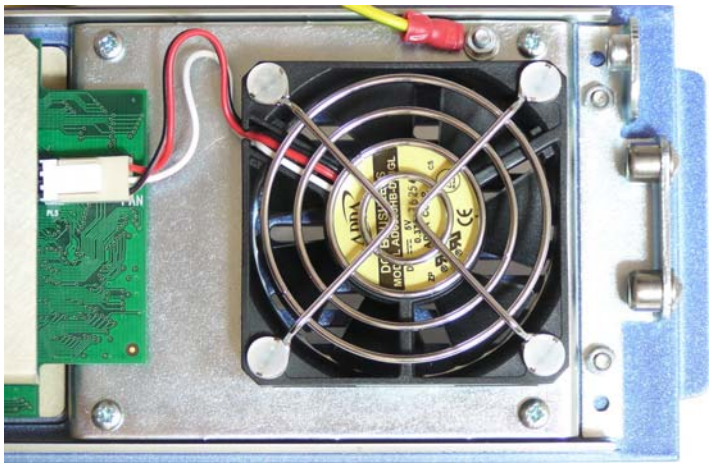
PSU fan showing 3-pin connector and finger guard

Replacing the front panel fan

To replace the front panel fan proceed as follows:

- If possible disconnect the power cord(s) connected to the frame
- Open the front panel.
- If the frame is powered, the fan on the front panel will stop and the PSU fan will automatically speed up to maximum speed
- Undo the 3-way connector which is attached to three wires on the fan from the front panel PCB labelled FAN
- Using a screwdriver remove the four screws that hold the fan and fan's finger guard on a mounting plate which is on the front panel
- Remove the fan and finger guard completely
- Replace the fan with a Crystal Vision supplied replacement part to ensure adequate cooling. Be sure to fit the finger guards on the outer side of the fan
- Reconnect the 3-way connector which is attached to three wires on the fan onto the front panel PCB connector labelled FAN
- Close the front panel and reconnect the power supply cords

The front panel fan should be operating and the FRONT FAN LED should be lit green. The display on an active panel will indicate 'Fault cleared'.



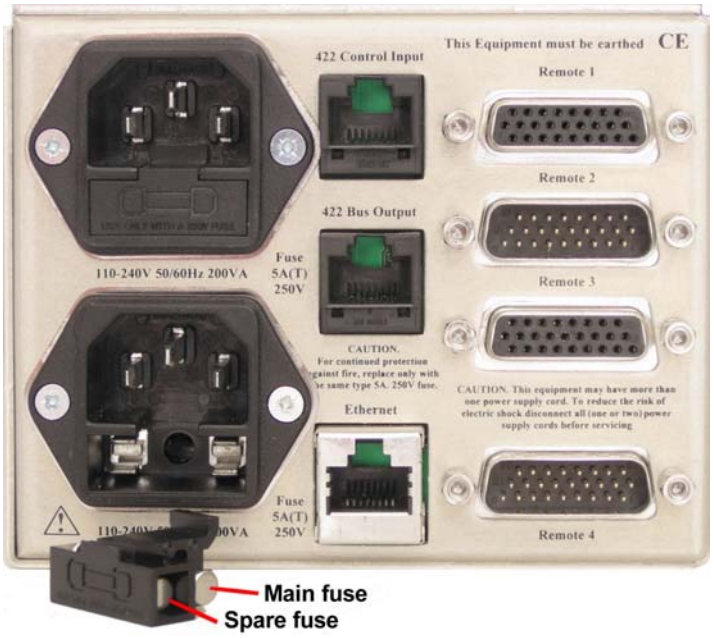
Front panel fan showing 3-pin connector and finger guard

Replacing the mains input fuses

The mains input fuses are fitted inside the IEC 320 connectors at the rear of the frame. A spare fuse is also stored inside the connector. The fuse can only be accessed when the power cord is disconnected.

The sequence is as follows: -

- Disconnect ALL the power cords (one or two depending on configuration) from the rear of the frame.
- Using a flat bladed screwdriver or similar tool gently lever out the fuse drawer from the relevant IEC connector using the tab visible at the bottom of the connector depression
- Remove the defective fuse and replace with either the spare fuse or with a 5A, 250V time delay fuse
- Replace the fuse drawer and reconnect the power cords



Rear connectors showing IEC mains inputs and fuse tray with main and spare fuses

If a fuse blows repeatedly this indicates a fault either in the associated power supply module or elsewhere. Return the frame and/or power supply to the manufacturer or dealer for repair.

Note: Replace the fuse only with one of the same type and rating (5A, 250V time delay).

Software upgrades

The Indigo 4 front panel will require the software to be upgraded on both front panel PCBs simultaneously.

Note: As both panels use the same software there will be no possibility of fitting the upgrade incorrectly.

To change the EPROM proceed as follows:

- Switch off the power and remove or drop down the front panel by undoing the two thumb screws
- If absolutely necessary the frame can remain powered but it is advisable to remove the two ribbon cables from the front panel PCBs prior to removing any covers or EPROM
- If necessary remove any protective metal shielding and keep the screws
- The EPROM can now be accessed and removed from its holder
- Fit the new EPROM ensuring it is placed the correct way round (note the position of Pin 1)
- Replace any shielding using the screws retained

Front panel PCB with cover removed showing firmware EPROM in the top right corner

Note. The Indigo 4SE front panels do not have removable EPROMs. Software upgrades are done via the Ethernet connection. See the Indigo active front panel manual for information concerning remote software loading.

