Indigo 2 CoolFlow

2U frames

(Includes Indigo 2 CoolFlow and Indigo 2SE CoolFlow)

USER MANUAL

Crystal Vision

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1 Introduction

The Indigo CoolFlow range comprises two frame types: 4U frames for up to 24 modules and 2U frames for up to 12 modules.

There are two 2U frame variants - passive front panel and active front panel which is a Statesman-enabled version without controls or a display. The active panel Statesman-enabled frame has also got Ethernet capability.

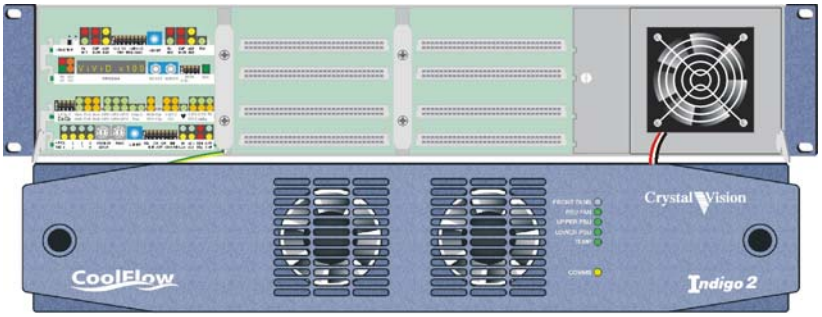
This manual covers:

Indigo 2 CoolFlow with passive front panel
Indigo 2SE CoolFlow Ethernet capable with active panel, no controls or display.

The Indigo 2SE CoolFlow version also supports Statesman.

There are configurable rear connectors and space for up to two plug-in power supplies. The dual supply facility allows for redundancy and continued operation in the event of a power supply failure.

All models have a hinged front panel that allows easy access to removable fan assemblies, power supplies and modules.



The Indigo 2 CoolFlow frame with front control panel open

There are three easily accessible front fans. One is fitted on a detachable plate in front of the PSUs and the other two are attached to the rear of the front panel.

If the front panel is opened an optical sensor switches the PSU fan on and at the same time the front panel mounted fans are switched off. If one fan fails, or operates too slowly, the other fan is automatically switched to full power and an alarm asserted.

A frame temperature sensor mounted above the top central module position (slot 5) also controls fan speed.

There are two cooling modes: automatic and maximum.

With automatic cooling both front panel fans run continuously, increasing in speed as the temperature inside the frame goes up.

In maximum cooling mode both front panel fans are set to maximum speed. This mode is ideal for equipment bays where noise is not a concern.

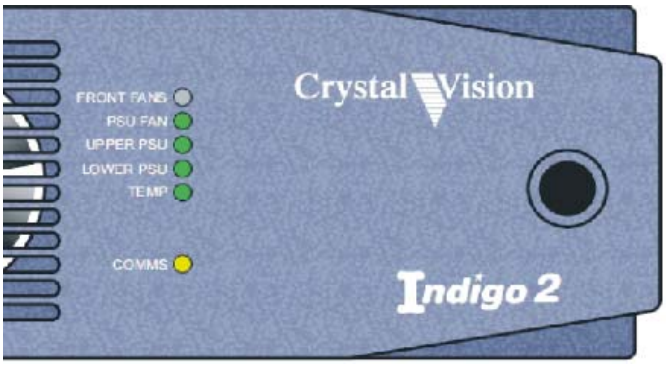
Only one of the fans is essential in normal operation. If one of the fans should fail, the closed frame can still operate indefinitely with an ambient temperature of 40 degrees.

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.

The Indigo PSUs have a built-in processor, which communicates with the front panel display processor (referred to as a PIC) and monitors power rail voltage levels (+5.75V and -6.0 V). The PSUs also store their own serial number in non-volatile memory.

The panel processor regularly receives status updates from the PSU processors about power rails. This allows the front panel to update its status LEDs and control the alarm changeover relay. The relay contacts are available on Remote 2/4 connector on the rear of the frame.

There are five two-colour LEDs on an active or passive front panel, with yellow/green indicating a normal condition and red an abnormal condition. If the LED is unlit, this indicates an inactive condition such as a single PSU fitted or PSU fan not running with the front panel closed. There is also a yellow comms LED that flashes when comms are received.



The Indigo 2 CoolFlow status LEDs

The following LED status indications may be seen:

LED	Colour	Notes
Front Fan	Unlit	Door open
	Green	Normal operation
	Red	Change the panel fan
PSU Fan	Unlit	Door closed and fan idle
	Green	Door open and fan operational
	Red	Change PSU fan
Upper PSU	Unlit	No upper PSU detected
	Green	Normal operation
	Red	Change upper PSU
Lower PSU	Unlit	No lower PSU detected
	Green	Normal operation
	Red	Change lower PSU
Temp	Green	Normal operation
	Red	Internal temperature too high(approx 65^{o}C)
Comms	Unlit	Press Device in Statesman mode for comms status
	Flash amber	

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 the 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 guidelines 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.

The Indigo 2 range of frames 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 not to look directly into the light beam.

This 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 the instruction manual, 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 his own expense.

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 2 CoolFlow 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

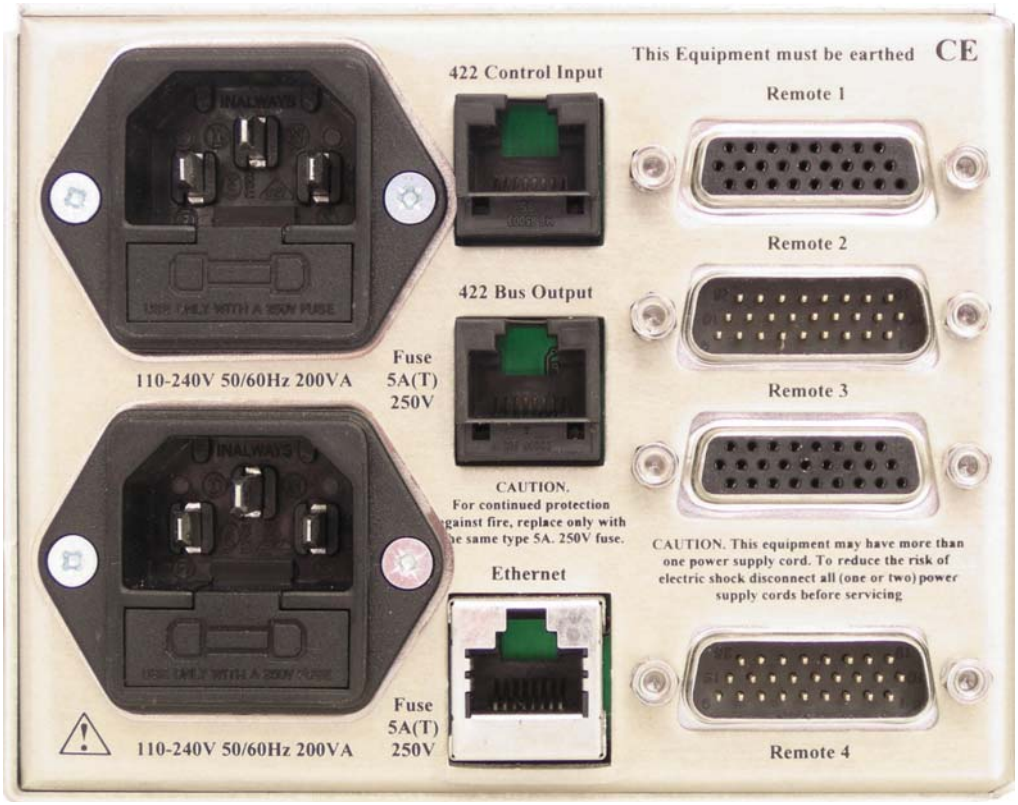
Note: Only one of the fans is essential in normal operation. If one of the fans should fail, the closed frame can still operate indefinitely with an ambient temperature of 40 degrees. It is also possible to operate the frame with the front panel open; however the frame may not meet electromagnetic compatibility (EMC) requirements in this open 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
Remote 1	GPI and DC out	Refer to pinout tables
Remote 2	GPI, serial/Statesman, upper PSU alarm relay and DC out	Refer to pinout tables
Remote 3	GPI and DC out	Refer to pinout tables
Remote 4	GPI, lower PSU alarm relay and DC out	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 PSUs at the rear of the frame.



Indigo 2 CoolFlow rear connectors

Connecting mains cables

To connect the Indigo 2 CoolFlow frame to AC mains proceed as follows:

- Power the unit 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 must have a minimum current rating of 6A and are 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.

2.3 Connector pinout

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 4. 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 and Remote 3 connections (26 way high density D-Type socket)

Pin number	Remote 1 - function	Remote 3 - function
1	+5.3V +/- 10% dc out	+5.3V +/- 10% dc out
2	Frame GND	Frame GND
3	Slot 9 GPI ‘a’	Slot 11 GPI ‘a’
4	Slot 6 GPI ‘a’	Slot 8 GPI ‘a’
5	Slot 5 GPI ‘a’	Slot 7 GPI ‘a’
6	Slot 5 GPI ‘b’	Slot 7 GPI ‘b’
7	Slot 2 GPI ‘a’	Slot 4 GPI ‘a’
8	Slot 1 GPI ‘a’	Slot 3 GPI ‘a’
9	Slot 1 GPI ‘b’	Slot 3 GPI ‘b’
10	Slot 10 GPI ‘a’	Slot 12 GPI ‘a’
11	Slot 10 GPI ‘b’	Slot 12 GPI ‘b’
12	Slot 9 GPI ‘b’	Slot 11 GPI ‘b’
13	Slot 6 GPI ‘c’	Slot 8 GPI ‘c’
14	Slot 6 GPI ‘b’	Slot 8 GPI ‘b’
15	Slot 5 GPI ‘c’	Slot 7 GPI ‘c’
16	Slot 2 GPI ‘b’	Slot 4 GPI ‘b’
17	Slot 2 GPI ‘c’	Slot 4 GPI ‘c’
18	Slot 1 GPI ‘c’	Slot 3 GPI ‘c’
19	Slot 10 GPI ‘c’	Slot 12 GPI ‘c’
20	Slot 10 GPI ‘d’	Slot 12 GPI ‘d’
21	Slot 9 GPI ‘d’	Slot 11 GPI ‘d’
22	Slot 9 GPI ‘c’	Slot 11 GPI ‘c’
23	Slot 6 GPI ‘d’	Slot 8 GPI ‘d’
24	Slot 5 GPI ‘d’	Slot 7 GPI ‘d’
25	Slot 2 GPI ‘d’	Slot 4 GPI ‘d’
26	Slot 1 GPI ‘d’	Slot 3 GPI ‘d’

Note: The total current available from the 5.3V dc outputs is limited to approximately 1.5Amps.
To maintain EMC compliance only good quality screened cable assemblies should be used.

Remote 2 and Remote 4 connections (26 way high density D-Type plug)

Pin number	Remote 2 - function	Remote 4 - function
1	Slot 5 GPI ‘e’	Slot 7 GPI ‘e’
2	Slot 5 GPI ‘f’	Slot 7 GPI ‘f’
3	Slot 6 GPI ‘a’	Slot 8 GPI ‘e’
4	Slot 6 GPI ‘f’	Slot 8 GPI ‘f’
5	Relay close on fault, upper PSU	Relay close on fault, lower PSU
6	Frame GND	Frame GND
7	RX+ bus RS422	N/C
8	TX- RS422 o/p Statesman	N/C
9	TX+ RS422 o/p Statesman	N/C
10	Slot 2 GPI ‘e’	Slot 4 GPI ‘e’
11	Slot 2 GPI ‘f’	Slot 4 GPI ‘f’
12	Slot 9 GPI ‘e’	Slot 11 GPI ‘e’
13	Slot 9 GPI ‘f’	Slot 11 GPI ‘f’
14	Relay common , upper PSU	Relay common , lower PSU
15	+5.3V +/- 10% dc out	N/C
16	RX- bus RS422	N/C
17	TX+ bus RS422	N/C
18	RX+ RS422 i/p Statesman	N/C
19	Slot 1 GPI ‘e’	Slot 3 GPI ‘e’
20	Slot 1 GPI ‘f’	Slot 3 GPI ‘f’
21	Slot 10 GPI ‘e’	Slot 12 GPI ‘e’
22	Slot 10 GPI ‘f’	Slot 12 GPI ‘f’
23	Relay open on fault, upper PSU	Relay open on fault, lower PSU
24	N/C	N/C
25	TX- bus RS422	N/C
26	RX- RS422 i/p Statesman	N/C

Note: The total current available from the 5.3V dc outputs is limited to approximately 1.5Amps.
To maintain EMC compliance only good quality screened cable assemblies should be used.

Power supply relay connections

The 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 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

Lower Power Supply 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

Note: The current though 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 2 connector.

Note: TX and RX are defined on the boards. This connector can be used to link two frames where one frame is either an active frame or Statesman-enabled. Alternatively a REMIND remote control panel can also be connected here and used to control up to two passive Indigo 2 frames. If an external RS422 control device is to be used ensure that the controller will drive the RX+ with TX+ etc.

Note: Since there is no ground connection via the 422 Bus two frames or other pieces of equipment that share this connection must have a common ground connection. This will normally occur through the earth pins on the mains connectors.

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 2 connector.

Note: Since there is no ground connection via the 422 Bus two frames or other pieces of equipment that share this connection must have a common ground connection. This will normally occur through the earth pins on the mains connectors.

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 a 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 top of the front control panel by opening the panel and lifting it upwards.

Statesman RS422 term/unterm switch

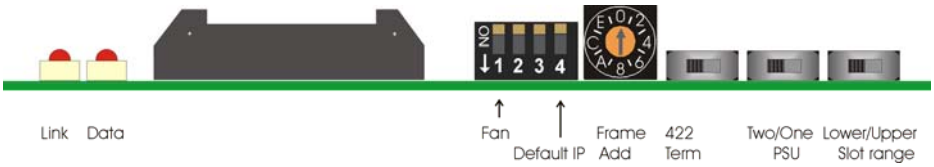
To terminate the RS422 link move the switch to the left, to unterminate it move it to the right.

RJ45 Ethernet connector

Pin number	Function
1	TD+
2	TD-
3	RD+
4 and 5	Not used – 75 ohm resistor to GND in frame
6	RD-
7 and 8	Not used – 75 ohm resistor to GND in frame

2.4 Front panel settings

On the upper edge of the 2U front panel PCB, the config switches and status LEDs can be found.



2U board top-edge switches and LEDs

Note: The Indigo 2 CoolFlow with the passive front panel will have a reduced build front panel PCB so not all switches and LEDs will be present

Frame Address

The frame address, which only relates to active panels such as the Statesman-enabled, 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.

Lower/Upper slot range

This switch is used when configuring a frame pair where the two frames must have their individual slot addresses. The position of the two-position slide switch labelled Lower/Upper on the top edge of the front panel PCB must be placed in the lower position for one frame and in the upper position for the other. Which frame of a pair selected to be upper and lower is not important.

Refer to the address range table in the section entitled 'Selecting different modules' in chapter two for the module addresses assigned when frames are operated as a pair.

The two frames should be connected so that control can pass from one frame to the other using an RS422 serial link.

Config Switches

Piano switch

Switch 1 & 2 controls the cooling fan modes. Switch one control which of the two cooling regime is to be implemented. Quiet mode uses a set of slightly higher temperature bands and will allow the frame to heat further before increasing the fan speed. This setting is idea for when the frame is situated in a noise sensitive area and is lightly loaded. Switch 2 controls whether the fans are in auto mode or maximum speed.

1	Fan	Normally up (best cooling), Down quieter running.
2	Fan	Normally up (auto), Down front panel fans full speed.
3	Debug	Normally up, no user function.
4	Default IP address	Normally up. Down sets IP address to default 10.0.0.201.

Note: Auto 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 three is for debug purposes and should normally be left in the up position.

Default IP address (Indigo 2SE only)

Switch four 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 incorrectly set. Should only a single power supply be fitted with the switch set to position two, a power supply fault will be registered.

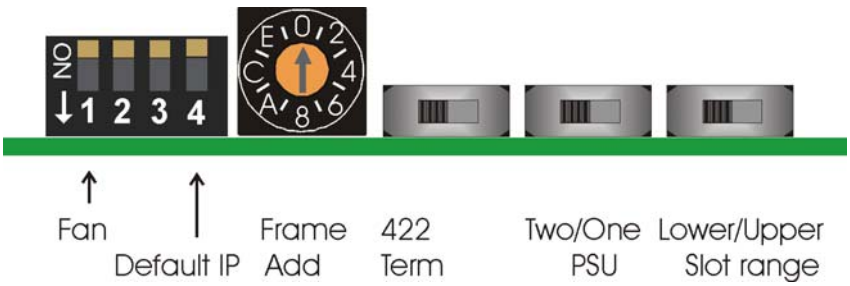
2.5 Controlling two frames from one panel

A single active or remote control panel may control modules in up to two frames. This constitutes a frame pair where one frame is set to its upper slot address range and the other to its lower address range. Only one panel in a frame pair needs to be non-passive.

If a remote REMIND panel is used the controlled frames need only have passive panels, if both frames are controlled from one frame that frame should have an active panel and the other a passive panel.

Note: If a frame pair has been established solely for Statesman control, one of the frames can have a Statesman panel and the other a passive panel.

The two frames can be up to 10m apart depending on cable type and ambient electrical noise.



Slot number range

The position of the two-position slide switch labelled Upper/Lower on the top edge of the front panel PCB must be placed in the Lower position for one frame and in the Upper

position for the other. For example it could be set to the Lower position for the Indigo 2SE CoolFlow frame and Upper for an Indigo 2 CoolFlow or Indigo 1 CoolFlow frame.

The number of modules reported to the active display includes the PSUs and front panel/frame as the Indigo front panel PIC and the two power supplies have an address and are treated as modules. Refer to the address range table in Chapter 3 - 'Operating the active panel' for more information.

The two frames should be connected so that control can pass from one frame to the other using an RS422 serial link.

Note: The switch will only have an effect the next time the front panel is powered up.

Establishing a serial link

This can be accomplished with a special cable linking the Remote 2 connectors or by using a CAT-5 patch cable linking the '422 Bus Output' connectors.

Using a CAT-5 patch cable

A CAT-5 cable (TIA/EIA 568A CAT-5 PATCH) is plugged in the connectors labelled ‘422 Bus Output’ on each frame.

Using Remote 2 connectors

A special cable is connected between the 'Remote 2' D-Type connectors of the two frames.

The cable required uses two female 26 way high density D-Type sockets. These should be connected with screened twisted pair cable containing two pairs. All the wiring is pin to pin. Pins 16 and 7 should use one twisted pair, pins 17 and 25 the other. The screen should be connected to pin 6 on both connectors.