3.2 Frequently asked questions

Why are no LEDs illuminated?

Check that at least one frame PSU is functioning

Check that the frame is powered and that the fuse is intact

What should I do if the TEMP LED is red and/or the FRAME TOO HOT message is displayed?

Check that cool air is able to circulate through the front panel grilles and out of the ventilation holes at each side of the frame

Check that the panel and PSU fans are operational and that the FRONT FAN and PSU FAN LEDs are not red

What should I do if the PSU FAN LED is red?

Check that the PSU fan is plugged in correctly

Try replacing the fan

What should I do if the FRONT FAN LED is red?

Check that the front control panel fan is plugged in correctly

Try replacing the fan

What should I do if any PSU LED is red?

Try replacing the appropriate PSU

Why do I keep getting a warning message about a power supply problem? (REMIND)

If PSU warnings persist even when no PSU fault is suspected, check that the Two/One PSU switch at the rear of the front panel is set correctly for the number of power supplies installed

Why does the LOWER PSU LED flash from green to off?

This will occur if the third PSU is fitted when the Two/One PSU switch at the rear of the front panel is set for only one PSU. Move the switch into the Two position.

Why do some cards not appear in the available cards list? (REMIND)

Some cards take longer than others to finish their initialisation routines - try waiting at least 30 seconds for all cards to initialise

Check that any cards with remote/local switches are set for remote control

Check that any hex node switches are set to zero

How do I check PSU or RS422 comms status?

Press the Device key in Statesman mode to display frame diagnostics

Look at the Comms LED. It should flash slowly at medium intensity when a valid communication link is present. It will flash brightly when the communication link is active

Why has Statesman serial communication failed?

Check that the appropriate cabling is connected correctly and is intact

Check that the 422/TCP panel switch is in the RS422 position

Why doesn't the switch on the front panel that sets the slot address work?

Changing this switch only takes effect the next time the front panel is powered up

4 Appendix

Module addresses and node numbers

The following table shows the upper/lower address or slot number range on the panel PIC, PSUs and installed modules for a variety of Indigo frames.

Device/Indigo frame	Lower address in 1st frame	Upper address in 2nd frame
Modules in 4U frames	1.01 to 1.12 (Upper)	No second frame.
	2.01 to 2.12 (lower)	
Modules in 2U frames	1.01 to 1.12	2.01 to 2.12
Modules in 1U frames	1.01 to 1.06	2.01 to 2.06
Modules in desktop frames	1.01 to 1.02	2.01 to 2.02
Panel PIC in all frames	1.00 (Indigo 4 upper)	2.00 (Indigo 4 lower)
PSU 1 in 4U frames	2.15	
PSU 2 in 4U frames	1.14	
PSU 3 in 4U frames	2.14	
Upper PSU in 2U frames	1.14	2.14
Lower PSU in 2U frames	1.15	2.15
PSU in 1U frames	1.14	2.14

Most Crystal Vision cards have their unique node or card location address assigned automatically by the panel processor based on the slot occupied in the frame and the Upper/Lower range address setting.

Older cards may have a special 16 position node switch for use with older frames such as the FR2-12 or FR1-6.

In all of the current frames, this node switch should be set to zero (factory default).

When a card is detected by the front panel processor some older cards will identify their location with a node address instead of a slot address.

The relationship between the two methods of referring to card addresses is as follows.

In the Indigo desk top box the node address is calculated as follows:

- slot number minus 1 – giving a range of 0 - 1 in frame 1 and 16 - 17 in frame 2

In the 1U frame the node address is calculated as follows:

- slot number minus 1 – giving a range of 0 - 5 in frame 1 and 16 - 21 in frame 2

In the 2U/4U frame the node address is calculated as follows:

- slot number minus 1 – giving a range of 0 - 11 in frame 1 (4U upper) and 16 - 27 in frame 2 (4U lower).

5 Specification

Indigo 4U frame

General

Dimensions:	482mm wide (19 inches), 176mm high (4U), 425mm deep. Weight 10 kg
Power requirements:	85 to 264 Volts, 47 to 400Hz
Operating conditions:	0 to 40 degrees C non-condensing Ventilation front to sides, without air filters
Power supply:	Up to four plug-in power supplies (160 Watt PSU-160i)

Module control

Remote options:	Six control lines per module. Assigned on module (eg. GPI or RS422/RS232) Contact open/closure for any power supply or frame fault condition (supply out of range or failure, fan too slow or fail, over-heat) RS485 loop system for front panel to all modules and rear connection (rear connection by way of 26-pin high density D-Type connector and RJ45 connector) Second serial port available for Statesman control (connection via 26-pin high density D-Type connector and RJ45 connector) REMIND active display control of passive frame Ethernet control capable option

Frames Summary

Indigo 4	4U frame without active control panel (passive) for up to 24 modules
Indigo 4SE	4U frame Ethernet capable and Statesman enabled with no controls or display for up to 24 modules
PSU-160i	160 Watt PSU for 1U/2U/4U Indigo frames