Note: The Comms LED will flash when communication has been established.

Signal	Female 26-way high density D-Type plug pin No		Female 26-way high density D-Type socket pin No
GND	**6 / Shell**		**6/ Shell**
PBRX +	**17**		**17**
PBRX -	**25**		**25**
PBTX +	**7**		**7**
PBTX -	**16**		**16**

Frame link cable connections

To ensure continued EMC compliance it is recommended to use high quality shielded twin pair cable for RS422 cabling.

Setting frame addresses

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. The address of a frame pair is set by its non-passive panel.

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

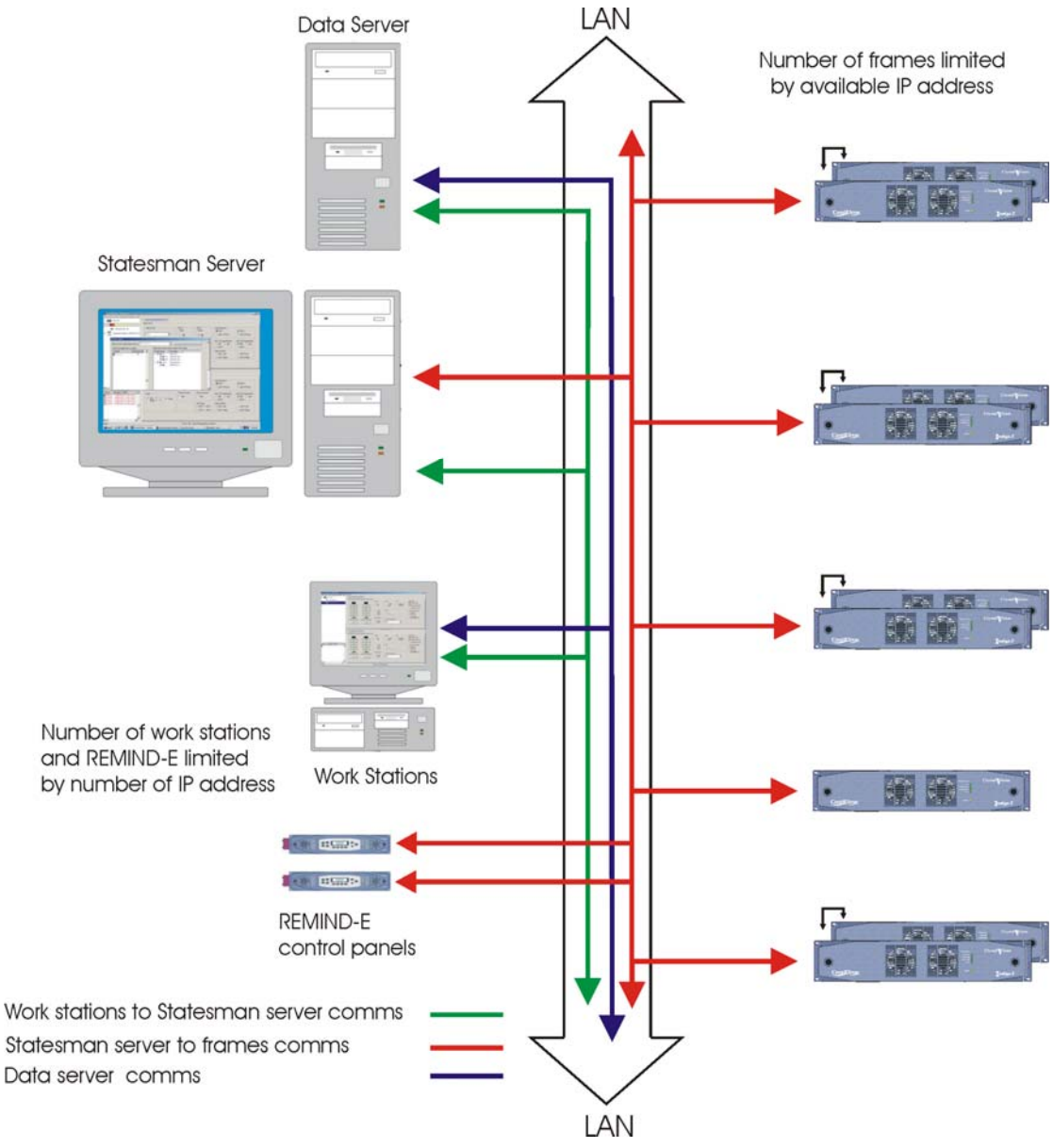
Note: Passive panels do not have a Frame Address switch.

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

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.

2.6 Ethernet control

Ethernet control is provided by the Indigo 2SE CoolFlow frame. 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.



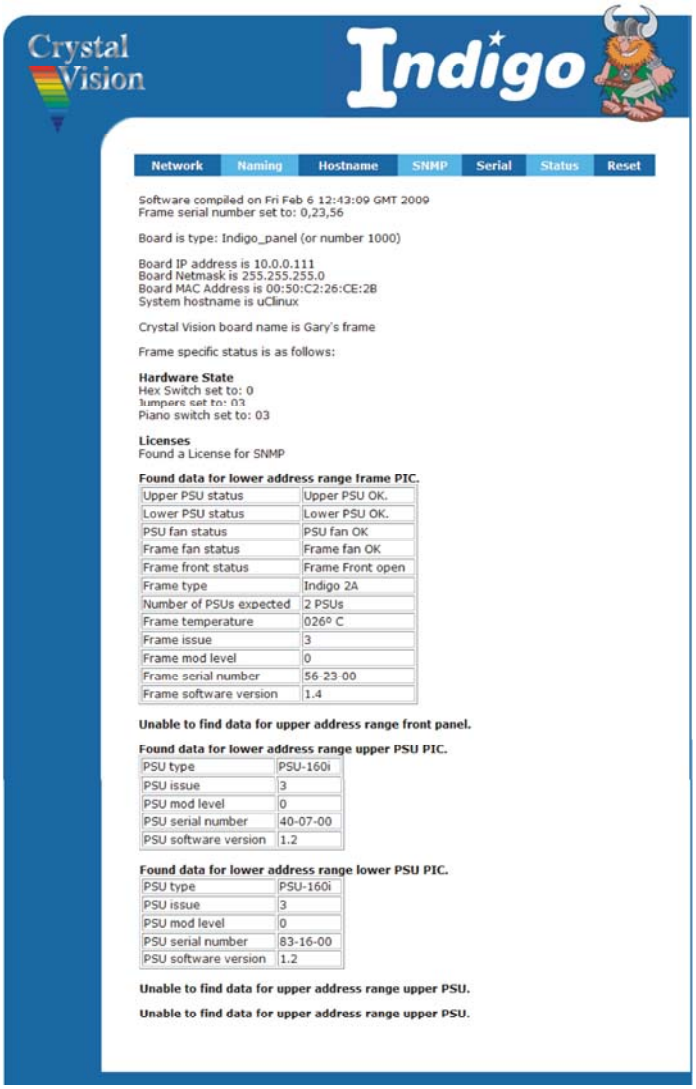
Statesman control of Indigo frames over the Ethernet

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.

To access the internal web page set the frame to the default IP address by setting the default IP address switch DIP4 to down. 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 the webpage several options are available such as changing the IP address and frame naming.

Note: Once the IP address has been changed the status page will be accessible via this new address.



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 and verify that the correct frame is being communicated with.

Status

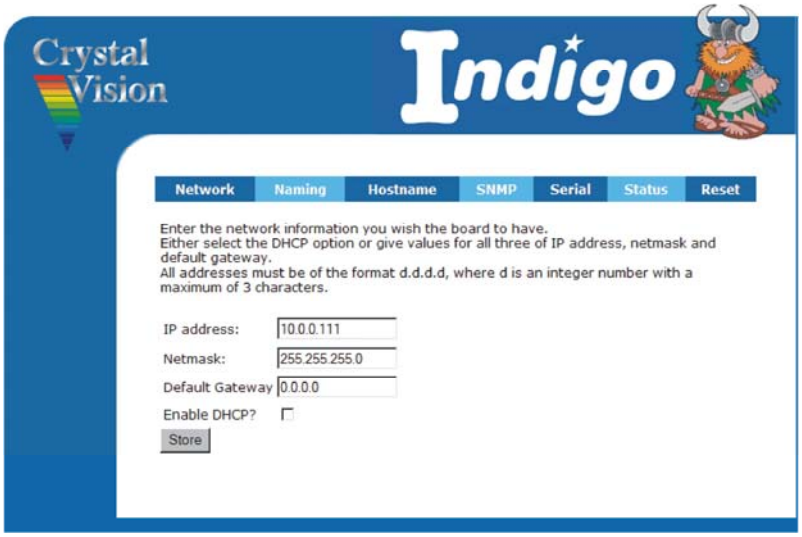
The status page gives an overview of the frame and its power supplies. The information that can be found here includes general information about the network attributes, frame name and serial number etc plus more frame specific information like internal temperature, fan status and PSU type. Further information is also given about the individual power supplies.

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.

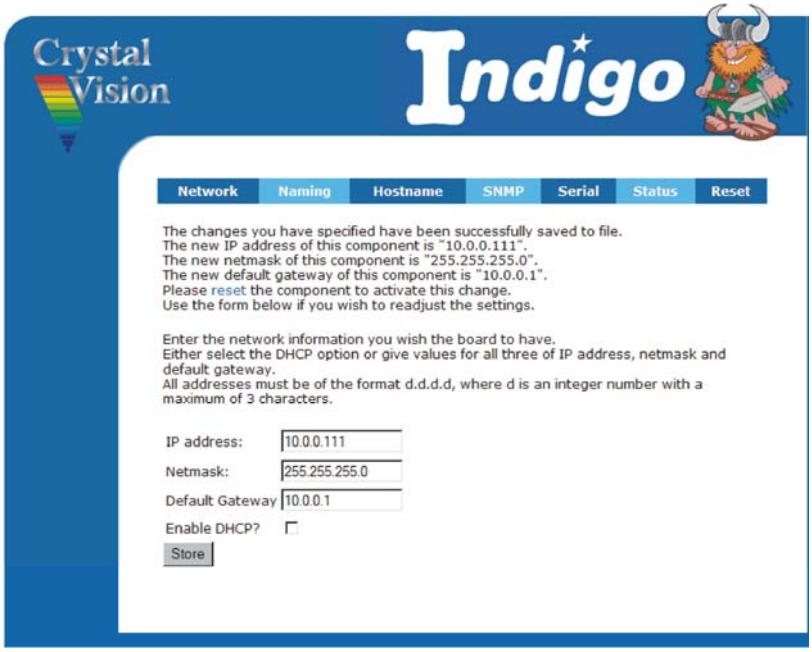
From this web page you are able then to change the IP address manually or automatically if DHCP is available. A frame serial number may also be entered.

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 four 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 is likely to result in their fracture.



Confirmation Window

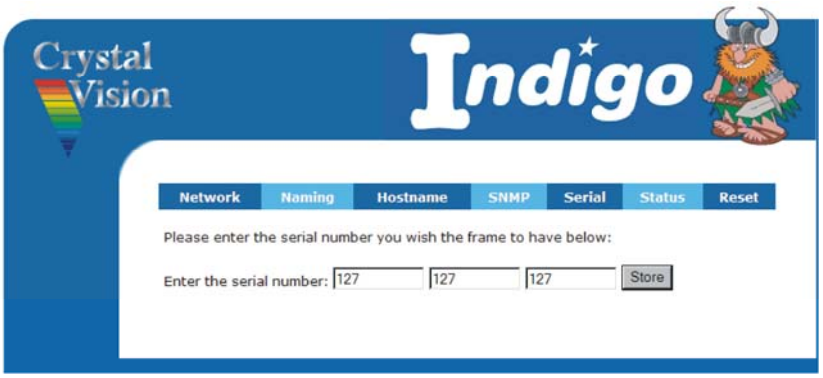
Should incorrectly formatted information be added, an error dialogue box will be displayed indicating the likely cause of the errors.

Adding a frame serial number

There is a facility 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, this will be 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.

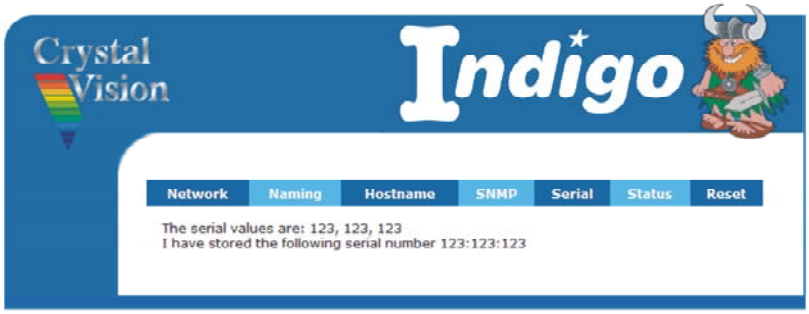


Serial number entry box

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

Naming

As well as having a discrete IP address it can be useful to give a frame its own unique name, perhaps to reflect its location. The naming tab allows this with up to 20 characters and no spaces.

Serial number successfully added

Hostname

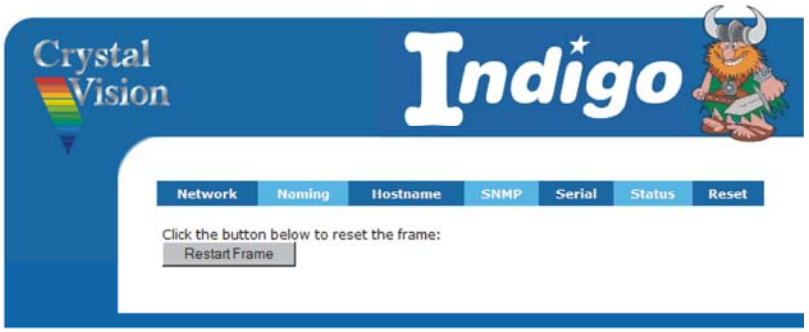
A **hostname** (occasionally also known as a **sitename**) is the unique name by which a network-attached device (which could consist of a computer, file server, network storage device, fax machine, copier, cable modem, etc.) is known on a network. The hostname is used to identify a particular host in various forms of electronic communication such as the World Wide Web, e-mail or Usenet.

The hostname tab enables such a name to be entered.

Hostname window

Reset

The reset button allows the frame front panel to be rebooted remotely, which is required when the IP address is changed.

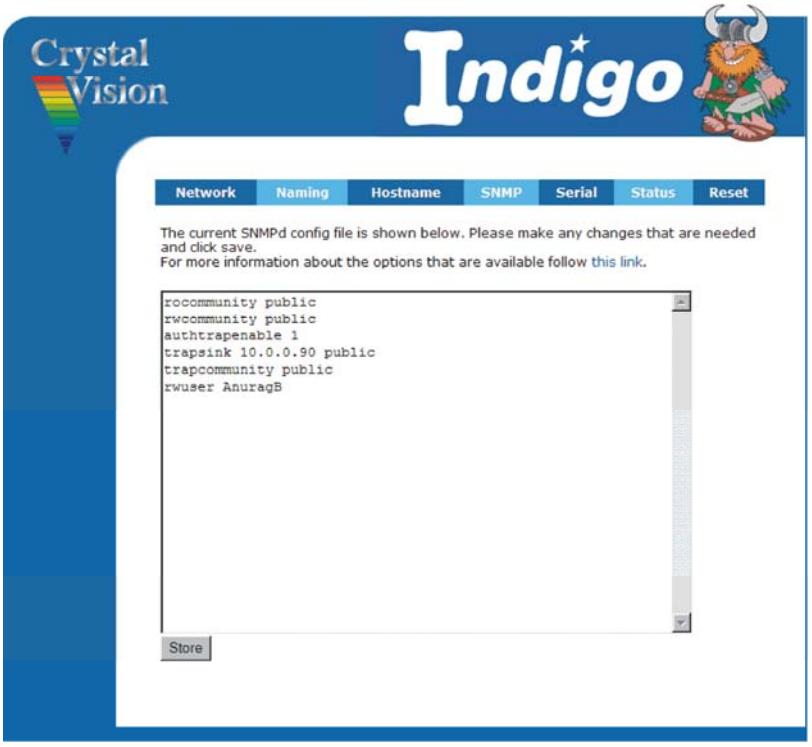


Reset window

Note: Restart only affects the front panel and not any other cards within the frame. No stored information will be lost.

SNMP

The Indigo 2SE CoolFlow front panel uses the Net-SNMP agent which uses one or more configuration files to control its operation and the management information provided. The SNMP window provides a list of these config files. An in-depth explanation can be found by following the link from the SNMP window.



SNMP window

2.7 SNMP agent

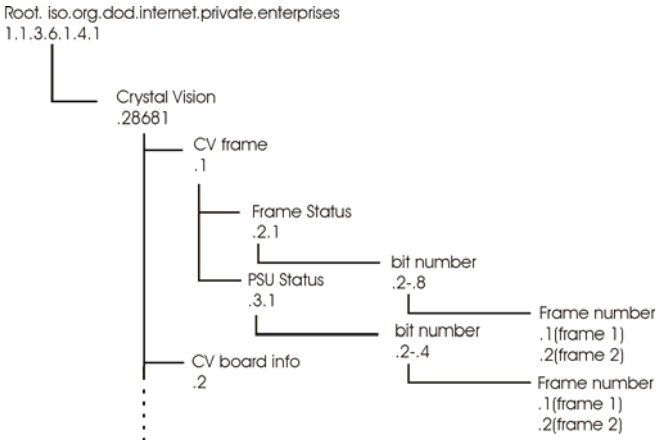
The Indigo 2SE CoolFlow frame comes with a pre-installed SNMP agent that can either report the status or generate traps on a status change of the PSU and frame systems. These SNMP traps can then be used to trigger alarms for example say when a signal has been removed, video standard changed or any of the many monitored status variables change.

Note: It will be necessary to import the frame MIB into the SNMP manager. See the manager instructions if necessary to accomplish this.

Management information base (MIB)

As is normal for an SNMP manager system each board, in this case the front panel, to be monitored has an associated MIB. Each MIB is a collection of object identifiers that identify all variables that can be read via SNMP.

The following diagram gives an overview of the OID sequences within the MIB tree.



MIB tree

Object identifiers (OID)

For each variable to be monitored there is an object identifier or OID which can be distinguished from any other OID within the MIB by its unique bit number.

As an example, the Front panel open status for the frame with slot addresses set to Lower (See section 2.4 for an explanation of slot addresses) is recorded by the OID 1.3.6.1.4.28681.**1**.2.1.**5**.**1** where 1 is the board type (Frame), the 5is the bit number (Frame open) and the final 1indicates that the frame slot addresses is set to lower. If the frame was set to upper slot addressing the OID would be 1.3.6.4.28681.**1**.2.1.5.**2**. The OID will then be accompanied by a value to indicate its status. Any status change will cause the transmitting of a trap to the SNMP manager.

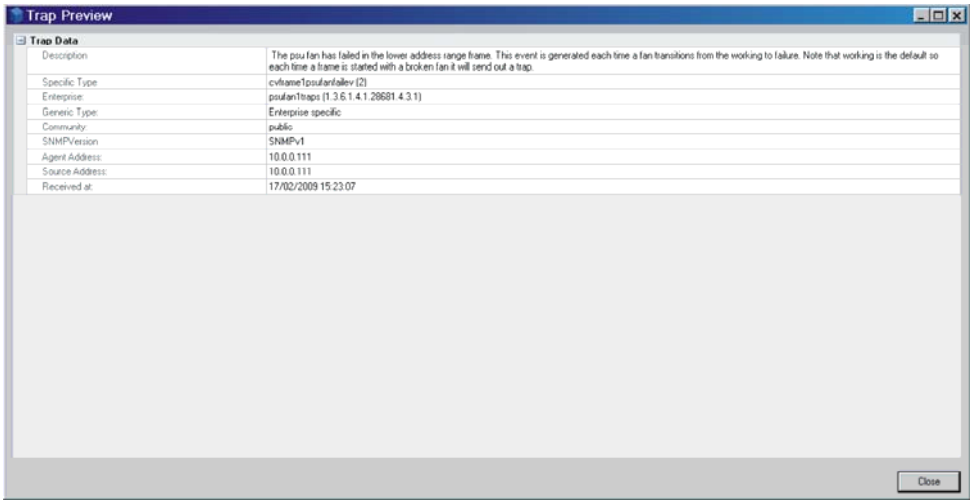
Note: The SNMP monitor allows for two frames to be connected as a frame pair. The second frame will be reported as Unknown when not present.

The frame variables monitored are;

Name	Value	Name	Value
Frame Present 1	Frame PIC found/not found	PSU Present 1	Found/not yet found
Frame Present 2	Frame PIC found/not found	PSU Present 2	Found/not yet found
Frame Type 1	Reserved/Unknown	PSU Present 3	Found/not yet found
Frame Type 2	Reserved/Unknown	PSU Present 4	Found/not yet found
Frame Temperature 1	Integer (temp)	PSU Type 1	PSU-160i/Unknown
Frame Temperature 2	Integer (0)	PSU Type 2	PSU-160i/Unknown
Frame Open 1	Front panel open/closed/unknown	PSU Type 3	PSU-160i/Unknown
Frame Open 2	Front panel open/closed/Unknown	PSU Type 4	PSU-160i/Unknown
Frame PSU Fan Status 1	PSU fan OK/problem/ Unknown	PSU Status 1	PSU OK/problem/Unknown
Frame PSU Fan Status 2	PSU fan OK/problem/ Unknown	PSU Status 2	PSU OK/problem/Unknown
Frame Panel Fan Status 1	Panel fan OK/problem/Unknown	PSU Status 3	PSU OK/problem/Unknown
Frame Panel Fan Status 2	Panel fan OK/problem/Unknown	PSU Status 4	PSU OK/problem/Unknown
Frame Temperature Alarm 1	Frame temperature OK/too high/Unknown	Expected but not fitted PSU	PSU not fitted or not powered
Frame Temperature Alarm 2	Frame temperature OK/too high/Unknown		

Traps

Whenever a status value changes a trap will be sent to the SNMP manager. By interrogating this trap it is possible to indentify the status change and its consequences. It will be quite common for multiple traps to be sent for any one incident. E.g. removing an input may typically trigger eight traps, it will then be down to the SNMP manager to sort these into a hierarchical order or mask as necessary.

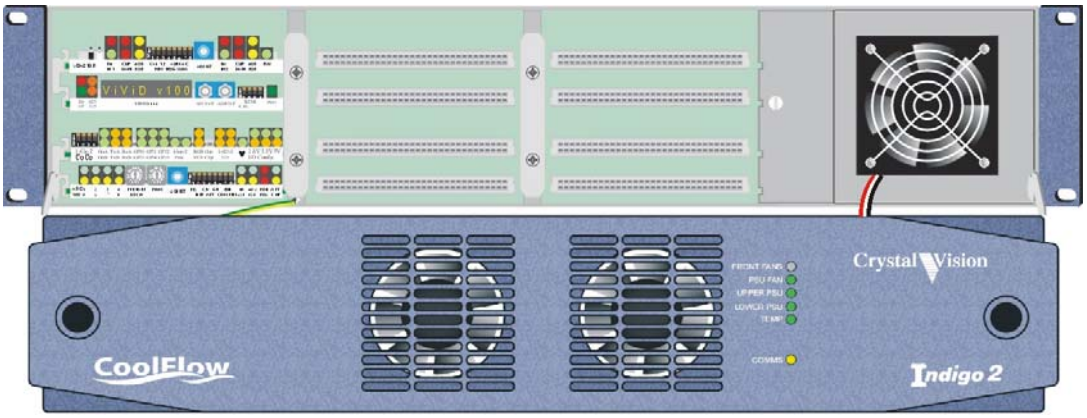


Example of a trap received by the SNMP manager

2.8 Installing Crystal Vision modules

The Indigo 2 CoolFlow frames each have 12 slots for Crystal Vision video or audio 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 knobs, one on each side of the front panel.

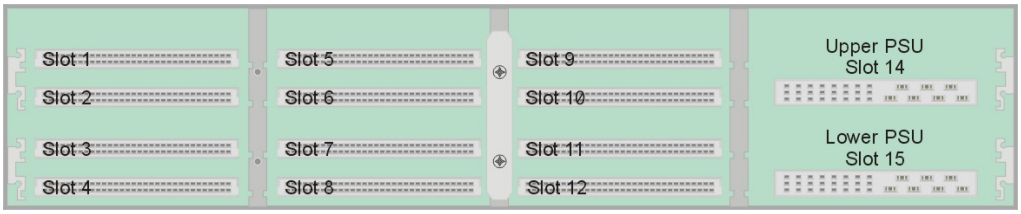


The Indigo 2CoolFlow frame with front control panel open

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 12 as shown below:



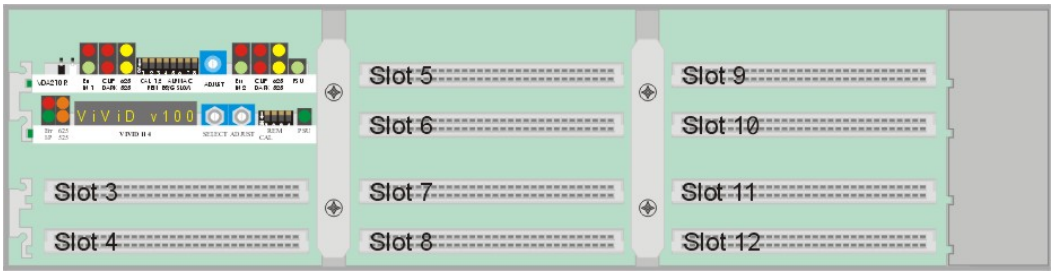
The Indigo 2 frame showing slot numbers (and left hand retaining bracket removed)

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 2 frame with two modules fitted in slots 1 and 2

Removing modules

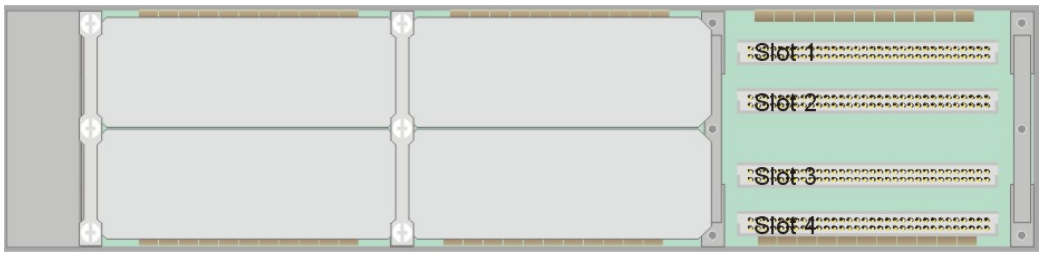
To remove single modules simply pull on the handle and withdraw them from the frame, with the retaining brackets removed.

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 2 frame rear view with EMC covers removed for slots 1 to 4

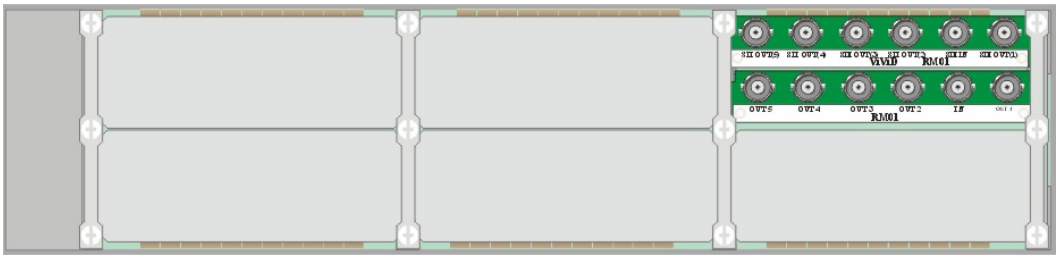
The rear modules are held in place by a retaining bar at each side. These run the height of the frame and provide mechanical support as well as ensuring EMC compliance.

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

Fitting rear connectors

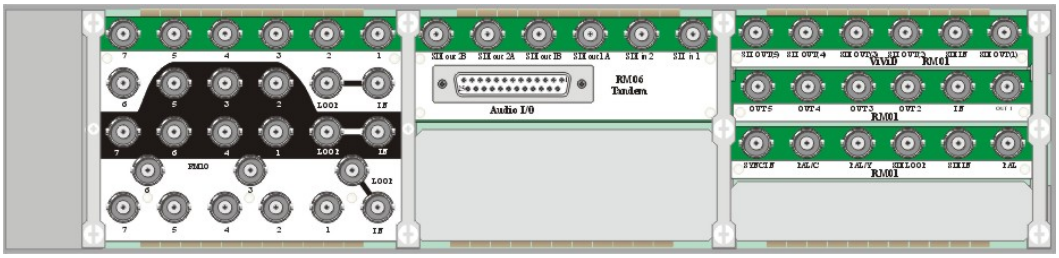
To fit a rear connector, proceed as follows:

- 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 2 CoolFlow 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.



The Indigo 2 CoolFlow 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.**

2.9 Indigo power supplies

The Indigo 2 CoolFlow frame is supplied with the 160W rated PSU-160i. It is possible to use the older PSU-75i and PSU-150i but it is preferred that these are not mixed in any one frame.

PSU-160i - top view

Note: Care should be taken if mixing power supply types. It is not recommended to combine the PSU-75i with anything other than a second PSU-75i. The Indigo power supply modules are **not** compatible with similar PSUs used in FR2AV and FR1AV frames.

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 UPPER PSU LED and LOWER PSU LED of the status of one or both power supplies.

A faulty condition is indicated when the corresponding LED is red and a normal condition when it is green/yellow. If only one PSU is fitted the corresponding LED will be un-lit.

The status of the PSUs can also be investigated using the Indigo Remind control panel and Statesman PC control.

Configuring PSUs

If a power supply is not fitted in either the upper or lower slots, the position of the two-position slide switch on the top right of the front panel PCB must be set to one.

Indigo 2 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.

Select the cooling mode

With the front panel closed both front panel fans will be functioning and the PSU fan will be idle. When the front panel is opened the front panel fans will be switched off and the frame cooling will be maintained by the PSU fan which will have been activated by the front panel being opened.

There are two cooling modes that can be selected using a switch at the rear of the control panel.

Indigo 2 CoolFlow front panel hardware settings – cooling mode

The two modes are normal (auto) and maximum cooling.

Switch one of the four-position DIL switch controls the two cooling modes as follows:

Levers 1	Function	Notes
1 up	Normal (auto) cooling	Both fans run continuously increasing in speed as the temperature inside the frame goes up. When the frame temperature is below approximately 30°C the panel fans run at minimum speed. If the frame temperature goes above 30°C the fan speed will increase to maintain adequate cooling.
1 down	Max cooling mode	In Maximum cooling mode both front panel fans run at maximum speed. This mode is ideal for equipment bays where noise is not a concern.

Note: Auto 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.

3 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.

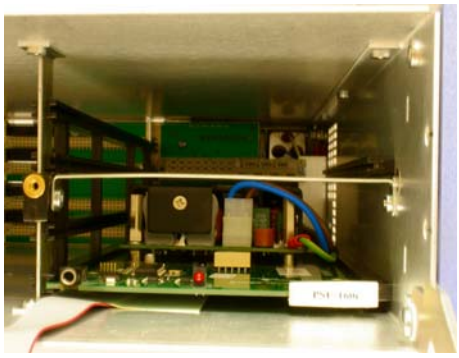
To gain access to the Indigo PSUs proceed as follows:

- Pull down the front panel using the black knobs at either side of the panel
- Unplug the wiring to the front panel PCB
- Release the captive screw to the left of the PSU fan. It will be necessary to use a screw driver
- Remove the fan assembly by unclipping the right side from the frame and pull away

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

Once the fan assembly has been unplugged from the front panel the front panel PSU FAN LED will change from green to red. The alarm relay will also be set to the alarm condition.

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.

The error LED will light up continuously if power rail levels are outside operational limits or in the presence of a second fitted PSU-160i the power supply is unpowered or has failed.

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: The power supply does not contain any serviceable parts.

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 any second 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: 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 replace 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
- Take care not to damage the panel ribbon cable
- Tighten the captive screw to the left of the PSU fan
- Connect to the plug on the front panel PCB
- 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 performed whilst the frame is powered, to prevent overheating.

Tip: Close the front panel once 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
- 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
- Replace the PSU fan assembly as shown in the preceding section
- Plug in the 3-way connector from the new fan to the front panel PCB
- 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. Once the front panel is closed the PSU fan will stop rotating and the PSU FAN LED will be unlit.

Front panel PCB showing PSU fan connector

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 3 wires on the fan from the front panel PCB
- Using a screwdriver remove the four screws that hold the fan and fan's finger guard to the front panel
- Remove the fan and finger guard completely
- Replace the fan with a Crystal Vision supplied replacement part to ensure adequate cooling and continued fire protection. Be sure to fit the finger guards on the outer side of the fan
- Reconnect the 3-way connector which is attached to the front panel PCB.
- 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.

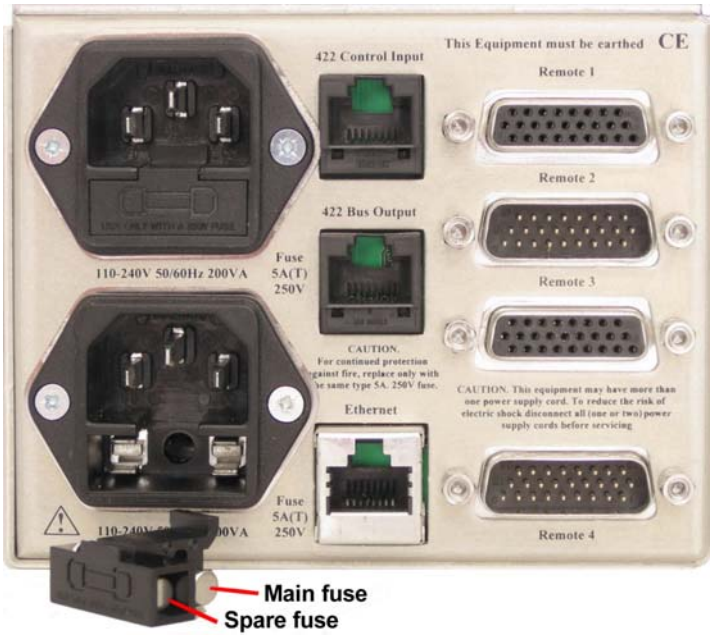
Front panel fan showing 3-pin connector and finger guard

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.

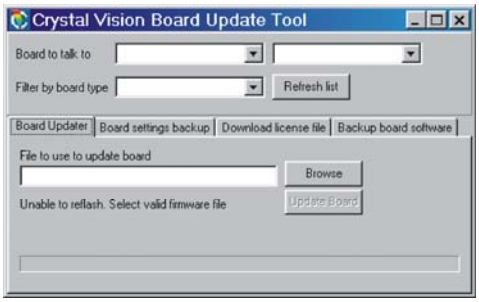
Note: Replace the fuse only with one of the same type and rating (5A, 250V time delay).

Software upgrades

From time to time software updates will be available to add additional functionality to the active front panel Indigo 2SE CoolFlow frame. The software updater is available from Crystal Vision customer support or as a download from www.crystalvision.tv.

Once the updater software “cv_reflasher.exe” is on your pc double click it to run.

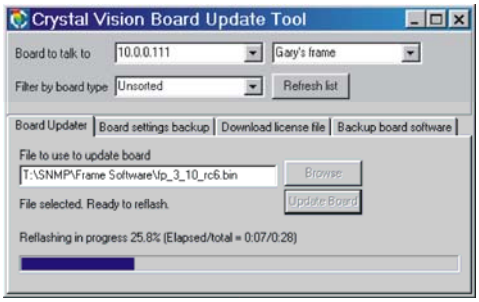
The following popup box will appear.



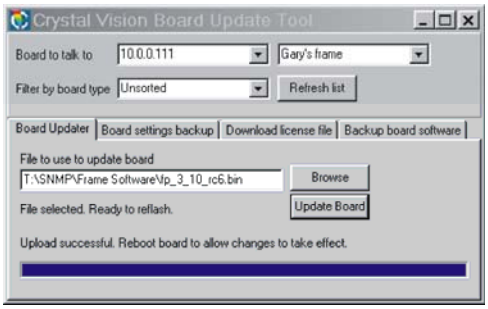
Note: This is a generic tool used for updating both cards and frames.

Click “Refresh list” button and wait whilst the network is scanned. Once done then select the frame for upgrading from the “Board to talk to” drop-down list by IP address or name.

If not already selected, select the Board Updater tab and click on the Browse button. Navigate to the folder containing the new software. Click “Update Board” and wait.



Once the download is complete the updater will confirm that the update was successful.



It will now be necessary to reboot the frame. This can be achieved by cycling the mains supply to the frame or if not convenient carefully remove the ribbon cable connector from the front panel PCB.

Note: Take great care when reinserting the front panel ribbon cable that none of the pins in the PCB connector become bent or misaligned.

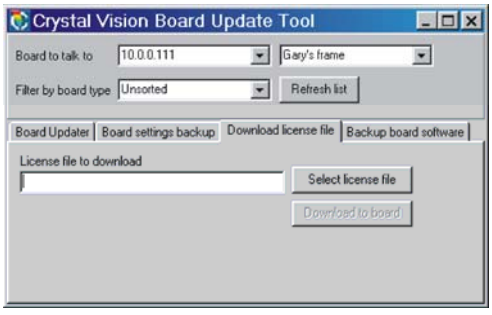
Downloading licenses

The Indigo 2SE CoolFlow frame is pre-installed with an SNMP manager which will require a license to be downloaded and installed. The license is available by email from Crystal Vision's customer support. To obtain a license the frame's MAC address will be required.

Once you have obtained the licence, the file is downloaded to the frame using the board update tool.

Click the "Refresh list" button and wait whilst the network is scanned. Once done then select the frame for upgrading from the "Board to talk to" drop-down list by IP address or name.

Select the "Download license file" tab and click on the Browse button. Navigate to the folder containing the License file. Click "Download to Board" and wait.



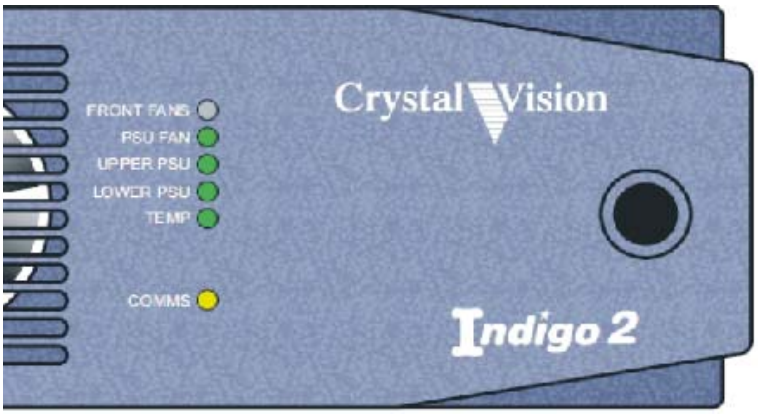
It will now be necessary to reboot the frame. This can be achieved by cycling the mains supply to the frame or if not convenient carefully remove the ribbon cable connector from the front panel PCB.

Note: Take great care when reinserting the front panel ribbon cable that none of the pins in the PCB connector become bent or misaligned.

4 Trouble shooting

Reading front panel LED status

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 2 CoolFlow LEDs

The following LED status indications may be seen:

LED	Colour	Notes
Front Fan	Unlit	Door open
	Green	Normal operation
	Red	Change the panel fan
PSU Fan	Unlit	Door closed and fan idle
	Green	Door open and fan operational
	Red	Change PSU fan
Upper PSU	Unlit	No upper PSU detected
	Green	Normal operation
	Red	Change upper PSU
Lower PSU	Unlit	No lower PSU detected
	Green	Normal operation
	Red	Change lower PSU
Temp	Green	Normal operation
	Red	Internal temperature too high (approx 65°C)
Comms	Unlit	Press Device in Statesman mode for comms status
	Flash amber	

If a PSU is not fitted, the corresponding LED will not illuminate unless the incorrect number of PSUs are selected when it will flash red.

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.

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 2 and Remote 4 connectors. These contacts can be used to operate external indicators as desired.

Please refer to the Connector pinout 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 two PSUs the frame will control both relays simultaneously.

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 PSU will flash repeatedly (on for one second and off for one second). The same red LED will light up continuously if levels of the power rails (+5.75V or -6.0V) are outside operational limits. Refer to section 4 for further details.

Frequently asked questions

Why are there no LEDs illuminated?

Check that at least one frame PSU is functioning

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

Check that the panel is cabled correctly

What should I do if the TEMP LED is red?

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 both front control panel fans are plugged in correctly

Try replacing the fans

What should I do if the UPPER or LOWER PSU LED is red?

Check that the mains cord is connected to the PSU indicating the fault

Try replacing the appropriate PSU

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

This will occur if two PSUs are 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.

How do I check RS422 comms status?

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 and/or two-panel link serial communication failed?

Check that the appropriate cabling is connected correctly and is intact

Can both panels in a frame pair have active (or Statesman) panels?

No, only one frame in a frame pair can have an active front panel

Why does a custom card name change to the default name when I plug in a card of the same type?

A custom name is only retained if a card is plugged in to a slot that had held a custom named card of exactly the same type and version

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

5 Appendix

5.1 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	1.01to 1.12 (upper half)	2.01 to 2.12 (lower half)
Modules in 2U frames	1.02to 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	2.00
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 the front panel processor detects a card 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 frame the node address is calculated as follows:

- slot number minus 1 – giving a range of 0 - 11 in frame 1 and 16 - 27 in frame 2

Note: Please refer to the FR1/2 Frame Manual for further information about node addresses.

5.2 SNMP Quick Start Guide

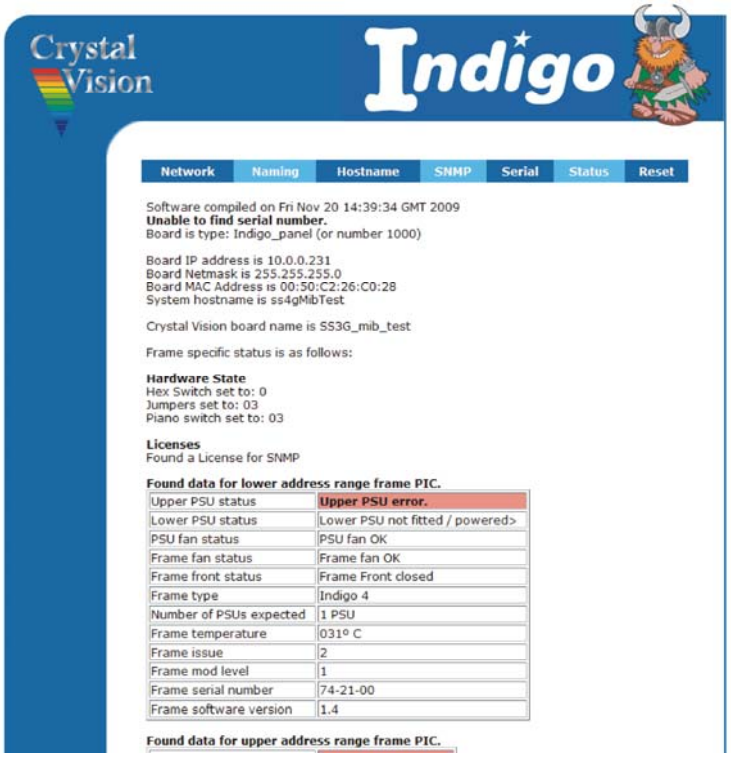
Introduction

This should provide the information you need to set up and check a Crystal Vision frame for operation with an SNMP manager.

Frame Setup

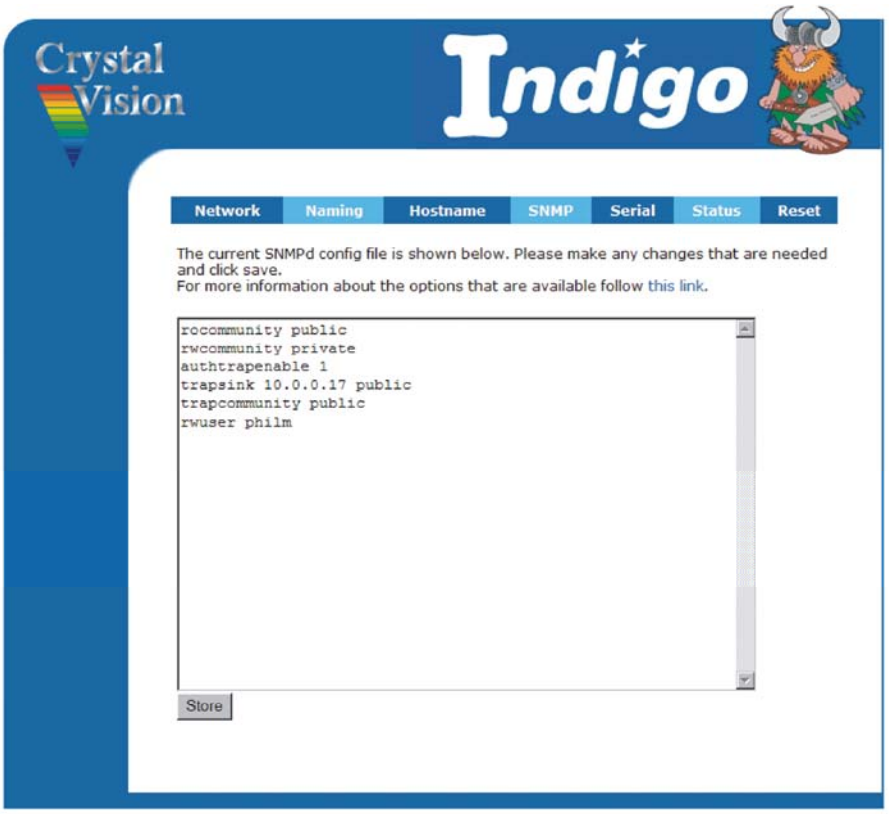
The frame must have a license for SNMP operation for it to respond properly to SNMP requests. This can be checked by looking at the frame web page. Look at the frame IP address using a web browser. You should see a page like this:

If you click as indicated, you should go to the frame home page. This may happen automatically.



Check that the ‘Licenses’ section shows “Found a License for SNMP”. If no licence is found contact Crystal Vision to get an SNMP license for this frame.

Once the frame is licensed for SNMP you will need to set the address that you want it to send unprompted SNMP messages (traps) to. On the web page shown above, select the ‘SNMP’ tab.

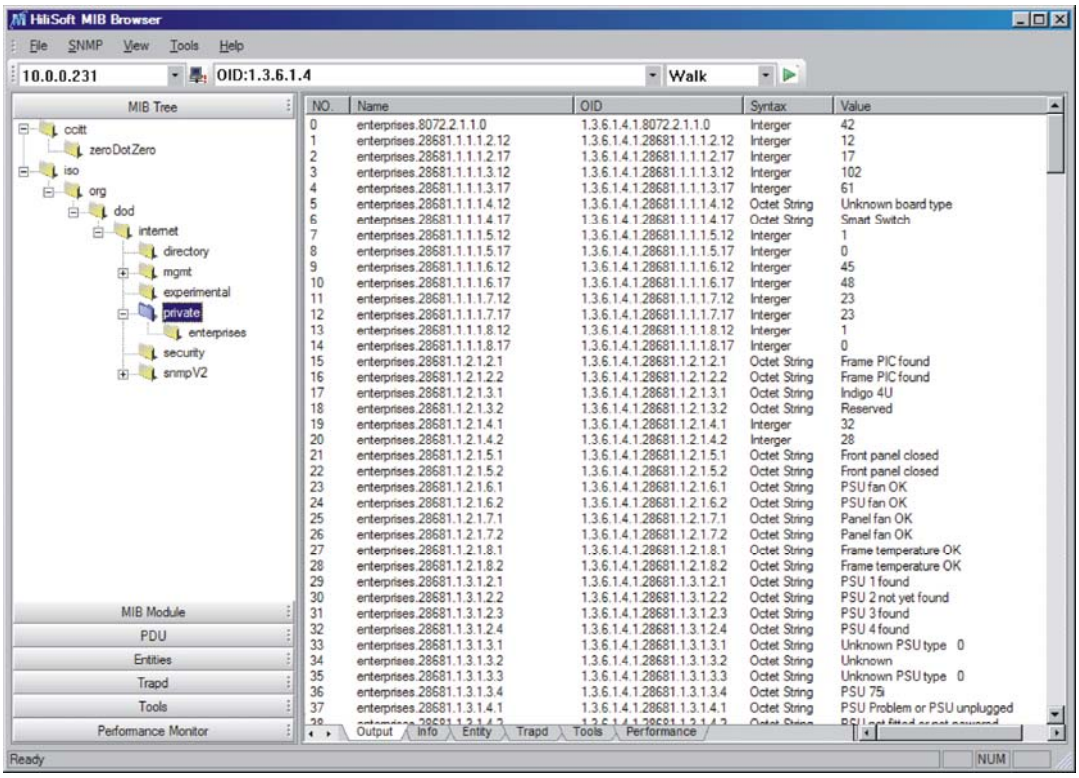


The SNMP Agent in the frame is highly configurable. However, the default settings are correct for most systems and it is likely that only the ‘trapsink’ address needs to be changed. Click and drag to select the trapsink IP address and type in the IP address of the SNMP manager being used as the trap receiver. Then click on the ‘Store’ button to write the new value into the frame. This will take a few seconds. You will then need to re-boot the frame (as described in the "Resetting the Frame" below) for the setting to take effect.

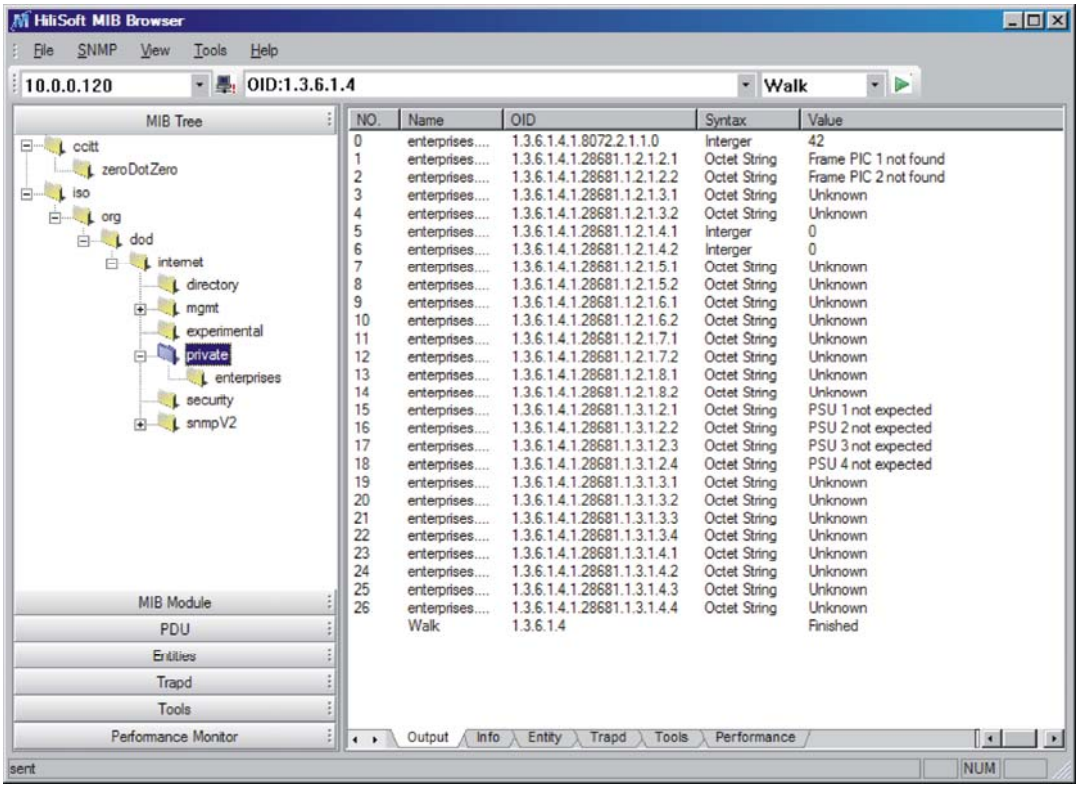
Checking

The frame should now be ready for SNMP operation. You can check this by setting a SNMP Manager, or MIB browser, to the frame IP address and performing an SNMP walk of the ‘private’ section of the Object ID tree.

See below for a screen shot of a successful walk; in this case of a 4U frame containing two boards.



If you do not see something similar to this, then the frame may need to be reset to activate the SNMP license. The frame will report the presence of the license even if it has not been activated by a reset. The same walk of an unlicensed frame gives the results below.



Resetting the Frame

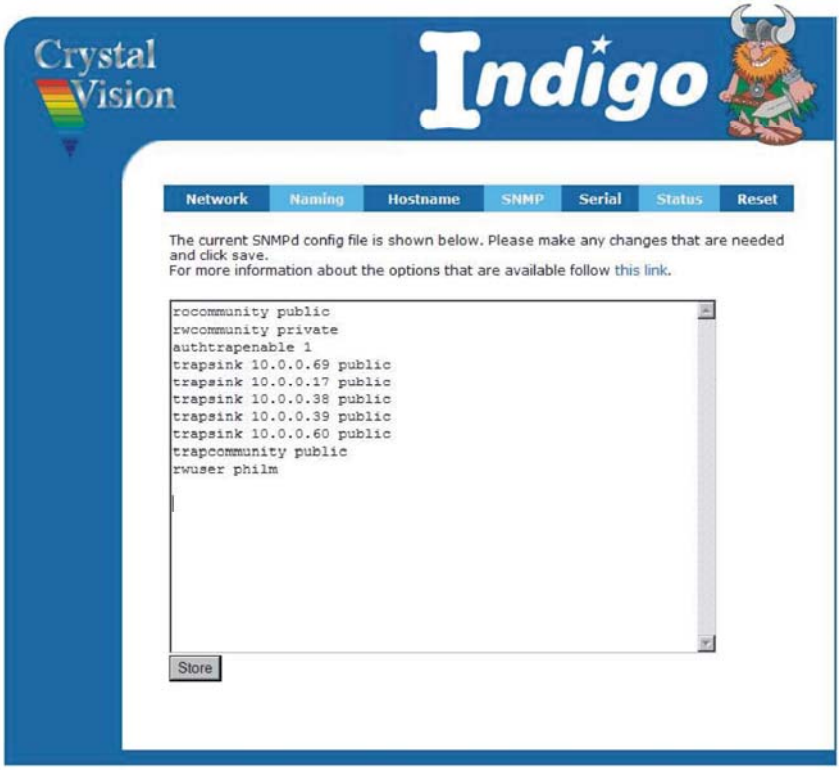
The frame can be reset from the web page. From the home page select the 'Reset' tab.

Click on the button to restart the frame. Note that if the frame has been set to DHCP it may come back at a different IP address.

The frame should now be set up to respond to SNMP requests and send traps to the desired IP address.

Sending traps to multiple addresses

To send traps to multiple addresses, define multiple trapsinks in the config file.



6 Specification

Indigo 2U frame

General

Dimensions:	482mm wide (19 inches), 89mm high (2U), 425mm deep. Weight 5 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 two plug-in power supplies (160 Watt PSU-160i)

Module control

Remote options:	Six control lines per module. Assigned on module (e.g. 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)
	For shared control, frame address selectable on front panel for first or second frame in a pair
	Second serial port available for Statesman control (connection via 26-pin high density D-Type connector and RJ45 connector)
	Ethernet control capable
	SNMP control and monitoring option
	Statesman and active frame can control a second passive frame
	One or two passive frames can be controlled via a remote active panel